

**Lyon County, MN**



Lyon County

504 Fairgrounds Road • Marshall, MN 56258



# BRIDGE INSPECTION AND LOAD RATING Report

For  
Bridge No. 42526

Lyon County, Minnesota  
CSAH 25 over Redwood River

.....  
Rating Analysis of Local  
Bridges  
MnDOT Contract No.  
01890

*I hereby certify that this report was prepared by me  
or under my direct supervision and that I am a duly  
Licensed Professional Engineer under the laws of the  
State of Minnesota.*

March 10, 2014

Ashley Slominski, PE

Date

License No. 50489



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## LOAD RATING SUMMARY

Bridge No.: 42526

<b>Current Load Ratings and Postings:</b>	
Inventory Rating	HS 17.7
Operating Rating	HS 25.8
Load Posting	None
<b>Recommended Load Ratings &amp; Postings:</b>	
Inventory Rating	HS 18.6
Operating Rating	HS 27.1
Recommended Load Posting	MnDOT Sign R12-5 34 Tons – Single Unit Truck (Type M3 & SHV's) 40 Tons – Truck & Trailer Combination (Type M3S2 & M3-3)

The recommended load ratings and postings stated reflect the current condition of the bridge superstructure.

<b>Load Rating Notes and Assumptions:</b>
<ul style="list-style-type: none"> <li>▼ Recommended load rating and posting is based on condition of bridge superstructure</li> <li>▼ Superstructure was calculated using Virtis (v6.3)</li> <li>▼ Curbs, rails and wearing surface loads are distributed equally across slab</li> <li>▼ Allowable stress: <math>f = 1.5\text{ksi}</math> (based on bridge plans)</li> <li>▼ 4in deep wearing course</li> </ul>

MnDOT BRIDGE RATING AND LOAD POSTING REPORT  
FOR COUNTY AND LOCAL AGENCIES

**Bridge Location and Description**

Hwy. No. CSAH 25 Over  Under  REDWOOD RIVER Bridge No. 42526

Year Built 1975 Year Remodeled NA Replaces Br. NA

Type 709 County LYON Ref. Pt. \_\_\_\_\_

Description THREE-SPAN NAIL-LAM TIMBER SLAB BRIDGE. NO SKEW. 32'-0" ROADWAY WIDTH. 26'-32'-26' SPANS. 4" BITUMINOUS OVERLAY WEAR SURFACE. TIMBER CURBS, SCUPPERS, POSTS AND RAILS.

Location 1.7 MI SW OF JCT CSAH 5

**Data for Basis of Report** (Check all that apply)

Bridge Inventory File

Previous Bridge Rating and Load Posting Report

Bridge Plans

New  Overlay

Repair/Reconstruction \_\_\_\_\_

Other Dead Load Modifications \_\_\_\_\_

Bridge Inspected by ASHLEY SLOMINKSI Date 11-08-13

Damaged Component \_\_\_\_\_

Deteriorated Component \_\_\_\_\_

Types of Analysis:

Manual  Computer\*  BARS  Virtis, V.6.3  Other\*

\*

**NBI Condition Ratings**

Deck	<u>7</u>
Superstructure	<u>7</u>
Substructure	<u>6</u>
ADTT	<u>4</u>

**Method of Rating** (Check appropriate box)

Load Factor (LF)  Assigned Load Ratings

Allowable Stress (AS)

Load & Resistance Factor (LRFR)

Load Testing

No Rating Computations performed

Design Load HS20

Design Method 1973 AASHTO DESIGN SPEC.

**Summary of Rating and Load Posting Analysis**

Load Posting	Required <input checked="" type="checkbox"/> Not Required <input type="checkbox"/>			Bridge Rating	
	Sign	TONS		Inventory	Operating
R12-1A <input type="checkbox"/>				HS <input checked="" type="checkbox"/> RF <input type="checkbox"/> <u>18.6</u>	HS <input checked="" type="checkbox"/> RF <input type="checkbox"/> <u>27.1</u>
R12-5a <input type="checkbox"/>					
R12-5 <input checked="" type="checkbox"/>		34 M3	40 M3S2		
R12-X11 <input type="checkbox"/>			40 M3-3		
			45		

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature: *Ashley Slominski* Date: 3/10/14

(Typed or Printed) Name: ASHLEY SLOMINKSI License No. 50489

(Typed or Printed) Employed by ( Agency/ Firm): WSB & ASSOCIATES, INC.

My signature below indicates that I have read and fully agreed with the load rating report.

Program Administrator's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**BRIDGE RATING DETAILS**

Bridge Type 709

Bridge No. 42526

Rating Method ASR

Design Load: HS20

Roadway Width 32.0'

Inventory Rating: 18.6

Curved       Tapered

Operating Rating: 27.1

Beam Spacing NA

Rated AOG      Checked AMS

Live Load Distribution Factor

Date 12/17/13

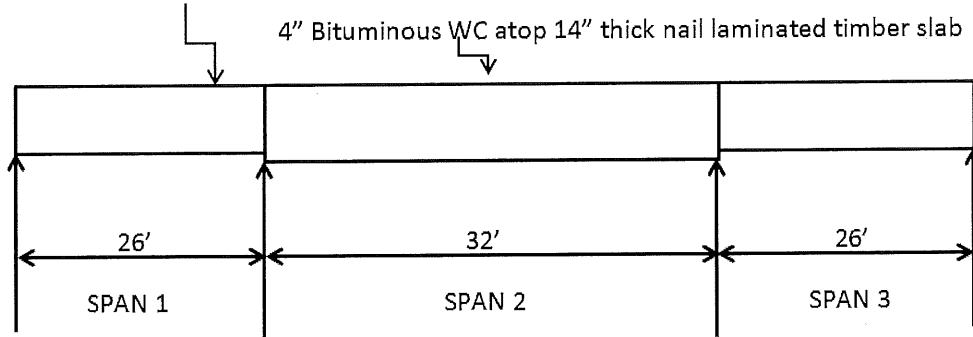
Single \_\_\_\_\_ Multiple N/A

Sheet 2 of 2

Finite/Grid Element Analysis

D.F. = 0.273 (HS20)      D.F. = 0.250 (HS20)  
D.F. = 0.308 (Posting)      D.F. = 0.279 (Posting)  
Span 1 & 3      Span 2

4" Bituminous WC atop 12" thick nail laminated timber slab



**BEAM ELEVATION <sup>2</sup>**

Show span lengths, structure/beam depths.

Truck	Rating Factor	Span/ Pier	Location	Limit State <sup>1</sup>	Notes/Comments
HS 20 Inventory	0.930	2	0.6	SERVICE MOMENT	12IN INTERIOR TRIB WIDTH
HS 20 Operating	1.356	2	0.6	SERVICE MOMENT	12IN INTERIOR TRIB WIDTH
Post, M3	1.393	1	0.5	SERVICE MOMENT	12IN INTERIOR TRIB WIDTH
Post, M3S2	1.424	1	0.5	SERVICE MOMENT	12IN INTERIOR TRIB WIDTH
Post, M3S3	1.325	1	0.5	SERVICE MOMENT	12IN INTERIOR TRIB WIDTH
Type SU4	1.196	1	0.5	SERVICE MOMENT	12IN INTERIOR TRIB WIDTH
Type SU5	1.102	1	0.5	SERVICE MOMENT	12IN INTERIOR TRIB WIDTH
Type SU6	1.021	1	0.5	SERVICE MOMENT	12IN INTERIOR TRIB WIDTH 1.021*34.75T=35T GOVERNS
Type SU7	1.012	1	0.5	SERVICE MOMENT	12IN INTERIOR TRIB WIDTH 1.012*38.75T=39T

**1** Choose from: service or ultimate; shear or moment

**2** Elevation may be on back or another sheet if it won't fit here.

# Rating Results Summary Report

Name: 709  
 Struct-Def: End Span Slab for HS-20...

Bridge ID: 42526  
 Member: Interior Slab Component

NBI: 42526  
 Member Alt: Timber Slab

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State	Impact	Lane
HS 20-44	Axle Load	ASD	Inventory	35.51	0.986	15.08	1 - (60.0)	Flexure - Maximum	As Requested	As Requested
HS 20-44	Axle Load	ASD	Operating	50.67	1.407	15.08	1 - (60.0)	Flexure - Maximum	As Requested	As Requested
HS 20-44	Lane	ASD	Inventory	44.33	1.231	12.56	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
HS 20-44	Lane	ASD	Operating	63.49	1.763	12.56	1 - (50.0)	Flexure - Maximum	As Requested	As Requested

# Rating Results Summary Report

Name: 709  
 Struct-Def: End Span Slab for Posti...

Bridge ID: 42526  
 Member: Interior Slab Component

NBI: 42526  
 Member Alt: Timber Slab

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State	Impact	Lane
M3	Axle Load	ASD	Operating	33.44	1.393	12.56	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
M3S2	Axle Load	ASD	Operating	56.95	1.424	12.56	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
M3S3	Axle Load	ASD	Operating	53.01	1.325	12.56	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
MNDot SU4	Axle Load	ASD	Operating	32.28	1.196	12.56	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
MNDot SU5	Axle Load	ASD	Operating	34.15	1.102	12.56	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
MNDot SU6	Axle Load	ASD	Operating	35.49	1.021	12.56	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
MNDot SU7	Axle Load	ASD	Operating	39.23	1.012	12.56	1 - (50.0)	Flexure - Maximum	As Requested	As Requested

# Rating Results Summary Report

Name: 709  
 Struct-Def: Center Span Slab for HS...

Bridge ID: 42526  
 Member: Interior Slab Component

NBI: 42526  
 Member Alt: Timber Slab

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State	Impact	Lane
HS 20-44	Axle Load	ASD	Inventory	33.47	0.930	18.85	1 - (60.0)	Flexure - Maximum	As Requested	As Requested
HS 20-44	Axle Load	ASD	Operating	48.82	1.356	18.85	1 - (60.0)	Flexure - Maximum	As Requested	As Requested
HS 20-44	Lane	ASD	Inventory	45.33	1.259	15.71	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
HS 20-44	Lane	ASD	Operating	66.46	1.846	15.71	1 - (50.0)	Flexure - Maximum	As Requested	As Requested

# Rating Results Summary Report

Name: 709  
 Struct-Def: Center Span Slab for Po...

