

State of California
Seismic Safety Commission

Memo

To: Seismic Safety Commissioners

From: Henry Reyes, Staff Structural Engineer
Seismic Safety Commission
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Date: October 31, 2012

Subject: Coordinated Planning and Preparedness for Fires
Following Major Earthquakes – Commission Research-
Funded Project

Background

On November 10, 2011 the Commission voted to provide funding for \$49,000 from the California Research and Assistance fund to the Pacific Earthquake Engineering Research Center (PEER) on the above subject project. The goal of this project is to follow-up on activities recommended on the Fire Following Earthquake Report – Phase I Report. This report entitled: *Water Supply in regard to Fire Following Earthquake* was completed in November 2011.

The report found (a) Most larger urban fire and water departments are ill informed as to the specifics of their earthquake risk; (b) Water department system vulnerabilities is not well understood by fire departments, although water and fire departments both generally believe most municipal water supply systems are unreliable in a major earthquake; and (c) While some water departments and fire departments have vigorously addressed this issue, many have not.

The purpose of the project is to cooperate with key urban fire and water departments in California, in order to encourage coordinated planning and preparedness for fires following major earthquakes. Cooperation will be fostered via preparation of 'white papers' on the issues.

Progress Update

PEER started work on the project on January 1, 2012. Conducting the study for PEER is Dr. Charles Scawthorn, as the lead researcher. End date is December 31, 2012.

Dr. Scawthorn will present a progress update on the project.

Enclosed is the progress update report

Water Supply in regard to fire following earthquake

- *Yr. 2 update*
8 November 2012

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PEER
PACIFIC EARTHQUAKE ENGINEERING RESEARCH CENTER



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Outline

- The Problem
- Yr 1 Findings
- Yr 2 Purpose and Activities
- Next Steps
- Q&A



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The Problem – *reliability of water for fire following earthquake*



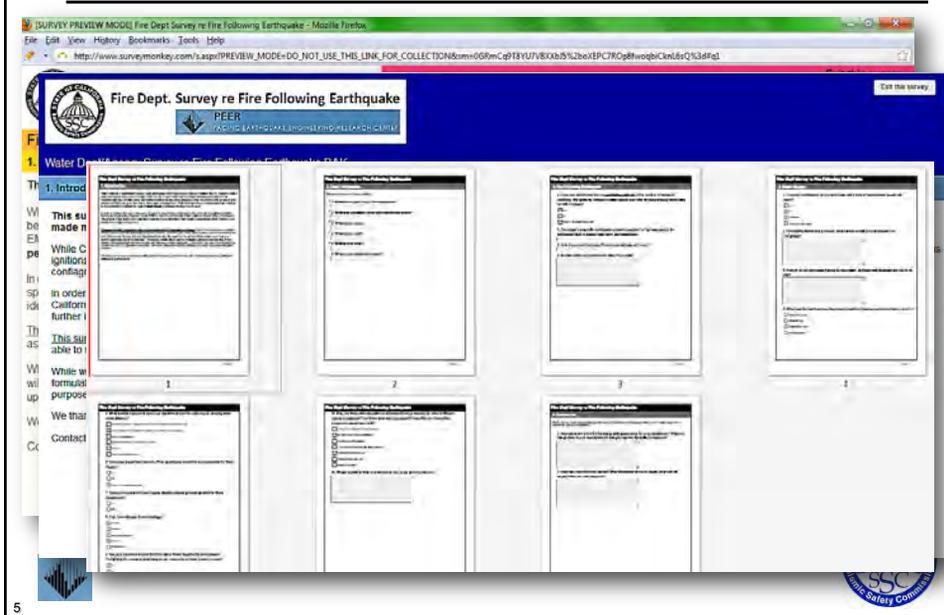
Yr 1 – do we have reliable water supply?

Questions:

- how well do water departments understand the potential damage to their distribution system? (focus to date has been on transmission)
- what are their current estimates of post-event firefighting water reliability?
- how well do fire departments understand this situation?
- how well are fire departments prepared for alternative water supply?
- how can this situation be improved?



