

Seismic Hazards Identification Ordinance Update

Policy & Services Committee

AUGUST 8, 2023

www.cityofpaloalto.org

OVERVIEW

Presentation

- **What** is the “seismic hazards identification ordinance update” project?
- **Why** is this project being undertaken?
- **How** has the City approached this project?
- **How** might the City approach this project going forward?



GOALS & DISCUSSION

Committee Discussion

- Questions & Answers
- Are staff headed in the right direction with our proposed approach?
- Initial reflections or preferences regarding policy components





SEISMIC HAZARDS IDENTIFICATION ORDINANCE UPDATE PROJECT

“What”

AUGUST 8, 2023

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PROJECT DIRECTION & HISTORY

- **2017:** City Council directed staff to “**Return to Policy and Services Committee With Amendments to the Municipal Code for the Regulation of Seismic Vulnerable Buildings.**”
 - Following the Seismic Hazards Risk Assessment Study
- **2014:** Following seismic events, Council initiated the study
- **1986:** City Council adopted the current Seismic Hazards Identification Seismic Hazards Identification Program codified at PAMC Section
 - 16.42.2 This ordinance established a **mandatory evaluation** program and **incentives** for property owners to **voluntarily** upgrade structurally deficient buildings



PROJECT DIRECTION & RECENT HISTORY

- **FY 2022-2023 & 2023-2024:** Council appropriated funds (combined \$225,000) for developing the ordinance update.
- **2023:** The Council identified the update of the seismic ordinance as a part of the **Community Health and Safety Priority**
 - This item is further nested under “Invest in reliable safety infrastructure and systems.”



SEISMIC HAZARDS RISK ASSESSMENT STUDY

“Why” & “What”

AUGUST 8, 2023

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CURRENT ORDINANCE PAMC 16.42



- **Current ordinance highly successful**
 - Identified 89 buildings
 - 100% of property owners complied with submitting reports
 - 74% of identified buildings were strengthened, demolished, or proposed to be demolished
 - Continues to bear fruit in 2023

Table 1: Building Types Included in Current PAMC

| Category | Building Type | Construction Date | Occupants & Size |
|----------|----------------------|-------------------|------------------------|
| I | Unreinforced Masonry | N/A | Over 6 + Over 1,900 sf |
| II | Any | Before 1-1-1935 | Over 100 occupants |
| III | Any | Before 8-1-1976 | Over 300 occupants |

SEISMIC RISK ASSESSMENT STUDY



- **Conclusions of Study**
 - Palo Alto faces significant losses in the event of seismic events
 - Potential benefits from retrofitting are also significant
 - Addressing known potentially hazardous building types that are present in large numbers maximizes risk reduction

ADDITIONAL BUILDING TYPES

- Lessons from seismic events have expanded the types of buildings that may be considered for strengthening or demolition
- Study identified **5 additional building types** that could be included in an updated ordinance
- *Image: Category IV, Wood-frame soft story building built before 1977; additional category*



Image: Category IV, Wood-frame soft story building built before 1977; additional category

ADDITIONAL BUILDING TYPES CONSIDERED

Table 2: Additional Building Types Considered for Updated Program

| Category | Approx # of Bldg | Building Type | Date of Construction | Occupants & Size |
|----------|------------------|----------------------------------|----------------------|------------------|
| IV | 294 | Soft-story wood frame | Before 1977 | Any |
| V | 99 | Tilt-up | Before 1998 | Any |
| VI | 37 | Soft-story concrete | Before 1977 | Any |
| VII | 35 | Steel moment frame | Before 1998 | Any |
| VIII | TBD | Other older non-ductile concrete | Before 1977 | Any |

RESILIENCE & RECOVERY

During a Seismic Event:

- Prevent/decrease loss of life
- Prevent/decrease loss of property

During Recovery:

- Reduce constraints in immediate aftermath (more buildings occupiable, functioning, etc.)
- Speed overall economic and social recovery (more buildings can perform and return to “normal”)



