Bridge Load Rating

Prepared for

Maine Department of Transportation

Bridge No. 5931

Rumford

River Street

OVER

Mill Yard

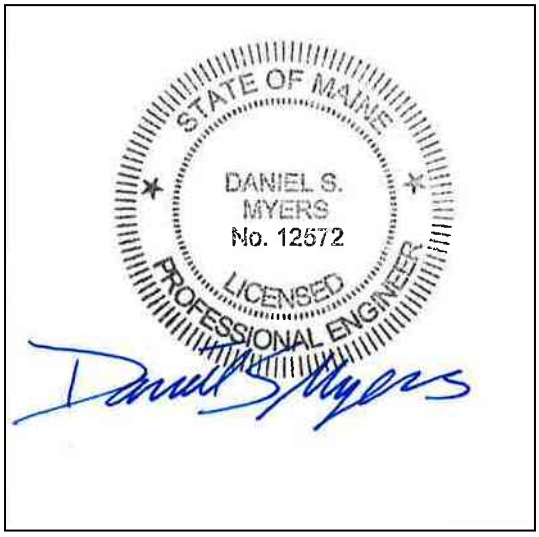
Date of Inspection: August 4, 2010

Date of Rating: April 7, 2015

Prepared By: Daniel Myers, P.E.

Checked By: Joshua Olund, P.E.

T·Y·LIN INTERNATIONAL



Bridge No:	5931	Owner:	MaineDOT
Town/City:	Rumford	Maintainer:	MaineDOT
Route Carried:	River Street	Year Built	1964
Crosses:	Mill Yard	Year(s) Rebuilt/Rehab:	N/A

SUMMARY OF BRIDGE RATING

VEHICLE TYPE		RF	RT (TONS)	POSTING LOAD (TONS)
HL-93	INVENTORY	1.36	48.96	
	OPERATING	1.77	63.72	
HL-93 modified	INVENTORY	***0.00***	0.00	
	OPERATING	***0.00***	0.00	
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 - FE Model of Full System
Live Load LF Routine Commercial:	1.30
Live Load LF Special Hauling:	1.30
Impact Factor:	1.33
Governing Condition Factor, ϕ_c:	0.95
System Factor, ϕ_s:	1
ADTT (one-way):	12

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 100+ years

BREAKDOWN OF BRIDGE RATING

Town/City: Rumford
Bridge No: 5931

Route Carried: River Street
Crosses: Mill Yard

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
Exterior Girder Strength I Positive Moment, 0.5L	1.75	2.27										
Interior Girder Strength I Positive Moment, 0.5L	1.37	1.78										
Exterior Girder Strength I Shear at CL Bearing	3.12	4.05										
Interior Girder Strength I Shear at CL Bearing	1.83	2.37										
Exterior Girder Service II Positive Moment, 0.5L	1.87	2.43										
Interior Girder Service II Positive Moment, 0.5L	1.36	1.77										
CONTROLLING RATING FACTORS	1.36	1.77										

DESCRIPTION OF BRIDGE

Bridge Number:	5931
Owner:	MaineDOT
Maintained By:	MaineDOT
Location:	Rumford
Route Carried:	River Street
Feature Intersected:	Mill Yard
Latest NBI Inspection Date:	8/4/2010
Field Verification Date (if applicable):	9/30/2014
Date of Construction:	1964
Bridge Type:	Girder
Material Properties:	Steel
Original Design Loading:	H20
Date(s) of Rebuild/Rehab :	N/A
Description of Rebuild/Rehab :	N/A
Posting:	None after project (10 Tons at start of project)
Superstructure:	Concrete deck on steel girders
Substructure:	Solid shaft piers on spread footings
Bearings:	Steel sliding plates
Bridge Spans:	350’ Total (7 simple spans at 50’)
Bridge Skew:	0 °0’0”
Bridge Width:	34’-6” out-to-out
Roadway Width:	26’-0” curb-to-curb
Roadway Surface:	Bituminous wearing surface
Curbs:	Granite
Sidewalk/Walkway/Median:	5’-0”
Utilities:	Fiber on bridge, power to streetlights on bridge
Bridge Railing:	Ornamental steel railing (substandard)
Approach Railing:	Guardrail (substandard)
Wearing Surface Condition:	Fair (prior to project)
Bridge Railing Condition:	Substandard
Deck Condition:	Fair
Beam Condition:	Serious (prior to project)
Bearing Condition:	Fair
Abutment Condition:	Fair
Pier Condition:	Fair

Rumford Bridge #5931

Load Rating Notes

1. The load rating analysis preformed and reported herein was based upon MaineDOT supplied design plans, fabrication drawings, inspection reports, and photographs. A site visit was conducted to evaluate girder deterioration. However, this load rating assumes that the girder repair is completed properly and restores girders to their original capacities; therefore no deterioration was considered. The repairs were designed to be stronger than the original steel member; therefore the original girders just beyond the repair locations will control the shear load rating.

2. The condition state of the bridge is "Fair" or better, based on the evaluation of the deck provided in the SI&A sheet.

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

4. 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.

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

6. 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.

7. The bridge was initially checked for infinite fatigue life. However, the low fatigue category detail at the end of the welded cover plate resulted in the need to consider a finite fatigue life. The MDX model was analyzed with a 20 year design life placeholder and the anticipated finite fatigue life of the structure was determined in accordance with MBE Section 7.

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

9. It is assumed that the concrete curbs do not contribute stiffness to the overall model. The sidewalk beam was not modeled. Utility loads from power and fiber were considered not significant and were not included.

10. 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. The remaining portion of the haunch identified in the plans and pictures was included as dead weight (DC1) only.

11. No reduction to multiple presence factors due to low truck traffic volume was considered in this analysis.

References:

1. MaineDOT Load Rating Guide, 2013
2. MaineDOT Bridge Design Guide 2003 with interims through 2014.
3. Manual for Bridge Evaluation Second Edition with Interims through 2013
4. AASHTO LRFD Bridge Design Specifications – 6th Edition, with Interims through 2013

Haverhill Bridge #5931

Loads, Geometry, Materials, & Use Information

Rating Inputs

Bridge Dimensions

$Year := 1963$	*Year of design*
$Bridge_L := 48.5ft$	*Bridge Span, CL support to CL support*
$Bridge_{wd.out} := 31ft$	*Bridge Width*
$Skew := 0deg$	*Bridge Skew, Measured Clockwise*
$Roadway_{wd} := 26ft$	*Roadway Width*
$t_s := 7in$	*Concrete slab thickness, structural portion*
$Overhang := 2.0ft$	*Slab overhang that extends beyond edge of exterior beam*
$Wearing_{t.conc} := 0in$	*Wearing Surface Thickness, Concrete*
$Wearing_{t.bit} := 2.5in$	*Wearing Surface Thickness, Bituminous*
$Curb_{wd} := 2.5ft$	*Average Width of Curbs*
$Curb_{ht} := Wearing_{t.conc} + Wearing_{t.bit} + 8.5in = 11\,in$	*Height of the Curbs*
$Stripe_Lane_{offset} := 0ft$	*Striped line offset from face of curb (not striped)*
$ADT_{cur} := 370$	*Average daily traffic, Current*
$ADT_{fut} := 407$	*Average daily traffic, Future*
$Truck_{perc} := 5\%$	*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)*
$ADTT := ceil\left(ADT_{fut} \cdot Truck_{perc} \cdot ADT_{Direction_Split}\right) = 12$	*Average Daily Truck Traffic in one direction (put in 5000 if unknown)*
$Condition := \text{"Fair"}$	*Condition of deck (2011, SIA sheet)*

Beam Dimensions

$S := 6ft + 9in = 6.75 \cdot ft$ — *Maximum beam spacing, CL Web to CL Web*

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

$Curb := Curb_{wd} - Overhang = 0.5 \cdot ft$ — *Gutterline offset from CL of exterior girder web, for use in MDX*

$b_f := 10in$ — *Width of top flange*

$t_f := 0.64in$ — *Thickness of the flange*

$Haunch := 3in$ — *Estimated clear distance between top of top flange and bottom of deck*

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

Properties

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

$\gamma_{WS} := 140pcf$ — *Unit weight of wearing surface (asphalt)*

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

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

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

$f'_c := \left(\frac{f_c}{0.4}\right) = 3\ ksi$ — *Maximum concrete compressive stress*

$F_y := 36ksi$ — *Yield strength of steel*

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

$E_c := 1820\sqrt{f'_c \cdot ksi} = 3152.33\ ksi$ — *Elastic modulus of concrete (AASHTO C5.4.2.4)*

$n := \frac{E_s}{E_c} = 9.2$ — *Modular Ratio*

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)*

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

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

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

Live Load Factors for each of the Truck Configurations

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

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

$\boxed{\varphi_s := 1.0}$

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

DC Loading

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

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, 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 noncomposte dead load, calculated herein.

Diaphragms

Type = C15x33.9

$S_{xframe} := 24.25\,ft$ — *Spacing between successive cross frames, along girder*

$N_{xframe} := 3$ — *Number of cross frames along girder*

$L_{xframe} := S - 2 \cdot 2.5in = 76\,in$ — *Length of each cross frame between girders*

Connection Plates

$wt_{plate} := 23in \cdot 6in \cdot 0.375in \cdot \gamma_{steel} = 14.67\,lbf$ — *Weight per connection plate*

$wt_{plate_ext} := \frac{wt_{plate} \cdot N_{xframe}}{Bridge_L} = 0.91 \cdot plf$ — *Distributed weight of connection plate along exterior girder*

$wt_{plate_int} := 2 \cdot \frac{wt_{plate} \cdot N_{xframe}}{Bridge_L} = 1.82 \cdot plf$ — *Distributed weight of connection plate along interior girder*

Miscellaneous

$wt_{misc_ext} := 5plf$ — *Additional steel weight along exterior girders (weld metal, bolts, etc)*

$wt_{misc_int} := 10plf$ — *Additional steel weight along interior girders (weld metal, bolts, etc)*

Total

$\boxed{WAS_{ext} := wt_{plate_ext} + wt_{misc_ext} = 0.0059 \cdot klf}$ — *Total weight of additional non-composite steel weight on exterior girders*

$\boxed{WAS_{int} := wt_{plate_int} + wt_{misc_int} = 0.0118 \cdot klf}$ — *Total weight of additional non-composite steel weight on interior girders*

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

$wt_{haunch} := \left[\left(Haunch + t_f - 1in\right)\cdot\left(b_f + 2W_{haunch}\right) - b_f\cdot t_f\right]\cdot\gamma_{conc} = 42.83\cdot plf$ *Weight of haunch, per girder*

$wt_{over} := 0plf$ *Additional concrete weight in the bottom of deck overhangs*

Total

$\boxed{WAC_{ext} := wt_{haunch} + wt_{over} = 0.0428\cdot klf}$ *Total weight of additional non-composite concrete weight on exterior girders*

$\boxed{WAC_{int} := wt_{haunch} = 0.0428\cdot klf}$ *Total weight of additional non-composite concrete weight on interior girders*

Edge Beams:

$Edge_{Bm} := (0.3692ft + Haunch)\cdot(1ft + 3.5in)\cdot S\cdot\gamma_{conc} = 0.81\cdot kip$ *Additional point load at end of girder, not included in MDX model (round up reaction 1 kip)*

Superimposed Dead Loads, composite (WS-i)

Assume equal distribution to all girders

Railing Load

$$wt_{rail} := Ceil\left[\left(7.58plf + 7.25plf + \frac{18\cdot 19.5in\cdot 1.68plf}{9.75ft} + \frac{32.75in\cdot 31plf}{9.75ft}\right)\cdot 1.10, 5plf\right]\cdot 2 = 70\cdot plf$$

Weight of 2 steel railings

Curb

$wt_{curb} := Ceil\left(Curb_{ht}\cdot Curb_{wd}\cdot\gamma_{conc}, 10plf\right)\cdot 2 = 700\cdot plf$ *Weight of 2 Curbs*

$\boxed{WS_{ext} := \frac{wt_{rail} + wt_{curb}}{N_{beams}} = 0.15\cdot klf}$ *Total weight of superimposed dead loads on exterior girder*

$\boxed{WS_{int} := \frac{wt_{rail} + wt_{curb}}{N_{beams}} = 0.15\cdot klf}$ *Total weight of superimposed dead loads on interior girder*

DW Loading

- *Assume evenly distributed to all girders*
- *Concrete WS weight is automatically calculated by MDX, if poured concurrently with structural deck*

$\boxed{WEAR := \frac{Wearing_{t.bit}\cdot\gamma_{WS}\cdot Roadway_{wd}}{N_{beams}} = 0.15\cdot klf}$ *Distributed wearing surface load applied to each girder*

Verification Calculations: Interior Girder

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

Demands:

DC1

$wt_{beam} := 84plf$ — *Self weight of the beam*

$wt_{cover} := 0.875in \cdot 8in \cdot \gamma_{steel} = 23.82 \cdot plf$ — *Weight of the cover plate*

$wt_{xframe} := \frac{L_{xframe} \cdot 33.9plf \cdot N_{xframe}}{Bridge_L} = 13.28 \cdot plf$ — *Weight of cross frames, distributed*

$wt_{deck} := (t_s + Wearing_{t.conc}) \cdot S \cdot \gamma_{conc} = 590.63 \cdot plf$ — *Weight of concrete deck*

$wt_{fillet} := wt_{haunch} + 1in \cdot (b_f + 2 \cdot W_{haunch}) \cdot \gamma_{conc} = 61.58 \cdot plf$ — *Weight of the haunch*

$M_{DC1} := \frac{Bridge_L^2}{8} \cdot (wt_{beam} + wt_{cover} + wt_{xframe} + WAS_{int} + wt_{deck} + wt_{fillet}) = 230.85 \cdot kip \cdot ft$ — *Moment due to DC1 terms*

DC2

$M_{DC2} := \frac{Bridge_L^2}{8} \cdot (WS_{int}) = 45.28 \cdot kip \cdot ft$ — *Moment due to Superimposed Dead Loads (Rail and Curb)*

DW

$M_{DW} := \frac{Bridge_L^2}{8} \cdot (WEAR) = 44.59 \cdot kip \cdot ft$ — *Moment due to wearing surface*

LL + IM

For simplicity, place center axle of HL93 Truck at midspan

- *One Design Lane Loaded* *AASHTO Table 4.6.2.2.2b-1*

$$g_{bend.single.int} := 0.06 + \left(\frac{S}{14ft}\right)^{0.4} \cdot \left(\frac{S}{Bridge_L}\right)^{0.3} \cdot (1.02) = 0.48$$

- *Two or More Design Lanes Loaded* *AASHTO Table 4.6.2.2.2b-1*

$$g_{bend.multi.int} := 0.075 + \left(\frac{S}{9.5ft}\right)^{0.6} \cdot \left(\frac{S}{Bridge_L}\right)^{0.2} \cdot (1.02) = 0.64$$

$$g := \max\left(g_{bend.single.int}, g_{bend.multi.int}\right) = 0.64$$ *Max Distribution Factor for bending, interior beam*

$$M_{truck} := g \cdot 1.33\left[\frac{32kip \cdot Bridge_L}{4} + (32kip + 8kip) \cdot \frac{\left(0.5 \cdot Bridge_L - 14ft\right) \cdot \left(0.5Bridge_L\right)}{Bridge_L}\right] = 500.89 \cdot kip \cdot ft$$ *Moment due to Truck*

$$M_{lane} := g \cdot 0.64klf \cdot \frac{Bridge_L^{\,2}}{8} = 119.51 \cdot kip \cdot ft$$ *Moment due to lane load*

$$\boxed{M_{LL_IM} := M_{truck} + M_{lane} = 620.4 \cdot kip \cdot ft}$$ *Live Load moment on interior girder*

Section Properties

Non-Composite

$A_{gird} := 24.8in^2$ *W27x84* *Area of Rolled Girder*

$I_{gird} := 2850in^4$ *Moment of Inertia of Rolled Girder*

$D_{gird} := 26.7in$ *Depth of Rolled Girder*

$t_w := 0.46in$ *Web thickness*

$t_{cover} := .875in$ *Thickness of Cover Plate*

$W_{cover} := 8in$ *Width of cover plate*

$A_{cover} := t_{cover} \cdot W_{cover} = 7\ in^2$ *Area of cover plate*

$$y_{non} := \frac{A_{cover} \cdot \frac{t_{cover}}{2} + A_{gird} \cdot \left(t_{cover} + \frac{D_{gird}}{2}\right)}{A_{cover} + A_{gird}} = 11.19\ in$$

Neutral Axis, from bottom

$$I_{non} := I_{gird} + A_{gird} \cdot \left(t_{cover} + \frac{D_{gird}}{2} - y_{non}\right)^2 + \frac{W_{cover} \cdot t_{cover}^3}{12} + A_{cover} \cdot \left(y_{non} - \frac{t_{cover}}{2}\right)^2 = 3888.2\ in^4$$

Moment of inertia of non-composite girder

$$S_{b_non} := \frac{I_{non}}{y_{non}} = 347.47 \cdot in^3$$

Section Modulus to bottom of section

Composite, Short Term/Transient

$$y_{comp_n} := \frac{A_{cover}\cdot\frac{t_{cover}}{2} + A_{gird}\cdot\left(t_{cover} + \frac{D_{gird}}{2}\right) + \frac{S}{n}\cdot t_s\cdot\left(t_{cover} + D_{gird} + \frac{t_s}{2} + 1in\right)}{A_{cover} + A_{gird} + \frac{S}{n}\cdot t_s} = 24.97\ in$$

Neutral Axis, from bottom

$$I_{comp_n} := I_{gird} + A_{gird}\cdot\left(t_{cover} + \frac{D_{gird}}{2} - y_{comp_n}\right)^2 + \frac{W_{cover}\cdot t_{cover}^3}{12} \ldots + A_{cover}\cdot\left(y_{comp_n} - \frac{t_{cover}}{2}\right)^2 + \frac{\frac{S}{n}\cdot t_s^3}{12} + \frac{S}{n}t_s\cdot\left(t_{cover} + D_{gird} + 1in + \frac{t_s}{2} - y_{comp_n}\right)^2 = 13289.63\ in^4$$

Moment of inertia of composite girder

$$S_{b_comp_n} := \frac{I_{comp_n}}{y_{comp_n}} = 532.29\cdot in^3$$

Section Modulus to bottom of section

Composite, Long Term

$$y_{comp_3n} := \frac{A_{cover}\cdot\frac{t_{cover}}{2} + A_{gird}\cdot\left(t_{cover} + \frac{D_{gird}}{2}\right) + \frac{S}{3n}\cdot t_s\cdot\left(t_{cover} + D_{gird} + 1in + \frac{t_s}{2}\right)}{A_{cover} + A_{gird} + \frac{S}{3n}\cdot t_s} = 19.39\ in$$

Neutral Axis, from bottom

$$I_{comp_3n} := I_{gird} + A_{gird}\cdot\left(t_{cover} + \frac{D_{gird}}{2} - y_{comp_3n}\right)^2 + \frac{W_{cover}\cdot t_{cover}^3}{12} \ldots + A_{cover}\cdot\left(y_{comp_3n} - \frac{t_{cover}}{2}\right)^2 + \frac{\frac{S}{3n}\cdot t_s^3}{12} + \frac{S}{3n}t_s\cdot\left(t_{cover} + D_{gird} + 1in + \frac{t_s}{2} - y_{comp_3n}\right)^2 = 9416.11\ in^4$$

Moment of inertia of composite girder

$$S_{b_comp_3n} := \frac{I_{comp_3n}}{y_{comp_3n}} = 485.69\cdot in^3$$

Section Modulus to bottom of section

Stresses

$$\sigma_u := 1.25\cdot\left(\frac{M_{DC1}}{S_{b_non}}\right) + 1.25\cdot\left(\frac{M_{DC2}}{S_{b_comp_3n}}\right) + 1.50\cdot\left(\frac{M_{DW}}{S_{b_comp_3n}}\right) + 1.75\cdot\left(\frac{M_{LL_IM}}{S_{b_comp_n}}\right) = 37.49\ ksi$$

MDX shows >36ksi, therefore verification considered complete and MDX results are acceptable

Plastic Section Capacity

Ref: AASHTO Appendix D6

$P_{cover} := A_{cover} \cdot F_y = 252 \cdot kip$ — *Yield strength of cover plate*

$P_t := b_f \cdot t_f \cdot F_y = 230.4 \cdot kip$ — *Yield Strength of bottom flange*

$P_w := \left(D_{gird} - 2 \cdot t_f\right) \cdot t_w \cdot F_y = 420.96 \cdot kip$ — *Yield strength of web*

$P_c := P_t = 230.4 \cdot kip$ — *Yield Strength of Top flange*

$P_s := 0.85 \cdot f'_c \cdot S \cdot t_s = 1445.85 \cdot kip$ — *'Yield' Strength of slab*

Case I

$$y_1 := t_{cover} + D_{gird} - t_f - \frac{\left(D_{gird} - 2 \cdot t_f\right)}{2} \cdot \left(\frac{P_{cover} + P_t - P_c - P_s}{P_w} + 1\right) = 50.27\ in$$

Plastic Neutral Axis, assuming location is within web

$$M_{p1} := \frac{P_w}{2 \cdot \left(D_{gird} - 2 \cdot t_f\right)} \cdot \left[\left(t_{cover} + D_{gird} - t_f - y_1\right)^2 + \left(y_1 - t_{cover} - t_f\right)^2\right] \ldots$$
$$+ \left[P_{cover} \cdot \left(y_1 - \frac{t_{cover}}{2}\right) + P_t \cdot \left(y_1 - t_{cover} - \frac{t_f}{2}\right) + P_c \cdot \left(t_{cover} + D_{gird} - \frac{t_f}{2} - y_1\right) + P_s \cdot \left(t_{cover} + D_{gird} + 1in + \frac{t_s}{2} - y_1\right)\right]$$

Plastic moment if PNA is within Web

Case II

$$y_2 := t_{cover} + D_{gird} - \left[\frac{\left(t_f\right)}{2} \cdot \left(\frac{P_{cover} + P_t + P_w - P_s}{P_c} + 1\right)\right] = 28.01\ in$$

Plastic Neutral Axis if in top flange

$$M_{p2} := \frac{P_c}{2 \cdot \left(t_f\right)} \cdot \left[\left(t_{cover} + D_{gird} - y_2\right)^2 + \left(y_2 - t_{cover} - D_{gird} + t_f\right)^2\right] \ldots$$
$$+ \left[P_{cover} \cdot \left(y_2 - \frac{t_{cover}}{2}\right) + P_t \cdot \left(y_2 - t_{cover} - \frac{t_f}{2}\right) + P_w \cdot \left(y_2 - t_{cover} - \frac{D_{gird}}{2}\right) + P_s \cdot \left(t_{cover} + D_{gird} + 1in + \frac{t_s}{2} - y_2\right)\right]$$

Plastic moment if PNA is within top flange

Case III - PNA in Slab

$$y_3 := \left(t_{cover} + D_{gird} + t_s + 1in - t_f\right) - t_s \cdot \frac{P_c + P_w + P_t + P_{cover}}{P_s} = 29.45\ in$$

Plastic Neutral Axis if in Concrete Slab

$$M_{p3} := \frac{\left(t_{cover} + D_{gird} + t_s + 1in - t_f - y_3\right)^2 \cdot P_s}{2 \cdot t_s} + \left[P_c \cdot \left[-\left(t_{cover} + D_{gird} + 1in - \frac{t_f}{2}\right) + y_3 \right] + P_w \cdot \left(y_3 - t_{cover} - \frac{D_{gird}}{2} + 1in\right) \ldots \right.$$
$$\left. + P_t \cdot \left(y_3 - t_{cover} - \frac{t_f}{2}\right) + P_{cover} \cdot \left(y_3 - \frac{t_{cover}}{2}\right) \right]$$

