

PROFILOMETER MEASUREMENT OF BRIDGE ROUGHNESS
Sixth Progress Report

Research Laboratory Division
Office of Testing and Research
Research Project R-61 F-65
Research Report No. R-492

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Michigan State Highway Department
Lansing, February 1965

PROFILOMETER MEASUREMENT OF BRIDGE ROUGHNESS
Sixth Progress Report

This is the sixth publication in a continuing series on profilometer measurement of the roughness of bridge decks. A total of 187 bridges have been reported, including those in this report. 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 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).

This sixth report presents results for a new group of 41 bridge projects (49 separate structures). 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 183 "span-run" values (see Glossary), and the 49 "structure" values (see Glossary), measured for the 41 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	20	62	10	92	6	18	1	25
Machine	13	57	21	91	2	16	6	24
Total	33	119	31	183	8	34	7	49

On page 46, following tabulations for State Highway Department projects, tests are reported for the Bogue St. Bridge in East Lansing which was finished by a longitudinal machine of special interest. This bridge and all its individual spans measured in the "good" category, but these figures are not included in the riding quality table above, since this is not a State trunkline bridge.

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. S01 of 03033 Location North Shore Drive over I 96

Date Measured 9-30-64 Number of Spans 4 Length (including approaches) 426.0

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Hand

E Bound Roadway District 7

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	37.2	60	56			58
2	71.4	65	57			61
3	80.4	115	111			113
4	37.0	66	64			65
5						
6						
Weighted Average for Bridge		82	77			80
W Approach	100.0	60	49			54
E Approach	100.0	72	75			74
Weighted Average for Bridge and Approaches		74	70			72

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	37.2	53	50			52
2	71.4	46	58			52
3	80.4	64	73			68
4	37.0	73	43			58
5						
6						
Weighted Average for Bridge		58	60			59
W Approach	100.0	71	51			61
E Approach	100.0	58	64			61
Weighted Average for Bridge and Approaches		61	59			60

Remarks Spans and Joints numbered from West to East. Joint #1, 3, 5, 7, 8 - Expansion; #2, 6 - Construction; #4 - Steel Expansion. Concrete Approaches.

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

Form 1011

Bridge No. S02 of 03033 Location I 96 over 71st St.

Date Measured 9-25-64 Number of Spans 3 Length (including approaches) 326.4

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Hand

N Bound Roadway

District 7

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	36.7	188	130	122	86	132
2	47.9	213	171	139	125	162
3	41.8	144	128	118	85	119
4						
5						
6						
Weighted Average for Bridge		183	145	127	100	139
S Approach	100.0	66	61	49	49	56
N Approach	100.0	107	85	54	60	76
Weighted Average for Bridge and Approaches		124	101	81	72	94

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	36.7	116	114	144	103	119
2	47.9	178	97	148	92	129
3	41.8	120	106	82	100	102
4						
5						
6						
Weighted Average for Bridge		141	105	125	98	117
S Approach	100.0	48	56	45	52	50
N Approach	100.0	81	84	66	63	74
Weighted Average for Bridge and Approaches		94	84	82	73	83

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

PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS
TEST RESULT TABULATION

Research Project 61 F-65

Form 1011

Bridge No. S03 of 03033 Location 107th Avenue over I 96

Date Measured 9-28-64 Number of Spans 4 Length (including approaches) 230.5

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Hand

E Bound Roadway District 7

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	40.6	149	80			114
2	76.3	135	127			131
3	76.3	123	109			116
4	37.3	164	81			122
5						
6						
Weighted Average for Bridge		138	106			122
Approach						
Approach						
Weighted Average for Bridge and Approaches						

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	40.6	114	74			94
2	76.3	138	139			138
3	76.3	112	138			125
4	37.3	89	77			83
5						
6						
Weighted Average for Bridge		117	117			117
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks Spans and Joints numbered from West to East. Joint #1, 5 - Construction; #2, 3, 4 - Expansion.

Tar and Chip Approaches too rough to measure.

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

Form 1011

Bridge No. S04 of 03033 Location 109th Avenue over I 96
Date Measured 9-29-64 Number of Spans 4 Length (including approaches) 334.6
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
E Bound Roadway District 7

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	35.6	178	208			193
2	82.2	173	189			181
3	81.2	95	107			101
4	35.6	233	255			244
5						
6						
Weighted Average for Bridge		156	174			165
W Approach	50.0	77	89			83
E Approach	50.0	---	---			---
Weighted Average for Bridge and Approaches		121	135			128

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	35.6	108	142			125
2	82.2	199	140			170
3	81.2	166	107			136
4	35.6	153	201			177
5						
6						
Weighted Average for Bridge		167	138			152
W Approach	50.0	50	50			50
E Approach	50.0	63	75			69
Weighted Average for Bridge and Approaches		134	115			124

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

Bituminous approaches. Unable to read E approach of EB roadway.

