OSSPAC MINUTES
May 12, 2020

The meeting was called to order at 9:00 PDT virtually

OSSPAC Members Present:

Jeffrey Soulages, Chair	Public member
Tiffany Brown, Vice Chair	Stakeholder: local government
Matt Crall	State agency: DLCD
Rep. David Gomberg	Legislative member
Dacia Grayber	Stakeholder: first responder
Joe Karney	Stakeholder: utilities
Christina LeClair	State agency: ODOT
Ed MacMullan	Stakeholder: banking
Bonnie Magura	Stakeholder: schools
Walter McMonies	Stakeholder: multi-family housing
Trent Nagele	Stakeholder: structural engineer
Althea Rizzo	State agency: OEM
Sen. Arnie Roblan	Legislative member
Susan Romanski	Public member
Aeron Teverbaugh	State agency: DCBS
Adam Pushkas	Stakeholder: building owners
Katie Young	Public member

OSSPAC Members Absent:

Yumei Wang	State agency: DOGAMI

Others in Attendance:

Mike Harryman	State Resilience Officer
Tyler Janzen	Chief of Staff, Rep. David Gomberg
Janiele Maffei	Presenter, CEA Chief Mitigation Officer
Evan Reis	Presenter, PEER/CEA Co-Project Director
Amelia Eveland	Public

1. Administrative Matters

1a. Welcome & Introductions

Chair Jeff Soulages opened the meeting and led introductions. Thank you for everyone's patience with the new digital meeting.

1b. Review and Approval of Minutes from previous meeting

Jeff Soulages asked if there were any changes to the March meeting minutes. After discussion without any proposed changes the minutes were approved.

1c. Events Notification

Due to COVID-19 most events have been canceled or postponed. May 18 is the 40th anniversary of the Mt. St. Helens eruption. There are several virtual events commemorating the event.

1d. New Business

No new business.

1e. Location for next OSSPAC Meeting

Due to the ongoing COVID-19 restrictions the July OSSPAC meeting will be virtual. Jeff Soulages asked the committee if people wanted to still meet on July 14. There were no objections so the July 14 meeting will go forward. The invitation to members and interested parties will go out later this week. There will be virtual meetings for the rest of the year.

2. Reports

2a. OEM

OEM is fully involved with the COVID-19 response. Currently in planning for demobilization and reconfiguration of the COVID-19 response. Putting together the NEHRP grant proposal for next year with $2500 for OSSPAC.

2b. DOGAMI

DOGAMI is working with DLCD, the lead agency on the 2020 update of the State Natural Hazard Mitigation Plan, which is a five year update from the 2015 plan. Earthquake hazards and tsunami hazards chapters are updated. Success stories drafted on:

- State Resilience Officer development and activities.
- Seaside School District new hillside campus.
- Oregon State Universities new tsunami vertical evacuation building.
- Coastal Hospital Resilience Project.
- Portland metropolitan region's use of DOGAMI's earthquake impact analyses (DOGAMI reports: https://www.oregongeology.org/pubs/ofr/p-O-18-02.htm and https://www.oregongeology.org/pubs/ofr/p-O-20-01.htm).

Forthcoming publications include:

- Tsunami casualty pilot study in five communities.
- Coastal Hospital Resilience Project (final publication and project completed).

Projects likely to be funded by FEMA Fall 2020:

- Earthquake Impact Analysis for the Greater Eugene-Springfield Area, Oregon.
- Natural Hazard Risk Assessments for Benton, Marion, Morrow, and Washington Counties.

2c.
DLCD

Working on the COVID-19 response. There are some interesting parallels between the COVID-19 impact and recovery after a Cascadia event. The lessons learned from the COVID-19 response will be valuable to incorporate into the Cascadia plans.

2d.
ODOT

Spent most of the time working on COVID-19. Currently 40% of ODOT staff is working remotely and keeping everyone (employees and citizens) safe.

2e.
DCBS

DCBS has a new director, Andrew Stolfi, who is awaiting senate confirmation. Still in the search process for other open positions. Lots of COVID-19 work, including insurance, loans and other issues. Previous planning has been parallel and useful for this pandemic. Not sure where in the process the building codes staff opening process is. As with most things it has taken a back seat to the response. The staff of the building codes section is, to the best of their abilities, still doing their work.

2f.
SRO

Governor's disaster cabinet was activated in February for the COVID-19 response. Also activated the economic recovery council at the same time. Currently the response is in the continuity of government phase. Having the Incident Management Team (IMT) working the response at DPSST has been very beneficial. It showed that DPSST will work for the governor's Continuity of Operations Plan (COOP). All six of Oregon's IMTs have been used for this response (fire marshal and forest service). There have been lots of lessons learned. Fire Marshal and Forest Service are working on COVID-19 and planning for fire season at the same time which is very impressive. There was discussion about what and where DPSST is: Department of Public Safety and Standards Training which is the training campus for all public safety officers located in SE Salem.

Contracting has been done for the creation of an after-action plan. The biggest difference between the COVID-19 disaster and a Cascadia disaster is that the infrastructure is not broken. Due to the long duration of the COVID-19 response it is expected that three to four after-action reports will be produced in the next 12-18 months.

All but three Oregon counties have applied to do the Phase I opening. The Governor has issued 19 executive orders regarding COVID and another is coming soon to consolidate the current orders.

Too early to talk about next session but budget for next year will be shocking and critical decisions need to be made. It is expected that there will be a one-day special session, possibly in June, for the legislature to work through a lot of the budget and COVID-19 issues that are pressing. The future of DOGAMI will also be on the agenda and it should be funded through the rest of the fiscal year. There was discussion about the new possible budget and the competition for dollars that will be coming. There was discussion about overwhelmed state agencies and the need to focus on resiliency for everyone in the State.

3. Review of 2019 OSSPAC Year-End Report

Jeff Soulages asked who has specific comments and then the committee will discuss each. Susan Romanski had one on page 11, the paragraph on tsunami mapping inundation line. In the fifth sentence, wanted to make sure it is shown there were differing views on this issue. Discussion commenced regarding wording of the edit, and historical letter process, content, multiple discussion sessions about the letter and the future. Change was proposed (adding “by Chair and Vice-Chair) to the sentence in question, voted on and approved. Ed MacMullan and Katie Young had previously pointed out editorial changes and Jeff went through them with the committee. A couple more were found and changed. The document was voted on to accept with all changes made and was approved. It will be given to OEM for posting on website and the resilience website. The SRO agreed to make hard copies to distribute to all Commission members.

4. PEER/CEA: Quantifying the Performance of Retrofit of Cripple Walls and Sill Anchorage in Single Family Wood-frame Buildings: Evan Reis, Co-Project Director

The study created analytical models of various single family home types to test the damage various types of earthquakes can produce. California single family homes were the focus. The home types were chosen to match what modelers currently use to develop insurance rates. The home types were tested both in an unmodified state as well as retrofitted with bolting to the foundation and bracing of the cripple walls. The results showed that there was a significant difference in loss between unmodified and retrofitted single family homes. The final results of the study will be published within the month. The presentation is attached as a separate document as Appendix A.

Althea Rizzo asked what it would take to do a similar study in Oregon. Evan Reis answered that a similar modeling processes should be used after identifying the common types of housing in Oregon including siding, foundation and interior finishes. A university should be engaged to define conditions and unknowns. This would allow the creation of a set of index buildings used and the definition of specific testing conditions for Oregon.

There was discussion about how this study highlights the importance and benefits of retrofitting in a quantifiable way.

Trent Nagele asked what the feedback there has been from the insurance companies and the modelers. Evan Reis answered that they have had several meetings with modelers and they have accepted the data quality and results well. Most data the modelers get about this subject is very coarse. The modelers appear to be eager to modify their models with this new data.

5. QuakeGrade and FEMA P-50: Janiele Maffei, CEA Chief Mitigation Officer

FEMA P-50 is a checklist procedure to give homeowners information on the earthquake resilience of a home. QuakeGrade is an app that follows FEMA P-50 and gives homes an earthquake resilience "grade" and actionable items that can be done to improve the grade. An inital grade is given based on the location and soil type of the house site and then penalty points are applied based on house condition and features that lead to damage. QuakeGrade is currently only available in California to licensed contractors and engineers, but CEA is hoping to expand the user base soon. More information can be found at www.quakegrade.com. The presentation is attached as a separate document as Appendix B.

Jeff Soulages asked if there is there a fee to use QuakeGrade. Janiele Maffei answered there is no charge for use. Jeff Soulages asked if Oregonians can use the current version of QuakeGrade. Janiele Maffei answered she was not sure and will look into it, noting that the answer could change. Jeff Soulages asked who is doing the training for QuakeGrade. Janiele Maffei answered that ATC is doing the training program.

Althea Rizzo asked how Oregon would gain a "train the trainer". Janiele answered that because FEMA paid for the training itself is should be publicly available but there might be a cost for the trainer to come out and train. This answer was affirmed by Jeff.

Sen. Roblan asked if the app uses address information for current hazard information. Janiele Maffei answered yes and the information is available in the paper forms of FEMA P-50. QuakeGrade's current default is California but Janiele will look into a possible expansion. Sen. Roblan asked if QuakeGrade covers the mandatory disclosure requirement. Janiele Maffei answered yes it does.

