

GUIDE TO EARTHQUAKE AND TSUNAMI HAZARDS

1. Earthquake Hazards

The topic of earthquake hazards examines factors that control the intensity of earthquake ground shaking and the resulting damage to buildings and infrastructure. The [Earthquake Hazards PowerPoint Presentation](#) presents an introduction to earthquake hazards and links to teaching resources tailored for a middle school audience. We recommend that you download and view this presentation so you can examine TOTLE resources in their logical sequence. However, this TOTLE Web Site Guide provides an outline view of TOTLE resources on Earthquake Hazards and an alternate way to locate resources posted on the web site.

Resources Featured in this PowerPoint Presentation by Topic:

TOPIC: Ground shaking intensity, amplification, landslides, and liquefaction

COMPUTER ANIMATIONS:

- [Effects of near-surface geology](#) on intensity of ground shaking.
- Narrated [Effects of near-surface geology](#) on intensity of ground shaking.
- Animation of [Liquefaction during 1906 San Francisco earthquake](#).

CLASSROOM ACTIVITIES:

- A [Liquefaction Activity](#) that investigates where and why liquefaction occurred during the 1989 Loma Prieta (World Series) earthquake.
- A [Relative Earthquake Hazard Activity](#) that includes effects of near-surface geology and liquefaction potential in Portland, Oregon.

TOPIC: Earthquake Building Damage and Earthquake Engineering

COMPUTER ANIMATIONS:

- [Effects of near-surface geology](#) on intensity of ground shaking.
- Narrated [Effects of near-surface geology](#) on intensity of ground shaking.
- Animation of [liquefaction during 1906 San Francisco earthquake](#).

CLASSROOM ACTIVITIES:

- The [BOSS Model of Building Resonance During Earthquake Ground Shaking](#) investigates how “buildings of different heights respond to different frequencies of earthquake ground shaking.
- [Build a Better Wall](#) invites students to increase the shear strength of a wall by inserting simple structural like cross members, shear walls, and gussets.
- [Base Isolation](#) is a classroom demonstration about decoupling a building from the ground.

VIDEOS:

- [BOSS Model of Building Oscillation During Earthquakes](#)
- [Demonstration of Manila Paper Building Oscillation Model](#)
- [Demonstration of Spaghetti Noodles as a Model for Building Resonance](#)

(videos continued)

[1989 Loma Prieta \(World Series\) Earthquake Damage](#)

[Shake Table Experiment Demonstrates Bedroom Contents Responding to Earthquake Shaking](#)

[Shake Table Experiment Demonstrates House Contents Responding to Earthquake Shaking](#)

[Build a Better Wall Demonstration](#)

[Model Building Demonstration of Base Isolation](#)

[Structural Design – USGS’ Documentary “Shock Waves”](#)

2. Tsunami Hazards

The [Tsunamis PowerPoint Presentation](#) presents the fundamental properties of tsunamis and the nature of tsunami risks. Many properties are introduced using the example of the December 2004 Sumatra – Andaman Islands earthquake and resulting Indian Ocean tsunami. We recommend that you download and view this presentation so you can appreciate the logical sequence of TOTLE resources on tsunamis. However, this TOTLE Web Site Guide provides an outline view of TOTLE tsunami resources and an alternate way to locate tsunami education resources posted on the web site.

Resources Featured in this PowerPoint Presentation:

COMPUTER ANIMATIONS:

[Tsunami Caused by Subduction Zone Earthquake](#)

[2004 Indian Ocean Tsunami](#)

[Tsunami Caused by Cascadia Subduction Zone Earthquake](#)

CLASSROOM ACTIVITIES:

[Earthquake and Tsunami Preparedness](#) is a role-playing activity that invites students to consider the many factors that must be considered for a coastal community to become “tsunami ready”.

