

MICHIGAN
DEPARTMENT OF STATE HIGHWAYS

DATE: July 2, 1976

TO: Traffic Control Devices Committee

D. E. Orne, Chairman
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FROM: A. J. Permoda

SUBJECT: 1975 Performance Tests of "Fast-Dry" White and Yellow
Pavement Marking Paints.
Research Project 47 G-36(28a). Research Report No. R-
1009.

Subject tests varied from recent past tests in that they consisted of performance evaluation of two separate groups of paints; those submitted for regular, annual tests which later determined the supplier of white and yellow paints for the Department's 1976 roadway marking program; and, some alleged "super" paints solicited from producers for information purposes and applied later in the year.

The regular performance stripes were applied according to the customary procedure as described in Research Report R-957 covering the 1974 tests. The sample paints were applied on US 27 south of St. Johns on June 2 through 4, 1975, which was about ten days later than last year's application. The producers of the test paints are listed in the Appendix, which also shows that the only additional experimental feature being evaluated was the "flotation" type glass beads. Inspections of the performance of the test lines were made as usual, with the respective ratings listed in Table 1.

As during the past few years, the Traffic Control Devices Committee met early, on November 20, 1975, to select producers for bids for 1976 roadway striping requirements. The Laboratory submitted the available test and performance data for Committee review. This resulted in bid requests being issued to four producers covering both the white and yellow paints. Subsequently, two additional ratings were made, with those data also presented in Table 1.

Earlier in the year, on April 30, 1975, the Committee met to review and discuss the status of the Department's pavement marking program. It was questioned whether higher quality fast-dry paints were available from producers, but were being withheld from normal testing because they would not be competitive in contract award procedures used by us, and by other Highway Departments. Accordingly, producers of traffic paints were contacted and asked if they had higher quality paints than those being submitted for our annual performance tests. The four producers, replying that they had better paints, were asked to submit samples. These were applied as transverse stripes alongside the standard performance stripes on US 27, on October 6 and 7, 1975 (see Appendix for identifications). The performance of these four paints could not be compared directly to the standard paints deposited four months earlier, but would be compared with our "control" white and yellow paints; those purchased for roadway striping in 1975. The performance of this series of paints was then followed by the regular rating team, with data presented in Table 2.

TEST RESULTS

Regular Performance

In reviewing test data presented in Table 1 listed under the final 301-day rating column, one will note that the best performing white paint, as indicated by Service Factor, was No. 9 with a value of 100; this, incidentally, is the white paint the Department purchased for 1975 roadway striping. The next best performing paints were Nos. 1, 2, 5, and 4 and 6 (tied), in descending order. Of these, the Department is purchasing No. 2 in 1976 for its roadway striping, with Nos. 1, 5, and 6 being ineligible for bidding because of excessive dry times as listed under an adjoining column marked "Longitudinal."

In reviewing comparable data for the yellow paints, one notes that the best performing paint was No. 7 with a 100-value Service Factor; it earned a bid for 1976 requirements. The next best performing paints were No. 9 (the paint purchased by the Department for 1975 roadway striping) and Nos. 2, 1, 4, 3, and 6 in descending order. Of these, the Department is purchasing No. 2 in 1976 for its roadway striping, with Nos. 1 and 6 being ineligible for bidding because of excessive dry times.

The only experimental feature being evaluated in the 1975 tests was the "flotation" type beads which gave about a +5 value Service Factor improvement over the Department's untreated beads, paints No. 10 vs. No. 9 in both the white and yellow control paints. Incidentally, the flotation beads also contributed to improved performance in the 1974 tests, when evaluated in our control white paint.

The duration of the tests was much longer this year than last -- 301 days vs. 223 days, and the difference would have been greater had we rated to an equal, average W.R. (weighted rating) value -- about 3.8 this year vs. about 3.0 last year. This additional performance is ascribed as being due to the start of the ban on use of studded tires on vehicles during the past winter. General appearance of the stripes at final rating is shown in Figure 1.

Extra Performance

In reviewing test data presented in Table 2 listed under the final, 177-day rating column, one notes that the best performing white paint, as indicated by Service Factor, was No. 3 with a value of 100. The next best were Nos. 2, then 1: No. 2 probably loses Department interest because of its long drying time, while No. 1 is the test control paint, the white paint purchased by the Department for 1975 roadway striping. Paint Nos. 4 and 5 showed noticeably poorer performance.

