

LOAD RATINGS
FOR
STANDARD BRIDGES

Final Report
For
HR-239 Phase V

OCTOBER 2016

Highway Division



ENGINEERING STUDY
IOWA HIGHWAY RESEARCH BOARD
PROJECT HR – 239
P H A S E V

F I N A L R E P O R T

LOAD RATING FOR STANDARD BRIDGES

IOWA DEPARTMENT OF TRANSPORTATION
AMES, IOWA 50010

OCTOBER 2016

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INTRODUCTION

- Load Rating: Evaluation of the capacity of a bridge to carry vehicle loads
- Standard Bridge: Bridge built according to standards issued by the Iowa Department of Transportation
- Inventory Rating: Load level which can safely utilize the bridge for an indefinite period of time
- Operating Rating: Absolute maximum permissible load level for the bridge

A load rating states the load in tons which a vehicle can impose on a bridge. Changes in guidelines, standards, and customary uses of bridges require analyses of bridges to be updated and reevaluated.

In this report, eight secondary and primary bridge standards for three types of bridges are rated utilizing Load Factor methodology and LARS Bridge software:

<u>Precast Beam</u>	<u>Reinforced Concrete Slab</u>	<u>Rolled Steel Beam</u>
H30-94	J24-87	RS40-10
	J30C-87	
	J24-06	
	J30-06	
	J40-06	
	J44-06	

The ratings apply only to those bridges which:

- (1) are built according to the applicable bridge standard plans,
- (2) have no structural deterioration or damage, and
- (3) have no added wearing surface in excess of one-half inch integral wearing surface.

Reinforced concrete slab bridges are rated for the following loads: operating level for special hauling vehicles (SHV) SU4, SU5, SU6, and SU7.

Precast beam bridges and rolled steel beam bridges are rated for the following loads: operating level for SHV (SU4, SU5, SU6, and SU7), operating level for special trucks (Types 4, 3S3, 3-3, and 4S3), and inventory and operating levels for HS20.

The Inventory and Operating Ratings for HS20 are based on the standard AASHTO HS20-44 loading.

Load ratings listed in this report are in compliance with the 2011 AASHTO Manual for Bridge Evaluation, second edition.

Summary sheets contain any additional qualifications for interpreting the load ratings. The proper use and application of these bridge ratings requires due consideration and evaluation by a qualified engineer of all relevant factors affecting these ratings. Anyone using any part of these bridge ratings assumes sole responsibility for their proper application.

References:

Manual for Bridge Evaluation, 2nd edition

prepared by Highway Subcommittee on Bridges and Structures
publ. American Association of State Highway and Transportation
Officials, Washington, D.C. , 2011.

Standard Specifications For Highway Bridges, 17th ed.

as amended by Interim Specifications ,
prepared by Highway Subcommittee on Bridges and Structures
publ. American Association of State Highway and Transportation
Officials, Washington, D.C. , 2000.

Precast Beam Bridge (H Series) Rating Summary 2016

Summary for Iowa DOT Precast Concrete Beam Bridges

H30-94 Standards (Issued 1994)

H30-94 Prestensioned Prestressed Concrete Beam Bridge Standards Load Rating Summary

2'-8" High Barrier Rail

Ratings are in TONS

Bridge Length	HS20-INV	HS20-OP	SU4	SU5	SU6	SU7	Type 4	Type 3S3	Type 3-3	Type 4S3
126'-4"	47.1	78.5	66.5	71.0	71.5	74.1	68.5	112.6	108.1	122.7
138'-10"	49.1	81.9	67.7	72.9	73.6	76.6	70.0	113.1	111.0	125.5
151'-4"	42.4	78.6	66.5	71.0	71.6	74.1	68.5	112.6	108.1	122.7
163'-10"	45.7	76.2	65.7	69.7	70.2	72.4	67.5	108.4	103.3	120.8
176'-4"	46.6	77.7	68.0	71.7	72.1	74.2	69.6	108.4	104.1	124.5
188'-10"	44.6	81.3	72.0	75.6	76.0	78.0	73.6	111.6	107.3	131.6
201'-4"	48.6	82.2	73.6	76.9	77.3	79.2	75.1	111.1	105.6	134.1
213'-10"	43.7	82.6	74.5	77.6	78.0	79.7	75.9	108.2	102.2	135.6
226'-4"	43.3	86.5	78.6	81.7	82.1	83.8	80.0	112.6	106.6	142.9
243'-0"	43.3	89.7	82.5	85.4	85.7	87.2	83.8	113.4	107.3	146.4

