DRAFT

2012 Annual Report

Seismic Safety Commission

Executive Summary

The Alfred E. Alquist Seismic Safety Commission (Commission) is the primary seismic resource for the State of California and acts as adviser to the Governor, the Legislature and the public on earthquake policy, providing California with cost-effective recommendations to reduce earthquake losses and speed recovery. The strategies created by the Commission will significantly affect economic impact in earthquake recovery phase. Dedicated to reducing earthquake risk for the people of California since 1975, the Commission investigates earthquakes, reports on earthquake-related issues, and evaluates and recommends to the Governor and Legislature policies needed to reduce earthquake risk and to ensure a coordinated framework for establishing earthquake safety policies and programs in California. Notably, the plans and programs for recovery following a major seismic event are applicable to other disasters, both natural and man-made and can assist in recovery from those events as well.

There have been over $300 million in economic losses and over 20,000 earthquake-related deaths worldwide since 2011. This reminds us that California needs to remain dedicated to mitigation programs and move forward with cost-effective programs that reduce losses. We have seen people suffer from post earthquake economic challenges long after the physical danger has passed. On average, 40% of existing businesses disappear after a major earthquake. California can learn from these lessons and look for solutions now, before the shaking begins again. Italy's 2012 earthquake and other recent earthquakes in Japan, New Zealand and Chile show a similarity with California's risk of products, industries, and economic issues. The Commission is working with private industry and world organizations to learn how to better reduce losses and recovery quickly after future events.

Following is a bulleted summary of the Commission's major accomplishments in 2012 and highlight efforts to reduce earthquake risk and improve post-earthquake recovery capabilities in California:

- A shake test of a full-scale, five-story hospital building that simulated earthquakes and then concluded with fire tests. This project will assist in the development of improved building codes for public emergency facilities and help better understand how fire spreads through damaged buildings.
- A "fire-following earthquake" study that will help improve coordination between fire departments and water districts.
- An examination of earthquake and tsunami hazards impacting the Lake Tahoe Basin through the use of new ground-breaking technologies.
- Participated in an independent peer review panel for the Diablo Canyon and San Onofre Nuclear Power Generating Stations.
- Participated in Global Earthquake Model (GEM) to understand and reduce seismic economic impacts in California.

The Commission's goals for next year are:

- Updating the *California Earthquake Loss Reduction Plan*, shifting the focus to post-earthquake economic recovery.
- Continued work with Global Earthquake Model (GEM) to reduce seismic economic impact in California.
- Assist the agricultural (livestock, poultry, and dairy) industries to be better prepared for disasters.

Deaths from Earthquakes in 2012 – Worldwide

(data provided by the USGS)
http://earthquake.usgs.gov/earthquakes/eqarchives/year/2012/2012_deaths.php

Date	Region	Magnitude	Number Killed *
2012 02 06	Negros-Cebu region, Philippines	6.7	113
2012 03 20	Oaxaca, Mexico	7.4	2
2012 03 25	Maule, Chile	7.1	1
2012 04 11	off the west coast of Northern Sumatra	8.6	10
2012 04 17	Valparaiso, Chile	6.7	2
2012 05 12	Tajikistan	5.7	1
2012 05 20	Northern Italy	6.0	7
2012 05 29	Northern Italy	5.8	17
2012 06 11	Hindu Kush region, Afghanistan	5.7	75
2012 06 24	Sichuan-Yunnan border region, China	5.5	4
2012 07 20	Jiangsu, China	4.9	1
2012 08 11	Northwestern Iran	6.4	306
2012 08 18	Sulawesi, Indonesia	6.3	6
2012 08 31	Philippine Islands region	7.6	1
2012 09 05	Costa Rica	7.6	2
2012 09 07	Sichuan-Yunnan-Guizhou region, China	5.5	81
2012 11 07	Offshore Guatemala	7.4	139
Total			768

Mission Statement

To provide decision makers and the general public
with cost-effective recommendations to reduce earthquake losses
and expedite recovery from damaging earthquakes.

Vision Statement

To provide leadership in implementing and achieving the goals and objectives in the *California Earthquake Loss Reduction Plan,* including to advance learning about earthquakes and risk reduction in both the short and long term, advance the earthquake-resistant designs of buildings and other important structures, and advance the preparedness and emergency response systems for earthquakes.

