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# **Belford over Happy Canyon Creek Bridge Rating**

**2021**

**DEVELOPED BY:**

**Felsburg Holt & Ullevig**



6400 S Fiddlers Green Circle, Suite 1500

Greenwood Village, CO 80111

303-721-1440

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<b>COLORADO DEPARTMENT OF TRANSPORTATION</b>		Structure #	Belford/HCC
<b>LOAD &amp; RESISTANCE FACTOR RATING SUMMARY</b>		State Highway #	
Rated using:		Batch I.D.	
Asphalt thickness: <u>3</u> in.		Structure Type	CPGC
<input checked="" type="checkbox"/> Colorado legal loads <input checked="" type="checkbox"/> Multi-lane for Legal & Permit Vehicles <input type="checkbox"/> Interstate legal loads <input type="checkbox"/> Single lane for Legal & Permit Vehicles		Parallel Structure #	

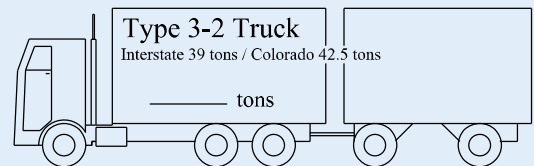
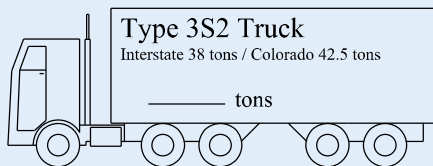
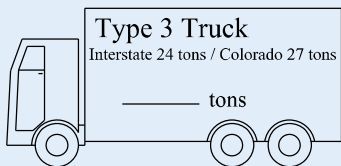
Structural Member	G1	G2-G5, G8-G11	G6-G7	G12	
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Rating Factor

Inventory	1.22	1.57	1.56	1.41	
Operating	1.58	2.03	2.03	1.83	

Tons

Type 3 truck	96.2	128.1	127.5	112.9	
Type 3S2 truck	130.2	173.3	172.5	152.7	
Type 3-2 truck	126.3	168.1	167.3	148.2	
Type SU4 truck (27T)	96.0	127.8	127.2	112.7	
Type SU5 truck (31T)	99.3	132.2	131.6	116.6	
Type SU6 truck (35T)	100.5	133.7	133.1	117.9	
Type SU7 truck (39T)	103.3	137.5	136.9	121.2	
NRL (40T)	102.1	136.0	135.3	119.8	
Lane-Type Legal					
EV2 (28.75T)	98.9	131.6	131.0	116.0	
EV3 (43T)	98.1	130.6	130.0	115.1	
Permit Truck (96T)	193.4	207.6	206.8	209.9	
Modified Tandem (50T)	159.9	177.4	176.6	176.0	



Comments: Controlling girder: Exterior Girder 1 Rating control point: 77.21' (100% of Span 1) Control mode: Strength-I Concrete Flexure  Overload Color Code = White  Rated by Felsburg Holt & Ullevig	PE Seal 
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Rated by: (Print name and sign) David Meier <i>David M. Meier</i>	Date: 3/12/21	Checked by: (Print name and sign) Alivia Plankis, PE <i>Alivia Plankis</i>	Date: 3/12/21
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## Bridge Rating Results Report

Bridge Id	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By
Belford over H	HL-93 (US)	Inventory	1.220	LRFR	43.94	Friday, March 12, 2021 12:10:39	virtis
Belford over H	HL-93 (US)	Operating	1.582	LRFR	56.96	Friday, March 12, 2021 12:10:39	virtis
Belford over H	Colorado Legal Type 3	Legal	3.565	LRFR	96.24	Friday, March 12, 2021 12:10:39	virtis
Belford over H	Colorado Legal Type 3-2	Legal	2.972	LRFR	126.32	Friday, March 12, 2021 12:10:39	virtis
Belford over H	Colorado Legal Type 3S2	Legal	3.064	LRFR	130.22	Friday, March 12, 2021 12:10:39	virtis
Belford over H	EV2	Legal	3.441	LRFR	98.93	Friday, March 12, 2021 12:10:39	virtis
Belford over H	EV3	Legal	2.282	LRFR	98.14	Friday, March 12, 2021 12:10:39	virtis
Belford over H	NRL	Legal	2.554	LRFR	102.18	Friday, March 12, 2021 12:10:39	virtis
Belford over H	SU4	Legal	3.558	LRFR	96.06	Friday, March 12, 2021 12:10:39	virtis
Belford over H	SU5	Legal	3.206	LRFR	99.38	Friday, March 12, 2021 12:10:39	virtis
Belford over H	SU6	Legal	2.892	LRFR	100.50	Friday, March 12, 2021 12:10:39	virtis
Belford over H	SU7	Legal	2.667	LRFR	103.35	Friday, March 12, 2021 12:10:39	virtis
Belford over H	Colorado Permit Vehicle	Permit	2.015	LRFR	193.48	Friday, March 12, 2021 12:10:39	virtis
Belford over H	Modified-Tandem	Permit	3.199	LRFR	159.96	Friday, March 12, 2021 12:10:39	virtis

*David M. Merie*

03/12/21

*Alivia Plankis*  
03/12/2021

## Rating Results Summary Report

Name: Belford over Happy Canyon Creek  
Struct-Def: BT\_42Belford

Bridge ID: Belford over HCC  
Member: Member 1

NBI: Belford / HCC  
Member Alt: Wizard Alternative

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State
HL-93 (US)	Truck + Lane	LRFR	Inventory	61.72	1.715	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	Truck + Lane	LRFR	Operating	80.01	2.223	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	Tandem + Lane	LRFR	Inventory	72.58	2.016	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	Tandem + Lane	LRFR	Operating	94.08	2.613	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	90%(Truck Pair + Lane)	LRFR	Inventory	43.94	1.220	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	90%(Truck Pair + Lane)	LRFR	Operating	56.96	1.582	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
Colorado Legal Type 3	Axle Load	LRFR	Legal	96.24	3.565	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
Colorado Legal Type 3-2	Axle Load	LRFR	Legal	126.32	2.972	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
Colorado Legal Type 3S2	Axle Load	LRFR	Legal	130.22	3.064	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
EV2	Axle Load	LRFR	Legal	98.93	3.441	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
EV3	Axle Load	LRFR	Legal	98.14	2.282	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
NRL	Axle Load	LRFR	Legal	102.18	2.554	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
SU4	Axle Load	LRFR	Legal	96.06	3.558	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
SU5	Axle Load	LRFR	Legal	99.38	3.206	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
SU6	Axle Load	LRFR	Legal	100.50	2.892	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
SU7	Axle Load	LRFR	Legal	103.35	2.667	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
Colorado Permit Vehicle	Axle Load	LRFR	Permit	193.48	2.015	77.21	1 - (100.0)	STRENGTH-II Concrete Flexure
Modified-Tandem	Axle Load	LRFR	Permit	159.96	3.199	30.88	1 - (40.0)	STRENGTH-II Concrete Flexure

*David M. Meier*

03/12/21

*Alivia Plankis*

03/12/2021

## Rating Results Summary Report

Name: Belford over Happy Canyon Creek  
Struct-Def: BT\_42Belford

Bridge ID: Belford over HCC  
Member: Member 2

NBI: Belford / HCC  
Member Alt: Wizard Alternative

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State
HL-93 (US)	Truck + Lane	LRFR	Inventory	79.48	2.208	77.21	2 - ( 0.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	Truck + Lane	LRFR	Operating	103.03	2.862	77.21	2 - ( 0.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	Tandem + Lane	LRFR	Inventory	93.45	2.596	77.21	2 - ( 0.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	Tandem + Lane	LRFR	Operating	121.14	3.365	77.21	2 - ( 0.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	90%(Truck Pair + Lane)	LRFR	Inventory	56.58	1.572	77.21	2 - ( 0.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	90%(Truck Pair + Lane)	LRFR	Operating	73.34	2.037	77.21	2 - ( 0.0)	STRENGTH-I Concrete Flexure
Colorado Legal Type 3	Axle Load	LRFR	Legal	128.11	4.745	30.88	1 - ( 40.0)	STRENGTH-I Concrete Flexure
Colorado Legal Type 3-2	Axle Load	LRFR	Legal	168.15	3.956	30.88	1 - ( 40.0)	STRENGTH-I Concrete Flexure
Colorado Legal Type 3S2	Axle Load	LRFR	Legal	173.34	4.079	30.88	1 - ( 40.0)	STRENGTH-I Concrete Flexure
EV2	Axle Load	LRFR	Legal	131.69	4.580	30.88	1 - ( 40.0)	STRENGTH-I Concrete Flexure
EV3	Axle Load	LRFR	Legal	130.64	3.038	30.88	1 - ( 40.0)	STRENGTH-I Concrete Flexure
NRL	Axle Load	LRFR	Legal	136.01	3.400	30.88	1 - ( 40.0)	STRENGTH-I Concrete Flexure
SU4	Axle Load	LRFR	Legal	127.86	4.736	30.88	1 - ( 40.0)	STRENGTH-I Concrete Flexure
SU5	Axle Load	LRFR	Legal	132.29	4.267	30.88	1 - ( 40.0)	STRENGTH-I Concrete Flexure
SU6	Axle Load	LRFR	Legal	133.77	3.850	30.88	1 - ( 40.0)	STRENGTH-I Concrete Flexure
SU7	Axle Load	LRFR	Legal	137.58	3.550	30.88	1 - ( 40.0)	STRENGTH-I Concrete Flexure
Colorado Permit Vehicle	Axle Load	LRFR	Permit	207.61	2.163	77.21	2 - ( 0.0)	STRENGTH-II Concrete Flexure
Modified-Tandem	Axle Load	LRFR	Permit	177.43	3.549	30.88	1 - ( 40.0)	STRENGTH-II Concrete Flexure

*David M. Meier*  
03/12/21

*Alivia Plankis*  
03/12/2021

## Rating Results Summary Report

Name: Belford over Happy Canyon Creek  
Struct-Def: BT\_42Belford

Bridge ID: Belford over HCC  
Member: Member 6

NBI: Belford / HCC  
Member Alt: Wizard Alternative

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State
HL-93 (US)	Truck + Lane	LRFR	Inventory	79.18	2.199	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	Truck + Lane	LRFR	Operating	102.64	2.851	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	Tandem + Lane	LRFR	Inventory	93.10	2.586	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	Tandem + Lane	LRFR	Operating	120.69	3.352	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	90%(Truck Pair + Lane)	LRFR	Inventory	56.36	1.566	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	90%(Truck Pair + Lane)	LRFR	Operating	73.06	2.030	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
Colorado Legal Type 3	Axle Load	LRFR	Legal	127.52	4.723	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
Colorado Legal Type 3-2	Axle Load	LRFR	Legal	167.38	3.938	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
Colorado Legal Type 3S2	Axle Load	LRFR	Legal	172.54	4.060	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
EV2	Axle Load	LRFR	Legal	131.09	4.560	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
EV3	Axle Load	LRFR	Legal	130.04	3.024	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
NRL	Axle Load	LRFR	Legal	135.39	3.385	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
SU4	Axle Load	LRFR	Legal	127.28	4.714	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
SU5	Axle Load	LRFR	Legal	131.69	4.248	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
SU6	Axle Load	LRFR	Legal	133.16	3.832	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
SU7	Axle Load	LRFR	Legal	136.95	3.534	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
Colorado Permit Vehicle	Axle Load	LRFR	Permit	206.83	2.154	77.21	1 - (100.0)	STRENGTH-II Concrete Flexure
Modified-Tandem	Axle Load	LRFR	Permit	176.62	3.532	30.88	1 - (40.0)	STRENGTH-II Concrete Flexure

*David M. Meier*

03/12/21

*Alivia Plankis*  
03/12/2021

## Rating Results Summary Report

Name: Belford over Happy Canyon Creek  
Struct-Def: BT\_42Belford

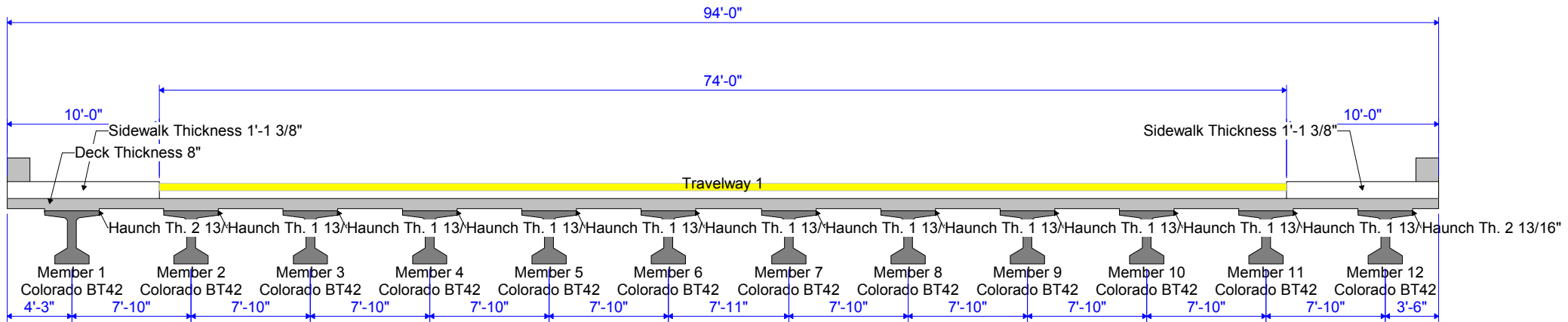
Bridge ID: Belford over HCC  
Member: Member 12

