PROFILOMETER MEASUREMENT OF BRIDGE ROUGHNESS
Fourth Progress Report

Research Laboratory Division
Office of Testing and Research
Research Project R-61 F-65
Research Report No. R-450

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

PROFILOMETER MEASUREMENT OF BRIDGE ROUGHNESS
Fourth Progress Report

This is the fourth publication in a 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.

This fourth progress report presents results for a new group of 35 bridge projects (42 separate structures), 28 of which were hand-finished and 7 machine-finished. In reporting riding quality, the following tentative roughness classification system is being used based on "span-runs" (see Glossary), and expressed in terms of accumulated inches-per-mile:

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

Using these categories, the 668 span-runs measured for the 35 bridge projects for which test result forms are presented in this report may be classified as follows:

Finishing Method	Riding Quality			Total
	Good	Average	Poor	
1. Hand	160	318	112	590
2. Transverse machine	18	39	21	78
Total Span-Runs	178	357	133	668

Design and Construction Factors in Bridge Deck Roughness

In a memorandum dated July 2, 1963, R. L. Greenman requested that roughness data be evaluated to determine: a) whether deck roughness between expansion joints can be determined, and b) whether structural type affects roughness, particularly with regard to the type of beam supporting the deck. The first of these questions was answered in a memorandum from E. A. Finney dated August 1, 1963, which stated that:

> ...In this analysis the profile trace 12 feet each way from all joints was omitted...so that the profile at the center or measuring wheel would not be influenced by any roughness occurring as an end, or profile support wheel, passed over a joint. As shown by the analysis the center portion of the span on the average is approximately 25 percent smoother than the entire span, and that this difference is approximately the same for transverse or longitudinal machine finishing or hand finishing methods. Measuring the roughness of the entire span does not unduly bias the roughness results for any one method of finishing. In addition, the roughness which a motorist experiences while passing over a bridge is due to the roughness of the entire bridge length, and therefore, it appears reasonable to continue the present practice of measuring the roughness over the entire bridge, including a small section of "approach" and "leaving" pavement.

Solution of the second problem, however, was delayed until enough data had been accumulated from bridges built with each of at least three important beam types used in Michigan. By December 1963, it was possible to analyze data from 117 structures, including a minimum representative sample for each of the following types:

1. Deck plate girders (14 structures)
2. Prestressed concrete I-beams (13 structures)
3. Steel I-beams (80 structures)

In the analysis, the evident disparity in the number of structures for each beam type was compensated for, and a quantitatively unbiased comparison was obtained. Statistical examination of the data, using the analysis-of-variance technique, indicated that only tentative inferences may be drawn at this time regarding possible influence of beam type on deck roughness, since not all necessary assumptions can be strictly met. Based on the minimum representative data sample available, however, it appears that a significant difference in mean structural roughness value does exist

for the three beam types. Frequency distributions of roughness values plotted in Fig. 1 permit the following observations:

1. On the average, prestressed concrete I-beam decks (with a mean value of 112.7 in. per mi), and deck plate girder decks (with 115.8), are somewhat smoother than those built using steel I-beams (129.8). It may also be noted that a greater percentage of steel I-beam decks appear in the "poor" category of riding quality, the actual percentages illustrated in Fig. 1 being as follows:

Deck Support	Riding Quality Category, percent		
	Good (0-100)	Average (100-160)	Poor (over 160)
Deck Plate Girder	7.1	85.8	7.1
Prestressed Concrete I-Beam	15.4	76.9	7.7
Steel I-Beam	12.4	71.5	16.1

2. However, all three types of deck have mean roughness values within a range of only 17 in. per mi, and this range in turn should be considered within the larger context of the 100- to 160-in. per mi category of "average" riding quality.

3. While a 17-in. range of roughness means is statistically significant, and while the average motorist might possibly note a difference between a deck with 112 in. per mile roughness and one with 129, nevertheless decks within this range may be considered quite adequate in riding quality.

