Living on Shaky Ground

How to survive earthquakes and tsunamis in Oregon

2 WEEKS READY

Disclaimer: This document is intended to promote earthquake and tsunami readiness. It is based on the best currently available scientific, engineering, and sociological research. Following its suggestions, however, does not guarantee the safety of an individual or of a structure.

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Introduction

You can prepare for the next quake or tsunami

Some people think it is not worth preparing for an earthquake or a tsunami because whether you survive or not is up to chance. NOT SO!

Most Oregon buildings will survive even a large earthquake, and so will you, especially if you follow the simple guidelines in this handbook and start preparing today. If you know how to recognize the warning signs of a tsunami and understand what to do, you will survive that too—but you need to know what to do ahead of time.

This handbook will help you prepare for earthquakes and tsunamis in Oregon. It explains how you can prepare for, survive and recover from them. It also describes what you can do today to save lives, reduce injuries and minimize damage. Government agencies and other emergency organizations cannot protect you from the next earthquake or tsunami. Even under the best of circumstances, medical aid or fire and law enforcement officials may not be able to reach you for many hours, or even days. It is our responsibility as individuals, neighborhoods and communities to reduce risks, to prepare for the critical period immediately after the earthquake, and to make sure that planning for earthquakes and tsunamis has the high priority it deserves. By becoming informed, we can take actions to protect ourselves, reduce losses and recover quickly.

What do I do?

During an earthquake you should:

- If you are indoors, DROP and take COVER under a sturdy table or other furniture. HOLD ON to it and stay put until the shaking stops.
- Stay clear of items that can fall and injure you, such as windows, fireplaces and heavy furniture.
- Stay inside. You may be injured by breaking glass and falling objects if you run outside.
- If you are at the coast, walk to higher ground away from the ocean as soon as it is safe for you to move.
- If you are driving, move your car as far out of the normal traffic pattern as possible and stop if it is safe. Stay away from structures or objects that could fall on you, such as bridges, overpasses, light posts, power lines or trees. Stay inside your car.
- If you are in the mountains, or near unstable slopes, be alert for falling rocks, trees or landslides that could be loosened by the earthquake.

After an earthquake you should:

- EVACUATE if you are in a TSUNAMI HAZARD ZONE. Walk inland or to higher ground as soon as it is safe to do so. Do not wait for official notification. Stay away from the coast until officials permit you to return. Check for injuries. Do not move seriously-injured persons unless they are in immediate danger.
- Check for hazards such as fires, gas leaks, downed utility lines and fallen objects.
- Clean up any potentially harmful material spills. Expect aftershocks. Aftershocks following large earthquakes can be large and damaging.

Answer these questions before a disaster

During an emergency you'll need immediate answers to many questions. Here are some questions you should answer long before a disaster strikes.

Where will my family be and how will I reach them?

- Make sure your family disaster plan includes:
  - Children who may be away at school, daycare or at other activities.
  - Planning for pets or livestock if you are away from home.
  - An out-of-the area contact to convey information to other friends and family members.
- Discuss your safety and emergency plans with everyone in your family. Remember—phone systems, such as land-based and cell phones, and Internet communications may be disrupted or overwhelmed almost immediately. The road system may also be damaged making it difficult or impossible to travel.

Where will I get medical help?

- Take first aid and CPR classes to help you respond to medical emergencies.
- Plan for back-up power if members of your family require electricity for life-saving medical equipment. Remember—the 9-1-1 system will likely be overloaded or completely down, ambulances and emergency vehicles will be overwhelmed or have limited access. Some medical facilities may not be operational.

Am I prepared to live without the essentials?

- Store water at home, work and in your car because drinking water will be in short supply.
- Keep at least two weeks' worth of food and medicine on hand for everyone in your family.
- Fill up your gas tank frequently and keep it at least half full because gasoline will be scarce. Remember—utilities and water supplies may be disrupted for weeks.

How will I pay for things?

- Keep cash on hand because banks may be closed and credit cards unusable. Remember—ATMs are likely to be out of order.

How will I repair the damage to my home?

- Examine what your insurance covers and consider earthquake and/or flood insurance.
- Minimize losses by taking action to reduce your hazards. Remember—construction materials and labor for repairs will be limited and costs may increase.

Do I live, work or visit in a tsunami hazard zone?

- If you are in a tsunami hazard area, determine your evacuation routes beforehand—you may only have 10 to 20 minutes to reach a safe zone on foot after feeling a very strong earthquake at the coast.
- If you are in a safe area, typically above 100 feet above sea level, stay put. You will not have to evacuate. Remember—there will be no time for an official tsunami warning to reach you if the ground shakes and you are at the coast.

Who's going to save you?

Who can you rely on to help you after a disaster? Who will provide you with food, water, shelter and medical care? You might be surprised by the answer: You and your neighbors!

A major earthquake or tsunami will likely overwhelm local law enforcement, fire, other emergency medical personnel and resources. In fact, it may take local, state and federal agencies a week or more to provide the most basic relief. This is particularly true in the many locations on the coast and in rural areas of Oregon. Getting prepared today by identifying and mitigating hazards, readying supplies, and developing an emergency plan may make all the difference to you and your family during a disaster.

SUPPLIES FOR FOURTEEN DAYS

Oregon Office of Emergency Management recommends that you store enough food and water to survive on your own for a minimum of fourteen days.

In rural areas of Oregon, it may take even longer for assistance to reach you—plan to be on your own for at least two weeks or more.

Earthquakes

You live in earthquake country

Oregon is one of the most beautiful places in the United States to live with its high mountains, rugged coast and dramatic vistas. The geologic forces that have made it a spectacular place to live also make it one of the most earthquake-prone spots in the continental United States. Forces deep within the earth have folded and broken great slabs of the earth's outer surface to create the Coast Range and the High Cascade volcanoes.