NBI: Belford / HCC  
Member Alt: Wizard Alternative

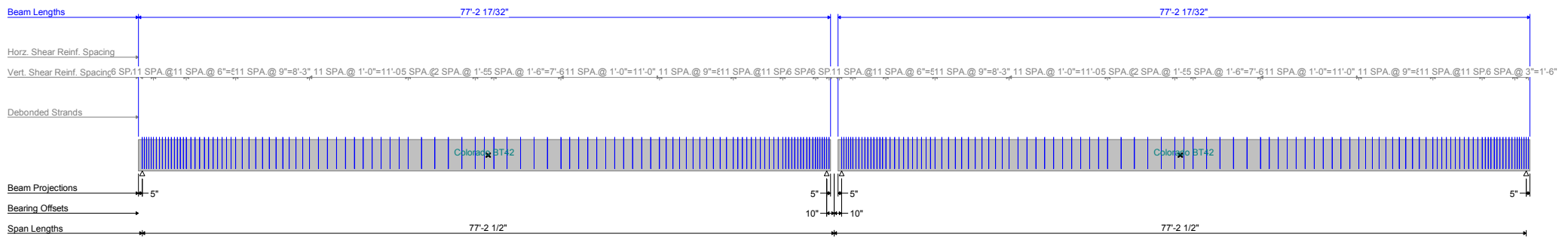
Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State
HL-93 (US)	Truck + Lane	LRFR	Inventory	71.41	1.984	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	Truck + Lane	LRFR	Operating	92.56	2.571	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	Tandem + Lane	LRFR	Inventory	83.96	2.332	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	Tandem + Lane	LRFR	Operating	108.84	3.023	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	90%(Truck Pair + Lane)	LRFR	Inventory	50.83	1.412	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
HL-93 (US)	90%(Truck Pair + Lane)	LRFR	Operating	65.89	1.830	77.21	1 - (100.0)	STRENGTH-I Concrete Flexure
Colorado Legal Type 3	Axle Load	LRFR	Legal	112.92	4.182	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
Colorado Legal Type 3-2	Axle Load	LRFR	Legal	148.22	3.487	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
Colorado Legal Type 3S2	Axle Load	LRFR	Legal	152.79	3.595	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
EV2	Axle Load	LRFR	Legal	116.08	4.037	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
EV3	Axle Load	LRFR	Legal	115.15	2.678	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
NRL	Axle Load	LRFR	Legal	119.89	2.997	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
SU4	Axle Load	LRFR	Legal	112.70	4.174	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
SU5	Axle Load	LRFR	Legal	116.61	3.762	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
SU6	Axle Load	LRFR	Legal	117.91	3.393	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
SU7	Axle Load	LRFR	Legal	121.27	3.129	30.88	1 - (40.0)	STRENGTH-I Concrete Flexure
Colorado Permit Vehicle	Axle Load	LRFR	Permit	209.91	2.187	77.21	1 - (100.0)	STRENGTH-II Concrete Flexure
Modified-Tandem	Axle Load	LRFR	Permit	176.01	3.520	30.88	1 - (40.0)	STRENGTH-II Concrete Flexure

*David M. Meier*  
03/12/21

*Alivia Plankis*  
03/12/2021







Notes:  
 \* All beam length dimensions are horiz.  
 \* X denotes diaphragm locations.

**Properties**

(LRFD 4.6.2.6)

$$\text{Girder Spacings } S_{g1\_6\_S1} := \left(7 + \frac{10}{12}\right) \cdot \text{ft} = 7.833 \text{ ft} \qquad S_{g1\_6\_S2} := \left(7 + \frac{10}{12}\right) \text{ ft} = 7.833 \text{ ft}$$

$$S_{g6\_7} := \frac{8.7434 \text{ ft} + 7.0535 \cdot \text{ft} + 8.4967 \cdot \text{ft} + 7.2956 \cdot \text{ft}}{4} = 7.897 \text{ ft}$$

Conservatively rounding the spacing of G6-G7 up:  $S_{g6\_7} := \left(7 + \frac{11}{12}\right) \text{ ft} = 7.917 \text{ ft}$

$$S_{g7\_12S1} := \left(7 + \frac{10}{12}\right) \cdot \text{ft} = 7.833 \text{ ft} \qquad S_{g7\_12S2} := \left(7 + \frac{10}{12}\right) \text{ ft} = 7.833 \text{ ft}$$

**Average Overhang**

$$b_{ohG1} := 4.25 \text{ ft}$$

$$b_{ohG12} := 3.5 \text{ ft}$$

**DW Utility Load**

$$a_{ut} := 5 \text{ psf}$$

**Area Load**
**SPAN 1 - Line Load per Girders (DW load)**
**SPAN 2 - Line Load per Girders (DW load)**

$$w_{uG1S1} := a_{ut} \cdot (0.5 S_{g1\_6\_S1} + b_{ohG1}) = 0.041 \text{ klf}$$

$$w_{uG1S2} := a_{ut} \cdot (0.5 S_{g1\_6\_S2} + b_{ohG1}) = 0.041 \text{ klf}$$

$$w_{uG2\_SS1} := a_{ut} \cdot (S_{g1\_6\_S1}) = 0.039 \text{ klf}$$

$$w_{uG2\_SS2} := a_{ut} \cdot (S_{g1\_6\_S2}) = 0.039 \text{ klf}$$

$$w_{uG6S1} := a_{ut} \cdot \left(\frac{S_{g1\_6\_S1} + S_{g6\_7}}{2}\right) = 0.039 \text{ klf}$$

$$w_{uG6S2} := a_{ut} \cdot \left(\frac{S_{g1\_6\_S2} + S_{g6\_7}}{2}\right) = 0.039 \text{ klf}$$

$$w_{uG7S1} := a_{ut} \cdot \left(\frac{S_{g6\_7} + S_{g7\_12S1}}{2}\right) = 0.039 \text{ klf}$$

$$w_{uG7S2} := a_{ut} \cdot \left(\frac{S_{g6\_7} + S_{g7\_12S2}}{2}\right) = 0.039 \text{ klf}$$

$$w_{uG8\_11S1} := a_{ut} \cdot (S_{g7\_12S1}) = 0.039 \text{ klf}$$

$$w_{uG8\_6S2} := a_{ut} \cdot (S_{g7\_12S2}) = 0.039 \text{ klf}$$

$$w_{uG12S1} := a_{ut} \cdot (0.5 S_{g7\_12S1} + b_{ohG12}) = 0.037 \text{ klf}$$

$$w_{uG12S2} := a_{ut} \cdot (0.5 S_{g7\_12S2} + b_{ohG12}) = 0.037 \text{ klf}$$

Girder Width	$b_g := 43 \text{ in}$	
Web Width	$t_w := 7 \text{ in}$	
Barrier Width	$b_{bar} := 1 \text{ ft} + 6 \text{ in}$	
Length of Each Span (2x spans)	$L_s := 77 \text{ ft} + 2.5 \text{ in}$	
Minimum Deck Depth	$t_d := 8 \text{ in}$	
Haunch		
Haunch at Bearing	$h_{end.sl} := (1 \cdot 12 + 1.75) \text{ in} - t_d = 5.75 \text{ in}$	
Haunch at Midspan	$h_{mid.sl} := 1 \text{ in}$	
Average Haunch Depth	$h_{avg} := \frac{2 \cdot h_{end.sl} + 10 \cdot h_{mid.sl}}{12} = 1.792 \text{ in}$	(CDOT BDM Eq 5.1)

**Line Load of Pedestrian Barrier (input in separate window)**

\* The light poles are centered for the loads to transfer all weight directly into the abutments / piers and are not considered below.

\* From Bridge Rail Details:

$$\begin{aligned}
 (32/12) \text{ ft} \times 1.5 \text{ ft} \times 0.150 \text{ kcf} &= 0.600 \text{ klf (concrete)} \\
 (+) & 0.050 \text{ klf (steel \& veneer weight)} \\
 \hline
 & 0.650 \text{ klf}
 \end{aligned}$$

**Diaphragm (input in separate window):**

$$7.83 - \frac{7}{12} \text{ ft} \times 26 \text{ lb/ft} = 0.188 \text{ kip per diaphragm}$$

**Lump Sum Losses**

Ultimate Tensile Strength	$F_y := 270 \text{ ksi}$
Jacking Stress Ratio	$r_j := 0.75$
Jacking Force, estimated:	$F_j := 1230 \text{ kip}$
Jacking Force, final	
Final Force, estimated:	$F_f := 985 \text{ kip}$
Final Force	
Area of Prestressing, estimated:	$A_s := \frac{F_j}{r_j \cdot F_y} = 6.074 \text{ in}^2$
Losses	$f_{LS} := \left( \frac{F_j - F_f}{A_s} \right) = 40.335 \text{ ksi}$

**GENERAL NOTES**

ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE COLORADO DEPARTMENT OF TRANSPORTATION (CDOT) STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 2019 EDITION, APPLICABLE TO THE PROJECT.

EXCEPT AS SHOWN IN THE PLANS, STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH M-206-2.

EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M-213.

STRUCTURAL CONCRETE EXPOSED TO SOIL SHALL CONFORM TO CEMENTITIOUS MATERIALS REQUIREMENTS CLASS 0, CORRESPONDING TO SULFATE EXPOSURE CLASS 0.

ALL ELECTRICAL CONDUIT IN BRIDGE CONCRETE LESS THAN 2" IN DIAMETER SHALL BE SEMIRIGID PLASTIC ELECTRICAL CONDUIT, SCHEDULE 80. CONDUIT THAT RUNS IN BRIDGE RAIL SHALL INCLUDE A PULL WIRE FOR WIRING INSTALLATION. PULL WIRE SHALL BE INCIDENTAL TO COST OF CONDUIT.

COMPRESSED JOINT MATERIAL SHALL BE PRE-COMPRESSED, CHEMICALLY RESISTANT, OPEN CELL POLYURETHANE FOAM SEALANT, IMPREGNATED WITH A WATER-REPELLENT MATERIAL, WITH ADHESIVE BACKING ON BOTH SIDES. THE JOINT MATERIAL SHALL BE EPOXIED IN PLACE, AND ALL SPLICES SEALED, AS RECOMMENDED BY THE SUPPLIER OF THE JOINT MATERIAL. THE COST SHALL BE INCLUDED IN THE COST OF ITEM 601, CLASS D CONCRETE.

ACCEPTABLE COMPRESSED JOINT MATERIAL ALTERNATIVES:

- WILL-SEAL
- SEAL-MATE #517
- POLY-TITE "N"

A COLORED STRUCTURAL CONCRETE COATING WILL BE REQUIRED ON EXPOSED CONCRETE SURFACES TO 1'-0" BELOW FINISHED GRADE, AS SHOWN ON THE PLANS. THE COLOR SHALL BE DAVIS COLOR "SEQUOIA SAND" (NO. 641)

THE FINAL FINISH FOR ALL EXPOSED CONCRETE SURFACES SHALL BE CLASS 2 TO 1'-0" BELOW FINISHED GRADE.

ALL EXTERIOR CONCRETE CORNERS SHALL BE CONSTRUCTED WITH 3/4" CHAMFERS, UNLESS OTHERWISE NOTED

ALL STRUCTURAL STEEL, UNLESS NOTED OTHERWISE, SHALL BE AASHTO M270 GRADE 36 (ASTM A-36).

LEVELING PADS ARE UNLAMINATED BEARINGS. THEY SHALL BE CUT OR MOLDED FROM AASHTO ELASTOMER GRADE 3, 4, OR 5 AS DESCRIBED IN TABLES 705-1 AND 705-2 WITH A DUROMETER (SHORE "A") HARDNESS OF 60.

GRADE 60 REINFORCING STEEL IS REQUIRED.

ALL REINFORCING STEEL SHALL HAVE 2" CONCRETE COVER UNLESS NOTED OTHERWISE.

ALL REINFORCING STEEL SHALL BE EPOXY COATED UNLESS OTHERWISE NOTED.

(N) DENOTES NON-COATED REINFORCING STEEL.

ALL THE PROVISIONS FOR BRIDGE DECK CONCRETE SHALL ALSO APPLY TO APPROACH SLAB CONCRETE.

AN EMERGENCY DECK CONSTRUCTION JOINT MAY BE LOCATED AT THE ONE QUARTER SPAN POINT BACK FROM A PIER OR ABUTMENT WITH RESPECT TO THE DIRECTION OF THE DECK PLACEMENT.

