

MICHIGAN  
STATE HIGHWAY DEPARTMENT  
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1954 PERFORMANCE TESTS OF TRAFFIC PAINTS

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Highway Research Project 47 G-36 (7)

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Testing and Research Division  
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would have been impractical to change or add to the requirements and methods of evaluation as long as those tests were being used for procurement purposes.

### Test Paints

In all, 22 paints were applied, white and yellow from each of 10 producers and two extra yellows made up by Truscon Laboratories according to Department formula specifications.

1. Prismo Superlifeline
2. Minnesota Mining and Manufacturing, Centerlite
3. LKR Chemical Products Corp.
4. Glidden Co.
5. Baltimore Paint and Color Works
6. D. C. Franche and Co.
7. Garland Co.
8. Michigan Road Improvement Co.
9. Truscon Laboratories
10. Silver Lead Co. (Great Lakes Paint)
11. Yellow only, Mich. Spec. 5A
12. Yellow only, Mich. Spec. 6A

### Application

All paints were applied in four test sections as before, except that the locations of the first two were changed from US 27 south of St. Johns to US 27-M 78 about 8 miles southwest of Lansing. All four test sections are shown in the diagram of Figure 1 and are located as follows:

1. US 27, 8 mi. southwest of Lansing, concrete, east roadway.
2. US 27, 8 mi. southwest of Lansing, bituminous, west roadway.

3. US 127, near intersection with Pennsylvania Avenue extension, concrete, west roadway.

4. US 16, 0.2 miles west of Okemos-Haslett Road, bituminous, north lanes.

Three stripes of each paint were applied in each test section. The paints were identified only by code number, stripes in each section were numbered consecutively in the order of application, and the locations of the various paints were again rotated in the four sections.

Detailed observations were made by Research Laboratory personnel during the field work, including air temperature and relative humidity, atomization pressures, wet film thickness, drying time, stripe width, and Hunter night visibility readings. A summary of these observations is given in Table 1.

Weather conditions were in general not as favorable for these tests as for the previous ones in 1953. Owing to the extension of the deadline for receipt of samples to September 10, there were numerous delays from frequent and prolonged periods of rain and cool weather that began shortly after the final samples were in. The data in Table 1 show that even on days when it was possible to work, the air temperatures were quite low and in some cases the humidity quite high.

Recommendations of the manufacturer with regard to rate of paint application and type of bead application, i. e. drop-in or overlay, were followed carefully. Without exception all paints were put down at wet film thicknesses deviating less than 5 percent from the prescribed value. When the manufacturer did not specify the rate of application, his paint was applied at the rate of 16.5 gal per mi, which corresponds to a wet film thickness of 15.0 mils. As mentioned previously, manufacturers were also free to specify the type of bead application desired for their products in these tests. Where no preference was expressed, beads were applied exclusively by drop-in at the rate of 6 lb per gal of paint. Beads

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for 6-lb drop-in were prepared by mixing 4 lb of 2 A specification beads with 2 lb of 1 A. Application details for the individual paints are given in Table 2.

Accuracy and flexibility of paint application were greatly improved in 1954 by completely redesigning and rebuilding the machine prior to last fall's operations. Through the use of a four-speed transmission and auxiliary gears, it was possible to apply paint at any desired wet film thickness in steps of approximately 1 mil. Application is maintained constant at the predetermined rate irrespective of travel speed of the machine or consistency of the paint. A photograph of the machine in operation is shown in Figure 2.

#### Qualification Tests

An entirely new phase of performance testing was introduced in our 1954 program through the use of specifications requiring qualification tests for color, drying time, consistency, bleeding and settling. Details of these requirements are given in the specifications. Results of the tests are listed in Table 3, which shows that the following paints failed to meet one or more of the requirements as indicated:

##### White Paint

- No. 146 Drying time, settling, bleeding on asphalt.
- No. 148 Consistency, bleeding on asphalt.
- No. 159 Bleeding on tar.

##### Yellow Paint

- No. 147 Drying time, bleeding on asphalt.
- No. 149 Color, consistency, bleeding on asphalt.

This paint also had a very low reflectivity, or brightness, although no minimum for this quality has been set in the specifications.

