

# EARTHQUAKE PREPAREDNESS *in the* NORTHWEST

## HOMEOWNER GUIDE



Image source: FEMA

Published April 1, 2016

Understand the risks

Protect your home

Keep your family safe

# WHAT'S THE RISK IN THE NORTHWEST?

“Our operating assumption is that everything west of Interstate 5 will be toast.”

-Kenneth Murphy, FEMA Regional Administrator  
quoted in *The New Yorker*, July 20, 2015

You’ve heard about it on the news, in movies, and on your social media newsfeed...they all say “the big one” is coming. But what really is the risk?

Much of Oregon and Washington sit in the Cascadia Subduction Zone (CSZ), a 600-mile stretch along the west coast between Vancouver Island, British Columbia and Cape Mendocino, California. Along the subduction zone, two sections of the earth’s crust, called tectonic plates, collide, with one plate sliding (subducting) beneath the other. This motion builds tension over time, which occasionally releases as a major earthquake. Over the past 10,000 years, 19 quakes around magnitude 9 have occurred, with an average recurrence every 234 years. Evidence confirms that an 8 or 9 magnitude earthquake last occurred in the CSZ on January 27, 1700. Three hundred and sixteen years later, **we could be due any day now.**

Oregon and Washington also have many other faults that pose a risk. Faults run directly beneath Portland, which could lead to magnitude 6.5 or higher quakes. The Seattle Fault runs under Puget Sound and Seattle, and in 2001 the Nisqually Earthquake caused property damage and 400 injuries.

High-magnitude earthquakes in other regions of the world show evidence of the damage that could very likely become a reality in our own neighborhoods here in the Northwest.



