

2015 Annual Report

California Seismic Safety Commission

Executive Summary

The Alfred E. Alquist Seismic Safety Commission (SSC) is the primary seismic resource for the State of California 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. Although the SSC does not have any governing authority on earthquake policy, the SSC strives to ensure a coordinated framework for establishing earthquake safety policies and programs in 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.

Timothy Strack, Chair	Fire Protection
Tracy Johnson, Vice Chair	Public Utilities
Senator Anthony Cannella	State Senate
Assembly Member Ken Cooley	State Assembly
Dr. Kit Miyamoto	Structural Engineering
Ian Parkinson	Emergency Services
Vacant	Geotechnical
Dr. Margaret Hellweg	Seismology
Helen Knudson	Social Services
Fuad Swiss	Mechanical Engineering
Dr. Gregory Beroza	Geology
Honorable Michael Gardner, Councilman Riverside	Local Government
David Rabbitt, Sonoma County Supervisor	Local Government
Mark Wheatley, Councilman, Arcata	Local Government
Vacant	Local Government
Randy Goodwin	Architectural and Building Official
Mia Marvelli, State Representative	Building Standards Commission
Mark Ghilarducci, State Representative	California Office of Emergency Services
Chester Widom, State Representative	State Architect
Vacant	Insurance

Commission Staff

Richard J. McCarthy, Executive Director
Robert Anderson, Senior Engineering Geologist
Sue Celli, Executive Secretary and Office Manager
Lena Daniel, Administrative Manager
Henry Reyes, Structural Engineer (Special Projects)
Fred Turner, Senior Structural Engineer
Salina Valencia, Legislative/ Communications Director

The SSC 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 SSC is under the State Business, Consumer Services and Housing Agency and consists of 20 commissioners. The Governor appoints 15 commissioners, 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*. The SSC is supported by 6.5 staff members.

Commission Funding

The SSC is supported by the Insurance Fund managed by the California Department of Insurance. The SSC's operational budget for fiscal year (FY) 2015/2016 is \$1,412,000.. Occasionally, the Commission will receive reimbursement funds for special projects. For projects supported by the *California Earthquake Research Fund*, the Commission is entitled to charge a 10% overhead.

Commission 2015 Projects

The 2014 South Napa earthquake occurred in and around the city of Napa, California, on August 24 at 3:20 a.m. local time, measuring at 6.0 on the moment magnitude scale. The tremor's epicenter was located south of Napa, approximately 3.7 miles (6.0 km) northwest of American Canyon near the West Napa Fault, beneath the Napa Valley Marina on Milton Road, just west of the Napa County Airport.

This earthquake was the largest in the San Francisco Bay Area since the 1989 Loma Prieta earthquake. Significant damage and several fires were reported in the southern Napa Valley area, and there was also damage in the nearby city of Vallejo, in Solano County. The quake killed one person, injured about 200, and interrupted power to more than 69,000 Pacific Gas and Electric Company customers. An experimental earthquake warning system provided several seconds of warning to select Bay Area locations before the strong shaking arrived. A Presidential Disaster Declaration was announced on September 11, 2014. Early estimates by California officials indicated that the earthquake caused over \$400 million in damage, of which \$87 million may be eligible for federal reimbursement. Several dozen previously-retrofitted unreinforced masonry buildings experienced mixed performance, with a few suffering life-threatening damage.

In 2014 the Commission contracted with the Pacific Earthquake Engineering Research (PEER) Center to identify lessons learned from the August 2014 South Napa earthquake. PEER has completed a draft of the report and it is to be released to the Commission in January 2016.

**Local Government Guidebook for Managing Risk of Collapse-Prone
Buildings in California**

California's 14 million buildings include some of the most modern and earthquake-resistant in the world. However, most older buildings could be damaged and a few – perhaps less than 5% - could collapse in severe shaking. This amount may seem small, but collapse can cause significant life loss, injuries and substantial social and economic disruption amounting to hundreds of billions of dollars.