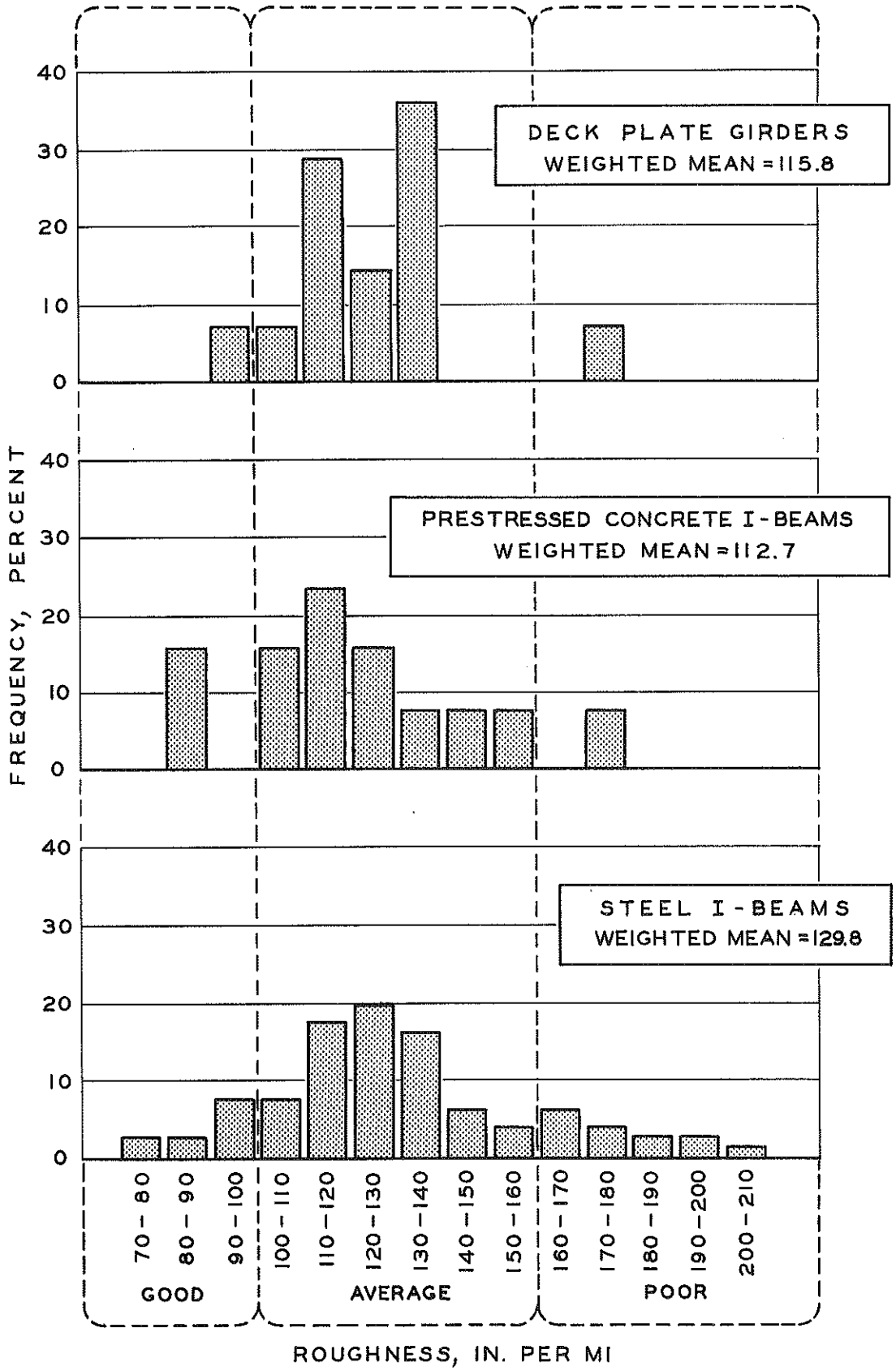

Figure 1. Frequency distributions of structure roughness for bridge decks supported by one of three types of beam.

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

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

WEIGHTED MEAN: for this study, the arithmetic mean including consideration of variable span lengths.

MICHIGAN
STATE HIGHWAY DEPARTMENT
Office of Testing and Research
Research Laboratory Division

District 2

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

Form 511

Bridge Number S08 of 17033, Location M 28 over I 75

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☒ No ☐

W Bound Roadway Date Measured 9-11-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	100.0	72.8	77.2			75.0
Span 1	38.6	98.1	72.5			85.3
2	79.3	115.8	108.4			112.1
3	77.2	175.6	142.0			158.8
4	35.4	98.7	147.6			123.2
5						
6						
E Approach	100.0	103.1	105.8			104.4
Average	430.5	110.6	106.6			108.6

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	100.0	85.8	85.1			85.4
Span 1	38.6	110.2	99.7			105.0
2	79.3	129.9	129.0			129.4
3	77.2	150.6	172.0			161.3
4	35.4	151.0	182.0			166.5
5						
6						
E Approach	100.0	100.4	123.2			111.8
Average	430.5	116.5	126.9			121.7

Remarks Spans and joints numbered from West to East. Joint #1 - Expansion; #2 - Expansion; #3 - Expansion; #4 - Construction; #5 - Expansion; #6 - Steel Expansion; #7 - Expansion; #8 - Construction; #9 - Expansion; #10 - Expansion; #11 - Expansion; #12 - Expansion.

Tar in EBTL - OWT on West approach.

Concrete approaches.

MICHIGAN
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District 4

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

Form 511

Bridge Number S04 of 16091, Location US 27 (SB) Rel. over existing US 27 Rel.

Dual Structures (separate for each roadway) Yes [xx] No [ ]

Single Structure Yes [ ] No [xx]

Number of Spans 3 Machine Finished Yes [ ] No [xx]

S Bound Roadway Date Measured 9-11-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	100.0	67.7	65.2	49.2	56.4	59.6
Span 1	62.7	98.8	107.6	134.2	116.5	114.3
2	93.9	123.2	106.6	88.9	91.6	102.6
3	71.3	129.4	159.7	126.6	114.6	132.6
4						
5						
6						
N Approach	100.0	81.6	65.0	55.5	72.2	68.6
Average	427.9	98.0	96.2	84.7	86.3	91.3

_____ Bound Roadway

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

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

Concrete approaches.

MICHIGAN
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District 5

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

Form 511

Bridge Number X02 of 37014, Location US 27 Relocation over C&O RR and US 10

Dual Structures (separate for each roadway) Yes [XX] No [ ]

Single Structure Yes [ ] No [XX]

Number of Spans 5 Machine Finished Yes [ ] No [XX]

N Bound Roadway Date Measured 10-10-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	100.0	94.3	101.2	104.3	102.4	100.6
Span 1	50.4	124.0	132.2	117.2	137.1	127.6
2	60.0	111.3	110.2	98.8	91.0	102.8
3	60.8	104.2	110.6	89.8	84.6	97.3
4	60.3	150.7	135.2	110.1	94.1	122.5
5	52.5	117.0	135.1	92.0	97.8	110.5
6						
N Approach	100.0	88.8	85.4	79.0	75.0	82.0
Average	484.0	109.0	111.4	97.4	95.2	103.2

S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	100.0	88.4	90.4	56.3	64.2	74.8
Span 1	50.4	119.0	123.9	121.0	126.4	122.6
2	60.0	109.2	101.0	129.7	107.6	118.9
3	60.8	136.0	132.3	97.0	89.7	113.8
4	60.3	108.1	96.7	95.6	111.2	102.9
5	52.5	134.9	117.2	88.1	114.3	113.6
6						
N Approach	100.0	95.4	100.4	122.0	111.0	107.2
Average	484.0	109.1	106.2	99.2	100.2	103.2

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

A type of epoxy sealer used on hair cracks in bridge.

