



What the City of Seattle is doing to prepare for an earthquake

Seattle has long known about the earthquake hazard. For many years, extensive planning, project implementation and policy development has been in place to reduce many of the known risks in our community. Two significant highlights are:

Fire Levy, 2003 – After the Nisqually quake of 2001, Seattle residents passed a \$167 million Fire Levy that provided funding to strengthen the City’s ability to respond after a major disaster. Thirty-two of the City’s 33 fire stations were slated for renovation or replacement. Construction and seismic retrofit has now been completed in all but three fire stations. The only Seattle Fire Department facility that has not had significant improvements since the ‘80s is the Headquarters Fire Station located at 2nd/Main in Pioneer Square.

Levy funds were also used to build a new joint training facility for Seattle Fire and Seattle Public Utilities, construct a new fire alarm center and City emergency operations center, harden fire hydrants so firefighters can draw water directly out of eight City reservoirs, place emergency generators at community centers, and place emergency supply caches in four areas of the City. For full details, go to: <http://www.seattle.gov/fire-facilities-and-emergency-response-levy>

Earthquake Preparedness: Activities Completed and Future Efforts – in June, 2010, the City published a summary of activities completed to date as the 10-year anniversary of the Nisqually earthquake approached. The report outlines future efforts and documents how each City department has strengthened critical infrastructure, built community preparedness and increased employee preparedness. For the complete report: <http://www.seattle.gov/Documents/Departments/Emergency/Preparedness/HazardSpecific/Earthquake/CityofSeattleEarthquakePreparednessActivitiesCompletedandFutureEffortsJune2010v2.pdf>

Unreinforced Masonry Buildings

URM building policy development – For the past few years, the City has been working to address the hazard posed by Unreinforced Masonry Buildings (URMs). URMs, typically brick buildings built prior to WWII, are especially vulnerable during earthquakes because the walls and parapets aren't securely tied to the floors and roof. In 2012, a URM Policy Committee was first convened with the purpose of making recommendations to the City on potential legislation to require seismic retrofits. In 2016, the Seattle Department of Construction and Inspections (SDCI) refined a list of over 1,100 URMs thought to be in the city limits and completed additional data analysis requested by the Policy Committee. The Policy Committee has now

reconvened for a series meetings in 2017 to finalize its recommendations on a City retrofit policy. For more details, go to:

<http://www.seattle.gov/dpd/codesrules/changestocode/unreinforcedmasonrybuildings/whatwhy/default.htm>.

City of Seattle Unreinforced Masonry Building Public Education and Outreach Pilot Project –

In 2015, the Seattle Office of Emergency Management (OEM) partnered with SDCI on an Unreinforced Masonry Building public education and outreach pilot project. Funded by a FEMA mitigation grant, the purpose of this project was to determine barriers and opportunities for communicating risk and encouraging seismic mitigation of URMs, the building type most vulnerable to structural damage and collapse from earthquakes. The pilot campaign was conducted in Columbia City, a neighborhood not only economically and culturally diverse, but with a high concentration of URMs as well. The lessons learned from the pilot will be used to inform outreach to other parts of Seattle.

Supplemental FEMA funds were used to develop infographics on URM risks and retrofit for three audiences: building owners, business owners and tenants. The infographics have since been translated into Chinese.

Buildings and Infrastructure Improvements

Seismic Retrofitting of Bridges – Seattle’s Department of Transportation (SDOT) has been retrofitting City bridges for many years. Below are highlights of recent initiatives:

Retrofitting of the North Queen Anne Drive Bridge was completed in 2005 using FEMA mitigation funds.

In 2007, a nine-year Bridging the Gap (BTG) levy was passed which allowed the City to continue the Bridge Seismic Retrofit Program that had been established in the mid-1990s. Construction for BTG began in 2009, with the last bridge completed in 2015. Bridges retrofitted under BTG are:

- Albro over Airport Way
- Fauntleroy Express Way
- Ballard Bridge
- 4th Avenue, Jackson to Airport Way
- 2nd Avenue Extension
- Airport, 4th Avenue to 5th Avenue
- South Jackson Street, 4th Avenue to 5th Avenue

Under the Bridge Replacement/Rehabilitation Program, BTG also funded the replacement of the Fairview Ave. Bridge, the Yesler Ave. Bridge, and the West Approach of the NE 45th St. Viaduct.

