Developing Seattle's Unreinforced Masonry Program

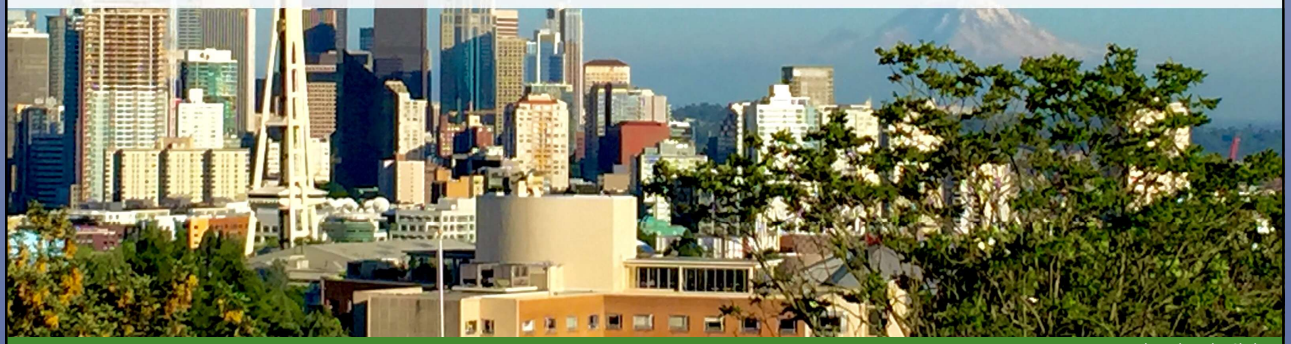


Photo by John Skelton

Seattle Department of
Construction and Inspections

January 2023

SEATTLE FIRE- 1889

The day after the fire, the Mayor called together all 600 downtown businessmen for a city meeting. They passed an ordinance that all buildings and sidewalks constructed in Seattle had to be built of fireproof materials. Thus began Seattle's love affair with brick.

1933 M 6.4 LONG BEACH CALIFORNIA


Terror-Stricken City Emerging From Frightful Experience

LONG BEACH SUN

53 DIE, 1000 HURT AS EARTHQUAKE SPREADS DESTRUCTION IN LONG BEACH

Downtown Long Beach, Once Stately Seaside Community, Transformed By Earth Shock

Buildings Appear "Shaky" After Streets Mass Of Debris; Thousands Frantically Rush To Safer Areas

AS TEMBLOR LEFT HEAVY TOLL OF DEATH AND DAMAGE

Scores Perish In Other Southland Communities As Buildings Crumble

115-120 Fatalities
Destroyed 70 Schools
Seriously Damaged 120
$40M Property Damage→ $837M

EARTHQUAKE LEGISLATION- 1933

Field Act
(1 month post-quake)

Riley Act

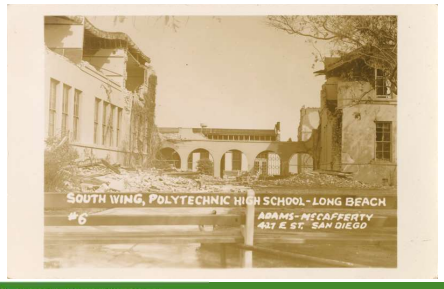
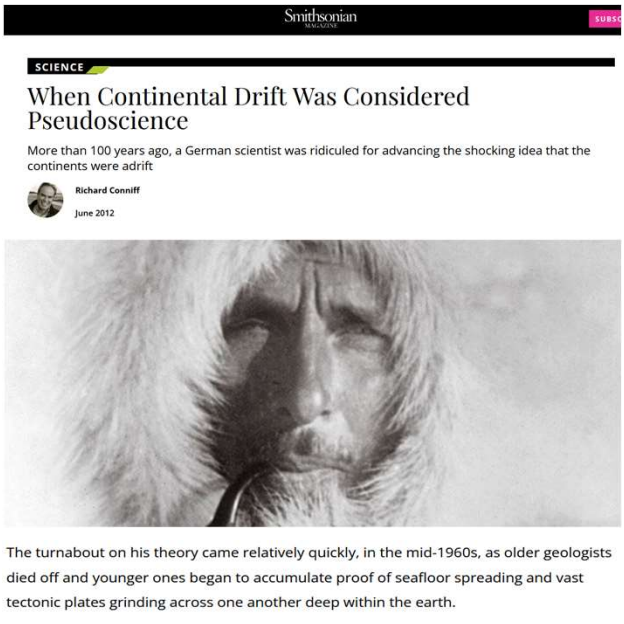


Plate Tectonics

- Not widely accepted until the mid-60s
- Seismic Design of buildings mostly non-existent until the 70's.



