Scientists close on earthquake warning system

David Perlman, San Francisco Chronicle, 1-20-10

After five years of research and experiments, scientists working on an earthquake early warning system say they should soon be able to alert Bay Area residents as much as a minute before a distant quake reaches them.

A major quake on the northern end of the San Andreas Fault could be detected in time to sound an alarm in San Francisco a full 60 seconds before the shaking starts. A closer quake might mean only a few seconds of warning, but could still be enough for people to take shelter - possibly saving lives, the UC Berkeley scientists say.

Whether such a system might have helped in Haiti, where an estimated 200,000 people have died and 1.5 million are homeless, is doubtful because the 7.0 temblor's epicenter was very close to the capital and population center of Port-au-Prince.

But the potential of such warnings is so great that the U.S. Geological Survey plans to funnel $10 million in federal stimulus funds into the work, said Richard Allen, associate director of the Berkeley Seismological Laboratory and leader of the project.

"Early warning networks are already operating in other countries where earthquakes are common, and we know that in a densely populated region like the Bay Area, even a few seconds of warning could save many lives when a big one hits," Allen said.

In the Bay Area, the system was recently tested in conjunction with BART, whose engineers were instantly able to stop all trains when a warning was transmitted based on simulated quakes.

The system also detected the 5.6 magnitude Alum Rock quake that hit the Calaveras fault two years ago. A signal reached San Francisco several seconds before the city started shaking.

Advanced system

The highly advanced warning system is based on complicated computer algorithms known as ElarmS, short for Earthquake Alarms Systems.

Whenever an earthquake happens, the sudden jolt sends several types of seismic waves coursing through the Earth for thousands of miles at various speeds.

By detecting and analyzing the slower but most damaging shock waves known as shear waves, seismometers equipped with the ElarmS computer program would instantly detect the earthquake's magnitude and location, predict where its ground-shaking shock waves would be strongest, and immediately transmit warnings to areas in danger.

Eventually the alarm system could tell dispatchers to halt trains, alert fire stations and ambulances, send warnings to home computers and trigger warning tones to every individual mobile phone in the area, Allen said.

Scientists at the Berkeley laboratory, together with colleagues at the Geological Survey in Menlo Park, have been developing and testing two networks of an early warning system for five years, and the new phase is being greatly helped by the stimulus funds, Allen said.

The ElarmS system now connects about 300 seismometers in Northern California. The $10 million in stimulus funds will help the Berkeley group to upgrade those seismometers and push other work expanding the system and testing it. Other funds will soon add 100 more seismic detectors and the entire array will eventually number 500 throughout Northern California.

The entire system could be in place and ready to operate in about three years, Allen said.

'Banker's bonus'

The California Seismic Safety Commission has asked him for a cost estimate of a full statewide early warning system covering every known active fault with upgraded seismographs. The total would come to $80 million, Allen said - "about the cost of a banker's bonus."

"Only a couple of seconds warning," Allen said, "could give everyone time to duck and cover under protection like a sturdy table."

The worst earthquakes being tested with the early warning systems are similar to the 1906 quake that hit San Francisco with an estimated 7.9 magnitude. In Southern California, if a similar quake were to strike at the southern end of the San Andreas fault just east of the Salton Sea, Los Angeles would also have a full minute's warning, Allen said.

Japan already has a fully effective warning system that can alert every school in the country, where pupils are regularly trained to sit under their desks when the alert sounds, Allen said.

The United States, including quake-prone California, is lagging behind many other nations where early warning systems are already operating. In addition to Japan, those countries include Mexico, Italy, Greece, Turkey, India, Romania, Switzerland, Iceland, Egypt, India and Taiwan.