WSSPC
WESTERN STATES SEISMIC POLICY COUNCIL

We develop seismic policies and share information to promote programs intended to reduce earthquake related losses.

A non-profit earthquake consortium for the western states

Fall 2019
e-Newsletter

Western States Seismic Policy Council
801 K Street, Suite 1236
Sacramento, CA 95814
Phone: 916-444-6816
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In This Issue

WSSPC NEWS

It's Awards Nomination Time Again!
Do you know an individual or project that has shown exceptional creative and innovative efforts within the earthquake hazards reduction community? If so, submit a nomination!

Nominations for the 2020 WSSPC Awards are now open. Recognize outstanding colleagues and projects that have had an impact on seismic risk reduction with a nomination for the WSSPC Awards in Excellence, Lifetime Achievement Award, or WSSPC Leadership Award. The nomination deadline is January 3, 2020. Nomination forms and eligibility guidelines can be found on the website at: *https://www.wsspc.org/awards/call-nominations/*

WSSPC at California Correctional Health Care Services

On September 10th WSSPC attended the Safety Fair at California Correctional Health Care Services (CCHCS) in Elk Grove, California. This was the first time WSSPC had attended this fair. The comprehensive, positive information on public safety available at the event was great and the turnout was excellent!

The fair was held in an effort to educate CCHCS employees on emergency preparedness, public safety, and health. Approximately 85 employees visited the WSSPC table. We shared with them who we are and what we do.

In the course of the safety fair, participants learned about what to do before, during, and after an earthquake event. They left our booth with a greater knowledge of what resources are out there to help you get prepared and how to "DROP, COVER, and HOLD ON."

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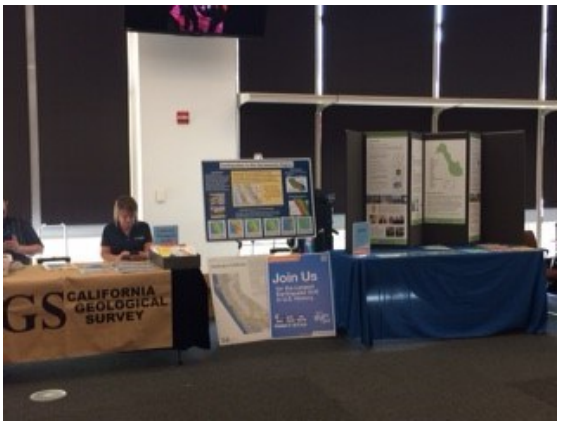
WSSPC NEWS

WSSPC at CalPERS Preparedness Fair

On September 12th, 2019 WSSPC supported the California Public Employees' Retirement System (CalPERS) employee Safety and Preparedness Fair in Sacramento, California. This was CalPERS' first preparedness fair.



The fair was held to educate CalPERS employees on emergency preparedness, public safety, and health. The turnout was great with, as per the organizer, approximately 400 people participating.
Those who came to our table left with a greater understanding about what to do before, during, and after an earthquake, what resources are out there to help them get prepared, and how to "DROP, COVER, and HOLD ON." All participants were incredibly engaged and interested in how they can better prepare for an earthquake.

WSSPC at California Preparedness day in Old Sacramento:

On September 14th, the California Office of Emergency Management (CalOES) sponsored a Preparedness Day in Old Sacramento. Among the many partners participating were the California Geological Survey (CGS) and, one of our Affiliate Partners, the California Earthquake Authority (CEA).

WSSPC had an estimated 120 to 150 people visit our booth where we shared information on who we are, what we do, and earthquake safety information. Of special note was the interest and willingness of other participating entities to seek out information and volunteer support for WSSPC. We look forward to their future participation.

NEWS

Budget Cuts to Seismic Monitoring System USArray in Alaska

The line-item funding for a statewide seismic network of seismic sensors that have been installed since 2014 throughout Alaska has been vetoed by Governor Dunleavy in his signing of the Capital Budget. The 150 seismic sensors installed by the National Science Foundation, whose main goal was to image the deep continent of North America, are scheduled to be decommissioned next year. The window to purchase the system before it is deconstructed is closing and, since the veto, the funds to do so are minimal.

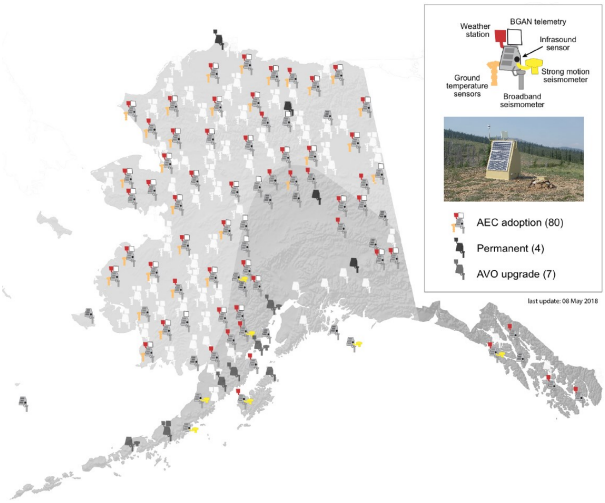


Image: Map of USArray stations
Source: earthquake.alaska.edu

The USArray project had drastically improved Alaska's ability to "pinpoint the depth, orientation, and footprints of the most remote quakes," improving and supplementing the current state-system. The system has allowed scientists to pinpoint earthquakes that they were usually unable to due to their remote location.

