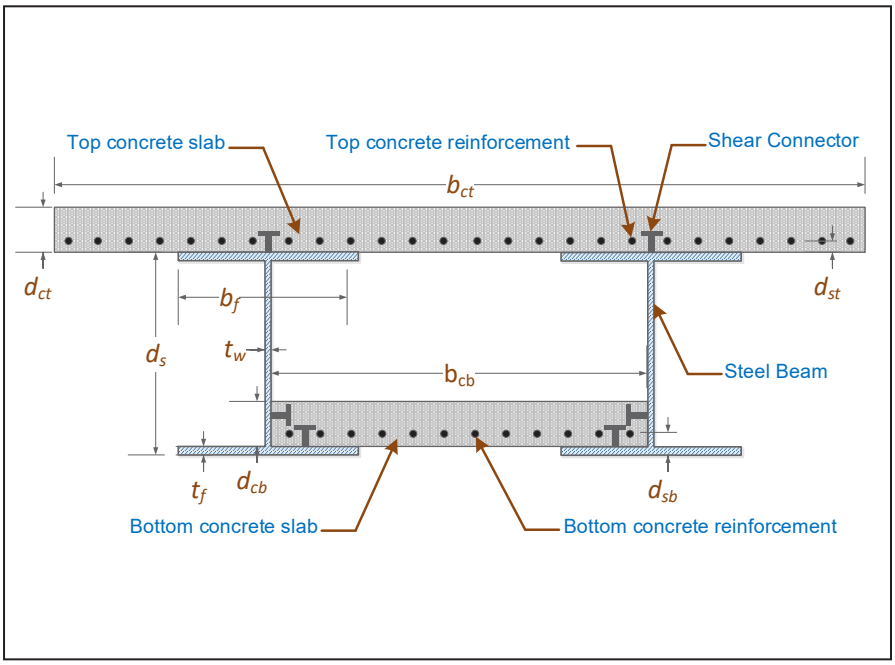
MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 23-495 (project 508) | March 2023

Evaluation of a New Double-Composite Simply-Supported Steel Bridge System



the ISSUE

The use of rolled beams (beams fabricated by rolling steel through a series of dies to create the desired shape) in medium- to long-span bridges can be very beneficial because they require much less maintenance in comparison with plate girders (girders fabricated by welding plates together to create the desired shape). However, rolled beams are limited in size, which constrains their use to relatively short-span bridges due to deflection requirements.

the RESEARCH

Researchers investigated the behavior of the double composite superstructure system. The system utilizes rolled beams in combination with a reinforced concrete slab, resting on the bottom flanges of the beams, to allow for longer spans to be built using rolled beams. To assess the full potential of double composite bridge systems, an analytical formulation, validated through numerical finite element analysis, was developed to capture the full nonlinear behavior of the bridges. The effect of some parameters relevant to performance, such as the use of prestressing tendons and ultra-high-performance concrete, was investigated.

MOUNTAIN-PLAINS CONSORTIUM REGION 8

A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

Colorado State University
North Dakota State University
South Dakota State University
University of Colorado Denver
University of Denver
University of Utah
Utah State University
University of Wyoming

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Project Title

Experimental Evaluation of a New Double Composite System for Steel Bridges

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the FINDINGS

The analysis results show a substantial reduction in deflection for the double composite bridges over their single composite counterparts. Similarly, a significant increase in the moment capacity was also shown when the double composite sections were used. The finite element modeling approach was used to reflect on the localized response of a selected bridge. The analysis procedure outlined in this study can be applied for the design and assessment of double composite bridges and can be used to determine the viability of using such systems for the construction and rehabilitation of new and existing bridges.

the IMPACT

The implementation of the double composite steel bridge system using rolled beams can save substantial inspection and maintenance costs typically associated with plate girder bridges.

For more information on this project, download the Main report at https://www.ugpti.org/resources/reports/details.php?id=1161

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.