Online Surveys



Key Findings from the Fire Agencies Survey

- See earthquake as a very important issue.
- But, could be better informed as to earthquake risk
- Have infrequent communication with their water departments.
- Consider their normal water supplies as seismically unreliable.
- Are improving water supply capability but efforts are piecemeal, not coordinated and often are 'reinventing the wheel'.
- Have identified alternative water sources, but These sources are often not particularly well documented, nor kept up to date nor regularly drilled.
- The very difficult task of moving water from these sources to the fire scene is in many cases not well thought out, not adequately equipped and not regularly drilled.



Key Findings from the Water Agencies Survey

- ❑ Most larger urban water agencies not aware of the specifics of the earthquake risk they are exposed to (i.e., two thirds had had no analysis in the last ten years).
- ❑ Earthquake is seen as a key issue by most water departments, but that provision of potable water has a higher priority in some cases than firefighting.
- ❑ Even where water departments have knowledge of the vulnerabilities of their systems, this is not often (only 22%) communicated to fire departments.
- ❑ Both water and fire departments expect major loss of water supply in a major earthquake, with the water department informing the fire department of the details of this about half the time.
- ❑ Many water departments are currently addressing their seismic vulnerabilities with significant engineering programs.
- ❑ Information on when water would be restored is sparse.
- ❑ Some water departments have alternatives given loss of normal water supply, but only a fraction (~1/3) are reasonably equipped to actually move water.
- ❑ Fire and water department liaison is not very good, and are often somewhat indirect, through larger enterprise-wide coordination meetings. Emergency water supply is not a focus.



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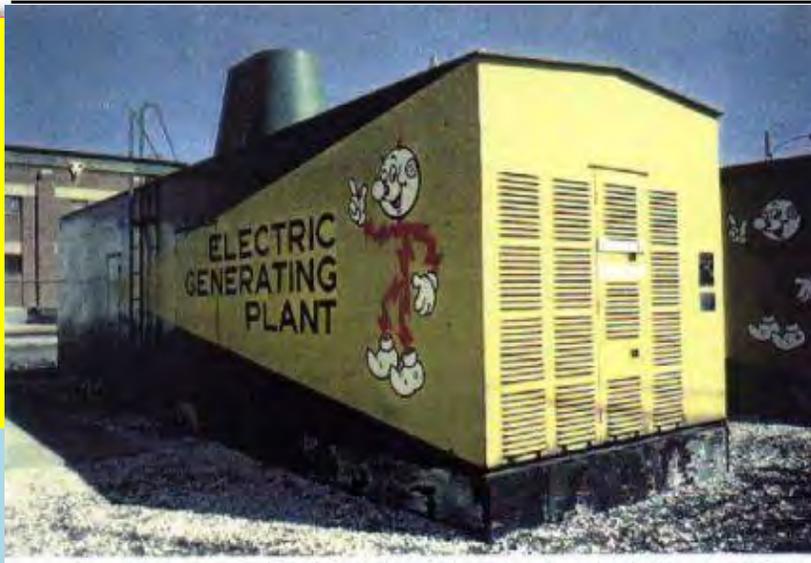


Solutions



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LA Basin HP system - feasibility



2,000 K.W. MP-36 EMD PACKAGED DIESEL ELECTRIC GENERATOR

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FIRE FOLLOWS EARTHQUAKES
Fire following earthquakes in California have shown that a major earthquake could trigger a major fire.