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Earthquakes such as the 6.4 quake in northeast Alaska and the 7.9 earthquake off the coast of Kodiak, both of which hit in 2018, would be almost impossible to properly study without this seismic network.

With the recent M7.0 earthquake in Anchorage, there had been a huge push to keep these stations and bolster Alaska's earthquake research capabilities. Due to the budget cut the Alaska Earthquake Center, with the help of USGS, is in the process of assuming the ownership of 43 USArray stations in southern Alaska. As of yet, there is no actionable plan for adopting the USArray sites in northern and western Alaska.

The criticality of the seismic sensors is emphasized by their use for infrastructure and city planners to help minimize the risks from a potential earthquake. By allowing scientists to better understand where faults are, forecast the size of earthquake and more clearly understand where they might be, better safety measures could be provided or implemented for the infrastructure and people in the regions.

There are efforts from USGS, Alaska Earthquake Center to secure as many seismic sensors as possible as well as many advocates for funding the sensors in the Alaska legislature to get the veto overturned.

References:
https://www.ktuu.com/content/news/Why-researchers-say-state-seismic-measuring-system-vetoed-in-Capital-Budget-matters-to-Alaska-536061981.html
https://earthquake.alaska.edu/usarray-and-alaska-state-budget-cuts
https://www.adn.com/alaska-news/2019/01/05/officials-push-to-keep-dozens-of-earthquake-sensors-slated-for-removal-across-alaska/

continued

University of California Buildings Unsafe During an Earthquake

First reports have been released in response to a UC Board of Regents 2017 directive for all UC campuses to undertake a seismic risk assessment.. Many buildings at both University of California Los Angeles (UCLA) and University of California Berkeley (UCB) were found to pose a serious risk to life in a strong earthquake. At least 68 buildings at UC Berkeley and 18 at UCLA are considered seismically deficient, according to the new university studies.

Although neither campus had buildings in the "dangerous" category, there were 9 that were found to have "severe" risk to life, 6 at UC Berkeley and 3 at UCLA. The other UC campuses have not yet released their studies, but those most at risk are UC Santa Cruz, UC San Francisco, UC Santa Barbara, UC Irvine, and UC Riverside.

Some of UCLA's most significant buildings such as Young and Powell libraries, both of which are large and highly populated, Murphy Hall, and Luskin School of public Affairs buildings, which hosts humanities classes for hundreds of students every quarter, are also the UCLA buildings that pose a serious risk to life in the case of an earthquake. Attended by 45,500 undergraduate and graduate students, UCLA is threatened by two faults that are each capable of producing a magnitude 7 quake or bigger: the Santa Monica fault and the Newport -Inglewood fault.

At UC Berkeley, some of the 6 buildings considered to have a "severe" risk to life are also some the most used and important buildings. For example, Moffitt Library, which many students utilize daily, and the 11 story Evans Hall, which houses the math, statistics, and economics department, are both considered a "severe" risk.

Attended by 42,500 undergraduate and graduate students, UC Berkeley is on top of the Hayward fault, which runs through the east side of campus and is capable of producing a magnitude 7 quake.

Despite previous attempts to retrofit some of these buildings, new technology has allowed engineers to better identify flaws in a building's design. For example, the 1992 retrofit of Moffitt Library strengthened the brittle concrete. However, today's seismic evaluation techniques show that in the case of a large quake, it is possible that the concrete could explode out of the columns if there is not a new retrofit of the columns with some kind of a "strong jacket." Initial estimates of repairing or replacing the buildings at UC Berkeley alone are over $1 billion.

Image: Potentially Seismically deficient Wheeler Hall at UC Berkeley
Source: LA Times

There is currently a system wide effort to prioritize the seismic safety of buildings throughout the 10 UC campuses.

Resources:
https://www.latimes.com/california/story/2019-08-29/how-would-uc-berkeley-fare-in-a-big-earthquake-officials-looked-and-its-scary
https://www.campussafetymagazine.com/university/ucla-uc-berkeley-buildings-unsafe-earthquake/

continued

USGS Awards $10.4 Million to ShakeAlert in the Pacific Northwest

The Pacific Northwest Seismic Network (PNSN), based at University of Washington, was awarded $10.4 million in funding from the U.S Geological Survey. This funding is in support of the ShakeAlert Early Warning System in Oregon and Washington and approximately $7.3 million of the funding will go directly to the University of Washington.