PERMANENT DECK FORMS ARE ALLOWED AND SHALL BE EITHER PRECAST CONCRETE DECK FORMS OR STEEL DECK FORMS.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.

- B.F. = BACK FACE
- E.F. = EACH FACE
- HCL = HORIZONTAL CONTROL LINE
- HMA = HOT MIX ASPHALT
- I.D. = INSIDE DIAMETER
- I.F. = INSIDE FACE
- O.F. = OUTSIDE FACE
- PGL = PROFILE GRADE LINE

FOR BURIED UTILITY INFORMATION  
**THREE (3) BUSINESS DAYS**  
**BEFORE YOU DIG**  
 CALL 811  
 (or 1-800-922-1987)  
 UTILITY NOTIFICATION  
 CENTER OF COLORADO (UNCC)  
[www.uncc.org](http://www.uncc.org)

NO EXISTING UTILITIES ARE KNOWN TO BE LOCATED IN THE LIMITS OF THE BRIDGE WORK. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATION AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES WHICH ARE LOCATED OUTSIDE THE BRIDGE LIMITS, AS MAY BE NECESSARY TO AVOID DAMAGE THERETO. THE CONTRACTOR SHALL CONTACT THE UTILITY NOTIFICATION CENTER OF COLORADO AT 811 OR 1-800-922-1987 AT LEAST 3 DAYS (2 DAYS NOT INCLUDING THE DAY OF NOTIFICATION) PRIOR TO ANY EXCAVATION OR OTHER EARTHWORK.

STATIONS, ELEVATIONS, AND DIMENSIONS CONTAINED IN THESE PLANS ARE BASED UPON A RECENT FIELD SURVEY. THE CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL. IF THERE IS A DISCREPANCY, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN WRITING WITHIN 48 HOURS.

**DESIGN DATA**

AASHTO, NINTH EDITION LRFD

DESIGN METHOD: LOAD AND RESISTANCE FACTOR DESIGN (LRFD)

SEISMIC PERFORMANCE ZONE 1

LIVE LOAD: HL-93 (DESIGN TRUCK OR TANDEM, AND DESIGN LANE LOAD)  
 DEAD LOAD: ASSUMES 36 LBS. PER SQ. FT. FOR 3" HMA BRIDGE DECK OVERLAY  
 ASSUMES 5 LBS. PER SQ. FT. FOR FUTURE UTILITIES  
 ASSUMES 5 LBS. PER SQ. FT. FOR PERMANENT STEEL DECK FORMS  
 ASSUMES 500 LBS FOR EACH LUMINAIRE

REINFORCED CONCRETE:

CDOT CLASS D CONCRETE:  $f'_c = 4,500$  psi  
 REINFORCING STEEL:  $f_y = 60,000$  psi

CAISSON CONCRETE:

CLASS BZ CONCRETE:  $f'_c = 4,000$  psi  
 REINFORCING STEEL:  $f_y = 60,000$  psi

DIAPHRAGM STEEL: AASHTO M270 (ASTM A709) GRADE 36  $F_y = 36,000$  psi

PRESTRESSED CONCRETE: CLASS PS CONCRETE  $f'_c =$  (SEE DETAILS)  
 $f'_s = 270,000$  psi

**SEISMIC DESIGN DATA**

EARTHQUAKE DESIGN METHOD: FORCE BASED (GENERAL PROCEDURE PER LRFD 3.10.2.1)

LATITUDE N 39° 33' 12"  
 LONGITUDE W 104° 48' 49"

AASHTO SPECTRUM FOR 7% FOR PE IN 75 YEARS (1000 YEAR RETURN PERIOD)

PERIOD (sec)	SA (g)	
0	0.056	PGA - SITE CLASS E
0.2	0.120	S <sub>s</sub> - SITE CLASS E
1.0	0.033	S <sub>1</sub> - SITE CLASS E

SPECTRAL RESPONSE ACCELERATIONS:

$A_s = F_{PGA} \times PGA$ ,  $S_{DS} = F_A S_s$  AND  $S_{D1} = F_v S_1$   
 $F_{PGA} = 2.5$ ,  $F_A = 2.5$ ,  $F_v = 3.5$

PERIOD (sec)	SA (g)	
0	0.140	A <sub>s</sub> - SITE CLASS E
0.2	0.300	S <sub>DS</sub> - SITE CLASS E
1.0	0.116	S <sub>D1</sub> - SITE CLASS E

OPERATIONAL CLASS:

SEISMIC ZONE: ZONE 1

RESPONSE MODIFICATION FACTORS:

- R-FACTOR: 1.5 (RC PILE BENTS)
- R-FACTOR: 1.0 (PILE BENTS TO CAP BEAM, COLUMNS TO CAP BEAM & FOUNDATION)
- R-FACTOR: 0.8 (SUPERSTRUCTURE TO FOUNDATION)

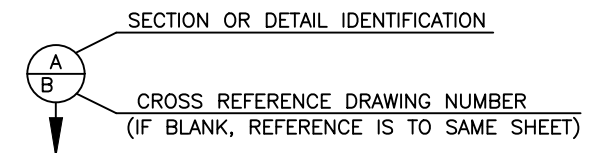
**INDEX OF DRAWINGS**

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- B2 SUMMARY OF QUANTITIES
- B3 GENERAL LAYOUT
- B4 TYPICAL SECTION
- B5 ENGINEERING GEOLOGY
- B6 BRIDGE HYDRAULIC INFORMATION (1 OF 2)
- B7 BRIDGE HYDRAULIC INFORMATION (2 OF 2)
- B8 CONSTRUCTION LAYOUT (1 OF 2)
- B9 CONSTRUCTION LAYOUT (2 OF 2)
- B10 CAISSON LAYOUT
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- B28 APPROACH SLAB DETAILS
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- B31 DECK GEOMETRY (1 OF 3)
- B32 DECK GEOMETRY (2 OF 3)
- B33 DECK GEOMETRY (3 OF 3)

**BRIDGE DESCRIPTION**

TWO SPAN (77'-2 1/2" / 77'-2 1/2") BRIDGE COMPOSITE CONCRETE SLAB AND PRECAST/PRESTRESSED CONCRETE I GIRDERS (BT42)

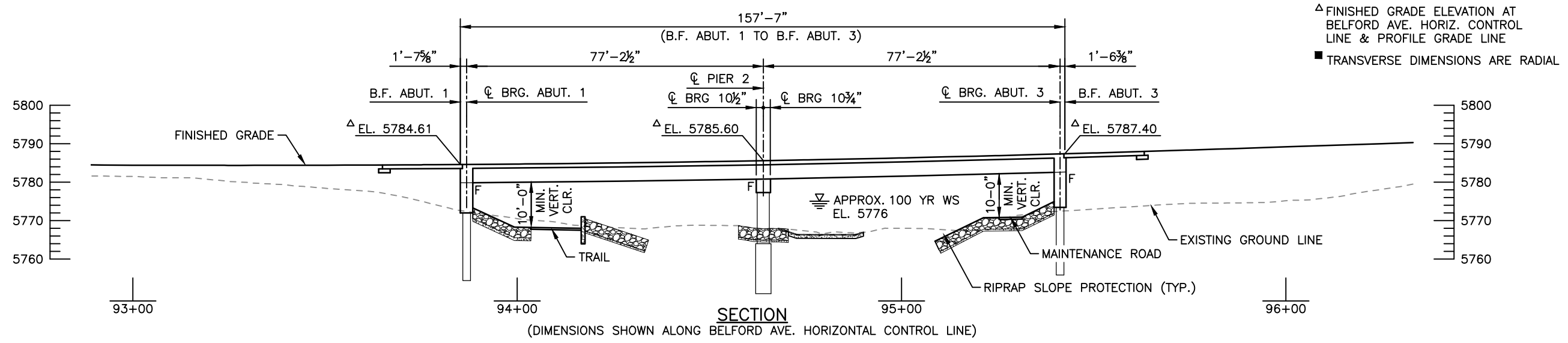
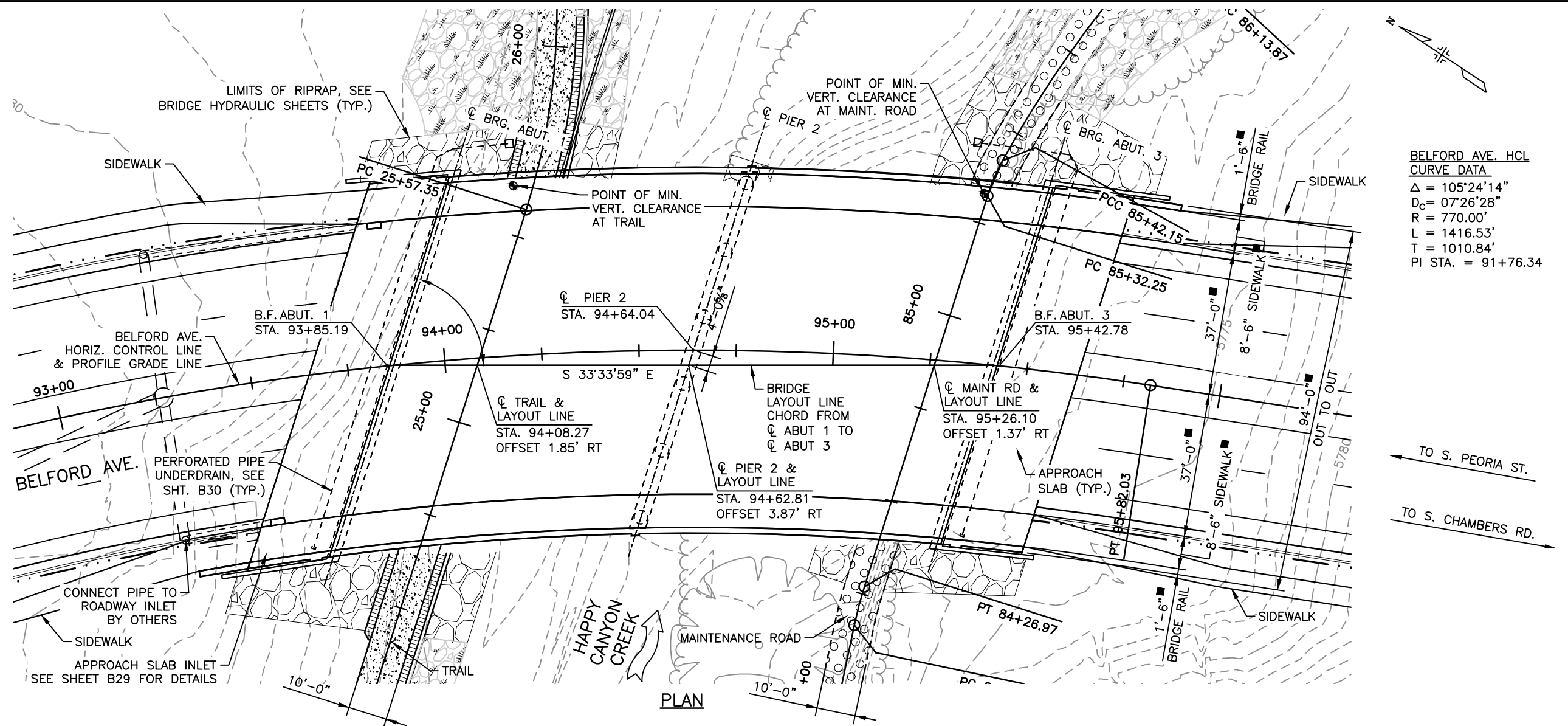
BELFORD AVENUE OVER HAPPY CANYON CREEK  
 72'30"00" SKEW (TO LAYOUT LINE)  
 74'-0" ROADWAY WIDTH, CURB TO CURB  
 8'-6" SIDEWALKS, 1'-6" BRIDGE RAILS



		Shear LLLDF		Positive Moment LLLDF		Negative Moment LLLDF	
		1 Lane	2+ Lanes	1 Lane	2+ Lanes	1 Lane	2+ Lanes
Span 1	G1	0.912	0.749	0.856	0.711	0.856	0.711
	G2-G3; G10-G11	0.718	0.855	0.476	0.663	0.476	0.663
	G4-G5; G8-G9	0.673	0.803	0.476	0.663	0.476	0.663
	G6-G7	0.675	0.806	0.477	0.664	0.477	0.664
	G12	0.791	0.685	0.742	0.656	0.742	0.656
Span 2	G1	0.871	0.723	0.832	0.701	0.832	0.701
	G2-G3; G10-G11	0.842	0.706	0.477	0.665	0.477	0.665
	G4-G5; G8-G9	0.675	0.805	0.477	0.665	0.477	0.665
	G6-G7	0.675	0.806	0.478	0.665	0.478	0.665
	G12	0.802	0.685	0.767	0.666	0.767	0.666

