Summary Report 187-20S

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FIELD PERFORMANCE OF ASPHALT-RUBBER INTERLAYERS

DEPARTMENTAL INFORMATION EXCHANGE

TEXAS TRANSPORTATION INSTITUTE

In cooperation with Texas Department of Transportation and the FHWA

Summary Report

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PROBLEM STATEMENT

According the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA), crumb rubber modifier must be used in a minimum percentage of the total tons of asphalt laid beginning in 1994. Blending modified scrap tire rubber (crumb rubber) with asphalt cement and then using it as an asphalt-rubber interlayer would meet these requirements. The interlayer is a spray application of asphalt-rubber binder and cover aggregate placed beneath an overlay of Hot Mixed Asphalt Concrete (HMAC). It is meant to serve as a stress absorbing membrane interlayer (SAMI) that reduces the development and propagation of reflective cracks through the new overlay.

While the use of crumb rubber in interlayers or seal coats is backed by years of experience, questions still remain about the overall performance of asphalt-rubber interlayers. Do they reduce reflection cracking? How do they compare to conventional interlayer binders? What variables contribute to the overall performance of the interlayers?

OBJECTIVES

The Texas Transportation Institute (TTI) has completed Study 187, task 4, *Monitoring of Asphalt Rubber Test Road*, in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA). During 1983 and 1984, three test roads with asphalt-rubber interlayers were constructed in El Paso, Buffalo, and Brownsville. TTI Research Report 187-20, "Evaluation of Asphalt-Rubber Interlayers," presents the long-term field performance results in terms of the interlayers' ability to reduce the rate of reflective cracking.

Researchers considered several variables in the field experiments: concentration of rubber, binder application rate, type or source of rubber, and digestion (mixing) time of asphalt and rubber. Control sections consisted of no interlayer and interlayer binders of polymer-modified asphalt and conventional asphalt cement. Before and after construction, researchers conducted visual distress surveys and statistically analyzed the comparison data.

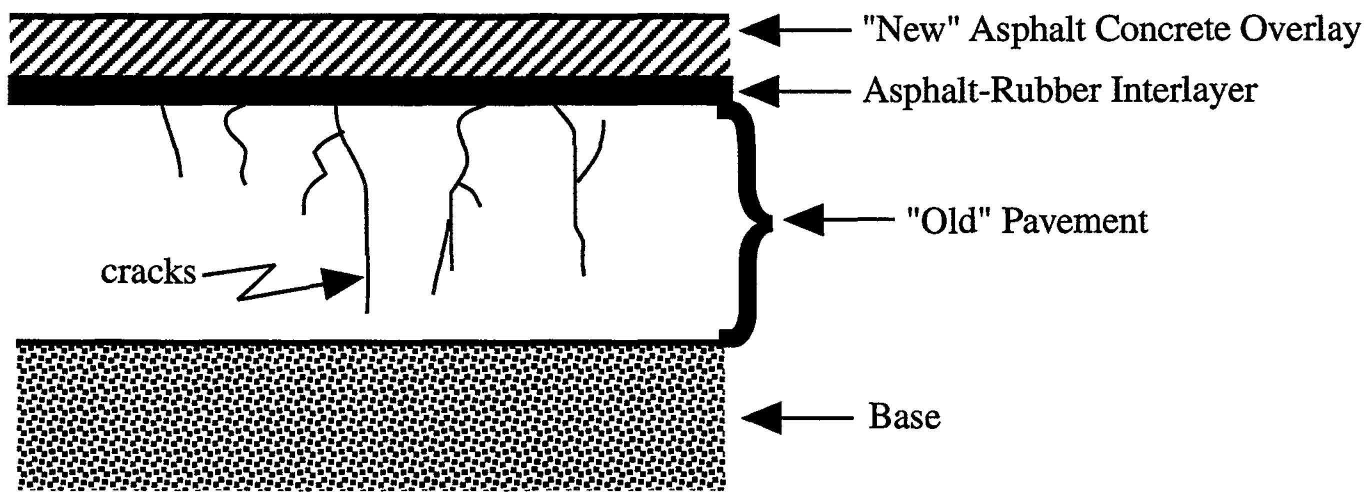
FINDINGS

The performance of the El Paso Test Road revealed that asphalt-rubber interlayers are better than no interlayer at all. It appeared that the fairest measure of how well a treatment performed was the length of time it took for the pavement to return to its preconstruction distress level. The general trends in the data taken from the nine test sections and the one control support the following:

1) Rubber type does not appear to be a factor in determining the reflection cracking.
2) The lowest concentration of rubber (22%) performed the best.
3) The highest binder application rate (0.45 gsy) appears to produce better performance in terms of reflection cracking.

The Brownsville Test Road was designed to evaluate field performance of two aggregate grades, grade 3 and grade 4, in single and double applications as interlayers. Applying additional binder to asphalt rubber interlayers or chip seals during construction can possibly reduce reflection cracking; so researchers also wanted to determine how other conventional binders (applied in double layers) compared to asphalt rubber. Data taken before 1991 show the asphalt-rubber interlayers to be sig-

Asphalt-rubber interlayers are more effective at reducing reflective cracks in the overlay than no interlayer at all.



nificantly better than the controls, with only the asphalt-rubber double interlayer significantly better than the two singles, the conventional, and the control. However, 1991 data show the asphalt *cement* double interlayer performed better than the Asphalt-Rubber Single Interlayer (The Asphalt-Rubber Double Interlayer had to be eliminated from further analysis due to excessive bleeding at the pavement surface that may have concealed any cracking.). This finding supports the possibility that the binder quantity applied to construct the interlayer may have the greatest effect on reducing reflection cracks.

The Buffalo Test Road consisted of eight test sections: four with Asphalt-Rubber Interlayers of varying rubber content and mixing times, two controls with conventional asphalt cement as the interlayer binder, and two controls with no interlayer. Rubber type and binder application rate were held constant. While final conclusions drawn from this test road would be premature, all four of the Asphalt-Rubber Interlayer sections had less cracking than the control sections. However, statistical analysis showed only the treatment with 18% rubber (a lower percentage) and a high digestion time was significantly better than all the others. It appears that low digestion may result in transverse cracking sooner than high digestion.

CONCLUSIONS

According to the statistical analyses of the data taken from these field experiments, in general, asphalt-rubber interlayers are more effective at reducing reflection cracking in the overlay than no interlayer at all. Asphalt-rubber also performed better than control sections composed of asphalt cement interlayers and polymer-modified interlayers, except in one case where the interlayer was a double application of an asphalt cement/aggregate .

The data also indicated that higher binder application rates lead to improved cracking resistance; however, on many test sections, *excessively* high binder application rates caused flushing at the pavement surface. Rubber type or source did not seem to be a factor in determining reflection cracking, but the interlayers with lower concentrations (18-22%) of rubber appeared to perform better than those with higher (24-26%) rubber content.

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The information described in this summary is reported in detail in TTI Research Report 187-20, "Evaluation of Asphalt-Rubber Interlayers," by Cindy K. Estakhri, Olga Pendleton, and Robert L. Lytton, May 1993. The contents of the summary do not necessarily reflect the official views of TxDOT or the FHWA.