2012 Commission Membership

1. Honorable Michael Gardner, Chair	*City Government*
2. Sheriff Mark Pazin, Vice Chairman	*Emergency Services*
3. Senator Elaine Alquist (Matt Ortiz)	*State Senate*
4. Assembly Member William Monning (Kathy Smith)	*State Assembly*
5. Mark Ghilarducci, *State Representative*	*Cal EMA*
6. Dr. Kit Miyamoto	*Structural Engineering*
7. Chester Widom, *State Representative*	*State Architect*
8. Jim McGowan, *State Representative*	*Building Standards Commission*
9. Vacant	*Cities/Building Official*
10. Emir Jose Macari	*Geotechnical Engineering*
11. Vacant	*County Government*
12. Vacant	*City Government*
13. Margaret Hellweg	*Seismology*
14. Helen Knudson	*Social Services*
15. Timothy Strack	*Fire Protection*
16. Vacant	*Public Utilities*
17. Vacant	*Mechanical Engineering*
18. Vacant	*Geology*
19. Vacant	*Architectural Planning*
20. Vacant	*Insurance*

Commission Staff

Richard J. McCarthy, *Executive Director*
Robert Anderson, *Senior Engineering Geologist*
Sue Celli, *Executive Secretary and Office Manager*
Karen Cogan, *Administrative Manager and Annual Report Editor*
Dave King, *Legislative & Special Projects Manager*
Henry Reyes, *Structural Engineer (Special Projects)*
Fred Turner, *Senior Structural Engineer*

Commission Authority

The California Seismic Safety Commission was established in 1975 to advise the Governor, Legislature, state and local agencies, and the public about strategies to reduce earthquake risk (Government Code §8870, et seq.). The Commission reports through the State and Consumer Services Agency and consists of 20 commissioners chosen for their technical expertise and experience. The Governor appoints 15 commissioners, the Senate and the Assembly each choose a representative from their respective memberships (2), and three (3) state organizations are represented (*California Emergency Management Agency, California Building Standards Commission, and the Division of the State Architect*).

Commission Funding

The Commission was supported by the Insurance Fund through June 30, 2012 and is now supported by the General Fund. The operational budget for fiscal year (FY) 2012/2013 is $1.2 million. Occasionally, the Commission will receive reimbursement money for special projects. In 2012, the San Francisco Public Utilities Commission requested the Commission's review of the *San Francisco public Utilities Commission's Water system Improvement Plan*. The Commission's reimbursement for this work was $4,760 in 2012. Within the *California Earthquake Research Fund*, the Commission is restricted to 10% overhead.

Commission 2012 Projects

Restoring California Commerce After Earthquakes &
California Earthquake Loss Reduction Plan
(*Economic Recovery and Resiliency Act)*

Restoring California Commerce After Earthquakes

The world has seen the economy suffer from earthquakes long after the physical danger has passed, adversely affecting the commerce significantly. California could be vulnerable to this same threat. Identifying solutions before disaster strikes will reduce life and property losses and speed business recovery and allow people to return to work more quickly. Italy's 2012 earthquakes disrupted its biomedical and cheese industries, thereby impacting its economy – these same risks parallel California's. The Commission is working with private industry and world organizations to prepare businesses for California's future destructive earthquakes. Precise plans are also needed now in order to protect business market share after disasters.

In 2012, the Commission outlined concepts, established business teams and solicited ideas for recommendations to help businesses recover after earthquakes. With the help of Deloitte International Consulting, a strategy was developed along with corporate business leaders and small business leaders. Deloitte conducted all work pro bono. The Deloitte study identified the top concerns for most companies were accurate, reliable and timely post-disaster communication, along with power restoration.

The Commission is now reviewing the findings with state departments and agencies to determine the next steps. The Commission has engaged GO-Biz -- *the Governor's Office of Business and Economic Development which was created by Governor Edmund G. Brown Jr. to serve as California's single point of contact for economic development and job creation efforts* – to discuss the results of the Deloitte study, striving towards protecting California's jobs and business market share.

California Earthquake Loss Reduction Plan

The Commission is also updating the *California Earthquake Loss Reduction Plan* and shifting the focus to restoring California commerce after earthquakes. Looking at past elements within the Plan and identifying how those initiatives may support economic recovery is a major goal for the Commission over the next year. This project is intended to identify billions of post-disaster dollars to be saved through reduced job market share loss after disasters.

Fire Following Earthquake Risk – Phase II
Will Water Be Available for Firefighters?

The risk of fires following urban earthquakes is a significant threat to California. Fire services in California have not been tested by a major earthquake since 1906. The Commission's Fire Following Earthquake - Phase I Study showed that significant earthquakes in major metropolitan cities in California will result in simultaneous ignitions and water distribution breaks. This study identified the vulnerabilities in the water supply and mitigation actions that can be developed to reduce the loss of life and property in California.