- No. 151 Drying time, consistency. Also low in reflectivity.
- No. 158 Bleeding on asphalt.

Attention was called to most of the above shortcomings in Mr. McMonagle's letter of June 23, 1955 to Mr. Downey requesting requisitions for test paints to be put down in 1955. In the same letter it was recommended that two producers represented in the above list not be allowed to participate in the 1955 tests because of their poor showing in the 1954 field tests. These two were the producers of paint Nos. 148 and 149, and 158 and 159.

Results of Field Performance Tests

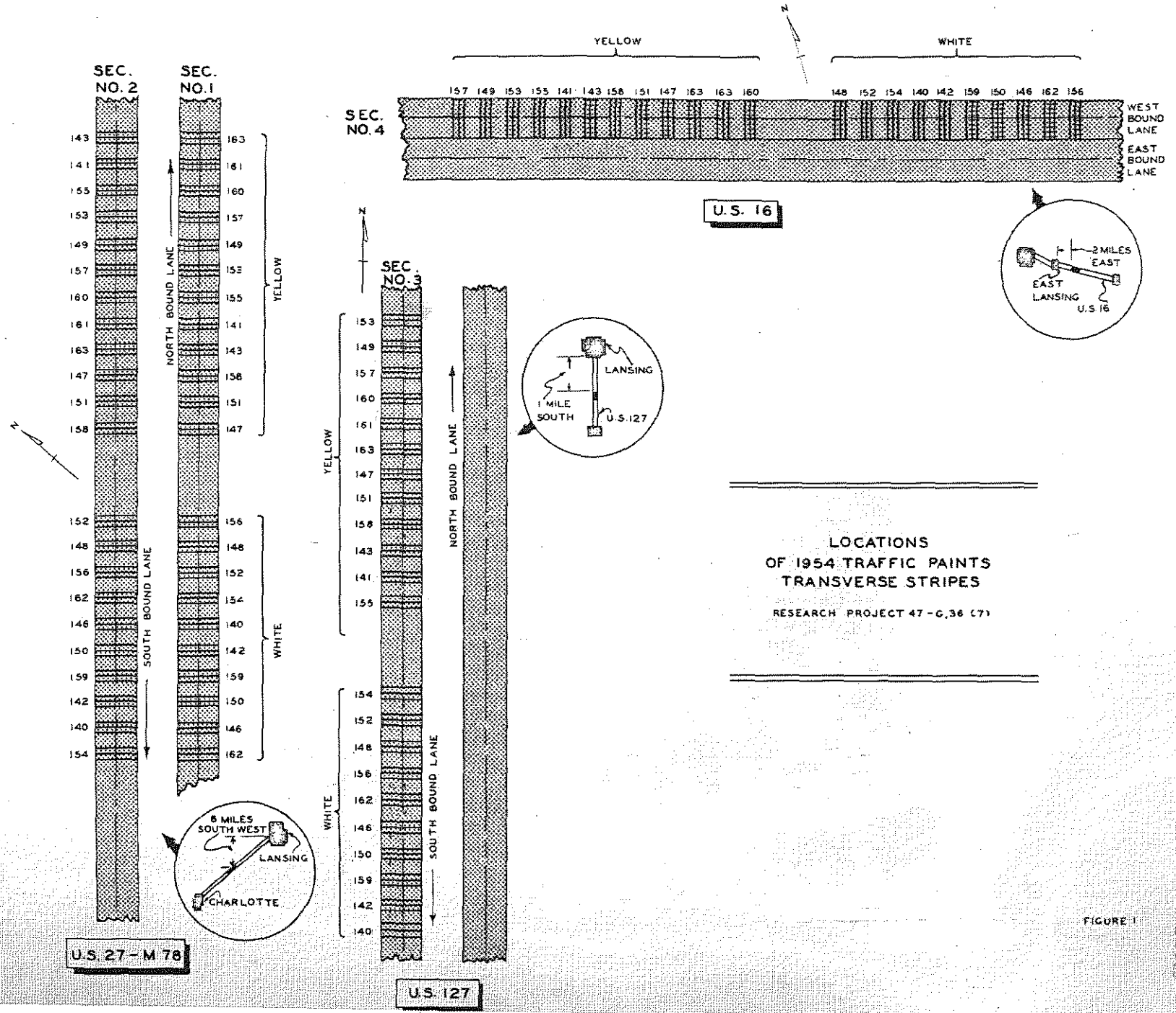
A summary of performance data is given in Table 4, and the final evaluations of the test paints are arranged in descending order of service factor in Table 5. A comparison of these results with a similar tabulation of the 1953 final evaluations a year ago immediately reveals what appears to be a startling drop in quality all along the line. The difference in performance is more apparent than real, however, and can be entirely accounted for by the operation of three new factors introduced into the tests this past year:

