

NORTHRIDGE **30** 1994 2024

The Northridge Earthquake - 30 Years Later *A Catalyst for Engineering Resilient Communities*

2024 Webinar Series
EarthquakeCountry.org/northridge/events



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The Northridge Earthquake - 30 Years Later *A Catalyst for Engineering Resilient Communities*

Series Partners:

- [American Society of Civil Engineers \(ASCE\) Infrastructure Resilience Division](#)
- [ASCE Los Angeles Section](#)
- [Earthquake Engineering Research Institute \(EERI\) Southern California Chapter](#)
- [Structural Engineers Association of Southern California \(SEAOSC\)](#)
- [Earthquake Country Alliance \(ECA\)](#), led by the [Statewide California Earthquake Center](#)



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The Northridge Earthquake - 30 Years Later

A Catalyst for Engineering Resilient Communities

2024 Webinar Series

Episode 2: Insurance Issues and Impacts Following the Northridge Earthquake

EarthquakeCountry.org/northridge30-webinar2

Charles Scawthorn (Pacific Earthquake Engineering Research Center and PA Risk LLC)

Janiele Maffei (California Earthquake Authority)



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The Northridge Earthquake - 30 Years Later

A Catalyst for Engineering Resilient Communities
Webinar Series

Insurance Issues and Impacts Following the Northridge Earthquake

Charles Scawthorn, S.E.
SPA Risk LLC



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Purpose

Explain insurance and loss estimation practices at the time of the 1994 Northridge earthquake, and issues that emerged.

Outline

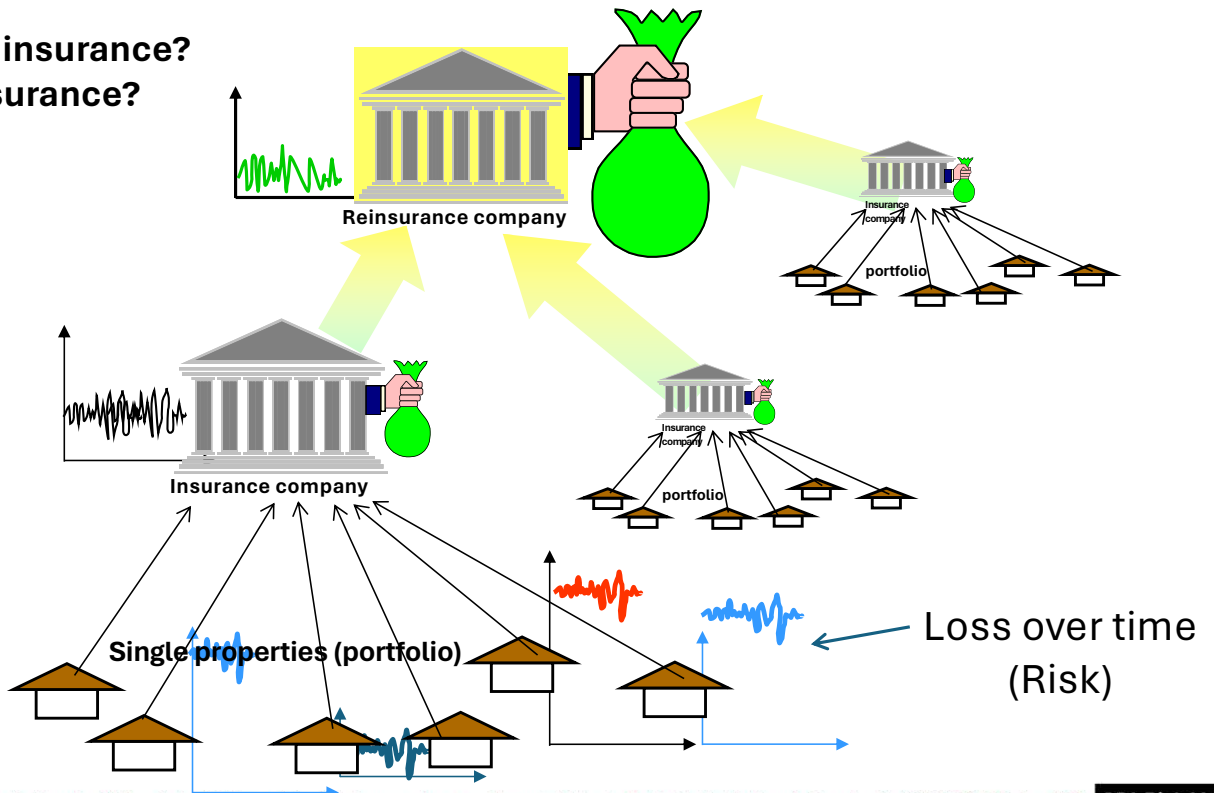
- Brief review of insurance practices in general
- Ditto, earthquake Insurance
- Change in insurance industry practices 1960s – 1990s
- ‘the rise of the modelers’
- Performance of loss estimation in the 1994 Northridge earthquake



Brief history of Insurance

- Insurance is nearly as old as seafaring (~3000 BC, Babylon)
- Great London fire of 1666 / Lloyds of London (1688)
- 1700s well established (Ben Franklin...)
- Industrial Revolution
 - Increasing size of risks (larger factories)
 - rise of mutual insurance companies
- Need to share (“reinsure”), but not with competitors → treaties with foreign companies
- Hamburg Fire (1842) → the Cologne Re (1846, first reinsurance company)
- Swiss Re (1863), Munich Re (1888)...Employers Re (1914), Am. Reins. (1917)...
- 1906 San Francisco fire...Lloyds paid 100%...others less...payments were for **fire losses only**, not earthquake losses, the flow of gold from London to US led to the 1907 panic*

But, what is insurance?
and reinsurance?