How seriously you and your community are impacted and how quickly you recover from the next large Oregon earthquake is largely a matter of what you know and how well you prepare for the inevitable. It is your personal responsibility to get prepared and to help your family do the same. How well you prepare will directly affect the quality of life you have following the earthquake or tsunami.

Plate tectonics

If our planet were the size of an egg, the earth's outermost layer would be about as thick as the eggshell. This shell is broken into several pieces called plates, which move about as fast as your fingernails grow. A plate boundary is where one plate meets another. A triple junction is an area where three plates or plate boundaries meet.

The vast majority of the world's earthquakes occur at or near the boundaries between plates. The most seismically active plate boundaries are collision zones where one plate dives beneath an adjacent plate in a process known as subduction. Western Oregon is located on top of one of these zones known as the Cascadia Subduction Zone.

Plate motions load the faults

Where the Juan de Fuca oceanic plate and the North American continental plate meet is called a subduction zone, because the denser Juan de Fuca Plate is being pulled under North America. The Juan de Fuca Plate is moving to the northeast at about an inch a year as the North American Plate moves west. The Oregon coastline is actually bulging upward from the two plates pushing against each other.

In 1993, a series of damaging earthquakes struck Oregon. The magnitude 5.6 Scotts Mills (or Spring Break) earthquake caused over $30 million in damage in the Portland metro area. Two magnitude 6.0 earthquakes hit the Klamath Falls area that same year, causing over $10 million in damage and one fatality.

In the event of a much larger Cascadia Subduction Zone earthquake, the devastation would extend from the coast to the Cascade Range, from northern California to British Columbia. The resulting earthquake could be larger than the magnitude 8.8 earthquake and tsunami that struck Chile in February 2010.

Our faults

Faults are weak zones in the earth's crust where the rock on one side has moved relative to the other side. Some faults are vertical and the two sides move horizontally like cars on a freeway. Thrust faults slope like a ramp and the rock above the fault is pushed up and over the rock below. The largest faults on earth are thrust faults in subduction zones. An earthquake is caused when the rock, miles below the earth's surface, breaks along the fault and the two sides suddenly slip in a process called fault rupture. The larger the rupture area, the larger the earthquake. In other words, it takes a very long fault rupturing to be a large magnitude earthquake, because magnitude measures the amount of energy released when an earthquake fault ruptures.

MYTH #1: INVEST IN BEACH-FRONT PROPERTY IN IDAHO

Despite Hollywood movie special effects, large chunks of the coast do not fall into the ocean during an earthquake. Earthquakes actually help keep the land above sea level. If it weren't for the uplift associated with them, all of the continental land masses would have been leveled just about to sea level long ago. In a big Cascadia Subduction Zone earthquake, parts of the Oregon coast may drop a few feet, but other parts will be pushed upward even higher.

The two magnitude 6.0 earthquakes that hit the Klamath Falls area in 1993 are the largest earthquakes in recorded history in Oregon (since 1841). We don't seem to get a lot of large earthquakes like our neighbors to the south and actually get six times less than the state of Washington.

Not all earthquakes that affect Oregon are centered here. In 1964, the magnitude 9.2 Great Alaska Subduction Zone Earthquake generated a tsunami that caused hundreds of thousands of dollars' damage to coastal Oregon cities and killed four children at the coast.

Types of earthquakes

Offshore earthquakes

Besides great Cascadia Subduction Zone earthquakes, there are many other earthquakes offshore along the Blanco Fracture Zone and the Mendocino Triple Junction, areas adjacent to the

Juan de Fuca Plate, where two or more tectonic plates are sliding next to each other. They are usually far enough offshore that they are not felt, but every so often they are large enough to cause damage inland. The magnitude 6.5 earthquake, 33 miles off the coast of Eureka, California in January, 2010, caused more than $43 million in damage. For offshore earthquakes larger than magnitude 7.0, tsunami alerts may be issued.

Onshore earthquakes

The most damaging Oregon earthquakes in the past century were caused by shallow crustal faults onshore, and earthquakes as small as magnitude 5.0 can cause damage. Geologists think these onshore faults are capable of producing earthquakes up to about magnitude 6.5, roughly the equivalent of the earthquake that struck the Los Angeles area in 1994 that caused more then $20 billion in damage.

The Big One – The Cascadia Subduction Zone

The world's largest faults are associated with subduction zones and have produced earthquakes in the M 9+ range! The last great earthquake on the Cascadia Subduction Zone occurred in 1700, a little more than 300 years ago. Geologists have found evidence of at least 40 great Cascadia earthquakes during the past 10,000 years—and estimate they occur irregularly at intervals anywhere between 200 and 800 years. The next Cascadia earthquake may be similar to the earthquake that set off the 2004 Indian Ocean tsunami. It could cause strong ground shaking from northern California to southern Canada lasting for up to five minutes. It will also produce a tsunami that could affect not only our coast, but other countries throughout the Pacific Basin.

Most earthquake damage is caused by shaking

Damage from earthquakes is mainly due to shaking. How strongly the ground shakes in a particular location is a result of earthquake magnitude, the distance away from the earthquake source, the orientation and type of fault movement, and the type of ground material such as bedrock or soft soil. An area that did not shake strongly in one earthquake may be severely affected in another. Many areas of Oregon have experienced strong ground shaking in the past and will again in the future.

Ground shaking can cause poorly-built structures to collapse. Seismic design requirements in Oregon weren't put in place until the 1970's, so many older buildings are vulnerable to damage. The most likely result of ground shaking, however, is falling items within homes and businesses. Lights, television sets, bookshelves, cupboard contents and other objects can topple over and injure you!