In 2015, the City received a federal highways matching grant to seismically retrofit the East Approach for the NE 45th Ave. Viaduct. Construction is expected to be complete in 2018.

In 2015, Seattle voters passed the Move Seattle Levy, a nine-year levy to fund transportation maintenance and improvements and continue the Bridge Seismic Retrofit Program.

Construction is set to begin in 2018 with the final bridge retrofit to be completed by 2024.

Bridges under the Move Seattle Levy are:

- Fremont Bridge
- Ballard Bridge
- Delridge Way Pedestrian Bridge
- 15th Ave. NE/NE 105th St. Bridge
- 1st Ave. S. Viaduct/Argo Bridge
- 4th Ave. S. Viaduct/Argo Bridge
- Cowen Park Bridge
- 4th Ave. S. Main to Airport Way Bridge
- McGraw St. Bridge
- W. Howe St. Bridge
- Admiral Way N. Bridge
- Admiral Way S. Bridge
- N. 41st Pedestrian Bridge
- SW Andover Pedestrian Bridge
- 8th Ave. NW/NW 133rd St. Bridge
- 15th Ave. NW/Leary Way Bridge

Elliot Bay Seawall replacement – The City is in the process of replacing the Elliot Bay seawall in conjunction with the Highway 99 tunnel project and waterfront redevelopment. The new seawall will be built to current seismic standards and is designed to last more than 75 years. Improvements include stabilizing the existing soil behind the seawall face, as well as moving the seawall 10 to 15 feet eastward to accommodate construction and create additional space for habitat. The segment of the seawall from Pike to Main Street, the most seismically vulnerable, is almost complete. The remaining segment, in front of Pier 62 and Pier 63, is anticipated to be completed by 2019.

Emma Schmitz Seawall replacement – Seattle Parks and Recreation has partnered with the U.S Army Corps of Engineers-Seattle District, to design and implement a replacement of this seawall. The project is expected to begin construction in 2017, and will effectively replace an approximate 400-foot section of the existing seawall at Emma Schmitz Overlook Park, located south of Alki Point in West Seattle. The project addresses damage caused by coastal storm events as well earthquakes. The current seawall, built in 1927, protects City and County water and waste water infrastructure, as well as Beach Drive SW.

Seattle City Light facility upgrades – A major seismic upgrade is underway to the building and equipment at the System Operations Center in Ballard.

Seattle City Light has upgraded its substations more than any other utility in the country and are considered national leaders within the industry. Plans and policies are in place to continue seismic retrofits to its facilities over time using available resources.

A study has been initiated to review City Light’s critical structures starting with operation and service centers and substation control buildings. This work incorporates industry standard evaluation techniques involving screening, evaluating and upgrading as needed.

City Light is currently reviewing its service centers for nonstructural failures that would impact post disaster operations. Components being looked at include battery back-up racks, EMS systems and warehouse storage. The utility is already using seismic spring dampers to enhance the seismic performance of these racks. The dampers are a way of dissipating the earthquake energy when loaded much like a car shock absorber. City Light has already used these inexpensive devices in our substations and like base isolation, they diminish loads to anchorages and foundations so that expensive construction inside the buildings is avoided.

Seattle Public Utilities seismic planning - Seattle Public Utilities (SPU) is a leader in the Pacific Northwest in recognizing the potential impacts of earthquakes on water systems. Following a comprehensive seismic study in 1990, SPU has spent over \$60 million for seismic upgrades to existing infrastructure. Also, as part of major infrastructure replacement programs, all new facilities have been designed to meet or exceed current seismic standards.

Scientific knowledge about the impact of earthquakes on water systems has increased dramatically since 1990. The understanding of the seismicity of the Puget Sound region—in particular, the Seattle Fault and the Cascadia Subduction Zone—also advanced substantially.

In a seismic study scheduled to finish in 2017, SPU is evaluating how the City’s water system might respond to withstand two earthquake scenarios:

- A magnitude 9.0 Cascadia subduction earthquake off the Washington coast
- A magnitude 7.0 Seattle Fault earthquake centered in Seattle

Retrofitting all existing facilities to meet current seismic codes would be prohibitively expensive. Consequently, SPU is concentrating on the most critical facilities that affect water system performance and post-earthquake recovery. By combining physical upgrades of the most critical facilities with emergency preparedness and response planning efforts, SPU will be able to significantly (and cost-effectively) increase the seismic resiliency of the water system as part of a long-term improvement plan.

