

SUMMARIES OF MICHIGAN PAVEMENT SKID RESISTANCE  
1965 Test Program

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State of Michigan  
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## INFORMATION RETRIEVAL DATA

**REFERENCE:** Schafer, P. M. "Summaries of Michigan Pavement Skid Resistance: 1965 Test Program." Michigan Department of State Highways Research Report No. R-585. June 1966.

**ABSTRACT:** Results are summarized for nearly 7000 skid resistance tests performed on Michigan trunklines, urban intersections and bridge decks, during the calendar 1965 test year. The program includes: a) testing of all regular trunkline projects, b) bituminous surface incorporating experimental mixtures or unusual construction features for improved skid resistance, c) high accident intersections, and d) locations tested by special request.

**KEY WORDS:** pavement skidding characteristics, skid resistance testing, skidding, deslicking treatment.

## CONTENTS

	<u>Page</u>
INTRODUCTION . . . . .	1
<b>SECTION 1. REGULAR CONCRETE AND BITUMINOUS PAVEMENTS . . . . .</b>	<b>5</b>
Table 1: Concrete Pavement Constructed in 1963 . . . . .	10
Table 2: Concrete Pavement Constructed in 1964 . . . . .	16
Table 3: Concrete Pavement Constructed in 1965 . . . . .	18
Table 4: Bituminous Concrete Pavement (4.12) Constructed in 1963 . . . . .	19
Table 5: Bituminous Concrete Pavement (4.12) Constructed in 1964 . . . . .	22
Table 6: Bituminous Concrete Pavement (4.12) Constructed in 1965 . . . . .	25
Table 7: Bituminous Aggregate Pavement (4.11) Constructed in 1963-1964-1965 . . . . .	27
Table 8: Seal Coat Resurfacing in 1963-1964-1965 . . . . .	28
<b>SECTION 2. EXPERIMENTAL FEATURES IN BITUMINOUS SURFACES . . . . .</b>	<b>29</b>
Table 9: Mine Rock and Related Aggregate in Upper Peninsula Bituminous Concrete and Bituminous Aggregate Projects . . . . .	36
Table 10: 2NS and 3BC Sands in Bituminous Concrete Resurfacing . . . . .	38
Table 11: 31A Slag Aggregate in Bituminous Concrete Resurfacing . . . . .	39
Table 12: Rubberized Sand-Asphalt Resurfacing; US 31 and M 66: City of Charlevoix. . . . .	40
Table 13: 2NS Modified Sand-Asphalt Resurfacing; US 131: Reed City North (Project Mb 67014, C3R) . . . . .	40
Table 14: 3BC Sand-Asphalt Resurfacing; US 131: Rockford to Cedar Springs (Project Mb 41013C, C12) . . . . .	41
Table 15: 3BC Sand-Asphalt Resurfacing; US 131 SB: North and South of Alba (Project Mm 4BC-3A; Control Section 05072) . . . . .	42
Tables 16 and 17: 2NS Modified Sand-Asphalt Surfaces and 3BCS Slag Sand-Asphalt Surfaces (District 10 Intersections) . . . . .	43
Table 18: Wyton Synthetic Binder Surface Course Mixtures . . . . .	44
Table 19: Asphalt Emulsion Hot Mix Surface Courses; US 127: Lansing Intersections (Project Mob 33032C, C6) . . . . .	45
Table 20: Ground Corncobs in Bituminous Mixtures; US 23 North of Ann Arbor (Patching Group No. Mm 5BC-8B) . . . . .	45
Table 21: Experimental Skid-Resistant Resurfacing . . . . .	46
Table 22: Sand-Asphalt Skid-Resistant Resurfacing at Intersections. . . . .	48
Table 23: Bituminous Concrete Interstate Projects. . . . .	50
Table 24: Bridge Deck Surface Coatings . . . . .	51
<b>SECTION 3. HIGH ACCIDENT INTERSECTIONS . . . . .</b>	<b>53</b>
Table 25: High Accident Intersections (Districts 1 through 4--Tests Run in November 1965) . . . . .	56
<b>SECTION 4. SPECIAL REQUEST TESTS . . . . .</b>	<b>57</b>
Table 26: 1965 "Special Request" Skid Test Results . . . . .	60

## SUMMARIES OF MICHIGAN PAVEMENT SKID RESISTANCE 1965 Test Program

In a change of reporting procedure, all data from an entire year's testing program for pavement skid resistance have been brought together in one publication for the first time, in this comprehensive report summarizing nearly 7000 skid tests conducted during the 1965 calendar test year. This report is organized in four sections:

1. Regular Concrete and Bituminous Pavements.
2. Experimental Features in Bituminous Surfaces.
3. High Accident Intersections.
4. Special Request Tests.

Introductory explanatory remarks are given at the beginning of each of these sections, as a preface to the tabulated data for that category of pavement testing. Of these categories, all Special Request tests and all High Accident Intersection tests for Districts 3 and 4 have already been reported to interested agencies within the Department of State Highways.

All skid test values are expressed as 40-mph wet sliding coefficients of friction. A coefficient value of 0.40 is generally considered the dividing point between "satisfactory" and "unsatisfactory" pavement surfaces. Surfaces with coefficient values of 0.35 to 0.40 are in a "transitional" or "questionable" range. Projects below 0.35 under wet conditions could be dangerous, depending on prevailing speeds, road alignment, and geometrics. Surfaces with coefficients of 0.20 or less are in the category of packed snow or ice.

### Operation of Skid Test Device

The skid test is initiated by actuating an electrically controlled test cycle. The cycle of events which occur are as follows:

1. Solenoids open water valves, spilling approximately 3.5 gal directly into wheel tracks of the skid trailer.

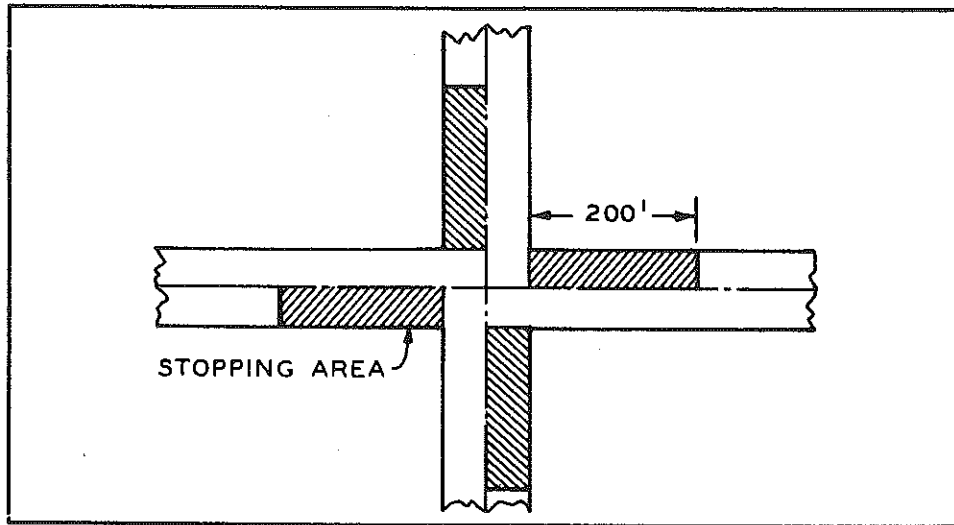
2. Trailer brakes are automatically locked. At this point, the operator of the towing vehicle must exercise care in maintaining the specified test speed.

3. A reading is taken which indicates the force required to pull the trailer.

4. After dragging the skidometer trailer for approximately 60 ft (at 40 mph), the water solenoids are closed and the brakes are released simultaneously.

### Selection of Test Areas

Each test conducted at 40 mph evaluates the wet sliding friction (wsf) value of a section of the roadway approximately 60 ft in length. A minimum series of three tests per lane are taken on all projects having up to 3 miles of "usable" length (suitable for testing). One test per lane is taken for each additional usable mile of length. At intersections, a minimum of three tests per lane are required in the stopping areas. Stopping areas are defined as the area from the curb line of the intersecting street, back 200 ft as shown below. The three tests conducted in the stopping area are taken at the start, middle, and end of the 200-ft area.



### Verification Retests

All oscillographic test traces are examined in the field after completion of a test series and the low-to-high range of trace lines is determined separately for each lane. If this range exceeds a defined allowable limit for a series of x number of tests, retests are made to verify the unusual range.

## NOTATION

### Direction of Test Vehicle

EB = eastbound  
WB = westbound  
NB = northbound  
SB = southbound  
NWB = northwestbound  
SEB = southeastbound  
NEB = northeastbound  
SWB = southwestbound

### Lane Tested (follows code for direction of test vehicle).

OL = outer lane  
CL = center lane  
IL = inner lane  
#4, #3, #2 = fourth, third, or second lane from centerline or median.

### Surface Type

Conc = portland cement concrete  
BA-G = bituminous aggregate with gravel aggregate  
BA-L = bituminous aggregate with limestone aggregate  
BC-G = bituminous concrete with gravel aggregate  
BC-L = bituminous concrete with limestone aggregate  
ST-G = surface treatment with gravel aggregate  
ST-L = surface treatment with limestone aggregate  
OT = oxidized tar  
SA = sand-asphalt

Section 1  
REGULAR CONCRETE AND BITUMINOUS PAVEMENTS  
First and Fifth Year Surveys

## REGULAR CONCRETE AND BITUMINOUS PAVEMENTS

To obtain more comprehensive data on skid resistance qualities of various types of pavements, both when opened to traffic and after various periods of service, the 1965 test program was expanded to include initial tests on all concrete, bituminous concrete (Specification Para. 4.12), bituminous aggregate (4.11), and seal coat surfaces built in 1963, 1964, and 1965. Friction levels obtained on these 249 projects (179 group lettings) in 1965 are summarized in Tables 1 through 9, along with pertinent construction data.

Follow-up skid tests will be run on 1963 projects in 1968, the 1964 projects in 1969, and the 1965 projects in 1970, and these five-year values will be included in subsequent annual reports on the skid testing program. It may be noted that somewhat similar tests were reported in Research Report No. R-357 (March 1961), after accumulation of skid resistance data throughout the trunkline system from 1957 through 1960.

### Table 1 - Concrete Pavement Constructed in 1963

After two years of service, 48 concrete projects (237 lanes) were tested. The average wsf value for all projects tested was 0.48, with low and high coefficients of 0.30 and 0.65. Only 21 of the 237 lanes tested yielded average wsf values below 0.40. None of the projects had all lanes below this skid resistance level.

### Table 2 - Concrete Pavement Constructed in 1964

The average friction level for 19 concrete projects constructed in 1964, after a one-year service period, was 0.50. In all, 71 lanes were skidded, and only eight values were below 0.40. The only project with an average coefficient below this level was BI 77111, C9, located on I 94 from northeast of the Black River northeast to west of US 25BR in Port Huron.

### Table 3 - Concrete Pavement Constructed in 1965

During 1965, wsf values were obtained on 11 concrete projects during their initial year of service. Thirty-four lanes were tested, producing an average value of 0.52, with a range of 0.40 to 0.65. Average wet sliding friction values for 1963, 1964, and 1965 concrete construction projects were 0.48, 0.50 and 0.52, respectively. As might be expected, skid resistance decreases as the number of years in service increases.



Table 4 - Bituminous Concrete Pavement (4.12) Constructed in 1963

Skid tests were conducted on 30 bituminous concrete (4.12) projects constructed in 1963. After a two-year service period, 43 of the 87 lanes tested had average values below 0.40. On eleven projects, average coefficients were below this value.

Table 5 - Bituminous Concrete Pavement (4.12) Constructed in 1964

The average wsf value for 36 projects of 102 lanes of bituminous concrete (4.12) constructed in 1964 was 0.45. Eighteen lanes involving nine projects yielded values of less than 0.40. Only three entire projects tested below this level.

Table 6 - Bituminous Concrete Pavement (4.12) Constructed in 1965

Skid tests were conducted on 47 lanes of bituminous concrete projects during their initial year of service. The wsf values fell below 0.40 on only two lanes, and averaged 0.38. The average wsf values of 1963, 1964 and 1965 bituminous concrete construction projects were 0.41, 0.45 and 0.48 respectively. As with concrete pavement, friction level decreases as the number of years in service increases.

Table 7 - Bituminous Aggregate Pavement (4.11)  
Constructed in 1963-1964-1965

Sixteen bituminous aggregate projects of 1963 through 1965 construction were tested this year. Average wsf value for the 34 lanes tested was 0.51. Only one lane had an average value below 0.40.

Table 8 - Seal Coat Resurfacing in 1963-1964-1965

Three seal coat projects were tested during 1965. Four of the six lanes had average wsf values below 0.40. Project Mb 78053C, C6, located on M 78 from M 86 in Colon northeast to the Branch-St. Joseph County Line, yielded values of 0.35 and 0.29 for eastbound and westbound roadways, respectively while Project Mb 45031C, C3, located on M 72 between Empire and Traverse City, yielded values of 0.14 for both eastbound and westbound roadways. Attention was called to the extreme slipperiness of the latter project in a memorandum from E. A. Finney to W. W. McLaughlin dated August 30, 1965. A surface deslicking consisting of a petroleum distillate and sand treatment was applied September 21, 1965 to a 5.25-mile section of the 15.8 miles of slippery pavement. A memorandum

dated October 20, 1965 reported the results of tests conducted October 12. A 246-percent increase in skid resistance to a wsf value of 0.46 was reported. The untreated area had wsf values ranging from 0.09 to 0.21, and averaging 0.14. On February 9, 1966, a 16.1-mile contract was let for special sheet asphalt non-skid resurfacing (Mb 45021C, C4) covering the untreated area as well as the portion deslicked on September 21.

TABLE 1  
CONCRETE PAVEMENT CONSTRUCTED IN 1963

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
BI 03033B, C14	I 196 from 101st Ave. N to 109th Ave.	Carl Goodwin & Sons, Inc.	Pit 3-65	Pit 3-65	NBOL	0.52	0.50	0.54
					NBIL	0.63	0.61	0.65
					SBOL	0.55	0.54	0.57
				SBIL	0.62	0.59	0.65	
BI 03033D, C16	I 196 from 109th Ave. to N of 116th Ave.	L. W. Edison	Pit 3-65	Pit 3-65	NBOL	0.55	0.54	0.55
					NBIL	0.63	0.62	0.65
					SBOL	0.55	0.54	0.57
				SBIL	0.58	0.57	0.58	
BI 03034D, C11	I 196 from N. of Washington Rd. N to S of 61st St.	Titus Construction Co.	Pits 70-9 & 75-5	Pits 3-47 & 70-9	NBOL	0.57	0.56	0.57
					NBIL	0.61	0.60	0.62
					SBOL	0.55	0.51	0.59
				SBIL	0.60	0.59	0.60	
BI 03033E, C12	I 196 from N of 116th Ave. N to S of Adams Rd.	Carl Goodwin & Sons, Inc.	Pits 3-65 & 75-5	Pits 3-47 & 3-65	NBOL	0.55	0.52	0.58
					NBIL	0.62	0.60	0.65
					SBOL	0.55	0.52	0.57
				SBIL	0.62	0.60	0.64	
BF 03032A, C3	US 31 from S of 61st St. NE to N of 58th St.	Titus Construction Co.	Pits 70-9 & 75-5	Pits 3-47 & 70-9	NBOL	0.53	0.50	0.56
					NBIL	0.58	0.53	0.64
					SBOL	0.51	0.48	0.55
				SBIL	0.57	0.53	0.62	
F 13022C, C7	M 60 from W of Goldup St., in Homer, to E of the Kalamazoo River	Titus Construction Co.	Pit 30-35	Pit 30-35	EBOL	0.48	0.47	0.48
					WBOL	0.44	0.42	0.46
USS 33011B, C3	M 99 from I 96 N to N of the NYCRR	Eisenhour Construction Co., Inc.	Pit 34-49	Pit 33-79	NBOL	0.42	0.40	0.44
					SBOL	0.40	0.39	0.41
I 33045D, C1	I 496 from S of Cavanaugh Rd. N to Mt. Hope Ave.	Sargent Construction Co.	Pit 47-3	Pit 33-6	NBOL	0.49	0.39	0.55
					NBIL	0.57	0.53	0.62
					SBOL	0.42	0.37	0.46
				SBIL	0.52	0.46	0.57	
I 33045A, C4	I 496 - US 127 - M 78 from Mt. Hope Ave. N to Grand River Ave.	Denton Construction Co.	Pit 47-3	Pit 33-81	NBOL	0.43	0.36	0.52
					NBCL	0.41	0.37	0.46
					NBIL	0.48	0.38	0.57
U 33171B, C2	U 33171B, C2				SBOL	0.42	0.36	0.45
					SBCL	0.39	0.33	0.44
U 33171D, C3	U 33171D, C3				SBIL	0.49	0.39	0.55
BF 39014A, C12	US 131 from I 94 NW to "M" Ave.	W. H. Knapp, Inc.	Pit 3-44	Pit 3-44	NBOL	0.52	0.46	0.55
					NBIL	0.55	0.54	0.57
					SBOL	0.53	0.50	0.56
				SBIL	0.55	0.53	0.58	

TABLE 1 (Cont.)  
CONCRETE PAVEMENT CONSTRUCTED IN 1963

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
BF 39014A, C23	US 131 from "M" Ave. N 2.14 mi.	W. H. Knapp, Inc.	Pit 3-44	Pit 3-44	NBOL NBIL SBOL SBIL	0.59 0.65 0.55 0.62	0.57 0.64 0.53 0.62	0.60 0.65 0.56 0.63
U 39041A, C5	US 31 BR (Stadium Dr.) from E of US 31 NE to SW of Michigan Ave. in Kalamazoo	W. H. Knapp, Inc.	Pit 3-44	Pit 3-44	EBOL WBOL	0.50 0.50	0.49 0.49	0.50 0.52
I 41027F, C59	I 196 from Fuller Ave. E to I 96	L. W. Edison	Pit 41-46	Pit 41-46	EBOL EBIL WBOL WBIL	0.58 0.58 0.58 0.61	0.57 0.57 0.58 0.58	0.58 0.59 0.59 0.65
U 46061D, C6 SS 46071A, C1	M 52 from Michigan-Ohio State Line N to S Limits of Adrian	Hertel-Deyo Co.	France Stone, Ohio	Pit 46-16	NBOL NBIL SBOL SBIL	0.52 0.47 0.54 0.44	0.47 0.47 0.48 0.43	0.58 0.47 0.59 0.45
BI 50111I, C12	I 94 from the Clinton River Spillway Bridge N to S of Joy Rd.	L. A. Davidson	E. C. Levy (Dix Yd.)	Pit 50-21	NBOL NBCL NBIL SBOL SECL SEIL	0.50 0.47 0.54 0.53 0.56 0.58	0.46 0.46 0.53 0.53 0.54 0.56	0.53 0.48 0.56 0.59 0.59 0.59
BI 50111J, C13	I 94 from S of Joy Rd. to N of Cotton Rd.	Denton Construction Co.	Pit 50-35 & 63-4	Pit 50-35	NBOL NBCL NBIL SBOL SBCL SBIL	0.48 0.56 0.58 0.48 0.53 0.59	0.45 0.55 0.56 0.45 0.51 0.58	0.52 0.59 0.60 0.50 0.54 0.60
BI 50111K, C22 RN BI 50112A, C1 RN	I 94 from N of Cotton Rd. NE to N of the Macomb-St. Clair County Line	Sargent Construction Co.	Pit 75-5	Pit 50-22	NBOL NBCL NBIL SBOL SBCL SBIL	0.48 0.54 0.59 0.47 0.51 0.58	0.46 0.53 0.56 0.41 0.50 0.55	0.53 0.55 0.61 0.52 0.52 0.61
U 56023A, C10 F 56023A, C11	M 20 (Buttles St.) from US 10 BR (Eastman) SE to 2nd St. & on Indian St. from US 10 BR (Eastman) SE to 1st St., in Midland	Titus Construction Co.	Pit 75-5	Pit 37-26	SBOL SECL SEIL	0.37 0.38 0.40	0.36 0.37 0.38	0.38 0.40 0.41
USS 63011C, C14	M 218 from S of Commerce Rd. N to Pontiac Dr. in Keego Harbor	Anderson & Ruzzin, Inc.	E. C. Levy (Dix Yd.)	Pit 63-56	NBOL NBIL SBOL SEIL	0.38 0.39 0.38 0.40	0.35 0.38 0.38 0.40	0.41 0.41 0.39 0.41

