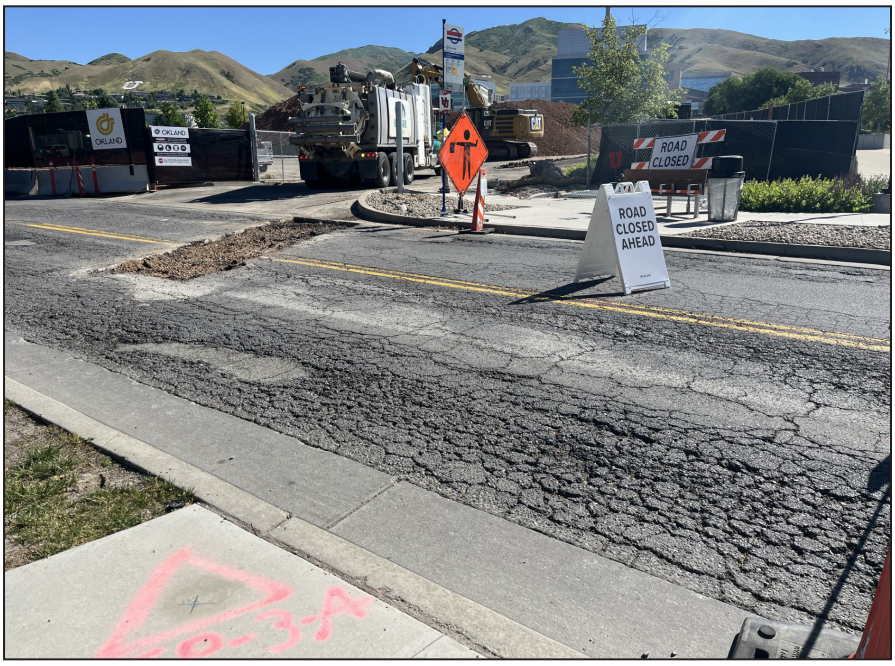
MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 24-527 (project 701) | June 2024

Relation Between the Dynamic Modulus of Asphalt Materials and Its Cracking Tolerance Index



the ISSUE

Inputs needed for mechanistic pavement design require complex, time-consuming tests not commonly conducted. As a result, pavements are designed using average or default material properties that might not represent the properties of materials actually used in construction. Doing so may result in inaccurate performance predictions and lessen the ability to optimize resources and conduct accurate life-cycle analyses.

the RESEARCH

Tests for dynamic modulus (the elastic properties of various materials) at different temperatures and tests for cracking performance were conducted on nine different asphalt mixtures. The results were analyzed, and a relation was developed between the two different tests. Based on the analysis, the developed relation can predict the dynamic modulus master curve from IDEAL CT tests (tests to determine the cracking potential of asphalt mixtures). Comparisons between measured values and predicted values were made.

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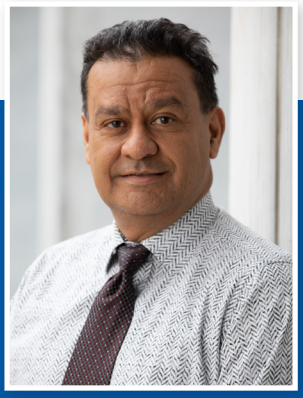

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Project Title

Relation Between Dynamic Modulus of Asphalt Materials and Its Cracking Tolerance

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the **FINDINGS**

The results support the hypothesis of this work given that the modeled values are within 17.2% of the measured values. Furthermore, it was shown that complete dynamic modulus master curves could be developed for each mix. While the relations are not perfect, the error observed is within values often observed in asphalt mixture testing. Furthermore, the predictions obtained are an improvement over default values often used. The implication of the results presented is also significant in terms of effort. As previously stated, at least three days of laboratory staff are needed to obtain the measured elasticity while the modeled elasticity requires, at most, a day of work. Furthermore, the results show that the tests used during mix design can be incorporated into the structural design of pavements.

the **IMPACT**

This work allows for the prediction of the dynamic modulus of asphalt mixtures by using data obtained from the IDEAL CT tests. While the predictions are not perfect, they are still an attractive alternative due to the shorter time and effort required to run the IDEAL CT tests. The data can be obtained in approximately one day. Using project-specific material properties allows for more robust pavement designs and the ability to optimize resources based on realistic life-cycle analysis.

For more information on this project, download the Main report at https://www.ugpti.org/resources/reports/details.php?id=1172

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.