"BRIDGE FOR THE 21ST CENTURY" INSTALLED ON UMR CAMPUS

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ROLLA, Mo. -- Students who set foot on the University of Missouri-Rolla this fall will step across a bridge for the future -- one made not of concrete, steel or wood, but of a strong, lightweight glass-and-carbon material and equipped with integral fiber optic sensors that monitor performance and warn engineers of potential structural problems. The bridge, installed on Saturday, July 29, is the centerpiece of an innovative teaching and research project funded by the National Science Foundation. Workers are putting the finishing touches on the bridge this week.

"This bridge is a demonstration project as well as a working laboratory, so that our students can see how a real, 'smart' composite bridge works," says Dr. Steve E. Watkins, associate professor of electrical engineering at UMR and the principal investigator for the research project. Watkins adds that the structure is the first bridge in Missouri to be made completely of composite materials.

The project is funded through the NSF's Combined Research Curriculum Development program. The three-year project, which began in January 1999, is supported by $400,000 from NSF and $149,000 from UMR. The bridge design work was supported by the Missouri Department of Transportation and the Missouri Department of Economic Development.

The bridge was built by Composite Products Inc., a St. Louis company, and was constructed in St. Louis at the Lemay Center for Composites Technology. The Lemay Center is is a technology-transfer and training center funded by the Navy Center of Excellence for Composites Manufacturing Technology. The center is managed by GLCC Inc. and operated by UMR.

The material used to make the bridge consists of glass and carbon fibers in a polymer matrix, and is lighter, stronger and more durable than concrete or steel. It replaces a wooden bridge located on the UMR Trace just east of the Curtis Laws Wilson Library.

Watkins and others are busy equipping the bridge with fiber-optic sensors -- the "smart" part of the structure -- that will allow researchers to monitor how well the material holds up under foot traffic. According to Watkins, the sensors will be wired to UMR's fiber-optic network, giving researchers
access to all manner of data about the structure from their desktop computers.

This project is about more than research, however. As part of the NSF program, Watkins and his co-investigators have designing two new interdisciplinary courses to go along with the bridge-building project. The new courses -- Smart Materials and Sensors and Smart Civil Engineering Structures -- are available to students in aerospace engineering, civil engineering, computer engineering, electrical engineering and mechanical engineering.

This approach makes the curriculum truly interdisciplinary, Watkins says.

"Our plan is to really teach interdisciplinary skills and knowledge to the students in these majors," he adds. "We're trying to teach them to work together with people from other disciplines, just as they'll do when they graduate and get jobs in industry."

The students in both courses will also work in teams composed of students from the various fields of study, Watkins says.

Working with Watkins on the project are Dr. D.J. Belarbi, associate professor of civil engineering; Dr. K. Chandrashekhara, professor of mechanical and aerospace engineering and engineering mechanics; Dr. Richard Hall, associate professor of psychology; and Dr. Antonio Nanni, the Vernon and Maralee Jones Missouri Distinguished Professor of civil engineering.

The project is documented online at http://www.umr.edu/~smarteng/