*Image: Category I, Unreinforced Masonry Building
Earthquake Damage*

FACTORS

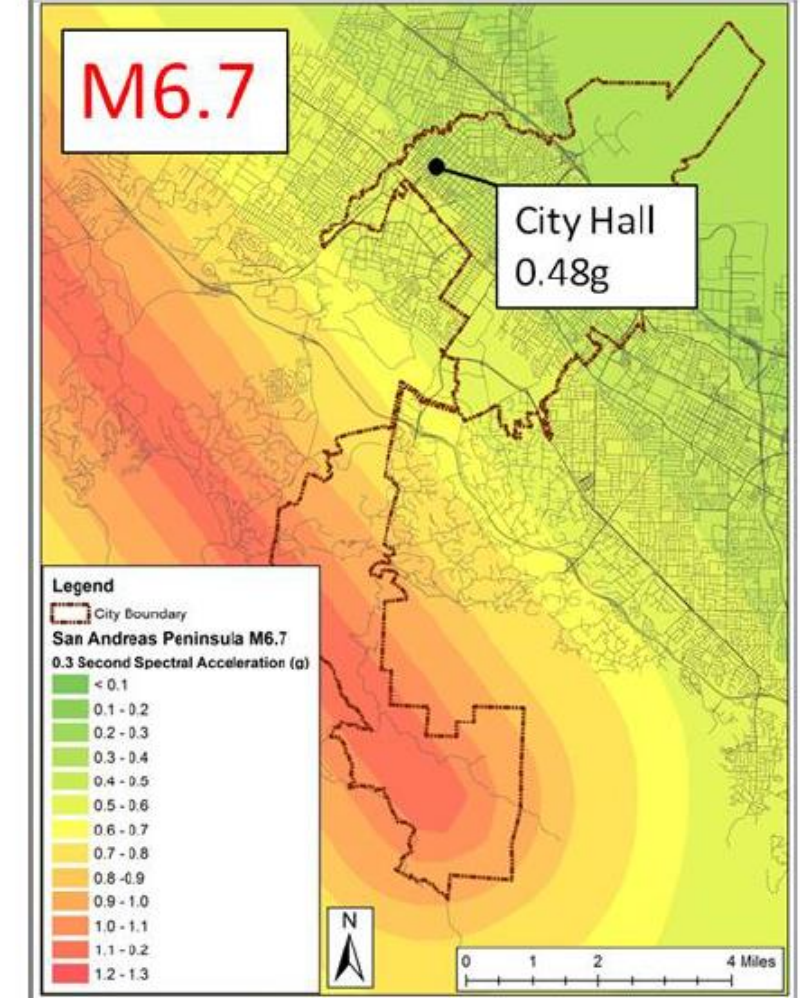
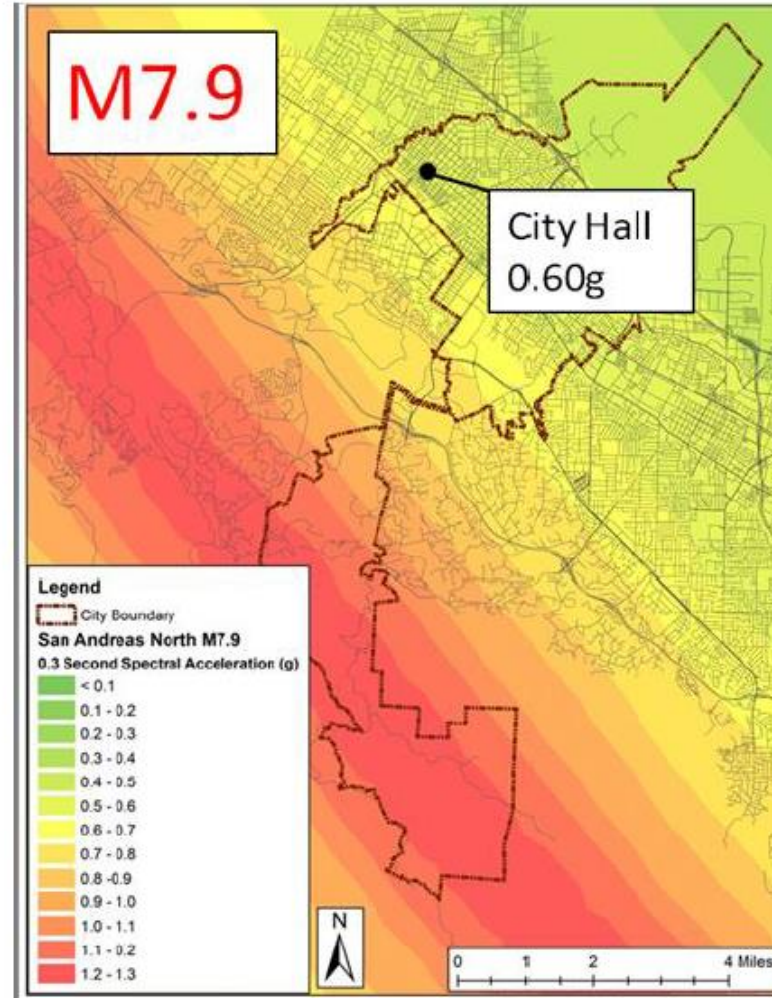
- **Type of Construction** – Known seismic vulnerabilities
- **Occupancy** – Could consider number of occupants
- **Ownership** – Include condominiums?
- **Risk Reduction and Cost** - Balance Cost of Retrofit with Incentives