1. Evaluation of transverse stripes only in the traffic lane, where failure is always earlier and much more extensive than in the passing lane. This has the net effect of accelerating the test, since the cushioning effect on the ratings of the relatively slow deterioration in the passing lane has been removed.

2. The change in location for Test Section 1 (on concrete) from US 27 south of St. Johns to US 27 - M 78 southwest of Lansing resulted in an unforeseen premature failure of most of the paints by scaling or chipping, indicating a general lack of adhesion. While this scaling was not as extensive on the Charlotte road as on Test Section 3 (US 127 north of Holt) it was sufficiently severe to further widen the gap between the one paint which was able to stick and the others which were not. Possibly a contributory cause was the lateness of the season and prolonged spells of rainy, cool weather when the test paints were put down.

3. Due to the decision of the committee to give the paint manufacturer his choice of type of bead application for the tests, only four of the 10 commercial paints were put down





LOCATIONS  
OF 1954 TRAFFIC PAINTS  
TRANSVERSE STRIPES  
RESEARCH PROJECT 47-G,36 (7)

FIGURE 1



Figure 2, Paint Striping Machine in Operation

TABLE I  
SUMMARY OF APPLICATION DATA  
1954 Transverse Stripes

Paint No.	Stripe Nos.	Time	Air Temp. °F	H. H. %	Drying Time min.	Calc. P.M.T. mils	Atom. Press. psi	Stripe Width in	Rolling, ft	Remarks
Test Area 1, US 27, 24 ft., Concrete, East Roadway, 3 mi. S. W. of Lansing White, Applied 8-29-54										
142	1-3	10:33	69	59	48	15.3	50	4	85	Clear, moderate
146	4-6	11:06			139	14.8	35	4	10	North Wind
150	7-9	11:16			47	14.6	35	3-7/8	57	
159	10-12	11:30			53	15.5	40	3-7/8	16	
142	13-15	11:32			47	14.6	30	3-7/8	48	North Wind
140	16-18	11:35	71	48	37	14.8	40	3-7/8	263	
154	19-21	12:28			58	14.1	40	3-7/8	169	
152	22-24	12:44			63	14.4	40	3-7/8	338	
148	25-27	1:04			31	14.3	35	4	18	
135	28-30	1:21	73	46	36	15.7	40	3-7/8	128	North Wind
Yellow, Applied 9-22-54										
147	1-3	9:40			160	14.7	40	4	5.5	
151	4-6	9:55	56	83	85	14.8	40	3-7/8	29	Cloudy, Strong
148	7-9	10:11			49	15.2	40	4	8.5	West Winds
143	10-12	10:25			60	15.2	40	3-7/8	24	
141	13-15	10:37			31	15.2	30	3-7/8	47	
133	16-18	10:52			23	14.0	40	3-7/8	66	
157	19-21	11:10	68	61	85	14.9	40	4	50	Cloudy, Strong
149	22-24	12:14			26	15.1	35	4	17	West Wind
157	25-27	12:30			30	14.5	35	3-7/8	61	
150	28-30	12:41			24	15.2	35	4	42	
141	31-33	12:56			24	15.6	45	3-7/8	127	
163	34-36	1:13	57	65	37	15.3	50	3-7/8	16	Cloudy, Strong West Winds
Test Area 2, US 27, 28 ft., Bituminous, West Roadway, 8 mi. S. W. of Lansing Yellow, Applied 9-23-54										
143	1-3	9:10	50	80	69	15.3	40	4-0	12	Clear, Light
141	4-6	9:33			32	15.4	40	4-1/8	10	West Wind
156	7-9	9:52			25	13.6	40	3-1/8	31	
133	10-12	10:10			90	15.0	40	4-1/8	20	
149	13-15	10:28	57	81	22	14.7	30	4-1/8	6.1	Clear, Light
137	16-18	10:48			52	14.4	40	4-0	20	West Wind
160	19-21	11:08			40	14.3	50	4-0	18	
151	22-24	11:25	53	52	23	14.1	50	4-0	95	Clear, Light
