Washington State Department of Transportation

Publications Transmittal

Transmittal Number	Date
PT 17-038	August 7, 2017
Publication Title / Publication Number: *Standard Plans* M 21-01	
Originating Organization: Design Office, Engineering and Regional Operations	

Remarks and Instructions

The complete manual and revision packages can be accessed at www.wsdot.wa.gov/design/standards/plans.htm.

Please contact **Bill Berens** at **360-705-7256** or berensb@wsdot.wa.gov with comments, questions, or suggestions for improvement to the manual.

Instructions

- Replace Cover page with **new Cover page** provided.
- Remove **pages 3 ~ 13** from your current manual.
- Insert **pages 3 ~ 13**.
- Refer to the ***REMOVE & INSERT INSTRUCTIONS ~ Standard Plans Revision 8-7-2017***

To get the latest information, please sign up for email updates for individual publications at www.wsdot.wa.gov/publications/manuals.

Washington State Department of Transportation
Engineering and Regional Operations
Design Office
PO Box 47329
Olympia, WA 98504-7329

Email: designstandards@wsdot.wa.gov
www.wsdot.wa.gov/design/standards/plans.htm

John Donahue
Approved By

Signature

REMOVE AND INSERT INSTRUCTIONS - Standard Plans Revision 8-7-2017

REMOVE			***INSERT***			
A-40.15-00	8/11/09	Sheet 2 of 2	A-40.15-00	8/11/09	Sheet 2 of 2	Reprinted
Blank			A-40.20-04	1/18/17	Sheet 1 of 2	Revised
A-40.20-03	12/23/14		A-40.20-04	1/18/17	Sheet 2 of 2	Revised
A-40.50-02	12/23/14	Sheet 1 of 2	A-40.50-02	12/23/14	Sheet 1 of 2	Reprinted
B-5.20-01	6/16/11		B-5.20-02	1/26/17		Revised
B-5.40-01	6/16/11		B-5.40-02	1/26/17		Revised
B-5.60-01	6/16/11		B-5.60-02	1/26/17		Revised
B-10.20-01	2/7/12		B-10.20-01	2/7/12		Reprinted
B-10.40-00	6/1/06		B-10.40-01	1/26/17		Revised
B-10.60-00	6/8/06		B-10.60-00	6/8/06		Reprinted
			B-10.70-00	1/26/17		New Plan
			Blank			
B-15.60-01	2/7/12		B-15.60-02	1/26/17		Revised
B-20.20-02	3/16/12		B-20.20-02	3/16/12		Reprinted
B-25.20-01	3/15/12		B-25.20-01	3/15/12		Reprinted
B-25.60-00	6/1/06		B-25.60-01	1/26/17		Revised
B-30.10-01	4/26/12		B-30.10-02	1/26/17		Revised
B-30.20-02	4/26/12		B-30.20-03	1/26/17		Revised
B-30.30-01	4/26/12		B-30.30-02	1/26/17		Revised
B-30.40-01	4/26/12		B-30.40-02	1/26/17		Revised
B-30.50-01	4/26/12		B-30.50-02	1/26/17		Revised
B-30.70-03	4/26/12		B-30.70-03	4/26/12		Reprinted
B-30.80-00	6/8/06		B-30.80-00	6/8/06		Reprinted
B-30.90-01	9/20/07		B-30.90-02	1/26/17		Revised
B-40.40-01	6/16/10		B-40.40-02	1/26/17		Revised
B-45.20-00	6/1/06		B-45.20-01	7/11/17		Revised
B-45.40-00	6/1/06		B-45.40-01	7/21/17		Revised
B-50.20-00	6/1/06		B-50.20-00	6/1/06		Reprinted
B-55.20-00	6/1/06		B-55.20-01	1/26/17		Revised
B-60.20-00	6/8/06		B-60.20-00	6/8/06		Reprinted
B-70.60-00	6/1/06		Blank			
B-75.20-01	6/10/08		B-70.60-01	1/26/17	Sheet 1 of 2	Revised
			B-70.60-01	1/26/17	Sheet 2 of 2	Revised
			B-75.20-01	6/10/08		Reprinted
B-90.30-00	6/8/06		B-90.30-00	6/8/06		Reprinted
B-90.40-00	6/8/06		B-90.40-01	1/26/17		Revised
Blank			C-1a	7/14/15		Reprinted
C-1	7/12/16	Sheet 1 of 2	C-1b	7/14/15	Sheet 1 of 2	Reprinted
THROUGH			***THROUGH (See Table of Contents)***			
C-85.20-01	6/11/14		Blank			
C-90.10-00	7/3/08		C-90.10-00	7/3/08		Reprinted
F-10.16-00	12/20/06		F-10.16-00	12/20/06		Reprinted
F-10.18-00	6/27/11		F-10.18-01	7/11/17		Revised
G-24.40-06	2/29/16	Sheet 4 of 4	G-24.40-06	2/29/16	Sheet 4 of 4	Reprinted
G-24.50-03	6/17/14		G-24.50-04	7/11/17		Revised
G-70.10-03	6/18/15	Sheet 4 of 4	G-70.10-03	6/18/15	Sheet 4 of 4	Reprinted
G-70.20-03	2/29/16		G-70.20-04	7/21/17		Revised
G-70.30-03	2/29/16		G-70.30-04	7/21/17		Revised
Blank			Blank			
G-90.10-02	4/28/16		G-90.10-03	7/11/17		Revised
G-90.11-00	4/28/16		G-90.11-00	4/28/16		Reprinted
G-90.20-04	4/28/16		G-90.20-05	7/11/17		Revised
G-90.30-03	4/28/16		G-90.30-04	7/11/17		Revised

REMOVE AND INSERT INSTRUCTIONS - Standard Plans Revision 8-7-2017

REMOVE			***INSERT***			
J-10.22-00	5/29/13	Sheet 2 of 2	J-10.22-00	5/29/13	Sheet 2 of 2	Reprinted
Blank			J-10.25-00	7/11/17		New Plan
J-28.45-03	7/21/16	Sheet 2 of 2	J-28.45-03	7/21/16	Sheet 2 of 2	Reprinted
Blank			J-28.50-03	7/21/16		Reprinted
J-28.50-03	7/21/16		J-28.60-02	7/21/16		Reprinted
J-28.60-02	7/21/16		J-28.70-03	7/21/17	Sheet 1 of 2	Revised
J-28.70-02	6/1/16		J-28.70-03	7/21/17	Sheet 2 of 2	Revised
J-29.10-01	7/21/16		J-29.10-01	7/21/16		Reprinted
J-40.36-01	5/20/13		J-40.36-02	7/21/17	Sheet 1 of 2	Revised
J-40.37-01	5/20/13	Sheet 1 of 2	J-40.36-02	7/21/17	Sheet 2 of 2	Revised
J-40.37-01	5/20/13	Sheet 2 of 2	J-40.37-02	7/21/17	Sheet 1 of 3	Revised
J-40.38-01	5/20/13		J-40.37-02	7/21/17	Sheet 2 of 3	Revised
			J-40.37-02	7/21/17	Sheet 3 of 3	Revised
			J-40.38-01	5/20/13		Reprinted
			Blank			
			J-45.36-00	7/21/17		New Plan
			Blank			
			J-50.05-00	7/21/17		New Plan
J-50.10-00	6/3/11		J-50.10-00	6/3/11		Reprinted
J-50.11-00	6/3/11	Sheet 1 of 2	J-50.11-01	7/21/17	Sheet 1 of 2	Revised
J-50.11-00	6/3/11	Sheet 2 of 2	J-50.11-01	7/21/17	Sheet 2 of 2	Revised
J-50.12-00	6/3/11	Sheet 1 of 3	J-50.12-01	7/21/17	Sheet 1 of 3	Revised
J-50.12-00	6/3/11	Sheet 2 of 3	J-50.12-01	7/21/17	Sheet 2 of 3	Revised
J-50.12-00	6/3/11	Sheet 3 of 3	J-50.12-01	7/21/17	Sheet 3 of 3	Revised
J-50.15-00	6/3/11	Sheet 1 of 3	J-50.15-01	7/21/17	Sheet 1 of 3	Revised
J-50.15-00	6/3/11	Sheet 2 of 3	J-50.15-01	7/21/17	Sheet 2 of 3	Revised
J-50.15-00	6/3/11	Sheet 3 of 3	J-50.15-01	7/21/17	Sheet 3 of 3	Revised
J-50.16-01	3/22/13	Sheet 1 of 2	J-50.16-01	3/22/13	Sheet 1 of 2	Reprinted
M-11.10-01	1/30/07		M-11.10-02	7/11/17		Revised
Blank			M-12.10-00	7/11/17		New Plan
M-24.60-04	6/24/14	Sheet 2 of 2	M-24.60-04	6/24/14	Sheet 2 of 2	Reprinted
M-40.10-03	6/24/14		M-24.65-00	7/11/17		New Plan
			M-24.66-00	7/11/17		New Plan
			M-40.10-03	6/24/14		Reprinted
M-40.20-00	10/12/07		M-40.20-00	10/12/07		Reprinted
M-40.30-00	9/20/07		M-40.30-01	7/11/17		Revised

This page left blank intentionally.

Washington State
Department of Transportation

Standard Plans

M 21-01

August 7, 2017

Engineering and Regional Operations
Development Division, Design Office

Americans with Disabilities Act (ADA) Information

Materials can be provided in alternative formats by calling the ADA Compliance Manager at 360-705-7097. Persons who are deaf or hard of hearing may contact that number via the Washington Relay Service at 7-1-1.

Title VI Notice to the Public

It is Washington State Department of Transportation (WSDOT) policy to ensure no person shall, on the grounds of race, color, national origin, or sex, as provided by Title VI of the Civil Rights Act of 1964, be excluded from participation in, be denied the benefits of, or be otherwise discriminated against under any of its federally funded programs and activities. Any person who believes his/her Title VI protection has been violated may file a complaint with WSDOT's Office of Equal Opportunity (OEO). For Title VI complaint forms and advice, please contact OEO's Title VI Coordinator at 360-705-7082 or 509-324-6018.

To get the latest information on WSDOT publications, sign up for individual email updates at www.wsdot.wa.gov/publications/manuals.

Washington State Department of Transportation
Engineering and Regional Operations
Development Division, Design Office
PO Box 47329
Olympia, WA 98504-7329

Email: designstandards@wsdot.wa.gov
www.wsdot.wa.gov/design/standards/plans.htm

Contents

Contents

Contents

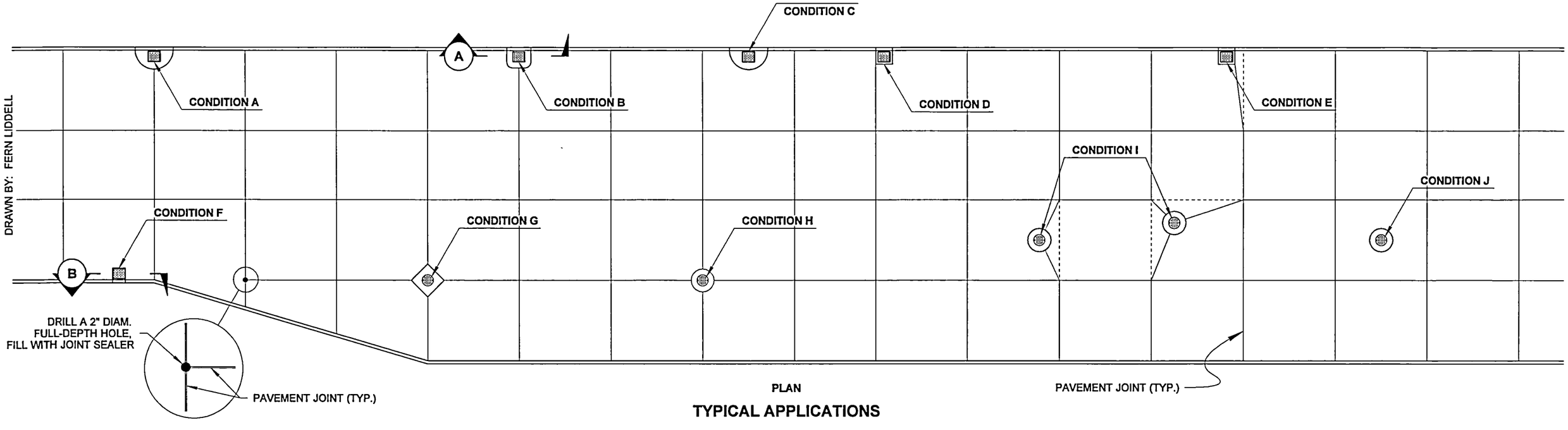
Contents

Contents

Contents

This page left blank intentionally.

DRAWN BY: FERN LIDDELL



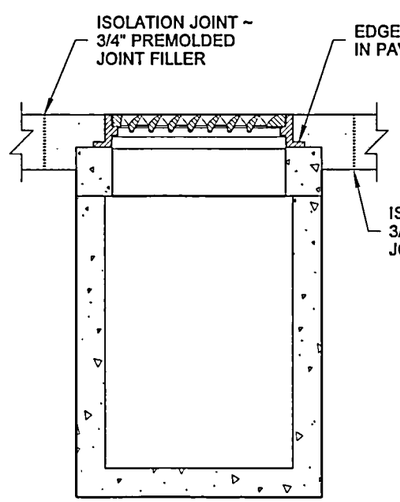
T - JOINT DETAIL

PLAN

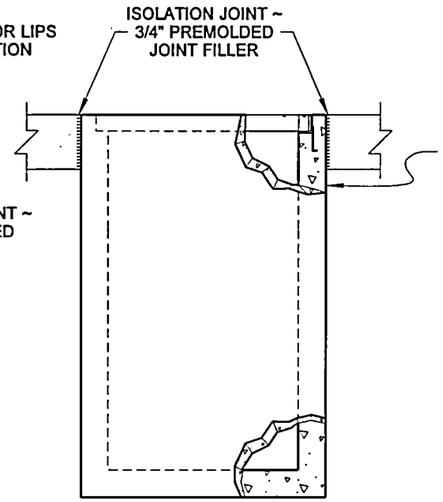
TYPICAL APPLICATIONS

TYPICAL ISOLATION JOINT GUIDELINES				
CONDITION	FEATURE	EDGES, FLANGES OR LIPS IN THE PAVEMENT SECTION ①	CONTINUOUS VERTICAL FACE THROUGH THE PAVEMENT SECTION ②	DISTANCE FROM NEAREST TRANSVERSE JOINT
A	CATCH BASIN OR COMBINATION GRATE	USE	—	—
B	CATCH BASIN OR COMBINATION GRATE	USE	—	—
C	CATCH BASIN OR COMBINATION GRATE	USE	—	> 4 FT FROM JOINT
D	GRATE INLET, CATCH BASIN OR CONCRETE INLET ✶	—	USE	< 4 FT FROM JOINT
E	GRATE INLET, CATCH BASIN OR CONCRETE INLET ✶	—	USE	< 4 FT FROM JOINT
F	GRATE INLET, CATCH BASIN OR CONCRETE INLET ✶	—	USE	> 4 FT FROM JOINT
G	MANHOLE OR CATCH BASIN TYPE 2	USE	—	—
H	MANHOLE OR CATCH BASIN TYPE 2	USE	—	—
I	MANHOLE OR CATCH BASIN TYPE 2	USE	—	< 4 FT FROM JOINT
J	MANHOLE OR CATCH BASIN TYPE 2	USE	—	> 4 FT FROM JOINT

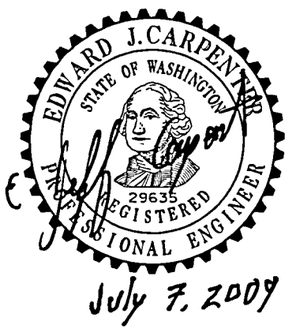
✶ WITH RECTANGULAR GRATE CAST INTO ADJUSTMENT SECTION.



① SECTION A



② SECTION B



PCC PAVEMENT ISOLATION JOINTS

STANDARD PLAN A-40.15-00

SHEET 2 OF 2 SHEETS

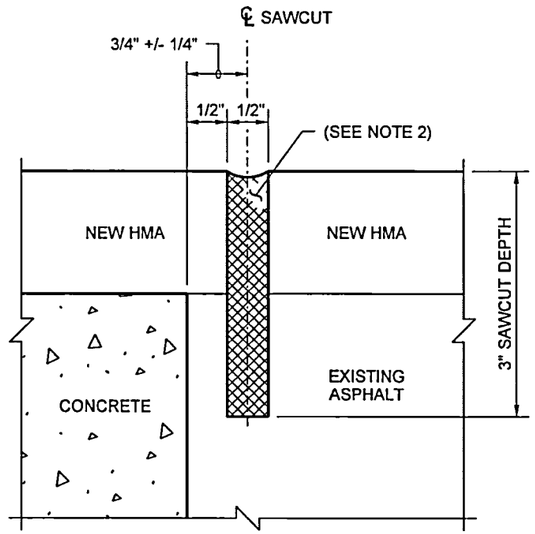
APPROVED FOR PUBLICATION

Pano Bakalis 8/11/09

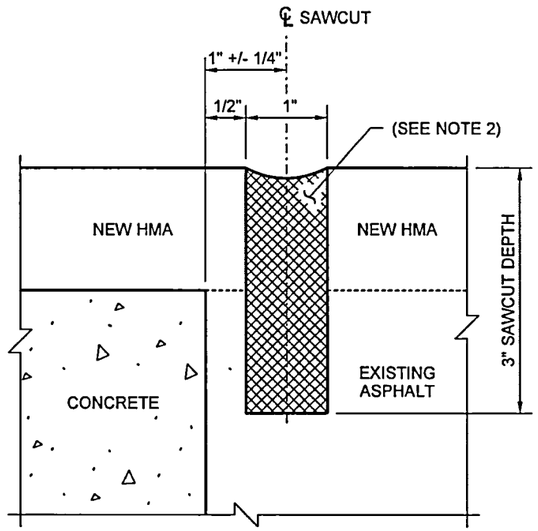
STATE DESIGN ENGINEER — DATE

Washington State Department of Transportation

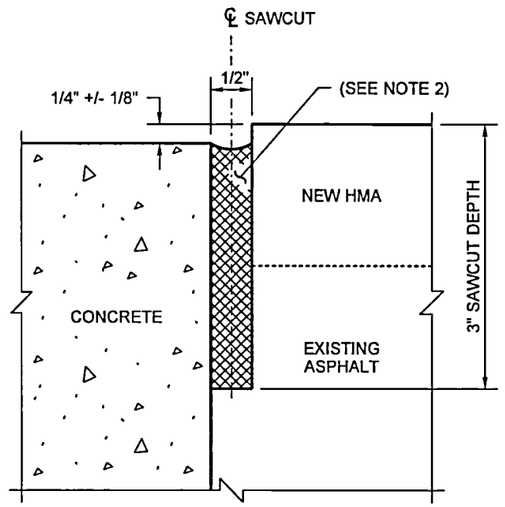
DRAWN BY: FERN LIDDELL



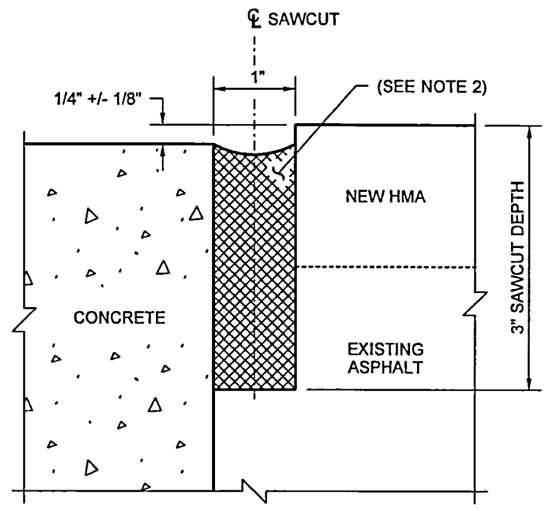
DETAIL 1
1/2 INCH JOINT SEAL AT END OF CONCRETE



DETAIL 2
1 INCH JOINT SEAL AT END OF CONCRETE



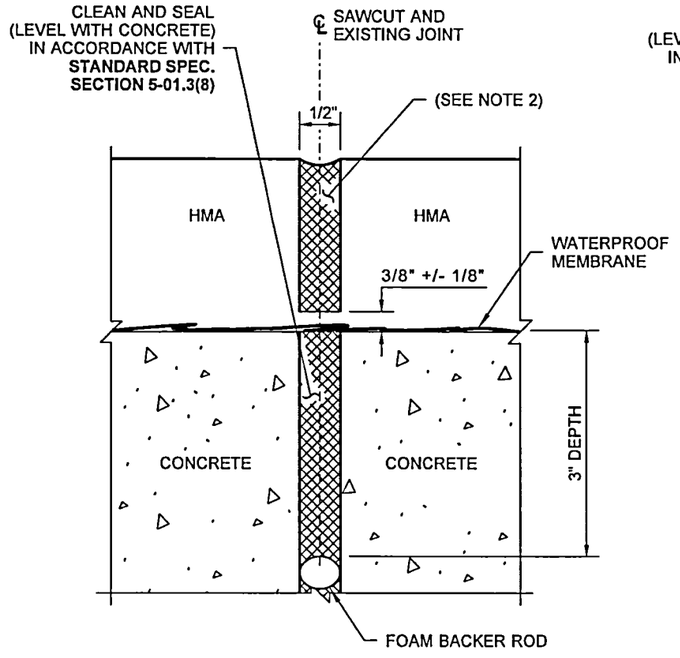
DETAIL 3
1/2 INCH CONCRETE ASPHALT BUTT JOINT



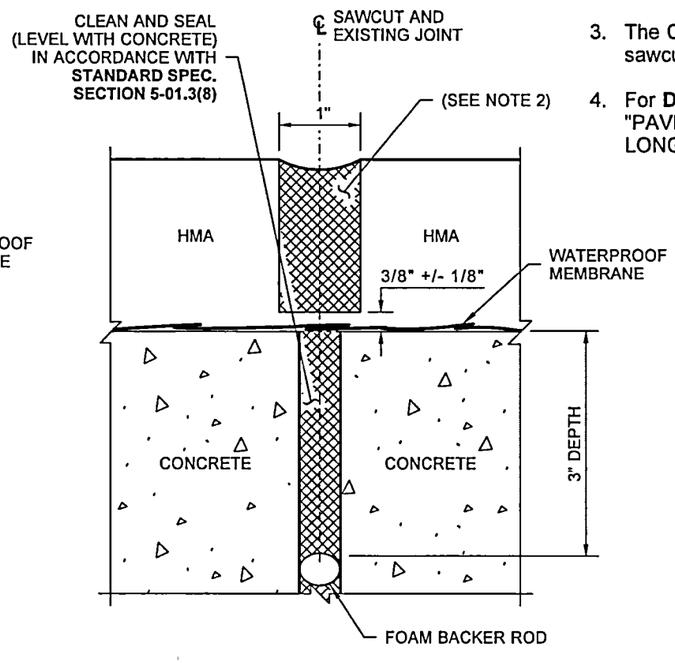
DETAIL 4
1 INCH CONCRETE ASPHALT BUTT JOINT

NOTES

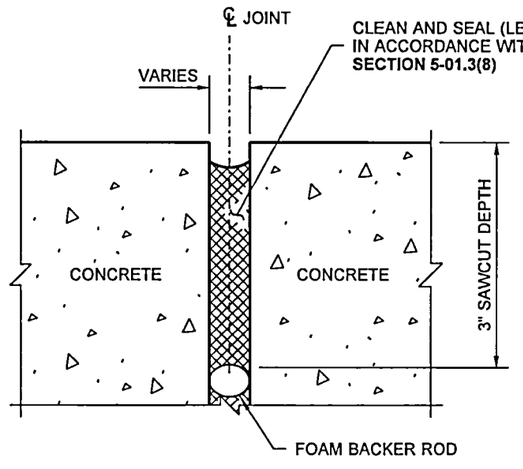
1. Use the 1/2 inch joint details for bridges with expansion length less than 100 feet and for bridges with L type abutments. Use the 1 inch joint details for other applications. Use Detail 5 on steel trusses and timber bridges with concrete deck panels.
2. Sawcut shall be as described in **Standard Specification Section 5-05.3(8)** and sealed in accordance with **Standard Specification Section 5-05.3(8)B**.
3. The Contractor shall avoid sawcutting concrete at all locations. For **Details 1** and **2**, the construction tolerance to locate the sawcut is 1/4 inch (0 min. to 1/2 inch max.) from the concrete.
4. For **Details 1, 2, 3**, and **4**, the item "HMA SAWCUT AND SEAL" shall be used for payment. For **Details 5** and **6**, the item "PAVED PANEL JOINT SEAL" shall be used for payment. For **Detail 7**, the item "SEALING EXISTING LONGITUDINAL AND TRANSVERSE JOINT" shall be used for payment.



DETAIL 5
1/2 INCH PAVED PANEL JOINT SEAL



DETAIL 6
1 INCH PAVED PANEL JOINT SEAL



DETAIL 7
CONCRETE OPEN JOINT

BIJAN KHALEGHI
STATE OF WASHINGTON
27695
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Khaleghi, Bijan
Jan 17 2017 11:00 AM
cosign

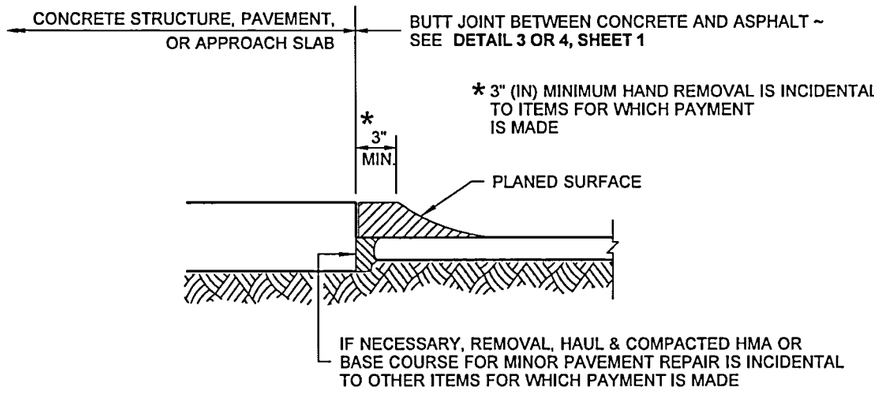
BRIDGE PAVING JOINT SEALS

STANDARD PLAN A-40.20-04

SHEET 1 OF 2 SHEETS

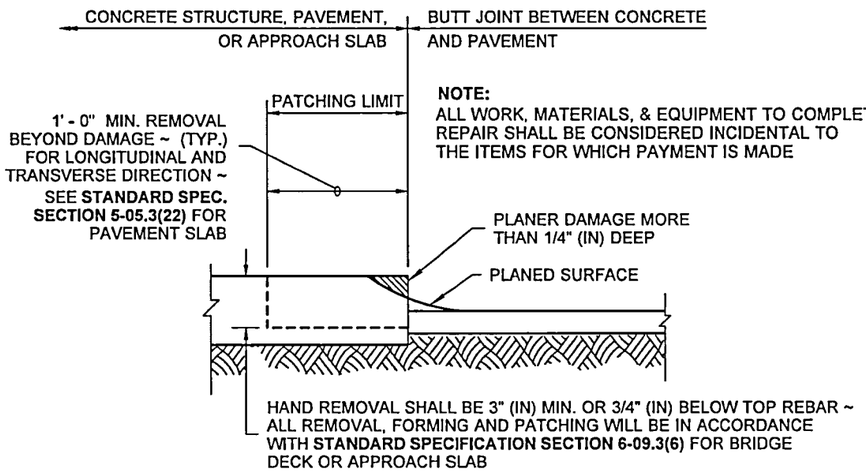
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 18 2017 1:44 PM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



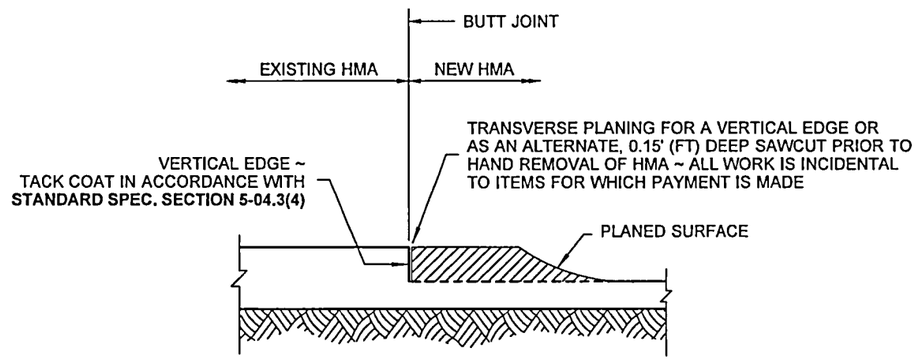
DETAIL 8

CONCERTE TO ASPHALT BUTT JOINT PLANING DETAIL



DETAIL 9

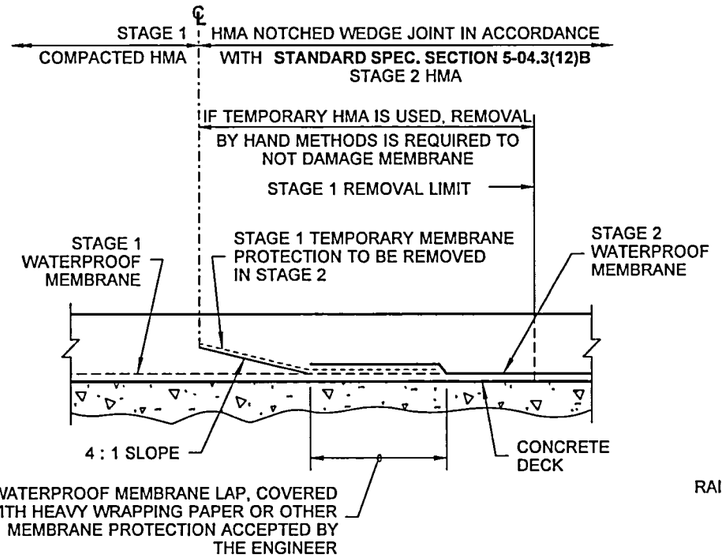
PLANER DAMAGE DETAIL



DETAIL 10

ASPHALT BUTT DETAIL

(SHOWING VERTICAL EDGE)



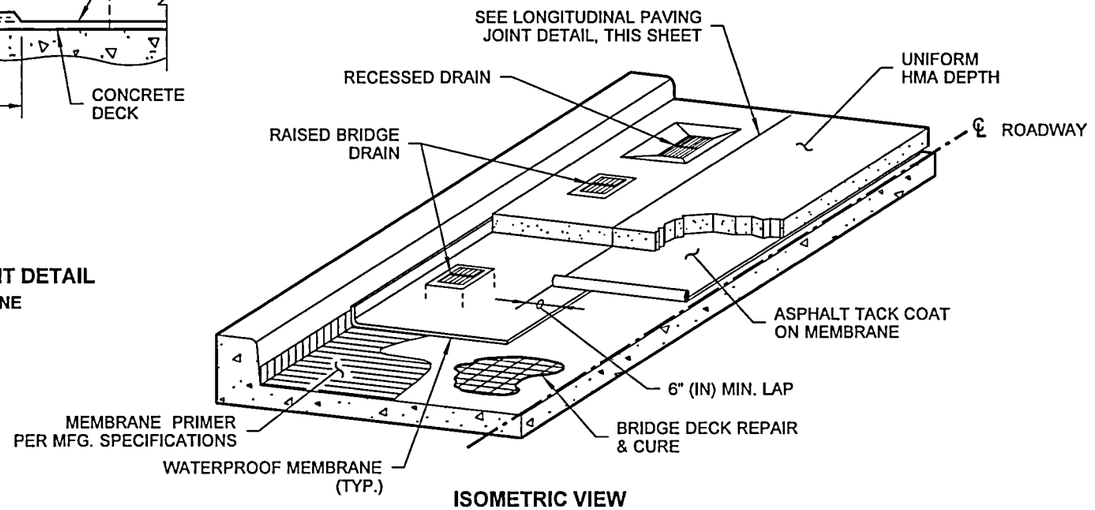
DETAIL 11

LONGITUDINAL PAVEMENT JOINT DETAIL

WITH WATERPROOF MEMBRANE

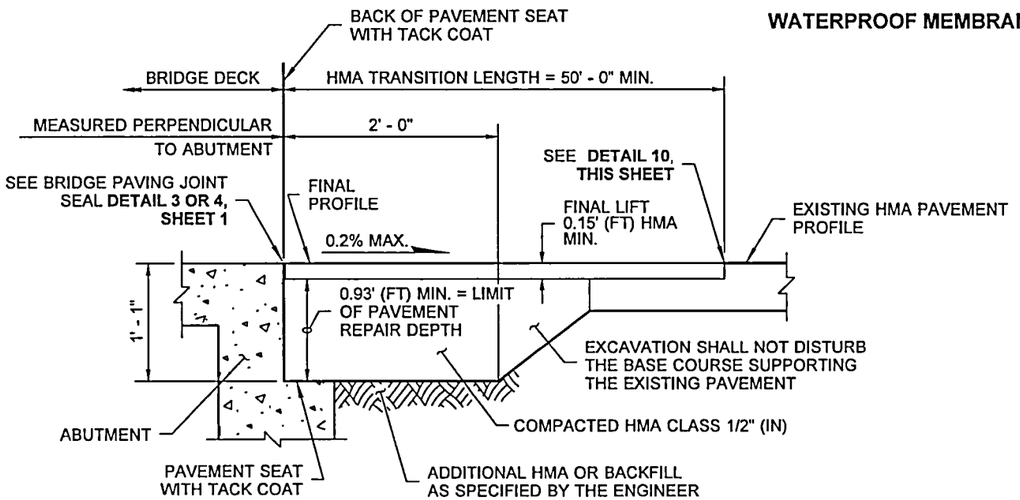
NOTES FOR DETAIL 12:
PAVEMENT REPAIR AT BACK OF PAVEMENT SEAT

1. Final profile grade shall transition per **Standard Plan A-60.30** to the existing profile and use vertical control per **Standard Specification Section 5-04.3(3)C.**
2. The length of pavement repair for measurement and payment is the curb distance, measured along the back-of-pavement seat. Placement will be in accordance with **Standard Specification Section 5-04.3(9).**
3. Payment for final lift HMA is considered incidental to the item Pavement Repair, unless specified otherwise in the plans.
4. Mix design, design & acceptance is commercial HMA, unless specified otherwise in the plans.
5. Additional backfill up to one (1x) cubic yard is considered incidental to the item Pavement Repair.



ISOMETRIC VIEW

WATERPROOF MEMBRANE PLACEMENT



DETAIL 12

PAVEMENT REPAIR AT BACK OF PAVEMENT SEAT

(BRIDGE WITH HMA NOT SHOWN)

BIJAN KHALEGHI
STATE OF WASHINGTON
27695
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Khaleghi, Bijan
Jan 17 2017 11:07 AM
cosign

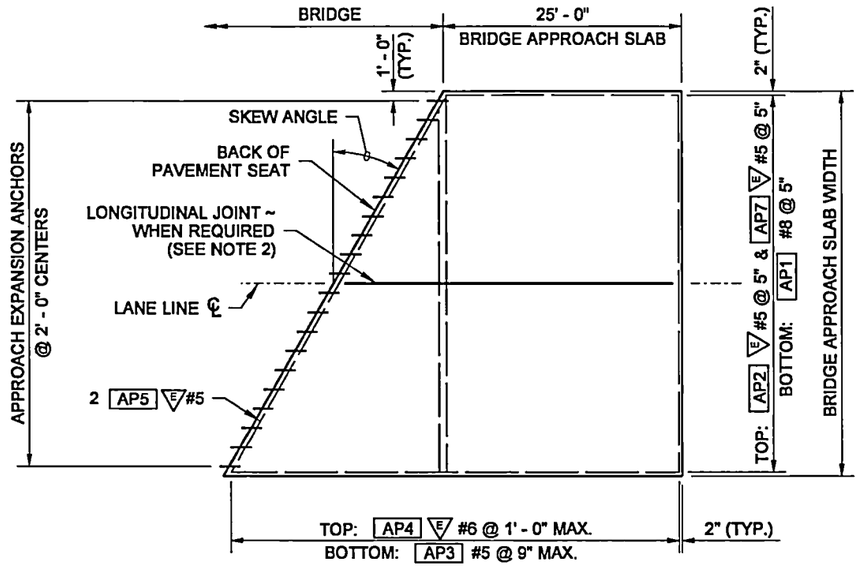
BRIDGE PAVING JOINT SEALS

STANDARD PLAN A-40.20-04

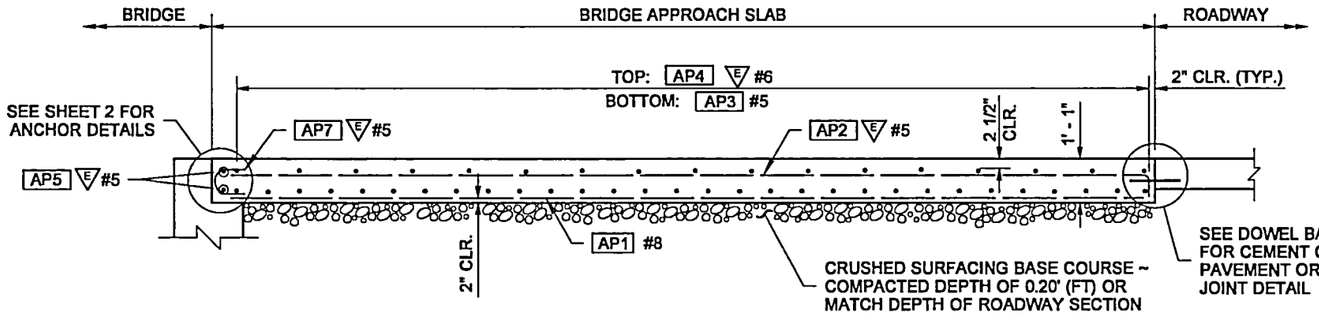
SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 18 2017 1.45 PM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: COLBY FLETCHER

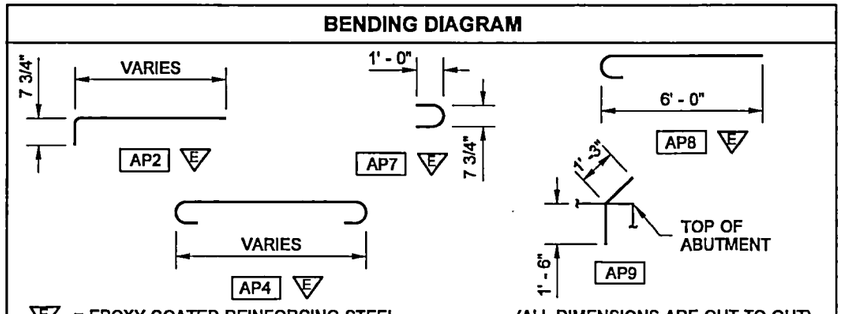


PLAN



LONGITUDINAL SECTION

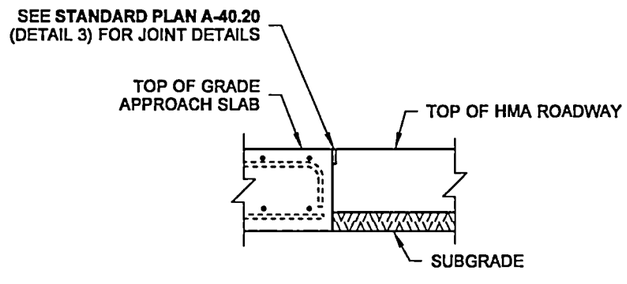
BENDING DIAGRAM



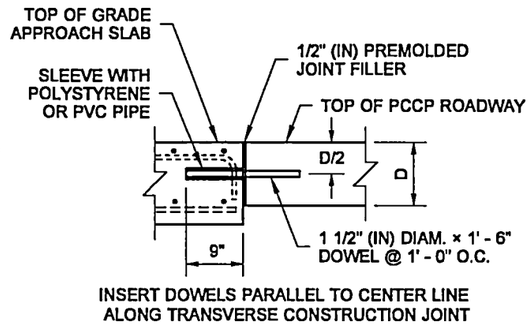
AP8 E #6 BARS SHALL BE PLACED WITH THE AP4 E #6 BARS ALONG EACH EDGE OF BRIDGE APPROACH SLAB HAVING A TRAFFIC BARRIER.

NOTES

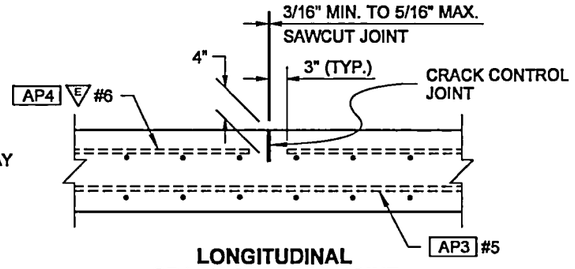
1. All edges of the approach slab shall have 1/2" (in) radii except at longitudinal construction joints and adjacent to L-Type abutments.
2. Longitudinal joints shall be placed on lane lines and shall be constructed and sealed in accordance with **Standard Specification Section 5-05.3(8)**. Joints may be either a sawcut crack control joint or a construction joint. Sawcut joints shall terminate 1' - 0" before reaching edge of slab and must be sawcut as soon as possible after placement of concrete.
   (A) Approach slabs less than 40' (ft) wide – no joint is required.
   (B) Approach slabs wider than 40' (ft) – one or more joints are required to divide the slab into approximately 24' (ft) wide sections.
3. The minimum lap splice of #5 is 2' - 0". E#5 is 2' - 6". E#6 is 3' - 0". And #8 is 3' - 3". All lap splices shall be staggered so that no more than 50% of rebar is spliced at the same location. Lap splices shall be located within the middle half of the bridge approach slab. Optional splices are allowed for AP4 E #6.



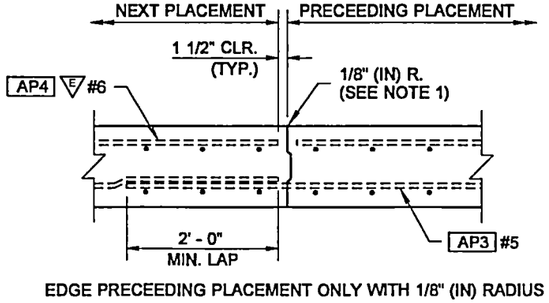
HMA ROADWAY JOINT DETAIL



DOWEL BAR DETAIL FOR CEMENT CONCRETE PAVEMENT



LONGITUDINAL CRACK CONTROL JOINT
(SEE NOTE 2)



EDGE PRECEEDING PLACEMENT ONLY WITH 1/8" (IN) RADIUS

ALTERNATE LONGITUDINAL JOINT DETAIL
(SEE NOTE 2)

FOR LOCAL AGENCY USE ONLY

BIJAN KHALEGHI
STATE OF WASHINGTON
27695
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Khaleghi, Bijan
Bijan Khaleghi Dec 18 2014 5:06 PM

BRIDGE APPROACH SLAB

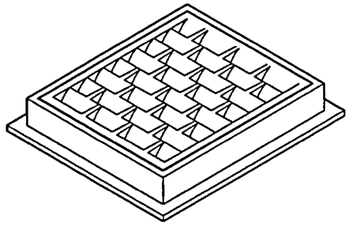
STANDARD PLAN A-40.50-02

SHEET 1 OF 2 SHEETS

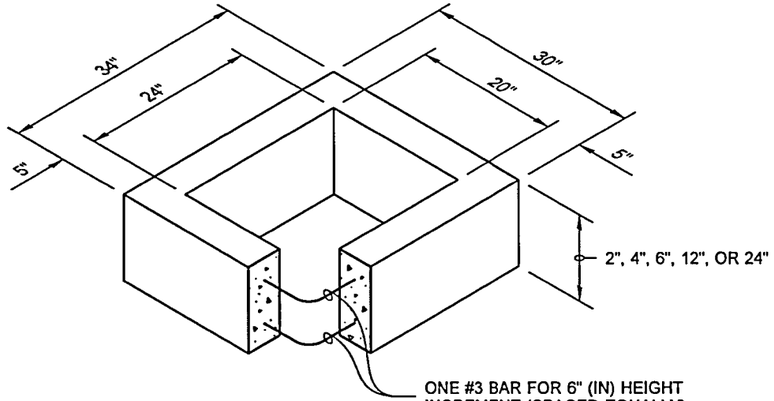
APPROVED FOR PUBLICATION
Bakotich, Pasco
Dec 23 2014 1:57 PM
STATE DESIGN ENGINEER

Washington State Department of Transportation

DRAWN BY: LISA CYFORD



FRAME AND VANED GRATE

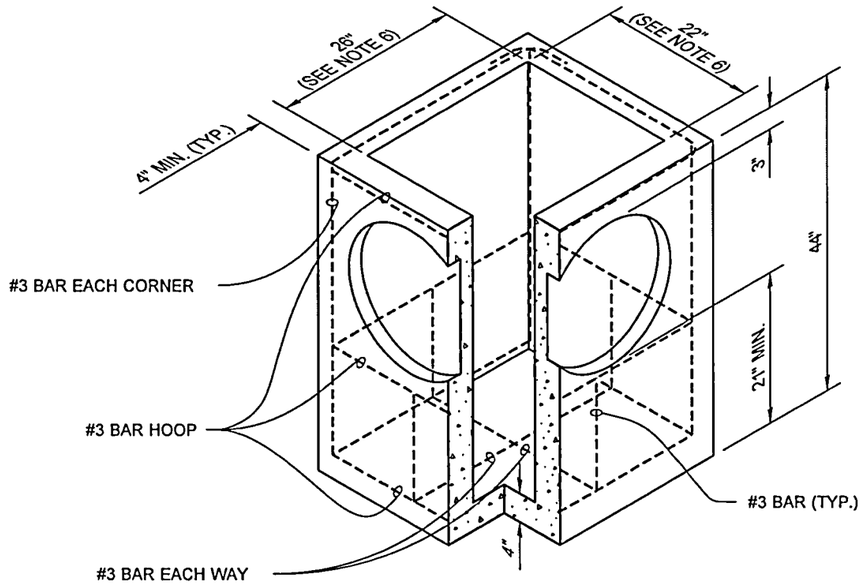


RECTANGULAR ADJUSTMENT SECTION

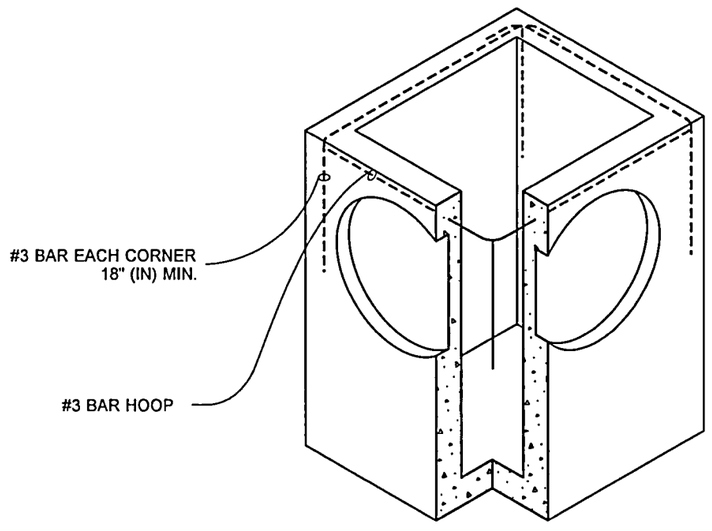
PIPE ALLOWANCES

PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
CPSSP * (STD. SPEC. SECT. 9-05.20)	12"
SOLID WALL PVC (STD. SPEC. SECT. 9-05.12(1))	15"
PROFILE WALL PVC (STD. SPEC. SECT. 9-05.12(2))	15"

* CORRUGATED POLYETHYLENE STORM SEWER PIPE



PRECAST BASE SECTION



(SEE NOTE 1)

ALTERNATIVE PRECAST BASE SECTION

NOTES

1. As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION**, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the ALTERNATIVE **PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.
2. The knockout diameter shall not be greater than 20" (in). Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.
3. The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).
4. The frame and grate may be installed with the flange down, or integrally cast into the adjustment section with flange up.
5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.
6. The opening shall be measured at the top of the **Precast Base Section**.
7. All pickup holes shall be grouted full after the basin has been placed.

