

PERFORMANCE EVALUATION OF PLASTIC
FABRICS AS OVERLAY REINFORCEMENT
TO CONTROL REFLECTION CRACKING

Work Plan for an Experimental Project
By the Testing and Research Division
In Cooperation with the Construction Division

Research Laboratory Section
Testing and Research Division
Research Projects 71 NM-286,
77 TI-398, 72 NM-323, 78 NM-552,
72 NM-318, and 78 NM-566
Work Plan No. 72

Michigan Transportation Commission
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The Problem

Experimental fabrics such as Mirafi 140, Petromat, Cerex, Bituthene, Prepave, and others are being tested by highway agencies as reinforcement of bituminous overlays to minimize reflection cracking. Reflection cracks are caused by vertical and horizontal movements due to temperature and moisture variations in the existing pavement beneath the asphaltic overlay. Because of these movements, joints and cracks in the underlying pavement propagate and 'reflect' through the overlay generally after one or two years of service performance. Prevention or reduction of reflection cracking is critical to the service life of the rehabilitated pavement.

Several factors such as permeability, resistance to environmental chemicals, breaking and bond strength, resistance to wrinkling and weathering, ease of installation, and economy must be considered before selecting the fabric for experimental purposes. As requested by the New Materials Committee at the June 6, 1978 meeting, this proposal has been prepared for an experimental project including six different types of fabrics which appear worth evaluating as reflection crack arrestor for pavement overlay restoration.

Scope

This investigation will include the rehabilitation of a jointed portland cement concrete pavement with an asphaltic concrete overlay reinforced with experimental fabrics to eliminate or reduce propagation and reflection of transverse joints and existing cracks through the overlay.

The trial project should include at least two miles of an old concrete pavement with substantial transverse joint failures and cracks where repairs are required before resurfacing.

Objectives

Specifically, this experiment is designed to evaluate the relative performance of six different thermoplastic fabrics as reinforcement for asphalt overlays and to determine their relative merits in retarding reflection cracking as compared with conventional practices of crack sealing and joint repairs.

Benefits

If the fabric treatment proves effective in reducing reflection cracking, one of the biggest pavement maintenance problems will be reduced.

Status of Known Research

Considerable experimental work with fabrics as reinforcement for asphalt overlays is underway across the nation in search of a practical

solution to the reflection cracking problem in bituminous resurfacing. In fact, about 13 states are formally participating in a National Experimental and Evaluation Program, identified officially as the "NEEP Project No. 10." The desirable features of a practical solution of the cracking problem include: elimination or reduction of reflection cracking, improved overlay durability, and economy of construction and maintenance procedures.

The test treatments being investigated under the NEEP Project No. 10 range from experimental fabrics (Petromat, Structofars, Cerex, Burlington, Reclamite, Mirafi 140) to plant and open graded mixes. Design features of the fabric installations vary from short strips placed directly over cracks and transverse joints of concrete pavements to full lane or more widths as reinforcement for asphalt overlays.

Presently, only two experimental fabrics (Petromat and Mirafi 140) have been recommended by some highway agencies as promising crack resistant material. These two fabrics are being evaluated under the current Departmental New Materials program. The Petromat installations over old concrete pavements (Ann Arbor and Saginaw projects) have proved inadequate to control surface cracking and pavement joints reflecting through asphalt overlays on residential streets carrying moderately heavy traffic. The Mirafi 140 installation, after two winters of pavement service, showed about 18 percent reflection cracking.

Preliminary results of these investigations were summarized in Research Report No. R-972 and office memo of June 8, 1978, Project File 71 NM-286.

Research Procedure

Once the project site has been selected, condition surveys will be made before construction to document deteriorated conditions of cracks and transverse joints and determine type of repairs and treatment as required by the number of fabrics being tested and control sections to be used for comparison purposes.

Six different types of fabrics, Mirafi 140, Petromat, Bituthene, Pre-pave, Cerex, and Polyguard, will be included in the project. Fabric strips 6 ft wide will be placed directly over cracks and transverse joints, and will extend the full lane width, as reinforcement before resurfacing. Selection of specific locations for the test strips will be made to ensure that the experimental treatments and their replicates will be tested under similar circumstances. After two or three years of service performance, data obtained from condition surveys will be analyzed to determine the relative merit of each treatment.

Project Supervision

The project will be a cooperative effort within the Michigan Department of Transportation and will include Construction Division, and Testing and Research Division personnel. Construction personnel will supervise construction of the project in the normal manner, and will work with researchers in the selection of joints for repair and for the experimental treatments to be tested. Pavement condition surveys, compilation and analysis of experimental data, and all subsequent evaluation and reporting will be handled by the Research Laboratory.

Time Requirements

Preliminary results regarding serviceability performance of the experimental project should be obtained within three years after construction.

Estimated Cost

	<u>1st Year</u>	<u>2nd Year</u>	<u>3rd Year</u>
Salaries and Wages	\$ 5,000	\$3,000	\$3,000
Materials and Supplies*	8,000	---	---
Travel Expenses	300	100	100
Reports	300	---	300
Contingencies	<u>1,000</u>	<u>---</u>	<u>---</u>
Total Estimated Cost	\$14,600	\$3,100	\$3,400
TOTAL COST	\$21,100		

*Includes plastic fabric and waterproof membranes.

APPENDIX

Fabric Name: Petromat (Research Project 71 NM-286)
Manufacturer: Phillips Petroleum Company
Composition: polypropylene fabric reinforced with filaments
Roll Size: 300 ft long by 12 ft wide (400 sq yd)
Test Area: 350 sq yd
Fabric Binder: asphalt cement 85/100 grade
Cost Installed: \$1.00-\$1.50/sq yd

Fabric Name: Mirafi 140 (Research Project 77 TI-398)
Manufacturer: Celanese Fibers Marketing Company
Composition: polypropylene core covered with a nylon sheath
Roll Size: 330 ft long by 14-3/4 ft wide (540 sq yd)
Test Area: 350 sq yd
Fabric Binder: asphalt cement 85/100 grade
Cost Installed: \$1.00-\$1.50/sq yd

Fabric Name: Bituthene (Heavy Duty) (Research Project 72 NM-323)
Manufacturer: W. R. Grace and Co.
Composition: polyethylene membrane coated on one side with rubberized asphalt
Roll Size: 200 ft long by 3 ft wide (67 sq yd)
Test Area: 350 sq yd
Fabric Binder: Bituthene primer and asphalt cement 85/100 grade
Cost Installed: over \$5.50/sq yd

Fabric Name: Prepave (Research Project 78 NM-552)
Manufacturer: The Logan-Long Company
Composition: polypropylene, two layers of spun bonded fabric
Roll Size: 200 ft long by 3 ft wide (67 sq yd)
Test Area: 350 sq yd
Fabric Binder: asphalt cement 85/100 grade
Cost Installed: over \$4.00/sq yd

Fabric Name: Cerex (Research Project 72 NM-318)
Manufacturer: Chemstrand Research Center, Inc.
Composition: spun bonded nylon filament
Roll Size: 1,500 ft long by 4-3/4 ft wide (790 sq yd)
Test Area: 350 sq yd
Fabric Binder: asphalt cement 85/100 grade
Cost Installed: \$0.80-\$1.20/sq yd

Fabric Name: Polyguard 665 Membrane (Research Project 78 NM-566)
Manufacturer: Polyguard Products, Inc.
Composition: rubberized asphalt and polypropylene mesh
Roll Size: 200 ft long by 2 ft wide (44 sq yd)
Test Area: 350 sq yd
Fabric Binder: Polyguard primer (No. 650)
Cost Installed: over \$5.00/sq yd