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PROFILOMETER MEASUREMENT OF BRIDGE ROUGHNESS Seventh Progress Report

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Research Laboratory Division Office of Testing and Research Research Project 61 F-65 Research Report No. R-542

Michigan State Highway Department Lansing, November 1965

PROFILOMETER MEASUREMENT OF BRIDGE ROUGHNESS Seventh Progress Report

This is the seventh and final publication of a series on profilometer measurement of the roughness of bridge decks. With this report, a total of 203 bridge projects have been reported. The first progress report in this series (Research Report No. R-421) described the profilometer equipment, gave procedures for testing and data analysis, and included measurements for 35 bridge projects. The second (Research Report No. R-430) reported measurements for an additional 22 bridge projects, including one structure of a project partially reported in the first report. The third (Research Report No. R-433) reported results for another 34 bridge projects and gave an updated analysis and evaluation of all bridge projects analyzed in this research program through November 1963. In that report, it was observed that as more project data became available. it was increasingly clear that no significant differences in surface roughness exist between hand-finished and transverse machine-finished bridge decks. The fourth (Research Report No. R-450) reported results for 35 more bridge projects and included an analysis of the effect of the deck beam type used in a bridge's construction on its relative roughness. The fifth progress report (Research Report No. R-469) presented results for a group of 20 bridge projects (23 separate structures). The sixth (Research Report No. R-492) included 41 bridge projects (49 separate structures). This seventh report presents results for a new group of 16 bridge projects (21 separate structures). Two bridges, B02 of 33061 and S34 of 82112, have previously been reported separately and are included here to complete the full series of reported structures.

In this report the same riding quality classification is used as before, expressed in terms of accumulated inches per mile:

"Good" = less than 100 "Average" = 100 to 160 "Poor" = over 160

Using these categories, the 89 "span-run" values (see Glossary), and the 21 "structure" values (see Glossary), measured for the 16 bridge projects for which test result forms are presented in this report, may be classified as follows:

····		Riding Quality									
Finishing Method		Span F	luns		Structures						
	Good	Average	Poor	Total	Good	Average	Poor	Total			
Hand	33	24	10	67	8	10	0	18			
Transverse Machine	0	4	0	4	0	1	0	1			
Longitudinal Machine	3	0	0	3	1	0	0	1			
Bid-Well Machine	11	4	0	15	1	0	0	1			
Totals	47	32	10	89	10	11	0	21			

Summary Remarks on Finishing Methods in Relation to Roughness

In completing this series of publications, a summary remark seems desirable concerning the principal comparison discussed in these progress reports. On the basis of all information now available, new cumulative frequency distributions of "span values" (see Glossary) are illustrated in Fig. 1. These curves for average roughness of span surfaces finished by various methods confirm previous conclusions, and indicate the following contributing factors to surface smoothness:

1. On the basis of three longitudinally finished bridge decks that have now been measured, it appears that this technique results in significantly smoother surfaces. The average roughness value for the bridges finished by this method is 64 in. per mile, much less than the hand-finished bridge average of 124 in. per mile, or the transverse-machine finished bridge average of 128 in. per mile.

2. Another special type of machine (Bid-Well) also produced somewhat smoother decks. Three bridges finished in this manner had an average roughness value of 96 in. per mile. Both the longitudinal and the Bid-Well finishing machines produced average roughness values within the "good" category of riding quality, although data indicate that the former gave significantly smoother results.

3. Differences in roughness resulting from finishing by hand or by transverse machine are not significant. This is also apparent in Fig. 2, where fitted frequency curves are presented of roughness distributions for complete structures rather than individual spans. No meaningful superiority of one finishing method over another is shown by either graphical comparison.



Figure 1. Cumulative frequency distributions of span values in relation to method of deck finishing.



Figure 2. Distributions of structure roughness in relation to method of deck finishing.

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Summary Remarks on Deck Support in Relation to Roughness

Another previously reported comparison for which an updated analysis of data is desirable in completing this report series, is roughness variation in relation to type of deck support. In the fourth progress report, a preliminary evaluation of 117 projects was discussed. It was inferred tentatively that a difference in mean roughness values did exist for bridge decks supported by deck plate girders, prestressed concrete I-beams, or steel I-beams. The range of the mean values was 17 in. per mile, and was within the "average" (100 to 160 in. per mile) category of riding quality.

Data now available from 187 structures are adequate for further comparison of the same three structural types previously examined:

- 1. Deck plate girders (40 structures)
- 2. Prestressed concrete I-beams (24 structures)
- 3. Steel I-beams (123 structures).

Frequency distributions of structure values for these three beam types are plotted in Fig. 3. Based on these sample data, statistical evaluation now indicates no significant difference in average roughness values. The range (13 in. per mi.) is smaller than in the previous analysis, but still within the "average" category of riding quality.

On the other hand, of structures supported by prestressed concrete I-beams, 37 percent have roughness values falling within the "good" category. This may be compared with only 11 percent for deck plate girders, and 17 percent for steel I-beams. Further, the distribution of roughness values for prestressed concrete I-beams is skewed to the right, differing markedly in form from those of the other two deck support types. These facts suggest that an actual difference in distribution form and mean may exist for roughness of such structures. Further measurements of additional structures of this type would be necessary to demonstrate a statistically significant relationship between greater deck smoothness and use of such beams.



Figure 3. Distributions of structure values for types of deck support.

GLOSSARY

(0.1)

BRIDGE PROJECT: used in this report series to refer to the Department's standard identification by construction project number, sometimes involving more than one structure. It should be noted that roughness is analyzed and reported in terms of "span," "span run," or "structure" values.

IWP: inner wheel path, in relation to the structure's centerline.

OWP: outer wheel path, in relation to the structure's centerline.

ROUGHNESS: riding quality of the deck lane surfaces, measured in accumulated inches and converted or prorated to inches per mile (in. per mi.).

SPAN VALUE: average of wheel path roughness measurements for all lanes of a given span.

SPAN RUN VALUE: roughness measurement for one wheel path on a given span.

STRUCTURE VALUE: roughness measurement (weighted mean) computed from values obtained from all spans and all wheel paths for a particular structure.

WEIGHTED MEAN: for this study, the arithmetic mean computed from individual span run roughness values, weighted according to span length.

MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	PI	ROFILOME'	TEST RES	E ROUGHNI ULT TABUI 1 Project 61	LATION	REMENTS Form 1011
Bridge No. <u>S04 of 0303</u>	4 Location	<u>US 31 ov</u>	er I 96			
Date Measured 9-23-64	Number	of Spans	4 Lei	ngth (includi	ing approach	nes) 476.2
Dual Structures (separat			Zes 🗍	No X		,
Single Structure Yes	X No	Method	of Finishing	(manany)		
<u>NB</u> Bound Road	rented to constant	1120 0220 14		,		
, WHEN THE REAL AND A DESCRIPTION OF A D		Profile	ometer Rou	ghness Valu	e – R inches	s per mile
Item	Length	Traffic Lane		Passir	ng Lane	
• • • • • • • • • • • • • • • • • • •		0.W.P.	I. W. P.	O. W. P.	I.W.P.	Average
Span 1	38.4	197	213		-	205
2	94.0	103	82			92
3	95.4	140	102			121
4	48.4	162	107			134
5						
6						
Weighted Average fo	r Bridge	139	112			126
NB Approach	100.0	76	73			74
SB Approach	100.0	75	82			78
Weighted Average fo	-	113	97			105

SB Bound Roadway

			Profilometer Roughness Value - R inches per mile						
It	tem	Length	Traffic	c Lane	Passin	Passing Lane			
			0.W.P.	I.W.P.	O. W. P.	I. W. P.	Average		
Spa	an 1	38.4	165	126			146		
- u - m	2	94.0	125	113			119		
	3	95,4	101	72			86		
	4	48.4	152	102			127		
	5								
	6								
Weighte	ed Average for	Bridge	127	99			113		
NB	Approach	100.0	66	71			68		
SB	Approach	100.0	72	85			78		
Weighted Average for Bridge and Approaches			103	90			96		

Remarks <u>Spans and Joints numbered from South to North.</u> Joint number and type: #1, 3, 5, 7 - expansion: #2, 6 - construction: #4 - steel expansion. Cantilevered.

Concrete approaches.

-7-

MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS TEST RESULT TABULATION Research Project 61 F-65 Form 101							
Bridge No. <u>B02 of 33061</u>	Location	n <u>Oaklar</u>	d Avenue o	<u>ver the Gra</u>	nd River			
Date Measured <u>1-6-65</u>	Number	of Spans <u>3</u>	Lei	ngth (includi	ng approach	es) <u>479.0</u>		
Dual Structures (separate		-	es 🗍	NoX		,		
Single Structure Yes X			0.00000000	Longitu	dinal Machi	ne		
W_Bound Roadwa	· Country and	Method	or e meaning		·*************************************			
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	Profilometer Roughness Value – R inches							
Item	Length	Lane 1		Lane 2		A		
		0.W.P.	I. W. P.	0.W.P.	I. W. P.	Average		
Span 1	89.0	40	44	42	41			
2	100.5	111	72	109	83			
3	89.5	46	47	51	23			
4								
5				·				
6								
Weighted Average for	Bridge	67	55	69	50			
E Approach	100.0	76	43	88	79			
W Approach	100.0	58	62	59	68			
Weighted Average for and Approaches	Bridge							
WBound Roadwa	ay					n ny kaodimina dia mampiasa ny kaodim-paositra dia kaodim-paositra dia kaodim-paositra dia kaodim-paositra dia k		

		Profilometer Roughness Value - R inches per mile						
Item	Length	La	ne 3	La	Lane 4			
		0.W.P.	I.W.P.	O, W. P.	I. W. P.	Average		
Span 1	89.0	52	61	61	110	56		
2	100.5	75	82	72	75	85		
3	89.5	80	41	43	52	48		
4								
5								
6								
Weighted Average for	or Bridge	69	62	59	79	64		
E Approach	100.0	68	76	86	120	80		
W Approach	100.0	73	69	108	114	76		
Weighted Average failed and Approach		70	66	75	95	70		

Remarks <u>Spans numbered from West to East.</u> Joint Number and Type: #1, 2, 3, 6, 8 - Expansion; #4, 7 - Construction; #5 - Steel Expansion.

Lanes numbered from North to South.

Concrete Approaches.

-8-

MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	PI	ROFILOME	TEST RESI	ULT TABUI	ATION	REMENTS	
Bridge No. <u>S01 of 39014</u>	Location	''M'' A		-		Form 1011	
_					ing approach	es) <u>343, 9</u>	
Dual Structures (separate					U .1	,	
Single Structure Yes 🗴	No	Method		Constanted of the	nd		
W Bound Roadwa	ıy						
ENTER also governmenteren enter al contra de la contra de l		Profile	ometer Roug	ghness Valu	e – R inches	per mile	
Item	Length	Traffi	c Lane	Passir	ng Lane	######################################	
		O.W.P.	I. W. P.	O.W.P.	I.W.P.	Average	
Span 1	34.7	81	82			82	
2	83.7	80	68			74	
3	83.0	128	122			125	
4	42,5	125	106			116	
5							
6							
	Bridge	105	95	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	an jaanaa Samaalad miyoo ay	100	
	50.0	252	292			272	
Approach	50.0	176	172			174	
	-	136	1 35			136	
T			n denne e o yar war eta estan razan nazan nazan nazan	and a second	THE REAL PROPERTY AND A DESCRIPTION OF THE PROPERTY AND A DESCRIPTION OF THE PROPERTY AND A DESCRIPTION OF THE		
yn ny gellet til feldul hinnen en en en en gyppgen y gell y far te liter treff af hân hef a hân hen en en en gy		Profilometer Roughness Value - R inches per mile					
Item	Length	Traffic Lane		Passin	an a		
		0.W.P.	I. W. P.	O.W.P.	I. W. P.	Average	
Span 1	34.7	113	110	an a		112	
2	83.7	100	63			82	
3	83.0	85	92			88	
4	42,5	122	117			120	
5							
6							
Weighted Average for	Bridge	101	89		an a	95	
W Approach	50.0	176	133			154	
E Approach	50.0	174	260			217	
Weighted Average for							
		122	120	-		121 construction;	
	STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division Bridge No. S01 of 39014 Date Measured 1-11-65 Dual Structures (separate Single Structure Yes x W Bound Roadwa Item Span 1 2 3 4 4 5 6 Weighted Average for and Approach E Approach Weighted Average for and Approaches E Bound Roadwa Item Item Span 1 2 3 4 5 6 Weighted Average for and Approaches 5 6 Weighted Average for and Approaches 5 6 Weighted Average for and Approaches 5 6	STATE HIGHWAY DEPARTMENT PH Office of Testing and Research Research Research Laboratory Division Bridge No. S01 of 39014 Location Date Measured 1-11-65 Number Number Dual Structures (separate for each road Single Structure Yes X No W Bound Roadway Item Length Span 1 34,7 2 83,7 3 83,0 4 42,5 5 - 6 - Weighted Average for Bridge - W Approach 50,0 E Bound Roadway Item Length Span 1 34,7 2 83,7 3 83,0 4 42,5 5 - 6 - Weighted Average for Bridge and Approaches - E Bound Roadway Item Length Span 1 34,7 2 83,7 3 83,0 4 42,5 5	STATE HIGHWAY DEPARTMENT PROFILOME" Office of Testing and Research Research Laboratory Division Bridge No. S01 of 39014 Location "M" A Date Measured 1-11-65 Number of Spans	STATE HIGHWAY DEPARTMENT PROFILOMETER BRIDG Office of Testing and Research TEST RESI Research Laboratory Division TEST RESI Bridge NoS01 of 39014 LocationMr Ave. over US Date Measured _1-11-65 Number of Spans _4Len Dual Structures (separate for each roadway) Yes Single Structure Yes x No Method of Finishing W W Bound Roadway W Bound Roadway Yes No Item Length Traffic Lane O.W.P. 0.W.P. I.W.P. Span 1 34, 7 81 3 83, 0 128 2 83, 7 80 68 3 83, 0 128 122 4 42, 5 125 106 5	STATE HIGHWAY DEPARTMENT Ordice of Testing and Research Research Laboratory Division PROFILOMETER BRIDGE ROUGHNI TEST RESULT TABUI Research Project 61 Bridge No. S01 of 39014 Location "M" Ave. over US 131 Date Measured 1-11-65 Number of Spans 4 Length (includi Dual Structures (separate for each roadway) Yes No x Single Structure Yes X No Method of Finishing Hat W Bound Roadway Profilometer Roughness Value Item Length Traffic Lane Passir 0.W.P. I.W.P. O.W.P. O.W.P. Span 1 34, 7 81 82 2 83, 7 80 68 6 3 83, 0 128 122 122 4 42, 5 125 106 16 Weighted Average for Bridge 105 95 136 135 E Approach 50, 0 176 172 136 135 E Bound Roadway Item Itength Traffic Lane Passin O.W.P. I.W.P. O.W.P. 1.W.P. 0.W.P.	Brane Inclaway DEPARTMENT Research Laboratory Division PROFILOMETER BRIDGE ROUGHNESS MEASUL TEST RESULT TABULATION Research Project 61 F -65 Bridge NoS01 of 39014 Location "M" Ave. over US 131 Date Measured 1-11-65 Number of Spans 4 Length (including approach 0 (x) (x) (x) Date Measured 1-11-65 Number of Spans 4 Length (including approach 0 (x) (x) Date Measured 1-11-65 Number of Spans 4 Length (including approach 0 (x) (x) Single Structure Yes (x) No () Method of Finishing Hand W Bound Roadway Profilometer Roughness Value - R inches Item Length Traffic Lane Passing Lane 0.W.P. I.W.P. O.W.P. I.W.P. Span 1 34,7 81 82 2 83,7 80 68 3 83,0 128 122 4 42,5 125 106 5 125 106 105 6 135 135 136 Weighted Average for Bridge and Approaches 136 135 136 136	