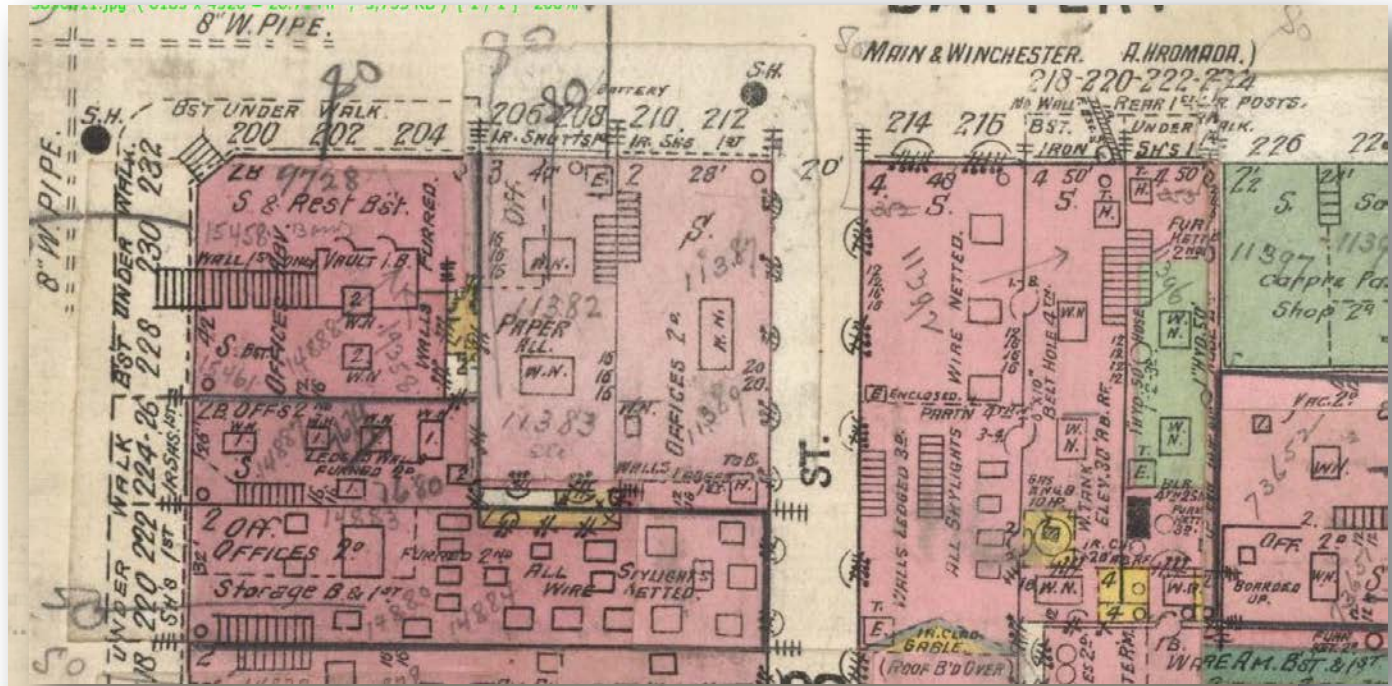
Risk = what the insurer will pay for claims

Risk (aka pure premium) + company overhead + profit = premium **you pay**

Risk =



Exposure – what's at risk? How risky is it?



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Earthquake insurance, pre-Northridge

- **1906:** **no earthquake insurance** – insurers paid fire (only) losses
- **1932:** Earthquake insurance is relatively new. It was almost unheard of until after the San Francisco earthquake of 1906 and in Santa Barbara in 1925 hardly one-tenth part of the property damaged had any earthquake insurance.

- J. R. Freeman (1932). *Earthquake Damage And Earthquake Insurance*

- **1945:** New Zealand and 1966 Japan created national EQ insurance programs
- **1960s:** US established the National Flood Insurance Program (but not EQ)
- **1971:** San Fernando Earthquake - little earthquake insurance
- **post-1971:** demand for earthquake/wind insurance
 - CRESTA Zones for EQ insurance accumulations
 - California Dept. Insurance Rule 226 reporting requirements



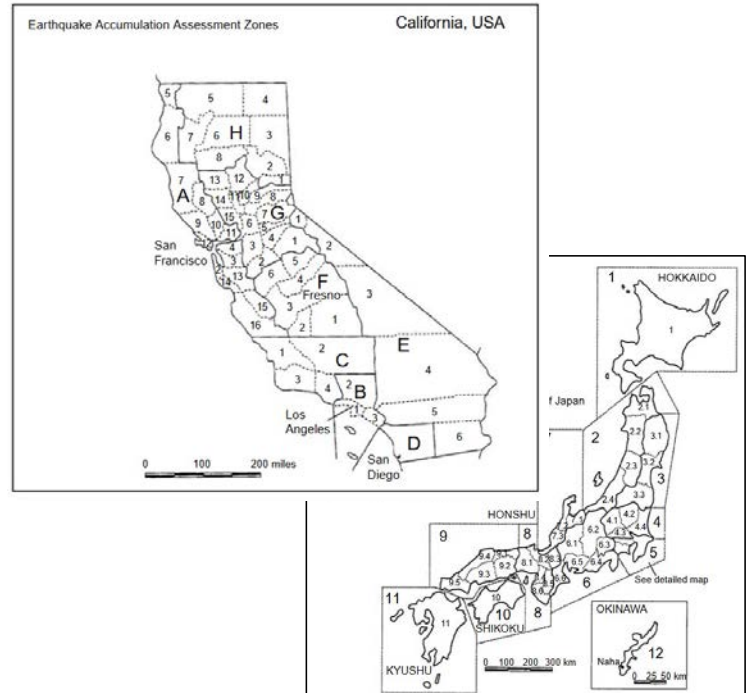
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CRESTA Zones

- CRESTA (*Catastrophe Risk Evaluating and Standardizing Target Accumulations*)
- The name actually derives from the initial meeting held at the Hotel Cresta
- Developed in the late 1970s in a joint project of several major reinsurance companies.
- A key system employed by reinsurers for tracking catastrophe exposure
- Method of exposure accumulation reporting by primary companies for reporting to reinsurance companies



California DOI Rule 226*

EARTHQUAKE PREMIUM AND POLICY COUNT DATA CALL

SUMMARY OF 2022 RESIDENTIAL TOTALS

<https://www.insurance.ca.gov/0400-news/0200-studies-reports/0300-earthquake-study/upload/EQEXP2022Summary.pdf>

