Bridge Load Rating

Prepared for

Maine Department of Transportation

Bridge No. 3039

Station 46 Bridge - Woolwich

US ROUTE 1

OVER

MAINE EASTERN RAILROAD

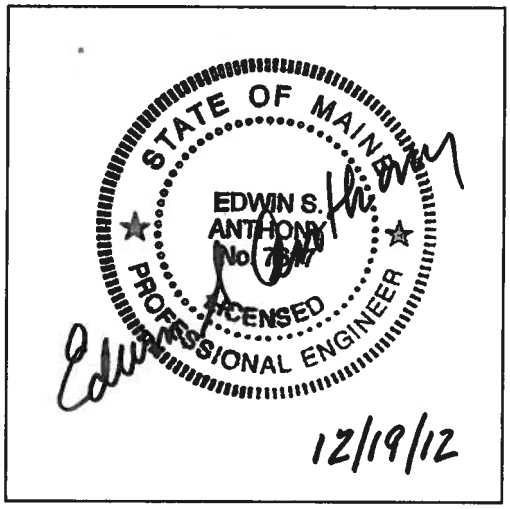
Date of Inspection: October 17, 2011

Date of Rating: December 19, 2012

Prepared By: Joshua T. Rodems

Checked By: Sam Anthony

ERDMAN ANTHONY



Bridge No:	3039	Owner:	Maine DOT
Town/City:	Woolwich	Maintainer:	Maine DOT
Route Carried:	US Route 1	Year Built	1933
Crosses:	M.E.R.R.	Year(s) Rebuilt/Rehab:	1961, 1981

SUMMARY OF BRIDGE RATING

VEHICLE TYPE		RF	RT (TONS)	POSTING LOAD (TONS)
HL-93	INVENTORY	1.25	45.00	
	OPERATING	1.62	58.33	
HL-93 modified	INVENTORY	1.03	46.35	
	OPERATING	1.34	60.08	
CONFIGURATION 1				
CONFIGURATION 2				
CONFIGURATION 3				
CONFIGURATION 4				
CONFIGURATION 5				
CONFIGURATION 6				
CONFIGURATION 7				
CONFIGURATION 8				

Group 1 Posting Analysis (Configuration 1)

Governing Posting: N/A

Governing Load Model:

Group 2 Posting Analysis (Configurations 2 - 5)

Governing Posting: N/A

Governing Load Model:

Group 3 Posting Analysis (Configurations 6 - 8)

Governing Posting: N/A

Governing Load Model:

LRFR Evaluation Factors:

Live Load Distribution Factor:	Varies
Live Load DF Routine Commercial:	N/A
Live Load DF Special Hauling:	N/A
Impact Factor:	1.33
Governing Condition Factor, ϕ_c:	0.95
System Factor, ϕ_s:	1.00
ADTT (one-way):	1610

Please check all the boxes that apply:

- ☐ Bridge load rating is governed by substructure rating
- ☐ Connections control the load rating
- ☐ Exterior girder controls load rating
- ☐ As-built load rating
- ☐ As-inspected load rating
- ☐ One Lane Loaded
- ☐ Advanced Analysis Used
- ☐ Actual Measurements Taken
- ☐ Finite Fatigue Life _____ years

BREAKDOWN OF BRIDGE RATING

Town/City: Woolwich
Bridge No: 3039

Route Carried: US Route 1
Crosses: M.E.R.R.

LOAD RATING POINTS OF INTEREST

Bridge Component	HL-93		HL-93 Modified		MaineDOT Truck Configurations							
	Inv 72.0 kip	Oper 72.0 kip	Inv 90.0 kip	Oper 90.0 kip	1 100.0 kip	2 94.0 kip	3 88.0 kip	4 88.0 kip	5 88.0 kip	6 75.9 kip	7 59.0 kip	8 37.4 kip
GIRDER G7 - TOWER SPAN STRENGTH I SHEAR AT SUPPORT	1.25	1.62	1.03	1.34								
GIRDER G7 - TOWER SPAN STRENGTH I BENDING AT MIDSPAN	1.26	1.63	1.31	1.70								
CONTROLLING RATING FACTORS	**1.25**	**1.62**	**1.03**	**1.34**								

Note: HL-93 Modified RF is higher than HL-93 RF for bending because rating is controlled by tandem axle.

DESCRIPTION OF BRIDGE

Bridge Number:	3039
Owner:	Maine DOT
Maintained By:	Maine DOT
Location:	Woolwich
Route Carried:	US Route 1
Feature Intersected:	Maine Eastern Railroad
Latest NBI Inspection Date:	October 17, 2011
Field Verification Date (if applicable):	N/A
Date of Construction:	1933
Bridge Type:	Steel Multi-Girder
Material Properties:	3 ksi concrete, 30-36 ksi structural Steel, 60 ksi reinforcing steel
Original Design Loading:	H15
Date(s) of Rebuild/Rehab :	1961, 1981
Description of Rebuild/Rehab :	1961 – widening, 1981 – widening and deck replacement
Posting:	A Open, No Restrictions
Superstructure:	Steel
Substructure:	Steel bents on concrete pedestals
Bearings:	Steel plates
Bridge Spans:	Varies from 25.0’ to 60.4’
Bridge Skew:	0 °0’0”
Bridge Width:	52’-8” out-to-out
Roadway Width:	49’-0” curb-to-curb
Roadway Surface:	Hot Mix Asphalt
Curbs:	Concrete
Sidewalk/Walkway/Median:	None
Utilities:	None
Bridge Railing:	2-bar elliptical aluminum bridge rail
Approach Railing:	Standard W-beam guard rail
Wearing Surface Condition:	Fair
Bridge Railing Condition:	Fair
Deck Condition:	Fair
Beam Condition:	Good
Bearing Condition:	Fair
Abutment Condition:	Fair
Bent Condition:	Fair

SHEET	OF		SUBSHEET NO.		
BY	JTR	DATE 12/19/12	CKD	ESA	DATE 12/19/12
PROJECT NAME & NO.	STA. 46 BRIDGE REHAB - 19330.03				
CLIENT	MAINE DOT				
SUBJECT	RATING				

ERDMAN ANTHONY

UPDATED LOAD RATING

FROM PRIOR ANALYSIS IT WAS DETERMINED THAT GIRDER 7 OF THE TOWER SPAN CONTROLS THE LOAD RATING.

SPAN = 25' – 0"
TRIBUTARY WIDTH = 5.75'
DECK THICKNESS = 8.5" (AVERAGE AT THAT LOCATION)
DISTRIBUTION FACTOR FOR SHEAR = 0.6522 (STRENGTH), 0.4917 (FATIGUE)
DISTRIBUTION FACTOR FOR BENDING = 0.5487 (STRENGTH), 0.3726 (FATIGUE)

RATING FOR REHABILITATED STRUCTURE WILL ONLY ANALYZE THE CONTROLLING MEMBER.

THE ONLY REHABILITATION WORK ITEM THAT WILL INFLUENCE THE LOAD RATING OF THE SUPERSTRUCTURE WILL BE REMOVING THE 1.25" LATEX MODIFIED CONCRETE OVERLAY (WEARING SURFACE) AND REPLACING IT WITH 3" OF HOT MIX ASPHALT. THE CALCULATIONS ON THE FOLLOWING PAGES ACCOUNT FOR THIS CHANGE.

THE ADDED DEAD LOAD WAS INPUT INTO MDX SOFTWARE FOR ANALYSIS (INPUT "WEAR"). SEE FOLLOWING PAGE FOR CALCULATION OF LOADS FOR BOTH WEARING SURFACES.

DESIGN/RATING LOAD: HL-93 & HL-93 MODIFIED

SHEET OF SUBSHEET NO.

BY JTR DATE 11/20/2012 CKD ESA DATE 11/21/12

PROJECT NAME & NO. STA. 46 BRIDGE REHAB - 19380.03

CLIENT MAINEDOT

SUBJECT NEW RATING (REHAB)

ERDMAN ANTHONY

UPDATED LOAD RATING

CALCULATE WEARING SURFACE DEAD LOAD TO ENTER AS "WEAR" IN MDX SOFTWARE.

EXISTING 1¼" LATEX MOD. CONCRETE OVERLAY:

$(1\frac{1}{4}")(\frac{1}{12})(5.75')(0.150\ kcf) = \underline{0.090\ KLF}$

PROPOSED 3" H.M.A. WEARING SURFACE

$(3")(\frac{1}{12})(5.75')(0.144\ kcf) = \underline{0.207\ KLF}$

SHEET 2 OF 17 SUBSHEET NO.