*Image: Category I, Unreinforced Masonry Building
Earthquake Damage*

RESILIENCE & RECOVERY

- **Damage & Loss Estimates** - Hazus multi-hazard loss estimation technology (software + methodology) used to model seismic scenarios, estimate damage, and losses
- M6.7 plausible event
- M7.9



LOSSES AS-IS

- Magnitude 7.9 Scenario:
\$2.4 billion in losses
- Magnitude 6.7 Scenario:
\$1.2 Billion in losses
- More shaking = more
damage – damage/loss
nearly doubles from M6.7
to M7.9

Total Losses As-Is Condition

| Earthquake Scenario | Building Value ¹ (\$B) | Content Value ² (\$B) | Number of Bldgs. with Damage Ratio \geq 20% ³ | Estimated Building Damage ⁴ (\$B) | Estimated Content Damage ⁴ (\$B) | Total Building and Content Damage (\$B) |
|---------------------|-----------------------------------|----------------------------------|--|--|---|---|
| M7.9 | 18.9 | 17.3 | 224 | 1.7 | 0.7 | 2.4 |
| M6.7 | 18.9 | 17.3 | 19 | 0.8 | 0.4 | 1.2 |
| Ratio of M7.9/M6.7 | | | | 2 | 2 | 2 |

LOSS REDUCTION VIA RETROFITTING

Key Takeaways

- Losses are still significant
- Reduction in total loss of 45% for the M7.9, and 33% for the M6.7
- Aggregate loss could be reduced: one third (M6.7); almost halved (M7.9)
- Reduction of the number of buildings with more than 20% damage.

Total Losses After Retrofitting

| Earthquake Scenario | Building Value (\$B) | Content Value (\$B) | Estimated Building Damage (\$B) | Number of Bldgs. with Damage Ratio \geq 20% | Estimated Content Damage (\$B) | Total Building & Content Damage (\$B) |
|---------------------|----------------------|---------------------|---------------------------------|---|--------------------------------|---------------------------------------|
| M7.9 | 18.9 | 17.3 | 0.9 | 6 | 0.5 | 1.3 |
| M6.7 | 18.9 | 17.3 | 0.5 | 0 | 0.3 | 0.8 |
| Ratio of M7.9/M6.7 | | | 2 | - | 2 | 2 |

LOSS REDUCTION VIA RETOFITTING OF BUILDING TYPES

Key Takeaways

- Representing about 15% of the total inventory, these 4 building types are responsible for 30% of the total loss
- Retrofitting this group can lead to 50% reduction in loss

Comparison of Benefits & Costs by Selected Building Type, Date and Characteristics

| Model Building Type | Number of Buildings | Total SF (1,000) | M7.9 EQ Average Loss by Building (\$/SF) | M7.9 EQ Average Loss Avoided by Retrofit (\$/SF) | Average Cost to Retrofit (\$/SF) | (Average Loss Avoided) / (Average Retrofit Cost) |
|--|---------------------|------------------|--|--|----------------------------------|--|
| Pre-1977 wood frame soft-story (W1, W1A, W2) | 294 | 3,690 | 66 | 46 | 12 | 4 |
| Pre-1998 tilt-up (PC1) | 99 | 3,078 | 106 | 71 | 23 | 3 |
| Pre-1977 concrete soft-story (C1, C2, C3) | 37 | 842 | 149 | 108 | 42 | 3 |
| Pre-1998 steel moment frame (S1) | 35 | 690 | 152 | 110 | 10 | 11 |



ORDINANCE UPDATE & POLICY MECHANISMS

“How”

AUGUST 8, 2023

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ORDINANCE UPDATE & PROGRAM DESIGN

- **Questions to Consider During Ordinance Update & Program Design**
 - **Which buildings to target?** Expand to one or more other types of buildings? If so, which ones (construction type, occupancy, age, ownership, use, etc.)? What standard of retrofitting?
 - **Which requirements and features?** Expand voluntary program measures, add mandatory screening and/or evaluation, and/or mandate retrofit
 - **How to motivate and sustain progress?** Phases, tiers, timing, and enforcement; offer a strategic range of incentives; adequate program budget
- **The update requires developing policy (code changes) and accompanying implementation (program) that leads to the realization of the policy objectives.**

ORDINANCE UPDATE APPROACHES

1. **Status Quo, no change.** *Council did not support this option; thus directing staff to return to Policy & Services with an updated ordinance.*

2. **Increase Number of Building Types Regulated, but Retrofit Remains Voluntary:** Add categories of structures requiring **mandatory evaluation**.

