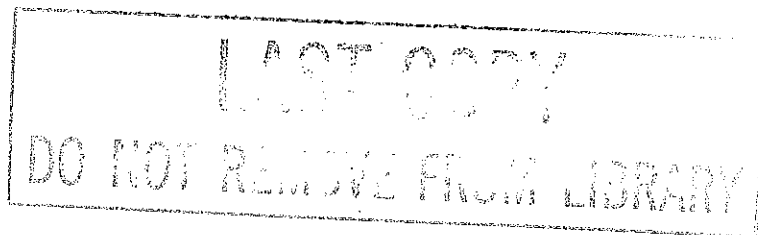


PROFILOMETER MEASUREMENT OF BRIDGE ROUGHNESS
Fifth Progress Report

Research Laboratory Division
Office of Testing and Research
Research Project R-61 F-65
Research Report No. R-469



Michigan State Highway Department
John C. Mackie, Commissioner
Lansing, September 1964

PROFILOMETER MEASUREMENT OF BRIDGE ROUGHNESS
Fifth Progress Report

This is the fifth publication in a continuing series on profilometer measurement of the roughness of bridge decks. The first (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 through November 1963, in this research program. 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 roughness value.

This fifth progress report presents results for a new group of 20 bridge projects (23 separate structures), 10 each finished by hand and

transverse machine methods. In reporting riding quality, the following tentative roughness classification is used again in this report, expressed in terms of accumulated inches-per mile:

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

Using these categories, the 107 "span-run" values (see Glossary), and the 23 "structure" values (see Glossary), measured for the 20 bridge projects for which test result forms are presented in this report, may be classified as follows:

Finishing Method	Riding Quality							
	Span Runs				Structures			
	Good	Average	Poor	Total	Good	Average	Poor	Total
Hand	26	39	7	72	5	8	0	13
Machine	8	24	3	35	2	8	0	10
Total	34	63	10	107	7	16	0	23

GLOSSARY

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 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 RUN VALUE: average of wheel path roughness measurements for all lanes of 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.

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

Form 1011

Bridge No. B01 of 33171 Location I 496 NB over Red Cedar River
Date Measured 5-26-64 Number of Spans 4 Length (including approaches) 490.6
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Center Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	58.3	97	145	132	109	
2	78.3	72	67	118	78	
3	85.3	143	146	82	84	
4	38.7	219	194	121	167	
5						
6						
Weighted Average for Bridge		123	129	110	100	
S Approach	100.0	122	97	91	69	
N Approach	100.0	98	109	119	96	
Weighted Average for Bridge and Approaches		117	118	108	92	

N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	58.3			108	154	124
2	78.3			130	119	97
3	85.3			105	86	108
4	38.7			207	163	178
5						
6						
Weighted Average for Bridge				128	123	119
S Approach	100.0			89	116	97
N Approach	100.0			Did not run - Gravel		106
Weighted Average for Bridge and Approaches				117	120	112

Remarks Spans and joints numbered from South to North. Joint #1, 2, 5, 8, and 9 Expansion; #3 and 7 Construction; #4 and 6 Steel Expansion. Concrete Approaches. North approach in NBPL not run due to too much gravel.

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

Form 1011

Bridge No. S12 of 33045 Location I 496 NB over Jolly Rd.
Date Measured 12-4-63 Number of Spans 3 Length (including approaches) 353.9
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Machine
N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	40.3	171	176	108	139	148
2	75.6	143	130	154	139	142
3	38.0	118	93	96	91	100
4						
5						
6						
Weighted Average for Bridge		144	112	128	127	128
S Approach	100.0	91	93	106	100	98
N Approach	100.0	141	96	122	138	124
Weighted Average for Bridge and Approaches		128	112	124	123	122

 Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1						
2						
3						
4						
5						
6						
Weighted Average for Bridge						
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks Joints and spans numbered from South to North. Joint #1, 2, 3; 8, 9, 10 - Expansion; #4 - Construction; #5 - Steel Expansion; #6 - Experimental.