Plastic moment if PNA is within Concrete slab

$$M_{p_loc} := \begin{cases} \text{"PNA in Web"} & \text{if } t_{cover} + t_f < y_1 < t_{cover} + D_{gird} - t_f \\ \text{"PNA in Top Flange"} & \text{if } t_{cover} + D_{gird} - t_f < y_2 < t_{cover} + D_{gird} \\ \text{"PNA in Concrete Slab"} & \text{if } t_{cover} + D_{gird} < y_3 < t_{cover} + D_{gird} + \left(t_s\right) \\ \text{"Different Case"} & \text{otherwise} \end{cases} = \text{"PNA in Concrete Slab"}$$

$$M_p := \begin{cases} M_{p1} & \text{if } t_{cover} + t_f < y_1 < D_{gird} - t_f + t_{cover} \\ M_{p2} & \text{if } t_{cover} + D_{gird} - t_f < y_2 < t_{cover} + D_{gird} \\ M_{p3} & \text{if } t_{cover} + D_{gird} < y_3 < t_{cover} + D_{gird} + t_s \\ \text{"Different Case"} & \text{otherwise} \end{cases} = 2002.79 \cdot kip \cdot ft$$

MDX shows 2034 therefore verification considered complete and MDX results are acceptable

Calculation of Remaining Fatigue Life:

Only consider E detail of cover plate termination location. (Flange lessthan 0.8 inches thick)

$\Delta f := 4.39\text{ksi}$

Fatigue Stress Range from MDX, Fatigue II combination, maximum among all girders for cover plate transition (E category)

$R_{sa} := 0.95$

Stress Range Deterimned 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)

$\Delta F_{th} := 4.5\text{ksi}$

Limiting Infinite Fatigue Life Stress Range (AASHTO Table 6.6.1.2.5-3)

$\Delta f_{eff} := \Delta f \cdot R_{sa} \cdot R_{st}$

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

MBE 7.2.4

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

$A := 1100000000\text{ksi}^3$

Detail category constant, AASHTO Table 6.6.1.2.5-1

$n_p := 1$

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

$$\left(\frac{ADT_{fut}}{ADT_{cur}}\right)^{\left(\frac{1}{20}\right)} - 1 = 0.48 \cdot \%$$

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

$ADTT_{mult} := 1.06$

ADTT multiplier (MBE Figure C7.2.5.1-1 with 21 years of age and growth rate above

$$Y := \frac{R_R \cdot A}{365 \cdot n_p \cdot ADTT \cdot ADTT_{mult} \cdot \left(\Delta f_{eff}\right)^3} \cdot yr = 3266.24 \cdot yr$$

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

$$\boxed{Remaining_Life := Y - (2014 - Year)yr = 3215 \cdot yr}$$

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

HAVERHILL BRIDGE 5931
Girder System : Input File : Layout/Slab/Loading Definition
Wed Apr 08 11:10:11 2015

```
ID: HAVERHILL BRIDGE 5931
CONDITIONS
  ENGLISH INPUT
  ENGLISH OUTPUT
  FLOAT LANES
  GRID MODEL
  INTERMEDIATE BRACING NOT BOLTED FOR STEEL ANALYSIS
  LRFD METHOD
  MEDIUM RESOLUTION MESH
  RATE MODE
  RATING PROJECT
  SELF WEIGHT FOR DEAD LOAD 1
DATA
  BR-1 24.25
  CURB  0.5
  FPC 3.
  GDSPC 6.75 6.75 6.75 6.75
  LANES 12. 12.
  ROADWP 26.
  SKEW-1 90. 90.
  SLABEXT 2. 2.
  SLABT 7.
  SLABWEAR  0.
  SPN-1 48.5
  WAC-1  0.0428
  WAC-2  0.0428
  WAC-3  0.0428
  WAC-4  0.0428
  WAC-5  0.0428
  WAS-1  0.006
  WAS-2  0.012
  WAS-3  0.012
  WAS-4  0.012
  WAS-5  0.006
  WCONC 150.
  WEAR  0.15
  WS-1  0.15
  WS-2  0.15
  WS-3  0.15
  WS-4  0.15
  WS-5  0.15
GO
```

HAVERHILL BRIDGE 5931
Girder 1 : Input File : Definition
Wed Apr 08 11:10:23 2015

```
ID: HAVERHILL BRIDGE 5931
CONDITIONS
  A36 STEEL
  AWS MINIMUM WELDS
  ENGLISH INPUT
  ENGLISH OUTPUT
  FULL DEPTH CONNECTION PLATES
  IGNORE MOMENT SHIFTING
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W27X84
DATA
  ADTT 12
  BCOVB 8.
  BCOVSP 9.75 29.
  BCOVT  0.875
  BR 24.25 24.25
  ESLABW 64.5
  ETAD 1.
  ETAI 1.
  ETAR 1.
  FILLET 1.
  FPC 3.
  HAUNCW 18.
  IGIRD 1
  LIFE 20
  LLDLIM 800
  NMOD 9
  NSTUDL 2
  PHIC  0.95
  PITCH 5. 6. 5. 6. 8. 6. 5. 6. 5.
  PITSP 4.5833 5. 5. 5. 9.3334 5. 5. 5. 4.5833
  SLABT 7.
  SLABWEAR  0.
  SPN 48.5
  STD  0.875
  STH 4.5
  TSLABW 64.5
  WCONC 150.
GO
```

HAVERHILL BRIDGE 5931
Girder 2 : Input File : Definition
Wed Apr 08 11:10:27 2015

```
ID: HAVERHILL BRIDGE 5931
CONDITIONS
  A36 STEEL
  AWS MINIMUM WELDS
  ENGLISH INPUT
  ENGLISH OUTPUT
  FULL DEPTH CONNECTION PLATES
  IGNORE MOMENT SHIFTING
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W27X84
DATA
  ADTT 12
  BCOVB 8.
  BCOVSP 9.75 29.
  BCOVT  0.875
  BR 24.25 24.25
  ESLABW 81.
  ETAD 1.
  ETAI 1.
  ETAR 1.
  FILLET 1.
  FPC 3.
  HAUNCW 18.
  IGIRD 2
  LIFE 20
  LLDLIM 800
  NMOD 9
  NSTUDL 2
  PHIC  0.95
  PITCH 5. 6. 5. 6. 8. 6. 5. 6. 5.
  PITSP 4.5833 5. 5. 5. 9.3334 5. 5. 5. 4.5833
  SLABT 7.
  SLABWEAR  0.
  SPN 48.5
  STD  0.875
  STH 4.5
  TSLABW 81.
  WCONC 150.
GO
```

HAVERHILL BRIDGE 5931
Girder 3 : Input File : Definition
Wed Apr 08 11:10:31 2015

```
ID: HAVERHILL BRIDGE 5931
CONDITIONS
  A36 STEEL
  AWS MINIMUM WELDS
  ENGLISH INPUT
  ENGLISH OUTPUT
  FULL DEPTH CONNECTION PLATES
  IGNORE MOMENT SHIFTING
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W27X84
DATA
  ADTT 12
  BCOVB 8.
  BCOVSP 9.75 29.
  BCOVT  0.875
  BR 24.25 24.25
  ESLABW 81.
  ETAD 1.
  ETAI 1.
  ETAR 1.
  FILLET 1.
  FPC 3.
  HAUNCW 18.
  IGIRD 3
  LIFE 20
  LLDLIM 800
  NMOD 9
  NSTUDL 2
  PHIC  0.95
  PITCH 5. 6. 5. 6. 8. 6. 5. 6. 5.
  PITSP 4.5833 5. 5. 5. 9.3334 5. 5. 5. 4.5833
  SLABT 7.
  SLABWEAR  0.
  SPN 48.5
  STD  0.875
  STH 4.5
  TSLABW 81.
  WCONC 150.
GO
```

HAVERHILL BRIDGE 5931
Girder 4 : Input File : Definition
Wed Apr 08 11:10:39 2015

```
ID: HAVERHILL BRIDGE 5931
CONDITIONS
  A36 STEEL
  AWS MINIMUM WELDS
  ENGLISH INPUT
  ENGLISH OUTPUT
  FULL DEPTH CONNECTION PLATES
  IGNORE MOMENT SHIFTING
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W27X84
DATA
  ADTT 12
  BCOVB 8.
  BCOVSP 9.75 29.
  BCOVT  0.875
  BR 24.25 24.25
  ESLABW 81.
  ETAD 1.
  ETAI 1.
  ETAR 1.
  FILLET 1.
  FPC 3.
  HAUNCW 18.
  IGIRD 4
  LIFE 20
  LLDLIM 800
  NMOD 9
  NSTUDL 2
  PHIC  0.95
  PITCH 5. 6. 5. 6. 8. 6. 5. 6. 5.
  PITSP 4.5833 5. 5. 5. 9.3334 5. 5. 5. 4.5833
  SLABT 7.
  SLABWEAR  0.
  SPN 48.5
  STD  0.875
  STH 4.5
  TSLABW 81.
  WCONC 150.
GO
```

HAVERHILL BRIDGE 5931
Girder 5 : Input File : Definition
Wed Apr 08 11:10:47 2015

```
ID: HAVERHILL BRIDGE 5931
CONDITIONS
  A36 STEEL
  AWS MINIMUM WELDS
  ENGLISH INPUT
  ENGLISH OUTPUT
  FULL DEPTH CONNECTION PLATES
  IGNORE MOMENT SHIFTING
  INCLUDE SLAB FILLER IN SECTION PROPERTIES
  LRFD METHOD
  LRFR RATINGS
  RATE MODE
  ROLLED SHAPES GIRDER
  SYSTEM FORCES
  W27X84
DATA
  ADTT 12
  BCOVB 8.
  BCOVSP 9.75 29.
  BCOVT  0.875
  BR 24.25 24.25
  ESLABW 64.5
  ETAD 1.
  ETAI 1.
  ETAR 1.
  FILLET 1.
  FPC 3.
  HAUNCW 18.
  IGIRD 5
  LIFE 20
  LLDLIM 800
  NMOD 9
  NSTUDL 2
  PHIC  0.95
  PITCH 5. 6. 5. 6. 8. 6. 5. 6. 5.
  PITSP 4.5833 5. 5. 5. 9.3334 5. 5. 5. 4.5833
  SLABT 7.
  SLABWEAR  0.
  SPN 48.5
  STD  0.875
  STH 4.5
  TSLABW 64.5
  WCONC 150.
GO
```

HAVERHILL BRIDGE 5931
Bracing : Input File : Definition
Wed Apr 08 11:10:55 2015

```
ID: HAVERHILL BRIDGE 5931
CONDITIONS
  A36 STEEL
  CATEGORY B FATIGUE AT CONNECTIONS
  DIAPHRAGM W16X36 FOR GROUP 1
  DIAPHRAGM C15X33.9 FOR GROUP 2
  ENGLISH INPUT
  ENGLISH OUTPUT
  LRFD METHOD
  RATE MODE
  TYPE D BRACING FOR GROUP 1
  TYPE D BRACING FOR GROUP 2
DATA
  ADTT 12
  BRL-1 6.75 6.75 6.75
  BRL-2 6.75 6.75 6.75
  BRL-3 6.75 6.75 6.75
  BRL-4 6.75 6.75 6.75
  ETAD 1.
  ETAI 1.
  ETAR 1.
  GCONNDST 4. 4.
  GRP-1 1 2 1
  GRP-2 1 2 1
  GRP-3 1 2 1
  GRP-4 1 2 1
  GRPHT  0.  0.
  KCOL  0.75
  LIFE 20
  PHIC  0.95
GO
```

HAVERHILL BRIDGE 5931
Girder System : Analysis Output : Case Data
Wed Apr 08 11:11:08 2015

Girder System Case Data - HAVERHILL BRIDGE 5931

Geometry

Span Lengths, Girder 1

Span 1 48.500 ft

Brace Angles at Supports, Girder 1

Support 1 90.000 deg
Support 2 90.000 deg

Girder spacing

Girder 1 to 2 6.75 ft
Girder 2 to 3 6.75 ft
Girder 3 to 4 6.75 ft
Girder 4 to 5 6.75 ft

Slab extension from center of girder 1 2.00 ft

Slab extension from center of girder 5 2.00 ft

Intermediate brace spacing

Girder 1

Brace 1 24.25 ft

No curvature

Lane Geometry

Curb from girder 1, ft

0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50
0.50

Lane Spacing

Lane 1 12.00 ft
Lane 2 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

All	24.50	26.00	2.00	26.00	26.50

Road width and float range perpendicular to girder 1.

Loading

Superimposed dead load, k/ft

Girder 1

0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
0.15

Girder 2

0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
0.15

Girder 3

0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
0.15

Girder 4

0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
0.15

Girder 5

0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
0.15

Wearing surface load

Girder 1
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
Girder 2
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
Girder 3
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft
0.15 k/ft

```
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
     Girder  4
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
     Girder  5
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 k/ft
          0.15 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
```

HAVERHILL BRIDGE 5931
Girder 1 : Rating Output : Case Data
Wed Apr 08 11:11:18 2015

Girder 1 Case Data - HAVERHILL BRIDGE 5931

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	9.96	in
Top Flange Thickness	0.64	in
Web Depth	25.43	in
Web Thickness	0.46	in
Bottom Flange Width	9.96	in
Bottom Flange Thickness	0.64	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft 24.25 ft 48.50 ft

Cover plates

Bottom cover plated regions-
9.75 - 38.75 ft
Bottom cover plate widths 8.00
Bottom cover plate thicknesses 0.88

Curvature

No curvature

Girder Type

Rolled shapes

Hinges

No interior hinges

Span lengths

Spans 48.50 ft

Stiffeners

Bearing stiffeners

Web splices

Fatigue

Average Single Lane Daily Truck Traffic: 12
Fatigue life: 20

Composite Behavior

Composite region for composite loading- 0. - 48.50 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
         36.89 k      36.89 k
   Min unfactored live load+impact reactions
          0.00 k       0.00 k
   Max unfactored live reactions - No dynamic load allowance
         29.36 k      29.36 k
   Min unfactored live reactions - No dynamic load allowance
         -0.11 k      -0.11 k
   Total unfactored dead load DC1+DC2 reactions
         20.26 k      20.26 k
   Total unfactored dead load DW reactions
          3.61 k       3.61 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           64.50 in
   Fillet                        1.00 in
   Slab haunch width            18.00 in
   Effective slab width         64.50 in
   Self weight slab width       64.50 in

 Steel

   Web splice section  1
         Steel grade           A36
   Rebar yield                 60.00 ksi

Output

   Standard resolution summary tables

Units

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

HAVERHILL BRIDGE 5931
Girder 2 : Rating Output : Case Data
Wed Apr 08 11:11:23 2015

Girder 2 Case Data - HAVERHILL BRIDGE 5931

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	9.96	in
Top Flange Thickness	0.64	in
Web Depth	25.43	in
Web Thickness	0.46	in
Bottom Flange Width	9.96	in
Bottom Flange Thickness	0.64	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft 24.25 ft 48.50 ft

Cover plates

Bottom cover plated regions-
9.75 - 38.75 ft
Bottom cover plate widths 8.00
Bottom cover plate thicknesses 0.88

Curvature

No curvature

Girder Type

Rolled shapes

Hinges

No interior hinges

Span lengths

Spans 48.50 ft

Stiffeners

Bearing stiffeners

Web splices

Fatigue

Average Single Lane Daily Truck Traffic: 12
Fatigue life: 20

Composite Behavior

Composite region for composite loading- 0. - 48.50 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
         56.45 k      56.45 k
   Min unfactored live load+impact reactions
          0.00 k       0.00 k
   Max unfactored live reactions - No dynamic load allowance
         44.66 k      44.66 k
   Min unfactored live reactions - No dynamic load allowance
          0.00 k       0.00 k
   Total unfactored dead load DC1+DC2 reactions
         22.79 k      22.79 k
   Total unfactored dead load DW reactions
          3.67 k       3.67 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           81.00 in
   Fillet                        1.00 in
   Slab haunch width            18.00 in
   Effective slab width         81.00 in
   Self weight slab width       81.00 in

 Steel

   Web splice section  1
         Steel grade           A36
   Rebar yield                 60.00 ksi

Output

   Standard resolution summary tables

Units

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

HAVERHILL BRIDGE 5931
Girder 3 : Rating Output : Case Data
Wed Apr 08 11:11:29 2015

Girder 3 Case Data - HAVERHILL BRIDGE 5931

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	9.96	in
Top Flange Thickness	0.64	in
Web Depth	25.43	in
Web Thickness	0.46	in
Bottom Flange Width	9.96	in
Bottom Flange Thickness	0.64	in

Execution Mode

Rate Mode

Geometry

Brace locations

0.00 ft 24.25 ft 48.50 ft

Cover plates

Bottom cover plated regions-
9.75 - 38.75 ft
Bottom cover plate widths 8.00
Bottom cover plate thicknesses 0.88

Curvature

No curvature

Girder Type

Rolled shapes

Hinges

No interior hinges

Span lengths

Spans 48.50 ft

Stiffeners

Bearing stiffeners

Web splices

Fatigue

Average Single Lane Daily Truck Traffic: 12
Fatigue life: 20

Composite Behavior

Composite region for composite loading- 0. - 48.50 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
         63.17 k      63.17 k
   Min unfactored live load+impact reactions
          0.00 k       0.00 k
   Max unfactored live reactions - No dynamic load allowance
         50.10 k      50.10 k
   Min unfactored live reactions - No dynamic load allowance
          0.00 k       0.00 k
   Total unfactored dead load DC1+DC2 reactions
         23.12 k      23.12 k
   Total unfactored dead load DW reactions
          3.63 k       3.63 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           81.00 in
   Fillet                        1.00 in
   Slab haunch width            18.00 in
   Effective slab width         81.00 in
   Self weight slab width       81.00 in

 Steel

   Web splice section  1
         Steel grade           A36
   Rebar yield                 60.00 ksi

Output

   Standard resolution summary tables

Units

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

HAVERHILL BRIDGE 5931
Bracing : Rating Output : Case Data
Wed Apr 08 11:12:29 2015

Case Data - HAVERHILL BRIDGE 5931

Execution Mode

Rate Mode

Fatigue

Category B
* Avg daily single lane truck traffic: 12

Geometry

Brace Lengths from Girder 1 (ft) -
6.75, 6.75, 6.75

Brace Lengths from Girder 2 (ft) -
6.75, 6.75, 6.75

Brace Lengths from Girder 3 (ft) -
6.75, 6.75, 6.75

Brace Lengths from Girder 4 (ft) -
6.75, 6.75, 6.75

Connection to center of girder distance by group

4.00 4.00

Loading

LRFD Method

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

Material

Steel grade: A36

Units

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

* Default

HAVERHILL BRIDGE 5931
Girder 1 : Rating Output : Lrfd Ratings
Wed Apr 08 11:12:41 2015

[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	1325. C	244.25	>999.00 B	>999.00	3.12	4.05
4.85	1325. B	244.25	3.98 T	5.16	3.60	4.67
9.70	1841. C	244.25	3.00 B	3.88	4.25	5.51
14.55	1841. C	244.25	2.20 B	2.85	5.16	6.68
19.40	1841. C	244.25	1.84 B	2.39	6.51	8.44
24.25	1841. C	244.25	1.75 B	2.27	6.17	8.00
29.10	1841. C	244.25	1.84 B	2.39	6.53	8.47
33.95	1841. C	244.25	2.20 B	2.85	5.17	6.70
38.80	1841. C	244.25	3.00 B	3.88	4.25	5.51
43.65	1325. B	244.25	3.98 T	5.16	3.55	4.60
48.50	1325. C	244.25	>999.00 B	>999.00	3.13	4.06

Service II

Span 1

Location	Allowable Stress	Rating Factors Bending Inv.	Bending Oper.
0.00	34200. S	> 999.00 B	>999.00
4.85	34200. S	3.78 B	4.91
9.70	34200. S	3.31 B	4.30
14.55	34200. S	2.39 B	3.10
19.40	34200. S	1.98 B	2.57
24.25	34200. S	1.87 B	2.43
29.10	34200. S	1.98 B	2.57
33.95	34200. S	2.39 B	3.10
38.80	34200. S	3.31 B	4.30
43.65	34200. S	3.78 B	4.91
48.50	34200. S	> 999.00 B	>999.00

****
Minimum rating is 1.75 at location 24.25 in span 1.
****

Rating Codes:
T - Top steel governs
B - Bottom steel governs
C - Concrete governs

R - Rebar governs
V - Shear governs
S - Serviceability governs

Mom Strength Codes:
C - Compact
B - Braced non-compact
U - Unbraced non-compact
T - Transition between compact and braced non-compact
S - Serviceability

Noncompact shapes ratings based on stress, as

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

HAVERHILL BRIDGE 5931
Girder 2 : Rating Output : Lrfd Ratings
Wed Apr 08 11:12:47 2015

[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	1392. B	244.25	>999.00 T	>999.00	2.07	2.68
4.85	1392. B	244.25	3.01 T	3.90	2.58	3.34
9.70	1956. C	244.25	2.50 B	3.23	3.31	4.29
14.55	1956. C	244.25	1.93 B	2.51	4.25	5.51
19.40	1956. C	244.25	1.68 B	2.17	5.70	7.39
24.25	1956. B	244.25	1.65 T	2.13	3.20	4.14
29.10	1956. C	244.25	1.68 B	2.17	5.51	7.14
33.95	1956. C	244.25	1.93 B	2.51	4.24	5.50
38.80	1956. C	244.25	2.50 B	3.23	3.31	4.29
43.65	1392. B	244.25	3.01 T	3.90	2.54	3.29
48.50	1392. B	244.25	>999.00 T	>999.00	2.07	2.69

Service II

Span 1

Location	Allowable Stress	Rating Factors Bending Inv.	Bending Oper.
0.00	34200. S	> 999.00 B	>999.00
4.85	34200. S	2.73 B	3.55
9.70	34200. S	2.60 B	3.38
14.55	34200. S	1.97 B	2.56
19.40	34200. S	1.68 B	2.19
24.25	34200. S	1.65 B	2.14
29.10	34200. S	1.68 B	2.19
33.95	34200. S	1.97 B	2.56
38.80	34200. S	2.60 B	3.38
43.65	34200. S	2.73 B	3.55
48.50	34200. S	> 999.00 B	>999.00

****
Minimum rating is 1.65 at location 24.25 in span 1.
****

Rating Codes:
T - Top steel governs
B - Bottom steel governs
C - Concrete governs

R - Rebar governs
V - Shear governs
S - Serviceability governs

Mom Strength Codes:
C - Compact
B - Braced non-compact
U - Unbraced non-compact
T - Transition between compact and braced non-compact
S - Serviceability

Noncompact shapes ratings based on stress, as

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

HAVERHILL BRIDGE 5931
Girder 3 : Rating Output : Lrfd Ratings
Wed Apr 08 11:12:52 2015

[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	1392. B	244.25	>999.00 T	>999.00	1.83	2.37
4.85	1392. B	244.25	2.57 T	3.33	2.20	2.85
9.70	1956. C	244.25	2.05 B	2.66	2.73	3.54
14.55	1956. C	244.25	1.57 B	2.04	3.48	4.51
19.40	1956. C	244.25	1.37 B	1.78	4.81	6.23
24.25	1956. B	244.25	1.37 T	1.78	3.29	4.27
29.10	1956. C	244.25	1.37 B	1.78	4.63	6.01
33.95	1956. C	244.25	1.57 B	2.04	3.49	4.53
38.80	1956. C	244.25	2.05 B	2.66	2.74	3.55
43.65	1392. B	244.25	2.57 T	3.33	2.17	2.81
48.50	1392. B	244.25	>999.00 T	>999.00	1.83	2.37

Service II

Span 1

Location	Allowable Stress	Rating Factors Bending Inv.	Bending Oper.
0.00	34200. S	> 999.00 B	>999.00
4.85	34200. S	2.33 B	3.03
9.70	34200. S	2.13 B	2.77
14.55	34200. S	1.60 B	2.07
19.40	34200. S	1.37 B	1.78
24.25	34200. S	1.36 B	1.77
29.10	34200. S	1.37 B	1.78
33.95	34200. S	1.60 B	2.07
38.80	34200. S	2.13 B	2.77
43.65	34200. S	2.33 B	3.03
48.50	34200. S	> 999.00 B	>999.00

****
Minimum rating is 1.36 at location 24.25 in span 1.
****

Rating Codes:
T - Top steel governs
B - Bottom steel governs
C - Concrete governs

R - Rebar governs
V - Shear governs
S - Serviceability governs

Mom Strength Codes:
C - Compact
B - Braced non-compact
U - Unbraced non-compact
T - Transition between compact and braced non-compact
S - Serviceability

Noncompact shapes ratings based on stress, as

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

HAVERHILL BRIDGE 5931
Girder 1 : Rating Output : Fatigue
Wed Apr 08 11:13:02 2015

