Bridge Load Rating

Prepared for

Maine Department of Transportation

HAMPDEN

COLD BROOK ROAD/I-95 BRIDGE

Bridge No. 5970

COLD BROOK ROAD

OVER

INTERSTATE 95

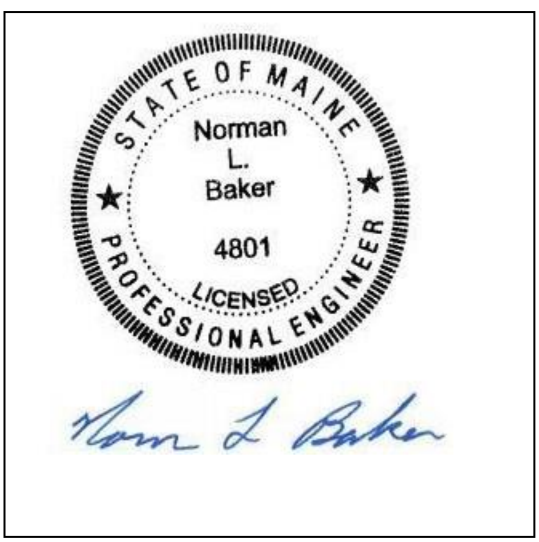
Date of Inspection: June 24, 2016

Date of Rating: August 30, 2017

Prepared By: Daniel Balter, P.E.

Checked By: Christopher Taylor, P.E.

T·Y·LIN INTERNATIONAL



Bridge No:	5970	Bridge Name:	Cold Brook Road/I-95
Town/City:	Hampden	Owner:	MaineDOT
Route Carried:	Cold Brook Road	Year Built	1962
Crosses:	I-95	Year(s) Rebuilt/Rehab:	N/A

SUMMARY OF BRIDGE RATING

VEHICLE TYPE		RF	RT (TONS)	POSTING LOAD (TONS)
HL-93	INVENTORY	1.52	54.72	
	OPERATING	1.97	70.92	
HL-93 modified	INVENTORY			
	OPERATING			
CONFIGURATION 1				OK
CONFIGURATION 2				OK
CONFIGURATION 3				OK
CONFIGURATION 4				OK
CONFIGURATION 5				OK
CONFIGURATION 6				OK
CONFIGURATION 7				OK
CONFIGURATION 8				OK

Group 1 Posting Analysis (Configuration 1)
Governing Posting: NA
Governing Load Model: NA

Group 2 Posting Analysis (Configurations 2 - 5)
Governing Posting: NA
Governing Load Model: NA

Group 3 Posting Analysis (Configurations 6 - 8)
Governing Posting: NA
Governing Load Model: NA

LRFR Evaluation Factors:

Live Load Distribution Factor: N/A - Grid Model in MDX
Live Load LF Routine Commercial: N/A
Live Load LF Special Hauling: N/A
Impact Factor: 1.33
Governing Condition Factor, ϕ_c: 1
System Factor, ϕ_s: 1
ADTT (one-way): 584

Please check all the boxes that apply:

- ☐ Bridge load rating is governed by substructure rating
- ☐ Connections control the load rating
- ☐ Exterior girder controls load rating
- ■ As-built load rating
- ☐ As-inspected load rating
- ☐ One Lane Loaded
- ■ Advanced Analysis Used
- ☐ Actual Measurements Taken
- ■ Finite Fatigue Life 51 years

BREAKDOWN OF BRIDGE RATING

Town/City: Hampden
Bridge No: 5970

Route Carried: Cold Brook Road
Crosses: I-95

LOAD RATING POINTS OF INTEREST

Bridge Component	HL-93		HL-93 Modified		MaineDOT Truck Configurations							
	Inv 72.0 kip	Oper 72.0 kip	Inv 90.0 kip	Oper 90.0 kip	1 100.0 kip	2 94.0 kip	3 88.0 kip	4 88.0 kip	5 88.0 kip	6 75.9 kip	7 59.0 kip	8 37.4 kip
Span 1 - Exterior Girder Strength I Positive Moment, 0.5L	2.27	2.94										
Span 1 - Interior Girder Strength I Positive Moment, 0.5L	1.89	2.46										
Span 1 - Exterior Girder Strength I Shear at CL Bearing	3.92	5.08										
Span 1 - Interior Girder Strength I Shear at CL Bearing	2.96	3.84										
Span 1 - Exterior Girder Service II Positive Moment, 0.5L	1.99	2.59										
Span 1 - Interior Girder Service II Positive Moment, 0.5L	1.56	2.03										
Span 2 thru 4 - Exterior Girder Strength I Positive Moment, 0.5L	1.76	2.28										
Span 2 thru 4 - Interior Girder Strength I Positive Moment, 0.5L	1.52	1.97										
Span 2 thru 4 - Exterior Girder Strength I Shear at CL Bearing	3.64	4.71										
Span 2 thru 4 - Interior Girder Strength I Shear at CL Bearing	2.81	3.64										
Span 2 thru 4 - Exterior Girder Service II Positive Moment, 0.5L	1.84	2.40										
Span 2 thru 4 - Interior Girder Service II Positive Moment, 0.5L	1.51	1.96										
Span 5 - Exterior Girder Strength I Positive Moment, 0.5L	1.83	2.37										
Span 5 - Interior Girder Strength I Positive Moment, 0.5L	1.54	2.00										
Span 5 - Exterior Girder Strength I Shear at CL Bearing	3.67	4.75										

Span 5 - Interior Girder Strength I Shear at CL Bearing	2.74	3.55										
Span 5 - Exterior Girder Service II Positive Moment, 0.5L	1.90	2.47										
Span 5 - Interior Girder Service II Positive Moment, 0.5L	1.52	1.97										
CONTROLLING RATING FACTORS	1.52	1.97										

DESCRIPTION OF BRIDGE

Bridge Number:	5970
Owner:	MaineDOT
Maintained By:	MaineDOT
Location:	Hampden
Route Carried:	Cold Brook Road
Feature Intersected:	Interstate 95
Latest NBI Inspection Date:	June 24, 2016
Field Verification Date (if applicable):	None
Date of Construction:	1962
Bridge Type:	Steel Girders
Material Properties:	Structural Steel: A373, F_y=32 ksi, Concrete Deck: f`c=3.0 ksi
Original Design Loading:	H-20
Date(s) of Rebuild/Rehab :	1983
Description of Rebuild/Rehab :	Wearing Surface, Concrete Barriers
Posting:	None
Superstructure:	5 Simple Spans, Concrete Deck on Multiple Steel Girders
Substructure:	Stub Concrete Abutments on Steel Piles; Concrete Column Piers on Steel Piles
Bearings:	Steel Bearings with Bronze Sliding Plates
Bridge Spans:	321.85’ Total, 68.25’ Max Span per design plans
Bridge Skew:	13°15’00” (to Long Chord)
Bridge Width:	35’-3” out-to-out
Roadway Width:	30’-0” curb-to-curb
Roadway Surface:	Concrete
Curbs:	None
Sidewalk/Walkway/Median:	None
Utilities:	None
Bridge Railing:	Concrete Barrier
Approach Railing:	Type 3 Guard Rail Attached
Wearing Surface Condition:	Satisfactory
Bridge Railing Condition:	Good
Deck Condition:	Very Good
Beam Condition:	Satisfactory
Bearing Condition:	Satisfactory
Abutment Condition:	Satisfactory
Pier Condition:	Fair

Hampden Cold Brook Road Bridge #5970

Load Rating Notes

1. The load rating analysis performed and reported herein was based upon MaineDOT supplied design plans, and inspection reports. No field visits were performed to verify dimension or conditions.

2. The load rating analysis was completed using LRFR methodology.

3. The load rating analysis was completed through the use of MDX software package. This software utilizes a finite element grid model (beam elements) to determine force demands and calculates corresponding capacities and rating factors. Distribution factors for live load are determined by the program and consider relative stiffness of members.

4. Verification calculations for the MDX model are provided in a MathCAD worksheet.

5. Strength I, Service II, and Fatigue load combinations were considered during this load rating for shear and bending of the composite girders – no other load combinations or design elements were checked.

6. The plastic moment capacity of the composite girders was used in the load rating analysis.

7. Current photos show the original curb and rails have been replaced with current Maine DOT standard Permanent Concrete Barriers (Section 526). It is assumed that the original overall bridge width was used with these barriers and that the barriers do not contribute stiffness to the overall model.

8. From the inspection photos, it appears that the original deck may have been replaced along with the barriers. No documentation was available. The original deck geometry was used for the load rating. Any variations in the new deck would likely have minor impact on the rating.

9. A 1” haunch equal to the flange width was included in the section properties for analysis purposes in accordance with MaineDOT Bridge Design Guide Section 7.1.2. An additional 1” of haunch thickness was included as dead weight (DC1) only.

10. Shear connectors are detailed in the plans, therefore the bridge has been rated as a fully-composite structure with shear connector verification calculations provided in a MathCAD worksheet.

References:

1. MaineDOT Load Rating Guide, 2015
2. MaineDOT Bridge Design Guide, 2003 with updates through 2014
3. Manual for Bridge Evaluation Second Edition with Interims through 2016
4. AASHTO LRFD Bridge Design Specifications – 7th Edition, with Interims through 2016
5. Design Plans, 1962
6. Shop Drawings, 1962
7. Rehabilitation Plans (joints and overlay), 1983
8. Inspection Report, 2016

TY·LIN INTERNATIONAL
engineers | planners | scientists

PROJECT: *Bridge Load Ratings* **JOB NO:** *411927.00*
TASK: *5970 Hampden Cold Brook Road Bridge*
ORIGINATOR: *D. Balter* **DATE:** *June 30, 2017*
CHECKER: *C. Taylor* **DATE:** *Aug 08, 2017*

Hampden Cold Brook Road Bridge #5970
Loads, Geometry, Materials, & Use Information

Rating Inputs

Bridge Dimensions

$Year := 1962$	*Year of design*
$Bridge_L := 321.85ft$	*Total bridge length*
$Span_1 := 43ft$ $Span_2 := 68ft + 3in$ $Span_5 := 66ft$ $N_{span} := 5$	*Span lengths and Number of spans*
$Bridge_{wd.out} := 35ft + 3in$	*Bridge Width*
$Skew := (13 + 15 \div 60)deg = 13.25 \cdot deg$	*Bridge Skew* $Skew + 90deg = 103.25 \cdot deg$
$Roadway_{wd} := 35ft + 3in - 2 \cdot (1ft + 4in) = 32.58\,ft$	*Roadway Width (Assumes 1'-4" standard concrete barrier placed flush to outside of original deck.)*
$t_s := 7in$	*Concrete slab thickness*
$Overhang := 2ft + 3in$	*Slab overhang that extends beyond center of exterior beam*
$Wearing_{t.conc} := 2in$	*Wearing Surface Thickness, Concrete*
$Wearing_{t.bit} := 0in$	*Wearing Surface Thickness, Bituminous*
$Curb_{wd.conc} := 0ft$	*Average Width of Concrete Curbs*
$Curb_{wd.gran} := 0in$	*Average Width of Granite Curbs*
$Curb_{ht} := 0in$	*Height of the Curbs from deck*
$Parapet := 1ft + 4in$	*Width of the parapet*
$Stripe\_Lane_{offset} := 0ft$	*Striped line offset from face of curb (assume not striped)*
$ADT_{cur} := 9473$	*Average daily traffic, Current*
$ADT_{fut} := 13262$	*Average daily traffic, Future*
$Truck_{perc} := 8\%$	*Percentage of truck percentage of the ADT*
$ADT_{Direction\_Split} := 0.55$	*Directional Split for ADT, 0.55 unless otherwise specified (per AASHTO C3.6.1.4.2)*
$ADTT := ceil(ADT_{fut} \cdot Truck_{perc} \cdot ADT_{Direction\_Split}) = 584$	*Average Daily Truck Traffic in one direction (put in 5000 if unknown)*
$Condition := "Satisfactory"$	*Condition of superstructure (2016, Inspection Report)*

TY·LIN INTERNATIONAL

Beam Dimensions

S := "Varies, 7'-10.5" to 8'-1" per Sheet 17 of 29 of plans" — *Beam spacing, CL Web to CL Web, all bays*

Use $S := 8ft + 1in$ *as spacing for load calculations*

$N_{beams} := 5$ — *Total number of beams*

$Curb := Parapet - Overhang = -0.9167 \cdot ft$ — *Gutterline offset from CL of right exterior girder web, for use in MDX (positive inside)*

$Haunch := 2in = 2\ in$ — *Theoretical clear distance between top of top flange and bottom of deck*

$W_{haunch} := 4in$ — *Width of haunch, beyond girder flange tips (for embedded flanges)*

36WF135 Span 1	*36WF170 Spans 2-4*	
$wt_{beam.1} := 135plf$	$wt_{beam.2} := 170plf$	*Self weight of the beam*
$SectionType_1$:= "Rolled"	$SectionType_2$:= "Rolled"	*Type of section Rolled or Built-Up*
$D_{gird.1} := 35.6in$	$D_{gird.2} := 36.2in$	*Depth of rolled girder*
$t_{w.1} := 0.600in$	$t_{w.2} := 0.680in$	*Thickness of web*
$b_{tf.1} := 12in$	$b_{tf.2} := 12in$	*Width of top flange*
$t_{tf.1} := 0.79in$	$t_{tf.2} := 1.10in$	*Thickness of the top flange*
$b_{bf.1} := 12in$	$b_{bf.2} := 12in$	*Width of bottom flange*
$t_{bf.1} := 0.79in$	$t_{bf.2} := 1.10in$	*Thickness of the bottom flange*
$t_{tcp.1} := 0in$	$t_{tcp.2} := 0in$	*Thickness of the top cover plate*
$b_{tcp.1} := 0in$	$b_{tcp.2} := 0in$	*Width of the top cover plate*
$t_{bcp.1.1} := 0.001in$	$t_{bcp.2.1} := 1.125in$	*Thickness of the exterior girder bottom cover plate*
$b_{bcp.1.1} := 0.001in$	$b_{bcp.2.1} := 11in$	*Width of the exterior girder bottom cover plate*
$t_{bcp.1.2} := 0.001in$	$t_{bcp.2.2} := 1.125in$	*Thickness of the interior girder bottom cover plate*
$b_{bcp.1.2} := 0.001in$	$b_{bcp.2.2} := 11in$	*Width of the interior girder bottom cover plate*
$A_{gird.1} := 39.7in^2$	$A_{gird.2} := 50.1in^2$	*Area of Rolled Girder*
$I_{rolledgirder.1} := 7800in^4$	$I_{rolledgirder.2} := 10500in^4$	*Moment of Inertia of Rolled Girder*
$Z_{rolledgirder.1} := 509in^3$	$Z_{rolledgirder.2} := 668in^3$	*Plastic Section Modulus of Rolled Girder*

TY·LIN INTERNATIONAL

36WF170 Span 5

$wt_{beam.5} := 170plf$	*Self weight of the beam*
$SectionType_5 :=$ "Rolled"	*Type of section Rolled or Built-Up*
$D_{gird.5} := 35.9in$	*Depth of rolled girder*
$t_{w.5} := 0.625in$	*Thickness of web*
$b_{tf.5} := 12in$	*Width of top flange*
$t_{tf.5} := 1.10in$	*Thickness of the top flange*
$b_{bf.5} := 12in$	*Width of bottom flange*
$t_{bf.5} := 1.10in$	*Thickness of the bottom flange*
$t_{tcp.5} := 0in$	*Thickness of the top cover plate*
$b_{tcp.5} := 0in$	*Width of the top cover plate*
$t_{bcp.5.1} := 1in$	*Thickness of the exterior girder bottom cover plate*
$b_{bcp.5.1} := 11in$	*Width of the exterior girder bottom cover plate*
$t_{bcp.5.2} := 1in$	*Thickness of the interior girder bottom cover plate*
$b_{bcp.5.2} := 11in$	*Width of the interior girder bottom cover plate*
$A_{gird.5} := 50.1in^2$	*Area of Rolled Girder*
$I_{rolledgirder.5} := 10500in^4$	*Moment of Inertia of Rolled Girder*
$Z_{rolledgirder.5} := 668in^3$	*Plastic Section Modulus of Rolled Girder*

T·Y·LIN INTERNATIONAL

Properties

$\gamma_{conc} := 150pcf$ — *Unit weight of concrete*

$\gamma_{WS} := 150pcf$ — *Unit weight of wearing surface (concrete)*

$\gamma_{steel} := 490pcf$ — *Unit weight of Steel*

$E_s := 29000ksi$ — *Elastic modulus of steel*

$f_c := 1200psi$ — *Allowable concrete stress (from existing design plans)*

$F_s := 18000psi$ — *Allowable steel stress (from existing design plans)*

$$f'_c := \text{if}\left[f_c = \text{"Unknown"}, \begin{vmatrix} 2.5ksi & \text{if } Year < 1959 \\ 3.0ksi & \text{otherwise} \end{vmatrix}, \left(\frac{f_c}{0.4}\right)\right] = 3 \cdot ksi$$

Maximum concrete compressive stress

$$F_y := \text{if}\left(F_s = \text{"Unknown"}, \begin{vmatrix} 26ksi & \text{if } Year < 1905 \\ 30ksi & \text{if } Year \ge 1905 \wedge Year < 1936 \\ 33ksi & \text{if } Year \ge 1936 \wedge Year < 1963 \\ 36ksi & \text{otherwise} \end{vmatrix}, \text{Ceil}\left(\frac{F_s}{0.55}, 1ksi\right)\right) = 33 \cdot ksi$$

Yield strength of steel

$F_y := 32ksi$ — *Yield strength of steel, Weldable A373 specified*

$\lambda := 1.0$ — *Concrete density modification factor (AASHTO 5.4.2.8)*

$f_r := 0.24 \cdot \lambda \sqrt{f'_c \cdot ksi} = 0.42\,ksi$ — *Rupture stress of concrete (AASHTO 5.4.2.6)*

$E_c := 2500ksi \left(\frac{f'_c}{ksi}\right)^{0.33} = 3592.44\,ksi$ — *Elastic modulus of concrete (AASHTO C5.4.2.4-1)*

$n := \frac{E_s}{E_c} = 8.07$ — *Modular Ratio*

$\phi_f := 1.00$ — *AASHTO LRFD 6.5.4.2*

Load Factors

$\gamma_{DC} := 1.25$ — *LRFD load factor for structural components and attachments (MBE Table 6A.4.2.3)*

$\gamma_{DW} := 1.50$ — *LRFD load factor for wearing surfaces and utilities*

$\gamma_{LL.INV} := 1.75$ — *Live Load Factor for Design Loads, Inventory (MBE Table 6A.4.2.2-1)*

$\gamma_{LL.OPR} := 1.35$ — *Live Load Factor for Design Loads, Operating (MBE Table 6A.4.2.2-1)*

$\gamma_{Fat} := 0.75$ — *Fatigue Load Factor (MBE Table 6A.4.2.2-1)*

$$\gamma_{LL.Legal} := \begin{vmatrix} 1.45 & \text{if } ADTT \ge 5000 \\ \max\left[1.30 + \frac{(1.45 - 1.30)}{(5000 - 1000)} \cdot (ADTT - 1000), 1.3\right] & \text{otherwise} \end{vmatrix} = 1.3$$

Generalized Live Load Factors for Maine Legal Loads (MBE 6A.4.4.2.3a-1, 2013 Interims)

T·Y·LIN INTERNATIONAL

$$\gamma_{LL} := \begin{pmatrix} \gamma_{LL.INV} \\ \gamma_{LL.OPR} \\ \gamma_{LL.Legal} \\ \gamma_{LL.Legal} \\ \gamma_{LL.Legal} \\ \gamma_{LL.Legal} \\ \gamma_{LL.Legal} \\ \gamma_{LL.Legal} \\ \gamma_{LL.Legal} \\ \gamma_{LL.Legal} \end{pmatrix} = \begin{pmatrix} 1.75 \\ 1.35 \\ 1.3 \\ 1.3 \\ 1.3 \\ 1.3 \\ 1.3 \\ 1.3 \\ 1.3 \\ 1.3 \end{pmatrix} \qquad Trucks := \begin{pmatrix} \text{"Inventory HL-93"} \\ \text{"Operating HL-93"} \\ \text{"Maine DOT C1"} \\ \text{"Maine DOT C2"} \\ \text{"Maine DOT C3"} \\ \text{"Maine DOT C4"} \\ \text{"Maine DOT C5"} \\ \text{"Maine DOT C6"} \\ \text{"Maine DOT C7"} \\ \text{"Maine DOT C8"} \end{pmatrix}$$

Live Load Factors for each of the Truck Configurations

$$MP_{red} := \begin{vmatrix} 0.9 \text{ if } ADTT < 100 \\ 0.95 \text{ if } 100 \le ADTT \le 1000 \\ 1 \text{ otherwise} \end{vmatrix} = 0.95$$

Multiple presence reduction factor (AASHTO C3.6.1.1.2)

$$MLFACTORS := MP_{red} \cdot \begin{pmatrix} 1.2 \\ 1.0 \\ 0.85 \\ 0.65 \end{pmatrix} = \begin{pmatrix} 1.14 \\ 0.95 \\ 0.81 \\ 0.62 \end{pmatrix}$$

Multiple presence factors, modified for reduction due to low traffic volume. MLFACTORS command in MDX

$$\varphi_c := \begin{vmatrix} 1.00 \text{ if } Condition = \text{"Satisfactory"} \vee Condition = \text{"Good"} \\ 0.95 \text{ if } Condition = \text{"Fair"} \\ 0.85 \text{ if } Condition = \text{"Poor"} \end{vmatrix} = 1$$

Condition Factor (MBE 6A.4.2.3-1) ('PHIC' command in MDX)

$$\varphi_s := 1.0$$

System factor - four girder system, spacing >4ft (MBE 6A.4.2.4-1) ('PHIS' command in MDX)

T·Y·LIN INTERNATIONAL

DC Loading

MDX will automatically calculate and apply self weight of girder, primary member in cross frame connection (ie: not connection plates), cover plates, concrete deck, concrete wearing surface, splices, and haunch. MaineDOT allows the use of 1" of haunch for section properties, so any haunch beyond 1 inch thickness needs to be applied as noncomposite dead load, calculated herein.

Additional Steel Weight, Non-composite (WAS-i)

Intermediate Diaphragms

Type = C15x33.9 welded to 3/8"x6"x2'-8" connection plates

Span 1 *Spans 2-5*

$$N_1 := \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix} \qquad N_2 := \begin{pmatrix} 2 \\ 2 \\ 2 \\ 2 \end{pmatrix}$$

Number of Intermediate diaphragms, per bay

$L_{dia.inter} := 7.5ft$ *Length of intermediate diaphragms*

$wt_{dia.inter} := 33.9plf$ *Weight per foot for intermediate diaphragms*

$wt_{plate} := \gamma_{steel} \cdot 0.375in \cdot 6in \cdot 32in = 20.42\,lbf$ *Weight per connection plate for intermediate diaphragms*

Abutment Diaphragms

Type = 16WF36 welded to 3/8"x6"x2'-8" connection plates

$wt_{dia.abut} := 36plf$ *Weight per foot for abutment diaphragms*

$L_{dia.abut} := 7.5ft$ *Length of abutment diaphragms*

$wt_{plate.abut} := \gamma_{steel} \cdot 0.375in \cdot 6in \cdot 32in = 20.42 \cdot lbf$ *Weight per connection plate for intermediate diaphragms*

Cover Plates

$wt_{cp.2} := \gamma_{steel} \cdot t_{bcp.2.1} \cdot b_{bcp.2.1} \cdot 49ft = 2063.36 \cdot lbf$ *Weight of bottom cover plate on Spans 2-4 girders, for verification calcs*

$wt_{cp.5} := \gamma_{steel} \cdot t_{bcp.5.1} \cdot b_{bcp.5.1} \cdot 45ft = 1684.37 \cdot lbf$ *Weight of bottom cover plate on Span 5 girders, for verification calcs*

Miscellaneous

$wt_{misc.ext} := 10plf$ *Additional steel weight along exterior girders (weld metal, bolts, etc)*

$wt_{misc.int} := 15plf$ *Additional steel weight along interior girders (weld metal, bolts, etc)*

T·Y·LIN INTERNATIONAL

Total

$$WAS_1 := \begin{bmatrix} \dfrac{N_{1_0} \cdot wt_{plate} + 2 \cdot wt_{plate.abut}}{Span_1} + wt_{misc.ext} \\ \dfrac{\left(N_{1_0} + N_{1_1}\right) \cdot wt_{plate} + 4 \cdot wt_{plate.abut}}{Span_1} + wt_{misc.int} \\ \dfrac{\left(N_{1_1} + N_{1_2}\right) \cdot wt_{plate} + 4 \cdot wt_{plate.abut}}{Span_1} + wt_{misc.int} \\ \dfrac{\left(N_{1_2} + N_{1_3}\right) \cdot wt_{plate} + 4 \cdot wt_{plate.abut}}{Span_1} + wt_{misc.int} \\ \dfrac{N_{1_3} \cdot wt_{plate} + 2 \cdot wt_{plate.abut}}{Span_1} + wt_{misc.ext} \end{bmatrix} = \begin{pmatrix} 0.0114 \\ 0.0178 \\ 0.0178 \\ 0.0178 \\ 0.0114 \end{pmatrix} \cdot klf$$

Weight of additional steel applied to each girder, 45'-0.5" spans

$$WAS_2 := \begin{bmatrix} \dfrac{N_{2_0} \cdot wt_{plate} + 2 \cdot wt_{plate.abut}}{Span_2} + wt_{misc.ext} \\ \dfrac{\left(N_{2_0} + N_{2_1}\right) \cdot wt_{plate} + 4 \cdot wt_{plate.abut}}{Span_2} + wt_{misc.int} \\ \dfrac{\left(N_{2_1} + N_{2_2}\right) \cdot wt_{plate} + 4 \cdot wt_{plate.abut}}{Span_2} + wt_{misc.int} \\ \dfrac{\left(N_{2_2} + N_{2_3}\right) \cdot wt_{plate} + 4 \cdot wt_{plate.abut}}{Span_2} + wt_{misc.int} \\ \dfrac{N_{2_3} \cdot wt_{plate} + 2 \cdot wt_{plate.abut}}{Span_2} + wt_{misc.ext} \end{bmatrix} = \begin{pmatrix} 0.0112 \\ 0.0174 \\ 0.0174 \\ 0.0174 \\ 0.0112 \end{pmatrix} \cdot klf$$

Weight of additional steel applied to each girder, 67' spans

$$WAS_5 := \begin{bmatrix} \dfrac{N_{2_0} \cdot wt_{plate} + 2 \cdot wt_{plate.abut}}{Span_5} + wt_{misc.ext} \\ \dfrac{\left(N_{2_0} + N_{2_1}\right) \cdot wt_{plate} + 4 \cdot wt_{plate.abut}}{Span_5} + wt_{misc.int} \\ \dfrac{\left(N_{2_1} + N_{2_2}\right) \cdot wt_{plate} + 4 \cdot wt_{plate.abut}}{Span_5} + wt_{misc.int} \\ \dfrac{\left(N_{2_2} + N_{2_3}\right) \cdot wt_{plate} + 4 \cdot wt_{plate.abut}}{Span_5} + wt_{misc.int} \\ \dfrac{N_{2_3} \cdot wt_{plate} + 2 \cdot wt_{plate.abut}}{Span_5} + wt_{misc.ext} \end{bmatrix} = \begin{pmatrix} 0.0112 \\ 0.0175 \\ 0.0175 \\ 0.0175 \\ 0.0112 \end{pmatrix} \cdot klf$$

Weight of additional steel applied to each girder, 53'-0.5" spans

T·Y·LIN INTERNATIONAL

Total DC1 load applied to girder 3 for verification calcs

$$DC1_{g3.1} := WAS1_2 + wt_{beam.1} + \frac{wt_{dia.inter} \cdot L_{dia.inter} \cdot \frac{N1_1 + N1_2}{2} + 2 \cdot wt_{dia.abut} \cdot L_{dia.abut}}{Span_1} = 0.17 \cdot klf$$

$$DC1_{g3.2} := WAS2_2 + wt_{beam.2} + \frac{wt_{dia.inter} \cdot L_{dia.inter} \cdot \frac{N2_1 + N2_2}{2} + 2 \cdot wt_{dia.abut} \cdot L_{dia.abut} + wt_{cp.2}}{Span_2} = 0.23 \cdot klf$$

$$DC1_{g3.5} := WAS5_2 + wt_{beam.5} + \frac{wt_{dia.inter} \cdot L_{dia.inter} \cdot \frac{N1_1 + N1_2}{2} + 2 \cdot wt_{dia.abut} \cdot L_{dia.abut} + wt_{cp.5}}{Span_5} = 0.23 \cdot klf$$

Additional Concrete Weight, Non-composite (WAC-i)

$$haunch_{wd} := \max\left(b_{tf.1}, b_{tf.2}\right) + 2 \cdot W_{haunch} = 20\,in$$

Total width of haunch for length of bridge

$$wt_{haunch.1} := \gamma_{conc} \cdot \left[\left(Haunch + t_{tf.1}\right) \cdot \left(haunch_{wd}\right) - b_{tf.1} \cdot \left(t_{tf.1} + 1in\right)\right] = 0.0358 \cdot klf$$

Weight of additional concrete in haunches

$$wt_{haunch.2} := \gamma_{conc} \cdot \left[\left(Haunch + t_{tf.2}\right) \cdot \left(haunch_{wd}\right) - b_{tf.2} \cdot \left(t_{tf.2} + 1in\right)\right] = 0.0383 \cdot klf$$

$$wt_{haunch.5} := \gamma_{conc} \cdot \left[\left(Haunch + t_{tf.5}\right) \cdot \left(haunch_{wd}\right) - b_{tf.5} \cdot \left(t_{tf.5} + 1in\right)\right] = 0.0383 \cdot klf$$

$$ht_{ohang.conc} := \left(Overhang - \frac{haunch_{wd}}{2}\right) \cdot \frac{0.25in}{12in} = 0.35\,in$$

Height of additional concrete under overhang at face of haunch

$$wt_{ohang} := \gamma_{conc} \cdot 0.5 \cdot \left(Overhang - \frac{haunch_{wd}}{2}\right) \cdot ht_{ohang.conc} = 0.0031 \cdot klf$$

Weight of additional concrete in slab overhangs

Total

$$\boxed{WAC_{1.ext.4} := wt_{haunch.1} + wt_{ohang} = 0.0389 \cdot klf}$$

Total weight of additional non-composite concrete weight on exterior girders, 46'-0.5" span (MDX)

$$\boxed{WAC_{1.int} := wt_{haunch.1} = 0.0358 \cdot klf}$$

Total weight of additional non-composite concrete weight on interior girders, 46'-0.5" span (MDX)

$$\boxed{WAC_{2.ext.4} := wt_{haunch.2} + wt_{ohang} = 0.0415 \cdot klf}$$

Total weight of additional non-composite concrete weight on exterior girders, 67'-1" span (MDX)

$$\boxed{WAC_{2.int} := wt_{haunch.2} = 0.0383 \cdot klf}$$

Total weight of additional non-composite concrete weight on interior girders, 67'-1" span (MDX)

$$\boxed{WAC_{5.ext.4} := wt_{haunch.5} + wt_{ohang} = 0.0415 \cdot klf}$$

Total weight of additional non-composite concrete weight on exterior girders, 53'-0.5" span (MDX)

$$\boxed{WAC_{5.int} := wt_{haunch.5} = 0.0383 \cdot klf}$$

Total weight of additional non-composite concrete weight on interior girders, 53'-0.5" span (MDX)

Additional concrete in slab end beam does not contribute to bending forces and is not included, shear does not control

Superimposed Dead Loads, composite (WS-i)

Assume equal distribution to all girders

Permanent Concrete Barrier

2'-8" Concrete Barrier

$Conc_{barrier} := 425plf$

Weight of MaineDot Type IIIA parapet per MaineDOT Bridge Design Guideline

$wt_{rail} := 2Conc_{barrier} = 850 \cdot plf$

Loads Applied in MDX

$$\boxed{WS := \frac{wt_{rail}}{N_{beams}} = 0.17 \cdot klf}$$

Total weight of superimposed dead loads per Girder

DW Loading

$$\boxed{WEAR := \frac{\left(Wearing_{t.conc} + Wearing_{t.bit}\right) \cdot \gamma_{WS} \cdot Roadway_{wd}}{N_{beams}} = 0.1629 \cdot klf}$$

Distributed wearing surface looad applied to each girder

T·Y·LIN INTERNATIONAL

Verification Calculations: Girder 3, 43'-0" Span

Note: These verification calculations are approximate, and are not to be reported as Rating Factors in the final Report

Demands:

DC1

$DC1_{g3.1} = 171.32 \cdot plf$ — *Distributed weight of steel elements*

$wt_{deck} := (t_s) \cdot S \cdot \gamma_{conc} = 707.29 \cdot plf$ — *Weight of concrete deck*

$wt_{fillet} := 1in \cdot (b_{tf.1}) \cdot \gamma_{conc} = 12.5 \cdot plf$ — *Weight of the haunch*

$$\boxed{M_{DC1} := \frac{(DC1_{g3.1} + wt_{deck} + wt_{fillet} + WAC_{1.int}) \cdot Span_1^{\ 2}}{8} = 214.22 \cdot kip \cdot ft}$$

Moment due to DC1 terms

*Compare to MDX result: 213 kip*ft ; say OK*

DC2

$$\boxed{M_{DC2} := \frac{WS \cdot Span_1^{\ 2}}{8} = 39.29 \cdot kip \cdot ft}$$

Moment due to Superimposed Dead Loads (Rail, Curb, Sidewalk and Utilities)

*Compare to MDX result: 39 kip*ft; OK*

DW

$$\boxed{M_{DW} := \frac{WEAR \cdot Span_1^{\ 2}}{8} = 37.65 \cdot kip \cdot ft}$$

Moment due to wearing surface

*Compare to MDX result: 38 kip*ft; OK*

LL + IM

For simplicity, place center axle of HL93 Truck at midspan

- *One Design Lane Loaded*

AASHTO Table 4.6.2.2.2b-1,includes multipresence

$$g_{bend.single.int} := 0.06 + \left(\frac{S}{14ft}\right)^{0.4} \cdot \left(\frac{S}{Span_1}\right)^{0.3} \cdot (1.02) = 0.56$$

- *Two or More Design Lanes Loaded*

AASHTO Table 4.6.2.2.2b-1,includes multipresence

$$g_{bend.multi.int} := 0.075 + \left(\frac{S}{9.5ft}\right)^{0.6} \cdot \left(\frac{S}{Span_1}\right)^{0.2} \cdot (1.02) = 0.74$$

$$g := \max(g_{bend.single.int}, g_{bend.multi.int}) = 0.74$$

Max Distribution Factor for bending, interior beam, with multipresence reduction

$$e_g := \frac{D_{gird.1}}{2} + \frac{t_s}{2} + 1in = 22.3\ in$$

Distance between the center of gravity of the beam and the deck

$$K_g := n \cdot \left(I_{rolledgirder.1} + A_{gird.1} \cdot e_g^{\ 2}\right) = 222336.09\ in^4$$

Longitudinal sitffness parameter [AASHTO 4.6.2.2.1-1]

T·Y·LIN INTERNATIONAL

$$c_1 := \begin{cases} \left[0.25 \cdot \left(\dfrac{K_g}{Span_1 \cdot t_s^{\,3}} \right)^{0.25} \cdot \left(\dfrac{S}{Span_1} \right)^{0.5} \right] & \text{if } Skew \geq 30deg \\ 0 & \text{otherwise} \end{cases} = 0$$

Skewed support distribution factor reduction parameter [AASHTO Table 4.6.2.2.2e-1]

$$g_{red} := 1 - c_1 \cdot \tan(Skew)^{1.5} = 1$$

Reduction to distribution factor for skewed supports

$$g := g_{red} \cdot g = 0.74$$

Distribution factor for moment, reduced for skewed supports

$$M_{truck.total} := 1.33 \left[(8kip + 32kip) \cdot \frac{\left(\frac{Span_1}{2} - 14ft \right) \cdot \frac{Span_1}{2}}{Span_1} + 32kip \cdot \frac{Span_1}{4} \right] = 657.02 \cdot kip \cdot ft$$

Moment due to Truck,

$$M_{tandem.total} := 1.33 \cdot 25kip \left(\frac{Span_1}{2} - 2ft \right) = 648.37 \cdot kip \cdot ft$$

Bending moment caused by design tandem (approximate, conservative)

$$M_{truck} := g \cdot \max\left(M_{truck.total}, M_{tandem.total}\right) = 484.71 \cdot kip \cdot ft$$

Controlling moment from design tandem or design truck

$$M_{lane.total} := \frac{0.64klf \cdot Span_1^{\,2}}{8} = 147.92 \cdot kip \cdot ft$$

Maximum positive moment due to lane load

$$M_{lane} := g \cdot M_{lane.total} = 109.13 \cdot kip \cdot ft$$

$$\boxed{M_{LL\_IM} := M_{truck} + M_{lane} = 593.84 \cdot kip \cdot ft}$$

Live Load moment on interior girder

*MDX says 612 kip*ft; Say OK.*

$$M_u := \gamma_{DC} \cdot \left(M_{DC1} + M_{DC2}\right) + \gamma_{DW} \cdot M_{DW} + \gamma_{LL.INV} \cdot M_{LL\_IM} = 1413 \cdot kip \cdot ft$$

Ultimate moment, strength I

MDX reports 1442.8; Moments, (results differ by 2.1%), say ok

T·Y·LIN INTERNATIONAL

Positive Moment Check:

Section Capacity

Plastic Section capacity is determined using section D6.3.2

Section Properties

$D_w := D_{gird.1} - 2 \cdot t_{tf.1} = 34.02\ in$ — *Depth of web*

$A_w := D_w \cdot t_{w.1} = 20.41\ in^2$ — *Area of web*

$A_{tf} := b_{tf.1} \cdot t_{tf.1} = 9.48\ in^2$ — *Area of top flange*

$A_{bf} := b_{bf.1} \cdot t_{bf.1} = 9.48\ in^2$ — *Area of bottom flange*

$A_{tcp} := b_{tcp.1} \cdot t_{tcp.1} = 0$ — *Area of top cover plate*

$A_{bcp} := b_{bcp.1.1} \cdot t_{bcp.1.1} = 1 \times 10^{-6}\ in^2$ — *Area of bottom cover plate*

$A_s := S \cdot t_s = 679\ in^2$ — *Area of slab for composite analysis*

$t_h := \min\left(Haunch - t_{tcp.1}, 1\,in\right) = 1\ in$ — *Portion of haunch allowed for capacity calcs*

$A_h := t_h \cdot b_{tf.1} = 12\ in^2$ — *Area of haunch allowed for capacity calcs*

$$I_{tcp} := \frac{b_{tcp.1} \cdot t_{tcp.1}^{\ 3}}{12} = 0$$ *Moment of Inertia of top cover plate*

$$I_{bcp} := \frac{b_{bcp.1.2} \cdot t_{bcp.1.2}^{\ 3}}{12} = 8.33 \times 10^{-14}\ in^4$$ *Moment of Inertia of bottom cover plate*

$$y_{gird} := \frac{A_{bcp} \cdot \frac{t_{bcp.1.1}}{2} + A_{tcp} \cdot \left(t_{bcp.1.1} + \frac{t_{tcp.1}}{2} + D_{gird.1}\right) + A_{gird.1} \cdot \left(t_{bcp.1.1} + \frac{D_{gird.1}}{2}\right)}{A_{tcp} + A_{bcp} + A_{gird.1}} = 17.8\ in$$

Neutral Axis, from bottom

$$I_{gird} := I_{rolledgirder.1} + A_{gird.1} \cdot \left[y_{gird} - \left(\frac{D_{gird.1}}{2} + t_{bcp.1.1}\right)\right]^2 \ldots = 7800\ in^4$$
$$+ I_{tcp} + A_{tcp} \cdot \left(D_{gird.1} + t_{bcp.1.1} - y_{gird} + \frac{t_{tcp.1}}{2}\right)^2 \ldots$$
$$+ I_{bcp} + A_{bcp} \cdot \left[y_{gird} - \left(\frac{t_{bcp.1.1}}{2}\right)\right]^2$$

Moment of inertia of non-composite girder

$y_{t\_non} := D_{gird.1} + t_{tcp.1} + t_{bcp.1.1} - y_{gird} = 17.8\ in$ — *Distance from Neutral Axis to top*

$$S_{b\_non} := \frac{I_{gird}}{y_{gird}} = 438.18 \cdot in^3$$ *Elastic Section Modulus - bottom*

$$S_{t\_non} := \frac{I_{gird}}{y_{t\_non}} = 438.2 \cdot in^3$$ *Elastic Section Modulus - top*

TYLININTERNATIONAL

Depth of Web in compression (D6.3):

$$D_{cp} := \begin{cases} \left[\dfrac{D_w}{2 \cdot A_w \cdot F_y} \cdot F_y \cdot (A_{bf} + A_{bcp} + A_w - A_{tf} - A_{tcp})\right] & \text{if } F_y \cdot A_w \geq \left|F_y \cdot A_{tf} + F_y \cdot A_{tcp} - F_y \cdot A_{bf} - F_y \cdot A_{bcp}\right| \\ D_w & \text{otherwise} \end{cases} = 17.01 \cdot in$$

Determine case for omposite section (D6.1)

Section := "Composite"

Type of section, "Composite" or "Non-Composite"

$P_c := F_y \cdot (A_{tf} + A_{tcp}) = 303.36 \cdot kip$

Plastic force in the compression flange and cover plate

$P_t := F_y \cdot (A_{bf} + A_{bcp}) = 303.36 \cdot kip$

Plastic force in the tension flange and cover plate

$P_w := F_y \cdot A_w = 653.18 \cdot kip$

Plastic force in the web

$$P_h := \begin{cases} (0.85 \cdot f'_c \cdot A_h) & \text{if Section} = \text{"Composite"} \\ 0 & \text{otherwise} \end{cases} = 30.6 \cdot kip$$

Plastic force in portion of haunch allowed to be used in capacity calcs by Bridge Design Guide

$$P_s := \begin{cases} (0.85 \cdot f'_c \cdot A_s) & \text{if Section} = \text{"Composite"} \\ 0 & \text{otherwise} \end{cases} = 1731.45 \cdot kip$$

Plastic force in slab

$$Case := \begin{cases} \text{"Case I"} & \text{if } P_t + P_w \geq P_c + P_h + P_s \\ \text{"Case II"} & \text{if } P_t + P_w + P_c \geq P_h + P_s \wedge P_t + P_w < P_c + P_h + P_s \\ \text{"Case III, haunch"} & \text{if } P_t + P_w + P_c + P_h \geq P_s \wedge P_t + P_w + P_c < P_h + P_s \\ \text{"Case III, slab"} & \text{otherwise} \end{cases}$$

Case = "Case III, slab"

Case determining which equations in AASHTO Table D6.1-1 to use in calculating plastic moment capacity of section, Case III taken as in structural portion of haunch only

$$Y_{bar} := \begin{cases} \left[\dfrac{D_w}{2} \cdot \left(\dfrac{P_t - P_c - P_s - P_h}{P_w} + 1\right)\right] & \text{if Case} = \text{"Case I"} \\ \left[\dfrac{t_{tf.1} + t_{tcp.1}}{2} \cdot \left(\dfrac{P_w + P_t - P_s - P_h}{P_c} + 1\right)\right] & \text{if Case} = \text{"Case II"} \\ \left(t_h \cdot \dfrac{P_c + P_w + P_t - P_s}{P_h}\right) & \text{if Case} = \text{"Case III, haunch"} \\ t_s \cdot \dfrac{P_c + P_w + P_t + P_h}{P_s} & \text{otherwise} \end{cases}$$

Distance from top of segment to plastic neutral axis

$Y_{bar} = 5.22\ in$

T·Y·LIN INTERNATIONAL

$$d_s := \begin{cases} Y_{bar} + t_{tf.1} + t_{tcp.1} + t_h + \dfrac{t_s}{2} & \text{if Case = "Case I"} \\ Y_{bar} + t_h + \dfrac{t_s}{2} & \text{if Case = "Case II"} \\ Y_{bar} + \dfrac{t_s}{2} & \text{if Case = "Case III, haunch"} \\ \left|Y_{bar} - \dfrac{t_s}{2}\right| & \text{otherwise} \end{cases} = 1.72 \cdot in$$

Distance from PNA to plastic force in slab for use in the D6.1 Tables

$$d_h := \begin{cases} Y_{bar} + t_{tf.1} + t_{tcp.1} + \dfrac{t_h}{2} & \text{if Case = "Case I"} \\ Y_{bar} + \dfrac{t_h}{2} & \text{if Case = "Case II"} \\ \left|Y_{bar} - \dfrac{t_h}{2}\right| & \text{if Case = "Case III, haunch"} \\ t_s - Y_{bar} + \dfrac{t_h}{2} & \text{otherwise} \end{cases} = 2.28 \cdot in$$

Distance from PNA to plastic force in structural portion of haunch for use in the D6.1 tables

$$d_c := \begin{cases} Y_{bar} + \dfrac{t_{tf.1} + t_{tcp.1}}{2} & \text{if Case = "Case I"} \\ \left|Y_{bar} - \dfrac{t_{tf.1} + t_{tcp.1}}{2}\right| & \text{if Case = "Case II"} \\ t_h - Y_{bar} + \dfrac{t_{tf.1} + t_{tcp.1}}{2} & \text{if Case = "Case III, haunch"} \\ t_s - Y_{bar} + t_h + \dfrac{t_{tf.1} + t_{tcp.1}}{2} & \text{otherwise} \end{cases} = 3.18 \cdot in$$

Distance from PNA to plastic force in compression flange and cover plate for use in D6.1 tables

$$d_w := \begin{cases} \left|Y_{bar} - \dfrac{D_w}{2}\right| & \text{if Case = "Case I"} \\ t_{tf.1} + t_{tcp.1} - Y_{bar} + \dfrac{D_w}{2} & \text{if Case = "Case II"} \\ t_h - Y_{bar} + t_{tcp.1} + t_{tf.1} + \dfrac{D_w}{2} & \text{if Case = "Case III, haunch"} \\ t_s - Y_{bar} + t_h + t_{tcp.1} + t_{tf.1} + \dfrac{D_w}{2} & \text{otherwise} \end{cases} = 20.58 \cdot in$$

Distance from PNA to plastic force in web for use in D6.1 tables

$$d_t := \begin{cases} D_w - Y_{bar} + \dfrac{t_{bf.1} + t_{bcp.1.1}}{2} & \text{if Case = "Case I"} \\ t_{tcp.1} + t_{tf.1} - Y_{bar} + D_w + \dfrac{t_{bf.1} + t_{bcp.1.1}}{2} & \text{if Case = "Case II"} \\ t_h - Y_{bar} + t_{tcp.1} + t_{tf.1} + D_w + \dfrac{t_{bf.1} + t_{bcp.1.1}}{2} & \text{if Case = "Case III, haunch"} \\ t_s - Y_{bar} + t_h + t_{tf.1} + t_{tcp.1} + D_w + \dfrac{t_{bf.1} + t_{bcp.1.1}}{2} & \text{otherwise} \end{cases} = 37.99 \cdot in$$

Distance from PNA to plastic force in tension flange for use in D6.1 tables

TYLININTERNATIONAL

$$M_p := \begin{cases} \dfrac{P_w}{2D_w}\cdot\left[Y_{bar}^{\;2} + \left(D_w - Y_{bar}\right)^2\right] + P_s\cdot d_s + P_h\cdot d_h + P_t\cdot d_t + P_c\cdot d_c & \text{if Case = "Case I"} \\ \dfrac{P_c}{2\cdot\left(t_{tf.1} + t_{tcp.1}\right)}\cdot\left[Y_{bar}^{\;2} + \left(t_{tf.1} + t_{tcp.1} - Y_{bar}\right)^2\right] + P_s\cdot d_s + P_h\cdot d_h + P_w\cdot d_w + P_t\cdot d_t & \text{if Case = "Case II"} \\ \dfrac{Y_{bar}^{\;2}\cdot P_h}{2\cdot t_h} + P_s\cdot d_s + P_c\cdot d_c + P_w\cdot d_w + P_t\cdot d_t & \text{if Case = "Case III, haunch"} \\ \dfrac{Y_{bar}^{\;2}\cdot P_s}{2\cdot t_s} + P_h\cdot d_h + P_c\cdot d_c + P_w\cdot d_w + P_t\cdot d_t & \text{otherwise} \end{cases}$$

$M_p = 2447.39\cdot kip\cdot ft$ *Plastic moment capacity*

$D_p := Y_{bar} = 5.22\ in$ *Distance from the top of the deck to the neutral axis of the composite section at the plastic moment*

$D_t := t_s + D_{gird.1} + Haunch = 44.6\ in$ *Total depth of the composite seciton*

$$M_n := \begin{cases} M_p & \text{if } D_p \le 0.1\cdot D_t \\ \left[M_p\cdot\left(1.07 - 0.7\cdot\dfrac{D_p}{D_t}\right)\right] & \text{otherwise} \end{cases} = 2418.3\ kip\cdot ft$$

Nominal flexural resistance

MDX results are 2431 kip-ft and Case III, results vary by 0.5%, say ok

T·Y·LIN INTERNATIONAL

Calculation of Remaining Fatigue Life:

The remaining fatigue life was calculated at location(s) where the fatigue detail was a Category C or lower: the bracing connection plates (conservatively assumed full depth) - category C', and the end of the cover plates (E')

Bracing Connection Plates (C)

$M_{ser} := \frac{0.75 kip \cdot ft}{0.75} = 1 \cdot kip \cdot ft$

Maximum unfactored Fatigue Truck Moment Range from MDX,maximum among all girders (Girder 3)

$Category := "C"$

Controlling fatigue category

$$\Delta F_{th} := \begin{cases} (24ksi) & \text{if } Category = "A" \\ (16ksi) & \text{if } Category = "B" \\ (12ksi) & \text{if } Category = "B'" \\ (10ksi) & \text{if } Category = "C" \\ (12ksi) & \text{if } Category = "C'" \\ (7ksi) & \text{if } Category = "D" \\ (4.5ksi) & \text{if } Category = "E" \\ (2.6ksi) & \text{if } Category = "E'" \\ "Need Category" & \text{otherwise} \end{cases} = 10 \cdot ksi$$

Constant-Amplitude Fatigue Threshold [AASHTO Table 6.6.1.2.5-3]

$$\Delta f := \frac{0.75 M_{ser}}{21053 in^4 \div 32.43 in} = 0.01\ ksi$$

Fatigue Stress Range (Fatigue II)

$R_{sa} := 0.95$

Stress Range Determined by Refined Analysis (MBE 7.2.2.1.1)

$R_{st} := 1.0$

Stress Range with AASHTO truck weight (MBE 7.2.2.1.1)

$L := Span_1$

Span Length

$ADTT_{cur} := ceil(ADT_{cur} \cdot Truck_{perc}) = 758$

Current Average daily truck traffic

$n_L := 2$

Number of lanes

$R_s := R_{sa} \cdot R_{st} = 0.95$

Stress-range estimate partial load factor (MBE 7.2.2)

$\Delta f_{eff} := R_s \cdot \Delta f = 0.01\ ksi$

Effective Stress Range (MBE 7.2.2)

$$Check_{inf} := if\left(\frac{2\Delta f_{eff}}{\Delta F_{th}} < 1.0, "Infinite Fatigue Life Anticipated", "Finite Fatigue Life Anticipated"\right)$$

$\boxed{Check_{inf} = "Infinite Fatigue Life Anticipated"}$

MBE 7.2.4

T·Y·LIN INTERNATIONAL

$$A := \begin{cases} 250 & \text{if } Category = \text{"A"} \\ 120 & \text{if } Category = \text{"B"} \\ 61 & \text{if } Category = \text{"B'"} \\ 44 & \text{if } Category = \text{"C"} \\ 44 & \text{if } Category = \text{"C'"} \\ 22 & \text{if } Category = \text{"D"} \\ 11 & \text{if } Category = \text{"E"} \\ 3.9 & \text{if } Category = \text{"E'"} \\ \text{"Need Category"} & \text{otherwise} \end{cases} \cdot 10^8 ksi^3 = 4.4 \times 10^9 \cdot ksi^3$$

Detail category constant, AASHTO Table 6.6.1.2.5-1

$n_p := 1.0$

Cycles due to truck passage (AASHTO Table 6.6.1.2.5-2)

$R_R := 1.0$

Resistance Factor for evaualtion, MBE Table 7.2.5.2-1, conservatively taken as the full design life

$$g := \left(\frac{ADT_{fut}}{ADT_{cur}}\right)^{\left(\frac{1}{20}\right)} - 1 = 1.7 \cdot \%$$

Approximate Growth rate of traffic, based on current and future Traffic Volumes

$a := 2017 - Year = 55$

Bridge Age

$$Y := \frac{\log\left[\frac{R_R \cdot A}{365 \cdot n_p \cdot ADTT \cdot \left(\Delta f_{eff}\right)^3} \cdot g \cdot (1+g)^{a-1} + 1\right]}{\log(1+g)} \cdot yr = 1174.37 \cdot yr$$

Total finite fatigue life of detail considered (MBE 7.2.5.1-1)

$\boxed{Remaining\_Life := Y - (a)yr = 1119 \cdot yr}$

Years of life remaining, based on finite fatigue of this detail

T·Y·LIN INTERNATIONAL

Shear Connectors Verification

Shear connectors have been verified against plans to determine if the beams and deck are acting as a composite section for the analysis.