Phase II of this project provides for cooperation with key urban fire departments and water districts in California in order to encourage coordinated planning and preparedness for fire following major earthquakes. Work on this project is being conducted by the Pacific Earthquake Engineering Center (PEER) with Dr. Charles Scawthorn as the lead researcher. This report will be released in spring 2013.

Commission Review of San Francisco Public Utilities Commission's Water System Improvement Plan

The San Francisco Public Utilities Commission (SFPUC) initiated a $4.3 billion project to retrofit its water delivery system from Hetch Hetchy and other reservoirs. This program calls for the construction of a new dam and pipelines, repair of existing pipelines and facilities, and construction of new earthquake fault crossings. Enabling legislation requires the SFPUC to make annual reports and provide notice to the California Seismic Safety Commission (CSSC) of any changes resulting in delays, additions, or deletions in the work or scheduling of its Water System Improvement Program (WSIP). When completed, this program will significantly reduce the risk from major earthquakes to the water supply for over 2.4 million people in the greater San Francisco Bay region. Additional delays in construction are postponing enhancement to the reliability of the Bay region's water supply.

In September 2012, the Commission completed an independent review of additional delays in the WSIP. The State Water Code requires the Commission to report to the Joint Legislature Audit Committee regarding the public safety implications on the delays and changes. The Commission's review will inform the Legislature an assist the SFPUC to manage the Water System Improvement Program.

Independent Peer Review Panel Participation
Diablo Canyon and San Onofre Nuclear Generating Station

The Commission is a member of the California Public Utilities Commission (PUC) Independent Peer Review Panel (IPRP) to review new geologic information obtained by PG&E regarding seismic hazards that could impact the Diablo Canyon Nuclear Power Plant (DCNPP) owned and operated by PG&E. The IPRP's task is to review PG&E's seismic and geological information related to a new seismic hazard assessment of the DCNPP and advise the PUC regarding the reasonableness and adequacy of the collection of new seismic and geologic data regarding nearby seismic hazards that impact the DCNPP .

The new information is being gathered and analyzed by PG&E and its consultants to identify or affirm existing and new potential seismic hazards that may impact the (DCNPP) and California's electric transmission system. New geologic and seismic data are proposed to be gathered by extensive onshore and offshore geophysical surveys. This review is being carried out by the California Geological Survey, the California Coastal Commission, San Luis Obispo County, and the California Energy Commission and is under the leadership of the PUC. PG&E received approval from the State Lands Commission to conduct an offshore geophysical survey, but the California Coastal Commission denied its permit application.

This project will help identify seismic hazard issues that may affect the DCNPP and California's electric transmission system. Permits for conducting an offshore high-energy seismic survey at Morro Bay were denied by the California Coastal Commission. The Coastal Commission denial was based on the belief that the high energy seismic surveys (noise from air guns towed behind the survey ship) would have a negative impact on marine mammals and fish. PG&E was informed by the Coastal Commission that, should they re-apply for a permit, the application would most likely be denied again. Meanwhile, PG&E continues to compile and analyze low-energy offshore seismic data.

Commission Membership in Global Earthquake Modeling (GEM)

The Global Earthquake Model (GEM) is an organization focused on developing damage models and sharing information on earthquake hazards to vulnerable communities worldwide. The Commission is now a nonvoting government member on GEM's Board of Directors, along with the World Bank and many other prominent organizations. GEM will benefit from California's knowledge and resources while providing good exposure and educational vehicles for California by disseminating information on California's earthquake hazards and structural vulnerabilities in furtherance of GEM's goals.

Partnering with Other Agencies

The Commission is invested in a partnership with the California Earthquake Authority (CEA) and the California Geological Survey provide technical assistance to the CEA on the development of the first update to the Uniform California Earthquake Rupture Forecast (UCERF) and the Next Generation Attenuation West 2 programs, which are needed to assess seismic shaking hazards by loss modeling companies and earthquake insurance companies throughout California.

The UCERF program covers several critical issues that were observed during recent earthquakes in Chile, China, California, Mexico, Japan and New Zealand. This will lead to a much greater understanding of the relationships of physical aspects of faults and earthquakes, ground motion potential, and assist loss modeling companies and insurance companies in setting premium rates. Results from both projects will be used by the United States Geological Survey in 2014 to update California's portion of the National Seismic Hazard Map and then later be integrated into building codes in the United States.