2022 Experience Year	Written Premiums Excluding EQ	No. of Policies Excluding EQ	Exposure Excluding EQ	Avg Prem Per Policy Non-EQ	Avg Rate Per \$1,000 Insurance Non-EQ	Market Share* Non-EQ	Written Premiums EQ	No. of Policies EQ	Exposure EQ	Avg Prem Per Policy EQ	Avg Rate Per \$1,000 Insurance EQ	Market Share* EQ	% with EQ**
Insurers with EQ coverage provided by California Earthquake Authority (CEA)	\$ 10,673,398,976	9,714,794	\$ 3,727,000,768,297	\$ 1,098.67	\$ 2.86	76.00%	\$ 949,767,131	1,068,386	\$ 642,093,436,670	\$ 888.97	\$ 1.48	65.77%	11.00%
Insurers with EQ coverage provided by Non-CEA	2,977,108,551	3,067,226	1,103,619,420,010	970.62	2.70	24.00%	468,047,737	556,093	228,406,197,815	841.67	2.05	34.23%	18.13%
Total Residential Market	\$ 13,650,507,527	12,782,020	\$ 4,830,620,188,308	\$ 1,067.95	\$ 2.83	100.00%	\$ 1,417,814,868	1,624,479	\$ 870,499,634,485	\$ 872.78	\$ 1.63	100.00%	12.71%
Total Homeowners Market	\$ 10,282,101,551	6,396,971	\$ 3,786,583,626,599	\$ 1,607.34	\$ 2.72	50.05%	\$ 1,235,321,581	961,852	\$ 786,934,901,059	\$ 1,284.32	\$ 1.57	59.21%	15.04%
Total Renters Market	514,883,847	3,082,264	91,820,764,767	167.05	5.61	24.11%	35,264,778	379,657	12,182,000,000	1,111.00	1.42	23.37%	12.32%
Total Condominium Market	716,319,157	1,027,769	57,483,489,677	696.97	13.17	13.17%	13,182,000,000	13,182,000	13,182,000,000	1,111.00	1.42	9.05%	14.30%
Total Dwelling Fire Market	1,868,884,969	1,086,056	1,086,056,000	1,086.06	1.08	1.08%	1,086,056,000	1,086,056	1,086,056,000	1,086.06	1.08	4.67%	3.82%
Total Mobilehome Market												3.70%	20.87%
Total Residential Market									\$ 870,499,634,485	\$ 872.78	\$ 1.63	100.00%	12.71%
California FAIR Plan	\$ 611,080,997	249,560	\$ 147,560,538,423	\$ 2,448.63	\$ 4.14	12.56%	\$ 5,546,079	4,665	\$ 3,952,409,850	\$ 1,188.87	\$ 1.40	6.15%	1.87%
Total Dwelling Fire (Excluding CA FAIR Plan)	1,257,803,973	1,737,396	710,012,527,572	723.96	1.77	87.44%	51,934,066	71,217	36,553,282,586	729.24	1.42	93.85%	4.10%
Total Dwelling Fire Market	\$ 1,868,884,969	1,986,956	\$ 857,573,065,995	\$ 940.58	\$ 2.18	100.00%	\$ 57,480,145	75,882	\$ 40,505,692,436	\$ 757.49	\$ 1.42	100.00%	3.82%

**Shaking damage only – no coverage for landslide, liquefaction...
Fire following earthquake IS covered, under the fire policy**

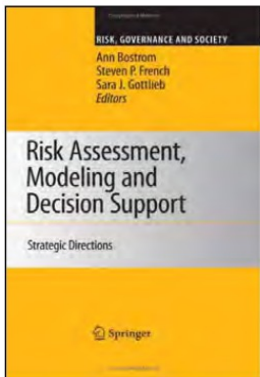
* Market share represents the percentage of policies to total residential market.
** Percent with EQ represents the percentage of policies that also have EQ coverage.

* <https://www.insurance.ca.gov/0250-insurers/0300-insurers/0100-applications/rsb-forms/2022/upload/PML2022Instructions.pdf>




State of Earthquake Insurance in 1980

- Low price (\$400/yr) / low deductibles (5 %)
- Increasing demand (20% market penetration and rising)
- 1960s – 1980s drift away from expensive data collection (e.g., Sanborn maps) towards loss-based underwriting (i.e., if there hasn't been a loss it must be a good risk)
- Companies knew almost nothing about the homes they insured (location, year built...all unknown)
- 1984: following Coalinga EQ, CDOI required admitted companies to offer EQ insurance → some companies withdrew
- Asymmetry of information (primaries at mercy of Swiss and Munich Re)
- Rise of the modelers


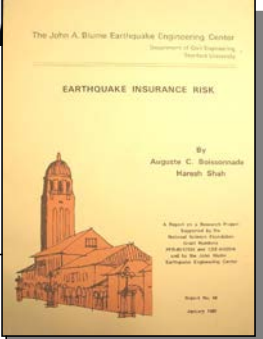
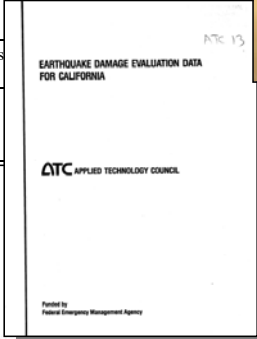


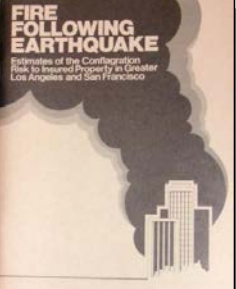
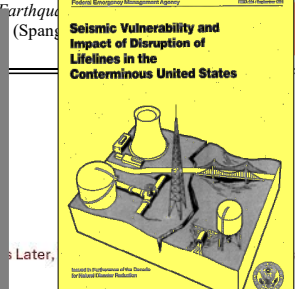
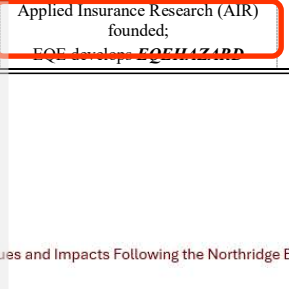
Scawthorn, C. (2008) *A Brief History of Seismic Risk Assessment* (Chapter 1 in: *Risk Assessment, Modeling, and Decision Support: Strategic Directions*, edited by Ann Bostrom, Steven French and Sara Gottlieb), Springer




1964	Prince William Sound (US) Earthquake and Niigata (Japan) earthquakes Major liquefaction, ground failures and building collapses – draws widespread attention; subsequent widespread investigations of liquefaction, esp. by H. Seed, R.V. Whitman and T.L. Youd in US, and T. Iwasaki and others in Japan.		Hydrologic Engineering Center (HEC) formed by US Army Corps of Engineers – develops and distributes HEC-1 and later free flood hazard and risk software (http://www.hec.usace.army.mil/)
1965			Moore's Law: <i>computing power doubles every 18 months</i>
1966	<i>Earthquake Engineering</i> (Wiegel, 1966)		The Insurance Institute of America creates " <i>Associate in Risk Management</i> ", first move towards professionalism in insurance industry Ralph Nader publishes <i>Unsafe at Any Speed</i> , consumer movement., rise of punitive damages
1968	Cornell BSSA paper <i>Engineering Seismic Risk (BSSA)</i> – breakthrough publication, everyone gets it. Paradigm shift in earthquake engineering		<i>Earthquake Hazard in the San Francisco Bay Area : A continuing Problem in Public Policy</i> (K.V. Steinbrugge) one of the first reports to translate what is known by scientists into public policy recommendations
1969	Probabilistic hazard map of Canada (Milne and Davenport) First revision of US hazard map since 1949 (Algermissen et al, but not probabilistic)		Algermissen, Steinbrugge, McClure begin development with Studies in Seismicity, for US Coast and Geodetic Survey
1970s	Birth of paleoseismology, lead by Wallace et al; late 70s Sieh finds several prehistoric Ft. Tejon type events at Pallett Creek, near Los Angeles		
1970		Wilson develops general purpose structural analysis program (SAP)	US EPA (Environmental Protection Agency) established, leading to many analytic advances in response to environmental regulations.



