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Interim Report on Plastic Tapes Compared to Extruded Thermoplastic Traffic Paint Used for Traffic Lane Delineation

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16. ABSTRACT

Introduction

Conventional solvent based air dry traffic paints are applied to road surfaces at approximately 15 mils wet film thickness. Subsequent evaporation of the solvents result in a dried paint film of about 7 mils thickness. The durability of a 7 mil paint film is limited because of the constant abrasion of traffic. The useful life of the best solvent based traffic paints under the heavy traffic of metropolitan freeways is in the order of 8-12 months. Its life is mostly dependent upon its dry film thickness, other factors being equal.

The "dry to no pick-up" time by traffic of satisfactory solvent based paints at 77*F applied in the thickness specified above, is required by California specifications to be in the range of 15-18 minutes. It is not presently possible to apply ordinary traffic paints containing solvents in greater than the 15 mil wet film thickness and still obtain quick drying and durability.

In order to obtain thicker films, it is necessary to apply non-solvent based materials. This report describes the field results observed on two such materials, both of which are about 3/32-inch in thickness. They are:

1. A beaded white plastic tape having a pressure sensitive adhesive on the side placed in contact with the road. This is rolled into place at prevailing air temperatures.
2. A thermoplastic white material extruded upon the roadway at a temperature of 400-450*F.

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STATE OF CALIFORNIA
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67-43 DND

State of California
Department of Public Works
Division of Highways
Materials and Research Department

March, 1967
M. & R. No. 645135

Mr. J. C. Womack
State Highway Engineer
Division of Highways
Sacramento, California

Dear Sir:

Submitted for your consideration is an:

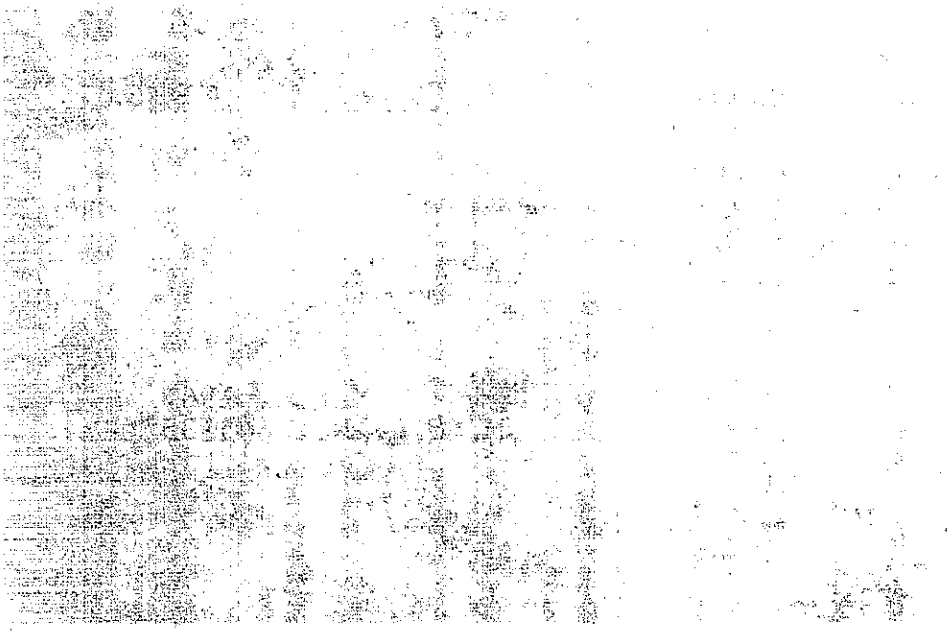
INTERIM REPORT ON
PLASTIC TAPES COMPARED TO EXTRUDED
THERMOPLASTIC TRAFFIC PAINT USED
FOR TRAFFIC LANE DELINEATION