Your home or business may escape major damage in the next Oregon earthquake, but downed power lines, damaged bridges and broken water lines will disrupt infrastructure and could isolate you at home, at work or in your car. The actions you take now to plan and to strengthen your home will reduce your losses.

Earthquakes also cause damage in other ways

Dam failures

Earthquake shaking and fault rupture can sometimes cause dams to fail, potentially creating catastrophic downstream flooding, reduced water supply and contamination. Having an emergency plan that deals with an upstream dam is a good idea.

Damaged infrastructure

Earthquakes often damage roads and bridges, which can hinder rescue and recovery efforts and may cause accidents. Ruptured pipelines result in water loss and can cause "sinkholes" that undermine roads and buildings.

Damage to gas and electrical systems can cause fires, as well as major service outages. Communications can also be disrupted for long periods of time.

Landslides

Earthquakes can trigger landslides that damage roads, buildings, pipelines and other infrastructure. Oregon has steep slopes underlain by loose rock that is highly susceptible to landslides. Landslides may temporarily dam rivers and cause a destructive flood hazard when the rivers break through.

Destructive fires

Earthquakes and tsunamis are often followed by fires because gas lines may break, electrical shorts cause sparks, damaged water tanks and broken pipes limit water for firefighting, and damaged roads prevent firefighter access.

Liquefaction

Strong ground shaking can cause loose soil and fill to behave like a liquid. Liquefied ground loses its strength causing slumps and fractures that can disrupt roads and cause buried gas and water lines to break. This hazard is greatest in saturated low-lying areas of loose, sandy soils or poorly compacted fill.

Surface rupture

Fault movements can break the ground surface, damaging buildings and other structures and breaking pipelines.

MYTH #2: SMALL EARTHQUAKES PREVENT BIG ONES FROM HAPPENING

Small earthquakes release very little energy compared to large ones. To equal the release of energy of an M 9.0 earthquake, we would need almost one million M 5.0 earthquakes!

Hazardous material releases

Chemicals, pesticides, and other hazardous materials can be released when industrial plants, laboratories, and other facilities are damaged in an earthquake.

Earthquake Early Warning

Earthquake early warning systems use earthquake science and the technology of monitoring systems to alert devices and people when shaking waves generated by an earthquake are expected to arrive at their location. The seconds to minutes of advance warning can allow people and systems to take actions to protect life and property from destructive shaking. The U.S. Geological Survey (USGS), in collaboration with several partners, has been working to develop an early warning system for the United States. ShakeAlert, a system currently under development, is designed to cover the west coast states of California, Oregon and Washington.

The ShakeAlert system is still under development and is still a few years from being widely accessible by the public. In the future, you will likely receive notices on your mobile device, so it is important that you know what to do. Take protective actions by doing DROP, COVER and HOLD ON until the shaking has passed. You can find more information on the USGS website, www.usgs.gov.

Thirty suggestions to make your home earthquake safe

Step 1: Identify hazards

1. Know whether you live, work or play in a tsunami hazard zone.
2. Hang plants in lightweight pots with closed hooks, well secured to a joist or stud and far away from windows.
3. Store fire extinguisher (type ABC) in easily accessible location.
4. Install strong latches on kitchen cabinets.
5. Use flexible connections where gas lines meet appliances.
6. Remove or lock refrigerator wheels, secure to studs.
7. Keep several flashlights in easily accessible places around the house.
8. Secure valuable electronics items such as computers and televisions.
9. Keep breakables in low or secure cabinets with latches.
10. Move heavy plants and other large items to floor or low shelves.
11. Hang mirrors and pictures on closed hooks.
12. Secure free-standing woodstove or fireplace insert.
13. Keep heavy unstable objects away from doors and exit routes.
14. Place bed away from windows or items that may fall.
15. Secure knick knacks and other small valuables with museum putty.
16. Brace overhead light fixtures.
17. Place only light weight/soft items over bed.
18. Secure top-heavy furniture to studs.
19. Keep wrench or turn-off tool in waterproof wrap near gas meter.
20. Know the location of your main electrical switch (fuse box or circuit breaker).
21. Secure water heater with metal straps attached to studs.
22. Trim hazardous tree limbs.

Step 2: Create a plan

23. Have your emergency plan accessible and discuss with all family members.

Step 3: Prepare disaster kits

24. Obtain a NOAA Weather Radio with the Public Alert feature to notify you of tsunamis and other hazards.
25. Keep an emergency backpack with copies of important documents near the door to grab and go.
26. Keep flashlight, slippers and gloves next to beds.
27. Keep gas tank at least half full.
28. Store emergency food and water supplies in a dry accessible area. Include first aid kit, extra cash, portable radio, extra batteries, medications and other necessary supplies.

Step 4: Strengthen your home

29. Use anchor bolts every 4 to 6 feet to secure home to foundation.
30. Reinforce brick chimneys.

Tsunamis

What is a tsunami?

A tsunami (soo-nah-me) is a series of waves or surges that is most often caused by a large earthquake offshore.

Tsunamis can cause great loss of life and property damage in coastal areas. Very large tsunamis can cause damage to coastal regions thousands of miles away from the earthquake that caused them.

Since 1854, 29 tsunamis have impacted the Oregon coast. Of these, the 1964 Great Alaska and the 2011 Tōhoku, Japan earthquakes resulted in considerable damage to ports and harbors. For example, the 1964 Alaska earthquake caused damage to communities such as Cannon Beach and Seaside, and cost the lives of four people at Beverly Beach. In 2011, the Japan tsunami caused millions of dollars in damage to several ports, including the ports of Depoe Bay, Coos Bay and Brookings harbor.