Concrete approaches.

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District 5
PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS
TEST RESULT TABULATION
Research Project 61 F-65

Form 511

Bridge Number S05 of 37014, Location Rosebush Road over US 27
Dual Structures (separate for each roadway) Yes ☐ No ☒
Single Structure Yes ☒ No ☐
Number of Spans 4 Machine Finished Yes ☐ No ☒

W Bound Roadway Date Measured 10-14-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	241.8	194.2			218.0
Span 1	34.5	186.2	194.9			190.6
2	71.7	82.0	87.4			84.7
3	70.4	118.0	130.4			124.2
4	34.4	141.4	145.1			143.2
5						
6						
E Approach	50.0	147.0	171.9			159.4
Average		144.4	146.2			145.3

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	106.8	80.8			93.8
Span 1	34.5	140.6	113.8			127.2
2	71.7	98.8	99.4			99.1
3	70.4	116.4	133.0			124.7
4	34.4	136.4	165.2			150.8
5						
6						
E Approach	50.0	148.3	93.3			120.8
Average		120.8	112.0			116.4

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

Bituminous approaches.

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District 5
PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS
TEST RESULT TABULATION
Research Project 61 F-65

Form 511

Bridge Number S09 of 37014, Location NB Clare Bridge over SB US 27 (rel.)
Dual Structures (separate for each roadway) Yes ☐ No ☒
Single Structure Yes ☒ No ☐
Number of Spans 3 Machine Finished Yes ☐ No ☒

N Bound Roadway Date Measured 10-10-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	100.0	165.8	139,6			152.7
Span 1	63.5	125.4	132.3			128.8
2	100.5	114.8	108.1			111.4
3	54.0	174.1	205.4			189.8
4						
5						
6						
N Approach	100.0	201.0	184.4			192.7
Average	418.0	156.9	150.2			153.6

S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	100.0	130.3	117.1			123.7
Span 1	63.5	127.2	161.4			144.3
2	100.5	96.7	140.8			118.8
3	54.0	190.2	192.8			191.5
4						
5						
6						
N Approach	100.0	172.4	193.6			183.0
Average	418.0	139.6	157.6			148.6

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

All joints open and material sunk.

Concrete approaches.

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District 4
PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS
TEST RESULT TABULATION
Research Project 61 F-65

Form 511

Bridge Number S05 of 69013, Location US 27 over I 75, 2.5 mi S. of Gaylord
Dual Structures (separate for each roadway) Yes ☐ No ☒
Single Structure Yes ☒ No ☐
Number of Spans 4 Machine Finished Yes ☐ No ☒

S Bound Roadway Date Measured 9-12-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	50.0	101.1	80.9			91.0
Span 1	39.5	217.2	225.6			221.4
2	89.9	139.6	124.6			132.1
3	91.9	115.8	109.3			112.6
4	44.6	115.4	99.4			107.4
5						
6						
N Approach	50.0	229.2	205.8			217.5
Average	365.9	146.0	133.7			139.8

N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	50.0	151.8	166.4			159.1
Span 1	39.5	163.8	161.8			162.8
2	89.9	117.4	111.6			114.5
3	91.9	98.2	104.8			101.5
4	44.6	165.6	218.8			192.2
5						
6						
N Approach	50.0	81.7	121.8			101.8
Average	365.9	123.3	137.2			130.2

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

Bituminous approaches.

MICHIGAN
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District 6

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

Form 511

Bridge Number B01 of 56044, Location US 10 crossing Bluff Creek

Dual Structures (separate for each roadway) Yes [XX] No [ ]

Single Structure Yes [ ] No [XX]

Number of Spans 3 Machine Finished Yes [ ] No [XX]

W Bound Roadway Date Measured 9-27-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	100.0	132.6	117.6	116.0	108.2	118.6
Span 1	76.7	114.9	106.4	107.0	104.9	108.3
2	63.9	92.2	73.8	66.0	84.1	79.0
3	76.0	100.4	107.4	103.8	115.4	106.8
4						
5						
6						
E Approach	100.0	80.8	71.2	80.2	123.9	89.0
Average	416.6	104.8	95.8	95.8	109.0	101.4

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	100.0	59.4	70.7	95.0	86.7	78.0
Span 1	76.3	89.6	116.0	112.0	111.4	107.2
2	63.6	92.6	87.7	136.1	138.4	113.7
3	76.0	126.7	121.2	96.0	102.0	111.5
4						
5						
6						
E Approach	100.0	77.4	72.1	73.0	103.8	81.6
Average	415.9	86.7	91.2	99.2	106.0	95.8

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

Concrete approaches.

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District 6
PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS
TEST RESULT TABULATION
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Form 511

Bridge Number S03 of 56044, Location M 30 over US 10

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☒ No ☐

N Bound Roadway Date Measured 10-11-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	50.0	217.6	224.2			220.9
Span 1	33.3	203.0	235.0			219.0
2	67.0	137.3	189.8			163.6
3	66.8	124.6	141.0			132.8
4	33.3	267.7	303.8			285.8
5						
6						
N Approach	50.0	202.2	201.2			201.7
Average	300.4	180.4	204.2			192.3

S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	50.0	214.5	167.8			191.2
Span 1	33.3	248.2	223.5			235.8
2	67.0	133.9	185.9			159.9
3	66.8	132.8	119.0			125.9
4	33.3	202.8	265.4			234.1
5						
6						
N Approach	50.0	184.6	127.3			156.0
Average	300.4	175.8	171.2			173.5

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

Bituminous approaches.