Smithsonian MAGAZINE

SCIENCE

When Continental Drift Was Considered Pseudoscience

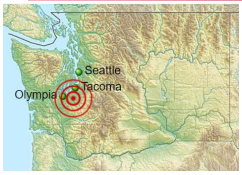
More than 100 years ago, a German scientist was ridiculed for advancing the shocking idea that the continents were adrift

Richard Conniff

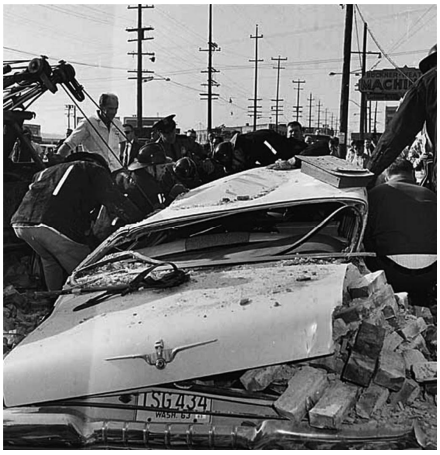
June 2012

The turnabout on his theory came relatively quickly, in the mid-1960s, as older geologists died off and younger ones began to accumulate proof of seafloor spreading and vast tectonic plates grinding across one another deep within the earth.

1949 M6.8- M7.0 EARTHQUAKE



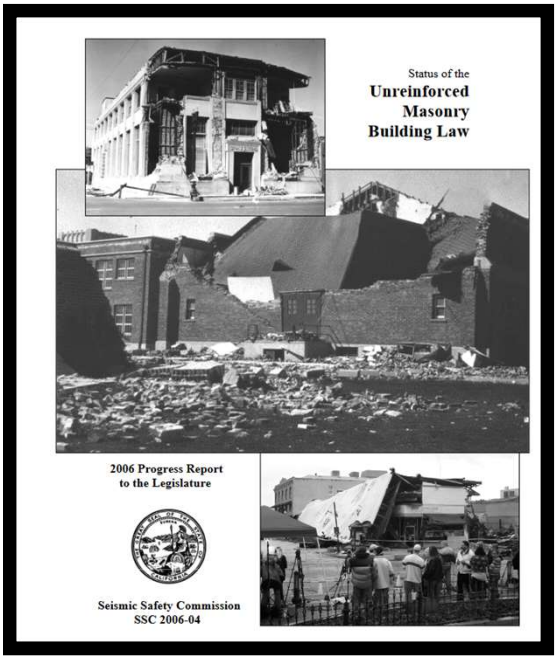
1965 M6.5-6.7 EARTHQUAKE



California Legislation

State URM Law 1986

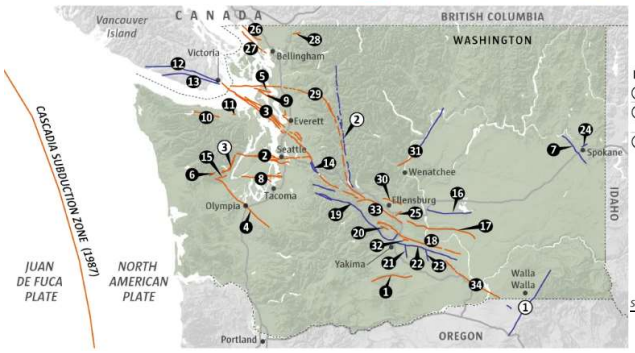
Required local governments in high seismic zones to develop an inventory for URM Buildings and establish a loss-reduction program.



SEATTLE'S EARTHQUAKE HAZARDS

Earthquake faults of the region

Since the late 1980s, geologists have discovered evidence of active quake threats on more than two dozen faults across Washington.