Cantilevered structure.
Concrete Approaches.

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

Form 1011

Bridge No. S13 of 33045 D Location I 496 NB over I 496 SB to I 96 EB ramp
 Date Measured 12-4163 Number of Spans 3 Length (including approaches) 433.6
 Dual Structures (separate for each roadway) Yes No
 Single Structure Yes No Method of Finishing Machine
N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	59.0	143	118	138	129	132
2	104.0	128	125	111	111	119
3	70.6	93	66	99	136	98
4						
5						
6						
Weighted Average for Bridge		121	105	114	123	116
S Approach	100.0	75	104	93	100	93
N Approach	100.0	81	118	99	95	98
Weighted Average for Bridge and Approaches		101	108	106	111	107

 Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1						
2						
3						
4						
5						
6						
Weighted Average for Bridge						
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks Joints and spans numbered from South to North. Joint #1, 2, 3, 5, 8, 9, 10 - Expansion; #4, 7 - Construction; #6 - Construction.

Bridge tar spotted.
Concrete approaches.

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

Form 1011

Bridge No. S14 of 33045 Location I 496 SB over Jolly Road
Date Measured 12-5-63 Number of Spans 3 Length (including approaches) 347.2
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Machine
S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Center Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	37.6	160	226	154	121	
2	71.6	139	136	128	157	
3	38.0	160	112	160	134	
4						
5						
6						
Weighted Average for Bridge		150	153	143	142	
S Approach	100.0	118	109	110	105	
N Approach	100.0	126	120	122	108	
Weighted Average for Bridge and Approaches		134	131	128	121	

S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	37.6			133	156	158
2	71.6			172	186	153
3	38.0			119	118	134
4						
5						
6						
Weighted Average for Bridge				148	161	150
S Approach	100.0			114	132	115
N Approach	100.0			107	100	114
Weighted Average for Bridge and Approaches				127	135	129

Remarks Joints and spans numbered from South to North. Joint #1, 2, 3, 8, 9, 10 - Expansion; #4, 7 - Construction; #5 - Steel Expansion; #6 - Experimental.

Cantilevered Structure.

Concrete Approaches.

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

Form 1011

Bridge No. S15 of 33045 Location Cavanaugh Rd Conn. over I 496
Date Measured 12-5-63 Number of Spans 4 Length (including approaches) 459.3
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Machine
E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	52.6	132	94			113
2	72.0	148	141			144
3	81.7	146	126			136
4	53.0	185	209			197
5						
6						
Weighted Average for Bridge		152	141			146
E Approach	100.0	81	84			82
W Approach	100.0	114	79			97
Weighted Average for Bridge and Approaches		128	115			122

W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	52.6	104	119			111
2	72.0	102	109			105
3	81.7	148	112			130
4	53.0	113	93			103
5						
6						
Weighted Average for Bridge		119	109			114
E Approach	100.0	64	77			70
W Approach	100.0	89	117			103
Weighted Average for Bridge and Approaches		100	104			102

Remarks Joints and spans numbered from West to East. Joint #1, 2, 3, 6, 9, 10, 11 - Expansion; #4, 8 - Steel Expansion.

Cantilevered Structure. Concrete Approaches.

Dried mud stuck in spots on WB TL including a larger one in the east approach.

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

Form 1011

Bridge No. X01 of 33084 Location I 96 (EB) over NYC RR S of Lansing
 Date Measured 5-21-64 Number of Spans 3 Length (including approaches) 340.7
 Dual Structures (separate for each roadway) Yes No
 Single Structure Yes No Method of Finishing Hand
E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	47.0	167	133	127	107	134
2	46.7	98	85	174	148	126
3	47.0	103	132	88	95	104
4						
5						
6						
Weighted Average for Bridge		123	117	130	117	122
E Approach	100	90	109	116	93	102
W Approach	100	94	109	137	122	116
Weighted Average for Bridge and Approaches		105	112	128	111	114

 Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1						
2						
3						
4						
5						
6						
Weighted Average for Bridge						
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks All Spans and Joints numbered from West to East. Joint #1, 2, 3, 5, 6, 8, 9, & 10 - Expansion; #4 & 7 - Construction.
Concrete approaches.