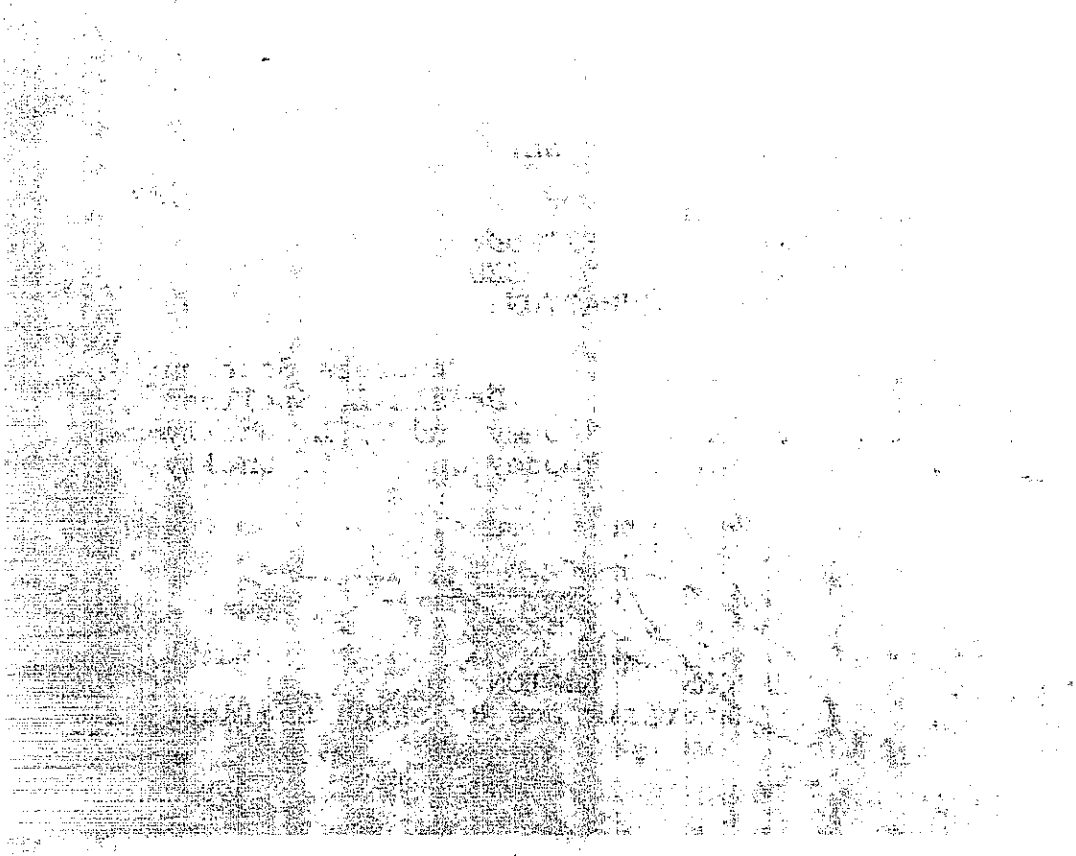
Study made by . . . . . .Concrete Section
Under General Directions of . . . . . Donald L. Spellman
Supervised by . . . . . H. A. Rooney and T. L. Shelly
Report by . . . . . H. A. Rooney and T. L. Shelly

Very truly yours,

JOHN L. BEATON
Materials and Research Engineer

cc: ELTinney
JEWilson
PCSheridan
Research Files





INTRODUCTION

Conventional solvent based air dry traffic paints are applied to road surfaces at approximately 15 mils wet film thickness. Subsequent evaporation of the solvents result in a dried paint film of about 7 mils thickness. The durability of a 7 mil paint film is limited because of the constant abrasion of traffic. The useful life of the best solvent based traffic paints under the heavy traffic of metropolitan freeways is in the order of 8 - 12 months. Its life is mostly dependent upon its dry film thickness, other factors being equal.

The "dry to no pick-up" time by traffic of satisfactory solvent based paints at 77°F applied in the thickness specified above, is required by California specifications to be in the range of 15 - 18 minutes. It is not presently possible to apply ordinary traffic paints containing solvents in greater than the 15 mil wet film thickness and still obtain quick drying and durability.

In order to obtain thicker films, it is necessary to apply non-solvent based materials. This report describes the field results observed on two such materials, both of which are about 3/32-inch in thickness. They are:

1. A beaded white plastic tape having a pressure sensitive adhesive on the side placed in contact with the road. This is rolled into place at prevailing air temperatures.

2. A thermoplastic white material extruded upon the roadway at a temperature of 400 - 450°F.

FINDINGS

The road testing of the cold applied white plastic tape and hot extruded thermoplastic traffic line described in this report for the delineation of crosswalks and lane lines has shown that the plastic tape is not as durable on crosswalks as the thermoplastic traffic stripe. The lack of adhesion and distortion of the plastic tape under traffic in crosswalks is caused by turning action and rapid acceleration of vehicles. When applied as lane line delineation where turning action and acceleration are less pronounced, the plastic tape and thermoplastic stripe are essentially equivalent when both are applied over sandblasted concrete. The thermoplastic had slightly less durability when applied over old paint. The material cost of the plastic tape is about twice that of the thermoplastic stripe and the labor costs for installing both types are about equal. Observation has shown the nighttime visibility of the beaded thermoplastic to be superior to the beaded plastic tape.

TEST RESULTS AND DISCUSSION

This study was based on applications of the plastic tape and hot extruded thermoplastic paint made on roads in Sacramento County. The photographs show the condition of the material as of the date they were evaluated.

When used in areas not subject to excessive acceleration or turning action, the plastic tape has proven to be durable and to have good bond when properly installed. Photograph No. 1 shows a distance view of the condition of transverse stripes of the plastic tape after about 5½ years of service on the northbound portland cement concrete lanes of the Elvas Freeway. Photograph No. 2 is a close-up view of the condition of the plastic tape on these transverse stripes. In the wheel tracks the tape is about 50 - 70% worn. (30 - 50% remaining.)

