



Building Community Partnerships through Strategic Outreach: the SEAOSC Strengthening Our Cities Summit and Safer Cities Survey

**David Cocke, SE, Jeff Ellis, SE, Michelle Kam-Biron, SE,
Annie Kao, PE, Victoria Wigle, SE
Structural Engineers Association of Southern California
Los Angeles, CA**

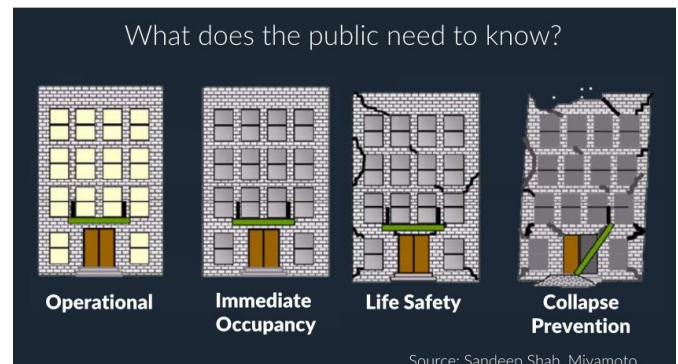
Abstract

The annual SEAOSC Strengthening Our Cities Summit (Summit) has been able to bring together many of the important stakeholders in the building community to discuss how to create safer and more resilient communities that are able to prepare for and recover from earthquakes. In 2016, SEAOSC partnered with the Dr. Lucy Jones Center for Science and Society to publish the SEAOSC Safer Cities Survey, a survey of the critical building ordinances and policies that are vital to ensuring that the earthquake hazards to the buildings in our community are minimized. SEAOSC invited 191 cities from the Southern California region to hear the Survey results at the Summit and informed them of SEAOSC's Safer Cities Advisory Program which advises them on their structural retrofit ordinances to improve the performance of their community's buildings, in the event that there should be an earthquake. This has helped lead to several additional cities adopting or considering to adopt mandatory retrofit ordinances with more cities anticipated to join in. The paper discusses the successes and lessons learned from organizing the Summit and how other Member Organizations (MOs) can use similar strategies to achieve partnerships within their own areas.

Introduction

We live in an age of unparalleled global interconnectedness and access to information 24/7 through news channels and mobile technology social media. As a result, the public is exposed to major natural disasters in real time and the news exposure has increased public knowledge of natural disaster risk and building performance which has helped to drive public discussions on how to increase the safety and resilience of our communities. Technology, tools and methodologies to evaluate and communicate natural disaster risk are available, but not well understood outside of

engineering and scientific communities. Structural engineers are in a unique position to combine their expertise of building performance with recommendations to building owners, policy makers, building departments, financiers, and the insurance industry to lead to a better understanding of earthquake risk and outcomes of potential solutions. The end result is giving decision makers within communities a way to understand and communicate the cost of doing nothing versus taking action when it comes to mitigating seismic risk to buildings.



Structural engineers have learned quite a bit about how buildings behave through an understanding of the building codes and observing building performance after major earthquakes. Subsequently, building codes have been revised to address some of the issues accordingly and although the building codes have been updated these new provisions are not retroactive to all of the buildings that have been built under previous building codes. According to the US Green Building Council, "...the annual replacement rate of buildings (the percent of the total building stock newly constructed or majorly renovated each year) has historically been about 2%, and during the economic recession and subsequent years, it's been much lower." This means that there are a lot of older buildings that have not been built to



current building codes and were not designed with modern engineering knowledge. SEAOSC has been able to reach out to different stakeholders and collaborate with other associations, advocacy groups, and industry partners to help identify buildings with known seismic vulnerabilities and provide input on seismic retrofit ordinances. However, SEAOSC has limited resources and there are many cities throughout Southern California that have yet to recognize that there is an issue and they have limited resources as well. By providing outreach education about the value of Structural Engineers and partnering with SEAOSC through task groups, community meetings, and public events, SEAOSC has been able to amplify its impact throughout the community.