TABLE 1 (Cont.)  
CONCRETE PAVEMENT CONSTRUCTED IN 1963

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
EBBU 63081D, C6	I 696 BS from E of US 24 SE to W of Labser Rd. The Kutchins Co.	E. C. Levy (Dix Yd.)	Pit 63-7		EBOL	0.35	0.33	0.38
					EBCL	0.40	0.39	0.41
					EBIL	0.40	0.37	0.41
					WBOL	0.37	0.36	0.37
					WBCL	0.42	0.42	0.43
				WBIL	0.43	0.41	0.44	
EBBU 63081E, C4	I 696 BS from NE of Lee Baker Dr. NE to NW of Labser Rd. L. A. Davidson	Pit 47-3 & E. C. Levy (Dix Yd. & Trenton Yd.)	Pits 47-3, 63-7, & 63-48		EBOL	0.39	0.39	0.40
					EBCL	0.47	0.46	0.49
					EBIL	0.52	0.50	0.53
					WBOL	0.43	0.41	0.46
					WBCL	0.47	0.45	0.49
				WBIL	0.51	0.49	0.53	
EBBU 63082A, C3	I 696 BS and Northwestern Hwy. from E of 12 Mile Rd. SE to E of US 24 The Kutchins Co.	E. C. Levy (Dix Yd.)	Pit 63-7		NBOL	0.46	0.45	0.47
					NB#4	0.45	0.44	0.47
					NB#2	0.43	0.41	0.44
					NBIL	0.36	0.33	0.39
					NBOL	0.43	0.40	0.45
				SBOL	0.46	0.44	0.49	
				SB#4	0.39	0.37	0.40	
				SB#3	0.32	0.30	0.33	
				SB#2	0.40	0.40	0.41	
				SBIL	0.49	0.48	0.50	
BI 63101D, C8	I 696 from W of Franklin Rd. SE to W of US 24 The Kutchins Co.	E. C. Levy (Dix Yd.)	Pit 63-7		EBOL	0.43	0.42	0.44
					EBIL	0.48	0.47	0.49
					WBOL	0.38	0.37	0.40
					WBIL	0.45	0.45	0.46
U 63171A, C1 BU 62193B, C9	M 39 from Cornell Ave. S to Trojan Ave. Cooke Contracting Co.	Pit 47-3	Pit 47-3		NBOL	0.49	0.47	0.50
					NBCL	0.50	0.50	0.50
					NBIL	0.48	0.47	0.49
					SBOL	0.46	0.45	0.47
					SBCL	0.48	0.48	0.49
				SBIL	0.49	0.49	0.50	
BI 63172A, C1	I 75 from N of Auburn Rd. to S of Walton Blvd. Pierson Contracting Co.	Pit 63-4	Pit 63-4		NBOL	0.46	0.44	0.49
					NBIL	0.52	0.48	0.56
					SBOL	0.46	0.46	0.47
					SBIL	0.57	0.55	0.59
BI 63174E, C2	I 75 from W of M 150 W & N to N of 17 Mile Rd. Cooke Contracting Co.	Pit 63-4	Pit 63-4		NBOL	0.44	0.42	0.45
					NBCL	0.51	0.50	0.52
					NBIL	0.57	0.56	0.59
					SBOL	0.43	0.40	0.47
				SBCL	0.54	0.51	0.59	
				SBIL	0.56	0.53	0.60	

TABLE 1 (Cont.)  
CONCRETE PAVEMENT CONSTRUCTED IN 1963

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
BI 63174F, C3	I 75 from S of E Long Lake Rd. N & W to E of Adams Rd.	Sargent Construction Co.	Pits 63-4 & 63-9	Pit 63-4	NBOL NBCL NBIL SBOL SBCL SBIL	0.46 0.54 0.60 0.47 0.52 0.57	0.44 0.51 0.59 0.45 0.48 0.54	0.48 0.57 0.61 0.49 0.56 0.60
BI 63174G, C4	I 75 from E of Adams Rd. W & N to Auburn Rd.	Sargent Construction Co.	Pit 63-4	Pit 63-4	NBOL NBCL NBIL SBOL SBCL SBIL	0.50 0.50 0.54 0.41 0.49 0.56	0.48 0.50 0.50 0.41 0.48 0.53	0.53 0.51 0.58 0.50 0.50 0.60
BI 63174I, C5 BI 63174D, C14	I 75 from 11 Mile Rd. N to N of 13 Mile Rd.	Cooke Contracting Co.	Pit 63-4 & E. C. Levy (Dix Yd.)	Pits 50-15 & 63-4	NBOL NBCL NBIL SBOL SBCL SBIL	0.38 0.46 0.55 0.44 0.50 0.58	0.37 0.44 0.51 0.43 0.50 0.56	0.39 0.47 0.57 0.44 0.51 0.59
BI 63174I, C6 BI 63174J, C7 BI 63174E, C8	I 75 from N of 13 Mile Rd. N & W to W of M 150	Denton Construction Co.	Pit 63-4	Pits 50-35 & 63-4	NBOL NBCL NBIL SBOL SBCL SBIL	0.44 0.51 0.58 0.46 0.52 0.56	0.40 0.47 0.56 0.44 0.48 0.53	0.48 0.53 0.60 0.56 0.56 0.59
U 63201A, C3 U 63201A, C4	I 75 BL - US 10 BR (Widetrack Drive) from Whittemore St. S counter clockwise to W. Huron St. in Pontiac	Oak Construction Co.	Pit 63-4	Pit 63-4	OL #3 #2 1L	0.38 0.38 0.36 0.40	0.36 0.34 0.36 0.38	0.40 0.44 0.44 0.44
U 73063B, C6	M 46 from intersection of Rust and Sheridan Sts. N on Sheridan to Remington St. (WB); Also N on Warren St. to Holland St., thence E on Holland St. to Genesee St. (EB) in Saginaw	W. F. McNally Co.	Pit 71-47	Pits 76-1 & 79-63	EBOL EBCL EBIL WBOL WB#3 WB#2 WBIL	0.38 0.41 0.39 0.45 0.41 0.44 0.48	0.38 0.39 0.38 0.44 0.38 0.42 0.47	0.38 0.44 0.41 0.46 0.43 0.46 0.48
SS 77052C, C2	M 29 from Thornapple St. N to N City Limits of St. Clair	Anderson & Ruzzin, Inc.	Pit 75-5	Pit 50-33	NBOL NBIL SBOL SBIL	0.43 0.40 0.42 0.43	0.41 0.38 0.40 0.41	0.44 0.41 0.44 0.44

TABLE 1 (Cont.)  
CONCRETE PAVEMENT CONSTRUCTED IN 1963

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low High	
BU 77111A, C2	I 94 from Springboard Rd. NE to St. Clair Hwy.	Sargent Construction Co.	Pit 75-5	Pits 50-22 & 50-26	NBOL	0.53	0.50	0.55
						0.58	0.55	0.61
						0.52	0.50	0.57
						0.57	0.55	0.60
BU 77111B, C3	I 94 from St. Clair Hwy. NE to Big Hand Rd.	Sargent Construction Co.	Pit 75-5	Pit 50-26	NBOL	0.51	0.50	0.53
						0.59	0.58	0.60
						0.52	0.49	0.55
						0.59	0.56	0.61
BU 77111D, C4	I 94 from Big Hand Rd. N to existing US 25	Sargent Construction Co.	Pit 75-5	Pit 50-26	NBOL	0.54	0.52	0.58
						0.62	0.60	0.64
						0.51	0.49	0.53
						0.60	0.60	0.61
F 78022C, C2	US 12 from M 78 (W. Jct.) E to E of Vinewood Ave.	Cross & White	Pits 78-5 & 78-25	Pit 78-25	EBOL	0.42	0.41	0.44
						0.43	0.42	0.44
						0.40	0.38	0.41
						0.39	0.38	0.39
F 79041C, C3	M 46 from Vassar Rd. E to M 24	Denton Construction Co.	Pit 32-4	Pit 79-63	EB	0.50	0.46	0.52
						0.52	0.49	0.55
BU 82111A, C19 BU 82111D, C22 BU 82251A, C14 BU 82251B, C18	I 75 - I 375 from S of Jefferson Ave. N to Division	L. A. Davidson	E. C. Levy (Dix Yd.)	Pits 47-3, 50-24, 63-7, & 63-48	NBOL	0.50	0.48	0.52
						0.43	0.41	0.44
						0.42	0.41	0.44
						0.45	0.44	0.47
						0.46	0.45	0.46
						0.44	0.41	0.47
BU 82112J, C19U	I 696 Spur from N of Meyers Rd. NW to N of 7 Mile Rd.	Denton Construction Co.	Pit 47-3	Pit 47-3	NBOL	0.45	0.44	0.46
						0.47	0.46	0.48
						0.48	0.47	0.49
						0.46	0.44	0.47
BU 82112K, C21	I 696 Spur from N of 7 Mile Rd. NW to S of Greenfield	Denton Construction Co.	Pit 47-3	Pit 47-3	NBOL	0.46	0.46	0.47
						0.46	0.44	0.47
						0.48	0.47	0.50
						0.45	0.43	0.47
					SBOL	0.48	0.48	0.48
					SBOL	0.51	0.50	0.52

TABLE 1 (Cont.)  
CONCRETE PAVEMENT CONSTRUCTED IN 1963

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction	
			Coarse	Fine		Average	Low High
BU 82112I, C29U	I 696 Spur from NW of Wyoming Ave. NW to NW of Meyers Rd.	Ministrielli Construction Co., Inc.	E. C. Levy (Dix Yd.)	Pits 47-3 & 82-15	NBOL NBCL NBIL SBOL SBCL SBIL	0.41 0.42 0.46 0.43 0.45 0.45	0.41 0.41 0.45 0.40 0.47 0.44
BI 82191D, C9RN F 82271A, C2R	I 75 from S of Sibley Rd. N to N of Eureka Rd.	L. A. Davidson	E. C. Levy (Dix Yd. & Trenton Yd.)	Pit 82-10	NBOL NBCL NBIL SBOL SBCL SBIL	0.45 0.41 0.48 0.41 0.50 0.50	0.38 0.40 0.45 0.36 0.49 0.46
BU 82192G, C17	M 39 from Capitol Ave. to Glendale Ave.	Denton Construction Co.	Pit 47-3 & E. C. Levy (Trenton Yd.)	Pit 47-3	NBOL NBCL NBIL SBOL SBCL SBIL	0.43 0.47 0.44 0.44 0.46 0.43	0.41 0.46 0.43 0.43 0.45 0.39
U 82192D, C22	M 39 from S of Rotunda Dr. to N of Village Rd. and from N of Michigan Ave. to S of Ford Rd.	Louis Garavaglia Contractors Inc. & The Kutchins Co.	Pit 47-3 E. C. Levy (Dix Yd. & Trenton Yd.)	Pits 47-3, 63-7, 82-5, & 82-10	NBOL NBCL NBIL SBOL SBCL SBIL	0.45 0.48 0.49 0.46 0.47 0.47	0.44 0.47 0.48 0.45 0.48 0.45
BU 82193B, C8	M 39 from N of McNichols Rd. to N of Trojan Ave.	Cooke Contracting Co.	Pit 47-3	Pit 47-3	NBOL NBCL NBIL SBOL SBCL SBIL	0.40 0.46 0.48 0.42 0.43 0.47	0.39 0.45 0.47 0.39 0.41 0.47
F 82211B, C16 U 82211B, C17	M85(Fort Rd.) from Allen Rd. NE to Sibley Rd.	Cooke Contracting Co.	E. C. Levy (Trenton Yd.)	Pits 81-59 & 82-5	NBOL NBIL SBOL SBIL	0.42 0.46 0.36 0.43	0.39 0.41 0.31 0.36
BI 82251E, C10UN BI 82251F, C12UN	I 75 from Alexandrine to Warren	Cooke Contracting Co.	E. C. Levy (Dix Yd. & Trenton Yd.)	Pit 63-9	NBOL NB#3 NB#2 NBIL SBOL SB#3 SB#2 SBIL	0.44 0.44 0.45 0.48 0.44 0.44 0.47 0.49	0.45 0.46 0.46 0.49 0.44 0.44 0.46 0.49



TABLE 2  
CONCRETE PAVEMENT CONSTRUCTED IN 1964

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
BI 03034B, C9	I 196 from N of Adams Rd. N to Washington Rd.	Carl Goodman & Sons, Inc.	Pits 3-65, 17-40, & 70-9	Pits 3-47 & 3-65	NBOL NBIL SBOL SBIL	0.55 0.59 0.55 0.60	0.54 0.57 0.54 0.57	0.56 0.62 0.55 0.64
F 13121B, C1	I 94 BL from Columbia Ave. NE to Dickman Rd.	Titus Construction Co.	Pit 8-80	Pit 8-5	NB SB	0.56 0.54	0.54 0.50	0.58 0.58
U 13121E, C2	I 94 BL from 20th St. in Springfield E to Upton Ave. in Battle Creek	Titus Construction Co.	Pits 8-20 & 8-80	Pit 8-5	NBOL NBIL	0.42 0.47	0.41 0.46	0.43 0.48
F 39051B, C6	US 131 BR from US 131 (S of "G" Ave.) E to N limits of Kalamazoo	Sargent Construction Co.	Pit 3-44	Pit 3-44	EBOL EBIL WBOL WBIL	0.65 0.65 0.59 0.65	0.62 0.64 0.58 0.63	0.67 0.65 0.61 0.66
I 41027A, C24 I 41027D, C36 I 41027E, C58 I 41027A, C163 I 41027B, C164 I 41029E, C1 I 41029F, C6 I 41029F, C8	I 196 from Fuller Ave. SW to Turner Ave.	Carl Goodwin & Sons, Inc.	Pit 41-46	Pit 41-46	NEBOL NEBCL NEBIL SWBOL SWBCL SWBIL	0.50 0.50 0.51 0.49 0.49 0.51	0.44 0.48 0.47 0.46 0.48 0.48	0.56 0.52 0.54 0.54 0.49 0.56
I 41029E, C3 I 41029D, C37 I 41029B, C54	I 196 from 0.762 mi SW of Wyoming NE to the Grand River in Grand Rapids	L. W. Edison	Pit 41-16	Pit 41-16	NBOL NBIL SBOL SBIL	0.47 0.52 0.50 0.51	0.44 0.51 0.48 0.48	0.50 0.53 0.52 0.54
I 41029A, C35 I 41029B, C36	I 196 from the Ottawa-Kent Co. Line NE to 0.762 mi SW of Wyoming	L. W. Edison	Pit 41-16	Pit 41-16	NBOL NBIL SBOL SBIL	0.51 0.54 0.51 0.54	0.49 0.53 0.48 0.52	0.54 0.56 0.53 0.55
Mb 50091A, C2 F 50092A, C1	M 19 from I 94 NW to the St. Clair-Macomb Co. Line	Anderson & Ruzzin, Inc.	E. C. Levy (Dix Yd.)	Pit 50-35	EB WB	0.58 0.58	0.58 0.56	0.58 0.59
BI 50111H, C11	I 94 from N of 14 Mile Rd. N to Clinton River Spillway	Cooke Contracting Co.	E. C. Levy (Dix Yd.)	Pit 50-21	NBOL NBCL NBIL SBOL SBCL SBIL	0.47 0.53 0.58 0.44 0.53 0.55	0.46 0.51 0.56 0.41 0.50 0.55	0.50 0.54 0.61 0.46 0.55 0.56

TABLE 2 (Cont.)  
CONCRETE PAVEMENT CONSTRUCTED IN 1964

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
BI 50111G, C41	I 94 from Masonic Blvd. N to N of 14 Mile Rd., St. Clair Shores	Cooke Contracting Co.	Pit 63-4 & E. C. Levy (Dix Yd.)	Pits 50-21 & 63-4	NBOL NBCL NBIL SBOL SBCL SBIL	0.45 0.45 0.53 0.47 0.49 0.57	0.44 0.44 0.52 0.47 0.49 0.56	0.45 0.47 0.53 0.48 0.49 0.58
F 52043B, C4	US 41 from NW of M 94 NW to Green Garden Hill Rd. (omitting 0.47 mi at the Choccolay River)	L. W. Brumm	Pits 52-38 & 52-39	Pit 52-9	NB SB	0.58 0.59	0.55 0.57	0.60 0.63
F 62031C, C9 F 62031C, C10	M 37 - M 46 from S of S Limits of Newaygo N to Wood St. in Newaygo	Eisenhour Construction Co., Inc.	Pit 67-2	Pits 62-16 & 67-2	NBOL SBOL	0.46 0.43	0.44 0.41	0.47 0.46
F 63041E, C7	M 59 from Airport Rd. to Elizabeth Lake Rd.	Eisenhour Construction Co., Inc. & T. A. Forsberg, Inc.	Pit 63-54	Pit 63-54	EBOL EBIL WBOL WBIL	0.38 0.42 0.38 0.42	0.38 0.40 0.36 0.41	0.39 0.43 0.39 0.43
EBBU 63081B, C2	I 696 from SE of M 39 NW to Lee Baker Rd.	The Kutichins Co.	E. C. Levy (Dix Yd.)	Pit 63-7	EBOL EBIL WBOL WBIL	0.38 0.41 0.39 0.42	0.37 0.38 0.38 0.41	0.38 0.44 0.39 0.44
EBBU 63081A, C9	I 696 from Northland Drive to Winona St.	The Kutichins Co.	E. C. Levy (Dix Yd.)	Pit 63-7	EBOL EBCL EBIL WBOL WBCL WBIL	0.42 0.42 0.44 0.39 0.42 0.45	0.39 0.40 0.43 0.38 0.40 0.43	0.44 0.44 0.45 0.40 0.45 0.47
BI 77111E, C5 BI 77111F, C6	I 94 from N of Gratiot N & NE to N of Griswold Rd.	Sargent Construction Co.	Pit 75-5	Pit 50-26	NBOL NBIL SBOL SBIL	0.54 0.56 0.52 0.57	0.50 0.53 0.47 0.52	0.58 0.61 0.57 0.63
BI 77111G, C7 BI 77111H, C8	I 94 from N of Griswold Rd. NE to N of Water St.	Sargent Construction Co.	Pits 17-40 & 75-5	Pits 50-26 & 74-51	NBOL NBIL SBOL SBIL	0.51 0.53 0.48 0.52	0.48 0.51 0.47 0.51	0.53 0.56 0.50 0.53
BI 77111I, C9	I 94 from NE of the Black River NE to W of US 25 BR	Sargent Construction Co.	Pit 17-40	Pit 74-51	NB SB	0.39 0.38	0.37 0.36	0.40 0.39
F 82052G, C25	US 24 from Eureka St. N to Haskell St.	Cooke Contracting Co.	E. C. Levy (Trenton Yd.)	Pit 82-10	SBOL SBCL SBIL	0.38 0.42 0.41	0.38 0.41 0.40	0.38 0.44 0.41

