

# MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 19-398 (project 500) | August 2019

## Rehabilitation of Longitudinal Joints in Double-Tee Girder Bridges



### the **ISSUE**

Longitudinal joints of double-tee bridges often rapidly deteriorate. A cost-effective, feasible, and structurally viable longitudinal joint rehabilitation method is needed to upgrade the existing double-tee bridges and to avoid girder or bridge replacement.

### the **RESEARCH**

Twenty joint rehabilitation detailing methods were proposed in this present study and four were found viable for further investigation. Thirteen large-scale beams were tested to investigate the performance of the top four rehabilitation methods. Ultra-high performance concrete (UHPC) and Latex Modified Concrete (LMC) were selected as the joint filler materials. Two joint rehabilitation methods, “pocket” and “continuous,” were developed based on the findings of the beam tests and an analytical study. A full-scale 40-ft long double-tee bridge, consisting of two interior girders, was constructed using the conventional longitudinal joint detailing then tested under 250,000 cycles of a fatigue loading (equivalent to approximately 46 years of service). Subsequently, the bridge was rehabilitated using two proposed details: “pocket” and “continuous,” each incorporated on one-half of the bridge length. The “pocket” joint consisted of discrete pockets reinforced with steel bars and filled with UHPC. A UHPC keyway was used to connect the pockets. The “continuous” joint was reinforced with a wire mesh and was filled with LMC. Finally, the rehabilitated specimen was tested under fatigue and strength loading to evaluate the performance of the bridge and to obtain data on the suitability of the proposed joint rehabilitation alternatives.



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### Project Title

Rehabilitation of Longitudinal  
Joints in Double-Tee Bridge  
Girders

### Sponsors | Partners

South Dakota DOT  
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## the FINDINGS

The key findings of the study are: (1) thirteen large-scale beam tests showed that at least a 3-in. lap-splice is needed for joints with UHPC, and 5-in. lap-splice is need for joints with LMC, (2) both rehabilitation longitudinal joint detailing, pocket and continuous, did not deteriorate through 500,000 cycles of the AASHTO Fatigue II loading and 100,000 cycles of the AASHTO Fatigue I loading, which are equivalent to 110 years of service, (3) the failure mode of the rehabilitated bridge was the flange concrete crushing in both girders in a ductile manner, (4) no damage of rehabilitated joints was observed at the girder failure, and (5) the rehabilitation cost of the pocket and continuous joint detailing for a 40-ft long, 30.6 ft wide double-tee bridge is respectively only 26% and 53% of the superstructure replacement cost of the same bridge. Overall, both proposed rehabilitation methods are structurally viable.

## the IMPACT

1. Development of two rehabilitation methods for double-tee bridge girder-to-girder joints. The pocket rehabilitation detail offers 70% cost saving compared with bridge superstructure replacement.
2. Extending the service life and eliminating the need for replacement of many existing double-tee girders/bridges.

For more information on this project, download the entire report at <http://www.ugpti.org/resources/reports/details.php?id=962>

## Research Website:

<https://sites.google.com/people.unr.edu/mostafa-tazarv/research/rehab-of-dt-bridges>

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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