Agriculture Disaster Preparedness

The Commission has been working with the Department of Food and Agriculture to understand the current plans that the agriculture industry has in place for a disaster of any type. The Commission is now planning a meeting with industry representatives and the Department of Food and Agriculture to review what, if any plans exist. Once there is a better understanding of the current plans, we will work in partnership to develop plans that could be applied to all hazards. The California Emergency Management Agency (CalEMA) will also be invited to the meetings for review of the State Multi-Hazard Mitigation Plan (SMHMP) to ensure that applicable updates are made.

The devastation to Japan's agricultural community from the 2011 tsunami will provide lessons on what measures California could take to reduce similar losses. This will save postdisaster dollars for California's agriculture industry.

Outreach efforts of the Commission included:

- Senator Cannella's office is reviewing the status of the Agricultural Industry in California and the vision of the Commission through working with farmers in his district who are interested agriculture professionals to review potential projects.
- Assembly Member Halderman is meeting with representatives of farming and agricultural communities for open dialogue on disaster planning and recovery.
- The Seismic Safety Commission is working with members of the Central Valley Agriculture community discussing preparedness concerns.
- The Seismic Safety Commission is working with Dr. Dan Sumner of the U. C. Agricultural Issues Center. He is preparing a project proposal for the Commission's consideration in 2013 that will identify areas of concern for the agricultural industry that have not been previously addressed.

Statewide Drop, Cover, and Hold Earthquake Exercise
Great California Shakeout Drill and Review of the Program

Annual Exercise.

2012 is the fourth year for the statewide Great California ShakeOut -- a drill designed to encourage the public to prepare, respond, and recover from earthquakes. On October 18, 2012, over 8.7 million people participated. Participants are asked to participate in the drop, cover and hold on exercise which is held the third Thursday in October each year. Participants register at the Shakeout.org website. This statewide exercise helps individuals as well as businesses become better prepared for disasters.

Review of Shakeout Program.

The Commission conducted a review of the annual "California Shakeout" program in 2012 and is developing a report that will set future directions for the drill and recommend ways to engage more California businesses. The Contractor is California State University Fullerton.

CalEMA has studied and documented lessons emerging from Japan and New Zealand about what worked and what didn't work with respect to placarding, barricading and stabilizing damaged buildings. CalEMA obtained a consensus from its advisors on how to enhance the state's safety assessment program.

CalEMA developed a consensus and updated its coordinator training manual to train Safety Assessment Program trainers about the enhancements. They have provided training throughout the state to help implement new enhancements. The Seismic Safety Commission entered into an interagency agreement ($34,380) with CalEMA to conduct this work. Staff arranged meetings with representatives of key state and local government agencies and the New Zealand Ministry of Civil Defense in August to share lessons learned about gaps and the need for enhancements in safety assessments. This project improved the state's capability to evaluate, barricade and stabilize damaged buildings after earthquakes.

The Seismic Safety Commission
California Earthquake Research Fund

In 2007, the Commission received $6.5 million settlement for seismic projects from the California Research Assistance Fund (now referred to as *California Earthquake Research Fund*. The Commission has achieved a leveraging ratio of 2.1 to 1 ratio over the life of the program (five years). These non-General Funds are designated for earthquake risk reduction projects. Projects in 2012 included**:**

Seismic Retrofit Standards for Public School Buildings.

The Commission initially contributed $200,000 to the Office of Public School Construction (OPSC) to develop an engineering template to be used by public schools to apply for Prop 1D (seismic retrofit funds). The template was finalized in late September 2010, and work on contacting and scheduling site visits to the school districts began in October 2010. Nine school districts containing 38 buildings agreed to participate in the evaluation process, of which 21 met all qualification standards and 17 did not. Seismic evaluations were completed for all the 21 buildings and submitted to the Division of the State Architect (DSA) for review and approval. There was approximately $72,000 of the original $200,000 remaining and the Commission committed an additional $50,000 for OPSC to make an effort to include additional vulnerable buildings. Start date of the project was December 1, 2009 and the end date was extended from March 31, 2011 to December 31, 2011 in order to provide additional opportunity for OPSC to include more vulnerable buildings. An additional six (6) school districts submitted requests for 45 school buildings, resulting in the encumbrance of the remaining funds. A report of final results of funding disbursement to school districts was submitted to the Commission at the May 2012 meeting. This enabled more districts to evaluate vulnerable public school buildings.

