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RESEARCH UPDATE U 2004-2

3M® STAMARK WET REFLECTIVE TAPE SERIES 820

REFERENCES

Work Plan No. 2002-R-7

INTRODUCTION

In 2000-2001, in response to an increased public concern about the inadequate visibility of pavement markings on Vermont's highways the Vermont Agency of Transportation began to actively pursue the evaluation of several new technologies that claim to enhance and improve the visibility of pavement marking lines under various conditions. These evaluations apply to both temporary and permanent pavement marking materials with respect to their adhesion, durability, retroreflectivity, and effectiveness in not only day and night, but under wet and dry conditions as well. The objective of this particular study was to evaluate one of these materials, 3M™ Stamark Wet Reflective Pavement Marking Tape series 820, a marking material that is designed to provide improved nighttime visibility in wet weather conditions.

PRODUCT DESCRIPTION

Stamark Wet Reflective Pavement Marking Tape series 820 is manufactured by the Traffic Control Division of 3M Company, Inc. of St. Paul, MN. This material is a white tape with reflective glass beads protected by a polymeric layer and polyurethane topcoat, reinforced by a structured medium with pressure sensitive adhesive for easy application. Application of this material is detailed in Guidelines for Pavement Marking Applications in Grooved Pavement Surfaces, published as Information Folder 5.18 Grooving Applications by 3M, Inc in February 2002.

That document recommends that the pre-coated, pressure sensitive adhesive tape, be applied to a dry surface using a surface preparation adhesive, 3M™ Scotch-Lane™ P-50. Immediately after the placement of the material, the area can be open to traffic.

PROJECT DESCRIPTION

The site chosen for the evaluation of the 3M™ Stamark series 820 tape was a portion of the

Brookfield/Montpelier IM089-1(21). This project extended from mile marker 37.77 to mile marker 53.11 in the northbound lane of I-89, and consisted of pavement rehabilitation and associated items. The majority of the markings on the project were SG-70 thermoplastic, manufactured by Lafarge Road Markings.

COST

The estimated installed cost for these markings is $3.41/linear foot for the inlaid Series 820 markings. The material itself is $3.10/Linear foot, with the grooved skip costing $0.31/linear foot.

INSTALLATION

On October 2, 2002, the skip lines were placed on Interstate I-89 in Brookfield, Vermont. The material was applied as grooved markings between mm 42.5 and 45.5 with the remainder of the project being striped with thermoplastic markings. The line striping subcontractor was L&D Safety Markings Inc. of Barre, VT.

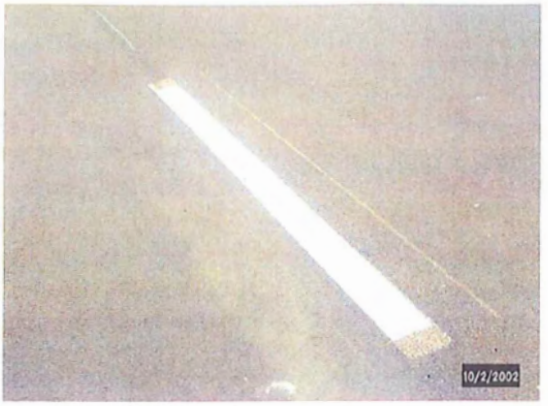
For the first hour to hour and fifteen minutes the grinding was adjusted and worked on in an effort to limit problems which might occur. The grooving process began at approximately 9:00 am, with a truck creating a groove 6 ½" by 11 ft by 90 mils deep. As a comparison the 820 tape averaged anywhere from 40 to 76 mils thick (based on its profile). In practice the grooves were 100 to 125 mils, which the manufacturer indicated would not be a problem. After the grinding operation was completed the grooves were cleaned and prepared for the lines.

A companion product, Stamark P-50 surface prep adhesive (Lot # 2264DZ), was then sprayed on the groove. The tape was then placed with a long leading edge and using a standard tape handcart applicator and rolled with a 230 lb hand roller and tamping device. The average temperature during the time of application was approximately 65°F. The manufacturer's recommended minimum temperature requirement is 50°F. The pavement temperature was 61°F

Grinding of Pavement

Installation of Lines

Tamping the Line



Final Product

PERFORMANCE

Initial Performance of the 3M™ 820 tape was favorable. On November 21, 2002, an engineer from VTrans drove the project at night. In his opinion the overall visibility with light rain and heavy fog was dismal. Traveling north along the project, he noticed a significant change in retroreflectivity between the thermoplastic and the tape when he reached the beginning of the test site. He indicated that in his opinion the product was performing well.

Retroreflectivity data was collected on all markings on a periodic basis using an LTL 2000 retroreflectometer. The values of these tests are presented in Table 1.

