

## MATERIALS & RESEARCH

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## RESEARCH UPDATE

U 2006-2

### SNOWPLOWABLE RAISED PAVEMENT MARKINGS

#### REFERENCES:

WP 2001-R-6, WP 2003-R-5, 2002-5, U88-5, U88-6, U-2004-3

#### INTRODUCTION

Raised pavement markers (RPMs) have been widely used by state transportation departments for several years. Manufactured in different shapes and sizes, these devices are designed to accommodate areas with little or no snowfall as well as those in the snow-belt region. Snowplowable raised pavement markers (SRPMS) differ in design from conventional RPMs by incorporating a lower ramp angle to provide for better plowability and a minimal exposure above the road surface.

These types of markers have been installed as experimental features numerous times over the past twenty years. Research completed in the 1980's concluded that the best use of SRPMS was in high accident areas (U88-5, U88-6). However in 2001, in an effort to further Vermont's experience with these products and to test new types of markers, a new evaluation was begun on SRPMS. As a result, 126 of Avery Dennison's model 101LPCR markers were installed in the southbound lane of Interstate 89 in Waterbury between mile markers 67.55 and 64.75. The markers were applied in recessed grooves, at intervals of 80 feet, between the center skip lines on this section of highway. The installation and performance of these markers were documented in Reports 2002-5 along with U2004-3. They were removed in September 2003 in anticipation of a 2004 resurfacing project on this section of I-89.

#### INSTALLATION

To further evaluate these types of markers, this section of I-89 was remarked in July 2004 with four different SPRM products. During the application of the markers the weather was clear and the temperature ranged from 65°F to 72°F. A detailed account of the installation is provided in Report U2004-3. The four types of markers installed in this test were the 101LPCR manufactured by Avery Denison, Incorporated, Hallen Incorporated's model H100 and two products by Ray-O-Lite Incorporated, the SnowLite 150 and SnowLite 200. Figures 1 & 2 show typical examples of the preparation and installation of these markers. All of the markers were installed in the same manner using epoxy manufactured by Avery Dennison.



Figure 1 – Marker Groove



Figure 2 – Marker in Place with Epoxy

**OBSERVATIONS:**

The markers have been monitored periodically since their installation. On November 29, 2005, seventeen months following installation, a visual inspection of each of the markers was performed, with the results of the examination reported in Table 1. Figures 3, 4, 5 & 6 are examples of the conditions of the four types of markers during this inspection. During this period, all marker housings have remained in-place and intact.

Performance of Snowplowable Raised Pavement Markers I-189							
Manufacturer	Model #	Installed	Lens Damaged	%	Lens Missing	%	% Lens Missing or Damaged
Avery Dennison	101LPCR	95	2	2.11	0	0.00	2.11
Hallen	H100	97	6	6.19	7	7.22	13.40
Ray-O-Lite	SnowLite 150	50	8	16.00	0	0.00	16.00
Ray-O-Lite	SnowLite 200	51	17	33.33	1	1.96	35.29
<b>Total</b>		293	33	11.26	8	2.73	13.99

**Table 1 – Marker Performance**

It was noted that one of the markers (in the Ray-O-Lite 150 area) appeared to be completely missing from the test site. However, upon closer inspection of that particular site, it became apparent that while the epoxy had been applied, no marker had been placed in the groove at the time of installation. All other housings appear to be in good condition with no significant distress at the time of this inspection.

Further inspection revealed that 101 LPCR only had two damaged or cracked lenses, while the H100 (6) and SnowLite 150 (8) exhibited a similar number of damaged lenses. The SnowLite 200 had the most significant damage with one third of the lenses (17) affected, however it had only one lens completely missing from the

marker. This compared to the H100 markers which had seven lenses absent from their housings. Both the 101LPCR and the Snowlite 150 had no lenses missing from their housings at the time of inspection.



Figure 3 – Avery Dennison 101LPCR



Figure 4– Hallen H100



Figure 5 - Ray-O-Lite SnowLite 150



Figure 6 - Ray-O-Lite SnowLite 200

### **ENVIRONMENTAL/MAINTENANCE FACTORS:**

The test site area on I-89 south bound has one of the higher traffic volumes in the state with an AADT of 27200. This along with the total snowfall and the number of plow events (snow/ice control days) can affect the performance and durability of the markers. This information as well as other maintenance data for the test locations is provided in Table 2. It should be noted that while the total snowfall decreased from 2004-2005 to the 2005-2006 season the number of events (Snow Ice Control days) has increased.

<b>I-89 South Bound MM 64.23 to 68.00</b>		
	<b>2004-2005</b>	<b>2005-2006</b>
Number Snow/Ice control Days	67	78
Inches of snow per year	89.7	44.8
AADT	27200	
Percent Truck Traffic	10.70%	
Type of De-Icing Chemicals	1 gal Calcium Chloride/ 1 ton Sodium Chloride	
Type of Grit	Salt/Sand	
Type of snow Blade	Carbide	
Angle of blade from Vertical	55-60 Degrees	
Average Yearly Air Temp. Range	7 to 85 degrees F	

**Table 2 –Snow, Traffic and Maintenance Data**

**SUMMARY:**

As of the date of this report, there are substantially different rates for distress in the lens of the SRPM.. The best performance in terms of durability has been exhibited by the Avery Dennison 101 LPCR markers as only 2% (2 of 95) of those installed exhibit lens damage in the 17 months since installation. The, Ray-O-Lite SnowLite 150, and Ray-O-Lite SnowLite 200 markers all exhibited more distress in terms of percent of lenses damaged. The Hallen H1010 markers suffered the most loss of lenses of the four types over the past two winters. (Table 1).

To further determine the performance of the markers, additional inspections will occur in during 2006 to assess any further damage, including housing debonding and loss of lenses. A final report will be published following those inspections.

Disclaimer

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