

# MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 22-451 (project 595) | March 2022

## Mechanically Spliced Precast Bridge Columns



### the ISSUE

There is a lack of unified experimental data on the structural performance of mechanically spliced bridge columns. A mechanical bar splice, also known as a bar coupler, is an alternative to the traditional lap splicing to connect bars in reinforced concrete structures. Even though mechanical bar splices can be used as new precast column connections to accelerate bridge construction, their use in the plastic hinge region of bridge columns is prohibited mainly because the coupler performance and the effects of couplers on the seismic behavior of columns have not been fully investigated.

### the RESEARCH

This study was performed to determine the seismic performance of mechanically spliced bridge columns and to develop the first-of-its-kind mechanically spliced column performance database. The seismic performance of mechanically spliced bridge columns was investigated through half-scale testing of eight bridge columns, one cast-in-place, and seven precasts. Furthermore, a post-test analytical study was performed to evaluate current modeling methods for bridge columns, specifically mechanically spliced columns, followed by a parametric study including 400 pushover and 540 nonlinear dynamic analyses. Three design methods for mechanically spliced bridge columns were evaluated and found viable for practice.



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### Project Title

Mechanically Spliced Precast  
Bridge Columns

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## the FINDINGS

Establishing a comprehensive precast column experimental database helped verify emerging design methods and provided a justification to relax the current coupler ban for bridge columns. Furthermore, the experimental study proved the feasibility of using new couplers and construction detailing for mechanically spliced precast columns, which will further promote accelerated bridge construction for bridge bents (the combination of posts/piles and caps that support bridge girders).

## the IMPACT

The benefits of accelerated bridge construction (including improved safety, increased durability, and reduced delivery), time, costs, and environmental impact have been well documented. As part of this project, new precast column connection details were developed incorporating mechanical bar splices, which can potentially reduce the bridge bent construction time by a factor of three to four, depending on the splice type. Furthermore, a new column detailing was developed and proof-tested in which the column bars are exposed for quick access and replacement.

For more information on this project, download the Main report at <https://www.ugpti.org/resources/reports/details.php?id=1062>

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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