MICHIGAN
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Research Laboratory Division

District 6

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

Form 511

Bridge Number S04 of 56044, Location Hope Road over US 10

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☒ No ☐

N Bound Roadway Date Measured 10-9-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	50.0	104.0	83.8			93.9
Span 1	42.0	191.8	160.8			176.3
2	92.9	121.4	113.4			117.4
3	92.0	155.6	141.3			148.4
4	43.0	149.8	140.6			145.2
5						
6						
N Approach	50.0	133.8	70.4			102.1
Average	369.9	140.6	119.0			129.8

S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	50.0	211.6	155.4			183.5
Span 1	42.0	89.4	133.6			111.5
2	92.9	146.1	141.4			143.8
3	92.0	161.4	174.4			167.9
4	43.0	163.6	210.6			187.1
5						
6						
N Approach	50.0	88.6	99.7			94.2
Average	369.9	146.6	153.0			149.8

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

Cantilevered construction.

Bituminous approaches.

MICHIGAN
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District 6
PROFILOMETER BRIDGE ROUGHNESS MEASUREMENTS
TEST RESULT TABULATION
Research Project 61 F-65

Form 511

Bridge Number S01 of 56045, Location Coleman Road over US 10
Dual Structures (separate for each roadway) Yes ☐ No ☒
Single Structure Yes ☒ No ☐
Number of Spans 4 Machine Finished Yes ☒ No ☐

S Bound Roadway Date Measured 10-9-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	50.0	180.3	205.0			192.6
Span 1	34.0	185.6	113.4			149.5
2	71.0	130.2	100.5			115.4
3	70.0	84.0	87.3			85.6
4	33.5	115.6	92.0			103.8
5						
6						
N Approach	50.0	191.6	135.2			163.4
Average	308.5	142.3	120.6			131.4

N Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	50.0	172.0	116.3			144.2
Span 1	34.0	108.0	126.8			117.4
2	71.0	119.4	106.8			113.1
3	70.0	104.1	96.4			100.2
4	33.5	166.2	174.4			170.3
5						
6						
N Approach	50.0	136.6	189.1			162.8
Average	308.5	131.0	128.8			129.9

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

Bituminous approaches.

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Form 511

Bridge Number S02 of 56045, Location Shaffer Road over US 10

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☒ No ☐

W Bound Roadway Date Measured 10-14-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	112.2	136.4			124.3
Span 1	49.8	157.9	122.1			140.0
2	102.6	63.8	92.2			78.0
3	105.0	75.2	75.4			75.3
4	46.3	123.6	117.6			120.6
5						
6						
E Approach	50.0	62.9	128.0			95.4
Average	353.7	91.1	104.4			97.8

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	149.0	96.6			122.8
Span 1	49.8	115.0	99.9			107.4
2	102.6	90.4	87.8			89.1
3	105.0	66.0	66.8			66.8
4	46.3	184.2	114.6			149.4
5						
6						
E Approach	50.0	141.8	134.4			138.1
Average	353.7	111.7	93.8			102.8

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

Cantilevered structure.

Bituminous approaches.

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Form 511

Bridge Number S04 of 73171, Location Busch Road over I 75
Dual Structures (separate for each roadway) Yes ☐ No ☒
Single Structure Yes ☒ No ☐
Number of Spans 4 Machine Finished Yes ☐ No ☒

E Bound Roadway Date Measured 10-4-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	101.6	39.0			70.3
Span 1	44.3	191.1	152.3			171.7
2	103.9	109.2	128.0			118.6
3	103.9	94.5	131.1			112.8
4	45.9	122.4	138.7			130.6
5						
6						
____ Approach	50.0	113.0	101.4			107.2
Average	398.0	115.5	118.2			116.8

W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	173.4	183.5			178.4
Span 1	44.3	193.6	149.3			171.4
2	103.9	105.6	120.0			112.8
3	103.9	109.9	119.4			114.6
4	45.9	120.7	169.6			145.2
5						
6						
____ Approach	50.0	104.2	60.7			82.4
Average	398.0	126.6	129.3			128.0

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

EBTL - OWT: scaled in Span #1.

Bituminous approaches.

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Form 511

Bridge Number S05 of 73171, Location Townline Road over I 75
Dual Structures (separate for each roadway) Yes ☐ No ☒
Single Structure Yes ☒ No ☐
Number of Spans 4 Machine Finished Yes ☐ No ☒

E Bound Roadway Date Measured 10-11-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	117.6	102.8			110.2
Span 1	43.0	190.7	120.9			155.8
2	89.6	144.8	109.1			127.0
3	90.6	164.5	136.1			150.3
4	42.4	178.4	174.9			176.6
5						
6						
E Approach	50.0	150.6	174.2			162.4
Average	365.6	156.0	132.8			144.4

W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	92.1	142.1			117.1
Span 1	43.0	128.4	104.5			116.4
2	89.6	129.2	80.8			105.0
3	90.6	141.8	122.2			132.0
4	42.4	150.2	198.2			174.2
5						
6						
E Approach	50.0	126.2	57.4			91.8
Average	365.6	129.2	112.6			120.9

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

Tar on desk - Span 1 EB and span 4 WB.

Bituminous approaches.

