Committee on Transportation and Infrastructure
U.S. House of Representatives
Washington, DC 20515

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SUMMARY OF SUBJECT MATTER

TO: Members, Committee on Transportation and Infrastructure
FROM: Staff, Subcommittee on Economic Development, Public Buildings, and Emergency Management
RE: Committee Hearing on "Pacific Northwest Seismic Hazards: Planning and Preparing for the Next Disaster."

PURPOSE

The Subcommittee on Economic Development, Public Buildings, and Emergency Management will hold a hearing on Tuesday, May 19, 2015, at 10:00 a.m. in 2167 Rayburn House Office Building for a hearing titled "Pacific Northwest Seismic Hazards: Planning and Preparing for the Next Disaster." The purpose of the hearing is: (1) to assess the Federal Emergency Management Agency's (FEMA) role in earthquake hazard preparedness, mitigation, response, and recovery; and (2) to examine the efforts of the Pacific Northwest and seismic hazard experts to reduce disaster impacts and build stronger communities. The Subcommittee will receive testimony from FEMA and leaders in engineering and seismology.

BACKGROUND

Over the last five years, globally there have been at least six catastrophic earthquakes. On May 12 and April 25, 2015, just two weeks apart, a 7.3 magnitude earthquake and a 7.8 magnitude earthquake struck Nepal. On March 11, 2011, a 9.0 magnitude earthquake jolted Honshu, Japan. In 2010, there were two powerful earthquakes within a month of each other—the January 12th earthquake in Haiti and the February 27th 8.8 magnitude earthquake in Chile. Combined, these earthquakes caused hundreds of thousands of deaths and injuries and a tremendous amount of property damage. Some caused tsunamis that washed away towns and resulted in damage in other countries. Here in the United States, the most recent devastating earthquakes were over 20 years ago in California: the October 17, 1989, Loma Prieta 6.9 earthquake, which resulted in 63 deaths and thousands of injuries and the January 17, 1994, Northridge 6.7 earthquake, which resulted in 57 deaths, more than 5,000 injured, and an estimated $20 billion in property damage.

Every state has the potential for earthquakes, and the U.S. Geological Survey estimates that "42 of the 50 states have a reasonable chance of experiencing damaging ground shaking from an earthquake in 50 years (the typical lifetime of a building)."[1]" Earthquakes pose a national challenge because 75 million Americans live in areas of significant seismic risk. Unlike hurricanes, tornados, and other storms, earthquakes strike without warning and may trigger devastating secondary effects, such as landslides, fires, tsunamis, and nuclear meltdowns. The damage wrought by earthquakes has a significant impact on people, infrastructure, and the economy.

Most of the Nation's earthquake risk is concentrated on the West Coast. FEMA has estimated the average annualized loss from earthquakes, nationwide, to be $5.3 billion, with 77 percent of that figure ($4.1 billion) coming from California, Washington, and Oregon, and 66 percent ($3.5 billion) from California alone.[2] In the next 30 years, California has a 99.7 percent chance of a magnitude 6.7 or larger earthquake, and the Pacific Northwest has a 10 percent chance of a magnitude 8 to 9 megathrust earthquake on the Cascadia Subduction Zone.[3]

States in the Pacific Northwest are partnering with the federal government to increase preparedness for the next earthquake with the goal of reducing earthquake losses, damages, and overall disaster losses. There are lessons to be learned from these best practices that can be implemented across the country, but much work is still needed to establish an earthquake early warning system and to encourage smart building and mitigation measures that will ultimately drive down the costs of these disasters.

ISSUES

FEMA's Role in Earthquake Preparedness, Mitigation, Response, and Recovery

FEMA was established in 1979 as the centralized location for federal disaster assistance and coordination of the federal government's disaster activities. FEMA is the federal government's lead agency for preparing for, mitigating, responding to, and recovering from disasters and emergencies related to all hazards, whether natural or man-made.

The Post Katrina Emergency Management Reform Act (P.L. 109-295) requires FEMA to perform national level exercises to test and evaluate federal, state, local, and tribal governments' ability to respond and recover in a coordinated and unified manner to catastrophic incidents.[4] The National Exercise Program serves to test and validate core capabilities. Participation in exercises, simulations, or other activities, including real world incidents, helps governments and organizations validate their capabilities and identify shortfalls. Exercises also help governments and organizations see their progress toward meeting their preparedness objectives.

[1] http://www.usgs.gov/blogs/features/usgs_top_story/new-insight-on-the-nations-earthquake-hazards/
[2] U.S. Geological Survey, "Technical Implementation Plan for the ShakeAlert Production System—An Earthquake Early Warning System for the West Coast of the United States," available at http://pubs.usgs.gov/of/2014/1097/pdf/ofr2014-1097.pdf.
[3] Id.
[4] 6 U.S.C. §748.

