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INNOVATIVE PRACTICE

Project Safe Haven: Tsunami Vertical Evacuation Systems on Washington State's Pacific Coast

SUMMARY

Washington State's Pacific coast faces the threat of large-scale earthquakes and tsunamis. To mitigate the risk, Washington is providing technical assistance to cities, counties, and tribes for construction of the Nation's first vertical evacuation structures capable of withstanding 9.0+ magnitude earthquakes and 30-foot waves. The project provides residents and visitors in coastal population centers a means of seeking safety without having to travel considerable distance to natural high ground.



Figure 1: Ocosta Elementary School in Westport, WA will double as a vertical evacuation structure

DESCRIPTION

In 2008, a Federal Emergency Management Agency (FEMA) report¹ ranked Washington's risk of economic loss from a devastating earthquake as 2nd nationally behind California. Coastal Washington faces the risk of tsunamis from local offshore earthquakes and massive quakes originating from as far away as Alaska, Japan, and Chile. The death toll from such an event could rival recent earthquake and tsunami combinations around the Pacific, such as the events that killed 15,885 in Japan (2011). Traditional over-land evacuation routes to high ground require residents to drive an average of 30+ minutes to safety; however, tsunami warnings may leave residents as few as 15 minutes to seek shelter. Given the speed with which tsunamis can reach land, Washington's coastal residents need a faster way of reaching high ground.

After witnessing the devastation of other Pacific earthquakes, Washington's Emergency Management Division (EMD) created *Project Safe Haven* to increase the resilience of coastal communities to large-scale tsunamis. This community-based project is a collaborative effort between EMD, FEMA, University of Washington, National Oceanographic and Atmospheric Association (NOAA), United States Geological Survey (USGS), Washington Department of

¹ United States. Federal Emergency Management Agency. FEMA 366: Estimated Annualized Earthquake Losses for the United States. Washington, DC. 2008.

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Natural Resources, and local and tribal communities. The goal of the project is to build artificial high-ground through vertical evacuation structures that coastal residents can reach before a tsunami strikes. The planned structures will consist of berms, towers, and raised platforms located in city centers and populated areas. The evacuation structures are intended to meet three criteria:

- Compliance with FEMA guidance “*Guidelines for Design of Structures for Vertical Evacuation from Tsunamis*” (FEMA P646) and the recommendations of the “Resilient Washington State” report (2012) to improve state resilience to earthquake and tsunami hazards within the next 50 years.
- Located within a 15 minute walk of population centers, with a high priority placed on providing ease of access for children, individuals with disabilities, and the elderly.
- Substantial involvement of the community in the planning process and selection of evacuation structure. During town hall meetings, residents voted on their favorite designs and consistently voiced a desire for structures to have multiple uses, including city parks, nature observation towers, and parking garages.

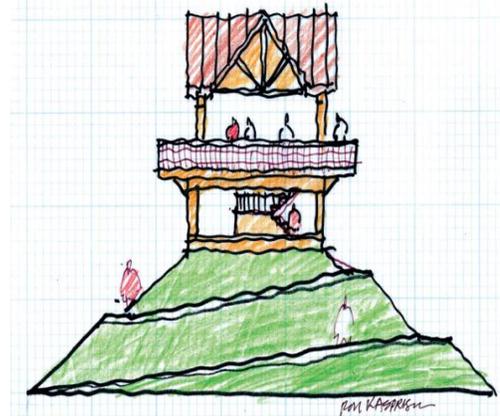


Figure 2: Conceptual tower design, with access and functional needs-specific modifications

Washington will begin construction on the first *Project Safe Haven* structure in 2014 at Ocosta Elementary School in Westport, WA. The school approved renovations that include a tsunami evacuation refuge with capacity for approximately 700 persons. This refuge will be the first vertical evacuation structure in the United States. Construction of a safe haven berm behind Long Beach Elementary School in Long Beach, WA with capacity for 600 evacuees is currently in the FEMA environmental review process. Over 43 structures are proposed for construction across coastal Washington and will collectively provide safe haven for more than 18,450 people and cost approximately \$40 million. In addition, EMD expects the vertical evacuation structure will contribute to the economic well-being and quality of life for residents of coastal Washington because of their multi-use applications, such as parking garages, nature observation platforms, and urban green spaces.

INVESTMENT INFORMATION

EMD used a four-year, \$320,000 grant from NOAA to support conceptual design, preliminary engineering, and cost estimations for *Project Safe Haven*. The towns of Westport and Long Beach have applied for FEMA’s Hazard Mitigation Grant Program funding to partially fund the proposed structures. EMD and its local and tribal stakeholders continue to seek partnerships with private developers as a means to fund future structures.

REFERENCES

Description of *Safe Haven* projects in Grays Harbor County, WA

http://www.crew.org/sites/default/files/GHCoFinal_small.pdf

FEMA 366 “Estimated Annualized Earthquake Losses for the United States” (2008)

<http://www.fema.gov/media-library-data/20130726-1627-20490-0934/fema366b.pdf>

FEMA P646 “Design Guide for Vertical Evacuation Structures”

<http://www.fema.gov/media-library-data/20130726-1641-20490-9063/femap646.pdf>

Ocosta Elementary School Becomes Site of Nation’s First Vertical Evacuation Structure

http://www.oregonlive.com/pacific-northwest-news/index.ssf/2014/05/school_on_washington_coast_bui.html

Project Safe Haven 2014 Annual Report

<http://nws.weather.gov/nthmp/2014annualmeeting/VerticalEvacUpdate.pdf>

"Resilient Washington State" Report

http://www.emd.wa.gov/about/documents/SSC_DRAFTRWS_policydoc_11-12-2012.pdf