MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 19-405 (project 496) | October 2019

Prevention of Low Temperature Cracking of Asphalt Pavements Using the Bending Beam Rheometer

the ISSUE

Cracking of asphalt pavements results in increased maintenance costs and premature deterioration of the pavement structure. Just in the state of Utah, more than $20 million dollars are spend in rehabilitation of the highways. Controlling cracking in pavements can potentially extend the life of the highway by 35 years resulting in 20% reduction of maintenance for a savings of $4 million per year.

The ability of asphalt to respond to stresses without cracking is reduced as temperature decreases and as the rate of load applications increase. Consequently, testing of asphalt materials must consider both the temperature and the rate of load application, making tasting of asphalt materials more complicated compared to test of other construction materials. Testing approaches have focused on the behavior of asphalt binder, but this approach fails to capture the interactions between the binder, aggregates, and any added materials such as recycled asphalt pavement (RAP). Researchers must consider not only the accuracy of proposed new tests, but the influence the tests may have on asphalt mixtures as well.

the RESEARCH

The bending beam rheometer (BBR) is proposed as a test for asphalt mixtures. The study consisted of the evaluation of asphalt mixture properties at one temperature using the BBR. The BBR addresses the cold temperature properties of asphalt mixtures. The test explored the effects of increased or reduced binder content, increased RAP content, and increased laboratory aging on the same materials. Data was produced by preparing samples appropriate to the BBR and testing them based on established protocols. Aggregates from local sources and a commonly used asphalt binder were used in the study.

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Project Title

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the FINDINGS

Researchers found that aging causes mechanical changes in the material that relate to lower performance. The data also indicates that RAP is detrimental to the overall expected performance of the mixtures when compared to virgin mixes. Based on this observation, the BBR appears to be a sensitive test to capture the effect of aging and RAP on the material. Thus, adoption of the BBR as a specification would likely result in changing the mixture design process to favor mixes with lower RAP replacement.

the IMPACT

Adoption of low-temperature tests for asphalt mixtures will results in pavements that are less susceptible to thermal cracking, thus increasing the life of the pavement and reducing the maintenance needs.

For more information on this project, download the entire report at https://www.ugpti.org/resources/reports/details.php?id=973

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.