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 2:53 PM
cosign

CATCH BASIN TYPE 1

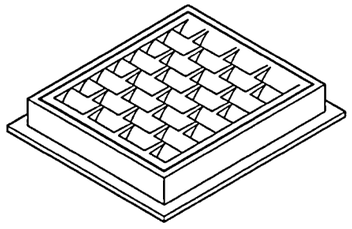
STANDARD PLAN B-5.20-02

SHEET 1 OF 1 SHEET

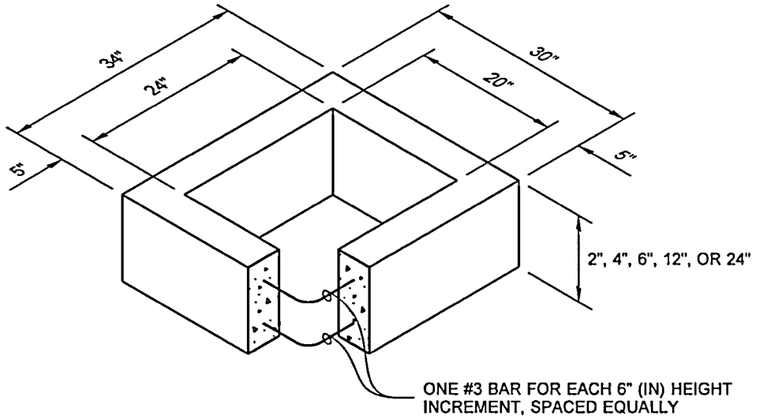
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:48 AM
cosign

STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: LISA CYFORD



FRAME AND VANED GRATE



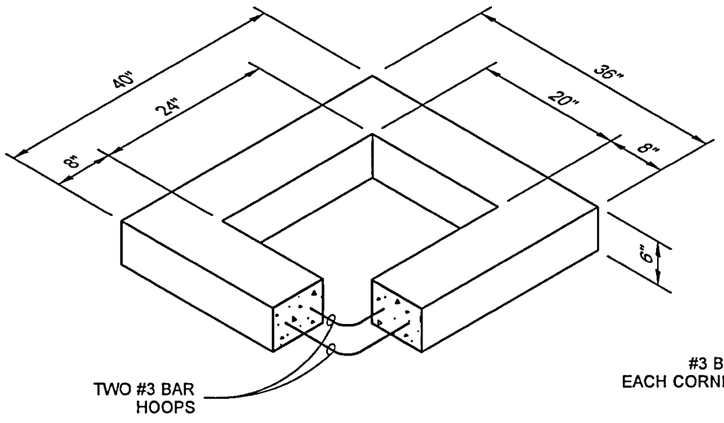
RECTANGULAR ADJUSTMENT SECTION

PIPE ALLOWANCES	
PIPE MATERIAL	**MAXIMUM INSIDE DIAMETER (INCHES)**
REINFORCED OR PLAIN CONCRETE	18"
ALL METAL PIPE	21"
CPSSP * **(STD. SPEC. SECT. 9-05.20)**	18"
SOLID WALL PVC **(STD. SPEC. SECT. 9-05.12(1))**	21"
PROFILE WALL PVC **(STD. SPEC. SECT. 9-05.12(2))**	21"

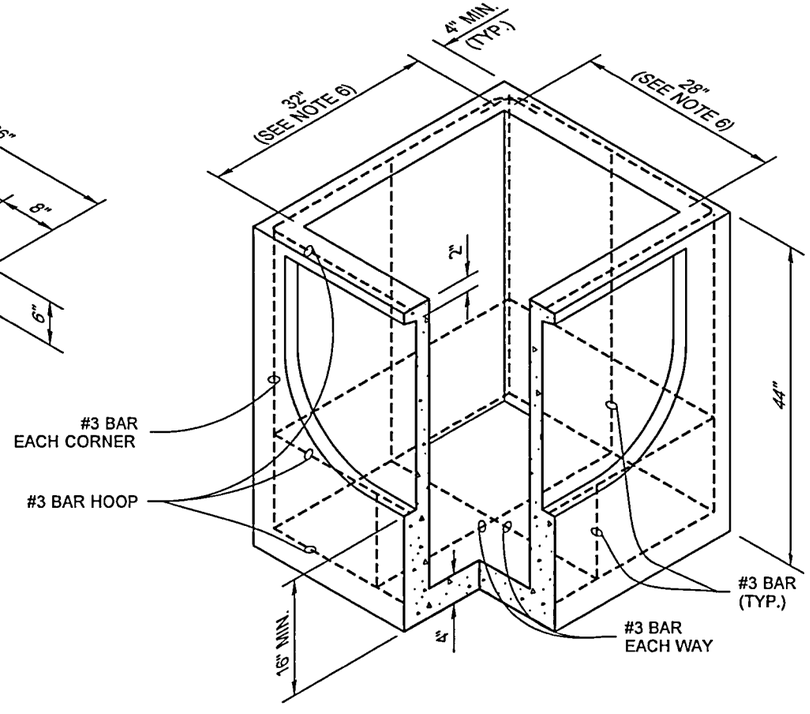
* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES

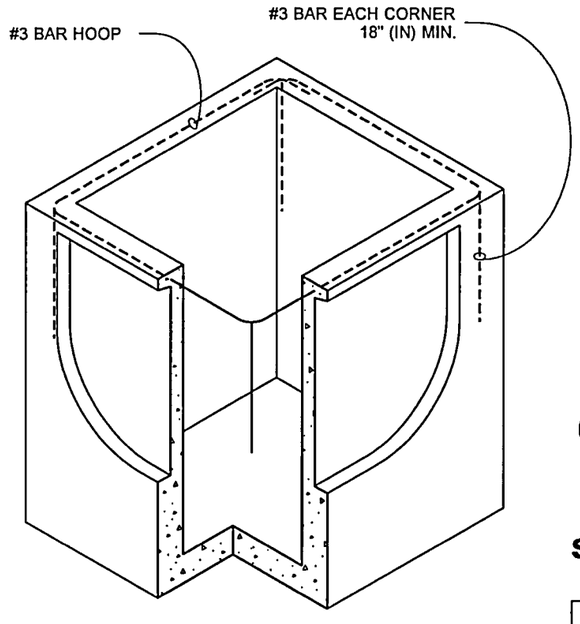
1. As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION**, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot, shall be used with the minimum required rebar shown in the ALTERNATIVE **PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.
2. The knockout shall not be greater than 26" (in), in any direction. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.
3. The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).
4. The frame and grate may be installed with the flange down or integrally cast into the adjustment section with flange up.
5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.
6. The opening shall be measured at the top of the Precast Base Section.
7. All pickup holes shall be grouted full after the basin has been placed.



REDUCING SECTION



PRECAST BASE SECTION



(SEE NOTE 1)

ALTERNATIVE PRECAST BASE SECTION

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 2:56 PM
cosign

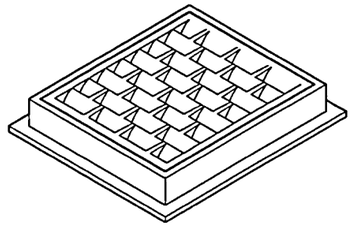
CATCH BASIN TYPE 1L

STANDARD PLAN B-5.40-02

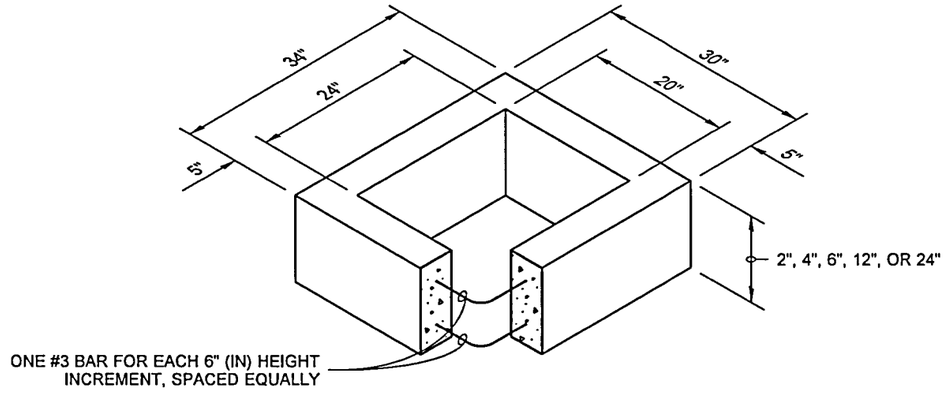
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:49 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

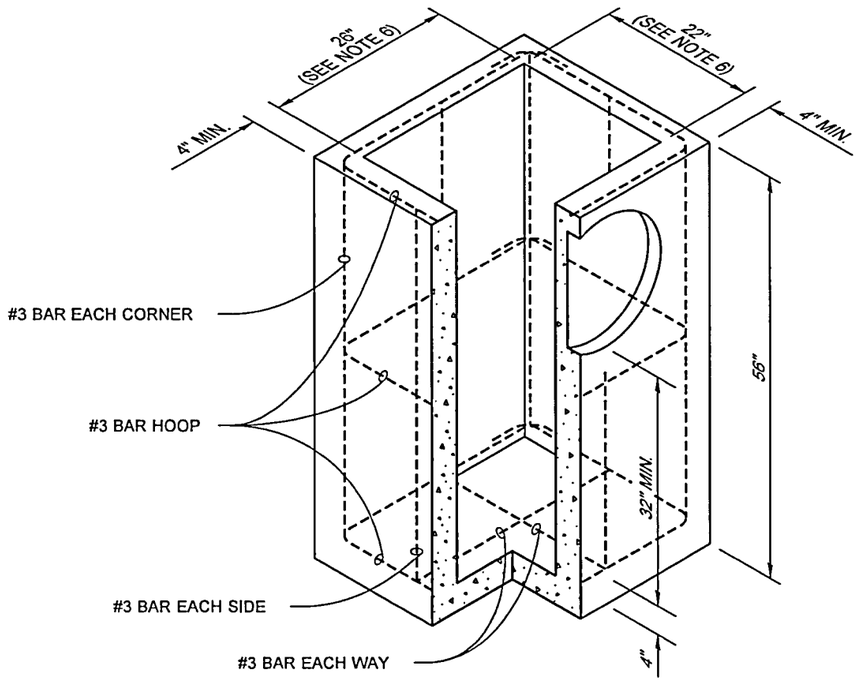
DRAWN BY: LISA CYFORD



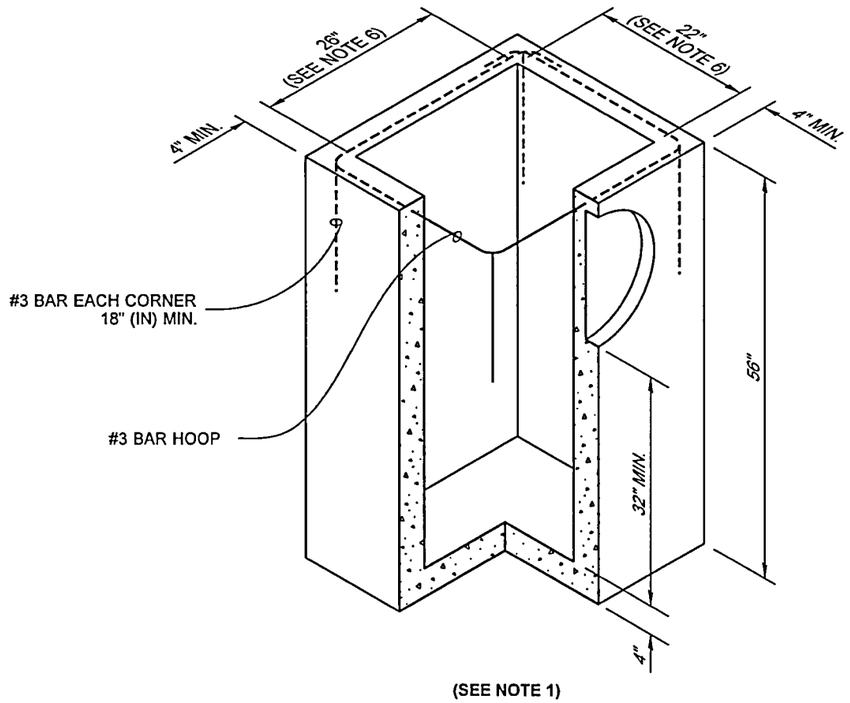
FRAME AND VANED GRATE



RECTANGULAR ADJUSTMENT SECTION



PRECAST BASE SECTION



(SEE NOTE 1)

ALTERNATIVE PRECAST BASE SECTION

NOTES

1. As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION**, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot, shall be used with the minimum required rebar shown in the ALTERNATIVE **PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.

2. The knockout diameter shall not be greater than 18" (in). Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.

3. The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).

4. The frame and grate may be installed with the flange down, or integrally cast into the adjustment section with flange up.

5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.

6. The opening shall be measured at the top of the Precast Base Section.

7. All pickup holes shall be grouted full after the basin has been placed.

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 2:56 PM
cosign

CATCH BASIN TYPE 1P (FOR PARKING LOT)

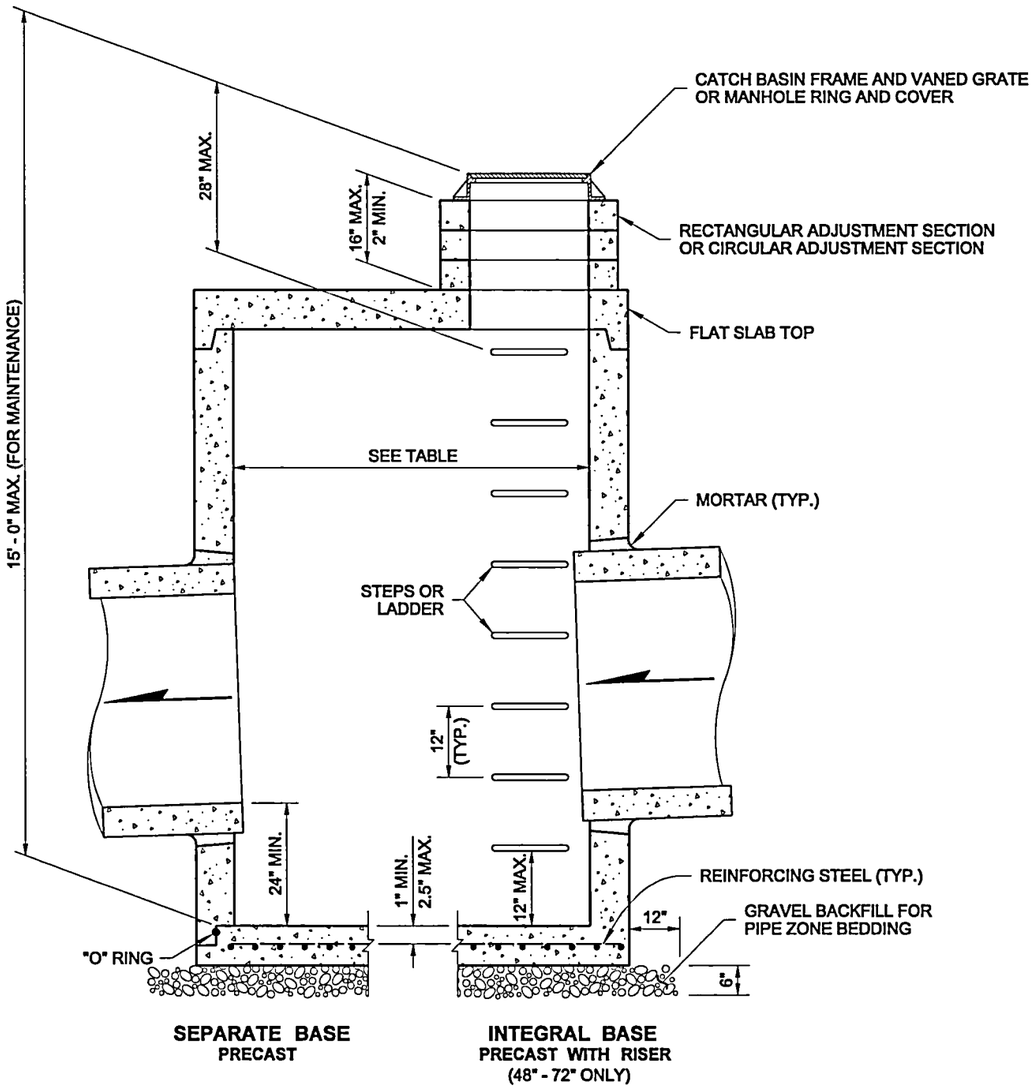
STANDARD PLAN B-5.60-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6 49 AM
cosign

STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: LISA CYFORD



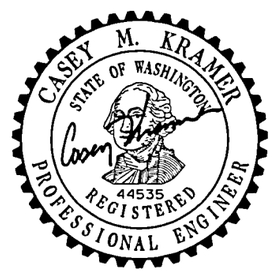
NOTES

1. No steps are required when height is 4' or less.
2. The bottom of the precast catch basin may be sloped to facilitate cleaning.
3. The rectangular frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.
4. Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification 9-04.3.**

CATCH BASIN DIMENSIONS				
CATCH BASIN DIAMETER	MIN. WALL THICKNESS	MIN. BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS
48"	4"	6"	36"	8"
54"	4.5"	8"	42"	8"
60"	5"	8"	48"	8"
72"	6"	8"	60"	12"
84"	8"	12"	72"	12"
96"	8"	12"	84"	12"
120"	10"	12"	96"	12"
144"	12"	12"	108"	12"

PIPE ALLOWANCES					
CATCH BASIN DIAMETER	PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER				
	CONCRETE	ALL METAL	CPSSP ①	SOLID WALL PVC ②	PROFILE WALL PVC ③
48"	24"	30"	24"	30"	30"
54"	30"	36"	30"	36"	36"
60"	36"	42"	36"	42"	42"
72"	42"	54"	42"	48"	48"
84"	54"	60"	54"	48"	48"
96"	60"	72"	60"	48"	48"
120"	66"	84"	60"	48"	48"
144"	78"	96"	60"	48"	48"

① Corrugated Polyethylene Storm Sewer Pipe **(Standard Specification 9-05.20)**
② **(Standard Specification 9-05.12(1))**
③ **(Standard Specification 9-05.12(2))**



1-3-12

CATCH BASIN TYPE 2

STANDARD PLAN B-10.20-01

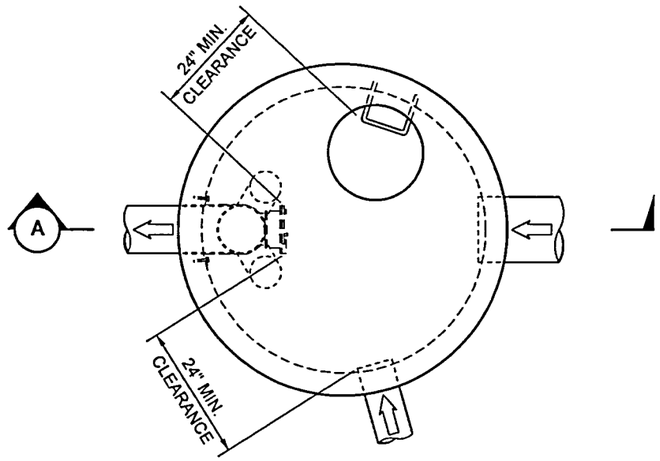
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

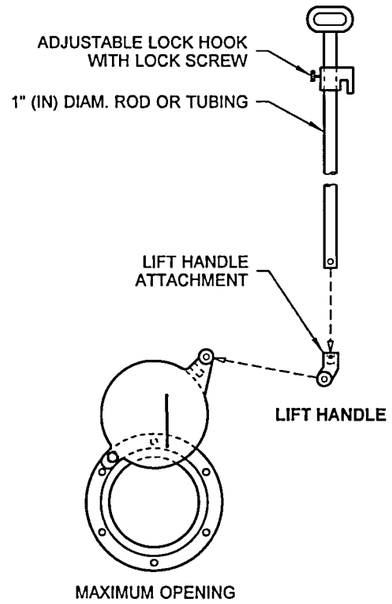
STATE DESIGN ENGINEER — DATE 2/7/12

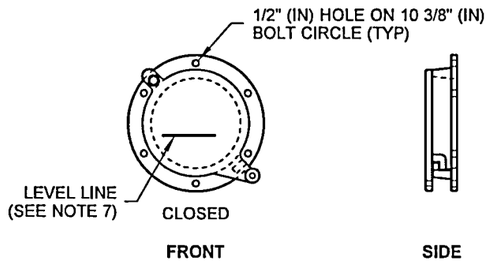
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

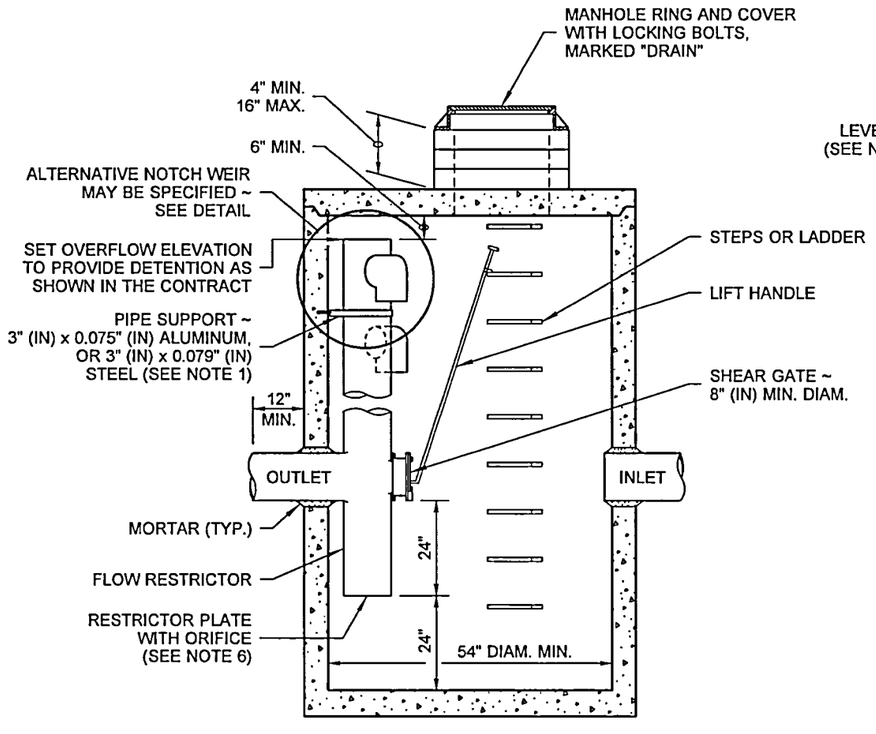


PLAN VIEW

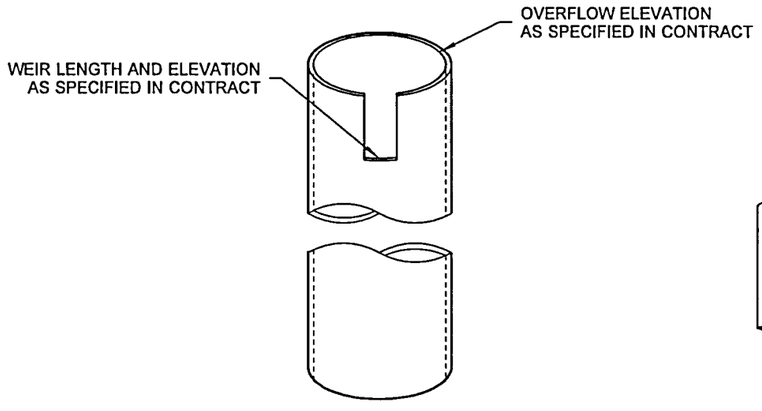




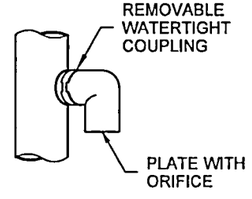
SHEAR GATE DETAILS



SECTION (A)



NOTCH WEIR DETAIL



ELBOW DETAIL

NOTES

1. The pipe supports and the flow restrictor shall be constructed of the same material and be anchored at a maximum spacing of 36" (in). Attach the pipe supports to the manhole with 5/8" (in) stainless steel expansion bolts or embed the supports into the manhole wall 2" (in).
2. The vertical riser stem of the flow restrictor shall be the same diameter as the horizontal outlet pipe with a minimum diameter of 8" (in).
3. The flow restrictor shall be fabricated from one of the following materials:

   0.060" (in) Corrugated Aluminum Alloy Drain Pipe
   0.064" (in) Corrugated Galvanized Steel Drain Pipe with Treatment 1
   0.064" (in) Corrugated Aluminized Steel Drain Pipe
   0.060" (in) Aluminum alloy flat sheet, in accordance with **ASTM B 209, 5052 H32 or EPS** High Density Polyethylene Storm Sewer Pipe
4. The frame and ladder or steps are to be offset so that: the shear gate is visible from the top; the climb-down space is clear of the riser and gate; the frame is clear of the curb.
5. The multi-orifice elbows may be located as shown, or all placed on one side of the riser to assure ladder clearance. The size of the elbows and their placement shall be specified in the Contract.
6. Restrictor plate with orifice as specified in the Contract. The opening is to be cut round and smooth.
7. The shear gate shall be made of aluminum alloy in accordance with **ASTM B 26 and ASTM B 275**, designation **ZG32A**; or cast iron in accordance with **ASTM A 48, Class 30B**.

   The lift handle shall be made of a similar metal to the gate (to prevent galvanic corrosion), it may be of solid rod or hollow tubing, with adjustable hook as required.

   A neoprene rubber gasket is required between the riser mounting flange and the gate flange.

   Install the gate so that the level-line mark is level when the gate is closed.

   The mating surfaces of the lid and the body shall be machined for proper fit.

   All shear gate bolts shall be stainless steel.
8. The shear gate maximum opening shall be controlled by limited hinge movement, a stop tab, or some other device.
9. Alternative shear gate designs are acceptable if material specifications are met.

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 2:57 PM
cosign

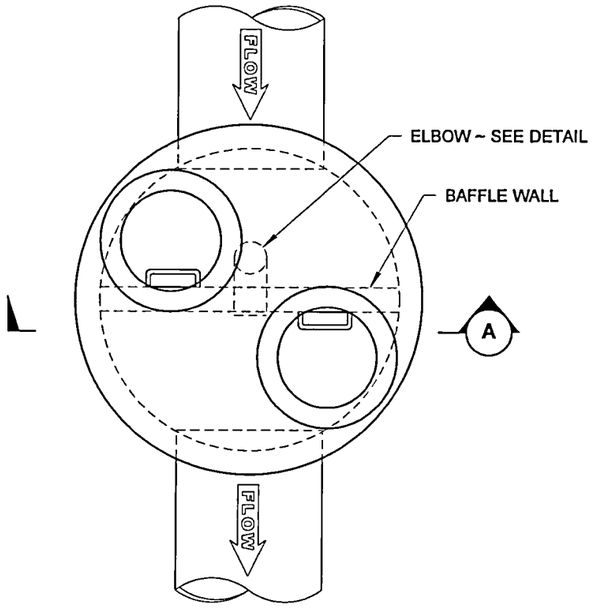
CATCH BASIN TYPE 2 WITH FLOW RESTRICTOR

STANDARD PLAN B-10.40-01

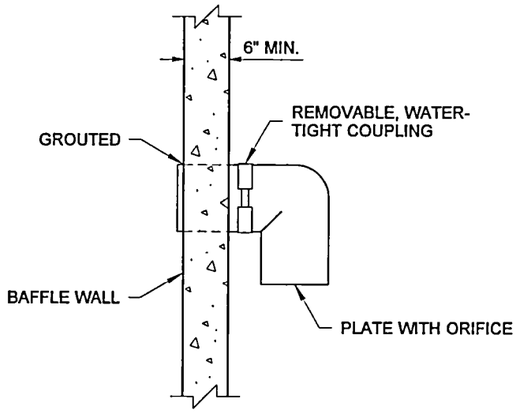
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:49 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: ADAM COCHRAN



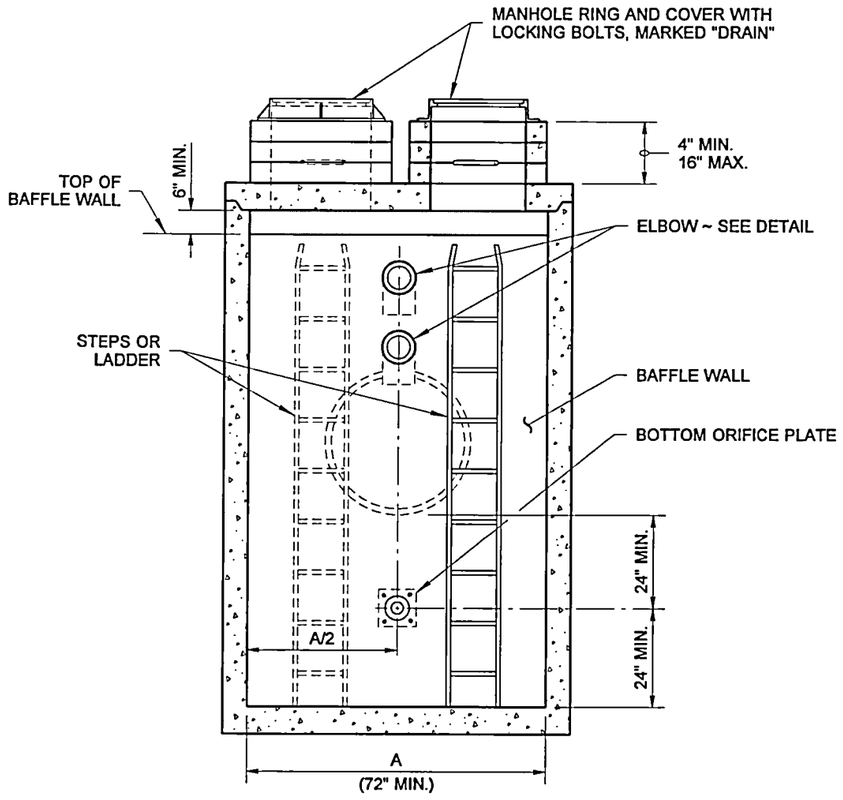
PLAN



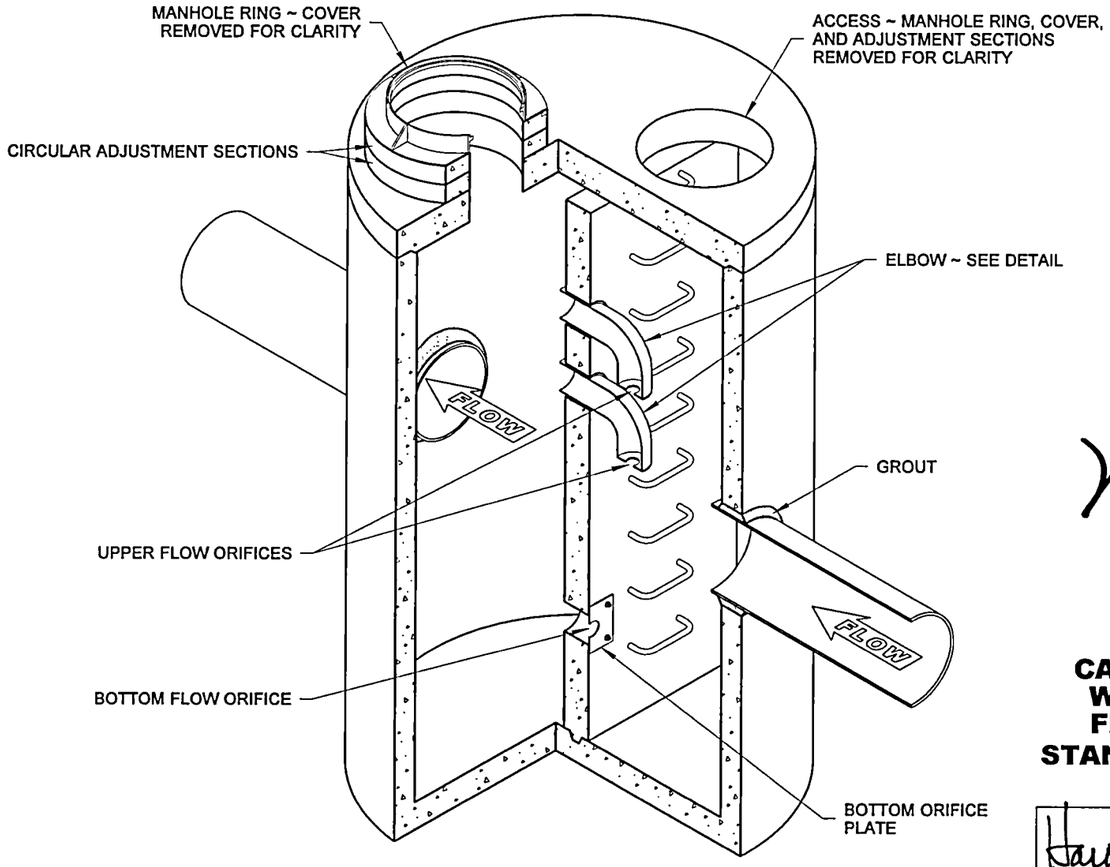
ELBOW DETAIL

NOTES

1. See Contract for size and location of all pipes and orifices.
2. Baffle wall shall have #4 Bar at 12" spacing each way.
3. Precast baffle shall be keyed and grouted in place.
4. Bottom orifice plate shall be galvanized steel with a minimum thickness of 1/4". Attach orifice with 1/2" stainless steel bolts.
5. Upper flow orifice plates and elbows shall be aluminum, aluminized steel or galvanized steel. Galvanized steel shall have Treatment 1.



SECTION (A)



ISOMETRIC CUTAWAY

MATTHEW J. WITECKI
STATE OF WASHINGTON
15578
REGISTERED PROFESSIONAL ENGINEER
6/8/06

EXPIRES JULY 1, 2007

CATCH BASIN TYPE 2 WITH BAFFLE TYPE FLOW RESTRICTOR STANDARD PLAN B-10.60-00

SHEET 1 OF 1 SHEET

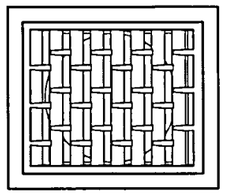
APPROVED FOR PUBLICATION

Harold Peterson 6-8-06

STATE DESIGN ENGINEER — DATE

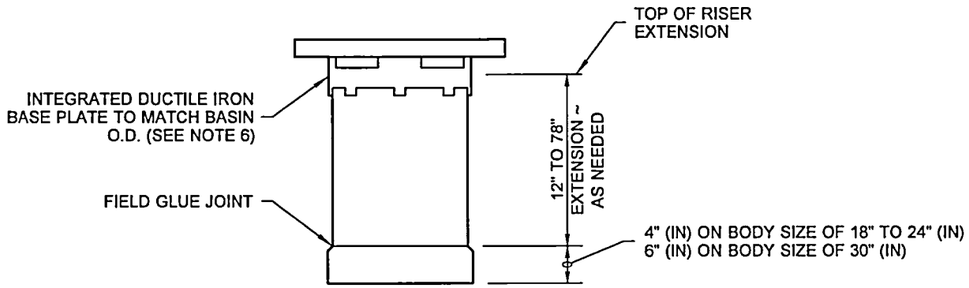
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

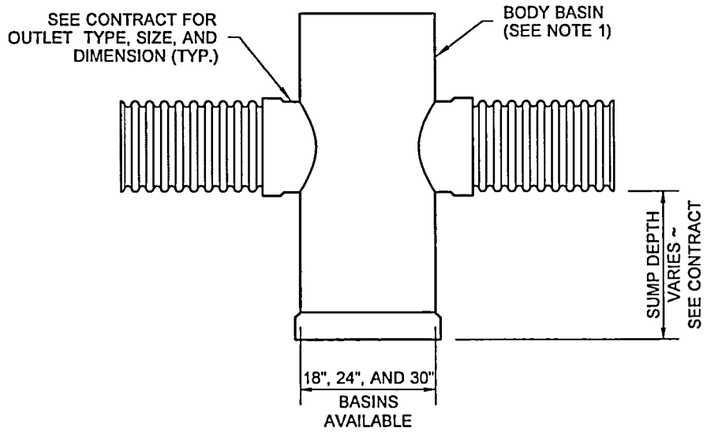


PLAN VIEW

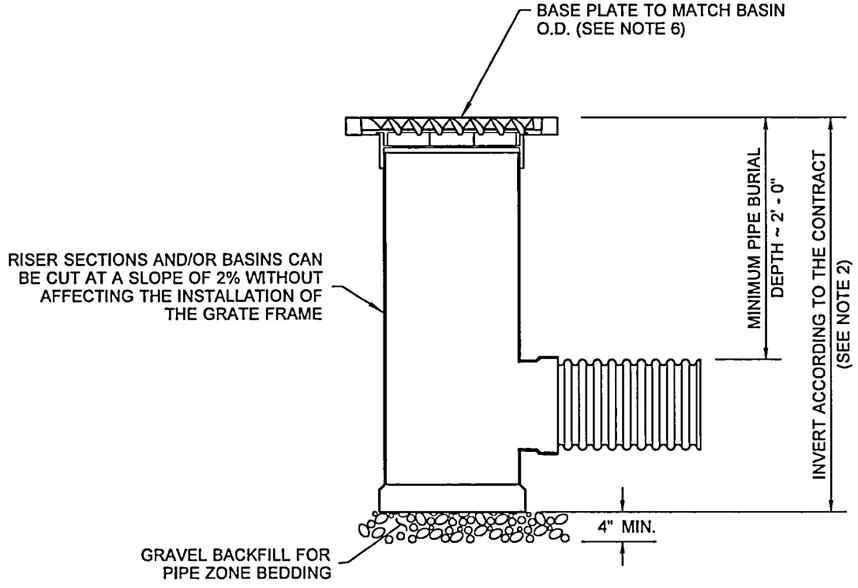
FRAME AND VANED GRATE



RISER EXTENSION



BASIN BODY



ELEVATION VIEW

NOTES

1. Drain basin to be custom manufactured according to plan details. Risers are needed for basins over 84" (in) due to shipping restrictions. The maximum depth from finished grade to the lowest invert shall be 8' (ft).
2. Drainage connections shall utilize flexable elastometric seals conforming to **ASTM F477** and shall meet the requirements of **ASTM D3212**.
3. Risers can be trimmed down to 3" (in) extension without interfering with the installation of the frame.
4. These structures can be used for Type 1, Type 1L, and Type 2 structures. usage for the Type 2 structures shall be limited to pipe size use only.
5. Basins shall be manufactured from PVC pipe stock meeting the requirements of **ASTM D1784**, cell classification **12454**.
6. Ductile iron castings for PVC catch basins shall conform to the requirements of **ASTM A536, grade 70-50-05**, and shall meet the proof load testing requirements of **AASHTO M 306**.
7. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.

INTEGRATED DUCTILE IRON

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 2:57 PM
cosign

CATCH BASIN - PVC

STANDARD PLAN B-10.70-00

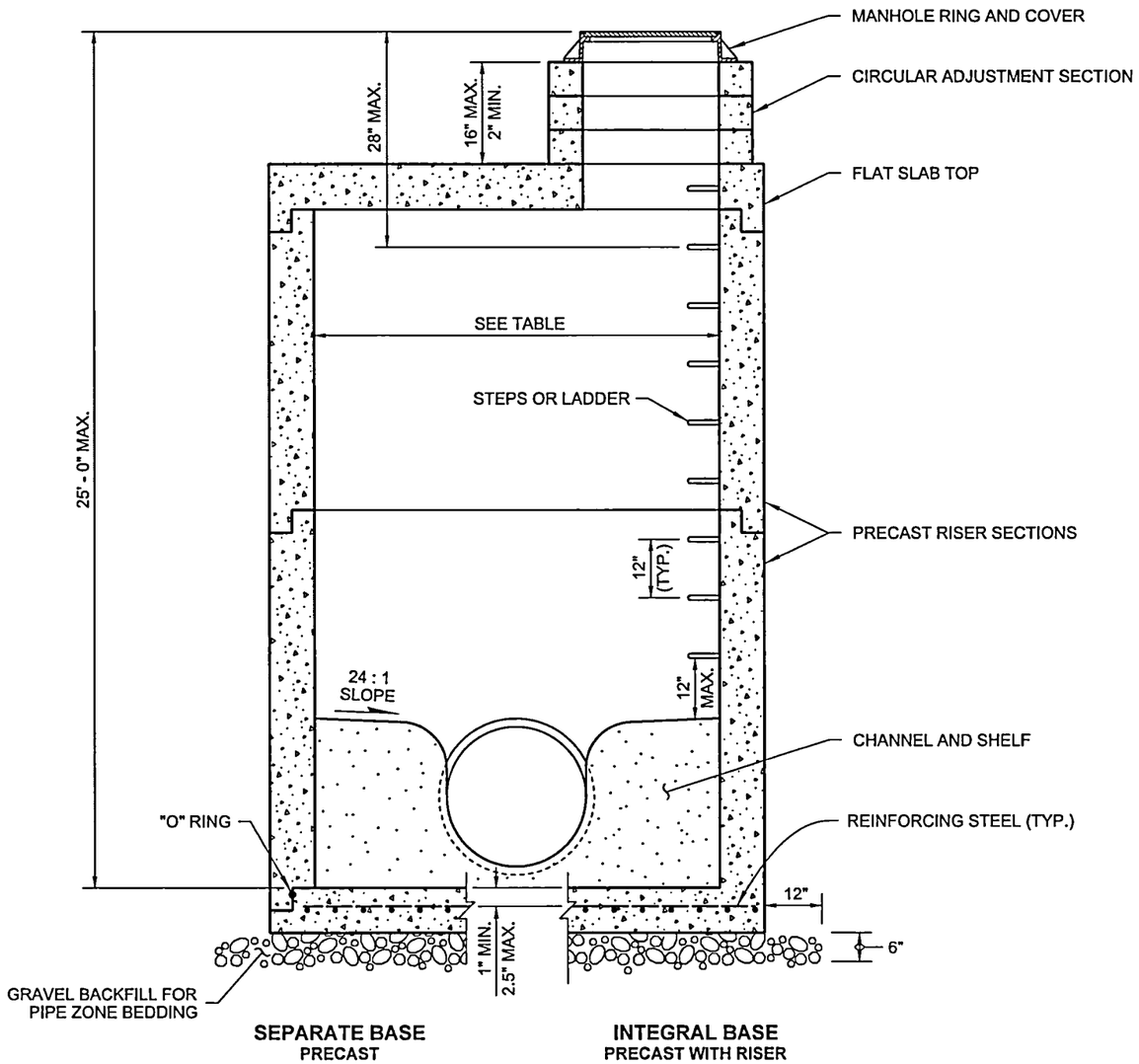
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:50 AM
cosign

STATE DESIGN ENGINEER
Washington State Department of Transportation

This page left blank intentionally.

DRAWN BY: LISA CYFORD



NOTES

1. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum.
2. For pipe allowances, see **Standard Plan B-10.20.**
3. No steps are required when height is 4' (ft) or less.

MANHOLE DIMENSION TABLE				
DIAM.	MIN. WALL THICKNESS	MIN. BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS
48"	4"	6"	36"	8"
54"	4.5"	8"	42"	8"
60"	5"	8"	48"	8"
72"	6"	8"	60"	12"
84"	8"	12"	72"	12"
96"	8"	12"	84"	12"
120"	10"	12"	96"	12"
144"	12"	12"	108"	12"

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Julie Heilman
Heilman, Julie
Jan 25 2017 2:58 PM
cosign

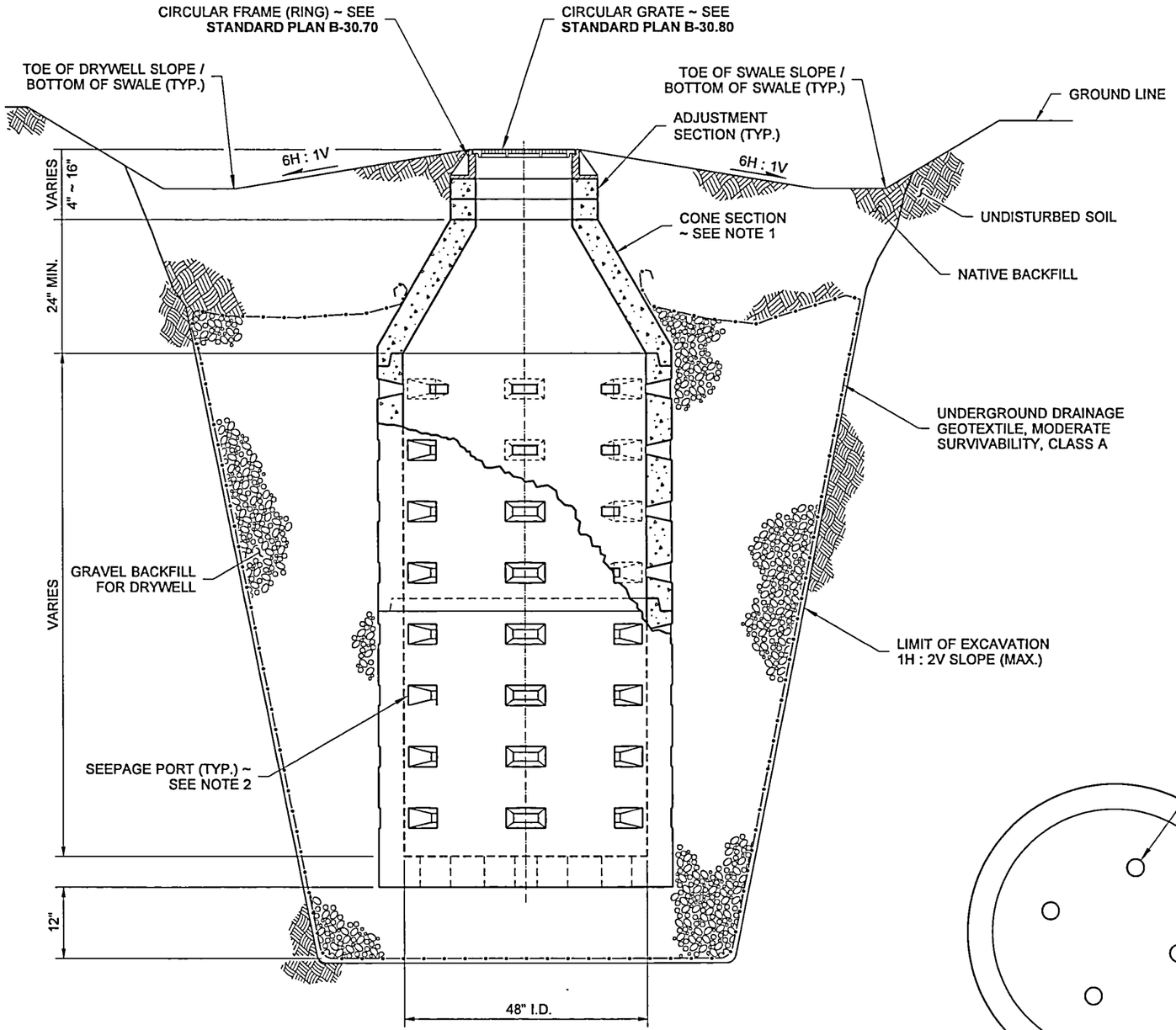
MANHOLE TYPE 3

STANDARD PLAN B-15.60-02

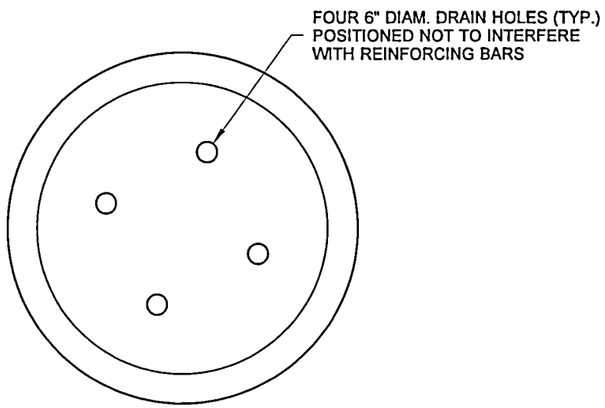
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:50 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



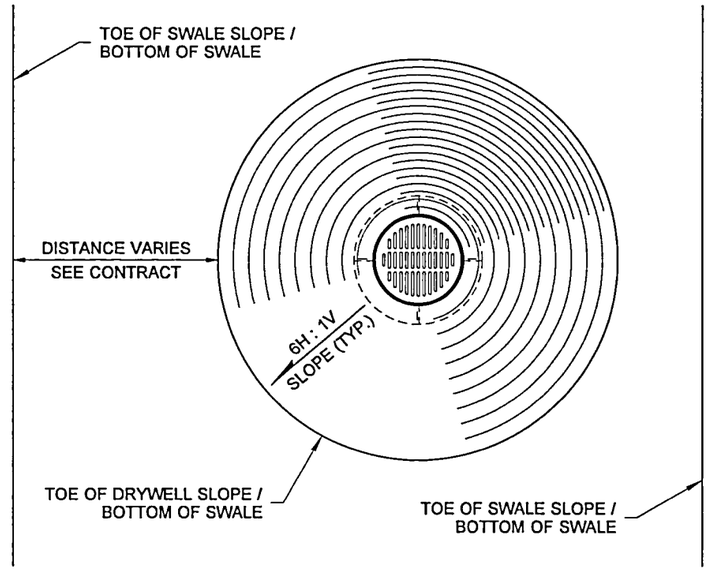
CUTAWAY ELEVATION VIEW



INTEGRAL BASE DETAIL

NOTES

1. Precast concrete cone sections may be eccentric or concentric.
2. Seepage port orientation varies among manufacturers.
3. When necessary, knockouts on precast cone, drywell base and riser sections shall have a wall thickness of 1 1/2" minimum and 2" maximum.



PLAN VIEW

CASEY M. KRAMER
STATE OF WASHINGTON
44535
REGISTERED
PROFESSIONAL ENGINEER
3/14/12

DRYWELL TYPE 1 (FOR SWALE)

STANDARD PLAN B-20.20-02

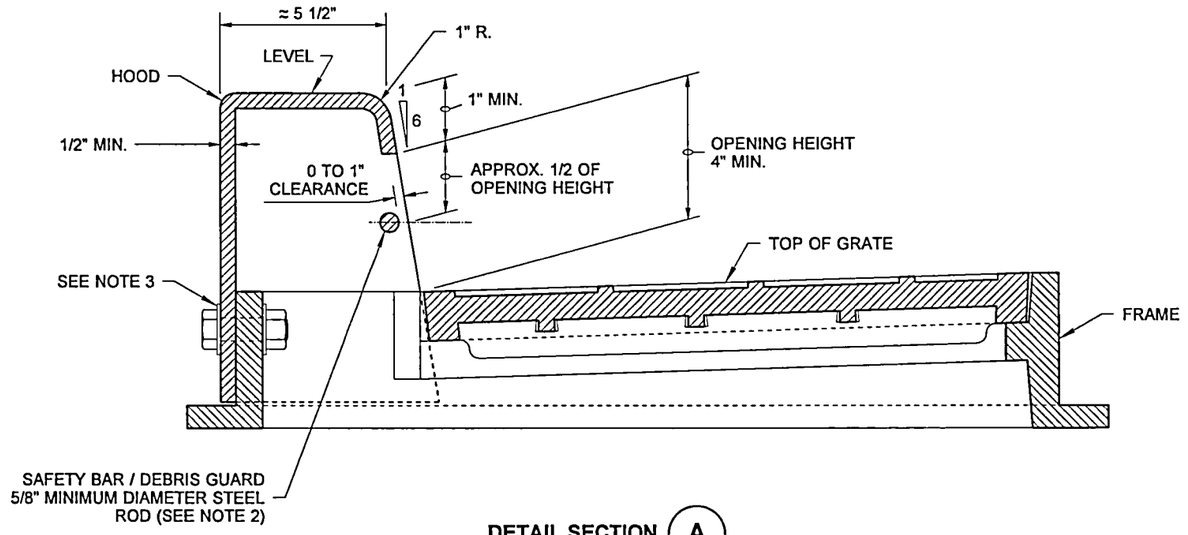
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 3/16/12

Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



DETAIL SECTION (A)

NOTES

1. This inlet requires the precast catch basin unit to be rotated 90 degrees so that the narrow side is parallel to the curb line. When calculating offsets from curb to CL of the precast catch basin, please note that the CL of the grate is not the CL of the precast catch basin. See **Section A**

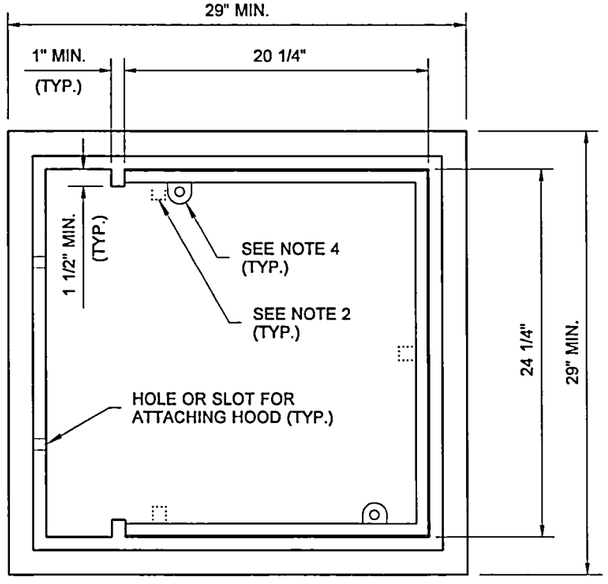
2. The dimensions of the frame and hood may vary slightly among different manufacturers. The Frame may have cast features intended to support a debris guard. Hood units may be mounted inside or outside of the frame. The methods for fastening the safety bar / debris guard rod to the hood may vary. The hood may include casting lugs. The top of the hood may be cast with a pattern.

3. Attach the hood to the frame with two 3/4" × 2" hex head bolts, nuts, and oversize washers. The washers shall have diameters adequate to ensure full bearing across the slots.