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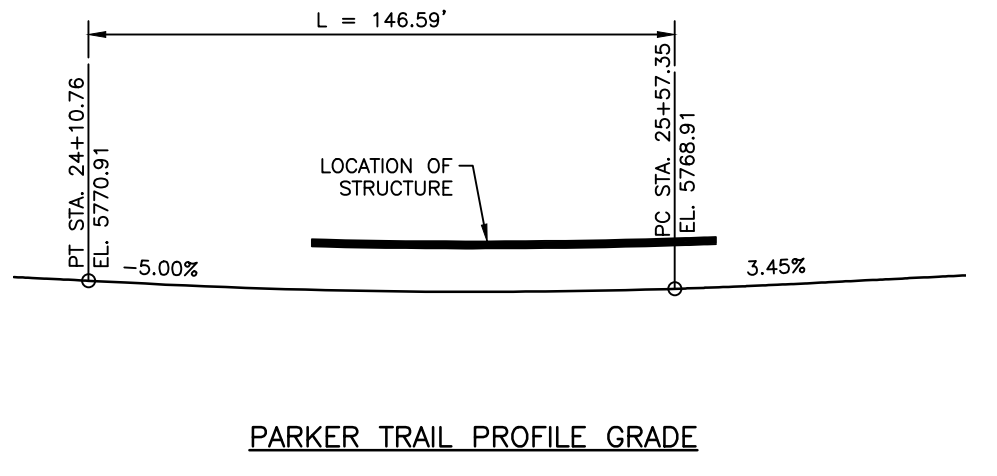
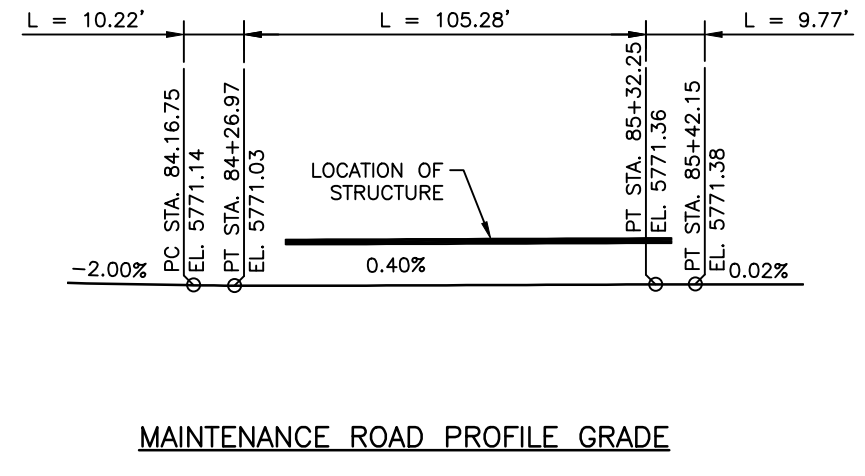
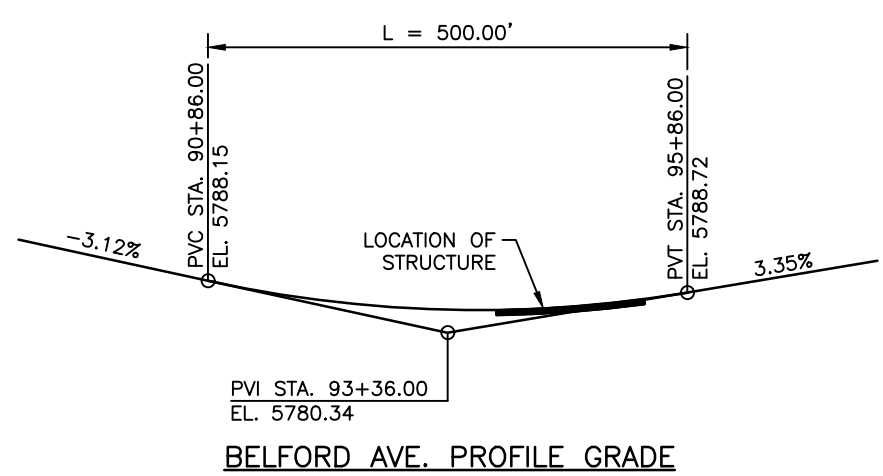
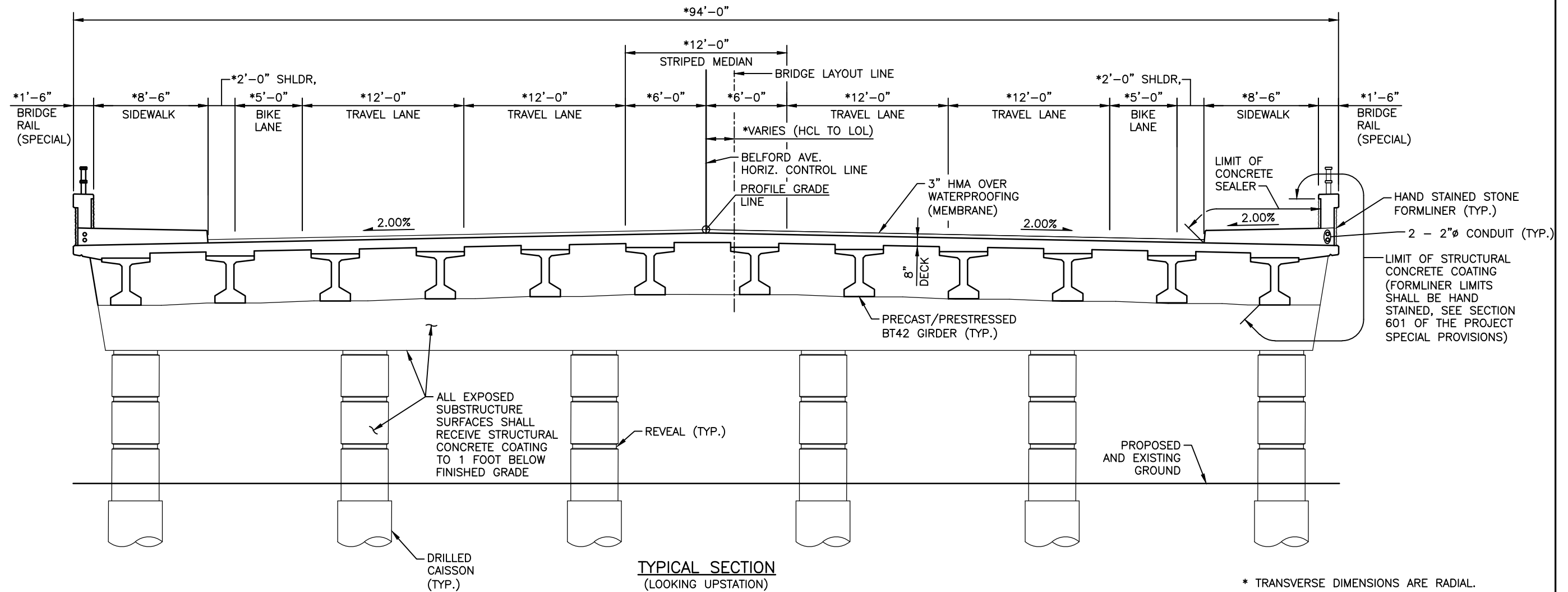
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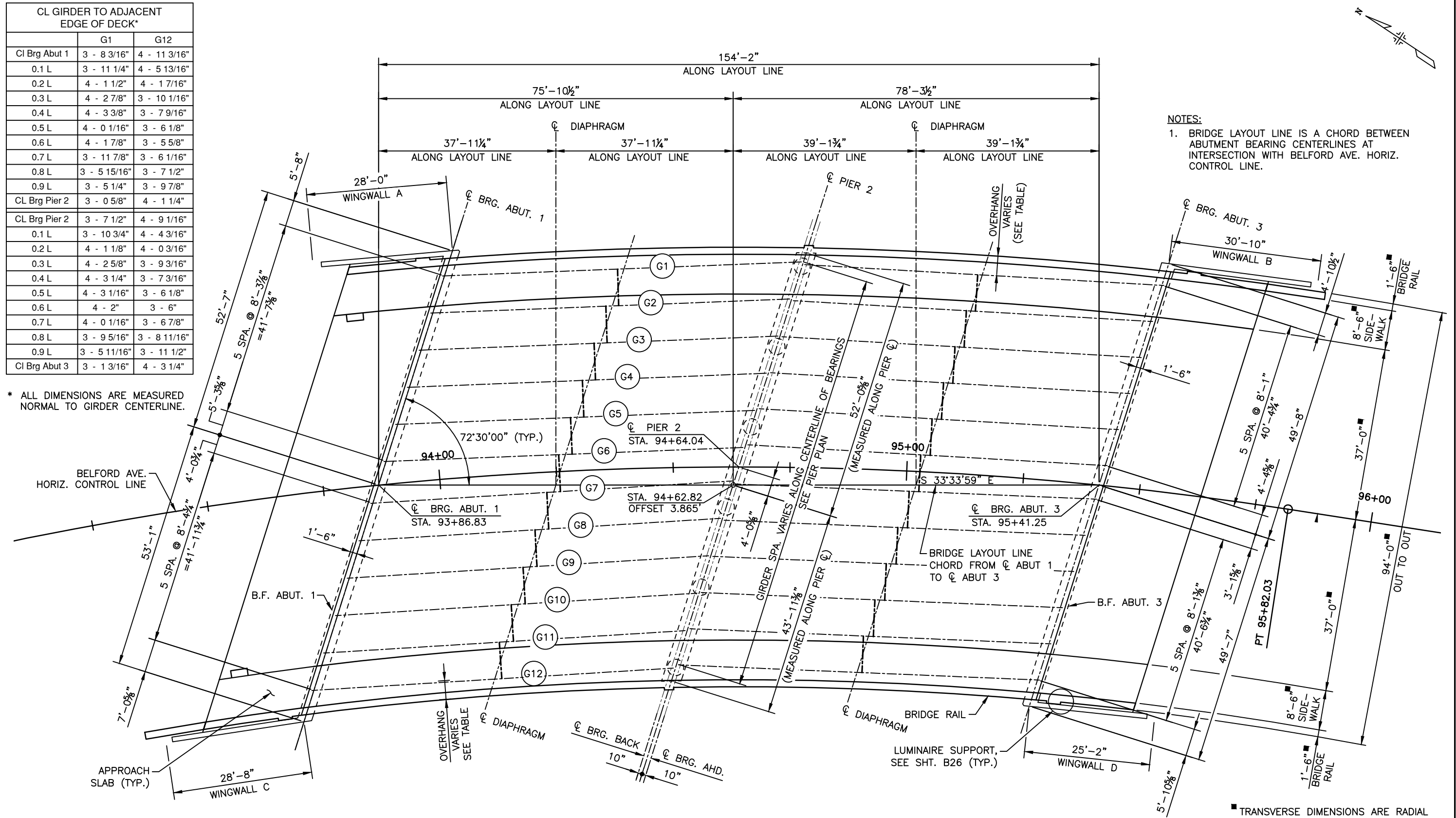
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CL GIRDER TO ADJACENT EDGE OF DECK*		
	G1	G12
Cl Brg Abut 1	3 - 8 3/16"	4 - 11 3/16"
0.1 L	3 - 11 1/4"	4 - 5 13/16"
0.2 L	4 - 1 1/2"	4 - 1 7/16"
0.3 L	4 - 2 7/8"	3 - 10 1/16"
0.4 L	4 - 3 3/8"	3 - 7 9/16"
0.5 L	4 - 0 1/16"	3 - 6 1/8"
0.6 L	4 - 1 7/8"	3 - 5 5/8"
0.7 L	3 - 11 7/8"	3 - 6 1/16"
0.8 L	3 - 5 15/16"	3 - 7 1/2"
0.9 L	3 - 5 1/4"	3 - 9 7/8"
CL Brg Pier 2	3 - 0 5/8"	4 - 1 1/4"
CL Brg Pier 2	3 - 7 1/2"	4 - 9 1/16"
0.1 L	3 - 10 3/4"	4 - 4 3/16"
0.2 L	4 - 1 1/8"	4 - 0 3/16"
0.3 L	4 - 2 5/8"	3 - 9 3/16"
0.4 L	4 - 3 1/4"	3 - 7 3/16"
0.5 L	4 - 3 1/16"	3 - 6 1/8"
0.6 L	4 - 2"	3 - 6"
0.7 L	4 - 0 1/16"	3 - 6 7/8"
0.8 L	3 - 9 5/16"	3 - 8 11/16"
0.9 L	3 - 5 11/16"	3 - 11 1/2"
Cl Brg Abut 3	3 - 1 3/16"	4 - 3 1/4"

\* ALL DIMENSIONS ARE MEASURED NORMAL TO GIRDER CENTERLINE.



NOTES:  
1. BRIDGE LAYOUT LINE IS A CHORD BETWEEN ABUTMENT BEARING CENTERLINES AT INTERSECTION WITH BELFORD AVE. HORIZ. CONTROL LINE.