PRE-1980 FAULTS

1. Hite 1940s
2. Straight Creek '50s
3. Saddle Mountain '79

FAULTS SINCE 1980

1	Mill Creek '81	13	Leech River '08	25	Boylston Ridge '13
2	Seattle '92	14	Rattlesnake Mt. '09	26	Birch Bay '12
3	Southern Whidbey Island '96	15	Frigid Creek '09	27	Sandy Point '12
4	Olympia '01	16	Frenchman Hills '11	28	Boulder Creek '13
5	Strawberry Point '01	17	Saddle Mountain '11	29	Darrington-Devil's Mt. '14
6	Canyon River '01	18	Umtanum '11	30	Reecer Creek '14
7	Latah '01	19	Naches-White River '11	31	Spencer Canyon '15
8	Tacoma '04	20	Wenas Valley '11	32	Burbank '15
9	Utsalady Point '04	21	Coyote Spring '11	33	Manastash Ridge '16
10	Lake Creek/Boundary Creek '07	22	Yakima Ridge '11	34	Walula fault '16
11	Sequim '07	23	Artesian '11		
12	San Juan Fault '08	24	Spokane fault '13		

Source: U.S. Geological Survey

Reporting by SANDI DOUGHTON, Map by MARK NOWLIN / THE SEATTLE TIMES

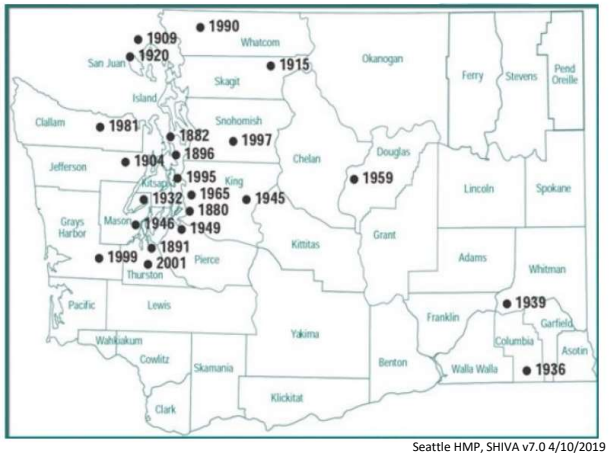
HISTORY OF SEATTLE'S URM WOR

- **2001**
  - Nisqually Earthquake
- **2007**
  - Seismic Hazard Report for Seattle (Reid Middleton)
- **2008**
  - Development of URM Technical and Policy Committee
- **2012**
  - Proposed Retrofit Standard
- **2016**
  - Finished validating URM Inventory list
  - Notified building owners
- **2017**
  - URM Policy Committee Recommendations
- **2018**
  - ASAP! Working Groups
  - National Development Council Report on cost, financing, and funding
- **2019**
  - ASAP! Working Groups
- **2020**
  - State established C-PACER Program
- **2021**
  - Resolution 32033 established URM program goals
  - Updating of Technical standard
- **2022**
  - URM Proclamation
  - SDCI hires URM Program Manager
  - Updating of Technical Standard

Nisqually 2001 | Sichuan China 2008 | Chile 2010 | Haiti 2010 | Tohoku Japan 2011 | Christchurch NZ 2011 | Napa 2014 | Chiapas Mexico 2017 | Magna Utah 2020 | Turkey/Syria 2023

EARTHQUAKES: NOT IF, BUT WHEN

Figure 5-3. Major earthquakes in Washington since 1880



Seattle HMP, SHIVA v7.0 4/10/2019

2016 Building Inventory & Notification

City of Seattle
Edward B. Murray, Mayor

Department of Construction and Inspections
Nathan Torgelson, Director

March 31, 2016

Proposal: Unreinforced Masonry Building Retrofit Program
Reference: Parcel Identification Number 8804900935
URM Building Address 516 E Union St

As part of the City's continual effort to be better prepared for emergencies such as an earthquake, the Seattle Department of Construction and Inspections (Seattle DCI) (the former Department of Planning and Development (DPD)) has been working with a policy advisory committee to develop a program that could require building owners to seismically retrofit buildings with unreinforced masonry (URM) bearing walls. These are the buildings that are most vulnerable to damage and collapse during earthquakes. The City's goal is to reduce the risk of collapse of URMs without resulting in demolition or abandonment of buildings.

