

# Bridge Load Rating

*Prepared for*

## Maine Department of Transportation

Bridge No. 1562

Brewer

Parkway South

OVER

I-395

Date of Inspection: 1/5/2015

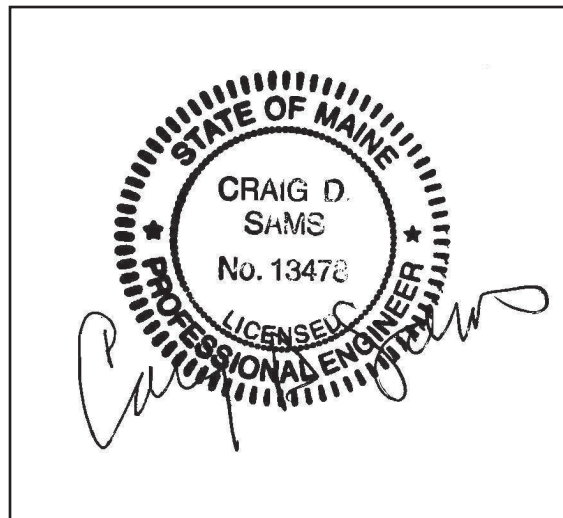
Date of Rating: 7/14/2016

Prepared By: Matthew M. Styckiewicz, P.E.

Checked By: Craig D. Sams, P.E.

Q.C. Review By: Charlie M. Roberts, P.E.

CEC – Childs Engineering Corporation



Note:

This Load Rating has been updated for the FAST Act's Emergency Vehicles on 8/31/2019.

# Bridge Load Rating

*Prepared for*

## Maine Department of Transportation

**BREWER**

**Bridge No. 1562**

**PARKWAY SOUTH**

**OVER**

**I-395**

**Date of Inspection: December 13, 2017**

**Date of Rating: August 31, 2019**

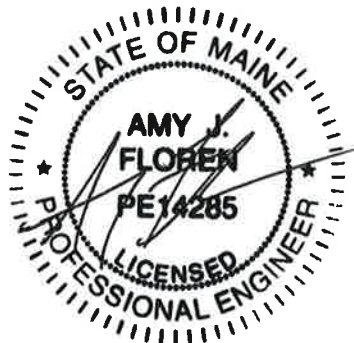
**Rating Factors are determined for the FAST Act's Emergency Vehicle Configurations Types EV2 and EV3 at the legal load rating level in accordance with AASHTO MBE.**

**Prepared By: Jason Stark, P.E.**

**Checked By: Amy Floren, P.E.**



*Louis Berger U.S., Inc.  
A WSP Company  
106 Lafayette Street, Suite 2F, Yarmouth, ME 04096*





Bridge No: 1562  
 Town/City: Brewer  
 Route Carried: Parkway South  
 Crosses: I-395

Owner: MaineDOT  
 Maintainer: MaineDOT  
 Year Built: 1985  
 Year(s) Rebuilt/Rehab: N/A

## SUMMARY OF BRIDGE RATING

VEHICLE TYPE		RF	RT (TONS)	POSTING LOAD (TONS)
HL-93	INVENTORY	1.165	41.94	
	OPERATING	1.51	54.36	
HL-93 modified	INVENTORY			
	OPERATING			
CONFIGURATION 1				
CONFIGURATION 2				
CONFIGURATION 3				
CONFIGURATION 4				
CONFIGURATION 5				
CONFIGURATION 6				
CONFIGURATION 7				
CONFIGURATION 8				
TYPE EV2		3.12	89.70	
TYPE EV3		2.16	92.88	

(Updated 7/31/19)

(Updated 7/31/19)

### Group 1 Posting Analysis (Configuration 1)

Governing Posting: N/A

Governing Load Model:

### Group 2 Posting Analysis (Configuration 2 - 5)

Governing Posting: N/A

Governing Load Model:

### Group 3 Posting Analysis (Configuration 6 - 8)

Governing Posting: N/A

Governing Load Model:

### LRFR Evaluation Factors:

Live Load Distribution Factor:	Varies (see calculations)
Impact Factor:	1.33
Governing Condition Factor, $\phi_c$ :	1.0
System Factor, $\phi_s$ :	1.0
ADTT (one-way):	377

*Please Check all the boxes that apply:*

- ☐ Bridge load rating is governed by substructure rating
- ☐ Connection control the load rating
- ☒ Exterior girder control load rating
- ☒ As-build 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: Brewer  
 Bridge No.: 1562

Route Carried: Parkway South  
 Crosses: I-395

## **LOAD RATING POINTS OF INTEREST**

(Updated 7/31/19)

<b><u>Bridge Component</u></b>	HL-93		HL-93 Modified		MaineDOT Truck Configurations								Emer. Vehicles	
	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	EV2 57.5 kip	EV3 86.0 kip
Interior Girder Strength I Positive Bending	1.868	2.422											5.35	3.55
Interior Girder Service II Positive Bending	1.894													
Interior Girder Strength I Negative Bending	1.452	1.882											3.12	2.16
Interior Girder Service II Negative Bending	2.173													
Exterior Girder Strength I Positive Bending	2.355	3.053											6.97	4.63
Exterior Girder Service II Positive Bending	2.383													
Exterior Girder Strength I Negative Bending	1.165	1.51											4.35	2.39
Exterior Girder Service II Negative Bending	1.743													
Girder Strength I Shear - Interior Support	2.226	2.886											5.07	3.42
Girder Strength I Shear - End Support	3.23	4.187											4.27	2.87
[COMPONENT] [LIMIT STATE] [ANALYZED CONDITION]														
[COMPONENT] [LIMIT STATE] [ANALYZED CONDITION]														
[COMPONENT] [LIMIT STATE] [ANALYZED CONDITION]														
CONTROLLING RATING FACTORS (STRENGTH I)	1.165	1.51											3.12	2.16

## DESCRIPTION OF BRIDGE

Bridge Number:	1562
Owner:	MaineDOT
Maintained By:	MaineDOT
Location:	Brewer
Route Carried:	Parkway South
Featured Intersection:	I-395
Latest NBI Inspection Date:	1/5/2015
Field Verification Date:	7/5/2016
Date of Construction:	1985
Bridge Type:	Steel Girder with Composite Concrete Deck
Material Properties:	Fy = 50 ksi (beam flanges), 36 ksi (all other steel) Fy (rebar) = 40 ksi, f'c = 3.0 ksi
Original Design Loading:	Unknown
Date(s) of Rebuild/Rehab:	N/A
Description of Rebuild/Rehab:	N/A
Posting:	N/A
Superstructure:	Steel Girder with Concrete Deck
Substructure:	Reinforced Concrete Abutments
Bearings:	Fixed Hinged Pedestal with Expansion Roller Pedestals
Bridge Spans:	Both Spans = 120'
Bridge Skew:	42°00'00"
Bridge Width:	53.2
Roadway Surface:	41 ft inside curb to inside curb
Curbs:	Concrete
Sidewalk/Walkway/Median:	Concrete walkway on one side.
Utilities:	One 14" utility pipe located on underside of structure
Bridge Railing:	Steel posts and railings in concrete curb Additional chain link fence adjacent to walkway.
Approach Railings:	Steel Guardrail
Wearing Surface Condition:	
Bridge Railing Condition:	-- from inspection report dated 1/5/2015 --
Deck Condition:	Deck – 7 GOOD
Beam Condition:	Superstructure – 8 VERY GOOD
Bearing Condition:	Substructure – 6 SATISFACTORY
Abutment Condition:	
Pier Condition:	

# **NOTES AND ASSUMPTIONS**

## **References Used:**

- *The Manual for Bridge Evaluation (MBE)*, Second Edition, 2011 (MBE) w/ 2013 Interims
- *AASHTO LRFD Bridge Design Specifications*, Sixth Edition, 2012
- MaineDOT Load Rating Guide, April 2015

## **General Notes:**

This load rating was performed in accordance with MaineDOT guidelines.

Bridge No. 1562 is a continuous 2 span bridge with 6 steel W-shape girders which act compositely with a steel reinforced concrete deck. The concrete deck thickness is 11 inches with no beam haunches and a 3 inch thick bituminous wearing surface. The bridge has concrete curbs on both sides of the roadway with a walkways on one side. Both side have a steel guardrail while the walkway side has an additional chain link fence.

The bridge has an overall width of 53.2 ft with a roadway width of 41 ft carrying 2 lanes of traffic. The current ADT of the bridge was recorded as 9787 from the previous inspection. The ADTT of the bridge was calculated as 377 with a Truck ADT of 5%.

There was no information in the plans about the concrete deck of the bridge, therefore the dimensions used were those taken during the site visit to the structure. Conservative engineering judgement was used when estimating the reinforcing steel quantity in the concrete deck based on minimum steel requirement.

The bridge was evaluated at the Inventory and Operating levels for the Strength I limit state, as well as the Service II limit state. The superstructure was rated for the AASHTO HL-93 load condition. Due to the inventory rating factor of greater than 1 at the HL-93 condition, it was not necessary to rate the structure for the MaineDOT legal loads.

STAAD.Pro V8i was used to generate moment and shear forces in the girders due to the various load conditions. The bridge girders and deck were then evaluated at those forces using the distribution factors and capacity calculations provided by the AASHTO LRFD Bridge Design Specifications.

## **Condition Factors:**

The condition factor used for this bridge was 1.0 due to the “Good” rating that the superstructure received in the most recent (2015) inspection report.

## **Assumptions:**

- Girders flanges specified as A572 steel,  $F_y$  assumed to be 50 ksi (most common grade of A572 during construction of bridge.)
- Concrete strength ( $f'_c$ ) assumed to be 3.0 ksi

- Reinforcing steel yield strength ( $F_y$ ) assumed to be 40 ksi
- Superimposed dead loads such as wearing surface and guardrails distributed evenly between all girders.
- Wearing surface thickness is approximated based on measurement taken during the site visit.

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## APPENDIX A

### Structural Inventory and Appraisal Sheets

## Structure Inventory and Appraisal Sheet (English Units)

Bridge Key: 1562	Agency ID: 1562	SR: 93.5 SD/FO: ND
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### IDENTIFICATION

State 1: 23 Maine Struc Num 8: 1562

Facility Carried 7: PARKWAY SOUTH Location 9: 0.5 MI W OF ROUTE 1A

Rte.(On/Under)5A: Route On Structure Rte. Signing Prefix 5B: 3 State Hwy

Level of Service 5C: 0 None of the below Rte. Number 5D: 00000

Directional Suffix 5E: 0 N/A (NBI) % Responsibility : 0

SHD District 2: 04 Eastern County Code 3: 019 Penobscot

Place Code 4: 19050 Brewer Mile Post 11: 1.270 mi

Feature Intersected 6: I-395

Latitude 16: 44d 46' 48" Longitude 17: 068d 45' 30"

Border Bridge Code 98: Not Applicable (P)

Border Bridge Number 99: n/a

### INSPECTION

Frequency 91: 24 months Inspection Date 90: 1/5/2015 Next Inspection: 01/05/2017

FC Frequency 92A: NA FC Inspection Date 93A: NA Next FC Inspection: NA

UW Frequency 92B: NA UW Inspection Date 93B: NA Next UW Inspection: NA

SI Frequency 92C: NA SI Date 93C: NA Next SI: NA

Element Frequency: 24 months Element Inspection Date: 01/05/2015 Next Elem. Insp. Due: 01/05/2017

### STRUCTURE TYPE AND MATERIALS

Number of Approach Spans 46: 0 Number of Spans Main Unit 45: 2

Main Span Material/Design 43A/B:

4 Steel Continuous 02 Stringer/Girder

Deck Type 107: 1 Concrete-Cast-in-Place

Wearing Surface 108A: 2 Integral Concrete

Membrane 108B: 0 None

Deck Protection 108C: None

### CLASSIFICATION

Defense Highway 100: 0 Not a STRAHNET hwy Parallel Structure 101: No || bridge exists

Direction of Traffic 102: 2 2-way traffic Temporary Structure 103: Not Applicable (P)

Highway System 104: 0 Not on NHS NBIS Length 112: Long Enough

Toll Facility 20: 3 On free road Functional Class 26: 16 Urban Minor Arterial

Defense Hwy 110: 0 Not a STRAHNET hwy Historical Significance 37: 4 Hist sign not determin

Owner 22: 01 State Highway Agency

Custodian 21: 01 State Highway Agency

### AGE AND SERVICE

Year Built 27: 1985 Year Reconstructed 106: -4

Type of Service on 42A: 5 Highway-pedestrian

Type of Service under 42B: 1 Highway

Lanes on 28A: 2 Lanes Under 28B: 4 Detour Length 19: 1.8 mi

ADT 29: 9,787 Truck ADT 109: 5 % Year of ADT 30: 2014

### CONDITION

Deck 55: 7 Good Super 59: 8 Very Good Sub 60: 6 Satisfactory

Culvert 62: N N/A (NBI) Channel/Channel Protection 61: N N/A (NBI)

### GEOMETRIC DATA

Length Max Span 48: 120.0 ft Structure Length 49: 246.0 ft

Curb/Sdwk Width L 50A: 6.0 ft Curb/Sidewalk Width R 50B: 0.5 ft

Width Curb to Curb 51: 44.0 ft Width Out to Out 52: 53.2 ft

Approach Roadway Width 32: 50.0 ft Median 33: 0 No median (w/ shoulders)

Deck Area: 13,087.1 sq. ft

Skew 34: 42.00 ° Structure Flared 35: 0 No flare

Vertical Clearance 10: 99.99 ft Horiz. Clearance 47: 44.00 ft

Minimum Vertical Clearance Over Bridge 53: 327.8 ft

Minimum Vertical Underclearance Reference 54A: H Hwy beneath struct

Minimum Vertical Underclearance 54B: 18.7 ft

Minimum Lateral Underclearance Reference R 55A: H Hwy beneath struct

Minimum Lateral Underclearance R 55: 29.9 ft

Minimum Lateral Underclearance L 56: 7.5 ft

### LOAD RATING AND POSTING

Inventory Rating Method 65: 1 LF Load Factor Operating Rating Method 63: 1 LF Load Factor

Inventory Rating 66: HS31.1 Operating Rating 64: HS52.2

Design Load 31: MS 22.5 or greater Posting 70: 5 At/Above Legal Loads

Posting status 41: A Open, no restriction

### APPRAISAL

Bridge Rail 36A: 1 Meets Standards Approach Rail 36C: 1 Meets Standards

Transition 36B: 0 Substandard Approach Rail Ends 36D: 1 Meets Standards

Str. Evaluation 67: 6 Deck Geometry 68: 6 Equal Min Criteria

Underclearance, Vertical and Horizontal 69: 6 Equal Minimum

Waterway Adequacy 71: N Not applicable Approach Alignment 72: 8 Equal Desirable Crit

Scour Critical 113: N Not Over Waterway

### PROPOSED IMPROVEMENTS

Bridge Cost 94: NA Type of Work 75: Unknown (P)

Roadway Cost 95: Unknown Length of Improvement 76:

Total Cost 96: Unknown Future ADT 114: 13,702

Year of Cost Estimate 97: Unknown Year of Future ADT 115: 2034

### NAVIGATION DATA

Navigation Control 38: N NA-no waterway

Vertical Clearance 39: 0.0 ft Horizontal Clearance 40: 0.0 ft

Pier Protection 111: Not Applicable (P) Lift Bridge Vertical Clearance 116: 0.0 ft

## ELEMENT CONDITION STATE DATA

Str Unit	Elm/Env	Description	Units	Total Qty	% in 1	Qty. St. 1	% in 2	Qty. St. 2	% in 3	Qty. St. 3	% in 4	Qty. St. 4	% in 5	Qty. St. 5
1	22/2	P Conc Deck/Rigid Ov	(SF)	13,087	100 %	13,087	0 %	0	0 %	0	0 %	0	0 %	0
1	107/2	Paint Stl Opn Girder	(LF)	1,476	92 %	1,358	5 %	74	3 %	44	0 %	0	0 %	0
1	205/2	R/Conc Column	(EA)	6	64 %	4	36 %	2	0 %	0	0 %	0	0 %	0
1	215/2	R/Conc Abutment	(LF)	150	50 %	75	25 %	38	25 %	38	0 %	0	0 %	0
1	218/2	Undefined Wall Elem.	(LF)	75	0 %	0	70 %	53	30 %	23	0 %	0	0 %	0
1	302/2	Compressn Joint Seal	(LF)	150	90 %	135	10 %	15	0 %	0	0 %	0	0 %	0



## Structure Inventory and Appraisal Sheet (English Units)

Str Unit	Elm/Env	Description	Units	Total Qty	% in 1	Qty. St. 1	% in 2	Qty. St. 2	% in 3	Qty. St. 3	% in 4	Qty. St. 4	% in 5	Qty. St. 5
1	311/2	Moveable Bearing	(EA)	12	100 %	12	0 %	0	0 %	0	0 %	0	0 %	0
1	313/2	Fixed Bearing	(EA)	6	100 %	6	0 %	0	0 %	0	0 %	0	0 %	0
1	330/2	Metal Rail Uncoated	(LF)	492	100 %	492	0 %	0	0 %	0	0 %	0	0 %	0
1	385/2	Wear.Surf. - Rigid	(SF)	10,824	50 %	5,412	50 %	5,412	0 %	0	0 %	0	0 %	0
1	388/2	Paint	(SF)	22,320	94 %	20,981	5 %	1,116	0 %	0	1 %	223	0 %	0
Str Unit	Elm/Env	Description	Element Notes											
1	22/2	Concrete Deck - Protected w/ Rigid	Did not chain deck due to wintery conditions, but observed minor cracking only. Curbs, fascias & bottom of deck have minor defects only.											
1	107/2	Painted Steel Open Girder/Beam	Minor paint failure & light rusting on exterior beam ends and on diaphragms.. Superstructure is in overall very good condition.											
1	205/2	Reinforced Conc Column or Pile Ex	Exterior column showing greater cracking and delaminations with interior columns having some cracking. Ely exterior column is f/g wrapped.											
1	215/2	Reinforced Conc Abutment	Northerly abutment has cracking, staining and efflorescence on approximately 60% of area. Rest of abutments have general map cracking and some efflorescence.											
1	218/2	Undefined Wall Elem (Incl. Wing-	Wing walls have approx. 30% cracking & efflo staining with light delaminations. NWly wing is worst with significant cracking.											
1	302/2	Compression Joint Seal	Minor spall at sidewalk joint header. Minor leakage of seals.											
1	311/2	Moveable Bearing (roller, sliding, e	Minor paint failure only. Orientation of bearings at 37F seems to be ok..											
1	313/2	Fixed Bearing	Minor paint failure only.											
1	330/2	Metal Bridge Railing - Uncoated (A	No problems noted.											
1	385/2	Wearing Surface - Rigid (Dummy El	In good cond. - few minor bit. patches.											
1	388/2	Paint (Dummy Element)	Beam ends and bearings.											

## BRIDGE NOTES

Two span 6 steel beam superstructure with concrete abutments, 6 pier columns, concrete deck and wearing surface. Concrete sidewalk with granite curb and 2 rail aluminum and 4 rail pedestrian rail.

## PAST INSPECTION

Inspection Date: 01/05/2015

Type: 1 Regular NBI

Inspector: DT2HARR

Pontis User Key: DT2HARR - SCO1

Scope:

NBI: ☒ Other: ☐ Element: ☒  
 Underwater: ☐ Fracture Critical: ☐

## INSPECTION NOTES

Structure is in overall good condition with minor/ isolated moderate areas of deterioration. Future rehab of cracking abutment/ wing areas desired. No other major work items needed. See individual elements & photos for details.

**Structure Inventory and Appraisal Sheet (English Units)**

## PAST INSPECTION

Inspection Date: 12/11/2012

Type: 1 Regular NBI

Inspector: DTCEDWA

Pontis User Key: DTCEDWA - CAR

## Scope:

NBI: ☒ Other: ☐ Element: ☒  
 Underwater: ☐ Fracture Critical: ☐

## INSPECTION NOTES

CHANNEL: Ledge cut. Center pier columns have bituminous slope protection that has slumped/dropped from original elevations. Drainage under center pier columns.

## SUBSTRUCTURE:

Abutments: Southerly abutment in generally good condition with minor map cracking and efflorescence. Northerly abutment has cracking, efflorescence and corrosion staining on approximately 50% of abutment face, westerly side. No full access at this time to sound all concrete but is mostly sound from what is checked.

Wingwalls: large scale map cracking with delaminations and spalling present. see photos.

Piers: Columns in generally good condition with Wly exterior column showing cracking and delaminations greater than interior ones. All columns have vertical cracking and minor map cracking. Ely exterior pier column is wrapped with fiberglass full height.

SUPERSTRUCTURE: Steel beams in good condition with splices and secondary members in good condition. Beam ends corroded under seals and near drains - see photo. Bottom flanges have worst of paint failure - freckled rust.

DECK: Good condition with minor cracking and efflorescence present in scattered locations. Three small bit patches in middle of

## PAST INSPECTION

Inspection Date: 01/06/2011

Type: 1 Regular NBI

Inspector: DT2HARR

Pontis User Key: DT2HARR - SCO1

## Scope:

NBI: ☒ Other: ☐ Element: ☒  
 Underwater: ☐ Fracture Critical: ☐

## INSPECTION NOTES

CHANNEL: Ledge cut. Center pier columns have bituminous slope protection that has slumped/dropped from original elevations. Drainage under center pier columns.

## SUBSTRUCTURE:

Abutments: Southerly abutment in generally good condition with minor map cracking and efflorescence. Northerly abutment has cracking, efflorescence and corrosion staining on approximately 50% of abutment face, westerly side. No access at this time to sound concrete but appears mostly sound from interstate below.

Wingwalls: large scale map cracking with delaminations and spalling present.

Piers: Columns in generally good condition with exterior columns showing cracking and delaminations greater than interior ones. All columns have vertical cracking and minor map cracking.

SUPERSTRUCTURE: Steel beams in very good condition with splices and econdary members in good condition. Beam ends corroded under seals.

DECK: Good condition with minor cracking and efflorescence present in scattered locations.

**Structure Inventory and Appraisal Sheet (English Units)**

## PAST INSPECTION

Inspection Date: 12/22/2009

Type: 1 Regular NBI

Inspector: DTRLANP

Pontis User Key: DTRLANP - ROBE

## Scope:

NBI: ☒ Other: ☐ Element: ☒  
Underwater: ☐ Fracture Critical: ☐

## INSPECTION NOTES

CHANNEL: Ledge cut. Center pier columns have bituminous slope protection that has slumped/dropped from original elevations. Drainage under center pier columns.

## SUBSTRUCTURE:

Abutments: Southerly abutment in generally good condition with minor map cracking and efflorescence. Northerly abutment has cracking, efflorescence and corrosion staining on approximately 50% of abutment face, westerly side. No access at this time to sound concrete but appears mostly sound from interstate below.

Wingwalls: large scale map cracking with delaminations and spalling present.

Piers: Columns in generally good condition with exterior columns showing cracking and delaminations greater than interior ones. All columns have vertical cracking and minor map cracking.

SUPERSTRUCTURE: Steel beams in very good condition with splices and econdary members in good condition. Beam ends corroded under seals.

DECK: Good condition with minor cracking and efflorescence present in scattered locations.

## PAST INSPECTION

Inspection Date: 12/27/2007

Type: 1 Regular NBI

Inspector: DTDBRYA

Pontis User Key: DTDBRYA - DARF

## Scope:

NBI: ☒ Other: ☐ Element: ☒  
Underwater: ☐ Fracture Critical: ☐

## INSPECTION NOTES

Superstructure & deck are in overall good condition with minor deterioration of elements. The exterior abutment & wing areas have moderate cracking & staining with light delamination. No major maint. needed. Concrete WS is in good condition. 2007 No changes since last inspection.

## Structure Inventory and Appraisal Sheet (English Units)

## PAST INSPECTION

Inspection Date: 05/04/2005

Type: 1 Regular NBI

Inspector: DT2HARR

Pontis User Key: DT2HARR - SCOT

## Scope:

NBI: ☒ Other: ☐ Element: ☒  
 Underwater: ☐ Fracture Critical: ☐

## INSPECTION NOTES

Superstructure & deck are in overall good condition with minor deterioration of elements. The exterior abutment & wing areas have moderate cracking & staining with light delamination. No major maint. needed. Concrete WS is in good condition.

## PAST INSPECTION

Inspection Date: 12/31/2003

Type: 1 Regular NBI

Inspector: -1

Pontis User Key: PWV

## Scope:

NBI: ☒ Other: ☐ Element: ☒  
 Underwater: ☐ Fracture Critical: ☐

## INSPECTION NOTES

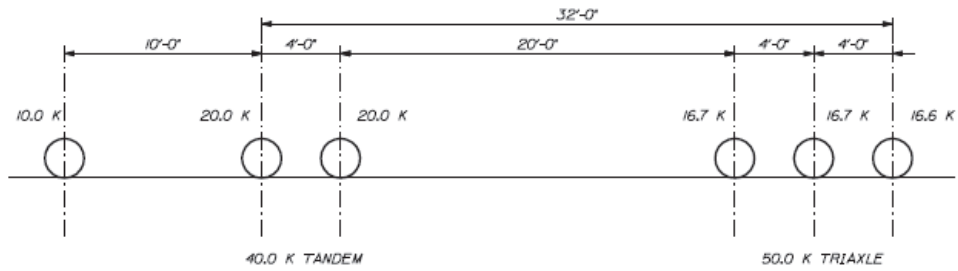
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## INSPECTOR WORK CANDIDATES

Work Candidate ID	Action	Object	Agency Status	Agency Priority	Assigned to a Project	Rec. Date
A-DOT001-0A0B3E95-0000003B	Rehab Elem	Undefined Wall Elem.	Approved	Medium	No	1/5/2015
A-DOT001-12C37571-00000017	Repl Elem	Moveable Bearing	Approved	Medium	No	1/5/2014

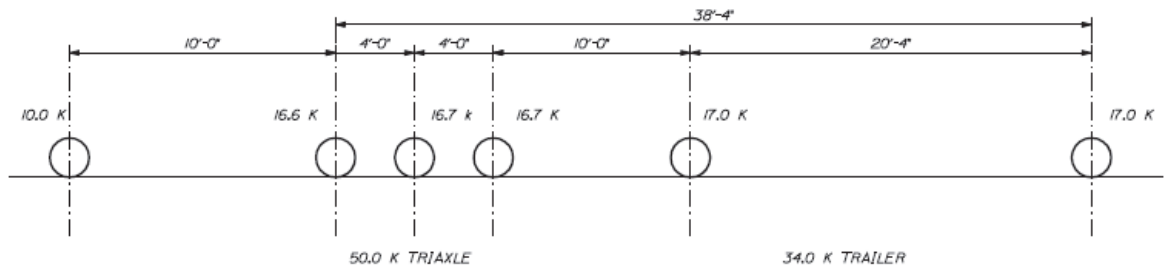
## APPENDIX B

### MaineDOT Legal Loads



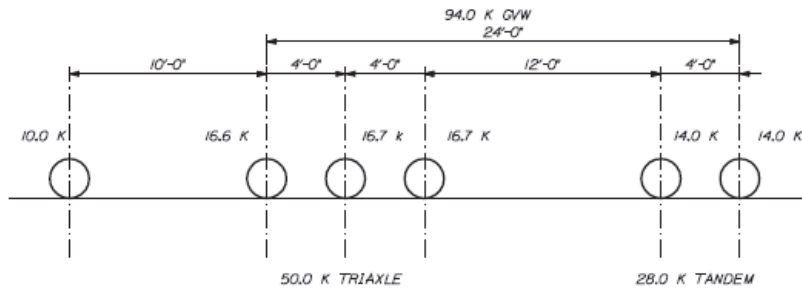
CONFIGURATON 1

SIX AXLE  
3 AXLE TRACTOR  
TRIAxLE SEMI-TRAILER  
100.0 K GVW



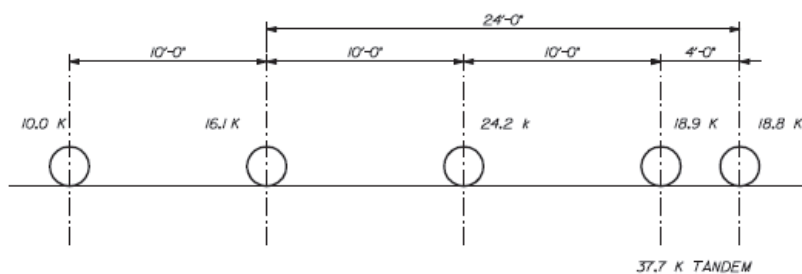
CONFIGURATON 2

SIX AXLE  
TRIAxLE TRUCK  
2 AXLE TRAILER  
94.0 K GVW



CONFIGURATON 3

SIX AXLE  
TRIAxLE TRUCK/TRACTOR  
TANDEM SEMI-TRAILER  
88.0 K GVW

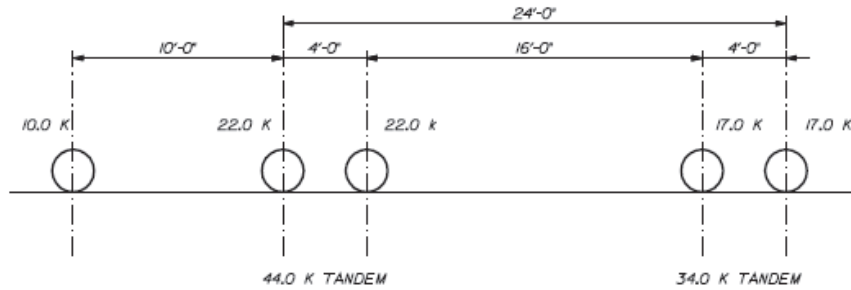


CONFIGURATON 4

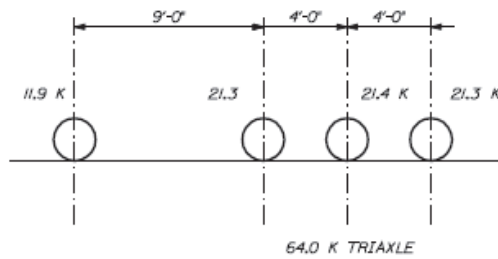
FIVE AXLE  
TWO AXLE TRUCK/TRACTOR  
THREE AXLE TRAILER  
88.0 K GVW

REVISION 03-07-11

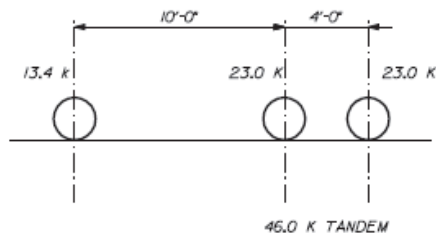
**Figure 1. Maine DOT Legal Loads**



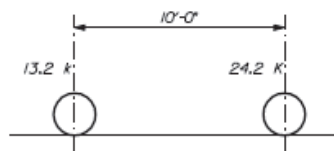
CONFIGURATON 5 FIVE AXLE  
TANDEM AXLE TRUCK  
OR TRACTOR SEMI-TRAILER  
88.0 K GVW



CONFIGURATON 6 FOUR AXLE TRUCK  
75.9 K GVW



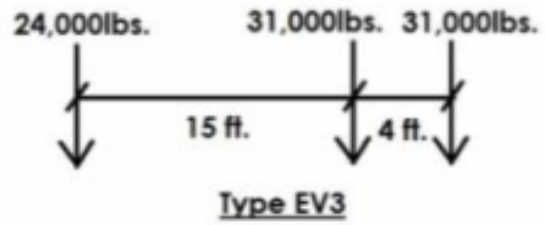
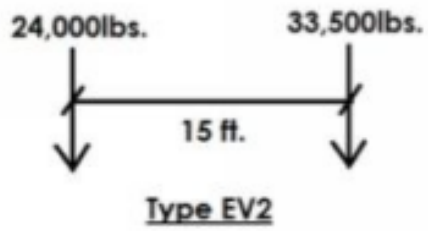
CONFIGURATON 7 THREE AXLE TRUCK  
59.0 K GVW



CONFIGURATON 8 TWO AXLE TRUCK  
37.4 K GVW

**Figure 2. Maine DOT Legal Loads**

FAST Act Legal Load Configurations: (Updated 8/31/2019)





## APPENDIX C

### Load Ratings Calculations

Project: MaineDOT Bridge Load Rating  
Job No.: 2582-15.02

Rated By: MMS  
Checked By: CDS

Date: 7/14/16

## PARK WAY SOUTH OVER 395 No. 1562

### BRIDGE INFO

$Year := 1985$

Year the bridge was constructed

$Bridge_L := 246 \cdot ft$

Overall bridge length

$Bridge_W := 53.2 \cdot ft$

Overall bridge width

$Skew := 42$

Degree of skew

$Curvature := 0$

Degree of horizontal curvature

$Roadway_W := 41 \cdot ft$

Overall width of the roadway from curb to curb

$N_{spans} := 2$

Number of bridge spans

$Span_{L1} := 120 \cdot ft$

Length of 1st span

$Span_{L2} := 120 \cdot ft$

Length of 2nd span

$Span_{L3} := 0 \cdot ft$

Length of 3rd span

$Span_{total} := Span_{L1} + Span_{L2} + Span_{L3} = 240 \cdot ft$

$N_{beams} := 6$

Number of bridge girders

$S_{girders} := 13 \cdot ft$

Spacing between girders

$H := 0 \cdot in$

Haunch depth

$OVH := .5 \cdot ft$

Length deck overhangs exterior girders

$Deck_T := 11 \cdot in$

Deck Thickness

$WearingConc_T := 0 \cdot in$

Concrete wearing surface thickness (0 if none)

$WearingBit_T := 3 \cdot in$

Bituminous wearing surface thickness (0 if none)

$$S_{brace\_neg} := 11.33 \cdot ft$$

$$S_{brace\_pos} := 23.33 \cdot ft$$

Spacing of braces in neg bending region

Spacing of braces in pos bending region

$$N_{vehlanes} := 2$$

$$N_{deslanes} := 2$$

Number of possible vehicle lanes according to AASHTO LRFD SPECS

Number of designated lanes on the bridge

$$Curb_H := .75 \cdot ft$$

$$Curb_W := 2 \cdot ft$$

$$Sidewalk_W := 8 \cdot ft$$

Curb Height

Curb Width

Sidewalk Width

$$ADT_{cur} := 9787$$

$$ADT_{fut} := 13702$$

$$ADT_{Dir\_Split} := 0.55$$

$$PerTrucks := 5\%$$

$$ADTT := \text{ceil}(ADT_{fut} \cdot ADT_{Dir\_Split} \cdot PerTrucks) = 377$$

$$\varphi_c := 1.0$$

Condition factor - Satisfactory = 1.0 / Fair = 0.95 / Poor = 0.85

$$\varphi_s := 1.0$$

System Factor - 0.85 for 3 girder bridges with girder spacing = 6'  
0.95 for 4 girder bridges with girders spacing less than 4 '  
1.0 for all other girder bridges

## **LIMIT STATES**

### ***Strength I Limit State - Inventory***

Limit states required for a steel girder bridge

$$\gamma_{STI\_inv} := \begin{bmatrix} 1.25 \\ 1.50 \\ 1.75 \end{bmatrix}$$

### ***Strength I Limit State - Operating***

$$\gamma_{STI\_op} := \begin{bmatrix} 1.25 \\ 1.50 \\ 1.35 \end{bmatrix}$$

### ***Service II Limit State***

$$\gamma_{SEII} := \begin{bmatrix} 1.00 \\ 1.00 \\ 1.30 \end{bmatrix}$$

## BRIDGE MATERIAL PROPERTIES

$$\gamma_{steel} := 490 \text{ pcf}$$

$$\gamma_{conc} := 150 \text{ pcf}$$

$$\gamma_{bit} := 140 \text{ pcf}$$

Unit weight of steel

Unit weight of concrete

Unit weight of bit. wearing surface

$$f'_c := 3 \text{ ksi}$$

$$F_u := 36 \text{ ksi}$$

$$F_{uflange} := 50 \cdot \text{ksi}$$

$$F_{y\_rebar} := 40 \cdot \text{ksi}$$

Compressive strength of concrete

Yield strength of steel

Yield strength of steel of flanges (use if flanges are differing grades)

Yield strength of rebars

$$E_{steel} := 29000 \text{ ksi}$$

$$E_{conc} := 1820 \cdot \sqrt{f'_c \cdot \text{ksi}} = (3.152 \cdot 10^3) \text{ ksi}$$

$$n := \frac{E_{steel}}{E_{conc}} = 9.2$$

## GIRDER SECTION PROPERTIES

**Positive Flexure --- Plate Girder - 70x5/8 web, 12x3/4 top flange, 14x1 bottom flange**

$$A_{girder} := 68.625 \text{ in}^2$$

Area of the steel section

$$I_x := 51160 \cdot \text{in}^4$$

Moment of inertia of the section

$$D_{girder} := 72 \cdot \text{in}$$

Depth of the girder

$$W_{tflange} := 12 \cdot \text{in}$$

Width of the top flange

$$t_{tflange} := .75 \cdot \text{in}$$

Thickness of the top flange

$$W_{bflange} := 14 \cdot \text{in}$$

Width of the bottom flange

$$t_{bflange} := 1 \cdot \text{in}$$

Thickness of the bottom flange

$$t_{web} := \frac{5}{8} \cdot \text{in}$$

Thickness of the web

$$S := \min \left( 0.25 \cdot \text{Span}_{L1}, \begin{cases} \text{if } t_{web} > \frac{t_{bflange}}{2} \\ 12 \cdot \text{Deck}_T + t_{web} \\ \text{else} \\ 12 \cdot \text{Deck}_T + \frac{t_{bflange}}{2} \end{cases}, S_{girders} \right) = 11.052 \text{ ft}$$

Effective deck slab width

$$S_{ext} := \min \left( S, \frac{S_{girders}}{2} + OVH \right) = 7 \text{ ft}$$

Effective deck slab width for exterior beams

$$W_{topplate} := 0 \cdot \text{in}$$

Width of additional plate on top flange of girder

$$t_{topplate} := 0 \cdot \text{in}$$

Thickness of additional plate on top flange of girder

$$A_{topplate} := W_{topplate} \cdot t_{topplate} = 0 \text{ in}^2$$

$$I_{topplate} := \frac{W_{topplate} \cdot t_{topplate}^3}{12} = 0 \text{ in}^4$$

$$W_{botplate} := 0 \cdot \text{in}$$

Width of additional plate on bottom flange of girder

$$t_{botplate} := 0 \cdot \text{in}$$

Thickness of additional plate on bottom flange of girder

$$A_{botplate} := W_{botplate} \cdot t_{botplate} = 0 \text{ in}^2$$

$$I_{botplate} := \frac{W_{botplate} \cdot t_{botplate}^3}{12} = 0 \text{ in}^4$$

$$d_0 := 280 \cdot \text{in}$$

Transverse stiffener spacing

$$d_{0\_end} := 15 \cdot \text{in}$$

Distance from end support to transverse stiffener

$$y := \frac{A_{topplate} \cdot \left( \frac{t_{topplate}}{2} + D_{girder} + t_{botplate} \right) + A_{girder} \cdot \left( \frac{D_{girder}}{2} + t_{botplate} \right) + A_{botplate} \cdot \frac{t_{botplate}}{2}}{A_{topplate} + A_{girder} + A_{botplate}} = 36 \text{ in}$$

Distance to neutral axis of non-composite girder

$$I := I_x + A_{girder} \cdot \left( t_{botplate} + \frac{D_{girder}}{2} - y \right)^2 + I_{topplate} + A_{topplate} \cdot \left( t_{botplate} + D_{girder} + \frac{t_{topplate}}{2} - y \right)^2 + I_{botplate} + A_{botplate} \cdot \left( y - \frac{t_{botplate}}{2} \right)^2 = (5.116 \cdot 10^4) \text{ in}^4$$

$$S_{x\_pos} := \frac{I}{y} = (1.421 \cdot 10^3) \text{ in}^3 \quad \text{Section modulus of non-composite girder}$$

Moment of inertia of non-composite girder

$$e_g := t_{botplate} + D_{girder} + H - t_{tflange} + \frac{Deck_T}{2} - y = 40.75 \text{ in}$$

$$K_{g\_pos} := n \cdot (I + (A_{girder} + A_{topplate} + A_{botplate}) \cdot e_g^2) = (1.519 \cdot 10^6) \text{ in}^4$$

### Composite Section Properties Interior Girder

#### Short Term / Transient (n)

$$A_{deck} := \frac{S \cdot Deck_T}{n} \quad I_{deck} := \frac{S \cdot Deck_T^3}{12 \cdot n}$$

$$y_{STC} := \frac{A_{topplate} \cdot \left( \frac{t_{topplate}}{2} + D_{girder} + t_{botplate} \right) + A_{girder} \cdot \left( \frac{D_{girder}}{2} + t_{botplate} \right) + A_{botplate} \cdot \left( \frac{t_{botplate}}{2} \right) + A_{deck} \cdot \left( t_{botplate} + D_{girder} + H - t_{tflange} + \frac{Deck_T}{2} \right)}{A_{topplate} + A_{girder} + A_{botplate} + A_{deck}} = 64.442 \text{ in}$$

Distance to neutral axis of composite girder for short term loads

$$d_{topplate} := t_{botplate} + D_{girder} + \frac{t_{topplate}}{2} - y_{STC}$$

$$d_{botplate} := y_{STC} - \frac{t_{botplate}}{2}$$

$$d_{deck} := t_{botplate} + D_{girder} - t_{tflange} + H + \frac{Deck_T}{2} - y_{STC}$$

$$I_{STC} := I_x + A_{girder} \cdot (d_{girder})^2 + I_{topplate} + A_{topplate} \cdot (d_{topplate})^2 + I_{botplate} + A_{botplate} \cdot (d_{botplate})^2 + I_{deck} + A_{deck} \cdot (d_{deck})^2 = (1.323 \cdot 10^5) \text{ in}^4$$

$$S_{x_{STC}} := \frac{I_{STC}}{y_{STC}} = (2.053 \cdot 10^3) \text{ in}^3 \quad \text{Section modulus of composite girder for short term loads}$$

Moment of inertia of composite girder for short term loads

#### Long Term (3n)

$$A_{deck} := \frac{S \cdot Deck_T}{3 n} \quad I_{deck} := \frac{S \cdot Deck_T^3}{12 \cdot 3 n}$$

$$y_{LTC} := \frac{A_{topplate} \cdot \left( \frac{t_{topplate}}{2} + D_{girder} + t_{botplate} \right) + A_{girder} \cdot \left( \frac{D_{girder}}{2} + t_{botplate} \right) + A_{botplate} \cdot \left( \frac{t_{botplate}}{2} \right) + A_{deck} \cdot \left( t_{botplate} + D_{girder} + H - t_{tflange} + \frac{Deck_T}{2} \right)}{A_{topplate} + A_{girder} + A_{botplate} + A_{deck}} = 53.731 \text{ in}$$

$$d_{girder} := t_{botplate} + \frac{D_{girder}}{2} - y_{LTC}$$

Distance to neutral axis of composite girder for long term loads

$$d_{topplate} := t_{botplate} + D_{girder} + \frac{t_{topplate}}{2} - y_{LTC}$$

$$d_{botplate} := y_{LTC} - \frac{t_{botplate}}{2}$$

$$d_{deck} := t_{botplate} + D_{girder} - t_{tflange} + H + \frac{Deck_T}{2} - y_{LTC}$$

$$I_{LTC} := I_x + A_{girder} \cdot (d_{girder})^2 + I_{topplate} + A_{topplate} \cdot (d_{topplate})^2 + I_{botplate} + A_{botplate} \cdot (d_{botplate})^2 + I_{deck} + A_{deck} \cdot (d_{deck})^2 = (1.013 \cdot 10^5) \text{ in}^4$$

$$S_{xLTC} := \frac{I_{LTC}}{y_{LTC}} = (1.885 \cdot 10^3) \text{ in}^3$$

Section modulus of composite girder for long term loads

Moment of inertia of composite girder for long term loads

### Plastic Moments Interior Girder ----- AASHTO Table D6.1-1

$$P_t := W_{bflange} \cdot t_{bflange} \cdot F_{yf} = 700 \text{ kip}$$

$$P_w := (D_{girder} - t_{tflange} - t_{bflange}) \cdot t_{web} \cdot F_y = (1.581 \cdot 10^3) \text{ kip}$$

$$P_c := W_{tflange} \cdot t_{tflange} \cdot F_y = 324 \text{ kip}$$

$$P_{topplate} := A_{topplate} \cdot F_y = 0 \text{ kip}$$

$$P_{botplate} := A_{botplate} \cdot F_y = 0 \text{ kip}$$

$$P_s := 0.85 \cdot f'_c \cdot S \cdot Deck_T = (3.72 \cdot 10^3) \text{ kip}$$

$$D := D_{girder} - t_{tflange} - t_{bflange} = 70.25 \text{ in}$$

Forces in each component of the composite girder at the plastic moment

### Case I - PNA in Web

$$Y_{web} := \frac{(D)}{2} \cdot \left( \frac{P_t + P_{botplate} - P_c - P_{topplate} - P_s}{P_w} + 1 \right) = -39.189 \text{ in}$$

$$y_{web} := t_{botplate} + D_{girder} - t_{tflange} - Y_{web} = 110.439 \text{ in}$$

$$d_{slab} := \frac{Deck_T}{2} + H + Y_{web}$$

$$d_{comp} := \frac{t_{tflange}}{2} + Y_{web}$$

$$d_{topplate} := \frac{t_{topplate}}{2} + t_{tflange} + Y_{web}$$

$$d_{ten} := y_{web} - t_{botplate} - \frac{t_{bflange}}{2}$$

$$d_{botplate} := y_{web} - \frac{t_{botplate}}{2}$$

$$M_{p\_web} := \frac{P_w}{2 \cdot D} \cdot \left( Y_{web}^2 + (D - Y_{web})^2 \right) + \langle P_s \cdot \langle d_{slab} \rangle + P_c \cdot \langle d_{comp} \rangle + P_{topplate} \cdot \langle d_{topplate} \rangle + P_t \cdot \langle d_{ten} \rangle + P_{botplate} \cdot \langle d_{botplate} \rangle \rangle = (7.589 \cdot 10^3) \text{ kip} \cdot \text{ft}$$

Plastic moment when  
PNA is in the web

### Case II - PNA in Flange

$$Y_{flange} := \left( \frac{t_{tflange} + t_{topplate}}{2} \right) \cdot \left( \frac{P_w + P_t + P_{botplate} - P_s}{P_c + P_{topplate}} + 1 \right) = -1.291 \text{ in}$$

$$y_{flange} := t_{botplate} + D_{girder} + t_{topplate} - Y_{flange} = 73.291 \text{ in}$$

$$d_{slab} := \frac{Deck_T}{2} + H - (t_{tflange} + t_{topplate} - Y_{flange})$$

$$d_{ten} := y_{flange} - t_{botplate} - \frac{t_{bflange}}{2}$$

$$d_{botplate} := y_{flange} - \frac{t_{botplate}}{2}$$

$$d_{web} := \frac{D_{girder}}{2} - Y_{flange}$$

$$M_{p\_flange} := \frac{P_c + P_{topplate}}{2 \cdot (t_{tflange} + t_{topplate})} \cdot \left( Y_{flange}^2 + (t_{tflange} + t_{topplate} - Y_{flange})^2 \right) + \langle P_t \cdot \langle d_{ten} \rangle + P_{botplate} \cdot \langle d_{botplate} \rangle + P_w \cdot \langle d_{web} \rangle + P_s \cdot \langle d_{slab} \rangle \rangle = (1.034 \cdot 10^4) \text{ kip} \cdot \text{ft}$$

Plastic moment when  
PNA is in the flange

### Case III - PNA in Slab

$$Y_{slab} := Deck_T \cdot \left( \frac{P_c + P_{topplate} + P_w + P_t + P_{botplate}}{P_s} \right) = 7.702 \text{ in}$$

$$y_{slab} := t_{botplate} + D_{girder} + H - t_{tflange} + Deck_T - Y_{slab} = 74.548 \text{ in}$$

$$d_{comp} := y_{slab} - t_{botplate} - \frac{t_{tflange}}{2}$$



$$d_{ten} := y_{slab} - t_{botplate} - \frac{t_{bflange}}{2}$$

$$d_{botplate} := y_{slab} - \frac{t_{botplate}}{2}$$

$$d_{web} := y_{slab} - t_{botplate} - \frac{D_{girder}}{2}$$

$$M_{p\_slab} := \left( \frac{Y_{slab}^2 \cdot P_s}{2 Deck_T} \right) + (P_{topplate} \cdot \langle d_{topplate} \rangle + P_c \cdot \langle d_{comp} \rangle + P_w \cdot \langle d_{web} \rangle + P_t \cdot \langle d_{ten} \rangle + P_{botplate} \cdot \langle d_{botplate} \rangle) = (1.031 \cdot 10^4) \text{ kip} \cdot ft$$

Plastic moment when  
PNA is in the slab

$$M_{p\_Location} := \begin{cases} \text{if } P_t + P_w + P_{botplate} \geq P_c + P_{topplate} + P_s \\ \quad \text{"PNA in Slab"} \\ \text{else} \\ \quad \text{if } P_t + P_{botplate} + P_w + P_c + P_{topplate} \geq P_s \\ \quad \quad \text{"PNA in Flange"} \\ \quad \text{else} \\ \quad \quad \text{"PNA in Slab"} \end{cases} = \text{"PNA in Slab"}$$

$$M_{p\_pos} := \begin{cases} \text{if } P_t + P_w + P_{botplate} \geq P_c + P_{topplate} + P_s \\ \quad M_{p\_web} \\ \text{else} \\ \quad \text{if } P_t + P_{botplate} + P_w + P_c + P_{topplate} \geq P_s \\ \quad \quad M_{p\_flange} \\ \quad \text{else} \\ \quad \quad M_{p\_slab} \end{cases} = (1.031 \cdot 10^4) \text{ (kip} \cdot ft)$$

Plastic Moment of the  
composite section

### Nominal Flexural Resistance - Compression Flange Continuously Braced by Deck

#### Service Limit State

$$f_{f\_top\_pos} := 0.95 \cdot F_y = 34.2 \text{ ksi}$$

Allowable Stress in the top flange

$f_t$  term can be ignored

$$f_{f\_bot\_pos} := 0.95 \cdot F_{yflange} = 47.5 \text{ ksi}$$

Allowable Stress in the bottom flange

### Strength Limit State

$$D_{cp} := \begin{cases} \text{if } M_{p\_Location} = \text{"PNA in Web"} \\ \left| \frac{D}{2} \cdot \left( \frac{F_y \cdot (A_{botplate} - A_{topplate}) - (0.85 \cdot f'_c \cdot S \cdot Deck_T)}{F_y \cdot D \cdot t_{web}} + 1 \right) \right| \\ \text{else} \\ 0 \end{cases} \text{ in} = 0 \text{ in}$$

$$D_t := t_{botplate} + D_{girder} - t_{tflange} + H + Deck_T = 82.25 \text{ in}$$

$$D_p := \begin{cases} \text{if } M_{p\_Location} = \text{"PNA in Web"} \\ D_t - y_{web} \\ \text{else if } M_{p\_Location} = \text{"PNA in Flange"} \\ D_t - y_{flange} \\ \text{else} \\ D_t - y_{slab} \end{cases} = 7.702 \text{ in}$$

$$Compactness := \begin{cases} \text{if } \frac{D}{t_{web}} > 150 \\ \text{"non compact"} \\ \text{else if } \frac{2 \cdot D_{cp}}{t_{web}} > 3.76 \cdot \sqrt{\frac{E_{steel}}{F_y}} \\ \text{"non compact"} \\ \text{else} \\ \text{"compact"} \end{cases}$$

Compactness check

$$M_{n\_pos} := \begin{cases} \text{if } Compactness = \text{"compact"} \\ \begin{cases} \text{if } D_p \leq 0.1 \cdot D_t \\ M_{p\_pos} \\ \text{else} \\ M_{p\_pos} \cdot \left( 1.07 - 0.7 \frac{D_p}{D_t} \right) \end{cases} \\ \text{else} \\ \text{"noncompact - check code"} \end{cases} = (1.031 \cdot 10^4) \text{ (kip} \cdot \text{ft)}$$

Moment Capacity of the Composite Girder in Positive Bending for an Interior Girder

## Nominal Shear Resistance

### Strength Limit State

$$V_p := 0.58 \cdot F_y \cdot D \cdot t_{web} = 916.763 \text{ kip}$$

Shear Capacity of the web

$$k := 5 + \frac{5}{\left(\frac{d_0}{D}\right)^2} = 5.315$$

k value for typical web section with stiffeners

$$k_{end} := 5 + \frac{5}{\left(\frac{d_{0\_end}}{D}\right)^2} = 114.668$$

k value for end section of web above supports

$$C := \begin{cases} \text{if } \frac{D}{t_{web}} \leq 1.12 \cdot \sqrt{\frac{E_{steel} \cdot k}{F_y}} \\ 1 \\ \text{else if } 1.12 \cdot \sqrt{\frac{E_{steel} \cdot k}{F_y}} < \frac{D}{t_{web}} \leq 1.40 \cdot \sqrt{\frac{E_{steel} \cdot k}{F_y}} \\ \frac{1.12}{\left(\frac{D}{t_{web}}\right)} \sqrt{\frac{E_{steel} \cdot k}{F_y}} \\ \text{else} \\ \frac{1.57}{\left(\frac{D}{t_{web}}\right)^2} \left(\frac{E_{steel} \cdot k}{F_y}\right) \end{cases} = 0.532$$

C value for typical web section with stiffeners

$$C_{end} := \begin{cases} \text{if } \frac{D}{t_{web}} \leq 1.12 \cdot \sqrt{\frac{E_{steel} \cdot k_{end}}{F_y}} \\ 1 \\ \text{else if } 1.12 \cdot \sqrt{\frac{E_{steel} \cdot k_{end}}{F_y}} < \frac{D}{t_{web}} \leq 1.40 \cdot \sqrt{\frac{E_{steel} \cdot k_{end}}{F_y}} \\ \frac{1.12}{\left(\frac{D}{t_{web}}\right)} \sqrt{\frac{E_{steel} \cdot k_{end}}{F_y}} \\ \text{else} \\ \frac{1.57}{\left(\frac{D}{t_{web}}\right)^2} \left(\frac{E_{steel} \cdot k_{end}}{F_y}\right) \end{cases} = 1$$

C value for end section of web above supports

$$V_{n\_int} := \begin{cases} \text{if } \frac{2 D \cdot t_{web}}{(W_{tflange} \cdot t_{tflange} + W_{bflange} \cdot t_{bflange})} \leq 2.5 \\ V_p \cdot \left( C + \frac{0.87 (1 - C)}{\sqrt{1 + \left(\frac{d_0}{D}\right)^2}} \right) \\ \text{else} \\ V_p \cdot \left( C + \frac{0.87 (1 - C)}{\sqrt{1 + \left(\frac{d_0}{D}\right)^2} + \frac{d_0}{D}} \right) \end{cases} = 533.861 \text{ kip}$$

Shear capacity of girder with stiffeners

$$V_{n\_end} := C_{end} \cdot V_p = 916.763 \text{ kip}$$

Shear capacity of end section of girder with stiffeners

## Composite Section Properties Exterior Girder

### Short Term / Transient (n)

$$A_{deck} := \frac{S_{ext} \cdot Deck_T}{n} \quad I_{deck} := \frac{S_{ext} \cdot Deck_T^3}{12 \cdot n}$$

$$y_{STC} := \frac{A_{topplate} \cdot \left( \frac{t_{topplate}}{2} + D_{girder} + t_{botplate} \right) + A_{girder} \cdot \left( \frac{D_{girder}}{2} + t_{botplate} \right) + A_{botplate} \cdot \left( \frac{t_{botplate}}{2} \right) + A_{deck} \cdot \left( t_{botplate} + D_{girder} + H - t_{tflange} + \frac{Deck_T}{2} \right)}{A_{topplate} + A_{girder} + A_{botplate} + A_{deck}} = 60.209 \text{ in}$$

$$d_{girder} := t_{botplate} + \frac{D_{girder}}{2} - y_{STC}$$

$$d_{topplate} := t_{botplate} + D_{girder} + \frac{t_{topplate}}{2} - y_{STC}$$

$$d_{botplate} := y_{STC} - \frac{t_{botplate}}{2}$$

$$d_{deck} := t_{botplate} + D_{girder} - t_{tflange} + H + \frac{Deck_T}{2} - y_{STC}$$

$$I_{STC} := I_x + A_{girder} \cdot (d_{girder})^2 + I_{topplate} + A_{topplate} \cdot (d_{topplate})^2 + I_{botplate} + A_{botplate} \cdot (d_{botplate})^2 + I_{deck} + A_{deck} \cdot (d_{deck})^2 = (1.199 \cdot 10^5) \text{ in}^4$$

$$S_{xSTC\_ext} := \frac{I_{STC}}{y_{STC}} = (1.991 \cdot 10^3) \text{ in}^3$$

Section modulus of composite girder for short term loads

Distance to neutral axis of composite girder for short term loads

Moment of inertia of composite girder for short term loads

### Long Term (3n)

$$A_{deck} := \frac{S_{ext} \cdot Deck_T}{3 \cdot n} \quad I_{deck} := \frac{S_{ext} \cdot Deck_T^3}{12 \cdot 3 \cdot n}$$

$$y_{LTC} := \frac{A_{topplate} \cdot \left( \frac{t_{topplate}}{2} + D_{girder} + t_{botplate} \right) + A_{girder} \cdot \left( \frac{D_{girder}}{2} + t_{botplate} \right) + A_{botplate} \cdot \left( \frac{t_{botplate}}{2} \right) + A_{deck} \cdot \left( t_{botplate} + D_{girder} + H - t_{tflange} + \frac{Deck_T}{2} \right)}{A_{topplate} + A_{girder} + A_{botplate} + A_{deck}} = 49.362 \text{ in}$$

$$d_{girder} := t_{botplate} + \frac{D_{girder}}{2} - y_{LTC}$$

$$d_{topplate} := t_{botplate} + D_{girder} + \frac{t_{topplate}}{2} - y_{LTC}$$

$$d_{botplate} := y_{LTC} - \frac{t_{botplate}}{2}$$

Distance to neutral axis of composite girder for long term loads

Deck<sub>T</sub>

$$d_{deck} := t_{botplate} + D_{girder} - t_{tflange} + H + \frac{Deck_T}{2} - y_{LTC}$$

$$I_{LTC} := I_x + A_{girder} \cdot (d_{girder})^2 + I_{topplate} + A_{topplate} \cdot (d_{topplate})^2 + I_{botplate} + A_{botplate} \cdot (d_{botplate})^2 + I_{deck} + A_{deck} \cdot (d_{deck})^2 = (8.886 \cdot 10^4) \text{ in}^4$$

$$S_{xLTC\_ext} := \frac{I_{LTC}}{y_{LTC}} = (1.8 \cdot 10^3) \text{ in}^3$$

Section modulus of composite girder for long term loads

Moment of inertia of composite girder for long term loads

### Plastic Moments Exterior Girder ----- AASHTO Table D6.1-1

$$P_t := W_{bflange} \cdot t_{bflange} \cdot F_{yf} = 700 \text{ kip}$$

$$P_w := (D_{girder} - t_{bflange} - t_{tflange}) \cdot t_{web} \cdot F_y = (1.581 \cdot 10^3) \text{ kip}$$

$$P_c := W_{tflange} \cdot t_{tflange} \cdot F_y = 324 \text{ kip}$$

$$P_{topplate} := A_{topplate} \cdot F_y = 0 \text{ kip}$$

$$P_{botplate} := A_{botplate} \cdot F_y = 0 \text{ kip}$$

$$P_s := 0.85 \cdot f'_c \cdot S_{ext} \cdot Deck_T = (2.356 \cdot 10^3) \text{ kip}$$

$$D := D_{girder} - t_{bflange} - t_{tflange} = 70.25 \text{ in}$$

Forces in each component of the composite girder at the plastic moment

### Case I - PNA in Web

$$Y_{web} := \frac{(D)}{2} \cdot \left( \frac{P_t + P_{botplate} - P_c - P_{topplate} - P_s}{P_w} + 1 \right) = -8.879 \text{ in}$$

$$y_{web} := t_{botplate} + D_{girder} - t_{tflange} - Y_{web} = 80.129 \text{ in}$$

$$d_{slab} := \frac{Deck_T}{2} + H + Y_{web}$$

$$d_{comp} := \frac{t_{tflange}}{2} + Y_{web}$$

$$d_{topplate} := \frac{t_{topplate}}{2} + t_{tflange} + Y_{web}$$

$$d_{ten} := y_{web} - t_{botplate} - \frac{t_{bflange}}{2}$$

$$d_{botplate} := y_{web} - \frac{t_{botplate}}{2}$$

Plastic moment when PNA is in the web

$$M_{p\_web} := \frac{P_w}{2 \cdot D} \cdot (Y_{web}^2 + (D - Y_{web})^2) + (P_s \cdot (d_{slab}) + P_c \cdot (d_{comp}) + P_{topplate} \cdot (d_{topplate}) + P_t \cdot (d_{ten}) + P_{botplate} \cdot (d_{botplate})) = (9.696 \cdot 10^3) \text{ kip} \cdot \text{ft}$$