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

Form 1011

Bridge No. X04 of 33045 Location I 496 NB over C & O RR and Trowbridge Road
 Date Measured 5-26-64 Number of Spans 3 Length (including approaches) 517.4
 Dual Structures (separate for each roadway) Yes No
 Single Structure Yes No Method of Finishing Machine
N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	107.0	113	119	131	119	120
2	104.2	126	89	123	150	122
3	106.2	135	141	145	108	132
4						
5						
6						
Weighted Average for Bridge		125	117	133	126	125
S Approach	100.0	68	84	82	69	76
N Approach	100.0	80	74	79	93	82
Weighted Average for Bridge and Approaches		105	102	113	108	107

 Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1						
2						
3						
4						
5						
6						
Weighted Average for Bridge						
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks Joint #1 Construction - #2 Steel Expansion - #3 Steel Expansion - #4 Construction - #5 Expansion - #6 Expansion. Joints and spans numbered from South to North. Concrete Approaches.

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

Form 1011

Bridge No. X05 of 33045 Location I 496 SB over GTW RR
Date Measured 5-25-64 Number of Spans 3 Length (including approaches) 395.8
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Machine
S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Center Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	55.1	141	174	96	142	
2	83.8	94	73	86	89	
3	56.9	137	101	113	108	
4						
5						
6						
Weighted Average for Bridge		120	110	97	109	
S Approach	100.0	104	86	85	60	
N Approach	100.0	160	130	136	74	
Weighted Average for Bridge and Approaches		126	109	104	88	

S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	55.1			72	102	121
2	83.8			84	104	88
3	56.9			100	90	108
4						
5						
6						
Weighted Average for Bridge				85	99	103
S Approach	100.0			117	82	89
N Approach	100.0			133	98	122
Weighted Average for Bridge and Approaches				105	95	104

Remarks Spans and joints are measured from South to North. Joint No. and Type: #1 Expansion; #2 Construction; #3 Steel Expansion; #4 Expansion; #5 Construction; #6 Expansion; #7 Expansion; and #8 Contraction. 3 span cantilevered bridge. Concrete Approaches.

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

Form 1011

Bridge No. X06 of 33045 Location I 496 (NB) over GTW RR
Date Measured 12-9-63 Number of Spans 3 Length (including approaches) 390.4
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Machine
N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	54.0	113	103	89	130	109
2	84.2	121	99	116	96	108
3	52.2	100	123	136	147	126
4						
5						
6						
Weighted Average for Bridge		113	107	114	120	114
S Approach	100.0	94	86	84	91	89
N Approach	100.0	76	80	75	69	75
Weighted Average for Bridge and Approaches		98	95	96	100	97

 Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1						
2						
3						
4						
5						
6						
Weighted Average for Bridge						
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks Spans and joints numbered from South to North. Joint #1, 2, 5, 7 - Expansion; #3, 6 - Construction; #4 - Steel Expansion.

Cantilevered structure.
Concrete approaches.

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

Form 1011

Bridge No. X07 of 33045 Location I 496 NB off ramp to Trowbridge Rd & C&O RR
 Date Measured 12-9-63 Number of Spans 5 Length (including approaches) 266.7
 Dual Structures (separate for each roadway) Yes No
 Single Structure Yes No Method of Finishing Machine
N Bound Roadway*

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	57.7	113				113
2	66.0	127				127
3	13.0	191				191
4	65.0	159				159
5	65.0	152				152
6						
Weighted Average for Bridge		141				141
Approach						
Approach						
Weighted Average for Bridge and Approaches						

N Bound Roadway*

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	56.6		124			124
2	64.6		136			136
3	28.6		85			85
4	64.6		184			184
5	65.0		177			177
6						
Weighted Average for Bridge			149			149
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks Spans and joints numbered from South to North. Joint #1, 6 - Construction; #2, 5 - Steel Expansion; #3, 4 - Expansion.