TABLE 3  
CONCRETE PAVEMENT CONSTRUCTED IN 1965

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
I 11016A, C17	I 94 from US 31 - US 33 N to I 196	L. W. Lamb Co.	Pits 70-9 & 75-5	Pits 14-45, 14-55, & 80-20	EBIL WBIL	0.62 0.62	0.58 0.60	0.64 0.64
U 30032A, C1	M 99 from Spring St. NW & N to S of Hillsdale	Titus Construction Co.	Pit 30-35	Pit 30-35	NBOL SBOL	0.47 0.47	0.44 0.44	0.50 0.50
USS 33011A, C5	M 99 from Eaton-Ingham Co. Line NE to I 96	Eisenhour Construction Co., Inc.	Pit 34-45	Pit 33-79	NBOL SBOL	0.52 0.56	0.51 0.55	0.53 0.58
I 39022C, C11	I 94 from Penn RR E to Sprinkle Rd.	Carl Goodwin & Sons, Inc.	Pit 3-44	Pit 3-44	EBOL WBOL WBIL	0.48 0.55 0.42 0.50	0.45 0.54 0.37 0.49	0.51 0.57 0.45 0.50
I 39022C, C12	I 94 from S Westnedge Ave. E to Lovers Lane	Carl Goodwin & Sons, Inc.	Pit 3-44	Pit 3-44	EBOL EBIL WBOL WBIL	0.40 0.42 0.43 0.56	0.36 0.39 0.40 0.52	0.43 0.46 0.48 0.60
F 50011F, C12	M 53 from 17 1/2 Mile Rd. N to N of M 59, E of Utica	Sargent Construction Co.	Pit 63-4	Pit 63-4	NBOL NBIL SBOL SBIL	0.63 0.63 0.62 0.60	0.58 0.62 0.60 0.56	0.63 0.65 0.64 0.63
F 50013A, C1	M 53 from S of 21 Mile Rd. N to S of 25 Mile Rd.	Sargent Construction Co.	Pit 63-4	Pit 63-4	NBOL NBIL SBOL SBIL	0.58 0.61 0.65 0.64	0.57 0.59 0.82 0.59	0.61 0.63 0.68 0.68
F 50022A, C5	M 59 from existing M 53 in Utica E to M 53 relocation	Holloway Construction Co.	Pit 63-4	Pit 63-47	EBOL WBOL	0.50 0.49	0.48 0.48	0.51 0.50
Mb 58021A, C1	M 151 from E of US 23 E to US 25	L. W. Edison	Maumee Stone Co., Maumee, Ohio	Pit 46-16	EB WB	0.53 0.51	0.45 0.43	0.64 0.56
U 63043B, C2 U 63043F, C3 BI 63172A, C13	M 59 from proposed GTW RR Grade Separation E to Mott Rd.	L. W. Edison	Pit 63-4	Pit 63-4	EBOL EBIL WBOL WBIL	0.57 0.53 0.56 0.55	0.56 0.48 0.53 0.52	0.58 0.60 0.60 0.58
U 82061E, C7	US 12 EB (Michigan Ave.) from Heywood St. E to 4th St.	L. A. Davidson	E. C. Levey (Dix Yd.)	Pit 82-10	EBOL EB#3 EB#2 EBIL	0.50 0.51 0.52 0.55	0.48 0.50 0.48 0.51	0.52 0.52 0.55 0.58

TABLE 4  
BITUMINOUS CONCRETE PAVEMENT (4.12) CONSTRUCTED IN 1963

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
Mb 03072C, C4	M 40 from US 31 SE in Holland	West Shore Construction Co.	Pit 75-5	Pit 70-27	NB SB	0.38 0.34	0.37 0.32	0.39 0.35
F 07012C, C3	US 41 from old US 41 S and SE	Thornton Construction Co., Inc.	Pit 7-22	Pit 7-22	NB SB	0.51 0.50	0.49 0.49	0.52 0.52
F 07023C, C1	M 28 from W of the Marquette-Baraga Co. Line W to W of DSSA RR	Thornton Construction Co., Inc.	Pit 7-22	Pit 7-22	EB WB	0.64 0.65	0.64 0.64	0.65 0.65
USS 08012C, C10	M 43 (Broadway) from Thorn St. to State Rd. in Hastings	Rieth-Riley Construction Co., Inc.	Pit 41-22	Pit 8-58	NBOL NBIL SBOL SBIL	0.42 0.39 0.44 0.40	0.40 0.37 0.44 0.37	0.44 0.40 0.45 0.41
F 08032C, C10	M 37 from S of 4th St. in Middleville SE and E to M 43	Rieth-Riley Construction Co., Inc.	Pit 41-22	Pit 8-58	NWB SEB	0.51 0.51	0.49 0.50	0.53 0.53
Mb 09032C, C8 Mb 09033C, C5	M 13 from N of Wilder Rd. N and NW to US 23	Midland Contracting Co.	Pit 17-40	Pit 63-4	NBOL NBIL SBOL SBIL	0.36 0.43 0.38 0.46	0.35 0.40 0.36 0.44	0.37 0.45 0.40 0.49
F 13022C, C7 F 13022C, C8	M 60 from 17 Mile Rd. E to E of the Kalamazoo River in Homer	Rieth-Riley Construction Co., Inc.	Pit 12-35	Material Service Corp., Thornton Illinois	EB WB	0.47 0.46	0.39 0.37	0.52 0.54
M 16032C, C4	M 27 from Seymour St. NE to US 23 in Cheboygan	Central Paving Co.	Pit 71-15	Pit 71-15	NBIL SBIL	0.32 0.29	0.30 0.28	0.34 0.30
F 22023B, C4	US 2 from E Limits of Norway E to the Sturgeon River	Payne and Dolan of Wisconsin, Inc.	Pit 22-26	Pit 22-18	EB WB	0.58 0.54	0.55 0.54	0.60 0.54
USS 33011B, C3 USS 33011D, C4	M 99 from 1.96 N to N of NYCRR	Spartan Asphalt Paving Co.	Pit 47-3	Pit 33-6	NBIL SBIL	0.42 0.43	0.37 0.42	0.47 0.44
SS 33091C, C5 SS 33141C, C1 SS 81011C, C4	M 92 from 1.2 mi SE of Boyce Rd. N and NW to M 106	Spartan Asphalt Paving Co.	Pit 47-3	Pit 47-3	NB SB	0.58 0.55	0.49 0.48	0.68 0.62
F 37021C, C2	M 20 from Gilmore Rd. E to Mt. Pleasant	The Hicks Co.	Pit 37-26	Pit 37-26	EB WB	0.49 0.39	0.48 0.36	0.50 0.43

TABLE 4 (Cont.)  
BITUMINOUS CONCRETE PAVEMENT (4.12) CONSTRUCTED IN 1963

Project No.	Location	Paving Contractor	Aggregate Courses		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
U 39041A, C5	US 31 BR (Stadium Dr.) NE from E of US 31 to SW of Michigan Ave. in Kalamazoo	Globe Construction Co.	Material Service, Corp. Thornton Illinois	Pit 39-1	EBIL WBIL	0.56 0.54	0.54 0.53	0.57 0.55
Mb 41012, C5	US 131 BR from Coldbrook NE to N Limits of Grand Rapids	Grand Rapids Asphalt Paving Co.	Pit 41-22	Pit 70-27	NBOL NBIL SBOL SBIL	0.40 0.39 0.38 0.37	0.39 0.38 0.37 0.40	0.41 0.41 0.40 0.40
Mb 41013C, C11	US 131 from Cedar St. in Cedar Springs NE to Montcalm-Kent Co. Line	Rieth-Riley Construction Co., Inc.	Pit 41-22	Pit 54-25	NB SB	0.38 0.37	0.37 0.34	0.40 0.40
Mb 41033C, C17 Mb 41033C, C18 Fb 61024C, C1 Mb 61024C, C2	M 37 from M 46 E to Casnovia Thence E on Old M 37 to W Limits of Kent City	Paul C. Miller	Pit 17-40	Pit 70-4	EB WB	0.38 0.35	0.32 0.30	0.47 0.42
Mb 41033C, C19	M 37 from US 16 BR N to N Limits of Grand Rapids	Grand Rapids Asphalt Paving Co.	Pit 41-22	Pit 70-27	NB SB	0.36 0.36	0.35 0.35	0.36 0.37
F 44031C, C1	M 53 from Main St. in Almont N to M 21 in Imlay City	Frank Strausberg & Son Co.	Pit 63-4	Pit 63-4	NB SB	0.50 0.46	0.49 0.45	0.50 0.47
F 45071C, C4	M 22 from S of Cedar Creek N 4.654 miles	Peninsula Asphalt & Construction Co.	Pit 45-13	Pit 45-13	NB SB	0.35 0.38	0.35 0.35	0.35 0.40
F 46101A, C3	US 12 from Mill Race River E and NE to E Limits of Clinton	Ayling-Cunningham Asphalt Paving Co.	Maumee Stone Co., Maumee, Ohio	Pit 46-16	EBOL EBIL WBOL WBIL	0.42 0.39 0.46 0.44	0.41 0.39 0.44 0.44	0.43 0.40 0.47 0.45
U 50011A, C6	M 53 from Wayne - Macomb Co. Line N to N Limits of Warren, omitting that portion within limits of Centerline	Cooke Contracting Co.	Pit 63-4	Pit 82-5	NBOL NBCL NBIL SBOL SBCL SBIL	0.33 0.34 0.36 0.36 0.35 0.35	0.32 0.34 0.36 0.35 0.34 0.34	0.34 0.35 0.37 0.37 0.37 0.36
U 50011A, C7	M 53 from S Limits of Centerline N to 11 Mile Rd.	Cooke Contracting Co.	Pit 63-4	Pit 82-5	NBOL NBCL NBIL	0.35 0.33 0.33	0.34 0.31 0.31	0.35 0.34 0.34

TABLE 4 (Cont.)  
 BITUMINOUS CONCRETE PAVEMENT (4.12) CONSTRUCTED IN 1963

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
F 50091C, C1	M 19 from Pound Rd. N to S Limits of Memphis	Cooke Contracting Co.	Pit 63-4	Pit 50-26	NB SB	0.34 0.47	0.31 0.46	0.37 0.48
F 56023A, C11	US 10 BR - M 20 (Indian St.) from Jerome St. SE to First St. in Midland	Midland Contracting Co.	Pit 17-40	Pit 63-54	NBOL NBCL NBIL	0.32 0.34 0.33	0.31 0.34 0.31	0.34 0.34 0.34
BF 61075B, C1	US 31 from M 20 N to N of Burpee Rd.	Spartan Asphalt Paving Co.	Pits 17-40 & 75-5	Pit 70-9	NBOL NBIL	0.45 0.61	0.44 0.60	0.46 0.61
BF 61075D, C4	US 31 from N of Burpee Rd. NW to existing US 31 at Colby Rd.	Spartan Asphalt Paving Co.	Pit 17-40	Pit 61-9	NBOL NBIL	0.44 0.64	0.42 0.62	0.46 0.65
Mb 63011C, C16	M 218 (Orchard Lake Road) from US 24 NE to W of M 59	Saginaw Asphalt Paving Co.	Pit 47-3	Pit 47-3	EBOL EBIL	0.33 0.35	0.32 0.35	0.34 0.35
Mb 77033C, C5 Mb 77033C, C6	US 25 from US 25A (Pine Grove Ave.) N to US 25A (Lyburner Ave.)	Blue Water Asphalt Co., Inc.	Pit 75-5	Pit 74-51	NB SB	0.34 0.32	0.31 0.31	0.38 0.33
F 78022A, C1	US 12 from US 131 E to E of Limits of White Pigeon	Rieth-Riley Construction Co., Inc.	Material Service Corp., Thornton, Illinois	Stone Lake, Indiana	EBOL EBIL WBOL WBIL	0.42 0.35 0.47 0.37	0.40 0.34 0.44 0.37	0.43 0.37 0.48 0.38
F 81031C, C3	US 12 from SW of Mills St. to NE of Saline	Washtenaw Asphalt Co.	Pit 47-3	Pit 81-1	EBOL EBIL WBOL WBIL	0.46 0.43 0.48 0.41	0.44 0.42 0.47 0.39	0.47 0.43 0.49 0.43

TABLE 5  
BITUMINOUS CONCRETE PAVEMENT (4. 12) CONSTRUCTED IN 1964

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
F 06073C, C1 F 06073C, C2 F 06073C, C3	US 23 from W of M 65 E and N to the Iosco-Arenac Co. Line, omitting that portion between Michigan Ave. and Water St. in AuGres	Sargent Construction Co.	Pit 17-40	Pit 71-15 & Local pits	EB WB	0.47 0.46	0.39 0.38	0.50 0.51
F 08031C, C5	M 37 from S of Quimby Rd. N to S of Starr Rd.	Globe Construction Co.	Pit 8-49	Pit 8-58	NB SB	0.45 0.42	0.43 0.41	0.48 0.42
SS 08041A, C10	M 79 from S of Starr Rd. E to E of Barryville Rd.	Globe Construction Co.	Pit 8-49	Pit 8-58	EB WB	0.46 0.52	0.46 0.52	0.47 0.52
U 09032C, C9	M 13 from S of Union St. N to N of Wilder Rd.	Carrollton Paving Co., Inc.	Pit 17-40	Pit 25-8	NBOL NBIL SBOL SBIL	0.30 0.36 0.35 0.34 0.35 0.32	0.29 0.35 0.34 0.35	0.32 0.37 0.35 0.35
Mh 11011C, C5	US 12 from Indiana-Michigan State Line NE to NE of New Buffalo	John G. Yerington Co.	Material Services Corp., Chicago, Ill.	Local pits	NBOL NBIL SBOL SBIL	0.31 0.39 0.33 0.42	0.29 0.34 0.33 0.41	0.33 0.42 0.33 0.42
F 11051A, C4	US 31 from Indiana-Michigan State Line N to M 60	Klett Construction Co.	Material Services Corp., Chicago, Ill.	Pit 14-45	NBOL NBIL SBOL SBIL	0.42 0.48 0.41 0.48	0.40 0.45 0.39 0.46	0.44 0.50 0.43 0.49
Mb 11054C, C1 Mb 80011C, C3	US 31 from N of Hagar Shore Rd. NE and N to SW of M 140	Rieth-Riley Construction Co., Inc.	Pit 75-5	Pit 3-47	NB SB	0.35 0.38	0.33 0.34	0.36 0.42
U 13121E, C2 U 13121E, C3	I 94 BL from 20th St. in Springfield E to Upton Ave. in Battle Creek	Rieth-Riley Construction Co., Inc.	Pit 39-1	Pit 13-38	SBOL SBIL	0.43 0.48	0.42 0.46	0.44 0.50
F 17052C, C2	M 28 from 2.3 mi. E of Strongs Rd. E to 1 mi. W of the Diamond Hill Fire Tower (E and W of Raco)	Hodgkiss & Douma, Inc.	Pit 75-5	Local pit	EB WB	0.54 0.54	0.52 0.54	0.55 0.55
F 19031C, C6	US 27 NB from N of Price Rd. N to S of St. Johns	Ayling-Cummingham Asphalt Paving Co.	Pit 34-53	Pit 19-4	NBOL NBIL	0.53 0.64	0.52 0.63	0.53 0.65
F 28012A, C1 F 28051B, C2	M 37 from M 113 N to 0.8 mi. N of Silver Lake Shore Rd.	Peninsula Asphalt & Construction Co.	Pit 45-13	Pit 45-13	NB SB	0.50 0.49	0.41 0.44	0.56 0.54
Mb 28021C, C2	M 113 from E and W of Knight Rd. (3.8 mi. E of Kingsley)	Peninsula Asphalt & Construction Co.	Pit 45-13	Pit 45-13	EB WB	0.49 0.47	0.46 0.46	0.51 0.48
F 31051A, C11	US 41 from Baraga-Houghton Co. Line NW to the Snake River	Thornton Construction Co.	Pit 31-45	Pit 31-45	NB SB	0.60 0.60	0.59 0.60	0.60 0.60