Photograph No. 3 shows a distance view after 2½ years of the condition of the plastic tape (center line) and thermoplastic traffic stripe (two outer lines) installed on the west bound portland cement concrete traffic lanes of Interstate 80 between Arden and Marconi Avenues in August, 1964. Both materials shown in this photograph were applied over sandblasted concrete. Photographs No. 4 and 5 are close-up views after 2½ years, of the plastic tape and thermoplastic traffic line, respectively. They are both in good condition at this location.

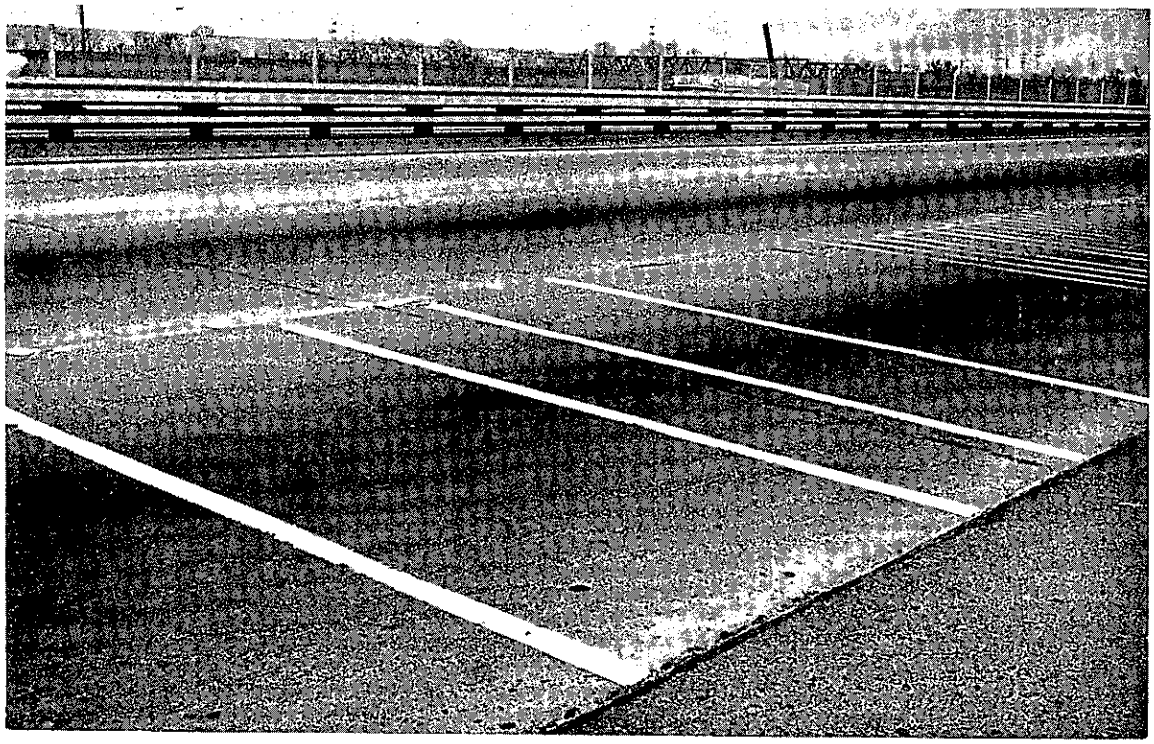
Photographs No. 6 and 7 show some failure of the plastic tape and thermoplastic lines in which applications were over old traffic paint. In the slow traffic lane on the Interstate 80 installation it is estimated the thermoplastic is about 10% deteriorated. In the higher speed lane (near median) it is estimated that about 2% of the material has deteriorated. In the middle lane the plastic tape is less than 1% deteriorated. The plastic tape and thermoplastic were installed over both old paint and blast cleaned surfaces. Where the thermoplastic was installed over old paint there was evidence of more failure than where it was applied to a blast cleaned surface. The thermoplastic used here was an older formulation. The latest specification material would have been more durable. At these freeway locations described above traffic is moving fast but with minor acceleration, deceleration, and turning action.

Photograph No's. 8 to 11 show the condition of the plastic tape after 2½ years when used on crosswalks on asphaltic concrete pavements at stop signals on Sacramento County Roads. Due to the accelerating and turning action of vehicles there is excessive wear and movement of the tape at these locations. In the many instances where the tape is missing, it has lost its bond to the pressure sensitive adhesive, not the pavement. Photographs No's.