### Case II - PNA in Flange

$$Y_{flange} := \left( \frac{t_{tflange} + t_{topplate}}{2} \right) \cdot \left( \frac{P_w + P_t + P_{botplate} - P_s}{P_c + P_{topplate}} + 1 \right) = 0.288 \text{ in}$$

$$y_{flange} := t_{botplate} + D_{girder} - Y_{flange} = 71.712 \text{ in}$$

$$d_{slab} := \frac{Deck_T}{2} + H - (t_{tflange} + t_{topplate} - Y_{flange})$$

$$d_{ten} := y_{flange} - t_{botplate} - \frac{t_{bflange}}{2}$$

$$d_{botplate} := y_{flange} - \frac{t_{botplate}}{2}$$

$$d_{web} := \frac{D_{girder}}{2} - Y_{flange}$$

$$M_{p\_flange} := \frac{P_c + P_{topplate}}{2 (t_{tflange} + t_{topplate})} \cdot \left( Y_{flange}^2 + (t_{tflange} + t_{topplate} - Y_{flange})^2 \right) + (P_t \cdot \langle d_{ten} \rangle + P_{botplate} \cdot \langle d_{botplate} \rangle + P_w \cdot \langle d_{web} \rangle + P_s \cdot \langle d_{slab} \rangle) = (9.853 \cdot 10^3) \text{ kip} \cdot \text{ft}$$

### Case III - PNA in Slab

Plastic moment when  
PNA is in the flange

$$Y_{slab} := Deck_T \cdot \left( \frac{P_c + P_{topplate} + P_w + P_t + P_{botplate}}{P_s} \right) = 12.16 \text{ in}$$

$$y_{slab} := t_{botplate} + D_{girder} + H - t_{tflange} + Deck_T - Y_{slab} = 70.09 \text{ in}$$

$$d_{comp} := y_{slab} - t_{botplate} - D_{girder} + \frac{t_{tflange}}{2}$$

$$d_{topplate} := y_{slab} - t_{botplate} - D_{girder} - \frac{t_{topplate}}{2}$$

$$d_{ten} := y_{slab} - t_{botplate} - \frac{t_{bflange}}{2}$$

$$d_{botplate} := y_{slab} - \frac{t_{botplate}}{2}$$

$$d_{web} := y_{slab} - t_{botplate} - \frac{D_{girder}}{2}$$

$$M_{p\_slab} := \left( \frac{Y_{slab}^2 \cdot P_s}{2 Deck_T} \right) + (P_{topplate} \cdot \langle d_{topplate} \rangle + P_c \cdot \langle d_{comp} \rangle + P_w \cdot \langle d_{web} \rangle + P_t \cdot \langle d_{ten} \rangle + P_{botplate} \cdot \langle d_{botplate} \rangle) = (9.828 \cdot 10^3) \text{ kip} \cdot \text{ft}$$

Plastic moment when  
PNA is in the slab

$$M_{p\_Location} := \begin{cases} \text{if } P_t + P_w + P_{botplate} \geq P_c + P_{topplate} + P_s & = \text{"PNA in Flange"} \\ \quad \text{"PNA in Web"} \\ \text{else} \\ \quad \text{if } P_t + P_{botplate} + P_w + P_c + P_{topplate} \geq P_s & \text{"PNA in Flange"} \\ \quad \text{else} & \text{"PNA in Slab"} \end{cases}$$

$$M_{p\_pos\_ext} := \begin{cases} \text{if } P_t + P_w + P_{botplate} \geq P_c + P_{topplate} + P_s & = (9.853 \cdot 10^3) \text{ (kip} \cdot \text{ft)} \\ \quad M_{p\_web} \\ \text{else} \\ \quad \text{if } P_t + P_{botplate} + P_w + P_c + P_{topplate} \geq P_s & M_{p\_flange} \\ \quad \text{else} & M_{p\_slab} \end{cases}$$

Plastic Moment of the composite section in negative bending

### Nominal Flexural Resistance - Compression Flange Continuously Braced by Deck

#### Service Limit State

$$f_{f\_top\_pos\_ext} := 0.95 \cdot F_y = 34.2 \text{ ksi} \quad \text{Allowable Stress in the top flange}$$

$$f_{f\_bot\_pos\_ext} := 0.95 \cdot F_{yflange} = 47.5 \text{ ksi} \quad \text{Allowable Stress in the bottom flange}$$

$f_l$  term can be ignored

#### Strength Limit State

$$D_{cp} := \begin{cases} \text{if } M_{p\_Location} = \text{"PNA in Web"} & \\ \quad \frac{D}{2} \cdot \left( \frac{F_y \cdot (A_{botplate} - A_{topplate}) - (0.85 \cdot f'_c \cdot S_{ext} \cdot Deck_T)}{F_y \cdot D \cdot t_{web}} + 1 \right) & = 0 \text{ in} \\ \text{else} & 0 \cdot \text{in} \end{cases}$$



$$D_t := t_{botplate} + D_{girder} - t_{tflange} + H + Deck_T = 82.25 \text{ in}$$

$$D_p := \begin{cases} \text{if } M_{p\_Location} = \text{"PNA in Web"} \\ \quad D_t - y_{web} \\ \text{else if } M_{p\_Location} = \text{"PNA in Flange"} \\ \quad D_t - y_{flange} \\ \text{else} \\ \quad D_t - y_{slab} \end{cases} = 10.538 \text{ in}$$

$$Compactness := \begin{cases} \text{if } \frac{D}{t_{web}} > 150 \\ \quad \text{"non compact"} \\ \text{else if } \frac{2 \cdot D_{cp}}{t_{web}} > 3.76 \cdot \sqrt{\frac{E_{steel}}{F_y}} \\ \quad \text{"non compact"} \\ \text{else} \\ \quad \text{"compact"} \end{cases} = \text{"compact"}$$

Compactness check

$$M_{n\_pos\_ext} := \begin{cases} \text{if } D_p \leq 0.1 \cdot D_t \\ \quad M_{p\_pos\_ext} \\ \text{else} \\ \quad M_{p\_pos\_ext} \cdot \left( 1.07 - 0.7 \frac{D_p}{D_t} \right) \end{cases} = (9.659 \cdot 10^3) \text{ (kip} \cdot \text{ft)}$$

Moment Capacity of the  
Composite Girder in Positive  
Bending for an Interior Girder

## Negative Flexure--- Plate Girder 70"x5/8" web (36ksi), 18"x1-5/8" flanges (50ksi)

$$A_{girder} := 95.125 \text{ in}^2$$

Area of the steel section

$$I_x := 88720 \cdot \text{in}^4$$

Moment of inertia of the section

$$D_{girder} := 72 \cdot \text{in}$$

Depth of the girder

$$W_{flange} := 18 \cdot \text{in}$$

Width of the flange

$$t_{flange} := \left(1 + \frac{3}{8}\right) \cdot \text{in}$$

Thickness of the flange

$$t_{web} := \frac{5}{8} \cdot \text{in}$$

Thickness of the web

$$W_{topplate} := 0 \cdot \text{in}$$

Width of additional plate added to top flange

$$t_{topplate} := 0 \cdot \text{in}$$

Thickness of additional plate added to top flange

$$A_{topplate} := W_{topplate} \cdot t_{topplate} = 0 \text{ in}^2$$

$$I_{topplate} := \frac{W_{topplate} \cdot t_{topplate}^3}{12} = 0 \text{ in}^4$$

$$W_{botplate} := 0 \cdot \text{in}$$

Width of additional plate added to bottom flange

$$t_{botplate} := 0 \cdot \text{in}$$

Thickness of additional plate added to bottom flange

$$A_{botplate} := W_{botplate} \cdot t_{botplate} = 0 \text{ in}^2$$

$$I_{botplate} := \frac{W_{botplate} \cdot t_{botplate}^3}{12} = 0 \text{ in}^4$$

$$A_{rt} := 8 \cdot \text{in}^2$$

Area of upper long. deck steel

$$d_{rt} := 2 \cdot \text{in}$$

Depth of upper long. deck steel

$$A_{rb} := 5 \cdot \text{in}^2$$

Area of lower long. deck steel

$$d_{rb} := 8 \cdot \text{in}$$

Depth of lower long. deck steel

$$A_{rt\_ext} := 5 \cdot \text{in}^2$$

Area of upper long. deck steel in exterior girder

$$A_{rb\_ext} := 3 \cdot \text{in}^2$$

Area of lower long. deck steel in exterior girder

$$d_0 := 96 \cdot \text{in}$$

Transverse stiffener spacing

$$d_{0\_end} := 16 \cdot \text{in}$$

Distance from support to transverse stiffener (if stiffener is at support then set  $d_{0\_end}$  to  $d_0$ )

$$y := \frac{A_{topplate} \cdot \left( \frac{t_{topplate}}{2} + D_{girder} + t_{botplate} \right) + A_{girder} \cdot \left( \frac{D_{girder}}{2} + t_{botplate} \right) + A_{botplate} \cdot \frac{t_{botplate}}{2}}{A_{topplate} + A_{girder} + A_{botplate}} = 36 \text{ in}$$

Distance to neutral axis of non-composite section

$$I_{neg} := I_x + A_{girder} \cdot \left( t_{botplate} + \frac{D_{girder}}{2} - y \right)^2 + I_{topplate} + A_{topplate} \cdot \left( t_{botplate} + D_{girder} + \frac{t_{topplate}}{2} - y \right)^2 + I_{botplate} + A_{botplate} \cdot \left( y - \frac{t_{botplate}}{2} \right)^2 = (8.872 \cdot 10^4) \text{ in}^4$$

$$S_{x\_neg} := \frac{I_{neg}}{t_{botplate} + D_{girder} + t_{topplate} - y} = (2.464 \cdot 10^3) \text{ in}^3$$

Section modulus of non-composite section

Moment of inertia of non-composite section

$$e_g := t_{botplate} + D_{girder} + H - t_{flange} + \frac{Deck_T}{2} - y = 40.125 \text{ in}$$

$$K_{g\_neg} := n \cdot \left( I + (A_{girder} + A_{topplate} + A_{botplate}) \cdot e_g^2 \right) = (1.88 \cdot 10^6) \text{ in}^4$$

Composite Section Properties Interior Girder

$$d_{topplate} := \frac{t_{topplate}}{2} + D_{girder} + t_{botplate}$$

$$d_{girder} := \frac{D_{girder}}{2} + t_{botplate}$$

$$d_{botplate} := \frac{t_{botplate}}{2}$$

$$dd_{rt} := t_{botplate} + D_{girder} - t_{flange} + H + Deck_T - d_{rt}$$

$$dd_{rb} := t_{botplate} + D_{girder} - t_{flange} + H + Deck_T - d_{rb}$$

$$y := \frac{A_{topplate} \cdot \langle d_{topplate} \rangle + A_{girder} \cdot \langle d_{girder} \rangle + A_{botplate} \cdot \langle d_{botplate} \rangle + A_{rt} \cdot \langle dd_{rt} \rangle + A_{rb} \cdot \langle dd_{rb} \rangle}{A_{topplate} + A_{girder} + A_{botplate} + A_{rt} + A_{rb}} = 40.968 \text{ in}$$

Distance to neutral axis of composite section

$$d_{topplate} := t_{botplate} + D_{girder} + \frac{t_{topplate}}{2} - y$$

$$d_{girder} := t_{botplate} + \frac{D_{girder}}{2} - y$$

$$d_{botplate} := y - \frac{t_{botplate}}{2}$$

$$dd_{rt} := t_{botplate} + D_{girder} - t_{flange} + H + Deck_T - d_{rt} - y$$

$$dd_{rb} := t_{botplate} + D_{girder} - t_{flange} + H + Deck_T - d_{rb} - y$$

Moment of inertia of composite section

$$I_{comp\_neg} := I_x + A_{girder} \cdot \langle d_{girder} \rangle^2 + I_{topplate} + A_{topplate} \cdot \langle d_{topplate} \rangle^2 + I_{botplate} + A_{botplate} \cdot \langle d_{botplate} \rangle^2 + A_{rt} \cdot \langle dd_{rt} \rangle^2 + A_{rb} \cdot \langle dd_{rb} \rangle^2 = (1.084 \cdot 10^5) \text{ in}^4$$

$$S_{x\_comp\_neg\_rt} := \frac{I_{comp\_neg}}{\langle t_{botplate} + D_{girder} - t_{flange} + H + Deck_T - d_{rt} - y \rangle} = (2.803 \cdot 10^3) \text{ in}^3$$

Section Modulus to top reinforcing steel

$$S_{x\_comp\_neg\_tf} := \frac{I_{comp\_neg}}{\langle t_{botplate} + D_{girder} + t_{topplate} - y \rangle} = (3.492 \cdot 10^3) \text{ in}^3$$

Section Modulus to top flange

$$S_{x\_comp\_neg\_bf} := \frac{I_{comp\_neg}}{y} = (2.645 \cdot 10^3) \text{ in}^3$$

Section Modulus to bottom flange

### Plastic Moments Interior Girder----- AASHTO Table D6.1-2

$$P_t := W_{flange} \cdot t_{flange} \cdot F_{yflange} = (1.238 \cdot 10^3) \text{ kip}$$

$$P_w := (D_{girder} - 2 \cdot t_{flange}) \cdot t_{web} \cdot F_y = (1.558 \cdot 10^3) \text{ kip}$$

$$P_c := P_t = (1.238 \cdot 10^3) \text{ kip}$$

$$P_{topplate} := A_{topplate} \cdot F_y = 0 \text{ kip}$$

$$P_{botplate} := A_{botplate} \cdot F_y = 0 \text{ kip}$$

$$P_{rt} := A_{rt} \cdot F_{y\_rebar} = 320 \text{ kip}$$

$$P_{rb} := A_{rb} \cdot F_{y\_rebar} = 200 \text{ kip}$$

Forces in each component of the composite girder at the plastic moment in negative bending

$$D := D_{girder} - 2 t_{flange} = 69.25 \text{ in}$$

### Case I - PNA in Web

$$Y_{web} := \frac{(D)}{2} \cdot \left( \frac{P_t + P_{botplate} - P_c - P_{topplate} - P_{rt} - P_{rb}}{P_w} + 1 \right) = 23.069 \text{ in}$$

$$y_{web} := t_{botplate} + D_{girder} - t_{flange} - Y_{web} = 47.556 \text{ in}$$

Distance to the plastic neutral axis if it is located in the web

$$d_{comp} := \frac{t_{flange}}{2} + Y_{web}$$

$$d_{topplate} := \frac{t_{topplate}}{2} + t_{flange} + Y_{web}$$

$$d_{ten} := y_{web} - t_{botplate} - \frac{t_{flange}}{2}$$

$$d_{botplate} := y_{web} - \frac{t_{botplate}}{2}$$

$$dd_{rt} := Y_{web} + H + Deck_T - d_{rt}$$

$$dd_{rb} := Y_{web} + H + Deck_T - d_{rb}$$

Plastic moment if the PNA is located in the web

$$M_{p\_web} := \frac{P_w}{2 \cdot D} \cdot \left( Y_{web}^2 + (D - Y_{web})^2 \right) + (P_c \cdot \langle d_{comp} \rangle + P_{topplate} \cdot \langle d_{topplate} \rangle + P_t \cdot \langle d_{ten} \rangle + P_{botplate} \cdot \langle d_{botplate} \rangle + P_{rt} \cdot \langle dd_{rt} \rangle + P_{rb} \cdot \langle dd_{rb} \rangle) = (1.107 \cdot 10^4) \text{ kip} \cdot \text{ft}$$

### Case II - PNA in Flange

$$Y_{flange} := \left( \frac{t_{flange} + t_{topplate}}{2} \right) \cdot \left( \frac{P_w + P_t + P_{botplate} - P_{rt} - P_{rb}}{P_c + P_{topplate}} + 1 \right) = 1.952 \text{ in}$$

$$y_{flange} := t_{botplate} + D_{girder} - Y_{flange} = 70.048 \text{ in}$$

Distance to the plastic neutral axis if it is located in the flange

$$d_Y := t_{flange} + t_{topplate} - Y_{flange}$$

$$d_{web} := \frac{D_{girder}}{2} - Y_{flange}$$

$$d_{ten} := y_{flange} - t_{botplate} - \frac{t_{flange}}{2}$$

$$d_{bot} := y_{flange} - \frac{t_{botplate}}{2}$$

$$dd_{rt} := H - t_{topplate} - t_{flange} + Y_{flange} + Deck_T - d_{rt}$$

$$dd_{rb} := H - t_{topplate} - t_{flange} + Y_{flange} + Deck_T - d_{rb}$$

Plastic moment if the PNA is located in the flange

$$M_{p\_flange} := \frac{P_c + P_{topplate}}{2 (t_{flange} + t_{topplate})} \cdot (Y_{flange}^2 + (d_Y)^2) + (P_t \cdot (d_{ten}) + P_{botplate} \cdot (d_{bot}) + P_w \cdot (d_{web}) + P_{rt} \cdot (dd_{rt}) + P_{rb} \cdot (dd_{rb})) = (1.214 \cdot 10^4) \text{ kip} \cdot \text{ft}$$

$$M_{p\_Location} := \begin{cases} \text{if } P_t + P_w + P_{botplate} \geq P_c + P_{topplate} + P_{rt} + P_{rb} \\ \quad \text{"PNA in Web"} \\ \text{else} \\ \quad \text{if } P_t + P_{botplate} + P_w + P_c + P_{topplate} \geq P_{rt} + P_{rb} \\ \quad \quad \text{"PNA in Flange"} \\ \quad \text{else} \\ \quad \quad \text{"Otherwise"} \end{cases} = \text{"PNA in Web"}$$

$$M_{p\_neg} := \begin{cases} \text{if } P_t + P_w + P_{botplate} \geq P_c + P_{topplate} + P_{rt} + P_{rb} \\ \quad M_{p\_web} \\ \text{else} \\ \quad \text{if } P_t + P_{botplate} + P_w + P_c + P_{topplate} \geq P_{rt} + P_{rb} \\ \quad \quad M_{p\_flange} \\ \quad \text{else} \\ \quad \quad M_{p\_slab} \end{cases} = (1.107 \cdot 10^4) \text{ (kip} \cdot \text{ft)}$$

Plastic moment of the composite section in negative bending

### Nominal Flexural Resistance - Compression Flange Discretely Braced by Braces

#### Service Limit State

$$f_{f\_top\_neg} := 0.95 \cdot F_{yflange} = 47.5 \text{ ksi}$$

$$f_{f\_bot\_neg} := 0.95 \cdot F_{yflange} = 47.5 \text{ ksi}$$

Allowable Stress in the top flange  
Allowable Stress in the bottom flange  
 $f_l$  term can be ignored

### Strength Limit State

$$\lambda_f := \frac{W_{flange}}{2 \cdot t_{flange}} = 6.545$$

$$\lambda_{pf} := 0.38 \cdot \sqrt{\frac{E_{steel}}{F_{yflange}}} = 9.152$$

$$\lambda_{rf} := 0.56 \cdot \sqrt{\frac{E_{steel}}{F_{yflange}}} = 13.487$$

$$\lambda_{rw} := 5.7 \cdot \sqrt{\frac{E_{steel}}{F_{yflange}}} = 137.274$$

$$D_c := y - t_{flange} - t_{botplate} = 39.593 \text{ in}$$

$$a_{wc} := \frac{2 D_c \cdot t_{web}}{W_{flange} \cdot t_{flange}} = 2$$

$$R_h := .976$$

$$D_n := \frac{D_{girder}}{2} - t_{flange} = 34.625 \text{ in}$$

$$A_{fn} := t_{flange} \cdot W_{flange} = 24.75 \text{ in}^2$$

$$\rho := \frac{F_y}{F_{yflange}} = 0.72 \quad \beta := \frac{2 \cdot D_n \cdot t_{web}}{A_{fn}} = 1.749$$

$$R_h := \frac{12 + \beta \cdot (3 \rho - \rho^3)}{12 + 2 \beta} = 0.976$$

Hybrid Factor, 1 if Fy of flange and web are the same, use value above if different

$$R_b := \begin{cases} \text{if } \frac{2 \cdot D_c}{t_{web}} \leq \lambda_{rw} \\ 1 \\ \text{else} \\ 1 - \left( \frac{a_{wc}}{1200 + 300 \cdot a_{wc}} \right) \left( \frac{2 D_c}{t_{web}} - \lambda_{rw} \right) \end{cases} = 1$$

$$F_{nc\_LB} := \begin{cases} \text{if } \lambda_f \leq \lambda_{pf} \\ R_h \cdot R_b \cdot F_{yflange} \\ \text{else} \\ \left( 1 - \left( 1 - \frac{0.7 F_{yflange}}{R_h \cdot F_{yflange}} \right) \left( \frac{\lambda_f - \lambda_{pf}}{\lambda_{rf} - \lambda_{pf}} \right) \right) \cdot R_b \cdot R_h \cdot F_{yflange} \end{cases} = 48.8 \text{ ksi}$$

Allowable stress in the compression flange for local bucking

$$r_t := \frac{W_{flange}}{\sqrt{12 \left( 1 + \frac{1}{3} \cdot \frac{D_c \cdot t_{web}}{W_{flange} \cdot t_{flange}} \right)}} = 4.5 \text{ in}$$

$$L_b := S_{brace\_neg} = 11.33 \text{ ft}$$

$$L_p := 1.0 \cdot r_t \cdot \sqrt{\frac{E_{steel}}{F_{yflange}}} = 9.031 \text{ ft}$$

$$L_r := \pi \cdot r_t \cdot \sqrt{\frac{E_{steel}}{F_{yflange}}} = 28.373 \text{ ft}$$

$$C_b := 1$$

$$F_{nc\_LTB} := \begin{cases} \text{if } L_b \leq L_p & R_b \cdot R_h \cdot F_{yflange} \\ \text{else if } L_p < L_b \leq L_r & C_b \cdot \left( 1 - \left( 1 - \frac{F_{yflange}}{R_h \cdot F_{yflange}} \right) \left( \frac{L_b - L_p}{L_r - L_p} \right) \right) \cdot R_h \cdot R_b \cdot F_{yflange} \\ \text{else} & \frac{C_b \cdot R_b \cdot \pi^2 \cdot E_{steel}}{\left( \frac{L_b}{r_t} \right)^2} \end{cases} = 48.943 \text{ ksi}$$

$$F_{nc} := \min(F_{nc\_LB}, F_{nc\_LTB}, R_h \cdot R_b \cdot F_{yflange}) = 48.8 \text{ ksi}$$

$$F_{nt} := R_h \cdot F_{yflange} = 48.8 \text{ ksi}$$

### Nominal Shear Resistance

#### Strength Limit State

$$V_p := 0.58 \cdot F_y \cdot D \cdot t_{web} = 903.713 \text{ kip}$$

$$k := 5 + \frac{5}{\left( \frac{d_0}{D} \right)^2} = 7.602$$

$$k_{end} := 5 + \frac{5}{\left( \frac{d_{0\_end}}{D} \right)^2} = 98.663$$

Unbraced length of the girders

Beam bending coefficient

Allowable stress in the compression flange for lateral torsional bucking

Allowable stress in the compression flange for negative bending

Allowable stress in the tension flange for negative bending

Shear capacity of the web

k value for interior of stiffened web

k value for end section of stiffened web



$$C := \begin{cases} \text{if } \frac{D}{t_{web}} \leq 1.12 \cdot \sqrt{\frac{E_{steel} \cdot k}{F_y}} \\ \quad \parallel 1 \\ \text{else if } 1.12 \cdot \sqrt{\frac{E_{steel} \cdot k}{F_y}} < \frac{D}{t_{web}} \leq 1.40 \cdot \sqrt{\frac{E_{steel} \cdot k}{F_y}} \\ \quad \parallel \frac{1.12}{\left(\frac{D}{t_{web}}\right)} \sqrt{\frac{E_{steel} \cdot k}{F_y}} \\ \text{else} \\ \quad \parallel \frac{1.57}{\left(\frac{D}{t_{web}}\right)^2} \left(\frac{E_{steel} \cdot k}{F_y}\right) \end{cases} = 0.783$$

C value for interior of stiffened web

$$C_{end} := \begin{cases} \text{if } \frac{D}{t_{web}} \leq 1.12 \cdot \sqrt{\frac{E_{steel} \cdot k_{end}}{F_y}} \\ \quad \parallel 1 \\ \text{else if } 1.12 \cdot \sqrt{\frac{E_{steel} \cdot k_{end}}{F_y}} < \frac{D}{t_{web}} \leq 1.40 \cdot \sqrt{\frac{E_{steel} \cdot k_{end}}{F_y}} \\ \quad \parallel \frac{1.12}{\left(\frac{D}{t_{web}}\right)} \sqrt{\frac{E_{steel} \cdot k_{end}}{F_y}} \\ \text{else} \\ \quad \parallel \frac{1.57}{\left(\frac{D}{t_{web}}\right)^2} \left(\frac{E_{steel} \cdot k_{end}}{F_y}\right) \end{cases} = 1$$

C value for end section of stiffened web

$$V_{n\_int\_neg} := \begin{cases} \text{if } \frac{2 D \cdot t_{web}}{(2 W_{flange} \cdot t_{flange})} \leq 2.5 \\ \quad \parallel V_p \cdot \left( C + \frac{0.87 (1 - C)}{\sqrt{1 + \left(\frac{d_0}{r}\right)^2}} \right) \end{cases} = 807.474 \text{ kip}$$

Shear capacity of interior section of stiffened girder

$$\left\| \left\| \begin{array}{l} \text{else} \\ V_p \cdot \left( C + \frac{0.87 (1-C)}{\sqrt{1 + \left( \frac{d_0}{D} \right)^2} + \frac{d_0}{D}} \right) \end{array} \right\| \right\|$$

### Composite Section Properties Exterior Girder

$$d_{topplate} := \frac{t_{topplate}}{2} + D_{girder} + t_{botplate}$$

$$d_{girder} := \frac{D_{girder}}{2} + t_{botplate}$$

$$d_{botplate} := \frac{t_{botplate}}{2}$$

$$dd_{rt} := t_{botplate} + D_{girder} - t_{flange} + H + Deck_T - d_{rt}$$

$$dd_{rb} := t_{botplate} + D_{girder} - t_{flange} + H + Deck_T - d_{rb}$$

$$y := \frac{A_{topplate} \cdot \langle d_{topplate} \rangle + A_{girder} \cdot \langle d_{girder} \rangle + A_{botplate} \cdot \langle d_{botplate} \rangle + A_{rt\_ext} \cdot \langle dd_{rt} \rangle + A_{rb\_ext} \cdot \langle dd_{rb} \rangle}{A_{topplate} + A_{girder} + A_{botplate} + A_{rt\_ext} + A_{rb\_ext}} = 39.21 \text{ in}$$

Distance to neutral axis of composite section

$$d_{topplate} := t_{botplate} + D_{girder} + \frac{t_{topplate}}{2} - y$$

$$d_{girder} := t_{botplate} + \frac{D_{girder}}{2} - y$$

$$d_{botplate} := y - \frac{t_{botplate}}{2}$$

$$dd_{rt} := t_{botplate} + D_{girder} - t_{flange} + H + Deck_T - d_{rt} - y$$

$$dd_{rb} := t_{botplate} + D_{girder} - t_{flange} + H + Deck_T - d_{rb} - y$$

Moment of inertia of composite section

$$I_{comp\_neg\_ext} := I_x + A_{girder} \cdot \langle d_{girder} \rangle^2 + I_{topplate} + A_{topplate} \cdot \langle d_{topplate} \rangle^2 + I_{botplate} + A_{botplate} \cdot \langle d_{botplate} \rangle^2 + A_{rt\_ext} \cdot \langle dd_{rt} \rangle^2 + A_{rb\_ext} \cdot \langle dd_{rb} \rangle^2 = (1.014 \cdot 10^5) \text{ in}^4$$

$$S_{x\_comp\_neg\_ext\_rt} := \frac{I_{comp\_neg\_ext}}{(t_{botplate} + D_{girder} - t_{flange} + H + Deck_T - d_{rt} - y)} = (2.509 \cdot 10^3) \text{ in}^3$$

Section Modulus to top reinforcing steel

$$S_{x\_comp\_neg\_ext\_tf} := \frac{I_{comp\_neg\_ext}}{(t_{botplate} + D_{girder} + t_{topplate} - y)} = (3.093 \cdot 10^3) \text{ in}^3$$

Section Modulus to top flange

$$S_{x\_comp\_neg\_ext\_bf} := \frac{I_{comp\_neg\_ext}}{y} = (2.587 \cdot 10^3) \text{ in}^3$$

Section Modulus to bottom flange

### Plastic Moments Exterior Girder----- AASHTO Table D6.1-2

$$P_t := W_{flange} \cdot t_{flange} \cdot F_{yflange} = (1.238 \cdot 10^3) \text{ kip}$$

$$P_w := (D_{girder} - 2 \cdot t_{flange}) \cdot t_{web} \cdot F_y = (1.558 \cdot 10^3) \text{ kip}$$

$$P_c := P_t = (1.238 \cdot 10^3) \text{ kip}$$

$$P_{topplate} := A_{topplate} \cdot F_y = 0 \text{ kip}$$

$$P_{botplate} := A_{botplate} \cdot F_y = 0 \text{ kip}$$

Forces in each component of the composite girder at the plastic moment in negative bending

$$P_{rt} := A_{rt\_ext} \cdot F_{y\_rebar} = 200 \text{ kip}$$

$$P_{rb} := A_{rb\_ext} \cdot F_{y\_rebar} = 120 \text{ kip}$$

$$D := D_{girder} - 2 \cdot t_{flange} = 69.25 \text{ in}$$

### Case I - PNA in Web

$$Y_{web} := \frac{(D)}{2} \cdot \left( \frac{P_t + P_{botplate} - P_c - P_{topplate} - P_{rt} - P_{rb}}{P_w} + 1 \right) = 27.514 \text{ in}$$

$$y_{web} := t_{botplate} + D_{girder} - t_{flange} - Y_{web} = 43.111 \text{ in}$$

Distance to the plastic neutral axis if it is located in the web

$$d_{comp} := \frac{t_{flange}}{2} + Y_{web}$$

$$d_{topplate} := \frac{t_{topplate}}{2} + t_{flange} + Y_{web}$$

$$d_{ten} := y_{web} - t_{botplate} - \frac{t_{flange}}{2}$$

$$d_{botplate} := y_{web} - \frac{t_{botplate}}{2}$$

$$dd_{rt} := Y_{web} + H + Deck_T - d_{rt}$$

$$dd_{rb} := Y_{web} + H + Deck_T - d_{rb}$$

Plastic moment if the PNA is located in the web

$$M_{p\_web} := \frac{P_w}{2 \cdot D} \cdot (Y_{web}^2 + (D - Y_{web})^2) + (P_c \cdot \langle d_{comp} \rangle + P_{topplate} \cdot \langle d_{topplate} \rangle + P_t \cdot \langle d_{ten} \rangle + P_{botplate} \cdot \langle d_{botplate} \rangle + P_{rt} \cdot \langle dd_{rt} \rangle + P_{rb} \cdot \langle dd_{rb} \rangle) = (1.054 \cdot 10^4) \text{ kip} \cdot \text{ft}$$

### Case II - PNA in Flange

$$Y_{flange} := \left( \frac{t_{flange} + t_{topplate}}{2} \right) \cdot \left( \frac{P_w + P_t + P_{botplate} - P_{rt} - P_{rb}}{P_c + P_{topplate}} + 1 \right) = 2.063 \text{ in}$$

$$y_{flange} := t_{botplate} + D_{girder} - Y_{flange} = 69.937 \text{ in}$$

Distance to the plastic neutral axis if it is located in the flange

$$d_Y := t_{flange} + t_{topplate} - Y_{flange}$$

$$d_{web} := \frac{D_{girder}}{2} - Y_{flange}$$

$$d_{ten} := y_{flange} - t_{botplate} - \frac{t_{flange}}{2}$$

$$d_{bot} := y_{flange} - \frac{t_{botplate}}{2}$$

$$dd_{rt} := H - t_{topplate} - t_{flange} + Y_{flange} + Deck_T - d_{rt}$$

$$dd_{rb} := H - t_{topplate} - t_{flange} + Y_{flange} + Deck_T - d_{rb}$$

Plastic moment if the PNA is located in the flange

$$M_{p\_flange} := \frac{P_c + P_{topplate}}{2 \cdot \langle t_{flange} + t_{topplate} \rangle} \cdot (Y_{flange}^2 + \langle d_Y \rangle^2) + (P_t \cdot \langle d_{ten} \rangle + P_{botplate} \cdot \langle d_{bot} \rangle + P_w \cdot \langle d_{web} \rangle + P_{rt} \cdot \langle dd_{rt} \rangle + P_{rb} \cdot \langle dd_{rb} \rangle) = (1.192 \cdot 10^4) \text{ kip} \cdot \text{ft}$$

$$M_{p\_Location} := \left\{ \begin{array}{l} \text{if } P_t + P_w + P_{botplate} \geq P_c + P_{topplate} + P_{rt} + P_{rb} \\ \quad \text{"PNA in Web"} \\ \text{else} \\ \quad \text{if } P_t + P_{botplate} + P_w + P_c + P_{topplate} \geq P_{rt} + P_{rb} \\ \quad \quad \text{"PNA in Flange"} \\ \quad \text{else} \\ \quad \quad \text{"Otherwise"} \end{array} \right\} = \text{"PNA in Web"}$$

$$M_{p\_neg\_ext} := \begin{cases} \text{if } P_t + P_w + P_{botplate} \geq P_c + P_{topplate} + P_{rt} + P_{rb} \\ \quad \parallel M_{p\_web} \\ \text{else} \\ \quad \parallel \text{if } P_t + P_{botplate} + P_w + P_c + P_{topplate} \geq P_{rt} + P_{rb} \\ \quad \parallel \quad \parallel M_{p\_flange} \\ \quad \parallel \text{else} \\ \quad \parallel \quad \parallel \text{"check PNA location"} \end{cases} = (1.054 \cdot 10^4) \text{ (kip} \cdot \text{ft)}$$

Plastic moment of the composite section in negative bending

## Nominal Flexural Resistance - Compression Flange Discretely Braced by Braces

### Service Limit State

$$f_{f\_top\_neg\_ext} := 0.95 \cdot F_{yflange} = 47.5 \text{ ksi} \quad \text{Allowable Stress in the top flange}$$

$$f_{f\_bot\_neg\_ext} := 0.95 \cdot F_{yflange} = 47.5 \text{ ksi} \quad \text{Allowable Stress in the bottom flange}$$

$f_l$  term can be ignored

### Strength Limit State

$$D_c := y - t_{flange} - t_{botplate} = 37.835 \text{ in}$$

$$a_{wc} := \frac{2 D_c \cdot t_{web}}{W_{flange} \cdot t_{flange}} = 1.911$$

$$R_h := .978$$

$$R_b := \begin{cases} \text{if } \frac{2 \cdot D_c}{t_{web}} \leq \lambda_{rw} \\ \quad \parallel 1 \\ \text{else} \\ \quad \parallel 1 - \left( \frac{a_{wc}}{1200 + 300 \cdot a_{wc}} \right) \left( \frac{2 D_c}{t_{web}} - \lambda_{rw} \right) \end{cases} = 1$$

$$F_{nc\_LB} := \begin{cases} \text{if } \lambda_f \leq \lambda_{pf} \\ R_h \cdot R_b \cdot F_{yflange} \\ \text{else} \\ \left(1 - \left(1 - \frac{0.7 F_{yflange}}{R_h \cdot F_{yflange}}\right) \left(\frac{\lambda_f - \lambda_{pf}}{\lambda_{rf} - \lambda_{pf}}\right)\right) \cdot R_b \cdot R_h \cdot F_{yflange} \end{cases} = 48.9 \text{ ksi}$$

Allowable stress in the compression flange for local bucking

$$r_t := \frac{W_{flange}}{\sqrt{12 \left(1 + \frac{1}{3} \cdot \frac{D_c \cdot t_{web}}{W_{flange} \cdot t_{flange}}\right)}} = 4.525 \text{ in}$$

$$L_b := S_{brace\_neg} = 11.33 \text{ ft}$$

Unbraced length of the girders

$$L_p := 1.0 \cdot r_t \cdot \sqrt{\frac{E_{steel}}{F_{yflange}}} = 9.082 \text{ ft}$$

$$L_r := \pi \cdot r_t \cdot \sqrt{\frac{E_{steel}}{F_{yflange}}} = 28.532 \text{ ft}$$

$$C_b := 1$$

Beam bending coefficient

$$F_{nc\_LTB} := \begin{cases} \text{if } L_b \leq L_p \\ R_b \cdot R_h \cdot F_{yflange} \\ \text{else if } L_p < L_b \leq L_r \\ C_b \cdot \left(1 - \left(1 - \frac{F_{yflange}}{R_h \cdot F_{yflange}}\right) \left(\frac{L_b - L_p}{L_r - L_p}\right)\right) \cdot R_h \cdot R_b \cdot F_{yflange} \\ \text{else} \\ \frac{C_b \cdot R_b \cdot \pi^2 \cdot E_{steel}}{\left(\frac{L_b}{r_t}\right)^2} \end{cases} = 49.027 \text{ ksi}$$

Allowable stress in the compression flange for lateral torsional bucking

$$F_{nc\_ext} := \min(F_{nc\_LB}, F_{nc\_LTB}, R_h \cdot R_b \cdot F_{yflange}) = 48.9 \text{ ksi}$$

Allowable stress in the compression flange for negative bending

$$F_{nt\_ext} := R_h \cdot F_{yflange} = 48.9 \text{ ksi}$$

Allowable stress in the tension flange for negative bending

## Dead Loads

### Steel Weight

#### End Girders

$$wt_{girder1} := 68.625 \cdot \text{in}^2 \cdot 490 \cdot \text{pcf} = 233.516 \text{ plf}$$

$$l_{girder1} := 180 \cdot \text{ft}$$

# per linear foot of the girder section  
overall length of the girder section

#### Middle Girders

$$wt_{girder2} := 95.125 \cdot \text{in}^2 \cdot 490 \cdot \text{pcf} = 323.689 \text{ plf}$$

$$l_{girder2} := 60 \cdot \text{ft}$$

# per linear foot of the girder section  
overall length of the girder section

$$wt_{girder} := \frac{(wt_{girder1} \cdot l_{girder1} + wt_{girder2} \cdot l_{girder2})}{Span_{total}} = 256.059 \text{ plf}$$

#### Girder Cover Plates

$$l_{topplate} := 0 \cdot \text{ft}$$

$$l_{botplate} := 0 \cdot \text{ft}$$

length of the top plates on the girders  
length of the bottom plates on the girders

$$wt_{plates} := \frac{(l_{topplate} \cdot W_{topplate} \cdot t_{topplate} + l_{botplate} \cdot W_{botplate} \cdot t_{botplate}) \cdot \gamma_{steel}}{Span_{total}} = 0 \text{ plf}$$

#### Diaphragms

$$N_{xframes} := 12$$

$$N_{sections} := 3$$

$$wt_{xframe} := 11 \cdot \text{plf}$$

$$l_{xframe} := 10 \cdot \text{ft}$$

# of diaphragms per girder  
# of members per brace (2 for cross brace)  
LB per lf of each brace member  
Length of each brace member

$$wt_{diaphragm} := \frac{N_{xframes} \cdot N_{sections} \cdot wt_{xframe} \cdot l_{xframe}}{Span_{total}} = 16.5 \text{ plf}$$

$$wt_{diaphragm\_ext} := \frac{0.5 \cdot N_{xframes} \cdot N_{sections} \cdot wt_{xframe} \cdot l_{xframe}}{Span_{total}} = 8.25 \text{ plf}$$

#### Connection Plates

##### Girder Splice Plates

$$w_{sp} := 9 \cdot \text{in}$$

$$t_{sp} := 1 \cdot \text{in}$$

Width of the girder splice plates  
Thickness of the girder splice plates

$$l_{sp} := 50 \cdot \text{in}$$

$$N_{sp} := 12$$

$$wt_{sp} := w_{sp} \cdot t_{sp} \cdot l_{sp} \cdot \gamma_{steel} = (1.251 \cdot 10^3) \frac{m}{s^2} \cdot lb$$

### Diaphragm Connection Plates

$$w_{cp} := 8 \cdot \text{in}$$

$$t_{cp} := \frac{3}{8} \cdot \text{in}$$

$$l_{cp} := 63 \cdot \text{in}$$

$$N_{cp} := N_{frames} \cdot 2 = 24$$

$$wt_{cp} := w_{cp} \cdot t_{cp} \cdot l_{cp} \cdot \gamma_{steel} = 525.575 \frac{m}{s^2} \cdot lb$$

$$wt_p := \frac{wt_{sp} \cdot N_{sp} + wt_{cp} \cdot N_{cp}}{Span_{total}} = 11.74 \text{ plf}$$

### Miscellaneous

$$wt_{misc\_ext} := 5 \cdot \text{plf}$$

$$wt_{misc\_int} := 10 \cdot \text{plf}$$

### Concrete Weight

#### Deck

$$wt_{deck} := \frac{Deck_T \cdot Bridge_W \cdot \gamma_{conc}}{N_{beams}} = (1.219 \cdot 10^3) \text{ plf}$$

#### Haunches

$$H_w := 0 \cdot \text{in}$$

$$wt_{haunch} := (H \cdot H_w - W_{flange} \cdot t_{flange}) \cdot \gamma_{conc} = -25.781 \text{ plf}$$

length of the girder splice plates

# of girder splices per girder

Width of the diaphragm connection plates

Thickness of the diaphragm connection plates

Length of the diaphragm connection plates

# of diaphragms per girder

Weight of additional steel per girder (bolts, welds, studs)

$$Deck_T = 11 \text{ in}$$

$$Bridge_W = 638.4 \text{ in}$$

$$\gamma_{conc} = 150 \text{ pcf}$$

Haunch width



## Superimposed Dead Loads

### Curbs

$$CurbR_w := 120 \cdot \text{in}$$

$$CurbL_w := 24 \cdot \text{in}$$

$$Curb_{ht} := 12 \cdot \text{in}$$

Width of right curb including sidewalk

Width of left curb including sidewalk

Height of curbs

$$wt_{curb} := \frac{(CurbR_w + CurbL_w) \cdot Curb_{ht} \cdot \gamma_{conc}}{N_{beams}} = 300 \text{ plf}$$

### Guardrail Loads

$$Rail := 20 \cdot \text{plf}$$

$$N_{rails} := 2$$

Weight of each guardrails

No. of guardrails

$$wt_{rail} := \frac{N_{rails} Rail}{N_{beams}} = 6.667 \text{ plf}$$

### Wearing Surface

$$wt_{ws} := \begin{cases} \text{if } WearingBit_T \neq 0 \\ \frac{WearingBit_T \cdot Roadway_W \cdot \gamma_{bit}}{N_{beams}} \\ \text{else} \\ \frac{WearingConc_T \cdot Roadway_W \cdot \gamma_{conc}}{N_{beams}} \end{cases} = 239.167 \text{ plf} \quad \text{Weight of wearing surface}$$

$$wt_{DC1} := wt_{girder} + wt_{plates} + wt_{diaphragm} + wt_p + wt_{deck} + wt_{haunch} + wt_{misc\_int} = (1.488 \cdot 10^3) \text{ plf} \quad \text{Weight of long term dead loads (interior girder)}$$

$$wt_{DC1\_ext} := wt_{girder} + wt_{plates} + wt_{diaphragm\_ext} + wt_p + wt_{deck} + wt_{haunch} + wt_{misc\_ext} = (1.474 \cdot 10^3) \text{ plf} \quad \text{Weight of long term dead loads (exterior girder)}$$

$$wt_{DC2} := wt_{curb} + wt_{rail} = 306.667 \text{ plf} \quad \text{Weight of superimposed dead loads}$$

## CAPACITY CHECKS

### Interior Girder - Positive Bending

$$L := \text{Span}_{L1} = 120 \text{ ft}$$

Length of span in which moments are being evaluated

$$M_{DC1} := 1507 \cdot \text{kip} \cdot \text{ft}$$

Max Moment output from Bridge Load Analysis using  $wt_{DC1}$

$$M_{DC2} := 310 \cdot \text{kip} \cdot \text{ft}$$

Max Moment output from Bridge Load Analysis using  $wt_{DC2}$

$$M_{DW} := 195 \cdot \text{kip} \cdot \text{ft}$$

Max Moment output from Bridge Load Analysis using  $wt_{ws}$

$$M_{LL} := 1984 \cdot \text{kip} \cdot \text{ft}$$

Max Moment output from Bridge Load Analysis using HL-93

$$IM := 33$$

Dynamic Load Allowance

Moment distribution factor  
for interior steel girders

$$g_{pos\_int} := \max \left( 0.06 + \left( \frac{S_{girders}}{14 \cdot \text{ft}} \right)^{0.4} \left( \frac{S_{girders}}{L} \right)^{0.3} \left( \frac{K_{g\_pos} \cdot \text{ft}}{12.0 L \cdot \text{Deck}_T^3 \cdot \text{in}} \right)^{0.1}, 0.075 + \left( \frac{S_{girders}}{9.5 \cdot \text{ft}} \right)^{0.6} \left( \frac{S_{girders}}{L} \right)^{0.2} \left( \frac{K_{g\_pos} \cdot \text{ft}}{12.0 L \cdot \text{Deck}_T^3 \cdot \text{in}} \right)^{0.1} \right) = 0.831$$

$$DC1 := M_{DC1}$$

$$DC2 := M_{DC2}$$

$$DW := M_{DW}$$

$$LL\_IM := M_{LL} \cdot \left( 1 + \frac{IM}{100} \right) \cdot g_{pos\_int}$$

Load Effects due to bridge moments

### Strength I - Inventory

$$F_{ad} := F_{yflange} - \gamma_{STI\_inv0} \cdot \frac{M_{DC1}}{S_{x\_pos}} - \gamma_{STI\_inv0} \cdot \frac{M_{DC2}}{S_{xLTC}} - \gamma_{STI\_inv1} \cdot \frac{M_{DW}}{S_{xLTC}} = 29.764 \text{ ksi}$$

Additional stress in the girder  
before yielding occurs

$$M_{ad} := \frac{F_{ad} \cdot S_{xSTC}}{\gamma_{STI\_inv2}} = (2.91 \cdot 10^3) \text{ kip} \cdot \text{ft}$$

Additional moment on girder  
before yielding occurs

$$M_y := \gamma_{STI\_inv0} \cdot M_{DC1} + \gamma_{STI\_inv0} \cdot M_{DC2} + \gamma_{STI\_inv1} \cdot M_{DW} + \gamma_{STI\_inv2} \cdot M_{ad} = (7.656 \cdot 10^3) \text{ kip} \cdot \text{ft}$$

Moment on girder when yielding occurs

$$M_n := \min (M_{n\_pos}, 1.3 \cdot R_h \cdot M_y) = (9.734 \cdot 10^3) \text{ (kip} \cdot \text{ft)}$$

Moment capacity of composite  
girder in positive bending

$$\varphi := 1$$

LRFD Resistance Factor

$$C := \varphi_c \cdot \varphi_c \cdot \varphi \cdot M_n = (9.734 \cdot 10^3) \text{ (kip} \cdot \text{ft)}$$

Strength Limit State Capacity

$$RF_{posM\_int\_STI\_INV} := \frac{C - \gamma_{STI\_inv_0} \cdot DC1 - \gamma_{STI\_inv_0} \cdot DC2 - \gamma_{STI\_inv_1} \cdot DW}{\gamma_{STI\_inv_2} \cdot LL\_IM} = 1.868$$

Rating Factor for positive bending of an interior girder in the STRENGTH I - INVENTORY load case

### Strength I - Operating

$$F_{ad} := F_{yflange} - \gamma_{STI\_op_0} \cdot \frac{M_{DC1}}{S_{x\_pos}} - \gamma_{STI\_op_0} \cdot \frac{M_{DC2}}{S_{xLTC}} - \gamma_{STI\_op_1} \cdot \frac{M_{DW}}{S_{xLTC}} = 29.764 \text{ ksi}$$

Additional stress in the girder before yielding occurs

$$M_{ad} := \frac{F_{ad} \cdot S_{xSTC}}{\gamma_{STI\_op_2}} = (3.772 \cdot 10^3) \text{ kip} \cdot \text{ft}$$

Additional moment on girder before yielding occurs

$$M_y := \gamma_{STI\_op_0} \cdot M_{DC1} + \gamma_{STI\_op_0} \cdot M_{DC2} + \gamma_{STI\_op_1} \cdot M_{DW} + \gamma_{STI\_op_2} \cdot M_{ad} = (7.656 \cdot 10^3) \text{ kip} \cdot \text{ft}$$

Moment on girder when yielding occurs

$$M_n := \min(M_{n\_pos}, 1.3 \cdot R_h \cdot M_y) = (9.734 \cdot 10^3) \text{ (kip} \cdot \text{ft)}$$

Moment capacity of composite girder in positive bending

$$\phi := 1$$

LRFD Resistance Factor

$$C := \phi_c \cdot \phi_c \cdot \phi \cdot M_n = (9.734 \cdot 10^3) \text{ (kip} \cdot \text{ft)}$$

Strength Limit State Capacity

$$RF_{posM\_int\_STI\_OP} := \frac{C - \gamma_{STI\_op_0} \cdot DC1 - \gamma_{STI\_op_0} \cdot DC2 - \gamma_{STI\_op_1} \cdot DW}{\gamma_{STI\_op_2} \cdot LL\_IM} = 2.422$$

Rating Factor for positive bending of an interior girder in the STRENGTH I - OPERATING load case

### Service II

$$C := f_{f\_bot\_pos} = 47.5 \text{ ksi}$$

Service Limit State Capacity - Allowable stress in tension flange

$$DC1 := \frac{M_{DC1}}{S_{x\_pos}} = 12.725 \text{ ksi}$$

$$DC2 := \frac{M_{DC2}}{S_{xLTC}} = 1.974 \text{ ksi}$$

Load Effects due to bridge moments

$$DW := \frac{M_{DW}}{S_{xLTC}} = 1.241 \text{ ksi}$$

$$LL\_IM := \frac{M_{LL} \cdot \left(1 + \frac{IM}{100}\right) \cdot g_{pos\_int}}{S_{xSTC}} = 12.819 \text{ ksi}$$

$$RF_{posM\_int\_SEII} := \frac{C - \gamma_{SEII_0} \cdot DC1 - \gamma_{SEII_0} \cdot DC2 - \gamma_{SEII_1} \cdot DW}{\gamma_{SEII_2} \cdot LL\_IM} = 1.894$$

Rating Factor for positive bending of an interior girder in the SERVICE II load case.

### Exterior Girder - Positive Bending

$$L := Span_{L1} = 120 \text{ ft}$$

Length of span in which moments are being evaluated

$$M_{DC1\_ext} := 1492 \cdot \text{kip} \cdot \text{ft}$$

Max Moment output from Bridge Load Analysis using  $wt_{DC1\_ext}$

$$M_{DC2} := 310 \cdot \text{kip} \cdot \text{ft}$$

Max Moment output from Bridge Load Analysis using  $wt_{DC2}$

$$M_{DW} := 195 \cdot \text{kip} \cdot \text{ft}$$

Max Moment output from Bridge Load Analysis using  $wt_{DW}$

$$M_{LL} := 1984 \cdot \text{kip} \cdot \text{ft}$$

Max Moment output from Bridge Load Analysis using HL-93

$$IM := 33$$

Dynamic Load Allowance

$$lever\_rule := .55$$

Distribution factor of Exterior Girder determined using the Lever Rule

$$d_e := 0 \cdot \text{ft}$$

Horizontal Distance from web of exterior girder to interior edge of curb or traffic barrier. Taken as positive if web is inboard of curb or traffic barrier.

$$e_{dis} := 0.77 + \frac{d_e}{9.1 \cdot \text{ft}} = 0.77$$

$$g_{pos\_ext} := \max(e_{dis} \cdot g_{pos\_int}, lever\_rule) = 0.64$$

Moment distribution factor for exterior steel girders

$$DC1 := M_{DC1\_ext}$$

$$DC2 := M_{DC2}$$

$$DW := M_{DW}$$

$$LL\_IM := M_{LL} \cdot \left(1 + \frac{IM}{100}\right) \cdot g_{pos\_ext}$$

Load Effects due to bridge moments

Moment distribution factor for interior steel girders

### Strength I - Inventory

$$F_{ad} := F_{yflange} - \gamma_{STI\_inv_0} \cdot \frac{M_{DC1\_ext}}{S_{x\_pos}} - \gamma_{STI\_inv_0} \cdot \frac{M_{DC2}}{S_{xLTC\_ext}} - \gamma_{STI\_inv_1} \cdot \frac{M_{DW}}{S_{xLTC\_ext}} = 29.719 \text{ ksi}$$

Additional stress in the girder before yielding occurs

$$M_{ad} := \frac{F_{ad} \cdot S_{xSTC\_ext}}{\gamma_{STI\_inv_2}} = (2.818 \cdot 10^3) \text{ kip} \cdot \text{ft}$$

Additional moment on girder before yielding occurs

$$M_y := \gamma_{STI\_inv_0} \cdot M_{DC1\_ext} + \gamma_{STI\_inv_0} \cdot M_{DC2} + \gamma_{STI\_inv_1} \cdot M_{DW} + \gamma_{STI\_inv_2} \cdot M_{ad} = (7.476 \cdot 10^3) \text{ kip} \cdot \text{ft}$$

Moment on girder when yielding occurs

$$M_n := \min(M_{n\_pos\_ext}, 1.3 \cdot R_h \cdot M_y) = (9.505 \cdot 10^3) \text{ (kip} \cdot \text{ft)}$$

Moment capacity of composite girder in positive bending

$$\begin{aligned} \varphi &:= 1 \\ C &:= \varphi_c \cdot \varphi_c \cdot \varphi \cdot M_n = (9.505 \cdot 10^3) \text{ (kip} \cdot \text{ft)} \end{aligned}$$

LRFD Resistance Factor  
Strength Limit State Capacity

$$RF_{posM\_ext\_STI\_INV} := \frac{C - \gamma_{STI\_inv_0} \cdot DC1 - \gamma_{STI\_inv_0} \cdot DC2 - \gamma_{STI\_inv_1} \cdot DW}{\gamma_{STI\_inv_2} \cdot LL\_IM} = 2.355$$

Rating Factor for positive bending of an exterior girder in the STRENGTH I - INVENTORY load case

### Strength I - Operating

$$F_{ad} := F_{yflange} - \gamma_{STI\_op_0} \cdot \frac{M_{DC1\_ext}}{S_{x\_pos}} - \gamma_{STI\_op_0} \cdot \frac{M_{DC2}}{S_{xLTC\_ext}} - \gamma_{STI\_op_1} \cdot \frac{M_{DW}}{S_{xLTC\_ext}} = 29.719 \text{ ksi}$$

$$M_{ad} := \frac{F_{ad} \cdot S_{xSTC\_ext}}{\gamma_{STI\_op_2}} = (3.652 \cdot 10^3) \text{ kip} \cdot \text{ft}$$

$$M_y := \gamma_{STI\_op_0} \cdot M_{DC1\_ext} + \gamma_{STI\_op_0} \cdot M_{DC2} + \gamma_{STI\_op_1} \cdot M_{DW} + \gamma_{STI\_op_2} \cdot M_{ad} = (7.476 \cdot 10^3) \text{ kip} \cdot \text{ft}$$

$$M_n := \min(M_{n\_pos\_ext}, 1.3 \cdot R_h \cdot M_y) = (9.505 \cdot 10^3) \text{ (kip} \cdot \text{ft)}$$

$$\begin{aligned} \varphi &:= 1 \\ C &:= \varphi_c \cdot \varphi_c \cdot \varphi \cdot M_n = (9.505 \cdot 10^3) \text{ (kip} \cdot \text{ft)} \end{aligned}$$

LRFD Resistance Factor  
Strength Limit State Capacity

$$RF_{posM\_ext\_STI\_OP} := \frac{C - \gamma_{STI\_op_0} \cdot DC1 - \gamma_{STI\_op_0} \cdot DC2 - \gamma_{STI\_op_1} \cdot DW}{\gamma_{STI\_op_2} \cdot LL\_IM} = 3.053$$

Rating Factor for positive bending of an exterior girder in the STRENGTH I - OPERATING load case

### Service II

$$C := f_{f\_bot\_pos\_ext} = 47.5 \text{ ksi}$$

Service Limit State Capacity - Allowable stress in tension flange

$$DC1 := \frac{M_{DC1\_ext}}{S_{x\_pos}} = 12.599 \text{ ksi}$$

$$M_{DC2}$$

$$DC2 := \frac{M_{DC2}}{S_{xLTC\_ext}} = 2.066 \text{ ksi}$$

Load Effects due to bridge moments

$$DW := \frac{M_{DW}}{S_{xLTC\_ext}} = 1.3 \text{ ksi}$$

$$LL\_IM := \frac{M_{LL} \cdot \left(1 + \frac{IM}{100}\right) \cdot g_{pos\_ext}}{S_{xSTC\_ext}} = 10.178 \text{ ksi}$$

$$RF_{posM\_ext\_SEI} := \frac{C - \gamma_{SEI0} \cdot DC1 - \gamma_{SEI0} \cdot DC2 - \gamma_{SEI1} \cdot DW}{\gamma_{SEI2} \cdot LL\_IM} = 2.383$$

Rating Factor for positive bending of an exterior girder in the SERVICE II load case.

