THE EVALUATION
OF
NON-WOVEN FABRICS

PETROMAT & MIRAFI

MAY, 1982

Research and Development Division
Oklahoma Department of Transportation

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16. ABSTRACT

The objective of this report is to study non-woven Thermoplastic fiber fabrics and their effects in eliminating and diminishing reflective cracking in asphalt concrete overlays. Two fabrics, namely Petromat and Mirafi 140, were placed on an existing Interstate highway. The road was overlayed with 1 1/2 inches of Type C asphalt concrete and 3/4 inches of open graded friction course. The fabrics appear to be performing in a cost effective manner.

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EXECUTIVE SUMMARY

This report covers a study of non-woven thermoplastic fiber fabrics and their effect in eliminating or diminishing reflective cracking in an asphalt concrete overlay.

In 1976 two fabrics were placed on badly cracked I-40 near Hydro, Oklahoma. Fabrics used were Petromat®, a non-woven, needle punched, polypropylene fabric made by Phillips Fibers Coperation, and Mirafi 140®, a non-woven fabric consisting of heat bonded polypropylene and polypropylene core with a nylon sheath made by the Celanese Corporation.

The treated and untreated sections were selected randomly and the fabrics were laid in full lane widths, using AC-3 as a tack coat. The asphalt concrete highway was overlaid with 1 1/2 inches of Type C asphalt concrete and 3/4 inch of open-graded friction course.

The use of 0.30 gal./yd.^{2} (1.37 l/m^2) or more asphalt cement as a tack coat, especially on warm sunny days, caused the laydown machine to slip and pull the fabric. Also on an up-grade section of road, traffic, rain, and inexperience in the handling of fabrics caused minor problems.

All cracks in both treated and untreated sections were mapped, classified, and recorded in detail before and after the fabric installation.

The final evaluation was conducted five years after installation. The fabrics appear to seal and diminish the reflective cracking in a cost effective manner. Both fabrics performed well in suppressing random and alligator cracking.

It is recommended that Petromat or Mirafi be used as an anti-reflective cracking treatment for alligator and random cracking. Use of either Petromat or Mirafi (or other fabrics with similar properties) for open transverse or longitudinal cracks 3/8 inch (10 mm) or less in width is recommended.

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in			centimeter	
mi				m

(weight)

	(2000 lb)			t

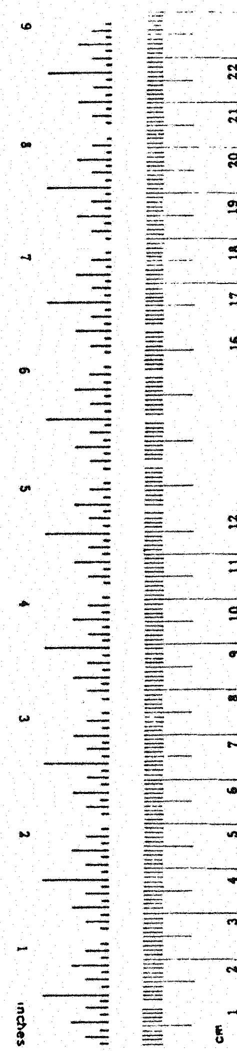
VOLUME

tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces		milliliters	ml
c	cups	0.24	liters	l
pt	pints		liters	l
	quarts			l
gal	gallons	3.8		l
ft^3	cubic feet		cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3

TEMPERATURE (exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in ≡ 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Te

LENGTH

mm				in

(weight)

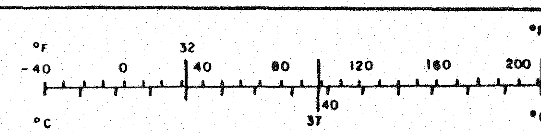
t	tonnes (1000 kg)	1.1	short	

VOLUME

ml	milliliters		fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters		gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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INTRODUCTION

Reflective cracking is a continuing problem in asphalt concrete (AC) pavement as well as Portland cement concrete (PCC). Reflective cracking generally refers to cracks that propagate from pre-existing cracks in the underlying pavement. For years, highway engineers have tried to eliminate reflective cracking in AC and PCC pavements.

This cracking not only decreases the life of an overlay, it also increases the cost of maintenance while producing a rough ride.

It was obvious that some material or construction method was needed to minimize or retard reflective cracking in order to increase the overlay life. Using fabric is one possible solution to this problem.

Background

The highway selected for the Petromat and Mirafi fabric test was a badly cracked section of I-40 approximately 55 miles west of Oklahoma City, Oklahoma. This section was originally constructed under Project No. I-204(19) in 1958 and consisted of 6 to 10 in (152 to 254 mm) of select material, 8 in (203 mm) of stabilized aggregate base with 3 in (76 mm) of Type "A" asphaltic concrete and 1-1/2 in((38 mm) of Type "C" as the surface course. (See Figure 1.)

Purpose

The purpose of this study is to evaluate non-woven thermoplastic fabrics and their effects in eliminating or diminishing reflective cracking in asphalt cement overlays.