In reviewing comparable data for the yellow paints, one notes that the best performing paint was No. 3 with a 100-value Service Factor. The next best were Nos. 2, then 1: No. 2 probably loses Department interest because of its long drying time, while No. 1 is the test control paint, the yellow purchased by the Department for 1975 roadway striping. Paint Nos. 4 and 5 showed noticeably poorer performance (Fig. 2).

In conclusion, two of the four "extra" tested white and yellow paints show better performance than the control paints being purchased by the Department for roadway striping, while the other two do not. Of the two better performers, one had an excessive drying time. Regarding improved performance of the extra paints, current results are somewhat better than in the 1965 tests, when the Department last solicited an "extra or quality" white paint from each supplier, as presented in Research Reports R-577 and R-611.

Regular vs. Extra Paints Performance Data

This explanation will have to be longer than we had hoped to have to give -- due mainly to an unexpected trend in test data covering the extra paints. Secondly, this longer explanation would not be required, had we been able to deposit both groups of paints at the same time in June 1975. However, as explained earlier, the extra paints were not available until fall; it was decided to deposit them then, rather than wait until the 1976 tests. The lag of four months in deposition time voided direct comparison in observable performance between the two groups of paints.

However, indirect comparisons are available since; both groups of paints included the same control white and yellow paints (the ones purchased by

the Department for its 1975 roadway striping program), and several different test data quality values permit comparison.

The unexpected trend in test data, the anomalies, are present because the final composite ratings listed under the W.R. columns for the same white and yellow control paints show lower values for those deposited in the extra group (177 days of service) than those deposited in the regular group (301 days of service). In the whites, 3.5 vs. 4.1; in the yellows, 3.5 vs. 4.4.

The overall performance of the white and yellow control paints is also lower in the extra group than in the regular group as shown by data listed under the Area S.F. (Service Factor) columns presented with the final ratings in Tables 1 and 2. In the whites, 55.0 vs. 59.0; in the yellows, 55.2 vs. 64.2.

We do not know the reason for the anomalous lower performance values of the control white and yellow paints in the extra group (177 days of service) than in the regular group (301 days of service). Despite the anomalous performance data, paint No. 3 in the extra group, in both white and yellow, showed noticeably better performance than the control white and yellow paints being purchased by the Department for 1975 roadway striping; and the drying times met Department specification requirements.

RECOMMENDATIONS

- 1) On the basis of test data, we recommend that bids for 1977 glass bead requirements be requested for standard untreated beads and treated flotation type beads. It appears that the latter would be a better buy if within about a 6 percent premium over the former.
- 2) Of the "super or extra" white and yellow paints, only one, No. 3, appears to have interest to the Department because of superior performance. Economic comparison is difficult because of anomalous test data, though we expect to obtain direct comparison data by applying the paints in the forthcoming 1976 tests of regular paints.

TESTING AND RESEARCH DIVISION



Supervisor - Materials Research Unit

AJP:bf

APPENDIX

1975 Fast-Dry Traffic Paint Tests

Paint Identifications:

I REGULAR PAINTS, White and Yellow

- 1. Standard Detroit
- 2. Baltimore
- 3. DeSantis
- 4. Glidden
- 5. Armstrong-Smith
- 6. Perry and Derrick
- 7. Synkoloid
- 8. Prismo
- 9. 1975 Roadway Paint (Baltimore) and Beads (Control Paint)
- 10. 1975 Roadway Paint (Baltimore) and Flotation Beads (Experimental)

Beads are from F-O-L; Laboratory No. 74 GB-1 meeting Departmental Specification Gradation requirements.

II EXTRA PAINTS, White and Yellow

- 1. 1975 Roadway Paint (Baltimore) and Beads (Control Paint)
- 2. Synkoloid; Nos. FF-5-428 White and FF-5-427 Yellow
- 3. Baltimore; Nos. 185-408 White and 185-413 Yellow
- 4. DeSantis; Nos. L 275 White and L 276 Yellow
- 5. Prismo; Nos. B 3054 White and B 3055 Yellow.