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Form 511

Bridge Number S06 of 73171, Location Curtis Road over I 75
Dual Structures (separate for each roadway) Yes ☐ No ☒
Single Structure Yes ☒ No ☐
Number of Spans 4 Machine Finished Yes ☐ No ☒

E Bound Roadway Date Measured 10-4-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	155.5	110.6			133.0
Span 1	39.3	164.4	145.7			155.0
2	88.4	129.0	110.9			120.0
3	86.6	114.9	110.6			112.8
4	41.3	180.0	144.0			162.0
5						
6						
____ Approach	50.0	112.2	75.1			93.6
Average	355.6	136.8	113.4			125.1

W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	103.6	55.0			79.3
Span 1	39.3	120.1	115.4			117.8
2	88.4	133.4	113.4			123.4
3	86.6	143.0	135.4			139.2
4	41.3	169.8	171.6			170.7
5						
6						
____ Approach	50.0	92.4	85.0			88.7
Average	355.6	128.6	113.6			121.1

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

Cantilevered spans.

Tar on Span #1 EB and #4 WB

Bituminous approaches.

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Form 511

Bridge Number S03 of 11015, Location Kruger Road over I 94
Dual Structures (separate for each roadway) Yes ☐ No ☒
Single Structure Yes ☒ No ☐
Number of Spans 5 Machine Finished Yes ☐ No ☒

W Bound Roadway Date Measured 8-21-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	128.7	108.5			118.6
Span 1	39.4	166.0	112.4			139.2
2	70.2	114.7	110.2			112.4
3	69.0	100.0	81.4			90.7
4	71.0	141.1	150.3			145.7
5	43.0	183.9	153.8			168.8
6						
E Approach	50.0	227.2	148.0			187.6
Average	392.6	145.8	122.0			133.9

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	221.0	166.3			193.6
Span 1	39.4	221.4	236.4			228.9
2	70.2	95.8	102.1			99,0
3	69.0	93.0	104.2			98.6
4	71.0	87.4	93.7			90.6
5	43.0	233.2	201.2			217.2
6						
E Approach	50.0	188.4	186.5			187.4
Average	392.6	149.2	144.2			146.7

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

Sharp drop from concrete bridge deck to bituminous approach at both ends.

Bituminous approaches.

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Bridge Number S04 of 11015, Location Union Pier Road over I 94
Dual Structures (separate for each roadway) Yes ☐ No ☒
Single Structure Yes ☒ No ☐
Number of Spans 4 Machine Finished Yes ☐ No ☒

E Bound Roadway Date Measured 8-21-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	101.3	103.5			102.4
Span 1	78.0	146.9	134.8			140.8
2	116.6	111.2	83.1			97.2
3	116.6	88.6	86.5			87.6
4	81.3	138.7	125.6			132.2
5						
6						
E Approach	50.0	164.2	156.3			160.2
Average	492.5	120.4	108.6			114.5

W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	112.7	135.6			124.2
Span 1	78.0	122.5	93.8			108.2
2	116.6	103.4	111.0			107.2
3	116.6	83.6	77.5			80.6
4	81.3	142.1	93.4			117.8
5						
6						
E Approach	50.0	135.2	150.0			142.6
Average	492.5	112.3	103.9			108.1

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

Cantilevered bridge.

Bituminous approaches.

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Form 511

Bridge Number S06 of 11015, Location Warren Woods Road over I 94

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☐ No ☒

E Bound Roadway Date Measured 8-21-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	96.0	131.4			113.7
Span 1	61.6	146.6	112.4			129.5
2	131.0	119.9	95.0			107.4
3	131.6	101.0	72.2			86.6
4	54.6	143.0	117.4			130.2
5						
6						
E Approach	50.0	91.4	77.8			84.6
Average	478.8	115.2	95.6			105.4

W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	163.6	196.4			180.0
Span 1	61.6	136.8	131.3			134.0
2	131.0	111.0	91.4			101.2
3	131.6	121.2	98.8			110.0
4	54.6	148.4	114.0			131.2
5						
6						
E Approach	50.0	141.8	108.1			125.0
Average	478.8	130.0	113.8			121.9

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

Tar in wheel tracks at approach ends of bridge, (W end of EB & E end of WB).

Bituminous approaches.

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Form 511

Bridge Number S07 of 11015, Location East Road over I 94

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☐ No ☒

E Bound Roadway Date Measured 8-22-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	113.0	129.6			121.3
Span 1	51.0	147.8	138.5			143.2
2	118.4	107.0	105.6			106.3
3	119.0	96.7	92.0			94.4
4	52.6	193.2	162.4			177.8
5						
6						
E Approach	50.0	185.0	98.2			141.6
Average	441.0	128.8	114.4			121.6

W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	101.2	60.2			80.7
Span 1	51.0	182.2	195.6			188.9
2	118.4	128.3	97.6			113.0
3	119.0	129.1	102.8			116.0
4	52.6	169.6	227.3			198.4
5						
6						
E Approach	50.0	170.3	178.8			174.6
Average	441.0	141.4	130.8			136.1

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

Sharp drop from deck to approaches.

Bituminous approaches.

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Bridge Number S10 of 11015, Location I 94 over Sawyer Road
Dual Structures (separate for each roadway) Yes [XX] No [ ]
Single Structure Yes [ ] No [XX]
Number of Spans 3 Machine Finished Yes [ ] No [XX]

E Bound Roadway — Date Measured 8-20-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	120.8	118.0	90.6	122.2	112.9
Span 1	42.4	160.6	165.0	170.2	106.2	150.5
2	64.4	77.6	112.2	119.3	126.0	108.8
3	41.2	72.2	83.6	80.0	113.6	87.4
4						
5						
6						
E Approach	50.0	126.8	111.2	103.0	104.2	111.3
Average	248.0	109.6	117.5	101.6	115.4	111.0

W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	93.4	105.9	82.4	77.0	89.7
Span 1	42.4	142.3	160.8	127.2	109.8	135.0
2	64.4	101.5	101.8	137.3	124.0	116.2
3	41.2	196.0	189.5	119.2	201.4	176.5
4						
5						
6						
E Approach	50.0	81.2	79.8	79.6	94.0	83.6
Average	248.0	118.4	122.8	109.9	119.0	117.5

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

Bituminous approaches.