3. **Increase Number of Building Types Regulated with Additional Disclosure Measures Incorporated:** Similar to Option 2, but with increased use of **disclosure measures**.



*Berkeley Required
Signage*

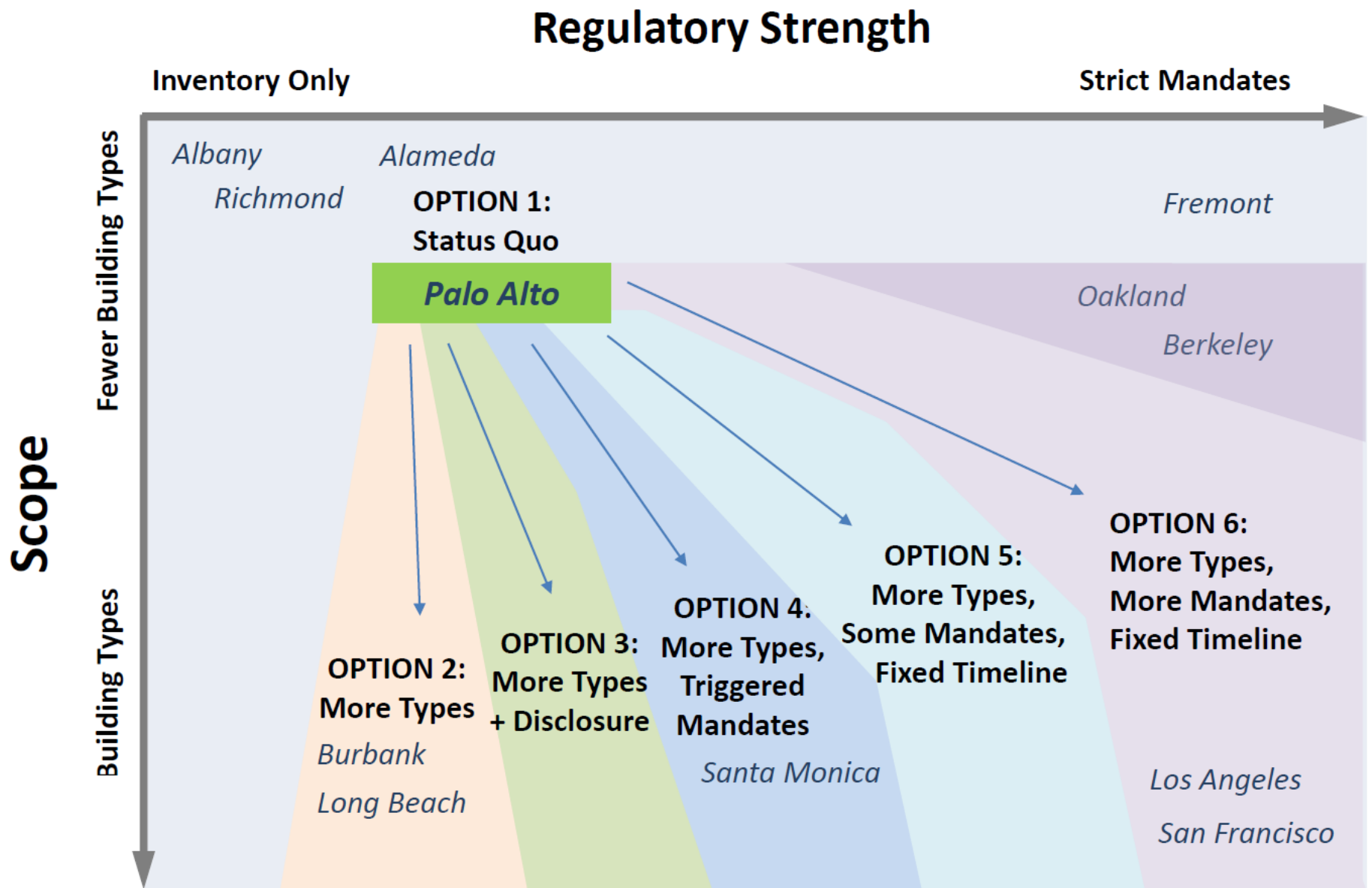
ORDINANCE UPDATE APPROACHES

4. **Increase Number of Building Types Regulated, Some Building Types Have Voluntary Retrofit and a Few Building Types Have Mandatory Retrofit, with Enforcement by a *Trigger Threshold*:** Option 3 plus **required retrofitting** for some building types at **future time** (sale or substantial renovation above a set threshold).
5. **Increase Number of Building Types Regulated, Retrofits for Some Categories are Voluntary and a Few Categories are Mandatory, with Enforcement by a *Fixed Timeline*:** Option 4 plus required retrofitting according to a **fixed timeline**, with timing and **enforcement** based on priority tiers.
6. **Increase Number of Building Types Regulated, but More Categories are Required to Have Mandatory Retrofits:** Option 5 plus retrofitting **required for additional categories** on a fixed timeline.

Summary of Recommended Policy Directions from the Seismic Risk Management Program Advisory Group

| Category | Approx. Number | Building Type | Date of Construction | Occupants | Evaluation Report | Voluntary, Triggered, or Mandatory Retrofit ¹ | Deadlines for Evaluation Report and Retrofit Construction (years) ² | Disclosure | Potential Incentives |
|--|----------------|---------------------------------|----------------------|----------------------------|-----------------------|--|--|--|--|
| Current Program (Potential Revision in <i>Italics</i>) | | | | | | | | | |
| I | 10 | Un-reinforced masonry | NA | Over 6 (and over 1,900 sf) | Required | <i>Mandatory</i> | Report: Expired Construction: 2-4 | <i>Website listing and tenant notification</i> | <i>Fee waiver, expedited permitting, FAR bonus/ transfer of development rights (TDR)</i> |
| II | 4 | Any | Before 1/1/35 | Over 100 | Required | <i>Voluntary or Triggered</i> | Report: Expired Construction | | |
| III | 9 | Any | Before 8/1/76 | Over 300 | Required | <i>Voluntary or Triggered</i> | <ul style="list-style-type: none">• Voluntary: Not required• Triggered: At sale or renovation | | |
| Expanded Program | | | | | | | | | |
