Joint Transportation Research Program

Principal Investigators: Ayesha Shah, Purdue University, bano@purdue.edu, 765.463-2317, ext. 227
Rebecca S. McDaniel, Purdue University, rsmcdani@purdue.edu, 765.463-2317, ext. 226
Program Office: jtrp@purdue.edu, 765.494.6508, www.purdue.edu/jtrp
Sponsor: Indiana Department of Transportation, 765.463.1521

SPR-3017 2012

Continued Monitoring of Indiana's SPS9-A Site

Introduction

The Indiana's SPS9-A site was initiated as a part of the SHRP's LTPP program in 1997 to study the influence of binder grades on mixture performance. In the earlier phase of this study entitled *Development of Indiana's SPS9-A Site*, five Superpave sections with different binder grades (including one SBS-modified binder) and one Marshall section were constructed on a 2.5-km section along eastbound I-70 east of Indianapolis. Four of the five Superpave mixes had the same aggregate gradation, source and mix design. The remaining fifth section contained 15% RAP and the same binder grade as the control Superpave section. In an earlier study, lab-compacted specimens from plant-produced mixtures obtained at the time of construction were tested to evaluate rutting and thermal cracking performance. Binders recovered from field core samples at predetermined intervals were tested. These results were compared with findings from field distress surveys conducted within the initial four-year study period. Discrepancies between the observed pavement distress (cracking and rutting) and mixture testing resulted in the initiation of the current study, with a view to obtain two more sets of field core samples for additional testing on recovered binders and for assessing the cracking resistance of the mixtures by directly testing the core samples at low temperatures. The overall objective of this research project was to provide long-term performance data of mixes with the same job-mix formula (JMF) and gradation but with different binder grades. It was also to allow evaluation of the long-term performance of RAP.

Findings

The air void content of the mixes in the field decreased from the time of construction through about 9.5 years, then remained relatively constant to 12 years. Aging of the binders in the mixtures was evidenced by increasing recovered binder high-temperature stiffness over time; the aging from 9.5 to 12 years was minimal. As time increased, the recovered low-temperature binder grade also increased (became warmer) for most of the binders, also indicating aging of the binder. Two of the binders were relatively insensitive to changes in the low-temperature grade with time. The binder data suggested that four of the six test sections would be expected to exhibit thermal cracking in the field. Low-temperature mixture testing indicated that all six test sections would show thermal cracking by 9.5 years and beyond. With the exception of the mix with polymer modified binder, the distress observed during field distress surveys correlated well with the laboratory binder and mixture test results. In general, mixes with the lower low-temperature grade showed better resistance to thermal cracking compared with mixes with higher low-temperature grade. The RAP section showed a slightly higher amount of total transverse cracking than the control mix. The section with the softest binder (PG58-28) had a minimal amount of low-temperature cracking at the end the final distress survey (6 years in service). Rutting was observed in all test sections at that time. The section with the SBS-modified binder showed the greatest amount of total crack length, contrary to expectations. No explanation for this behavior could be found from the test data.

Implementation

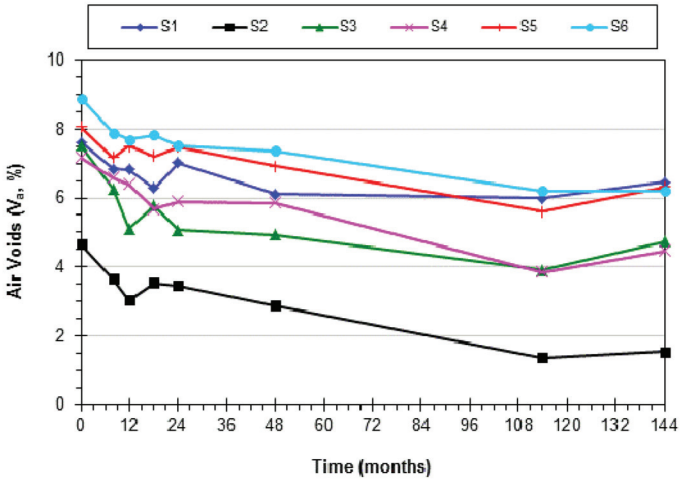
This long-term evaluation of the performance of Marshall and Superpave mixtures with different binders did not raise any "red flags" signifying cause for concern with the current binder grade selection policy or implementation of RAP in surface mixtures. The specification changes that have already been implemented were confirmed. No additional changes are required based on this research.

Recommended Citation

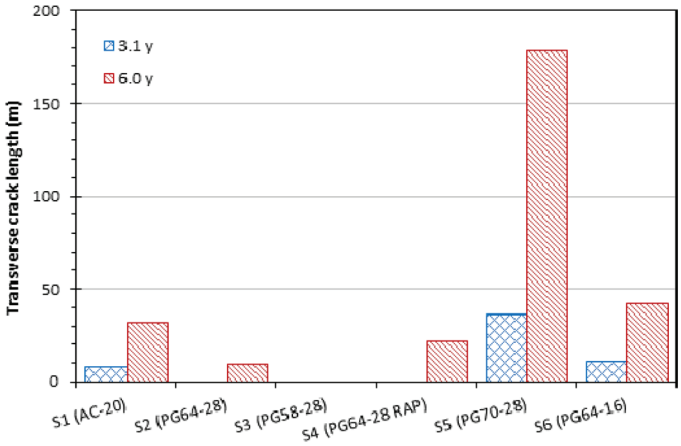
Shah, A., R. S. McDaniel, and J. Olek. *Continued Monitoring of Indiana's SPS9-A Site*. Publication FHWA/IN/JTRP-2012/19. Joint Transportation Research Program, Indiana Department of Transportation and Purdue University, West Lafayette, Indiana, 2012. doi: 10.5703/1288284314983.

View the full text of this technical report here: http://dx.doi.org/10.5703/1288284314983

Published reports of the Joint Transportation Research Program are available at: http://docs.lib.purdue.edu/jtrp/



Transverse cracking from photographic surveys.



Trend in air content of the surface layer.