Strengthening Our Cities Summit

The Strengthening Our Cities Summit began as the Buildings at Risk Summit back in 2011, with the goal of bringing various stakeholders such as engineering, government, and business groups together to provide education on the latest tools, techniques, rules, and proposals related to building seismic stability and motivate attendees to work together on addressing the community's need for more resilient communities. Trends and best practices for building owners, businesses, and government in addressing existing buildings built before the latest codes were highlighted and discussed. The forefront of discussions in recent years have been the new mandatory building retrofit ordinance by the City of Los Angeles, which requires the retrofit of wood-frame soft-story buildings within 7 years and the retrofit of non-ductile concrete buildings within 25 years of the ordinance passing.



2016 Strengthening Our Cities Summit, Los Angeles, CA

At these events, public officials, building owners, insurance industry representatives, lending industry representatives, emergency managers & first responders, as well as architects and engineers were able to gather together in one place to

discuss and share how all the different segments of the community could partner together. At the Summits, the panel discussions not only addressed the single building solutions but also the “whole community approach” implemented in cities across the state. Earlier Summits acted as a precursor to the “Great California ShakeOut” and served to not only increase the awareness of seismic risk, but to also spur action. The sessions stressed the benefit of seismic risk mitigation, best practices from the state's experts, and to encourage synergy among those working to build a more resilient community and economy.

More recently, the 2016 SEAOSC Summit had a theme of Partnership, Performance & Policy and served as an education and outreach forum focused on building officials and policymakers and how collaboration with a wide variety of different stakeholders could help develop more comprehensive and practical solutions more quickly to make our communities safer, stronger, and more resilient. As a result of the Summit, communities were talking about not only building or strengthening their buildings to survive, but how to do so to recover more quickly and improve the resiliency and sustainability of their built environment. The Summit also served as a catalyst for news coverage of the importance of safer buildings, resulting in radio interviews, local television coverage, and newspaper articles. An article in the Los Angeles Times highlighted that “fewer than 5% of the cities in six Southern California counties (San Diego County not included) have done anything about mandating retrofitting of the soft-story wood buildings that proliferate across California” while another article noted the work of SEAOSC in identifying how underprepared cities are to address the very real earthquake risk.



L-to-R: '16-'17 SEAOSC Pres. Jeff Ellis SE, Dr. Lucy Jones of DLJCSS, LA Chief Resilience Officer Marissa Aho, SEAOC President-Elect Janah Risha SE at the 2017 Summit



As a result of the conversations at the Summit and the relationship between SEAOSC and the City of Los Angeles, the City requested input from the association to advise on the development of a mandatory retrofit ordinance. More recently, this has led to additional Southern California cities to ask for the SEAOSC's input on the development of retrofit ordinances for their communities.

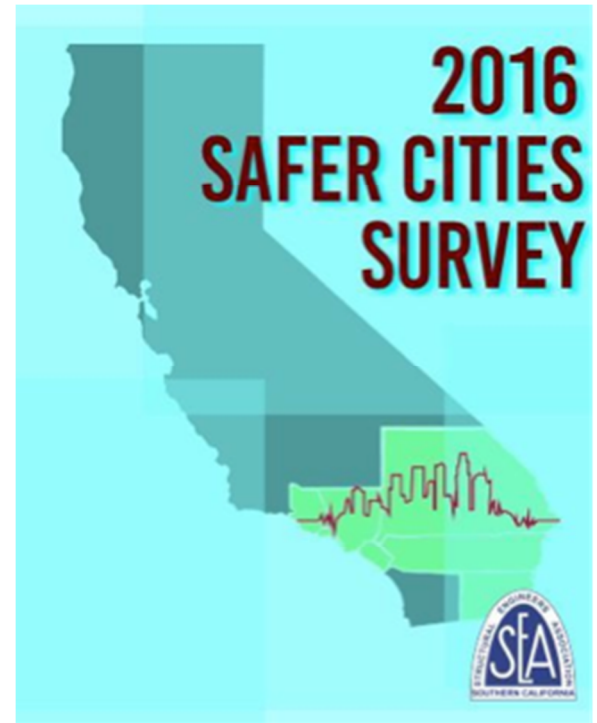
The question of how much a retrofit ordinance can cost a building owner is always at the forefront of discussions, and SEAOSC has been sure to include the cost-benefit topic. SEAOSC has engaged other organizations about the building retrofit process and worked to approximate the costs of strengthening buildings. One of the key discussions during the Summit centered on performance based design, and how it can be used to allow building owners to choose what level of performance they need or desire for their asset. Those outside of structural engineering are often unaware that there are different levels of building performance and that minimal cost increases are associated with increasing the building performance level. The Summit has given structural engineers the opportunity to increase awareness and host conversations about seismic risk, strengthening solutions for vulnerable buildings, and beyond code minimum resilience based design to improve community resilience.