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Bituminous Approaches. Blowup in the West approach (EBTL-OWP) -9-

:	MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	P	PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS TEST RESULT TABULATION Research Project 61 F-65 Form 1011							
]	Bridge No. <u>S05 of 39014</u>	Location	Mich	igan Ave. o	ver US 131	18.6199/#41+18/#_mmmmmm=1-17_+17_+				
()]	Date Measured <u>10-23-</u>	64 Number	Number of Spans4 Length (including approaches)402.0							
]	Dual Structures (separat	e for each road	lway) Y	es 🗍	NoX	,				
, , ,	Single Structure Yes <u>E</u> Bound Road	ana	Method	of Finishing	ACCOUNTS OF THE OWNER OF THE OWNE	a ng tang ng ng sa	ĸ─₩₽₽₽₩₽₩₽₩₽₩₽₩₽₩₽₽₩₽₽₽₩₽₽₽₩₽₽₽₽₽₽₽₽₽₽₽			
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	Item	Length	Traffi	c Lane	Passin	g Lane	T Colomotory of their of control of the state of the stat			
`		· .	O.W.P.	I. W. P.	0.W.P.	I.W.P.	Average			
	Span 1	55.2	75	51			63			
-	2	90.3	89	74	a and a state of the		82			
_	3	91.0	101	65			83			
-	4	65.5	77	61			69			
-	5									
-	6									
_	Weighted Average for	or Bridge	87	64			76			
_	W Approach	50.0	208	141			174			
-	E Approach	50.0	130	70			100			
		Weighted Average for Bridge and Approaches		75		and the second	92			
-	W Bound Road	way	za "Mar ya kuwa da Mar kuwa kuwa kuwa kuwa kuwa kuwa kuwa kuwa	All 2 and an and a first the of the state of	al book sound and the state of the					
			Profile	meter Roug	hness Value	- R inches	per mile			
	Item	Length	Traffic	e Lane	Passin	g Lane	A			
				**************************************		and the second	Average			

	5					
_	6				-	
-	Weighted Average for	Bridge	80	72		76
	W Approach	50.0	135	126		130
-	E Approach	50.0	123	109		116
2 	Weighted Average for					
	and Approaches		92	76	l	84

0.W.P.

92

84

72

74

55.2

90.3

91.0

65.5

I.W.P.

69

84

72

59

O.W.P.

I.W.P.

80

84

72

66

Remarks <u>Spans and Joints numbered from West to East</u>. Joint number and type: #1, 5 - construction; #2, 4 - steel expansion; #3 - expansion.

Cantilevered structure.

Bituminous approaches.

Span 1

 $\mathbf{2}$

3

4

-10-

MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS TEST RESULT TABULATION Research Project 61 F-65							
Bridge No. <u>S08 of 39014</u>	Location	<u>US 131 S</u>	B over US 1	131 NB		romi ivii		
Date Measured <u>10-14-64</u>	Number	of Spans <u>3</u>	Le	ngth (includi	ing approach	ues) <u>418.0</u>		
Dual Structures (separate			/es	NoX				
Single Structure Yes X	No	Method	of Finishing	gHand				
S Bound Roadwa	ay							
and a provide the second s	Car a fan a trainin a na georgian nga caratan na trainin a sana a sa a ga gaga	Profile	ometer Rou	ghness Valu	e – R inches	per mile		
Item	Length	Traffi	c Lane	Passir	ng Lane			
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	Average		
Span 1	54.0	127	113	251	190	170		
2	96.0	153	104	142	178	144		
3	68.0	179	147	166	151	161		
4								
5								
6								
Weighted Average for	Bridge	155.	120	176	172	156		
S Approach	100.0	90	85	95	77	87		
N Approach	100.0	102	85	83	58	82		
Weighted Average for and Approaches		126	103	135	122	122		
Bound Roadwa	ay							
		Profile	meter Roug	ghness Value	e – R inches	per mile		
Item	Length	Traffic Lane		Passin	an a			
		0.W.P.	I.W.P.	O.W.P.	I. W. P.	Average		
Span 1						and and a second se		
2						· · ·		
3								
4	· · · · · · · · · · · · · · · · · · ·				· · · · · · · · · · · · · · · · · · ·			
5								
6	······					· · · · · · · · · · · · · · · · · · ·		
Weighted Average for	Bridge							
Approach	n na	97777777777777777777777777777777777777	OMMAND DOMINISTING AND	ala na manana kaominina mpikamana amin'ny kaodim-paositra dia kaominina. Ny INSEE dia mampikamana mpikamana amin'ny kaodim-paositra dia kaodim-paositra dia kaodim-paositra dia kaodim-p		ni vetro ti a la dese de por como constante da constante de segurores ,		
Approach			· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·			
Weighted Average for and Approaches	•	-		-				
Remarks Spans and Joints	numbered fr	om South to	North. Jo	int number a	and type #1	. 2. 3. 5. 8		

Remarks <u>Spans and Joints numbered from South to North</u>. Joint number and type: #1, 2, 3, 5, 8, 9 - expansion; #4, 7 - construction; #6 - steel expansion.

