EVALUATION OF QUICK-DRYING PAVEMENT STRIPING MATERIALS FOR STOP LINES AND CROSSWALKS

by

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(The opinions, findings, and conclusions expressed in this report are those of the author and not necessarily those of the sponsoring agencies.)

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SUMMARY

New pavement marking materials and systems are continuously being introduced with claims of improvements in durability and reflectivity, as well as cost advantages. Because of the potential for savings through the use of a new system of pavement striping utilizing traffic paint and a sand/bead mixture, research was undertaken to compare the system with the striping procedure and materials presently used by the Department for transverse markings.

Based on the results of this study, the proposed new system of pavement striping offers no advantages over the striping materials and procedures presently used, therefore, the Department should continue its present striping program for crosswalks and stop lines using the instant-dry powders.

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INTRODUCTION

Transverse pavement markers are applied at roadway intersections to control vehicular and pedestrian traffic. Stop lines are used wherever it is important to indicate the point on the roadway behind which vehicles must stop in compliance with a stop sign, signal, or other legal requirements. As an aid to pedestrians, crosswalk lines are placed to channelize movement into locations of safest crossing, and, in effect, provide for an extension of the sidewalk across the roadway.

Since stop and crosswalk lines are applied transversely within intersection areas, they are more susceptible to wear than are longitudinal lines. Therefore, it is important that the pavement striping material used be durable in addition to having good visibility characteristics. The quick-drying pavement striping powders presently used by the Virginia Department of Highways and Transportation for stop lines and crosswalks are thermoplastic types of materials possessing good durability and visibility characteristics.

A new system for instant, non-tracking traffic line painting presented at the 1974 TRB meeting was reported to offer substantial savings in materials cost while possessing the non-tracking, durability, visibility and application qualities of quick-drying striping powders.(1) Basically, the system consists of spraying a thin coating (10-12 mils wet) of fast-drying traffic paint onto which a mixture of reflective glass spheres and sand is pressure applied at a rate of 15-18 lb./gal. (1.80-2.15 kg/l). Theoretically the system works in the following manner:

> "The spheres and/or mineral matter are applied under pressure to penetrate the wet film to the highway surface. Due to the close packing of the applied spheres and mineral aggregate, in addition to the fact that their average diameter is greater than the wet paint film thickness, the glass and mineral surface supports the tires of the automobile, allowing the vehicle to roll on the top of a dry mineral surface and not touch the wet paint underneath."(2)

PURPOSE

Because of the potential for savings through the use of the new system of pavement striping utilizing traffic paint and a sand/bead mixture, it was proposed that research be undertaken to compare the system with the striping procedures and materials presently used by the Department.

The specific objectives of this study were to:

(1) Compare the durability of the "beads/sand on paint" system with that of the striping powder presently being used,
(2) compare the visibility properties of each material during daytime and under night conditions, and
(3) note and compare any problems in the application of each system, e.g. spatter or overspillage.

Based on the above comparisons between the systems, conclusions are made concerning the relative merits of each, along with recommendations pertaining to the system most applicable for use by the Department.

PROCEDURE

Test Sections

Each striping material was applied to one intersection in Northern Virginia; namely, the intersection of Route 50 and Patrick Henry Drive. Each system was applied in the sequence shown in Figure 1, with the Virginia standard powder being designated as Type A and the test material as Type B.

Application

The equipment needed for applying the striping powder presently being used by the Department was provided by the Culpeper District, with District personnel applying the test sections using normal striping procedures and application rates. The new system was applied by a representative of the company supplying the new material, using their own special equipment. Each material was applied at the rate recommended by its manufacturer.

Evaluation

Periodic inspections of each test section were made by the Research Council to determine the relative durability and visibility of the materials. The durability was determined by on-site observation of chipping and abrasion as well as a comparative rating of photographs taken of each material at preselected locations which included vehicle wheel paths crossing each test line.

The visibility was determined by day and night visual inspections.