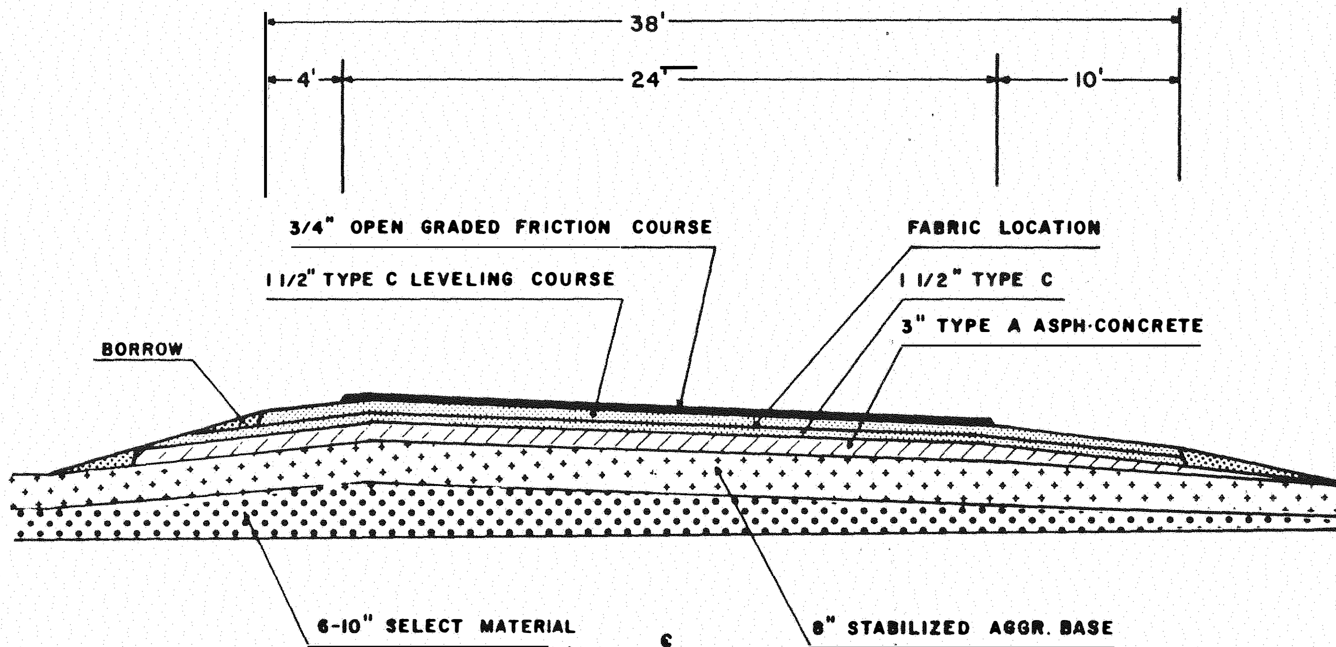

Figure 1. Typical Roadway Half Section

Scope

The test sections were randomly selected from the eastbound lanes of I-40 near the city of Hydro. The fabrics were laid in full lane widths, using AC-3 as a tack coat. Then they were overlayed with one and one-half inches of Type "C" asphalt concrete and 3/4 in (19) mm of open graded friction course.

Two fabrics, namely Petromat and Mirafi were selected for this study.

Petromat is a non-woven polypropylene fabric which has been used mostly as a stress absorbing membrane interlayer and as a membrane in a bituminous surface treatment (seal coat). It has been used as a bridge deck protective seal on highways with mixed results. It had been used previously on two small projects on Oklahoma highways; U.S. 69 near Checotah, McIntosh County, and I-35 near Braman, Kay County.

Mirafi 140 is a non-woven fabric consisting of two types of continuous filament fibers, polypropylene and polypropylene core with nylon sheath. The subject project is the first highway project in Oklahoma to specify Mirafi 140 as an anti-reflective crack membrane.

Fabric Properties

Petromat is a non-woven polypropylene fabric manufactured by Phillips Petroleum Co. The fabric was originally made for carpet backing. It has been used by the highway industry as a waterproofing and stress relieving membrane beneath the road surface. The properties of Petromat as listed by the manufacturer prior to construction were:

Tensile strength either direction, minimum 50 lbs/in (0.9 kg/mm)

Weight	- Approximately 5 oz/yd^2 (167 gm/m^2)
Color	- Black
Width	- 12.5 ft (3.8 m)
Length per roll	- 300 ft (91.4 m)

Mirafi is a non-woven permeable fabric manufactured by the Celanese Fibers Market Company. The fabric was originally made for ground stabilization and subsurface drainage applications, but was recommended for pavement reinforcement by the manufacturer. The properties of Mirafi as listed by the manufacturer prior to construction were:

Tensile strength	- machine direction	- 56 lbs/in (1.0 kg/mm)
	- transverse dir.	- 49 lbs/in (0.9 kg/mm)
Weight		- 4 oz/yd^2 (134 gm/m^2)
Color		- white
Width		- 14.75 ft (4.5 m)
Length per roll		- 328 ft (100 m)

CONSTRUCTION

The Interstate highway overlay project (I-40-3(39)086) was done in the fall of 1976, and began at the Custer-Caddo County line and extended east for 3.45 mi (5.5 km). The dual lane road section was overlaid with approximately 1 1/2 in (38 mm) of Type "C" asphalt concrete as a leveling-course and 3/4 in (19 mm) of open-graded friction course for a safety overlay (see Figure 1). The fabric was laid in full lane width strips on randomly selected sections of the project in the eastbound lanes.

