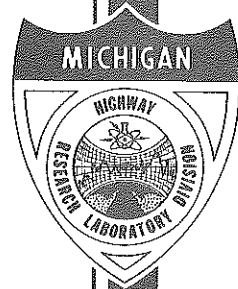


1966 PERFORMANCE TESTS
ON WHITE AND YELLOW TRAFFIC PAINTS
(Including Cooperative Tests in Detroit and Wayne County)

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MICHIGAN DEPARTMENT OF STATE HIGHWAYS

1966 PERFORMANCE TESTS
ON WHITE AND YELLOW TRAFFIC PAINTS
(Including Cooperative Tests in Detroit and Wayne County)

A. J. Permoda
A. R. Cabel
M. H. Janson

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The following eight producers submitted paints for the 1966 tests:

1. Argo Paint and Chemical Co. of Detroit
2. Baltimore Paint and Chemical Corp. of Baltimore
3. Forman Ford, Inc. of Minneapolis
4. Glidden Co. of Cleveland
5. Jaegle Paint and Varnish Co., Camden, New Jersey
6. Prismo Safety Corp. of Huntingdon, Pennsylvania
7. Sherwin-Williams Co. of Detroit
8. Standard Detroit Paint Co. of Detroit

Compared to 1965, this list has one deletion--Truscon Division of Devoe Paints--which was under labor strike when samples were to be submitted and could not comply.

The 1966 tests differ from preceding ones in being the first to be conducted on a biennial basis, rather than the former annual basis. The change was authorized by Committee action at its meeting of May 3, 1966. This will require using the 1966 test data as a basis for Departmental striping requirements for both 1968 and 1969.

Qualification Tests

All submitted paints were evaluated for conformance with qualification requirements given in the governing specifications dated April 1, 1966. Laboratory qualification tests covered color, reflectivity, consistency, bleeding, settling, and vehicle stability. Field qualification tests covered drying time and applicability in regular highway striping equipment. Results of the qualification tests are given in Table 1, which shows that the following paints were borderline or failed to meet one or more of the requirements:

White Paints

No. 66--Excessive bleeding on asphalt.

No. 70--Excessive drying time and borderline low viscosity.

TABLE I
 QUALIFICATION TEST RESULTS
 1966 PERFORMANCE PAINTS

Paint No.	Color ⁽¹⁾		Consistency KU - 77 F	Bleeding Index		Settling Index	Vehicle Stability	Avg. Field Drying Time, min	Applicability in Roadway Stripper
	Dominant Wavelength, mμ	Reflectivity, percent		Asphalt	Tar				
66		87.2	73	3.0	3.7	9	satisfactory	22	All are presumed as satisfactory, since striping crew did not keep and submit data.
68		85.6	82	6.7	6.3	9	satisfactory	32	
70		83.1	76	6.3	5.7	9	satisfactory	58	
72		84.1	76	5.0	4.7	9	satisfactory	24	
74		85.3	81	6.0	4.5	9	satisfactory	47	
76		87.7	81	4.7	4.7	7	satisfactory	26	
78		82.6	66	4.3	4.5	8	unsatisfactory	30	
80		78.5	85	4.3	5.3	8	satisfactory	21	
61								24	
62								21	
63								24	
67	582.3	50.1	71	3.3	5.7	9	satisfactory	26	
69	582.1	55.3	75	6.0	7.0	9	satisfactory	40	
71	582.1	56.3	78	5.3	7.0	8	satisfactory	45	
73	581.7	51.2	91	6.7	5.7	8	satisfactory	28	
75	581.9	53.8	76	8.7	7.5	9	satisfactory	45	
77	581.3	59.6	85	7.0	6.5	8	satisfactory	30	
79	582.6	51.6	73	6.0	6.0	7	unsatisfactory	38	
81	581.4	56.6	93	7.0	6.0	7	satisfactory	29	

¹ All paints were satisfactory in being non-fluorescent.