Bridge ID: 42526  
 Member: Interior Slab Component

NBI: 42526  
 Member Alt: Timber Slab

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State	Impact	Lane
M3	Axle Load	ASD	Operating	33.78	1.407	15.71	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
M3S2	Axle Load	ASD	Operating	62.56	1.564	15.71	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
M3S3	Axle Load	ASD	Operating	57.33	1.433	15.71	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
MNDot SU4	Axle Load	ASD	Operating	33.92	1.256	15.71	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
MNDot SU5	Axle Load	ASD	Operating	36.37	1.173	15.71	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
MNDot SU6	Axle Load	ASD	Operating	37.09	1.067	15.71	1 - (50.0)	Flexure - Maximum	As Requested	As Requested
MNDot SU7	Axle Load	ASD	Operating	39.63	1.023	15.71	1 - (50.0)	Flexure - Maximum	As Requested	As Requested



Project SHV Contract #3

Job Number 02172-000

Calcs For Load Rating Inputs



Originated AOG  
 Checked KLY  
 Back Check AMS  
 Corrected KLY  
 Verified AMS

Date 12/17/2013  
 Date 1/7/2014  
 Date 3/8/2014  
 Date 3/10/2014  
 Date 3/10/2014

**TIMBER SLAB ALLOWABLE STRESS MOMENT RATING**

**SPAN 1 & 3**

Bridge Number: 42526

Equivalent Width:  $b := 12\text{in}$

Beam Height:  $h := 12\text{in}$

Span Length:  $\text{Span} := 26\text{ft}$

Bearing Length:  $l_{b1} := 14\text{in}$

Skew:  $\text{Skew} := 0\text{deg}$

$l_{b2} := 7\text{in}$

Effective Bearing Length:  $c_1 := \frac{l_{b1}}{\cos(\text{Skew})} = 1.167\text{ft}$      $c_2 := \frac{l_{b2}}{\cos(\text{Skew})} = 0.583\text{ft}$

Effective Span Length:  $L_{\text{eff}} := \text{Span} - \frac{c_1}{2} - \frac{c_2}{2} = 25.125\text{ft}$

Distribution Factor for HS20 Loading:  $DF_{\text{HS20}} := \frac{b}{20 \cdot \text{in} + 2 \cdot h} = 0.273$     Use Tire Width of 20in

Distribution Factor for Posting Loading:  $DF_{\text{POST}} := \frac{b}{15 \cdot \text{in} + 2 \cdot h} = 0.308$     Use Tire Width of 15in

**Material Properties (MnDOT Standard Unit Weights from Table 3.3.1):**

Bituminous Wearing Course:  $\gamma_{\text{bwc}} := 0.150\text{kcf}$

Gravel Wearing Course:  $\gamma_{\text{gwc}} := 0.120\text{kcf}$

Timber:  $\gamma_{\text{timber}} := 0.05\text{kcf}$

**DEAD LOADS:**

Determine the Dead Loads applied to the bridge:

**Wear Course:**

$d_{\text{BWC}} := 4\text{in}$     Depth of Bit Wear Course

$d_{\text{GWC}} := 0\text{in}$     Depth of Gravel Wear Course

$W_{\text{roadway}} := 32.083\text{ft}$     Roadway Width

$W_{\text{deck}} := 34 \cdot \text{ft}$     Deck Width

Weight of Wear Course:

$$W_{\text{WC}} := (\gamma_{\text{bwc}} \cdot d_{\text{BWC}} + \gamma_{\text{gwc}} \cdot d_{\text{GWC}}) \cdot \frac{W_{\text{roadway}}}{W_{\text{deck}}} = 47.181 \frac{\text{lb}}{\text{ft}}$$

Project SHV Contract #3

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Calcs For Load Rating Inputs



Originated AOG  
Checked KLY  
Back Check AMS  
Corrected KLY  
Verified AMS

Date 12/17/2013  
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Date 3/10/2014

**Slab and Stool:**

Weight of Slab and Stool:

$$W_{SLAB} := \gamma_{timber} \cdot h = 50 \frac{lb}{ft}$$

**Spreader Beam:**

$$Spread_W := 6in$$

$$Spread_D := 12in$$

DC1

$$W_{Spread} := \frac{\gamma_{timber} \cdot Spread_W \cdot Spread_D}{L} = 0.995 \frac{lb}{ft}$$

**Timber Curbs, Rail, or Utilities:**

Distance between Rail Posts  $Space_{RP} := 5.75ft$

**Top Rail:**

If wood:  $TopR_W := 6in$

$TopR_D := 12in$

$$TopR_A := TopR_W \cdot TopR_D \cdot Space_{RP} = 4968 \cdot in^3$$

If steel:  $W_{12guage} := 0.64 \frac{lb}{in}$

$SteelGuard_D := 0in$

$$TopR_{DCSteel} := W_{12guage} \cdot SteelGuard_D = 0$$

**Post:**

$$Post_W := 8in$$

$$Post_D := 12in$$

$$Post_L := 3.5ft$$

$$Post_A := Post_W \cdot Post_D \cdot Post_L = 4032 \cdot in^3$$

**Rail Post Block**

$$PostBk_W := 0in$$

$$PostBk_D := 0in$$

$$PostBk_L := 0ft$$

$$PostBk_A := PostBk_W \cdot PostBk_D \cdot PostBk_L = 0 \cdot in^3$$

**Curb:**

$$Curb_W := 12in$$

$$Curb_D := 6in$$

$$Curb_A := Curb_W \cdot Curb_D \cdot Space_{RP} = 4968 \cdot in^3$$

**Scupper Block:**

$$ScupB_W := 12in$$

$$ScupB_D := 6in$$

$$ScupB_L := 2.6ft$$

$$ScupB_A := ScupB_W \cdot ScupB_D \cdot ScupB_L = 2246.4 \cdot in^3$$

**Additional:**

$$Additional := 0lb$$

**Steel Rail:**

$$W_{steelpipe} := 5 \frac{lb}{ft}$$

$$Post_{steel} := 5ft$$

**Total Weight of Rail Distributed over Entire Deck:**

$$Area_{Rail} := TopR_A + Post_A + PostBk_A + Curb_A + ScupB_A = 9.383 \cdot ft^3$$

$$W_{DC2} := \gamma_{timber} \cdot \left( \frac{2 \cdot Area_{Rail}}{Space_{RP}} \right) + \frac{2 \cdot TopR_{DCSteel} \cdot 1ft}{W_{deck}} + \frac{[(4W_{steelpipe} \cdot Space_{RP}) + 2Post_{steel} \cdot W_{steelpipe}]}{W_{deck}} = 9.653 \frac{lb}{ft}$$

Project SHV Contract #3

Job Number 02172-000

Calcs For Load Rating Inputs



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 Verified AMS

Date 12/17/2013  
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 Date 3/10/2014  
 Date 3/10/2014

**RATING ANALYSIS - INVENTORY AND OPERATING RATING:**

$$S_{\text{W}} := \frac{b \cdot h^2}{6} = 288 \cdot \text{in}^3 \quad \text{Section Modulus}$$

Condition of Superstructure: Super := 7 Inspected by AMS - 11/8/2013

**Rating Equation Factors:**

$$\phi := \text{if}(\text{Super} \geq 6, 1, \text{if}(\text{Super} > 4, 0.95, 0.85)) = 1$$

$$f := 1.50 \cdot \text{ksi} \quad \text{Found on bridge plans}$$

$$f_b := \phi \cdot f = 1.5 \cdot \text{ksi} \quad \text{Allowable stress to use in load rating.}$$

$$f_{\text{bOR}} := \phi \cdot 1.33 \cdot f = 1.995 \cdot \text{ksi}$$

**Resisting Moment of Timber Beams:**

$$M_r := S \cdot f_b = 36 \cdot \text{kip} \cdot \text{ft} \quad \text{Inventory Rating}$$

$$M_{\text{rOR}} := S \cdot f_{\text{bOR}} = 47.88 \cdot \text{kip} \cdot \text{ft} \quad \text{Operating Rating}$$

**Dead Load Moment of Timber Beams:**

$$M_{\text{DL}} := \frac{[(W_{\text{WC}} + W_{\text{SLAB}} + W_{\text{DC2}} + W_{\text{Spread}}) \cdot L^2]}{8} = 8.509 \cdot \text{kip} \cdot \text{ft}$$

0.6\*L :

$$M_{\text{DL0.6}} := \frac{[(W_{\text{WC}} + W_{\text{SLAB}} + W_{\text{DC2}} + W_{\text{Spread}}) \cdot (0.6L) \cdot (L - 0.6L)]}{2} = 8.168 \cdot \text{kip} \cdot \text{ft}$$

**Moment available for Live Load per Wheel Line:**

$$M_{\text{LL}} := \frac{(M_r - M_{\text{DL}})}{\text{DF}_{\text{HS20}}} = 100.802 \cdot \text{kip} \cdot \text{ft} \quad \text{Inventory Rating}$$

$$M_{\text{LLOR}} := \frac{(M_{\text{rOR}} - M_{\text{DL}})}{\text{DF}_{\text{HS20}}} = 144.362 \cdot \text{kip} \cdot \text{ft} \quad \text{Operating Rating}$$

**Moment available for Live Load per Wheel Line:**

Midspan :	0.6*L:
$M_{\text{LL0.5}} := \frac{(M_r - M_{\text{DL}})}{\text{DF}_{\text{HS20}}} = 100.802 \cdot \text{kip} \cdot \text{ft}$	$M_{\text{LL0.6}} := \frac{(M_r - M_{\text{DL0.6}})}{\text{DF}_{\text{HS20}}} = 102.05 \cdot \text{kip} \cdot \text{ft}$

Project SHV Contract #3

Job Number 02172-000

Calcs For Load Rating Inputs



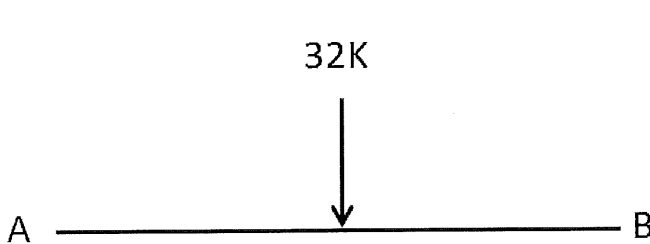
Originated AOG  
 Checked KLY  
 Back Check AMS  
 Corrected KLY  
 Verified AMS

Date 12/17/2013  
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 Date 3/8/2014  
 Date 3/10/2014  
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$$M_{LLOR0.5} := \frac{(M_{rOR} - M_{DL})}{DF_{HS20}} = 144.362 \cdot \text{kip} \cdot \text{ft} \quad M_{LLOR0.6} := \frac{(M_{rOR} - M_{DL0.6})}{DF_{HS20}} = 145.61 \cdot \text{kip} \cdot \text{ft}$$