Concrete approaches.

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MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	Pl	PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS TEST RESULT TABULATION Research Project 61 F-65							
Bridge No. <u>S09 of 39014</u>	Location	Ravine I	Rd over US	131		1010 1011			
Date Measured <u>10-23-64</u>				ngth (includi	na annroad	419.6			
Dual Structures (separate		-	Zes 🗍		ng approaci	105)			
	p marting	• •	Surger and	Paramana 1					
Single Structure Yes X <u>E</u> Bound Roadwa	(compared)	Method	of Finishing	y <u>Astranovanis</u>		₶₶ਜ਼ਜ਼੶ਸ਼ਫ਼ਜ਼ਲ਼ਜ਼ਸ਼ਗ਼ੑੑਫ਼ਗ਼ੑਫ਼ਗ਼ਫ਼ਗ਼ਫ਼ਜ਼ਫ਼ਖ਼ੑਫ਼ਜ਼ਜ਼੶ਖ਼ਫ਼ੑਫ਼ਫ਼ਫ਼ਖ਼ੑੑਫ਼ਗ਼ਫ਼ਫ਼ਗ਼ੑਫ਼ਗ਼ੑਖ਼ਖ਼ਖ਼ੑਖ਼ੑਖ਼ੑਖ਼ਖ਼ਖ਼ੑਖ਼ੑਖ਼			
Doulin roanwa	ıy I	2792397772942977;0342942,4434491457545473462999444294	Marie	an de se galante antara manan para manan marana na ka	Tel (1 Tel	rindölölölön öyar veran ar payt yezen manan könöy évezen			
		Profile	ometer Rou	ghness Value	e - R inches	per mile			
Item	Length	Traffi	c Lane	Passir	g Lane	A			
		0.W.P.	I. W. P.	0.W.P.	I.W.P.	Average			
Span 1	79.0	135	123			1.29			
2	89.6	97	98			98			
3	91.0	75	88	,		82			
4	60.0	104	101			102			
5					and an and a second	A A A A A A A A A A A A A A A A A A A			
6			· ·						
Weighted Average for	Bridge	101	102			102			
W Approach	50.0	152	138		an a	145			
E Approach	50.0	207	236			222			
Weighted Average for									
and Approaches		120	122			121			
Bound Roadwa	ty .								
General meneral production of the field of the second second second second second second second second second	Warner an and a state of the special state of the s	Profile	meter Roug	ghness Value	- R inches	per mile			
Item	Length	Traffic	c Lane	Passin					
		an a		an a managana kata kata kata kata ka ta kata		Average			
Snon 1	ana sa	0.W.P.	I.W.P.	O.W.P.	I.W.P.	and the second			
Span 1	79.0	131	142			136			
2	89,6	107	76			92			
3	<u>91.0</u>	125	100			112			
4	60.0	<u>163</u>	164		·····	164			
5			P						
6					·				
Weighted Average for		129	116	IN CLANIC WARDER CONTRACTOR OF MILLION	alder on a state of the state o	122			
W Approach	50.0	181	238			210			
E Approach	50.0	168	245			206			
Weighted Average for and Approaches	<u> </u>	1.40	1.46						
and Approaches	ting and a second s	140	146			143			

4

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Remarks <u>Spans and Joints numbered from West to East.</u> Joint number and type: #1, 5 - construction; #2, 4 - expansion; #3 - steel expansion. _______Bituminous approaches.

ç	MICHIGAN FATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	P	'ROFILOME'	TEST RES	E ROUGHNI ULT TABUI 1 Project 61	ATION	REMENTS
В	ridge No. <u>S10 of 39014</u>	Locatio	n <u>US 131 (</u>	SB) over ''I	O" Avenue		FORM TUI
\mathbf{D}	ate Measured <u>10-14-64</u>	Number	of Spans	<u>3</u> Le	ngth (includi	ing approach	es) <u>310.2</u>
D	ual Structures (separate			Zes 🗌	NoX		
Si	ingle Structure Yes X	A AND AND A	Method	of Finishing	g <u>Hand</u>		
· · · · ·			Profile	ometer Rou	ghness Valu	e – R inches	per mile
tı	Item	Length	Traffi	c Lane	Passir	ng Lane	zer hat fan hen gener en en en skriver en
ж.		U	0.W.P.	I.W.P.	O, W. P.	I.W.P.	Average
	Span 1	35.4	83	103	67	89	86
	2	40.8	50	66	76	77	67
40000	3	34.0	121	93	128	135	119
	4						
	5			• Mathematical and the second state and the second state of the	CRO PERCENTI AND A MILLION COMPANY AND COMPANY AND A MILLION	in a sea ann ann ann ann ann ann ann ann ann a	<u> </u>
	6						· · · · · · · · · · · · · · · · · · ·
	Weighted Average for	Bridge	82	86	89	99	89
	S Approach	100.0	64	87	84	90	81
	_N Approach	100.0	123	111	85	101	105
-	Weighted Average for and Approaches	-	90	95	86	96	92
	Bound Roadw	ay					
-	a an	na posta na se interne con esta posta de la consta de la co	Profile	meter Rou	ghness Value	e - R inches	per mile
	Item	Length	Traffic Lane		Passin		
			O.W.P.	I.W.P.	0.W.P.	I.W.P.	Average
	Span 1	an a	226 Ja-200 Augumento 199 27 200 Augumento 199				∽
	2			·			
-356.44	3						
	4					1	
_	5						,
	6		······································		· · ·		
	Weighted Average for	Bridge				<u> </u>	
•	Approach	a an	ing of the domain of the standard standard standard standard standard standard standard standard standard stand	an a		an a	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
	Approach						
	Weighted Average for and Approaches	0					
	emarks <u>Spans and Joints</u> 9, 10 - expansion; #4, 5			North. Joi	nt number a	nd type: #1,	2, 3, 5, 6,
	Concrete approa	· · · · · · · · · · · · · · · · · · ·				2000 7 2000 000 000 000 000 000 000 000	**************************************