Preparation

Prior to the start of the project, ODOT maintenance forces sealed cracks with SS-1 liquid asphalt emulsion and blotted with screenings from the Cooperton quarry. Afterward, all cracking in both lanes was mapped in detail and 35mm slides were taken every 25 ft (6.3 m) on the eastbound lanes from Station 4601+30 to 4740+50. These items have been used on an annual basis for comparison and quantitative analysis.

Research and Construction personnel selected the locations for fabric placement and the control sections by visual inspection. They attempted to make selections so that each individual test or control section had approximately the same type and amount of cracking.

Placement of Fabric

The test sections were randomly selected on the eastbound lane of I-40 near the town of Hydro.

Construction began on September 30, 1976, with the contractor building crossovers and erecting signs and barricades. October 1, 2, and most of the morning of the 4th, were spent reconstructing the inside eastbound shoulder.

Initial construction with the reinforcing fabric began around 10:30 a.m., October 4, 1976. Field representatives for both companies supplying fabric were on hand to aid in the placement of their fabric. Both had required that an 85-100 penetration grade asphalt, AC-3, be used as a tack coat. The temperature of the oil was $300^{o}F$. There were generally 5-30 minutes between the asphalt application and the fabric laydown. Petromat required a 0.22 gal/ yd^2 (1.0 l/m^2) application rate while Mirafi 140 needed only 0.15 gal/ yd^2 (0.68 l/m^2).

Petromat

For Petromat, the contractor used a laydown machine which was designed and provided by Phillips. It consisted of a small Allis Chambers tractor with a modified front end loading device. The Petromat fabric came in 300 ft. (91.4 m) sections rolled on 12.5 ft. (3.8 m) long hollow cardboard tubes. The roll was mounted on an axle of special design and placed on the front of the loading device where it was held in place by 14 psi (0.10 MPa) tension devices. A section of fabric was rolled off and placed under brooms mounted directly behind the fabric roll. The front end was then lowered until the brooms pressed the fabric into the tack coat. The tractor was then driven slowly forward pulling the fabric off the roll. The brooms provided an even distribution of pressure on the fabric to achieve a smooth surface. A bicycle chain on a pipe boom mounted on the front of the roll was used as a guiding device.

A 300 ft. (91.4 m) roll of Petromat could be placed in 4-7 minutes, depending on the experience of the crew. The fabric was overlapped 6 in (152 mm) in the direction of the overlay. These joints were then tacked with either AC-3 or SS-1 asphalt. The operation required a machine operator, two roll handlers, and a truck and trailer with the fabric rolls. The wrinkles were few, minor and mostly resulted from correcting the alignment of the tractor or from high winds. There was very little wrinkle cutting and overlapping. It was felt that given an hour or so lead time, this operation could stay ahead of a typical laydown operation.

Petromat was left exposed on two occasions with mixed results. A 200 ft. (61 m) section was left exposed to traffic on October 4th with no visible damage, and all wrinkles were smoothed out. The surface of the fabric appeared slightly worn or fuzzy, but this did not adversely affect either the fabric or the bond. On the contrary, it was felt that the overlay bonded better to the worn surface. Two sections were exposed to an all day rain on October 7th, which resulted in one section (Station 4775+75 to 4778+75) being removed and replaced.

Mirafi 140

Mirafi 140 comes on hollow rolls, 328 ft.(100 m) long and 14.75 ft. (4.5 m) wide, which were cut with a power saw to a width of 12 ft. (3.6 m). The first day's operations began by using a single axle, two wheel device, built by the fabric manufacturer. A tension device and handle were mounted on each side next to the wheel. On October 4, the first day of placement, a roll of fabric was mounted on the axle and a small section was rolled off. The fabric was then placed on the tack coat, and the device was pulled forward by personnel stationed on each of the handles. The fabric was supposed to be pulled slowly off the rolls, but the tension handles failed to keep uniform pressure, causing the device to skew into the tack leaving large wrinkles. This skewing was difficult to correct, often resulting in misalignment of the fabric. The fabrrc then was cut, realigned and overlapped to form a new joint. Also, the wind blew the light fabric about causing numerous wrinkles which had to be repaired by cutting and overlapping. In the afternoon, the axle device was discarded, and the material was rolled out by hand. This resulted in poor alignment and lack of tautness which caused wrinkles and numerous joints.

The second day, October 5, 1976, the contractor again used the wheel and axle with several workmen pushing a hollow cardboard tube with brooms directly behind the Mirafi fabric roll. This created some pressure which forced the fabric into the tack coat. There were some wrinkles, although fewer than the previous day, but proper alignment was still a problem.

Mirafi 140 was extremely difficult to overlay on one section of road (Station 4681+00 to 4686+00) that had excess tack (0.30 gal/ yd^2) (1.35 l/m^2) and was on a mild upgrade. The laydown machine slipped and pulled the fabric causing an unevenly laid surface with gaps or cracks in the freshly laid material. One section of material was replaced with new fabric, due to excessive wrinkles in the material surface which could not be removed.