**Determine Live Load Moment per axel for HS-20 Truck:**

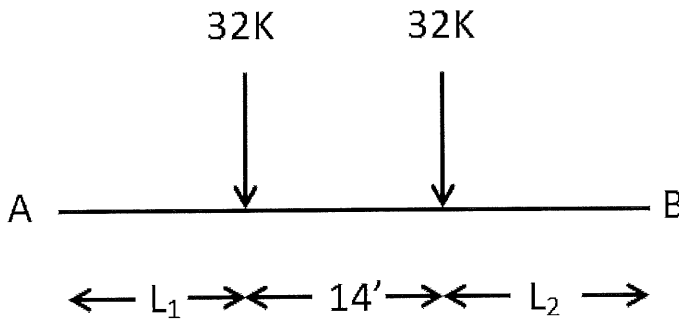
Determine the absolute maximum moment in the simply supported beam. Place one of the 32 kip loads at the midspan of the bridge. Due to the span length and placement of load, only one axel fits on bridge.



$$F_R := 32 \text{kip}$$

$$M_R := \frac{F_R \cdot L}{4} = 201 \cdot \text{kip} \cdot \text{ft}$$

There is a possibility that the absolute maximum moment may occur at different location when two axels can fit on bridge. Place 32kip load at 0.6\*L.



$$F_R := 64 \text{kip}$$

$$L_1 := 0.6 \cdot L - 14 \text{ft} = 1.075 \text{ft}$$

$$L_2 := 0.4 \cdot L = 10.05 \text{ft}$$

Determine the reaction at B.

$$R_B := \frac{[L_1 \cdot 32 \text{kip} + (L_1 + 14 \text{ft}) \cdot 32 \text{kip}]}{L} = 20.569 \cdot \text{kip}$$

Using method of sections, determine the internal moment under the 32kip load at each end.

Right Section:

$$M_{\text{maxR}} := (F_R - R_B) \cdot L_1 = 46.688 \cdot \text{kip} \cdot \text{ft}$$

Left Section:

$$M_{\text{maxL}} := R_B \cdot L_2 = 206.72 \cdot \text{kip} \cdot \text{ft} \quad \text{Governs}$$

Project SHV Contract #3

Job Number 02172-000

Calcs For Load Rating Inputs



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**Determine Live Load Moment per Wheel base for HS-20 Truck:**

$$M_{HS20} := \frac{\max(M_{\max R}, M_{\max L})}{2} = 103.36 \cdot \text{kip} \cdot \text{ft}$$

$$M_{\max} := \max(M_{LL0.5}, M_{LL0.6}) = 102.05 \cdot \text{kip} \cdot \text{ft}$$

$$M_{\max OR} := \max(M_{LLOR0.5}, M_{LLOR0.6}) = 145.61 \cdot \text{kip} \cdot \text{ft}$$

Inventory Rating:  $IR := 20 \cdot \frac{M_{LL}}{M_{HS20}} = 19.7$

$$RF := \frac{IR}{20} = 0.987$$

Operating Rating:

$$OR := 20 \cdot \frac{M_{LLOR}}{M_{HS20}} = 28.2$$

$$RF_{OR} := \frac{OR}{20} = 1.409$$

**RATING ANALYSIS - POSTING RATINGS:**

$S = 288 \cdot \text{in}^3$  Section Modulus

$f_{bOR} = 1.995 \cdot \text{ksi}$  Allowable Stress

**Resisting Moment of Timber Beams:**

$$M_{rOR} = 47.88 \cdot \text{kip} \cdot \text{ft}$$

**Dead Load Moment of Timber Beams:**

$$M_{DL} = 8.509 \cdot \text{kip} \cdot \text{ft}$$

**Moment available for Live Load per Wheel Line:**

$$M_{LLPOST} := \frac{(M_{rOR} - M_{DL})}{DF_{POST}} = 127.957 \cdot \text{kip} \cdot \text{ft}$$

Project SHV Contract #3

Job Number 02172-000

Calcs For Load Rating Inputs



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Date 12/17/2013  
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**Live Load Moment per Wheel Based off of Table C6B-1 and C6B-2 taken from MBE V.2011:**

See Excel Spreadsheet C6B-1 and C6B-2.xlsx for interpolation results:

$$M_3 := 90.44 \text{ kip} \cdot \text{ft}$$

$$M_{SU4} := 107.05 \text{ kip} \cdot \text{ft}$$

$$M_{3S2} := 86.04 \text{ kip} \cdot \text{ft}$$

$$M_{SU5} := 116.08 \text{ kip} \cdot \text{ft}$$

$$M_{3S3} := 74.53 \text{ kip} \cdot \text{ft}$$

$$M_{SU6} := 125.21 \text{ kip} \cdot \text{ft}$$

$$M_{SU7} := 127.63 \text{ kip} \cdot \text{ft}$$

Type 3 Rating (Gross Weight = 24T):

$$OR_3 := 24 \cdot \frac{M_{LLPOST}}{M_3} = 34$$

$$RF_3 := \frac{OR_3}{24} = 1.415$$

Type 3S2 Rating (Gross Weight = 40T):

$$OR_{3S2} := 40 \cdot \frac{M_{LLPOST}}{M_{3S2}} = 59.5$$

$$RF_{3S2} := \frac{OR_{3S2}}{40} = 1.487$$

These values represent the AASHTO Trucks and not the MN Trucks. This is why they do not match the vritis ratings. They are used as a guide.

Type 3-3 Rating (Gross Weight = 40T):

$$OR_{3S3} := 40 \cdot \frac{M_{LLPOST}}{M_{3S3}} = 68.7$$

$$RF_{3S3} := \frac{OR_{3S3}}{40} = 1.717$$

Type SU4 Rating (Gross Weight = 27T):

$$OR_{SU4} := 27 \cdot \frac{M_{LLPOST}}{M_{SU4}} = 32.3$$

$$RF_{SU4} := \frac{OR_{SU4}}{27} = 1.195$$

Type SU5 Rating (Gross Weight = 31T):

$$OR_{SU5} := 31 \cdot \frac{M_{LLPOST}}{M_{SU5}} = 34.2$$

$$RF_{SU5} := \frac{OR_{SU5}}{31} = 1.102$$

Type SU6 Rating (Gross Weight = 34.75T):

$$OR_{SU6} := 34.75 \cdot \frac{M_{LLPOST}}{M_{SU6}} = 35.5$$

$$RF_{SU6} := \frac{OR_{SU6}}{34.75} = 1.022$$

Type SU7 Rating (Gross Weight = 38.75T):

$$OR_{SU7} := 38.75 \cdot \frac{M_{LLPOST}}{M_{SU7}} = 38.8$$

$$RF_{SU7} := \frac{OR_{SU7}}{38.75} = 1.003$$

Project SHV Contract #3

Job Number 02172-000

Calcs For Load Rating Inputs



Originated AOG  
Checked KLY  
Back Check AMS  
Corrected KLY  
Verified AMS

Date 12/17/2013  
Date 1/7/2014  
Date 3/8/2014  
Date 3/10/2014  
Date 3/10/2014

**TIMBER SLAB ALLOWABLE STRESS MOMENT RATING**

**SPAN 2**

Bridge Number: 42526

Equivalent Width:  $b_m := 12\text{in}$     Beam Height:  $h_m := 14\text{in}$     Span Length:  $Span := 32\text{ft}$

Bearing Length:  $l_{b1} := 7\text{in}$     Skew:  $Skew := 0\text{deg}$

$l_{b2} := 7\text{in}$

Effective Bearing Length:  $c_{w1} := \frac{l_{b1}}{\cos(Skew)} = 0.583\text{ ft}$      $c_{w2} := \frac{l_{b2}}{\cos(Skew)} = 0.583\text{ ft}$

Effective Span Length:  $L_m := Span - \frac{c_1}{2} - \frac{c_2}{2} = 31.417\text{ ft}$

Distribution Factor for HS20 Loading:  $DF_{HS20} := \frac{b}{20 \cdot \text{in} + 2 \cdot h} = 0.250$     Use Tire Width of 20in

Distribution Factor for Posting Loading:  $DF_{POST} := \frac{b}{15 \cdot \text{in} + 2 \cdot h} = 0.279$     Use Tire Width of 15in

**Material Properties (MnDOT Standard Unit Weights from Table 3.3.1):**

Bituminous Wearing Course:  $\gamma_{bwc} := 0.150\text{kcf}$

Gravel Wearing Course:  $\gamma_{gwc} := 0.120\text{kcf}$

Timber:  $\gamma_{timber} := 0.05\text{kcf}$

**DEAD LOADS:**

Determine the Dead Loads applied to the bridge:

**Wear Course:**

$d_{BWC} := 4\text{in}$     Depth of Bit Wear Course

$d_{GWC} := 0\text{in}$     Depth of Gravel Wear Course

$W_{roadway} := 32.083\text{ft}$     Roadway Width

$W_{deck} := 34\text{ft}$     Deck Width

Weight of Wear Course:

$$W_{WGC} := (\gamma_{bwc} \cdot d_{BWC} + \gamma_{gwc} \cdot d_{GWC}) \cdot \frac{W_{roadway}}{W_{deck}} = 47.181 \frac{\text{lb}}{\text{ft}}$$

Project SHV Contract #3

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**Slab and Stool:**

Weight of Slab and Stool:

$$W_{SLAB} := \gamma_{timber} \cdot h = 58.333 \frac{lb}{ft}$$

**Spreader Beam:**

DC1

$$Spread_W := 6in$$

$$Spread_D := 12in$$

$$W_{spread} := \frac{\gamma_{timber} \cdot Spread_W \cdot Spread_D}{L} = 0.796 \frac{lb}{ft}$$

