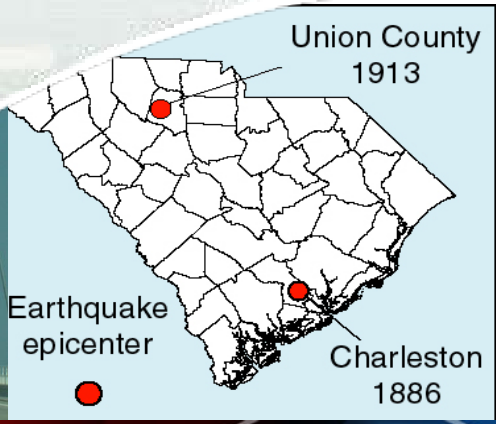
Earthquake!

Charleston District, Emergency Management Division



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What is an earthquake?

An earthquake is what happens when two blocks of the Earth suddenly slip past one another. The surface where they slip is called the fault or fault plane. The location below the earth's surface where the earthquake starts is called the hypocenter, and the location directly above it on the surface of the earth is called the epicenter.

What is an earthquake? (continued)

Sometimes an earthquake has foreshocks. These are smaller earthquakes that happen in the same place as the larger earthquake that follows. Scientist's cannot tell that an earthquake is a foreshock until the larger earthquake happens. The largest, main earthquake is called the mainshock. Mainshocks always have aftershocks that follow. These are smaller earthquakes that occur afterwards in the same place as the mainshock. Depending on the size of the mainshock, aftershocks can continue for weeks, months or even years after the mainshock.

What causes earthquakes and where do they happen?

The earth has four major layers: the inner core, outer core, mantle and crust. The crust and the top of the mantle make up a thin skin on the surface of the planet. But this skin is not all in one piece – it is made up of many pieces like a puzzle covering the surface of the earth. Not only that, but these puzzle pieces keep moving around, sliding past one another and bumping into each other. We call these puzzle pieces tectonic plates, and the edges of the plates are called the plate boundaries.

What causes earthquakes and where do they happen? (continued)

The plate boundaries are made up of many faults, and most of the earthquakes around the world occur on these faults. Since the edges of the plates are rough, they get stuck while the rest of the plate keeps moving. Finally, when the plate has moved far enough, the edges un-stick on one of the faults and there in an earthquake.

Why does the earth shake when there is an earthquake?

While the edges of faults are stuck together, and the rest of the block is moving, the energy that would normally cause the blocks to slide past one another is being stored up. When the force of the moving blocks finally overcomes the friction of the jagged edges of the fault and it un-sticks, all that stored up energy is released. The energy radiates outward from the fault in all directions in the form of seismic waves like ripples on a pond. The seismic waves shake the earth as they move through it, and when the waves reach the earth's surface, they shake the ground and anything on it.

How are earthquakes recorded?

Earthquakes are recorded by instruments called seismographs. The seismograph has a base that sets firmly in the ground, and a heavy weight that hangs free. When an earthquake causes the ground to shake, the base of the seismograph shakes too, but the hanging weight does not. Instead the spring or string it is hanging from absorbs the movement. The difference in position between the shaking part of the seismograph and the motionless part is recorded.

How do scientists measure the size of earthquakes?

The size of the earthquake is called its magnitude. There is one magnitude for each earthquake. Scientists also talk about the intensity of shaking from an earthquake, and this varies depending on where you are during the earthquake.

Can scientists predict earthquakes?

No, and it is unlikely they will ever be able to predict them. Scientists have tried many different ways of predicting earthquakes, but none have been successful. On any particular fault, scientists know there will be another earthquake sometime in the future, but they have no way of telling when it will happen.

Two basic types of earthquakes:

There are 2 basic types of earthquakes. A strike-slip earthquake occurs when the rock on one side of a fault slides horizontally past the other.

In a dip-slip earthquake, the fault is at an angle to the surface of the earth and the movement of the rock is up or down.

Interesting earthquake facts:

- The largest recorded earthquake in the United States was a magnitude 9.2 that struck Prince William Sound, Alaska on Good Friday, 28 March 1964.