The “Guide to Identify & Manage Seismic Risks of Collapse-Prone Buildings” summarizes California's laws and regulations to assist local governments to identify and reduce collapse risks, as well as best practices that building owners can take to further manage the risks. At the October 2015 hearing, the SSC's ad hoc Committee on Collapse Prone Buildings presented a final draft of a 14-page executive summary. The ad hoc committee is chaired by Commissioner Randy Goodwin and includes Commissioners Kit Miyamoto and Fuad Sweiss. The Committee is currently focused on developing a draft companion appendix to the “Guide to Identify & Manage Seismic Risks of Collapse-Prone Buildings”. A draft of the appendix will be handed out at the Commission hearing in January 2016. The draft appendix includes an introduction, a summary of the

common types of buildings that are prone to collapse, the most effective methods of managing this risk, a section on who is responsible for managing the risks, checklists of typical tasks for inventorying and evaluating buildings, sample form letters, and reference materials.

California Earthquake Early Warning Benefit Analysis Report

The California Office of Emergency Services (CalOES) was tasked with leading a comprehensive effort to bring together experts, scientific members of government and private industry, to secure an effective and reliable Earthquake Early Warning System (EEWS) in California.

In September 2013, Governor Jerry Brown signed Senate Bill 135 into law. This was a critical step forward in the overall effort to provide Californians with enough warning that an earthquake capable of producing intense ground shaking has occurred.

SB 135 requires that the CalOES will, in collaboration with the California Institute of Technology (Caltech), the California Geological Survey (CGS), the University of California (UC Berkeley), the United States Geological Survey (USGS), the SSC and other stakeholders, develop a comprehensive statewide EEWS through a public/private partnership.

The SSC is part of the “California Office of Emergency Services Earthquake Early Warning Working Group.” This partnership is dedicated to develop a needs-driven, user-driven California Early Earthquake Warning System (CEEWS). The working group completed a charter in 2014 to serve as a road map to developing a working system.

CalOES has agreed to pursue a phased approach to a Benefit Analysis of CEEWS. The SSC will fund phase-one of the Benefit Analysis. Per the request of CalOES in partnership with the SSC the Pacific Earthquake Engineering Research (PEER) Center will be conducting research and study to prepare a business case for EEWS. PEER is a multi-institutional research & education center. The PEER study will provide an objective analysis to assess and validate the potential benefits of an EEWS. The objective is to establish the system’s value to the business community and key sectors in order to promote public and employee safety, enhance business resiliency, and protect infrastructure critical to local communities and the economy. This project is an initial step toward what will be a more comprehensive analysis over time and as the system is developed.

Senate Bill 1345: Seven Year Extension of Seismic Safety Commission Review of San Francisco Public Utilities Water Delivery System Retrofit Project

SB 1345 extends the Commission's oversight of the public safety implications of delays and project deletions during the San Francisco Public Utilities' Commission's (SFPUC) efforts to retrofit and replace major portions of the Hetch Hetchy Regional Water Transmission System to the Bay Area.

The Wholesale Regional Water System Security and Reliability Act required the City and County of San Francisco to adopt a specified program of capital improvement projects designed to restore and improve the Bay Area regional water system. Within 90 days of receiving changes to the program or postponements of the scheduled completion dates, the Seismic Safety Commission and the State Department of Public Health are to submit to the SFPUC and the Joint Legislative Audit Committee written comments with regard to the significance of the change with respect to public health and safety. Existing law makes the act inoperative and repeals these provisions on January 1, 2015.

SB 1345 extends the time the Seismic Safety Commission and the State Department of Public Health have to submit the written comments to 120 days and would extend the repeal date of the act to January 1, 2022. By extending the period of time during which certain requirements would apply to regional wholesale water suppliers and the City and County of San Francisco, the bill will impose a state-mandated local program.

The latest delays to five seismic safety-related projects do not appear to adversely impact the program's overall completion date. All of the delayed projects will have substantially completed their construction and will be operable prior to March 2016 when the SSC is required to submit a review. The delays have reportedly been caused by minor items during the final phases of the projects, including late change order requests and litigation claims from contractors that the SFPUC staff is processing.