Fatigue Resistance:

$Load_{Comb} := \begin{cases} \text{"Fatigue I"} & \text{if } ADTT \geq 960 \\ \text{"Fatigue II"} & \text{if } ADTT < 960 \end{cases} = \text{"Fatigue II"}$

Determination of fatigue loading case to be used in calculations per AASHTO 6.10.10.2

$\gamma_{LL.SC} := \begin{cases} 1.5 & \text{if } Load_{Comb} = \text{"Fatigue I"} \\ 0.75 & \text{otherwise} \end{cases} = 0.75$

Load Factor for live load (Table 3.4.1-1)

$n := 1$

Per AASHTO LRFD Bridge Design Specification Table 6.6.1.2.5.2

$N := 365 \cdot 75 \cdot n \cdot ADTT = 1.6 \times 10^{7}$

Per AASHTO LRFD Bridge Design Specification Equation 6.6.1.2.5-3

$\alpha := 34.5 - 4.28 \log(N) = 3.67$

Per AASHTO LRFD Bridge Design Specification Equation 6.10.10.2-4

$d := \frac{3}{4} in = 0.75\, in$

Diameter of stud (from shop drawing)

$Z_r := \alpha \cdot \left(\frac{d}{in}\right)^2 \cdot kip = 2.06 \cdot kip$

AASHTO LRFD Bridge Design Specification Equation 6.10.10.2-3

Required Pitch:

$F_{fat1\_ext} := 0 \frac{kip}{in}$ $\quad F_{fat1\_int} := 0 \frac{kip}{in}$

Radial fatigue shear range, Straight Bridge

$F_{fat2\_ext} := 0 \frac{kip}{in}$ $\quad F_{fat2\_int} := 0 \frac{kip}{in}$

Radial fatigue shear range, Straight Bridge with colinear bracing AASHTO 6.10.10.1.2-5

$V_{f\_ext} := 23.81 kip$ $\quad V_{f\_int} := 28.55 kip$

Unfactored vertical shear force range (From MDX) (girder 1 & 2, at max shear range)

$I_{ext} := 19899 in^4$ $\quad I_{int} := 21053 in^4$

From MDX - Short term composite moment of inertia at point of V.f

$y_{b\_c\_ext} := 31.21 in$ $\quad y_{b\_c\_int} := 32.43 in$

From MDX - distance to composite NA at point of V.f

$y_{b\_slab\_ext} := D_{gird.1} + Haunch + \frac{t_s}{2} = 41.1\, in$

Distance to deck centroid from bottom of exterior beam

$y_{b\_slab\_int} := D_{gird.1} + Haunch + \frac{t_s}{2} = 41.1\, in$

Distance to deck centroid from bottom of interior beam

$b_{s\_ext} := \left(\frac{S}{2} + Overhang\right) = 75.5\, in$

Effective slab width exterior beams

$b_{s\_int} := S = 97\, in$

Effective slab width interior beam

$Q_{ext} := \left(\frac{t_s \cdot b_{s\_ext}}{n}\right) \cdot \left(y_{b\_slab\_ext} - y_{b\_c\_ext}\right) = 5226.87 \cdot in^3$

Transformed first area moment of inertia, exterior beam

T·Y·LIN INTERNATIONAL

$Q_{int} := \left(\frac{t_s \cdot b_{s\_int}}{n}\right) \cdot \left(y_{b\_slab\_int} - y_{b\_c\_int}\right) = 5886.93 \cdot in^3$ — *Transformed first area moment of inertia, interior beam*

$V_{f\_ext} := V_{f\_ext} = 23.81 \cdot kip$ $\quad V_{f\_int} := V_{f\_int} = 28.55 \cdot kip$ — *Factored vertical shear force range (girder 1 & 2, at max shear range)*

$V_{fat\_ext} := \frac{\left(V_{f\_ext}\, Q_{ext}\right)}{I_{ext}} = 6.25 \cdot \frac{kip}{in}$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-3*

$V_{fat\_int} := \frac{\left(V_{f\_int}\, Q_{int}\right)}{I_{int}} = 7.98 \cdot \frac{kip}{in}$ — *AASHO LRFD Bridge Design Specification Equation 6.10.10.1.2-3*

$V_{sr\_ext} := \gamma_{LL.SC} \sqrt{\left(V_{fat\_ext}^{\ 2} + \max\left(F_{fat1\_ext}, F_{fat2\_ext}\right)^2\right)} = 4.69 \cdot \frac{kip}{in}$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-2*

$V_{sr\_int} := \gamma_{LL.SC} \cdot \sqrt{\left(V_{fat\_int}^{\ 2} + \max\left(F_{fat1\_int}, F_{fat2\_int}\right)^2\right)} = 5.99 \cdot \frac{kip}{in}$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-2*

$n_{ext} := 3$ $\quad n_{int} := 3$ — *Number of shear connectors*

$p_{ext} := \frac{\left(n_{ext} \cdot Z_r\right)}{V_{sr\_ext}} = 1.32\, in$ $\quad p_{int} := \frac{\left(n_{int} \cdot Z_r\right)}{V_{sr\_int}} = 1.03\, in$ — *Required pitch spacing for beam (6.10.10.1.2-1)*

$p_{max\_ext} := \max\left(\min\left(24in, p_{ext}\right), 6 \cdot d\right) = 4.5 \cdot in$ — *Maximum allowable pitch AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-1*

$p_{max\_int} := \max\left(\min\left(24in, p_{int}\right), 6d\right) = 4.5\, in$ — *Maximum allowable pitch AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-1*

The spacing on the plans for this zone is 4.5", which meets the required spacing, shear connectors are ok for fatigue

Strength Limit State:

$A_{sc} := \frac{(d)^2 \cdot \pi}{4} = 0.44\, in^2$ — *Cross sectional area of a stud shear connector*

$E_c = 3592.44\, ksi$ — *Modulus of elasticity of the deck concrete*

$F_u := 58ksi$ — *Minimum tensile strength of a stud shear connector (A373 specified in plans)*

$Q_n := \min\left(0.5 \cdot A_{sc} \cdot \sqrt{f'_c \cdot E_c}, A_{sc} \cdot F_u\right) = 22.93 \cdot kip$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.3-2*

$\phi_{sc} := 0.85$ — *AASHTO LRFD Bridge Design Specification 6.5.4.2*

$Q_r := \phi_{sc} \cdot Q_n = 19.49 \cdot kip$ — *AASHTO LRFD Bridge Design Spec. Eq. 6.10.10.4-1*

$F_p := 0kip$ — *Straight Span*

$b_{s\_ext} := Overhang + \frac{S}{2} = 75.5\, in$ — *Effective slab width exterior beams*

$b_{s\_int} := S = 97\, in$ — *Effective slab width interior beam*

$P_{1p\_ext} := 0.85 \cdot \left[\left(f'_c\right) \cdot b_{s\_ext} \cdot t_s\right] = 1347.67 \cdot kip$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.2-2*

T·Y·LIN INTERNATIONAL

$P_{1p\_int} := 0.85\left(f'_c \cdot b_{s\_int} \cdot t_s\right) = 1731.45 \cdot kip$

AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.2-2

$P_{max.ext} := \sqrt{P_{1p\_ext}^{\ 2} + F_p^{\ 2}} = 1347.67 \cdot kip$

AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.2-1

$P_{max.int} := \sqrt{P_{1p\_int}^{\ 2} + F_p^{\ 2}} = 1731.45 \cdot kip$

AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.2-1

$n_{sc\_min.ext} := \text{Ceil}\left(\frac{P_{max.ext}}{Q_r}, 1\right) = 70$

AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.1-2, Minimum number of shear connectors required in section

$n_{sc\_min.int} := \text{Ceil}\left(\frac{P_{max.int}}{Q_r}, 1\right) = 89$

AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.1-2, Minimum number of shear connectors required in section

Number required for section (68 ext., 86 int.) is less than number provided in section (103 ext., 103 int.), composite action is allowed.

T·Y·LIN INTERNATIONAL

Verification Calculations: Girder 3, 68'-3" Spans

Note: These verification calculations are approximate, and are not to be reported as Rating Factors in the final Report

Demands:

DC1

$DC1_{g3.2} = 232.99 \cdot plf$ — *Distributed weight of steel elements*

$wt_{deck} := (t_s) \cdot S \cdot \gamma_{conc} = 707.29 \cdot plf$ — *Weight of concrete deck*

$wt_{fillet} := 1in \cdot (b_{tf.2}) \cdot \gamma_{conc} = 12.5 \cdot plf$ — *Weight of the haunch*

$$\boxed{M_{DC1} := \frac{(DC1_{g3.2} + wt_{deck} + wt_{fillet} + WAC_{2.int}) \cdot Span_2^{\ 2}}{8} = 577.08 \cdot kip \cdot ft}$$

Moment due to DC1 terms

*Compare to MDX result: 567 kip*ft ; say OK*

DC2

$$\boxed{M_{DC2} := \frac{WS \cdot Span_2^{\ 2}}{8} = 98.98 \cdot kip \cdot ft}$$

Moment due to Superimposed Dead Loads (Rail, Curb, Sidewalk and Utilities)

*Compare to MDX result: 98 kip*ft; OK*

DW

$$\boxed{M_{DW} := \frac{WEAR \cdot Span_2^{\ 2}}{8} = 94.86 \cdot kip \cdot ft}$$

Moment due to wearing surface

*Compare to MDX result: 95 kip*ft; OK*

LL + IM

For simplicity, place center axle of HL93 Truck at midspan

- *One Design Lane Loaded* — *AASHTO Table 4.6.2.2.2b-1,includes multipresence*

$$g_{bend.single.int} := 0.06 + \left(\frac{S}{14ft}\right)^{0.4} \cdot \left(\frac{S}{Span_2}\right)^{0.3} \cdot (1.02) = 0.49$$

- *Two or More Design Lanes Loaded* — *AASHTO Table 4.6.2.2.2b-1,includes multipresence*

$$g_{bend.multi.int} := 0.075 + \left(\frac{S}{9.5ft}\right)^{0.6} \cdot \left(\frac{S}{Span_2}\right)^{0.2} \cdot (1.02) = 0.68$$

$g := \max(g_{bend.single.int}, g_{bend.multi.int}) = 0.68$ — *Max Distribution Factor for bending, interior beam, with multipresence reduction*

$e_g := \frac{D_{gird.2}}{2} + \frac{t_s}{2} + 1in = 22.6\,in$ — *Distance between the center of gravity of the beam and the deck*

$K_g := n \cdot \left(I_{rolledgirder.2} + A_{gird.2} \cdot e_g^{\ 2}\right) = 291329.01\,in^4$ — *Longitudinal sitffness parameter [AASHTO 4.6.2.2.1-1]*

TY·LIN INTERNATIONAL

$$c_1 := \begin{cases} \left[0.25\cdot\left(\frac{K_g}{Span_1\cdot t_s^{\,3}}\right)^{0.25}\cdot\left(\frac{S}{Span_1}\right)^{0.5}\right] & \text{if } Skew \geq 30deg \\ 0 & \text{otherwise} \end{cases} = 0$$

Skewed support distribution factor reduction parameter [AASHTO Table 4.6.2.2.2e-1]

$$g_{red} := 1 - c_1\cdot \tan(Skew)^{1.5} = 1$$

Reduction to distribution factor for skewed supports

$$g := g_{red}\cdot g = 0.68$$

Distribution factor for moment, reduced for skewed supports

$$M_{truck.total} := 1.33\left[(8kip + 32kip)\cdot\frac{\left(\frac{Span_2}{2} - 14ft\right)\cdot\frac{Span_2}{2}}{Span_2} + 32kip\cdot\frac{Span_2}{4}\right] = 1261.51\cdot kip\cdot ft$$

Moment due to Truck,

$$M_{tandem.total} := 1.33\cdot 25kip\left(\frac{Span_2}{2} - 2ft\right) = 1068.16\cdot kip\cdot ft$$

Bending moment caused by design tandem (approximate, conservative)

$$M_{truck} := g\cdot \max\left(M_{truck.total}, M_{tandem.total}\right) = 856.88\cdot kip\cdot ft$$

Controlling moment from design tandem or design truck

$$M_{lane.total} := \frac{0.64klf\cdot Span_2^{\,2}}{8} = 372.65\cdot kip\cdot ft$$

Maximum positive moment due to lane load

$$M_{lane} := g\cdot M_{lane.total} = 253.12\cdot kip\cdot ft$$

$$\boxed{M_{LL\_IM} := M_{truck} + M_{lane} = 1110\cdot kip\cdot ft}$$

Live Load moment on interior girder

*MDX says 1120 kip*ft; Say OK.*

$$M_u := \gamma_{DC}\cdot\left(M_{DC1} + M_{DC2}\right) + \gamma_{DW}\cdot M_{DW} + \gamma_{LL.INV}\cdot M_{LL\_IM} = 2930\cdot kip\cdot ft$$

Ultimate moment, strength I

MDX reports 2933.2; Moments, (results differ by 0.1%), say ok

TYLININTERNATIONAL

Positive Moment Check:

Section Capacity

Plastic Section capacity is determined using section D6.3.2

Section Properties

$D_w := D_{gird.2} - 2 \cdot t_{tf.2} = 34\,in$ — *Depth of web*

$A_w := D_w \cdot t_{w.2} = 23.12\,in^2$ — *Area of web*

$A_{tf} := b_{tf.2} \cdot t_{tf.2} = 13.2\,in^2$ — *Area of top flange*

$A_{bf} := b_{bf.2} \cdot t_{bf.2} = 13.2\,in^2$ — *Area of bottom flange*

$A_{tcp} := b_{tcp.2} \cdot t_{tcp.2} = 0$ — *Area of top cover plate*

$A_{bcp} := b_{bcp.2.2} \cdot t_{bcp.2.2} = 12.38\,in^2$ — *Area of bottom cover plate*

$A_s := S \cdot t_s = 679\,in^2$ — *Area of slab for composite analysis*

$t_h := \min\left(Haunch - t_{tcp.2}, 1\,in\right) = 1\,in$ — *Portion of haunch allowed for capacity calcs*

$A_h := t_h \cdot b_{tf.2} = 12\,in^2$ — *Area of haunch allowed for capacity calcs*

$$I_{tcp} := \frac{b_{tcp.2} \cdot t_{tcp.2}^{\;3}}{12} = 0$$ *Moment of Inertia of top cover plate*

$$I_{bcp} := \frac{b_{bcp.2.2} \cdot t_{bcp.2.2}^{\;3}}{12} = 1.31\,in^4$$ *Moment of Inertia of bottom cover plate*

$$y_{gird} := \frac{A_{bcp} \cdot \frac{t_{bcp.2.2}}{2} + A_{tcp} \cdot \left(t_{bcp.2.2} + \frac{t_{tcp.2}}{2} + D_{gird.2}\right) + A_{gird.2} \cdot \left(t_{bcp.2.2} + \frac{D_{gird.2}}{2}\right)}{A_{tcp} + A_{bcp} + A_{gird.2}} = 15.53\,in$$ *Neutral Axis, from bottom*

$$\begin{aligned} I_{gird} := {} & I_{rolledgirder.2} + A_{gird.2} \cdot \left[y_{gird} - \left(\frac{D_{gird.2}}{2} + t_{bcp.2.2}\right)\right]^2 \ldots = 13957.64\,in^4 \\ & + I_{tcp} + A_{tcp} \cdot \left(D_{gird.2} + t_{bcp.2.2} - y_{gird} + \frac{t_{tcp.2}}{2}\right)^2 \ldots \\ & + I_{bcp} + A_{bcp} \cdot \left[y_{gird} - \left(\frac{t_{bcp.2.2}}{2}\right)\right]^2 \end{aligned}$$ *Moment of inertia of non-composite girder*

$y_{t\_non} := D_{gird.2} + t_{tcp.2} + t_{bcp.2.2} - y_{gird} = 21.8\,in$ — *Distance from Neutral Axis to top*

$$S_{b\_non} := \frac{I_{gird}}{y_{gird}} = 898.85 \cdot in^3$$ *Elastic Section Modulus - bottom*

$$S_{t\_non} := \frac{I_{gird}}{y_{t\_non}} = 640.36 \cdot in^3$$ *Elastic Section Modulus - top*

T·Y·LIN INTERNATIONAL

Depth of Web in compression (D6.3):

$$D_{cp} := \begin{cases} \left[\dfrac{D_w}{2 \cdot A_w \cdot F_y} \cdot F_y \cdot \left(A_{bf} + A_{bcp} + A_w - A_{tf} - A_{tcp}\right)\right] & \text{if } F_y \cdot A_w \geq \left|F_y \cdot A_{tf} + F_y \cdot A_{tcp} - F_y \cdot A_{bf} - F_y \cdot A_{bcp}\right| \\ D_w & \text{otherwise} \end{cases} = 26.1 \cdot in$$

Determine case for composite section (D6.1)

Section := "Composite" — *Type of section, "Composite" or "Non-Composite"*

$P_c := F_y \cdot \left(A_{tf} + A_{tcp}\right) = 422.4 \cdot kip$ — *Plastic force in the compression flange and cover plate*

$P_t := F_y \cdot \left(A_{bf} + A_{bcp}\right) = 818.4 \cdot kip$ — *Plastic force in the tension flange and cover plate*

$P_w := F_y \cdot A_w = 739.84 \cdot kip$ — *Plastic force in the web*

$$P_h := \begin{cases} \left(0.85 \cdot f'_c \cdot A_h\right) & \text{if Section = "Composite"} \\ 0 & \text{otherwise} \end{cases} = 30.6 \cdot kip$$

Plastic force in portion of haunch allowed to be used in capacity calcs by Bridge Design Guide

$$P_s := \begin{cases} \left(0.85 \cdot f'_c \cdot A_s\right) & \text{if Section = "Composite"} \\ 0 & \text{otherwise} \end{cases} = 1731.45 \cdot kip$$

Plastic force in slab

$$Case := \begin{cases} \text{"Case I"} & \text{if } P_t + P_w \geq P_c + P_h + P_s \\ \text{"Case II"} & \text{if } P_t + P_w + P_c \geq P_h + P_s \wedge P_t + P_w < P_c + P_h + P_s \\ \text{"Case III, haunch"} & \text{if } P_t + P_w + P_c + P_h \geq P_s \wedge P_t + P_w + P_c < P_h + P_s \\ \text{"Case III, slab"} & \text{otherwise} \end{cases}$$

Case = "Case II"

Case determining which equations in AASHTO Table D6.1-1 to use in calculating plastic moment capacity of section, Case III taken as in structural portion of haunch only

$$Y_{bar} := \begin{cases} \left[\dfrac{D_w}{2} \cdot \left(\dfrac{P_t - P_c - P_s - P_h}{P_w} + 1\right)\right] & \text{if Case = "Case I"} \\ \left[\dfrac{t_{tf.2} + t_{tcp.2}}{2} \cdot \left(\dfrac{P_w + P_t - P_s - P_h}{P_c} + 1\right)\right] & \text{if Case = "Case II"} \\ \left(t_h \cdot \dfrac{P_c + P_w + P_t - P_s}{P_h}\right) & \text{if Case = "Case III, haunch"} \\ t_s \cdot \dfrac{P_c + P_w + P_t + P_h}{P_s} & \text{otherwise} \end{cases}$$

Distance from top of segment to plastic neutral axis

$Y_{bar} = 0.28\ in$

T·Y·LIN INTERNATIONAL

$$d_s := \begin{cases} Y_{bar} + t_{tf.2} + t_{tcp.2} + t_h + \dfrac{t_s}{2} & \text{if } Case = \text{"Case I"} \\ Y_{bar} + t_h + \dfrac{t_s}{2} & \text{if } Case = \text{"Case II"} \\ Y_{bar} + \dfrac{t_s}{2} & \text{if } Case = \text{"Case III, haunch"} \\ \left| Y_{bar} - \dfrac{t_s}{2} \right| & \text{otherwise} \end{cases} = 4.78 \cdot in$$

Distance from PNA to plastic force in slab for use in the D6.1 Tables

$$d_h := \begin{cases} Y_{bar} + t_{tf.2} + t_{tcp.2} + \dfrac{t_h}{2} & \text{if } Case = \text{"Case I"} \\ Y_{bar} + \dfrac{t_h}{2} & \text{if } Case = \text{"Case II"} \\ \left| Y_{bar} - \dfrac{t_h}{2} \right| & \text{if } Case = \text{"Case III, haunch"} \\ t_s - Y_{bar} + \dfrac{t_h}{2} & \text{otherwise} \end{cases} = 0.78 \cdot in$$

Distance from PNA to plastic force in structural portion of haunch for use in the D6.1 tables

$$d_c := \begin{cases} Y_{bar} + \dfrac{t_{tf.2} + t_{tcp.2}}{2} & \text{if } Case = \text{"Case I"} \\ \left| Y_{bar} - \dfrac{t_{tf.2} + t_{tcp.2}}{2} \right| & \text{if } Case = \text{"Case II"} \\ t_h - Y_{bar} + \dfrac{t_{tf.2} + t_{tcp.2}}{2} & \text{if } Case = \text{"Case III, haunch"} \\ t_s - Y_{bar} + t_h + \dfrac{t_{tf.2} + t_{tcp.2}}{2} & \text{otherwise} \end{cases} = 0.27 \cdot in$$

Distance from PNA to plastic force in compression flange and cover plate for use in D6.1 tables

$$d_w := \begin{cases} \left| Y_{bar} - \dfrac{D_w}{2} \right| & \text{if } Case = \text{"Case I"} \\ t_{tf.2} + t_{tcp.2} - Y_{bar} + \dfrac{D_w}{2} & \text{if } Case = \text{"Case II"} \\ t_h - Y_{bar} + t_{tcp.2} + t_{tf.2} + \dfrac{D_w}{2} & \text{if } Case = \text{"Case III, haunch"} \\ t_s - Y_{bar} + t_h + t_{tcp.2} + t_{tf.2} + \dfrac{D_w}{2} & \text{otherwise} \end{cases} = 17.82 \cdot in$$

Distance from PNA to plastic force in web for use in D6.1 tables

$$d_t := \begin{cases} D_w - Y_{bar} + \dfrac{t_{bf.2} + t_{bcp.2.2}}{2} & \text{if } Case = \text{"Case I"} \\ t_{tcp.2} + t_{tf.2} - Y_{bar} + D_w + \dfrac{t_{bf.2} + t_{bcp.2.2}}{2} & \text{if } Case = \text{"Case II"} \\ t_h - Y_{bar} + t_{tcp.2} + t_{tf.2} + D_w + \dfrac{t_{bf.2} + t_{bcp.2.2}}{2} & \text{if } Case = \text{"Case III, haunch"} \\ t_s - Y_{bar} + t_h + t_{tf.2} + t_{tcp.2} + D_w + \dfrac{t_{bf.2} + t_{bcp.2.2}}{2} & \text{otherwise} \end{cases} = 35.93 \cdot in$$

Distance from PNA to plastic force in tension flange for use in D6.1 tables

T·Y·LIN INTERNATIONAL

$$M_p := \begin{cases} \dfrac{P_w}{2D_w}\cdot\left[Y_{bar}^{\;2} + \left(D_w - Y_{bar}\right)^2\right] + P_s\cdot d_s + P_h\cdot d_h + P_t\cdot d_t + P_c\cdot d_c & \text{if Case = "Case I"} \\ \dfrac{P_c}{2\cdot\left(t_{tf.2} + t_{tcp.2}\right)}\cdot\left[Y_{bar}^{\;2} + \left(t_{tf.2} + t_{tcp.2} - Y_{bar}\right)^2\right] + P_s\cdot d_s + P_h\cdot d_h + P_w\cdot d_w + P_t\cdot d_t & \text{if Case = "Case II"} \\ \dfrac{Y_{bar}^{\;2}\cdot P_h}{2\cdot t_h} + P_s\cdot d_s + P_c\cdot d_c + P_w\cdot d_w + P_t\cdot d_t & \text{if Case = "Case III, haunch"} \\ \dfrac{Y_{bar}^{\;2}\cdot P_s}{2\cdot t_s} + P_h\cdot d_h + P_c\cdot d_c + P_w\cdot d_w + P_t\cdot d_t & \text{otherwise} \end{cases}$$

$M_p = 4252.95\cdot kip\cdot ft$ *Plastic moment capacity*

MDX results are 4210 kip-ft and Case II, results vary by 1.0%, say ok

$D_p := Y_{bar} = 0.28\ in$ *Distance from the top of the deck to the neutral axis of the composite section at the plastic moment*

$D_t := t_s + D_{gird.2} + Haunch = 45.2\ in$ *Total depth of the composite seciton*

$$M_n := \begin{cases} M_p & \text{if } D_p \le 0.1\cdot D_t \\ \left[M_p\cdot\left(1.07 - 0.7\cdot\dfrac{D_p}{D_t}\right)\right] & \text{otherwise} \end{cases} = 4252.95\ kip\cdot ft$$

Nominal flexural resistance

T·Y·LIN INTERNATIONAL

Calculation of Remaining Fatigue Life:

The remaining fatigue life was calculated at location(s) where the fatigue detail was a Category C or lower: the bracing connection plates (conservatively assumed full depth) - category C', and the end of the cover plates (E')

Welded end of Cover Plates (E')

$$M_{ser} := \frac{185.12\text{kip}\cdot\text{ft}}{0.75} = 246.83\cdot\text{kip}\cdot\text{ft}$$

Maximum unfactored Fatigue Truck Moment Range from MDX,maximum among all girders (Girder 4), at end of bottom cover plate

$\text{Category} := \text{"E'"}$

Controlling fatigue category

$$\Delta F_{th} := \left| \begin{array}{l} (24\text{ksi}) \text{ if Category} = \text{"A"} \\ (16\text{ksi}) \text{ if Category} = \text{"B"} \\ (12\text{ksi}) \text{ if Category} = \text{"B'"} \\ (10\text{ksi}) \text{ if Category} = \text{"C"} \\ (12\text{ksi}) \text{ if Category} = \text{"C'"} \\ (7\text{ksi}) \text{ if Category} = \text{"D"} \\ (4.5\text{ksi}) \text{ if Category} = \text{"E"} \\ (2.6\text{ksi}) \text{ if Category} = \text{"E'"} \\ \text{"Need Category" otherwise} \end{array} \right. = 2.6\cdot\text{ksi}$$

Constant-Amplitude Fatigue Threshold [AASHTO Table 6.6.1.2.5-3]

$$\Delta f := \frac{0.75 M_{ser}}{263292\text{in}^4 \div 31.80\text{in}} = 0.27\,\text{ksi}$$

Fatigue Stress Range (Fatigue II)

$R_{sa} := 0.95$

Stress Range Determined by Refined Analysis (MBE 7.2.2.1.1)

$R_{st} := 1.0$

Stress Range with AASHTO truck weight (MBE 7.2.2.1.1)

$L := \text{Span}_2$

Span Length

$ADTT_{cur} := \text{ceil}\left(ADT_{cur}\cdot \text{Truck}_{perc}\cdot ADT_{Direction\_Split}\right) = 417$

Current Average daily truck traffic

$n_L := 1$

Number of lanes

$R_s := R_{sa}\cdot R_{st} = 0.95$

Stress-range estimate partial load factor (MBE 7.2.2)

$\Delta f_{eff} := R_s\cdot \Delta f = 0.25\,\text{ksi}$

Effective Stress Range (MBE 7.2.2)

$$\text{Check}_{inf} := \text{if}\left(\frac{2\Delta f_{eff}}{\Delta F_{th}} < 1.0, \text{"Infinite Fatigue Life Anticipated"}, \text{"Finite Fatigue Life Anticipated"}\right)$$

$$\boxed{\text{Check}_{inf} = \text{"Infinite Fatigue Life Anticipated"}}$$

MBE 7.2.4

T·Y·LIN INTERNATIONAL

$$A := \begin{cases} 250 & \text{if } Category = \text{"A"} \\ 120 & \text{if } Category = \text{"B"} \\ 61 & \text{if } Category = \text{"B'"} \\ 44 & \text{if } Category = \text{"C"} \\ 44 & \text{if } Category = \text{"C'"} \\ 22 & \text{if } Category = \text{"D"} \\ 11 & \text{if } Category = \text{"E"} \\ 3.9 & \text{if } Category = \text{"E'"} \\ \text{"Need Category"} & \text{otherwise} \end{cases} \cdot 10^8 ksi^3 = 3.9 \times 10^8 \cdot ksi^3$$

Detail category constant, AASHTO Table 6.6.1.2.5-1

$n_p := 1.0$

Cycles due to truck passage (AASHTO Table 6.6.1.2.5-2)

$R_R := 1.0$

Resistance Factor for evaulation, MBE Table 7.2.5.2-1, conservatively taken as the full design life

$$g := \left(\frac{ADT_{fut}}{ADT_{cur}}\right)^{\left(\frac{1}{20}\right)} - 1 = 1.7 \cdot \%$$

Approximate Growth rate of traffic, based on current and future Traffic Volumes

$a := 2017 - Year = 55$

Bridge Age

$$Y := \frac{\log\left[\frac{R_R \cdot A}{365 \cdot n_p \cdot ADTT \cdot \left(\Delta f_{eff}\right)^3} \cdot g \cdot (1+g)^{a-1} + 1\right]}{\log(1+g)} \cdot yr = 501.98 \cdot yr$$

Total finite fatigue life of detail considered (MBE 7.2.5.1-1)

$\boxed{Remaining\_Life := Y - (a)yr = 447 \cdot yr}$

Years of life remaining, based on finite fatigue of this detail

T·Y·LIN INTERNATIONAL

Shear Connectors Verification

Shear connectors have been verified against plans to determine if the beams and deck are acting as a composite section for the analysis.

Fatigue Resistance:

$$Load_{Comb} := \begin{cases} \text{"Fatigue I"} & \text{if } ADTT \geq 960 \\ \text{"Fatigue II"} & \text{if } ADTT < 960 \end{cases} = \text{"Fatigue II"}$$

Determination of fatigue loading case to be used in calculations per AASHTO 6.10.10.2

$$\gamma_{LL\_SC} := \begin{cases} 1.5 & \text{if } Load_{Comb} = \text{"Fatigue I"} \\ 0.75 & \text{otherwise} \end{cases} = 0.75$$

Load Factor for live load (Table 3.4.1-1)

$$n := 1$$

Per AASHTO LRFD Bridge Design Specification Table 6.6.1.2.5.2

$$N := 365 \cdot 75 \cdot n \cdot ADTT = 1.6 \times 10^{7}$$

Per AASHTO LRFD Bridge Design Specification Equation 6.6.1.2.5-3

$$\alpha := 34.5 - 4.28 \log(N) = 3.67$$

Per AASHTO LRFD Bridge Design Specification Equation 6.10.10.2-4

$$d := \frac{3}{4} in = 0.75\, in$$

Diameter of stud (from shop drawing)

$$Z_r := \alpha \cdot \left(\frac{d}{in}\right)^2 \cdot kip = 2.06 \cdot kip$$

AASHTO LRFD Bridge Design Specification Equation 6.10.10.2-2

Required Pitch:

$$F_{fat1\_ext} := 0 \frac{kip}{in} \qquad F_{fat1\_int} := 0 \frac{kip}{in}$$

Radial fatigue shear range, Straight Bridge

$$F_{fat2\_ext} := 0 \frac{kip}{in} \qquad F_{fat2\_int} := 0 \frac{kip}{in}$$

Radial fatigue shear range, Straight Bridge with colinear bracing AASHTO 6.10.10.1.2-5

$$V_{f\_ext} := 28.84 kip \qquad V_{f\_int} := 31.44 kip$$

Unfactored vertical shear force range (From MDX) (girder 1 & 4, at max shear range)

$$I_{ext} := 24704 in^4 \qquad I_{int} := 26265 in^4$$

From MDX - Short term composite moment of inertia at point of V.f

$$y_{b\_c\_ext} := 30.46 in \qquad y_{b\_c\_int} := 31.77 in$$

From MDX - distance to composite NA at point of V.f

$$y_{b\_slab\_ext} := D_{gird.2} + Haunch + \frac{t_s}{2} = 41.7\, in$$

Distance to deck centroid from bottom of exterior beam

$$y_{b\_slab\_int} := D_{gird.2} + Haunch + \frac{t_s}{2} = 41.7\, in$$

Distance to deck centroid from bottom of interior beam

$$b_{s\_ext} := \left(\frac{S}{2} + Overhang\right) = 75.5\, in$$

Effective slab width exterior beams

$$b_{s\_int} := S = 97\, in$$

Effective slab width interior beam

$$Q_{ext} := \left(\frac{t_s \cdot b_{s\_ext}}{n}\right) \cdot \left(y_{b\_slab\_ext} - y_{b\_c\_ext}\right) = 5940.34 \cdot in^3$$

Transformed first area moment of inertia, exterior beam

T·Y·LIN INTERNATIONAL

$Q_{int} := \left(\frac{t_s \cdot b_{s\_int}}{n}\right) \cdot \left(y_{b\_slab\_int} - y_{b\_c\_int}\right) = 6742.47 \cdot in^3$ *Transformed first area moment of inertia, interior beam*

$V_{f\_ext} := V_{f\_ext} = 28.84 \cdot kip$ $V_{f\_int} := V_{f\_int} = 31.44 \cdot kip$ *Unfactored vertical shear force range (From MDX) (girder 1 & 4, at max shear range)*

$V_{fat\_ext} := \frac{\left(V_{f\_ext} Q_{ext}\right)}{I_{ext}} = 6.93 \cdot \frac{kip}{in}$ *AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-3*

$V_{fat\_int} := \frac{\left(V_{f\_int} Q_{int}\right)}{I_{int}} = 8.07 \cdot \frac{kip}{in}$ *AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-3*

$V_{sr\_ext} := \gamma_{LL.SC} \sqrt{\left(V_{fat\_ext}{}^2 + \max\left(F_{fat1\_ext}, F_{fat2\_ext}\right)^2\right)} = 5.2 \cdot \frac{kip}{in}$ *AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-2*

$V_{sr\_int} := \gamma_{LL.SC} \cdot \sqrt{\left(V_{fat\_int}{}^2 + \max\left(F_{fat1\_int}, F_{fat2\_int}\right)^2\right)} = 6.05 \cdot \frac{kip}{in}$ *AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-2*

TY·LIN INTERNATIONAL

$n_{ext} := 3$ $\quad$ $n_{int} := 3$ — *Number of shear connectors*

$p_{ext} := \dfrac{(n_{ext} \cdot Z_r)}{V_{sr\_ext}} = 1.19\ in$ $\quad$ $p_{int} := \dfrac{(n_{int} \cdot Z_r)}{V_{sr\_int}} = 1.02\ in$ — *Required pitch spacing for beams (6.10.10.1.2-1)*

$p_{max\_ext} := max(min(24in, p_{ext}), 6 \cdot d) = 4.5 \cdot in$ — *Maximum allowable pitch AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-1*

$p_{max\_int} := max(min(24in, p_{int}), 6d) = 4.5\ in$ — *Maximum allowable pitch AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-1*

The spacing on the plans for this zone is 4", which meets the required spacing, shear connectors are ok for fatigue

Strength Limit State:

$A_{sc} := \dfrac{(d)^2 \cdot \pi}{4} = 0.44\ in^2$ — *Cross sectional area of a stud shear connector*

$E_c = 3592.44\ ksi$ — *Modulus of elasticity of the deck concrete*

$F_u := 58ksi$ — *Minimum tensile strength of a stud shear connector (A373 specified in plans)*

$Q_n := min\left(0.5 \cdot A_{sc} \cdot \sqrt{f'_c \cdot E_c}, A_{sc} \cdot F_u\right) = 22.93 \cdot kip$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.3-2*

$\phi_{sc} := 0.85$ — *AASHTO LRFD Bridge Design Specification 6.5.4.2*

$Q_r := \phi_{sc} \cdot Q_n = 19.49 \cdot kip$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4-1*

$F_p := 0kip$ — *Straight Span*

$b_{s\_ext} := Overhang + \dfrac{S}{2} = 75.5\ in$ — *Effective slab width exterior beams*

$b_{s\_int} := S = 97\ in$ — *Effective slab width interior beam*

$P_{1p\_ext} := 0.85 \cdot \left[(f'_c) \cdot b_{s\_ext} \cdot t_s\right] = 1347.67 \cdot kip$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.2-2*

$P_{1p\_int} := 0.85(f'_c \cdot b_{s\_int} \cdot t_s) = 1731.45 \cdot kip$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.2-2*

$P_{max} := \sqrt{max(P_{1p\_ext}, P_{1p\_int})^2 + F_p^{\ 2}} = 1731.45 \cdot kip$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.2-1*

$n_{sc\_min} := Ceil\left(\dfrac{P_{max}}{Q_r}, 1\right) = 89$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.1-2, Minimum number of shear connectors required in section*

Number required for section (86) is less than number provided in section (162), composite action is allowed.

TY·LIN INTERNATIONAL

Verification Calculations: Girder 3, 66'-0" Span

Note: These verification calculations are approximate, and are not to be reported as Rating Factors in the final Report

Demands:

DC1

$DC1_{g3.5} = 225.03 \cdot plf$ — *Distributed weight of steel elements*

$wt_{deck} := (t_s) \cdot S \cdot \gamma_{conc} = 707.29 \cdot plf$ — *Weight of concrete deck*

$wt_{fillet} := 1in \cdot (b_{tf.5}) \cdot \gamma_{conc} = 12.5 \cdot plf$ — *Weight of the haunch*

$$\boxed{M_{DC1} := \frac{(DC1_{g3.5} + wt_{deck} + wt_{fillet} + WAC_{5.int}) \cdot Span_5^{\ 2}}{8} = 535.33 \cdot kip \cdot ft}$$

Moment due to DC1 terms

*Compare to MDX result: 536 kip*ft ; say OK*

DC2

$$\boxed{M_{DC2} := \frac{WS \cdot Span_5^{\ 2}}{8} = 92.56 \cdot kip \cdot ft}$$

Moment due to Superimposed Dead Loads (Rail, Curb, Sidewalk and Utilities)

*Compare to MDX result: 92 kip*ft; OK*

DW

$$\boxed{M_{DW} := \frac{WEAR \cdot Span_5^{\ 2}}{8} = 88.71 \cdot kip \cdot ft}$$

Moment due to wearing surface

*Compare to MDX result: 89 kip*ft; OK*

LL + IM

For simplicity, place center axle of HL93 Truck at midspan

- *One Design Lane Loaded* — *AASHTO Table 4.6.2.2.2b-1,includes multipresence*

$$g_{bend.single.int} := 0.06 + \left(\frac{S}{14ft}\right)^{0.4} \cdot \left(\frac{S}{Span_5}\right)^{0.3} \cdot (1.02) = 0.5$$

- *Two or More Design Lanes Loaded* — *AASHTO Table 4.6.2.2.2b-1,includes multipresence*

$$g_{bend.multi.int} := 0.075 + \left(\frac{S}{9.5ft}\right)^{0.6} \cdot \left(\frac{S}{Span_5}\right)^{0.2} \cdot (1.02) = 0.68$$

$g := \max(g_{bend.single.int}, g_{bend.multi.int}) = 0.68$ — *Max Distribution Factor for bending, interior beam, with multipresence reduction*

$e_g := \frac{D_{gird.5}}{2} + \frac{t_s}{2} + 1in = 22.45\, in$ — *Distance between the center of gravity of the beam and the deck*

$K_g := n \cdot \left(I_{rolledgirder.5} + A_{gird.5} \cdot e_g^{\ 2}\right) = 288596.06\, in^4$ — *Longitudinal sitffness parameter [AASHTO 4.6.2.2.1-1]*

T·Y·LIN INTERNATIONAL

$$c_1 := \begin{cases} \left[0.25\cdot\left(\frac{K_g}{Span_1\cdot t_s^3}\right)^{0.25}\cdot\left(\frac{S}{Span_1}\right)^{0.5}\right] & \text{if } Skew \geq 30deg \\ 0 & \text{otherwise} \end{cases} = 0$$

Skewed support distribution factor reduction parameter [AASHTO Table 4.6.2.2.2e-1]

$$g_{red} := 1 - c_1\cdot\tan(Skew)^{1.5} = 1$$

Reduction to distribution factor for skewed supports

$$g := g_{red}\cdot g = 0.68$$

Distribution factor for moment, reduced for skewed supports

$$M_{truck.total} := 1.33\left[(8kip + 32kip)\cdot\frac{\left(\frac{Span_5}{2} - 14ft\right)\cdot\frac{Span_5}{2}}{Span_5} + 32kip\cdot\frac{Span_5}{4}\right] = 1207.64\cdot kip\cdot ft$$

Moment due to Truck,

$$M_{tandem.total} := 1.33\cdot 25kip\left(\frac{Span_5}{2} - 2ft\right) = 1030.75\cdot kip\cdot ft$$

Bending moment caused by design tandem (approximate, conservative)

$$M_{truck} := g\cdot\max\left(M_{truck.total}, M_{tandem.total}\right) = 825.2\cdot kip\cdot ft$$

Controlling moment from design tandem or design truck

$$M_{lane.total} := \frac{0.64klf\cdot Span_5^2}{8} = 348.48\cdot kip\cdot ft$$

Maximum positive moment due to lane load

$$M_{lane} := g\cdot M_{lane.total} = 238.12\cdot kip\cdot ft$$

$$\boxed{M_{LL\_IM} := M_{truck} + M_{lane} = 1063.32\cdot kip\cdot ft}$$

Live Load moment on interior girder

*MDX says 1084 kip*ft; Say OK.*

$$M_u := \gamma_{DC}\cdot\left(M_{DC1} + M_{DC2}\right) + \gamma_{DW}\cdot M_{DW} + \gamma_{LL.INV}\cdot M_{LL\_IM} = 2779\cdot kip\cdot ft$$

Ultimate moment, strength I

MDX reports 2814.9; Moments, (results differ by 1.3%), say ok

T·Y·LIN INTERNATIONAL

Positive Moment Check:

Section Capacity

Plastic Section capacity is determined using section D6.3.2

Section Properties

$D_w := D_{gird.5} - 2 \cdot t_{tf.5} = 33.7\,in$ *Depth of web*

$A_w := D_w \cdot t_{w.5} = 21.06\,in^2$ *Area of web*

$A_{tf} := b_{tf.5} \cdot t_{tf.5} = 13.2\,in^2$ *Area of top flange*

$A_{bf} := b_{bf.5} \cdot t_{bf.5} = 13.2\,in^2$ *Area of bottom flange*

$A_{tcp} := b_{tcp.5} \cdot t_{tcp.5} = 0$ *Area of top cover plate*

$A_{bcp} := b_{bcp.5.2} \cdot t_{bcp.5.2} = 11\,in^2$ *Area of bottom cover plate*

$A_s := S \cdot t_s = 679\,in^2$ *Area of slab for composite analysis*

$t_h := \min(Haunch - t_{tcp.5}, 1in) = 1\,in$ *Portion of haunch allowed for capacity calcs*

$A_h := t_h \cdot b_{tf.5} = 12\,in^2$ *Area of haunch allowed for capacity calcs*

$I_{tcp} := \dfrac{b_{tcp.5} \cdot t_{tcp.5}^{\,3}}{12} = 0$ *Moment of Inertia of top cover plate*

$I_{bcp} := \dfrac{b_{bcp.5.2} \cdot t_{bcp.5.2}^{\,3}}{12} = 0.92\,in^4$ *Moment of Inertia of bottom cover plate*

$$y_{gird} := \frac{A_{bcp} \cdot \dfrac{t_{bcp.5.2}}{2} + A_{tcp} \cdot \left(t_{bcp.5.2} + \dfrac{t_{tcp.5}}{2} + D_{gird.5}\right) + A_{gird.5} \cdot \left(t_{bcp.5.2} + \dfrac{D_{gird.5}}{2}\right)}{A_{tcp} + A_{bcp} + A_{gird.5}} = 15.63\,in$$

Neutral Axis, from bottom

$$I_{gird} := I_{rolledgirder.5} + A_{gird.5} \cdot \left[y_{gird} - \left(\frac{D_{gird.5}}{2} + t_{bcp.5.2}\right)\right]^2 \ldots = 13571.22\,in^4$$
$$+ I_{tcp} + A_{tcp} \cdot \left(D_{gird.5} + t_{bcp.5.2} - y_{gird} + \frac{t_{tcp.5}}{2}\right)^2 \ldots$$
$$+ I_{bcp} + A_{bcp} \cdot \left[y_{gird} - \left(\frac{t_{bcp.5.2}}{2}\right)\right]^2$$

Moment of inertia of non-composite girder

$y_{t\_non} := D_{gird.5} + t_{tcp.5} + t_{bcp.5.2} - y_{gird} = 21.27\,in$ *Distance from Neutral Axis to top*

$S_{b\_non} := \dfrac{I_{gird}}{y_{gird}} = 868.37 \cdot in^3$ *Elastic Section Modulus - bottom*

$S_{t\_non} := \dfrac{I_{gird}}{y_{t\_non}} = 638 \cdot in^3$ *Elastic Section Modulus - top*

T·Y·LIN INTERNATIONAL

Depth of Web in compression (D6.3):

$$D_{cp} := \begin{cases} \left[\dfrac{D_w}{2\cdot A_w\cdot F_y}\cdot F_y\cdot\left(A_{bf}+A_{bcp}+A_w-A_{tf}-A_{tcp}\right)\right] & \text{if } F_y\cdot A_w \geq \left|F_y\cdot A_{tf}+F_y\cdot A_{tcp}-F_y\cdot A_{bf}-F_y\cdot A_{bcp}\right| \\ D_w & \text{otherwise} \end{cases} = 25.65\cdot in$$

Determine case for composite section (D6.1)

Section := "Composite" — *Type of section, "Composite" or "Non-Composite"*

$P_c := F_y\cdot\left(A_{tf}+A_{tcp}\right) = 422.4\cdot kip$ — *Plastic force in the compression flange and cover plate*

$P_t := F_y\cdot\left(A_{bf}+A_{bcp}\right) = 774.4\cdot kip$ — *Plastic force in the tension flange and cover plate*

$P_w := F_y\cdot A_w = 674\cdot kip$ — *Plastic force in the web*

$$P_h := \begin{cases} \left(0.85\cdot f'_c\cdot A_h\right) & \text{if Section} = \text{"Composite"} \\ 0 & \text{otherwise} \end{cases} = 30.6\cdot kip$$

Plastic force in portion of haunch allowed to be used in capacity calcs by Bridge Design Guide

$$P_s := \begin{cases} \left(0.85\cdot f'_c\cdot A_s\right) & \text{if Section} = \text{"Composite"} \\ 0 & \text{otherwise} \end{cases} = 1731.45\cdot kip$$

Plastic force in slab

$$Case := \begin{cases} \text{"Case I"} & \text{if } P_t+P_w \geq P_c+P_h+P_s \\ \text{"Case II"} & \text{if } P_t+P_w+P_c \geq P_h+P_s \wedge P_t+P_w < P_c+P_h+P_s \\ \text{"Case III, haunch"} & \text{if } P_t+P_w+P_c+P_h \geq P_s \wedge P_t+P_w+P_c < P_h+P_s \\ \text{"Case III, slab"} & \text{otherwise} \end{cases}$$

Case = "Case II"

Case determining which equations in AASHTO Table D6.1-1 to use in calculating plastic moment capacity of section, Case III taken as in structural portion of haunch only

$$Y_{bar} := \begin{cases} \left[\dfrac{D_w}{2}\cdot\left(\dfrac{P_t-P_c-P_s-P_h}{P_w}+1\right)\right] & \text{if Case} = \text{"Case I"} \\ \left[\dfrac{t_{tf.5}+t_{tcp.5}}{2}\cdot\left(\dfrac{P_w+P_t-P_s-P_h}{P_c}+1\right)\right] & \text{if Case} = \text{"Case II"} \\ \left(t_h\cdot\dfrac{P_c+P_w+P_t-P_s}{P_h}\right) & \text{if Case} = \text{"Case III, haunch"} \\ t_s\cdot\dfrac{P_c+P_w+P_t+P_h}{P_s} & \text{otherwise} \end{cases}$$

Distance from top of segment to plastic neutral axis

$Y_{bar} = 0.14\ in$

$$d_s := \begin{cases} Y_{bar} + t_{tf.5} + t_{tcp.5} + t_h + \dfrac{t_s}{2} & \text{if } Case = \text{"Case I"} \\ Y_{bar} + t_h + \dfrac{t_s}{2} & \text{if } Case = \text{"Case II"} \\ Y_{bar} + \dfrac{t_s}{2} & \text{if } Case = \text{"Case III, haunch"} \\ \left| Y_{bar} - \dfrac{t_s}{2} \right| & \text{otherwise} \end{cases} = 4.64 \cdot in$$

