

***Science and Technology Update:***  
**New Footbridge on Campus is First in State  
to Utilize ‘Smart Bridge’ Technology**

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*Editor’s note: Science and Technology Update is a new feature of the Missouri Miner. Each issue, we will try to bring you information on recent scientific and technological developments here at the University of Missouri-Rolla campus and elsewhere.*

During the summer, the wooden bridge near the library was moved to near the Multi-Purpose building and was replaced with a new high tech bridge. “This is the first fully composite bridge in the state of Missouri,” said Dr. Steve E. Watkins. Watkins is an Associate Professor of Electrical Engineering at UMR and lead researcher for the project. The bridge, funded partially by the National Science Foundation, is known as the Smart Composite Bridge and was constructed of lightweight durable materials. These materials range from glass and soybean resin to recycled Ranger truck composite parts.

These materials were fashioned into square tubes and then constructed into I beams in a combination of glass and carbon beams. The bridge is stronger than it looks. Although it is used for pedestrian traffic and light vehicle traffic on the UMR campus, it is rated for highway truck traffic.

Because it is so lightweight, the bridge was built off site by Composite Products Inc. at the Lemay Center for Composites Technology in St. Louis, funded by the U.S. Navy Center of Excellence for Composites Manufacturing Technology. It was then transported to Rolla and set into place, a task that was completed in about a half of a day. This is a major change in construction practices because most bridges are constructed on site.

This type of technology could be used in the decking of conventional bridges, the section that usually needs to be replaced first. A composite deck could be placed on an existing concrete and steel bridge rather than replacing the entire bridge. Sections of the composite decking could be kept on hand thereby cutting down on repair time.

Another feature of the Smart Bridge is the fiber optic sensors that are imbedded in the bridge. They will be connected to a campus fiber optic line that will allow researchers to access data from their desktop computers. The sensors will monitor the bridge for signs of fatigue and strain. There is also a website that has been set up for people to visit and learn more about the bridge. One feature of the website is a camera with a live feed. Viewers will be able to view the pedestrian traffic on the bridge. The website address is [www.umn.edu/~smarteng/bridge](http://www.umn.edu/~smarteng/bridge).

The bridge project has given the University the chance to offer two new interdisciplinary courses. The courses Smart Materials and Sensors and Smart Civil Engineering Structures are co-listed in the catalog and are offered to Aerospace, Civil,

and Computer and Electrical Engineering students. The courses will stress working with other engineering students in different disciplines. They are designed to provide practical experience for the students.

In addition to the new course, the bridge has offered research opportunities for a number of students and will continue to serve as a real world laboratory for students throughout the campus. “The project is important because it demonstrates the use of advanced composite materials and the use of fiber optic sensors for long term monitoring,” said Dr. Watkins.

St. James, Missouri is in the process of building four bridges ranging from fully composite to composite reinforced decks. These bridges will be completed later this year and are being developed by some of the same researchers that worked on the UMR Bridge. The group consists mainly of UMR faculty.



The new bridge is hoisted into place. The “Smart Composite Bridge” was made of glass, carbon, soybean resin and recycled truck parts and was manufactured at the Lemay Center for Composites Technology. *Photo courtesy of Steve Watkins*