- No. 72--Borderline low viscosity.
- No. 74--Borderline drying time.
- No. 78--Failed vehicle stability tests, low viscosity, and borderline bleeding on asphalt base.
- No. 80--Borderline bleeding on asphalt base and reflectivity.

Yellow Paints

- No. 67--Excessive low viscosity, bleeding on asphalt base, and does not meet color requirements.
- No. 69--Borderline low viscosity.
- No. 71--Borderline drying time.
- No. 73--Borderline high viscosity and borderline in meeting color requirements.
- No. 75--Borderline low viscosity and drying time.
- No. 79--Failed vehicle stability test and borderline low viscosity.
- No. 81--Borderline high viscosity.

The above list shows a high percentage of paints that fail or nearly fail to meet specification requirements. These deficiencies should be brought to the attention of the respective producers when paints are ordered for next performance testing in 1968.

Field Application

The submitted paints were applied for road performance tests between August 9 and 17, 1966 in four areas, as usual. The road areas were the same as used in the previous 1965 tests, with the specific locations shown in Figure 1.

The road stripes used to evaluate performance extended transversally across two lanes of four-lane divided roadways. Application details for the test paints were standard, in that each was applied as a set of three 4-in. wide stripes at a 15-mil wet thickness, having glass beads "dropped on" in a ratio of 6 lb per gal of paint. Subsequently, 45-gal amounts of each paint purchased for the tests were applied as longitudinal striping by the Grand Rapids striping crew to evaluate handling and application characteristics in highway striping equipment. This year, however, notes were not kept and submitted by the crew, because of a change in personnel.

Field Performance Ratings

Test stripes deposited in the four road areas were rated for performance six days after application and at three-month intervals thereafter over a period of one year. Quality ratings of the test stripes in the four areas, averaged from evaluations of the four observers, are given in Table 2. These averaged quality values for the individual paints were then used to calculate the respective weighted ratings, also listed in that table.

Final appearance of striping in two test areas is shown in Figures 2 and 3.

Field Test Results

Table 3 presents ratings of all tested 1966 paints, listed in a descending order of performance, as determined on a terminal "Percent of Best" Scale. Half-year and one-year service factor values, from which the "Percent of Best" scale is derived, are also presented in the table, as is a column giving results of the previously described qualification tests.

The "Qualification Tests" column in Table 3 and data in Table 1 show that of the 16 paints submitted for the tests, five failed, eight were borderline, and only three clearly met all specification requirements. This is a poor record of compliance with specifications, and suggests that the Committee review the matter including possible corrective action.

The Table 3 column listing the final service factor values of the paints in the previous year (1965) is given to allow comparison of the performance ratings of a producer's paint in the last two test years. This shows that both the whites and the yellows rated lower in the 1966 tests than in 1965. For the yellows the difference varied from -0.6 points to -11.6 points, with an average of -5.3 points.

As before, the current tests included sample stripes of the white and yellow paints purchased for the Department's 1966 roadway striping, for information on reproducibility of ratings and for a possible check on analytical methods employed in acceptance testing. A comparison shows that the white paint was rated -4.9 points lower in the 1966 tests than previously, while the yellow paint rated -5.5 points lower. A graphical comparison of the "weighted ratings" for the two paints is given in Figure 5. Since the two paints are the same, the lower 1966 ratings must be due to some combination of, (a) tougher road areas in 1966 tests, (b) more traffic or worse weather during 1966 tests, and (c) changed rating personnel assign poorer values to striping.