The first distribution of the funding, $5.4 million was given to the PNSN in August, 2019. The second distribution of $5 million to be given out next year, is contingent on approval by Congress.

The award will allow for 104 new seismic stations in Washington State and 44 in Oregon. This funding will be a major increase in federal support for the Cascadia region, with doubling the number of seismic stations that contribute to real-time earthquake early warning across the region at the end of the two years. The funding and growth in seismic stations will allow PNSN's network to meet USGS's recommended station-density standard for public alerting along most of the areas of Washington and Oregon.

The funding will also support ongoing research to integrate GPS data into ShakeAlert. This would allow researchers to continue working on a system where they could receive "near real-time GPA data from across Washington and Oregon that will be integrated into future releases of ShakeAlert."

With earthquake early warning systems growing across the West Coast (as exemplified by Los Angeles' ShakeAlert app) these new seismic networks will allow the Pacific Northwest to continue working on its goal of getting an earthquake early warning app available for residents of Washington and Oregon.

Resources:
https://www.seattletimes.com/seattle-news/environment/earthquake-warning-system-gets-funding-boost-could-provide-smartphone-alerts/
https://www.washington.edu/news/2019/08/19/usgs-awards-10-4m-to-shakealert-earthquake-early-warning-system-in-the-pacific-northwest/

Why L.A's ShakeAlert Earthquake Early Warning App did not warn against the Ridgecrest Earthquakes

Although over 500,000 people have downloaded the new ShakeAlertLA app in an effort to receive warning before a major earthquake, when the two earthquakes hit Ridgecrest on July 4th and 5th, L.A residents received no warning. Despite disappointment from residents of Las Angeles, the app actually worked exactly as expected and did not send a warning message due to the low shaking felt within L.A. County.

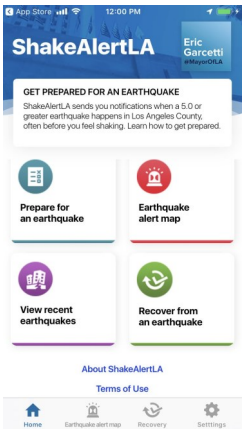

Image: ShakeAlertLA App Source: Graham Johnson at KIRO7

ShakeAlertLA is designed to warn its users when predicted shaking has reached a level 4 intensity or at least a magnitude 5.0 at their location. The shaking felt after the two Ridgecrest earthquakes were predicted to be a level 3 intensity and a magnitude 5.0 quake. This resulted in Los Angeles residents not receiving a warning message and a sense among the app's users that it did not work.

Due to the negative feedback received, officials have agreed to lower the minimum requirements by the end of July. As of July 24th, 2019 the app will now send warning messages for quakes with a magnitude of at least 4.5 and result in "weak shaking."

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Although there is debate about the fine line between properly informing residents of earthquake hazards and accidently causing "alert fatigue" by over-using the app, researchers have found that people generally prefer getting false alerts over not getting enough warning. By lowering the minimum requirements for sending out warnings to the app's users, officials hope that they will better prepare L.A residents for the next earthquake.

Resources:
https://www.latimes.com/science/story/2019-07-14/earthquake-warning-shakealert-app-worked
https://www.nytimes.com/2019/07/08/us/california-earthquake-alert-app.html

Nevada's Governor Calls for Reevaluations of Storing Nuclear Waste in Yucca Mountain

The seismically active zone that includes Yucca Mountain has been considered as a site for storing the nation's nuclear waste for years. In the wake of the powerful earthquakes that shook Ridgecrest early July, Nevada officials are calling on the federal government to reevaluate the dangers of storing the waste at that location. As the epicenter of the Ridgecrest quake was only 100 miles southwest from the site, it brought attention to the serious threat a possible nuclear waste site located there could be.

Image: U.S. Rep. Greg Walden, R-Ore., walks through a tunnel extending from the south portal during a congressional tour of Yucca Mountain near Mercury, July 14, 2018)
Source: .Chase Stevens/Las Vegas Review-Journal

Yucca Mountain is about 10 miles from a fault at Bare Mountain, which the Nevada Geological Survey predicts could produce a 6.5 magnitude quake. It is also just under 30 miles from two active faults which could produce earthquakes with 6.5-7.9 magnitude. With these hazards, Nevada officials and geologists are urging the federal government to fund studies of the earthquake dangers in the area and reexamine the seismic hazards at Yucca Mountain.