162	25-27	11:42			36	15.3	50	4-0	18	West Wind
147	28-30	12:00	68	81	120	15.4	40	4-0	7.5	Clear, Light
151	31-33	12:13			37	15.2	40	4-0	12	West Wind
158	34-36	12:30			50	15.8	40	4-0	7.5	
White, Applied 9-23-54										
152	1-3	2:06	64	44	50	14.7	40	4-0	62	Clear, Light
148	4-6	2:21	61	41	29	14.7	30	3-7/8	15	West Wind
136	7-9	2:34			31	14.4	40	4-0	81	
132	10-12	2:50			40	15.0	40	3-7/8	41	
144	13-15	3:02			121	14.5	35	4-5	0.7	
159	16-18	3:12			20	14.7	40	3-7/8	33	
159	19-21	3:25			34	15.0	35	3-7/8	6.3	
142	22-24	3:45			50	14.7	35	4-0	16	
140	25-27	3:59			21	14.7	35	4-0	27	
154	28-30	4:15	63	48	22	14.7	40	4-0	50	Clear, Light West Wind
Test Area 3, US 127, 22 ft., Concrete, West Roadway, Near Intersection with Pennsylvania Ave. Extension Yellow, Applied 9-24-54										
153	1-3	9:11	56	60	64	14.5	40	4	14	Clear, Light
146	4-6	9:29			26	14.7	30	4	8.2	West Wind
157	7-9	9:57			60	15.7	40	4	15	
180	10-12	10:25			33	15.3	50	3-7/8	12	Clear, Light
181	13-15	10:43	62	80	24	15.3	50	3-7/8	83	West Wind
163	16-18	10:58			37	14.7	40	3-7/8	11	
147	19-21	11:15			112	15.4	35	4	5.3	
151	22-24	11:27			86	15.3	40	4	8.6	
158	25-27	11:46			55	15.0	40	3-7/8	9.0	
152	28-30	11:56	67	45	55	14.4	40	3-7/8	10	Clear, Light
141	31-33	12:15			30	12.8	40	3-7/8	22	West Wind
135	34-36	12:32			33	14.0	40	3-7/8	126	
White, Applied 9-24-54										
154	1-3	1:52	67	46	33	13.9	40	3-7/8	87	Clear, Light
152	4-6	2:09			73	14.6	40	3-7/8	80	West Wind
148	7-9	2:23			29	14.4	30	3-7/8	12	Slight Over- Cast, Mild
150	10-12	2:31	65	42	44	15.6	40	3-7/8	26	West Wind
145	13-15	2:57			43	14.8	40	3-7/8	38	
146	16-18	3:26			184	14.6	40	3-7/8	7.9	
159	19-21	3:40	63	42	83	14.4	40	3-7/8	41	Slight Over- Cast, Mild
139	22-24	3:53			41	15.0	35	3-7/8	6.7	West Wind
142	25-27	4:34			74	14.6	35	4	9.5	Complete Over- Cast Light West Wind
140	28-30	4:50	66	53	37	15.1	40	3-7/8	11	
Test Area 4, US 16, 20 ft., Bituminous, North Lane, 9.2 mi. West of Okemos - Haslett Rd. White, Applied 9-28-54										
155	1-3	10:06	67	53	41	14.4	35	4	39	Overcast, Light
162	4-6	10:21			34	14.8	40	4	26	East Wind
148	7-9	10:30			176	14.4	35	4	5.2	
150	10-12	10:58			53	14.4	40	4	20	
159	13-15	11:11	70	51	50	14.8	25	4	6.8	Overcast, Light
142	16-18	11:26			65	14.5	40	4	28	East Wind
140	19-21	11:41			51	14.7	40	4	87	
154	22-24	12:08	70	51	42	14.0	40	4-1/8	65	Overcast, Light
152	25-27	12:21			70	14.5	40	4-1/8	55	East Wind
148	28-30	12:31	72	52	24	15.6	30	4-1/8	11	Overcast, Light East Wind
Yellow, Applied 10-7-54										
160	1-3	9:39	49	60	33	14.6	50	4-1/8	10	Clear, Light
161	4-6	10:19			24	14.4	35	4	23	East Wind
163	7-9	10:37	49	48	82	14.9	35	4-1/8	6	Clear, Light
147	10-12	10:55			155	14.0	30	4	5	East Wind
151	13-15	11:13			87	15.1	40	4-1/8	6	
158	16-18	11:35	51	45	98	15.2	35	3-7/8	7	Clear, Light
143	19-21	11:47			70	14.9	25	4-1/8	7	East Wind
141	22-24	12:08			49	14.7	40	4	13	
155	25-27	1:34	54	42	33	14.0	45	4-1/8	41	Clear, Light
153	28-30	1:49			61	14.5	45	4-1/8	18	East Wind
149	31-33	2:09			24	14.6	30	4	6	
167	34-36	2:27			35	14.8	40	4-1/8	13	

