MICHIGAN
STATE HIGHWAY DEPARTMENT
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1952 PERFORMANCE TESTS OF TRAFFIC PAINTS

By

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Joint investigation between Maintenance,
Planning and Traffic, and Testing and Research Divisions

Research Project 47 G-36 (5)

Second and Third Interim Reports

Research Laboratory
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1952 PERFORMANCE TESTS OF TRAFFIC PAINTS

Included in this report are two interim reports, the second and third respectively on the 1952 performance tests of traffic paints started in June of that year. The first interim report was issued on December 18, 1952, Research Laboratory Report No. 187, giving results for the transverse stripes to that date. The first report also presented the facts surrounding the inception of the project, and stated its scope and principal objectives. Certain important limitations in purchasing traffic paints on the basis of this test program were also pointed out.

The purpose of the second interim report is twofold: first, to supplement the first report with information concerning the operation of the project; and second, to present the results of the paint tests in both longitudinal and transverse stripes as of January 28, 1953. At the time of these evaluations, the longitudinal stripes had been down an average of 203 days and the transverse stripes 170 days. Attached to this second interim report is a third report giving the results of evaluations at 253 days and 229 days for the longitudinal and transverse stripes respectively.

Second Interim Report

Application of Paints

The layout of longitudinal test stripes and decision to include transverse stripes were agreed upon in a joint conference of representatives of Planning and Traffic, Maintenance, and Testing and Research Divisions on April 29, 1952. An attempt was made to include application of white and yellow paints on both bituminous and concrete surfaces. Owing to lack of sufficient mileage of four-lane undivided pavement and shortages of some

of the test paints, this was not always possible in the longitudinal stripes. The transverse stripe test sections contained all paints on both types of surfaces.

Longitudinal Stripes: The first stripes were put down on June 23, and the application was complete on July 10. Paints and beads were applied by regular Department paint crews, using standard field equipment. Detailed observations by Research Laboratory personnel were made throughout the work, including air temperature and relative humidity, tank and atomization pressures, wet film thickness, drying time, and amount of paint used in each test stripe. Locations of the longitudinal test stripes are given in the schematic layout of Figure 1 and a summary of application data in Table 1. While every effort was made to assure a uniform film thickness of 15 mils for all paints, a check of the thickness calculated from the amount of paint consumed against the measured thickness showed a wide disparity in some cases. Measurements were made with a wet film gage on steel plates laid in the line of the stripe and at least two such measurements were made on each test stripe if possible.

Transverse Stripes: Locations of the transverse stripes were selected by the Research Laboratory to provide sections of pavement where traffic is heavy and free-rolling and wear is uniform, with no grades, curves, intersections or access points near enough to cause excessive braking or turning movement. Four test sections were laid out - two on portland cement concrete and two on bituminous concrete surfaces - in the following locations (see also map of locations in Figure 2):

Test Section Number	Type of Surface	Route	Location
1	Concrete	US-27	About 1.5 miles south of St. Johns west roadway
2	Bituminous	US-27	About 1.5 miles south of St. Johns east roadway
3	Concrete	US-127	Between Miller Rd. and Pennsylvania extension
4	Bituminous	US-16	Between Okemos and Haslett Roads

Paints were applied in alphabetical order of code letter, white section first, from north to south on the first three test sections, regardless of the direction of traffic; on test section 4, the order was from west to east, on the two south lanes. In all cases, the trial stripes for adjusting film thickness of the various paints were kept separate in a section preceding the test section proper. Three stripes were put down for each paint in each test section. The paints were applied with a hand-operated machine fitted with a full-size spray gun and bead dispenser of the same type used in regular field equipment. Observations and measurements similar to those for longitudinal stripes were made during the work and are summarized in Table 2.

Evaluation

Both longitudinal and transverse stripes were evaluated independently by a committee of three representing Maintenance, Planning and Traffic, and Testing and Research Divisions. At each inspection, the paints were identified only by their code letters and ratings of 0 to 10 were assigned to each test stripe by the individual members of the committee and the three ratings averaged. Performance rating is based on four qualities defined as follows:

1. General Appearance.- This is the complete impression conveyed when the painted surface is viewed at a distance of at least 10 feet before any detailed inspection has been made, and is estimated purely in terms of satisfactory or unsatisfactory appeal to the observer.

2. Color.- This term designates a comparison of the color of the surface under consideration with the original color, and includes changes due to yellowing, darkening, fading, dirt collection, mold growth, etc. The determination is made without preliminary washing or any other modification of the surface of the test lines.

3. Durability.- The factor used in rating film failure is equal to one-tenth of the percentage of material remaining on the pavement when examined closely by the unaided eye. For transverse stripes, durability was evaluated only in each wheel track 9 inches each side of the point of greatest wear in accordance with the method prescribed in recent ASTM cooperative traffic paint tests.

4. Night Visibility.- This term designates the apparent brightness when examined from an automobile at a distance of at least 75 feet. Hunter Night-Visibility Meter readings may be substituted for visual comparison, the rating being based on a factor of 10 for the highest reading, and 0 for complete failure.

Hunter readings were taken on all transverse stripes, three readings each wheel track, each lane - which means 12 readings for each stripe or a total of 144 readings for each paint at every evaluation. Readings were not taken on the longitudinal stripes because of sampling uncertainties and the excessively large number of observations required for statistical validity.

As explained in the first interim report, the four qualities just defined are not considered of equal importance and are not given equal weight in the composite performance rating in these tests. Durability and night visibility are much more important attributes than color and general appearance, and for analytical purposes the ratings have been weighted on the basis of 40 percent for durability, 40 percent for night visibility, and 10 percent each for color and general appearance in summarizing the test results.

In addition to weighting the ratings on the basis of these four qualities at each evaluation, some consideration should be given to the overall level of performance for the entire period of service up to the last evaluation. It is obviously inequitable to rate a given paint only on its record at a single specific time near the end of the test without taking into account its previous performance from the very beginning. For the present tests a single performance figure, which will be called "service factor" for convenience, has been worked out by summing the products of the average weighted rating for each interval between evaluations and the number of days in the interval, and dividing this sum by 100. In this way, outstanding performance in the early phases of the test is recognized as well as durability. Service factors based on performance for the periods covered by evaluations of both longitudinal and transverse stripes are therefore included in the tabulated summaries of test results.

Test Results

The results of the tests on transverse stripes at the age of 170 days are given in Tables 3 and 4. Table 3 contains data representing the average ratings assigned by the inspection committee, and their weighted

average. In Table 4, these ratings are compared on the basis of 100 percent for the paint having the highest rating. Service factors are similarly compared and, in addition, the service factor of each paint is compared with that of a perfect paint having a rating of 10 throughout the given period. In making this comparison, the white and yellow paints are grouped separately and compared within their respective color groups.