1978	Tokai (Japan) earthquake forecast (Ando) and subsequent creation of special zone for broad mitigation effort Tangshan (China) earthquake – 250,000+ killed, no apparent effect	ATC 3-06 model building code; McGuire FRISK Program; Canvey Island study (process safety, UK)	
1979		VisiCalc Spreadsheet; Three Mile Island NPP – partial core meltdown	
1980		Society for Risk Analysis formed	
1981	First base isolated building: William Clayton Building, Wellington, New Zealand	EQE Inc. founded to offer seismic risk reduction services I	First IBM PC
1982		First probabilistic model of fire following earthquake; First research into hazardous material releases in earthquakes	
1983	Estimation of earthquake losses in Los Angeles : damage scenarios under varying earthquake research effort (Dames & Moore)	William Ruckelshaus speech on "Science, Risk and Public Policy" to US National Academy of Sciences, putting risk management on national political agenda.	
1984	Characteristic earthquake (Schwartz and Coppersmith)	F. Press proposes International Decade of Hazard Reduction (8 th World Conference on Earthquake Engineering)	
1985		ATC-13 Earthquake Damage Data in California; first base isolated building in US (Footbills Justice Center, Rancho Cucamonga, CA)	Mexico City
1986	Increasing insurance portfolio analysis projects for Dames & Moore, EQE and other companies	Chernobyl NPP explosion, widespread contamination	
1987		Applied Insurance Research (AIR) founded; EQE develops EQEHAZARD	

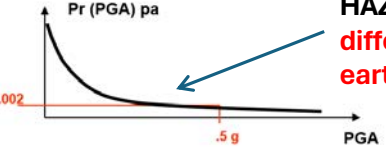




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Risk = what the insurer will pay for claims

Risk (aka pure premium) + company overhead + profit = premium you pay




HAZARD

HAZARD: How frequent different size fires (or earthquakes) will be

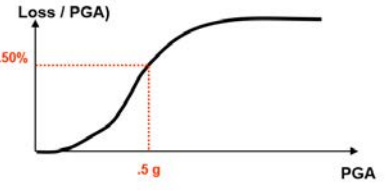
+

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RISK



Loss Exceedance Curve




VULNERABILITY


+

=

RISK



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The Modelers:

- Convergence of
 - probabilistic methods (hazard analysis, nuclear power industry)
 - Computational power (PC)
- Emergence 1981-1987 of three modeling companies
 - **AIR Worldwide** (Karen Clark, broker, top-down)
 - **EQE** (Charles Scawthorn, engineering, bottom-up)
 - **RMS** (Haresh Shah/Weimin Dong, financial, bottom-up)
- Little interest by insurance industry at first, but interest increased:
 - 1987 Whittier Narrows EQ
 - 1989 Loma Prieta EQ and Hurricane Hugo
 - **1992 Hurricane Andrew**
 - **1994 Northridge**

Gov. Wilson Puts Cost of Earthquake In Los Angeles as High as \$30 Billion

Wall St. Journal, 21 January 1994

Los Angeles Daily News

Northridge Earthquake: 1994 quake still fresh...

A costly quake

The quake cost \$20 billion in property damage — the most expensive U.S. natural disaster until Hurricane Katrina's \$81 billion toll on New Orleans in 2005 — plus \$29 billion in economic losses. It would far exceed the combined cost of 50 years of earthquakes, windstorms, wildfires, floods and landslides across Los Angeles County, according to a NASA Jet Propulsion Laboratory study.

The response from the Federal Emergency Management Agency, which would pour \$14 billion into the region, was immediate. As a result of FEMA aid, California State Northridge would fix 107 buildings damaged or destroyed by the quake.

EQE said. It estimated insured losses at \$1.5 billion to \$1.9 billion.

Modeling of the 1994 Northridge earthquake

Estimates of Insured Loss, Northridge Earthquake

Organization Estimating Loss	Estimate (\$ billion)	Date of Estimate	Basis for Estimate
AIR	0.6-2.3	Jan. 17	Loss-estimation technology
EQE International	1.5-1.9	Jan. 18	I t
PCS	2.5	Feb. 7	E
Risk Engineering	1.7	n.d.	I t
RMS	1.5-2	Jan. 19	I t

*Based on company claims reported at the time.

...ll...
...the 1994 Northridge earthquake, and the estimates of industry losses that were initially provided using loss-estimation technology, can furnish some insight into the accuracy and utility of this technology.



PCS Estimate of Insured Losses, Northridge Earthquake

Date	Estimate (\$ billion)
February 7, 1994	2.5
April 8, 1994	4.5
June 7, 1994	5.5
August 4, 1994	7.2
January 1995	10.4

Why?



What led to the underestimates?

Conclusion

Models are only as good as the data provided, and, in the Northridge event, two critical data sets (on ground motions and adverse selection) were inaccurate.

Should the available models have anticipated Northridge-type events? Yes, there was evidence from the 1983 Coalinga and 1987 Whittier events that thrust faults are a potential problem not satisfactorily simulated, but how extensive they are was a recent discovery.



Thank you

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1994 → 2024

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Funding Seismic Retrofits: A Unique Insurance Model

Janiele Maffei
California Earthquake Authority



Funding Seismic Retrofits: A Unique Insurance Model



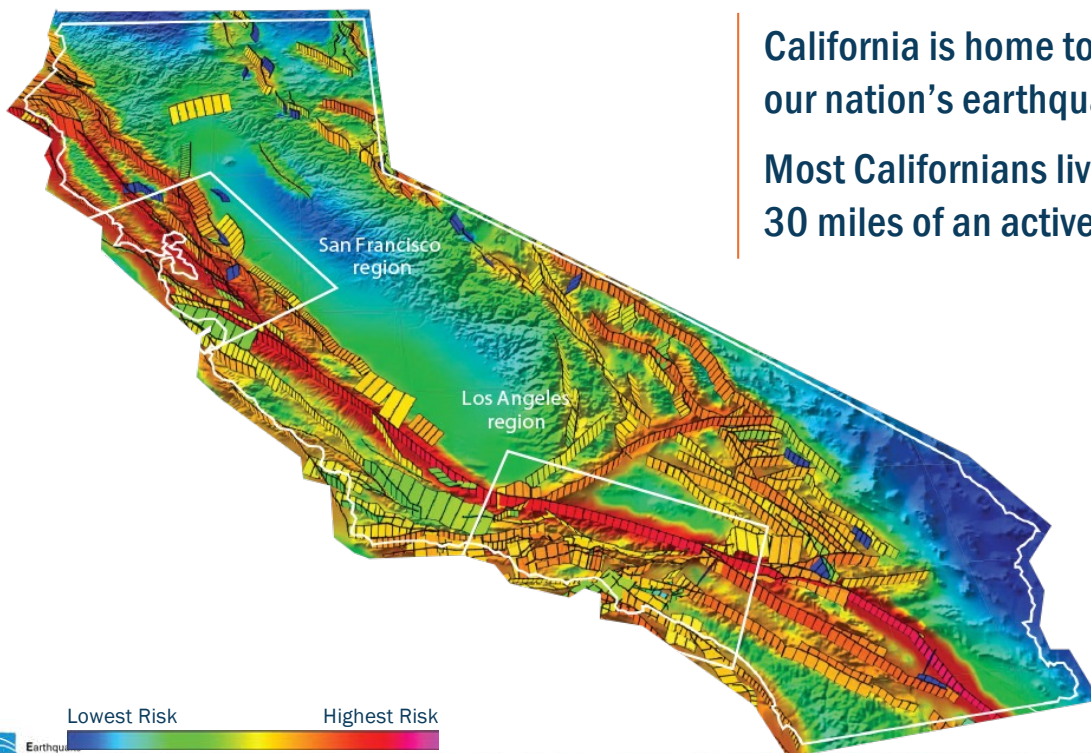
JANIELE MAFFEI

CHIEF MITIGATION OFFICER

April 22 2024



The Northridge Earthquake - 30 Years Later, Webinar : Episode 2: Insurance



California is home to two-thirds of our nation's earthquake risk.