TABLE 5 (Cont.)  
 BITUMINOUS CONCRETE PAVEMENT (4.12) CONSTRUCTED IN 1964

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
U 33082B, C13	M 43 from Bogue St. SE to Oakland Rd.	Eisenhour Construction Co., Inc.	Pit 47-3	Pit 33-79	EBOL EBIL WBOL WBIL	0.54 0.56 0.54 0.55	0.51 0.55 0.53 0.55	0.56 0.57 0.55 0.55
Mb 34062C, C2	M 21 from Dexter St. E to E Limits of Ionia	Rieth-Riley Construction Co. Inc.	Pit 41-46	Pit 41-46	EB WB	0.41 0.37	0.40 0.36	0.42 0.39
F 35031C, C1	US 23 from Arenac-Iosco Co. Line N to W Limits of Tawas City	Saginaw Asphalt Paving Co.	Pit 17-40	Local pits	NB SB	0.45 0.42	0.41 0.42	0.47 0.42
F 35032C, C7	US 23 from E Limits of Tawas City N to Mill St.	Rieth-Riley Construction Co., Inc.	Pit 71-15	Pit 71-15	NB SB	0.47 0.44	0.46 0.40	0.48 0.46
F 35032C, C9	US 23 from E to W Limits of Tawas City	Saginaw Asphalt Paving Co.	Pit 17-40	Local pits	EBOL EBIL WBOL WBIL	0.40 0.44 0.42 0.44	0.39 0.42 0.41 0.44	0.41 0.46 0.43 0.45
Mb 39041C, C7	I 94 BL from 9 Mile Rd. in Oshtemo NE to US 131	Globe Construction Co.	Material Service Corp., Chicago, Ill.	Pit 39-04	EB WB	0.38 0.44	0.36 0.44	0.40 0.45
Mb 41061C, C3	M 11 from N of Fennessey St. N to N of Johnson Park Entrance	Rieth-Riley Construction Co., Inc.	Pit 41-50	Pit 70-27	NBOL NBIL SB	0.44 0.44 0.40	0.43 0.44 0.39	0.45 0.44 0.41
U 41063A, C5 U 41063D, C6 U 41063E, C7 F 41063B, C8	M 11 from Division St. E to I 96	Michigan Colprovia Co.	Pit 41-14	Pit 70-27	EBOL EBIL WBOL WBIL	0.43 0.46 0.45 0.47	0.39 0.39 0.41 0.41	0.48 0.56 0.56 0.56
F 50022D, C3	M 59 from W of M 97 E to E of M 29	Ward & Van Nuck, Inc.	Pit 63-4	Pit 50-21	EBOL EBIL WBOL WBIL	0.44 0.42 0.42 0.43	0.43 0.41 0.41 0.42	0.45 0.43 0.43 0.44
U 50051A, C20	US 25 from Common Rd. N to 14 Mile Rd.	Asphalt Products	E. C. Levy	E. C. Levy	NBOL NB#3 NB#2 NBIL SBOL SB#3 SB#2 SBIL	0.48 0.48 0.44 0.46 0.45 0.40 0.43 0.43	0.46 0.48 0.41 0.44 0.44 0.39 0.42 0.42	0.51 0.49 0.46 0.48 0.46 0.42 0.44 0.44



TABLE 5 (Cont.)  
BITUMINOUS CONCRETE PAVEMENT (4.12) CONSTRUCTED IN 1964

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
F 52043A, C5	US 41 from 3.5 mi. NW of Alger-Marquette Co. Line NW to NW of M 94	Payne & Dolan of Wisconsin, Inc.	Pit 52-39	Pit 52-9	NB SB	0.68 0.68	0.67 0.67	0.68 0.69
F 55011A, C7 F 55012A, C5 F 55012B, C6	US 41 from 1 mi. S of Ingalls N to N Limits of Daggett, omitting that portion within the Stevenson Limits	George Hocking Construction Co.	Pit 55-4	Pit 55-4	NB SB	0.51 0.51	0.47 0.48	0.55 0.53
BF 61075D, C7	US 31 from N of Colby Rd. NW to existing US 31, N of Whitehall	Spartan Asphalt Paving Co.	Pit 75-5	Pit 70-9	NBOL NBIL SBOL SBIL	0.47 0.62 0.50 0.63	0.46 0.61 0.50 0.61	0.47 0.64 0.51 0.64
BF 61075A, C16	US 31 from Muskegon River N to River Rd.	Spartan Asphalt Paving Co.	Pit 75-5	Pit 70-9	NBOL NBCL NBIL SBOL SBCL SBIL	0.37 0.45 0.51 0.42 0.40 0.53	0.37 0.44 0.49 0.41 0.38 0.50	0.38 0.46 0.54 0.43 0.43 0.55
F 62031C, C9 F 62031C, C10	M 37-M 46 from S of 96th St. to Wood St. in Newxygo	Paul C. Miller	Pit 41-22	Pit 70-9	NBIL SBIL	0.46 0.44	0.44 0.40	0.49 0.47
Mb 73031A, C8 SS 73031A, C9	M 47 from Bell Ave. in St. Charles N to M 46	Saginaw Asphalt Paving Co.	Pit 79-21	Pits 73-5 & 76-32	NBOL SBOL	0.49 0.50	0.46 0.46	0.54 0.55
F 73151C, C1	M 15 from S of M 81 SE to the Tuscola-Saginaw Co. Line (Reese Rd.)	Bay Asphalt Co.	Pit 79-21	Pits 73-5 & 76-32	NB SB	0.47 0.48	0.45 0.45	0.50 0.51
Mb 77031C, C3	US 25 from the Macomb-St. Clair Co. Line NE to I 94	Blue Water Asphalt Co., Inc.	Pit 17-40	Pit 74-51	NB SB	0.45 0.48	0.41 0.44	0.49 0.50
U 77033C, C4	US 25 from the Glenwood Ave. NW to Thomas St.	Blue Water Asphalt Co., Inc.	Pit 17-40	Pit 74-51	NBOL NBIL SBOL SBIL	0.35 0.32 0.41 0.32	0.32 0.27 0.36 0.27	0.39 0.36 0.45 0.35
Fb 79031C, C3	M 15 from Willard Rd. N to S Limits of Millington	Cooke Contracting Co.	Pit 32-4	Pit 79-53	NB SB	0.49 0.50	0.49 0.48	0.50 0.51
Fb 79031C, C4	M 15 from S of N Limits of Millington N to N of S Limits of Vassar	Cooke Contracting Co.	Pit 32-4	Pit 79-53	NB SB	0.48 0.48	0.47 0.45	0.49 0.50
Mb 80032C, C2	US 31 BR from Dyckman Ave. NE to Allegan-Van Buren Co. Line	Rieth-Riley Construction Co., Inc.	Pit 75-5	Pit 3-47	NB SB	0.37 0.36	0.37 0.34	0.38 0.37
F 82052G, C25	US 24 from Eureka St. N to Haskell St.	Detroit Asphalt Paving Co.	Pit 47-3	Pit 82-11	NBOL NBCL NBIL	0.34 0.40 0.43	0.32 0.39 0.43	0.35 0.41 0.44

TABLE 6  
BITUMINOUS CONCRETE PAVEMENT (4. 12) CONSTRUCTED IN 1965

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
Mb 13033C, C14	M 78 (Capitol Ave.) from N of Columbia Ave. N and NE, intermittently, to Jackson St.	Rieth-Riley Construction Co., Inc.	Pit 39-1	Pit 13-38	NB SBOL SBIL	0.41 0.40 0.44	0.39 0.39 0.44	0.42 0.41 0.45
Mb 18031C, C4	US 27 BR from S of Schoolcrest Rd. N and E to Wilcox Parkway	The Hicks Co.	Pit 37-26	Pit 37-26	SBOL	0.57	0.55	0.58
F 27023B, C3	US 2 from Gogebic Station SE 8.416 mi	Mathy Construction Co.	Pit 27-66	Pit 27-66	EB WB	0.53 0.55	0.51 0.53	0.57 0.56
F 27023D, C4	US 2 from 8.416 mi SE of Gogebic Station E to 1.250 mi W of Watersmeet	Mathy Construction Co.	Pit 27-66	Pit 27-66	EB WB	0.54 0.52	0.51 0.52	0.55 0.52
U 30032A, C1	M 99 from Spring St. NW and N to S of N Limits of Hillsdale	Ayling-Cunningham Asphalt Paving Co.	France Stone Waterfield, Ohio	Pit 30-35	NBIL SBIL	0.55 0.59	0.53 0.56	0.56 0.61
U 30041A, C2	M 34 from S of N Limits of Hillsdale N to Bacon St.	Ayling-Cunningham Asphalt Paving Co.	Pit 47-3	Pit 30-35	EBOL EBIL WBOL WBIL	0.58 0.55 0.55 0.57	0.55 0.54 0.53 0.54	0.59 0.57 0.57 0.59
USS 33011A, C5	M 99 from Eaton-Ingham Co. Line NE to I 96	Rieth-Riley Construction Co., Inc.	Pit 47-3	Pit 33-6	NBIL SBIL	0.59 0.60	0.59 0.59	0.59 0.61
F 34033A, C3 F 59051B, C3 F 59051A, C4	M 66 from M 44 N to Main St. (Co. Rd. 522) in Stanton	Spartan Asphalt Paving Co.	Pit 34-53	Pits 34-26 41-46	NB SB	0.55 0.51	0.50 0.48	0.57 0.53
U 37011C, C7	US 27 BR from Broomfield Rd. N to N of Preston Rd. in Mt. Pleasant	Eisenhour Construction Co., Inc.	Pit 37-26	Pit 37-26	NBOL NBIL SBOL SBIL	0.48 0.44 0.42 0.41	0.47 0.43 0.40 0.41	0.49 0.44 0.43 0.41

TABLE 6 (Cont.)  
 BITUMINOUS CONCRETE PAVEMENT (4.12) CONSTRUCTED IN 1965

Project No.	Location	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
			Coarse	Fine		Average	Low	High
F 50022A, C5	M 59 from existing M 53 in Utica E to M 53 relocation	Thompson-McCully Co.	Pit 63-4	Pit 50-35	EBIL WBIL	0.52 0.51	0.51 0.50	0.52 0.53
Mb 58021A, C1	M 151 from E of US 23 E to US 25	Ayling-Cunningham Asphalt Paving Co.	Pit 47-3	Pit 46-20	EB WB	0.46 0.49	0.44 0.48	0.48 0.50
BU 61153A, C1 BU 61153B, C2	US 31 RR from Spring St. NE to proposed US 31 relocation	Reith-Riley Construction Co., Inc.	Pit 75-5	Pit 70-9	NBOL NB#3 NB#2 NBIL SBOL SB#3 SB#2 SBIL	0.41 0.43 0.37 0.47 0.47 0.46 0.53 0.58	0.39 0.41 0.35 0.40 0.44 0.42 0.51 0.56	0.43 0.44 0.39 0.56 0.51 0.48 0.54 0.59
SS 78054A, C2	M 78 from Wasepi Rd. N to M 60	Reith-Riley Construction Co., Inc.	Pit 39-1 & Stone Street Pit, Brighton Indiana	Pit 12-35	NB SB	0.57 0.57	0.56 0.54	0.58 0.59
I 82022A, C24	I 94 WB (D.I.E.) from W of Beech-Daly Rd. E to US 24	Thompson-McCully Co.	Pit 47-3	Pit 63-7	WBOL WBCL WBIL	0.44 0.44 0.47	0.44 0.43 0.46	0.45 0.45 0.48
Mb 82121C, C7	I 96 BR (Grand River Ave.) from 6 Mile Rd. (McNichols Rd.) SE to Freeland Rd.	Detroit Asphalt Paving Co.	Pit 47-3	Pit 47-3	NWBOL NWBIL SEBOL SEBIL	0.44 0.46 0.41 0.45	0.44 0.44 0.39 0.44	0.44 0.48 0.42 0.47
Mb 82131C, C9	US 10 (Woodward Ave.) from E Grand Blvd. NW to Clairmont St.	Cooke Contracting Co.	Pit 63-4	Pit 63-4	NBOL NBIL SBOL SBIL	0.42 0.41 0.39 0.44	0.41 0.39 0.38 0.42	0.42 0.43 0.39 0.47

**TABLE 7**  
**BITUMINOUS AGGREGATE PAVEMENT (4. 11) CONSTRUCTED IN 1963-1964-1965**

Project No.	Location	Paving Contractor	Coarse Aggregate Sources	Direction and Lane	Coefficient of Wet Sliding Friction			
					Average	Low	High	
1963	F 20021C, C1	M 72 from the Kalkaska-Crawford Co. Line SE to I 75 BL in Grayling	The Hicks Co.	Pit 20-39	EBOL WBOL	0.50 0.51	0.48 0.49	0.51 0.53
	FFH 64022B, C1	M 82 relocation from 1 mi. S of existing M 82 E to the Newaygo-Oceana Co. Line in Hesperia	Spartan Asphalt Paving Co.	Pit 64-35	EB WB	0.58 0.56	0.55 0.55	0.62 0.57
	F 66031B, C3 F 66032C, C8	US 45 from 4.9 mi. S of M 28 N to M 28	Mathy Construction Co.	Pit 66-33	NB SB	0.64 0.63	0.62 0.61	0.66 0.65
1964	Mb 20012C, C2	I 175 BL (Southbound only) from 0.7 mi. S of M 72 N to S Limits of Grayling	Central Paving Co.	Pit 20-30	SBOL SBIL	0.41 0.49	0.40 0.48	0.43 0.50
	Mb 42012C, C5	US 41 from 0.5 mi. NE of FAS #313 E and NE to SW of M 26	Thornton Construction Co.	Pit 42-6	NB SB	0.56 0.60	0.55 0.59	0.57 0.61
	F 43022C, C9 F 67021C, C3	US 10 from 0.4 mi. W of Hawkins Rd. E to 1.9 mi. E of the Lake-Osceola Co. Line	The Hicks Co.	Pit 67-8	EBOL WBOL	0.51 0.51	0.48 0.48	0.53 0.55
	F 52011A, C6	M 95 from Michigamme River N	Payne & Dolan of Wisconsin, Inc.	Pit 52-61	NB SB	0.55 0.54	0.55 0.53	0.56 0.55
	SS 52032A, C4	M 35 from N of Palmer NE to Co. Rd. #480	Payne & Dolan of Wisconsin, Inc.	Pit 52-9	NB SB	0.48 0.49	0.47 0.47	0.50 0.52
	SS 57012C, C4	M 55-M 66 from 1st St. N to Union St. in Lake City	The Hicks Co.	Pit 57-20	NBOL NBIL SBOL SBIL	0.47 0.47 0.48 0.46	0.44 0.44 0.45 0.44	0.50 0.49 0.51 0.48
	Mb 63132C, C4	M 150 from N of Orion Rd. N to Romeo Rd.	A & A Asphalt Paving Co.	Pit 63-86	NB SB	0.40 0.36	0.38 0.35	0.42 0.37
	FFH 64022A, C3	M 82 from US 31 E to Billings Ave.	Rieth-Riley Construction Co., Inc.	Pit 64-41	EB WB	0.52 0.50	0.49 0.46	0.56 0.53
	F 66022B, C2	M 28 from 2.5 mi. E of Bergland SE to Ewen	Mathy Construction Co.	Pit 66-4	EB WB	0.61 0.60	0.60 0.60	0.63 0.60
	Mb 69022C, C3	M 32 from E of Gaylord E to E of Big Lake Rd.	Central Paving Co.	Pit 69-29	EBOL WBOL	0.55 0.57	0.53 0.55	0.56 0.59
	SS 77011A, C1 SS 77011B, C2	M 33 from the Montmorency-Presque Isle Co. Line N to M 68 in Onaway	Spartan Asphalt Paving Co.	Pit 60-21	NBOL SBOL	0.51 0.50	0.49 0.45	0.56 0.54
	1965	FFH 01023C, C4	M 72 from 11 mi. E of M 65 E to Co. Rd. #171	S. D. Solomon & Sons	Pit 01-57	EB WB	0.46 0.48	0.44 0.46
F 04021A, C4 F 04021B, C5 Mb 60022A, C2		M 32 from HHMan E to Bean Creek Rd.	Lake & Howell Construction Co.	Pit 04-42	EB WB	0.41 0.41	0.35 0.29	0.47 0.52

TABLE 8  
SEAL COAT RESURFACING CONSTRUCTED IN 1963-1964-1965

Project No.	Location	Constr. Year	Surface Type	Paving Contractor	Aggregate Sources		Direction and Lane	Coefficient of Wet Sliding Friction		
					Fine	Coarse		Average	Low	High
Mb 45021C, C3	M 72 from 6.4 mi. E of M 22 in Empire E to W of M 22 in Traverse City	1963	Prime & double seal	Spartan Asphalt Paving Co.	Pit 45-19	Pit 45-19	EB WB	0.14	0.09	0.21
								0.14	0.10	0.20
F 04021B, C2	M 32 from Bean Creek Rd. E to W Limits of Alpena	1964	Prime & single seal	Yockey Construction Co., Inc.	Pit 71-15	None	EB WB	0.42 0.45	0.40 0.44	0.43 0.46
Mb 78053C, C6	M 78 from M 86 in Colon NE to Branch-St. Joseph Co. Line	1965	Single seal	Rieth-Riley Construction Co., Inc.	Pit 13-30	None	EB WB	0.35 0.29	0.32 0.28	0.39 0.30

Section 2  
EXPERIMENTAL FEATURES IN BITUMINOUS SURFACES

## EXPERIMENTAL FEATURES IN BITUMINOUS SURFACES

Testing of bituminous pavement and bridge deck surfaces of various types, all incorporating experimental materials or unusual construction techniques, is reported in this section. Tables 9 through 20 include trunk-line projects and urban intersections being retested periodically for information on rate of decline of skid resistance with increasing age, in relation to traffic and environment. Tables 21 and 22 summarize initial test results for intersections and roadways where various skid-resistant resurfacings were applied late in the 1965 construction season. Table 23 contains data on bituminous projects built to interstate freeway standards and having up to four years of service under traffic. Finally, Table 24 reports testing of experimental surfaces on bridge decks.

### Table 9 - Mine Rock and Related Aggregate in Upper Peninsula Bituminous Concrete and Bituminous Aggregate Projects.

Skid test data for Upper Peninsula bituminous concrete and bituminous aggregate projects containing mine rock and related aggregate are summarized in Table 9. Skid tests were conducted on these 22 projects from July 24 through 27. During this period, air temperatures ranged from 63 to 77 F and pavement temperatures from 65 to 96 F. Projects tested ranged in age from 3 to 14 years and continued to exhibit outstanding skid resistance qualities. Wsf values obtained during 1965 ranged from 0.34 to 0.72 and averaged 0.58. A 1965 experimental resurfacing project at the intersection of M 121 and Fenton Road, south of Flint (listed in Table 21), used a similar aggregate. Future skid tests should indicate effects of increased traffic volumes on this aggregate's skid resistance qualities.

### Table 10 - 2NS and 3BC Sands in Bituminous Concrete Resurfacing.

Table 10 summarizes results for seven older experimental bituminous concrete projects employing 2NS and 3BC sands. Tests were conducted intermittently from May 24 through October 16. During these tests, air temperatures ranged from 58 to 75 F and pavement temperatures from 55 to 92 F. Average wsf values obtained during 1965 were 0.36 and 0.40 for 3BC and 2NS sands, respectively, thus continuing to show little difference between the two sand types.

### Table 11 - 31A Slag Aggregate in Bituminous Concrete Resurfacing.

Four 1960 and 1961 construction projects for comparison of 31A slag

with 31A crushed gravel are summarized in Table 11. During 1965, tests were conducted July 13 and August 7. While conducting tests, air and pavement temperatures ranged from 74 to 79 F and from 76 to 81 F, respectively. Initial tests on the two slag types in November 1961 showed little difference in skid resistance qualities. Wsf values of both slag types declined in a similar pattern through the 1964 tests; however, 1965 tests break this pattern. Coefficients obtained on the area containing blast furnace slag have leveled off some 28 percent below the initial values. Conversely, 1965 coefficients in the area containing open hearth slag increased to a point only 19 percent below initial values.

