

Journal of Civil Defense™

Fall 2006 Volume 39, Issue 3



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QUAKE



Next Issue...Alternative Energy



Dear Readers,

Our approach to earthquake preparedness, especially when we live in earthquake-prone areas, is usually an indication of our overall preparedness posture. The preparations that would help significantly in the event of an earthquake are relatively simple and can be addressed in the course of our day-to-day activities.

We don't have to go very far out of our way to make the prudent preparations. If we believe in the philosophy of being prepared, it will gradually start to show in our actions.

- We can have the proper bracing installed by the contractor when our water heater needs to be replaced, or we can buy a kit while at the hardware store for other reasons and install the recommended bracing for our water heater by ourselves.
- While at that same hardware store, we can purchase some small "L" brackets to fasten taller furniture to the studs in the walls.



We might also 'pick up' the appropriate sized wrenches to turn off gas and water supplies to our homes, so that there is less danger of fire damage or water damage, after an earthquake. We should be sure to store these tools in the proper locations, so that they can be located easily and quickly when the time comes. each room in the house along with a designated meeting place outside, so that every member of the family can be located after the event.

The preparations required are relatively simple and call for little more than an awareness and resolve to protect our loved ones and ourselves.



- As with any disaster, the potential need for food and water, and other supplies, is great. As a family we can check on our storage and make sure we have what we need.
- We can have a half-hour discussion regarding an appropriate escape route from

I hope that each of you, our readers, will take the time to reflect on these comments and choose to do something today to protect yourselves and your families.

Sincerely,

Jay Whimpey TACDA President



Dear Readers.

It is with great pleasure that I may inform you of some of the latest additions to the education and information that TACDA offers.

If you have not visited the TACDA website (www.tacda.org) recently, please do so. There are many advancements changes and already in place, such as: the new TACDA Member Login. the Journal of Civil Defense Archives, and new products in the TACDA Store. You can also edit and update your membership info, and even renew your Contributing Membership. All online and easy to access.

The latest and most exciting addition to TACDA is the TACDA Academy. For several decades, information and education has been researched and collected by the entire TACDA team, including TACDA Members, employees, and the board of directors. From this research, we have developed an introductory series of lessons called "Civil Defense Basics."

To call these lessons "basic" is definitely an understatement, but you have to start somewhere, right?

The lessons include education on various natural and manmade disaster preparedness topics. including nuclear weapons effects, EMP, radiation, food and water, cold weather and post event survival, and civil defense psychology.

The information is available online complimentary for all TACDA members. Just login to your TACDA Member Home and open the Academy.

With all we currently offer on the TACDA website and in the Journal of Civil Defense, we are always looking to add and improve our information.

TACDA Journal of Civil Defense™

We gladly accept all letters, faxes, emails, and phone calls. We will do our best to research your questions, comments, and requests and respond as soon as we can.

Please continue to visit the TACDA website and look for additional information coming soon, like a more enhanced Resources & Links section, more TACDA Academy lessons, more Journal of Civil Defense issues. and so much more.

Again, it is with great pleasure to inform you of what TACDA offers now...and what is coming.

Thank you for supporting TACDA.

Trev Edwards Journal of Civil Defense Editor

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EARTHQUAKES IN THE UNITED STATES

Earthquakes are among the most frightening and devastating of natural events - they strike without warning, allowing no time for preparations or evacuation. Nationwide, at least 39 states are considered at risk from moderate to great earthquakes.¹

Risk Areas:

The map below shows the areas of earthquake risk in the continental United States. Large areas of California, Nevada (San Andreas Fault), Montana, Utah, Idaho (Intermountain Seismic Belt), and the Mississippi Valley ((New Madrid Seismic Area) have the greatest potential for damaging quakes in the United States.

Magnitude as Measured on the Richter Scale:

The Richter scale was created in 1935 by the American seismologist Charles F. Richter. The Richter scale measures how much the ground shakes 60 miles from the earthquakes epicenter. Richter magnitudes increase logarithmically, meaning the level of shaking increases 10 times for each full magnitude number.

Using this scale, a magnitude 5 earthquake would result in ten times the level of ground shaking as a magnitude 4 earthquake (and 32 times as much energy would be released). Thinking of it in terms of the energy released by explosives: a magnitude 1 seismic wave releases as much energy as blowing up 6 ounces of TNT. A magnitude 8 earthquake releases as much energy as detonating 6 million tons of TNT (or a 6 megaton nuclear weapon).

An earthquake measuring 8.0 on



the Richter scale releases ten times the level of ground shaking as one that measures 7.0. That same magnitude 8.0 earthquake releases one hundred times the level of ground shaking as a magnitude 6.0 earthquake and one thousand times more than a magnitude 5.0 earthquake.

Frequency & Magnitude Potential:

Geologists stress that earthquake prediction forecasts tend to be very general, specifying a range of decades rather than years or weeks for possible activity.

New Madrid:

Frequency-magnitude relations in the New Madrid seismic zone suggest that great earthquakes (magnitude 7.5 to 9) should occur every 700--1,200 yrs. Scientists estimate that the probability of a moderate to large earthquake (magnitude 6 to 7) occurring in this seismic zone within the next 50 years is higher than 90%. Such an earthquake could hit the Mississippi Valley at any time.