TABLE 2
PERFORMANCE RATING DATA
1966 TESTS

Exposure Days	Factor Evaluated	White Paint Identifications												
		66	68	70	72	74	76	78	80	64-(82)	61 ⁽¹⁾	62 ⁽¹⁾	63 ⁽¹⁾	
White Paints	6	General Appearance	9.2	9.1	8.9	9.5	9.3	9.2	9.1	8.8	9.0	9.0	9.4	9.0
		Durability	9.8	9.9	9.6	9.8	9.7	9.6	9.8	9.9	9.9	9.9	9.8	9.9
		Night Visibility	5.8	7.0	5.8	5.7	5.9	6.5	4.7	4.6	7.8	7.8	8.3	7.6
		Weighted Rating	7.7	8.4	7.6	7.7	7.8	8.0	7.2	7.1	8.8	8.8	9.0	8.7
	91	General Appearance	7.0	7.6	7.3	7.4	7.6	7.6	7.4	7.8	7.7	7.6	7.8	7.8
		Durability	8.2	8.8	8.9	8.0	8.6	8.8	8.6	8.3	8.8	8.8	8.8	8.9
		Night Visibility	5.2	6.3	5.4	5.2	5.6	5.4	5.2	4.8	6.4	6.1	5.9	6.1
		Weighted Rating	6.6	7.4	7.0	6.5	7.0	7.0	6.8	6.5	7.5	7.3	7.2	7.4
	193	General Appearance	3.9	5.7	5.8	4.2	5.5	4.9	4.3	4.5	5.6	4.9	5.1	4.2
		Durability	4.1	6.2	6.6	4.2	6.1	5.3	4.6	4.7	6.1	5.0	5.1	5.1
		Night Visibility	2.4	3.9	4.2	2.8	3.9	3.4	3.1	3.0	4.4	4.1	3.8	3.7
		Weighted Rating	3.2	5.0	5.3	3.5	4.9	4.3	3.8	3.8	5.2	4.5	4.4	4.3
		Service Factor	59.8	70.2	67.0	60.4	66.5	65.3	61.0	59.5	72.0	69.5	69.5	68.9
	275	General Appearance	2.9	4.8	5.0	3.1	4.3	3.8	3.4	3.4	4.5	3.7	3.6	3.6
		Durability	3.2	5.0	5.5	3.1	4.5	3.7	3.7	3.5	4.7	3.9	3.8	3.6
		Night Visibility	1.3	2.6	2.9	1.7	2.9	2.2	1.9	1.9	2.8	2.7	2.8	2.9
		Weighted Rating	2.2	3.8	4.2	2.4	3.7	3.0	2.8	2.7	3.7	3.3	3.3	3.2
	365	General Appearance	2.3	4.3	5.0	2.8	4.2	3.6	3.1	2.8	4.0	3.2	3.0	3.0
		Durability	2.6	4.4	5.2	2.6	4.1	3.4	3.2	2.8	3.9	3.2	2.8	2.8
		Night Visibility	1.1	2.4	3.0	1.3	2.4	1.8	1.6	1.7	2.4	2.0	2.2	2.2
Weighted Rating		1.8	3.4	4.1	3.0	3.3	2.6	2.4	2.2	3.2	3.6	2.5	2.5	
Service Factor		42.8	55.9	56.4	45.2	53.5	49.8	46.1	45.0	56.7	54.1	53.9	52.1	
Yellow Paints	Yellow Paints	Yellow Paint Identifications												
			67	69	71	73	75	77	79	81	64-(83)			
		6	General Appearance	9.1	9.6	9.5	9.3	9.6	9.5	9.0	9.4	9.7		
			Durability	9.8	10.0	9.6	10.0	9.9	9.8	9.8	9.9	10.0		
			Night Visibility	6.0	7.5	6.2	7.7	6.8	6.8	5.3	6.5	7.1		
			Weighted Rating	7.8	8.7	7.9	8.8	8.3	8.3	7.5	8.2	8.5		
		91	General Appearance	7.4	8.2	8.3	7.8	8.1	7.9	7.3	8.0	7.8		
			Durability	8.4	9.3	8.8	8.3	8.9	8.6	9.0	8.8	9.0		
			Night Visibility	5.6	6.5	5.5	5.6	5.8	5.8	5.3	6.2	6.0		
			Weighted Rating	6.9	7.8	7.1	6.9	7.3	7.1	7.0	7.4	7.4		
		193	General Appearance	4.3	6.2	6.3	4.2	6.1	5.0	5.0	5.2	6.0		
	Durability		4.8	6.7	6.7	4.3	6.4	5.3	5.5	5.7	6.5			
	Night Visibility		2.9	4.3	4.7	2.9	4.6	3.7	3.5	3.8	4.6			
	Weighted Rating		3.8	5.4	5.7	3.6	5.5	4.5	4.4	4.7	5.5			
	Service Factor		63.2	74.0	69.2	65.0	70.6	67.1	64.3	68.9	71.7			
	275	General Appearance	3.7	5.6	5.5	3.2	5.3	4.5	4.1	4.4	5.3			
		Durability	4.0	5.9	5.8	3.4	5.5	4.7	4.7	4.6	5.8			
		Night Visibility	1.8	3.1	3.4	1.9	3.4	2.7	2.6	2.5	3.4			
		Weighted Rating	2.9	4.5	4.6	2.6	4.4	3.7	3.6	3.5	4.6			
	365	General Appearance	3.2	5.0	5.3	2.8	4.9	3.9	3.5	4.4	4.7			
Durability		3.0	5.2	5.3	2.8	4.9	3.8	3.8	4.1	4.8				
Night Visibility		1.2	2.8	3.1	1.4	3.1	2.3	2.2	2.3	3.1				
Weighted Rating		2.4	3.7	4.2	2.1	4.0	3.0	3.0	3.2	3.9				
Service Factor		47.5	60.5	59.0	47.2	59.0	53.0	51.2	54.1	59.8				