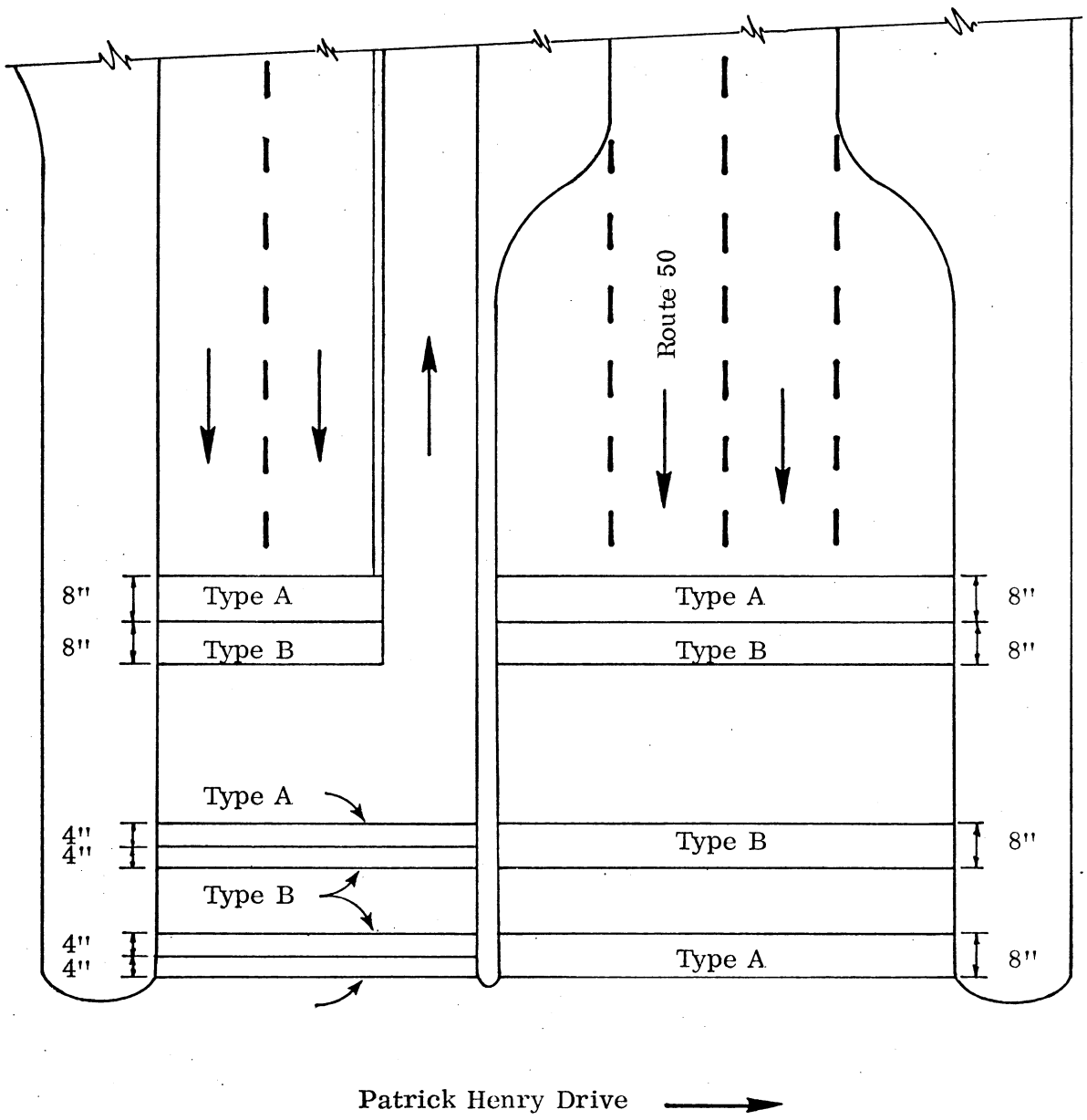

Figure 1. Test site. Note: 1" = 25 mm.

RESULTS

Within one month after application of the test materials it became obvious from periodic observations that the proposed new system of pavement striping utilizing traffic paint and a sand/bead mixture was unsuccessful. As a result of the obvious difference in durability it was not necessary to continue the periodic inspections just for the purpose of determining the durability of the material presently being used by the Department. Therefore, the results shown below are based on general observations and photographs taken.

Durability

The durability, or resistance to abrasive wear and chipping, of each material was to have been determined using a subjective rating on a 1 to 10 scale. However, this was unnecessary because of the early failure of one of the test materials. After three weeks the sand/bead mixture had failed within the vehicle wheel paths whereas the standard powder showed no sign of failure. As shown in Figure 2 the mixture had worn to a point where the original striping powder, over which the mixture was applied, was beginning to show.

After four months the sand/bead on paint application had completely disappeared whereas the standard striping powder was still intact. Examples are shown in Figure 3.

Color

The general appearance of each powder was considered by rating the degree of whiteness. Under night conditions the sand/bead mixture initially had superior reflective properties; however, after three weeks the night retroreflection had dissipated to a point equivalent to that of white paint without glass beads. The standard striping powder retained its reflective properties while exhibiting superior retroreflection after two to three weeks.