- The largest recorded earthquake in the world was a magnitude 9.5 in Chile on 22 May 1960.

- The average rate of motion across the San Andreas Fault Zone during the past 3 million years is 56 millimeters a year, (approximately 2 inches a year). This is about the same rate at which your fingernails grow.

Interesting earthquake facts: (continued)

- The hypocenter of an earthquake is the location beneath the earth's surface where the rupture of the fault begins.

- The epicenter of an earthquake is the location directly above the hypocenter on the surface of the earth.

- It is estimated that there are 500,000 detectable earthquakes in the world each year. 100,000 of those can be felt, and 100 of them cause damage.

- Florida and North Dakota have the smallest number of earthquakes in the United States.

Interesting earthquake facts: (continued)

- The magnitude of an earthquake is a measured value of the earthquake size. The magnitude is the same no matter where you are, or how strong or weak the shaking was in various locations.

- The intensity of an earthquake is a measure of the shaking created by the earthquake, and this value does vary with location.

- Alaska is the most earthquake prone state and one of the most seismically active regions in the world.

Interesting earthquake facts: (continued)

- Alaska experiences a magnitude 7 earthquake almost every year, and a magnitude 8 or greater earthquake on average every 14 years.

- The world's deadliest recorded earthquake occurred in 1556 in central China. It struck a region where most people lived in caves carved from soft rock. These dwellings collapsed during the earthquake, killing an estimated 830,000 people.

Interesting earthquake facts: (continued)

- The majority of the earthquakes and volcanic eruptions occur along plate boundaries such as the boundary between the Pacific Plate and the North American plate. One of the most active plate boundaries where earthquakes and eruptions are frequent, for example, is around the massive Pacific Plate commonly referred to as the “Pacific Ring of Fire.”

- The sun and moon cause tremors. It’s long been known that they create tides in the planet’s crust, very minor versions of ocean tides. Now researchers say the tug of the sun and moon on the San Andreas Fault stimulates tremors deep underground.

Interesting earthquake facts: (continued)

• A city in Chile moved 10 feet in the massive 8.8 magnitude earthquake on 27 February 2010. The rip in the Earth's crust shifted the city of Concepcion that much to the west. The quake is also through to have changed the planet's rotation slightly and shortened Earth's day.

• Quakes on one side of the Earth can shake the other side. Seismologists studying the massive 2004 earthquake that triggered killer tsunamis throughout the Indian Ocean found that the quake had weakened at least a portion of California's famed San Andreas Fault. The Chilean quake of 1960 shook the entire Earth for many days, a phenomenon called oscillation that was measured by seismic stations around the planet.

7 - Steps to Earthquake Safety:

1. Secure it now
2. Make a plan
3. Make disaster kits
4. Is your place safe?
5. Drop, cover and hold on
6. Check it out
7. Communicate and recover

Step 1: Secure it now!

Reducing and/ or eliminating hazards throughout your home, neighborhood, and workplace can greatly reduce your risk of injury or death following the next earthquake or other disaster. Conduct a “hazard hunt” to help identify and fix things such as unsecured televisions, computers, bookcases, furniture, unstrapped water heaters, etc. Securing these items now will help to protect you tomorrow.

Step 2: Make a plan

Planning for an earthquake or other emergency is not much different from planning for a party or vacation. Make sure that your emergency plan includes evacuation and reunion plans; out-of-state contact person's name and number; the location of your emergency supplies and other pertinent information. By planning now, you will be ready for the next emergency

Step 3: Make disaster kits

Everyone should have disaster supplies kits stored in accessible locations at home, at work and in your vehicle. Having emergency supplies readily available can reduce the impact of an earthquake or other emergency on you and your family. Your disaster supplies kits should include food, water, flashlights, portable radios, batteries, a first aid kit, cash, extra medications, a whistle, fire extinguisher, etc.

Step 4: Is your place safe?