Most Californians live within 30 miles of an active fault.



The Northridge Earthquake - 30 Years Later, Webinar : Episode 2: Insurance Issues and Impacts Following the Northridge Earthquake Tuesday, April 23, 2024 | 12 - 1 pm PST

ECA, April 22, 2024

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California Earthquake Authority

- CEA is a not-for-profit residential earthquake insurer.



CALIFORNIA : MANDATORY OFFER LAW

- Earthquake coverage is excluded from homeowner's insurance policy.

- However, insurance companies are required to offer a separate earthquake insurance policy at time of homeowner policy sale.





• WHEN M6.7 NORTHRIDGE EARTHQUAKE STRUCK IN 1994:

- One of the costliest natural disasters in U.S. history.
- Caused **\$20 billion** in residential damage.
- Destroyed or severely damaged thousands of single-family homes.
- Left about 22,000 people homeless.
- Most insurance companies stopped writing Homeowners insurance; prompted creation of CEA.



Publicly Managed • Privately Financed

- A not-for-profit provider of residential earthquake insurance

Governing Board:

- Governor
- Insurance Commissioner
- State Treasurer



Governor
Gavin Newsom



Insurance
Commissioner
Ricardo Lara



State Treasurer
Fiona Ma

Non Voting:

- Assembly Speaker
- Senate Rules Chair



Assembly Speaker
Robert Rivas



Senate Rules
Chair
Mike McGuire

Privately Financed:

1,132,605 Policyholders

Mission:

Educate
Mitigate
Insure



CEA Participating Insurers

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	<h3>Residential Earthquake Insurance</h3> <ul style="list-style-type: none"> • 1,041,000 Million Policyholders • Publicly Managed/Privatey Financed/Not for Profit • \$19 Billion in Claim Paying Capacity
	<h3>Residential Earthquake Mitigation Grants</h3> <ul style="list-style-type: none"> • Pre-1980 Homes/\$3,000 Grant • Retrofits to date: 24,600 • 2024 Goal: 6,000 Retrofits
	<h3>California Wildfire Fund</h3> <ul style="list-style-type: none"> • Coverage for Wildfires Caused by Investor-Owned Utilities • Overseen by California Catastrophe Response Council • \$21 Billion in Claim Paying Capacity

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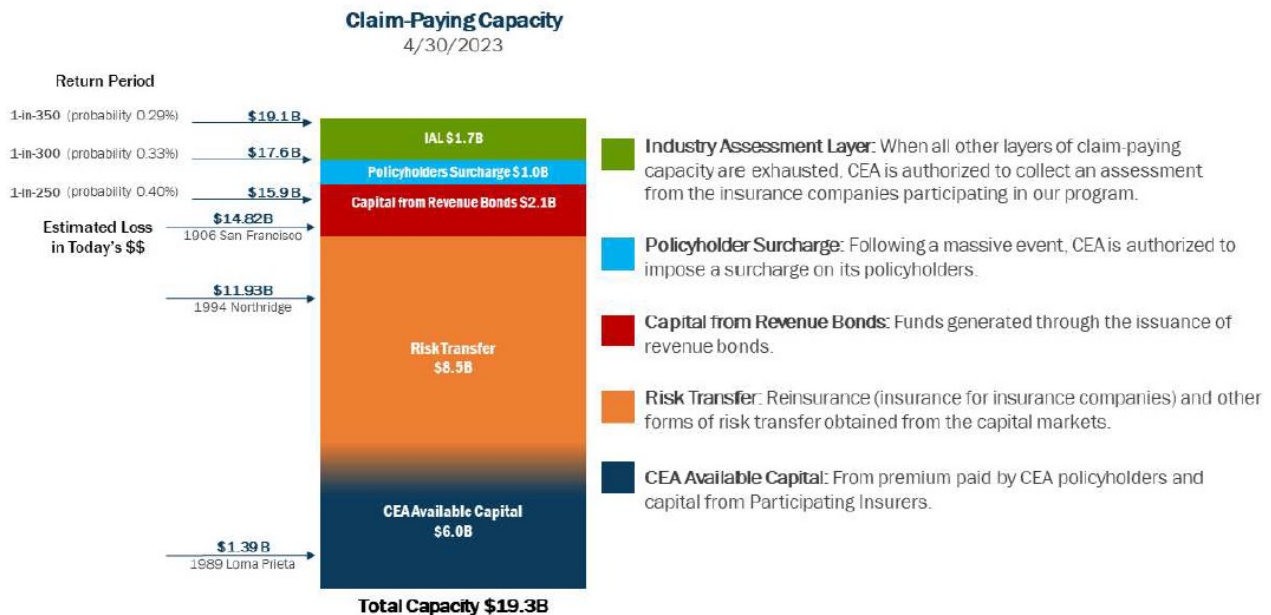
Claim Paying Capacity (CPC)

- Insurance providers must maintain funds on hand (or accessible) sufficient to assure policyholders filing a claim are paid all policy benefits to which they are entitled

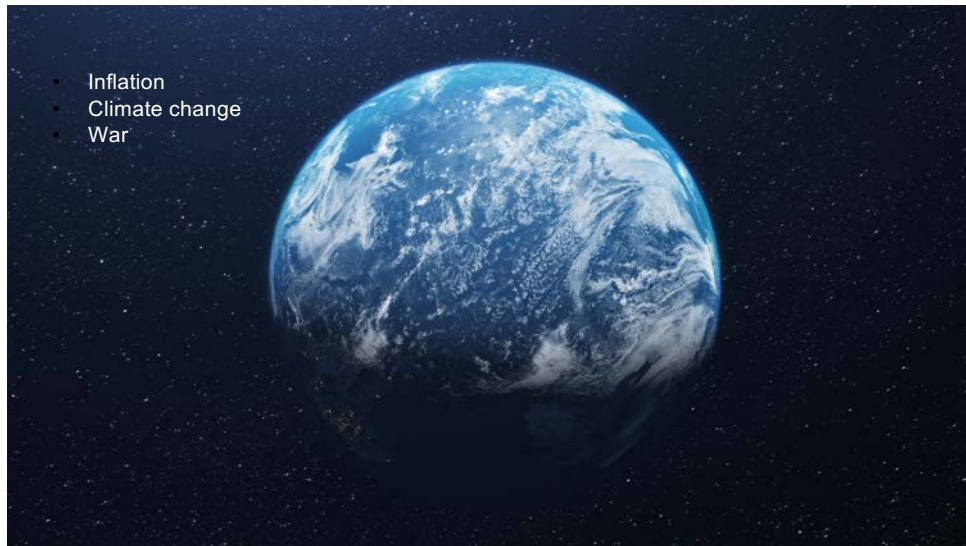


CEA Claim Paying Capacity

- The CEA is financially sound



The Cost of Capital is a Global Issue



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Government Post-Disaster Response

How can FEMA help you?