BY LJ DATE 6/29/10 CKD ZU DATE 09/08/10

PROJECT NAME & NO. STA 46 19224.17

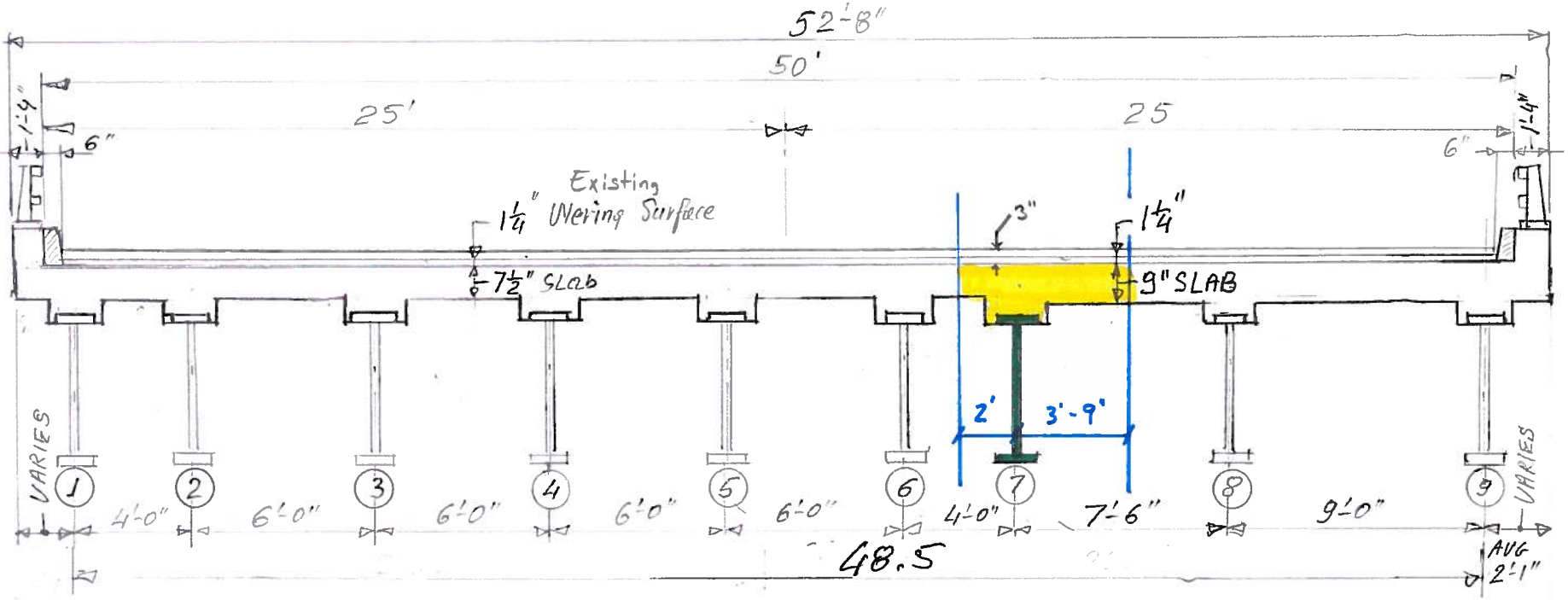
CLIENT MAINE DOT

SUBJECT RATINGS

ERDMAN ANTHONY

* REMOVE 1 1/4" CEMENT-BASED OVERLAY - REPLACE WITH 3" H.M.A. WEARING SURFACE

ADDITIONAL DEAD LOAD MAY INFLUENCE LOAD RATING



TRANSVERSE SECTION (TYP)

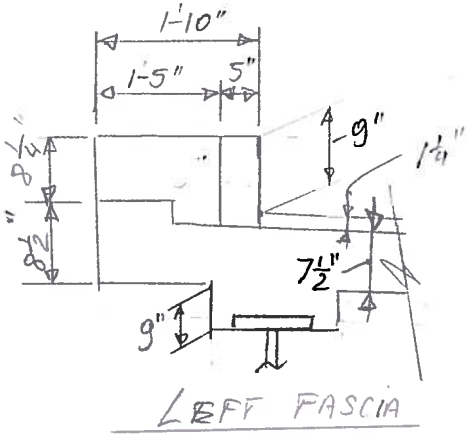
$W_{TRIB} = \left(\frac{4'-0"}{2}\right) + \left(\frac{7'-6"}{2}\right) = 5'-9"$

SLAB THICKNESS = 7½" G1-G7

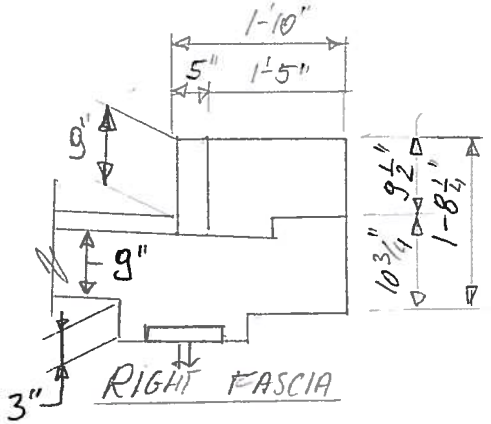
= 9" G7-G9

$\therefore 7\frac{1}{2}"\left(\frac{2'}{5.75'}\right) + 9"\left(\frac{3.75'}{5.25'}\right) = 8.50"$

USE 8.50" FOR t_{SLAB}



LEFT FASCIA



RIGHT FASCIA

FOR ENTIRE LOAD RATING:

ERDMAN, ANTHONY and ASSOCIATES, Inc.					
By	LJ	Date	11/26/12	Sheet	of
Ckd	JTR	Date	11/26/12	Sub-Sheet	of


```
FILE=R1.WRN
1. Bearing stiffener in web section 1 extends beyond flange. Bearing stress
   calcs will use given width.

2. Because ADTT was not given as data the default value of 4000 is being used.
   Except for category E' this will double actual and nearly double allowable
   fatigue stresses (6.6.1.2.3) from those calculated using the 2008 interims.

(Above warnings may not be comprehensive.)
FILE=R1.OUT


****************************************************************
MDX Steel Highway Girder Design Program, Version
Load and Resistance Factor Design - Composite Girder

Copyright (c) 1996-2009 MDX Software, Inc.
Ph:573-446-3221 Fax:573-446-3278 Email: support@mdxsoftware.com
****************************************************************
 Nov 21, 2012 - 10:59 am
 Files: TOWER-G7-RUN3.R1
        R1.OUT

    Contents of data file-

      ***************************************************
      ID: TOWER - G7
      CONDITIONS
        CONCRETE DECK ON STEEL BEAMS
        ENGLISH INPUT
        ENGLISH OUTPUT
        INTERIOR BEAM
        LRFD METHOD
        LRFR RATINGS
        NO INTERMEDIATE TRANSVERSE STIFFENERS
        RATE MODE
        SELF WEIGHT FOR DEAD LOAD 1
        SINGLE BEARING STIFFENERS EACH SIDE
      DATA
        BR 1. 22.67
        ESLABW 69.
        FPC 3.
        FY 33.
        FYS 30.
        GDSPC 5.75
        HAUNCH 3.5
        HAUNCW 18.
        NB 9
        NL 2
        NSUPBR 1 1
        ROADWIDTH 49.
        SKEW 90.
        SLABT 8.5
        SLABWEAR  0.
        SPLBFT  0.57
        SPLBFW 7.5
        SPLTFT  0.57
        SPLTFW 7.5
        SPLWD 16.86
        SPLWT  0.358
        SPN 25.
        SS 1.
        SUPBST  0.375
        SUPBSW 5.
        TSLABW 69.
        WAC  0.
        WAS  0.0156
        WCONC 150.
        WEAR  0.207
        WSDL  0.059
      GO
      ***************************************************


 Case Data

   Case Data - TOWER - G7

AASHTO Specification
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SEE PAGE 14 OF RATING OUTPUT FOR CONTROLLING RATING FACTOR.

Load and Resistance Factor Method
5th Edition LRFD Bridge Design Specifications - 2010 Interims
5th Edition Append. A and B compactness and moment redistribution
2005 Interim Revisions to the Guide Manual for Condition
Evaluation and Load and Resistance Factor Rating (LRFR)
of Highway Bridges

Dimensions (additional information available in Dimensions table)

Given dimensions-

Web Depth	16.86	in		
Web Thickness	0.36	in		
Bearing Stiff. Width	5.00	in	5.00	in
Bearing Stiff. Thickness	0.38	in	0.38	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft 1.00 ft 23.67 ft 25.00 ft

Cover plates

No cover plates

Curvature

No curvature

Flange splices

Girder Type

Plate girder
Interior girder

Hinges

No interior hinges

Span lengths

Spans 25.00 ft

Stiffeners

Bearing stiffeners

Single bearing stiffeners each side

Longitudinal stiffeners

No longitudinal stiffener

Transverse stiffeners

No transverse stiffeners

Web haunches

Web splices

Fatigue

Average Single Lane Daily Truck Traffic: 4000
Allowable weld stress 18.00 ksi
AWS minimum welds
Fatigue life: 75

Composite Behavior

Composite region for composite loading- 0. - 25.00 ft

Lane fraction for strength limit state

Shear	0.6522	0.6522	0.6522	0.6522	0.6522
	0.6522	0.6522	0.6522	0.6522	0.6522
	0.6522				
Moment	0.5487	0.5487	0.5487	0.5487	0.5487
	0.5487	0.5487	0.5487	0.5487	0.5487
	0.5487				

Lane fraction for fatigue limit state

Shear	0.4917	0.4917	0.4917	0.4917	0.4917
	0.4917	0.4917	0.4917	0.4917	0.4917
	0.4917				
Moment	0.3726	0.3726	0.3726	0.3726	0.3726
	0.3726	0.3726	0.3726	0.3726	0.3726
	0.3726				

Lane fraction for live-load deflection
0.2222

Loaded lanes 2
Tandem truck multiplier: 1.0000
Design truck multiplier: 1.0000
Influence lines not displayed
Unshored construction
Tenth pt values of distributed dead load carried by steel alone

0.737 k/ft	0.737 k/ft	0.737 k/ft	0.737 k/ft	0.737 k/ft
0.737 k/ft	0.737 k/ft	0.737 k/ft	0.737 k/ft	0.737 k/ft
0.737 k/ft				

Steel wt in addition to cross section included in dist dead load

0.016 k/ft	0.016 k/ft	0.016 k/ft	0.016 k/ft	0.016 k/ft
0.016 k/ft	0.016 k/ft	0.016 k/ft	0.016 k/ft	0.016 k/ft
0.016 k/ft				

Superimposed dead load

0.059 k/ft	0.059 k/ft	0.059 k/ft	0.059 k/ft
0.059 k/ft	0.059 k/ft	0.059 k/ft	0.059 k/ft
0.059 k/ft	0.059 k/ft	0.059 k/ft	

Wearing surface dead load

0.207 k/ft	0.207 k/ft	0.207 k/ft	0.207 k/ft
0.207 k/ft	0.207 k/ft	0.207 k/ft	0.207 k/ft
0.207 k/ft	0.207 k/ft	0.207 k/ft	

Load Factors

DC1,DC2	1.250
DW	1.500
HL93 LL+I	1.750
Constructibility	1.250

Load Modifiers

Ductility	1.00
Redundancy	1.00
Operational Classification	1.00

Reactions

Max unfactored live load+Impact reactions
45.19 k 45.19 k
Min unfactored live load+im reactions
0.00 k 0.00 k
Max unfactored live reactions - No dynamic load allowance
35.27 k 35.27 k
Min unfactored live reactions - No dynamic load allowance
0.00 k 0.00 k
Total unfactored dead load DC1+DC2 reactions
10.61 k 10.61 k
Total unfactored dead load DW reactions
2.59 k 2.59 k

Support skew for shear and moment modification
90.00 90.00
Bearing skew for redistribution qualification

90.00 90.00

Material

Concrete

Concrete strength	3.00 ksi
Unit wt of concrete	150. lb/cu ft
Aggregate source correction factor K1	1.00
Slab T for strength	8.50 in
Effective slab width	69.00 in
Slab haunch	3.50 in
Slab haunch width	18.00 in
Effective slab width	69.00 in
Self weight slab width	69.00 in

Steel

Top flange yield	33.00 ksi
Bottom flange yield	33.00 ksi
Web yield	33.00 ksi
Stiffener yield	30.00 ksi
Rebar yield	60.00 ksi

Output