4. Bolt-down capability is required on all frames, grates and covers, unless specified in the Contract. Provide two holes in the Frame that are vertically aligned with the grate slots. The frame shall accept the 5/8" × 11 NC × 2" allen head cap screw by being tapped, or other approved mechanism. The location of bolt-down holes varies among manufacturers. See BOLT-DOWN DETAIL, **Standard Plan B-30.10.**

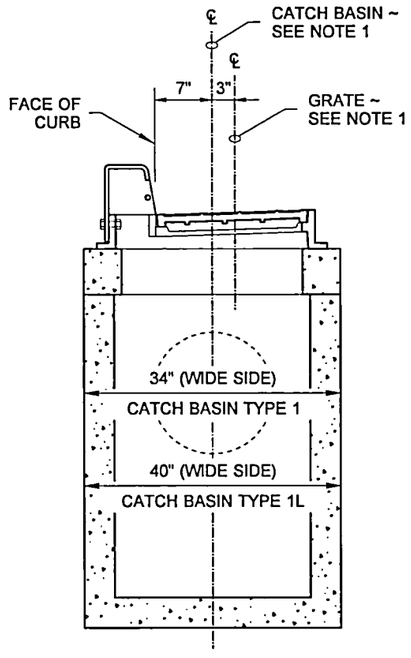
5. Only ductile iron Vaned Grates shall be used. See **Standard Plans B-30.30 and B-30.40** for grate details. Refer to **Standard Specification 9-05.15(2)** for additional requirements.

6. This plan is intended to show the installation details of a manufactured product. This plan is not intended to show the specific details necessary to fabricate the castings depicted in this drawing.

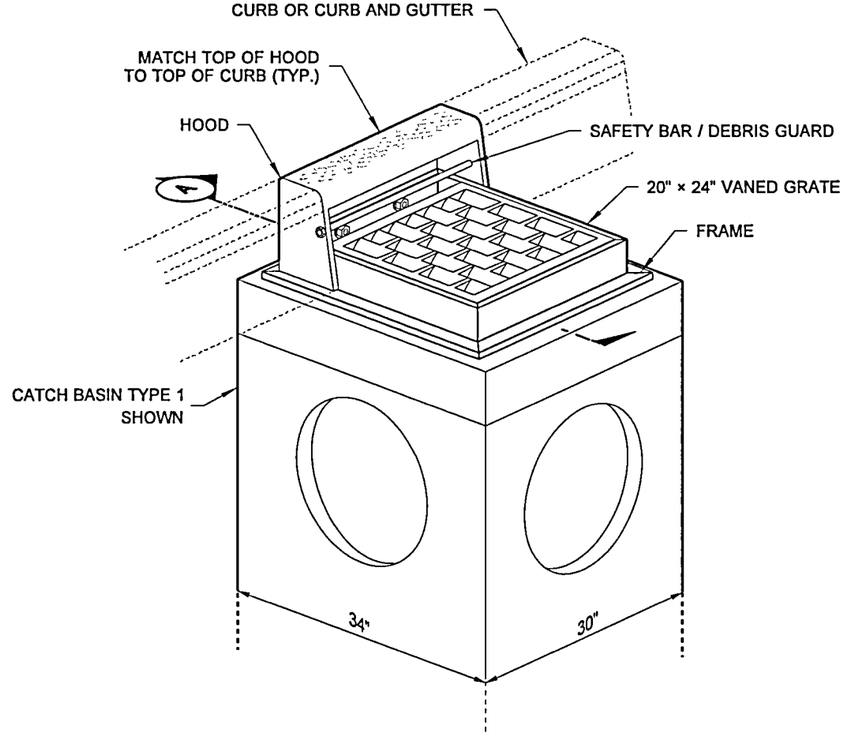


TOP VIEW

FRAME DETAIL



SECTION (A)



ISOMETRIC VIEW

COMBINATION INLET
FRAME, HOOD, AND VANED GRATE

CASEY M. KRAMER
STATE OF WASHINGTON
44535
REGISTERED
PROFESSIONAL ENGINEER
3/14/12

COMBINATION INLET

STANDARD PLAN B-25.20-01

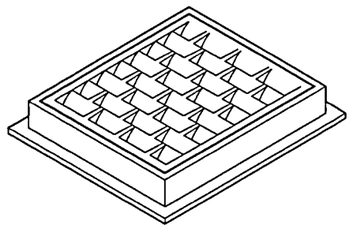
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

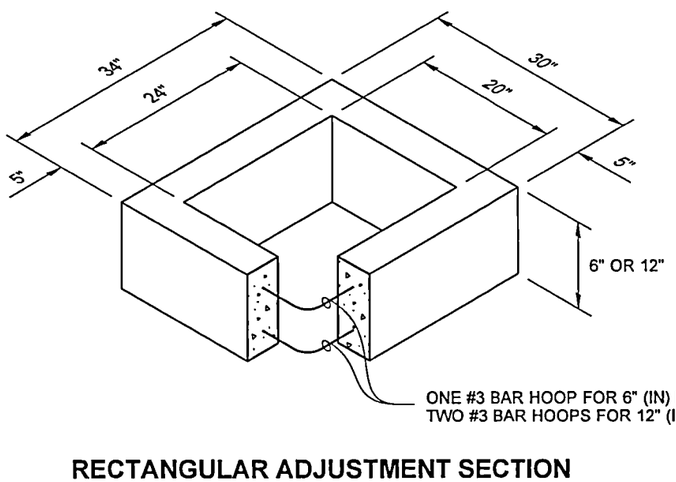
STATE DESIGN ENGINEER — DATE 3/15/12

Washington State Department of Transportation

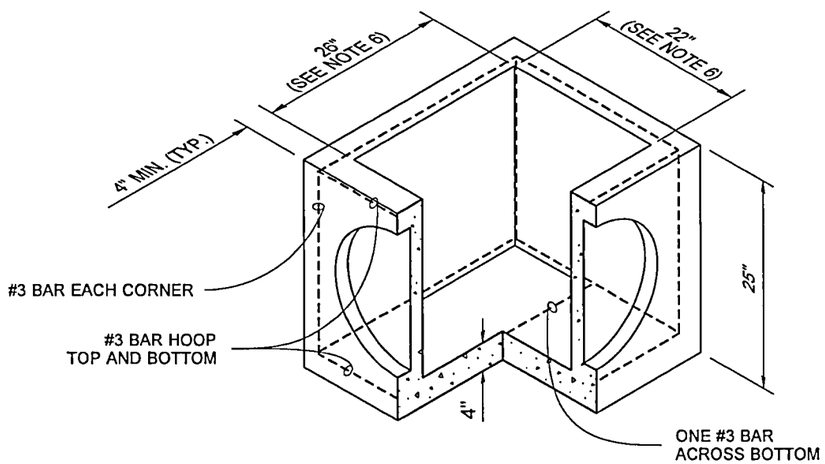
DRAWN BY: MARK SUJKA



FRAME AND VANED GRATE



RECTANGULAR ADJUSTMENT SECTION

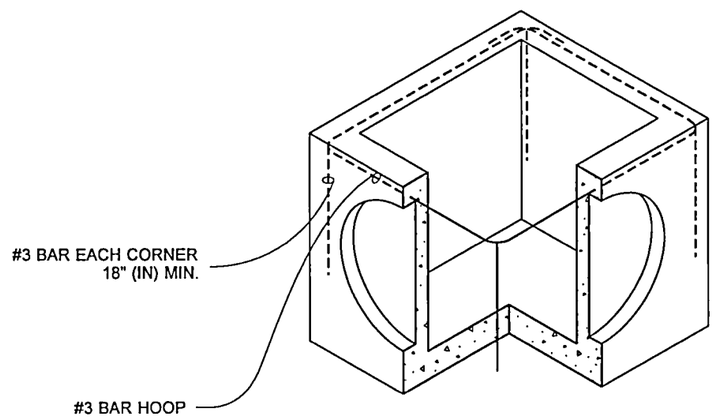


PRECAST BASE SECTION

PIPE ALLOWANCES

PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
CPSSP * (STD. SPEC. SECT. 9-05.20)	12"
SOLID WALL PVC (STD. SPEC. SECT. 9-05.12(1))	15"
PROFILE WALL PVC (STD. SPEC. SECT. 9-05.12(2))	15"

* CORRUGATED POLYETHYLENE STORM SEWER PIPE



SEE NOTE 1

ALTERNATIVE PRECAST BASE SECTION

NOTES

1. As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION**, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the **ALTERNATIVE PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.
2. The knockout diameter shall not be greater than 18" (in) . Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.
3. The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).
4. The frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.
5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.
6. The opening shall be measured at the top of the precast base section.
7. All pickup holes shall be grouted full after the inlet has been placed.

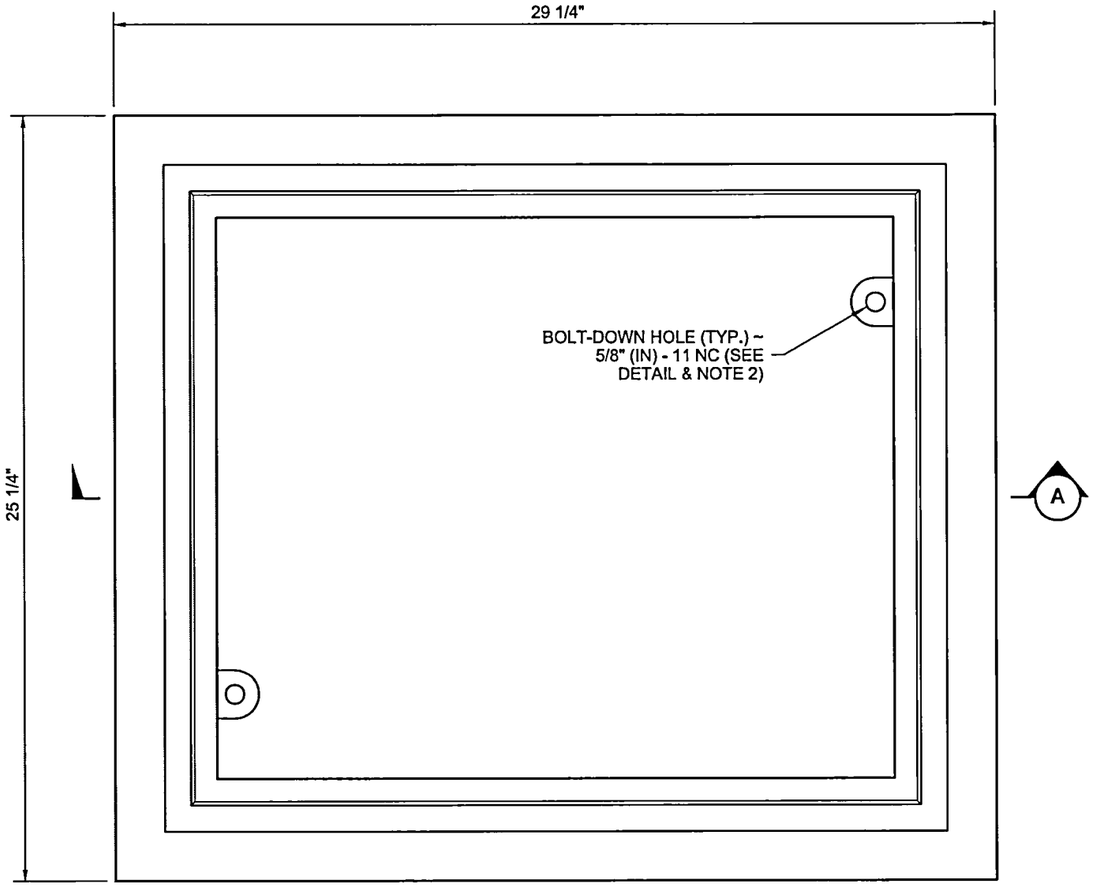
Heilman, Julie
Jan 25 2017 2:58 PM
cosign

CONCRETE INLET

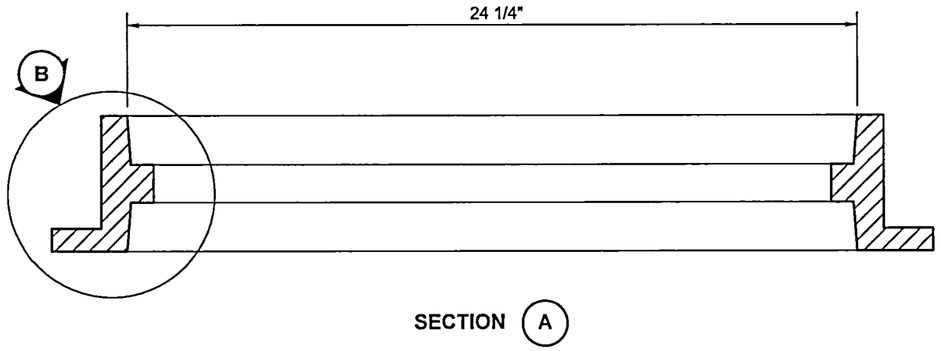
STANDARD PLAN B-25.60-01

SHEET 1 OF 1 SHEET

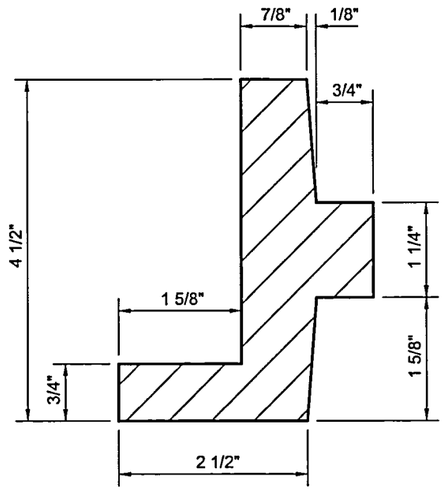
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:50 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation



TOP



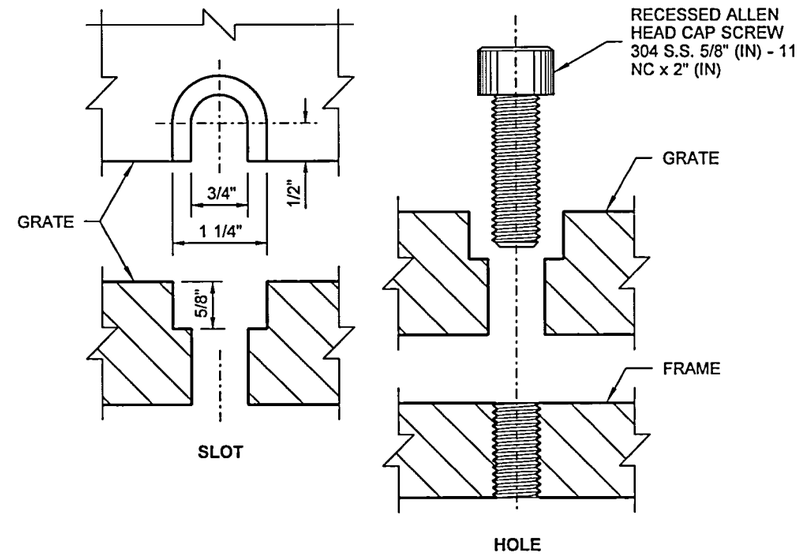
SECTION (A)



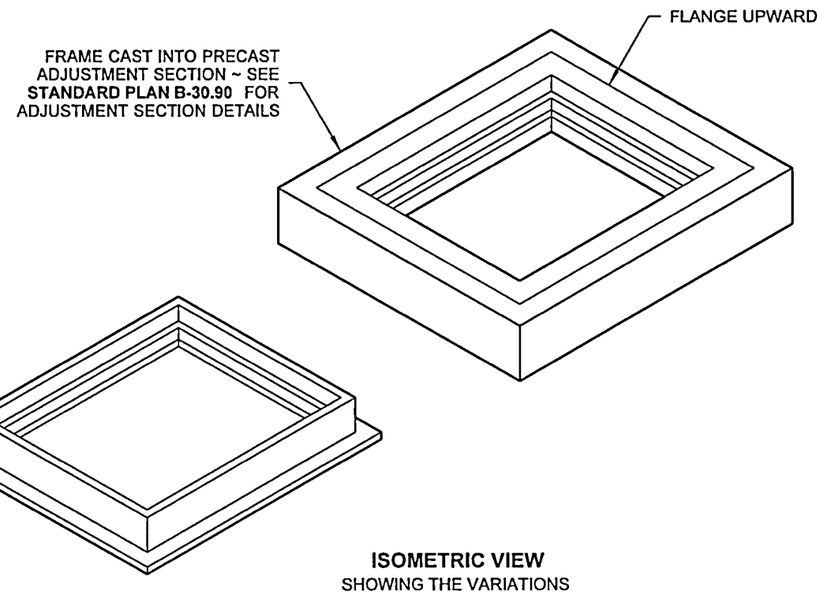
DETAIL (B)

NOTES

1. This frame is designed to accommodate 20" (in) × 24" (in) grates or covers as shown on **Standard Plans B-30.20, B-30.30, B-30.40,** and **B-30.50.**
2. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
3. Refer to **Standard Specification Section 9-05.15(2)** for additional requirements.



BOLT-DOWN DETAILS
SEE NOTE 2



ISOMETRIC VIEW
SHOWING THE VARIATIONS

DRAWN BY: FERN LIDDELL

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 2:59 PM
cosign

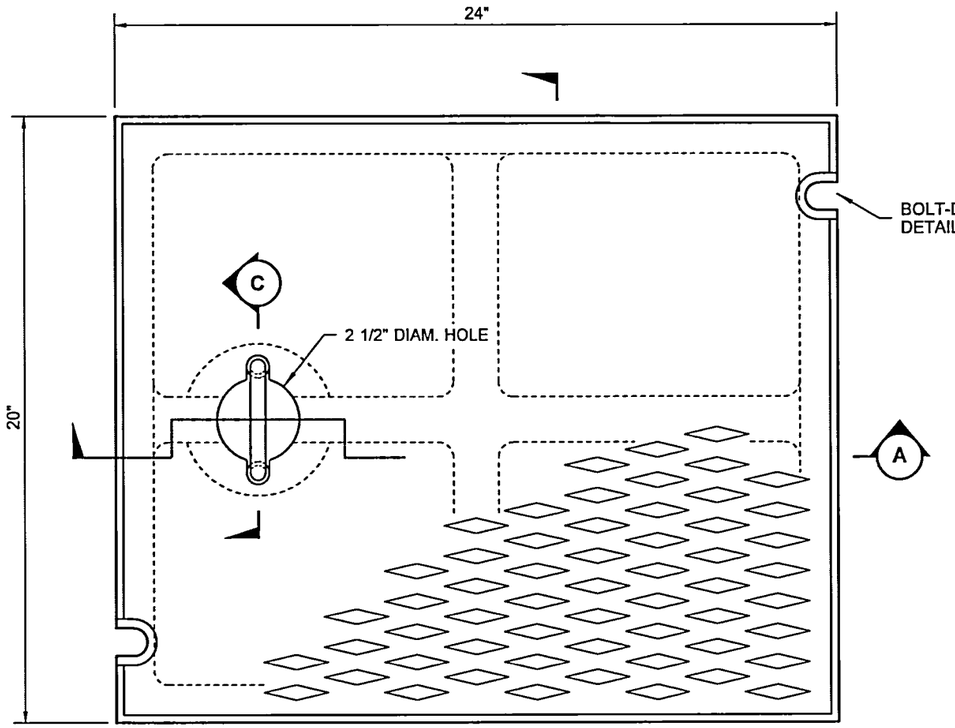
RECTANGULAR FRAME (REVERSIBLE)

STANDARD PLAN B-30.10-02

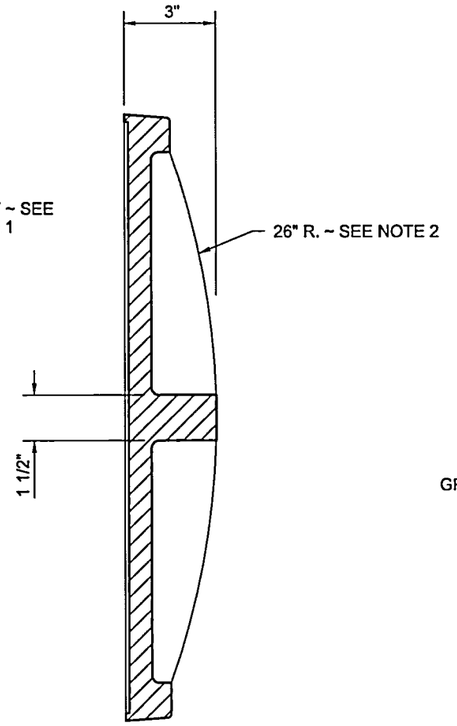
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:51 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



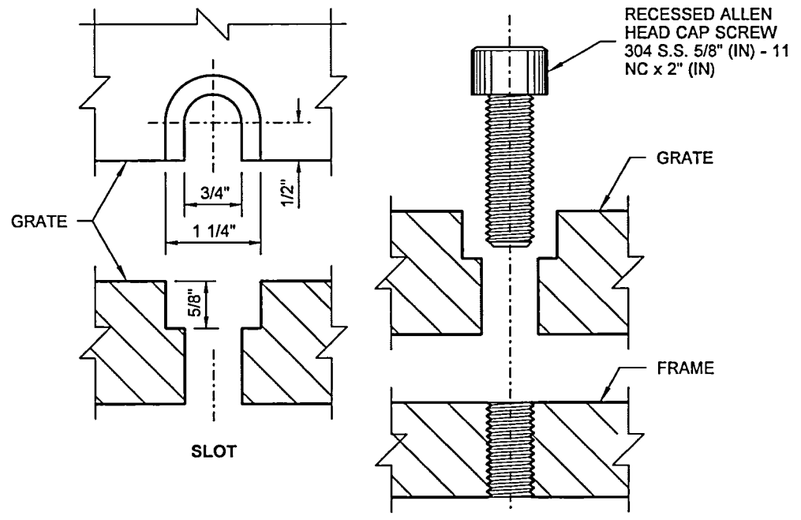
TOP B



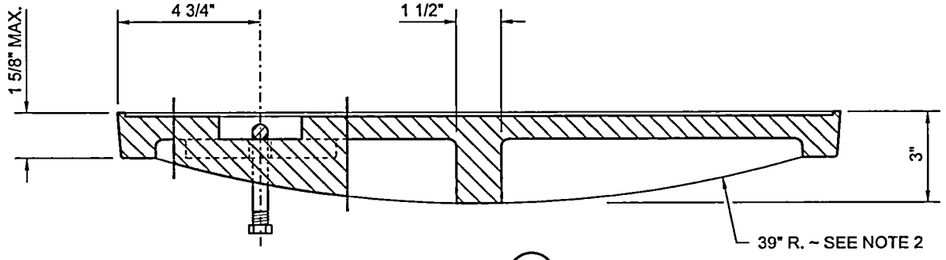
SECTION B

NOTES

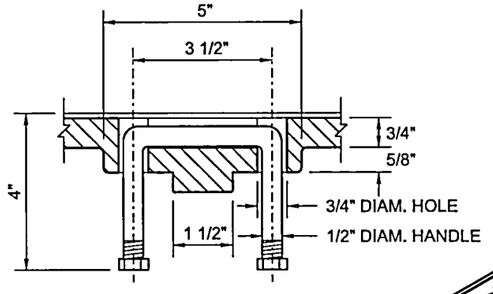
1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
2. Alternative reinforcing designs are acceptable in lieu of the rib design.
3. Refer to **Standard Specification Section 9-05.15(2)** for additional requirements.
4. For frame details, see **Standard Plan B-30.10.**



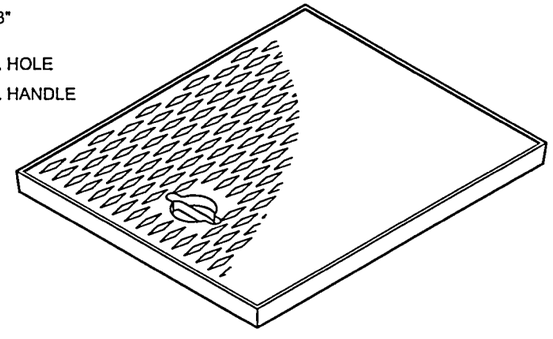
BOLT-DOWN DETAILS
SEE NOTE 1



SECTION A



SECTION C



ISOMETRIC

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 2:59 PM

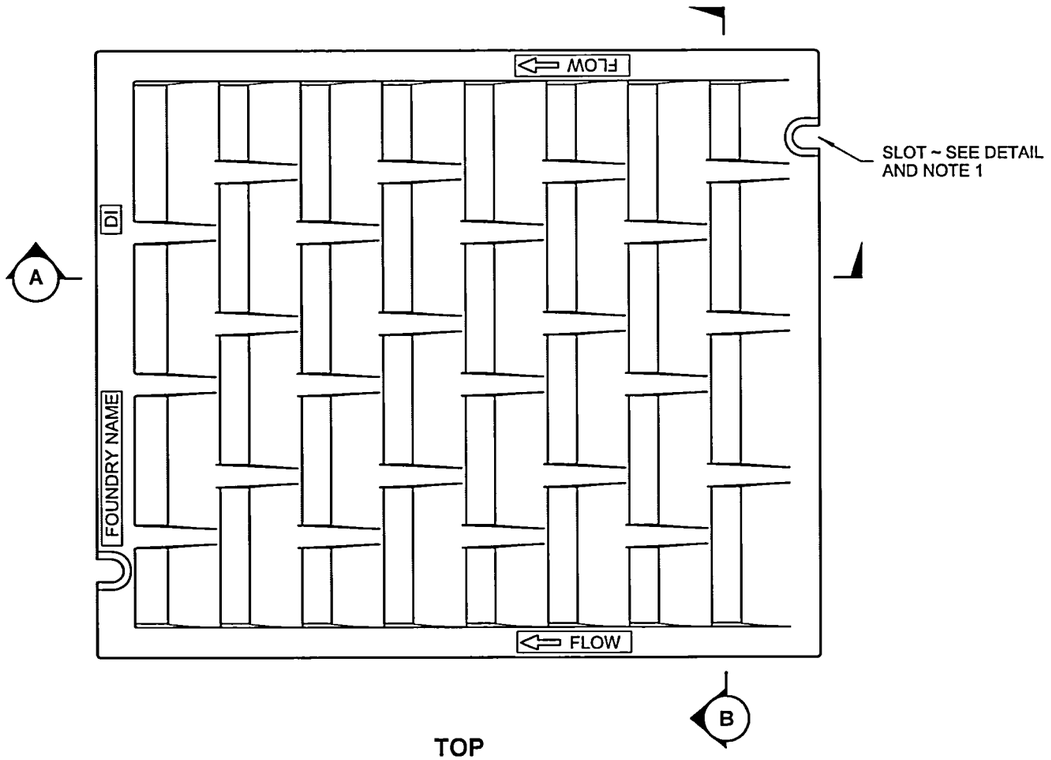
RECTANGULAR SOLID METAL COVER

STANDARD PLAN B-30.20-03

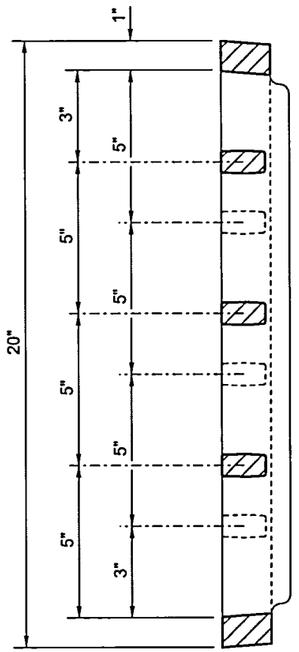
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:51 AM

STATE DESIGN ENGINEER
Washington State Department of Transportation



TOP

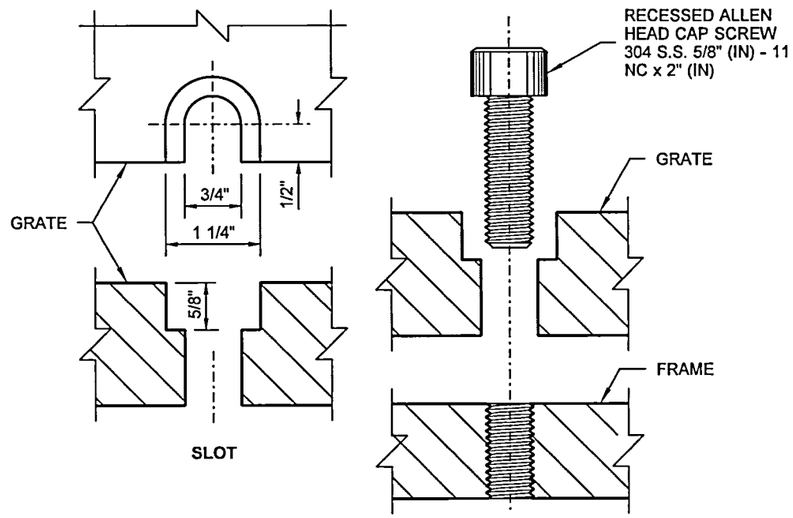


SECTION B

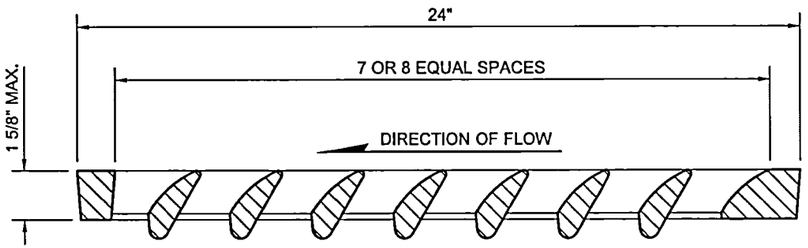
DRAWN BY: FERN LIDDELL

NOTES

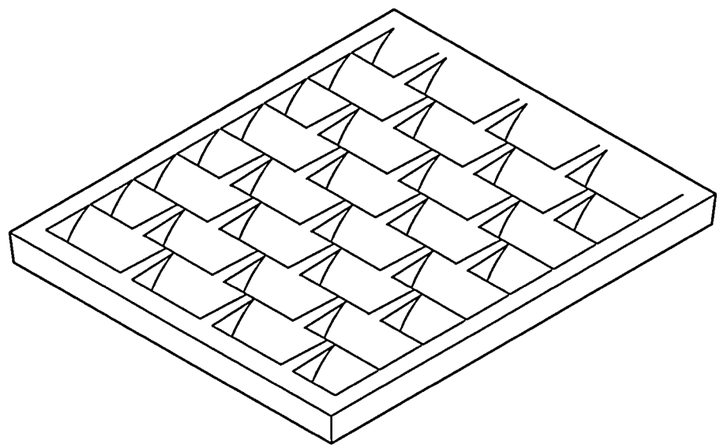
1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
2. Refer to **Standard Specification Section 9-05.15(2)** for additional requirements.
3. For frame details, see **Standard Plan B-30.10**.



BOLT-DOWN DETAILS
SEE NOTE 1



SECTION A



ISOMETRIC

Heilman, Julie
Jan 25 2017 3:00 PM

RECTANGULAR VANED GRATE

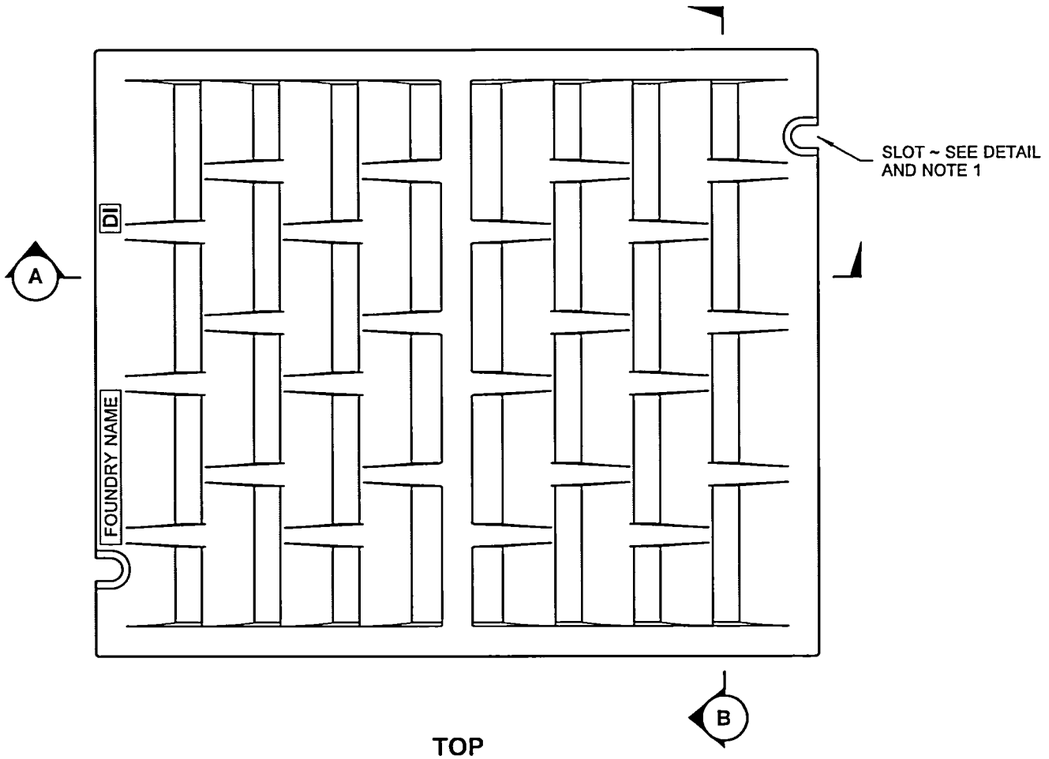
STANDARD PLAN B-30.30-02

SHEET 1 OF 1 SHEET

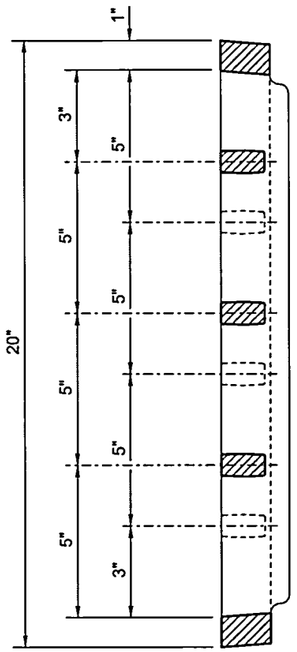
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6 51 AM

STATE DESIGN ENGINEER

Washington State Department of Transportation



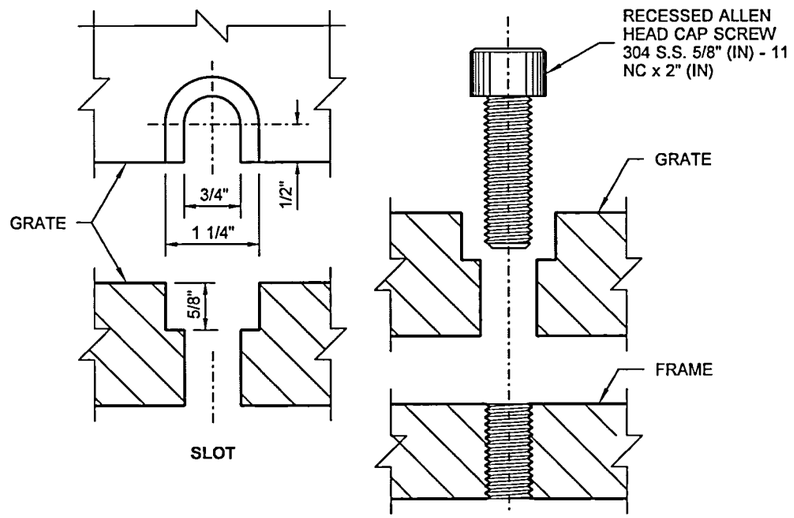
TOP



SECTION (B)

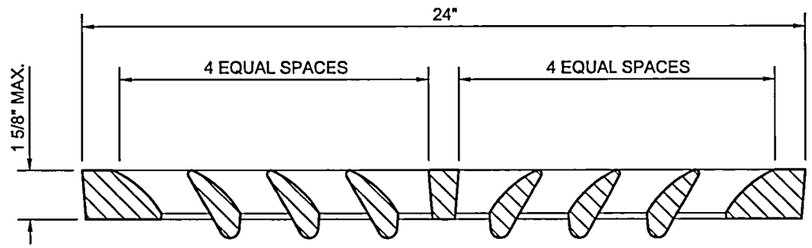
NOTES

1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
2. Refer to **Standard Specification Section 9-05.15(2)** for additional requirements.
3. For frame details, see **Standard Plan B-30.10.**

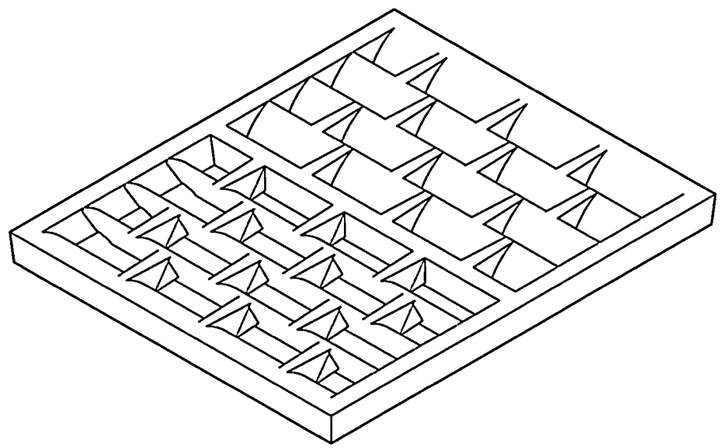


HOLE

BOLT-DOWN DETAILS
SEE NOTE 1



SECTION (A)



ISOMETRIC

DRAWN BY: FERN LIDDELL

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 3:00 PM

RECTANGULAR BI-DIRECTIONAL VANED GRATE

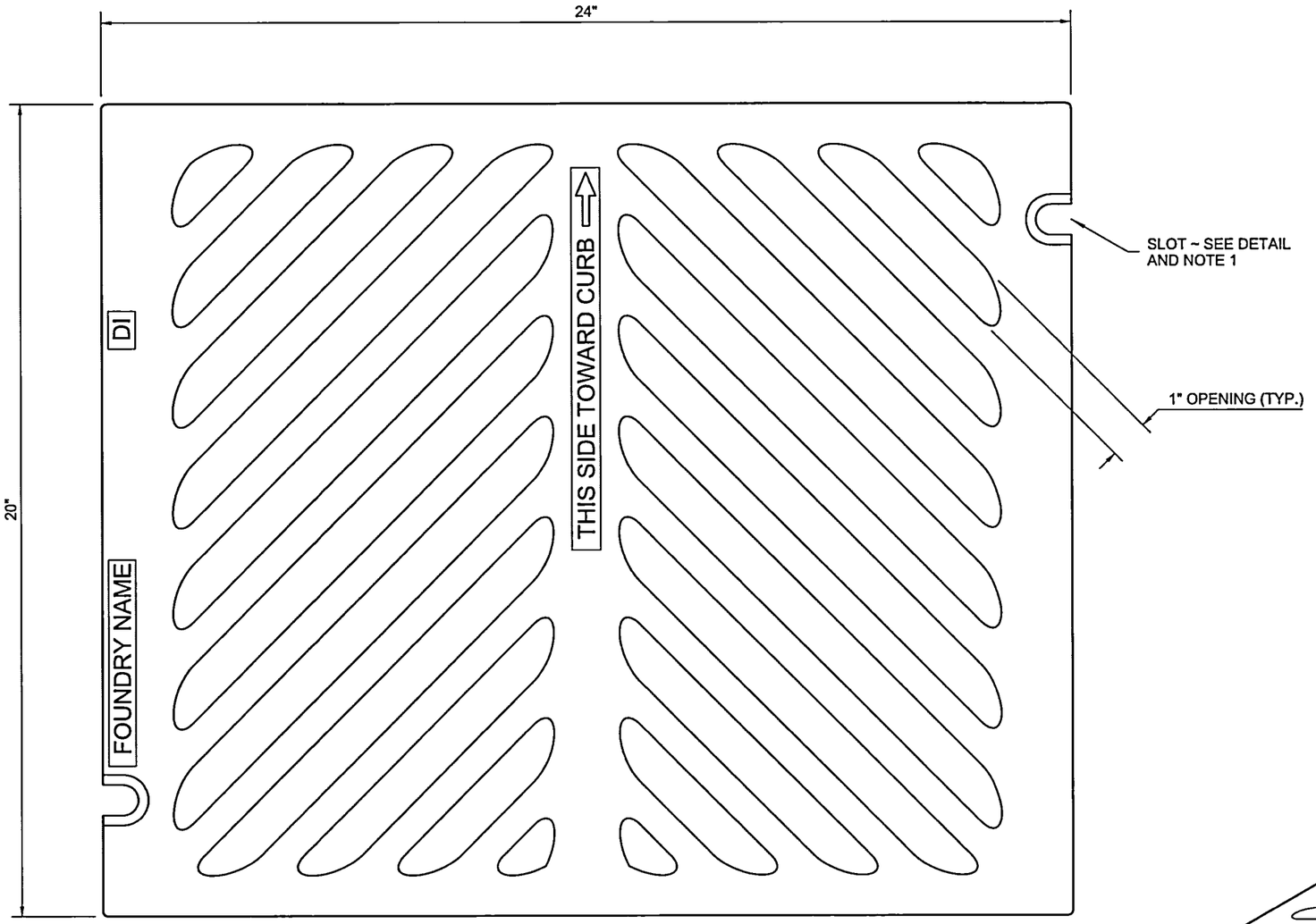
STANDARD PLAN B-30.40-02

SHEET 1 OF 1 SHEET

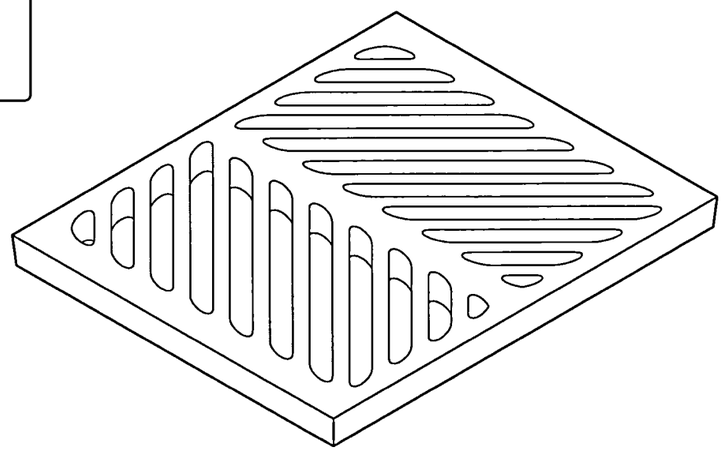
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:52 AM

STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



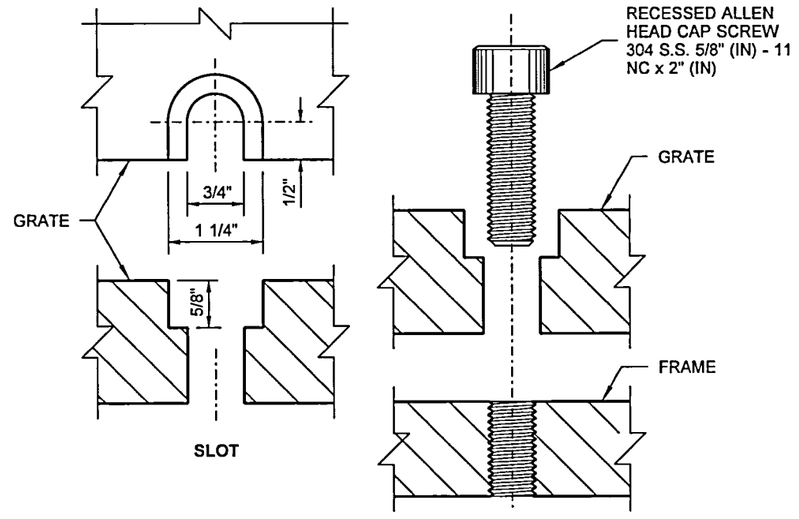
TOP



ISOMETRIC

NOTES

1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
2. Refer to **Standard Specification section 9-05.15(2)** for additional requirements.
3. For frame details, see **Standard Plan B-30.10**.
4. The thickness of the grate shall not exceed 1 5/8" (in).



BOLT-DOWN DETAILS
SEE NOTE 1

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 3:00 PM
cosign

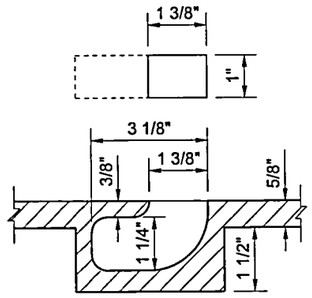
RECTANGULAR HERRINGBONE GRATE

STANDARD PLAN B-30.50-02

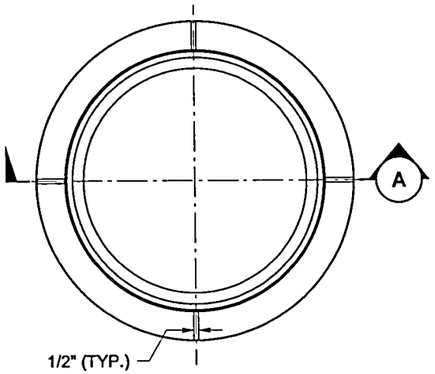
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6 52 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

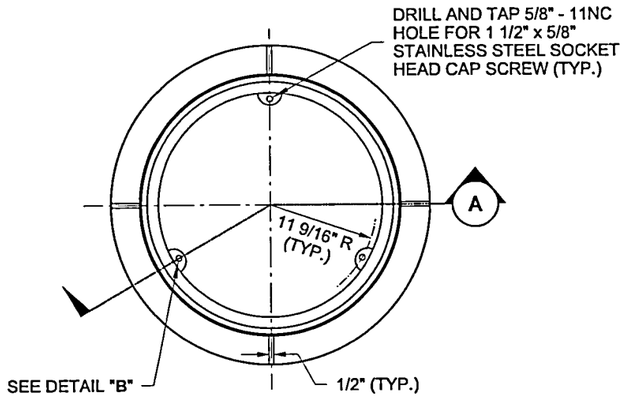
DRAWN BY: LISA CYFORD



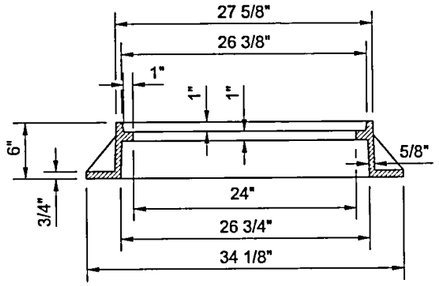
BLIND PICK NOTCH
DETAIL "A"



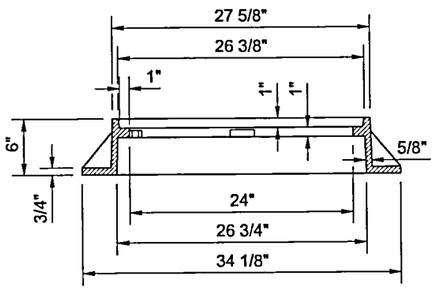
RING PLAN



RING PLAN



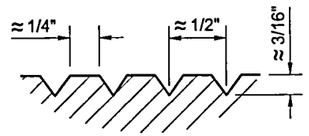
RING SECTION (A)



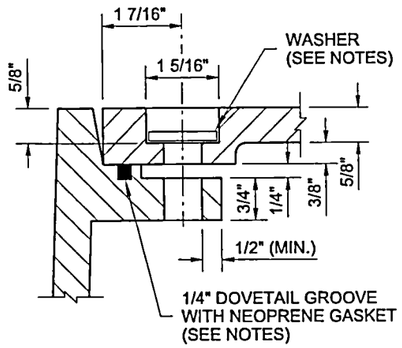
RING SECTION (A)

NOTES

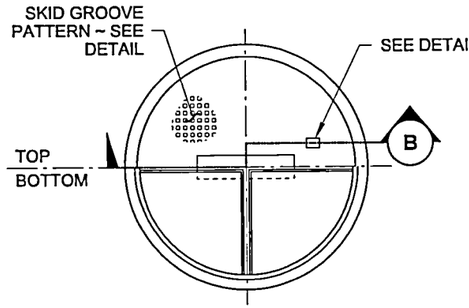
1. The gasket and groove may be in the seat (frame) or in the underside of the cover. The gasket may be "T" shaped in section. The groove may be cast or machined.
2. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 3 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 5/8" - 1 NC × 2" Allen head cap screw by being tapped, or other approved mechanism. Location of bolt down holes varies by manufacturer.
3. For bolt-down manhole ring and covers that are not designated "Watertight," the neoprene gasket, groove, and washer are not required.
4. Washer shall be neoprene (Detail "B").
5. In lieu of blind pick notch for manhole covers, a single 1" pick hole is acceptable. Hole location and number of holes may vary by manufacturer.
6. Alternative reinforcing designs are acceptable in lieu of the rib design.
7. For clarity, the vertical scale of the Cover Section has been exaggerated, it is 1.5 times the horizontal scale (1H:1.5V).