Resources:
https://www.reviewjournal.com/news/politics-and-government/nevadas-governor-wants-yucca-earthquake-review-1758638/
https://www.rgj.com/story/news/2019/07/18/nevada-feds-should-restudy-seismic-risk-yucca-mountain/1768557001/

San Francisco Mayor Signs $629 Million Earthquake Safety Bond

On July11, 2019 San Francisco Mayor London Breed signed a $629 Million Earthquake Safety and Emergency Response (ESER) bond for the March 2020 ballot. The bond would fund "seismic retrofitting and resiliency of fire station, police station, and other critical public safety infrastructure." The bond was unanimously approved by the Board of Supervisors on July 9th and is expected to be approved by San Francisco voters based on the overwhelming majority support for the previous $412 million 2010 and $400 million 2014 ESER bonds.

As October will mark the 30 year anniversary of the 1989 Loma Prieta earthquake, there is a growing sense of necessity to prepare for the next big earthquake in the Bay Area. If voters choose to approve the bond, it will provide:

- $275 million to fund seismic retrofitting and resiliency projects for Neighborhood Fire Stations and support facilities, such as firefighting training facilities
- $153.5 million for the Emergency Firefighting Water System

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- $121 million to fund seismic retrofitting\and resiliency projects for San Francisco Police District Stations, and support facilities
- $70 million for disaster response facilities
- $9 million for the Department of Emergency Management 9-1-1 Call Center

The ESER bond is included in the 10-Year Capital Plan adopted by the Board of Supervisors on April 30, 2019 and is published every odd year.

Resources:
https://sfmayor.org/article/mayor-london-breed-signs-629-million-bond-earthquake-safety-and-emergency-response-march
https://www.nbcbayarea.com/news/local/San-Francisco-Mayor-Breed-Proposes-628M-Earthquake-Bond-509369111.html

Updates from Alaska Division of Homeland Security

From July 18-25, 2019, the Alaska Division of Homeland Security & Emergency Management (DHS&EM) partnered with FEMA Region X, the FEMA National Earthquake Hazard Reduction Program Applied Technology Council, the Anchorage Field Office of the US Department of Housing & Urban Development, the University of Alaska Anchorage, Alaska Department of Transportation & Public Facilities, and the Matanuska Susitna Borough to deliver in-demand pre- and post- earthquake structural assessment, and nonstructural mitigation training in Anchorage, Fairbanks, and Palmer, Alaska.
The courses:

- FEMA P154, Rapid Visual Screenings of Buildings for Potential Seismic Hazards (pre-disaster)
- ATC-20, Post Earthquake Safety Evaluation of Buildings (post-disaster)
- FEMA E-74, Reducing the Risks of Nonstructural Earthquake Damage

had been offered and well-attended in previous years, but were in particular demand after the

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November 30, 2018 M7.1 Cook Inlet Earthquake did an estimated $290M of damage to Anchorage, Matanuska-Susitna Borough, and Kenai Peninsula roads, bridges, buildings, and residences. Building inspectors and facility managers looked to improve their pre-disaster building earthquake risk assessments, understand nonstructural hazards and pre-disaster mitigation options, and sharpen their earthquake response capability to assess building habitability and tag appropriately and expediently.

Image: Barry Welliver instructs the ATC-20
Source: Earthquake Program Manager, Dan Belanger

Dan Belanger, The Alaska Earthquake Program Manager, requested these trainings through NEHRP and Applied Technologies Council due to the increased interest. The four statewide deliveries brought in 160 public and private sector attendees from federal, tribal, state, and local agencies, school districts, universities, hospitals, Alaska Railroad, utility companies, housing authorities and affordable housing partners, engineering and construction companies. Housing partners included Alaska Housing Finance Corporation, Cook Inlet Housing Authority, and NeighborWorks Alaska.

John Malaby, a Civil & Structural Engineer attending the courses commented *"I felt that the instructor had a breadth of knowledge on the subject and the seminar was very useful to me as a structural EIT. I have performed many post-earthquake inspections in the Anchorage and Kenai area since the event this past winter and the information provided in the seminar confirmed my methodology in some instances and gave me tips for improvement in others".*

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Why Ridgecrest was Largely Spared from Destruction in the Midst of Huge Temblors

Major temblors hit Ridgecrest, California on July 4th and 5th with magnitudes 6.4 and 7.1 respectively. These were the largest quakes in California since Northridge and, had it occurred in a place like the Hollywood fault, would have resulted in huge amounts of damage. However, due to a variety of factors, Ridgecrest was spared some of the damages that Californians have come to expect in the case of such large quakes.

This lack of destruction has been largely attributed to the Mojave Desert town's relatively new and resilient buildings, its lack of unretrofitted brick buildings, the small population, and the location of the quake. The 7.1 magnitude earthquake occurred on a fault where the worst shaking occurred away from the main towns and into sparsely populated areas. This kept the strongest shaking in areas where lives and structures were sparse and less at risk.

The largest losses were felt by owners of mobile homes, which were the most vulnerable building type in the Ridgecrest quake, as they are often not secured to their foundations.

