National Center for Asphalt Technology
NCAT
at AUBURN UNIVERSITY

The Effect of GlasPave™ in RAP on Asphalt Mixture Performance

RESEARCH SYNOPSIS–NCAT REPORT

Problem Statement

The geosynthetic material GlasPave™ has been effectively used at the bottom of asphalt surface layers to help mitigate the potential for thermal and stress-related cracks. However, there is concern regarding whether or not pavements containing GlasPave can be recycled. Specifically, will reclaimed asphalt pavement (RAP) material containing milled-up GlasPave affect the performance properties of asphalt mixtures containing the RAP?

Objective

This study by the National Center for Asphalt Technology (NCAT) was conducted to evaluate the effect of GlasPave in RAP by comparing the performance properties of two asphalt mixtures: one containing control RAP and the other containing GlasPave RAP materials.

Description of Study

To begin the study, a two-layer test section was constructed at East Alabama Paving plant in Opelika, AL. The asphalt material used in both layers was a 9.5 mm nominal maximum aggregate (NMAS) mix with a PG 67-22 binder. GlasPave fabric was installed at the interface of the two layers. The control asphalt mixture was obtained by milling the upper portion of the test section that did not include GlasPave fabric, and the GlasPave RAP was obtained by milling the middle portion of the test section, where the GlasPave was installed.

Figure 1 Installation of GlasPave fabric on a test section at East Alabama Paving.

The two RAP materials were brought back to the NCAT laboratory, dried out and characterized. They were then mixed with virgin aggregate and binder to produce two 12.5-mm NMAS Superpave mix designs. One design contained 30 percent of the control RAP by weight of aggregate, and the other contained 30 percent of the GlasPave RAP by weight of aggregate. Both mixes used the same virgin aggregates – a mixture of limestone, granite, and sand – and a PG 67-22 virgin binder.

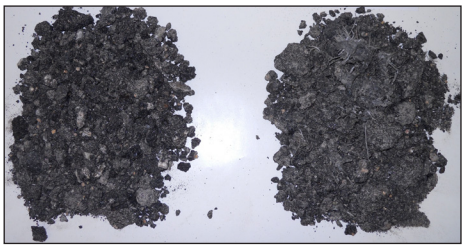

Figure 2 Control RAP mixture (left) and RAP mixture containing GlasPave (right).

The two mix designs were then tested to evaluate mixture performance characteristics such as moisture susceptibility, stiffness, and resistance to rutting and low-temperature cracking. Moisture susceptibility was tested according to AASHTO T 283-07, which determines the tensile strength ratio (TSR) between dry and moisture-saturated specimens of the same mix. The Hamburg wheel-tracking device was used to assess both moisture and rutting susceptibility, and dynamic modulus testing was performed to evaluate mixture stiffness. Lastly, a critical temperature analysis was used to characterize the low-temperature cracking performance of the asphalt mixtures using AASHTO T 322-07. This analysis involves determining the temperature at which the estimated thermal stress exceeds the testing indirect tensile strength of a mixture.

Conclusions and Recommendations

Overall, no significant impact could be linked to using the GlasPave RAP instead of the control RAP in an asphalt mix design. The following specific conclusions can be drawn based on the results of laboratory testing in this study:

1) Characterization of the two 12.5 mm NMAS mix designs showed that they were very similar in terms of aggregate gradation and volumetric properties, making them ideal for comparative laboratory performance testing.
2) The extracted binder content of the GlasPave RAP was slightly higher than that of the control RAP, most likely due to sampling and testing variability. There was no significant difference between the two mix designs in terms of the recovered binder grades and the gradations of the recovered aggregates.

3) The TSR results for the control RAP and GlasPave RAP mix designs were not significantly different.
4) Results from the Hamburg wheel-tracking device showed that the control mix design had a lower average rut depth and that the GlasPave RAP design had a higher stripping inflection point (SIP) value. However, the differences were not statistically significant, and the two mix designs should have similar resistances to rutting and moisture damage.
5) The dynamic modulus test showed that while the control RAP mix design was slightly stiffer than the GlasPave RAP mix design, the difference may not be practically significant.
6) The critical temperature analysis indicated that there was no significant difference in the critical low temperature at which the two mix designs would experience thermal cracking.

Acknowledgements and Disclaimer

The research reported herein was performed by the National Center for Asphalt Technology, Auburn University. This research synopsis provides a brief summary of the study's final publication. This document is for general guidance and reference purposes only. NCAT, Auburn University, and the listed sponsoring agencies assume no liability for the contents or their use.