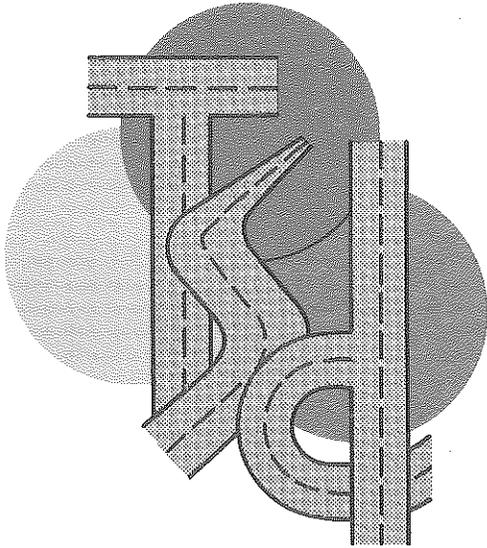


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THERMOPLASTIC HIGHWAY STRIPING MATERIALS

TSD-0-117 (I)-69



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MICHIGAN DEPARTMENT OF STATE HIGHWAYS

REFLECTIVE THERMOPLASTIC HIGHWAY STRIPING MATERIALS

TSD-0-117 (I)-69

Interim Report

By

William J. Hitchens

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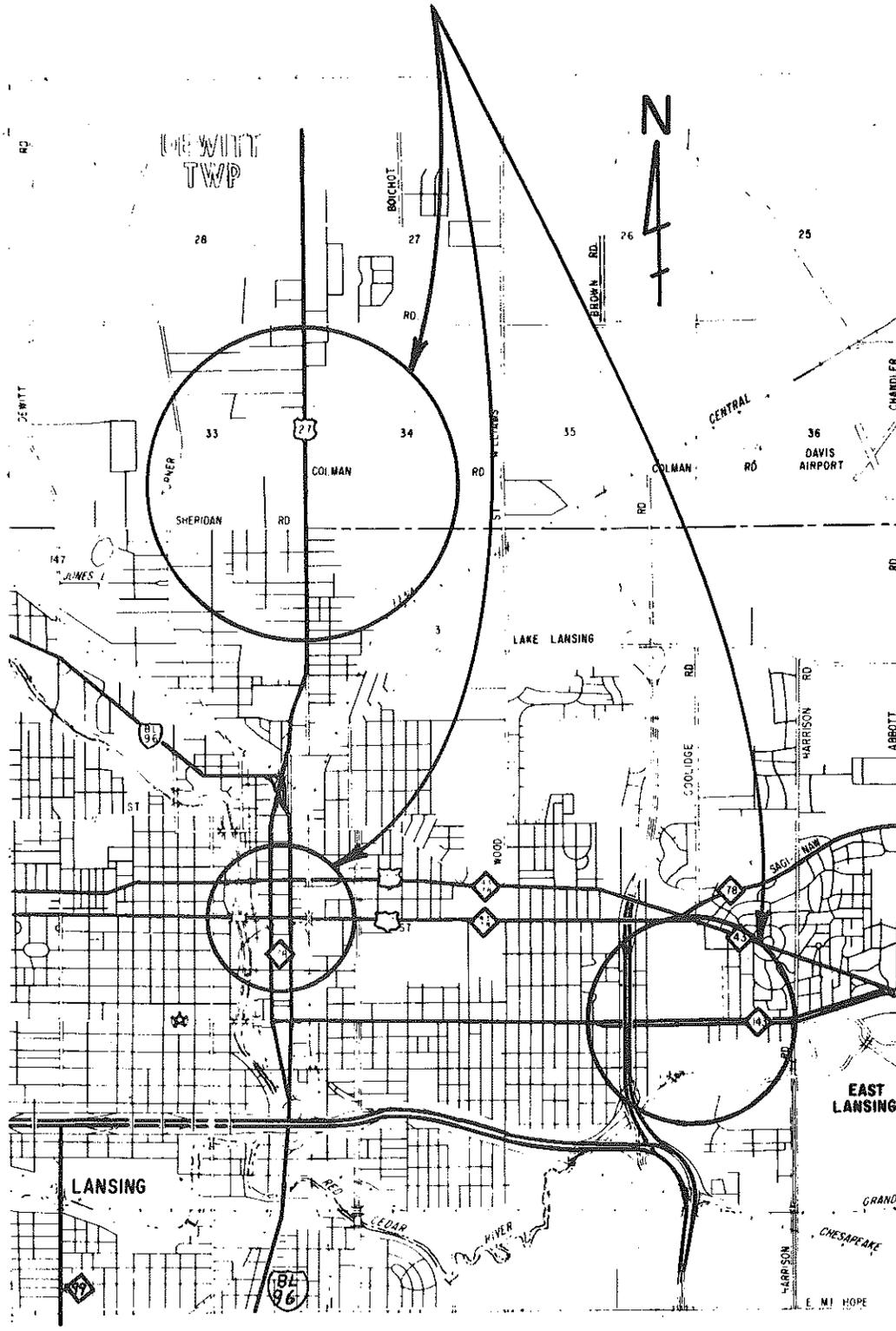
Reflective Devices Unit  
Operations Section  
Traffic and Safety Division