Oregon gets two kinds of tsunami - know how to correctly respond to them

Distant – caused by a large earthquake elsewhere in Pacific Ocean

- Will take hours before it arrives on the Oregon coast
- Only impacts coastline
- Tsunami Warning System effective

Local – caused by a Cascadia Subduction Zone earthquake

- Will take minutes to arrive on Oregon coast
- Earthquake shaking is your only warning
- Will impact entire Pacific Northwest

Only distant tsunamis, which take hours to arrive on Oregon's coast, will have an official warning. There isn't enough time during a local Cascadia tsunami to issue a warning. The Cascadia earthquake shaking is the only warning. You must evacuate as soon as possible!

If the earthquake lasts 20 seconds or more, has strong shaking and you are in a tsunami hazard zone, **evacuate to a safe area as soon as you can safely walk.**

How will I know if a tsunami is coming?

You may find out that a tsunami is coming in two ways:

Natural warnings (local tsunami)

- STRONG GROUND SHAKING
- A loud ocean roar
- Water receding unusually far exposing the seafloor

If you observe any of these warning signs, immediately walk to higher ground or inland. A tsunami may arrive within minutes and damaging surges may continue for eight hours or longer. Stay away from coastal areas until officials permit you to return.

Official warnings (distant tsunami)

You may be notified that a Tsunami Warning has been issued via NOAA weather radios, TV, radio stations, social media, door-to-door contact by emergency responders, or in some cases, by outdoor sirens and announcements from airplanes. Move away from the beach and seek more information without using a phone. Tune into local radio or television stations for more information. Follow the directions of emergency personnel who may ask you to evacuate low-lying coastal areas.

Go on foot. Roads and bridges may be damaged by strong ground shaking. Avoid downed power lines—some may retain a charge even when they are on the ground. If evacuation is impossible, go to the upper floor of a sturdy building or climb a tree—but only as a last resort.

Be Prepared

- Look for the blue and white tsunami evacuation signs along the coast.
- Assemble a small evacuation kit or "to go bag" (essential documents, medications, flashlight, portable NOAA weather radio and batteries, water, snack, warm clothes).
- Prepare a reunification plan with your family. Decide when and where you will meet if you are separated. Designate an out of state relative or friend for the individuals in your family to call if it is not possible to meet at your reunification spot.
- Make plans for how to address any needs or disabilities you might have.

Find out more: www.shakeout.org/california/downloads/ShakeOut_Tsunami_Drill.pdf

The seven steps for earthquake & tsunami safety

Seven steps that may save your life

Earthquakes and tsunamis are inevitable but the damage is not—even in a great earthquake on the Cascadia Subduction Zone. Most damage and loss can be reduced by steps you take before, during, and after the quakes. The following seven steps include actions to keep you and your loved ones safe, reduce potential damage, and help you to recover quickly. These steps should also be followed in schools, workplaces and other facilities. By following them, countless casualties can be avoided and millions of dollars saved.

Preparation is the key to surviving a disaster—that much is clear—but where should you start? Start by talking—talk to your family, friends, neighbors and co-workers about what you've learned in this handbook about earthquakes and tsunamis in Oregon. Then discuss what you have done to prepare and together plan your next steps.

Many people are overwhelmed by the mere prospect of a natural disaster and, as a result, don't prepare at all. Do not fall into that trap. Sit down with friends and work on an emergency kit and plan. You can start today by following these seven steps.

Visit www.earthquakecountry.org for instructions and resources.

STEP 1: Identify potential earthquake and tsunami hazards

The first step to earthquake and tsunami safety is to recognize your hazards.

Look around your home and workplace and identify objects that might fall or shift during shaking. Additional information, including how-to instructions, is available at www.shakeout.org/Oregon and from your local American Red Cross office.

Start now by identifying items that may fall, topple or slide. Secure potentially hazardous and valuable items.

Hanging objects

- Place only soft art above beds and sofas.
- Hang mirrors and pictures on closed hooks.
- Brace overhead light fixtures.

Objects on open shelves and tabletops

- Hold small valuables in place with removable putty, museum wax or quake gel.
- Add lips to shelves to prevent costly items from sliding.
- Move heavy objects and breakables to lower shelves.

Kitchens

- Install strong latches on cabinet doors.
- Secure refrigerators and major appliances.

Wood stoves

- Anchor stove feet by bolting to floor or creating brick and mortar bracing to keep stove from sliding. Note: Anchors must not conduct heat.
- Brace stove pipes.

Garages and utility rooms

- Move flammable or hazardous material to low cabinets that are securely latched.
- Ensure that items stored above or beside vehicle cannot fall.

Water and gas pipes

- Evaluate, replace and properly secure rusted or worn pipes.
- Replace rigid gas connections with flexible stainless steel gas connections.

Above ground propane tanks

- Propane tanks can be anchored by mounting the tank on a continuous concrete pad and bolting the four legs to the pad.

Water heaters

- Anchor to wall studs or masonry with metal straps and lag screws.
- Install flexible (corrugated) copper water connectors.

Home and office electronics

- Secure televisions, computers, sound systems and other electronics with flexible nylon straps and buckles.

Furniture

- Store heavy and breakable items on lower shelves.
- Secure tall furniture to wall studs with lag bolts.

Start now by determining if you live, work or play in a tsunami hazard zone

Know your risk. Use signs and maps to find out which areas are hazardous. No signs or maps for your area? Go to www.OregonTsunami.org to find a tsunami evacuation map that you can download.

STEP 2: Create a disaster preparedness plan

Will everyone in your household know what to do during the violent shaking of a strong earthquake or when a tsunami warning has been issued? Do you know how to get in touch with each other afterwards? Before the next earthquake or tsunami, talk to your family, housemates, or co-workers and plan what each person will do before, during and after an earthquake or tsunami.

After the shaking stops or the waves recede, power, utilities, communication systems and roads may be out; fires and chemical spills may occur; you may be separated from children, pets and other family members. Planning for earthquakes and tsunamis will also prepare you for other more frequent emergencies such as storms, fires and flooding.