6. Legislative Look-ahead

Probably too early to do a look ahead due to the uncertain financial outlook.

7. Public Comment

No public comment.

At the end if the meeting it was suggested to do a summary or short report of the information presented in the last two meetings on single family homes as it might be helpful and useful. There was discussion on what policy changes or legislation could be proposed from these presentations. There was a call for commissioners to volunteer to put together a proposal for the meeting in July. Althea Rizzo, Jeff Soulages, Trent Nagele, Katie Young, Susan Romanski and Bonnie Magura volunteered. The meeting will be the second Tuesday in June and Jeff Soulages will send out a poll to find a good time.

The meeting was adjourned at 12:03 PM PDT.

Appendix A:

PEER/CEA: Quantifying the Performance of Retrofit of Cripple Walls and Sill Anchorage in Single Family Wood-frame Buildings

Comparative Study of PEER-CEA Woodframe Project Results with Catastrophe Loss Models

Evan Reis, SE

January 17, 2020

Objectives

- Review PEER-CEA analysis process with cat modelers
- Compare selected results with modelers
- Provide damage functions that can be incorporated into the models
- PEER objective NOT to determine insurance premium discounts

PEER

Index buildings – Cat Models

- Cat modelers use “Primary” and “Secondary” modifiers to categorize buildings
- Typically these modifiers need to be observable by the underwriters’ agents
- “Hidden” characteristics that are not observable but affect vulnerability are not considered by modelers
- Cat modelers are protective of their IP

PEER

Index buildings – Model Comparison

- The PEER-CEA team identified a subset of its index buildings that could be matched to the cat models
- We provided the modelers with four locations we specifically chose to compare results
- Each modeler ran the index buildings through their models
- Ground up loss at 250yr RP and Average Annual Loss were provided to PEER

PEER

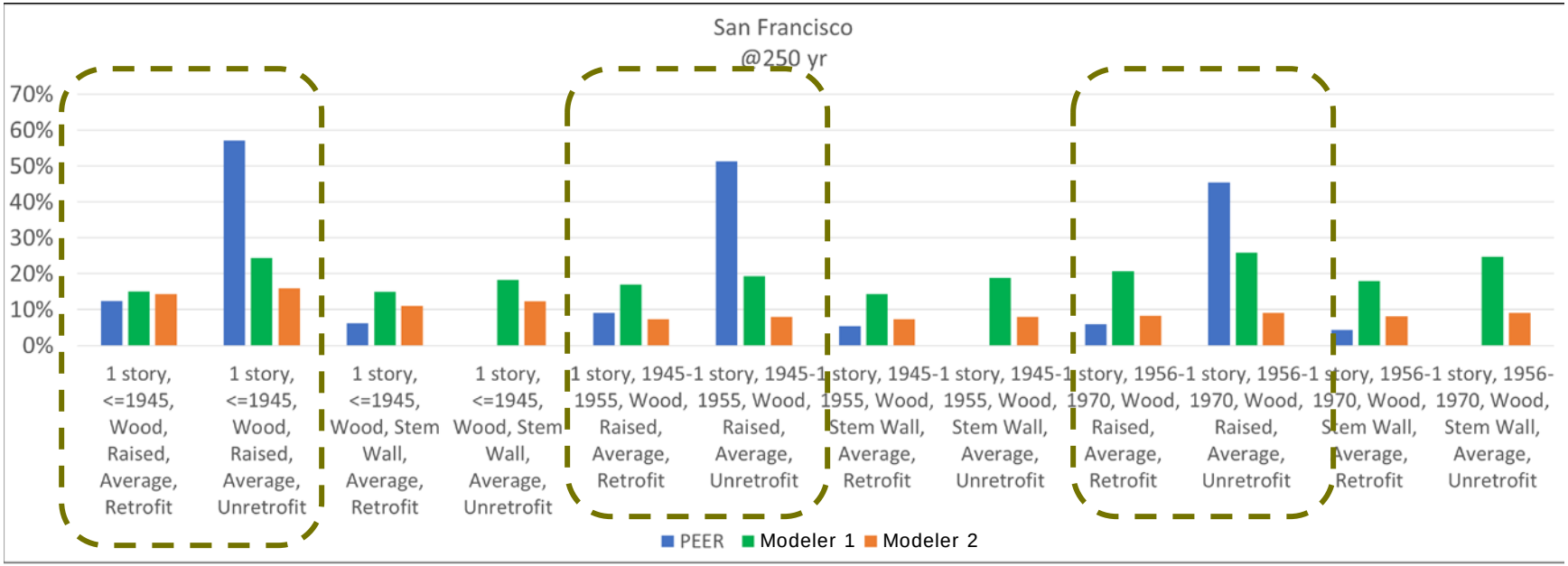
48 Index Building compared to cat modelers

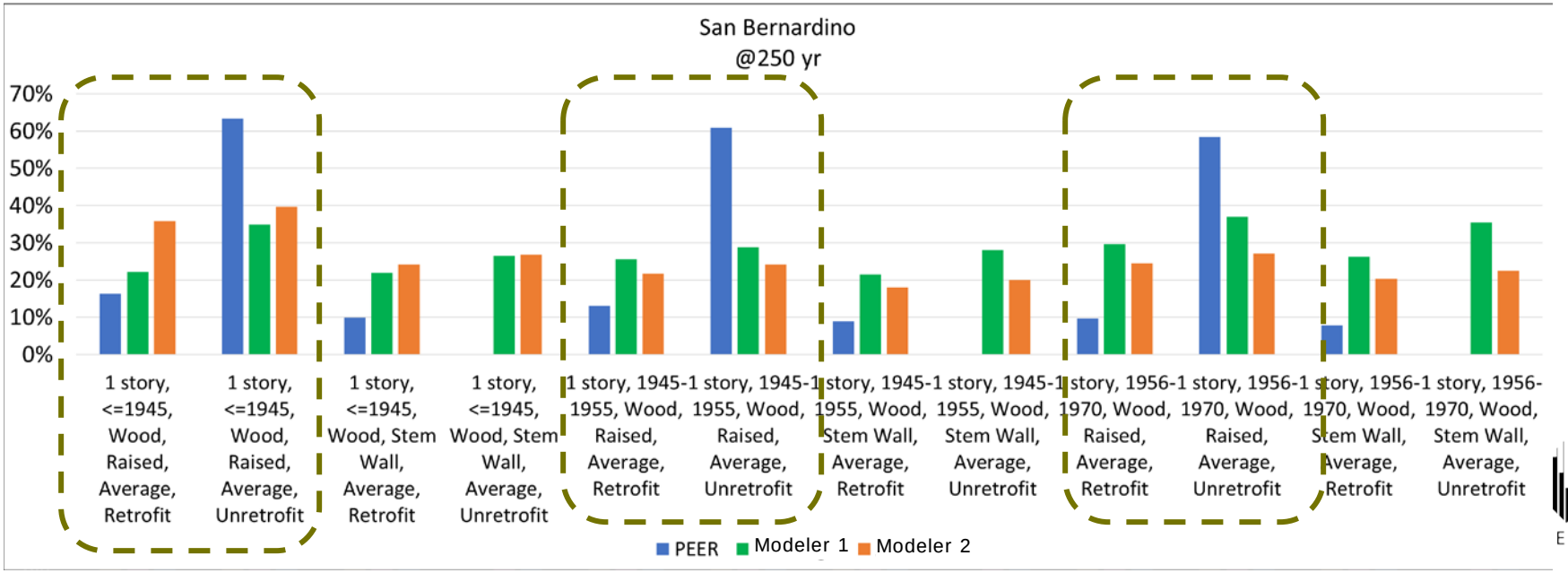
Results Presentation

- PEER-CEA – Modeler results were presented to each modeler after initial run of 12 buildings
- Comments, questions and suggested revisions were proposed
- PEER team revised models based on comments and ran remaining 36 buildings
- Comparison of all 48 buildings were presented to modelers