Table 12 - Rubberized Sand-Asphalt Resurfacing; US 31 and M 66: City of Charlevoix.

A rubberized asphalt surface is compared in Table 12 with a bituminous concrete and a bituminous aggregate project. All were resurfaced in October 1960. The 1965 tests were conducted on July 17 at air and pavement temperatures of 70 and 83 F, respectively. Of the three types, the rubberized sand-asphalt surface has given the best performance, followed in order by bituminous aggregate and bituminous concrete. The bituminous concrete section (Project 15012, C2) yielded coefficients considered to be at a dangerously low level.

Table 13 - 2NS Modified Sand-Asphalt Resurfacing; US 131: Reed City North (Project Mb 67014, C3R).

Test data for a sand-asphalt resurfacing project are summarized in Table 13. This project was surfaced in July and August 1961. Later, a kerosene and sand treatment was applied in November 1961, to correct an area at the north end that was too rich in asphalt content. The 1965 tests were conducted June 8 at air and pavement temperatures of 71 and 74 F, respectively. These tests showed almost identical coefficients between treated and non-treated areas. Good skid resistance qualities are indicated, even though the 1965 friction values averaged 9 percent lower than 1964 values.

Table 14 - 3BC Sand-Asphalt Resurfacing; US 131: Rockford to Cedar Springs.

Three-year test results are shown in Table 14 for a special 3BC and sand-asphalt resurfacing, applied in September 1963 to correct a slippery condition on US 131 from Rockford to Cedar Springs. The resurfacing variable was differing percentages of bitumen and dust content in the four sections (A through D). The 1965 tests were conducted on May 25, with



air and pavement temperatures of 87 and 105 F, respectively. Wsf values were lower this year. No marked difference was apparent between the sections of varying asphalt contents. Coefficients were very similar.

Table 15 - 3BC Sand-Asphalt Resurfacing; US 131 SB: Alba (Project Mm 4BC-3A, Control Section 05072).

Table 15 contains a summary of skid tests on a special 3BC sand-asphalt nonskid resurfacing project. Two penetration grades of asphalt were used on this project. On June 17, after one year of service, identical friction values were determined in several tests conducted at air and pavement temperatures of 70 and 83 F, respectively, indicating good qualities of skid resistance.

Tables 16 and 17 - 2NS Modified Sand-Asphalt Surfaces and 3BCS Slag Sand-Asphalt Surfaces (District 10 Intersections).

These tables report tests on Detroit area intersections treated either with 2NS modified sand-asphalt or with 3BCS slag sand-asphalt. Since the 1964 test series, three of the 2NS modified sand-asphalt intersections, having an average 1964 wsf value of 0.37, had been resurfaced. The 1965 tests were conducted between June 13 and August 11. Air and pavement temperatures during tests varied from 66 to 79 F and 70 to 81 F, respectively. Comparing the average of the 2NS modified sand lanes tested since 1961 with the average of the slag sand lanes, the former have performed only slightly better during the four years of service.

Table 18 - Wyton Synthetic Binder Surface Course Mixtures.

Included in Table 18 are 1965 skid test results accumulated on four applications of Wyton synthetic binder surface course. Experimental mixtures were applied for varying reasons, as reported last year in Research Report No. R-507. The 1965 tests were conducted between May 26 and August 17. Air and pavement temperatures ranged from 65 to 82 F and 68 to 87 F, respectively. Friction values since initial tests have not followed a uniform pattern. Outstanding in skid resistance qualities after two years of service, is Project 39014B, C6, represented by an average 1965 wsf value of 0.64. This value is 45 percent higher than in the initial tests of 1963. The other two-year-old surface yielded an average coefficient of 0.45, 2 percent below the initial value. After one year of service, the two newer projects yielded average coefficients about 25 percent below last year. Part of this reduction in skid resistance may be accounted for by oil droppings from traffic which were noted on the surface.

Table 19 - Asphalt Emulsion Hot Mix Surface Courses; US 127: Lansing Intersections (Project Mob 33032C, C6).

Wet sliding friction values are shown in Table 19 for two asphalt emulsion hot mix surface courses applied in October 1964 to two Lansing intersections. Initially, in 1964, the bituminous concrete emulsified hot mix wearing course yielded slightly higher wsf values than the sand emulsified asphalt hot mix surface course. After one year of service, average wsf values have decreased to 0.41 for both surfaces.

Table 20 - Ground Corncobs in Bituminous Mixtures; US 23 North of Ann Arbor (Patching Group No. Mm 5BC-8B).

A 349-ft test area was installed in 1964 approximately 8 miles north of Ann Arbor on the northbound lanes of US 23. In this test area, ground corncobs were incorporated into two bituminous surface types (i. e. , 2NS Sand-Asphalt and 4.12 Wearing Course), designed to produce a surface undergoing a form of slight progressive surface deterioration that might contribute toward skid resistance. After a one-year service period, coefficients of several tests were similar and rated as good.

Table 21 - Experimental Skid-Resistant Resurfacing.

Supplemental specifications patterned after mix designs used on American Oil Company's circular laboratory test track were prepared by the Testing Laboratory Division in July 1965, by direction of the Pavement Selection Committee. These specifications employ varying hard aggregates and mix designs for skid-resistant surfaces, and were applied to intersections selected as a result of previously determined low friction levels. The resurfacings were applied at 19 locations in September and October under Contract Groups Mns 88500C, C1, C3, and C6. Pertinent material and construction data were reported in December, 1965 by P. J. Serafin and A. P. Chritz of the Testing Laboratory Division.

Table 22 - Sand-Asphalt Skid-Resistant Resurfacing at Intersections.

Skid tests were also conducted at 30 other intersection and roadway locations resurfaced in a manner similar to those reported in Table 21, with comparable mix designs also containing 3BC or 2MS aggregates. Initial coefficients at these locations also yielded good skid resistance values; however, future skid tests will not be conducted unless specially requested.

Table 23 - Bituminous Concrete Interstate Projects.

The five-year accumulation of tests performed on the I 75-US 27 interstate bituminous concrete projects from Clare to Indian River are presented in Table 23. Projects included were constructed between July 1961 and June 1963. The skid tests were conducted from June 14 to June 22. Temperatures during these tests ranged from 59 to 79 F and from 68 to 88 F for air and pavement, respectively. A previously noted effect of traffic wear, indicated by consistent variation of wsf values between inside and outside lanes, continued to be apparent in the test results. This year coefficients of the inside lane are 27 percent higher than those of the outside lane. Nevertheless, the 1965 average wsf values of 0.65 and 0.51 for the inside and outside lanes, respectively, continue to indicate good skid resistance qualities.

Table 24 - Bridge Deck Surface Coatings.

Skid tests performed on several types of bridge deck coating are summarized in Table 24. Six more bridges were added for study and tested during 1965. Five projects treated with a coal tar slurry seal application have been exposed to traffic wear for two to four years; their coefficients continue to exhibit poor skid resistance qualities in spite of a slight increase in friction level during 1965. Initial tests on six coal tar epoxy treatments yielded coefficients of good skid-resistant quality. A thin coating of polysulfide epoxy was applied to B01 of 34032 in 1961; after four years of service most of the cover aggregate and epoxy has been removed through normal wear, and consequently the 1964 and 1965 tests represent the low friction level of the original surface. After a one-year service period, the Wyton-sand surface continues to exhibit good qualities of skid resistance. Initial tests were conducted this year on X01 of 11031, comparing a 31A bituminous concrete with a rubberized sand-asphalt resurfacing on a repaired concrete deck. Initial friction levels are good and nearly identical for the two materials.

TABLE 9  
MINE ROCK AND RELATED AGGREGATE IN UPPER PENINSULA  
BITUMINOUS CONCRETE AND BITUMINOUS AGGREGATE PROJECTS

Project Number (and Control Section Number)	Route	Location	Year Surfaced	Course Aggregate		Asphalt Cement	Direction and Lane	Average Coefficient of Wet Sliding Friction				
				Size	Source			Frestone Tire		General Tire		
								1958	1959	1961	1964	1965
27021D, C6	US 2	Bessemer - Wakefield	1962	25A	Trap Rock - Gilbert Western Quarry (Pit 27-62)(d)	American Oil Co., Whiting, Ind. (d)	EBOL EBIL WBOL WBIL	--	--	--	0.57 0.55 0.57 0.55	0.56 0.63 0.57 0.64
27-09, C5 (27021)	US 2	State Line E to Ironwood	1956	25A	Mine Rock - Ironon Mine (Pit 27-42)(b)	Lion Oil Co., El Dorado, Ark.; American Liberty Oil, Mt. Pleasant, Texas (d)	EB WB	0.52 0.49	0.50 0.50	0.51	0.52 0.47	0.41 0.44
31-31, C13 (31011)	M 26	Ontonogan Co. Line NE 3.9 mi.	1956	25A	Waste Mine Rock - Winona Pit (Pit 31-4)(b)	American Liberty Oil, Mt. Pleasant, Texas (d)	NB SB	0.62	--	0.64	0.68 0.64	0.65 0.66
31012, C1, C2 31051, C1, C2	M 26 US 41	SW of SW limits of Houghton SE of SE limits of Houghton	1957	25A	Waste Mine Rock - Winona Pit (Pit 31-4)(b)	American Liberty Oil, Mt. Pleasant, Texas (d)	EB WB	--	--	--	0.46 0.43	0.39 0.44
31-25, C4 (31013)	M 26	Laurium to Lake Linden	1952	25A	Waste Mine Rock - Hancock Mine (Pit 31-20)(b)	Lion Oil Co., El Dorado, Ark. (d)	NB SB	--	0.51	--	0.59 0.58	0.52 0.59
31-19, C5 (31051)	US 41	Houghton to Chassel	1952	25A	Waste Mine Rock - Hancock Mine (Pit 31-20)(b)	Lion Oil Co., El Dorado, Ark. (d)	NB SB	--	0.49 0.59	0.58	0.50 0.55	0.54 0.58
31052, C1	US 41	Hancock to Calumet	1956	25A	Waste Mine Rock - Hancock Mine (Pit 31-20)(b)	American Petrofina Co., Mt. Pleasant, Texas; Lion Oil Co., El Dorado, Ark. (d)	NB SB	0.50	--	0.62	0.54 0.57	0.62 0.61
66-54, C4 (66051)	M 26	Mass to Rockland	1956	25A	Waste Mine Rock - Mass Pit (Pit 66-51)(b)	Lion Oil Co., El Dorado, Ark.; American Liberty Oil, Mt. Pleasant, Texas (d)	NB SB	--	--	--	0.68 0.69	0.64 0.66
27024, C1 36021, C1	US 2	From 1.7 mi. W of Iron-Gogebic Co. Line E to 5.4 mi. E of Co. Line	1957	25A	Caspian Lumber Co. (Pit 36-34)(b)	American Liberty Oil, Mt. Pleasant, Texas; Lion Oil Co., El Dorado, Ark. (d)	EB WB	--	--	--	0.67 0.67	0.69 0.69
27-20, C13 (27024)	US 2	US 45 E	1956	25A	Maber Pit (Pit 27-33)(b)	American Liberty Oil, Mt. Pleasant, Texas; Lion Oil Co., El Dorado, Ark. (d)	EB WB	--	0.66	--	0.60 0.64	0.65 0.66
27-11, C14 (27051)	US 45	US 2 N 2 mi.	1956	25A	Maber Pit (Pit 27-33)(b)	American Liberty Oil, Mt. Pleasant, Texas; Lion Oil Co., El Dorado, Ark. (d)	NB SB	0.48 0.49	0.53	0.49	0.42 0.44	0.41 0.40

(a) Filler: Flyash from Wisconsin Flyash, Green Bay, Wisconsin.  
(b) Filler: Limestone dust from Huribut Chemical Co., Green Bay, Wisconsin.  
(c) Filler: Flyash from Detroit Edison Co., St. Clair, Michigan.  
(d) Penetration: 85/100.  
(e) Penetration: 60/70.  
(f) Penetration: 150/175.

**TABLE 9 (Cont.)**  
**MINE ROCK AND RELATED AGGREGATE IN UPPER PENINSULA**  
**BITUMINOUS CONCRETE AND BITUMINOUS AGGREGATE PROJECTS**

Project Number (and Control Section Number)	Route	Location	Year Surfaced	Coarse Aggregate		Asphalt Cement	Direction and Lane	Average Coefficient of Wet Sliding Friction				
				Size	Source			Firestone Tire		General Tire		
								1958	1959	1961	1964	1965
31011, C1	M 26	Fairdale to Lake Roland	1960	20A	Toivola Pit (Pit 31-53)(b)	Gustafson Oil Co., Escanaba, Mich. (others)(e)	NB SB	--	--	--	0.61 0.64	0.66 0.63
31-21, C4 (31013)	M 26	Dollar Bay to Lake Linden	1955	25A	Hancock "Racetrack" (Pit 31-1)(b)	American Liberty Oil, Mt. Pleasant, Texas; Lion Oil Co., El Dorado, Ark. (d)	NB SB	--	0.60	--	0.58 0.55	0.59 0.57
31041, C1	M 35	From Ontonagon Co. Line E 12.2 mi. in Houghton Co.	1961	20A	Lake Mine #2 (Pit 66-64)(b)	Lion Oil Co., El Dorado, Ark. (f)	EB WB	--	--	--	0.60 0.60	0.65 0.66
31-19, C3 (31052)	US 41	Calumet to Mohawk	1955	25A	Hancock "Racetrack" (Pit 31-1)(b)	American Liberty Oil, Mt. Pleasant, Texas(d)	NB SB	0.44	0.55	0.55	0.50 0.54	0.53 0.53
36021, C3, C4	US 2	From 4.7 mi. W of Iron River E to 0.7 mi. E of W limits of Iron River	1961	25A	Lumber Pit #2 (Pit 36-40)(b)	Gustafson Oil Co., Escanaba, Mich. (d)	EB WB	--	--	--	0.45 0.52	0.58 0.56
42-05, C3 (42011) 42-14, C4 (42012)	US 41	Mohawk to Delaware	1955	20A	C&H Pit #1 (Pit 42-14)(b)	Socony Mobil, Augusta, Kansas (e)	NB SB	--	--	--	0.65 0.62	0.69 0.66
52-13, C5 (52041)	US 41	Champion West	1956	25A	Dishneau (Pit 52-1)(b)	Lion Oil Co., El Dorado, Ark. (d)	EB WB	0.54	--	0.50	0.44 0.53	0.37 0.44
52-19, C4 (52041)	US 41	Marquette Co. Line E	1956	25A	Dishneau (Pit 52-1)(b)	Lion Oil Co., El Dorado, Ark. (d)	EB WB	--	--	--	0.56 0.56	0.58 0.60
52-25, C3 (52042)	US 41 - M 26	From 2.3 mi. E of W limits of Marquette E	1951	25A	Marquette Co. Rd. Comm. (Pit 52-9)(b)	Lion Oil Co., El Dorado, Ark. (d)	NB SB	--	--	--	0.42 0.42	0.54 0.49
66032, C4	US 45	M 28 S, near Rockland	1960	20A	Arenz (Pit 66-43)(c)	Leonard Refineries, Inc., Alma, Mich. (f)	NB SB	--	--	--	0.68 0.68	0.68 0.70
66041, C2	M 35	Lake Mine E to Houghton Co. Line	1960	20A	Lake Mine Pit #2 (Pit 66-64)(b)	Lion Oil Co., El Dorado, Ark. (f)	EB WB	--	--	--	0.64 0.64	0.68 0.87

(a) Filler: Flyash from Wisconsin Flyash, Green Bay, Wisconsin.  
(b) Filler: Limestone dust from Hurbit Chemical Co., Green Bay, Wisconsin.  
(c) Filler: Flyash from Detroit Edison Co., St. Clair, Michigan.  
(d) Penetration: 85/100.  
(e) Penetration: 60/70.  
(f) Penetration: 150/175.

RELATED AGGREGATE

TABLE 10  
2NS AND 3BC SANDS IN BITUMINOUS CONCRETE RESURFACING

Project Number (and Control Section Number)	Length, mi.	Route	Location	Source of Coarse Aggregate	Test Section	Average Coefficient of Wet Sliding Friction									
						Firestone Tire					General Tire				
						1958	1959	1960	1961	1962	1963	1964	1965		
79061, C1	4.9	M 81	E and W of Warrsville	Inland L.S., Pt. Island	Sec. 1 (2NS) Sec. 3 (3BC)	0.52 0.48	0.53 0.49	0.49 0.44	0.45 0.42	0.43 0.40	0.40 0.38	0.40 0.40	0.35 0.31		
79-23, C4 (79061)	1.4	M 81	Between Sections 1 and 3 (Comparison section sur- faced in 1952)	Drummond Dolomite	Sec. 2 (3BC)	0.38	0.44	0.41	0.41	0.41	0.34	0.32	0.38		
30071, C1 46011, C1	13.9	US 127	From M 34 to US 12	France Stone, Waterville, Ohio	3BC, 3.5% MF 2NS, 4.5% MF 2NS, 2.0% MF 2NS, 0.0% MF	-- -- -- --	0.48 0.50 0.55 0.55	0.39 0.49 0.44 0.39	-- -- -- --	-- -- -- --	-- -- -- --	0.28 0.40 0.33 0.35	0.29 0.43 0.37 0.40		
39042, C6	6.6	M 96	Kalamazoo to Galesburg	Materials Service, Chicago	3BC Coarse Sand 2NS	-- -- --	0.39 0.42 0.46	0.40 0.46 0.44	0.44 0.48 0.38	-- -- --	-- -- --	0.30 0.40 0.36	0.28 0.40 0.41		
41051, C1	3.9	US 131BP	Kaapp Rd., N (Grand Rapids)	Grand Rapids Gravel Co.	3BC 2NS	-- --	0.52 0.48	0.58 0.54	-- --	-- --	-- --	0.42 0.46	0.42 0.44		
81032, C2, C3	1.5	US 12	In Ypsilanti	American Agg., Green Oak	2NS	--	0.46	0.44	--	--	--	0.35	0.36		
81102, C1	11.6	M 14	Ann Arbor, E	American Agg., Green Oak	3BC 2NS	-- --	0.59 0.56	0.52 0.48	-- --	-- --	-- --	0.44 0.40	0.45 0.41		

TABLE 11  
31A SLAG AGGREGATE IN BITUMINOUS CONCRETE RESURFACING

Project No.	Location	Year Paved	Type of Material	Direction and Lane	Average Coefficient of Wet Sliding Friction				
					Firestone Tire				
					1960	1961	1962	1964	1965
82082, C4	US 12 (Michigan Ave.) from Washington St. to Brady St. in Dearborn	1960	31A slag coarse 3BCS slag sand 60/70 pen. AC	EBOL	0.51	0.41	0.31	0.36	0.40
				EBIL	0.51	0.42	0.32	0.34	0.34
				WBOL	0.48	0.43	0.32	0.34	0.38
				WBIL	0.50	0.41	0.31	0.35	0.30
82121, C1	Grand River (old US 16) from 6 Mile Rd. to Berg Rd.	1960	31A slag coarse 3BCS slag sand 60/70 pen. AC	EBOL	0.44	0.40	0.38	0.34	0.36
				EBCL	0.46	0.45	0.38	0.36	0.38
				EBIL	0.47	0.43	0.40	0.39	0.37
				WBOL	0.49	0.44	0.39	0.38	0.38
				WBCL	0.46	0.44	0.39	0.39	0.40
				WBIL	0.52	0.45	0.40	0.35	0.44
82131, C5	US 10 (Woodward Ave.) from Clairmont St. to city limits of Highland Park	1960	31A crushed gravel 3BC sand 3MF fly ash 60/70 pen. AC	NBOL	0.52	0.45	--	0.35	0.40
				NBIL	0.52	0.43	--	0.37	0.41
				SBOL	0.52	0.42	--	0.36	0.37
				SBIL	0.54	0.43	--	0.35	0.36
82091C, C5	Schaefer Rd. from Gate 4 (Ford Motor Co.) to Mellon Rd., Dearborn	1961	31A open hearth slag 3BCS open hearth slag open hearth slag	NBOL	--	0.59	0.41	0.30	0.51
				NBCL	--	0.65	0.45	0.38	0.48
				NBIL	--	0.64	0.49	0.48	0.53
				SBOL	--	0.62	0.51	0.45	0.42
				SBCL	--	0.66	0.49	0.46	0.46
				SBIL	--	0.64	0.53	0.51	0.50

TABLE 12  
RUBBERIZED SAND-ASPHALT RESURFACING  
US 31 and M 66: City of Charlevoix

Project No.	Route	Location	Mix Type	Average Coefficient of Wet Sliding Friction						
				Firestone Tire					General Tire	
				1958*	1959**	1960	1961	1963	1964	1965
15012, C2	US 31	Bascule Bridge N to Dixon St.	Rubberized Sand Asphalt	0.19	0.48	0.52	0.40	0.38	0.46	0.44
15012, C2	US 31	Bascule Bridge S to Party St.	Bituminous Concrete	0.19	0.44	--	--	0.29	0.32	0.29
15031, C1	M 66	Stover St. to Garfield St.	Bituminous Aggregate	--	--	0.54	--	0.36	0.38	0.35

\*Initial tests on polished portland cement surface.