You are receiving this letter because a building you own (see reference above) has been identified as a URM building that may be affected by new regulations developed to implement the policy. The policy has been under development for several years and is not complete, but once it is implemented, the URM retrofit program would be phased in over a period of years so no immediate action on your part is required at this time. This letter is notification of the continuing policy development.

In response to a Public Disclosure Request, Seattle DCI is about to release an updated list of URM building addresses, which includes your building. Washington State's Public Disclosure Act requires that the City promptly release records unless the records are specifically exempted from disclosure. As a person affected by the request, however, you have the legal right under RCW 42.56.540 to bring a legal action to enjoin the release of any records you believe may not be subject to disclosure. The City will make the requested records available on or about April 20, 2016, unless you have obtained and served the City with a court injunction prohibiting disclosure.

Seattle DCI has been working on updating the list of URMs for several years. Since April 2015, a structural engineer has been validating the list by reviewing photographs of the buildings, visiting selected buildings to view the exterior construction details, and reviewing permit records, as well as consulting other documents to determine if each building on the list has a strong probability of being a URM. The list that Seattle DCI has compiled is intended to be a nearly complete list of URM buildings. However, even if a building is not on the list, it would be subject to the new policy if it is found to have URM bearing walls. Buildings retrofitted in the past may or may not meet the seismic retrofit standard adopted in the future. The extent of retrofit that would be required by a future ordinance would be determined on a case by case

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City of Seattle, Department of Construction and Inspections
700 Fifth Avenue, Suite 2000
P.O. Box 34019, Seattle, WA 98124-4019
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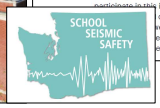

Topic 2023 Multi-Hazard Inventory Workshop

Description FEMA Region 9's Planning and Implementation Division will host its second Multi-Hazard Inventory Workshop Jan. 10-12. Our planning committee—composed of local, state, and federal agency partners—hand-picked you to participate in this interactive workshop. The workshop will continue last year's dive further into inventory types, uses, and management ere unable to attend last year's workshop, not to worry! The ed to build on each day's presentations and discussion, so we ers to participate and share their knowledge.

Seattle Legislation Past

Pioneer Square property will have to be fixed—not torn down

1973 business over $1 billion

Washington Mutual biggest mortgage lender

As evidence of the peril mounted, Seattle's City Council focused on the cluster of old brick buildings in Pioneer Square. The day after Christmas in 1973, the council approved minimum seismic standards. It planned to expand the requirements to the Chinatown-International District, Belltown and Columbia City.

That never happened. Building owners balked at paying for the retrofits. The council repealed the requirement in 1978.

12/26/1973

05/01/1978

The Seattle Times

Seattle Department of Construction & Inspections

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Politics: Costs, Displacements, Preservation

Fixing Seattle's most seismically dangerous buildings is politically dicey. Doing a retrofit can disrupt businesses and displace tenants. The expensive work can raise the cost of rent in buildings that are often more affordable, while officials confront a spike in homelessness.

The Seattle Times

Buildings that kill: The earthquake danger lawmakers have ignored for decades

If forced to retrofit, Bennett said he would have to raise rents to cover the cost, which could drive out the artists and entrepreneurs that give Georgetown its funky charm.

He believes the Horton is solidly built. But like much of Georgetown, the building rests on soil so loose it can liquefy when shaken in an earthquake. The risk is so high no one will sell him earthquake insurance, Bennett said.

"There's no doubt that if my buildings were seismically retrofitted, that it would be better," he said in an interview. "I just wonder at what price."

He leases commercial space for as little as $1.50 a square foot per month, compared to monthly rents of $2 to $6 per square foot in other parts of Seattle. Upstairs, tenants can rent a studio with a shared bathroom for $350 a month.

"Here is my main thing," he said. "I want to keep Georgetown affordable."

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Public Safety & Historic Preservation

"We don't want to end up like some California cities where they ended up demolishing buildings instead of having them retrofitted,"

The Seattle Times

Portland

Portland NAACP, others rally, demanding city rescind earthquake warning sign ordinance

Updated: Jan. 05, 2019, 1:00 p.m. | Published: Jan. 05, 2019, 12:10 p.m.