PEER

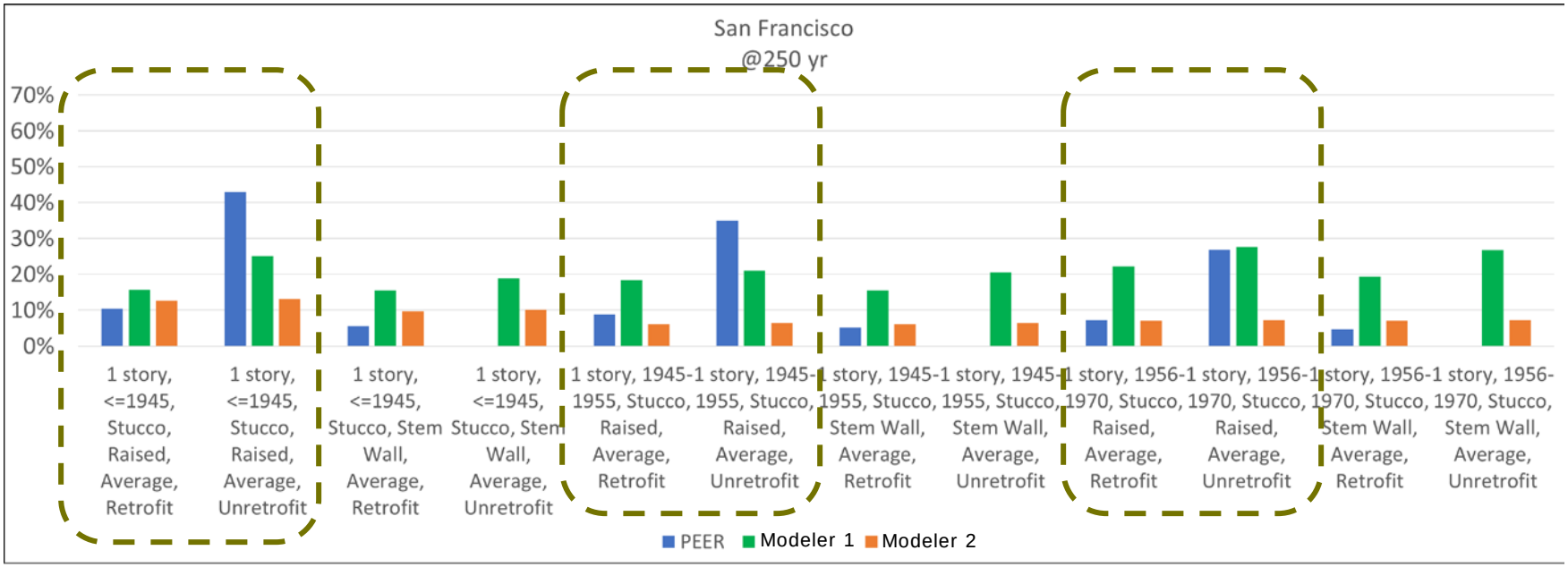
Results: 1 story, wood

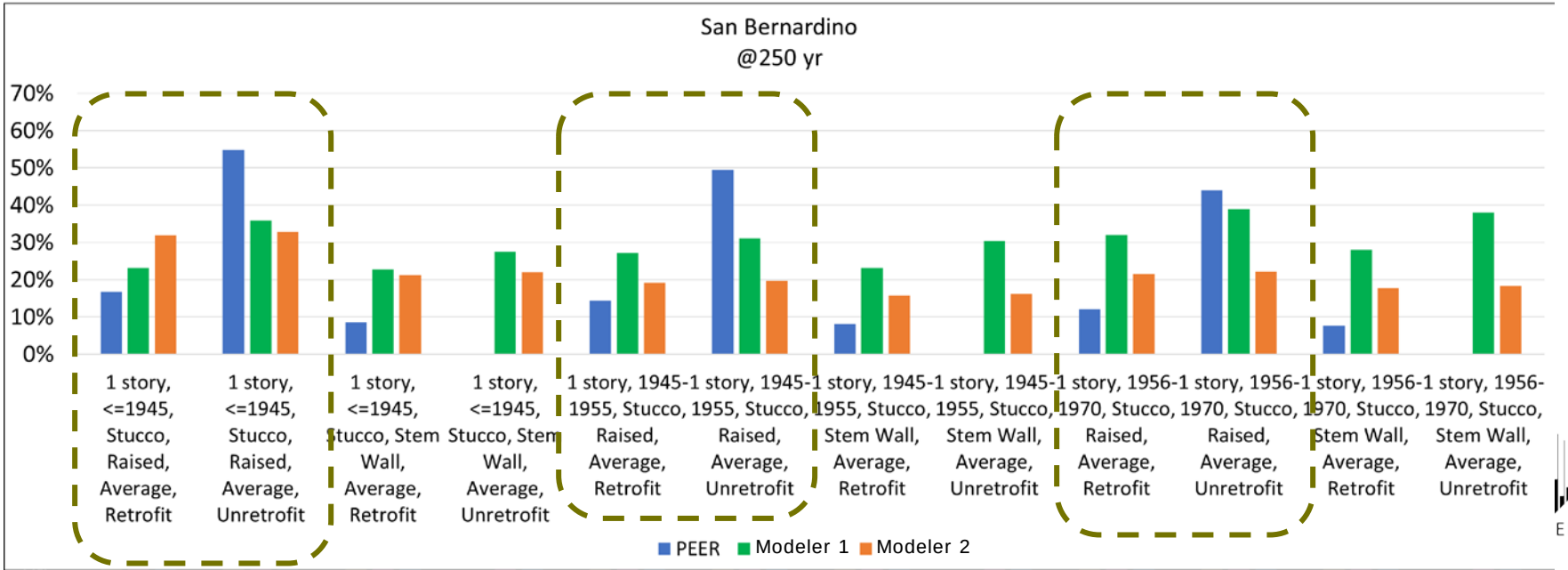




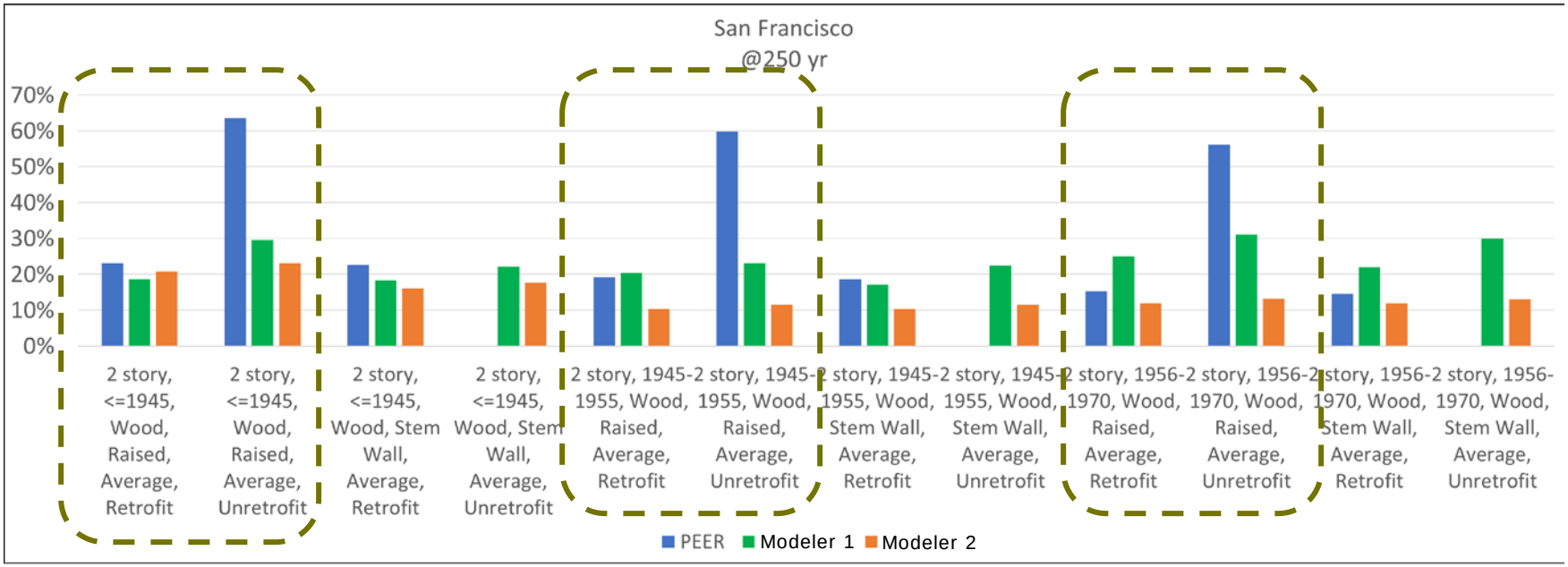
EER

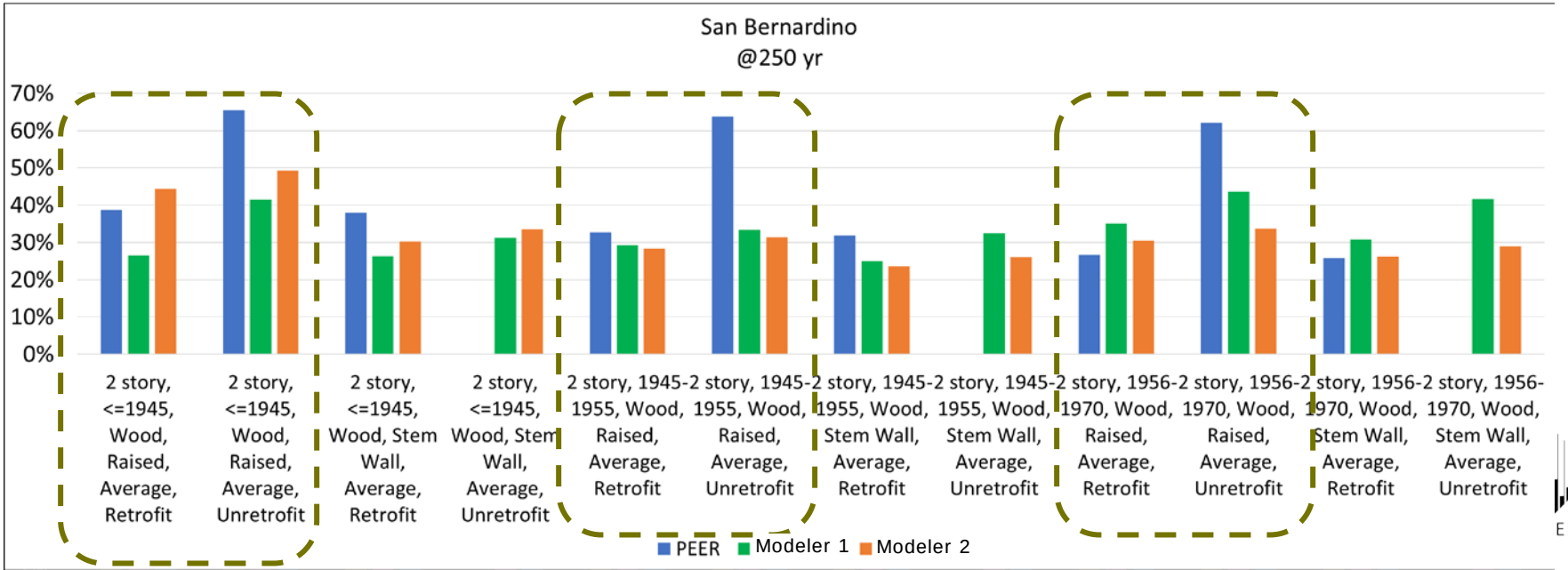
Results: 1 story, stucco



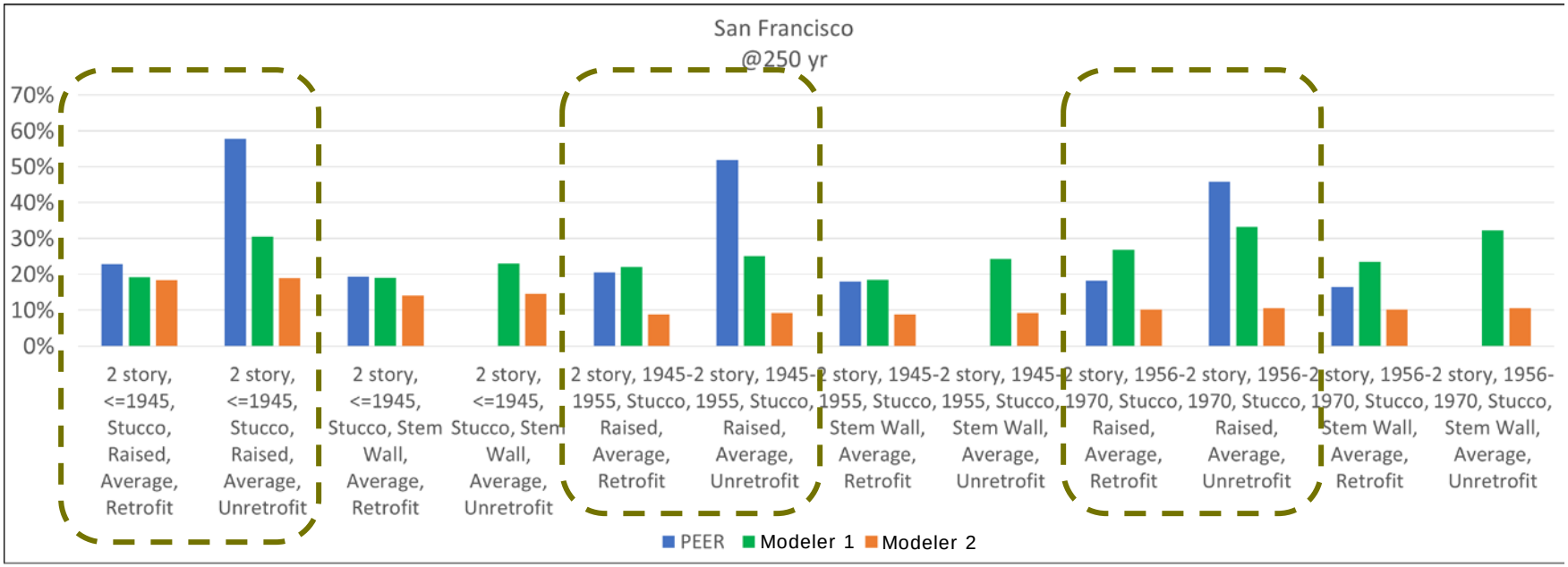


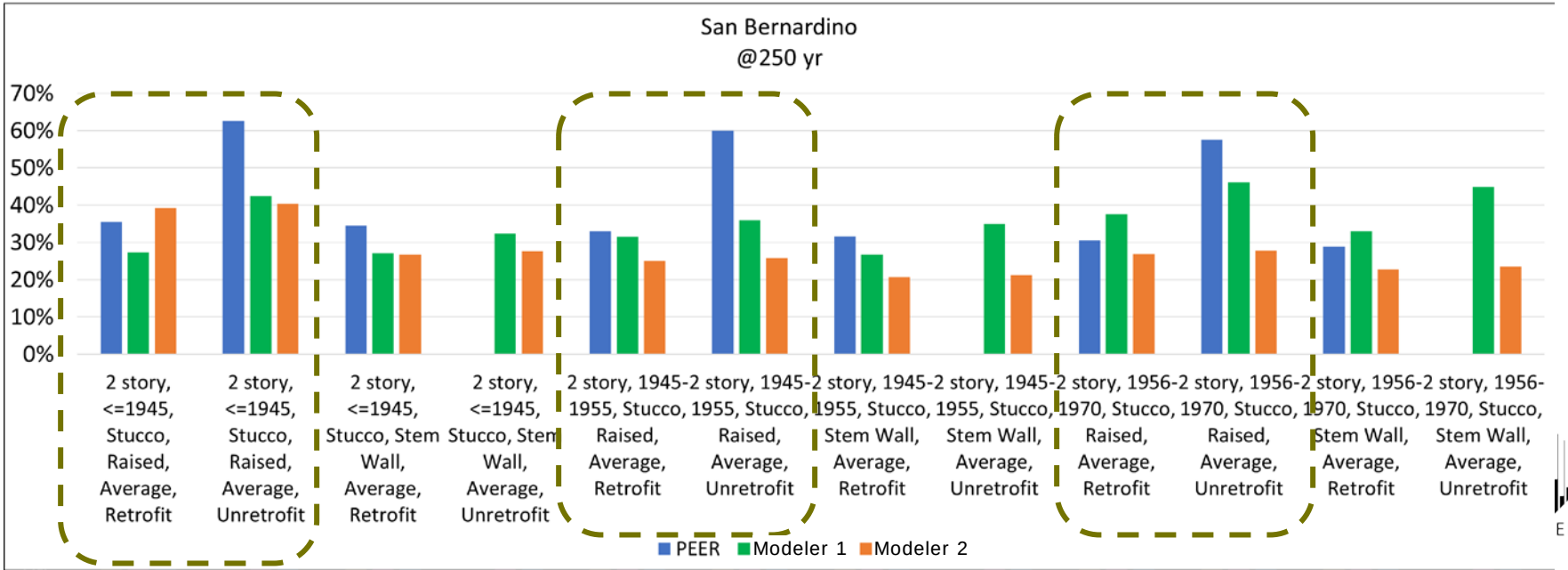
Results: 2 story, wood





Results: 2 story, stucco





Summary

- One relatively clear result appears to be that the PEER-CEA models predict a greater difference in damage between the retrofitted and existing conditions than do the modelers.

PEER

Key Findings

- For unretrofitted raised (2-ft) cripple-wall conditions the PEER-CEA Project models consistently and significantly estimated more significant damage than the modelers.
- Both the Modelers and PEER-CEA Project predicted greater damage for the two-story, raised cripple-wall homes versus the one-story homes.
- For unretrofitted stem-wall conditions the Modelers consistently estimated lower damage than the PEER-CEA Project models.
- For retrofitted conditions, the PEER-CEA Project and Modelers' results compared significantly better than unretrofitted conditions.
- The PEER-CEA Project results showed a consistent improvement in performance with age. The Modelers results showed consistent improvement from the 1945–1955 age range over the pre-1945 age range, but poorer performance from the 1955–1970 age range over the 1945–1955 age range.
- The PEER-CEA Project models show distinctly better performance for stucco over wood siding in the unretrofitted condition, unlike the Modelers.

PEER

Appendix B:
QuakeGrade and FEMA P-50

It could happen today.

FEMA P-50 and QuakeGrade™

Janiele Maffei

Chief Mitigation Officer

May 12, 2020

CEA California Earthquake Authority™

CALIFORNIA:
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.

CEA CALIFORNIA EARTHQUAKE AUTHORITY™

NORTHRIDGE EARTHQUAKE

Los Angeles Times

TUESDAY, JANUARY 18, 1994

33 Die, Many Hurt in 6.6 Quake

L.A. Area Freeways Buckle, Buildings Topple

Sylmar Jolted by Ghosts of Horror Past

■ **History:** The city that crumpled under a 6.5 quake in 1971 remembers well the terror that came when the earth gave way. On Monday, it seemed like it was cursed.