Distance from PNA to plastic force in slab for use in the D6.1 Tables

$$d_h := \begin{cases} Y_{bar} + t_{tf.5} + t_{tcp.5} + \dfrac{t_h}{2} & \text{if } Case = \text{"Case I"} \\ Y_{bar} + \dfrac{t_h}{2} & \text{if } Case = \text{"Case II"} \\ \left| Y_{bar} - \dfrac{t_h}{2} \right| & \text{if } Case = \text{"Case III, haunch"} \\ t_s - Y_{bar} + \dfrac{t_h}{2} & \text{otherwise} \end{cases} = 0.64 \cdot in$$

Distance from PNA to plastic force in structural portion of haunch for use in the D6.1 tables

$$d_c := \begin{cases} Y_{bar} + \dfrac{t_{tf.5} + t_{tcp.5}}{2} & \text{if } Case = \text{"Case I"} \\ \left| Y_{bar} - \dfrac{t_{tf.5} + t_{tcp.5}}{2} \right| & \text{if } Case = \text{"Case II"} \\ t_h - Y_{bar} + \dfrac{t_{tf.5} + t_{tcp.5}}{2} & \text{if } Case = \text{"Case III, haunch"} \\ t_s - Y_{bar} + t_h + \dfrac{t_{tf.5} + t_{tcp.5}}{2} & \text{otherwise} \end{cases} = 0.41 \cdot in$$

Distance from PNA to plastic force in compression flange and cover plate for use in D6.1 tables

$$d_w := \begin{cases} \left| Y_{bar} - \dfrac{D_w}{2} \right| & \text{if } Case = \text{"Case I"} \\ t_{tf.5} + t_{tcp.5} - Y_{bar} + \dfrac{D_w}{2} & \text{if } Case = \text{"Case II"} \\ t_h - Y_{bar} + t_{tcp.5} + t_{tf.5} + \dfrac{D_w}{2} & \text{if } Case = \text{"Case III, haunch"} \\ t_s - Y_{bar} + t_h + t_{tcp.5} + t_{tf.5} + \dfrac{D_w}{2} & \text{otherwise} \end{cases} = 17.81 \cdot in$$

Distance from PNA to plastic force in web for use in D6.1 tables

$$d_t := \begin{cases} D_w - Y_{bar} + \dfrac{t_{bf.5} + t_{bcp.5.2}}{2} & \text{if } Case = \text{"Case I"} \\ t_{tcp.5} + t_{tf.5} - Y_{bar} + D_w + \dfrac{t_{bf.5} + t_{bcp.5.2}}{2} & \text{if } Case = \text{"Case II"} \\ t_h - Y_{bar} + t_{tcp.5} + t_{tf.5} + D_w + \dfrac{t_{bf.5} + t_{bcp.5.2}}{2} & \text{if } Case = \text{"Case III, haunch"} \\ t_s - Y_{bar} + t_h + t_{tf.5} + t_{tcp.5} + D_w + \dfrac{t_{bf.5} + t_{bcp.5.2}}{2} & \text{otherwise} \end{cases} = 35.71 \cdot in$$

Distance from PNA to plastic force in tension flange for use in D6.1 tables

T·Y·LIN INTERNATIONAL

$$M_p := \begin{cases} \dfrac{P_w}{2D_w}\cdot\left[Y_{bar}^{\ 2} + \left(D_w - Y_{bar}\right)^2\right] + P_s\cdot d_s + P_h\cdot d_h + P_t\cdot d_t + P_c\cdot d_c & \text{if Case = "Case I"} \\ \dfrac{P_c}{2\cdot\left(t_{tf.5} + t_{tcp.5}\right)}\cdot\left[Y_{bar}^{\ 2} + \left(t_{tf.5} + t_{tcp.5} - Y_{bar}\right)^2\right] + P_s\cdot d_s + P_h\cdot d_h + P_w\cdot d_w + P_t\cdot d_t & \text{if Case = "Case II"} \\ \dfrac{Y_{bar}^{\ 2}\cdot P_h}{2\cdot t_h} + P_s\cdot d_s + P_c\cdot d_c + P_w\cdot d_w + P_t\cdot d_t & \text{if Case = "Case III, haunch"} \\ \dfrac{Y_{bar}^{\ 2}\cdot P_s}{2\cdot t_s} + P_h\cdot d_h + P_c\cdot d_c + P_w\cdot d_w + P_t\cdot d_t & \text{otherwise} \end{cases}$$

$M_p = 3991\cdot kip\cdot ft$ — *Plastic moment capacity*

MDX results are 4092 kip-ft and Case II, results vary by 2.5%, say ok

$D_p := Y_{bar} = 0.14\ in$ — *Distance from the top of the deck to the neutral axis of the composite section at the plastic moment*

$D_t := t_s + D_{gird.5} + Haunch = 44.9\ in$ — *Total depth of the composite seciton*

$$M_n := \begin{cases} M_p & \text{if } D_p \le 0.1\cdot D_t \\ \left[M_p\cdot\left(1.07 - 0.7\cdot\dfrac{D_p}{D_t}\right)\right] & \text{otherwise} \end{cases} = 3991\ kip\cdot ft$$

Nominal flexural resistance

T·Y·LIN INTERNATIONAL

Calculation of Remaining Fatigue Life:

The remaining fatigue life was calculated at location(s) where the fatigue detail was a Category C or lower: the bracing connection plates (conservatively assumed full depth) - category C', and the end of the cover plates (E')

Welded end of Cover Plates (E')

$M_{ser} := \dfrac{177.15\text{kip}\cdot\text{ft}}{0.75} = 236.2\cdot\text{kip}\cdot\text{ft}$

Maximum unfactored Fatigue Truck Moment Range from MDX,maximum among all girders (Girder 1)

$\text{Category} := \text{"E'"}$

Controlling fatigue category

$$\Delta F_{th} := \begin{array}{|l} (24\text{ksi}) \ \text{ if } \ \text{Category} = \text{"A"} \\ (16\text{ksi}) \ \text{ if } \ \text{Category} = \text{"B"} \\ (12\text{ksi}) \ \text{ if } \ \text{Category} = \text{"B'"} \\ (10\text{ksi}) \ \text{ if } \ \text{Category} = \text{"C"} \\ (12\text{ksi}) \ \text{ if } \ \text{Category} = \text{"C'"} \\ (7\text{ksi}) \ \text{ if } \ \text{Category} = \text{"D"} \\ (4.5\text{ksi}) \ \text{ if } \ \text{Category} = \text{"E"} \\ (2.6\text{ksi}) \ \text{ if } \ \text{Category} = \text{"E'"} \\ \text{"Need Category"} \ \text{ otherwise} \end{array} = 2.6\cdot\text{ksi}$$

Constant-Amplitude Fatigue Threshold [AASHTO Table 6.6.1.2.5-3]

$\Delta f := \dfrac{0.75M_{ser}}{24770\text{in}^4 \div 30.52\text{in}} = 2.62\,\text{ksi}$

Fatigue Stress Range (Fatigue II)

$R_{sa} := 0.95$

Stress Range Determined by Refined Analysis (MBE 7.2.2.1.1)

$R_{st} := 1.0$

Stress Range with AASHTO truck weight (MBE 7.2.2.1.1)

$L := \text{Span}_5$

Span Length

$ADTT_{cur} := \text{ceil}\left(ADT_{cur}\cdot\text{Truck}_{perc}\cdot ADT_{Direction\_Split}\right) = 417$

Current Average daily truck traffic

$n_L := 1$

Number of lanes

$R_s := R_{sa}\cdot R_{st} = 0.95$

Stress-range estimate partial load factor (MBE 7.2.2)

$\Delta f_{eff} := R_s\cdot\Delta f = 2.49\,\text{ksi}$

Effective Stress Range (MBE 7.2.2)

$\text{Check}_{inf} := \text{if}\left(\dfrac{2\Delta f_{eff}}{\Delta F_{th}} < 1.0, \text{"Infinite Fatigue Life Anticipated"}, \text{"Finite Fatigue Life Anticipated"}\right)$

$\boxed{\text{Check}_{inf} = \text{"Finite Fatigue Life Anticipated"}}$

MBE 7.2.4

T·Y·LIN INTERNATIONAL

$$A := \begin{cases} 250 & \text{if Category} = \text{"A"} \\ 120 & \text{if Category} = \text{"B"} \\ 61 & \text{if Category} = \text{"B'"} \\ 44 & \text{if Category} = \text{"C"} \\ 44 & \text{if Category} = \text{"C'"} \\ 22 & \text{if Category} = \text{"D"} \\ 11 & \text{if Category} = \text{"E"} \\ 3.9 & \text{if Category} = \text{"E'"} \\ \text{"Need Category"} & \text{otherwise} \end{cases} \cdot 10^8 \text{ksi}^3 = 3.9 \times 10^8 \cdot \text{ksi}^3$$

Detail category constant, AASHTO Table 6.6.1.2.5-1

$n_p := 1.0$

Cycles due to truck passage (AASHTO Table 6.6.1.2.5-2)

$R_R := 1.0$

Resistance Factor for evaulation, MBE Table 7.2.5.2-1, conservatively taken as the full design life

$$g := \left(\frac{ADT_{fut}}{ADT_{cur}}\right)^{\left(\frac{1}{20}\right)} - 1 = 1.7 \cdot \%$$

Approximate Growth rate of traffic, based on current and future Traffic Volumes

$a := 2017 - \text{Year} = 55$

Bridge Age

$$Y := \frac{\log\left[\dfrac{R_R \cdot A}{365 \cdot n_p \cdot ADTT \cdot \left(\Delta f_{eff}\right)^3} \cdot g \cdot (1+g)^{a-1} + 1\right]}{\log(1+g)} \cdot yr = 106.48 \cdot yr$$

Total finite fatigue life of detail considered (MBE 7.2.5.1-1)

$\boxed{\text{Remaining\_Life} := Y - (a)yr = 51 \cdot yr}$

Years of life remaining, based on finite fatigue of this detail

T·Y·LIN INTERNATIONAL

Shear Connectors Verification

Shear connectors have been verified against plans to determine if the beams and deck are acting as a composite section for the analysis.

Fatigue Resistance:

$$Load_{Comb} := \begin{cases} \text{"Fatigue I"} & \text{if } ADTT \ge 960 \\ \text{"Fatigue II"} & \text{if } ADTT < 960 \end{cases} = \text{"Fatigue II"}$$

Determination of fatigue loading case to be used in calculations per AASHTO 6.10.10.2

$$\gamma_{LL\_SC} := \begin{cases} 1.5 & \text{if } Load_{Comb} = \text{"Fatigue I"} \\ 0.75 & \text{otherwise} \end{cases} = 0.75$$

Load Factor for live load (Table 3.4.1-1)

$$n := 1$$

Per AASHTO LRFD Bridge Design Specification Table 6.6.1.2.5.2

$$N := 365 \cdot 75 \cdot n \cdot ADTT = 1.6 \times 10^{7}$$

Per AASHTO LRFD Bridge Design Specification Equation 6.6.1.2.5-3

$$\alpha := 34.5 - 4.28 \log(N) = 3.67$$

Per AASHTO LRFD Bridge Design Specification Equation 6.10.10.2-4

$$d := \frac{3}{4} in = 0.75\, in$$

Diameter of stud (from shop drawing)

$$Z_r := \alpha \cdot \left(\frac{d}{in}\right)^2 \cdot kip = 2.06 \cdot kip$$

AASHTO LRFD Bridge Design Specification Equation 6.10.10.2-3

Required Pitch:

$$F_{fat1\_ext} := 0 \frac{kip}{in} \qquad F_{fat1\_int} := 0 \frac{kip}{in}$$

Radial fatigue shear range, Straight Bridge

$$F_{fat2\_ext} := 0 \frac{kip}{in} \qquad F_{fat2\_int} := 0 \frac{kip}{in}$$

Radial fatigue shear range, Straight Bridge with colinear bracing AASHTO 6.10.10.1.2-5

$$V_{f\_ext} := 27.52 kip \qquad V_{f\_int} := 31.05 kip$$

Unfactored vertical shear force range (From MDX) (girder 1 & 2, at max shear range)

$$I_{ext} := 24770 in^4 \qquad I_{int} := 26367 in^4$$

From MDX - Short term composite moment of inertia at point of V.f

$$y_{b\_c\_ext} := 30.52 in \qquad y_{b\_c\_int} := 31.86 in$$

From MDX - distance to composite NA at point of V.f

$$y_{b\_slab\_ext} := D_{gird.5} + Haunch + \frac{t_s}{2} = 41.4\, in$$

Distance to deck centroid from bottom of exterior beam

$$y_{b\_slab\_int} := D_{gird.5} + Haunch + \frac{t_s}{2} = 41.4\, in$$

Distance to deck centroid from bottom of interior beam

$$b_{s\_ext} := \left(\frac{S}{2} + Overhang\right) = 75.5\, in$$

Effective slab width exterior beams

$$b_{s\_int} := S = 97\, in$$

Effective slab width interior beam

$$Q_{ext} := \left(\frac{t_s \cdot b_{s\_ext}}{n}\right) \cdot \left(y_{b\_slab\_ext} - y_{b\_c\_ext}\right) = 5750.08 \cdot in^3$$

Transformed first area moment of inertia, exterior beam

T·Y·LIN INTERNATIONAL

$Q_{int} := \left(\frac{t_s \cdot b_{s\_int}}{n}\right) \cdot \left(y_{b\_slab\_int} - y_{b\_c\_int}\right) = 6477.66 \cdot in^3$ — *Transformed first area moment of inertia, interior beam*

$V_{f\_ext} := V_{f\_ext} = 27.52 \cdot kip$ $\quad V_{f\_int} := V_{f\_int} = 31.05 \cdot kip$ — *Unfactored vertical shear force range (From MDX) (girder 1 & 4, at max shear range)*

$V_{fat\_ext} := \frac{\left(V_{f\_ext} Q_{ext}\right)}{I_{ext}} = 6.39 \cdot \frac{kip}{in}$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-3*

$V_{fat\_int} := \frac{\left(V_{f\_int} Q_{int}\right)}{I_{int}} = 7.63 \cdot \frac{kip}{in}$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-3*

$V_{sr\_ext} := \gamma_{LL.SC} \sqrt{\left(V_{fat\_ext}{}^2 + \max\left(F_{fat1\_ext}, F_{fat2\_ext}\right)^2\right)} = 4.79 \cdot \frac{kip}{in}$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-2*

$V_{sr\_int} := \gamma_{LL.SC} \cdot \sqrt{\left(V_{fat\_int}{}^2 + \max\left(F_{fat1\_int}, F_{fat2\_int}\right)^2\right)} = 5.72 \cdot \frac{kip}{in}$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-2*

$n_{ext} := 3$ $\quad n_{int} := 3$ — *Number of shear connectors*

$p_{ext} := \frac{\left(n_{ext} \cdot Z_r\right)}{V_{sr\_ext}} = 1.29\,in$ $\quad p_{int} := \frac{\left(n_{int} \cdot Z_r\right)}{V_{sr\_int}} = 1.08\,in$ — *Required pitch spacing for beams (6.10.10.1.2-1)*

$p_{max\_ext} := \max\left(\min\left(24in, p_{ext}\right), 6 \cdot d\right) = 4.5 \cdot in$ — *Maximum allowable pitch AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-1*

$p_{max\_int} := \max\left(\min\left(24in, p_{int}\right), 6d\right) = 4.5\,in$ — *Maximum allowable pitch AASHTO LRFD Bridge Design Specification Equation 6.10.10.1.2-1*

The spacing on the plans for this zone is 4", which meets the required spacing, shear connectors are ok for fatigue

TYLININTERNATIONAL

Strength Limit State:

$A_{sc} := \frac{(d)^2 \cdot \pi}{4} = 0.44\,in^2$ — *Cross sectional area of a stud shear connector*

$E_c = 3592.44\,ksi$ — *Modulus of elasticity of the deck concrete*

$F_u := 58ksi$ — *Minimum tensile strength of a stud shear connector (A373 specified in plans)*

$Q_n := \min\left(0.5 \cdot A_{sc} \cdot \sqrt{f'_c \cdot E_c}, A_{sc} \cdot F_u\right) = 22.93 \cdot kip$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.3-2*

$\phi_{sc} := 0.85$ — *AASHTO LRFD Bridge Design Specification 6.5.4.2*

$Q_r := \phi_{sc} \cdot Q_n = 19.49 \cdot kip$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4-1*

$F_p := 0kip$ — *Straight Span*

$b_{s\_ext} := Overhang + \frac{S}{2} = 75.5\,in$ — *Effective slab width exterior beams*

$b_{s\_int} := S = 97\,in$ — *Effective slab width interior beam*

$P_{1p\_ext} := 0.85 \cdot \left[\left(f'_c\right) \cdot b_{s\_ext} \cdot t_s\right] = 1347.67 \cdot kip$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.2-2*

$P_{1p\_int} := 0.85\left(f'_c \cdot b_{s\_int} \cdot t_s\right) = 1731.45 \cdot kip$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.2-2*

$P_{max} := \sqrt{\max\left(P_{1p\_ext}, P_{1p\_int}\right)^2 + F_p^{\,2}} = 1731.45 \cdot kip$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.2-1*

$n_{sc\_min} := Ceil\left(\frac{P_{max}}{Q_r}, 1\right) = 89$ — *AASHTO LRFD Bridge Design Specification Equation 6.10.10.4.1-2, Minimum number of shear connectors required in section*

Number required for section (86) is less than number provided in section (158), composite action is allowed.

```
ID: 5970 - COLD BROOK ROAD - SPAN 1
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  FLOAT LANES
  GRID MODEL
  LRFD METHOD
  RATE MODE
  RATING PROJECT
  SELF WEIGHT FOR DEAD LOAD 1
DATA
  BRINCD 1 4 2 5 3 6 4 7 5 8 6 9 7 10 8 11 9 12 10 13 11 14 12 15
  FPC 3.
  GCD-1  0. 4.9277 21.6305 3.6761 42.923 2.4441
  GCD-2 1.8718 12.577 23.5029 11.3358 44.7999 10.1137
  GCD-3 3.7436 20.2263 25.3752 18.9954 46.6767 17.7832
  GCD-4 5.6153 27.8757 27.2476 26.655 48.5535 25.4528
  GCD-5 7.4871 35.525 29.1199 34.3146 50.4304 33.1223
  LANWID 12.
  LCD-1  -0.218 4.037 21.4125 2.7854 42.705 1.5534
  LCD-2 2.6343 15.6931 24.2648 14.4415 45.5573 13.2095
  RAD-1  0.
  RAD-2  0.
  RAD-3  0.
  RAD-4  0.
  RAD-5  0.
  ROADWG 33.14 33.14 33.14 33.14 33.14 33.14 33.14 33.14 33.14 33.14
  33.14
  SLABEXT 2.25 2.25
  SLABT 7.
  SLABWEAR  0.
  SUP-1 1 3
  SUP-2 1 3
  SUP-3 1 3
  SUP-4 1 3
  SUP-5 1 3
  WAC-1  0.0389
  WAC-2  0.0354
  WAC-3  0.0354
  WAC-4  0.0354
  WAC-5  0.0389
  WAS-1  0.0114
  WAS-2  0.0178
  WAS-3  0.0178
  WAS-4  0.0178
  WAS-5  0.0114
  WCONC 150.
  WEAR  0.1642
  WS-1  0.17
  WS-2  0.17
  WS-3  0.17
  WS-4  0.17
  WS-5  0.17
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 1
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X135
DATA
  ADTT 584
  BR 21.6667  21.3281
  ESLABW 74.2654  74.2654  74.2772  74.2889  74.3007  74.3124  74.325
   74.3376  74.3502  74.3627  74.3627
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 1
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.5  5.75  5.5  5.75  4.5
  PITSP 6.9583  7.667  13.75  7.667
  SLABT 7.
  SPN 43.0104
  STD  0.75
  STH 5.
  TSLABW 74.2654  74.2654  74.2772  74.2889  74.3007  74.3124  74.325
   74.3376  74.3502  74.3627  74.3627
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 1
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X135
DATA
  ADTT 584
  BR 21.6667  21.332
  ESLABW 94.5253  94.5253  94.5503  94.5752  94.6001  94.625  94.65
   94.6751  94.7001  94.7251  94.7251
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 2
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.5  5.75  5.5  5.75  4.5
  PITSP 6.9583  7.667  13.75  7.667
  SLABT 7.
  SPN 43.0104
  STD  0.75
  STH 5.
  TSLABW 94.5253  94.5253  94.5503  94.5752  94.6001  94.625  94.65
   94.6751  94.7001  94.7251  94.7251
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 1
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X135
DATA
  ADTT 584
  BR 21.6666  21.336
  ESLABW 94.5221  94.5221  94.5478  94.5735  94.5993  94.625  94.65
   94.6751  94.7001  94.7251  94.7251
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 3
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.5  5.75  5.5  5.75  4.5
  PITSP 6.9583  7.667  13.75  7.667
  SLABT 7.
  SPN 43.0104
  STD  0.75
  STH 5.
  TSLABW 94.5221  94.5221  94.5478  94.5735  94.5993  94.625  94.65
   94.6751  94.7001  94.7251  94.7251
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 1
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X135
DATA
  ADTT 584
  BR 21.6667  21.3398
  ESLABW 94.525  94.525  94.5501  94.5752  94.6003  94.6255  94.6504
   94.6753  94.7002  94.7251  94.7251
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 4
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.5  5.75  5.5  5.75  4.5
  PITSP 6.9583  7.667  13.75  7.667
  SLABT 7.
  SPN 43.0104
  STD  0.75
  STH 5.
  TSLABW 94.525  94.525  94.5501  94.5752  94.6003  94.6255  94.6504
   94.6753  94.7002  94.7251  94.7251
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 1
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X135
DATA
  ADTT 584
  BR 21.6666  21.3438
  ESLABW 74.2628  74.2628  74.2754  74.2879  74.3005  74.313  74.3254
   74.3377  74.35  74.3624  74.3624
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 5
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.5  5.75  5.5  5.75  4.5
  PITSP 6.9583  7.667  13.75  7.667
  SLABT 7.
  SPN 43.0104
  STD  0.75
  STH 5.
  TSLABW 74.2628  74.2628  74.2754  74.2879  74.3005  74.313  74.3254
   74.3377  74.35  74.3624  74.3624
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 1
CONDITIONS
  A7 STEEL
  DIAPHRAGM W16X36 FOR GROUP 1
  DIAPHRAGM C15X33.9 FOR GROUP 2
  ENGLISH INPUT
  ENGLISH OUTPUT
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  TYPE D BRACING FOR GROUP 1
  TYPE D BRACING FOR GROUP 2
DATA
  BRL-1 7.875  7.8852  7.8959
  BRL-2 7.875  7.8851  7.8958
  BRL-3 7.8751  7.8851  7.8959
  BRL-4 7.875  7.8851  7.8958
  GCONNDST 4.375  4.375
  GRP-1 1 2 1
  GRP-2 1 2 1
  GRP-3 1 2 1
  GRP-4 1 2 1
  GRPHT  0.  0.
GO
```

Girder System Case Data - 5970 - COLD BROOK ROAD - SPAN 1

Geometry

Radius of curvature - Girder 2
0.00 ft

Radius of curvature - Girder 3
0.00 ft

Radius of curvature - Girder 4
0.00 ft

Radius of curvature - Girder 5
0.00 ft

Lane Geometry

Curb from girder 1, ft

-0.90 -0.90 -0.90 -0.90 -0.90 -0.90 -0.90 -0.90 -0.90
-0.90

Lane Width
12.00 ft

Float Range for Lanes - ft

Tenth Point	Far Lane Boundary From Gdr 1	Given Road Width From Curb	Range	Adjusted Road Width	Far Gdr From Curb
0	23.28	33.14	8.94	33.14	32.42
1	23.29	33.14	8.94	33.14	32.43
2	23.29	33.14	8.94	33.14	32.43
3	23.28	33.14	8.94	33.14	32.44
4	23.29	33.14	8.94	33.14	32.45
5	23.29	33.14	8.94	33.14	32.46
6	23.28	33.14	8.94	33.14	32.47
7	23.29	33.14	8.94	33.14	32.48
8	23.29	33.14	8.94	33.14	32.48
9	23.29	33.14	8.94	33.14	32.49
10	23.29	33.14	8.94	33.14	32.49

Road width and float range along lines connecting tenth points of exterio

Loading

Superimposed dead load, k/ft

Girder 1

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Girder 2

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Girder 3

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Girder 4

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Girder 5

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Wearing surface load

Girder 1
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
Girder 2
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
Girder 3
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
Girder 4
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
Girder 5
0.16 k/ft

0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft

LRFD Des or Tndm Truck with lane loading

Design truck multiplier: 1.0000

Tandem truck multiplier: 1.0000

Influence surface values not displayed

Multiple Presence Factors

1.20
1.00
0.85
0.65

Units

Input: U.S. customary

Output: U.S. customary

Girder 1 Case Data - 5970 - COLD BROOK ROAD - SPAN 1

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-

Top Flange Width	11.95	in
Top Flange Thickness	0.79	in
Web Depth	33.97	in
Web Thickness	0.60	in
Bottom Flange Width	11.95	in
Bottom Flange Thickness	0.79	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft   21.67 ft   43.01 ft

Cover plates

No cover plates

Curvature

No curvature

Girder Type

Rolled shapes

Hinges

No interior hinges

Span lengths

Spans   43.01 ft

Stiffeners

Bearing stiffeners

Web splices

Fatigue

Average Single Lane Daily Truck Traffic: 496
Lanes available to trucks   2
Fatigue life: 100

Composite Behavior

Composite region for composite loading-   0. -   43.01 ft
Unshored construction

Load Factors

DC1,DC2	1.250
DW	1.500
HL93 LL+I	1.750

```
      Constructibility          1.250

   Load Modifiers
       Ductility                   1.00
       Redundancy                  1.00
       Operational Classification  1.00

Reactions

   Max unfactored live load+impact reactions
         51.29 k      51.29 k
   Min unfactored live load+impact reactions
         -0.55 k      -0.52 k
   Max unfactored live reactions - No dynamic load allowance
         40.55 k      40.57 k
   Min unfactored live reactions - No dynamic load allowance
         -0.44 k      -0.42 k
   Total unfactored dead load DC1+DC2 reactions
         20.57 k      20.62 k
   Total unfactored dead load DW reactions
          3.51 k       3.53 k
   Bearing skew for redistribution qualification
                90.00   90.00

Material


 Concrete

   Concrete strength            3.00 ksi
   Unit wt of concrete          150. lb/cu ft

   Aggregate source correction
       factor K1                1.00

   Slab T for strength             7.00 in
   Effective slab width           74.27 in     74.27 in     74.28 in     74.29 i
                                  74.30 in     74.31 in     74.32 in     74.34 i
                                  74.35 in     74.36 in     74.36 in
   Fillet                       1.00 in
   Effective slab width by tenth pt
                               74.27 in     74.27 in     74.28 in     74.29 in
                               74.30 in     74.31 in     74.32 in     74.34 in
                               74.35 in     74.36 in     74.36 in
   Self weight slab width by tenth pt
                               74.27 in     74.27 in     74.28 in     74.29 in
                               74.30 in     74.31 in     74.32 in     74.34 in
                               74.35 in     74.36 in     74.36 in

 Steel

   Top flange yield            32.00 ksi
   Bottom flange yield         32.00 ksi
   Web yield                   32.00 ksi
   Rebar yield                 60.00 ksi

Output

   Standard resolution summary tables

Units

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

Girder 2 Case Data - 5970 - COLD BROOK ROAD - SPAN 1

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-

Top Flange Width	11.95	in
Top Flange Thickness	0.79	in
Web Depth	33.97	in
Web Thickness	0.60	in
Bottom Flange Width	11.95	in
Bottom Flange Thickness	0.79	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft   21.67 ft   43.01 ft

Cover plates

No cover plates

Curvature

No curvature

Girder Type

Rolled shapes

Hinges

No interior hinges

Span lengths

Spans   43.01 ft

Stiffeners

Bearing stiffeners

Web splices

Fatigue

Average Single Lane Daily Truck Traffic: 496
Lanes available to trucks   2
Fatigue life: 100

Composite Behavior

Composite region for composite loading-   0. -   43.01 ft
Unshored construction

Load Factors

DC1,DC2	1.250
DW	1.500
HL93 LL+I	1.750

```
       Constructibility         1.250

   Load Modifiers
       Ductility                   1.00
       Redundancy                  1.00
       Operational Classification  1.00

Reactions

   Max unfactored live load+impact reactions
         69.06 k      68.36 k
   Min unfactored live load+impact reactions
          0.00 k       0.00 k
   Max unfactored live reactions - No dynamic load allowance
         54.53 k      54.00 k
   Min unfactored live reactions - No dynamic load allowance
          0.00 k       0.00 k
   Total unfactored dead load DC1+DC2 reactions
         23.75 k      23.71 k
   Total unfactored dead load DW reactions
          3.55 k       3.54 k
   Bearing skew for redistribution qualification
                 90.00   90.00

Material


 Concrete

   Concrete strength            3.00 ksi
   Unit wt of concrete          150. lb/cu ft

   Aggregate source correction
       factor K1                1.00

   Slab T for strength             7.00 in
   Effective slab width           94.53 in     94.53 in     94.55 in     94.58 i
                                  94.60 in     94.62 in     94.65 in     94.68 i
                                  94.70 in     94.73 in     94.73 in
   Fillet                       1.00 in
   Effective slab width by tenth pt
                               94.53 in     94.53 in     94.55 in     94.58 in
                               94.60 in     94.62 in     94.65 in     94.68 in
                               94.70 in     94.73 in     94.73 in
   Self weight slab width by tenth pt
                               94.53 in     94.53 in     94.55 in     94.58 in
                               94.60 in     94.62 in     94.65 in     94.68 in
                               94.70 in     94.73 in     94.73 in

 Steel

   Top flange yield            32.00 ksi
   Bottom flange yield         32.00 ksi
   Web yield                   32.00 ksi
   Rebar yield                 60.00 ksi

Output

   Standard resolution summary tables

Units

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

Girder 3 Case Data - 5970 - COLD BROOK ROAD - SPAN 1

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-

Top Flange Width	11.95	in
Top Flange Thickness	0.79	in
Web Depth	33.97	in
Web Thickness	0.60	in
Bottom Flange Width	11.95	in
Bottom Flange Thickness	0.79	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft   21.67 ft   43.01 ft

Cover plates

No cover plates

Curvature

No curvature

Girder Type

Rolled shapes

Hinges

No interior hinges

Span lengths

Spans   43.01 ft

Stiffeners

Bearing stiffeners

Web splices

Fatigue

Average Single Lane Daily Truck Traffic: 496
Lanes available to trucks   2
Fatigue life: 100

Composite Behavior

Composite region for composite loading-   0. -   43.01 ft
Unshored construction

Load Factors

DC1,DC2	1.250
DW	1.500
HL93 LL+I	1.750

```
      Constructibility        1.250

   Load Modifiers
       Ductility                   1.00
       Redundancy                  1.00
       Operational Classification  1.00

Reactions

   Max unfactored live load+impact reactions
         67.25 k      66.97 k
   Min unfactored live load+impact reactions
          0.00 k       0.00 k
   Max unfactored live reactions - No dynamic load allowance
         53.15 k      52.94 k
   Min unfactored live reactions - No dynamic load allowance
          0.00 k       0.00 k
   Total unfactored dead load DC1+DC2 reactions
         24.14 k      24.20 k
   Total unfactored dead load DW reactions
          3.51 k       3.52 k
   Bearing skew for redistribution qualification
                90.00   90.00

Material


 Concrete

   Concrete strength            3.00 ksi
   Unit wt of concrete          150. lb/cu ft

   Aggregate source correction
       factor K1                1.00

   Slab T for strength            7.00 in
   Effective slab width          94.52 in     94.52 in     94.55 in     94.57 i
                                 94.60 in     94.62 in     94.65 in     94.68 i
                                 94.70 in     94.73 in     94.73 in
   Fillet                       1.00 in
   Effective slab width by tenth pt
                               94.52 in     94.52 in     94.55 in     94.57 in
                               94.60 in     94.62 in     94.65 in     94.68 in
                               94.70 in     94.73 in     94.73 in
   Self weight slab width by tenth pt
                               94.52 in     94.52 in     94.55 in     94.57 in
                               94.60 in     94.62 in     94.65 in     94.68 in
                               94.70 in     94.73 in     94.73 in

 Steel

   Top flange yield            32.00 ksi
   Bottom flange yield         32.00 ksi
   Web yield                   32.00 ksi
   Rebar yield                 60.00 ksi

Output

   Standard resolution summary tables

Units

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

Case Data - 5970 - COLD BROOK ROAD - SPAN 1

Execution Mode

Rate Mode

Fatigue

* Category B
* Avg daily single lane truck traffic: 4000

Geometry

Brace Lengths from Girder 1 (ft) -
7.88, 7.89, 7.90

Brace Lengths from Girder 2 (ft) -
7.88, 7.89, 7.90

Brace Lengths from Girder 3 (ft) -
7.88, 7.89, 7.90

Brace Lengths from Girder 4 (ft) -
7.88, 7.89, 7.90

Connection to center of girder distance by group

4.38 4.38

Loading

LRFD Method

* Ductility factor: 1.0000
* Operation classification factor: 1.0000
* Redundancy factor: 1.0000

Material

Steel grade: A7

Units

Input - U.S. Customary
Output - U.S. Customary

* Default

[This table uses the rating equation (6A.4.2.1-1) of the 2011 edition of the Manual for Bridge Evaluation.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmpt Allow Stress	Shear Capacity	Rating Factors Bending Inv.		Oper.	Shear Inv.	Oper.
0.00	2278. C	378.29	>999.00	B	>999.00	3.95	5.12
4.30	2278. C	378.29	6.56	B	8.50	4.39	5.70
8.60	2278. C	378.29	3.68	B	4.78	5.13	6.65
12.90	2279. C	378.29	2.76	B	3.58	5.96	7.73
17.20	2279. C	378.29	2.33	B	3.01	7.24	9.39
21.51	2279. C	378.29	2.27	B	2.94	10.88	14.11
25.81	2279. C	378.29	2.48	B	3.22	7.88	10.22
30.11	2279. C	378.29	2.87	B	3.72	6.54	8.47
34.41	2279. C	378.29	3.44	B	4.46	5.89	7.63
38.71	2279. C	378.29	5.48	B	7.11	4.82	6.25
43.01	2279. C	378.29	>999.00	B	>999.00	3.92	5.08

Service II

Span 1

Location	Allowable Stress	Rating Factors Bending Inv.		Oper.
0.00	30400. S	> 999.00	B	>999.00
4.30	30400. S	6.10	B	7.93
8.60	30400. S	3.35	B	4.35
12.90	30400. S	2.46	B	3.20
17.20	30400. S	2.05	B	2.67
21.51	30400. S	1.99	B	2.59
25.81	30400. S	2.19	B	2.85
30.11	30400. S	2.56	B	3.33
34.41	30400. S	3.13	B	4.06
38.71	30400. S	5.10	B	6.63
43.01	30400. S	> 999.00	B	>999.00

****
Minimum rating is 1.99 at location 21.51 in span 1.
****

Note: PHIC and PHIS are not shown in the above capacities.

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
```

[This table uses the rating equation (6A.4.2.1-1) of the 2011 edition of the Manual for Bridge Evaluation.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmpt Allow Stress	Shear Capacity	Rating Factors Bending Inv.	Bending Oper.	Shear Inv.	Shear Oper.
0.00	2401. C	378.29	972.34 B	******	2.94	3.81
4.30	2401. C	378.29	5.35 B	6.94	3.35	4.35
8.60	2401. C	378.29	3.05 B	3.96	4.00	5.19
12.90	2401. C	378.29	2.27 B	2.94	4.65	6.03
17.20	2401. C	378.29	1.97 B	2.56	5.92	7.67
21.51	2401. C	378.29	1.97 B	2.55	7.90	10.24
25.81	2401. C	378.29	2.13 B	2.77	6.48	8.40
30.11	2401. C	378.29	2.41 B	3.12	5.10	6.61
34.41	2402. C	378.29	2.82 B	3.66	4.66	6.04
38.71	2402. C	378.29	4.40 B	5.71	3.73	4.83
43.01	2402. C	378.29	>999.00 B	>999.00	2.93	3.80

Service II

Span 1

Location	Allowable Stress	Rating Factors Bending Inv.	Bending Oper.
0.00	30400. S	901.95 B	******
4.30	30400. S	4.77 B	6.21
8.60	30400. S	2.65 B	3.44
12.90	30400. S	1.92 B	2.49
17.20	30400. S	1.65 B	2.14
21.51	30400. S	1.64 B	2.13
25.81	30400. S	1.78 B	2.32
30.11	30400. S	2.04 B	2.65
34.41	30400. S	2.45 B	3.18
38.71	30400. S	3.93 B	5.11
43.01	30400. S	> 999.00 B	>999.00

****
Minimum rating is 1.64 at location 21.51 in span 1.
****

Note: PHIC and PHIS are not shown in the above capacities.

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
```

[This table uses the rating equation (6A.4.2.1-1) of the 2011 edition of the Manual for Bridge Evaluation.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmpt Allow Stress	Shear Capacity	Rating Factors Bending Inv.	Bending Oper.	Shear Inv.	Shear Oper.
0.00	2401. C	378.29	913.67 B	******	3.00	3.89
4.30	2401. C	378.29	5.33 B	6.91	3.36	4.36
8.60	2401. C	378.29	3.01 B	3.90	3.97	5.15
12.90	2401. C	378.29	2.24 B	2.91	4.62	5.99
17.20	2401. C	378.29	1.92 B	2.48	5.74	7.44
21.51	2401. C	378.29	1.89 B	2.46	8.73	11.32
25.81	2401. C	378.29	2.06 B	2.67	6.27	8.12
30.11	2401. C	378.29	2.36 B	3.06	5.07	6.57
34.41	2402. C	378.29	2.80 B	3.63	4.59	5.95
38.71	2402. C	378.29	4.43 B	5.75	3.71	4.81
43.01	2402. C	378.29	890.16 B	******	2.96	3.84

Service II

Span 1

Location	Allowable Stress	Rating Factors Bending Inv.	Bending Oper.
0.00	30400. S	847.53 B	******
4.30	30400. S	4.75 B	6.18
8.60	30400. S	2.60 B	3.39
12.90	30400. S	1.89 B	2.46
17.20	30400. S	1.59 B	2.07
21.51	30400. S	1.56 B	2.03
25.81	30400. S	1.71 B	2.22
30.11	30400. S	1.99 B	2.59
34.41	30400. S	2.42 B	3.15
38.71	30400. S	3.95 B	5.14
43.01	30400. S	825.49 B	******

****
Minimum rating is 1.56 at location 21.51 in span 1.
****

Note: PHIC and PHIS are not shown in the above capacities.

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
```

Girder 1 Fatigue Summary

Condition	Location from Left End of Girder	Category (Table 6.6.1.2.3-1)	Force Range (k-ft)	Actual Stress Range	Allowable Stress Range	Ratio
Base metal	0.00	C	0.17	0.00	6.24	0.000
Base metal	4.30	A	61.34	1.15	12.00	0.096
Base metal	8.60	A	105.86	1.99	12.00	0.166
Base metal	12.90	A	138.84	2.61	12.00	0.218
Base metal	17.20	A	164.80	3.10	12.00	0.259
Base metal	21.51	A	162.04	3.05	12.00	0.254
Base metal	25.81	A	138.09	2.60	12.00	0.217
Base metal	30.11	A	125.13	2.36	12.00	0.196
Base metal	34.41	A	119.14	2.24	12.00	0.187
Base metal	38.71	A	88.27	1.66	12.00	0.138
Base metal	43.01	C	0.26	0.00	6.24	0.000

Girder 2 Fatigue Summary

Condition	Location from Left End of Girder	Category (Table 6.6.1.2.3-1)	Force Range (k-ft)	Actual Stress Range	Allowable Stress Range	Ratio
Base metal	0.00	C	0.49	0.00	6.24	0.000
Base metal	4.30	A	70.90	1.31	12.00	0.109
Base metal	8.60	A	119.65	2.21	12.00	0.184
Base metal	12.90	A	155.05	2.87	12.00	0.239
Base metal	17.20	A	177.71	3.29	12.00	0.274
Base metal	21.51	A	160.33	2.96	12.00	0.247
Base metal	25.81	A	142.20	2.63	12.00	0.219
Base metal	30.11	A	136.89	2.53	12.00	0.211
Base metal	34.41	A	136.44	2.52	12.00	0.210
Base metal	38.71	A	105.45	1.95	12.00	0.162
Base metal	43.01	C	0.60	0.00	6.24	0.000

Girder 3 Fatigue Summary

Condition	Location from Left End of Girder	Category (Table 6.6.1.2.3-1)	Force Range (k-ft)	Actual Stress Range	Allowable Stress Range	Ratio
Base metal	0.00	C	0.76	0.00	6.24	0.000
Base metal	4.30	A	48.73	0.90	12.00	0.075
Base metal	8.60	A	83.37	1.54	12.00	0.128
Base metal	12.90	A	108.82	2.01	12.00	0.168
Base metal	17.20	A	128.12	2.37	12.00	0.197
Base metal	21.51	A	123.75	2.29	12.00	0.191
Base metal	25.81	A	105.82	1.96	12.00	0.163
Base metal	30.11	A	97.24	1.80	12.00	0.150
Base metal	34.41	A	93.48	1.73	12.00	0.144
Base metal	38.71	A	69.83	1.29	12.00	0.108
Base metal	43.01	C	0.79	0.00	6.24	0.000

Girder 1 Factored Strengths

Forces include ductility, redundancy, and operational factors

Tenth Point	Loc	Factored Shear (k) HL93	Shear Strength (k)	Ratio	Factored Moment (k-ft) HL93	Bending Strength (k-ft)	Ratio
0	0.00	118.2	378.3 (5)	0.312	1.1 I	2278.4 (20)	0.000
1	4.30	104.7	378.3 (5)	0.277	445.9 I	2278.4 (20)	0.196
2	8.60	88.3	378.3 (5)	0.233	769.2 I	2278.5 (20)	0.338
3	12.90	73.6	378.3 (5)	0.195	999.3 I	2278.6 (20)	0.439
4	17.20	57.6	378.3 (5)	0.152	1157.4 I	2278.6 (20)	0.508
5	21.51	35.2	378.3 (5)	0.093	1186.4 I	2278.7 (20)	0.521
6	25.81	59.6	378.3 (5)	0.158	1103.4 I	2278.8 (20)	0.484
7	30.11	72.7	378.3 (5)	0.192	971.7 I	2278.9 (20)	0.426
8	34.41	79.3	378.3 (5)	0.210	809.3 I	2279.0 (20)	0.355
9	38.71	97.5	378.3 (5)	0.258	510.7 I	2279.1 (20)	0.224
10	43.01	119.0	378.3 (5)	0.315	1.1 I	2279.1 (20)	0.000

Absolute values of factored moment are shown with determining strength

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

Girder 2 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	150.9	378.3	(5)	0.399	2.5	I	2400.8	(20)	0.001
1	4.30	131.7	378.3	(5)	0.348	554.4	I	2400.8	(20)	0.231
2	8.60	109.6	378.3	(5)	0.290	942.0	I	2400.9	(20)	0.392
3	12.90	91.8	378.3	(5)	0.243	1229.1	I	2401.0	(20)	0.512
4	17.20	71.5	378.3	(5)	0.189	1386.8	I	2401.1	(20)	0.578
5	21.51	51.7	378.3	(5)	0.137	1395.8	I	2401.2	(20)	0.581
6	25.81	72.6	378.3	(5)	0.192	1308.8	I	2401.4	(20)	0.545
7	30.11	93.4	378.3	(5)	0.247	1173.8	I	2401.5	(20)	0.489
8	34.41	97.0	378.3	(5)	0.256	1000.0	I	2401.6	(20)	0.416
9	38.71	121.2	378.3	(5)	0.320	646.1	I	2401.7	(20)	0.269
10	43.01	151.4	378.3	(5)	0.400	2.1	I	2401.7	(20)	0.001

Absolute values of factored moment are shown with determining strength

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

Girder 3 Factored Strengths

Forces include ductility, redundancy, and operational factors

Tenth Point	Loc	Factored Shear (k) HL93	Shear Strength (k)		Ratio	Factored Moment (k-ft) HL93		Bending Strength (k-ft)		Ratio
0	0.00	148.9	378.3	(5)	0.393	2.7	I	2400.7	(20)	0.001
1	4.30	131.8	378.3	(5)	0.349	557.9	I	2400.7	(20)	0.232
2	8.60	110.7	378.3	(5)	0.293	954.9	I	2400.9	(20)	0.398
3	12.90	92.7	378.3	(5)	0.245	1242.8	I	2401.0	(20)	0.518
4	17.20	76.7	378.3	(5)	0.203	1423.4	I	2401.1	(20)	0.593
5	21.51	44.1	378.3	(5)	0.117	1442.8	I	2401.2	(20)	0.601
6	25.81	74.7	378.3	(5)	0.198	1349.4	I	2401.4	(20)	0.562
7	30.11	92.9	378.3	(5)	0.246	1196.9	I	2401.5	(20)	0.498
8	34.41	98.6	378.3	(5)	0.261	1008.5	I	2401.6	(20)	0.420
9	38.71	121.9	378.3	(5)	0.322	644.2	I	2401.7	(20)	0.268
10	43.01	150.3	378.3	(5)	0.397	2.7	I	2401.7	(20)	0.001

Absolute values of factored moment are shown with determining strength

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

Girder 1 Service Moment - k-ft - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I	Fatigue Truck Range LL+I
0	0.0	0.	0.	0.	0.	-1.	0.	-1.	0.
1	4.3	63.	14.	14.	188.	0.	165.	0.	82.
2	8.6	112.	25.	24.	321.	0.	303.	0.	141.
3	12.9	147.	33.	32.	411.	0.	416.	0.	185.
4	17.2	168.	37.	36.	483.	0.	473.	0.	220.
5	21.5	176.	39.	38.	492.	0.	488.	0.	216.
6	25.8	169.	37.	36.	452.	0.	428.	0.	184.
7	30.1	147.	33.	32.	400.	0.	364.	0.	167.
8	34.4	112.	25.	24.	344.	0.	302.	0.	159.
9	38.7	63.	14.	14.	225.	0.	220.	0.	118.
10	43.0	0.	0.	0.	1.	0.	1.	0.	0.
Bracing									
	21.7	176.	39.	38.	491.	0.	487.	0.	

	Sidewalk Max	Sidewalk Min	Max LL+I Fat Trk	Min LL+I Fat Trk	Max LL+I Prmt Trk	Min LL+I Prmt Trk
0	0.	0.	0.	0.	0.	0.
1	0.	0.	82.	0.	0.	0.
2	0.	0.	141.	0.	0.	0.
3	0.	0.	185.	0.	0.	0.
4	0.	0.	220.	0.	0.	0.
5	0.	0.	216.	0.	0.	0.
6	0.	0.	184.	0.	0.	0.
7	0.	0.	167.	0.	0.	0.
8	0.	0.	159.	0.	0.	0.
9	0.	0.	118.	0.	0.	0.
Top flg spl	0.	0.	0.	0.	0.	0.
Bot flg spl	0.	0.	0.	0.	0.	0.

Girder 2 Service Moment - k-ft - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I	Fatigue Truck Range LL+I
0	0.0	0.	0.	0.	0.	-1.	0.	-1.	1.
1	4.3	73.	14.	14.	242.	0.	216.	0.	95.
2	8.6	130.	25.	24.	406.	0.	392.	0.	160.
3	12.9	171.	33.	32.	515.	0.	529.	0.	207.
4	17.2	195.	38.	37.	595.	0.	587.	0.	237.
5	21.5	202.	40.	38.	586.	0.	592.	0.	214.
6	25.8	195.	38.	37.	550.	0.	525.	0.	190.
7	30.1	171.	33.	32.	497.	0.	464.	0.	183.
8	34.4	130.	25.	24.	439.	0.	398.	0.	182.
9	38.7	73.	14.	14.	295.	0.	293.	0.	141.
10	43.0	0.	0.	0.	1.	-1.	1.	-1.	1.

Bracing

	21.7	202.	40.	38.	585.	0.	591.	0.

	Sidewalk Max	Sidewalk Min	Max LL+I Fat Trk	Min LL+I Fat Trk	Max LL+I Prmt Trk	Min LL+I Prmt Trk
0	0.	0.	0.	-1.	0.	0.
1	0.	0.	95.	0.	0.	0.
2	0.	0.	160.	0.	0.	0.
3	0.	0.	207.	0.	0.	0.
4	0.	0.	237.	0.	0.	0.
5	0.	0.	214.	0.	0.	0.
6	0.	0.	190.	0.	0.	0.
7	0.	0.	183.	0.	0.	0.
8	0.	0.	182.	0.	0.	0.
9	0.	0.	141.	0.	0.	0.
Top flg spl	0.	0.	0.	0.	0.	0.
Bot flg spl	0.	0.	0.	0.	0.	0.

Girder 3 Service Moment - k-ft - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I	Fatigue Truck Range LL+I
0	0.0	0.	0.	0.	1.	-2.	1.	-1.	1.
1	4.3	75.	14.	14.	243.	0.	215.	0.	65.
2	8.6	134.	25.	24.	411.	0.	392.	0.	111.
3	12.9	177.	33.	32.	524.	0.	533.	0.	145.
4	17.2	203.	38.	36.	610.	0.	600.	0.	171.
5	21.5	213.	39.	38.	612.	0.	612.	0.	165.
6	25.8	203.	38.	36.	568.	0.	539.	0.	141.
7	30.1	177.	33.	32.	507.	0.	467.	0.	130.
8	34.4	135.	25.	24.	442.	0.	393.	0.	125.
9	38.7	76.	14.	14.	292.	0.	288.	0.	93.
10	43.0	0.	0.	0.	1.	-2.	1.	-1.	1.
Bracing									
	21.7	213.	39.	38.	612.	0.	611.	0.	

	Sidewalk Max	Sidewalk Min	Max LL+I Fat Trk	Min LL+I Fat Trk	Max LL+I Prmt Trk	Min LL+I Prmt Trk
0	0.	0.	0.	-1.	0.	0.
1	0.	0.	65.	0.	0.	0.
2	0.	0.	111.	0.	0.	0.
3	0.	0.	145.	0.	0.	0.
4	0.	0.	171.	0.	0.	0.
5	0.	0.	165.	0.	0.	0.
6	0.	0.	141.	0.	0.	0.
7	0.	0.	130.	0.	0.	0.
8	0.	0.	125.	0.	0.	0.
9	0.	0.	93.	0.	0.	0.
Top flg spl	0.	0.	0.	-1.	0.	0.
Bot flg spl	0.	0.	0.	-1.	0.	0.