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Form 511

Bridge Number S12 of 11015, Location I 94 over existing US 12

Dual Structures (separate for each roadway) Yes [XX] No [ ]

Single Structure Yes [ ] No [XX]

Number of Spans 4 Machine Finished Yes [ ] No [XX]

E Bound Roadway Date Measured 8-22-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	53.9	50.0	90.4	74.4	67.2
Span 1	55.0	118.0	86.0	123.6	159.9	121.9
2	79.6	92.4	75.4	101.8	147.0	104.2
3	77.8	78.2	102.5	88.6	124.4	98.4
4	51.2	136.7	107.2	143.0	116.9	126.0
5						
6						
E Approach	50.0	99.8	76.8	79.4	91.8	87.0
Average	363.6	95.2	84.0	103.4	122.3	101.2

W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	67.4	81.4	90.2	75.8	78.7
Span 1	54.6	139.8	107.8	110.2	154.9	128.2
2	80.2	145.4	127.6	110.2	121.4	126.2
3	79.0	83.2	81.6	112.4	138.7	104.0
4	51.6	113.9	98.6	149.1	168.5	132.5
5						
6						
E Approach	50.0	98.3	82.6	88.0	81.2	87.5
Average	365.4	109.6	98.0	110.4	125.0	110.8

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

Tar spots in both lanes in Span #4 EB

Bituminous approaches.

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Form 511

Bridge Number S13 of 11015, Location I 94 over Shawnee Road
Dual Structures (separate for each roadway) Yes [xx] No [ ]
Single Structure Yes [ ] No [xx]
Number of Spans 3 Machine Finished Yes [ ] No [xx]

E Bound Roadway Date Measured 8-23-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	72.0	86.9	100.0	93.8	88.2
Span 1	57.0	141.8	161.7	106.4	129.7	134.9
2	56.5	121.0	129.8	103.0	118.4	118.0
3	56.6	117.4	168.0	151.7	127.4	141.1
4						
5						
6						
E Approach	50.0	164.8	150.8	78.2	64.5	114.6
Average	270.1	123.6	140.4	108.8	108.2	120.2

W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	87.4	90.8	82.8	95.9	89.2
Span 1	57.0	134.9	161.6	120.0	133.4	137.5
2	56.5	152.8	144.9	110.8	98.4	126.7
3	56.6	141.4	133.6	102.6	124.9	125.6
4						
5						
6						
E Approach	50.0	135.7	117.4	116.4	146.4	129.0
Average	270.1	131.3	131.0	105.3	119.8	121.8

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

Tar in both wheel tracks of EBTL for over half the length of bridge from west end approach.

Bridge deck finished with ridges in places from 12 in. to 20 in. apart.

Bituminous approaches.

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Form 511

Bridge Number S15 of 11015, Location Grandmere Road over I 94
Dual Structures (separate for each roadway) Yes ☐ No ☒
Single Structure Yes ☒ No ☐
Number of Spans 4 Machine Finished Yes ☐ No ☒

W Bound Roadway Date Measured 9-5-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	173.8	231.3			202.6
Span 1	33.0	255.7	246.0			250.8
2	70.6	152.9	132.0			142.4
3	71.3	183.0	131.4			157.2
4	44.0	207.1	196.6			201.8
5						
6						
E Approach	50.0	96.8	117.8			107.3
Average	368.9	172.2	166.0			169.1

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	224.0	163.0			193.5
Span 1	33.0	283.8	285.6			284.7
2	70.6	166.4	143.5			155.0
3	71.3	161.8	151.4			156.6
4	44.0	205.0	231.2			218.1
5						
6						
E Approach	50.0	136.6	133.8			135.2
Average	368.9	187.2	173.6			180.4

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

Bituminous approaches.

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

Form 511

Bridge Number S03 of 11111, Location Benton Center Road over I 96
Dual Structures (separate for each roadway) Yes ☐ No ☒
Single Structure Yes ☒ No ☐
Number of Spans 4 Machine Finished Yes ☒ No ☐

E Bound Roadway Date Measured 9-5-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
____ Approach						
Span 1	36.2	83.2	107.8			95.5
2	70.6	97.6	82.0			89.8
3	70.6	135.8	108.6			122.2
4	36.0	129.9	165.2			147.6
5						
6						
____ Approach						
Average	213.0	114.0	106.4			110.2

W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
____ Approach						
Span 1	36.2	68.6	97.2			82.9
2	70.6	108.7	86.2			97.4
3	70.6	102.2	111.6			106.9
4	36.0	103.6	103.8			103.7
5						
6						
____ Approach						
Average	213.0	100.2	99.3			99.8

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

Tar and chip approaches.

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Form 511

Bridge Number S07 of 11111, Location Hager Shore Road over I 96

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☒ No ☐

W Bound Roadway Date Measured 9-6-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	166.5	179.4			173.0
Span 1	36.5	187.6	142.4			165.0
2	66.2	104.0	86.9			95.4
3	75.2	115.4	99.3			107.4
4	36.6	135.2	85.8			110.5
5						
6						
E Approach	50.0	142.5	116.8			129.6
Average	314.5	136.2	115.6			125.9

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	213.6	145.1			179.4
Span 1	36.5	106.6	116.8			111.7
2	66.2	130.5	132.6			131.6
3	75.2	92.4	99.4			95.9
4	36.6	161.4	155.2			158.3
5						
6						
E Approach	50.0	139.0	105.6			122.3
Average	314.5	136.8	123.2			130.0

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

Bituminous approaches.