in cooperation with

Material Research Unit  
Testing and Research Division

July 1969

# THERMOPLASTIC TEST SECTIONS



LOCATION MAP OF  
THIS REPORT

## SYNOPSIS

The following is an interim report on the thermoplastic highway striping materials which have been placed at various locations in the immediate Lansing area. The findings in this report are based on our observations of a six month experience with these materials. In our opinion, these materials are performing in a satisfactory manner and may provide an economic and effective year-round type of pavement marking on urban trunkline facilities which carry large traffic volumes.

Interim Report on  
Thermoplastic Highway Striping Materials

INTRODUCTION

The present system of lane marking, using conventional traffic paints at locations where there are high traffic volumes, often fails to provide a functional year-round service for the motorist and, in particular, there is little reflectivity at night when adequate delineation is most needed. In an effort to fulfill these needs, we have initiated a comparative study on the durability, performance and economy of hot-extruded thermoplastic highway striping materials and conventional paint striping.

Thermoplastics are claimed to have a life expectancy of three to seven years, depending on the nature and condition of the surface to which it is bonded, in comparison with the three to twelve-month life expectancy of the paint now being used. The service life of thermoplastic is, however, also related to winter maintenance activities, such as snowplowing and salting, and to traffic density. A study was undertaken to determine the conditions for which there would be adequate economic justification for its use.

PROCEDURE

The Cataphote and Perma-Line Companies applied their products, "Catatherm" and "Permaline" respectively, in October, 1968 at the following locations:

Catatherm

<u>Project Area</u>	<u>Surface</u>	<u>Type of Line</u>	<u>Length</u>
US-27 from Chilson St. to Coleman Rd.	New Bituminous	Solid Centerline Lane Line	7200Lft-6"White 2900Lft-4"White
M-43 (Saginaw) from Washington Ave. to Pennsylvania Ave.	Concrete	Lane Line	4200Lft-4"White
Michigan Ave. WB from Foster St. to Harrison Rd.	Old Bituminous	Lane Line	2100Lft-4"White

Permaline

US-27 from Coleman Rd. to State Rd.	New Bituminous	Solid Centerline Lane Line	7600Lft-6"White 3000Lft-4"White
Michigan Ave. EB from Foster to Harrison Rd.	Old	Lane Line	2100Lft-4"White

An Epoxy Primer was used by both companies on the concrete and old bituminous surfaces. Perma-Line used no primer for the new bituminous surface on US-27, while Cataphote used a light epoxy spray.

During the thermoplastic application, a vehicle pulling an illuminated target arrow approximately one-minute travel distance behind the striping equipment was the only device required to control traffic and provide the necessary drying time for the freshly extruded thermoplastic.

RESULTS

A survey was made of each location in April, 1969 (Figures #1-4), after six months of service, to determine the condition of the markings after one winter of maintenance operations.

US-27 - LANSING TEST SECTION ON NEW BITUMINOUS

On a section of US-27 south of the thermoplastic test area, the conventional paint striping (figure #1), applied at the same

time as the thermoplastic, had already been non-functional for some time though that applied at the north end of the test section gave significantly better performance and was considered adequate in Spring 1969. The Catatherm, applied in the south half of the test section on US-27 (Figure #1) had some transverse cracking occurring at scattered locations and only one spot of actual material loss. The remaining skip lines and solid striping for the center lane for left turns appeared to be in excellent condition.

On the north half of the test section, the Permaline (Figure #2) also had some transverse cracking and, at one location, the skip lines were completely removed. A few of the skip lines also had material chipped from the edges for the full length of the lines. The remainder of the skip lines and the solid striping for the center lane did not appear to have any material loss and were in good condition.