Safer Cities Survey

Building off of previous Summit discussions, the 2016 Summit introduced a new study on how prepared the Southern California region is to respond to future earthquakes. The pioneering study titled, "SEAOSC Safer Cities Survey" was performed in partnership with the Dr. Lucy Jones Center for Science and Society. The Survey brought to light where Southern California is currently with regard to understanding the type and number of vulnerable buildings in Southern California through an inventory process, the implementation of strategies to mitigate the risk, and recommended programs to decrease recovery time, such as a back-to-business program. The Survey also advocates for seismic safety locally and statewide, the benefits of being more proactive than reactive, how policy can create safer cities, how we got to where we are today, and how we can work together to improve our cities strength and resiliency.

The Safer Cities Survey was developed in order to help inform of the current risk and motivate the development of an effective strategy to improve the safety and resilience of our communities. The critical first step in the process was to benchmark building performance policies currently in place. For Southern California, this benchmarking includes recognizing which building types are most vulnerable to

collapse in earthquakes, and understanding whether or not there are programs in place to decrease risk and improve recovery time. In light of this, SEAOSC partnered with the Dr. Lucy Jones Center for Science and Society (DLJCSS) to perform a survey of the cities in Southern California with the goal of providing a snapshot of current strategies to strengthen the built environment in our region.



This groundbreaking report is the first comprehensive look at what critical policies have been implemented in the region of the United States with the highest risk of earthquake damage, namely southern California. According to the Los Angeles Times, the Survey *"found that most local governments in the region have done nothing to mandate retrofits of important building types known to be at risk, such as concrete and wooden apartment buildings."*

The Safer Cities Survey highlights how the high population density of the SoCal region coupled with the numerous earthquake faults and aging buildings is an issue that needs to be addressed by all jurisdictions as soon as possible. An excerpt from the Survey covers in detail why this issue is so important:

No building code is retroactive; a building is as strong as the

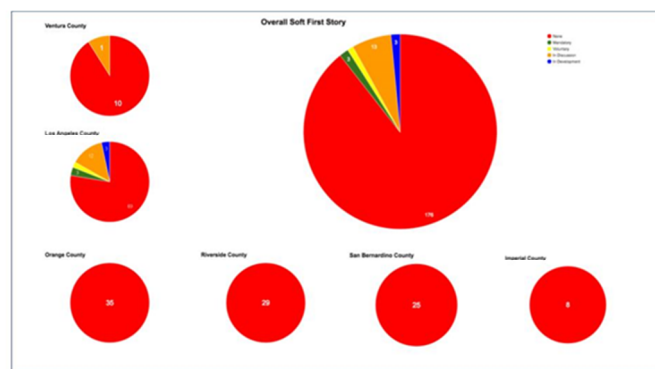
building code that was in place when the building was built. When an earthquake in one location exposes a weakness in a type of building, the code is changed to prevent further construction of buildings with that weakness, but it does not make those buildings in other locations disappear. For example, in Los Angeles, the strongest earthquake shaking has only been experienced in the northern parts of the San Fernando Valley in 1971 and 1994 (Jones, 2015). In San Bernardino, a city near the intersection of the two most active faults in southern California where some of the strongest shaking is expected, the last time strong shaking was experienced was in 1899. Most buildings in southern California have only experienced relatively low levels of shaking and many hidden (and not so hidden) vulnerabilities await discovery in the next earthquake.



