
San Francisco's Community Action Plan for Seismic Safety

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14th US-Japan Workshop on Improvement of Structural
Design and Construction Practices

December 3-5, 2012 ● Maui

Project Purposes

- Develop earthquake mitigation approaches that make sense for San Francisco and reflect good public policy
- Provide:
 - *Policy Road Map* to reduce earthquake impacts in San Francisco
 - *Repair and Rebuilding Guidelines* to expedite recovery after an earthquake

Project Development

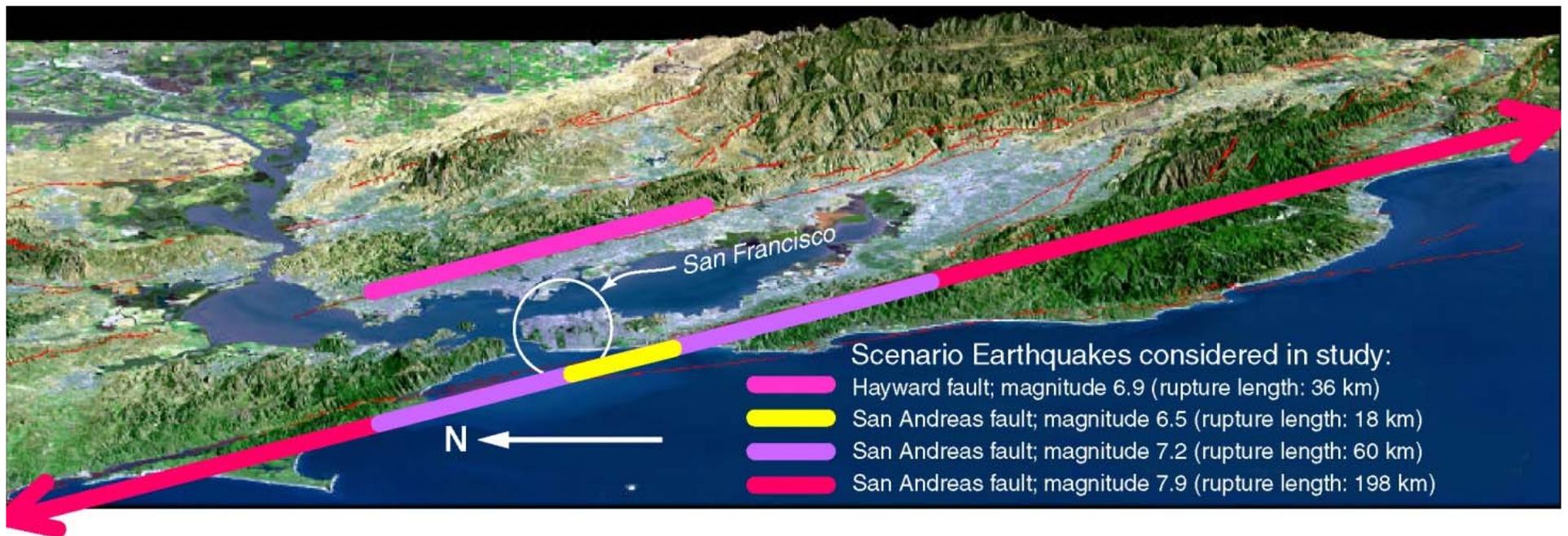
- Premise:
 - Risk reduction activities will only be implemented and will only succeed if they make sense financially, culturally and politically, and are based on technically sound information.
- Approach:
 - Engage community leaders, earth scientists, social scientists, economists, tenants, building owners, and engineers to find out which mitigation approaches make sense in all of these ways and could, therefore, be good public policy

Tasks

1. Conduct Potential Earthquake Impacts Study
 - Carried out using FEMA's HAZUS Software
 - Presented and discussed results with stakeholders
2. Study the city's most vulnerable building types and recommend the means to reduce these hazards (task added by Mayor)
3. Develop a "Community Action Plan for Seismic Safety" (set of recommendations for long term)
4. Develop Post-Earthquake Repair and Retrofit Requirements (to update city's current policies)

1. Potential Earthquake Impacts Study

- An initial study to estimate damage and loss to privately owned buildings under the jurisdiction of the San Francisco Dept. of Building Inspection (DBI), considering 4 scenario earthquakes:



1. Potential Earthquake Impacts Study

Building Use	Cost of Building Damage in Billions (2009 U.S. \$)			
	Hayward Mag. 6.9	San Andreas Mag. 6.5	San Andreas Mag. 7.2	San Andreas Mag. 7.9
Residential Buildings	\$ 8.5	\$14.6	\$21.7	\$33.1
Commercial Buildings	4.5	4.2	6.6	11.0
Industrial Buildings	0.9	1.0	1.4	2.2
Other Buildings	0.1	0.2	0.3	0.7
Total, All Buildings	\$14.0	\$20.0	\$30.0	\$48.0