#### M-43 (SAGINAW) LANSING TEST SECTION ON CONCRETE

The one-mile test section of concrete on M-43 (Saginaw) had thermoplastic installed for two skip lines by the Cataphote Company (Figure #3). The entire concrete section appeared to be in excellent condition with no apparent cracking or material loss.

#### M-43 (MICHIGAN AVE) TEST SECTION ON OLD BITUMINOUS

Permaline was utilized for one skip line on the old bituminous pavement on eastbound Michigan Avenue, and Catatherm was placed for one skip line in the westbound direction (Figure #4). The Permaline experienced some transverse cracking and

edge-chipping but still appeared to be in good condition. The Catatherm had a small amount of edge-chipping, no apparent transverse cracking and was considered to be in excellent condition.

#### DISCUSSION

On the basis of experience to date, it is evident that the experimental thermoplastic striping material has provided effective operational service. The conventional paint striping south of the test section on US-27, applied at the same time as the thermoplastic, deteriorated to the extent that it was no longer of functional value to the motorist.

To make any type of comparative cost study, the paint striping should be maintained at the same level of quality as the thermoplastic material. The frequent conventional painting operations required to maintain equivalent markings, as compared to the single thermoplastic striping operation, would certainly create more traffic delay and increase accident potential. It is therefore probable that costs related to traffic delay and a number of accidents could be attributed to the frequent maintenance of conventional striping. Since it is not normally possible to maintain effective paint striping in all areas, the lack of lane markings between maintenance operations could also be responsible for other accidents and increased accident potential and be another factor for economic consideration.

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## BREAK-EVEN COST COMPARISON

The following analysis was employed to determine the "Break-even" point between conventional paint and thermoplastic:

<u>Paint</u>	<u>Thermoplastic</u>
30' Black w/20' White = \$60.00/mile	35¢/ft. (average) 40% of 5280' = 2112 ft./mile 2112 <u>ft.</u> x \$.35/ft. = \$740/mile mile

In order to compare the paint with thermoplastic markings, we are assuming that the paint should be applied at least 3 times per year in order to maintain a quality equal to that of thermoplastic markings:

$$\$60.00 \text{ per mile} \times 3 \text{ applications per year} \times Y \text{ (yrs.)} = \$740.00 \text{ per mile}$$

$$Y \text{ (yrs.)} = \frac{740.00}{60 \times 3} = \frac{740.00}{180.00} = 4.1 \text{ years}$$

Therefore, the break-even point appears to be approximately 4.1 years. It is important to note that this fiscal analysis does not incorporate additional costs to motorists in the form of delays and/or accidents inherent in the repetitive replacement of conventional pavement marking materials.

## CONCLUSION

Our experience to date indicates an adequate performance of thermoplastics on high volume facilities after six months service though an earlier test section on the Chrysler Freeway in Detroit gave somewhat less definitive long range results as presented in a current Research Laboratory Report.

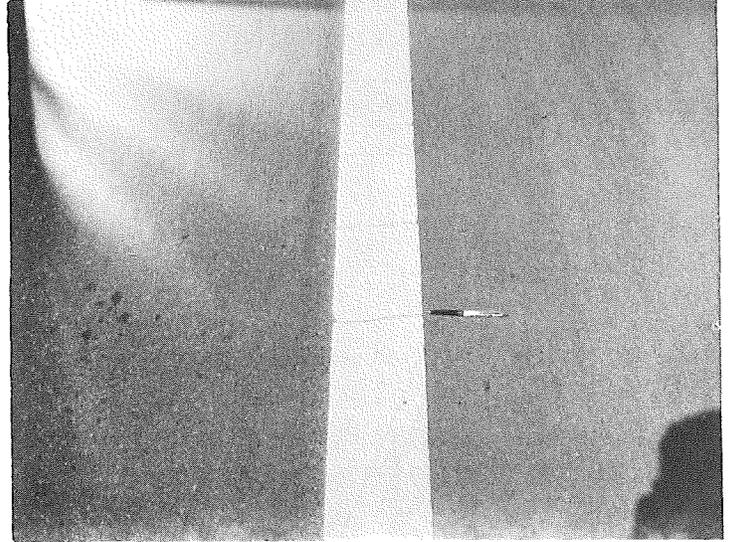
Since our six month observations were recorded, the Prismo Company and the Perma-Line Corporation have installed similar

thermoplastic materials at four additional locations throughout the Lansing area. The several thermoplastic test areas will be kept under surveillance for continued evaluation of the durability and performance of the products before making a final report and recommendations on the use and serviceability of hot-extruded thermoplastic materials.