Lake Tahoe Hazard Survey

In 2010 the Commission entered into agreements with Northern Illinois University ($49,900) and the California Geological Survey ($25,700) to co-fund the use of a new remote operating vehicle "ROV" (a remote-controlled submarine) that will be field tested at Lake Tahoe before being sent to its research site in Antarctica. The ROV will observe faults and landslides in Lake Tahoe allowing the Commission to obtain data pertinent to seismic and tsunami hazards in the Lake Tahoe basin. Previous studies documented evidence of past earthquake activity in the Lake Tahoe region that suggests a magnitude-7 earthquake potential. Data suggests past earthquakes produced a nearly 4-meter-high offset of the Lake floor, creating a sciche many years ago. This research can be utilized not only in the Lake Tahoe area, but findings can be applied to other underwater landslide risks that could result in a tsunami or seiche for example, along the coast. Testing of instrumentation and sampling equipment was completed in August 2012. The ROV was expected to be tested at Lake Tahoe in October 2012 but has been postponed until March 2013. This information will be used to gauge the risks in the Lake Tahoe Region and communicate those risks to local officials and the public so they will be better prepared against earthquake and seiche threat.

Public Education through California Public Television – "Totally Unprepared" Campaign Phase I

The Commission completed a partnership with University of California at San Diego ($300K Commission contribution) in collaboration with California Emergency Management Agency "CalEMA" ($500K), California Earthquake Authority ($250K), and the insurance industry ($20K) for an education and outreach projects entitled "Totally Unprepared." The project included short videos, Drop Cover and Hold On event, a Shake Room, interviews with homeowners, a public video contest, and advancing social media. The project is completed and has won numerous media awards. Phase II has begun with CalEMA.

Public Education through California Public Television – "Totally Unprepared" Campaign Phase II

This project will use the materials developed in Phase I and expand the use of the social media to get the preparedness message to the public. This project will continue to remind Californians to prepare for disaster, avoid becoming victims, and be self-reliant. The Commission has partnered with CalEMA for Phase II.

High-Performance Shake Table and Fire Test

Recent earthquakes have shown that nonstructural components resulted in hospitals being evacuated and contributed to substantial direct and indirect disruption in health care and economic losses. While building codes have enhanced requirements, components designed and installed to these latest requirements have not yet been tested in strong earthquakes. Post-earthquake fires have also been a major source of loss of life.

Because of this, the Commission contracted with UC San Diego to help conduct a series of tests:

1) Design an intensive care hospital unit to be built on shaking table;
2) Design a seismic isolation system and testing plan for the shaking table
4) Document results of shake and fire tests
5) Develop educational videos targeted to hospital personnel and the general public.

Data interpretation will continue over the next two (2) years and a second video was aired on public television and the internet in late 2012. The end result of the tests will lead to safer hospitals during earthquakes and better informed medical personnel.

Survey and Evaluation of Recent Hospital Evacuations Following Earthquakes:

Recent earthquakes in Mexico, New Zealand, and Chile have shown problems with evacuation procedures. It appears that horizontal evacuations are less disruptive than vertical evacuations, involving moving patients from floor to floor. This study captured the circumstances that lead to loss of function, draw upon lessons learned, and identified follow-up steps from these experiences.

Other problems observed with the affected hospitals were: 1) Extensive damage to communication systems with outages of land lines and cell phones that caused problems in hospitals; 2) Power utilities were severely damaged, and many backup systems had problems that could have been

prevented with regular testing and maintenance; 3) Water and wastewater systems malfunctioned; 4) Structural damage was typically less severe, and nonstructural damage was a greater problem; 5) Vulnerability of electronic medical records also needs to be addressed.

The Commission entered into an agreement with the Pacific Earthquake Engineering Research (PEER) Center to survey hospital personnel from New Zealand, Mexico, and El Centro, California, about post-earthquake response and evacuations. PEER's survey team met in early June with Dr. Nakagawa from the Tohoku University Hospital in Sendai to learn more about hospital systems that were disrupted in the March 11, 2011 earthquake and tsunami. Interview notes about hospital evacuations and system disruptions have been shared with Commission staff for hospitals in Christchurch, El Centro, and Mexicali. The final report was released September 2012. Findings from this survey will identify areas needed to improve and speed the emergency response and post-disaster recovery of hospitals.

Commission Budget Summary

Budget Year 2011/2012 Last Year	Staff 2011/2012 Last Year	Budget Year 2012/2013 Current	Staff 2012/2013 Current
$1,144,000	7.8	$1,245,000	6.4