-13-

MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	PI	ROFILOME		E ROUGHNI ULT TABUI 1 Project 61	LATION	REMENTS Form 1011
Bridge No. X01 of 39014	Location	US 131	over NYC I	R and ''KL'	' Avenue	annan a bha bha a she ann a she ann a sao ann a she ann a she ann a she ann a she ann ann a
Date Measured <u>10-13-64</u>	Number	of Spans	5 Lei	ngth (includi	ing approacl	hes) <u>505.2</u>
Dual Structures (separate	for each road	way) 3	Zes X	No		
Single Structure Yes	No X	Method	of Finishing	Hand		and the start of the second
S Bound Roadw	ay		_			
ALL AND ALL ALL ALL ALL ALL ALL ALL ALL ALL AL	ta fan de fan E	Profile	ometer Rou	ghness Value	e - R inches	s per mile
Item	Length	Traffi	c Lane	Passir	ıg Lane	ning (inning tillingen av en anvenningen anderen av en anvenningen av en anvenningen av en anvenningen av en a
		O.W.P.	I. W. P.	O.W.P.	I.W.P.	Average
Span 1	56.3	130	124	108	93	114
2	61.0	120		103	99	1.00
3	61.0	81	57	72	95	76
4	60.3	73	52	71	88	71
5	66.6	62	46	94	94	74
6						
Weighted Average for	Bridge	92	70	90	94	86
S Approach	100.0	132	103	87	71	98
N Approach	100.0	143	78	130	127	120
Weighted Average for and Approaches		110	78	97	96	95
N Bound Roadw	ay	Barrina verzen austrikuszteren elementek (d. d. z. k k.)	Bloophamhainge = standard Constant anns ann ann ann ann	ellum market som	ай жалаасы арталыйн өөмөрдөг чөлстэг хэлхээлэг	n an
€ EEN hAnge get provinsi and the second of	UP PORTER INTERNATION CONTRACTOR AND A DESCRIPTION AND A DESCRIPTION OF THE RESERVE	Profile	meter Roug	hness Value	e - R inches	per mile
Item	Length	Traffic	c Lane	Passin	g Lane	
•	an a	0.W.P.	I.W.P.	0.W.P.	I.W.P.	Average
Span 1	56.3	126	107	140	122	1.24
2	61.0	97	105	95	81	94
3	61.0	56	49	72	121	74
4	60.3	92	84	65	66	77

Approach Ν 100.0 $\mathbf{72}$ Weighted Average for Bridge and Approaches Remarks _ Spans and Joints numbered from South to North. Joint number and type: #1, 2, 3, 5, 6, 7, 10, 11, 12 - expansion; #4, 9 - construction; #8 - steel expansion.

66.6

100.0

Concrete approaches.

S

Weighted Average for Bridge

Approach

-14-

S	MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	PF	OFILOMET	TEST RESU	E ROUGHNE ULT TABUL Project 61	ATION	REMENTS Form 1013
$p := \mathbf{I}$	Bridge No. <u>S07 of 39024</u>	Location	I 94 (EB)	over US 13	1 (SB)		
1	Date Measured <u>10-22-64</u>	Number	of Spans	<u>3</u> Ler	ngth (includi	ng approach	es) <u>337.6</u>
	Dual Structures (separate			defendence in.	No		·
	Single Structure Yes		• ·	of Finishing			
-	<u> </u>	Constant Sector Sector	1120 0120 02	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~			
	nan kanan	yn de hef an fei	Profile	meter Roug	shness Value	e – R inches	per mile
v	Item	Length	Traffi	Traffic Lane P		g Lane	Average
			0.W.P.	I. W. P.	O.W.P.	I.W.P.	Average
~	Span 1	32.4	71	63	107	77	80
-	2	70,2	74	104	102	106	96
-	3	35.0	87	95	107	68	89
	4						
	5						
	6						
-	Weighted Average for	Bridge	77	92	104	90	91
_	W Approach	100.0	104	105	104	116	107
_	E Approach	100.0	134	142	134	<u>i44</u>	138
	Weighted Average for Bridge and Approaches		102	111	113	113	110
	Bound Roadwa	зу			-		
-	·		Profile	meter Roug	thness Value	e – R inches	per mile

	Profile	per mile			
Length	Traffi	Traffic Lane		Passing Lane	
	0.W.P.	I.W.P.	O. W. P.	I, W. P.	Average
Bridge					
					and a second second second provide a second
				·····	
Bridge					
	Bridge Bridge	Length Traffie O.W.P.	LengthTraffic LaneO.W.P.I.W.P.I.W.P.I.W.P.IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	Length Traffic Lane Passin O.W.P. I.W.P. O.W.P. Image: Image in the second	O. W. P. I. W. P. O. W. P. I. W. P. Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image Image <t< td=""></t<>

Remarks <u>Spans and Joints numbered from West to East</u> <u>Joint number and type</u>: #1, 5, 8 - <u>construction</u>; #2, 3, 4, 6, 8, 9 - expansion; #7 - steel expansion. The acceleration and <u>deceleration lanes were not run because of heavy traffic flow, cantilevered structure</u>:

Concrete approaches.

	MICHIGAN TATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	P	PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS TEST RESULT TABULATION Research Project 61 F-65					
\mathbf{B}	oridge No. <u>S07 of 39024</u>	Location	n_194 WB o	ver US 131	SB		Form 1011	
D	ate Measured <u>1-11-65</u>	Number	of Spans	<u>3</u> Le	ngth (includi	ng approach	es) <u>337,6</u>	
D	ual Structures (separate	for each road	lway) y	Zes X	No			
S	ingle Structure Yes WBound Roadwa	- conceptor	Method	of Finishing	g	land		
1990 	nan an Miley (Agenang sepang sepan	MATTERNA TARA LA A 2700 Tark operations and a second second second second second second second second second s	Profile	ometer Rou	ghness Value	e ~ R inches	per mile	
¢	Item	Length	Traffi	c Lane	Passin	g Lane		
*			O.W.P.	I. W. P.	O. W. P.	I.W.P.	Average	
- 1999	Span 1	32.5	74	89	119	92	94	
	2	69.6	75	67	49	48	60	
	3	35,5	25	6	90	65	46	
-	4							
	5	· · · · · · · · · · · · · · · · · · ·						
_	6							
-	Weighted Average for	Bridge	62	56	76	63	64	
	W Approach	100.0	98	96	101	114	102	
- j. 	E Approach	100.0	103	124	108	125	115	
-	Weighted Average for Bridge and Approaches		85	88	93	96.	90	
	Bound Roadw	ay						
			Profile	meter Rou	ghness Value	- R inches	per mile	
	Item	Length	Traffic	c Lane	Passin	g Lane	yang kanang mang kanang ka	
		4	O.W.P.	I.W.P.	O.W.P.	I. W. P.	Average	
	Span 1		a talihiya aasoo ya ya ku ku ahaa ahaa ahaa ahaa ahaa ahaa ah	,	and Mine and Annual Protection of the second sec	2011222012220122	ann an fail an San San San San San San San San San	
	2							
	3					**************************************		
	4						,	
	5							
	6							
	Weighted Average for	Bridge	N NEW YORK OF THE ACTIVATION OF A STREET AND A DECIDENCE AND A DECIDENCE AND A DECIDENCE AND A DECIDENCE AND A	oomaa oo yoo ahaa ahaa maaya ka waxaan ahaayan aha	ling of the Demonstration of the	811-11-1-11-1-1-1-1-1-1-1-1-1-1-1-1-1-1	a serve and the server sector of the sector of	
	Approach		THE REAL OF CONTRACTOR OF					
-11-11-	Approach			NANA CELONA MANUNIKA SU PARA PARA PARA PARA PARA PARA PARA PAR				
	Weighted Average for and Approaches	<u> </u>						
R	emarks <u>Spans</u> and joints expansion; #4, 7				t number and	d type: #1,2	2, 3, 5, 8	
	Concrete Appro		_16		2019			