\* Calculated by weight from test stripes 100 cm. long on paper strips.



TABLE 2

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APPLICATION DETAILS FOR INDIVIDUAL PAINTS  
1954 Transverse Stripes

Paint	* Recommended Rate		Permissible Range	As Applied(4)	Beads, Quantity Per Gal.
	Gal. Per. Mi.	Film Thickness, Mils			
<u>White Paint</u>					
Prismo (1)	16.5	15.0	14.3 to 15.8	14.8	6 lb on, Prismo Beads
Baltimore (2)	16.0	14.6	13.9 to 15.3	14.2	2 lb on, Balt. Beads
3 M Co. (3)	16.5	15.0	14.3 to 15.8	14.6	2 lb 1A on
Truscon	16.5	15.0	14.3 to 15.8	15.0	6 lb 1A-2A on
Silver Lead	16.5	15.0	14.3 to 15.8	14.6	6 lb 1A-2A on
Garland	16.5	15.0	14.3 to 15.8	14.6	6 lb 1A-2A on
Franche	16.5	15.0	14.3 to 15.8	14.8	4 lb 2A in - 2 lb 1A on
Mich. Road Impr.	16.5	15.0	14.3 to 15.8	15.1	6 lb 1A-2A on
Glidden	16.5	15.0	14.3 to 15.8	14.6	6 lb 1A-2A on
LKR	16.5	15.0	14.3 to 15.8	15.0	4 lb 2A in - 2 lb 1A on
<u>Yellow Paint</u>					
Prismo (1)	15.5	14.1	13.4 to 14.8	14.8	6 lb on, Prismo Beads
Baltimore (2)	16.0	14.6	13.9 to 15.3	14.4	2 lb on, Balt. Beads
3 M Co. (3)	16.5	15.0	14.3 to 15.8	14.7	2 lb 1A on
Truscon	16.5	15.0	14.3 to 15.8	15.1	6 lb 1A-2A on
Silver Lead	16.5	15.0	14.3 to 15.8	15.0	6 lb 1A-2A on
Garland	16.5	15.0	14.3 to 15.8	15.1	6 lb 1A-2A on
Franche	16.5	15.0	14.3 to 15.8	14.8	4 lb 2A in - 2 lb 1A on
Mich. Road Impr.	16.5	15.0	14.3 to 15.8	15.3	6 lb 1A-2A on
Glidden	16.5	15.0	14.3 to 15.8	15.0	6 lb 1A-2A on
LKR	16.5	15.0	14.3 to 15.8	14.9	4 lb 2A in - 2 lb 1A on
MSHD 5A	16.5	15.0	14.3 to 15.8	14.9	4 lb 2A in - 2 lb 1A on
MSHD 6A	16.5	15.0	14.3 to 15.8	14.9	4 lb 2A in - 2 lb 1A on

- (1) See letter dated August 13, 1954, Prismo Safety Corporation  
 (2) See letter dated August 12, 1954, Baltimore Paint and Color Works  
 (3) Same as recommended last year - no new recommendation made this year  
 (4) Average for four test areas