**Timber Curbs, Rail, or Utilities:**

Distance between Rail Posts

$$Space_{RP} := 6ft$$

**Top Rail:**

If wood:  $TopR_W := 6in$

$$TopR_D := 12in$$

$$TopR_A := TopR_W \cdot TopR_D \cdot Space_{RP} = 5184 \cdot in^3$$

If steel:

$$W_{12guage} := 0.64 \frac{lb}{in}$$

$$SteelGuard_D := 0in$$

$$TopR_{DCsteel} := W_{12guage} \cdot SteelGuard_D = 0$$

**Post:**

$$Post_W := 8in$$

$$Post_D := 12in$$

$$Post_L := 3.5ft$$

$$Post_A := Post_W \cdot Post_D \cdot Post_L = 4032 \cdot in^3$$

**Rail Post Block**

$$PostBk_W := 0in$$

$$PostBk_D := 0in$$

$$PostBk_L := 0ft$$

$$PostBk_A := PostBk_W \cdot PostBk_D \cdot PostBk_L = 0 \cdot in^3$$

**Curb:**

$$Curb_W := 12in$$

$$Curb_D := 6in$$

$$Curb_A := Curb_W \cdot Curb_D \cdot Space_{RP} = 5184 \cdot in^3$$

**Scupper Block:**

$$ScupB_W := 12in$$

$$ScupB_D := 6in$$

$$ScupB_L := 2ft$$

$$ScupB_A := ScupB_W \cdot ScupB_D \cdot ScupB_L = 1728 \cdot in^3$$

**Additional:**

$$Additional := 0lb$$

**Steel Rail:**

$$W_{steelpipe} := 5 \frac{lb}{ft}$$

$$Post_{steel} := 5ft$$

**Total Weight of Rail Distributed over Entire Deck:**

$$Area_{Rail} := TopR_A + Post_A + PostBk_A + Curb_A + ScupB_A = 9.333 \cdot ft^3$$

$$W_{rc2} := \gamma_{timber} \cdot \left( \frac{2 \cdot Area_{Rail}}{Space_{RP}} \right) + \frac{2 \cdot TopR_{DCsteel} \cdot 1ft}{W_{deck}} + \frac{[(4W_{steelpipe} \cdot Space_{RP}) + 2Post_{steel} \cdot W_{steelpipe}]}{W_{deck}} = 9.575 \frac{lb}{ft}$$



Project SHV Contract #3

Job Number 02172-000

Calcs For Load Rating Inputs



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 Date 3/10/2014  
 Date 3/10/2014

**RATING ANALYSIS - INVENTORY AND OPERATING RATING:**

$$S := \frac{b \cdot h^2}{6} = 392 \cdot \text{in}^3 \quad \text{Section Modulus}$$

Condition of Superstructure: Super := 7 Inspected by AMS - 11/8/2013

**Rating Equation Factors:**

$$\phi := \text{if}(\text{Super} \geq 6, 1, \text{if}(\text{Super} > 4, 0.95, 0.85)) = 1$$

$$f_w := 1.50 \cdot \text{ksi} \quad \text{Found on bridge plans}$$

$$f_{bw} := \phi \cdot f = 1.5 \cdot \text{ksi} \quad \text{Allowable stress to use in load rating.}$$

$$f_{bOR} := \phi \cdot 1.33 \cdot f = 1.995 \cdot \text{ksi}$$

**Resisting Moment of Timber Beams:**

$$M_{rx} := S \cdot f_b = 49 \cdot \text{kip} \cdot \text{ft} \quad \text{Inventory Rating}$$

$$M_{rOR} := S \cdot f_{bOR} = 65.17 \cdot \text{kip} \cdot \text{ft} \quad \text{Operating Rating}$$

**Dead Load Moment of Timber Beams:**

$$M_{DLw} := \frac{[(W_{WC} + W_{SLAB} + W_{DC2} + W_{Spread}) \cdot L^2]}{8} = 14.297 \cdot \text{kip} \cdot \text{ft}$$

0.6\*L :

$$M_{DL0.6} := \frac{[(W_{WC} + W_{SLAB} + W_{DC2} + W_{Spread}) \cdot (0.6L) \cdot (L - 0.6L)]}{2} = 13.726 \cdot \text{kip} \cdot \text{ft}$$

**Moment available for Live Load per Wheel Line:**

$$M_{llw} := \frac{(M_r - M_{DL})}{DF_{HS20}} = 138.81 \cdot \text{kip} \cdot \text{ft} \quad \text{Inventory Rating}$$

$$M_{llOR} := \frac{(M_{rOR} - M_{DL})}{DF_{HS20}} = 203.49 \cdot \text{kip} \cdot \text{ft} \quad \text{Operating Rating}$$

Project SHV Contract #3

Job Number 02172-000

Calcs For Load Rating Inputs



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Date 3/10/2014

**Moment available for Live Load per Wheel Line:**

Midspan :

0.6\*L:

$$M_{\text{Inventory}} := \frac{(M_r - M_{DL})}{DF_{HS20}} = 138.81 \cdot \text{kip} \cdot \text{ft}$$

$$M_{\text{Inventory}} := \frac{(M_r - M_{DL0.6})}{DF_{HS20}} = 141.098 \cdot \text{kip} \cdot \text{ft}$$

Inventory Rating

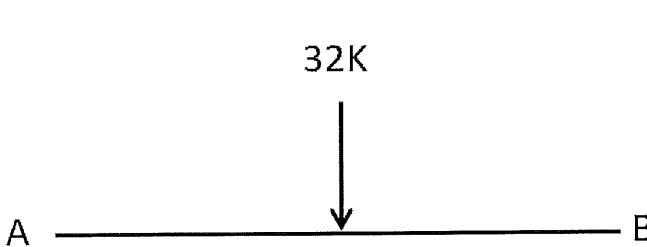
$$M_{\text{Operating}} := \frac{(M_{FOR} - M_{DL})}{DF_{HS20}} = 203.49 \cdot \text{kip} \cdot \text{ft}$$

$$M_{\text{Operating}} := \frac{(M_{FOR} - M_{DL0.6})}{DF_{HS20}} = 205.778 \cdot \text{kip} \cdot \text{ft}$$

Operating Rating

**Determine Live Load Moment per axel for HS-20 Truck:**

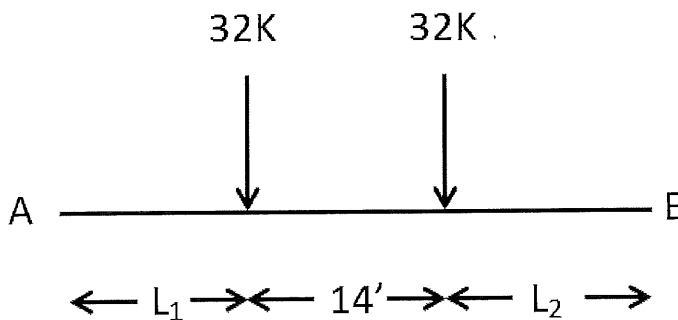
Determine the absolute maximum moment in the simply supported beam. Place one of the 32 kip loads at the midspan of the bridge. Due to the span length and placement of load, only one axel fits on bridge.



$$F_R := 32 \text{ kip}$$

$$M_R := \frac{F_R \cdot L}{4} = 251.333 \cdot \text{kip} \cdot \text{ft}$$

There is a possibility that the absolute maximum moment may occur at different location when two axels can fit on bridge. Place 32kip load at 0.6\*L.



$$F_R := 64 \text{ kip}$$

$$L_1 := 0.6 \cdot L - 14 \text{ ft} = 4.85 \text{ ft}$$

$$L_2 := 0.4 \cdot L = 12.567 \text{ ft}$$

Determine the reaction at B.

$$R_B := \frac{[L_1 \cdot 32 \text{ kip} + (L_1 + 14 \text{ ft}) \cdot 32 \text{ kip}]}{L} = 24.14 \cdot \text{kip}$$

Using method of sections, determine the internal moment under the 32kip load at each end.

Right Section:

$$M_{\text{maxR}} := (F_R - R_B) \cdot L_1 = 193.321 \cdot \text{kip} \cdot \text{ft}$$

Left Section:

$$M_{\text{maxL}} := R_B \cdot L_2 = 303.36 \cdot \text{kip} \cdot \text{ft} \quad \text{Governs}$$

Project SHV Contract #3

Job Number 02172-000

Calcs For Load Rating Inputs



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**Determine Live Load Moment per Wheel base for HS-20 Truck:**

$$M_{HS20} := \frac{\max(M_{\max R}, M_{\max L})}{2} = 151.68 \cdot \text{kip} \cdot \text{ft}$$

$$M_{LL} := \max(M_{LL0.5}, M_{LL0.6}) = 141.098 \cdot \text{kip} \cdot \text{ft}$$

$$M_{LLOR} := \max(M_{LLOR0.5}, M_{LLOR0.6}) = 205.778 \cdot \text{kip} \cdot \text{ft}$$

Inventory Rating:

$$IR := 20 \cdot \frac{M_{LL}}{M_{HS20}} = 18.6$$

$$RF := \frac{IR}{20} = 0.93$$

Operating Rating:

$$OR := 20 \cdot \frac{M_{LLOR}}{M_{HS20}} = 27.1$$

$$RF_{OR} := \frac{OR}{20} = 1.357$$

**RATING ANALYSIS - POSTING RATINGS:**

$S = 392 \cdot \text{in}^3$  Section Modulus

$f_{bOR} = 1.995 \cdot \text{ksi}$  Allowable Stress

**Resisting Moment of Timber Beams:**

$$M_{FOR} = 65.17 \cdot \text{kip} \cdot \text{ft}$$

**Dead Load Moment of Timber Beams:**

$$M_{DL} = 14.297 \cdot \text{kip} \cdot \text{ft}$$

**Moment available for Live Load per Wheel Line:**

$$M_{LLPOST} := \frac{(M_{FOR} - M_{DL})}{DF_{POST}} = 182.293 \cdot \text{kip} \cdot \text{ft}$$

Project SHV Contract #3

Job Number 02172-000

Calcs For Load Rating Inputs



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**Live Load Moment per Wheel Based off of Table C6B-1 and C6B-2 taken from MBE V.2011:**

See Excel Spreadsheet C6B-1 and C6B-2.xlsx for interpolation results:

$$\begin{aligned}
 M_{3v} &:= 121.68 \text{ kip} \cdot \text{ft} & M_{SU4} &:= 146.29 \text{ kip} \cdot \text{ft} \\
 M_{3S2} &:= 118.23 \text{ kip} \cdot \text{ft} & M_{SU5} &:= 155.35 \text{ kip} \cdot \text{ft} \\
 M_{3S3} &:= 98.58 \text{ kip} \cdot \text{ft} & M_{SU6} &:= 170.87 \text{ kip} \cdot \text{ft} \\
 & & M_{SU7} &:= 179.22 \text{ kip} \cdot \text{ft}
 \end{aligned}$$

Type 3 Rating (Gross Weight = 24T):

$$\begin{aligned}
 OR_{3v} &:= 24 \cdot \frac{M_{LLPOST}}{M_3} = 36 & RF_{3v} &:= \frac{OR_3}{24} = 1.498
 \end{aligned}$$

Type 3S2 Rating (Gross Weight = 40T):

$$\begin{aligned}
 OR_{3S2} &:= 40 \cdot \frac{M_{LLPOST}}{M_{3S2}} = 61.7 & RF_{3S2} &:= \frac{OR_{3S2}}{40} = 1.542
 \end{aligned}$$

These values represent the AASHTO Trucks and not the MN Trucks. This is why they do not match the virtis ratings. They are used as a guide.

