

Earthquakes and Society

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- Can scientists predict when earthquakes will happen?
- Why do some buildings survive earthquakes better than others?
- How can you prepare for an earthquake?

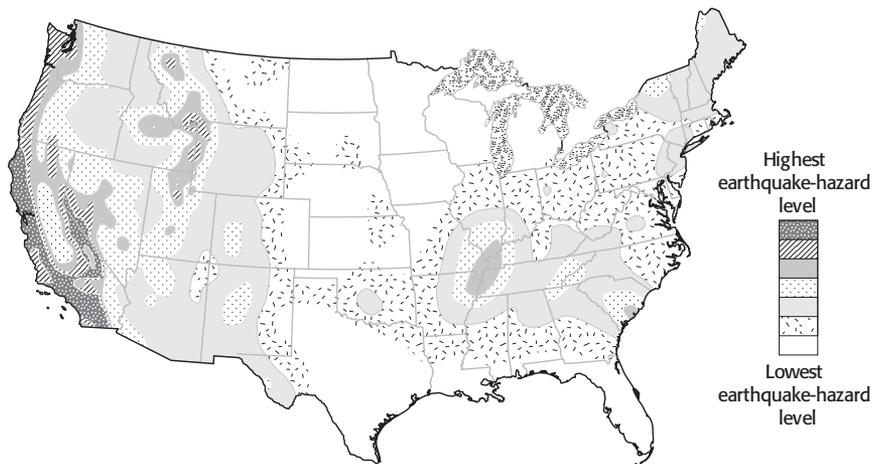
**National Science
Education Standards**
ES 1b

What Is Earthquake Hazard?

Earthquake hazard tells how likely it is that a place will have a damaging earthquake in the future. Scientists look to the past to figure out earthquake-hazard levels. A place that has had a lot of strong earthquakes in the past has a high earthquake-hazard level. A place that has had few or no earthquakes has a much lower level.



Be Prepared As you read, underline important safety information that can help you to prepare for an earthquake.

Earthquake Hazard Map of the Continental United States**TAKE A LOOK**

1. Identify On the map, find the place where you live. What is its earthquake-hazard level?

Look at the map above. Notice that California has the highest earthquake-hazard level in the country. The San Andreas Fault Zone runs through most of California, and a lot of earthquakes happen there. Minnesota has a very low earthquake-hazard level. Very few strong earthquakes have been recorded in Minnesota.

SECTION 3 Earthquakes and Society *continued*

Can Scientists Predict Earthquakes?

You know that earthquakes have different magnitudes. You can probably guess that earthquakes don't happen on a set schedule. But what you may not know is that the strength of earthquakes is related to how often they happen.

Scientists can't predict earthquakes. However, by looking at how often earthquakes have happened in the past, they can estimate where and when an earthquake is likely to happen.

Look at the table below. It shows the number of earthquakes of different sizes that happen every year. There are many more weak earthquakes than strong earthquakes every year.

Description	Magnitude on the Richter scale	Average number per year
Great	8.0 and higher	1
Major	7.0 to 7.9	18
Strong	6.0 to 6.9	120
Moderate	5.0 to 5.9	800
Light	4.0 to 4.9	6,200
Minor	3.0 to 3.9	49,000
Very minor	2.0 to 2.9	365,000

Math Focus

2. Calculate About how many times more light earthquakes than strong earthquakes happen every year?

Scientists can guess when an earthquake will happen by looking at how many have happened in the past. For example, if only a few strong earthquakes have happened recently in an earthquake zone, scientists can guess that a strong earthquake will happen there soon.

What Is the Gap Hypothesis?

Some faults are very active. They have a lot of earthquakes every year. These faults sometimes have very strong earthquakes. A part of an active fault that hasn't had a strong earthquake in a long time is called a **seismic gap**.

The **gap hypothesis** says that if an active fault hasn't had a strong earthquake in a long time, it is likely to have one soon. In other words, it says that strong earthquakes are more likely to happen in seismic gaps.

