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TEARDOWN DIARY

Living on Shaky Ground

Columnist Considers Earthquake Safety Measures as She Rebuilds Her Home in Portland, Ore.

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Given the recent spate of news about natural disasters – earthquakes, cyclones, hurricanes, wildfires and floods – it is surprising how little new home builders discuss the subject of protecting houses against potential acts of nature.

In the almost weekly meetings we had over the past year with our architect and the innumerable discussions with our contractor, the topic of how we might safeguard against natural disasters never came up.

It is true that I tend to be overly cautious – or anxious, if you believe my husband. But it is hardly unjustified: Over the past 28 years there have been 78 weather-related disasters in the U.S., from floods to tornados, in which overall damages and costs reached or exceeded \$1 billion each. In 2007 alone there were over \$10 billion in such damages.


Many safety measures aren't excessively expensive. Even existing homeowners who have no intention of building or remodeling can retrofit a house to be safer.

Since we live in Portland, earthquakes are our biggest concern. According to the United States Geological Survey, which has a good [map](#)¹ rating earthquake risk for every state, Portland falls in the red, or high risk, zone, along with the rest of the West Coast from Seattle down through Southern California.

Our house was designed to conform to local and national building codes for an earthquake-prone area. But our architect says that we could raise the level of earthquake resistance by modifying the foundation connections and providing more than the minimum of shear wall locations, walls composed of braced panels – or extra wood and nails for extra support. That could add another \$10,000 or so on to the overall cost. My husband and I will decide if we want to take this step over the next few weeks before framing starts.

The cost may seem steep, but fully retrofitting a house for earthquake resistance – putting in the extra measures after a house is finished – can run between \$40,000 and \$60,000, says John Hopper, director of earthquake engineering for Seattle engineering firm Magnusson Klemencic Associates. And few insurance companies will provide earthquake coverage – those that do charge a premium. To add earthquake insurance to our policy would more than double our insurance payment per year. If we add in the extra resistance measures we would forgo the extra

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cost.

About 10 years ago the Federal Emergency Management Agency launched a campaign to get people living in houses built before 1960 to retrofit their homes – but very few people actually went ahead with that, says Mr. Hopper, who estimates it was less than 10% in the high-risk zones. Retrofitting can involve as little as bolting down walls to the foundation and adding sheathing to the lowest levels of wood walls to making a house fully earthquake proof by stripping off the entire exterior of the house and the roof, and replacing them with stronger materials.

Some communities – like the Association of Bay Area Governments – have lists of [contractors with seismic retrofitting experience](#)². The association warns against contractors who might recommend expensive, unnecessary services. For example, the association says the need to replace bolts due to 'rust' is highly unlikely.

Since most damage from an earthquake results from stuff in the house flying around, interior design choices can also be made with the risk in mind. Taking this into consideration, we have chosen built-in bookshelves and cabinets, made sure hanging light fixtures were adequately secured and will anchor all the appliances to the wall or floor. Any appliance connected to a gas pipe will have bendable tubing.

New earthquake resistant materials and techniques are popping up thanks to research -- but they are still in the early stages and are aimed at commercial buildings. The University of Michigan came up with "[bendable](#)" [cement](#)³ that's 500 times more resistant to cracking and 40 percent lighter than regular concrete. The University of Leeds' NanoManufacturing Institute (NMI) is developing special walls for the house that contain nano polymer particles that turn to liquid when squeezed under pressure, flow into the cracks, and then harden to form a solid material. And engineers at Penn State have designed windows and walls with glass panels that don't touch the corners of the frames, thus preventing breakage when shaken by an earthquake.

Our architect says his biggest concern, in regard to earthquakes, is not the house, but a landslide from the hillside behind us. It is a little harder to protect a house from that potential disaster. But there are some things we can do, like making sure we don't exacerbate the slope by digging in too high, putting in proper drainage and maybe even building a retaining wall at the bottom of the hill. We'll probably do this, though we won't make that decision for a few months.

GDC Construction in La Jolla, Calif. – prime territory for landslides – says overwatering your yard can cause landslides. They recommend using drought-resistant plants (like ornamental grasses) to reduce over-watering. We'll definitely do this, though that will really only make a difference in the summer when it isn't rainy season.

Fire is also an issue, since our house backs up to a forest. Beyond the obvious – like installing a sprinkler system – we kept that possibility in mind. We decided to go with a slate roof rather than wood shake. However, we just learned that our insurer, Geico, won't give earthquake insurance to homeowner's with slate roofs. I may try and convince my husband that asphalt works as a compromise.

The likelihood of a natural disaster is small. But, like having an emergency kit with water, a medical supplies and canned food, preparing for the worst makes sense.

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