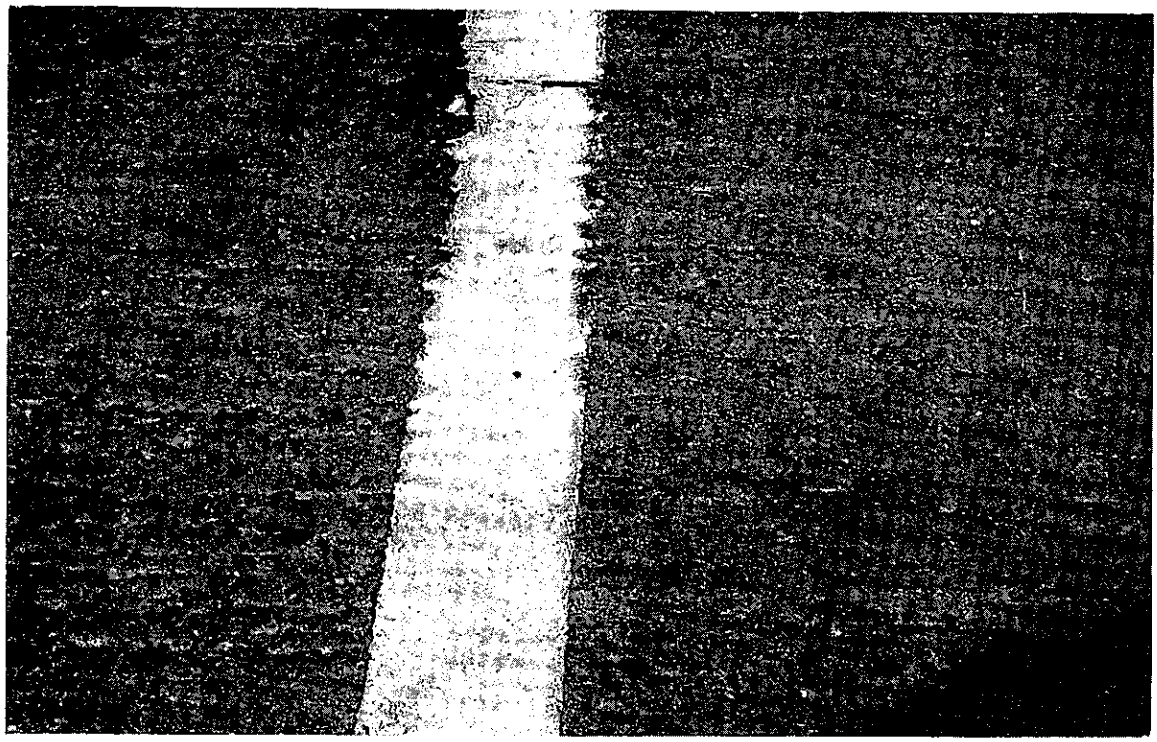
12 to 14 illustrate the superior wear resistance of the thermoplastic stripe applied in 1962 at similar locations subject to accelerating and turning action. Of course, should the pavement itself be unstable and move under traffic, the thermoplastic would also distort.

The plastic tape costs between 80 cents and one dollar per square foot for materials, dependent upon the quantity purchased. The thermoplastic striping costs about 25 to 40 cents per square foot for materials. Labor costs of installation are about identical for both the tape and the thermoplastic stripe on jobs requiring the placement of many lines.

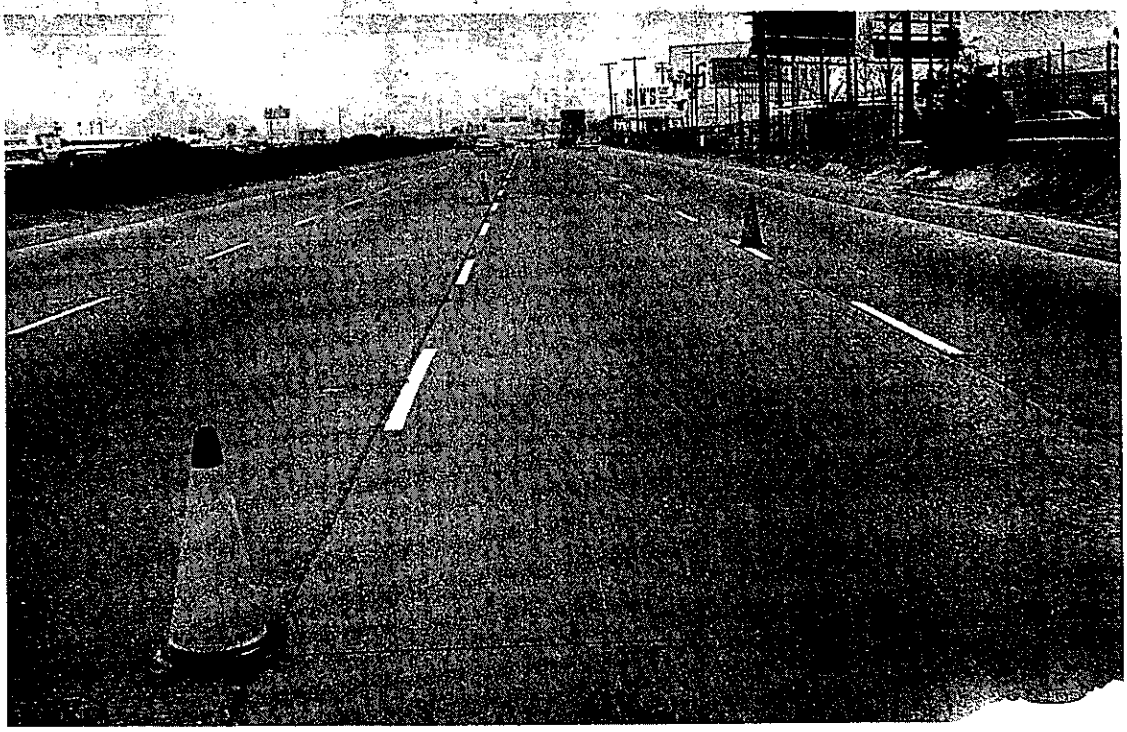
Observation has shown the beaded thermoplastic to have better nighttime visibility than the beaded plastic tape.



