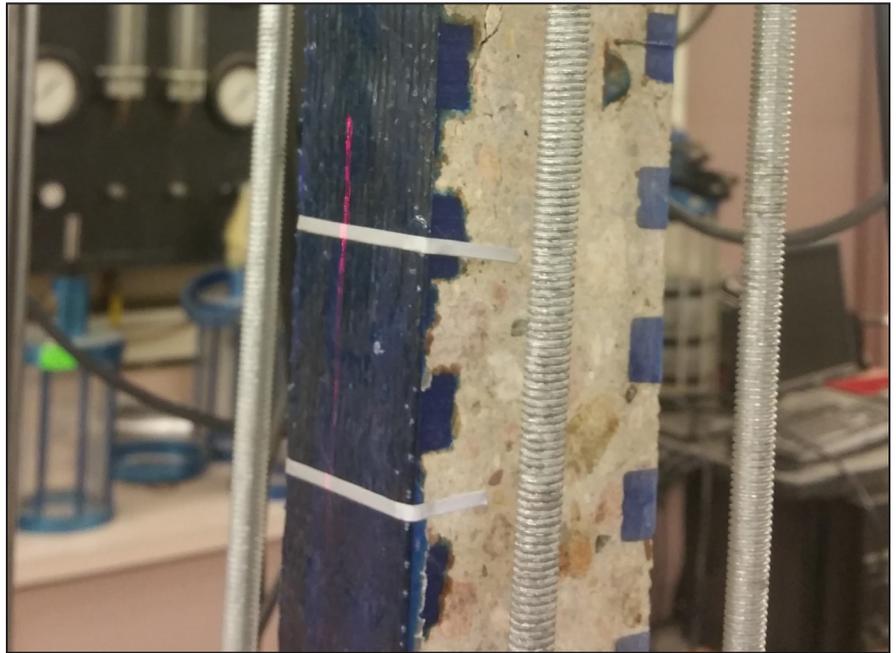


# MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 19-402 (project 554) | October 2019

## Composite-Based Rehabilitation of Constructed Bridge Girders with Grooved Geometrics



### the ISSUE

Premature debonding failure is prevalent in composite-based repair for concrete structures such as bridge girders. Mechanical anchorage is often used, which is costly. The proposed methods demonstrate that debonding can be controlled without the use of such anchor systems.

### the RESEARCH

Experimental investigations are conducted at element- and structure-levels. Statistical techniques are employed and analytical models are formulated to predict the interfacial behavior of the test specimens. The proposed grooved bonding techniques effectively mitigate the occurrence of premature bond failure.



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University of Denver  
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### Project Title

Composite-Based  
Rahabilitation of Constructed  
Bridge Girders with Grooved  
Geometrics

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### the FINDINGS

The periodic configurations of the element-level specimens (the number of grooves and U-wraps) influence the degree of the capacity increase and failure modes by distributing interfacial stresses. The presence of the grooves at the carbon fiber reinforced polymer-termination decreases interfacial stresses by up to 78%. The energy release rate of the grooved interface is examined to account for the integrity and delamination mechanisms of the proposed bonding approach.

### the IMPACT

The proposed anchor system with grooved bonding schemes will reduce repair/strengthening costs and extend the life of bridge members and other concrete structural elements because no corrosion-prone metallic anchorage is necessary. Consequently the repair approach will enhance the longevity and safety of bridges.

For more information on this project, download the entire report at <https://www.ugpti.org/resources/reports/details.php?id=969>

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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