Test results for the longitudinal stripes are given in Table 5. Values in this table represent the average rating of all stripe segments containing the given paint as listed in Table 1, irrespective of location or other qualifying conditions. In Table 6, ratings and service factors are given in the same way as for the transverse stripes, and compared on the basis of 100 percent for the paint having the highest rating. The results obtained with two methods of rating night visibility are given in Table 7.

It should be noted that test paints of relatively limited extent of application whose assigned areas include a large proportion of pavement subjected to unusually severe abrasion are placed at a disadvantage in these tests. Examples of this are found in the yellow centerlines of Paints D and F on US-127 from Willard Avenue south to Miller Road, which constitute the only test of these paints in longitudinal stripes on concrete pavement.

Concluding Remarks

1. At this point in the tests it is quite evident that specification paint has deteriorated to a considerably lower level than the others. Recent alternate periods of wet and freezing weather have accelerated the

deterioration since the last previous evaluation, and the method of estimating durability intensifies the apparent rapidity of change after the paint has worn to the point where the first small areas of pavement under the stripe are uncovered.

2. The order of the other paints is not well defined. Although they have all deteriorated considerably, especially in the longitudinal stripes, the differences between paints are not great. More time will be needed to establish a final order of merit for these paints.

3. The test program to date has demonstrated the fallibility of using longitudinal stripes as a basis for performance testing. While records were kept of pavement condition at the time of application, amount of paint remaining from previous applications, film thickness, and weather conditions, it is utterly impossible to take these conditions quantitatively into consideration when making evaluations of comparative performance. All of the above conditions varied widely in the tests of longitudinal stripes. Besides this, there are invariably local areas subjected to extremely severe abrasion from high traffic volume combined with dirt tracked from access roads. Test paints located largely or entirely in such areas are penalized from the beginning. On the other hand, a yellow paint which is applied only as no-passing lines on a three-lane pavement outside the city has an unfair advantage.

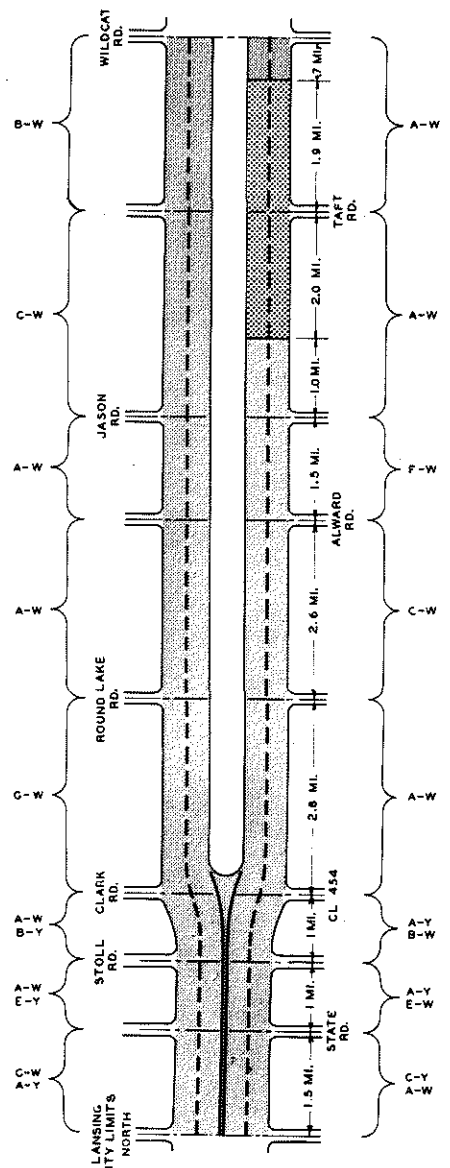
4. As far as these tests are concerned, it is apparent once more that the "drop-in" method (beads on only) does not produce as durable a line or as permanent brightness as the "overlay" method (beads in and on). This may possibly be chiefly a matter of bead gradation and should be investigated further.

Third Interim Report

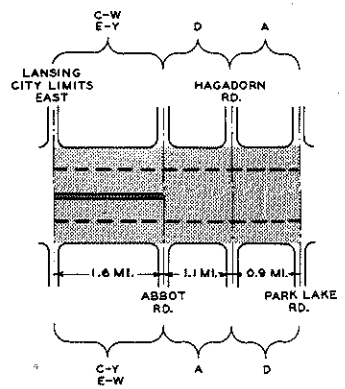
Subsequent to the preparation of the second interim report, another evaluation was made on March 11 and 12 at which time the longitudinal and transverse stripes had been down an average of 253 days and 229 days respectively.

The results of these observations are given in Tables A through C and show little change in the trends noted in previous reports. It seems worthy of mention, however, that Paint C apparently is dropping slightly behind Paints B, D, and E in the durability run, although it has given excellent performance in these tests so far.

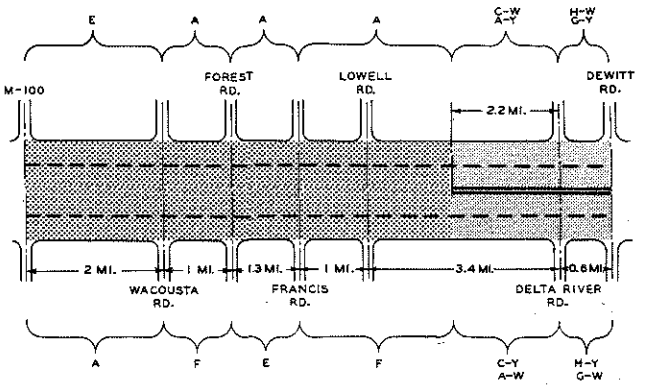
FIGURE 1



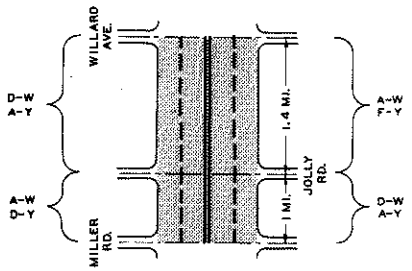
US 27 - NORTH OF LANSING



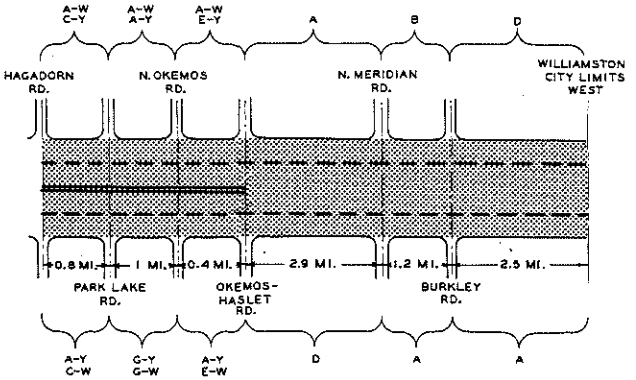
M 78 - EAST OF LANSING



US 16 - WEST OF LANSING



US 127 - SOUTH OF LANSING



US 16 - EAST OF EAST LANSING

LEGEND:

= BITUMINOUS SURFACE

= CONCRETE PAVEMENT

LETTERS A THROUGH H ARE PAINT CODE DESIGNATIONS
LETTERS Y AND W INDICATE YELLOW AND WHITE PAINT RESPECTIVELY

LOCATIONS OF 1952 TRAFFIC PAINT TESTS

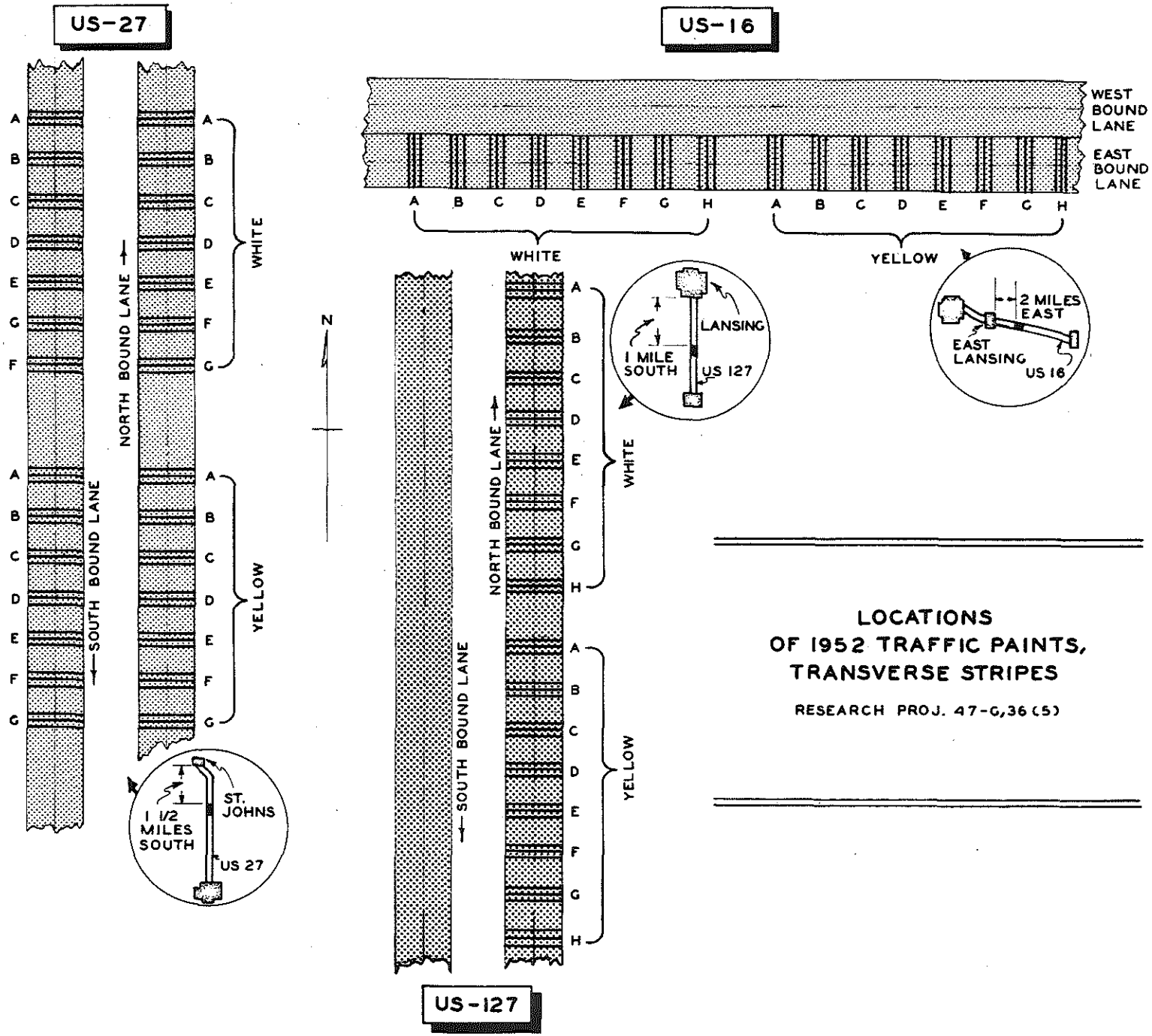


FIGURE 2

LOCATIONS OF 1952 TRAFFIC PAINTS, TRANSVERSE STRIPES

RESEARCH PROJ. 47-G,36(5)