Intermountain Seismic Belt:

The strongest earthquake ever recorded in the Intermountain West was in Hebgen Lake, MT (mag. 7.5). The frequency of large quakes in Utah (6.5 to 7.5 in magnitude) is every 50 to 150 years. The frequency of large quakes along Utah's Wasatch Front every 350 vears. is Moderate earthquakes in Utah (magnitude 5.5 to 6.5 occur) occur on the average of every 10 to 50 years.²

San Andreas Fault:

Geologic studies show that over

¹ www.fema.gov



² Homebuyers Guide to Earthquake

Hazards in Utah

(Continued from previous page)

the past 1,400 to 1,500 years large earthquakes have occurred at about 150-year intervals on the southern San Andreas Fault. As the last large earthquake on the southern San Andreas occurred in 1857, that section of the fault is considered a likely location for an earthquake within the next few decades. The San Francisco Bay area has a slightly lower potential for a great earthquake, as less than 100 years have passed since the areat 1906 earthquake; however. moderately-sized, potentially damaging earthquakes could occur in this area at any time.³

Quakes with significant numbers of deaths:

- 1994, Northridge, CA (30-60 deaths) mag 6.7
- 1989 Loma Prieta, CA (63 deaths) mag. 7.2
- 1964 Prince William, AK (125 tsunami deaths) mag. 9.2
- 1971 San Fernando, CA (65 deaths) mag. 6.5
- 1959 Hebgen Lake, MT, (28 deaths) mag. 7.5
- 1933 Long Beach, CA (115-120 deaths) mag. 6.4
- 1906 San Francisco, CA (3,000 deaths), mag. 7.8
- 1886 Charleston, SC (60 deaths) mag. 7.3
- 1868 Hawaii Island, HI (77 deaths) mag. 7
- 1811 New Madrid, MO (some deaths) mag. 8.5

Quakes of magnitude 5 or greater in the 50 US states:

1950 to 1959

Total

16 quakes mag. 5 or greater • Average

1.6 quakes mag. 5 or greater per yr.

1960 to 1969

Total

10 quakes mag. 5 or greater • Average

1 quake mag. 5 o greater per yr.

1970 to 1979

- Total 10 guakes mag. 5 or greater
- Average

 quake mag. 5 or greater per vr.

1980 to 1989

• Total 17 mag. 5 or greater

 Average
 1.7 quakes, mag. 5 or greater per yr.

1990 to 1999

Total

7 quakes mag. 5 or greater • Average

.7 quakes mag. 5 or greater per yr.

2000-2005

• Total

25 mag. 5 or greater

Average
 4.17 mag. 5 or greater per year

The above figures show a significant increase in the frequency of magnitude 5 or greater quakes in the years 2000 to 2005 when compared to the previous decades.

The percentage of increase follows:

Increase of 500%, mag. 5 or greater per year compared to 1990 to 1999

Increase of 145%, mag. 5 or greater per year compared to 1980 to 1989

Increase of 317%, mag. 5 or greater per year compared to 1970 to 1979

Increase of 161%, mag. 5 or greater per year compared to 1950 to 1959

All figures above were computed from the USGS Earthquake Hazards Program: http://earthquake.usgs.gov/eqcenter/top1 0.php

Large events such as these can continue to be expected in the United States, and they will not be confined solely to the West Coast region

the severe Two of most earthouakes in U.S. historv occurred east of the Rockies: one in Charleston, South Carolina, in 1886 (60 deaths) magnitude 7.3; and the other, a series of three shocks centered near New Madrid, Missouri, in 1811-12.

Measuring an estimated 8.5 in magnitude, the New Madrid earthquake sent shock waves as far west as the Rocky Mountains and as far east as Washington, D.C. and Boston.

The New Madrid earthquakes of 1811 and 1812 were so great that they changed the course of the Mississippi River.

³ pubs.usgs.gov/gip/earthq3/contents.html

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Threat

Before, During, & After an Earthquake

Most of this material has been taken from the FEMA website, <http://www.fema.gov /index.shtm>.

Analusis Resource

*Some small changes to the FEMA material have been made and will be noted in italics and preceded by an asterisk.

What to do Before an Earthquake

Earthquakes strike suddenly, violently and without warning. Identifying potential hazards ahead of time and advance planning can reduce the dangers of serious injury or loss of life from an earthquake. Repairing deep plaster cracks in ceilings and foundations, anchoring overhead lighting fixtures to the ceiling, and following local seismic building standards, will help reduce the impact of earthquakes.

Six Ways to Plan Ahead

1. Check for Hazards in the Home

- Fasten shelves securely to walls.
- Place large or heavy objects on lower shelves.
- Store breakable items such as bottled foods, glass, and china in low, closed cabinets with latches.
- Hang heavy items such as pictures and mirrors away from beds, couches, and anywhere people sit.
- Brace overhead light fixtures.
- Repair defective electrical wiring and leaky gas connections. These are potential fire risks.
- Secure a water heater by strapping it to the wall studs and bolting it to the floor.
- Repair any deep cracks in ceilings or foundations. Get expert advice if there are signs of structural defects.

 Store weed killers, pesticides, and flammable products securely in closed cabinets with latches and on bottom shelves.

2. Identify Safe Places Indoors and Outdoors

- Under sturdy furniture such as a heavy desk or table.
- Against an inside wall.
- Away from where glass could shatter around windows, mirrors, pictures, or where heavy bookcases or other heavy furniture could fall over.
- In the open, away from buildings, trees, telephone and electrical lines, overpasses, or elevated expressways.