(MICHIGAN FATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	Pl	PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS TEST RESULT TABULATION Research Project 61 F-65					
B	ridge No. <u>S08 of 39024</u>	Location	<u>I 94 (EB)</u>	over US 13	1 (WB)			
$(1, \infty)$	ate Measured <u>10-22-64</u>					ng approach	es) <u>338.6</u>	
D	ual Structures (separate		-	es X	No			
	ingle Structure Yes	No X	• •	of Finishing	g <u>Hand</u>		······	
	E Bound Roadwa				•			
. .	an fan de fan		Profile	meter Rou	ghness Value	e – R inches	per mile	
	Item	Length	Traffie	c Lane	Passir	lg Lane	24470-000-000-000-000-000-000-000-000-000	
		Ű	O.W.P.	I. W. P.	O.W.P.	I.W.P.	Average	
	Span 1	32.4	91	73	53	85	76	
	2	70.2	96	94	72	76	84	
	3	36.0	83	73	97	102	89	
	4]	
_	5							
	6						<u></u>	
ويسعن	Weighted Average for	Bridge	92	84	74	85	84	
	W Approach	100.0	106	116	115	148	121	
. —	E Approach	100.0	87	70	117	127	100	
	Weighted Average for Bridge and Approaches		94	89	99	116	100	
	Bound Roadwa	ay						
			Profile	meter Rou	ghness Value	e – R inches	per mile	
	Item	Length	Traffic	e Lane	Passir	ig Lane		
			O.W.P.	I.W.P.	O.W.P.	I.W.P.	Average	
-000	Span 1	an a	an a	TATALING LINE INFERIORAL MENALUSING	nen analas al sa anna an	а унталистики аксалар — консултария — к		
	2							
_	3							
	4							
	5					<u> </u>		
	6				·			
-67-02	Weighted Average for	Bridge						
: -	Approach							
	Approach							
	Weighted Average for and Approaches							

Remarks <u>Spans and Joints numbered from West to East</u>. Joint number and type: #1, 3, 6, 7, 8 - expansion; #2, 5, 9 - construction; #4 - steel expansion. The acceleration and deceleration lanes were not run due to heavy traffic flow. Cantilevered structure.

Concrete approaches.

MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	PI	ROF ILOME'	TEST RES	E ROUGHNE ULT TABUL 1 Project 61	ATION	
Bridge No. <u>S08 of 39024</u>	Location	I 94 WB	over US 131	NB		Form 1011
Date Measured <u>1-8-65</u>					ng approach	nes) <u>338.5</u>
Dual Structures (separate		-		No		
Single Structure Yes	AUTOTAL MAL	Method		<u>م</u>	Hand	
W Bound Roadwa	ay		-	-		
ELLER FERRETARIA (CARTA CARTA CA	a na serie de la constatution de la constatute de la constatute de la constatute de la constatute de la constat La constatute de la constat La constatute de la consta	Profile	ometer Rou	ghness Value	e – R inches	per mile
Item	Length	Traffi	c Lane	Passin	g Lane	A
		O.W.P.	I. W. P.	O. W. P.	I. W. P.	Average
Span 1	33,2	72	87	117	<u>9</u> 0	92
2	69.8	75	67	49	48	60
3	35.5	25	06	.90	65	46
4						
5						
6						· · · · · · · · · · · · · · · · · · ·
Weighted Average for	Bridge	61	56	75	62	64
W Approach	100.0	103	124	108	125	115
E Approach	100,0	<u>.98</u>	96	102	114	102
Weighted Average for and Approaches	-	85	88	093	96	90
Bound Roadwa	ay					
		Profile	ometer Rou	ghness Value	e – R inches	per mile
Item	Length	Traffi	c Lane	Passin	g Lane	**************************************
		0.W.P.	I.W.P.	0.W.P.	I. W. P.	Average
Span 1		9 PEATE BRIDGES AND ADDRESS AND ADDRES				
2	· · · · · · · · · · · · · · · · · · ·					
3						
4		· · · · · · · · · · · · · · · · · · ·	·····			
5					,	
6	· · · · · · · · · · · · · · · · · · ·					
Weighted Average for	Bridge		<u></u>			
Approach		12.) yanimi mwana kata kutomena kata kutomenya kutowa kata kutowa kutowa kutowa kutowa kutowa kutowa kutowa kut	a ana manana amin'ny fany amin'ny	and the same of the same many the same of the same		an an a sha
Approach						
Weighted Average for and Approaches	•				λ.	
Remarks Spans and joints	numbered fr	om West to	East.	2007-00-00-00-00-000-000-000-000-000-000		and a second
Joint number ar				construction	#4 steel ex	pansion.
Concrete approx		· · ·				

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	• •								
MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	Pl	ROFILOME	TEST RES	E ROUGHNI ULT TABUI 1 Project 61	ATION	REMENTS			
Bridge No. S24 of 41027	Location	Location Maryland Ave. over I 96							
Date Measured <u>10-30-64</u>					ng approac	hes) 330.6			
Dual Structures (separate		-	Yes	No X					
Single Structure Yes X		• •	lournal	g <u>Machine</u>	Э				
<u> </u>	and the second sec	1120 0000 00		,					
	and a first an increase of a support of the second s	Profil	ometer Rou	ghness Value	e – R inche	s per mile			
Item	Length	Traffi	c Lane	Passir	ng Lane				
		O.W.P.	I. W. P.	O.W.P.	I.W.P.	- Average			
Span 1	32.3	171	138			154			
2	71.5	122	125			124			
3	71.5	103	107			105			
4	55.3	98	114			106			
5									
6									
Weighted Average for	Bridge	117	118			118			
N Approach	50,0	238	151			194			
S Approach	50.0	174	107			140			
Weighted Average for and Approaches	-	144	122			133			
S Bound Roadw	ay								
		Profile	ometer Rou	ghness Value	e – R inches	s per mile			
Item	Length	Traffi	c Lane	Passin	g Lane				
		0.W.P.	I.W.P.	0.W.P.	I.W.P.	Average			
Span 1	32.3	134	144			1.39			
2	71.5	128	121			124			
3	71.5	121	116			118			
4	55.3	161	126			144			

-	Span 1	32.3	134	144		139
	2	71.5	128	121		124
-	3	71.5	121	116		118
_	4	55.3	161	126		144
-	5					
	6					
	Weighted Average for	Bridge	135	124		130
	N Approach	50.0	188	137		162
-	s Approach	50.0	167	136		152
(`) _	Weighted Average for and Approaches	Ŷ	148	128		138
]	Remarks Spans and Joint	s numbered fr	rom South t	to North. J	Joint number and f	type: #1, 5 -
-	construction; #2	, 3, 4 - expan	sion.			
_	<u>Bituminous app</u>	roaches.				

MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	P	ROFILOME	TEST RES	E ROUGHN ULT TABUI h Project 61	LATION	
Bridge No. X01 of 4102	7 Location	n 196 ove	er GTWRR	N. of Grand	Rapids	Form 101
Date Measured <u>10-29-6</u>						14466
Dual Structures (separat				No	m9 upprouor	
Single Structure Yes			Queen and		Hand	
E Bound Roady		1110 0110 0	0. 2 maprice			
n 1999 - Anna an Sanan ann an Anna an A	991223 2 (44)	Profile	ometer Rou	ghness Valu	e - R inches	s per mile
Item	Length		c Lane	- -	ng Lane	
10em	Length	O.W.P.	I.W.P.		7	Average
				O. W. P.	I. W. P.	a haineit - in the second s
Span 1	69.3	67	56	68	75	66
2	106.0	68	86	82	65	75
3	71.3	79	80	78	84	80
4						<u> </u>
5						
<u> </u>	- Devider-					
Weighted Average fo		71	76	77	73	74
W Approach E Approach	100.0	89	80	70	99	84
	100.0	89	80	70	99	84
Weighted Average fo and Approache	-	79	76	75	80	78
W Bound Roady	way		an a	αφ ⁴ υναστείαται στα	CONTRACTOR A MARKAGE CONTRACTOR AND	
99900000000000000000000000000000000000		Profile	meter Roug	ghness Value	e – R inches	per mile
Item	Length	Traffie	c Lane	Passin	g Lane	
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	Average
Span 1	69.3	117	74	77	53	80
2	106.0	100	81	97	136	104
3	71.3	56		75	112	81
4						
5			······			
6						
Weighted Average for	r Bridge	92	55	85	106	84
W Approach	100.0	81	69	95	87	83
E Approach	100.0	64		79	68	70
Weighted Average for	0					
and Approache	S	83	46	86	93	77

Spans and joints numbe			
 Joint number and type:	#1, 2, 4, 7, 8 expansion;	#3,6 construction; #	5 steel expansion.

Contilevered structure Concrete Approaches

	MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	PF	ROFILOME'.	TEST RESU	E ROUGHNE JLT TABUL Project 61	ATION		
	Bridge No. <u>S 15 of 41029</u>	Location	I 96 ov	er Garfield	and Valley A	Ave.	Form 1011	
	Date Measured 10-27-64	Number	of Spans	Ler	ngth (includi	ng approach	es) <u>414.9</u>	
	Dual Structures (separate	for each road	way) Y	es X	No		·	
	Single Structure Yes	NoX	Method	of Finishing	Hand			
	S Bound Roadwa	(CONTRACT)		-				
	n y generalizet zen en e	2001 - David Anton	Profile	meter Roug	hness Value	e – R inches	per mile	
	Item	Length	Traffi	c Lane	Passin	g Lane		
			0.W.P.	I. W. P.	O.W.P.	I.W.P.	Average	
	Span 1	60.2	84	112	118	127	110	
	2	64.8	127	138	130	105	125	
	3	50.5	110	112	108	1 32	116	
	4	39.4	194	201	150	145	172	
	5							
	6							
	Weighted Average for	Bridge	123	136	125	124	127	
	<u>s</u> Approach	100.0	96	106	79	112	98	
	N Approach	100,0	77	106	82	81	86	
	Weighted Average for	÷						
	and Approaches	Annual and the State of the second	106	122	104	111	111	
	N Bound Roadwa	y						
			Profile	meter Roug	hness Value	- R inches	s per mile	
	Item	Length	Traffic	: Lane	Passin	g Lane	n ya mang ya ng ka manung di panan sa ka ng k Ng ka ng k	
			O.W.P.	I. W. P.	O.W.P.	I. W. P.	Average	
	Span 1	60.2	187	162	137	161	162	
	2	64.8	200	215	139	130	171	
	3	50,5	129	156	184	235	176	
-	4	39,4	215	187	180	232	204	
	5							
	6							
	Weighted Average for	Bridge	182	181	156	182	175	
	S Approach	100.0	97	91	107	123	104	
	N Approach	100.0	111	123	110	109	113	
*	Weighted Average for							
$\left(\frac{1}{2} \right)$	and Approaches	Zanionishing a population and a state of the	144	145	133	150	143	
	Remarks <u>Spans and joints</u>				<u>nt number a</u>	nd type: #1,	2,4,6,8,9,10	
	expansion; #3,7 Concrete Approa		₩5 Steel ex	pansion.				

	MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	P	ROFILOME'	TEST RES	E ROUGHNI ULT TABUI 1 Project 61	ATION	
	Bridge No. X01 of 41029	Location	1 I 96 EB	over C&O	RR		Form 1011
	Date Measured <u>10-28-64</u>					ng approach	es) 560.0
	Dual Structures (separat				No X	we approad	· · ·
	Single Structure Yes		Method	terms units?	42 mer mit		
	E Bound Roady				5		
14 14	, #3392/2010/2020/2020/2020/2020/2020/2020/20	an a	Profile	ometer Rou	ghness Valu	e – R inches	per mile
	Item	Length		c Lane		ig Lane	
~		Longu	0.W.P.	I.W.P.	O. W. P.	I.W.P.	Average
	Span 1				149	1.65	1 5 0
	2	<u> 62.0</u> 67.5	<u>127</u> 139	<u>167</u> 148	149	183	152 156
	3						}
	4	<u>63.5</u> 85.0	<u>181</u> 153	<u>163</u> 149	<u> </u>	<u>157</u> 144	154 151
	5	82.0	110	132	161	162	141
	6			104	TOT	104	
	Weighted Average fo	r Bridge	141	151	149	161	150
	E Approach	100.0	71	100	<u>79</u>	72	80
	W Approach	100.0	85	74	69	82	78
	Weighted Average fo and Approache		118	128	122	130	124
	Bound Roady	way	annan suurgeonnen of is éen ei férsélik asaanna		an an the an annual sector of the annual sector of the annual sector of the annual sector of the annual sector	Charlenny and another the solution of the	ann amaran a sanna ann an an an an an ann an ann an
	, CITALET and provide a second		Profile	meter Rou	ghness Value	- R inches	per mile
	Item	Length	Traffi	c Lane	Passin	g Lane	
			0.W.P.	I.W.P.	O.W.P.	I. W. P.	Average
	Span 1	+ in the state of		A, IV, A A A	0		a particular and a substantian and a substantian from the substantian and a substantian for the substantian and
	2			· · · · ·			
	3		······································				
	4			· · · · · · · · · · · · · · · · · · ·			
	5			······································			
	6	· · · · · · · · · · · · · · · · · · ·					
	Weighted Average for	r Bridge			·····		· · · · · · · · · · · · · · · · · · ·
	Approach	n an	an felicina kalendera za kina una kina kina kina kina kina kina kina ki		and fattises in the state of the		an ta ka Gibbi Birkan ninggi yang kana kana matan matan matan kana da ya ka muga
	Approach						
а. ^в 1 Х	Weighted Average fo and Approache	•					
	Remarks <u>Spans and joint</u>	<u>s number</u> ed fr	om West to	East.			ληγά γραφησεία στο στο το το διαλογολογία ματά ματά το στο στο στο στο στο στο στο στο στο
	Joint number a				n; # 3, 8 con	struction.	
	Concrete appro	oaches.					
	Contraction and a second se						

