

## The Problem

Houses that are not bolted to the foundation can move off their foundations during earthquakes.

## How to Identify

- ✓ Go down into the crawl space – the area between the first floor and the foundation – to find out if your house is bolted to its foundation.
- ✓ Look for the heads of anchor bolts that fasten the sill plate – the wooden board that sits directly on top of the foundation – securely to the foundation. (See Figure 11a, page 8)
- ✓ You should be able to see the large nuts, washers, and anchor bolts, installed at least every 4 to 6 feet along the sill plate. Steel plates are sometimes used instead of anchor bolts. (See Figure 11b, page 8)

## Remember

- It is very expensive to lift a house, and place it back on its foundation.
- Homes moving off their foundations can cause gas lines to rupture, which in turn can result in fires.



Office of Emergency Services

**Figure 10** - This home wasn't bolted and slid off its foundation. Sometimes the damage can be so bad that houses have to be demolished.

*If your home has no foundation, or an old concrete foundation, see page 23.*

## Slab Foundations

Some homes are built directly on concrete slabs. These houses do not have crawl spaces and foundation walls.

Nearly all homes with slab foundations that were originally built to code will have anchor bolts or straps.

However, if the house is not bolted to the slab, you have an earthquake weakness.

Newer homes generally have anchor bolts or straps.

If you have an unfinished garage, you may be able to see the anchor bolts.

You are not required to remove siding, drywall, or plaster to determine if your house has anchor bolts.

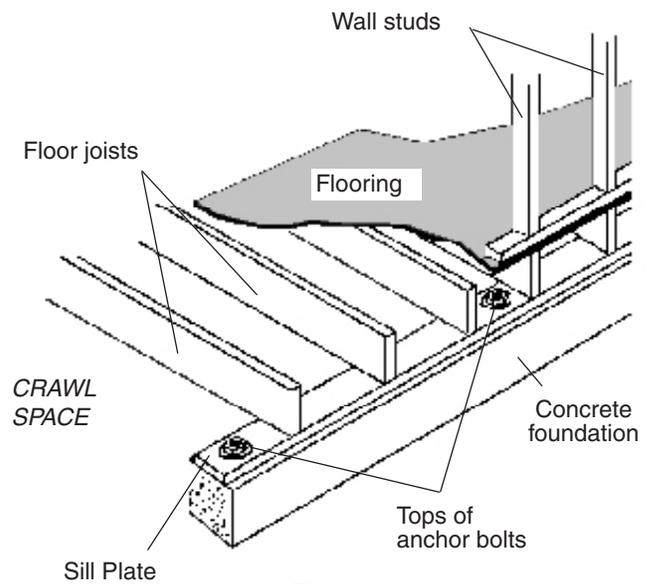
**The Solution**

Drill holes through the sill plate into the foundation and install anchor bolts. (See *Figure 11a*)

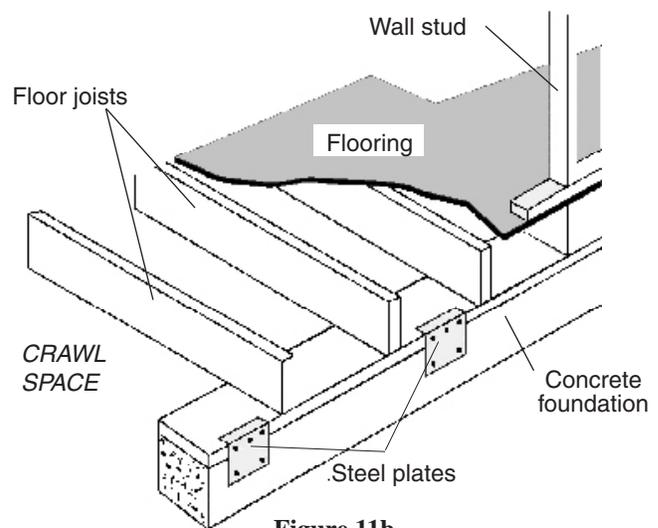
If there is not enough room to drill, you can attach steel plates to hold the sill plate to the foundation. (See *Figure 11b*)

Anchor bolts have to be installed properly for them to be effective.

You must obtain the proper permits from your local Building Department before beginning work.



**Figure 11a**



**Figure 11b**

**Figure 11 - Anchor bolts or steel plates.** A home’s crawl space may be formed by a wood stud wall (see next page for description) between the foundation and the floor joists or the floor joists may rest directly on the sill plate. In either case, you should be able to see the heads of anchor bolts or steel plates installed at appropriate intervals. These fixtures fasten the sill plate to the foundation.

**How-to Resources**

- Detailed information for do-it-yourselfers or engineers can be found in the [International Existing Building Code](#), published by the International Code Council.
- Go to [www.fema.gov](http://www.fema.gov), and under the Earthquake section, search for “Strengthen Foundation Walls” for specific anchoring instructions.

**Comparison of Cost: Preventing vs. Repairing Earthquake Damage**

Project Cost	Cost to Repair After an Earthquake
\$250 to \$5,000	\$25,000 to total value of home (if completely destroyed)