Assistance from FEMA may help you and members of your household affected by a disaster take care of necessary expenses and serious needs that cannot be met through insurance or other forms of assistance.

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Presidentially Declared Disaster Designation

- A DR is required for individual assistance after a disaster

Apply for Assistance

Federal assistance is available to eligible individuals and families affected by this disaster.

California Severe Storm
And Flooding (DR-4758-CA)

Designated Areas

News & Media

Reports & Notices

How a Disaster Gets Declared

Disaster Authorities

Historic Disasters


Volunteer & Donate

DR-4758-CA



Incident Period: Jan 21, 2024 - Jan 23, 2024

Declaration Date: Feb 19, 2024

 English [Español](#)

Quick Links

- **Recovery resources:** [State & Local](#) | [National](#)
- **Connect:** [Social Media](#) | [Mobile App & Text](#)
- **24/7 counseling:** [Disaster Distress Helpline](#)



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FEMA Relief is Not Insurance

Disaster assistance comes in two forms: a U.S. Small Business Administration loan, which must be paid back with interest, or a FEMA disaster award, which is about \$5,000 on average per household.



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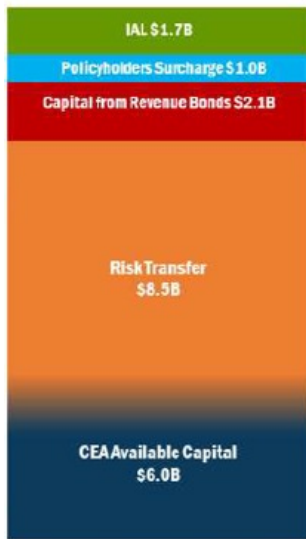
CEA Mitigation

Standards • Research • Incentives



CEA Loss Mitigation Fund

Claim-Paying Capacity
4/30/2023



CEA Claim Paying Capacity
\$19.4 Billion

Capital Reserves
Invested per CEA investment policy
\$ 6.1 Billion

Annual Transfer to Loss Mitigation Fund
5% of investment income (\$5 million maximum)
\$ 5 Million



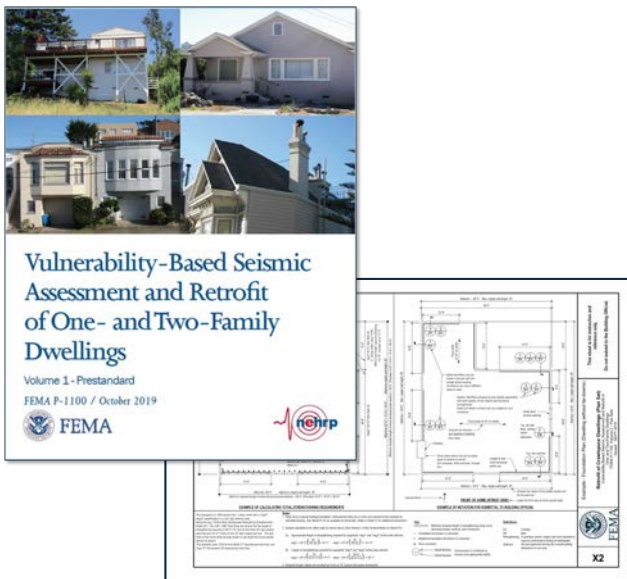
Mitigation Standards

- CEA has funded and managed the development of:
- FEMA P-1100 – Vulnerability Based Assessment and Retrofit of One and Family Dwellings
- CEA EDA 02 – Earthquake Damage Assessment and Repair Guidelines (Replacement for CUREE document)

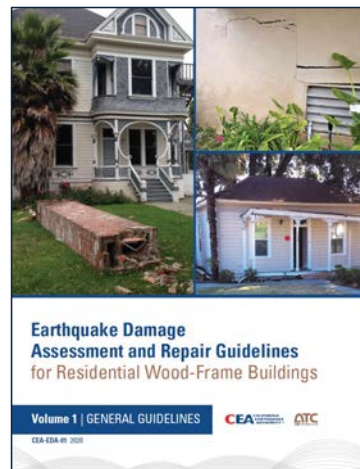


CEA Mitigation Research

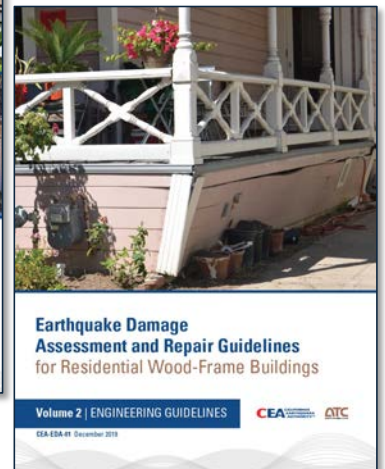
- Guidelines and Standards Development



FEMA P-1100 – Assessment and Retrofit



CEA EDA 02 – Earthquake Damage Assessment and Repair



Earthquake Vulnerabilities



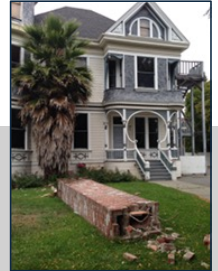
Crawlspace House



Living-space-over garage



Hillside House



Chimney

Crawlspace Anchorage/Bracing and Unbraced Water

• Heater Vulnerability

2007/6/9 Southern California Earthquake



CEA Mitigation Research

- PEER Cripple Wall Damage Project (2020)

How Much Could I Save In "The Big One" If I Retrofit My House*?