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PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS TEST RESULT TABULATION Research Project 61 F-65

Bridge No. <u>S34</u>	of 82112	Locati	on <u>M 10</u>	2 over I 6	96				
Date Measured <u>11-17-64</u> Number of Spans <u>15</u> Length (including approaches) <u>1989.2**</u>									
Dual Structures (separate fo	or each roa	adway)	Yes	No	x			
Single Structure Yes X No Method of Finishing Bid-Well Finishing Machine								chine	
<u> </u>									
and an		Profilometer Roughness Value - R inches per mile							
Item	Length								
		Traffic Lane						Avg.	
		0.W.P.	I.W.P.	O.W.P:	I.W.P.	0.W.P.	I.W.P.		
Span_1	90.4	85	116	73	85	120	114	99	
2	91.3	68	57	69	81	64	67	68	
3*	Variable	58	66	62	88	63	83	70	
4	130.0	82	68	36	60	73	· 64	64	
5	128.8	90	114	102	82	89	85	94	
6	124.1	66	67	78	59	85	72	71	
· 7	213.4	64	84	72	79	73	63	72	
8	127.4	68	106	112	95	116	99	99	
9 *	Variable	137	179	118	121	114	124	132	
10	130.6	48	56	54	59	48	59	54	
Í 1	130.8	126	114	115	85	119	129	115	
12	130.8	102	75	69	60	61	69	73	
13	140.0	132	115	112	123	132	119	122	
14	107.5	68	70	99	75	98	95	84	
15	105.6	138 .	146	147	98	184	144	143	
Weighted Avg.									
for Brid	ge	86	93	86	82	94	90	88	
Approach	100.0	126	<u>118</u>	74	73	94	84	95	
Approach	50.0	106	71	79	38	53	83	72	
Weighted Avg.									
for Bridge and Approaches		89	93	85	81	93	90	. 88	
Remarks <u>Spans and Joints numbered from West to East</u> . Joint number and Type: #1, 3, 24, - Construction; #2, 6, 7, 12, 16, 20, 25, 26 - Expansion; #4, 5, 15, 19, 23 - Steel Expansion									
#8, 11 - Steel finger: #9, 10, 13, 14, 17, 18, 21, 22 - Contraction. Concrete Appraches									
* Lengths of wheel paths vary: one end of span is at an angle.									
** Average lengths of spans 3 and 9 included.									

PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS TEST RESULT TABULATION

Research Project 61 F-65

Bridge No. <u>S34</u>	of 82112	Locati	on <u>M 1</u>	02 over I 6	396					
Date Measured	11-17-64	Numbe	r of Spans	, 15	Length (in	ncluding ar	proaches)	1989.2**		
Dual Structures (separate fo	or each ro	adway)	Yes	No	x				
Single Structure	YesX	No	Meth	od of Finis	shing		Finishing	Machine		
		Profilometer Roughness Value - R inches per mile								
- (Length	FIOTIONELET Roughness value – It mones per min						~ 		
Item		Traffic Lane		Center Lane		Inner Lane		Avg.		
		0.W.P.	I.W.P.	O.W.P:	I.W.P.	0.W.P.	I.W.P.	0.		
Span 1	90.4	80	126	126	133	125	103	<u>116</u>		
2	91.3	72	70	68	71	55	57	66		
3*	Variable	146	146	113	131	86	82	117		
4	130.0	51	86	64	72	92	74	73		
5	128.8	90	85	82	84	101	125	94		
6	124.1	34	78	76	67	69	70	66		
7	213.4	50	51	62	70	53	64	58		
8	127.4	51	59	68	68	64	50	60		
9*	Variable	57	99	86	80	86	114	87		
10	130.6	82	122	100	99	109	87	100		
Í 1	130.8	92	115	115	122	106	104	109		
12	130.8	4 1	70	67	83	56	60	63		
13	140.0	57	62	65	82	78	59	67		
14	107.5	47	62	75	77	73	61	66		
15	105.6	153	172	165	156	144	139	155		
Weighted Avg. for Bridge		69	89	86	91	84	82	84		
W Approach	100.0	74	87	38	72	98	76	74		
E Approach	100.0	101	119	136	85	124	118	114		
Weighted Avg. for Bridge and Approaches		71	90	86	90	87	83	84		
Remarks	**************************************									

MICHIGAN STATE HIGHWAY DEPARTMENT Office of Testing and Research Research Laboratory Division	P	ROFILOME	TEST RES	E ROUGHNI ULT TABUI n Project 61	ATION	REMENTS Form 1011			
Bridge No. <u>S 23 of 822</u>	51 Location	n EB 194	Ramp to N	BI75		rom turi			
Date Measured 6-26-64					ng approach	nes) <u>508.0</u>			
Dual Structures (separate		-	(es		0 11	,			
Single Structure Yes X	No	Method	of Finishing	<u>Hand</u>					
NB Bound Roadw	at terment								
**************************************		Profilometer Roughness Value - R inches per mile							
Item	Length	Traffi	c Lane	Passir	ng Lane				
		O.W.P.	I. W. P.	O.W.P.	I.W.P.	Average			
Span 1	43.0	155				155			
2	89.0	122				122			
3	120.3	120				120			
4	55.7	179				179			
5									
6									
Weighted Average for	Weighted Average for Bridge					136			
S Approach	100.0	219				219			
B Approach	100.0	112				112			
Weighted Average for Bridge and Approaches		148		27 A 26 Carriedo a 27 a 27 a 2 A 20 a 2 a 2 a 2 a 2 a 2 a 2 a 2 a 2 a 2		148			
<u>NB</u> Bound Roadw	'ay								
	Length	Profile	per mile						
Item		Traffic Lane		Passing Lane					
		O, W, P.	I.W.P.	O. W. P.	I.W.P.	Average			
Span 1	44.0		194			194			
2	91.0		110			110			
3	129,7		97			97			
4	52,0		194			194			
5									
6									
Weighted Average for Bridge			130			130			
S Approach	100.00		240			240			
N Approach	100.00		122			122			
Weighted Average for Bridge and Approaches			150			150			
Remarks <u>Spans and joint</u> construction; #	s numbered fr 2, 3, 4, 6, 8, 10,	rom South to ,11 expansio	North. Jo n; #7 steel	int number a expansion	and type: #1	.,5,9			

s,

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