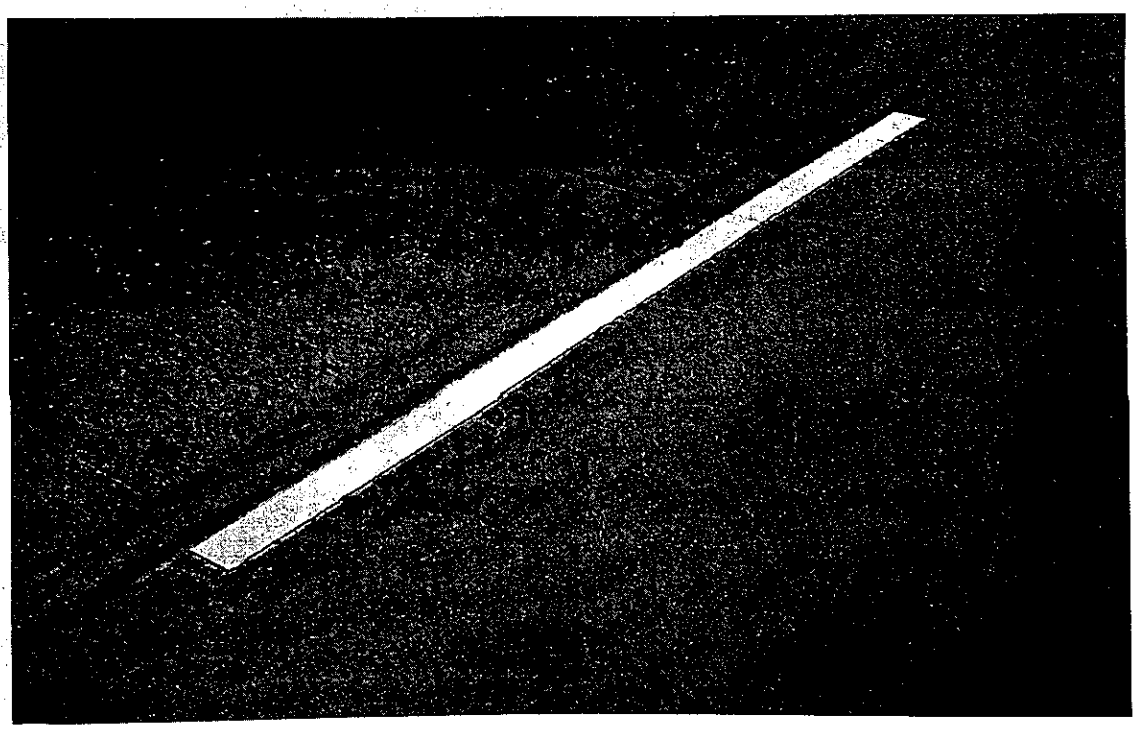
No. 1. Distance view on 2/14/67 of plastic tape installed on Elvas Freeway 8/15/61. (First 4 lines in foreground)



No. 2 Close-up view on 2/14/67 of plastic tape installed on Elvas Freeway 8/15/61. Note wear in wheel tracks.

