

# MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 16-312 (project 415 | September 2016

## Earthquake Fragility Assessment of Curved and Skewed Bridges in Mountain West Region



### the **ISSUE**

Reinforced concrete bridges with both skew and curvature are common in areas with complex terrains. These bridges are irregular and complex geometric designs, and comprehensive seismic risk studies are not always required. As a result, little knowledge is available about actual seismic risks for these bridges in areas of low-to-moderate seismic activity.

### the **RESEARCH**

Analytical fragility studies were carried out on four typical bridge designs with different geometric configurations (i.e. straight, curved, skewed, skewed and curved) in the mountain west region of the United States. The influences of skewed and curved geometric configurations on bridge component seismic fragility were investigated by developing analytical fragility curves. A typical 3-span concrete straight bridge located in Denver, CO, was selected as the prototype bridge, from which three bridge models with complex geometric variations were modified. Based on the nonlinear FEM analysis results of these bridge models, fragility analyses were carried out considering the uncertainties of the bridge model and ground motions. Comparative studies also were conducted to investigate influences from the geometric configurations.

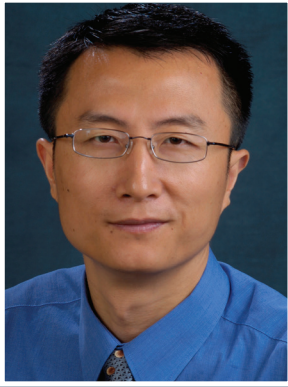


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University of Utah

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University of Wyoming



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### Project Title

Framework of Performance-Based Earthquake Design of Curved and Skewed Bridges

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### Sponsors | Partners

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### the FINDINGS

Results show the curved and skewed geometries can considerably affect the bridge seismic fragility in a complex manner. Further detailed seismic risk assessment of skewed and curved bridges is needed in regions with low-to-moderate seismic activity.

### the IMPACT

The findings will lead to improved seismic designs for curved and skewed bridges in moderate seismic zones.

For more information on this project, download the entire report at <http://www.ugpti.org/resources/reports/details.php?id=855>

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