US-27 Thermoplastic Test Area  
after six months service



Conventional Paint



Catatherm Transverse  
Cracking



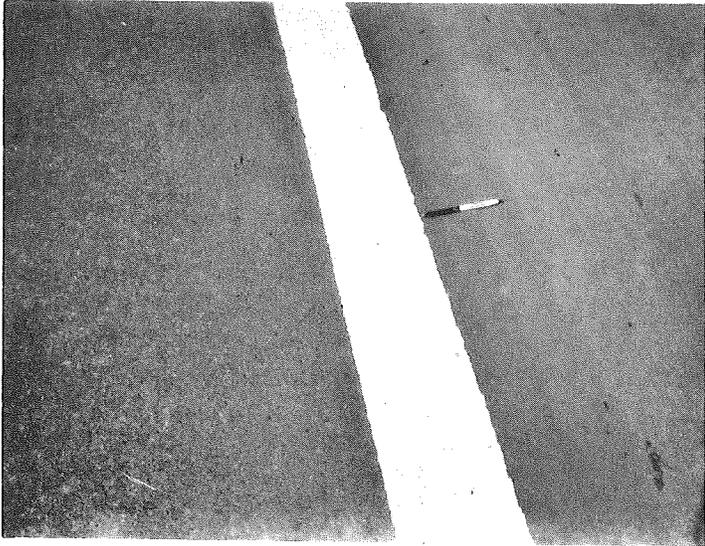
Catatherm  
Solid Striping



Catatherm  
Skip Lines

Figure #1

US-27 Thermoplastic Test Area  
after six months service

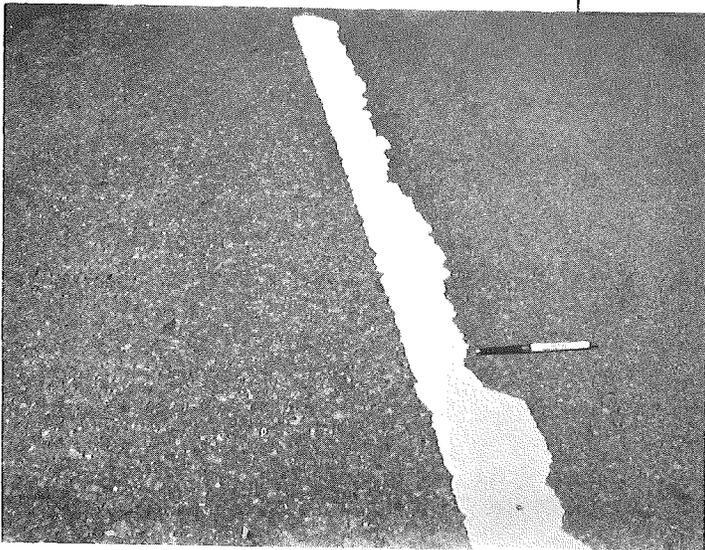


Permaline  
Transverse Cracking



Permaline  
Skip Line Removal

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Permaline  
Chipped Edges



Permaline  
Skip and Solid Striping

Figure #2

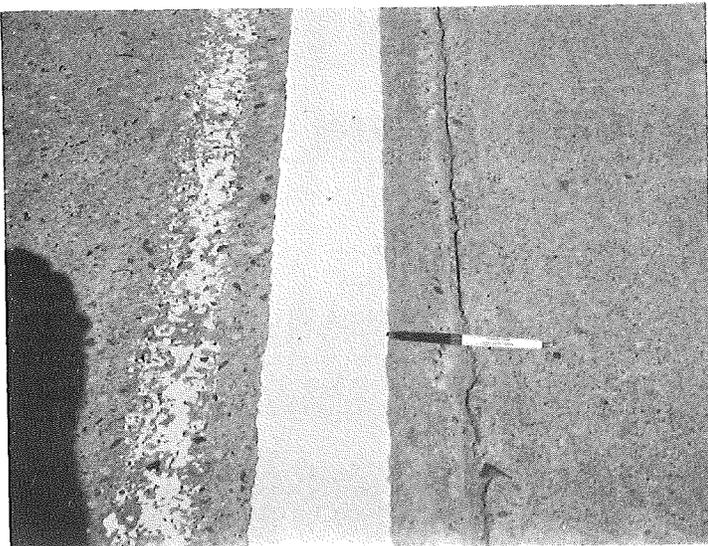
M-43 (Saginaw) Thermoplastic Test Area  
after six months service



