State of California

Alfred E. Alquist

Annual Report for 2013

California Seismic Safety Commission

1755 Creekside Oaks Drive, Suite 100

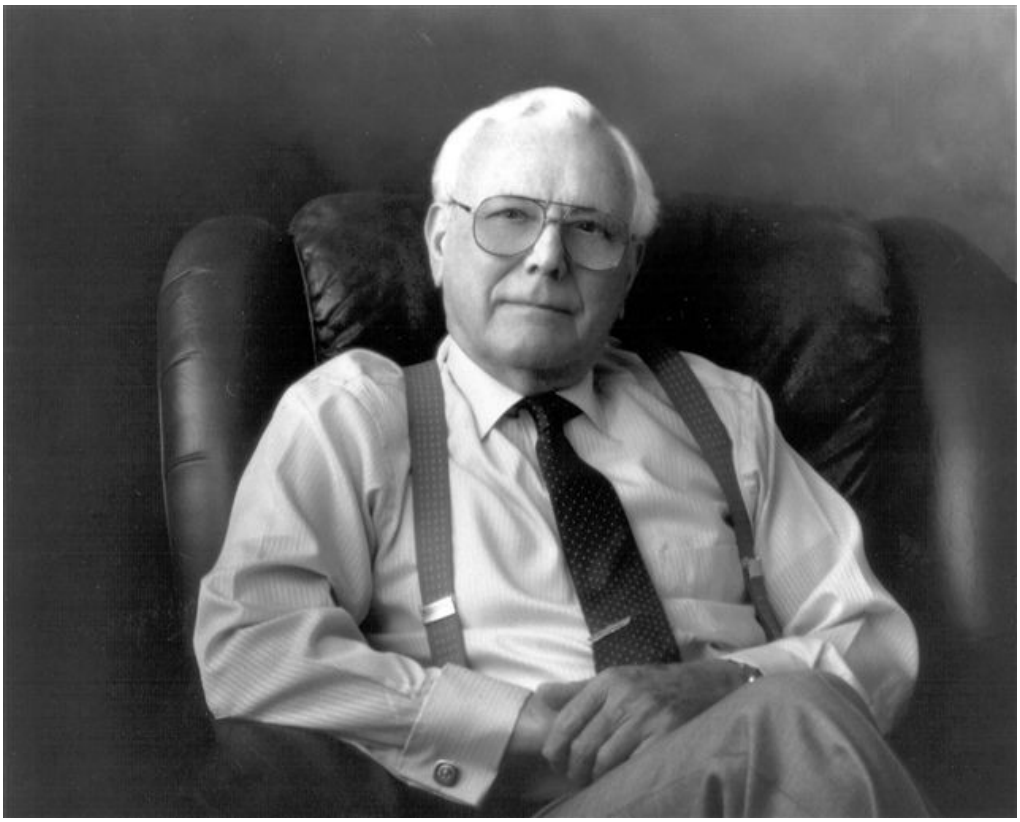
Sacramento CA 95833

(916) 263-5506

Senator Alfred E. Alquist

Seismic Safety Commission

Founder



State Senator Al Alquist was born on August 2, 1908 in Memphis, Tennessee. Senator Alquist was elected to the State Assembly in 1962, and four years later, the State Senate, where he served for 30 years.

The Commission will not let his legacy be in vain, but will continue supporting his efforts. He laid a strong foundation and his courage and leadership will be profoundly missed by all whose lives he touched.

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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 the 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.

In 2012, California ranked 10th largest economy in the world, with a GDP of $2.003 trillion -- all the more reason to focus on preparing our industries and sharpening our recovery goals.

The following is a summary of the major accomplishments in 2013:

- Released the "*California Earthquake Loss Reduction Plan – Post Earthquake Economic Recovery*" report.
- Collaborated with Northern Illinois University and the California Geological Survey to send a remotely operated vehicle to observe faults and landslides in Lake Tahoe, allowing the Commission to obtain data pertinent to seismic and tsunami hazards in the Lake Tahoe basin.
- Participated in an independent peer review panel for the Diablo Canyon and San Onofre Nuclear Power Generating Stations.
- Collaborated with Global Earthquake Model Foundation (GEM) in two projects that will help cities and counties in California become more prepared for a disaster.
- Examined ways to reduce the "fire following earthquake" risk to the citizens and the State environment.