3. Educate Your Family Members

- *Study Lesson 7 on Natural Disasters in the TACDA Academy.
- Contact your local emergency management office or American Red Cross chapter for more information on earthquakes. Read the "How-To Series" for information on how to protect your property from earthquakes.
- Teach children how and when to call 9-1-1, police, or fire department and which radio station to tune to for emergency information.
- Teach all family members how and when to turn off gas, electricity, and water.

4. Have Supplies on Hand

- Flashlight and extra batteries.
- Portable battery-operated radio and extra batteries.
- First aid kit and manual
- Emergency food and water.
- Non-electric can opener.
- Essential medicines.

- Cash and credit cards.
- Sturdy shoes.

5. Develop an Emergency Communication Plan

- In case family members are separated from one another during an earthquake (a real possibility during the day when adults are at work and children are at school), develop a plan for reuniting after the disaster.
- Ask an out-of-state relative or friend to serve as the "family contact." After a disaster, it's often easier to call long distance. Make sure everyone in the family knows the name, address, and phone number of the contact person.

6. *Prepare an Expedient Shelter

- Store camping tent and supplies near an outside door.
- Prepare an alternate site, such as an underground shelter or camping trailer. Keep these areas supplied with emergency foods and equipment. Prepare this shelter as if it could become your temporary home.

What to do During an Earthquake

Stay as safe as possible during an earthquake. Be aware that some earthquakes are actually foreshocks and a larger earthquake might occur. Minimize your movements to a few steps to a nearby safe place and stay indoors until the shaking has stopped and you are sure exiting is safe.

If Indoors

 DROP to the ground; take COVER by getting under a sturdy table or other piece of



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(Continued from previous page)

furniture; and HOLD ON until the shaking stops. If there isn't a table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.

- Stay away from glass, windows, outside doors and walls, and anything that could fall, such as lighting fixtures or furniture.
- Stay in bed if you are there when the earthquake strikes. Hold on and protect your head with a pillow, unless you are under a heavy light fixture that could fall. In that case, move to the nearest safe place.
- Stay inside until shaking stops and it is safe to go outside. Research has shown that most injuries occur when people inside buildings attempt to move to a different location inside the building or try to leave.
- Be aware that the electricity may go out or the sprinkler systems or fire alarms may turn on.
- DO NOT use the elevators.
- *Follow the 'Triangle of Life' posture if you are in a nonreinforced brick or concrete building. Curl into a crouching position near a heavy object such as a bed or couch.

If Outdoors

- Stay there.
- Move away from buildings, streetlights, and utility wires.
- Once in the open, stay there until the shaking stops. The greatest danger exists directly outside buildings, at exits, and alongside exterior walls. Many of the 120 fatalities from the 1933 Long Beach earthquake occurred when people ran outside of buildings only to be killed by falling debris from collapsing walls. Most earthquake-related casualties

result from collapsing walls, flying glass, and falling objects.

If in a Moving Vehicle

- Stop as quickly as safety permits and stay in the vehicle (unless under an overpass). Avoid stopping near or under buildings, trees, overpasses, and utility wires.
- Proceed cautiously once the earthquake has stopped. Avoid roads, bridges, or ramps that might have been damaged by the earthquake.

If Trapped Under Debris

- Do not light a match, as there could danger of explosion from gas leaks.
- Do not move about or kick up dust.
- Cover your mouth with a handkerchief or clothing.
- Tap on a pipe or wall so rescuers can locate you. Use a whistle if one is available. Shout only as a last resort. Shouting can cause you to inhale dangerous amounts of dust.

What to Do After an Earthquake

Expect aftershocks. These secondary shockwaves are usually less violent than the main quake but can be strong enough to do additional damage to weakened structures and can occur in the first hours, days, weeks, or even months after the quake.

- Listen to a battery-operated radio or television. Listen for the latest emergency information.
- Use the telephone only for emergency calls.
- Open cabinets cautiously. Beware of objects that can fall off shelves.
- Stay away from damaged areas. Stay away unless police, fire, or relief organizations have specifically requested your assistance. Return home only when authorities say it is safe.

- Be aware of possible tsunamis if you live in coastal areas. These are also known as seismic sea waves (mistakenly called "tidal waves"). When local authorities issue a tsunami warning, assume that a series of dangerous waves is on the way. Stay away from the beach.
- Help injured or trapped persons. Remember to help neighbors vour who may require special assistance such as infants, the elderly, and people with disabilities. Give first aid where appropriate. Do not move seriously injured persons unless they are in immediate danger of further injury. Call for help.
- Clean up spilled medicines, bleaches, gasoline or other flammable liquids immediately. Leave the area if you smell gas or fumes from other chemicals.
- Inspect chimneys for damage. Unnoticed damage could lead to a fire.
- Check for gas leaks. If you smell gas or hear blowing or hissing noise, open a window and quickly leave the building. Turn off the gas at the outside main valve if you can and call the gas company from a neighbor's home. Professionals only should turn it back on.
- Look for electrical system damage. If you see sparks or broken or frayed wires, or if you smell hot insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in water to get to the fuse box or circuit breaker, call an electrician first for advice.
- Check for sewage and water lines damage. If you suspect sewage lines are damaged, avoid using the toilets and call a plumber. If water pipes are damaged, contact the water company and avoid using water from the tap. You can obtain safe water by melting ice cubes.





IMPACT OF LARGE EARTHQUAKES ON METROPOLITAN AREAS

Each metropolitan area is uniquely vulnerable to damage from large earthquakes. Studies should be available for most all cities with populations of more than 1-millioin.

