

## Waves Portfolio Worksheet

**Directions:** Use this worksheet to record your answers to the two activities that make up the Waves Portfolio: the Earthquake-Resistant Buildings Portfolio activity and the Earthquake Warning System Portfolio activity. When you are finished, save this worksheet with your answers and submit it for a portfolio grade.

### Earthquake-Resistant Buildings Portfolio

Investigate the design of a unique structure that was designed and engineered to withstand earthquake activity. Then use what you have learned about seismic waves and about the construction of buildings near faults and coastlines to design your own earthquake-resistant structure. Record your answers below.

#### Question 1

Research the structural design of the Taipei 101 building. Describe what the building looks like. What makes Taipei 101 a unique structure in terms of earthquake engineering? What features make it able to withstand strong surface waves?

Description of Taipei 101:

Features that make Taipei 101 a unique structure in terms of earthquake engineering:

Features that enable Taipei 101 to withstand strong surface waves:

## **Question 2**

Design a hypothetical structure to be used as a 500,000 square-foot office space in Los Angeles, California. Create a drawing with labels for dimensions and describe any specifications for materials and other features that will add to its structural integrity in the event of a typical earthquake event in that area. Incorporate at least three features to help maintain the building's structural integrity during an earthquake. Describe how each feature will improve the building's earthquake resistance.

Labeled drawing of hypothetical structure:

Materials:

List of features that will add to/maintain the building's structural integrity in the event of a typical earthquake event for the area (with explanations of how each feature will improve the building's earthquake resistance):

# Earthquake Warning System Portfolio

Use what you have learned about seismic waves to investigate a way to verify the hypothesis that the Earth has a liquid outer core and a solid inner core. Then use what you have learned to design an earthquake warning system.

## Question 1

Design a repeatable experiment using various seismograph stations around the globe to verify the hypothesis that the Earth has a liquid outer core and a solid inner core. Describe how you would set up the experiment, what equipment would be needed, and what information you would gather. What evidence would prove that the outer core is liquid? What evidence would prove that the inner core is not liquid? How would you use repeatability to show whether the hypothesis is valid or not?

Experiment design:

Experiment setup:

Equipment needed:

Information to be gathered:

What evidence would prove that the outer core is liquid?

What evidence would prove that the inner core is not liquid?

How would you use repeatability to show whether the hypothesis is valid or not?

## Question 2

Create a design for an earthquake warning system. Describe how your system would work from the time the seismic waves are released at the earthquake's focus. Include details about how the system will detect and record various types of waves and how the system will be used to find the epicenter of an earthquake and warn residents. Who will your system protect? Where will it be located? (Why is an earthquake warning system especially needed in this area?) What kinds of instruments will be used and how will they work?

Who will your system protect?

Where will it be located? (Why is an earthquake warning system especially needed in this area?)

Overall, how will the system work from the time the seismic waves are released at the earthquake's focus?

What kinds of instruments will be used and how will they work?

How will the system detect and record various types of waves?

How will the system be used to find the epicenter of an earthquake?

How will the system warn residents?