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Form 511

Bridge Number S01 of 39013, Location "Q" Avenue (Center Street) over US 131

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☐ No ☒

W Bound Roadway Date Measured 8-14-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	178.6	146.0			162.3
Span 1	35.0	286.8	220.5			253.6
2	74.8	165.8	122.4			144.1
3	75.0	100.4	142.0			121.2
4	35.0	183.8	200.2			192.0
5						
6						
E Approach	50.0	96.8	74.7			85.8
Average	319.8	156.8	142.5			149.6

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	143.0	154.8			148.9
Span 1	35.0	216.3	257.4			236.8
2	74.8	128.9	122.2			125.6
3	75.0	144.6	153.6			149.1
4	35.0	293.8	190.6			242.2
5						
6						
E Approach	50.0	202.4	160.1			181.2
Average	319.8	173.8	162.9			168.4

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

Bituminous approaches.

Sharp rise in approach.

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Form 511

Bridge Number S03 of 39013, Location "O" Avenue (Milham Road) over US 131
Dual Structures (separate for each roadway) Yes ☐ No ☒
Single Structure Yes ☒ No ☐
Number of Spans 4 Machine Finished Yes ☐ No ☒

W Bound Roadway Date Measured 8-15-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	168.8	123.6			146.2
Span 1	32.3	163.2	217.0			190.1
2	72.5	131.5	103.8			117.6
3	72.5	153.8	129.6			141.7
4	32.3	171.0	164.6			167.8
5						
6						
E Approach	50.0	215.7	143.2			179.4
Average	309.6	163.8	137.6			150.7

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	138.8	211.6			175.2
Span 1	32.3	154.8	173.6			164.2
2	72.5	125.2	138.0			131.6
3	72.5	87.6	102.6			95.1
4	32.3	205.4	155.4			180.4
5						
6						
E Approach	50.0	184.5	157.7			171.1
Average	309.6	139.6	150.4			145.0

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

Sharp rise in approach near bridge at each end.

Bituminous approaches.

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Form 511

Bridge Number S03 of 39014, Location Stadium Drive over US 131
Dual Structures (separate for each roadway) Yes [XX] No [ ]
Single Structure Yes [ ] No [XX]
Number of Spans 4 Machine Finished Yes [ ] No [XX]

W Bound Roadway Date Measured 8-14-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	100.0	93.9	91.7	87.6	106.6	95.0
Span 1	41.2	80.8	88.2	108.4	87.1	91.1
2	81.5	99.3	71.4	67.4	74.6	78.2
3	81.2	79.5	87.5	82.4	69.9	79.8
4	39.2	121.4	83.6	116.4	90.8	103.0
5						
6						
E Approach	100.0	117.6	117.1	115.6	137.4	121.9
Average	443.1	98.8	91.9	93.4	97.8	95.5

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	100.0	143.2	203.1	221.4	180.8	187.1
Span 1	41.2	99.1	102.0	91.8	73.4	91.6
2	81.5	78.8	78.3	108.2	108.6	93.5
3	81.2	82.1	72.0	89.2	135.8	94.8
4	39.2	109.8	100.5	130.4	65.2	101.5
5						
6						
E Approach	100.0	171.0	160.0	169.4	136.2	159.2
Average	443.1	119.4	128.0	144.6	129.0	130.2

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

Cantilever Bridge.

Concrete approaches.

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Form 511

Bridge Number S06 of 39014, Location M 43 over US 131

Dual Structures (separate for each roadway) Yes [xx] No [ ]

Single Structure Yes [ ] No [xx]

Number of Spans 4 Machine Finished Yes [ ] No [xx]

W Bound Roadway Date Measured 8-14-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	100.0	74.8	72.2	78.6	80.2	76.4
Span 1	34.3	121.6	119.2	86.0	71.4	99.6
2	80.4	73.7	77.2	63.2	100.2	78.6
3	80.8	98.5	100.0	112.0	102.8	103.3
4	34.0	118.8	99.2	94.3	88.7	100.2
5						
6						
E Approach	100.0	84.8	116.4	103.3	93.5	99.5
Average	429.5	88.6	94.6	89.6	91.2	91.0

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	100.0	57.6	61.4	70.2	72.8	65.5
Span 1	34.3	53.5	67.0	77.8	114.4	78.2
2	80.4	87.8	68.4	82.8	80.4	79.8
3	80.8	80.8	75.6	72.8	87.3	79.1
4	34.0	192.7	112.2	77.9	147.4	132.6
5						
6						
E Approach	100.0	74.6	65.7	64.4	69.1	68.4
Average	429.5	81.9	70.8	72.9	85.3	77.7

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

Cantilever bridge.

Concrete approaches.

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Form 511

Bridge Number S04 of 81074, Location Geddes Road over US 23

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☐ No ☒

W Bound Roadway Date Measured 11-4-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	216.1	207.9			212.0
Span 1	35.6	300.1	287.1			293.6
2	80.3	207.8	216.2			212.0
3	81.3	192.6	221.6			207.1
4	35.6	199.6	180.7			190.2
5						
6						
E Approach	50.0	331.2	231.2			281.2
Average	332.8	232.9	222.3			227.6

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	230.7	218.2			224.4
Span 1	35.6	250.9	182.4			216.6
2	80.3	217.8	169.6			193.7
3	81.3	172.0	178.4			175.2
4	35.6	281.1	243.2			262.2
5						
6						
E Approach	50.0	191.2	263.7			227.4
Average	332.8	214.9	202.5			208.7

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

Bituminous approaches.