CONSTRUCTION LAYOUT

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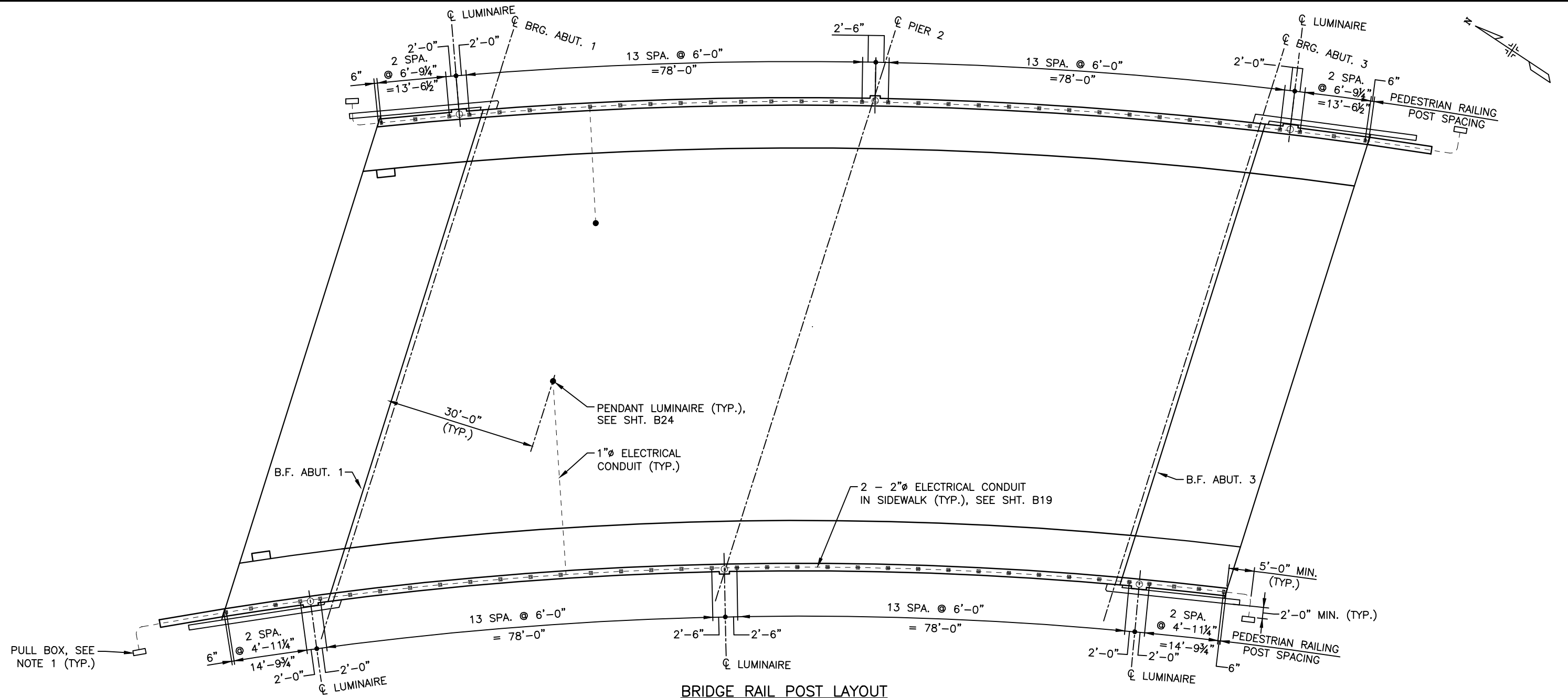
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BRIDGE RAIL POST LAYOUT

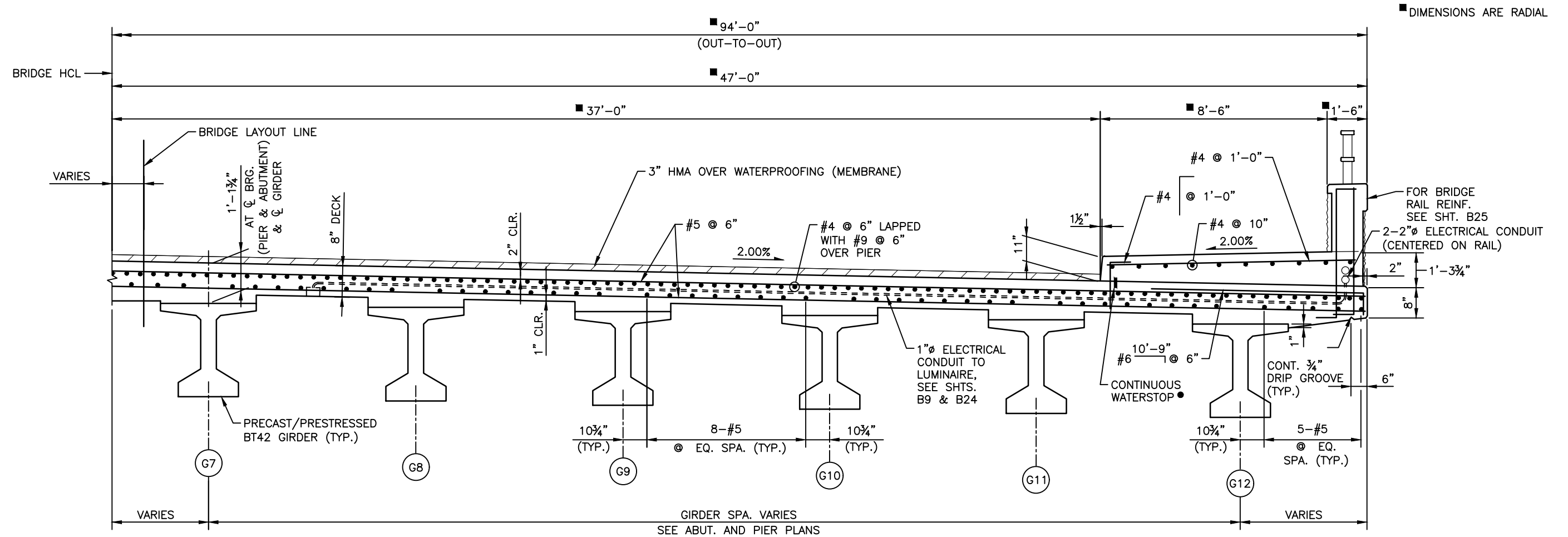
- NOTES:**
- PULL BOXES WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE COST OF ITEM 613 - 2 INCH ELECTRICAL CONDUIT. SEE CDOT S-613-1, SHT. NO. 4 OF 6 FOR TYPICAL DETAIL AND NOTES.

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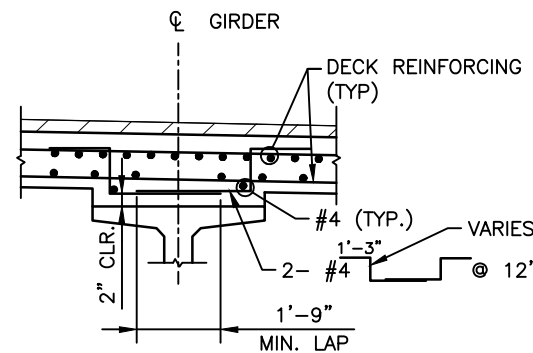
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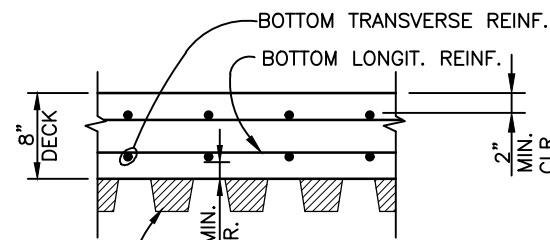
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Revised:	Detailer: C. MIYAMOTO		
Void:	Subset: BRIDGE	Sheets: B9 of 33	Sheet Number 38



**PARTIAL TYPICAL SECTION**  
(LOOKING SOUTH)  
(RIGHT SIDE SHOWN, LEFT SIMILAR)



**HAUNCH REINFORCEMENT DETAIL**  
(PROVIDE WHEN HAUNCH DEPTH EXCEEDS 4 INCHES AT  $\phi$  GIRDER)



**PERMANENT STEEL DECK FORM DETAIL**  
(DETAILS FOR CONCRETE DECK FORMS FOUND ON B22-B23)

**NOTES:**

- DECK & SIDEWALK CONCRETE SHALL BE CLASS D (BRIDGE).
- PROVIDE TRANSVERSE RAKE FINISH ( $\frac{1}{4}$ "  $\pm$  AMPLITUDE) ON THE BRIDGE DECK IN THE AREAS WHERE SIDEWALK IS TO BE PLACED, CLEAN PRIOR TO PLACING SIDEWALK CONCRETE.
- BAR MAY BE STABBED INTO WET CONCRETE WITH 6" MIN. EMBEDMENT, OR DRILLED & EPOXIED INTO DECK AFTER SLAB HAS CURED. USE HILTI HIT HY-150 EPOXY ADHESIVE, OR APPROVED EQUAL, 6" MIN. EMBEDMENT DEPTH. IF DRILL AND EPOXY OPTION IS USED, THE COST OF DRILLING & EPOXY WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN ITEM 601, CONCRETE CLASS D (BRIDGE).
- PROVIDE CONTINUOUS BENTONITE/BUTYL RUBBER BASED WATERSTOP (CARLISLE MIRASTOP OR APPROVED EQUAL). THE COST OF THE WATERSTOP WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN ITEM 601, CONCRETE CLASS D (BRIDGE).
- CONCRETE SEALER SHALL BE APPLIED TO CONCRETE SIDEWALK AND CURBS. SEALER SHALL AVOID AREAS REQUIRING STONE VENEER.
- STAGGER ALL LONGITUDINAL REINFORCING BAR SPLICES.

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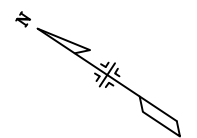
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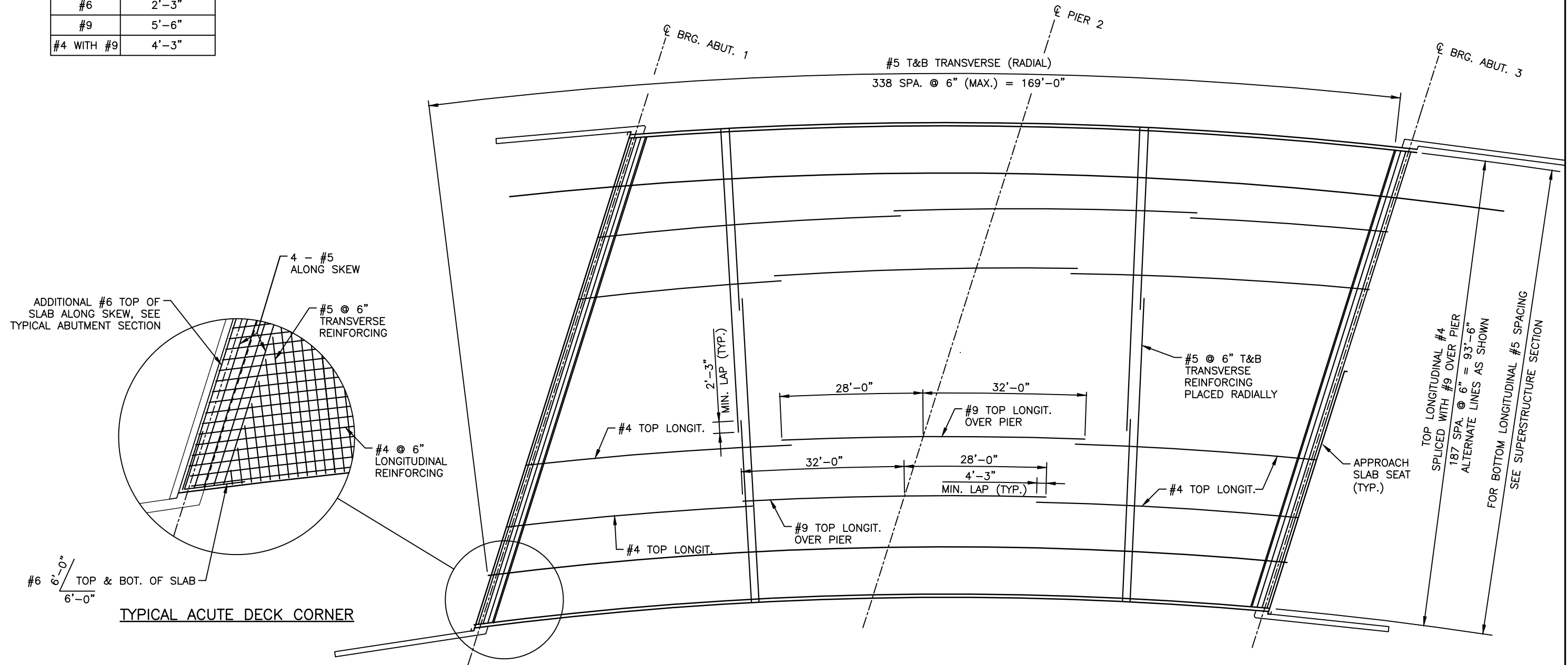
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LAP SPLICE TABLE	
BAR SIZE	SPLICE LENGTH
#5	1'-10"
#6	2'-3"
#9	5'-6"
#4 WITH #9	4'-3"



