



Winter Quarter 2006
January, February, March

CORONADO FIRE DEPARTMENT

Fire Division Chief Alan Nowakowski
Emergency Preparedness Coordinator

Earthquake Basics

*Excerpt from the booklet Putting Down Roots in Earthquake Country.
Developed by the Southern California Earthquake Center*

Epicenter, aftershock, foreshock, fault, seismograph, magnitude, intensity, amplification... We hear them. After big earthquakes, we say them. But what do these terms mean? What do they mean for what we felt and what we will feel the next time?

Do we really understand what seismologists are saying?

An earthquake is caused by a sudden slip on a fault, much like what happens when you snap your fingers. Before the snap, you push your fingers together and sideways. Because you are pushing them together, friction keeps them from moving to the side. When you push sideways hard enough to overcome this friction, your fingers move suddenly, releasing energy in the form of sound waves that set the air vibrating and travel from your hand to your ear, where you hear the snap. The same process goes on in an earthquake. Stresses in the earth's outer layer push the side of the fault together. The friction across the surface of the fault holds the rocks together so they do not slip immediately when pushed sideways. Eventually enough stress builds up and the rocks slip suddenly, releasing energy in waves that travel through the rock to cause the shaking that we feel during an earthquake. Just as you snap your fingers with the whole area of your fingertip and thumb, earthquakes happen over an area of the fault, called the rupture surface. However, unlike your fingers, the whole fault plane does not slip at once. The rupture begins at a point on the fault plane called the hypocenter, a point usually deep down on the fault. The epicenter is the point on the surface directly above the hypocenter. The rupture keeps spreading until something stops it

(exactly how this happens is a hot research topic in seismology).

Aftershocks

Part of living with earthquakes is living with aftershocks. Earthquakes come in clusters. In any earthquake cluster, the largest one is called the mainshock; anything before it is a foreshock, and anything after it is an aftershock. Aftershocks are earthquakes that usually occur near the mainshock. The stress on the mainshock's fault changes during the mainshock and most of the aftershocks occur on the same fault. Sometimes the change in stress is great enough to trigger aftershocks on nearby faults as well.

**Be one step ahead
of a disaster!
Sign up for a
CERT class!**

An earthquake large enough to cause damage will probably produce several felt aftershocks within the first hour. The rate of aftershocks dies off quickly. The day after the mainshock has about half the aftershocks of the first day. Ten days after the mainshock there are only a tenth the number of aftershocks. An earthquake will be called an aftershock as long as the rate of earthquakes is higher than it was before the mainshock. For big earthquakes this might go on for decades. Bigger earthquakes have more and larger aftershocks. The bigger the mainshock, the bigger the largest aftershock, on average, though there are many more small aftershocks than large ones. Also, just as smaller earthquakes can continue to occur a year or more after a mainshock, there is still a chance for a large aftershock long after an earthquake.

Foreshocks

Sometimes what we think is a mainshock is followed by a larger earthquake. Then the original earthquake is considered a foreshock. The chance of this happening dies off quickly with time just like aftershocks. After three days the risk is almost gone.

Continued on page 2

Earthquake Basics - *Continued from page 1*

Sometimes, the chance that an event is a foreshock seems higher than average — usually because of its proximity to a major fault. The Governor’s Office of Emergency Services will then issue an advisory based on scientists’ recommendations. These are the only officially recognized short-term “predictions.”

Faults

Earthquakes occur on faults. A fault is a thin zone of crushed rock separating blocks of the earth’s crust. When an earthquake occurs on one of these faults, the rock on one side of the fault slips with respect to the other. Faults can be centimeters to thousands of kilometers (fractions of an inch to thousands of miles) long. The fault surface can be vertical, horizontal, or at some angle to the surface of the earth. Faults can extend deep into the earth and may or may not extend up to the earth’s surface.

How do we know a fault exists?

- ◆ Past fault movement has brought together rocks that used to be farther apart;
- ◆ Earthquakes on the fault have left surface evidence, such as surface ruptures or fault scarps (cliffs made by earthquakes);
- ◆ Earthquakes recorded by seismographic networks are mapped and indicate the location of a fault.

Some faults have not shown these signs and we will not know they are there until they produce a large earthquake. Several damaging earthquakes in California have occurred on faults that were previously unknown.

Earthquake Shaking

Magnitude is a measurement of the energy produced by an earthquake and is not a measure of the shaking you feel. What you feel is very complex — hard or gentle, long or short, jerky or rolling — and is not describable with one number. Aspects of the motion are described by the velocity (how fast the ground is moving), acceleration (how quickly the speed of the ground is changing), the frequency (seismic waves vibrate at different frequencies just like sound waves), and the duration (how long the strong shaking lasts). What you feel in an earthquake is controlled by three main factors: magnitude, distance, and local soil conditions.