The following impact study has been taken from a 1997 FEMA report made for the Intermountain Seismic area of the Wasatch Front of Utah (2-million population); including the counties of Salt Lake, Davis, Utah and Weber. These figures may be higher now with growth and higher replacement evaluations. This quake study used a value of magnitude 7.5 on the Richter scale.

- Direct economic losses (damage to buildings) estimated at \$12 billion dollars.
- Indirect economic losses of jobs and economic activity \$6 billion dollars
- Failure of many small businesses
- Loss of manufacturing capacity

- Fatalities (assuming no dam failure) 7,600
- Fatalities (assuming dam failure) 24,000
- Injuries 44,000
- Homeless 45,000
- Over 50% loss of emergency response capabilities
- Extensive damage to State owned buildings
- 25% of natural gas transmission lines disrupted for an extended period
- 50% of potable water lost, leaving 646,500 people out of water for an extended period
- Wastewater treatment services disrupted, leaving 500,000 residents without services for an extended period
- Electricity out for extended period in parts of Salt Lake County; 72 hours in parts of Davis, Utah & Weber Counties

- All petroleum products for nearly all of Utah and Idaho lost for an extended period, leaving about 2.7 million people isolated.
- Communications routing through Salt Lake County disrupted for a least 72 hours; 50 % of all telephone services out for at least a week.
- 55% of hospital beds nonfunctional
- Continuous travel of interstate highways not feasible; Davis and Weber counties cut off from Salt Lake County
- Salt Lake International Airport not operational for an extended period.
- Response to multiple hazardous material incidents overwhelmed
- 60% of television and radio facilities (buildings and transmission towers) lost for an extended period
- 65% of mortuaries rendered nonfunctional



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The Journal of Civil Defense is published quarterly by The American Civil Defense Association (TACDA) as a main vehicle for the distribution of current and reliable civil defense and disaster preparedness information and resources to our members and subscribers.

The Journal of Civil Defense presents articles that cover a wide spectrum of civil defense and disaster preparedness and mitigation issues on both the personal and the professional levels.

For more information, or to submit to the TACDA Journal of Civil Defense, email: info@TACDA.org.

Duck and Cover...

Earthquakes in 3rd world countries have resulted in massive numbers of fatalities. Most of these fatalities were a direct result from catastrophic building collapse. In the United States, however, most buildings are built to strict building codes that resist catastrophic collapse. Most of our homes are framed with wood. Wood is flexible and moves with the force of the earthquake. If the wooden building does collapse, large survival voids are created. Also, a wooden building has less concentrated, crushing weight. Un-reinforced brick buildings will break into individual bricks and cause many injuries. Concrete slabs are the most dangerous type of construction for earthquake survival.

For many years, the Federal Government has advised that the 'Duck and Cover' survival strategy be used during an earthquake. Recently, a new survival technique called 'The Triangle of Life' has emerged.

The 'Structural Engineers Association of California (SEAPC), supports the 'Duck & Cover' survival technique. They maintain that the greatest danger from earthquakes in the United States is from injury of falling hazards; such as bookshelves, filing cabinets, chimneys, and portions of ceilings, exterior facades, and window glass; not from overall building collapse. They believe the 'Triangle of Life' method puts people at greater risk for the more probable types of injuries.

On the other hand, Doug Copp, Rescue chief and Disaster Manager of the American Rescue Team International (ARTI), remains firm in his belief that the safest place to take refuge during an earthquake is in a triangular shaped area next to a large, compact object. The following is a summary of Mr. Copp's findings:

1. Most everyone who simply "ducks and covers" when buildings collapse are crushed.

2. In areas next to bulky objects, there is nearly always a small triangle of safety formed by falling walls. Look for objects that will compress slightly and curl up into a tight ball next to the object. Desks and tables are not heavy enough to carry the weight of falling walls, ceilings and other heavy objects.

3. If you are in bed during the night and an earthquake occurs, simply roll off the bed. A safe void will exist around the bed. Hotels can achieve a much greater survival rate in earthquakes, simply by posting a sign on the back of the door of every room telling occupants to lie down on the floor, next to the bottom of the bed during an earthquake.

4. Doorways are not safe. If you stand under a doorway and the doorjamb falls forward or backward you will be crushed by the ceiling above. Earthquakes can also cause the doors

or Triangle of Life

to slam against your hands.

5. Never go to the stairs. The stairs have a different "moment of frequency" (they swing separately from the main part of the building). The stairs and remainder of the building continuously bump into each other until structural failure of the stairs takes place.

6. Move near the outer walls of buildings, if possible – The closer you are to the outside wall, the greater the probability becomes that you will be rescued or that you can escape on your own. Search out good locations in your home before an earthquake occurs.

7. The victims of the San Francisco earthquake all stayed inside their vehicles and were killed from the collapse of the highway above them. They could possibly have survived by getting out and sitting or lying next to their vehicles. Most all the crushed cars formed a void 3 feet high in an area around the vehicle.

From 1990 to 2006, approximately 230,000 people have died in earthquakes in 3rd world countries. During that same period, only 68 people have died in earthquakes in the United States. Statistical information from the International Data Base http://www.em-dat.net verifies this information.