TABLE 1
SUMMARY OF APPLICATION DATA
1952 Longitudinal Stripes

Route	Location	Line	Type Surf. (a)	Length mi.	Date	Time Complete	Air Temp. °F	R.H. %	Drying Time min.	Amt. Paint gal.	Calc. Film mils	Meas. Film mils	Tank Press. psi.	Atom. Press. psi.	Remarks
						PAINT A, WHITE									
US 27	N. City Limits to State Rd.	N.	C	1.477	6-24-52	10:00 A	87	66	--	12	18.5	--	78	95	
	State Rd. to CL 454	N.	C	2.066	7-1 -52	2:55 P	87	50	--	13	14.3	15	58	95	
	CL 454 to Round Lake Rd.	N.	C	2.811	6-24-52	12:00 N	91	56	25	23	18.6	17	78	95	
	Round Lake Rd. to Jason Rd.	N.	C	4.155	7-1 -52	1:15 P	87	50	30	24	13.2	14.5	58	95	
	Jason Rd. to Wildcat Rd.	N.	C	5.609	6-24-52	4:00 P	92	56	22	44	17.9	15	72	95	
US 127	Willard Ave. to Jolly Rd.	N.	C	1.422	7-1 -52	4:20 P	86	54	--	9	14.4	14	58	95	
	Jolly Rd. to Miller Rd.	N.	C	1.000	7-1 -52	3:50 P	86	54	41	7	16.0	16	55	95	
M 78	Abbott Rd. to Hagadorn Rd.	S.	C	1.099	7-2 -52	3:05 P	93	52	26	4.5	9.3	15	60	95	
	Hagadorn Rd. to Park Lake Rd.	N.	C	0.855	7-2 -52	3:27 P	93	52	--	3.5	9.3	16	60	95	
W. US 16	Delta River Dr. to end 4-Lane	S.	C	2.177	7-10-52	5:15 P	83	42	29	14	14.7	14	74	95	
	End of 4-Lane to Waconsta Rd.	N.	B	4.612	7-3 -52	10:30 A	78	74	48	24	11.9	14	58	95	
	Waconsta Rd. to M-100	S.	B	2.022	7-3 -52	11:40 A	82	72	32	11	12.4	14	60	95	Cloudy, rain
E. US 16	Hagadorn Rd. to N. Meridian Rd.	N.	B.	5.144	7-2 -52	2:05 P	88	56	23	30	13.3	14	60	95	
	N. Meridian Rd. to Williamston	S.	B	3.700	7-2 -52	11:30 A	88	56	43	18	11.1	13.5	58	95	
						PAINT A, YELLOW									
US 27	N. City Limits to State Rd.	W.	C	1.477	6-25-52	8:00 A	83	66	--	22	13.6	--	70	95	
	State Rd. to Sta. 134+40	N.	C	0.500	6-25-52	8:15 A	83	66	--	8	14.6	--	70	95	
	Sta. 134+40 to CL 454	N.	C	1.566	7-1 -52	11:15 A	87	50	30	27	15.7	16	60	95	
US 127	Willard Ave. to Jolly Rd.	W.	C	1.422	7-1 -52	6:30 P	86	47	36	17	10.9	14	55	95	
	Jolly Rd. to Miller Rd.	N.	C	1.000	7-1 -52	5:06 P	86	47	--	15	13.7	14	53	95	
W. US 16	Delta River Dr. to end 4-Lane	N.	C	2.177	7-3 -52	8:54 A	78	74	44	27	11.3	15	58	95	
E. US 16	Hagadorn Rd. to Park Lake Rd.	S.	B	0.799	7-2 -52	9:15 A	78	63	--	10	11.4	14	58	95	
	Park Lake Rd. to Okemos Rd.	N.	B	1.044	7-2 -52	9:33 A	80	61	29	13	11.4	14	58	95	
	Okemos Rd. to end 4-Lane	S.	B	0.388	7-2 -52	9:50 A	83	60	--	5	11.7	14.5	58	95	
						PAINT B, WHITE									
US 27	Stoll Rd. to CL 454	N.	C	0.966	7-7 -52	1:20 P	90	47	30	7	16.5	15	45	95	
	Taft Rd. to Wildcat Rd.	W.	C	2.621	7-7 -52	2:31 P	91	47	27	17	14.8	16.5	45	95	
E. US 16	N. Meridian Rd. to Burkley Rd.	N.	B	1.212	7-7 -52	11:35 A	88	54	34	9	16.9	15	45	95	
						PAINT B, YELLOW									
US 27	Stoll Rd. to CL 454	W.	C	0.966	7-7 -52	3:48 P	92	47	25	15	14.2	15	35	95	
						PAINT C, WHITE									
US 27	N. City Limits to State Rd.	W.	C	1.477	6-27-52	2:15 P	83	47	29	11	17.0	15	50	95	
	Round Lake Rd. to Alward Rd.	N.	C	2.655	6-27-52	11:00 A	78	59	35	25	21.5	15	50	95	
	Jason Rd. to Taft Rd.	W.	C	2.988	6-27-52	12:16 P	80	51	--	19	14.5	15	50	95	
M 78	Lans. City Limits to Abbott Rd.	N.	C	1.588	6-26-52	3:42 P	89	61	59	13	18.7	15	50	95	
W. US 16	Delta River Dr. to end 4-Lane	N.	C	2.177	6-27-52	3:05 P	84	44	27	13	13.6	16	50	95	
E. US 16	Hagadorn Rd. to Park Lake Rd.	S.	B	0.855	6-26-52	4:41 P	87	63	40	5	13.3	12	50	95	
						PAINT C, YELLOW									
US 27	N. City Limits to State Rd.	N.	C	1.477	6-27-52	9:40 A	68	76	30	26	16.0	15	42	95	
M 78	Lans. City Limits to Abbott Rd.	S.	C	1.588	6-26-52	2:40 P	91	59	41	35	20.1	15	40	95	
W. US 16	Delta River Dr. to end 4-Lane	S.	C	2.177	6-27-52	4:05 P	84	44	34	40	16.7	18	50	95	
E. US 16	Hagadorn Rd. to Park Lake Rd.	S.	B	0.855	6-26-52	5:20 P	87	63	--	25	26.6	21	50	95	
						PAINT D, WHITE									
US 127	Jolly Rd. to Miller Rd.	N.	C	1.000	7-9 -52	12:30 P	74	51	21	6	13.7	14.7	80	95	Paint very heavy
	Willard Ave. to Jolly Rd.	W.	C	1.422	7-9 -52	2:20 P	77	38	--	10	16.0	14	70	95	Thinned with ½ pt. LT-1 per gal.
M 78	Hagadorn Rd. to Park Lake Rd.	N.	C	0.855	7-9 -52	3:50 P	79	38	17	5	13.3	16	70	95	Thinned with ½ pt.
	Abbott Rd. to Hagadorn Rd.	N.	C	1.099	7-9 -52	4:28 P	77	41	--	6	12.4	15	67	95	LT-1 per gal.
E. US 16	Haslett Rd. to Van Atta Rd.	S.	B	2.225	7-9 -52	5:05 P	77	41	19	13	13.3	15	67	95	Thinned with ½ pt. LT-1 per gal.
	Van Atta Rd. to N. Meridian Rd.	S.	B	0.688	7-10-52	12:00 M	79	41	--	5	16.6	11	68	95	Used ½ pt. VMP in-
	Williamston Limits to Burkley E.	N.	B	2.488	7-10-52	1:55 P	82	41	15	18	16.5	14	72	95	stead of LT-1
						PAINT D, YELLOW									
US 127	Jolly Rd. to Miller Rd.	W.	C	0.900	7-10-52	10:19 A	75	42	19	15	15.2	15	50	95	½ pt. VMP per gal.
						PAINT E, WHITE									
US 27	State Rd. to Stoll Rd.	N.	C	1.000	6-25-52	2:00 P	94	55	40	10	22.8	15-20	65	95	Film thick, increases during run
M 78	Lans. City Limits to Abbott Rd.	S.	C	1.588	6-25-52	4:30 P	93	55	16	15	21.5	15-20	65	95	Film thick, increases during run
W. US 16	M-100 to Waconsta Rd.	N.	B	2.022	6-25-52	10:35 A	84	66	36	21	23.7	17-20	69	95	Film thick, increases
	Forest Hill Rd. to Francis Rd.	S.	B	1.333	6-25-52	12:00 M	89	62	--	14	23.9	15	65	95	during run
E. US 16	Okemos Rd. to end 4-Lane	S.	B	0.388	6-26-52	11:42 A	93	65	--	6	35.2	19	65	95	
						PAINT E, YELLOW									
US 27	State Rd. to Stoll Rd.	W.	C	1.000	6-25-52	3:00 P	94	55	--	22	20.0	19	60	95	
M 78	Lans. City Limits to Abbott Rd.	N.	C	1.588	6-26-52	10:00 A	88	56	25	40	23.0	15-20	60	95	Film thick, increases during run
E. US 16	Okemos Rd. to end 4-Lane	N.	B	0.388	6-26-52	11:02 A	92	62	28	15	35.2	16-20	60	95	Film thick, increases during run
						PAINT F, WHITE									
US 27	Alward Rd. to Jason Rd.	N.	C	1.500	7-8 -52	9:15 A	80	68	19	10	15.2	15.5	50	95	Settles badly
W. US 16	Waconsta Rd. to Forest Hill Rd.	S.	B	1.023	7-8 -52	12:10 P	72	90	--	7	15.6	17.5	50	95	Finished in light rain
	Francis Rd. to 4-Lane pvt.	S.	B	2.256	7-9 -52	8:25 A	62	63	20	12	12.1	14.5	55	95	
						PAINT F, YELLOW									
US 127	Willard Ave. to Jolly Rd.	N.	C	1.422	7-9 -52	10:53 A	70	55	17	15	9.6	13	55	95	
W. US 16	Lowell Rd. to M-100	S.(d)	B	---	7-10-52	8:15 A	70	44	14	10	--	--	65	95	
						PAINT G, WHITE									
US 27	Co. Rd. 454 to Round Lake Rd.	W.	C	2.166(c)	6-30-52	12:25 P	76	70	20	14	14.6(b)	14.3(b)	53	75	
W. US 16	DeWitt Rd. to Delta River Dr.	S.	C	0.634	6-30-52	3:00 P	81	57	--	3	10.8(b)	--	53	75	
E. US 16	Park Lake Rd. to Okemos Rd.	S.	B	1.044	6-30-52	5:12 P	80	61	25	5	10.9(b)	14(b)	53	75	
						PAINT G, YELLOW									
W. US 16	DeWitt Rd. to Delta River Dr.	N.	C	0.634	6-30-52	3:45 P	81	57	21	7	10.1(b)	15(b)	53	75	
E. US 16	Park Lake Rd. to Okemos Rd.	S.	B	1.044	6-30-52	5:35 P	80	61	25	18	15.7(b)	--	53	75	
						PAINT H, WHITE									
W. US 16	DeWitt Rd. to Delta River Dr.	N.	C	0.634	7-1 -52	10:15 A	73	74	36	3	10.8(b)	14.5(b)	55	75	
						PAINT H, YELLOW									
W. US 16	DeWitt Rd. to Delta River Dr.	S.	C	0.634	7-1 -52	9:15 A	73	73	19	7	10.1(b)	14(b)	50	75	

