# Civil engineers using recycled plastic pins to shore up failing highway slopes

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Sadik Khan, Sahadat Hossain's doctoral student, views a failing slope at US 287 recently. Credit: UT Arlington

A UT Arlington civil engineering researcher has won a $1 million state transportation department grant to install pins made from reclaimed and recycled plastic along some of the region's busiest highways to shore up clay soils that support the roads.

Sahadat Hossain, an associate professor of civil engineering, demonstrated the technique as a cost effective and efficient solution to failing soil slopes as part of the project during the last few years. His team first installed the pins along U.S. 287 in Midlothian.

The study also indicates that the cost of slope stabilization and repair can be reduced by more than 50 percent in using these recycled plastic pins when compared to conventional methods.

The current phase calls for the pins to be installed along parts of Texas 183 or Texas 360, depending on where they are needed most.

"Texas has limited resources available to maintain state highways, so anything we can do to extend the life of our roads is good for our state," Hossain said. "Our innovative process strengthens the soil slopes with recyclable plastics in a way that is good for motorists and the Earth."

Khosrow Behbehani, dean of the UT Arlington College of Engineering, said the work is representative of the many innovations developed within University.

"Their work is a reminder that universities like ours—and civil engineering researchers in particular—are dedicated to developing solutions for pressing, everyday concerns," Behbehani said. "Using recycled materials to achieve such solutions speaks volumes about the kind of engineering advances that will benefit Texas and our nation for years to come."

This is a major signature project in Texas, where recycling products diverted from landfill and solid waste stream are utilized for providing competent and cost-effective engineering solutions.

Hossain's team utilized plastic pins that are about 4 inches wide by 4

inches deep and 8 to 12 feet long, a great example of sustainable management of resources.

Ashfaq Adnan, an assistant professor of Mechanical & Aerospace Engineering and an expert in analyzing crack and fracture of materials, collaborated on the project and developed a numerical model to help TxDOT field staff determine where to place the pins to ensure soil stability. The pins were embedded in stretches of soil where long cracks were visible along asphalt highways.

"The equation allows them to use the pins without a complex computer program," Adnan said. "It's a very simple spreadsheet that helps them in the field."

The reinforced sections along U.S. 287 have held up much better than the untreated areas along that road, researchers found. The team concluded that the reinforced plastic pins could be a viable, sustainable alternative for TxDOT to stabilize shallow slope failure in the North Texas and Houston areas.

Hossain and his team members also will be working on a sustainable pavement base and sub-base materials, and their effectiveness in providing competent and cost-effective solutions as part of this project.

Provided by University of Texas at Arlington