Girder 1 Service Shear - k - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane LL+I (+)	Design Truck+ Lane LL+I (-)	Tandem Truck+ Lane LL+I	Fatigue Truck Range LL+I
0	0.00	16.15	3.64	3.51	50.39	0.00	46.28	22.69
1	4.30	12.97	2.91	2.81	46.06	0.00	38.90	19.96
2	8.60	9.80	2.18	2.10	40.12	-3.60	34.94	20.19
3	12.90	6.62	1.45	1.40	35.09	-5.72	31.91	20.17
4	17.20	3.44	0.72	0.69	29.36	-9.73	28.09	16.08
5	21.51	0.26	-0.02	0.02	19.84	-16.27	19.94	15.04
6	25.81	-3.44	-0.72	-0.69	12.33	-26.96	-30.52	17.63
7	30.11	-6.62	-1.45	-1.40	7.54	-32.01	-34.57	20.94
8	34.41	-9.80	-2.18	-2.10	4.60	-34.95	-33.12	20.08
9	38.71	-12.99	-2.91	-2.81	1.68	-41.96	-37.13	20.45
10	43.01	-16.17	-3.64	-3.52	0.00	-50.83	-45.56	23.81

Tenth Point	Fatigue Trk LL+I	Permit Trk LL+I	Permit Range	Sidewalk
0	22.69	0.00	0.00	0.00
1	19.96	0.00	0.00	0.00
2	17.78	0.00	0.00	0.00
3	16.52	0.00	0.00	0.00
4	11.58	0.00	0.00	0.00
5	8.54	0.00	0.00	0.00
6	-12.33	0.00	0.00	0.00
7	-16.86	0.00	0.00	0.00
8	-17.05	0.00	0.00	0.00
9	-19.24	0.00	0.00	0.00
10	-23.81	0.00	0.00	0.00

Girder 2 Service Shear - k - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane LL+I (+)	Design Truck+ Lane LL+I (-)	Tandem Truck+ Lane LL+I	Fatigue Truck Range LL+I
0	0.00	18.97	3.68	3.55	67.02	0.00	63.39	27.30
1	4.30	15.15	2.95	2.85	59.89	0.00	51.57	22.83
2	8.60	11.32	2.22	2.14	51.12	-6.33	45.46	23.95
3	12.90	7.49	1.48	1.43	44.80	-10.13	40.99	25.71
4	17.20	3.66	0.75	0.73	35.89	-16.93	37.06	20.64
5	21.51	-0.17	0.02	-0.02	23.69	-27.35	-29.47	19.64
6	25.81	-3.65	-0.75	-0.73	21.56	-32.77	-37.74	21.70
7	30.11	-7.48	-1.48	-1.43	13.50	-40.89	-45.73	26.84
8	34.41	-11.31	-2.21	-2.14	8.10	-43.93	-42.92	23.87
9	38.71	-15.14	-2.95	-2.84	2.95	-53.88	-48.96	23.70
10	43.01	-18.98	-3.68	-3.55	0.00	-67.27	-62.08	28.55

Tenth Point	Fatigue Trk LL+I	Permit Trk LL+I	Permit Range	Sidewalk
0	27.30	0.00	0.00	0.00
1	22.83	0.00	0.00	0.00
2	19.71	0.00	0.00	0.00
3	19.24	0.00	0.00	0.00
4	12.70	0.00	0.00	0.00
5	-11.40	0.00	0.00	0.00
6	-12.51	0.00	0.00	0.00
7	-19.64	0.00	0.00	0.00
8	-18.52	0.00	0.00	0.00
9	-21.58	0.00	0.00	0.00
10	-28.55	0.00	0.00	0.00

Girder 3 Service Shear - k - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane LL+I (+)	Design Truck+ Lane LL+I (-)	Tandem Truck+ Lane LL+I	Fatigue Truck Range LL+I
0	0.00	19.46	3.64	3.52	65.54	0.00	60.95	18.11
1	4.30	15.64	2.91	2.81	59.68	0.00	50.88	15.02
2	8.60	11.81	2.18	2.11	51.47	-5.24	45.28	15.03
3	12.90	7.98	1.45	1.40	45.06	-8.33	41.08	13.82
4	17.20	4.15	0.72	0.69	36.94	-14.08	39.78	13.71
5	21.51	0.32	-0.01	0.01	24.72	-23.28	25.40	12.24
6	25.81	-4.15	-0.72	-0.69	17.79	-33.84	-38.64	14.13
7	30.11	-7.98	-1.45	-1.40	10.96	-41.11	-45.15	14.96
8	34.41	-11.81	-2.18	-2.11	6.64	-44.55	-42.79	14.91
9	38.71	-15.65	-2.91	-2.81	2.42	-54.01	-48.39	15.42
10	43.01	-19.48	-3.64	-3.52	0.00	-66.35	-60.29	17.91

	Fatigue Trk LL+I	Permit Trk LL+I	Permit Range	Sidewalk
0	18.11	0.00	0.00	0.00
1	15.02	0.00	0.00	0.00
2	12.88	0.00	0.00	0.00
3	10.55	0.00	0.00	0.00
4	9.69	0.00	0.00	0.00
5	6.47	0.00	0.00	0.00
6	-9.46	0.00	0.00	0.00
7	-11.35	0.00	0.00	0.00
8	-12.23	0.00	0.00	0.00
9	-14.35	0.00	0.00	0.00
10	-17.91	0.00	0.00	0.00

Girder 1 Elastic Section Properties for Pos Mom Stress

	Noncomp			Comp (n = 8.73)			Comp (3n =26.20)		
Tenth Point	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg
0	7800.	17.77	17.77	19893.	31.20	4.35	14499.	25.28	10.27
1	7800.	17.77	17.77	19893.	31.20	4.35	14499.	25.28	10.27
2	7800.	17.77	17.77	19893.	31.21	4.34	14499.	25.28	10.27
3	7800.	17.77	17.77	19894.	31.21	4.34	14500.	25.28	10.27
4	7800.	17.77	17.77	19895.	31.21	4.34	14501.	25.28	10.27
5	7800.	17.77	17.77	19896.	31.21	4.34	14501.	25.28	10.27
6	7800.	17.77	17.77	19897.	31.21	4.34	14502.	25.28	10.27
7	7800.	17.77	17.77	19897.	31.21	4.34	14503.	25.29	10.26
8	7800.	17.77	17.77	19898.	31.21	4.34	14504.	25.29	10.26
9	7800.	17.77	17.77	19899.	31.21	4.34	14504.	25.29	10.26
10	7800.	17.77	17.77	19899.	31.21	4.34	14504.	25.29	10.26

Girder 2 Elastic Section Properties for Pos Mom Stress

	Noncomp			Comp (n = 8.73)			Comp (3n =26.20)		
Tenth Point	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg
0	7800.	17.77	17.77	21053.	32.43	3.12	15604.	26.50	9.05
1	7800.	17.77	17.77	21053.	32.43	3.12	15604.	26.50	9.05
2	7800.	17.77	17.77	21054.	32.44	3.11	15605.	26.50	9.05
3	7800.	17.77	17.77	21055.	32.44	3.11	15606.	26.51	9.04
4	7800.	17.77	17.77	21057.	32.44	3.11	15607.	26.51	9.04
5	7800.	17.77	17.77	21058.	32.44	3.11	15609.	26.51	9.04
6	7800.	17.77	17.77	21059.	32.44	3.11	15610.	26.51	9.04
7	7800.	17.77	17.77	21060.	32.44	3.11	15611.	26.51	9.04
8	7800.	17.77	17.77	21062.	32.44	3.11	15612.	26.51	9.04
9	7800.	17.77	17.77	21063.	32.44	3.11	15614.	26.51	9.04
10	7800.	17.77	17.77	21063.	32.44	3.11	15614.	26.51	9.04

Girder 3 Elastic Section Properties for Pos Mom Stress

	----- Noncomp -----			------ Comp ------ (n = 8.73)			------ Comp ------ (3n =26.20)		
Tenth Point	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg
0	7800.	17.77	17.77	21053.	32.43	3.12	15604.	26.50	9.05
1	7800.	17.77	17.77	21053.	32.43	3.12	15604.	26.50	9.05
2	7800.	17.77	17.77	21054.	32.44	3.11	15605.	26.50	9.05
3	7800.	17.77	17.77	21055.	32.44	3.11	15606.	26.51	9.04
4	7800.	17.77	17.77	21057.	32.44	3.11	15607.	26.51	9.04
5	7800.	17.77	17.77	21058.	32.44	3.11	15609.	26.51	9.04
6	7800.	17.77	17.77	21059.	32.44	3.11	15610.	26.51	9.04
7	7800.	17.77	17.77	21060.	32.44	3.11	15611.	26.51	9.04
8	7800.	17.77	17.77	21062.	32.44	3.11	15612.	26.51	9.04
9	7800.	17.77	17.77	21063.	32.44	3.11	15614.	26.51	9.04
10	7800.	17.77	17.77	21063.	32.44	3.11	15614.	26.51	9.04

Girder 1 Plastic Section Properties

Tenth Point	Ps+Pr	Ptf+Pw +Pbf	PNA Frm tab D6.1-1 +Mp	-Mp	Pos Mp (k-ft)	Case	Neg Mp (k-ft)	Case
0	1356.	1256.	6.49	8.85	2359.	III	1819.	I
1	1356.	1256.	6.49	8.85	2359.	III	1819.	I
2	1356.	1256.	6.48	8.85	2359.	III	1819.	I
3	1357.	1256.	6.48	8.85	2359.	III	1819.	I
4	1357.	1256.	6.48	8.85	2359.	III	1819.	I
5	1357.	1256.	6.48	8.85	2359.	III	1819.	I
6	1357.	1256.	6.48	8.85	2359.	III	1819.	I
7	1357.	1256.	6.48	8.85	2359.	III	1819.	I
8	1358.	1256.	6.48	8.85	2360.	III	1819.	I
9	1358.	1256.	6.48	8.85	2360.	III	1819.	I
10	1358.	1256.	6.48	8.85	2360.	III	1819.	I

Girder 2 Plastic Section Properties

Tenth Point	Ps+Pr	Ptf+Pw +Pbf	PNA Frm tab D6.1-1 +Mp	-Mp	Pos Mp (k-ft)	Case	Neg Mp (k-ft)	Case
0	1718.	1256.	5.12	6.62	2431.	III	1914.	I
1	1718.	1256.	5.12	6.62	2431.	III	1914.	I
2	1718.	1256.	5.12	6.62	2431.	III	1914.	I
3	1719.	1256.	5.12	6.62	2431.	III	1914.	I
4	1719.	1256.	5.12	6.62	2431.	III	1914.	I
5	1720.	1256.	5.11	6.62	2431.	III	1914.	I
6	1720.	1256.	5.11	6.62	2431.	III	1914.	I
7	1720.	1256.	5.11	6.62	2431.	III	1914.	I
8	1721.	1256.	5.11	6.62	2431.	III	1914.	I
9	1721.	1256.	5.11	6.62	2431.	III	1914.	I
10	1721.	1256.	5.11	6.62	2431.	III	1914.	I

Girder 3 Plastic Section Properties

Tenth Point	Ps+Pr	Ptf+Pw +Pbf	PNA Frm tab D6.1-1 +Mp	-Mp	Pos Mp (k-ft)	Case	Neg Mp (k-ft)	Case
0	1718.	1256.	5.12	6.62	2431.	III	1914.	I
1	1718.	1256.	5.12	6.62	2431.	III	1914.	I
2	1718.	1256.	5.12	6.62	2431.	III	1914.	I
3	1719.	1256.	5.12	6.62	2431.	III	1914.	I
4	1719.	1256.	5.12	6.62	2431.	III	1914.	I
5	1720.	1256.	5.11	6.62	2431.	III	1914.	I
6	1720.	1256.	5.11	6.62	2431.	III	1914.	I
7	1720.	1256.	5.11	6.62	2431.	III	1914.	I
8	1721.	1256.	5.11	6.62	2431.	III	1914.	I
9	1721.	1256.	5.11	6.62	2431.	III	1914.	I
10	1721.	1256.	5.11	6.62	2431.	III	1914.	I

```
ID: 5970 - COLD BROOK ROAD - SPAN 2
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  FLOAT LANES
  GRID MODEL
  LRFD METHOD
  RATE MODE
  RATING PROJECT
  SELF WEIGHT FOR DEAD LOAD 1
DATA
  BRINCD 1 5 5 9 9 13 13 17 2 6 6 10 10 14 14 18 3 7 7 11 11 15 15 19 4
  8 8 12 12 16 16 20
  FPC 3.
  GCD-1 44.5617 2.7579 67.2116 1.8861 89.8615 1.0144 112.7404  0.1338
  GCD-2 46.4384 10.4275 69.0888 9.5692 91.7393 8.711 114.6265 7.8437
  GCD-3 48.3152 18.097 70.9661 17.2523 93.617 16.4076 116.5125 15.5537
  GCD-4 50.1919 25.7666 72.8433 24.9354 95.4947 24.1042 118.3986 23.2637
  GCD-5 52.0686 33.4361 74.7205 32.6184 97.3724 31.8008 120.2846 30.9737
  LANWID 12.
  LCD-1 44.3437 1.8672 66.9936  0.9954 89.6435  0.1236 112.5224  -0.7569
  LCD-2 47.196 13.5233 69.8459 12.6515 92.4958 11.7797 115.3747 10.8992
  RAD-1  0.
  RAD-2  0.
  RAD-3  0.
  RAD-4  0.
  RAD-5  0.
  ROADWG 32.8333 32.8333 32.8333 32.8333 32.8333 32.8333 32.8333 32.8333
  32.8333 32.8333 32.8333
  SLABEXT 2.25 2.25
  SLABT 7.
  SLABWEAR  0.
  SUP-1 1 4
  SUP-2 1 4
  SUP-3 1 4
  SUP-4 1 4
  SUP-5 1 4
  WAC-1  0.0415
  WAC-2  0.0383
  WAC-3  0.0383
  WAC-4  0.0383
  WAC-5  0.0415
  WAS-1  0.0112
  WAS-2  0.0174
  WAS-3  0.0174
  WAS-4  0.0174
  WAS-5  0.0112
  WCONC 150.
  WEAR  0.1642
  WS-1  0.17
  WS-2  0.17
  WS-3  0.17
  WS-4  0.17
  WS-5  0.17
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 2
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X170
DATA
  ADTT 584
  BCOVB 11.
  BCOVSP 9.625  49.
  BCOVT 1.125
  BR 22.6667  22.6667  22.8958
  ESLABW 74.3998  74.3998  74.4248  74.4499  74.4749  74.4999  74.5249
   74.5499  74.5749  74.6  74.6
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 1
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.  5.  6.  5.  6.  5.  6.  5.  4.
  PITSP 7.625  6.25  7.5  6.25  13.  6.25  7.5  6.25
  SLABT 7.
  SPN 68.2604
  STD  0.75
  STH 5.
  TSLABW 74.3998  74.3998  74.4248  74.4499  74.4749  74.4999  74.5249
   74.5499  74.5749  74.6  74.6
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 2
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X170
DATA
  ADTT 584
  BCOVB 11.
  BCOVSP 9.625  49.
  BCOVT 1.125
  BR 22.6667  22.6668  22.9036
  ESLABW 94.799  94.799  94.8491  94.8992  94.9493  94.9995  95.0496
   95.0998  95.1499  95.2  95.2
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 2
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.  5.  6.  5.  6.  5.  6.  5.  4.
  PITSP 7.625  6.25  7.5  6.25  13.  6.25  7.5  6.25
  SLABT 7.
  SPN 68.2604
  STD  0.75
  STH 5.
  TSLABW 94.799  94.799  94.8491  94.8992  94.9493  94.9995  95.0496
   95.0998  95.1499  95.2  95.2
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 2
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X170
DATA
  ADTT 584
  BCOVB 11.
  BCOVSP 9.625  49.
  BCOVT 1.125
  BR 22.6666  22.6666  22.9114
  ESLABW 94.7989  94.7989  94.849  94.899  94.9492  94.9994  95.0496
   95.0997  95.1496  95.1995  95.1995
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 3
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.  5.  6.  5.  6.  5.  6.  5.  4.
  PITSP 7.625  6.25  7.5  6.25  130.  6.25  7.5  6.25
  SLABT 7.
  SPN 68.2604
  STD  0.75
  STH 5.
  TSLABW 94.7989  94.7989  94.849  94.899  94.9492  94.9994  95.0496
   95.0997  95.1496  95.1995  95.1995
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 2
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X170
DATA
  ADTT 584
  BCOVB 11.
  BCOVSP 9.625  49.
  BCOVT 1.125
  BR 22.6667  22.6666  22.9193
  ESLABW 94.7995  94.7995  94.8496  94.8996  94.9495  94.9994  95.0493
   95.0992  95.1493  95.1993  95.1993
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 4
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.  5.  6.  5.  6.  5.  6.  5.  4.
  PITSP 7.625  6.25  7.5  6.25  13.  6.25  7.5  6.25
  SLABT 7.
  SPN 68.2604
  STD  0.75
  STH 5.
  TSLABW 94.7995  94.7995  94.8496  94.8996  94.9495  94.9994  95.0493
   95.0992  95.1493  95.1993  95.1993
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 2
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X170
DATA
  ADTT 584
  BCOVB 11.
  BCOVSP 9.625  49.
  BCOVT 1.125
  BR 22.6666  22.6667  22.9271
  ESLABW 74.3998  74.3998  74.4248  74.4499  74.4748  74.4996  74.5244
   74.5494  74.5746  74.5998  74.5998
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 5
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.  5.  6.  5.  6.  5.  6.  5.  4.
  PITSP 7.625  6.25  7.5  6.25  13.  6.25  7.5  6.25
  SLABT 7.
  SPN 68.2604
  STD  0.75
  STH 5.
  TSLABW 74.3998  74.3998  74.4248  74.4499  74.4748  74.4996  74.5244
   74.5494  74.5746  74.5998  74.5998
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 2
CONDITIONS
  A7 STEEL
  DIAPHRAGM W16X36 FOR GROUP 1
  DIAPHRAGM C15X33.9 FOR GROUP 2
  ENGLISH INPUT
  ENGLISH OUTPUT
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  TYPE D BRACING FOR GROUP 1
  TYPE D BRACING FOR GROUP 2
DATA
  BRL-1 7.8959  7.9091  7.9224  7.9373
  BRL-2 7.8958  7.9091  7.9223  7.9373
  BRL-3 7.8959  7.9091  7.9223  7.9373
  BRL-4 7.8958  7.909  7.9223  7.9373
  GCONNDST 4.375  4.375
  GRP-1 1 2 2 1
  GRP-2 1 2 2 1
  GRP-3 1 2 2 1
  GRP-4 1 2 2 1
  GRPHT  0.  0.
GO
```

Girder System Case Data - 5970 - COLD BROOK ROAD - SPAN 2

Geometry

Radius of curvature - Girder 2
0.00 ft

Radius of curvature - Girder 3
0.00 ft

Radius of curvature - Girder 4
0.00 ft

Radius of curvature - Girder 5
0.00 ft

Lane Geometry

Curb from girder 1, ft

-0.90 -0.90 -0.90 -0.90 -0.90 -0.90 -0.90 -0.90 -0.90
-0.90

Lane Width
12.00 ft

Float Range for Lanes - ft

Tenth Point	Far Lane Boundary From Gdr 1	Given Road Width From Curb	Range	Adjusted Road Width	Far Gdr From Curb
0	23.33	32.83	8.59	32.83	32.50
1	23.33	32.83	8.59	32.83	32.52
2	23.33	32.83	8.59	32.83	32.53
3	23.33	32.83	8.59	32.83	32.55
4	23.33	32.83	8.59	32.83	32.57
5	23.33	32.83	8.59	32.83	32.58
6	23.33	32.83	8.59	32.83	32.60
7	23.33	32.83	8.59	32.83	32.62
8	23.33	32.83	8.59	32.83	32.63
9	23.33	32.83	8.59	32.83	32.65
10	23.33	32.83	8.59	32.83	32.65

Road width and float range along lines connecting tenth points of exterio

Loading

Superimposed dead load, k/ft

Girder 1

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Girder 2

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Girder 3

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Girder 4

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Girder 5

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Wearing surface load

Girder 1
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
Girder 2
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
Girder 3
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
Girder 4
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
Girder 5
0.16 k/ft

0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft

LRFD Des or Tndm Truck with lane loading

Design truck multiplier: 1.0000

Tandem truck multiplier: 1.0000

Influence surface values not displayed

Multiple Presence Factors

1.20
1.00
0.85
0.65

Units

Input: U.S. customary

Output: U.S. customary

Girder 1 Case Data - 5970 - COLD BROOK ROAD - SPAN 2

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-

Top Flange Width	12.00	in
Top Flange Thickness	1.10	in
Web Depth	34.00	in
Web Thickness	0.68	in
Bottom Flange Width	12.00	in
Bottom Flange Thickness	1.10	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft   22.67 ft   45.33 ft   68.26 ft

Cover plates

Bottom cover plated regions-
9.62 -   58.62 ft
Bottom cover plate widths   11.00
Bottom cover plate thicknesses   1.12

Curvature

No curvature

Girder Type

Rolled shapes

Hinges

No interior hinges

Span lengths

Spans   68.26 ft

Stiffeners

Bearing stiffeners

Web splices

Fatigue

Average Single Lane Daily Truck Traffic: 496
Lanes available to trucks   2
Fatigue life: 100

Composite Behavior

Composite region for composite loading-   0. -   68.26 ft
Unshored construction

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

   Load Modifiers
       Ductility                   1.00
       Redundancy                  1.00
       Operational Classification  1.00

Reactions

   Max unfactored live load+impact reactions
         60.48 k      60.50 k
   Min unfactored live load+impact reactions
         -0.23 k      -0.15 k
   Max unfactored live reactions - No dynamic load allowance
         48.72 k      48.77 k
   Min unfactored live reactions - No dynamic load allowance
         -0.20 k      -0.14 k
   Total unfactored dead load DC1+DC2 reactions
         35.08 k      35.11 k
   Total unfactored dead load DW reactions
          5.55 k       5.57 k
   Bearing skew for redistribution qualification
                 90.00   90.00

Material


 Concrete

   Concrete strength            3.00 ksi
   Unit wt of concrete          150. lb/cu ft

   Aggregate source correction
       factor K1                1.00

   Slab T for strength             7.00 in
   Effective slab width           74.40 in     74.40 in     74.42 in     74.45 i
                                  74.47 in     74.50 in     74.52 in     74.55 i
                                  74.57 in     74.60 in     74.60 in
   Fillet                       1.00 in
   Effective slab width by tenth pt
                               74.40 in     74.40 in     74.42 in     74.45 in
                               74.47 in     74.50 in     74.52 in     74.55 in
                               74.57 in     74.60 in     74.60 in
   Self weight slab width by tenth pt
                               74.40 in     74.40 in     74.42 in     74.45 in
                               74.47 in     74.50 in     74.52 in     74.55 in
                               74.57 in     74.60 in     74.60 in

 Steel

   Top flange yield            32.00 ksi
   Bottom flange yield         32.00 ksi
   Bottom cover plate yield    32.00 ksi
   Web yield                   32.00 ksi
   Rebar yield                 60.00 ksi

Output

   Standard resolution summary tables

Units

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

Girder 2 Case Data - 5970 - COLD BROOK ROAD - SPAN 2

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-

Top Flange Width	12.00	in
Top Flange Thickness	1.10	in
Web Depth	34.00	in
Web Thickness	0.68	in
Bottom Flange Width	12.00	in
Bottom Flange Thickness	1.10	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft   22.67 ft   45.33 ft   68.26 ft

Cover plates

Bottom cover plated regions-
9.62 -   58.62 ft
Bottom cover plate widths   11.00
Bottom cover plate thicknesses   1.12

Curvature

No curvature

Girder Type

Rolled shapes

Hinges

No interior hinges

Span lengths

Spans   68.26 ft

Stiffeners

Bearing stiffeners

Web splices

Fatigue

Average Single Lane Daily Truck Traffic: 496
Lanes available to trucks   2
Fatigue life: 100

Composite Behavior

Composite region for composite loading-   0. -   68.26 ft
Unshored construction

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

   Load Modifiers
       Ductility                  1.00
       Redundancy                 1.00
       Operational Classification 1.00

Reactions

   Max unfactored live load+impact reactions
         78.68 k      78.07 k
   Min unfactored live load+impact reactions
         -0.73 k      -0.66 k
   Max unfactored live reactions - No dynamic load allowance
         63.13 k      62.67 k
   Min unfactored live reactions - No dynamic load allowance
         -0.59 k      -0.52 k
   Total unfactored dead load DC1+DC2 reactions
         39.15 k      39.21 k
   Total unfactored dead load DW reactions
          5.66 k       5.65 k
   Bearing skew for redistribution qualification
                 90.00   90.00

Material


 Concrete

   Concrete strength           3.00 ksi
   Unit wt of concrete         150. lb/cu ft

   Aggregate source correction
       factor K1               1.00

   Slab T for strength            7.00 in
   Effective slab width          94.80 in     94.80 in     94.85 in     94.90 i
                                 94.95 in     95.00 in     95.05 in     95.10 i
                                 95.15 in     95.20 in     95.20 in
   Fillet                      1.00 in
   Effective slab width by tenth pt
                              94.80 in     94.80 in     94.85 in     94.90 in
                              94.95 in     95.00 in     95.05 in     95.10 in
                              95.15 in     95.20 in     95.20 in
   Self weight slab width by tenth pt
                              94.80 in     94.80 in     94.85 in     94.90 in
                              94.95 in     95.00 in     95.05 in     95.10 in
                              95.15 in     95.20 in     95.20 in

 Steel

   Top flange yield           32.00 ksi
   Bottom flange yield        32.00 ksi
   Bottom cover plate yield   32.00 ksi
   Web yield                  32.00 ksi
   Rebar yield                60.00 ksi

Output

   Standard resolution summary tables

Units

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

Girder 3 Case Data - 5970 - COLD BROOK ROAD - SPAN 2

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-

Top Flange Width	12.00	in
Top Flange Thickness	1.10	in
Web Depth	34.00	in
Web Thickness	0.68	in
Bottom Flange Width	12.00	in
Bottom Flange Thickness	1.10	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft   22.67 ft   45.33 ft   68.26 ft

Cover plates

Bottom cover plated regions-
9.62 -   58.62 ft
Bottom cover plate widths   11.00
Bottom cover plate thicknesses   1.12

Curvature

No curvature

Girder Type

Rolled shapes

Hinges

No interior hinges

Span lengths

Spans   68.26 ft

Stiffeners

Bearing stiffeners

Web splices

Fatigue

Average Single Lane Daily Truck Traffic: 496
Lanes available to trucks   2
Fatigue life: 100

Composite Behavior

Composite region for composite loading-   0. -   68.26 ft
Unshored construction

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

   Load Modifiers
       Ductility                   1.00
       Redundancy                  1.00
       Operational Classification  1.00

Reactions

   Max unfactored live load+impact reactions
         77.38 k      76.87 k
   Min unfactored live load+impact reactions
          0.00 k       0.00 k
   Max unfactored live reactions - No dynamic load allowance
         62.18 k      61.78 k
   Min unfactored live reactions - No dynamic load allowance
          0.00 k       0.00 k
   Total unfactored dead load DC1+DC2 reactions
         39.95 k      39.85 k
   Total unfactored dead load DW reactions
          5.59 k       5.57 k
   Bearing skew for redistribution qualification
                 90.00   90.00

Material


 Concrete

   Concrete strength            3.00 ksi
   Unit wt of concrete          150. lb/cu ft

   Aggregate source correction
       factor K1                1.00

   Slab T for strength             7.00 in
   Effective slab width           94.80 in     94.80 in     94.85 in     94.90 i
                                  94.95 in     95.00 in     95.05 in     95.10 i
                                  95.15 in     95.20 in     95.20 in
   Fillet                       1.00 in
   Effective slab width by tenth pt
                               94.80 in     94.80 in     94.85 in     94.90 in
                               94.95 in     95.00 in     95.05 in     95.10 in
                               95.15 in     95.20 in     95.20 in
   Self weight slab width by tenth pt
                               94.80 in     94.80 in     94.85 in     94.90 in
                               94.95 in     95.00 in     95.05 in     95.10 in
                               95.15 in     95.20 in     95.20 in

 Steel

   Top flange yield            32.00 ksi
   Bottom flange yield         32.00 ksi
   Bottom cover plate yield    32.00 ksi
   Web yield                   32.00 ksi
   Rebar yield                 60.00 ksi

Output

   Standard resolution summary tables

Units

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

Case Data - 5970 - COLD BROOK ROAD - SPAN 2

Execution Mode

Rate Mode

Fatigue

```
*    Category B
*    Avg daily single lane truck traffic:    4000
```

Geometry

Brace Lengths from Girder 1 (ft) -
7.90, 7.91, 7.92, 7.94

Brace Lengths from Girder 2 (ft) -
7.90, 7.91, 7.92, 7.94

Brace Lengths from Girder 3 (ft) -
7.90, 7.91, 7.92, 7.94

Brace Lengths from Girder 4 (ft) -
7.90, 7.91, 7.92, 7.94

Connection to center of girder distance by group

4.38   4.38

Loading

LRFD Method

```
*    Ductility factor:                      1.0000
*    Operation classification factor:       1.0000
*    Redundancy factor:                   1.0000
```

Material

Steel grade: A7

Units

Input - U.S. Customary
Output - U.S. Customary

* Default

[This table uses the rating equation (6A.4.2.1-1) of the 2011 edition of the Manual for Bridge Evaluation.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmpt Allow Stress	Shear Capacity	Rating Factors Bending Inv.	Bending Oper.	Shear Inv.	Shear Oper.
0.00	2719. C	429.11	778.03 B	******	3.64	4.71
6.83	2719. C	429.11	3.80 B	4.93	4.07	5.28
13.65	3773. C	429.11	2.86 B	3.70	4.71	6.10
20.48	3774. C	429.11	2.05 B	2.65	6.11	7.92
27.30	3774. C	429.11	1.78 B	2.31	8.32	10.79
34.13	3774. C	429.11	1.76 B	2.28	8.62	11.18
40.96	3774. C	429.11	1.77 B	2.30	9.32	12.08
47.78	3775. C	429.11	2.15 B	2.79	6.49	8.41
54.61	3775. C	429.11	3.01 B	3.90	4.71	6.11
61.43	2721. C	429.11	3.69 B	4.78	4.38	5.68
68.26	2721. C	429.11	778.14 B	******	3.64	4.72

Service II

Span 1

Location	Allowable Stress	Rating Factors Bending Inv.	Bending Oper.
0.00	30400. S	625.35 B	812.96
6.83	30400. S	3.68 B	4.79
13.65	30400. S	3.09 B	4.01
20.48	30400. S	2.18 B	2.83
27.30	30400. S	1.88 B	2.44
34.13	30400. S	1.84 B	2.40
40.96	30400. S	1.87 B	2.43
47.78	30400. S	2.29 B	2.97
54.61	30400. S	3.26 B	4.23
61.43	30400. S	3.58 B	4.65
68.26	30400. S	791.24 B	******

****
Minimum rating is 1.76 at location 34.13 in span 1.
****

Note: PHIC and PHIS are not shown in the above capacities.

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
```

[This table uses the rating equation (6A.4.2.1-1) of the 2011 edition of the Manual for Bridge Evaluation.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmpt Allow Stress	Shear Capacity	Rating Factors Bending Inv.	Bending Oper.	Shear Inv.	Shear Oper.
0.00	2925. C	429.11	546.06 B	707.86	2.80	3.62
6.83	2925. C	429.11	3.33 B	4.32	3.25	4.21
13.65	3948. C	429.11	2.51 B	3.26	3.90	5.05
20.48	3949. C	429.11	1.86 B	2.41	5.41	7.01
27.30	3949. C	429.11	1.63 B	2.11	6.04	7.84
34.13	3950. C	429.11	1.58 B	2.05	6.32	8.19
40.96	3950. C	429.11	1.62 B	2.10	6.77	8.77
47.78	3951. C	429.11	1.96 B	2.54	5.79	7.51
54.61	3951. C	429.11	2.66 B	3.45	4.00	5.19
61.43	2928. C	429.11	3.21 B	4.16	3.53	4.58
68.26	2928. C	429.11	603.54 B	782.37	2.80	3.63

Service II

Span 1

Location	Allowable Stress	Rating Factors Bending Inv.	Bending Oper.
0.00	30400. S	529.73 B	688.65
6.83	30400. S	3.01 B	3.92
13.65	30400. S	2.61 B	3.40
20.48	30400. S	1.89 B	2.46
27.30	30400. S	1.63 B	2.12
34.13	30400. S	1.58 B	2.06
40.96	30400. S	1.63 B	2.11
47.78	30400. S	2.00 B	2.59
54.61	30400. S	2.76 B	3.59
61.43	30400. S	2.90 B	3.77
68.26	30400. S	581.32 B	755.71

****
Minimum rating is 1.58 at location 34.13 in span 1.
****

Note: PHIC and PHIS are not shown in the above capacities.

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
```

[This table uses the rating equation (6A.4.2.1-1) of the 2011 edition of the Manual for Bridge Evaluation.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmpt Allow Stress	Shear Capacity	Rating Factors Bending Inv.	Bending Oper.	Shear Inv.	Shear Oper.
0.00	2925. C	429.11	590.03 B	764.85	2.81	3.65
6.83	2925. C	429.11	3.27 B	4.24	3.21	4.16
13.65	3948. C	429.11	2.43 B	3.15	3.80	4.93
20.48	3949. C	429.11	1.77 B	2.30	5.14	6.66
27.30	3949. C	429.11	1.55 B	2.00	6.24	8.08
34.13	3950. C	429.11	1.52 B	1.97	6.50	8.43
40.96	3950. C	429.11	1.54 B	2.00	6.95	9.00
47.78	3951. C	429.11	1.87 B	2.42	5.50	7.13
54.61	3951. C	429.11	2.57 B	3.34	3.81	4.93
61.43	2928. C	429.11	3.17 B	4.11	3.49	4.52
68.26	2928. C	429.11	591.37 B	766.59	2.81	3.64

Service II

Span 1

Location	Allowable Stress	Rating Factors Bending Inv.	Bending Oper.
0.00	30400. S	572.38 B	744.10
6.83	30400. S	2.95 B	3.84
13.65	30400. S	2.52 B	3.28
20.48	30400. S	1.80 B	2.34
27.30	30400. S	1.55 B	2.01
34.13	30400. S	1.51 B	1.96
40.96	30400. S	1.54 B	2.00
47.78	30400. S	1.89 B	2.46
54.61	30400. S	2.67 B	3.47
61.43	30400. S	2.86 B	3.72
68.26	30400. S	573.27 B	745.25

****
Minimum rating is 1.51 at location 34.13 in span 1.
****

Note: PHIC and PHIS are not shown in the above capacities.

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
```

Girder 1 Fatigue Summary

Condition	Location from Left End of Girder	Category (Table 6.6.1.2.3-1)	Force Range (k-ft)	Actual Stress Range	Allowable Stress Range	Ratio
Base metal	0.00	C	0.86	0.00	6.24	0.000
Base metal	6.83	A	127.81	1.89	12.00	0.158
Base metal	13.65	A	221.56	2.14	12.00	0.178
Base metal	20.48	A	281.70	2.72	12.00	0.226
Base metal	27.30	A	295.48	2.85	12.00	0.238
Base metal	34.13	A	303.09	2.92	12.00	0.244
Base metal	40.96	A	323.98	3.13	12.00	0.260
Base metal	47.78	A	265.08	2.56	12.00	0.213
Base metal	54.61	A	206.09	1.99	12.00	0.166
Base metal	61.43	A	145.63	2.15	12.00	0.180
Base metal	68.26	C	1.06	0.00	6.24	0.000
End of bot cover PL	9.62	E'	170.27	2.52	2.78	0.906
End of bot cover PL	58.62	E'	180.70	2.67	2.78	0.961

Girder 2 Fatigue Summary

Condition	Location from Left End of Girder	Category (Table 6.6.1.2.3-1)	Force Range (k-ft)	Actual Stress Range	Allowable Stress Range	Ratio
Base metal	0.00	C	1.33	0.00	6.24	0.000
Base metal	6.83	A	128.48	1.87	12.00	0.155
Base metal	13.65	A	214.57	2.03	12.00	0.169
Base metal	20.48	A	253.54	2.40	12.00	0.200
Base metal	27.30	A	256.90	2.43	12.00	0.203
Base metal	34.13	A	272.32	2.58	12.00	0.215
Base metal	40.96	A	292.81	2.77	12.00	0.231
Base metal	47.78	A	231.83	2.19	12.00	0.183
Base metal	54.61	A	191.49	1.81	12.00	0.151
Base metal	61.43	A	154.75	2.25	12.00	0.187
Base metal	68.26	C	1.44	0.00	6.24	0.000
End of bot cover PL	9.62	E'	168.75	2.45	2.78	0.881
End of bot cover PL	58.62	E'	183.99	2.67	2.78	0.960

Girder 3 Fatigue Summary

Condition	Location from Left End of Girder	Category (Table 6.6.1.2.3-1)	Force Range (k-ft)	Actual Stress Range	Allowable Stress Range	Ratio
Base metal	0.00	C	1.64	0.00	6.24	0.001
Base metal	6.83	A	96.73	1.40	12.00	0.117
Base metal	13.65	A	164.94	1.56	12.00	0.130
Base metal	20.48	A	205.68	1.95	12.00	0.162
Base metal	27.30	A	213.03	2.02	12.00	0.168
Base metal	34.13	A	219.34	2.08	12.00	0.173
Base metal	40.96	A	235.62	2.23	12.00	0.186
Base metal	47.78	A	190.68	1.81	12.00	0.150
Base metal	54.61	A	150.40	1.42	12.00	0.119
Base metal	61.43	A	110.78	1.61	12.00	0.134
Base metal	68.26	C	1.67	0.00	6.24	0.001
End of bot cover PL	9.62	E'	127.95	1.86	2.78	0.668
End of bot cover PL	58.62	E'	135.50	1.97	2.78	0.707

Girder 1 Factored Strengths

Forces include ductility, redundancy, and operational factors

Tenth Point	Loc	Factored Shear (k) HL93	Shear Strength (k)	Ratio	Factored Moment (k-ft) HL93	Bending Strength (k-ft)	Ratio
0	0.00	155.1	429.1 (5)	0.361	3.5 I	2719.1 (20)	0.001
1	6.83	136.6	429.1 (5)	0.318	948.1 I	2719.1 (20)	0.349
2	13.65	115.8	429.1 (5)	0.270	1687.4 I	3773.4 (20)	0.447
3	20.48	88.1	429.1 (5)	0.205	2223.3 I	3773.6 (20)	0.589
4	27.30	60.5	429.1 (5)	0.141	2486.6 I	3773.9 (20)	0.659
5	34.13	49.8	429.1 (5)	0.116	2527.4 I	3774.1 (20)	0.670
6	40.96	55.0	429.1 (5)	0.128	2495.7 I	3774.3 (20)	0.661
7	47.78	84.1	429.1 (5)	0.196	2150.9 I	3774.5 (20)	0.570
8	54.61	115.8	429.1 (5)	0.270	1626.5 I	3774.7 (20)	0.431
9	61.43	129.7	429.1 (5)	0.302	964.9 I	2720.7 (20)	0.355
10	68.26	155.0	429.1 (5)	0.361	3.4 I	2720.7 (20)	0.001

Absolute values of factored moment are shown with determining strength

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

Girder 2 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	189.5	429.1 (5)	0.442	5.4 I	2924.9 (20)	0.002
1	6.83	163.2	429.1 (5)	0.380	1119.1 I	2924.9 (20)	0.383
2	13.65	135.1	429.1 (5)	0.315	1940.1 I	3948.4 (20)	0.491
3	20.48	97.5	429.1 (5)	0.227	2493.5 I	3948.9 (20)	0.631
4	27.30	80.5	429.1 (5)	0.188	2780.4 I	3949.3 (20)	0.704
5	34.13	67.9	429.1 (5)	0.158	2844.5 I	3949.7 (20)	0.720
6	40.96	73.1	429.1 (5)	0.170	2787.5 I	3950.1 (20)	0.706
7	47.78	92.5	429.1 (5)	0.216	2405.7 I	3950.5 (20)	0.609
8	54.61	132.5	429.1 (5)	0.309	1864.6 I	3950.9 (20)	0.472
9	61.43	153.6	429.1 (5)	0.358	1147.3 I	2927.8 (20)	0.392
10	68.26	189.4	429.1 (5)	0.441	4.8 I	2927.8 (20)	0.002

Absolute values of factored moment are shown with determining strength

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

Girder 3 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	189.2	429.1 (5)	0.441	5.0 I	2924.9 (20)	0.002
1	6.83	165.2	429.1 (5)	0.385	1137.8 I	2924.9 (20)	0.389
2	13.65	138.3	429.1 (5)	0.322	1992.8 I	3948.4 (20)	0.505
3	20.48	102.1	429.1 (5)	0.238	2584.1 I	3948.9 (20)	0.654
4	27.30	78.4	429.1 (5)	0.183	2883.8 I	3949.3 (20)	0.730
5	34.13	66.0	429.1 (5)	0.154	2933.2 I	3949.7 (20)	0.743
6	40.96	71.5	429.1 (5)	0.167	2890.9 I	3950.1 (20)	0.732
7	47.78	96.9	429.1 (5)	0.226	2494.4 I	3950.5 (20)	0.631
8	54.61	138.2	429.1 (5)	0.322	1913.6 I	3950.9 (20)	0.484
9	61.43	155.6	429.1 (5)	0.363	1160.1 I	2927.8 (20)	0.396
10	68.26	189.4	429.1 (5)	0.441	5.0 I	2927.8 (20)	0.002

Absolute values of factored moment are shown with determining strength

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

Girder 1 Service Moment - k-ft - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I	Fatigue Truck Range LL+I
0	0.0	0.	0.	0.	1.	-2.	1.	-2.	1.
1	6.8	176.	35.	34.	361.	0.	304.	0.	170.
2	13.7	315.	63.	60.	643.	0.	559.	0.	295.
3	20.5	418.	82.	79.	846.	0.	730.	0.	376.
4	27.3	475.	93.	90.	939.	0.	798.	0.	394.
5	34.1	494.	97.	94.	942.	0.	860.	0.	404.
6	41.0	475.	93.	90.	943.	0.	829.	0.	432.
7	47.8	415.	81.	78.	807.	0.	660.	0.	353.
8	54.6	313.	62.	60.	610.	0.	484.	0.	275.
9	61.4	175.	35.	33.	373.	0.	282.	0.	194.
10	68.3	0.	0.	0.	2.	-1.	2.	-1.	1.

Bracing

	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I
	22.7	441.	86.	83.	888.	0.	763.	0.
	45.3	441.	86.	83.	863.	0.	722.	0.

Tenth Point	Sidewalk Max	Sidewalk Min	Max LL+I Fat Trk	Min LL+I Fat Trk	Max LL+I Prmt Trk	Min LL+I Prmt Trk
0	0.	0.	0.	-1.	0.	0.
1	0.	0.	170.	0.	0.	0.
2	0.	0.	295.	0.	0.	0.
3	0.	0.	376.	0.	0.	0.
4	0.	0.	394.	0.	0.	0.
5	0.	0.	404.	0.	0.	0.
6	0.	0.	432.	0.	0.	0.
7	0.	0.	353.	0.	0.	0.
8	0.	0.	275.	0.	0.	0.
9	0.	0.	194.	0.	0.	0.
10	0.	0.	1.	-1.	0.	0.

Girder 2 Service Moment - k-ft - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I	Fatigue Truck Range LL+I
0	0.0	0.	0.	0.	1.	-3.	1.	-3.	2.
1	6.8	198.	36.	35.	442.	0.	382.	0.	171.
2	13.7	351.	64.	62.	759.	0.	683.	0.	286.
3	20.5	461.	85.	82.	965.	0.	851.	0.	338.
4	27.3	525.	96.	93.	1066.	0.	916.	0.	343.
5	34.1	547.	100.	96.	1081.	0.	1000.	0.	363.
6	41.0	525.	96.	93.	1070.	0.	965.	0.	390.
7	47.8	458.	84.	81.	919.	0.	766.	0.	309.
8	54.6	349.	63.	61.	719.	0.	598.	0.	255.
9	61.4	196.	35.	34.	461.	0.	367.	0.	206.
10	68.3	0.	0.	0.	3.	-2.	2.	-1.	2.

Bracing

	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I
	22.7	487.	89.	86.	1009.	0.	883.	0.
	45.3	487.	89.	86.	979.	0.	833.	0.

Tenth Point	Sidewalk Max	Sidewalk Min	Max LL+I Fat Trk	Min LL+I Fat Trk	Max LL+I Prmt Trk	Min LL+I Prmt Trk
0	0.	0.	0.	-1.	0.	0.
1	0.	0.	171.	0.	0.	0.
2	0.	0.	286.	0.	0.	0.
3	0.	0.	338.	0.	0.	0.
4	0.	0.	343.	0.	0.	0.
5	0.	0.	363.	0.	0.	0.
6	0.	0.	390.	0.	0.	0.
7	0.	0.	309.	0.	0.	0.
8	0.	0.	255.	0.	0.	0.
9	0.	0.	206.	0.	0.	0.
10	0.	0.	1.	-1.	0.	0.

Girder 3 Service Moment - k-ft - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I	Fatigue Truck Range LL+I
0	0.0	0.	0.	0.	2.	-3.	2.	-2.	2.
1	6.8	204.	36.	34.	450.	0.	384.	0.	129.
2	13.7	363.	63.	61.	782.	0.	695.	0.	220.
3	20.5	479.	83.	80.	1007.	0.	882.	0.	274.
4	27.3	544.	94.	91.	1114.	0.	954.	0.	284.
5	34.1	567.	98.	95.	1120.	0.	1035.	0.	292.
6	41.0	544.	94.	91.	1118.	0.	998.	0.	314.
7	47.8	475.	82.	79.	959.	0.	784.	0.	254.
8	54.6	360.	62.	60.	740.	0.	601.	0.	201.
9	61.4	202.	35.	34.	465.	0.	360.	0.	148.
10	68.3	0.	0.	0.	2.	-3.	2.	-2.	2.

Bracing

	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I
	22.7	505.	87.	84.	1054.	0.	918.	0.
	45.3	505.	87.	84.	1023.	0.	857.	0.

Tenth Point	Sidewalk Max	Sidewalk Min	Max LL+I Fat Trk	Min LL+I Fat Trk	Max LL+I Prmt Trk	Min LL+I Prmt Trk
0	0.	0.	1.	-1.	0.	0.
1	0.	0.	129.	0.	0.	0.
2	0.	0.	220.	0.	0.	0.
3	0.	0.	274.	0.	0.	0.
4	0.	0.	284.	0.	0.	0.
5	0.	0.	292.	0.	0.	0.
6	0.	0.	314.	0.	0.	0.
7	0.	0.	254.	0.	0.	0.
8	0.	0.	201.	0.	0.	0.
9	0.	0.	148.	0.	0.	0.
10	0.	0.	1.	-1.	0.	0.

Girder 1 Service Shear - k - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane LL+I (+)	Design Truck+ Lane LL+I (-)	Tandem Truck+ Lane LL+I	Fatigue Truck Range LL+I
0	0.00	28.52	5.74	5.54	59.41	0.00	51.18	28.84
1	6.83	23.21	4.58	4.42	54.39	0.00	43.91	24.94
2	13.65	17.61	3.42	3.30	48.30	-2.99	39.94	23.51
3	20.48	12.16	2.26	2.18	38.16	-5.84	34.60	19.96
4	27.30	5.63	1.17	1.13	28.76	-15.58	25.81	17.89
5	34.13	0.03	0.01	0.01	28.44	-24.65	27.63	23.23
6	40.96	-5.58	-1.15	-1.11	18.05	-25.69	-23.10	17.92
7	47.78	-12.14	-2.26	-2.19	7.99	-35.91	-31.29	19.77
8	54.61	-17.74	-3.42	-3.31	5.71	-48.20	-45.27	26.35
9	61.43	-23.01	-4.58	-4.43	1.35	-50.64	-42.89	25.55
10	68.26	-28.52	-5.74	-5.55	0.00	-59.36	-50.39	28.61

Tenth Point	Fatigue Trk LL+I	Permit Trk LL+I	Permit Range	Sidewalk
0	28.84	0.00	0.00	0.00
1	24.94	0.00	0.00	0.00
2	21.63	0.00	0.00	0.00
3	17.23	0.00	0.00	0.00
4	12.47	0.00	0.00	0.00
5	-11.80	0.00	0.00	0.00
6	-11.00	0.00	0.00	0.00
7	-15.99	0.00	0.00	0.00
8	-23.98	0.00	0.00	0.00
9	-24.58	0.00	0.00	0.00
10	-28.61	0.00	0.00	0.00

Girder 2 Service Shear - k - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane LL+I (+)	Design Truck+ Lane LL+I (-)	Tandem Truck+ Lane LL+I	Fatigue Truck Range LL+I
0	0.00	32.19	5.87	5.67	76.23	0.00	68.86	31.44
1	6.83	25.84	4.71	4.55	67.53	0.00	55.81	25.04
2	13.65	19.21	3.55	3.43	58.00	-7.20	50.88	25.50
3	20.48	12.71	2.39	2.31	42.97	-13.95	40.36	21.98
4	27.30	6.65	1.16	1.12	39.48	-20.64	35.64	22.39
5	34.13	0.01	0.00	0.00	38.81	-33.88	37.92	27.85
6	40.96	-6.63	-1.16	-1.12	23.66	-35.26	-32.03	22.27
7	47.78	-12.68	-2.38	-2.30	19.18	-40.12	-36.16	22.12
8	54.61	-19.33	-3.54	-3.42	13.49	-56.43	-55.11	28.99
9	61.43	-25.64	-4.70	-4.54	3.19	-62.19	-55.53	27.15
10	68.26	-32.20	-5.86	-5.66	0.00	-76.16	-67.46	31.26

	Fatigue Trk LL+I	Permit Trk LL+I	Permit Range	Sidewalk
0	31.44	0.00	0.00	0.00
1	25.04	0.00	0.00	0.00
2	20.93	0.00	0.00	0.00
3	15.40	0.00	0.00	0.00
4	15.84	0.00	0.00	0.00
5	-15.59	0.00	0.00	0.00
6	-14.09	0.00	0.00	0.00
7	-13.49	0.00	0.00	0.00
8	-23.38	0.00	0.00	0.00
9	-24.85	0.00	0.00	0.00
10	-31.26	0.00	0.00	0.00

Girder 3 Service Shear - k - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane LL+I (+)	Design Truck+ Lane LL+I (-)	Tandem Truck+ Lane LL+I	Fatigue Truck Range LL+I
0	0.00	33.04	5.79	5.59	75.58	0.00	66.85	22.37
1	6.83	26.69	4.63	4.47	68.21	0.00	55.86	18.76
2	13.65	20.06	3.47	3.35	59.34	-5.14	49.99	18.06
3	20.48	13.56	2.31	2.23	45.12	-9.92	42.20	15.43
4	27.30	6.66	1.16	1.12	38.27	-20.59	32.83	14.53
5	34.13	0.02	0.00	0.00	37.72	-33.00	36.91	19.07
6	40.96	-6.63	-1.16	-1.12	23.57	-34.36	-31.03	14.54
7	47.78	-13.52	-2.30	-2.23	13.25	-42.17	-37.56	15.28
8	54.61	-20.17	-3.46	-3.35	9.61	-59.25	-57.62	20.67
9	61.43	-26.48	-4.62	-4.47	2.27	-62.87	-54.72	19.48
10	68.26	-33.04	-5.78	-5.59	0.00	-75.71	-65.89	22.04

Tenth Point	Fatigue Trk LL+I	Permit Trk LL+I	Permit Range	Sidewalk
0	22.37	0.00	0.00	0.00
1	18.76	0.00	0.00	0.00
2	16.04	0.00	0.00	0.00
3	12.51	0.00	0.00	0.00
4	10.13	0.00	0.00	0.00
5	-9.74	0.00	0.00	0.00
6	-9.01	0.00	0.00	0.00
7	-11.40	0.00	0.00	0.00
8	-18.21	0.00	0.00	0.00
9	-18.47	0.00	0.00	0.00
10	-22.04	0.00	0.00	0.00

Girder 1 Elastic Section Properties for Pos Mom Stress

	Noncomp			Comp (n = 8.73)			Comp (3n =26.20)		
Tenth Point	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg
0	10500.	18.10	18.10	24704.	30.46	5.74	17917.	24.60	11.60
1	10500.	18.10	18.10	24704.	30.46	5.74	17917.	24.60	11.60
2	13958.	15.53	21.80	35425.	28.48	8.85	24585.	21.97	15.36
3	13958.	15.53	21.80	35428.	28.48	8.84	24588.	21.97	15.36
4	13958.	15.53	21.80	35432.	28.48	8.84	24591.	21.97	15.36
5	13958.	15.53	21.80	35436.	28.48	8.84	24593.	21.97	15.35
6	13958.	15.53	21.80	35439.	28.49	8.84	24596.	21.97	15.35
7	13958.	15.53	21.80	35443.	28.49	8.84	24598.	21.97	15.35
8	13958.	15.53	21.80	35447.	28.49	8.83	24601.	21.98	15.35
9	10500.	18.10	18.10	24721.	30.47	5.73	17932.	24.61	11.59
10	10500.	18.10	18.10	24721.	30.47	5.73	17932.	24.61	11.59

Girder 2 Elastic Section Properties for Pos Mom Stress

	----- Noncomp -----			------ Comp ------ (n = 8.73)			------ Comp ------ (3n =26.20)		
Tenth Point	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg
0	10500.	18.10	18.10	26265.	31.77	4.43	19251.	25.76	10.44
1	10500.	18.10	18.10	26265.	31.77	4.43	19251.	25.76	10.44
2	13958.	15.53	21.80	38066.	30.04	7.28	26627.	23.19	14.13
3	13958.	15.53	21.80	38072.	30.04	7.28	26631.	23.20	14.13
4	13958.	15.53	21.80	38078.	30.05	7.28	26636.	23.20	14.13
5	13958.	15.53	21.80	38084.	30.05	7.27	26641.	23.20	14.12
6	13958.	15.53	21.80	38089.	30.05	7.27	26645.	23.20	14.12
7	13958.	15.53	21.80	38095.	30.06	7.27	26650.	23.21	14.12
8	13958.	15.53	21.80	38101.	30.06	7.26	26655.	23.21	14.11
9	10500.	18.10	18.10	26292.	31.80	4.40	19275.	25.78	10.42
10	10500.	18.10	18.10	26292.	31.80	4.40	19275.	25.78	10.42

Girder 3 Elastic Section Properties for Pos Mom Stress

	Noncomp			Comp (n = 8.73)			Comp (3n =26.20)		
Tenth Point	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg
0	10500.	18.10	18.10	26265.	31.77	4.43	19251.	25.76	10.44
1	10500.	18.10	18.10	26265.	31.77	4.43	19251.	25.76	10.44
2	13958.	15.53	21.80	38066.	30.04	7.28	26627.	23.19	14.13
3	13958.	15.53	21.80	38072.	30.04	7.28	26631.	23.20	14.13
4	13958.	15.53	21.80	38078.	30.05	7.28	26636.	23.20	14.13
5	13958.	15.53	21.80	38084.	30.05	7.27	26641.	23.20	14.12
6	13958.	15.53	21.80	38089.	30.05	7.27	26645.	23.20	14.12
7	13958.	15.53	21.80	38095.	30.06	7.27	26650.	23.21	14.12
8	13958.	15.53	21.80	38101.	30.06	7.26	26655.	23.21	14.12
9	10500.	18.10	18.10	26292.	31.80	4.40	19275.	25.78	10.42
10	10500.	18.10	18.10	26292.	31.80	4.40	19275.	25.78	10.42

Girder 2 Plastic Section Properties

Tenth Point	Ps+Pr	Ptf+Pw +Pbf	PNA Frm tab D6.1-1 +Mp	-Mp	Pos Mp (k-ft)	Case	Neg Mp (k-ft)	Case
0	1723.	1585.	6.44	7.81	3021.	III	2371.	I
1	1723.	1585.	6.44	7.81	3021.	III	2371.	I
2	1724.	1585.	8.33	7.81	4209.	II	3103.	I
3	1725.	1585.	8.33	7.81	4210.	II	3103.	I
4	1725.	1585.	8.33	7.81	4210.	II	3103.	I
5	1726.	1585.	8.33	7.81	4210.	II	3103.	I
6	1727.	1585.	8.33	7.81	4211.	II	3103.	I
7	1728.	1585.	8.33	7.81	4211.	II	3103.	I
8	1729.	1585.	8.33	7.81	4212.	II	3103.	I
9	1730.	1585.	6.41	7.81	3023.	III	2371.	I
10	1730.	1585.	6.41	7.81	3023.	III	2371.	I

Girder 3 Plastic Section Properties

Tenth Point	Ps+Pr	Ptf+Pw +Pbf	PNA Frm tab D6.1-1 +Mp	-Mp	Pos Mp (k-ft)	Case	Neg Mp (k-ft)	Case
0	1723.	1585.	6.44	7.81	3021.	III	2371.	I
1	1723.	1585.	6.44	7.81	3021.	III	2371.	I
2	1724.	1585.	8.33	7.81	4209.	II	3103.	I
3	1725.	1585.	8.33	7.81	4210.	II	3103.	I
4	1725.	1585.	8.33	7.81	4210.	II	3103.	I
5	1726.	1585.	8.33	7.81	4210.	II	3103.	I
6	1727.	1585.	8.33	7.81	4211.	II	3103.	I
7	1728.	1585.	8.33	7.81	4211.	II	3103.	I
8	1729.	1585.	8.33	7.81	4212.	II	3103.	I
9	1730.	1585.	6.41	7.81	3023.	III	2371.	I
10	1730.	1585.	6.41	7.81	3023.	III	2371.	I