2'-5" High Open Rail

Ratings are in TONS

Bridge Length	HS20-INV	HS20-OP	SU4	SU5	SU6	SU7	Type 4	Type 3S3	Type 3-3	Type 4S3
126'-4"	47.4	79.0	66.9	71.4	72.0	74.6	68.9	113.3	108.7	123.4
138'-10"	49.4	82.3	68.1	73.3	74.0	77.0	70.4	113.7	111.7	126.2
151'-4"	43.0	79.1	66.9	71.5	72.0	74.6	68.9	113.3	108.8	123.5
163'-10"	46.0	76.7	66.2	70.2	70.6	72.9	67.9	109.1	104.0	121.6
176'-4"	46.9	78.2	68.4	72.2	72.6	74.7	70.1	109.2	104.8	125.4
188'-10"	45.2	81.9	72.6	76.2	76.6	78.6	74.2	112.4	108.1	132.6
201'-4"	49.3	82.8	74.1	77.5	77.9	79.7	75.6	111.9	106.3	135.1
213'-10"	44.4	83.2	75.1	78.2	78.6	80.3	76.5	109.0	103.0	136.6
226'-4"	44.0	87.2	79.2	82.3	82.7	84.4	80.6	113.4	107.4	144.0
243'-0"	44.1	90.4	83.2	86.0	86.4	87.9	84.5	114.3	108.2	147.5

- Note: 1. Ratings were calculated using ½" integral wearing surface deducted from the slab thickness as shown on the standard plans.
 2. Nominal roadway width is 30 feet.

Slab Bridge (J Series) Rating Summary 2016

Summary for Iowa DOT Standard Concrete Slab Bridges

J24-87

J30C-87

J24-06

J30-06

J40-06

J44-06

J24-87 Standards (Issued 1987)

J24-87 Slab Bridge Standards Load Rating Summary

2'-8" High Barrier Rail

Ratings are in TONS

Built with Flat Bottom Option:

Bridge Length	SU4	SU5	SU6	SU7
75'-0"	67.6	74.8	77.7	84.7
87'-6"	69.6	76.3	78.5	84.2
100'-0"	74.2	80.8	83.4	88.5
112'-6"	78.7	84.9	87.9	92.5
125'-0"	84.5	90.7	92.9	97.2

Built with Sloped Bottom Option:

Bridge Length	SU4	SU5	SU6	SU7
75'-0"	61.5	68.0	70.7	77.1
87'-6"	63.7	69.8	71.8	77.0
100'-0"	68.4	74.5	76.8	81.6
112'-6"	72.7	78.5	81.2	85.4
125'-0"	78.8	84.5	86.5	90.5

2'-5" High Open Rail

Ratings are in TONS

Built with Flat Bottom Option:

Bridge Length	SU4	SU5	SU6	SU7
75'-0"	67.8	75.0	77.9	85.0
87'-6"	69.9	76.5	78.7	84.5
100'-0"	74.4	81.1	83.7	88.9
112'-6"	78.9	85.2	88.2	92.9
125'-0"	84.8	91.0	93.3	97.6

Built with Sloped Bottom Option:

Bridge Length	SU4	SU5	SU6	SU7
75'-0"	61.7	68.3	70.9	77.3
87'-6"	63.9	70.0	72.0	77.3
100'-0"	68.6	74.8	77.1	81.9
112'-6"	73.0	78.8	81.5	85.8
125'-0"	79.1	84.9	86.9	90.9

- Note: 1. Ratings were calculated using ½" integral wearing surface deducted from the slab thickness as shown on the standard plans.
 2. Nominal roadway width is 24 feet.

