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TESTING AND RESEARCH DIVISION

SUMMARIES OF MICHIGAN PAVEMENT ROUGHNESS
1967 Test Program

Prepared for the Road Construction Division

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ABSTRACT: Test results for the seventeenth year of this long-term study of riding quality of newly constructed or opened Michigan pavements are tabulated, with full identification of projects; their lengths, routes, and locations; and contractors responsible for paving.

KEY WORDS: roughness, riding quality.

SUMMARIES OF MICHIGAN PAVEMENT ROUGHNESS
1967 Test Program[1]

This report summarizes 1967 roughness measurements of 368 lane miles of standard rigid pavement (two-lane pours) and 25 lane miles of rigid pavement widening (one-lane pours).

From 1959 through 1965 pavement roughness indices were recorded using two measuring methods: 1) The integrator method, measuring accumulated inches per mile units of roughness, and 2) the level indicator method measuring accumulated g's per mile units of roughness. In late 1966 repeated electronic problems with the level indicator device resulted in deletion of these values from the 1966 report. Inasmuch as these problems have not been satisfactorily resolved the level indicator values will be deleted from this report.

Rigid Pavement Construction (Two-Lane Pours)

Individual rigid pavement projects constructed as standard two-lane pours, and their roughness values as determined in the 1967 test program, are listed in Table 1. These projects are grouped by year of construction and ranked within these years according to accumulated inches per mile roughness by integrator measurements. During the 17 years of roughness surveys, these integrator values have ranged from a low (smooth) of 93 to a high (rough) of 282. For 1967 the range was from 114 to 207.

On the basis of riding qualtiy, the Laboratory classified projects in three integrator-count categories:

"good"	(0 to 130 accumulated inches per mile)
"average"	(131 to 174)
"poor"	(175 or more)

Table 2 shows that since 1951, with a total of 497 rigid pavement projects tested, 38, 51, and 11 percent of this total have been rated good,

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[1] Throughout this report, the terms "construction year" and "test year" are specifically used to distinguish between the period of construction operations, and the time when measurements were conducted by the Research Laboratory. Further, the term "project mileage" refers to length given by the Contract Division, and "lane mile" to length given in terms of individual vehicle lanes.

average, and poor, respectively. In the 1967 test year 35, 61, and 4 percent of the 23 projects tested were rated good, average, and poor respectively. The weighted arithmetic mean for roughness of all projects tested during the 1967 test year was 132 accumulated inches per mile. This represents an 8-percent decrease in measured roughness for two lane pours tested in 1967 over those tested in 1966.

Rigid Pavement Construction (One-Lane Pours)

In addition to the usual surveys of roughness on newly constructed standard rigid pavement (two-lane pours), the 1967 measurements include 6 rigid pavement widening projects (one-lane pours), with results shown in Table 3.

The testing procedure for these projects is the same as for the standard rigid pavements. However, due to somewhat different construction procedures required for pours of one-lane width, the range of roughness values to be expected varies from standard rigid pavements. Table 4 summarizes test data obtained during the 10 years in which this type of construction has been under study.

Flexible Pavement Construction

As in the case of rigid pavement widening, measurements on flexible pavement construction represent a supplement and extension of the Research Laboratory's pavement roughness program, and is included in the annual reports as construction warrants. Normally, only flexible pavements of freeway specifications are included in the surveys. There were no projects of this type completed during the 1967 test year and consequently no data are available.

TABLE 1
ROUGHNESS DATA SUMMARY FOR RIGID PAVEMENT (Two-Lane Pours)