■ **Disaster:** Epicenter is in Northridge, where three-story apartment complex pancakes. Ruptured gas lines erupt in fire in strongest temblor in city's modern history.

By TRACEY KAPLAN and GREG KRIKORIAN

Thrust Faults Pose Brutal Danger to Basin

Commuters Will Face Nightmare for Months

■ **Transportation:** Several freeway sections are shut. Golden State, Santa Monica routes are heavily damaged.

Questions on Reinforcing of Freeways Raised

To Our Readers

January 17, 1994

CEA: PUBLICLY MANAGED AND PRIVATELY FINANCED

A not-for-profit provider of residential earthquake insurance

GOVERNING BOARD:

Governor

Insurance Commissioner

State Treasurer

Non Voting:

Assembly Speaker and Senate Rules Chair

PRIVATELY FINANCED:

1,115,040 Policyholders

MISSION:

Educate

Mitigate

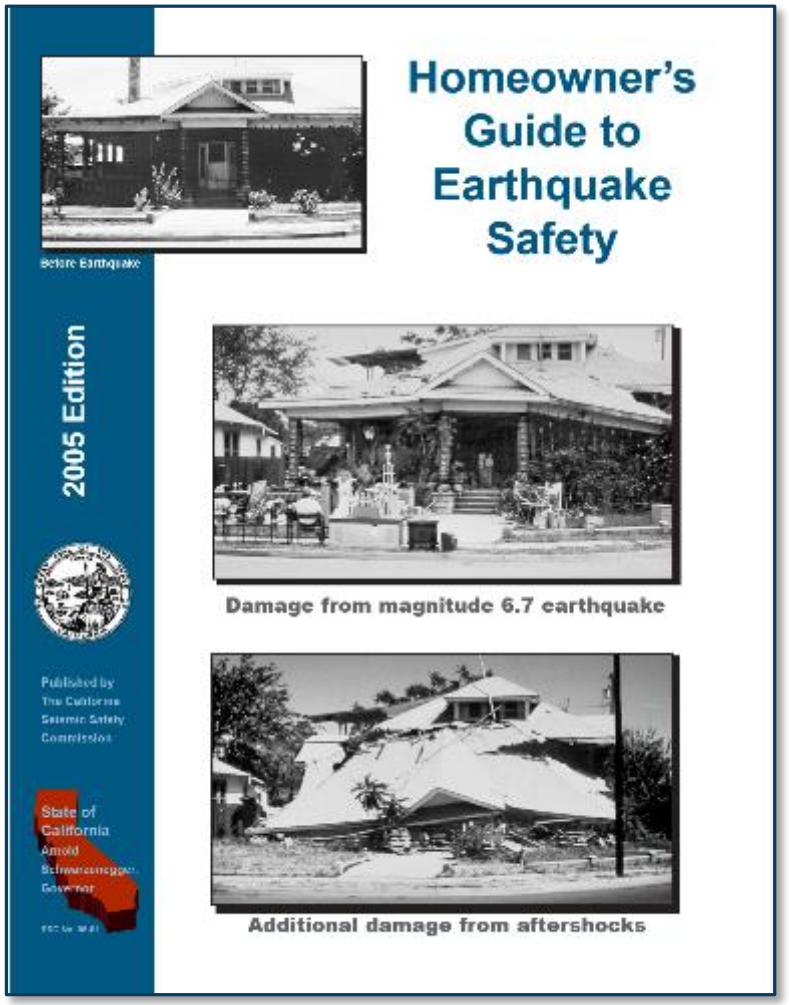
Insure

CEA CALIFORNIA EARTHQUAKE AUTHORITY™

CEA: PARTICIPATING INSURERS

CEA CALIFORNIA EARTHQUAKE AUTHORITY™

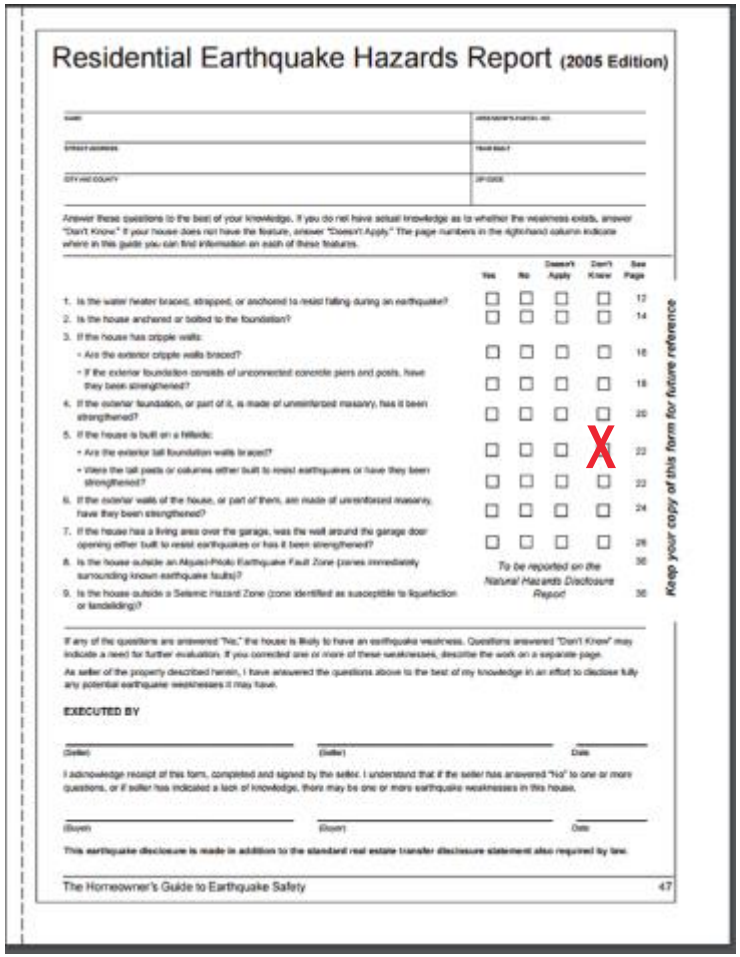
Since 1990, CA State Law Requires Seller to Inform Buyer of Known Weaknesses



Real Estate agents required to give this book to a buyer of houses built before 1960

CA REAL ESTATE HAZARD REPORT

Required since 1990



Residential Earthquake Hazards Report (2005 Edition)

Answer these questions to the best of your knowledge. If you do not have actual knowledge as to whether the weakness exists, answer "Don't Know." If your house does not have the feature, answer "Doesn't Apply." The page numbers in the right-hand column indicate where in this guide you can find information on each of these features.

	Yes	No	Doesn't Apply	Don't Know	See Page
1. Is the water heater braced, strapped, or anchored to resist falling during an earthquake?	☐	☐	☐	☐	12
2. Is the house anchored or bolted to the foundation?	☐	☐	☐	☐	14
3. If the house has cripple walls:					
• Are the exterior cripple walls braced?	☐	☐	☐	☐	16
• If the exterior foundation consists of unconnected concrete piers and posts, have they been strengthened?	☐	☐	☐	☐	18
4. If the exterior foundation, or part of it, is made of unreinforced masonry, has it been strengthened?	☐	☐	☐	☐	20
5. If the house is built on a hillside:					
• Are the exterior tall foundation walls braced?	☐	☐	☐	X	22
• Were the tall posts or columns either built to resist earthquakes or have they been strengthened?	☐	☐	☐	☐	22
6. If the exterior walls of the house, or part of them, are made of unreinforced masonry, have they been strengthened?	☐	☐	☐	☐	24
7. If the house has a living area over the garage, was the wall around the garage door opening either built to resist earthquakes or has it been strengthened?	☐	☐	☐	☐	26
8. Is the house outside an Alquist-Priolo Earthquake Fault Zone (zones immediately surrounding known earthquake faults)?	*To be reported on the Natural Hazards Disclosure Report*				30
9. Is the house outside a Seismic Hazard Zone (zone identified as susceptible to liquefaction or landsliding)?					30

Keep your copy of this form for future reference

If any of the questions are answered "No," the house is likely to have an earthquake weakness. Questions answered "Don't Know" may indicate a need for further evaluation. If you corrected one or more of these weaknesses, describe the work on a separate page.

As seller of the property described herein, I have answered the questions above to the best of my knowledge in an effort to disclose fully any potential earthquake weaknesses it may have.

EXECUTED BY

(Seller) (Seller) Date

I acknowledge receipt of this form, completed and signed by the seller. I understand that if the seller has answered "No" to one or more questions, or if seller has indicated a lack of knowledge, there may be one or more earthquake weaknesses in this house.

(Buyer) (Buyer) Date

This earthquake disclosure is made in addition to the standard real estate transfer disclosure statement also required by law.