**REINFORCING PLAN**  
(SIDEWALK REINFORCING NOT SHOWN FOR CLARITY)

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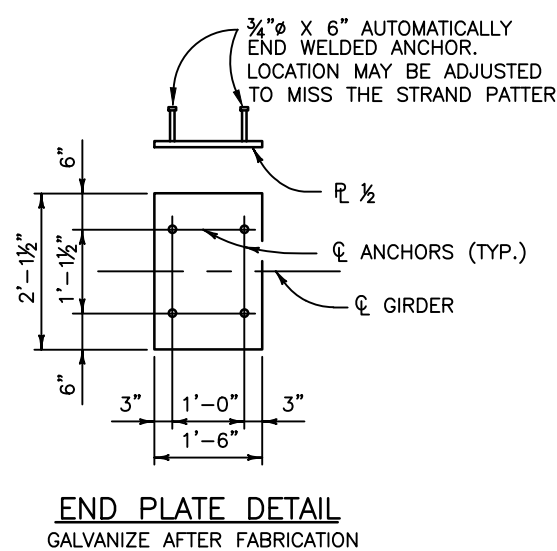
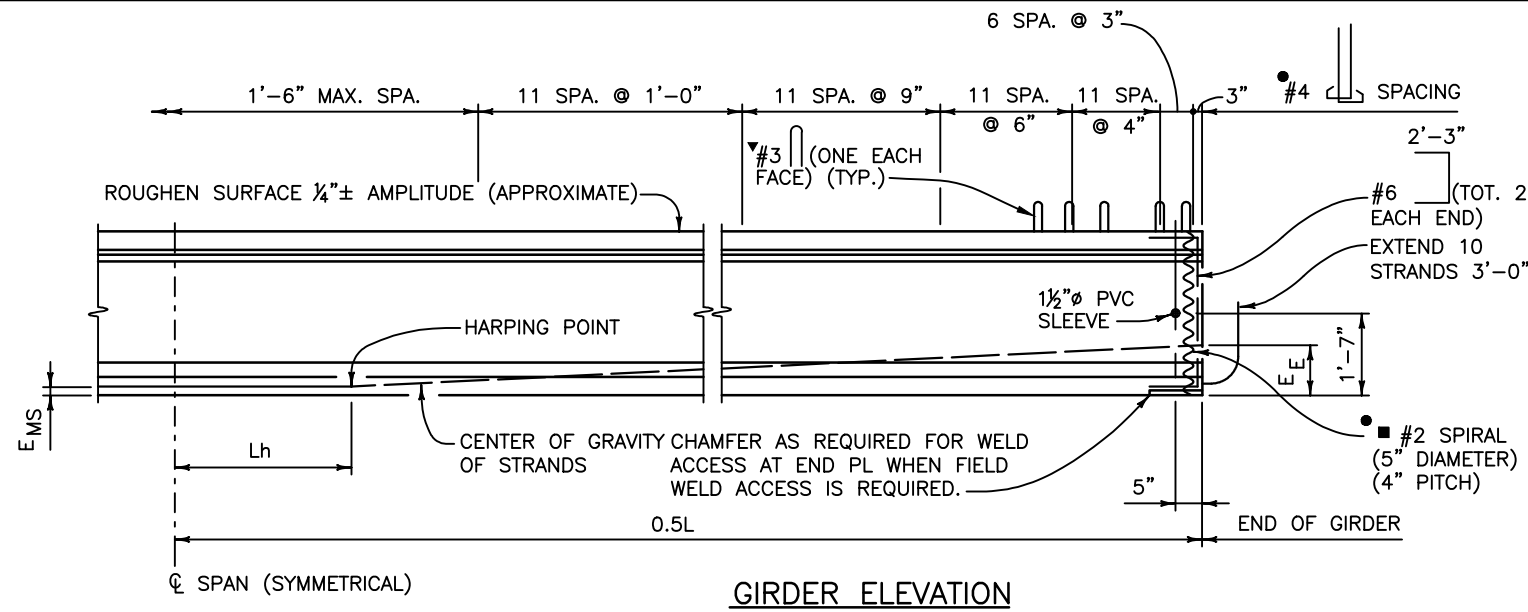
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	Subset: BRIDGE	Sheets: B19 of 33	Sheet Number 48



**NOTES:**  
 ALL WORK NECESSARY TO FABRICATE AND INSTALL THE INTEGRAL PARTS OF THE GIRDER (INCLUDING THE INTERMEDIATE DIAPHRAGMS, 7/8\"/>

WHEN APPROVED BY THE ENGINEER, A MINIMUM OF TACK WELDING WILL BE PERMITTED ON ASTM A706 UNCOATED REINFORCING STEEL.

REINFORCING PROJECTING FROM THE TOP OF THE GIRDER AND REINFORCING WITHIN EIGHT FEET OF AN EXPANSION DEVICE IN THE BRIDGE DECK SHALL BE EPOXY COATED. DAMAGED COATING ON GIRDER REINFORCING WITHIN THE GIRDER NEED NOT BE REPAIRED. THE MINIMUM COVER FOR REINFORCING STEEL IS 1\"/>

AT GIRDER ENDS NOT EMBEDDED IN CONCRETE DIAPHRAGMS, CUT STRANDS OFF 1\"/>

USE LOW RELAXATION STRANDS MEETING THE REQUIREMENTS OF ASTM A-416 GRADE 270. THE MINIMUM CLEAR DISTANCE BETWEEN GROUPS OR INDIVIDUAL STRANDS SHALL BE 2.3(D<sub>s</sub>) BUT NOT LESS THAN 1 1/4\"/>

A MINIMUM OF TWO HARPING POINTS SHALL BE USED PER GIRDER. HARPED STRANDS SHALL BE WELL DISTRIBUTED AT THE GIRDER ENDS, STARTING WITHIN 4\"/>

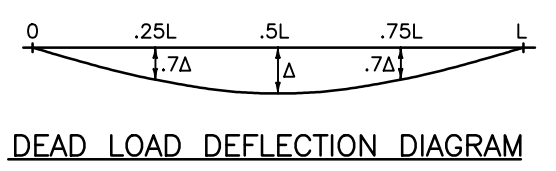
A<sub>s</sub>\* = MINIMUM AREA OF THE PRESTRESSING STEEL.  
 d<sub>s</sub> = NOMINAL STRAND DIAMETER.  
 f'<sub>s</sub> = ULTIMATE STRENGTH OF PRESTRESSING STEEL.  
 F<sub>j</sub> = JACKING FORCE PER GIRDER.  
 F<sub>f</sub> = FINAL FORCE PER GIRDER AFTER ALL LOSSES.  
 f'<sub>ci</sub> = REQUIRED CONCRETE STRENGTH AT RELEASE OF PRESTRESS FORCE.  
 f'<sub>c</sub> = REQUIRED CONCRETE STRENGTH AT 28 DAYS OF AGE.  
 L = LENGTH OF GIRDER ALONG THE GRADE OF THE GIRDER.  
 Δ = DEFLECTION AT CENTERLINE OF SPAN DUE TO CAST-IN-PLACE SLAB, DIAPHRAGMS, ASPHALT, CURBS, RAILS, AND WALKS.

CONCRETE SHALL BE CLASS PS.

ENTRAINED AIR IS NOT REQUIRED FOR GIRDER CONCRETE.

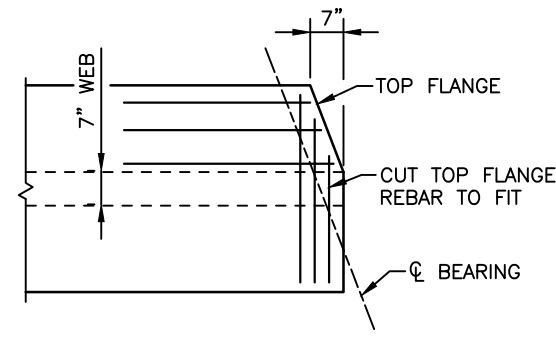
USE 1/2\"/>

PREDICTED CAMBER IS THE CAMBER FOR THE GIRDER ALONE AT 60 DAYS. ACCEPTABLE CAMBER VARIABILITY IS LIMITED TO 20% OVER THE PREDICTED CAMBER AND 50% UNDER THE PREDICTED CAMBER OR ± 1 INCH, WHICHEVER IS GREATER. THE CONTRACTOR SHALL REPORT TO THE ENGINEER VALUES OF CAMBER WHICH REQUIRE REMEDIAL MEASURES. THE REMEDIAL MEASURES SHALL BE REVIEWED AND APPROVED BY THE ENGINEER. THE COSTS ASSOCIATED WITH ALL REMEDIAL MEASURES SHALL BE BORNE BY THE CONTRACTOR.

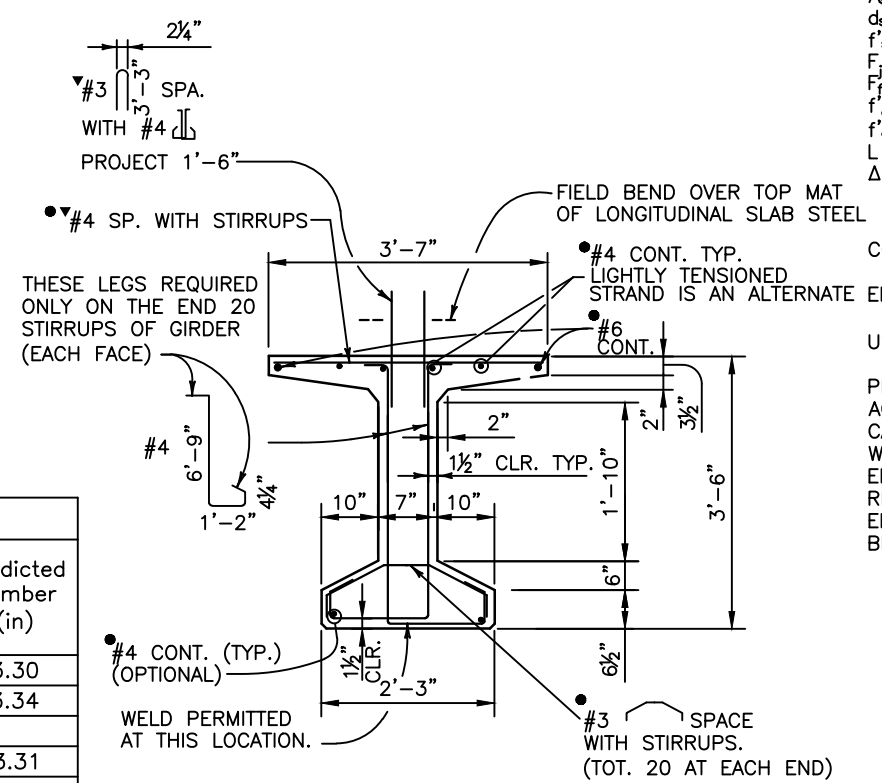


■ THE CONTRACTOR MAY SUBMIT AN ALTERNATE CROSS TIE ARRANGEMENT, AT THE END OF THE WEB, FOR APPROVAL BY THE ENGINEER.  
 ▼ SPACE WITH #4 FOR STIRRUP SPACINGS OF 9\"/>

● D20 WIRES MAY BE USED IN LIEU OF #4.  
 2 - D20 WIRES MAY BE USED IN LIEU OF #6.  
 D11 OR W10.9 WIRES MAY BE USED IN LIEU OF #3.  
 W5 WIRES MY BE USED IN LIEU OF #2.