Plan now to be safe during an earthquake

- Practice DROP, COVER and HOLD ON (see step 5, page 16).
- Identify safe spots in every room, such as under sturdy desks and tables.
- Learn how to protect yourself no matter where you are when an earthquake strikes.

Plan now to respond after an earthquake or tsunami

- Get a fire extinguisher for your home and learn how to use it properly.
- Teach everyone in your household to use emergency whistles and to knock three times repeatedly if trapped.
- Identify family members or neighbors with special needs such as medications, special diets and wheelchairs.
- Take a Red Cross First Aid and Cardiopulmonary Resuscitation (CPR) class or refresher course.
- Know the location of utility shut-offs and keep needed tools nearby. Only turn off the

gas if you smell or hear leaking gas. Only the gas company should turn the gas back on.
- Install smoke alarms and check them monthly. Change batteries once a year or whenever you hear a "chirping" sound.
- Work with your neighbors to identify people who have skills and resources useful in an emergency.
- Know the tsunami hazard zones in your community and how to get to safe areas. Recognize the natural warning signs of a tsunami—strong ground shaking, water receding unusually far, and/or a loud roar from the ocean—and make sure everyone in your family knows to immediately evacuate if they are in a hazard zone.
- Know how you may be notified if a tsunami warning is issued. Consider a NOAA Weather Radio with the Public Alert feature if you live or work in or near a tsunami hazard zone.
- If a tsunami warning is issued, get off the beach and tune in to your radio or television for further instructions on what to do.
- Is there a Community Emergency Response Team (CERT) in your area? If not, go to www.ready.gov/community-emergency-response-team and find out how to start one.

Plan now to communicate and recover after an earthquake or tsunami

- Select a safe place outside of your home to meet your family or housemates after the shaking stops.
- Identify an out-of-the area contact person to call who can relay information to other friends and family.
- Provide all family members with a current list of important contact telephone numbers.
- Determine where you might stay if your home cannot be occupied after an earthquake or tsunami.
- Ask about your children's school or day care emergency response plans. Keep emergency release information current.
- Talk to your insurance agent about your coverage for earthquake and tsunami losses.
- Make copies of important documents such as identification, deeds, insurance policies, and financial records in a secure, waterproof container. Include a household inventory of your belongings.

STEP 3: Prepare disaster supply kits

Everyone should have personal disaster supply kits. Keep them where you spend most of your time, so they can be reached even if your building is damaged or if you need to quickly evacuate out of a tsunami hazard zone. Keep one kit in your home, another in your car, and a third kit at work.

Personal/office disaster supply kit

- Medications, prescription list, copies of medical cards, doctors' names, and contact information
- Medical consent forms for dependents and copies of personal identification
- First-aid kit and handbook
- Non-latex gloves, dust masks
- Spare eyeglasses or contact lenses and cleaning solution
- Whistle (to alert rescuers to your location)
- Sturdy shoes, change of clothes, blanket
- Emergency cash (ATMs require power and might not work)
- Local road maps
- List of emergency out-of-area contact phone numbers
- Bottled water, snack foods high in water and calories
- Flashlight with extra batteries and light bulbs
- Comfort items such as games, crayons, writing materials, stuffed animals
- Toiletries and personal care supplies
- Extra keys for car, home, office, safe deposit box, etc.

Household disaster supply kit– supplies for at least fourteen days

Store in an easily accessible location, preferably outdoors, in a large watertight, easily-moved container. Replace perishable items like water, food, medications and batteries on a yearly basis.

- Water (minimum one gallon a day for each person and pet)
- Wrenches or other special tools to turn off gas and water supplies
- Work gloves and protective goggles
- Heavy duty plastic bags for waste, and to serve as tarps, rain ponchos, etc. Include duct tape.
- Portable or hand-cranked radio with extra batteries
- Additional flashlights or light sticks
- Canned and packaged food
- Charcoal or propane for outdoor cooking and matches if needed
- Cooking utensils and a manual can opener
- Pet food, pet carrier and restraints
- Comfortable, warm clothing including extra socks
- Blankets and/or sleeping bags, and perhaps a tent
- Copies of vital documents (deeds, insurance, bank accounts etc.)

Car disaster supply kit

Decide what items in your personal kit are absolute necessities and add:

- An additional 6-pack of water
- Tire repair kit, booster/jumper cables, pump and flares, white distress flag or silver space blanket
- Seasonal supplies: winter (blanket, hat, mittens, shovel, sand, chains, windshield scraper); summer (sunscreen and hat)

STEP 4: Identify potential weaknesses and begin to fix them

In **Step 1**, you learned to recognize the hazards that are easy to see such as items that can fall or slide in an earthquake and whether you are in a tsunami hazard zone. Now it is time to dig a little deeper and look at how well your building will withstand strong ground shaking, and if your community has developed the protocols that will allow it to provide tsunami warnings and guide you to safety.

Common building problems

Buildings are designed to withstand the downward pull of gravity, yet earthquakes shake a building in all directions— up and down, but most of all, from side to side. The following presents some common structural problems and how to recognize them.

Inadequate foundations

- Look under your house at your foundation. Look for bolts in the mudsills. They should be no more than six feet apart in a single story and four feet apart in a multistory building.

Unbraced cripple walls

- Homes with a crawl space should have panels of plywood connecting the studs of the short "cripple" walls.

Soft first stories

- Look for large openings in the lower floor, such as a garage door or a house built on stilts. Consult a professional to determine if your building is adequately braced.

Unreinforced masonry

- The most typical type of unreinforced masonry in Oregon is brick. While there are few brick homes in our area, many older buildings have unreinforced brick chimneys. If your house has brick or blocks as a structural element, consult a professional to find what can be done and to determine if it is safe.