Critical Thinking

3. Apply Concepts What do you think makes strong earthquakes more likely to happen in seismic gaps?

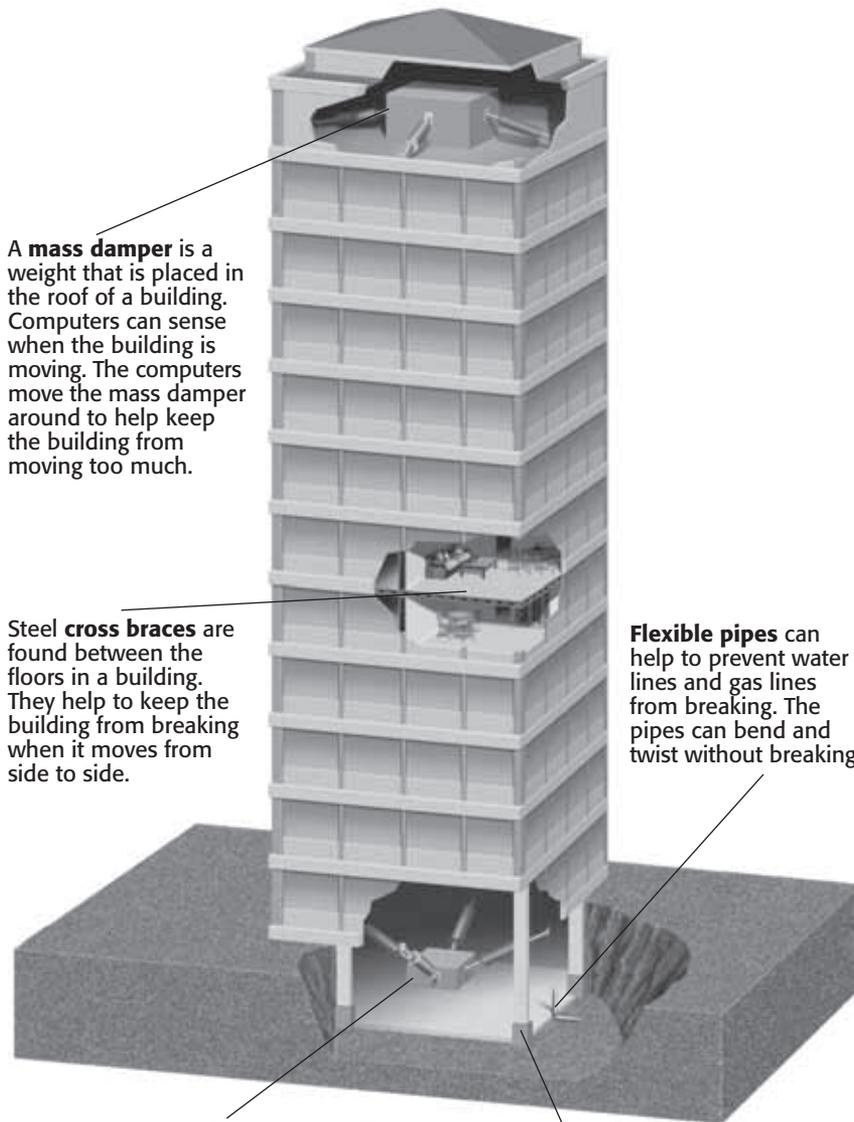
SECTION 3 Earthquakes and Society *continued*

How Do Earthquakes Affect Buildings?

Have you ever seen pictures of a city after a strong earthquake has hit? You may have noticed that some buildings don't have very much damage. Other buildings, however, are totally destroyed. Engineers can study the damage to learn how to make buildings that are stronger and safer.

Critical Thinking

4. List Give three factors that can affect how much a building will be damaged by an earthquake.



A **mass damper** is a weight that is placed in the roof of a building. Computers can sense when the building is moving. The computers move the mass damper around to help keep the building from moving too much.

Steel **cross braces** are found between the floors in a building. They help to keep the building from breaking when it moves from side to side.

Flexible pipes can help to prevent water lines and gas lines from breaking. The pipes can bend and twist without breaking.

An **active tendon system** is like a mass damper, except it is placed under the building.