Resources:
https://www.latimes.com/local/lanow/la-me-ln-earthquake-ridgecrest-worse-20190710-story.html
https://www.usatoday.com/story/news/nation/2019/07/09/california-earthquakes-ridgecrest-survived-how/1678659001/

How the Devils Hole pupfish survived the Ridgecrest Earthquake

The magnitude 7.1 Ridgecrest earthquake ripped through southern California, causing a 10-15ft wave in Devils Hole in Death Valley national park, the home to an endangered species of pupfish. However, Devils Hole pupfish, among the rarest fish on earth, know a thing or two about earthquake safety.

Numbering less than 200, the Devils Hole pupfish are only found in a geothermal pool so deep that divers have ventured over 400 feet down it and still are unable to see the bottom. With the epicenter of the Ridgecrest earthquake being 70 miles away from this pool, it caused a violent wave that could have harmed these fish if this species of pupfish had not evolved to cope with earthquakes. In fact, a periodic quake benefits the fish by clearing away built-up dead vegetation and resetting the ecosystem.

Image: The Devils Hole pupfish, one of the rarest fish on the planet
Source: National Park Service

In a video released by the US National Park Service, the pupfish are shown swimming deeper into the water to avoid getting swept up and smashed. Although not visible in the video, it is assumed that the fish are probably seeking safety inside some of the larger rooms and shelves deep inside Devils Hole.

Resources:
https://www.theguardian.com/us-news/2019/jul/28/california-devils-hole-pupfish-earthquake
https://www.sfchronicle.com/travel/article/What-about-the-pupfish-How-the-7-1-Ridgecrest-14106965.php?psid=i3HvX

Ridgecrest Earthquakes Generate the Second-Largest Monthly Increase of insurance policies in CEA's History

The California Earthquake Authority (CEA) gained 23,861 earthquake insurance policies in the month of July. This is the second largest monthly net increase in CEA's 23 year history. This increase is second only to the month of September in 2017, the year of the hurricanes in the southeastern U.S and Caribbean, the earthquakes in Mexico, and the wildfires in California, which had given CEA an increase of nearly 26,000 policies.

The 23,861 policies gained by CEA was driven by the magnitude 6.4 and 7.1 earthquakes, and their corresponding aftershocks, in Ridgecrest, California that began on the Fourth of July weekend. For comparison, for the first six month of 2019 combined, CEA gained a total of 6,289 polices. The July numbers have brought CEA's total policy count to 1,080,986 as of July 31st, 2019.

It is currently too soon to see the total damage caused by the Ridgecrest earthquakes. However, CEA has approximately 2,000 policy holders in the area of the quake who likely experienced strong to severe shaking. As of August 26th, 2019 CEA had received 462 damage claims for its participating residential insurances. Although the shaking from the quake was powerful, it was fortunate that it happened in a more rural location with many of the homes in the Ridgecrest area being newer and less prone to earthquake damage.

Resources:
https://www.earthquakeauthority.com/Press-Room/Press-Releases/2019/Ridgecrest-earthquakes-generate-spike-CEA-policies
https://www.insurancejournal.com/news/west/2019/08/28/538206.htm

RESEARCH

New Southern California Earthquake Catalog Hints to How Large Earthquakes Start

A new study cataloging seismic activity in Southern California from 2008 to 2017 has found that, for earthquakes with a magnitude of 4 or higher, at least 72% of them followed less-powerful earthquakes. In previous studies, scientists observed that only half of all moderate quakes had smaller precursor events. This seems to indicate there is some evidence that the fault changes before a larger event with smaller foreshock sequences.

Image: Destruction from the Northridge earthquake
Source: LA Times

Knowing that moderate quakes probably occur after a series of smaller foreshocks can help scientist get better at aftershock forecasting. In the study, foreshock sequences ranged from starting 3 to 35 days prior to the mainshock. Although the scientists could not determine the specific pattern of foreshocks that lead to a moderate quake or larger, the results have helped scientists start to see how earthquakes begin.

This discovery could also help improve the speed of earthquake early warning systems. As addressed in the National Geographic article, "If the computer has detected micro quakes close to a major fault, and knows that most major quakes are preceded by smaller foreshocks, that can help speed up the decision by the system to issue a warning in the moments after an earthquake has begun along a fault."

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Although these findings may help with earthquake early warning systems and further scientists' understanding of seismic events, it does not mean that researchers are any closer to predicting the exact timing and epicenters of earthquakes. However, the suggestion that all moderate and large quakes are preceded by foreshocks may allow for greater research on how earthquakes start and how to better prepare for them.

Resources:
https://www.latimes.com/california/story/2019-08-19/earthquakes-foreshocks-seismology-new-study
https://www.nationalgeographic.com/science/2019/08/earthquakes-groundbreaking-catalog-solved-seismic-mystery-foreshocks-southern-california/

Study Shows Washington Public School Buildings not ready for an Earthquake

A study published by the Washington State Department of Natural Resources assessing the seismic safety of 222 Washington State public schools has found that many of them would not be safe to occupy after a powerful earthquake.