Retroreflectivity 3M™ Stamark Wet Reflective Tape Series 820					
Location	**Test date**				
	10/22/2002	**04/28/2003**	**06/17/2003**	**08/13/2003**	**05/13/2004**
Test Site 1	835	84	228	72	38
Test Site 2	915	86	175	68	35
Test Site 3	706	75	145	155	32
Test Site 4	766	66	115	143	29
Test Site 5	1103	85	219	68	33
Test Site 6	1073	78	200	65	33

Table 1. Retroreflectivity Values (Dry)

The product was also tested at the NTPEP Test Deck in Williamsport, PA (Managed by PennDOT). The retroreflectivity readings gathered at this location were as follows (as quoted at www.ntpep.org)

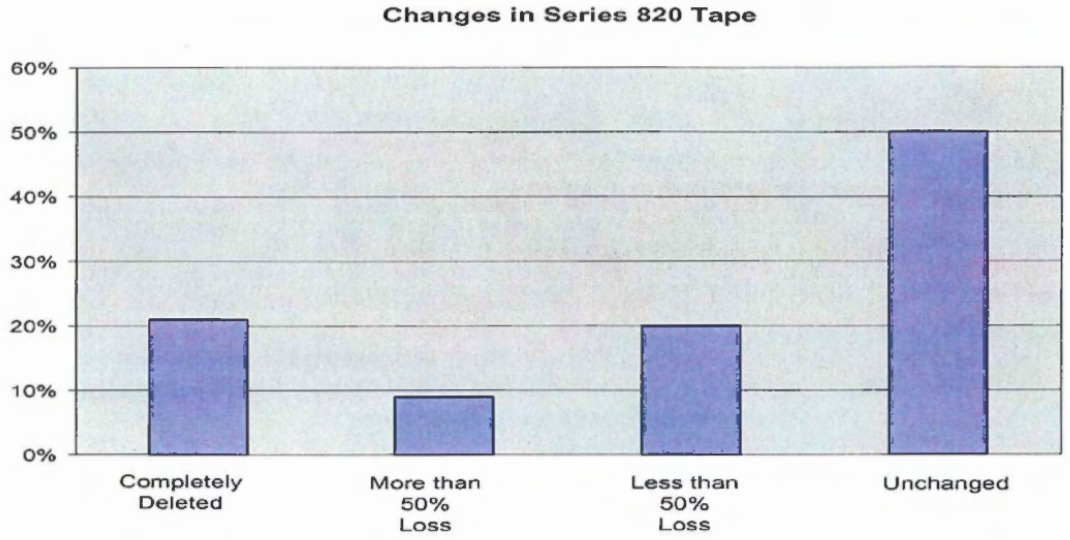
Interval (months)	Date	Retroreflectivity	
		Skip	Wheel
0	8/1/2000	881	933
1	9/1/2000	957	980
2	10/1/2000	1,040	778
3	11/1/2000	1,125	767
10	5/1/2001	658	212
11	6/1/2001	746	238
12	7/1/2001	710	264

It must be noted that while the lines on I-89 are placed longitudinally to traffic the markings in Williamsport were placed transverse to the direction of travel.

SUMMARY

After one year of service, the 3M™ Stamark™ Wet Reflective Tape Series 820 appeared to be an effective wet reflective marking material. However, even though the tape was still recessed, after two years of service, the tape was no longer effective as a large amount had peeled off from snow plow abrasion and traffic loads, with the retroreflectivity becoming increasingly worse (see Table 1). In July 2004, after frequent complaints by drivers of this area of Interstate 89 that the Series 820 Tape markings were no longer visible at night or when wet, staff from the Materials and Research section investigated the problem. During the investigation it was found that at least 21% of the 396 skip lines had delaminated completely, 9% was more than partially damaged, 20%was less than half damaged and the remaining 50% was in relatively good condition (See bar chart below).

What tape did remain had diminished retroreflectivity necessitating the repainting of all skip lines in the test area as the data obtained fell below 100 mcdl. Visual observation compared favorably with the retroreflectivity results and can be seen in the following photographs:



820 Tape on skip lines (Aug. 3, 2004)

Thermoplastic on skip lines (Aug. 3, 2004)

Final retroreflective readings taken in May 2004 resulted in no readings greater than 50 mcdl. Because of this data and the poor condition of the markings, it was determined that the markings were in need of rehabilitation and were repainted in the summer of 2004.

RECOMMENDATION

Based on the performance, it is recommended that this material should not be considered for inclusion on VTrans Approved Product List at this time.

DISCLAIMER

"The information contained in this report was complied for the use of the Vermont Agency of Transportation. Conclusions and recommendations contained herein are based upon the research data obtained and the expertise of the researchers, and are not necessarily to be construed as Agency policy. This report does not constitute a standard, specification, or regulation. The Vermont Agency of Transportation assumes no liability for its contents of the use thereof."