Magnitude

Typically you will feel more intense shaking from a big earthquake than from a small one. Bigger earthquakes also release their energy over a larger area and for a longer period of time. An earthquake begins at a hypocenter, and from there the rupture front travels along the fault, producing waves all the time it is moving. Every point crossed by the rupture front gives off shaking, so longer faults produce bigger earthquakes that have longer durations. For a magnitude 5 event, the actual process of rupturing the fault is over in a few seconds, although you might continue to feel shaking for longer because some waves reach you after they bounce and echo within the earth. The magnitude 7.8 earthquake on the San Andreas fault in 1857 took two minutes for that length of fault to rupture, so you would have felt shaking for several minutes. If the idea of a two-minute earthquake frightens you, remember that some of the energy may be traveling from hundreds of miles away. In most cases, only the 10 - 15 seconds of shaking that originates from the part of the fault nearest you will be very strong.

Distance

Earthquake waves die off as they travel through the earth, so earthquake shaking is less intense farther from the fault. If you are near an earthquake, you will experience all the shaking produced by the earthquake and feel “jolted.” Farther away, the higher frequencies will have died away and you will feel a rolling motion. The amount of damage to a building does not depend solely on how hard it is shaken. In general, smaller buildings such as houses must be relatively close to the hypocenter to be severely damaged. Larger structures such as high-rises and bridges will be more noticeably affected by the largest earthquakes, even at considerable distances.

Local Soil Conditions

Soils can greatly amplify the shaking in an earthquake. Passing from rock to soil, seismic waves slow down but get bigger. Hence a soft, loose soil may shake more intensely than hard rock at the same distance from the same earthquake. An extreme example for this type of amplification was in the Marina district of San Francisco during the 1989 Loma Prieta earthquake. That earthquake was 100 kilometers (60 miles) from San Francisco, and most of the

Bay Area escaped serious damage. However, some sites in the Bay Area on landfill or soft soils experienced significant shaking. This amplified shaking was one of the reasons for the collapse of the elevated Nimitz freeway. Ground motion at those sites was more than 10 times stronger than at neighboring sites on rock. The same factors also apply to areas covered by thick sediment in Southern California. Shaking from an earthquake in the region can be 5 or more times greater at a site in a basin than the level of shaking in the nearby mountains.

Earthquake Risk

We know that the San Andreas fault produces large earthquakes and that many other faults are also hazardous. However, it is often difficult to understand how to incorporate this information into our lives. Should we care only if we live near the San Andreas fault? Is every place just as dangerous? Southern California has thousands of earthquakes every year. A few are damaging, but most are not even felt. However, almost none are on the San Andreas fault. The last significant earthquake on the Southern California stretch of this fault was in 1857. It is still storing energy for some future earthquake. Other faults produce most of our earthquakes. In Southern California there have been 360,000 earthquakes smaller than magnitude 4 in 22 years, but less than 1,600 earthquakes above magnitude 4 in 70 years. The largest earthquakes were the 1992 magnitude 7.3 Landers and 1999 magnitude 7.1 Hector Mine earthquakes in the Mojave Desert and the 1952 magnitude 7.5 Kern County earthquake near Bakersfield.

The earthquakes of California are caused by the movement of huge blocks of the earth’s crust. Southern California straddles the boundary between the Pacific and North American plates. These large sections of the earth’s crust (the North American plate extends east to Iceland while the Pacific plate extends west to Japan) are moving past each other. These plates push into each other, compressing the earth’s crust into the mountains of Southern California and producing faults and earthquakes. Over half of the significant earthquakes in Southern California occur

Congratulations CERT class graduates Fall 2005!

*In alphabetical order:
Sean Carey, La Donna Carroll,
Rennie Darnell, Donald Fink,
Nanci Henehan, Michelle Lang,
Luisa Mijares, Connie Rigsby,
and Elaine Rothwell.
Alan Nowakowski (Emergency
Preparedness Coordinator)
fourth from left*



Preparedness Starts With YOU...

Only 30 percent of Californians are prepared for disasters. Californians constantly face natural and man-made disasters from earthquakes, wildfires, and winter storms, and now the possibility of a terrorist attack.

To prepare for the inevitable, the Coronado Fire Department in conjunction with the San Diego County Office of Emergency Services, urges you to create a **Family Disaster Plan**. The plan discusses what steps families should take before, during and after a disaster. There are helpful tips for evacuating your home, suggestions for home emergency supplies, and a location to list important telephone numbers.