Collapse of the Northridge Meadows apartment building in the 1994 Northridge earthquake. Photo credit: NOAA/NGDC, M. Celebi, U.S. Geological Survey.

The prevalence of the older, seismically vulnerable buildings varies across southern California. Some new communities, incorporated in the last twenty years, may have no vulnerable buildings at all. Much of Los Angeles County and the central areas of the other counties may have very old buildings in their original downtown that could be very dangerous in an earthquake, surrounded by other seismically vulnerable buildings constructed in the building booms of the 1950s and 1960s. Building codes do have provisions to require upgrading of the building structure when a building undergoes a significant alteration or when the use of it changes significantly (e.g., a warehouse gets converted to office or living space). Seismic upgrades can require changes to the fundamental structure of the building. Significantly for a city, many buildings never undergo a change that would trigger an upgrade. Consequently, known vulnerable buildings exist in many cities, waiting to kill or injure citizens, pose risks to neighboring buildings, and increase

recovery time when a nearby earthquake strikes.



Survey Figure 4. Ordinances to address soft first-story construction for all six counties and individually by county

The survey also serves as a valuable reference in being able to identify and understand what the known vulnerable buildings types are:

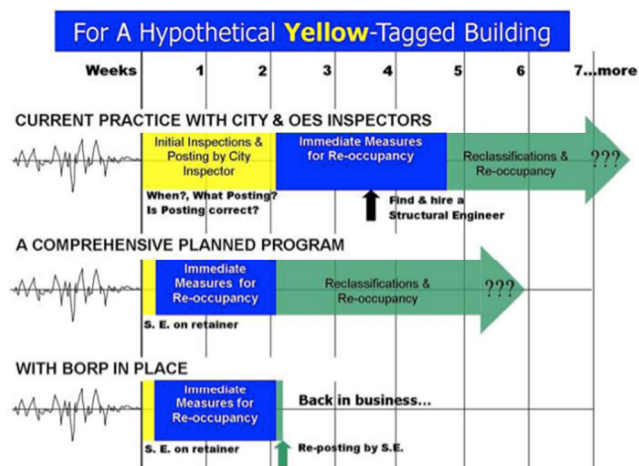
1. Unreinforced masonry buildings: brick or masonry block buildings with no internal steel reinforcement — susceptible to collapse
2. Wood-frame buildings with raised foundations: single-family homes not properly anchored to the foundation and/or built with a crawl space under the first floor — possible collapse of crawl space cripple walls or sliding off foundation
3. Tilt-up concrete buildings: concrete walls connected to a wood roof — possible roof-to-wall connection failures leading to roof collapse
4. Non-ductile reinforced concrete buildings: concrete buildings with insufficient steel reinforcement — susceptible to cracking and damage
5. Soft first-story buildings: buildings with large openings in the first floor walls, typically for a garage — susceptible to collapse of the first story
6. Pre-1994 steel moment frame buildings: steel frame buildings built before the 1994 Northridge earthquake with connections — susceptible to cracking leading to potential collapse



Front wall of the John Muir School, Pacific Avenue, Long Beach, California, downed by the March 11, 1933 earthquake. Photo credit: W.L. Huber, earthquake.usgs.gov

Along with the comprehensive list of potentially dangerous buildings, the survey also offers key recommendations on how cities can directly address these hazards and reduce potential risks due to earthquakes. As a good starting point, the survey recommends having “...an active or planned program to assess the building inventory to gauge the number and locations of potentially vulnerable buildings...is one of the first steps in developing appropriate and prioritized risk mitigation and resilience strategies.”