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	A	0.00	0.00	65.84	0.000
Base metal	4.85	A	54.98	2.00	65.84	0.030
Base metal	9.70	A	93.44	2.14	65.84	0.032
Base metal	14.55	A	116.78	2.67	65.84	0.041
Base metal	19.40	A	136.45	3.12	65.84	0.047
Base metal	24.25	A	144.27	3.30	65.84	0.050
Base metal	29.10	A	136.45	3.12	65.84	0.047
Base metal	33.95	A	116.78	2.67	65.84	0.041
Base metal	38.80	A	93.44	2.14	65.84	0.032
Base metal	43.65	A	54.98	2.00	65.84	0.030
Base metal	48.50	A	0.00	0.00	65.84	0.000
End of bot cover PL	9.75	E	93.76	3.41	23.24	0.147
End of bot cover PL	38.75	E	93.76	3.41	23.24	0.147
Full depth conn PL	0.00	C'	0.00	0.00	36.89	0.000
Full depth conn PL	24.25	C'	144.27	3.21	36.89	0.087
Full depth conn PL	48.50	C'	0.00	0.00	36.89	0.000

HAVERHILL BRIDGE 5931
Girder 2 : Rating Output : Fatigue
Wed Apr 08 11:13:08 2015

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	0.01	0.00	36.89	0.000
Base metal	4.85	A	76.54	2.74	65.84	0.042
Base metal	9.70	A	122.44	2.76	65.84	0.042
Base metal	14.55	A	145.94	3.29	65.84	0.050
Base metal	19.40	A	152.48	3.43	65.84	0.052
Base metal	24.25	A	144.02	3.24	65.84	0.049
Base metal	29.10	A	152.48	3.43	65.84	0.052
Base metal	33.95	A	145.94	3.29	65.84	0.050
Base metal	38.80	A	122.44	2.76	65.84	0.042
Base metal	43.65	A	76.54	2.74	65.84	0.042
Base metal	48.50	C	0.01	0.00	36.89	0.000
End of bot cover PL	9.75	E	122.80	4.39	23.24	0.189
End of bot cover PL	38.75	E	122.80	4.39	23.24	0.189
Full depth conn PL	0.00	C'	0.01	0.00	36.89	0.000
Full depth conn PL	24.25	C'	144.02	3.16	36.89	0.086

HAVERHILL BRIDGE 5931
Girder 3 : Rating Output : Fatigue
Wed Apr 08 11:13:13 2015

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	0.00	0.00	36.89	0.000
Base metal	4.85	A	53.09	1.90	65.84	0.029
Base metal	9.70	A	87.13	1.96	65.84	0.030
Base metal	14.55	A	105.94	2.39	65.84	0.036
Base metal	19.40	A	116.60	2.63	65.84	0.040
Base metal	24.25	A	116.29	2.62	65.84	0.040
Base metal	29.10	A	116.60	2.63	65.84	0.040
Base metal	33.95	A	105.94	2.39	65.84	0.036
Base metal	38.80	A	87.13	1.96	65.84	0.030
Base metal	43.65	A	53.09	1.90	65.84	0.029
Base metal	48.50	C	0.00	0.00	36.89	0.000
End of bot cover PL	9.75	E	87.41	3.13	23.24	0.135
End of bot cover PL	38.75	E	87.41	3.13	23.24	0.135
Full depth conn PL	0.00	C'	0.00	0.00	36.89	0.000
Full depth conn PL	24.25	C'	116.29	2.55	36.89	0.069

HAVERHILL BRIDGE 5931
Girder 1 : Rating Output : Factored Strengths
Wed Apr 08 11:13:27 2015

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	94.6	244.3 (5)	0.387	0.0	1325.3 (20)	0.000
1	4.85	81.9	244.3 (5)	0.335	416.2 I	1325.3 (20)	0.314
2	9.70	68.6	244.3 (5)	0.281	740.0 I	1841.0 (20)	0.402
3	14.55	55.0	244.3 (5)	0.225	964.5 I	1841.0 (20)	0.524
4	19.40	41.1	244.3 (5)	0.168	1111.3 I	1841.0 (20)	0.604
5	24.25	36.8	244.3 (5)	0.150	1158.0 I	1841.0 (20)	0.629
6	29.10	41.0	244.3 (5)	0.168	1111.3 I	1841.0 (20)	0.604
7	33.95	54.8	244.3 (5)	0.225	964.5 I	1841.0 (20)	0.524
8	38.80	68.5	244.3 (5)	0.281	740.0 I	1841.0 (20)	0.402
9	43.65	82.8	244.3 (5)	0.339	416.2 I	1325.3 (20)	0.314
10	48.50	94.5	244.3 (5)	0.387	0.0	1325.3 (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

HAVERHILL BRIDGE 5931
Girder 2 : Rating Output : Factored Strengths
Wed Apr 08 11:13:34 2015

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	129.1	244.3 (5)	0.528	0.0	1392.2 (20)	0.000
1	4.85	106.2	244.3 (5)	0.435	536.7 I	1392.2 (20)	0.386
2	9.70	84.0	244.3 (5)	0.344	898.2 I	1955.7 (20)	0.459
3	14.55	64.5	244.3 (5)	0.264	1124.2 I	1955.7 (20)	0.575
4	19.40	46.0	244.3 (5)	0.188	1262.3 I	1955.7 (20)	0.645
5	24.25	72.9	244.3 (5)	0.299	1284.0 I	1955.7 (20)	0.657
6	29.10	47.4	244.3 (5)	0.194	1262.3 I	1955.7 (20)	0.645
7	33.95	64.7	244.3 (5)	0.265	1124.2 I	1955.7 (20)	0.575
8	38.80	83.8	244.3 (5)	0.343	898.2 I	1955.7 (20)	0.459
9	43.65	107.4	244.3 (5)	0.440	536.7 I	1392.2 (20)	0.386
10	48.50	129.0	244.3 (5)	0.528	0.0	1392.2 (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

HAVERHILL BRIDGE 5931
Girder 3 : Rating Output : Factored Strengths
Wed Apr 08 11:13:41 2015

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	142.2	244.3 (5)	0.582	0.0	1392.2 (20)	0.000
1	4.85	120.0	244.3 (5)	0.491	605.5 I	1392.2 (20)	0.435
2	9.70	97.7	244.3 (5)	0.400	1038.8 I	1955.7 (20)	0.531
3	14.55	76.2	244.3 (5)	0.312	1306.6 I	1955.7 (20)	0.668
4	19.40	53.6	244.3 (5)	0.219	1460.7 I	1955.7 (20)	0.747
5	24.25	70.6	244.3 (5)	0.289	1464.6 I	1955.7 (20)	0.749
6	29.10	55.4	244.3 (5)	0.227	1460.7 I	1955.7 (20)	0.747
7	33.95	76.0	244.3 (5)	0.311	1306.6 I	1955.7 (20)	0.668
8	38.80	97.5	244.3 (5)	0.399	1038.8 I	1955.7 (20)	0.531
9	43.65	121.5	244.3 (5)	0.497	605.5 I	1392.2 (20)	0.435
10	48.50	142.0	244.3 (5)	0.581	0.0	1392.2 (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

HAVERHILL BRIDGE 5931
Girder 1 : Rating Output : Service Moment
Wed Apr 08 11:13:50 2015

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.	0.	0.	0.	0.
1	4.8	70.	16.	16.	163.	-4.	85.	-2.	73.
2	9.7	126.	28.	28.	289.	-7.	156.	-4.	125.
3	14.6	166.	37.	37.	375.	-11.	211.	-6.	156.
4	19.4	191.	42.	42.	433.	-15.	249.	-8.	182.
5	24.2	201.	43.	43.	450.	-18.	269.	-10.	192.
6	29.1	191.	42.	42.	433.	-15.	249.	-8.	182.
7	34.0	166.	37.	37.	375.	-11.	211.	-6.	156.
8	38.8	126.	28.	28.	289.	-7.	156.	-4.	125.
9	43.6	70.	16.	16.	163.	-4.	85.	-2.	73.
10	48.5	0.	0.	0.	0.	0.	0.	0.	0.

Bracing

24.2	201.	43.	43.	450.	-18.	269.	-10.

	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.	72.	-1.	0.	0.
2	0.	0.	122.	-3.	0.	0.
3	0.	0.	152.	-4.	0.	0.
4	0.	0.	177.	-5.	0.	0.
5	0.	0.	186.	-7.	0.	0.
6	0.	0.	177.	-5.	0.	0.
7	0.	0.	152.	-4.	0.	0.
8	0.	0.	122.	-3.	0.	0.
9	0.	0.	72.	-1.	0.	0.
10	0.	0.	0.	0.	0.	0.

HAVERHILL BRIDGE 5931
Girder 2 : Rating Output : Service Moment
Wed Apr 08 11:13:55 2015

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.	0.	0.	0.	0.
1	4.8	80.	16.	16.	225.	0.	128.	0.	102.
2	9.7	141.	29.	29.	367.	0.	218.	0.	163.
3	14.6	185.	38.	38.	451.	0.	272.	0.	195.
4	19.4	211.	43.	43.	503.	0.	300.	0.	203.
5	24.2	219.	45.	45.	507.	0.	305.	0.	192.
6	29.1	211.	43.	43.	503.	0.	300.	0.	203.
7	34.0	185.	38.	38.	451.	0.	272.	0.	195.
8	38.8	141.	29.	29.	367.	0.	218.	0.	163.
9	43.6	80.	16.	16.	225.	0.	128.	0.	102.
10	48.5	0.	0.	0.	0.	0.	0.	0.	0.

Bracing

24.2	219.	45.	45.	507.	0.	305.	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.	102.	0.	0.	0.
2	0.	0.	163.	0.	0.	0.
3	0.	0.	195.	0.	0.	0.
4	0.	0.	203.	0.	0.	0.
5	0.	0.	192.	0.	0.	0.
6	0.	0.	203.	0.	0.	0.
7	0.	0.	195.	0.	0.	0.
8	0.	0.	163.	0.	0.	0.
9	0.	0.	102.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.

HAVERHILL BRIDGE 5931
Girder 3 : Rating Output : Service Moment
Wed Apr 08 11:14:01 2015

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.	0.	0.	0.	0.	0.
1	4.8	81.	16.	16.	263.	0.	145.	0.	71.
2	9.7	145.	28.	28.	446.	0.	253.	0.	116.
3	14.6	191.	37.	37.	552.	0.	325.	0.	141.
4	19.4	218.	42.	42.	612.	0.	364.	0.	155.
5	24.2	228.	44.	44.	605.	0.	370.	0.	155.
6	29.1	218.	42.	42.	612.	0.	364.	0.	155.
7	34.0	191.	37.	37.	552.	0.	325.	0.	141.
8	38.8	145.	28.	28.	446.	0.	253.	0.	116.
9	43.6	81.	16.	16.	263.	0.	145.	0.	71.
10	48.5	0.	0.	0.	0.	0.	0.	0.	0.

Bracing

24.2	228.	44.	44.	605.	0.	370.	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.	71.	0.	0.	0.
2	0.	0.	116.	0.	0.	0.
3	0.	0.	141.	0.	0.	0.
4	0.	0.	155.	0.	0.	0.
5	0.	0.	155.	0.	0.	0.
6	0.	0.	155.	0.	0.	0.
7	0.	0.	141.	0.	0.	0.
8	0.	0.	116.	0.	0.	0.
9	0.	0.	71.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.

HAVERHILL BRIDGE 5931
Girder 1 : Rating Output : Service Shear
Wed Apr 08 11:14:08 2015

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	15.99	3.60	3.60	36.97	-0.76	19.11	17.28
1	4.85	12.98	2.87	2.87	33.01	-0.76	17.08	15.11
2	9.70	9.90	2.15	2.15	28.76	-1.70	15.10	13.40
3	14.55	6.77	1.42	1.42	24.35	-4.00	13.13	11.84
4	19.40	3.63	0.69	0.69	19.81	-6.80	11.23	11.01
5	24.25	-0.50	-0.04	-0.04	21.42	-17.44	12.59	14.71
6	29.10	-3.63	-0.69	-0.69	6.55	-19.74	-11.16	11.74
7	33.95	-6.77	-1.42	-1.42	2.71	-24.28	-13.08	12.12
8	38.80	-9.90	-2.15	-2.15	1.61	-28.72	-15.03	13.37
9	43.65	-12.98	-2.87	-2.87	0.74	-33.51	-17.56	15.09
10	48.50	-15.99	-3.60	-3.60	0.75	-36.89	-19.04	17.28

	Fatigue Trk LL+I	Permit Trk LL+I	Permit Range	Sidewalk
0	17.00	0.00	0.00	0.00
1	14.84	0.00	0.00	0.00
2	12.57	0.00	0.00	0.00
3	10.15	0.00	0.00	0.00
4	8.38	0.00	0.00	0.00
5	8.54	0.00	0.00	0.00
6	-9.10	0.00	0.00	0.00
7	-10.43	0.00	0.00	0.00
8	-12.54	0.00	0.00	0.00
9	-14.82	0.00	0.00	0.00
10	-17.00	0.00	0.00	0.00

HAVERHILL BRIDGE 5931
Girder 2 : Rating Output : Service Shear
Wed Apr 08 11:14:15 2015

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	18.24	3.67	3.67	54.96	0.00	30.66	25.54
1	4.85	14.61	2.95	2.95	45.62	0.00	25.62	21.04
2	9.70	10.92	2.22	2.22	36.69	-4.51	21.10	19.77
3	14.55	7.17	1.49	1.49	29.41	-12.99	17.01	19.96
4	19.40	3.43	0.76	0.76	22.63	-21.52	14.10	19.69
5	24.25	0.52	-0.04	0.04	26.51	-41.35	-25.14	25.49
6	29.10	-3.43	-0.76	-0.76	21.66	-23.42	-14.18	19.12
7	33.95	-7.17	-1.49	-1.49	8.61	-29.48	-17.12	19.15
8	38.80	-10.92	-2.22	-2.22	4.22	-36.62	-21.19	19.84
9	43.65	-14.61	-2.95	-2.95	0.00	-46.30	-26.43	21.10
10	48.50	-18.24	-3.67	-3.67	0.00	-54.90	-30.60	25.54

	Fatigue Trk LL+I	Permit Trk LL+I	Permit Range	Sidewalk
0	25.54	0.00	0.00	0.00
1	21.04	0.00	0.00	0.00
2	16.83	0.00	0.00	0.00
3	12.83	0.00	0.00	0.00
4	-11.77	0.00	0.00	0.00
5	-13.39	0.00	0.00	0.00
6	10.50	0.00	0.00	0.00
7	-13.37	0.00	0.00	0.00
8	-16.90	0.00	0.00	0.00
9	-21.10	0.00	0.00	0.00
10	-25.54	0.00	0.00	0.00

HAVERHILL BRIDGE 5931
Girder 3 : Rating Output : Service Shear
Wed Apr 08 11:14:20 2015

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	18.61	3.63	3.63	62.24	0.00	33.62	17.28
1	4.85	14.98	2.91	2.91	53.30	0.00	28.86	14.59
2	9.70	11.29	2.18	2.18	44.33	-3.83	24.39	13.47
3	14.55	7.54	1.45	1.45	35.87	-11.23	20.24	12.65
4	19.40	3.80	0.72	0.72	26.78	-18.79	12.88	12.62
5	24.25	0.16	0.00	0.00	28.09	-40.24	-21.61	17.00
6	29.10	-3.79	-0.72	-0.72	18.91	-27.78	-16.27	12.26
7	33.95	-7.54	-1.45	-1.45	7.38	-35.77	-20.14	12.68
8	38.80	-11.29	-2.18	-2.18	3.59	-44.20	-24.32	13.49
9	43.65	-14.97	-2.91	-2.91	0.00	-54.14	-29.75	14.61
10	48.50	-18.60	-3.63	-3.63	0.00	-62.14	-33.53	17.28

	Fatigue Trk LL+I	Permit Trk LL+I	Permit Range	Sidewalk
0	17.28	0.00	0.00	0.00
1	14.59	0.00	0.00	0.00
2	11.98	0.00	0.00	0.00
3	9.39	0.00	0.00	0.00
4	6.39	0.00	0.00	0.00
5	-8.51	0.00	0.00	0.00
6	-6.71	0.00	0.00	0.00
7	-9.71	0.00	0.00	0.00
8	-11.99	0.00	0.00	0.00
9	-14.61	0.00	0.00	0.00
10	-17.28	0.00	0.00	0.00

Structure Inventory and Appraisal Sheet (English Units)

Bridge Key: 5931 Agency ID: 5931 SR: 22 SD/FO: SD

IDENTIFICATION

State 1: 23 Maine
Struc Num 8: 5931
Facility Carried 7: CONGRESS STREET
Location 9: 0.1 MI N PORTLAND ST
Rte.(On/Under)5A: Route On Structure
Rte. Signing Prefix 5B: 5 City Street
Level of Service 5C: 0 None of the below
Rte. Number 5D: 00000
Directional Suffix 5E: 0 N/A (NBI)
% Responsibility : 0
SHD District 2: 03 Western
County Code 3: 017 Oxford
Place Code 4: 17270 Rumford
Mile Post 11: 0.460 mi
Feature Intersected 6: MILL YARD
Latitude 16: 44d 32' 58"
Longitude 17: 070d 32' 38"
Border Bridge Code 98: Not Applicable (P)
Border Bridge Number 99: n/a

INSPECTION

Frequency 91: 24 months
Inspection Date 90: 8/4/2010
Next Inspection: 08/04/2012
FC Frequency 92A: NA
FC Inspection Date 93A: NA
Next FC Inspection: NA
UW Frequency 92B: NA
UW Inspection Date 93B: NA
Next UW Inspection: NA
SI Frequency 92C: NA
SI Date 93C: NA
Next SI: NA
Element Frequency: 24 months
Element Inspection Date: 08/04/2010
Next Elem. Insp. Due: 08/04/2012

CLASSIFICATION

Defense Highway 100: 0 Not a STRAHNET hwy
Parallel Structure 101: No || bridge exists
Direction of Traffic 102: 2 2-way traffic
Temporary Structure 103: Not Applicable (P)
Highway System 104: 0 Not on NHS
NBIS Length 112: Long Enough
Toll Facility 20: 3 On free road
Functional Class 26: 19 Urban Local
Defense Hwy 110: 0 Not a STRAHNET
Historical Significance 37: 4 Hist sign not determin
Owner 22: 01 State Highway Agency
Custodian 21: 01 State Highway Agency

STRUCTURE TYPE AND MATERIALS

Number of Approach Spans 46: 0
Number of Spans Main Unit 45: 7
Main Span Material/Design 43A/B:
3 Steel
02 Stringer/Girder
Deck Type 107: 1 Concrete-Cast-in-Place
Wearing Surface 108A: 6 Bituminous
Membrane 108B: 1 Built-up
Deck Protection 108C: None

CONDITION

Deck 58: 5 Fair
Super 59: 3 Serious
Sub 60: 5 Fair
Culvert 62: N N/A (NBI)
Channel/Channel Protection 61: N N/A (NBI)

LOAD RATING AND POSTING

Inventory Rating Method 65: 2 AS Allowable Stres
Operating Rating Method 63: 2 AS Allowable Stress
Inventory Rating 66: HS17.8
Operating Rating 64: HS31.1
Design Load 31: 0 Other or Unknown
Posting 70: 5 At/Above Legal Loads
Posting status 41: A Open, no restriction

AGE AND SERVICE

Year Built 27: 1964
Year Reconstructed 106: 0
Type of Service on 42A: 5 Highway-pedestrian
Type of Service under 42B: 0 Other
Lanes on 28A: 2
Lanes Under 28B: 0
Detour Length 19: 99.9 mi
ADT 29: 779
Truck ADT 109: 5 %
Year of ADT 30: 2010

APPRAISAL

Bridge Rail 36A: 0 Substandard
Approach Rail 36C: 0 Substandard
Transition 36B: 0 Substandard
Approach Rail Ends 36D: 0 Substandard
Str. Evaluation 67: 3
Deck Geometry 68: 5 Above Tolerable
Underclearance, Vertical and Horizontal 69: N Not applicable (NBI)
Waterway Adequacy 71: N Not applicable
Approach Alignment 72: 8 Equal Desirable Crit
Scour Critical 113: 8 Stable Above Footing

GEOMETRIC DATA

Length Max Span 48: 50.0 ft
Structure Length 49: 355.0 ft
Curb/Sdwlk Width L 50A: 1.6 ft
Curb/Sidewalk Width R 50B: 5.0 ft
Width Curb to Curb 51: 26.0 ft
Width Out to Out 52: 34.6 ft
Approach Roadway Width 32: 30.0 ft (w/ shoulders)
Median 33: 0 No median
Deck Area: 12,283. sq. ft
Skew 34: 0.00 °
Structure Flared 35: 0 No flare
Vertical Clearance 10: 99.99 ft
Horiz. Clearance 47: 26.00 ft
Minimum Vertical Clearance Over Bridge 53: 327.8 ft
Minimum Vertical Underclearance Reference 54A: N Feature not hwy or RR
Minimum Vertical Underclearance 54B: 0.0 ft
Minimum Lateral Underclearance Reference R 55A: N Feature not hwy or RR
Minimum Lateral Underclearance R 55: 327.8 ft
Minimum Lateral Underclearance L 56: 327.8 ft

PROPOSED IMPROVEMENTS

Bridge Cost 94: NA
Type of Work 75: Unknown (P)
Roadway Cost 95: Unknown
Length of Improvement 76:
Total Cost 96: Unknown
Future ADT 114: 1,169
Year of Cost Estimate 97: Unknown
Year of Future ADT 115: 2030

NAVIGATION DATA

Navigation Control 38: 0 Permit Not Required
Vertical Clearance 39: 0.0 ft
Horizontal Clearance 40: 0.0 ft
Pier Protection 111: Not Applicable (P)
Lift Bridge Vertical Clearance 116: 0.0 ft

ELEMENT CONDITION STATE DATA

Str Unit	Elm/Env	Description	Units	Total Qty	% in 1	Qty. St. 1	% in 2	Qty. St. 2	% in 3	Qty. St. 3	% in 4	Qty. St. 4	% in 5	Qty. St. 5
1	14/2	P Conc Deck/AC Ovly	(SF)	12,283	0 %	0	0 %	0	100 %	12,283	0 %	0	0 %	0
1	107/2	Paint Stl Opn Girder	(LF)	2,130	0 %	0	35 %	745	0 %	0	40 %	852	25 %	533
1	210/2	R/Conc Pier Wall	(LF)	150	0 %	0	75 %	113	15 %	23	10 %	15	0 %	0
1	217/2	Other Mtl Abutment	(LF)	69	0 %	0	75 %	52	24 %	17	1 %	1	0 %	0
1	218/2	Undefined Wall Elem.	(LF)	200	0 %	0	40 %	80	10 %	20	50 %	100	0 %	0
1	234/2	R/Conc Cap	(LF)	208	50 %	104	45 %	94	5 %	10	0 %	0	0 %	0

Structure Inventory and Appraisal Sheet (English Units)

Str Unit	Elm/Env	Description	Units	Total Qty	% in 1	Qty. St. 1	% in 2	Qty. St. 2	% in 3	Qty. St. 3	% in 4	Qty. St. 4	% in 5	Qty. St. 5
1	302/2	Compressn Joint Seal	(LF)	277	25 %	69	25 %	69	50 %	139	0 %	0	0 %	0
1	311/2	Moveable Bearing	(EA)	84	0 %	0	80 %	67	20 %	17	0 %	0	0 %	0
1	333/2	Other Bridge Railing	(LF)	710	0 %	0	100 %	710	0 %	0	0 %	0	0 %	0
1	363/2	Section Loss SmFlag	(EA)	1	0 %	0	100 %	1	0 %	0	0 %	0	0 %	0
1	383/2	Wear.Surf- AC+Membr.	(SF)	9,230	0 %	0	20 %	1,846	70 %	6,461	10 %	923	0 %	0
1	388/2	Paint	(SF)	34,920	0 %	0	65 %	22,698	25 %	8,730	10 %	3,492	0 %	0
1	389/2	Reinfor conc dk/slab	(SF)	12,283	33 %	4,053	33 %	4,053	34 %	4,176	0 %	0	0 %	0

Looking N/NE'ly.		Ibid.	
5931	RUMFORD	Haverhill	06062006

Looking N/NE'ly.	Ibid.

5931	RUMFORD	Haverhill	06062006

Cor plumes from S'ly abut.