```
ID: 5970 - COLD BROOK ROAD - SPAN 5
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  FLOAT LANES
  GRID MODEL
  LRFD METHOD
  RATE MODE
  RATING PROJECT
  SELF WEIGHT FOR DEAD LOAD 1
DATA
  BRINCD 1 5 2 6 3 7 4 8 5 9 6 10 7 11 8 12 9 13 10 14 11 15 12 16 13 17
  14 18 15 19 16 20
  FPC 3.
  GCD-1 254.0724 1.7439 276.2237 2.5691 298.375 3.3943 319.985 4.1994
  GCD-2 255.9788 9.5349 278.1309 10.3399 300.2829 11.145 321.9119 11.931
  GCD-3 257.8853 17.3258 280.038 18.1107 302.1908 18.8956 323.8387
  19.6626
  GCD-4 259.7917 25.1168 281.9452 25.8815 304.0987 26.6462 325.7654
  27.3942
  GCD-5 261.6982 32.9078 283.8523 33.6523 306.0065 34.3969 327.6921
  35.1257
  LANWID 12.
  LCD-1 253.8544  0.8532 276.0057 1.6784 298.157 2.5036 319.7671 3.3087
  LCD-2 256.7067 12.5093 278.858 13.3345 301.0093 14.1597 322.6193
  14.9648
  RAD-1  0.
  RAD-2  0.
  RAD-3  0.
  RAD-4  0.
  RAD-5  0.
  ROADWG 33.84 33.84 33.84 33.84 33.84 33.84 33.84 33.84 33.84 33.84
  33.84
  SLABEXT 2.25 2.25
  SLABT 7.
  SLABWEAR  0.
  SUP-1 1 4
  SUP-2 1 4
  SUP-3 1 4
  SUP-4 1 4
  SUP-5 1 4
  WAC-1  0.0415
  WAC-2  0.0383
  WAC-3  0.0383
  WAC-4  0.0383
  WAC-5  0.0415
  WAS-1  0.0112
  WAS-2  0.0175
  WAS-3  0.0175
  WAS-4  0.0175
  WAS-5  0.0112
  WCONC 150.
  WEAR  0.1642
  WS-1  0.17
  WS-2  0.17
  WS-3  0.17
  WS-4  0.17
  WS-5  0.17
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 5
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X170
DATA
  ADTT 584
  BCOVB 11.
  BCOVSP 10.5  45.
  BCOVT 1.
  BR 22.1667  22.1667  21.625
  ESLABW 75.1624  75.1624  75.1999  75.2373  75.2748  75.3123  75.3498
   75.3873  75.4248  75.4622  75.4622
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 1
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.  5.  6.  5.  6.  5.  6.  5.  4.
  PITSP 7.583  6.25  7.5  6.67  10.  6.67  7.5  6.25
  SLABT 7.
  SPN 66.0313
  STD  0.75
  STH 5.
  TSLABW 75.1624  75.1624  75.1999  75.2373  75.2748  75.3123  75.3498
   75.3873  75.4248  75.4622  75.4622
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 5
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X170
DATA
  ADTT 584
  BCOVB 11.
  BCOVSP 10.5  45.
  BCOVT 1.
  BR 22.1667  22.1666  21.6433
  ESLABW 96.3249  96.3249  96.3998  96.4748  96.5499  96.625  96.7001
   96.7751  96.85  96.925  96.925
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 2
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.  5.  6.  5.  6.  5.  6.  5.  4.
  PITSP 7.583  6.25  7.5  6.67  10.  6.67  7.5  6.25
  SLABT 7.
  SPN 66.0313
  STD  0.75
  STH 5.
  TSLABW 96.3249  96.3249  96.3998  96.4748  96.5499  96.625  96.7001
   96.7751  96.85  96.925  96.925
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 5
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X170
DATA
  ADTT 584
  BCOVB 11.
  BCOVSP 10.5  45.
  BCOVT 1.
  BR 22.1666  22.1667  21.6615
  ESLABW 96.3248  96.3248  96.3998  96.4748  96.5498  96.6249  96.6999
   96.775  96.85  96.925  96.925
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 3
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.  5.  6.  5.  6.  5.  6.  5.  4.
  PITSP 7.583  6.25  7.5  6.67  10.  6.67  7.5  6.25
  SLABT 7.
  SPN 66.0313
  STD  0.75
  STH 5.
  TSLABW 96.3248  96.3248  96.3998  96.4748  96.5498  96.6249  96.6999
   96.775  96.85  96.925  96.925
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 5
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X170
DATA
  ADTT 584
  BCOVB 11.
  BCOVSP 10.5  45.
  BCOVT 1.
  BR 22.1667  22.1667  21.6796
  ESLABW 96.3249  96.3249  96.4001  96.4753  96.5502  96.6249  96.6996
   96.7744  96.8494  96.9244  96.9244
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 4
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.  5.  6.  5.  6.  5.  6.  5.  4.
  PITSP 7.583  6.25  7.5  6.67  10.  6.67  7.5  6.25
  SLABT 7.
  SPN 66.0313
  STD  0.75
  STH 5.
  TSLABW 96.3249  96.3249  96.4001  96.4753  96.5502  96.6249  96.6996
   96.7744  96.8494  96.9244  96.9244
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 5
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W36X170
DATA
  ADTT 584
  BCOVB 11.
  BCOVSP 10.5  45.
  BCOVT 1.
  BR 22.1666  22.1667  21.6979
  ESLABW 75.1626  75.1626  75.2003  75.238  75.2754  75.3126  75.3499
   75.3872  75.4247  75.4622  75.4622
  FILLET 1.
  FPC 3.
  FY 32.
  IGIRD 5
  LIFE 100
  NSTUDL 3
  PHIC 1.
  PHIS 1.
  PITCH 4.  5.  6.  5.  6.  5.  6.  5.  4.
  PITSP 7.583  6.25  7.5  6.67  10.  6.67  7.5  6.25
  SLABT 7.
  SPN 66.0313
  STD  0.75
  STH 5.
  TSLABW 75.1626  75.1626  75.2003  75.238  75.2754  75.3126  75.3499
   75.3872  75.4247  75.4622  75.4622
  WCONC 150.
GO
```

```
ID: 5970 - COLD BROOK ROAD - SPAN 5
CONDITIONS
  A7 STEEL
  DIAPHRAGM W16X36 FOR GROUP 1
  DIAPHRAGM C15X33.9 FOR GROUP 2
  ENGLISH INPUT
  ENGLISH OUTPUT
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  TYPE D BRACING FOR GROUP 1
  TYPE D BRACING FOR GROUP 2
DATA
  BRL-1 8.0208  8.0014  7.9821  7.9681
  BRL-2 8.0208  8.0014  7.982  7.9681
  BRL-3 8.0208  8.0014  7.982  7.968
  BRL-4 8.0209  8.0014  7.982  7.968
  GCONNDST 4.375  4.375
  GRP-1 1 2 2 1
  GRP-2 1 2 2 1
  GRP-3 1 2 2 1
  GRP-4 1 2 2 1
  GRPHT  0.  0.
GO
```

Girder System Case Data - 5970 - COLD BROOK ROAD - SPAN 5

Geometry

Radius of curvature - Girder 2
0.00 ft

Radius of curvature - Girder 3
0.00 ft

Radius of curvature - Girder 4
0.00 ft

Radius of curvature - Girder 5
0.00 ft

Lane Geometry

Curb from girder 1, ft

-0.88 -0.88 -0.88 -0.88 -0.88 -0.88 -0.88 -0.88 -0.88
-0.88

Lane Width
12.00 ft

Float Range for Lanes - ft

Tenth Point	Far Lane Boundary From Gdr 1	Given Road Width From Curb	Range	Adjusted Road Width	Far Gdr From Curb
0	23.56	33.84	9.36	33.84	33.00
1	23.56	33.84	9.36	33.84	32.98
2	23.56	33.84	9.36	33.84	32.96
3	23.57	33.84	9.36	33.84	32.94
4	23.57	33.84	9.35	33.84	32.92
5	23.57	33.84	9.35	33.84	32.89
6	23.58	33.84	9.35	33.84	32.87
7	23.58	33.84	9.34	33.84	32.85
8	23.58	33.84	9.34	33.84	32.83
9	23.58	33.84	9.34	33.84	32.81
10	23.59	33.84	9.34	33.84	32.81

Road width and float range along lines connecting tenth points of exterio

Loading

Superimposed dead load, k/ft

Girder 1

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Girder 2

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Girder 3

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Girder 4

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Girder 5

0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17 0.17
0.17

Wearing surface load

Girder 1
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
Girder 2
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
Girder 3
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
Girder 4
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
Girder 5
0.16 k/ft

0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft
0.16 k/ft

LRFD Des or Tndm Truck with lane loading

Design truck multiplier: 1.0000

Tandem truck multiplier: 1.0000

Influence surface values not displayed

Multiple Presence Factors

1.20
1.00
0.85
0.65

Units

Input: U.S. customary

Output: U.S. customary

Girder 1 Case Data - 5970 - COLD BROOK ROAD - SPAN 5

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-

Top Flange Width	12.00	in
Top Flange Thickness	1.10	in
Web Depth	34.00	in
Web Thickness	0.68	in
Bottom Flange Width	12.00	in
Bottom Flange Thickness	1.10	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft   22.17 ft   44.33 ft   66.03 ft

Cover plates

Bottom cover plated regions-
10.50 -   55.50 ft
Bottom cover plate widths   11.00
Bottom cover plate thicknesses   1.00

Curvature

No curvature

Girder Type

Rolled shapes

Hinges

No interior hinges

Span lengths

Spans   66.03 ft

Stiffeners

Bearing stiffeners

Web splices

Fatigue

Average Single Lane Daily Truck Traffic: 496
Lanes available to trucks   2
Fatigue life: 100

Composite Behavior

Composite region for composite loading-   0. -   66.03 ft
Unshored construction

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

   Load Modifiers
       Ductility                   1.00
       Redundancy                  1.00
       Operational Classification  1.00

Reactions

   Max unfactored live load+impact reactions
         59.61 k      58.86 k
   Min unfactored live load+impact reactions
         -0.44 k      -0.23 k
   Max unfactored live reactions - No dynamic load allowance
         47.92 k      47.39 k
   Min unfactored live reactions - No dynamic load allowance
         -0.36 k      -0.20 k
   Total unfactored dead load DC1+DC2 reactions
         33.97 k      34.05 k
   Total unfactored dead load DW reactions
          5.35 k       5.40 k
   Bearing skew for redistribution qualification
                 90.00   90.00

Material


 Concrete

   Concrete strength            3.00 ksi
   Unit wt of concrete          150. lb/cu ft

   Aggregate source correction
       factor K1                1.00

   Slab T for strength             7.00 in
   Effective slab width           75.16 in     75.16 in     75.20 in     75.24 i
                                  75.27 in     75.31 in     75.35 in     75.39 i
                                  75.42 in     75.46 in     75.46 in
   Fillet                       1.00 in
   Effective slab width by tenth pt
                               75.16 in     75.16 in     75.20 in     75.24 in
                               75.27 in     75.31 in     75.35 in     75.39 in
                               75.42 in     75.46 in     75.46 in
   Self weight slab width by tenth pt
                               75.16 in     75.16 in     75.20 in     75.24 in
                               75.27 in     75.31 in     75.35 in     75.39 in
                               75.42 in     75.46 in     75.46 in

 Steel

   Top flange yield            32.00 ksi
   Bottom flange yield         32.00 ksi
   Bottom cover plate yield    32.00 ksi
   Web yield                   32.00 ksi
   Rebar yield                 60.00 ksi

Output

   Standard resolution summary tables

Units

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

Girder 2 Case Data - 5970 - COLD BROOK ROAD - SPAN 5

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-

Top Flange Width	12.00	in
Top Flange Thickness	1.10	in
Web Depth	34.00	in
Web Thickness	0.68	in
Bottom Flange Width	12.00	in
Bottom Flange Thickness	1.10	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft   22.17 ft   44.33 ft   66.03 ft

Cover plates

Bottom cover plated regions-
10.50 -   55.50 ft
Bottom cover plate widths   11.00
Bottom cover plate thicknesses   1.00

Curvature

No curvature

Girder Type

Rolled shapes

Hinges

No interior hinges

Span lengths

Spans   66.03 ft

Stiffeners

Bearing stiffeners

Web splices

Fatigue

Average Single Lane Daily Truck Traffic: 496
Lanes available to trucks   2
Fatigue life: 100

Composite Behavior

Composite region for composite loading-   0. -   66.03 ft
Unshored construction

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

   Load Modifiers
       Ductility                   1.00
       Redundancy                  1.00
       Operational Classification  1.00

Reactions

   Max unfactored live load+impact reactions
         79.51 k      77.01 k
   Min unfactored live load+impact reactions
         -1.04 k      -0.99 k
   Max unfactored live reactions - No dynamic load allowance
         63.68 k      61.75 k
   Min unfactored live reactions - No dynamic load allowance
         -0.84 k      -0.80 k
   Total unfactored dead load DC1+DC2 reactions
         38.30 k      38.26 k
   Total unfactored dead load DW reactions
          5.48 k       5.46 k
   Bearing skew for redistribution qualification
                 90.00   90.00

Material


 Concrete

   Concrete strength            3.00 ksi
   Unit wt of concrete          150. lb/cu ft

   Aggregate source correction
       factor K1                1.00

   Slab T for strength             7.00 in
   Effective slab width           96.32 in     96.32 in     96.40 in     96.47 i
                                  96.55 in     96.62 in     96.70 in     96.78 i
                                  96.85 in     96.93 in     96.93 in
   Fillet                       1.00 in
   Effective slab width by tenth pt
                               96.32 in     96.32 in     96.40 in     96.47 in
                               96.55 in     96.62 in     96.70 in     96.78 in
                               96.85 in     96.93 in     96.93 in
   Self weight slab width by tenth pt
                               96.32 in     96.32 in     96.40 in     96.47 in
                               96.55 in     96.62 in     96.70 in     96.78 in
                               96.85 in     96.93 in     96.93 in

 Steel

   Top flange yield            32.00 ksi
   Bottom flange yield         32.00 ksi
   Bottom cover plate yield    32.00 ksi
   Web yield                   32.00 ksi
   Rebar yield                 60.00 ksi

Output

   Standard resolution summary tables

Units

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

Girder 3 Case Data - 5970 - COLD BROOK ROAD - SPAN 5

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-

Top Flange Width	12.00	in
Top Flange Thickness	1.10	in
Web Depth	34.00	in
Web Thickness	0.68	in
Bottom Flange Width	12.00	in
Bottom Flange Thickness	1.10	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft   22.17 ft   44.33 ft   66.03 ft

Cover plates

Bottom cover plated regions-
10.50 -   55.50 ft
Bottom cover plate widths   11.00
Bottom cover plate thicknesses   1.00

Curvature

No curvature

Girder Type

Rolled shapes

Hinges

No interior hinges

Span lengths

Spans   66.03 ft

Stiffeners

Bearing stiffeners

Web splices

Fatigue

Average Single Lane Daily Truck Traffic: 496
Lanes available to trucks   2
Fatigue life: 100

Composite Behavior

Composite region for composite loading-   0. -   66.03 ft
Unshored construction

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

   Load Modifiers
       Ductility                  1.00
       Redundancy                 1.00
       Operational Classification  1.00

Reactions

   Max unfactored live load+impact reactions
         78.96 k      77.41 k
   Min unfactored live load+impact reactions
          0.00 k       0.00 k
   Max unfactored live reactions - No dynamic load allowance
         63.32 k      62.12 k
   Min unfactored live reactions - No dynamic load allowance
          0.00 k       0.00 k
   Total unfactored dead load DC1+DC2 reactions
         38.89 k      38.99 k
   Total unfactored dead load DW reactions
          5.39 k       5.39 k
   Bearing skew for redistribution qualification
                 90.00   90.00

Material


 Concrete

   Concrete strength           3.00 ksi
   Unit wt of concrete         150. lb/cu ft

   Aggregate source correction
       factor K1               1.00

   Slab T for strength            7.00 in
   Effective slab width          96.32 in     96.32 in     96.40 in     96.47 i
                                 96.55 in     96.62 in     96.70 in     96.78 i
                                 96.85 in     96.93 in     96.93 in
   Fillet                      1.00 in
   Effective slab width by tenth pt
                              96.32 in     96.32 in     96.40 in     96.47 in
                              96.55 in     96.62 in     96.70 in     96.78 in
                              96.85 in     96.93 in     96.93 in
   Self weight slab width by tenth pt
                              96.32 in     96.32 in     96.40 in     96.47 in
                              96.55 in     96.62 in     96.70 in     96.78 in
                              96.85 in     96.93 in     96.93 in

 Steel

   Top flange yield           32.00 ksi
   Bottom flange yield        32.00 ksi
   Bottom cover plate yield   32.00 ksi
   Web yield                  32.00 ksi
   Rebar yield                60.00 ksi

Output

   Standard resolution summary tables

Units

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

Case Data - 5970 - COLD BROOK ROAD - SPAN 5

Execution Mode

Rate Mode

Fatigue

* Category B
* Avg daily single lane truck traffic: 4000

Geometry

Brace Lengths from Girder 1 (ft) -
8.02, 8.00, 7.98, 7.97

Brace Lengths from Girder 2 (ft) -
8.02, 8.00, 7.98, 7.97

Brace Lengths from Girder 3 (ft) -
8.02, 8.00, 7.98, 7.97

Brace Lengths from Girder 4 (ft) -
8.02, 8.00, 7.98, 7.97

Connection to center of girder distance by group

4.38 4.38

Loading

LRFD Method

* Ductility factor: 1.0000
* Operation classification factor: 1.0000
* Redundancy factor: 1.0000

Material

Steel grade: A7

Units

Input - U.S. Customary
Output - U.S. Customary

* Default

[This table uses the rating equation (6A.4.2.1-1) of the 2011 edition of the Manual for Bridge Evaluation.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmpt Allow Stress	Shear Capacity	Rating Factors Bending Inv.		Bending Oper.	Shear Inv.	Shear Oper.
0.00	2725. C	429.11	585.76	B	759.32	3.67	4.75
6.60	2725. C	429.11	4.10	B	5.31	4.41	5.72
13.21	3665. C	429.11	2.97	B	3.85	4.80	6.22
19.81	3665. C	429.11	2.13	B	2.76	6.28	8.15
26.41	3665. C	429.11	1.86	B	2.41	8.80	11.41
33.02	3666. C	429.11	1.83	B	2.37	10.07	13.06
39.62	3666. C	429.11	1.85	B	2.39	9.52	12.35
46.22	3666. C	429.11	2.22	B	2.87	6.65	8.62
52.83	3667. C	429.11	3.15	B	4.09	4.84	6.28
59.43	2727. C	429.11	3.96	B	5.13	4.47	5.79
66.03	2727. C	429.11	572.09	B	741.60	3.76	4.87

Service II

Span 1

Location	Allowable Stress	Rating Factors Bending Inv.		Bending Oper.
0.00	30400. S	599.34	B	779.15
6.60	30400. S	3.98	B	5.17
13.21	30400. S	3.18	B	4.14
19.81	30400. S	2.25	B	2.92
26.41	30400. S	1.94	B	2.52
33.02	30400. S	1.90	B	2.47
39.62	30400. S	1.92	B	2.50
46.22	30400. S	2.34	B	3.04
52.83	30400. S	3.38	B	4.39
59.43	30400. S	3.85	B	5.00
66.03	30400. S	580.86	B	755.12

****
Minimum rating is 1.83 at location 33.02 in span 1.
****

Note: PHIC and PHIS are not shown in the above capacities.

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
```

[This table uses the rating equation (6A.4.2.1-1) of the 2011 edition of the Manual for Bridge Evaluation.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmpt Allow Stress	Shear Capacity	Rating Factors Bending Inv.	Bending Oper.	Shear Inv.	Shear Oper.
0.00	2936. C	429.11	399.62 B	518.03	2.75	3.57
6.60	2936. C	429.11	3.56 B	4.61	3.51	4.55
13.21	3843. C	429.11	2.58 B	3.34	3.89	5.04
19.81	3844. C	429.11	1.90 B	2.46	5.40	7.00
26.41	3844. C	429.11	1.67 B	2.16	6.31	8.18
33.02	3845. C	429.11	1.62 B	2.10	7.23	9.38
39.62	3846. C	429.11	1.65 B	2.14	6.80	8.82
46.22	3846. C	429.11	1.99 B	2.58	5.85	7.58
52.83	3847. C	429.11	2.75 B	3.56	4.03	5.22
59.43	2940. C	429.11	3.40 B	4.41	3.54	4.59
66.03	2940. C	429.11	446.04 B	578.20	2.85	3.70

Service II

Span 1

Location	Allowable Stress	Rating Factors Bending Inv.	Bending Oper.
0.00	30400. S	386.64 B	502.63
6.60	30400. S	3.22 B	4.19
13.21	30400. S	2.65 B	3.44
19.81	30400. S	1.91 B	2.48
26.41	30400. S	1.65 B	2.15
33.02	30400. S	1.60 B	2.08
39.62	30400. S	1.64 B	2.13
46.22	30400. S	2.00 B	2.61
52.83	30400. S	2.82 B	3.67
59.43	30400. S	3.08 B	4.01
66.03	30400. S	428.36 B	556.86

****
Minimum rating is 1.60 at location 33.02 in span 1.
****

Note: PHIC and PHIS are not shown in the above capacities.

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
```

[This table uses the rating equation (6A.4.2.1-1) of the 2011 edition of the Manual for Bridge Evaluation.]

HL93

Strength I

Span 1

Location	Compct Mom Cap/Noncmpt Allow Stress	Shear Capacity	Rating Factors Bending Inv.	Bending Oper.	Shear Inv.	Shear Oper.
0.00	2936. C	429.11	425.82 B	551.99	2.74	3.55
6.60	2936. C	429.11	3.44 B	4.46	3.41	4.42
13.21	3843. C	429.11	2.47 B	3.20	3.76	4.88
19.81	3844. C	429.11	1.80 B	2.33	5.13	6.65
26.41	3844. C	429.11	1.58 B	2.04	6.35	8.23
33.02	3845. C	429.11	1.54 B	2.00	7.27	9.42
39.62	3846. C	429.11	1.56 B	2.03	6.83	8.86
46.22	3846. C	429.11	1.88 B	2.44	5.52	7.15
52.83	3847. C	429.11	2.63 B	3.41	3.80	4.93
59.43	2940. C	429.11	3.31 B	4.29	3.44	4.46
66.03	2940. C	429.11	419.22 B	543.44	2.80	3.64

Service II

Span 1

Location	Allowable Stress	Rating Factors Bending Inv.	Bending Oper.
0.00	30400. S	411.99 B	535.58
6.60	30400. S	3.11 B	4.05
13.21	30400. S	2.53 B	3.29
19.81	30400. S	1.80 B	2.34
26.41	30400. S	1.56 B	2.02
33.02	30400. S	1.52 B	1.97
39.62	30400. S	1.54 B	2.01
46.22	30400. S	1.89 B	2.45
52.83	30400. S	2.70 B	3.50
59.43	30400. S	2.99 B	3.89
66.03	30400. S	405.17 B	526.72

****
Minimum rating is 1.52 at location 33.02 in span 1.
****

Note: PHIC and PHIS are not shown in the above capacities.

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
```

Girder 1 Fatigue Summary

Condition	Location from Left End of Girder	Category (Table 6.6.1.2.3-1)	Force Range (k-ft)	Actual Stress Range	Allowable Stress Range	Ratio
Base metal	0.00	C	1.03	0.00	6.24	0.000
Base metal	6.60	A	119.39	1.77	12.00	0.147
Base metal	13.21	A	210.05	2.11	12.00	0.175
Base metal	19.81	A	265.51	2.66	12.00	0.222
Base metal	26.41	A	278.83	2.79	12.00	0.233
Base metal	33.02	A	284.51	2.85	12.00	0.238
Base metal	39.62	A	306.58	3.07	12.00	0.256
Base metal	46.22	A	250.34	2.51	12.00	0.209
Base metal	52.83	A	193.63	1.94	12.00	0.162
Base metal	59.43	A	137.48	2.03	12.00	0.169
Base metal	66.03	C	1.41	0.00	6.24	0.001
End of bot cover PL	10.50	E'	177.15	2.62	2.78	0.941
End of bot cover PL	55.50	E'	170.81	2.52	2.78	0.908

Girder 2 Fatigue Summary

Condition	Location from Left End of Girder	Category (Table 6.6.1.2.3-1)	Force Range (k-ft)	Actual Stress Range	Allowable Stress Range	Ratio
Base metal	0.00	C	1.73	0.00	6.24	0.001
Base metal	6.60	A	122.23	1.77	12.00	0.148
Base metal	13.21	A	206.63	2.03	12.00	0.169
Base metal	19.81	A	245.60	2.42	12.00	0.201
Base metal	26.41	A	247.81	2.44	12.00	0.203
Base metal	33.02	A	258.21	2.54	12.00	0.212
Base metal	39.62	A	283.69	2.79	12.00	0.232
Base metal	46.22	A	222.76	2.19	12.00	0.183
Base metal	52.83	A	183.85	1.81	12.00	0.151
Base metal	59.43	A	147.22	2.13	12.00	0.178
Base metal	66.03	C	1.98	0.00	6.24	0.001
End of bot cover PL	10.50	E'	177.54	2.57	2.78	0.925
End of bot cover PL	55.50	E'	168.73	2.45	2.78	0.879

Girder 3 Fatigue Summary

Condition	Location from Left End of Girder	Category (Table 6.6.1.2.3-1)	Force Range (k-ft)	Actual Stress Range	Allowable Stress Range	Ratio
Base metal	0.00	C	2.18	0.00	6.24	0.001
Base metal	6.60	A	94.77	1.37	12.00	0.115
Base metal	13.21	A	164.10	1.61	12.00	0.134
Base metal	19.81	A	202.34	1.99	12.00	0.166
Base metal	26.41	A	208.73	2.05	12.00	0.171
Base metal	33.02	A	214.17	2.11	12.00	0.176
Base metal	39.62	A	232.35	2.28	12.00	0.190
Base metal	46.22	A	186.48	1.83	12.00	0.153
Base metal	52.83	A	147.57	1.45	12.00	0.121
Base metal	59.43	A	109.40	1.59	12.00	0.132
Base metal	66.03	C	2.30	0.00	6.24	0.001
End of bot cover PL	10.50	E'	139.44	2.02	2.78	0.727
End of bot cover PL	55.50	E'	132.02	1.91	2.78	0.688

Girder 1 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	153.1	429.1 (5)	0.357	4.7 I	2725.0 (20)	0.002
1	6.60	128.2	429.1 (5)	0.299	888.6 I	2725.0 (20)	0.326
2	13.21	113.3	429.1 (5)	0.264	1582.4 I	3664.8 (20)	0.432
3	19.81	85.6	429.1 (5)	0.199	2088.2 I	3665.1 (20)	0.570
4	26.41	57.5	429.1 (5)	0.134	2336.7 I	3665.4 (20)	0.637
5	33.02	46.8	429.1 (5)	0.109	2375.9 I	3665.7 (20)	0.648
6	39.62	53.8	429.1 (5)	0.125	2348.6 I	3666.1 (20)	0.641
7	46.22	82.0	429.1 (5)	0.191	2033.2 I	3666.4 (20)	0.555
8	52.83	112.7	429.1 (5)	0.263	1519.8 I	3666.7 (20)	0.414
9	59.43	127.0	429.1 (5)	0.296	906.9 I	2727.4 (20)	0.333
10	66.03	150.5	429.1 (5)	0.351	4.7 I	2727.4 (20)	0.002

Absolute values of factored moment are shown with determining strength

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

Girder 2 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	190.7	429.1 (5)	0.444	7.4 I	2936.1 (20)	0.003
1	6.60	153.6	429.1 (5)	0.358	1059.1 I	2936.1 (20)	0.361
2	13.21	134.7	429.1 (5)	0.314	1843.8 I	3843.2 (20)	0.480
3	19.81	97.2	429.1 (5)	0.227	2382.8 I	3843.8 (20)	0.620
4	26.41	77.4	429.1 (5)	0.180	2650.2 I	3844.4 (20)	0.689
5	33.02	66.8	429.1 (5)	0.156	2714.8 I	3845.1 (20)	0.706
6	39.62	72.5	429.1 (5)	0.169	2665.1 I	3845.7 (20)	0.693
7	46.22	91.4	429.1 (5)	0.213	2304.0 I	3846.3 (20)	0.599
8	52.83	131.2	429.1 (5)	0.306	1762.8 I	3846.9 (20)	0.458
9	59.43	152.5	429.1 (5)	0.355	1089.9 I	2940.4 (20)	0.371
10	66.03	185.8	429.1 (5)	0.433	6.5 I	2940.4 (20)	0.002

Absolute values of factored moment are shown with determining strength

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

Girder 3 Factored Strengths

Forces include ductility, redundancy, and operational factors

Tenth Point	Loc	Factored Shear (k) HL93	Shear Strength (k)	Ratio	Factored Moment (k-ft) HL93	Bending Strength (k-ft)	Ratio
0	0.00	191.8	429.1 (5)	0.447	7.0 I	2936.1 (20)	0.002
1	6.60	157.3	429.1 (5)	0.367	1086.9 I	2936.1 (20)	0.370
2	13.21	138.7	429.1 (5)	0.323	1905.9 I	3843.2 (20)	0.496
3	19.81	101.8	429.1 (5)	0.237	2480.6 I	3843.8 (20)	0.645
4	26.41	77.0	429.1 (5)	0.180	2762.1 I	3844.4 (20)	0.718
5	33.02	65.9	429.1 (5)	0.154	2814.9 I	3845.1 (20)	0.732
6	39.62	72.3	429.1 (5)	0.168	2776.8 I	3845.7 (20)	0.722
7	46.22	96.2	429.1 (5)	0.224	2402.3 I	3846.3 (20)	0.625
8	52.83	137.7	429.1 (5)	0.321	1824.3 I	3846.9 (20)	0.474
9	59.43	156.2	429.1 (5)	0.364	1116.7 I	2940.4 (20)	0.380
10	66.03	188.7	429.1 (5)	0.440	7.1 I	2940.4 (20)	0.002

Absolute values of factored moment are shown with determining strength

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

Girder 1 Service Moment - k-ft - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I	Fatigue Truck Range LL+I
0	0.0	0.	0.	0.	1.	-3.	1.	-2.	1.
1	6.6	165.	33.	32.	339.	0.	288.	0.	159.
2	13.2	295.	58.	56.	603.	0.	530.	0.	280.
3	19.8	391.	77.	74.	796.	0.	693.	0.	354.
4	26.4	444.	87.	84.	884.	0.	756.	0.	372.
5	33.0	462.	91.	88.	888.	0.	814.	0.	379.
6	39.6	444.	87.	84.	890.	0.	785.	0.	409.
7	46.2	389.	76.	73.	767.	0.	628.	0.	334.
8	52.8	294.	58.	56.	570.	0.	456.	0.	258.
9	59.4	164.	32.	31.	351.	0.	262.	0.	183.
10	66.0	0.	0.	0.	3.	-2.	2.	-1.	2.

Bracing

	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I
	22.2	415.	81.	78.	839.	0.	727.	0.
	44.3	409.	80.	77.	810.	0.	675.	0.

	Sidewalk Max	Sidewalk Min	Max LL+I Fat Trk	Min LL+I Fat Trk	Max LL+I Prmt Trk	Min LL+I Prmt Trk
0	0.	0.	0.	-1.	0.	0.
1	0.	0.	159.	0.	0.	0.
2	0.	0.	280.	0.	0.	0.
3	0.	0.	354.	0.	0.	0.
4	0.	0.	372.	0.	0.	0.
5	0.	0.	379.	0.	0.	0.
6	0.	0.	409.	0.	0.	0.
7	0.	0.	334.	0.	0.	0.
8	0.	0.	258.	0.	0.	0.
9	0.	0.	183.	0.	0.	0.
10	0.	0.	1.	-1.	0.	0.

Girder 2 Service Moment - k-ft - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I	Fatigue Truck Range LL+I
0	0.0	0.	0.	0.	1.	-4.	1.	-3.	2.
1	6.6	187.	34.	33.	420.	0.	370.	0.	163.
2	13.2	332.	60.	58.	724.	0.	661.	0.	276.
3	19.8	435.	79.	76.	929.	0.	825.	0.	327.
4	26.4	495.	90.	87.	1023.	0.	883.	0.	330.
5	33.0	517.	93.	90.	1039.	0.	965.	0.	344.
6	39.6	495.	90.	87.	1031.	0.	931.	0.	378.
7	46.2	432.	78.	76.	887.	0.	740.	0.	297.
8	52.8	329.	59.	57.	681.	0.	573.	0.	245.
9	59.4	185.	33.	32.	440.	0.	347.	0.	196.
10	66.0	0.	0.	0.	4.	-2.	3.	-2.	3.

Bracing

	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I
	22.2	461.	84.	81.	975.	0.	858.	0.
	44.3	454.	82.	79.	935.	0.	792.	0.

Tenth Point	Sidewalk Max	Sidewalk Min	Max LL+I Fat Trk	Min LL+I Fat Trk	Max LL+I Prmt Trk	Min LL+I Prmt Trk
0	0.	0.	1.	-2.	0.	0.
1	0.	0.	163.	0.	0.	0.
2	0.	0.	276.	0.	0.	0.
3	0.	0.	327.	0.	0.	0.
4	0.	0.	330.	0.	0.	0.
5	0.	0.	344.	0.	0.	0.
6	0.	0.	378.	0.	0.	0.
7	0.	0.	297.	0.	0.	0.
8	0.	0.	245.	0.	0.	0.
9	0.	0.	196.	0.	0.	0.
10	0.	0.	2.	-1.	0.	0.

Girder 3 Service Moment - k-ft - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I	Fatigue Truck Range LL+I
0	0.0	0.	0.	0.	3.	-4.	3.	-3.	3.
1	6.6	193.	33.	32.	432.	0.	376.	0.	126.
2	13.2	343.	59.	57.	753.	0.	679.	0.	219.
3	19.8	452.	77.	75.	975.	0.	860.	0.	270.
4	26.4	514.	88.	85.	1075.	0.	926.	0.	278.
5	33.0	536.	92.	89.	1084.	0.	1007.	0.	286.
6	39.6	515.	88.	85.	1083.	0.	972.	0.	310.
7	46.2	450.	77.	74.	933.	0.	764.	0.	249.
8	52.8	341.	58.	56.	709.	0.	581.	0.	197.
9	59.4	191.	33.	32.	451.	0.	346.	0.	146.
10	66.0	0.	0.	0.	3.	-4.	3.	-3.	3.

Bracing

	Loc	DC1	DC2	DW	Design Truck+ Lane Max LL+I	Design Truck+ Lane Min LL+I	Tandem Truck+ Lane Max LL+I	Tandem Truck+ Lane Min LL+I
	22.2	480.	82.	79.	1025.	0.	897.	0.
	44.3	473.	81.	78.	984.	0.	821.	0.

	Sidewalk Max	Sidewalk Min	Max LL+I Fat Trk	Min LL+I Fat Trk	Max LL+I Prmt Trk	Min LL+I Prmt Trk
0	0.	0.	1.	-2.	0.	0.
1	0.	0.	126.	0.	0.	0.
2	0.	0.	219.	0.	0.	0.
3	0.	0.	270.	0.	0.	0.
4	0.	0.	278.	0.	0.	0.
5	0.	0.	286.	0.	0.	0.
6	0.	0.	310.	0.	0.	0.
7	0.	0.	249.	0.	0.	0.
8	0.	0.	197.	0.	0.	0.
9	0.	0.	146.	0.	0.	0.
10	0.	0.	1.	-2.	0.	0.

Girder 1 Service Shear - k - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane LL+I (+)	Design Truck+ Lane LL+I (-)	Tandem Truck+ Lane LL+I	Fatigue Truck Range LL+I
0	0.00	27.63	5.55	5.36	59.18	0.00	51.15	27.52
1	6.60	22.46	4.43	4.28	50.38	0.00	43.16	24.01
2	13.21	17.04	3.31	3.19	47.47	-2.96	39.27	22.67
3	19.81	11.75	2.19	2.11	37.14	-5.71	34.12	19.33
4	26.41	5.43	1.13	1.09	27.22	-15.17	25.31	16.85
5	33.02	0.01	0.01	0.01	24.34	-24.28	26.75	21.97
6	39.62	-5.41	-1.11	-1.07	15.85	-25.16	-22.71	17.38
7	46.22	-11.73	-2.19	-2.11	7.94	-35.11	-30.42	18.70
8	52.83	-17.16	-3.31	-3.20	3.60	-47.03	-44.02	25.36
9	59.43	-22.31	-4.43	-4.28	1.29	-49.78	-42.31	24.35
10	66.03	-27.65	-5.55	-5.36	0.00	-57.70	-48.98	26.70

Tenth Point	Fatigue Trk LL+I	Permit Trk LL+I	Permit Range	Sidewalk
0	27.52	0.00	0.00	0.00
1	24.01	0.00	0.00	0.00
2	20.80	0.00	0.00	0.00
3	16.63	0.00	0.00	0.00
4	11.56	0.00	0.00	0.00
5	11.12	0.00	0.00	0.00
6	-10.55	0.00	0.00	0.00
7	-15.05	0.00	0.00	0.00
8	-23.09	0.00	0.00	0.00
9	-23.42	0.00	0.00	0.00
10	-26.70	0.00	0.00	0.00

Girder 2 Service Shear - k - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane LL+I (+)	Design Truck+ Lane LL+I (-)	Tandem Truck+ Lane LL+I	Fatigue Truck Range LL+I
0	0.00	31.42	5.68	5.48	77.77	0.00	70.61	31.05
1	6.60	25.21	4.55	4.40	62.73	0.00	56.02	24.63
2	13.21	18.75	3.43	3.32	58.28	-7.06	51.13	25.22
3	19.81	12.41	2.31	2.23	43.12	-13.45	40.63	21.35
4	26.41	6.50	1.12	1.08	37.86	-20.43	35.60	21.51
5	33.02	0.03	0.00	0.00	33.80	-33.89	-38.16	29.48
6	39.62	-6.44	-1.12	-1.08	21.42	-35.11	-31.97	21.84
7	46.22	-12.36	-2.30	-2.22	18.39	-39.83	-35.67	20.80
8	52.83	-18.84	-3.42	-3.31	8.63	-56.23	-54.94	28.50
9	59.43	-25.04	-4.55	-4.39	3.10	-62.23	-55.89	26.99
10	66.03	-31.44	-5.67	-5.47	0.00	-74.99	-66.58	30.37

Tenth Point	Fatigue Trk LL+I	Permit Trk LL+I	Permit Range	Sidewalk
0	31.05	0.00	0.00	0.00
1	24.63	0.00	0.00	0.00
2	20.72	0.00	0.00	0.00
3	14.88	0.00	0.00	0.00
4	15.13	0.00	0.00	0.00
5	14.82	0.00	0.00	0.00
6	-13.58	0.00	0.00	0.00
7	-12.37	0.00	0.00	0.00
8	-23.05	0.00	0.00	0.00
9	-24.76	0.00	0.00	0.00
10	-30.37	0.00	0.00	0.00

Girder 3 Service Shear - k - (load modifier not included)

Tenth Point	Loc	DC1	DC2	DW	Design Truck+ Lane LL+I (+)	Design Truck+ Lane LL+I (-)	Tandem Truck+ Lane LL+I	Fatigue Truck Range LL+I
0	0.00	32.28	5.60	5.41	77.91	0.00	69.25	22.93
1	6.60	26.07	4.48	4.32	64.39	0.00	56.74	18.97
2	13.21	19.61	3.35	3.24	60.09	-5.43	50.69	18.51
3	19.81	13.27	2.23	2.16	45.26	-10.39	42.83	15.73
4	26.41	6.50	1.13	1.09	37.64	-20.69	33.50	14.40
5	33.02	0.03	0.00	0.00	33.64	-33.75	-37.63	19.45
6	39.62	-6.45	-1.12	-1.08	21.49	-34.96	-31.72	15.02
7	46.22	-13.23	-2.23	-2.15	14.20	-42.11	-37.40	15.19
8	52.83	-19.71	-3.35	-3.23	6.57	-59.42	-57.89	21.08
9	59.43	-25.92	-4.47	-4.32	2.35	-63.85	-56.13	19.78
10	66.03	-32.31	-5.59	-5.40	0.00	-76.12	-66.67	21.93

Tenth Point	Fatigue Trk LL+I	Permit Trk LL+I	Permit Range	Sidewalk
0	22.93	0.00	0.00	0.00
1	18.97	0.00	0.00	0.00
2	16.24	0.00	0.00	0.00
3	12.46	0.00	0.00	0.00
4	9.88	0.00	0.00	0.00
5	9.78	0.00	0.00	0.00
6	-9.21	0.00	0.00	0.00
7	-10.94	0.00	0.00	0.00
8	-18.38	0.00	0.00	0.00
9	-18.68	0.00	0.00	0.00
10	-21.93	0.00	0.00	0.00

Girder 1 Elastic Section Properties for Pos Mom Stress

	----- Noncomp -----			------ Comp ------ (n = 8.73)			------ Comp ------ (3n =26.20)		
Tenth Point	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg
0	10500.	18.10	18.10	24770.	30.52	5.68	17971.	24.65	11.55
1	10500.	18.10	18.10	24770.	30.52	5.68	17971.	24.65	11.55
2	13621.	15.75	21.45	34409.	28.74	8.46	23994.	22.26	14.94
3	13621.	15.75	21.45	34415.	28.74	8.46	23998.	22.26	14.94
4	13621.	15.75	21.45	34420.	28.75	8.45	24001.	22.26	14.94
5	13621.	15.75	21.45	34425.	28.75	8.45	24005.	22.27	14.93
6	13621.	15.75	21.45	34430.	28.75	8.45	24009.	22.27	14.93
7	13621.	15.75	21.45	34435.	28.75	8.45	24013.	22.27	14.93
8	13621.	15.75	21.45	34440.	28.76	8.44	24017.	22.27	14.93
9	10500.	18.10	18.10	24796.	30.54	5.66	17992.	24.66	11.54
10	10500.	18.10	18.10	24796.	30.54	5.66	17992.	24.66	11.54

Girder 2 Elastic Section Properties for Pos Mom Stress

	Noncomp			Comp (n = 8.73)			Comp (3n =26.20)		
Tenth Point	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg
0	10500.	18.10	18.10	26367.	31.86	4.34	19343.	25.84	10.36
1	10500.	18.10	18.10	26367.	31.86	4.34	19343.	25.84	10.36
2	13621.	15.75	21.45	36986.	30.31	6.89	26019.	23.52	13.68
3	13621.	15.75	21.45	36994.	30.32	6.88	26025.	23.52	13.68
4	13621.	15.75	21.45	37002.	30.32	6.88	26032.	23.53	13.67
5	13621.	15.75	21.45	37010.	30.33	6.87	26039.	23.53	13.67
6	13621.	15.75	21.45	37018.	30.33	6.87	26045.	23.54	13.66
7	13621.	15.75	21.45	37026.	30.34	6.86	26052.	23.54	13.66
8	13621.	15.75	21.45	37034.	30.34	6.86	26059.	23.55	13.65
9	10500.	18.10	18.10	26406.	31.89	4.31	19379.	25.87	10.33
10	10500.	18.10	18.10	26406.	31.89	4.31	19379.	25.87	10.33

Girder 3 Elastic Section Properties for Pos Mom Stress

	----- Noncomp -----			------ Comp ------ (n = 8.73)			------ Comp ------ (3n =26.20)		
Tenth Point	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg	I	na from Bott	na from Top Flg
0	10500.	18.10	18.10	26367.	31.86	4.34	19343.	25.84	10.36
1	10500.	18.10	18.10	26367.	31.86	4.34	19343.	25.84	10.36
2	13621.	15.75	21.45	36986.	30.31	6.89	26019.	23.52	13.68
3	13621.	15.75	21.45	36994.	30.32	6.88	26025.	23.52	13.68
4	13621.	15.75	21.45	37002.	30.32	6.88	26032.	23.53	13.67
5	13621.	15.75	21.45	37010.	30.33	6.87	26039.	23.53	13.67
6	13621.	15.75	21.45	37018.	30.33	6.87	26045.	23.54	13.66
7	13621.	15.75	21.45	37026.	30.34	6.86	26052.	23.54	13.66
8	13621.	15.75	21.45	37034.	30.34	6.86	26059.	23.55	13.65
9	10500.	18.10	18.10	26406.	31.89	4.31	19379.	25.87	10.33
10	10500.	18.10	18.10	26406.	31.89	4.31	19379.	25.87	10.33