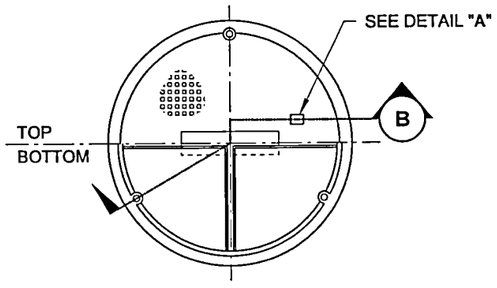
SKID GROOVE PATTERN DETAIL



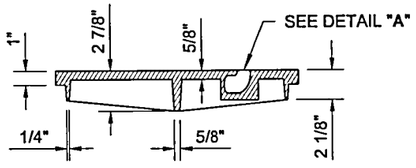
BOLT-DOWN / WATERTIGHT
DETAIL "B"



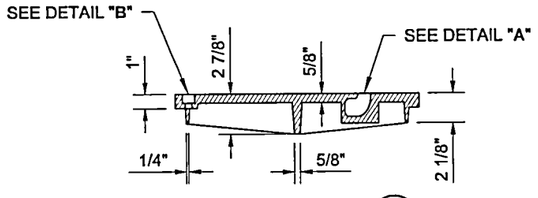
COVER PLAN



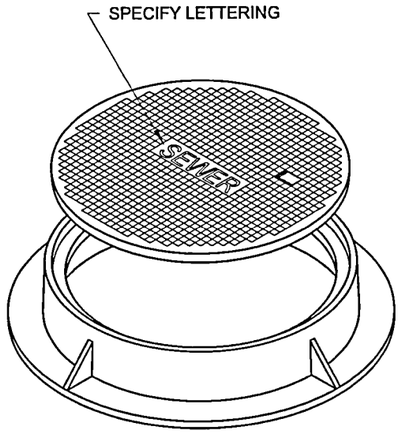
COVER PLAN



COVER SECTION (B)
(SEE NOTE 7)
STANDARD
TYPE 1



COVER SECTION (B)
(SEE NOTE 7)
BOLT-DOWN / WATERTIGHT
TYPE 2



ISOMETRIC VIEW

CASEY M. KRAMER
STATE OF WASHINGTON
44535
REGISTERED
PROFESSIONAL ENGINEER

4-25-12

CIRCULAR FRAME (RING) AND COVER

STANDARD PLAN B-30.70-03

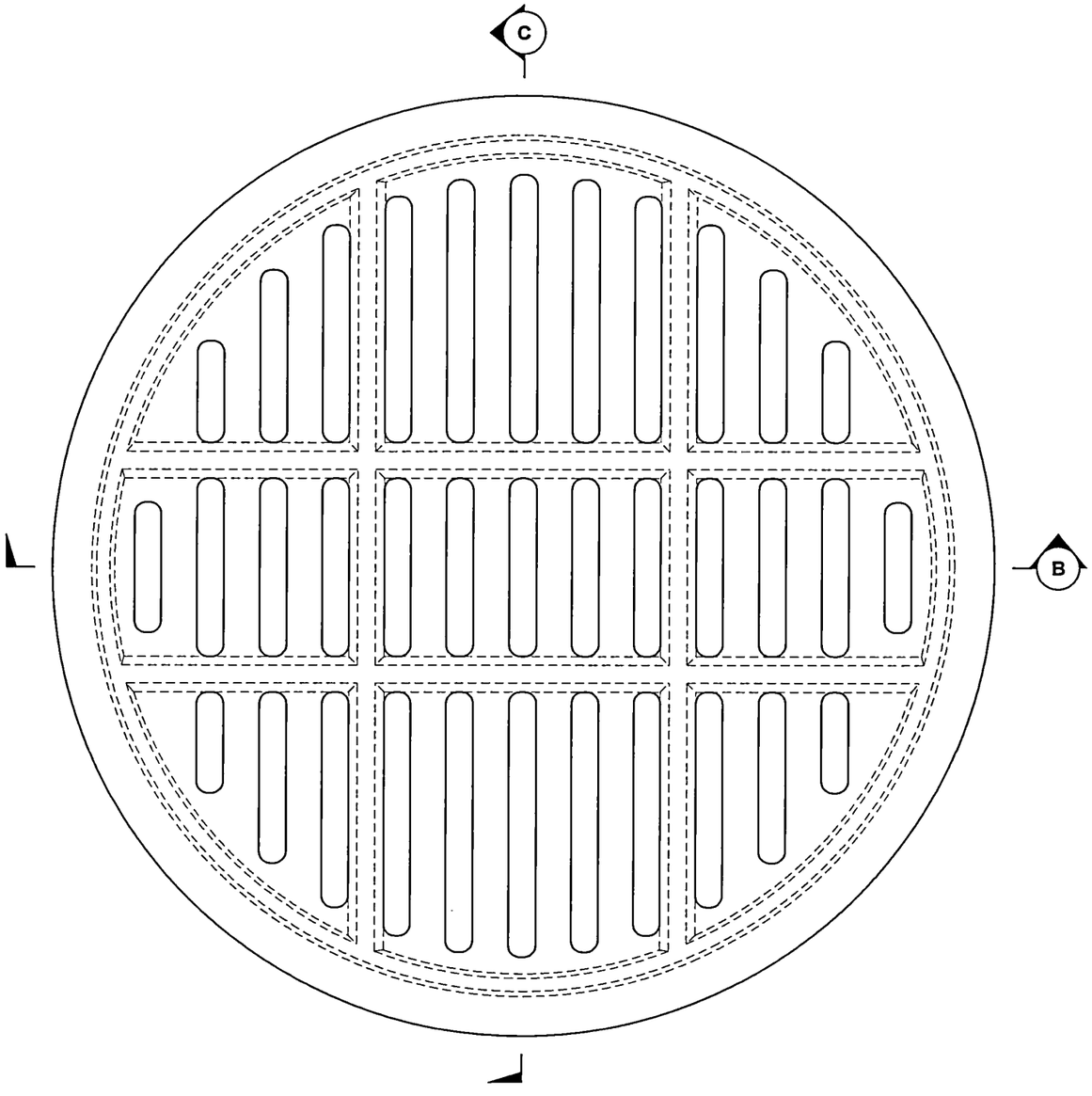
SHEET 1 OF 1 SHEET

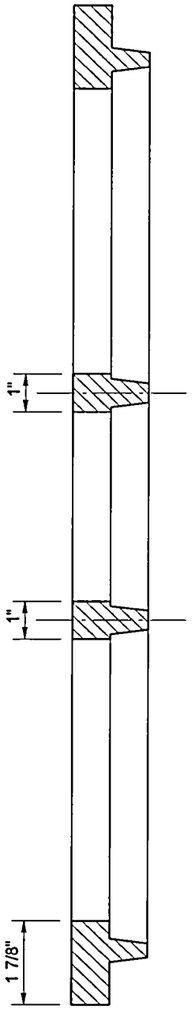
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 4/22/12

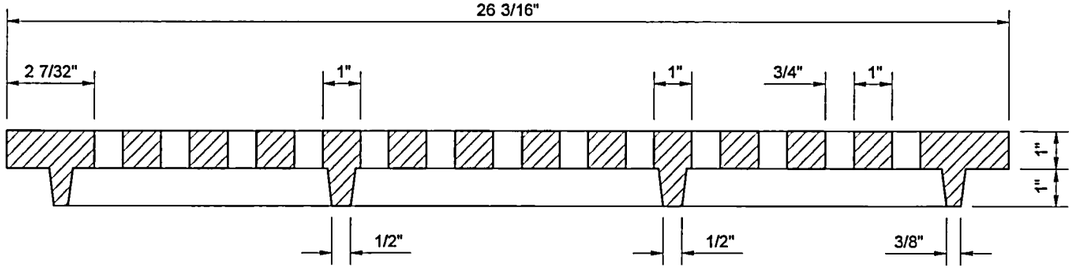
Washington State Department of Transportation

DRAWN BY: ADAM COCHRAN





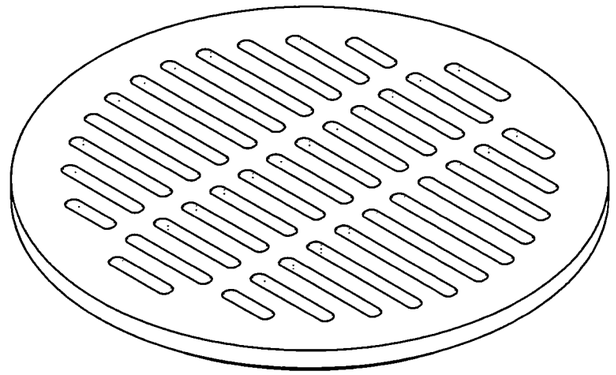
SECTION C



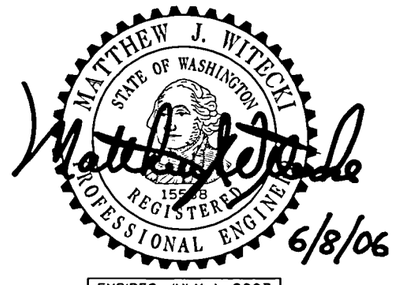
SECTION B

NOTES

1. For use with Circular Frames (rings) detailed in Standard Plan B-30.70.
2. Slotted Manhole Covers are intended for use with Drywells only. See Standard Plans B-20.20 and B-20.60.



ISOMETRIC VIEW



6/8/06

EXPIRES JULY 1, 2007

CIRCULAR GRATE

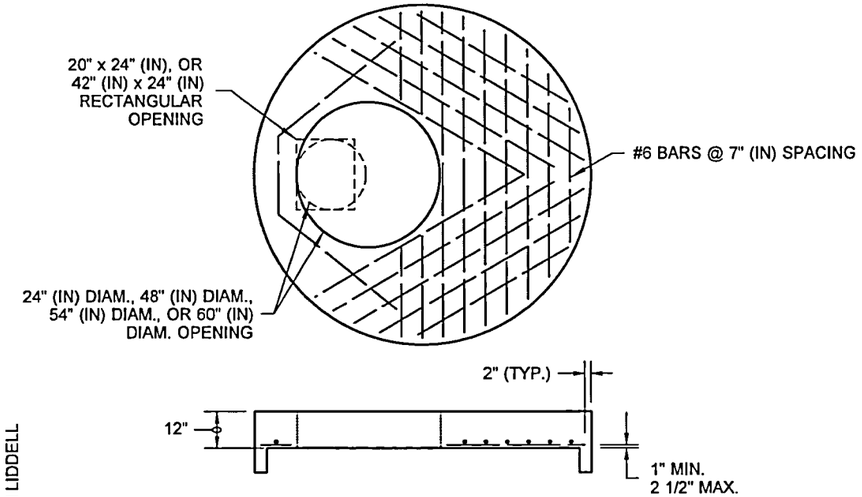
STANDARD PLAN B-30.80-00

SHEET 1 OF 1 SHEET

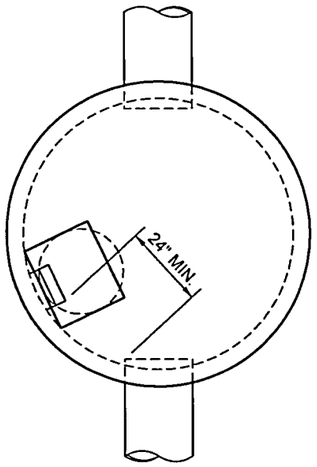
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 6-8-06

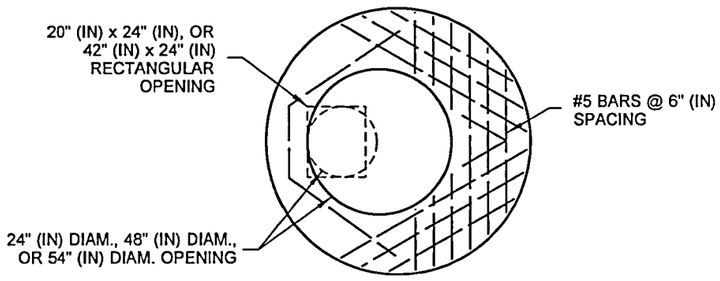
Washington State Department of Transportation



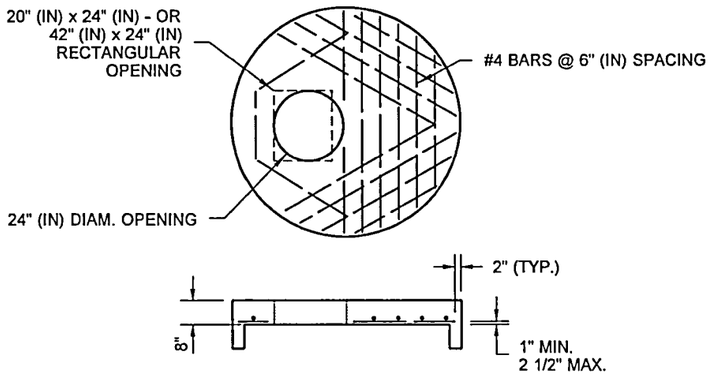
84" (IN) or 96" (IN) FLAT SLAB TOP



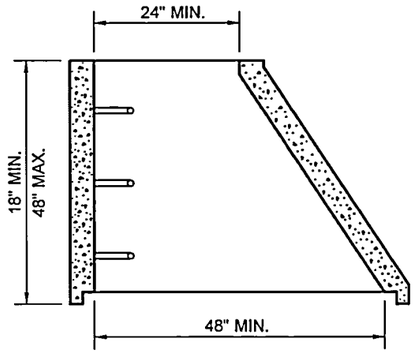
TYPICAL ORIENTATION FOR ACCESS AND STEPS



72" (IN) FLAT SLAB TOP



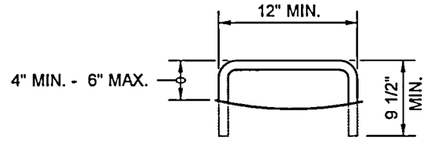
48" (IN), 54", or 60" (IN) FLAT SLAB TOP



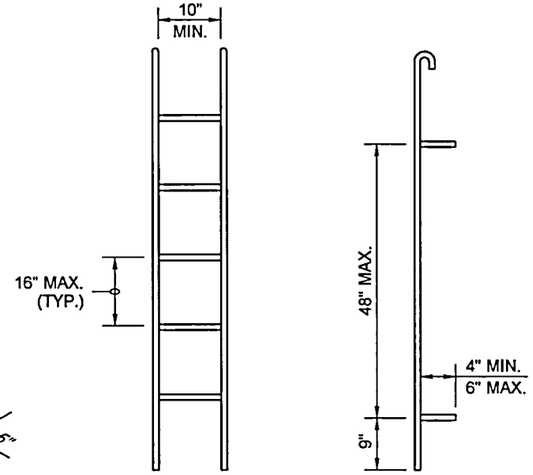
ECCENTRIC CONE SECTION

NOTE

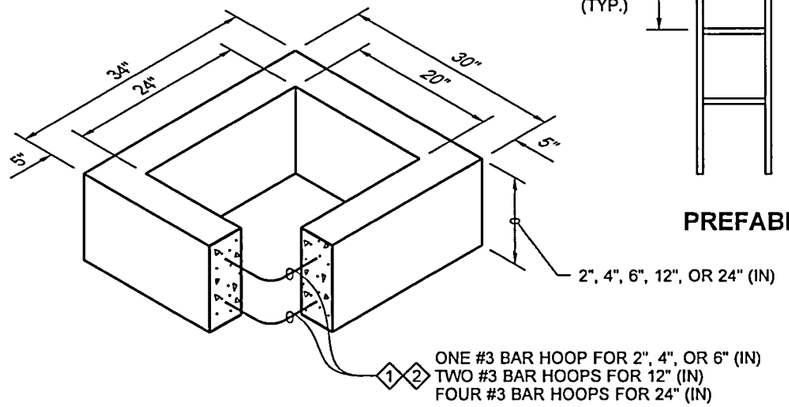
1. Ladder rungs for manholes and catch basins shall meet the requirements of **AASHTO M 199.**



STEP

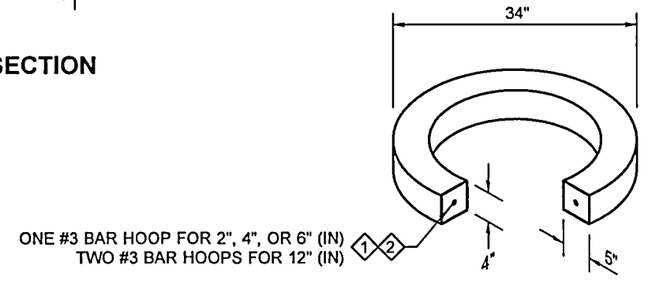


PREFABRICATED LADDER



RECTANGULAR ADJUSTMENT SECTION

1. As an acceptable alternative to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used for adjustment sections.
2. As an acceptable alternative to conventional steel reinforcment, manufacturers shall use Synthetic Structural Fibers meeting the requirements of **Standard Specification Section 9-05.50(10).**



CIRCULAR ADJUSTMENT SECTION

For rectangular and circular adjustment sections, approved alternate material compositions are acceptable in lieu of precast concrete designs

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Julie Heilman
Heilman, Julie
Jan 25 2017 3.01 PM

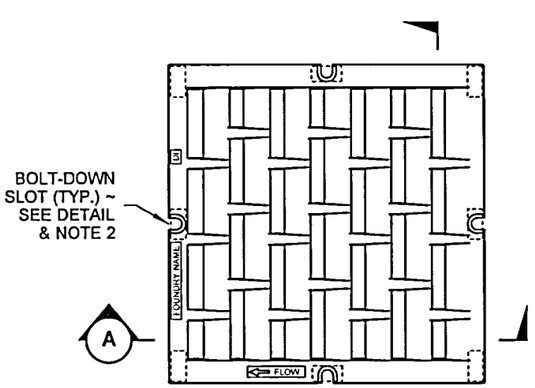
MISCELLANEOUS DETAILS FOR DRAINAGE STRUCTURES STANDARD PLAN B-30.90-02

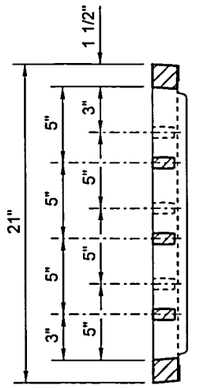
SHEET 1 OF 1 SHEET

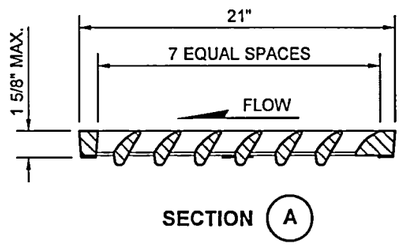
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:52 AM

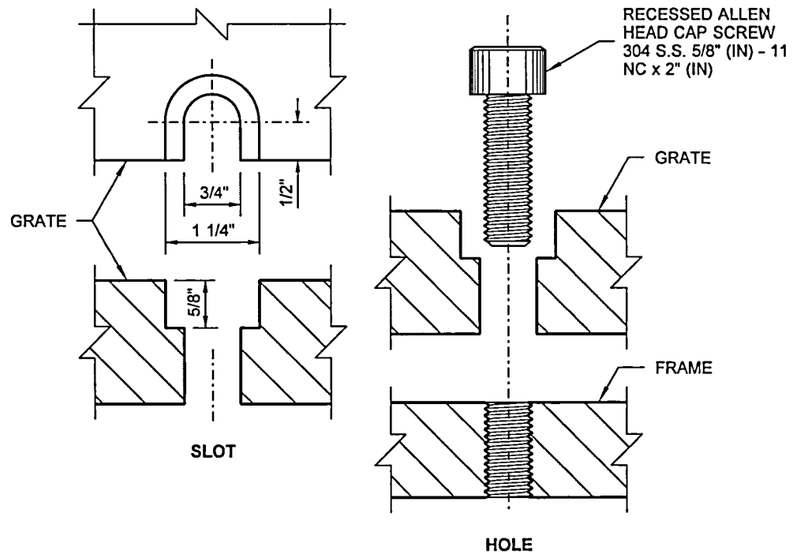
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL





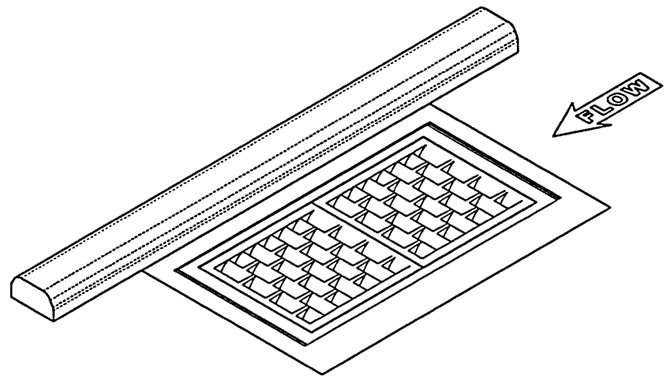




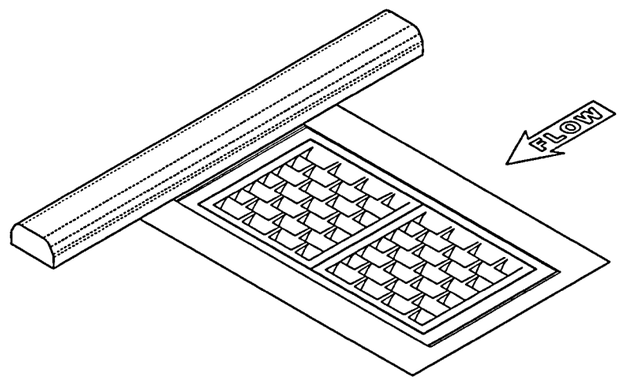
BOLT-DOWN DETAILS
SEE NOTE 2

NOTES

1. The Contract may specify a rotated inlet installation. Orient the grates in the frame so they intercept flow.
2. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC × 2" (in) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
3. Refer to **Standard Specification Section 9-05-15(2)** for additional requirements.
4. Frame and Grates shall be Ductile Iron.



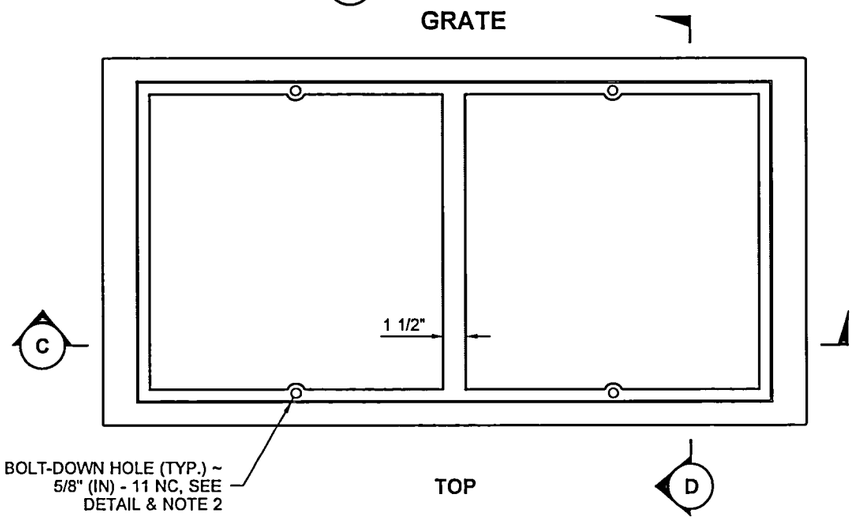
NORMAL INSTALLATION

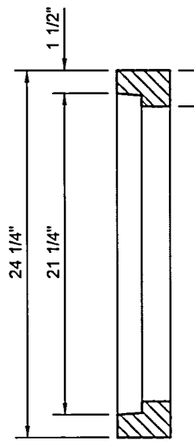


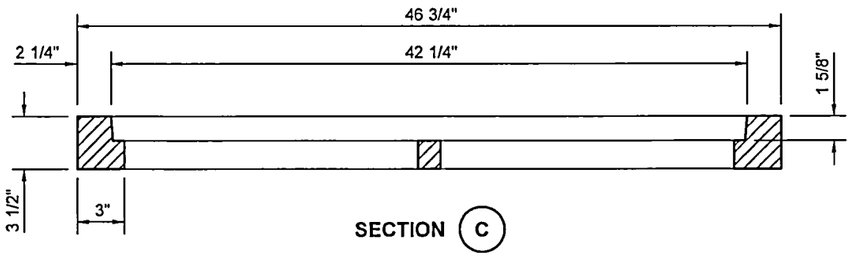
ROTATED INSTALLATION

ISOMETRIC VIEWS
SEE NOTE 1

GRATE







FRAME

DRAWN BY: LISA CYFORD

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 3 01 PM

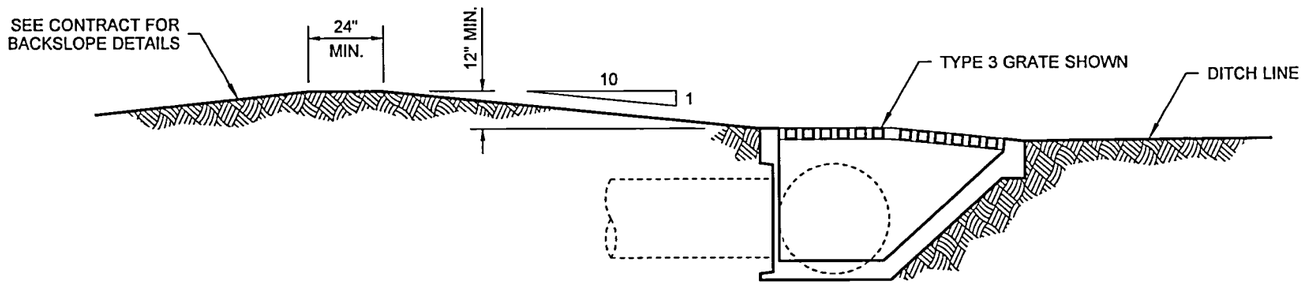
FRAME AND DUAL VANED GRATES FOR GRATE INLET
STANDARD PLAN B-40.40-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:52 AM

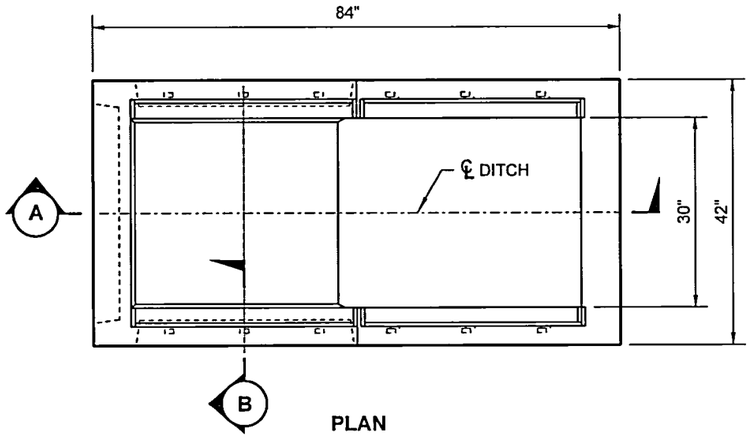
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: MARK SUJKA

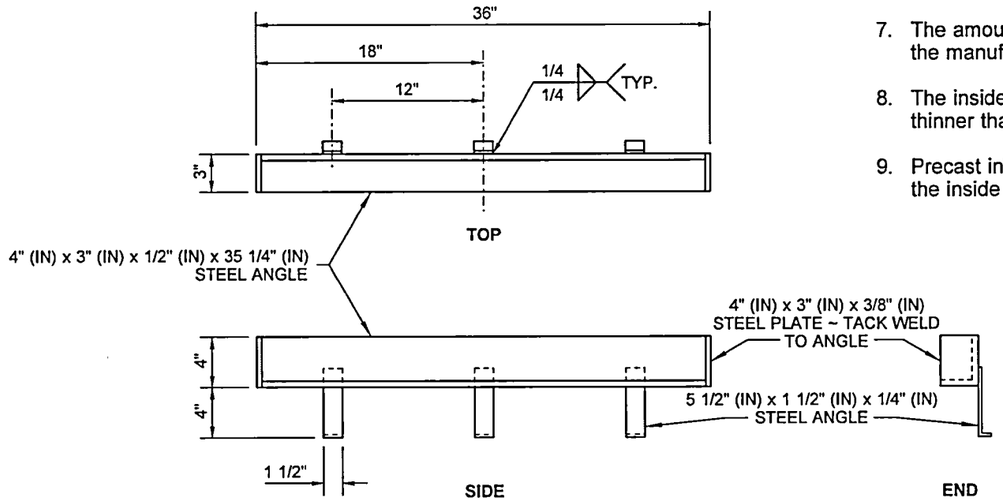


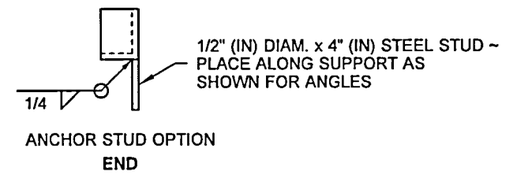
SECTION ON DITCH LINE

DIKE INSTALLATION FOR PREFERRED SLOPE

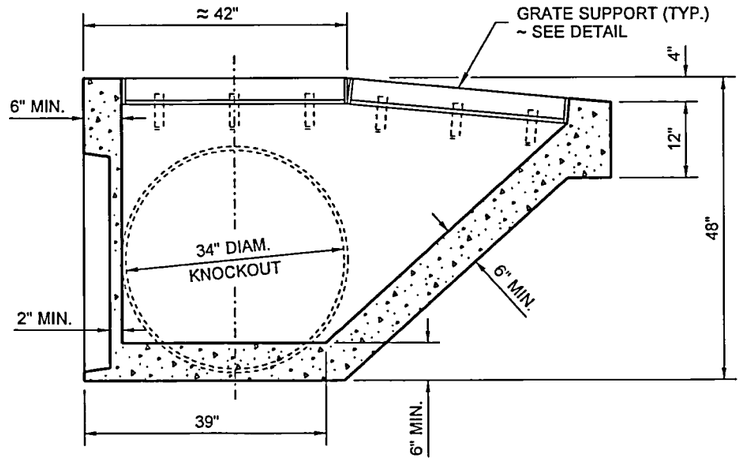


PLAN

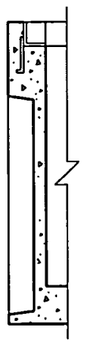




GRATE SUPPORT DETAIL
(FOUR SUPPORTS REQUIRED)



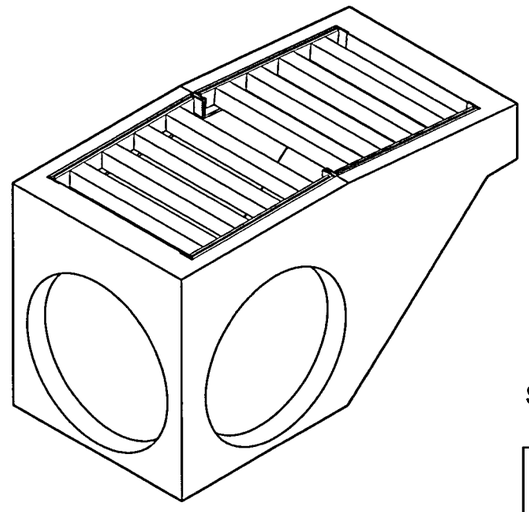
SECTION (A)



SECTION (B)

NOTES

1. The top of the inlet shall be placed at ground level to present an unobstructed ditch or median section.
2. Bevel or round exposed concrete edges 1/2" (in).
3. Pipes may enter through the knockouts at any reasonable angle provided the outside of the pipe can be contained within the knockout provided.
4. The grade line of the lowest inlet pipe shall enter the structure at an elevation equal to or higher than the grade line of the outlet pipe.
5. All pickup holes shall be grouted full after the inlet has been placed.
6. The steel angles shall be set so that each bearing bar of the grate shall have full seating on both ends. The finished top of concrete shall be even with the grate surface. For grates, see **Standard Plan B-50-20**.
7. The amount, type, and grade of reinforcing steel is the responsibility of the manufacturer.
8. The inside wall taper for form removal shall not result in any wall section thinner than 6" (in) except in pipe knockout areas.
9. Precast inlets shall be marked with the manufacturer's identification on the inside of the structure in some readily accessible location.



ISOMETRIC
(SHOWN WITH TYPE 1 GRATE)

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Julie Heilman
Heilman, Julie
Apr 26 2017 7:40 AM
cosign

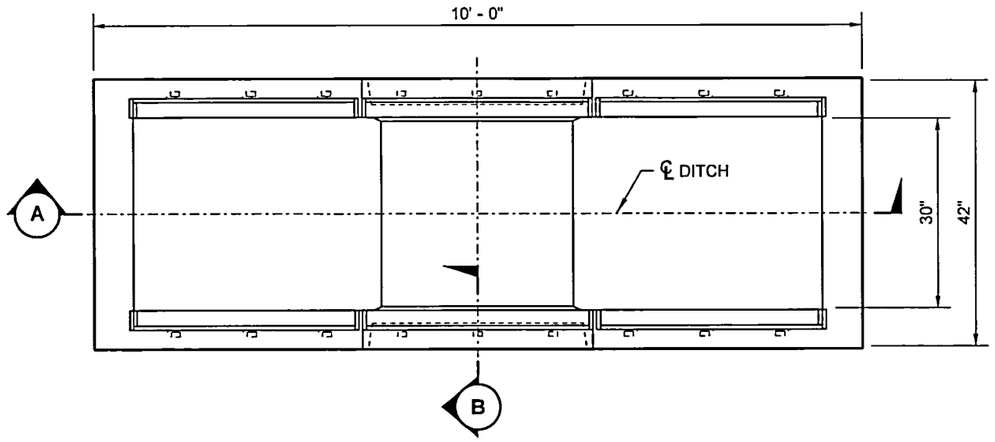
DROP INLET TYPE 1

STANDARD PLAN B-45.20-01

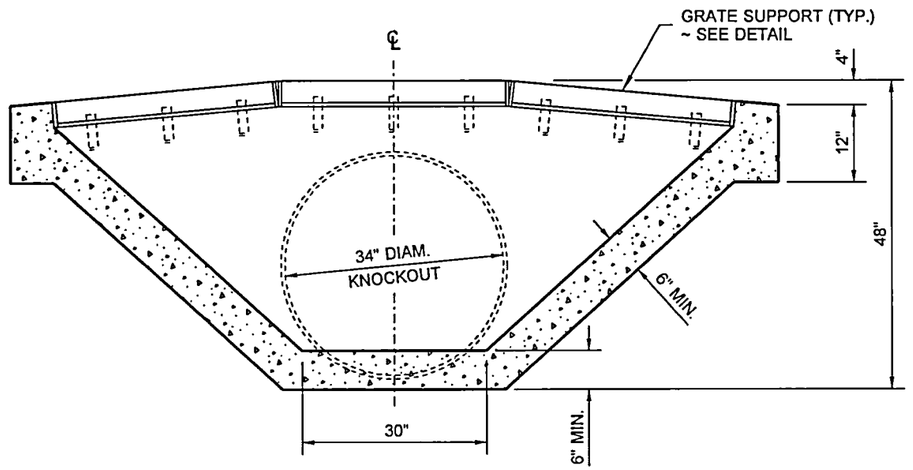
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 11 2017 1:38 PM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

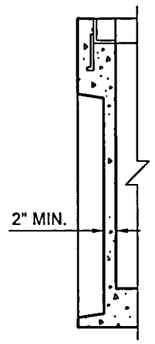
DRAWN BY: MARK SUJKA



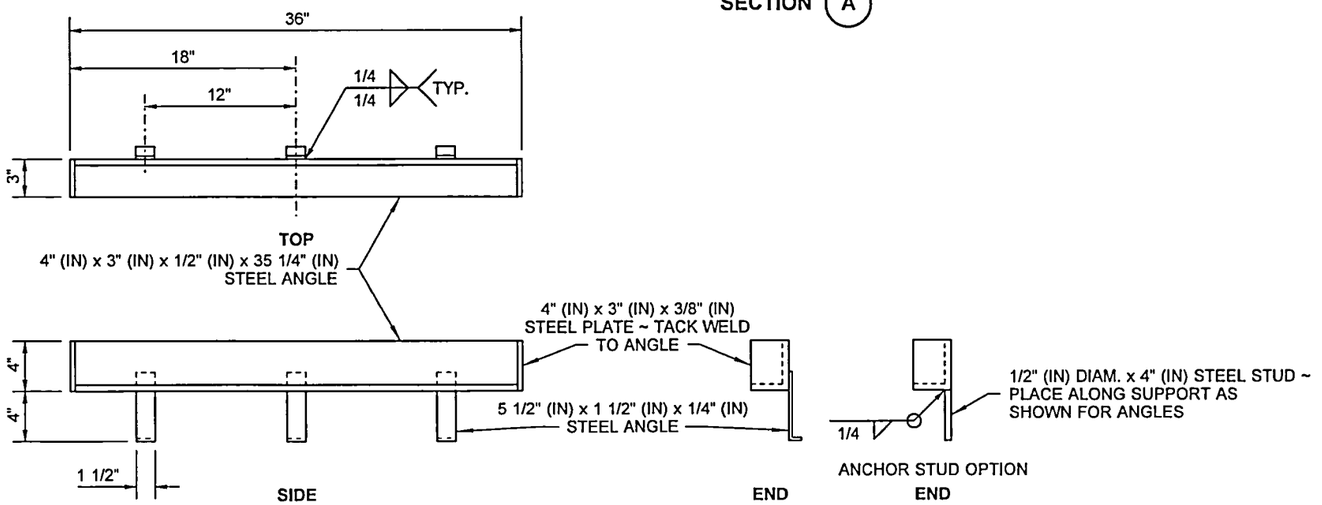
PLAN



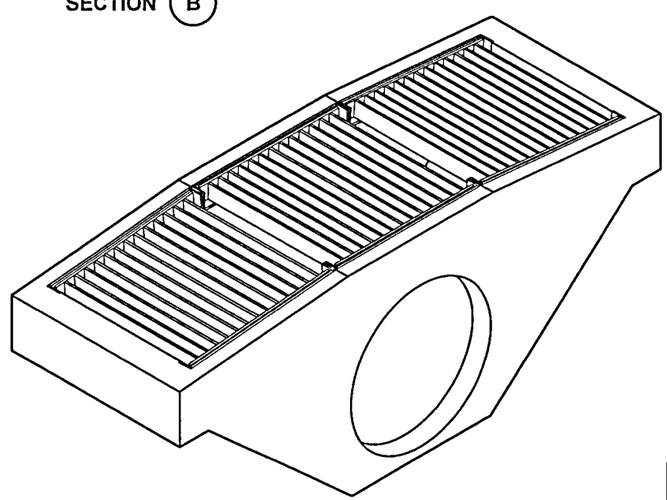
SECTION (A)



SECTION (B)



GRATE SUPPORT DETAIL
(SIX SUPPORTS REQUIRED)



ISOMETRIC
(SHOWN WITH TYPE 2 GRATE)

NOTES

1. The top of the inlet shall be placed at ground level to present an unobstructed ditch or median section.
2. Bevel or round exposed concrete edges 1/2" (in).
3. Pipes may enter through the knockouts at any reasonable angle provided the outside of the pipe can be contained within the knockout provided.
4. The grade line of the lowest inlet pipe shall enter the structure at an elevation equal to or higher than the grade line of the outlet pipe.
5. All pickup holes shall be grouted full after the inlet has been placed.
6. The steel angles shall be set so that each bearing bar of the grate shall have full seating on both ends. The finished top of concrete shall be even with the grate surface. For grates, see **Standard Plan B-50.20**.
7. The amount, type, and grade of reinforcing steel is the responsibility of the manufacturer.
8. The inside wall taper for form removal shall not result in any wall section thinner than 6" (in) except in pipe knockout areas.
9. Precast inlets shall be marked with the manufacturer's identification on the inside of the structure in some readily accessible location.

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jul 13 2017 7:18 AM
cosign

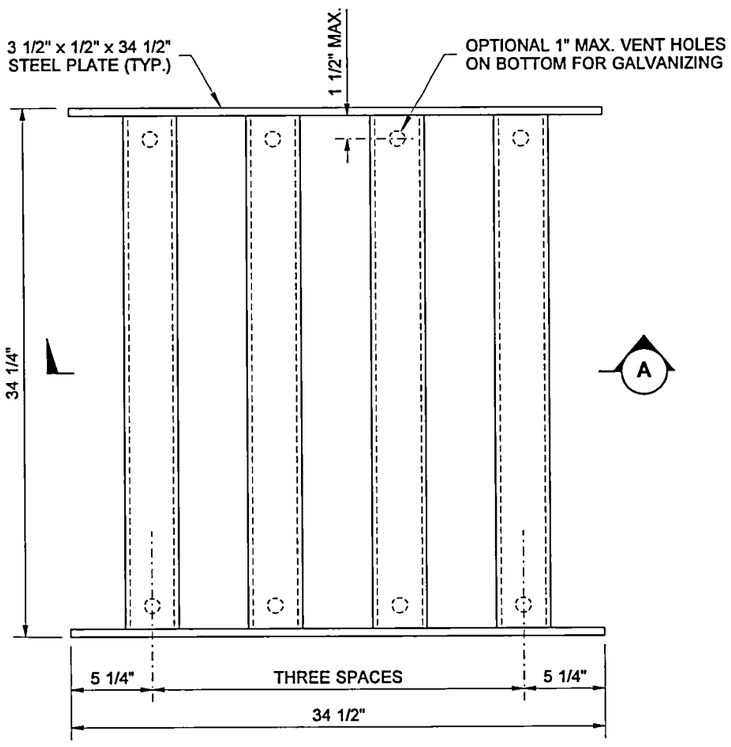
DROP INLET TYPE 2

STANDARD PLAN B-45.40-01

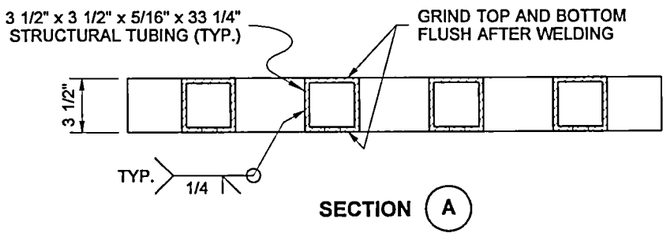
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:42 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

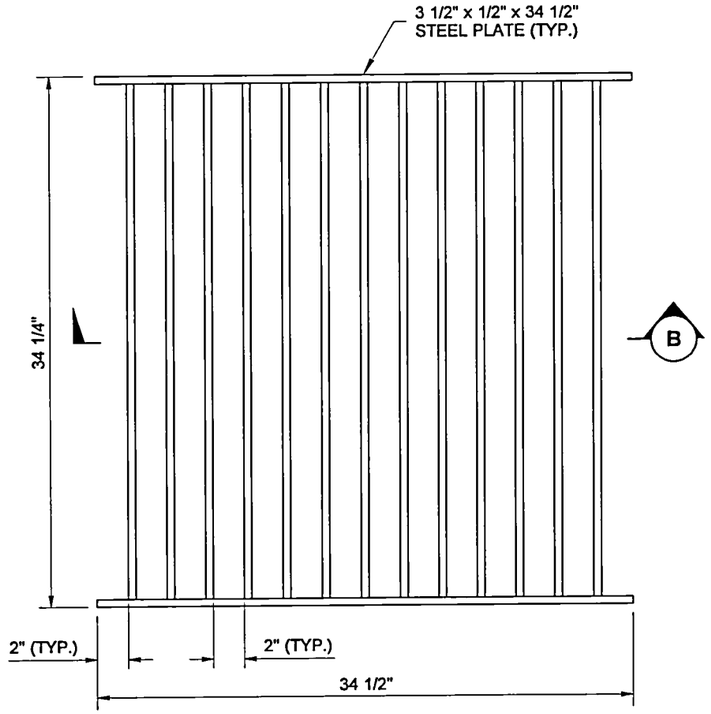
DRAWN BY: MARK SUJKA



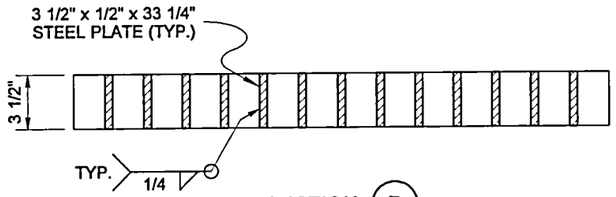
TYPE 1



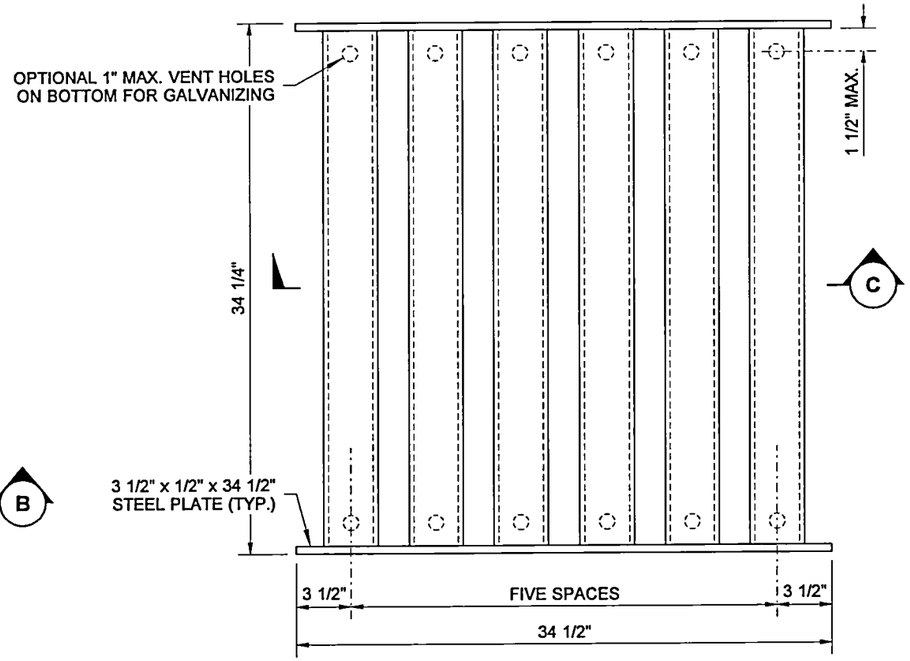
SECTION (A)



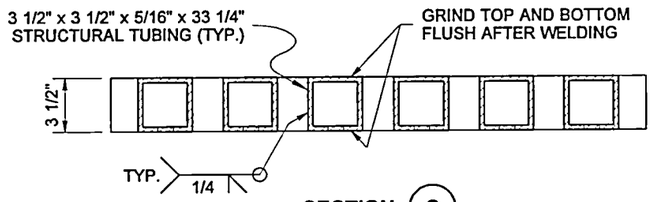
TYPE 2



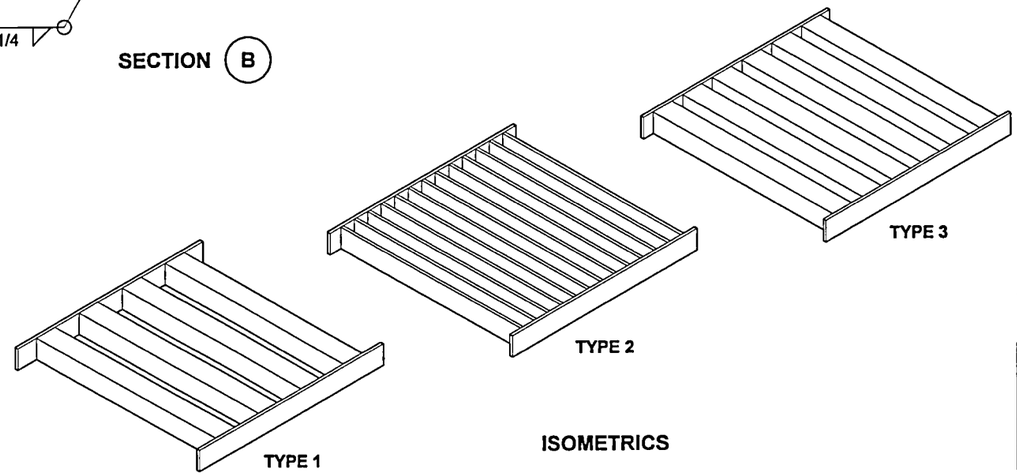
SECTION (B)



TYPE 3



SECTION (C)



ISOMETRICS

MATTHEW J. WITECKI
STATE OF WASHINGTON
15585
REGISTERED
PROFESSIONAL ENGINEER

6/1/06

EXPIRES JULY 1, 2007

GRATES FOR DROP INLET

STANDARD PLAN B-50.20-00

SHEET 1 OF 1 SHEET

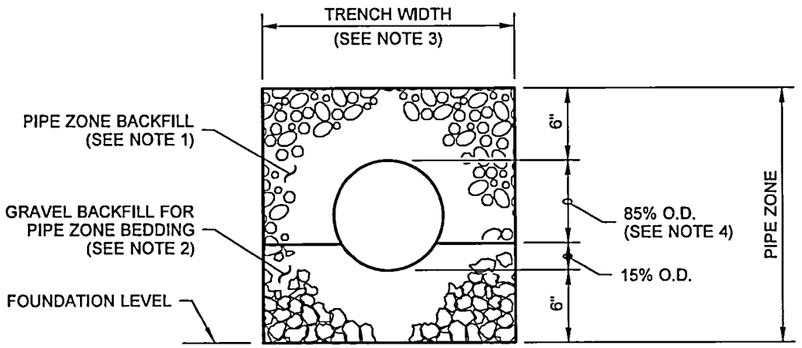
APPROVED FOR PUBLICATION

Harold Pitrucco 6-1-06

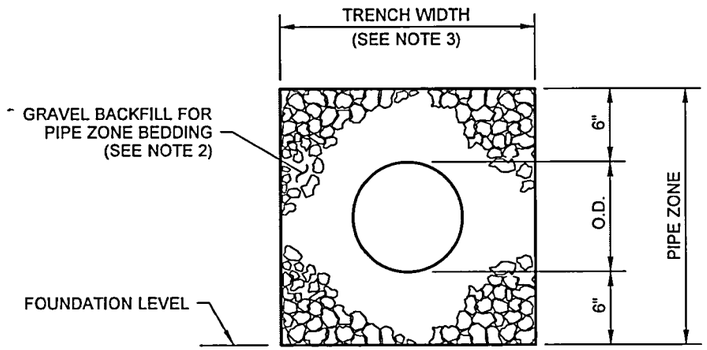
STATE DESIGN ENGINEER DATE

Washington State Department of Transportation

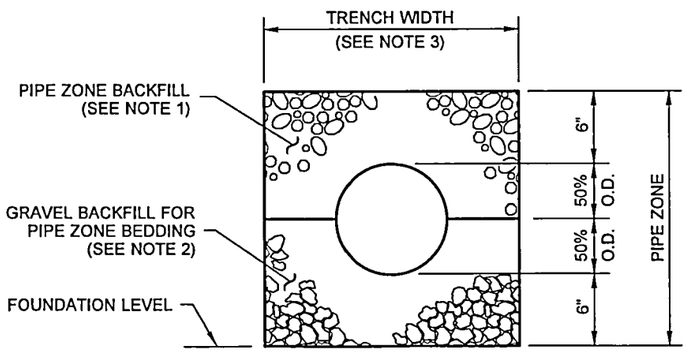
DRAWN BY: FERN LIDDELL



CONCRETE AND DUCTILE IRON PIPE



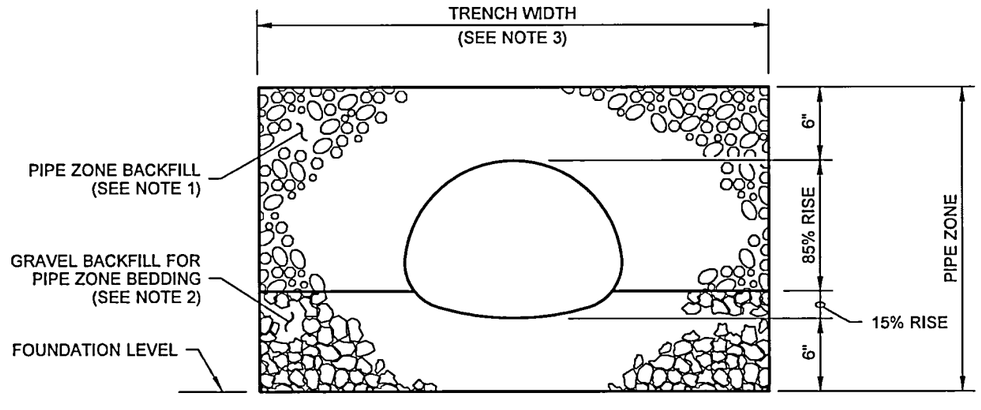
THERMOPLASTIC PIPE



METAL AND STEEL RIB REINFORCED POLYETHYLENE PIPE

NOTES

1. See **Standard Specifications Section 7-08.3(3)** for Pipe Zone Backfill.
2. See **Standard Specifications Section 9-03.12(3)** for Gravel Backfill for Pipe Zone Bedding.
3. See **Standard Specifications Section 2-09.4** for Measurement of Trench Width.
4. For sanitary sewer installation, concrete pipe shall be bedded to spring line.



