

Intelligent construction practices developed for roads also apply to river levees

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Iowa State University's Geotechnical Mobile Lab shows up on construction sites to help researchers develop technologies that measure the performance of the earth materials used for roadbeds and foundations. Photo courtesy of David White. Credit: Photo courtesy of David White/Iowa State University

The same technologies that Iowa State University's David J. White is developing to build better roads and foundations could also be used to build better river levees.

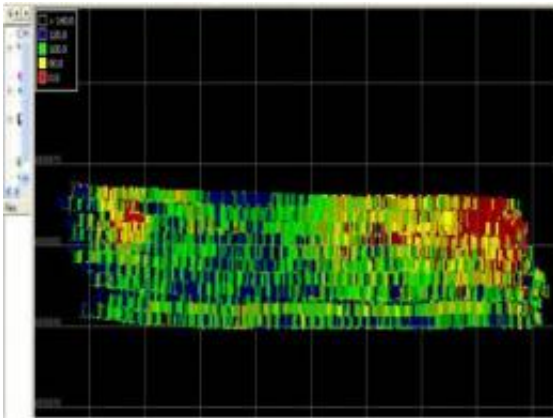
White, the Waldo W. Wegner Associate Professor in Civil Engineering, leads the crew working with Iowa State's Geotechnical Mobile Lab. In six years of operation, the lab has visited construction sites in 22 states to test new ideas for making sure solid, long-lasting earthen foundations are built under roads and buildings.

"The work we're doing is extremely important," White said.

First, "Earth materials are the world's most abundant construction materials - and the most variable [construction materials](#)."

And second, "The improper use of earth materials contributes to billions of dollars in taxpayer expense for roadbeds, levees, foundations for buildings and slopes that fail."

White, for example, said up to \$100 billion a year is spent because of bad roads. That includes the cost of road repairs, the wear on cars and time lost to traffic delays. If better, smarter construction practices can save just 1 percent of that, that's \$1 billion that can be spent on other needs.



High-tech instruments and sensors show engineers where the earthworks under roads and buildings are strong and weak. Credit: David J. White/Iowa State University

So what can contractors do to build better roads and foundations?

White - plus mobile lab researchers Heath Gieselmann and Pavana Vennapusa - are testing and developing technologies that equip those big, heavy rollers that smooth roadways with sensors that can detect the hard and soft spots in a road or roadbed. The technology's color-coded data instantly tells the operator exactly where the roadbed is good and where it needs more work. The technology, in fact, collects a million times more data than typical roadbed sampling and testing.

The Iowa State engineers are also working with new instruments, including a \$75,000 resilient modulus triaxial device. White said Iowa State's device is the only one in the world that's part of a mobile lab. It quickly subjects earthwork samples to thousands of load tests to determine the long-term performance of a roadbed or foundation.

And the Iowa State engineers are starting to work with nondestructive evaluation techniques. White said microwaves and near infrared waves can tell researchers about the water or mineral content in soil.

White said the mobile lab's work has been supported by grants from the Federal Highway Administration and state departments of transportation. He said the construction industry and its manufacturers are also following and supporting the research.

And, in these days of prolonged flooding causing Missouri River levees to fail, White said the same techniques and instruments that lead to better roadbeds and foundations could also be applied to the construction and monitoring of earthen levees.

"These new technologies could be used to test river levees for stability," White said. "Normally, you have some lead time before floods come down the Missouri River. You could see this technology rapidly deployed to do an assessment. Then you can identify that badger hole and plug it."

And, he said, whenever Iowa State's mobile lab pulls into a construction site, it's starting to change some minds about the best [construction practices](#).

"This is not just a research project," White said. "We now have a network of people around the country who are becoming more interested and motivated to research and implement these emerging technologies."

Provided by Iowa State University

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