TACDA's Conclusion:

After researching the number and types of deaths in the United States from earthquakes in the last 10 years, we suggest that both the "Duck and Cover" AND the "Triangle of Life" philosophy be carefully considered when teaching earthquake survival techniques. Sixty of the 68 deaths reported in the United States in the last 12 years occurred in the California earthquake of 1994. Most of these victims were crushed inside their cars during the collapse of the Nimitz Freeway above their vehicles. Many of these crushed vehicles formed a 'Triangle of Life' area. Some of the victims may have survived if they had exited their vehicles and taken cover within that area. On the other hand, many of the injured inside buildings may have ultimately been more severely injured or even killed if they had not taken the "Duck & Cover" approach.

Many buildings and homes throughout the United States have NOT yet been retrofitted to the standards set by the (SEAOC) California Engineers. Every person should learn about the materials and construction methods used in their individual homes and work places.

Each situation must be carefully analyzed in order to determine the most effective choice. 'Study', 'Think', 'Observe' and 'Prepare' accordingly.

TACDA Journal of Civil Defense From the Past Vol. 28 Issue 2 Spring 1995



Bangkok, Thailand, Jan 17 19:00 ... I try to check in early for my midnight flight back to Japan. "Sorry, your flight may be delayed and we can't check you in yet, because of the earthquake in Japan."

I quickly find an airport CNN station and discover that early that morning Kobe suffered a "direct hit" quake and they estimate over a thousand people are dead. Japanese tourists huddle around the set, straining desperately to understand the English. Then they strain to understand my rough Japanese with pleading eyes as I translate during commercials.

Finally the flight is confirmed. They were worried about the International Kansai Airport just recently built on an artificial island in the bay off from Osaka and Kobe. They had already had trouble with it sinking more than anticipated when building it. Apparently they have had time to check out the runways and see if everything was OK.

On the flight, one returning Japanese tells me he had called all day to locate his family and finally found out they were in a school shelter. A friend is coming to the airport to pick him up with a motorcycle. There is no public land transportation yet. Other Kobe residents on the flight are hoping to take a ferry if ferries are working. In Japan: We see nothing as we approach over water from the south and land. The airport seems amazingly empty, yet the intensity of the arrivals is apparent. Two journalists search for portable phones before they leave for the quake site. Reports now are that there are 1,300 dead. Fires are still raging.

Too little, too late

The Japanese "bullet trains" aren't working yet, but other private rail companies are. I get a seat going north to my hometown, Nagoya. Changing trains in Osaka, there is more running in the normally calmly rushing crowds, more intensity. In the crowded train, a guy sits next to me who was in a hotel above Kobe and said he awoke to the tune of all the windows being broken in his hotel. He seems intensely "alive" and focused, a tragic mix of thankfulness and disbelief. Newspapers are pushing up the numbers of dead, missing and homeless with each edition.

Now, one week later, it's an immense aftershock to see that the number of dead has surpassed 5,000. Three and four days after the quake, teams from Europe and the U.S. were arriving to help search for the missing. Too little, too late. The

government is being criticized for responding to their offers too slowly and being asked what kind of special rescue teams they have of their own. Shock, concern and disbelief are giving way to anger.

Bureaucracy is apparently not an appropriate structure for reacting to emergency. Vague political talk and searching for the right signature may have costs many lives. In a country known for its natural disasters, it's volcanoes, typhoons, tidal waves, and earthquakes, it seems they would have a policy of preparing for the worst with rehearsed and automatic actions. Perhaps being forced to be without a military for 50 years has made some people "hope" that bad things just won't happen, instead of preparing for them realistically.

Bureaucratic scapegoat hunting is not what is needed now, but rather action to train a "special forces team" for natural disaster relief that would need no signatures to save lives.



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Earthquakes can occur at any time of the day or night. No one knows when the next earthquake will occur. There are many things, however, that you can do to prepare for an earthquake. Every family should have a 'plan'. Remind your parents and teachers that these plans should be practiced for a few minutes every month.

- Ask your parents to assist you in making a 'Family Plan'.
- Remind your parents to make a plan while you are on vacation together.
- Ask your teacher to help you make a plan for your school classroom.
- Ask your church leaders what plans they have if an earthquake were to occur while you were in your church service.

You can help your parents prepare for an earthquake by taking them on a 'Hazard Hunt''. Large pieces of furniture, mirrors, heavy items and water heaters should be securely tied to walls. Beds should not be placed directly under windows or heavy light fixtures. Cabinet doors should be fastened.

See how many of the following hazards you and your parents can identify in and around your home:



15

From Within the Eye of a 7.2 Earthquake

by Barbara Salsbury

This article comes from a few pages of my journal

October 17, 1989

8:30 p.m., Santa Clara, CA, approximately 10 miles from the epicenter of the Loma Prieta earthquake.

Three and a half hours into the aftermath of a 7.2 earthquake - and I'm alive to write about it in my journal. I'm writing by the light of a camping lantern. Right now, I'm sick to my stomach and still half crying. I feel like a pile of Jell-O.

Tonight, I was working in my office, preparing of all things, a presentation on emergency preparedness. Т was just completing the finishing touches when everything felt weird. I heard a dull roar and thought, "Oh no!" I jumped and ran for the doorway as the 7.2 Loma Prieta Earthquake exploded around me. I couldn't hear anything except awful. terrible the roaring. Everything was shaking so hard that it was all I could do to hang The whole house was on. shaking and ripping horribly. I could hear crashing and breaking glass. I was so frightened I can't even describe it. All I could think to do was to pray. I survived the longest 30 seconds of my life.

Survival seemed very fragile as the earth continued to rock, shudder, rumble and roll. The floor moved constantly caused my head to throb and the bile to rise in my throat. And always there was fear, - a horrible debilitating monster.