Approaches not run because of curve; also clay and gravel on each approach.

* Bridge built on curve making wheel paths different lengths.

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

Form 1011

Bridge No. S03 of 47014 Location US 23 (NB) over M-59
Date Measured 5-21-64 Number of Spans 3 Length (including approaches) 339.4
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
NB Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	32.2	159	220	205	158	186
2	72.5	171	208	165	172	179
3	34.7	214	235	193	168	202
4						
5						
6						
Weighted Average for Bridge		179	217	181	168	186
S Approach	100.0	106	110	92	109	104
N Approach	100.0	86	94	66	124	92
Weighted Average for Bridge and Approaches		130	149	121	141	135

Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1						
2						
3						
4						
5						
6						
Weighted Average for Bridge						
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks All Spans and Joints numbered from South to North. Joint #1, 2, 3, 5, 8, 9, 10 - Expansion; #4, 7 - Construction; #6 steel expansion.
Concrete Approaches.

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

Form 1011

Bridge No. B03 of 50111 Location I 94 SB over Clinton River
Date Measured 6-3-64 Number of Spans 6 Length (including approaches) 559.5
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	55.7	153	136	52	67	
2	61.2	87	54	93	105	
3	61.8	96	92	99	48	
4	62.0	81	91	63	65	
5	62.8	93	74	50	65	
6	56.0	114	100	134	78	
Weighted Average for Bridge		103	90	81	71	
S Approach	100.0	91	134	89	62	
N Approach	100.0	94	82	147	113	
Weighted Average for Bridge and Approaches		101	98	94	77	

S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Ramp Lane		Center Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	55.7	83	91	119	121	103
2	61.2	75	110	54	91	84
3	61.8	36	74	103	125	84
4	62.0	63	71	88	54	72
5	62.8	93	89	70	49	73
6	56.0	137	108	85	104	108
Weighted Average for Bridge		80	90	86	90	86
S Approach	100.0	104	137	97	95	101
N Approach	100.0	115	108	62	76	100
Weighted Average for Bridge and Approaches		91	102	84	88	92

Remarks Spans and joints numbered from South to North. Joints #2, 3, 5, 6, 8, 9, 11, 12 - Expansion; #1, 4, 10 - Construction; #7 - Steel Expansion.

Concrete Approaches.

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

Form 1011

Bridge No. B04 of 50111 Location I 94 NB over Clinton River
Date Measured 6-10-64 Number of Spans 6 Length (including approaches) 556.6
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Center Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	55.8	240	169	146	124	
2	61.2	161	116	176	140	
3	61.7	159	130	113	135	
4	60.9	143	92	142	116	
5	61.4	196	159	127	137	
6	55.6	210	188	128	166	
Weighted Average for Bridge		184	141	139	136	
S Approach	100.0	144	123	171	143	
N Approach	100.0	169	148	130	137	
Weighted Average for Bridge and Approaches		174	139	143	138	

N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	55.8			125	116	153
2	61.2			78	83	126
3	61.7			103	70	118
4	60.9			90	112	116
5	61.4			80	75	129
6	55.6			134	107	156
Weighted Average for Bridge				101	93	132
S Approach	100.0			126	135	140
N Approach	100.0			119	127	138
Weighted Average for Bridge and Approaches				109	107	135

Remarks Joints #1, 2, 3, 5, 6, 8, 9, 11, 12, and 13 Expansion; #4 and 10 Construction; #7 Steel Expansion. Traffic and center lanes old pavement - passing lane new. Joints blown and broken on old pavement. Joints and spans numbered from South to North. Concrete Approaches.

