

INVESTIGATION OF A PROCESS UTILIZING
LATEX FOR REDUCING OR PREVENTING
REFLECTION CRACKING IN BITUMINOUS
OVERLAYS PLACED ON FLEXIBLE PAVEMENTS

Research Laboratory Section
Testing and Research Division
Research Project 77 NM-541
Work Plan No. 73

Michigan Transportation Commission
Hannes Meyers, Jr., Chairman; Carl V. Pellonpaa,
Vice-Chairman; Weston E. Vivian, Rodger D. Young,
Lawrence C. Patrick, Jr., William C. Marshall
John P. Woodford, Director
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The Problem

Reflection cracking in bituminous overlays is becoming an increasingly important maintenance problem due to the many miles of roads and streets now in need of major repair or rehabilitation. Such cracking degrades riding quality and allows foreign material to infiltrate the surface, causing further damage to the pavement. Sealing these cracks has proven costly and relatively ineffective.

Scope

This project is being proposed to evaluate the effectiveness of a new process to reduce or prevent reflection cracking in bituminous overlays placed on flexible pavements. A test site approximately two miles long will be required.

The process uses an asphalt-latex mixture to form a stress absorbing membrane interlayer between the existing surface and the leveling and wearing courses. The mixture consists of latex and asphalt emulsion.

Objectives

Reflection cracking is primarily the result of vertical and horizontal movement in the underlying pavement which is transmitted into the bituminous overlay. Such movements may be thermally or load induced. Any attempt to reduce reflection cracking must be directed to reducing this movement or its transmission into the overlay.

Latex, when combined with emulsified asphalt and placed as a stress absorbing membrane-interlayer, will provide an elastic separation layer between the underlying pavement and surface course which may reduce transmission of strain.

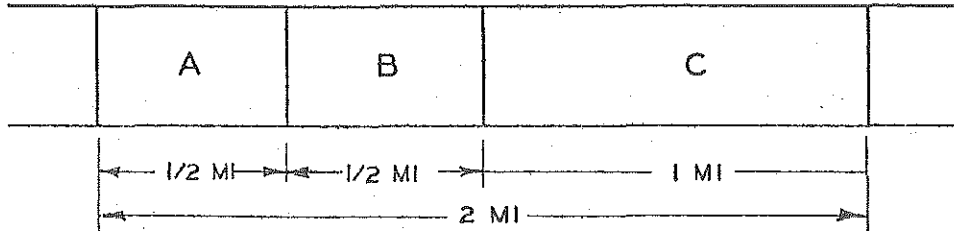
Status of Known Research

The asphalt-latex membrane was proposed by the Firestone Synthetic Rubber and Latex Co. and Rub-R-Road, Inc., to compete with the asphalt-ground tire rubber process introduced in Michigan last year by Sahuaro Petroleum and Asphalt Co. The asphalt-latex mixture has never been used to produce a stress absorbing membrane-interlayer. The mixture has been tried as a seal coat using a much lower proportion of latex than that suggested by Rub-R-Road for the membrane. Asphalt-latex seal coats have been applied to several city streets in Toledo, Ohio, a 4-mile project in Washtenaw County (1977), and two 3.5-mile projects in Jackson County (1978). The Washtenaw County project suffered base failures and had to be reconstructed before performance of the seal coat could be evaluated. The two Jackson County projects are performing satisfactorily; however, they have been in place for less than one year.

This investigation is being proposed to evaluate the performance of the asphalt-latex membrane when placed over a flexible pavement. Localized movements in the underlying flexible pavement should be less than in a rigid pavement and thereby impose less severe demands on the stress absorbing membrane.

Research Procedure

A test site two miles in length is proposed, constructed as follows:



- A) Asphalt emulsion-latex membrane to be placed directly on existing pavement followed by conventional leveling and wearing courses.
- B) Asphalt emulsion-latex membrane to be placed between conventional leveling and wearing courses.
- C) Conventional leveling and wearing courses for control.

The stress absorbing membrane-interlayer will be placed the full width of the proposed surface including surfaced shoulder and shall be composed of 86 percent \pm 2 percent asphalt residue and 14 percent \pm 2 percent latex solids by volume in the cured state. The asphalt emulsion to be used shall be determined by the latex supplier who shall certify it to be compatible with the latex. The asphalt-latex mixture will be applied in two courses at 0.25 gal/sq yd each with cover stone 28B applied at 30 lb/sq yd.

Detailed condition surveys will be taken prior to construction and repeated at least annually to evaluate performance of the experimental sections.

Project Supervision

Construction of the project will be supervised by the Construction Division. The experimental design, condition surveys, compilation and analysis of research data, and performance evaluation will be supervised by the Research Laboratory. R. L. Felter of the Pavement Performance Group will be the Project Leader.