Standard resolution summary tables

Units

Input units: U.S. cust.
Output units: U.S. cust.

END OF CASE DATA

* * * * * * * * * * * * * * * * R A T E M O D E * * * * * * * * * * * * * * * *
(Prismatic section used for this analysis.)

Service load shear (kips) and moment (kip-ft) at span tenth points on web section 1

Max Live Load+Impact Shear							
45.2	39.8	34.6	29.4	24.4	19.5	-24.4	-29.4
-34.6	-39.8	-45.2					
DC1 Shear							
9.2	7.4	5.5	3.7	1.8	0.0	-1.8	-3.7
-5.5	-7.4	-9.2					
DC2+DW Shear							
3.3	2.7	2.0	1.3	0.7	0.0	-0.7	-1.3
-2.0	-2.7	-3.3					
Max Live Load+Impact Moment							
0.0	84.7	148.9	192.7	216.1	219.0	216.1	192.7
148.9	84.7	0.0					
DC1 Moment							
0.0	20.7	36.9	48.4	55.3	57.6	55.3	48.4
36.9	20.7	0.0					
DC2+DW Moment							
0.0	7.5	13.3	17.5	20.0	20.8	20.0	17.5
13.3	7.5	0.0					

* * * * * * * * * * * * * * * * R A T E M O D E * * * * * * * * * * * * * * * *

Rate Web depth = 16.8600 in
Web thickness = 0.3580 in

Tenth Point	Top Flange Width	Min Top Flange t	Bott Flange Width	Min Bott Flange t	Flange to web weld Top	Flange to web weld Bott
0	7.50	0.570	7.50	0.570	1/ 4	1/ 4
1	7.50	0.570	7.50	0.570	1/ 4	1/ 4
2	7.50	0.570	7.50	0.570	1/ 4	1/ 4

3	7.50	0.570	7.50	0.570	1/ 4	1/ 4
4	7.50	0.570	7.50	0.570	1/ 4	1/ 4
5	7.50	0.570	7.50	0.570	1/ 4	1/ 4
6	7.50	0.570	7.50	0.570	1/ 4	1/ 4
7	7.50	0.570	7.50	0.570	1/ 4	1/ 4
8	7.50	0.570	7.50	0.570	1/ 4	1/ 4
9	7.50	0.570	7.50	0.570	1/ 4	1/ 4
10	7.50	0.570	7.50	0.570	1/ 4	1/ 4

2 - 5.00 x 0.38 brng. stf. at 0.00 ft from left end of web section

2 - 5.00 x 0.38 brng. stf. at 25.00 ft from left end of web section

Composite section properties at max positive moment - n = 8

I	=	4334. in4
S (top steel)	=	1009.60 in3
S (bottom steel)	=	194.41 in3
S (concrete)	=	607.25 in3
Neutral axis from bottom flange	=	22.29 in

Composite section properties at max positive moment - n = 26

I	=	3239. in4
S (top steel)	=	4066.31 in3
S (bottom steel)	=	172.34 in3
S (concrete)	=	304.64 in3
Neutral axis from bottom flange	=	18.80 in

Section properties of girder alone at max positive moment

I	=	793. in4
S (top)	=	88.07 in3
S (bottom)	=	88.07 in3
Neutral axis from bottom flange	=	9.00 in

* * * * * * * * * * * * * * * * R A T E M O D E * * * * * * * * * * * * * * * *

Web Section 1 Strengths

Tenth Point	Factored Shear (k) HL93	Shr Strgth (k)	Ratio	Factored Moment (k-ft) HL93	Bndg Strgth (k-ft)	Ratio
Forces include ductility, redundancy, and operational factors.						
0	95.4	115.5 (5)	0.826	0.0	764.6 (20)	0.000
1	82.7	115.5 (5)	0.716	184.9 I	764.6 (20)	0.242
2	70.3	115.5 (5)	0.608	325.9 I	764.6 (20)	0.426
3	58.1	115.5 (5)	0.503	422.9 I	764.6 (20)	0.553
4	46.0	115.5 (5)	0.398	476.1 I	764.6 (20)	0.623
5	34.2	115.5 (5)	0.296	485.3 I	764.6 (20)	0.635
6	46.0	115.5 (5)	0.398	476.1 I	764.6 (20)	0.623
7	58.1	115.5 (5)	0.503	422.9 I	764.6 (20)	0.553
8	70.3	115.5 (5)	0.608	325.9 I	764.6 (20)	0.426
9	82.7	115.5 (5)	0.716	184.9 I	764.6 (20)	0.242
10	95.4	115.5 (5)	0.826	0.0	764.6 (20)	0.000

(5) C 0.58 Fyw D t
(20) Compact for pos. mom, Appendix A criteria for neg. mom

Bearing Stiffeners

Location from Left End of Web Sect. (ft)	Factored Reaction (k)	Allowable Column Force (k)	Ratio	Allowable Bearing Force (k)	Ratio
0.00	96.23	163.34	0.589	126.00	0.764
25.00	96.23	163.34	0.589	126.00	0.764

Fatigue Truck Loading

Condition	Location from Left End of Girder	Category (Table 6.6.1.2.3-1)	Force Range	Actual Stress Range	Allowable Stress Range	Ratio
Base metal	2.50	B	50.65	3.13	16.00	0.195
Base metal	5.00	B	88.45	5.46	16.00	0.341
Base metal	7.50	B	113.39	7.00	16.00	0.437
Base metal	10.00	B	125.47	7.74	16.00	0.484
Base metal	12.50	B	128.56	7.94	16.00	0.496
Base metal	15.00	B	125.47	7.74	16.00	0.484
Base metal	17.50	B	113.39	7.00	16.00	0.437
Base metal	20.00	B	88.45	5.46	16.00	0.341
Base metal	22.50	B	50.65	3.13	16.00	0.195
Near flg-web weld	2.50	B	50.65	3.05	16.00	0.190
Near flg-web weld	5.00	B	88.45	5.32	16.00	0.332
Near flg-web weld	7.50	B	113.39	6.82	16.00	0.426
Near flg-web weld	10.00	B	125.47	7.55	16.00	0.472
Near flg-web weld	12.50	B	128.56	7.73	16.00	0.483
Near flg-web weld	15.00	B	125.47	7.55	16.00	0.472
Near flg-web weld	17.50	B	113.39	6.82	16.00	0.426
Near flg-web weld	20.00	B	88.45	5.32	16.00	0.332
Near flg-web weld	22.50	B	50.65	3.05	16.00	0.190
Full depth conn PL	1.00	C'	10.13	1.22	12.00	0.102
Full depth conn PL	23.67	C'	13.47	1.62	12.00	0.135

* * * * * * * * * * * * * * * R A T E M O D E * * * * * * * * * * * * * * *

Cost Schedule for Web Section 1

	lb
Flange	727.3
Web	513.5
Bearing stiff.	35.9
Total steel	1276.7

Welding	Vol	lb
Flange-web	37.5	10.6
Brng.stiff.(1)-web(1/ 4 Cont.)	2.1	0.6
Brng.stiff.(2)-web(1/ 4 Cont.)	2.1	0.6
Total welding *	41.7	11.8
Total steel and weld		1288.5

Service Shear

Service Shear - k - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane LL+I (+)	Design Truck+ Lane LL+I (-)	Tandem Truck+ Lane LL+I	Fatigue Truck Range LL+I
0	0.00	9.22	0.74	2.59	45.19	0.00	45.12	20.08
1	2.50	7.37	0.59	2.07	38.92	-2.83	39.79	18.73
2	5.00	5.53	0.44	1.55	32.48	-5.76	34.57	18.27
3	7.50	3.69	0.30	1.04	26.15	-8.80	29.45	17.82
4	10.00	1.84	0.15	0.52	19.92	-11.94	24.43	17.37
5	12.50	0.00	0.00	0.00	15.18	-15.18	19.52	17.19
6	15.00	-1.84	-0.15	-0.52	11.94	-19.64	-24.43	17.19
7	17.50	-3.69	-0.29	-1.03	8.80	-26.15	-29.45	17.60

8	20.00	-5.53	-0.44	-1.55	5.76	-32.48	-34.57	18.05
9	22.50	-7.37	-0.59	-2.07	2.83	-38.92	-39.79	18.50
10	25.00	-9.22	-0.74	-2.59	0.00	-45.19	-45.12	20.08

	Fatigue Trk LL+I	Permit Trk LL+I	Permit Range	Sidewalk
0	20.08	0.00	0.00	0.00
1	17.82	0.00	0.00	0.00
2	15.56	0.00	0.00	0.00
3	13.30	0.00	0.00	0.00
4	11.04	0.00	0.00	0.00
5	9.05	0.00	0.00	0.00
6	-9.95	0.00	0.00	0.00
7	-12.17	0.00	0.00	0.00
8	-14.43	0.00	0.00	0.00
9	-16.69	0.00	0.00	0.00