### Interior Girder - Negative Bending

$$L := \frac{Span_{L1} + Span_{L2}}{2} = 120 \text{ ft}$$

Length of span in which moments are being evaluated

$$M_{DC1} := 2678 \cdot \text{kip} \cdot \text{ft}$$

$$M_{DC2} := 551 \cdot \text{kip} \cdot \text{ft}$$

$$M_{DW} := 347 \cdot \text{kip} \cdot \text{ft}$$

$$M_{LL} := 2165 \cdot \text{kip} \cdot \text{ft}$$

Max Moment output from Bridge Load Analysis using  $wt_{DC1}$

Max Moment output from Bridge Load Analysis using  $wt_{DC2}$

Max Moment output from Bridge Load Analysis using  $wt_{DW}$

Max Moment output from Bridge Load Analysis using HL-93

$$IM := 33$$

Dynamic Load Allowance

Moment distribution factor for interior steel girders

$$g_{neg\_int} := \max \left( 0.06 + \left( \frac{S_{girders}}{14 \cdot \text{ft}} \right)^{0.4} \left( \frac{S_{girders}}{L} \right)^{0.3} \left( \frac{K_{g\_neg} \cdot \text{ft}}{12.0 L \cdot Deck_T^3 \cdot \text{in}} \right)^{0.1}, 0.075 + \left( \frac{S_{girders}}{9.5 \cdot \text{ft}} \right)^{0.6} \left( \frac{S_{girders}}{L} \right)^{0.2} \left( \frac{K_{g\_neg} \cdot \text{ft}}{12.0 L \cdot Deck_T^3 \cdot \text{in}} \right)^{0.1} \right) = 0.847$$

### Compression Flange

$$DC1 := \frac{M_{DC1}}{S_{x\_comp\_neg\_bf}} = 12.15 \text{ ksi}$$

$$DC2 := \frac{M_{DC2}}{S_{x\_comp\_neg\_bf}} = 2.5 \text{ ksi}$$

Load Effects due to bridge moments

$$M_{DW}$$

$$DW := \frac{M_{DW}}{S_{x\_comp\_neg\_bf}} = 1.574 \text{ ksi}$$

$$LL\_IM := \frac{M_{LL} \cdot \left(1 + \frac{IM}{100}\right) \cdot g_{neg\_int}}{S_{x\_comp\_neg\_bf}} = 11.07 \text{ ksi}$$

### Strength I - Inventory

$$RF_{negM\_CF\_int\_STI\_INV} := \frac{F_{nc} - \gamma_{STI\_inv_0} \cdot DC1 - \gamma_{STI\_inv_0} \cdot DC2 - \gamma_{STI\_inv_1} \cdot DW}{\gamma_{STI\_inv_2} \cdot LL\_IM} = 1.452$$

Rating Factor for allowable stress in the compression flange during negative bending of an interior girder in the STRENGTH I - INVENTORY load case

### Strength I - Operating

$$RF_{negM\_CF\_int\_STI\_OP} := \frac{F_{nc} - \gamma_{STI\_op_0} \cdot DC1 - \gamma_{STI\_op_0} \cdot DC2 - \gamma_{STI\_op_1} \cdot DW}{\gamma_{STI\_op_2} \cdot LL\_IM} = 1.882$$

Rating Factor for allowable stress in the compression flange during negative bending of an interior girder in the STRENGTH I - OPERATING load case

### Service II

$$RF_{negM\_CF\_int\_SEII} := \frac{f_{f\_bot\_neg} - \gamma_{SEII_0} \cdot DC1 - \gamma_{SEII_0} \cdot DC2 - \gamma_{SEII_1} \cdot DW}{\gamma_{SEII_2} \cdot LL\_IM} = 2.173$$

Rating Factor for allowable stress in the compression flange during negative bending of an interior girder in the SERVICE II load case

### Tension Flange

$$DC1 := \frac{M_{DC1}}{S_{x\_comp\_neg\_tf}} = 9.204 \text{ ksi}$$

$$DC2 := \frac{M_{DC2}}{S_{x\_comp\_neg\_tf}} = 1.894 \text{ ksi}$$

Load Effects due to bridge moments

$$DW := \frac{M_{DW}}{S_{x\_comp\_neg\_tf}} = 1.193 \text{ ksi}$$

-- ( IM \

$$LL_{IM} := \frac{M_{LL} \cdot \left(1 + \frac{IM}{100}\right) \cdot g_{neg\_int}}{S_{x\_comp\_neg\_tf}} = 8.386 \text{ ksi}$$

### Strength I - Inventory

$$RF_{negM\_TF\_int\_STI\_INV} := \frac{F_{nt} - \gamma_{STI\_inv_0} \cdot DC1 - \gamma_{STI\_inv_0} \cdot DC2 - \gamma_{STI\_inv_1} \cdot DW}{\gamma_{STI\_inv_2} \cdot LL_{IM}} = 2.258$$

Rating Factor for allowable stress in the tension flange during negative bending of an interior girder in the STRENGTH I - INVENTORY load case

### Strength I - Operating

$$RF_{negM\_TF\_int\_STI\_OP} := \frac{F_{nt} - \gamma_{STI\_op_0} \cdot DC1 - \gamma_{STI\_op_0} \cdot DC2 - \gamma_{STI\_op_1} \cdot DW}{\gamma_{STI\_op_2} \cdot LL_{IM}} = 2.927$$

Rating Factor for allowable stress in the tension flange during negative bending of an interior girder in the STRENGTH I - OPERATING load case

### Service II

$$RF_{negM\_TF\_int\_SEII} := \frac{f_{f\_top\_neg} - \gamma_{SEII_0} \cdot DC1 - \gamma_{SEII_0} \cdot DC2 - \gamma_{SEII_1} \cdot DW}{\gamma_{SEII_2} \cdot LL_{IM}} = 3.23$$

Rating Factor for allowable stress in the tension flange during negative bending of an interior girder in the SERVICE II load case

### Reinforcing Steel

$$DC1 := \frac{M_{DC1}}{S_{x\_comp\_neg\_rt}} = 11.465 \text{ ksi}$$

$$DC2 := \frac{M_{DC2}}{S_{x\_comp\_neg\_rt}} = 2.359 \text{ ksi}$$

Load Effects due to bridge moments

$$DW := \frac{M_{DW}}{S_{x\_comp\_neg\_rt}} = 1.486 \text{ ksi}$$

$$LL_{IM} := \frac{M_{LL} \cdot \left(1 + \frac{IM}{100}\right) \cdot g_{neg\_int}}{S_{x\_comp\_neg\_rt}} = 10.446 \text{ ksi}$$



### Strength I - Inventory

$$RF_{negM\_RS\_int\_STI\_INV} := \frac{F_{y\_rebar} - \gamma_{STI\_inv_0} \cdot DC1 - \gamma_{STI\_inv_0} \cdot DC2 - \gamma_{STI\_inv_1} \cdot DW}{\gamma_{STI\_inv_2} \cdot LL\_IM} = 1.121$$

Rating Factor stress in the rebar during negative bending of an interior girder in the STRENGTH I - INVENTORY load case (not a requirement of AASHTO or MaineDOT load ratings)

### Strength I - Operating

$$RF_{negM\_RS\_int\_STI\_OP} := \frac{F_{y\_rebar} - \gamma_{STI\_op_0} \cdot DC1 - \gamma_{STI\_op_0} \cdot DC2 - \gamma_{STI\_op_1} \cdot DW}{\gamma_{STI\_op_2} \cdot LL\_IM} = 1.453$$

Rating Factor for stress in the rebar during negative bending of an interior girder in the STRENGTH I - OPERATING load case (not a requirement of AASHTO or MaineDOT load ratings)

### ***Exterior Girder - Negative Bending***

$$L := \frac{Span_{L1} + Span_{L2}}{2} = 120 \text{ ft}$$

Length of span in which moments are being evaluated

$$M_{DC1\_ext} := 2653 \cdot \text{kip} \cdot \text{ft}$$

$$M_{DC2} := 551 \cdot \text{kip} \cdot \text{ft}$$

$$M_{DW} := 347 \cdot \text{kip} \cdot \text{ft}$$

Max Moment output from Bridge Load Analysis using  $wt_{DC1\_ext}$

Max Moment output from Bridge Load Analysis using  $wt_{DC2}$

Max Moment output from Bridge Load Analysis using  $wt_{DW}$

$$M_{LL} := 2165 \cdot \text{kip} \cdot \text{ft}$$

Max Moment output from Bridge Load Analysis using HL-93

$$IM := 33$$

Dynamic Load Factor

$$lever\_rule := .55$$

Distribution factor of Exterior Girder determined using the Lever Rule

$$d_e := 4 \cdot \text{ft}$$

Horizontal Distance from web of exterior girder to interior edge of curb or traffic barrier. Taken as positive if web is inboard of curb or traffic barrier.

$$e_{dis} := 0.77 + \frac{d_e}{9.1 \cdot \text{ft}} = 1.21$$

$$g_{neg\_ext} := \max(e_{dis} \cdot g_{neg\_int}, lever\_rule) = 1.025$$

Moment distribution factor for exterior steel girders

### Compression Flange

$$DC1 := \frac{M_{DC1\_ext}}{S_{x\_comp\_neg\_ext\_bf}} = 12.308 \text{ ksi}$$

$$DC2 := \frac{M_{DC2}}{S_{x\_comp\_neg\_ext\_bf}} = 2.556 \text{ ksi}$$

Load Effects due to bridge moments

$$DW := \frac{M_{DW}}{S_{x\_comp\_neg\_ext\_bf}} = 1.61 \text{ ksi}$$

$$LL\_IM := \frac{M_{LL} \cdot \left(1 + \frac{IM}{100}\right) \cdot g_{neg\_ext}}{S_{x\_comp\_neg\_ext\_bf}} = 13.692 \text{ ksi}$$

### Strength I - Inventory

$$RF_{negM\_CF\_ext\_STI\_INV} := \frac{F_{nc\_ext} - \gamma_{STI\_inv_0} \cdot DC1 - \gamma_{STI\_inv_0} \cdot DC2 - \gamma_{STI\_inv_1} \cdot DW}{\gamma_{STI\_inv_2} \cdot LL\_IM} = 1.165$$

Rating Factor for allowable stress in the compression flange during negative bending of an exterior girder in the STRENGTH I - INVENTORY load case

### Strength I - Operating

$$RF_{negM\_CF\_ext\_STI\_OP} := \frac{F_{nc\_ext} - \gamma_{STI\_op_0} \cdot DC1 - \gamma_{STI\_op_0} \cdot DC2 - \gamma_{STI\_op_1} \cdot DW}{\gamma_{STI\_op_2} \cdot LL\_IM} = 1.51$$

Rating Factor for allowable stress in the compression flange during negative bending of an exterior girder in the STRENGTH I - OPERATING load case

### Service II

$$RF_{negM\_CF\_ext\_SEII} := \frac{f_{f\_bot\_neg\_ext} - \gamma_{SEII_0} \cdot DC1 - \gamma_{SEII_0} \cdot DC2 - \gamma_{SEII_1} \cdot DW}{\gamma_{SEII_2} \cdot LL\_IM} = 1.743$$

Rating Factor for allowable stress in the compression flange during negative bending of an exterior girder in the SERVICE II load case

### Tension Flange

$$DC1 := \frac{M_{DC1}}{S_{x\_comp\_neg\_ext\_tf}} = 10.39 \text{ ksi}$$

$$DC2 := \frac{M_{DC2}}{S_{x\_comp\_neg\_ext\_tf}} = 2.138 \text{ ksi}$$

Load Effects due to bridge moments

$$M_{DW}$$

$$DW := \frac{M_{DW}}{S_{x\_comp\_neg\_ext\_tf}} = 1.346 \text{ ksi}$$

$$LL\_IM := \frac{M_{LL} \cdot \left(1 + \frac{IM}{100}\right) \cdot g_{neg\_ext}}{S_{x\_comp\_neg\_ext\_tf}} = 11.45 \text{ ksi}$$

### Strength I - Inventory

$$RF_{negM\_TF\_ext\_STI\_INV} := \frac{F_{nt\_ext} - \gamma_{STI\_inv_0} \cdot DC1 - \gamma_{STI\_inv_0} \cdot DC2 - \gamma_{STI\_inv_1} \cdot DW}{\gamma_{STI\_inv_2} \cdot LL\_IM} = 1.558$$

Rating Factor for allowable stress in the tension flange during negative bending of an exterior girder in the STRENGTH I - INVENTORY load case

### Strength I - Operating

$$RF_{negM\_TF\_ext\_STI\_OP} := \frac{F_{nt\_ext} - \gamma_{STI\_op_0} \cdot DC1 - \gamma_{STI\_op_0} \cdot DC2 - \gamma_{STI\_op_1} \cdot DW}{\gamma_{STI\_op_2} \cdot LL\_IM} = 2.02$$

Rating Factor for allowable stress in the tension flange during negative bending of an exterior girder in the STRENGTH I - OPERATING load case

### Service II

$$RF_{negM\_TF\_ext\_SEII} := \frac{f_{f\_top\_neg\_ext} - \gamma_{SEII_0} \cdot DC1 - \gamma_{SEII_0} \cdot DC2 - \gamma_{SEII_1} \cdot DW}{\gamma_{SEII_2} \cdot LL\_IM} = 2.259$$

Rating Factor for allowable stress in the tension flange during negative bending of an exterior girder in the SERVICE II load case

### Reinforcing Steel

$$DC1 := \frac{M_{DC1}}{S_{x\_comp\_neg\_ext\_rt}} = 12.806 \text{ ksi}$$

$$DC2 := \frac{M_{DC2}}{S_{x\_comp\_neg\_ext\_rt}} = 2.635 \text{ ksi}$$

Load Effects due to bridge moments

$$DW := \frac{M_{DW}}{S_{x\_comp\_neg\_ext\_rt}} = 1.659 \text{ ksi}$$

-- ( IM )

$$LL\_IM := \frac{M_{LL} \cdot \left(1 + \frac{IM}{100}\right) \cdot g_{neg\_ext}}{S_{x\_comp\_neg\_ext\_rt}} = 14.113 \text{ ksi}$$

### Strength I - Inventory

$$RF_{negM\_RS\_ext\_STI\_INV} := \frac{F_{y\_rebar} - \gamma_{STI\_inv_0} \cdot DC1 - \gamma_{STI\_inv_0} \cdot DC2 - \gamma_{STI\_inv_1} \cdot DW}{\gamma_{STI\_inv_2} \cdot LL\_IM} = 0.737$$

Rating Factor for stress in the rebar during negative bending of an exterior girder in the STRENGTH I - INVENTORY load case (not a requirement of AASHTO or MaineDOT load ratings)

### Strength I - Operating

$$RF_{negM\_RS\_ext\_STI\_OP} := \frac{F_{y\_rebar} - \gamma_{STI\_op_0} \cdot DC1 - \gamma_{STI\_op_0} \cdot DC2 - \gamma_{STI\_op_1} \cdot DW}{\gamma_{STI\_op_2} \cdot LL\_IM} = 0.956$$

Rating Factor for stress in the rebar during negative bending of an exterior girder in the STRENGTH I - OPERATING load case (not a requirement of AASHTO or MaineDOT load ratings)

### Girder Shear - Interior Support

$$L := Span_{L1} = 120 \text{ ft}$$

Length of span in which moments are being evaluated

$$V_{DC1} := 112 \cdot \text{kip}$$

$$V_{DC2} := 22.9 \cdot \text{kip}$$

$$V_{DW} := 14.4 \cdot \text{kip}$$

$$V_{LL} := 104 \cdot \text{kip}$$

Max Shear output from Bridge Load Analysis using  $wt_{DC1}$

Max Shear output from Bridge Load Analysis using  $wt_{DC2}$

Max Shear output from Bridge Load Analysis using  $wt_{DW}$

Max Shear output from Bridge Load Analysis using HL-93

$$IM := 33$$

Dynamic Load Factor

$$g_{shear\_int} := \max \left( 0.36 + \left( \frac{S_{girders}}{25 \cdot \text{ft}} \right), 0.2 + \left( \frac{S_{girders}}{12 \cdot \text{ft}} \right) - \left( \frac{S_{girders}}{35 \cdot \text{ft}} \right)^2 \right) = 1.145$$

Shear distribution factor for interior steel girders

$$DC1 := V_{DC1}$$

$$DC2 := V_{DC2}$$

$$DW := V_{DW}$$

$$LL\_IM := V_{LL} \cdot \left(1 + \frac{IM}{100}\right) \cdot g_{shear\_int}$$

Load Effects due to bridge shears

## Strength I - Inventory

$$RF_{shear\_int\_STI\_INV} := \frac{V_{n\_int\_neg} - \gamma_{STI\_inv_0} \cdot DC1 - \gamma_{STI\_inv_0} \cdot DC2 - \gamma_{STI\_inv_1} \cdot DW}{\gamma_{STI\_inv_2} \cdot LL\_IM} = 2.226$$

Rating Factor for allowable shear of an interior web section STRENGTH I - INVENTORY load case

## Strength I - Operating

$$RF_{shear\_int\_STI\_OP} := \frac{V_{n\_int\_neg} - \gamma_{STI\_op_0} \cdot DC1 - \gamma_{STI\_op_0} \cdot DC2 - \gamma_{STI\_op_1} \cdot DW}{\gamma_{STI\_op_2} \cdot LL\_IM} = 2.886$$

Rating Factor for allowable shear of an interior web section STRENGTH I - OPERATING load case

## Girder Shear - End Support

$$L := Span_{L1} = 120 \text{ ft}$$

Length of span in which moments are being evaluated

$$V_{DC1\_ext} := 67 \cdot kip$$

Max Shear output from Bridge Load Analysis using  $wt_{DC1\_ext}$

$$V_{DC2} := 13.8 \cdot kip$$

Max Shear output from Bridge Load Analysis using  $wt_{DC2}$

$$V_{DW} := 8.66 \cdot kip$$

Max Shear output from Bridge Load Analysis using  $wt_{DW}$

$$V_{LL} := 86.7 \cdot kip$$

Max Shear output from Bridge Load Analysis using HL-93

$$IM := 33$$

Dynamic Impact Factor

$$lever\_rule := .715$$

Distribution factor of Exterior Girder determined using the Lever Rule

$$d_e := 4 \cdot ft$$

Horizontal Distance from web of exterior girder to interior edge of curb or traffic barrier. Taken as postivite if web is inboard or curb or traffic barrier.

$$e_{dis} := 0.6 + \frac{d_e}{10 \cdot ft} = 1$$

$$g_{shear\_ext} := \max(e_{dis} \cdot g_{shear\_int}, lever\_rule) = 1.145$$

Shear distribution factor for an exterior girder

$$DC1 := V_{DC1}$$

$$DC2 := V_{DC2}$$

$$DW := V_{DW}$$

$$LL\_IM := V_{LL} \cdot \left(1 + \frac{IM}{100}\right) \cdot g_{shear\_ext}$$

Load Effects due to bridge shears

### Strength I - Inventory

$$RF_{shear\_end\_STI\_INV} := \frac{V_{n\_end} - \gamma_{STI\_inv_0} \cdot DC1 - \gamma_{STI\_inv_0} \cdot DC2 - \gamma_{STI\_inv_1} \cdot DW}{\gamma_{STI\_inv_2} \cdot LL\_IM} = 3.23$$

Rating Factor for allowable shear of  
an end web section STRENGTH I -  
INVENTORY load case

### Strength I - Operating

$$RF_{shear\_end\_STI\_OP} := \frac{V_{n\_end} - \gamma_{STI\_op_0} \cdot DC1 - \gamma_{STI\_op_0} \cdot DC2 - \gamma_{STI\_op_1} \cdot DW}{\gamma_{STI\_op_2} \cdot LL\_IM} = 4.187$$

Rating Factor for allowable shear of  
an end web section STRENGTH I -  
OPERATING load case

## APPENDIX D

### STAAD Input Data and Moment/Shear Summary Report



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## Nodes

Node	X (ft)	Y (ft)	Z (ft)
1	0.000	0.000	0.000
2	90.000	0.000	0.000
3	120.000	0.000	0.000
4	150.000	0.000	0.000
5	240.000	0.000	0.000

## Beams

Beam	Node A	Node B	Length (ft)	Property	$\beta$ (degrees)
1	1	2	90.000	1	0
2	2	3	30.000	1	0
3	3	4	30.000	1	0
4	4	5	90.000	1	0

## Materials

Mat	Name	E (kip/in <sup>2</sup> )	$\nu$	Density (kip/in <sup>3</sup> )	$\alpha$ (1/°F)
1	STEEL	29E+3	0.300	0.000	6.5E -6
2	STAINLESSSTEEL	28E+3	0.300	0.000	9.9E -6
3	ALUMINUM	10E+3	0.330	0.000	12.8E -6
4	CONCRETE	3.15E+3	0.170	0.000	5.5E -6

## Supports

Node	X (kip/in)	Y (kip/in)	Z (kip/in)	rX (kip*ft/deg)	rY (kip*ft/deg)	rZ (kip*ft/deg)
1	Fixed	Fixed	Fixed	-	-	-
3	Fixed	Fixed	Fixed	-	-	-
5	Fixed	Fixed	Fixed	-	-	-

## Basic Load Cases

Number	Name
1	DC1
2	DC2
3	DW
4	DC1_EXT
5	DESIGN LANE
486	90% DESIGN LANE





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## Moving Load Definition : Type 1

Width (ft)
-

Force (kip)	Distance (ft)
32.000	-
32.000	14.000
8.000	14.000

## Moving Load Definition : Type 2

Width (ft)
-

Force (kip)	Distance (ft)
32.000	-
32.000	22.000
8.000	14.000

## Moving Load Definition : Type 3

Width (ft)
-

Force (kip)	Distance (ft)
32.000	-
32.000	30.000
8.000	14.000

## Moving Load Definition : Type 4

Width (ft)
-

Force (kip)	Distance (ft)
25.000	-
25.000	4.000



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## Moving Load Definition : Type 5

**Width**

(ft)

-

Force (kip)	Distance (ft)
7.200	-
28.800	14.000
28.800	14.000
7.200	100.000
28.800	14.000
28.800	14.000

## Beam Force Detail Summary

Sign convention as diagrams:- positive above line, negative below line except Fx where positive is compression. Distance d is given from beam end A.

	L/C	Beam	d (ft)	Axial	Shear		Torsion	Bending	
				Fx (kip)	Fy (kip)	Fz (kip)	Mx (kip-ft)	My (kip-ft)	Mz (kip-ft)
Max Fx	1:DC1	1	0.000	<b>0.000</b>	66.960	0.000	0.000	0.000	0.000
Min Fx	1:DC1	1	0.000	<b>0.000</b>	66.960	0.000	0.000	0.000	0.000
Max Fy	1:DC1	3	0.000	0.000	<b>111.600</b>	0.000	0.000	0.000	2.68E+3
Min Fy	1:DC1	2	30.000	-0.000	<b>-111.600</b>	-0.000	-0.000	-0.000	2.68E+3
Max Fz	1:DC1	1	0.000	0.000	66.960	<b>0.000</b>	0.000	0.000	0.000
Min Fz	1:DC1	1	0.000	0.000	66.960	<b>0.000</b>	0.000	0.000	0.000
Max Mx	1:DC1	1	0.000	0.000	66.960	0.000	<b>0.000</b>	0.000	0.000
Min Mx	1:DC1	1	0.000	0.000	66.960	0.000	<b>0.000</b>	0.000	0.000
Max My	1:DC1	1	0.000	0.000	66.960	0.000	0.000	<b>0.000</b>	0.000
Min My	1:DC1	1	0.000	0.000	66.960	0.000	0.000	<b>0.000</b>	0.000
Max Mz	1:DC1	2	30.000	-0.000	-111.600	-0.000	-0.000	-0.000	<b>2.68E+3</b>
Min Mz	26:LOAD GENI	1	45.000	0.000	4.389	0.000	0.000	0.000	<b>-1.96E+3</b>

## Beam Maximum Forces by Section Property

Section		Axial	Shear		Torsion	Bending	
		Max Fx (kip)	Max Fy (kip)	Max Fz (kip)	Max Mx (kip-ft)	Max My (kip-ft)	Max Mz (kip-ft)
Prismatic General	Max +ve	0.000	111.600	0.000	0.000	0.000	2.68E+3
	Max -ve	0.000	-111.600	0.000	0.000	0.000	-1.98E+3



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## Beam Maximum Moments

*Distances to maxima are given from beam end A.*

L/C	Beam	Node A	Length (ft)		d (ft)	Max My (kip-ft)	d (ft)	Max Mz (kip-ft)
1:DC1	1	1	90.000	Max -ve	0.000	0.000	0.000	0.000
				Max +ve	0.000	0.000	45.000	-1.51E+3
	2	2	30.000	Max -ve	0.000	0.000	30.000	2.68E+3
				Max +ve	0.000	0.000	0.000	-0.000
	3	3	30.000	Max -ve	0.000	0.000	0.000	2.68E+3
				Max +ve	0.000	0.000	30.000	-0.000
	4	4	90.000	Max -ve	0.000	0.000		
				Max +ve	0.000	0.000	45.000	-1.51E+3
2:DC2	1	1	90.000	Max -ve	0.000	0.000	0.000	0.000
				Max +ve	0.000	0.000	45.000	-309.825
	2	2	30.000	Max -ve	0.000	0.000	30.000	550.800
				Max +ve	0.000	0.000	0.000	-0.000
	3	3	30.000	Max -ve	0.000	0.000	0.000	550.800
				Max +ve	0.000	0.000	30.000	-0.000
	4	4	90.000	Max -ve	0.000	0.000	90.000	0.000
				Max +ve	0.000	0.000	45.000	-309.825
3:DW	1	1	90.000	Max -ve	0.000	0.000	90.000	0.000
				Max +ve	0.000	0.000	45.000	-194.906
	2	2	30.000	Max -ve	0.000	0.000	30.000	346.500
				Max +ve	0.000	0.000		
	3	3	30.000	Max -ve	0.000	0.000	0.000	346.500
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	0.000
				Max +ve	0.000	0.000	45.000	-194.906
4:DC1_EXT	1	1	90.000	Max -ve	0.000	0.000	90.000	0.000
				Max +ve	0.000	0.000	45.000	-1.49E+3
	2	2	30.000	Max -ve	0.000	0.000	30.000	2.65E+3
				Max +ve	0.000	0.000		
	3	3	30.000	Max -ve	0.000	0.000	0.000	2.65E+3
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	0.000
				Max +ve	0.000	0.000	45.000	-1.49E+3
5:DESIGN LAN	1	1	90.000	Max -ve	0.000	0.000	90.000	0.000
				Max +ve	0.000	0.000	45.000	-487.013
	2	2	30.000	Max -ve	0.000	0.000	30.000	865.800
				Max +ve	0.000	0.000		
	3	3	30.000	Max -ve	0.000	0.000	0.000	865.800
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	0.000
				Max +ve	0.000	0.000	45.000	-487.013
6:LOAD GENE	1	1	90.000	Max -ve	0.000	0.000	0.000	0.000
				Max +ve	0.000	0.000	30.000	-896.241
	2	2	30.000	Max -ve	0.000	0.000	30.000	1.03E+3
				Max +ve	0.000	0.000	0.000	-45.448



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**Beam Maximum Moments Cont...**

L/C	Beam	Node A	Length (ft)		d (ft)	Max My (kip-ft)	d (ft)	Max Mz (kip-ft)
	3	3	30.000	Max -ve	0.000	0.000	0.000	1.03E+3
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	122.624
				Max +ve	0.000	0.000	45.000	-425.701
26:LOAD GENI	1	1	90.000	Max -ve	0.000	0.000		
				Max +ve	0.000	0.000	52.500	-1.98E+3
	2	2	30.000	Max -ve	0.000	0.000	30.000	1.59E+3
				Max +ve	0.000	0.000	0.000	-347.030
	3	3	30.000	Max -ve	0.000	0.000	0.000	1.59E+3
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	540.970
				Max +ve	0.000	0.000	60.000	-252.577
67:LOAD GENI	1	1	90.000	Max -ve	0.000	0.000	90.000	237.769
				Max +ve	0.000	0.000	37.500	-374.414
	2	2	30.000	Max -ve	0.000	0.000	30.000	1.18E+3
				Max +ve	0.000	0.000		
	3	3	30.000	Max -ve	0.000	0.000	0.000	1.18E+3
				Max +ve	0.000	0.000	30.000	-374.213
	4	4	90.000	Max -ve	0.000	0.000		
				Max +ve	0.000	0.000	37.500	-691.775
496:LOAD GENI	1	1	90.000	Max -ve	0.000	0.000	90.000	121.626
				Max +ve	0.000	0.000	52.500	-1.5E+3
	2	2	30.000	Max -ve	0.000	0.000	30.000	2.17E+3
				Max +ve	0.000	0.000		
	3	3	30.000	Max -ve	0.000	0.000	0.000	2.17E+3
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	143.226
				Max +ve	0.000	0.000	45.000	-1.49E+3

**Beam Maximum Shear Forces***Distances to maxima are given from beam end A.*

L/C	Beam	Node A	Length (ft)		d (ft)	Max Fz (kip)	d (ft)	Max Fy (kip)
1:DC1	1	1	90.000	Max -ve	0.000	0.000	0.000	66.960
				Max +ve	0.000	0.000	90.000	-66.960
	2	2	30.000	Max -ve	0.000	0.000		
				Max +ve	0.000	0.000	30.000	-111.600
	3	3	30.000	Max -ve	0.000	0.000	0.000	111.600
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	66.960
				Max +ve	0.000	0.000	90.000	-66.960
2:DC2	1	1	90.000	Max -ve	0.000	0.000	0.000	13.770
				Max +ve	0.000	0.000	90.000	-13.770
	2	2	30.000	Max -ve	0.000	0.000		



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**Beam Maximum Shear Forces Cont...**

L/C	Beam	Node A	Length (ft)		d (ft)	Max Fz (kip)	d (ft)	Max Fy (kip)
				Max +ve	0.000	0.000	30.000	-22.950
	3	3	30.000	Max -ve	0.000	0.000	0.000	22.950
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	13.770
				Max +ve	0.000	0.000	90.000	-13.770
3:DW	1	1	90.000	Max -ve	0.000	0.000	0.000	8.662
				Max +ve	0.000	0.000	90.000	-8.662
	2	2	30.000	Max -ve	0.000	0.000		
				Max +ve	0.000	0.000	30.000	-14.437
	3	3	30.000	Max -ve	0.000	0.000	0.000	14.437
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	8.662
				Max +ve	0.000	0.000	90.000	-8.662
4:DC1_EXT	1	1	90.000	Max -ve	0.000	0.000	0.000	66.330
				Max +ve	0.000	0.000	90.000	-66.330
	2	2	30.000	Max -ve	0.000	0.000		
				Max +ve	0.000	0.000	30.000	-110.550
	3	3	30.000	Max -ve	0.000	0.000	0.000	110.550
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	66.330
				Max +ve	0.000	0.000	90.000	-66.330
5:DESIGN LAN	1	1	90.000	Max -ve	0.000	0.000	0.000	21.645
				Max +ve	0.000	0.000	90.000	-21.645
	2	2	30.000	Max -ve	0.000	0.000		
				Max +ve	0.000	0.000	30.000	-36.075
	3	3	30.000	Max -ve	0.000	0.000	0.000	36.075
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	21.645
				Max +ve	0.000	0.000	90.000	-21.645
6:LOAD GENE	1	1	90.000	Max -ve	0.000	0.000	0.000	86.680
				Max +ve	0.000	0.000	90.000	-28.610
	2	2	30.000	Max -ve	0.000	0.000		
				Max +ve	0.000	0.000	30.000	-43.040
	3	3	30.000	Max -ve	0.000	0.000	0.000	37.437
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	23.007
				Max +ve	0.000	0.000	90.000	-20.283
26:LOAD GENI	1	1	90.000	Max -ve	0.000	0.000	0.000	58.034
				Max +ve	0.000	0.000	90.000	-57.256
	2	2	30.000	Max -ve	0.000	0.000		
				Max +ve	0.000	0.000	30.000	-71.686
	3	3	30.000	Max -ve	0.000	0.000	0.000	42.086
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	27.656
				Max +ve	0.000	0.000	90.000	-15.634



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**Beam Maximum Shear Forces Cont...**

L/C	Beam	Node A	Length (ft)		d (ft)	Max Fz (kip)	d (ft)	Max Fy (kip)
67:LOAD GENI	1	1	90.000	Max -ve	0.000	0.000	0.000	19.003
				Max +ve	0.000	0.000	90.000	-24.287
	2	2	30.000	Max -ve	0.000	0.000		
				Max +ve	0.000	0.000	30.000	-38.717
	3	3	30.000	Max -ve	0.000	0.000	0.000	103.917
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	17.487
				Max +ve	0.000	0.000	90.000	-25.803
496:LOAD GENI	1	1	90.000	Max -ve	0.000	0.000	0.000	42.134
				Max +ve	0.000	0.000	90.000	-61.636
	2	2	30.000	Max -ve	0.000	0.000		
				Max +ve	0.000	0.000	30.000	-74.626
	3	3	30.000	Max -ve	0.000	0.000	0.000	73.906
				Max +ve	0.000	0.000		
	4	4	90.000	Max -ve	0.000	0.000	0.000	60.916
				Max +ve	0.000	0.000	90.000	-42.854

## APPENDIX E

### Bridge Inspection Photos





Looking southerly on Parkway South



Looking northerly on Parkway South



General view

1562

Brewer



General view

Parkway South/I-395

12/11/2012





Northerly joint (Typ.)



Northerly abutment



Northerly wing/seat - note heavy cracking



Bearing (Typ.)





Southerly abutment



Southerly abutment



Girders/pier



Girder/drain – rust is worst case

1562

Brewer

Parkway South/I-395

12/11/2012





Roadway looking south



North joint



Ws view



South joint

1562

Brewer

Parkway South I-395

1-5-2015





south abutment



Debris on bridge seat south abutment



South span view



Typical of columns

1562

Brewer

Parkway South I-395

1-5-2015





Heavy cracking & staining at SE wing turn



north span view



north abutment



Wrapped east pier column

## APPENDIX F

### Original Plans and Drawings

BILL OF MATERIAL									
MARK	NO.	SECTION	FL.	INCHES	MAT.	REMARKS			
ONE EXP. JT. 2EJA ABUT. #1									
1M1	1	AS-400 STRIP SEAL	85	0	NEOP	SHOP INSTALL			
2M2	2	TYPE "F" EXTRUSION	30	2 3/16	A588				
2M2	2	TYPE "F" EXTRUSION	30	0 15/16					
2M2	2	TYPE "F" EXTRUSION	0	8 5/8					
2M2	2	TYPE "F" EXTRUSION	0	8 5/8					
2M2	1	ANGLE 4 x 4 x 3/8	87	7 3/8	A36				
2M2	1	ANGLE 4 x 4 x 3/8	87	7 3/8					
2M2	1	ANGLE 3 1/2 x 3 1/2 x 3/8	1	0					
2M2	1	ANGLE 3 1/2 x 3 1/2 x 3/8	1	0					
2M2	32	ANGLE 5 x 3 x 1/2	0	3					
2M2	136	1/2 DIA STUD	0	8	A108				
2M2	134	1/2 DIA STUD	0	8	A108				
2M2	18	1/2 DIA THRD ROD	0	8	A307	W/4N + 4W			
2M2	6	BAR 1/2 x 3	1	4	A157	1019			
2M2	6	7/8 DIA H.S.B.	0	2 1/4	A325	W/N & W			
2M2	1	PL 3/8 x 1'-5 1/2"	2	4 5/16	A36	CHECKERED			
2M2	1	PL 3/8 x 11 1/2"	2	1 7/16	A36				
2M2	1	PL 3/8 x 2"	1	8 1/2	A36	CHECKERED			
2M2	1	PL 3/8 x 8"	0	11 1/8	A36				
2M2	1	PL 3/8 x 8 1/4"	0	10 1/16					
2M2	1	PL 3/8 x 8 1/8"	1	11 3/4					
2M2	1	PL 3/8 x 11 7/16"	0	8 5/16					
2M2	1	PL 3/8 x 11 3/16"	0	1 7/8					
2M2	1	PL 3/8 x 11 1/2"	0	4					
2M2	1	PL 3/8 x 11 1/4"	0	4					
2M2	18	1/2 DIA STUD	0	8	A108				
2M2	8	3/4 DIA STUD	0	4	A108				
2M2	1	PL 3/8 x 1'-5 1/2"	10	0	A36	CHECKERED			
2M2	1	PL 3/8 x 8 1/8"	2	0	A36				
2M2	1	PL 3/8 x 11 1/2"	9	3 11/16					
2M2	1	PL 3/8 x 8 1/4"	0	10 7/16					
2M2	1	PL 3/8 x 8"	0	10 1/16					
2M2	1	PL 3/8 x 2"	8	11 11/16	A36	CHECKERED			
2M2	1	PL 3/8 x 11 3/4"	1	2 1/8	A36				
2M2	1	PL 3/8 x 11 3/4"	0	4					
2M2	1	PL 3/8 x 11 3/16"	0	4					
2M2	1	PL 3/8 x 11 1/8"	0	4 13/16					
2M2	31	1/2 DIA STUD	0	8	A108				
2M2	8	3/4 DIA STUD	0	4	A108				
2M2	3	PL 3/8 x 4"	0	9	A36				
2M2	3	PL 3/8 x 4"	0	9	A36				
2M2	3	3/4 DIA BOLT	0	2	A307	W/N & W			
2M2	1	LIFTING DEVICES	0	2	A307	W/N & W			
2M2	1	ANGLE 8 x 4 x 1/2	0	3	A36	BY SHOP			
2M2	1	ANGLE 8 x 4 x 1/2	0	3					
2M2	1	ANGLE 8 x 4 x 1/2	1	2 3/4					
2M2	1	3/4 DIA HSB	0	2 1/2	A325	W/N & W			
BILL FOR GCS1, ABUT. #2 NORTH CURB									
2M2	3	PL 3/8 x 4"	0	9	A36				
2M2	3	PL 3/8 x 4"	0	9					
2M2	1	PL 3/8 x 1'-5 1/2"	9	9 1/2	A36	CHECKERED			
2M2	1	PL 3/8 x 2"	9	1 3/4		CHECKERED			
2M2	1	PL 3/8 x 11 1/2"	9	8 11/16	A36				
2M2	1	PL 3/8 x 11 3/8"	1	1 7/8					
2M2	1	PL 3/8 x 4"	0	11 3/8					
2M2	1	PL 3/8 x 4"	0	11 9/16					
2M2	1	PL 3/8 x 5 1/8"	0	11 1/2					
2M2	1	PL 3/8 x 8 1/8"	1	11 5/8					
2M2	1	PL 3/8 x 8 1/4"	0	9 3/4					
2M2	1	PL 3/8 x 9"	0	11 1/8					
2M2	3	3/4 DIA BOLT	0	2	A307				
2M2	31	1/2 DIA STUD	0	8	A108				
2M2	8	3/4 DIA STUD	0	4	A108				
2M2	16	1/2 DIA THRD ROD	0	6	A307	W/4N + 4W			
2M2	16	WOOD BLOCKING							

#### GENERAL NOTES

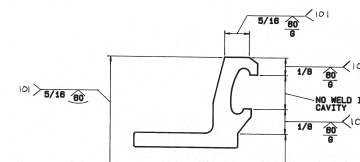
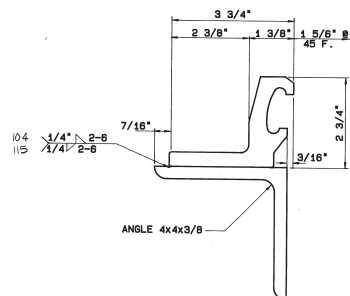
- ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH STATE OF MAINE, STATE HIGHWAY COMMISSION, HIGHWAYS STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION CURRENT EDITION WITH REVISIONS AND THE SPECIAL NOTES APPLICABLE TO THIS PROJECT.
- ALL STRUCTURAL EXTRUSIONS SHALL BE ASTM A-588 ALL STRUCTURAL STEEL SHALL BE ASTM A-36 UNLESS NOTED.
- ALL WELDING SHALL CONFORM TO A.W.S. SPECIFICATIONS D.1.1.-80, & M.D.O.T. SUPPL. SPEC. DATED 11/9/81
- ALL METAL SURFACES OF THE JOINT TO BE IN DIRECT CONTACT WITH THE NEOPRENE SEAL SHALL BE THOROUGHLY SANDING AND SOLVENT CLEANED BEFORE THE APPLICATION OF ADHESIVE.
- THE SEAL SHALL BE INSTALLED USING ACME PRIMA-LUB ADHESIVE.
- ALL SURFACES SHALL BE BRIT BLASTED TO SSPC-SP6 COMMERCIAL BLAST CLEAN. ALL SURFACES NOT EMBEDDED IN CONCRETE OR IN DIRECT CONTACT WITH THE SEAL SHALL BE PAINTED WITH ONE COAT FIRST COAT ORANGE AND ONE COAT OF SECOND COAT MARON LEAD SILTOD CHROMATE PAINT. EACH COAT SHALL BE APPLIED AT 4 MILS NET FILM THICKNESS. PAINT SUPPLIER IS PRISMO UNIVERSAL CORP. EAST POINT, GEORGIA.
- ALL EXTRUSION SPLICES SHALL DEVELOP FULL STRENGTH.
- PRIOR TO THE START OF FABRICATION, THE CONTRACTOR SHALL VERIFY ALL EXPANSION JOINT DIMENSIONS TO INSURE PROPER FIT TO ADJOINING MEMBERS.
- ALL THERMAL MOVEMENT CHARTS ARE BASED ON A TEMPERATURE RANGE OF -30 F. TO 120 F.
- ALL PRESETTING ANGLES AND LIFTING DEVICES SHALL BE PAINTED RED.
- THE SEAL SHALL BE INSTALLED AND BONDED TO THE STEEL WITH ACME PRIMA-LUB ADHESIVE.
- THE SEAL SHALL BE SUPPLIED AND INSTALLED IN ONE CONTINUOUS PIECE.
- ALL ELEVATIONS AND DIMENSIONS ARE TO BE VERIFIED BY THE FIELD ENGINEER.
- ANY DISCREPANCIES THAT MAY EXIST BETWEEN THE CONTRACT DRAWINGS AND ACTUAL FIELD CONDITIONS, THE FIELD ENGINEER OR ARCHITECT IS TO BE CONTACTED AND INFORMED OF ANY SUCH DISCREPANCIES.
- INSPECTION BY M.D.O.T.

#### INSTALLATION NOTES

- CARE SHALL BE TAKEN THAT THE JOINT WIDTH IS UNIFORM ACROSS ITS ENTIRE LENGTH.
- TOP OF EXPANSION JOINT TO BE PROTECTED DURING PLACEMENT OF CONCRETE.
- THE EXPANSION JOINT SHALL BE PLACED INTO FINAL POSITION AND ADJUSTED TO THE PROPER ELEVATION BY THE CONTRACTOR.
- AFTER JOINT ASSEMBLY HAS BEEN TIED IN TO THE BRIDGES SUPERSTRUCTURE AND ALL ADJUSTMENTS HAVE BEEN MADE, ALL PRESET DEVICES ARE TO BE REMOVED.
- THE CONTRACTOR SHALL ENSURE THAT ALL LIFTING OF THE EXPANSION JOINT ASSEMBLY IS ONLY PREFORMED BY USING THE LIFTING DEVICES PROVIDED.
- PRIOR TO FINAL PLACEMENT, THE ASSEMBLY SHALL BE ADJUSTED ON THE SITE TO ITS FINAL PRESET WIDTH.
- CONCRETE PLACEMENT SHALL BE IN ACCORDANCE WITH STATE SPECIFICATIONS.

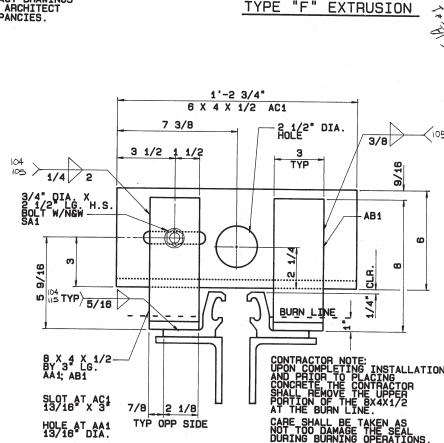
\* OPENING OF AS-400 STRIP SEAL SYSTEM

TEMPERATURE ADJUSTMENT TABLE									
BASED ON TEMPERATURE CHANGE OF -30 TO +120									
MARK	TYPE	OPENING *	MINIMUM	MAXIMUM	15 F	30 F	45 F	60 F	75 F
2EJA	AS 400	1/4	4 1/4	1 1/2	1 3/8	1 5/16	1 3/16	1 1/8	15/16
									13/16



WELD DETAIL

#### TYPE "F" EXTRUSION



SHOP NOTE:  
SHOP SHALL DETERMINE THE QUANTITY  
AND LOCATION REQUIRED FOR THE  
LIFTING DEVICES AT THE EXPANSION  
JOINT.

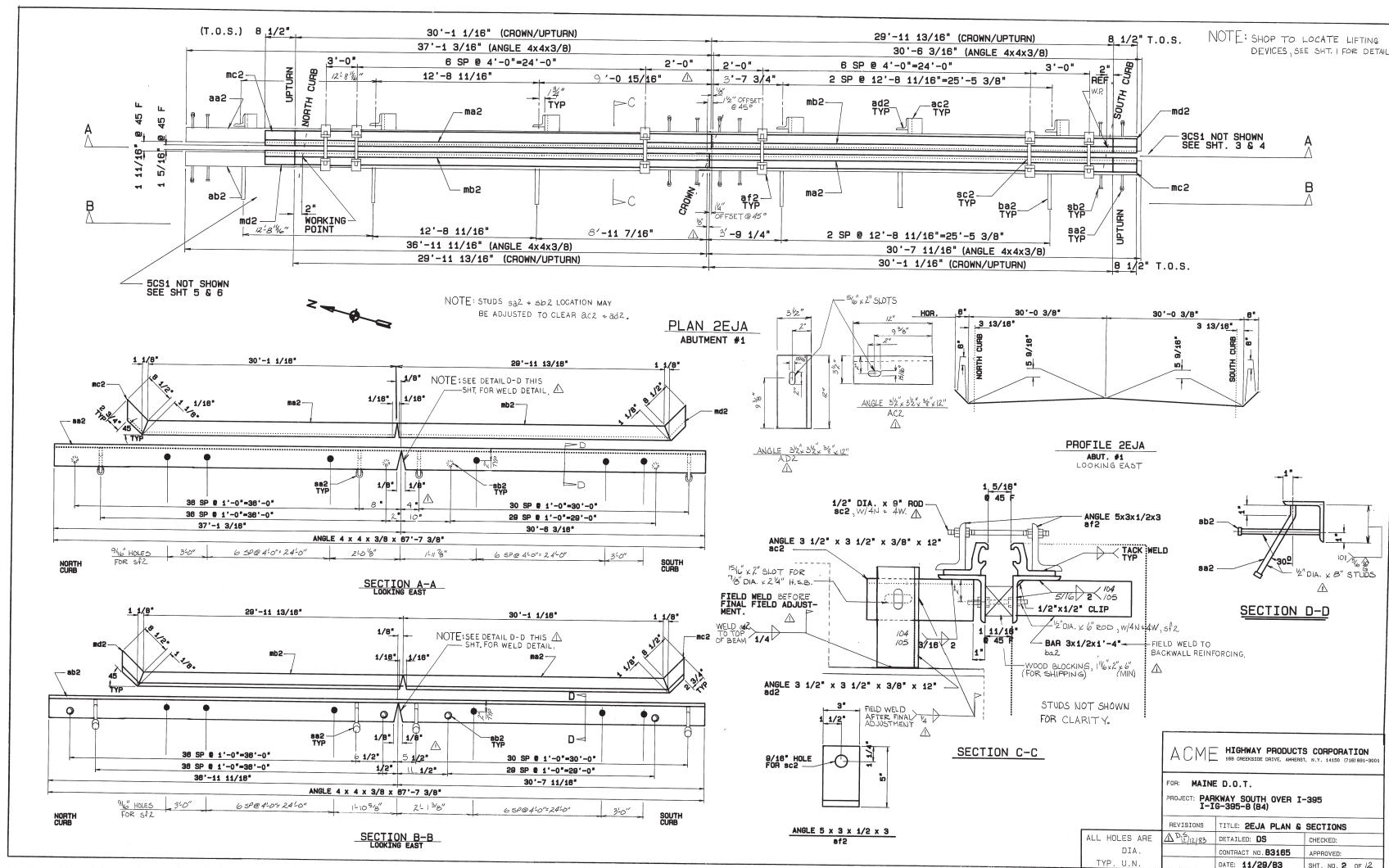
#### LIFT DEVICE

ALL HOLES ARE  
DIA.  
TYP. U.N.

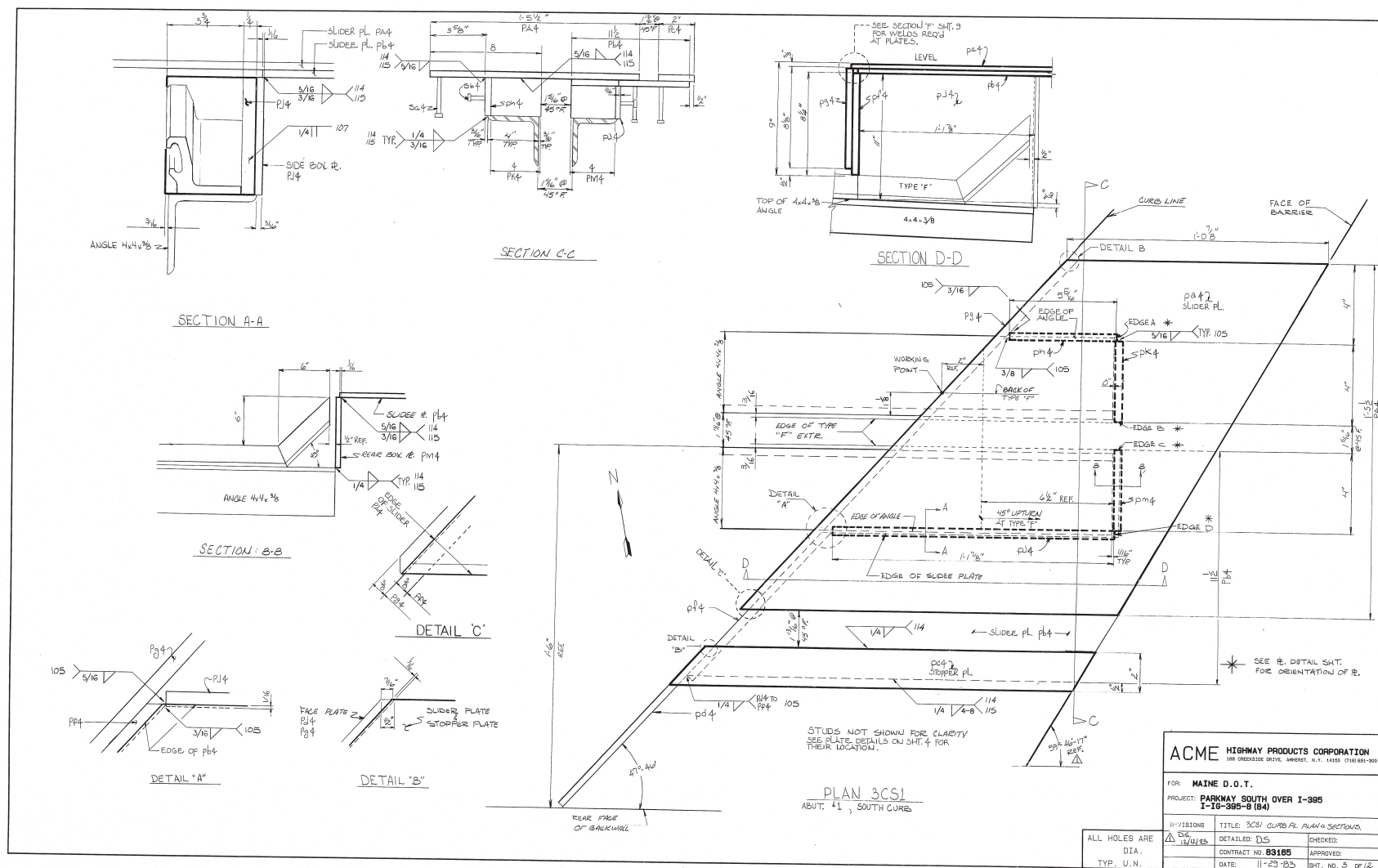
ACME HIGHWAY PRODUCTS CORPORATION			
FOR: MAINE D.O.T.			
PROJECT: PARKWAY SOUTH OVER I-395			
I-16-395-8 (84)			
REVISIONS	TITLE: 2EJA B.O.M. & NOTES		
1	DETAILED: DS	CHECKED:	
	CONTRACT NO. B3185	APPROVED:	
	DATE: 11/30/83	SHT. NO. 1 OF 12	

181-9

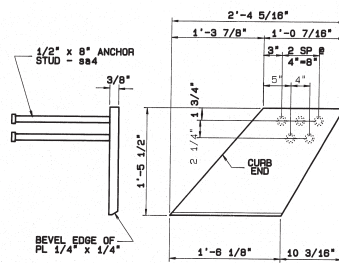




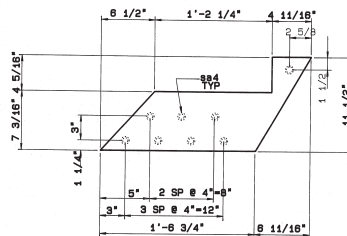




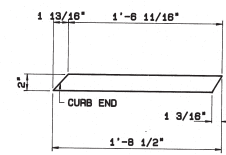
181-1



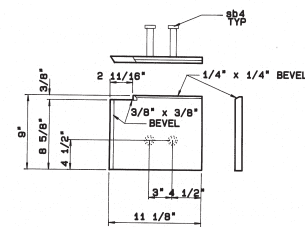
1 - PLATE - pa4  
3/8" x 1'-5 1/2" x 2'-4 5/16"



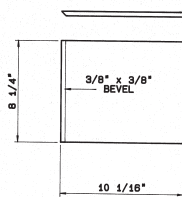
1 - PLATE - pb4  
3/8" x 11 1/2" x 2'-1 7/16"



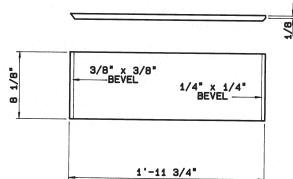
1 - PLATE - pc4  
3/8" x 2" x 1'-8 1/2"



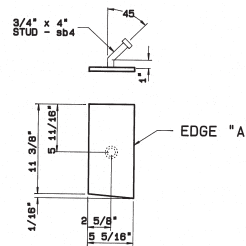
1 - PLATE - pd4  
3/8" x 9" x 11 1/8"



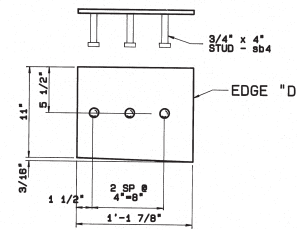
1 - PLATE - pf4  
3/8" x 8 1/4" x 10 1/16"



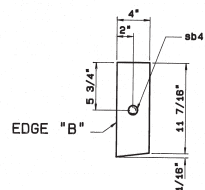
1 - PLATE - pg4  
3/8" x 8 1/8" x 1'-11 3/4"



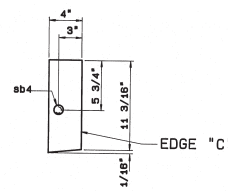
1 - PLATE - ph4  
3/8" x 11 7/16" x 5 5/16"



1 - PLATE - pi4  
3/8" x 11 3/16" x 1'-1 7/8"



1 - PLATE - pk4  
3/8" x 11 1/2" x 4"



1 - PLATE - pm4  
3/8" x 11 1/4" x 4"

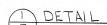
1/2" DIA. x 8" STUDS - sb4  
3/4" DIA. x 4" STUDS - sb4

ACME HIGHWAY PRODUCTS CORPORATION  
585 GREENSIDE DRIVE, ARKIST, N.Y. 14005 (716) 881-3901

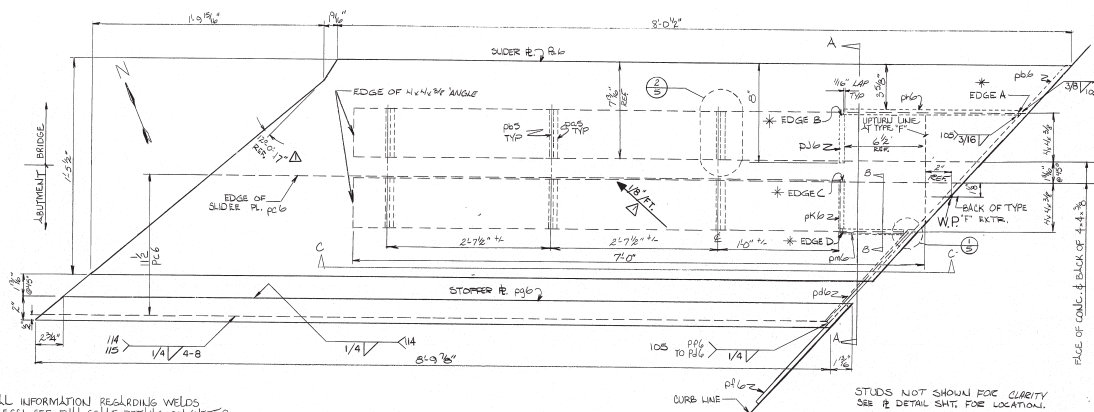
FOR: MAINE D.O.T.	
PROJECT: PARKWAY SOUTH OVER I-395 I-19-395-B (84)	
REVISIONS	TITLE: 3CS1 PL. DETAILS
Detailed: RICHARDSON	CHECKED:
CONTRACT NO. 83165	APPROVED:
DATE: 11/29/83	SHT. NO. 4 OF 12

ALL HOLES ARE  
DIA.  
TYP. U.N.