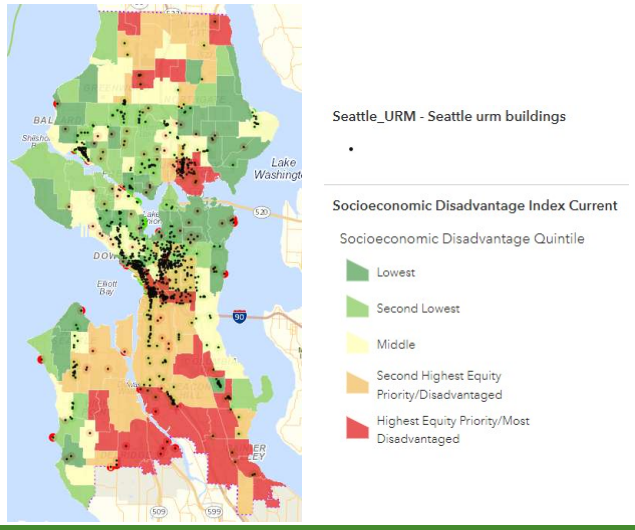
NAACP gathers at City Hall to demand city rescind earthquake warning sign ordinance

Importance of Stakeholder Engagement

- Build Trust
- Transparency
- Increase Awareness and Understanding
- Build support for adoption
  - Implementation is the metric

Identification of External Stakeholders

- Building Owners
  - Developers
  - Family-Owned
- Building Occupants:
  - Renters & Advocacy Groups
    - RSJI Factors
  - Office workers
  - Public Gathering
    - Government Buildings
    - Theaters
    - Schools
- Public Passersby



Identification of Internal Stakeholders

- Elected Officials:
  - City Council & Election Cycles
  - Mayoral Election Cycles
- City Departments
  - Budget
  - Finance
  - Planning
  - Engineers
  - Housing
  - Neighborhoods
  - Sustainability and Environment

Working Groups

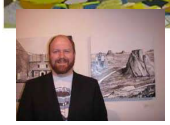
- Communications
- Technical Standard Briefings
- Building Owner & Tenant Needs
- Funding

Communications:

- Federal Support:
  - FLASH
  - CERC
  - CTP
  - BRIC/HMGP
  - NEHRP

- Technical Influencers
  - WABO
  - SEAW
  - Simpson Strong Tie
  - Plan/Permit Reviewers
- Social Influencers
  - Lucy Jones
  - PNSN
  - The Science Center
  - Artists- Glass Blowers, Geologic, Office of Arts and Culture
- Political Influencers
  - Design/Build
    - ASAP
  - Council
  - Public

Secrets of Seattle Geology – Unlike many regions in the country, the Seattle area is constantly reminded of its geologic past, present, and future. Whether it is our landslides, our glacier-carved topography, or our three major earthquake zones, this area's geologic history is young, dynamic, and accessible. In this talk, I will explain why we can blame California for some of our geo hazards, how coal influenced our economic development, and why its harder to travel east/west than north/south.



Technical Standard Briefings

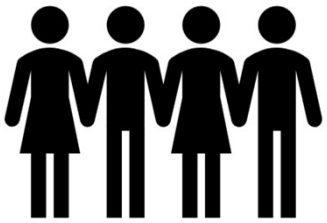
- Life Safety Standard
  - Alternate Method ("Bolts Plus")
  - Substantial Alterations
- Code Trigger Concerns
  - Accessibility
  - Fire Codes
  - Energy Efficiency
- Past Retrofits
- Timelines & Compliance
  - Critical Risk, High Risk, Medium Risk
    - RSJI? Pedestrian?
- Opportunities for increased resilience
  - Braced Frame
  - Energy Upgrades/Decarbonization Efforts

The Belmont Apartments building on Capitol Hill is one of at least 223 unreinforced-brick buildings with residential units that haven't been strengthened. The company that owns it set aside money for a seismic upgrade several years ago but the city wouldn't guarantee that the work would pass muster in the future, according to Morris Groberman, one of the owners.