10	-20.08	0.00	0.00	0.00

Reactions

Factored Reactions - Strength I - k

Location	DC1	DC2	DW	LL+I Max	LL+I Min	Max Total	Min Total
Includes ductility, redundancy, and operational factors.							
0.00	12.35	0.92	3.88	79.08	0.00	96.23	11.24
Steel	1.08						
Conc	11.27						
25.00	12.35	0.92	3.88	79.08	0.00	96.23	11.24
Steel	1.08						
Conc	11.27						

See 5th Ed.LRFD, commentary pg 3.11, for min total calcs

Unfactored Reactions - k

Location	DC1	DC2	DW	LL+I Max	LL+I Min	Max Total	Min Total
0.00	9.88	0.74	2.59	45.19	0.00	58.39	13.20
Steel	0.87						
Conc	9.01						
25.00	9.88	0.74	2.59	45.19	0.00	58.39	13.20
Steel	0.87						
Conc	9.01						

Reactions in girder output include weight in girder extensions at abutments.

Service Moment

Service Moment - k-ft - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I	Fatigue Truck Range LL+I
0	0.0	0.	0.	0.	0.	0.	0.	0.	0.
1	2.5	21.	2.	6.	82.	0.	85.	0.	34.
2	5.0	37.	3.	10.	139.	0.	149.	0.	59.
3	7.5	48.	4.	14.	170.	0.	193.	0.	76.
4	10.0	55.	4.	16.	176.	0.	216.	0.	84.
5	12.5	58.	5.	16.	173.	0.	219.	0.	86.
6	15.0	55.	4.	16.	176.	0.	216.	0.	84.
7	17.5	48.	4.	14.	170.	0.	193.	0.	76.
8	20.0	37.	3.	10.	139.	0.	149.	0.	59.
9	22.5	21.	2.	6.	82.	0.	85.	0.	34.
10	25.0	0.	0.	0.	0.	0.	0.	0.	0.

Bracing

1.0	9.	0.	2.	36.	0.	36.	0.
23.7	12.	1.	3.	47.	0.	48.	0.

	Sidewalk Max	Sidewalk Min	Max LL+I Fat Trk	Min LL+I Fat Trk	Max LL+I Prmt Trk	Min LL+I Prmt Trk
0	0.	0.	0.	0.	0.	0.
1	0.	0.	34.	0.	0.	0.
2	0.	0.	59.	0.	0.	0.
3	0.	0.	76.	0.	0.	0.
4	0.	0.	84.	0.	0.	0.
5	0.	0.	86.	0.	0.	0.
6	0.	0.	84.	0.	0.	0.
7	0.	0.	76.	0.	0.	0.
8	0.	0.	59.	0.	0.	0.
9	0.	0.	34.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.

Service Force Summary Tables

Force Summary at Tenth Points

(k,k-ft)

Location	DL-S	SDL-S	LLI-S HL93	DL-M	SDL-M	LLI+M HL93	LLI-M HL93	DL-T	SDL-T	LLI-T HL93
0.0	9	3	45	0	0	0	0	0	0	0
2.5	7	3	40	21	7	85	0	0	0	0
5.0	6	2	35	37	13	149	0	0	0	0
7.5	4	1	29	48	17	193	0	0	0	0
10.0	2	-1	24	55	20	216	0	0	0	0
12.5	0	0	20	58	21	219	0	0	0	0
15.0	-2	-1	-24	55	20	216	0	0	0	0
17.5	-4	1	-29	48	17	193	0	0	0	0
20.0	-6	2	-35	37	13	149	0	0	0	0
22.5	-7	3	-40	21	7	85	0	0	0	0
25.0	-9	3	-45	0	0	0	0	0	0	0

Force Summary at Quarter Points

(k,k-ft)

Location	DL-S	SDL-S	LLI-S HL93	DL-M	SDL-M	LLI+M HL93	LLI-M HL93	DL-T	SDL-T	LLI-T HL93
0.0	9	3	45	0	0	0	0	0	0	0
6.2	5	2	32	43	16	173	0	0	0	0
12.5	0	0	20	58	21	219	0	0	0	0
18.7	-5	2	-32	43	16	173	0	0	0	0
25.0	-9	3	-45	0	0	0	0	0	0	0

Force Summary at Brace Locations

(k,k-ft)

Location	DL-S	SDL-S	LLI-S HL93	DL-M	SDL-M	LLI+M HL93	LLI-M HL93	DL-T	SDL-T	LLI-T HL93
1.0	8	3	43	9	3	36	0	0	0	0
10.0	2	-1	24	55	20	216	0	0	0	0
23.6	-8	3	-42	12	4	48	0	0	0	0
25.0	-9	3	-45	0	0	0	0	0	0	0

Key

DL-S Noncomp dead shear
SDL-S Superimposed dead shear
LLI-S Live+impact shear
DL-M Noncomp dead moment
SDL-M Superimposed dead moment
LLI+M Max live+impact moment
LLI-M Min live+impact moment
DL-T Noncomp dead torque
SDL-M Superimposed dead torque
LLI-T Max live+impact torque

Shear on right side of pier is found in Service Shear table.

Combined Factored Moment

Combined Factored Moment - HL93 - k-ft

Tenth Pt	Loc	DC1+DC2+DW+Max LL+I	DC1+DC2+DW+Min LL+I
	Load modifiers included		
0	0.00	0.00	0.00
1	2.50	184.91	36.73
2	5.00	325.89	65.30
3	7.50	422.94	85.70
4	10.00	476.06	97.94
5	12.50	485.25	102.03
6	15.00	476.06	97.94
7	17.50	422.94	85.70
8	20.00	325.89	65.30
9	22.50	184.91	36.73
10	25.00	0.00	0.00

Dimensions

Dimensions

Tenth Point	Loc	-Top Flange- tfw	tft	Weld	----Web---- wd	wt	Weld	-Bot Flange- bfw	bft	Area
0	0.00	7.50	0.570	1/ 4	16.86	0.358	1/ 4	7.50	0.570	14.59
1	2.50	7.50	0.570	1/ 4	16.86	0.358	1/ 4	7.50	0.570	14.59

2	5.00	7.50	0.570	1/ 4	16.86	0.358	1/ 4	7.50	0.570	14.59
3	7.50	7.50	0.570	1/ 4	16.86	0.358	1/ 4	7.50	0.570	14.59
4	10.00	7.50	0.570	1/ 4	16.86	0.358	1/ 4	7.50	0.570	14.59
5	12.50	7.50	0.570	1/ 4	16.86	0.358	1/ 4	7.50	0.570	14.59
6	15.00	7.50	0.570	1/ 4	16.86	0.358	1/ 4	7.50	0.570	14.59
7	17.50	7.50	0.570	1/ 4	16.86	0.358	1/ 4	7.50	0.570	14.59
8	20.00	7.50	0.570	1/ 4	16.86	0.358	1/ 4	7.50	0.570	14.59
9	22.50	7.50	0.570	1/ 4	16.86	0.358	1/ 4	7.50	0.570	14.59
10	25.00	7.50	0.570	1/ 4	16.86	0.358	1/ 4	7.50	0.570	14.59

Bearing Stiffeners

Location	Width	Thickness
0.00	5.00	0.375
25.00	5.00	0.375

Elastic Section Properties for Stiffness Analysis

Elastic Section Properties for Stiffness Analysis

Tenth Point	----- Noncomp ----- I	na from Bott	na from Top Flg	------ Comp ------ (n = 8.73) I	na from Bott	na from Top Flg	------ Comp ------ (3n =26.20) I	na from Bott	na from Top Flg
0	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
1	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
2	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
3	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
4	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
5	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
6	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
7	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
8	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
9	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
10	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80

Elastic Section Properties for Pos Mom Stress

Elastic Section Properties for Pos Mom Stress

Tenth Point	----- Noncomp ----- I	na from Bott	na from Top Flg	------ Comp ------ (n = 8.73) I	na from Bott	na from Top Flg	------ Comp ------ (3n =26.20) I	na from Bott	na from Top Flg
0	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
1	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
2	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
3	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
4	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
5	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