Scaling of pier base.

NW'ly parapet broken.

Scaling at base of pier. Note rule.

5931	RUMFORD	Haverhill	06062006

Underside overgrown.

Drain inlet bars and bowl failing(ed).

Sidewalk and gutter defects.

As adj.

5931	RUMFORD	Haverhill	06062006

Discolor w cor plumes from deck. Cor of superstr end. Paint.

As adj.

5931	RUMFORD	Haverhill	06062006

Joint ann has deter'd to two sharp blades at this loc.

As adj.

5931	RUMFORD	Haverhill	06062006

Looking east on River Rd.

General view

Joint (Typ.)

Westerly cracked wing

5931	Rumford	Haverhill	02-25-09

Roadway looking SW

NE joint - leakage

Concrete sidewalk – recent repair

Large potholes along gutter line

5931	Rumford	Haverhill	11/30/2009

Drain – broken grate

SW parapet – diagonal crack

NW parapet – diagonal crack

NW wing – mod efflo – vertical crack

5931	Rumford	Haverhill	11/30/2009

NE abutment – moderate cracking – rust staining (leakage)

Deck view – discoloration (typical)

NE Pier – rusty beam ends

View looking SW

5931	Rumford	Haverhill	11/30/2009

Deck view – center span - discoloration

Center pier – footing - moderate scaling

View looking South

Exterior beam – rusting of top flange

5931	Rumford	Haverhill	11/30/2009

Roadway looking SW'ly

General view of wearing surface cracks that have been sealed

S'ly side of bridge

Minor collision damage to bridge rail on the South side at the SW'ly end.

5931	Rumford	Haverhill	07-08-2010

Full depth crack at West corner has an offset of 2.25"

End pediment tipped back at West corner

6.25" as measured on the top of the guard rail to the concrete end pediment

1.5" Gap between sidewalk and end granite, West corner

5931	Rumford	Haverhill	07-08-2010

Cracking of end pediment at N/NE corner of the bridge

Cracking of end pediment at N/NE corner of the bridge, offset by 1.5"

Deteriorated bearing at the W/SW corner

Typical paint condition on bridge rail, North side

5931	Rumford	Haverhill	07-08-2010

Deteriorated bearing at the W/SW corner

Girder pinned against backwall

5931	Rumford	Haverhill	07-08-2010

Bottom plate slid back by up to 2", top plate slid back by 1 1/4", bearing blocks broken and now bearings are cantilevered at S'ly abutment.

Section loss and holes in webs of girder ends. Girders have pinned against back wall resulting in cracked wing walls.

5931	Rumford	Haverhill	07-28-2010

Outside girder ends over Pier #2, S'ly side. Typical of at least 15 girder end locations.	Holes and unzipping 12" in front of bearing with knife edging of bottom flange.

5931	Rumford	Haverhill	07-28-2010

Outside girder end section loss near top of web

Outside girder end section loss near top of web

Section loss at girder ends

Heavy scaling at base of pier

5931	Rumford	Haverhill	07-28-2010

Second span, girder #1, East end. Unzipped 12" back from in front of bearing. Knife edging of bottom flange.

Second span, girder #6, East end. Holes in top of web.

Second span, girder #3, East end. Holes in webs, both girders shown, back to bearings.

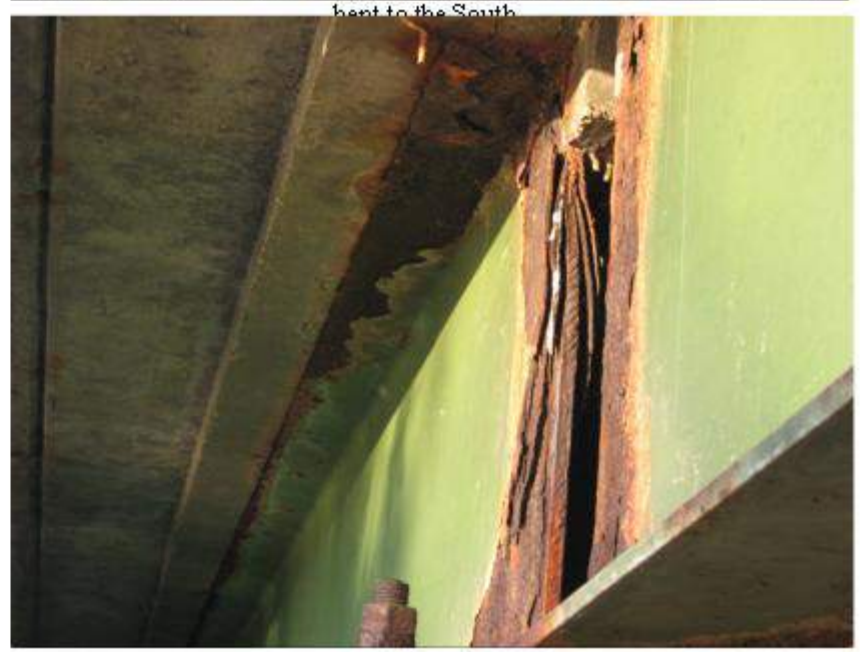
Second span, girder #3, East end (taken from another angle).

5931	Rumford	Haverhill	07-28-2010

Third span, girder #6, East end. Hole at top of web.

Fifth span, girder #2, West end. Holes for 8" in bottom of web.

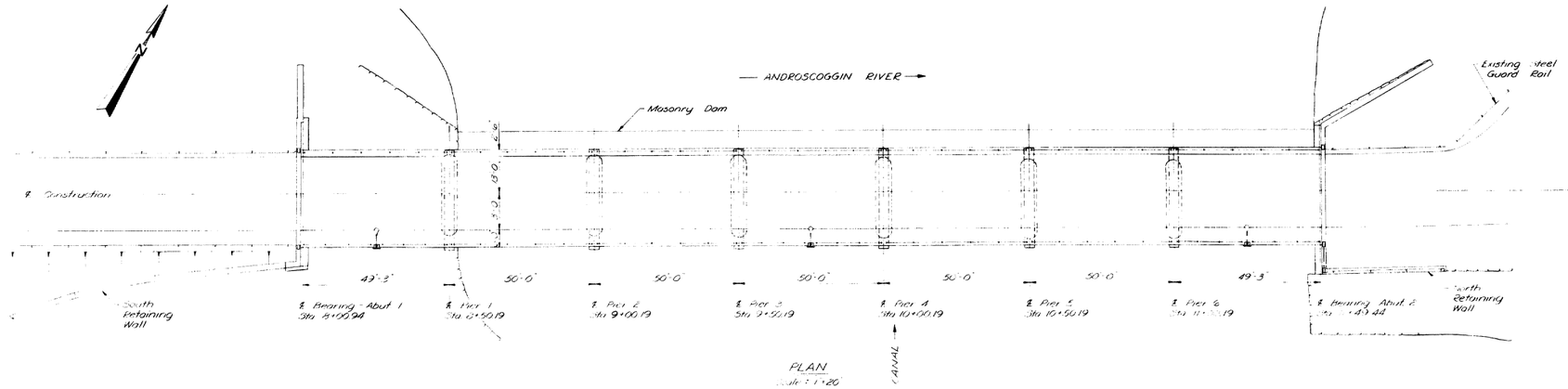
Fifth span, West Girder ends sitting on pier #4 are shifted South by 1 1/4". This shift can be seen in fascia, haunch, girder and bearing bolts all bent to the South.



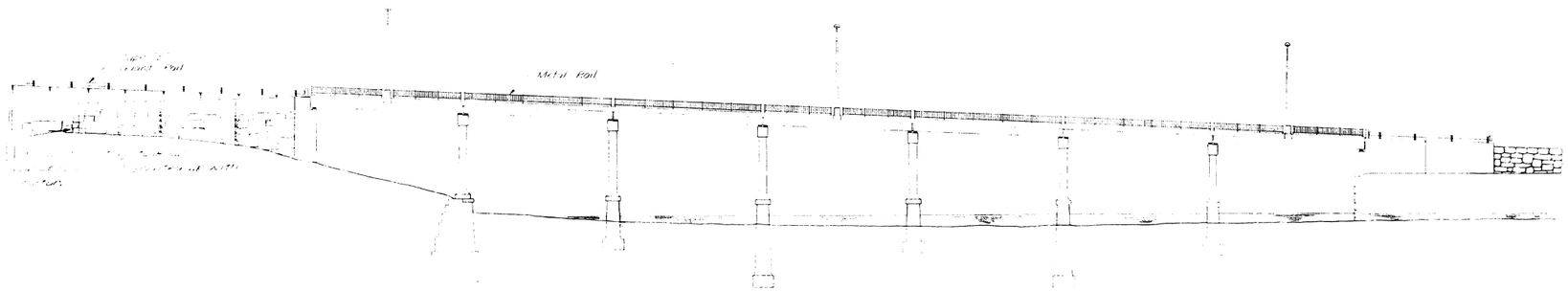
Seventh span, girder #6, West end. Distortion of web end, could not get UBC closer than halfway to #6 pier.

5931	Rumford	Haverhill	07-28-2010

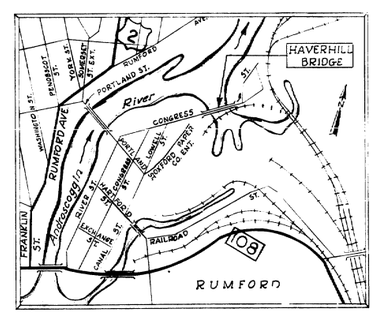
B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			



PLAN
Scale: 1"=20'



ELEVATION
Scale: 1"=20'



LOCATION PLAN

SPECIFICATIONS

Design - AASHO Standard Specifications for Highway Bridges 1961, with Interim Specifications 1961.

Contract - State of Maine, State Highway Commission, Standard Specifications for Highways and Bridges, Revision of 1956, and Supplemental Specifications.

LIVE LOADING

HS20-44

ALLOWABLE STRESSES

Concrete - [illegible]

Reinforcing Steel - Intermediate Grade - 20,000 psi

Structural Steel - As [illegible] 20,000 psi.

CONCRETE CLASSIFICATION

All concrete - Class A

STRUCTURAL STEEL CLASSIFICATION

Main members, Plates - ASTM designation A36

All other - ASTM Designation A36 or A7.

PAY NOTE

(Removal and Patching of Existing Concrete)

In those areas of existing concrete surface which need patching, as determined by the Engineer, and are not to be covered with new concrete, the required patching including the removal of deteriorated existing concrete, will be paid for as extra work on a force account basis.

The removal of deteriorated existing concrete, as determined by the Engineer, in those areas where new concrete is to be placed against existing concrete, and the removal of other existing concrete as indicated on these plans, will be paid for under Item 5.01-2 Removal of Existing Concrete. The new concrete will be paid for under the applicable concrete item.

As Built Notes

Refer to print in letter file for plan of approaches.

INDEX OF SHEETS

Sheet	Title
1 --	General Plan
2 --	Survey
3 --	Existing Structure
4 --	Temporary Pedestrian Bdwk. on R.R. Bridge
5 --	Cross Sections
6 --	Abutment No. 1
7 --	South Wall
8 --	Abutment No. 2
9 --	North Retaining Wall
10 --	Piers
11 --	Structural Steel
12 --	Superstructure
13 --	Lighting System and Rail
14 --	Reinforcing Steel

Standard Details

BC 101-62	Bearing Pedestals
BD 1&4-62	Diaphragms, Armored Joint Seal, Connectors, Drain
1-62	Catch Basins
2-62	Guard Rail

DESIGN- ARS	CKT. EEL	BRIDGE NO. 5931
TRACE- EEL		SURVEY-
CHECK- MCP		PLOT-

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

HAVERHILL BRIDGE
OVER CANAL TO
ANDROSCOGGIN RIVER
IN THE TOWN OF
RUMFORD
OXFORD COUNTY

GENERAL PLAN

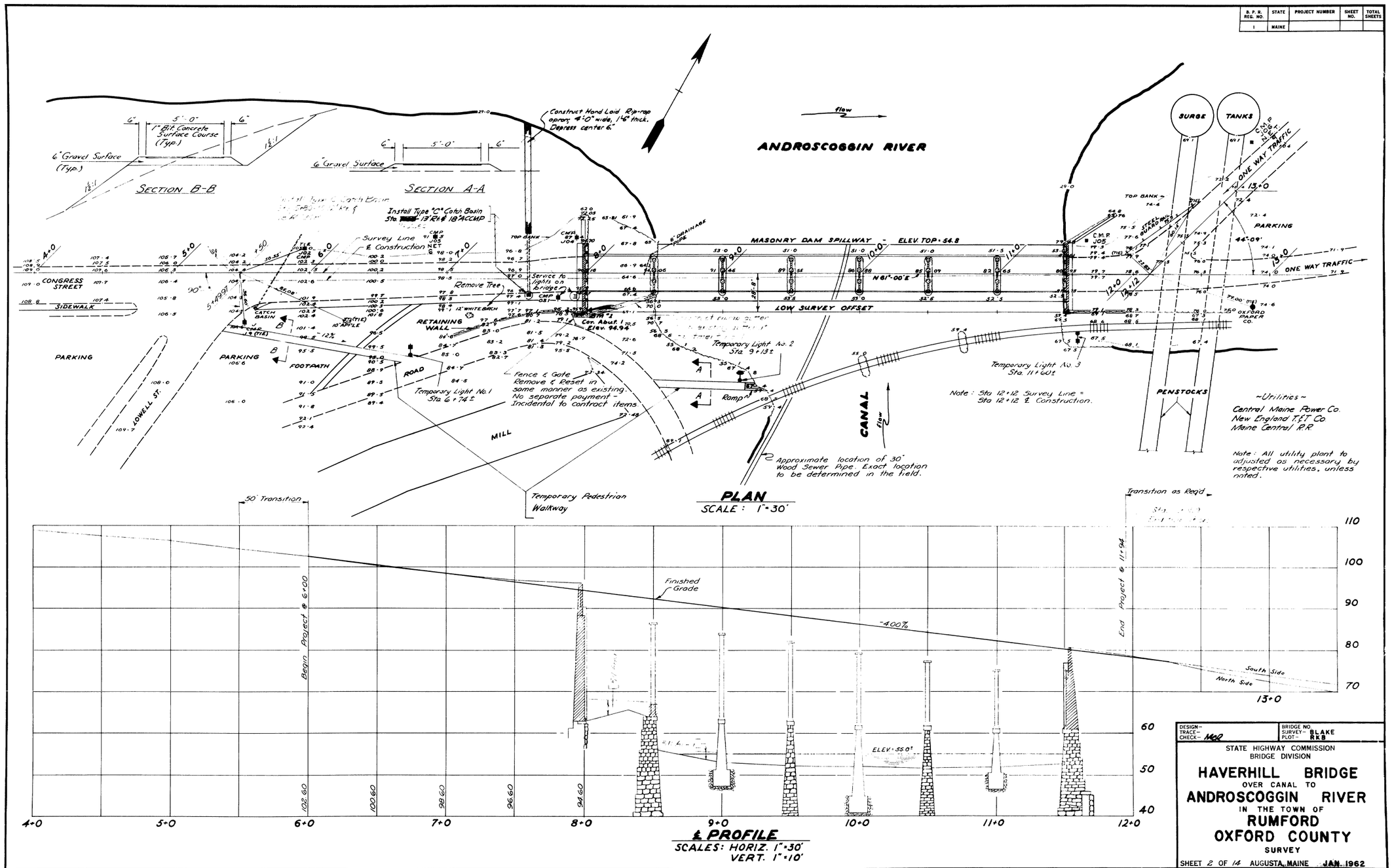
SHEET 1 OF 14 AUGUSTA, MAINE APRIL 1963

91-101

C. S. CO., NO. 44-302 5951

0 1 2 3 4 5 INCHES

B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			



DESIGN-
TRACE-
CHECK- MCD

BRIDGE NO.
SURVEY- BLAKE
PLOT- RKB

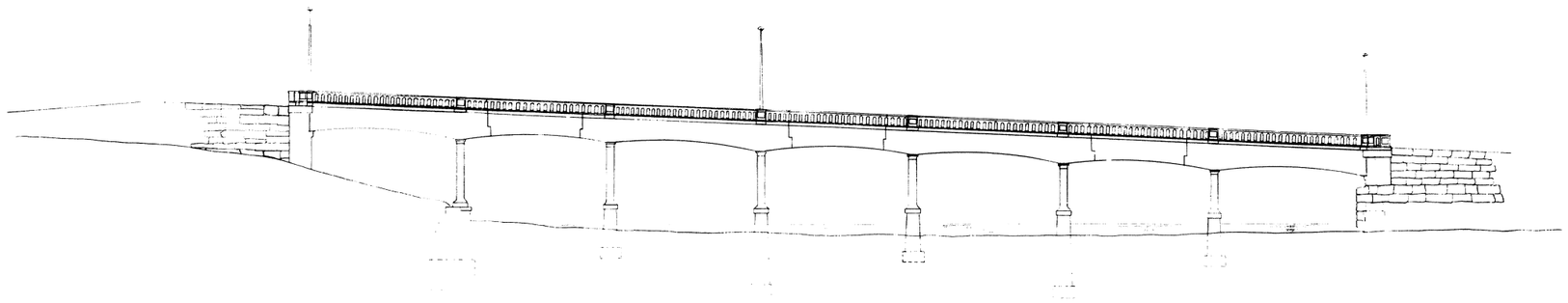
STATE HIGHWAY COMMISSION
BRIDGE DIVISION

HAVERHILL BRIDGE
OVER CANAL TO
ANDROSCOGGIN RIVER
IN THE TOWN OF
RUMFORD
OXFORD COUNTY
SURVEY

SHEET 2 OF 14 AUGUSTA, MAINE JAN. 1962

0 1 2 3 4 5 INCHES

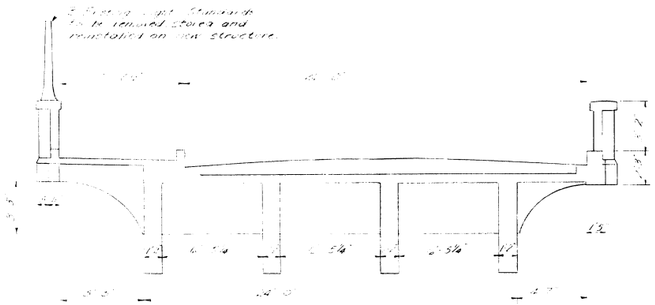
B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			



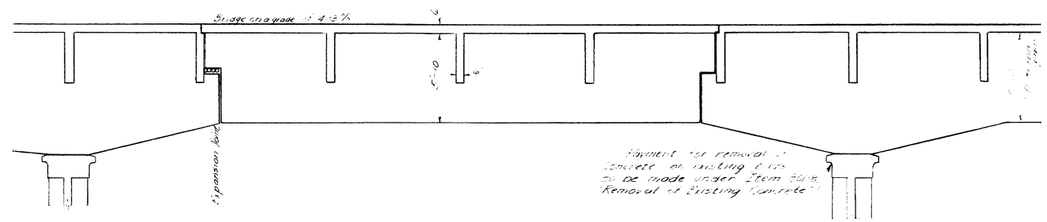
ELEVATION

NOTES

Elevations of Structure are approximate from data of Land Plan No. 861-7.



TYPICAL SECTION



LONGITUDINAL SECTION

DESIGN- JRW
TRACE- JLA
CHECK- MAP

BRIDGE NO. 5931
SURVEY-
PLOT-

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

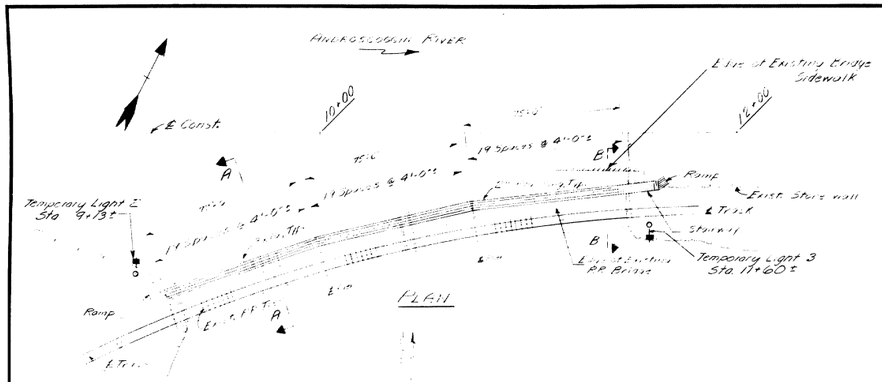
HAVERHILL BRIDGE
OVER CANAL TO
ANDROSCOGGIN RIVER
IN THE TOWN OF
RUMFORD
OXFORD COUNTY
EXISTING STRUCTURE

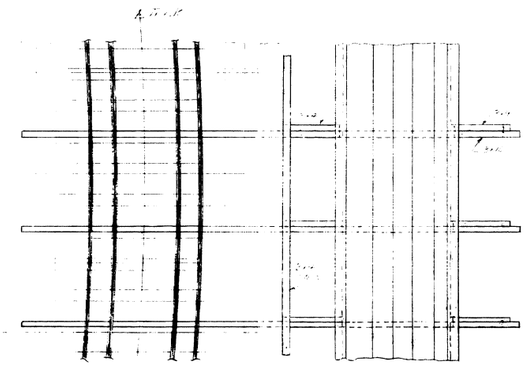
SHEET 3 OF 14 AUGUSTA, MAINE APRIL 1963

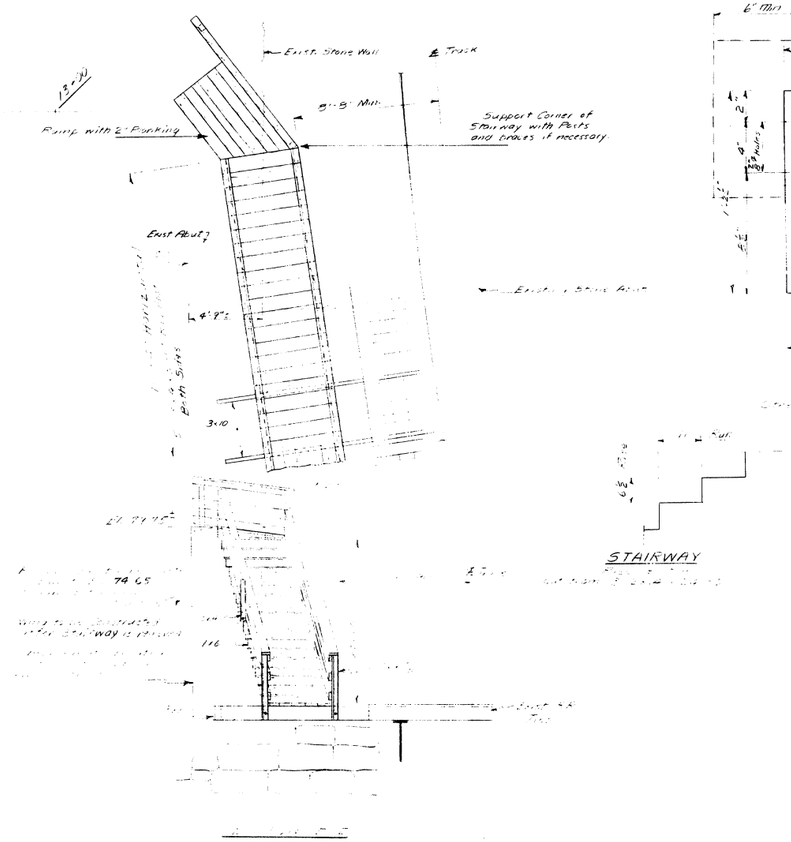
91-103

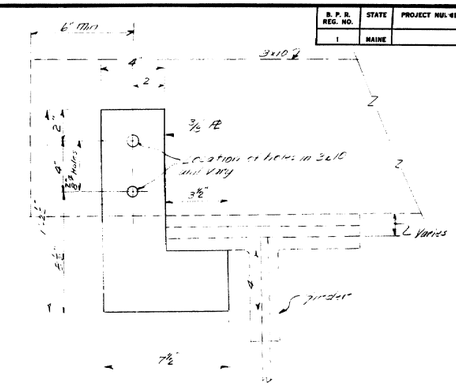
C. H. CO., NO. 44-302 26414

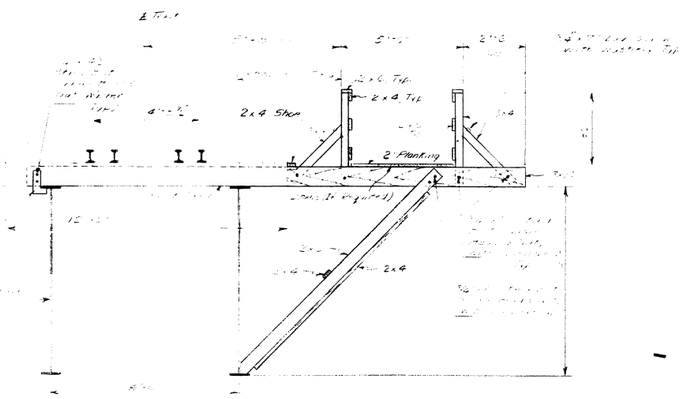
B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			