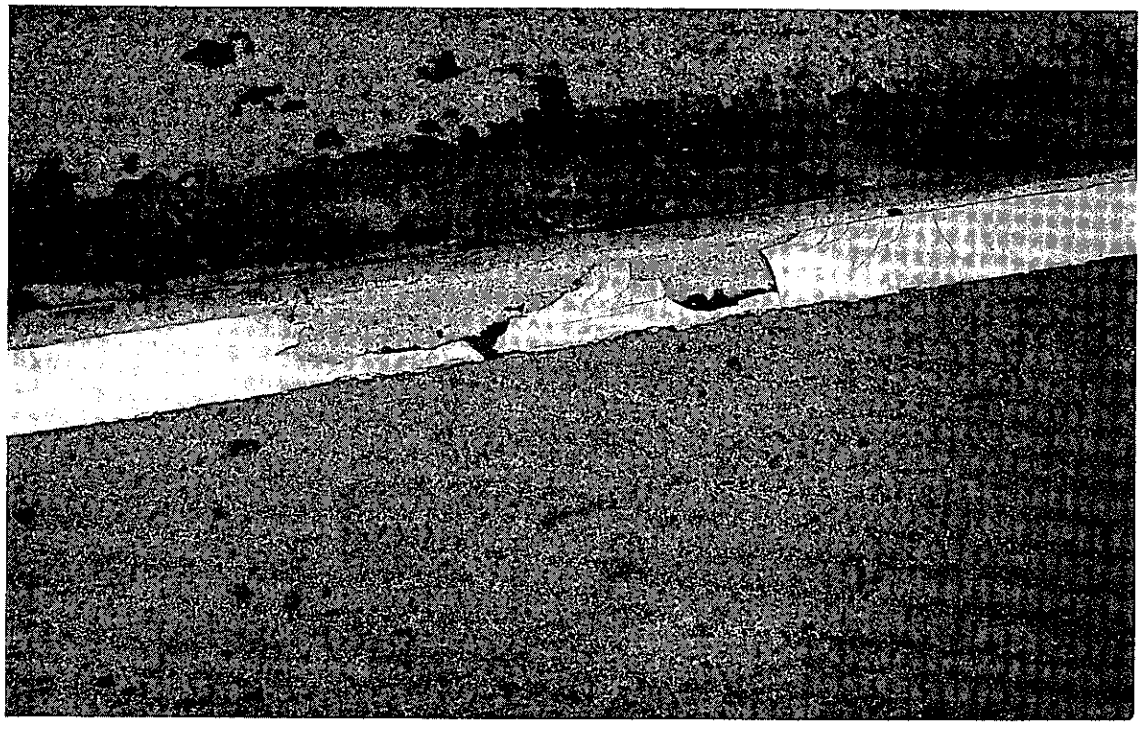


No. 3. Condition on 2/24/67 of plastic tape (center line) and thermoplastic traffic line (2 outer lines) installed 8/64 on Interstate 80 Westbound. Distance view.



No. 4. Close-up view on 2/24/67 of plastic tape in good condition after 2½ years on Interstate 80.

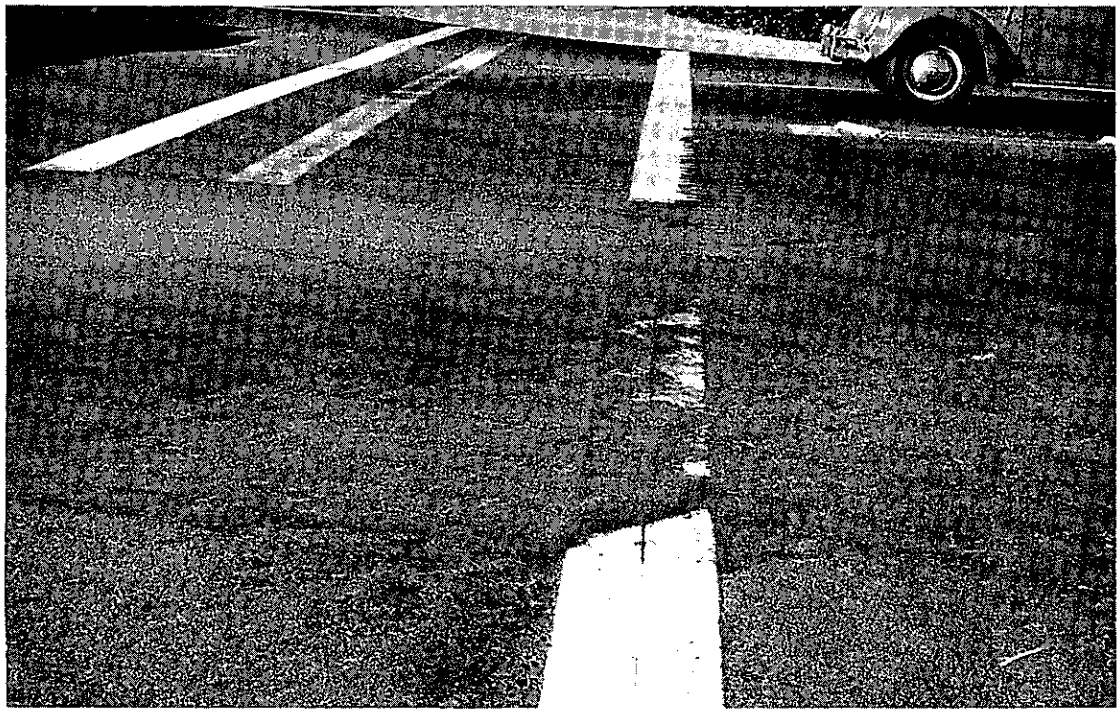
No. 5 Close-up view on 2/24/67 of thermoplastic traffic line in good condition after 2½ years on Interstate 80.