TABLE 1
1975 TEST PAINT PERFORMANCE RATINGS

Paint Identification No. 1	2-Day Rating ² June 5, 1975			70-Day Rating August 12, 1975			139-Day Rating October 20, 1975			163-Day Rating November 13, 1975			228-Day Rating January 19, 1976			301-Day Rating - April 1, 1976			Drying Time, Minutes								
	APP	DUR	N.V.	APP	DUR	N.V.	APP	DUR	N.V.	APP	DUR	N.V.	APP	DUR	N.V.	APP	DUR	N.V.	Service Area Factor S. E.	Longitudinal	Transverse ³						
	W.R.	W.R.	W.R.	W.R.	W.R.	W.R.	W.R.	W.R.	W.R.	W.R.	W.R.	W.R.	W.R.	W.R.	W.R.	W.R.	W.R.	W.R.									
1 - Yellow	8.5	9.9	7.3	8.5	7.3	4.2	6.7	7.2	9.4	4.5	6.7	6.8	4.1	6.2	7.4	6.8	3.4	5.2	6.3	5.6	2.8	4.3	90.5	60.0	5	> 12	
2 - Yellow	8.2	9.9	6.6	8.1	7.5	9.2	5.4	7.2	7.8	9.1	4.9	6.8	7.2	8.7	4.1	6.2	7.0	6.8	4.0	5.4	6.1	5.3	3.1	4.3	2-1/2	5	
3 - Yellow	8.1	10.0	5.2	7.4	8.0	9.8	3.8	6.7	7.6	9.2	3.8	6.3	6.8	8.7	3.2	5.8	6.2	5.8	3.1	4.5	5.2	4.3	4.0	4.2	2-3/4	3	
4 - Yellow	7.0	9.9	8.0	8.7	6.3	8.7	6.2	7.2	8.2	8.2	6.3	6.6	5.5	7.4	4.9	6.0	5.2	4.2	4.0	4.2	3.8	2.8	3.2	3.1	2	2	
5 - Yellow	7.6	9.9	6.2	7.8	7.3	9.3	3.9	6.4	7.3	8.7	3.0	5.7	6.3	6.7	2.9	4.7	5.7	4.9	2.5	3.8	4.7	4.2	1.3	2.8	4-1/2	8	
6 - Yellow	9.5	10.0	5.3	7.6	3.5	9.7	3.3	6.4	8.7	9.4	2.9	6.1	7.9	9.1	2.9	5.9	6.6	2.4	4.5	6.5	5.6	1.6	3.7	85.8	56.9	> 5	9
7 - Yellow	8.5	9.9	7.8	8.7	7.4	9.7	6.3	7.8	7.3	9.4	5.2	7.1	6.8	9.1	4.6	6.6	6.8	3.5	5.1	6.2	6.0	2.6	4.3	100.0	1-3/4	8	
8 - Yellow	8.8	10.0	4.7	7.2	8.8	8.6	2.8	6.1	8.4	9.5	2.5	5.9	7.8	9.0	2.4	5.6	6.2	6.0	2.2	4.1	5.3	4.3	1.6	3.1	80.5	4-1/2	7
9 - Yellow Exp.	8.8	10.0	7.2	8.5	7.7	9.7	5.3	7.3	7.7	9.5	4.4	6.8	7.4	8.8	4.4	6.4	7.2	6.6	3.5	5.1	6.8	5.9	2.8	4.4	96.8	3	9
10 - Yellow Exp. 4	9.1	10.0	7.6	8.7	7.2	9.6	5.8	7.4	6.7	9.5	5.2	7.0	6.3	9.0	5.2	6.9	7.2	7.0	4.2	5.6	6.8	6.2	3.5	4.9	103.1	3	9
1 - White	8.7	10.0	8.2	9.0	8.0	9.7	4.2	6.8	8.2	9.0	3.1	6.0	7.3	8.2	2.8	5.4	6.6	5.7	3.0	4.4	6.1	4.7	2.1	3.9	99.0	> 5	> 10
2 - White	8.7	10.0	4.4	7.1	8.5	9.7	2.7	6.0	8.5	9.3	2.3	5.8	8.2	8.7	2.1	5.3	7.2	6.6	2.3	4.5	6.3	5.2	1.7	4.9	94.2	3-1/2	6
3 - White	9.3	10.0	3.7	6.8	8.8	9.7	2.3	5.9	8.4	8.9	2.0	5.4	7.6	8.1	2.4	5.2	6.8	5.6	2.1	4.0	5.8	4.6	1.3	3.1	85.9	2-5/9	8
4 - White	7.3	10.0	8.5	9.0	6.0	8.5	5.8	6.9	5.0	7.2	4.3	5.5	4.7	6.1	3.9	4.8	4.4	4.2	3.6	3.9	3.8	2.9	2.1	2.6	92.2	2-1/4	8
5 - White	8.0	10.0	5.0	7.3	7.5	9.7	3.1	6.2	7.7	9.5	2.3	5.7	7.5	8.9	2.4	5.5	7.2	7.0	2.3	4.7	6.0	5.6	1.6	3.6	93.7	> 5	> 10
6 - White	8.6	10.0	4.3	7.0	8.8	9.7	2.7	6.1	8.6	9.4	2.0	5.0	8.2	8.8	2.2	5.5	7.7	6.7	2.3	4.0	6.4	5.6	1.0	3.7	82.2	> 5	12
7 - White 5																										9-1/4	
8 - White	7.5	10.0	4.5	7.0	8.2	9.6	2.4	5.9	8.0	9.3	2.5	5.8	7.2	8.8	2.4	5.4	6.2	5.8	2.2	4.0	4.9	4.0	1.3	2.8	87.3	> 5	7
9 - White Exp.	8.7	10.0	6.0	7.9	8.2	9.4	3.7	6.4	7.8	9.5	3.2	6.2	7.8	8.9	3.1	5.9	7.5	6.8	3.0	5.0	6.5	5.8	2.2	4.1	100.0	2-1/2	9
10 - White Exp. 4	8.7	10.0	6.2	8.0	7.5	9.7	4.6	6.9	7.1	9.4	4.0	6.5	7.2	8.9	3.8	6.2	7.2	6.8	3.3	5.1	6.5	5.7	2.9	4.4	104.7	2-1/2	9