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

Form 1011

Bridge No. S05 of 03033 Location 114th Avenue over I 96

Date Measured 9-30-64 Number of Spans 4 Length (including approaches) 354.0

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Machine

E Bound Roadway District 7

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	184	101			142
2	71.9	137	139			138
3	71.9	155	118			136
4	55.1	132	118			125
5						
6						
Weighted Average for Bridge		151	120			136
W Approach	50.0	140	102			121
E Approach	50.0	170	158			164
Weighted Average for Bridge and Approaches		153	123			138

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	55.1	89	97			93
2	71.9	124	135			130
3	71.9	128	100			114
4	55.1	101	86			94
5						
6						
Weighted Average for Bridge		113	106			110
W Approach	50.0	156	125			140
E Approach	50.0	123	82			102
Weighted Average for Bridge and Approaches		120	105			112

Remarks Spans and Joints numbered from West to East. Joint #1, 5 - Construction; #2, 3, 4 - Expansion.

Bituminous Approaches.

PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS
TEST RESULT TABULATION

Research Project 61 F-65

Form 1011

Bridge No. S06 of 03033 Location US 31 over I 96

Date Measured 9-24-64 Number of Spans 4 Length (including approaches) 486.6

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Machine

N Bound Roadway District 7

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	44.2	164	130			147
2	99.7	145	134			140
3	98.5	121	116			118
4	44.2	120	109			114
5						
6						
Weighted Average for Bridge		136	123			130
S Approach	100.0	106	136			121
N Approach	100.0	77	84			78
Weighted Average for Bridge and Approaches		118	118			118

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	44.2	126	124			125
2	99.7	138	108			123
3	98.5	145	115			130
4	44.2	141	78			110
5						
6						
Weighted Average for Bridge		139	108			124
S Approach	100.0	79				79
N Approach	100.0	77	86			82
Weighted Average for Bridge and Approaches		114	81			98

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

Cantilevered Structure.

Concrete Approaches.

SBTL - IWP Not Run.

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

Form 1011

Bridge No. S07 of 03033 Location 118th Avenue over I 96
 Date Measured 9-23-64 Number of Spans 4 Length (including approaches) 215.4
 Dual Structures (separate for each roadway) Yes No
 Single Structure Yes No Method of Finishing Hand
E Bound Roadway District 7

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	35.2	104	102			103
2	72.5	175	87			131
3	72.5	149	122			136
4	35.2	147	119			133
5						
6						
Weighted Average for Bridge		153	106			130
Approach						
Approach						
Weighted Average for Bridge and Approaches						

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	35.2	178	122			150
2	72.5	182	168			175
3	72.5	147	137			142
4	35.2	188	131			160
5						
6						
Weighted Average for Bridge		169	146			158
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks Spans and Joints numbered from West to East. Joint #1, 5 - Construction; #2, 3, 4 - Expansion.

Tar and Chip Approaches too rough to measure.

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

Form 1011

Bridge No. S08 of 03033 Location M 89 over I 96

Date Measured 9-23-64 Number of Spans 4 Length (including approaches) 319.2

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Hand

E Bound Roadway District 7

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	34.7	169	118			144
2	72.2	101	108			104
3	72.0	177	135			156
4	40.3	195	157			176
5						
6						
Weighted Average for Bridge		154	127			140
W Approach	50.0	108	84			96
E Approach	50.0	126	121			124
Weighted Average for Bridge and Approaches		142	120			131

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	34.7	146	127			136
2	72.2	170	126			148
3	72.0	181	123			152
4	40.3	131	163			147
5						
6						
Weighted Average for Bridge		163	132			148
W Approach	50.0	137	150			144
E Approach	50.0	124	95			110
Weighted Average for Bridge and Approaches		153	129			141

Remarks Spans and Joints numbered from West to East. Joint #1, 5 - Construction; #2, 3, 4 - Expansion.
Bituminous Approaches.

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

Form 1011

Bridge No. S01 of 03034 Location US 31 over I 96
Date Measured 9-22-64 Number of Spans 4 Length (including approaches) 420.7
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
NB Bound Roadway District 7

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	48.4	193	159			176
2	110.4	155	149			152
3	109.6	125	124			124
4	52.3	129	134			132
5						
6						
Weighted Average for Bridge		146	140			143
S Approach	50.0	119	131			125
N Approach	50.0	81	135			108
Weighted Average for Bridge and Approaches		135	138			136

SB 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	48.4	179	164			172
2	110.4	117	61			89
3	109.6	141	109			125
4	52.3	187	176			182
5						
6						
Weighted Average for Bridge		146	112			129
S Approach	50.0	172	124			148
N Approach	50.0	117	107			112
Weighted Average for Bridge and Approaches		146	113			130

Remarks Spans and Joints numbered from South to North. Joint #1, 5, 7 - Expansion; #6, 2 - Construction; #4 - Steel Expansion. Cantilevered structure. Concrete approaches. Ramps too close for 100 ft approaches.

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

Form 1011

Bridge No. S01 of 03111 Location 102nd Avenue over US 131

Date Measured 10-1-64 Number of Spans 4 Length (including approaches) 309.6

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Hand

W Bound Roadway District 7

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	34.0	80	68			74
2	70.8	54	64			59
3	70.8	85	62			74
4	34.0	99	97			98
5						
6						
Weighted Average for Bridge		76	69			72
W Approach	50.0	120	88			104
E Approach	50.0	89	102			96
Weighted Average for Bridge and Approaches		85	77			81

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	34.0	87	84			86
2	70.8	64	64			64
3	70.8	92	60			76
4	34.0	138	89			114
5						
6						
Weighted Average for Bridge		89	70			80
W Approach	50.0	101	89			95
E Approach	50.0	189	174			182
Weighted Average for Bridge and Approaches		107	90			99

Remarks Spans and Joints numbered from West to East. Joints #1, 5 - Construction; #2, 3, 4 - Expansion.