Economic costs can be substantial for businesses whose buildings have been affected by an earthquake. After a major seismic event, a structure needs to be cleared by the building department as safe before it can be reoccupied, and it will generally receive a green (safe), yellow (moderately damaged) or red (dangerous) tag. A typical yellow-tagged building could take up to two months to be inspected, repaired and then cleared, meaning an enormous absence of income for businesses. The survey offers a strategy for getting businesses up and running more quickly after an earthquake, in order to minimize such losses. The Safer Cities Survey recommends that cities adopt a “Back-to-Business” or “Building Re-Occupancy” program, which would “create partnerships between private parties and the City to allow rapid review of buildings in concert with City safety assessments...Back-to-Business programs...[allow] private parties to activate pre-qualified assessment teams, who became familiar with specific buildings to shorten evaluation time [and] support city inspections.”



Basically, a program like this would allow a property owner to work with a structural engineer *before* an earthquake occurs. This way, the engineer is familiar with the building and potential risks, and can more quickly assess and address any potential damage. Having a program like this in place can dramatically shorten the recovery time for a business, from two months down to perhaps two weeks. Several cities have already adopted these types of programs, including San Francisco and Glendale, and it showed up as a component of Los Angeles’ Resilience by Design report.

Ultimately, the survey found that only a handful of cities have actually adopted a retrofit ordinance, but many cities indicated they were interested in learning more about how they could get started on the process. As a result, SEAOSC launched a Safer Cities Advisory Program, which offers SEAOSC volunteers experts who will provide their technical advice for any southern California city seeking an independent qualified review of their draft building retrofit ordinances and programs. This collaboration will hopefully help increase the momentum of strengthening southern California so that it can recover more quickly from the next “Big One.”

A copy of the Safer Cities Survey was sent to every city that was included as part of the study with a letter that encouraged the local building official and elected officials to reach out to SEAOSC to get more information on exploring retrofit ordinances and their impact. Several cities have done so since the publications of the Survey, and cities such as Beverly Hills, West Hollywood, and Santa Monica have already moved forward with enacting mandatory retrofit ordinances. The City Council of Santa Monica unanimously



passed a comprehensive mandatory seismic retrofit ordinance in March 2017 that will “encompass 20 years of work to increase safety of earthquake-vulnerable buildings in the event of a large quake.” Additionally, the City of Santa Monica will be the first city to require the retrofit of steel moment frame buildings built before the 1994 Northridge earthquake as well as four other building types vulnerable to collapse in an earthquake.

Structural engineers have long recognized the need to strengthen existing buildings, but policy changes required to achieve this require input from many stakeholders and the skill and adeptness of our local leaders to advance common goals. As the discussion continues, SEAOSC plans on updating the information in the Survey to measure progress, which is something that can only be achieved with the stakeholders working together toward a common goal for safer and more resilient cities.

Ongoing Education, Outreach, and Resilience Work in Southern California

Primary focus areas for SEAOSC in the past few years have been to advocate for the structural engineering profession and for a stronger built environment. These efforts included the aforementioned Summit, Safer Cities Survey, and Safer Cities Advisory Program. Additionally, they included the publication of our retrofit design guides, our Find An Engineer online referral service for the public, development of our “*What You Need to Know about Structural Engineering*” flyer, hiring an External Affairs Advisor, hosting a quarterly Leadership Lunch for SoCal organizations, creating a Strategic Outreach Ad Hoc Committee, and speaking at the City of Los Angeles Seismic Retrofit Resource Fair..

SEAOSC published, through ICC, two design guides for the City of Los Angeles’ Mandatory Earthquake Hazard Reduction in Existing Non-Ductile Concrete Buildings (NDC) and in Existing Wood-Frame Buildings with Soft, Weak or Open-Front Walls (SWOF). They were developed through task groups in the SEAOSC Seismology and Existing Buildings Committees. These design guides represent a tremendous achievement and will be an excellent resource not just for local structural engineers performing designs in accordance with the Los Angeles retrofit ordinance, but also for engineers and building officials evaluating these building types and for policy makers developing seismic risk mitigation policy.