The contractor acquired a set of tension devices on the third day, October 6, 1976, and changed his method of working. The AC-3 tack coat was shot early to allow more time for the oil to cure out. Several workmen then stood on the end of the Mirafi 140 on the tack coat as they hand pulled the roll forward in the air for about 50 ft. (15.2 m). Then, with several workers holding onto each side, the fabric was pulled tight and laid on the tack. The surface then was broomed to eliminate wrinkles; the workmen walked forward to where the roll lay; and the operation was repeated.

After the fabric was laid, the entire surface was rolled using a rubber tire roller. This produced an excellent tight surface with no wrinkles and was easily overlaid. The fabric placement was slow but did not interfere with the Mirafi due to the early start. This technique was used in placing the rest of the Mirafi 140 on Friday, October 8th.

At the request of the fabric manufacturer's representative, no Mirafi was left exposed to traffic.

PROBLEMS

Excess Oil - Approximately 0.30 gal/ yd^2 (1.35 l/m^2) of tack coat was shot on a two percent upgrade, for about 100 ft. (30.5 m) on the inside lane of Petromat and 500 ft. (152.4 m) of Mirafi on the outside lane. This occurred on a warm, 75°F (24°C) sunny day and laydown operations, upon reaching this oil, began to slip and pull the fabric. The slipping on Petromat was stopped by spreading bituminous hot mix material under the tracks of the laydown machine. On Mirafi, the laydown machine continued to slip and pull despite the bituminous material, leaving cracks in the newly laid surface. The fabric wrinkled under the overlay and caused the surface to be very uneven or bumpy. This required a good deal of hand finishing to correct the condition.

The next day, the entire Mirafi and Petromat section had numerous transverse cracks. These were found to correspond with wrinkles that could be seen in the fabric from the shoulder. At the material representative's suggestion, the road was left exposed to traffic for several days. Traffic was detoured to these lanes, while the westbound lanes were being overlaid. Many of the transverse cracks had closed due to traffic and warm weather. Six sections of the badly cracked Mirafi section 150 ft. long (45.7 m), were removed and replaced with new Mirafi 140. No additional tack was required.

Weather - Wind caused problems with both fabrics. Mirafi was the more susceptible due to its lighter weight, as compared to Petromat. In winds above 20 mph (32 km/h) both fabrics were difficult to keep free of wrinkles.

Petromat was left exposed to traffic overnight twice and was rained on all day October 7th. Two 300 ft. (91.5 m) sections were exposed to both the rain and traffic. The ends toward approaching traffic of both sections began to come loose, as the dynamic action of the traffic and the effects of water on the fabric broke the bond between the fabric and the tack. Both were nailed with metal strips, but one section, Station 4775+75 to 4778+75, eventually peeled off and was replaced with new Petromat.

Peeled Spots - At several locations, such as bridge approaches and the right wheel path on the outside lane, where the overlay course was less than 1/2 inch in thickness, the fabric became exposed to traffic. These were generally 6 to 12 in (152 to 305 mm) wide and 2 to 15 in. (4.6 m) in length. It was felt that the thin overlay course lacked enough heat to pull the tack coat up to the aggregate and that the traffic then beat these overlay sections off the fabric surface.

Re-overlay - The outside eastbound lane, for the entire length of the project, was re-overlaid with one in. of Type C due to a rough riding surface. Outside lane pavement thickness varied from an aggregate thickness of 1/2 to 2 in. (12 to 48 mm). This was due to the malfunction of the paver sensing apparatus. This re-overlay was one inch thick feathered to nothing at the centerline of the road. The overlay on the outside lane now has a thickness of at least 1 1/2 in. (38 mm) and ranges up to 2 3/4 in. (70 mm).

Discussion

It is felt that the problems were due to a combination of excess oil, an up-grade section of road, and inexperience in the handling of fabrics. Traffic also can cause problems with the fabric, especially on rainy days. A thin overlay, less than 1/2 in. (12 mm) in thickness, over the fabric can be a problem if it is immediately exposed to traffic. The traffic quickly removes the overlay in the wheelpaths.

CRACK EVALUATION

Pre-construction Evaluation

The pre-construction evaluation was done during a two week period in September, 1976, The experimental sections were located and marked. The treated sections were chosen randomly. The existing system of reflective cracks was measured, classified, and drawn in detail, developing a detailed crack map. The width and length of each crack was measured, classified, and recorded. Figure 2 shows a typical crack evaluation map.

30-Day Evaluation

The 30-day evaluation took place on January 14, 1977, which was approximately 30 days after the final inspection. All of the fabric had been covered with overlay since October 8, 1976. The section of road had recently been subjected to several freeze/thaw cycles with approximately 3 in. (76 mm) of snow falling on January 7-8, 1977.

All fabric locations were marked with P-K nails 6 in. (152 mm) from the shoulder's edge andrecorded in a field book by station, lane width, and fabric type. In addition, the type of fabric, lane and location are given on a sign on the south right-of-way fence.