Bituminous Approaches.

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

Form 1011

Bridge No. S02 of 11014 Location LaPorte Road over I 94
Date Measured 9-1-64 Number of Spans 4 Length (including approaches) 340.7
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
N Bound Roadway District 7

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	34.0	125	59			92
2	85.9	88	69			78
3	85.8	106	99			102
4	35.0	102	99			100
5						
6						
Weighted Average for Bridge		102	83			92
S Approach	50.0	111	136			124
N Approach	50.0	136	141			138
Weighted Average for Bridge and Approaches		108	99			104

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	34.0	145	160			152
2	85.9	70	75			72
3	85.8	73	71			72
4	35.0	118	81			100
5						
6						
Weighted Average for Bridge		89	86			88
S Approach	50.0	160	153			156
N Approach	50.0	96	100			98
Weighted Average for Bridge and Approaches		100	98			99

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

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

Form 1011

Bridge No. B01 of 11111 Location I 196 over Paw Paw River

Date Measured 9-2-64 Number of Spans 3 Length (including approaches) 301.4

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Hand

S Bound Roadway District 7

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	67.0	93	83	82	83	85
2	67.4	114	131	114	98	114
3	67.0	110	130	130	132	126
4						
5						
6						
Weighted Average for Bridge		106	115	109	104	108
<u>S</u> Approach	50.0	78	89	125	117	102
<u>N</u> Approach	50.0	121	120	194	170	151
Weighted Average for Bridge and Approaches		104	111	126	118	115

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	67.0	140	152	159	155	152
2	67.4	117	121	100	123	115
3	67.0	153	165	185	186	172
4						
5						
6						
Weighted Average for Bridge		137	146	148	155	146
<u>S</u> Approach	50.0	123	122	185	132	140
<u>N</u> Approach	50.0	189	200	173	202	191
Weighted Average for Bridge and Approaches		143	151	158	159	153

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

Tar spotted.

Bituminous approaches.

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

Form 1011

Bridge No. S06 of 11111 Location Central Ave. over I 96

Date Measured 10-1-64 Number of Spans 4 Length (including approaches) 232.5

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Machine

E Bound Roadway District 7

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	42.3	118	94			106
2	74.6	189	152			170
3	73.3	136	133			134
4	42.3	80	101			90
5						
6						
Weighted Average for Bridge		140	126			133
Approach						
Approach						
Weighted Average for Bridge and Approaches						

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	42.3	122	105			114
2	74.6	157	140			148
3	73.3	170	146			158
4	42.3	110	75			92
5						
6						
Weighted Average for Bridge		146	124			135
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks Spans and Joints numbered from West to East. Joint #1, 5 - Construction; #2, 4 - Expansion; #3 - Steel Expansion.

Tar and chip approaches not run.

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

Form 1011

Bridge No. X01 of 11111 Location I 196 over C & O RR

Date Measured 9-3-64 Number of Spans 3 Length (including approaches) 246.0

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Machine

N Bound Roadway District 7

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	48.5	154	125	154	114	137
2	49.0	110	127	121	109	117
3	48.5	97	100	99	95	98
4						
5						
6						
Weighted Average for Bridge		120	117	125	106	117
S Approach	50.0	140	148	158	155	150
N Approach	50.0	68	57	107	129	90
Weighted Average for Bridge and Approaches		114	111	128	121	118

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	48.5	134	122	100	85	110
2	49.0	139	135	174	172	155
3	48.5	177	145	144	133	150
4						
5						
6						
Weighted Average for Bridge		150	134	139	130	138
S Approach	50.0	155	109	77	98	110
N Approach	50.0	93	82	88	116	95
Weighted Average for Bridge and Approaches		139	119	116	121	124

Remarks Spans and Joints numbered from South to North. Joint #1, 2, 3, 4 - Construction. Tar spotted.

Bituminous Approaches.

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

Form 1011

Bridge No. S02 of 23152 Location I 96 (EB) over M 43

Date Measured 2-11-64 Number of Spans 3 Length (including approaches) 211.2

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Machine

E Bound Roadway District 8

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	50.0	186	187	114	125	
2	35.0	139	164	169	162	
3	91.0	240	232	196	182	
4	35.2	188	200	236	227	
5						
6						
Weighted Average for Bridge		207	208	199	187	
Approach						
Approach						
Weighted Average for Bridge and Approaches		202	205	179	172	

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	50.0			113	105	139
2	35.0			173	149	160
3	91.0			144	142	190
4	35.2			182	165	200
5						
6						
Weighted Average for Bridge				159	149	185
Approach						
Approach						
Weighted Average for Bridge and Approaches				148	138	174

Remarks Joints and spans numbered from West to East. Joint #1, 2, 4 - Expansion; #3, 6 - Construction; #5 - Steel Expansion.

Cantilevered structure.

Bituminous Approaches.

HPR Project Special Request Measurement.

PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS

TEST RESULT TABULATION

Research Project 61 F-65

Form 1011

Bridge No. X03 of 33045 Location I 496 SB over C&O RR and Trowbridge Road

Date Measured 5-27-64 Number of Spans 3 Length (including approaches) 505.0

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Machine

S Bound Roadway District 8

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	114.0	174	163	111	119	
2	112.0	125	108	85	99	
3	79.0	94	141	157	132	
4						
5						
6						
Weighted Average for Bridge		135	137	113	115	
South Approach	100.0	129	80	76	63	
North Approach	100.0	120	125	163	93	
Weighted Average for Bridge and Approaches		131	123	116	100	

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	114.0			119	104	132
2	112.0			129	99	108
3	79.0			107	140	128
4						
5						
6						
Weighted Average for Bridge				120	111	122
South Approach	100			101	101	92
North Approach	100			173	209	147
Weighted Average for Bridge and Approaches				127	129	121

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

Concrete approaches.

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

Form 1011

Bridge No. B02 of 33171 Location I 496 SB over Red Cedar River

Date Measured 5-27-64 Number of Spans 4 Length (including approaches) 471.2

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Hand

S Bound Roadway

District 8

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	56.4	205	176	160	156	
2	86.9	152	119	71	94	
3	86.5	87	78	93	74	
4	41.4	111	113	101	142	
5						
6						
Weighted Average for Bridge		136	117	101	108	
S Approach	100.0	92	109	97	102	
N Approach	100.0	132	95	93	112	
Weighted Average for Bridge and Approaches		126	110	98	108	

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	56.4			195	168	177
2	86.9			110	101	108
3	86.5			92	97	87
4	41.4			114	145	121
5						
6						
Weighted Average for Bridge				123	120	118
S Approach	100.0			88	74	94
N Approach	100.0			101	74	101
Weighted Average for Bridge and Approaches				111	101	109

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

Concrete approaches.

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

Form 1011

Bridge No. S11 of 39014 Location US 131 NB over "D" Avenue
Date Measured 10-1-64 Number of Spans 3 Length (including approaches) 310.2
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
N Bound Roadway District 7

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	35.4	51	71	105	102	82
2	40.8	115	98	86	74	93
3	34.0	51	78	108	70	77
4						
5						
6						
Weighted Average for Bridge		75	83	99	82	85
S Approach	100.0	102	122	114	102	110
N Approach	100.0	95	102	91	89	94
Weighted Average for Bridge and Approaches		90	102	101	90	96

 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, 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. B01 of 41024 Location I 96 over Thornapple River

Date Measured 7-17-64 Number of Spans 4 Length (including approaches) 640.3

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Machine

W Bound Roadway District 5

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	110.5	91	109	92	93	96
2	109.3	118	130	112	106	116
3	110.5	85	101	84	85	89
4	110.0	102	90	103	99	98
5						
6						
Weighted Average for Bridge		99	107	98	96	100
W Approach	100.0	142	134	132	134	136
E Approach	100.0	131	146	76	115	117
Weighted Average for Bridge and Approaches		111	118	100	105	108

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	110.5	153	118	118	121	128
2	109.3	160	157	135	136	147
3	110.5	132	146	126	142	136
4	110.0	138	111	119	126	124
5						
6						
Weighted Average for Bridge		146	133	124	131	134
W Approach	100.0	110	121	96	106	108
E Approach	100.0	173	153	80	132	134
Weighted Average for Bridge and Approaches		144	134	113	127	130

Remarks Spans and Joints numbered from West to East. Joint #1, 2, 3, 6, 9, 10, 11 - Expansion; #4, 8 - Construction; #5, 7 - Steel Expansion.

Cantilever structure.

Concrete approaches.

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

Form 1011

Bridge No. S09 of 41025 Location I 96 WB over I 96 EB, E of Grand Rapids
Date Measured 7-14-64 Number of Spans 3 Length (including approaches) 402.2
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
W Bound Roadway District 5

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	49.6	171	141	121	127	140
2	90.3	174	150	129	116	142
3	62.3	159	122	148	130	140
4						
5						
6						
Weighted Average for Bridge		169	139	133	123	141
W Approach	100.0	81	96	110	120	102
E Approach	100.0	86	88	118	132	106
Weighted Average for Bridge and Approaches		126	116	123	125	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						
2						
3						
4						
5						
6						
Weighted Average for Bridge						
Approach						
Approach						
Weighted Average for Bridge and Approaches						

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

Concrete approaches.

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

Form 1011

Bridge No. B02 of 44031 Location M 5.3 over Western Drain

Date Measured 7-2-64 Number of Spans 1 Length (including approaches) 146.7

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Machine

S Bound Roadway District 6

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	46.7	178	213			195
2						
3						
4						
5						
6						
Weighted Average for Bridge		178	213			195
S Approach	50.0	133	156			144
N Approach	50.0	249	235			242
Weighted Average for Bridge and Approaches		187	201			194

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	46.7	122	120			121
2						
3						
4						
5						
6						
Weighted Average for Bridge		122	120			121
S Approach	50.0	139	137			138
N Approach	50.0	116	163			139
Weighted Average for Bridge and Approaches		126	141			133

Remarks Spans and Joints numbered from South to North. Joint #1, 2 - Construction. Bifuminous approaches.