Most houses are not as safe as they could be. Whether you are a homeowner or renter, there are things that you can do to improve the structural integrity of your home. Some of the things that you might consider checking include inadequate foundations, unbraced cripple walls, soft first stories, unreinforced masonry and vulnerable pipes. Consult a contractor or engineer to help you identify your building's weaknesses and begin to fix them now.

Step 5: Drop, Cover and Hold On!

Learn what to do during an earthquake, whether you're at home, at work, or just out and about. Taking the proper actions, such as "Drop, Cover, and Hold On," can save lives and reduce your risk of death or injury. During earthquakes, drop to the floor, take cover under sturdy desk or table, and hold on firmly. Be prepared to move with it until the shaking stops.

Step 6: Check it out!

One of the first things you should do following a major disaster is to check for injuries and damages that need immediate attention. Make sure you are trained in first aid and in damage assessment techniques. You should be able to administer first aid and to identify hazards such as damage gas, water, sewage and electrical lines. Be prepared to report damage to city or county government.

Step 7: Communicate and recover!

Following a major disaster, communication will be an important step in your recovery efforts. Turn on your portable radio for information and safety advisories. If your home is damaged, contact your insurance agent right away to begin your claims process. For most Presidentially declared disasters, resources will also be available from Federal, state and local government agencies.

Before the earthquake:

- Teach all members of your family about earthquake safety. This includes the actions you should take when an earthquake occurs, the safe places in a room such as under a strong desk, along interior walls, and places to avoid such as near windows, large mirrors, hanging objects heavy furniture and fireplaces.
- Stock up on emergency supplies. These include: battery operated radio (and extra batteries), flashlights (and extra batteries), first aid kit, bottled water, two weeks of food and medical supplies, blankets, cooking fuel, tools needed to turn off your gas, water, and electric utilities.
- Arrange your home for safety: Store heavy objects on lower shelves and store breakable objects in cabinets with latched doors. Don't hang heavy mirrors of pictures above where people frequently sit or sleep.

Before the earthquake: (continued)

- Anchor heavy appliances and furniture such as water heaters, refrigerators and bookcases.
- Store flamable liquids away from potential ignition sources such as water heaters, stoves, and furnaces.
- Get educated. Learn what to do during an earthquake (see, During the Earthquake). Then you will be ready for the fast action needed. Make sure that all members of your family have this important education.
- Learn where the main turn-offs are for your water, gas and electricity. Know how to turn them off and the location of any needed tools.

During the earthquake:

- If you are indoors, stay there. Quickly move to a safe location in the room such as under a strong desk, a strong table, or along an interior wall. The goal is to protect yourself from falling objects and be located near the structural strong points of the room. Avoid taking cover near windows, large mirrors, hanging objects, heavy furniture, heavy appliances or fireplaces.
- If you are cooking, turn off the stove and take cover.
- If you are outdoors, move to an open area where falling objects are unlikely to strike you. Move away from buildings, power lines, and trees.
- If you are driving, slow down smoothly and stop on the side of the road. Avoid stopping on or under bridges and overpasses, or under power lines, trees and large signs. Stay in your car.

After the earthquake:

- Check for injuries, attend to injuries if needed, help ensure the safety of people around you.
- Check for damage. If your building is badly damaged you should leave it until it has been inspected by a safety professional.
- If you smell or hear a gas leak, get everyone outside and open windows and doors. If you can do it safely, turn off the gas at the meter. Report the leak to the gas company and fire department. Do not use any electrical appliances because a tiny spark could ignite the gas.
- If the power is out, unplug major appliances to prevent possible damage when the power is turned back on. If you see sparks, frayed wires, or smell hot insulations turn off electricity at the main fuse box or breaker

Contact Information:

Emergency Management Division CESAC-EM

3rd Floor of the CESAC HQ building, room 325

E-Mail: cesac-eoc2@usace.army.mil

Chief:

Gilbert Dent

Office: 843-329-8104

Natural Disaster PM:

Michael Hind

Office: 843-329-8106

National Disaster PM:

Trae Redmond

Office: 843-329-8155