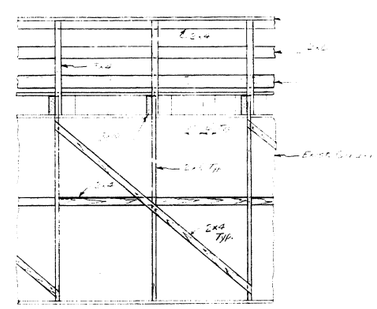








SECTION A-A
END ELEVATION



SIDE ELEVATION

DESIGN– ARS TRACE– CHECK–	BRIDGE NO. 5931 SURVEY– PLOT–

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

HAVERHILL BRIDGE
OVER CANAL TO
ANDROSCOGGIN RIVER
IN THE TOWN OF
RUMFORD
OXFORD COUNTY

TEMPORARY PEDESTRIAN SDWK. ON RR. BRIDGE

SHEET 4 OF 14 AUGUSTA, MAINE APRIL 1963

91-104

C. R. CO., NO. 44-302 24114

B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			

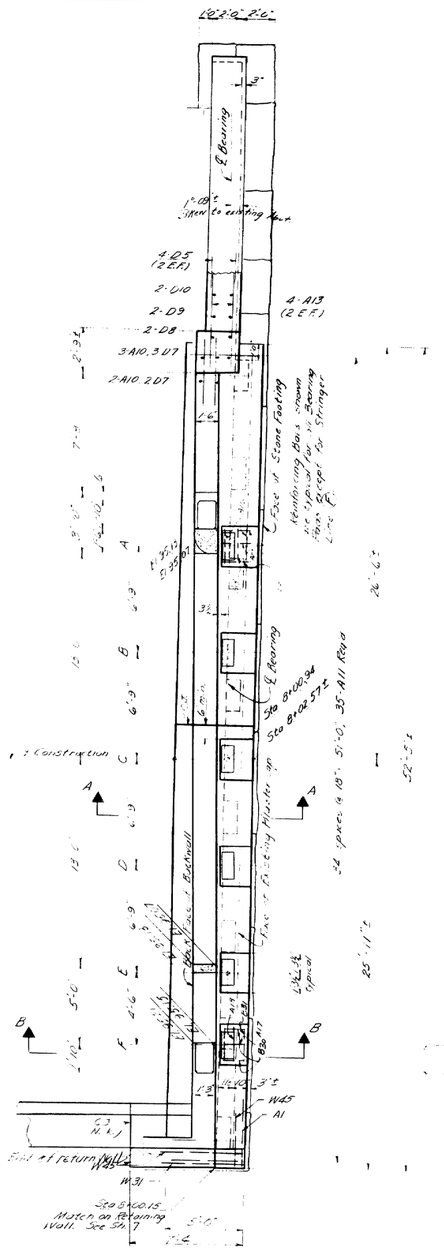
PLOT - E.E.L. CHECK - MAR	BRIDGE NO. 5931

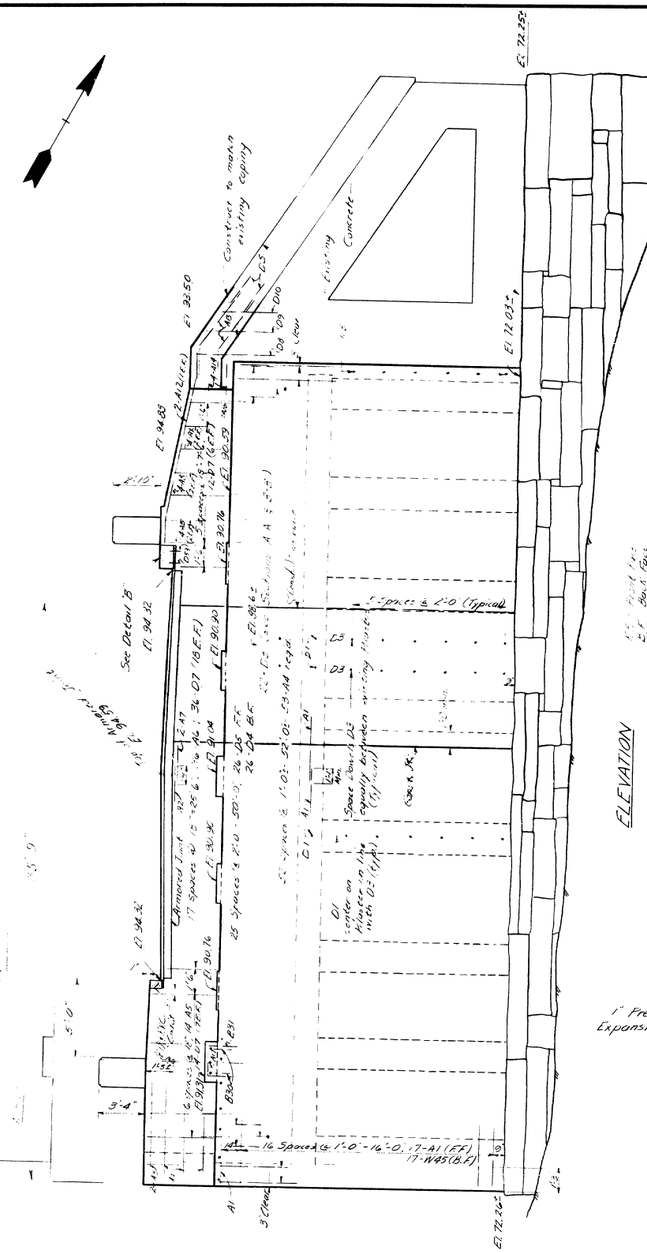
STATE HIGHWAY COMMISSION
BRIDGE DIVISION

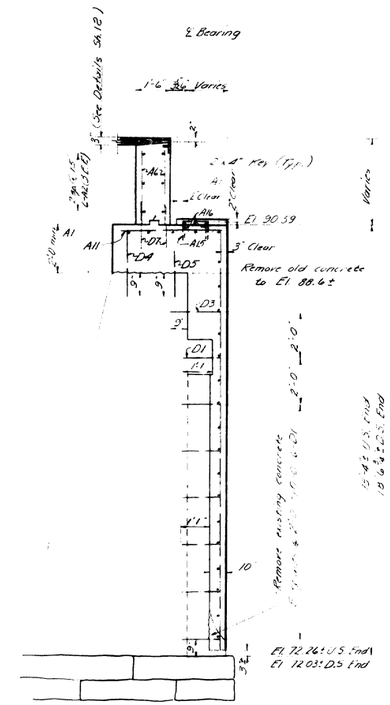
HAVERHILL BRIDGE
OVER CANAL TO
ANDROSCOGGIN RIVER
IN THE TOWN OF
RUMFORD
OXFORD COUNTY
CROSS SECTIONS

SHEET 5 OF 14 AUGUSTA, MAINE APRIL 1963

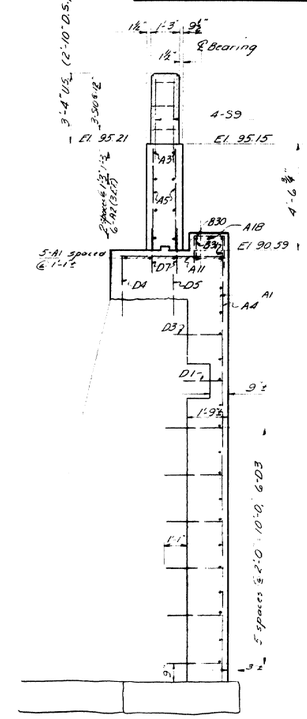
B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			



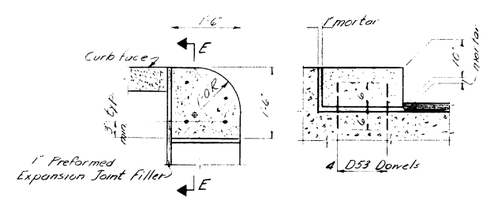




SECTION A-A



SECTION B-B



PLAN

SECTION E-E

Note: Grout bars D53 into 1½" ø holes in stone prior to setting stone on backwall. Drill 1½" holes in backwall to suit D53 Dowels.

Payment for drilling for and grouting of D53 Dowels to be included in the price for Item 705-14 Reinforcing Steel, Placing.

DETAIL "B"
3 Required

GENERAL ABUTMENT NOTES

1. Dress Bearing Areas ½" larger all around than masonry plates, and to exact elevations shown. Caulk around edges of masonry plates with an approved caulking material. Payment to be incidental to contract item.

2. Cover all unexposed vertical joints on the back with two layers of heavy roofing 10" wide. Coat the surface of concrete and the back of each layer as applied with a suitable grade of roofing cement. The area to be covered shall be recessed ½" inch.

3. Vertical Joints are to have a 1" V-Groove when exposed. For Detail see Sh. 7.

4. Drill and grout dowels into existing concrete as shown on plan. Payment to be made under Item 705-20, "Drilling and Grouting Dowels into Existing Masonry."

5. Reinforcing steel under Bridge Seat to clear Anchor Bolts.

6. Backfill behind Abutment and Wing to be Gravel Borrow up to bottom of Gravel Base or Loam Borrow.

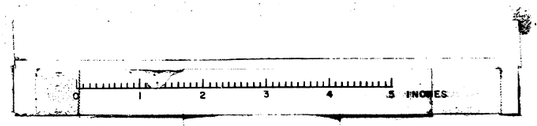
DESIGN- ARS	DETAIL-PLA	BRIDGE NO. 5931
TRACE- PLA		SURVEY-
CHECK- MCR		PLOT-

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

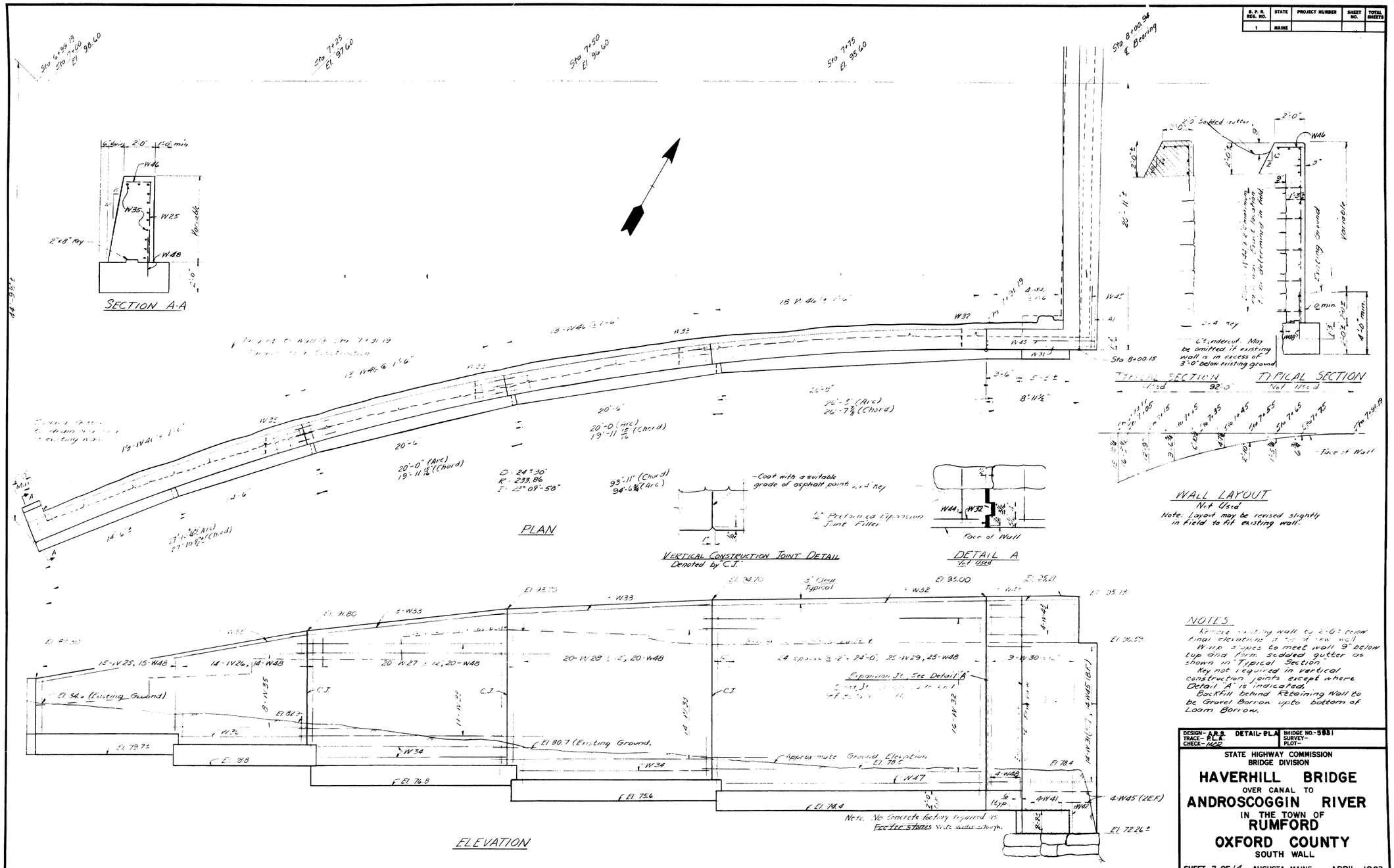
HAVERHILL BRIDGE
OVER CANAL TO
ANDROSCOGGIN RIVER
IN THE TOWN OF
RUMFORD
OXFORD COUNTY
ABUTMENT NO. 1

SHEET 6 OF 14 AUGUSTA, MAINE APRIL 1963

C. B. CO., NO. 44-302 10614



B. P. R. REV. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			



DESIGN- A.R.S. DETAIL- R.L.A.
TRACE- R.L.A.
CHECK- M.A.R.

BRIDGE NO.- 5551
SURVEY-
PLOT-

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

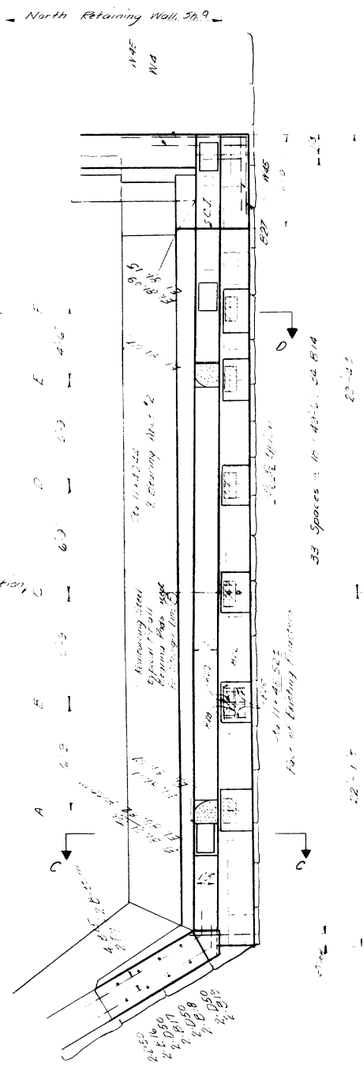
HAVERHILL BRIDGE
OVER CANAL TO
ANDROSCOGGIN RIVER
IN THE TOWN OF
RUMFORD
OXFORD COUNTY
SOUTH WALL

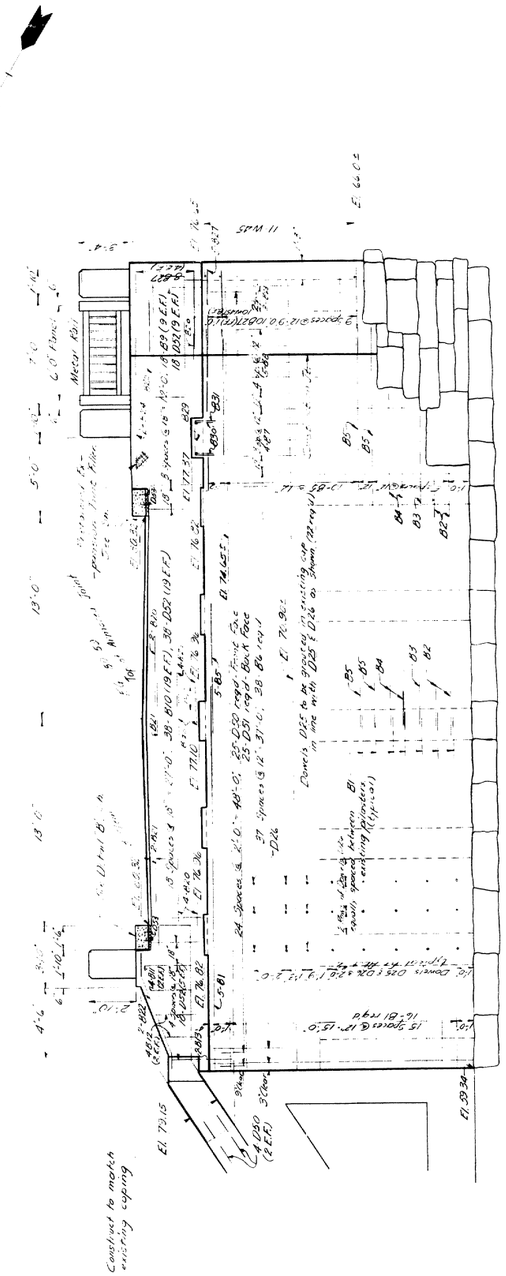
SHEET 7 OF 14 AUGUSTA, MAINE APRIL 1963

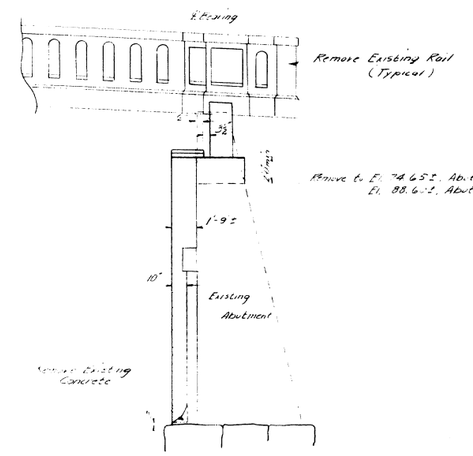
91-107

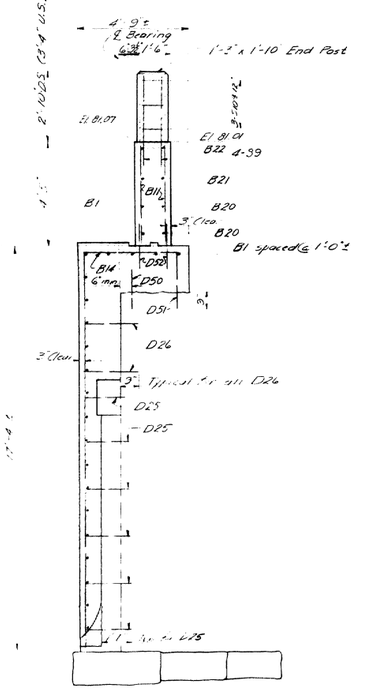
C. B. CO., NO. 44-302 84419

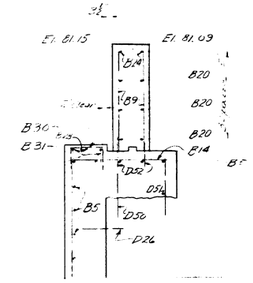
B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			











NOTES

1. [illegible] abutment [illegible]
2. For [illegible] see Detail [illegible] Sheet 20 of 24.
3. For detail of [illegible] see Sh. [illegible]

DESIGN– A.B.S. DETAIL– PLA
TRACE– PLA
CHECK– [illegible]

BRIDGE NO. 5931
SURVEY–
PLOT–

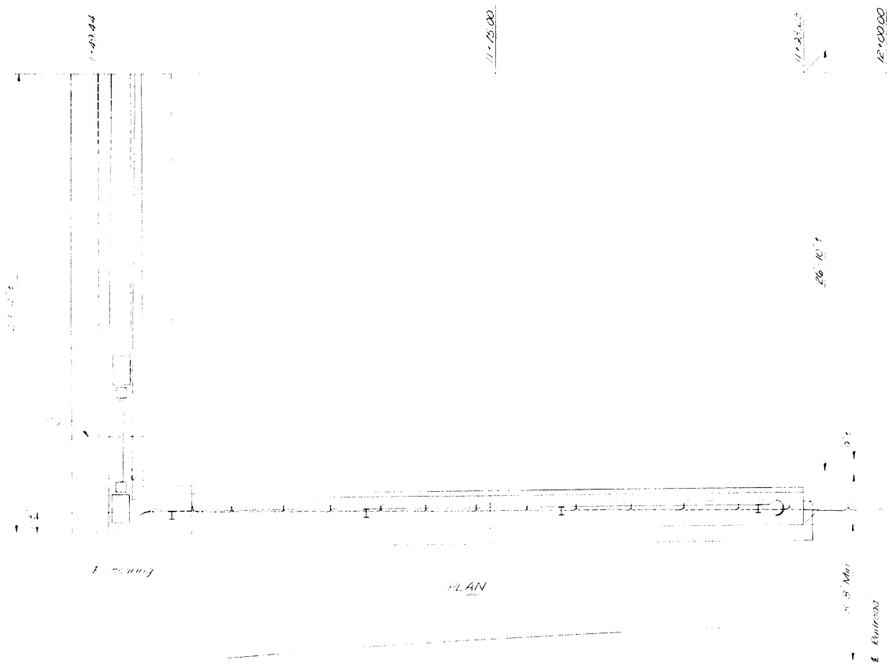
STATE HIGHWAY COMMISSION
BRIDGE DIVISION

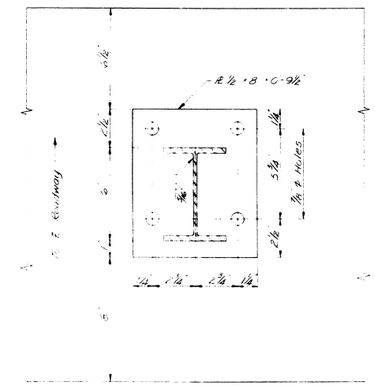
HAVERHILL BRIDGE
OVER CANAL TO
ANDROSCOGGIN RIVER
IN THE TOWN OF
RUMFORD
OXFORD COUNTY
ABUTMENT NO. 2

SHEET 8 OF 14 AUGUSTA, MAINE APRIL 1963

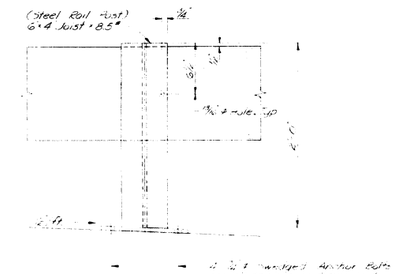
91-108

B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			



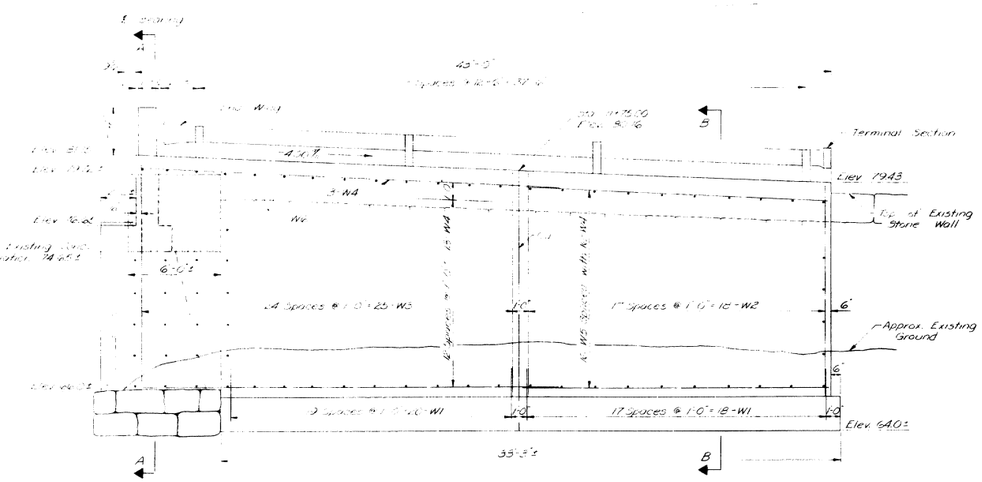


CAST PLATE AND POST
Fin. wise after fabrication.
See 1.0.3 for under item #15.27.