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

Form 1011

Bridge No. B02 of 50051 Location US 25 over Clinton River
Date Measured 7-6-64 Number of Spans 3 Length (including approaches) 469.9
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Machine
N Bound Roadway District 9

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	83.6	178	157	156	164	
2	101.9	209	224	163	185	
3	84.4	241	220	192	220	
4						
5						
6						
Weighted Average for Bridge		209	202	170	189	
N Approach	100.0	102	119	164	117	
S Approach	100.0	123	98	150	99	
Weighted Average for Bridge and Approaches		168	162	165	155	

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	83.6			155	133	146
2	101.9			166	196	190
3	84.4			265	254	232
4						
5						
6						
Weighted Average for Bridge				194	195	193
N Approach	100.0			141	103	123
S Approach	100.0			125	102	116
Weighted Average for Bridge and Approaches				168	155	162

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

Cantilevered structure.

Concrete approaches.

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

Form 1011

Bridge No. S29 of 50111 Location M 59 over I 94
Date Measured 7-7-64 Number of Spans 4 Length (including approaches) 425.6
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Machine
E Bound Roadway District 9

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	36.3	143	192			168
2	71.5	135	163			149
3	81.5	156	192			174
4	36.3	183	134			158
5						
6						
Weighted Average for Bridge		152	173			162
W Approach	100.0	69	79			74
E Approach	100.0	94	85			90
Weighted Average for Bridge and Approaches		118	130			124

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	36.3	144	151			148
2	71.5	99	106			102
3	81.5	197	207			202
4	36.3	190	188			189
5						
6						
Weighted Average for Bridge		156	163			160
W Approach	100.0	99	84			92
E Approach	100.0	112	104			108
Weighted Average for Bridge and Approaches		132	130			131

Remarks Spans and joints numbered from West to East. Joint #1, 2, 3, 5, 7, 9, 10, 11 - Expansion; #4, 8 - Construction; #6 - Steel Expansion.

Concrete approaches.

Cantilevered Construction.

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

Form 1011

Bridge No. B07 of 73051 Location M 13 over Cass River

Date Measured 7-1-64 Number of Spans 6 Length (including approaches) 489.5

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Machine

N Bound Roadway

District 6

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	64.6	202	183			192
2	65.1	134	108			121
3	65.6	195	150			172
4	64.5	191	132			162
5	65.2	145	143			144
6	64.5	186	172			179
Weighted Average for Bridge		175	148			162
S Approach	50.0	144	187			166
N Approach	50.0	180	154			167
Weighted Average for Bridge and Approaches		186	153			170

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	64.6	202	157			180
2	65.1	171	126			148
3	65.6	218	200			209
4	64.5	181	168			174
5	65.2	178	150			164
6	64.5	158	132			145
Weighted Average for Bridge		185	156			170
S Approach	50.0	177	256			216
N Approach	50.0	205	156			180
Weighted Average for Bridge and Approaches		186	166			176

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

Bituminous Approaches.

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

Form 1011

Bridge No. B01 of 77111 Location I 94 over Belle River
Date Measured 7-8-64 Number of Spans 3 Length (including approaches) 382.0
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Machine
N Bound Roadway District 9

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	60.5	165	185	117	158	156
2	61.1	164	123	118	172	144
3	60.6	162	168	229	225	196
4						
5						
6						
Weighted Average for Bridge		164	159	155	185	166
S Approach	100.0	56	75	86	85	76
N Approach	100.0	123	105	106	101	109
Weighted Average for Bridge and Approaches		125	123	124	137	127

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	60.5	165	133	82	82	116
2	61.1	106	130	95	143	118
3	60.6	120	136	89	138	121
4						
5						
6						
Weighted Average for Bridge		130	133	89	121	118
S Approach	100.0	63	87	67	77	74
N Approach	100.0	54	79	105	94	83
Weighted Average for Bridge and Approaches		93	107	87	103	98

Remarks Spans and Joints numbered from South to North. Joints #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. B02 of 77111 Location I 94 over Pine River
Date Measured 7-22-64 Number of Spans 3 Length (including approaches) 403.3
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Machine
N Bound Roadway District 9

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	64.0	135	135	88	125	121
2	76.0	160	138	122	143	141
3	63.3	130	117	98	127	118
4						
5						
6						
Weighted Average for Bridge		143	131	104	132	128
S Approach	100.0	96	105	98	94	98
N Approach	100.0	150	108	117	138	128
Weighted Average for Bridge and Approaches		133	118	106	124	120

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	64.0	193	124	110	143	142
2	76.0	140	103	145	125	128
3	63.3	125	90	125	139	120
4						
5						
6						
Weighted Average for Bridge		152	106	128	135	130
S Approach	100.0	101	119	127	173	130
N Approach	100.0	129	147	195	212	171
Weighted Average for Bridge and Approaches		134	119	144	164	140

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

Cantilever structure.
Concrete approaches.

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

Form 1011

Bridge No. S01 of 77111 Location Meisner Rd over I 94

Date Measured 7-7-64 Number of Spans 4 Length (including approaches) 283.9

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Hand

E Bound Roadway District 9

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	41.8	139	124			132
2	100.0	167	114			140
3	101.6	149	105			127
4	40.5	117	108			112
5						
6						
Weighted Average for Bridge		149	111			130
Approach						
Approach						
Weighted Average for Bridge and Approaches		148	111			130

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	41.8	129	91			110
2	100.0	130	113			121
3	101.6	140	87			114
4	40.5	104	96			100
5						
6						
Weighted Average for Bridge		130	98			114
Approach						
Approach						
Weighted Average for Bridge and Approaches		130	98			114

Remarks Spans and joints numbered from West to East. Joint #1, 3 - Steel Expansion; #2 - Expansion.

