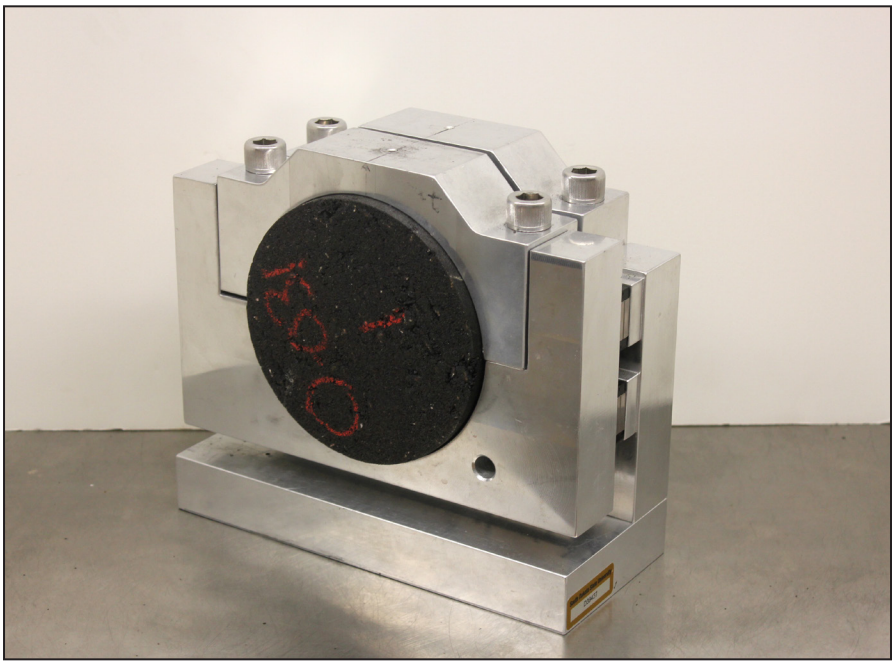
MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 22-468 (project 522) | July 2022

Development of a Guideline for the Selection of Tack Coats in South Dakota



the **ISSUE**

Pavement failures have been reported in Upper Great Plains and Intermountain West regions, and particularly in South Dakota, with a primary cause of insufficient or excessive tack coat application and moisture penetration in the interface of two layers.

the **RESEARCH**

Researchers have addressed these issues by helping develop a database to assist pavement engineers select the appropriate tack coat type and application rate. Tack coat binder is much softer shortly after construction compared with after aging during its in-service life, which raises the likelihood of early-age interlayer shear failure. This study was undertaken to evaluate the effects of tack coat type (CRS-2P, CSS-1h, and SS-h); application rate (0, 0.140, 0.281, and 0.702 L/m2); surface texture (grooved Portland cement concrete [PCC] and new, aged and worn, and milled hot-mix asphalt [HMA]); and freeze–thaw (F-T) cycles on early-age interlayer shear strength (ISS) of laboratory-compacted samples.

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

Development of a Guideline for Selection of Tack Coats in South Dakota

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the FINDINGS

The researchers found that tack coats with a hard binder grade applied at a low residual rate resulted in higher early-age ISS values compared with those prepared using a polymer-modified tack coat. F-T cycles were not found to have a significant effect on the early-age ISS values of specimens with HMA bottom layer. However, all tested tack coats were found to be significantly effective in improving the ISS values of samples with grooved PCC surface texture. For samples compacted on grooved PCC without tack coat, F-T cycles were found to considerably reduce the ISS values. Application of tested tack coats on grooved PCC was found to mitigate the adverse effect of F-T cycles on ISS values.

In addition, it was found that applying tack coats resulted in a reduction in early-age ISS values for specimens prepared by using different textures of HMA surfaces. Moisture conditioning resulted in a considerable reduction in the specimens' ISS values consisting of an HMA layer compacted on a grooved PCC layer using different tack coats. The polymer-modified tack coat was the most effective in reducing moisture's effect on the ISS values.

the IMPACT

Outcomes will aid state DOTs improve their current practice of selection of tack coat type and application rate. The developed database will help pavement engineers in the selection of tack coat type and application rate and development of quality control measures for tack coats for enhanced performance. Additionally, it will benefit DOTs by reducing tack coat-related failures and pavement maintenance costs. These recommended application rates are given in terms of residual application rates to help the user pick the rate and compare it with the equivalent rates to minimize related errors.

For more information on this project, download the Main report at https://www.ugpti.org/resources/reports/details.php?id=1088

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.