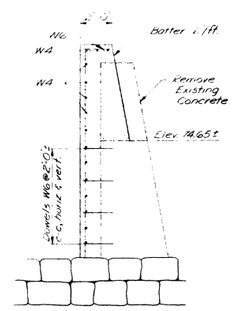


4 ¾" ø (weight) Anchor Bolts
Nuts: Nuts are not full
threaded.
Bolts required.

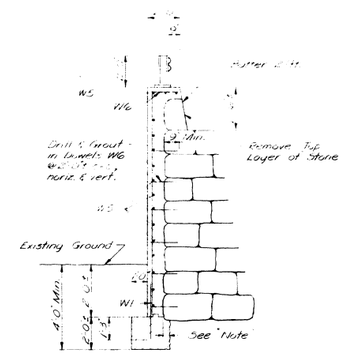
SNAKE RAIL POST
As shown in the plans.



ELEVATION
For vertical construction joint details, see sheet 7.



SECTION A-A



SECTION B-B
Note: 6" Undercut may be omitted if existing wall is in excess of 3'-0" below existing ground.

DESIGN- ARS	DET. EEL	BRIDGE NO. 5931
TRACE-		SURVEY-
CHECK- MCR		PLOT-

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

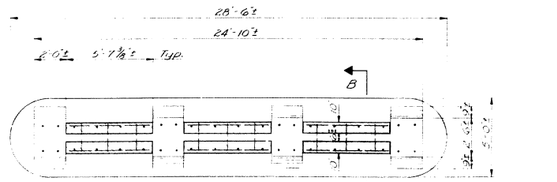
HAVERHILL BRIDGE
OVER CANAL TO
ANDROSCOGGIN RIVER
IN THE TOWN OF
RUMFORD
OXFORD COUNTY
NORTH RETAINING WALL

SHEET 9 OF 14 AUGUSTA, MAINE APRIL 1963

91-109

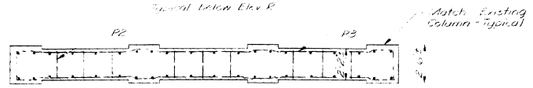
C. B. CO., NO. 66-302

S. P. R. REF. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			



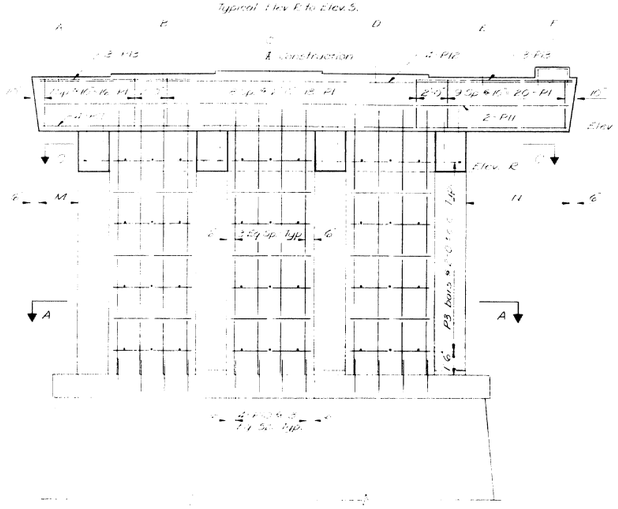
SECTION A-A

Typical below Elev. R

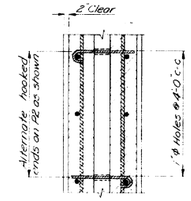


SECTION C-C

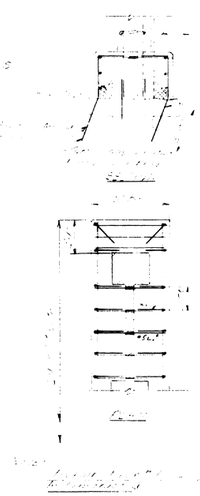
Typical Elev. R to Elev. S.

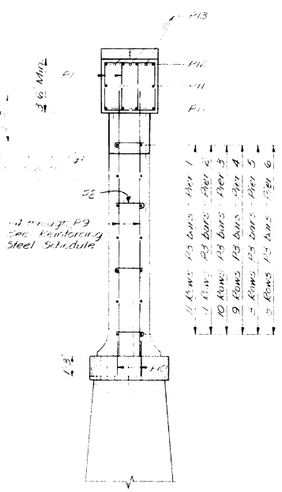


PIER

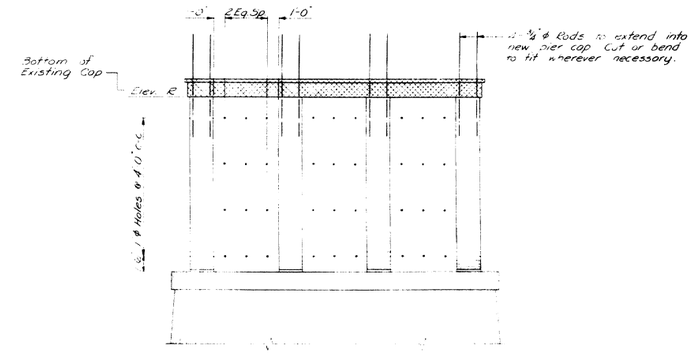


SECTION B-B





END ELEVATION



EXISTING PIER

[illegible]

GENERAL PIER NOTES

[illegible]

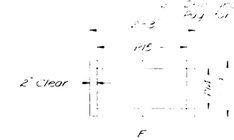
2. All reinforcing steel to be ϕ bar, unless otherwise noted.

3. Diameter of exposed edges to be 1" unless otherwise noted.

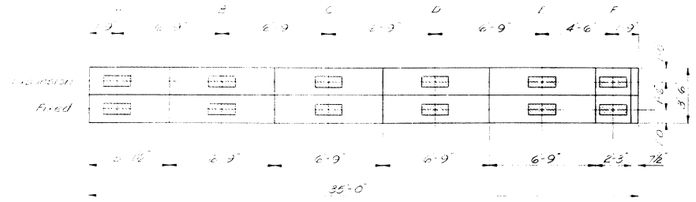
4. [illegible] reinforcing bar [illegible] clear [illegible] bars.

[illegible] to be installed to [illegible] 705.4 Reinforcing Steel, [illegible].

[illegible] grout [illegible] bearing surface [illegible] Pay for under Item 705.20.



SIDEWALK BEARING PAD



PIER CAP

Top bridge seat elevations see Table 1.

TABLE 1

SPAN	PIER	Line A	Line B	Line C	Line D	Line E	Line F
1	1	88.82	88.96	89.10	88.96	88.82	89.37
2	1	88.76	88.90	89.04	88.90	88.76	89.31
2	2	86.82	86.96	87.10	86.96	86.82	87.37
3	2	86.76	86.90	87.04	86.90	86.76	87.31
3	3	84.82	84.96	85.10	84.96	84.82	85.37
4	3	84.76	84.90	85.04	84.90	84.76	85.31
4	4	82.82	82.96	83.10	82.96	82.82	83.37
5	4	82.76	82.90	83.04	82.90	82.76	83.31
5	5	80.82	80.96	81.10	80.96	80.82	81.37
6	5	80.76	80.90	81.04	80.90	80.76	81.31
6	6	78.82	78.96	79.10	78.96	78.82	79.37
7	6	78.76	78.90	79.04	78.90	78.76	79.31

TABLE 2

PIER	Elev. R	Elev. S	H	M	N
1	83.40±	85.26	22'-10"±	2'-7"±	6'-7"±
2	81.20±	83.26	21'-7"±	3'-0"±	6'-2"±
3	79.10±	81.26	19'-10"±	3'-6"±	5'-8"±
4	76.90±	79.26	18'-9"±	3'-11"±	5'-3"±
5	74.70±	77.26	17'-0"±	4'-5"±	4'-9"±
6	72.60±	75.26	15'-9"±	4'-10"±	4'-4"±

DESIGN- ARS DET. EEL
TRACE-
CHECK- MCR

BRIDGE NO. 5931
SURVEY-
PLOT-

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

HAVERHILL BRIDGE

OVER CANAL TO

ANDROSCOGGIN RIVER

IN THE TOWN OF

RUMFORD
OXFORD COUNTY

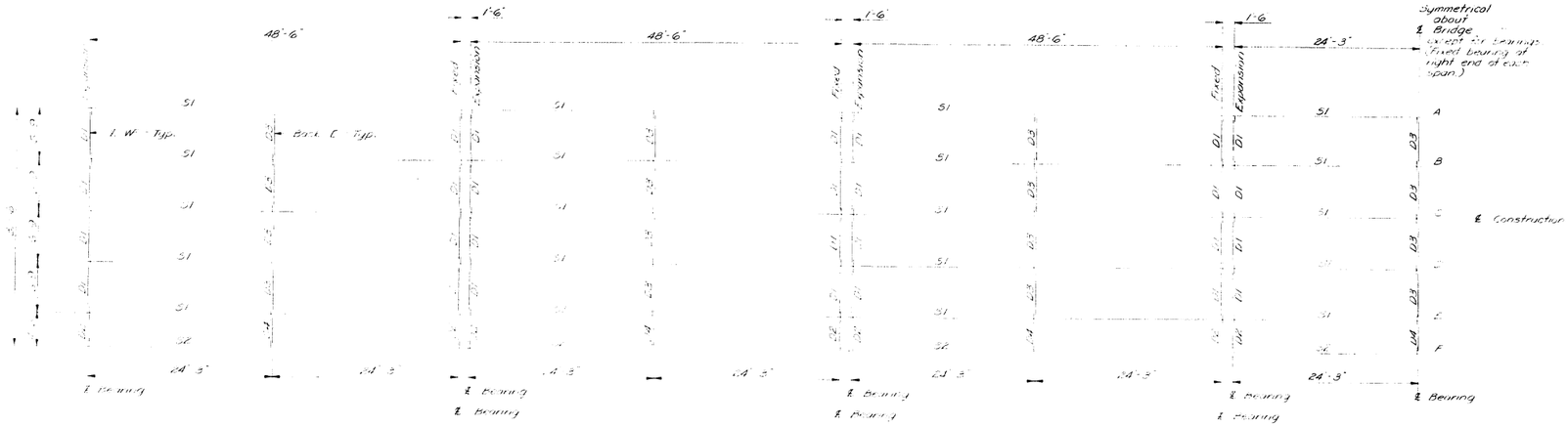
PIERS

SHEET 10 OF 14 AUGUSTA, MAINE — APRIL 1963

C. B. CO., NO. 44-302

91-110

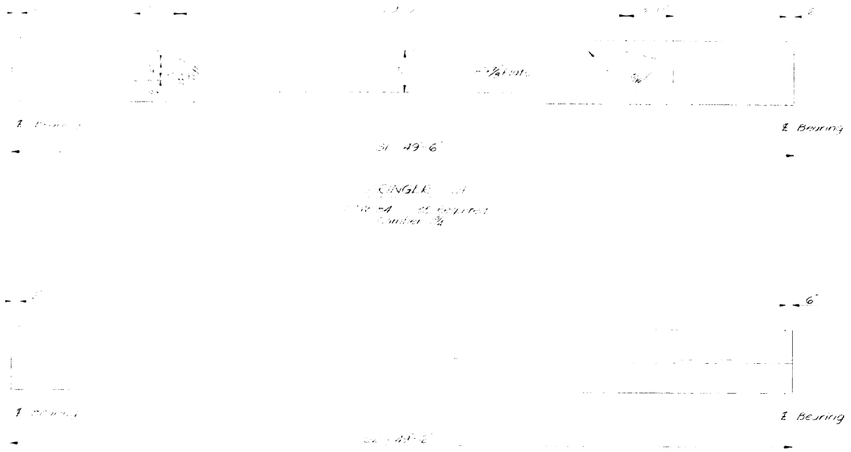
B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			



ERECTION DIAGRAM

Elevations shown at top of girders and are for use with Standard Details, Sheet 20 (A-62).

Elevations are horizontal.



STRINGER

SPW 25 7 required
Sheet 2

PLACING OF STAILS

Stringers are shown on Standard Details, Sheet (BD 104-6a.)

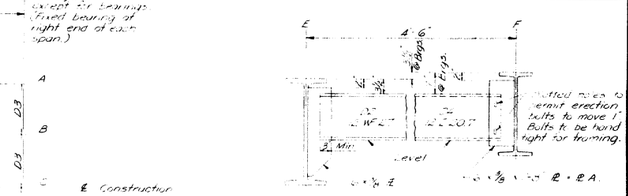
[illegible] required: [illegible] per end at Abutment 1, Sheet [illegible].

[illegible] required: [illegible] per end at Abutment 2, Sheet [illegible].

SPIRAL TABLE				
MARK	NO.	SPACES	PITCH	LENGTH
SP1	140	13	5"	5'-5"
SP2	140	11	6"	5'-6"
SP3	140	9	7"	5'-3"
SP4	140	7	9"	5'-3"
SP5	35	14	6"	7'-0"

BLOCKING TABLE

Span	Point	Elev.	Span A	Span B	Span C	Span D	Span E	Span F	Span G
A	0		[illegible]	93.65	93.71	93.65	[illegible]	[illegible]	
	1		93.57	93.21	92.85	93.21	[illegible]	[illegible]	
N	2	1/4	[illegible]	92.74	92.88	92.74	[illegible]	[illegible]	1/4
	3	1/2	92.10	92.24	92.38	92.24	[illegible]	[illegible]	1/2
1	4		[illegible]	91.71	91.85	[illegible]	[illegible]	[illegible]	
	5	0	91.51	91.65	91.79	[illegible]	[illegible]	[illegible]	
A	6	1/4	91.07	91.21	91.35	[illegible]	[illegible]	[illegible]	1/4
N	7	1/2	90.60	90.74	90.88	90.74	[illegible]	[illegible]	1/2
	8		90.10	90.24	90.38	90.24	[illegible]	[illegible]	
	9	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
2	10		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	11	0	89.51	89.65	89.79	89.65	[illegible]	[illegible]	
A	12	1/4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1/4
N	13	1/2	88.60	[illegible]	[illegible]	88.74	[illegible]	[illegible]	1/2
	14		88.10	88.24	88.38	88.24	[illegible]	[illegible]	
3	15	0	87.57	87.71	87.85	87.71	87.57	[illegible]	
	16	0	[illegible]	87.65	87.79	87.65	[illegible]	[illegible]	
4	17		[illegible]	87.21	[illegible]	[illegible]	[illegible]	[illegible]	
A	18	1/4	86.60	86.74	86.88	86.74	[illegible]	[illegible]	1/4
N	19	1/2	[illegible]	86.24	86.38	86.24	[illegible]	[illegible]	1/2
	20	0	85.57	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
5	21	0	85.51	85.65	85.79	[illegible]	[illegible]	[illegible]	
	22		85.07	85.21	85.35	85.21	[illegible]	[illegible]	
A	23	1/4	84.60	84.74	84.88	84.74	84.60	[illegible]	1/4
N	24	1/2	84.10	84.24	84.38	84.24	[illegible]	[illegible]	1/2
	25	0	83.57	[illegible]	[illegible]	[illegible]	[illegible]	84	
5	26	0	[illegible]	83.65	[illegible]	[illegible]	[illegible]	[illegible]	
P	27	1/2	83.07	83.21	83.35	[illegible]	83.07	[illegible]	
A	28	1/4	82.60	82.74	82.88	82.74	[illegible]	[illegible]	1/4
N	29	1/2	82.10	82.24	82.38	82.24	82.10	[illegible]	1/2
6	30	0	81.57	81.71	81.85	81.71	[illegible]	[illegible]	0
5	31	0	81.51	81.65	81.79	[illegible]	81.51	[illegible]	0
P	32	1/2	81.07	81.21	81.35	[illegible]	[illegible]	[illegible]	1/2
A	33	1/4	80.60	80.74	80.88	80.74	80.60	81.12	1/4
N	34	1/2	80.10	80.24	80.38	80.24	[illegible]	[illegible]	1/2
7	35	0	79.57	79.71	79.85	79.71	79.57	[illegible]	0

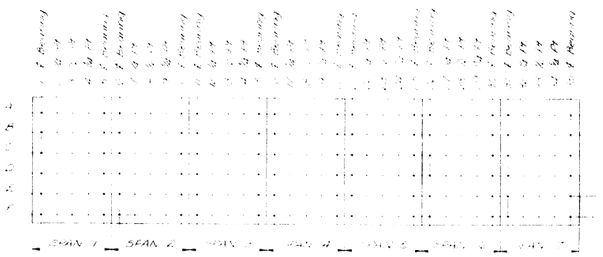


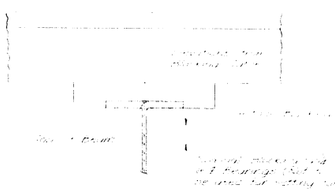
SIDEWALK DIAPHRAGM

Welding to be as shown on Standard Details, Sheet BD 104 [illegible]. Welding shall be performed after [illegible] ℄ A [illegible] bearing surface and concrete has [illegible].

BLOCKING NOTE

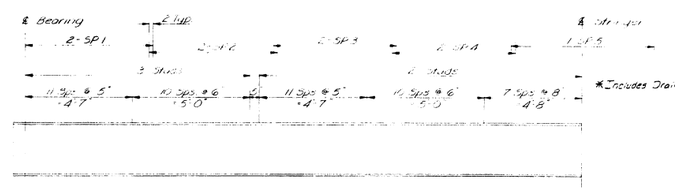
[illegible]





PLACING DETAIL

[illegible] Sheet 12.



SHEAR CONNECTORS

All shear connectors are symmetrical about ℄ Girder. Shear connector details shown on Standard Details, Sheet (BD 104-6a.) Skew angle 0°. 8610 Studs required.

DESIGN- ARS	DET. EEL	BRIDGE NO. 5931
TRACE-		SURVEY-
CHECK-		PLOT-

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

HAVERHILL BRIDGE
OVER CANAL TO
ANDROSCOGGIN RIVER
IN THE TOWN OF
RUMFORD
OXFORD COUNTY

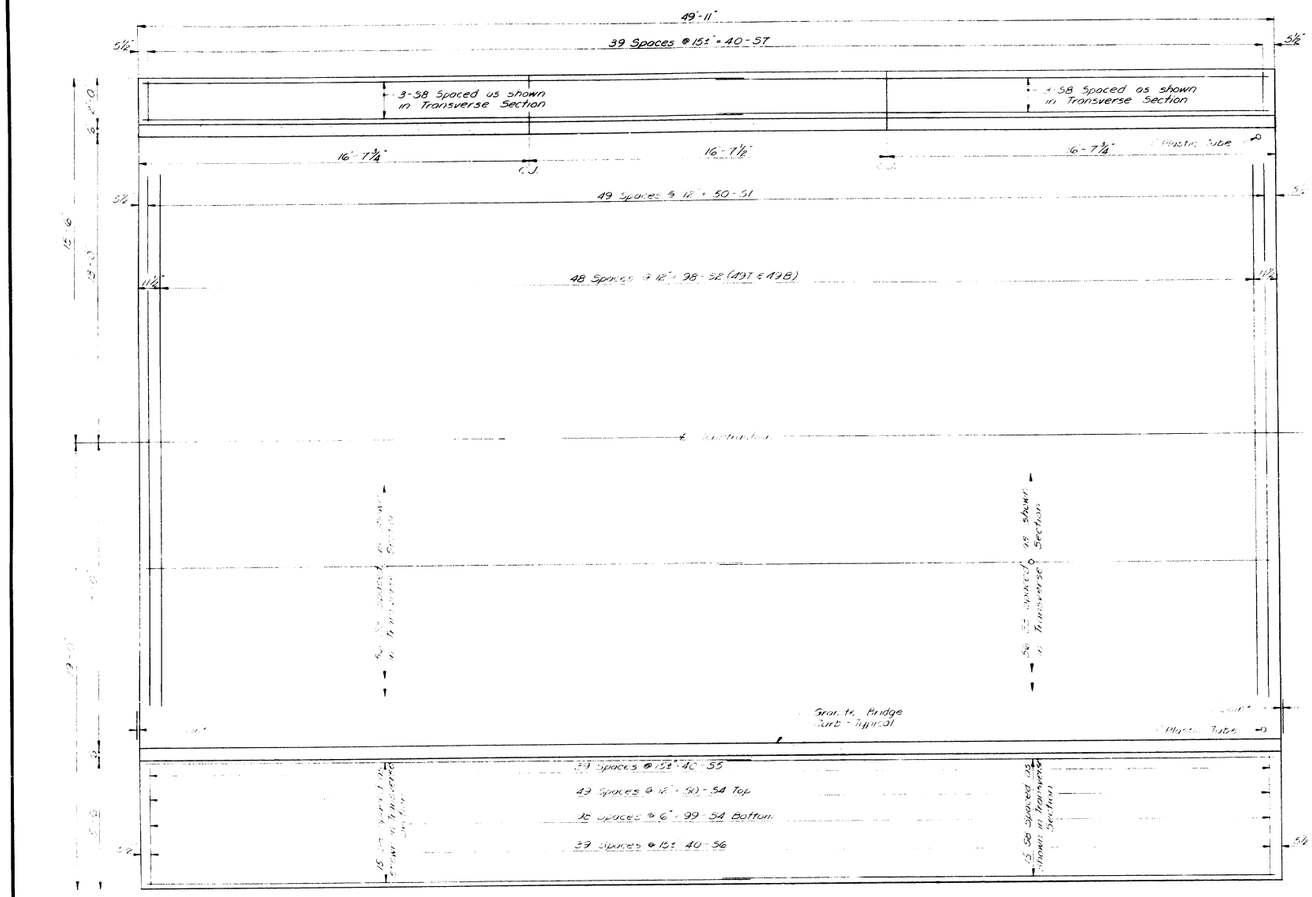
STRUCTURAL STEEL

SHEET 11 OF 14 AUGUSTA, MAINE APRIL 1963

91-111

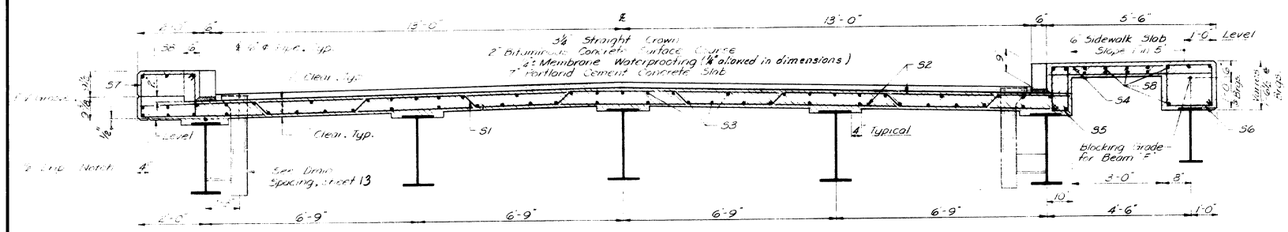
C. B. CO., NO. 46-302 55514

B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			

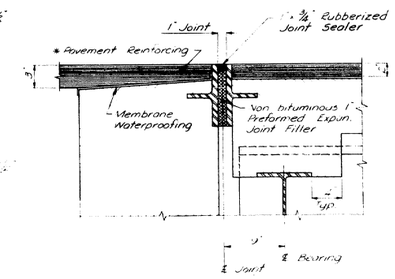


PLAN

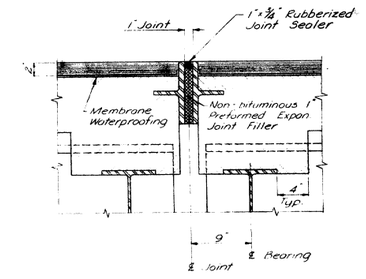
All Spans
T-Top B-Bottom



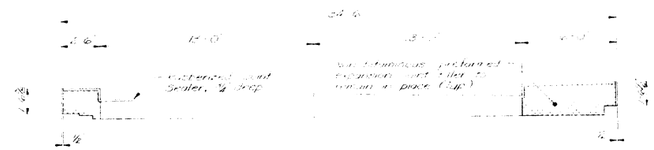
TRANSVERSE SECTION



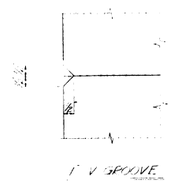
SECTION @ ABUTMENTS



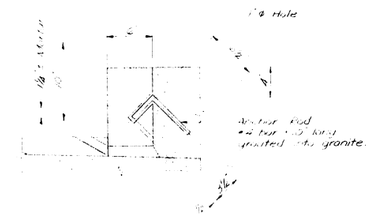
SECTION @ PIERS



JOINT TREATMENT @ ABUTMENTS & PIERS



1" V GROOVE



SECTION GRANITE CURB

* Pavement Reinforcing between contraction joints of Bituminous Concrete Surface Course, curb to curb. Pavement Reinforcing to be 5'-0" minimum width 4"x4" 10 gage galvanized welded wire fabric. An equivalent satisfactory to the Engineer may be substituted if 44 kip is not available. Payment for furnishing and placing of wire fabric shall be considered incidental to Bituminous Concrete Surface Course.

