Earthquake Risk Reduction Policy

Local Policies and Programs

David Bonowitz, S.E.

EERI Annual Meeting
March 8, 2019
Vancouver

New and Recent Programs

- Portland mandate: URM placards, disclosures
- S.F. Mayor's directive: Downtown recovery plan
- Oakland mandate: “Soft story” retrofit
- Berkeley incentive: Tilt-up, concrete retrofit
- Oakland incentive: Cripple wall retrofit
- San Luis Obispo initiative: Public building eval’n
"Soft story" buildings

Policy development


2010 2011-2013 2013 2014
# "Soft story" retrofit programs

<table>
<thead>
<tr>
<th>City</th>
<th>Stories</th>
<th>Units</th>
<th>Age</th>
<th>Buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oakland</td>
<td>2+</td>
<td>5+</td>
<td>1990-</td>
<td>1400</td>
</tr>
<tr>
<td>San Francisco</td>
<td>3+</td>
<td>5+</td>
<td>1977-</td>
<td>4900</td>
</tr>
<tr>
<td>Berkeley</td>
<td>2+</td>
<td>5+</td>
<td>1977-</td>
<td>270</td>
</tr>
<tr>
<td>Fremont</td>
<td>2+</td>
<td>0+</td>
<td>1977-</td>
<td>22</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>2+</td>
<td>4+ (if R)</td>
<td>1977-</td>
<td>13,500</td>
</tr>
<tr>
<td>Santa Monica</td>
<td>2+</td>
<td>0+</td>
<td>1995-</td>
<td>1600</td>
</tr>
<tr>
<td>West Hollywood</td>
<td>2+</td>
<td>0+</td>
<td>1977-</td>
<td>800</td>
</tr>
</tbody>
</table>

David Bonowitz, S.E.
Program options

Less effort
Notice to owners
Placarding
Evaluation
Target story structural retrofit

More effort
Target story structural retrofit
+ selective nonstruc. mitig’n
Full building structural retrofit
+ full nonstructural mitigation
Full building structural, nonstruc., geologic mitigation

Key issue: Cost sharing

<table>
<thead>
<tr>
<th>City</th>
<th>Amount</th>
<th>Years</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oakland</td>
<td>70%</td>
<td>*</td>
<td>* “Useful life”</td>
</tr>
<tr>
<td>San Francisco</td>
<td>100%</td>
<td>20</td>
<td>10% cap, hardship appeal</td>
</tr>
<tr>
<td>Berkeley</td>
<td>100%</td>
<td>8</td>
<td>Only for small buildings</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>50%</td>
<td>20</td>
<td>$38_mo cap</td>
</tr>
<tr>
<td>Santa Monica</td>
<td>50%</td>
<td>20</td>
<td>Hardship appeal available</td>
</tr>
<tr>
<td>West Hollywood</td>
<td>na</td>
<td>na</td>
<td>Case-specific petition</td>
</tr>
</tbody>
</table>
LEADERS AND FOLLOWERS

- Burdens of a leader
- Advantages of a follower
- Perils of a follower
  - Through the Overton window ...
  - To a destination unknown?
Leaders and Followers

- Should we have a mandatory “soft story” program?
  - Eureka
  - Mountain View
    - 490+/- buildings
    - 5100+/- units

Community Resilience Planning

S.F. ERP, 2008

<table>
<thead>
<tr>
<th>Hours</th>
<th>Critical Services</th>
<th>Days</th>
<th>1-7 days</th>
<th>Weeks</th>
<th>Social Needs</th>
<th>7-30 days</th>
<th>Months</th>
<th>Years</th>
<th>Reconstruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Community Resilience Planning