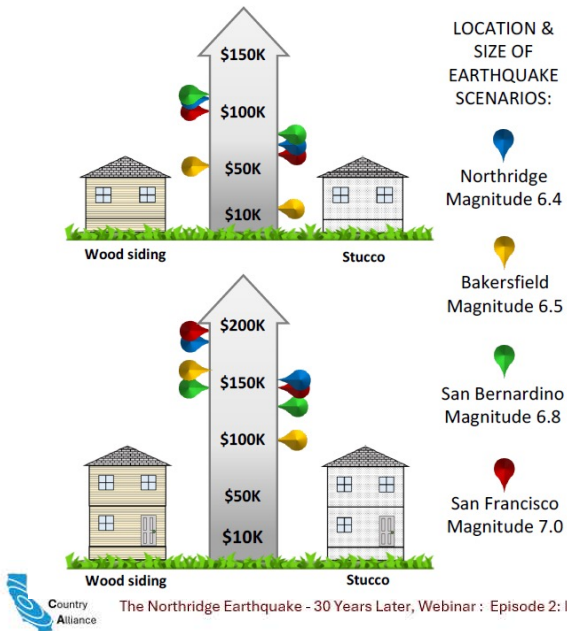


Figure 1. Estimated average savings for four generic house types in four scenario earthquakes.

*Note: Savings are average repair costs avoided in thousands of 2019 US dollars. Values assume a one-story 1,200 sq.ft. house (UPPER) and a two-story 2,400 sq.ft. house (LOWER), at a construction cost of \$200 per sq.ft. Potential savings depend on the actual size, age, location, and configuration of the house, the quality, and types of construction materials, the intensity of earthquake shaking, and regional construction market conditions.

M 7.0 Scenario Earthquake in SF:
Retrofitted two-story house with wood siding would have \$200,000 less damage (based on \$200/SF replacement cost)



Mitigation Incentive Programs

- CEA has jointly managed the California Residential Mitigation Program (CRMP) with CalOES through a Joint Powers Agreement (JPA). CRMP manages the Earthquake Brace + Bolt program (EBB)



Earthquake Brace + Bolt Retrofit - EBB

- California Residential Mitigation Program Retrofit Grants - Earthquake Brace + Bolt



Earthquake Brace + Bolt Program:

- Retrofits crawlspace with plywood bracing and new bolting
- Provides up to \$3,000 grant
- Currently requires owner-occupied
- In select ZIP Codes with high seismic hazard
- Has collected **important** data:
 - Retrofit averages \$5,200 in CA
 - More expensive in Northern CA
 - Number of retrofitted houses in a City



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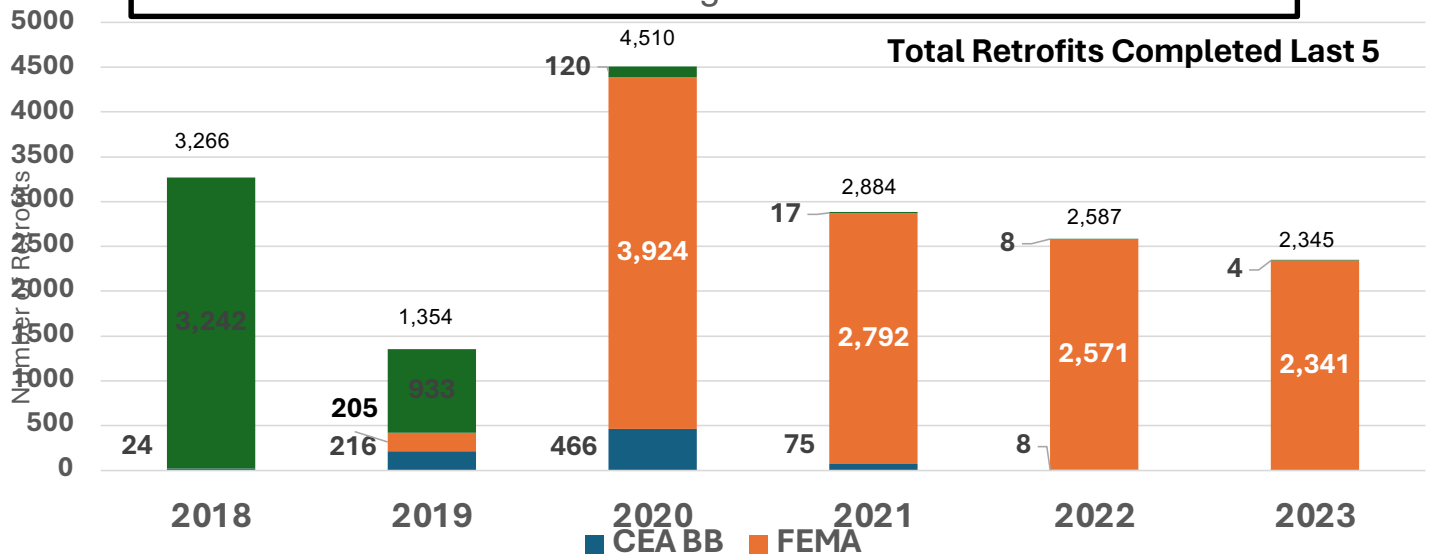
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Earthquake Brace + Bolt Retrofit - Funding

Challenge: State Funding (including CEA LMF) is considered taxable income on Federal tax return. FEMA HMGP funds are "Stafford Act" funding and are not taxable.



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Mitigation Funding

For 10 years the CRMP has leveraged the CEA Loss Mitigation Fund with State and Federal Mitigation Funding.

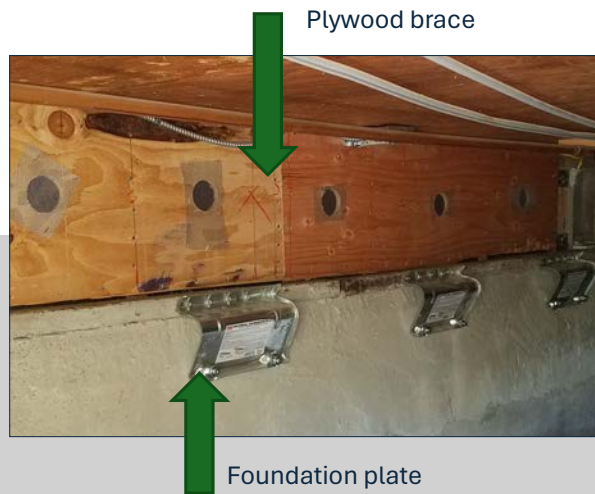


Earthquake Brace + Bolt

- Short Cripple Wall Requires Framing Clips, Foundation Plates, and Plywood



Crawlspace **Before** Retrofit



Crawlspace **After** Retrofit

Developing Mitigation Incentive Programs

- The following retrofit incentive grant programs are under development:
- Earthquake Soft-Story Pilot Program (ESS)
- Soft-Story Retrofit of Multi-Family (5-10 unit) Structures



Earthquake Soft-Story (ESS)

- SF "Painted Ladies" Survived 1906 Earthquake



The "Soft-Story" was created when the garage doors were installed in
1920s

Earthquake Soft-Story (ESS)

- Living-Space-Over-Garage (Soft-Story) Found in Pre-2000 Houses



1971 San Fernando EQ



1989 Loma Prieta EQ



1994 Northridge EQ



2014 Napa EQ

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Earthquake Soft-Story (ESS)