REFERENCES

Drain Detail - "Standard Details", Feb. 1964-Rev.
Rail Detail - Sheet 13
Lighting Detail - Sheet 13

NOTES

1. Place 1" Plastic Tube through slab as shown. Exact location to be determined in the field. Do not cover with membrane waterproofing. This work to be incidental to contract items.

DESIGN- ARS DET. EEL TRACE- CHECK-	BRIDGE NO. 5931 SURVEY- PLOT-

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

HAVERHILL BRIDGE
OVER CANAL TO
ANDROSCOGGIN RIVER
IN THE TOWN OF
RUMFORD
OXFORD COUNTY

SUPERSTRUCTURE

SHEET 12 OF 14 AUGUSTA, MAINE APRIL 1963

91-112

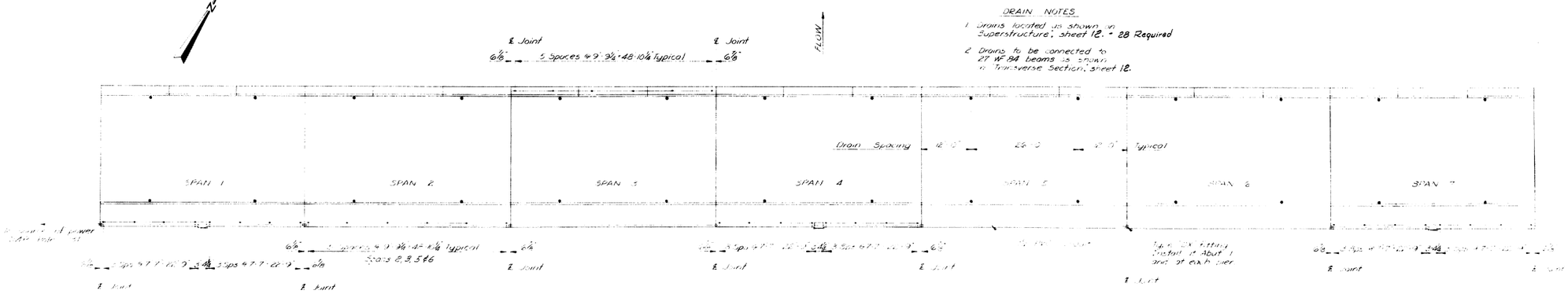
C. E. CO., NO. 46-903 25016

0 1 2 3 4 5 INCHES

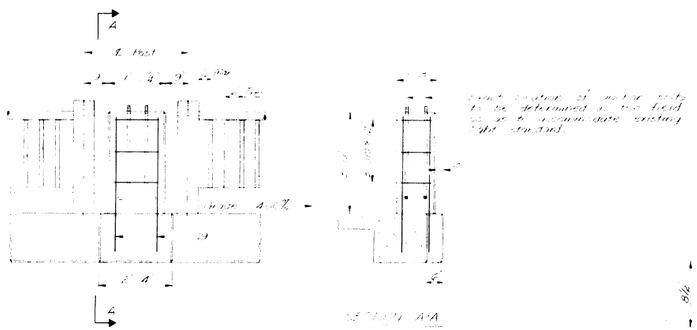
R. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			

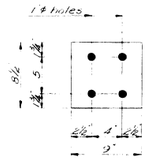
DRAIN NOTES

1. Drains located as shown on Superstructure, sheet 12. - 28 Required
2. Drains to be connected to 27" WF 84 beams as shown in Transverse Section, sheet 12.



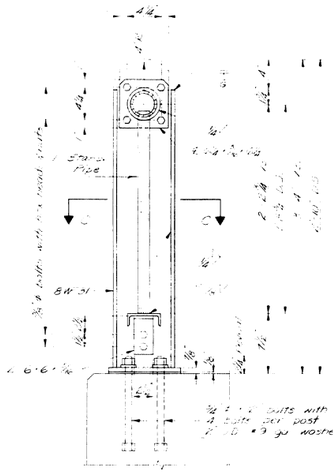
PLAN



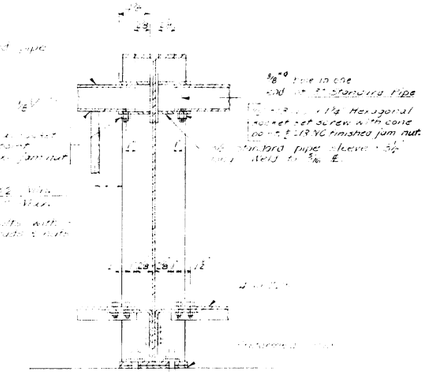


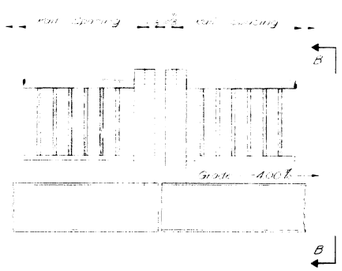
EXTERIOR PAD

At east end shall be placed under each post. 90 pots shall be furnished.



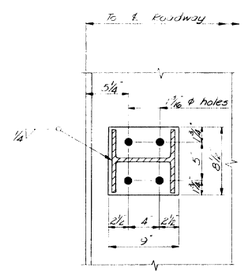
SECTION B-B



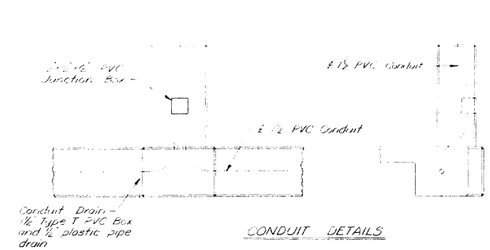


EXP. DETAIL @ JOINTS

Note: All bolts to be galv.



SECTION C-C



CONDUIT DETAILS

DESIGN- ARS DET. EEL TRACE- CHECK-	BRIDGE NO. 5931 SURVEY- PLOT-

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

HAVERHILL BRIDGE
OVER CANAL TO
ANDROSCOGGIN RIVER
IN THE TOWN OF
RUMFORD
OXFORD COUNTY

LIGHTING SYSTEM & RAIL

SHEET 13 OF 14 AUGUSTA, MAINE APRIL 1963

C. B. CO., NO. 46-302

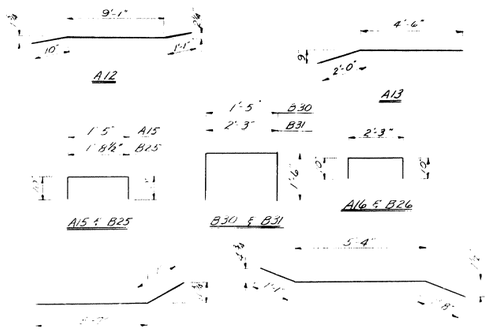
91-113

0 1 2 3 4 5 INCHES

B. P. R. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE			

REINFORCING STEEL SCHEDULE

ABUTMENTS & RETAINING WALLS



ABUTMENTS & RETAINING WALLS

STRAIGHT BARS

MARK	SIZE	NO.	LENGTH	LOCATION
B9	#5	18	4'-2"	Abutment No. 2 - Backwall
B10		38	3'-1"	do
B11		4	3'-10"	do
B12		4	2'-9"	do
B13		2	2'-3"	do
B14		34	4'-3"	do - Cap
B16		2	2'-5"	do - Wing
B17		2	2'-11"	do
B18		2	3'-4"	do
B19		2	3'-10"	do
B20		10	23'-6"	do - Backwall
B21		2	21'-2"	do
B23		3	10'-0"	do - Breastwall
B24		2	9'-1"	do - Backwall
B27		23	5'-9"	do
B28	#4	6	2'-3"	do - Bearing Pad
B29	#4	6	1'-9"	do

BENT BARS

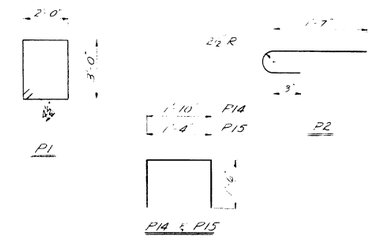
MARK	SIZE	NO.	LENGTH	LOCATION
B1	#5	2	[illegible]	Abutment No. 1 - Backwall
B2	#5	4	[illegible]	do
A15	#4	10	[illegible]	do - Bearing Pad
A16	#4	10	3'-11"	do
B15	#5	4	[illegible]	Abutment No. 2 - Wing
B22	#5	2	[illegible]	do - Backwall
B25	#4	10	2'-5"	do - Bearing Pad
B26	#4	10	3'-11"	do
B30	#4	10	[illegible]	Abutment No. 2 - Bearing Pad
B31	#4	10	[illegible]	do

STRAIGHT BARS

MARK	SIZE	NO.	LENGTH	LOCATION
A	#5	44	26'-5"	Abutment No. 1 - Breastwall
A2		6	27'-3"	do - Backwall
A3		2	2'-0"	do
A4		32	[illegible]	do - Breastwall
A5		10	4'-6"	do - Backwall
A6		26	3'-3"	do
A7		4	4'-4"	do
A8		4	4'-0"	do
A9		4	3'-5"	do
A10		5	2'-9"	do
A11		25	4'-6"	do - Cap
A14		4	24'-0"	do - Backwall
A17	#4	6	1'-5"	do - Bearing Pad
A18	#4	6	2'-3"	do
B1	#5	21	25'-0"	Abutment No. 2 - Breastwall
B2		2	14'-0"	do
B3		1	17'-0"	do
B4		2	19'-0"	do
B5		16	22'-6"	do
B6		38	16'-7"	do
B7		4	13'-10"	do
B8		5	10'-7"	do

MARK	SIZE	NO.	LENGTH	LOCATION
* D1	#6	70	[illegible]	Abutment No. 1 - Face of Breastwall
* D3	#6	82	2'-0"	do
* D4	#5	26	2'-6"	do - Cap
* D5		30	2'-0"	do - Cap & Wing
D7		67	2'-3"	do - Backwall
* D8		2	5'-5"	do - Wing
* D9		2	4'-5"	do
* D10		[illegible]	[illegible]	
* D25	#6	57	1'-6"	Abutment No. 2 - Face of Breastwall
* D26	#6	90	2'-0"	do
* D50	#5	37	2'-0"	do - Cap
* D51	#5	25	2'-6"	do - Cap
D52	#5	66	2'-3"	do - Backwall
D53	#6	12	[illegible]	Abutment No. 1 & 2 Backwall Curb
W1	#5	38	3'-6"	North Retaining Wall
W2	#5	18	18'-3"	do
W3	#5	25	14'-0"	do
W4	#5	16	28'-6"	do
W5	#5	16	18'-0"	do
* W6	#5	100	1'-6"	do
W25	#5	15	5'-4"	South Retaining Wall
W26		4	8'-6"	do
W27		20	12'-9"	do
W28		10	15'-10"	do
W29		25	19'-0"	do
W30		3	18'-3"	do
W31		4	10'-3"	do
W32		13	27'-9"	do
W33		31	21'-1"	do
W34		3	19'-0"	do
W35		11	27'-6"	do
W36		1	13'-0"	do
				do
W41	#5	4	4'-10"	do
W42	#5	1	6'-3"	do
W43	#5	7	8'-4"	do
* W44	#6	330	1'-6"	do - Dowels
W45	#6	56	5'-6"	Corner of Abutments and Walls
W46	#5	67	1'-8"	South Retaining Wall
W47	#5	1	25'-8"	do
W48	#5	38	3'-6"	do

PIERS



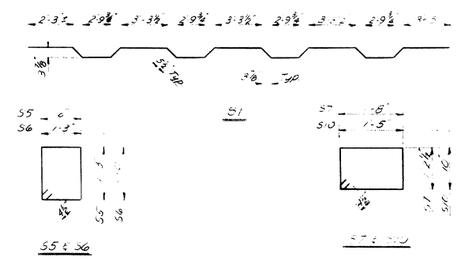
BENT BARS

MARK	SIZE	NO.	LENGTH	LOCATION
P1	#5	324	[illegible]	Cap
P2	#5	297	[illegible]	Stiffener Walls
P14	#4	24	[illegible]	Bearing Pad
P15	#4	24	4'-4"	do

STRAIGHT BARS

MARK	SIZE	NO.	LENGTH	LOCATION
P3	#5	342	5'-4"	Stiffener Walls
P4		24	24'-10"	Pier 3 Stiffener Walls
P5		24	[illegible]	Pier 3 Stiffener Walls
P6		24	[illegible]	Pier 4 Stiffener Walls
P7		24	20'-9"	Pier 4 Stiffener Walls
P8		24	19'-3"	Pier 5 Stiffener Walls
P9		24	17'-9"	Pier 6 Stiffener Walls
* P10		144	3'-0"	Dowels
P11	#6	36	33'-6"	Cap
P12	#10	24	34'-5"	Cap
P13	#10	36	10'-0"	Cap

SUPERSTRUCTURE



BENT BARS

MARK	SIZE	NO.	LENGTH	LOCATION
S1	#5	250	[illegible]	Slab
S5	#4	280	4'-3"	Sidewalk Slab
S6	#4	280	5'-3"	Sidewalk
S7	#4	280	[illegible]	Slab
S10	#4	24	[illegible]	End Posts & Joint Posts

STRAIGHT BARS

MARK	SIZE	NO.	LENGTH	LOCATION
S2	#5	[illegible]	[illegible]	Slab
S3	#5	342	[illegible]	Slab
S4	#4	242	[illegible]	Sidewalk
S8	#4	252	[illegible]	Sidewalk & Curb
S9	#6	92	[illegible]	End Posts & Joint Posts

[illegible]

DESIGN- ARS TRACE- PLA CHECK- [illegible] MAR	BRIDGE NO. 5951 SURVEY- PLOT-

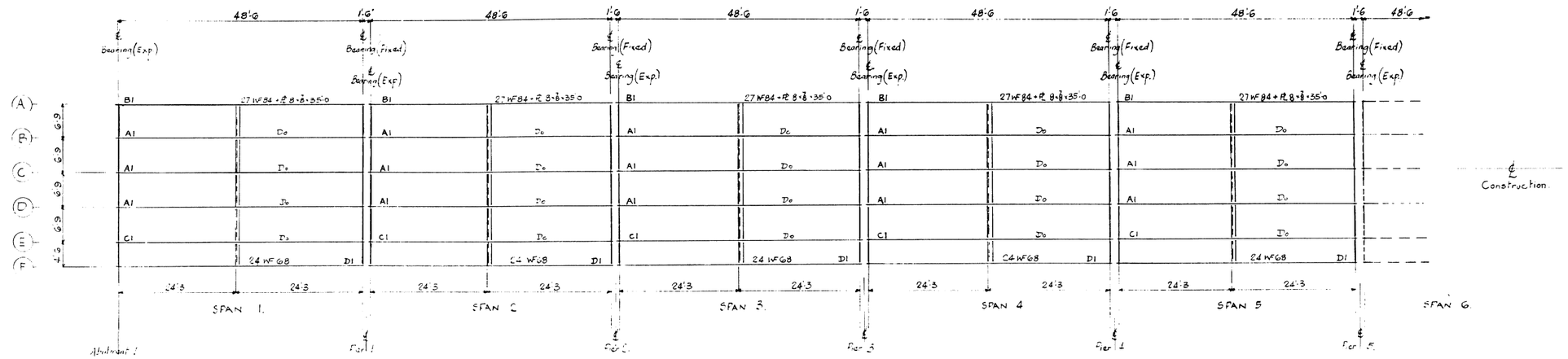
STATE HIGHWAY COMMISSION
BRIDGE DIVISION

HAVERHILL BRIDGE
OVER CANAL TO
ANDROSCOGGIN RIVER
IN THE TOWN OF
RUMFORD
OXFORD COUNTY
REINFORCING STEEL

SHEET 14 OF 14 AUGUSTA, MAINE APRIL 1963

91-114

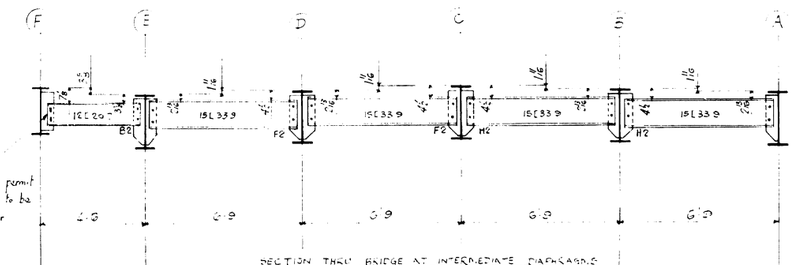
C. B. CO., NO. 66-102 [illegible]



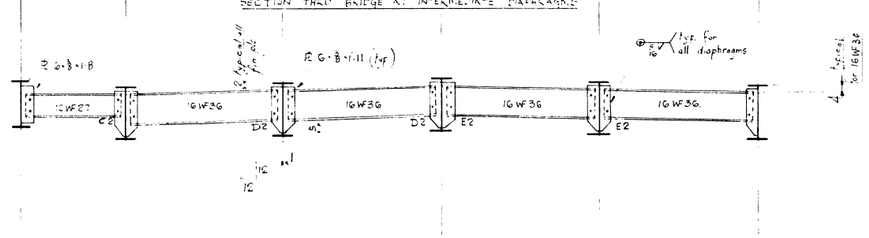
ERECTION PLAN

ALL DIMENSIONS ARE HORIZONTAL

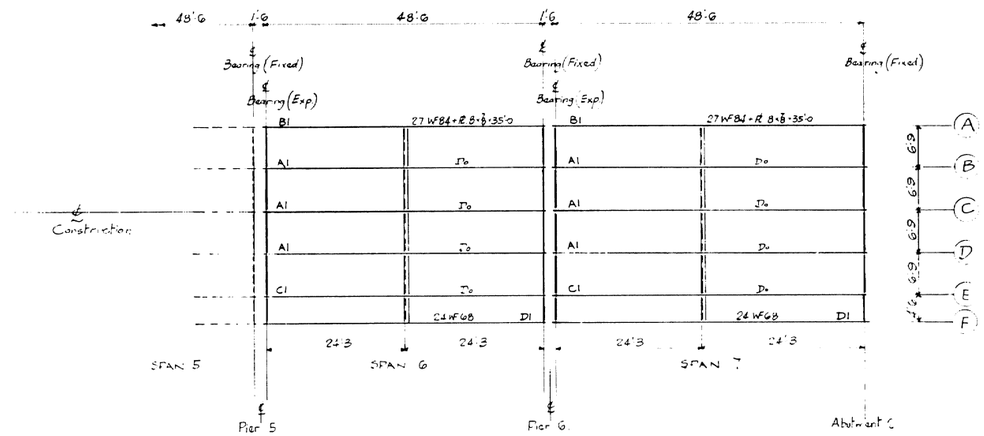
BRIDGE ON GRADE OF 4%



SECTION THRU BRIDGE AT INTERMEDIATE DIAPHRAGMS



SECTION THRU BRIDGE AT PIERS



ERECTOR NOTE

MEMBERS TO BE ERECTED SO THAT MARKED END IS IN SAME LOCATION AS SHOWN ON THIS DRG.

NOTES

ALL COVER PLATES ARE ON UNDERSIDE OF STRINGERS

DIAPHRAGMS AT BEARINGS - 16 WF 36. } EXCEPT
INTERMEDIATE DIAPHRAGMS - 15 [33.9 } LINE E-F.

DIAPHRAGM SPACING DIMENSIONS ARE TO ℄ OF BEAMS AND BACK OF CHANNELS.

27 WF 84 STRINGERS - 1¾" CAMBER.

24 WF 68 STRINGERS - 2" CAMBER.

GENERAL NOTES

STEEL TO A.S.T.M. SPEC A36.

SHOP CONNECTIONS:- WELDED.

FIELD CONNECTIONS:- WELDED & H.T. BOLTS.

SHOP PAINT:- RED LEAD & OIL AS PER SPECS.

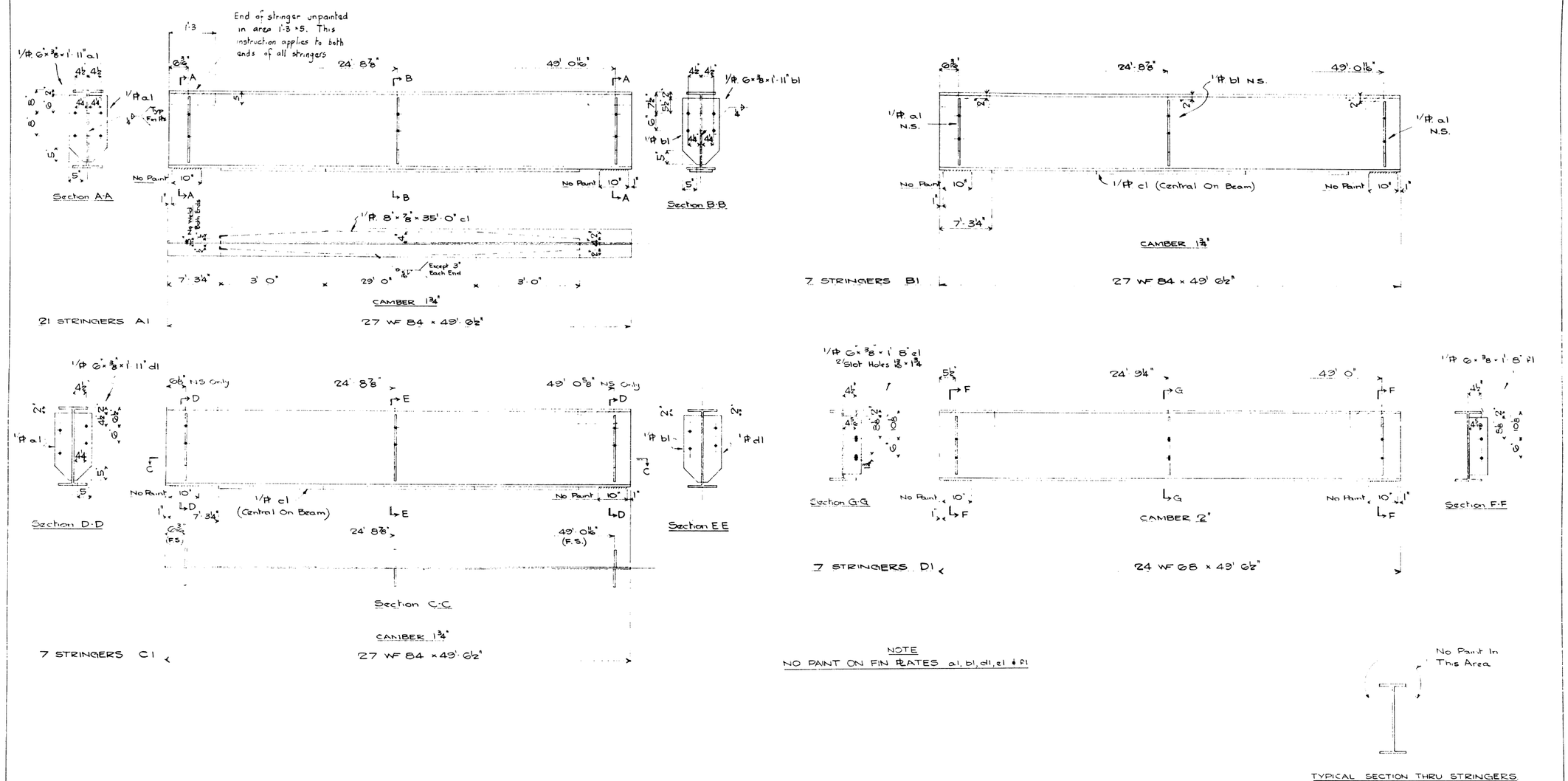
ERECTION:- BY OTHERS

ANCHOR BOLTS:- SUPPLIED BY A I W. - SET BY OTHERS.

