Kansas Department of Transportation

TECHNICAL SUMMARY

# Midwest States Accelerated Testing Program: Well Bonded Superpave Overlays on Hot Mix Asphalt

Report Number: FHWA-KS-17-04 ▪ Publication Date: July 2017

**Daniel D. Mealiff**
**Xingdong Wu**
**Mustaque Hossain, Ph.D., P.E.**

*Kansas State University Transportation Center*

*A Transportation Pooled Fund Study - TPF-5(048)*

## Introduction

The construction of hot-mix asphalt (HMA) overlay or multiple lifts involves spraying tack coat onto the existing surface to obtain a good bond and to ensure that the multiple pavement layers behave monolithically. Insufficient tack coat application has been linked to premature cracking failure. The Kansas Department of Transportation (KDOT) regularly uses a slow setting anionic polymer-modified emulsion (SS-1HP) as a tack material in both new construction and rehabilitation. Recently, KDOT has allowed the use of Emulsion Bonding Liquid (EBL, applied with spray pavers) and trackless tack, both of which avoid the problem of truck/paver tires picking up the tack material.

*Kansas State University Civil Infrastructure Systems Laboratory Accelerated Pavement Testing*

## Project Description

This study compares the bond strength of these materials by compacting a fresh HMA layer in the laboratory on top of cores taken from milled and non-milled highway sections. These cores were treated with different tack materials and application rates in order to find the optimal bond strength. The samples were tested in direct tension at two days, similar to KDOT's construction quality assurance tests for the in-situ interface bond strength.

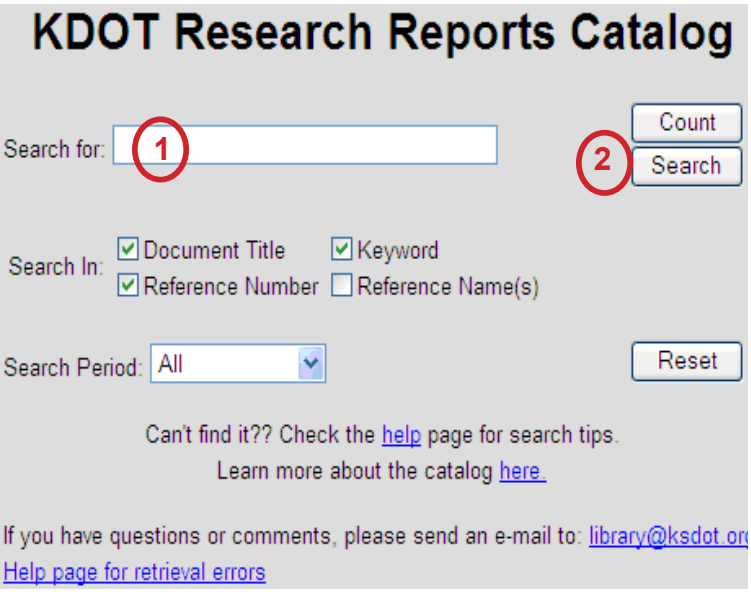
## Project Results

Preliminary results indicate that SS-1HP does not improve bond strength at rates below 0.05 gal/yd$^2$ (0.23 liter/m$^2$) while EBL performs well at a rate that is 50% of the manufacturer's recommendation. Trackless tack achieved acceptable bond strength as well. Surface texture was significant in achieving acceptable bond strength in some cases. A full-scale accelerated pavement testing (APT) was also performed, and the results showed that EBL had better bond strength and slightly less permanent deformation, but showed no difference in cracking.

Further APT testing with variable application rates of SS-1HP indicated that the KDOT-recommended rate of 0.05 gal/yd$^2$ (0.23 liter/m$^2$) showed good performance as a tack coat material based on the in-situ strain, in-situ bond strength, laboratory bond strength, and bond energy. Strain at the overlay interface and the existing HMA pavement was lowest for this rate. Although very heavy application of SS-1HP showed somewhat good performance, such high rate tends to decrease the interface bond strength as when evaluated in-situ as well as in the laboratory. Comparison of the SS-1HP test sections in the two APT experiments of this study indicates that the cleanliness of the milled surface is a big contributor to interface bonding.

## Project Information

For information on this report, please contact Mustaque Hossain, Ph.D., P.E.; Kansas State University, 2124 Fiedler Hall, Manhattan, KS 66506; (785) 532-1576 phone; mustak@ksu.edu.




### Directions for Downloading the Full Report

To download the full report, visit http://kdotapp.ksdot.org/kdotlib/kdotlib2.aspx and do the following:

1. Enter FHWA-KS-17-04 in the search box.
2. Click the Search button to the right of the search box.
3. You may have to scroll to find the specific report.
4. To download the report, click on the title of the report to open the PDF file and save it to your hard drive.

**If you have any questions, please email us at KDOT#Research.Library@ks.gov.**