In the last four years, FEMA has organized several exercises focused on earthquake hazards. The National Level Exercise in 2011 simulated the catastrophic nature of a major earthquake in the central United States region of the New Madrid Seismic Zone. It included participants from various federal, state, and local agencies, as well as private sector and nonprofit organizations. The exercise lasted four days and included more than 4,000 federal employees from 43 departments and agencies. While federal and regional earthquake plans were effectively exercised, there were important lessons learned regarding liability and licensure concerns with Urban Search and Rescue teams that delayed deployment, and it was realized that there were not enough resources or facilities available to support mass healthcare.

The Capstone Exercise in 2014 used the 1964 Great Alaskan Earthquake, which resulted in significant damage from both the quake and the tsunami it triggered, as the basis of the exercise scenario. The exercise examined federal stakeholders' ability to demonstrate operational coordination and information sharing capabilities with the private sector and other non-traditional partners as well as fulfill mandated exercise requirements or internal assessments to validate capabilities and identify key issues or potential shortfalls. One of the greatest lessons learned through this exercise was the movement and prioritizations of assets, particularly to remote areas.

The 2015 National Level Exercise will use the scenario of a 7.8 magnitude earthquake on the Southern San Andreas Fault. This scenario will build upon the lessons learned from previous exercises and continue to test FEMA's national and regional teams, as well as their speed and ability to execute mission assignments.

Encouraging Mitigation through the National Earthquake Hazards Reduction Program

The federal government has supported efforts to assess and monitor earthquake hazards and risk in the United States under the National Earthquake Hazards Reduction Program (NEHRP) program since 1977. The four federal agencies that have responsibility for long-term earthquake risk reduction are FEMA, the U.S. Geological Survey, the National Science Foundation, and the National Institute of Standards and Technology. These agencies coordinate their activities to assess U.S. earthquake hazards and conduct research to help reduce overall U.S. vulnerability to earthquakes.

FEMA is responsible for translating research and lessons learned from earthquakes into guidance, training, support for states and multistate consortia, and other program implementation activities. FEMA works with national model codes and standards groups; promotes better building code practices; assists states in developing mitigation, preparedness, and response plans; aids in the development of multistate groups; and supports comprehensive earthquake education and awareness. FEMA also develops and disseminates earthquake-resistant design guidance for new and existing buildings and lifelines and aids in the development of performance-based design guidelines and methods. FEMA applies earthquake hazards reduction measures, where applicable, to other natural and man-made hazards; provides preparedness, response, and mitigation recommendations to communities; and establishes demonstration projects on earthquake hazard mitigation to link earthquake research and mitigation with emergency management programs.

In 2004, Congress reauthorized NEHRP through FY 2009. Total funding enacted from reauthorization through FY 2009 was $613.2 million, approximately 68 percent of the total amount of the $902.4 million authorized. Although authorization for appropriations expired in 2009, Congress has continued to appropriate funds for NEHRP activities. NEHRP agencies spent $119.5 million for program activities in FY 2013, less than FY 2012 spending of $124.1 million and less than the FY 2014 enacted amount of $121.4.[5] Specifically, for FEMA activities, $23.6 million was authorized in 2009. Since, FY 2011, FEMA has dedicated $7.8 million annually from its appropriations for activities under the NEHRP program.

Urban Search and Rescue Teams are Essential to Earthquake Response

One of the most critical resources available for earthquake response is Urban Search and Rescue (USAR) teams. These task forces are comprised of first responders, firefighters, medical professionals, engineers, emergency managers, and others and can be deployed to rescue victims of structural collapses during disasters, particularly earthquakes.

The capabilities of the USAR task forces include:

- Conducting physical search and rescue in collapsed buildings;
- Providing reconnaissance to assess damage and needs;
- Rendering emergency medical care to trapped victims;
- Canine search-and-rescue;
- Assessing and controlling hazardous materials, electrical services, and gas leaks;
- Providing structural evaluations of buildings; and
- Evaluating and stabilizing damaged structures.

Encouraging Mitigation Through Recovery

In a catastrophic disaster, if the governor requests assistance, FEMA can mobilize federal resources for search and rescue, electrical power, food, water, shelter, and other basic human needs. But long-term recovery can place severe financial strain on state, tribal, or local governments. Damage to public facilities and infrastructure, often not insured, can overwhelm even a large city.

During the rebuilding phase, FEMA encourages communities to include mitigation measures as they reconstruct. FEMA also encourages the avoidance of future loss of life and property through hazard mitigation. FEMA helps fund measures like retrofitting buildings to make them resistant to earthquakes

Efforts to Prepare for Pacific Northwest Seismic Hazards

Scientists have recently discovered new faults and continue to apply new data, raising earthquake hazard estimates for several areas in California and increasing the estimates of a magnitude 9.3 earthquake along the Cascadia Subduction Zone.

[5] Congressional Research Service, "The National Earthquake Hazards Reduction Program (NEHRP): Issues in Brief," published August 27, 2014.