Hospital Safety Board Annual Report To Commission

Government Code Section 8870.95 requires the Hospital Building Safety Board to report annually to the Alfred E. Alquist Seismic Safety Commission.

This year's budget required the Department of State Hospitals to consult with the SSC while Department State Hospitals (DSH) summarized known information about the level of seismic safety of its state-owned hospital buildings by January 10, 2016. A rough draft "Report on the Seismic Safety of the State Hospitals" was issued by DSH on October 9, 2015. The SSC staff offered recommendations for changes to the draft. Second and third drafts were released in late December. Some, but not all of the SSC staff recommendations were addressed by DSH. The final report, though not yet available, is intended to support a more comprehensive priority-setting process for the Department's future capital outlays.

The SSC 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 is 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.

GEM publicly released OpenQuake on schedule on December 31, 2014, followed by a release event January 21st in Pavia, Italy. This milestone represents the culmination of five years of development and an investment of more than \$25 million. The OpenQuake platform for earthquake risk assessment includes original datasets, software, graphical interfaces, and tools for modeling and visualization, all open and free for public use.

The precedent that GEM has set for open data and modeling, and for public-private partnerships, is now being actively followed by the climate change community.

University of California, Los Angeles, (UCLA) has been actively conducting analyses to produce recovery curves, specific relationships between damage states and time to regain function for a given building. The GEM staff in Pavia is establishing macro-level relationships between damage and recovery time, by analyzing historical data from the Northridge and Loma Prieta earthquakes.

The OpenQuake release includes risk and hazard toolkits for investigating the influence of modeling parameters on results. With these, GEM has begun to produce results for California and identify the most influential parameters, making use of historical data from Northridge and Loma Prieta, to make comparisons and validate its findings.

Both GEM projects include training workshops and publications that will provide specific guidance on how to build California's resilience to earthquakes.

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.

Community & Media Outreach

One of the SSC's primary objectives is to assist the residents in the State of California to become aware of the risks and preparation associated with earthquakes and other natural disasters. In order to enhance the impact of the SSC's continued work towards assisting the residents of California, the SSC has contracted with the University of California San Diego (UCSD) and Professor Michael Kleeman to create effective public awareness, engagement with and community practice for earthquake preparedness and disaster response in California.

The purpose of the community and outreach project is to create and leverage a network of services and media partners who will highlight efforts supported and enabled by the SSC. The community and media outreach project will significantly expand the number, quality of channels and media types used to communicate information and build ongoing public awareness of the importance of preparedness for earthquakes and other natural disasters.

Earthquake & Tsunami Classroom Curriculum

Humboldt State University has partnered with the SSC for a project designed to deliver preparedness information to elementary aged students and their families in the North Coast network of schools. The framework of the project includes the development of a web-based interactive earthquake and tsunami education program that extends to include curriculum and preparedness information. This project provides accessible materials that will fit into the current state teaching framework and address the priority needs in the State for earthquake and tsunami outreach.

Independent Peer Review Panel for Diablo Canyon Nuclear Power Plant

The SSC with a number of other state organizations, assisted the California Energy Commission in the development of a report based upon AB 1632 (Blakeslee) in 2008. The legislation directed PG&E to use advanced 3-D seismic surveying and other methods to try to reduce the uncertainty in information regarding the seismic hazard. In 2011 The California Public Utilities Commission secured funding and created an Independent Peer Review Panel (IPRP) consisting of the California Public Utilities Commission (CPUC), the SSC, the California Geological Survey, the California Energy Commission, The California Coastal Commission and a representative from the County of San Luis Obispo. The IPRP has been reviewing and meeting as warranted with personnel from the Pacific Gas and Electric Company and various interveners since 2011.