181-12

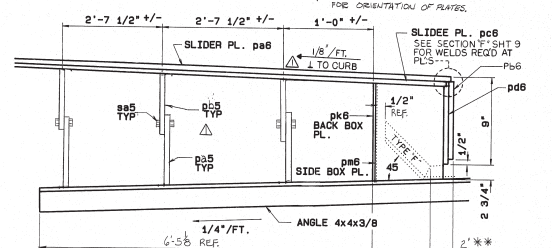


SECTION B-B



PLAN 5CS1

ABUT. #1, NORTH CURB



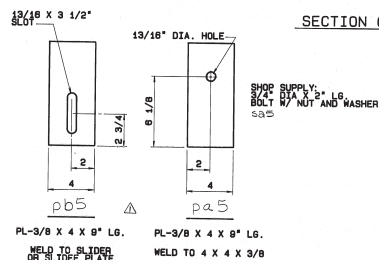
SECTION C-C

\*\* = MEASURED FROM W.P. (SEE PLAN)



## INSTALLATION PROCEDURE FOR PLATE PB5

- 1) SHOP SHALL LOCATE AND WELD PLATE PB5 TO 4 X 4 X 3/8 AS INDICATED ON THE SHOP DRAWINGS
- 2) COMPLETE CURB ASSEMBLY AND WELD CURB SECTION INCLUDING UPTURN BOX TO THE EXPANSION JOINTS AS INDICATED ON THE SHOP DRAWINGS
- 3) SHOP TO ADJUST CURB ASSEMBLY TO PROPER GRADE AND TACK WELD TEMPORARY SUPPORTS TO ALLOW FOR INSTALLATION OF PLATE PB5
- 4) BUTT PB5 TO PLATE PB4, ADJUST HEIGHT AS REQUIRED AND INSTALL 3/4" DIA. BOLT, WELD PLATE PB5 TO THE UNDERPLATE AS NOTED. PLATE PB5 SHOULD BE AT AN APPROX. 1/8" TO 1/2" 12 BEVEL AS INDICATED ON THE PLAN & DETAIL.



<h1>ACME</h1>		<h2>HIGHWAY PRODUCTS CORPORATION</h2>	
100 CREEKSIDE DRIVE, AMHERST, N.Y. 14350 (716) 695-3031			
FOR: <b>MAINE D.O.T.</b>			
PROJECT: <b>PARKWAY SOUTH OVER I-395</b> <b>I-10-395-B (84)</b>			
REVISIONS	TITLE: <b>5051 CURB PL. PLAN + SECTION</b>		
1. <b>DS</b> <b>2/12/85</b>	DETAILED: <b>RICHARDSON</b>	CHECKED:	
	CONTRACT NO. <b>83185</b>	APPROVED:	
	DATE: <b>1/12/85</b>	SHT NO. <b>5</b> OF <b>12</b>	

181-13



<h1>ACME</h1>			<h2>HIGHWAY PRODUCTS CORPORATION</h2>		
508 GREENSIDE DRIVE, ARNEGIST, N.Y. 14550 (716) 693-3030					
FOR: <b>MAINE D.O.T.</b>					
PROJECT: <b>PARKWAY SOUTH OVER I-395</b> <b>I-10-395-B (84)</b>					
REVISIONS		TITLE:		5C51 CURB PL. DETAILS	
1 J.E.S. 12-15-85		DETAILED: <b>RICHARDSON</b>		CHECKED:	
		CONTRACT NO. <b>83165</b>		APPROVED:	
		DATE: <b>11-28-85</b>		SHT. NO. <b>8</b> OF <b>12</b>	

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BILL OF MATERIAL					
MARK	NO.	SECTION	LENGTH FT. INCHES	MAT.	REMARKS
		ONE EXP. JT. BEJB ABUT. #2			
1W7	1	AS-400 STRIP SEAL	85 0	NEOP	SHOP INSTALL
mb8	1	TYPE "F" EXTRUSION	30 2 9/16	A588	
mc8	1	TYPE "F" EXTRUSION	30 0 15/16		
md8	1	TYPE "F" EXTRUSION	0 9 5/8		
mf8	1	TYPE "F" EXTRUSION	0 9 5/8		
mg8	1	TYPE "F" EXTRUSION	30 1 3/4		
mh8	1	TYPE "F" EXTRUSION	30 3		
mi8	1	TYPE "F" EXTRUSION	0 8 11/16		
mj8	1	TYPE "F" EXTRUSION	0 8 11/16		
mk8	1	ANGLE 4 x 4 x 3/8	87 7 3/8	A36	
ml8	1	ANGLE 4 x 4 x 3/8	87 7 3/8		
nm8	8	ANGLE 3 1/2 x 3 1/2 x 3/8	1 0		
no8	8	ANGLE 3 1/2 x 3 1/2 x 3/8	1 0		
pf8	32	ANGLE 3 x 3 x 1/2	0 3		
q8	8	BAR 1/2 x 3	1 4		
rb8	136	1/2 DIA STUD	0 8	A108	
sd8	134	1/2 DIA STUD	0 8	A108	
te8	18	1/2 DIA FULL THRD ROD	0 8	A307	W/ 4N & 4W
uf8	8	7/8 DIA H.S.S.	0 2 1/4	A325	W/ N & W
vf8	18	1/2 DIA FULL THRD ROD	0 8	A307	W/ 4N & 4W
wd8	8	WOOD BLOCKING 1 1/16 x 2	0 8		
		10CS1 SLIDER PL. ASSEMBLY			
ph12	1	PL 3/8 x 11 1/2	2 8 3/8	A1020	CHECKERED
pb12	1	PL 3/8 x 11 1/2	1 10 1/2	A36	
pc12	1	PL 3/8 x 2	1 8 5/16	A1020	CHECKERED
pd12	1	PL 3/8 x 8	0 10 1/16	A36	
pe12	1	PL 3/8 x 8 1/8	2 0		
pf12	1	PL 3/8 x 8 1/4	0 10 1/4		
pg12	1	PL 3/8 x 2 5/8	0 11 1/16		
ph12	1	PL 3/8 x 4	0 11 1/8		
pi12	1	PL 3/8 x 4	0 11 1/8		
pj12	1	PL 3/8 x 11 9/16	0 11 9/16		
sk12	15	1/2 DIA STUD	0 11 15/16	A108	
sl12	4	3/4 DIA STUD	0 4	A108	
		LIFTING DEVICE			
sa7	8W	ANGLE 8 x 4 x 1/2	0 3	A36	DETERMINED
sb7	8W	ANGLE 8 x 4 x 1/2	0 3		BY SHOP
sc7	8W	ANGLE 8 x 4 x 1/2	1 2 3/4		
sd7	8W	3/4 DIA H.S.S.	0 2 1/2	A325	W/ N & W
		N = ESTIMATED QUANTITY			
		SEE SHT. 1 FOR 9CS1 SLIDER PL. ASSEMBLY B.O.M.			

#### INSTALLATION NOTES

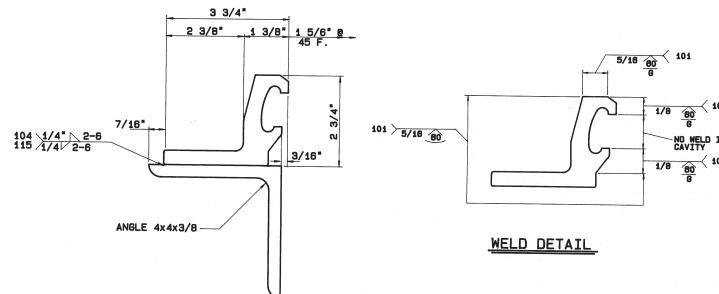
- CARE SHALL BE TAKEN THAT THE JOINT WIDTH IS UNIFORM ACROSS ITS ENTIRE LENGTH.
- TOP OF EXPANSION JOINT TO BE PROTECTED DURING PLACEMENT OF CONCRETE.
- THE EXPANSION JOINT SHALL BE PLACED INTO FINAL POSITION AND ADJUSTED TO THE PROPER ELEVATION BY THE CONTRACTOR.
- AFTER JOINT ASSEMBLY HAS BEEN TIED IN TO THE BRIDGES SUPERSTRUCTURE AND ALL ADJUSTMENTS HAVE BEEN MADE, ALL PRESET DEVICES ARE TO BE REMOVED.
- THE CONTRACTOR SHALL ENSURE THAT ALL LIFTING OF THE EXPANSION JOINT ASSEMBLY IS ONLY PERFORMED BY USING THE LIFTING DEVICES PROVIDED.
- PRIOR TO FINAL PLACEMENT, THE ASSEMBLY SHALL BE ADJUSTED ON THE SITE TO ITS FINAL PRESET WIDTH.
- CONCRETE PLACEMENT SHALL BE IN ACCORDANCE WITH STATE SPECIFICATIONS.

#### GENERAL NOTES

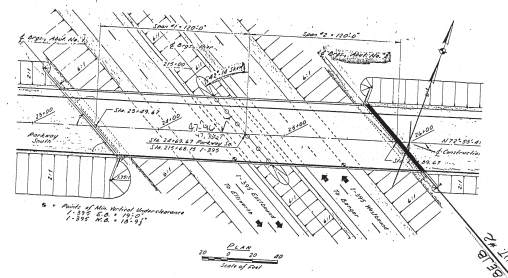
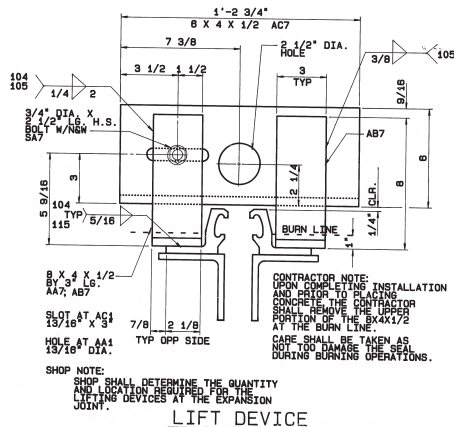
- ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH STATE OF MAINE STATE HIGHWAY COMMISSION, HIGHWAYS STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION CURRENT EDITION WITH REVISIONS AND THE SPECIAL NOTES APPLICABLE TO THIS PROJECT.
- ALL STRUCTURAL EXTRUSIONS SHALL BE ASTM A-588 ALL STRUCTURAL STEEL SHALL BE ASTM A-36 UNLESS NOTED.
- ALL WELDING SHALL CONFORM TO A.W.S. SPECIFICATIONS D.1.1.-80. & M.D.O.T. SUPPL. SPEC. DATED 11/9/81
- ALL METAL SURFACES OF THE JOINT TO BE IN DIRECT CONTACT WITH THE NEOPRENE SEAL SHALL BE THOROUGHLY SANDBLASTED AND SOLVENT CLEANED BEFORE THE APPLICATION OF ADHESIVE.
- THE SEAL SHALL BE INSTALLED USING ACME PRIMA-LUB ADHESIVE.
- ALL SURFACES SHALL BE GRIT BLASTED TO SSPC-SP6 COMMERCIAL BLAST CLEAN. ALL SURFACES NOT EMBEDDED IN CONCRETE OR IN DIRECT CONTACT WITH THE SEAL SHALL BE PAINTED WITH ONE COAT FIRST COAT ORANGE AND ONE COAT OF SECOND COAT MARON LEAD SILICO CHROMATE PAINT. EACH COAT SHALL BE APPLIED AT 4 MILS WET FILM THICKNESS. PAINT SUPPLIER IS PRISMO UNIVERSAL CORP. EAST POINT, GEORGIA.
- ALL EXTRUSION SPLICES SHALL DEVELOP FULL STRENGTH.
- PRIOR TO THE START OF FABRICATION, THE CONTRACTOR SHALL VERIFY ALL EXPANSION JOINT DIMENSIONS TO INSURE PROPER FIT TO ADJOINING MEMBERS.
- ALL THERMAL MOVEMENT CHARTS ARE BASED ON A TEMPERATURE RANGE OF -30 F. TO 120 F.
- ALL PRESETTING ANGLES AND LIFTING DEVICES SHALL BE PAINTED RED.
- THE SEAL SHALL BE INSTALLED AND BONDED TO THE STEEL WITH ACME PRIMA-LUB ADHESIVE.
- THE SEAL SHALL BE SUPPLIED AND INSTALLED IN ONE CONTINUOUS PIECE.
- ALL ELEVATIONS AND DIMENSIONS ARE TO BE VERIFIED BY THE FIELD ENGINEER.
- ANY DISCREPANCIES THAT MAY EXIST BETWEEN THE CONTRACT DRAWINGS AND ACTUAL FIELD CONDITIONS, THE FIELD ENGINEER OR ARCHITECT IS TO BE CONTACTED AND INFORMED OF ANY SUCH DISCREPANCIES.
- INSPECTION BY M.D.O.T.

\* OPENING OF AS-400 STRIP SEAL SYSTEM

TEMPERATURE ADJUSTMENT TABLE									
BASED ON TEMPERATURE CHANGE OF -30 TO +120									
MARK	TYPE	OPENING *		15 F	30 F	45 F	60 F	75 F	90 F
		MINIMUM	MAXIMUM						
AS	400	1/4	4 1/4	1 1/2	1 3/8	1 5/16	1 3/16	1 1/8	15/16
BEJB	400								13/16



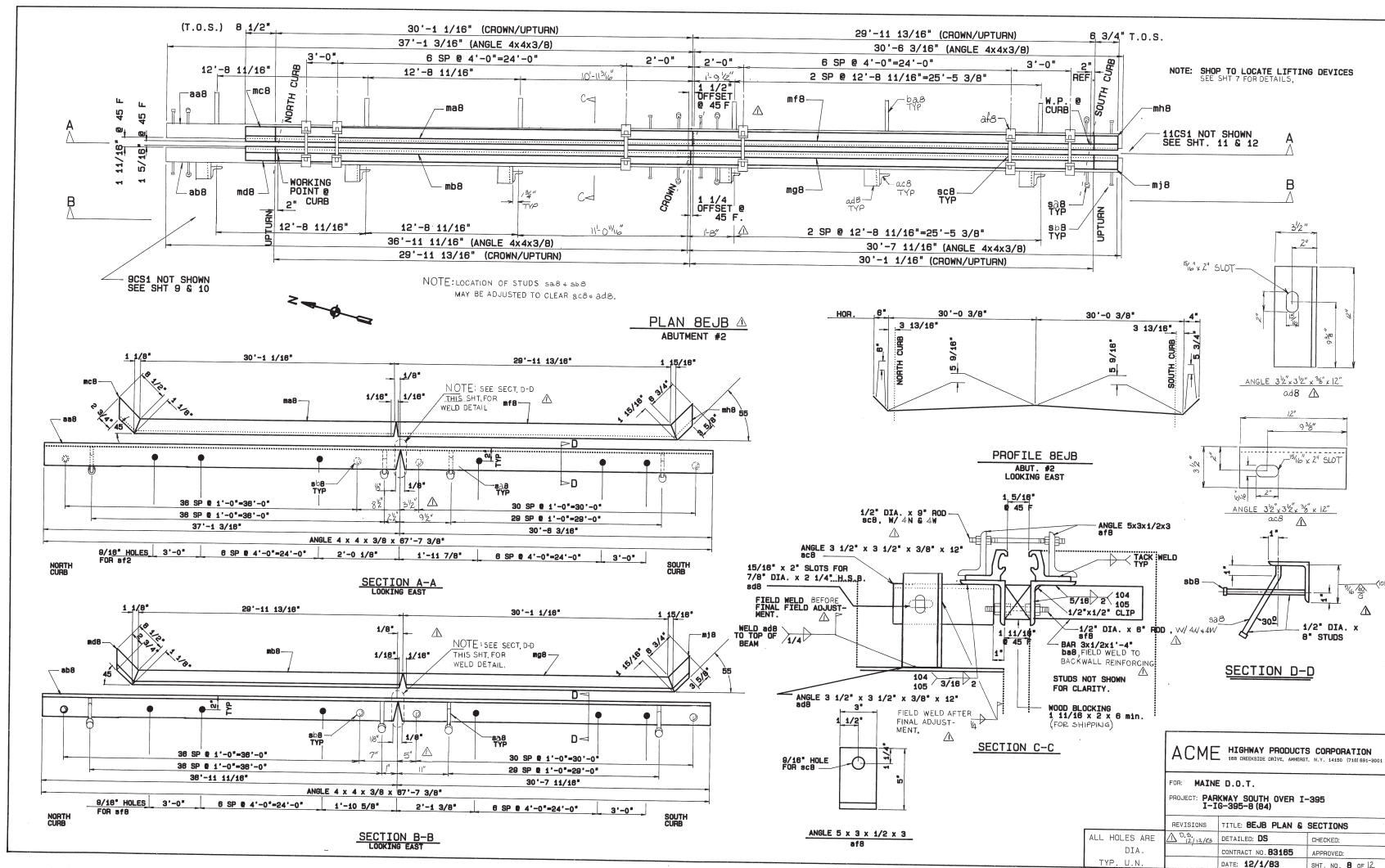
TYPE "F" EXTRUSION

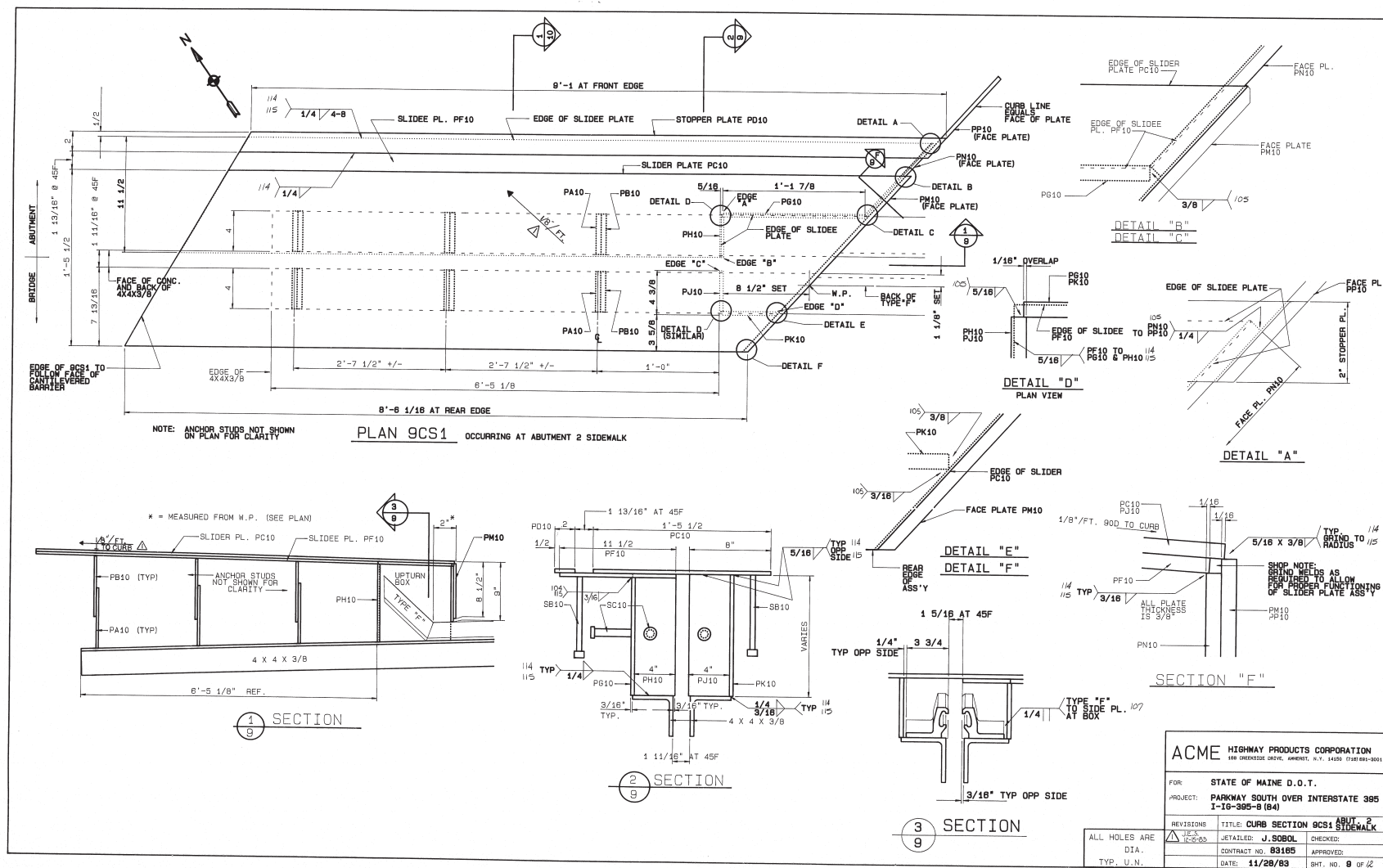


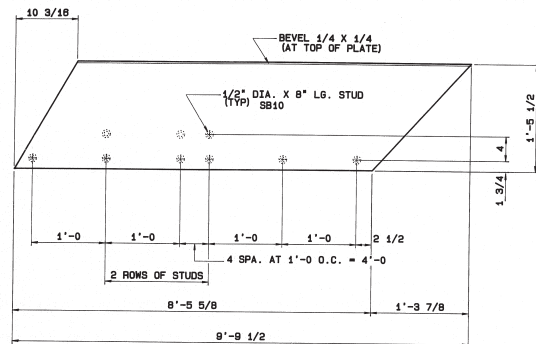
ACME HIGHWAY PRODUCTS CORPORATION 188 DUNDAS DRIVE, HANOVER, N.Y. 10926 (716) 891-3831			
FOR: MAINE D.O.T.			
PROJECT: PARKWAY SOUTH OVER I-395 I-16-395-B (84)			
REVISIONS	TITLE: BEJB B.O.M. & NOTES	CHECKED:	
DATE: 12/1/83	DETAILED: DS	APPROVED:	
DATE: 12/1/83	CONTRACT NO. 83185	APPROVED:	
DATE: 12/1/83	SHT. NO. 7 OF 12		

ALL HOLES ARE  
DIA.  
TYP. U.N.

181-15

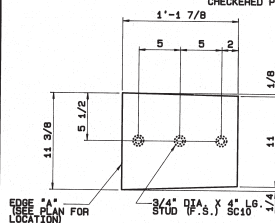




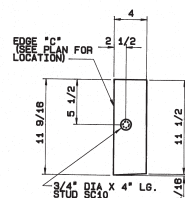


**1-PLATE-PC10**

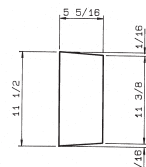
SLIDER PLATE-3/8 X 1'-5 1/2 X 9'-9 1/2  
CHECKERED PLATE



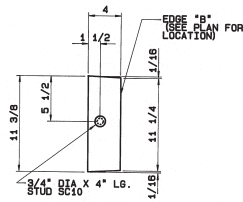
**1-PLATE-PG10**  
PL-3/8 X 11 3/8 X 1'-1 7/8



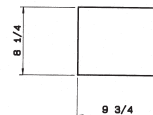
**1-PLATE-PJ10**  
PL-3/8 X 4 X 11 9/16



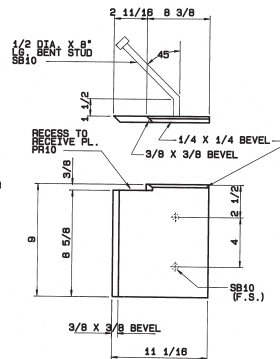
**1-PLATE-PK10**  
PL-3/8 X 5 5/16 X 11 1/2



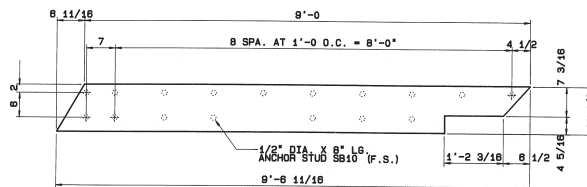
**1-PLATE-PH10**  
PL-3/8 X 4 X 11 3/8



**1-PLATE-PN10**  
PL-3/8 X 8 1/4 X 9 3/4

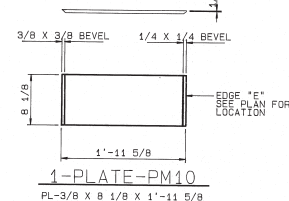


**1-PLATE-PP10**  
PL-3/8 X 9 X 11 1/8

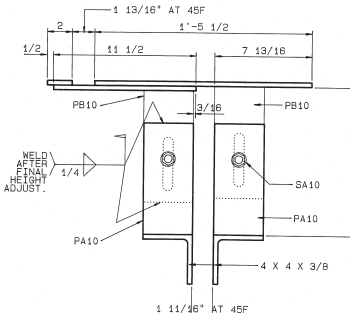


**1-PLATE-PF10**

SLIDE PLATE - 3/8 X 11 1/2 X 9'-8 11/16

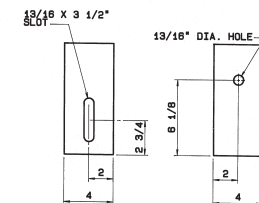


**1-PLATE-PM10**  
PL-3/8 X 8 1/8 X 1'-11 5/8



1 11/16" AT 45F

**SECTION**  
10



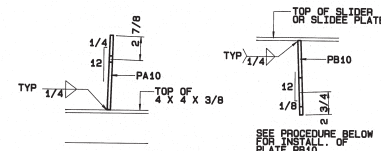
**PB10**

PL-3/8 X 4 X 9" LG.  
WELD TO SLIDER  
OR SLIDE PLATE

**PA10**

PL-3/8 X 4 X 9" LG.  
WELD TO 4 X 4 X 3/8

SHOP SUPPLY:  
3/8" DIA. X 2" LG.  
SA10  
7/8" NUT AND WASHER

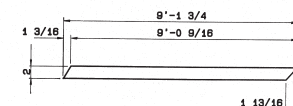


SEE PROCEDURE BELOW  
FOR INSTALL. OF  
PLATE PB10.

**DETAIL**  
10

INSTALLATION PROCEDURE FOR PLATE PB10

- 1) SHOP SHALL LOCATE AND WELD PLATE PA10 TO 4 X 4 X 3/8 AS INDICATED ON THESE SHOP DRAWINGS.
- 2) INCLUDING CURB ASSEMBLY AND WELD SECTION TO CURB AS INDICATED ON THESE SHOP DRAWINGS.
- 3) SHOP TO ADJUST CURB ASSEMBLY TO PROPER GRADE AND TO ADJUST CURB ASSEMBLY TO ALLOW FOR INSTALLATION OF PLATE PB10.
- 4) BUTT PB10 TO PLATE PA10; ADJUST HEIGHT AS REQUIRED AND INSTALL 3/4" DIA. 8" LG. WELD PLATE PB10 TO PLATE PA10. NOTE: PLATE PB10 TO BE 1/8" TO 1/2" BEVEL AS INDICATED ON THE DETAIL (AND PLAN).



**1-PLATE-PD10**

STOPPER PLATE - 3/8 X 2 X 9'-1 3/4  
CHECKERED PLATE

ACME HIGHWAY PRODUCTS CORPORATION  
100 CHESTER DRIVE, AMHERST, N.Y. 14226 (716) 491-2000

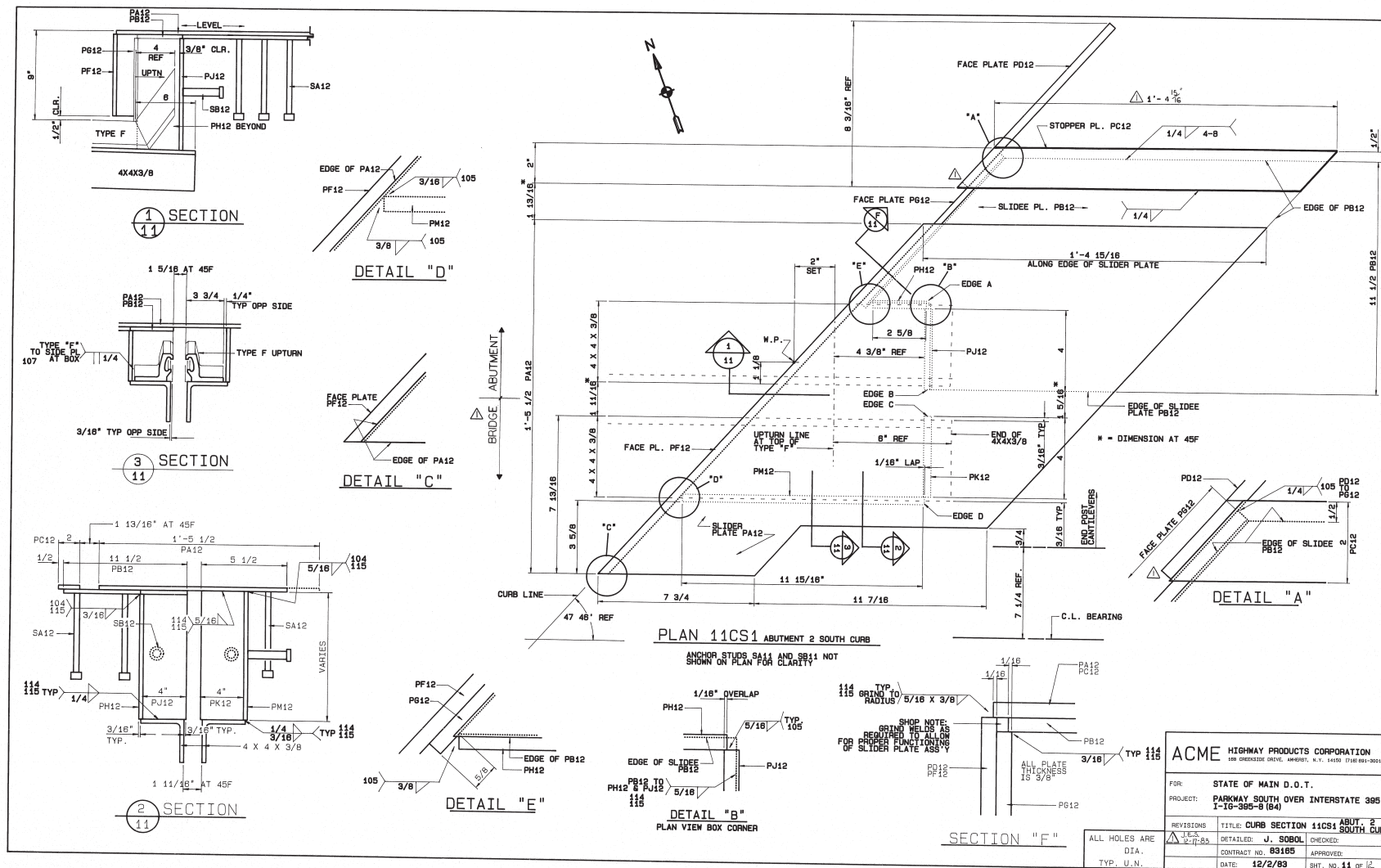
FOR: STATE OF MAINE D.O.T.  
PROJECT: PARKWAY SOUTH OVER INTERSTATE 395  
1-10-395-B (64)

REVISIONS: TITLE: PLATE DETAILS FOR OBSISTON  
CHECKED: J. SOBOL  
CONTRACT NO. 83165  
DATE: 11/29/83  
SHT. NO. 10 OF 12

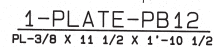
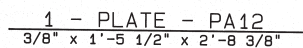
ALL HOLES ARE  
DIA.  
TYP. U.N.

101-18





181-19



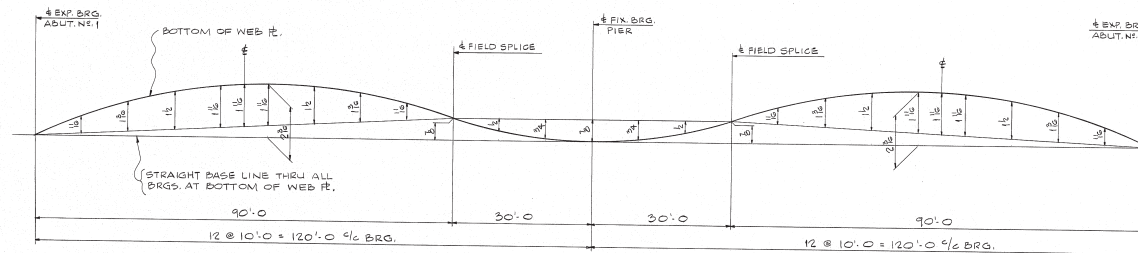
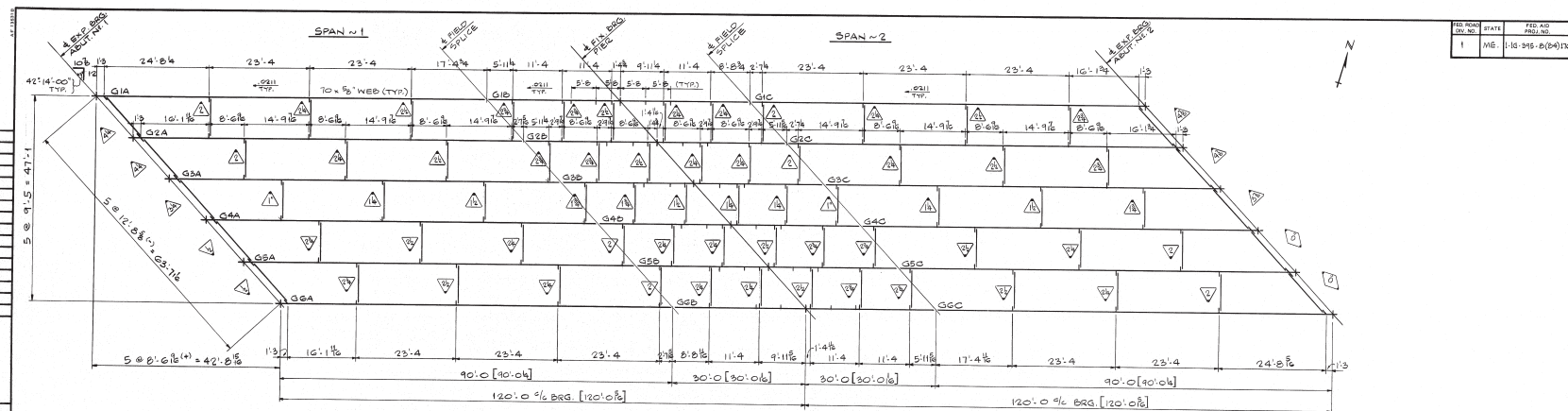
<h1>ACME</h1> <h2>HIGHWAY PRODUCTS CORPORATION</h2> <p>188 CREEKSIDE DRIVE, AMHERST, N.Y. 14205 (716) 682-3001</p>								
<p>FOR: <b>MAINE D.O.T.</b></p> <p>PROJECT: <b>PARKWAY SOUTH OVER I-395</b>  <b>I-16-395-B (84)</b></p>								
<table border="1"> <tr> <th>REVISIONS</th> <th>TITLE: CURB PLATE DETAILS</th> <th>11CS1</th> </tr> <tr> <td> </td> <td> <p>DETAILED: <b>J. SOBOL</b></p> <p>DATE: <b>12/2/83</b></p> </td> <td> <p>CHECKED:</p> <p>APPROVED:</p> <p>SHT. NO. <b>12</b> OF <b>12</b></p> </td> </tr> </table>	REVISIONS	TITLE: CURB PLATE DETAILS	11CS1		<p>DETAILED: <b>J. SOBOL</b></p> <p>DATE: <b>12/2/83</b></p>	<p>CHECKED:</p> <p>APPROVED:</p> <p>SHT. NO. <b>12</b> OF <b>12</b></p>		
REVISIONS	TITLE: CURB PLATE DETAILS	11CS1						
	<p>DETAILED: <b>J. SOBOL</b></p> <p>DATE: <b>12/2/83</b></p>	<p>CHECKED:</p> <p>APPROVED:</p> <p>SHT. NO. <b>12</b> OF <b>12</b></p>						

181-20

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CAMBER DIAGRAM  
SCALE: HORIZ. 3/8" = 1'-0", VERT. 6" = 1'-0"

NOTES:

1. ALL DIMENSIONS ARE GIVEN HORIZONTALLY (U.N.). DIMENSIONS GIVEN THUS (120'-0") ARE SLOPING DIMENSIONS PARALLEL TO GRADE.
2. FIGURES GIVEN THUS: Δ ARE THE DIFFERENCES IN ELEVATIONS OF GIRDERS AT CROSSFRAMES; ARROW POINTS TOWARD LOW GDR.
3. FIGURES GIVEN THUS: ∇ ARE THE GRADES BETWEEN BRG. & SPLICE OR SPLICE & SPLICE AFTER ALL DEAD LOAD HAS BEEN APPLIED; ARROW POINT DOWNWARD.
4. ENDS OF GIRDERS, ALL BRG. STIFFS & END CROSSFRAMES TO BE VERTICAL AFTER DEFLECTION.
5. ALL STIFFENERS AND CROSSFRAME SPACINGS ARE GIVEN TO & STIFFENERS P.
6. ALL FIELD CONNECTIONS TO BE MADE WITH 7/8" # H.S. BOLTS (A325, TYPE 1) (U.N.).
7. ALL STEEL TO BE A.S.T.M. A36 (U.N.).

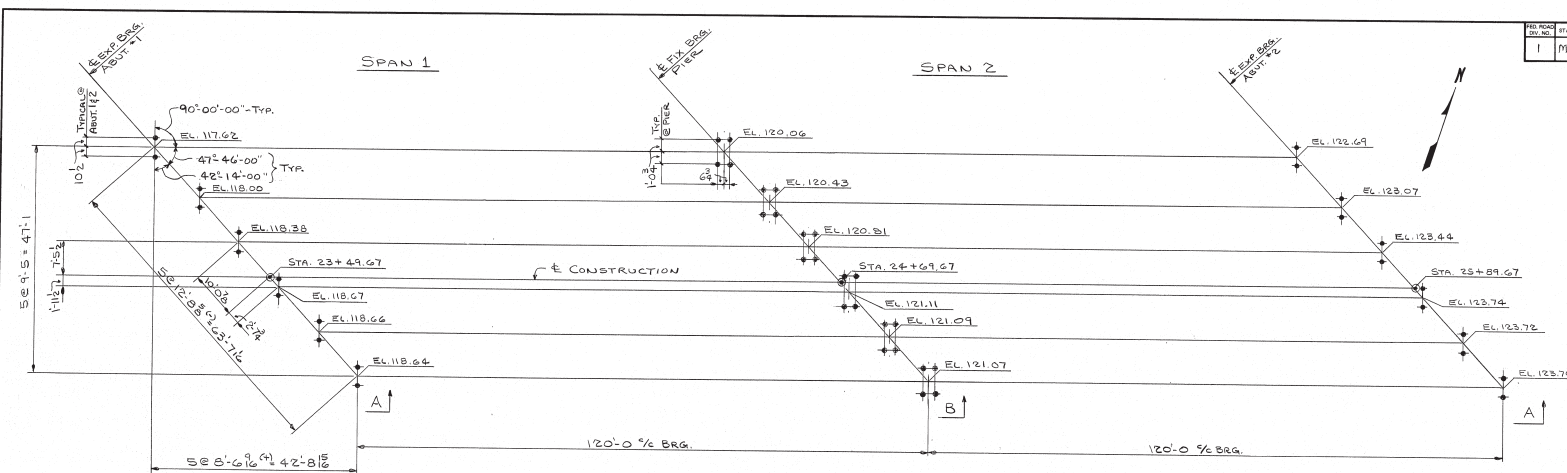
CONN. & SIZE FOR CROSSFRAMES

- BAR-G x 3/8 ~ CROSSFRAMES AT ABUTMENTS,
- BAR-S x 7/8 ~ CROSSFRAMES BETWEEN GDR. LINES G4 & G5,
- BAR-T x 7/8 ~ ALL OTHER CROSSFRAMES.

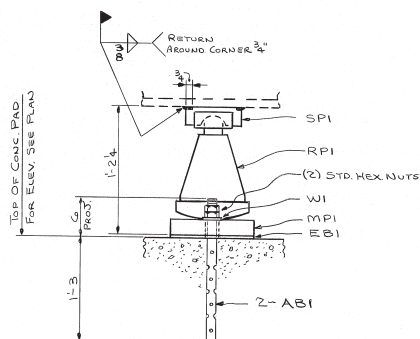
NO.	REVISION	DATE
<p><b>HIGH STEEL STRUCTURES, INC.</b></p> <p>1900 Old Portsmouth Pike Lafayette, Pennsylvania 15809 Phone 717/288-6271</p> <p>A Subsidiary of High Industries, Inc.</p>		
<p>FIGURING PLAN</p> <p>PARKWAY SOUTH OVER I-395</p> <p>PARKWAY SOUTH STA. 24+82.61</p> <p>STATE OF MAINE, DEPARTMENT OF TRANSPORTATION</p> <p>TOWN OF BOWDOIN</p> <p>PENOBSCOT COUNTY, MAINE</p>		
<p>STATE CONTRACT OR REF. NO. _____ CONTRACTOR <b>SEED &amp; SEED, INC.</b></p> <p>BY <b>CHRISTIAN</b> MADE BY <b>KMA</b> CHK. BY <b>WJ</b> DATE <b>2-23-83</b></p> <p>CONTRACT NUMBER <b>ME-83080</b> DRAWING NUMBER <b>WS1</b></p>		

181-41

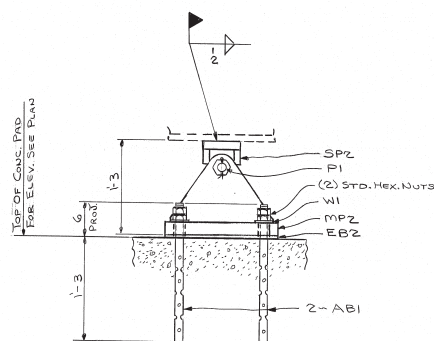
REV.	NO.	DATE	BY	CHKD.
1	ME	11/4/85	8/60	ME



### ANCHOR BOLT PLAN



SECTION A



SECTION B

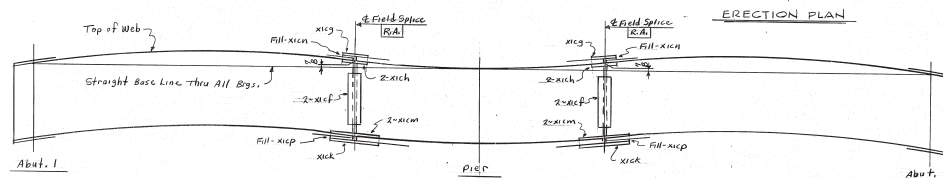
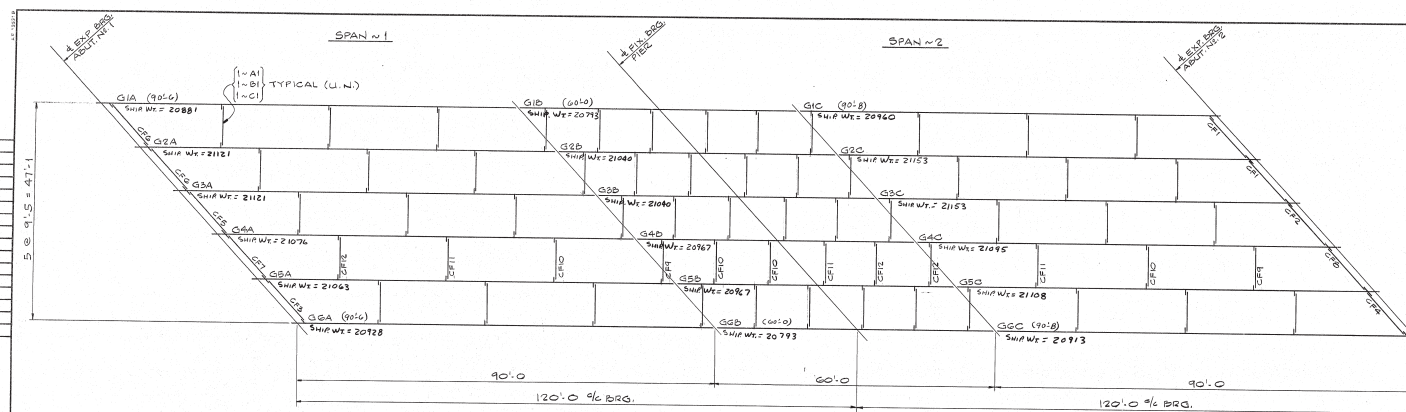
- NOTES:
1. All dimensions are given horizontally.
  2. Elevation are given to top of concrete pad.
  3. Anchor bolt settings must be exact in every detail in accordance with this drawing.
  4. Anchor bolts are furnished by High Steel Structures, Inc., and set by others.

NO.	REVISION	DATE
<p><b>HIGH STEEL STRUCTURES, INC.</b></p> <p>180 Old Providence Pike Concord, Massachusetts 01742 Phone 781-388-0211</p> <p>A Subsidiary of High Industries, Inc.</p>		
<p><b>ANCHOR BOLT PLAN</b></p> <p><b>PARKWAY SOUTH OVER K-395</b></p> <p><b>PARKWAY SOUTH STA. 24+69.67</b></p> <p><b>STATE OF MAINE, DEPARTMENT OF TRANSPORTATION</b></p> <p><b>TOWN OF BREWER</b></p> <p><b>PENOBSCOT COUNTY, MAINE</b></p>		
<p>STATE CONTRACT NO. _____ CONTRACTOR <b>REED &amp; REED, INC.</b></p>		
<p>IN CHARGE <b>CHRISTMAN</b> MADE BY <b>G.F.B.</b> DATE <b>8-23-83</b></p>		
<p>CONTRACT <b>ME-83080</b> DRAWING <b>E1</b></p>		

181-42



REV.	DATE	BY	APP.
1	ME	181-43	181-43



**Reaming Diagram**  
Assemble Girders, Ream Holes Marked [R.A.]  
To 1/8" Sec. Plan for Reaming One  
Line of Girders.

#### Field Bolt Summary

3/4" H.S. Bolts (A325-Type 1) w/ Hex. Nut H.H. (A563-Gr. C) Hex. Nut

Cross from 1/2" Strut On. to Girders — 1550 @ 2" Lg.

Center Conn. of Struts — 100 @ 24" Lg.

Girder Web Splice — 1040 @ 3" Lg.

Girder Top Flange Splice — 150 @ 3 3/4" Lg.

Girder Bottom Flange Splice — 350 @ 4" Lg.

3,190 — Hard Flat Washers (F436) For 3/4" H.S. Bolts.

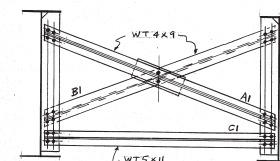
Fleming Bracket Holes { 200-3/8" CARRIAGE BOLTS x 1 1/2" Lg. (A307) W/ A563 GRADE A HEX. NUT.  
200-5/8" WASHERS FOR 3/8" BOLTS.

#### Notes:

- All Dims. Are Given Horizontally.
- All Steel ASTM-A36 (U.M.) Painted.
- All Field Connections To Be Made With 3/4" (A325-Type 1) H.S. Bolts.
- For Placement of Brg. Assemblies See Dwg. E1.
- Stud Shear Connectors, Exp. Joint Material, Scrapers or any Bridge Drainage And Field Touch-up Paint or Painting Not By H.S.S., Inc.
- Work This Dwg. With Dwg. E1.
- \* Dims. Indicated Thus: (90'-6") Are The Lengths of Girders Out to Out.

#### ERECTION NOTE

No credit will be allowed for work performed by others in replacing or correcting materials or workmanship covered by this drawing unless expressly authorized by High Steel Structures, Inc.



**Typical Strut Connection**  
(Looking West)

NO.	REVISION	DATE
1	ME	181-43

CONTRACTOR: REED & REED, INC.

IN CHARGE: CHRISTMAN MADE BY: WRC DATE: 7-9-83

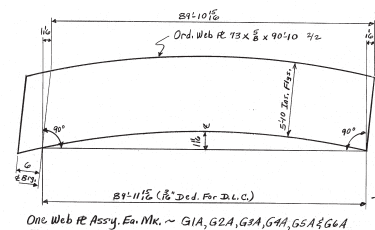
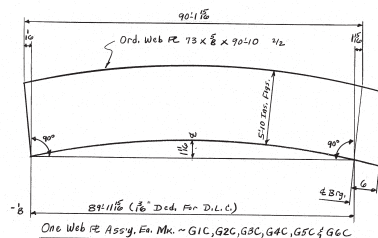
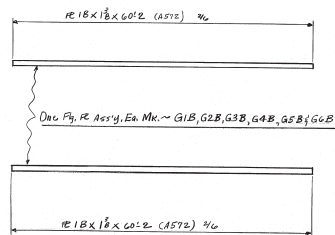
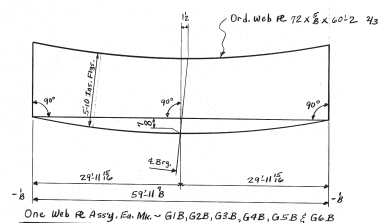
CONTRACT NUMBER: ME-53080 DRAWING NUMBER: E2

181-43


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- Notes:
- For General Notes See Dwg. N1.
  - All Steel To Be ASTM-A36 (U.N.)
  - All Steel To Have Charpy V-Notch Testing.

NO.	REVISION	DATE
		
<b>HIGH STEEL STRUCTURES, INC.</b> 1405 Old Pennsylvania Pike Lancaster, Pennsylvania 17602 Phone (717) 371-8771 A Subsidiary of Ohio Structural, Inc.		
<i>Flange &amp; Detail &amp; Camber Diagrams</i> <i>Parkway South, Ord. I-395</i> <i>Parkway South Sta. 2+767.57</i> <i>State of Maine, Dept. of Trans.</i> <i>Town of Brewer</i> <i>Penobscot Co., Maine</i>		
STATE CONTRACT		CONTRACTOR <i>Redd &amp; Red, Inc.</i>
OR STATE		
IN CHARGE	BY	DATE
<i>ME-830 B0</i>	<i>EPN</i>	<i>9-8-82</i>
	DRAWING	WRC
	<i>FSI</i>	

CODE: 4000

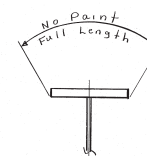
181-44





# GENERAL NOTES:

- DESIGN SPECIFICATIONS: AASHTO 1977 EDITION WITH INTERIMS, AND STATE OF MAINE, STATE HIGHWAY COMMISSION STANDARD SPECS. 1981.
- TYPE OF STEEL: ASTM-A36 (UNLESS NOTED)
- CLEANING METHOD: SSPC-SP6 COMMERCIAL BLAST CLEAN.
- TYPE OF PAINT: BASIC LEAD CHROMATE AASHTO M-229 TYPE 2, MINIMUM THICKNESS 4.0 MILS (WET)
- NO PAINT WITHIN 3" OF HOLES, UNLESS NOTED "P."
- STEEL LEFT UNPAINTED FOR FIELD WELDING TO RECEIVE ONE COAT OF BOILED LINSEED OIL.
- NO DIE STAMPING SHALL BE USED FOR ANY PURPOSE, EITHER AT THE MILL OR IN THE FABRICATING SHOP, OR ROLLED SHAPES OR PLATES TO BE USED AS MAIN STRESS CARRYING MEMBERS.
- SHOP INSPECTION BY: MDT & R.W. HUNT CO.
- MAGNETIC PARTICLE TESTING TO BE PERFORMED ON 10% OF ALL FILLET WELDS IN MAIN MEMBERS.
- (CT) INDICATES CHARPY V-NOTCH TESTING REQ'D. (STD. SPEC. PG. 438)
- ALL WELDING TO CONFORM TO AWS, STRUCTURAL WELDING CODE D1.1-B0 AS AMENDED BY AASHTO '81 & MDT SUPPL. SPECS DATED 11/9/81.
- ALL STEEL TO BE FURNISHED UNDER BID ITEM # 504.7001.
- BOLTED FIELD CONNECTIONS TO BE MADE WITH  $\frac{3}{8}$ "  $\phi$  U.S. BOLTS ASTM-A325 TYPE 1.
- HOLES MARKED [R.N.] TO BE SUBPUNCHED  $\frac{1}{16}$ "  $\phi$  AND REAMED TO  $\frac{1}{16}$ "  $\phi$  WITH CONNECTING PARTS ASSEMBLED AND MATCH MARKED, FOR REAM ASSEMBLY DIAGRAM SEE ERECTION DWGS.
- FOR CAMBER DIAGRAMS AND FLANGE PLATE DETAILS SEE DWG. PREFIXED "FS".
- CAMBER TOLERANCE: ".0" TO "+ $\frac{1}{4}$ ".
- FOR JOB STANDARD PIECES SEE DWGS. PREFIXED "X".
- ALL SOLE PLATES ARE OF UNIFORM THICKNESS.
- FIELD MEASUREMENTS, STUD SHEAR CONNECTORS, EXPANSION JOINT MATERIAL, SCUPPERS OR ANY BRIDGE DRAINAGE AND FIELD TOUCH-UP PAINT OR PAINTING ARE NOT SUPPLIED BY HIGH STEEL STRUCTURES, INC.
- ALL RE-ENTRANT CUTS TO HAVE  $\frac{3}{4}$ " MINIMUM RADII.



Typical Paint Section  
(Girders)

NO.	REVISION	DATE
<p><b>HIGH STEEL STRUCTURES, INC.</b></p> <p>100 Old Philadelphia Pike Lancaster, Pennsylvania 17602 Phone 717/299-0271</p> <p>A Subsidiary of High Industries, Inc.</p>		
<p><i>General Notes</i></p> <p>Parkway South Over I-395</p> <p>Parkway South Sta. 24+61.67</p> <p>State of Maine, Dept. of Trans.</p> <p>Town of Brewer</p> <p>Penobscot Co., Maine</p>		
<p>STATE CONTRACT OR REF. NO. _____ CONTRACTOR <u>Reed &amp; Reed, Inc.</u></p>		
BY <u>Christman</u>	MADE BY <u>WRC</u>	DATE <u>9-9-88</u>
<p>CONTRACT <u>ME-83080</u> DRAWING <u>N1</u></p>		

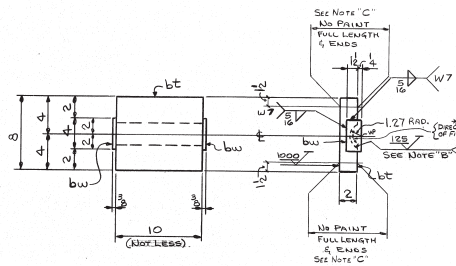
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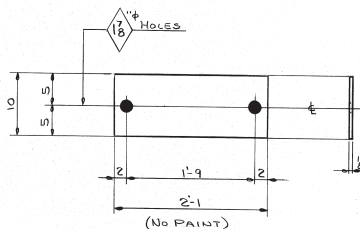
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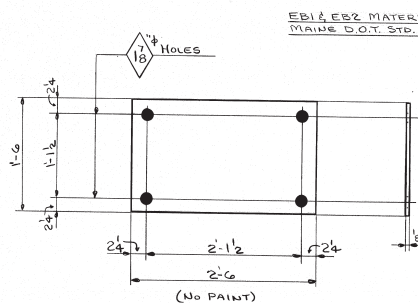
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12-SOLE RS.-MK.SP1

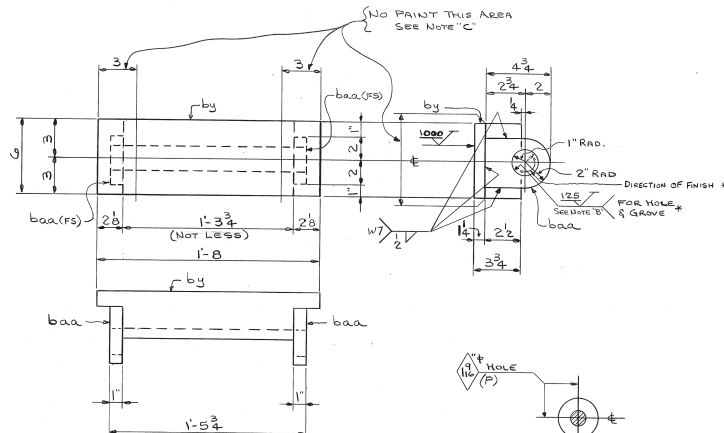


12-PREFORMED PAD-MK.EB1

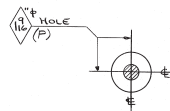


6-PREFORMED PAD-MK.EB2

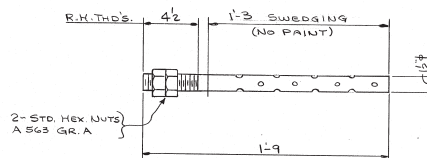
EB1 & EB2 MATERIAL SPECS PER  
MAINE D.O.T. STD. SPECS. SECT. 713.03 Pg. 441.



6-SOLE RS.-MK.SP2



48-WASHERS-MK.W1



48-ANCHOR BOLTS-MK.AB1

### NOTE "B"

SURFACES INDICATED TO RECEIVE  
ONE COAT OF NEVER SEIZE.

### NOTE "C"

AREAS NOT PAINTED WILL RECEIVE  
ONE (1) COAT OF BOILED LINSEED OIL.

### NOTE "D"

TWO (2) SHOP COATS OF PAINT REQ'D.

NOTE:  
DO NOT BURN 1 1/2" HOLES.

### SHOPNOTE

HOLES: AS NOTED

BOLTS: NONE

PAINT: SEE DWG. N1.

FOR GENERAL NOTES, SEE DWG. N1.  
BRG. ASSEMBLIES SHALL BE SHOP ASSEMBLED AND THE INDIVIDUAL PIECES MATCH MARKED OR THEY SHALL BE SHOP ASSEMBLED AND SHIPPED AS A UNIT.

