Experimental Pavement Marking Materials Interim Status Report

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PAVEMENT MARKING MATERIALS

In general, there are five groups of pavement marking materials on the market today, in addition to our standard highway paint. These groups are, Epoflex—epoxy thermoplastic, two-part epoxies, polyester, hot applied thermoplastic, and preformed tape. The Indiana Department of Highways (IDOH) is in the process of or has completed the evaluation of the types listed below.

EXPLANATION OF TYPES

Epoflex—This material is an epoxy thermoplastic that contains a blend of two epoxy resins, which has a formulation similar to thermoplastic marking materials. Since the resins have thermoplastic properties, Epoflex is handled in a manner like normal thermoplastic. It is heated to 450°F and sprayed on 15-mil. thick, using airless equipment. The approximate drying time is 5 sec under ideal conditions.

100% Solids Epoxy—This is a (fast reacting) two-component internally-mixed epoxy. Internally mixed, means it is mixed within the spraying equipment, very close to the spray guns. This material is applied in 15-mil thick lines and is flooded with glass beads to provide reflectivity and reduce no-track time to 2-3 min. under ideal conditions. This material does require specialized paint equipment.

Solvent Epoxy—The material is composed of a solvent (Methyl-Ethyl-Ketone) and two components of epoxy pre-mixed outside the application equipment. During stripping operation, the material is heated to approximately 140°F in the paint heater. When the material is sprayed at this elevated temperature, the solvent will flash off and permit the epoxy to set. The line is then flooded with glass beads to reduce no-track time to about 2 min. Conventional paint equipment can be used to apply this material.

High Solids Rubber Base Paint—This is a paint which is a pigmented binder that contains high solids—77-80% by weight. The solid material is rubber. The no-track drying time for this material is approximately 3 min. This material was also applied with a thickness of 15 mil.

Polyester—This is another family of resins, which is supplied as two components. Although epoxies are normally proportioned from 1:1 to

3:1 (resin to hardener). The polyester marking material uses only 2 or 3% hardener by volume. Because of the small proportion of hardener, an external spray-mixing system is used with two spray fans from separate spray systems, mixing at the pavement surface. This material also applied at 15 mil and flooded with glass beads, has the slowest no-tract time, 10-15 min under normal conditions. As a result coning is necessary to protect the line.

Stamark-brand bisymetric tape by the 3M Company—Is a preformed marking tape produced at the factory and shipped to the job site in rolls, ready for applications. The tape consists of a resin binder, pigment, glass beads, fillers and an adhesive added to the back of the tape to provide adhesion to the pavement. An overlaid method was to use to apply the tape to the existing pavement. In the case of tape under evaluation, an application machine was used to place and tamp the tape into place.

LOCATIONS AND CRITERIA

The application of the various materials began on May 11, 1983, and was completed throughout the state on October 1, 1983.

The location and placement of the materials was based on the IDOH criteria for "Use of Pavement Marking Material". Within this criteria, the materials are divided into the two main categories shown in Table 1.

In Table 1 the material noted as "Intermediate Marking Material" was placed on roads with:

1. No resurfacing scheduled for three years.
2. An average daily traffic (ADT) in excess of 100 vehicles/lane.

The intermediate marking material can be used on center lines, lane lines and edge lines.

TABLE 1.

INTERMEDIATE MARKING MATERIAL	PERMANENT MARKING MATERIALS
Epoflex	Plastic Compound Pavement Tape (except const. temp. tape)
Polyester	
Solvent Base Epoxy	100% Solids Epoxy
High Solids Rubber Base Paint	

The material noted in Table 1 as "Permanent Marking Materials" was placed on roads with:

1. No resurfacing scheduled for four years.
2. An ADT in excess of 3500 vehicles/lane

The permanent marking material has warrants noted as follows:

1. On roads painted once per year.
2. Roads that normally require two or more paints per year.

However, due to adverse prior winter weather, the resurfacing schedule changed and some locations chosen for intermediate or permanent marking materials were resurfaced.

TESTING

The testing of the materials began in February 1984, and concluded the first checks of all locations in October 1984. One of the important factors of pavement markings is visibility at nighttime. To conduct testing of the visibility factor a Ecolux Retroreflectometer was used. The retroreflectometer simulates, on a reduced scale, the night visibility conditions met when driving with low beam headlights. An example of this principal is shown in Figure 1 and the machine is shown in Figure 2. The unit works in daylight and gives spot readings on a pavement marking. The unit is calibrated on a plate before actual readings are taken on a pavement marking.

