CENTER FOR TRANSPORTATION RESEARCH

PROJECT SUMMARY

Texas Department of Transportation

0-6857: Cost-Effective Alternatives to Seal Coats

Background

Pavement preservation is critical to maintain and operate a cost-effective and safe pavement infrastructure. Wear from traffic results in loss of skid resistance accompanied or followed by cracking, penetration of water and oxygen into the pavement structure, and concomitant deterioration of the pavement. Loss of skid resistance is especially significant from a safety point of view, because a pavement with low skid resistance can increase the braking time for vehicles. Timely maintenance can also increase the serviceable life of the pavement. There are various methods used for surface treatments, including seal coats, slurry seals, and ultra thin asphalt concrete overlays. Ultra thin overlays have increased in popularity due to their lack of noise and improved ride quality, as well as their reduced overall cost owing to the reduced layer thickness. This study had three major objectives: (i) determine the best mix type for use as an ultra thin overlay, (ii) using performance tests relevant for surface mixes, evaluate the volumetric-based criterion that is currently used to determine the optimum binder content for mixes used in ultra thin overlays, and (iii) identify the properties of the tack coat that must be achieved to construct such mixes in the field. In addition, this study also examined the best practices to prepare the surface receiving the ultra thin mix and determined the life cycle cost of this treatment compared to seal coats. Although ultra thin overlays are more expensive than seal coats, the reductions in traffic delay and noise pollution, as well as the longer service life, are major advantages of ultra thin overlays.

What the Researchers Did

In order to achieve the goals of this study, a nationwide survey of aggregate structures that could potentially be used as an ultra thin overlay was conducted. Six different aggregate structures were identified and used in the remainder of this study. These mixes were used with a volumetric mix design criterion to determine the optimum binder content. The research team prepared mixture specimens and conducted performance tests at, above, and below the optimum content for each mix. These performance tests were conducted using a Hamburg wheel tracking device (HWTD), modified specimen HWTD, overlay tester, and three-wheel polishing device/direct friction tester (TWPD-DFT) combination. Performance metrics included resistance to rutting, cracking, bleeding, and raveling and the ability to maintain a desirable level of skid resistance. In addition, four

Research Performed by:
UT Austin's Center for Transportation Research;
University of Texas at El Paso

Research Supervisor:
Dr. Amit Bhasin, CTR

Researchers:
Angelo Filonzi (CTR)
Ramez Hajj (CTR)
Aliasghar Dormohammadi (UT-El Paso)
Cheng Zhu (UT-El Paso)
Dr. Vivek Tandon (UT-El Paso)

Project Completed:
08-31-2017

different field mixes were also used to benchmark the results from the performance tests. The skid resistance results from the mixes were compared to the skid resistance of chip seals, using data and correlations available from the existing literature for the latter. The study also evaluated the quality of commonly used tack coats within Texas.

What They Found

Of the six possible aggregate structures evaluated in this study, the mixes with a majority of coarse aggregates behaved better than those with finer aggregates in the TWPD and HWTD tests. Three of the six candidate aggregate structures were ultimately deemed viable for use as ultra thin overlays. Measurements of skid resistance show that mixes designed for ultra thin overlays had comparable, and in most cases better, performance when compared to equivalent DFT friction values obtained on seal coats from other studies. Although it may not be economically feasible in all cases, ultra thin can provide an alternative to seal coating with improved ride quality and noise characteristics. Finally, this study also demonstrated that the TWPD combined with a DFT is sensitive to differences in performance of the selected mixes in terms of raveling, bleeding, rutting, and skid resistance and can be used on a routine basis to validate the performance of mixes designed for use in ultra thin overlays. The tack coat quality evaluation indicated that a trackless tack and performance-graded (PG) binder are suitable tack coat materials for ultra thin overlays.

What This Means

Recommendations from this study are condensed into a proposed specification and two standard test methods that accompany this project's comprehensive research report (see the appendices of 0-6857-1). The first test method is for the use of the TWPD as a performance screening tool for designing mixes used in ultra thin overlays. The second test method is to evaluate the properties and acceptability of the tack coat used in an ultra thin overlay to bond with the existing pavement surface. Some of the aspects related to the proposed specification, such as the use of a PG70 binder, must be validated through additional field implementation studies.

For More Information

Project Manager:
Darrin Jensen, RTI (512) 416-4728

Research Supervisor:
Amit Bhasin (512) 471-3667

Technical reports when published are available at **http://library.ctr.utexas.edu.**

Research and Technology Implementation Office
Texas Department of Transportation
125 E. 11th Street
Austin, TX 78701-2483

www.txdot.gov
Keyword: Research