(a) - C = concrete, B = bituminous (b) - Film thickness for paint only, exclusive of beads

(c) - Total distance is 2.811 mi. First 3300 ft. S. of Round Lake Rd. applied 6-29-52 with large beads promised. (d) - All south no-passing lines

TABLE 2
SUMMARY OF APPLICATION DATA
1952 Transverse Stripes

Code Letter	Paint Lab. No.	Color	Time Completed	Air Temp. °F	R.H. %	Drying Time min.	Amt. Paint oz.	Calc. Film mils	Meas. Film mils	Tank Press. psi.	Atom. Press. psi.	Stripe Width	Hunter Reading Average
Test Area 1, US-27, 22 ft., Concrete, West Roadway, 1-1/2 mi. South of St. Johns 7-24-52													
A	52 PR 20	White	9:42	70	55	47	--	----	14.5	85	85	3-5/8	14.4
B	52 PR 22	White	10:06	--	--	56	--	----	14.5	52	60	3-7/8	25.3
C	52 PR 24	White	10:24	--	--	73	--	----	14.25	55	60	3-13/16	35.8
D	52 PR 26	White	11:05	--	--	33	--	----	15.5	65	75	3-9/16	21.0
E	52 PR 28	White	11:26	--	--	23	--	----	12.5	40	70	3-9/16	27.1
G	52 PR 30	White	11:55	--	--	42	--	----	14.5	45	75	3-3/4	1000
F	52 PR 32	White	12:33	--	--	20	--	----	15	70	75	3-7/8	25.7
A	52 PR 21	Yellow	2:07	79	40	35	--	----	14.5	70	75	3-5/8	45.5
B	52 PR 23	Yellow	2:27	--	--	84	36	20.5	16	50	75	4	34
C	52 PR 25	Yellow	2:43	--	--	67	36	21.8	15	50	75	3-3/4	27.4
D	52 PR 27	Yellow	3:07	--	--	43	32	20.1	13	52	75	3-5/8	73.3
E	52 PR 29	Yellow	3:30	--	--	42	36	21.5	15	52	65	3-13/16	35
F	52 PR 33	Yellow	3:55	--	--	37	32	19.1	15	60	75	3-13/16	12.4
G	52 PR 31	Yellow	4:10	78	43	24	21	12.7	14	40	75	3-3/4	580.4
Test Area 2, US-27, 18 ft., Bituminous, East Roadway, 1-1/2 mi. South of St. Johns 7-25-52													
A	52 PR 20	White	8:30	70	64	43	32	23.6	11.5	90	95	3-3/4	83.3
B	52 PR 22	White	8:47	--	--	54	--	----	15	50	60	4-1/4	25.9
C	52 PR 24	White	9:04	--	--	65	21	14.7	16	50	60	4	72.7
D	52 PR 26	White	9:50	--	--	30	28	20.7	12	60	75	3-7/8	101
E	52 PR 28	White	9:56	--	--	31	32	22.2	14.5	40	50	4	68.3
F	52 PR 32	White	10:15	--	--	36	29	20.7	15	52	64	3-7/8	119
G	52 PR 30	White	10:34	--	--	26	--	----	14.5	50	75	3-7/8	584
A	52 PR 21	Yellow	12:12	83	42	45	26	18.7	15	75	75	3-7/8	25
B	52 PR 23	Yellow	12:24	--	--	63	34	22.9	14.5	45	55	4-1/8	10.4
C	52 PR 25	Yellow	12:38	--	--	57	48	33.3	15	50	75	4	38.1
D	52 PR 27	Yellow	12:52	--	--	38	33	23.7	13	35	40	3-7/8	44.6
E	52 PR 29	Yellow	1:05	--	--	39	32	22.9	15	45	55	3-7/8	85.6
F	52 PR 33	Yellow	1:35	--	--	41	27	20.0	11.5	45	65	3-3/4	155
G	52 PR 31	Yellow	2:05	86	39	31	26	19.2	15	34	50	3-3/4	607.3
Test Area 3, US-127, 22 ft., Concrete, East Roadway, Near Intersection with Pennsylvania Ave. Extension 7-31-52													
A	52 PR 20	White	12:17	68	54	45	28	15.7	15	60	65	4-1/16	21.6
B	52 PR 22	White	10:31	--	--	70	41	22	15	48	55	4-1/4	13.9
C	52 PR 24	White	10:47	--	--	68	--	--	14.5	40	55	4-1/8	22.9
D	52 PR 26	White	11:10	--	--	32	26½	16.6	11.5	52	55	3-5/8	46
E	52 PR 28	White	11:21	--	--	36	30	16.5	15	38	50	4-1/8	13.9
F	52 PR 32	White	11:46	--	--	35	39½	22.1	15	45	45	4-1/16	7.5
G	52 PR 30	White	12:38	--	--	14	28	16.0	14	43	74	4	446.8
H	52 PR 20B	White	1:58	73	39	19	28	16.2	14	45	75	3-15/16	550
A	52 PR 21	Yellow	3:04	--	--	49	32	20.0	15	75	65	3-5/8	28.3
B	52 PR 23	Yellow	3:16	--	--	67	16	10.9	15	40	53	3-7/8	10.0
C	52 PR 25	Yellow	3:23	--	--	75	43	25.3	15	45	55	3-7/8	11.9
D	52 PR 27	Yellow	3:40	--	--	43	46	27.6	15	50	55	3-13/16	36.3
E	52 PR 29	Yellow	3:51	--	--	41	43	24.8	15	55	60	3-13/16	17.5
F	52 PR 33	Yellow	4:08	--	--	49	32	20.0	14	50	55	3-5/8	5.2
G	52 PR 31	Yellow	4:22	--	--	36	19	11.7	14	30	55	3-11/16	707
H	52 PR 21B	Yellow	4:41	76	38	30	32	19.1	14	38	50	3-13/16	456
Test Area 4, E. US-16, 20 ft., Bituminous, South Lane, .2 mi. West of Okemos-Haslett Rd. 8-1-52													
A	52 PR 20	White	9:12	68	58	50	21	14	14	65	70	3-3/4	23.1
B	52 PR 22	White	9:26	--	--	62	28	18	14	35	45	3-7/8	16.6
C	52 PR 24	White	9:46	--	--	60	19	12.7	13	38	52	3-3/4	46.5
D	52 PR 26	White	10:05	--	--	37	22	14.7	14.5	50	55	3-3/4	48.5
E	52 PR 28	White	10:17	--	--	35	35	22.6	14	45	55	3-7/8	17.8
F	52 PR 32	White	10:33	--	--	23	21	14.0	13.5	27	27	3-3/4	13.3
G	52 PR 30	White	10:51	--	--	32	22	14.4	14	35	50	3-13/16	456
H	52 PR 20B	White	11:04	77	45	58	23	15.2	14	45	75	3-13/16	316.6
A	52 PR 21	Yellow	1:05	79	43	32	20	13.4	15	60	70	3-3/4	16.1
B	52 PR 23	Yellow	1:15	--	--	51	32	20.7	14.5	35	40	3-7/8	4.7
C	52 PR 25	Yellow	1:24	--	--	64	36	23.2	15	37	40	3-7/8	14.3
D	52 PR 27	Yellow	1:36	--	--	52	23	15.3	15	67	75	3-3/4	22.9
E	52 PR 29	Yellow	1:45	--	--	43	38	25.3	15	53	60	3-3/4	26.6
F	52 PR 33	Yellow	1:59	--	--	50	32	21.4	15	30	35	3-3/4	3.9
G	52 PR 31	Yellow	2:13	--	--	37	22	14.7	14	36	60	3-3/4	254.1
H	52 PR 21B	Yellow	2:25	82	36	46	32	21.4	14	45	55	3-3/4	119