	Project	District	Test Length, mi.	Type	Route and Project Location	Roughness Integrator (in./mile)	Paving Contractor
1966 CONSTRUCTION	F 74061A, C2 F 79042A, C3, C4	6	13.936	24 ft	M 46 east from M 24 to M 53 (omitting within village of Kingston)	120	L. W. Edison Co.
	F 73073D, C6	6	8.274	55 & 60 ft	M 47 southeast from Sarle Rd. to M 81	120	Denton Construction Co. (1)
	I 82191K, C29* J, C35	10	0.96	36 ft (Dual)	I 75 - Seaway Freeway north from north of Dix-Toledo Rd. to north of Southfield Rd.	143(2)	The Kutchins Co. and Kutchins Co., Inc. (3)
	I 82194A, C12* B, C13 D, C14	10	1.73	36 ft (Dual)	I 75 - Seaway Freeway - Fisher Freeway north from north of Southfield Rd. to south of Schaefer Highway	148(2)	L. A. Davidson Co.
	BI 50111G, C73* C74 C 75 I 82025 H, C47	9, 10	6.991	36 ft (Dual)	I 94 north from 740 ft south of Eight Mile Rd. to Fourteen Mile Rd.	149	Eisenhour Construction Co., Inc. (4)
	I 63174B, C61*	9	0.525	36 ft (Dual)	I 75 north from Sixth St. to Sprague St.	153	Cooke Contracting Co. (5)
	F 02041B, C5*	2	3.376	24, 36 & 48 ft	M 28 north and west from Hickory St. 3.376 miles	158	Bacco Construction Co.
	U 63031A, C16 U 82053A, C39	9, 10	0.590	48 ft (Dual)	US 24 north from 1913 ft south of the Wayne-Oakland Co. Line to 1287 ft north of the Wayne-Oakland Co. Line	207	Cooke Contracting Co. (6)
					Weighted arithmetic mean for 1966 construction tested in 1967	137	
1967 CONSTRUCTION	I 09035E, C10	6	6.00	24 ft (Dual)	I 75 north from Anderson Rd. to Neuman Rd.	114	Sargent Contracting Co., and Sargent Machinery and Equipment Co. (1)
	I 09035F, C14	6	4.969	24 ft (Dual)	I 75 north from Neuman Rd. to the Bay-Arenac Co. Line	115	Sargent Contracting Co., and Sargent Machinery and Equipment Co. (1)
	I 09035D, C9	6	5.493	24 ft (Dual)	I 75 north from north of Beaver Rd. to Anderson Rd.	118	Sargent Contracting Co., and Sargent Machinery and Equipment Co. (1)
	I 06111-001	6	5.540	24 ft (Dual)	I 75 north from the Bay-Arenac Co. Line to 2815 ft north of M 61	125	L. W. Edison Co.
	I 12033A, C10	7	3.220	24 ft (Dual)	I 69 north from the Michigan-Indiana State Line to north of Copeland Rd.	129	L. A. Davidson Co. (7)
	I 13073D, C8	7	6.126	24 ft (Dual)	I 69 north from south of J Drive to north of A Drive	129	L. A. Davidson Co. (8)
	F 12031A, C8	7	0.740	24 ft	I 69 BL west and north from 1890 ft east of US 27 to 2675 ft north of Fenn Rd.	131	L. W. Edison Co. (9)

(1) Subcontract from Holloway Construction Co.
(2) Continuously reinforced pavement
(3) Subcontract from Louis Garavaglia Contractors, Inc.
(4) Contract awarded to L. A. Davidson Co. and Eisenhour Construction Co., Inc.
(5) Subcontract from Chas. J. Rogers, Construction Co. & Chas. J. Rogers, Inc., and Jutton-Kelly Co.
(6) Contract awarded to Cooke Contracting Co., and Jutton-Kelly Co.
(7) Subcontract from Canonie Construction Co.
(8) Contract awarded to S. D. Solomon & Sons and L. A. Davidson Co.
(9) Subcontract from A. Lindberg & Sons, Inc.

* For additional data, see Table 3.

TABLE 1 (Cont.)
ROUGHNESS DATA SUMMARY FOR RIGID PAVEMENT (Two-Lane Pours)

1967 CONSTRUCTION (CONT)

Project	District	Test Length, mi.	Type	Route and Project Location	Roughness Integrator (in./mile)	Paving Contractor
I 13073-007	7	4.283	24 ft (Dual)	I 69 north from north of M 60 to south of J Drive	133	L. A. Davidson Co.[10]
I 12034B, C1	7	6.913	24 ft (Dual)	I 69 north from 1047 ft north of Newton Rd. to the Branch-Calhoun Co. Line	134	Rieth-Riley Construction Co., Inc.
I 12033D, C5	7	2.578	24 ft (Dual)	I 69 north from 2882 ft north of Fenn Rd. to 1540 ft north of US 12	138	L. W. Edison Co.[9]
I 12034A, C4	7	2.304	24 ft (Dual)	I 69 north from 1540 ft north of US 12 to 1047 ft north of Newton Rd.	139	L. W. Edison Co.[9]
I 12033B, C7 A, C8	7	4.953	24 ft (Dual)	I 69 north from 111 ft north of Maxon Rd. to 2882 ft north of Fenn Rd.	140	L. W. Edison Co.[9]
I 09035B, C8	6	5.777	24 ft (Dual)	I 75 north from Union Rd. to north of Beaver Rd.	142	The Kutchins Co. and Kutchins Co., Inc.[1]
U 63043A, C1 (Part)	9	1.262	24 ft (Dual)	M 59 Reloc. east from Paddock to east of GTW RR	150	Cooke Contracting Co.
I 13073A, 65-1748	7	3.03	24 ft (Dual)	I 69 north from the Branch-Calhoun Co. Line to north of M 60	155	Carl Goodwin & Sons, Inc.
				Weighted arithmetic mean for 1967 construction tested in 1967	130	
				Weighted arithmetic mean for 1967 test year (two-lane pours)	132	