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Form 511

Bridge Number S05 of 81074, Location Earhardt Road over US 23
Dual Structures (separate for each roadway) Yes ☐ No ☒
Single Structure Yes ☒ No ☐
Number of Spans 4 Machine Finished Yes ☐ No ☒

W Bound Roadway Date Measured 11-4-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach						
Span 1	50.0*	160.1	134.0			147.0
2	107.0	145.2	135.4			140.3
3	107.9	188.3	148.3			168.3
4	50.0*	207.5	161.9			184.7
5						
6						
E Approach						
Average	314.9	171.4	143.4			157.4

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach						
Span 1	50.0*	173.8	144.4			159.1
2	107.0	168.7	116.0			142.4
3	107.9	162.4	149.9			156.2
4	50.0*	131.2	153.0			142.1
5						
6						
E Approach						
Average	314.9	162.0	137.2			149.6

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

Cantilevered structure.

Tar and chip approaches too rough to run.

* Less 10.2 ft. Entire Profilometer on bridge deck at start and end of run.

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Form 511

Bridge Number S06 of 81074, Location Plymouth Road (M 14) over US 23

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☐ No ☒

E Bound Roadway Date Measured 11-7-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	100.0	134.4	120.4	73.3	80.4	102.1
Span 1	56.6	91.8	107.4	72.6	121.6	98.4
2	85.6	117.2	144.6	99.1	109.6	117.6
3	84.6	111.4	125.7	114.3	76.1	106.9
4	57.6	122.6	103.2	85.8	101.4	103.2
5						
6						
E Approach	100.0	110.4	121.3	97.9	100.2	107.4
Average	484.4	116.0	122.2	91.5	96.2	106.5

W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	100.0	89.5	93.2	83.4	104.2	92.6
Span 1	56.6	95.6	82.2	95.4	79.0	88.0
2	85.6	115.6	94.9	93.4	72.6	94.1
3	84.6	113.8	104.5	90.6	74.1	95.8
4	57.6	108.8	119.8	67.1	66.2	90.5
5						
6						
E Approach	100.0	125.7	101.0	86.6	105.8	104.8
Average	484.4	108.8	99.0	86.6	86.2	95.2

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

Cantilever bridge.

Concrete approaches.

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Form 511

Bridge Number S07 of 81074, Location Ellsworth Road over US 23

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☐ No ☒

W Bound Roadway Date Measured 10-7-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach						
Span 1	72.4	94.9	80.8			87.8
2	70.6	85.6	70.3			78.0
3	70.6	90.0	40.7			65.4
4	72.4	75.6	42.9			59.2
5						
6						
E Approach						
Average	286.0	86.6	58.4			72.5

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach						
Span 1	72.4	52.0	68.2			60.1
2	70.6	112.8	89.4			101.1
3	70.6	69.5	54.6			62.0
4	72.4	73.6	58.5			66.0
5						
6						
E Approach						
Average	286.0	77.9	68.0			73.0

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

Tar and chip approaches too rough to run.

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Form 511

Bridge Number S08 of 81075, Location 6 Mile Road over US 23

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☐ No ☒

E Bound Roadway Date Measured 11-4-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	179.4	172.2			175.8
Span 1	35.1	119.0	109.8			114.4
2	77.5	132.9	137.4			135.2
3	65.5	124.8	148.0			136.4
4	38.0	133.9	160.0			147.0
5						
6						
E Approach	50.0	181.4	161.4			171.4
Average	316.1	144.8	148.6			146.7

W Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach	50.0	149.7	115.9			132.8
Span 1	35.1	176.8	160.6			168.7
2	77.5	124.9	107.0			116.0
3	65.5	149.3	120.2			134.8
4	38.0	123.4	147.4			135.4
5						
6						
E Approach	50.0	137.0	120.8			128.9
Average	316.1	141.4	124.1			132.8

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

Bituminous approaches.

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Form 511

Bridge Number S01 of 81076, Location Carpenter Road over US 23

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☐ No ☒

N Bound Roadway Date Measured 10-8-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	100.0	92.0	90.5			91.2
Span 1	52.8	98.5	77.4			88.0
2	112.3	66.0	84.9			75.4
3	118.8	77.7	87.5			82.6
4	53.0	101.0	116.6			108.8
5						
6						
N Approach	100.0	122.7	142.8			132.8
Average	536.9	90.6	99.6			95.1

S Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
S Approach	100.0	108.0	110.2			109.1
Span 1	52.8	130.2	146.0			138.1
2	112.3	82.8	89.2			86.0
3	118.8	121.0	101.0			111.0
4	53.0	191.9	131.8			161.8
5						
6						
N Approach	100.0	153.8	133.4			143.6
Average	536.9	124.6	113.8			119.2

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

Concrete approaches.

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Bridge Number S02 of 81076, Location Willow Road over US 23

Dual Structures (separate for each roadway) Yes ☐ No ☒

Single Structure Yes ☒ No ☐

Number of Spans 4 Machine Finished Yes ☐ No ☒

W Bound Roadway Date Measured 10-8-63

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach						
Span 1	33.3*	139.7	111.4			125.6
2	70.7	127.2	75.9			101.6
3	70.7	164.2	138.9			151.6
4	33.3*	85.4	174.8			130.1
5						
6						
E Approach						
Average	208.0	137.6	116.2			126.9

E Bound Roadway

Item	Length	Profilometer Roughness Value - R inches per mile				
		Traffic Lane		Passing Lane		Average
		O.W.P.	I.W.P.	O.W.P.	I.W.P.	
W Approach						
Span 1	33.3*	183.0	96.8			139.9
2	70.7	121.8	111.1			116.4
3	70.7	128.0	129.2			128.6
4	33.3*	207.3	229.4			218.4
5						
6						
E Approach						
Average	208.0	142.2	130.7			136.4

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

Tar and chip approaches too rough to run.

Span #1 EBTL IWT caked with tar and stone also span #4 all wheel tracks EB and WB but not as bad.

* less than 10.2 ft. Entire Profilometer on bridge deck at start and finish of run.