NOTE: Test Areas 1, 2, and 3 - Code applies north to south

Test Area 4 - Code applies west to east

Each letter represents 3 stripes

TABLE 3, SUMMARY OF PERFORMANCE DATA
1952 Transverse Stripes

Age Days	Factor Evaluated	White Paint A	B	C	D	E	F	G	H	Yellow Paint A	B	C	D	E	F	G	H
0*	General Appearance	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Color	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Paint Remaining	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Night Visibility	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Weighted Rating**	8.8	7.2	7.7	8.0	7.9	8.4	8.7	8.8	8.7	7.3	8.0	8.4	8.2	8.1	8.8	9.2
31*	General Appearance	8	8	9	8	8	8	7	8	8	8	8	8	7	9	8	8
	Color	8	8	8	8	7	8	8	8	7	9	8	8	7	8	8	8
	Paint Remaining	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Night Visibility	8	4	5	6	6	7	8	8	8	4	6	7	7	6	8	9
	Weighted Rating	8.8	7.2	7.7	8.0	7.9	8.4	8.7	8.8	8.7	7.3	8.0	8.4	8.2	8.1	8.8	9.2
80	General Appearance	8	8	8	8	8	8	8	8	8	9	8	8	8	8	8	8
	Color	8	8	8	8	8	8	8	8	8	9	8	8	8	8	8	7
	Paint Remaining	9	10	10	9	9	9	9	9	9	10	10	10	10	9	9	9
	Night Visibility	10	7	9	8	8	8	8	9	9	7	8	8	8	7	9	10
	Weighted Rating	9.2	8.4	9.2	8.4	8.4	8.4	8.4	8.8	8.8	8.6	8.8	8.8	8.8	8.0	8.8	9.1
108	General Appearance	9	8	8	8	8	8	8	8	8	9	8	8	8	8	8	8
	Color	8	8	8	8	8	8	8	8	8	9	8	8	8	8	8	8
	Paint Remaining	8	9	9	9	9	8	8	8	8	10	9	9	9	8	8	8
	Night Visibility	9	6	8	7	7	6	7	7	9	6	7	7	7	6	8	7
	Weighted Rating	8.5	7.6	8.4	8.0	8.0	7.2	7.6	7.6	8.4	8.2	8.0	8.0	8.0	7.2	8.0	8.4
170	General Appearance	5	8	7	8	8	6	8	5	4	8	8	8	8	7	7	6
	Color	6	8	7	8	8	7	8	6	6	9	8	9	8	7	7	6
	Paint Remaining	4	8	8	8	8	6	8	5	4	8	9	9	9	7	7	6
	Night Visibility	5	7	8	6	7	7	6	4	4	7	8	7	7	7	6	4
	Weighted Rating	4.7	7.6	7.8	7.2	7.6	6.5	7.2	4.7	4.2	7.7	8.4	8.1	8.0	7.0	6.6	5.2

* Evaluation by Research Laboratory only
** Initial ratings assumed to be the same as those at 31 days for the purpose of calculating service factor in Table 4.