Girder 1 Plastic Section Properties

Tenth Point	Ps+Pr	Ptf+Pw +Pbf	PNA Frm tab D6.1-1 +Mp	-Mp	Pos Mp (k-ft)	Case	Neg Mp (k-ft)	Case
0	1372.	1585.	8.28	9.72	2902.	II	2269.	I
1	1372.	1585.	8.28	9.72	2902.	II	2269.	I
2	1373.	1585.	8.73	9.72	3934.	II	2879.	I
3	1374.	1585.	8.73	9.72	3934.	II	2879.	I
4	1374.	1585.	8.73	9.72	3934.	II	2879.	I
5	1375.	1585.	8.73	9.72	3934.	II	2879.	I
6	1376.	1585.	8.73	9.72	3935.	II	2879.	I
7	1376.	1585.	8.73	9.72	3935.	II	2879.	I
8	1377.	1585.	8.73	9.72	3935.	II	2879.	I
9	1378.	1585.	8.27	9.72	2904.	II	2269.	I
10	1378.	1585.	8.27	9.72	2904.	II	2269.	I

Girder 2 Plastic Section Properties

Tenth Point	Ps+Pr	Ptf+Pw +Pbf	PNA Frm tab D6.1-1 +Mp	-Mp	Pos Mp (k-ft)	Case	Neg Mp (k-ft)	Case
0	1750.	1585.	6.34	7.65	3028.	III	2379.	I
1	1750.	1585.	6.34	7.65	3028.	III	2379.	I
2	1751.	1585.	8.24	7.65	4091.	II	3049.	I
3	1753.	1585.	8.24	7.65	4091.	II	3049.	I
4	1754.	1585.	8.24	7.65	4092.	II	3049.	I
5	1755.	1585.	8.24	7.65	4092.	II	3049.	I
6	1757.	1585.	8.23	7.65	4093.	II	3049.	I
7	1758.	1585.	8.23	7.65	4093.	II	3049.	I
8	1759.	1585.	8.23	7.65	4094.	II	3049.	I
9	1761.	1585.	6.30	7.65	3031.	III	2379.	I
10	1761.	1585.	6.30	7.65	3031.	III	2379.	I

Girder 3 Plastic Section Properties

Tenth Point	Ps+Pr	Ptf+Pw +Pbf	PNA Frm tab D6.1-1 +Mp	-Mp	Pos Mp (k-ft)	Case	Neg Mp (k-ft)	Case
0	1750.	1585.	6.34	7.65	3028.	III	2379.	I
1	1750.	1585.	6.34	7.65	3028.	III	2379.	I
2	1751.	1585.	8.24	7.65	4091.	II	3049.	I
3	1753.	1585.	8.24	7.65	4091.	II	3049.	I
4	1754.	1585.	8.24	7.65	4092.	II	3049.	I
5	1755.	1585.	8.24	7.65	4092.	II	3049.	I
6	1757.	1585.	8.23	7.65	4093.	II	3049.	I
7	1758.	1585.	8.23	7.65	4093.	II	3049.	I
8	1759.	1585.	8.23	7.65	4094.	II	3049.	I
9	1761.	1585.	6.30	7.65	3031.	III	2379.	I
10	1761.	1585.	6.30	7.65	3031.	III	2379.	I

Highway Bridge Inspection Report

COLD BROOK ROAD/I-95

COLD BROOK ROAD

over

I-95

Asset Code: 5970

Inspection Date: 06/24/2016

Inspected By: Jamie Hannum

Inspection Type(s): Routine

National Bridge Inventory

Status: 0 - ND | Bridge Name: **COLD BROOK ROAD/I-95** | Sufficiency Rating: 59.8

Inspections

(90) INSPECTION DATE & (91) DESIGNATED INSPECTION FREQUENCY		24	06/24/2016
(92) CRITICAL FEATURE INSPECTION & (93) CFI DATE			
(92A) FRACTURE CRITICAL DETAIL	N		
(92B) UNDERWATER INSPECTION	N		
(92C) OTHER SPECIAL INSPECTION	N		

Identification

(1) STATE CODE	231 - Maine
(8) STRUCTURE NUMBER	5970
(5) INVENTORY ROUTE	
(5A) RECORD TYPE	1: Route carried "on" the structure
(5B) ROUTE SIGNING PREFIX	4 - COUNTY HIGHWAY
(5C) DESIGNATED LEVEL OF SERVICE	0 - None
(5) INVENTORY ROUTE	0
(5) INVENTORY ROUTE	0 - NOT APPLICABLE
(2) HIGHWAY AGENCY DISTRICT	04 - Eastern
(3) COUNTY CODE	019 Penobscot
(4) PLACE CODE	30795
(6) FEATURES INTERSECTED	I-95
(7) FACILITY CARRIED	COLD BROOK ROAD
(9) LOCATION	I-95 INTERCHANGE #44
(11) MILEPOINT	2.090
(12) BASE HIGHWAY NETWORK	Inventory Route is not on the Base Network
(13) LRS INVENTORY ROUTE, SUBROUTE	
(13A) LRS INVENTORY ROUTE	0001900553
(13B) SUBROUTE NUMBER	00
(16) LATITUDE	44.7737
(17) LONGITUDE	68.859438888 8889
(98A) BORDER BRIDGE CODE	
(98B) PERCENT RESPONSIBILITY	0
(99) BORDER BRIDGE STRUCT NO.	n/a

Structure Type and Material

(43) STRUCTURE TYPE, MAIN	
(43A) KIND OF MATERIAL/DESIGN	3 - Steel
(43B) TYPE OF DESIGN/CONSTR	02 - Stringer/Multi-beam or Girder
(44) STRUCTURE TYPE, APPROACH SPANS	
(44A) KIND OF MATERIAL/DESIGN	0 - Other
(44B) TYPE OF DESIGN/CONSTRUCTION	00 - Other
(45) NUMBER OF SPANS IN MAIN UNIT	5
(46) NUMBER OF APPROACH SPANS	0
(107) DECK STRUCTURE TYPE	1 - Concrete Cast-in-Place
(108) WEARING SURFACE/PROTECTIVE SYSTEMS	
(108A) WEARING SURFACE	1 - Monolithic Concrete (concurrently placed with structural deck)
(108B) DECK MEMBRANE	0 - None
(108C) DECK PROTECTION	0 - None

Age of Service

(27) YEAR BUILT	1962
(106) YEAR RECONSTRUCTED	-4
(42) TYPE OF SERVICE	
(42A) TYPE OF SERVICE ON BRIDGE	1 - Highway
(42B) TYPE OF SERVICE UNDER BRIDGE	1 - Highway, with or w/out pedestrian
(28) LANES	
(28A) LANES ON THE STRUCTURE	02
(28B) LANES UNDER THE STRUCTURE	04
(29) AVERAGE DAILY TRAFFIC	9473
(30) YEAR OF AVERAGE DAILY TRAFFIC	2014
(109) AVERAGE DAILY TRUCK TRAFFIC	8
(19) BYPASS DETOUR LENGTH	6

Geometric Data

(48) LENGTH OF MAXIMUM SPAN (ft.)	68.0
(49) STRUCTURE LENGTH (ft.)	325
(50) CURB/SIDEWALK WIDTHS	
(50A) LEFT CURB SIDEWALK (ft.)	1.5
(50B) RIGHT CURB SIDEWALK (ft.)	1.5
(51) BRDG RDWY WIDTH CURB-TO-CURB (ft.)	30
(52) DECK WIDTH, OUT-TO-OUT (ft.)	35.5
(32) APPROACH ROADWAY WIDTH (ft.)	40
(33) BRIDGE MEDIAN	0 - No median
(34) SKEW (deg.)	0
(35) STRUCTURE FLARED	0 - No flare
(10) INV RTE, MIN VERT CLEARANCE (ft.)	328.05
(47) TOTAL HORIZONTAL CLEARANCE (ft.)	30
(53) VERTICAL CLEARANCE OVER BRIDGE ROADWAY (ft.)	327.76
(54) MIN VERTICAL UNDERCLEARANCE	
(54A) REFERENCE FEATURE	H - Highway beneath structure
(54B) MIN VERTICAL UNDERCLEARENCE (ft.)	16.75
(55) MIN LATERAL UNDER CLEARANCE RIGHT	
(55A) REFERENCE FEATURE	H - Highway beneath structure
(55B) MIN LATERAL UNDER CLEARANCE RIGHT (ft.)	11.15
(56) MIN LATERAL UNDER CLEARANCE (ft.)	6.9

Classification

(112) NBIS BRIDGE LENGTH	Yes
(104) HIGHWAY SYSTEM OF THE INVENTORY ROUTE	0 - Structure/Route is NOT on NHS
(26) FUNCTIONAL CLASSIFICATION OF INVENTORY ROUTE	07 - Rural - Major Collector
(100) STRAHNET HIGHWAY DESIGNATION	Not a STRAHNET route
(101) PARALLEL STRUCTURE DESIGNATION	N - No parallel structure
(102) DIRECTION OF TRAFFIC	2-way traffic
(103) TEMP STRUCTURE	
(105) FEDERAL LANDS HIGHWAYS	Not Applicable
(110) DESIGNATED NATIONAL NETWORK	Inventory route not on network
(20) TOLL	3 - On Free Road
(21) MAINTENANCE RESPONSIBILITY	01 - State Highway Agency
(22) OWNER	01 - State Highway Agency
(37) HISTORICAL SIGNIFICANCE	4 - Not determinable

Condition

(58) DECK	8 - Very Good Condition (no problems noted)
(59) SUPERSTRUCTURE	6 - Satisfactory Condition (minor deterioration)
(60) SUBSTRUCTURE	5 - Fair Condition (minor section loss)
(61) CHANNEL & CHANNEL PROTECTION	N - Not Applicable
(62) CULVERT	N - Not Applicable

Load Rating and Posting

(31) DESIGN LOAD	5 - HS 20
(63) METHOD USED TO DETERMINE OPERATING RATING	2 - Allowable Stress (AS)
(64) OPERATING RATING	39
(65) METHOD USED TO DETERMINE INVENTORY RATING	2 - Allowable Stress (AS)
(66) INVENTORY RATING	30.8
(70) BRIDGE POSTING	5 - Equal to or above legal
(41) STRUCTURE OPEN/POSTED/CLOSED	A - Open

Appraisal

(67) STRUCTURAL EVALUATION	5
(68) DECK GEOMETRY	4
(69) UNDERCLEARANCES, VERTICAL & HORIZONTAL	5
(71) WATERWAY ADEQUACY	N - Not Applicable
(72) APPROACH ROADWAY ALIGNMENT	8 - Equal to present desirable criteria
(36) TRAFFIC SAFETY FEATURE	
36A) BRIDGE RAILINGS:	0 - Does not meet acceptable standards/safety feature is required
36B) TRANSITIONS:	0 - Does not meet acceptable standards/safety feature is required
36C) APPROACH GUARDRAIL	1 - Meets acceptable standards
36D) APPROACH GUARDRAIL ENDS	1 - Meets acceptable standards
(113) SCOUR CRITICAL BRIDGES	N - Not over waterway

Proposed Improvements

(75) TYPE OF WORK	
(75A) TYPE OF WORK PROPOSED	
(75B) WORK DONE BY	
(76) LENGTH OF STRUCTURE IMPROVEMENT (ft.)	
(94) BRIDGE IMPROVEMENT COST (SK)	
(95) ROADWAY IMPROVEMENT COST (SK)	
(96) TOTAL PROJECT COST	
(97) YEAR OF IMPROVEMENT COST ESTIMATE	
(114) FUTURE ADT	13262
(115) YEAR OF FUTURE ADT	2034

Navigation Data

(38) NAVIGATION CONTROL	N - Not applicable, no waterway
(111) PIER OR ABUTMENT PROTECTION	
(39) NAV VERT CLEARANCE	0
(116) MIN NAVIGATION VERT CLEARANCE, VERT LIFT BRIDGE	0
(40) NAV HORIZONTAL CLEARANCE	0

Inspection Notes

Structure Number: 5970 | Town: Hampden

Structure Name: COLD BROOK ROAD/I-95 | Inspection Date: 06/24/2016

Structure Notes

Five span steel painted girders. Concrete deck, piers, abutments, wings and wearing surface.

Wearing Surface

Concrete wearing surface is in satisfactory condition with no issues noted.

Deck **NBI Item 58:** 8

Bottom of the deck is in very good condition with no issues noted. No areas of spalled or delaminated concrete over the travel lanes. No signage or light poles are attached to the bridge.

Superstructure **NBI Item 59:** 6

Painted steel girders have 15% paint distress to the exterior girders and the bottom flanges of the interior girders and girder ends. No measurable section loss noted.

Substructure **NBI Item 60:** 5

Concrete abutments have minor cracking and rust staining. Three out of four pier caps have serious section loss under the South exterior bearings, which have required blocking, see photos. No change since previous inspection. Several of the columns have been rehabbed, but several have large areas of delaminated and cracked concrete that should be rehabbed, see photo. All of the seals are full of sand need to be cleaned out.

Culvert **NBI Item 62:** N

Channel **NBI Item 61:** N

Other

Special Inspection

Monitoring

Pontis Notes

Inspector: Jamie Hannum

Inspection Date: 06/24/2016

Structure Number: 5970

Facility Carried: COLD BROOK ROAD

Highway Bridge Inspection Report

Element Inspection

	Environment	Total Quantity	Units	Condition State 1	Condition State 2	Condition State 3	Condition State 4
12 - Reinforced Concrete Deck	2 - Low	11538	sq. ft.	11488	50		
107 - Steel Open Girder/Beam	2 - Low	1625	ft.	1615	10		
515 - Steel Protective Coating		1625	sq. ft.	0	1625		
205 - Reinforced Concrete Column	2 - Low	12	each	10	2		
215 - Reinforced Concrete Abutment	2 - Low	71	ft.	56	15		
234 - Reinforced Concrete Pier Cap	2 - Low	142	ft.	107	25		10
302 - Compression Joint Seal	2 - Low	178	ft.	178			
311 - Movable Bearing	2 - Low	15	each	10	5		
313 - Fixed Bearing	2 - Low	15	each	10	5		
331 - Reinforced Concrete Bridge Railing	2 - Low	650	ft.	650			
801 - Beam End	2 - Low	50	each	50			
820 - Reinforced Concrete Wall	2 - Low	40	ft.	20	20		
843 - Rigid Wearing Surface	2 - Low	9750	sq. ft.	9650	100		
861 - Beam End – Protective Coating	2 - Low	50	each	0	50		

Inspector: Jamie Hannum

Inspection Date: 06/24/2016

Structure Number: 5970

Facility Carried: COLD BROOK ROAD

Highway Bridge Inspection Report

Pictures

PHOTO 1

Description Roadway under looking South in the NB lane

PHOTO 2

Description West side of the East pier

Pictures

PHOTO 3

Description Delam on the bottom of the East pier cap

PHOTO 4

Description Easty abutment slope protection in good condition

Inspector: Jamie Hannum

Inspection Date: 06/24/2016

Structure Number: 5970

Facility Carried: COLD BROOK ROAD

Highway Bridge Inspection Report

Pictures

PHOTO 5

Description East abutment and bearings

PHOTO 6

Description Roadway and wearing surface, looking West

Inspector: Jamie Hannum

Inspection Date: 06/24/2016

Structure Number: 5970

Facility Carried: COLD BROOK ROAD

Highway Bridge Inspection Report

Pictures

PHOTO 7

Description West abutment

PHOTO 8

Description Beam end, West abutment

Inspector: Jamie Hannum

Inspection Date: 06/24/2016

Structure Number: 5970

Facility Carried: COLD BROOK ROAD

Highway Bridge Inspection Report

Pictures

PHOTO 9

Description Looking East from West abutment

PHOTO 10

Description Supported exterior South bearing, West pier

Inspector: Jamie Hannum

Inspection Date: 06/24/2016

Structure Number: 5970

Facility Carried: COLD BROOK ROAD

Highway Bridge Inspection Report

Pictures

PHOTO 11

Description

PHOTO 12

Description Section loss at the South end of the West pier cap

Inspector: Jamie Hannum

Inspection Date: 06/24/2016

Structure Number: 5970

Facility Carried: COLD BROOK ROAD

Highway Bridge Inspection Report

Pictures

PHOTO 13

Description Pier two in median

PHOTO 14

Description Supported exterior South bearing, pier two, pier cap section loss

Inspector: Jamie Hannum

Inspection Date: 06/24/2016

Structure Number: 5970

Facility Carried: COLD BROOK ROAD

Highway Bridge Inspection Report

Pictures

PHOTO 15

Description Supported exterior South bearing, pier three, pier cap section loss

PHOTO 16

Description Supported exterior South bearing, pier three, pier cap section loss

Pictures

PHOTO 17

Description Section loss of pier cap South end of pier three

PHOTO 18

Description South end of the fourth pier cap, bearing not blocked up.

Inspector: Jamie Hannum

Inspection Date: 06/24/2016

Structure Number: 5970

Facility Carried: COLD BROOK ROAD

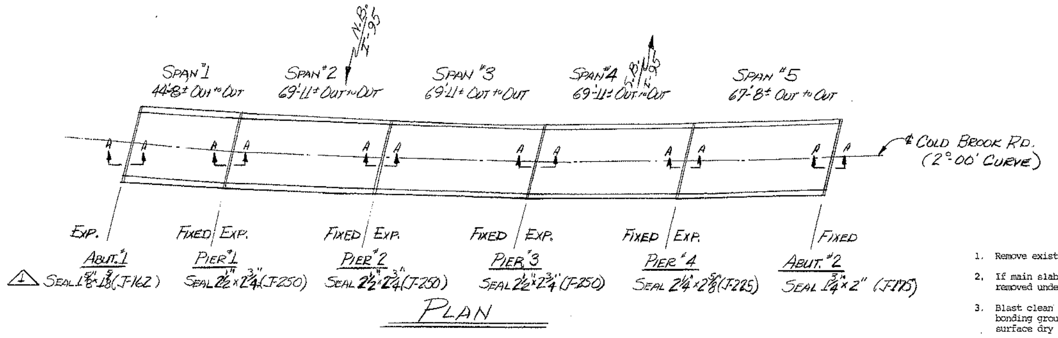
Highway Bridge Inspection Report

Pictures

PHOTO 19

Description North end of the bridge

F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			



PLAN

SCOPE OF WORK

REMOVE EXISTING BIT. WEARING SURFACE AND MEMBRANE.
MODIFY ARMORED JOINTS & INSTALL SEALS AS FOLLOWS:
(1) ABUT. #1: USE SEAL J-162 × 37'-0 MOVE EXIST. JOINT
PIER #1: USE SEAL J-250 × 37'-0 MOVE ½ OF EXIST. JOINT.
PIER #2: USE SEAL J-250 × 37'-0 MOVE ½ OF EXIST. JOINT.
PIER #3: USE SEAL J-250 × 37'-0 MOVE ½ OF EXIST. JOINT.
PIER #4: USE SEAL J-225 × 37'-0 MOVE ½ OF EXIST. JOINT.
ABUT. #2: USE SEAL J-175 × 37'-0 DO NOT MOVE EXIST. JOINT
PLACE NEW 2¼"± BONDED CONC. WEAR. SURFACE.

GENERAL NOTES

1. Remove existing wearing surface.
2. If main slab steel is exposed, concrete should be removed under the steel to a depth of 1" minimum.
3. Blast clean the slab before any placement of bonding grout or concrete. NOTE: Slab is to be surface dry before placement of bonding grout.
4. Broom on a layer of bonding grout just prior to placing concrete. See note this sheet for bonding grout specifications.
5. Concrete to be cured using burlap and water or other approved methods.
6. Concrete to be Class "Y" and aggregate to be crushed ledge.
7. Minumum cover to be 2" unless otherwise noted.
8. Chamfer all exposed edges ½" unless otherwise noted.

BONDING GROUT

The deck surface must be thoroughly sandblasted and cleaned to remove all dust or loose materials immediately before bonding grout is placed.

Deck surface to be surface dry with no standing water in pockets or low areas when bonding grout is applied.

The bonding grout shall consist of equal parts by weight of Portland Cement and concrete sand with the plus #8 material removed and mixed with enough water to give a thick creamy consistency.

Bonding grout to be evenly broomed onto the concrete surface ensuring that the entire surface is coated and that no excess grout collects in low spots or pockets. Grout shall be thoroughly broomed under and around reinforcing.

Rate of application must be controlled so that the grout does not dry before the new concrete is placed.

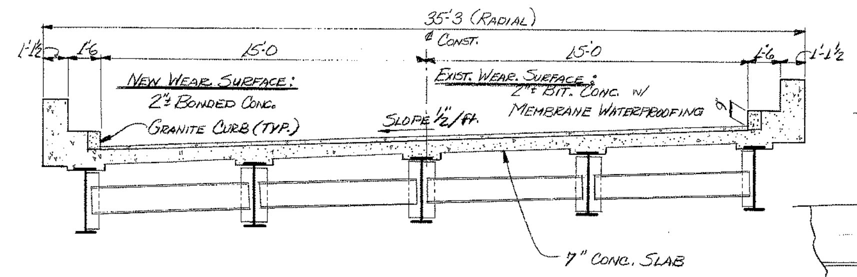
MATERIALS

(1) ONE REQ'D ~ PREFORMED JOINT SEAL 1⅝"×1⅝"×37'-0 (J-162)
ONE REQ'D ~ PREFORMED JOINT SEAL 2¼"×2⅝"×37'-0 (J-225)
ONE REQ'D ~ PREFORMED JOINT SEAL 1¾"×1¾×37'-0 (J-175)
3 REQ'D ~ PREFORMED JOINT SEAL 2½"×2¾"×37'-0 (J-250)
24 l.f.± ~ PL ½"×11"
168 l.f.± ~ BAR ¼"×¼" C.R. SQUARE (KEEPERS)
168± ~ ½"Φ×6" MACH. BOLTS (ANCHORS IN CURBS)
63 l.f.± ~ BAR 6"×½"

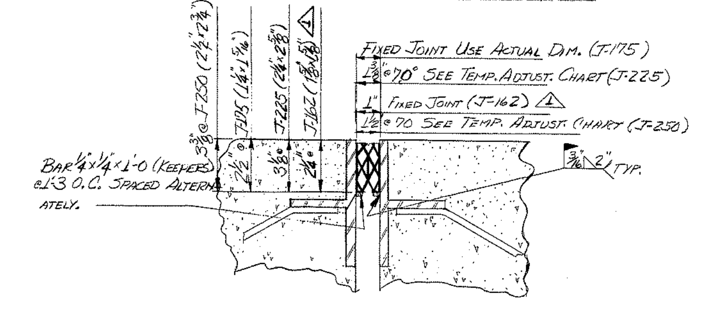
CONCRETE EST.

$$\frac{.2083 \times 326' \times 30.5}{27} = 76.7 \text{ c.y. SAY } \underline{77 \text{ c.y.}}$$

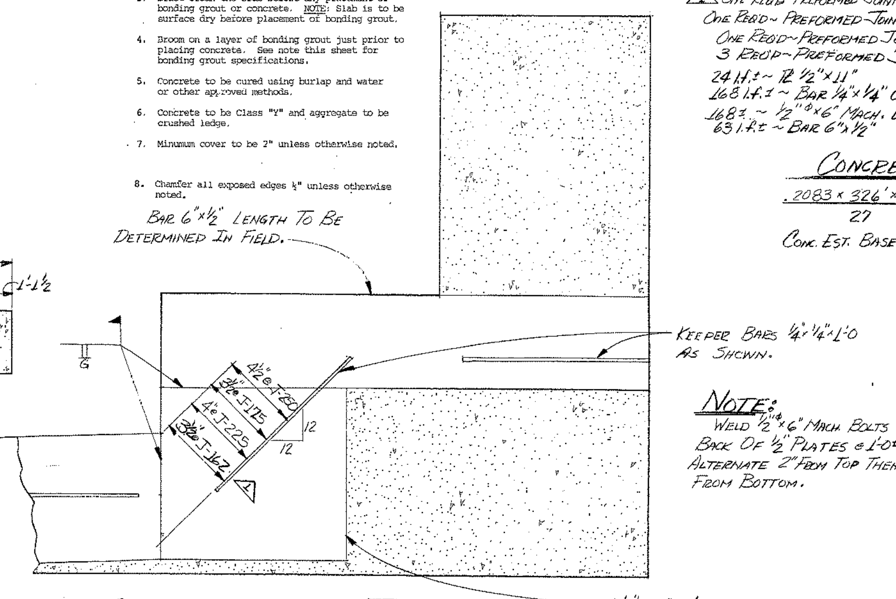
CONC. EST. BASED ON 2½" DEPTH



TRANSVERSE SECTION



SECTION A-A



NOTE:
WELD ½"Φ×6" MACH. BOLTS TO BACK OF ½" PLATES @ 1'-0± O.C. ALTERNATE 2" FROM TOP THEN 2" FROM BOTTOM.

SECTION THRU ARMORED JOINT IN CURB

FOR USE WITH
PIER #4 ONLY

TEMPERATURE ADJUSTMENT TABLE									
TEMP.	5°	15°	25°	35°	45°	55°	70°	85°	95°
*OPENING	1 11/16	1 11/16	1⅝"	1 9/16	1½"	1 7/16	1⅜"	1¼	1¼
* ALL DIMENSIONS ARE NORMAL TO JOINT.									

FOR USE WITH
PIERS #1 & 2 & 3

TEMPERATURE ADJUSTMENT TABLE									
TEMP.	5°	15°	25°	35°	45°	55°	70°	85°	95°
OPENING	1⅞"	1 13/16	1¾"	1 11/16	1⅝"	1 9/16	1½"	1 7/16	1⅜"
* ALL DIMENSIONS ARE NORMAL TO JOINT.									

6-15-84 (1) CHANGE SEAL J-300 TO J-162 (PB)

PROJECT DESIGN ENGINEER	BY	DATE
PLANS: DESIGN - DETAILED	(PBM)	9-15-83
CHECKED		
REVISIONS		
FIELD CHANGES		

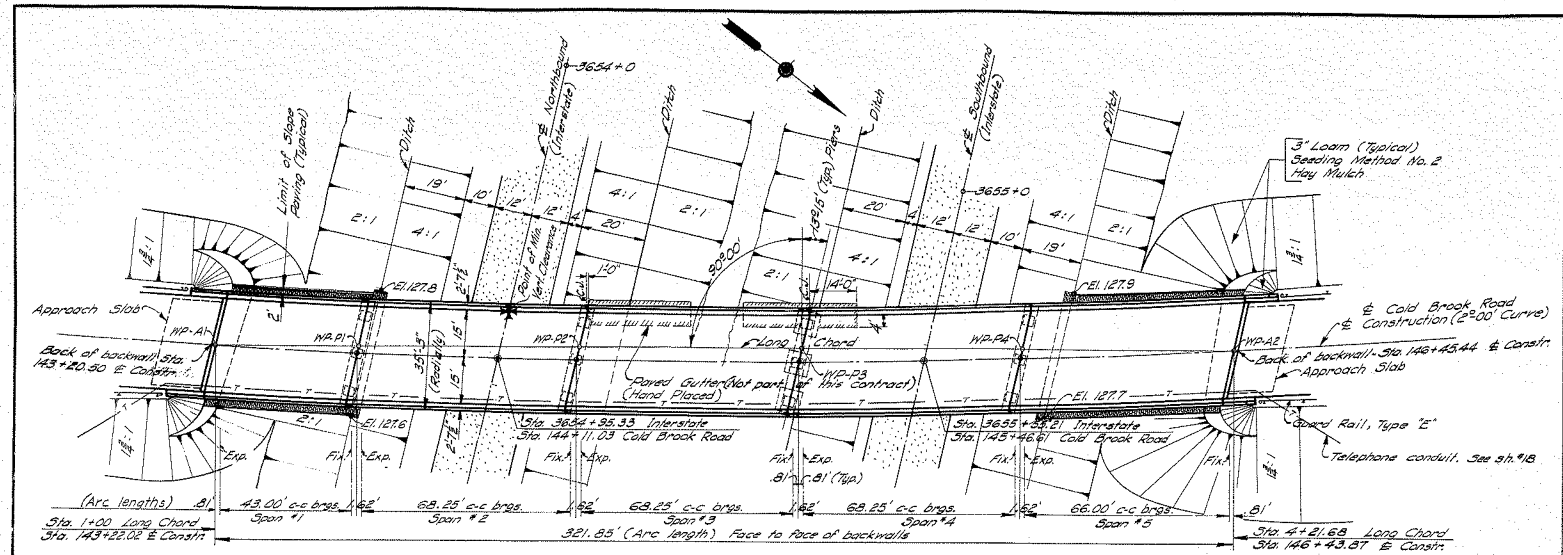
BRUNING 44-132 45710

96-388

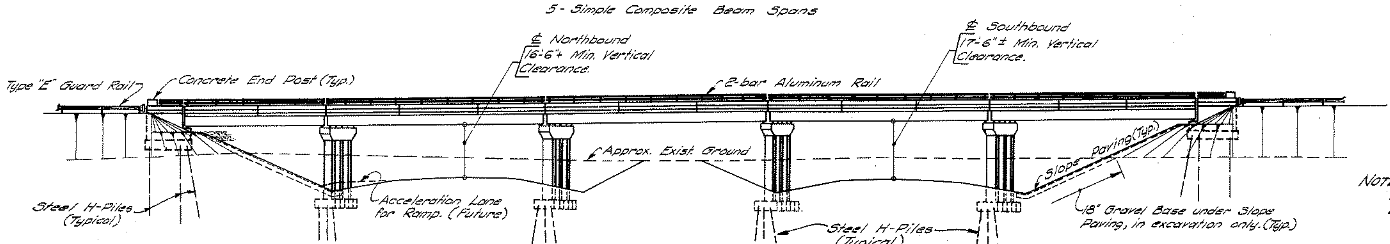
STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

#5970
COLD BROOK RD. BRIDGE
OVER
I-95
IN THE TOWN OF
HAMPDEN
IN
PENOBSCOT COUNTY
CONC. W.S., SEALS, MODIFY A. JOINTS
SHEET 1 OF 1 AUGUSTA, MAINE JULY 15, 1983

B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	I-95-7(16)	13	142



GENERAL PLAN
Scale ~ 1" = 20'
5 - Simple Composite Beam Spans

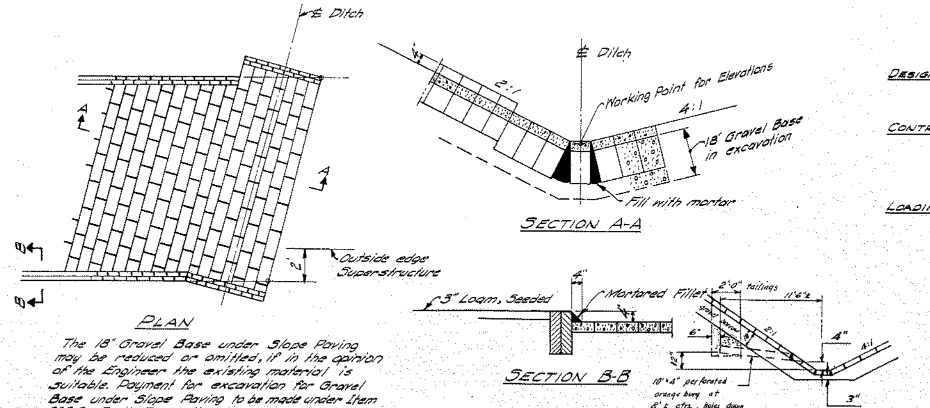


ELEVATION
Scale ~ Hor. & Vert. 1" = 20'

NOTE: Embankment adjacent to the abutments to be placed by Controlled Density Method.

ESTIMATE OF BRIDGE QUANTITIES

ITEM	DESCRIPTION	QUANTITY
203-9	Earth Excavation	150 Cu. Yds.
204-14	Structural Earth Excavation— Piers	275 Cu. Yds.
205-9	Granular Borrow	1200 Cu. Yds.
302-7	Gravel Base Course— In Place Measurement	170 Cu. Yds.
404-28	Bituminous Concrete Surface Course, Type "A"	120 Tons
701-33	Portland Cem. Conc., Abuts. & Ret. Walls	154 Cu. Yds.
701-35	Portland Cement Concrete, Piers	259 Cu. Yds.
701-40	Portland Cem. Conc. Roadway & Sdwk. Slabs on Steel Br.	377 Cu. Yds.
701-47	Portland Cement	1185 Bbls.
702-103	Structural Steel, Fabricated & Delivered	346,500 Lbs.
702-104	Structural Steel, Erection	346,500 Lbs.
702-105	Structural Steel, Field Painting	346,500 Lbs.
703-9	Bronze or Copper — Alloy Bearing & Exp. Plts., Delivd	215 Lbs.
703-10	Bronze or Copper— Alloy Bearing & Exp. Plts., Placing	215 Lbs.
705-13	Reinforcing Steel, Delivered	108,000 Lbs
705-14	Reinforcing Steel, Placing	108,000 Lbs
705-17	Shear Connectors	L. S.
708-16	Steel H-Beam Piles 42 lbs./ft.	4642 Lin. Ft.
806-7	Aluminum Rail	665 Lin. Ft.
807-9	Membrane Waterproofing	1070 Sq. Yds
808-6	Slope Paving	500 Sq. Yds
901-21	Granite Bridge Curb	685 Lin. Ft.



PLAN

SECTION A-A

SECTION B-B

The 18" Gravel Base under Slope Paving may be reduced or omitted, if in the opinion of the Engineer the existing material is suitable. Payment for excavation for Gravel Base under Slope Paving to be made under Item 203-9, Earth Excavation.

SLOPE PAVING
Concrete Blocks 8"×16"×4" (Grouted)

added both abutments Aug. '63 Mollicone

SPECIFICATIONS

DESIGN: A.A.S.H.O. Specifications for Highway Bridges 1957, and subsequent revisions.

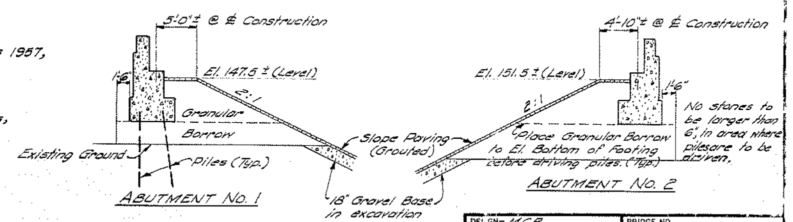
CONTRACT: State of Maine, State Highway Commission Standard Specifications for Highways & Bridges, Revision of January 1956 with supplements.

LOADING: H20-S16-44
Structural Steel ~ f_s = 18,000 p.s.i.

Concrete ~ f_s = 20,000 p.s.i. (Reinf. Steel)
f_c = 1200 p.s.i.
n = 10

CONCRETE CLASSIFICATION

All Concrete _ _ _ _ _ _ _ _ _ Class "A"

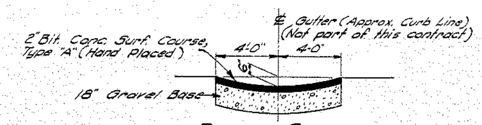


ABUTMENT No. 1

ABUTMENT No. 2

No stones to be larger than 6", in area where piles are to be driven.

NORMAL SECTIONS
Perpendicular to abutments



PAVED GUTTER
Under Roadway Drains as indicated

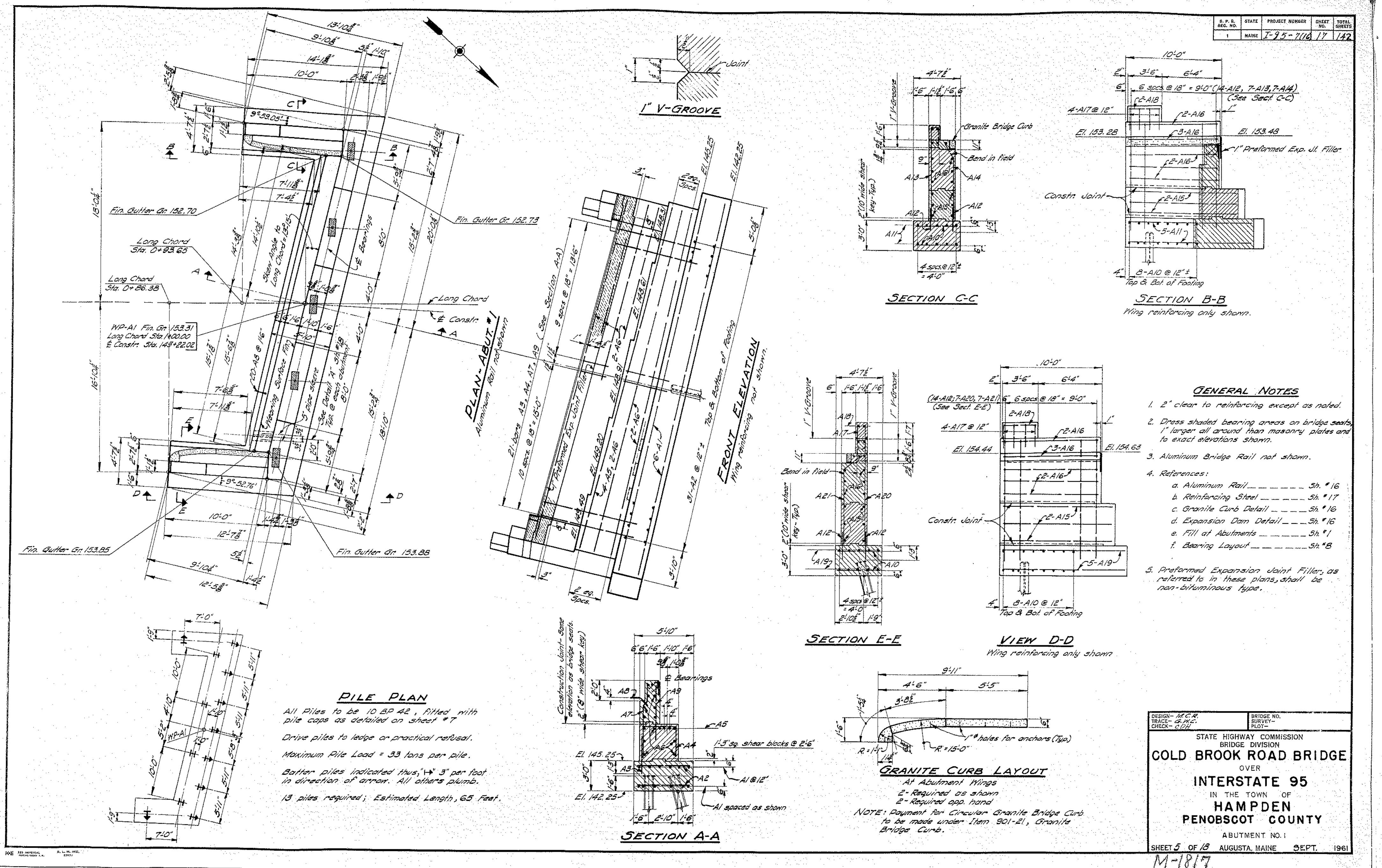
DESIGN– M.C.R. TRACE + DET. – G.W.C. CHECK– T.H.K.	BRIDGE NO. SURVEY– PLOT–

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

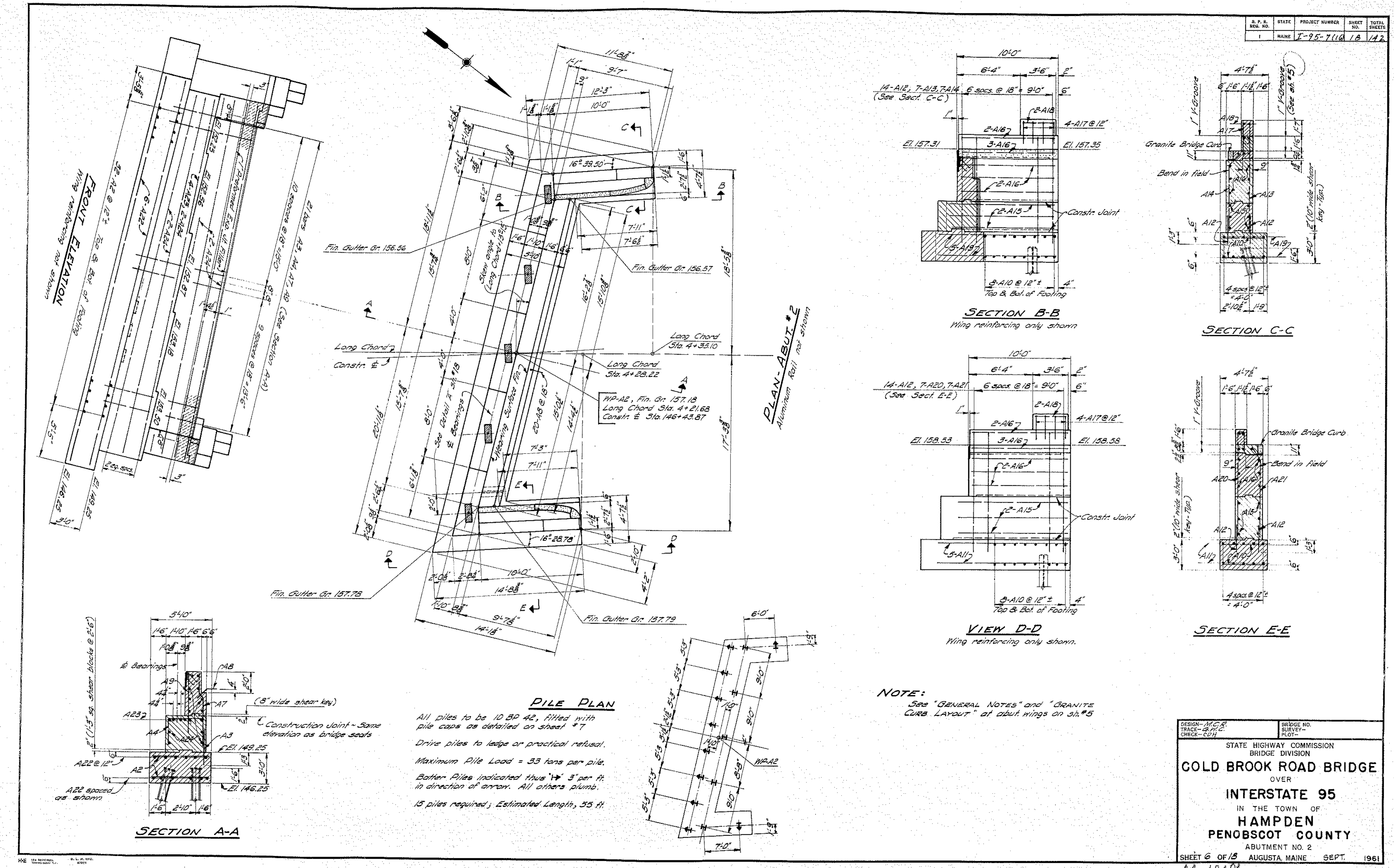
COLD BROOK ROAD BRIDGE
OVER
INTERSTATE 95
IN THE TOWN OF
HAMPDEN
PENOBSCOT COUNTY

GENERAL PLAN & ESTIMATE OF BRIDGE QUANTITIES
SHEET 1 OF 18 AUGUSTA, MAINE SEPT. 1961

M-1813

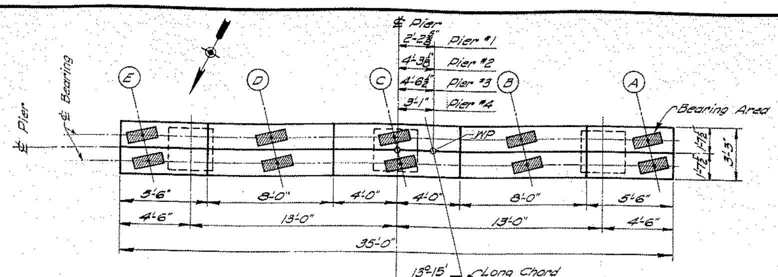


I-95-7(16) 17 142
1" V-GROOVE
Joint
PLAN - ABUT. #1
Aluminum Rail not shown
FRONT ELEVATION
Wing reinforcing not shown
SECTION C-C
SECTION B-B
Wing reinforcing only shown.
SECTION E-E
VIEW D-D
Wing reinforcing only shown
SECTION A-A
GRANITE CURB LAYOUT
At Abutment Wings
2-Required as shown
2-Required opp. hand
NOTE: Payment for Circular Granite Bridge Curb to be made under Item 901-21, Granite Bridge Curb.
PILE PLAN
All Piles to be 10 BP 42, Fitted with pile caps as detailed on sheet #7
Drive piles to ledge or practical refusal.
Maximum Pile Load = 33 tons per pile.
Batter piles indicated thus, 3" per foot in direction of arrow. All others plumb.
13 piles required; Estimated Length, 65 Feet.
GENERAL NOTES
1. 2" clear to reinforcing except as noted.
2. Dress shaded bearing areas on bridge seats 1" larger all around than masonry plates and to exact elevations shown.
3. Aluminum Bridge Rail not shown.
4. References:
a. Aluminum Rail .... Sh. #16
b. Reinforcing Steel .... Sh. #17
c. Granite Curb Detail .... Sh. #16
d. Expansion Dam Detail .... Sh. #16
e. Fill at Abutments .... Sh. #1
f. Bearing Layout .... Sh. #8
5. Preformed Expansion Joint Filler, as referred to in these plans, shall be non-bituminous type.
STATE HIGHWAY COMMISSION
BRIDGE DIVISION
COLD BROOK ROAD BRIDGE
OVER
INTERSTATE 95
IN THE TOWN OF
HAMPDEN
PENOBSCOT COUNTY
ABUTMENT NO. 1
SHEET 5 OF 18 AUGUSTA, MAINE SEPT. 1961
M-1817

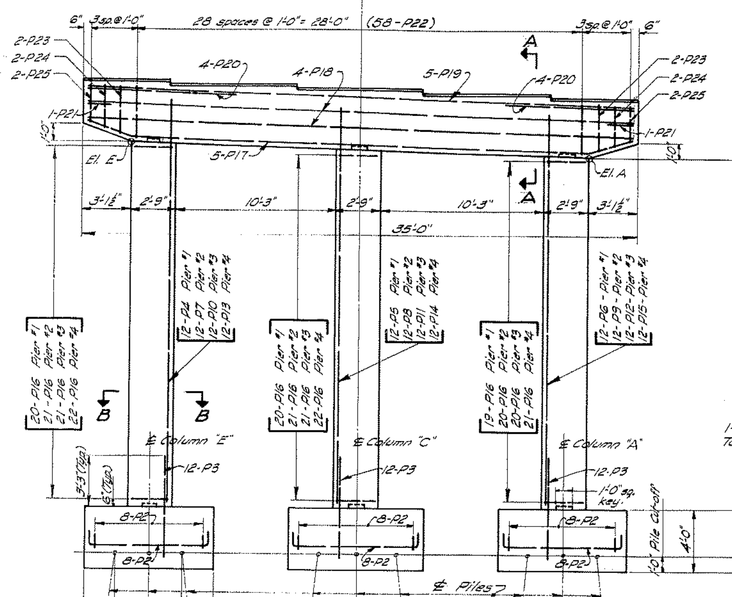


I-95-7(10) 13 142
FRONT ELEVATION
Wing reinforcing not shown
PLAN - ABUT. #2
Aluminum Rail not shown
SECTION B-B
Wing reinforcing only shown
SECTION C-C
VIEW D-D
Wing reinforcing only shown.
SECTION E-E
SECTION A-A
PILE PLAN
All piles to be 10 BP 42, fitted with pile caps as detailed on sheet #7
Drive piles to ledge or practical refusal.
Maximum Pile Load = 33 tons per pile.
Batter Piles indicated thus 3" per ft. in direction of arrow. All others plumb.
15 piles required; Estimated Length, 35 ft.
NOTE:
See "General Notes" and "Granite Curb Layout" at abut. wings on sh. #5
Fin. Gutter Gr. 156.54
Fin. Gutter Gr. 156.57
Fin. Gutter Gr. 157.78
Fin. Gutter Gr. 157.79
Long Chord Sta. 4+35.10
Long Chord Sta. 4+28.22
WP-A2, Fin. Gr. 157.18
Long Chord Sta. 4+21.68
Constr. ℄ Sta. 146+43.87
Constr. Joint
Granite Bridge Curb
Bend in field
Construction Joint - Same elevation as bridge seats
El. 157.31
El. 157.35
El. 158.53
El. 158.58
El. 149.25
El. 146.25
STATE HIGHWAY COMMISSION
BRIDGE DIVISION
COLD BROOK ROAD BRIDGE
OVER
INTERSTATE 95
IN THE TOWN OF
HAMPDEN
PENOBSCOT COUNTY
ABUTMENT NO. 2
SHEET 6 OF 15 AUGUSTA, MAINE SEPT. 1961
M-1818

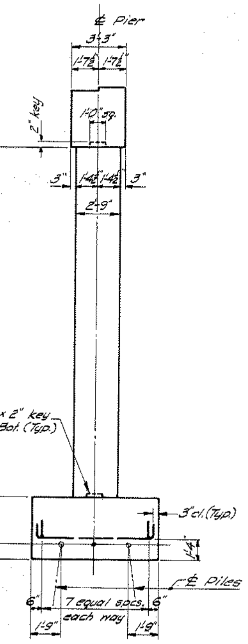
B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	I-95-7(16)	19	142



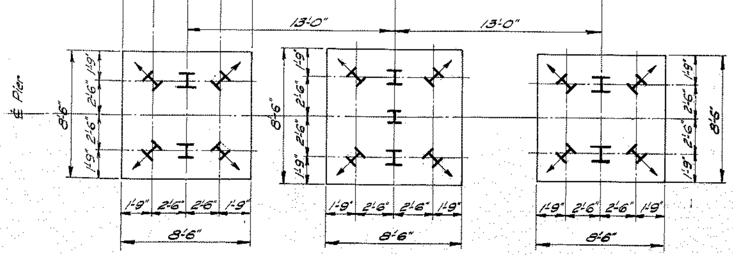
PLAN - PIER CAP
For Bearing Layout see sheet #8



SIDE ELEVATION
For elevations see "TABLE OF ELEVATIONS"
Vertical column steel spaced as per "SECT. B-B"

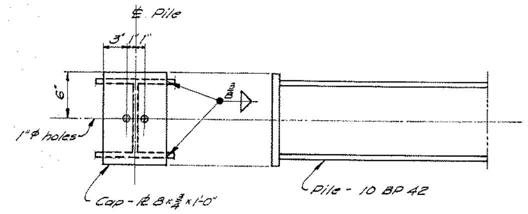


END ELEVATION



PILE & FOOTING PLAN

TABLE OF ELEVATIONS									
LOCATION		BEARING AREAS					BOTTOM OF CAP		BOTTOM OF FOOTINGS
		E	D	C	B	A	E	A	
Pier #1	South	150.47	150.17	149.88	149.58	149.28	146.59	145.51	122.50
	North	150.27	149.97	149.68	149.39	149.09			
Pier #2	South	151.54	151.24	150.94	150.64	150.34	147.71	146.62	122.50
	North	151.39	151.09	150.80	150.49	150.20			
Pier #3	South	152.43	152.13	151.82	151.52	151.22	148.59	147.48	123.00
	North	152.27	151.97	151.67	151.37	151.06			
Pier #4	South	153.08	152.77	152.47	152.16	151.85	149.25	148.12	123.00
	North	152.93	152.62	152.31	152.00	151.70			



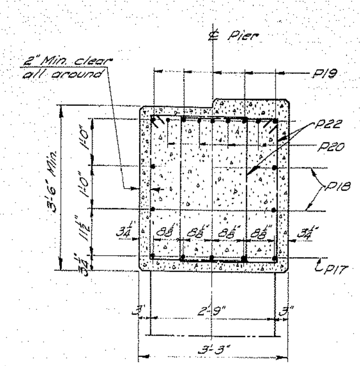
PILE DETAILS

PILE NOTES

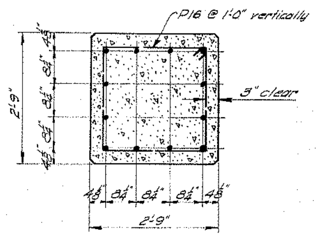
1. Nineteen (19) 10 BP 42 Steel H-Piles required for each pier.
2. Maximum Pile Load = 37 tons
3. Piles are to be driven to ledge or practical refusal to develop end bearing.
4. Piles marked thus ⊢→ to be battered 2 inches per foot in the direction of the arrow.
5. All piles to be capped as indicated.
6. Estimated Length of piles:
   a. Pier No. 1, 40 Feet
   b. Pier No. 2, 35 Feet
   c. Pier No. 3, 35 Feet
   d. Pier No. 4, 30 Feet

GENERAL NOTES

1. Position reinforcing steel in pier cap, under bearings, to clear swedged anchor bolts
2. Chamfer all exposed edges of concrete ¾ inch.
3. Dress the shaded bearing areas on the bridge seats 1 inch larger all around than masonry plates, to exact elevations shown in "TABLE OF ELEVATIONS".
4. For pier stations and W.P. along the Long Chord, See sheet #8.



