

An Unbroken Cup: Reflecting on preparations for the Great Northwest Earthquake in the context of Japan's experience

Subject: Science, CTE Construction modules

Time directive: 2-3 days depending if speaker is available.

Background information: Salem, Oregon, along with other cities along the Western coast of the United States, will someday be vulnerable to a large, region shaping earthquake. This unit briefly explores the adaptations made to Japanese buildings to ensure earthquake survivability, and also future changes that will be made to the Salem Public Library. It can be adapted to any city located on the *Ring of Fire* which faces structural decisions to reinforce or build structures that are resistant to earthquake damage. This unit includes an on-site work component if such is available. All major Pacific Northwest Cities have buildings that are undergoing some major earthquake retrofitting to make buildings safer for the public.

Video links:

Recent update from the Salem Public Library Seismic Upgrade

<https://www.youtube.com/watch?v=Doqfo35qP1w>

Shepherd Smith reporting on the New Yorker Article

https://www.youtube.com/watch?v=z5hssNL_AhQ

Cascadia Earthquake scenario

https://www.youtube.com/watch?v=KnIuS4AE1_w

Supporting Materials:

<https://www.newyorker.com/magazine/2015/07/20/the-really-big-one>

<https://www.seattletimes.com/seattle-news/science/californias-celeb-quake-expert-says-preventing-damage-is-key-to-quick-recovery/>

<https://www.opb.org/news/series/unprepared/cascadia-subduction-zone-earthquake-shelter-home-camping/>

Supporting Materials: Shimizu Corporation: Earthquake Technology

<https://www.shimz.co.jp/en/company/about/sit/facility/facility04/>

<https://www.japantimes.co.jp/news/2011/06/17/business/quake-proof-building-makers-prepare-for-bigger-shock/#.W9CATGhKjZs>

Course Level Expectation:

In Design, students will design on the computer building supports to reinforce against earthquake damage, or, they will design reinforcements for an already existing building.

In Construction, students will develop skills by working on site with a community project, in this case, the Salem Public Library, as it undergoes an earthquake refit.

Formative assessment: Students will create and submit a design to the instruction, or, students will gain work experience and a grade from their construction supervisor.

Learning Activities:

Day 1: Students will read the article from the New Yorker, July 20th, 2015, "*The Next Big One.*"

They will complete the chart as they work through the article. Students will also view the accompanying newscast that refer to the article.

Day 2: Students will examine different ways that *Shimizu Corporation* is employing Earthquake technology in both old and new buildings, including removal of hazardous obstacles, and preventing damage, both internal and external, to building structures.

Day 3: On site experience (may include several days, or a week (working at the Salem Public Library refit; or CAD design for creating an earthquake refitting for Sprague High School using historical blueprints of the original building.)

This unit will have assessments based on notes, creative computer designs, and work experience. Technology used by *Shimizu Corporation* will be assessed and applied by students in a creative way to solve various challenges posed by a public building, undergoing refitting, in their area.

Day 1:

Questions to *The Really Big One* by Kathryn Schulz, *The New Yorker*, July 20, 2015

1. What did Chris Goldfinger notice about the base of the building when he experiences the 2011 earthquake in Tohoku, Japan?
2. What had Japanese geologist, Yasutaka Ikeda warned about in 2005?
3. Where does the Cascadia subduction zone located?
4. What is the predicted impact for this future earthquake?
5. What is the difference in earthquakes between Japan and the Pacific Northwest?
6. What is the theory of the origin of the Orphan Tsunami of the Genroku era (January 27, 1700) in Japan?
7. At approximately what year was the last major Cascadia earthquake?
8. List some of the weaknesses of the land that will magnify during an earthquake
9. What is the current advice for those who live in the Tsunami zone, near Seaside Oregon?
10. The 2011 earthquake in Japan was a combination of this.
11. What will happen soon after the Cascadia Earthquake?
12. Of the four schools that Doug Dougherty examined, how many were safe?
13. What commitment will be required to bring the schools up to code?
14. What are the death estimates for the Cascadia Quake?

Discussion questions to impact of Cascadia Earthquake:

1. Look at the video that projects the impact of the Cascadia Quake.
2. How long will the earthquake last?
3. To what extent will the Tsunami devastate the coastal cities
4. How large of an area of infrastructure and buildings be affected?
5. Who are your relatives, besides your own family, who live within the affected zone?

If time, use the supplemental videos to aid further discussion.

Day 2:

Shimizu Corporation and Earthquake technology

Go to the Shimizu website

<https://www.shimz.co.jp/en/company/about/sit/facility/facility04/>

1. What are your impressions as you look at the videos of the e-beetle and the e-spider platforms. Do you think this gives a good impression of the kind of forces that buildings sustain during an earthquake?

2. What do you think would happen with the large, slab style construction at Sprague High School if it was subjected to the same forces? What areas would be particularly vulnerable? Use the map and highlight the areas you predict to be vulnerable in one color of felt pen.
3. Look at the next video---only highlight on the purple subtitles.
<https://www.youtube.com/watch?v=R-sbNexwSF8>
4. Though this video jumps around a lot, it does highlight many words that describe earthquake building retrofits or adjustments. Please slow down the video and write down five steps that Shimizu corporation makes to help make building earthquake safer.
5. After viewing the video, discuss whether your predictions for the vulnerability of Sprague High School were correct. Use another color of highlighter to compare your assessment of vulnerable areas.

Day3

CAD computer design of reinforcements for Sprague High School using map of school and knowledge acquired on Day 2.

On site experience working at the Salem Public Library (to be arranged with CTEC leaders and the selected contractor for the earthquake retrofit.

SPRAGUE HIGH SCHOOL

MAIN LEVEL FLOOR PLAN