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

Form 1011

Bridge No. S26 of 50111 Location I 94 (NB) over Metro. Beach Parkway
Date Measured 6-4-64 Number of Spans 4 Length (including approaches) 403.0
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	32.2	58	51	93	93	
2	66.2	66	76	64	72	
3	66.6	73	82	66	97	
4	38.0	100	131	127	166	
5						
6						
Weighted Average for Bridge		73	84	81	101	
S Approach	100.0	80	66	85	105	
N Approach	100.0	88	80	81	57	
Weighted Average for Bridge and Approaches		79	79	82	91	

N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Ramp Lane		Center Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	32.2	80	111	66	90	80
2	66.2	85	98	82	85	78
3	66.6	122	99	78	63	85
4	38.0	103	82	141	73	115
5						
6						
Weighted Average for Bridge		100	97	89	76	88
S Approach	100.0	99	110	88	71	88
N Approach	100.0	88	99	65	64	78
Weighted Average for Bridge and Approaches		97	101	83	72	86

Remarks Spans and joints numbered from South to North. Joint No. & Type: #1 - Expansion; #2 - Expansion; #3 - Construction; #4 - Expansion; #5 - Steel Expansion; #6 - Expansion; #7 - Construction; #8 - Expansion; #9 - Expansion.
Concrete approaches.

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

Form 1011

Bridge No. S26 of 50111 Location I 94 (SB) over Metro. Beach Parkway
Date Measured 6-4-64 Number of Spans 4 Length (including approaches) 403.0
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Center Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	32.2	113	64	100	69	86
2	66.2	109	79	104	93	96
3	66.6	95	106	88	126	104
4	38.0	113	73	78	79	86
5						
6						
Weighted Average for Bridge		106	84	93	97	95
S Approach	100.0	61	88	93	94	84
N Approach	100.0	82	71	74	105	83
Weighted Average for Bridge and Approaches		89	82	88	98	89

 Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1						
2						
3						
4						
5						
6						
Weighted Average for Bridge						
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks Spans and joints numbered from South to North. Joint #1, 2, 4, 6, 8, 9 - Expansion; #3, 7 - Construction; #5 - Steel Expansion.

Ramp and traffic lanes were not run because of tar on the surface.

Concrete Approaches.

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

Form 1011

Bridge No. S27 of 50111 Location I 94 (NB) over Crocker Road
Date Measured 6-10-64 Number of Spans 5 Length (including approaches) 579.3
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Center Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	69.5	106	74	68	65	
2	72.0	107	92	104	80	
3	99.3	84	100	93	88	
4	69.5	92	85	79	65	
5	69.0	147	110	105	98	
6						
Weighted Average for Bridge		105	93	90	80	
S Approach	100.0	111	108	98	97	
N Approach	100.0	117	114	100	94	
Weighted Average for Bridge and Approaches		108	99	93	85'	

N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	69.5			96	115	87
2	72.0			77	79	90
3	99.3			59	94	86
4	69.5			64	91	79
5	69.0			98	105	110
6						
Weighted Average for Bridge				77	96	90
S Approach	100.0			94	71	96
N Approach	100.0			80	75	97
Weighted Average for Bridge and Approaches				81	88	92

Remarks Spans and joints numbered from South to North. Joint #1, 2, 4, 5, 7, 9, 10 - Expansion; #3, 8 - Construction; #6 - Steel Expansion.

Cantilevered structure.

Concrete approaches.