One of the public outreach tools developed through the

SEAOSC Image & PR Committee is “*What You Need to Know about Structural Engineering*” flyer. As the title states, the flyer provides the public basic information about structural engineering, licensed structural engineers and their value, and directs them to the SEAOSC Find An Engineer online referral service. The online referral service provides resources to the public to help them in their selection of a licensed structural engineer and offers a directory of structural engineers that is searchable based on specialty.

Understanding that SEAOSC had limited expertise in outreach, lobbying and advocacy, SEAOSC’s wisely contracted with a company with an understanding of and contacts with local governments beginning with our Summits in 2013. The consultants have been very instrumental in increasing outreach efforts and this year SEAOSC expanded the role of the consultant and has given him a title of SEAOSC External Affairs Advisor. SEAOSC also initiated a quarterly Leadership Lunch last fall for like-minded SoCal organizations such as AIA, BOMA, CALBO and USGBC. The purpose of these meetings is to outreach and engage other local organizations to enhance our relationships, be better informed of each group’s goals and efforts, and to determine if there are possible areas of collaboration that may help to develop better and more comprehensive solutions in a timelier manner. Additionally, as outreach is a primary focus, the SEAOSC Board created a Strategic Outreach Ad Hoc Committee last year to focus on outreach, evaluate current outreach efforts, and develop recommendations for a more comprehensive outreach effort. The Board has recently approved the recommendations and are in the process of implementing them.

The City of Los Angeles has worked hard to partner with local organizations and to listen to community stakeholders in the past few years in an effort to improve community resilience. SEAOSC was one of the partners in the development of the City’s December 2014 Resilience by Design action plan, which identified major community vulnerabilities such as non-ductile concrete buildings, soft-story wood buildings, water system infrastructure, and telecommunication infrastructure and provided recommendations to mitigate the risk and decrease recovery time after a big earthquake. This report led to the October 2015 mandatory seismic retrofit ordinance. The City has provided two seismic retrofit fairs for the community and SEAOSC and many of our members participated to provide presentations and information to affected building owners. In 2017 the L.A. Mayor’s Office convened Building Forward LA (BFLA), of which SEAOSC is a partner. BFLA is a task force charged to prepare recommendations on how to modify policies and rules in the City of Los Angeles to further realize



the vision for a more sustainable and resilient Los Angeles whatever the shock or stressor, including earthquakes.

The strengthening and resilience discussions expanded to other communities in southern California and SEAOSC was asked to provide advice through the Safer Cities Advisory Program on retrofit ordinances such as for the cities of Beverly Hills, Santa Monica, and West Hollywood. Indeed these three cities have now adopted mandatory ordinances to reduce risk to their communities from the next earthquake. Other cities have also requested SEAOSC's input on ordinances they're considering.

Conclusions and Recommendations

From 1927, when the first consistent statewide building code was adopted, significant strides have been made in increasing the structural performance of buildings during earthquake events. However, nearly every existing building gains little to no benefit from the continued code enhancements because current codes rarely require upgrades to buildings built in compliance with past codes. Instead, owners are most often left to decide how and when to implement upgrades, if any, to their structures and some don't have the necessary tools to to understand the full implications of what is at risk. Even when upgrade requirements are triggered by current codes, the building can remain vulnerable, compared to a new building, due to the fact that portions of the building continue to contain older methods of construction not conforming to current standards and that didn't necessarily require special inspection. This can be further exacerbated by the need of building owners and retrofit designers to work within fixed budgets focused on enhancing a building's performance while staying just below a threshold that may trigger mandated requirements. The result is a building inventory with non-uniform performance objectives and capabilities. For city officials, policy makers, and emergency planners, this increases the difficulty of prioritizing planning and response programs. For current and future building owners and tenants, this can result in unmatched expectations with regard to long-term value and short-term recovery time of their buildings.