Catatherm  
North Skip Line



Catatherm  
South Skip Line



Catatherm  
Skip Line

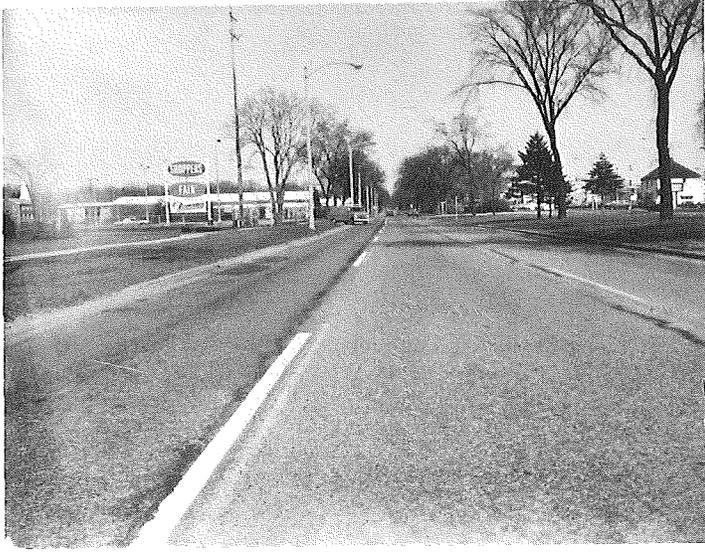


Catatherm  
South Skip Line

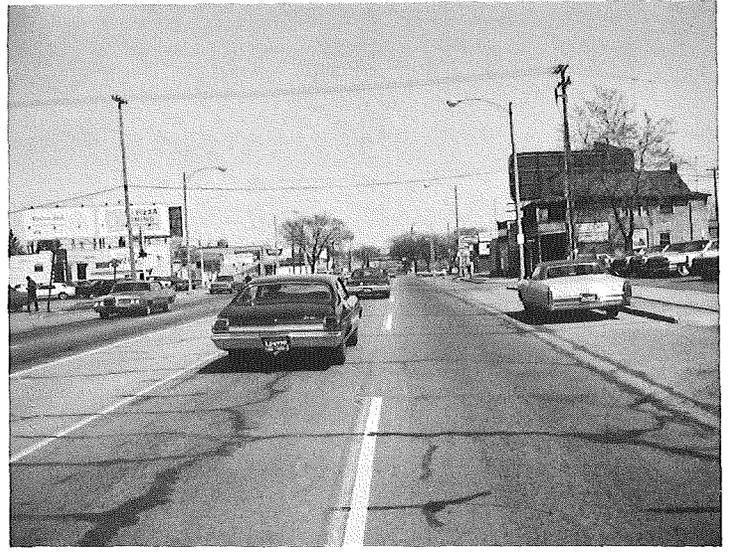
Figure #3

Michigan Ave.-Thermoplastic Test Area

after six months service



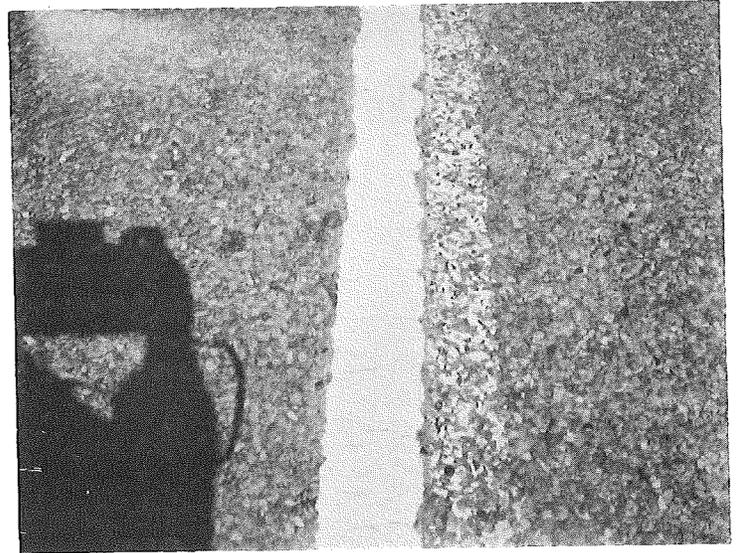
Catatherm  
Westbound Skip Line



Permaline  
Eastbound Skip Line



Catatherm  
Westbound Skip Line



Permaline  
Eastbound Skip Line

Figure #4