The Seattle Times

BUILDING OWNER & TENANT NEEDS

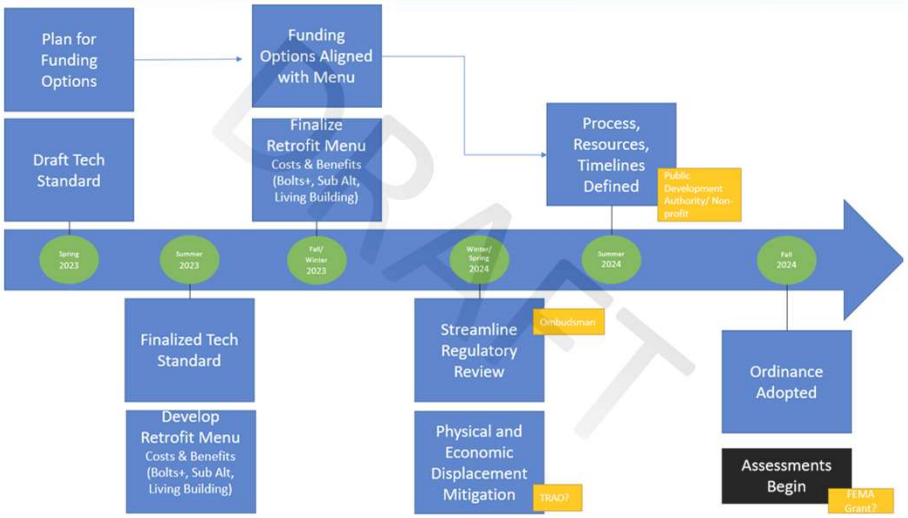
- Identify and develop resources and services:
  - To mitigate increased rent and tenant displacement
  - To support and guide building owners
    - Contractor trainings
    - Process education and guidance
  - Meet needs of underserved stakeholders



Funding Opportunities

- Grants:
  - BRIC
    - BCA Requirements, Hazus/Tool Limitations
    - Resilience Zones?
  - HMGP
    - Berkeley Example
      - Procurement issues
      - Additional Upgrades
- Financing:
  - C-PACER
  - Lender Sponsored Financing
  - Insurance Incentives
  - STORM?
- Incentive Zoning (TDR)

PROPOSED NEXT STEPS



EARTHQUAKES: NOT IF, BUT WHEN

In the next 50 years:

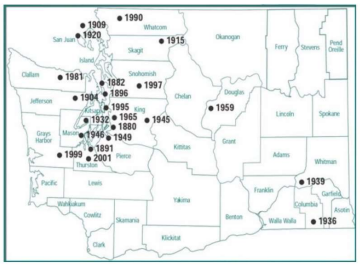
Seattle has an 86% chance of experiencing a M6.8 earthquake

and

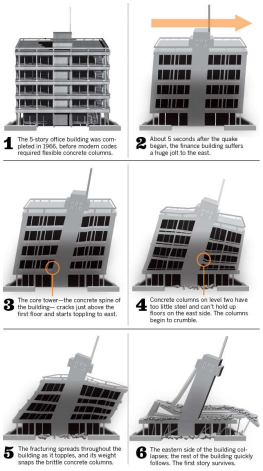
33% of experiencing a M8 Earthquake.

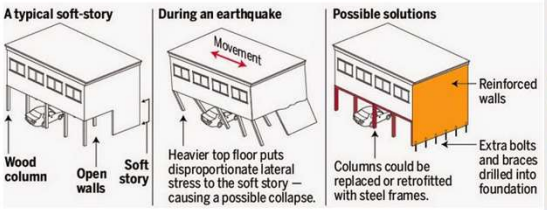
Seattle HMP, SHIVA v7.0 4/10/2019

Figure 5-3. Major earthquakes in Washington since 1880



Resiliency: Other Vulnerable Structure Types





Non-Ductile Concrete Structures

- Beverly Hills
- Burbank
- Long Beach
- Los Angeles
- Santa Monica
- West Hollywood

Wood-Frame Soft-Story Structures

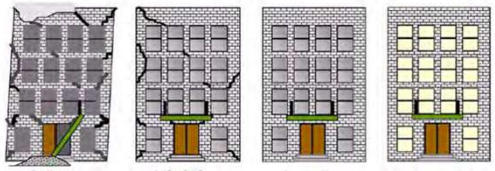
- Alameda
- Berkeley
- Beverly Hills
- Burbank
- Carpinteria
- Culver City
- Fremont
- Hayward
- Long Beach
- Los Angeles
- Mountain View
- Oakland
- Pasadena
- Richmond
- San Francisco
- San Jose
- Santa Monica
- Torrance
- West Hollywood

Resiliency: Building Codes vs Performance

Meeting the minimum code helps ensure that people in a building are safe, but does not ensure that the building itself is preserved following a disaster. Higher levels are required by code for buildings considered essential for public safety—such as hospitals and fire stations—where buildings must remain standing and usable.