Cantilevered structure.

Tar and chip approaches too rough to run.

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

Form 1011

Bridge No. S02 of 77111 Location Church Road over I 94

Date Measured 8-25-64 Number of Spans 4 Length (including approaches) _____

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Machine

N Bound Roadway District 9

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	52.0	112	105			108
2	92.4	135	142			138
3	99.5	157	168			162
4	57.7	101	98			100
5						
6						
Weighted Average for Bridge		132	136			134
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	52.0	140	149			144
2	92.4	125	146			136
3	99.5	221	196			208
4	57.7	155	147			151
5						
6						
Weighted Average for Bridge		165	163			164
Approach						
Approach						
Weighted Average for Bridge and Approaches						

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

Tar and chip approaches too rough to run.

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

Form 1011

Bridge No. S03 of 77111 Location Muldrum Rd. over I 94
Date Measured 8-24-64 Number of Spans 4 Length (including approaches) 301.6
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Machine
N Bound Roadway District 9

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	52.0	171	168			170
2	92.4	157	140			148
3	99.5	157	113			135
4	57.7	111	113			112
5						
6						
Weighted Average for Bridge		151	131			141
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	52.0	128	130			129
2	92.4	143	138			140
3	99.5	179	175			177
4	57.7	161	191			176
5						
6						
Weighted Average for Bridge		156	159			158
Approach						
Approach						
Weighted Average for Bridge and Approaches						

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

Tar and chip approaches too rough to measure.

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

Form 1011

Bridge No. S04 of 77111 Location St. Clair Highway over I 94
Date Measured 8-26-64 Number of Spans 4 Length (including approaches) 517.0
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Machine
E Bound Roadway District 9

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	84	111			98
2	105.0	115	131			123
3	104.0	128	139			134
4	54.0	147	162			154
5						
6						
Weighted Average for Bridge		119	135			127
W Approach	100.0	64	62			63
E Approach	100.0	68	79			73
Weighted Average for Bridge and Approaches		99	110			104

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	54.0	99	75			87
2	105.0	134	110			122
3	104.0	111	81			96
4	54.0	154	137			146
5						
6						
Weighted Average for Bridge		124	99			112
W Approach	100.0	53	49			51
E Approach	100.0	95	93			94
Weighted Average for Bridge and Approaches		104	88			96

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

Concrete approaches.

PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS
TEST RESULT TABULATION

Research Project 61 F-65

Form 1011

Bridge No. S05 of 77111 Location Palms Rd over I 94
 Date Measured 7-9-64 Number of Spans 4 Length (including approaches) 333.0
 Dual Structures (separate for each roadway) Yes No
 Single Structure Yes No Method of Finishing Machine
S Bound Roadway District 9

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	71.0	130	191			160
2	90.6	207	202			204
3	91.0	234	199			216
4	70.4	174	177			176
5						
6						
Weighted Average for Bridge		190	193			192
S Approach	50.0	112	125			118
N Approach	50.0	132	116			124
Weighted Average for Bridge and Approaches		174	176			175

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	71.0	157	176			166
2	90.6	177	171			174
3	91.0	200	214			207
4	70.4	175	178			176
5						
6						
Weighted Average for Bridge		179	186			182
S Approach	50.0	111	119			115
N Approach	50.0	118	107			112
Weighted Average for Bridge and Approaches		163	168			166

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

Bituminous approaches. Cantilevered construction.

Tar tracked on bridge deck at the South end of the North bound roadway.

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

Form 1011

Bridge No. S06 of 77111 Location Division Rd over I 94

Date Measured 7-10-64 Number of Spans 5 Length (including approaches) 586.4

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Machine

E Bound Roadway District 9

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	57.5	246	203			224
2	116.6	193	183			188
3	39.6	102	86			94
4	115.4	274	244			259
5	57.4	248	174			211
6						
Weighted Average for Bridge		224	193			208
W Approach	100.0	125	77			101
E Approach	100.0	113	72			92
Weighted Average for Bridge and Approaches		188	152			170

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	57.5	202	201			202
2	116.6	262	219			240
3	39.6	100	89			94
4	115.4	169	219			194
5	57.4	179	191			185
6						
Weighted Average for Bridge		196	199			198
W Approach	100.0	94	84			89
E Approach	100.0	97	92			94
Weighted Average for Bridge and Approaches		162	161			162

Remarks Spans and Joints numbered from West to East. Joint #1, 2, 3, 7, 8, 11, 12, 13 - Expansion; #4, 10 - Construction; #5, 9 - Steel Expansion.

Concrete approaches. Cantilevered Construction.

Cracks on deck filled with Epoxy-Resin.

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

Form 1011

Bridge No. S08 of 77111 Location Rattle Run Rd over I 94
Date Measured 7-10-64 Number of Spans 4 Length (including approaches) 219.6
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Machine
W Bound Roadway District 9

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	36.6	119	110			114
2	73.3	158	135			146
3	72.5	180	123			151
4	37.2	163	100			132
5						
6						
Weighted Average for Bridge		162	122			142
Approach						
Approach						
Weighted Average for Bridge and Approaches						

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	36.6	96	67			81
2	73.3	184	125			154
3	72.5	119	119			119
4	37.2	179	108			144
5						
6						
Weighted Average for Bridge		148	113			130
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks Spans and Joints numbered from West to East. Joint #1, 3 - Steel Expansion; #2 - Expansion.
Gravel approaches.
Cantilevered Construction.