CODE: 6000

NO.	REVISION	DATE
1	ME	10/25/80

NO.	MARK	DESCRIPTION	LENGTH	REMARKS	ITEM	QUANTITY
12	SP1	SOLE RS.				47
12	BT	BAR 8x2	0 10			1/4
24	BW	BAR 1 1/2x3/8	0 4			1/8
6	SP2	SOLE RS.				138
6	BW	BAR 6x3/4	1 8			1/10
12	BW	BAR 4x1	0 4 1/2			1/8
12	EB1	PAD 10x10	2 1		SKI	—
6	EB2	PAD 18x18	2 6		SKI	—
48	AB1	1 1/2" SWEDGE BOLTS	1 9	W/ 2-STD. HEX. NUTS	1/2	612
48	W1	3/4x3/8 THK. WASHERS			1/8	26

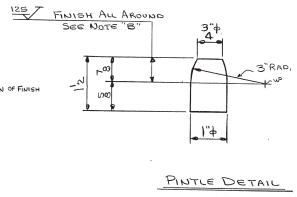
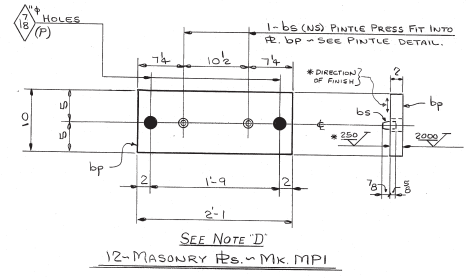
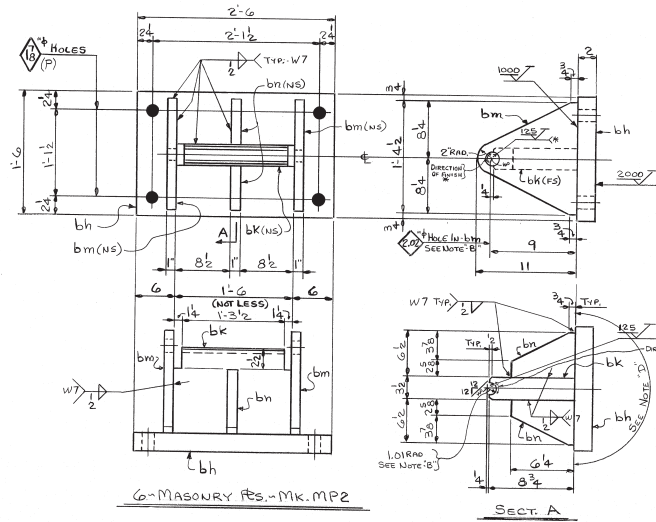
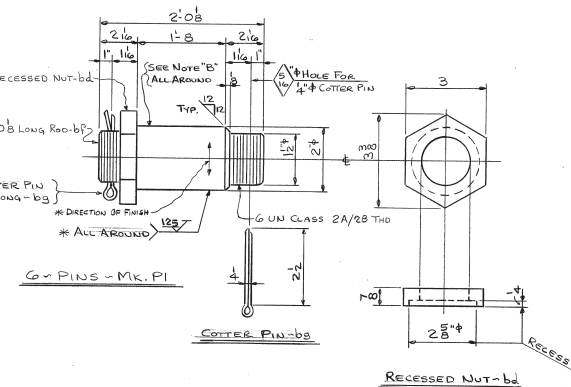
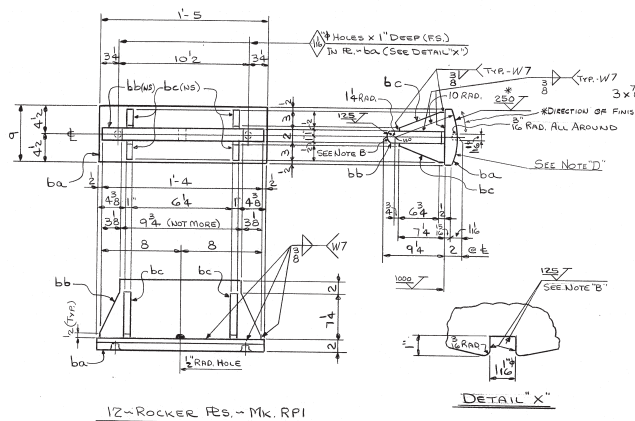
NO.	REVISION	DATE
1	ME	10/25/80

HIGH STEEL STRUCTURES, INC.  
1985 Old Philadelphia Pike  
Lawrenceville, Georgia 30043  
Phone 770/962-1271  
A Subsidiary of High Industrial, Inc.

BEARING DETAILS
PARKWAY SOUTH OVER I-395
PARKWAY SOUTH STA. 24+61.67
STATE OF MAINE DEPARTMENT OF TRANSPORTATION
TOWN OF BREWER
PENOBSCOT COUNTY, MAINE
STATE CONTRACT NO. 83080
CONTRACTOR: REED & REED, INC.
IN CHARGE: CHRISTIAN
MADE BY: G.F.
CHECKED BY: J.S.
DATE: 8/13/83
CONTRACT NO.: 83080
DRAWING NO.: 181-48
DATE: 8/13/83

181-48

10-20854



NOTE:  
DO NOT BURN 1 1/2" HOLES.  
SHOP NOTE  
HOLES: AS NOTED  
BOLTS: NONE  
PAINT: SEE DWG. N1

WORK THIS DWG. WITH DWG. 1.

CODE 5 6000

BILL OF MATERIAL		REV.	DATE	BY	CHKD.	APP'D.
1	ME	1/16/31	6/09/14			
NO.	MARK	DESCRIPTION	LENGTH	REMARKS	ITEM	QTY.
12	RPI	ROCKER RS.				103
12	ba	RE 9x2	1	5		1
12	bb	RE 9x2	1	4		1
43	bc	BAR 3x1	0	74		1
6	PI	PIN				23
6	bp	2" ROD	2	0		1
12	bd	BAR 3x2	0	30		1
12	bs	4" COTTER PIN	0	22		1
6	MP2	MASONRY RS.				588
6	bh	RE 10x2	2	6		1
6	bk	BAR 3x2	1	6		1
12	bm	RE 11x1	1	42		1
12	bn	BAR 6x1	0	62		1
12	MPI	MASONRY RS.				144
12	bp	RE 10x2	2	1		1
24	bs	BAR 1"	0	12		1

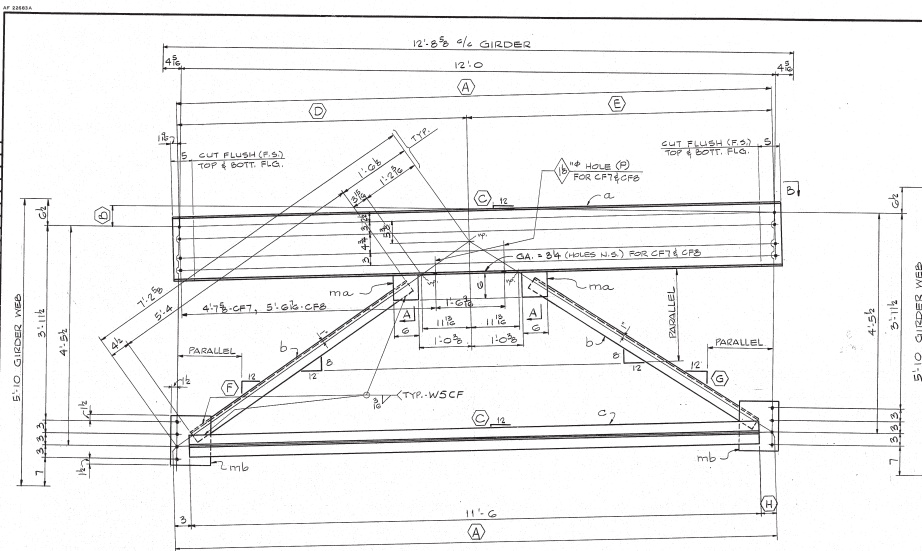
NO.	REVISION	DATE
HIGH STEEL STRUCTURES, INC.		
100 Old Portsmouth Rd. Lewiston, Maine 04203 Phone 755-2211		
BEARING DETAILS		
PARKWAY SOUTH OVER I-395		
PARKWAY SOUTH STA. 24+69.67		
STATE OF MAINE, DEPARTMENT OF TRANSPORTATION		
TOWN OF BREWER		
PENOBSCOT COUNTY, MAINE		
STATE CONTRACT	CONTRACTOR	REED & REED, INC.
OR REF. NO.		
IN CHARGE	MADE BY	DATE
CHRISTIAN	G.F.Z.	8-23-83
CONTRACT	ME-83080	DRAWING
		2 OF 19

101-49

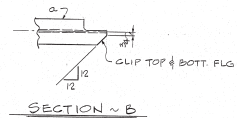
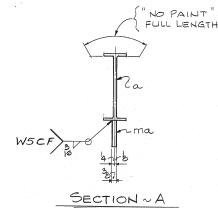


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MARK	REMARKS	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
CF1	2	12' 0"	4 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"
CF2	ONE	12' 0"	3 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"
CF3	ONE	12' 0"	1/2"	5' 11 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"
CF4	ONE	12' 0"	0'	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"
CF5	ONE	12' 0"	0'	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"
CF6	ONE	12' 0"	0'	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"
CF7	ONE	12' 0"	0'	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"
CF8	ONE	12' 0"	0'	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"
CF9	ONE	12' 0"	0'	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"
CF10	ONE	12' 0"	0'	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"	5' 10 1/2"



# SHOP NOTE

HOLES: 1/2" (U.N.)  
BOLTS: NONE  
PAINT: SEE DWG. N1.

FOR GENERAL NOTES, SEE DWG. N1.

FED. ROAD DIST. NO.		STATE		FED. AID PROJ. NO.	
1		ME.		119-595 0247	
BILL OF MATERIAL					
NO.	MARK	DESCRIPTION	LENGTH	REMARKS	ITEM
2	CF1				544
ONE	CF2				4
ONE	CF3	CROSSFRAMES			
ONE	CF4				
ONE	CF5				
2	CF6				544
ONE	CF7				
ONE	CF8				
20	b	5 3/8 x 3/8	5	A	3/16 33
10	c	WT 5 x 11	11	G	1/2 127
20	ma	BAR 5 x 3/8	0	G	1/2 4
20	mb	R 3 x 3/8	1	O	1/2 17
10	a	WIG x 2G	12	3B	1/2 377

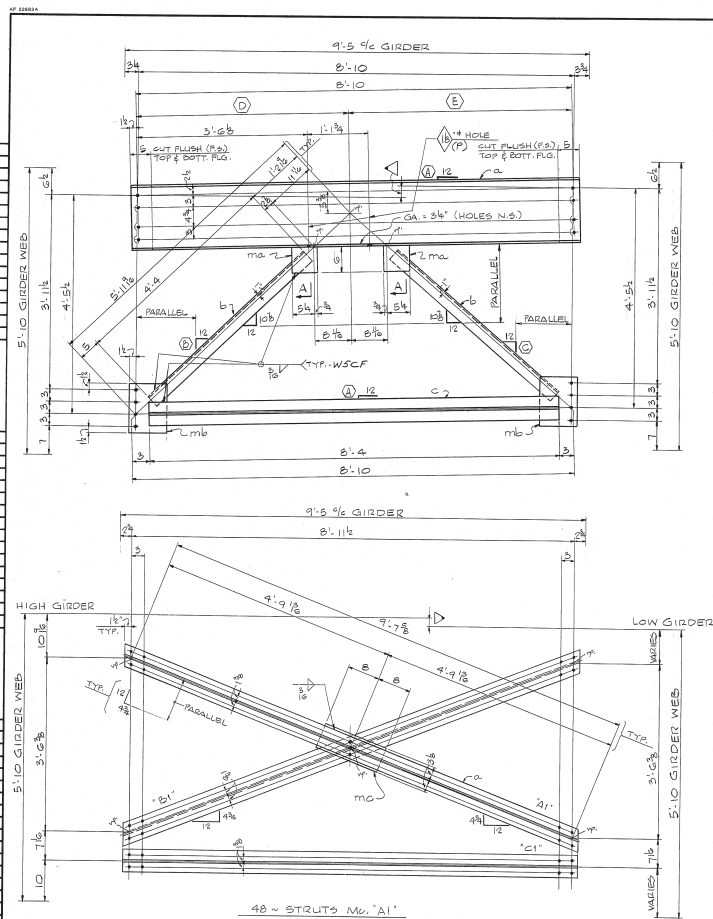
NO.	REVISION	DATE
HIGH STEEL STRUCTURES, INC.		
1000 Old Providence Pike Lewiston, Pennsylvania 17032 Phone 717/239-0271		
A Subsidiary of High Industries, Inc.		
ABUTMENT CROSSFRAMES		
PARKWAY SOUTH OVER I-95		
PARKWAY SOUTH STA. 24+69.67		
STATE OF MAINE, DEPARTMENT OF TRANSPORTATION		
TOWN OF BREWER		
PENOBSCOT COUNTY, MAINE		
STATE CONTRACT NO. 8000	CONTRACTOR REED & REED, INC.	
IN CHARGE CHRISTIAN	MADE BY KMA	ONE D. 36 J
CONTRACT NO. ME-83080	DRAWING NO. 181-50	DATE 8-23-83
		3 OF 19

181-50

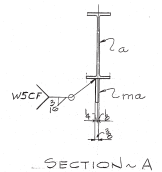
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MARK	REQ'D	(A)	(B)	(C)	(D)	(E)	
CF9	2	4	11 1/2	10 1/2	4' 4	4' 6	
CF10	4	2 1/2	4	11 1/2	10 1/2	4' 3 1/2	4' 6 1/2
CF11	3	2 1/2	5 1/2	11 1/2	10 1/2	4' 3 1/2	4' 6 1/2
CF12	3	2 1/2	5 1/2	11 1/2	10 1/2	4' 3 1/2	4' 6 1/2



SECTION A-A

# SHOPNOTE

HOLES: 1/8" (U.N.)  
BOLTS: NONE  
PAINT: SEE DWG. N1.

FOR GENERAL NOTES, SEE DWG. N1.

NO.	REV.	DATE
1	ME	1-15-55

NO.	REV.	DATE
1	ME	1-15-55

NO.	REV.	DATE
1	ME	1-15-55

181-51



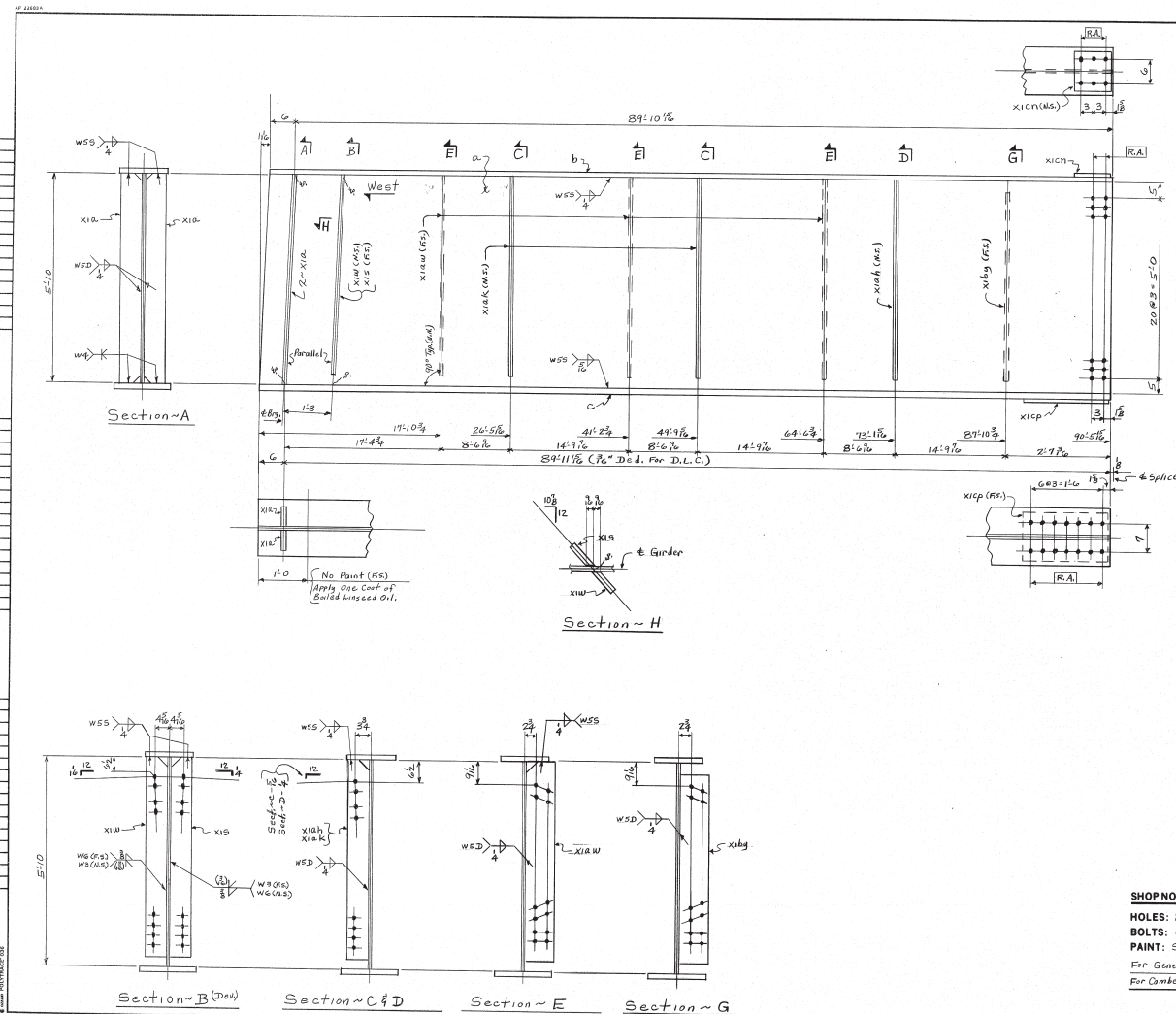




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**SHOPNOTE**  
HOLES: 15/16" (A.M.)  
BOLTS: None  
PAINT: See Dwg. N1  
For General Notes See Dwg. N1.  
For Member Diagram See Dwg. PS1.

CODE: 4000

NO.		REVISION		DATE	
1		ME		1/16/54	
BILL OF MATERIAL					
NO.	MARK	DESCRIPTION	LENGTH	REMARKS	ITEM
One G4A Girder					
One	a	Wt. 70 x 1/2	90	(1)	
One	b	Flg. 12 x 1/2	90	(1)	
One	c	Flg. 14 x 1/2	90	(1)	
2	X10	Bar 4 x 6	5' 10"		
One	X12	Bar 6 x 6	5' 6"		
One	X14	Bar 8 x 8	5' 6"		
One	X16	Bar 10 x 10	5' 6"		
One	X18	Bar 12 x 12	5' 6"		
One	X20	Bar 14 x 14	5' 6"		
One	X22	Bar 16 x 16	5' 6"		
One	X24	Bar 18 x 18	5' 6"		
One	X26	Bar 20 x 20	5' 6"		
One	X28	Bar 22 x 22	5' 6"		
One	X30	Bar 24 x 24	5' 6"		
One	X32	Bar 26 x 26	5' 6"		
One	X34	Bar 28 x 28	5' 6"		
One	X36	Bar 30 x 30	5' 6"		
One	X38	Bar 32 x 32	5' 6"		
One	X40	Bar 34 x 34	5' 6"		
One	X42	Bar 36 x 36	5' 6"		
One	X44	Bar 38 x 38	5' 6"		
One	X46	Bar 40 x 40	5' 6"		
One	X48	Bar 42 x 42	5' 6"		
One	X50	Bar 44 x 44	5' 6"		
One	X52	Bar 46 x 46	5' 6"		
One	X54	Bar 48 x 48	5' 6"		
One	X56	Bar 50 x 50	5' 6"		
One	X58	Bar 52 x 52	5' 6"		
One	X60	Bar 54 x 54	5' 6"		
One	X62	Bar 56 x 56	5' 6"		
One	X64	Bar 58 x 58	5' 6"		
One	X66	Bar 60 x 60	5' 6"		
One	X68	Bar 62 x 62	5' 6"		
One	X70	Bar 64 x 64	5' 6"		
One	X72	Bar 66 x 66	5' 6"		
One	X74	Bar 68 x 68	5' 6"		
One	X76	Bar 70 x 70	5' 6"		
One	X78	Bar 72 x 72	5' 6"		
One	X80	Bar 74 x 74	5' 6"		
One	X82	Bar 76 x 76	5' 6"		
One	X84	Bar 78 x 78	5' 6"		
One	X86	Bar 80 x 80	5' 6"		
One	X88	Bar 82 x 82	5' 6"		
One	X90	Bar 84 x 84	5' 6"		
One	X92	Bar 86 x 86	5' 6"		
One	X94	Bar 88 x 88	5' 6"		
One	X96	Bar 90 x 90	5' 6"		
One	X98	Bar 92 x 92	5' 6"		
One	X100	Bar 94 x 94	5' 6"		

NO.	REVISION	DATE
1	ME	1/16/54
HIGH STEEL STRUCTURES, INC.		
Girder - G4A		
Parkway South, Over I-395		
Parkway South, Sta. 24+62.67		
State of Maine, Dept. of Trans.		
Town of Brewer		
Penobscot Co., Maine		
STATE CONTRACT		
CONTRACTOR: Reed & Red, Inc.		
IN CHARGE: Christman		
MADE: EPIM		
BY: WRC		
DATE: 9-9-53		
CONTRACT: ME-83080		
DRAWING: 1 of 19		

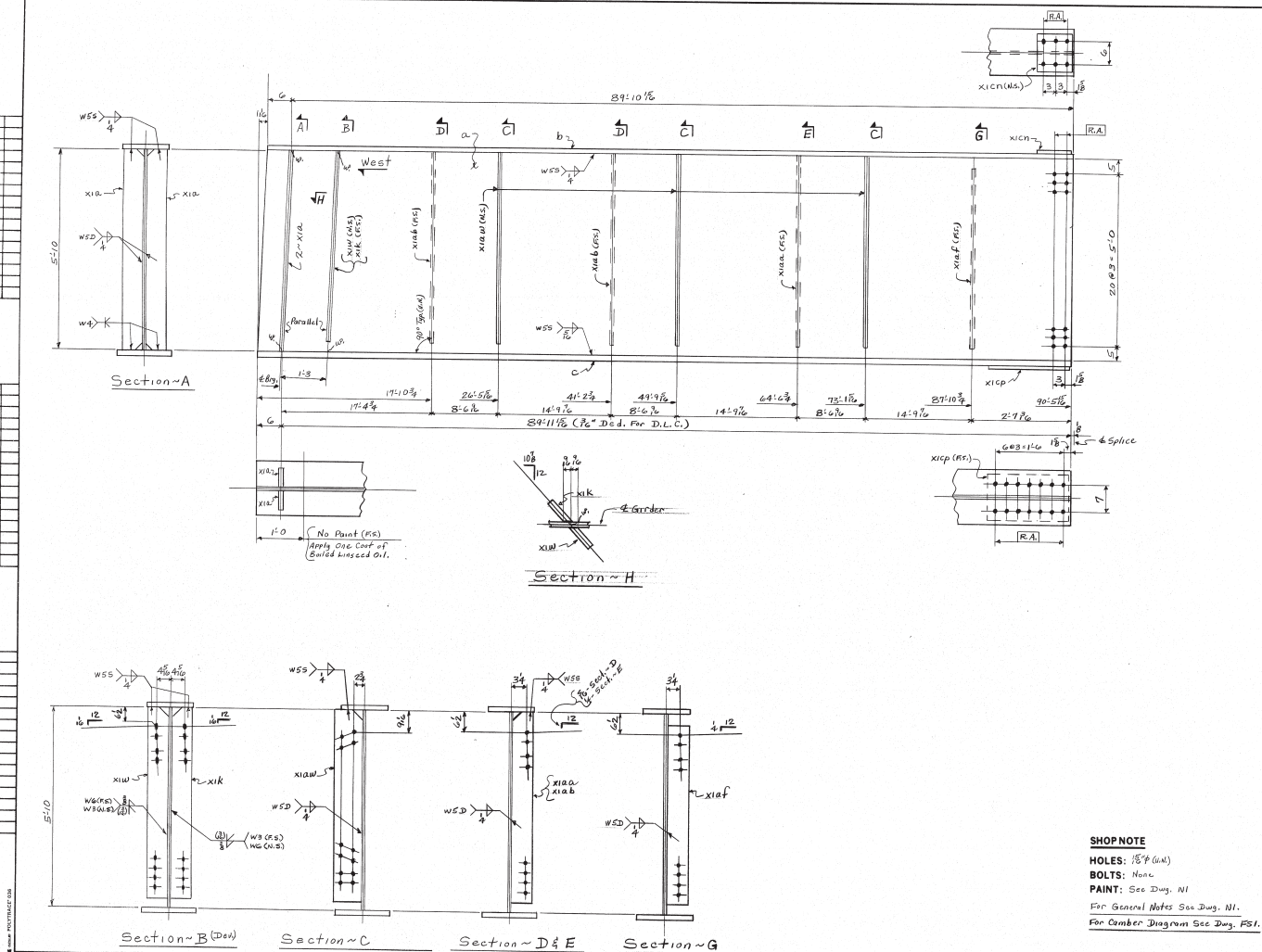
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**SHOP NOTE**  
HOLES: 15/16" (MIN)  
BOLTS: None  
PAINT: See Dwg. N1  
For General Notes See Dwg. N1.  
For Camber Diagram See Dwg. F51.

CODE: 4000

NO. 1  
REVISION  
DATE  
1 ME 1-16-35 (804) 110

**BILL OF MATERIAL**

NO.	MARK	DESCRIPTION	LENGTH	REMARKS	ITEM	UNIT
One	G5A	Girder			2043	
One	a	W16 x 26	90' 6"	(T)		
One	b	Flt. PL 12 x 3/4	90' 4 1/2"	(T)		
One	c	Flt. PL 14 x 1"	90' 5 1/2"	(T) ASSE		
2	x1a	Bar 4 1/2 x 1/2	5' 10"		45	
One	x1b	Bar 6 x 3/8	5' 0 1/2"		43	
One	x1c	Do.	5' 6 3/8"		43	
One	x1d	Bar 5 x 3/8	5' 0 1/2"		35	
2	x1e	Do.	5' 0 1/2"		35	
One	x1f	Do.	5' 3"		34	
3	x1g	Bar 7 x 3/8	5' 0 1/2"		50	
One	x1h	PL 10 x 3/8	0' 9"	Fill	16	
One	x1i	PL 12 x 3/8	1' 9"	Fill ASSE	27	

NO.	REVISION	DATE
1	ME 1-16-35 (804) 110	

**HIGH STEEL STRUCTURES, INC.**

180 Old Providence Pk.  
Lancaster, Pennsylvania 17602  
Phone 773-0800 (21)

A Subsidiary of High Industrial, Inc.

**CONTRACTOR: Reed & Reed, Inc.**

IN CHARGE: Christman  
MADE BY: WRC  
DATE: 1-9-35

CONTRACT NO.: ME-83080  
DRAWING NO.: 8 of 19

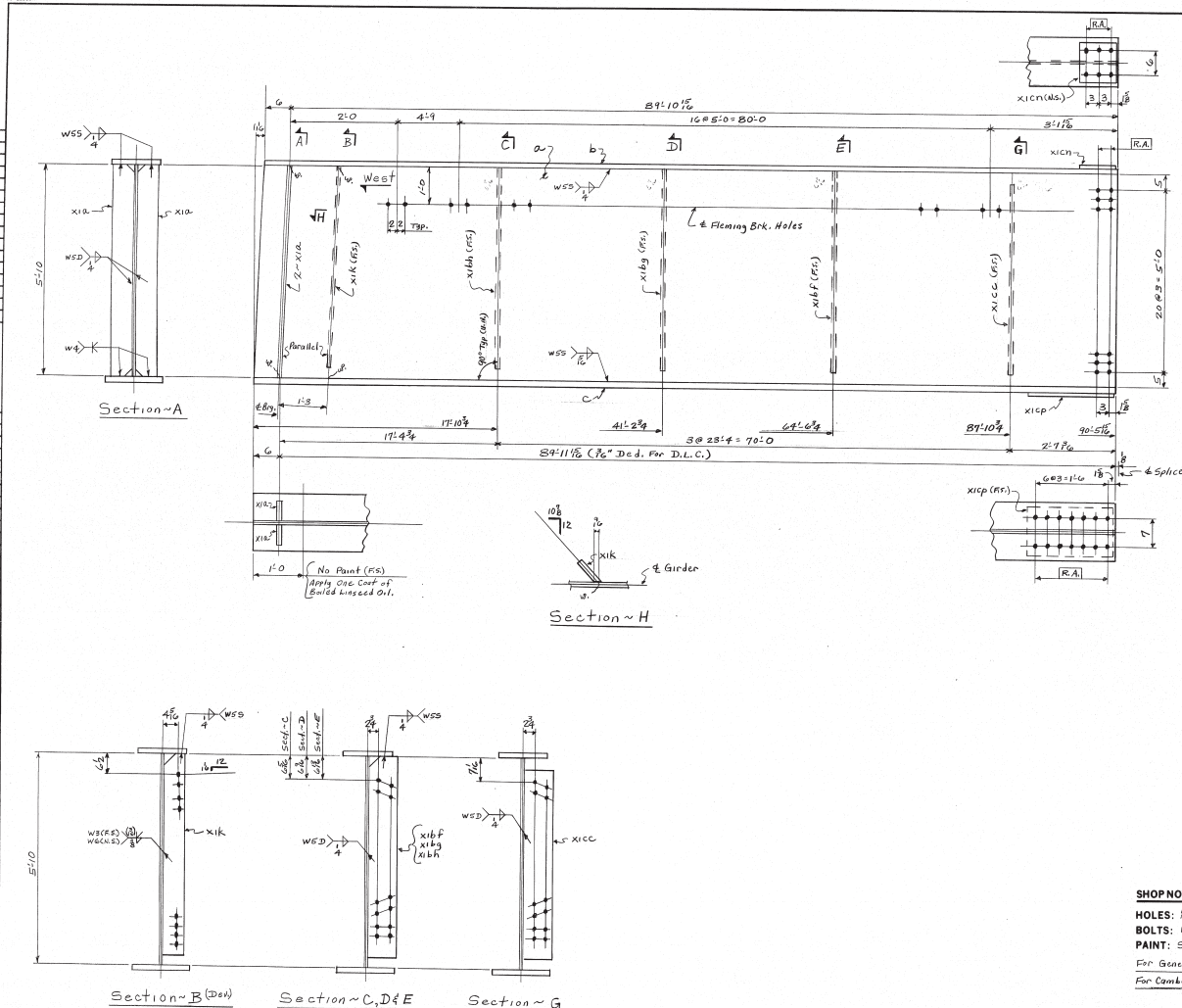
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100-2000



**SHOP NOTE**  
HOLES:  $\frac{1}{8}$ " (Min)  
BOLTS: None  
PAINT: See Dwg. N1  
For General Notes See Dwg. N1.  
For Camber Diagram See Dwg. PS1.

CODE: 4000

REV. NO. 1 ME 1163958(89)170

BILL OF MATERIAL					
NO.	MARK	DESCRIPTION	LENGTH	REMARKS	ITEM QUANTITY
One	G6A	Girder			2092
One	a	W6x8 70x $\frac{1}{2}$	90	G (T)	
One	b	Flg. PL 12x $\frac{1}{2}$	90	4 $\frac{1}{2}$ (T)	
One	c	Flg. PL 14x1'	90	5 $\frac{1}{2}$ (T) A572	
2	X12	Bar 4x $\frac{1}{2}$	5' 10"		45
One	X12	Bar 6x $\frac{1}{2}$	5' 10"		45
	X12f	Bar 7x $\frac{1}{2}$	5' 6"		50
	X12h	Do.	5' 6"		50
	X12c	Do.	5' 6"		47
	X12h	Do.	5' 3"		47
	X12h	Do.	0' 9"	F.H. A572	16
One	X12p	PL 12x $\frac{1}{2}$	1' 9"	F.H. A572	27

NO.	REVISION	DATE
HIGH STEEL STRUCTURES, INC.		
100 Old Pennsylvania Pk. Lancaster, Pennsylvania 17602 Phone 770-295-0211		
A Subsidiary of High Industries, Inc.		
Girder - G6A		
Parkway South Over I-395		
Parkway South Sta. 24+69.67		
State of Maine, Dept. of Trans.		
Town of Brewer		
Penobscot Co., Maine		
STATE CONTRACT	CONTRACTOR	Redd, Paul, Inc.
DR. CHARGE	MADE BY	CHRISTMAS
CONTRACT	DATE	9-8-88
ME-83080	DRAWING	9 of 19

181-56

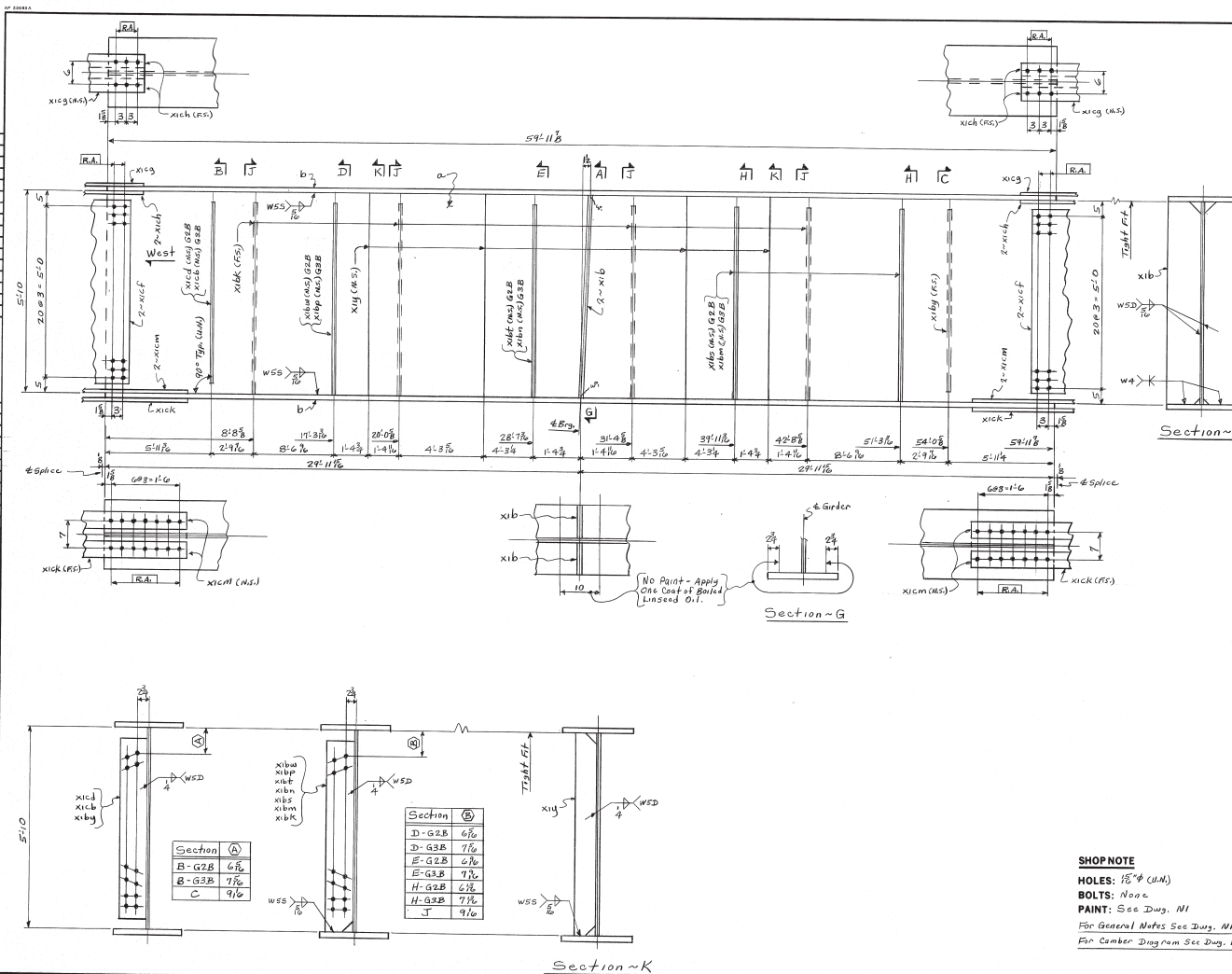




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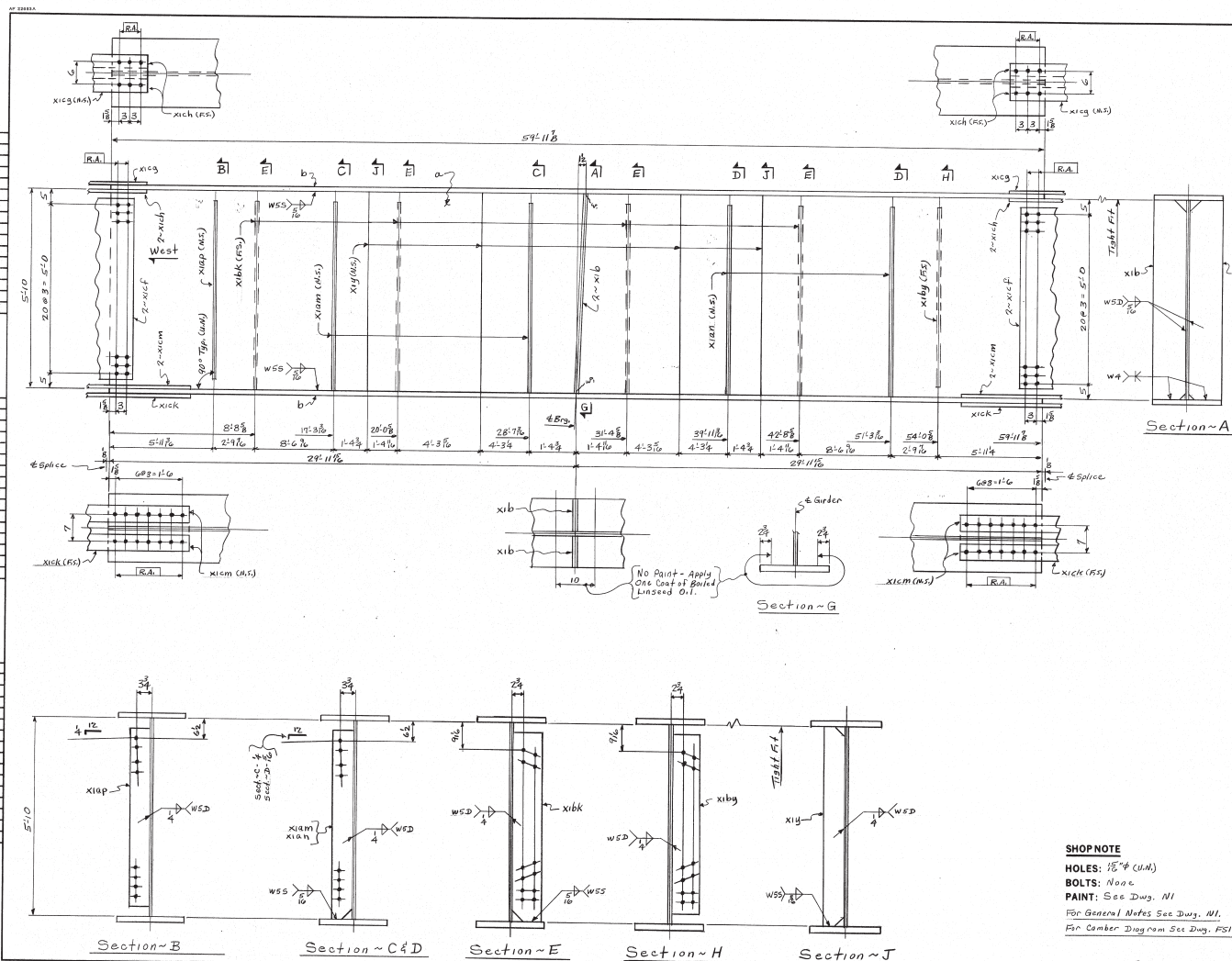
BILL OF MATERIAL					
NO.	MARK	DESCRIPTION	LENGTH	REMARKS	ITEM QUANTITY
1		One G2B Girder			21040
2		One G3B Girder			21040
3		2 x 1/2" x 1/2" x 1/2" (T)	59	11 1/2" (T)	
4		2 x 1/2" x 1/2" x 1/2" (T) AS72	59	11 1/2" (T)	
5		2 x 1/2" x 1/2" x 1/2" (T)	5	10	
6		2 x 1/2" x 1/2" x 1/2" (T)	5	10	
7		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
8		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
9		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
10		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
11		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
12		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
13		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
14		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
15		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
16		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
17		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
18		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
19		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
20		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
21		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
22		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
23		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
24		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
25		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
26		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
27		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
28		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
29		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
30		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
31		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
32		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
33		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
34		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
35		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
36		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
37		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
38		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
39		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
40		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
41		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
42		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
43		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
44		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
45		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
46		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
47		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
48		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
49		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
50		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
51		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
52		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
53		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
54		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
55		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
56		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
57		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
58		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
59		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
60		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
61		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
62		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
63		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
64		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
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66		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
67		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
68		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
69		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
70		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
71		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
72		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
73		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
74		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
75		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
76		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
77		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
78		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
79		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
80		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
81		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
82		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
83		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
84		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
85		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
86		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
87		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
88		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
89		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
90		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
91		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
92		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
93		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
94		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
95		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
96		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
97		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
98		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
99		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	
100		2 x 1/2" x 1/2" x 1/2" (T)	5	6 1/2	

**SHOP NOTE**  
 HOLES: 1/8" (MIN.)  
 BOLTS: None  
 PAINT: See Dwg. N1  
 For General Notes See Dwg. N1  
 For Camber Diagram See Dwg. FSI

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CODE: 4000

181-58



BILL OF MATERIAL					
NO.	MARK	DESCRIPTION	LENGTH	REMARKS	WEIGHT
One	G4B	Girder			20%
One	a	W6x16 70x16 59 11/8 (T)			
2	b	FLG 18x16 59 11/8 (T) A572			
2	X1C6	Bar 9x14 5 10			22%
4	X1C8	Bar 5x8 5 10			5%
2	X1C10	5 6 1/2			
2	X1C11	5 6 1/2			
One	X1C12	Bar 5x8 5 3			5%
4	X1C13	Bar 7x8 5 6 1/2			5%
One	X1C14	5 3			
4	X1C15	1 0 1/2 (T)			
2	X1C16	1 6 1/2 (T)			
4	X1C17	1 6 1/2 (T)			
2	X1C18	3 6 1/2 (T) A572			
4	X1C19	3 6 1/2 (T) A572			

**SHOP NOTE**  
 HOLES: 1/8" (U.M.)  
 BOLTS: None  
 PAINT: See Dwg. N1  
 For General Notes See Dwg. N1,  
 For Camber Diagram See Dwg. F51.

NO.	REVISION	DATE
HIGH STEEL STRUCTURES, INC.		
1000 Old Providence Hwy. Greenville, Pennsylvania 17033 Phone 770-225-2211 A Subsidiary of High Industries Inc.		
Girder - G4B		
Parkway South Over I-95		
Parkway South Sta. 24+69.67		
State of Maine, Dept. of Trans.		
Town of Brewer		
Pinebloss Co., Maine		
STATE CONTRACT NO. 83080	CONTRACTOR Reed & Reed, Inc.	
IN CHARGE: Christian	DATE: 9-7-83	
CONTRACT ME-83080	DRAWING NO. 12 of 19	

181-59

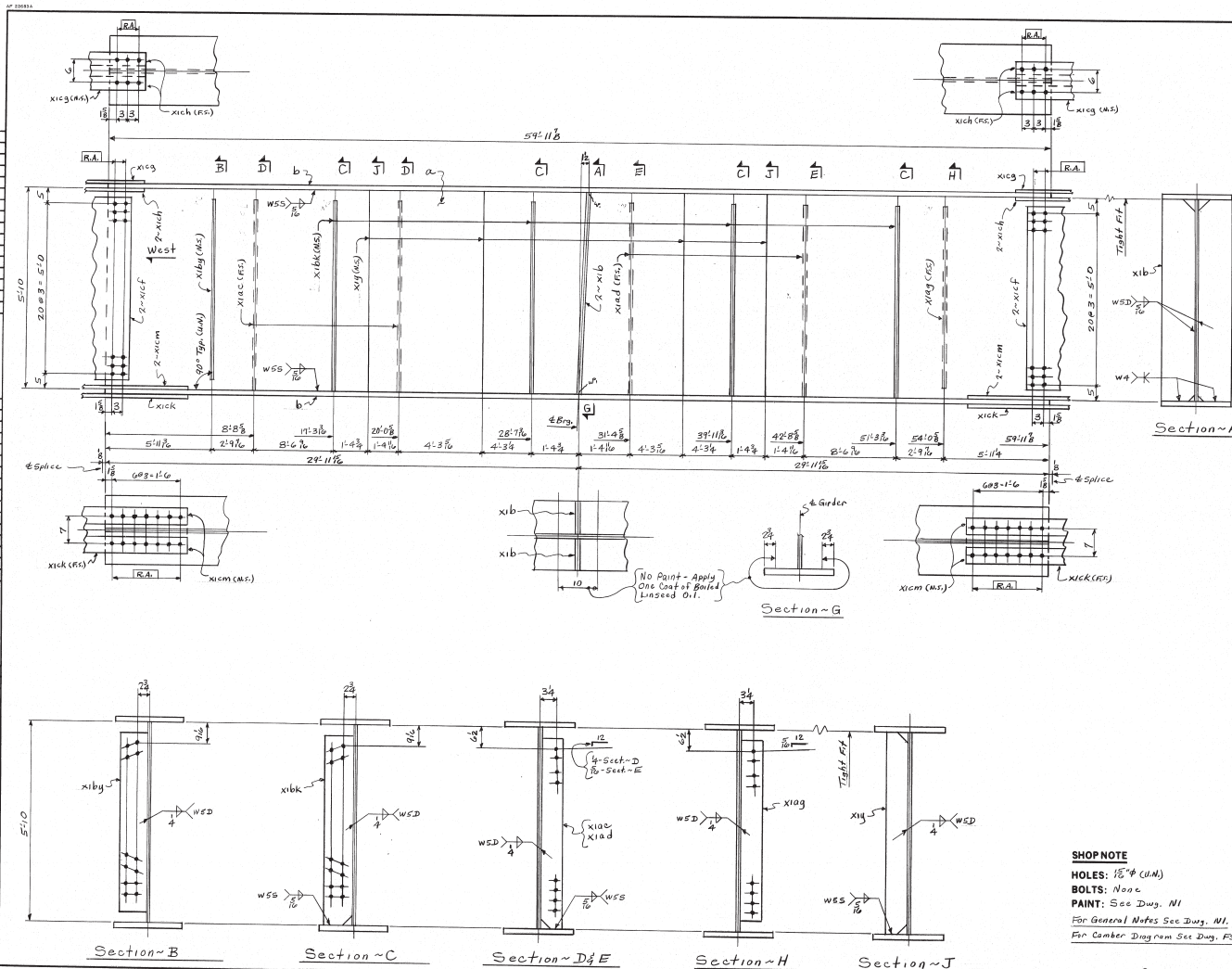


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BILL OF MATERIAL					
NO.	MARK	DESCRIPTION	LENGTH	REMARKS	ITEM QUANTITY
ONE	G5B	Girder			204.7
ONE	a	web PL 70 x 5/8	59' 11 1/2" (T)		
2	b	FL PL 18 x 1/2	59' 11 1/2" (T) ASTM		
2	x10b	Bar 5 x 1/2	5' 10"		283
4	x10c	Bar 5 x 1/2	5' 10"		37
2	x10d	Bar 5 x 1/2	5' 6 1/2"		35
2	x10e	Bar 5 x 1/2	5' 6 1/2"		35
ONE	x10f	Bar 5 x 1/2	5' 3"		34
4	x10g	Bar 7 x 1/2	5' 6 1/2"		50
ONE	x10h	Do.	5' 3"		47
4	x10i	PL 63 x 1/2	1' 0 1/2" (T)		
2	x10j	PL 10 x 1/2	1' 6 1/2" (T)		
4	x10k	Bar 4 x 1/2	1' 6 1/2" (T)		
2	x10l	PL 12 x 1/2	3' 6 1/2" (T) ASTM		
4	x10m	Bar 5 x 1/2	3' 6 1/2" (T) ASTM		

NO.	REVISION	DATE
HIGH STEEL STRUCTURES, INC.		
Girder - G5B		
Parkway South Over I-395		
Parkway South Sta 24+62.67		
State of Maine, Dept. of Trans.		
Town of Bangor		
Penobscot Co., Maine		
STATE CONTRACT NO. REF. NO. CONTRACTOR Reed & Reed, Inc.		
IN CHARGE: Christman MARK: EPM CHK'D: WRC DATE: 7-9-83		
CONTRACT ME-83080 DRAWING NUMBER 13 of 19		

SHOP NOTE  
HOLES: 1 1/2" (MIN.)  
BOLTS: None  
PAINT: See Dwg. N1  
For General Notes See Dwg. N1.  
For Camber Diagram See Dwg. FSI.

CODE: 9000

181-60

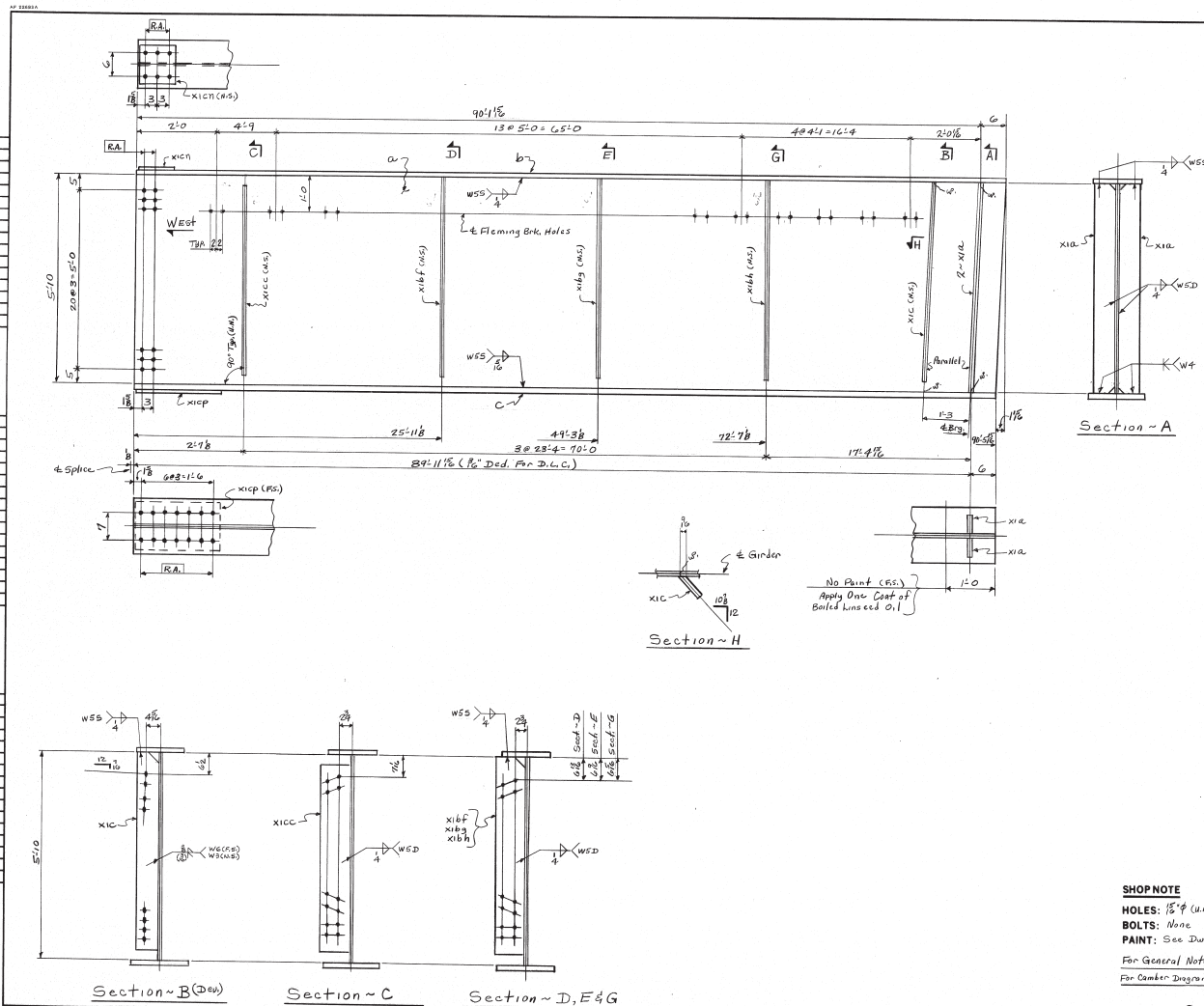


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1 ME 116-395-800/10

BILL OF MATERIAL					
NO.	MARK	DESCRIPTION	LENGTH	REMARKS	UNIT
One	GIC	Girder			20'0"
One	a	Web 12 x 1/2	90	7 1/2 (CT)	17'0"
One	b	Flg. 12 x 1/2	90	7 1/2 (CT)	17'0"
One	c	Flg. 12 x 1/2	90	7 1/2 (CT) A572	17'0"
2	xia	Bar 4 x 1/2	5	10	4'5"
One	xic	Bar 6 x 1/2	5	6 1/2	4'5"
	xibf	Bar 7 x 1/2	5	6 1/2	4'5"
	xibg	Bar 7 x 1/2	5	6 1/2	4'5"
	xibh	Bar 7 x 1/2	5	6 1/2	4'5"
	xicc	Bar 7 x 1/2	5	3	4'5"
	xich	Bar 10 x 1/2	0	9	Fill
One	xicp	Bar 12 x 1/2	1	9	Fill A572

# SHOP NOTE

HOLES: 15/16" (U.N.)

BOLTS: None

PAINT: See Dwg. N1

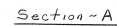
For General Notes See Dwg. N1.


For Center Diagram See Dwg. P51.

CODE: 4000

NO.	REVISION	DATE
1		

181-62



NO.	REVISION	DATE
H&C PHOTODUPLICATIONS, INC. 10500 Old Philadelphia Pike Leesburg, Pennsylvania 17033 Phone (717) 839-7171		
HIGH STEEL STRUCTURES, INC.		
		
A Subsidiary of High Insurance, Inc.		
Girders — G2C4 G3C Parkway South Over I-395 Parkway South Sta. 24260-67 State of Maine, Dept. of Trans. Town of Brewer Penobscot Co., Maine		
STATE CONTRACT		CONTRACT NO.
OR REF. NO.		Reed & Reed, Inc.
IN CHARGE	MADE BY	CHK'D BY
Christian	EDM	JRC
DATE	DRANK	DATE
ME-83080		10/6/79

CODE: 4000

NUMBER: 10 OF 15  
181-63





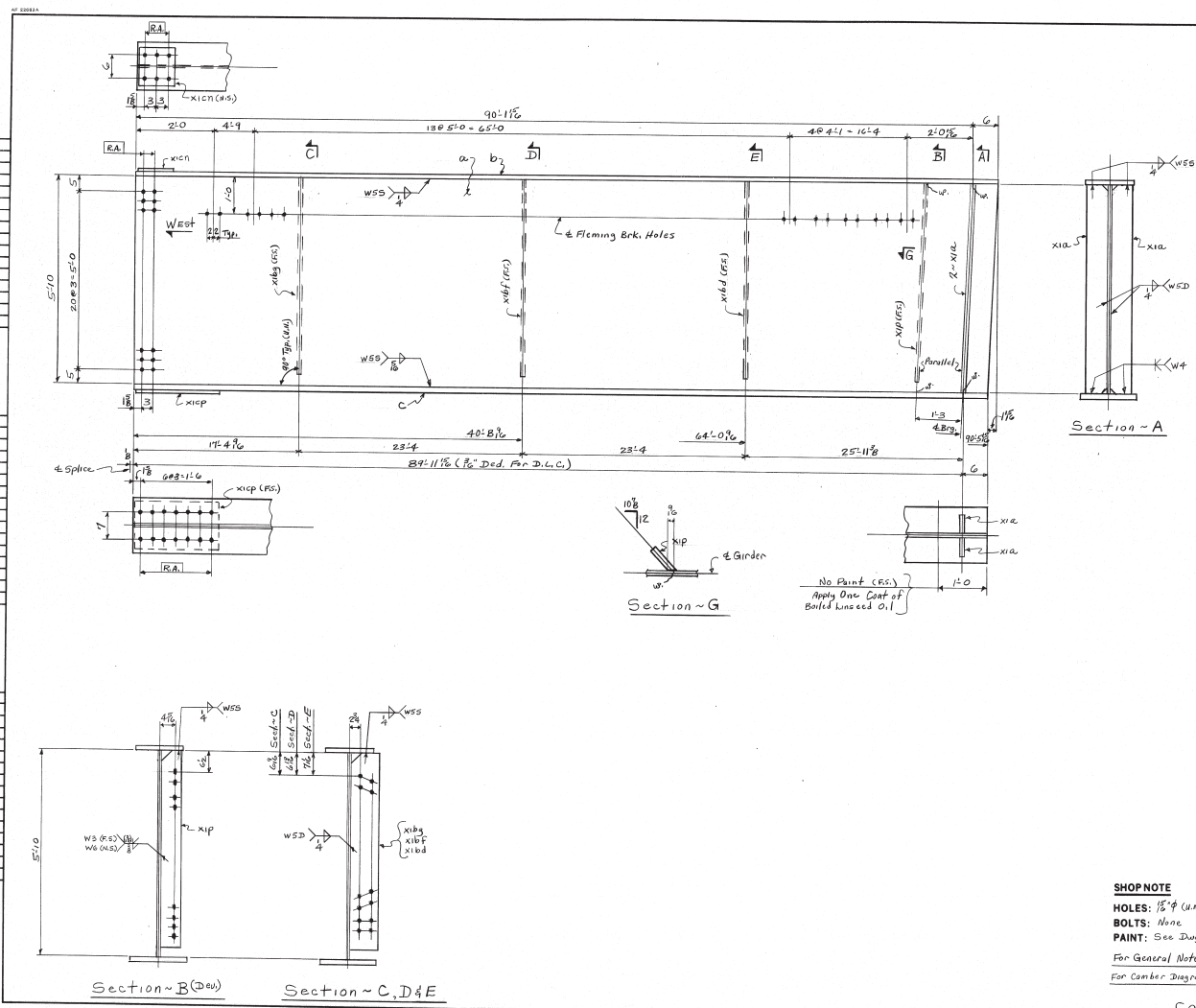


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**SHOP NOTE**  
 HOLES: 5/8" (U.N.)  
 BOLTS: None  
 PAINT: See Dwg. N1  
 For General Notes See Dwg. N1.  
 For Camber Diagram See Dwg. FSI.