Base isolators can absorb energy during an earthquake. They keep seismic waves from moving through the building. Base isolators are made of rubber, steel, and lead.

TAKE A LOOK

5. Compare How is a mass damper different from an active tendon system?

SECTION 3 Earthquakes and Society *continued*

How Can You Prepare for an Earthquake?

If you live in a place where earthquakes happen often, you and your family should have an earthquake plan. You should practice your plan so you will be prepared if an earthquake happens. ✓

READING CHECK

6. Explain Why is it important to make and practice an earthquake plan?

How Can You Make an Earthquake Plan?

There are several things to include in your earthquake plan.

SAFE HOME

Put heavy things near the floor so that they do not fall during an earthquake. Make sure things that can burn are kept away from electric wires and other things that can start a fire.

SAFE PLACES IN YOUR HOME

Make sure you know a safe place in each room in your home. Safe places are areas far from windows or heavy objects that could fall or break. ✓

READING CHECK

7. Identify Think about your bedroom. Write down a safe place in your bedroom that you can go during an earthquake.

PLAN TO MEET OTHERS

Talk to your family, friends, or neighbors and set up a place where you all will meet after an earthquake. If you all know where to meet one another, it will be easy to make sure that everyone is safe.

EARTHQUAKE KIT

Your earthquake kit should have things that you might need after an earthquake. Remember that you may not have electricity or running water after an earthquake.

TAKE A LOOK

8. List List four foods that would be useful to have in an earthquake kit.

What Should Be in an Earthquake Kit	
• water	• food that won't go bad
• a fire extinguisher	• a flashlight with batteries
• a small radio that runs on batteries	• extra batteries for the radio and flashlight
• medicines	• a first-aid kit

SECTION 3 Earthquakes and Society *continued***What Should You Do During an Earthquake?**

If you are inside when an earthquake happens, crouch or lie facedown under a table or a desk. Make sure you are far away from windows or heavy objects that might fall. Cover your head with your hands. ✓

If you are outside during an earthquake, lie face down on the ground. Make sure you are far from buildings, power lines, and trees. Cover your head with your hands.

If you are in a car or bus, you should ask the driver to stop. Everyone should stay inside the car or bus until the earthquake is over.

**What Should You Do After an Earthquake?**

Being in an earthquake can be scary. After an earthquake happens, people are often confused about what happened. They may not know what to do or where to go.

After an earthquake, try to stay calm. Look around you. If you are near something dangerous, like a power line or broken glass, get away as quickly as you can. Never go into a building after an earthquake until your parent, a teacher, a police officer, or a firefighter tells you it is safe. ✓

Always remember that there could be aftershocks. Aftershocks are weaker earthquakes that can happen after a large earthquake. Even though they are weaker than the main earthquake, aftershocks can still be very strong and damaging.

Stick to your earthquake plan. Stay together with your family or friends so that they know you are safe.

READING CHECK

9. List Look around your classroom. List two places that you could go in case of an earthquake.

Say It

Share Experiences Have you ever been in an earthquake? In a small group, talk about what it was like.

READING CHECK

10. Identify Who should you ask if you want to know whether it is safe to go back into a building after an earthquake?

Section 3 Review

SECTION VOCABULARY

gap hypothesis a hypothesis that is based on the idea that a major earthquake is more likely to occur along the part of an active fault where no earthquakes have occurred for a certain period of time

seismic gap an area along a fault where relatively few earthquakes have occurred recently but where strong earthquakes have occurred in the past

1. Identify Why are seismologists interested in seismic gaps?

2. Describe Fill in the chart below to show what you should do during an earthquake.

If you are...	Then you should...
...inside a building	
	...lie face down on the ground with your hands on your head, far from power lines or fire hazards.
...in a car or bus	

3. Identify What do engineers do to learn how to make a building more likely to survive an earthquake?

4. Identify Relationships What is the relationship between the strength of an earthquake and how often it occurs?

5. Infer In most cases, you should stay inside a car or a bus in an earthquake. When might it be best to leave a car or a bus during an earthquake?