6	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
7	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
8	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
9	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80
10	793.	9.00	9.00	4334.	22.29	-4.29	3239.	18.80	-0.80

Plastic Section Properties

Plastic Section Properties

Tenth Point	Ps+Pr	Ptf+Pw +Pbf	PNA Frm tp of slb +Mp	PNA -Mp	Pos Mp (k-ft)	Case	Neg Mp (k-ft)	Case
0	1496.	481.	2.74	11.69	765.	V	587.	II
1	1496.	481.	2.74	11.69	765.	V	587.	II
2	1496.	481.	2.74	11.69	765.	V	587.	II
3	1496.	481.	2.74	11.69	765.	V	587.	II

4	1496.	481.	2.74	11.69	765.	V	587. II
5	1496.	481.	2.74	11.69	765.	V	587. II
6	1496.	481.	2.74	11.69	765.	V	587. II
7	1496.	481.	2.74	11.69	765.	V	587. II
8	1496.	481.	2.74	11.69	765.	V	587. II
9	1496.	481.	2.74	11.69	765.	V	587. II
10	1496.	481.	2.74	11.69	765.	V	587. II

Top Flange Factored Bending Stress - Strength I Loading

Strngth I Factored Bending Stresses - ksi

Tenth Point	LOC	Top Flange DC1	DC2+DW	Max LL+I	Min LL+I	LL+I Rng	Tot	Allow	Ratio
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	33.0	0.000
1	2.50	-3.5	-0.1	-1.8	0.0	1.8	-5.4	33.0	0.164
2	5.00	-6.3	-0.2	-3.1	0.0	3.1	-9.6	33.0	0.291
3	7.50	-8.2	-0.3	-4.0	0.0	4.0	-12.5	33.0	0.380
4	10.00	-9.4	-0.3	-4.5	0.0	4.5	-14.3	33.0	0.432
5	12.50	-9.8	-0.4	-4.6	0.0	4.6	-14.7	33.0	0.446
6	15.00	-9.4	-0.3	-4.5	0.0	4.5	-14.3	33.0	0.432
7	17.50	-8.2	-0.3	-4.0	0.0	4.0	-12.5	33.0	0.380
8	20.00	-6.3	-0.2	-3.1	0.0	3.1	-9.6	33.0	0.291
9	22.50	-3.5	-0.1	-1.8	0.0	1.8	-5.4	33.0	0.164
10	25.00	0.0	0.0	0.0	0.0	0.0	0.0	33.0	0.000

Governing expression for allowable compression stress

Tenth Pt	Expression
1	compact - Cb 1.00
2	compact - Cb 1.00
3	compact - Cb 1.00
4	compact - Cb 1.00
5	compact - Cb 1.00
6	compact - Cb 1.00
7	compact - Cb 1.00
8	compact - Cb 1.00
9	compact - Cb 1.00

Perf. ratio for compact section is (factored mom/mom strength).

Bottom Flange Factored Bending Stress - Strength I Loading

Strngth I Factored Bending Stresses - ksi

Tenth Point	Loc	Bottom Flange DC1	DC2+DW	Max LL+I	Min LL+I	LL+I Rng	Wind	Tot	Allow	Ratio
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.0	0.000
1	2.50	3.5	0.8	9.1	0.0	9.1	0.0	13.4	33.0	0.242
2	5.00	6.3	1.3	16.1	0.0	16.1	0.0	23.7	33.0	0.426
3	7.50	8.2	1.8	20.8	0.0	20.8	0.0	30.8	33.0	0.553
4	10.00	Factored stresses in inelastic range. **								0.623
5	12.50	Factored stresses in inelastic range. **								0.635
6	15.00	Factored stresses in inelastic range. **								0.623
7	17.50	8.2	1.8	20.8	0.0	20.8	0.0	30.8	33.0	0.553
8	20.00	6.3	1.3	16.1	0.0	16.1	0.0	23.7	33.0	0.426
9	22.50	3.5	0.8	9.1	0.0	9.1	0.0	13.4	33.0	0.242
10	25.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.0	0.000

** Permitted for compact section.

Governing expression for allowable compression stress

Tenth Pt	Expression

Perf. ratio for compact section is (factored mom/mom strength).

Factored Slab and Rebar Stresses

Factored Bending Stresses - ksi

Tenth Point	Loc	Slab Comp Dead	Slab Max LL+I	Slab Tot	Rebars Comp Dead	Rebars Min LL+I	Rebars Tot
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	2.50	-0.02	-0.34	-0.36	0.00	0.00	0.00
2	5.00	-0.04	-0.59	-0.63	0.00	0.00	0.00
3	7.50	-0.06	-0.76	-0.82	0.00	0.00	0.00
4	10.00	-0.07	-0.86	-0.92	0.00	0.00	0.00
5	12.50	-0.07	-0.87	-0.94	0.00	0.00	0.00
6	15.00	-0.07	-0.86	-0.92	0.00	0.00	0.00
7	17.50	-0.06	-0.76	-0.82	0.00	0.00	0.00
8	20.00	-0.04	-0.59	-0.63	0.00	0.00	0.00
9	22.50	-0.02	-0.34	-0.36	0.00	0.00	0.00
10	25.00	0.00	0.00	0.00	0.00	0.00	0.00

Only slab compression stresses tabulated.

Constructibility of Web in Bending

Web Compression Bending Stress for Constructibility - ksi

Tenth Point	Noncomp. Dead Factored Mom	Noncomp. Dead Web Bending Stress	Rb	Rh	Allowable 6.10.1.9	Ratio
0	0.00	0.00	1.0000	1.0000	33.00	0.000
1	25.92	3.31	1.0000	1.0000	14.68*	0.225
2	46.08	5.88	1.0000	1.0000	14.68*	0.401
3	60.49	7.72	1.0000	1.0000	14.68*	0.526
4	69.13	8.82	1.0000	1.0000	14.68*	0.601
5	72.01	9.19	1.0000	1.0000	14.68*	0.626
6	69.13	8.82	1.0000	1.0000	14.68*	0.601
7	60.49	7.72	1.0000	1.0000	14.68*	0.526
8	46.08	5.88	1.0000	1.0000	14.68*	0.401
9	25.92	3.31	1.0000	1.0000	14.68*	0.225
10	0.00	0.00	1.0000	1.0000	33.00	0.000

* Flexural-torsional or local buckling governs

Top Flange Permanent Deflection Control Stress

Top Flange 6.10.4.2 Permanent Deflection Control - ksi

Tenth	Location	DC1	DC2+ DW	1.3LL+I Max	1.3LL+I Min	Total	Allowable	Ratio
0	0.00	0.00	0.00	0.00	0.00	0.00	31.35	0.000
1	2.50	-2.83	-0.09	-1.31	0.00	-4.22	31.35	0.135
2	5.00	-5.02	-0.16	-2.30	0.00	-7.48	31.35	0.239
3	7.50	-6.59	-0.21	-2.98	0.00	-9.78	31.35	0.312
4	10.00	-7.54	-0.24	-3.34	0.00	-11.11	31.35	0.354
5	12.50	-7.85	-0.25	-3.38	0.00	-11.48	31.35	0.366
6	15.00	-7.54	-0.24	-3.34	0.00	-11.11	31.35	0.354
7	17.50	-6.59	-0.21	-2.98	0.00	-9.78	31.35	0.312
8	20.00	-5.02	-0.16	-2.30	0.00	-7.48	31.35	0.239
9	22.50	-2.83	-0.09	-1.31	0.00	-4.22	31.35	0.135
10	25.00	0.00	0.00	0.00	0.00	0.00	31.35	0.000

Bottom Flange Permanent Deflection Control Stress

Bottom Flange 6.10.4.2 Permanent Deflection Control - ksi

Tenth	Location	DC1	DC2+ DW	1.3LL+I Max	1.3LL+I Min	Total	Allowable	Ratio

0	0.00	0.00	0.00	0.00	0.00	0.00	31.35	0.000
1	2.50	2.83	0.52	6.79	0.00	10.14	31.35	0.323
2	5.00	5.02	0.93	11.95	0.00	17.90	31.35	0.571
3	7.50	6.59	1.22	15.46	0.00	23.27	31.35	0.742
4	10.00	7.54	1.39	17.34	0.00	26.26	31.35	0.838
5	12.50	7.85	1.45	17.57	0.00	26.87	31.35	0.857
6	15.00	7.54	1.39	17.34	0.00	26.26	31.35	0.838
7	17.50	6.59	1.22	15.46	0.00	23.27	31.35	0.742
8	20.00	5.02	0.93	11.95	0.00	17.90	31.35	0.571
9	22.50	2.83	0.52	6.79	0.00	10.14	31.35	0.323
10	25.00	0.00	0.00	0.00	0.00	0.00	31.35	0.000

Factored Noncomp Dead Wet Concrete Stress