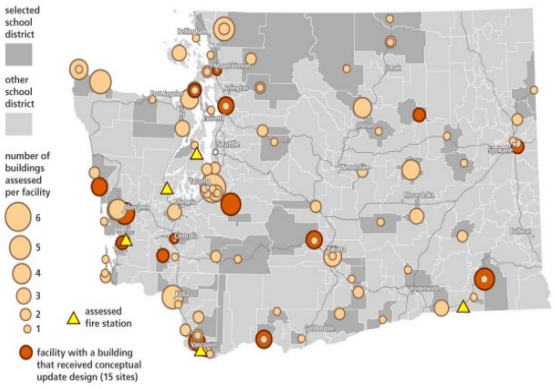

Image: Map showing the location of the 222 school buildings and five fire stations assessed for this project.
Source: Washington Department of Natural Resources

The assessment was based on local geology, as well as the engineering and construction of the buildings. This study is the first statewide assessment of the seismic stability of Washington State schools. Older unreinforced masonry buildings and non-ductile concrete buildings were found to be especially at risk, as well as buildings constructed prior to 1975, which is when the statewide building code was adopted.

Many of the schools with the highest estimate of damage following an earthquake are located in areas of highest earthquake hazard. Washington has approximately 200 schools within one mile of a known fault and about 70% of the state's schools are located in high seismic risk areas.

A larger assessment of more than 4,000 schools is expect to continue through 2021, contingent on an additional $2.2 million in funding from the Washington State Legislature.

Resources:
https://fortress.wa.gov/dnr/geologydata/school_seismic_safety/School_Seismic_Safety_Project_2019_Final_Report_DNR.pdf?x6hjl4
https://www.kiro7.com/news/local/study-public-school-buildings-wouldn-t-be-safe-after-an-earthquake/963403423

Similar Starts for Large and Small Earthquakes

New research published in the magazine *Nature* indicates that "onsets of large earthquakes can be identical to those of small ones, and therefore that the initial conditions and dynamics of a quake do not determine its magnitude." If the magnitude of an earthquake is controlled by its conditions and dynamics, then measurements of initial seismic waves could enable early warning of ground shaking. If not, there is a very low chance of short-term prediction of seismic events.

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Satoshi Ide, the University of Tokyo professor and researcher that analyzed these earthquakes around Japan, found that the onset of approximately 20% of large earthquakes are indistinguishable from the smaller ones that are closely located. By analyzing the large earthquakes along the Japan Trench from June 2002 to April 2018, he was able to carry out a comprehensive analysis and comparison of these quakes. Starting with 1,654 earthquakes of magnitudes greater than 4.5 and comparing them with known small events (with magnitudes less than 4), he calculated the similarity between the first fifth of a second of the seismometer records for each of the quakes.

The findings showed that initial conditions and dynamics likely do not determine its magnitude, therefore there is a low chance of short-term prediction being possible. For now, earthquake prone populations must continue to rely on earthquake early-warning systems. Ide's results help towards a greater understanding of earthquake initiation, which could improve the speed and accuracy of earthquake early warning.

Resources:
https://www.nature.com/magazine-assets/d41586-019-02613-5/d41586-019-02613-5.pdf
https://www.nature.com/articles/s41586-019-1508-5

Laser Sensors can Create Faster, Cheaper Seismic Damage Assessments

In the recovery period after an earthquake, assessing building safety is often a long, expensive process. Now, a low cost laser based sensor that can accurately measure displacement between floors of multistory buildings has been created by scientists at the Lawrence Berkeley National Laboratory. This new technology could allow for rapid assessment of critical buildings like hospitals after an earthquake to greater assist in the recovery process.

The traditional approach to assessing interstorey drift, or the displacement of different floors of multilevel buildings, has been an expensive, laborious, and long process that suffers from the frequency limitations of the current accelerometers. There had been no way to accurately measure the drift between building stories until the discovery of this new laser based device, called a discrete diode position senor (DDPS).