(1) Subcontract from Holloway Construction Co.
(9) Subcontract from A. Lindberg & Sons, Inc.
(10) Subcontract from S. D. Solomon & Sons

TABLE 2
SEVENTEEN-YEAR ROUGHNESS SUMMARY FOR RIGID PAVEMENT
(Two-Lane Pours)

Test Year	Total Projects	Project Mileage	Lane Mileage	Percent of Total Projects			Weighted Arithmetic Mean in./mi
				Good (0-130 in./mi)	Average (131-174 in./mi)	Poor (175 or more in./mi)	
1951	17	48.327	109.318	47	29	24	144
1952	25	70.615	173.900	4	68	28	154
1953	40	98.791	250.082	17	68	15	146
1954	17	41.271	110.838	29	42	29	147
1955	22	52.690	145.723	36	64	0	140
1956	21	82.473	241.866	19	62	19	141
1957	33	165.086	520.200	61	36	3	126
1958	34	140.506	487.352	74	26	0	114
1959	45	168.892	660.744	51	42	7	124
1960	35	154.333	558.866	83	14	3	117
1961	37	133.043	477.087	38	49	13	133
1962	36	140.128	511.668	25	61	14	137
1963	35	167.040	606.852	40	51	9	131
1964							
1965	52	159.679	572.206	21	60	19	140
1966	25	70.586	216.644	16	84	0	143
1967	23	99.570	367.912	35	61	4	132
1951-1967	497	1793.030	6011.258	38	51	11	132

TABLE 3

ROUGHNESS DATA SUMMARY FOR RIGID PAVEMENT WIDENING (One-Lane Pours)

	Project	District	Test Length, mi.	Type	Route and Project Location	Roughness Integrator (in./mile)	Paving Contractor
1966 CONSTRUCTION	I 82194A, C12* B, C13 D, C14	10	1.73	12 ft	I 75 - Seaway Freeway - Fisher Freeway (median side, both roadways) north from north of Southfield Rd. to south of Schaefer Highway	129(1)	L. A. Davidson Co.
	I 82191K, C29* J, C35	10	0.96	12 ft	I 75 - Seaway Freeway (median side, both roadways) north from north of Dix-Toledo Rd. to north of Southfield Rd	151(1)	The Kutchins Co. and Kutchins Co., Inc. (2)
	BI 50111G, C73* C74 C75 I 82025H, C47	9,10	6.991	12 ft	I 94 (alternating median side and shoulder side; both roadways) north from 740 ft south of Eight Mile Rd. to Fourteen Mile Rd	152	Eisenhour Construction Co., Inc. (3)
	I 63022-021	9	1.70	12 ft	I 96 (median side, both roadways) east from the Livingston-Oakland Co. 1.70 miles	166	Sargent Contracting Co., and Sargent Machinery and Equipment Co.
	I 63174B, C61*	9	0.525	12 ft	I 75 (median side, both roadways) north from Sixth St. to Sprague St.	171	Cooke Contracting Co. (4)
	F 02041B, C5*	2	1.40	12 ft	M 28 (EB and WB truck lanes) north and west of Munising.	184	Bacco Construction Co.
					Weighted arithmetic mean for 1967 test year (single lane pours)	153	

(1) Continuously reinforced pavement

(2) Subcontract from Louis Garavaglia Contractors, Inc.

(3) Contract awarded to L. A. Davidson Co. and Eisenhour Construction Co., Inc.

(4) Subcontract from Chas. J. Rogers, Construction Co. & Chas. J. Rogers, Inc., and Jutton-Kelly Co.

* All construction is "third-lane" widening to projects reported in Table 1.

TABLE 4

TEN-YEAR ROUGHNESS SUMMARY FOR RIGID PAVEMENT WIDENING (One-Lane Pours)

Test Year	Total Projects	Project Mileage*	Lane Mileage**	Percent of Total Projects			Weighted Arithmetic Mean in./mi
				Good (0-130 in./mi)	Average (131-174 in./mi)	Poor (175 or more in./mi)	
1958	3	5.403	11.176	33.3	33.3	33.3	122
1959	2	3.092	6.184	0	50	50	194
1960	5	13.925	24.152	20	60	20	138
1961	10	17.704	31.995	0	70	30	162
1962	4	10.006	20.012	0	75	25	169
1963-1964	14	27.093	57.940	0	64	36	163
1965	30	61.360	122.508	7	63	30	156
1966	13	27.252	54.173	0	100	0	147
1967	6	13.306	25.212	17	66	17	153
1958-1967	87	179.141	353.352	6	69	25	155

* As given in Contract Division monthly "Report of Awards"

** Total mileage of 11- or 12-ft wide lanes