Notes: All paints applied at the rate of 16.5 gallons per mile unless otherwise specified by vendor  
 Beads applied at the rate of 6 lb per gal by drop-in unless otherwise specified by vendor

TABLE 3

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SUMMARY OF QUALIFICATION TESTS  
1954 Transverse Stripes

Paint No.	Color	Reflectivity, Percent	Drying Time, Min. *	Consistency, KU, 77F		Bleeding Index		Settling Index (6 m)
				Without Beads	With Beads	Tar	Asphalt	
<u>White Paint</u>								
140	--	83	37	80	90	4.5	8.0	7
142	--	83	54	64	70	4.5	7.5	6
146	--	81	154	71	77	6.5	2.0	2
148	--	89	28	58	65	4.5	3.0	7
150	--	85	46	80	91	5.0	7.5	7
152	--	87	66	--	86	6.0	9.0	8
154	--	81	44	--	88	5.0	9.0	6
156	--	87	38	73	86	5.5	9.0	6
159	--	86	45	77	88	3.0	4.0	6
162	--	79	41	70	82	4.0	8.0	6
<u>Yellow Paint</u>								
141	**P <sub>o</sub>	56	36	77	86	6.0	6.3	6
143	P <sub>g</sub>	50	66	64	70	6.3	9.3	7
147	P <sub>o</sub>	52	152	70	75	9.3	3.3	7
149	F <sub>g</sub>	45	27	59	67	6.7	2.0	8
151	P <sub>g</sub>	46	88	95	107	9.0	4.0	8
153	P <sub>g</sub>	53	70	--	76	8.0	9.3	7
155	P <sub>g</sub>	55	31	--	86	6.7	9.3	7
157	P <sub>g</sub>	52	45	72	87	7.7	8.3	6
158	P <sub>g</sub>	59	50	79	90	5.0	3.7	7
160	P <sub>g</sub>	56	33	84	94	6.7	8.3	7
161	P <sub>g</sub>	55	24	90	102	5.3	8.3	7
163	P <sub>g</sub>	52	37	71	84	6.0	7.3	6

\* Average for four test areas

\*\* P indicates pass; F, failed. Subscript o signifies a color match with the standard shade and subscript g that the sample is on the green side of standard