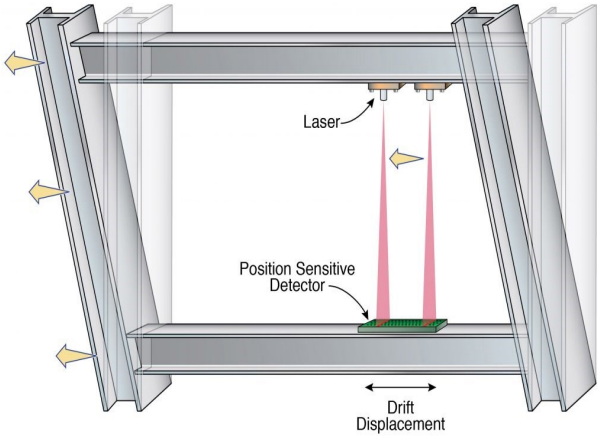

Image: This graphic shows how a laser beam that has been modified to form a line shines onto a board with optical sensors that function as on/off switches. Seeing that movement in real time can inform investigators what parts of buildings are damaged and to what extent.
Source: Diana Swantek/Berkeley Lab

In the next few months, the research team will install the sensors at the Lawrence Berkeley National Laboratory, which is adjacent to California's Hayward Fault Zone. If successful, the device could be installed in critical buildings throughout the region to better prepare cities, building owners, and first responders in the case of an earthquake.

Resources:
http://temblor.net/earthquake-insights/lasers-speed-up-seismic-damage-assessments-9200/
https://physicsworld.com/a/low-cost-laser-sensors-survey-earthquake-damage/

The Segmented Cascadia Megathrust

The subduction zone boundaries within the Cascadia Subduction Zone have the potential to produce some of the world's largest earthquakes with magnitude of 8.0 and higher. Researchers used seismic tomography, an imaging method similar to CT scans, to examine the segmentation in this region. Understanding how and where a segmentation along a fault might occur is critical for earthquake assessment. What they found, and was addressed in their AGU publication, were "two distinct, localized low-velocity anomalies beneath the subducting plate." The authors believe that this means that these regions beneath the subducting plate are more buoyant than in other areas, therefore affecting the behavior of the subducting slab.

The researchers in this study (Bodmer et al.) came to this conclusion by combing seismic data from over 2,320 seismic events recorded at 1,115 stations. This yielded a total of 108, 922 delay times for the analysis. The data is from both onshore and offshore seismic stations. The offshore data obtained spans the entire oceanic plate, which has never been collected before.

The low velocity anomalies found in the study could affect the relationship between the plates in the subduction zone. Therefore, these low-velocity anomalies could influence where the segmentation of the plate occurs as well as where the location and what the magnitude of the megathrust quake will be.

Resources:
https://www.iris.edu/hq/science_highlights/a_subduction_zone_in_pieces_the_segmented_cascadia_megathrust
https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2018GL078700

OSU Researchers estimate the cost of "The Big One" to the Electrical Grid

The true cost "the big one" will have on the electrical grid is still largely unknown. An Oregon State University team hopes to fill the knowledge gap, taking advantage of a newly announced $433,792 National Science Foundation grant.

Led by Ted Brekken, an electrical and computer engineering professor in Corvallis, the researchers plan to use an interdisciplinary approach to study the extent of the possible damage, likely recovery time, critical grid locations, remedial action plans and more.

Image: Power grid of Bonneville Power Administration in Oregon.
Source: Bonneville Power Administration

"As the total direct and indirect costs of a large earthquake for the West Coast soar into the billions of dollars, any estimates of impact and avenues for mitigation for the electrical lifeline will have a significant benefit for millions of residents and businesses," the researchers said in their grant award abstract.

Resources:
https://www.bizjournals.com/portland/news/2019/08/28/researchers-estimate-how-the-big-one-earthquake.html?s=print
https://www.sfchronicle.com/news/education/article/OSU-to-get-funds-to-research-quake-impact-on-14396043.php

Researchers Develop Improved Method for Studying Tsunami Risk to Infrastructure

Researchers at Oregon State University have begun developing a better means of modeling the destructive force of tsunami waves, thus allowing for safer and more secure bridges, buildings, and roads.

Tsunami risk to coastal infrastructure is rare, but potentially devastating. Part of the issue and cause of such a great deal of damage is due to unstable localized soil. In order to develop engineering techniques that can make infrastructure better equipped to withstand the forces within a tsunami, it is key to understand the processes in which a tsunami destabilizes soil.

Research led by Ben Mason and Harry Yeh of the OSU College of Engineering used a centrifuge that once tested Apollo astronauts' resistance to G-forces. The centrifuge in the study, housed at the UC Davis Center for Geotechnical Modeling, has a radius of 9.1 meters. To carry out the experiment, the researchers attached a container apparatus filled with soil and water and gave it gates that allowed for a flow in order simulate a tsunami wave.

By using a centrifuge, the researchers can use high speed video to learn about what is happening to the soil. This includes things like scouring and, under the surface, how pore water pressure changes with time as the water moves across the soil. The researchers hope that these methods of understanding how tsunamis work will help engineers design safer infrastructure.

Resources:
https://today.oregonstate.edu/news/researchers-develop-improved-method-studying-tsunami-risk-bridges-buildings-roads
https://www.eurekalert.org/pub_releases/2019-08/osu-rdi081319.php

Researchers at University of Texas San Antonio Awarded Funding for Earthquake Resistant Buildings

Researchers at the University of Texas San Antonio were awarded funding to develop architectural materials to "help reduce the lateral movement caused by seismic events." These new architectural materials would be able to deform when impacted by an earthquake to trap and displace the energy, then return to its "undeformed state" without the need for repairs. This could drastically decrease the costs of reconstructive efforts after a quake.