PIPE ARCHES

CLEARANCE BETWEEN PIPES FOR MULTIPLE INSTALLATIONS		
PIPE	**SIZE**	**MINIMUM DISTANCE BETWEEN BARRELS**
CIRCULAR PIPE (DIAMETER)	12" to 24"	12"
	30" to 96"	DIAM. /2
	102" to 180"	48"
PIPE ARCH (SPAN) METAL ONLY	18" to 36"	12"
	43" to 142"	SPAN /3
	148" to 200"	48"

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

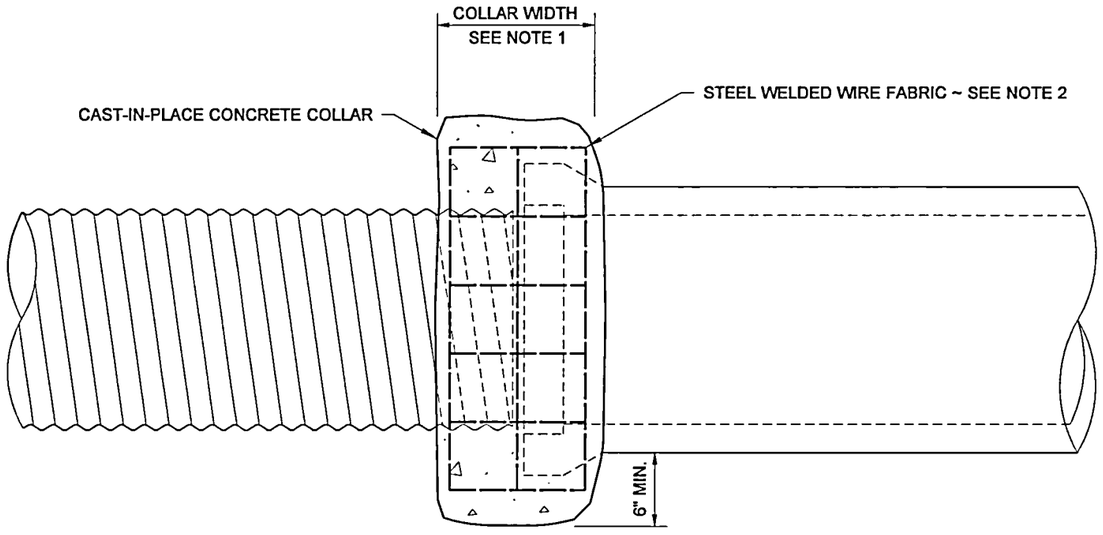
Heilman, Julie
Jan 25 2017 3:01 PM
cosign

PIPE ZONE BEDDING AND BACKFILL

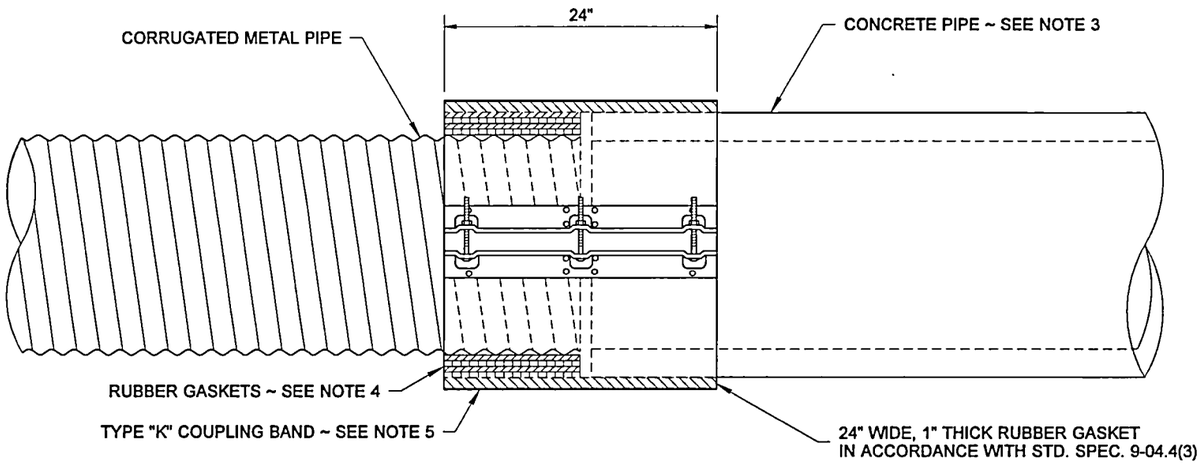
STANDARD PLAN B-55.20-01

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:53 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation



CONCRETE COLLAR OPTION



COUPLING BAND OPTION

NOTES

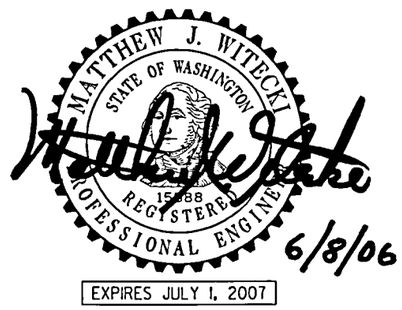
1. The Concrete Collar width shall be one half of the outside pipe diameter of the largest pipe. The minimum Concrete Collar width shall be 12". Concrete Collars may be used with all pipe materials and diameters. The Concrete Collar option shall only be used to extend existing pipes.

2. Steel Welded Wire Fabric shall be in accordance with Standard Specification 9-07.7. Install two wraps for size 6 × 6 W1.4 × W1.4 (10 Gage) Steel Welded Wire Fabric or one wrap for any of the following sizes:
   6 × 6 W2.1 × W2.1 (8 Gage)
   6 × 6 W2.9 × W2.9 (6 Gage)
   4 × 4 W2.9 × W2.9 (6 Gage)
   4 × 4 W4.0 × W4.0 (4 Gage)

3. When a Coupling Band connection requires attachment to the bell end of a concrete pipe, the bell end of the pipe shall be removed before the connection is installed.

4. Increase the outside diameter of the metal pipe to match the outside diameter of the concrete pipe by installing 12" wide rubber gaskets, thickness as required (Coupling Band only). The rubber gaskets shall be in accordance with Standard Specification 9-04.4(3).

5. Use a flat Type K Coupling Band. Type K Coupling Bands with dimples are not allowed for the installation detail shown. The Coupling Band option shall only be used for extending existing pipes that have an inside diameter of 36" or less.



EXPIRES JULY 1, 2007

CONNECTION DETAILS FOR DISSIMILAR CULVERT PIPE

STANDARD PLAN B-60.20-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Harold Peterson 6-8-06

STATE DESIGN ENGINEER / DATE

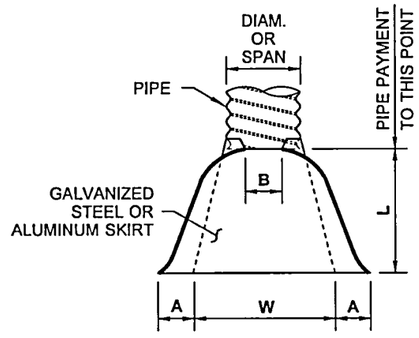
Washington State Department of Transportation

This page left blank intentionally.

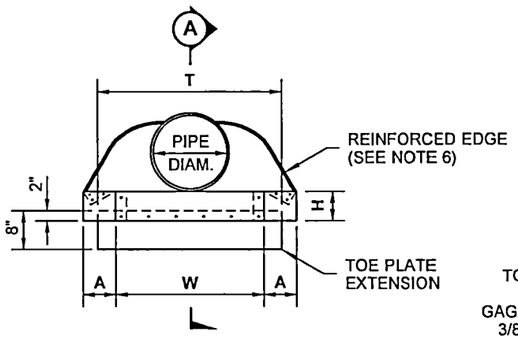
DRAWN BY: BILL BERENS

PIPE ARCH												
PIPE ARCH DIMENSION (INCHES)		THICKNESS (INCHES)			DIMENSIONS (INCHES)						SKIRT	END SECTION SLOPE (H : V)
					A	B	H	L	W	T		
SPAN	RISE	STEEL		ALUM.	TOL. ± 1"	MAX.	TOL. ± 1"	TOL. ± 1 1/2"	TOL. ± 2"	TOL. ± 2"		
17	13	0.064		0.060	7	9	6	19	30	40	1 PC.	2 1/2 : 1
21	15	0.064		0.060	7	10	6	23	36	46	1 PC.	2 1/2 : 1
24	18	0.064		0.060	8	12	6	28	42	52	1 PC.	2 1/2 : 1
28	20	0.064		0.075	9	14	6	32	48	58	1 PC.	2 1/2 : 1
35	24	0.079		0.075	10	16	6	39	60	70	1 PC.	2 1/2 : 1
42	29	0.079		0.105	12	18	8	46	75	85	2 PC.	2 1/2 : 1
49	33	0.109		0.105	13	21	9	53	85	103	2 PC.	2 1/2 : 1
57	38	0.109	0.138	0.105	18	26	12	63	90	114	3 PC.	2 1/2 : 1
64	43	0.109	0.138	0.105	18	30	12	70	102	130	3 PC.	2 1/2 : 1
71	47	0.109	0.138	0.135	18	33	12	77	114	146	3 PC.	2 1/2 : 1
77	52	0.109	0.138	-----	18	36	12	77	126	152	3 PC.	1 3/4 : 1
83	57	0.109	0.138	-----	18	39	12	77	138	158	3 PC.	1 1/2 : 1

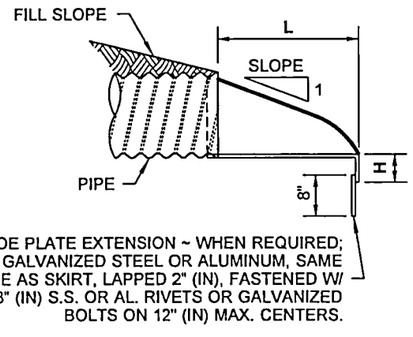
PIPE										
PIPE DIAM. (INCHES)	THICKNESS (INCHES)			DIMENSIONS (INCHES)						SKIRT	END SECTION SLOPE (H : V)
				A	B	H	L	W	T		
	STEEL		ALUM.	TOL. ± 1"	MAX.	TOL. ± 1"	TOL. ± 1 1/2"	TOL. ± 2"	TOL. ± 2"		
12	0.064		0.060	6	6	6	21	24	34	1 PC.	2 1/2 : 1
15	0.064		0.060	7	8	6	26	30	40	1 PC.	2 1/2 : 1
18	0.064		0.060	8	10	6	31	36	46	1 PC.	2 1/2 : 1
21	0.064		0.060	9	12	6	36	42	52	1 PC.	2 1/2 : 1
24	0.064		0.075	10	13	6	41	48	58	1 PC.	2 1/2 : 1
30	0.079		0.075	12	16	8	51	60	70	2 PC.	2 1/2 : 1
36	0.079		0.105	14	19	9	60	72	94	2 PC.	2 1/2 : 1
42	0.109		0.105	16	22	11	69	84	106	2 PC.	2 1/2 : 1
48	0.109		0.105	18	27	12	78	90	112	2 PC.	2 1/2 : 1
54	0.109		----	18	30	12	84	102	122	2 PC.	2 1/2 : 1
60	0.109	0.138	----	18	33	12	87	114	134	3 PC.	1 3/4 : 1
66	0.109	0.138	----	18	36	12	87	120	142	3 PC.	1 1/2 : 1
72	0.109	0.138	----	18	39	12	87	126	146	3 PC.	1 1/3 : 1
78	0.109	0.138	----	18	42	12	87	132	152	3 PC.	1 1/4 : 1
84	0.109	0.138	-----	18	45	12	87	138	158	3 PC.	1 1/6 : 1



PIPE & PIPE ARCH ~ PLAN

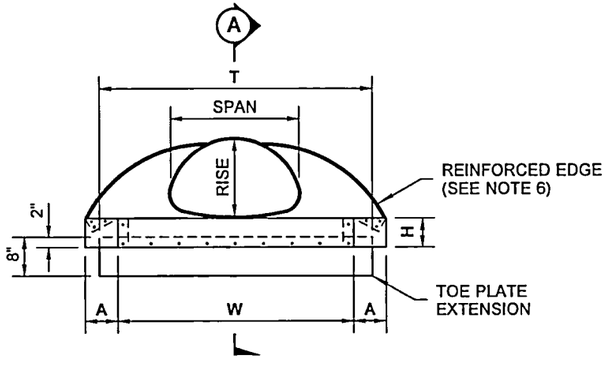


PIPE ~ ELEVATION



TOE PLATE EXTENSION ~ WHEN REQUIRED; GALVANIZED STEEL OR ALUMINUM, SAME GAGE AS SKIRT, LAPPED 2" (IN), FASTENED W/ 3/8" (IN) S.S. OR AL. RIVETS OR GALVANIZED BOLTS ON 12" (IN) MAX. CENTERS.

SECTION (A)



PIPE ARCH ~ ELEVATION

NOTES

1. The diameter of the end section of **Design B** shall match the inside diameter of the concrete pipe.
2. Skirt sections shall be made in one piece for round pipe with a diameter of 12" (in) to 24" (in) inclusive and for pipe arches with a rise of 13" (in) to 20" (in) inclusive. Skirt sections for larger sizes of pipes may be multiple pieces in conformance with the tabulated values shown.
3. **Design A** end sections for 42" (in) thru 84" (in) diameter and 49" (in) x 33" (in) thru 83" (in) x 57" (in) arch with annular corrugations and all helically corrugated pipe arch include one foot of pipe length as a connector section. The connector section shall be attached to the end section by welds, rivets or bolts and shall be the same thickness as the end section.
4. **Design C** may be used in lieu of **Design A** for all metal pipe sizes except as noted. Coupling bands may be any acceptable type for the pipe specified.
5. Multiple panel skirts shall have 2" (in) lap seams tightly joined by 3/8" (in) stainless steel rivets or galvanized bolts on 6" (in) max. centers.
6. The reinforced edges of the following size End Sections shall be supplemented with galvanized steel stiffener angles:

   60" (in) thru 72" (in) diameter pipe ..... 2" (in) x 2" (in) x 1/4" (in) angle

   78" (in) and 84" (in) diameter pipe, and
   77" (in) x 52" (in) & 83" (in) x 57" (in) pipe arch ..... 2 1/2" (in) x 2 1/2" (in) x 1/4" (in) angle

   The above galvanized angles shall be attached by 3/8" (in) galvanized nuts and bolts.
7. Galvanized steel angle reinforcement will be placed under the center panel seams on the 72" (in) thru 84" (in) diam. pipe and 77" (in) x 52" (in) & 83" (in) x 57" (in) pipe arch End Sections.
8. As an alternative to the connector lug and threaded rod used on 12" (in) thru 24" (in) culvert pipe, the attachment may be made with a 1" (in) wide strap, 16 gage galvanized steel fastened with a 1/2" (in) diam., 6" (in) long galvanized bolt and one squarehead nut.

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 3:02 PM
cosign

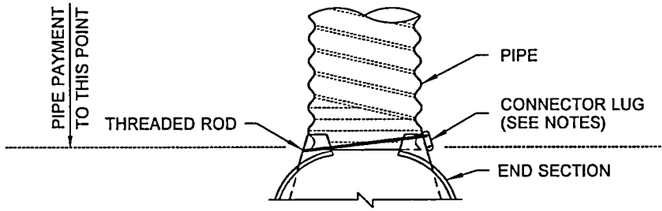
FLARED END SECTIONS

STANDARD PLAN B-70.60-01

SHEET 1 OF 2 SHEETS

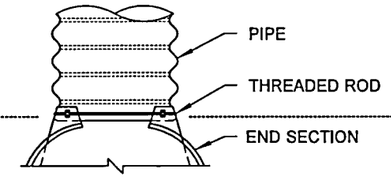
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:53 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: BILL BERENS



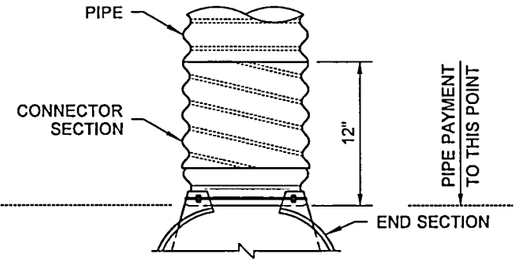
FOR 12" (IN) THRU 24" (IN) PIPE AND 17" (IN) x 13" (IN) THRU 28" (IN) x 20" (IN) PIPE ARCH WITH ANNULAR END CORRUGATIONS

TYPE 1
CONNECTION TO METAL PIPE



FOR 30" (IN) THRU 84" (IN) PIPE AND 35" (IN) x 24" (IN) THRU 83" (IN) x 57" (IN) PIPE ARCH WITH ANNULAR END CORRUGATIONS

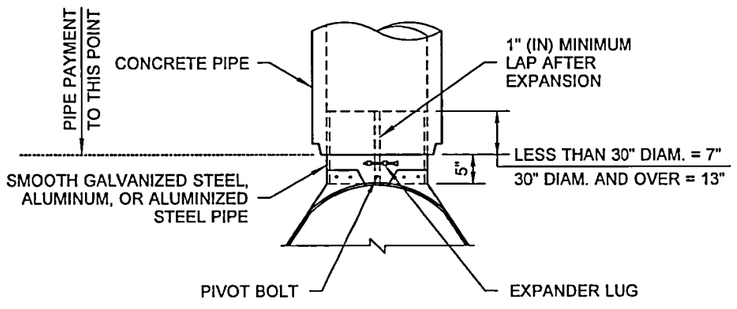
TYPE 2
CONNECTION TO METAL OR CORR. HDPE PIPE



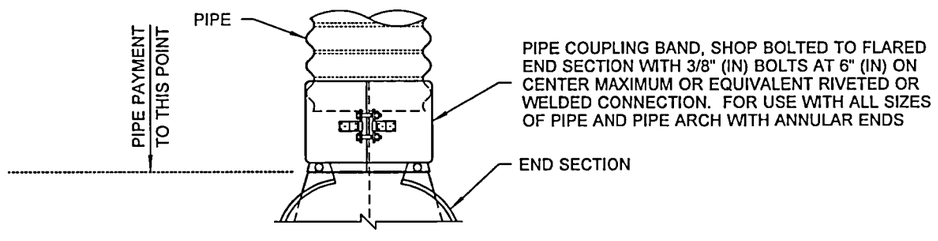
FOR 42" (IN) THRU 84" (IN) PIPE AND 49" (IN) x 33" (IN) THRU 83" (IN) x 57" (IN) PIPE ARCH WITH ANNULAR END CORRUGATIONS, AND ALL HELICAL END CORRUGATED PIPE AND PIPE ARCH

TYPE 3
CONNECTION TO METAL PIPE

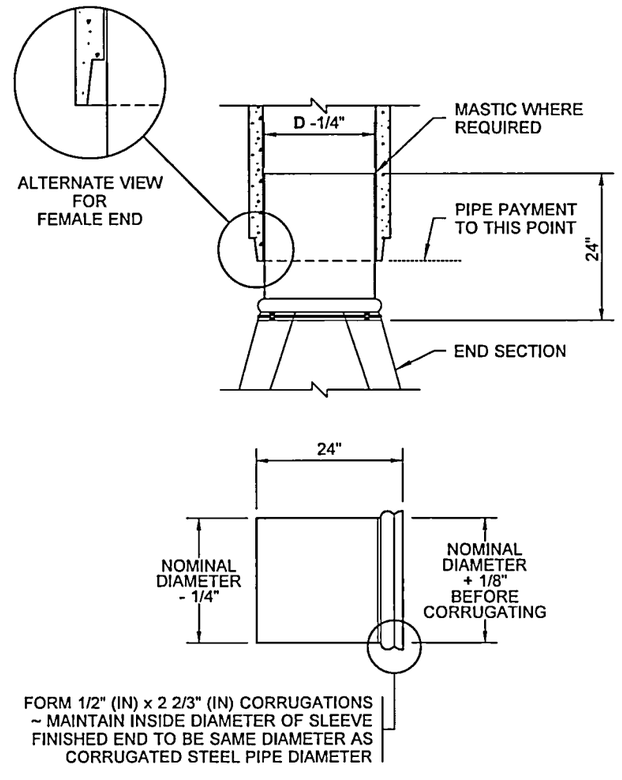
DESIGN A



DESIGN B
CONNECTION TO CONCRETE OR HDPE PIPE
INLET END ONLY



DESIGN C
CONNECTION TO METAL OR CONCRETE PIPE
OUTLET ONLY



SMOOTH TAPERED SLEEVE DETAIL
FOR USE WITH CONCRETE OR HDPE PIPE

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 3:39 PM
cosign

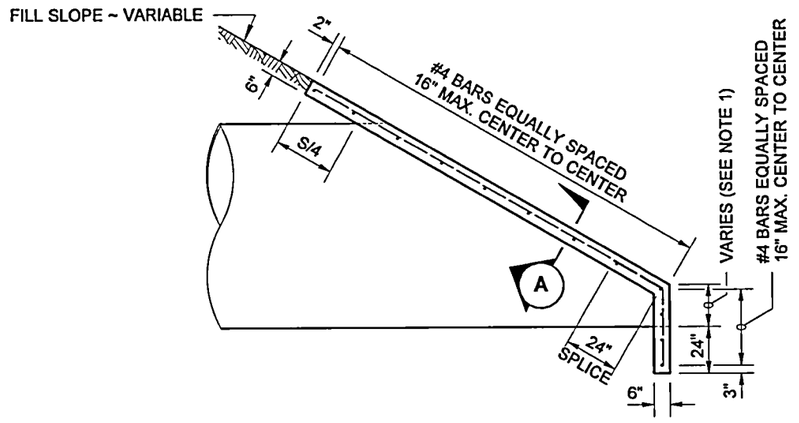
FLARED END SECTIONS

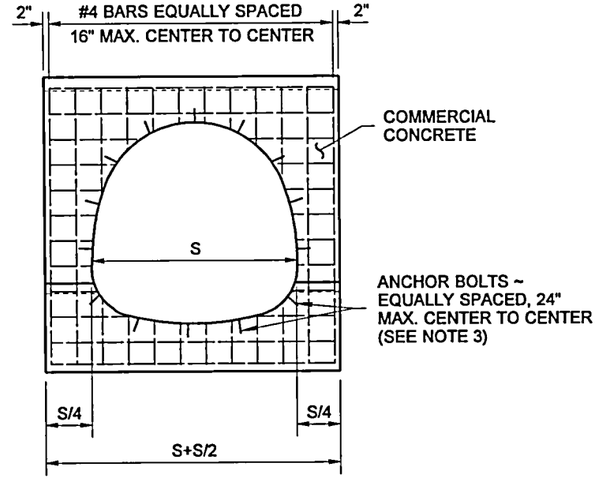
STANDARD PLAN B-70.60-01

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 7:10 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: LISA CYFORD

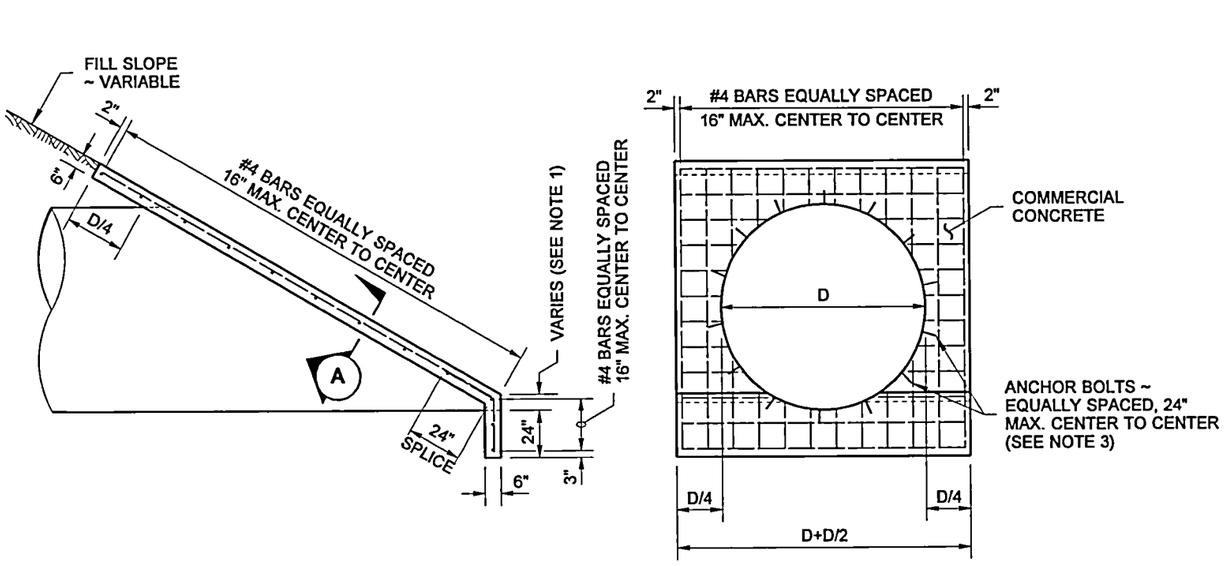




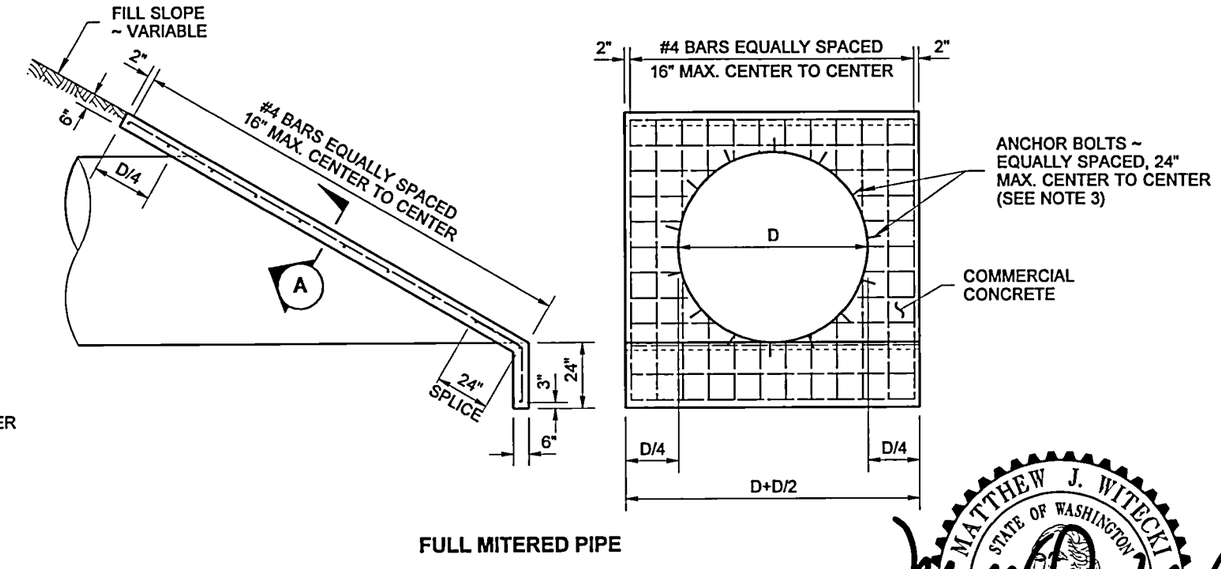
NOTES

1. The variable dimension indicated for the height of step for step mitered pipes shall conform to the manufacturers recommendations unless specified differently on the plans or in the Special Provisions.
2. Reinforcing steel shall have 1 1/2" min. clear cover to all concrete surfaces.
3. Headwalls for concrete culvert pipe may omit anchor bolt attachment.
4. When steel pipe safety bars ar used, headwall thickness shall be increased to 8".

STRUCTURAL PLATE PIPE ARCHES AND UNDERPASSES

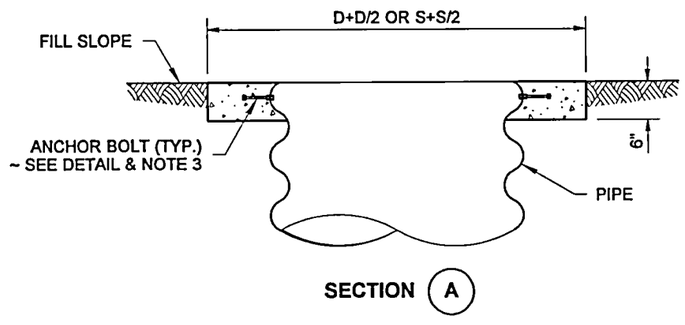


STEP MITERED PIPE

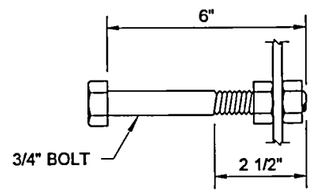


FULL MITERED PIPE

PIPES AND STRUCTURAL PLATE PIPES



SECTION (A)



ANCHOR BOLT DETAIL

EXPIRES JULY 1, 2009

HEADWALLS FOR CULVERT PIPE AND UNDERPASS

STANDARD PLAN B-75.20-01

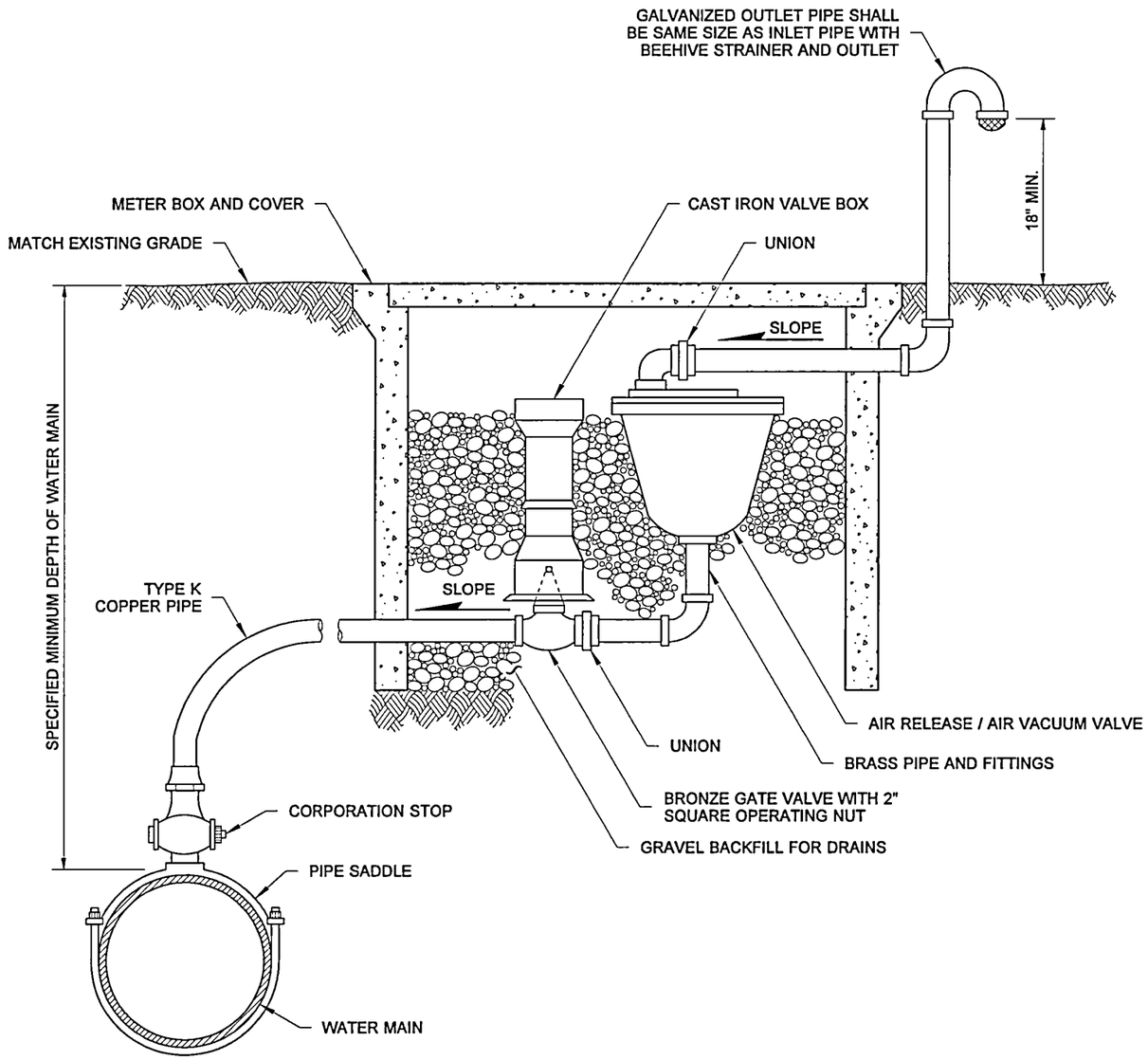
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 6/10/08

Washington State Department of Transportation

DRAWN BY: ADAM COCHRAN



NOTES

1. The size of the combination air release / air vacuum valve shall be specified in the Contract. The piping and valves shall be the same size as the combination air release / air vacuum valve.

2. Locate at the high point of the main, tap top of main.

MATTHEW J. WITECKI
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL ENGINEER

6/8/06

EXPIRES JULY 1, 2007

COMBINATION AIR RELEASE / AIR VACUUM VALVE ASSEMBLY

STANDARD PLAN B-90.30-00

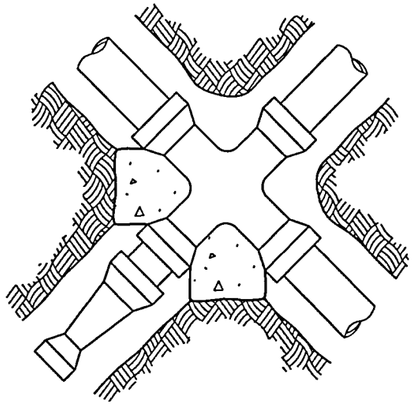
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 6-8-06

Washington State Department of Transportation

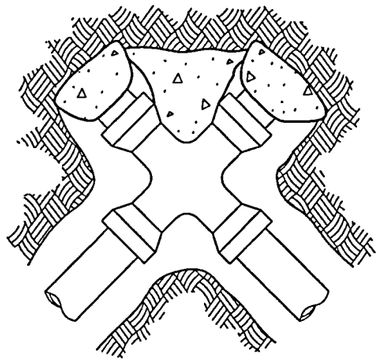
DRAWN BY: FERN LIDDELL



PLAN VIEW

UNBALANCED CROSS

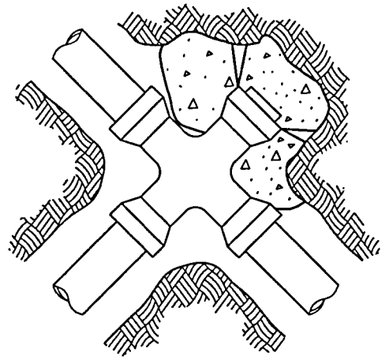
(USE COLUMN A)



PLAN VIEW

PLUGGED CROSS

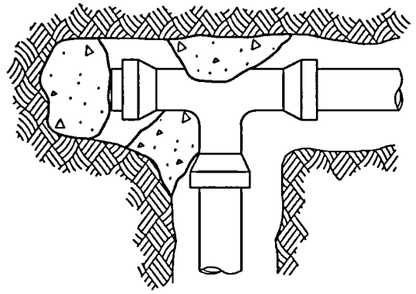
(USE COLUMN B)



PLAN VIEW

PLUGGED CROSS

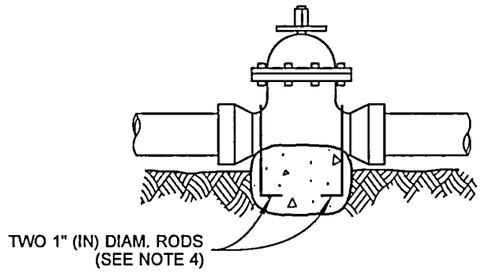
(USE COLUMN A)



PLAN VIEW

PLUGGED TEE

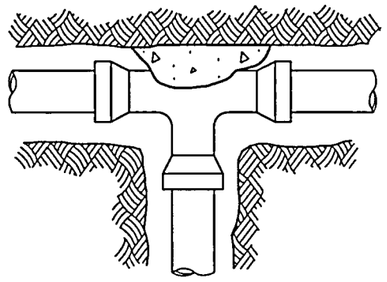
(USE COLUMN B)



PROFILE VIEW

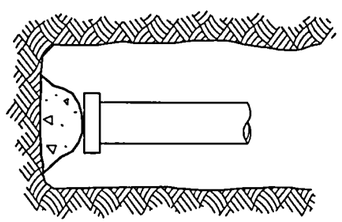
VALVE

(USE COLUMN A)



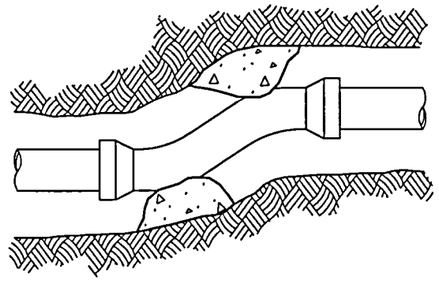
PLAN VIEW

TEE



PLAN VIEW

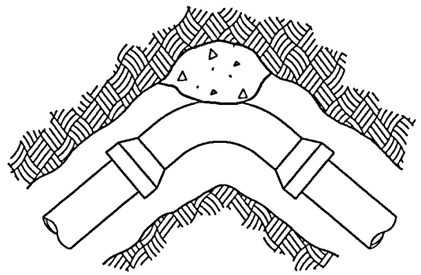
DEAD END



PLAN VIEW

OFFSET

(USE COLUMNS B ~ E)



PLAN VIEW

BEND

NOTES

1. Contractor to provide blocking adequate to withstand full test pressure.
2. Divide thrust by safe bearing load to determine required area (in square feet) of concrete to distribute load.
3. Areas to be adjusted for other pressure conditions.
4. Provide two 1" (in) minimum diameter rods on valves up through 10" (in) diameter. Valves larger than 10" (in) require special tie rod design.

SIZE	TEST PRESSURE (PSI)	THRUST AT FITTINGS IN POUNDS				
		A	B	C	D	E
		TEE AND DEAD ENDS	90° BEND	45° BEND	22.5° BEND	11.25° BEND
4"	250	3,140	4,440	2,405	1,225	615
6"	250	7,070	9,995	5,410	2,760	1,385
8"	250	12,565	17,770	9,620	4,905	2,465
10"	250	19,635	27,770	15,030	7,660	3,850
12"	250	28,275	39,985	21,640	11,030	5,545
14"	250	38,485	54,425	29,455	15,015	7,545
16"	250	50,265	71,085	38,470	19,615	9,855

SOIL TYPE	SAFE BEARING LOAD (PSF)
MUCK, PEAT, ETC.	0
SOFT CLAY	1,000
SAND	2,000
SAND AND GRAVEL	3,000
SAND AND GRAVEL CEMENTED WITH CLAY	4,000
HARD SHALE	10,000

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jan 25 2017 3:02 PM
cosign

CONCRETE THRUST BLOCK

STANDARD PLAN B-90.40-01

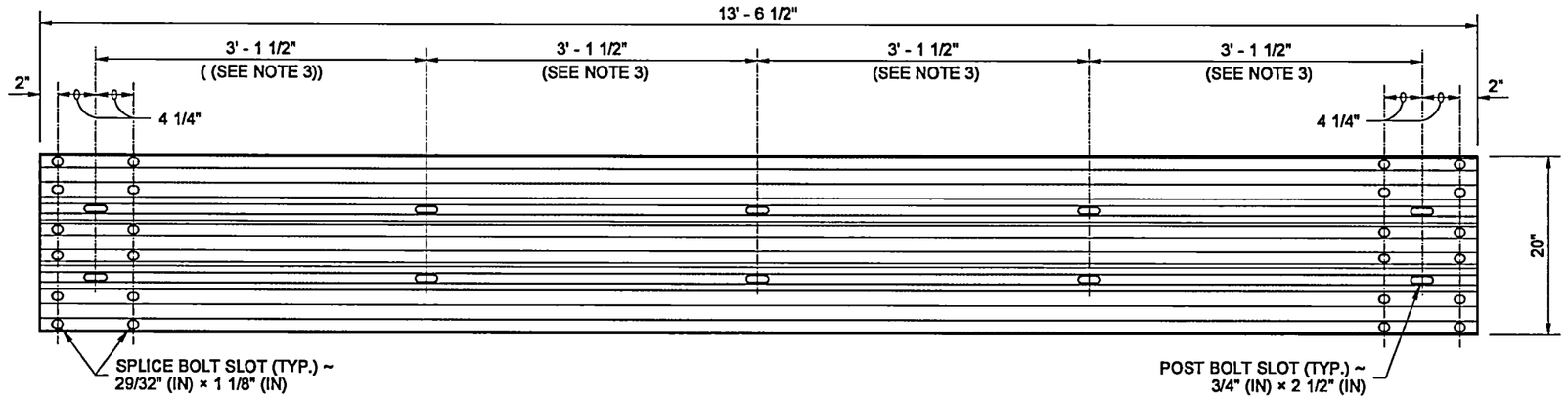
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jan 26 2017 6:53 AM
cosign

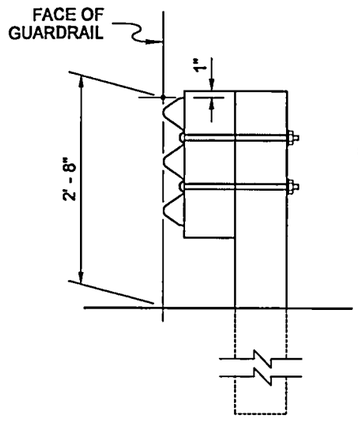
STATE DESIGN ENGINEER

Washington State Department of Transportation

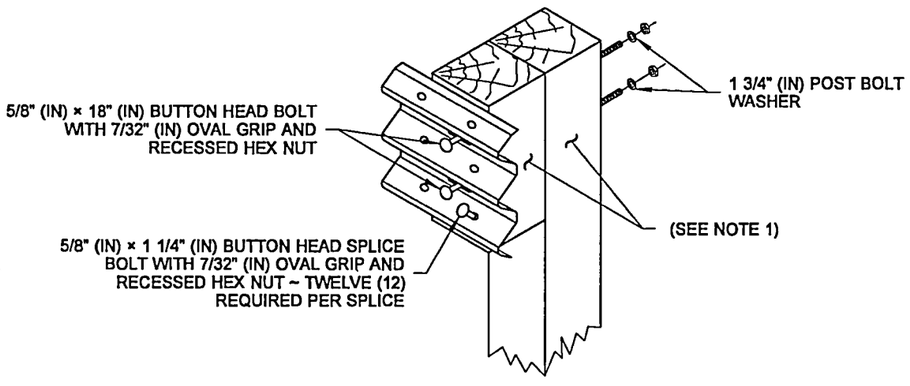
DRAWN BY: FERN LIDDELL



TYPICAL RAIL ELEMENT

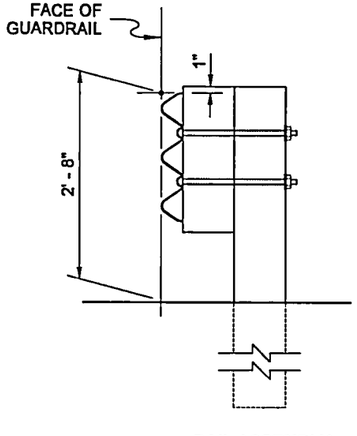


RAIL ASSEMBLY

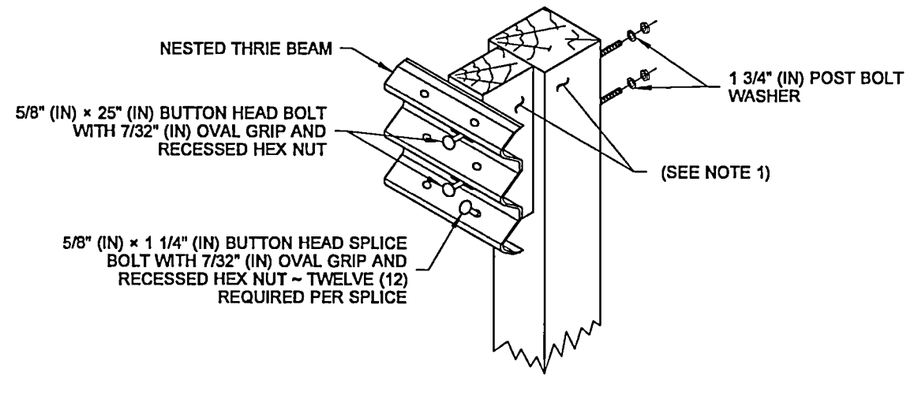


WOOD POST ASSEMBLY

TYPE 10



RAIL ASSEMBLY

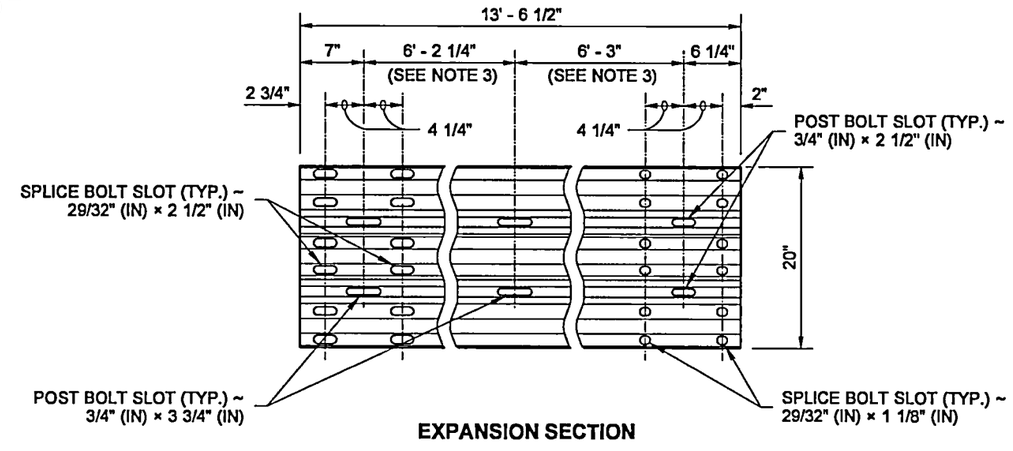


WOOD POST ASSEMBLY

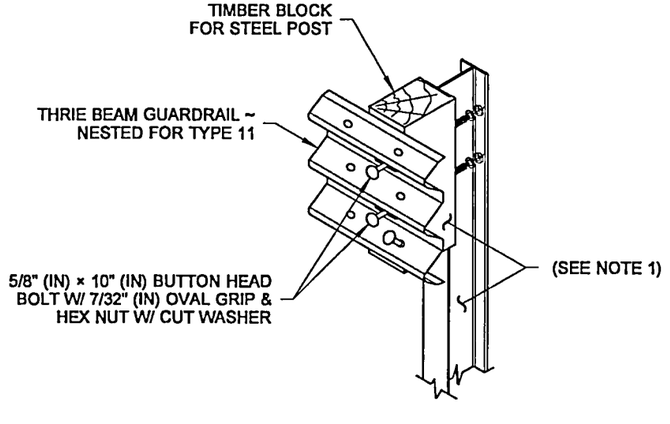
TYPE 11

NOTES

1. Type 10 post shall be 6 × 8 timber, OR either W6 × 9, or W6 × 8.5 steel.
   Type 11 post shall be 10 × 10 timber or W6 × 15.
   For additional details see **Standard Plan C-1b.**
2. Type 10 guardrail post spacing shall be 6' - 3" on center.
   Type 11 shall be a maximum of 3' - 1 1/2" on center.
3. Spacing may vary depending on application. See **Standard Specification Section 9-16.3(1)** for rail element requirements.



EXPANSION SECTION



STEEL POST ASSEMBLY

TYPES 10 AND 11

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
Jul 14 2015 7:07 AM
cosign

BEAM GUARDRAIL (THRIE BEAM)

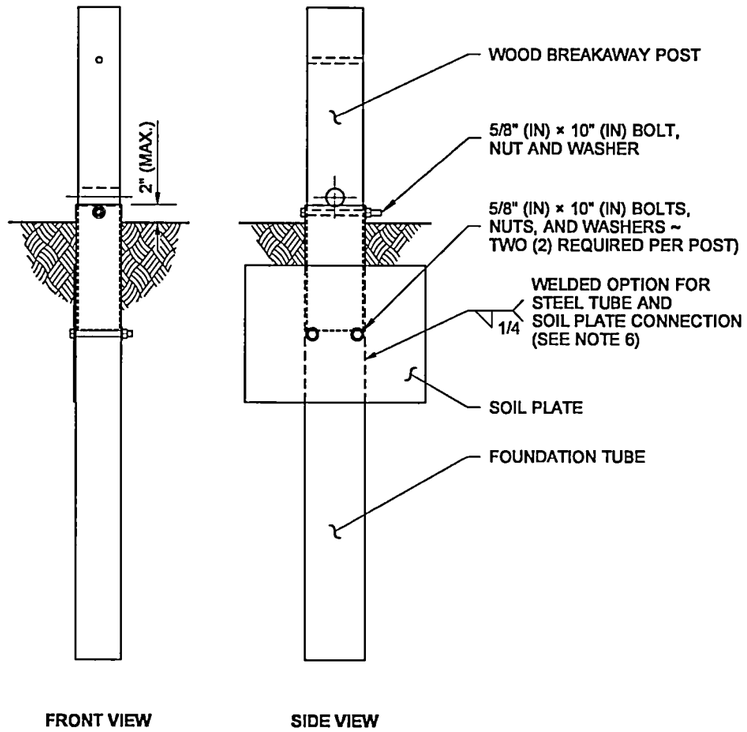
STANDARD PLAN C-1a

SHEET 1 OF 1 SHEET

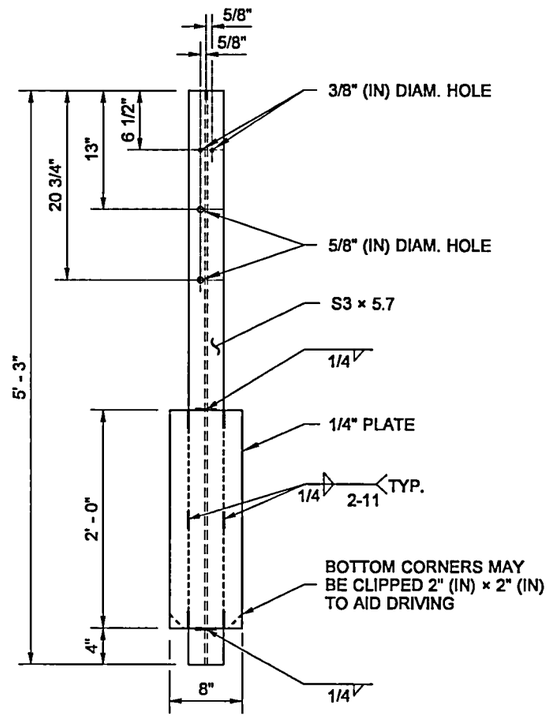
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 14 2015 11:30 AM
STATE DESIGN ENGINEER
cosign

Washington State Department of Transportation

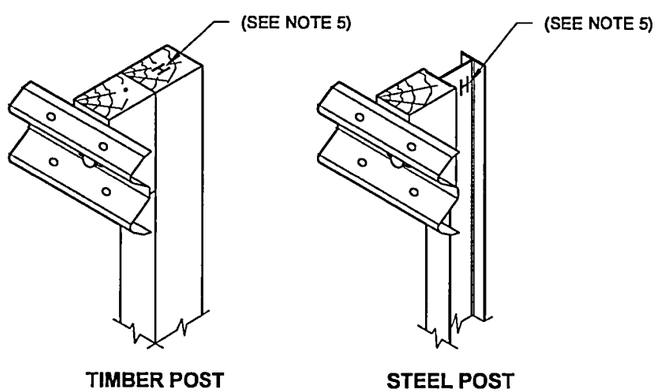
DRAWN BY: FERN LIDDELL



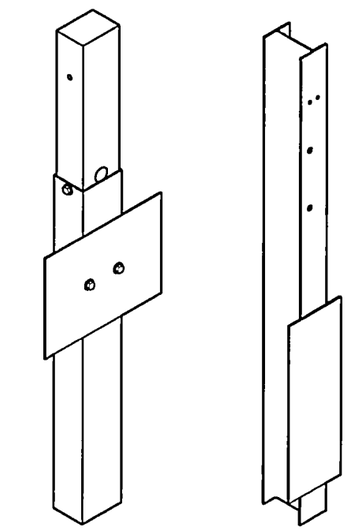
ANCHOR POST ASSEMBLY



G-2 POST



PARTIAL ASSEMBLY DETAIL



ISOMETRIC

NOTES

1. Wood posts for all guardrail placement plans shall be 6 × 8 except where noted otherwise.
2. Lower hole is for Rub Rail of Type 2 and Type 3 Beam Guardrail.
3. W6×8.5 or W6×9 steel posts and timber blocks are alternates for 6×8 timber posts and blocks. W6×15 steel posts and timber blocks are alternates for 10×10 timber posts and blocks.
4. Holes shall be located on approaching traffic side of web.
5. When "Beam Guardrail Type - _ _ Ft. Long Post" is specified in the Contract, the post length shall be stamped with numbers, 1 1/2" (in) min. high and 3/4" (in) wide at the location where the letter "H" is shown in the ASSEMBLY DETAIL. For wood post applications, the letter shall be stamped to a minimum depth of 1/4" (in). For steel post applications, the letter shall be legible after the post is galvanized. After post installation, it shall be the Contractor's responsibility to ensure the stamped numbers remain visible.
6. Soil plate may be welded to foundation tube. If so, holes in soil plate and foundation tube may be omitted.