Seattle. Source: FEMA



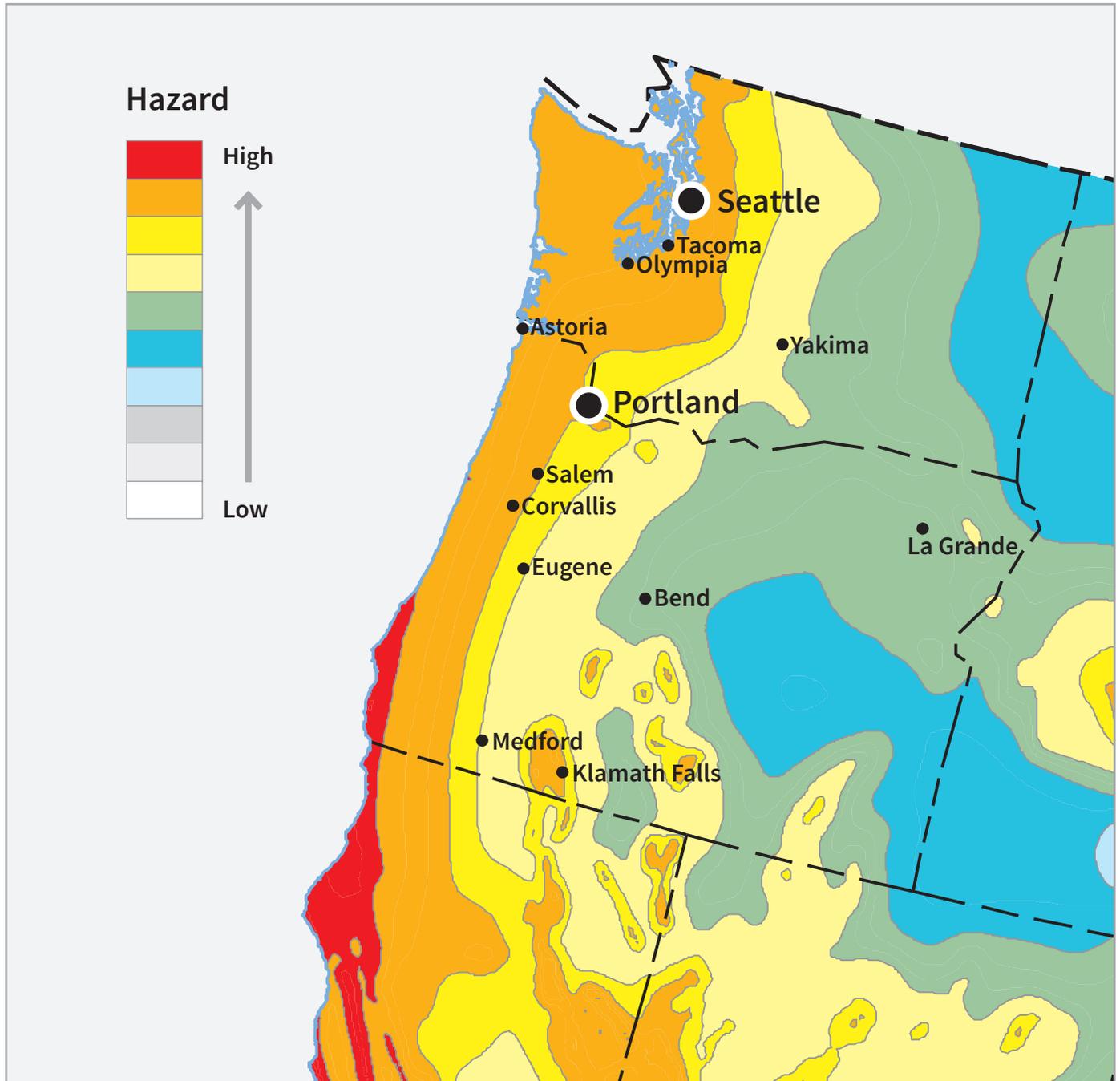
Northridge, Calif. Source: FEMA



Northridge, Calif. Source: FEMA

# Hazard maps

Hazard maps show which regions would be hit the hardest during an earthquake. Coastal Oregon, most of western Washington (including the Puget Sound region and Olympic Peninsula), Portland metro, and parts of southern Oregon are most at risk. Oregon residents can see more specific views with an interactive tool called Aftershock ([opb.org/news/widget/aftershock-find-your-cascadia-earthquake-story](https://www.opb.org/news/widget/aftershock-find-your-cascadia-earthquake-story)) that helps you “find your Cascadia quake story.” Simply type in your address and learn the expected intensity, recovery timeline, and more based on your precise location in Oregon.



Source: USGS

# WHAT CAN I DO?

The threat of an earthquake is very real, and while scary to imagine the worst, there are many things you can do to plan ahead.



## 1. MAKE A PLAN

A plan helps all family members know what to do during and after a major earthquake. Plan how to reach one another, where to meet, and where to find crucial supplies.

Consider key components for a plan:

1. **Educate and prepare** - Teach your family members about ways to be prepared, whether at home, at school, or at work. Keep a pair of shoes and a flashlight by everyone's bed, and hold an emergency drill every few months to practice enacting the whole plan. Make an at-home emergency kit (list featured below) and keep it in a spot everyone knows.
2. **Choose a meeting place** - Choose a safe spot near your home where the family can regroup together after evacuating, or where you can meet up again if you are separated during the earthquake.
3. **Discuss communication and recovery** - Consider how you will communicate after the earthquake, especially in the event that phone service is down. Cell towers may be tied up locally, so appoint an out-of-town relative or friend who everyone in your household can contact.
4. **Remember your pets!** - Not all emergency shelters accept pets, so identify where they can go if your home is unsafe. Create pet emergency kits (see next section).

### Useful Resources

#### Red Cross Earthquake Preparedness

[redcross.org/prepare/disaster/earthquake](https://www.redcross.org/prepare/disaster/earthquake)

#### A Northwest Earthquake Survival Guide

[portlandoregon.gov/pbem/article/504516](https://portlandoregon.gov/pbem/article/504516)

## 2. ASSEMBLE YOUR KITS

### At-home emergency kit checklist

In the event an earthquake strikes, a well-stocked emergency kit will provide necessities you may need to survive before help arrives or until you are able to evacuate.

- Water:** one gallon of water per person per day for at least seven days, for drinking & sanitation
- Food:** at least a seven-day supply of non-perishable food such as canned food, and protein rich foods like nuts and energy bars
- Pet supplies:** food and water
- Battery-powered or hand crank radio** and a NOAA weather radio with tone alert and extra batteries for both - see [nws.noaa.gov/nwr/info/nwrrcvr.html](https://www.nws.noaa.gov/nwr/info/nwrrcvr.html)
- Flashlights:** with extra batteries
- First aid kit:** remember any necessary medications, baby formula and diapers if you have a small child
- Medications:** 7-day supply and other medical items
- Whistle:** to signal for help
- Dust mask, plastic sheeting and duct tape:** to help filter contaminated air and to make shelter
- Moist towelettes, garbage bags, plastic ties, personal hygiene items** for personal sanitation
- Tools:** wrench or pliers to turn off utilities, wood saw to cut limbs or branches for firewood, a stout, sharp knife, and 300 feet of strong cord
- Fire starting materials:** Zippo style or “light in any weather” lighters, battery & steel wool, flint and striker
- Manual can opener** for food
- Maps, paper and pencil**
- Cell phone** with chargers, inverter or solar charger
- Family and emergency contact info** (laminates to protect against moisture and wear)
- Copies of personal documents:** medication list, pertinent medical info, proof of address, deed/lease to home, passports, birth certificates, insurance policies
- Extra cash**

Once you have assembled the basics, you may want to enhance the kit with additional items, based on medical conditions and other specific needs for you and your family. Find those suggestions at [ready.gov/kit](https://www.ready.gov/kit).