If you live in a mobile home

Mobile homes can easily slide off their foundations if not properly secured to resist side to side motion. Look under your home—if you only see a metal or wood "skirt" on the outside with concrete blocks or steel tripods/jacks supporting your home, you need to have an "earthquake resistant bracing system" (ERBS) installed.

For those who rent

As a renter, you have less control over the structural integrity of your building, but you do control which apartment or house you rent.

When looking for housing, remember:

- Apartment buildings have to meet the same codes and structural requirements as houses.
- Avoid rental units made of unreinforced masonry or those with "tuck-under" parking spaces on the ground floor.
- Consider the safety of attached structures such as stairways and balconies, which can break during an earthquake.

Ask your landlord these questions:

- What retrofitting has been done on this building?
- Has the water heater been strapped to the wall studs?
- May I secure furniture to the walls?

Tsunamis

Does your community:

- Have plans to notify you if a tsunami warning is issued?
- Have a designated evacuation zone and posted tsunami hazard signs?
- Practice evacuation drills?
- Conduct tsunami education and awareness campaigns?

Your community does all of the above and more if it has been recognized by the National Weather Service as TsunamiReady. The TsunamiReady program sets guidelines for adequate tsunami readiness, including the ability to receive and send out tsunami warnings, designation of tsunami hazard zones and evacuation routes, and outreach programs that address both natural and official warnings.

Find out if your community is recognized as TsunamiReady at www.weather.gov/TsunamiReady. If it isn't, find out what you can do to encourage your community to gain this recognition.

Special considerations

Children

Earthquakes and tsunamis may be traumatic events for all of us. They are especially frightening for children who may not understand such events and feel anxious and confused. After an earthquake, a child fears reoccurrence and injuries, and being separated from other family members. Seeing a parent or other adult become frightened adds to a child's anxiety. Repeated aftershocks can increase these fears. You can help to alleviate your child's fears before the next earthquake.

- Talk with children about what might happen during an earthquake or tsunami. Let them ask questions.
- Involve children in reducing hazards, putting together an earthquake kit, and in developing an earthquake plan. Include emergency information in your child's backpack. Practice family earthquake drills.

TIP: A SPACE BLANKET NOT ONLY KEEPS YOU WARM AND DRY, ITS REFLECTIVE SURFACE CAN BE USED TO SIGNAL FOR HELP.

After the earthquake

- Keep the family together.
- Reassure children.
- Encourage children to talk or draw pictures about their experience.
- Include children in earthquake cleanup and safety activities whenever possible and age appropriate.
- Take particular care at bedtime. Children may have difficulty sleeping, may wake up frequently, and/or have nightmares for weeks or months afterwards. Allowing a child to share a room with another child or parents may alleviate these fears.

Fragile, elderly and disabled

Persons with any special considerations need to take extra precautions.

- Realistically assess your own special needs and those of family members and write them down. Include medications and special equipment such as ventilators and oxygen tanks.
- Keep medications, duplicate prescriptions, glasses, and any special equipment in a safe place where they can be easily reached.
- Keep a notebook, pencils, a whistle and flashlight in several locations if you have difficulty in communicating.
- Include supplies for seeing eye, hearing or companion dogs.

During and after an earthquake

- If you are in a wheelchair, lock the wheels of the chair once you are in a safe and protected position.
- If unable to move safely and quickly, stay where you are, even in bed, and cover your head and body with your arms, pillows and blankets.
- Use your whistle to call for help and signal others if you need it. To find out more about how children and adults react to emergencies and how you can help, contact your local mental health department.

Pets and Livestock

Don't forget your pets in your earthquake and tsunami plan.

- Include extra pet food and medications in your disaster kits.
- Consider implanting your pet with an identification microchip so that if you and your pet are separated, you can be easily reunited.
- Many emergency shelters don't allow pets. Prepare a list of family, friends and other locations that could shelter your pets in an emergency. Emergency preparedness is particularly important for livestock owners because of their food and shelter needs, and difficulties in transporting large or numerous animals.
- Make sure every animal has durable and visible identification.
- Identify alternate water and power sources. A generator with a safely stored supply of fuel may be essential if you have electrical equipment necessary to the well-being of your animals.
- If you use heat lamps or other electrical machinery, make sure the wiring is safe and that any heat source is clear of flammable debris.

Strengthening your "pier and post" foundation

"Pier and post" or "post and beam" foundations consist of wooden posts on isolated concrete footings, which support the entire structure. Many homes in rural Oregon use this foundation system. This type is particularly vulnerable to the strong side-to-side shaking from earthquakes. There is no question that the best foundation to resist earthquake shaking is a continuous perimeter foundation, but for many Oregon residents, the cost of installing such a foundation is prohibitive.

It is possible, however, to strengthen your pier and post foundation at relatively low cost. The bracing system will increase resistance to lateral forces for your home. The bracing should be installed around the perimeter of the structure and, at a minimum, every second line of interior posts. This type of strengthening should be considered adequate for short term stabilization until you are able to install a permanent, concrete, perimeter system.

Find out more at www.earthquakecountry.org.

STEP 5: protect yourself during an earthquake – drop, cover and hold on

INDOORS

Drop, cover and hold on:

- Drop down to the floor and take cover under a sturdy desk, table or other furniture.
- Hold on to the table or desk and be prepared to move with it. Hold the position until the ground stops shaking and it is safe to move.

If there is no nearby table or desk:

- Sit on the floor against an inside wall, away from windows, tall furniture or bookcases.
- Protect your head and neck with your arms.
- If you are elderly or have mobility impairment, remain where you are, bracing yourself in place.
- Avoid exterior walls, windows, hanging objects, mirrors, tall furniture, large appliances, and cabinets with heavy objects or glass.