Eventually it slowed down, but it seemed it would never stop. The floor was like Jell-O, and continued to quiver. From the onset, there was no power, no phone, no communications, and darkness was setting in.

Although I knew as well as anyone what to do during an earthquake, my mind was a blank. It was so terrifying that I had to force myself to calm down and think about what I should do. First, I had to find shoes so that I could get through the rubble and broken glass. Next, I found my purse (after all, women do have priorities), and then, my batterypowered radio. I crawled over, around, and through the mess, trying to get to the front door to see if it would open, just in case I needed to get out. Then I got our 72-hour kits and put them by the front door. The house guivered continuously, and I could tell this was bad, but at that point, I didn't realize just how bad.

About 20 minutes later, as my husband somehow made it home and came through the front door, the second quake hit. The nightmare escalated. By that time my anxiety and trembling climbed to a 7.2 on the 'stress Richter scale' (the neighbors thought the shaking was just aftershocks!). We struggled through the rubble to get to our lanterns, and first-aid kits, and the other items we knew we'd need to get us through the night.

Our next step was to check on our neighbors, especially the two elderly sisters who lived alone across the street. We discovered another neighbor going house-tohouse with a wrench, tool pouch, and large flashlight to see what he could do to help his neighbors. Most of the neighbors, especially children, those with stayed outside all night, many seeking strength and support just by being together.

The points were being stressed over and over on the emergency broadcast stations that people had been forced out of their homes with nothing more than the clothes on their backs. Others were stranded miles from security or family. Still others were suffering the agony of uncertainty. In just 30 seconds, sudden reality had taken its toll.

It was unbearable to be inside with the continuous aftershocks. so we walked the neighborhood streets with a lantern. It was eerie. It was guiet in the middle of the city except for the sound of the sirens. Total darkness replaced the brightness of city lights and streetlights. About 2:00 or 3:00 a.m. we finally attempted to sleep, but every time another aftershock would hit, we would head for the doorway, not knowing how bad it was going to get. I don't think anyone in the entire Bay Area slept that night.

For the next few days, as we dug our way out of the wreckage, our battery-powered radio was our lifeline. The rest of the country knew how severe the earthquake





damage was before we did, because our local communications channels were down. Fortunately for us, our sustained only minor home structural damage; though the inside looked like, well, like it had gone through an earthquake! We were fortunate. We had our home, and we had the necessities on hand that we needed to sustain us for the next days and weeks.

Others weren't so fortunate. Many lost everything, including their homes and had to stay in evacuation shelters, or set up tents in the park. The people who stayed in parks had to rely on water wagons; standing in long lines with cups, bottles, buckets or anything they could find to carry water. Stores and gas stations were shut down for several days, and in some areas, for weeks and months. The power came on and off sporadically, so we couldn't rely on stores or gas stations to remain open. Bottled water, convenience foods and plywood became extremely scarce as stores opened occasionally and only for short periods of time. Flashlights and batteries completely disappeared off the shelves.

Being prepared did not lessen the seriousness of the calamity all around us, but at least it made it bearable. Because we were prepared, we were able to take care of ourselves and assess what we could do to help others. We were able to cope and live through the crisis.

And now the PS from Barbara:

I still become panicked for several seconds when a truck rumbles by and I forget that trucks are supposed to rumble! None of us are exempt from Mother Nature throwing a temper tantrum in our neighborhood and calling it an earthquake. The little ones – you know, the 4's or less on the Richter scale, you can usually nonchalantly identify and continue on with normal life.

But the next time a truck rumbles by, and you realize your still OK, --count your blessings and then immediately do something practical, such as making sure you have some provisions on hand that are readily accessible. Remember to balance the kinds of supplies and equipment you purchase and store. Then if your earthquake and aftermath last longer than a few hours, you will still be able to cope. If you fail to prepare, there will be total chaos and confusion. Remember one more inaredient to build into your plan: -caring. Plan to watch out for and care about those who live around you. It's not fun to go through a severe crisis, but it is much more bearable if you are not alone! And of course remember how important chocolate can be...no. is.





A Large Earthquake on the Wasatch Fault

by Sharon Packer

Nephi, Utah is a small town in Juab County about 75 miles south of Salt Lake City. Deposits of sediment, as deep as 12,000 feet, formed the fertile, flat valley, carried by tributaries entering the ancient inland sea, called Lake Bonneville. Earthquakes eventually opened a passage through which the lake drained, leaving the Great Salt Lake and other minor lakes as relics of this original inland sea. A scarp just north of Nephi, seen prominently against the mountain to the East, bears witness to the violent earthquake history of past years.

The city of Nephi lies at the base of the jagged, rocky peak of Mount Nebo, which rises to an altitude of nearly 12,000 ft. (6700 feet above the valley floor). The mountains were formed from earthquakes, forcing the valley floor gradually lower, and the mountain peaks ever higher. During the summer, thick grass provides feed for the cattle, and streams wind their way through the sleepy lush pastures. In the winter, dreaded by man and beast, the land turns cruel, and the snow piles high as it drifts on the sides of the barns and fences.

A Future Fictional Account

Inspired by Real & Possible Scenarios

Alec, nearing his 14th birthday, lay on his bed in the pre-dawn light, wishing he did not have to leave the warmth and comfort of his soft blankets. It was Jan 6, 2007, and the temperature in Nephi that day had plummeted to -10 degree F, ten degrees warmer than the -20 F record set in February of 1989. He ventured into the crisp morning to help his father feed the cattle, with cold so severe he could not breathe without covering his nose and mouth with a scarf-- strange, since the earth had just reached perihelion, its shortest distance from the sun. The night had been dark, with a new moon, which occurs when the three bodies (earth, moon and sun) line up with maximum gravitational effect.