## Car emergency kit checklist

Why a car kit? In the event your home becomes unsafe, or you are stranded away from home, you may have to travel to emergency shelters or stay with friends or family in another city.

- Jumper cables:** include flares or reflective triangle
- Flashlights:** with extra batteries
- First aid kit:** remember any necessary medications, baby formula and diapers if you have a small child
- Food:** non-perishable food such as canned food, and protein rich foods like nuts and energy bars
- Manual can opener** for food
- Water:** at least 1 gallon of water per person a day for at least 3 days
- Tools:** pliers, wrench, screwdriver, wire saw to cut limbs or branches for firewood, a stout, sharp knife, and 300 feet of strong cord
- Fire starting materials:** Zippo style or “light in any weather” lighters, battery & steel wool, flint and striker
- Maps, paper and pencil**
- Pet supplies:** food and water
- Radio:** battery or hand cranked
- Cat litter or sand:** for better tire traction
- Shovel:** for clearing debris from roadway and freeing vehicle stuck in debris or damaged roads
- Ice scraper**
- Clothes:** warm clothes, gloves, hat, sturdy boots, jacket and an extra change of clothes for the cold
- Blankets** or sleeping bags
- Charged Cell Phone:** and car charger

Be sure to keep your car serviced, running well, and with a full tank of gas in case you need to evacuate quickly.

Looking for a pre-assembled kit? Check out what you can order online from the Red Cross at [redcrossstore.org/category/id/1](https://redcrossstore.org/category/id/1).

## Kits for public transportation, bikes and foot travel

Homeowners without cars will need to make other evacuation arrangements, and car owners should consider alternatives as roads may be impassible. Public transportation may be unavailable until roads and railways are repaired. You might choose to evacuate by bike or even on foot, allowing you to maneuver around debris and past slow-moving traffic.

### Grab-and-go bag

Whether you're able to evacuate by transit, by bike or even on foot, each family member should carry a mobile "grab and go" bag with basic supplies.

- Water and food** for three days if possible (pack high-calorie, ready-to-eat foods such as energy bars and nuts - canned food may be too heavy and bulky)
- Water filter** and/or purification tablets
- Fire starting materials:** "light in any weather" lighter, battery & steel wool, flint and striker
- Small first aid kit:** remember any necessary medications, baby formula and diapers if you have a small child
- Clothing:** warm hat, gloves, emergency blanket, socks, dust masks
- Maps, paper and pencil**
- Flashlight:** with extra batteries
- Personal hygiene items**
- Small radio:** battery or hand cranked
- Charged cell phone** and charger
- Contact information:** On paper, family and emergency contact info
- Copies of personal documents:** medication list, pertinent medical info, proof of address, deed/lease to home, passports, birth certificates, insurance policies
- Extra cash**

### Bicycle checklist

- Rack and bags:** with grab-and-go bag contents. A backpack can work in a pinch.
- Puncture-resistant tires,** patch kit and portable pump
- Basic tools:** a bike-specific tool set, available at most bike shops
- Lights:** Look for bright lights with at least 850 lumen output. Buy lights with removable batteries and carry extras, or if you have lights with integrated batteries, choose those lasting at least several hours on a charge and keep them fully charged.
- Trailer:** to carry supplies, children and pets, and even injured people.

## Pet preparedness kits

Furry family members will need their own emergency preparedness kits - **DoveLewis Emergency Animal Hospital** makes the following recommendations.