The Homeowner's Guide to Earthquake Safety 47

Seller must provide hazard (fault rupture, liquefaction, landslide) information

But…

Can check "don't know" about structural weaknesses

EARTHQUAKE WEAKNESSES

Some houses may have more than one weakness

Crawlspace (Cripple wall)

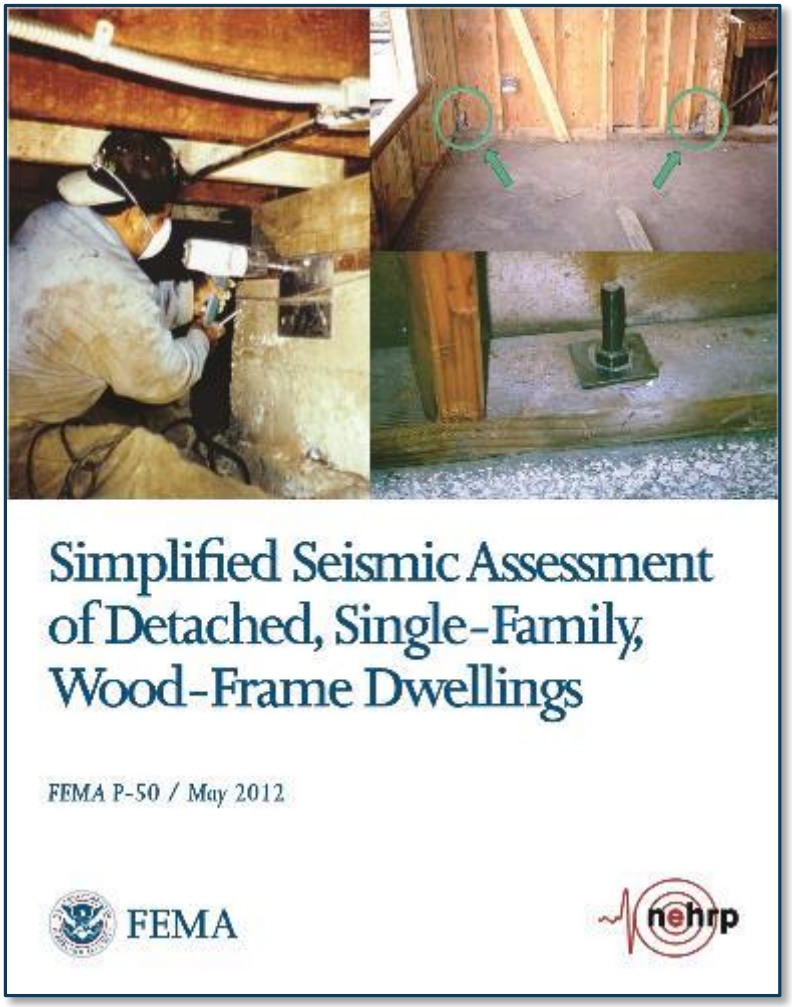
Living-space-over garage

Hillside house

Chimney

Water Heater

FEMA P-50


Simplified Seismic Assessment of Detached, Single-Family, Wood-Frame Dwellings
FEMA P-50 / May 2012
FEMA
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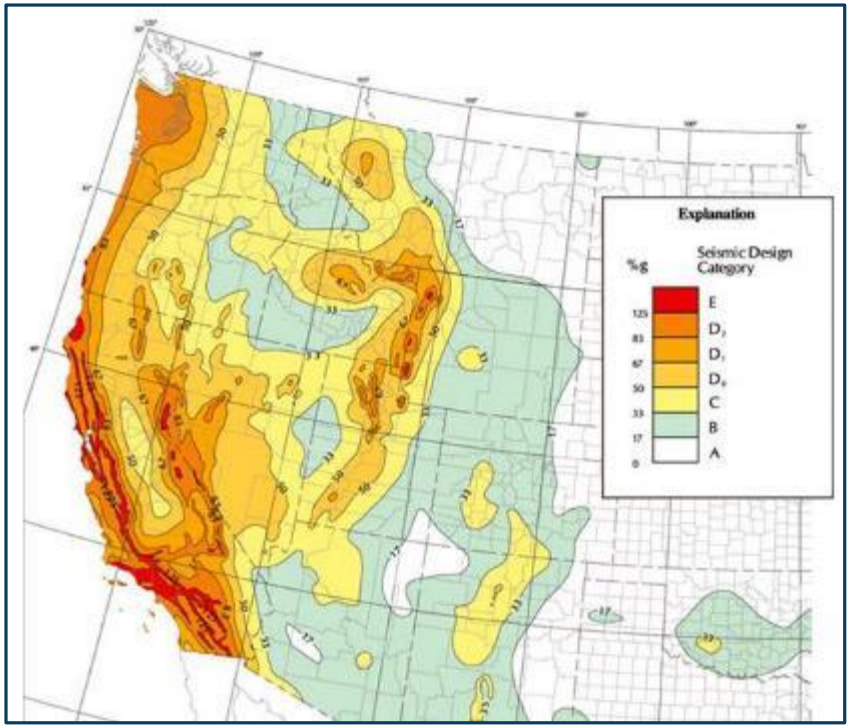
SEISMIC PERFORMANCE GRADE

Combination of hazard and structural scores

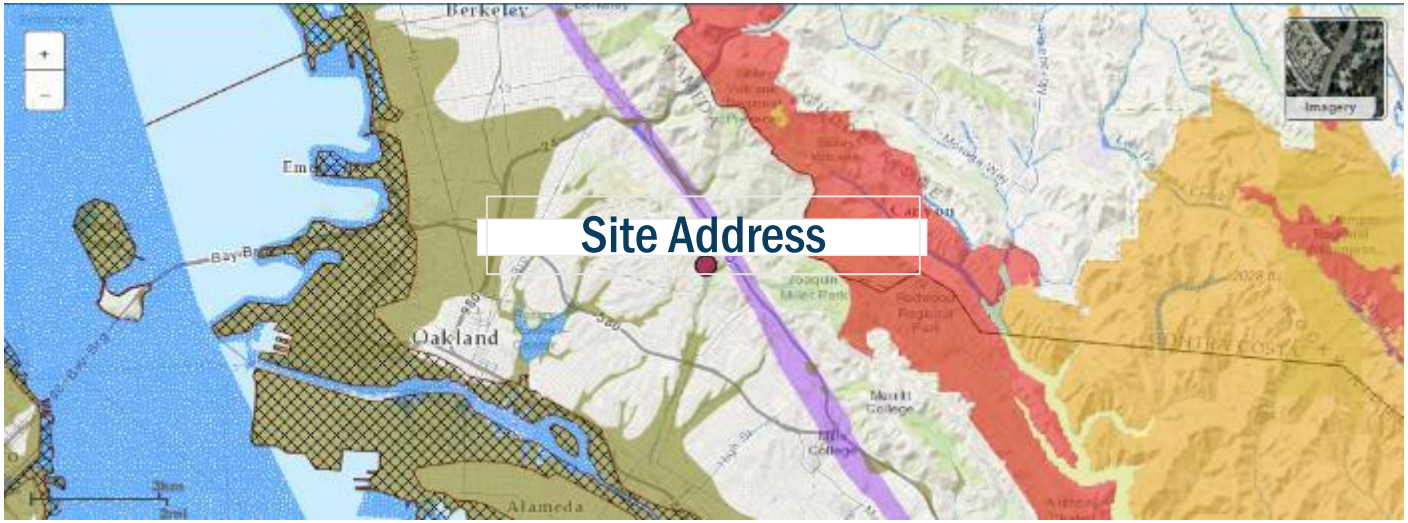


Earthquake Hazard

Structural Weaknesses

SEISMIC PERFORMANCE GRADE

Seismic hazard score – location and soil type



Liquefaction Zone

Landslide Zone

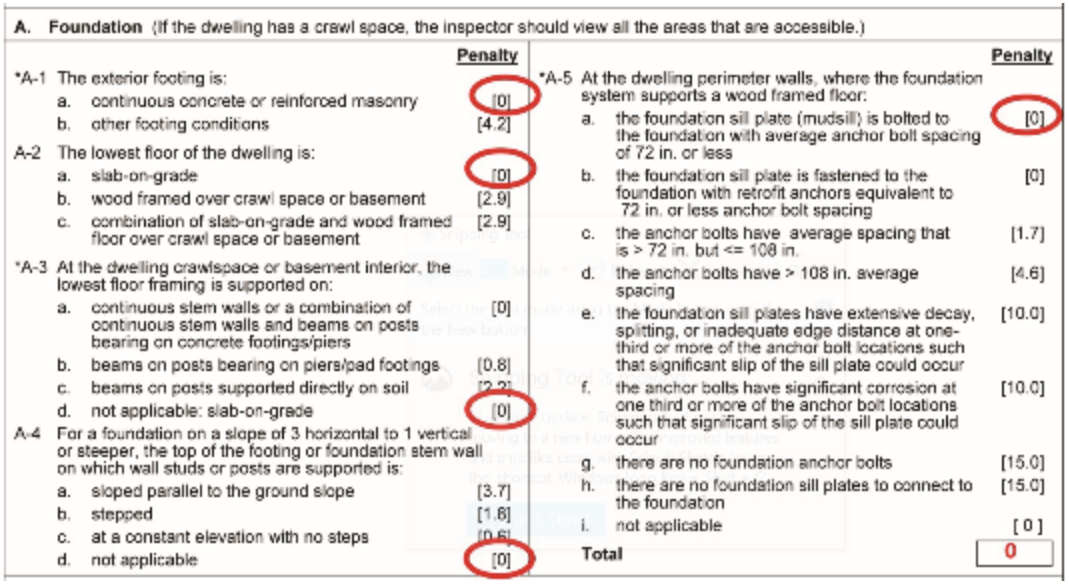
SEISMIC PERFORMANCE GRADE

Structural score – house characteristics

House characteristics:

