MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 17-340 (project 439) | December 2017

Precast Bridge Girder Details for Improved Performance

the **ISSUE**

Longitudinal joints between double tee bridge girders deteriorate with time due to inadequate shear connection between adjacent girders. This creates a path for moisture and deicing chemicals to reach the steel reinforcement in the deck, leading to corrosion, concrete spalling, and structural degradation of the bridge.

the **RESEARCH**

Two 40-ft long full-scale bridge superstructure specimens, each consisting of two joined double tee girders, were tested at the Lohr Structures Laboratory at South Dakota State University (SDSU). Each specimen represented two adjacent interior girders of a two-lane bridge (approximately 31 ft wide). One specimen incorporated the conventional longitudinal joint detailing that has been traditionally used in South Dakota (grouted keyway with discrete welded steel connections). The other specimen incorporated a redesigned monolithic longitudinal joint with a grouted shear keyway that is 4 in. wider than the conventional shear keyway. Each specimen was subjected to cyclic loading representative of AASHTO's Fatigue I and Fatigue II load combinations, then tested to failure under increasing monotonic load. Based upon expected average daily truck traffic, the number of load cycles corresponding to 75 years of service was determined to be 411,000 load cycles. A strength test was performed for each specimen following the completion of the respective fatigue loading.

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Project Title

Precast Bridge Girder Details for Improved Perormance

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the **FINDINGS**

The monolithic joint provides substantially improved serviceability and strength performance characteristics over the discrete welded joint at no significant increase in initial construction cost. The joint service life may well exceed the bridge design life of 75 years. The joint is water-tight, exhibits negligible stiffness degradation, leads to better distribution of the support reaction to the girder stems, and engages adjacent girders at the strength limit state.

the **IMPACT**

The monolithic joint detail developed in this study was adopted by South Dakota Department of Transportation for the design of new precast double tee girder bridges.

For more information on this project, download the entire report at www.ugpti.org/resources/reports/details.php?id=895

For more information or additional copies, visit the Web site at 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.