

# Earthquake Weaknesses

## EARTHQUAKE WEAKNESS

## Walls Poorly Anchored to Floors and Roofs

### The Problem

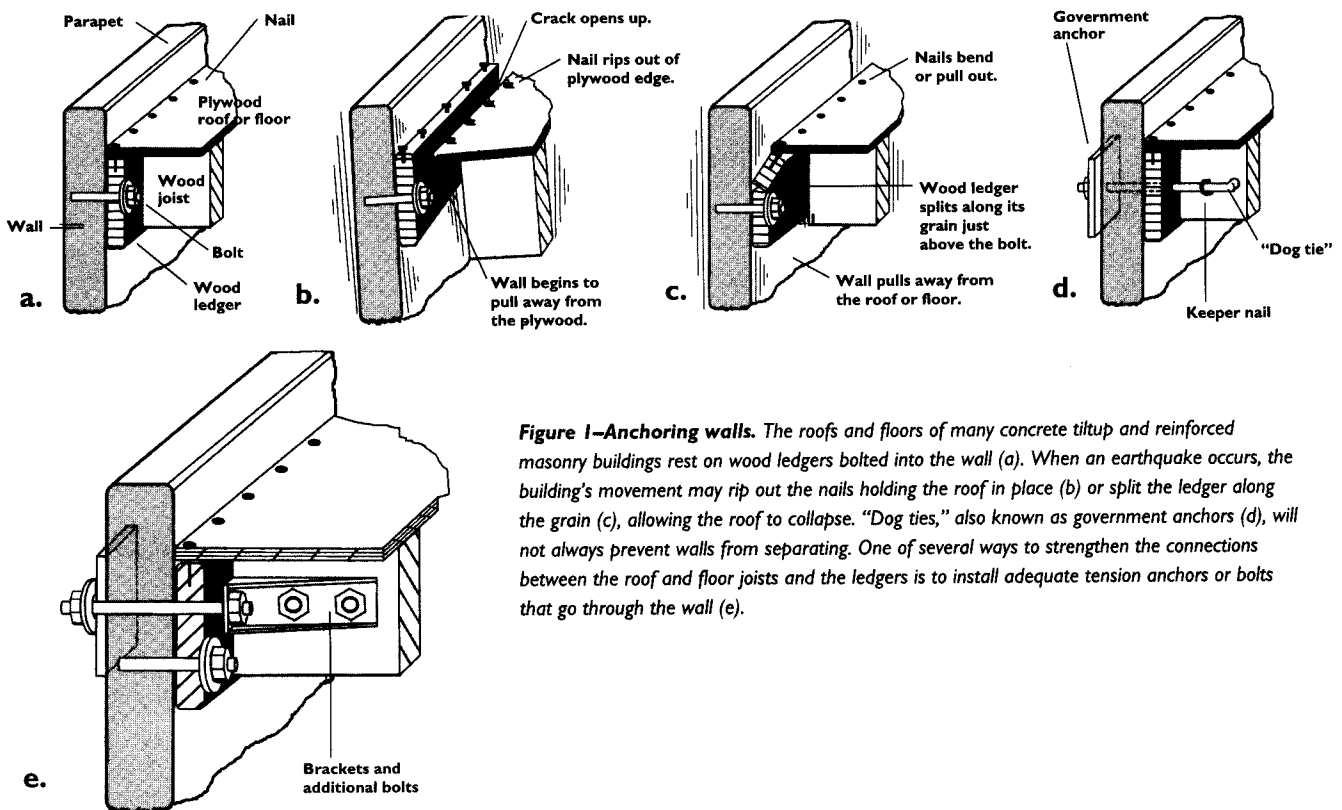
When earthquakes shake the ground, the various parts of buildings may move in different directions. If the connections (anchorage) between the walls, wood floors, and roof are weak, concrete or reinforced masonry walls can pull away (see figure 1: a, b, c) and the building, or a portion of it, may collapse. Until the mid-1970s, the *Uniform Building Code* did not require new buildings to have wall anchorage that was adequate to prevent separation between the walls and the roof.

### How to Identify It

Check buildings with precast (tiltup) concrete or reinforced masonry walls that were built before 1975 for wall anchorage. The Northridge earthquake showed that some of the types of anchorages installed even after 1975 were not adequate to support the walls. It is a good idea to check all anchorages to post-Northridge standards. Poor wall anchorage is also common in unreinforced masonry buildings.

### What Can Be Done

Contractors can add new anchorage on the roof or inside, above the ceiling (see figure 1e), at relatively low cost. If you suspect your building has poor wall anchorage, consider hiring a qualified engineer or architect to determine the most cost-effective way to strengthen it. A good time to check and fix wall anchorage is when you replace or patch your roof.



**Figure 1—Anchoring walls.** The roofs and floors of many concrete tiltup and reinforced masonry buildings rest on wood ledgers bolted into the wall (a). When an earthquake occurs, the building's movement may rip out the nails holding the roof in place (b) or split the ledger along the grain (c), allowing the roof to collapse. "Dog ties," also known as government anchors (d), will not always prevent walls from separating. One of several ways to strengthen the connections between the roof and floor joists and the ledgers is to install adequate tension anchors or bolts that go through the wall (e).