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

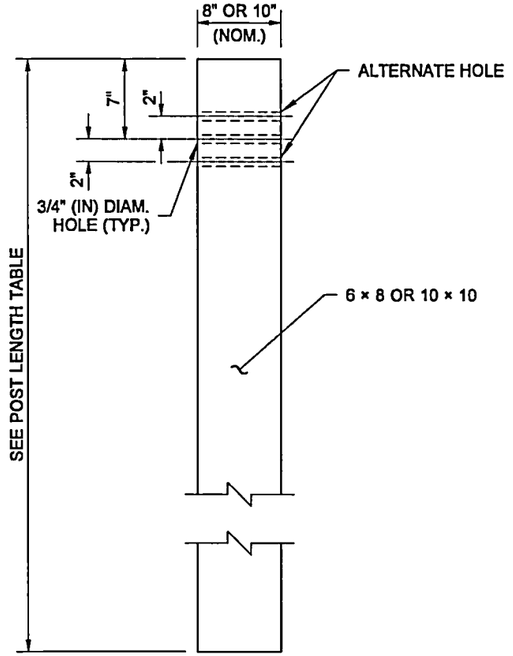
Barry, Ed
Jul 14 2015 7:12 AM

BEAM GUARDRAIL POSTS AND BLOCKS

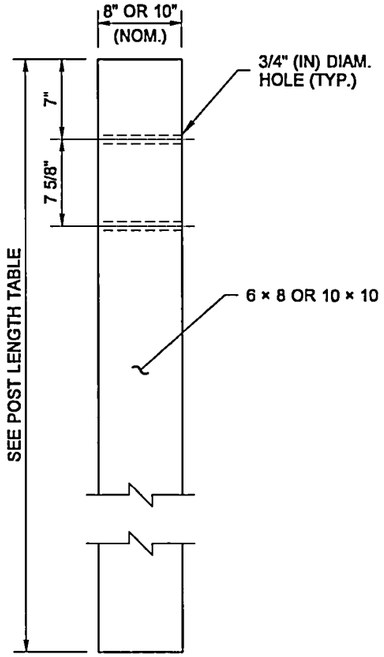
STANDARD PLAN C-1b

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 14 2015 11:29 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

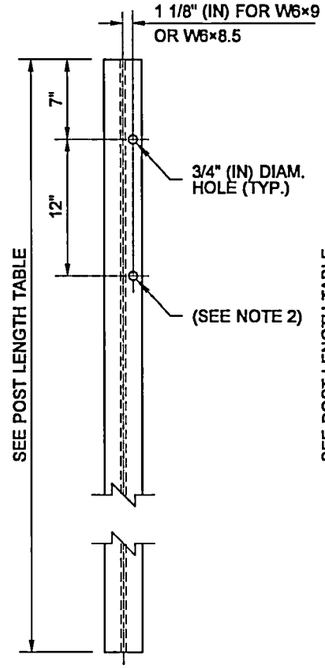


W-BEAM

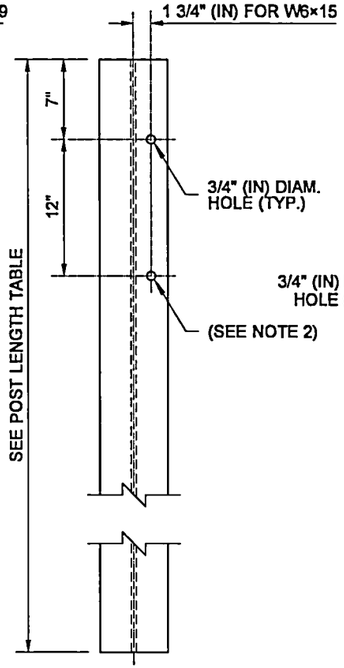


THRIE BEAM

WOOD POST

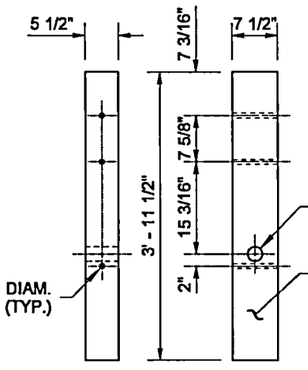


W-BEAM

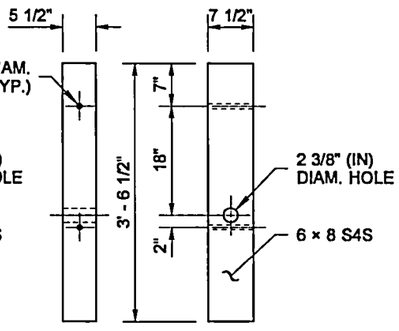


THRIE BEAM

STEEL POST
(SEE NOTES 3 AND 4)

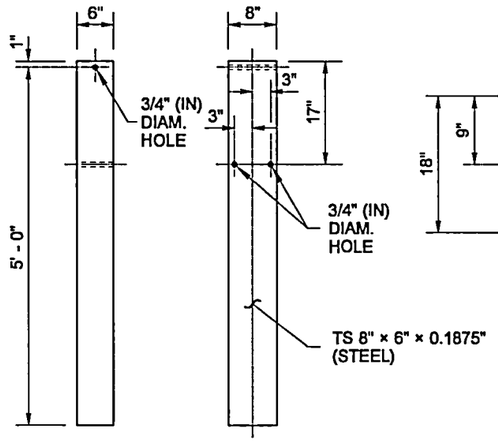


THRIE BEAM

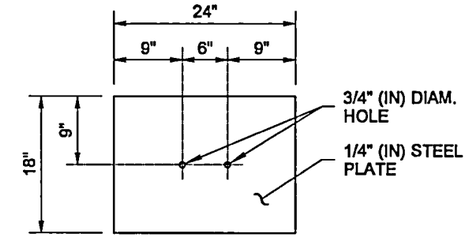


W-BEAM

WOOD BREAKAWAY POST

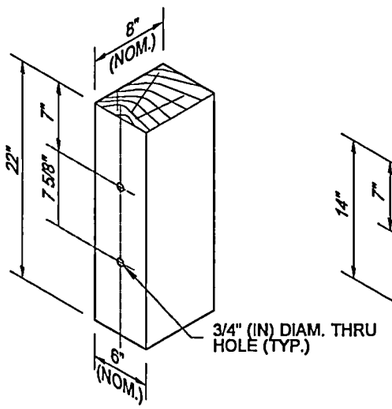


FOUNDATION TUBE

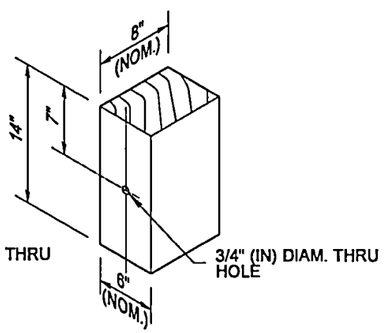


SOIL PLATE

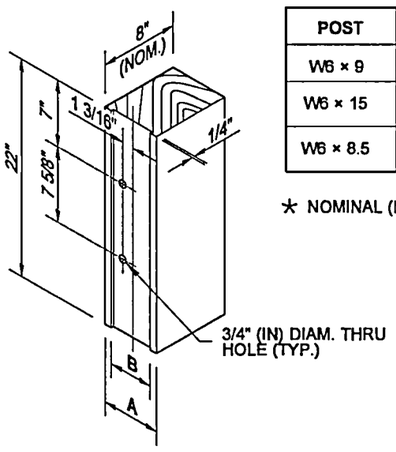
POST LENGTH TABLE	
GUARDRAIL TYPE	LENGTH
1 through 4 & 31	6' - 0"
10 or 11	6' - 6"



THRIE BEAM WOOD BLOCK
FOR WOOD POST



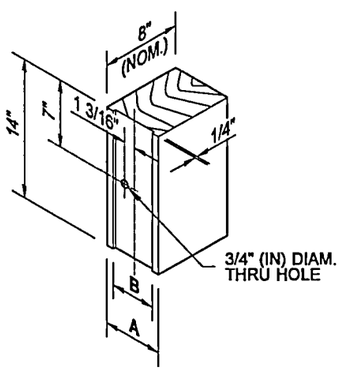
W-BEAM WOOD BLOCK
FOR WOOD POST



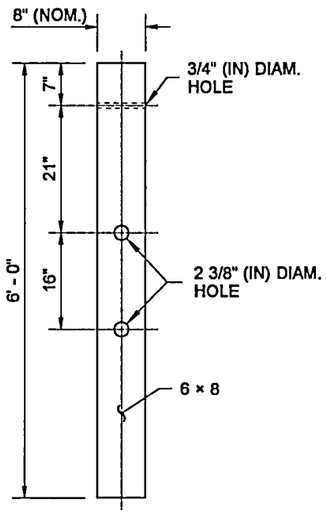
THRIE BEAM WOOD BLOCK
FOR STEEL POST

POST	A	B
W6 × 9	6"*	4 1/4"
W6 × 15	8"*	6 1/4"
W6 × 8.5	8"*	6 1/4"

* NOMINAL (NOM.)



W-BEAM WOOD BLOCK
FOR STEEL POST



CONTROLLED RELEASING
TERMINAL (CRT) POST

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
Jul 14 2015 7:12 AM

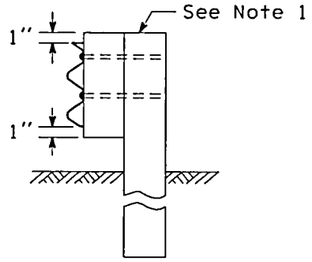
BEAM GUARDRAIL POSTS AND BLOCKS

STANDARD PLAN C-1b

SHEET 2 OF 2 SHEETS

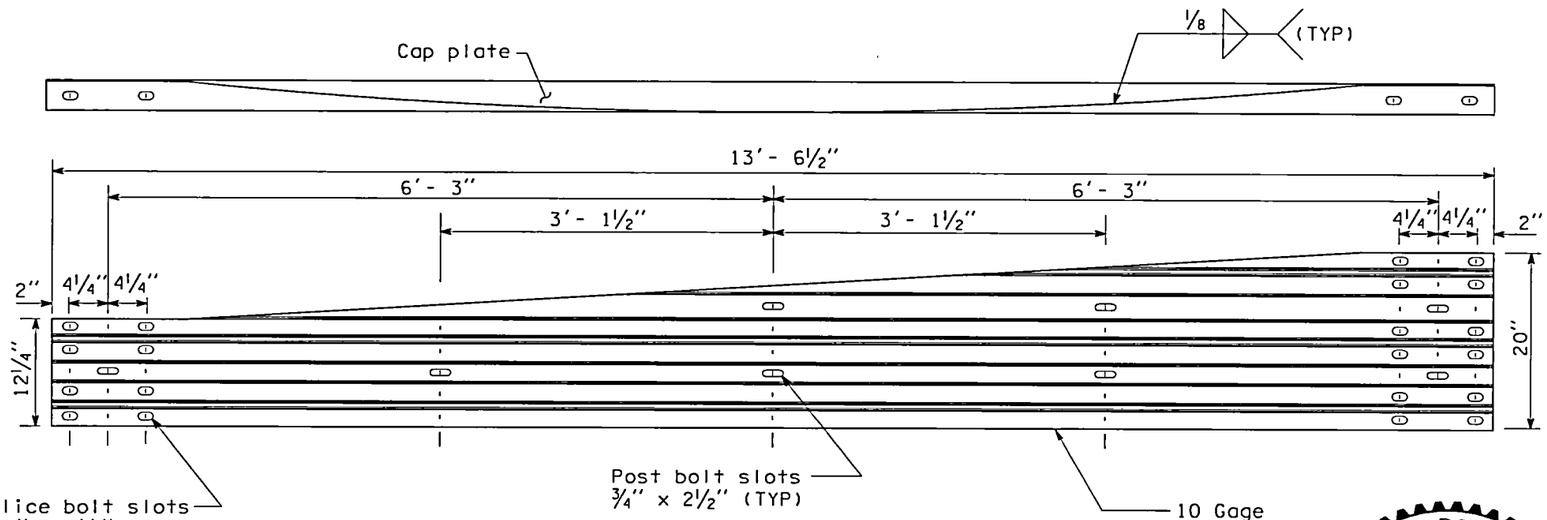
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 14 2015 11:29 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



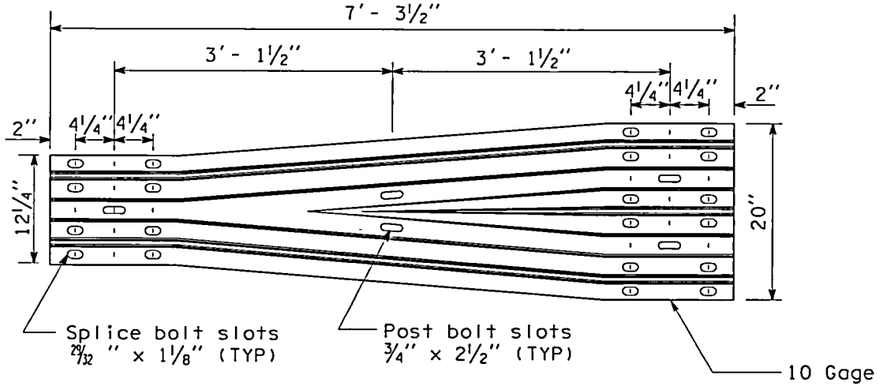
INTERMEDIATE GUARDRAIL
POST CONNECTION DETAILS
(Type A shown)

NOTES
1. For wood posts, saw top of post and block to 1" above thrie beam guardrail reducer section. For steel posts, drive post down to 1" maximum above the thrie beam guardrail reducer section.



THRIE BEAM GUARDRAIL REDUCER SECTION
TYPE A

(Left section shown, right section reversed)



THRIE BEAM GUARDRAIL REDUCER SECTION
TYPE B

RICHARD BARSTOW ALBIN
STATE OF WASHINGTON
34042
REGISTERED
PROFESSIONAL ENGINEER
10/30/03
EXPIRES JULY 24, 2004

THRIE BEAM GUARDRAIL REDUCER SECTION

STANDARD PLAN C-1d

SHEET 1 OF 1 SHEET

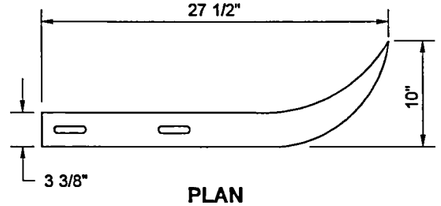
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 10.31.03

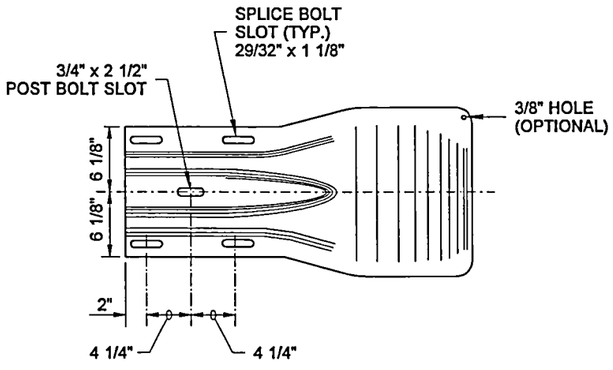
Washington State Department of Transportation

DATE	REVISION	BY
09/2003	ADDED 10 GAGE STEEL DESIGNATION; REV. NOTE 1	RG

DRAWN BY: FERN LIDDELL

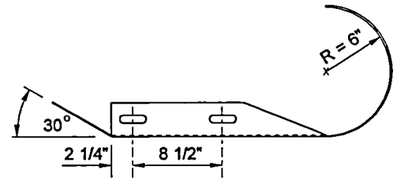


PLAN

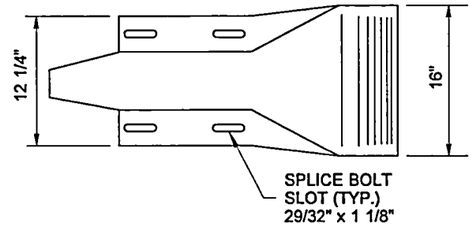


ELEVATION

DESIGN A



PLAN

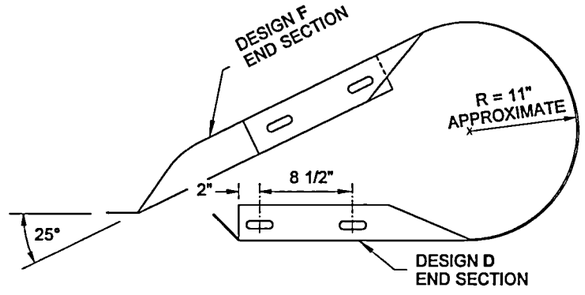


ELEVATION

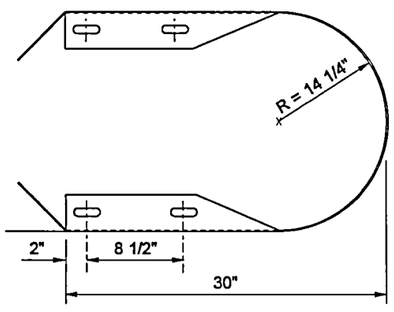
DESIGN C

NOTES

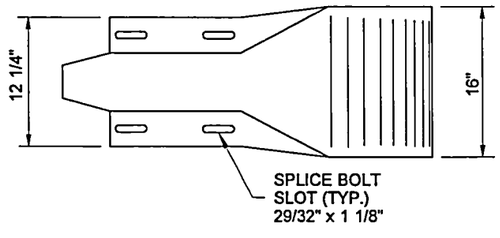
1. End Section Design G shall be used except where noted on the plans or contract.
2. Attach guardrail to bridge rail or concrete barrier with 7/8" diameter bolts (five minimum) **Standard Spec. 9-06.5(4),** with thin slab ferrule inserts or resin bonded anchors. See the Contract Plans.
3. A single piece having similar dimensional shape to Design G and mating with the W-beam guardrail is an alternate.
4. In cases where Design "F" end section is lapped on the outside of the guardrail, a galvanized 1" ID, 2" OD, 0.134" thick, narrow Type A Plain Washer or a anchor rail washer shall be placed under the splice bolt heads.



PLAN

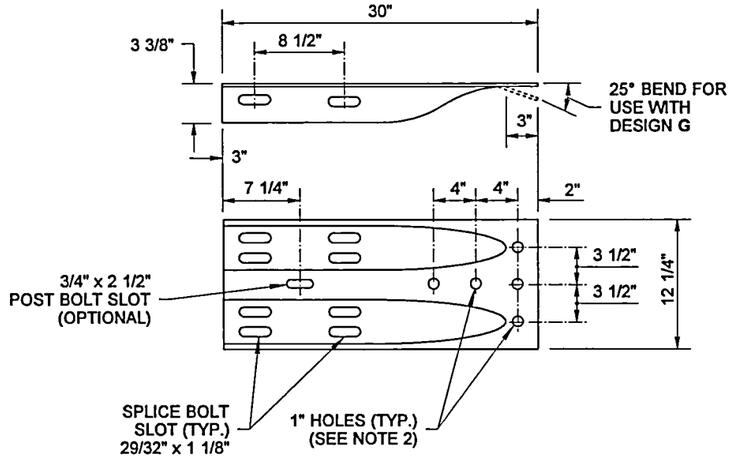


PLAN



ELEVATION

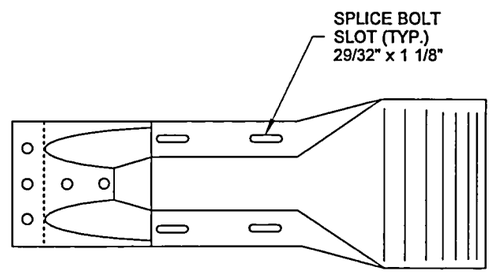
DESIGN D



ELEVATION

DESIGN F

(SEE NOTE 4)



ELEVATION

DESIGN G

(SEE NOTE 3)

6-8-2011

BEAM GUARDRAIL END SECTIONS

STANDARD PLAN C-7

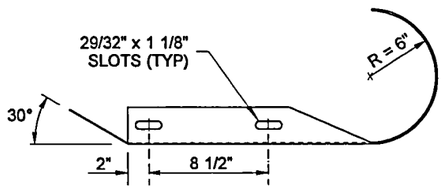
SHEET 1 OF 1 SHEET

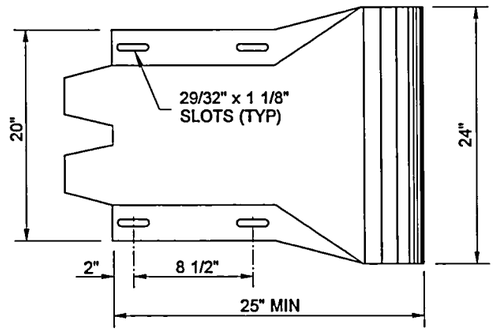
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 6/16/11

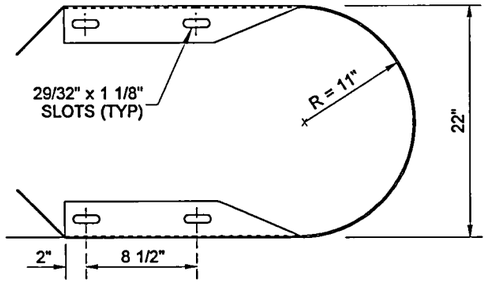
Washington State Department of Transportation

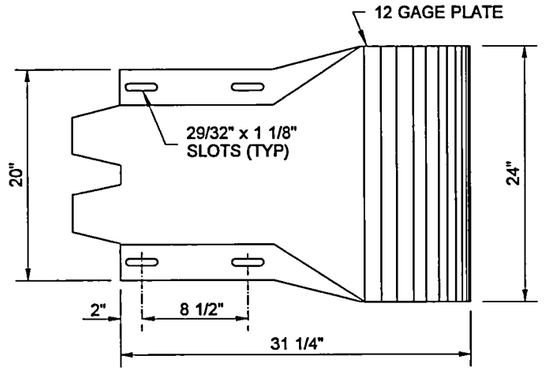
DRAWN BY: FERN LIDDELL





DESIGN C (THRIE BEAM)



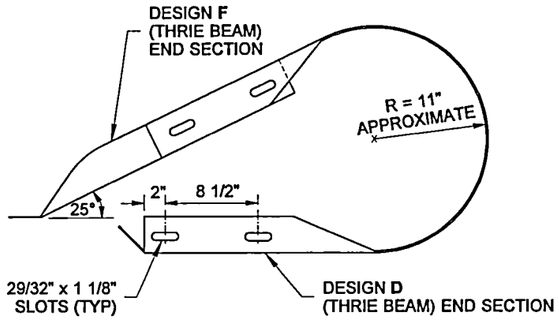


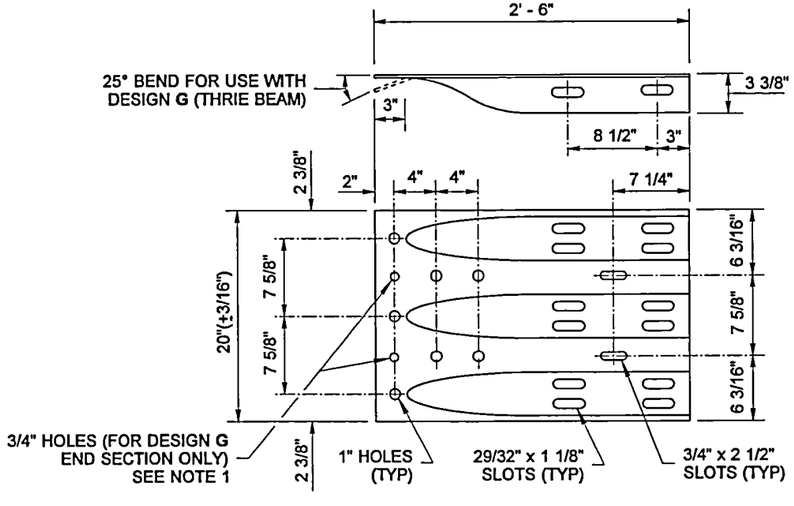
DESIGN D (THRIE BEAM)

NOTES

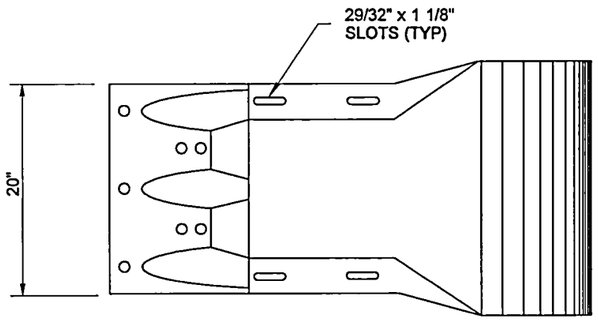
1. Attach guardrail to bridge rail or concrete barrier with 7/8" diameter bolts (five minimum) **Standard Spec. 9-06.5(4),** with thin slab ferrule inserts or resin bonded anchors. See the Contract Plans.

2. In cases where Design F End Section is lapped on the outside of the guardrail, a galvanized 1" ID, 2" OD, 0.134" thick, narrow Type A Plain Washer or an anchor rail washer will be placed under the splice bolt heads.





DESIGN F (THRIE BEAM)



DESIGN G (THRIE BEAM)

TERRY L. BERENDS
STATE OF WASHINGTON
32350
REGISTERED
PROFESSIONAL ENGINEER

6-8-2011

THRIE BEAM END SECTIONS

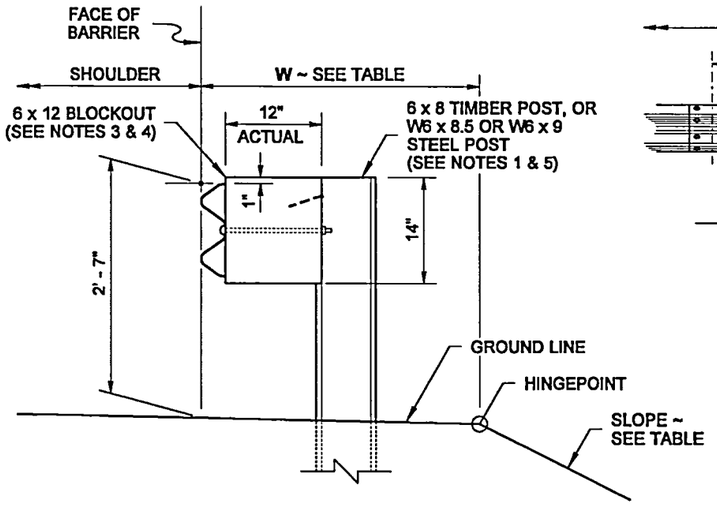
STANDARD PLAN C-7a

SHEET 1 OF 1 SHEET

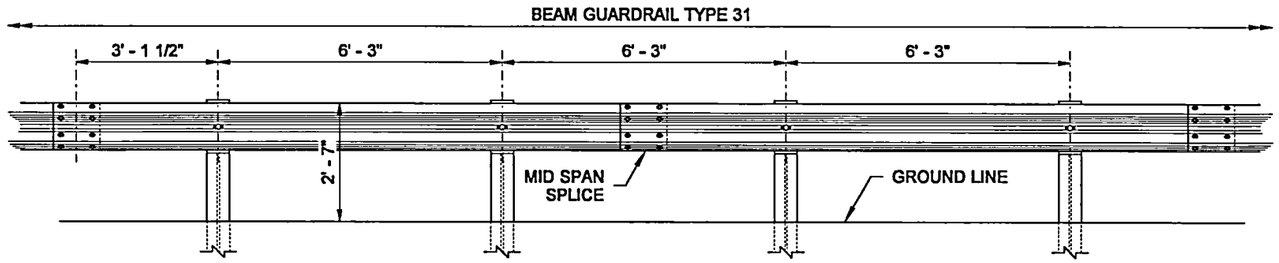
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 6/16/11

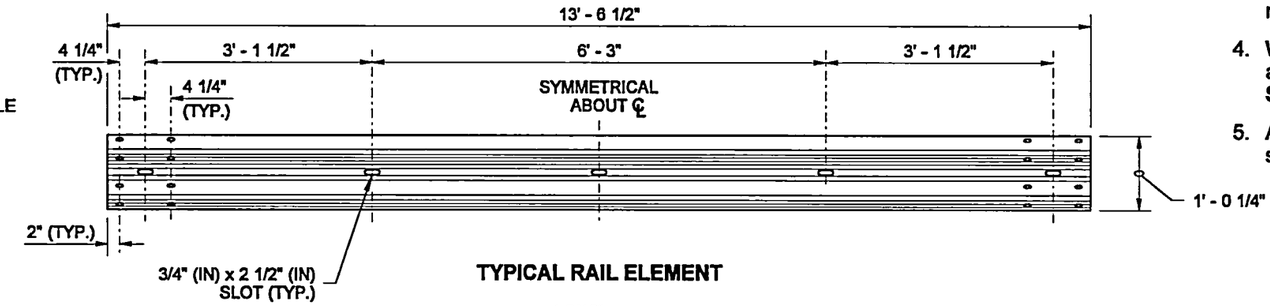
Washington State Department of Transportation



TYPICAL SECTION ~ WITHOUT CURB
(6' - 0" LONG POSTS)



TYPICAL ELEVATION

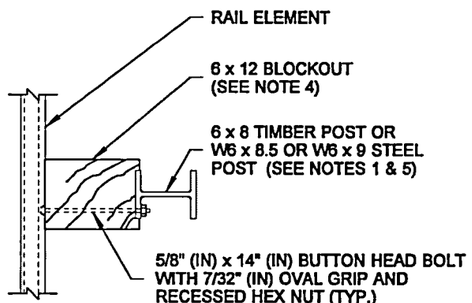


TYPICAL RAIL ELEMENT

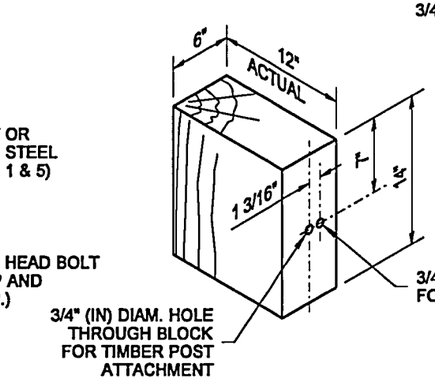
NOTES

1. Refer to **Standard Plan C-1b** and **C-20.11** for additional details not shown on this plan.
2. Extend shoulder pavement to provide a base for the extruded curb. See Contract Plans for exceptions to distances shown.
3. Use a single block or combination of blocks (no more than two (2) to achieve the actual 12" (in) offset. See **Standard Specification Section 9-16.3(2)**. Wood blocks shall be secured to the posts with anti-rotation nails. If combination blocks are used, the adjacent blocks shall be toenailed with two 16d galvanized nails to prevent block rotation.
4. Wood blocks are shown. Blocks of an approved alternative material may be used. See **Standard Specification Section 9-16.3(2).**
5. All posts for any standard barrier run shall be of the same type: timber or steel.

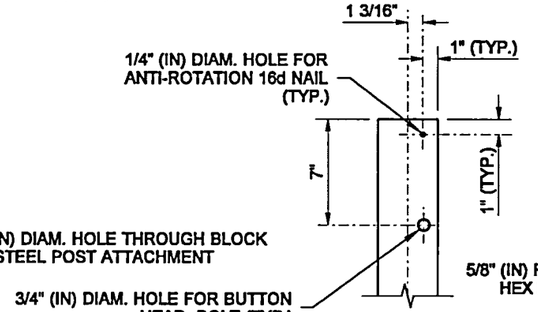
SLOPE \ EMBANKMENT TABLE	
SLOPE	W (FT)
2H : 1V OR FLATTER	2.5' MIN.
STEEPER THAN 2H : 1V BUT NOT STEEPER THAN 1H : 1V	4.0' MIN.



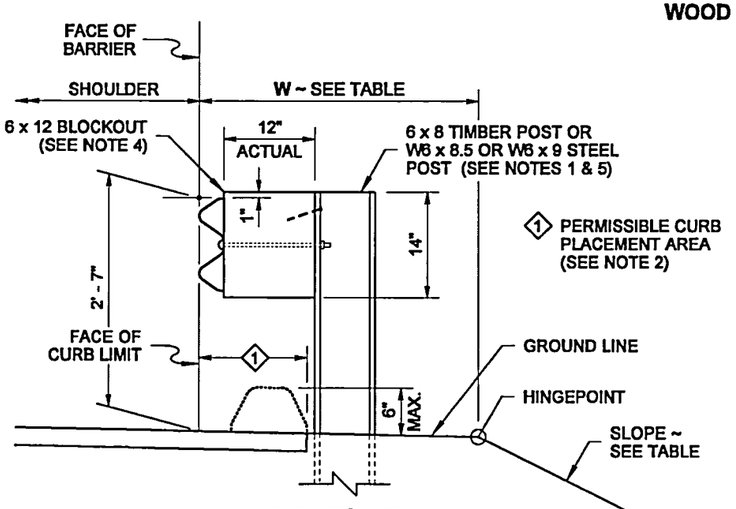
PLAN VIEW



WOOD BLOCK

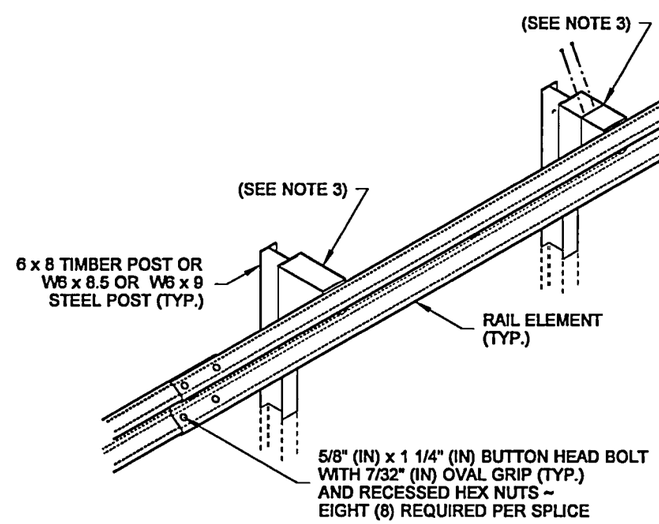


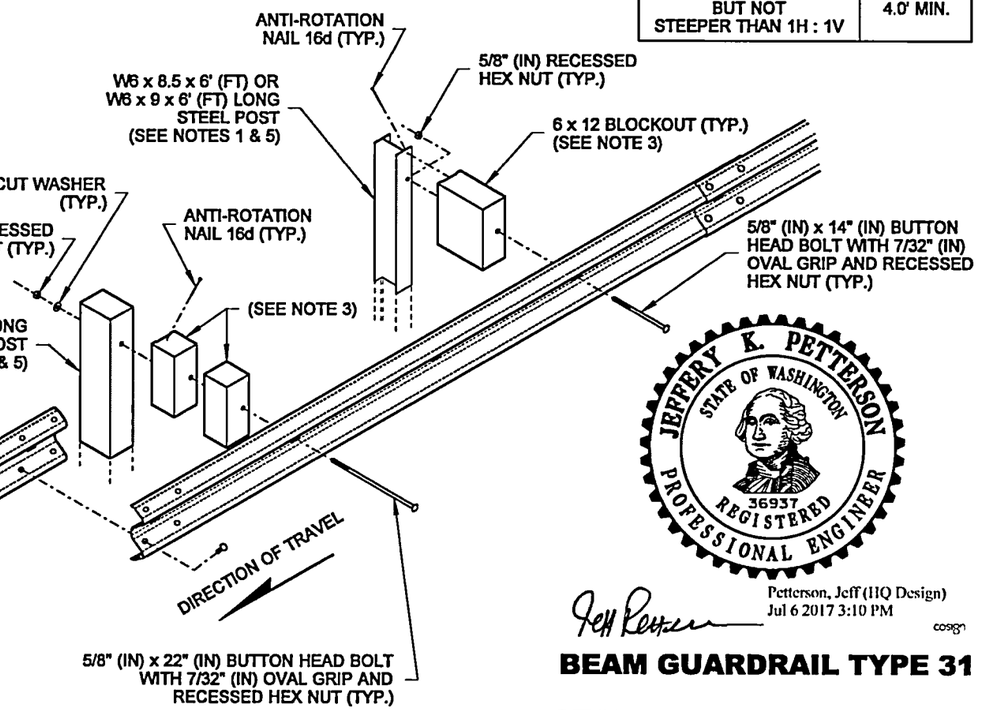
STEEL POST



ELEVATION VIEW

TYPICAL SECTION ~ WITH CURB
(6' - 0" LONG POSTS)





ISOMETRIC VIEW

JEFFREY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jul 6 2017 3:10 PM

BEAM GUARDRAIL TYPE 31

STANDARD PLAN C-20.10-04

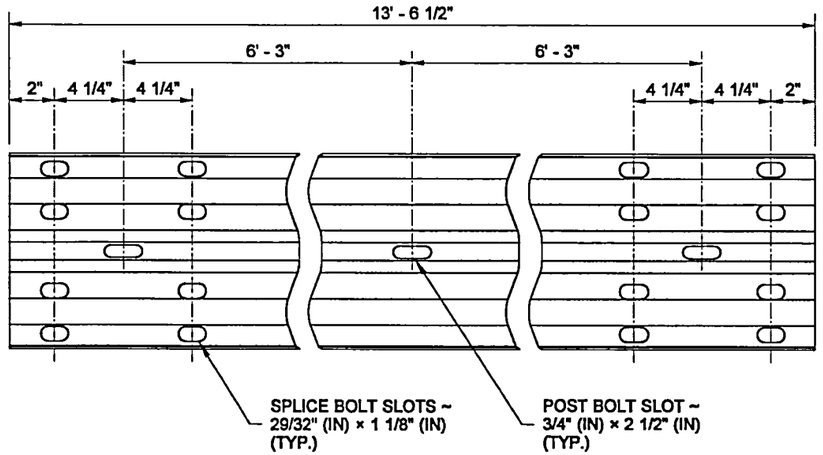
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:41 AM

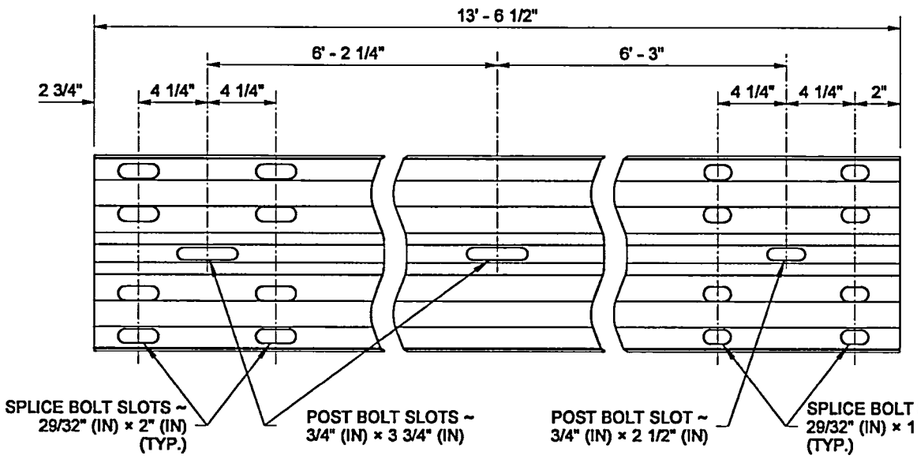
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

DRAWN BY: FERN LIDDELL



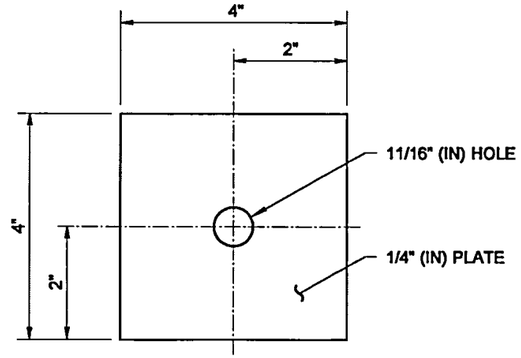
TYPICAL RAIL ELEMENT



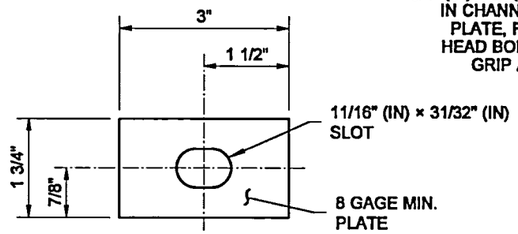
EXPANSION SECTION

NOTES

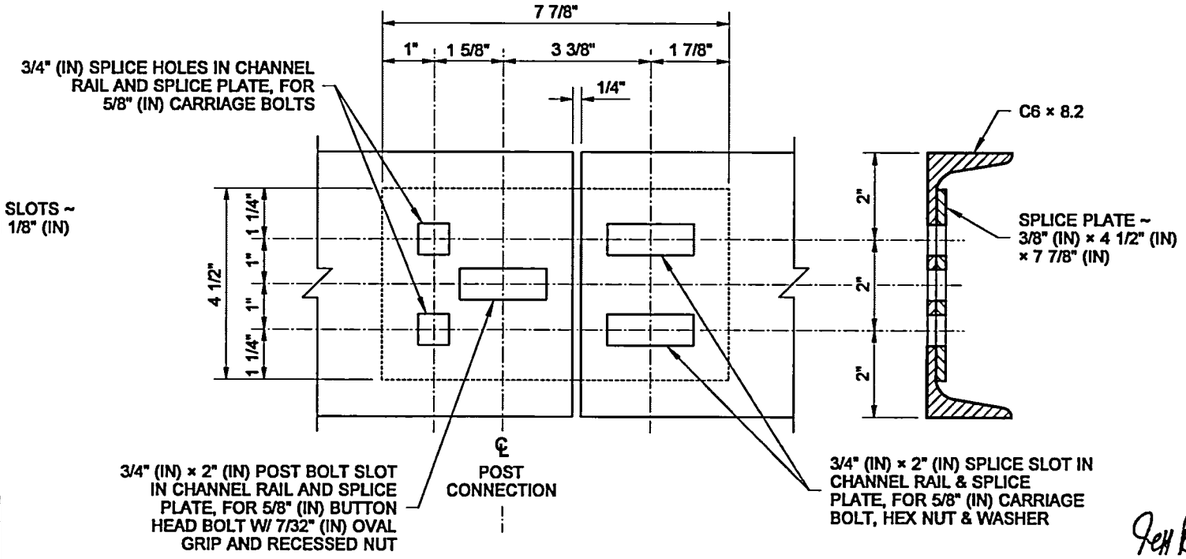
1. When required by the Contract, a Snow Load Post Washer shall be used on the backside of the post (in lieu of the 1 3/4" (in) Post Bolt Washer) and a Snow Load Rail Washer shall be placed on the face side of Beam Guardrail Types 1 and 2. Snow Load Rail Washers shall not be installed on terminals.
2. Rail Washers, also called "Snow Load Rail Washers", are not required on new installation, except as called for in Note 1. Unnecessary Rail washers need not be removed from existing installations, except those on posts 2 through 8 of a BCT installation shall be removed.
3. Timber blocks shall be toe-nailed to the post with a 16d galvanized nail to prevent block rotation.
4. For post and block details, see **Standard Plan C-1b**.
5. When "Beam Guardrail Type - ___ Ft. Long Post" is specified in the Contract, the post length shall be stamped with numbers, 1 1/2" (in) min. high and 3/4" (in) wide at the location where the letter "H" is shown in the ASSEMBLY DETAIL. For wood post applications, the letter shall be stamped to a minimum depth of 1/4" (in). For steel post applications, the letter shall be legible after the post is galvanized. After post installation, it shall be the Contractor's responsibility to ensure the stamped numbers remain visible.
6. Existing posts shall not be raised. Replace posts as necessary to achieve required guardrail height.
7. Holes shall be located on approaching traffic side of web.



SNOW LOAD POST WASHER
SEE NOTE 1



SNOW LOAD RAIL WASHER
SEE NOTES 1 & 2



CHANNEL RAIL SPLICE

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jul 6 2017 3:11 PM
cosign

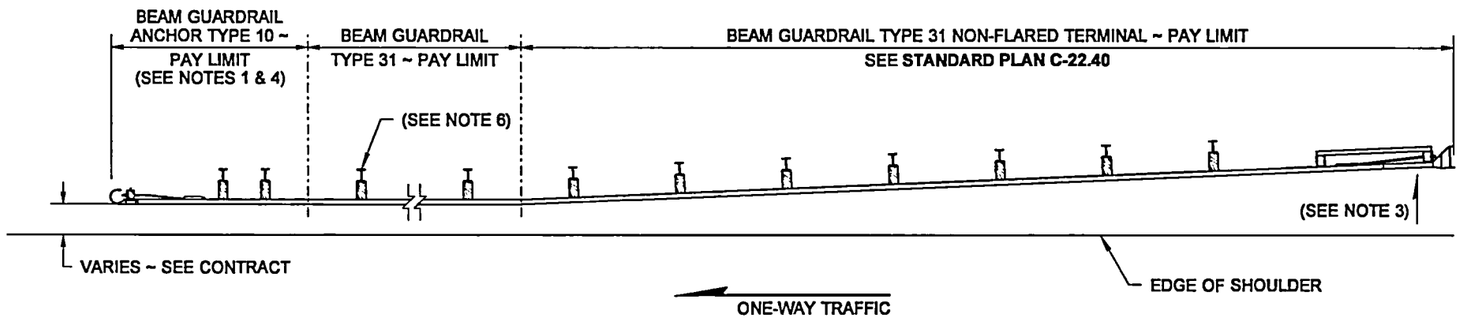
BEAM GUARDRAIL TYPE 31 COMPONENTS

STANDARD PLAN C-20.11-00

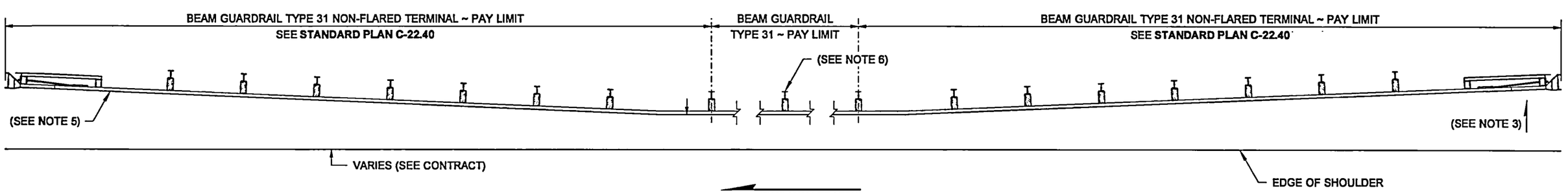
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:31 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

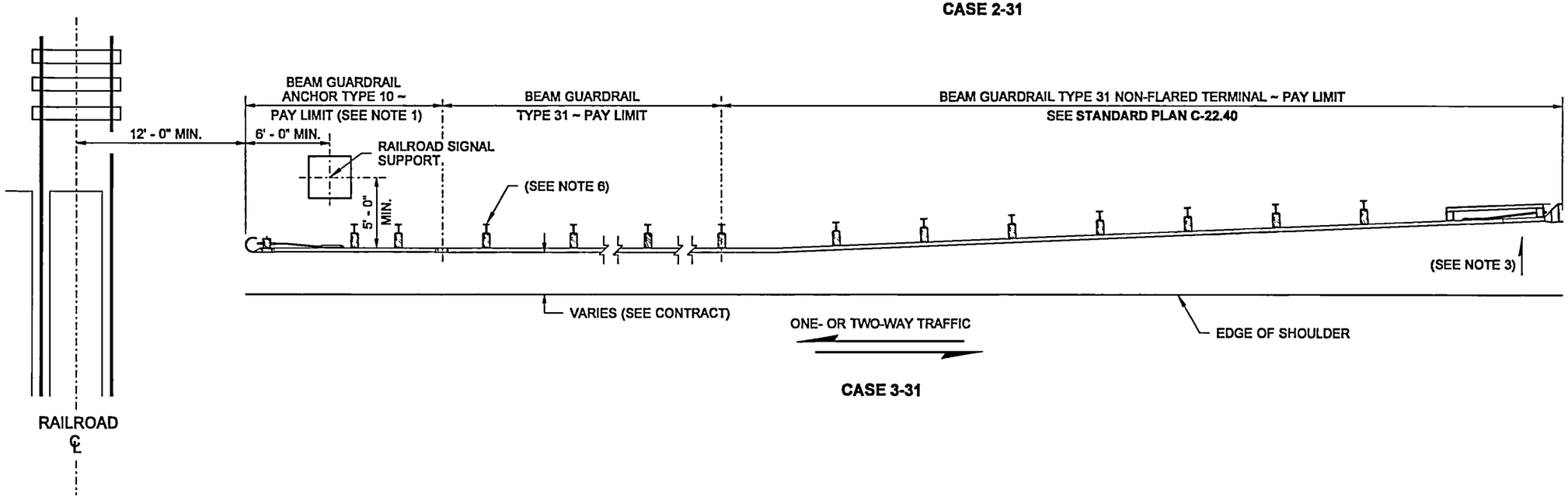
DRAWN BY: FERN LIDDELL



CASE 1-31



CASE 2-31



CASE 3-31

NOTES

1. For component details, see **Standard Plan C-23.60.**
2. For terminal type and details, see Contract Plans and applicable drawings.
3. The slope from the edge of the shoulder into the face of the guardrail cannot exceed 10H : 1V when the face of the guardrail is less than 12' - 0" from the edge of the shoulder.
4. For one-way traffic and where a crashworthy terminal is not required, use the Beam Guardrail Anchor Type 10; see **Standard Plan C-23.60.**
5. Where a crashworthy terminal is required, use a Beam Guardrail Type 31 Non-Flared Terminal; see **Standard Plan C-22.40.**
6. Timber or steel post. Steel post shown.