There were 42 transverse cracks within the project limits on the eastbound section (see Figure 3). Six of the cracks were located in Petromat between Stations 4672+00 and 4678+00. One crack was located in Mirafi (Station 4743+84) and one at the end of a Mirafi section at Station 4616+56. Only one crack ran the complete width of the road and it was in a control section. Most of the transverse

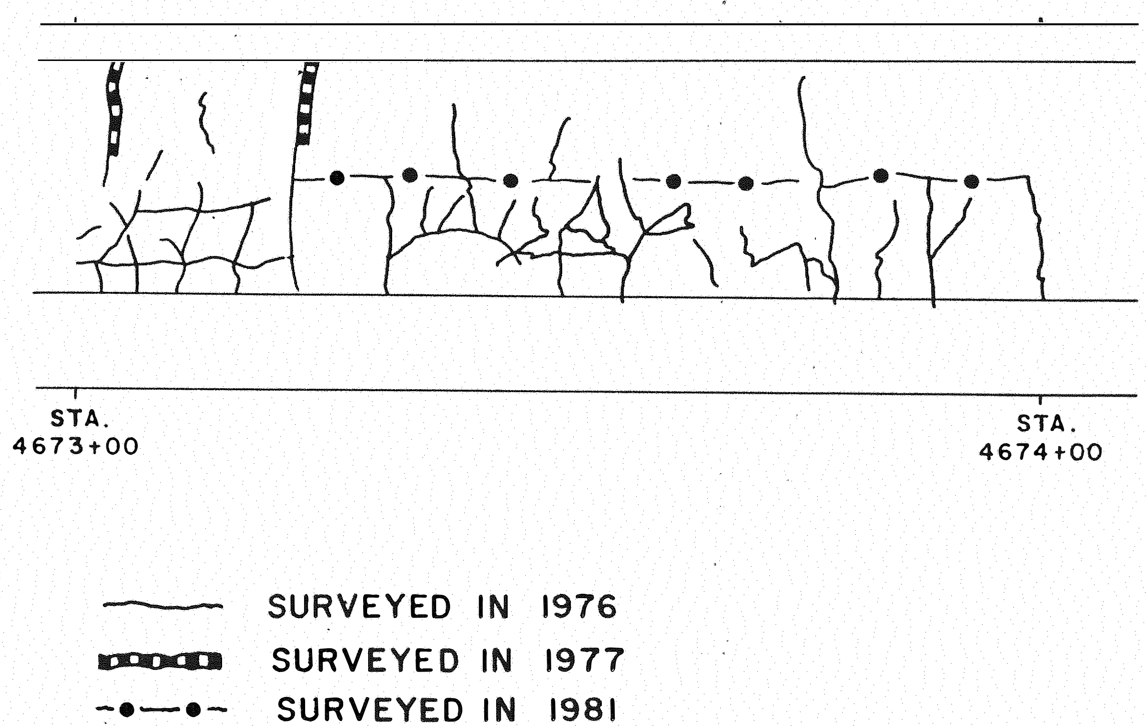

Figure 2. Typical Crack Evaluation Map for Petromat Test Section

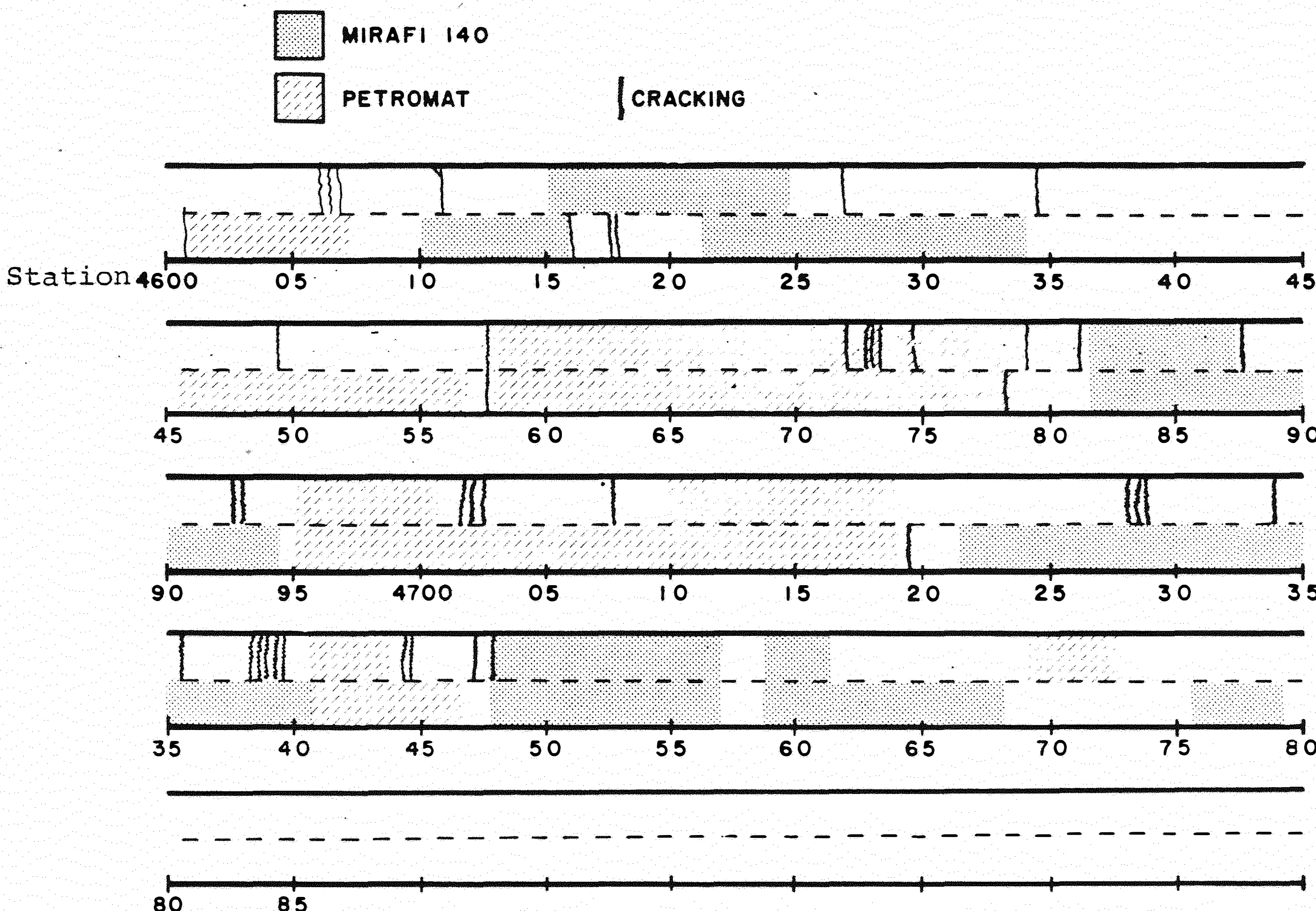

Figure 3. Transverse Cracks on Eastbound Section
30 Days after Construction

cracks began in the control sections opposite fabric sections and ran across the control section to the fabric edge. This occurred in control sections adjacent to both Petromat and Mirafi 140.

This evaluation was done to identify any construction errors and was not intended to evaluate the effectiveness of either fabric. In January, 1977, the road surface appeared to be in very good condition. The normal amount of surface cracking for this type of thin overlay was evident in the control sections.

Six Month and One Year Evaluations

The six month evaluation was made in June, 1977. The one year evaluation took place in February, 1978. The evaluation procedures were conducted according to those described in the pre-construction evaluation section.

It was desireable to determine how quickly the cracks were reflecting through in the treated and untreated areas. For evaluation purposes, 1,000 ft. (305 m) sections were choosen randomly for each of Petromat, Mirafi, and untreated areas.

In the 1,000 ft. (305 m) Mirafi section, no cracks had reflected through in six months. Only 8 percent of transverse cracks had reflected through in one year. The longitudinal, random (block), and alligator cracks had not reflected through at the end of the year.

In the 1,000 ft. (305 m) Petromat section, 9 percent of the transverse cracks reflected through in six months with 17 percent of the cracks reflecting through at the end of the first year. Neither the longitudinal nor the alligator nor the random (large block) cracks had reflected through in the first year.

In the 1,000 ft (305 m) control sections, 35 percent of the transverse cracks had reflected through in six months and 56 percent of them had reflected through at the end of the year. There were no longitudinal cracks reflecting through in the first year. Only 0.2 percent of the random and alligator cracks had reflected through in six months and 8 percent at the end of the year. (See Figure 4.)