- 3-7 days' worth of canned (pop-top) or dry food
- Disposable litter trays
- Litter or paper toweling
- Liquid dish soap and disinfectant
- Disposable garbage bags for clean-up
- Pet feeding dishes
- Extra collar or harness as well as an extra leash
- Bottled water, at least 7 days' worth for each pet
- A traveling bag, crate or sturdy carrier, one for each pet
- Flashlight
- Blanket (for scooping up a fearful pet)
- Pillowcase or Evacsack [evacpet.com](http://evacpet.com)
- Toys and treats
- Photocopies of medical records and current prescriptions in a waterproof container
- A two-week supply of any medicine your pet requires and appropriate administration devices
- Recent photos of your pets (in case you are separated and need to make "Lost" posters)

Find more information about preparing your pets from DoveLewis at [dovelewis.org/pdf/pet-health/emergency-preparedness\\_quick-reference.pdf](http://dovelewis.org/pdf/pet-health/emergency-preparedness_quick-reference.pdf).

## 3. ASSESS & RETROFIT YOUR HOME

### Earthquakes and your home

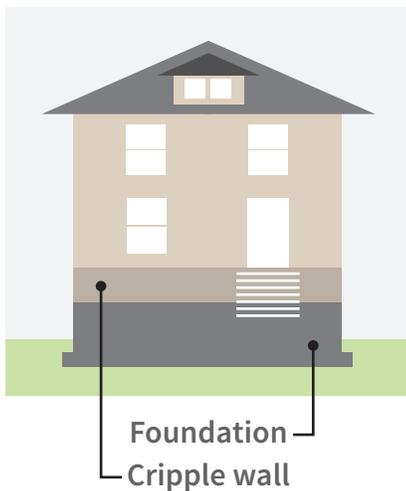
Earthquake damage to houses can range from minor to complete destruction. Many factors are at play, like the intensity of the earthquake and where it originated, soil conditions, and the house design.

In general, earthquakes can affect your home in two ways. Side to side forces, also called shear or lateral forces, can cause the house to tilt or slide off the foundation. Upward forces, or uplift, can cause the house to overturn.

#### Why does damage happen?

- The house is not bolted down. In many cases, a lack of secure attachment to the foundation is the most important factor.
- The “cripple walls” between the foundation and first floor are unreinforced.
- Weak connection points exist elsewhere in the structure.
- Rooms are built over porches or garages, without sufficient reinforcement.

#### Common failure points



#### Useful resources

##### Residential Seismic Strengthening - City of Portland

[portlandoregon.gov/bds/53562](https://portlandoregon.gov/bds/53562)

##### Earthquake Home Retrofit Handbook - City of Seattle

[seattle.gov/dpd/cs/groups/pan/@pan/documents/web\\_informational/p2191421.pdf](https://seattle.gov/dpd/cs/groups/pan/@pan/documents/web_informational/p2191421.pdf)

# Does your house need retrofitting?

While you may be able to answer some basic questions yourself, a seismic professional will deliver a comprehensive in-home assessment. Seismic building codes were enacted in 1974 in Oregon and 1980 in Washington. If your home was built before those years, it's unlikely built to withstand earthquakes.

Other factors influencing seismic readiness of your home may include:



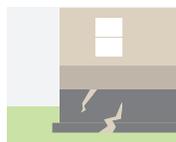
**Configuration:** Rooms built over garages or porches are vulnerable to collapse.



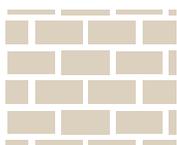
**Number of floors:** Houses over three stories present additional challenges.



**Slope:** Steeper slopes present challenges that may require custom engineering.



**Foundation:** Cracked or crumbling concrete, or foundations made of brick or concrete blocks may increase risk of damage.



**Wall materials:** Homes made of masonry may be more difficult to reinforce than those framed in wood.



## Professional assessment

While a self-assessment can help you get started, only evaluation by a trained seismic professional will produce a list of specific recommendations to safeguard your home.

In some areas, Enhabit offers professional assessment and retrofit services performed by carefully-selected contractors.

[enhabit.org/seismic](https://enhabit.org/seismic)

# Retrofitting your home

Seismic retrofits vary in complexity and cost. The first step is to get an evaluation by a seismic contractor to find out what upgrades will provide the most effective protection for your home.