Factored Noncomp Dead Wet Concrete Stresses - ksi

[While the constructibility load factor is used for this table, slab pouring is not. Actual stresses are dependent on the pouring sequence and may be significantly different from those printed here.]

Tenth Point	Loc	Top Flange	Allow-able	Bottom Flange	Allow-able
0	0.0	0.0	33.0	0.0	33.0
1	2.5	-3.5	14.7	3.5	33.0
2	5.0	-6.3	14.7	6.3	33.0
3	7.5	-8.2	14.7	8.2	33.0
4	10.0	-9.4	14.7	9.4	33.0
5	12.5	-9.8	14.7	9.8	33.0
6	15.0	-9.4	14.7	9.4	33.0
7	17.5	-8.2	14.7	8.2	33.0
8	20.0	-6.3	14.7	6.3	33.0
9	22.5	-3.5	14.7	3.5	33.0
10	25.0	0.0	33.0	0.0	33.0

Construction load factor 1.25 being used for this table.

Factored Strengths

Factored Strengths

Tenth Point	Loc	Factored Shear (k) HL93	Shear Strength (k)	Ratio	Factored Moment (k-ft) HL93	Bending Strength (k-ft)	Ratio
0	0.00	95.4	115.5 (5)	0.826	0.0	764.6 (20)	0.000
1	2.50	82.7	115.5 (5)	0.716	184.9 I	764.6 (20)	0.242
2	5.00	70.3	115.5 (5)	0.608	325.9 I	764.6 (20)	0.426
3	7.50	58.1	115.5 (5)	0.503	422.9 I	764.6 (20)	0.553
4	10.00	46.0	115.5 (5)	0.398	476.1 I	764.6 (20)	0.623
5	12.50	34.2	115.5 (5)	0.296	485.3 I	764.6 (20)	0.635
6	15.00	46.0	115.5 (5)	0.398	476.1 I	764.6 (20)	0.623
7	17.50	58.1	115.5 (5)	0.503	422.9 I	764.6 (20)	0.553
8	20.00	70.3	115.5 (5)	0.608	325.9 I	764.6 (20)	0.426
9	22.50	82.7	115.5 (5)	0.716	184.9 I	764.6 (20)	0.242
10	25.00	95.4	115.5 (5)	0.826	0.0	764.6 (20)	0.000

Forces include ductility, redundancy, and operational factors

(5) C 0.58 Fyw D t
(20) Compact for pos. mom, Appendix A criteria for neg. mom

Lrfd Ratings

[This table uses the rating equation in section 6.4.2 of the 2003 (2005 interims) AASHTO manual "Manual for Condition

Evaluation and Load and Resistance Factor Rating (LRFR)
of Highway Bridges.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmpt Allow Stress	Shear Capacity	Rating Factors Bending Inv.	Bending Oper.	Shear Inv.	Shear Oper.	
0.00	765. B	115.53	>999.00 T	>999.00	1.25	1.63	CONTROLS
2.50	765. B	115.53	4.91 T	6.37	1.50	1.95	
5.00	765. B	115.53	2.68 T	3.48	1.86	2.41	
7.50	765. B	115.53	2.01 T	2.61	2.38	3.09	
10.00	765. B	115.53	1.76 T	2.29	3.22	4.17	
12.50	765. B	115.53	1.73 T	2.24	4.35	5.64	
15.00	765. B	115.53	1.76 T	2.29	3.27	4.23	
17.50	765. B	115.53	2.01 T	2.61	2.38	3.09	
20.00	765. B	115.53	2.68 T	3.48	1.86	2.41	
22.50	765. B	115.53	4.91 T	6.37	1.50	1.95	
25.00	765. B	115.53	>999.00 T	>999.00	1.25	1.63	CONTROLS

Service II

Span 1

Location	Allowable Stress	Rating Factors Bending Inv.	Bending Oper.
0.00	31350. S	> 999.00 B	>999.00
2.50	31350. S	4.12 B	5.36
5.00	31350. S	2.13 B	2.76
7.50	31350. S	1.52 B	1.98
10.00	31350. S	1.29 B	1.68
12.50	31350. S	1.26 B	1.63
15.00	31350. S	1.29 B	1.68
17.50	31350. S	1.52 B	1.98
20.00	31350. S	2.13 B	2.76
22.50	31350. S	4.12 B	5.36
25.00	31350. S	> 999.00 B	>999.00

****
* Minimum rating is 1.25 at location 25.00 in span 1. *
****

Rating Codes:
T - Top steel governs
B - Bottom steel governs
C - Concrete governs
R - Rebar governs
V - Shear governs
S - Serviceability governs

Mom Strength Codes:
C - Compact
B - Braced non-compact

U - Unbraced non-compact
T - Transition between compact and braced non-compact
S - Serviceability

Noncompact shapes ratings based on stress, as

$$IR = \frac{Fb \text{ - factored dead load stress}}{\text{factored LL+I stress}}$$

Bearing Stiffeners

Bearing Stiffeners

Location from Left End of Web Sect. (ft)	Factored Reaction (k)	Allowable Column Force (k)	Ratio	Allowable Bearing Force (k)	Ratio
0.00	96.23	163.34	0.589	126.00	0.764
25.00	96.23	163.34	0.589	126.00	0.764

Fatigue

Fatigue Summary

Condition	Location from Left End of Girder	Category (Table 6.6.1.2.3-1)	Force Range (k-ft)	Actual Stress Range	Allowable Stress Range	Ratio
Base metal	2.50	B	50.65	3.13	16.00	0.195
Base metal	5.00	B	88.45	5.46	16.00	0.341
Base metal	7.50	B	113.39	7.00	16.00	0.437
Base metal	10.00	B	125.47	7.74	16.00	0.484
Base metal	12.50	B	128.56	7.94	16.00	0.496
Base metal	15.00	B	125.47	7.74	16.00	0.484
Base metal	17.50	B	113.39	7.00	16.00	0.437
Base metal	20.00	B	88.45	5.46	16.00	0.341
Base metal	22.50	B	50.65	3.13	16.00	0.195
Near flg-web weld	2.50	B	50.65	3.05	16.00	0.190
Near flg-web weld	5.00	B	88.45	5.32	16.00	0.332
Near flg-web weld	7.50	B	113.39	6.82	16.00	0.426
Near flg-web weld	10.00	B	125.47	7.55	16.00	0.472
Near flg-web weld	12.50	B	128.56	7.73	16.00	0.483
Near flg-web weld	15.00	B	125.47	7.55	16.00	0.472
Near flg-web weld	17.50	B	113.39	6.82	16.00	0.426
Near flg-web weld	20.00	B	88.45	5.32	16.00	0.332
Near flg-web weld	22.50	B	50.65	3.05	16.00	0.190
Full depth conn PL	1.00	C'	10.13	1.22	12.00	0.102
Full depth conn PL	23.67	C'	13.47	1.62	12.00	0.135

Max Performance Ratios

Maximum Performance Ratios

Criterion	Location ft	Max Performance Ratio
Design and tandem trucks		
Shear	0.00	0.826
Bending	12.50	0.857
Fatigue truck		
Fatigue	12.50	0.496
Bearing Stf.	0.00	0.764

Shear Connectors

Maximum Pitch for 0.875 X 4.50 Stud Connectors for Fatigue

Tenth Point	Location	Shear Range (k)	Q	I	Studs in a Line	Max Pitch (in)
0	0.00	30.13 T	193.9	4334.	2	6.25
1	2.50	28.09 T	193.9	4334.	2	6.70
2	5.00	27.41 T	193.9	4334.	2	6.87
3	7.50	26.73 T	193.9	4334.	2	7.04
4	10.00	26.05 T	193.9	4334.	2	7.23
5	12.50	25.78 T	193.9	4334.	2	7.30
6	15.00	25.78 T	193.9	4334.	2	7.30
7	17.50	26.39 T	193.9	4334.	2	7.13
8	20.00	27.07 T	193.9	4334.	2	6.95
9	22.50	27.75 T	193.9	4334.	2	6.78
10	25.00	30.13 T	193.9	4334.	2	6.25

HL93 fatigue truck shear range used for the above.

Total Minimum Required for Strength

Span 1
20 between tenth points 0 and 5
20 between tenth points 5 and 10

* * * * * * * * * * * * * * * * R A T E M O D E * * * * * * * * * * * * * * * *

Weight

	Volume cu ft	Weight k	
Top Flange	0.74	0.36	
Web	1.05	0.51	