January 26, 2015, marked the 315th anniversary of the last great earthquake along the Cascadia Subduction Zone. The quake, which took place in 1700, was estimated to be around 9.0 in magnitude. For years, scientists have warned residents in the Pacific Northwest that the area is due for another massive earthquake. An event of this magnitude has historically occurred approximately every 300 years.

Oregon's Earthquake Commission and Resilience Plan

As a result of the Loma Prieta Earthquake in the Bay Area of California in 1989, Oregon formed the Oregon Seismic Safety Policy Advisory Commission (OSSPAC or the "Earthquake Commission") in 1991. The Earthquake Commission has the unique task of promoting earthquake awareness and preparedness through education, research, and legislation. Their mission is to positively influence decisions and policies regarding pre-disaster mitigation of earthquake and tsunami hazards, increase public understanding of hazard, risk, exposure, and vulnerability through education, and be responsive to the new studies and/or issues raised around earthquakes and tsunamis.

Since its inception, OSSPAC has continued to increase Oregon's awareness of earthquake hazards by supporting earthquake education, research, and legislation. Most recently, in February 2013, the Commission released the Oregon Resilience Plan launching a sustained program to reduce the state's vulnerability and reduce recovery time to achieve resilience before the next Cascadia earthquake strikes.[6]

The Development of an Earthquake Warning System

Today, the technology exists to detect earthquakes so quickly that an alert can reach some areas before strong shaking arrives. Since 2006, earthquake experts with the U.S. Geological Survey and a coalition of university partners, including the California Institute of Technology and the University of California at Berkeley, have been developing an earthquake early warning system for the West Coast. Using a network of sensors across the state, the system, called ShakeAlert, began sending notifications of quakes in 2012 to a selected group of test users including California emergency management agencies, transit agencies, utilities, and private companies. An earthquake warning system began testing in the Pacific Northwest earlier this year.

The purpose of an earthquake early warning system is to identify and characterize an earthquake a few seconds after it begins, calculate the likely intensity of ground shaking that will result, and deliver warnings to people and infrastructure in harm's way. Studies of earthquake early warning methods in California have shown that the warning time could range from a few seconds to a few tens of seconds, depending on the distance to the epicenter of the earthquake.

For very large events like those expected on the San Andreas fault or the Cascadia Subduction Zone, the warning time could be much longer because the affected area is much larger. ShakeAlert can give enough time to slow and stop trains and taxiing planes, to prevent cars from entering bridges and tunnels, to move away from dangerous machines or chemicals in work environments, and to take cover under a desk, or to automatically shut down and isolate industrial systems. Taking such actions before shaking starts can reduce damage and casualties

[6] Available at http://www.oregon.gov/OMD/OEM/osspac/docs/Oregon_Resilience_Plan_Final.pdf

during an earthquake. It can also prevent cascading failures in the aftermath of an event. For example, isolating utilities before shaking starts can reduce the number of fire initiations.

Implementing and Enforcing Building Codes

Building codes are sets of regulations governing the design, construction, alteration, and maintenance of structures. They specify the minimum requirements to adequately safeguard the health, safety, and welfare of building occupants. Some provisions within the International Building Code (IBC), International Residential Code (IRC), and International Existing Building Code (IEBC) are intended to ensure that structures can adequately resist seismic forces during earthquakes. These seismic provisions represent the best available guidance on how structures should be designed and constructed to limit seismic risk.

Adoption of the model codes is uneven across and within states, even in areas with high levels of seismic hazard. Some states and local jurisdictions have adopted the codes but have made amendments or exclusions relating to the seismic provisions. And adopting the latest building codes is only part of the solution. Codes must also be effectively enforced to ensure that buildings and their occupants benefit from advances in seismic provisions in the model codes. For the most part, code enforcement is the responsibility of local government building officials who review design plans, inspect construction work, and issue building and occupancy permits.

Many of our Nation's communities have older structures that were built before building codes included seismic standards, and the buildings have not yet been replaced or substantially altered. It is possible to make these buildings more resistant to earthquakes through seismic retrofitting. Seismic retrofitting of vulnerable structures is critical to reducing risk. But until the buildings are retrofitted, they remain the single biggest contributor to seismic risk in the United States today.

CONCLUSION

Past earthquakes and related hazards have impacted communities across the country and such events will happen again. A single large event could cause thousands of deaths and tens of thousands of injuries from the shaking alone, and many more from possible resulting fires, hazards, and other hardships that come in the wake of large quakes. Through close coordination of federal partners and the engagement of state, local, and tribal governments, scientists, and the private sector, adequate warning and planning can help communities protect lives, property, livelihoods, and prosperity for the future. There are lessons to be learned from the activities on the West Coast, but there is much work to be done to reduce the catastrophic impacts of earthquakes across the United States.

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WITNESS LIST

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