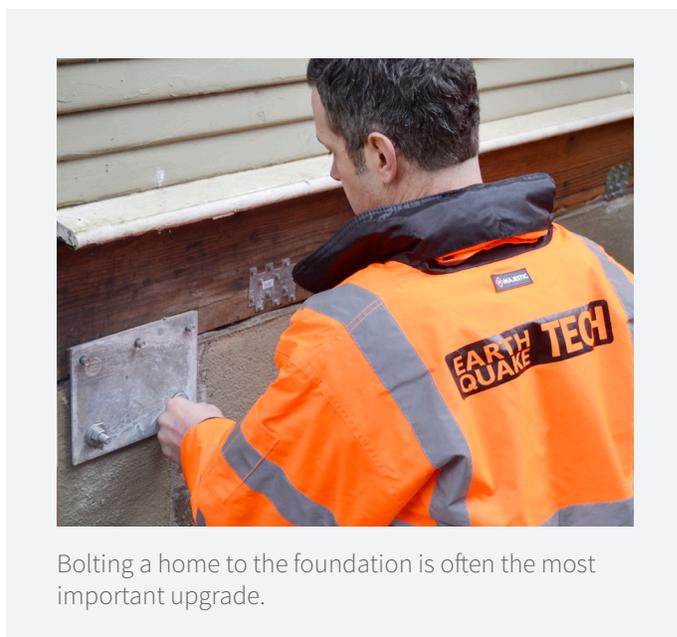
Upgrades typically fall into one of two categories:

1. **Prescriptive path:** For suitable homes with strong foundations and meeting other criteria, this path includes upgrades such as braced walls, sheathing, and bolting the home to the foundation.
2. **Engineered path:** For homes with weak foundations, on steep slopes, or otherwise are ineligible for the prescriptive path, a licensed engineer will design a solution.

Note that both paths usually require a building permit. Upon successful inspection, the home may become eligible for earthquake insurance.\*

## Costs of a seismic retrofit

Seismic retrofits vary in cost, ranging from around \$3,000 to \$8,000 for prescriptive path retrofits. The cost for engineered path upgrades are generally more expensive, but vary significantly depending on the complexity of the design.



## \*About earthquake insurance

Earthquake insurance covers direct loss to property. However, it's not included in most homeowner policies, which means you need to purchase it separately. The best time to buy is before the earthquake has happened! Some insurers place a hold on selling coverage for a period of time after a seismic event.

The cost of earthquake insurance varies based on the type of house, its age, the nature of the soil, and its proximity to fault lines. Older homes often cost more to insure, and in some cases, they may need a retrofit before they can qualify for coverage.

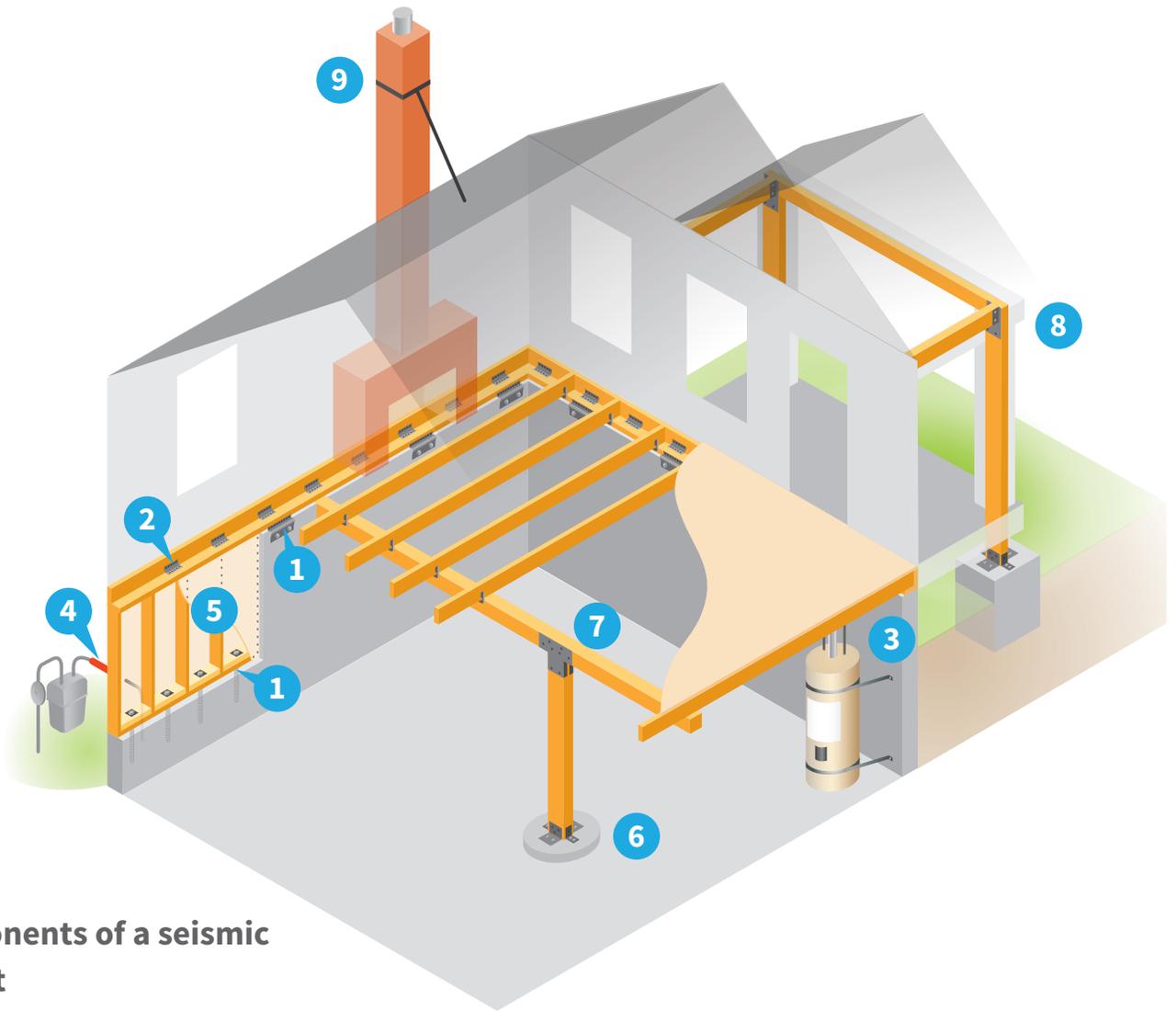
### Oregon information:

