

# MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 19-390 (project 483) | July 2019

## Interaction Analysis of Long-span Bridges and Traffic System Subjected to Earthquakes



### the **ISSUE**

Existing bridge seismic analyses examine the inertial forces applied on bridge structures during earthquakes, but do not fully consider the interaction between earthquake motions and bridges and their traffic. Long-span bridges often carry a significant amount of traffic and many vehicles are likely to be present when an earthquake strikes.

### the **RESEARCH**

Researchers developed a new analysis formulation that can incorporate the coupled earthquake forces on both the bridge and vehicles, which are expressed as functions of the bridge-traffic coupling matrices and earthquake displacement inputs. The proposed methodology is numerically demonstrated on a prototype long-span bridge and traffic system under spatially varying earthquake excitations. The responses of the bridge and vehicles are predicted when the bridge-traffic system is subjected to earthquake excitations.

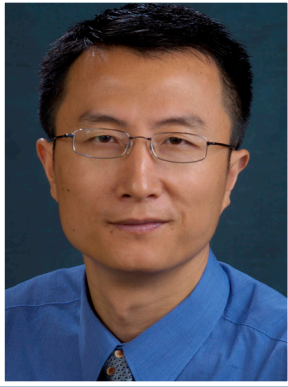


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### Project Title

Interaction Analysis of Girder  
Bridges and Traffic System  
Subjected to Earthquakes

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## the FINDINGS

The proposed new approach can be used for complex bridge seismic analysis. It is found from the numerical analysis that the coupled earthquake force, as derived in the present study, has notable influence on the dynamic performance of the bridge and vehicles under seismic excitations.

## the IMPACT

The new analytical approach as proposed offers a new method to more accurately predict bridge seismic responses. As a result, future bridge seismic response can be predicted more rationally.

For more information on this project, download the entire report at <http://www.ugpti.org/resources/reports/details.php?id=957>

For more information or additional copies, visit the Web site at [www.mountain-plains.org](http://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.



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