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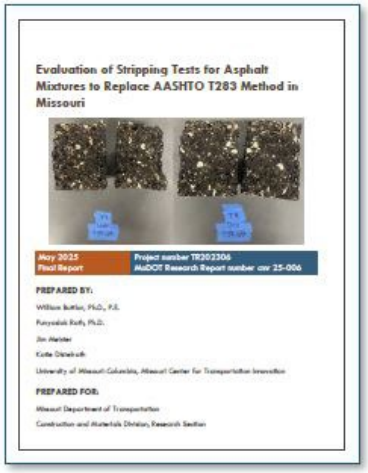
Research Summary

Evaluation of Stripping Tests for Asphalt Mixtures to Replace AASHTO T283 Method in Missouri



Many paving agencies in the U.S., including the Missouri Department of Transportation (MoDOT), use the AASHTO T283 method (Tensile Strength Ratio (TSR) test) to determine the moisture damage susceptibility of asphalt mixtures. However, the TSR test has been shown to have a poor correlation with field results. In addition, the TSR test is time consuming and may be redundant in light of current requirements to conduct the Hamburg Wheel Tracking Test (HWTT) as part of Balanced Mix Design (BMD). Based on these factors, further research on test methods was conducted.

The research team worked with MoDOT to obtain four mixtures with known field performance. In addition, one of the mixtures was tested after removal of the liquid anti-strip (LAS) to determine its effect on performance. The mixtures were subjected to the TSR test, to the Hamburg Wheel Tracking Test (HWTT), and to the IDEAL-RT test per AASHTO and ASTM standards. The Stripping Inflection Point (SIP) parameter was computed from the HWTT rut depth versus wheel passes curve to be used as an indicator of moisture damage in the asphalt specimens.

The Iowa method was used to compute the SIP parameter. The method includes an additional step prior to the calculation of the SIP, which is computing the slope ratio (SR). The SR parameter is simply the ratio of the stripping slope to the creep slope, and the SIP needs to be calculated only if the SR $\geq$ 2.0. If SR < 2.0, the mixture is deemed to be not stripping (i.e., no moisture damage) and the SIP is unnecessary. Figure 1 shows an example of SIP calculation from a Hamburg rut depth curve for an asphalt mixture based on the Iowa method.

"Based on the results obtained in this limited study, a framework was proposed to replace the TSR method."

Comparison of the test results showed that the HWTT and TSR agreed on the ranking of only one out of the five mixtures. More importantly, the SIP parameter had a better correlation with the qualitative field performance measure compared to the TSR test, highlighting its superiority as a stripping test and its potential to replace the AASHTO T283 method. The rankings of RT-Index were observed to match SIP and TSR rankings for only one out of the five mixtures tested. Based on these limited observations, the RT-Index parameter is likely a poor indication of moisture damage.

Based on the results obtained in this limited study, a framework was proposed to replace the TSR method. The framework is as follows; first,

the mixtures are screened for rut depths lower than 4.0 mm at 20,000 passes in the Hamburg test. If the mixture exhibits low rut depths in the Hamburg test (less than or equal to 4 mm), it is highly likely that it is resistant to moisture damage and therefore judged as non-stripping. Second, if the rut depth is greater than 4.0 mm, then the slope ratio is computed. If the slope ratio is found to be less than 2.0, then the mixture can be categorized as non-stripping. Finally, if the slope ratio is greater than or equal to 2.0, then the SIP is determined and reported. A minimum threshold of 15,000 passes was chosen as the SIP threshold for initial implementation. Mixtures possessing SIP values less than or equal to 15,000 passes are scored as failing the stripping requirement.

This study was limited to only a few dense-graded mixtures. To gain further confidence in the SIP parameter and to finetune the proposed evaluation framework, a larger number and wider variety of asphalt mixtures with known field performance data should be investigated. While the SIP parameter has been adopted by several agencies and has proven to be an effective indicator of moisture damage, other parameters derived from the HWTT have also been proposed for use.

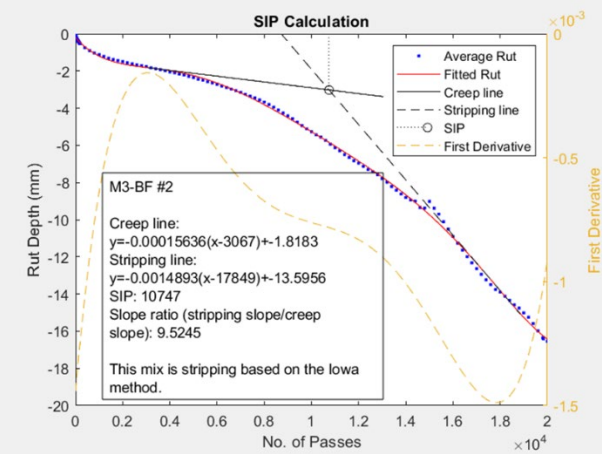


Figure 1. Example of SIP calculation based on the Iowa method

Project Information

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