TABLE 4, WEIGHTED RATINGS AND SERVICE FACTORS
1952 Transverse Stripes

Age Days	Factor Evaluated	White Paint A	B	C	D	E	F	G	H	Yellow Paint A	B	C	D	E	F	G	H
0	Weighted Rating*	8.8	7.2	7.7	8.0	7.9	8.4	8.7	8.8	8.7	7.3	8.0	8.4	8.2	8.1	8.8	9.2
	Percent of Maximum	100	82	88	91	90	95	99	100	95	79	87	91	89	88	96	100
	Service Factor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Percent of Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Percent of Perfect	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
31	Weighted Rating	8.8	7.2	7.7	8.0	7.9	8.4	8.7	8.8	8.7	7.3	8.0	8.4	8.2	8.1	8.8	9.2
	Percent of Maximum	100	82	88	91	90	95	99	100	95	79	87	91	89	88	96	100
	Service Factor	2.7	2.2	2.4	2.5	2.4	2.6	2.7	2.7	2.7	2.3	2.5	2.6	2.5	2.5	2.7	2.9
	Percent of Maximum	100	81	89	93	89	96	100	100	93	79	86	90	86	86	93	100
	Percent of Perfect	87	71	77	81	77	84	87	87	87	74	81	84	81	81	87	94
80	Weighted Rating	9.2	8.4	9.2	8.4	8.4	8.4	8.4	8.8	8.8	8.6	8.8	8.8	8.8	8.0	8.8	9.1
	Percent of Maximum	100	91	100	91	91	91	91	96	97	95	97	97	97	88	97	100
	Service Factor	7.1	6.1	6.5	6.5	6.4	6.7	6.9	7.0	7.0	6.2	6.6	6.8	6.7	6.5	7.0	7.3
	Percent of Maximum	100	86	92	92	90	94	99	100	96	85	90	93	92	89	96	100
	Percent of Perfect	89	76	81	81	80	84	86	88	87	78	83	85	84	81	87	91
108	Weighted Rating	8.5	7.6	8.4	8.0	8.0	7.2	7.6	7.6	8.4	8.2	8.0	8.0	8.0	7.2	8.0	8.4
	Percent of Maximum	100	89	99	94	94	95	89	89	100	90	95	95	95	86	95	100
	Service Factor	9.6	8.3	9.0	8.8	8.7	8.9	9.1	9.3	9.4	8.5	8.9	9.2	9.1	8.6	9.4	9.8
	Percent of Maximum	100	86	94	92	91	93	95	97	96	87	91	94	93	88	96	100
	Percent of Perfect	89	77	83	81	81	82	84	86	87	79	82	85	84	80	87	91
170	Weighted Rating	4.7	7.6	7.8	7.2	7.6	6.5	7.2	4.7	4.2	7.7	8.4	8.1	8.0	7.0	6.6	5.2
	Percent of Maximum	60	98	100	92	98	83	92	60	50	92	100	96	95	83	79	62
	Service Factor	13.7	13.0	14.0	13.5	13.6	13.2	13.7	13.1	13.3	13.4	14.0	14.2	14.0	13.0	13.9	14.0
	Percent of Maximum	98	93	100	96	97	94	98	94	94	95	99	100	99	92	98	99
	Percent of Perfect	81	77	82	80	80	77	81	77	78	79	82	83	82	77	82	82

* Initial ratings assumed to be the same as those at 31 days for the purpose of calculating service factors

TABLE 5, SUMMARY OF PERFORMANCE DATA
1952 Longitudinal Stripes

Age Days	Factor Evaluated	White Paint								Yellow Paint							
		A	B	C	D	E	F	G	H	A	B	C	D	E	F	G	H
	Number of Test Stripes	14	3	6	7	5	3	3	1	9	1	4	1	3	2	2	1
0	General Appearance	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Color	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Paint Remaining	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Night Visibility	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Weighted Rating*	8.4	8.4	8.4	8.0	8.0	8.0	8.7	6.6	7.4	8.4	7.9	7.6	8.5	6.4	9.2	7.0
77	General Appearance	8	8	8	8	8	8	8	7	7	10	8	8	8	8	8	7
	Color	8	8	8	8	8	8	7	7	7	10	7	8	9	8	8	7
	Paint Remaining	9	10	9	10	10	9	10	9	8	10	9	9	10	8	10	9
	Night Visibility	8	7	8	6	6	7	8	4	7	6	7	6	7	4	9	4
	Weighted Rating	8.4	8.4	8.4	8.0	8.0	8.0	8.7	6.6	7.4	8.4	7.9	7.6	8.5	6.4	9.2	7.0
105	General Appearance	8	8	8	8	8	8	8	7	7	9	8	7	9	5	8	7
	Color	8	8	8	8	8	8	7	6	7	9	8	8	9	5	8	8
	Paint Remaining	8	9	9	9	9	9	9	8	8	10	9	9	9	6	8	9
	Night Visibility	8	7	8	6	7	7	9	4	7	7	7	4	6	3	9	4
	Weighted Rating	8.0	8.0	8.4	7.6	8.0	8.0	8.7	6.1	7.4	8.6	8.0	6.7	7.8	4.6	8.4	6.7
161	General Appearance	7	8	7	6	7	9	7	3	7	9	8	7	8	---	7	5
	Color	7	8	7	7	8	9	7	4	6	9	8	7	8	---	7	5
	Paint Remaining	7	8	7	8	8	8	8	4	7	9	8	9	9	---	8	6
	Night Visibility	7	7	7	5	7	8	7	5	6	6	7	5	5	---	7	6
	Weighted Rating	7.0	7.6	7.0	6.5	7.5	8.2	7.4	4.3	6.5	7.8	7.6	7.0	7.2	---	7.4	5.8
203	General Appearance	4	6	6	5	6	7	5	0	3	7	6	6	7	4	6	1
	Color	4	6	5	5	6	7	5	0	3	7	6	6	6	4	7	1
	Paint Remaining	4	7	6	6	7	7	5	0	3	8	6	7	7	4	6	1
	Night Visibility	4	6	5	4	6	6	3	0	1	4	6	3	6	4	5	0
	Weighted Rating	4.0	6.4	5.5	5.0	6.4	6.6	4.2	0	2.2	6.2	6.0	5.2	6.5	4.0	5.7	0.6

* Initial ratings assumed to be the same as those at 77 days for the purpose of calculating service factors in Table 6.