No. 6 Close-up view on 2/21/67 of plastic tape showing failure after 2½ years on Interstate 80.

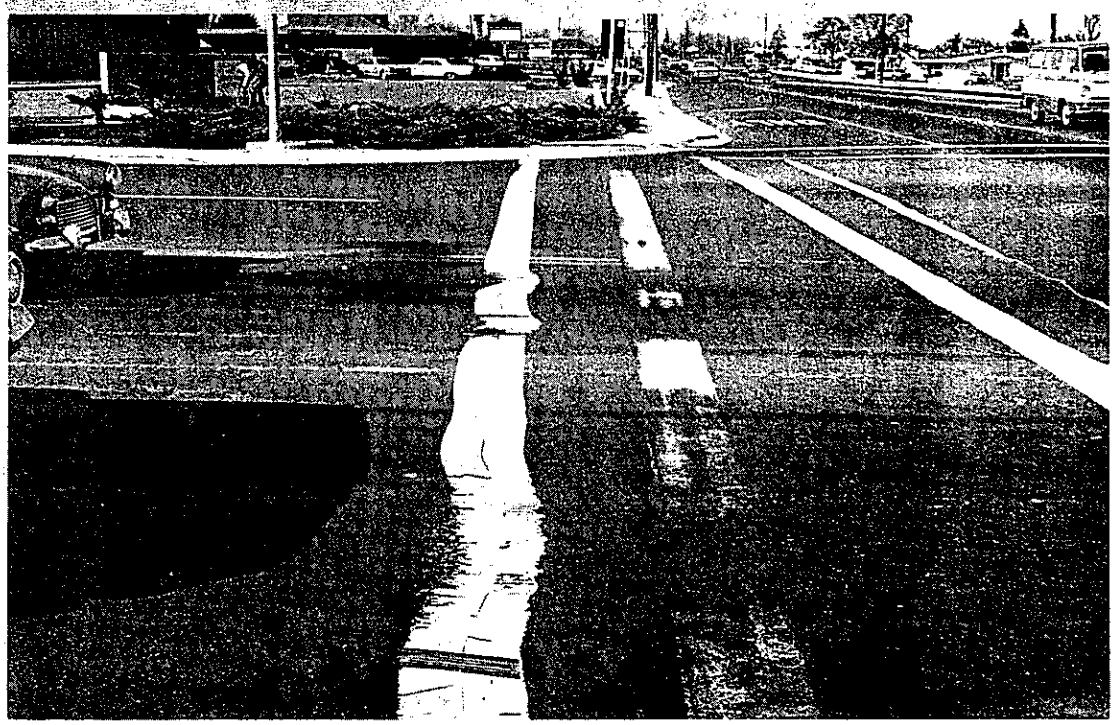
No. 7. Close-up view on 2/24/67 of thermoplastic line showing failure after 2½ years on Interstate 80.

No. 8. Condition on 2/14/67 of Plastic Tape installed 9/64 on S.W. corner turn lane at Fair Oaks Blvd. and Watt Avenue.

