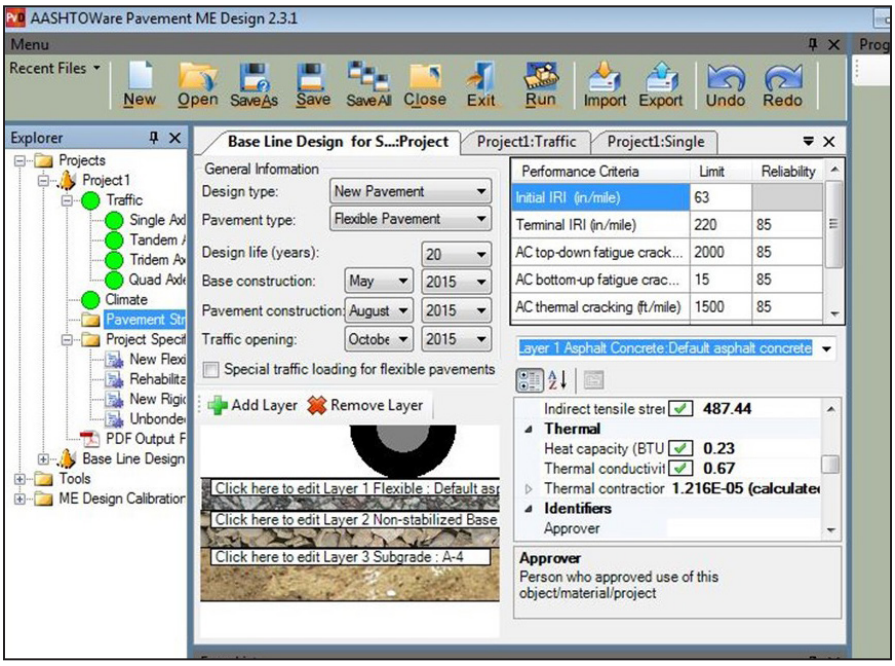
MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 19-380 (project 471) | March 2019

Enhancement of Mechanistic-Empirical Pavement Design Guide for Roadway Design, and Construction in the State of Wyoming



the **ISSUE**

To account for different variables related to traffic, climate and materials, and their interactions affecting pavement performance, a research effort initiated by the National Cooperative Highway Research Program (NCHRP) has led to the development of a Mechanistic-Empirical Pavement Design Guide. This guide is being adapted by the Wyoming Department of Transportation (WYDOT) for roadway designs. However, the default input variables recommended in the MEPDG were developed based on national conditions that do not reflect the local Wyoming conditions. Calibration procedures and methods are needed to calibrate the guide for use on the local level.

the **RESEARCH**

This research focuses on calibrating local material properties for unbound subgrade layer and serves as a supplementary study to enhance the full implementation of the MEPDG in Wyoming, including rehabilitation roadway projects. The research project evaluated the relationships between subgrade resilient modulus (Mr) and the dynamic cone penetration (DCP) and the standard penetration test (SPT) results. Three best subgrade Mr predictive models were selected based on both Mr and pavement distress estimations. The sensitivity of the design parameters on pavement distresses in Wyoming was determined. New flexible pavement design outcomes based on WYDOT MEPDG pavement design user's guide (2012) and the locally calibrated pavement input parameters were compared.

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

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the **FINDINGS**

Relationship between DCPI and subgrade resilient modulus was established while relationship with SPT N-value cannot be developed. Constitutive Model I, Mr design tables (Model D) and c-factor Model J were the best Mr predictive models. Alligator cracking was found to be hyper sensitive to AC air void, very sensitive to AC thickness, base thickness, base Mr, and AADTT. Thermal cracking was found to be sensitive only to AC thickness. Total rutting was found to be sensitive to AC thickness, AC air void, AADTT and climate.

On average, the overall material cost for a new flexible pavement designed based on Design Approach 1 using the WYDOT 2012 design guide was found to be 21% higher than the Design Approach 2 using the locally calibrated material properties and distress coefficients.

the **IMPACT**

This research will enhance the pavement design procedure and efficiency, overcome shortcomings of the ongoing research, and expedite the full implementation of locally calibrated MEPDG in Wyoming.

For more information on this project, download the entire report at http://www.ugpti.org/resources/reports/details.php?id=940

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.