

# 5-9 How do earthquakes cause damage?

**Objective** Recognize the power of earthquakes and the damage they can cause.

**Key Terms**  
**Richter** (RIHK-tuh) **scale:** scale that measures the energy released by an earthquake  
**tsunami** (tsou-NAH-mee): large ocean wave caused by an earthquake

**The Richter Scale** In 1935, a geologist named Charles Richter developed a scale to measure the energy released by earthquakes. The Richter scale shows an earthquake's relative strength, or magnitude. On the Richter scale, an earthquake is given a number, usually between 1 and 9. The stronger the earthquake, the higher the number. For each increase in number, the earthquake is said to release ten times more energy.

An earthquake measuring 7 or more on the Richter scale can cause a great deal of damage. Earthquakes that measure 2.5 or less on the Richter scale are usually not felt by people. The largest earthquakes recorded so far have measured around 9.5 on the scale.

Magnitude	Effects Near Epicenter
Less than 2.0	Generally not felt but recorded
2.0-2.9	Potentially perceptible
3.0-3.9	Felt by some
4.0-4.9	Felt by most
5.0-5.9	Damaging shocks
6.0-6.9	Destructive in settled regions
7.0-7.9	Major earthquakes; inflict serious damage
More than 8.0	Great earthquakes; destroy communities near epicenter

▲ Figure 5-31 The strength of an earthquake is called its magnitude. Different magnitudes cause different levels of damage.

▶ **EXPLAIN:** What is the Richter scale?

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**Earthquake Damage** Many new buildings are built to be "earthquake-proof." This means they are not likely to collapse during an earthquake. Older buildings, however, may be destroyed completely. Tall buildings might sway or even topple over. Earthquakes can also damage electrical lines, telephone lines, and water pipes. Explosions and fires are caused by broken electric and gas lines.



▲ Figure 5-32 Earthquakes can destroy homes and buckle roads.

▶ **EXPLAIN:** What is meant by "earthquake-proof"?

**Tsunamis** A large ocean wave that is caused by an earthquake is called a **tsunami**. A tsunami forms when an earthquake's epicenter is on the ocean floor. Out in the open ocean, tsunamis do not get very high. Near the shore, as water depth decreases, wave heights increase. A tsunami near shore may be more than 30 m high. When a tsunami hits land, it can kill many people and cause a lot of damage.



▲ Figure 5-33 A tsunami caused this flood in Hawaii.

▶ **DESCRIBE:** What is a tsunami?

**Predicting Earthquakes** Scientists use past earthquakes to help predict future earthquakes. Small movements in Earth's crust are a signal that an earthquake may soon occur. Scientists look at the ground in the area to see if it has moved up or down. Laser field stations record the smallest movements along faults. Lasers are very strong, focused light beams. The laser beam is aimed at a reflector. By measuring the time it takes the beam to hit the reflector and come back, scientists can find out if there has been any movement along a fault. Using past earthquake information, scientists have developed a seismic risk map. The map shows where earthquakes may occur and the kind of damage they may cause.

▶ **INFER:** Why is it helpful to be able to predict an earthquake?

### CHECKING CONCEPTS

1. A strong earthquake on the Richter scale measures \_\_\_\_\_ or more.
2. Earthquakes less than \_\_\_\_\_ on the Richter scale are usually not felt.

## Real-Life Science

### EARTHQUAKE SAFETY

#### Earthquake Checklist

- BEFORE: Be prepared**
- 1. Always have a supply of ready-to-eat canned food and bottled water on hand.
  - 2. Have a portable radio and extra batteries also on hand.
  - 3. Learn how to turn off the electricity, gas, and water in your house.
- DURING: Stay calm**
- 1. If you are indoors, stay indoors. Protect yourself from falling materials by standing in a doorway or taking cover under a desk or large table.
  - 2. Stay away from glass, especially windows.
  - 3. If you are outdoors, move away from buildings and overhead electrical and telephone wires.
  - 4. If you are in a car, stop as long as you are away from buildings, bridges, tunnels, and so on. Stay in the car until the shaking stops. Get out of a tunnel or off a bridge if you can.
- AFTER: Be careful**
- 1. Check the gas, water, and electricity. Look for fires or fire hazards. If you smell gas, open windows, and turn off the gas. Leave the building. Contact the gas company or police. Do not go back into the building. If water pipes are broken, turn off the main water valve. If there are electrical shorts, turn off the electricity at the main fuse box or circuit breaker.
  - 2. Do not use the telephone except for emergencies.
  - 3. Turn on a radio to get emergency information. Use the television if you can.
  - 4. Do not enter badly damaged buildings.
  - 5. Do not go sightseeing.

**Thinking Critically** Why is it important to be prepared before an earthquake happens?

3. Buildings built to stand during an earthquake are called \_\_\_\_\_.
4. A map that shows where an earthquake may happen is called a \_\_\_\_\_ map.

### THINKING CRITICALLY

5. **SEQUENCE:** Place the following earthquakes in order from weakest to strongest on the Richter scale.

- a. San Francisco, California, 1906, 8.3
- b. Santa Cruz, California, 1989, 7.0
- c. Mexico City, Mexico, 1985, 8.1
- d. New York, New York, 1984, 5.0
- e. Tokyo, Japan, 1923, 8.3
- f. Sumatra, Indonesia, 1994, 7.2

### BUILDING SCIENCE SKILLS

**Researching** The Mercalli scale is also used to measure earthquakes. Find out about the Mercalli scale. Make a poster that shows the Mercalli scale. How does this scale measure earthquakes? How is it different from the Richter scale?