SECTION A-A



SECTION B-B
Typical for all columns

DESIGN- C.D.H.
TRACE- G.W.C.
CHECK- T.H.K.

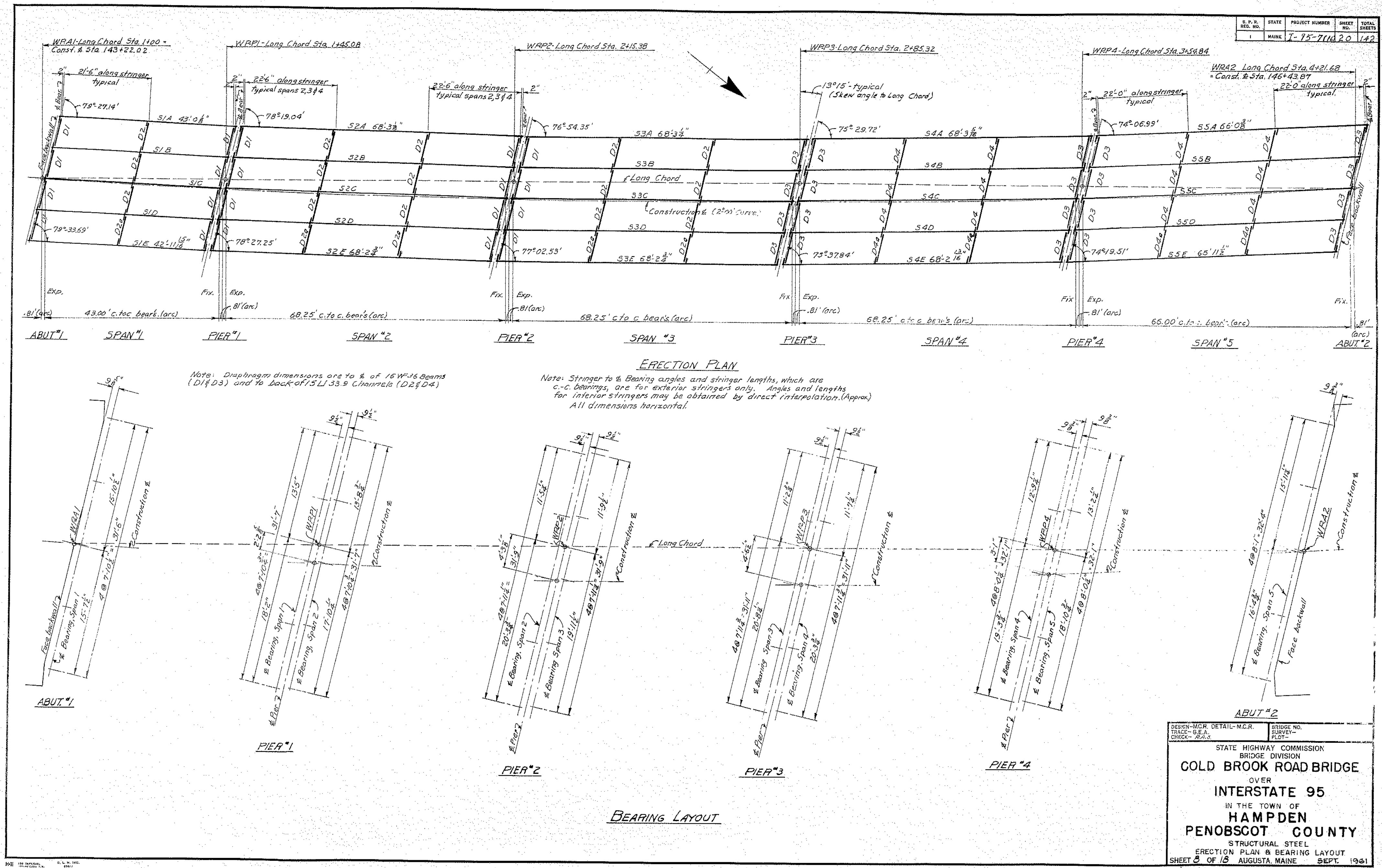
BRIDGE NO.
SURVEY-
PLOT-

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

COLD BROOK ROAD BRIDGE
OVER
INTERSTATE 95
IN THE TOWN OF
HAMPDEN
PENOBSCOT COUNTY
PIERS

SHEET 7 OF 18 AUGUSTA, MAINE SEPT. 1961

M-1819



DESIGN–M.C.R. DETAIL–M.C.R.
TRACE–G.E.A.
CHECK–R.A.S.

BRIDGE NO.
SURVEY–
PLOT–

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

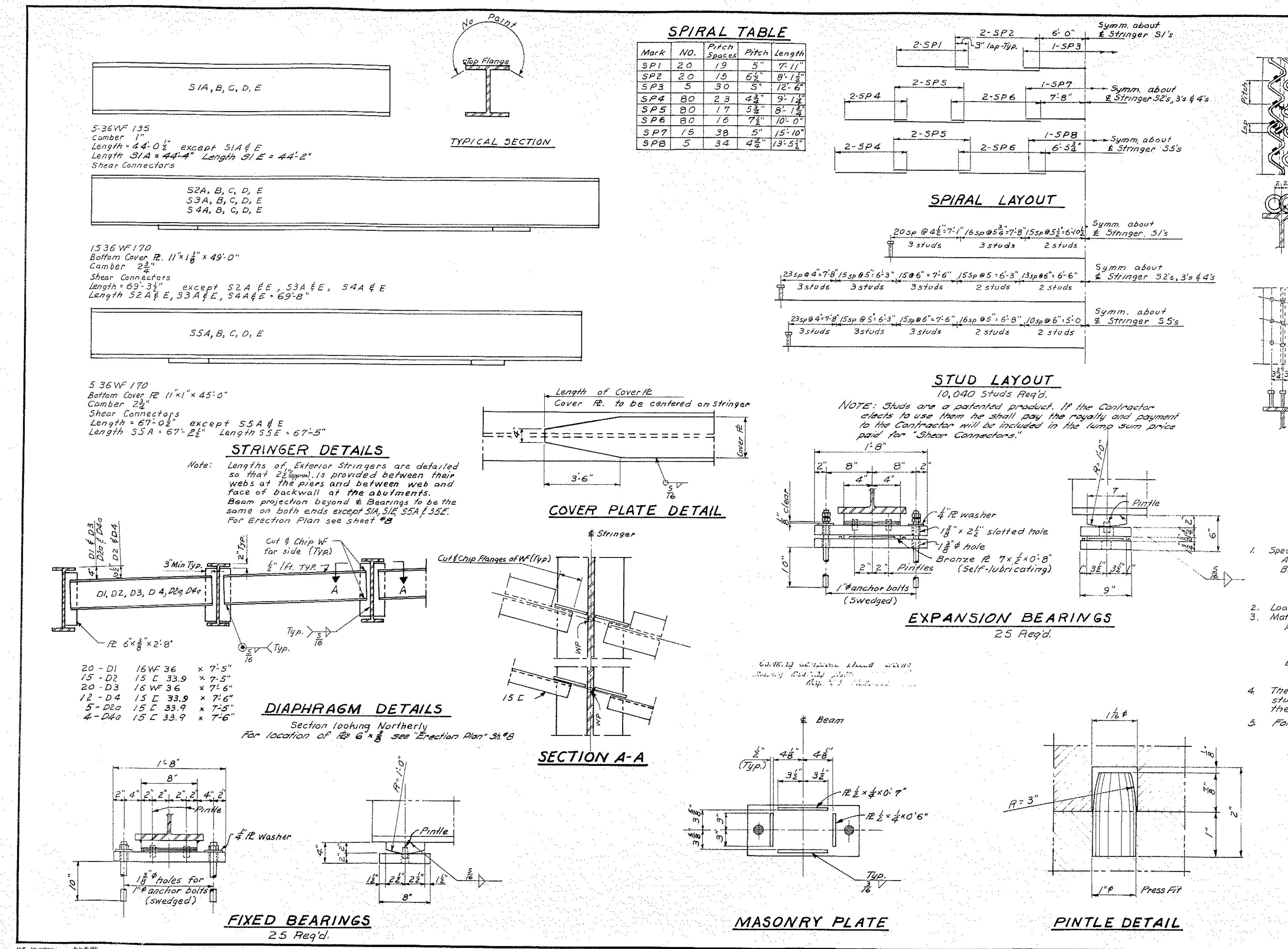
COLD BROOK ROAD BRIDGE
OVER
INTERSTATE 95
IN THE TOWN OF
HAMPDEN
PENOBSCOT COUNTY

STRUCTURAL STEEL
ERECTION PLAN & BEARING LAYOUT

SHEET 8 OF 18 AUGUSTA, MAINE SEPT. 1961

M-1820

F.A.P. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	I-95-7(16)	21	142



SPIRAL TABLE

Mark	No.	Pitch Spaces	Pitch	Length
SP1	20	19	5"	7'-11"
SP2	20	15	6½"	8'-1½"
SP3	5	30	5"	12'-6"
SP4	80	23	4¾"	9'-1¼"
SP5	80	17	5¾"	8'-1¾"
SP6	80	16	7½"	10'-0"
SP7	15	38	5"	15'-10"
SP8	5	34	4¾"	13'-5¼"

NOTES

1. Specifications:
   A. Design & Detail - A.A.S.H.O. Standard Specifications
   B. Fabrication & Erection - M.S.H.C. Standard Specifications Highways and Bridges. Revision of Jan. 1956 and Supplemental Specifications Feb. 1960.
2. Loading H20-S16-44
3. Material.
   A. Stringers with cover plates and cover plates shall be Structural weldable steel conforming to the latest revision of the Specification ASTM Design A373.
   B. All other structural steel shall conform to A.S.T.M. Design A373 or A7 except as otherwise noted.
4. The type of shear connectors, Spiral or stud, to be used shall be the option of the Contractor.
5. For Expansion Dam Details see sheet #16

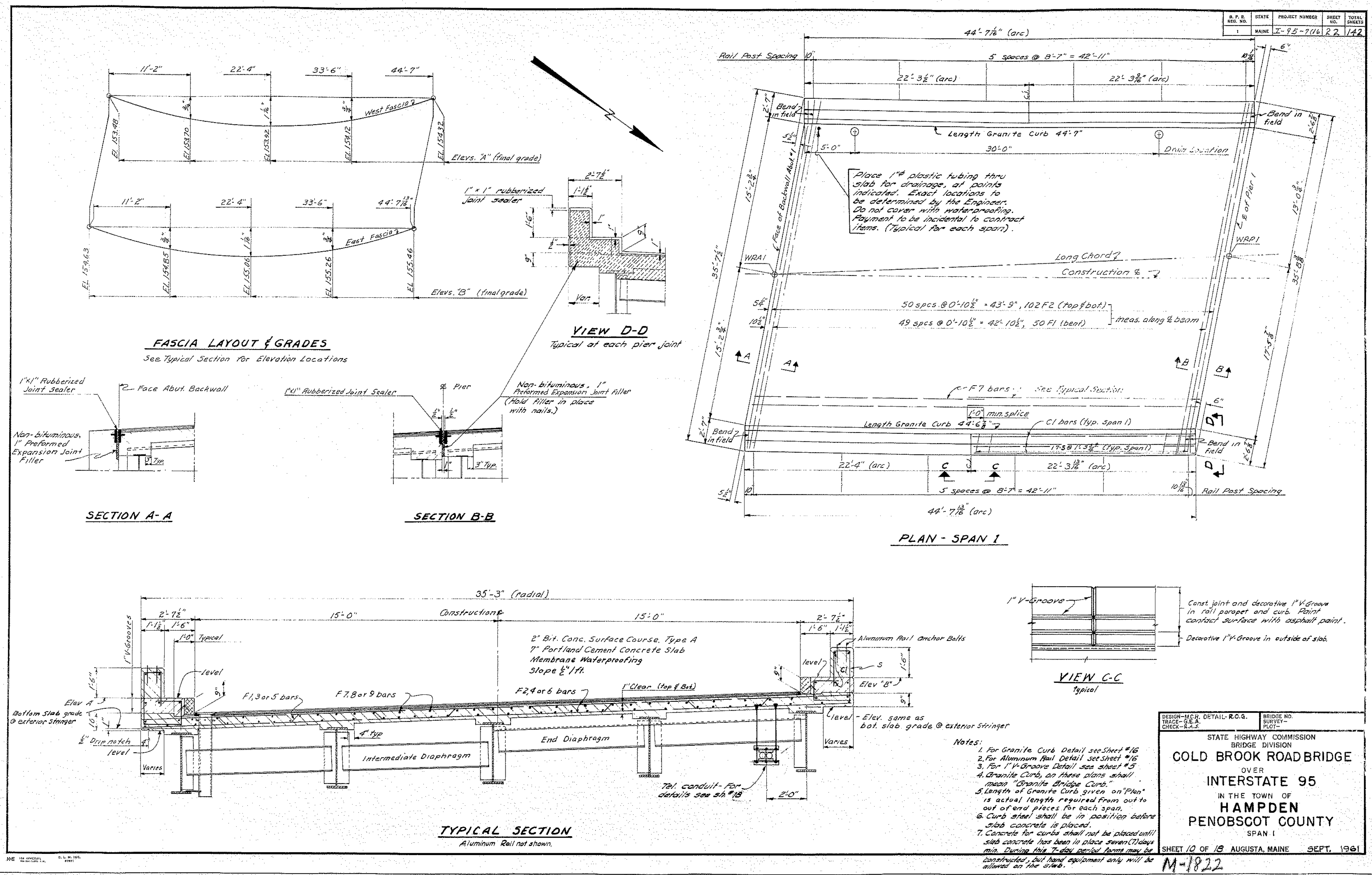
DESIGN-M.C.R. DETAIL-C.D.H. TRACE-G.E.A. CHECK-T.H.K. | BRIDGE NO. SURVEY- PLOT-

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

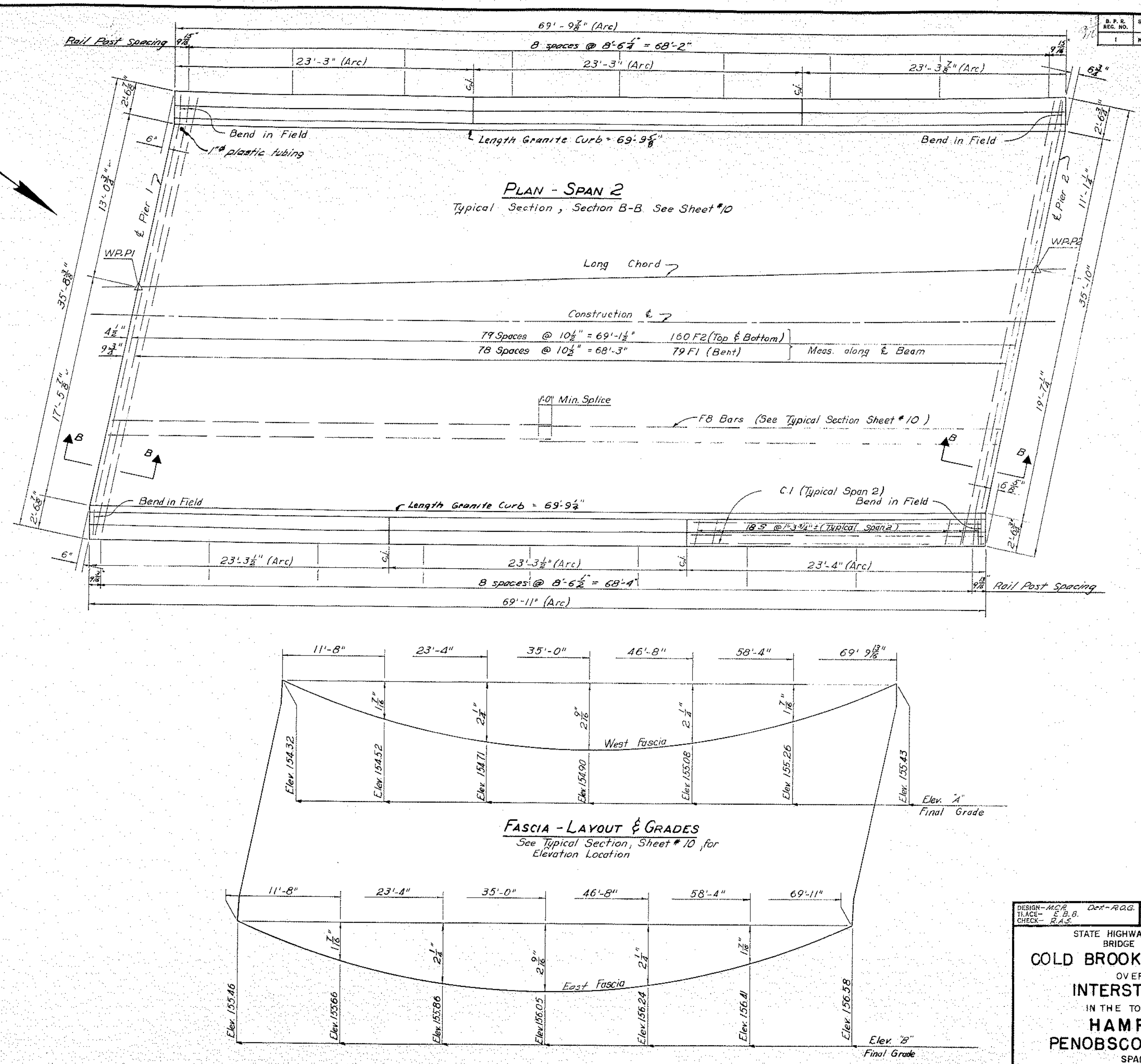
COLD BROOK ROAD BRIDGE
OVER
INTERSTATE 95
IN THE TOWN OF
HAMPDEN
PENOBSCOT COUNTY
STRUCTURAL STEEL DETAILS

SHEET 9 OF 18 AUGUSTA, MAINE SEPT. 1961

M-1821


B.P.R. REG. NO. 1 | STATE MAINE | PROJECT NUMBER I-95-7(16) | SHEET NO. 22 | TOTAL SHEETS 142
FASCIA LAYOUT & GRADES
See Typical Section for Elevation Locations
VIEW D-D
Typical at each pier joint
SECTION A-A
SECTION B-B
PLAN - SPAN 1
Place 1"ϕ plastic tubing thru slab for drainage, at points indicated. Exact locations to be determined by the Engineer. Do not cover with waterproofing. Payment to be incidental to contract items. (Typical for each span).
VIEW C-C
typical
Const. joint and decorative 1" V-Groove in rail parapet and curb. Paint contact surface with asphalt paint.
Decorative 1" V-Groove in outside of slab.
TYPICAL SECTION
Aluminum Rail not shown.
2" Bit. Conc. Surface Course, Type A
7" Portland Cement Concrete Slab
Membrane Waterproofing
Slope 1/4"/ft.
Notes:
1. For Granite Curb Detail see Sheet #16
2. For Aluminum Rail Detail see Sheet #16
3. For 1" V-Groove Detail see sheet #5
4. Granite Curb, on these plans shall mean "Granite Bridge Curb."
5. Length of Granite Curb given on "Plan" is actual length required from out to out of end pieces for each span.
6. Curb steel shall be in position before slab concrete is placed.
7. Concrete for curbs shall not be placed until slab concrete has been in place seven (7) days min. During this 7-day period forms may be constructed, but hand equipment only will be allowed on the slab.
DESIGN-M.C.R. DETAIL-R.O.G.
TRACE-G.E.A.
CHECK-R.A.S.
BRIDGE NO.
SURVEY-
PLOT-
STATE HIGHWAY COMMISSION
BRIDGE DIVISION
COLD BROOK ROAD BRIDGE
OVER
INTERSTATE 95
IN THE TOWN OF
HAMPDEN
PENOBSCOT COUNTY
SPAN 1
SHEET 10 OF 18 AUGUSTA, MAINE SEPT. 1961
M-1822

B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	I-95-7(16)	23	142



DESIGN- M.C.R. Det- R.O.G.
TRACE- E.B.B.
CHECK- R.A.S.

BRIDGE NO.
SURVEY-
PLOT-

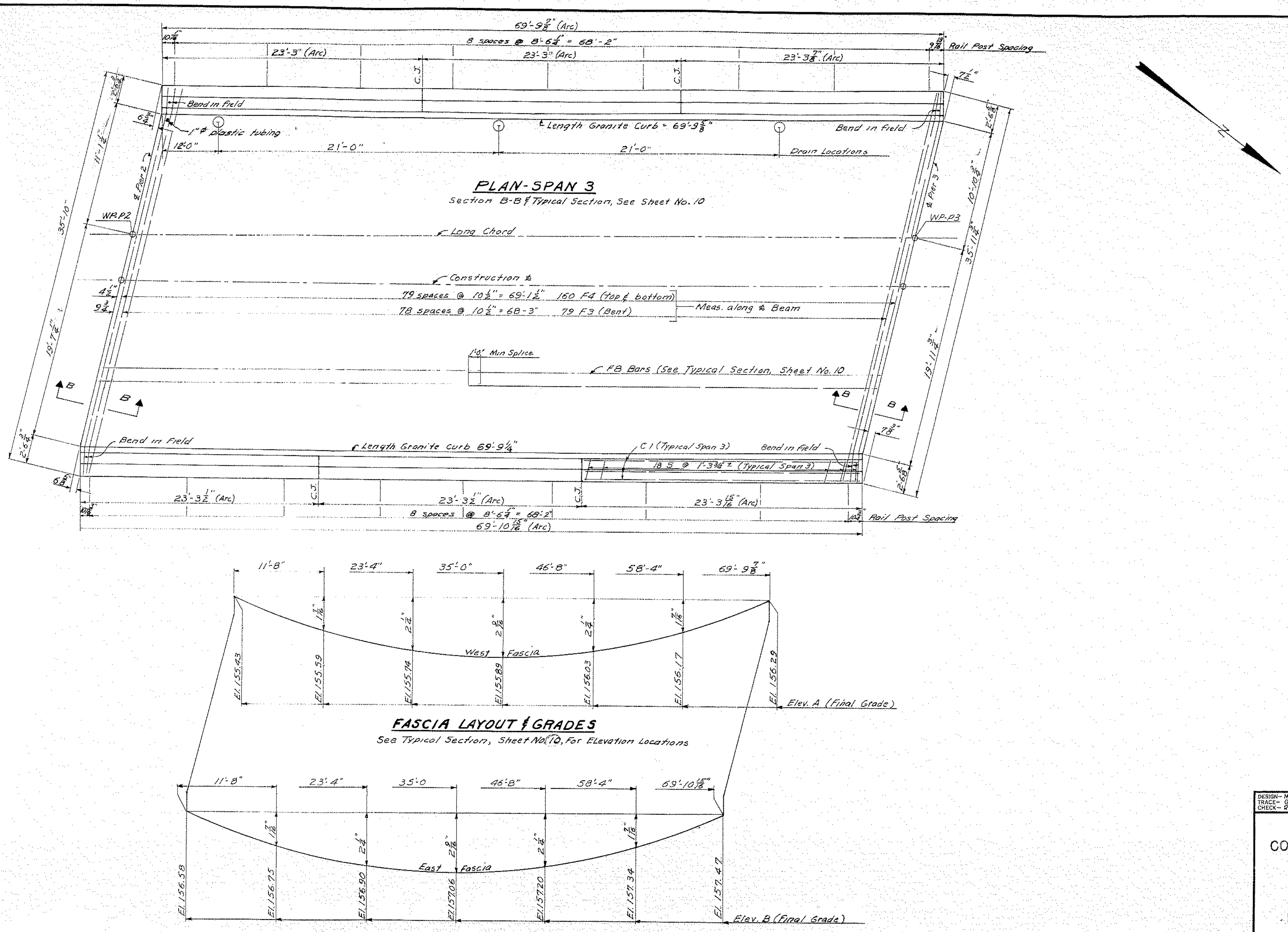
STATE HIGHWAY COMMISSION
BRIDGE DIVISION

COLD BROOK ROAD BRIDGE
OVER
INTERSTATE 95
IN THE TOWN OF
HAMPDEN
PENOBSCOT COUNTY
SPAN 2

SHEET 11 OF 18 AUGUSTA, MAINE SEPT. 1961

M-1823

F.A.P. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	I-95-7(16)	24	142



DESIGN– M.C.R. DETAIL– R.O.G. TRACE– G.E.A. CHECK– R.A.S.

BRIDGE NO. SURVEY– PLOT–

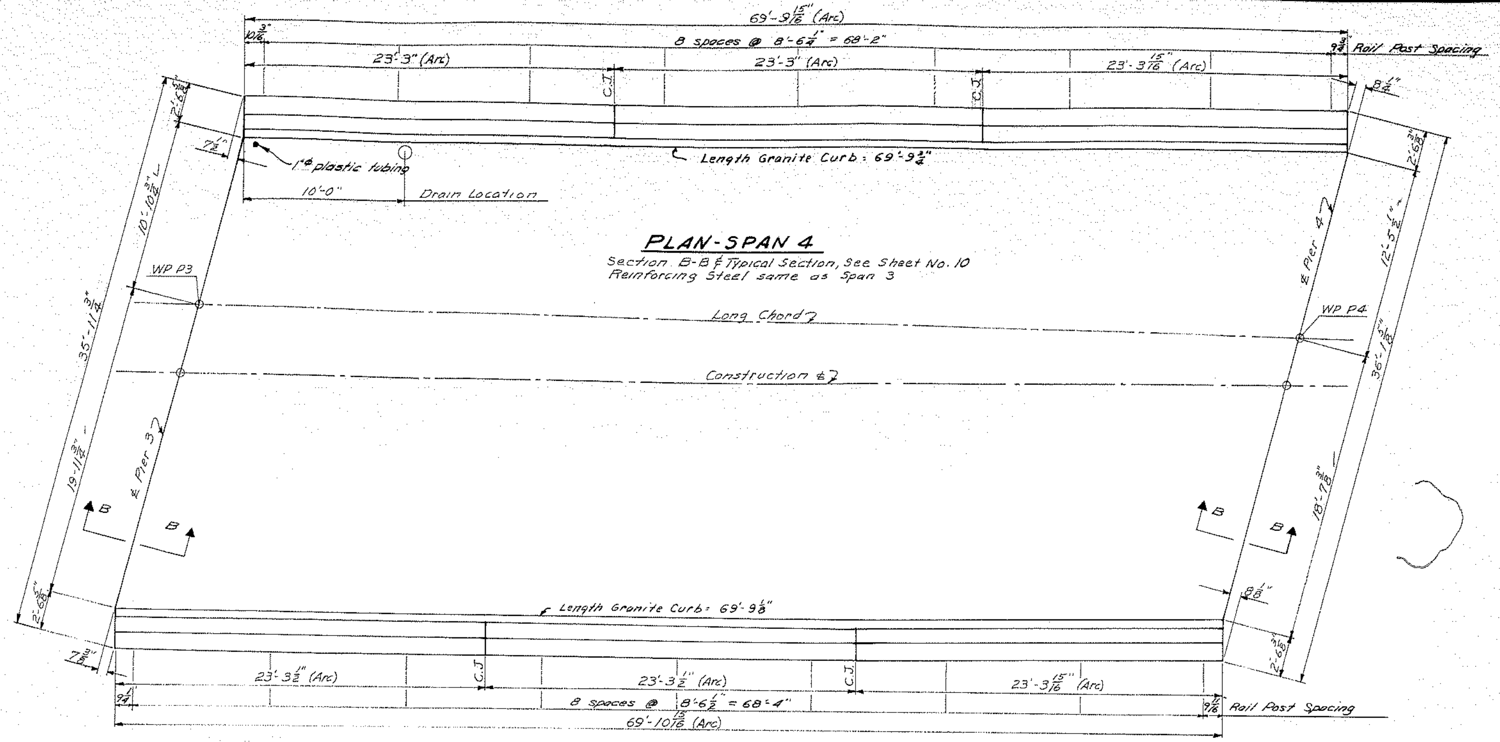
STATE HIGHWAY COMMISSION
BRIDGE DIVISION

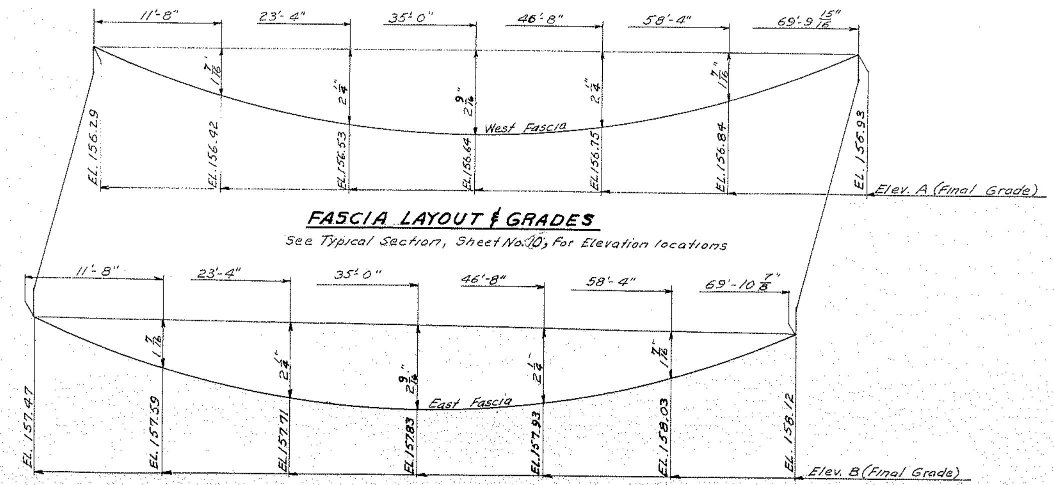
COLD BROOK ROAD BRIDGE
OVER
INTERSTATE 95
IN THE TOWN OF
HAMPDEN
PENOBSCOT COUNTY
SPAN 3

SHEET 12 OF 18 AUGUSTA, MAINE SEPT. 1961

M-1824

B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	I-95-7(16)	25	142





DESIGN- M.C.R. DETAIL- R.O.G.
TRACE- G.F.A.
CHECK- R.A.S.

BRIDGE NO.
SURVEY-
PLOT-

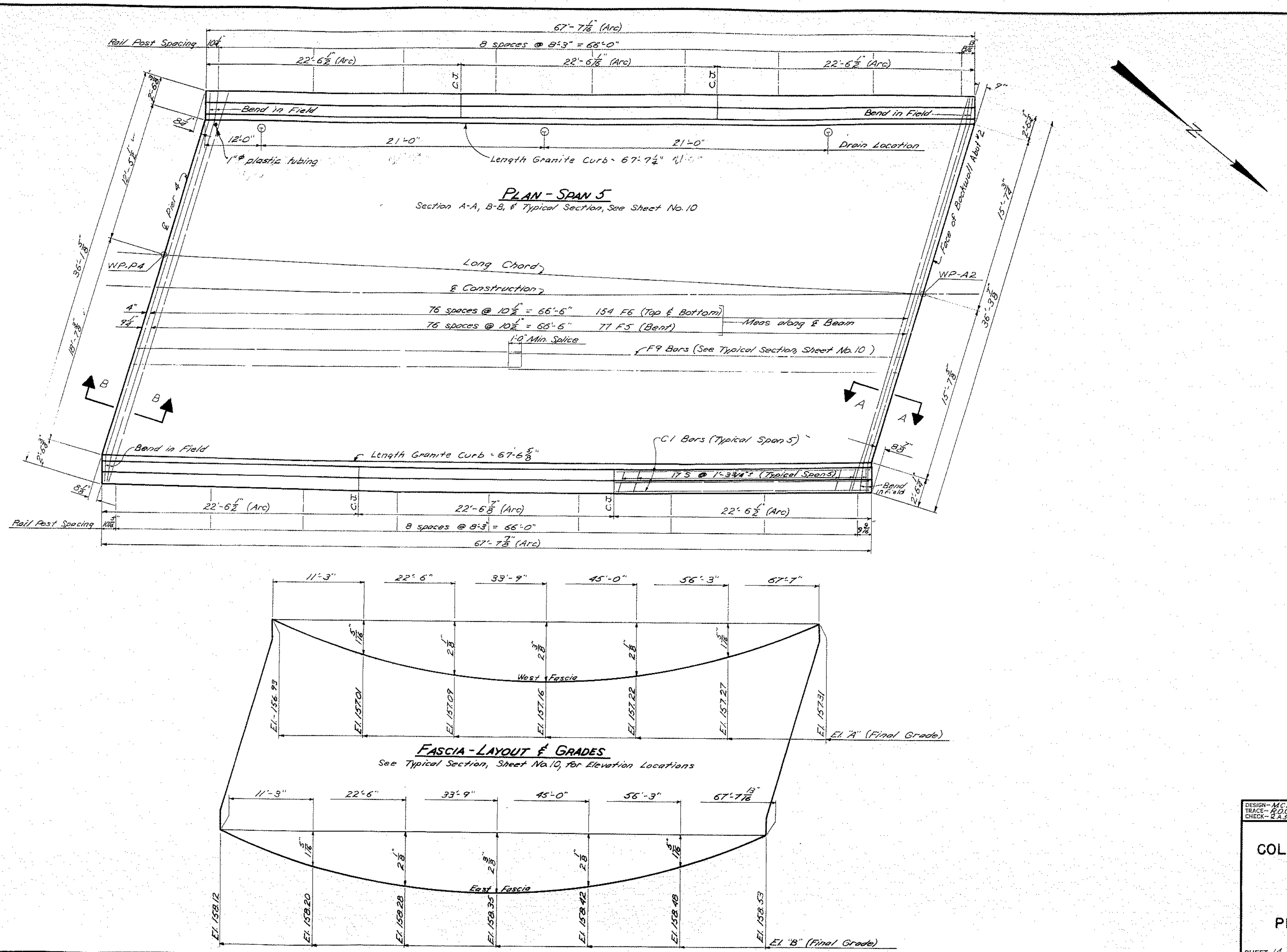
STATE HIGHWAY COMMISSION
BRIDGE DIVISION

COLD BROOK ROAD BRIDGE
OVER
INTERSTATE 95
IN THE TOWN OF
HAMPDEN
PENOBSCOT COUNTY
SPAN 4

SHEET 13 OF 18 AUGUSTA, MAINE SEPT. 1961

M-1825

S. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	I-95-7(10) 2 G		142



DESIGN - MCR DET - R.O.G. BRIDGE NO.
TRACE - R.O.G. SURVEY -
CHECK - R.A.S. PLOT -

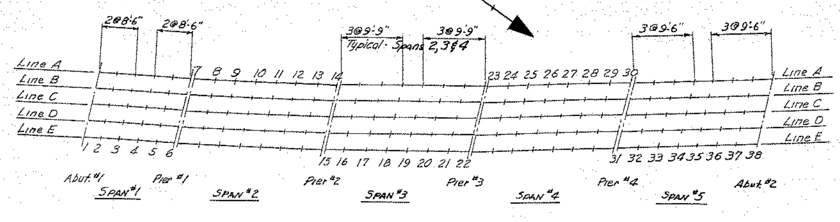
STATE HIGHWAY COMMISSION
BRIDGE DIVISION

COLD BROOK ROAD BRIDGE
OVER
INTERSTATE 95
IN THE TOWN OF
HAMPDEN
PENOBSCOT COUNTY
SPAN 5

SHEET 14 OF 18 AUGUSTA, MAINE SEPT. 1961

M-1826

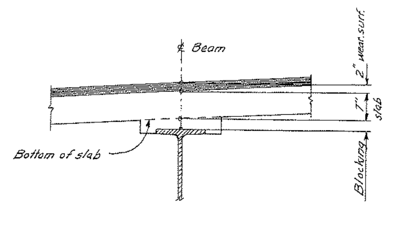
F.P.S. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	I-95-7(16)	27	142



BLOCKING POINT LAYOUT

BOTTOM OF SLAB ELEVATIONS							
Span	Point	Stringer Line					Max D.L. Defl.‡
		A	B	C	D	E	
℄ Brg's.	1	151.98	152.28	152.58	152.87	153.16	
	2	152.16	152.46	152.76	153.06	153.35	
1	3	152.33	152.63	152.93	153.22	153.52	5/16"
	4	152.50	152.80	153.09	153.39	153.68	
	5	152.64	152.94	153.24	153.53	153.83	
℄ Brg's.	6	152.78	153.08	153.38	153.67	153.97	
℄ Brg's.	7	152.81	153.11	153.40	153.69	153.99	
	8	153.02	153.32	153.61	153.91	154.21	
	9	153.22	153.51	153.80	154.10	154.40	
2	10	153.39	153.68	153.98	154.28	154.58	1 1/8"
	11	153.54	153.84	154.13	154.44	154.74	
	12	153.68	153.97	154.27	154.57	154.87	
	13	153.80	154.09	154.39	154.67	154.99	
℄ Brg's.	14	153.89	154.19	154.49	154.79	155.09	
℄ Brg's.	15	153.92	154.21	154.52	154.81	155.11	
	16	154.10	154.40	154.69	154.99	155.29	
	17	154.26	154.55	154.86	155.16	155.46	
3	18	154.40	154.70	155.00	155.30	155.60	1 1/8"
	19	154.52	154.82	155.12	155.42	155.72	
	20	154.63	154.92	155.22	155.53	155.83	
	21	154.70	155.00	155.31	155.61	155.91	
℄ Brg's	22	154.77	155.07	155.37	155.68	155.98	
℄ Brg's.	23	154.79	155.09	155.39	155.69	155.99	
	24	154.93	155.23	155.54	155.84	156.14	
	25	155.06	155.36	155.66	155.97	156.27	
4	26	155.16	155.47	155.77	156.08	156.38	1 1/8"
	27	155.25	155.55	155.86	156.16	156.47	
	28	155.32	155.63	155.93	156.24	156.54	
	29	155.37	155.68	155.98	156.29	156.59	
℄ Brg's.	30	155.40	155.71	156.02	156.32	156.63	
℄ Brg's.	31	155.42	155.72	156.03	156.34	156.65	
	32	155.52	155.83	156.14	156.45	156.76	
	33	155.60	155.92	156.23	156.53	156.84	
5	34	155.68	155.99	156.30	156.61	156.92	1"
	35	155.73	156.04	156.35	156.66	156.97	
	36	155.77	156.08	156.39	156.70	157.01	
	37	155.79	156.11	156.42	156.73	157.04	
℄ Brgs.	38	155.80	156.11	156.42	156.73	157.05	

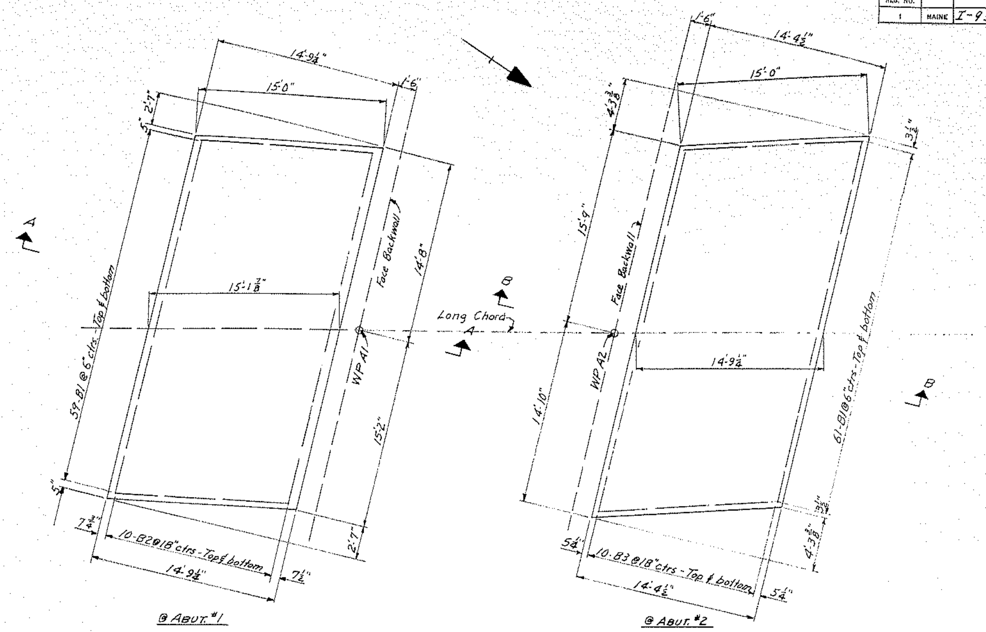
‡Exclusive of that caused by structural steel



BLOCKING DETAIL

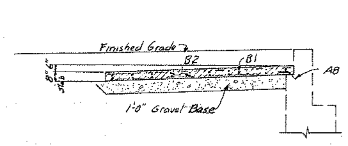
Nominal blocking @ ℄ Brgs.= 2 1/2"

NOTE: In order that the roadway slab may conform to the profile and cross sections shown on these plans, the accompanying table of elevations is given. Elevations for the bottom of the slab which are computed to compensate for dead load deflections must be established before slab forms are started.

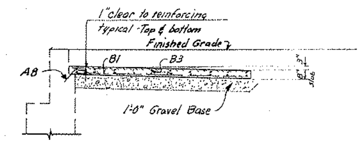


PLAN - APPROACH SLABS

NOTE: Payment for concrete in approach slabs to be made under Item 701-40, Portland Cement Concrete Roadway and Sidewalk Slabs on Steel Bridges.