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

Form 1011

Bridge No. S27 of 50111 Location I 94 (SB) over Crocker Rd.
Date Measured 6-11-64 Number of Spans 5 Length (including approaches) 579.3
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Center Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	69.5	140	122	81	83	
2	72.0	106	78	92	78	
3	99.3	94	88	52	72	
4	69.5	82	79	59	48	
5	69.0	68	80	101	111	
6						
Weighted Average for Bridge		98	89	75	78	
<u>S</u> Approach	100.0	90	91	91	98	
<u>N</u> Approach	100.0	132	117	105	99	
Weighted Average for Bridge and Approaches		102	94	83	85	

S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	69.5			96	92	102
2	72.0			68	84	84
3	99.3			88	101	83
4	69.5			77	109	76
5	69.0			90	112	94
6						
Weighted Average for Bridge				84	100	87
<u>S</u> Approach				82	100	92
<u>N</u> Approach				101	97	109
Weighted Average for Bridge and Approaches				86	99	92

Remarks Spans and joints numbered from South to North. Joint #1, 2, 4, 7, 9, and 10 Expansion; #3 and 8 Construction; #5 and 6 Steel-Expansion. Concrete Approaches.

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

Form 1011

Bridge No. S07 of 81103 Location Dixboro Road over M14 Relocation
Date Measured 6-30-64 Number of Spans 4 Length (including approaches) 239.4
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Bid-Well Finishing Machine
N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	48.0	102	88			95
2	71.7	68	38			53
3	71.7	85	81			83
4	48.0	61	66			64
5						
6						
Weighted Average for Bridge		79	66			72
Approach						
Approach						
Weighted Average for Bridge and Approaches						

S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	48.0	63	77			70
2	71.7	53	59			56
3	71.7	83	85			84
4	48.0	83	93			88
5						
6						
Weighted Average for Bridge		70	76			73
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks Spans and Joints numbered from South to North. Joint #1, 2, 3, - Expansion.
Approaches not run - incomplete construction.

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

Form 1011

Bridge No. S08 of 81103 Location Vorhies Road over M 14 Relocation

Date Measured 6-30-64 Number of Spans 4 Length (including approaches) 244.5

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Bid-Well Finishing Machine

N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	45.7	197	173			185
2	72.1	147	169			158
3	72.0	116	64			90
4	54.7	111	91			101
5						
6						
Weighted Average for Bridge		138	120			129
Approach						
Approach						
Weighted Average for Bridge and Approaches						

S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	45.7	118	162			140
2	72.1	220	168			194
3	72.0	85	98			91
4	54.7	71	83			77
5						
6						
Weighted Average for Bridge		131	128			129
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks Spans and Joints numbered from South to North. Joint #1, 2, 3 - Expansion.
Approaches not run - incomplete construction.

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

Form 1011

Bridge No. S08 of 82251 Location I 75 over I 375
Date Measured 6-25-64 Number of Spans 7 Length (including approaches) 457.3
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	29.6	151	150	147	137	146
2	45.7	108	113	128	66	104
3	44.8	145	147	140	169	150
4	78.7	93	89	117	84	96
5	67.8	118	117	93	151	120
6/7	56.8/34.0	54/83	80/92	78/107	98/161	78/111
Weighted Average for Bridge		104	109	112	119	111
W Approach	50.0	204	269	148	137	190
E Approach	50.0	152	136	103	110	125
Weighted Average for Bridge and Approaches		120	129	115	120	121

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	29.6	155	131	131	148	141
2	45.7	86	92	95	123	99
3	44.8	122	119	134	132	127
4	78.7	87	100	85	94	92
5	67.8	78	82	92	69	80
6/7	56.8/34.0	112/114	93/83	91/87	79/72	94/89
Weighted Average for Bridge		102	98	99	98	99
W Approach	50.0	130	153	159	158	150
E Approach	50.0	177	147	136	154	154
Weighted Average for Bridge and Approaches		113	109	109	110	110

Remarks Spans and joints numbered from West to East. Joint No. and Type: #1 - Expansion; #2 - Expansion; #3 - Construction; #4 - Expansion; #5 - Expansion; #6 - Steel Expansion; #7 - Expansion; #8 - Steel Expansion; #9 - Expansion; #10 - Construction; #11 - Expansion; #12 - Expansion. Bituminous Approaches.