J30C-87 Standards (Issued 1987)

J30C-87 Slab Bridge Standards Load Rating Summary

2'-8" High Barrier Rail

Ratings are in TONS

Built with Flat Bottom Option:

Bridge Length	SU4	SU5	SU6	SU7
75'-0"	69.5	76.8	79.8	87.0
87'-6"	71.5	78.3	80.6	86.5
100'-0"	76.0	82.8	85.5	90.8
112'-6"	80.6	87.0	90.1	94.8
125'-0"	86.4	92.7	95.1	99.4

Built with Sloped Bottom Option:

Bridge Length	SU4	SU5	SU6	SU7
75'-0"	61.8	68.3	71.0	77.4
87'-6"	64.0	70.1	72.1	77.4
100'-0"	68.7	74.9	77.2	82.0
112'-6"	73.1	78.9	81.6	85.9
125'-0"	79.2	85.0	87.0	91.0

2'-5" High Open Rail

Ratings are in TONS

Built with Flat Bottom Option:

Bridge Length	SU4	SU5	SU6	SU7
75'-0"	69.6	77.0	80.0	87.2
87'-6"	71.7	78.5	80.8	86.7
100'-0"	76.2	83.1	85.7	91.0
112'-6"	80.8	87.2	90.4	95.1
125'-0"	86.7	93.0	95.4	99.7

Built with Sloped Bottom Option:

Bridge Length	SU4	SU5	SU6	SU7
75'-0"	61.9	68.5	71.2	77.6
87'-6"	64.2	70.3	72.3	77.6
100'-0"	68.9	75.1	77.4	82.2
112'-6"	73.3	79.1	81.8	86.1
125'-0"	79.4	85.2	87.3	91.3

- Note: 1. Ratings were calculated using ½" integral wearing surface deducted from the slab thickness as shown on the standard plans.
 2. Nominal roadway width is 30 feet.

J24-06 Standards (Issued 2006)

J24-06 Slab Bridge Standards Load Rating Summary

2'-8" High Open Rail

Ratings are in TONS

Bridge Length	SU4	SU5	SU6	SU7
70'-0"	67.4	74.5	77.7	83.9
80'-0"	62.5	68.9	71.3	77.2
90'-0"	62.2	68.0	69.8	74.8
100'-0"	63.4	68.9	70.5	74.9
110'-0"	64.0	69.2	71.1	75.0
120'-0"	67.7	72.8	74.1	77.6
130'-0"	70.3	75.2	77.5	81.0
140'-0"	74.9	79.7	81.4	84.7
150'-0"	73.4	77.8	78.7	81.7

- Note: 1. Ratings were calculated using ½" integral wearing surface deducted from the slab thickness as shown on the standard plans.
2. Nominal roadway width is 24 feet.

J30-06 Standards (Issued 2006)

J30-06 Slab Bridge Standards Load Rating Summary

2'-10" High Barrier Rail

Ratings are in TONS

Bridge Length	SU4	SU5	SU6	SU7
70'-0"	67.5	74.7	77.9	84.1
80'-0"	62.6	69.0	71.4	77.3
90'-0"	62.3	68.1	69.9	74.8
100'-0"	63.5	69.0	70.6	74.9
110'-0"	64.1	69.3	71.2	75.0
120'-0"	67.8	72.9	74.1	77.7
130'-0"	70.4	75.3	77.6	81.1
140'-0"	75.0	79.8	81.5	84.8
150'-0"	73.5	78.0	78.8	81.8

2'-8" High Open Rail

Ratings are in TONS

Bridge Length	SU4	SU5	SU6	SU7
70'-0"	67.6	74.8	78.0	84.5
80'-0"	62.7	69.2	71.6	77.5
90'-0"	62.4	68.3	70.1	75.1
100'-0"	63.7	69.3	70.9	75.3
110'-0"	64.4	69.6	71.5	75.4
120'-0"	68.1	73.2	74.5	78.1
130'-0"	70.7	75.7	77.9	81.5
140'-0"	75.3	80.2	81.9	85.2
150'-0"	73.9	78.4	79.3	82.3

- Note: 1. Ratings were calculated using ½" integral wearing surface deducted from the slab thickness as shown on the standard plans.
 2. Nominal roadway width is 30 feet.