So what are possible solutions to moving a community toward a stronger and more resilient built environment? Certainly collaboration of local organizations and government, community education, and listening to stakeholders are important components. Understanding the community's risk by performing an inventory of the building stock is certainly one of the important initial steps so that the risk is understood and appropriate strategies are developed. These strategies may include mandatory retrofit ordinances

for the most vulnerable buildings, implementing a Back-to-Business program to decrease recovery time for businesses, and possibly implementing a resilience based design approach for new construction focused on decreasing recovery time rather than just surviving the earthquake, as the code minimum currently requires. Potentially a building rating system would provide better understanding by those who own, use, fund or insure buildings or are affected by damage to them so that they may make more informed decisions. Certainly, community engagement with consistent and understandable messaging by the local structural engineering association is critical to a community's understanding of structural risk and to their development of appropriate strategies for the built environment.

A few recommendations on how each individual structural engineer can help to strengthen and improve the resilience of our communities include:

1. Speak consistently on topics such as seismic risk, building vulnerability, seismic mitigation solutions, building performance, and back to business programs. This will help reduce confusion to better ensure action is taken.
2. Join your local SEA and engage fellow engineers in meetings, education events, and committees to support and increase the dialog and help develop innovative and cost-effective solutions meeting the desired objective. The structural engineering community can do so much more together than individually.
3. Participate in the SEAOSC "Find An Engineer" website service as it's being used more frequently by the public and jurisdictions as they look for engineers for their projects.
4. Assist in advisory efforts, such as the SEAOSC Safer Cities Advisory Program, which provides a jurisdiction an objective review of structural ordinances and programs they've developed with their contracted structural engineer.
5. Participate in local chapter SEA outreach efforts, such as assisting in formal efforts to engage others in our community to help increase understanding, solutions and policies to improve our existing building stock and decrease recovery time after an earthquake.

This is certainly a special time as there is so much thoughtful and important work going on in SoCal to strengthen our communities and decrease recovery time and a big part is persistent and increased community education as well as collaboration between organizations and government. Structural engineers should continue to work toward improving outreach efforts including collaboration with other



organizations and government. Additionally, they should continue to consider innovative methods to communicate risk and solutions as well as innovative building performance improvements.

Acknowledgements

Thank you to the time, dedication, and enthusiasm of the following individuals who have made the outreach efforts of SEAOSC possible.

SEAOSC Safer Cities Survey

David Cocke, S.E., F.SEI, F.ASCE, Structural Focus, John Duncan, DLJCSS, Jeff Ellis, S.E., Simpson Strong-Tie, Michelle Kam-Biron, S.E., SECB, American Wood Council, Annie Kao, P.E., Simpson Strong-Tie, Robert Lyons, S.E., Risha Engineering, Kenneth O'Dell, S.E., MHP Inc, Ron Takiguchi, P.E., CBO, City of Santa Monica, Victoria Wigle, S.E., DPR Construction, David Williams, S.E., Degenkolb John Bwarie, Stratiscope. Special thanks to the California Building Officials (CALBO) members and the SEAOC Foundation for their support.

SEAOSC Strategic Outreach Ad-hoc Committee

Kenneth O'Dell, S.E. (Chair), John Bwarie, Jeff Ellis, S.E., Saeed Fathali, PhD, PE, Bob Lyons, S.E., Michael Cochran, S.E., David Cocke, S.E., Michelle Kam-Biron, S.E., Annie Kao, P.E., Kevin O'Connell S.E., Mehran Pourzanjani, S.E., Janah Risha, S.E., Doug Thompson, S.E., Victoria Wigle, S.E., David Williams, S.E.

References

"Earthquakes are equal-opportunity destroyers." Editorial. *Los Angeles Times*. 6 Dec 2016. Retrieved from <http://www.latimes.com>

Lin, R. (2016, November 25). Live in Santa Monica, West Hollywood, or Beverly Hills? Quake retrofits for apartments may be coming to you. *Los Angeles Times*. Retrieved from <http://www.latimes.com>

Resilience by Design Report (2014, December 8) Mayor's Office of Los Angeles Mayoral Seismic Task Force. Retrieved from <http://www.lamayor.org>

SEAOSC Safer Cities Survey, 2016, Structural Engineers Association of Southern California, San Dimas, California. <http://www.seaosc.org/summit>