¹ Experimental paints put down in two areas only, due to limited quantities.

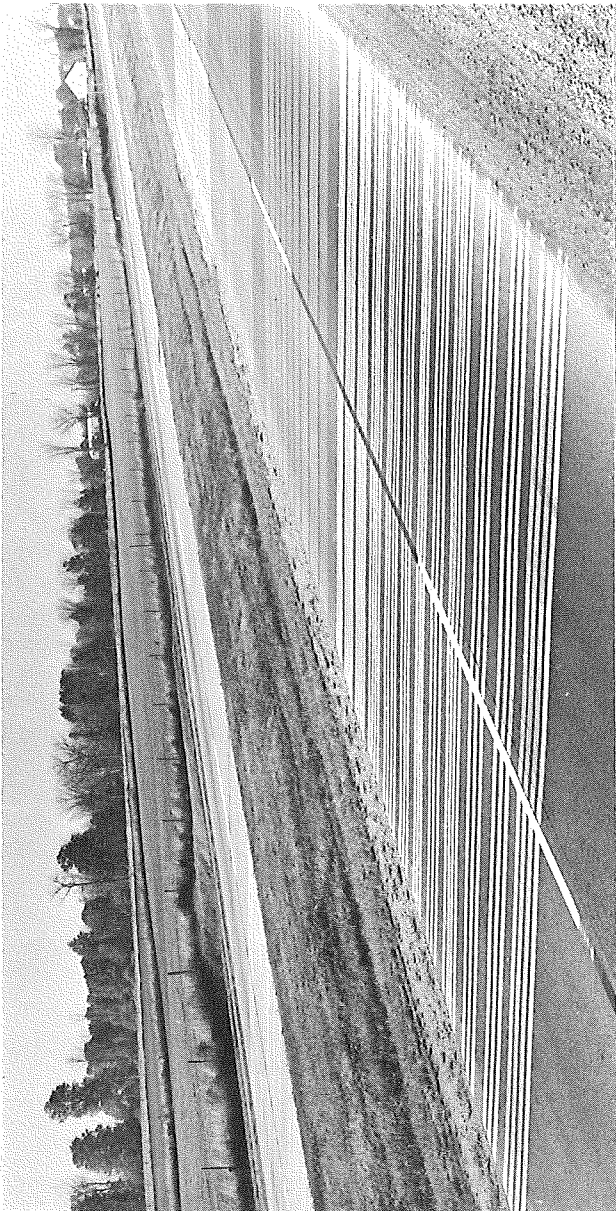


Figure 2. Good condition of Department white (foreground) and yellow (background) stripes on test area 4 bituminous on NB US 27 after 1 year exposure.