JOB NO. JOB NO.		STATE	FED. AID PROJ. NO.			
1		ME.	116-395-0000			
BILL OF MATERIAL						
NO.	MARK	DESCRIPTION	LENGTH	REMARKS	ITEM	EST. QUANTITY
One	GCC	Girder				20915
One	a	Wich PE 70 x 8	90	75 (CT)		
One	b	Fl. PE 12 x 4	90	75 (CT)		
One	c	Fl. PE 14 x 1	90	85 (CT) A572		
2	X1A	Bar 4 x 6	5	10		400
One	X1P	Bar 6 x 6	5	66		45
1	X1B	Bar 7 x 8	1	1		50
1	X1C	Do.	1	1		50
1	X1D	PE 10 x 8	0	9	Full	6
One	X1P	PE 12 x 8	1	9	Full A572	6

NO.	REVISION	DATE
1		
HIGH STEEL STRUCTURES, INC.		
190 Old Providence Pike Lafayette, Pennsylvania 15802 Phone 712-280-2211 A Subsidiary of High Industries, Inc.		
Girder - GCC		
Parkway South Over I-395		
Parkway South Sta. 24+69.67		
State of Maine, Dept. of Trans.		
Town of Bangor		
Panobscot Co., Maine		
STATE CONTRACT	CONTRACTOR Reed & Reed, Inc.	
ORDER NO.	MADE BY: EPM	
CHARGE: Christian	DATE: 9-9-83	CHKD: WRC
CONTRACT: ME-83080	DRAWING: 19 of 19	DATE: 9-9-83
ISSUED:	100-66	

CODE: 4000



## **APPENDIX**

### **MDX EV2 and EV3 Load Rating Output**

**(Updated 8/31/2019)**

BRIDGE 1562 EXTERIOR

Line Girder : Input File : Definition

Exterior girder - EV2 Truck

Thu Aug 29 12:52:52 2019

ID: BRIDGE 1562 EXTERIOR

CONDITIONS

A36 STIFFENER STEEL  
 A36 TOP FLANGE FOR SECTION 1  
 A36 TOP FLANGE FOR SECTION 3  
 A36 WEB FOR SECTION 1  
 A36 WEB FOR SECTION 2  
 A36 WEB FOR SECTION 3  
 A572 BOTTOM FLANGE FOR SECTION 1  
 A572 BOTTOM FLANGE FOR SECTION 2  
 A572 TOP FLANGE FOR SECTION 2  
 A572 BOTTOM FLANGE FOR SECTION 3  
 ASSUME SLAB ON FLANGE FOR SECTION PROPERTIES  
 ENGLISH INPUT  
 ENGLISH OUTPUT  
 FULL DEPTH CONNECTION PLATES  
 IGNORE WET CONCRETE STRESS CHECK  
 INTERMEDIATE TRANSVERSE STIFFENERS ONE SIDE OF WEB  
 LRFD METHOD  
 RATE MODE  
 SINGLE BEARING STIFFENERS EACH SIDE

DATA

ADTT 511  
 BETA 1.75  
 BNGSKEW 132.2333 132.2333 132.2333  
 BR 17.3958 23.3333 23.3333 23.3333 11.3333 11.3333 11.3333  
 11.3333 11.3333 23.3333 23.3333 23.3333 25.9379  
 BSPL 90. 60.  
 DCGAMMA 1.25  
 DWGAMMA 1.5  
 ESLABW 93.  
 ETAD 1.  
 ETAI 1.  
 ETAR 1.  
 FILLET 1.  
 FPC 3.  
 LANED 0.425  
 LANEM 0.64  
 LANEMF 0.64  
 LANEV 1.145  
 LANEVF 1.145  
 LIFE 75  
 LLDLIM 800  
 NSUPBR 1 1 1  
 PBETA 1.3  
 PBETAOP 1.3  
 PRMITP 24. 33.5  
 PRMITSP 15.  
 SLABT 11.  
 SLABWEAR 0.  
 SPL 90. 60.  
 SPLBFT 1. 1.375 1.  
 SPLBFW 14. 18. 14.  
 SPLTFT 0.75 1.375 0.75  
 SPLTFW 12. 18. 12.  
 SPLTST 0.375  
 SPLTSW 5.  
 SPLWD 70.  
 SPLWT 0.625  
 SPN 120. 120.  
 SS 1.  
 STFGAP 0.  
 SUPBST 0.5 1.25 0.5  
 SUPBSW 4.5 9. 4.5  
 TSPL 90. 60.  
 TSPP 208.75 280. 280. 280. 136. 119.25 16.75 51.25 84.75  
 51.25 68. 16.75 136. 280. 280. 280.  
 WCONC 150.  
 WDL 1.488  
 WEAR 0.2392  
 WSDL 0.3067

GO

BRIDGE 1562 EXTERIOR  
Line Girder : Rating Output : Case Data  
Thu Aug 29 13:43:05 2019

## Exterior Girder - EV2 Truck

Case Data - BRIDGE 1562 EXTERIOR

### AASHTO Specification

Load and Resistance Factor Method  
6th Edition LRFD Bridge Design Specifications  
2nd Edition Manual for Bridge Evaluation

Dimensions (additional information available in Dimensions table)

Given dimensions-

Web Depth	70.00	in	70.00	in	70.00	in
Web Thickness	0.62	in	0.62	in	0.62	in
Trans. Stiff. Width	5.00	in	5.00	in	5.00	in
Trans. Stiff. Thickness	0.38	in	0.38	in	0.38	in
Bearing Stiff. Width	4.50	in	9.00	in	4.50	in
Bearing Stiff. Thickness	0.50	in	1.25	in	0.50	in

### Execution Mode

Rate Mode

### Geometry

Brace locations

0.00 ft	17.40 ft	40.73 ft	64.06 ft
87.40 ft	98.73 ft	110.06 ft	120.00 ft
121.40 ft	132.73 ft	144.06 ft	167.40 ft
190.73 ft	214.06 ft	240.00 ft	

Unbraced length of comp. flange at support 2 is 9.94 ft.

### Cover plates

No cover plates

### Curvature

No curvature

### Flange splices

Top flange splice locations

90.00 ft 150.00 ft

Bottom flange splice locations

90.00 ft 150.00 ft

### Girder Type

Plate girder  
Interior girder

### Hinges

No interior hinges

### Span lengths

Spans 120.00 ft 120.00 ft

### Stiffeners

Bearing stiffeners

Single bearing stiffeners each side

Longitudinal stiffeners

## Exterior Girder - EV2 Truck

No longitudinal stiffener

### Transverse stiffeners

Transverse stiffeners one side only

Stiffener clips	1.00 in			
Stiffener transitions	17.40 ft	87.40 ft	98.73 ft	108.67 ft
	110.06 ft	114.33 ft	120.00 ft	121.40 ft
	125.67 ft	131.33 ft	132.73 ft	144.06 ft
	214.06 ft			

### Web haunches

No web haunches

### Web splices

Web splice locations 90.00 ft 150.00 ft

### Fatigue

Average Single Lane Daily Truck Traffic: 511  
Allowable weld stress 18.00 ksi  
AWS minimum welds  
Fatigue life: 75  
Fatigue stress category B flange splices

### Composite Behavior

Composite region for composite loading- 0. - 240.00 ft

#### Lane fraction for strength limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400				

#### Lane fraction for fatigue limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400				

Lane fraction for live-load deflection  
0.4250

Loaded lanes 2  
Tandem truck multiplier: 1.0000  
Design truck multiplier: 1.0000

### Permit truck loading

Axle loads 24.00 k 33.50 k  
Axle spacing 15.00 ft 15.00 ft

### Influence lines not displayed

Unshored construction

Dead load carried by steel alone

1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k

# Exterior Girder - EV2 Truck

1.474 k/ft

Tenth pt values of distributed dead load carried by steel alone

1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft

Superimposed dead load

0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft			

Wearing surface dead load

0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft			

Load Factors

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

Permit Trk Strength In	1.300
Permit Trk Strength Op	1.300
Permit Trk Service II	1.000

Load Modifiers

Ductility	1.00
Redundancy	1.00
Operational Classification	1.00

Reactions

Max des trk or des tandem + lane unfactored live load+impact reactions		
136.88 k	271.13 k	136.82 k
Min des trk or des tandem + lane unfactored live load+impact reactions		
-17.14 k	0.00 k	-17.12 k
Max unfactored live reactions - No dynamic load allowance		
Des trk or des tandem + lane		
112.36 k	228.78 k	112.31 k
Min unfactored live reactions - No dynamic load allowance		
Des trk or des tandem + lane		
-14.36 k	0.00 k	-14.34 k
Total unfactored dead load DC1+DC2 reactions		
77.46 k	275.02 k	77.46 k
Total unfactored dead load DW reactions		
10.42 k	36.58 k	10.42 k

Support skew for shear and moment modification

90.00	90.00	90.00
-------	-------	-------

Bearing skew for redistribution qualification

132.23	132.23	132.23
--------	--------	--------

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	11.00 in	11.00 in
---------------------	----------	----------

Effective slab width	93.00 in
----------------------	----------

Neg mom rebar area

10.23 in<sup>2</sup>

Rebar placement from bottom of slab

6.50 in

Negative mom. slab used in dead load 2 analysis

Fillet	1.00 in
--------	---------

Effective slab width	93.00 in
----------------------	----------

Steel

## Exterior Girder - EV2 Truck

Page 5 of 88  
ENG: JPS 8/30/19  
CHK: AJF 8/30/19

Web splice section 1	
Top flange grade	A36
Web grade	A36
Stiffener grade	A36
Bottom flange grade	A572
Web splice section 2	
Web grade	A36
Stiffener grade	A36
Top flange grade	A572
Bottom flange grade	A572
Web splice section 3	
Top flange grade	A36
Web grade	A36
Stiffener grade	A36
Bottom flange grade	A572
Rebar yield	60.00 ksi

### Output

Standard resolution summary tables

### Units

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



BRIDGE 1562 EXTERIOR  
Line Girder : Rating Output : Factored Strengths  
Thu Aug 29 13:43:19 2019

Exterior Girder - EV2 Truck

Factored Strengths

Forces include ductility, redundancy, and operational factors

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		HL93			HL93		
0	0.00	350.4	460.5 (5)	0.761	0.0	9837.0 (20)	0.000
1	12.00	282.5	569.3 (3)	0.496	2513.6 I	9837.0 (20)	0.256
2	24.00	215.4	460.5 (5)	0.468	4238.0 I	9837.0 (20)	0.431
3	36.00	151.2	460.5 (5)	0.328	5262.4 I	9723.6 (20)	0.541
4	48.00	117.7	460.5 (5)	0.255	5533.9 I	9713.0 (20)	0.570
5	60.00	179.1	460.5 (5)	0.389	5113.6 I	9837.0 (20)	0.520
6	72.00	240.8	460.5 (5)	0.523	4036.0 I	9837.0 (20)	0.410
7	84.00	302.2	460.5 (5)	0.656	2300.8 I	9837.0 (20)	0.234
8	96.00	362.9	714.3 (3)	0.508	2884.4 I	9227.2 (6)	0.313
9	108.00	422.5	748.8 (3)	0.564	5419.4 I	9389.2 (6)	0.577
10L	120.00	480.8	882.9 (3)	0.545	8926.3 I	9376.3 (6)	0.952
10R	120.00	480.8	913.5 (3)	0.526	8926.3 I	9376.3 (6)	0.952
11	132.00	422.4	913.5 (3)	0.462	5421.8 I	9389.3 (6)	0.577
12	144.00	362.8	460.5 (5)	0.788	2882.9 I	9471.9 (6)	0.304
13	156.00	302.2	460.5 (5)	0.656	2301.3 I	9837.0 (20)	0.234
14	168.00	240.9	460.5 (5)	0.523	4034.4 I	9837.0 (20)	0.410
15	180.00	179.2	460.5 (5)	0.389	5111.1 I	9837.0 (20)	0.520
16	192.00	117.7	460.5 (5)	0.256	5531.8 I	9713.0 (20)	0.570
17	204.00	151.1	460.5 (5)	0.328	5260.7 I	9723.6 (20)	0.541
18	216.00	215.4	460.5 (5)	0.468	4236.9 I	9837.0 (20)	0.431
19	228.00	282.5	460.5 (5)	0.613	2513.2 I	9837.0 (20)	0.255
20	240.00	350.3	460.5 (5)	0.761	0.0	9837.0 (20)	0.000

Absolute values of factored moment are shown with determining strength

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	252.4	569.3 (3)	0.443
40.73	138.0	460.5 (5)	0.300
64.06	200.0	460.5 (5)	0.434
87.40	319.4	460.5 (5)	0.694
98.73	376.4	714.3 (3)	0.527
108.67	425.7	748.8 (3)	0.569
110.06	432.5	913.5 (3)	0.473
114.33	453.3	882.9 (3)	0.513
121.40	474.0	913.5 (3)	0.519
125.67	453.2	882.9 (3)	0.513
131.33	425.7	882.9 (3)	0.482
132.73	418.8	714.3 (3)	0.586
167.40	244.0	460.5 (5)	0.530
190.73	124.2	460.5 (5)	0.270
214.06	205.0	460.5 (5)	0.445

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		Permit only			Permit only		
0	0.00	217.1	460.5 (5)	0.471	0.0	9837.0 (20)	0.000
1	12.00	171.7	569.3 (3)	0.302	1760.2 II	9837.0 (20)	0.179
2	24.00	126.6	460.5 (5)	0.275	2959.0 II	9837.0 (20)	0.301
3	36.00	82.0	460.5 (5)	0.178	3606.5 II	9723.6 (20)	0.371
4	48.00	58.9	460.5 (5)	0.128	3718.0 II	9713.0 (20)	0.383
5	60.00	100.4	460.5 (5)	0.218	3336.3 II	9837.0 (20)	0.339
6	72.00	143.9	460.5 (5)	0.312	2481.3 II	9837.0 (20)	0.252
7	84.00	186.4	460.5 (5)	0.405	1143.2 II	9837.0 (20)	0.116
8	96.00	227.7	714.3 (3)	0.319	1901.0 II	9227.2 (6)	0.206

# Exterior Girder - EV2 Truck

9	108.00	267.8	748.8 (3)	0.358	3813.5 II	9389.2 (6)	0.406
10L	120.00	309.7	882.9 (3)	0.351	6098.2 II	9376.3 (6)	0.650
10R	120.00	309.7	882.9 (3)	0.351	6098.2 II	9376.3 (6)	0.650
11	132.00	271.5	913.5 (3)	0.297	3812.3 II	9389.3 (6)	0.406
12	144.00	227.7	714.3 (3)	0.319	1899.9 II	9471.9 (6)	0.201
13	156.00	186.4	460.5 (5)	0.405	1143.9 II	9837.0 (20)	0.116
14	168.00	143.9	460.5 (5)	0.313	2480.5 II	9837.0 (20)	0.252
15	180.00	100.5	460.5 (5)	0.218	3335.0 II	9837.0 (20)	0.339
16	192.00	58.9	460.5 (5)	0.128	3717.0 II	9713.0 (20)	0.383
17	204.00	105.0	460.5 (5)	0.228	3605.7 II	9723.6 (20)	0.371
18	216.00	154.2	460.5 (5)	0.335	2958.5 II	9837.0 (20)	0.301
19	228.00	204.0	460.5 (5)	0.443	1760.0 II	9837.0 (20)	0.179
20	240.00	217.1	460.5 (5)	0.471	0.0	9837.0 (20)	0.000

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	151.4	569.3 (3)	0.266
40.73	72.9	460.5 (5)	0.158
64.06	115.1	460.5 (5)	0.250
87.40	198.1	460.5 (5)	0.430
98.73	236.8	714.3 (3)	0.332
108.67	270.1	748.8 (3)	0.361
110.06	275.0	913.5 (3)	0.301
114.33	289.9	882.9 (3)	0.328
121.40	474.0	913.5 (3)	0.519
125.67	453.2	882.9 (3)	0.513
131.33	425.7	882.9 (3)	0.482
132.73	268.8	714.3 (3)	0.376
167.40	146.1	460.5 (5)	0.317
190.73	63.3	460.5 (5)	0.137
214.06	146.3	460.5 (5)	0.318

- (3)  $V_p(C+.87(1-C)/\sqrt{1+(D_o/D)^2})$
- (5)  $C = 0.58 F_y W D t$
- (20) Compact section
- (6)  $R_b R_h F_y S(\text{equiv})$   
Maximum moment in factored strength expression

BRIDGE 1562 EXTERIOR Exterior Girder - EV2 Truck  
Line Girder : Rating Output : Lrfd Ratings  
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[This table uses the rating equation (6B.4.1-1) of the 2011 edition of the Manual for Bridge Evaluation where A1D is the sum of factored composite dead, noncomposite dead, and factored wearing surface loads. The denominator A2L(1+I) is the factored live load. If equation (6a.4.2.1-1) is to be used for LRFR ratings the condition LRFR RATINGS must be used in the girder input file.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	9837. C	460.51	>999.00	B>999.00	1.46	2.55
12.00	9837. C	569.26	6.35 B	11.11	2.41	4.23
24.00	9837. C	460.51	3.41 B	5.97	2.47	4.32
36.00	9724. C	460.51	2.51 B	4.40	3.32	5.81
48.00	9713. C	460.51	2.31 B	4.04	4.28	7.50
60.00	9837. C	460.51	2.52 B	4.40	3.09	5.40
72.00	9837. C	460.51	3.11 B	5.43	2.33	4.07
84.00	9837. C	460.51	4.57 B	8.00	1.81	3.16
90.00L	4709. C	652.27	2.84 B	4.97	2.52	4.40
90.00R	9297. C	714.29	5.93 B	10.38	2.81	4.92
96.00	48707. B	714.29	5.22 B	9.14	2.56	4.48
108.00	50000. B	748.81	2.91 B	5.10	2.28	4.00
120.00	50000. B	882.87	1.22 B	2.13	2.43	4.25

Span 2

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	50000. B	913.50	1.22 B	2.13	2.54	4.44
12.00	50000. B	913.50	2.91 B	5.09	2.93	5.13
24.00	50000. B	714.29	5.39 B	9.43	2.56	4.48
30.00L	49557. B	460.51	6.25 B	10.93	1.61	2.81
30.00R	37610. B	460.51	3.02 B	5.29	1.61	2.81
36.00	9837. C	460.51	4.57 B	8.00	1.81	3.16
48.00	9837. C	460.51	3.11 B	5.44	2.33	4.07
60.00	9837. C	460.51	2.52 B	4.41	3.08	5.40
72.00	9713. C	460.51	2.31 B	4.04	4.28	7.49
84.00	9724. C	460.51	2.52 B	4.40	3.32	5.81
96.00	9837. C	460.51	3.41 B	5.97	2.47	4.33

# Exterior Girder - EV2 Truck

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108.00	9837. C	460.51	6.35 B	11.11	1.88	3.29
120.00	9837. C	460.51	>999.00 B	>999.00	1.46	2.56

## Service II

### Span 1

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	45105. S	> 999.00 B	>999.00
12.00	45105. S	6.57 B	8.54
24.00	45105. S	3.38 B	4.40
36.00	45105. S	2.47 B	3.20
48.00	45105. S	2.26 B	2.94
60.00	45105. S	2.48 B	3.23
72.00	45105. S	3.20 B	4.16
84.00	45105. S	4.94 B	6.43
90.00L	32876. S	4.38 T	5.69
90.00R	46275. S	6.88 B	8.94
96.00	46243. S	6.86 B	8.92
108.00	46243. S	3.90 B	5.07
120.00	46243. S	1.81 B	2.36

### Span 2

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	46243. S	1.81 B	2.36
12.00	46243. S	3.89 B	5.06
24.00	46243. S	6.86 B	8.92
30.00L	46243. S	7.91 B	10.29
30.00R	32500. S	4.25 T	5.53
36.00	45105. S	4.94 B	6.43
48.00	45105. S	3.20 B	4.16
60.00	45105. S	2.49 B	3.23
72.00	45105. S	2.27 B	2.95
84.00	45105. S	2.47 B	3.21
96.00	45105. S	3.38 B	4.40
108.00	45105. S	6.57 B	8.54
120.00	45105. S	> 999.00 B	>999.00

\*\*\*\*\*  
Minimum rating is 1.22 at location 120.00 in span 1.  
\*\*\*\*\*

## Permit

## Strength II

### Span 1

Location	Allowable	Shear	Rating Factors Bending		Shear	
			Inv.	Oper.	Inv.	Oper.

Exterior Girder - EV2 Truck

0.00	9837. C	460.51	>999.00	4.28
12.00	9837. C	569.26	18.34	6.93
24.00	9837. C	460.51	9.87	6.88
36.00	9724. C	460.51	7.46	8.97
48.00	9713. C	460.51	6.97	12.72
60.00	9837. C	460.51	7.61	9.63
72.00	9837. C	460.51	9.27	7.30
84.00	9837. C	460.51	13.18	5.75
90.00L	4404. C	652.27	8.59	8.07
90.00R	9206. C	714.29	19.13	9.02
96.00	48707. B	714.29	17.36	8.30
108.00	50000. B	748.81	12.35	7.59
120.00	50000. B	882.87	7.27	8.05

Span 2

Location	Allowable	Shear	Rating Factors		Shear
			Bending		
			Inv.	Oper.	Inv. Oper.
0.00	50000. B	913.50	7.27		8.41
12.00	50000. B	913.50	12.37		9.39
24.00	50000. B	714.29	17.92		8.30
30.00L	48245. B	460.51	20.00		5.16
30.00R	37610. B	460.51	10.03		5.16
36.00	9837. C	460.51	13.17		5.75
48.00	9837. C	460.51	9.27		7.29
60.00	9837. C	460.51	7.62		9.63
72.00	9713. C	460.51	6.97		12.73
84.00	9724. C	460.51	7.46		6.60
96.00	9837. C	460.51	9.88		5.08
108.00	9837. C	460.51	18.34		3.99
120.00	9837. C	460.51	>999.00		4.28

Service II

Span 1

Location	Allowable Stress	Rating Factors	
		Bending	
		Inv.	Oper.
0.00	32475. S	>999.00	
12.00	45105. S	14.10	
24.00	45105. S	7.27	
36.00	45105. S	5.43	
48.00	45105. S	5.08	
60.00	45105. S	5.59	
72.00	45105. S	7.09	
84.00	45105. S	10.58	
90.00L	45662. S	12.25	
90.00R	46275. S	13.96	
96.00	46243. S	16.94	
108.00	46243. S	12.27	
120.00	46243. S	8.03	

Span 2

Location	Allowable	Rating Factors	
		Bending	

Exterior Girder - EV2 Truck

Stress

Inv. Oper.

0.00	46243. S	8.03
12.00	46243. S	12.29
24.00	46243. S	16.97
30.00L	46243. S	17.40
30.00R	45139. S	12.03
36.00	45105. S	10.58
48.00	45105. S	7.09
60.00	45105. S	5.59
72.00	45105. S	5.08
84.00	45105. S	5.44
96.00	45105. S	7.27
108.00	45105. S	14.10
120.00	32475. S	>999.00

\*\*\*\*\*  
 Minimum rating is 3.99 at location 228.00 in span 2.  
 \*\*\*\*\*

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

Fb - factored dead load stress  
 IR = -----  
 factored LL+I stress



BRIDGE 1562 EXTERIOR  
Line Girder : Input File : Definition      Exterior girder - EV3 Truck  
Thu Aug 29 13:46:03 2019

ID: BRIDGE 1562 EXTERIOR  
CONDITIONS

A36 STIFFENER STEEL  
A36 TOP FLANGE FOR SECTION 1  
A36 TOP FLANGE FOR SECTION 3  
A36 WEB FOR SECTION 1  
A36 WEB FOR SECTION 2  
A36 WEB FOR SECTION 3  
A572 BOTTOM FLANGE FOR SECTION 1  
A572 BOTTOM FLANGE FOR SECTION 2  
A572 TOP FLANGE FOR SECTION 2  
A572 BOTTOM FLANGE FOR SECTION 3  
ASSUME SLAB ON FLANGE FOR SECTION PROPERTIES  
ENGLISH INPUT  
ENGLISH OUTPUT  
FULL DEPTH CONNECTION PLATES  
IGNORE WET CONCRETE STRESS CHECK  
INTERMEDIATE TRANSVERSE STIFFENERS ONE SIDE OF WEB  
LRFD METHOD  
RATE MODE  
SINGLE BEARING STIFFENERS EACH SIDE

DATA

ADTT 511  
BETA 1.75  
BNGSKEW 132.2333 132.2333 132.2333  
BR 17.3958 23.3333 23.3333 23.3333 11.3333 11.3333 11.3333  
11.3333 11.3333 23.3333 23.3333 23.3333 25.9379  
BSPL 90. 60.  
DCGAMMA 1.25  
DWGAMMA 1.5  
ESLABW 93.  
ETAD 1.  
ETAI 1.  
ETAR 1.  
FILLET 1.  
FPC 3.  
LANED 0.425  
LANEM 0.64  
LANEMF 0.64  
LANEV 1.145  
LANEVF 1.145  
LIFE 75  
LLDLIM 800  
NSUPBR 1 1 1  
PBETA 1.3  
PBETAOP 1.3  
PRMITP 24. 31. 31.  
PRMITSP 15. 4.  
SLABT 11.  
SLABWEAR 0.  
SPL 90. 60.  
SPLBFT 1. 1.375 1.  
SPLBFW 14. 18. 14.  
SPLTFT 0.75 1.375 0.75  
SPLTFW 12. 18. 12.  
SPLTST 0.375  
SPLTSW 5.  
SPLWD 70.  
SPLWT 0.625  
SPN 120. 120.  
SS 1.  
STFGAP 0.  
SUPBST 0.5 1.25 0.5  
SUPBSW 4.5 9. 4.5  
TSPL 90. 60.  
TSSP 208.75 280. 280. 280. 136. 119.25 16.75 51.25 84.75  
51.25 68. 16.75 136. 280. 280. 280.  
WCONC 150.  
WDL 1.474  
WEAR 0.2392  
WSDL 0.3067

GO

BRIDGE 1562 EXTERIOR  
Line Girder : Rating Output : Case Data  
Thu Aug 29 13:46:40 2019

Exterior Girder - EV3 Truck

Case Data - BRIDGE 1562 EXTERIOR

AASHTO Specification

Load and Resistance Factor Method  
6th Edition LRFD Bridge Design Specifications  
2nd Edition Manual for Bridge Evaluation

Dimensions (additional information available in Dimensions table)

Given dimensions-

Web Depth	70.00	in	70.00	in	70.00	in
Web Thickness	0.62	in	0.62	in	0.62	in
Trans. Stiff. Width	5.00	in	5.00	in	5.00	in
Trans. Stiff. Thickness	0.38	in	0.38	in	0.38	in
Bearing Stiff. Width	4.50	in	9.00	in	4.50	in
Bearing Stiff. Thickness	0.50	in	1.25	in	0.50	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft	17.40 ft	40.73 ft	64.06 ft
87.40 ft	98.73 ft	110.06 ft	120.00 ft
121.40 ft	132.73 ft	144.06 ft	167.40 ft
190.73 ft	214.06 ft	240.00 ft	

Unbraced length of comp. flange at support 2 is 9.94 ft.

Cover plates

No cover plates

Curvature

No curvature

Flange splices

Top flange splice locations

90.00 ft 150.00 ft

Bottom flange splice locations

90.00 ft 150.00 ft

Girder Type

Plate girder  
Interior girder

Hinges

No interior hinges

Span lengths

Spans 120.00 ft 120.00 ft

Stiffeners

Bearing stiffeners

Single bearing stiffeners each side

Longitudinal stiffeners

## Exterior Girder - EV3 Truck

No longitudinal stiffener

### Transverse stiffeners

Transverse stiffeners one side only

Stiffener clips	1.00 in			
Stiffener transitions	17.40 ft	87.40 ft	98.73 ft	108.67 ft
	110.06 ft	114.33 ft	120.00 ft	121.40 ft
	125.67 ft	131.33 ft	132.73 ft	144.06 ft
	214.06 ft			

### Web haunches

No web haunches

### Web splices

Web splice locations 90.00 ft 150.00 ft

### Fatigue

Average Single Lane Daily Truck Traffic: 511  
Allowable weld stress 18.00 ksi  
AWS minimum welds  
Fatigue life: 75  
Fatigue stress category B flange splices

### Composite Behavior

Composite region for composite loading- 0. - 240.00 ft

#### Lane fraction for strength limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400				

#### Lane fraction for fatigue limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400				

#### Lane fraction for live-load deflection

0.4250

Loaded lanes 2  
Tandem truck multiplier: 1.0000  
Design truck multiplier: 1.0000

### Permit truck loading

Axle loads	24.00 k	31.00 k	31.00 k
Axle spacing	15.00 ft	4.00 ft	

### Influence lines not displayed

#### Unshored construction

#### Dead load carried by steel alone

1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k

# Exterior Girder - EV3 Truck

1.474 k/ft

Tenth pt values of distributed dead load carried by steel alone

1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft

Superimposed dead load

0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft			

Wearing surface dead load

0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft			

Load Factors

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

Permit Trk Strength In	1.300
Permit Trk Strength Op	1.300
Permit Trk Service II	1.000

Load Modifiers

Ductility	1.00
Redundancy	1.00
Operational Classification	1.00

Reactions

Max des trk or des tandem + lane unfactored live load+impact reactions		
136.88 k	271.13 k	136.82 k
Min des trk or des tandem + lane unfactored live load+impact reactions		
-17.14 k	0.00 k	-17.12 k
Max unfactored live reactions - No dynamic load allowance		
Des trk or des tandem + lane		
112.36 k	228.78 k	112.31 k
Min unfactored live reactions - No dynamic load allowance		
Des trk or des tandem + lane		
-14.36 k	0.00 k	-14.34 k
Total unfactored dead load DC1+DC2 reactions		
77.46 k	275.02 k	77.46 k
Total unfactored dead load DW reactions		
10.42 k	36.58 k	10.42 k

Support skew for shear and moment modification

90.00	90.00	90.00
-------	-------	-------

Bearing skew for redistribution qualification

132.23	132.23	132.23
--------	--------	--------

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	11.00 in	11.00 in
---------------------	----------	----------

Effective slab width	93.00 in
----------------------	----------

Neg mom rebar area

10.23 in<sup>2</sup>

Rebar placement from bottom of slab

6.50 in

Negative mom. slab used in dead load 2 analysis

Fillet	1.00 in
--------	---------

Effective slab width	93.00 in
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Steel

Exterior Girder - EV3 Truck

Web splice section 1	
Top flange grade	A36
Web grade	A36
Stiffener grade	A36
Bottom flange grade	A572
Web splice section 2	
Web grade	A36
Stiffener grade	A36
Top flange grade	A572
Bottom flange grade	A572
Web splice section 3	
Top flange grade	A36
Web grade	A36
Stiffener grade	A36
Bottom flange grade	A572
Rebar yield	60.00 ksi

Output

Standard resolution summary tables

Units

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

BRIDGE 1562 EXTERIOR  
Line Girder : Rating Output : Factored Strengths  
Thu Aug 29 13:46:59 2019

Exterior Girder - EV3 Truck

Factored Strengths

Forces include ductility, redundancy, and operational factors

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		HL93			HL93		
0	0.00	350.4	460.5 (5)	0.761	0.0	9837.0 (20)	0.000
1	12.00	282.5	569.3 (3)	0.496	2513.6 I	9837.0 (20)	0.256
2	24.00	215.4	460.5 (5)	0.468	4238.0 I	9837.0 (20)	0.431
3	36.00	151.2	460.5 (5)	0.328	5262.4 I	9723.6 (20)	0.541
4	48.00	117.7	460.5 (5)	0.255	5533.9 I	9713.0 (20)	0.570
5	60.00	179.1	460.5 (5)	0.389	5113.6 I	9837.0 (20)	0.520
6	72.00	240.8	460.5 (5)	0.523	4036.0 I	9837.0 (20)	0.410
7	84.00	302.2	460.5 (5)	0.656	2300.8 I	9837.0 (20)	0.234
8	96.00	362.9	714.3 (3)	0.508	2884.4 I	9227.2 (6)	0.313
9	108.00	422.5	748.8 (3)	0.564	5419.4 I	9389.2 (6)	0.577
10L	120.00	480.8	882.9 (3)	0.545	8926.3 I	9376.3 (6)	0.952
10R	120.00	480.8	913.5 (3)	0.526	8926.3 I	9376.3 (6)	0.952
11	132.00	422.4	913.5 (3)	0.462	5421.8 I	9389.3 (6)	0.577
12	144.00	362.8	460.5 (5)	0.788	2882.9 I	9471.9 (6)	0.304
13	156.00	302.2	460.5 (5)	0.656	2301.3 I	9837.0 (20)	0.234
14	168.00	240.9	460.5 (5)	0.523	4034.4 I	9837.0 (20)	0.410
15	180.00	179.2	460.5 (5)	0.389	5111.1 I	9837.0 (20)	0.520
16	192.00	117.7	460.5 (5)	0.256	5531.8 I	9713.0 (20)	0.570
17	204.00	151.1	460.5 (5)	0.328	5260.7 I	9723.6 (20)	0.541
18	216.00	215.4	460.5 (5)	0.468	4236.9 I	9837.0 (20)	0.431
19	228.00	282.5	460.5 (5)	0.613	2513.2 I	9837.0 (20)	0.255
20	240.00	350.3	460.5 (5)	0.761	0.0	9837.0 (20)	0.000

Absolute values of factored moment are shown with determining strength

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	252.4	569.3 (3)	0.443
40.73	138.0	460.5 (5)	0.300
64.06	200.0	460.5 (5)	0.434
87.40	319.4	460.5 (5)	0.694
98.73	376.4	714.3 (3)	0.527
108.67	425.7	748.8 (3)	0.569
110.06	432.5	913.5 (3)	0.473
114.33	453.3	882.9 (3)	0.513
121.40	474.0	913.5 (3)	0.519
125.67	453.2	882.9 (3)	0.513
131.33	425.7	882.9 (3)	0.482
132.73	418.8	714.3 (3)	0.586
167.40	244.0	460.5 (5)	0.530
190.73	124.2	460.5 (5)	0.270
214.06	205.0	460.5 (5)	0.445

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		Permit only			Permit only		
0	0.00	268.9	460.5 (5)	0.584	0.0	9837.0 (20)	0.000
1	12.00	216.4	569.3 (3)	0.380	2036.3 II	9837.0 (20)	0.207
2	24.00	164.3	460.5 (5)	0.357	3421.4 II	9837.0 (20)	0.348
3	36.00	113.0	460.5 (5)	0.245	4228.3 II	9723.6 (20)	0.435
4	48.00	86.2	460.5 (5)	0.187	4412.5 II	9713.0 (20)	0.454
5	60.00	133.0	460.5 (5)	0.289	4017.1 II	9837.0 (20)	0.408
6	72.00	182.4	460.5 (5)	0.396	3076.3 II	9837.0 (20)	0.313
7	84.00	230.1	460.5 (5)	0.500	1607.2 II	9837.0 (20)	0.163
8	96.00	276.1	714.3 (3)	0.386	2208.8 II	9227.2 (6)	0.239



Exterior Girder - EV3 Truck

9	108.00	320.1	748.8 (3)	0.427	4159.8 II	9389.2 (6)	0.443
10L	120.00	362.2	882.9 (3)	0.410	6483.0 II	9376.3 (6)	0.691
10R	120.00	362.1	882.9 (3)	0.410	6483.0 II	9376.3 (6)	0.691
11	132.00	320.1	913.5 (3)	0.350	4158.8 II	9389.3 (6)	0.443
12	144.00	276.0	714.3 (3)	0.386	2207.9 II	9471.9 (6)	0.233
13	156.00	230.1	460.5 (5)	0.500	1608.8 II	9837.0 (20)	0.164
14	168.00	182.4	460.5 (5)	0.396	3075.6 II	9837.0 (20)	0.313
15	180.00	133.1	460.5 (5)	0.289	4015.4 II	9837.0 (20)	0.408
16	192.00	86.1	460.5 (5)	0.187	4410.9 II	9713.0 (20)	0.454
17	204.00	112.9	460.5 (5)	0.245	4227.0 II	9723.6 (20)	0.435
18	216.00	164.3	460.5 (5)	0.357	3420.7 II	9837.0 (20)	0.348
19	228.00	216.3	460.5 (5)	0.470	2036.0 II	9837.0 (20)	0.207
20	240.00	268.9	460.5 (5)	0.584	0.0	9837.0 (20)	0.000

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	193.0	569.3 (3)	0.339
40.73	102.4	460.5 (5)	0.222
64.06	149.7	460.5 (5)	0.325
87.40	243.1	460.5 (5)	0.528
98.73	286.1	714.3 (3)	0.401
108.67	322.4	748.8 (3)	0.431
110.06	327.3	913.5 (3)	0.358
114.33	342.3	882.9 (3)	0.388
121.40	474.0	913.5 (3)	0.519
125.67	453.2	882.9 (3)	0.513
131.33	425.7	882.9 (3)	0.482
132.73	317.4	714.3 (3)	0.444
167.40	184.8	460.5 (5)	0.401
190.73	91.1	460.5 (5)	0.198
214.06	156.0	460.5 (5)	0.339

(3)  $V_p(C + .87(1-C)/\sqrt{1+(D_o/D)^2})$   
(5)  $C = 0.58 F_y w D t$   
(20) Compact section  
(6)  $R_b R_h F_y S(\text{equiv})$   
Maximum moment in factored strength expression

BRIDGE 1562 EXTERIOR Exterior Girder - EV3 Truck  
Line Girder : Rating Output : Lrfd Ratings  
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[This table uses the rating equation (6B.4.1-1) of the 2011 edition of the Manual for Bridge Evaluation where A1D is the sum of factored composite dead, noncomposite dead, and factored wearing surface loads. The denominator A2L(1+I) is the factored live load. If equation (6a.4.2.1-1) is to be used for LRFR ratings the condition LRFR RATINGS must be used in the girder input file.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	9837. C	460.51	>999.00	B>999.00	1.46	2.55
12.00	9837. C	569.26	6.35 B	11.11	2.41	4.23
24.00	9837. C	460.51	3.41 B	5.97	2.47	4.32
36.00	9724. C	460.51	2.51 B	4.40	3.32	5.81
48.00	9713. C	460.51	2.31 B	4.04	4.28	7.50
60.00	9837. C	460.51	2.52 B	4.40	3.09	5.40
72.00	9837. C	460.51	3.11 B	5.43	2.33	4.07
84.00	9837. C	460.51	4.57 B	8.00	1.81	3.16
90.00L	4709. C	652.27	2.84 B	4.97	2.52	4.40
90.00R	9297. C	714.29	5.93 B	10.38	2.81	4.92
96.00	48707. B	714.29	5.22 B	9.14	2.56	4.48
108.00	50000. B	748.81	2.91 B	5.10	2.28	4.00
120.00	50000. B	882.87	1.22 B	2.13	2.43	4.25

Span 2

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	50000. B	913.50	1.22 B	2.13	2.54	4.44
12.00	50000. B	913.50	2.91 B	5.09	2.93	5.13
24.00	50000. B	714.29	5.39 B	9.43	2.56	4.48
30.00L	49557. B	460.51	6.25 B	10.93	1.61	2.81
30.00R	37610. B	460.51	3.02 B	5.29	1.61	2.81
36.00	9837. C	460.51	4.57 B	8.00	1.81	3.16
48.00	9837. C	460.51	3.11 B	5.44	2.33	4.07
60.00	9837. C	460.51	2.52 B	4.41	3.08	5.40
72.00	9713. C	460.51	2.31 B	4.04	4.28	7.49
84.00	9724. C	460.51	2.52 B	4.40	3.32	5.81
96.00	9837. C	460.51	3.41 B	5.97	2.47	4.33

# Exterior Girder - EV3 Truck

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CHK: AJF 8/30/19

108.00	9837. C	460.51	6.35 B	11.11	1.88	3.29
120.00	9837. C	460.51	>999.00 B	>999.00	1.46	2.56

## Service II

### Span 1

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	45105. S	> 999.00 B	>999.00
12.00	45105. S	6.57 B	8.54
24.00	45105. S	3.38 B	4.40
36.00	45105. S	2.47 B	3.20
48.00	45105. S	2.26 B	2.94
60.00	45105. S	2.48 B	3.23
72.00	45105. S	3.20 B	4.16
84.00	45105. S	4.94 B	6.43
90.00L	32876. S	4.38 T	5.69
90.00R	46275. S	6.88 B	8.94
96.00	46243. S	6.86 B	8.92
108.00	46243. S	3.90 B	5.07
120.00	46243. S	1.81 B	2.36

### Span 2

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	46243. S	1.81 B	2.36
12.00	46243. S	3.89 B	5.06
24.00	46243. S	6.86 B	8.92
30.00L	46243. S	7.91 B	10.29
30.00R	32500. S	4.25 T	5.53
36.00	45105. S	4.94 B	6.43
48.00	45105. S	3.20 B	4.16
60.00	45105. S	2.49 B	3.23
72.00	45105. S	2.27 B	2.95
84.00	45105. S	2.47 B	3.21
96.00	45105. S	3.38 B	4.40
108.00	45105. S	6.57 B	8.54
120.00	45105. S	> 999.00 B	>999.00

\*\*\*\*\*  
Minimum rating is 1.22 at location 120.00 in span 1.  
\*\*\*\*\*

## Permit

## Strength II

### Span 1

Location	Allowable	Shear	Rating Factors Bending		Shear	
			Inv.	Oper.	Inv.	Oper.

Exterior Girder - EV3 Truck

0.00	9837. C	460.51	>999.00	2.88
12.00	9837. C	569.26	12.66	4.66
24.00	9837. C	460.51	6.84	4.63
36.00	9724. C	460.51	5.03	6.04
48.00	9713. C	460.51	4.63	7.97
60.00	9837. C	460.51	5.05	6.09
72.00	9837. C	460.51	6.20	4.68
84.00	9837. C	460.51	8.86	3.72
90.00L	4600. C	652.27	6.06	5.24
90.00R	9269. C	714.29	12.96	5.86
96.00	48707. B	714.29	11.67	5.41
108.00	50000. B	748.81	8.30	4.97
120.00	50000. B	882.87	4.88	5.46

Span 2

Location	Allowable	Shear	Rating Factors		Shear
			Bending		
			Inv.	Oper.	Inv. Oper.
0.00	50000. B	913.50		4.88	5.70
12.00	50000. B	913.50		8.31	6.38
24.00	50000. B	714.29		12.04	5.41
30.00L	48245. B	460.51		13.46	3.35
30.00R	37610. B	460.51		6.74	3.35
36.00	9837. C	460.51		8.85	3.72
48.00	9837. C	460.51		6.20	4.67
60.00	9837. C	460.51		5.05	6.09
72.00	9713. C	460.51		4.63	7.98
84.00	9724. C	460.51		5.04	6.05
96.00	9837. C	460.51		6.84	4.64
108.00	9837. C	460.51		12.67	3.62
120.00	9837. C	460.51		>999.00	2.88

Service II

Span 1

Location	Allowable Stress	Rating Factors	
		Bending	
		Inv.	Oper.
0.00	32475. S		>999.00
12.00	45105. S		9.74
24.00	45105. S		5.04
36.00	45105. S		3.67
48.00	45105. S		3.37
60.00	45105. S		3.70
72.00	45105. S		4.74
84.00	45105. S		7.11
90.00L	45662. S		8.24
90.00R	46275. S		9.40
96.00	46243. S		11.39
108.00	46243. S		8.25
120.00	46243. S		5.40

Span 2

Location	Allowable	Rating Factors	
		Bending	

Exterior Girder - EV3 Truck

Stress		Inv.	Oper.
0.00	46243. S		5.40
12.00	46243. S		8.26
24.00	46243. S		11.40
30.00L	46243. S		11.71
30.00R	45139. S		8.09
36.00	45105. S		7.11
48.00	45105. S		4.74
60.00	45105. S		3.71
72.00	45105. S		3.37
84.00	45105. S		3.67
96.00	45105. S		5.04
108.00	45105. S		9.74
120.00	32475. S		>999.00

\*\*\*\*\*  
 Minimum rating is 2.88 at location 0.00 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

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

BRIDGE 1562 INTERIOR  
Line Girder : Input File : Definition  
Thu Aug 29 13:36:44 2019

## Interior girder - EV2 Truck

ID: BRIDGE 1562 INTERIOR

### CONDITIONS

A36 STIFFENER STEEL  
A36 TOP FLANGE FOR SECTION 1  
A36 TOP FLANGE FOR SECTION 3  
A36 WEB FOR SECTION 1  
A36 WEB FOR SECTION 2  
A36 WEB FOR SECTION 3  
A572 BOTTOM FLANGE FOR SECTION 1  
A572 BOTTOM FLANGE FOR SECTION 2  
A572 TOP FLANGE FOR SECTION 2  
A572 BOTTOM FLANGE FOR SECTION 3  
ASSUME SLAB ON FLANGE FOR SECTION PROPERTIES  
ENGLISH INPUT  
ENGLISH OUTPUT  
FULL DEPTH CONNECTION PLATES  
IGNORE WET CONCRETE STRESS CHECK  
INTERMEDIATE TRANSVERSE STIFFENERS ONE SIDE OF WEB  
LRFD METHOD  
RATE MODE  
SINGLE BEARING STIFFENERS EACH SIDE

### DATA

ADTT 511  
BETA 1.75  
BNGSKEW 132.2333 132.2333 132.2333  
BR 17.3958 8.5485 14.7848 8.5485 14.7848 8.5485 14.7848 8.5485  
2.7848 8.5485 2.7848 8.5485 2.7848 8.5485 2.7848 8.5485 2.7848  
8.5485 14.7848 8.5485 14.7848 8.5485 14.7848 8.5485 17.3894  
BSPL 90. 60.  
DCGAMMA 1.25  
DWGAMMA 1.5  
ESLABW 93.  
ETAD 1.  
ETAI 1.  
ETAR 1.  
FILLET 1.  
FPC 3.  
LANED 0.425  
LANEM 0.831  
LANEMF 0.831  
LANEV 1.145  
LANEVF 1.145  
LIFE 75  
LLDLIM 800  
NSUPBR 1 1 1  
PBETA 1.3  
PBETAOP 1.3  
PRMITP 24. 33.5  
PRMITSP 15.  
SLABT 11.  
SLABWEAR 0.  
SPL 90. 60.  
SPLBFT 1. 1.375 1.  
SPLBFW 14. 18. 14.  
SPLTFT 0.75 1.375 0.75  
SPLTFW 12. 18. 12.  
SPLTST 0.375  
SPLTSW 5.  
SPLWD 70.  
SPLWT 0.625  
SPN 120. 120.  
SS 1.  
STFGAP 0.  
SUPBST 0.5 1.25 0.5  
SUPBSW 4.5 9. 4.5  
TSPL 90. 60.  
TSSP 208.75 102.582 177.418 102.582 177.418 102.582 177.418  
102.582 33.418 102.582 33.418 67.25 35.332 33.418 51.25  
51.332 33.418 102.582 33.418 102.582 33.418 102.582 177.418  
102.582 177.418 102.582  
WCONC 150.  
WDL 1.488  
WEAR 0.2392  
WSDL 0.3067

GO



BRIDGE 1562 INTERIOR Interior Girder - EV2 Truck  
Line Girder : Rating Output : Case Data  
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Case Data - BRIDGE 1562 INTERIOR

#### AASHTO Specification

Load and Resistance Factor Method  
6th Edition LRFD Bridge Design Specifications  
2nd Edition Manual for Bridge Evaluation

Dimensions (additional information available in Dimensions table)

Given dimensions-

Web Depth	70.00 in	70.00 in	70.00 in
Web Thickness	0.62 in	0.62 in	0.62 in
Trans. Stiff. Width	5.00 in	5.00 in	5.00 in
Trans. Stiff. Thickness	0.38 in	0.38 in	0.38 in
Bearing Stiff. Width	4.50 in	9.00 in	4.50 in
Bearing Stiff. Thickness	0.50 in	1.25 in	0.50 in

#### Execution Mode

Rate Mode

#### Geometry

Brace locations

0.00 ft	17.40 ft	25.94 ft	40.73 ft
49.28 ft	64.06 ft	72.61 ft	87.40 ft
95.94 ft	98.73 ft	107.28 ft	110.06 ft
118.61 ft	120.00 ft	121.40 ft	129.94 ft
132.73 ft	141.28 ft	144.06 ft	152.61 ft
167.40 ft	175.94 ft	190.73 ft	199.28 ft
214.06 ft	222.61 ft	240.00 ft	

Unbraced length of comp. flange at support 2 is 1.40 ft.

#### Cover plates

No cover plates

#### Curvature

No curvature

#### Flange splices

Top flange splice locations

90.00 ft 150.00 ft

Bottom flange splice locations

90.00 ft 150.00 ft

#### Girder Type

Plate girder  
Interior girder

#### Hinges

No interior hinges

#### Span lengths

Spans 120.00 ft 120.00 ft

#### Stiffeners

Bearing stiffeners

Single bearing stiffeners each side Interior Girder - EV2 Truck

Longitudinal stiffeners

No longitudinal stiffener

Transverse stiffeners

Transverse stiffeners one side only

Stiffener clips	1.00 in			
Stiffener transitions	17.40 ft	25.94 ft	40.73 ft	49.28 ft
	64.06 ft	72.61 ft	87.40 ft	95.94 ft
	98.73 ft	107.28 ft	110.06 ft	115.67 ft
	118.61 ft	120.00 ft	121.40 ft	125.67 ft
	129.94 ft	132.73 ft	141.28 ft	144.06 ft
	152.61 ft	155.40 ft	163.94 ft	178.73 ft
	187.28 ft	202.06 ft	210.61 ft	

Web haunches

No web haunches

Web splices

Web splice locations 90.00 ft 150.00 ft

Fatigue

Average Single Lane Daily Truck Traffic: 511  
Allowable weld stress 18.00 ksi  
AWS minimum welds  
Fatigue life: 75  
Fatigue stress category B flange splices

Composite Behavior

Composite region for composite loading- 0. - 240.00 ft

Lane fraction for strength limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310				

Lane fraction for fatigue limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310				

Lane fraction for live-load deflection  
0.4250

Loaded lanes 2  
Tandem truck multiplier: 1.0000  
Design truck multiplier: 1.0000

Permit truck loading

Axle loads	24.00 k	33.50 k
Axle spacing	15.00 ft	15.00 ft

Influence lines not displayed  
Unshored construction

# Interior Girder - EV2 Truck

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Dead load carried by steel alone

1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft			

Tenth pt values of distributed dead load carried by steel alone

1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft				

Superimposed dead load

0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft			

Wearing surface dead load

0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft			

Load Factors

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

Permit Trk Strength In	1.300
Permit Trk Strength Op	1.300
Permit Trk Service II	1.000

Load Modifiers

Ductility	1.00
Redundancy	1.00
Operational Classification	1.00

Reactions

Max des trk or des tandem + lane unfactored live load+impact reactions  
136.88 k 271.13 k 136.82 k

Min des trk or des tandem + lane unfactored live load+impact reactions  
-17.14 k 0.00 k -17.12 k

Max unfactored live reactions - No dynamic load allowance

Des trk or des tandem + lane  
112.36 k 228.78 k 112.31 k

Min unfactored live reactions - No dynamic load allowance

Des trk or des tandem + lane  
-14.36 k 0.00 k -14.34 k

Total unfactored dead load DC1+DC2 reactions

78.05 k 277.19 k 78.05 k

Total unfactored dead load DW reactions

10.42 k 36.58 k 10.42 k

Support skew for shear and moment modification

90.00 90.00 90.00

Bearing skew for redistribution qualification

132.23 132.23 132.23

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	11.00 in	11.00 in
---------------------	----------	----------

Effective slab width	93.00 in
----------------------	----------

Neg mom rebar area

10.23 in<sup>2</sup>

Rebar placement from bottom of slab

6.50 in  
Negative mom. slab used in dead load 2 analysis  
Fillet 1.00 in  
Effective slab width 93.00 in

## Steel

Web splice section 1  
Top flange grade A36  
Web grade A36  
Stiffener grade A36  
Bottom flange grade A572  
Web splice section 2  
Web grade A36  
Stiffener grade A36  
Top flange grade A572  
Bottom flange grade A572  
Web splice section 3  
Top flange grade A36  
Web grade A36  
Stiffener grade A36  
Bottom flange grade A572  
Rebar yield 60.00 ksi

## Output

Standard resolution summary tables

## Units

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

BRIDGE 1562 INTERIOR Interior Girder - EV2 Truck  
Line Girder : Rating Output : Factored Strengths  
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# Factored Strengths

Forces include ductility, redundancy, and operational factors

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		HL93			HL93		
0	0.00	351.1	460.5 (5)	0.762	0.0	9837.0 (20)	0.000
1	12.00	283.1	569.3 (3)	0.497	2930.1 I	9837.0 (20)	0.298
2	24.00	215.8	739.0 (3)	0.292	4943.9 I	9837.0 (20)	0.503
3	36.00	151.3	595.3 (3)	0.254	6157.4 I	9713.6 (20)	0.634
4	48.00	117.8	739.0 (3)	0.159	6501.8 I	9702.9 (20)	0.670
5	60.00	179.4	595.3 (3)	0.301	6056.6 I	9837.0 (20)	0.616
6	72.00	241.3	739.0 (3)	0.327	4866.5 I	9837.0 (20)	0.495
7	84.00	303.0	595.3 (3)	0.509	2931.1 I	9837.0 (20)	0.298
8	96.00	363.8	791.9 (3)	0.459	3375.4 I	9512.7 (6)	0.355
9	108.00	423.6	913.5 (3)	0.464	6132.2 I	9429.7 (6)	0.650
10L	120.00	482.2	913.5 (3)	0.528	10042.3 I	9416.1 (6)	1.067
10R	120.00	482.2	913.5 (3)	0.528	10042.3 I	9416.1 (6)	1.067
11	132.00	423.6	913.5 (3)	0.464	6135.3 I	9429.9 (6)	0.651
12	144.00	363.8	791.9 (3)	0.459	3373.4 I	9512.6 (6)	0.355
13	156.00	303.0	739.0 (3)	0.410	2931.7 I	9837.0 (20)	0.298
14	168.00	241.4	595.3 (3)	0.406	4864.4 I	9837.0 (20)	0.495
15	180.00	179.5	739.0 (3)	0.243	6053.5 I	9837.0 (20)	0.615
16	192.00	117.8	595.3 (3)	0.198	6499.2 I	9702.9 (20)	0.670
17	204.00	151.2	739.0 (3)	0.205	6155.2 I	9713.6 (20)	0.634
18	216.00	215.7	460.5 (5)	0.468	4942.5 I	9837.0 (20)	0.502
19	228.00	283.0	460.5 (5)	0.615	2929.5 I	9837.0 (20)	0.298
20	240.00	351.0	460.5 (5)	0.762	0.0	9837.0 (20)	0.000

Absolute values of factored moment are shown with determining strength

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	252.8	569.3 (3)	0.444
25.94	205.3	595.3 (3)	0.345
40.73	138.1	595.3 (3)	0.232
49.28	124.3	595.3 (3)	0.209
64.06	200.4	595.3 (3)	0.337
72.61	244.5	595.3 (3)	0.411
87.40	320.2	595.3 (3)	0.538
98.73	377.4	791.9 (3)	0.477
107.28	420.0	791.9 (3)	0.530
110.06	433.7	884.9 (3)	0.490
115.67	461.0	884.9 (3)	0.521
118.61	475.4	913.5 (3)	0.520
121.40	475.4	913.5 (3)	0.520
125.67	454.5	913.5 (3)	0.498
129.94	433.6	913.5 (3)	0.475
132.73	419.9	791.9 (3)	0.530
141.28	377.3	791.9 (3)	0.476
152.61	320.1	739.0 (3)	0.433
155.40	306.0	739.0 (3)	0.414
163.94	262.2	595.3 (3)	0.440
178.73	186.1	595.3 (3)	0.313
187.28	142.1	595.3 (3)	0.239
202.06	145.8	595.3 (3)	0.245
210.61	186.7	460.5 (5)	0.405

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		Permit only			Permit only		

# Interior Girder - EV2 Truck

0	0.00	217.9	460.5 (5)	0.473	0.0	9837.0 (20)	0.000
1	12.00	172.2	569.3 (3)	0.303	1951.8 II	9837.0 (20)	0.198
2	24.00	126.9	739.0 (3)	0.172	3283.3 II	9837.0 (20)	0.334
3	36.00	82.1	595.3 (3)	0.138	4007.4 II	9713.6 (20)	0.413
4	48.00	59.0	739.0 (3)	0.080	4144.1 II	9702.9 (20)	0.427
5	60.00	100.7	595.3 (3)	0.169	3748.9 II	9837.0 (20)	0.381
6	72.00	147.7	739.0 (3)	0.200	2847.9 II	9837.0 (20)	0.290
7	84.00	193.0	595.3 (3)	0.324	1428.1 II	9837.0 (20)	0.145
8	96.00	236.4	913.5 (3)	0.259	2098.5 II	9512.7 (6)	0.221
9	108.00	278.0	913.5 (3)	0.304	4047.1 II	9429.7 (6)	0.429
10L	120.00	311.0	913.5 (3)	0.340	6370.3 II	9416.1 (6)	0.677
10R	120.00	311.0	913.5 (3)	0.340	6370.3 II	9416.1 (6)	0.677
11	132.00	272.6	913.5 (3)	0.298	4045.5 II	9429.9 (6)	0.429
12	144.00	228.6	913.5 (3)	0.250	2097.1 II	9512.6 (6)	0.220
13	156.00	187.1	739.0 (3)	0.253	1428.9 II	9837.0 (20)	0.145
14	168.00	144.4	595.3 (3)	0.243	2846.8 II	9837.0 (20)	0.289
15	180.00	100.8	739.0 (3)	0.136	3747.2 II	9837.0 (20)	0.381
16	192.00	59.0	595.3 (3)	0.099	4142.7 II	9702.9 (20)	0.427
17	204.00	112.1	739.0 (3)	0.152	4006.2 II	9713.6 (20)	0.412
18	216.00	162.8	460.5 (5)	0.353	3282.6 II	9837.0 (20)	0.334
19	228.00	214.2	460.5 (5)	0.465	1951.6 II	9837.0 (20)	0.198
20	240.00	217.9	460.5 (5)	0.473	0.0	9837.0 (20)	0.000

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	151.8	569.3 (3)	0.267
25.94	119.6	595.3 (3)	0.201
40.73	73.0	595.3 (3)	0.123
49.28	63.5	595.3 (3)	0.107
64.06	116.6	595.3 (3)	0.196
72.61	150.0	595.3 (3)	0.252
87.40	205.3	595.3 (3)	0.345
98.73	245.8	791.9 (3)	0.310
107.28	275.5	791.9 (3)	0.348
110.06	283.6	884.9 (3)	0.321
115.67	299.1	884.9 (3)	0.338
118.61	307.2	913.5 (3)	0.336
121.40	475.4	913.5 (3)	0.520
125.67	454.5	913.5 (3)	0.498
129.94	433.6	913.5 (3)	0.475
132.73	270.0	791.9 (3)	0.341
141.28	238.6	791.9 (3)	0.301
152.61	198.8	739.0 (3)	0.269
155.40	189.2	739.0 (3)	0.256
163.94	158.9	595.3 (3)	0.267
178.73	105.4	595.3 (3)	0.177
187.28	75.4	595.3 (3)	0.127
202.06	103.5	595.3 (3)	0.174
210.61	140.0	460.5 (5)	0.304

- (3)  $V_p(C+.87(1-C)/\sqrt{1+(D_o/D)**2})$
- (5) C 0.58 Fyw D t
- (20) Compact section
- (6) Rb Rh FY S(equiv)  
Maximum moment in factored strength expression

BRIDGE 1562 INTERIOR Interior Girder - EV2 Truck  
Line Girder : Rating Output : Lrfd Ratings  
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[This table uses the rating equation (6B.4.1-1) of the 2011 edition of the Manual for Bridge Evaluation where A1D is the sum of factored composite dead, noncomposite dead, and factored wearing surface loads. The denominator A2L(1+I) is the factored live load. If equation (6a.4.2.1-1) is to be used for LRFR ratings the condition LRFR RATINGS must be used in the girder input file.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	9837. C	460.51	>999.00	B>999.00	1.46	2.55
12.00	9837. C	569.26	4.88 B	8.55	2.41	4.22
24.00	9837. C	739.01	2.62 B	4.59	4.14	7.25
36.00	9714. C	595.27	1.93 B	3.38	4.33	7.58
48.00	9703. C	739.01	1.77 B	3.10	6.95	12.16
60.00	9837. C	595.27	1.93 B	3.39	4.08	7.14
72.00	9837. C	739.01	2.39 B	4.18	4.01	7.01
84.00	9837. C	595.27	3.52 B	6.16	2.49	4.36
90.00L	4836. C	739.01	2.25 B	3.94	2.92	5.11
90.00R	9581. C	791.93	4.71 B	8.24	3.17	5.55
96.00	50000. B	913.50	4.14 B	7.25	3.44	6.01
108.00	50000. B	913.50	2.24 B	3.91	2.93	5.12
120.00	50000. B	913.50	0.93 B	1.63	2.53	4.43

Span 2

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	50000. B	913.50	0.93 B	1.63	2.53	4.43
12.00	50000. B	913.50	2.23 B	3.91	2.93	5.12
24.00	50000. B	913.50	4.14 B	7.25	3.44	6.02
30.00L	49557. B	791.93	4.81 B	8.41	3.17	5.56
30.00R	34713. T	739.01	2.54 T	4.44	2.92	5.12
36.00	9837. C	739.01	3.52 B	6.16	3.23	5.64
48.00	9837. C	595.27	2.39 B	4.18	3.14	5.49
60.00	9837. C	739.01	1.94 B	3.39	5.15	9.00
72.00	9703. C	595.27	1.77 B	3.10	5.57	9.74
84.00	9714. C	739.01	1.93 B	3.38	5.41	9.47
96.00	9837. C	460.51	2.62 B	4.59	2.47	4.32



# Interior Girder - EV2 Truck

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108.00	9837. C	460.51	4.89 B	8.55	1.88	3.28
120.00	9837. C	460.51	>999.00 B>999.00		1.46	2.55

## Service II

### Span 1

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	45105. S	> 999.00 B	>999.00
12.00	45105. S	5.05 B	6.57
24.00	45105. S	2.60 B	3.38
36.00	45105. S	1.89 B	2.46
48.00	45105. S	1.74 B	2.26
60.00	45105. S	1.91 B	2.48
72.00	45105. S	2.46 B	3.20
84.00	45105. S	3.81 B	4.95
90.00L	32876. S	3.37 T	4.38
90.00R	46275. S	5.30 B	6.89
96.00	46243. S	5.28 B	6.86
108.00	46243. S	2.99 B	3.89
120.00	46243. S	1.39 B	1.81

### Span 2

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	46243. S	1.39 B	1.81
12.00	46243. S	2.99 B	3.89
24.00	46243. S	5.28 B	6.87
30.00L	46243. S	6.09 B	7.92
30.00R	32500. S	3.27 T	4.25
36.00	45105. S	3.81 B	4.95
48.00	45105. S	2.46 B	3.20
60.00	45105. S	1.91 B	2.48
72.00	45105. S	1.74 B	2.26
84.00	45105. S	1.89 B	2.46
96.00	45105. S	2.60 B	3.38
108.00	45105. S	5.05 B	6.57
120.00	45105. S	> 999.00 B	>999.00

\*\*\*\*\*  
Minimum rating is 0.93 at location 120.00 in span 1.  
\*\*\*\*\*

## Permit

## Strength II

### Span 1

Location	Allowable	Shear	Rating Factors Bending		Shear	
			Inv.	Oper.	Inv.	Oper.