J40-06 Standards (Issued 2006)

J40-06 Slab Bridge Standards Load Rating Summary

2'-10" High Barrier Rail

Ratings are in TONS

Bridge Length	SU4	SU5	SU6	SU7
70'-0"	67.8	75.0	78.2	84.9
80'-0"	62.9	69.4	71.8	77.7
90'-0"	62.6	68.5	70.3	75.3
100'-0"	63.9	69.4	71.0	75.4
110'-0"	64.5	69.8	71.7	75.6
120'-0"	68.2	73.4	74.7	78.3
130'-0"	70.9	75.8	78.1	81.7
140'-0"	75.5	80.4	82.1	85.4
150'-0"	74.2	78.7	79.5	82.5

2'-8" High Open Rail

Ratings are in TONS

Bridge Length	SU4	SU5	SU6	SU7
70'-0"	67.9	75.1	78.3	85.2
80'-0"	63.0	69.5	71.9	77.9
90'-0"	62.8	68.7	70.5	75.5
100'-0"	64.1	69.7	71.3	75.7
110'-0"	64.7	70.0	71.9	75.8
120'-0"	68.5	73.7	75.0	78.6
130'-0"	71.1	76.1	78.4	82.0
140'-0"	75.8	80.7	82.5	85.8
150'-0"	74.5	79.0	79.9	82.9

- Note: 1. Ratings were calculated using ½" integral wearing surface deducted from the slab thickness as shown on the standard plans.
 2. Nominal roadway width is 40 feet.

J44-06 Standards (Issued 2006)

J44-06 Slab Bridge Standards Load Rating Summary

2'-10" High Barrier Rail

Ratings are in TONS

Bridge Length	SU4	SU5	SU6	SU7
70'-0"	67.8	75.1	78.3	85.0
80'-0"	63.0	69.5	71.8	77.8
90'-0"	62.7	68.5	70.4	75.3
100'-0"	63.9	69.5	71.1	75.5
110'-0"	64.6	69.9	71.8	75.7
120'-0"	68.3	73.5	74.8	78.4
130'-0"	71.0	75.9	78.2	81.8
140'-0"	75.6	80.5	82.2	85.6
150'-0"	74.3	78.8	79.7	82.6

2'-8" High Open Rail

Ratings are in TONS

Bridge Length	SU4	SU5	SU6	SU7
70'-0"	68.0	75.2	78.5	85.4
80'-0"	63.1	69.6	72.0	78.0
90'-0"	62.9	68.7	70.6	75.6
100'-0"	64.2	69.7	71.3	75.7
110'-0"	64.8	70.1	72.0	75.9
120'-0"	68.5	73.7	75.0	78.7
130'-0"	71.2	76.2	78.5	82.1
140'-0"	75.9	80.8	82.6	85.9
150'-0"	74.6	79.1	80.0	83.0

- Note: 1. Ratings were calculated using ½" integral wearing surface deducted from the slab thickness as shown on the standard plans.
 2. Nominal roadway width is 44 feet.

Rolled Steel Beam Bridge (RS Series) Rating Summary 2016

Summary for Iowa DOT Rolled Steel Beam Bridges

RS40-10 Standards (Issued 2010)

RS40-10 Rolled Steel Beam Bridge Standards Load Rating Summary

2'-10" High Barrier Rail

Ratings are in TONS

Bridge Length	HS20-INV	HS20-OP	SU4	SU5	SU6	SU7	Type 4	Type 3S3	Type 3-3	Type 4S3
160'-0"	47.7	79.4	78.5	82.6	83.2	85.7	80.3	98.3	101.0	94.7
180'-0"	49.5	82.5	75.8	79.3	79.9	82.0	77.4	111.5	109.2	103.4
200'-0"	51.6	86.0	79.5	82.9	83.4	85.3	81.1	114.7	109.8	114.8
220'-0"	52.7	87.9	86.9	90.3	90.8	92.7	88.4	121.2	116.2	126.0
240'-0"	52.0	86.7	99.4	102.9	103.4	105.3	101.0	128.1	126.7	133.6
260'-0"	57.7	96.2	94.3	97.4	97.8	99.6	95.7	124.7	120.4	153.4
280'-0"	54.7	91.1	95.0	97.9	98.3	99.9	96.3	123.0	118.9	148.7
300'-0"	55.0	91.7	99.4	102.2	102.5	104.2	100.7	126.5	122.5	150.7
320'-0"	54.7	91.2	100.6	103.2	103.6	105.1	101.8	126.0	122.4	148.4
340'-0"	52.3	87.1	109.3	111.9	112.3	113.8	110.5	134.6	131.1	156.8

- Note: 1. Ratings were calculated using ½" integral wearing surface deducted from the slab thickness as shown on the standard plans.
 2. Nominal roadway width is 40 feet.