DO NOT GO OUTSIDE WHILE THE GROUND IS SHAKING!

In bed

- If you are in bed, stay there, hold on and protect your head with a pillow.

In a multistory building

- Drop, cover and hold on. Do not use elevators. Do not be surprised if sprinkler systems or fire alarms activate.

If you are outside

- Move to a clear area if you can safely do so. Avoid power lines, trees, signs, buildings, vehicles and other hazards.

Driving

- Pull over to the side of the road, stop and set the parking brake. Avoid overpasses, bridges, power lines, signs and other hazards. Stay inside the vehicle until the shaking is over. If power lines fall on your vehicle, stay inside until a trained person removes them.

If you are in a theater or stadium

- Stay at your seat. Duck down and protect your head and neck with your arms. If you can't duck under the seat, at least put your head and upper body under the seat. Don't try to leave until the shaking stops. Then exit slowly, watching for fallen debris or for anything that could fall on you in the aftershocks. Stay calm and encourage others to do likewise.

If you are in the mountains

- Avoid unstable slopes or cliffs, and watch for falling rock and debris.

Step 6: Evacuate if necessary – check for injuries and damage

The previous steps have concentrated on getting ready for the next earthquake or tsunami. What should you do while the ground is shaking?

Evacuate if you are in a tsunami hazard zone

For a large local earthquake, feeling strong ground shaking may be the only warning you will get that a tsunami is on its way. Use tsunami hazard maps and posted hazard zone signs to identify safe evacuation areas (Step 1). Refer to page 8 for more information about tsunamis.

Do not wait for an official warning.

MYTH #3: THE "TRIANGLE OF LIFE" IS THE BEST WAY TO PROTECT YOURSELF INSIDE A BUILDING

NOT TRUE. The best survival method inside a building is to drop, cover and hold on. The Triangle of Life advocates that you get next to a large object rather than crouch beneath a desk or table. This will expose you to lacerations and crushing injuries from falling objects and debris. Almost all scientific, government and relief organizations, including the Red Cross, have examined the Triangle of Life and are unanimous in recommending that you DROP, COVER and HOLD ON. Find out more at www.earthquakecountry.org/dropcoverholdon.

If you are at the beach

- Move to higher ground immediately– no matter how small the earthquake.

If you are in a tsunami hazard zone and the earthquake is very strong

- Immediately gather your family members, grab your tsunami disaster kit, and WALK to a safe area.

If evacuation is impossible

- Go to the upper floor of a sturdy building or climb a tree. THIS SHOULD ONLY BE A LAST RESORT.

If you are not in a tsunami hazard zone

- STAY WHERE YOU ARE. YOU ARE NOT AT RISK OF A TSUNAMI. Unnecessary evacuation will put you at risk and hamper the evacuation of people who really need to get away from danger.

Check for injuries

Once you are in a safe area, check for injuries and damage. First take care of your own situation—check yourself for injuries so you can help others. Aftershocks may cause additional damage, so get to a safe location and take your disaster supply kit with you. Once you are safe, help others and check for damage. Protect yourself by wearing sturdy shoes and work gloves to avoid injury from broken glass and debris. Wear a dust mask and eye protection if you have them.

If you are trapped under debris, protect your mouth, nose and eyes from dust. If you are bleeding, put pressure on the wound and elevate the injured part. Signal for help with your emergency whistle, a cell phone, or tap on pipe or wall, three times every few minutes, to help rescuers locate you. Don't shout—shouting will wear you out and can cause you to inhale dangerous amounts of dust.

- Use your first-aid kit or the front pages of your telephone book for detailed instructions on first-aid measures such as stopping bleeding, rescue breathing and CPR (cardiopulmonary resuscitation).
- Do not move seriously-injured persons unless they are in immediate danger of further injuries.
- Cover injured persons with blankets or additional clothing to keep them warm.

Check for damage

Fire

- If possible, put out small fires in your home or neighborhood immediately. Call for help, but don't wait for the fire department.

Gas leaks

- Shut off the main gas valve only if a leak is suspected or identified by the odor of natural gas. Wait for the utility company to turn it back on once the damage is repaired.

Damaged electrical wiring

- Shut off power at the breaker box. Leave the power off until damage is repaired.

Unplug broken lights and appliances

- They could cause fires when power is restored.

Downed power lines

- Consider all downed lines as potentially hazardous and stay well away from them. Never touch downed lines or any objects in contact with them even if you think they may be dead.

Fallen items

- Beware of items tumbling off shelves when you open closet and cupboard doors. Wear gloves before handling broken items. Replace your telephone on its receiver. Telephones off the hook tie up the telephone network.

Spills

- Clean up any spilled medicines, drugs or other non-toxic substances. Potentially harmful materials such as bleach, lye, paint, garden chemicals and gasoline should be isolated or covered with an absorbent such as dirt or cat litter. When in doubt, leave your home.

Downed or damaged chimneys

- Stay away from chimneys and walls made of brick. They may be weakened and could topple during an aftershock. Don't use a fireplace until it is inspected by an expert – it could start a fire or let poisonous gases into your home.

STEP 7: When safe, continue to follow your disaster preparedness plan

Tsunamis

Stay away from the coast until officials reopen the area for you to return.

- The first surge is almost never the largest. The largest waves may arrive hours after the first.
- Successive surges will arrive at irregular intervals spaced minutes to tens of minutes apart. The danger period may last eight hours or longer.
- Never go to the coast to watch a tsunami. Tsunamis move faster than a person can run. Incoming traffic hampers safe and timely evacuation of coastal areas.

Be in communication

Listen to your NOAA Weather Radio for updates on the hazard and for instructions on what to do.