<table>
<thead>
<tr>
<th>Building Clusters</th>
<th>Support Needed*</th>
<th>Design Hazard Performance</th>
<th>Phase 1 Short-Term</th>
<th>Phase 2 Intermediate</th>
<th>Phase 3 Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Facilities</td>
<td></td>
<td></td>
<td>D</td>
<td>C</td>
<td>A</td>
</tr>
<tr>
<td>Emergency Operation Centers</td>
<td>R, S, MS</td>
<td></td>
<td>90%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>First Responder Facilities</td>
<td>R, S, MS</td>
<td></td>
<td>90%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Memorial Hospital</td>
<td>R, S, MS</td>
<td></td>
<td>90%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Non-ambulatory Occupants (prisons, nursing homes, etc.)</td>
<td>R, S, MS</td>
<td></td>
<td>90%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>National Aircraft Parts Factory (NAP)</td>
<td>R, S, C</td>
<td></td>
<td>90%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Emergency Housing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary Emergency Shelters</td>
<td>R, S</td>
<td></td>
<td>90%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Single and Multi-family Housing (Shelter in place)</td>
<td>R, S</td>
<td></td>
<td>90%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Housing/Neighborhood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical Retail</td>
<td>R, S, C</td>
<td></td>
<td>90%</td>
<td>60%</td>
<td>30%</td>
</tr>
<tr>
<td>Religious and Spiritual Centers</td>
<td>R, S</td>
<td></td>
<td>90%</td>
<td>60%</td>
<td>30%</td>
</tr>
<tr>
<td>Single and Multi-family Housing (Full Function)</td>
<td>R, S</td>
<td></td>
<td>90%</td>
<td>60%</td>
<td>30%</td>
</tr>
<tr>
<td>Schools</td>
<td>R, S</td>
<td></td>
<td>90%</td>
<td>60%</td>
<td>30%</td>
</tr>
<tr>
<td>Hotels &amp; Motels</td>
<td>R, S, C</td>
<td></td>
<td>90%</td>
<td>60%</td>
<td>30%</td>
</tr>
<tr>
<td>Community &amp; Economy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Businesses - Manufacturing (except NAP)</td>
<td>R, S, C</td>
<td></td>
<td>90%</td>
<td>60%</td>
<td>30%</td>
</tr>
<tr>
<td>Businesses - Commodity Services</td>
<td>R, S, C</td>
<td></td>
<td>90%</td>
<td>60%</td>
<td>30%</td>
</tr>
<tr>
<td>Businesses - Service Professions</td>
<td>R, S, C</td>
<td></td>
<td>90%</td>
<td>60%</td>
<td>30%</td>
</tr>
<tr>
<td>Conference &amp; Event Venues</td>
<td>R, S, C</td>
<td></td>
<td>90%</td>
<td>60%</td>
<td>30%</td>
</tr>
</tbody>
</table>

### Recovery Targets

- **Service**
  - Hospitals operational: 0 hrs
  - 95% housing habitable: 24 hrs
  - Emergency shelters open: 24 hrs
  - Essential City services restored: 1 mo
  - Schools reopened: 1 mo
  - Social services reopened: 1 mo
  - Community retail reopened: 1 mo
  - All businesses reopened: 4 mo
### The Case for Mountain View

<table>
<thead>
<tr>
<th>Housing type</th>
<th>Units</th>
<th>% of Housing Stock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft story, 3-4 units</td>
<td>540</td>
<td>2%</td>
</tr>
<tr>
<td>Soft story, 5+ units</td>
<td>4590</td>
<td>14%</td>
</tr>
<tr>
<td>Cripple wall house</td>
<td>1380</td>
<td>4%</td>
</tr>
<tr>
<td>URM</td>
<td>5</td>
<td>0%</td>
</tr>
<tr>
<td>Non-ductile concrete</td>
<td>980</td>
<td>3%</td>
</tr>
<tr>
<td>Mobile home</td>
<td>1050</td>
<td>3%</td>
</tr>
<tr>
<td>Hillside house</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Room over garage</td>
<td>3300</td>
<td>10%</td>
</tr>
<tr>
<td>Other</td>
<td>21,000</td>
<td>64%</td>
</tr>
</tbody>
</table>

### Community Profile

#### Hospitals

- URM: [ ]
- Soft story: [ ][ ][ ][ ]
- NDC: [ ][ ][ ]
- Cripple W: [][ ][ ]
- Tilt-up: [ ][ ]
- Fire sources: [ ]
- Non-struct: [ ]