Type 3-3 Rating (Gross Weight = 40T):

$$\begin{aligned}
 OR_{3S3} &:= 40 \cdot \frac{M_{LLPOST}}{M_{3S3}} = 74 & RF_{3S3} &:= \frac{OR_{3S3}}{40} = 1.849
 \end{aligned}$$

Type SU4 Rating (Gross Weight = 27T):

$$\begin{aligned}
 OR_{SU4} &:= 27 \cdot \frac{M_{LLPOST}}{M_{SU4}} = 33.6 & RF_{SU4} &:= \frac{OR_{SU4}}{27} = 1.246
 \end{aligned}$$

Type SU5 Rating (Gross Weight = 31T):

$$\begin{aligned}
 OR_{SU5} &:= 31 \cdot \frac{M_{LLPOST}}{M_{SU5}} = 36.4 & RF_{SU5} &:= \frac{OR_{SU5}}{31} = 1.173
 \end{aligned}$$

Type SU6 Rating (Gross Weight = 34.75T):

$$\begin{aligned}
 OR_{SU6} &:= 34.75 \cdot \frac{M_{LLPOST}}{M_{SU6}} = 37.1 & RF_{SU6} &:= \frac{OR_{SU6}}{34.75} = 1.067
 \end{aligned}$$

Type SU7 Rating (Gross Weight = 38.75T):

$$\begin{aligned}
 OR_{SU7} &:= 38.75 \cdot \frac{M_{LLPOST}}{M_{SU7}} = 39.4 & RF_{SU7} &:= \frac{OR_{SU7}}{38.75} = 1.017
 \end{aligned}$$

Table C6B-1

WSB Associates

Span, ft c/c	Live Load Moments in ft-kips per Wheel Line										
	Type of Loading (without Impact)						Type of Loading (with impact)				
	H-15	HS-20	3	3S2	3-3	H-15	HS-20	3	3S2	3-3	
5.0	15.0	20.0	10.6	9.7	10.0	19.5	26.0	13.8	12.6	13.0	
6.0	18.0	24.0	12.8	11.6	12.0	23.4	31.2	16.6	15.1	15.6	
7.0	21.0	28.0	15.2	13.8	14.0	27.3	36.4	19.7	18.0	18.2	
8.0	24.0	32.0	19.1	17.4	16.0	31.2	41.6	24.9	22.7	20.8	
9.0	27.0	36.0	23.1	21.1	19.1	35.1	46.8	30.1	27.4	24.8	
10.0	30.0	40.0	27.2	24.8	22.4	39.0	52.0	35.4	32.2	29.1	
11.0	33.0	44.0	31.3	28.5	25.8	42.9	57.2	40.7	37.1	33.5	
12.0	36.0	48.0	35.4	32.2	29.2	46.8	62.4	46.0	42.0	37.9	
13.0	39.0	52.0	39.6	36.1	32.6	50.7	67.6	51.4	46.9	42.3	
14.0	42.0	56.0	43.7	39.9	36.0	54.6	72.8	56.8	51.8	46.8	
15.0	45.0	60.0	47.9	43.7	39.4	58.5	78.0	62.2	56.8	51.3	
16.0	48.0	64.0	52.1	47.5	42.9	62.4	83.2	67.7	61.7	55.7	
17.0	51.0	68.0	56.3	51.3	46.3	66.3	88.4	73.1	66.7	60.2	
18.0	54.0	72.0	60.4	55.1	49.8	70.2	93.6	78.6	71.6	64.7	
19.0	57.0	76.0	64.6	58.9	53.2	74.1	98.8	84.0	76.6	69.2	
20.0	60.0	80.0	68.9	62.8	56.7	78.0	104.0	89.5	81.6	73.7	
21.0	63.0	84.0	73.1	66.6	60.2	81.9	109.2	95.0	86.6	78.2	
22.0	66.0	88.0	77.3	70.5	63.6	85.8	114.4	100.5	91.6	82.7	
23.0	69.0	92.0	81.5	75.2	67.1	89.7	119.6	105.9	97.7	87.2	
24.0	72.0	96.3	85.7	80.3	70.6	93.6	125.2	111.4	104.4	91.8	
25.0	75.0	103.7	89.9	85.4	74.1	97.5	134.8	116.9	111.0	96.3	
26.0	78.0	111.1	94.2	90.5	77.5	101.4	144.4	122.4	117.7	100.8	
27.0	81.3	118.5	98.4	95.6	81.0	105.7	154.1	127.9	124.3	105.3	
28.0	85.1	126.0	102.6	100.7	84.5	110.6	163.8	133.4	131.0	109.8	
29.0	88.8	133.5	106.8	105.9	88.0	115.4	173.6	138.9	137.6	114.4	
30.0	92.5	141.0	112.9	111.0	91.5	120.2	183.3	146.8	144.3	118.9	
32.0	99.8	156.2	125.3	121.2	101.5	130.0	203.1	162.9	157.6	132.0	
34.0	107.4	171.8	137.6	131.5	112.3	139.6	223.3	178.9	170.9	146.0	
36.0	114.8	189.4	150.0	141.7	123.1	149.2	246.2	195.0	184.2	160.1	
38.0	122.3	207.1	162.4	151.9	134.0	159.0	269.2	211.1	197.5	174.1	
40.0	129.7	224.9	174.8	162.2	144.8	168.6	292.4	227.3	210.8	188.3	
42.0	137.2	242.7	187.2	172.4	155.7	178.3	315.3	243.3	224.0	202.3	
44.0	144.7	260.4	199.7	182.7	166.6	187.5	337.5	258.7	236.7	215.8	
46.0	152.1	278.3	212.1	192.9	177.4	196.6	359.6	274.1	249.3	229.3	
48.0	159.6	296.1	224.5	203.2	188.3	205.7	381.7	289.4	261.9	242.8	
50.0	167.1	314.0	237.0	220.8	199.3	214.8	403.8	304.7	283.9	256.2	
52.0	174.6	331.8	249.4	238.4	214.3	223.9	425.5	319.9	305.8	274.8	
54.0	182.0	349.7	261.8	256.1	231.3	232.8	447.3	335.0	327.6	295.9	
56.0	189.5	367.6	274.3	273.8	248.3	241.8	469.1	350.1	349.4	316.9	
58.0	198.8	385.4	286.8	291.4	265.3	253.1	490.6	365.1	371.1	337.7	
60.0	209.2*	403.3	299.2	309.2	282.3	265.8*	512.2	380.1	392.7	358.5	
70.0	265.1*	492.8	361.5	398.0	372.2	333.1*	619.0	454.2	500.1	467.6	
80.0	327.*	582.4	423.9	487.1	471.9	406.8*	724.5	527.3	605.9	587.0	
90.0	394.9*	672.2	486.3	576.4	571.7	486.7*	828.8	599.4	710.5	704.6	
100.0	468.8*	762.0	548.7	665.9	671.5	572.9*	931.2	670.7	813.9	820.7	
120.0	634.5*	941.6	673.6	845.1	871.3	764.*	1133.7	811.1	1017.5	1049.1	
140.0	824.2*	1121.4	798.5	1024.5	1071.1	979.8*	1333.3	949.2	1217.8	1273.2	
160.0	1038.*	1384.0	923.5	1204.1	1270.9	1220.1*	1626.2	1085.5	1415.3	1493.9	
180.0	1275.8*	1701.0	1048.4	1383.7	1470.8	1484.9*	1980.0	1222.3	1610.6	1712.0	
200.0	1537.5*	2050.0	1173.4	1563.5	1670.8	1774.*	2365.7	1353.9	1804.0	1927.8	
250.0	2296.9*	3062.5	1485.8	2013.0	2170.6	2603.1*	3469.8	1683.9	2281.4	2460.0	
300.0	3206.2*	4275.0	1798.2	2462.6	2670.5	3583.5*	4779.4	2009.8	2752.4	2984.7	

\* Based on standard lane loading. All other values are based on standard truck loading.

<b>HS-20</b>
Interpolation Value
X1 = 25
X2 = Span Length 25.125 ft
X3 = 26
Y1 = 103.7
Y2 = 104.63 Interpolated Value
Y3 = 111.1

<b>Type 3</b>
Interpolation Value
X1 = 25
X2 = Span Length 25.125 ft
X3 = 26
Y1 = 89.9
Y2 = 90.44 Interpolated Value
Y3 = 94.2

<b>Type 3S2</b>
Interpolation Value
X1 = 25
X2 = Span Length 25.125 ft
X3 = 26
Y1 = 85.4
Y2 = 86.04 Interpolated Value
Y3 = 90.5

<b>Type 3-3</b>
Interpolation Value
X1 = 25
X2 = Span Length 25.125 ft
X3 = 26
Y1 = 74.1
Y2 = 74.53 Interpolated Value
Y3 = 77.5