The standard striping powder was clearly superior to the new mixture in the comparison of daytime whiteness. Figure 2 is a good example of the difference in whiteness as seen throughout the test.

Application

Upon observing the application of each material it was noted that there was considerable splatter when applying the sand/bead mixture, whereas this problem was not evident with the standard striping powder.

CONCLUSIONS

1. The durability of the striping powder presently used by the Department was far superior to that shown by the proposed sand/bead on paint mixture.

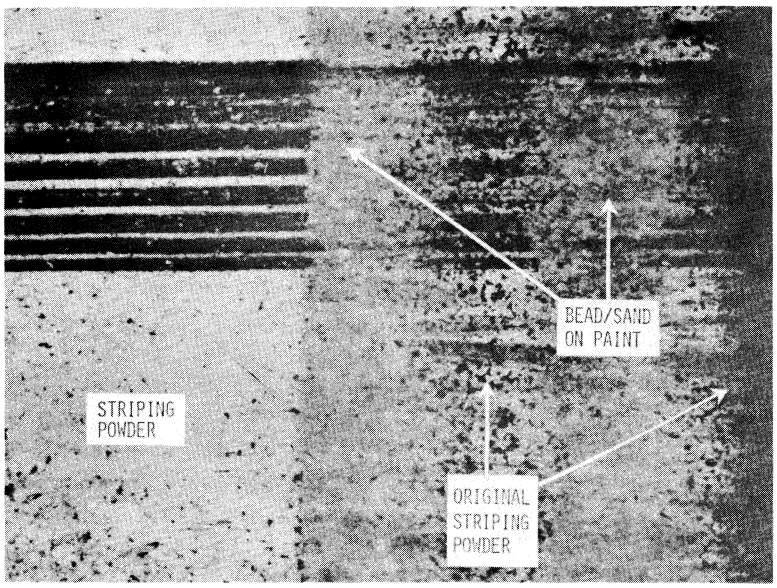

Figure 2. Example of deterioration and whiteness after three weeks.

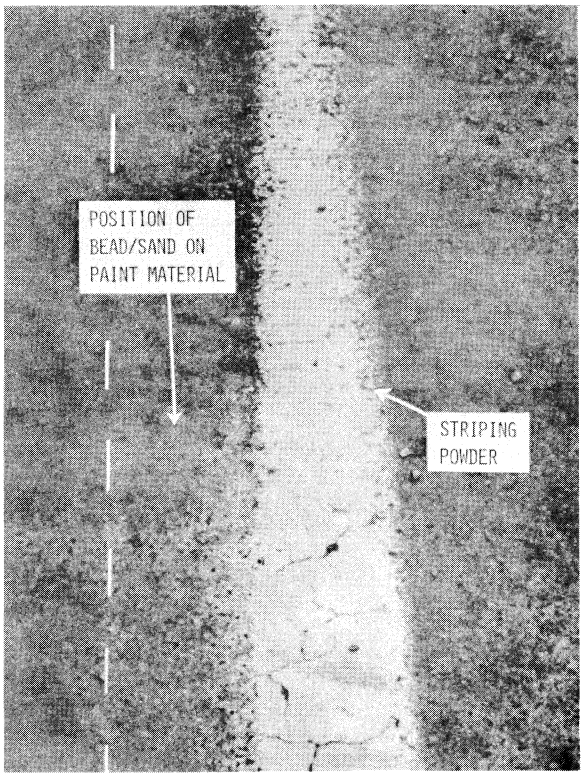

Figure 3. Example of deterioration after four months.

2. A comparison of color, or degree of whiteness, showed the standard striping powder to be brighter during both day- and nighttime conditions.

3. Based on observations during the application of each material there was obvious splattering upon application of the sand/bead mixture, whereas the powder and procedure presently being used by the Department presented no particular problem.

RECOMMENDATION

Based on the results of this study, it is obvious that the proposed new system of pavement striping utilizing traffic paint and a sand/bead mixture offers no advantages over the striping materials and procedures presently being used by the Department. It is therefore recommended that the Department continue its present striping program for crosswalks and stop lines using the instant-dry powders.

ACKNOWLEDGMENTS

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REFERENCES

1. Transportation Research Board Committee A2G02, Coating, Signing & Pavement Marking Materials.

2. "Norris System for Instant Non-Tracking Traffic Line Painting", Norris Paint and Varnish Co., Inc., Salem, Oregon.