The Commission's goals for 2014 are:

- Speed recovery of California's building stock through work with Global Earthquake Model Foundation (GEM).
- Assist the agricultural (livestock, poultry, and dairy) industries to better prepare for and recover from disasters.
- Continue working with the Governor's Office of Business and Economic Development to seek partnerships and projects that further the recommendations in the latest Commission report on post - earthquake economic recovery.
- Develop risk management guidelines for collapse-prone buildings
- Assist California Office of Emergency Services with establishing and funding an "Earthquake Early Warning System" for California.

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.

2013 Commission Membership

1. Honorable Michael Gardner, Chair	*Local Government*
2. Sheriff Mark Pazin, Vice Chairman	*Emergency Services*
3. Senator Ellen Corbett	*State Senate*
4. Assembly Member Ken Cooley	*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	*Local Building Official*
10. Dr. Emir Jose Macari	*Geotechnical Engineering*
11. David Rabbitt	*Local Government*
12. Honorable Salud Carbajal	*Local Government*
13. Dr. Margaret Hellweg	*Seismology*
14. Helen Knudson	*Social Services*
15. Timothy Strack	*Fire Protection*
16. Tracy Johnson	*Public Utilities*
17. Fuad Swiss	*Mechanical Engineering*
18. Dr. Gregory Beroza	*Geology*
19. Randy Goodwin	*Architectural Planning*
20. Vacant	*Insurance*

Commission Staff

Richard J. McCarthy, *Executive Director*
Karen Cogan, *Administrative Manager & Annual Report Editor*
Robert Anderson, *Senior Engineering Geologist*
Sue Celli, *Executive Secretary and Office Manager*
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 is under the State Business, Consumer Services and Housing Agency and consists of 20 commissioners. (The Governor appoints 15 commissioners of those, chosen for their technical expertise and experience; the Senate and the Assembly each choose a representative from their respective memberships; and three State organizations are represented. The State representatives are the *California Office of Emergency Services, California Building Standards Commission, and the Division of the State Architect*.)

Commission Funding

As of July 1, 2013, the Commission is now supported by the Insurance Fund, managed by the California Department of Insurance by a fee of 14 cents a year per property exposure. The operational budget for fiscal year (FY) 2013/2014 is $1.2 million. Occasionally, the Commission will receive reimbursement funds for special projects. In 2013, the San Francisco Public Utilities Commission, on two occasions, requested the Commission's review of the *San Francisco Public Utilities Commission's Water System Improvement Plan*. For projects supported by the *California Earthquake Research Fund*, the Commission's overhead is restricted to 10% of research funded.

Commission 2013 Projects

California Earthquake Loss Reduction Plan – Post Earthquake Economic Recovery

California is the 10th largest economy in the world (gross domestic product), and 88% of the State's economy is derived from the private sector. Because of these two factors, the Commission updated the *California Earthquake Loss Reduction Plan*, (Plan) and focused on restoring California commerce after earthquakes. The *California Earthquake Loss Reduction Plan – Post Earthquake Economic Recovery"* report looked at past elements within the Plan and identified how those initiatives support economic recovery. This project identified billions of post-disaster dollars to be saved through reduced business market share after disasters.

The *California Earthquake Loss Reduction Plan 2013* was devoted to developing a comprehensive post-earthquake economic recovery plan that will enable California to continue maintaining its economic vibrancy and leadership, and continue to provide employment and services for its residents.

Issues highlighted in the new plan include:

- Agriculture is the State's largest industry.
- Small businesses are a very important part of the State's economy.
- The current interdependent global economy can impact many national economies should a disaster strike one nation. The interdependent nature of the global economy can impact national economies should a disaster occur.
- Previous loss reduction plans have focused on the built environment and the public sector, with insufficient attention paid to the needs of the private sector, including small businesses.

A more comprehensive study of past earthquakes worldwide should be undertaken next to examine economic recovery measures taken by various local and national governments. This information could be used to develop a comprehensive strategic plan for California's rapid economic recovery after an earthquake.

Although California has made great strides towards improving seismic safety, much remains to be achieved.

Some other important facts to consider are:

- As of July 2012, the total non-farm employment was 14.3 million individuals, and those employed in the agricultural sector was approximately 2.5 million.

- Key among California's industrial sectors are information technology, microelectronics, and biomedical technology. Recognizing California's global leadership in these areas, several

multinational companies have located their research and development facilities in California.

- One important reason for California's leadership in high-tech is the fact that it is home to over 400 public and private colleges and universities which produce more than 200,000 graduates annually.

- According to the United States Geological Survey, "California has more than a 99% chance of having a magnitude 6.7 or larger earthquake within the next 30 years." The likelihood of an earthquake greater than magnitude 7.5 occurring is 46% over the next 30 years.