\*\*Tests conducted on temporary seal coat applied in summer 1959, with surfacing in October 1960.

TABLE 13  
2NS MODIFIED SAND-ASPHALT RESURFACING  
US 131: Reed City North (Project Mb 67014, C3R)

Test Area Locations	Treatment <sup>(1)</sup>	Average Coefficient of Wet Sliding Friction					
		Firestone Tire				General Tire	
		1961*	Jan. 1962	Nov. 1962	1963	1964	1965
Section 1 2.3-2.9 mi. N of Ashton Rd.	.035 gal kerosene per sq yd plus sand	0.45	0.49	0.52	0.48	0.56	0.52
Section 2 1.4-2.3 mi. N of Ashton Rd.	.050 gal kerosene per sq yd plus sand	0.37	0.46	0.52	0.47	0.55	0.50
Section 3 0.9-1.4 mi. N of Ashton Rd.	.040 gal kerosene per sq yd plus sand	0.34	0.47	0.52	0.47	0.53	0.48
Remainder of Project US 10 to 0.9 mi. N of Ashton Rd.	none	0.44	0.41	0.49	--	0.56	0.50

(1) Areas 0.9 to 2.9 mi N of Ashton Rd. treated as indicated on November 20, 1961. Original sand asphalt surfacing was placed July 5 through August 9, 1961.

\* Initial skid tests run in northbound lanes only. All subsequent skid tests represent an average of northbound and southbound lanes.



**TABLE 14**  
**3BC SAND-ASPHALT RESURFACING**  
**US 131: Rockford to Cedar Springs (Project Mb 41013C, C12)**

Location			Materials		Average Coefficient of Wet Sliding Friction							
Section Designation(1)	Stationing	Lane	Percent Bitumen	Dust	Firestone Tire			Avg. of Both Tires	Firestone Tire	General Tire		
					Sept. 20 1963	Sept. 25 1963	Oct. 24 1963	Dec. 5 1963	May 12 1964	May 12 1964	Sept. 4 1964	May 25 1965
A	323+90 to 299+25	SB	7.5	3.5	.35	.33	.31	.38	.45	.43	.40	.39
	323+79 to 314+94	NB	7.5	3.5	.35	.32	.36	.38	.45	.46	.42	.39
	Average				.35	.33	.33	.38	.45	.44	.41	.39
B	314+94 to 297+20	NB	6.5	3.5	.38	.37	.38	.42	.47	.46	.46	.39
C	299+25 to 281+80	SB	6.5	4.5	.41	.40	.36	.42	.45	.45	.45	.38
	297+20 to 281+94	NB	6.5	4.5	.38	.38	.36	.45	.45	.45	.46	.41
	Average				.40	.38	.36	.44	.45	.45	.46	.39
D	281+80 to 264+97	SB	5.5	4.5	.44	.44	.42	.49	.49	.47	.47	.38
	281+94 to 268+93	NB	5.5	4.5	.44	.45	.44	.46	.51	.49	.49	.43
	Average				.44	.44	.43	.48	.50	.46	.46	.40
Kent County Resurfacing (1962)	138+88 to 156+92	SB	31A, Grand Rapids Gravel Co. No. 8 (Pit 41-16)		.35	.34	.35	.44	.37	.36	.36	.36
	138+88 to 156+92	NB			.38	.35	.35	.44	.40	.39	.39	.39
	Average				.36	.34	.35	.44	.38	.38	.38	.38
Balance of Project	90+00 South	SB	6.5	4.5	.46	.40	.39	.47	.50	.47	.47	.40
	90+00 South	NB	6.5	4.5	.47	.40	.43	.46	.49	.47	.47	.41
	Average				.46	.40	.41	.46	.50	.47	.47	.40

(1) Test areas designated in P. J. Serafin's letter to E. A. Finney, September 16, 1963. Sheet asphalt surfacing placed September 9-13, 1963.

TABLE 15  
 3BC SAND-ASPHALT RESURFACING  
 US 131 SB: North and South of Alba (Project Mm 4BC-3A; Control Section 05072)

Test Area Locations	Asphalt Cement	Aggregate	Mineral Filler	Direction and Lane	Average Coefficient of Wet Sliding Friction		
					General Tire		
					July 1964	October 1964	June 1965
Mancelona to S of Alba	Trumbull Asphalt Co., Muskegon, Mich. * 85/100 pen.	1:1 mixture from Pol- ous and Gerstenberg- er Pits	Fly ash - Detroit Edison Co.	SBOL	0.51	0.54	0.56
				SBIL	0.63	0.66	0.68
N of Alba to M 32	Trumbull Asphalt Co. Muskegon, Mich. ** 150/175 pen.	1:1 mixture from Pol- ous and Gerstenberg- er Pits	Fly ash - Detroit Edison Co.	SBOL	0.50	0.60	0.56
				SEIL	0.63	0.68	0.68

\* 6.9 percent Bitumen.  
 \*\* 6.4 percent Bitumen.

TABLE 16

## 2NS MODIFIED SAND-ASPHALT RESURFACING

District 10 Intersections

Control Section No.	Intersection	Route	Direction and Lane	Average Coefficient of Wet Sliding Friction				
				Firestone Tire			General Tire	
				1961	1962	1963	1964	1965
82053	US 24 at US 25 (S. Jct.)	US 25	NBOL	0.45	0.57	0.35	0.42	0.36
			NBIL	0.51	0.53	0.34	0.52	0.47
			SBIL	0.50	0.50	0.33	0.37	0.37
			NBOL	0.52	0.54	0.34	0.40	0.40
			NBIL	0.48	0.54	0.35	0.42	0.41
82052	US 24 (SB) at M 17 (N. Jct. - Ames Rd.)	US 24	SBOL	0.45	0.49	0.31	0.40	0.36
			SBIL	0.46	0.49	0.32	0.39	0.37
82052	US 24 at Cypress St.	US 24	NBOL	0.45	0.49	0.28	0.39	0.36
			NBIL	0.49	0.51	0.32	0.39	0.40
			SBOL	0.42	0.52	0.30	0.39	0.38
			SBIL	0.46	0.53	0.30	0.39	0.38
			NBOL	0.43	0.49	0.32	0.36	0.36
82052	US 24 at Wick Rd.	US 24	NBIL	0.44	0.48	0.31	0.38	Resurfaced
			SBOL	0.44	0.47	0.32	0.36	Resurfaced
			SBIL	0.49	0.51	0.31	0.39	
			NBOL	0.45	0.45	0.30	0.35	
			NBIL	0.40	0.47	0.30	0.36	
82052	US 24 at Goddard Rd.	US 24	NBOL	0.40	0.43	0.29	0.37	Resurfaced
			SBOL	0.41	0.47	0.30	0.37	
			SBIL	0.45	0.43	0.28	0.36	
			NBIL	0.47	0.46	0.29	0.38	Resurfaced
			SBOL	0.47	0.47	0.30	0.38	Resurfaced
82052	US 24 at Northline Rd.	US 24	SBIL	0.48	0.45	0.30	0.37	
			NBOL	0.42	0.47	0.29	0.41	0.37
			NBIL	0.46	0.49	0.29	0.39	0.37
			SBOL	0.46	0.45	0.29	0.40	0.39
			SBIL	0.44	0.44	0.28	0.42	0.36
82041	M 17 at Pelham Rd.	M 17	EBOL	0.46	0.48	0.28	0.39	0.34
			EBIL	0.46	0.48	0.28	0.39	0.34
			NBIL	0.46	0.45	0.29	0.40	0.39
			SBOL	0.44	0.44	0.28	0.42	0.36
			SBIL	0.46	0.48	0.28	0.39	0.34
Average of all 2NS modified sand lanes				0.46	0.49	0.31	0.39	0.38

TABLE 17

## 3BCS SLAG SAND-ASPHALT RESURFACING

District 10 Intersections

Control Section No.	Intersection	Route	Direction and Lane	Average Coefficient of Wet Sliding Friction				
				Firestone Tire			General Tire	
				1961	1962	1963	1964	1965
82053	US 24 (NB) at 5 Mile Rd.	US 24	NBOL	0.55	0.46	0.32	0.33	0.34
			NBCL	0.50	0.47	0.35	0.29	0.31
			NBIL	0.52	0.41	0.34	0.31	0.32
82053	US 24 (NB) at W. Chicago Blvd.	US 24	NBOL	0.43	0.46	0.30	0.28	0.32
			NB 3	0.48	0.32	0.32	0.25	0.33
			NB 2	0.52	0.43	0.31	0.26	0.36
			NBIL	0.51	0.44	0.32	0.34	0.38
82053	US 24 (NB) at Joy Rd.	US 24	NBOL	0.53	0.47	0.31	0.32	0.35
			NB 3	0.55	0.45	0.33	0.28	0.35
			NB 2	0.54	0.45	0.35	0.33	0.37
			NBIL	0.55	0.46	0.33	0.32	0.35
			NBOL	0.51	0.52	0.33	0.35	0.31
82053	US 24 (NB) at Richardson St.	US 24	NB 3	0.54	0.58	0.34	0.36	0.37
			NB 2	0.58	0.57	0.33	0.40	0.40
			NBIL	0.61	0.57	0.36	0.43	0.41
			NBOL	--	--	--	0.31	0.34
			WB 3	0.53	0.42	0.33	0.25	0.29
82121	US 16 at Inkster Rd.	US 16	WB 2	0.55	0.41	0.31	0.29	0.30
			WBIL	0.55	0.42	0.31	0.30	0.30
			EBOL	0.51	0.41	0.29	0.35	0.33
			EB 3	0.49	0.42	0.31	0.29	0.30
			EB 2	0.54	0.44	0.31	0.31	0.35
82121	US 16 at Poinciana St.	US 16	EBIL	0.54	0.40	0.33	0.35	0.34
			WBOL	--	--	--	0.33	0.33
			WB 3	0.53	0.41	0.34	0.27	0.35
			WB 2	0.51	0.42	0.33	0.26	0.36
			WBIL	0.53	0.41	0.33	0.34	0.37
82121	US 16 at Beech-Daly Rd.	US 16	EBOL	--	--	--	0.33	0.35
			EB 3	0.52	0.43	0.33	0.31	0.35
			EB 2	0.53	0.44	0.34	0.30	0.38
			EBIL	0.55	0.43	0.32	0.35	0.40
			WBOL	--	--	--	0.28	0.31
82141	M 102 at Beech-Daly Rd.	US 16	WB 3	0.49	0.39	0.29	0.24	0.27
			WB 2	0.53	0.44	0.26	0.30	0.31
			WBIL	0.51	0.41	0.30	0.32	0.33
			EBOL	--	--	--	0.26	0.28
			EB 3	0.49	0.42	0.30	0.27	0.29
82141	M 102 at Inkster Rd.	Inkster Rd.	EB 2	0.48	0.40	0.29	0.30	0.30
			EBIL	0.46	0.40	0.32	0.29	0.32
			NB	0.47	0.42	0.29	0.25	0.27
			SB	0.45	0.39	0.28	0.34	0.37
			EBOL	0.48	0.40	0.28	0.20	0.27
82141	M 102 at Beech-Daly Rd.	M 102	EBCL	0.51	0.41	0.28	0.32	0.30
			EBIL	0.66	0.45	0.34	0.39	0.34
			EBOL	0.48	0.40	0.28	0.20	0.27
			EBCL	0.51	0.41	0.28	0.32	0.30
			EBIL	0.66	0.45	0.34	0.39	0.34
Average of all slag sand lanes				0.52	0.44	0.31	0.31	0.35

TABLE 18  
WYTON SYNTHETIC BINDER SURFACE COURSE MIXTURES

Project No.	Route	Location	Surface Applied	Aggregate	Percent Wyton	Mineral Filler	Direction and Lane	Average Coefficient of Wet Sliding Friction		
								1963	1964	1965
25-75, C1	Bristol Rd.	From M 15 West	Sept. 1963	(2NS) Local Pit - (31A) Wallace	6.0	Fly Ash	EB WB	0.47 0.46	0.48** 0.47**	0.46 0.44
39014B, C6*	US 131	US 131 at M 43	Sept. 1963	(2NS) American Aggregate, Kalama-zoo (Pit 39-1)	6.3	Limestone Dust - Material Service, Thornton, Illinois	NBOL NBIL	0.41 0.46	0.58** 0.62**	0.62 0.66
82112C, C28	I 696BS	John Lodge Expressway (I 696BS) at Wyoming Avenue	Oct. 1964	(2NS) Manning - Lockin (Pit 82-4) - (31A) American Aggregate, Green Oak (Pit 47-3)	6.6	Limestone Dust - Ohio Lime Co., Woodville, Ohio	NBOL NBCL NBIL SBOL SBCL SBIL	-- -- -- -- -- --	0.52 0.51 0.54 0.50 0.50 0.53	0.45 0.44 0.43 0.46 0.42 0.43
82112C, C8	I 96BS	Grand River Avenue (I 96BS) at Telegraph Rd. (US 24)	Oct. 1964	(2NS) Manning - Lockin (Pit 82-4)	6.6	Limestone Dust - Ohio Lime Co., Woodville, Ohio	EBOL	--	0.47	0.34
							EB 3	--	0.54	0.36
							EB 2	--	0.52	0.33
							EBIL	--	0.66	0.35
							WBOL	--	0.57	0.36
							WB 3	--	0.55	0.35
							WB 2	--	0.57	0.33
							WBIL	--	0.54	0.36
							NBOL	--	0.60	0.41
							NB 3	--	0.51	0.38
NB 2	--	0.55	0.35							
NBIL	--	0.60	0.38							
SBOL	--	0.62	0.45							
SB 3	--	0.59	0.37							
SB 2	--	0.54	0.37							
SBIL	--	0.66	0.40							

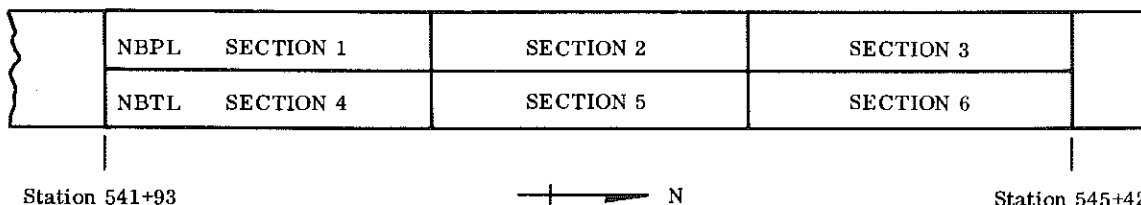
\* See Authorization No. R2006 and S2007.  
\*\* Average of two 1964 test series.

TABLE 19  
 ASPHALT EMULSION HOT MIX SURFACE COURSES  
 US 127: Lansing Intersections (Project Mob 33032C, C6)

Intersection	Surface Type	Direction and Lane	Average Coefficient of Wet Sliding Friction		
			1964*	1964**	1965
Cedar Street (US 127) at Holmes Road	Sand emulsified asphalt hot mix surface course	NBOL	0.19	0.49	0.42
		NBIL	0.20	0.47	0.41
		SBOL	0.23	0.45	0.40
		SBIL	0.22	0.47	0.40
		Avg.	0.21	0.47	0.41
Cedar Street (US 127) at Baker Street	Bituminous concrete emulsified hot mix wearing course	NBOL	0.24	0.48	0.38
		NBIL	0.31	0.56	0.47
		SBOL	0.33	0.47	0.39
		SBIL	0.32	0.55	0.39
		Avg.	0.30	0.52	0.41

\* Tests conducted prior to resurfacing.  
 \*\* Initial tests after resurfacing.