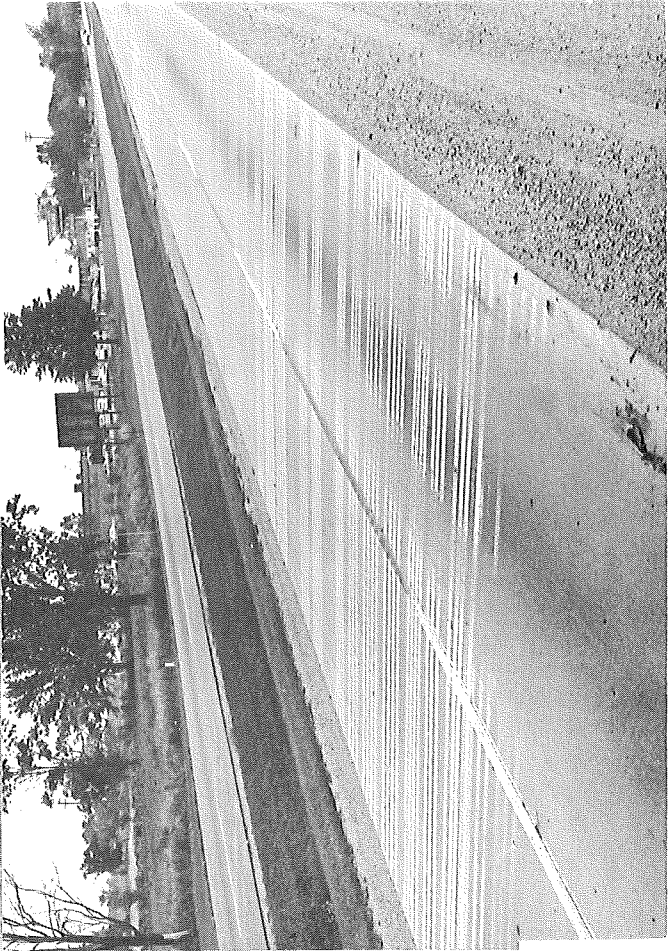


Figure 3. Fair-poor condition of Department white (foreground) and yellow (background) stripes on test area 1 concrete on EB M 78 after 1 year exposure.

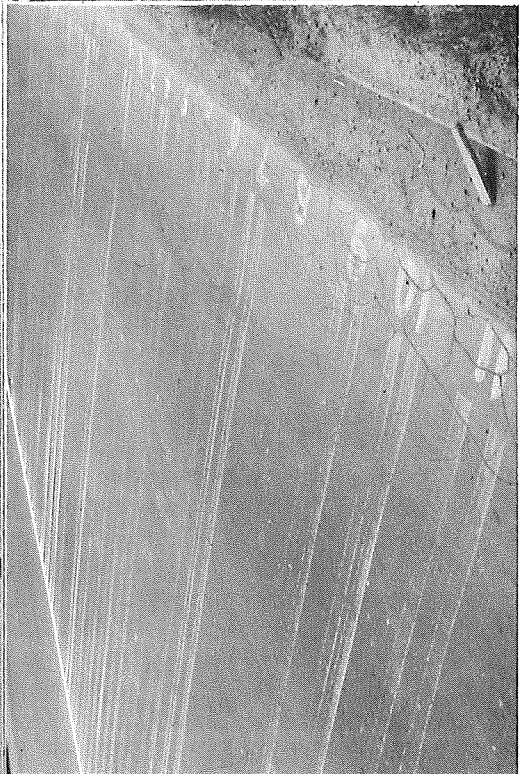


Figure 4. Poor condition of Detroit yellow stripes after 8-1/2 months of service on sheet asphalt of Oakland Ave adjoining I 75 under construction. MDSH paint is No. 1.