**CLIPPED TOP FLANGE DETAIL**  
 (TYPICAL AT BOTH GIRDER ENDS)  
 (SEE CONSTRUCTION LAYOUT FOR ORIENTATION)



**TYPICAL GIRDER SECTION**

GIRDER SCHEDULE														
Girder Type	Span No.	Girder No.	L (ft)	Lh (ft)	A <sub>s</sub> (in <sup>2</sup> )	EMS (in)	EE (in)	F <sub>j</sub> (kips)	F <sub>f</sub> (kips)	f' <sub>ci</sub> (psi)	f' <sub>c</sub> (psi)	Δ (in)	Predicted Release Camber (in)	Predicted Camber (in)
BT42	1	G1-G6	76.82	7.68	6.08	4.14	14.14	1230	985	6000	8000	1.10	1.69	3.30
BT42	1	G7-G12	77.47	7.74	6.08	4.14	14.14	1230	985	6000	8000	1.10	1.70	3.34
BT42	2	G1-G6	77.00	7.70	6.08	4.14	14.14	1230	985	6000	8000	1.10	1.69	3.31
BT42	2	G7-G12	77.32	7.73	6.08	4.14	14.14	1230	985	6000	8000	1.10	1.70	3.33

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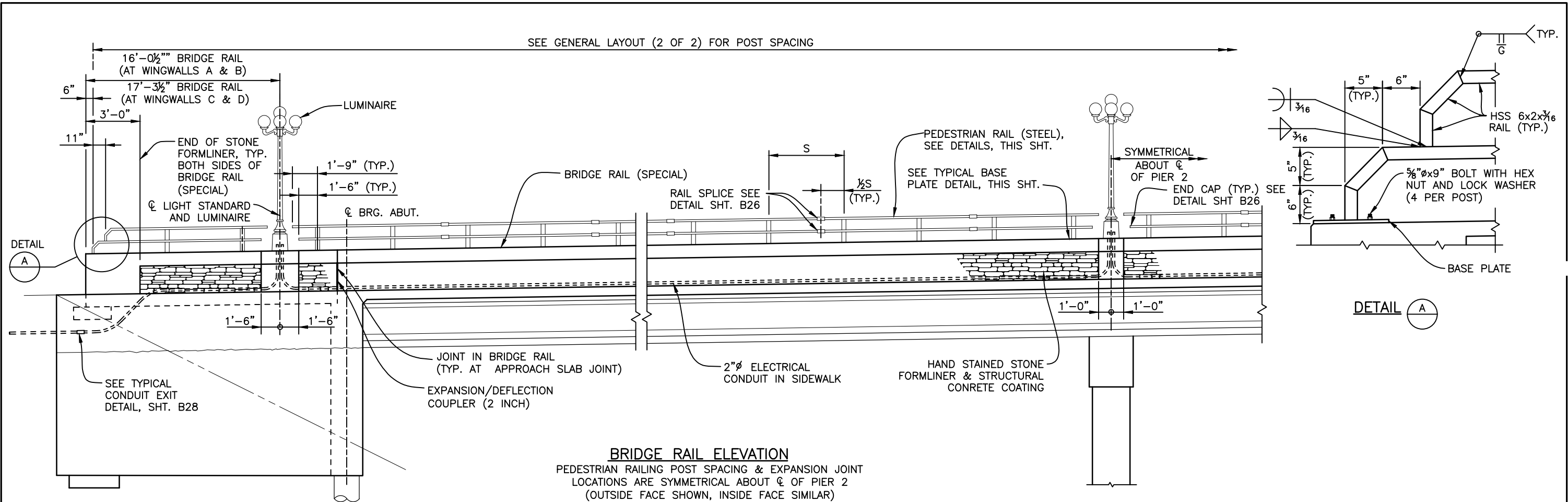
Sheet Revisions		
Date	Comments	Initials

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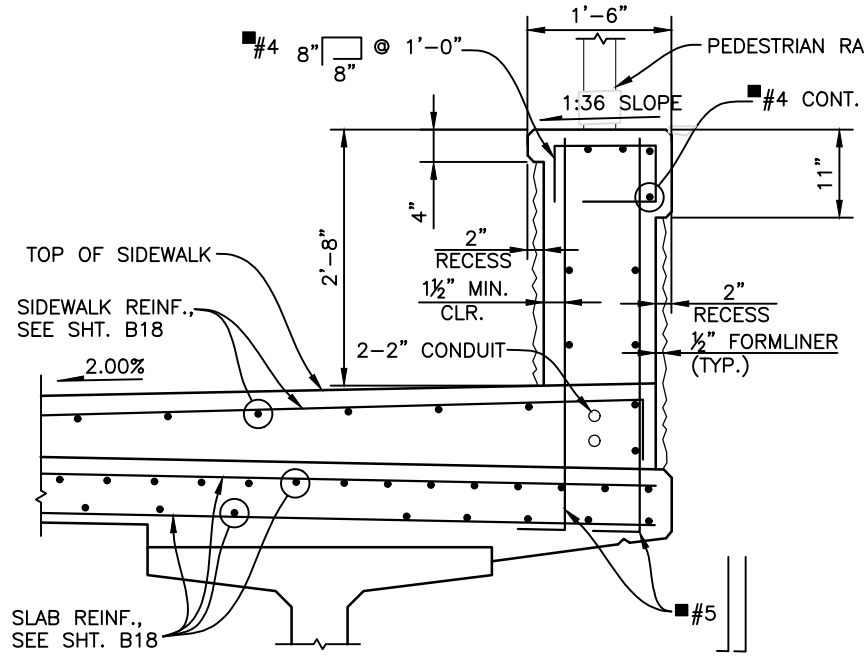
BELFORD-HAPPY CANYON CREEK BRIDGE PRECAST CONCRETE I GIRDER	
Designer:	J. LYNCH
Detailer:	C. MIYAMOTO
Subset:	BRIDGE

Project No./Code	
Structure Numbers	
Sheets:	B20 of 33
Sheet Number	49



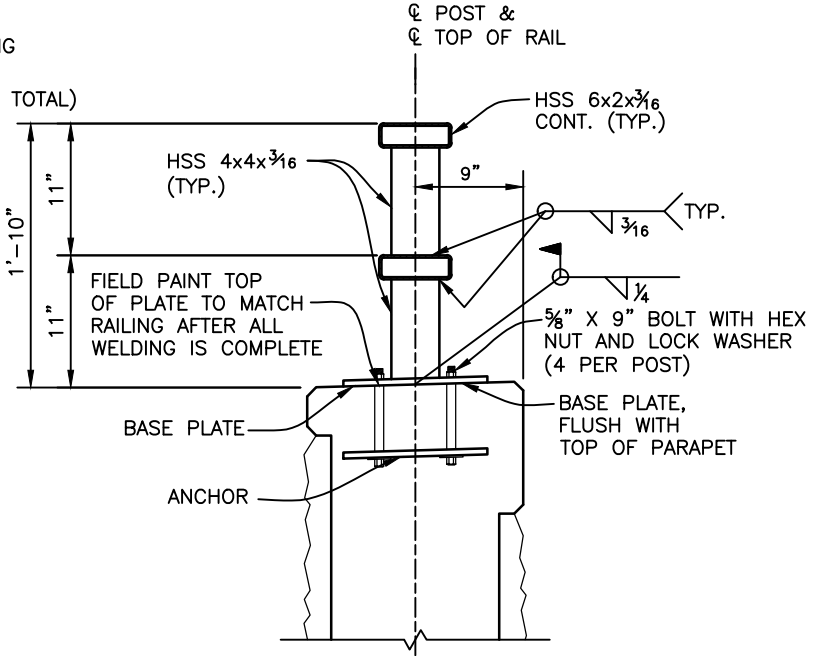
**BRIDGE RAIL ELEVATION**  
PEDESTRIAN RAILING POST SPACING & EXPANSION JOINT LOCATIONS ARE SYMMETRICAL ABOUT CL OF PIER 2 (OUTSIDE FACE SHOWN, INSIDE FACE SIMILAR)

**NOTE**  
SEE SHEET B26 AND B27 FOR ADDITIONAL NOTES

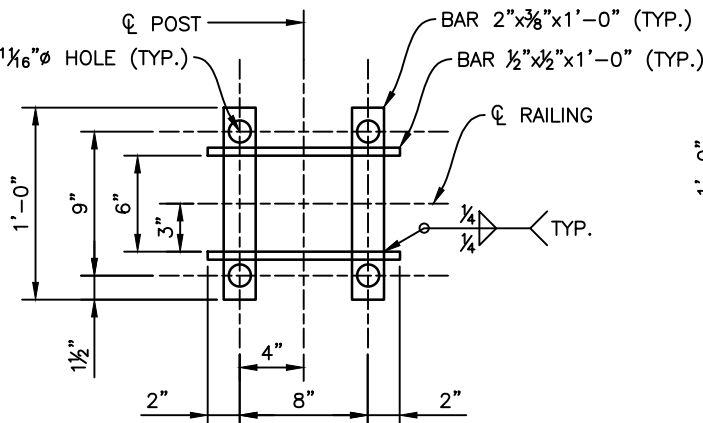


**TYPICAL SECTION**

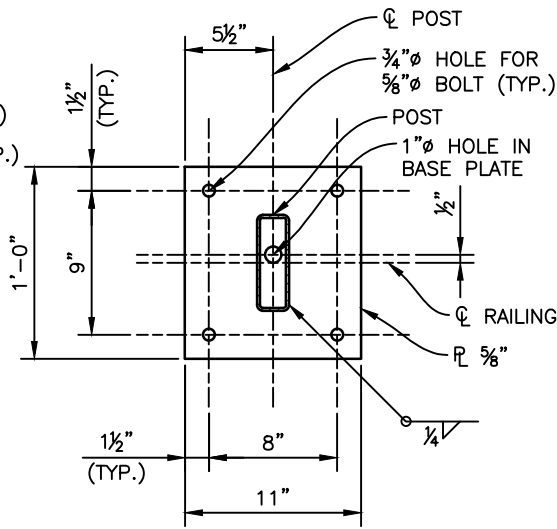
REINFORCEMENT SHALL BE INCLUDED IN ITEM 606, BRIDGE RAIL (SPECIAL)



**TYPICAL PEDESTRIAN RAILING SECTION**



**ANCHOR DETAIL**



**BASE PLATE DETAIL**

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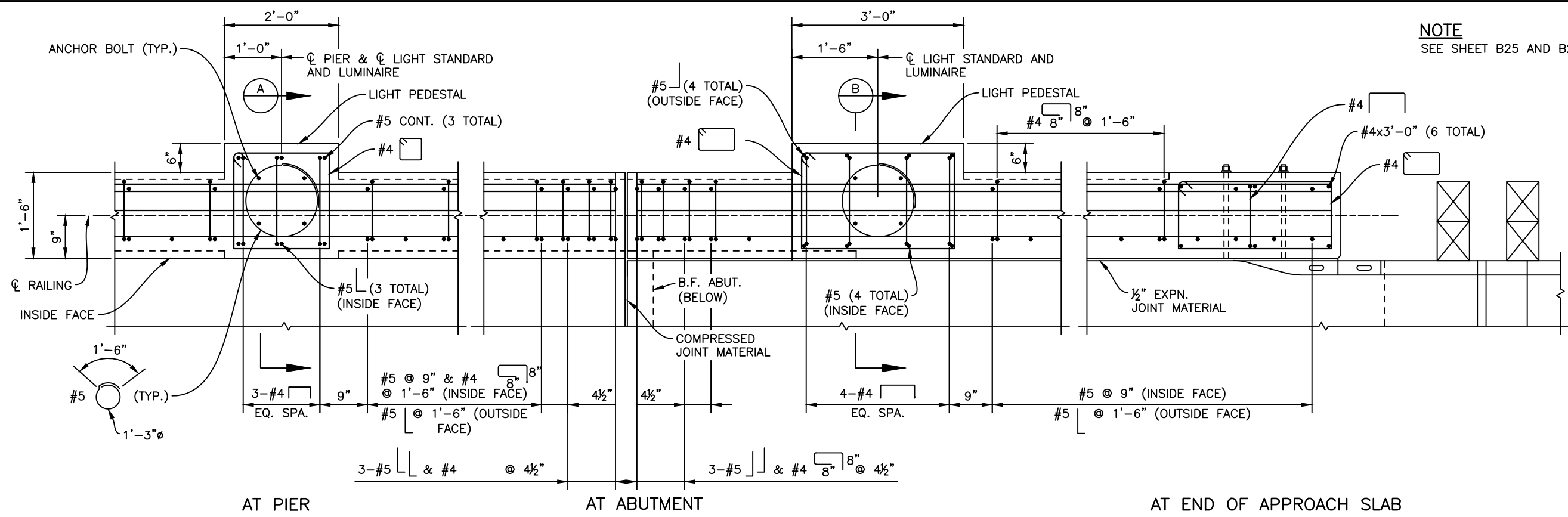
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Date	Comments	Initials

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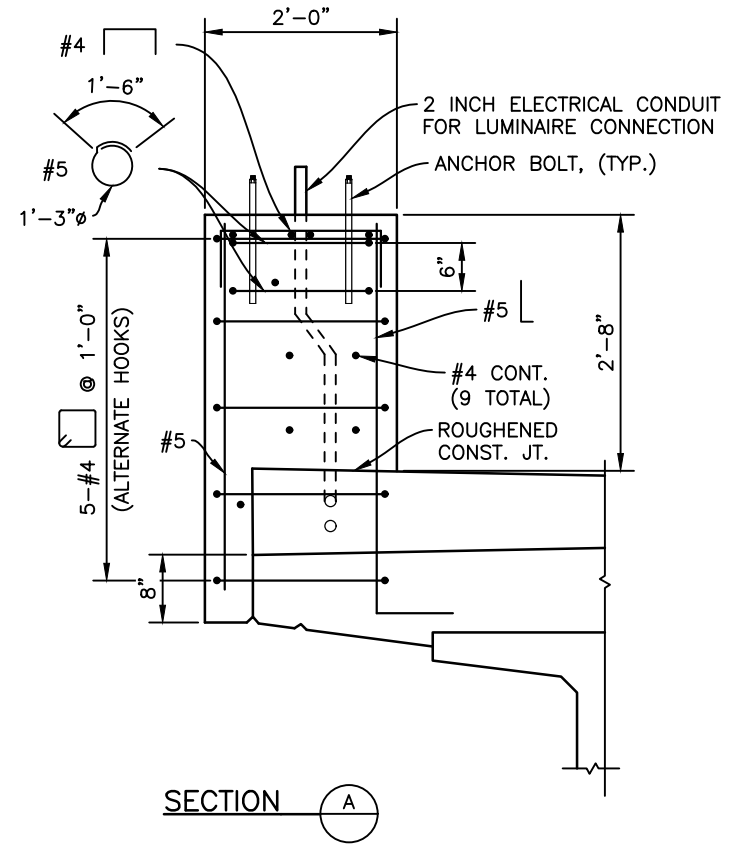
8008 E. Arapahoe Court, Suite 110, Centennial, CO 80112 ph:303.708.0900 fax:303.708.0400 manhard.com  
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No Revisions:	Designer: J. LYNCH	Structure Numbers	
Revised:	Detailer: R. DILLON		
Void:	Subset: BRIDGE	Sheets: B25 of 33	Sheet Number 54