SPU is also working with neighboring utilities to proactively evaluate the region's existing water supply systems resiliency and plan for potential water supply disruptions.

Seattle Information Technology upgrades – Seattle IT has completed a new Western data center and Eastern data center located in diverse locations to provide redundancy for the City's IT services.

Emergency Shelter Improvements – Seattle Parks and Recreation has been improving the capability of the generators that were obtained for six community shelters in the 2003 Fire Levy since 2009, and adding generators to Priority 1 and 2 shelter sites as funding becomes available. Improvements to Queen Anne and Delridge Community Center for generators and electrical panels are complete; and new generators were added at Rainier Beach, Rainier, and Jefferson Community Centers with Parks and Recreation capital funds and a FEMA grant. The Southwest Community Center will receive a new generator in 2017. At the end of 2017, the generator project work will be 60% complete. Two of the remaining four sites may receive funding in 2018 through the Department's Asset Management Plan. Through a FEMA grant, three generators were purchased that can be transported to shelter sites as needed during disaster.

Work continues to bring community centers into compliance with ADA requirements to make City shelter locations accessible to those with access and functional needs. To date, work has been completed at Jefferson and Bitter Lake. In 2017, work is anticipated for completion at Delridge, Garfield and Meadowbrook, all Priority 1 emergency shelter locations with generators.

Parks and Recreation, in partnership with the Human Services Department, put together communication supplies and equipment for Priority 1 shelters to provide better service to the disabled and other vulnerable populations.

Sheltering capacity has also been increased by adding a soft-sided sheltering strategy in the event there is not enough sheltering capacity in available City structures.

FEMA-funded earthquake mitigation projects – The City successfully applied for and received FEMA grants for several seismic retrofit projects in recent years. Highlights include: seismic retrofit of two Priority 1 shelter locations, the Jefferson and Queen Anne community centers, seismic retrofit of the Post Alley Areaway to protect steam power infrastructure, and the installation of gas shut-off valves in City facilities to reduce the chance of post-earthquake fire.

Planning & Exercises

Seattle Comprehensive Emergency Management Plan (CEMP) – the CEMP serves as the City's response doctrine during a major disaster. It outlines how the City will function, make policy

decisions and provide clear, concise information in the aftermath of a major disaster. The plan includes a separate incident annex for Earthquake.

Seattle Hazard Identification and Vulnerability Analysis (SHIVA) – the SHIVA is the foundation of all the City’s disaster planning and preparedness activities. It identifies the biggest threats to the Seattle region and is updated every four years to capture new and emerging trends. The SHIVA was updated in 2015 to reflect current hazards research, and includes a new earthquake section.

Continuity of Operations Plans (COOPs) – the primary operational departments within the City write and maintain their own COOPs. Each department’s COOP identifies what their essential functions will be after a disaster, prioritizes how department resources will be used, identifies the roles and responsibilities of response personnel, and designates a line-of-succession.

Mitigation Plan – this plan is the guiding document for the City’s hazard mitigation program. The plan’s goal is to identify strategies for reducing vulnerability to both natural and man-made hazards. In February, 2016, FEMA approved the 2015-2021 Seattle All Hazards Mitigation Plan. This revision features several major changes, such as alignment with the Emergency Management Accreditation Program (EMAP) standards, and expansion to include human-caused hazards. It also allows for the development of a new Seismic Risk Assessment methodology to be used to assess and prioritize mitigation improvements to City facilities.

Recovery Framework – On Nov. 14, 2016, the City Council formally adopted the Seattle Disaster Recovery Framework. The Framework was developed to address how the City would partner with the community and coordinate with County, State and Federal agencies in recovering from the effects of disaster, using a massive earthquake as the premise. The adoption culminated several years of study and planning that began in 2013. Consultants and staff researched lessons and best practices from communities’ recovery from Hurricanes Sandy, Irene, and Katrina as well as earthquakes in New Zealand, Chile, and Japan. The heart of the Framework is the Disaster Recovery Organization structure, which establishes a post-disaster governance and oversight structure, seeking to leverage and coordinate the resources, intelligence, and energy of our community, including public, private, and not-for-profit organizations.