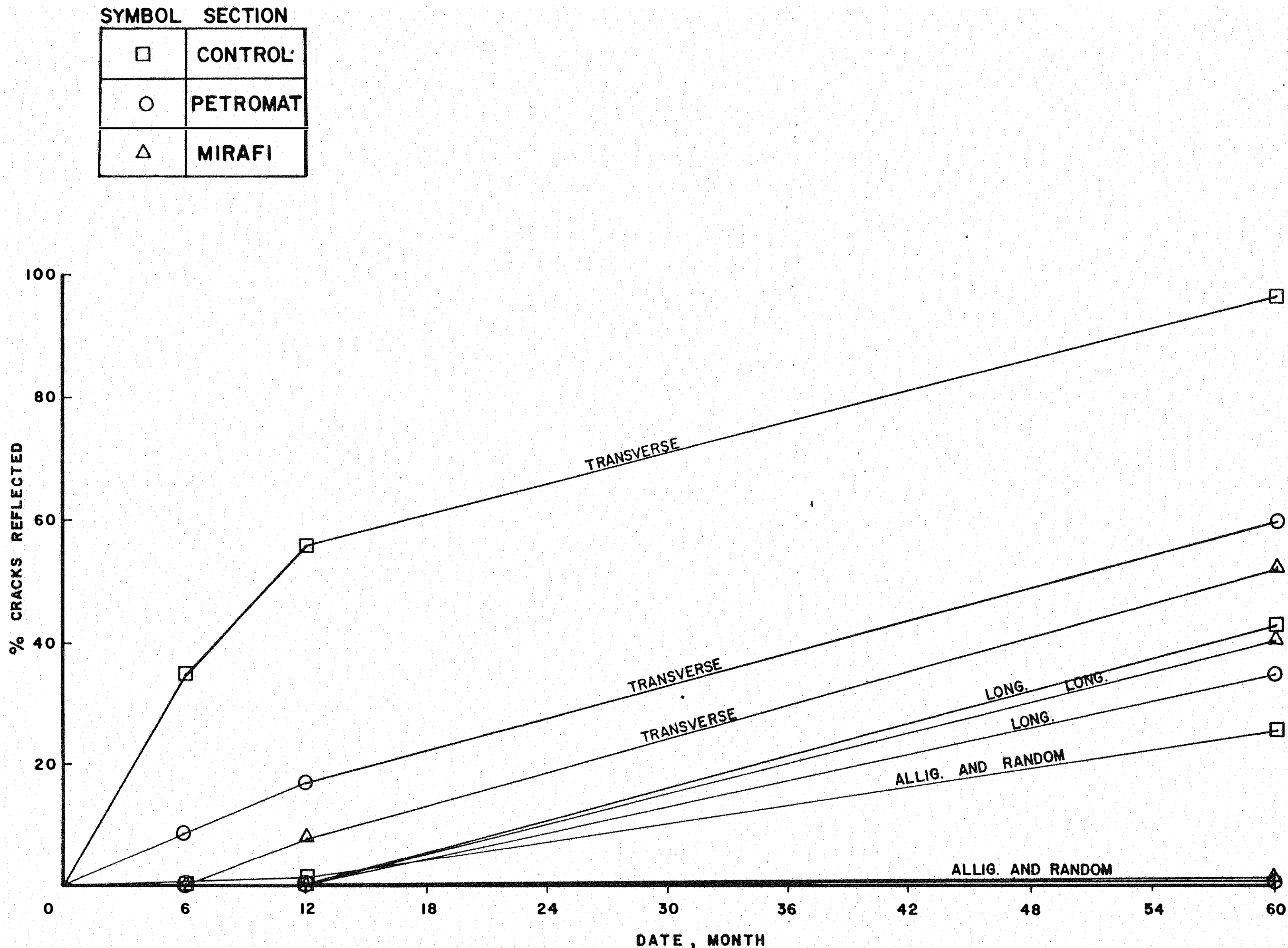

Figure 4. Crack Development for 1000 Foot Section

The width of the transverse cracks in both the treated and untreated areas was light to medium. See Table 1 for crack width classes.

The width of the longitudinal, alligator, and random cracks was very light to light.

Figure 2 shows the development of reflected cracks during the six month and year evaluations.

Table 1 - Crack Width Classifications

Dimension	Description
0-1/8 inch	very light
1/8 - 3/8 inch	light
3/8 - 5/8 inch	medium
5/8 inch and more	heavy

Note: 1 inch = 25.4 mm.

Five Year Evaluation

The final crack evaluation took place in May, 1981, approximately five years after the fabric placement. The test sections were located and marked every 100 ft. (30.5 m) from beginning of each test section in order to locate the reflective cracking accurately.

All the pre-construction cracking was located from the original crack map. Then the length and the width of each reflective crack was measured and recorded. The cracks were tabulated and categorized as alligator, transverse, longitudinal, and random (large blocks). See Table 2. It was decided to compare the width and the length of the original cracks with those found in the final survey, to determine how well the Petromat and Mirafi fabrics are performing.

DESCRIPTION			1976 SURVEY				1981 SURVEY			
STATION BEGIN / END	LANE LOCATION	TYPES OF FABRICS	ALLI. L*/W	TRANS. L/W	LONGIT. L/W	RANDOM L/W	ALLI. L/W	TRANSO L/W	LONGIT. L/W	RANDOM L/W
	LEFT									
	RIGHT									
	LEFT									
	RIGHT									
	LEFT									
	RIGHT									
	LEFT									
	RIGHT									

*L - length W - width

Table 2. Categorized Crack Form

In the Petromat sections, 37 percent of the transverse and 10 percent of the longitudinal cracks have reflected through (see Table 3). Only 1 percent of the alligator and 1 percent of the random cracks have reflected through (see Table 4 and 5). The widths of the random cracks which have reflected though were mainly light. The alligator cracks were very light.

In the Mirafi sections, 34 percent of the transverse and 19 percent of the longitudinal cracks have reflected through (see Table 3). Only 14 percent of the alligator and 3 percent of the random cracks have reflected through (see Table 4 and 5). The widths of the random and alligator cracks were the same as those described for the Petromat sections.

In the control sections, 88 percent of the transverse and 27 percent of the longitudinal cracks have reflected through. (See Table 3.) Also 23 percent of the alligator and 24 percent of the random cracks have reflected through (see Table 4 and 5).

Five year evaluations for 1,000 ft sections were also conducted according to procedures described in the 6 month and one year evaluation section. The results of the evaluation are summarized in Table 6 and Figure 4.

Discussion

Almost no alligator and random cracks have reflected through during the five year evaluation period. Random and alligator cracks are usually caused by excessive and repeated loadings (1). Petromat or Mirafi seem to be of considerable benefit in preventing the reflection of this kind of distress. Transverse cracks are caused primarily by thermal and moisture changes (1). Petromat and Mirafi are not as effective in preventing reflection of the transverse cracks, especially those that are 3/8 inch (10 mm) or more in width. Longitudinal cracks usually are caused by excessive loading and thermal changes (1). Petromat or Mirafi could be a solution for preventing the longitudinal cracks.