TOTLE RESOURCES ON EARTHQUAKE AND TSUNAMI HAZARDS

POWERPOINT PRESENTATIONS:

Earthquake Hazards PowerPoint Presentation

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/PowerPoints/EarthquakeHazards.ppt>

Tsunamis PowerPoint Presentation

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/PowerPoints/Tsunamis.ppt>

COMPUTER ANIMATIONS:

2004 Indian Ocean Tsunami

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Animations/2004IndianOceanTsunami.mov>

Building Collapse During Earthquake Ground Shaking

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Animations/BuildingCollapseUSGS.mpg>

Ground Shaking Amplification

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Animations/amplification_Exaggerated_Music.mov

Ground Shaking Amplification, 3 Seismograms

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Animations/GroundShakingAmplification_SeismicWaves.mov

Liquefaction During 1906 San Francisco Earthquake

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Animations/Liquefaction_SF_1906.mov

Los Angeles City Hall Shaking With and Without Base Isolation

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Animations/LACityHall.mov>

Retrofit Building Withstanding Earthquake Ground Shaking

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Animations/BuildingRetrofitUSGS.mpg>

Tsunami Caused by Cascadia Subduction Zone Earthquake

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Animations/CascadiaTsunami.mov>

Tsunami Caused by Subduction Zone Earthquake

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Animations/tsunami_cause.mov

LESSON PLANS:

Base Isolation

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/LessonPlans/Base_Isolation_TOTLE.pdf

BOSS Model of Building Resonance During Earthquake Ground Shaking

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/LessonPlans/BOSS_ModelOfResonance_TOTLE.pdf

Build a Better Wall

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/LessonPlans/BuildABetterWall_TOTLE.pdf

Earthquake and Tsunami Preparedness

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/LessonPlans/ACTIVITY_TsunamiPreparedness.doc

Earthquake Hazard Maps and Liquefaction

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/LessonPlans/EQHazardMaps_Liquefaction-TOTLE.pdf

Liquefaction Teacher and Student Word Document

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/LessonPlans/Liquefaction_Teacher&Student_WORD.doc

Portland Earthquake Scenarios Poster

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/AdditionalResources/EarthquakeScenarioPoster_PortlandSeattle.pdf

Seattle Earthquake Scenarios Poster

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/AdditionalResources/EarthquakeScenarioPoster_SeattleNisqually.pdf

VIDEOS AND VIDEO LECTURES:

1989 Loma Prieta (World Series) Earthquake Damage

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Videos/LomaPrietaEQ.mov>

BOSS Model of Building Oscillation During Earthquakes

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Videos/Dowell.mov>

Build a Better Wall Demonstration

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Videos/BetterWall.mov>

Demonstration of Manila Paper Building Oscillation Model

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Videos/Manilla.mov>

Demonstration of Spaghetti Noodles as a Model for Building Resonance

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Videos/Spaghetti.mov>

Model Building Demonstration of Base Isolation

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Videos/BaselsolationModel.mov>

Shake Table Experiment Demonstrates Bedroom Contents Responding to Earthquake Shaking

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Videos/RoomEQDamage2.mov>

Shake Table Experiment Demonstrates House Contents Responding to Earthquake Shaking

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Videos/RoomEQDamage1.mov>

Structural Design – USGS’ Documentary “Shock Waves”

<http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/Videos/StructureDesign.mov>

Robert Butler, a University of Portland environmental science professor, talks about the March 11, 2011 Magnitude 9.0 earthquake and tsunami that impacted Northern Japan. This lecture is divided into four QuickTime files listed below.

http://www.iris.edu/hq/files/programs/education_and_outreach/aotm/videos/Part1_Japan_PNW_Earthquake_Butler.mov

http://www.iris.edu/hq/files/programs/education_and_outreach/aotm/videos/Part2_Japan_PNW_Earthquakes_Butler.mov

http://www.iris.edu/hq/files/programs/education_and_outreach/aotm/videos/Part3_Japan_PNW_Earthquakes_Butler.mov

http://www.iris.edu/hq/files/programs/education_and_outreach/aotm/videos/Part4_Japan_PNW_Earthquakes_Butler.mov