Quake Warning System Promises to Help Cut Casualties, Damages

Two scientists reported today developing a new early warning system for earthquakes that could have given downtown Los Angeles 12 seconds to stop elevators, cut off gas and get people under desks before heavy shaking began during the 1994 Northridge quake.

That warning period would be enough in their view to result in a material reduction in loss of life and damage from a big temblor.

However, fully testing, funding and building systems to deliver the warnings and make some action automatic would take at least several years.

The early warning system is described in an article appearing today in the journal Science. It is based on just one or two seconds of technical analysis of the first weak P, or primary, waves of a quake. The P waves serve as a precursor to severe shaking from stronger S, or secondary, waves, which come seconds later in any large temblor.

This is the first time that earthquake scientists have said they were able to learn enough from the initial waves to tell how big the quake would be. Until now, they have been unable to divine the eventual power of a temblor because the first waves appeared to begin in much the same configuration on instrumental recordings for a mild magnitude 3 as for a huge magnitude 7.

The scientists — Richard M. Allen of the University of Wisconsin and Hiroo Kanamori of Caltech — recognize that effective warning is not workable unless small quakes can be ignored and only large ones counted. Otherwise, there would be too many false alarms.

The new kind of warning could not be used in the epicentral areas of a temblor, because there would not be enough time to convey more than a second or two of warning.

But Allen and Kanamori’s system would convey a warning to places closer to the
allowed by the Mexico City early warning system, which uses seismographic sensors 200 miles away on the Pacific coast to send advisories only after heavy shaking begins. They may arrive more than a minute before the shaking finally reaches the Mexican capital.

This is useful in Mexico City because the metropolis is built on an ancient lakebed subject to liquefaction — shaking like gelatin from a powerful quake centered even hundreds of miles distant.

By contrast, Los Angeles, where there is less liquefaction, would be shaken noticeably but not for the most part destructively by a major quake centered 200 miles away in the Imperial Valley. So the sensors would not be as useful for Los Angeles at a comparable distance.

The early warning system based on the P waves researched by Allen and Kanamori would be useful to Los Angeles if the powerful quake were centered on the San Andreas fault northeast of the city. This would allow 20 seconds' warning downtown.

There were reports in February that a study funded by the Federal Emergency Management Agency and the state Office of Emergency Services had raised questions about whether an earthquake early warning of a few seconds would do much good.

The study sampled opinion and found some officials fearing such warnings could panic, while others suggested people might dither rather than take immediate protective action.

Allen said in an interview this week that such concerns seemed fanciful. If the delivery system were extensive enough, many of the shut-offs of gas and power lines would be automatic. And if only some people took cover, that would still be better than none doing so, he sug