Table 3
Transverse and Longitudinal Cracking

Treatment	Crack Width Class *	(Prior To Treatment) 1976		(5 Yr. after Treatment) 1981		COMMENTS
		Trans-Verse (ft)	Longi-tudi-nal (ft)	Trans-Verse (ft)	Longi-tudi-nal (ft)	
PETROMAT	VL	--	--	18	126	New (VL) transverse and longitudinal cracks reflecting.
	L	2,683	3,263	793	170	29% (L) transverse cracks reflecting. 5% (L) longitudinal cracks reflecting.
	M	112	20	231	50	More than 100% (M) transverse cracks reflecting. The (L) transverse probably changed to (M) transverse cracks. New (M) longitudinal cracks developed.
	Total	2,795	3,283	1,042	346	37% of total transverse cracks reflecting including new transverse cracks. 10% of total longitudinal cracks reflecting.
MIRAFI	VL	16	--	44	118	New (VL) transverse and longitudinal cracks reflecting.
	L	3,401	2,106	763	272	22% (L) transverse cracks reflecting. 13% (L) longitudinal cracks reflecting.
	M	104	12	394	22	More than 100% transverse cracks reflecting. The (L) transverse probably changed to (M) transverse cracks. All of (M) longitudinal cracks reflecting.
	Total	3,521	2,118	1,201	412	34% of total transverse cracks reflecting. 19% of total longitudinal cracks reflecting
CONTROL	VL	7	--	32	177	More than 100% (L) longitudinal and transverse cracks reflecting.
	L	1,867	3,867	925	822	49% (L) transverse cracks reflecting. 21% (L) longitudinal cracks reflecting.
	M	574	--	1,196	43	More than 100% transverse and longitudinal cracks reflecting.
	Total	2,448	3,867	2,153	1,042	88% of total transverse cracks reflecting. 27% of total longitudinal cracks reflecting

*See Table 1.

TABLE 4: ALLIGATOR CRACKING (ft^2)

TREATMENT 1976	PRIOR TO TREATMENT 1976	5 YEARS AFTER TREATMENT 1981	COMMENTS
MIRAFI	1002	138	14 % REFLECTED
PETROMAT	896	13	1 % REFLECTED
CONTROL	426	99	23 % REFLECTED

TABLE 5: RANDOM CRACKING (ft^2)

TREATMENT 1976	PRIOR TO TREATMENT 1976	5 YEARS AFTER TREATMENT 1981	COMMENTS
MIRAFI	11,458	365	3 % REFLECTED
PETROMAT	8,426	130	1 % REFLECTED
CONTROL	3,709	900	24 % REFLECTED

Table 6

TYPICAL CRACK DEVELOPMENT FOR EACH 1000 FOOT SECTION
OF TREATED AND UNTREATED AREAS

Description	Mirafi			Petromat			Control		
	Trans. ft.	Long. ft.	Allig. & Rand. ft^2	Trans. ft.	Long. ft.	Allig. & Rand. ft^2	Trans. ft.	Long. ft.	Allig. & Rand. ft^2
Pre-Const. Crack Evaluation	557	398	6800	481	583	5644	332	411	3984
6 month Crack Evaluation	0	0	0	42	0	0	118	0	8
1 year Crack Evaluation	42	0	0	82	0	0	186	0	74
5 year Crack Evaluation	288	165	62	291	208	58	313	175	1031

Cost Summary (December, 1981)

Mirafi 140 N*, fabric	$ .65/yd^2
Mirafi 140 N*, installed	$1.55/$yd^2$**
Petromat, fabric	$ .62/yd^2
Petromat, Installed	$1.55/$yd^2$**
1 inch thick asphalt concrete, Type C, installed	$1.13/$yd^2$**

*Mirafi 140 is no longer available and has been replaced by Mirafi 140N and 140S.

**Contractors' average bid.

CONCLUSION & RECOMMENDATIONS

Fabric reinforcement layers appear to slow some types of cracking while virtually stopping other types.

Petromat seems to do very well in suppressing random and alligator cracking. Only one percent of the original alligatored areas have reflected to the surface in five years. This fabric does not do as well with transverse and longitudinal cracks. Thirty-seven percent of the total length of the transverse cracks have reflected. Ten percent of the longitudinal cracks have reflected.

Mirafi appears to perform similarly to Petromat. Only one percent of the random cracks have reflected to the surface in five years. Fourteen percent of the alligator cracks have reflected. As seen with the Petromat fabric, Mirafi allows more transverse and longitudinal cracking to reflect through to the surface. Thirty-four percent of the transverse and nineteen percent of the longitudinal cracks have reflected.

Neither of the fabrics appears to stop cracking. However, both of these fabrics do slow the cracking process. In the case of alligator cracking, good control can be achieved. At the end of the five year period no other flaws such as base failures or ruts are present.

The reflection of cracks 3/8 in. (10 mm) or less in width can be effectively slowed or sometimes stopped. Cracks wider than this come through within a year. The fabric layer seems to hold the cracks to a smaller width for a year or so, then they widen to the width of the underlying cracks.

It is speculated that, if there is no vertical movement involved at a crack, the asphalt impregnated fabric will maintain a seal for a few years after that crack has reflected through. The effectiveness of sealing should be investigated, as a long lasting seal would be of considerable benefit to roadway performance. It is also possible that the fabric could provide protection against the pumping of base or subgrade material even with a large reflecting crack.

It is recommended that Petromat or Mirafi be used as an anti-reflective cracking treatment for alligator and random cracking. It is recommended to use either Petromat or Mirafi or other fabrics with similar properties for transverse cracks 3/8 inch or less in width. Petromat and Mirafi also can be used effectively for longitudinal cracks of light width.

Further research is needed to study the effectiveness of cost and long term performance of fabric interlayers compared to an additional thickness of overlay with no fabric.

REFERENCES

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