At school that day, Alec learned that the moon not only has an affect on the tides, but that it also pulls on the solid surface of the earth. He learned that you can actually measure the tidal influence on land during the course of a day, and that in theory anyway, this slight deformation of Earth's crust could be the sufficient to trigger an earthquake. At a 'full moon' and a 'new moon', the gravitational pull from the sun moon has and maximum gravitational affect on the earth.

It was a full moon on Dec. 26, 2004 at the time of the Indian Ocean (Banda Aceh) earthquake and tsunami. He also learned that the Banda Aceh and the 1989 Newcastle earthquake events, both occurred precisely on the full and new moon, within days of the perihelion. The students were told that most experts believe this is a mere coincidence and that the National Earthquake information Center in Golden, Colorado did studies that indicate there is no lunar link to relative frequency and distribution of earthquakes as many severe earthquakes do not fall on the full or new moon.

That Alec's evening, at suggestion, his father took the opportunity to lead the family in an earthquake preparedness drill. They had previously made plans for such an event, and had equipped their underground shelter with supplies to see them through major disasters. Their father maintained that exercising the plan was part of being prepared. He reminded them of the PEP concept, "Plan, Equip and Practice". He had previously read in the 2006 fall guarter of the JCD Journal, that the noise from wind chimes placed in bedrooms, in some instances, might awaken people in time to take a defensive position against an earthquake.

Alec's account:

The night remained unusually cold and we went to bed, thankful for warm. secure homes. Our dogs had been barking all evening and the other animals seemed unusually restless. Sometime after I had fallen asleep, I was awakened by the noise of the chimes, and I felt a slight rolling motion. I immediately took a position, as I had been taught, on the floor at the end of my bed. holding on to the heavy legs of the footboard. I heard a thunderous roar, and a violent shock shook the house. The shaking continued for many minutes. It seemed it would never stop. I could hear breaking glass and falling timber. The walls and roof collapsed, but the bed held the debris away from the small, triangle of safety where I had taken refuge.



(Continued from previous page)

After the shaking stopped, I crawled from my safe location under the debris and found my way to the pre-assigned gathering spot in the yard. My entire family was there, frightened, but unhurt. We were shoeless, as there had been no time to retrieve warm clothing. We knew we could not survive the night without getting relief from the severe cold. We quickly made our way to the outside shelter door. The key had previously been placed in a secure, nearby location. We opened the door and retrieved the flashlight, where it had been placed for such an emergency. Our father went first, assisting each of us down the ladder, just as we had done in our practice My parents quietly exercises. assured my younger brother, Braye, that we were now in a safe place, as the corrugated steel shelter would move and bend with any further motion of the earth.

We had food, water, clothing, and communication capabilities and could stay in the shelter for months, if needed. The shelter always remained at a constant temperature between 45 and 65 degrees F. At 10 degrees below zero, the shelter still held the 45degree level, which gave a full 55differential from the degree extreme cold outside. As we closed the door against the frigid night, we knew the shelter would provide the security we so badly needed.

We turned on a couple of lowamperage battery powered lights and made our way to our bunks. A trickle charger was always left connected to the full bank of batteries, and the batteries had been tested on a regular basis. We donned stockings and warm hats, and the sleeping bags felt wonderful as we settled into our safe cocoons. My older sister, Hannah, brought each of us a drink of hot chocolate that she had heated on our alcohol stove, and Mom bandaged our small cuts from the medical kit that had been prepared as part of the essential shelter supplies. Father turned on the battery-powered radio and placed it near his bunk to listen for any news of the extent of the quake.

Our cousins, who lived next door, soon joined us in the shelter. Father told us that each person gives off as much heat as a 100watt light bulb, and that soon the shelter would reach a comfortable temperature.

As I drifted off to sleep I heard Uncle Bob ask Father what he could do to help. Father said, "Nothing, tonight. Let's all go to sleep and deal with it in the morning".

Utah Geological Survey

Average Repeat Time

The combined average repeat for large earthquakes time (magnitude greater than 7) on any of the five central segments (Brigham City, Weber, Salt Lake City, Provo, and Nephi segments) of the Wasatch fault zone is 350 years. The last major guakes on any of these segments, accord between 620 and 2,120 years ago. These statistics would indicate that the Wasatch fault is well overdue for a major quake.

Earthquake Probability

Based on the historical earthquake record and assuming earthquakes are random, the probability of a large earthquake somewhere in the Wasatch Front region is 25% over the next 50 years.

Reference

McCalpin, J.P., and Nishenko, Journal of Geophysical Research, February 1996.

TACDA Journal of Civil Defense™



The Mississippi Valley -"Whole Lotta Shakin' Goin' On"

http://quake.wr.usgs.gov/prepare/f actsheets/NewMadrid/

In the winter of 1811-12, the central Mississippi Valley was struck by three of the most powerful earthquakes in U.S. history. Even today, this region has more earthquakes than any other part of the United States east of the Rocky Mountains. Government agencies, universities, and private organizations are working to increase awareness of the earthquake threat and to reduce loss of life and property in future shocks.

The 400 terrified residents in the town of New Madrid (Missouri) were abruptly awakened by violent shaking and a tremendous roar. It was December 16, 1811, and a powerful earthquake had just struck. This was the first of three magnitude-8 earthquakes and thousands of aftershocks to rock the region that winter.