Plywood or OSB
on first-floor
walls

New steel shear walls
either side of garage
door opening

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Multi-Family Soft-Story Retrofit Program



Photo credits: LA Times

Northridge Meadows Apartments – Northridge M6.7 Earthquake
1994

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Multi-Family Soft-Story Retrofit Program



Photo credit: Janiele Maffei

Steel frame around garage door opening

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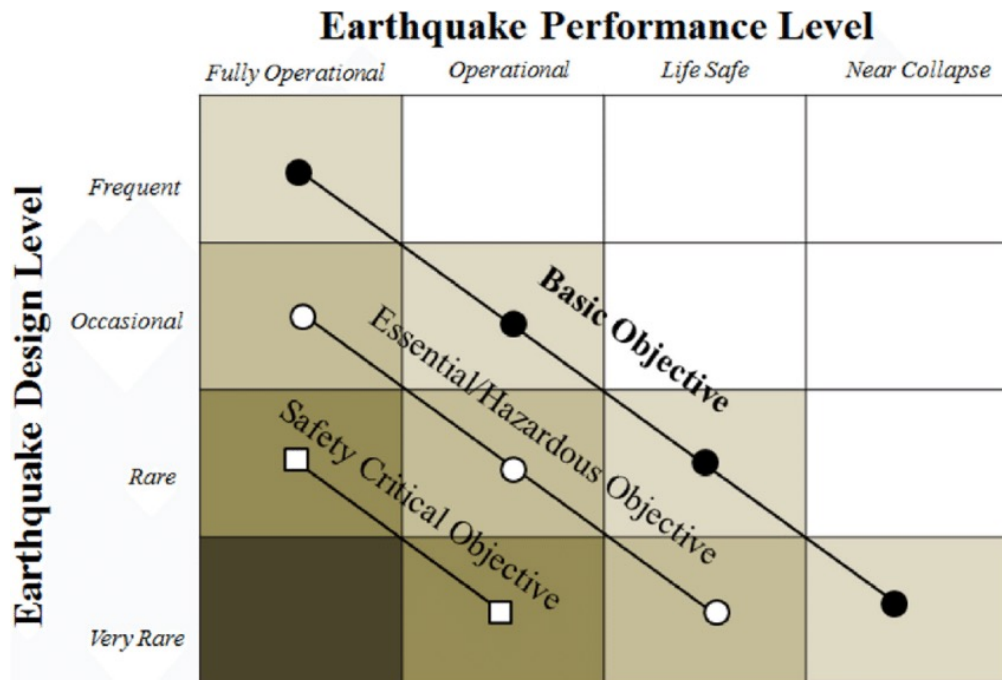
An Idea Under Development: Vision 2050 – Insurability and Habitability

- “Functional recovery performance aims for buildings and infrastructure systems to quickly return to function or service following an earthquake event.”
- (Source: NIST)



SEAOC VISION 2000 – Performance Based Engineering

- “Basic Objective” Represents New Building Cod Design



Vision 2050– Performance Based Insurability

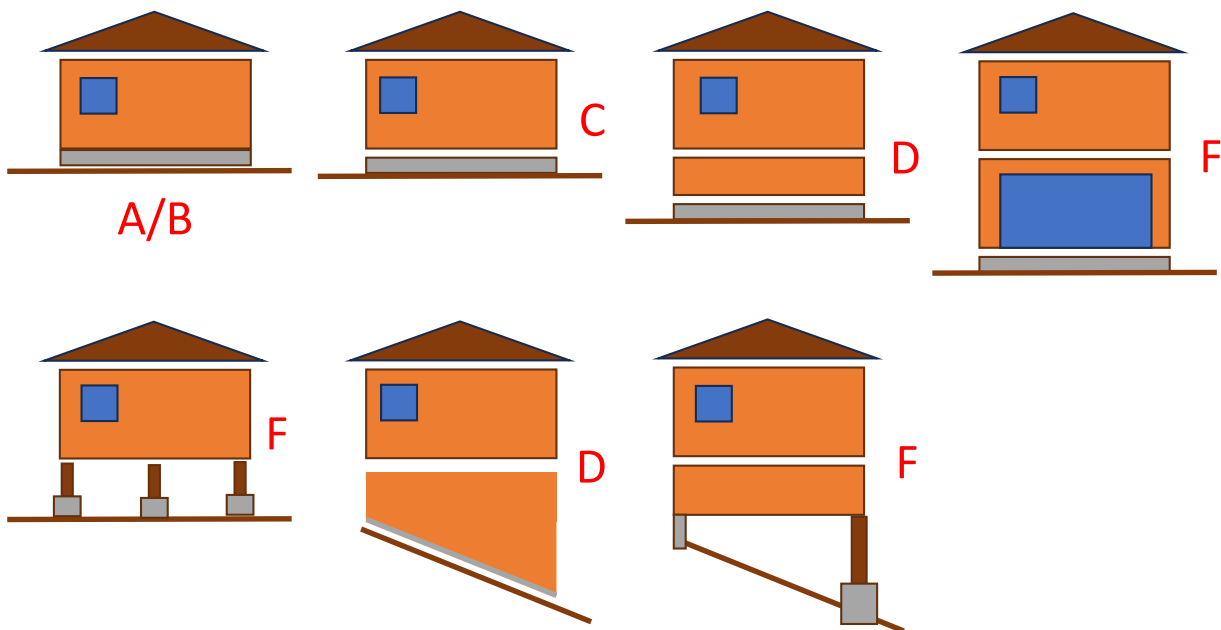
- Un-Retrofitted Pre-1940 Houses

Earthquake Performance Level				
	Fully operational	Operational	Life Safe	Near Collapse
Frequent				Below deductible
Occasional				Below deductible
Rare				Struct and Non-structural
Very Rare				Some full replacement



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Vision 2050– Performance Based Insurability



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Thank You.

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Earthquakebraceandbolt.com



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Questions?



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The Northridge Earthquake - 30 Years Later

A Catalyst for Engineering Resilient Communities

2024 Webinar Series

Episode 3: 30 Years of Progress in Quantification of Seismic Hazards (June 12, 12-1pm)

EarthquakeCountry.org/northridge30-webinar3

Yousef Bozorgnia

Professor, Department of Civil and Environmental Engineering, &
Director, Natural Hazards Risk and Resiliency Research Center (NHR3), UCLA



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Zoom Webinar General Information

- Your *sound will be muted* & your *camera will be off*.
- Click “**Show Captions**” to manage your view of subtitles.
(Mobile devices - manage in Zoom settings, meetings section)
- Use the **Q&A** feature to ask questions
- Use **chat** for technical assistance or to share comments, suggested resources, etc.
- This webinar will be recorded and shared (along with presentation slides) at EarthquakeCountry.org/northridge30-webinar2

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The Northridge Earthquake - 30 Years Later

A Catalyst for Engineering Resilient Communities

2024 Webinar Series
EarthquakeCountry.org/northridge/events



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