[oregon.gov/DCBS/Insurance/gethelp/homeowner/Pages/earthquake.aspx](https://www.oregon.gov/DCBS/Insurance/gethelp/homeowner/Pages/earthquake.aspx)

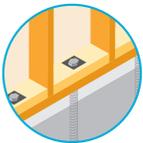
### Washington information:

[insurance.wa.gov/your-insurance/home-insurance/earthquake/](https://insurance.wa.gov/your-insurance/home-insurance/earthquake/)

Talk to your insurance agent to find out which coverage may be available for your home.

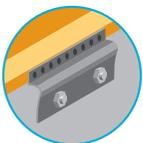


## Components of a seismic retrofit

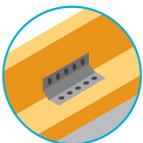


### 1. Foundation anchors

Connect the wall to the foundation; keep house in place. **Vertical bolts** are used where space allows

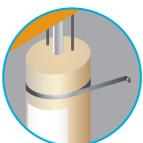


**Foundation plates with horizontal bolts** are used where space does not permit vertical bolts (see p. 12)



### 2. Framing anchors

Attach rim joist to mud sills and floor joist to mud sills (see p. 12)



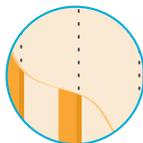
### 3. Water heater

Strapping prevents heater falling and causing water damage; can be emergency drinking water source



### 4. Gas valve

Automatic emergency shutoff valve reduces risk of fires



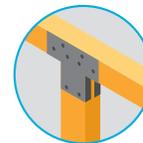
### 5. Shear wall

New plywood added to basement wood frame “cripple wall” protects against side-to-side movement



### 6. Masonry

Footers and basement walls made of concrete, brick or stone may need evaluation and reinforcement or replacement



### 7. Post and beam

Reinforcement brackets add resistance to side-to-side motion



### 8. Porch

Strengthening adds new posts and beams inside historic box beams and hollow columns

