Earthquake Insurance and Mitigation – Leveraging Risk Transfer to Increase Risk Reduction

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Thursday, March 7
California has 2/3 of the US earthquake risk – 1/5 of US mortgage debt
99% chance of a M6.7 or larger earthquake in CA sometime in the next 30 years

1994 M6.7 Northridge Earthquake
Approximately 13% of Californians have earthquake insurance

1994 M6.7 Northridge Earthquake
California’s 1984 Mandatory Offer Law

• Earthquake coverage is excluded from homeowners insurance policy

• However, insurance companies are required to offer a separate earthquake insurance policy at time of homeowner policy sale.
California Earthquake Authority (CEA)
created in the wake of the Northridge EQ

33 Die, Many Hurt in 6.6 Quake
L.A. Area Freeways Buckle, Buildings Topple

Sylmar Jolted by Ghosts of Horror Past

Thrust Faults Pose Brutal Danger to Basin

Commuters Will Face Nightmare for Months

Questions on Reinforcement of Freeways Raised

Los Angeles Times
$20 billion in residential damage – half of that was insured

- One of the costliest natural disasters in U.S. history
- Destroyed or severely damaged thousands of single-family homes
- Displaced about 22,000 people
- Most insurance companies stopped writing Homeowners insurance; prompted creation of CEA
CEA – Privately financed and Publicly managed

CEA Board:
- Governor
- Treasurer
- Insurance Commissioner

CEA is a public instrumentality of the State (not an agency)

Educate – Mitigate - Insure
Claim paying capacity – 1 in 400 years

SINCE CEA’S INCEPTION IN 1996:

CEA policyholder premium: $12.6B

CEA reinsurance premium: $5B

Reinsurance claims paid to CEA: $250,000
Earthquake insurance changes made in 2016 spurred tremendous take-up
First incentive program – Earthquake Brace + Bolt

earthquakebracebolt.com
Grants to reimburse homeowners up to $3,000 regardless of whether you have a CEA policy.

CEA policyholders may be eligible for up to a 25% premium discount.
Mitigation funding -

- CEA loss mitigation fund – LMF (grows by 5% of annual investment income or $5 million, whichever is less)
- Two years of $3 million from CA general fund
- FEMA hazard mitigation grant program – (HMGP)
  - Funding made available following US Presidential disaster declaration
  - Managed by CA department of emergency services
  - Homeowners retrofit costs used as 25% “local match”
- Future foundation (meet the needs of vulnerable homeowners)
Seismic vulnerability – Inadequate sill plate anchorage and cripple wall bracing

2014 M 6.0 Napa Earthquake
Seismic vulnerability – Inadequate sill plate anchorage and cripple wall wall bracing

2014 M 6.0 Napa Earthquake
Retrofits work

Un-retrofitted

Retrofitted

2014 M 6.0 Napa Earthquake
“Code-compliant” retrofit of entire crawlspace required - $3,000 - $10,000

Before

Plywood brace

After

Foundation plate
EBB ZIP Codes selected for seismicity and number of pre-1940 houses

For homeowner to qualify:
- Available to all Californians
- Owner-occupied

For house to qualify:
- Located in EBB ZIP Code
- Constructed pre-1980
- Have crawlspace that requires retrofit
- Not a hillside home (7’ high maximum cripple wall)
> 7600 EBB retrofits completed – Northern California and ….
> 7600 EBB retrofits completed – ..... Southern California
CEA Research program

• The research department is managing three special projects:
  o ATC 110 – FEMA P-1100 – Vulnerability Based Assessment and Retrofit
  o CEA-PEER Quantifying the Performance of Retrofit of Cripple Walls and Sill Anchorage in Single Family Wood-frame Buildings
  o Update to the CUREE General Guidelines for the Assessment and Repair of Earthquake Damage in Residential Wood-frame Buildings
FEMA P-1100 | Vulnerability-Based Seismic Assessment and Retrofit of One- and Two-Family Dwellings

Improved seismic design and seismic retrofitting of vulnerable configurations will increase the probability that homes are available to provide shelter immediately following moderate to large seismic events. The purpose of this prestandard is provide a methodology to identify and retrofit specific known vulnerabilities in wood light-frame dwellings. Development of the assessment and retrofit provisions has included use of the best available seismic numerical modeling tools and engineering practices to assist in development of assessment methods and to identify retrofit criteria to best achieve targeted performance objectives. Use of the provisions is anticipated to improve earthquake performance but is not intended to prevent earthquake damage.

This prestandard provides a stand-alone resource for assessment and retrofit, incorporating all provisions required for implementation, and includes figures containing prescriptive, pre-engineered structural drawings and commentary, as well as appendices that are expected to remain non-mandatory.

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Assessment / retrofit methodology and prescriptive plan sets
ATC 110 – FEMA P-1100 –
Cripple wall, Living-space-over garage, hillside, and unreinforced masonry chimneys

2014 M 6.0 Napa
1989 M 6.9 Loma Prieta
1994 M 6.7 Northridge
CEA – PEER project – Quantifying retrofit performance of cripple wall house

Component testing UCSD
CEA – PEER project – Quantifying retrofit performance of cripple wall house

Full-scale testing – UC Berkeley
CEA – PEER project – Quantifying retrofit performance of cripple wall house

How to Analyze?
Structural Modeling (OpenSEES)

Target Structure
Idealized Floor Plan

Sub-Assembly Testing

Shear Spring Model (OpenSEES)

Structural modeling – Stanford University
CEA – PEER project – Quantifying retrofit performance of cripple wall house

Sample Damage Description: CS1-UN-DS2

Coordination with claim adjusters/modelers on repair pricing
CEA-ATC update of former CUREE Assessment and repair of earthquake damage document

- Assessment and repair of earthquake damage

| Patch and Paint | Remove and Replace | Project managed by ATC |

GENERAL GUIDELINES FOR THE ASSESSMENT AND REPAIR OF EARTHQUAKE DAMAGE IN RESIDENTIAL WOODFRAME BUILDINGS

Project managed by ATC
Future mitigation incentive programs – Earthquake Soft-Story (ESS) single-family

San Francisco, CA – Victorians with living-space-over garage vulnerability
Future mitigation incentive programs – Earthquake Soft-Story, multi-family

1994 M 6.7 Northridge EQ – Northridge Meadows Apartment first story collapse