2008 ShakeOut Exercise M_{7.8} San Andreas earthquake analysis found that **APPROXIMATELY 1,600 IGNITIONS OCCUR IN SOUTHERN CALIFORNIA, WITH THE CENTRAL LA BASIN EXPERIENCING HUNDREDS OF LARGE FIRES.**

MOST FIRE AND WATER DEPARTMENTS IN CALIFORNIA could be **BETTER INFORMED** about the specifics of their earthquake risk generally believe most municipal water supplies are **UNRELIABLE** in a major earthquake do **NOT FULLY UNDERSTAND** water department system vulnerabilities

CALIFORNIA IS HIGHLY EXPOSED
There are about **9.5 million** residential population **1 MILLION** commercial and temporary recreational population in CA **\$4.7 trillion** is the total value of residential property worldwide provided by the distribution of public water supply systems **DOES NOT TAKE INTO ACCOUNT** the risk of earthquakes

Deliver

SALTWATER HIGH PRESSURE SYSTEMS as alternative sources of water

San Francisco has already developed and maintains a high pressure seawater-supplied Auxiliary Water Supply System (AWSS). SF recently in June 2010, approved a \$412 million bond issue to enhance their system.

Central Los Angeles and Orange County could benefit from building a saltwater high pressure system since they are at great risk due to fire following earthquake.

San Francisco Bay Area

PEER Pacific Earthquake Engineering Research Center
Water Supply in regard to Fire Following Earthquake by Charles Swartham
www.safwater.ca.gov
http://peer.berkeley.edu/pub/conf/peer_reports_complete.html

3 Develop and deploy neighborhood equipment container caches to enhance post-disaster fire-fighting capabilities. These would be used by NERT, CERT, and other volunteers.

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Year 2 Purpose / Goals

Year 1 identified the problem – that water for fighting post-earthquake fires is not currently assured.

Year 2's purpose is to obtain agreement by major California Fire and Water Departments on Performance (or reliability) Goals, to be subsequently achieved.

- Highlight the problem to the California Fire Service
- Enlist the Water Community via a joint meeting of key senior fire chiefs and water department managers,
- Develop state-wide requirements for development of post-earthquake firefighting water target goals



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Develop state-wide requirements for development of post-earthquake firefighting water performance goals

Performance Goal:

- defines the capability or outcome to be achieved, rather than prescribing what to do.

Target Fire Departments

- 70 FDs (of 789 total in state)
- protecting total population of 15 million



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Post-earthquake firefighting water performance goals

Performance Goals: For Fire Departments protecting urban areas in California, each Fire Department shall:

1. Develop and maintain a quantitative estimate of the **median** and **upper bound** number and locations of fires that are likely to occur due to the **MCE event**. The estimates shall consider variability in time of day, season, occupancy and other key factors.
2. Develop and maintain a written plan for responding to and fighting such fires, to be termed the Fire Following Earthquake Water Supply Plan (the "Plan"). The Plan shall consider:
 - a) Non-firefighting demands on the Department's resources, such as EMS and USAR.
 - b) Variability in wind, humidity, access and other relevant factors.
 - c) Supply of water from **Alternative sources of water**, and also from **Normal sources** to the extent that such Normal sources are reliable at the upper bound confidence level. Sources of water may only be considered available when the Department can demonstrate the ability to transport the water in adequate volume and pressure, from the source to the likely fire location.
 - d) Assistance by Automatic and Mutual Aid only after twelve hours following the MCE event.
3. Exercise the Plan at least one time per year.
4. Based on the Plan, publish each year a quantitative estimate of the median and upper bound number and location of buildings likely to be damaged and destroyed due to the MCE event.

A Plan Preparation Guidance Document will be needed

Activities to Enlist Fire and Water Depts.

Meetings and discussions with senior management:

- Fire Departments
 - San Francisco
 - Oakland
 - Berkeley
 - San Jose
 - Los Angeles City
 - Los Angeles County
 - Long Beach
- Water Departments
 - San Francisco
 - LADWP

Outcome: General support, willingness to participate



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Next Steps

1. Continue Discussions with FDs, CalEMA, fine-tune the draft Performance Goals
2. Convene SoCal and NoCal meetings FDs (late January)
3. Involve WDs in discussion (Feb-March)
4. Finalize Performance Goals (April-May)
5. Outline Plan Preparation Guidance Document (by mid-January)
6. Project Report (June)



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Thank You

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