- Foundation
- Superstructure
- General Condition
- Non-structural, Age, and Size
- Local Site Conditions

Start with 100 and take off penalty points



A. Foundation (If the dwelling has a crawl space, the inspector should view all the areas that are accessible.)

		Penalty
*A-1	The exterior footing is:	
	a. continuous concrete or reinforced masonry	[0]
	b. other footing conditions	[4.2]
A-2	The lowest floor of the dwelling is:	
	a. slab-on-grade	[0]
	b. wood framed over crawl space or basement	[2.9]
	c. combination of slab-on-grade and wood framed floor over crawl space or basement	[2.9]
*A-3	At the dwelling crawlspace or basement interior, the lowest floor framing is supported on:	
	a. continuous stem walls or a combination of continuous stem walls and beams on posts bearing on concrete footings/piers	[0]
	b. beams on posts bearing on piers/pad footings	[0.8]
	c. beams on posts supported directly on soil	[2.2]
	d. not applicable: slab-on-grade	[0]
A-4	For a foundation on a slope of 3 horizontal to 1 vertical or steeper, the top of the footing or foundation stem wall on which wall studs or posts are supported is:	
	a. sloped parallel to the ground slope	[3.7]
	b. stepped	[1.8]
	c. at a constant elevation with no steps	[0.6]
	d. not applicable	[0]

		Penalty
*A-5	At the dwelling perimeter walls, where the foundation system supports a wood framed floor:	
	a. the foundation sill plate (mudsill) is bolted to the foundation with average anchor bolt spacing of 72 in. or less	[0]
	b. the foundation sill plate is fastened to the foundation with retrofit anchors equivalent to 72 in. or less anchor bolt spacing	[0]
	c. the anchor bolts have average spacing that is > 72 in. but <= 108 in.	[1.7]
	d. the anchor bolts have > 108 in. average spacing	[4.6]
	e. the foundation sill plates have extensive decay, splitting, or inadequate edge distance at one-third or more of the anchor bolt locations such that significant slip of the sill plate could occur	[10.0]
	f. the anchor bolts have significant corrosion at one third or more of the anchor bolt locations such that significant slip of the sill plate could occur	[10.0]
	g. there are no foundation anchor bolts	[15.0]
	h. there are no foundation sill plates to connect to the foundation	[15.0]
	i. not applicable	[0]
	Total	0

Foundation checklist from FEMA P-50

SEISMIC PERFORMANCE GRADE

Table 5. Seismic Performance Grade Based on Structural Score and Regional Seismic Hazard Score

Seismic Hazard Score		0 - 1	2 - 3	4 - 5	6 - 7	8 - 10	11 - 12
Structural Score	1.0 - 45.9	B-	C+	C	D	D-	D-
	46.0 - 64.9	B+	B	C+	D+	D	D-
	65.0 - 74.9	A-	B+	B	C	C-	D+
	75.0 - 84.9	A-	A-	B+	B-	C	C
	85.0 - 100	A	A	A-	B+	B	B-

G. Determination of Seismic Performance Grade

1. Structural Score

		Penalty Sum
a.	Foundation (Section A)	[3.7]
b.	Superstructure Framing and Configuration (Section B)	[7.3]
c.	General Condition Assessment	[2.4]
d.	Nonstructural Elements, Age, and Size (Section D)	[5.0]
e.	Local Site Conditions (Section E)	[1.3]
	Total Penalty Points (a to e):	19.7
	Structural Score = (100 – Total Penalty points from line above):	80.3

2. Seismic Hazard Score (from Section F): 6

3. Seismic Performance Grade (from Table 5)
Note: insert this grade, including + or -, if applicable in box on page 1: B-

4. Anticipated Seismic Performance[1]

Following anticipated seismic events:[2]

Grade A, A-: Excellent Performer
(Potential minor structural and finish damage, earthquake damage ratio[3] of 0%-10%, continued occupancy is likely)

Grade B, B+, B-: Good Performer
(Potential moderate structural and finish damage, continued occupancy likely following minor structural repairs, earthquake damage ratio[3] of 0%-50%, seismic retrofit measures are encouraged)

Grade C, C+, C-: Fair Performer
(Potential moderate to major structural and finish damage, structural repairs may be required prior to continued occupancy, earthquake damage ratio[3] of 10%-60%, seismic retrofit measures are strongly encouraged)

Grade D, D+, D-: Poor Performer
(Potential severe structure and finish damage requiring significant repairs prior to re-occupancy, earthquake damage ratio[3] of 20% – 100%, significant seismic retrofit measures are strongly encouraged)

Seismic Performance Table from FEMA P-50

SEISMIC PERFORMANCE GRADE

Combination of hazard and structural scores

Table 5. Seismic Performance Grade Based on Structural Score and Regional Seismic Hazard Score

Seismic Hazard Score		0 - 1	2 - 3	4 - 5	6 - 7	8 - 10	11 - 12
Structural Score	1.0 - 45.9	B-	C+	C	D	D-	D-
	46.0 - 64.9	B+	B	C+	D+	D	D-
	65.0 - 74.9	A-	B+	B	C	C-	D+
	75.0 - 84.9	A-	A-	B+	B-	C	C
	85.0 - 100	A	A	A-	B+	B	B-

Seismic Performance Grade Table from FEMA P-50

SEISMIC PERFORMANCE GRADE

Improving the seismic performance grade through retrofit

H. Improving the Seismic Performance Grade

The Structural Score and Seismic Performance Grade may be altered as a result of seismic retrofit or by a more in-depth seismic evaluation of the dwelling and the site by a qualified licensed design professional. Guidance on these issues is provided in Chapter 8.

If seismic retrofit is being considered, the Structural Score could be increased (and the Seismic Performance Grade potentially increased) by retrofitting conditions that would allow the elimination or reduction in penalties, if any, for the following items:

Item	Retrofit Description	Points (circle applicable number)	Priority Retrofit
A-1	Provide continuous reinforced concrete foundation	4.2	
A-3	Provide foundation pads under interior posts	1.4	Yes
A-5	Add anchor bolts or retrofit anchors	1.7 4.6 10.0 15.0	Yes
B-2	Add bracing walls at dwelling exterior	3.2	
B-3	Install lighter roofing	1.6 3.5	
B-4	Install plywood/OSB or steel frame at garage front	3.0	Yes
B-5	Change exterior wall finish	1.0 2.5 3.5	
B-8	Improve bracing at perimeter walls below lowest floor	4.0 7.0 14.0	Yes
C-2	Repair cut structural framing	1.5	
C-3	Repair deteriorated stucco	1.0 2.0	
C-4	Repair deteriorated foundation	0.6 1.3	
D-1	Strap exterior chimney to roof and floors	1.0	
D-2	Provide bracing and flexible water and gas connections for water heater	1.0	Yes
D-3	Provide earthquake-activated gas shut-off valves	1.0	Yes
D-4	Anchor exterior stairs, deck and porch roof	1.0	Yes
E-3	Repair footing cracks	1.0 2.7	
E-6	Improve rain water routing away from foundations	1.3 2.6	Yes

Priority Retrofits: For this dwelling, the Structural Score can be increased by as many as 3.3 "Priority Retrofit" points (insert sum of points for circled items in rows with "Yes" in Priority Retrofit column). This will increase Structural Score to 89.4 (Section G, Item 1f Structural Score plus "Priority" retrofit points). This will result in an improved Structural Grade of B+ (from Table 5, using improved Structural Score).

All Retrofits: For this dwelling, the Structural Score can be increased by as many as 7.5 retrofit points (insert sum of ALL points for circled items). This will increase the Structural Score to 93.6 (Section G, Item 1f structural score plus ALL points circled above). This will result in an improved Structural Grade of B+ (from Table 5, using improved Structural Score).