Table C6B-2

WSB Associates

Span ft c/c	Live Load Moments in ft-kip per Wheel Line													
	Type of Loading (without Impact)							Type of Loading (with Impact)						
	HS-20	NRL	SU4	SU5	SU6	SU7	HS-20	NRL	SU4	sus	SU6	SU7		
5.0	20.0	10.6	10.6	10.6	10.6	10.6	26.0	13.8	13.8	13.8	13.8	13.8		
6.0	24.0	12.8	12.8	12.8	12.8	12.8	31.2	16.6	16.6	16.6	16.6	16.6		
7.0	28.0	15.2	15.2	15.2	15.2	15.2	36.4	19.8	19.8	19.8	19.8	19.8		
8.0	32.0	19.1	19.1	19.1	19.1	19.1	41.6	24.8	24.8	24.8	24.8	24.8		
9.0	36.0	23.1	23.1	23.1	23.1	23.1	46.8	30.0	30.0	30.0	30.0	30.0		
10.0	40.0	27.9	27.9	27.9	27.9	27.9	52.0	36.3	36.3	36.3	36.3	36.3		
11.0	44.0	33.1	33.1	33.1	33.1	33.1	57.2	43.0	43.0	43.0	43.0	43.0		
12.0	48.0	38.3	38.3	38.3	38.3	38.3	62.4	49.8	49.8	49.8	49.8	49.8		
13.0	52.0	43.5	43.5	43.5	43.5	43.5	67.6	56.6	56.6	56.6	56.6	56.6		
14.0	56.0	48.8	48.8	48.8	48.8	48.8	72.8	63.4	63.4	63.4	63.4	63.4		
15.0	60.0	54.4	54.0	54.0	54.4	54.4	78.0	70.7	70.2	70.2	70.7	70.7		
16.0	64.0	60.6	59.2	59.2	60.6	60.6	83.2	78.8	77.0	77.0	78.8	78.8		
17.0	68.0	66.7	64.5	65.3	66.7	66.7	88.4	86.7	83.9	84.9	86.7	86.7		
18.0	72.0	73.6	69.7	71.5	73.6	73.6	93.6	95.1	90.6	93.0	95.1	95.1		
19.0	76.0	80.8	74.9	77.8	80.8	80.8	98.8	105.0	97.4	101.1	105.0	105.0		
20.0	80.0	88.1	80.2	84.0	88.1	88.1	104.0	114.5	104.3	109.2	114.5	114.5		
21.0	84.0	95.3	85.4	90.3	95.3	95.3	109.2	123.9	111.0	117.4	123.9	123.9		
22.0	88.0	102.6	90.7	96.5	102.6	102.6	114.4	133.4	117.9	125.5	133.4	133.4		
23.0	92.0	110.2	95.9	102.8	109.8	110.2	119.6	143.3	124.7	133.6	142.7	143.3		
24.0	96.3	118.4	101.2	109.0	117.1	118.4	125.2	153.9	131.6	141.7	152.2	153.9		
25.0	103.7	126.6	106.4	115.3	124.3	126.6	134.8	164.5	138.3	149.9	161.6	164.5		
26.0	111.1	135.5	111.6	121.5	131.6	134.8	144.4	176.2	145.1	158.0	171.1	175.2		
27.0	118.5	144.8	116.9	127.8	138.8	143.0	154.1	188.2	152.0	166.1	180.4	185.9		
28.0	126.0	154.0	123.4	134.0	146.1	151.2	163.8	200.2	160.4	174.2	189.9	196.6		
29.0	133.5	163.3	130.1	140.3	153.3	159.4	173.6	212.3	169.1	182.4	199.3	207.2		
30.0	141.0	172.5	136.8	146.5	160.6	167.6	183.3	224.3	177.8	190.5	208.7	217.9		
32.0	156.2	191.0	150.2	159.0	175.1	184.0	203.1	248.3	195.3	206.7	227.6	239.2		
34.0	171.8	209.5	163.6	172.0	189.6	200.5	223.3	272.4	212.7	223.6	246.5	260.7		
36.0	189.4	228.9	177.1	187.3	205.4	216.9	246.2	297.6	230.2	243.5	267.0	282.0		
38.0	207.1	248.8	190.5	202.7	222.7	235.6	269.2	323.4	247.7	263.5	289.5	306.3		
40.0	224.9	268.8	204.0	218.0	240.0	255.0	292.4	349.4	265.1	283.4	312.0	331.5		
42.0	242.7	288.8	217.4	233.4	257.3	274.3	315.4	375.3	282.5	303.3	334.3	356.4		
44.0	260.4	308.7	230.9	248.7	274.7	293.7	337.4	400.0	299.2	322.3	356.0	380.6		
46.0	278.3	328.7	244.3	264.1	292.0	313.1	359.7	424.8	315.7	341.3	377.4	404.6		
48.0	296.1	348.7	257.8	279.5	309.3	332.4	381.7	449.5	332.3	360.3	398.7	428.5		
50.0	314.0	368.7	271.3	294.9	326.6	351.8	403.7	474.0	348.8	379.2	419.9	452.3		
52.0	331.8	388.6	284.8	310.3	344.0	371.2	425.5	498.4	365.3	398.0	441.2	476.1		
54.0	349.7	408.6	298.2	325.7	361.3	390.5	447.4	522.7	381.5	416.7	462.2	499.6		
56.0	367.6	428.6	311.7	341.1	378.7	409.9	469.1	547.0	397.8	435.3	483.3	523.1		
58.0	385.4	448.6	325.2	356.6	396.0	429.3	490.7	571.2	414.1	454.0	504.2	546.6		
60.0	403.3	468.5	338.7	372.0	413.3	448.7	512.2	595.1	430.2	472.5	525.0	569.9		
70.0	492.8	568.5	406.1	449.2	500.1	545.5	619.2	714.2	510.2	564.4	628.3	685.4		
80.0	582.5	668.4	473.5	526.5	586.9	642.4	724.5	831.4	589.0	654.9	730.0	799.0		
90.0	672.2	768.4	540.9	603.8	673.7	739.2	828.5	947.0	666.7	744.2	830.4	911.1		
100.0	762.0	868.3	608.4	681.2	760.5	836.1	931.3	1061.3	743.6	832.6	929.5	1021.9		
120.0	941.6	1068.3	743.3	836.0	934.2	1029.8	1133.8	1286.3	895.0	1006.6	1124.8	1240.0		
140.0	1121.4	1268.2	878.3	990.9	1107.9	1223.6	1333.0	1501.5	1044.0	1177.8	1316.9	1454.4		
160.0	1384.*	1468.2	1013.2	1145.8	1281.6	1417.3	1626.8*	1725.8	1191.0	1346.8	1506.4	1665.9		
180.0	1701.*	1668.2	1148.2	1300.7	1455.3	1611.1	1979.9*	1941.7	1396.4	1513.9	1693.9	1875.2		
200.0	2050.*	1868.2	1283.2	1455.6	1629.0	1804.8	2365.4*	2155.6	1480.6	1679.5	1879.6	2082.5		
250.0	3062.5*	2368.1	1620.7	1843.0	2063.3	2289.2	3470.8*	2683.8	1836.8	2088.7	2338.4	2594.4		
300.0	4275.*	2868.1	1958.1	2230.4	2497.7	2773.5	4777.9*	3205.5	2188.5	2492.8	2791.5	3099.8		

\* Based on standard loading. All other values based on standard truck loading.

<b>SU4</b>
<u>Interpolation Value</u>
X1 = 25
X2 = Span Length 25.125 ft
X3 = 26
Y1 = 106.4
<b>Y2 = 107.05 Interpolated Value</b>
Y3 = 111.6

<b>SU5</b>
<u>Interpolation Value</u>
X1 = 25
X2 = Span Length 25.125 ft
X3 = 26
Y1 = 115.3
<b>Y2 = 116.08 Interpolated Value</b>
Y3 = 121.5

<b>SU6</b>
<u>Interpolation Value</u>
X1 = 25
X2 = Span Length 25.125 ft
X3 = 26
Y1 = 124.3
<b>Y2 = 125.21 Interpolated Value</b>
Y3 = 131.6

<b>SU7</b>
<u>Interpolation Value</u>
X1 = 25
X2 = Span Length 25.125 ft
X3 = 26
Y1 = 126.6
<b>Y2 = 127.63 Interpolated Value</b>
Y3 = 134.8

Table C6B-1

WSB Associates

Span, ft c/c	Live Load Moments in ft-kips per Wheel Line									
	Type of Loading (without Impact)					Type of Loading (with Impact)				
	H-15	HS-20	3	3S2	3-3	H-15	HS-20	3	3S2	3-3
5.0	15.0	20.0	10.6	9.7	10.0	19.5	26.0	13.8	12.6	13.0
6.0	18.0	24.0	12.8	11.6	12.0	23.4	31.2	16.6	15.1	15.6
7.0	21.0	28.0	15.2	13.8	14.0	27.3	36.4	19.7	18.0	18.2
8.0	24.0	32.0	19.1	17.4	16.0	31.2	41.6	24.9	22.7	20.8
9.0	27.0	36.0	23.1	21.1	19.1	35.1	46.8	30.1	27.4	24.8
10.0	30.0	40.0	27.2	24.8	22.4	39.0	52.0	35.4	32.2	29.1
11.0	33.0	44.0	31.3	28.5	25.8	42.9	57.2	40.7	37.1	33.5
12.0	36.0	48.0	35.4	32.2	29.2	46.8	62.4	46.0	42.0	37.9
13.0	39.0	52.0	39.6	36.1	32.6	50.7	67.6	51.4	46.9	42.3
14.0	42.0	56.0	43.7	39.9	36.0	54.6	72.8	56.8	51.8	46.8
15.0	45.0	60.0	47.9	43.7	39.4	58.5	78.0	62.2	56.8	51.3
16.0	48.0	64.0	52.1	47.5	42.9	62.4	83.2	67.7	61.7	55.7
17.0	51.0	68.0	56.3	51.3	46.3	66.3	88.4	73.1	66.7	60.2
18.0	54.0	72.0	60.4	55.1	49.8	70.2	93.6	78.6	71.6	64.7
19.0	57.0	76.0	64.6	58.9	53.2	74.1	98.8	84.0	76.6	69.2
20.0	60.0	80.0	68.9	62.8	56.7	78.0	104.0	89.5	81.6	73.7
21.0	63.0	84.0	73.1	66.6	60.2	81.9	109.2	95.0	86.6	78.2
22.0	66.0	88.0	77.3	70.5	63.6	85.8	114.4	100.5	91.6	82.7
23.0	69.0	92.0	81.5	75.2	67.1	89.7	119.6	105.9	97.7	87.2
24.0	72.0	96.3	85.7	80.3	70.6	93.6	125.2	111.4	104.4	91.8
25.0	75.0	103.7	89.9	85.4	74.1	97.5	134.8	116.9	111.0	96.3
26.0	78.0	111.1	94.2	90.5	77.5	101.4	144.4	122.4	117.7	100.8
27.0	81.3	118.5	98.4	95.6	81.0	105.7	154.1	127.9	124.3	105.3
28.0	85.1	126.0	102.6	100.7	84.5	110.6	163.8	133.4	131.0	109.8
29.0	88.8	133.5	106.8	105.9	88.0	115.4	173.6	138.9	137.6	114.4
30.0	92.5	141.0	112.9	111.0	91.5	120.2	183.3	146.8	144.3	118.9
32.0	99.8	156.2	125.3	121.2	101.5	130.0	203.1	162.9	157.6	132.0
34.0	107.4	171.8	137.6	131.5	112.3	139.6	223.3	178.9	170.9	146.0
36.0	114.8	189.4	150.0	141.7	123.1	149.2	246.2	195.0	184.2	160.1
38.0	122.3	207.1	162.4	151.9	134.0	159.0	269.2	211.1	197.5	174.1
40.0	129.7	224.9	174.8	162.2	144.8	168.6	292.4	227.3	210.8	188.3
42.0	137.2	242.7	187.2	172.4	155.7	178.3	315.3	243.3	224.0	202.3
44.0	144.7	260.4	199.7	182.7	166.6	187.5	337.5	258.7	236.7	215.8
46.0	152.1	278.3	212.1	192.9	177.4	196.6	359.6	274.1	249.3	229.3
48.0	159.6	296.1	224.5	203.2	188.3	205.7	381.7	289.4	261.9	242.8
50.0	167.1	314.0	237.0	220.8	199.3	214.8	403.8	304.7	283.9	256.2
52.0	174.6	331.8	249.4	238.4	214.3	223.9	425.5	319.9	305.8	274.8
54.0	182.0	349.7	261.8	256.1	231.3	232.8	447.3	335.0	327.6	295.9
56.0	189.5	367.6	274.3	273.8	248.3	241.8	469.1	350.1	349.4	316.9
58.0	198.8	385.4	286.8	291.4	265.3	253.1	490.6	365.1	371.1	337.7
60.0	209.2*	403.3	299.2	309.2	282.3	265.8*	512.2	380.1	392.7	358.5
70.0	265.1*	492.8	361.5	398.0	372.2	333.1*	619.0	454.2	500.1	467.6
80.0	327.*	582.4	423.9	487.1	471.9	406.8*	724.5	527.3	605.9	587.0
90.0	394.9*	672.2	486.3	576.4	571.7	486.7*	828.8	599.4	710.5	704.6
100.0	468.8*	762.0	548.7	665.9	671.5	572.9*	931.2	670.7	813.9	820.7
120.0	634.5*	941.6	673.6	845.1	871.3	764.*	1133.7	811.1	1017.5	1049.1
140.0	824.2*	1121.4	798.5	1024.5	1071.1	979.8*	1333.3	949.2	1217.8	1273.2
160.0	1038.*	1384.0	923.5	1204.1	1270.9	1220.1*	1626.2	1085.5	1415.3	1493.9
180.0	1275.8*	1701.0	1048.4	1383.7	1470.8	1484.9*	1980.0	1222.3	1610.6	1712.0
200.0	1537.5*	2050.0	1173.4	1563.5	1670.8	1774.*	2365.7	1353.9	1804.0	1927.8
250.0	2296.9*	3062.5	1485.8	2013.0	2170.6	2603.1*	3469.8	1683.9	2281.4	2460.0
300.0	3206.2*	4275.0	1798.2	2462.6	2670.5	3583.5*	4779.4	2009.8	2752.4	2984.7