| IV | 294 | Soft-story wood frame | Before 1977 | Any | Required | Triggered or Mandatory | Report: 2-4 Construction <ul style="list-style-type: none">• Triggered: At sale or renovation• Mandatory: 4-6 | Same as above | Fee waiver, expedited permitting, TDR, parking exemptions, permission to add units |
| V | 99 | Tilt-up | Before 1998 | Any | Required | Triggered or Mandatory | Report: 2-4 Construction <ul style="list-style-type: none">• Triggered: At sale or renovation• Mandatory: 4-6 | Same as above | Same as Categories I, II and III |
| VI | 37 | Soft-story concrete | Before 1977 | Any | Required | Voluntary, Triggered or Mandatory | Report: 2-4 Construction <ul style="list-style-type: none">• Voluntary: Not required• Triggered: At sale or renovation• Mandatory: 6-8 | Same as above | Same as Categories I, II and III |
| VII | 35 | Steel moment frame | Before 1998 | Any | Required | Voluntary, Triggered or Mandatory | | | |
| VIII | TBD | Other older nonductile concrete | Before 1977 | Any | Not rec. at this time | Not recommended at this time | Report: NA Construction: NA | NA | NA |
| ¹ Voluntary: Retrofit is voluntary. Triggered: Retrofit is triggered when the building is sold or undergoes substantial renovation. Mandatory: Retrofit is required per a fixed timeline. | | | | | | | | | |
| ² Deadlines provide a potential range. Timelines would vary depending on tiers or priority groupings of different subcategories. | | | | | | | | | |

APPROACHES ACROSS CALIFORNIA CITIES





PROPOSED NEXT STEPS

“How”

PROPOSED ACTION STEPS

1. **Procure Expertise & Limited Refresh of Study**
2. **Establish Community Engagement Strategy & Schedule**
3. **Return to P&S with policy framework, recommended policy, program. Then to City Council for direction**
4. **Draft Ordinance & Program Budget**
5. **Ordinance Adoption & Program Appropriation**



DISCUSSION

Committee Discussion

- Questions & Answers
- Are staff headed in the right direction with our proposed approach?
- Initial reflections or preferences regarding policy components:
 - Building types, occupancies, uses
 - Mandatory vs. voluntary (screening, evaluation, retrofit)
 - Fixed timeline vs. open ended
 - Disclosure
 - Incentives, Financing



Summary of Recommended Policy Directions from the Seismic Risk Management Program Advisory Group

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REFERENCE SLIDES



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