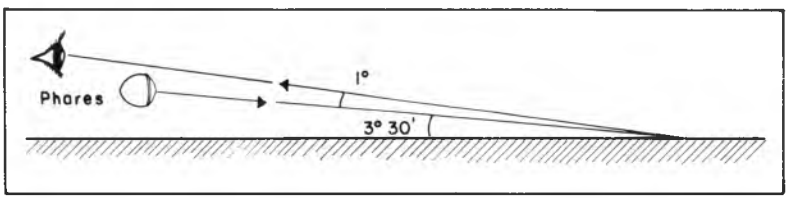

Figure 1.
Visual geometrical conditions of stripes when driving at night. Angle of lighting between the light beam emitted by the headlamp and the normal to the road 80° 30' equals incidence angle. Angle between the incident ray and the retroreflected ray in the observed direction 1° equals divergence angle.

The procedure to conduct the testing was to drive each road segment and review each segment at five-mile increments. At each increment or location a review was conducted and data gathered in the format shown in Figure 3. This review sheet shows the location, date, instrument number (since each retroreflectometer has a different calibration formula, this number is needed), color and readings. At each location, three readings were taken, these readings were averaged and then used in the calibration formula for determining the reflectance value. Visual obser-

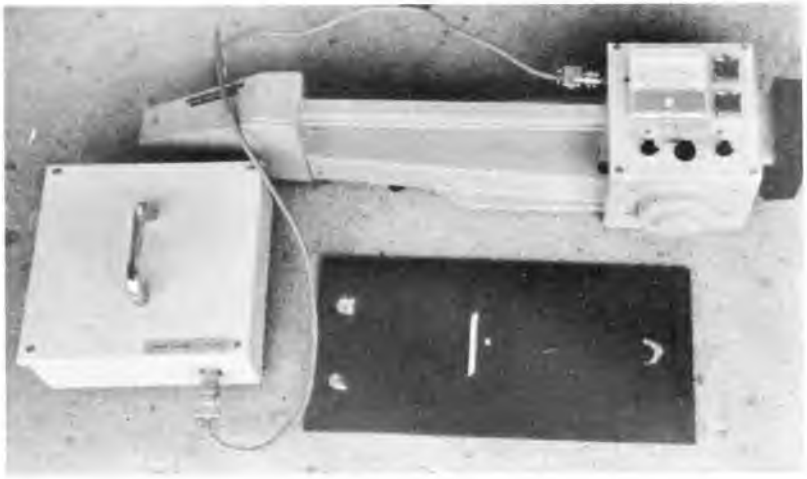

Figure 2.

TEMPERATURE _____ Revised 4-3-84

PAVEMENT MARKINGS REVIEW

Location: _____

Date: _____ INST. NO.: _____ Color: _____

READINGS

1) Reference: _____ 1st: _____ 2nd: _____ 3rd: _____ Ave: _____ Value: _____

2) Reference: _____ 1st: _____ 2nd: _____ 3rd: _____ Ave: _____ Value: _____

3) Reference: _____ 1st: _____ 2nd: _____ 3rd: _____ Ave: _____ Value: _____

VISUAL OBSERVATION

Bead Distribution: Regular _____ Irregular _____ Missing _____ Not Visible _____

Color: Faded: _____ Discolor: _____ Acceptable: _____

Wear & Tear: _____

Comments: _____

Picture No.: _____

Pavement type	Value
( ) Asphalt	_____
( ) Concrete	_____

Material: _____ Contract: _____

High Ave: _____ Low Ave: _____

File Reference: _____

Figure 3.

vation of the bead distribution, color, conditions, wear and tear were also made.

COST

The contract cost for the placement of the different materials is shown in Table 2, cost summary. Table 2 also shows the lineal feet of each material placed.

INTERIM RESULTS

The results to date, obtained from testing and observing durability has given the IDOH the status shown in Table 3, regarding general use of the products under evaluation. The materials noted with an asterisk are continuing to be reviewed for additional testing.

TABLE 2.

COST SUMMARY

MATERIAL	* AVERAGE COST $/Ln Ft	** Ln Ft
Epoflex	$0.145	944,652
100% Solids Epoxy	0.187	2,960,238
Solvent Epoxy	0.106	2,931,391
High Solids Rubber Base Paint	0.039	1,599,608
Polyester	0.087	789,885
3M Bisymetric Pavement Tape	0.703	96,752

* The cost includes yellow, white, skip and solid lane lines.
** The lineal feet includes skip and solid lane lines.

TABLE 3.

CURRENT STATUS REGARDING GENERAL USE

MATERIAL	STATUS
Epoflex	Not Suitable for use
*100% Solids Epoxy	Pending
Solvent Epoxy	Not Suitable for use
*High Solids Rubber Base Paint	Pending
*Polyester	Pending
*Bi-Symetric Tape	Pending