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

Form 1011

Bridge No. S01 of 80012 Location 44th Avenue over I 96

Date Measured 9-9-64 Number of Spans 4 Length (including approaches) 221.2

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Machine

E Bound Roadway

District 7

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	38.6	153	223			188
2	73.6	118	123			120
3	73.6	108	113			110
4	34.8	228	196			212
5						
6						
Weighted Average for Bridge		133	142			138
Approach						
Approach						
Weighted Average for Bridge and Approaches						

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	38.6	133	151			142
2	73.6	84	93			88
3	73.6	84	90			87
4	34.8	234	175			204
5						
6						
Weighted Average for Bridge		109	111			110
Approach						
Approach						
Weighted Average for Bridge and Approaches						

Remarks Spans and joints numbered from West to East. Joint #1, 5 - Construction; #2, 3, 4 - Expansion.

Tar and chip approaches too rough to run.

PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS
TEST RESULT TABULATION

Research Project 61 F-65

Form 1011

Bridge No. S02 of 80012 Location I 96 over 32nd Avenue
 Date Measured 9-8-64 Number of Spans 3 Length (including approaches) 208.6
 Dual Structures (separate for each roadway) Yes No
 Single Structure Yes No Method of Finishing Machine
N Bound Roadway District 7

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	33.5	145	126	108	85	116
2	41.6	76	65	59	49	62
3	33.5	97	91	96	104	97
4						
5						
6						
Weighted Average for Bridge		104	92	86	77	90
S Approach	50.0	82	115	114	74	96
N Approach	50.0	101	93	104	96	98
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	33.5	96	114	119	101	108
2	41.6	52	64	62	90	67
3	33.5	76	84	111	84	89
4						
5						
6						
Weighted Average for Bridge		73	86	95	92	86
S Approach	50.0	148	150	102	92	123
N Approach	50.0	110	105	129	93	109
Weighted Average for Bridge and Approaches		100	106	104	92	100

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

Thick, narrow patch across ends of deck at approaches (N Bound Roadway only). Bituminous Approaches. -38-

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

Form 1011

Bridge No. S03 of 80012 Location I 96 over 20th Avenue
 Date Measured 9-10-64 Number of Spans 3 Length (including approaches) _____
 Dual Structures (separate for each roadway) Yes No
 Single Structure Yes No Method of Finishing Hand
N Bound Roadway District 7

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	34.3	79	126	124	82	103
2	42.9	64	81	76	89	78
3	34.3	95	87	109	135	106
4						
5						
6						
Weighted Average for Bridge		78	97	101	101	94
S Approach	50.0	102	120	116	112	112
N Approach	50.0	99	89	99	132	105
Weighted Average for Bridge and Approaches		89	100	104	111	101

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	34.3	159	84	101	141	121
2	42.9	114	69	110	97	98
3	34.3	108	119	130	164	130
4						
5						
6						
Weighted Average for Bridge		126	89	113	131	115
S Approach	50.0	73	63	95	106	84
N Approach	50.0	81	57	65	83	72
Weighted Average for Bridge and Approaches		103	75	98	114	98

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

Bituminous approaches.

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

Form 1011

Bridge No. S01 of 80013 Location M 43 over I 96
 Date Measured 9-24-64 Number of Spans 4 Length (including approaches) 337.4
 Dual Structures (separate for each roadway) Yes No
 Single Structure Yes No Method of Finishing Hand
EB Bound Roadway District 7

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	39.9	154	130			142
2	77.1	123	92			107
3	78.1	57	44			50
4	42.3	83	49			71
5						
6						
Weighted Average for Bridge		99	77			88
W Approach	50.0	107	124			116
E Approach	50.0	82	72			77
Weighted Average for Bridge and Approaches		98	83			90

WB 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	39.9	210	152			181
2	77.1	107	103			105
3	78.1	83	93			88
4	42.3	162	104			133
5						
6						
Weighted Average for Bridge		126	108			117
W Approach	50.0	134	84			104
E Approach	50.0	165	126			146
Weighted Average for Bridge and Approaches		133	107			120

Remarks Spans and Joints numbered from West to East. Joint #1, 5 - Construction; #2, 4 - Expansion; #3 - Steel Expansion.
Bituminous approaches.

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

Form 1011

Bridge No. S02 of 80013 Location Phoenix Avenue over I 96
Date Measured 9-30-64 Number of Spans 4 Length (including approaches) 338.6
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Hand
E Bound Roadway District 7

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	38.6	110	70			90
2	81.2	61	61			61
3	80.2	50	55			52
4	38.6	128	89			108
5						
6						
Weighted Average for Bridge		76	65			70
W Approach	50.0	129	70			100
E Approach	50.0	113	85			99
Weighted Average for Bridge and Approaches		89	69			79

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	38.6	94	59			76
2	81.2	65	68			66
3	80.2	88	65			76
4	38.6	85	104			94
5						
6						
Weighted Average for Bridge		81	71			76
W Approach	50.0	146	93			120
E Approach	50.0	100	99			100
Weighted Average for Bridge and Approaches		93	79			86

Remarks Spans and Joints numbered from West to East. Joint #1, 5 - Construction; #2, 4 - Expansion; #3 - Steel Expansion. Bituminous Approaches.

