

MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 21-433 (project 443) | May 2021

Bridge Structure Alternatives for Local Roads



the **ISSUE**

South Dakota local governments own more than 1,000 bridges that are 40 feet or less in length. Nearly half of those bridges are in need of replacement, but current state and federal funding levels provide assistance for replacement of only about 30 bridges statewide per year. Local government bridge replacement projects funded with federal aid must comply with South Dakota Department of Transportation (SDDOT) design standards and federal requirements, which may significantly increase a project's construction time and cost. If federal funds are not used, short-span bridge projects could have more flexibility and potentially have significantly lower costs without compromising safety, structural capacity, or durability. Research is needed to develop guidance identifying applicable local government bridge construction techniques, materials, and construction planning and administration process requirements to enable local governments to more efficiently and cost effectively replace short-span bridges.

the **RESEARCH**

Researchers conducted an extensive literature review of research articles, reports, and existing practices within and outside South Dakota to develop a comprehensive list of short-span innovative bridge elements and systems that are suitable to implement at the local government level. The list was converted into a catalog and divided into techniques, superstructures, substructures, materials, and entire bridge structures. The techniques include using prefabricated bridge elements and systems (PBES) and the jointless bridge. Emphasis was on maximum economy with mass-production of prefabricated components. A cost estimate was developed for the alternatives listed in the catalog. The cost for each alternative provides a somewhat reliable representation of the item's average cost per square foot of deck, and was obtained from the literature and state department of transportation websites. A list of administrative requirements on local bridge replacements without SDDOT or federal assistance was also compiled and included in this report. An evaluation procedure with simple inputs for use by local government decision-making was developed.



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

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North Dakota State University
South Dakota State University

University of Colorado Denver
University of Denver
University of Utah

Utah State University
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Project Title

Bridge Structure Alternatives
for Local Roads

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the FINDINGS

A catalog of innovative construction methods was developed in selecting a bridge type for local road construction, as well as the use of conventional practices. The catalog will serve as a basis for local governments to develop their own innovative low-volume road bridges. Information was used to create local road bridge technique profiles, and these profiles were designed to inform the user of the application of each off-system bridge technique. The catalog also includes guidance on construction planning and administration for local government bridge replacement.

the IMPACT

An evaluation tool with simple inputs for use by local government decision-making was developed. The tool will lead decision-makers through the process of cost evaluation, and finally recommend if a project should be completed using cost-saving innovative methods for bridge construction or by using conventional methods.

For more information on this project, download the report at <https://www.ugpti.org/resources/reports/details.php?id=1036>

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.



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