¹ Identification listed in Appendix.

² Ratings: APP - Appearance, DUR - Durability, N.V. - Night Visibility, W.R. - Weighted Rating

³ Determined by ASTM D 711 wheel.

⁴ Exp. - Experimental

⁵ Supplier did not furnish paint in 5 gal can for transverse stripe tests.

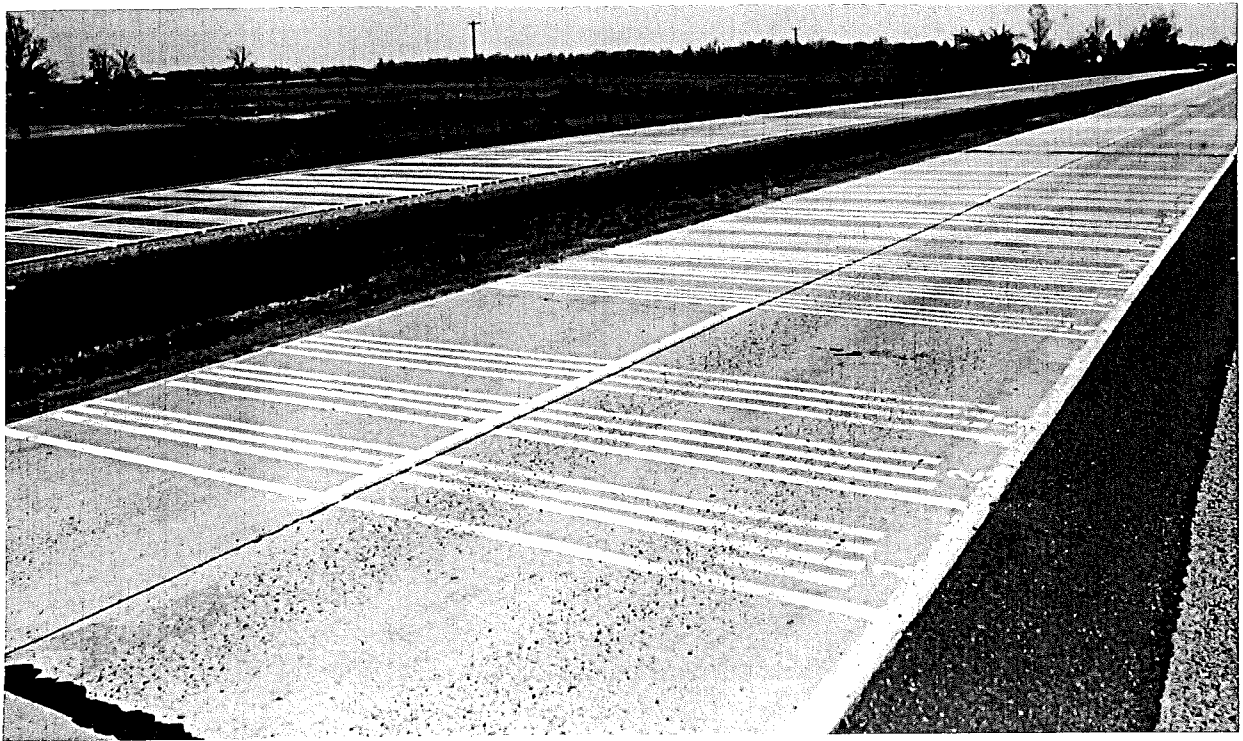