Improving the grade table from FEMA P-50

Crawlspace (Cripple Wall) Weakness

House shifted and dropped

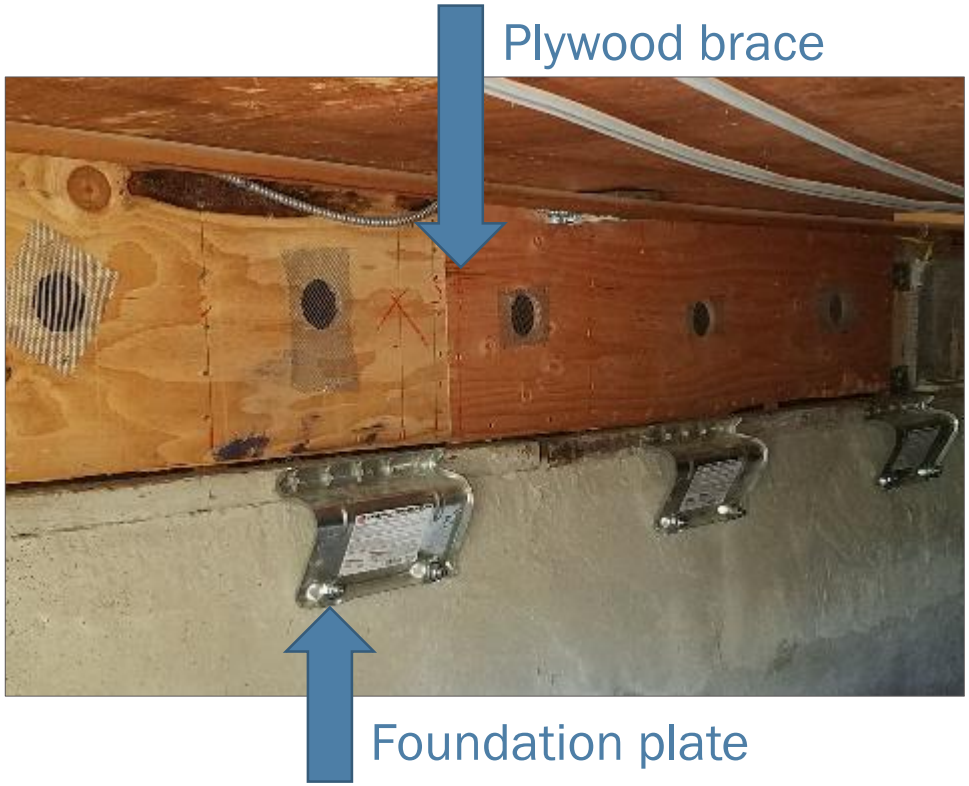
2014 South Napa M6.0 Earthquake Damage to a House

EARTHQUAKE BRACE + BOLT

Typical crawlspace (cripple wall) retrofit

Crawlspace **Before** Retrofit

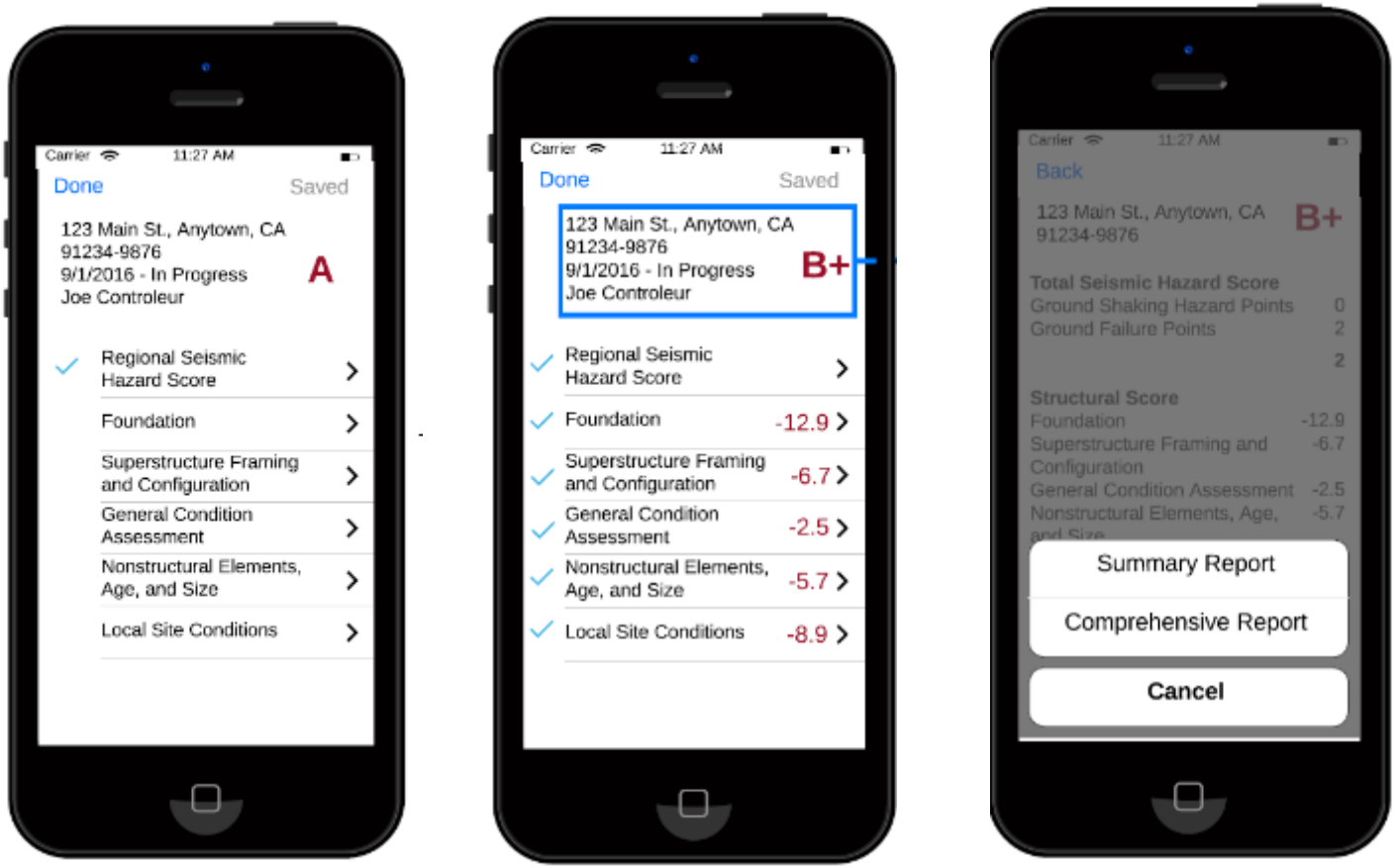
Crawlspace **After** Retrofit




QuakeGrade™

QuakeGrade™

FEMA P-50 App for computer, smartphones, and tablets



QuakeGrade™

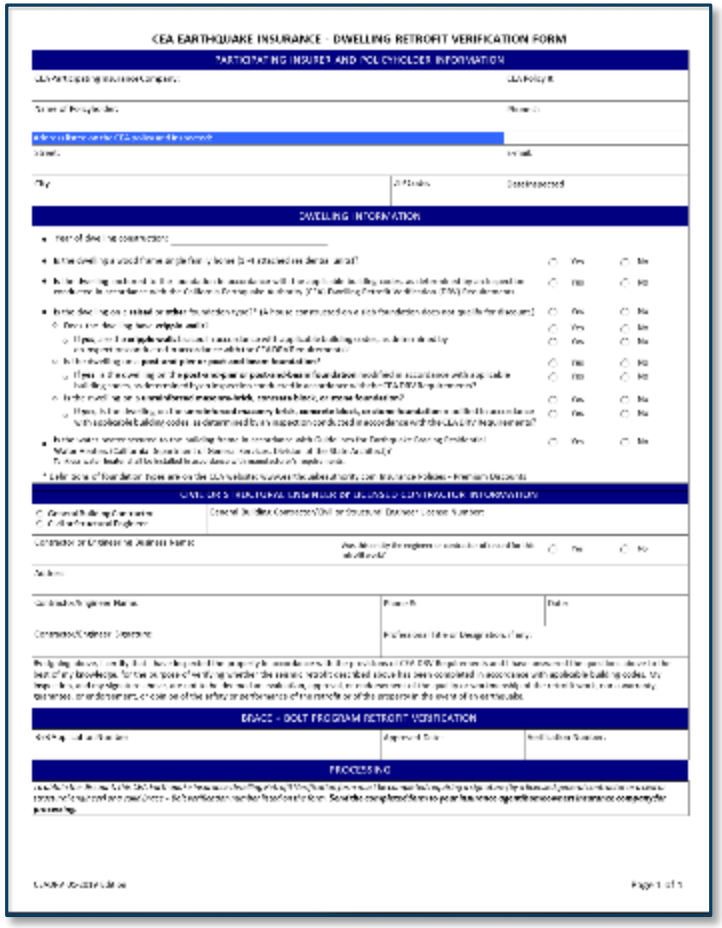
QuakeGrade™ currently requires a contractor or engineering license

- CEA currently requires that a QuakeGrade™ user have a contractor or engineering license
- CEA is working on adding architects and trained home inspectors

FEMA P-50 / QuakeGrade™ training for home inspectors

- CEA is working with the Applied Technology Council and the California Real Estate Inspection Association (CREIA) to train CA home inspectors in the use of FEMA P-50
- CEA plans to have an inspector directory on the website

QuakeGrade™ short report for CEA hazard reduction discount



CEA EARTHQUAKE INSURANCE – DWELLING RETROFIT VERIFICATION FORM

PARTICIPATING INSURER AND POLICYHOLDER INFORMATION

DWELLING INFORMATION

BRACE + BOLT PROGRAM RETROFIT VERIFICATION

PROCESSING

- CEA Policyholders with a code-compliant retrofit can receive a discount of up to 25% with a signed *Dwelling Retrofit Verification (DRV) Form*
- QuakeGrade™ can produce a DRV short report

QuakeGrade™ is live at QuakeGrade.com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