MISSOURI S&T

Smart Engineering Research Team and Partners

The Smart Engineering research team for the Smart Composite Bridge and related activities were an interdisciplinary group of Missouri S&T faculty: Steve E. Watkins (ECE), Antonio Nanni (CE), A. Belarbi (CE), K. Chandrashekhara (MAEEM), and Richard H. Hall (Pyschology) and their students. Key student participants included Martha J. Molander (ECE for instrumentation, Prakash Kumar (MAEEM) for laboratory load testing, Minjie Xu and Yuelin Shen (MAEEM) for analysis, Bethany Konz (CE) for site preparation, Vicki M. Eller (ECE) for documentation, and the team of Wesley Tull Jr. and Matthew Sander (CE) for the railing design.

The manufacturing partner was Composite Products Inc. (John Unser, President) and the funding sources were the National Science Foundation, campus research centers, the Missouri Department of Transportation, and other government agencies. The installation was done by Ironworkers Local Union #396 (St. Louis). The carbon for the tubes and rods were supplied by Zoltek St, Louis. The soybean-based resin for the railings was supported through the Missouri Soybean Merchandising Council. Industry donations were made by Dow Chemicals, Fiber Glass Industries, Albemarie Corporation, Vetrotex America, Interplastic Corporation, and Dexter.

NSF-Supported Project

Installation by the Ironworkers Local Union #396

Smart Engineering References

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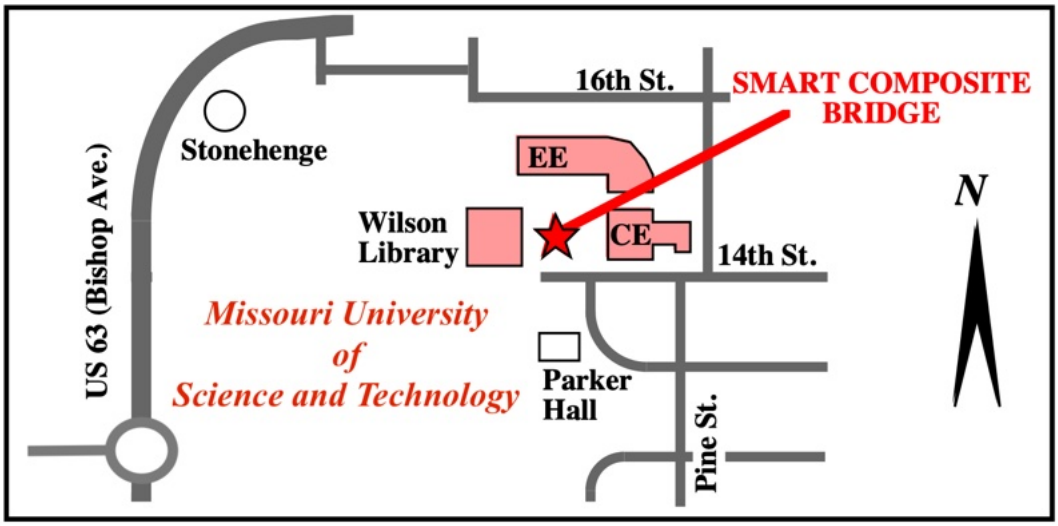
Smart Engineering Project and Smart Composite Bridge Location

The "Smart Engineering" title identifies the topical approach of integrating sensors and actuators for monitoring and control of structures. The Smart Engineering project addressed the need for improvement in bridge technology is this approach. The nation's bridge infrastructure is rapidly aging and many bridges will need to be replaced or repaired in the near future. Fiber reinforced polymer (FRP) composite materials are promising alternatives to traditional construction material in many applications. FRP composites have a high strength-to-weight ratio, design flexibility, corrosion resistance, and a long service life. Potential applications include new construction of short-span bridges, bridge decks, etc. and repair or rehabilitation of existing reinforced-concrete bridges. Smart sensing techniques are developing which provide detailed information about the health and performance of structures. Fiber-optic-based sensors are particularly attractive due to their environmental ruggedness and unobtrusive size. Smart instrumentation offers versatile capability for inspecting, evaluating, and managing infrastructure throughout its service life.

Descriptive Plaques for the Smart Composite Bridge

The core support for the project was provided by the National Science Foundation CRCD Grant # EEC-9872546. The project included the design and construction of the Smart Composite Bridge (SCB) and the creation of an interdisciplinary course which explored materials and instrumentation for smart applications in civil engineering. The SCB is a long-term technological demonstration for industry and an interdisciplinary field laboratory for students at Missouri S&T.

The SCB is located on the Missouri campus east of the Library. While it exceeds an AASHTO H20 highway rating, its normal usage is by pedestrians and light vehicles



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