TABLE 4  
SUMMARY OF PERFORMANCE DATA  
1954 Transverse Stripes

Age, Days	Factor Evaluated	White Paint										Yellow Paint											
		140	142	146	148	150	152	154	156	159	162	141	143	147	149	151	153	155	157	158	160	161	163
15	General Appearance	7.6	8.8	9.6	8.2	8.4	9.1	8.6	8.8	7.4	7.5	8.6	9.2	9.9	7.5	8.2	8.6	9.0	9.0	7.2	8.0	8.4	7.8
	Durability	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.0	10.0	10.0	10.0	10.0	9.5	10.0	10.0	10.0	10.0	8.5	9.7	10.0	10.0
	Night Visibility	9.0	8.2	6.8	8.5	8.6	8.9	8.5	8.4	6.5	9.2	8.8	8.2	5.8	6.7	8.4	7.9	8.0	8.2	6.4	7.8	8.4	8.6
	Weighted Rating	9.3	9.0	8.3	9.1	9.1	9.4	9.1	9.1	7.6	9.4	9.3	9.0	7.9	7.9	9.0	8.8	8.9	9.0	7.3	8.6	9.0	9.1
110	General Appearance	7.0	7.4	7.4	4.2	6.5	6.6	7.9	7.6	4.0	7.6	7.3	7.4	7.4	3.8	5.8	6.8	7.2	5.4	4.4	5.0	6.9	8.2
	Durability	8.2	8.4	7.7	4.6	7.4	6.2	7.6	7.8	4.2	9.6	8.8	8.1	7.7	4.2	6.4	7.8	7.8	5.6	4.2	5.2	7.8	9.8
	Night Visibility	4.5	5.2	5.1	2.6	4.8	5.6	5.3	6.6	2.5	7.8	5.6	5.8	4.3	2.9	3.8	5.9	5.3	3.0	2.9	3.5	5.8	7.7
	Weighted Rating	6.2	6.7	6.4	3.6	6.0	5.9	6.5	7.2	3.3	8.5	7.0	6.9	6.0	3.5	5.0	6.8	6.5	4.3	3.6	4.3	6.7	8.6
195	General Appearance	5.2	6.0	5.5	1.8	4.1	4.6	4.6	4.4	2.8	7.6	5.4	5.2	5.0	2.6	3.1	4.8	4.4	1.8	3.1	2.8	3.8	7.6
	Durability	5.5	6.5	5.4	1.7	4.4	4.4	4.8	5.0	3.0	9.3	6.2	5.6	5.0	3.2	3.6	5.4	4.7	1.8	3.4	3.2	4.6	9.2
	Night Visibility	3.0	4.2	3.5	1.0	2.8	4.2	3.6	4.3	1.8	6.9	3.3	3.8	2.4	2.2	1.9	4.4	2.9	1.6	2.5	2.6	3.4	6.5
	Weighted Rating	4.2	5.3	4.5	1.4	3.6	4.3	4.2	4.6	2.4	7.9	4.7	4.7	3.7	2.6	2.7	4.8	3.8	1.7	2.9	2.9	3.9	7.7
289	General Appearance	4.0	4.8	3.4	0.9	2.8	3.6	3.7	3.8	2.1	7.9	4.4	3.8	3.3	2.4	2.7	3.2	3.4	1.3	2.5	2.3	2.9	7.8
	Durability	4.7	5.4	3.6	1.0	3.2	3.4	3.9	4.0	2.6	8.8	5.0	4.2	3.5	2.7	2.6	4.0	3.4	1.3	3.2	2.9	3.7	9.0
	Night Visibility	1.8	2.6	2.2	0.5	1.7	3.3	2.6	3.2	1.5	4.2	1.9	2.1	1.8	1.6	1.2	2.7	1.8	0.7	1.7	1.9	2.3	4.5
	Weighted Rating	3.2	3.9	2.9	0.8	2.4	3.4	3.2	3.6	2.0	6.4	3.4	3.1	2.6	2.1	1.9	3.3	2.6	1.0	2.4	2.3	2.9	6.6
369	General Appearance	3.6	4.4	3.0	0.8	2.8	3.0	3.3	3.4	2.0	7.4	3.4	3.6	2.7	1.5	1.8	2.3	2.2	0.8	2.2	1.8	2.2	7.6
	Durability	3.9	4.8	3.2	0.6	3.2	3.2	3.4	3.5	2.4	8.3	4.0	3.6	3.2	2.0	2.0	2.9	2.4	0.6	2.8	2.1	3.0	8.6
	Night Visibility	1.2	2.0	1.3	0.4	1.2	2.3	1.6	2.0	0.8	3.0	1.6	1.4	1.3	0.9	0.8	1.8	1.3	0.2	1.4	1.4	1.8	3.4
	Weighted Rating	2.5	3.4	2.2	0.5	2.2	2.7	2.5	2.7	1.6	5.6	2.7	2.5	2.2	1.4	1.4	2.3	1.8	0.6	2.0	1.7	2.3	5.9

SERVICE FACTORS AND TERMINAL RATINGS  
1954 Transverse Stripes  
Age, 369 Days

Paint Number	Terminal Weighted Rating	Service Factor	Percent of Best	Percent of Perfect *
<u>White Paint</u>				
162	5.6	27.0	100	76
142	3.4	19.8	73	56
156	2.7	19.1	71	54
152	2.7	17.7	66	50
154	2.5	17.7	66	50
140	2.5	17.5	65	49
146	2.2	17.1	63	48
150	2.2	15.9	59	45
159	1.6	11.1	41	31
148	0.5	9.7	36	27
<u>Yellow Paint</u>				
163	5.9	27.0	100	76
141	2.7	19.0	70	54
143	2.5	18.4	68	52
153	2.3	18.4	68	52
161	2.3	17.2	64	49
155	1.8	16.5	61	47
147	2.2	15.6	58	44
151	1.4	13.4	50	38
160	1.7	13.2	49	37
158	2.0	12.2	48	34
149	1.4	11.6	43	33
157	0.6	10.8	40	31

\* Service factor for perfect performance = 35.4