TABLE 3
SERVICE FACTORS AND TERMINAL RATINGS
1966 PERFORMANCE PAINTS⁽¹⁾

	Paint No.	1965 Service Factor 375 Days	1966 Service Factors		Terminal Percent of Best	Qualification Tests
			193 Days	365 Days		
White Paints	70	60.3 + 56.7	67.0	56.4	100.0	Failed
	68	61.7 + 57.7	70.2	55.9	99.2	Passed
	74	60.4 + 59.2	66.5	53.5	94.8	Passed
	76	59.6 + 58.8	65.3	49.8	88.3	Passed ⁽²⁾
	78	51.9	61.0	46.1	81.7	Failed
	72	56.6 + 56.2	60.4	45.2	80.2	Passed
	80	58.4 + 55.4	59.5	45.0	79.7	Passed
	66	44.3	59.8	42.8	75.9	Failed
	64-82(a)	61.6(b)	72.0	56.7	100.5	
	61(c)	-----	69.5	54.1	95.9	
62(c)	-----	69.5	53.9	95.6		
63(c)	-----	68.9	52.1	92.4		
Yellow Paints	69	61.9	74.0	60.5	100.0	Passed
	71	63.7	69.2	59.0	97.6	Passed
	75	59.6	70.6	59.0	97.5	Passed
	81	59.4	68.9	54.1	89.5	Passed
	77	62.4	67.1	53.0	87.7	Passed ⁽²⁾
	79	55.5	64.3	51.2	84.7	Failed
	67	-----	63.2	47.5	78.5	Failed
	73	58.8	65.0	47.2	78.1	Passed
	64-83(a)	65.3(b)	71.7	59.8	98.8	

- a) Paints purchased for 1966 roadway striping.
- b) Values obtained in 1964 tests, using two different areas than in 1965 tests.
- c) Experimental paints, performance tested in two areas only.

¹All paints applied at rate of 16.5 gals per mile of 4-in. stripe, with six lb of MDSH Type 3 beads dropped on per gallon. Same road areas as in 1965 tests.

²Paints furnished with beads, which were not used since they did not meet specifications.