The American Society of Civil Engineers' Standard Number 41 presents four levels of seismic upgrade options for existing buildings.

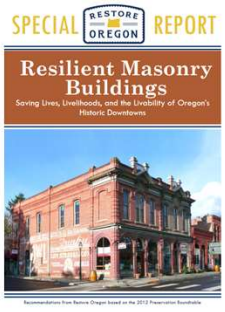
- **Collapse Prevention**—Occupants may be able to exit, but building is near collapse
- **Life Safety**—Occupants are able to exit, but building has considerable damage
- **Immediate Occupancy**—Building is safe to occupy, but minor damage is present
- **Operational**—Building suffers very little damage and can be used for its essential functions



Current building code addresses collapse prevention, but does not ensure the building or the businesses and residences inside it can be saved. Illustration courtesy American Society of Civil Engineers.

While very few masonry buildings warrant the expenditure required to achieve Operational status, there is technology for a range of seismic upgrades that will not harm the character-defining features of historic buildings. Simple solutions such as stabilizing parapets, tying-in the roof and floor joists to exterior walls, and joining exterior walls to the foundation provide significant advancement towards Collapse Prevention.

Achieving a Life Safety standard while protecting historic character-defining features should be a goal of all historic buildings. For the most significant buildings and districts, higher level upgrades should be pursued to ensure these important landmarks are passed forward to future generations.

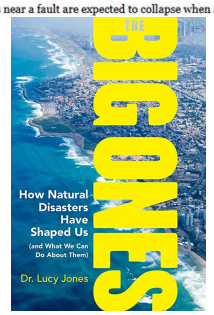


Los Angeles Times

Opinion: If you think the earthquake damage you see in Turkey can't happen here, think again

The code essentially says this: You can choose to build a structure that is so weak that it will be a total financial loss after an earthquake, as long as it doesn't kill someone. Engineers need a more concrete definition for "not killing someone," and that has become "avoid collapse."

This rule, called the life safety standard, is really just designed to make the probability of building collapse in an earthquake very low, less than 10% in the worst shaking expected. That sounds good, but put another way it means that no more than 10% of new buildings near a fault are expected to collapse when a big earthquake hits.



RESEARCH ARTICLE | FEBRUARY 01, 2021

Should we build better? The case for resilient earthquake design in the United States

Keith A Porter

Earthquake Spectra (2021) 37 (1): 523–544.
https://doi-org.offcampus.lib.washington.edu/10.1177/8755293020944186
Article history

America seems to have an earthquake investment gap, paying billions more annually on average to recover from earthquakes than it invests to prevent losses beforehand. Two large studies for Federal Emergency Management Agency (FEMA) and the US Geological Survey (USGS) offer insight into how well American buildings will resist future catastrophic earthquakes. They suggest that the public prefers new buildings to do more than to assure life safety, which has been the building code's historic objective. They also suggest that greater resilience would better serve society's economic interests. People expect to be safe in new buildings and the building code delivers safety. But people also want to use buildings after the Big One. America has a few options for meeting those expectations, including stronger, stiffer construction, with geographically optimized strength and stiffness. Greater strength and stiffness is not

Better buildings would not cost much more

Engineers can realistically make most new buildings at least 50% stronger and stiffer than the code requires, even in the highest hazard locations of the United States. Doing so adds perhaps 1% to the construction cost. How do we know this?

THE WHITE HOUSE

JUNE 01, 2022

FACT SHEET: Biden-Harris Administration Launches Initiative to Modernize Building Codes, Improve Climate Resilience, and Reduce Energy Costs

ICC INTERNATIONAL CODE COUNCIL®

Recommended Options for Improving the Built Environment for Post-Earthquake Reoccupancy and Functional Recovery Time

FEMA P-2090/ NIST SP-1254 / January 2021

FEMA nehrp NIST National Institute of Standards and Technology

QUESTIONS?

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URM Program Manager
City of Seattle
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