SECTION A-A



SECTION B-B

DESIGN-M.C.R. DETAIL-M.C.R. TRACE-G.E.A. CHECK-R.A.S.	BRIDGE NO. SURVEY- PLOT-

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

COLD BROOK ROAD BRIDGE

OVER

INTERSTATE 95

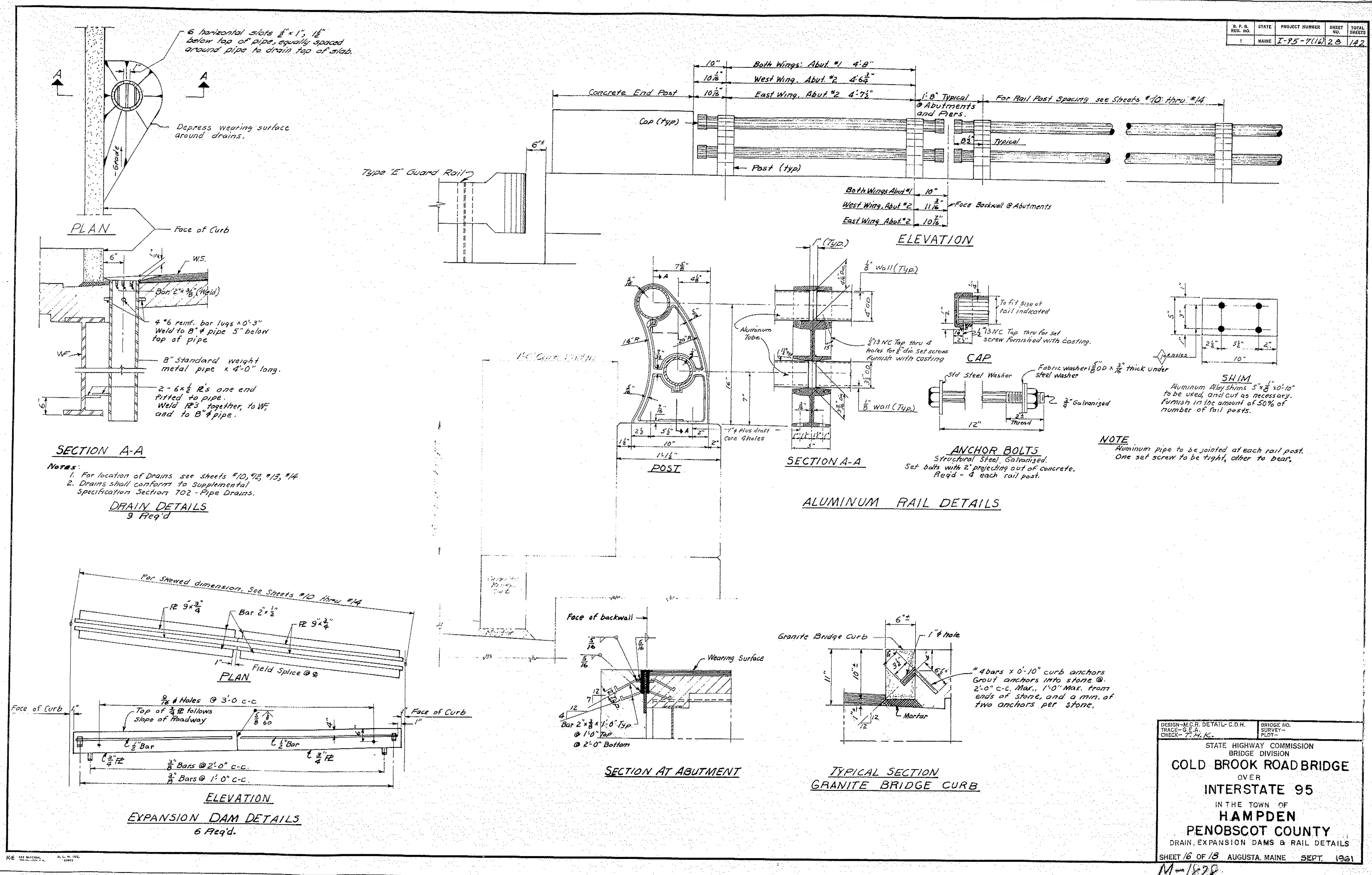
IN THE TOWN OF

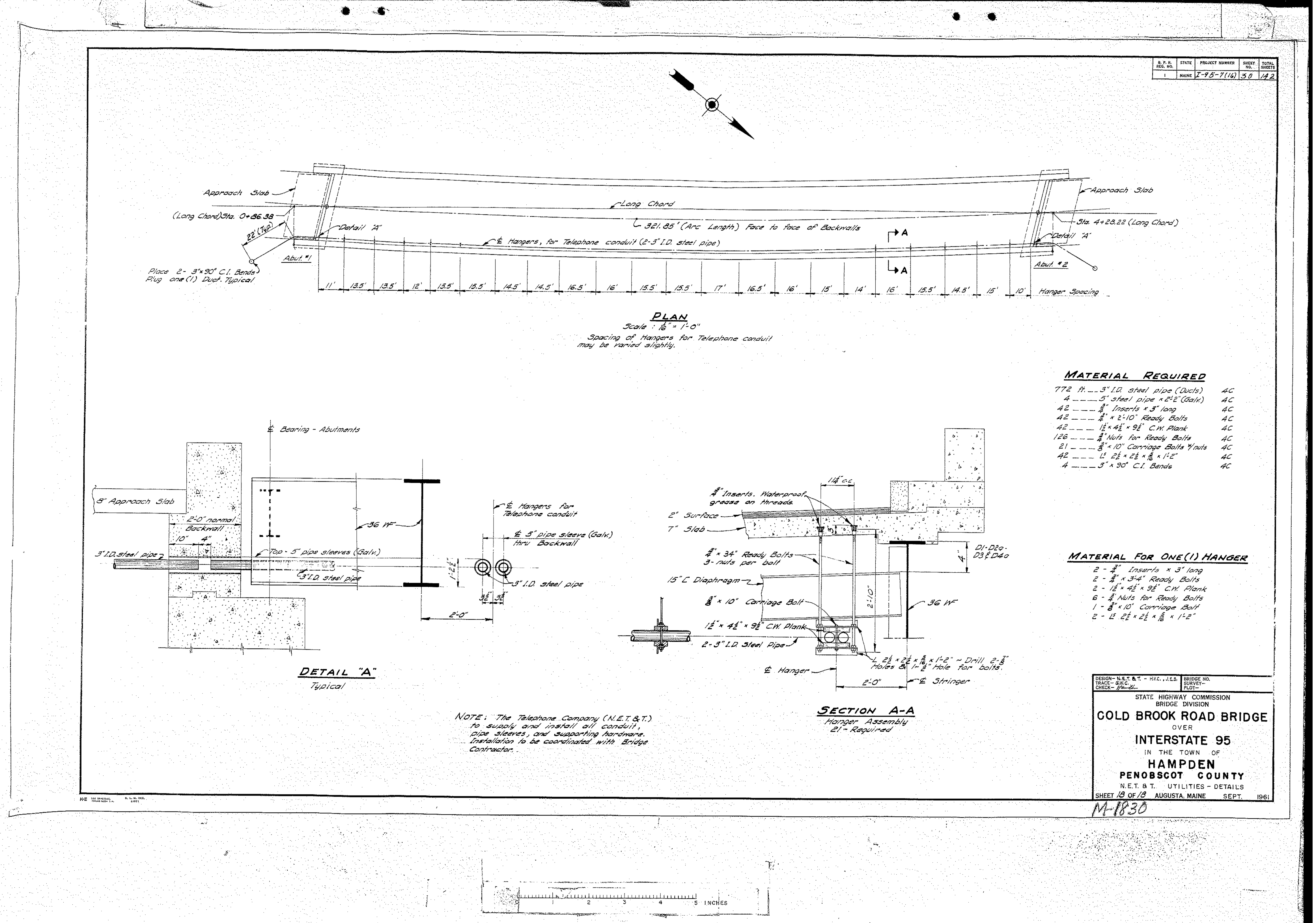
HAMPDEN
PENOBSCOT COUNTY

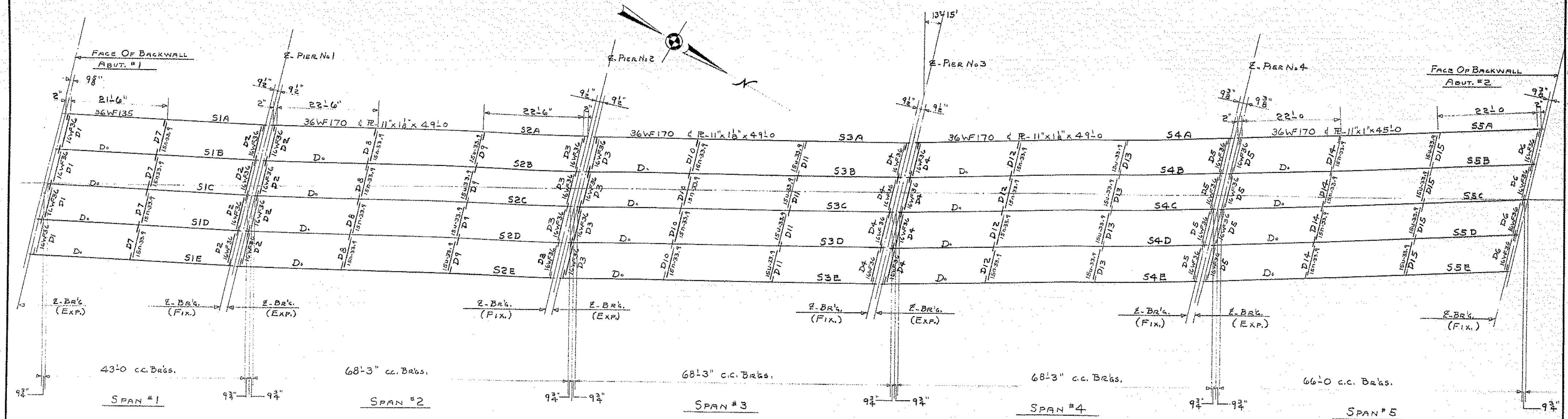
BLOCKING & APPROACH SLAB DETAILS

SHEET 15 OF 18 AUGUSTA, MAINE SEPT. 1961

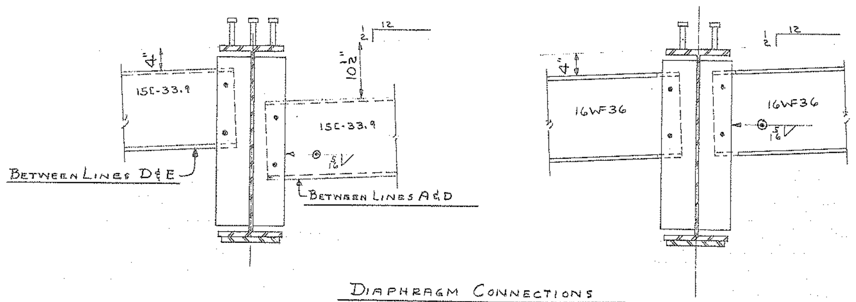
M-[redacted] 1827


PLAN
SECTION A-A
Notes:
1. For location of Drains see sheets #10, #12, #13, #14
2. Drains shall conform to Supplemental Specification Section 702 - Pipe Drains.
DRAIN DETAILS
9 Req'd
ELEVATION
POST
SECTION A-A
CAP
ANCHOR BOLTS
Structural Steel, Galvanized.
Set bolts with 2" projecting out of concrete.
Req'd - 4 each rail post.
SHIM
Aluminum Alloy Shims 5"x 1/8" x 0'-10" to be used, and cut as necessary. Furnish in the amount of 50% of number of rail posts.
NOTE
Aluminum pipe to be jointed at each rail post. One set screw to be tight, other to bear.
ALUMINUM RAIL DETAILS
PLAN
ELEVATION
EXPANSION DAM DETAILS
6 Req'd.
SECTION AT ABUTMENT
TYPICAL SECTION
GRANITE BRIDGE CURB
STATE HIGHWAY COMMISSION
BRIDGE DIVISION
COLD BROOK ROAD BRIDGE
OVER
INTERSTATE 95
IN THE TOWN OF
HAMPDEN
PENOBSCOT COUNTY
DRAIN, EXPANSION DAMS & RAIL DETAILS
SHEET 16 OF 18 AUGUSTA, MAINE SEPT. 1961
M-1828


Approach Slab
(Long Chord) Sta. 0+86.38
22' (Typ.)
Detail "A"
Long Chord
321.85' (Arc Length) Face to face of Backwalls
℄ Hangers, for Telephone conduit (2-3" I.D. steel pipe)
Abut. #1
Place 2- 3"x90° C.I. Bends
Plug one (1) Duct. Typical
Sta. 4+28.22 (Long Chord)
Abut. #2
A
11' 13.5' 13.5' 12' 13.5' 15.5' 14.5' 14.5' 16.5' 16' 15.5' 15.5' 17' 16.5' 16' 15' 14' 16' 15.5' 14.5' 15' 10' Hanger Spacing
PLAN
Scale : 1/16" = 1'-0"
Spacing of Hangers for Telephone conduit may be varied slightly.
MATERIAL REQUIRED
772 ft. — 3" I.D. steel pipe (Ducts) 4C
4 — 5" steel pipe x 2'-2" (Galv.) 4C
42 — 3/4" Inserts x 3" long 4C
42 — 3/4" x 2'-10" Ready Bolts 4C
42 — 1 1/2" x 4 1/2" x 9 1/2" C.W. Plank 4C
126 — 3/4" Nuts for Ready Bolts 4C
21 — 3/8" x 10" Carriage Bolts w/nuts 4C
42 — Ls 2 1/2 x 2 1/2 x 5/16 x 1'-2" 4C
4 — 3" x 90° C.I. Bends 4C
MATERIAL FOR ONE (1) HANGER
2 - 3/4" Inserts x 3" long
2 - 3/4" x 3'-4" Ready Bolts
2 - 1 1/2" x 4 1/2" x 9 1/2" C.W. Plank
6 - 3/4" Nuts for Ready Bolts
1 - 3/8" x 10" Carriage Bolt
2 - Ls 2 1/2 x 2 1/2 x 5/16 x 1'-2"
℄ Bearing - Abutments
8" Approach Slab
2'-0" normal Backwall
10" 4"
3" I.D. steel pipe
Top - 5" pipe sleeves (Galv.)
3" I.D. steel pipe
36 WF
℄ Hangers for Telephone conduit
℄ 5" pipe sleeve (Galv.) thru Backwall
1'-2 1/2"
3" I.D. steel pipe
3 1/2" 3 1/2"
2'-0"
DETAIL "A"
Typical
NOTE: The Telephone Company (N.E.T. & T.) to supply and install all conduit, pipe sleeves, and supporting hardware. Installation to be coordinated with Bridge Contractor.
11 1/4" c.c.
3/4" Inserts. Waterproof grease on threads.
2" Surface
7" Slab
3/4" x 34" Ready Bolts 3-nuts per bolt
15" C Diaphragm
3/8" x 10" Carriage Bolt
1 1/2" x 4 1/2" x 9 1/2" C.W. Plank
2-3" I.D. Steel Pipe
℄ Hanger
L 2 1/2 x 2 1/2 x 5/16 x 1'-2" ~ Drill 2-7/8" Holes & 1-1/2" Hole for bolts.
2'-0"
℄ Stringer
2'-10"
4"
D1-D2a-D3 & D4a
36 WF
SECTION A-A
Hanger Assembly
21 - Required
DESIGN- N.E.T. & T. - H.V.C., J.E.S.
TRACE- G.W.C.
CHECK-
BRIDGE NO.
SURVEY-
PLOT-
STATE HIGHWAY COMMISSION
BRIDGE DIVISION
COLD BROOK ROAD BRIDGE
OVER
INTERSTATE 95
IN THE TOWN OF
HAMPDEN
PENOBSCOT COUNTY
N.E.T. & T. UTILITIES - DETAILS
SHEET 18 OF 18 AUGUSTA, MAINE SEPT. 1961
M-1830
INCHES



Framing Plan



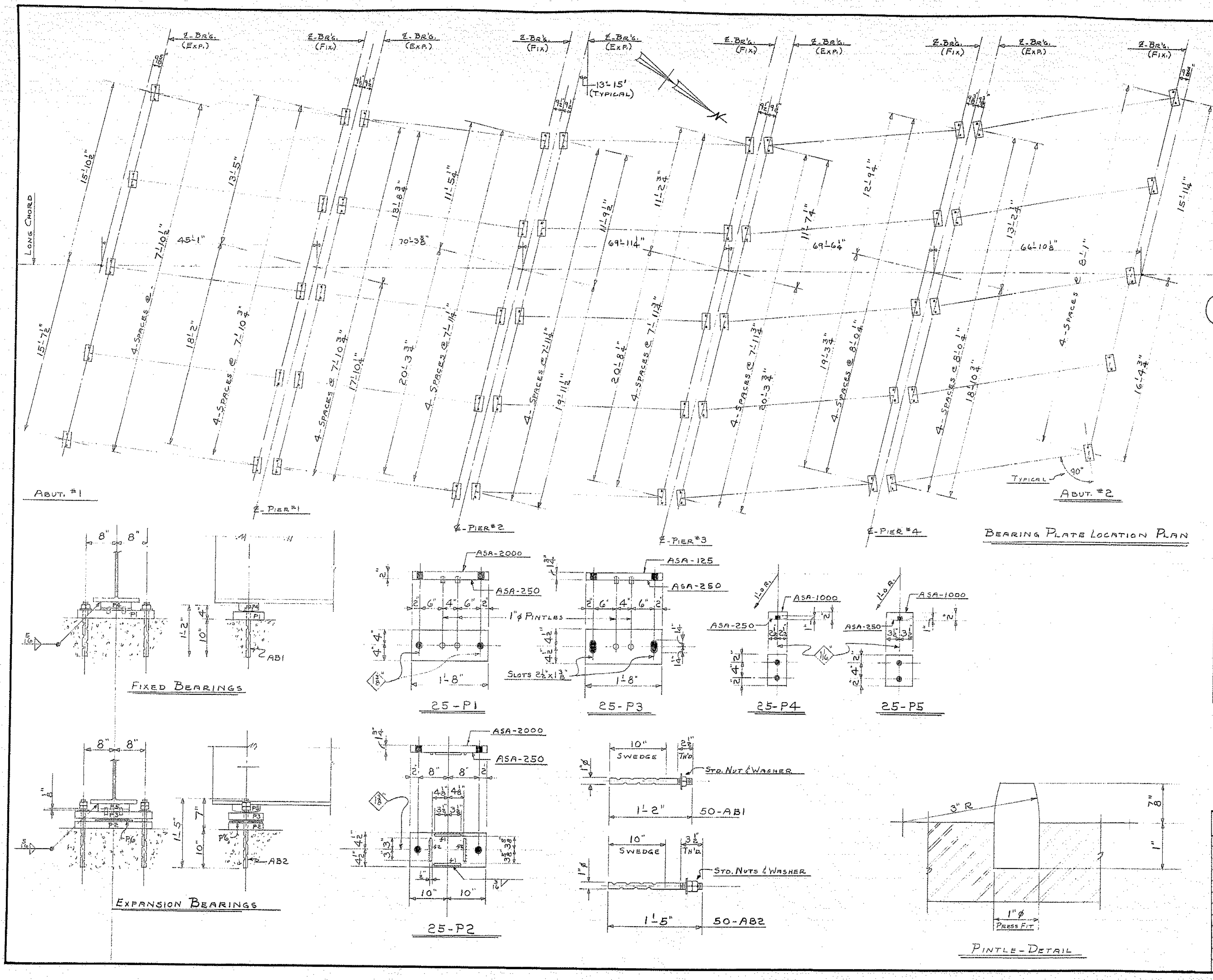
Diaphragm Connections

SHOP CONNECTIONS: Weld
FIELD CONNECTIONS: Weld
HOLES: As Noted
PAINT: State Of Maine Spec's.

App'd 7-10-62

Framing Plan			
PRINT ISSUE			Bancroft & Martin Rolling Mills Company, Brewer, Maine
1	Shop	7-19-62	Cold Brook Road Bridge, Hampden-Hermon, Maine
3	Cust	7-19-62	
2	F/A	6-26-62	
DRAWN	6-15-62	D.C.	CUSTOMER Reed & Reed
REVISION			DESIGNER State Highway Commission
REVISION			
REVISION			ORDER Verbal — DWG. B61-451-E1

87-29A



SHIP MARK	NO.	MARK	SHAPE	LENGTH		WT.	REMARKS
P1	25		℞-8x2	1	8		
P2	25		℞ 9x1¾	1	8		
P3	25		Do	1	8		
P4	25		℞ 5x2	0	8		
P5	25		℞-7x2	0	8		
	100		1"φ Rod	0	1⅞		Pintles
AB1	50		1"φ Rod	1	2		
AB2	50		Do	1	5		
	150		1" Nuts				
	100		1"φ Washers				
	50	f1	Bar ½x4	0	7		
	50	f2	Do	0	6		
P6	25		℞-7x½	0	8		Self Lubr. Bronze
	Ordered By C.F.W. On Req. #670						
Struct. Steel Is Item 702-103							

BILL OF MATERIAL DWG. B61-451-S1

Scale Wt

SHOP CONNECTIONS: Weld
FIELD CONNECTIONS: Weld
HOLES: As Noted
PAINT: State Of Maine Spec's.

App'd As Noted 6-14-62

Bearing Plates & Anchor Bolts

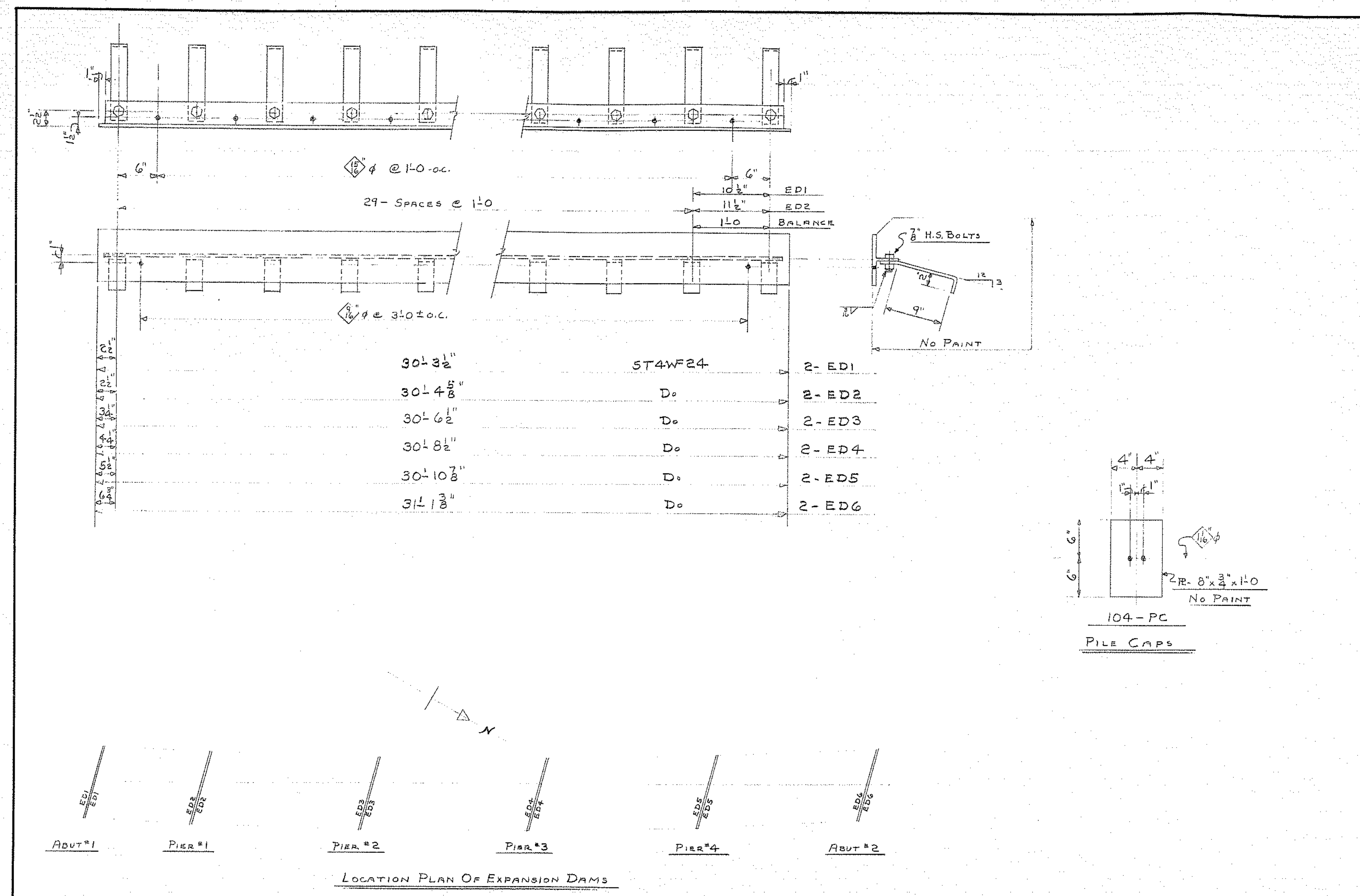
Bancroft & Martin Rolling Mills Company
Brewer, Maine

Cold Brook Road Bridge
Hampden-Hermon, Maine

PRINT ISSUE		
3	Cust.	6-22-62
3	Cust	6-22-62
5	Port	6-22-62
2	FIA	6-12-62
DRAWN	6-11-62	D.C.
REVISION		
REVISION		
REVISION		

CUSTOMER Reed & Reed
DESIGNER State Highway Comm.
ORDER Verbal
DWG. B61-451-S1

87-29B



SHIP MARK	NO.	MARK	SHAPE	LENGTH		WT.	DEDUCT.	REMARKS
ED1	2		ST4WF24	30	3 1/2		7#	
ED2	2		Do	30	4 5/8		7#	
ED3	2		Do	30	6 1/2		7#	
ED4	2		Do	30	8 1/2		7#	
ED5	2		Do	30	10 7/8		7#	
ED6	2		Do	31	1 3/8		7#	
PC	104		PL-8 x 3/4	1	0		39#	
	372	f1	Bar 2 1/2 x 3/8	1	2			
	372	Shop	7/8 H.S. Bolts	0	2		@ 36# Per 100	
Struct. Steel Is Item 702-103								

BILL OF MATERIAL DWG. B61-451-52

SHOP CONNECTIONS: 7/8" H.S. Bolts
FIELD CONNECTIONS:
HOLES: As Noted
PAINT: State Of Maine Spec's.

App'd As Noted 6-14-62

EXPANSION DAMS & PILE CAPS

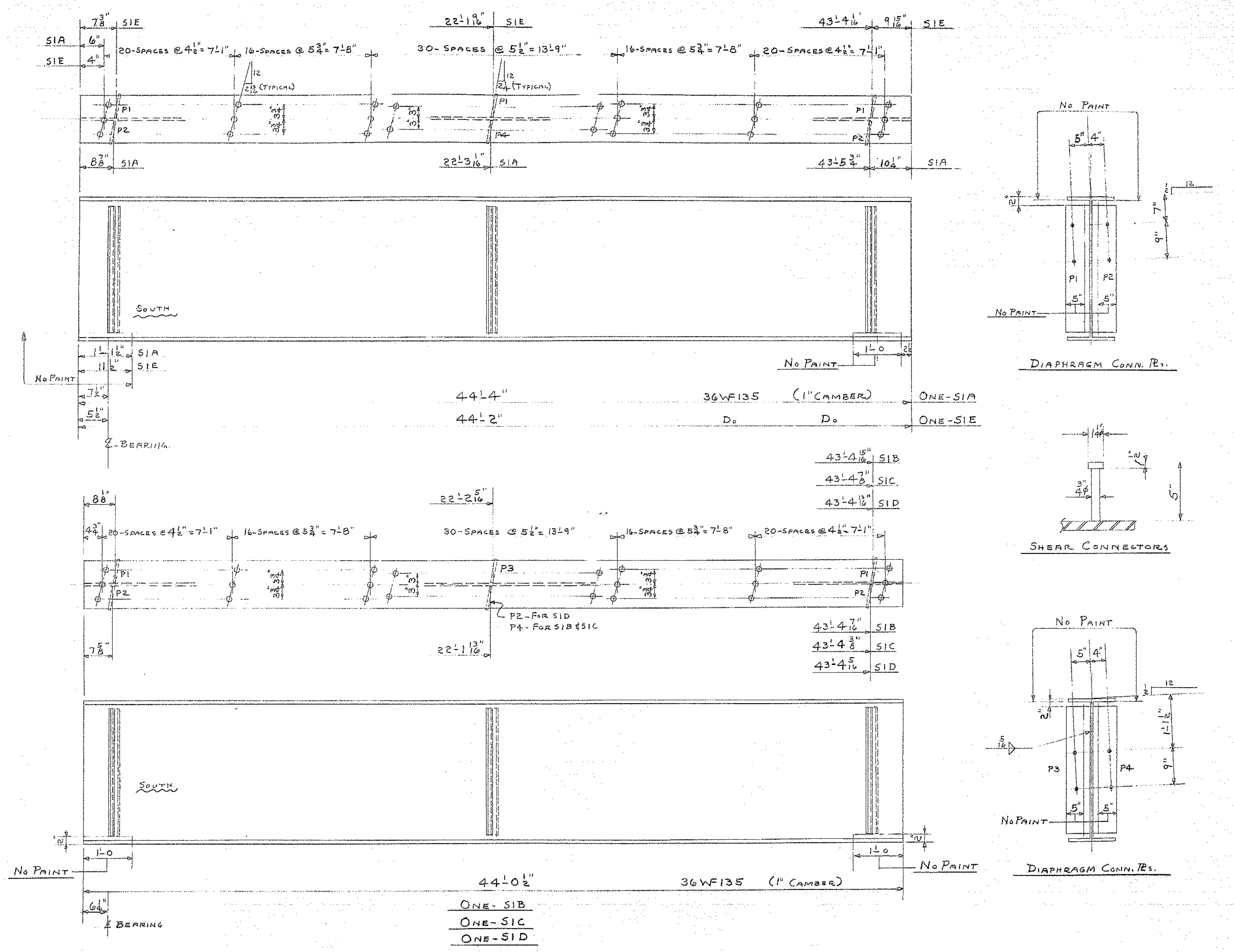
Bancroft & Martin Rolling Mills Company
Brewer, Maine

COLD BROOK ROAD BRIDGE
HAMPDEN-HERMON, MAINE

PRINT ISSUE		
3	Cust	7-6-62
3	Cust	6-22-62
5	Shop	6-22-62
2	F/A	6-12-62
DRAWN	6-12-62	D.C.
REVISION		
REVISION		
REVISION		

CUSTOMER Reed & Reed
DESIGNER State Highway Comm.
ORDER Verbal DWG. B61-451-52

87-29C



SHIP MARK	NO.	MARK	SHAPE	LENGTH		WT.	DEDUCT.	REMARKS
S1A	1		36WF135	44	4			A373
S1B	1		Do	44	0½			Do
S1C	1		Do	44	0½			Do — 1" CAMBER
S1D	1		Do	44	0½			Do
S1E	1		Do	44	2			Do
	9	P1	PL-6x⅜	2	8		1½#	A7
	9	P2	Do	2	8		1½#	Do
	3	P3	Do	2	8		½#	Do
	3	P4	Do	2	8		½#	Do
	1400		¾" STUDS	0	5			NELSON SHEAR CONN.
	1		5/16" WELD	128	0			@ .166# PER. FT.
STRUCT.	STEEL IS	ITEM	702-10	3				

DWG. B61-451-53

SHOP CONNECTIONS: WELD
FIELD CONNECTIONS: WELD
HOLES: 15/16" ø
PAINT: STATE OF MAINE SPEC'S.

APP'D AS NOTED 7-10-62

STRINGERS SPAN No 1

PRINT ISSUE		
5	SHOP	7-19-62
3	CUST.	7-19-62
2	F/A	6-26-62
DRAWN	6-22-62	D.C.
REVISION		
REVISION		
REVISION		

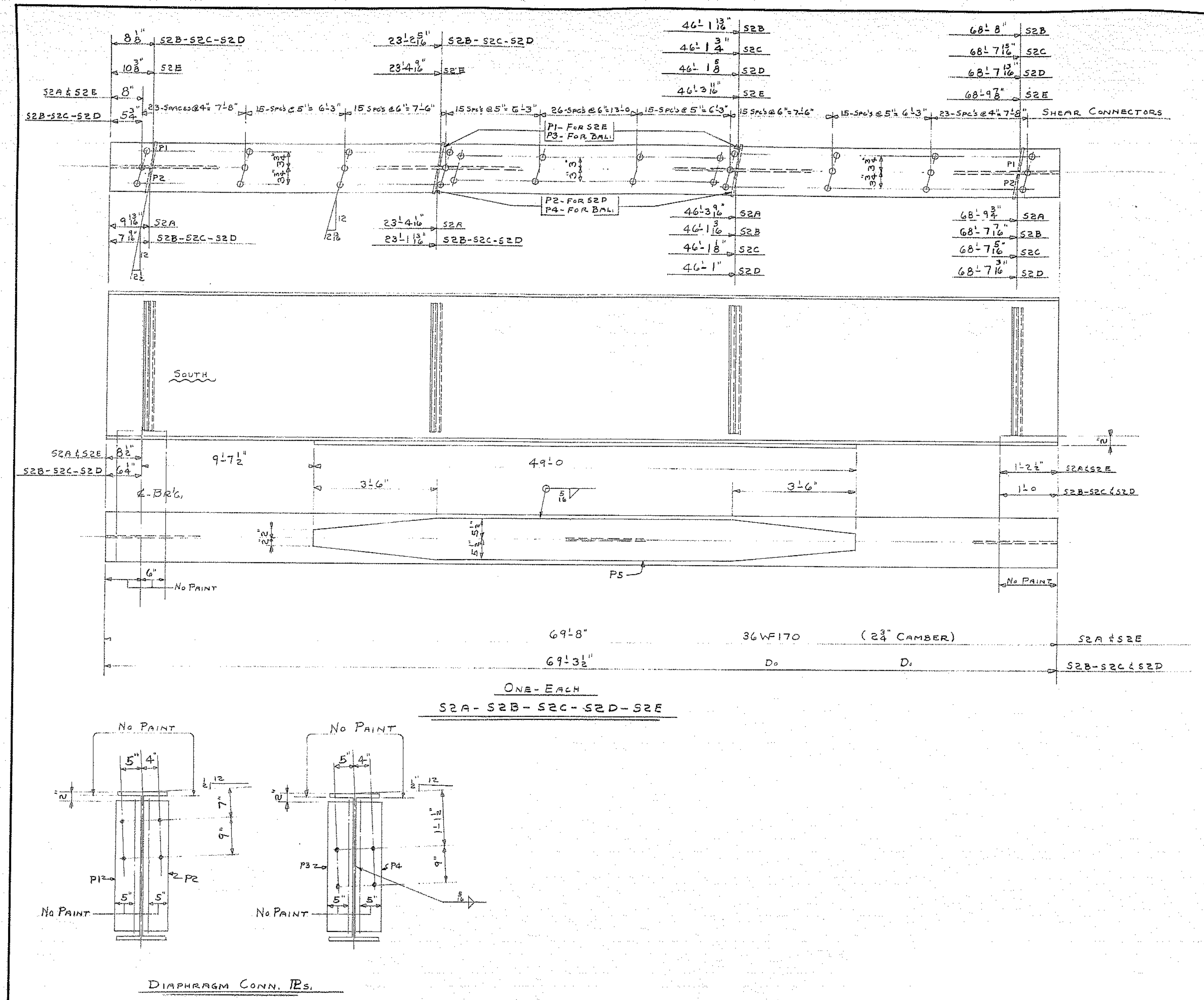
Bancroft & Martin Rolling Mills Company
Brewer, Maine

COLD BROOK ROAD BRIDGE
HAMPDEN-HERMON, MAINE

CUSTOMER REED & REED
DESIGNER STATE HIGHWAY COMMISSION

ORDER VERBAL DWG. B61-451-53

87-29D



SHIP MARK	NO.	MARK	SHAPE	LENGTH		WT.	DEDUCT.	REMARKS
BILL OF MATERIAL								DWG. B61-451-S4
S2A	1		36WF170	69	8			A373
S2B	1		Do	69	3½			Do 2¾"
S2C	1		Do	69	3½			Do CAMBER
S2D	1		Do	69	3½			Do
S2E	1		Do	69	8			Do
	5	P5	PL-11×1⅛	49	0		468#	Do
	10	P1	PL-6×⅜	2	8		1½#	A7
	10	P2	Do	2	8		1½#	A7
	6	P3	Do	2	8		1#	A7
	6	P4	Do	2	8		1#	A7
	2170		¾" STUDS	0	5		SHEAR CONNECTORS	
	1		5/16" WELD	666	0		@ .166# PER. FT.	
STRUCT.	STEEL IS ITEM 702-103							

SHOP CONNECTIONS: WELD
FIELD CONNECTIONS: WELD
HOLES: 15/16" ø
PAINT: STATE OF MAINE SPEC'S.

APP'D AS NOTED 7-10-62

STRINGERS SPAN No 2

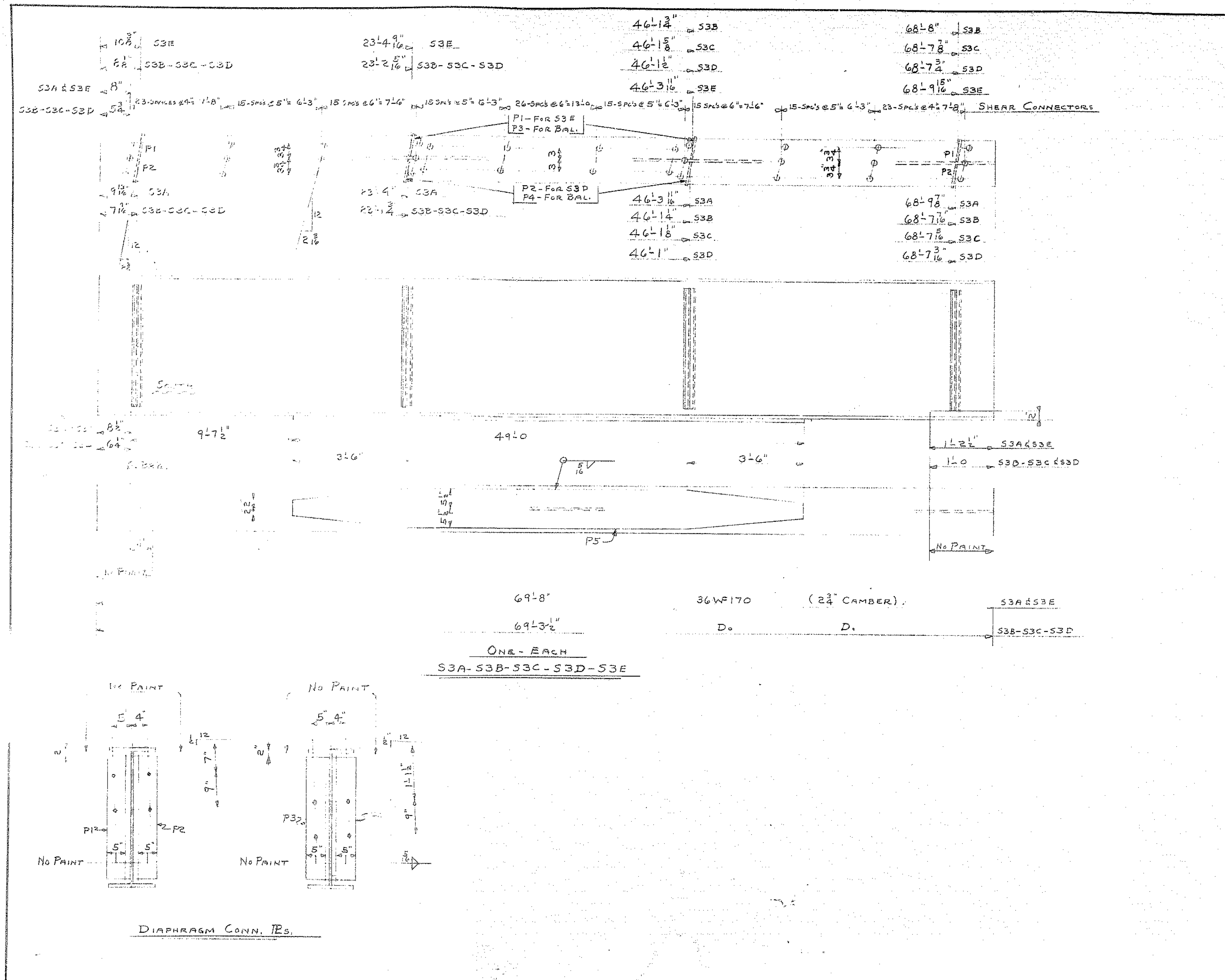
Bancroft & Martin Rolling Mills Company
Brewer, Maine

COLD BROOK ROAD BRIDGE
HAMPDEN-HERMON, MAINE

PRINT ISSUE		
3	CUST.	7-19-62
5	SHOP	7-19-62
2	F/A	6-26-62
DRAWN	6-22-62	D.C.
REVISION		
REVISION		
REVISION		

CUSTOMER REED & REED
DESIGNER STATE HIGHWAY COMMISSION
ORDER VERBAL
DWG. B61-451-S4

87-29E



SHIP MARK	NO.	MARK	SHAPE	LENGTH		WT.	DEDUCT.	REMARKS
S3A	1		36WF170	69	8			A373 } 2¾" Camber
S3B	1		Do	69	3½			Do
S3C	1		Do	69	3½			Do
S3D	1		Do	69	3½			Do
S3E	1		Do	69	8			Do
	5	P5	P-11x1⅛	49	0		468#	Do
	10	P1	P-6x⅜	2	8		1½#	A7
	10	P2	Do	2	8		1½#	A7
	6	P3	Do	2	8		1#	A7
	6	P4	Do	2	8		1#	A7
	270		¾" Studs	0	5		Shear Connectors	
	1		5/16" Weld	366	0		@ .166# Per Ft.	
Struct.	Steel / - Item			702-103				

DWG. B61-451-55

SHOP CONNECTIONS: [illegible]
FIELD CONNECTIONS: Do
HOLES: 15/16" ø
PAINT: State Of Maine Spec's.

[illegible] 7-10-62

[illegible] Span No 3

Bancroft & Martin Rolling Mills Company
Brewer, Maine

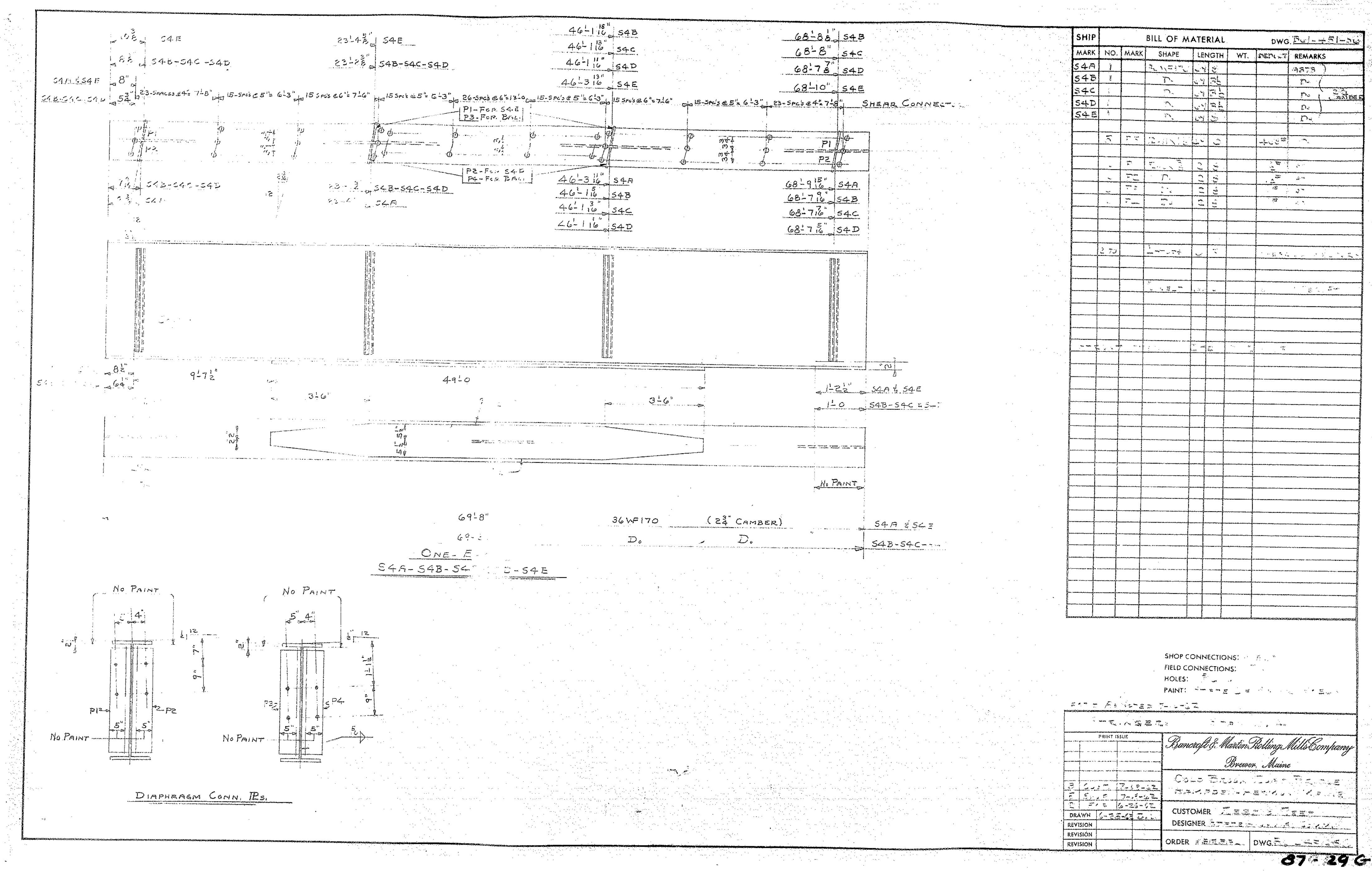
Cold Brook Road Bridge
Hampden-Hermon, Maine

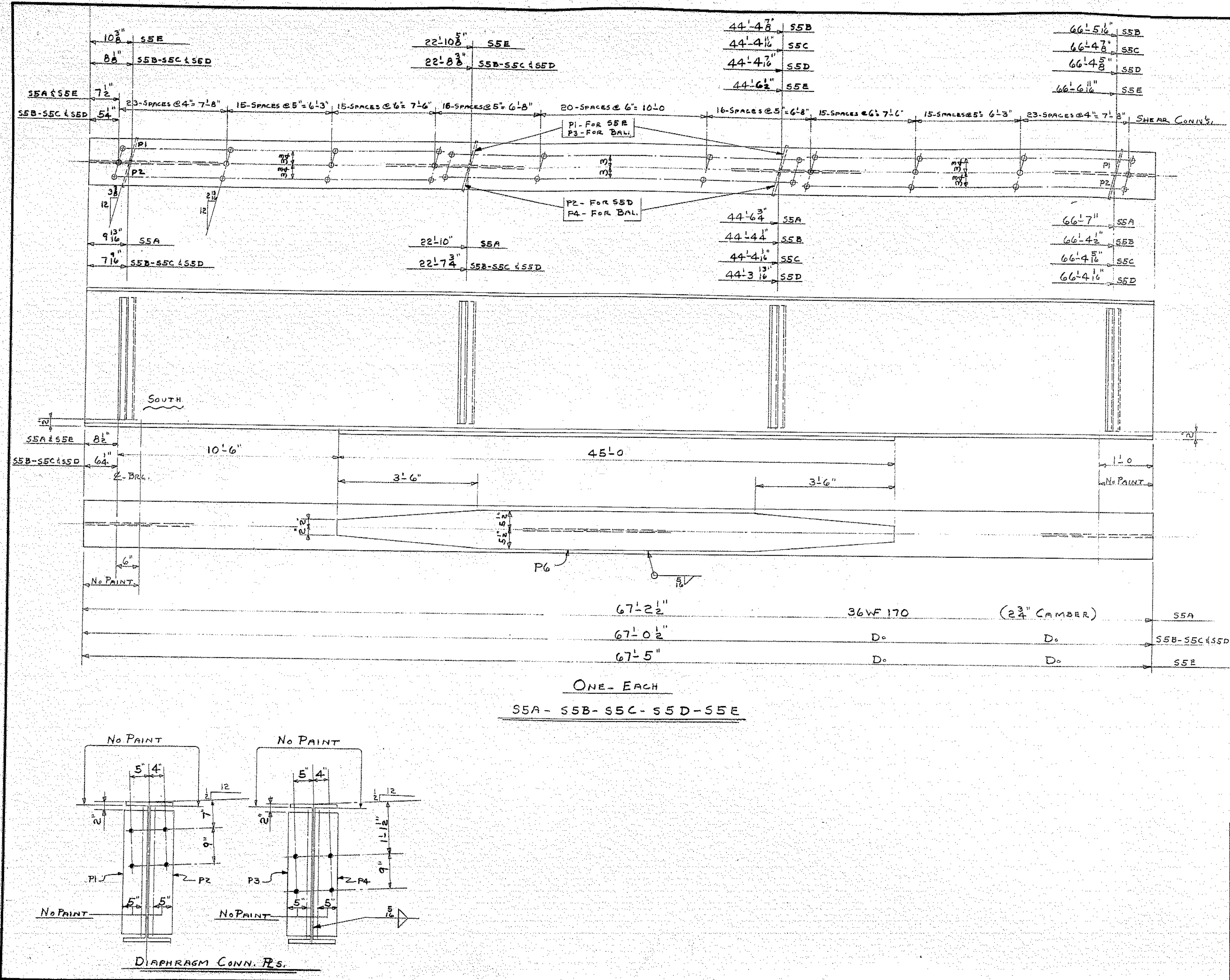
3 Cust. 7-19-62
5 Shop 7-19-62
2 " " 6-26-62

DRAWN 6-25-62 D.C.
REVISION
REVISION
REVISION

CUSTOMER Reed & Reed
DESIGNER State Highway Commission
ORDER Verbal DWG. B61-451-55

87-29F


SHEAR CONNEC-
P1-FOR S4B
P3-FOR BAL.
36WF170
(2¾" CAMBER)
No PAINT
DIAPHRAGM CONN. PLs.
BILL OF MATERIAL
SHIP
MARK
NO.
SHAPE
LENGTH
WT.
REMARKS
S4A
S4B
S4C
S4D
S4E
SHOP CONNECTIONS:
FIELD CONNECTIONS:
HOLES:
PAINT:
PRINT ISSUE
Bancroft & Martin Rolling Mills Company
Brewer, Maine
CUSTOMER
DESIGNER
DRAWN
REVISION
ORDER
DWG.
87-29G



SHIP MARK	NO.	MARK	SHAPE	LENGTH (ft)	LENGTH (in)	WT.	DEDUCT.	REMARKS
S5A	1		36WF170	67	2½			A373
S5B	1		Do	67	0½			Do (2¾" CAMBER)
S5C	1		Do	67	0½			Do
S5D	1		Do	67	0½			Do
S5E	1		Do	67	5			Do
	5	P6	PL-11x1	45	0		417#	Do
	10	P1	PL-6x⅜	2	8		1½#	A7
	10	P2	Do	2	8		1½#	A7
	6	P3	Do	2	8		1#	A7
	6	P4	Do	2	8		1#	A7
	2130	STUDS	¾"φ	0	5		SHEAR CONNECTORS	
	1		5/16" WELD	586	0		@ .166# PER FT.	

BILL OF MATERIAL DWG. B61-451-57

STRUCT. STEEL IS ITEM 702-103

SHOP CONNECTIONS: WELD
FIELD CONNECTIONS: Do
HOLES: 15/16" φ
PAINT: STATE OF MAINE SPECS.

APP'D AS NOTED 7-10-62

STRINGERS SPAN No 5

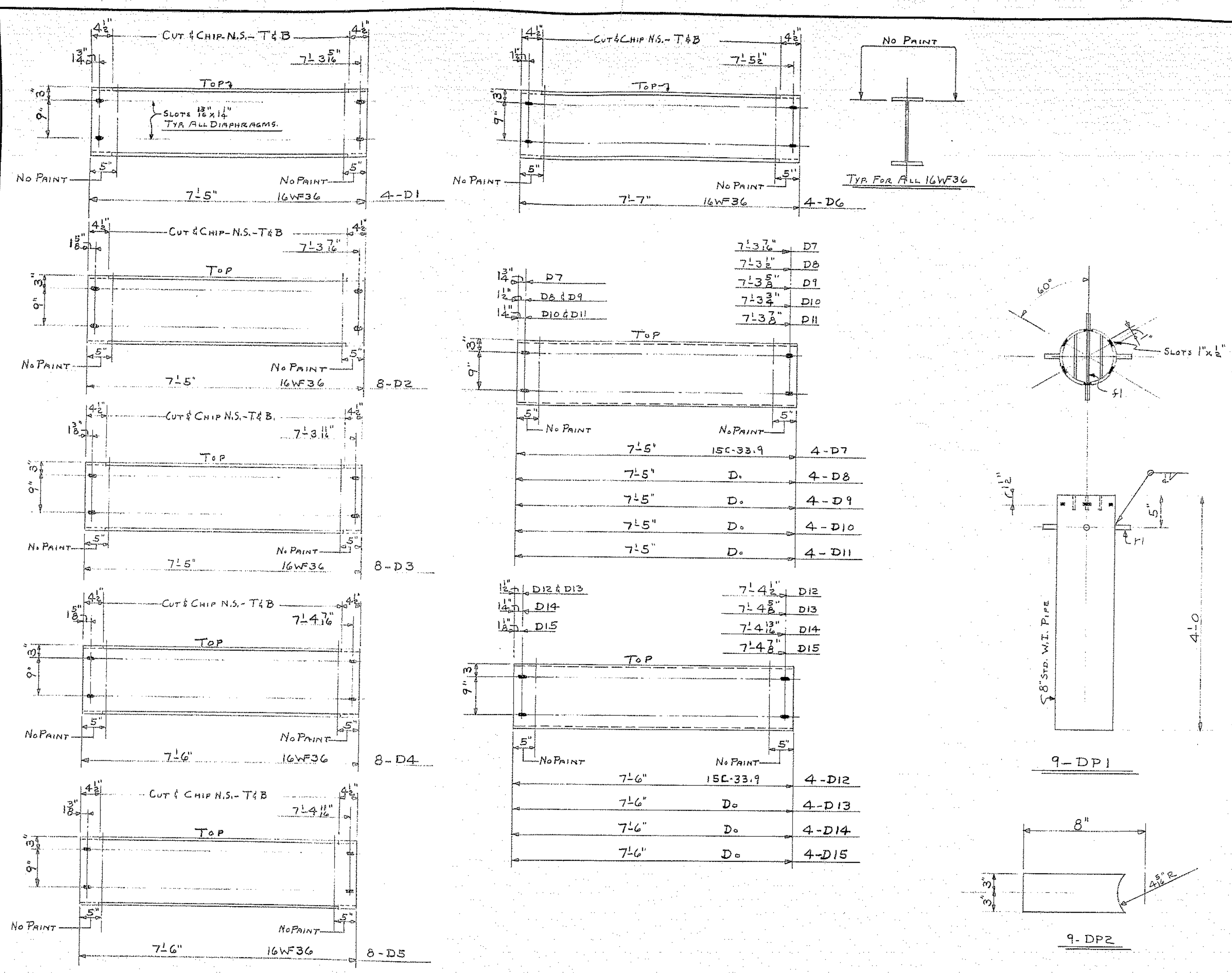
Bancroft & Martin Rolling Mills Company
Brewer, Maine

COLD BROOK ROAD BRIDGE
HAMPDEN-HERMON, MAINE

PRINT ISSUE		
3	CUST.	7-19-62
5	SHOP	7-19-62
2	F/A	6-26-62
DRAWN	6-25-62	D.C.
REVISION		
REVISION		
REVISION		

CUSTOMER REED & REED
DESIGNER STATE HIGHWAY COMM.
ORDER VERBAL DWG. B61-451-57

07-29H



SHIP	BILL OF MATERIAL						DWG. B61-451-SB
MARK	NO.	MARK	SHAPE	LENGTH		WT.	DEDUCT.	REMARKS
D1	4		16WF36	7	5		31#	A7
D2	8		Do	7	5		61#	
D3	8		Do	7	5		61#	
D4	8		Do	7	6		61#	
D5	8		Do	7	6		61#	
D6	4		Do	7	7		31#	
D7	4		15C-33.9	7	5		2#	
D8	4		Do	7	5		2#	
D9	4		Do	7	5		2#	
D10	4		Do	7	5		2#	
D11	4		Do	7	5		2#	
D12	4		Do	7	6		2#	
D13	4		Do	7	6		2#	
D14	4		Do	7	6		2#	
D15	4		Do	7	6		2#	
DP1	9		8 W.I. Pipe	4	0			A72
	27	f1	Bar 2x3/8	0	8			
	36	r1	#6 Re-Bar	0	3			
DP2	9		PL-6x1/2	0	5			
DP3	9		Do	0	8		No Fab	
Field	320		3/4" M. Bolts	0	1 1/2	[redacted]	Not In Pay Wt.	
Struct	Steel Is	Item 702-103						

SHOP CONNECTIONS: Weld
FIELD CONNECTIONS: Do
HOLES: 13/16 x 1 1/4" Slots
PAINT: State Of Maine Spec's.

App'd 7-10-62

DIAPHRAGMS & BRIDGE DRAINS

PRINT ISSUE		
3	Cust.	7-19-62
5	Shop	7-19-62
2	F/A	6-26-62
DRAWN	6-26-62	D.C.
REVISION		
REVISION		
REVISION		

Bancroft & Martin Rolling Mills Company
Brewer, Maine

Cold Brook Road Bridge
Hampden-Herman, Maine

CUSTOMER Reed & Reed
DESIGNER State Highway Comm.
ORDER Verbal DWG. B61-451-SB

87-291