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METHYL METHACRYLATE (MMA) LANE LINES

I-5
Nisqually River Bridge to
Gravelly Lake I/C

by

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Experimental Feature WA93-01
Post-Construction Report

Prepared for
Washington State Department of Transportation
and in cooperation with
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Federal Highway Administration

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DISCLAIMER

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Introduction

The objective of this experimental feature is to evaluate the installation and material cost, the ease of application, the degree of reflectivity, and the service life of a methyl methacrylate (MMA) lane and edge stripe installation on I-5 between Olympia and Tacoma.

Study Site

The Olympic Region contract for the placement of the MMA lane lines is describe below in tabular form for easy reference.

Contract Number: 004250
Location Project Number: 0L 0975
Title: Nisqually River Bridge to Gravelly Lake I/C
Route Number: I-5
County: Pierce
Milepost Limits: MP 114.79 to MP 124.64
Number of Lanes: 3 northbound and 3 southbound
Plan Quantities: 40 miles of extruded lane lines and
40 miles of sprayed edge lines

Project Description

The MMA striping material was placed on a new ACP Class A overlay using two different application techniques, as described in the contract special provisions titled DURABLE PAVEMENT MARKINGS (see Appendix A). The lane lines were extruded at a thickness of 90 mils with profile bumps of 500 mils thickness. The edge lines were sprayed at a thickness of 40 mils.

Construction Costs

Morton International supplied the following quantities of MMA lane lines which have the product name Dura-Stripe:

Durable Lane Stripe:	214, 188 linear feet at \$0.45 per foot
Durable Edge Stripe:	235, 651 linear feet at \$0.50 per foot
Durable Gore Stripe:	14, 576 linear feet at \$1.00 per foot

Construction Summary

Placement of the MMA material was relatively fast compared to placement of Type 1 and Type 2 Raised Pavement Markers (RPMs). The lane stripes were extruded and the edge stripes were sprayed. For both, the beads were mixed in with the MMA material and placed, then closely following placement, more beads were applied to the stripe.

A couple of minor problems were encountered however, the first involving material consistency. The extruded MMA material used for the lane stripe did not form the profile bumps as planned, which caused the contractor to add additional catalyst to obtain the consistency required. A second problem was the long cure time of about 20 minutes which caused traffic delays (compared to conventional striping with paint)

The striping on this contract was placed in two construction seasons. In the fall of 1993, the ACP overlay was completed and striping was placed on the northbound lanes. Then in the fall of 1994, the ACP overlay was completed and striping was placed on the southbound lanes.

Performance Testing

Visual observations from the drivers perspective were conducted during both daylight hours and darkness in the spring and fall of 1995. During daylight hours, the stripes appear relatively unworn, maintaining their original white color without noticeable fading. The 'rumble effect' of the profiles appears to be performing well, unchanged from the original installation, although not to the level of noise and feeling that results from traversing RPMs. The edge stripes appear moderately worn, but not more than standard paint stripe currently used by WSDOT. Heavy rain during daylight hours obscures both the lane and edge stripe, but not more than other types of lane delineation systems used by WSDOT.

During darkness, the reflectivity of the lane and edge stripes is poor, and the absence of reflective, Type 1 RPMs is very noticeable. Heavy rain during darkness worsens the reflectivity to very poor, to the point where the driver with average eyesight must strain to see any lane or edge stripe at all. Through interchange areas however, reflective Type 2 RPMs have been placed along with the MMA stripe, which significantly improves the driver's ability to see the lane stripe.

Construction Evaluation

MMA can be applied faster and lasts longer than conventional RPMs, and it lasts longer than conventional paint as well. When used for lane lines, the MMA consistency must be thick enough to form the profile bumps. Also the lack of reflectivity must be overcome in one of two ways. Either reflective Type 2 RPMs must be placed along with the lane stripe (preferably every 40 feet on curves and tangents), or the timing of the bead application must be better controlled.

Beads mixed with the MMA will sink below the surface, as will beads applied too soon after the MMA is placed. The MMA is so resistant to wearing that these beads and their reflectivity will not be exposed. Therefore, the beads must be applied to the MMA after it is hard enough to prevent the beads from sinking, but before it is so hard that it is not tacky enough to allow the beads to stick to the stripe.

Regardless of which method is used, the lane lines must be reflectorized to provide positive delineation for driving in darkness, especially during heavy rain.

Evaluation Plan

The MMA stripes will be monitored for 3 years to obtain service life data.

APPENDIX - Contract Special Provisions

Special Provisions from the Contract 4250,
Nisqually River Bridge to Gravelly Lake I/C

DURABLE PAVEMENT MARKINGS

Description

Pavement marking shall be placed where designated in the Plans in accordance with the requirements of Section 8-22 and these Special Provisions.

Materials

The durable edge stripe and durable gore stripe shall be a spray application, and the durable lane stripe shall be an extruded application each using an ambient temperature curing, two component methyl methacrylate system for application on either asphalt or cement concrete surfaces. The material shall be free from defects and imperfections which might adversely affect the serviceability of the finished product. It shall be free from dirt and other foreign materials and cure to a tough, serviceable film.

Approved materials and sources for durable pavement marking materials are as follows:

Manufacturer

Morton International
PO Box 2023
Salem, OR 97308
1-800-835-3357
Attn: Steve Van DeWalker
or Ben Farrar
Telephone: (206)838-4393

Name Brand

Dura-Stripe Type V (sprayed)
Dura-Stripe Type III (extruded)

Distributor

Alpine Chemical
1321 South Central
Kent, WA 98032
Attn: Bart
Telephone: (206)852-3157

Construction Requirements

The roadway areas to receive the pavement markings shall be prepared in accordance with the requirements of Section 8-22.3(2) and the manufacturer's recommendations.

The durable lane stripe shall be applied as shown in the Plans, with each stripe 12 feet long, 4 inches wide, and 90 mils (+/-15%) thick, measured without the glass beads. The profiles shall be 4 inches long and a minimum

of 500 mils thick. Durable lane stripe and glass beads shall be applied simultaneously from the direction opposite that of normal traffic, with the flat side of the profile facing oncoming traffic

Durable edge and gore stripe will be applied at the rate of 40 mils thick. The thickness will be measured without the glass beads.

A manufacturer's representative shall be present on the first day of striping for each type (sprayed and extruded) and as determined by the Engineer afterward.

Striping shall not be applied to new asphalt until the asphalt has cured to the satisfaction of the manufacturer's representative.

The second sentence of Section 8-22.3(4) is supplemented by the following:

The application rate of beading on sprayed markings shall be 20 pounds of beads per gallon and 12 pounds of beads per 100 square feet for extruded markings.

Glass beads for drop on shall be those recommended in writing by the striping material manufacturer as approved by the Engineer.

The surface temperature of the roadway shall be in the range of 30 to 105 degrees Fahrenheit for stripe application. The roadway surface shall be thoroughly dry.

Durable stripe material shall be applied with equipment designed and capable of properly mixing at the point and time of application in accordance with the manufacturer's recommendations.

Section 8-22.3(3) is supplemented by the following:

One durastripe will be required on all durable stripe markings.

Measurement

Measurement for durable pavement marking will be in accordance with Section 8-22.4.

Payment

The unit contract prices per lineal foot for "Durable Edge Stripe", "Durable Gore Stripe", and "Durable Lane Stripe" shall be full pay for performing the work as specified.

