MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 19-395 (project 461) | August 2019

Analytical Modeling of Seismic Performance of Curved and Skewed Bridges

the **ISSUE**

There is no reported methodology so far that can be used for nonlinear seismic analyses of typical short- and medium-span bridges while rationally considering the coupling effects between the bridge, moving vehicles and earthquake at the same time.

the **RESEARCH**

A new hybrid simulation approach is proposed to conduct the nonlinear seismic analysis of the bridge and traffic system by integrating the stochastic traffic flow simulation, the mode-based fully-coupled simulation technique of the bridge-traffic system and the nonlinear seismic analysis platform developed based on OpenSees software. A skewed and curved bridge, which is a common design to overcome complex intersections and terrain restrictions for short and medium span bridges, is studied as a demonstration followed by the numerical investigation of the bridge seismic performance and the impact of incorporating traffic loads.

MOUNTAIN-PLAINS CONSORTIUM REGION 8

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

Analytical Modeling of Seismic Progressive Failure Assessment of Curved and Skewed Bridges Subjected to Seismic Hazards

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the FINDINGS

The results suggest that the proposed hybrid methodology can capture the complex dynamic interactions between the bridge and multiple vehicles as well as the nonlinear seismic performance to provide rational prediction results.

the IMPACT

This study will help providing more accurate and efficient approach to study complex bridge seismic performance analytically, with appropriate consideration of the combined effect from seismic and traffic impacts.

For more information on this project, download the entire report at http://www.ugpti.org/resources/reports/details.php?id=959

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.