Bottom Flange	0.74	0.36	
Flange-Web Weld		0.01	
Bearing Stiffeners	0.07	0.04	
Steel in extensions		0.10	
Additional Steel		0.39	
Total Steel			1.78
Slab	101.82	15.27	
Flange Haunch	9.16	1.37	
Concrete in extensions		1.22	
Total Concrete			17.87
Total Steel and Concrete			19.65

Noncomposite weight data used in girder input is used for analysis loading.

Deflections

Service Deflections - in

	Noncomp Dead Total	Noncomp Dead Steel Only	Noncomp Dead Slab Only	Comp Dead Excldg Wearng	Comp Dead Wearng Surfce Only	Live+I Max Up	Live+I Max Down
SUPPORT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1	0.089	0.008	0.081	0.002	0.006	0.000	0.017
2	0.168	0.015	0.153	0.003	0.012	0.000	0.032
3	0.230	0.020	0.209	0.004	0.016	0.000	0.043
4	0.269	0.024	0.245	0.005	0.018	0.000	0.050
5	0.282	0.025	0.257	0.006	0.019	0.000	0.052
6	0.269	0.024	0.245	0.005	0.018	0.000	0.050
7	0.230	0.020	0.209	0.004	0.016	0.000	0.043
8	0.168	0.015	0.153	0.003	0.012	0.000	0.032
9	0.089	0.008	0.081	0.002	0.006	0.000	0.017
SUPPORT	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Includes sidewalk deflections.

Wearing surface deflections are for future wearing surface.

Loading for defl uses larger of des trk alone
or 0.25 des truck + full lane

Deflections use a multipresence factor of 1.00 on 2 lanes.

	Loc							
Brace	1.00	0.037	0.003	0.033	0.001	0.003	0.000	0.007
Brace	23.67	0.048	0.004	0.044	0.001	0.003	0.000	0.009

Positive dead load deflection is downward.
Live load deflection as indicated in column heading.

Support Rotations

Service Support Rotations

Clockwise Positive

Location	Total Dead Load Deg	Total Dead Load Rad	Live Load Range Deg Low	Live Load Range Deg High	Live Load Range Rad Low	Live Load Range Rad High
0.00	0.182	0.00317	0.000	0.070	0.00000	0.00123
25.00	-0.182	-0.00317	-0.070	0.000	-0.00123	0.00000

Factored Support Rotations - degrees

	Clockwise	Counterclockwise
0.00	0.350	0.000
25.00	0.000	-0.350

Concurrent Max Live Reactions and Slopes

Concurrent Max Live Service Reactions and Slopes

Location ft	Max Reaction k	Concurrent Slope Deg	Max Slope Deg	Concurrent Reaction k

0.00	45.19	0.012	0.070	36.86
25.00	45.19	-0.012	-0.070	31.64

Status

run completed

SHEET 1 OF 3 SUBSHEET NO.
BY ESA DATE 12/14/12 CKD JTR DATE 12/19/12
PROJECT NAME & NO. STATION 46 BRIDGE
CLIENT MAINE
SUBJECT RATING

ERDMAN ANTHONY

Rating

Predicated on removing 1¼" concrete Overlay and replacing with 3" Asphalt

From MDX, Service II controls, RF = 1.26

Confirm:

$C = f_R = 0.95(33) = \underline{31.35 \text{ ksi}}$

$\gamma_{DC} f_{DC} = M_{DC1}/S_{DC1} + M_{DC2}/S_{DC2}$ $(\gamma_{DC} = 1.0)$

$= \frac{57.6^{k'}(12'')}{88.07 \text{ in}^3} + \frac{20.8^{k'}(12'')}{172.34}$

$= 7.85 \text{ ksi} + 1.45 \text{ ksi} = \underline{9.30 \text{ ksi}}$

$\gamma_{LL}(f_{LL+IM}) = 1.30 \times M_{LL+IM}/S_{LL}$

$= 1.30 \times \frac{219.0^{k'}(12'')}{194.41 \text{ in}^3} = 17.57 \text{ ksi}$

$RF = \frac{31.35 - 9.30}{17.57} = 1.26$ ✓ Same as MDX, p.14

ERDMAN ANTHONY

M_{LL+IM} = 219.0 k' (MDX - Tandem + Lane)

Confirm

$M_{lane} = 0.640 \times 25 \frac{7}{8} = 50.0^{k'}$

$M_{Tandem} = 25 \times \frac{25}{2} - 2' = 262.5^{k'}$

g_m: $n = \frac{E_B}{E_D} = \frac{29000}{3156} = 9.19$

Beam is W18x50 $I = 802\ in^4$ $A = 14.7\ in^2$
$d = 18"$ $b_f = 7\frac{1}{2}"$
$t_w = 3/8$ $t_f = 9/16$

$e_g = 8.50/2 + 18/2 = 13.25"$

$K_g = 9.19\left(802 + 14.7(13.25)^2\right) = 31,088\ in^4$

$\frac{K_g}{12Lt_s^3} = \frac{31088}{12(25)(8.5)^3} = 0.169$

$g_{m_1} = 0.06 + \left(\frac{5.75}{14}\right)^{0.4}\left(\frac{5.75}{25}\right)^{0.3}(0.169)^{0.1}$

$g_{m_1} = 0.437$

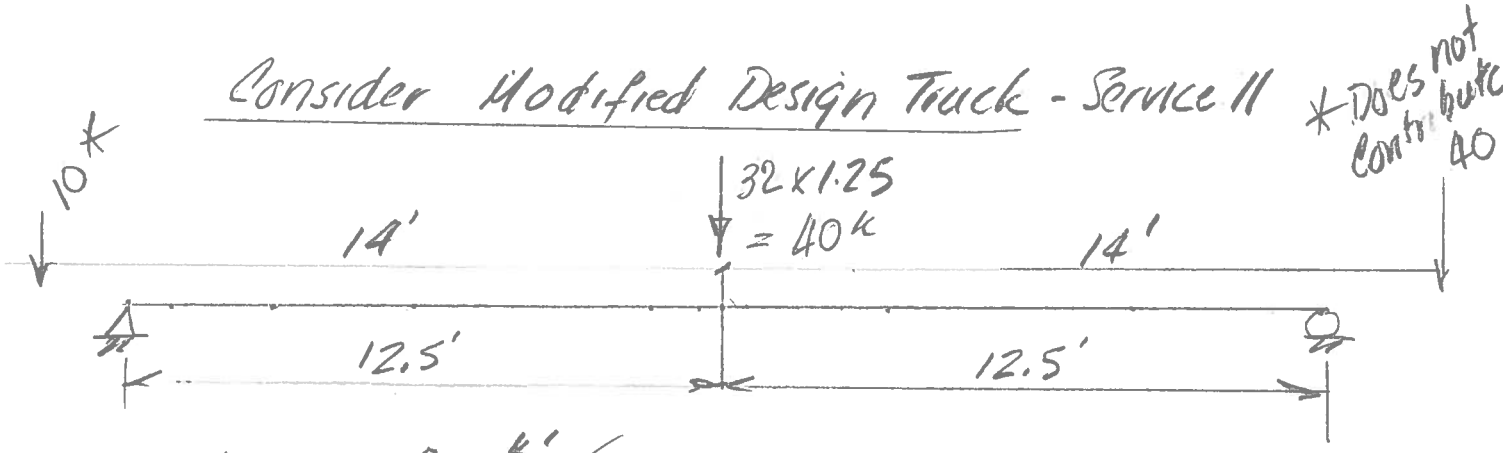
$g_{m_2} = 0.075 + \left(\frac{5.75}{9.5}\right)^{0.6}\left(\frac{5.75}{25}\right)^{0.2}(0.169)^{0.1}$

$g_{m_2} = 0.537 \leftarrow$ Controls MDX 0.5487

$M_{LL+IM} = \left((262.5)(1.33) + 50.0\right)(0.548T) = 219.0 \approx 219.0$ Ok

ERDMAN ANTHONY

Consider Modified Design Truck - Service II



$M_{lane} = 50.0^{k'}$ ✓

$M_{MDT} = 20^{k} \times 12.5' = 250^{k'}$ ✓

$M_{LL+IM} = (50 + (250)(1.33))(0.5487) = 209.9^{k'}$ ✓

$\sigma_{LL}(f_{LL+IM}) = 1.30 \times \frac{209.9 \times 12}{194.41} = 16.84 \text{ ksi}$ ✓

$RF = \frac{31.35 - 9.30}{16.84} = 1.31$ ✓

SHEET 1 OF 1 SUBSHEET NO.
BY ESA DATE 12/14/12 CKD JTR DATE 12/19/12
PROJECT NAME & NO. STA 46 BRIDGE
CLIENT MAINE
SUBJECT RATING

ERDMAN ANTHONY

For Strength I, Inv. RF = 1.73 (MDX p. 14)

$C = 764.6^{k'}$

$\gamma \cdot f_D = 1.25(57.6^{k'}) + 1.5(20.8) = 103.2^{k'}$

$\gamma f_L = 1.75(219.0) = 383.3^{k'}$

$RF = \frac{764.6 - 103.2}{383.3} = 1.73$ ✓

Re-calculate for HL 93 Modified

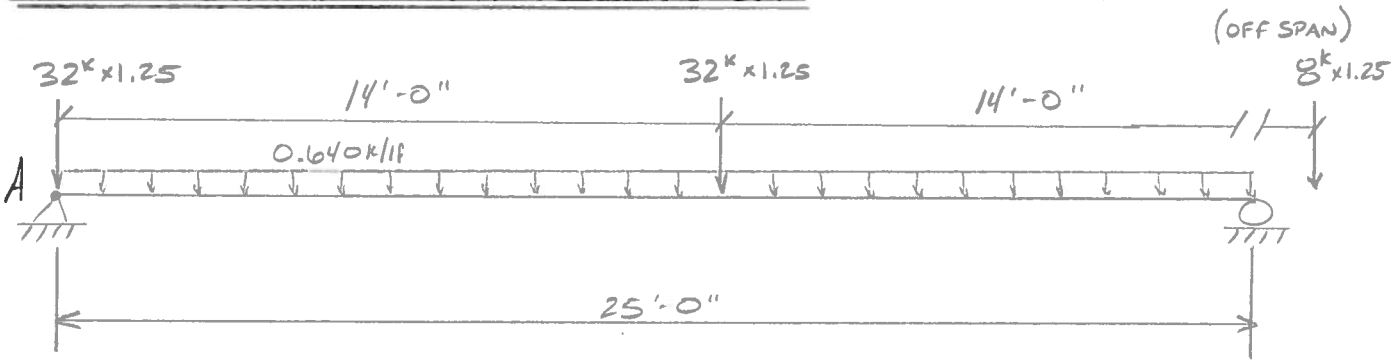
$\gamma f_L = 1.75 \times 209.9 = 367.3$ ✓

$Inv.\ RF = \frac{764.6 - 103.2}{367.3} = 1.80$ ✓

SHEET	OF		SUBSHEET NO.		
BY	JTR	DATE 12/17/12	CKD ESA	DATE 12/19/12	
PROJECT NAME & NO.	STATION 46 BRIDGE - 19390.03				
CLIENT	MAINE DOT				
SUBJECT	RATING				

ERDMAN ANTHONY

HL-93 MODIFIED RATING - SHEAR (STRENGTH I)



$$V_{LANE(A)} = \frac{wL}{2} = \frac{0.640\ k/lf\ (25')}{2} = 8^k \checkmark$$

$$V_{HL\text{-}93\ MOD(A)} = \left[32^k + 32^k\left(\frac{25'-14'}{25'}\right)\right](1.25) = 57.6^k \checkmark$$

USE DISTRIBUTION FACTOR FROM MDX: 0.6522 (SHEAR) ✓

$$V_{LL+IM} = DF\left[V_{HL\text{-}93\ MOD(A)}(IM) + V_{LANE(A)}\right]$$

$$V_{LL+IM} = 0.6522\left[1.33(57.6^k) + 8^k\right] = \underline{55.18^k} \checkmark$$

USE DEAD LOAD SHEARS & SHEAR CAPACITY FROM MDX

$$RF = \frac{\gamma C - \left[\gamma_{DC1}\,DC_1 + \gamma_{DC2/DW}(DC2 + DW)\right]}{\gamma_{LL}\,(V_{LL+IM})}$$

$$RF = \frac{115.3^k - \left[1.25(9.2^k) + 1.50(3.3^k)\right]}{1.75(55.18^k)}$$

$$RF = 1.03 \checkmark \text{ (INVENTORY)} \rightarrow \left[1.03\left(\frac{1.75}{1.35}\right)\right] = 1.34 \text{ (OPERATING)}$$