A **Family Disaster Plan** includes:

- ▶ A list of emergency contact numbers for family members
- ▶ An out-of-area contact for family members to call following a disaster
- ▶ Pre-identified meeting areas near and away from the home, in case family members become separated.

The **Family Disaster Kit** provides instructions on creating a Disaster Kit for your home, school and car. Your kit should include a number of items such as:

- ▶ One gallon of water per person per day
- ▶ Medications (prescription/non-prescription)
- ▶ Portable radio with extra batteries

Copies of the **Family Disaster Plan and Personal Survival Guide** can be found at

<http://www.sdcounty.ca.gov/oes/community/families/>

Or obtain a copy from the

Coronado Fire Department
1001 Sixth Street
Coronado, CA 92118

Discuss and review the Family Disaster Plan and Personal Survival Guide with your family. This is only the first step in disaster preparedness.

Earthquake Basics - *Continued from page 2*

on these faults. We could worry about every one of the faults. But we do not need to. Since the ground shaking in an earthquake depends on the magnitude, the distance from the fault, and local soil conditions, earthquakes on distant faults may not be a threat to you. However, since there are faults throughout the region, in the long run most

areas of Southern California will experience heavy earthquake shaking. Some locations will experience such shaking more frequently because they are closer to more faults or have local soil conditions that amplify earthquake shaking. Unfortunately, scientists do not yet have the information needed to predict which earthquakes will

happen first, so we must be ready for the shaking in our area from any possible earthquake.

For more information:
www.earthquakecountry.info



The City of Coronado encourages the participation of disabled individuals in this activity, services and programs provided by the City. Individuals with disabilities who require reasonable accommodations in order to participate should contact: Americans with Disabilities Act Compliance Officer, in the Administrative Services Department. Telephone: 619-522-7304.

Winter 2006 CPR

DATE	DAY	TIME
Jan. 14	Saturday	9:00 a.m. - 1:30 p.m.
Feb. 15	Wednesday	5:15 p.m. - 9:45 p.m.
March 11	Saturday	9:00 a.m. - 1:30 p.m.
March 28	Tuesday	5:15 p.m. - 9:45 p.m.

CPR classes will be held at the Emergency Operations Center (EOC) in the Police Facility at 700 Orange Avenue. The fee of \$25.00 must be paid at the time of the class. Participants will receive an American Heart Association book and a barrier device to protect themselves when performing CPR. Please call the Fire Department for registration: 619-522-7374.

The CERT Program (Community Emergency Response Team)

DATE	DAY	TIME
MODULE 1 - Disaster Preparedness		
Jan. 21	Saturday	9:00 a.m. - 1:00 p.m.
MODULE 2 - Disaster Fire Suppression		
Jan. 28	Saturday	9:00 a.m. - 1:00 p.m.
MODULE 3 - Disaster Medical Operations		
Feb. 4	Saturday	9:00 a.m. - 1:30 p.m.
MODULE 4 - Light Search and Rescue Operations		
Feb. 11	Saturday	9:00 a.m. - 1:00 p.m.
MODULE 5 - Terrorism		
Feb. 18	Saturday	9:00 a.m. - 1:00 p.m.
MODULE 6 - Disaster Psychology and Team Organization		
Feb. 25	Saturday	9:00 a.m. - 1:15 p.m.

Following is a brief description of the CERT classes and some of the skills that will be taught.

- Module 1 • Disaster Preparedness:** Introduction to types of disasters and the role of CERTs in a disaster.
- Module 2 • Disaster Fire Suppression:** Basic fire suppression strategy, fire fighting resources and fire fighting techniques.
- Module 3 • Disaster Medical Operations:** Treatment techniques for life-threatening conditions, principles of triage, establishing treatment areas, and more.
- Module 4 • Disaster Light Search and Rescue Operations:** Search and rescue priorities, size-up strategies, and rescuer safety.
- Module 5 • Terrorism:** Potential threats and how to identify them, CERT activation, and Preparedness in Coronado.
- Module 6 • Disaster Psychology Team Organization:** The post-disaster emotional environment, the CERT organization and decision making.

In order to receive certification all six Modules have to be completed. Module 1 must be taken first and Module 6 last.

**CERT Fans and
CERT Members:**

There is a CERT meeting every **third Thursday** of the month at **6:00 p.m.** in the EOC at the Police Department where CERT members will receive more training and new updates on Emergency Preparedness.

There is no fee for CERT classes. Please call the Coronado Fire Department for location and registration: 619-522-7374.

The **Emergency Preparedness Newsletter** is a publication from the Coronado Fire Department 1001 Sixth Street, Coronado, California 92118 Telephone: 619-522-7374 Fax: 619-435-2742