Research Cost Estimate

	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
Salaries and Wages	\$2,500	\$300	\$300	\$300	\$1,000
Travel and Subsistence	300	200	200	200	200
Report	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>1,000</u>
	\$2,800	\$500	\$500	\$500	\$2,200
Total Research Cost	\$6,500				

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
ASPHALT-LATEX STRESS ABSORBING
MEMBRANE (INTERLAYER)

The application of an asphalt-latex stress absorbing membrane (inter-layer) shall be accomplished in accordance with Sections 4.06 and 6.31 of the 1976 Standard Specifications with the following exceptions and additions:

4.06.02 Materials. -The stress absorbing membranes (interlayer) shall be a blend of asphalt emulsion and latex. The materials used shall meet the requirements as specified in Section 4.06 of the 1976 Standard Specifications with the following exceptions and additions.

1. Coarse Aggregate for Cover Material. -The coarse aggregate for cover material shall meet the requirements for 28B aggregate.

2. Latex. -The latex to be used shall be an unvulcanized virgin synthetic latex with rubber solids content between 48 and 71 ± 2 percent by weight.

3. Asphalt Emulsion. -The asphalt emulsion shall be an approved type certified by the latex supplier to be compatible with the latex to be used.

4.06.03 Equipment Requirements.

(b) Pressure Distributor. -The distributor shall be equipped with a spray bar capable of being extended to the side to a distance sufficient to allow material application over a full lane width adjacent to the vehicle's path of travel.

4.06.04b Mixing Asphalt-Latex Material. -The quantity of latex to be used shall be such that 14 ± 2 percent, by volume, of the cured membrane will be latex solids. Unless otherwise approved by the Engineer, the materials shall be combined using the following method: (a) Fill the distributor half full with asphalt emulsion at the temperature specified for application of the emulsion. (b) Add the total quantity of latex required for the batch, followed by the remaining quantity of asphalt emulsion. (c) Mixing must be continuous during the addition of all materials and shall continue for approximately 15 to 30 minutes after all material has been added. During this time, the temperature of the mixture shall be raised to that specified for application of the asphalt emulsion. The heated mixture shall be thoroughly mixed before using and shall be used within 24 hours after blending.

4.06.06 Preparation of Foundation. -When the asphalt-latex membrane is to be placed directly on a distressed surface, all cracks and joints exceeding 1/4 inch in width shall be filled with asphalt-latex material prior to placing the membrane.

4.06.08 Bituminous Surface Coat. -The asphalt-latex stress absorbing membrane (interlayer) shall be placed in two courses of 0.25 gallons per square yard each. The first course must be cured before application of the second course.

All transverse joints shall be made by covering a length at the end of the previous application with building paper. The new application shall then start on the building paper. Once the application process has progressed beyond the covered portion, the paper shall be disposed of as directed by the Engineer.

All longitudinal joints shall be lapped a minimum of 4 inches.

4.06.09 Application of Cover Material. -The cover material shall be applied immediately following the second application of asphalt-latex material.

The cover material shall be 28B aggregate applied at a rate of 30 pounds per square yard.

(b) Application of Leveling Course or Wearing Course. -The bituminous concrete leveling and/or wearing course to be placed over the membrane shall not be applied until the membrane is thoroughly cured. Traffic shall not be allowed on the membrane until it is thoroughly cured; however, once curing is complete, low speed traffic may be allowed on the membrane before the leveling or wearing course is applied.

4.06.13 Method of Measurement. -The asphalt-latex stress absorbing membrane (interlayer) will be measured in square yards.

4.06.14 Basis of Payment. -The completed work as measured for ASPHALT-LATEX STRESS ABSORBING MEMBRANE (INTERLAYER) will be paid for at the contract unit price for the following contract items (pay items).

<u>Pay Item</u>	<u>Pay Unit</u>
Asphalt-Latex Stress Absorbing Membrane (Interlayer)	sq yd

This price shall be payment in full for furnishing material and filling cracks as required, and for furnishing and placement of prime coat, asphalt emulsion, latex, and cover material.

6.31.09b Bituminous Seal Coat Construction. -When a two-lane roadway is being treated, and the shoulder is insufficient for operation of the distributor, traffic must be stopped in both lanes during application of the second course of asphalt-latex material to allow operation of the distributor adjacent to the lane being treated. Once the asphalt-latex material has been applied, traffic can resume in the lane not being treated. When the cover material has been applied, rolled and the membrane is thoroughly cured, low speed traffic can be allowed on the membrane. Also, traffic should be discouraged from stopping on the membrane to prevent tearing the surface.