Image: representation of an indestructible cell
Source: University of Texas San Antonio

Currently, architects rely on metallic or thick elastic dampers to displace energy and mitigate the movement of a building during a seismic event. This process is not only expensive as the inflexibility of the materials results in crumbling but also is less practical as these devices melt in extreme temperatures and deform upon impact.

With these new materials, the researchers hope to reduce the cost of structural steel in construction while providing a more lightweight building material that can absorb high levels of energy in the case of an earthquake.

Resources:
https://www.eurekalert.org/pub_releases/2019-08/uota-uwf080619.php
https://www.utsa.edu/today/2019/08/story/EarthquakeMaterials.html

continued

MITIGATION

Alaska's Seismic Gas Shutoff Valves have Long-term Benefits after the November Quake

In an effort to better prepare for earthquakes, the Municipality of Anchorage and the Anchorage School District used funding from FEMA's Pre-Disaster Mitigation Grant program to install 117 seismic gas shutoff valves in municipal facilities, 83 of which were in schools, long before the November 30th earthquake struck last year.

Image: Damage from the Anchorage, Alaska earthquake
Source: Donovan Johnson

As Alaska is one of the most seismically active regions in the world, Local Mitigation Plans are constantly being looked at and improved upon. This particular action of installing the gas shutoff valves helped protect more than 297,000 Anchorage residents, 50,000 of which were school children, during last year's magnitude 7.1 quake. The gas shutoff valves reduce the potential for gas to escape through the leaks caused by the earthquakes, protecting schools, the police department, fire stations, and many other municipal buildings from possible gas leaks.

Resources:
https://content.govdelivery.com/attachments/USDHSFEMA/2019/06/27/file_attachments/1239014/DR%204413%20AK%20NR%20032%20Seismic%20Gas%20Shutoff%20Valves%20a%20Long-Term%20Benefit%20Realized%20in%20Alaska.pdf
https://www.ktva.com/story/40814404/small-gas-valves-play-big-role-in-keeping-anchorage-safe-during-earthquakes

CONFERENCES & EVENTS

SAGE/GAGE Workshop
October 9-11, 2019
Portland, Oregon
https://www.iris.edu/hq/workshops/2019/10/earth_in_4d

USRC 2019 Resilience Policy Summit
October 16, 2019
Vancouver, British Columbia

Great Shakeout
October 17, 2019

ICC Annual Conference
October 20-30, 2019
Las Vegas, Nevada
https://media.iccsafe.org/2019_ICC_AnCon/index.html

NEMA Forum
October 26-29, 2019
Coeur D'Alene, Idaho
https://www.nemaweb.org/index.php/forums-meetings/the-nema-annual-forum

National Earthquake Conference (NEC)
March 4-6, 2020
San Diego, California
http://earthquakeconference.org/

If you have events you would like WSSPC to publish in its Newsletters and Bulletins, please email us at: *wsspc@wsspc.org*

WSSPC EVENTS AND UPDATES

WSSPC Affiliate Member Drive: November 1st!
WSSPC welcomes all members of the professional community who share the common goal of reducing losses from earthquakes!
In November, WSSPC will be advertising for more affiliate members through our new annual drive. Keep an eye out for outreach from WSSPC letting the seismic safety community know of the benefits of being an affiliate member.
These benefits include:
• Recognition of support with a link on the WSSPC website to your organization
• Participation on WSSPC Committees providing input to policy recommendations
• Quarterly E-Newsletters and Monthly Bulletins
• Opportunities to exhibit and sponsor activities

We look forward to your support!

Thank You 2019 WSSPC Affiliate Members!
We at WSSPC would like to show our support for our affiliate members. Thank you to our 2019 members:

Corporate	Government
California Earthquake Authority	City of Las Vegas Building and Safety
Saunders Construction, Inc.	Clark County Building and Fire Prevention
Individual	**Non-Profit Organizations**
Dominic Sims	Applied Technology Council

You can Provide Input for our Resources Webpage and Social Media Page!

We are updating the resources and reports page on our website! We are looking for input on what you would like to see in our resources page and any specific articles, studies, or projects you would like referenced there.

We have also been expanding our social media. With efforts like #FableFriday, we are working to give more attention to earthquake safety to a greater and more diverse audience. If you have any ideas for legends for #FableFriday or any other content you would like to see us start posting, please reach out with ideas!

If you have any thoughts, either on the concept for the page or possible content, please email us at: *wsspc@wsspc.org*.

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If you have a newsworthy item for our e-Newsletter, please forward it us at *wsspc@wsspc.org*