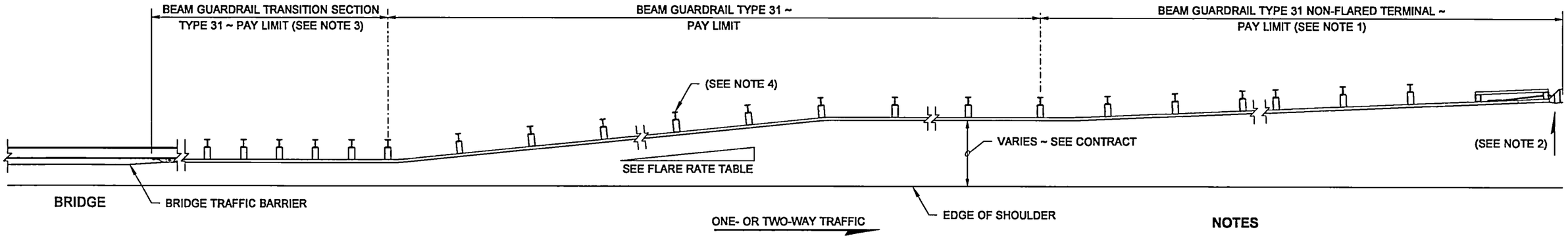
EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 2 2014 1:18 PM

BEAM GUARDRAIL TYPE 31 PLACEMENT (CASES 1-31, 2-31 & 3-31) STANDARD PLAN C-20.14-03

SHEET 1 OF 1 SHEET

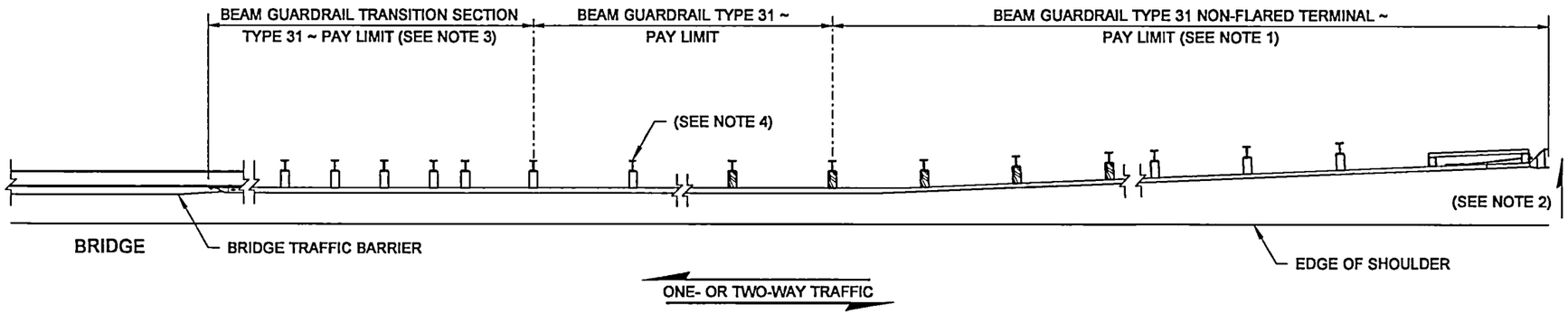
APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:05 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation



CASE 4 - 31

NOTES

1. For details, see **Standard Plan C-22.40**.
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10H : 1V when the guardrail is within 12' - 0" from the edge of the shoulder.
3. See Contract for Beam Guardrail Transition Section type and Connection to Bridge Traffic Barrier or Concrete Barrier. See **Standard Plan C-24.10** for connection details.
4. Timber or steel post. Steel post shown.



CASE 5 - 31

FLARE RATE TABLE	
POSTED SPEED (MPH)	RATE (FT)
70	15 : 1
60	14 : 1
55	12 : 1
50	11 : 1
45	10 : 1
40 OR LESS	9 : 1

DRAWN BY: FERN LIDDELL

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 2 2014 1.23 PM

BEAM GUARDRAIL TYPE 31 PLACEMENT (CASES 4-31 & 5-31)

STANDARD PLAN C-20.15-02

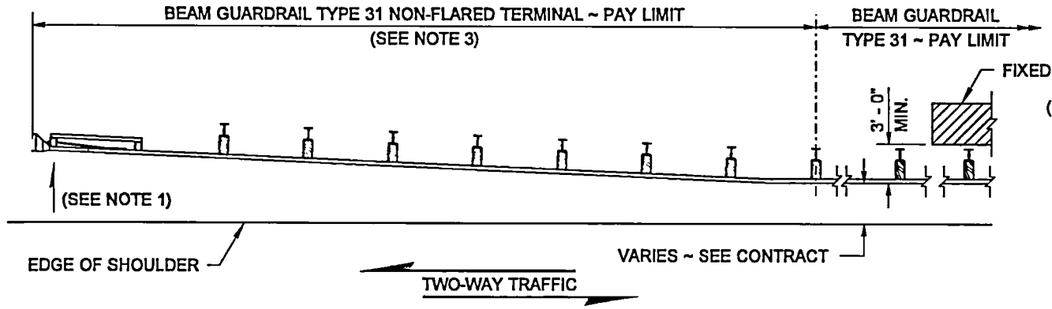
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1.06 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

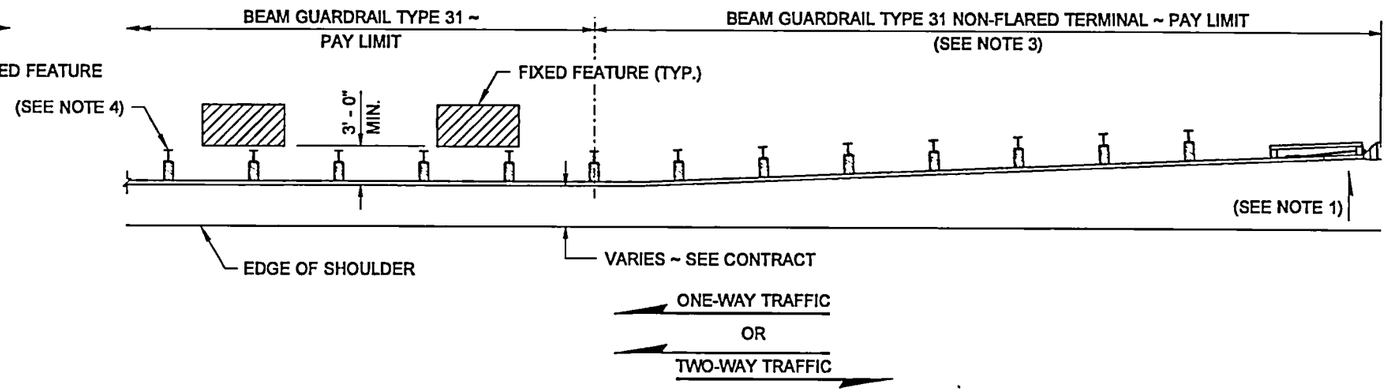
DRAWN BY: FERN LIDDELL

NOTES

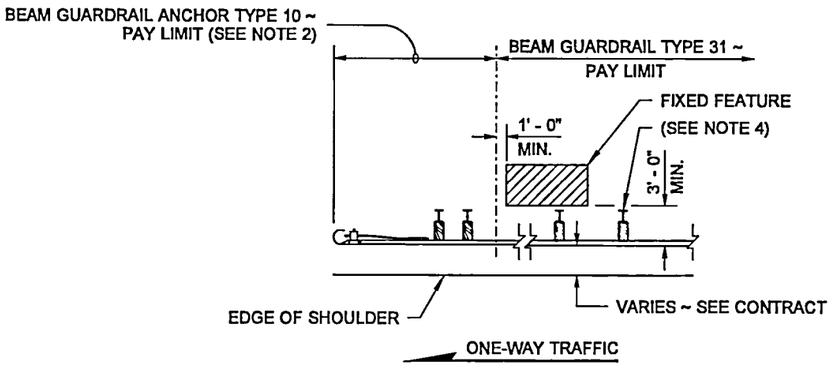
1. The slope from the edge of the shoulder into the face of the guardrail should not exceed 10H : 1V when the guardrail is within 12' - 0" from the edge of the shoulder.
2. For details, see **Standard Plan C-23.60**.
3. For details, see **Standard Plan C-22.40**.
4. Timber or steel post. Steel post shown.



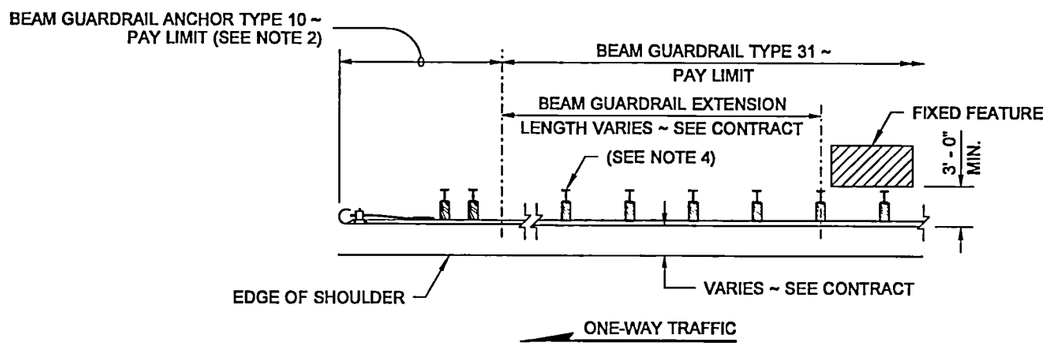
CASE 10A - 31
(TRAILING END)



CASE 10A-31, 10B-31, OR 10C-31
(APPROACH END)



CASE 10B-31
(TRAILING END)



CASE 10C-31
(TRAILING END)

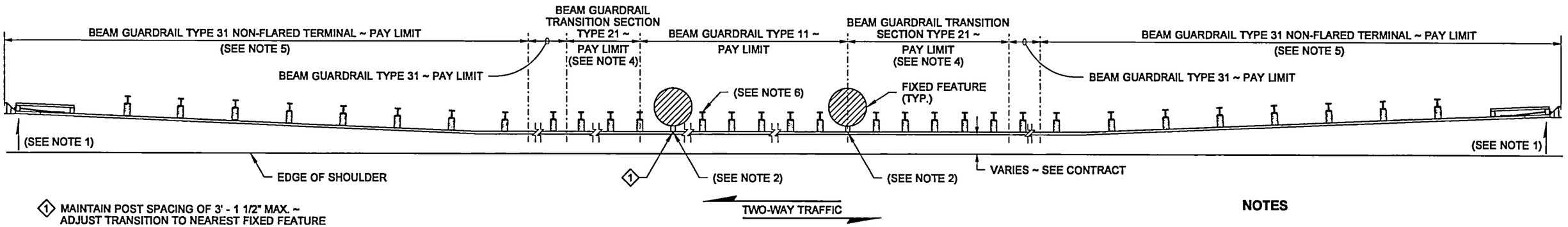
EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 2 2014 2.06 PM

BEAM GUARDRAIL TYPE 31 PLACEMENT (CASES 10A-31, 10B-31 & 10C-31)
STANDARD PLAN C-20.18-02

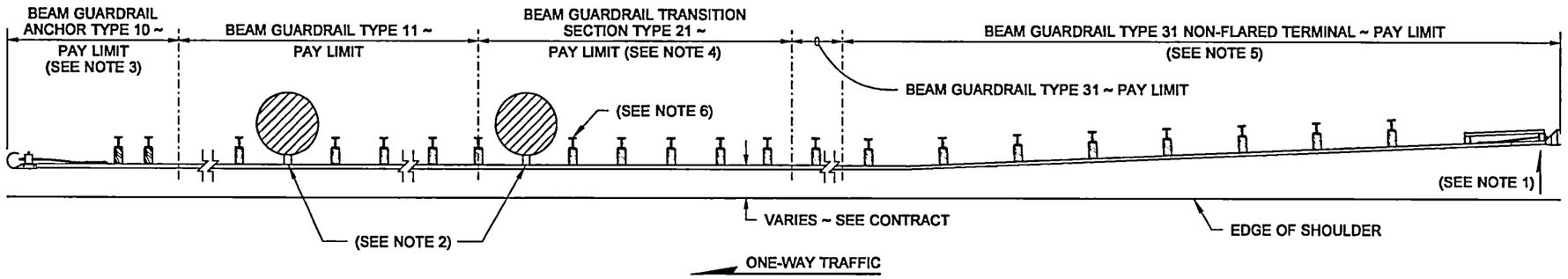
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1.07 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

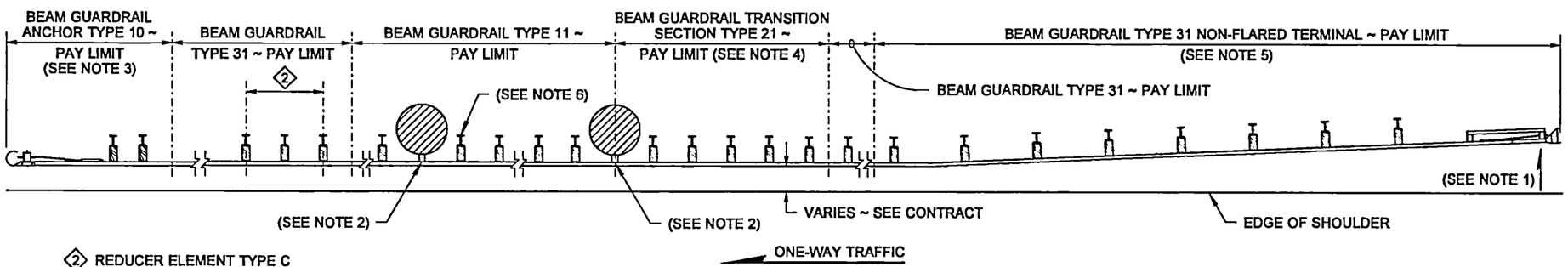


1 MAINTAIN POST SPACING OF 3' - 1 1/2" MAX. ~ ADJUST TRANSITION TO NEAREST FIXED FEATURE

CASE 11A-31



CASE 11B-31



2 REDUCER ELEMENT TYPE C (TYPE 31) ~ FOR DETAILS, SEE **STD. PLAN C-25.20**

CASE 11C-31

NOTES

1. The slope from the edge of the shoulder into the face of the guardrail should not exceed 10H : 1V when the guardrail is within 12' - 0" from the edge of the shoulder.
2. Attach the standard wood block to the rail using two 5/8" (in) × 4" (in) lag bolts.
3. Beam Guardrail Anchor Type 10 (W-Beam) or Type 10 (Thrie Beam) required. For details, see **Standard Plan C-23.60**.
4. For details, see **Standard Plan C-25.20**.
5. For details, see **Standard Plan C-22.40**.
6. Timber or steel post. Steel post shown.

DRAWN BY: FERN LIDDELL

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

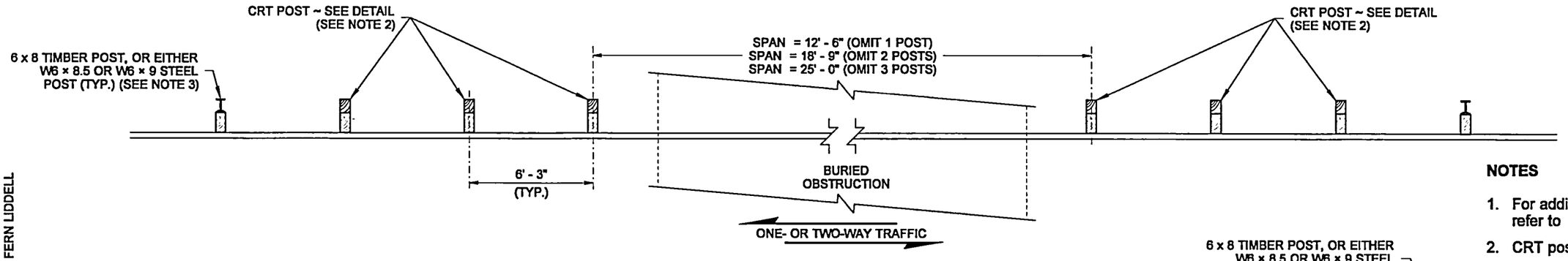
Barry, Ed
May 2 2014 2.09 PM

BEAM GUARDRAIL TYPE 31 PLACEMENT (CASES 11A-31, 11B-31 & 11C-31) STANDARD PLAN C-20.19-02

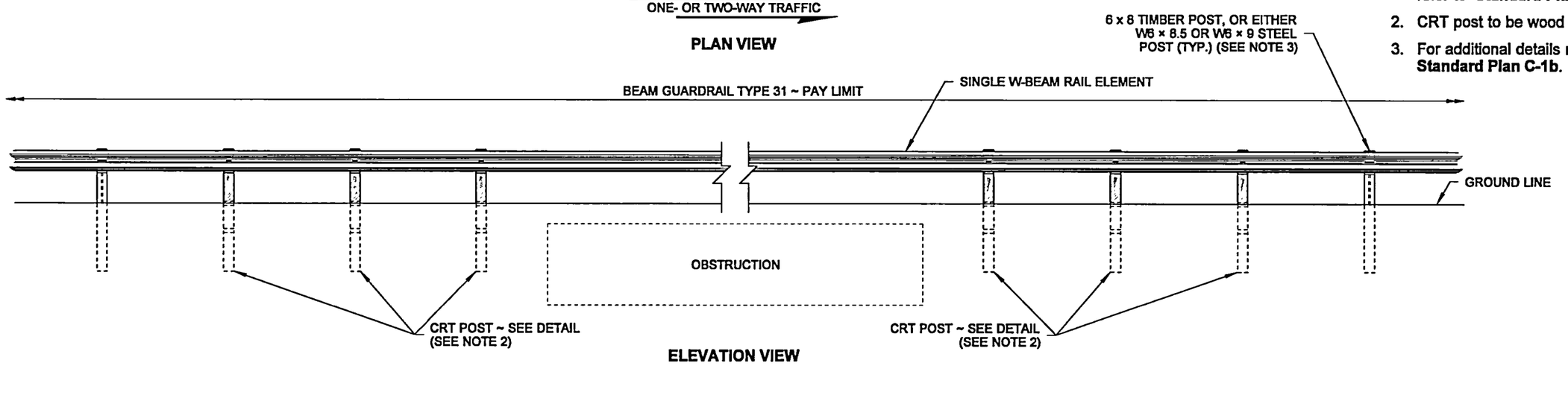
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:07 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



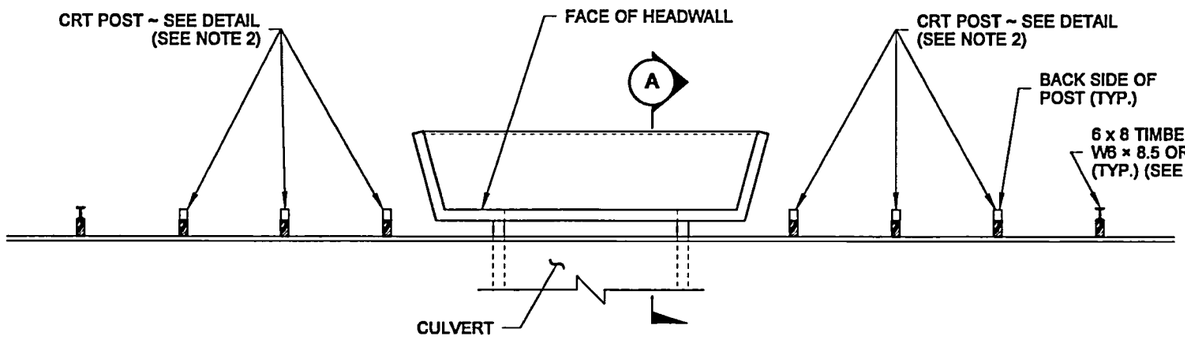
PLAN VIEW



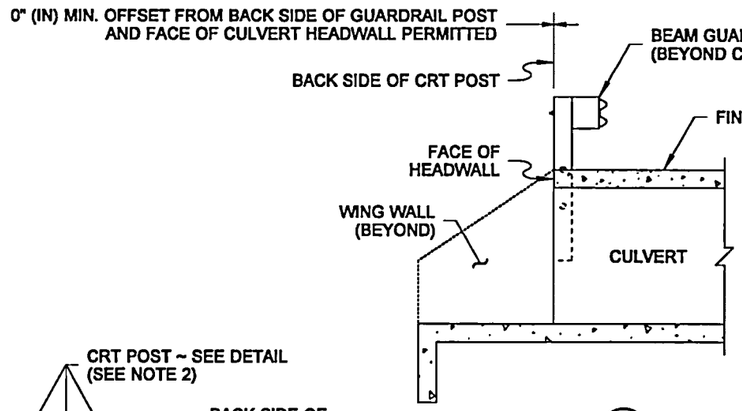
ELEVATION VIEW

NOTES

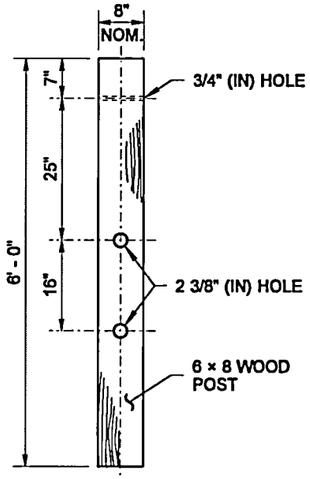
1. For additional details not shown on this plan, refer to **Standard Plan C-20.10.**
2. CRT post to be wood only.
3. For additional details not shown, see **Standard Plan C-1b.**



SPAN WITH HEADWALL DETAIL



SECTION (A)



CONTROLLED RELEASING TERMINAL (CRT) POST DETAIL

JEFFREY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (IIQ Design)
Jul 6 2017 3:12 PM

BEAM GUARDRAIL TYPE 31 PLACEMENT 12' - 6", 18' - 9", OR 25' - 0" SPAN

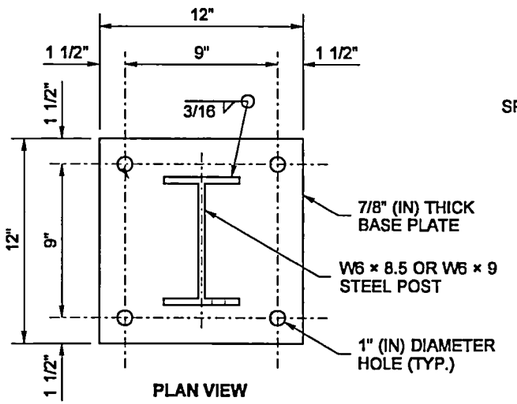
STANDARD PLAN C-20.40-06

SHEET 1 OF 1 SHEET

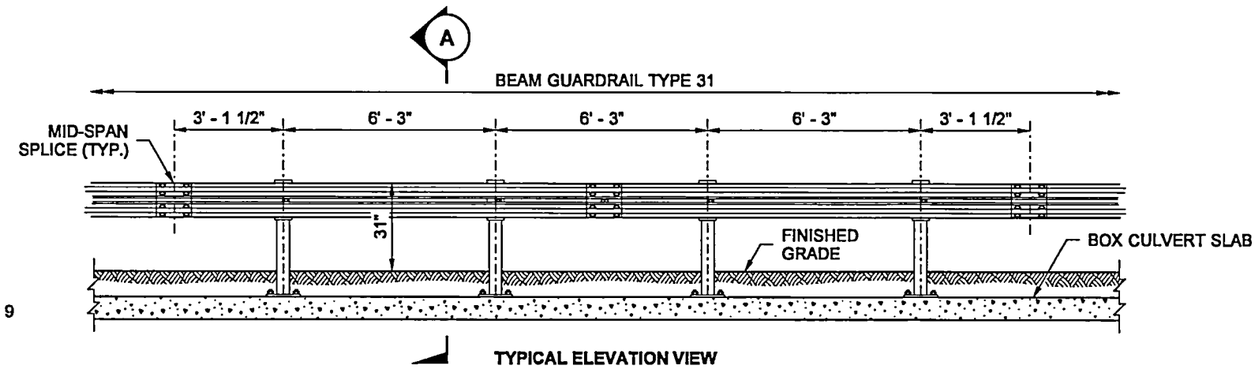
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:27 AM

STATE DESIGN ENGINEER

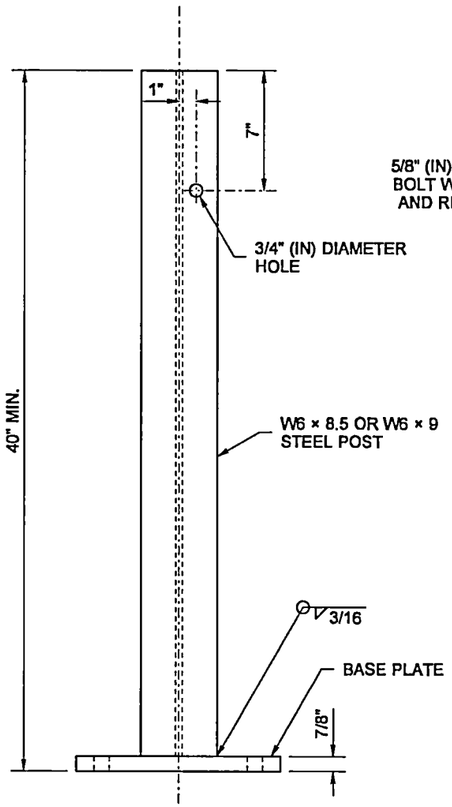
Washington State Department of Transportation



PLAN VIEW

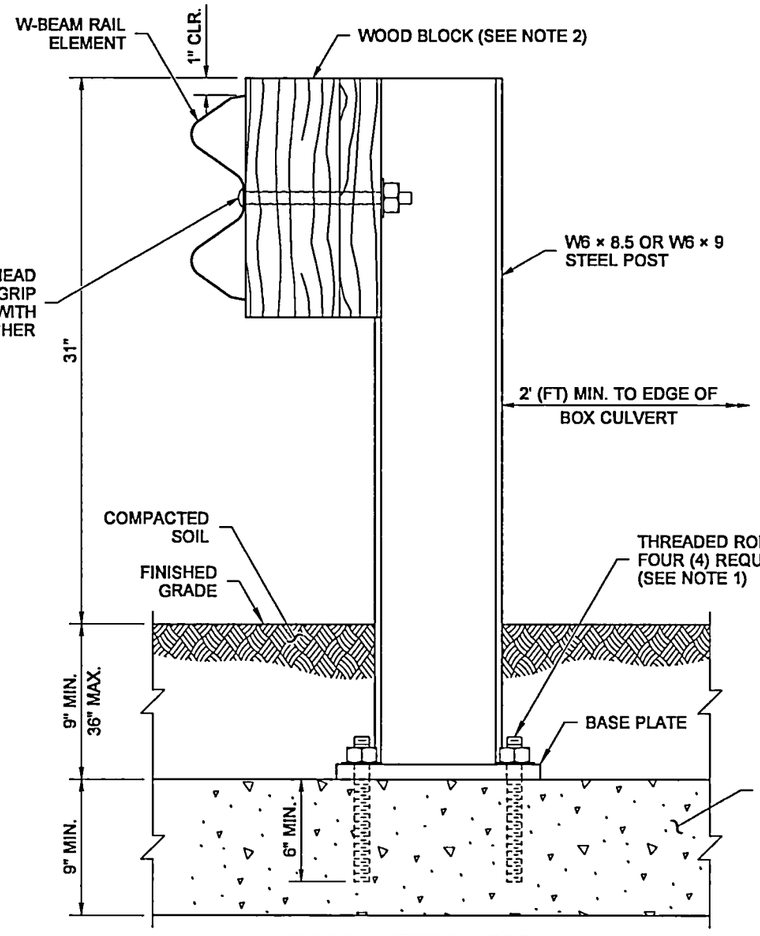


TYPICAL ELEVATION VIEW



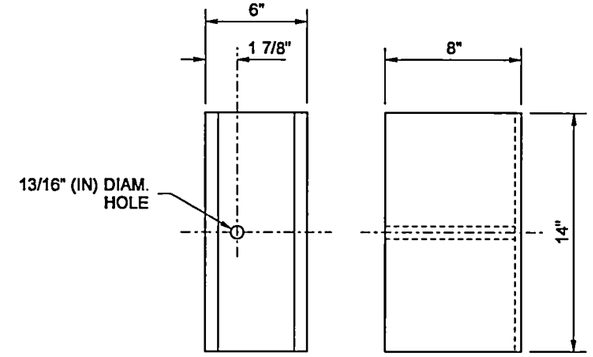
BOX CULVERT POST

ELEVATION VIEW

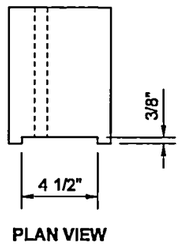


BOX CULVERT GUARDRAIL STEEL POST TYPE 31

SECTION (A)



ELEVATION VIEW SIDE VIEW



PLAN VIEW

WOOD BLOCKOUT
(SEE NOTE 2)

NOTES

1. Attach Guardrail Post to Box Culvert with 7/8" (in) diameter high-strength threaded rods 8 1/2" (in) in length with resin-bonded anchors.
2. Wood blocks are shown. Blocks of an approved alternative may be used. See **Standard Specification 9-16.3(2)**.

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
Jul 14 2015 7:41 AM

DRAWN BY: FERN LIDDELL

BOX CULVERT GUARDRAIL STEEL POST ~ TYPE 31

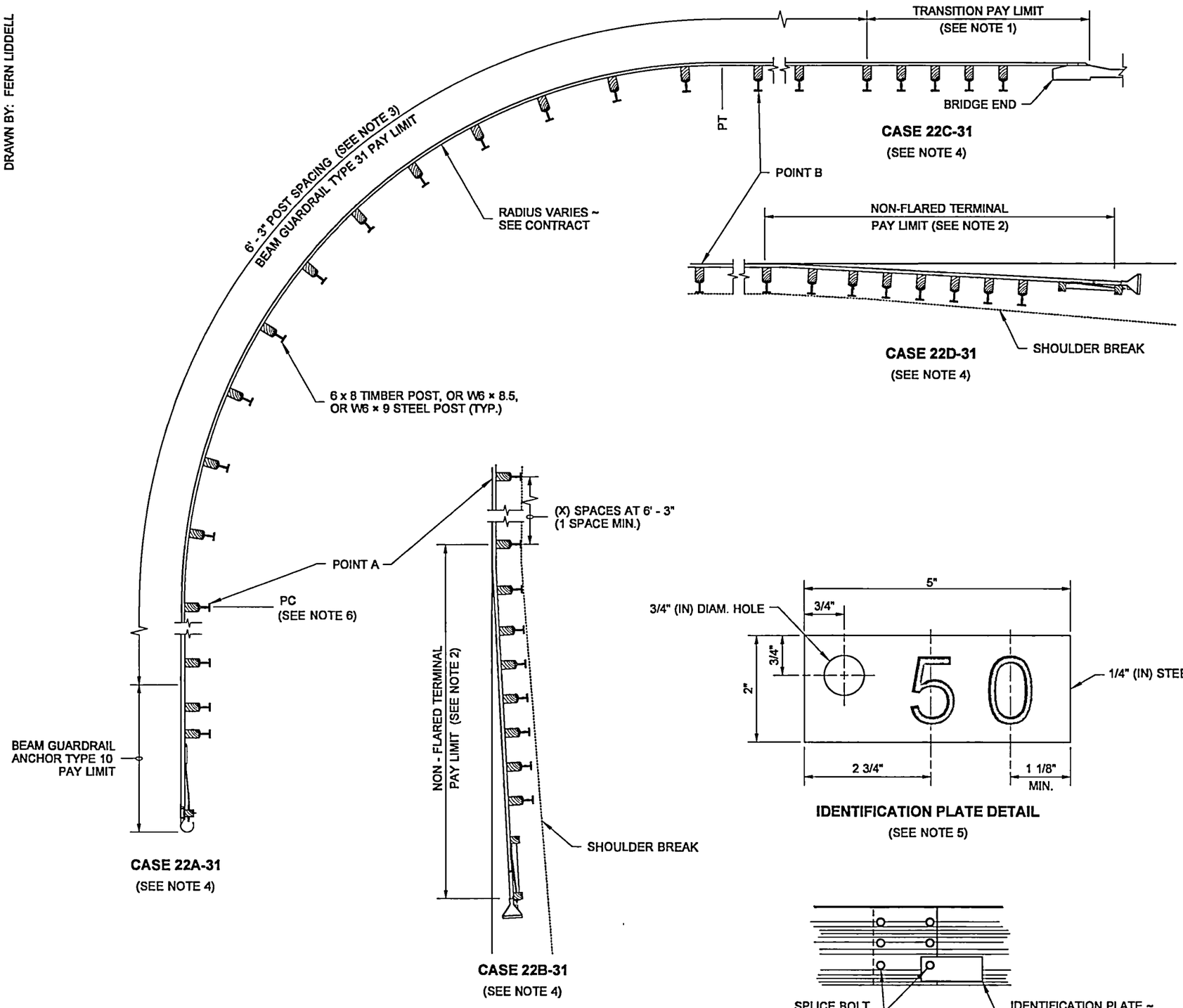
STANDARD PLAN C-20.41-01

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 14 2015 11:28 AM
STATE DESIGN ENGINEER

Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



IDENTIFICATION PLATE DETAIL
(SEE NOTE 5)

IDENTIFICATION PLATE MOUNTING DETAIL
(SEE NOTE 6)

NOTES

1. See Contract for transition and connection type.
2. For additional installation requirements for Non-Flared Terminal placement, see **Standard Plan C-22.40.**
3. Guardrail installation shall be Beam Guardrail Type 31 with standard post and block. See **Standard Plan C-20.10** for additional details.
4. The first letter of case designation indicates the end treatment on the side road. The second letter indicates the end treatment on the main road. For instance, a terminal on a side road and a bridge connection on the main road would be Case 22BC-31.
5. The radius dimension shall be etched into the plate as shown in the example on the Identification Plate Detail. Numerals shall be 1 1/2" (in) high minimum, and 3/4" (in) wide maximum. Plate shall be galvanized after etching and the letter shall remain permanently legible.
6. The guardrail Identification Plate shall be mounted at the lower splice bolt on the back side of the rail element at the PC of the guardrail radius.

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

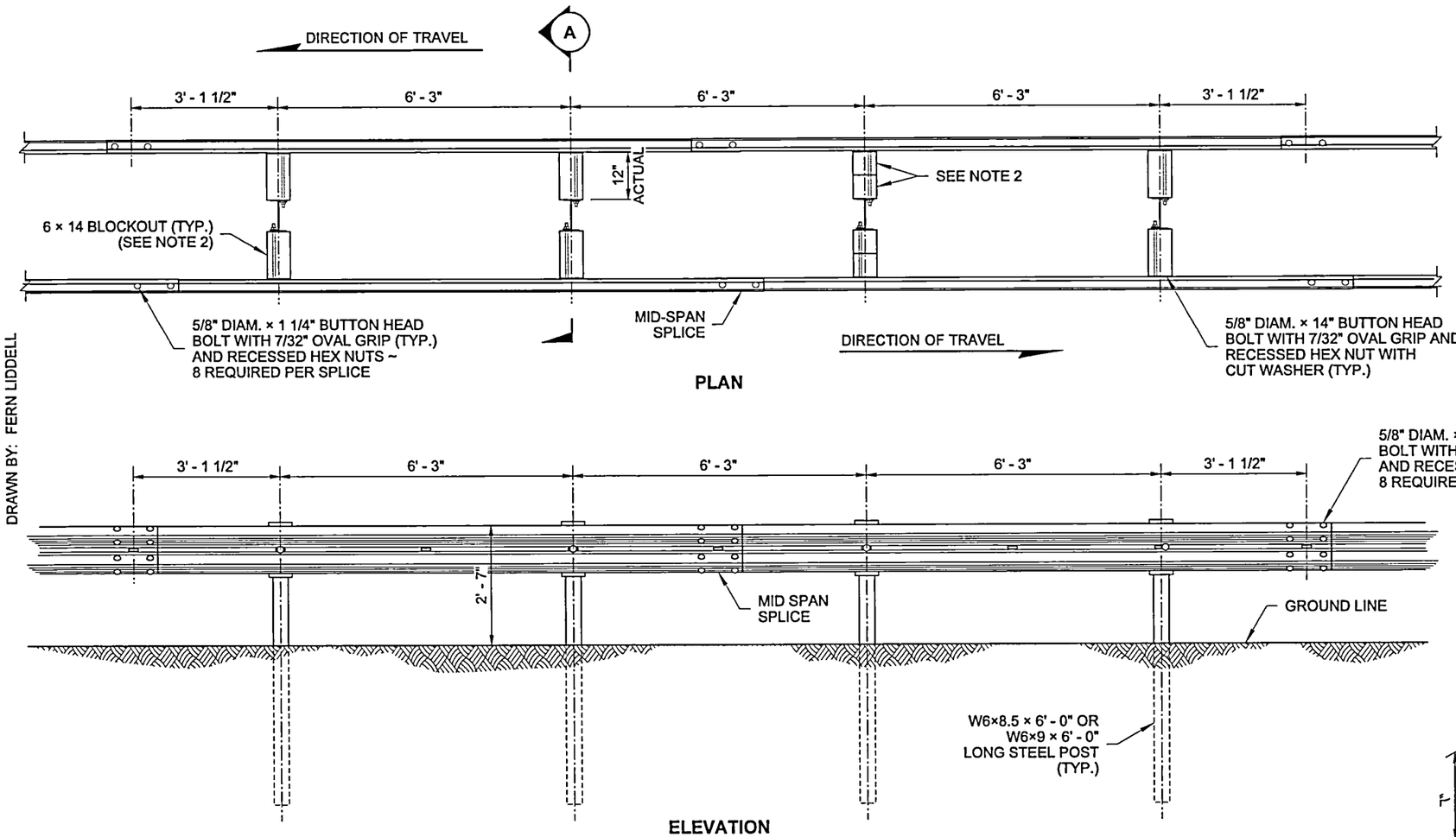
Barry, Ed
Jul 14 2015 8:00 AM

GUARDRAIL PLACEMENT STRONG POST ~ TYPE 31 INTERSECTION DESIGN STANDARD PLAN C-20.42-05

SHEET 1 OF 1 SHEET

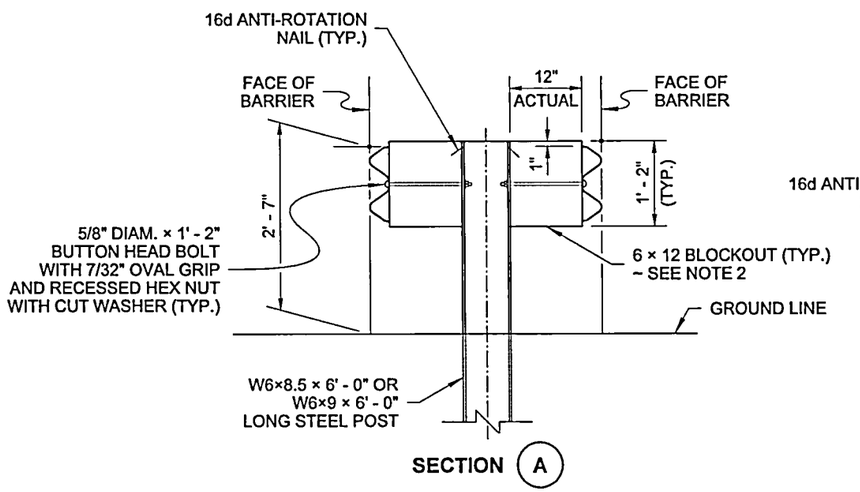
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 14 2015 11:27 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

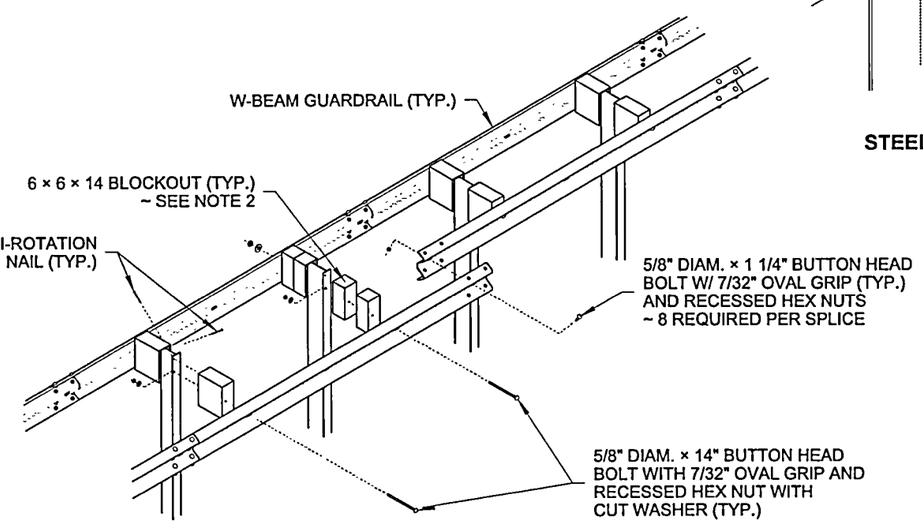


PLAN

ELEVATION



SECTION (A)

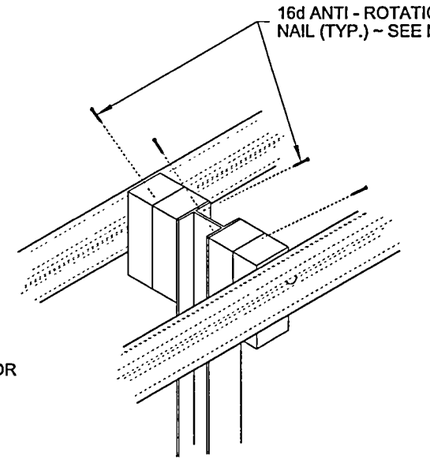


ISOMETRIC

STEEL POST

NOTES

1. Beam Guardrail post spacing shall be 6' - 3" on centers.
2. Use a single or combination of blocks to achieve the actual 12" offset. See **Standard Specification 9-16.3(2)**. Wood blocks shall be toe-nailed to post (and blocks, if block combinations are used) with 16d galvanized nails to prevent block rotation.
3. Attach blockouts to steel posts using bolt holes on approaching traffic side of post web.
4. For details not shown, see **Standard Plan C-20.10.**
5. Wood blocks shown. Blocks of alternate material may be used. See **Standard Specification 9-16.3(2).**



ANTI-ROTATION NAIL DETAIL

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

7.2.2012

BEAM GUARDRAIL TYPE 31 DS (DOUBLE SIDED) (W-BEAM)

STANDARD PLAN C-20.45-01

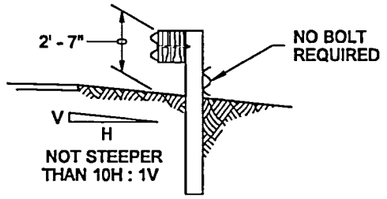
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

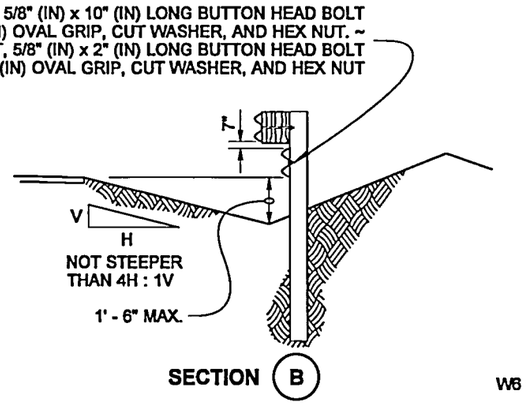
STATE DESIGN ENGINEER — DATE 7/2/12

Washington State Department of Transportation

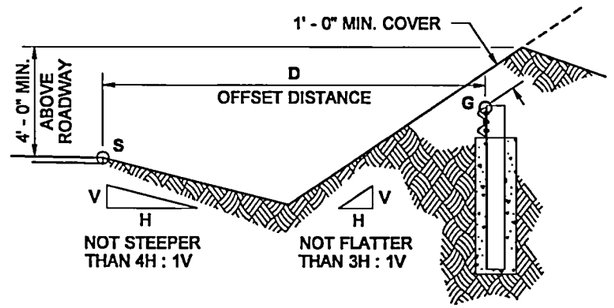
DRAWN BY: FERN LIDDELL



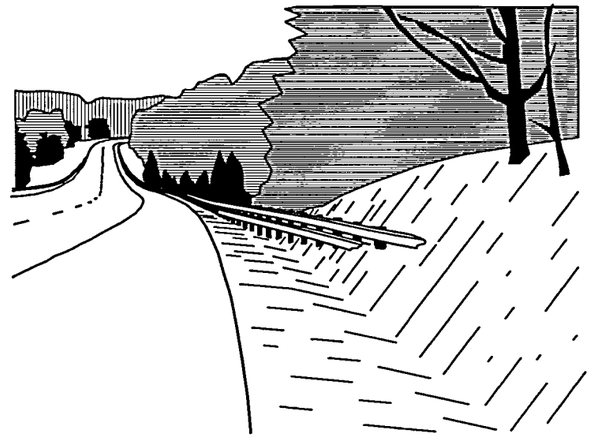
SECTION (A)



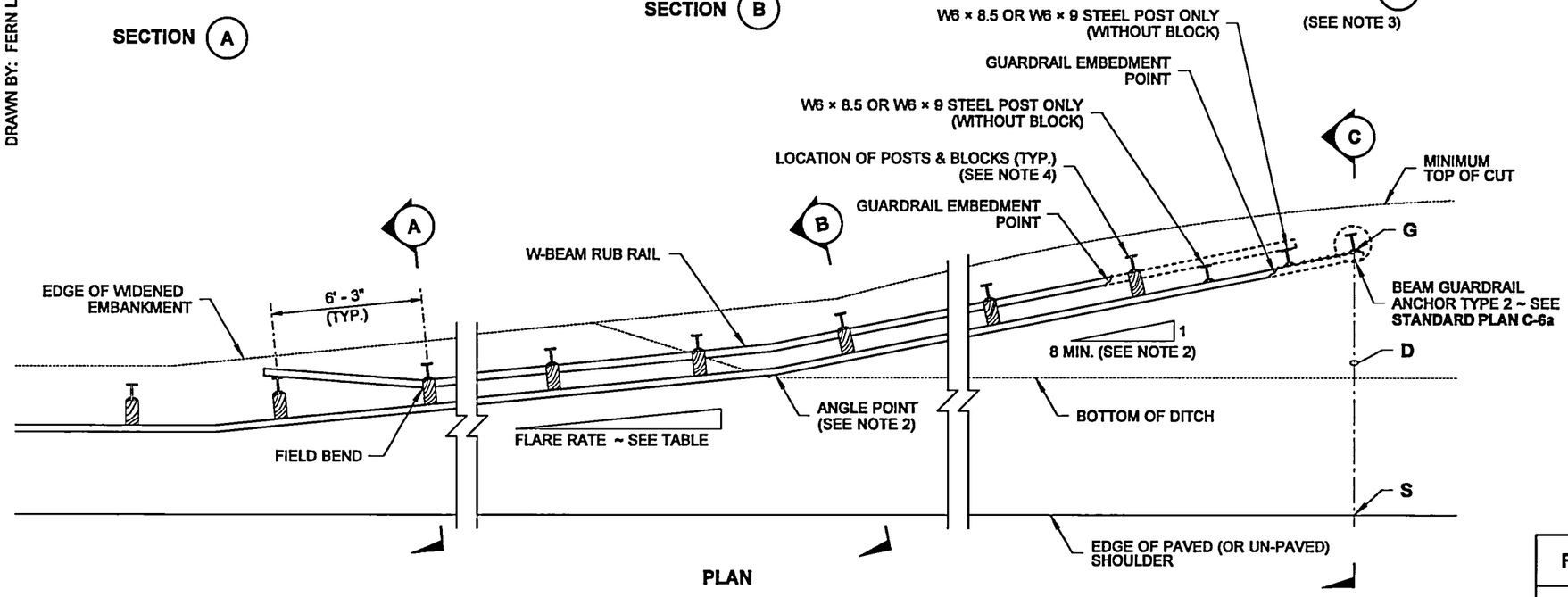
SECTION (B)



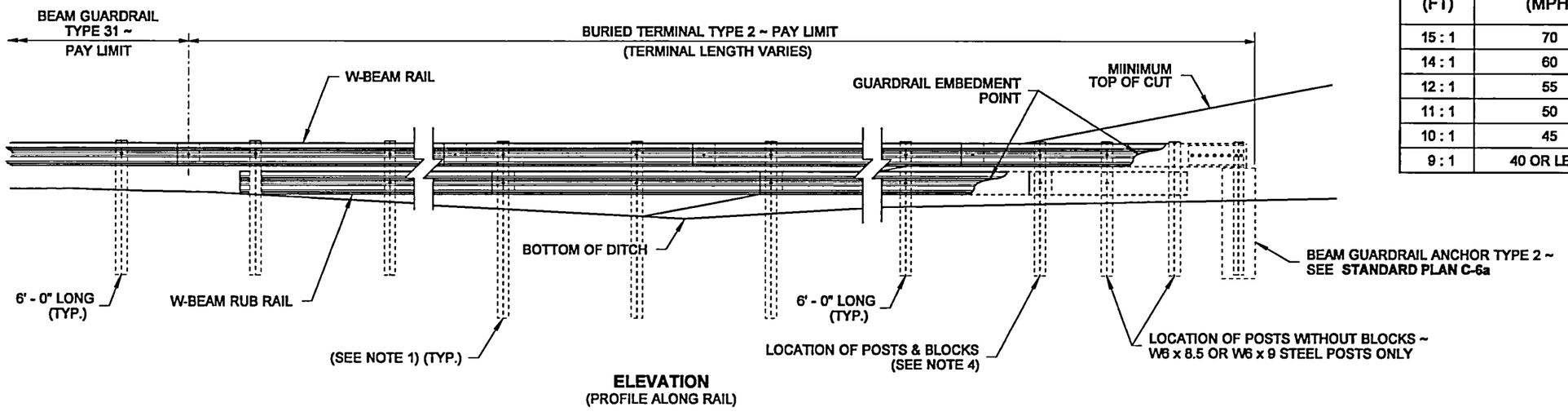
SECTION (C)
(SEE NOTE 3)



PERSPECTIVE



PLAN



ELEVATION
(PROFILE ALONG RAIL)

NOTES

1. Posts installed on shoulder slopes steeper than 10H : 1V shall be 8' (ft) long.
2. The flare rate of the guardrail may be increased after crossing the ditch bottom to shorten the length of the terminal.
3. Determine the height of the W-Beam at the Anchor **(G)** by first calculating the perpendicular offset distance **(D)** from the edge of shoulder **(S)** to the Anchor (on station). Multiply that distance by 0.1, then subtract the product from the elevation of the same point **(S)** on the edge of shoulder used to obtain the offset distance (at the same station). Add Beam Guardrail design height (31" (in)) to that remainder for a sum that equals the elevation of the top of the W-Beam at the Anchor.