TABLE 20  
 GROUND CORNCOBS IN BITUMINOUS MIXTURES  
 US 23 North of Ann Arbor (Patching Group No. Mm 5BC-8B)



Section No.	Type of Surfacing	Length (ft)	Average Wet Sliding Friction Values		
			1-8-65	4-7-65	11-11-65
1	2NS Sand Asphalt containing ground corn cobs	55	0.57	0.58	0.51
2	4.12 Wearing Course containing ground corn cobs	30	0.64	0.64	0.54
3	4.12 Wearing Course	264	0.54	0.58	0.53
4	2NS Sand Asphalt	55	0.55	0.54	0.47
5	4.12 Wearing Course	30	---	---	---
6	4.12 Wearing Course	264	0.56	0.57	0.47

TABLE 21  
EXPERIMENTAL SKID-RESISTANT RESURFACING

Control Section	Location	1965 Construction Months	Mixture Type	Route	Direction and Lane	Coefficient of Wet Sliding Friction		
						Average	Low	High
09033	US 23 at Linwood Rd., N of Bay City	Oct.	80-lb Sandstone + asphalt	US 23	NBOL	0.71	0.69	0.73
				US 23	NBIL	0.72	0.70	0.73
				US 23	SBOL	0.73	0.70	0.76
				US 23	SBIL	0.76	0.73	0.78
09033	US 23 at Grove St., N of Bay City	Sept.-Oct.	80-lb Sandstone + asphalt	US 23	NBOL	0.73	0.72	0.73
				US 23	NBIL	0.76	0.73	0.78
				US 23	SBOL	0.75	0.74	0.75
				US 23	SBIL	0.76	0.74	0.78
09042	M 25 at Wagner Rd., E of Bay City	Sept.	80-lb Sandstone + asphalt	M 25	EB	0.77	0.76	0.78
				M 25	WB	0.74	0.70	0.76
25072	M 54 at Carpenter Rd., N of Flint	Oct.	50-lb Quartzite + asphalt	M 54	NBOL	0.74	0.71	0.76
				M 54	NBIL	0.78	0.77	0.78
				M 54	SBOL	0.73	0.69	0.75
				M 54	SBIL	0.76	0.71	0.78
25072	M 54 at Coldwater Rd., N of Flint	Oct.	50-lb Quartzite + asphalt	M 54	NBOL	0.67	0.65	0.70
				M 54	NBIL	0.77	0.76	0.78
				M 54	SBOL	0.70	0.66	0.73
				M 54	SBIL	0.78	0.73	0.78
25073	M 54 at M 57 N of Flint	Sept.	50-lb Quartzite + asphalt + additive	M 54 BR	NBOL	0.70	0.69	0.72
				M 54 BR	NBIL	0.71	0.70	0.72
				M 54 BR	SBOL	0.65	0.65	0.66
				M 54 BR	SBIL	0.71	0.69	0.72
				M 57	EB	0.70	0.69	0.72
				M 57	WB	0.72	0.70	0.73
25072	M 54 at M 54 BR (S Jct.), S of Flint	Oct.	50-lb crushed beach pebbles + asphalt	M 54	NBOL	0.60	0.59	0.62
				M 54	NBIL	0.66	0.63	0.67
				M 54 BR	SBOL	0.62	0.59	0.66
				M 54 BR	SBIL	0.66	0.66	0.67
				M 54 (Dort)	WBOL	0.62	0.61	0.62
				M 54 (Dort)	WBIL	0.62	0.61	0.63
25061	M 121 at Fenton Rd., S of Flint	Oct.	50-lb trap rock + asphalt	M 121	EBOL	0.66	0.65	0.69
				M 121	EBIL	0.68	0.66	0.66
				M 121	WBOL	0.68	0.65	0.69
				M 121	WBIL	0.69	0.68	0.69
47065	I 96 WB Off-Ramp at Grand River, W of Brighton	Sept.	80-lb 2MS + Wyton	I 96 Off-Ramp	WBOL	0.58	0.57	0.59
				I 96 Off-Ramp	WBIL	0.62	0.61	0.63
81031	US 12, W from Neblo Rd., NW of Clinton	Sept.	50-lb 3BC + hot asphalt emulsion	US 12	EB	0.60	0.57	0.63
				US 12	WB	0.62	0.61	0.65
81031	US 12, E from Lima Center Rd., NW of Clinton	Sept.	50-lb 2MS + hot asphalt emulsion	US 12	EB	0.58	0.56	0.59
				US 12	WB	0.60	0.59	0.61
82052	US 24 at Fenkell Rd. (Five Mile Rd.), Detroit	Sept.	50-lb 3BC + asbestos fiber + asphalt	US 24	NBOL	0.56	0.54	0.59
				US 24	NB#3	0.53	0.51	0.55
				US 24	NB#2	0.57	0.57	0.57
				US 24	NBIL	0.60	0.60	0.61
				US 24	SBOL	0.52	0.51	0.53
				US 24	SBCL	0.60	0.59	0.60
				US 24	SBIL	0.59	0.59	0.60
				Five Mile Rd.	EBOL	0.51	0.51	0.51
				Five Mile Rd.	EBIL	0.55	0.55	0.56
				Five Mile Rd.	WBOL	0.55	0.53	0.56
Five Mile Rd.	WBIL	0.60	0.59	0.62				

TABLE 21 (Cont.)  
EXPERIMENTAL SKID-RESISTANT RESURFACING

Control Section	Location	1965 Construction Months	Mixture Type	Route	Direction and Lane	Coefficient of Wet Sliding Friction		
						Average	Low	High
82053	US 24 at Schoolcraft Rd., Detroit	Sept.	50-lb 3BC + asbestos fiber + asphalt	US 24	NBOL	0.54	0.51	0.55
					NBCL	0.53	0.52	0.54
					NBIL	0.55	0.55	0.55
					SBOL	0.48	0.47	0.50
					SBCL	0.51	0.51	0.51
					SBIL	0.52	0.52	0.52
					Schoolcraft Rd. EB R. Turn	0.55	0.53	0.56
					Schoolcraft Rd. EB#3	0.52	0.52	0.53
					Schoolcraft Rd. EB#2	0.54	0.53	0.55
					Schoolcraft Rd. EBIL	0.56	0.55	0.56
					Schoolcraft Rd. WB R. Turn	0.55	0.55	0.55
					Schoolcraft Rd. WB#3	0.55	0.55	0.55
					Schoolcraft Rd. WB#2	0.51	0.51	0.52
					Schoolcraft Rd. WBIL	0.55	0.55	0.56
82053	US 24 at Plymouth Rd., Detroit	Sept.-Oct.	50-lb 2MS + asbestos fiber + asphalt	US 24	NBOL	0.59	0.59	0.60
					NB#3	0.59	0.56	0.61
					NB#2	0.62	0.61	0.62
					NBIL	0.62	0.61	0.63
					SBOL	0.60	0.60	0.61
					SB#3	0.62	0.61	0.63
					SB#2	0.61	0.60	0.63
					SBIL	0.64	0.62	0.66
					Plymouth Rd. EBOL	0.62	0.60	0.63
					Plymouth Rd. EBCL	0.63	0.63	0.63
					Plymouth Rd. EBIL	0.64	0.61	0.67
					Plymouth Rd. WBOL	0.63	0.62	0.63
					Plymouth Rd. WBCL	0.61	0.60	0.63
					Plymouth Rd. WBIL	0.60	0.59	0.63
82053	US 24 at W. Chicago Rd., Detroit	Oct.	80-lb 2MS + 31AA + asphalt	US 24	NBOL	0.57	0.55	0.58
					NB#3	0.58	0.58	0.59
					NB#2	0.61	0.59	0.62
					NBIL	0.62	0.62	0.63
					NB L. Turn	0.62	0.62	0.63
					SBOL	0.56	0.55	0.57
					SBCL	0.57	0.55	0.58
					SBIL	0.59	0.55	0.62
					W. Chicago Rd. EB R. Turn	0.63	0.62	0.65
					W. Chicago Rd. EBIL	0.63	0.62	0.63
					W. Chicago Rd. WB R. Turn	0.63	0.62	0.63
W. Chicago Rd. WBIL	0.63	0.62	0.65					
82071	US 24 at Sibley Rd., Detroit	Oct.	80-lb 3NS + 31AA + asphalt	US 24	NBOL	0.50	0.50	0.51
					NBIL	0.52	0.50	0.53
					SBOL	0.51	0.49	0.54
					SBIL	0.51	0.49	0.53
					Sibley Rd. EB	0.54	0.52	0.55
					Sibley Rd. WB	0.52	0.51	0.54
11031	M 139 at Napier Rd., Benton Harbor	Oct.	80-lb 3NS (P-4) + Trinidad sheet asphalt	M 139	NBOL	0.51	0.49	0.53
					NBIL	0.44	0.41	0.48
					SBOL	0.47	0.44	0.49
					SBIL	0.46	0.44	0.49
					Napier Rd. EBOL	0.43	0.41	0.44
					Napier Rd. EBIL	0.47	0.44	0.49
					Napier Rd. WBOL	0.45	0.41	0.49
					Napier Rd. WBIL	0.48	0.47	0.48
11031	M 139 NB at Empire Rd., Benton Harbor	Oct.	80-lb 3NS (P-4) + Synopal + asphalt	M 139	NBOL	0.44	0.43	0.44
					NBIL	0.50	0.49	0.50
11031	M 139 SB at Empire Rd., Benton Harbor	Oct.	80-lb 3NS (P-4) + asphalt	M 139	SBOL	0.45	0.44	0.46
					SBIL	0.48	0.47	0.49

TABLE 22  
SAND-ASPHALT SKID RESISTANT RESURFACING  
AT INTERSECTIONS

(CONT'D)

Control Section	Location	Route	Direction and Lane	Coefficient of Wet Sliding Friction		
				Average	Low	High
13061	M 96 at Hussey Ave.	M 96	EB WB	0.49 0.50	0.48 0.50	0.49 0.51
25041	M 78 from I 75 to Ballenger Rd.	M 78	EBOL EBIL WBOL WBIL	0.58 0.61 0.58 0.63	0.57 0.60 0.58 0.62	0.59 0.61 0.59 0.64
25072	M 54 at Mt. Morris Rd.	M 54	NBOL NBIL SB R. Turn SBIL	0.63 0.70 0.72 0.71	0.61 0.70 0.72 0.69	0.64 0.71 0.73 0.73
25081	M 21 at Graham Rd.	M 21	EBOL EBIL WBOL WBIL	0.61 0.61 0.57 0.61	0.60 0.59 0.55 0.59	0.62 0.63 0.59 0.63
25083	M 21 at Center Rd.	M 21	EBOL EBIL WBOL WBIL	0.52 0.56 0.53 0.60	0.51 0.56 0.51 0.59	0.53 0.59 0.55 0.62
25091	M 15 at Lapeer Rd.	M 15	NB SB	0.56 0.59	0.54 0.57	0.58 0.60
33042	M 43 WB (Grand River Ave.) at Foster St.	M 43	WBOL WB#3 WB#2 WBIL	0.50 0.52 0.49 0.53	0.49 0.51 0.48 0.51	0.51 0.53 0.51 0.55
39042	M 96 at River St.	M 96	EBOL EBIL WBOL WBIL	0.50 0.50 0.48 0.50	0.48 0.49 0.47 0.48	0.51 0.51 0.48 0.51
41051	M 44 at Cascade Rd.	M 44	NBOL NBIL SBOL SBIL Cascade Rd. Cascade Rd. Cascade Rd.	0.44 0.48 0.45 0.45 0.49 0.54 0.52	0.42 0.47 0.44 0.44 0.48 0.51 0.50	0.46 0.49 0.46 0.48 0.49 0.56 0.53
47082	M 59 at Old US 23	M 59	EB WB	0.72 0.72	0.70 0.71	0.74 0.73
58052	US 24 at Stewart Rd.	US 24	NB SB	0.70 0.66	0.67 0.65	0.72 0.67
58071	US 25 at Stewart Rd.	US 25	NBOL NBIL SBOL SBIL	0.67 0.69 0.67 0.67	0.66 0.69 0.66 0.65	0.69 0.70 0.69 0.69
73073	M 81 at Center Rd.	M 81	EBOL EBCL EBIL WBOL WBCL WBIL NB Center St.	0.67 0.68 0.74 0.61 0.63 0.69 0.71	0.64 0.66 0.73 0.60 0.62 0.65 0.70	0.69 0.70 0.76 0.62 0.66 0.72 0.73
81032	US 12 BR at Harris Rd.	US 12 BR	EBOL EBIL WBOL WBIL	0.52 0.54 0.51 0.54	0.51 0.51 0.50 0.53	0.53 0.56 0.51 0.55
81081	M 17 at Carpenter Rd.	M 17	EBOL EBIL WB Carpenter Rd.	0.53 0.50 0.52 0.53	0.51 0.49 0.51 0.51	0.55 0.51 0.53 0.55
82041	M 17 at Beech-Daily Rd.	M 17	EBOL EBIL WBOL WBIL Beech-Daily Rd. Beech-Daily Rd. Beech-Daily Rd.	0.62 0.63 0.58 0.60 0.65 0.67 0.64	0.60 0.60 0.56 0.59 0.62 0.65 0.63	0.65 0.65 0.59 0.62 0.67 0.69 0.65
82041	M 17 at Inkster Rd.	M 17	EBOL EBIL WBOL WBIL Inkster Rd. Inkster Rd.	0.55 0.59 0.54 0.61 0.56 0.56	0.53 0.57 0.53 0.60 0.55 0.55	0.58 0.61 0.55 0.62 0.55 0.56
82041	M 17 at Middlebelt Rd.	M 17	EBOL EBIL WBOL WBIL	0.52 0.48 0.46 0.46	0.49 0.45 0.44 0.44	0.55 0.49 0.48 0.48



(CONT'D)

TABLE 22 (Cont.)  
SAND-ASPHALT SKID RESISTANT RESURFACING  
AT INTERSECTIONS

Control Section	Location	Route	Direction and Lane	Coefficient of Wet Sliding Friction		
				Average	Low	High
82052	US 24 at Annapolis Rd.	US 24	NBOL	0.54	0.53	0.55
		US 24	NB#3	0.54	0.53	0.55
		US 24	NB#2	0.52	0.52	0.53
		US 24	NBIL	0.52	0.51	0.53
		US 24	SBOL	0.55	0.54	0.56
		US 24	SBCL	0.55	0.55	0.55
		US 24	SBIL	0.53	0.53	0.54
		US 24	NBOL	0.54	0.52	0.55
		US 24	NB#3	0.55	0.51	0.58
		US 24	NB#2	0.54	0.53	0.57
		US 24	NBIL	0.54	0.51	0.57
		US 24	SBOL	0.55	0.51	0.59
		US 24	SBCL	0.54	0.51	0.55
		US 24	SBIL	0.52	0.50	0.54
82052	US 24 at Joy Rd.	Joy Rd.	EBOL	0.55	0.53	0.56
		Joy Rd.	EBIL	0.59	0.57	0.60
		Joy Rd.	WBOL	0.54	0.53	0.56
		Joy Rd.	WBIL	0.56	0.55	0.57
		US 24	NBOL	0.54	0.52	0.55
		US 24	NB#3	0.55	0.51	0.58
82052	US 24 at Oxford St.	US 24	NBOL	0.52	0.50	0.54
		US 24	NB#3	0.51	0.50	0.51
		US 24	NB#2	0.49	0.48	0.50
		US 24	NBIL	0.51	0.49	0.52
		US 24	NBOL	0.54	0.53	0.57
		US 24	NBCL	0.54	0.51	0.57
		US 24	NBIL	0.57	0.55	0.59
		US 24	SBOL	0.53	0.51	0.55
		US 24	SBCL	0.53	0.50	0.55
		US 24	SBIL	0.53	0.49	0.55
		US 24	EBOL	0.41	0.39	0.44
		US 24	EBIL	0.49	0.48	0.50
		US 24	WBOL	0.48	0.47	0.51
		US 24	WBIL	0.52	0.51	0.52
82052	US 24 at Van Borne Rd.	US 24	NBOL	0.54	0.53	0.57
		US 24	NBCL	0.54	0.51	0.57
		US 24	NBIL	0.57	0.55	0.59
		US 24	SBOL	0.53	0.51	0.55
		US 24	SBCL	0.53	0.50	0.55
		US 24	SBIL	0.53	0.49	0.55
		US 24	EBOL	0.41	0.39	0.44
		US 24	EBIL	0.49	0.48	0.50
		US 24	WBOL	0.48	0.47	0.51
		US 24	WBIL	0.52	0.51	0.52
		US 12	EBOL	0.49	0.48	0.51
		US 12	EBIL	0.53	0.52	0.55
		US 12	WBOL	0.50	0.48	0.51
		US 12	WBIL	0.51	0.51	0.51
82061	US 12 at Canton Center Rd.	US 12	EBOL	0.51	0.51	0.51
		US 12	EBIL	0.50	0.49	0.50
		US 12	WBOL	0.51	0.51	0.51
		US 12	WBIL	0.54	0.51	0.59
		US 12	EBOL	0.55	0.53	0.59
		US 12	EBIL	0.56	0.53	0.59
82061	US 12 at Sheldon Rd.	US 12	WBOL	0.51	0.47	0.54
		US 12	WBIL	0.54	0.54	0.55
		US 12	EBOL	0.55	0.53	0.59
		US 12	EBIL	0.56	0.53	0.59
		US 12	WBOL	0.51	0.47	0.54
		US 12	WBIL	0.54	0.54	0.55

**TABLE 23**  
**BITUMINOUS CONCRETE INTERSTATE PROJECTS**  
**I 75-US 27 from Clare to Indian River (Projects listed from South to North)**