Earthquakes

You may be safest staying in your home even if the power is off and some items have been damaged. Shelters may be overcrowded and initially lack many services. Use the information you put together in your disaster plan and the supplies you organized in your disaster kits.

- Do not use open flames (candles, matches, lighters or grills) or operate any device that could generate a spark such as light switches, generators and motor vehicles until you are sure there are no gas leaks.
- Never use a camp stove, gas lantern or heater, gas or charcoal grill, or gas generator indoors.

Be in communication

- Use your portable, car or NOAA Weather Radio for updates and safety advisories. Scan channels to find one that is on air and broadcasting safety information.
- Call your out-of-area contact and tell them your status, then stay off the phone. Emergency responders need the phone lines for life-saving communications.
- Check on the condition of your neighbors.

Food and water

- If the power is off, plan meals to use up refrigerated and frozen foods first. With the door closed, food in the freezer may last several days.
- If your water is off or unsafe, you can drink from water heaters, melted ice cubes or canned vegetables. Avoid drinking water from swimming pools or spas.
- Do not eat or drink anything from open containers that are near shattered glass.

The first weeks after the earthquake

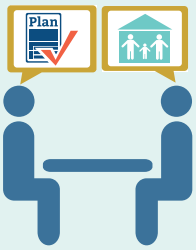
This is a time of transition. Aftershocks may continue for many months, but it is time to work toward getting your life, your home and family, and your routines back in order. Emotional care and recovery are just as important as healing physical injuries and rebuilding a home.

- Make sure your home is safe to occupy and not in danger of collapse in an aftershock.
- If your gas was turned off, you will need to arrange for the gas company to turn it back on.
- If the electricity went off and came back on, check your appliances and electronic equipment for damage.

The first few hours and days after an earthquake or tsunami

Once you have met your and your family's immediate needs, continue to follow the plan you prepared (see Step 2, page 11).

- If water lines broke, look for water damage.
- Have a professional inspect your fireplace or wood burning stove before you use them after an earthquake. The damage may not be easy to see and could cause a chimney fire or poisonous gas release.
- Locate and/or replace critical documents that may have been misplaced, damaged or destroyed.
- Contact your insurance agent right away to begin your claims process. Take pictures of the damage of your building and its contents.



TIP: JOIN A COMMUNITY EMERGENCY RESPONSE TEAM (CERT)

CERT programs will educate you about the hazards in your area and will train you in basic disaster response skills. Contact your local American Red Cross office to find out about CERT teams in your area or go to www.ready.gov/community-emergency-response-team. This training is free, and provided locally. The training is a standard curriculum and is updated with local information regularly.

If you cannot stay in your home

If your home is in a tsunami hazard zone, is structurally unsafe, or threatened by a fire or other hazard, you need to evacuate.

If you evacuate, tell a neighbor and your out-of-area contact where you are going.

Set up an alternative mailing address with the post office as soon as possible. Take the following, if possible, when you evacuate:

- Personal disaster supply kits
- Supply of food, water, and snacks
- Blanket/pillow/air mattress or sleeping pad
- Change of clothing and a jacket
- Towel and washcloth
- Comfort items such as family pictures, games, books
- Personal identification and copies of household and health insurance information
- Special needs items such as medicines, eyewear, infant supplies (diapers, bottles, baby food), and supplies for elderly and disabled persons

Do not take to a shelter

- Pets—have a plan for your pets in advance (service animals for people with disabilities are allowed but you must bring food for them)
- Large quantities of unnecessary clothing or other personal items—space is very limited
- Valuables that might be lost, stolen, or take up needed space

If a major disaster has been declared by the president, the Federal Emergency Management Agency (FEMA) may activate the Individuals and Households Program. This program may include home-repair cash grants, rental assistance and/or temporary housing. These amounts are generally quite small and do not come close to meeting all of the costs and needs.

Find out more by visiting www.ready.gov.

The seven steps for earthquake and tsunami safety summary

Tear off this page and put it on your refrigerator, bulletin board or other prominent place.

1. Identify potential hazards
- Identify items that may fall, topple, or slide
- Secure potentially hazardous and valuable items
- Determine if you live, work or play in a tsunami hazard zone

2. Create a disaster preparedness plan
- Practice Drop, Cover and Hold drills
- Collect critical supplies
- Choose a meeting place and an out-of-area contact
- Recognize the natural and official warnings of a tsunami and know how to respond

3. Prepare disaster kits
- Create kits for home, work and car
- Be prepared to be isolated for at least two weeks

4. Identify weaknesses
- Identify weaknesses in your building and fix them
- Contact your local government and find out what tsunami plans are in your community

5. Protect yourself during an earthquake
- Drop to the floor
- Take cover under a sturdy table or desk
- Hold on until the shaking stops

6. Evacuate if necessary, check for injuries and damage
- If you are in a tsunami hazard zone, immediately walk to higher ground or inland away from coast
- Check for injuries and damage

7. Follow your plan
- If you evacuated coastal areas—stay away until officials permit you to return
- Be in communication—use your radio for information
- Expect aftershocks—some may be large enough to do additional damage

Important information

Out-of-area contact name:		
Email:		Phone:
Neighborhood meeting place:		
Regional meeting place:		
Doctor/office:		
Account no.:		Phone:
Medical insurance:		
Policy no.:		Phone:
Pharmacist:		
Account no.:		Phone:
Rx no.:	Rx no.:	Rx no.:
Home/rental insurance:		
Policy no.:		Phone:
Veterinarian/kennel:		
Account no.:		Phone:

Oregon Office of Emergency Management

www.oregon.gov/OEM

Oregon Department of Geology and Mineral industries

www.OregonGeology.org

www.OregonTsunami.org

US Geological Survey Earthquake Preparedness

earthquake.usgs.gov/learn/preparedness.php

National Tsunami Warning Center

www.tsunami.gov