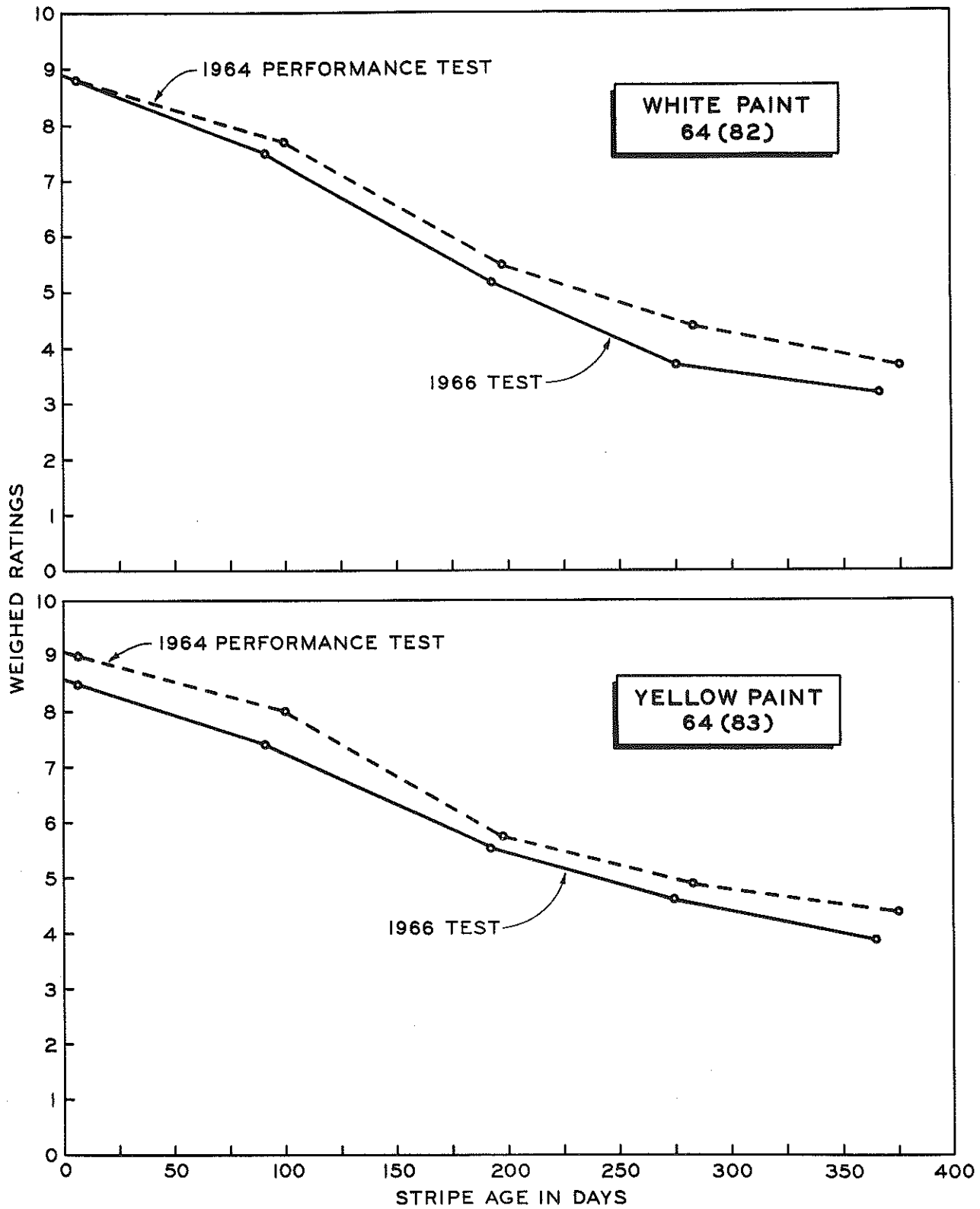


Figure 5. Comparison of performance ratings in 1964 and 1966 tests of paints purchased for roadway striping in 1966.

By deduction from above it appears that the lower ratings of paints in the 1966 tests is due to other factors besides the possibility of poorer quality.

As is customary, no recommendation is being made concerning test paints to be selected for bids.

Experimental Paint and Beads

The only experimental materials under evaluation in the 1966 tests, were three white paints received from the Ontario Highway Department on an exchange basis. All were evaluated in only two areas, due to limited size of submitted samples. These paints were faster drying than most and earned good ratings. We were informed that they were based on a chlorinated alkyd vehicle. The samples were from different producers.

Cooperative Tests with Detroit and Wayne County

In accordance with previous arrangements, as in the past, the Department cooperated with the City of Detroit and with Wayne County in their performance tests, mainly by loaning striping equipment and operators.

In Detroit, stripes were applied on July 26, 1966 consisting of 12 whites and 11 yellows, plus one MDSH control of each. When rated after 8-1/2 months of service the best white rated a two in durability while the best yellow and the MDSH rated a three. This is again poorer performance than expected (Fig. 4) brought about partially by construction of I 75 adjoining the Oakland Avenue test site.

In Wayne County, striping was finished on August 4, 1966 on bituminous of Middle Belt Road. Prior application was on concrete of Beech Daly. Twelve whites and yellows were applied, plus one MDSH control of each. When inspected after seven months of service the best paints rated about a six in durability, with the MDSH paints rating about five. The performance was considered as better than in some previous years, and apparently not adversely affected by the big snow of January 26-27, 1967.