Because the effects of a severe earthquake will be regional, Seattle was a major partner in the creation of an eight-county **Puget Sound Regional Catastrophic Plan** that outlines how the region will coordinate and manage resources in several key areas such as transportation, health and medical services, firefighting, communications and mass fatality management. These plans can be found at: <http://mil.wa.gov/other-links/plans>

For additional details on any of the above City plans, go to: <http://www.seattle.gov/emergency-management>

Cascadia Rising Exercise, June, 2016 – Seattle tested its plans on how priorities are identified and resource requests will be coordinated with regional partners at the County, State and Federal levels. The exercise scenario was a 9.0 earthquake on the Cascadia subduction zone.

Community Preparedness

In addition to City-wide planning, community education and preparedness has been a main priority of the Seattle Office of Emergency Management (OEM).

- In 2016, **OEM reached 13,113 people through face-to-face interactions and taught 225 programs** that included personal preparedness training, emergency skills classes, and neighborhood organization. The goal is for everyone to be as self-sufficient as possible, and take care of themselves and their family for the first 7 to 10 days following a major disaster. Emergency preparedness materials are currently available in 19 different languages.
- Since its pilot in mid-2015, OEM's **Community Safety Advocates (CSAs)** serve as bi-lingual cultural ambassadors and community trainers, and has expanded OEM's ability to engage directly with many of the City's ethnic communities through language and culture, building trust as well as awareness of natural hazards and personal preparedness. Twenty-one CSAs provide outreach in 16 languages, teaching such topics as personal preparedness, the Alert Seattle system, hands-only CPR and winter weather preparedness.
- In August, 2015, **Alert Seattle**, the City's official emergency notification system, was launched to the public. The free service allows people who sign up on-line the ability to receive customized alerts via text message, email, voice or social media (Facebook and Twitter). The system provides emergency alerts 24 hours a day. A total of 24,000 subscribers currently receive alerts and notifications through Alert Seattle.
- In December, 2015, OEM introduced a self-directed, interactive **Seattle Hazard Explorer** map where people can enter an address of their choosing to discover what kinds of natural hazards pose the greatest risk to their area, be it home, work, school or other location. The Explorer pages also provide more detail on what do to prepare for or better respond to the Seattle's greatest natural hazards such as: earthquake, tsunamis/seiches, liquefaction, flooding and landslides. When the Explorer map first went public, it was so popular it shut down the OEM website. To view the map, go to: <http://seattlecitygis.maps.arcgis.com/apps/MapSeries/index.html?appid=0489a95dad4e42148dbef571076f9b5b>
- The City's **Seismic Home Retrofit program** has been a mainstay of OEM's training program, and provides free resident training throughout the year. During the two-hour class, homeowners are given instruction on what tools and techniques should be used to do the

work themselves, and learn about other ways to reduce damage to their home during an earthquake. In 2016, 330 people attended a class. For more, go to:

<http://www.seattle.gov/emergency-management/what-can-i-do/prepare-your-home>

- Seattle OEM continues to promote **SNAP (Seattle Neighborhoods Actively Prepare)** as a way for neighbors to organize themselves for disaster. OEM volunteers teach neighbors how to exchange contact information, designate a meeting place and prioritize response tasks like checking on one another, controlling utilities and providing first aid when city resources are overwhelmed or unavailable. For more: <http://www.seattle.gov/emergency-management/working-together/seattle-neighborhoods-actively-prepare>.
- For several years, OEM has supported the **Community Emergency Hub program** as a way for neighbors to help each other during a disaster. An Emergency Hub is a gathering place where neighbors come together to share information, resources and problem-solve among each other. For more information, go to: <http://www.seattle.gov/emergency-management/working-together/community-emergency-hubs>. Community members have also organized at a grass-roots level and formed Emergency Hubs in several parts of the city. Neighbors can put themselves on a map and contact each other directly at: <http://seattleemergencyhubs.org/seattle-emergency-neighborlink-map/>.
- In 2016, the City partnered with **Airbnb** to facilitate the ability for 3,900 Airbnb hosts in the Seattle region to offer free, temporary accommodation to responding emergency workers or displaced survivors during emergencies. The co-signed Memorandum of Understanding represents a new partnership with the private sector, provides a gateway to educate hosts on emergency preparedness, and helps connect them to local emergency sources of information such as Alert Seattle.