\* Based on standard lane loading. All other values are based on standard truck loading.

<b>HS-20</b>
Interpolation Value
X1 = 30
X2 = Span Length 31.4167 ft
X3 = 32
Y1 = 141.0
Y2 = 151.77 Interpolated Value
Y3 = 156.2

<b>Type 3</b>
Interpolation Value
X1 = 30
X2 = Span Length 31.4167 ft
X3 = 32
Y1 = 112.9
Y2 = 121.68 Interpolated Value
Y3 = 125.3

<b>Type 3S2</b>
Interpolation Value
X1 = 30
X2 = Span Length 31.4167 ft
X3 = 32
Y1 = 111.0
Y2 = 118.23 Interpolated Value
Y3 = 121.2

<b>Type 3-3</b>
Interpolation Value
X1 = 30
X2 = Span Length 31.4167 ft
X3 = 32
Y1 = 91.5
Y2 = 98.58 Interpolated Value
Y3 = 101.5

Table C6B-2

WSB Associates

Span ft c/c	Live Load Moments in ft-kip per Wheel Line													
	Type of Loading (without Impact)							Type of Loading (with Impact)						
	HS-20	NRL	SU4	SU5	SU6	SU7	HS-20	NRL	SU4	sus	SU6	SU7		
5.0	20.0	10.6	10.6	10.6	10.6	10.6	26.0	13.8	13.8	13.8	13.8	13.8	13.8	
6.0	24.0	12.8	12.8	12.8	12.8	12.8	31.2	16.6	16.6	16.6	16.6	16.6	16.6	
7.0	28.0	15.2	15.2	15.2	15.2	15.2	36.4	19.8	19.8	19.8	19.8	19.8	19.8	
8.0	32.0	19.1	19.1	19.1	19.1	19.1	41.6	24.8	24.8	24.8	24.8	24.8	24.8	
9.0	36.0	23.1	23.1	23.1	23.1	23.1	46.8	30.0	30.0	30.0	30.0	30.0	30.0	
10.0	40.0	27.9	27.9	27.9	27.9	27.9	52.0	36.3	36.3	36.3	36.3	36.3	36.3	
11.0	44.0	33.1	33.1	33.1	33.1	33.1	57.2	43.0	43.0	43.0	43.0	43.0	43.0	
12.0	48.0	38.3	38.3	38.3	38.3	38.3	62.4	49.8	49.8	49.8	49.8	49.8	49.8	
13.0	52.0	43.5	43.5	43.5	43.5	43.5	67.6	56.6	56.6	56.6	56.6	56.6	56.6	
14.0	56.0	48.8	48.8	48.8	48.8	48.8	72.8	63.4	63.4	63.4	63.4	63.4	63.4	
15.0	60.0	54.4	54.0	54.0	54.4	54.4	78.0	70.7	70.2	70.2	70.7	70.7	70.7	
16.0	64.0	60.6	59.2	59.2	60.6	60.6	83.2	78.8	77.0	77.0	78.8	78.8	78.8	
17.0	68.0	66.7	64.5	65.3	66.7	66.7	88.4	86.7	83.9	84.9	86.7	86.7	86.7	
18.0	72.0	73.6	69.7	71.5	73.6	73.6	93.6	95.1	90.6	93.0	95.1	95.1	95.1	
19.0	76.0	80.8	74.9	77.8	80.8	80.8	98.8	105.0	97.4	101.1	105.0	105.0	105.0	
20.0	80.0	88.1	80.2	84.0	88.1	88.1	104.0	114.5	104.3	109.2	114.5	114.5	114.5	
21.0	84.0	95.3	85.4	90.3	95.3	95.3	109.2	123.9	111.0	117.4	123.9	123.9	123.9	
22.0	88.0	102.6	90.7	96.5	102.6	102.6	114.4	133.4	117.9	125.5	133.4	133.4	133.4	
23.0	92.0	110.2	95.9	102.8	109.8	110.2	119.6	143.3	124.7	133.6	142.7	143.3	143.3	
24.0	96.3	118.4	101.2	109.0	117.1	118.4	125.2	153.9	131.6	141.7	152.2	153.9	153.9	
25.0	103.7	126.6	106.4	115.3	124.3	126.6	134.8	164.5	138.3	149.9	161.6	164.5	164.5	
26.0	111.1	135.5	111.6	121.5	131.6	134.8	144.4	176.2	145.1	158.0	171.1	175.2	175.2	
27.0	118.5	144.8	116.9	127.8	138.8	143.0	154.1	188.2	152.0	166.1	180.4	185.9	185.9	
28.0	126.0	154.0	123.4	134.0	146.1	151.2	163.8	200.2	160.4	174.2	189.9	196.6	196.6	
29.0	133.5	163.3	130.1	140.3	153.3	159.4	173.6	212.3	169.1	182.4	199.3	207.2	207.2	
30.0	141.0	172.5	136.8	146.5	160.6	167.6	183.3	224.3	177.8	190.5	208.7	217.9	217.9	
32.0	156.2	191.0	150.2	159.0	175.1	184.0	203.1	248.3	195.3	206.7	227.6	239.2	239.2	
34.0	171.8	209.5	163.6	172.0	189.6	200.5	223.3	272.4	212.7	223.6	246.5	260.7	260.7	
36.0	189.4	228.9	177.1	187.3	205.4	216.9	246.2	297.6	230.2	243.5	267.0	282.0	282.0	
38.0	207.1	248.8	190.5	202.7	222.7	235.6	269.2	323.4	247.7	263.5	289.5	306.3	306.3	
40.0	224.9	268.8	204.0	218.0	240.0	255.0	292.4	349.4	265.1	283.4	312.0	331.5	331.5	
42.0	242.7	288.8	217.4	233.4	257.3	274.3	315.4	375.3	282.5	303.3	334.3	356.4	356.4	
44.0	260.4	308.7	230.9	248.7	274.7	293.7	337.4	400.0	299.2	322.3	356.0	380.6	380.6	
46.0	278.3	328.7	244.3	264.1	292.0	313.1	359.7	424.8	315.7	341.3	377.4	404.6	404.6	
48.0	296.1	348.7	257.8	279.5	309.3	332.4	381.7	449.5	332.3	360.3	398.7	428.5	428.5	
50.0	314.0	368.7	271.3	294.9	326.6	351.8	403.7	474.0	348.8	379.2	419.9	452.3	452.3	
52.0	331.8	388.6	284.8	310.3	344.0	371.2	425.5	498.4	365.3	398.0	441.2	476.1	476.1	
54.0	349.7	408.6	298.2	325.7	361.3	390.5	447.4	522.7	381.5	416.7	462.2	499.6	499.6	
56.0	367.6	428.6	311.7	341.1	378.7	409.9	469.1	547.0	397.8	435.3	483.3	523.1	523.1	
58.0	385.4	448.6	325.2	356.6	396.0	429.3	490.7	571.2	414.1	454.0	504.2	546.6	546.6	
60.0	403.3	468.5	338.7	372.0	413.3	448.7	512.2	595.1	430.2	472.5	525.0	569.9	569.9	
70.0	492.8	568.5	406.1	449.2	500.1	545.5	619.2	714.2	510.2	564.4	628.3	685.4	685.4	
80.0	582.5	668.4	473.5	526.5	586.9	642.4	724.5	831.4	589.0	654.9	730.0	799.0	799.0	
90.0	672.2	768.4	540.9	603.8	673.7	739.2	828.5	947.0	666.7	744.2	830.4	911.1	911.1	
100.0	762.0	868.3	608.4	681.2	760.5	836.1	931.3	1061.3	743.6	832.6	929.5	1021.9	1021.9	
120.0	941.6	1068.3	743.3	836.0	934.2	1029.8	1133.8	1286.3	895.0	1006.6	1124.8	1240.0	1240.0	
140.0	1121.4	1268.2	878.3	990.9	1107.9	1223.6	1333.0	1501.5	1044.0	1177.8	1316.9	1454.4	1454.4	
160.0	1384.*	1468.2	1013.2	1145.8	1281.6	1417.3	1626.8*	1725.8	1191.0	1346.8	1506.4	1665.9	1665.9	
180.0	1701.*	1668.2	1148.2	1300.7	1455.3	1611.1	1979.9*	1941.7	1336.4	1513.9	1699.9	1875.2	1875.2	
200.0	2050.*	1868.2	1283.2	1455.6	1629.0	1804.8	2365.4*	2155.6	1480.6	1679.5	1879.6	2082.5	2082.5	
250.0	3062.5*	2368.1	1620.7	1843.0	2063.3	2289.2	3470.8*	2683.8	1836.8	2088.7	2398.4	2594.4	2594.4	
300.0	4275.*	2868.1	1958.1	2230.4	2497.7	2773.5	4777.9*	3205.5	2188.5	2492.8	2791.5	3099.8	3099.8	

\* Based on standard loading. All other values based on standard truck loading.