Survivors reported that the earthquakes caused cracks to open in the earth's surface, the ground to roll in visible waves, and large areas of land to sink or rise. The crew of the New Orleans



(Continued from previous page)

(the first steamboat on the Mississippi, which was on her maiden voyage) reported mooring to an island only to awake in the morning and find that the island had disappeared below the waters of the Mississippi River. Damage was reported as far away as Charleston, South Carolina, and Washington, D.C.

These dramatic accounts clearly show that destructive earthquakes do not happen only in the western United States. In the past 20 years, scientists have learned that strong earthquakes in the central Mississippi Valley are not freak events but have occurred repeatedly in the geologic past. The area of major earthquake activity also has frequent minor shocks and is known as the New Madrid seismic zone.



Although earthquakes in the central and eastern United States are less frequent than in the western United States, they affect much larger areas. This is shown by two areas affected by earthquakes of similar magnitude-the 1895 Charleston, Missouri, earthquake in the New Madrid seismic zone and the 1994 Northridge, California, earthquake. Red indicates minor to major damage to buildings and their contents. Yellow indicates shaking felt, but little or no damage to objects, such as dishes.

Earthquakes in the central or eastern United States affect much larger areas than earthquakes of similar magnitude in the western United States. For example, the San Francisco, California, earthquake of 1906 (magnitude 7.8) was felt 350 miles away in the middle of Nevada; whereas the New Madrid earthquake of December 1811 (magnitude 8.0) rang church bells in Boston, Massachusetts, 1,000 miles away. Differences in geology east and west of the Rocky Mountains cause this strong contrast.

The loss of life and destruction in recent earthquakes of only moderate magnitude (for example, 30 to 60 lives and \$20 billion in the 1994 magnitude-6.7 Northridge, California, earthguake; and 5,500 lives and \$100 billion damage in the 1995 magnitude-6.9 Kobe, Japan, earthquake) dramatically emphasize the need for residents of the Mississippi Valley to prepare further for an earthquake of such magnitude. Earthquakes of moderate magnitude occur much more frequently than powerful earthquakes of magnitude 8 to 9; the probability of a moderate earthquake occurring in the New Madrid seismic zone in the near future is high. Scientists estimate that the probability of a magnitude 6 to 7 earthquake occurring in this seismic zone within the next 50 years is higher than 90%. Such an earthquake could hit the Mississippi Valley at any time.

In 1811, the central Mississippi Valley was sparsely populated. Today, the region is home to millions of people, including those in the cities of St. Louis, Missouri, and Memphis, Tennessee. Adding to the danger, most structures in the region were not built to withstand earthquake shaking, as they have been in California and Japan. Moreover, earthquake preparations also have lagged far behind. Recognizing these problems, the U.S. Geological Survey (USGS) and other organizations are joining in actions that will greatly reduce loss of life and property in future temblors:



The central Mississippi Valley is the most earthquake-prone region of the United States east of the Rocky Mountains. Crosses show the locations of the many earthquakes recorded in the New Madrid seismic zone since 1974.

Strong earthquakes in the New Madrid seismic zone are certain to occur in the future. In contrast to the western United States the effects causes and of earthquakes in the central and eastern United States are just beginning to be understood. Through better understanding of earthquake hazards and through public education, earth scientists and engineers are helping to protect the citizens of all parts the United States from loss of life and property in future earthquakes.

For more information contact: U.S. Geological Survey (901) 678-2007

Center for Earthquake Research and Information at The University of Memphis - Memphis, TN 38152 http://www.ceri.memphis.edu





On June 26, 2006, President Bush signed executive order #13407, which mandates the institution of the Emergency Alert System (EAS). The purpose of this system is to alert and warn the American people to situations of war, terrorist attack, natural disaster or hazards to public safety.

To quote the order:

"It is the policy of the United States to have an effective. reliable, integrated, flexible, and comprehensive system to alert and warn the American people in situations of war. terrorist attack. natural disaster. or other hazards to public safety and well-being (public alert and warning system), taking appropriate account of the functions, capabilities, and needs of the private sector and of all levels of government in our Federal system, and to ensure that under all conditions the President can communicate with the American people."

The EAS will utilize and integrate as many communication pathways as practicable. It is TACDA's understanding that they will utilize cell phones, home phones, radios, television, amateur radios and other means.

This system has been designed to reach all levels of government as well as the private sector. including those with disabilities and limited English language skills. It will use standard terminology and operating procedures. A brief summary of the EAS executive order is shown below.

The order, among other mandates, states that the EAS will provide for:

- The assurance that the President can alert and warn the American People under all conditions
- The 'Emergency Alert System' to replace the 'Emergency Broadcast System'
- The protection, maintenance and restoration of government and private communication facilities



- The continual exercise of the EAS warning system
- Public education to the functions, access and response to the warning system
- Consultation and cooperation from government agencies with communications media organizations
- The administration of the Emergency Alert System (EAS) as a critical component of the public alert and warning system
- The Secretary of Homeland Security to issue guidance and coordination of this order with all appropriate agencies, departments, officers and commissions of the United States including the Secretary of Defense, the Secretary of Commerce, and the Federal Communications Commission
- Each of these agencies to provide development, interoperability and maintenance of this system.

We would encourage all of our readers to visit the entire order located at: http://fas.org/irp/offdocs/eo/eo-13407.htm



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ISSN# 0740-5537

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