# Interior Girder - EV2 Truck

0.00	9837. C	460.51	>999.00	4.27
12.00	9837. C	569.26	14.11	6.92
24.00	9837. C	739.01	7.59	11.53
36.00	9714. C	595.27	5.72	11.70
48.00	9703. C	739.01	5.35	20.64
60.00	9837. C	595.27	5.85	12.75
72.00	9837. C	739.01	7.13	11.99
84.00	9837. C	595.27	10.15	7.38
90.00L	4526. C	739.01	6.82	8.68
90.00R	9492. C	791.93	15.21	9.43
96.00	50000. B	913.50	13.76	10.27
108.00	50000. B	913.50	9.48	8.91
120.00	50000. B	913.50	5.55	8.40

Span 2

Location	Allowable	Shear	Rating Factors		Shear
			Bending		
			Inv.	Oper.	Inv.
					Oper.
0.00	50000. B	913.50		5.55	8.40
12.00	50000. B	913.50		9.49	9.37
24.00	50000. B	913.50		13.79	11.15
30.00L	48245. B	791.93		15.41	10.19
30.00R	34713. T	739.01		7.89	9.38
36.00	9837. C	739.01		10.14	10.25
48.00	9837. C	595.27		7.13	9.83
60.00	9837. C	739.01		5.86	16.06
72.00	9703. C	595.27		5.35	16.56
84.00	9714. C	739.01		5.73	9.96
96.00	9837. C	460.51		7.59	4.71
108.00	9837. C	460.51		14.12	3.69
120.00	9837. C	460.51		>999.00	4.27

Service II

Span 1

Location	Allowable	Rating Factors	
		Bending	
	Stress	Inv.	Oper.
0.00	32475. S		>999.00
12.00	45105. S		10.84
24.00	45105. S		5.58
36.00	45105. S		4.17
48.00	45105. S		3.89
60.00	45105. S		4.29
72.00	45105. S		5.45
84.00	45105. S		8.15
90.00L	45662. S		9.43
90.00R	46275. S		10.76
96.00	46243. S		13.03
108.00	46243. S		9.43
120.00	46243. S		6.15

Span 2

Location	Allowable	Rating Factors	
		Bending	

Stress

Interior Girder - EV2 Truck

Inv. Oper.

0.00	46243. S	6.15
12.00	46243. S	9.44
24.00	46243. S	13.05
30.00L	46243. S	13.40
30.00R	45139. S	9.26
36.00	45105. S	8.14
48.00	45105. S	5.45
60.00	45105. S	4.29
72.00	45105. S	3.90
84.00	45105. S	4.17
96.00	45105. S	5.59
108.00	45105. S	10.85
120.00	32475. S	>999.00

\*\*\*\*\*  
Minimum rating is 3.69 at location 228.00 in span 2.  
\*\*\*\*\*

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

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

BRIDGE 1562 INTERIOR  
Line Girder : Input File : Definition  
Thu Aug 29 13:49:03 2019

## Interior girder - EV3 Truck

ID: BRIDGE 1562 INTERIOR

### CONDITIONS

A36 STIFFENER STEEL  
A36 TOP FLANGE FOR SECTION 1  
A36 TOP FLANGE FOR SECTION 3  
A36 WEB FOR SECTION 1  
A36 WEB FOR SECTION 2  
A36 WEB FOR SECTION 3  
A572 BOTTOM FLANGE FOR SECTION 1  
A572 BOTTOM FLANGE FOR SECTION 2  
A572 TOP FLANGE FOR SECTION 2  
A572 BOTTOM FLANGE FOR SECTION 3  
ASSUME SLAB ON FLANGE FOR SECTION PROPERTIES  
ENGLISH INPUT  
ENGLISH OUTPUT  
FULL DEPTH CONNECTION PLATES  
IGNORE WET CONCRETE STRESS CHECK  
INTERMEDIATE TRANSVERSE STIFFENERS ONE SIDE OF WEB  
LRFD METHOD  
RATE MODE  
SINGLE BEARING STIFFENERS EACH SIDE

### DATA

ADTT 511  
BETA 1.75  
BNGSKEW 132.2333 132.2333 132.2333  
BR 17.3958 8.5485 14.7848 8.5485 14.7848 8.5485 14.7848 8.5485  
2.7848 8.5485 2.7848 8.5485 2.7848 8.5485 2.7848 8.5485 2.7848  
8.5485 14.7848 8.5485 14.7848 8.5485 14.7848 8.5485 17.3894  
BSPL 90. 60.  
DCGAMMA 1.25  
DWGAMMA 1.5  
ESLABW 93.  
ETAD 1.  
ETAI 1.  
ETAR 1.  
FILLET 1.  
FPC 3.  
LANED 0.425  
LANEM 0.831  
LANEMF 0.831  
LANEV 1.145  
LANEVF 1.145  
LIFE 75  
LLDLIM 800  
NSUPBR 1 1 1  
PBETA 1.3  
PBETAOP 1.3  
PRMITP 24. 31. 31.  
PRMITSP 15. 4.  
SLABT 11.  
SLABWEAR 0.  
SPL 90. 60.  
SPLBFT 1. 1.375 1.  
SPLBFW 14. 18. 14.  
SPLTFT 0.75 1.375 0.75  
SPLTFW 12. 18. 12.  
SPLTST 0.375  
SPLTSW 5.  
SPLWD 70.  
SPLWT 0.625  
SPN 120. 120.  
SS 1.  
STFGAP 0.  
SUPBST 0.5 1.25 0.5  
SUPBSW 4.5 9. 4.5  
TSPL 90. 60.  
TSSP 208.75 102.582 177.418 102.582 177.418 102.582 177.418  
102.582 33.418 102.582 33.418 67.25 35.332 33.418 51.25  
51.332 33.418 102.582 33.418 102.582 33.418 102.582 177.418  
102.582 177.418 102.582  
WCONC 150.  
WDL 1.488  
WEAR 0.2392  
WSDL 0.3067

GO

# Interior Girder - EV3 Truck

BRIDGE 1562 INTERIOR  
Line Girder : Rating Output : Case Data  
Thu Aug 29 13:49:27 2019

Case Data - BRIDGE 1562 INTERIOR

## AASHTO Specification

Load and Resistance Factor Method  
6th Edition LRFD Bridge Design Specifications  
2nd Edition Manual for Bridge Evaluation

Dimensions (additional information available in Dimensions table)

Given dimensions-

Web Depth	70.00 in	70.00 in	70.00 in
Web Thickness	0.62 in	0.62 in	0.62 in
Trans. Stiff. Width	5.00 in	5.00 in	5.00 in
Trans. Stiff. Thickness	0.38 in	0.38 in	0.38 in
Bearing Stiff. Width	4.50 in	9.00 in	4.50 in
Bearing Stiff. Thickness	0.50 in	1.25 in	0.50 in

## Execution Mode

Rate Mode

## Geometry

Brace locations

0.00 ft	17.40 ft	25.94 ft	40.73 ft
49.28 ft	64.06 ft	72.61 ft	87.40 ft
95.94 ft	98.73 ft	107.28 ft	110.06 ft
118.61 ft	120.00 ft	121.40 ft	129.94 ft
132.73 ft	141.28 ft	144.06 ft	152.61 ft
167.40 ft	175.94 ft	190.73 ft	199.28 ft
214.06 ft	222.61 ft	240.00 ft	

Unbraced length of comp. flange at support 2 is 1.40 ft.

## Cover plates

No cover plates

## Curvature

No curvature

## Flange splices

Top flange splice locations

90.00 ft 150.00 ft

Bottom flange splice locations

90.00 ft 150.00 ft

## Girder Type

Plate girder  
Interior girder

## Hinges

No interior hinges

## Span lengths

Spans 120.00 ft 120.00 ft

## Stiffeners

Bearing stiffeners

Single bearing stiffeners each side Interior Girder - EV3 Truck

Longitudinal stiffeners

No longitudinal stiffener

Transverse stiffeners

Transverse stiffeners one side only

Stiffener clips	1.00 in			
Stiffener transitions	17.40 ft	25.94 ft	40.73 ft	49.28 ft
	64.06 ft	72.61 ft	87.40 ft	95.94 ft
	98.73 ft	107.28 ft	110.06 ft	115.67 ft
	118.61 ft	120.00 ft	121.40 ft	125.67 ft
	129.94 ft	132.73 ft	141.28 ft	144.06 ft
	152.61 ft	155.40 ft	163.94 ft	178.73 ft
	187.28 ft	202.06 ft	210.61 ft	

Web haunches

No web haunches

Web splices

Web splice locations 90.00 ft 150.00 ft

Fatigue

Average Single Lane Daily Truck Traffic: 511  
Allowable weld stress 18.00 ksi  
AWS minimum welds  
Fatigue life: 75  
Fatigue stress category B flange splices

Composite Behavior

Composite region for composite loading- 0. - 240.00 ft

Lane fraction for strength limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310				

Lane fraction for fatigue limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310				

Lane fraction for live-load deflection  
0.4250

Loaded lanes 2  
Tandem truck multiplier: 1.0000  
Design truck multiplier: 1.0000

Permit truck loading

Axle loads	24.00 k	31.00 k	31.00 k
Axle spacing	15.00 ft	4.00 ft	

Influence lines not displayed  
Unshored construction

## Dead load carried by steel alone

1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft			

## Tenth pt values of distributed dead load carried by steel alone

1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft				

## Superimposed dead load

0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft			

## Wearing surface dead load

0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft			

## Load Factors

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

Permit Trk Strength In	1.300
Permit Trk Strength Op	1.300
Permit Trk Service II	1.000

## Load Modifiers

Ductility	1.00
Redundancy	1.00
Operational Classification	1.00

## Reactions

Max des trk or des tandem + lane unfactored live load+impact reactions			
136.88 k	271.13 k	136.82 k	
Min des trk or des tandem + lane unfactored live load+impact reactions			
-17.14 k	0.00 k	-17.12 k	
Max unfactored live reactions - No dynamic load allowance			
Des trk or des tandem + lane			
112.36 k	228.78 k	112.31 k	
Min unfactored live reactions - No dynamic load allowance			
Des trk or des tandem + lane			
-14.36 k	0.00 k	-14.34 k	
Total unfactored dead load DC1+DC2 reactions			
78.05 k	277.19 k	78.05 k	
Total unfactored dead load DW reactions			
10.42 k	36.58 k	10.42 k	

## Support skew for shear and moment modification

90.00	90.00	90.00
-------	-------	-------

## Bearing skew for redistribution qualification

132.23	132.23	132.23
--------	--------	--------

## 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	11.00 in	11.00 in
Effective slab width	93.00 in	
Neg mom rebar area		
10.23 in <sup>2</sup>		
Rebar placement from bottom of slab		



# Interior Girder - EV3 Truck

6.50 in  
Negative mom. slab used in dead load 2 analysis  
Fillet 1.00 in  
Effective slab width 93.00 in

## Steel

Web splice section 1  
Top flange grade A36  
Web grade A36  
Stiffener grade A36  
Bottom flange grade A572  
Web splice section 2  
Web grade A36  
Stiffener grade A36  
Top flange grade A572  
Bottom flange grade A572  
Web splice section 3  
Top flange grade A36  
Web grade A36  
Stiffener grade A36  
Bottom flange grade A572  
Rebar yield 60.00 ksi

## Output

Standard resolution summary tables

## Units

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

BRIDGE 1562 INTERIOR Interior Girder - EV3 Truck  
Line Girder : Rating Output : Factored Strengths  
Thu Aug 29 13:49:46 2019

# Factored Strengths

Forces include ductility, redundancy, and operational factors

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		HL93			HL93		
0	0.00	351.1	460.5 (5)	0.762	0.0	9837.0 (20)	0.000
1	12.00	283.1	569.3 (3)	0.497	2930.1 I	9837.0 (20)	0.298
2	24.00	215.8	739.0 (3)	0.292	4943.9 I	9837.0 (20)	0.503
3	36.00	151.3	595.3 (3)	0.254	6157.4 I	9713.6 (20)	0.634
4	48.00	117.8	739.0 (3)	0.159	6501.8 I	9702.9 (20)	0.670
5	60.00	179.4	595.3 (3)	0.301	6056.6 I	9837.0 (20)	0.616
6	72.00	241.3	739.0 (3)	0.327	4866.5 I	9837.0 (20)	0.495
7	84.00	303.0	595.3 (3)	0.509	2931.1 I	9837.0 (20)	0.298
8	96.00	363.8	791.9 (3)	0.459	3375.4 I	9512.7 (6)	0.355
9	108.00	423.6	913.5 (3)	0.464	6132.2 I	9429.7 (6)	0.650
10L	120.00	482.2	913.5 (3)	0.528	10042.3 I	9416.1 (6)	1.067
10R	120.00	482.2	913.5 (3)	0.528	10042.3 I	9416.1 (6)	1.067
11	132.00	423.6	913.5 (3)	0.464	6135.3 I	9429.9 (6)	0.651
12	144.00	363.8	791.9 (3)	0.459	3373.4 I	9512.6 (6)	0.355
13	156.00	303.0	739.0 (3)	0.410	2931.7 I	9837.0 (20)	0.298
14	168.00	241.4	595.3 (3)	0.406	4864.4 I	9837.0 (20)	0.495
15	180.00	179.5	739.0 (3)	0.243	6053.5 I	9837.0 (20)	0.615
16	192.00	117.8	595.3 (3)	0.198	6499.2 I	9702.9 (20)	0.670
17	204.00	151.2	739.0 (3)	0.205	6155.2 I	9713.6 (20)	0.634
18	216.00	215.7	460.5 (5)	0.468	4942.5 I	9837.0 (20)	0.502
19	228.00	283.0	460.5 (5)	0.615	2929.5 I	9837.0 (20)	0.298
20	240.00	351.0	460.5 (5)	0.762	0.0	9837.0 (20)	0.000

Absolute values of factored moment are shown with determining strength

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	252.8	569.3 (3)	0.444
25.94	205.3	595.3 (3)	0.345
40.73	138.1	595.3 (3)	0.232
49.28	124.3	595.3 (3)	0.209
64.06	200.4	595.3 (3)	0.337
72.61	244.5	595.3 (3)	0.411
87.40	320.2	595.3 (3)	0.538
98.73	377.4	791.9 (3)	0.477
107.28	420.0	791.9 (3)	0.530
110.06	433.7	884.9 (3)	0.490
115.67	461.0	884.9 (3)	0.521
118.61	475.4	913.5 (3)	0.520
121.40	475.4	913.5 (3)	0.520
125.67	454.5	913.5 (3)	0.498
129.94	433.6	913.5 (3)	0.475
132.73	419.9	791.9 (3)	0.530
141.28	377.3	791.9 (3)	0.476
152.61	320.1	739.0 (3)	0.433
155.40	306.0	739.0 (3)	0.414
163.94	262.2	595.3 (3)	0.440
178.73	186.1	595.3 (3)	0.313
187.28	142.1	595.3 (3)	0.239
202.06	145.8	595.3 (3)	0.245
210.61	186.7	460.5 (5)	0.405

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		Permit only			Permit only		

# Interior Girder - EV3 Truck

0	0.00	269.7	460.5 (5)	0.586	0.0	9837.0 (20)	0.000
1	12.00	216.9	569.3 (3)	0.381	2310.3 II	9837.0 (20)	0.235
2	24.00	164.6	739.0 (3)	0.223	3883.6 II	9837.0 (20)	0.395
3	36.00	113.1	595.3 (3)	0.190	4814.7 II	9713.6 (20)	0.496
4	48.00	86.3	739.0 (3)	0.117	5045.8 II	9702.9 (20)	0.520
5	60.00	133.3	595.3 (3)	0.224	4633.0 II	9837.0 (20)	0.471
6	72.00	182.9	739.0 (3)	0.247	3620.4 II	9837.0 (20)	0.368
7	84.00	230.9	595.3 (3)	0.388	2030.6 II	9837.0 (20)	0.206
8	96.00	277.0	913.5 (3)	0.303	2498.2 II	9512.7 (6)	0.263
9	108.00	321.2	913.5 (3)	0.352	4496.7 II	9429.7 (6)	0.477
10L	120.00	363.5	913.5 (3)	0.398	6869.9 II	9416.1 (6)	0.730
10R	120.00	363.5	913.5 (3)	0.398	6869.9 II	9416.1 (6)	0.730
11	132.00	321.2	913.5 (3)	0.352	4495.4 II	9429.9 (6)	0.477
12	144.00	277.0	913.5 (3)	0.303	2497.0 II	9512.6 (6)	0.262
13	156.00	230.8	739.0 (3)	0.312	2032.6 II	9837.0 (20)	0.207
14	168.00	182.9	595.3 (3)	0.307	3619.5 II	9837.0 (20)	0.368
15	180.00	133.4	739.0 (3)	0.181	4630.7 II	9837.0 (20)	0.471
16	192.00	86.2	595.3 (3)	0.145	5043.7 II	9702.9 (20)	0.520
17	204.00	113.1	739.0 (3)	0.153	4813.0 II	9713.6 (20)	0.495
18	216.00	164.6	460.5 (5)	0.357	3882.7 II	9837.0 (20)	0.395
19	228.00	216.9	460.5 (5)	0.471	2309.9 II	9837.0 (20)	0.235
20	240.00	269.7	460.5 (5)	0.586	0.0	9837.0 (20)	0.000

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	193.4	569.3 (3)	0.340
25.94	156.3	595.3 (3)	0.263
40.73	102.5	595.3 (3)	0.172
49.28	91.3	595.3 (3)	0.153
64.06	150.1	595.3 (3)	0.252
72.61	185.3	595.3 (3)	0.311
87.40	243.9	595.3 (3)	0.410
98.73	287.1	791.9 (3)	0.362
107.28	318.6	791.9 (3)	0.402
110.06	328.5	884.9 (3)	0.371
115.67	348.2	884.9 (3)	0.394
118.61	358.6	913.5 (3)	0.393
121.40	475.4	913.5 (3)	0.520
125.67	454.5	913.5 (3)	0.498
129.94	433.6	913.5 (3)	0.475
132.73	318.5	791.9 (3)	0.402
141.28	287.0	791.9 (3)	0.362
152.61	243.9	739.0 (3)	0.330
155.40	233.2	739.0 (3)	0.316
163.94	199.1	595.3 (3)	0.334
178.73	138.6	595.3 (3)	0.233
187.28	104.8	595.3 (3)	0.176
202.06	108.7	595.3 (3)	0.183
210.61	141.4	460.5 (5)	0.307

- (3)  $V_p(C+.87(1-C)/\sqrt{1+(D_o/D)**2})$
- (5) C 0.58 Fyw D t
- (20) Compact section
- (6) Rb Rh FY S(equiv)  
Maximum moment in factored strength expression

BRIDGE 1562 INTERIOR Interior Girder - EV3 Truck  
Line Girder : Rating Output : Lrfd Ratings  
Thu Aug 29 13:49:59 2019

[This table uses the rating equation (6B.4.1-1) of the 2011 edition of the Manual for Bridge Evaluation where A1D is the sum of factored composite dead, noncomposite dead, and factored wearing surface loads. The denominator A2L(1+I) is the factored live load. If equation (6a.4.2.1-1) is to be used for LRFR ratings the condition LRFR RATINGS must be used in the girder input file.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	9837. C	460.51	>999.00	B>999.00	1.46	2.55
12.00	9837. C	569.26	4.88	B 8.55	2.41	4.22
24.00	9837. C	739.01	2.62	B 4.59	4.14	7.25
36.00	9714. C	595.27	1.93	B 3.38	4.33	7.58
48.00	9703. C	739.01	1.77	B 3.10	6.95	12.16
60.00	9837. C	595.27	1.93	B 3.39	4.08	7.14
72.00	9837. C	739.01	2.39	B 4.18	4.01	7.01
84.00	9837. C	595.27	3.52	B 6.16	2.49	4.36
90.00L	4836. C	739.01	2.25	B 3.94	2.92	5.11
90.00R	9581. C	791.93	4.71	B 8.24	3.17	5.55
96.00	50000. B	913.50	4.14	B 7.25	3.44	6.01
108.00	50000. B	913.50	2.24	B 3.91	2.93	5.12
120.00	50000. B	913.50	0.93	B 1.63	2.53	4.43

Span 2

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	50000. B	913.50	0.93	B 1.63	2.53	4.43
12.00	50000. B	913.50	2.23	B 3.91	2.93	5.12
24.00	50000. B	913.50	4.14	B 7.25	3.44	6.02
30.00L	49557. B	791.93	4.81	B 8.41	3.17	5.56
30.00R	34713. T	739.01	2.54	T 4.44	2.92	5.12
36.00	9837. C	739.01	3.52	B 6.16	3.23	5.64
48.00	9837. C	595.27	2.39	B 4.18	3.14	5.49
60.00	9837. C	739.01	1.94	B 3.39	5.15	9.00
72.00	9703. C	595.27	1.77	B 3.10	5.57	9.74
84.00	9714. C	739.01	1.93	B 3.38	5.41	9.47
96.00	9837. C	460.51	2.62	B 4.59	2.47	4.32

# Interior Girder - EV3 Truck

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108.00	9837. C	460.51	4.89 B	8.55	1.88	3.28
120.00	9837. C	460.51	>999.00 B	>999.00	1.46	2.55

## Service II

### Span 1

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	45105. S	> 999.00 B	>999.00
12.00	45105. S	5.05 B	6.57
24.00	45105. S	2.60 B	3.38
36.00	45105. S	1.89 B	2.46
48.00	45105. S	1.74 B	2.26
60.00	45105. S	1.91 B	2.48
72.00	45105. S	2.46 B	3.20
84.00	45105. S	3.81 B	4.95
90.00L	32876. S	3.37 T	4.38
90.00R	46275. S	5.30 B	6.89
96.00	46243. S	5.28 B	6.86
108.00	46243. S	2.99 B	3.89
120.00	46243. S	1.39 B	1.81

### Span 2

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	46243. S	1.39 B	1.81
12.00	46243. S	2.99 B	3.89
24.00	46243. S	5.28 B	6.87
30.00L	46243. S	6.09 B	7.92
30.00R	32500. S	3.27 T	4.25
36.00	45105. S	3.81 B	4.95
48.00	45105. S	2.46 B	3.20
60.00	45105. S	1.91 B	2.48
72.00	45105. S	1.74 B	2.26
84.00	45105. S	1.89 B	2.46
96.00	45105. S	2.60 B	3.38
108.00	45105. S	5.05 B	6.57
120.00	45105. S	> 999.00 B	>999.00

\*\*\*\*\*  
Minimum rating is 0.93 at location 120.00 in span 1.  
\*\*\*\*\*

## Permit

## Strength II

### Span 1

Location	Allowable	Shear	Rating Factors Bending		Rating Factors Shear	
			Inv.	Oper.	Inv.	Oper.

Interior Girder - EV3 Truck

0.00	9837. C	460.51	>999.00	2.87
12.00	9837. C	569.26	9.75	4.65
24.00	9837. C	739.01	5.26	7.76
36.00	9714. C	595.27	3.86	7.88
48.00	9703. C	739.01	3.55	12.93
60.00	9837. C	595.27	3.88	8.06
72.00	9837. C	739.01	4.77	8.05
84.00	9837. C	595.27	6.82	5.12
90.00L	4728. C	739.01	4.81	6.09
90.00R	9554. C	791.93	10.30	6.61
96.00	50000. B	913.50	9.25	7.26
108.00	50000. B	913.50	6.37	6.37
120.00	50000. B	913.50	3.73	5.69

Span 2

Location	Allowable	Shear	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	50000. B	913.50		3.73		5.69
12.00	50000. B	913.50		6.38		6.37
24.00	50000. B	913.50		9.26		7.26
30.00L	48245. B	791.93		10.37		6.62
30.00R	34713. T	739.01		5.30		6.09
36.00	9837. C	739.01		6.81		6.63
48.00	9837. C	595.27		4.77		6.30
60.00	9837. C	739.01		3.88		10.16
72.00	9703. C	595.27		3.56		10.38
84.00	9714. C	739.01		3.87		9.85
96.00	9837. C	460.51		5.26		4.63
108.00	9837. C	460.51		9.75		3.62
120.00	9837. C	460.51		>999.00		2.87

Service II

Span 1

Location	Allowable Stress	Rating Factors	
		Bending	
		Inv.	Oper.
0.00	32475. S		>999.00
12.00	45105. S		7.49
24.00	45105. S		3.87
36.00	45105. S		2.81
48.00	45105. S		2.59
60.00	45105. S		2.84
72.00	45105. S		3.64
84.00	45105. S		5.48
90.00L	45662. S		6.34
90.00R	46275. S		7.24
96.00	46243. S		8.76
108.00	46243. S		6.34
120.00	46243. S		4.13

Span 2

Location	Allowable	Rating Factors	
		Bending	

# Interior Girder - EV3 Truck

	Stress	Inv.	Oper.
0.00	46243. S		4.13
12.00	46243. S		6.34
24.00	46243. S		8.77
30.00L	46243. S		9.01
30.00R	45139. S		6.23
36.00	45105. S		5.47
48.00	45105. S		3.65
60.00	45105. S		2.85
72.00	45105. S		2.59
84.00	45105. S		2.82
96.00	45105. S		3.87
108.00	45105. S		7.49
120.00	32475. S		>999.00

\*\*\*\*\*  
 Minimum rating is 2.59 at location 48.00 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

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



## MDX runs for Negative bending over the pier

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BRIDGE 1562 EXTERIOR  
 Line Girder : Input File : Definition Exterior girder - EV2 Truck  
 Fri Aug 30 07:45:32 2019

ID: BRIDGE 1562 EXTERIOR

## CONDITIONS

A36 STIFFENER STEEL  
 A36 TOP FLANGE FOR SECTION 1  
 A36 TOP FLANGE FOR SECTION 3  
 A36 WEB FOR SECTION 1  
 A36 WEB FOR SECTION 2  
 A36 WEB FOR SECTION 3  
 A572 BOTTOM FLANGE FOR SECTION 1  
 A572 BOTTOM FLANGE FOR SECTION 2  
 A572 TOP FLANGE FOR SECTION 2  
 A572 BOTTOM FLANGE FOR SECTION 3  
 ASSUME SLAB ON FLANGE FOR SECTION PROPERTIES  
 ENGLISH INPUT  
 ENGLISH OUTPUT  
 FULL DEPTH CONNECTION PLATES  
 IGNORE WET CONCRETE STRESS CHECK  
 INTERMEDIATE TRANSVERSE STIFFENERS ONE SIDE OF WEB  
 LRFD METHOD  
 RATE MODE  
 SINGLE BEARING STIFFENERS EACH SIDE

## DATA

ADTT 511  
 BETA 1.75  
 BNGSKEW 132.2333 132.2333 132.2333  
 BR 17.3958 23.3333 23.3333 23.3333 11.3333 11.3333 11.3333  
 11.3333 11.3333 23.3333 23.3333 23.3333 25.9379  
 BSPL 90. 60.  
 DCGAMMA 1.25  
 DWGAMMA 1.5  
 ESLABW 93.  
 ETAD 1.  
 ETAI 1.  
 ETAR 1.  
 FILLET 1.  
 FPC 3.  
 LANED 0.425  
 LANEM 0.64  
 LANEMF 0.64  
 LANEV 1.145  
 LANEVF 1.145  
 LIFE 75  
 LLDLIM 800  
 NSUPBR 1 1 1  
 PBETA 1.3  
 PBETAOP 1.3  
 PRMITP 24. 33.5 24. 33.5  
 PRMITSP 15. 30. 15.  
 SLABT 11.  
 SLABWEAR 0.  
 SPL 90. 60.  
 SPLBFT 1. 1.375 1.  
 SPLBFW 14. 18. 14.  
 SPLTFT 0.75 1.375 0.75  
 SPLTFW 12. 18. 12.  
 SPLTST 0.375  
 SPLTSW 5.  
 SPLWD 70.  
 SPLWT 0.625  
 SPN 120. 120.  
 SS 1.  
 STFGAP 0.  
 SUPBST 0.5 1.25 0.5  
 SUPBSW 4.5 9. 4.5  
 TSPL 90. 60.  
 TSPP 208.75 280. 280. 280. 136. 119.25 16.75 51.25 84.75  
 51.25 68. 16.75 136. 280. 280. 280.  
 WCONC 150.  
 WDL 1.474  
 WEAR 0.2392  
 WSDL 0.3067

GO

BRIDGE 1562 EXTERIOR  
Line Girder : Rating Output : Case Data  
Fri Aug 30 07:45:50 2019

Exterior Girder - EV2 Truck @ Pier

Case Data - BRIDGE 1562 EXTERIOR

AASHTO Specification

Load and Resistance Factor Method  
6th Edition LRFD Bridge Design Specifications  
2nd Edition Manual for Bridge Evaluation

Dimensions (additional information available in Dimensions table)

Given dimensions-

Web Depth	70.00	in	70.00	in	70.00	in
Web Thickness	0.62	in	0.62	in	0.62	in
Trans. Stiff. Width	5.00	in	5.00	in	5.00	in
Trans. Stiff. Thickness	0.38	in	0.38	in	0.38	in
Bearing Stiff. Width	4.50	in	9.00	in	4.50	in
Bearing Stiff. Thickness	0.50	in	1.25	in	0.50	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft	17.40 ft	40.73 ft	64.06 ft
87.40 ft	98.73 ft	110.06 ft	120.00 ft
121.40 ft	132.73 ft	144.06 ft	167.40 ft
190.73 ft	214.06 ft	240.00 ft	

Unbraced length of comp. flange at support 2 is 9.94 ft.

Cover plates

No cover plates

Curvature

No curvature

Flange splices

Top flange splice locations

90.00 ft 150.00 ft

Bottom flange splice locations

90.00 ft 150.00 ft

Girder Type

Plate girder  
Interior girder

Hinges

No interior hinges

Span lengths

Spans 120.00 ft 120.00 ft

Stiffeners

Bearing stiffeners

Single bearing stiffeners each side

Longitudinal stiffeners

## Exterior Girder - EV2 Truck @ Pier

No longitudinal stiffener

### Transverse stiffeners

Transverse stiffeners one side only

Stiffener clips	1.00 in			
Stiffener transitions	17.40 ft	87.40 ft	98.73 ft	108.67 ft
	110.06 ft	114.33 ft	120.00 ft	121.40 ft
	125.67 ft	131.33 ft	132.73 ft	144.06 ft
	214.06 ft			

### Web haunches

No web haunches

### Web splices

Web splice locations 90.00 ft 150.00 ft

### Fatigue

Average Single Lane Daily Truck Traffic: 511  
Allowable weld stress 18.00 ksi  
AWS minimum welds  
Fatigue life: 75  
Fatigue stress category B flange splices

### Composite Behavior

Composite region for composite loading- 0. - 240.00 ft

#### Lane fraction for strength limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400				

#### Lane fraction for fatigue limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400				

#### Lane fraction for live-load deflection

0.4250

Loaded lanes 2  
Tandem truck multiplier: 1.0000  
Design truck multiplier: 1.0000

### Permit truck loading

Axle loads	24.00 k	33.50 k	24.00 k	33.50 k
Axle spacing	15.00 ft	30.00 ft	15.00 ft	

### Influence lines not displayed

### Unshored construction

Dead load carried by steel alone

1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k

	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
	1.474 k/ft			
Tenth pt values of distributed dead load carried by steel alone				
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft				

## Superimposed dead load

0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft			

## Wearing surface dead load

0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft			

## Load Factors

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

Permit Trk Strength In	1.300
Permit Trk Strength Op	1.300
Permit Trk Service II	1.000

## Load Modifiers

Ductility	1.00
Redundancy	1.00
Operational Classification	1.00

## Reactions

Max des trk or des tandem + lane unfactored live load+impact reactions			
136.88 k	271.13 k	136.82 k	
Min des trk or des tandem + lane unfactored live load+impact reactions			
-17.14 k	0.00 k	-17.12 k	
Max unfactored live reactions - No dynamic load allowance			
Des trk or des tandem + lane			
112.36 k	228.78 k	112.31 k	
Min unfactored live reactions - No dynamic load allowance			
Des trk or des tandem + lane			
-14.36 k	0.00 k	-14.34 k	
Total unfactored dead load DC1+DC2 reactions			
77.46 k	275.02 k	77.46 k	
Total unfactored dead load DW reactions			
10.42 k	36.58 k	10.42 k	

## Support skew for shear and moment modification

90.00	90.00	90.00
-------	-------	-------

## Bearing skew for redistribution qualification

132.23	132.23	132.23
--------	--------	--------

## 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	11.00 in	11.00 in
Effective slab width	93.00 in	
Neg mom rebar area		
10.23 in <sup>2</sup>		
Rebar placement from bottom of slab		
6.50 in		
Negative mom. slab used in dead load 2 analysis		
Fillet	1.00 in	
Effective slab width	93.00 in	

Steel

Exterior Girder - EV2 Truck @ Pier

Web splice section 1	
Top flange grade	A36
Web grade	A36
Stiffener grade	A36
Bottom flange grade	A572
Web splice section 2	
Web grade	A36
Stiffener grade	A36
Top flange grade	A572
Bottom flange grade	A572
Web splice section 3	
Top flange grade	A36
Web grade	A36
Stiffener grade	A36
Bottom flange grade	A572
Rebar yield	60.00 ksi

Output

Standard resolution summary tables

Units

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

BRIDGE 1562 EXTERIOR  
Line Girder : Rating Output : Factored Strengths  
Fri Aug 30 07:46:04 2019

Exterior Girder - EV2 Truck @ Pier

Factored Strengths

Forces include ductility, redundancy, and operational factors

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		HL93			HL93		
0	0.00	350.4	460.5 (5)	0.761	0.0	9837.0 (20)	0.000
1	12.00	282.5	569.3 (3)	0.496	2513.6 I	9837.0 (20)	0.256
2	24.00	215.4	460.5 (5)	0.468	4238.0 I	9837.0 (20)	0.431
3	36.00	151.2	460.5 (5)	0.328	5262.4 I	9723.6 (20)	0.541
4	48.00	117.7	460.5 (5)	0.255	5533.9 I	9713.0 (20)	0.570
5	60.00	179.1	460.5 (5)	0.389	5113.6 I	9837.0 (20)	0.520
6	72.00	240.8	460.5 (5)	0.523	4036.0 I	9837.0 (20)	0.410
7	84.00	302.2	460.5 (5)	0.656	2300.8 I	9837.0 (20)	0.234
8	96.00	362.9	714.3 (3)	0.508	2884.4 I	9227.2 (6)	0.313
9	108.00	422.5	748.8 (3)	0.564	5419.4 I	9389.2 (6)	0.577
10L	120.00	480.8	882.9 (3)	0.545	8926.3 I	9376.3 (6)	0.952
10R	120.00	480.8	913.5 (3)	0.526	8926.3 I	9376.3 (6)	0.952
11	132.00	422.4	913.5 (3)	0.462	5421.8 I	9389.3 (6)	0.577
12	144.00	362.8	460.5 (5)	0.788	2882.9 I	9471.9 (6)	0.304
13	156.00	302.2	460.5 (5)	0.656	2301.3 I	9837.0 (20)	0.234
14	168.00	240.9	460.5 (5)	0.523	4034.4 I	9837.0 (20)	0.410
15	180.00	179.2	460.5 (5)	0.389	5111.1 I	9837.0 (20)	0.520
16	192.00	117.7	460.5 (5)	0.256	5531.8 I	9713.0 (20)	0.570
17	204.00	151.1	460.5 (5)	0.328	5260.7 I	9723.6 (20)	0.541
18	216.00	215.4	460.5 (5)	0.468	4236.9 I	9837.0 (20)	0.431
19	228.00	282.5	460.5 (5)	0.613	2513.2 I	9837.0 (20)	0.255
20	240.00	350.3	460.5 (5)	0.761	0.0	9837.0 (20)	0.000

Absolute values of factored moment are shown with determining strength

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	252.4	569.3 (3)	0.443
40.73	138.0	460.5 (5)	0.300
64.06	200.0	460.5 (5)	0.434
87.40	319.4	460.5 (5)	0.694
98.73	376.4	714.3 (3)	0.527
108.67	425.7	748.8 (3)	0.569
110.06	432.5	913.5 (3)	0.473
114.33	453.3	882.9 (3)	0.513
121.40	474.0	913.5 (3)	0.519
125.67	453.2	882.9 (3)	0.513
131.33	425.7	882.9 (3)	0.482
132.73	418.8	714.3 (3)	0.586
167.40	244.0	460.5 (5)	0.530
190.73	124.2	460.5 (5)	0.270
214.06	205.0	460.5 (5)	0.445

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		Permit only			Permit only		
0	0.00	271.5	460.5 (5)	0.590	0.0	9837.0 (20)	0.000
1	12.00	213.8	569.3 (3)	0.376	1999.7 II	9837.0 (20)	0.203
2	24.00	157.5	460.5 (5)	0.342	3346.7 II	9837.0 (20)	0.340
3	36.00	102.9	460.5 (5)	0.223	4126.9 II	9723.6 (20)	0.424
4	48.00	71.7	460.5 (5)	0.156	4256.0 II	9713.0 (20)	0.438
5	60.00	111.5	460.5 (5)	0.242	3811.6 II	9837.0 (20)	0.387
6	72.00	167.7	460.5 (5)	0.364	2947.8 II	9837.0 (20)	0.300
7	84.00	224.1	460.5 (5)	0.487	1461.9 II	9837.0 (20)	0.149
8	96.00	278.8	714.3 (3)	0.390	2323.7 II	9227.2 (6)	0.252

# Exterior Girder - EV2 Truck @ Pier

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CHK: AJF 8/30/19

9	108.00	331.5	748.8	(3)	0.443	4289.0	II	9389.2	(6)	0.457
10L	120.00	382.0	882.9	(3)	0.433	6626.6	II	9376.3	(6)	0.707
10R	120.00	382.0	882.9	(3)	0.433	6626.6	II	9376.3	(6)	0.707
11	132.00	331.5	913.5	(3)	0.363	4288.2	II	9389.3	(6)	0.457
12	144.00	278.8	714.3	(3)	0.390	2322.9	II	9471.9	(6)	0.245
13	156.00	224.2	460.5	(5)	0.487	1461.5	II	9837.0	(20)	0.149
14	168.00	167.8	460.5	(5)	0.364	2946.6	II	9837.0	(20)	0.300
15	180.00	111.6	460.5	(5)	0.242	3809.9	II	9837.0	(20)	0.387
16	192.00	71.7	460.5	(5)	0.156	4255.7	II	9713.0	(20)	0.438
17	204.00	102.9	460.5	(5)	0.223	4126.2	II	9723.6	(20)	0.424
18	216.00	157.5	460.5	(5)	0.342	3346.2	II	9837.0	(20)	0.340
19	228.00	213.8	460.5	(5)	0.464	1999.4	II	9837.0	(20)	0.203
20	240.00	271.5	460.5	(5)	0.590	0.0		9837.0	(20)	0.000

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	188.5	569.3	(3)	0.331
40.73	90.6	460.5	(5)	0.197
64.06	130.6	460.5	(5)	0.284
87.40	239.6	460.5	(5)	0.520
98.73	290.8	714.3	(3)	0.407
108.67	334.3	748.8	(3)	0.446
110.06	340.2	913.5	(3)	0.372
114.33	358.2	882.9	(3)	0.406
121.40	474.0	913.5	(3)	0.519
125.67	453.2	882.9	(3)	0.513
131.33	425.7	882.9	(3)	0.482
132.73	328.3	714.3	(3)	0.460
167.40	170.6	460.5	(5)	0.371
190.73	75.9	460.5	(5)	0.165
214.06	148.7	460.5	(5)	0.323

- (3)  $V_p(C + .87(1 - C) / \sqrt{1 + (D_o/D)^2})$
- (5)  $C = 0.58 F_y w D t$
- (20) Compact section
- (6)  $R_b R_h F_y S(\text{equiv})$   
Maximum moment in factored strength expression



BRIDGE 1562 EXTERIOR  
Line Girder : Rating Output : Lrfd Ratings  
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Exterior Girder - EV2 Truck @ Pier

[This table uses the rating equation (6B.4.1-1) of the 2011 edition of the Manual for Bridge Evaluation where A1D is the sum of factored composite dead, noncomposite dead, and factored wearing surface loads. The denominator A2L(1+I) is the factored live load. If equation (6a.4.2.1-1) is to be used for LRFR ratings the condition LRFR RATINGS must be used in the girder input file.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	9837. C	460.51	>999.00	B>999.00	1.46	2.55
12.00	9837. C	569.26	6.35 B	11.11	2.41	4.23
24.00	9837. C	460.51	3.41 B	5.97	2.47	4.32
36.00	9724. C	460.51	2.51 B	4.40	3.32	5.81
48.00	9713. C	460.51	2.31 B	4.04	4.28	7.50
60.00	9837. C	460.51	2.52 B	4.40	3.09	5.40
72.00	9837. C	460.51	3.11 B	5.43	2.33	4.07
84.00	9837. C	460.51	4.57 B	8.00	1.81	3.16
90.00L	4709. C	652.27	2.84 B	4.97	2.52	4.40
90.00R	9297. C	714.29	5.93 B	10.38	2.81	4.92
96.00	48707. B	714.29	5.22 B	9.14	2.56	4.48
108.00	50000. B	748.81	2.91 B	5.10	2.28	4.00
120.00	50000. B	882.87	1.22 B	2.13	2.43	4.25

Span 2

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	50000. B	913.50	1.22 B	2.13	2.54	4.44
12.00	50000. B	913.50	2.91 B	5.09	2.93	5.13
24.00	50000. B	714.29	5.39 B	9.43	2.56	4.48
30.00L	49557. B	460.51	6.25 B	10.93	1.61	2.81
30.00R	37610. B	460.51	3.02 B	5.29	1.61	2.81
36.00	9837. C	460.51	4.57 B	8.00	1.81	3.16
48.00	9837. C	460.51	3.11 B	5.44	2.33	4.07
60.00	9837. C	460.51	2.52 B	4.41	3.08	5.40
72.00	9713. C	460.51	2.31 B	4.04	4.28	7.49
84.00	9724. C	460.51	2.52 B	4.40	3.32	5.81
96.00	9837. C	460.51	3.41 B	5.97	2.47	4.33

108.00	9837. C	460.51	6.35 B	11.11	1.88	3.29
120.00	9837. C	460.51	>999.00 B	>999.00	1.46	2.56

## Service II

## Span 1

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	45105. S	> 999.00 B	>999.00
12.00	45105. S	6.57 B	8.54
24.00	45105. S	3.38 B	4.40
36.00	45105. S	2.47 B	3.20
48.00	45105. S	2.26 B	2.94
60.00	45105. S	2.48 B	3.23
72.00	45105. S	3.20 B	4.16
84.00	45105. S	4.94 B	6.43
90.00L	32876. S	4.38 T	5.69
90.00R	46275. S	6.88 B	8.94
96.00	46243. S	6.86 B	8.92
108.00	46243. S	3.90 B	5.07
120.00	46243. S	1.81 B	2.36

## Span 2

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	46243. S	1.81 B	2.36
12.00	46243. S	3.89 B	5.06
24.00	46243. S	6.86 B	8.92
30.00L	46243. S	7.91 B	10.29
30.00R	32500. S	4.25 T	5.53
36.00	45105. S	4.94 B	6.43
48.00	45105. S	3.20 B	4.16
60.00	45105. S	2.49 B	3.23
72.00	45105. S	2.27 B	2.95
84.00	45105. S	2.47 B	3.21
96.00	45105. S	3.38 B	4.40
108.00	45105. S	6.57 B	8.54
120.00	45105. S	> 999.00 B	>999.00

\*\*\*\*\*  
Minimum rating is 1.22 at location 120.00 in span 1.  
\*\*\*\*\*

## Permit

## Strength II

## Span 1

Location	Allowable	Shear	Rating Factors Bending		Shear	
			Inv.	Oper.	Inv.	Oper.

Exterior Girder - EV2 Truck @ Pier

0.00	9837. C	460.51	>999.00	2.83
12.00	9837. C	569.26	13.21	4.75
24.00	9837. C	460.51	7.20	4.92
36.00	9724. C	460.51	5.32	6.76
48.00	9713. C	460.51	5.01	9.94
60.00	9837. C	460.51	5.62	8.04
72.00	9837. C	460.51	6.67	5.42
84.00	9837. C	460.51	9.87	3.91
90.00L	4658. C	652.27	5.48	5.31
90.00R	9287. C	714.29	11.57	5.93
96.00	48707. B	714.29	10.40	5.30
108.00	50000. B	748.81	7.40	4.62
120.00	50000. B	882.87	4.35	4.86

Span 2

Location	Allowable	Shear	Rating Factors		Shear
			Bending		
			Inv.	Oper.	Inv. Oper.
0.00	50000. B	913.50	4.35		5.08
12.00	50000. B	913.50	7.40		5.94
24.00	50000. B	714.29	10.73		5.30
30.00L	49557. B	460.51	12.41		3.39
30.00R	37610. B	460.51	6.00		3.39
36.00	9837. C	460.51	9.88		3.91
48.00	9837. C	460.51	6.68		5.41
60.00	9837. C	460.51	5.62		8.04
72.00	9713. C	460.51	5.01		9.94
84.00	9724. C	460.51	5.32		6.76
96.00	9837. C	460.51	7.20		4.93
108.00	9837. C	460.51	13.21		3.69
120.00	9837. C	460.51	>999.00		2.83

Service II

Span 1

Location	Allowable Stress	Rating Factors	
		Bending	
		Inv.	Oper.
0.00	32475. S	>999.00	
12.00	45105. S	10.15	
24.00	45105. S	5.30	
36.00	45105. S	3.87	
48.00	45105. S	3.65	
60.00	45105. S	4.12	
72.00	45105. S	5.10	
84.00	45105. S	7.93	
90.00L	45662. S	7.59	
90.00R	46275. S	11.29	
96.00	46243. S	10.15	
108.00	46243. S	7.35	
120.00	46243. S	4.81	

Span 2

Location	Allowable	Rating Factors	
		Bending	

Exterior Girder - EV2 Truck @ Pier

Stress		Inv.	Oper.
0.00	46243. S		4.81
12.00	46243. S		7.36
24.00	46243. S		10.15
30.00L	46243. S		11.68
30.00R	45139. S		7.51
36.00	45105. S		7.93
48.00	45105. S		5.11
60.00	45105. S		4.13
72.00	45105. S		3.65
84.00	45105. S		3.87
96.00	45105. S		5.30
108.00	45105. S		10.16
120.00	32475. S		>999.00

\*\*\*\*\*  
 Minimum rating is 2.83 at location 0.00 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

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

BRIDGE 1562 EXTERIOR  
Line Girder : Input File : Definition  
Fri Aug 30 07:48:43 2019

## Exterior girder - EV3 Truck

ID: BRIDGE 1562 EXTERIOR  
CONDITIONS

A36 STIFFENER STEEL  
A36 TOP FLANGE FOR SECTION 1  
A36 TOP FLANGE FOR SECTION 3  
A36 WEB FOR SECTION 1  
A36 WEB FOR SECTION 2  
A36 WEB FOR SECTION 3  
A572 BOTTOM FLANGE FOR SECTION 1  
A572 BOTTOM FLANGE FOR SECTION 2  
A572 TOP FLANGE FOR SECTION 2  
A572 BOTTOM FLANGE FOR SECTION 3  
ASSUME SLAB ON FLANGE FOR SECTION PROPERTIES  
ENGLISH INPUT  
ENGLISH OUTPUT  
FULL DEPTH CONNECTION PLATES  
IGNORE WET CONCRETE STRESS CHECK  
INTERMEDIATE TRANSVERSE STIFFENERS ONE SIDE OF WEB  
LRFD METHOD  
RATE MODE  
SINGLE BEARING STIFFENERS EACH SIDE

### DATA

ADTT 511  
BETA 1.75  
BNGSKEW 132.2333 132.2333 132.2333  
BR 17.3958 23.3333 23.3333 23.3333 11.3333 11.3333 11.3333  
11.3333 11.3333 23.3333 23.3333 23.3333 25.9379  
BSPL 90. 60.  
DCGAMMA 1.25  
DWGAMMA 1.5  
ESLABW 93.  
ETAD 1.  
ETAI 1.  
ETAR 1.  
FILLET 1.  
FPC 3.  
LANED 0.425  
LANEM 0.64  
LANEMF 0.64  
LANEV 1.145  
LANEVF 1.145  
LIFE 75  
LLDLIM 800  
NSUPBR 1 1 1  
PBETA 1.3  
PBETAOP 1.3  
PRMITP 24. 31. 31. 24. 31. 31.  
PRMITSP 15. 4. 3. 15. 4.  
SLABT 11.  
SLABWEAR 0.  
SPL 90. 60.  
SPLBFT 1. 1.375 1.  
SPLBFW 14. 18. 14.  
SPLTFT 0.75 1.375 0.75  
SPLTFW 12. 18. 12.  
SPLTST 0.375  
SPLTSW 5.  
SPLWD 70.  
SPLWT 0.625  
SPN 120. 120.  
SS 1.  
STFGAP 0.  
SUPBST 0.5 1.25 0.5  
SUPBSW 4.5 9. 4.5  
TSPL 90. 60.  
TSSP 208.75 280. 280. 280. 136. 119.25 16.75 51.25 84.75  
51.25 68. 16.75 136. 280. 280. 280.  
WCONC 150.  
WDL 1.474  
WEAR 0.2392  
WSDL 0.3067

GO

# Exterior Girder - EV3 Truck @ Pier

BRIDGE 1562 EXTERIOR  
Line Girder : Rating Output : Case Data  
Fri Aug 30 07:49:13 2019

Case Data - BRIDGE 1562 EXTERIOR

## AASHTO Specification

Load and Resistance Factor Method  
6th Edition LRFD Bridge Design Specifications  
2nd Edition Manual for Bridge Evaluation

Dimensions (additional information available in Dimensions table)

Given dimensions-

Web Depth	70.00 in	70.00 in	70.00 in
Web Thickness	0.62 in	0.62 in	0.62 in
Trans. Stiff. Width	5.00 in	5.00 in	5.00 in
Trans. Stiff. Thickness	0.38 in	0.38 in	0.38 in
Bearing Stiff. Width	4.50 in	9.00 in	4.50 in
Bearing Stiff. Thickness	0.50 in	1.25 in	0.50 in

## Execution Mode

Rate Mode

## Geometry

Brace locations

0.00 ft	17.40 ft	40.73 ft	64.06 ft
87.40 ft	98.73 ft	110.06 ft	120.00 ft
121.40 ft	132.73 ft	144.06 ft	167.40 ft
190.73 ft	214.06 ft	240.00 ft	

Unbraced length of comp. flange at support 2 is 9.94 ft.

