

UA team touts road-hardening material

By Miriam Davidson
Special for The Arizona Republic

TUCSON — University of Arizona researchers say they have developed a strong, flexible material that could have prevented many freeways and buildings from collapsing in Monday's earthquake in California.

"The research is extremely promising in terms of what these materials can do," said Mohammad Ehsani, associate professor of civil engineering.

The material, called fiber composites, was originally developed for the aerospace and defense industries. It is made from varying combinations of fiberglass, graphite, carbon and Kevlar, which is used in bulletproof vests.

The fiber composites developed at UA are less than an eighth-inch thick and weigh almost nothing, yet are five to 10 times stronger than steel, Ehsani said.

The transparent material can be wrapped around freeway columns and glued to masonry walls and chimneys to hold them together during an earthquake. The material is designed primarily to retrofit structures built before the mid-1970s, when California's construction codes and methods were tightened to stand up better to earthquakes, Ehsani said.

The California Department of Transportation, or Caltrans, uses steel jackets to reinforce older freeway columns. But that method requires

heavy equipment and is labor-intensive and time consuming, Ehsani said. Moreover, steel rusts.

"Our method takes only a couple days, instead of weeks, and can be done with much less equipment and traffic down time," Ehsani said.

That, plus the fact that it lasts much longer than steel, may mean it costs less in the long run despite the more expensive material, Ehsani said.

John Mander, assistant professor of civil engineering at the State University of New York at Buffalo, said fiber composites are one solution but hardly a panacea for earthquake-caused structural failure.

"You have to choose a solution to fit the situation," Mander said.

For example, many of the freeway collapses in Monday's quake resulted from broken slabs rather than crumbled columns.

According to Mander, Caltrans studied fiber composites and decided not to use them in retrofitting freeway columns. But Ehsani said he has improved the application method since the Caltrans study.

"If he's improved them, we'd be more than happy to take a look at them again," said Jim Drago, Caltrans spokesman.

Ehsani and fellow Professor Hamid Saadatmanesh have tested the fiber composites in an earthquake simulator at UA. They say that scale-model columns wrapped with the material

and bearing a load of 100,000 pounds were able to withstand shaking equivalent to 8 on the Richter scale, or a force more than 10 times stronger than Monday's quake.

Even rebuilt columns were 30 percent stronger with the wrap than new columns without the wrap, said Limin Jin, a doctoral candidate in civil engineering who works with Ehsani.

Ehsani only recently completed his research on the improved fiber composites, so he does not know whether the material will be used in rebuilding the Los Angeles freeway system. He plans to present some of his work at a conference in San Francisco in early February.