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

Form 1011

Bridge No. S25 of 82251 Location NB I 75 ramp to WB I 94
Date Measured 6-23-64 Number of Spans 9 Length (including approaches) 994.6
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	96.8		154			154
2	99.0		174			174
3	112.7		148			148
4	107.6		129			129
5	101.0		117			117
6	84.6		110			110
Weighted Average for Bridge						
Approach						
Approach						
Weighted Average for Bridge and Approaches						

N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 7	43.6		161			161
8	93.6		146			146
9	55.7		169			169
Weighted Average for Bridge			143			143
S Approach	100.0		170			170
N Approach	100.0		158			158
Weighted Average for Bridge and Approaches			147			147

Remarks _____

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

Form 1011

Bridge No. S25 of 82251 Location NB I 75 ramp to WB I 94
Date Measured 6-23-64 Number of Spans 9 Length (including approaches) 973.9
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	96.0	128				128
2	99.3	182				182
3	110.0	162				162
4	99.3	142				142
5	95.2	109				109
6	82.2	106				106
Weighted Average for Bridge						
Approach						
Approach						
Weighted Average for Bridge and Approaches						

 Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 7	43.2	116				116
8	90.8	144				144
9	57.9	195				195
Weighted Average for Bridge						
S Approach	100.0	172				172
N Approach	100.0	173				173
Weighted Average for Bridge and Approaches						

Remarks Spans and joints numbered from South to North. Joints #2, 5, 7, 9, 11, 13 - Expansion; #1, 3, 12 - Construction; #4, 6, 8, 10 - Steel Expansion.

Bridge built on a curve making wheel paths different lengths.

Concrete Approaches. (I. W. P. continued on next page)

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

Form 1011

Bridge No. S26 of 82251 Location I 75 ramp over NB I 75 to WB I 94 ramp
 Date Measured 6-23-64 Number of Spans 9 Length (including approaches) 782.3
 Dual Structures (separate for each roadway) Yes No
 Single Structure Yes No Method of Finishing Hand
N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	53.6		105			105
2	52.0		155			155
3	54.3		109			109
4	64.3		129			129
5	64.2		118			118
6	64.2		90			90
Weighted Average for Bridge						
Approach						
Approach						
Weighted Average for Bridge and Approaches						

N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 7	60.7		153			153
8	85.3		130			130
9	70.3		151			151
Weighted Average for Bridge						
S Approach	100.0		145			145
N Approach	100.0		175			175
Weighted Average for Bridge and Approaches						

Remarks Spans and joints numbered from South to North. Joints #1, 2, 4, 5, 6, 7, 8, 9, 11, 12 - Expansion; #3 - Construction; #10 - Steel Expansion. Bridge built on curve making wheel paths different lengths. No construction joint on N end of bridge and N approach is part of S30 of 82251. Concrete Approaches.
 (O. W. P. continued on next page)

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

Form 1011

Bridge No. S26 of 82251 Location I 75 ramp over NB I 75 to WB I 94 ramp
 Date Measured 6-23-64 Number of Spans 9 Length (including approaches) 782.3
 Dual Structures (separate for each roadway) Yes No
 Single Structure Yes No Method of Finishing Hand
N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 1	53.4	138				138
2	54.1	164				164
3	54.3	151				151
4	62.8	131				131
5	62.7	106				106
6	62.8	120				120
Weighted Average for Bridge						
Approach						
Approach						
Weighted Average for Bridge and Approaches						

N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				Average
		Traffic Lane		Passing Lane		
		O. W. P.	I. W. P.	O. W. P.	I. W. P.	
Span 7	62.2	87				87
8	100.4	140				140
9	69.6	159				159
Weighted Average for Bridge		133				133
S Approach	100.0	170				170
N Approach	100.0	120				120
Weighted Average for Bridge and Approaches		136				136

Remarks _____