Project No.	Length (mi.)	Location	Date Paved (Wearing Course)	Paving Contractor	Source of Coarse Aggregate	Average Coefficient of Wet Sliding Friction													
						1961						1962						General Tire	
						IL*	OL*	IL	OL	IL	OL	IL	OL	IL	OL	IL	OL		
18033, C5	4.150	N of Hutton Rd. to M 61	June 1963	Pierston Const. Co.	Wallace Stone Co. (Pit 32-4)	--	--	--	--	--	--	--	--	0.60	0.40	0.52	0.44		
18034, C3	6.756	M 61 to Arnold Rd.	May-June 1962	Rieth-Riley	Wallace Stone Co. (Pit 32-4)	0.52**	0.51**	--	--	--	--	--	--	0.56	0.47	0.64	0.48		
18034, C1	5.202	Arnold Rd. N to Rosecommon Co. Line	July-Aug.-Oct. 1961	Mid-America Eng.	Wallace Stone Co. (Pit 32-4)	0.60	0.60	0.60	0.52	--	--	--	--	0.61	0.49	0.62	0.51		
72013, C2	3.007	Rosecommon Co. Line N 3.007 mi.				--	--	--	--	--	--	--	--	0.58	0.47	0.69	0.57		
72013, C1	9.643	3.007 mi. N of Clare Co. Line to 0.5 mi. N of M 35	July-Aug.-Sept. 1961	Ann Arbor Const. & Lake & Howell	Afon Quarry (Pit 20-35)	--	--	0.60	0.50	--	--	--	--	0.57	0.44	0.63	0.41		
72014, C1	6.981	0.5 mi. N of M 55 to 0.5 mi. N of Higgins Lake Rd.	Sept.-Oct. 1961	Thornton Const.	Pickitt, Schreur (Merritt Pit)	0.52	0.48	0.60	0.53	--	--	--	--	0.58	0.51	0.70	0.62		
72014, C3	4.220	0.4 mi. N of Higgins Lake State Park Rd. N	Sept.-Oct. 1961 and May-June 1962	Thornton Const.	Pickitt, Schreur (Merritt Pit)	--	--	0.54	0.48	--	--	--	--	0.58	0.51	0.67	0.53		
72014, C4	6.273	0.6 mi. S of Rosecommon-Crawford Co. Line to M 18-M 76	May-June 1962	Thornton Const.	Pickitt, Schreur (Merritt Pit)	--	--	0.51	0.49	--	--	--	--	0.58	0.53	0.68	0.59		
20015, C3	5.063	M 18-M 76 to 0.5 mi. S of M 72	Aug.-Sept. 1961	Lake & Howell	Afon Quarry (Pit 20-35)	0.43	0.43	0.56	0.43	--	--	--	--	0.53	0.40	0.66	0.43		
20014, C3	5.076	0.5 mi. S of M 72 to 0.5 mi. N of M 80	Sept.-Oct. 1961	Saginaw Asphalt	Afon Quarry (Pit 20-35)	0.53	0.50	0.60	0.50	0.56	0.49	0.53	0.46	0.74	0.54	0.83	0.45		
20015, C2	4.864	0.5 mi. N of M 93 to Co. Rd. 612	May-June 1962	Thornton Const.	McCready Pit (Pit 60-18)	--	--	0.56	0.51	0.57	0.55	0.57	0.51	0.70	0.64	0.66	0.59		
20015, C3	4.847	Co. Rd. 612 to N. Crawford Co. Line	Sept. 1961	Thornton Const.	McCready Pit (Pit 60-18)	0.60	0.56	0.60	0.52	0.61	0.56	0.59	0.51	0.73	0.63	0.66	0.59		
69013, C1	7.665	Owego Co. Line N Mariette Rd. to Charles Brink Rd.	Oct. 1961 June 1962	Saginaw Asphalt	Afon Quarry (Pit 20-35)	--	--	--	--	0.57	0.49	0.59	0.54	0.70	0.54	0.80	0.44		
69013, C3, C5	5.385	Charles Brink Rd. N to M 32 (Gaylord)	June 1962	Spartan Asphalt	Lewiston Pit	--	--	--	--	0.59	0.54	0.63	0.57	0.71	0.62	0.66	0.57		
69014, C1, C3	8.719	M 32 (Gaylord) N to Vanderbilt	June-July 1962	Spartan Asphalt	Lewiston Pit and Drummond Dolomite (Pit 17-40)	--	--	0.54	0.52	0.60	0.58	0.58	0.57	0.70	0.60	--	--		
69014, C5	3.894	Vanderbilt to 3/4 mi. N of Wolverine Rd.	Sept.-Oct. 1962	Rieth-Riley	Afon Quarry (Pit 20-35)	--	--	--	--	0.60	0.55	0.58	0.48	0.75	0.53	0.71	0.51		
18033, C1	6.657	NB from Alexander Rd. to NYC RR - SB from Co. Line to NYC RR	June 1963			--	--	--	--	--	--	--	--	0.51	0.47	0.69	0.50		
16033, C3, C5	7.942	3/4 mi. N of Wolverine Rd. to 0.5 mi. S of M 66	Aug.-Sept. 1962	Saginaw Asphalt	Afon Quarry (Pit 20-35)	--	--	0.56	0.52	0.62	0.55	0.60	0.50	0.65	0.50	0.67	0.44		
16031, C9	2.629	0.5 mi. S of M 68 N to MC RR	Aug.-Sept. 1962	East Shore Asphalt	Big Cut Pit (Pit 71-15)	--	--	0.63	0.58	--	--	--	--	0.63	0.56	0.75	0.60		

\* IL and OL denote passing and traffic lanes.  
 \*\* Tested on leveling course mix.  
 \*\*\* CWF is wear factor for traffic lane only.

TABLE 24  
BRIDGE DECK SURFACE COATINGS

Bridge No.	Location	Year Coated	Type of Coating	Direction and Lane	Avg. Coefficient of Wet Sliding Friction	
					1964	1965
B04 of 06073	US 23 over Whitney Drain	1965	Coal tar epoxy plus quartz applied to steel plate deck	NB	--	0.59
				SB	--	0.63
B01 of 10042*	M 115 over Betsie River	1963	Coal tar slurry and fine sand applied to old bituminous concrete	NWB	0.19	0.27
				SEB	0.20	0.26
X01 of 11016**	I 94 over NYC RR	1963	Coal tar epoxy plus crushed quartz applied to cracked concrete deck	EBOL	--	0.50
X01 of 11031	M 139 over NYC RR	1964	North 5 spans of deck only 31A bituminous concrete applied to repaired concrete deck	WBOL	--	0.44
				NBOL	--	0.40
				NBIL	--	0.42
				SBOL	--	0.47
			South 4 spans of deck only Rubberized sand asphalt applied to repaired concrete deck	SBIL	--	0.43
				NBOL	--	0.41
				NBIL	--	0.45
				SBOL	--	0.42
B01 of 31012	US 41 over Portage Lake, Houghton	1963	Coal tar epoxy plus quartz applied to concrete filled steel grid	SBIL	--	0.49
				NBOL	--	0.42
				NBIL	--	0.37
				SBOL	--	0.38
B01 of 34032	M 66 over Grand River	1961	Polysulfide-epoxy coating applied 80 sq ft/gal and 8-30 mesh quartz applied to scaled and cracked concrete	SBIL	--	0.43
				NBOL	0.28	0.33
				NBIL	0.30	0.33
				SBOL	0.26	0.33
B01 of 34044	I 96 WB over Grand River	1961	East half of deck only Coal tar slurry (rubberized) and 8-30 mesh quartz applied to cracked concrete	SBIL	0.25	0.33
				WBOL	0.31	0.34
				WBIL	0.41	0.38
				WBOL	0.52	0.51
			West half of deck only Coal tar epoxy (Guard Kote 140) 0.3 gal/sq yd and 80-30 mesh quartz applied to cracked concrete	WBIL	0.67	0.60
B01 of 35032	US 23 over Au Sable River, Oseoda	1965	Coal tar epoxy plus quartz applied to steel plate deck	NB	--	0.51
				SB	--	0.48
B01 of 45041	M 204 over Lake Leelanau Narrows	1964	Coal tar epoxy plus quartz applied to repaired concrete deck	EB	--	0.59
				WB	--	0.60
B01 of 51041*	M 115 over Betsie River	1963	Coal tar slurry and fine sand applied to old bituminous concrete	NWB	0.25	0.30
				SEB	0.25	0.30
X01 of 51041*	M 115 over C&O RR	1963	Coal tar slurry and fine sand applied to old bituminous concrete	NWB	0.24	0.30
B01 of 58022	M 57 over Flat River	1962	Coal tar slurry (rubberized) and 8-30 mesh quartz applied to new bituminous concrete	SEB	0.24	0.28
				WB	0.27	0.30
B01 of 78051	M 24 over Cass River	1964	Wyton with 2NS sand mix applied at 50 lb/sq yd to old concrete deck	EB	0.26	0.32
				SB	0.51	0.50

\* County Maintenance Projects

\*\* Due to construction in the area, it was impractical to test inside lanes this year.

**Section 3**  
**HIGH ACCIDENT INTERSECTIONS**

## HIGH ACCIDENT INTERSECTIONS

This section reports the Department's continuing program to reduce skidding accidents on wet pavement at critical intersections. High-accident intersections selected by the Traffic Division are skid-tested to indicate priorities for resurfacing. In some cases, these locations are used for testing of experimental skid-resistant resurfacing mixtures.

Table 25 summarizes tests in 1965, including locations in Districts 1, 2, 3, and 4, as requested by the Traffic Division. Because data on high accident intersections and areas were not received by the Research Laboratory until November, tests were conducted at only 19 locations in only four districts before poor weather ended the testing season.

TABLE 25  
HIGH ACCIDENT INTERSECTIONS\*  
Districts 1 through 4 -- Tests Run in November 1965

Intersection	1964 Accidents		Test Location	Surface Type	Average Coefficient
	Total	Wet Surface			
<b>District 1</b>					
<u>Dickinson County</u>					
US 2, Control Section 22021, from W end of bridge-State Line E 1/2 mile	3	--	US 2, EB US 2, WB	BC-G BC-G	0.47 0.49
<u>Iron County</u>					
M 73, Control Section 36011, from intersection of US 2 SW 1 mile	3	--	M 73, NB M 73, SB	ST-G ST-G	0.49 0.53
US 2, Control Section 36022, from curve 1/2 mile W of W Jct of US 141 E to W limits of Crystal Falls	3	--	US 2, EB US 2, WB	BC-G BC-G	0.42 0.44
<u>Marquette County</u>					
M 35, Control Section 52032, from EA Rd NW 3/4 mile, around curve	4	--	M 35, NB M 35, SB	ST-G ST-G	0.51 0.51
US 41, Control Section 52042, from Airport Rd (JPA) E to 500-ft E of M 35 Relocation	3	--	US 41, EBOL US 41, EBIL US 41, WBOL US 41, WBIL	Conc Cone Cone Cone	0.53 0.46 0.44 0.51
<u>Ontonagon County</u>					
M 64, Control Section 66012, from the Mineral River bridge S 0.3 mile	3	--	M 64, NB M 64, SB	BA-G BA-G	0.63 0.65
<b>District 2</b>					
<u>Delta County</u>					
US 2-US 41, Control Sections 21023, 21054 and 21051, at Jct and E on US 2	6	--	US 2-US 41, EB US 2, WB US 41, SB	BC-L BC-L BC-L	0.26 0.26 0.23
US 2, Control Section 21024, at intersection with County Rd 483 and N-32	3	--	US 2, EB US 2, WB County Rd 483, NB	BC-L BC-L --	0.61 0.61 0.44
M 35, Control Section 21032, from 0.3 mile S of Rd G-22 N 1.25 miles	3	--	M 35, NB M 35, SB	BA-L BA-L	0.26 0.32
<u>Schoolcraft County</u>					
US 2, Control Section 75021, at M 149 Intersection	3	--	US 2, EB US 2, WB M 149, SB	BC-L BC-L BA-G	0.53 0.58 0.60
US 2, Control Section 75022, spot check from 0.5 mile E of 800 Line RR E 1.25 mile	4	--	US 2, EB US 2, WB	BC-G BC-G	0.37 0.35
<b>District 3</b>					
<u>Clare County</u>					
US 27 BR, Control Section 15031, from N limits of Clare N to US 27	5	--	US 27 BR, NB US 27 BR, SB	BC-L BC-L	0.31 0.33
<u>Alpena County</u>					
M 32, Control Section 04021, spot check from 0.25 mile W of W limits of Alpena W 3 miles	6	--	M 32, EB M 32, WB	ST-G ST-G	0.34 0.34
US 23, Control Section 04031, from 0.25 mile S of S limits of Alpena S 1.50 miles	10	--	US 23, NB US 23, SB	BC-G BC-G	0.40 0.36
US 23, Control Section 04032, spot check from N limits of Alpena N 2.50 miles	7	--	US 23, NB US 23, SB	BC-G BC-G	0.44 0.47
<u>Iosco County</u>					
US 23, Control Section 35032, from 1.0 mile N of Ausable Pt. Rd N 1.0 mile	4	--	US 23, NB US 23, SB	BC-G BC-G	0.51 0.53
US 23, Control Section 35032, from 0.25 mile S of Johnson Rd N 2.50 Miles	9	--	US 23, NB US 23, SB	BC-G BC-G	0.51 0.47
<u>Roscommon County</u>					
M 55, Control Section 72022, spot check entire Control Section (about 6.0 miles)	15	--	M 55, EBOL M 55, EBIL M 55, WBOL M 55, WBIL	BC-G BC-G BC-G BC-G	0.42 0.44 0.39 0.44
M 55, Control Section 72031, spot check entire Control Section (about 3.5 miles)	9	--	M 55, EBOL M 55, EBIL M 55, WBOL M 55, WBIL	BC-G BC-G BC-G BC-G	0.43 0.47 0.43 0.46

\*Requested by Traffic Division on basis of 1964 Traffic accident records.

Section 4  
SPECIAL REQUEST TESTS

## SPECIAL REQUEST TESTS

During the course of any one year, many requests for skid testing of certain questionable areas are received from field personnel or through the Offices of Design, Testing and Research, and Maintenance. Such requests are generally incorporated into the Laboratory's skidometer program and the results forwarded to the person or agency making the request. Table 26 contains skid test data resulting from 13 special requests received during 1965.



TABLE 26  
1965 "SPECIAL REQUEST" SKID TEST RESULTS

Special Request No.*	Project No.	Location	Surface Type	Direction and Lane	Coefficient of Wet Sliding Friction
1	BF 11017, C3RN BI 11016, C1RN	I 94 from S of Carmody Rd. SW to 575 ft S of Main St., S of Benton Harbor	Conc.	EBOL	0.46
				EBIL	0.60
				WBOL	0.51
				WBIL	0.57
1	BI 11016, C3RN	I 94 from 575 ft S of Main St. SW to 1,842 ft N of Townline Rd.	Conc.	EBOL	0.51
				EBIL	0.60
				WBOL	0.53
				WBIL	0.57
1	BI 11016, C2RN	I 94 from 1,842 ft N of Townline Rd. SW to the St. Joseph River	Conc.	EBOL	0.51
				EBIL	0.62
				WBOL	0.53
				WBIL	0.62
1	BI 11015, C1RN	I 94 from the St. Joseph River SW to Ridge Rd.	Conc.	EBOL	0.50
				EBIL	0.65
				WBOL	0.54
				WBIL	0.65
1	EBI 11015, C14UN EBI 11015, C10RN	I 94 from Ridge Rd. SW to Snow Rd.	B. C.	EBOL	0.49
				EBIL	0.63
				WBOL	0.40
				WBIL	0.57
1	BI 11015, C8RN	I 94 from Snow Rd. SW to 2,947 ft SW of Easy Rd.	B. C.	EBOL	0.41
				EBIL	0.65
				WBOL	0.45
				WBIL	0.62
1	EBI 11015, C16RN	I 94 from 2,947 ft SW of Easy Rd. SW to 2,100 ft S of M 60 - US 12 intersection	B. C.	EBOL	0.44
				EBIL	0.60
				WBOL	0.52
				WBIL	0.64
1	BI 11014A, C4	I 94 from 2,100 ft S of M 60 - US 12 intersection SW to LaPorte Rd.	B. C.	WBOL	0.39
				WBIL	0.40
2	F 73051B, C1R	M 13 from M 57 to S limits of Saginaw	B. C.	NB SB	0.36 0.37
3	SS 51031C, C4	M 22 from jct. US 31 N to Manistee-Benzie County line, omitting that portion in Onekama	B. A.	NB SB	0.40 0.43
3	DSS 51031, C1U	M 22, S to N limits of Onekma	B. A.	NB SB	0.35 0.33
4	82-190 C1	US 25 (Fort St.) at Dearborn Rd.	B. C.	EBOL	0.21
				EBCL	0.19
				EBIL	0.19
				WBOL	0.19
				WBCL	0.19
4	--	Dearborn Rd. at US 25 (Fort St.)	B. C.	NB	0.38
				SB	0.32
5	Mm 5BC-5D	M 44 from M 50 N to Knapp Rd.	B. A.	NB SB	0.46 0.43
6	70-42, C6	M 104 from 0.5 mi E of Spring Lake E to 130th St.	B. C.	EB	0.19
				WB	0.21
6	70-42, C4	M 104 from 130th St. E 0.4 mi	Conc.	EB	0.41
				WB	0.47
6	Mm 3BC-5F	M 104 from 0.4 mi E of 130th St. E to E of 120th St.	B. C.	EB	0.34
				WB	0.38
7	--	Main St. at Pine St., Lansing	B. C.	EBOL	0.21
				EBCL	0.31

TABLE 26 (Cont.)  
1965 "SPECIAL REQUEST" SKID TEST RESULTS

Special Request No.*	Project No.	Location	Surface Type	Direction and Lane	Coefficient of Wet Sliding Friction
7	--	Pine St. at Main St., Lansing	B. C.	SBOL	0.31
				SBIL	0.32
7	--	Main St. at Walnut St., Lansing	B. C.	EBOL	0.20
				EBCL	0.25
7	--	Walnut St. at Main St., Lansing	B. C.	NBOL	0.40
				NBCL	0.41
7	--	Main St. at Washington Ave., Lansing	B. C.	EBOL	0.20
				EBCL	0.20
				EBIL	0.20
7	--	Washington Ave. at Main St., Lansing	B. C.	NBOL	0.31
				NBIL	0.33
				SBOL	0.28
				SBIL	0.31
8	15-12, C3	US 31 from Dixon St. N to SW of Ainslie St., Charlevoix	Conc.	NBOL	0.47
				NBIL	0.44
				SBOL	0.43
				SBIL	0.42
8	15-12, C3	US 31 from SW to NE of Ainslie St., Charlevoix	Conc.	NBOL	0.34
				NBIL	0.37
				SBOL	0.40
				SBIL	0.34
8	15-12, C3	US 31 from NE of Ainslie St. to SW of Nicholls and Michigan Sts., Charlevoix	Conc.	NBOL	0.45
				NBIL	0.41
				SBOL	0.41
				SBIL	0.38
8	15-12, C3	US 31 from SW to E of Nicholls and Michigan Sts., Charlevoix	Conc.	NBOL	0.36
				NBIL	0.40
				SBOL	0.34
				SBIL	0.34
8	15-12, C3	US 31 from E of Nicholls and Michigan Sts., E and NE to N limits of Charlevoix	Conc.	NBOL	0.42
				NBIL	0.44
				SBOL	0.52
				SBIL	0.47
8	15-12, C2	US 31 from N limits of Charlevoix NE 2.0 miles	Conc.	NB	0.48
				SB	0.54
9	11-15, C3	US 31-33, N of Red Bud Trail	B. C.	NB	0.24
				SB	0.28
10	--	M 54 BR at Stanley Rd., Saginaw	Conc.	NBOL	0.38
				NBIL	0.42
				SBOL	0.37
				SBIL	0.39
10	--	Stanley Rd. at M 54 BR, Saginaw	B. C.	EB	0.49
				WB	0.53
11	Mb 45021C, C3	M 72 from Co. Rd. 651 E to M 22 in Traverse City	P & DS	EB	0.47
				WB	0.45
12	B02 of 11052	US 31-33 over St. Joseph River, Berrien Springs (Spans 2, 3, 4)	Conc.	NB	0.39
				SB	0.35
		US 31-33 over St. Joseph River, Berrien Springs (Spans 5, 6, 7, 8)	Conc.	NB	0.16
				SB	0.14
13	BI 80012B, C10	I 196 Rest Area, S of South Haven	O. T.	--	0.60

\* Numbered in order requests received from Traffic Division and other sources.