TABLE 6, WEIGHTED RATINGS AND SERVICE FACTORS
1952 Longitudinal Stripes

Age Days	Factor Evaluated	White Paint								Yellow Paint							
		A	B	C	D	E	F	G	H	A	B	C	D	E	F	G	H
0	Weighted Rating*	8.4	8.4	8.4	8.0	8.0	8.0	8.7	6.6	7.4	8.4	7.9	7.6	8.5	6.4	9.2	7.0
	Percent of Maximum	97	97	97	92	92	92	100	76	80	91	86	83	92	70	100	76
	Service Factor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Percent of Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Percent of Perfect	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
77	Weighted Rating	8.4	8.4	8.4	8.0	8.0	8.0	8.7	6.6	7.4	8.4	7.9	7.6	8.5	6.4	9.2	7.0
	Percent of Maximum	97	97	97	92	92	92	100	76	80	91	86	83	92	70	100	76
	Service Factor	6.5	6.5	6.5	6.2	6.2	6.2	6.7	5.1	5.7	6.5	6.1	5.9	6.5	4.9	7.1	5.4
	Percent of Maximum	97	97	97	92	92	92	100	76	80	92	86	83	92	69	100	76
	Percent of Perfect	84	84	84	81	81	81	87	66	74	84	79	77	84	64	92	70
105	Weighted Rating	8.0	8.0	8.4	7.6	8.0	8.0	8.7	6.1	7.4	8.6	8.0	6.7	7.8	4.6	8.4	6.7
	Percent of Maximum	92	92	97	87	92	92	100	70	86	100	93	78	91	54	98	78
	Service Factor	8.8	8.8	8.8	8.3	8.4	8.4	9.1	6.9	7.8	8.8	8.3	7.9	8.8	6.5	9.5	7.3
	Percent of Maximum	97	97	97	91	92	92	100	76	82	93	87	83	93	68	100	77
	Percent of Perfect	84	84	84	79	80	80	87	66	74	84	79	75	84	62	90	70
161	Weighted Rating	7.0	7.6	7.0	6.5	7.5	8.2	7.4	4.3	6.5	7.8	7.6	7.0	7.2	---	7.4	5.8
	Percent of Maximum	85	93	85	79	92	100	90	52	83	100	97	90	92	---	95	74
	Service Factor	13.0	13.1	13.1	12.3	12.7	12.9	13.6	9.8	11.7	13.4	12.7	11.7	13.0	---	14.0	10.8
	Percent of Maximum	96	96	96	90	93	95	100	72	84	96	91	84	93	---	100	77
	Percent of Perfect	81	81	81	76	79	80	84	61	73	83	79	73	81	---	87	67
203	Weighted Rating	4.0	6.4	5.5	5.0	6.4	6.6	4.2	0.0	2.2	6.2	6.0	5.2	6.5	4.0	5.7	0.6
	Percent of Maximum	61	97	83	76	97	100	64	0	34	95	92	80	100	62	88	9
	Service Factor	15.3	16.1	15.8	14.7	15.7	16.0	16.1	10.7	13.5	16.4	15.5	14.3	15.9	10.7	16.7	12.2
	Percent of Maximum	95	100	98	91	98	99	100	66	81	98	93	86	95	64	100	73
	Percent of Perfect	75	79	78	72	77	79	79	53	66	81	76	70	78	53	82	60

* Initial ratings assumed to be the same as at 77 days for the purpose of calculating service factors

TABLE 7. NIGHT VISIBILITY
1952 Transverse Stripes

Age Days	Method of Evaluating Night Visibility	White Paint								Yellow Paint							
		A	B	C	D	E	F	G	H	A	B	C	D	E	F	G	H
0*	Estimated	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Hunter Meter	36	20	45	54	32	41	622	433	29	15	23	44	41	44	537	288
31*	Estimated	8	4	5	6	6	7	8	8	8	4	6	7	7	6	8	9
	Hunter Meter	151	28	46	31	27	41	104	138	57	13	24	45	28	16	83	110
80	Estimated	10	7	9	8	8	8	8	9	9	7	8	8	8	7	9	10
	Hunter Meter	174	63	64	43	20	27	59	198	47	17	20	37	21	10	164	168
108	Estimated	9	6	8	7	7	6	7	7	9	6	7	7	7	6	8	9
	Hunter Meter	39	12	18	12	7	9	14	19	13	7	8	12	7	6	14	48
170	Estimated	5	7	8	6	7	7	6	4	4	7	8	7	7	7	6	4
	Hunter Meter	6	14	22	8	11	5	4	3	4	9	10	8	8	5	6	4

* Evaluation by Research Laboratory Only

	Age Days	Factor Evaluated	White Paint A	B	C	D	E	F	G	H	Yellow Paint A	B	C	D	E	F	G	H
Performance Ratings (A)																		
		Transverse Stripes																
	229	General Appearance	4	7	7	7	7	5	7	4	4	7	8	7	7	6	7	5
		Color	4	7	7	7	7	6	7	4	4	7	7	7	7	6	7	5
		Paint Remaining	3	7	7	7	7	5	6	4	3	6	7	8	7	6	6	4
		Night Visibility	3	8	7	7	7	6	6	2	4	6	7	6	7	7	6	3
		Weighted Rating	3.3	7.3	6.9	7.1	7.0	5.7	6.1	3.3	3.2	6.4	7.2	7.0	7.1	6.1	6.5	4.0
		Longitudinal Stripes																
	253	General Appearance	4	6	5	5	6	7	4	0	2	8	5	7	7	3	5	0
		Color	4	5	5	6	6	7	4	0	2	8	5	8	7	3	5	0
		Paint Remaining	3	6	5	6	6	6	3	0	2	8	5	7	7	3	5	0
		Night Visibility	3	5	4	3	6	6	3	0	1	5	4	4	6	3	3	0
		Weighted Rating	3.2	5.5	4.6	4.7	6.0	6.2	3.2	0.0	1.6	6.8	4.6	5.9	6.6	3.0	4.2	0.0
Weighted Ratings (B)																		
		Transverse Stripes																
	229	Weighted Rating	3.3	7.3	6.9	7.1	7.0	5.7	6.1	3.3	3.2	6.4	7.2	7.0	7.1	6.1	6.5	4.0
		Percent of Maximum	45	100	95	97	96	78	84	45	45	89	100	97	99	85	90	56
		Service Factor	16.1	17.4	18.4	17.7	17.9	16.8	17.6	15.5	15.5	17.6	18.6	18.6	18.5	16.9	17.8	16.7
		Percent of Maximum	88	95	100	96	97	91	96	84	83	95	100	100	99	91	96	90
		Percent of Perfect	70	76	80	77	78	73	77	68	68	77	81	81	81	74	78	73
		Longitudinal Stripes																
	253	Weighted Rating	3.2	5.5	4.6	4.7	6.0	6.2	3.2	0.0	1.6	6.8	4.6	5.9	6.6	3.0	4.2	0.0
		Percent of Maximum	52	89	74	76	97	100	52	0	24	100	68	87	97	44	62	0
		Service Factor	17.1	19.0	18.3	17.1	18.8	19.2	17.9	10.7	14.4	19.6	18.2	17.0	19.2	12.4	19.2	12.3
		Percent of Maximum	89	99	95	89	98	100	93	56	73	100	93	87	98	63	98	63
		Percent of Perfect	68	75	72	68	74	76	71	42	57	78	72	67	76	49	76	49
Night Visibility (C)																		
		Night Visibility																
	229	Estimated	3	8	7	7	7	6	6	2	4	6	7	6	7	7	6	3
		Hunter Meter	4	15	15	6	9	7	3	1	2	6	7	5	5	4	3	2

Table A. Summary of Performance Data, 1952 Traffic Paint Tests

Table B. Weighted Ratings and Service Factors, 1952 Traffic Paint Tests

Table C. Night Visibility, 1952 Transverse Stripes