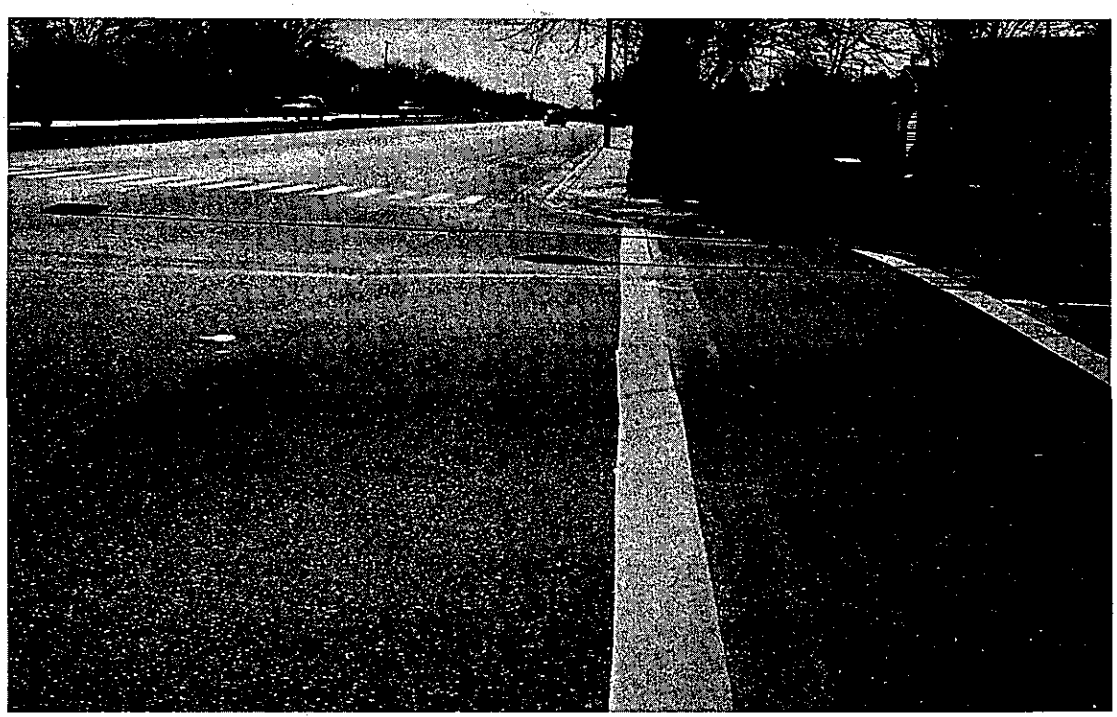


No. 9. Condition on 2/14/67 of plastic tape installed 9/64 on crosswalk at N.E. corner of Arden Way and Professional Drive. (Line at far right)

No. 10. Condition on 2/14/67 of plastic tape installed 9/63 on crosswalk at S.E. corner of El Camino and Eastern Avenue.

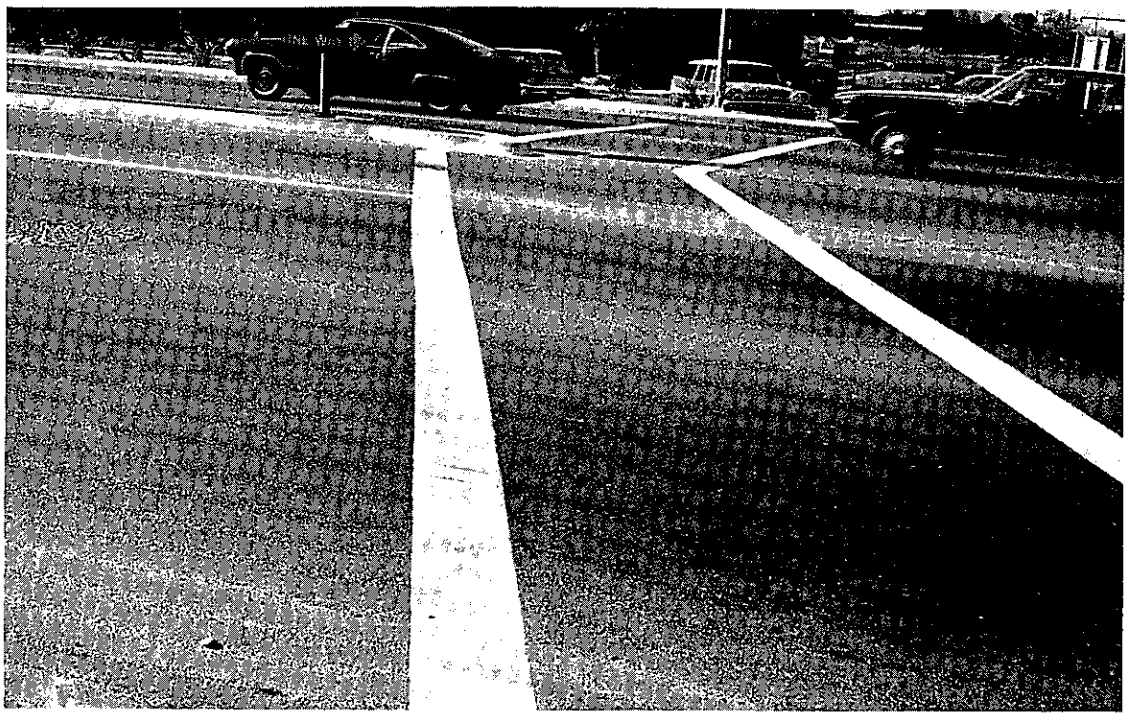


No. 11. Condition on 2/14/67 of plastic tape installed 9/64 on crosswalk at Arden and Morse Avenues. (Far left line)



No. 12. Condition on 2/14/67 of thermoplastic traffic line installed 9/62 on crosswalk at N.W. corner of Watt Avenue and Hurley Way.

No. 13. Condition on 2/14/67 of thermoplastic traffic line installed 9/62 on S.E. corner crosswalk (turn lane) at Watt and Whitney Avenues.



No. 14. Condition on 2/14/67 of thermoplastic traffic line installed 9/62 on crosswalk at N.E. corner of Watt Avenue and Cottage Way.