

NEES and the University of Oklahoma

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Every spring Oklahoma faces the threat of strong tornados, but a different kind of threat is also very real and present. Contrary to the common wisdom, earthquakes in the U.S. are not limited to any single geographical area, such as Alaska and California. According to the American Society of Civil Engineers, all or parts of 39 states are within zones where the probability of earthquakes is substantial. Moreover, new studies have heightened the risk to the central U.S. Two of the ten largest recorded earthquakes in U.S. history occurred in the central U.S., in Missouri along the New Madrid fault. A magnitude 8.1 earthquake that hit Missouri in 1811 unleashed enough energy to ring church bells in Boston, Massachusetts, more than 1,000 miles away.

Earthquakes, of course, are potentially costly and deadly. Natural disasters, including earthquakes, cost the U.S. about \$50 billion per year, an amount which is equal to roughly 3% of the federal government's budget. Worldwide, there are easily more than 100 earthquakes annually with a magnitude of 6.0 or above, powerful enough to produce serious damage. As recently as May 2003, an earthquake in Algeria with a magnitude 6.8 killed at least 2,000 people and left another 200,000 homeless, according to the National Earthquake Information Center at the U.S. Geological Survey. In 1999, and again in 2001, earthquakes caused more than 20,000 deaths worldwide. Many of these earthquake fatalities were due to structural failures. The U.S.'s ability to endure a major earthquake without substantial loss of life remains questionable.

To address the U.S.'s vulnerability to catastrophic earthquakes, a major research initiative in earthquake engineering is underway at the University of Oklahoma, in association with a consortium of other top universities and national laboratories. The Network for Earthquake Engineering Simulation (NEES) is the largest engineering research program ever supported by the National Science Foundation, with capital outlays in excess of \$100 million. The goal of NEES is to accelerate progress in earthquake engineering research and education by bringing together people, ideas, and tools. "The basic concept is to make resources at one NEES site available for use at all NEES sites, and to the national earthquake engineering community," says Kim Mish, a professor at OU's School of Civil Engineering and Environmental Science and a member of the NEES Board of Directors. A component of NEES called NEESgrid will enable the earthquake engineering community to share resources at some 20 universities throughout the nation via an Internet network. "NEESgrid will remove distance as a barrier," declares Mish. "It will be possible to perform both real and virtual experiments conveniently from a distant location." NEES is scheduled to be fully operational in October 2004.

Mish believes that the lessons learned through the NEES research initiative will have value beyond the realm of earthquake engineering, and will upgrade structural designs in general. "Earthquake forces have a similarity with tornado forces and the explosive forces that may develop in a terrorist attack," explains Mish. In the end, NEES is likely to improve building codes and, consequently, public safety.