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

The San Francisco Public Utilities Commission (SFPUC) initiated a $4.6 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 earthquake fault crossings. Enabling legislation would require the SFPUC to make annual reports and provide notice to the California Seismic Safety Commission (CSSC) of any changes that result in delays or deletions of work in its Water System Improvement Program (WSIP). When completed, this project will significantly reduce the risk from major earthquakes to the water supply for over 2.5 million people in the greater San Francisco Bay region. Any delays in construction would postpone improvement to the reliability of the Bay region's water supply.

In May and September 2013, the Commission conducted independent reviews of additional delays in the WSIP. The State Water Code requires the Commission to report to the Joint Legislative Audit Committee regarding the public safety implications on the delays and changes. The Commission's review informed the Legislature and assisted the SFPUC to manage the Water System Improvement Program.

Independent Peer Review Panel Participation Diablo Canyon 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 Pacific Gas & Electric (PG&E) Company regarding seismic hazards that could impact the Diablo Canyon Nuclear Power Plant (DCNPP) owned and operated by PG&E. The IPRP is tasked with reviewing PG&E's seismic and geological information related to a new seismic hazard assessment of the DCNPP. The IPRP also advises 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 confirm existing and new potential seismic hazards that may impact the DCNPP as well as California's electric transmission system. New geologic and seismic data are proposed to be gathered by extensive onshore and

offshore geophysical surveys. The IPRP members include the California Geological Survey, the California Coastal Commission, San Luis Obispo County, and the California Energy Commission.

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 it re-apply for a permit, the application would most likely once again, be denied. Meanwhile, PG&E continues to compile and analyze low-energy offshore seismic data.

Partnering with Other Agencies

The Commission invested in a partnership with the California Earthquake Authority (CEA) and the California Geological Survey and the Commission provide technical assistance on the development of the first update to the Uniform California Earthquake Rupture Forecast (UCERF) and the Next Generation Attenuation West 2 programs. These products will be 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. Results obtained from this program will lead to a much greater understanding of the relationships between the physical aspects of faults and earthquakes, ground motion potential, and will 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 United States' building code.

Agriculture Disaster Preparedness

The Commission is working with the Governor's Office of Business and Economic Development to identify projects to assist in post earthquake economic recovery and propose ways to mitigate damage and economic losses. Agriculture is uniquely vulnerable to earthquakes and other natural and man-made disasters. Studies are needed to determine potential impacts from those hazards and identify ways to mitigate them. The geographic dispersion of agriculture in the State presents challenges. By being geographically diverse, farms and ranches may seem less vulnerable than some industries to seismic disruptions. However, agricultural products are marketed and exported through the rural and urban infrastructure, and often rely on lifelines such as water distribution systems and port facilities that are highly susceptible to earthquake damage. Therefore, understanding vulnerabilities of agriculture to infrastructure disruption is crucial.

Much of California farm output is highly perishable. Farmers often have little flexibility in the timing of harvest, processing or marketing. This applies to milk, many fresh fruits and vegetables, and some nursery and greenhouse items. These commodities face severe losses from disruptions in harvest, transport, processing, and marketing services. The livestock industries also raise animal welfare concerns. For example, in case of power failure, living conditions of confined livestock deteriorate and daily harvest of milk or eggs will be disrupted. The extent and scope of the effects of potential earthquake damage vary by

region. Quantifying damage requires systematic analysis based on information on seismic activity and impacts linked to data on agricultural activities.

The goals of this project are to: (a) identify the most vulnerable areas within the agricultural industry to seismic shaking; (b) project potential losses quantitatively; (c) assess potential ways to mitigate seismic damage; (d) suggest ways that farmers and others in agriculture might be better prepared for earthquakes; and (e) identify information, post disaster economic needs, and roles for local, state and federal governments.

Engaging Californians in a Shared Vision for Resiliency: Practical Lessons Learned from the Great California Shakeout

In February 2013, the Commission released a report which summarized the history and development of the Great California ShakeOut Drill, and made recommendations to guide future planning and coordination of earthquake drill activities in California with emphasis on preservation of economic health.

The ShakeOut Drill is an annual community-wide event begun in 2008. The goal of the drill is to provide Californians with an opportunity to learn what to do before, during, and after an earthquake. Since first implemented, the Shakeout drill has spread to other states and several countries as well.

Key findings from the report include:

- Just as real earthquakes prompt preparedness behavior, simulated events like the ShakeOut drill also prompt information-seeking and preparedness action.

- California schools remain an underutilized resource for promoting household earthquake preparedness and can do more to encourage staff and student families to prepare for disaster at home and provide support materials for doing so.