Figure 1. Appearance of test stripes at final ratings on concrete roadway of US 27, south of St. Johns. Foreground stripes are regular group, while background stripes are extra group.

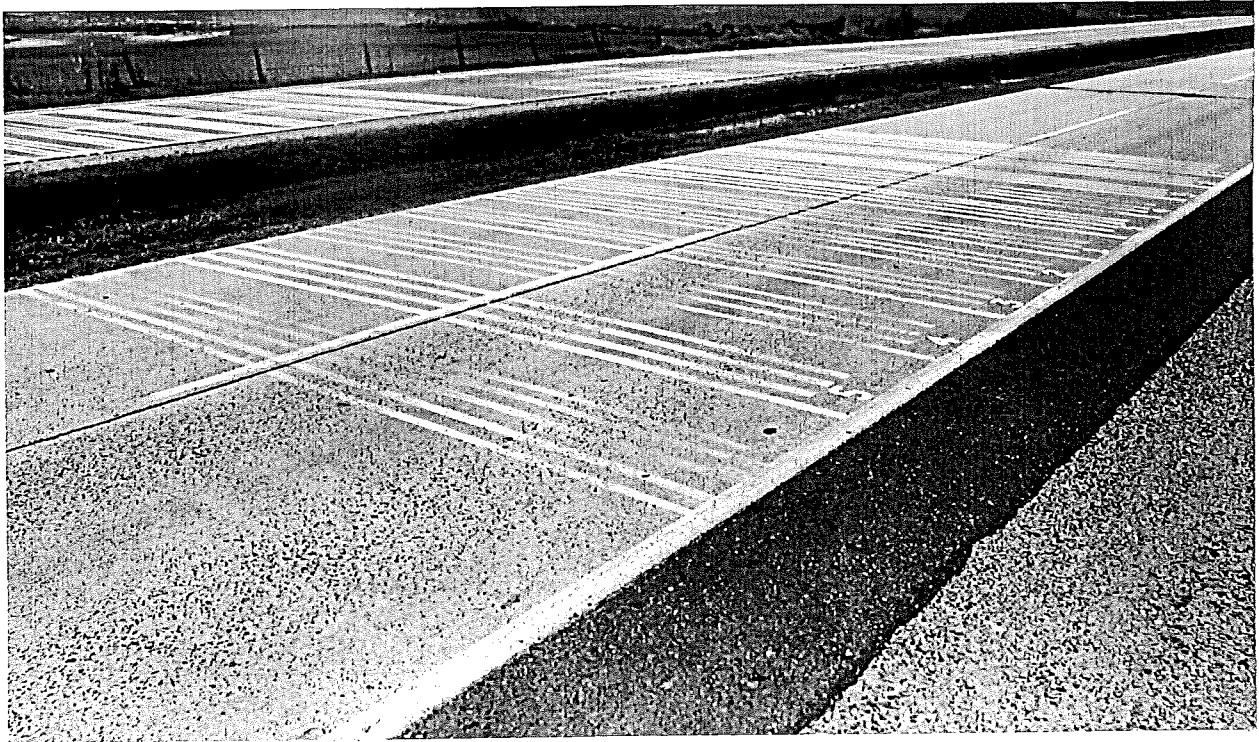


Figure 2. Appearance of extra group test stripes included in Figure 1 at final ratings. Foreground stripes are yellow, with the first set belonging to the regular group.