

MOUNTAIN-PLAINS CONSORTIUM

PROJECT BRIEF | MPC 16-307 | March 2016

Structural Health Monitoring of Highway Bridges Subjected to Overweight Trucks, Phase I – Instrumentation Development and Validation



the **ISSUE**

In this project, researchers developed a structural health monitoring system for bridges using fiber Bragg gratings as the strain sensors. The objectives are to provide long-term sensing of bridges that are subjected to overweight and other permit vehicles so that the accuracy of bridge rating software can be evaluated.

the **RESEARCH**

Instrumentation, packaging, installation techniques and data collection and storage for a structural health monitoring system (SHM) using fiber Bragg grating (FBG) sensors were developed in the laboratory. The essential elements of the SHM system are in place and include (a) sensor installation and protection techniques for both concrete and steel host structures, (b) commercial and special-purpose instrumentation for interrogating the SHM network, and (c) a triggering system based in RFID technology to control the amount of data that is collected by the SHM network.



A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

Colorado State University
North Dakota State University
South Dakota State University

University of Colorado Denver
University of Denver
University of Utah

Utah State University
University of Wyoming



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Project Title

Structural Health
Monitoring of Highway
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Phase I – Instrumentation
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Validation

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the FINDINGS

FBG sensors are shown to be effective, economical, and long-lasting components of an SHM system for bridges. The system developed in this research includes an innovative radio-frequency identification (RFID) triggering system that will be important for activating the SHM system when a permit vehicle approaches a bridge. Bridge response data is then automatically recorded and transmitted to a server so that postprocessing can be performed for comparison to bridge rating analysis software.

the IMPACT

The project has made direct contributions to the following strategic goals.

1. State of Good Repair: An effective SHM system for highway bridges will improve the ability of bridge engineers to predict the effect of overweight vehicles on the condition of bridges.
2. Safety: Accurate real-time monitoring of bridge response will improve the operational safety of bridges during overload events by controlling the magnitude of the overload.
3. Economic Competitiveness: The SHM system will provide the initial economic advantage to the project. The second advantage is in improved predictions of bridge durability and lifecycle.

For more information on this project, download the entire report at <http://www.ugpti.org/resources/reports/details.php?id=844>

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7938 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.



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