NETC 15-3: Moisture Susceptibility Testing for Hot Mix Asphalt Pavements in New England

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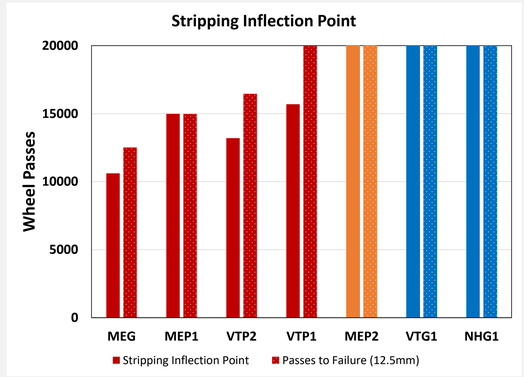
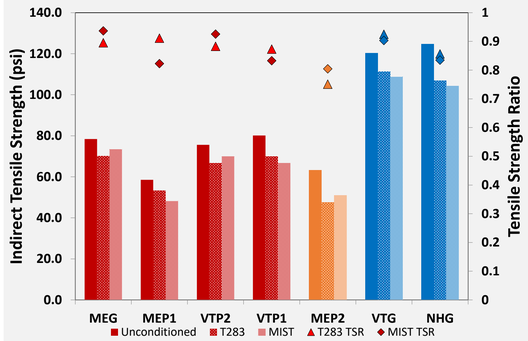
ABSTRACT

Asphalt materials experience substantial amounts of environmental damage throughout their lives as surface layers in pavements. One of the prominent forms of environmental degradation is moisture-induced damage. This type of damage is a common problem for asphalt pavements in wet climates such as New England. Moisture-induced damage is typically accounted for during asphalt mixture design by conducting performance tests to ensure the material is not susceptible to experiencing severe damage from moisture, although many of these methods have seen mixed amounts of success in New England. The main objective of this study is to evaluate the ability of multiple asphalt mixture moisture susceptibility tests to identify good and poor performing mixtures with respect to moisture-induced damage to replace current moisture testing requirements in New England. Results from this study suggest that moisture-induced damage can have a significant detrimental impact on pavement performance and service life and that the Hamburg wheel tracker test is the most effective and practical test method to reliably identify mixtures prone to experiencing significant amounts of moisture-induced damage.

DATA

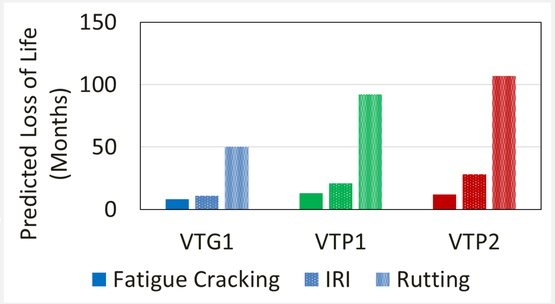
- Mixtures selected from New England region on basis of historic performance in terms of moisture susceptibility (10 selected, results for 7 are presented here)
- Laboratory testing campaign focused on evaluating different lab conditioning (Lottman, Moisture-induced Stress Tester and Multi-cycle Freeze-Thaw) and mechanical property tests (Hamburg Wheel Tracking, Indirect Tensile Strength, Complex Modulus, Ultra-sonic Pulse Velocity, Semi-Circular Bend and Disk-shaped Compact Tension Tests).
- Results for Indirect Tensile Strength Ratio (TSR) and Hamburg Wheel Tracking Test Stripping Infraction Point (SIP) are presented





ANALYSIS

- Indirect Tensile Strength: No clear distinction between good and poor TSR values (MiST or T283 Conditioning)
- Hamburg Wheel Tracking Test: Clear distinction between good and poor performers for both traditional SIP and newly proposed Texas Transportation Institute methods. This test was also able to distinguish between mixes with and without additives for lowering moisture damage
- MiST conditioning combined with complex modulus (E*) testing can aid in incorporation of the moisture induced damage in pavement performance and longevity. A sample of life reduction for three pavement section is presented here.



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CONCLUSIONS

- Traditional moisture susceptibility testing using AASHTO T-283 (regardless of conditioning method) did not show good connection between field and laboratory results, making this an unideal test for mixture design.
- Both Dynamic Modulus and the Hamburg wheel tracker showed much clearer and consistent relations between field and lab results.
- While Dynamic modulus hold promise as it can be paired with pavement design to mechanistically predict performance and life cycle costs, the Hamburg is the preferred option of the two for mixture design considering it is more practical, simpler, and more readily available for agency usage in New England.
- The ultra-sonic pulse velocity (UPV) non-destructive test showed very promising result to serve as a low cost test procedure as a screening test to identify poor performing materials during mix design.