<b>SU4</b>
<b>Interpolation Value</b>
X1 = 30
X2 = Span Length 31.4167 ft
X3 = 32
Y1 = 136.8
<b>Y2 = 146.29 Interpolated Value</b>
Y3 = 150.2

<b>SU5</b>
<b>Interpolation Value</b>
X1 = 30
X2 = Span Length 31.4167 ft
X3 = 32
Y1 = 146.5
<b>Y2 = 155.35 Interpolated Value</b>
Y3 = 159.0

<b>SU6</b>
<b>Interpolation Value</b>
X1 = 30
X2 = Span Length 31.4167 ft
X3 = 32
Y1 = 160.6
<b>Y2 = 170.87 Interpolated Value</b>
Y3 = 175.1

<b>SU7</b>
<b>Interpolation Value</b>
X1 = 30
X2 = Span Length 31.4167 ft
X3 = 32
Y1 = 167.6
<b>Y2 = 179.22 Interpolated Value</b>
Y3 = 184.0



## Mn/DOT Structure Inventory Report

Bridge ID: 42526

CSAH 25 over REDWOOD RIVER

Date: 01/10/2013

+ GENERAL +	+ ROADWAY +	+ INSPECTION +
Agency Br. No. S2	Bridge Match ID (TIS) 1	Deficient Status ADEQ
District 8 Maint. Area	Roadway O/U Key 1-ON	Sufficiency Rating 94.8
County 42 - LYON	Route Sys/Nbr CSAH 25	Last Inspection Date 02-08-2012
City	Roadway Name or Description	Inspection Frequency 24
Township LYND	CSAH 25	Inspector Name LYON
Desc. Loc. 1.7 MI SW OF JCT CSAH 5	Roadway Function MAINLINE	Structure A-OPEN
Sect., Twp., Range 32 - 111NN - 42W	Roadway Type 2 WAY TRAF	+ NBI CONDITION RATINGS +
Latitude 44d 22m 31.94s	Control Section (TH Only)	Deck 7
Longitude 95d 55m 09.51s	Ref. Point (TH Only)	Superstructure 7
Custodian COUNTY	Date Opened to Traffic	Substructure 6
Owner COUNTY	Detour Length 6 mi.	Channel 7
Inspection By LYON COUNTY	Lanes 2 Lanes ON Bridge	Culvert N
BMU Agreement	ADT (YEAR) 39 (2008)	+ NBI APPRAISAL RATINGS +
Year Built 1975	HCA DT	Structure Evaluation 6
Year Fed Rehab	Functional Class. RURAL LOCAL	Deck Geometry 8
Year Remodeled	+ RDWY DIMENSIONS +	Underclearances N
Temp	If Divided NB-EB SB-WB	Waterway Adequacy 9
Plan Avail. COUNTY	Roadway Width 32.0 ft	Approach Alignment 9
+ STRUCTURE +	Vertical Clearance	+ SAFETY FEATURES +
Service On HIGHWAY	Max. Vert. Clear.	Bridge Railing 0-SUBSTANDARD
Service Under STREAM	Horizontal Clear.	GR Transition 0-SUBSTANDARD
Main Span Type TIMB SLAB SPAN	Lateral Clr. - Lt/Rt	Appr. Guardrail 0-SUBSTANDARD
Main Span Detail	Appr. Surface Width 32.0 ft	GR Termini 0-SUBSTANDARD
Appr. Span Type	Roadway Width 32.0 ft	+ IN DEPTH INSP. +
Appr. Span Detail	Median Width	Frac. Critical
Skew	+ MISC. BRIDGE DATA +	Underwater
Culvert Type	Structure Flared NO	Pinned Asbly.
Barrel Length	Parallel Structure NONE	Spec. Feat.
Number of Spans	Field Conn. ID	+ WATERWAY +
MAIN: 3 APPR: 0 TOTAL: 3	Cantilever ID	Drainage Area 259.0 sq mi
Main Span Length 32.0 ft	Foundations	Waterway Opening 875 sq ft
Structure Length 84.0 ft	Abut. TIMBER - PILE BENT	Navigation Control NO PRMT REQD
Deck Width 34.0 ft	Pier STEEL - PILE BENT	Pier Protection NOT APPL
Deck Material TIMBER	Historic Status NOT ELIGIBLE	Nav. Vert./Horz. Clr.
Wear Surf Type BITUMINOUS	On - Off System OFF	Nav. Vert. Lift Bridge Clear.
Wear Surf Install Year	+ PAINT +	MN Scour Code O-STBL;ACT REQD
Wear Course/Fill Depth 0.17 ft	Year Painted 1975 Pct. Unsound	Scour Evaluation Year 2008
Deck Membrane NONE	Painted Area	+ CAPACITY RATINGS +
Deck Protect. N/A	Primer Type LEAD	Design Load HS20
Deck Install Year	Finish Type PHENOLIC RESIN ALUM.	Operating Rating HS 25.80
Structure Area 2,856 sq ft	+ BRIDGE SIGNS +	Inventory Rating HS 17.70
Roadway Area 2,691 sq ft	Posted Load NOT REQUIRED	Posting
Sidewalk Width - L/R	Traffic NOT REQUIRED	Rating Date 02-01-1975
Curb Height - L/R	Horizontal OBJECT MARKERS	Mn/DOT Permit Codes
Rail Codes - L/R 38 38	Vertical NOT APPLICABLE	A: N B: N C: N

### Mn/DOT BRIDGE INSPECTION REPORT

Inspected by: LYON COUNTY

**BRIDGE 42526 CSAH 25 OVER REDWOOD RIVER**

**INSP. DATE: 02-08-2012**

County: LYON	Location: 1.7 MI SW OF JCT CSAH 5	Length: 84.0 ft
City:	Route: CSAH 25 Ref. Pt.: 000+00.290	Deck Width: 34.0 ft
Township: LYND	Control Section: Maint. Area:	Rdwy. Area / Pct. Unsnd: 2,691 sq ft
Section: 32 Township: 111NN Range: 42W	Local Agency Bridge Nbr: S2	Paint Area/ Pct. Unsnd:
Span Type: TIMB SLAB SPAN		Culvert N/A
NBI Deck: 7 Super: 7 Sub: 6 Chan: 7 Culv: N		
Open, Posted, Closed: OPEN		
Appraisal Ratings - Approach: 9 Waterway: 9	MN Scour Code: O-STBL;ACT REQD	Def. Stat: ADEQ Suff. Rate: 94.8
Required Bridge Signs - Load Posting: NOT REQUIRED	Traffic: NOT REQUIRED	
Horizontal: OBJECT MARKERS	Vertical: NOT APPLICABLE	

**STRUCTURE UNIT: 0**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5	
55	TIMBER SLAB-BIT O/L	2	02-08-2012	2,852 SF	0	2,852	0	0	N/A	
			11-05-2009	2,852 SF	0	2,852	0	0	N/A	
Notes:   Moderate cracking and small potholes are present in the bituminous overlay. Only minor decay of the decking is present.										
407	BITUMINOUS APPROACH	1	02-08-2012	2 EA	1	1	0	0	N/A	
			11-05-2009	2 EA	0	2	0	0	N/A	
Notes:  The west approach was washed out due to flooding and has been replaced. The east approach has minor cracking and minor settlement.										
332	TIMBER RAILING	2	02-08-2012	167 LF	0	167	0	N/A	N/A	
			11-05-2009	167 LF	0	167	0	N/A	N/A	
Notes:  Minor cracking and decay.										
333	RAILING - OTHER	2	02-08-2012	167 LF	167	0	0	N/A	N/A	
			11-05-2009	167 LF	167	0	0	N/A	N/A	
Notes:  > PLACED A METAL PIPE RAILING ABOVE THE TIMBER RAILING FOR BIKE TRAIL CROSSING										
202	PAINT STL COLUMN	2	02-08-2012	22 EA	0	0	22	0	0	
			11-05-2009	22 EA	0	0	22	0	0	
Notes:  Extensive rust and section loss of the steel caps for the center two columns for each abutment. Moderate surface rust and flaking is present for most other steel columns. Paint failure is 60%.										
216	TIMBER ABUTMENT	2	02-08-2012	69 LF	0	69	0	0	N/A	
			11-05-2009	69 LF	0	69	0	0	N/A	
Notes:   < none >										
235	TIMBER CAP	2	02-08-2012	135 LF	0	135	0	0	N/A	
			11-05-2009	135 LF	0	135	0	0	N/A	
Notes:  The east timber pier cap has an moderate crack the entire length.										
386	TIMBER WINGWALL	2	02-08-2012	4 EA	0	4	0	0	N/A	
			11-05-2009	4 EA	0	4	0	0	N/A	
Notes:   < none >										
361	SCOUR	2	02-08-2012	1 EA	1	0	0	N/A	N/A	
			11-05-2009	1 EA	1	0	0	N/A	N/A	
Notes:   < none >										
964	CRITICAL FINDING	2	02-08-2012	1 EA	1	0	N/A	N/A	N/A	
			11-05-2009	1 EA	1	0	N/A	N/A	N/A	
Notes:  DO NOT DELETE THIS CRITICAL FINDING SMART FLAG.										
981	SIGNING	2	02-08-2012	1 EA	1	0	0	0	0	
			11-05-2009	1 EA	1	0	0	0	0	
Notes:  Signs Required: Horizontal Clearance NEEDS END MARKERS 2005 end markers up										

### Mn/DOT BRIDGE INSPECTION REPORT

Inspected by: LYON COUNTY

**BRIDGE 42526      CSAH 25 OVER REDWOOD RIVER**

**INSP. DATE: 02-08-2012**

**STRUCTURE UNIT: 0**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
985	SLOPES	2	02-08-2012	1 EA	1	0	0	N/A	N/A
			11-05-2009	1 EA	1	0	0	N/A	N/A
Notes:  The west slope has been restored due to washout in the spring of 2011.									
986	CURB & SIDEWALK	2	02-08-2012	1 EA	1	0	0	N/A	N/A
			11-05-2009	1 EA	1	0	0	N/A	N/A
Notes:  Minor cracking and decay only.									

General Notes:    SMJ 2003 smj & ckm  
                       2005 smj 2007 smj 2009smj  
                       2011 (spring). West approach embankment was washed out and replaced due to flooding.

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Inspector's Signature

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Reviewer's Signature / Date