#### SF Res’l

- URM: [ ]
- Soft story: [ ][ ][ ][ ]
- NDC: [ ][ ][ ]
- Cripple W: [ ][ ][ ]
- Tilt-up: [ ][ ][ ]
- Fire sources: [ ]
- Non-struct: [ ]

#### MF Res’l

- URM: [ ]
- Soft story: [ ][ ][ ][ ]
- NDC: [ ][ ][ ]
- Cripple W: [ ][ ][ ]
- Tilt-up: [ ][ ][ ]
- Fire sources: [ ]
- Non-struct: [ ]

#### Shelters

- URM: [ ]
- Soft story: [ ][ ][ ][ ]
- NDC: [ ][ ][ ]
- Cripple W: [ ][ ][ ]
- Tilt-up: [ ][ ][ ]
- Fire sources: [ ]
- Non-struct: [ ]

#### City services

- URM: [ ]
- Soft story: [ ][ ][ ][ ]
- NDC: [ ][ ][ ]
- Cripple W: [ ][ ][ ]
- Tilt-up: [ ][ ][ ]
- Fire sources: [ ]
- Non-struct: [ ]

#### Industry

- URM: [ ]
- Soft story: [ ][ ][ ][ ]
- NDC: [ ][ ][ ]
- Cripple W: [ ][ ][ ]
- Tilt-up: [ ][ ][ ]
- Fire sources: [ ]
- Non-struct: [ ]

#### Social svcs

- URM: [ ]
- Soft story: [ ][ ][ ][ ]
- NDC: [ ][ ][ ]
- Cripple W: [ ][ ][ ]
- Tilt-up: [ ][ ][ ]
- Fire sources: [ ]
- Non-struct: [ ]

#### Retail

- URM: [ ]
- Soft story: [ ][ ][ ][ ]
- NDC: [ ][ ][ ]
- Cripple W: [ ][ ][ ]
- Tilt-up: [ ][ ][ ]
- Fire sources: [ ]
- Non-struct: [ ]
Resilience-based inventory

- Start with recovery-critical occupancies
  - Not vulnerable structure types
- Get the denominator
  - Count all of them
  - Need rough counts, not address lists
**Resilience-based mitigation**

- Start with recovery-critical occupancies
  - Not vulnerable structure types
- Get the denominator
  - Count all of them
  - Need rough counts, not address lists
- Make the case for specific programs
  - Details (tracking lists, maps) come later
- Develop a mitigation agenda

**Effect of a mitigation agenda**

<table>
<thead>
<tr>
<th>Recovery time after expected earthquake</th>
<th>Recovery time after expected earthquake</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 hours</td>
<td>0-4 hours</td>
</tr>
<tr>
<td>24-72 hours</td>
<td>24-72 hours</td>
</tr>
<tr>
<td>Weeks</td>
<td>Weeks</td>
</tr>
<tr>
<td>Years</td>
<td>Years</td>
</tr>
<tr>
<td>No recovery</td>
<td>No recovery</td>
</tr>
</tbody>
</table>

Mitigation programs:
- A Weak story multi-unit residential, mandatory
- B Various structure types, triggered
- C Various structure types, demolition and replacement
- D Wood frame residential, voluntary
- E Non-ductile concrete, various occupancies, mandatory retrofit or demolition and replacement
- F Emergency services, various structures, various programs

On completion, 2039?

New Bldgs?
The role of the state, feds

- Cities follow each other
  - Leaders set hard-to-follow examples?
- Cities *might* follow the state
  - If funding is provided ...
- The state follows the cities
  - Cities have the ideas, local expertise, community engagement
- The role of the Feds
  - Slow, massive, authoritative

Lessons

- The Overton window has shifted
  - Key issue is political, not technical or financial
- City cultures vary: Leaders and followers
- City building stocks vary: Policy should too

- State and Federal policy should be adaptable
  - Recognize that the work is done locally
  - Let leaders lead
  - Nudge and guide the followers
  - Support, don’t constrain, both