

Not My Fault: Preparing your house for an earthquake starts with a good foundation

Lori Dengler/For the Times-Standard
Posted September 12, 2019

Our son recently bought a house in Arcata. Built in 1893 almost entirely out of old growth redwood, it's been a rental for as long as the neighbors can remember. To say it needs a little work is an understatement. By the time the renovation is done, every surface will have been worked on.

Where to start? At the bottom of course. A home is only as good as its foundation, the structure's link between the ground and everything above it. Its purpose is to provide a stable platform on which to build and to transfer the weight of the building evenly so it doesn't tilt or collapse. Most of the time, a structure is only subjected to the vertical forces of gravity. Gravity is relatively easy to deal with. The force is constant and straight down.

But earthquakes and other events such as floods, tsunamis and hurricanes subject a structure to side-to-side or lateral forces that push first one way and then another. The rules of the stability game quickly change and inertia, the tendency of an object to stay where it is, quickly becomes the enemy. The ground suddenly jerks to the left or right and the heavy home wants to stay where it was. Unless the structure is tied to a strong foundation, the ground moves right out from under it. Weak foundations are more prone to failure the longer the shaking lasts as each successive wave yanks the building in a different way.

The simplest foundations are padstones. These flattened rocks were leveled and wooden beams placed atop them to provide the building surface. The Odd Fellows Building in Crescent City, built in the late 1800s, sat atop 40 stones arranged in four rows. This worked just fine until the 1964 tsunami floated the building about 15 feet away. It was old growth redwood too, very strong and suffered almost no damage but sadly, was within the Army Corps of Engineers redevelopment zone. The owners were faced with the choice of building a foundation and bringing it up to code on their own dime or abandoning it to the Corps and getting current market value for it.

I'm not aware of any remaining padstone structures on the North Coast. Today's homes are of three general foundation types. Newer homes are built on reinforced concrete slabs or perimeter foundations and, if up to code, include bolts that firmly tie the house and foundation together. Many older homes have post and pier (or pier and beam) foundations – with a set of concrete piers set into the ground and posts attached to them that the house is built upon. It is the least expensive type of foundation but performs poorly in strong shaking. Each of the dozen or more supporting piers may move independently because they experience different forces and aren't firmly tied to each other. The result may be collapse.

My son's house was built on post and piers. So the first order of business was a new foundation. Several acquaintances asked me why bother. This house had survived at least five strong North Coast earthquakes and a new foundation is a pricey undertaking. I gnash my teeth when someone gives me the "survived past earthquakes" line. Each earthquake is unique in ground motion and surviving one quake is no guarantee of making it through the next one. For most people, a home is their biggest investment and for me, resilience to strong shaking is essential to peace of mind.

The 1992 Cape Mendocino earthquake brought home the lesson of poor foundations and earthquakes. More than 200 homes in the Rio Dell, Ferndale and Petrolia areas parted ways with their foundations during the earthquake and suffered significant damage. There were multiple ways of failure. Some, like the Odd Fellows Hall, had never been secured to foundations and simply flew off. Others had weak cripple walls (the short wood stud walls that enclose the crawl space beneath the first floor) and keeled over like a house of cards.

The job of repairing many of these homes fell to George Kurwitz, a Eureka-based engineering contractor who has specialized in foundations for decades and made restoring old buildings an art form. We featured slides of his 1992 retrofit work in our 25-year retrospective of the earthquake. So when the question of foundation work came up, George was the person to talk to. Fortunately we were able to squeeze into his schedule.

The best option for post and pier structures is to jack the home up just high enough so that a perimeter foundation can be built beneath it. For a small simple rectangular house like Peter's, it's a fairly straightforward process. More complex shapes and homes with multiple additions pose bigger challenges. George is a master at figuring

out how to hoist a structure without damage and to brace it so that it people can safely work beneath it. George has experienced at least one Humboldt earthquake while underneath such a house.

Redoing a foundation is not a do-it-yourself project. It requires expertise and a permit from either the city or the county. It is in the government's interest to encourage the retrofiting of foundations. The July 5th M 7.1 Searles Valley earthquake was a case in point. Damage to structures in Ridgecrest where most homes are built to recent code requirements was minimal compared to damage in Trona where many structures were older and were inadequately secured to foundations. Less damage means a quicker recovery. Every planning/building department should go out of their way to facilitate foundation upgrades. The California Building Code even has provisions to avoid costly engineering and soils studies for most situations.

The new foundation beneath my son's house makes me smile whenever I see it. It now stands a much better chance of making it through another 116 years in good shape.

Note: Listen to Troy Nicolini's Community Comment about foundations on KINS at

<https://www.kins1063.com/troy-nicolini-cc090219/>

Lori Dengler is an emeritus professor of geology at Humboldt State University, an expert in tsunami and earthquake hazards. Questions or comments about this column, or want a free copy of the preparedness magazine "Living on Shaky Ground"? Leave a message at (707) 826-6019 or email Kamome@humboldt.edu

<https://www.times-standard.com/2019/09/12/lori-dengler-prepping-your-house-for-a-quake-starts-with-a-good-foundation/>