

## Earthquake alert system may be coming

David Perlman

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An early warning system that flashes imminent danger that a damaging earthquake is about to strike is ready to operate in California, seismic experts said Monday as a legislator introduced a Senate bill to develop the first \$80 million system across the state.

After 10 years of research and testing, the system called ShakeAlert could warn emergency workers and the public as much as a full minute before a big quake ruptures the ground along any of the faults in the state, the experts said.

State Sen. Alex Padilla, D-Pacoima (Los Angeles County) said his bill, SB135, is based on recent advances in preparing the California warning system to operate and on evidence that other early warning systems are proving effective in Japan, Mexico and other quake-prone nations.

Padilla, an MIT-trained engineer from the San Fernando Valley and a former space systems software specialist, speaking at a news conference at the California Institute of Technology, said it could provide "critical seconds for teachers to get their pupils to duck and cover, for drivers to pull to the side of the road, for trains to stop, and for utilities to power down."

Richard M. Allen, director of the UC Berkeley Seismological Laboratory, and his colleagues at Caltech and the U.S. Geological Survey, developed ShakeAlert as part of the California Integrated Seismic Network.

"We're ready to build it up right now," Allen said. "It's ready for prime time."

The system, he said, is based on a highly sophisticated algorithm that can send out a signal from any one of the 2,000 quake-detecting instruments now in place up and down the state. An alert would go out whenever the system senses a temblor's first pulse of short shock waves - known as P waves - that speed through the ground just as a seismic fault starts to rupture.

Those waves cause no damage, but they are followed by the longer and more destructive pulses known as S-waves. The ShakeAlert system instantly predicts the quake's magnitude and also calculates the time in seconds when the damaging shock waves will reach any region in California where people are equipped to receive the signal.

The warning time, Allen noted, will depend on the distance between a quake's epicenter and the location where the S-waves will arrive.

For example, Allen said, in one test of the ShakeAlert system last year, a very small quake hit near the epicenter of the deadly 1989 Loma Prieta temblor. The system correctly predicted that its magnitude would be only 3.5 and warned San Francisco locations that its shock waves would reach there exactly 25 seconds after the quake ruptured near Santa Cruz.

The system's test phases have proved so successful that BART trains are already equipped to stop instantly whenever the system flashes a hazard warning for the area where BART operates, Allen said.

A \$6.5 million grant from the Gordon and Betty Moore Foundation has helped pay for the system's development, he said, but to make it complete many of the seismic stations must still be upgraded.

Padilla estimated it would take \$80 million to develop a statewide version of ShakeAlert through the California Emergency Management Agency, and \$20 million more in annual operating costs. But upgrading it and operating it year after year would require much more funding - presumably from both federal and state sources, he said.

"But an investment like that is a no-brainer," he said.

### Check out ShakeAlert

To see how the ShakeAlert system worked when it detected a small earthquake near Santa Cruz last April and sent its signal to San Francisco: <http://bit.ly/Uyz7kY>

*David Perlman is The San Francisco Chronicle science editor. E-mail: [dperlman@sfchronicle.com](mailto:dperlman@sfchronicle.com)*

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