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

Form 1011

Bridge No. S04 of 80013 Location M 140 over I 96

Date Measured 9-29-64 Number of Spans 4 Length (including approaches) 584.3

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Hand

S Bound Roadway District 7

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	80.3	85	82			84
2	114.4	119	87			103
3	112.6	120	139			130
4	77.0	107	113			110
5						
6						
Weighted Average for Bridge		110	106			108
S Approach	100.0	70	73			72
N Approach	100.0	109	112			110
Weighted Average for Bridge and Approaches		103	102			102

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	80.3	162	137			150
2	114.4	138	108			123
3	112.6	128	132			130
4	77.0	124	130			127
5						
6						
Weighted Average for Bridge		137	125			131
S Approach	100.0	88	78			83
N Approach	100.0	74	67			70
Weighted Average for Bridge and Approaches		118	107			112

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

Concrete Approaches.

PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS
TEST RESULT TABULATION

Research Project 61 F-65

Form 1011

Bridge No. X01 of 80013 Location I 96 over NYC RR & Black River

Date Measured 9-11-64 Number of Spans 4 Length (including approaches) 537.0

Dual Structures (separate for each roadway) Yes No

Single Structure Yes No Method of Finishing Hand

N Bound Roadway District 7

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	76.4	115	97	156	189	139
2	86.7	186	152	110	103	138
3	87.2	111	132	148	129	130
4	86.7	146	141	110	130	132
5						
6						
Weighted Average for Bridge		140	132	130	136	135
S Approach	100.0	74	79	76	92	80
N Approach	100.0	89	92	87	96	91
Weighted Average for Bridge and Approaches		118	114	115	120	117

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	76.4	101	104	137	140	120
2	86.7	118	140	101	83	110
3	87.2	141	146	109	101	124
4	86.7	102	114	149	140	126
5						
6						
Weighted Average for Bridge		116	127	124	115	120
S Approach	100.0	83	102	79	83	87
N Approach	100.0	174	172	181	188	179
Weighted Average for Bridge and Approaches		121	131	126	123	125

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

Concrete approaches.

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

Form 1011

Bridge No. S24 of 82251 Location WB to SB Turn Lane I 94 to I 75
Date Measured 6-24-64 Number of Spans 4 Length (including approaches) OWP = 511.0
Dual Structures (separate for each roadway) Yes No IWP = .514.1
Single Structure Yes No Method of Finishing Hand
S Bound Roadway District 10

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	43.6	172				172
2	89.6	165				165
3	89.0	138				138
4	88.8	157				157
5						
6						
Weighted Average for Bridge		156				156
Approach	100.0	96				96
Approach	100.0	201				201
Weighted Average for Bridge and Approaches		153				153

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	43.8		163			163
2	90.4		195			195
3	92.5		162			162
4	87.4		143			143
5						
6						
Weighted Average for Bridge			166			166
Approach	100.0		133			133
Approach	100.0		194			194
Weighted Average for Bridge and Approaches			165			165

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

PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS
TEST RESULT TABULATION

Research Project 61 F-65

Form 1011

Bridge No. S24 of 82251 Location WB to SB Turn Lane I 94 to I 75
 Date Measured 6-24-64 Number of Spans 4 Length (including approaches) OWP = 511.0
 Dual Structures (separate for each roadway) Yes No IWP = 514.1
 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	44.0			220		220
2	91.0			167		167
3	96.0			128		128
4	87.0			152		152
5						
6						
Weighted Average for Bridge				158		158
Approach	100.0			151		151
Approach	100.0			139		139
Weighted Average for Bridge and Approaches				153		153

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	44.2				188	188
2	92.0				131	131
3	99.6				111	111
4	85.3				165	165
5						
6						
Weighted Average for Bridge					142	142
Approach	100.0				158	158
Approach	100.0				208	208
Weighted Average for Bridge and Approaches					158	158

Remarks 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. (Not State Project) Location Bogue St. over Red Cedar River
Date Measured 8-18-64 Number of Spans 3 Length (including approaches) 274
Dual Structures (separate for each roadway) Yes No
Single Structure Yes No Method of Finishing Shugart Longitudinal Machine
N Bound Roadway District 8

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	58.0	56	50	47	74	57
2	58.0	99	38	46	59	60
3	58.0	81	68	42	50	60
4						
5						
6						
Weighted Average for Bridge		79	52	45	61	59
S Approach	50.0	143	144	86	107	120
N Approach	50.0	103	84	84	148	105
Weighted Average for Bridge and Approaches		95	74	60	85	78

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	58.0	40	45	35	56	44
2	58.0	46	57	49	31	46
3	58.0	41	36	37	47	40
4						
5						
6						
Weighted Average for Bridge		42	46	40	45	43
S Approach	50.0	199	127	46	156	132
N Approach	50.0	187	116	200	269	193
Weighted Average for Bridge and Approaches		97	74	70	106	87

Remarks Spans and joints numbered from South to North. Joint #1, 2, 3, 4 - Construction.
No joint seal applied.
Bituminous Approaches.
Special Request Measurement.