Residential buildings have highest losses

Total losses due to shaking and ground failure

Building Occupancy	Number of Buildings by Damage State, San Andreas Magnitude-7.2 Earthquake			
	Usable, Light Damage	Usable, Moderate Damage	Repairable, Cannot be Occupied	Not Repairable
Single-Family Houses	45,000	54,000	11,000	1,700
Two-Unit Residences	8,200	7,400	3,200	290
Three-or-More Unit Residences	7,200	7,500	7,200	1,100
Commercial Buildings	1,600	2,400	More than 26,000 buildings of the 160,000 buildings in San Francisco will not be safe to occupy after the earthquake	
Other Buildings	1,000	1,700		
Total, All Buildings	63,000	73,000	22,500	3,600

2. Earthquake Safety for Soft-Story Buildings

- *Purpose:* Advise the City on how to address soft-story residential structures
- *Tasks:*



- Inventory Development & Seismic Vulnerability Analysis:

Volunteers & DBI identified 4,400 wood-frame buildings built before May 21, 1973 with 3 or more stories and 5 or more residential units and likely soft stories

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Determined that 1,200 to 2,400 of these would receive a red UNSAFE placard in the scenario Magnitude 7.2 event, and a quarter would collapse

3. Earthquake Safety for Soft-Story Buildings

- *Tasks (continued):*

- Development of Key Recommendations for Earthquake Safety for Soft-Story Buildings:

- Establish a Program that requires owners to evaluate all buildings with 3 or more stories and 5 or more residential units and retrofit those found to be seismically deficient.
- Buildings should be retrofitted to a standard that will allow many of them to be occupied after a large earthquake.
- The City should immediately offer incentives to encourage voluntary retrofits.
- The Department of Building Inspection should form a working group to develop a detailed plan to implement the recommended Program.

3. A Community Action Plan for Seismic Safety (CAPSS)

- Recommends 3-Step Strategy:
 1. Facilitate a market in which earthquake performance is valued.
 2. Nudge the market by requiring evaluation upon sale, or by a deadline.
 3. Require retrofitting by a deadline
- Identifies 17 Recommendations to Reduce the Consequences of Future Earthquakes
- Accompanied by Mayor's Executive Order to Establish an Earthquake Safety Implementation Committee to Implement the Recommendations

3. A Community Action Plan for Seismic Safety (CAPSS)

- Some example recommendations:
 - ✓ Establish clear responsibility within City government for preparing for and reducing risk from earthquakes
 - ✓ Require all buildings to be evaluated for seismic risk
 - ✓ Require retrofits of vulnerable buildings
 - ✓ Offer incentives for retrofit of buildings
 - ✓ Provide technical assistance for building retrofits
 - ✓ Track evaluations and retrofits in a database system
 - ✓ Require gas shut-off valves on select buildings
 - ✓ Adopt improved repair standards

4. Post-Earthquake Repair and Retrofit Requirements

- Purpose and Intent:

The intent was not to change existing standards significantly, but to clarify post-earthquake repair and retrofit provisions primarily for the purpose of avoiding delays and disputes about whether a damaged building should be repaired or retrofitted. A secondary purpose was to enable implementation of a mitigation policy, based on damage patterns from actual ground motions.

4. Post-Earthquake Repair and Retrofit Requirements

- Developed Repair and Retrofit Requirements for three building types that represent more than 95% of all buildings in San Francisco:
 - Single-Family and Two-Unit Residential Buildings
 - Multi-Unit Wood-Frame Residential Buildings
 - Older Concrete Buildings
- Introduced the concept of *Disproportionate Damage Triggers* to address seismic deficiencies demonstrated to be severe and potentially dangerous at low shaking levels

Project Outputs

- Six Reports in the series, *Here Today—Here Tomorrow, The Road to Earthquake Resilience in San Francisco*:
 - *Potential Earthquake Impacts* (ATC-52-1 report) and companion *Technical Documentation* (ATC-52-1A)
 - *A Community Action Plan for Seismic Safety* (ATC-52-2 report)
 - *Earthquake Safety for Soft-Story Buildings* (ATC-52-3 report) and companion *Documentation Appendices* (ATC-52-3A report)
 - *Post-earthquake Repair and Retrofit Requirements* (ATC-52-4 report)

Available Resources



- Electronic versions downloadable at www.sfcapps.org
- Bound versions available from www.ATCouncil.org