## Cover plates

No cover plates

## Curvature

No curvature

## Flange splices

Top flange splice locations

90.00 ft 150.00 ft

Bottom flange splice locations

90.00 ft 150.00 ft

## Girder Type

Plate girder  
Interior girder

## Hinges

No interior hinges

## Span lengths

Spans 120.00 ft 120.00 ft

## Stiffeners

Bearing stiffeners

Single bearing stiffeners each side

Longitudinal stiffeners

# Exterior Girder - EV3 Truck @ Pier

No longitudinal stiffener

## Transverse stiffeners

Transverse stiffeners one side only

Stiffener clips	1.00 in			
Stiffener transitions	17.40 ft	87.40 ft	98.73 ft	108.67 ft
	110.06 ft	114.33 ft	120.00 ft	121.40 ft
	125.67 ft	131.33 ft	132.73 ft	144.06 ft
	214.06 ft			

## Web haunches

No web haunches

## Web splices

Web splice locations 90.00 ft 150.00 ft

## Fatigue

Average Single Lane Daily Truck Traffic: 511  
Allowable weld stress 18.00 ksi  
AWS minimum welds  
Fatigue life: 75  
Fatigue stress category B flange splices

## Composite Behavior

Composite region for composite loading- 0. - 240.00 ft

### Lane fraction for strength limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400				

### Lane fraction for fatigue limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400	0.6400	0.6400	0.6400	0.6400
	0.6400				

### Lane fraction for live-load deflection

0.4250

Loaded lanes 2  
Tandem truck multiplier: 1.0000  
Design truck multiplier: 1.0000

## Permit truck loading

Axle loads	24.00 k	31.00 k	31.00 k	24.00 k
	31.00 k	31.00 k		
Axle spacing	15.00 ft	4.00 ft	3.00 ft	15.00 ft
	4.00 ft			

## Influence lines not displayed

Unshored construction

Dead load carried by steel alone

1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k

1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k
1.474 k/ft			

Tenth pt values of distributed dead load carried by steel alone

1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft	1.474 k/ft
1.474 k/ft				

Superimposed dead load

0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft			

Wearing surface dead load

0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft			

Load Factors

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

Permit Trk Strength In	1.300
Permit Trk Strength Op	1.300
Permit Trk Service II	1.000

Load Modifiers

Ductility	1.00
Redundancy	1.00
Operational Classification	1.00

Reactions

Max des trk or des tandem + lane unfactored live load+impact reactions		
136.88 k	271.13 k	136.82 k
Min des trk or des tandem + lane unfactored live load+impact reactions		
-17.14 k	0.00 k	-17.12 k
Max unfactored live reactions - No dynamic load allowance		
Des trk or des tandem + lane		
112.36 k	228.78 k	112.31 k
Min unfactored live reactions - No dynamic load allowance		
Des trk or des tandem + lane		
-14.36 k	0.00 k	-14.34 k
Total unfactored dead load DC1+DC2 reactions		
77.46 k	275.02 k	77.46 k
Total unfactored dead load DW reactions		
10.42 k	36.58 k	10.42 k

Support skew for shear and moment modification

90.00	90.00	90.00
-------	-------	-------

Bearing skew for redistribution qualification

132.23	132.23	132.23
--------	--------	--------

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	11.00 in	11.00 in
---------------------	----------	----------

Effective slab width	93.00 in
----------------------	----------

Neg mom rebar area

10.23 in<sup>2</sup>

Rebar placement from bottom of slab

6.50 in

Negative mom. slab used in dead load 2 analysis

Fillet	1.00 in
--------	---------

Effective slab width	93.00 in
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Exterior Girder - EV3 Truck @ Pier

Steel

Web splice section 1	
Top flange grade	A36
Web grade	A36
Stiffener grade	A36
Bottom flange grade	A572
Web splice section 2	
Web grade	A36
Stiffener grade	A36
Top flange grade	A572
Bottom flange grade	A572
Web splice section 3	
Top flange grade	A36
Web grade	A36
Stiffener grade	A36
Bottom flange grade	A572
Rebar yield	60.00 ksi

Output

Standard resolution summary tables

Units

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

Exterior Girder - EV3 Truck @ Pier

BRIDGE 1562 EXTERIOR  
Line Girder : Rating Output : Factored Strengths  
Fri Aug 30 07:49:28 2019

Factored Strengths

Forces include ductility, redundancy, and operational factors

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		HL93			HL93		
0	0.00	350.4	460.5 (5)	0.761	0.0	9837.0 (20)	0.000
1	12.00	282.5	569.3 (3)	0.496	2513.6 I	9837.0 (20)	0.256
2	24.00	215.4	460.5 (5)	0.468	4238.0 I	9837.0 (20)	0.431
3	36.00	151.2	460.5 (5)	0.328	5262.4 I	9723.6 (20)	0.541
4	48.00	117.7	460.5 (5)	0.255	5533.9 I	9713.0 (20)	0.570
5	60.00	179.1	460.5 (5)	0.389	5113.6 I	9837.0 (20)	0.520
6	72.00	240.8	460.5 (5)	0.523	4036.0 I	9837.0 (20)	0.410
7	84.00	302.2	460.5 (5)	0.656	2300.8 I	9837.0 (20)	0.234
8	96.00	362.9	714.3 (3)	0.508	2884.4 I	9227.2 (6)	0.313
9	108.00	422.5	748.8 (3)	0.564	5419.4 I	9389.2 (6)	0.577
10L	120.00	480.8	882.9 (3)	0.545	8926.3 I	9376.3 (6)	0.952
10R	120.00	480.8	913.5 (3)	0.526	8926.3 I	9376.3 (6)	0.952
11	132.00	422.4	913.5 (3)	0.462	5421.8 I	9389.3 (6)	0.577
12	144.00	362.8	460.5 (5)	0.788	2882.9 I	9471.9 (6)	0.304
13	156.00	302.2	460.5 (5)	0.656	2301.3 I	9837.0 (20)	0.234
14	168.00	240.9	460.5 (5)	0.523	4034.4 I	9837.0 (20)	0.410
15	180.00	179.2	460.5 (5)	0.389	5111.1 I	9837.0 (20)	0.520
16	192.00	117.7	460.5 (5)	0.256	5531.8 I	9713.0 (20)	0.570
17	204.00	151.1	460.5 (5)	0.328	5260.7 I	9723.6 (20)	0.541
18	216.00	215.4	460.5 (5)	0.468	4236.9 I	9837.0 (20)	0.431
19	228.00	282.5	460.5 (5)	0.613	2513.2 I	9837.0 (20)	0.255
20	240.00	350.3	460.5 (5)	0.761	0.0	9837.0 (20)	0.000

Absolute values of factored moment are shown with determining strength

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	252.4	569.3 (3)	0.443
40.73	138.0	460.5 (5)	0.300
64.06	200.0	460.5 (5)	0.434
87.40	319.4	460.5 (5)	0.694
98.73	376.4	714.3 (3)	0.527
108.67	425.7	748.8 (3)	0.569
110.06	432.5	913.5 (3)	0.473
114.33	453.3	882.9 (3)	0.513
121.40	474.0	913.5 (3)	0.519
125.67	453.2	882.9 (3)	0.513
131.33	425.7	882.9 (3)	0.482
132.73	418.8	714.3 (3)	0.586
167.40	244.0	460.5 (5)	0.530
190.73	124.2	460.5 (5)	0.270
214.06	205.0	460.5 (5)	0.445

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		Permit only			Permit only		
0	0.00	387.9	460.5 (5)	0.842	0.0	9837.0 (20)	0.000
1	12.00	314.9	569.3 (3)	0.553	2698.7 II	9837.0 (20)	0.274
2	24.00	243.4	460.5 (5)	0.529	4555.3 II	9837.0 (20)	0.463
3	36.00	174.0	460.5 (5)	0.378	5666.8 II	9723.6 (20)	0.583
4	48.00	122.4	460.5 (5)	0.266	5994.7 II	9713.0 (20)	0.617
5	60.00	178.5	460.5 (5)	0.388	5565.7 II	9837.0 (20)	0.566
6	72.00	248.6	460.5 (5)	0.540	4415.2 II	9837.0 (20)	0.449
7	84.00	316.3	460.5 (5)	0.687	2588.3 II	9837.0 (20)	0.263
8	96.00	380.8	714.3 (3)	0.533	3072.0 II	9227.2 (6)	0.333

9	108.00	441.9	748.8 (3)	0.590	5130.8 II	9389.2 (6)	0.546
10L	120.00	500.8	882.9 (3)	0.567	7561.9 II	9376.3 (6)	0.806
10R	120.00	500.7	882.9 (3)	0.567	7561.9 II	9376.3 (6)	0.806
11	132.00	445.3	913.5 (3)	0.488	5129.3 II	9389.3 (6)	0.546
12	144.00	380.8	714.3 (3)	0.533	3070.6 II	9471.9 (6)	0.324
13	156.00	316.3	460.5 (5)	0.687	2588.9 II	9837.0 (20)	0.263
14	168.00	248.7	460.5 (5)	0.540	4414.2 II	9837.0 (20)	0.449
15	180.00	178.7	460.5 (5)	0.388	5563.0 II	9837.0 (20)	0.566
16	192.00	122.4	460.5 (5)	0.266	5991.8 II	9713.0 (20)	0.617
17	204.00	173.9	460.5 (5)	0.378	5664.5 II	9723.6 (20)	0.583
18	216.00	243.3	460.5 (5)	0.528	4553.8 II	9837.0 (20)	0.463
19	228.00	314.8	460.5 (5)	0.684	2698.1 II	9837.0 (20)	0.274
20	240.00	387.9	460.5 (5)	0.842	0.0	9837.0 (20)	0.000

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	282.8	569.3 (3)	0.497
40.73	153.7	460.5 (5)	0.334
64.06	202.3	460.5 (5)	0.439
87.40	334.5	460.5 (5)	0.726
98.73	394.7	714.3 (3)	0.553
108.67	445.2	748.8 (3)	0.595
110.06	452.0	913.5 (3)	0.495
114.33	473.0	882.9 (3)	0.536
121.40	474.0	913.5 (3)	0.519
125.67	453.2	882.9 (3)	0.513
131.33	425.7	882.9 (3)	0.482
132.73	441.4	714.3 (3)	0.618
167.40	252.1	460.5 (5)	0.548
190.73	128.4	460.5 (5)	0.279
214.06	232.1	460.5 (5)	0.504

(3)  $V_p(C + .87(1-C)/\sqrt{1+(D_o/D)^2})$

(5)  $C = 0.58 F_y W D t$

(20) Compact section

(6)  $R_b R_h F_y S(\text{equiv})$

Maximum moment in factored strength expression

BRIDGE 1562 EXTERIOR  
Line Girder : Rating Output : Lrfd Ratings  
Fri Aug 30 07:49:41 2019  
Exterior Girder - EV3 Truck @ Pier

[This table uses the rating equation (6B.4.1-1) of the 2011 edition of the Manual for Bridge Evaluation where A1D is the sum of factored composite dead, noncomposite dead, and factored wearing surface loads. The denominator A2L(1+I) is the factored live load. If equation (6a.4.2.1-1) is to be used for LRFR ratings the condition LRFR RATINGS must be used in the girder input file.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	9837. C	460.51	>999.00	B>999.00	1.46	2.55
12.00	9837. C	569.26	6.35 B	11.11	2.41	4.23
24.00	9837. C	460.51	3.41 B	5.97	2.47	4.32
36.00	9724. C	460.51	2.51 B	4.40	3.32	5.81
48.00	9713. C	460.51	2.31 B	4.04	4.28	7.50
60.00	9837. C	460.51	2.52 B	4.40	3.09	5.40
72.00	9837. C	460.51	3.11 B	5.43	2.33	4.07
84.00	9837. C	460.51	4.57 B	8.00	1.81	3.16
90.00L	4709. C	652.27	2.84 B	4.97	2.52	4.40
90.00R	9297. C	714.29	5.93 B	10.38	2.81	4.92
96.00	48707. B	714.29	5.22 B	9.14	2.56	4.48
108.00	50000. B	748.81	2.91 B	5.10	2.28	4.00
120.00	48676. B	882.87	1.15 B	2.01	2.43	4.25

Span 2

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	48676. B	913.50	1.15 B	2.01	2.54	4.44
12.00	50000. B	913.50	2.91 B	5.09	2.93	5.13
24.00	50000. B	714.29	5.39 B	9.43	2.56	4.48
30.00L	49557. B	460.51	6.25 B	10.93	1.61	2.81
30.00R	37610. B	460.51	3.02 B	5.29	1.61	2.81
36.00	9837. C	460.51	4.57 B	8.00	1.81	3.16
48.00	9837. C	460.51	3.11 B	5.44	2.33	4.07
60.00	9837. C	460.51	2.52 B	4.41	3.08	5.40
72.00	9713. C	460.51	2.31 B	4.04	4.28	7.49
84.00	9724. C	460.51	2.52 B	4.40	3.32	5.81
96.00	9837. C	460.51	3.41 B	5.97	2.47	4.33

# Exterior Girder - EV3 Truck @ Pier

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CHK: AJF 8/30/19

108.00	9837. C	460.51	6.35 B	11.11	1.88	3.29
120.00	9837. C	460.51	>999.00 B	>999.00	1.46	2.56

## Service II

### Span 1

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	45105. S	> 999.00 B	>999.00
12.00	45105. S	6.57 B	8.54
24.00	45105. S	3.38 B	4.40
36.00	45105. S	2.47 B	3.20
48.00	45105. S	2.26 B	2.94
60.00	45105. S	2.48 B	3.23
72.00	45105. S	3.20 B	4.16
84.00	45105. S	4.94 B	6.43
90.00L	32876. S	4.38 T	5.69
90.00R	46275. S	6.88 B	8.94
96.00	46243. S	6.86 B	8.92
108.00	46243. S	3.90 B	5.07
120.00	46243. S	1.81 B	2.36

### Span 2

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	46243. S	1.81 B	2.36
12.00	46243. S	3.89 B	5.06
24.00	46243. S	6.86 B	8.92
30.00L	46243. S	7.91 B	10.29
30.00R	32500. S	4.25 T	5.53
36.00	45105. S	4.94 B	6.43
48.00	45105. S	3.20 B	4.16
60.00	45105. S	2.49 B	3.23
72.00	45105. S	2.27 B	2.95
84.00	45105. S	2.47 B	3.21
96.00	45105. S	3.38 B	4.40
108.00	45105. S	6.57 B	8.54
120.00	45105. S	> 999.00 B	>999.00

\*\*\*\*\*  
Minimum rating is 1.15 at location 120.00 in span 1.  
\*\*\*\*\*

## Permit

## Strength II

### Span 1

Location	Allowable	Shear	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.

# Exterior Girder - EV3 Truck @ Pier

0.00	9837. C	460.51	>999.00	1.64
12.00	9837. C	569.26	7.27	2.71
24.00	9837. C	460.51	3.90	2.75
36.00	9724. C	460.51	2.87	3.68
48.00	9713. C	460.51	2.62	5.32
60.00	9837. C	460.51	2.86	4.03
72.00	9837. C	460.51	3.55	2.89
84.00	9837. C	460.51	5.23	2.19
90.00L	4927. C	652.27	3.41	3.04
90.00R	9360. C	714.29	6.82	3.39
96.00	48707. B	714.29	6.08	3.08
108.00	50000. B	748.81	4.33	2.76
120.00	48676. B	882.87	2.39	2.95

Span 2

Location	Allowable	Shear	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	48676. B	913.50		2.39		3.08
12.00	50000. B	913.50		4.33		3.50
24.00	50000. B	714.29		6.27		3.08
30.00L	49557. B	460.51		7.26		1.94
30.00R	37610. B	460.51		3.51		1.94
36.00	9837. C	460.51		5.23		2.19
48.00	9837. C	460.51		3.55		2.89
60.00	9837. C	460.51		2.86		4.03
72.00	9713. C	460.51		2.63		5.32
84.00	9724. C	460.51		2.88		3.69
96.00	9837. C	460.51		3.90		2.75
108.00	9837. C	460.51		7.27		2.11
120.00	9837. C	460.51		>999.00		1.64

Service II

Span 1

Location	Allowable Stress	Rating Factors	
		Bending	
		Inv.	Oper.
0.00	32475. S		>999.00
12.00	45105. S		5.59
24.00	45105. S		2.87
36.00	45105. S		2.09
48.00	45105. S		1.91
60.00	45105. S		2.10
72.00	45105. S		2.71
84.00	45105. S		4.20
90.00L	45662. S		4.44
90.00R	46275. S		5.74
96.00	46243. S		5.93
108.00	46243. S		4.30
120.00	46243. S		2.81

Span 2

Location	Allowable	Rating Factors	
		Bending	
		Inv.	Oper.

Exterior Girder - EV3 Truck @ Pier

Stress		Inv.	Oper.
0.00	46243. S		2.81
12.00	46243. S		4.30
24.00	46243. S		5.94
30.00L	46243. S		6.83
30.00R	45139. S		4.39
36.00	45105. S		4.20
48.00	45105. S		2.71
60.00	45105. S		2.10
72.00	45105. S		1.91
84.00	45105. S		2.09
96.00	45105. S		2.88
108.00	45105. S		5.59
120.00	32475. S		>999.00

\*\*\*\*\*  
 Minimum rating is 1.64 at location 0.00 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

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

BRIDGE 1562 INTERIOR  
Line Girder : Input File : Definition  
Fri Aug 30 06:33:23 2019

## Interior girder - EV2 Truck

ID: BRIDGE 1562 INTERIOR

### CONDITIONS

A36 STIFFENER STEEL  
A36 TOP FLANGE FOR SECTION 1  
A36 TOP FLANGE FOR SECTION 3  
A36 WEB FOR SECTION 1  
A36 WEB FOR SECTION 2  
A36 WEB FOR SECTION 3  
A572 BOTTOM FLANGE FOR SECTION 1  
A572 BOTTOM FLANGE FOR SECTION 2  
A572 TOP FLANGE FOR SECTION 2  
A572 BOTTOM FLANGE FOR SECTION 3  
ASSUME SLAB ON FLANGE FOR SECTION PROPERTIES  
ENGLISH INPUT  
ENGLISH OUTPUT  
FULL DEPTH CONNECTION PLATES  
IGNORE WET CONCRETE STRESS CHECK  
INTERMEDIATE TRANSVERSE STIFFENERS ONE SIDE OF WEB  
LRFD METHOD  
RATE MODE  
SINGLE BEARING STIFFENERS EACH SIDE

### DATA

ADTT 511  
BETA 1.75  
BNGSKEW 132.2333 132.2333 132.2333  
BR 17.3958 8.5485 14.7848 8.5485 14.7848 8.5485 14.7848 8.5485  
2.7848 8.5485 2.7848 8.5485 2.7848 8.5485 2.7848 8.5485  
2.7848 8.5485 14.7848 8.5485 14.7848 8.5485 14.7848 8.5485  
17.3894  
BSPL 90. 60.  
DCGAMMA 1.25  
DWGAMMA 1.5  
ESLABW 93.  
ETAD 1.  
ETAI 1.  
ETAR 1.  
FILLET 1.  
FPC 3.  
LANED 0.425  
LANEM 0.831  
LANEMF 0.831  
LANEV 1.145  
LANEVF 1.145  
LIFE 75  
LLDLIM 800  
NSUPBR 1 1 1  
PBETA 1.3  
PBETAOP 1.3  
PRMITP 24. 33.5 24. 33.5  
PRMITSP 15. 30. 15.  
SLABT 11.  
SLABWEAR 0.  
SPL 90. 60.  
SPLBFT 1. 1.375 1.  
SPLBFW 14. 18. 14.  
SPLTFT 0.75 1.375 0.75  
SPLTFW 12. 18. 12.  
SPLTST 0.375  
SPLTSW 5.  
SPLWD 70.  
SPLWT 0.625  
SPN 120. 120.  
SS 1.  
STFGAP 0.  
SUPBST 0.5 1.25 0.5  
SUPBSW 4.5 9. 4.5  
TSPL 90. 60.  
TSSP 208.75 102.582 177.418 102.582 177.418 102.582 177.418  
102.582 33.418 102.582 33.418 67.25 35.332 33.418 51.25  
51.332 33.418 102.582 33.418 102.582 33.418 102.582 177.418  
102.582 177.418 102.582  
WCONC 150.  
WDL 1.488  
WEAR 0.2392  
WSDL 0.3067

GO



BRIDGE 1562 INTERIOR  
Line Girder : Rating Output : Case Data  
Fri Aug 30 06:35:45 2019

# Interior Girder - EV2 Truck @ Pier

Case Data - BRIDGE 1562 INTERIOR

## AASHTO Specification

Load and Resistance Factor Method  
6th Edition LRFD Bridge Design Specifications  
2nd Edition Manual for Bridge Evaluation

Dimensions (additional information available in Dimensions table)

Given dimensions-

Web Depth	70.00 in	70.00 in	70.00 in
Web Thickness	0.62 in	0.62 in	0.62 in
Trans. Stiff. Width	5.00 in	5.00 in	5.00 in
Trans. Stiff. Thickness	0.38 in	0.38 in	0.38 in
Bearing Stiff. Width	4.50 in	9.00 in	4.50 in
Bearing Stiff. Thickness	0.50 in	1.25 in	0.50 in

## Execution Mode

Rate Mode

## Geometry

Brace locations

0.00 ft	17.40 ft	25.94 ft	40.73 ft
49.28 ft	64.06 ft	72.61 ft	87.40 ft
95.94 ft	98.73 ft	107.28 ft	110.06 ft
118.61 ft	120.00 ft	121.40 ft	129.94 ft
132.73 ft	141.28 ft	144.06 ft	152.61 ft
167.40 ft	175.94 ft	190.73 ft	199.28 ft
214.06 ft	222.61 ft	240.00 ft	

Unbraced length of comp. flange at support 2 is 1.40 ft.

## Cover plates

No cover plates

## Curvature

No curvature

## Flange splices

Top flange splice locations

90.00 ft 150.00 ft

Bottom flange splice locations

90.00 ft 150.00 ft

## Girder Type

Plate girder  
Interior girder

## Hinges

No interior hinges

## Span lengths

Spans 120.00 ft 120.00 ft

## Stiffeners

Bearing stiffeners

Single bearing stiffeners each side Interior Girder - EV2 Truck @ Pier

Longitudinal stiffeners

No longitudinal stiffener

Transverse stiffeners

Transverse stiffeners one side only

Stiffener clips	1.00 in			
Stiffener transitions	17.40 ft	25.94 ft	40.73 ft	49.28 ft
	64.06 ft	72.61 ft	87.40 ft	95.94 ft
	98.73 ft	107.28 ft	110.06 ft	115.67 ft
	118.61 ft	120.00 ft	121.40 ft	125.67 ft
	129.94 ft	132.73 ft	141.28 ft	144.06 ft
	152.61 ft	155.40 ft	163.94 ft	178.73 ft
	187.28 ft	202.06 ft	210.61 ft	

Web haunches

No web haunches

Web splices

Web splice locations 90.00 ft 150.00 ft

Fatigue

Average Single Lane Daily Truck Traffic: 511  
Allowable weld stress 18.00 ksi  
AWS minimum welds  
Fatigue life: 75  
Fatigue stress category B flange splices

Composite Behavior

Composite region for composite loading- 0. - 240.00 ft

Lane fraction for strength limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310				

Lane fraction for fatigue limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310				

Lane fraction for live-load deflection  
0.4250

Loaded lanes 2  
Tandem truck multiplier: 1.0000  
Design truck multiplier: 1.0000

Permit truck loading

Axle loads	24.00 k	33.50 k	24.00 k	33.50 k
Axle spacing	15.00 ft	30.00 ft	15.00 ft	

Influence lines not displayed

# Interior Girder - EV2 Truck @ Pier

## Unshored construction

### Dead load carried by steel alone

1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft			

### Tenth pt values of distributed dead load carried by steel alone

1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft				

### Superimposed dead load

0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft			

### Wearing surface dead load

0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft			

## Load Factors

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

Permit Trk Strength In	1.300
Permit Trk Strength Op	1.300
Permit Trk Service II	1.000

## Load Modifiers

Ductility	1.00
Redundancy	1.00
Operational Classification	1.00

## Reactions

### Max des trk or des tandem + lane unfactored live load+impact reactions

136.88 k	271.13 k	136.82 k
----------	----------	----------

### Min des trk or des tandem + lane unfactored live load+impact reactions

-17.14 k	0.00 k	-17.12 k
----------	--------	----------

### Max unfactored live reactions - No dynamic load allowance

#### Des trk or des tandem + lane

112.36 k	228.78 k	112.31 k
----------	----------	----------

### Min unfactored live reactions - No dynamic load allowance

#### Des trk or des tandem + lane

-14.36 k	0.00 k	-14.34 k
----------	--------	----------

### Total unfactored dead load DC1+DC2 reactions

78.05 k	277.19 k	78.05 k
---------	----------	---------

### Total unfactored dead load DW reactions

10.42 k	36.58 k	10.42 k
---------	---------	---------

### Support skew for shear and moment modification

90.00	90.00	90.00
-------	-------	-------

### Bearing skew for redistribution qualification

132.23	132.23	132.23
--------	--------	--------

## 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	11.00 in	11.00 in
---------------------	----------	----------

Effective slab width	93.00 in
----------------------	----------

Neg mom rebar area	
--------------------	--

10.23 in2	
-----------	--

Interior Girder - EV2 Truck @ Pier

Rebar placement from bottom of slab  
6.50 in  
Negative mom. slab used in dead load 2 analysis  
Fillet 1.00 in  
Effective slab width 93.00 in

Steel

Web splice section 1  
Top flange grade A36  
Web grade A36  
Stiffener grade A36  
Bottom flange grade A572  
Web splice section 2  
Web grade A36  
Stiffener grade A36  
Top flange grade A572  
Bottom flange grade A572  
Web splice section 3  
Top flange grade A36  
Web grade A36  
Stiffener grade A36  
Bottom flange grade A572  
Rebar yield 60.00 ksi

Output

Standard resolution summary tables

Units

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

BRIDGE 1562 INTERIOR Interior Girder - EV2 Truck @ Pier  
Line Girder : Rating Output : Factored Strengths  
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# Factored Strengths

Forces include ductility, redundancy, and operational factors

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		HL93			HL93		
0	0.00	351.1	460.5 (5)	0.762	0.0	9837.0 (20)	0.000
1	12.00	283.1	569.3 (3)	0.497	2930.1 I	9837.0 (20)	0.298
2	24.00	215.8	739.0 (3)	0.292	4943.9 I	9837.0 (20)	0.503
3	36.00	151.3	595.3 (3)	0.254	6157.4 I	9713.6 (20)	0.634
4	48.00	117.8	739.0 (3)	0.159	6501.8 I	9702.9 (20)	0.670
5	60.00	179.4	595.3 (3)	0.301	6056.6 I	9837.0 (20)	0.616
6	72.00	241.3	739.0 (3)	0.327	4866.5 I	9837.0 (20)	0.495
7	84.00	303.0	595.3 (3)	0.509	2931.1 I	9837.0 (20)	0.298
8	96.00	363.8	791.9 (3)	0.459	3375.4 I	9512.7 (6)	0.355
9	108.00	423.6	913.5 (3)	0.464	6132.2 I	9429.7 (6)	0.650
10L	120.00	482.2	913.5 (3)	0.528	10042.3 I	9416.1 (6)	1.067
10R	120.00	482.2	913.5 (3)	0.528	10042.3 I	9416.1 (6)	1.067
11	132.00	423.6	913.5 (3)	0.464	6135.3 I	9429.9 (6)	0.651
12	144.00	363.8	791.9 (3)	0.459	3373.4 I	9512.6 (6)	0.355
13	156.00	303.0	739.0 (3)	0.410	2931.7 I	9837.0 (20)	0.298
14	168.00	241.4	595.3 (3)	0.406	4864.4 I	9837.0 (20)	0.495
15	180.00	179.5	739.0 (3)	0.243	6053.5 I	9837.0 (20)	0.615
16	192.00	117.8	595.3 (3)	0.198	6499.2 I	9702.9 (20)	0.670
17	204.00	151.2	739.0 (3)	0.205	6155.2 I	9713.6 (20)	0.634
18	216.00	215.7	460.5 (5)	0.468	4942.5 I	9837.0 (20)	0.502
19	228.00	283.0	460.5 (5)	0.615	2929.5 I	9837.0 (20)	0.298
20	240.00	351.0	460.5 (5)	0.762	0.0	9837.0 (20)	0.000

Absolute values of factored moment are shown with determining strength

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	252.8	569.3 (3)	0.444
25.94	205.3	595.3 (3)	0.345
40.73	138.1	595.3 (3)	0.232
49.28	124.3	595.3 (3)	0.209
64.06	200.4	595.3 (3)	0.337
72.61	244.5	595.3 (3)	0.411
87.40	320.2	595.3 (3)	0.538
98.73	377.4	791.9 (3)	0.477
107.28	420.0	791.9 (3)	0.530
110.06	433.7	884.9 (3)	0.490
115.67	461.0	884.9 (3)	0.521
118.61	475.4	913.5 (3)	0.520
121.40	475.4	913.5 (3)	0.520
125.67	454.5	913.5 (3)	0.498
129.94	433.6	913.5 (3)	0.475
132.73	419.9	791.9 (3)	0.530
141.28	377.3	791.9 (3)	0.476
152.61	320.1	739.0 (3)	0.433
155.40	306.0	739.0 (3)	0.414
163.94	262.2	595.3 (3)	0.440
178.73	186.1	595.3 (3)	0.313
187.28	142.1	595.3 (3)	0.239
202.06	145.8	595.3 (3)	0.245
210.61	186.7	460.5 (5)	0.405

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		Permit only			Permit only		

0	0.00	272.3	460.5 (5)	0.591	0.0	9837.0 (20)	0.000
1	12.00	214.4	569.3 (3)	0.377	2262.7 II	9837.0 (20)	0.230
2	24.00	157.8	739.0 (3)	0.214	3786.6 II	9837.0 (20)	0.385
3	36.00	103.0	595.3 (3)	0.173	4683.0 II	9713.6 (20)	0.482
4	48.00	71.8	739.0 (3)	0.097	4842.7 II	9702.9 (20)	0.499
5	60.00	111.8	595.3 (3)	0.188	4366.1 II	9837.0 (20)	0.444
6	72.00	168.2	739.0 (3)	0.228	3453.6 II	9837.0 (20)	0.351
7	84.00	224.8	595.3 (3)	0.378	1841.8 II	9837.0 (20)	0.187
8	96.00	279.7	913.5 (3)	0.306	2647.4 II	9512.7 (6)	0.278
9	108.00	332.7	913.5 (3)	0.364	4664.5 II	9429.7 (6)	0.495
10L	120.00	383.4	913.5 (3)	0.420	7056.3 II	9416.1 (6)	0.749
10R	120.00	383.4	913.5 (3)	0.420	7056.3 II	9416.1 (6)	0.749
11	132.00	332.7	913.5 (3)	0.364	4663.3 II	9429.9 (6)	0.495
12	144.00	279.7	913.5 (3)	0.306	2646.3 II	9512.6 (6)	0.278
13	156.00	224.9	739.0 (3)	0.304	1841.4 II	9837.0 (20)	0.187
14	168.00	168.3	595.3 (3)	0.283	3452.0 II	9837.0 (20)	0.351
15	180.00	111.9	739.0 (3)	0.151	4364.0 II	9837.0 (20)	0.444
16	192.00	71.8	595.3 (3)	0.121	4842.2 II	9702.9 (20)	0.499
17	204.00	103.0	739.0 (3)	0.139	4682.1 II	9713.6 (20)	0.482
18	216.00	157.8	460.5 (5)	0.343	3785.9 II	9837.0 (20)	0.385
19	228.00	214.3	460.5 (5)	0.465	2262.3 II	9837.0 (20)	0.230
20	240.00	272.2	460.5 (5)	0.591	0.0	9837.0 (20)	0.000

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	188.9	569.3 (3)	0.332
25.94	148.9	595.3 (3)	0.250
40.73	90.7	595.3 (3)	0.152
49.28	76.1	595.3 (3)	0.128
64.06	130.9	595.3 (3)	0.220
72.61	171.1	595.3 (3)	0.287
87.40	240.4	595.3 (3)	0.404
98.73	291.8	791.9 (3)	0.368
107.28	329.5	791.9 (3)	0.416
110.06	341.4	884.9 (3)	0.386
115.67	365.1	884.9 (3)	0.413
118.61	377.5	913.5 (3)	0.413
121.40	475.4	913.5 (3)	0.520
125.67	454.5	913.5 (3)	0.498
129.94	433.6	913.5 (3)	0.475
132.73	329.4	791.9 (3)	0.416
141.28	291.7	791.9 (3)	0.368
152.61	240.4	739.0 (3)	0.325
155.40	227.6	739.0 (3)	0.308
163.94	187.4	595.3 (3)	0.315
178.73	117.9	595.3 (3)	0.198
187.28	87.6	595.3 (3)	0.147
202.06	98.0	595.3 (3)	0.165
210.61	133.2	460.5 (5)	0.289

(3)  $V_p(C+.87(1-C)/\sqrt{1+(D_o/D)**2})$   
(5)  $C = 0.58 F_y W D t$   
(20) Compact section  
(6)  $R_b R_h F_y S(\text{equiv})$   
Maximum moment in factored strength expression

BRIDGE 1562 INTERIOR Interior Girder - EV2 Truck @ Pier  
Line Girder : Rating Output : Lrfd Ratings  
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[This table uses the rating equation (6B.4.1-1) of the 2011 edition of the Manual for Bridge Evaluation where A1D is the sum of factored composite dead, noncomposite dead, and factored wearing surface loads. The denominator A2L(1+I) is the factored live load. If equation (6a.4.2.1-1) is to be used for LRFR ratings the condition LRFR RATINGS must be used in the girder input file.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	9837. C	460.51	>999.00	B>999.00	1.46	2.55
12.00	9837. C	569.26	4.88 B	8.55	2.41	4.22
24.00	9837. C	739.01	2.62 B	4.59	4.14	7.25
36.00	9714. C	595.27	1.93 B	3.38	4.33	7.58
48.00	9703. C	739.01	1.77 B	3.10	6.95	12.16
60.00	9837. C	595.27	1.93 B	3.39	4.08	7.14
72.00	9837. C	739.01	2.39 B	4.18	4.01	7.01
84.00	9837. C	595.27	3.52 B	6.16	2.49	4.36
90.00L	4836. C	739.01	2.25 B	3.94	2.92	5.11
90.00R	9581. C	791.93	4.71 B	8.24	3.17	5.55
96.00	50000. B	913.50	4.14 B	7.25	3.44	6.01
108.00	50000. B	913.50	2.24 B	3.91	2.93	5.12
120.00	48676. B	913.50	0.87 B	1.53	2.53	4.43

Span 2

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	48676. B	913.50	0.87 B	1.53	2.53	4.43
12.00	50000. B	913.50	2.23 B	3.91	2.93	5.12
24.00	50000. B	913.50	4.14 B	7.25	3.44	6.02
30.00L	49557. B	791.93	4.81 B	8.41	3.17	5.56
30.00R	34713. T	739.01	2.54 T	4.44	2.92	5.12
36.00	9837. C	739.01	3.52 B	6.16	3.23	5.64
48.00	9837. C	595.27	2.39 B	4.18	3.14	5.49
60.00	9837. C	739.01	1.94 B	3.39	5.15	9.00
72.00	9703. C	595.27	1.77 B	3.10	5.57	9.74
84.00	9714. C	739.01	1.93 B	3.38	5.41	9.47
96.00	9837. C	460.51	2.62 B	4.59	2.47	4.32

# Interior Girder - EV2 Truck @ Pier

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108.00	9837. C	460.51	4.89 B	8.55	1.88	3.28
120.00	9837. C	460.51	>999.00 B	>999.00	1.46	2.55

## Service II

### Span 1

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	45105. S	> 999.00 B	>999.00
12.00	45105. S	5.05 B	6.57
24.00	45105. S	2.60 B	3.38
36.00	45105. S	1.89 B	2.46
48.00	45105. S	1.74 B	2.26
60.00	45105. S	1.91 B	2.48
72.00	45105. S	2.46 B	3.20
84.00	45105. S	3.81 B	4.95
90.00L	32876. S	3.37 T	4.38
90.00R	46275. S	5.30 B	6.89
96.00	46243. S	5.28 B	6.86
108.00	46243. S	2.99 B	3.89
120.00	46243. S	1.39 B	1.81

### Span 2

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	46243. S	1.39 B	1.81
12.00	46243. S	2.99 B	3.89
24.00	46243. S	5.28 B	6.87
30.00L	46243. S	6.09 B	7.92
30.00R	32500. S	3.27 T	4.25
36.00	45105. S	3.81 B	4.95
48.00	45105. S	2.46 B	3.20
60.00	45105. S	1.91 B	2.48
72.00	45105. S	1.74 B	2.26
84.00	45105. S	1.89 B	2.46
96.00	45105. S	2.60 B	3.38
108.00	45105. S	5.05 B	6.57
120.00	45105. S	> 999.00 B	>999.00

\*\*\*\*\*  
Minimum rating is 0.87 at location 120.00 in span 1.  
\*\*\*\*\*

## Permit

## Strength II

### Span 1

Location	Allowable	Shear	Rating Factors Bending		Rating Factors Shear	
			Inv.	Oper.	Inv.	Oper.



# Interior Girder - EV2 Truck @ Pier

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0.00	9837. C	460.51	>999.00	2.82
12.00	9837. C	569.26	10.16	4.74
24.00	9837. C	739.01	5.53	8.25
36.00	9714. C	595.27	4.08	8.82
48.00	9703. C	739.01	3.84	16.13
60.00	9837. C	595.27	4.32	10.64
72.00	9837. C	739.01	5.13	9.32
84.00	9837. C	595.27	7.60	5.39
90.00L	4786. C	739.01	4.35	6.17
90.00R	9570. C	791.93	9.19	6.70
96.00	50000. B	913.50	8.25	7.12
108.00	50000. B	913.50	5.68	5.93
120.00	48676. B	913.50	3.12	5.07

Span 2

Location	Allowable	Shear	Rating Factors	
			Bending	Shear
			Inv.	Oper.
			Inv.	Oper.
0.00	48676. B	913.50	3.12	5.07
12.00	50000. B	913.50	5.68	5.93
24.00	50000. B	913.50	8.25	7.12
30.00L	49557. B	791.93	9.55	6.70
30.00R	34713. T	739.01	4.72	6.17
36.00	9837. C	739.01	7.60	6.97
48.00	9837. C	595.27	5.14	7.30
60.00	9837. C	739.01	4.32	13.41
72.00	9703. C	595.27	3.84	12.93
84.00	9714. C	739.01	4.08	11.02
96.00	9837. C	460.51	5.54	4.92
108.00	9837. C	460.51	10.17	3.69
120.00	9837. C	460.51	>999.00	2.82

Service II

Span 1

Location	Allowable Stress	Rating Factors	
		Bending	
		Inv.	Oper.
0.00	32475. S	>999.00	
12.00	45105. S	7.81	
24.00	45105. S	4.07	
36.00	45105. S	2.97	
48.00	45105. S	2.80	
60.00	45105. S	3.17	
72.00	45105. S	3.92	
84.00	45105. S	6.11	
90.00L	45662. S	5.85	
90.00R	46275. S	8.70	
96.00	46243. S	7.81	
108.00	46243. S	5.65	
120.00	46243. S	3.68	

Span 2

Location	Allowable	Rating Factors	
		Bending	

Interior Girder - EV2 Truck @ Pier

Stress		Inv.	Oper.
0.00	46243. S		3.68
12.00	46243. S		5.65
24.00	46243. S		7.81
30.00L	46243. S		8.99
30.00R	45139. S		5.78
36.00	45105. S		6.11
48.00	45105. S		3.93
60.00	45105. S		3.17
72.00	45105. S		2.80
84.00	45105. S		2.97
96.00	45105. S		4.07
108.00	45105. S		7.81
120.00	32475. S		>999.00

\*\*\*\*\*  
Minimum rating is 2.80 at location 48.00 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

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

BRIDGE 1562 INTERIOR  
Line Girder : Input File : Definition  
Fri Aug 30 06:55:14 2019

## Interior girder - EV3 Truck

ID: BRIDGE 1562 INTERIOR

### CONDITIONS

A36 STIFFENER STEEL  
A36 TOP FLANGE FOR SECTION 1  
A36 TOP FLANGE FOR SECTION 3  
A36 WEB FOR SECTION 1  
A36 WEB FOR SECTION 2  
A36 WEB FOR SECTION 3  
A572 BOTTOM FLANGE FOR SECTION 1  
A572 BOTTOM FLANGE FOR SECTION 2  
A572 TOP FLANGE FOR SECTION 2  
A572 BOTTOM FLANGE FOR SECTION 3  
ASSUME SLAB ON FLANGE FOR SECTION PROPERTIES  
ENGLISH INPUT  
ENGLISH OUTPUT  
FULL DEPTH CONNECTION PLATES  
IGNORE WET CONCRETE STRESS CHECK  
INTERMEDIATE TRANSVERSE STIFFENERS ONE SIDE OF WEB  
LRFD METHOD  
RATE MODE  
SINGLE BEARING STIFFENERS EACH SIDE

### DATA

ADTT 511  
BETA 1.75  
BNGSKEW 132.2333 132.2333 132.2333  
BR 17.3958 8.5485 14.7848 8.5485 14.7848 8.5485 14.7848 8.5485  
2.7848 8.5485 2.7848 8.5485 2.7848 8.5485 2.7848 8.5485  
2.7848 8.5485 14.7848 8.5485 14.7848 8.5485 14.7848 8.5485  
17.3894  
BSPL 90. 60.  
DCGAMMA 1.25  
DWGAMMA 1.5  
ESLABW 93.  
ETAD 1.  
ETAI 1.  
ETAR 1.  
FILLET 1.  
FPC 3.  
LANED 0.425  
LANEM 0.831  
LANEMF 0.831  
LANEV 1.145  
LANEVF 1.145  
LIFE 75  
LLDLIM 800  
NSUPBR 1 1 1  
PBETA 1.3  
PBETAOP 1.3  
PRMITP 24. 31. 31. 24. 31. 31.  
PRMITSP 15. 4. 30. 15. 4.  
SLABT 11.  
SLABWEAR 0.  
SPL 90. 60.  
SPLBFT 1. 1.375 1.  
SPLBFW 14. 18. 14.  
SPLTFT 0.75 1.375 0.75  
SPLTFW 12. 18. 12.  
SPLTST 0.375  
SPLTSW 5.  
SPLWD 70.  
SPLWT 0.625  
SPN 120. 120.  
SS 1.  
STFGAP 0.  
SUPBST 0.5 1.25 0.5  
SUPBSW 4.5 9. 4.5  
TSPL 90. 60.  
TSSP 208.75 102.582 177.418 102.582 177.418 102.582 177.418  
102.582 33.418 102.582 33.418 67.25 35.332 33.418 51.25  
51.332 33.418 102.582 33.418 102.582 33.418 102.582 177.418  
102.582 177.418 102.582  
WCONC 150.  
WDL 1.488  
WEAR 0.2392  
WSDL 0.3067

GO

BRIDGE 1562 INTERIOR  
 Line Girder : Rating Output : Case Data  
 Fri Aug 30 07:09:02 2019

# Interior Girder - EV3 Truck @ Pier

Case Data - BRIDGE 1562 INTERIOR

## AASHTO Specification

Load and Resistance Factor Method  
 6th Edition LRFD Bridge Design Specifications  
 2nd Edition Manual for Bridge Evaluation

Dimensions (additional information available in Dimensions table)

Given dimensions-

Web Depth	70.00 in	70.00 in	70.00 in
Web Thickness	0.62 in	0.62 in	0.62 in
Trans. Stiff. Width	5.00 in	5.00 in	5.00 in
Trans. Stiff. Thickness	0.38 in	0.38 in	0.38 in
Bearing Stiff. Width	4.50 in	9.00 in	4.50 in
Bearing Stiff. Thickness	0.50 in	1.25 in	0.50 in

## Execution Mode

Rate Mode

## Geometry

Brace locations

0.00 ft	17.40 ft	25.94 ft	40.73 ft
49.28 ft	64.06 ft	72.61 ft	87.40 ft
95.94 ft	98.73 ft	107.28 ft	110.06 ft
118.61 ft	120.00 ft	121.40 ft	129.94 ft
132.73 ft	141.28 ft	144.06 ft	152.61 ft
167.40 ft	175.94 ft	190.73 ft	199.28 ft
214.06 ft	222.61 ft	240.00 ft	

Unbraced length of comp. flange at support 2 is 1.40 ft.

## Cover plates

No cover plates

## Curvature

No curvature

## Flange splices

Top flange splice locations

90.00 ft 150.00 ft

Bottom flange splice locations

90.00 ft 150.00 ft

## Girder Type

Plate girder  
 Interior girder

## Hinges

No interior hinges

## Span lengths

Spans 120.00 ft 120.00 ft

## Stiffeners

Bearing stiffeners

Single bearing stiffeners each side Interior Girder - EV3 Truck @ Pier

Longitudinal stiffeners

No longitudinal stiffener

Transverse stiffeners

Transverse stiffeners one side only

Stiffener clips	1.00 in			
Stiffener transitions	17.40 ft	25.94 ft	40.73 ft	49.28 ft
	64.06 ft	72.61 ft	87.40 ft	95.94 ft
	98.73 ft	107.28 ft	110.06 ft	115.67 ft
	118.61 ft	120.00 ft	121.40 ft	125.67 ft
	129.94 ft	132.73 ft	141.28 ft	144.06 ft
	152.61 ft	155.40 ft	163.94 ft	178.73 ft
	187.28 ft	202.06 ft	210.61 ft	

Web haunches

No web haunches

Web splices

Web splice locations	90.00 ft	150.00 ft
----------------------	----------	-----------

Fatigue

Average Single Lane Daily Truck Traffic: 511  
Allowable weld stress 18.00 ksi  
AWS minimum welds  
Fatigue life: 75  
Fatigue stress category B flange splices

Composite Behavior

Composite region for composite loading- 0. - 240.00 ft

Lane fraction for strength limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310				

Lane fraction for fatigue limit state

Shear	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450	1.1450	1.1450	1.1450	1.1450
	1.1450				
Moment	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310	0.8310	0.8310	0.8310	0.8310
	0.8310				

Lane fraction for live-load deflection  
0.4250

Loaded lanes 2  
Tandem truck multiplier: 1.0000  
Design truck multiplier: 1.0000

Permit truck loading

Axle loads	24.00 k	31.00 k	31.00 k	24.00 k
	31.00 k	31.00 k		
Axle spacing	15.00 ft	4.00 ft	30.00 ft	15.00 ft
	4.00 ft			

# Interior Girder - EV3 Truck @ Pier

Influence lines not displayed

Unshored construction

Dead load carried by steel alone

1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k
1.488 k/ft			

Tenth pt values of distributed dead load carried by steel alone

1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft	1.488 k/ft
1.488 k/ft				

Superimposed dead load

0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft	0.307 k/ft	0.307 k/ft	0.307 k
0.307 k/ft			

Wearing surface dead load

0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft	0.239 k/ft	0.239 k/ft	0.239 k
0.239 k/ft			

Load Factors

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

Permit Trk Strength In	1.300
Permit Trk Strength Op	1.300
Permit Trk Service II	1.000

Load Modifiers

Ductility	1.00
Redundancy	1.00
Operational Classification	1.00

Reactions

Max des trk or des tandem + lane unfactored live load+impact reactions

136.88 k	271.13 k	136.82 k
----------	----------	----------

Min des trk or des tandem + lane unfactored live load+impact reactions

-17.14 k	0.00 k	-17.12 k
----------	--------	----------

Max unfactored live reactions - No dynamic load allowance

Des trk or des tandem + lane

112.36 k	228.78 k	112.31 k
----------	----------	----------

Min unfactored live reactions - No dynamic load allowance

Des trk or des tandem + lane

-14.36 k	0.00 k	-14.34 k
----------	--------	----------

Total unfactored dead load DC1+DC2 reactions

78.05 k	277.19 k	78.05 k
---------	----------	---------

Total unfactored dead load DW reactions

10.42 k	36.58 k	10.42 k
---------	---------	---------

Support skew for shear and moment modification

90.00	90.00	90.00
-------	-------	-------

Bearing skew for redistribution qualification

132.23	132.23	132.23
--------	--------	--------

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	11.00 in	11.00 in
Effective slab width	93.00 in	
Neg mom rebar area		

Interior Girder - EV3 Truck @ Pier

10.23 in2  
Rebar placement from bottom of slab  
6.50 in  
Negative mom. slab used in dead load 2 analysis  
Fillet 1.00 in  
Effective slab width 93.00 in

Steel

Web splice section 1  
Top flange grade A36  
Web grade A36  
Stiffener grade A36  
Bottom flange grade A572  
Web splice section 2  
Web grade A36  
Stiffener grade A36  
Top flange grade A572  
Bottom flange grade A572  
Web splice section 3  
Top flange grade A36  
Web grade A36  
Stiffener grade A36  
Bottom flange grade A572  
Rebar yield 60.00 ksi

Output

Standard resolution summary tables

Units

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

BRIDGE 1562 INTERIOR Interior Girder - EV3 Truck @ Pier  
Line Girder : Rating Output : Factored Strengths  
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# Factored Strengths

Forces include ductility, redundancy, and operational factors

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		HL93			HL93		
0	0.00	351.1	460.5 (5)	0.762	0.0	9837.0 (20)	0.000
1	12.00	283.1	569.3 (3)	0.497	2930.1 I	9837.0 (20)	0.298
2	24.00	215.8	739.0 (3)	0.292	4943.9 I	9837.0 (20)	0.503
3	36.00	151.3	595.3 (3)	0.254	6157.4 I	9713.6 (20)	0.634
4	48.00	117.8	739.0 (3)	0.159	6501.8 I	9702.9 (20)	0.670
5	60.00	179.4	595.3 (3)	0.301	6056.6 I	9837.0 (20)	0.616
6	72.00	241.3	739.0 (3)	0.327	4866.5 I	9837.0 (20)	0.495
7	84.00	303.0	595.3 (3)	0.509	2931.1 I	9837.0 (20)	0.298
8	96.00	363.8	791.9 (3)	0.459	3375.4 I	9512.7 (6)	0.355
9	108.00	423.6	913.5 (3)	0.464	6132.2 I	9429.7 (6)	0.650
10L	120.00	482.2	913.5 (3)	0.528	10042.3 I	9416.1 (6)	1.067
10R	120.00	482.2	913.5 (3)	0.528	10042.3 I	9416.1 (6)	1.067
11	132.00	423.6	913.5 (3)	0.464	6135.3 I	9429.9 (6)	0.651
12	144.00	363.8	791.9 (3)	0.459	3373.4 I	9512.6 (6)	0.355
13	156.00	303.0	739.0 (3)	0.410	2931.7 I	9837.0 (20)	0.298
14	168.00	241.4	595.3 (3)	0.406	4864.4 I	9837.0 (20)	0.495
15	180.00	179.5	739.0 (3)	0.243	6053.5 I	9837.0 (20)	0.615
16	192.00	117.8	595.3 (3)	0.198	6499.2 I	9702.9 (20)	0.670
17	204.00	151.2	739.0 (3)	0.205	6155.2 I	9713.6 (20)	0.634
18	216.00	215.7	460.5 (5)	0.468	4942.5 I	9837.0 (20)	0.502
19	228.00	283.0	460.5 (5)	0.615	2929.5 I	9837.0 (20)	0.298
20	240.00	351.0	460.5 (5)	0.762	0.0	9837.0 (20)	0.000

Absolute values of factored moment are shown with determining strength

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	252.8	569.3 (3)	0.444
25.94	205.3	595.3 (3)	0.345
40.73	138.1	595.3 (3)	0.232
49.28	124.3	595.3 (3)	0.209
64.06	200.4	595.3 (3)	0.337
72.61	244.5	595.3 (3)	0.411
87.40	320.2	595.3 (3)	0.538
98.73	377.4	791.9 (3)	0.477
107.28	420.0	791.9 (3)	0.530
110.06	433.7	884.9 (3)	0.490
115.67	461.0	884.9 (3)	0.521
118.61	475.4	913.5 (3)	0.520
121.40	475.4	913.5 (3)	0.520
125.67	454.5	913.5 (3)	0.498
129.94	433.6	913.5 (3)	0.475
132.73	419.9	791.9 (3)	0.530
141.28	377.3	791.9 (3)	0.476
152.61	320.1	739.0 (3)	0.433
155.40	306.0	739.0 (3)	0.414
163.94	262.2	595.3 (3)	0.440
178.73	186.1	595.3 (3)	0.313
187.28	142.1	595.3 (3)	0.239
202.06	145.8	595.3 (3)	0.245
210.61	186.7	460.5 (5)	0.405

Tenth Point	Loc	Factored Shear (k )	Shear Strength (k )	Ratio	Factored Moment (k-ft)	Bending Strength (k-ft)	Ratio
		Permit only			Permit only		



0	0.00	344.1	460.5 (5)	0.747	0.0	9837.0 (20)	0.000
1	12.00	273.6	569.3 (3)	0.481	2807.4 II	9837.0 (20)	0.285
2	24.00	205.2	739.0 (3)	0.278	4644.4 II	9837.0 (20)	0.472
3	36.00	139.5	595.3 (3)	0.234	5695.9 II	9713.6 (20)	0.586
4	48.00	101.0	739.0 (3)	0.137	5853.3 II	9702.9 (20)	0.603
5	60.00	145.4	595.3 (3)	0.244	5315.4 II	9837.0 (20)	0.540
6	72.00	211.8	739.0 (3)	0.287	4344.7 II	9837.0 (20)	0.442
7	84.00	280.9	595.3 (3)	0.472	2564.3 II	9837.0 (20)	0.261
8	96.00	347.4	913.5 (3)	0.380	3252.4 II	9512.7 (6)	0.342
9	108.00	411.0	913.5 (3)	0.450	5345.2 II	9429.7 (6)	0.567
10L	120.00	471.5	913.5 (3)	0.516	7812.6 II	9416.1 (6)	0.830
10R	120.00	471.5	913.5 (3)	0.516	7812.6 II	9416.1 (6)	0.830
11	132.00	411.1	913.5 (3)	0.450	5343.7 II	9429.9 (6)	0.567
12	144.00	347.4	913.5 (3)	0.380	3251.1 II	9512.6 (6)	0.342
13	156.00	280.9	739.0 (3)	0.380	2563.1 II	9837.0 (20)	0.261
14	168.00	211.9	595.3 (3)	0.356	4342.1 II	9837.0 (20)	0.441
15	180.00	145.4	739.0 (3)	0.197	5312.9 II	9837.0 (20)	0.540
16	192.00	100.9	595.3 (3)	0.170	5852.6 II	9702.9 (20)	0.603
17	204.00	139.5	739.0 (3)	0.189	5695.2 II	9713.6 (20)	0.586
18	216.00	205.2	460.5 (5)	0.446	4643.5 II	9837.0 (20)	0.472
19	228.00	273.5	460.5 (5)	0.594	2806.8 II	9837.0 (20)	0.285
20	240.00	344.1	460.5 (5)	0.747	0.0	9837.0 (20)	0.000

Shear Strength at Intermediate Transverse Stiffeners  
not Located at a Tenth Point

17.40	242.9	569.3 (3)	0.427
25.94	194.6	595.3 (3)	0.327
40.73	124.3	595.3 (3)	0.209
49.28	105.7	595.3 (3)	0.178
64.06	167.9	595.3 (3)	0.282
72.61	215.3	595.3 (3)	0.362
87.40	299.7	595.3 (3)	0.503
98.73	361.9	791.9 (3)	0.457
107.28	407.2	791.9 (3)	0.514
110.06	421.4	884.9 (3)	0.476
115.67	449.6	884.9 (3)	0.508
118.61	464.5	913.5 (3)	0.508
121.40	475.4	913.5 (3)	0.520
125.67	454.5	913.5 (3)	0.498
129.94	433.6	913.5 (3)	0.475
132.73	407.2	791.9 (3)	0.514
141.28	361.9	791.9 (3)	0.457
152.61	299.7	739.0 (3)	0.406
155.40	284.3	739.0 (3)	0.385
163.94	235.2	595.3 (3)	0.395
178.73	152.5	595.3 (3)	0.256
187.28	118.5	595.3 (3)	0.199
202.06	133.2	595.3 (3)	0.224
210.61	175.7	460.5 (5)	0.381

(3)  $V_p(C+.87(1-C)/\sqrt{1+(D_o/D)**2})$   
 (5) C 0.58 Fyw D t  
 (20) Compact section  
 (6) Rb Rh FY S(equiv)  
 Maximum moment in factored strength expression

BRIDGE 1562 INTERIOR  
Line Girder : Rating Output : Lrfd Ratings  
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Interior Girder - EV3 Truck @ Pier

[This table uses the rating equation (6B.4.1-1) of the 2011 edition of the Manual for Bridge Evaluation where A1D is the sum of factored composite dead, noncomposite dead, and factored wearing surface loads. The denominator A2L(1+I) is the factored live load. If equation (6a.4.2.1-1) is to be used for LRFR ratings the condition LRFR RATINGS must be used in the girder input file.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	9837. C	460.51	>999.00	B>999.00	1.46	2.55
12.00	9837. C	569.26	4.88 B	8.55	2.41	4.22
24.00	9837. C	739.01	2.62 B	4.59	4.14	7.25
36.00	9714. C	595.27	1.93 B	3.38	4.33	7.58
48.00	9703. C	739.01	1.77 B	3.10	6.95	12.16
60.00	9837. C	595.27	1.93 B	3.39	4.08	7.14
72.00	9837. C	739.01	2.39 B	4.18	4.01	7.01
84.00	9837. C	595.27	3.52 B	6.16	2.49	4.36
90.00L	4836. C	739.01	2.25 B	3.94	2.92	5.11
90.00R	9581. C	791.93	4.71 B	8.24	3.17	5.55
96.00	50000. B	913.50	4.14 B	7.25	3.44	6.01
108.00	50000. B	913.50	2.24 B	3.91	2.93	5.12
120.00	48676. B	913.50	0.87 B	1.53	2.53	4.43

Span 2

Location	Compct Mom Cap/Noncmt Allow Stress	Shear Capacity	Rating Factors			
			Bending		Shear	
			Inv.	Oper.	Inv.	Oper.
0.00	48676. B	913.50	0.87 B	1.53	2.53	4.43
12.00	50000. B	913.50	2.23 B	3.91	2.93	5.12
24.00	50000. B	913.50	4.14 B	7.25	3.44	6.02
30.00L	49557. B	791.93	4.81 B	8.41	3.17	5.56
30.00R	34713. T	739.01	2.54 T	4.44	2.92	5.12
36.00	9837. C	739.01	3.52 B	6.16	3.23	5.64
48.00	9837. C	595.27	2.39 B	4.18	3.14	5.49
60.00	9837. C	739.01	1.94 B	3.39	5.15	9.00
72.00	9703. C	595.27	1.77 B	3.10	5.57	9.74
84.00	9714. C	739.01	1.93 B	3.38	5.41	9.47
96.00	9837. C	460.51	2.62 B	4.59	2.47	4.32

108.00	9837. C	460.51	4.89 B	8.55	1.88	3.28
120.00	9837. C	460.51	>999.00 B	>999.00	1.46	2.55

## Service II

## Span 1

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	45105. S	> 999.00 B	>999.00
12.00	45105. S	5.05 B	6.57
24.00	45105. S	2.60 B	3.38
36.00	45105. S	1.89 B	2.46
48.00	45105. S	1.74 B	2.26
60.00	45105. S	1.91 B	2.48
72.00	45105. S	2.46 B	3.20
84.00	45105. S	3.81 B	4.95
90.00L	32876. S	3.37 T	4.38
90.00R	46275. S	5.30 B	6.89
96.00	46243. S	5.28 B	6.86
108.00	46243. S	2.99 B	3.89
120.00	46243. S	1.39 B	1.81

## Span 2

Location	Allowable Stress	Rating Factors Bending	
		Inv.	Oper.
0.00	46243. S	1.39 B	1.81
12.00	46243. S	2.99 B	3.89
24.00	46243. S	5.28 B	6.87
30.00L	46243. S	6.09 B	7.92
30.00R	32500. S	3.27 T	4.25
36.00	45105. S	3.81 B	4.95
48.00	45105. S	2.46 B	3.20
60.00	45105. S	1.91 B	2.48
72.00	45105. S	1.74 B	2.26
84.00	45105. S	1.89 B	2.46
96.00	45105. S	2.60 B	3.38
108.00	45105. S	5.05 B	6.57
120.00	45105. S	> 999.00 B	>999.00

\*\*\*\*\*  
Minimum rating is 0.87 at location 120.00 in span 1.  
\*\*\*\*\*

## Permit

## Strength II

## Span 1

Location	Allowable	Shear	Rating Factors Bending		Shear
			Inv.	Oper.	
			Inv.	Oper.	

Interior Girder - EV3 Truck @ Pier

0.00	9837. C	460.51	>999.00	1.95
12.00	9837. C	569.26	6.82	3.29
24.00	9837. C	739.01	3.79	5.75
36.00	9714. C	595.27	2.85	6.17
48.00	9703. C	739.01	2.73	10.76
60.00	9837. C	595.27	3.08	7.10
72.00	9837. C	739.01	3.64	6.34
84.00	9837. C	595.27	5.29	3.65
90.00L	4966. C	739.01	3.14	4.18
90.00R	9618. C	791.93	6.41	4.53
96.00	50000. B	913.50	5.72	4.82
108.00	50000. B	913.50	3.94	4.00
120.00	48676. B	913.50	2.16	3.42

Span 2

Location	Allowable	Shear	Rating Factors		Shear
			Bending		
			Inv.	Oper.	Inv. Oper.
0.00	48676. B	913.50	2.16		3.42
12.00	50000. B	913.50	3.94		4.00
24.00	50000. B	913.50	5.72		4.82
30.00L	49557. B	791.93	6.62		4.53
30.00R	34713. T	739.01	3.28		4.18
36.00	9837. C	739.01	5.29		4.72
48.00	9837. C	595.27	3.64		4.96
60.00	9837. C	739.01	3.08		8.95
72.00	9703. C	595.27	2.73		8.63
84.00	9714. C	739.01	2.85		7.71
96.00	9837. C	460.51	3.79		3.43
108.00	9837. C	460.51	6.82		2.56
120.00	9837. C	460.51	>999.00		1.95

Service II

Span 1

Location	Allowable Stress	Rating Factors	
		Bending	
		Inv.	Oper.
0.00	32475. S	>999.00	
12.00	45105. S	5.24	
24.00	45105. S	2.79	
36.00	45105. S	2.08	
48.00	45105. S	1.99	
60.00	45105. S	2.26	
72.00	45105. S	2.78	
84.00	45105. S	4.25	
90.00L	45662. S	4.05	
90.00R	46275. S	6.03	
96.00	46243. S	5.41	
108.00	46243. S	3.92	
120.00	46243. S	2.55	

Span 2

Location	Allowable	Rating Factors	
		Bending	

Interior Girder - EV3 Truck @ Pier

	Stress	Inv.	Oper.
0.00	46243. S		2.55
12.00	46243. S		3.92
24.00	46243. S		5.42
30.00L	46243. S		6.23
30.00R	45139. S		4.01
36.00	45105. S		4.25
48.00	45105. S		2.78
60.00	45105. S		2.26
72.00	45105. S		1.99
84.00	45105. S		2.08
96.00	45105. S		2.79
108.00	45105. S		5.24
120.00	32475. S		>999.00

\*\*\*\*\*  
 Minimum rating is 1.95 at location 0.00 in span 1.  
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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

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