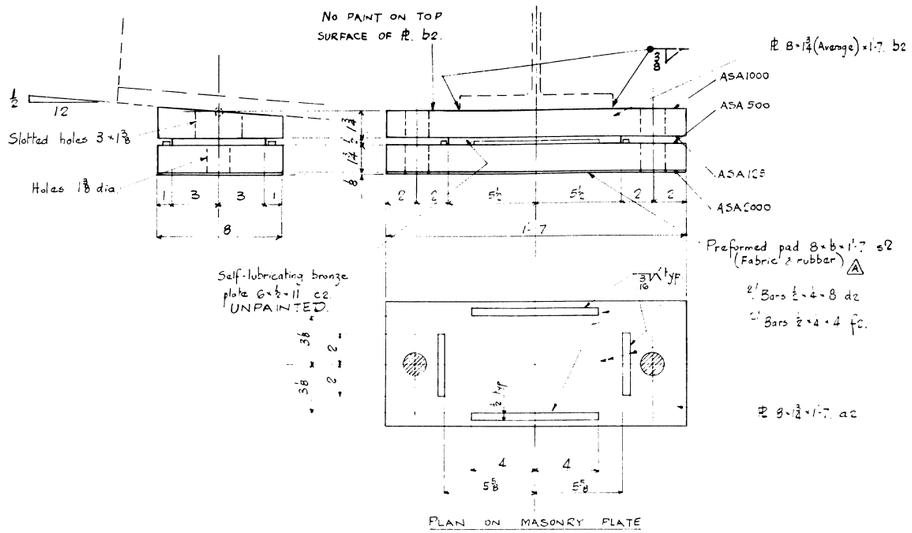
REVISIONS	ERECTION PLAN		
	JOB: HAVERHILL BRIDGE. RUMFORD - OXFORD COUNTY (STATE HIGHWAY COMMISSION)	DRAWN BY KWS	DATE JULY 15 '68
		CHECKED BY EWG	DATE 18 July 68
	CUSTOMER: CALLAHAN BROS.	SHEET E1	
	AUGUSTA IRON WORKS AUGUSTA, MAINE	ORDER 969	

91-115

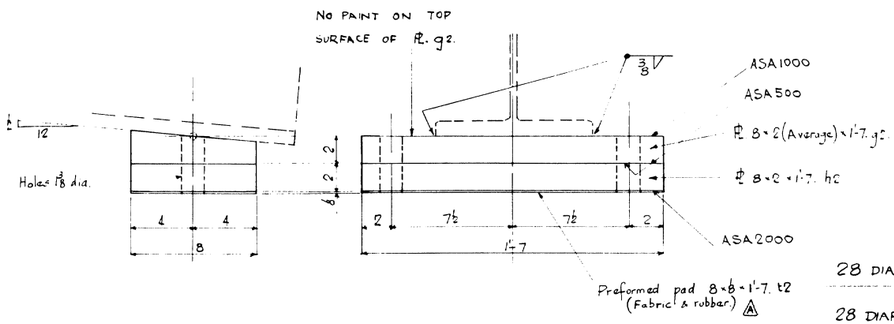
0 1 2 3 4 5 INCHES


End of stringer unpainted in area 1'-3" x 5". This instruction applies to both ends of all stringers
1/PL 6" x 3/8" x 1'-11" a1
1/PL a1
Typ For PLs
Section A-A
24' 8 7/8"
49' 0 11/16"
No Paint 10"
1/PL 8" x 7/8" x 35'-0" c1
Except 3" Each End
7'-3 1/4"
3'-0"
29'-0"
CAMBER 1 3/4"
21 STRINGERS A1
27 WF 84 x 49' 0 1/2"
1/PL 6" x 3/8" x 1'-11" b1
1/PL b1
Section B-B
1/PL a1 N.S.
1/PL b1 N.S.
1/PL c1 (Central On Beam)
CAMBER 1 3/4"
7 STRINGERS B1
27 WF 84 x 49' 0 1/2"
1/PL 6" x 3/8" x 1'-11" d1
Section D-D
1/PL c1 (Central On Beam)
Section C-C
CAMBER 1 3/4"
7 STRINGERS C1
27 WF 84 x 49' 0 1/2"
1/PL 6" x 3/8" x 1'-8" c1
2 Slot Holes 1 3/8" x 1 3/4"
24' 9 1/4"
49' 0"
Section G-G
CAMBER 2"
Section F-F
7 STRINGERS D1
24 WF 68 x 49' 0 1/2"
NOTE
NO PAINT ON FIN PLATES a1, b1, d1, e1 & f1
No Paint In This Area
TYPICAL SECTION THRU STRINGERS
PAINT
RED LEAD & OIL (AS PER SPECS)
EXCEPT WHERE NOTED
HOLES 1 3/8" ø
REVISIONS
DESCRIPTION Stringers
JOB HAVERHILL BRIDGE
RUMFORD - OXFORD COUNTY
(STATE HIGHWAY COMISSION)
CUSTOMER CALLAHAN BROS.
AUGUSTA IRON WORKS
AUGUSTA, MAINE
DRAWN BY DWG
DATE 17 July 68
CHECKED BY RWS
DATE 19 JULY
SHEET 1
ORDER 969
0 1 2 3 4 5 INCHES

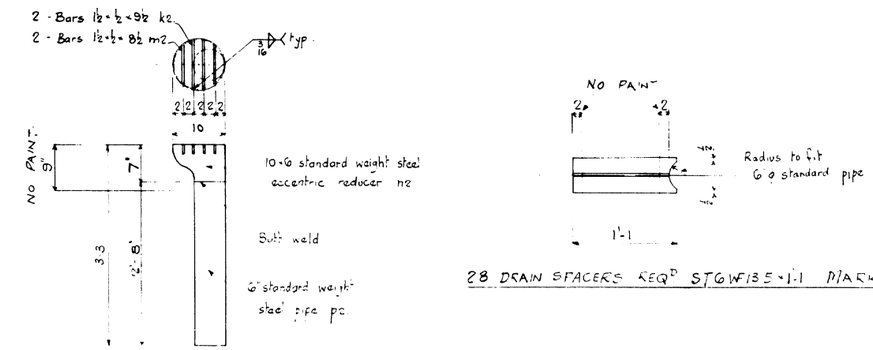
91-116



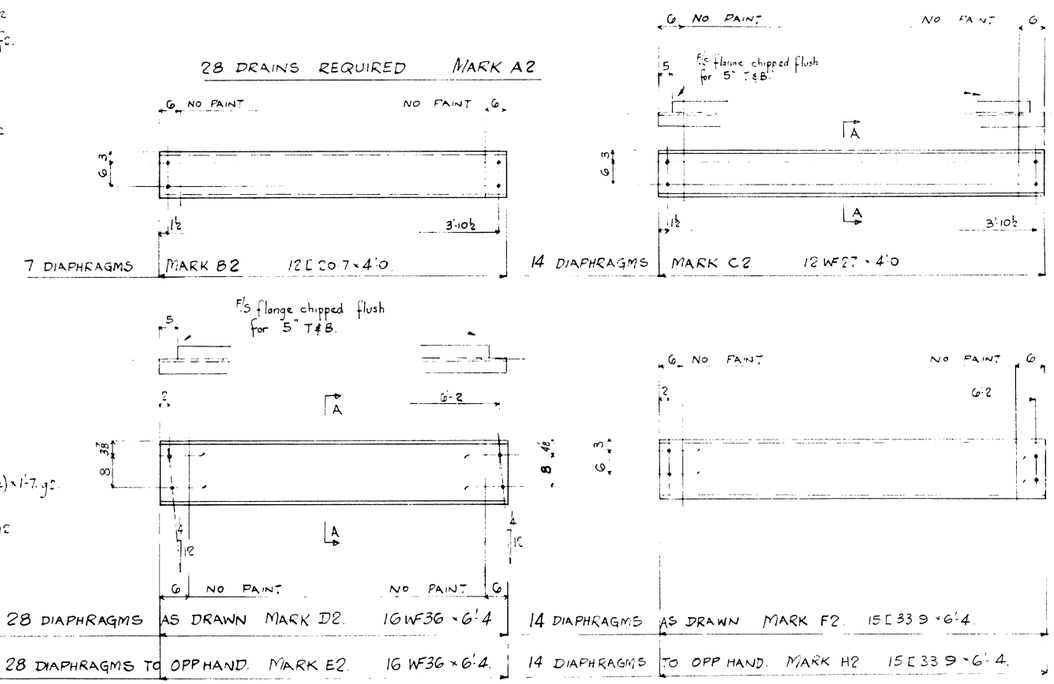
42 EXPANSION BEARINGS REQUIRED - MARK EPA2

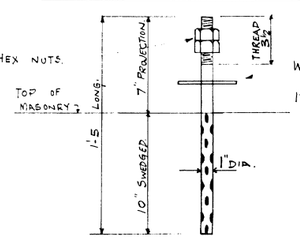


42 FIXED BEARINGS REQUIRED - MARK FPA2



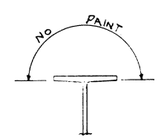
28 DRAINS REQUIRED MARK A2





WASHER. SEE TABLE FOR SIZE
1⅛ ϕ HOLE IN WASHER.

No. REQ^D.	WASHER.	LOCATION.
84	STANDARD WASHER 2½ ϕ × 8 ga.	BEARINGS FPA2
84	PL. 3 × 4 × 5.	BEARINGS EPA2



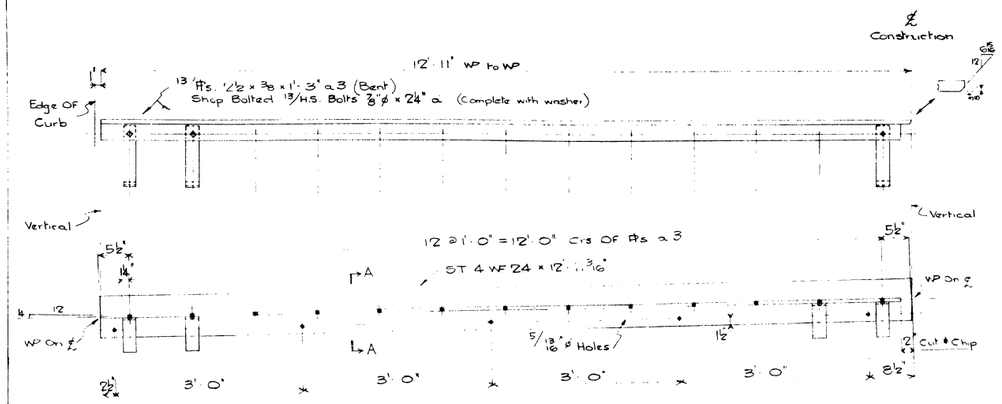
SECTION A-A.
(FOR DIAPHRAGMS C2, D2, E2)

HOLES 13/16 ϕ UNLESS NOTED.
PAINT:- RED LEAD & OIL (AS PER SPECS)
EXCEPT AS NOTED.
COAT ALL FINISHED SURFACES WITH
WHITE LEAD & TALLOW.

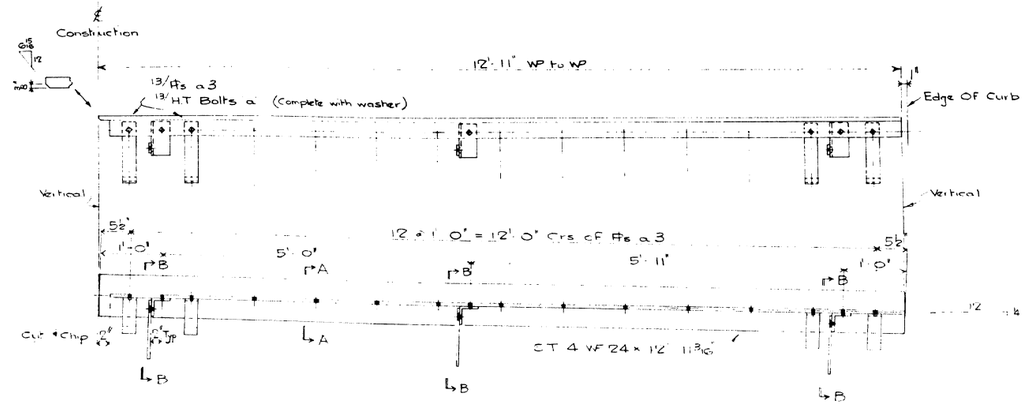
REVISIONS: July 26	DESCRIPTION: BEARINGS, BOLTS DRAINS & DIAPHRAGMS		
	SUBJ.: HAVERHILL BRIDGE RUMFORD - OXFORD COUNTY (STATE HIGHWAY COMMISSION)	DRAWN BY JWS	DATE July 17
		CHECKED BY Dwg	DATE 13 July 63
	PURCHASER: CALLAHAN BROS.	SHEET 2	
	AUGUSTA IRON WORKS AUGUSTA, MAINE	ORDER 969	

91-117

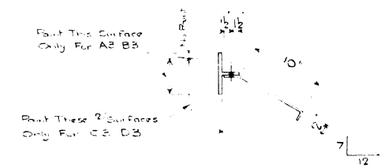
0 1 2 3 4 5 INCHES



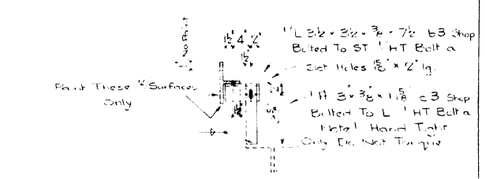
2 ARMORED JOINTS REQ^D AS DRAWN — MARK A3
2 " " " OPP HAND — MARK B3



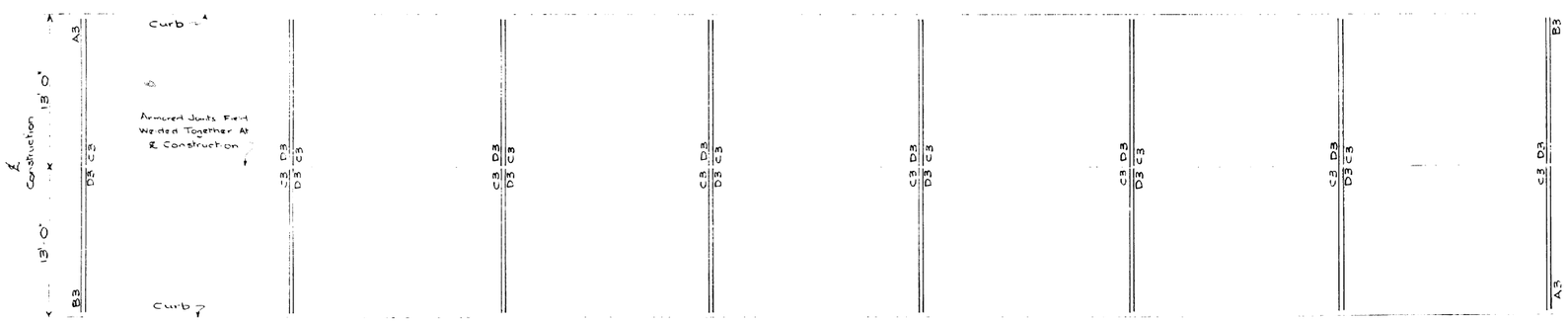
14 ARMORED JOINTS REQ^D AS DRAWN — MARK C3
14 " " " OPP HAND — MARK D3



Section A-A



Section B-B



Key Plan Showing Armored Joint Positions.

Erector Note: Marked End Of Each Piece To Be In Same Location As Shown On This Plan.

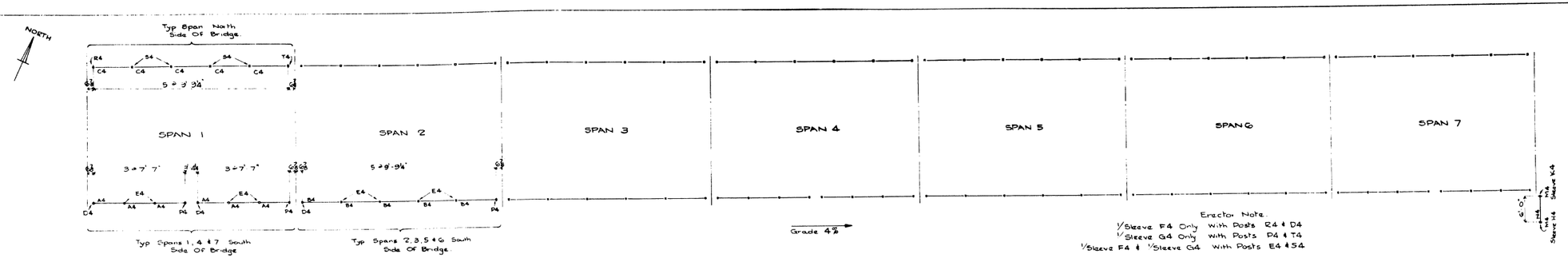
Paint
Red Lead & Oil As Per Specs
Only As Shown At A-A & B-B

Holes 15/16" ø Unless Noted.

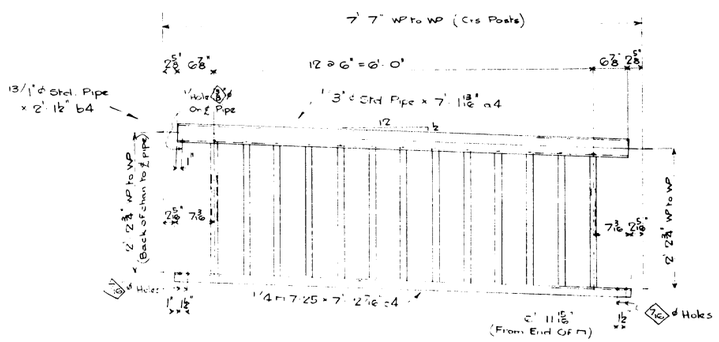
REVISIONS	DESCRIPTION: Armored Joints		
	JOB: HAVERHILL BRIDGE RUMFORD - OXFORD COUNTY (STATE HIGHWAY COMISSION)	DRAWN BY: Kerry	DATE: 13 July 63
		CHECKED BY: Ross	DATE: 13 July
	CALLAHAN BROS.	SHEET 3	
	AUGUSTA IRON WORKS AUGUSTA MAINE	ORDER 969	

91-118

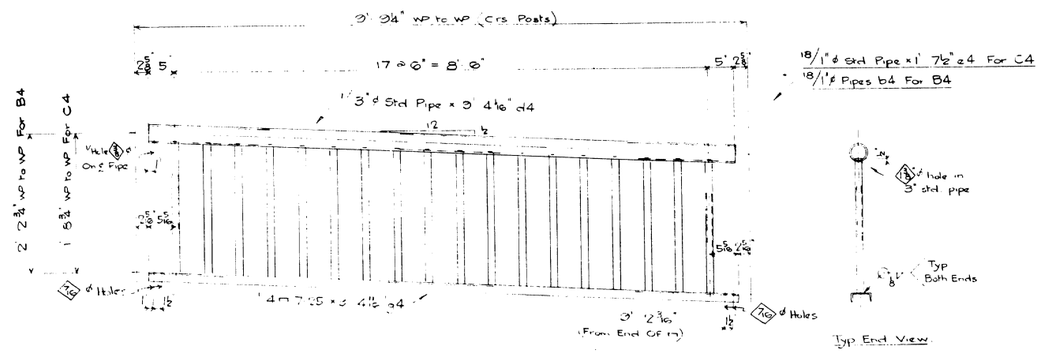
0 1 2 3 4 5 INCHES



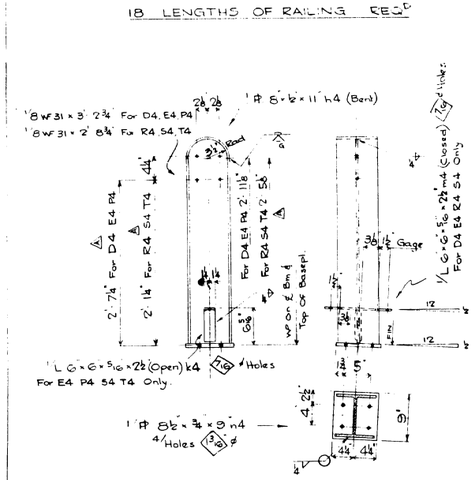
KEY PLAN ON BRIDGE



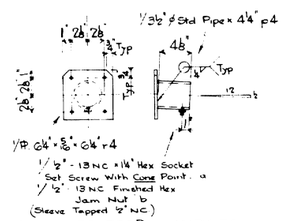
18 LENGTHS OF RAILING REQ'D MARK A4



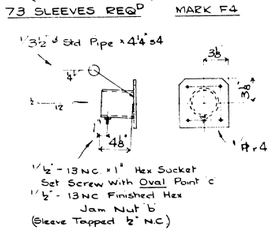
20 LENGTHS OF RAILING REQ'D AS DRAWN & NOTED MARK B4
35 " " " " " MARK C4



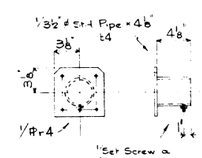
10	POSTS REQ'D AS DRAWN & NOTED	MARK D4	
28	POSTS REQ'D AS DRAWN & NOTED	MARK E4	
10	POSTS REQ'D AS DRAWN & NOTED	MARK P4	
7	POSTS REQ'D AS DRAWN & NOTED	MARK R4	
28	POSTS REQ'D AS DRAWN & NOTED	MARK S4	
7	POSTS REQ'D AS DRAWN & NOTED	MARK T4	



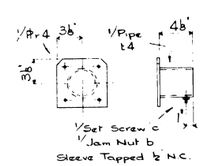
73 SLEEVES REQ'D MARK F4



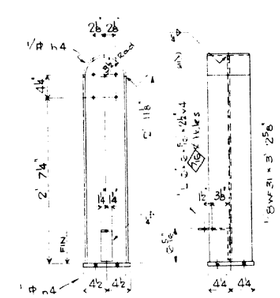
73 SLEEVES REQ'D MARK G4



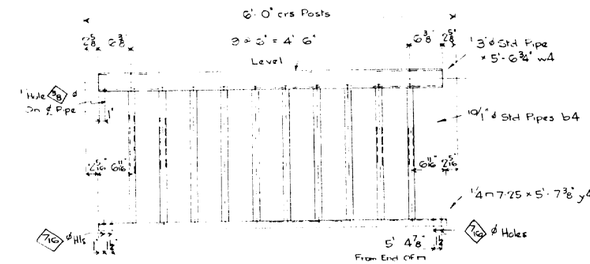
ONE SLEEVE REQ'D MARK H4



ONE SLEEVE REQ'D MARK K4



2 POSTS REQ'D MARK M4



ONE LENGTH OF RAILING REQ'D MARK N4

Paint:-
Red Lead & Oil
(As Per Spec)

Holes 11/16" ø U.N.

308 - Anchor Bolts Req'd 34" ø × 1' 0" lg. (Hex Head & Nut) Each Complete With 1/Washer 2" O.D. #9 Ga. With 13/16" ø hole. — Bundle & Tag 50969

REVISIONS	DESCRIPTION: Railing	DRAWN BY Dwg	DATE 23 July 63
	JOB: Haverhill Bridge Rumford - Oxford County. (State Highway Comission)	CHECKED BY RWS	DATE July 24 63
	CUSTOMER: Callahan Bros.	SHEET 4	
	AUGUSTA IRON WORKS AUGUSTA, MAINE	ORDER 969	

91-119

0 1 2 3 4 5 INCHES