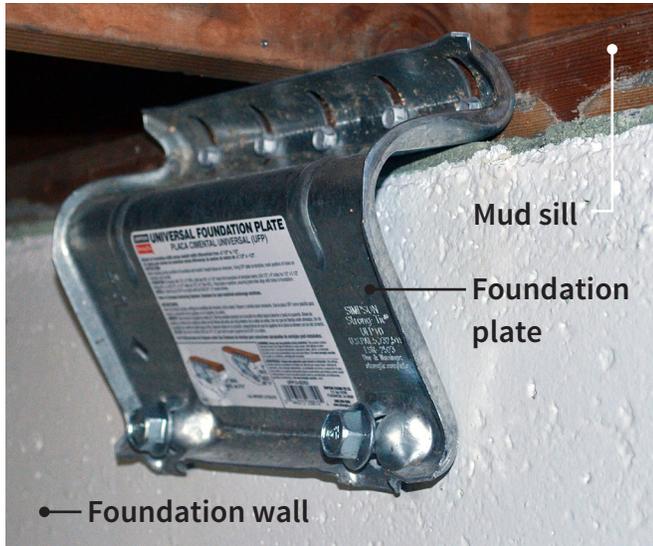


### 9. Chimney

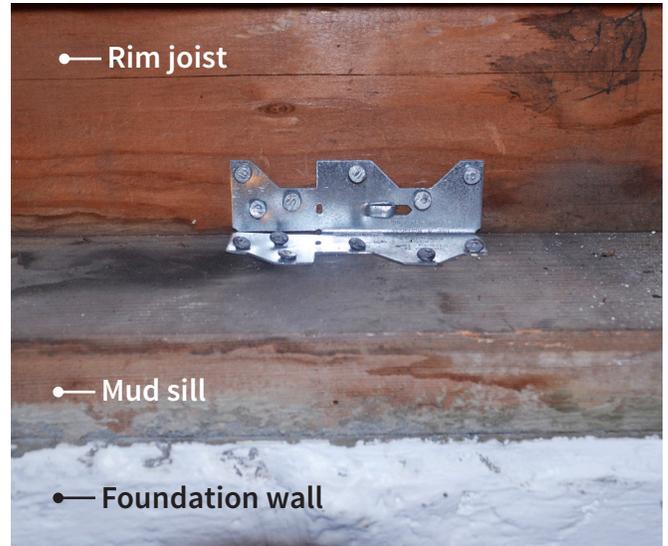
Bracing or removal reduces risk of chimney collapse, injury to occupants and damage to structure

# Two ways to bolt down the house

## 1. Interior option - for unfinished basements and crawlspaces

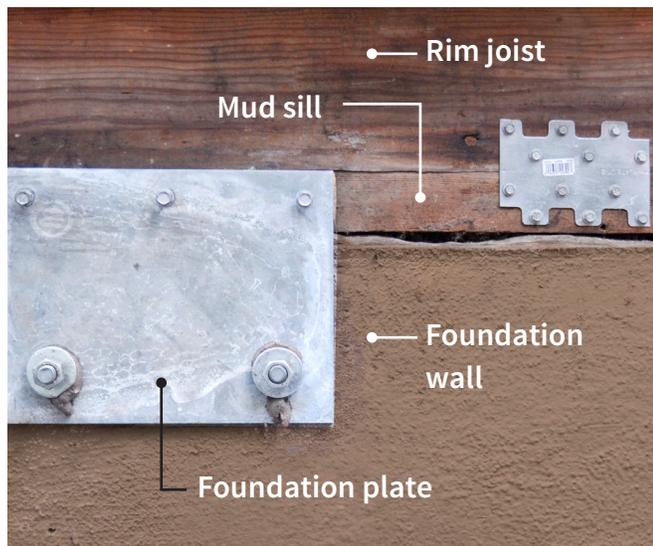


**Foundation plate:** In crawlspaces and unfinished basements, installation of plates like this one connect the wood structure to the foundation.



**Framing angles and other hardware:** Strengthen connections between frame components.

## 2. Exterior option - minimizes disruption to finished basements



Exterior plate and bracket retrofit in progress. This is a good option with finished basements because it does not require removal and replacement of drywall.



Exterior plate after completion and painting. The plates extend only a few inches below siding and are very inconspicuous.

# RESOURCES

Read about additional preparation ideas, along with enhanced education on earthquake danger for you and your family.

## General preparedness

### **American Red Cross Earthquake Preparedness**

[redcross.org/prepare/disaster/earthquake](https://www.redcross.org/prepare/disaster/earthquake) The Red Cross offers emergency kit lists, facts, tips for before, during, and after a quake, planning ideas, and even an online store that sells pre-made emergency kits, emergency blankets, flashlights, radios etc.

### **Ready.gov Earthquake Preparedness**

[ready.gov/earthquakes](https://www.ready.gov/earthquakes) Tips for before, during, and after an earthquake, emergency kit lists, and other information to help you make a plan.

### **FEMA Earthquake Preparedness**

[fema.gov/earthquake](https://www.fema.gov/earthquake) Find earthquake records and tracking, hazard maps, fact sheets and more all provided in one central location.

### **Oregon Public Broadcasting’s “Unprepared” Series**

[opb.org/news/series/unprepared](https://www.opb.org/news/series/unprepared) A collection of stories highlighted by OPB documenting the “Living Off Your Quake Kit” weekend, tips for disaster planning with disabilities, general earthquake prep, and more.