- Stakeholders such as business and non-profits also remain underutilized in promoting household preparedness and can have a tremendous impact on the level of preparedness as well as the rate of recovery in local communities.

- The Shakeout drill has been successful in promoting earthquake safety and preparedness and has proven to be an effective strategy for motivating household preparedness.

The entire report with recommendations can be viewed at the Commission's website. The report was prepared by Michele M. Wood, Ph.D, CSU Fullerton, Department of Health Science with Deborah Glik, Community Health Science, University of California, Los Angeles, and supported by the Seismic Safety Commission.

The Seismic Safety Commission
Earthquake Research Fund

In 2007, the Commission received a $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 over the life of the program (five years). These non-General Funds are designated for earthquake risk reduction projects. Projects in 2013 included**:**

Lake Tahoe Hazard Survey

In 2010, the Commission entered into agreements with Northern Illinois University (NIU) ($49,900) and the California Geological Survey (CGS) ($25,700) to co-fund the use of a new submersible remote operating vehicle (ROV) (a remote-controlled submarine) that was field tested at Lake Tahoe before being sent to its research site in Antarctica. The ROV's purpose was to 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 Tahoe floor, creating a seiche many years ago. *(A seiche is a wave that oscillates in lakes, bays, or gulfs from a few minutes to a few hours as a result of seismic or atmospheric disturbances).* 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. This information will be used to gauge the seismic hazard 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. The ROV mission was launched at Lake Tahoe July 2013 and a final report was completed January 2014. The report was posted on the Commission's website in November, 2013. The California Geological Hazards Survey Lake Tahoe Report was completed in December, 2013.

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

The risk of fires following urban earthquakes present 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. This study also identified the carbon emission footprint caused by post-earthquake

fires from a magnitude 7.8 on the southern port of the San Andreas Fault. Work on this project was conducted by the Pacific Earthquake Engineering Center (PEER). This report was released in December, 2013.

Totally Unprepared Phase II Project

The "Totally Unprepared Phase I Program" of individual and community engagement around the topic of disaster preparedness, with an emphasis on earthquake risks, has been successful in raising the awareness of the public about earthquake risks and preparedness activities. By targeting the channels of social media, online content, and mobile applications, with the use of broadcast interstitials and advertisements, the project reached a wide audience.

"Totally Unprepared Phase II" extended the usefulness of the media already produced (under Phase I) and utilized multiple channels to reach a broader, more diverse audience with a series of outreach efforts and expanded public relations and partner programs. This expanded program continued the use of live outreach; business, non-profit, and government partner recruitment; and digital outreach including website refinement and mobile applications.

Specifically, the Commission supported the development of a new mobile application that provides a local copy of many first aid and disaster tips downloaded from Wikipedia. This allowed the public to have access to a number of important recovery documents locally on their handheld device in case the Internet was unavailable.

The Commission partnered with the California Office of Emergency Services in both Totally Unprepared projects.

Global Earthquake Modeling Foundation (GEM) – Back to Normal

The Commission has identified a serious lack of seismic research in the area of post-disaster economic recovery. This is especially true for the speedy recovery of the State's building stock. Current computer earthquake programs (models) perform simulations that estimate consequences. Unfortunately, current loss models used around the world are "closed models," that is, the mathematics used to run the model are "proprietary."

The Global Earthquake Model Foundation (GEM) is an organization focused on developing damage models and sharing information on earthquake hazards to vulnerable communities worldwide. GEM's own computer earthquake model (OpenQuake) is NOT proprietary and users can review the mathematics and assumptions that drive the model. Currently, models can account for social consequences and resilience, but only approximately – like applying a "fudge factor" to an otherwise complicated calculation. In particular, models can NOT yet reliably estimate the amount of recovery time for a community or region to "get back to normal."

The Commission partnered with GEM in 2013 to produce an earthquake model that will benefit California. This is a unique opportunity for the Commission. It will bring products and services to California that otherwise would not be available. GEM will quantify the effectiveness of specific actions, now or in the future, to speed recovery. Additionally, this project will produce the technical basis for models to estimate recovery times. Currently, models are used only to estimate earthquake damage.

Note: The Commission became a nonvoting government member on GEM's Board of Directors in 2012, along with the World Bank and many other prominent organizations. GEM benefits from California's knowledge and resources while providing good exposure and educational materials for California by disseminating information on California's earthquake hazards and structural vulnerabilities.

Commission Budget Summary

Budget Year General Fund 2012/2013 Last Year	Staff 2012/2013 Last Year	Budget Year Insurance Fund 2013/2014 Current	Staff 2013/2014 Current
$1,245,000	6.5	$1,122,000	6.5