HayWired: How Earthquakes Damage Communication and Information Technology in the Bay Area

The United States Geological Service (USGS) and Joint Venture Silicon Valley have partnered with the SSC to research and strategize to enhance the resilience of Bay Area communities to Climate Change and Natural Hazards. The USGS in collaboration with its partners and stakeholders transform hazard information into risk products that are useful for decision and policy makers across scales of government and the private sectors.

Currently, the USGS is leading a scenario, called HayWired, in the San Francisco Bay Area of California. The HayWired scenario is a hypothetical, but realistic earthquake sequence initiating with a rupture of the Hayward Fault. The main shock earthquake is a magnitude 7.05 earthquake with the hypocenter in Oakland, California. The scenario's name HayWired, is a reference to the Hayward Fault and speaks to the potential chaos caused by impacts to the wired and wireless world. California has not experienced a large earthquake since our society, culture, and economy have become entwined with the Internet. More generally "wired" represents interconnectedness at many levels: interdependencies of lifeline, social connectivity through technology, and the ripple effects of damages and disruption throughout the economy encompassing the digital economy. The HayWired theme is particularly apropos for the Bay Area, a leader in digital communications and technology.

The Haywired scenario address risks of climate change and natural hazards, benefiting communities, businesses, governmental agencies and the general public in the Bay Area, California. The HayWired project is slated to end on April 30, 2017.

California Small Businesses Earthquake Education & Outreach

California's Small Business Development Centers (CASBDC) network is one of the State's primary resource partners for small business development. The CASBDC consortium of over 42 service

centers and administrative lead centers play a leading role in driving the states economy by providing small businesses and entrepreneurs with confidential, no-cost advising and expert training. The CASBDC network works closely with 65,000 businesses and entrepreneurs across California annually.

In an effort to bring forth an awareness of disaster preparedness amongst the State's small businesses, the Commission contracted with the CASBDC in 2013 and 2014 to assess the preparedness amongst California small businesses in the event of a natural disaster. This contract was two-fold: One was to conduct a survey of California small businesses and secondly, the creation of the California Small Business Disaster Resource Guide. As a result of the project it was found that the State's small business owners are focused on keeping their businesses growing and thriving. Preparing for a disaster is not always an active priority for the small business owner.

This year, the SSC has contracted with the CASBDC who will be hosting a series of educational workshops targeting potential entrepreneurs as well as the over 3.4 million business owners in California. The purpose of the educational sessions will be to provide new and existing businesses with information they need to be prepared for disruption caused by major earthquakes or other natural disasters. These workshops assist the small business owner in planning for business continuity during and after an earthquake.

**Earthquake Resiliency in California – Report and Assessment
Jet Propulsion Laboratory/
National Aeronautics and Space Administration**

Situational awareness following an earthquake or other natural disaster is critical for state, county and local officials for proficient emergency response. Understanding the scope of the damage, identifying where critical infrastructure is compromised and where it is still working is necessary for getting needed supplies to locations where people are at risk in the most efficient way possible.

The SSC has partnered with the Jet Propulsion Laboratory (JPL)/ National Aeronautics and Space Authority (NASA) in the sponsorship of a report that will investigate and assess the potential for JPL-developed technology and capabilities that may assist in reducing earthquake hazard and improving earthquake resiliency and other natural disaster within California.

Guide to Identify & Manage Seismic Risks of Buildings for Local Governments

At the October hearing, the Commission's Committee on Collapse Prone Buildings presented a final draft of

a 14-page executive summary. The committee is chaired by Commissioner Randy Goodwin and includes Commissioners Kit Miyamoto and Fuad Sweiss. Since October, the Committee has focused on developing a draft of a companion appendix. A draft of the appendix will be handed out at the Commission hearing in January 2016. It includes an introduction, a summary of the common types of buildings that are prone to collapse, the most effective methods of managing this risk, a section on who is responsible for managing the risks, checklists of typical tasks for inventorying and evaluating buildings, sample form letters, and reference materials.

Commission Budget Summary

Budget Year 2015/2016

Staff	California Insurance Fund
6.5	\$1,412,000.00