### **Oregon Public Broadcasting’s “Preparing Your Home for a Megaquake”**

[opb.org/news/series/unprepared/food-and-water-are-second-to-safety-after-a-megaquake/](https://www.opb.org/news/series/unprepared/food-and-water-are-second-to-safety-after-a-megaquake/) What do you need to know as a homeowner? Be sure to learn all of the essential steps to protect your biggest investment—your home.

### **Oregon Public Broadcasting’s “How to Safely Turn Off Utilities After a Disaster”**

[opb.org/news/series/unprepared/how-to-safely-turn-off-utilities-after-a-disaster/](https://www.opb.org/news/series/unprepared/how-to-safely-turn-off-utilities-after-a-disaster/)

Natural gas, water, and electricity can be a source of serious threats to health and well-being in the event of an earthquake. Be sure to educate yourself for how to turn utilities off.

### **Your Bike – the coolest part of your disaster kit**

<http://blog.sfgate.com/bicycle/2011/04/08/your-bike-the-coolest-part-of-your-disaster-kit/> A compelling case for using bikes for transportation after a disaster, with lessons from Japan and Hurricane Katrina.

## Retrofitting your home

### **Residential Seismic Strengthening - City of Portland**

[portlandoregon.gov/bds/53562](https://www.portlandoregon.gov/bds/53562) Detailed information specific to Portland for assessing, permitting and upgrading a home.

### **City of Seattle Earthquake Home Retrofit Handbook**

[seattle.gov/dpd/cs/groups/pan/@pan/documents/web\\_informational/p2191421.pdf](https://www.seattle.gov/dpd/cs/groups/pan/@pan/documents/web_informational/p2191421.pdf)

Detailed information about home retrofitting requirements and permits.

(Continues on next page)



# Local resources

## **Oregon Public Broadcasting’s Aftershock Tool**

[opb.org/aftershock](http://opb.org/aftershock) Type in your address to discover the expected intensity of a 9.0 magnitude earthquake in your neighborhood, a projected timeline for community recovery and more.

## **A Northwest Earthquake Survival Guide (Portland Monthly)**

[portlandoregon.gov/pbem/article/504516](http://portlandoregon.gov/pbem/article/504516) A comprehensive guide educating Portland-Metro residents about how to prepare, as well as details about the damage and aftermath. This is a must-read, especially if you live in the City of Portland!

## **Portland Neighborhood Emergency Teams**

[portlandoregon.gov/pbem/58587](http://portlandoregon.gov/pbem/58587) Neighborhood Emergency Teams (NETs) are all over the city of Portland. Members of the community get trained by trained by Portland Bureau of Emergency Management and Portland Fire & Rescue to provide emergency disaster assistance within their own neighborhoods.

## **Portland and bikes when disaster strikes**

<http://bikeportland.org/2011/05/13/portland-and-bikes-when-disaster-strikes-52933> A thought-provoking 2011 interview with Joe Partridge, former Multnomah County Deputy for Planning and Preparedness

## **Oregon earthquake insurance policies\***

[oregon.gov/DCBS/insurance/gethelp/homeowner/Pages/earthquake.aspx](http://oregon.gov/DCBS/insurance/gethelp/homeowner/Pages/earthquake.aspx) Information about earthquake insurance policies from Oregon.gov.

## **Washington insurance policies\***

[insurance.wa.gov/your-insurance/home-insurance/earthquake/](http://insurance.wa.gov/your-insurance/home-insurance/earthquake/) What to expect from insurers, from the office of the Washington Insurance Commissioner.

## **Seattle Times “Get ready to rumble” Guide**

[seattletimes.com/seattle-news/get-ready-to-rumble-a-guide-to-earthquake-preparedness](http://seattletimes.com/seattle-news/get-ready-to-rumble-a-guide-to-earthquake-preparedness) This article includes tips for planning and recovery, plus a link to a downloadable quick reference guide to print and post in your home.

## **City of Seattle Emergency Management - Prepare Yourself**

[seattle.gov/emergency-management/preparedness/prepare-yourself](http://seattle.gov/emergency-management/preparedness/prepare-yourself) General emergency preparedness, including special considerations for people with impaired hearing, vision, or mobility, and seniors.

## **City of Seattle - “Prepare Your Home”**

[seattle.gov/emergency-management/preparedness/prepare-your-home](http://seattle.gov/emergency-management/preparedness/prepare-your-home) includes a link to Seattle-area seismic contractors.

\*Consult your insurance agent for further information regarding your home’s eligibility for earthquake insurance.