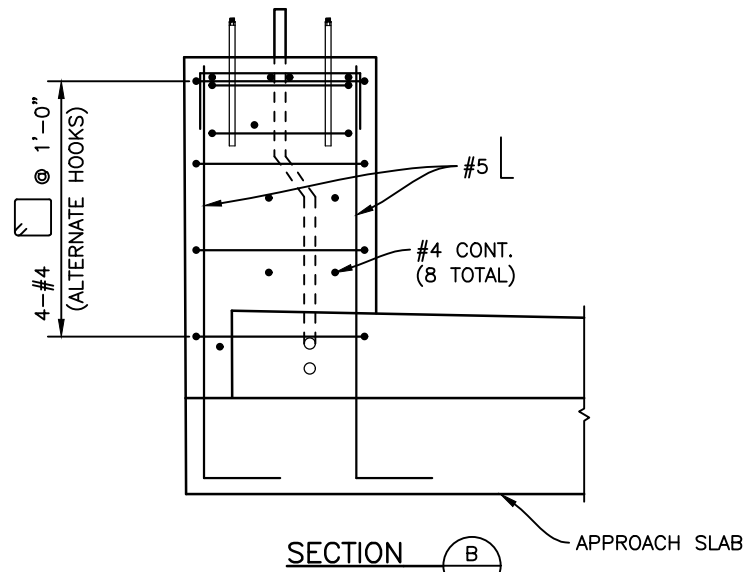
**NOTE**  
SEE SHEET B25 AND B27 FOR ADDITIONAL NOTES



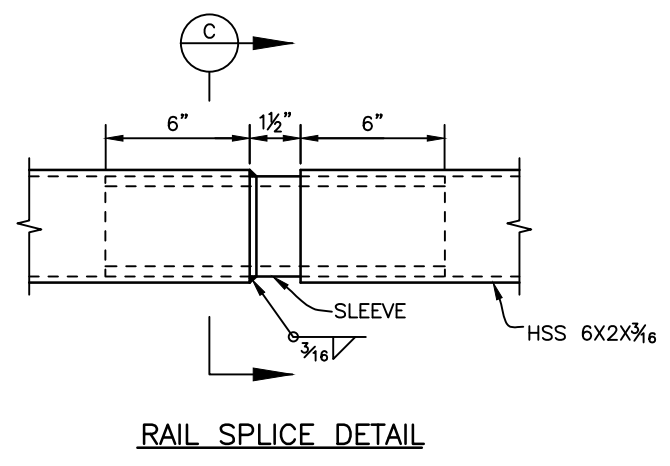
**PARTIAL RAILING PLAN**



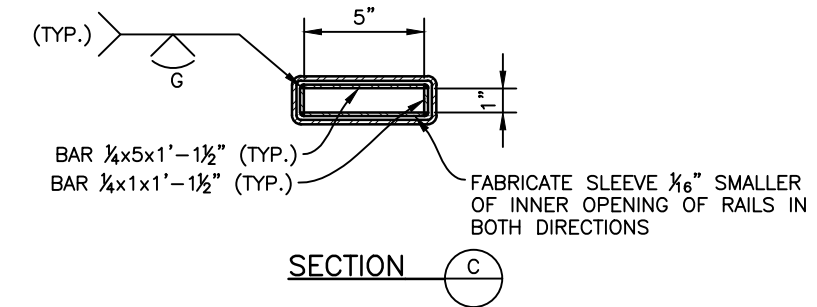
**SECTION A**



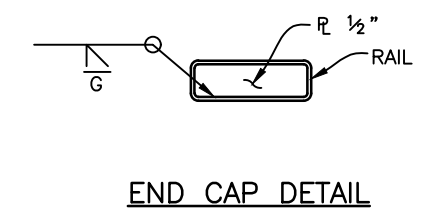
**SECTION B**  
(SIMILAR TO SECTION "A", EXCEPT AS SHOWN)



**RAIL SPLICE DETAIL**



**SECTION C**



**END CAP DETAIL**

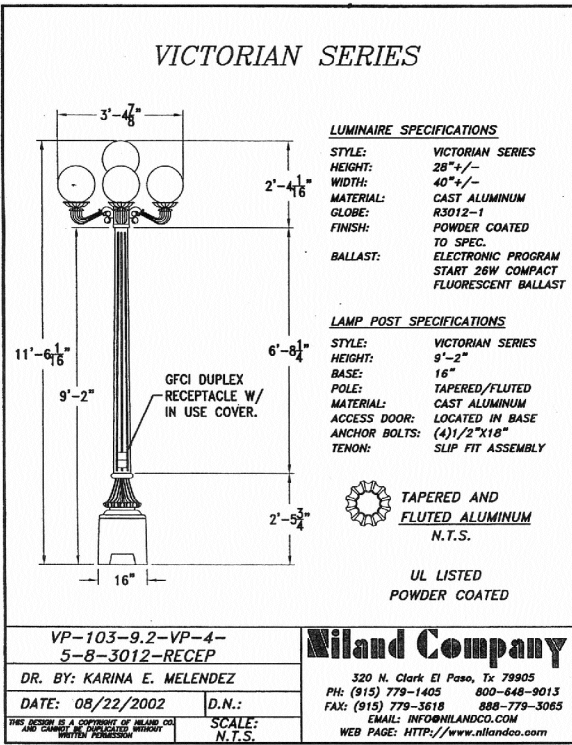
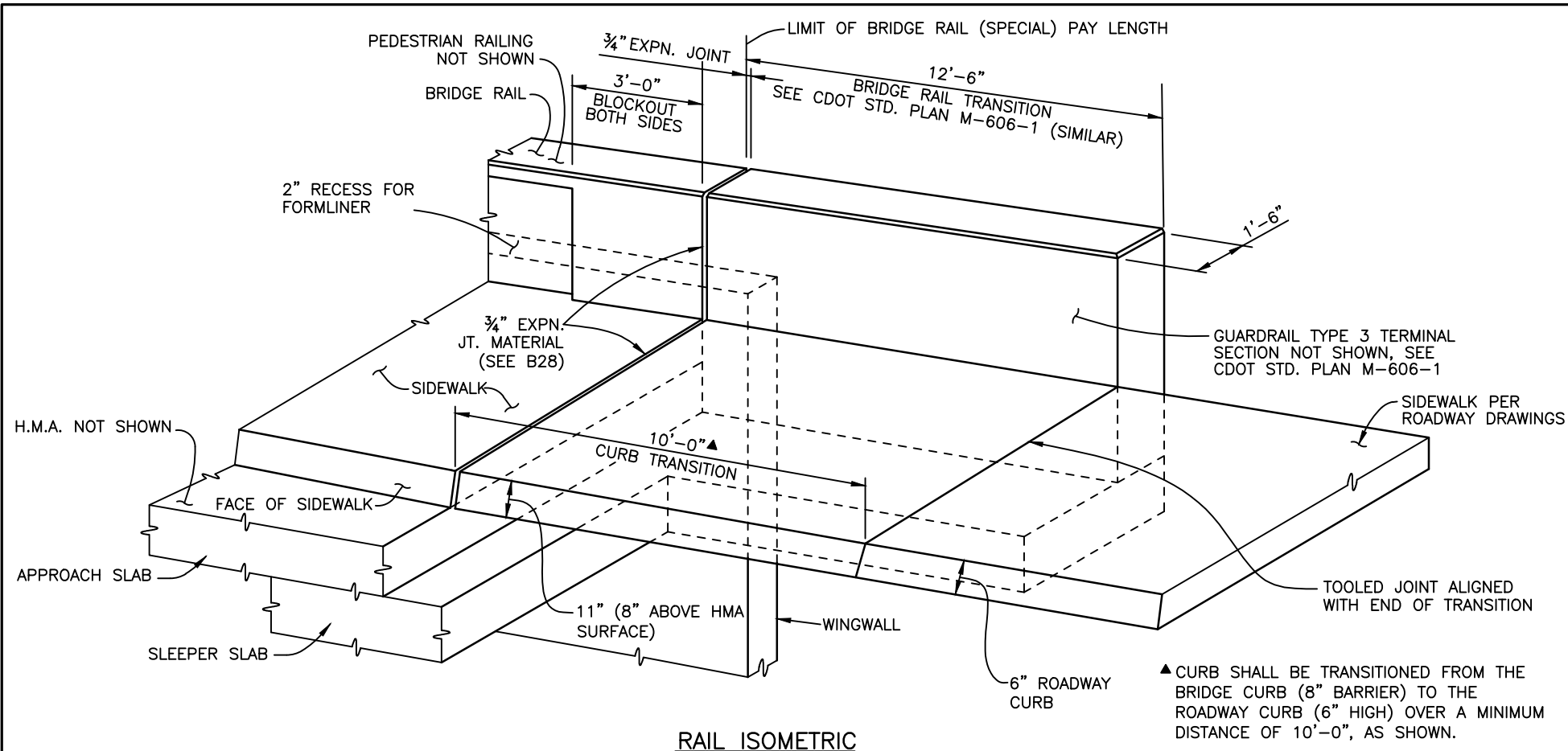
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No Revisions:	BRIDGE RAIL PLAN & SECTIONS		
Revised:	Designer: J. LYNCH	Structure Numbers	Sheet Number 55
Void:	Detailer: R. DILLON	Numbers	
	Subset: BRIDGE	Sheets: B26 of 33	



**NOTES**

1. ALL BRIDGE RAIL CONCRETE SHALL BE CLASS D.
2. BRIDGE RAIL SHALL BE CONSTRUCTED PLUMB.
3. RAIL TUBES SHALL BE CONTINUOUS OVER NOT LESS THAN TWO POSTS. MAXIMUM SPLICE SPACING SHALL BE 24'-0". NO WELDED BUTT SPLICES WILL BE ALLOWED IN THE RAIL SECTIONS.
4. TUBES SHALL BE SHOP BENT OR FABRICATED TO FIT HORIZONTAL CURVES.
5. CONCRETE AND REINFORCING STEEL SHALL CONFORM TO THE CONSTRUCTION, MEASUREMENT AND PAYMENT REQUIREMENTS OF SECTIONS 601 AND 602.
6. STEEL ELEMENTS SHALL CONFORM TO THE REQUIREMENTS OF SECTION 509.
7. WELDING SHALL BE IN ACCORDANCE WITH AWS D1.1. EXPOSED WELDS SHALL BE GROUND SMOOTH.
8. ALL TUBE STEEL SHALL BE ASTM A500 GRADE B. BASE PLATES SHALL BE ASTM A572 GRADE 50. ALL OTHER STEEL SHALL BE ASTM A36.
9. ANCHOR BOLTS SHALL BE A325 OR ASTM A449.
10. ALL RAILING STEEL, EXCEPT ANCHOR BOLTS, SHALL BE GALVANIZED AND POWDER COATED AFTER FABRICATION IN ACCORDANCE WITH SECTION 522 OF THE PROJECT SPECIAL PROVISIONS. COLOR SHALL BE "PARKER BROWN" EQUIVALENT TO TNEMEC ENDURA SHIELD COLOR F073D3884A.
11. ALL MATERIALS AND LABOR NECESSARY FOR FABRICATION AND ERECTION OF THE STEEL RAILING SHALL BE INCLUDED IN ITEM 514, PEDESTRIAN RAILING (STEEL).
12. PRIOR TO FABRICATION OF THIS ITEM, THREE SETS OF SHOP DRAWINGS WHICH COMPLY WITH THE REQUIREMENTS OF SECTION 105, SHALL BE SUBMITTED TO THE ENGINEER, FOR APPROVAL.
13. ALL MATERIALS AND WORKMANSHIP NECESSARY FOR CONSTRUCTION OF STONE FORMLINER SHALL BE INCLUDED IN ITEM 601, HAND STAINED FORMLINER.

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File Name: B115360-01RAL01.dwg	Date	Comments	Initials		No Revisions:			
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<p>6400 South Fiddlers Green Circle, Suite 1500        Greenwood Village, CO 80111        Phone: 303.721.1440        www.FHUENG.com</p>				Void:	Detailer: R. DILLON			
					Subset: BRIDGE	Sheets: B27 of 33	Sheet Number 56	