   Refer to SECTION "C":

   $$\text{Elevation}_G = (\text{Elevation}_S - D \times (0.1)) + 31$$

4. Timber or steel post. Steel post shown.

FLARE RATE TABLE	
RATE (FT)	POSTED SPEED (MPH)
15 : 1	70
14 : 1	60
12 : 1	55
11 : 1	50
10 : 1	45
9 : 1	40 OR LESS

JEFFREY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

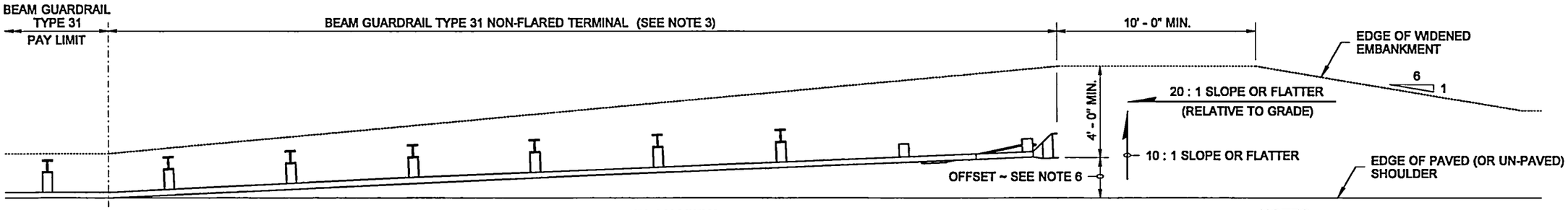
Petterson, Jeff (HQ Design)
Jul 6 2017 3:13 PM

BEAM GUARDRAIL TYPE 31 ~ BURIED TERMINAL TYPE 2

STANDARD PLAN C-22.16-06

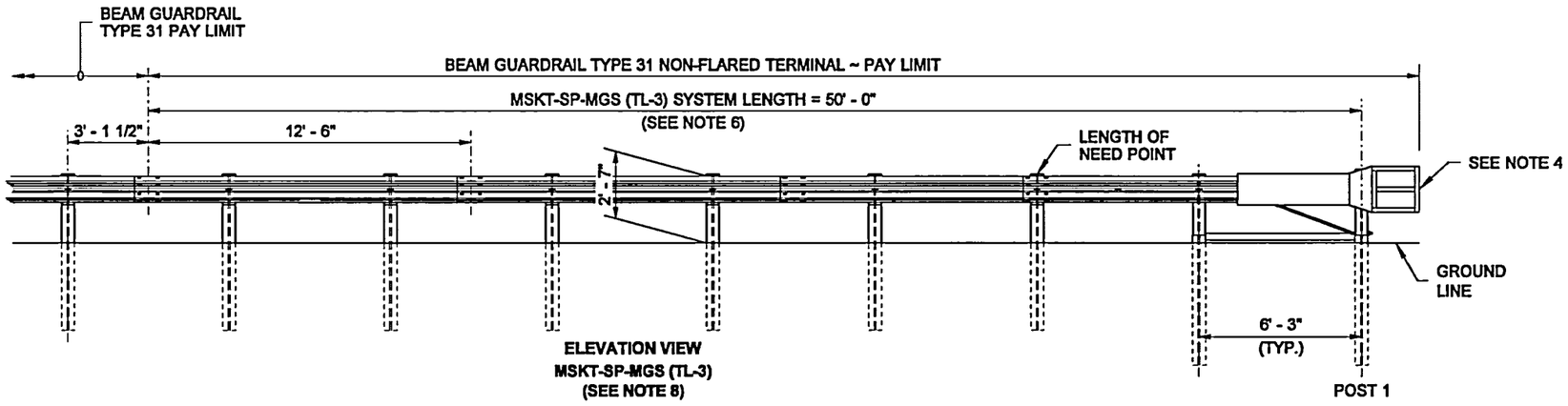
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:26 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

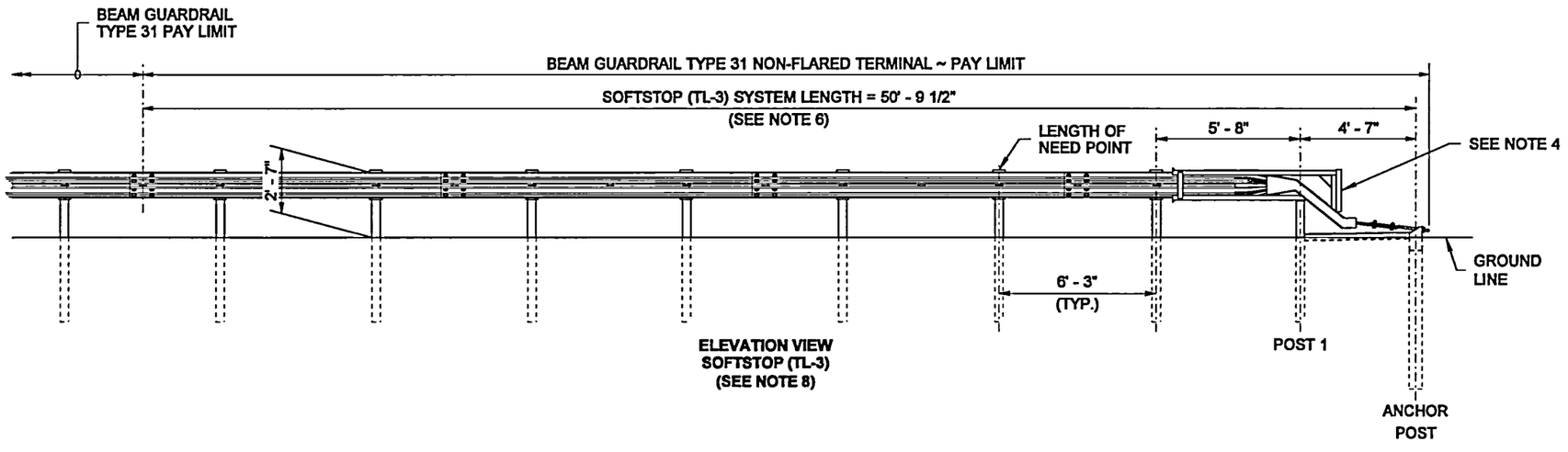


PLAN VIEW
MSKT-SP-MGS (TL-3) SHOWN

DRAWN BY: BILL BERENS



ELEVATION VIEW
MSKT-SP-MGS (TL-3)
(SEE NOTE 8)



ELEVATION VIEW
SOFTSTOP (TL-3)
(SEE NOTE 8)

NOTES

1. The Implementation of the Manual for Assessment of Safety Hardware (MASH) criteria may result in the acceptance of guardrail terminal systems currently not shown on this plan. Non-Flared terminals shall be selected from the WSDOT Qualified Products List (QPL) or approved through the WSDOT Request for Approval of Materials (RAM) process.
2. This terminal is MASH compliant at Test Level Three (TL-3) and may be used for all posted speeds.
3. An MSKT-SP-MGS (TL-3) as manufactured by Road Systems, Inc. or SOFTSTOP (TL-3) as manufactured by Trinity Highway Products, LLC shall be installed according to manufacturer's recommendations.
4. A reflectorized object marker shall be installed according to manufacturer's recommendations.
5. When snow load post washers and snow load rail washers are required by the Contract, the snow load rail washers shall not be installed within the terminal limits.
6. Terminal shall be installed at a widening, ensuring the end piece is entirely off the shoulder. While this terminal does not require an offset at the end, a taper is recommended. For the MSKT-SP-MGS (TL-3), a maximum taper of 25 : 1 or flatter over the length of the terminal is allowed with a maximum offset of 24" (in) over 50' (ft).

   For the SOFTSTOP (TL-3) a maximum taper of 25.4 : 1 or flatter is allowed over the system length of 50' - 9 1/2" with a maximum offset of 24" (in) at the anchor post.
7. For terminal details, see WSDOT approved manufacturer's drawings.
8. These terminals are supplied with steel posts only. They can be used with beam guardrail Type 31 runs composed of steel or wood guardrail posts.

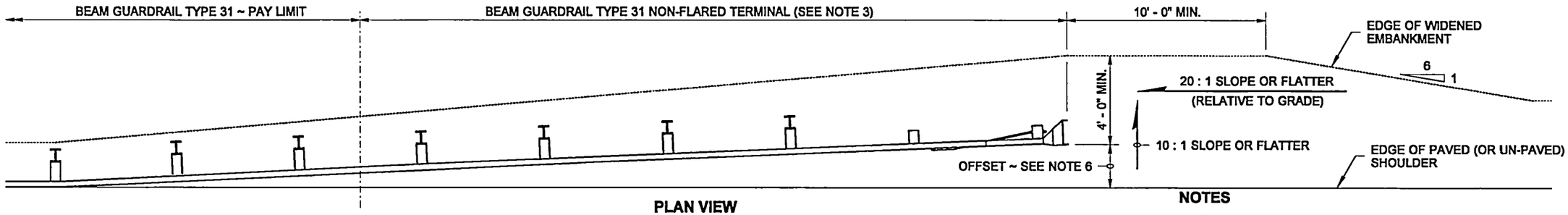
JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jul 6 2017 3:13 PM

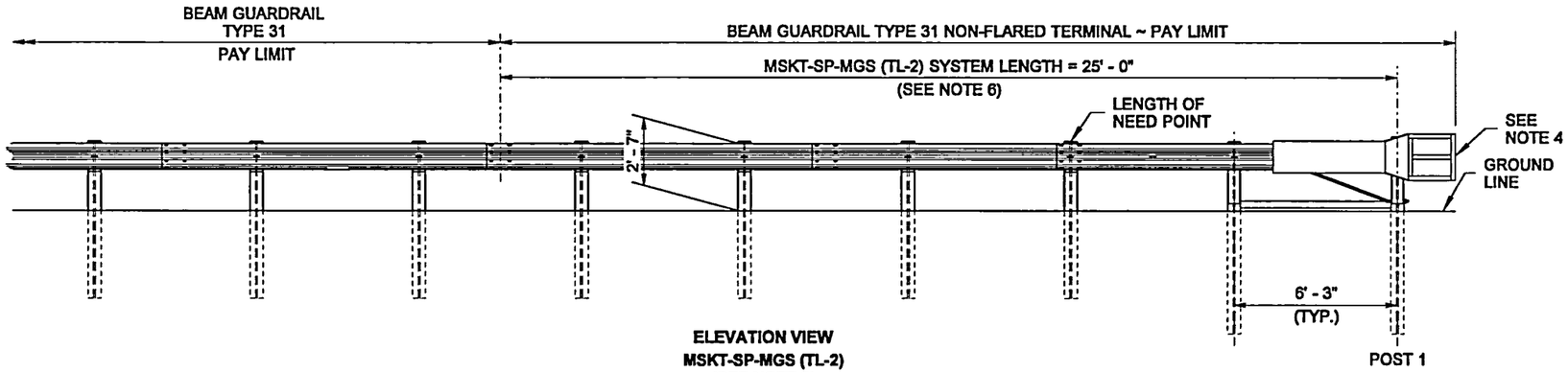
BEAM GUARDRAIL TYPE 31 NON-FLARED TERMINAL (ALL POSTED SPEEDS) STANDARD PLAN C-22.40-06

SHEET 1 OF 1 SHEET

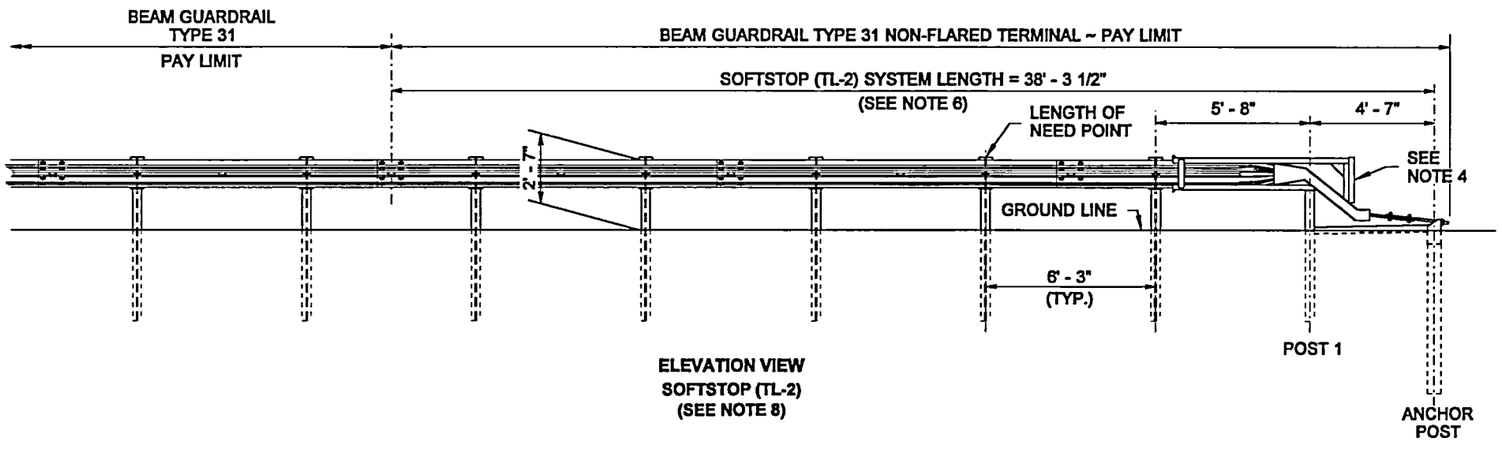
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:26 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation



PLAN VIEW
(MSKT-SP-MGS (TL-2) SHOWN)



ELEVATION VIEW
MSKT-SP-MGS (TL-2)
(SEE NOTE 8)



ELEVATION VIEW
SOFTSTOP (TL-2)
(SEE NOTE 8)

NOTES

1. The Implementation of the Manual for Assessment of Safety Hardware (MASH) criteria may result in the acceptance of guardrail terminal systems currently not shown on this plan. Non-Flared terminals shall be selected from the WSDOT Qualified Products List (QPL) or approved through the WSDOT Request for Approval of Materials (RAM) process.
2. This terminal is MASH compliant at Test Level Two (TL-2) and may be used in applications with posted speeds of 45 mph or less.
3. An MSKT-SP-MGS (TL-2) as manufactured by Road Systems, Inc. or SOFTSTOP (TL-2) as manufactured by Trinity Highway Products, LLC shall be installed according to manufacturer's recommendations.
4. A reflectorized object marker shall be installed according to manufacturer's recommendations.
5. When snow load post washers and snow load rail washers are required by the Contract, the snow load rail washers shall not be installed within the terminal limits.
6. Terminal shall be installed at a widening, ensuring the end piece is entirely off the shoulder. While this terminal does not require an offset at the end, a flare is recommended. For the MSKT-SP-MGS (TL-2), a maximum flare of 25 : 1 or flatter over the length of the terminal is allowed with a maximum offset of 24" (in) over 50' (ft).

   For the SOFTSTOP (TL-2) a maximum flare of 38.29 : 1 or flatter is allowed over the system length of 38' - 3 1/2" with a maximum offset of 12" (in) at the anchor post.
7. For terminal details, see WSDOT approved manufacturer's drawings.
8. These terminals are supplied with steel posts only. They can be used with guardrail runs composed of steel or wood guardrail posts.

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

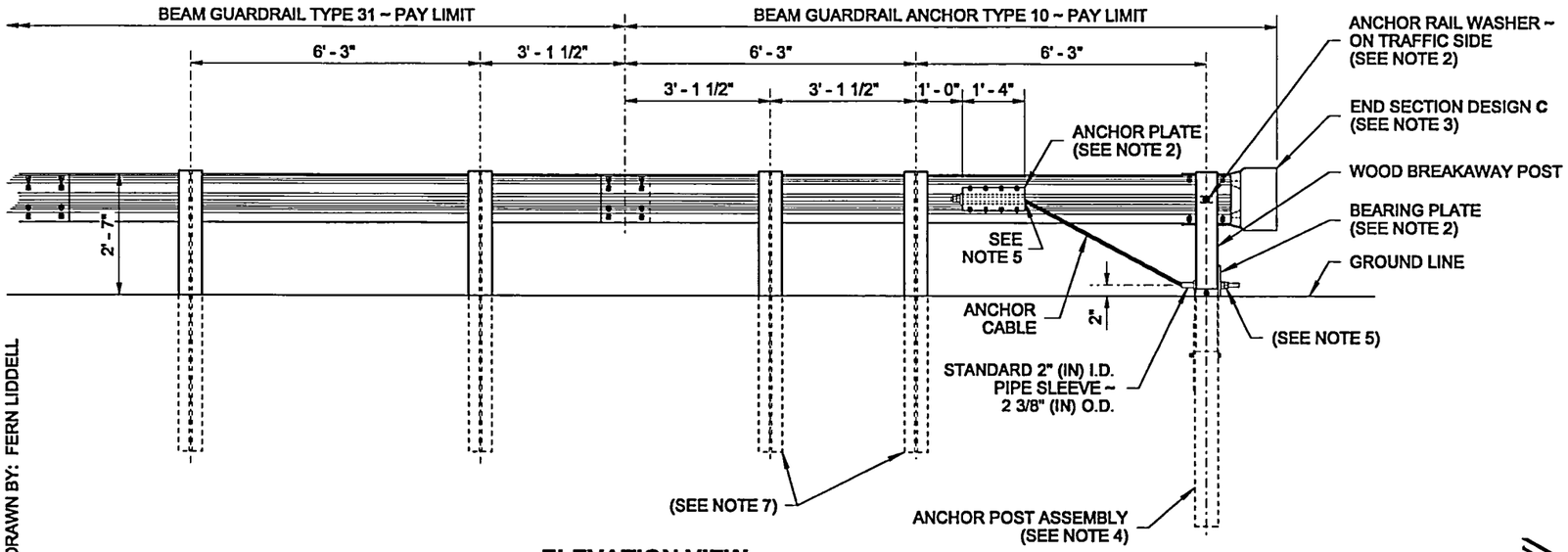
Jeff Petterson (IIQ Design)
Jul 6 2017 3:14 PM

BEAM GUARDRAIL TYPE 31 NON-FLARED TERMINAL (POSTED SPEED 45 MPH AND BELOW) STANDARD PLAN C-22.45-03

SHEET 1 OF 1 SHEET

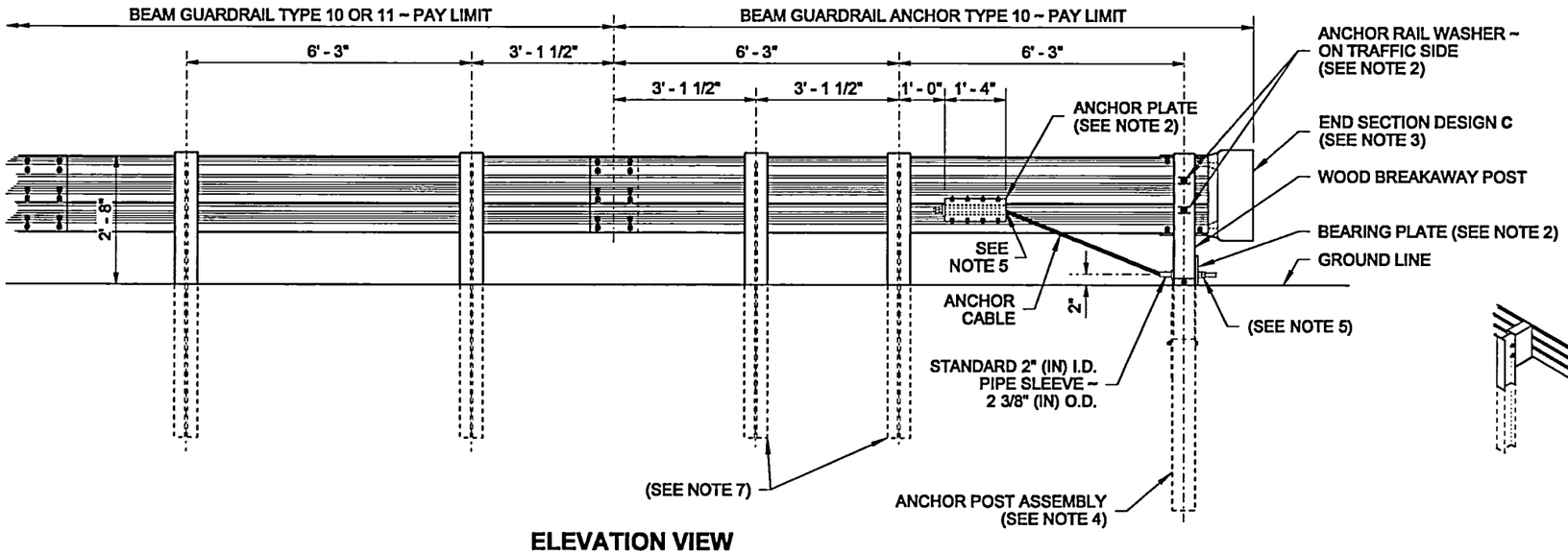
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:25 AM

STATE DESIGN ENGINEER
Washington State Department of Transportation



ELEVATION VIEW
W-BEAM

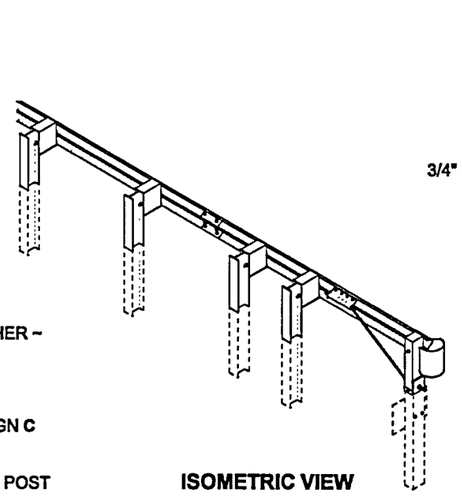
DRAWN BY: FERN LIDDELL



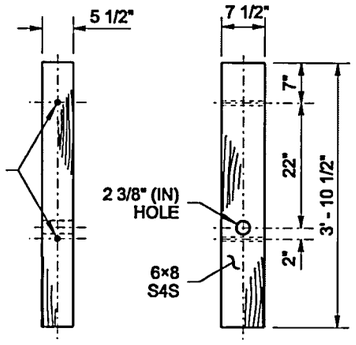
ELEVATION VIEW
THRIE BEAM

NOTES

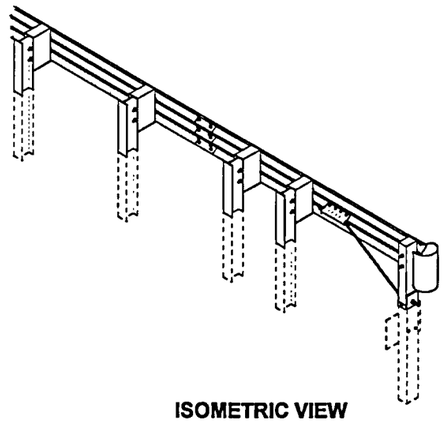
1. For use on the end of guardrail runs when a crashworthy terminal is not required.
2. For additional details not shown, see **Sheet 2** of this Plan.
3. For end section details, see **Standard Plans C-7** and **C-7a**.
4. Use details for Wood Breakaway post shown on this plan and components shown on **Standard Plan C-1b**.
5. Fasten the Anchor Cable using two 1" (in) nuts and washer, at both ends of cable. Outside nut shall be torqued against inside nut a minimum of 100 ft.-lbs.
6. Wood blocks shown. Blocks of alternate material may be used. See **Standard Specification, Section 9-16.3(2)**.
7. Posts shall match those of the connecting run: timber or steel.
8. Anchor plate may be constructed from 1/4" (in) plates welded to equal strength and dimensions as shown.
9. Eight 5/8" (in) x 1/2" (in) machine bolts with hex nut and washer. Place washer on face side of rail.



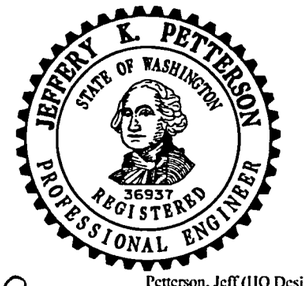
ISOMETRIC VIEW



WOOD BREAKAWAY POST DETAIL



ISOMETRIC VIEW



Petterson, Jeff (IIQ Design)
Jul 6 2017 3:15 PM

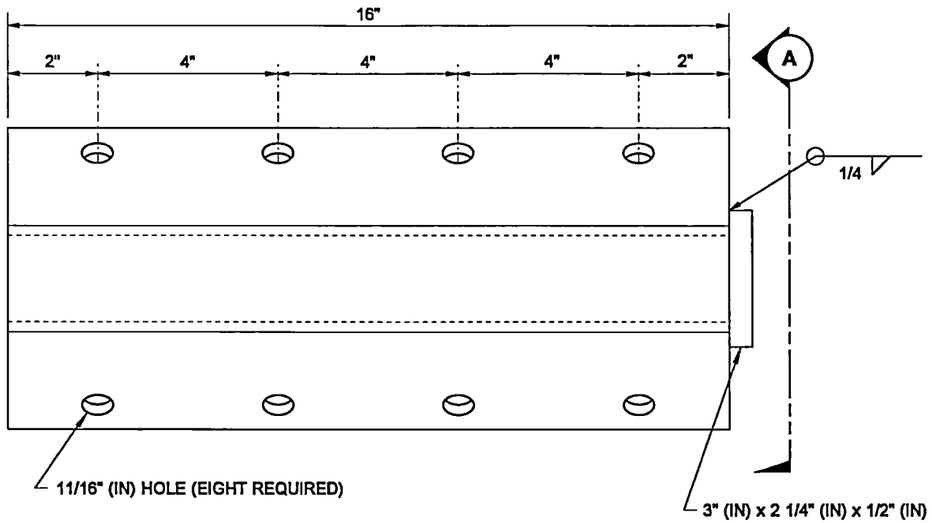
BEAM GUARDRAIL (TYPE 31) ANCHOR TYPE 10

STANDARD PLAN C-23.60-04

SHEET 1 OF 2 SHEETS

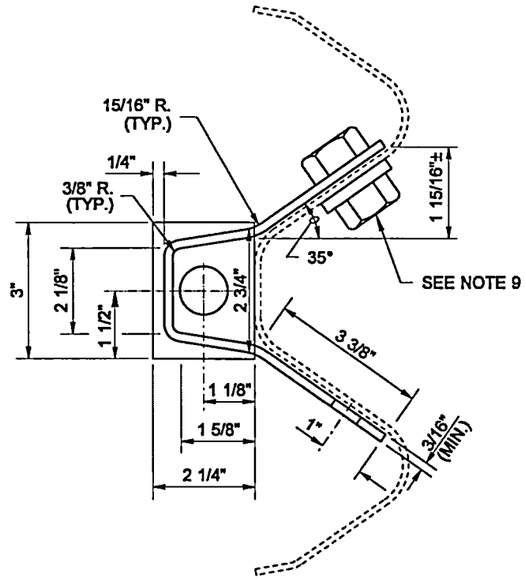
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:25 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

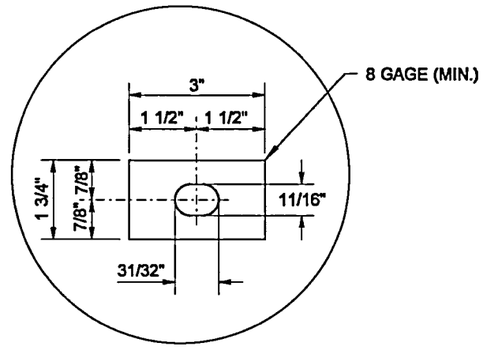


ELEVATION

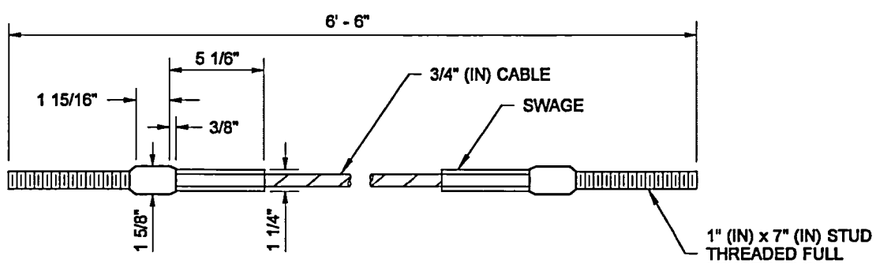
ANCHOR PLATE
(SEE NOTE 8)



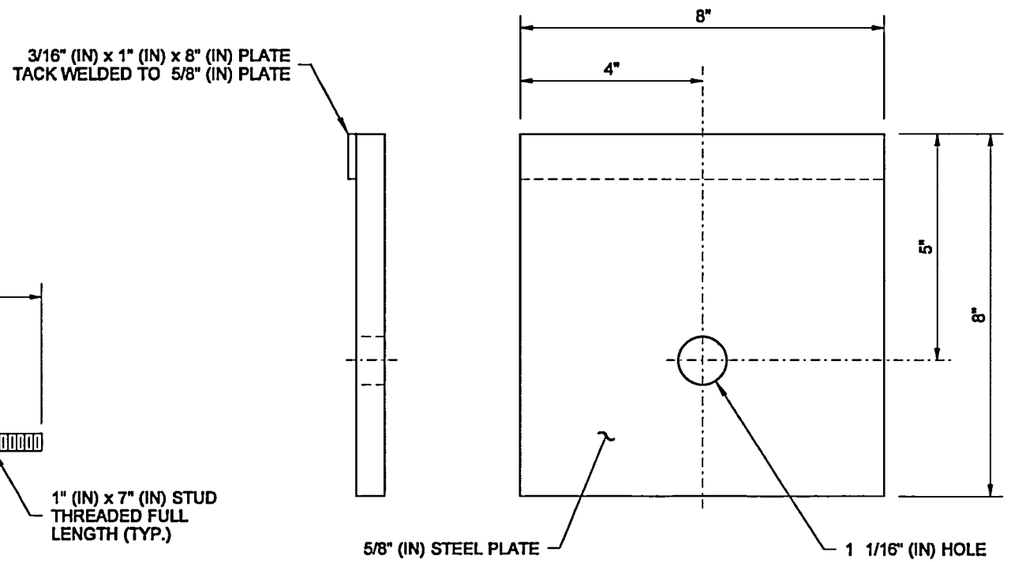
SECTION (A)



ANCHOR RAIL WASHER



ANCHOR CABLE



BEARING PLATE

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jul 6 2017 3:15 PM

BEAM GUARDRAIL (TYPE 31)
ANCHOR TYPE 10

STANDARD PLAN C-23.60-04

SHEET 2 OF 2 SHEETS

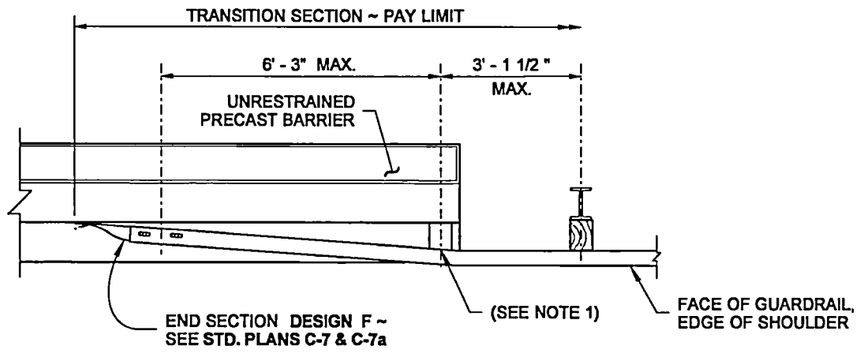
APPROVED FOR PUBLICATION

Carpenter, Jeff
Jul 21 2017 8:25 AM

STATE DESIGN ENGINEER

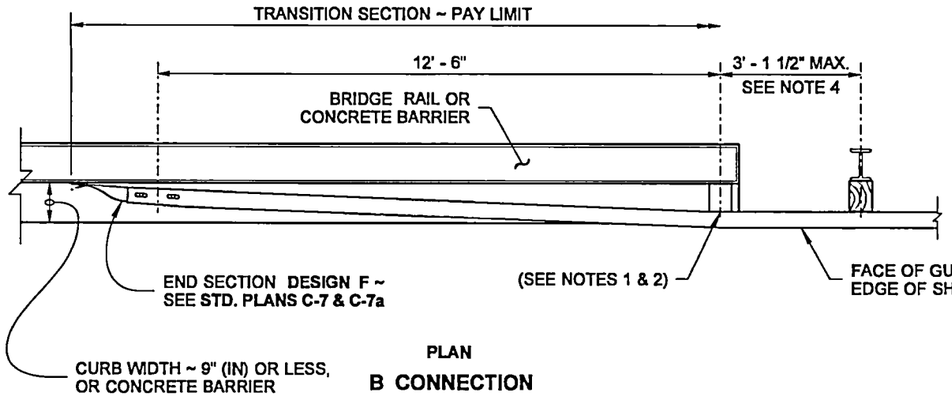
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



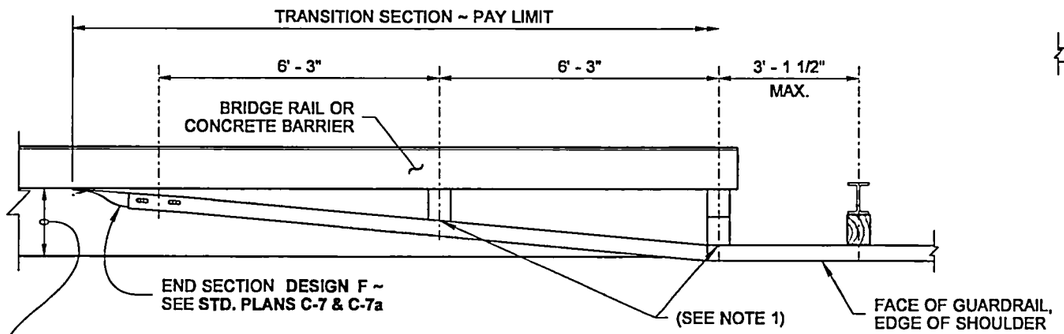
PLAN

A CONNECTION



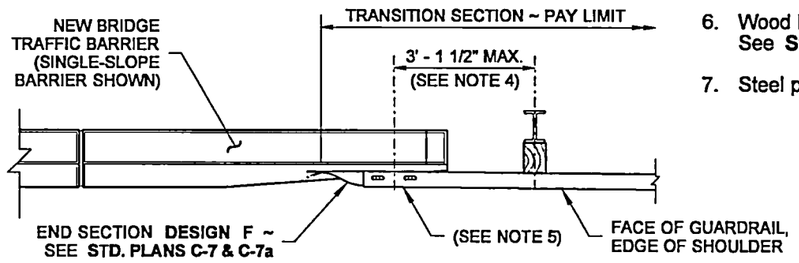
PLAN

B CONNECTION



PLAN

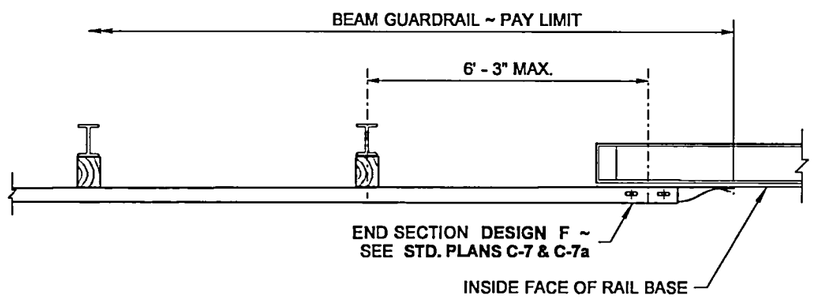
C CONNECTION



PLAN

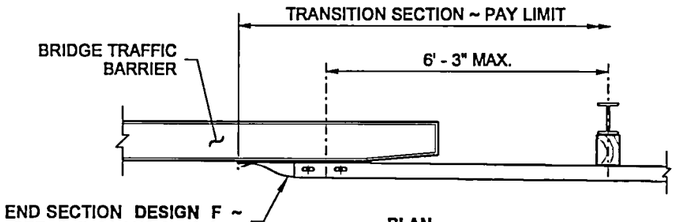
D CONNECTION

(SEE NOTE 3)



PLAN

F CONNECTION



PLAN

E CONNECTION

NOTES

1. Attach guardrail to bridge rail or concrete barrier with 7/8" (in) diameter bolts in accordance with **Standard Spec. 9-06.5(4),** with thin slab ferrule inserts or resin-bonded anchors. See Contract Plans.
2. If the last guardrail post is 3" (in) or less from the end of the bridge barrier, this attachment and blockout is not necessary.
3. This case is also applicable for F-shape and vertical faces with no curbs.
4. When B connection is used with Type 1A Transition, the maximum spacing between bolts is 6' - 3".
5. See Bridge Plans for additional connection details.
6. Wood blocks shown. Blocks of alternate material may be used. See **Standard Specification 9-16.3 (2).**
7. Steel posts shown. Timber posts may be used.

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 2 2014 2:33 PM

GUARDRAIL CONNECTION TO BRIDGE RAIL OR CONCRETE BARRIER STANDARD PLAN C-24.10-01

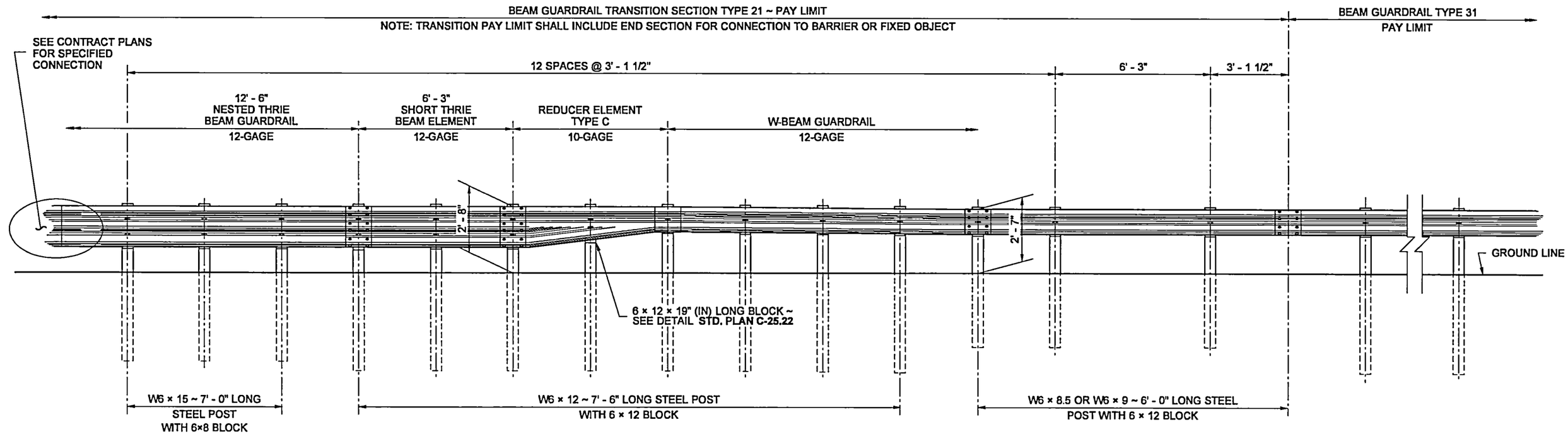
SHEET 1 OF 1 SHEET

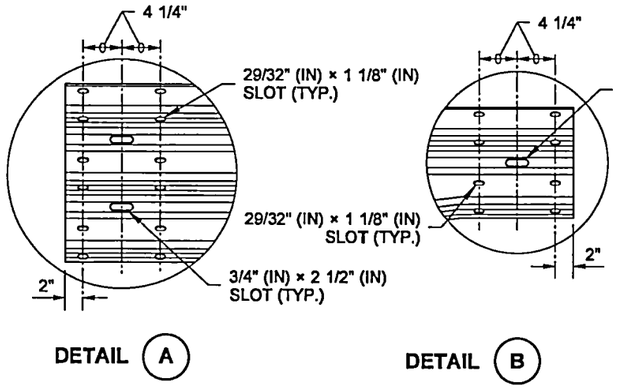
APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:11 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

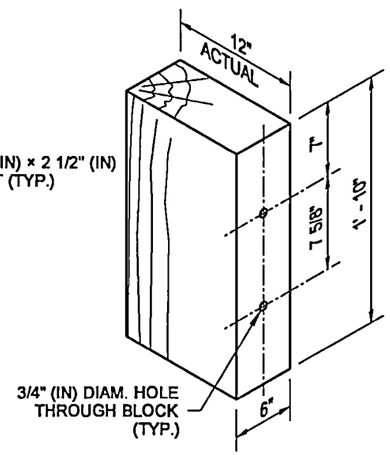
DRAWN BY: FERN LIDDELL

NOTES

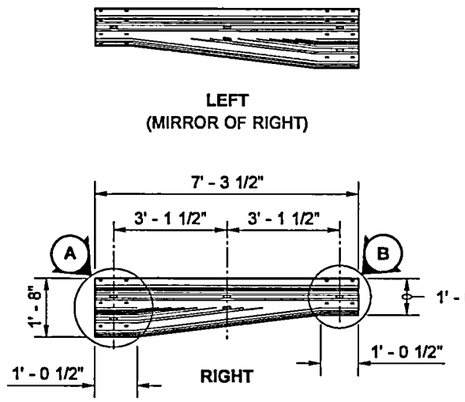
1. This guardrail transition is for connection to a vertical concrete shape, a single slope, or a safety-shape barrier. The toe of the single slope and the safety-shape barrier shall be tapered or the barrier blocked out so that the toe of the barrier does not project past the face of the approach guardrail.
2. See **Standard Plan C-24.10** for details regarding connection to bridge rail or traffic barrier.
3. For details of typical components, see **Standard Plans C-1b** and **C-20.10**.



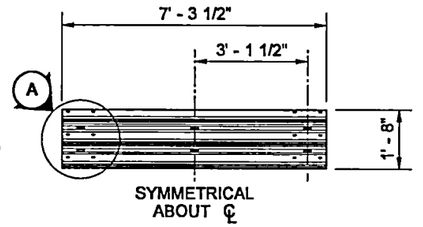




THRIE BEAM WOOD BLOCK



REDUCER ELEMENT TYPE C



SHORT THRIE BEAM ELEMENT

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
Jul 14 2015 8:06 AM

BEAM GUARDRAIL (TYPE 31) TRANSITION SECTION TYPE 21

STANDARD PLAN C-25.20-06

SHEET 1 OF 1 SHEET

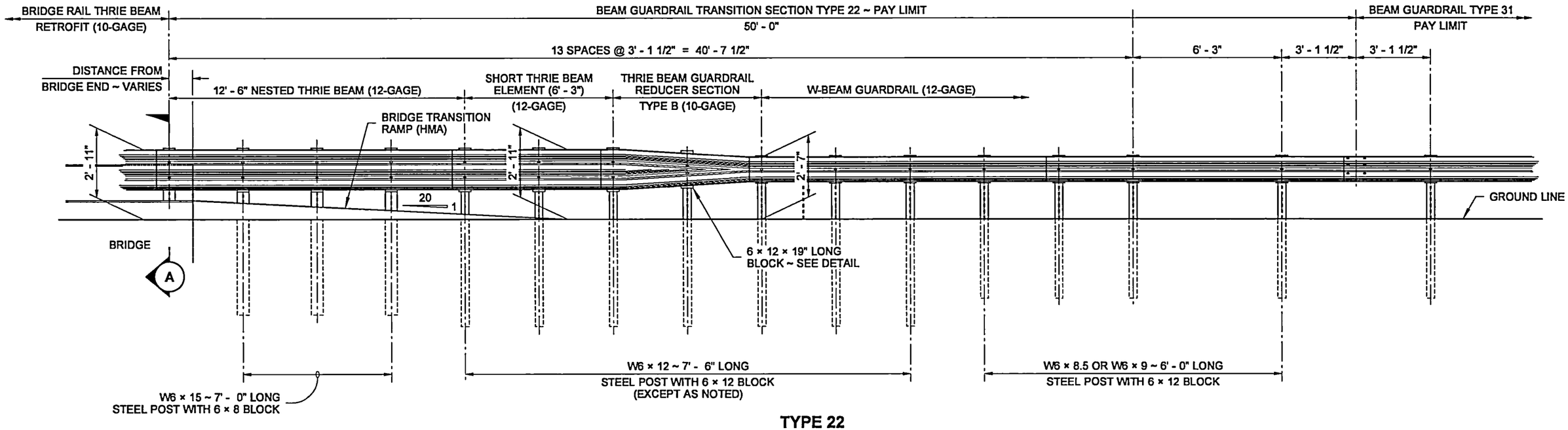
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 14 2015 11:26 AM
STATE DESIGN ENGINEER

Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

NOTES

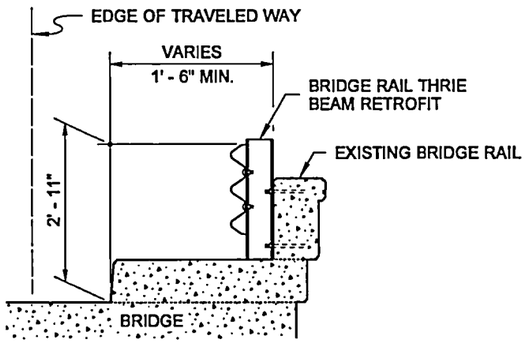
1. See **Standard Plans C-1b, C-1d, C-20.10,** and **C-25.20** for rail elements and thrie beam block details.
2. When a transition is required on the trailing end of the bridge, use a mirror image of this plan.



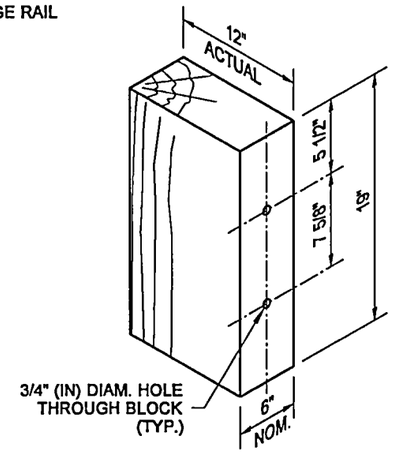
TYPE 22

APPROACH END (SHOWN - SEE NOTE 2)

THRIE BEAM INSTALLED AT FACE OF BRIDGE RAIL



SECTION (A)



THRIE BEAM REDUCER WOOD BLOCK

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
Jul 14 2015 8:26 AM

BEAM GUARDRAIL (TYPE 31) TRANSITION SECTION TYPE 22

STANDARD PLAN C-25.22-05

SHEET 1 OF 1 SHEET

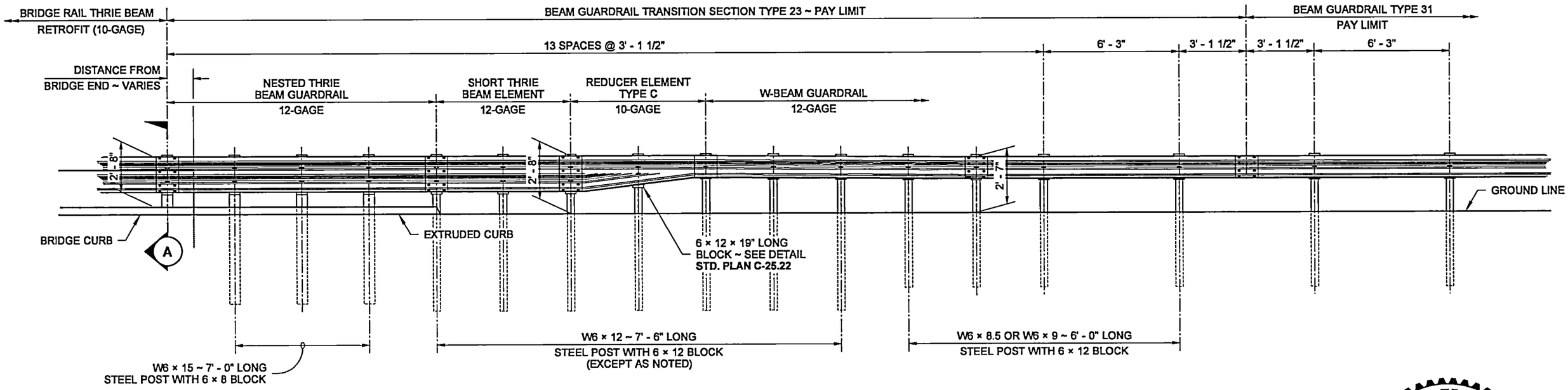
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 14 2015 11:26 AM
STATE DESIGN ENGINEER

Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

NOTES

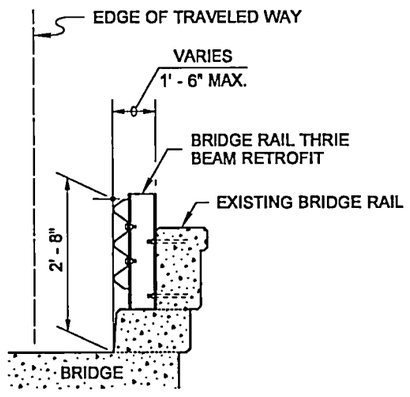
1. See **Standard Plan C-1b, C-20.10,** and **C-25.20** for rail elements and thrie beam block details.
2. When a transition is required on the trailing end of the bridge, use a mirror image of this plan.
3. For additional alternatives not shown, see Contract Plans.



TYPE 23

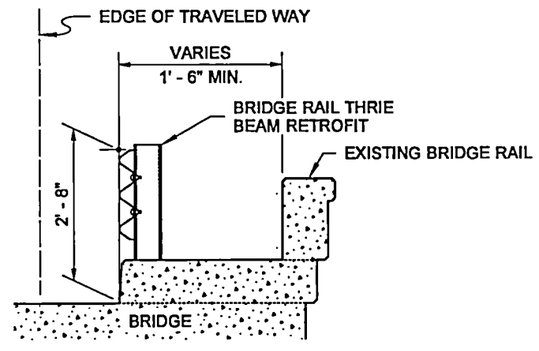
APPROACH END (SHOWN - SEE NOTE 2)

THRIE BEAM INSTALLED AT FACE OF CURB



SECTION (A)

ALTERNATIVE 1



SECTION (A)

ALTERNATIVE 2

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
Jul 14 2015 8:27 AM

BEAM GUARDRAIL (TYPE 31) TRANSITION SECTION TYPE 23

STANDARD PLAN C-25.26-03

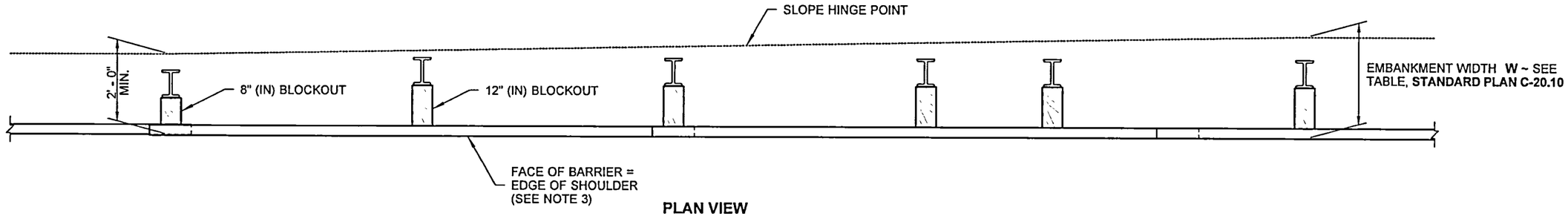
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 14 2015 11:25 AM
STATE DESIGN ENGINEER

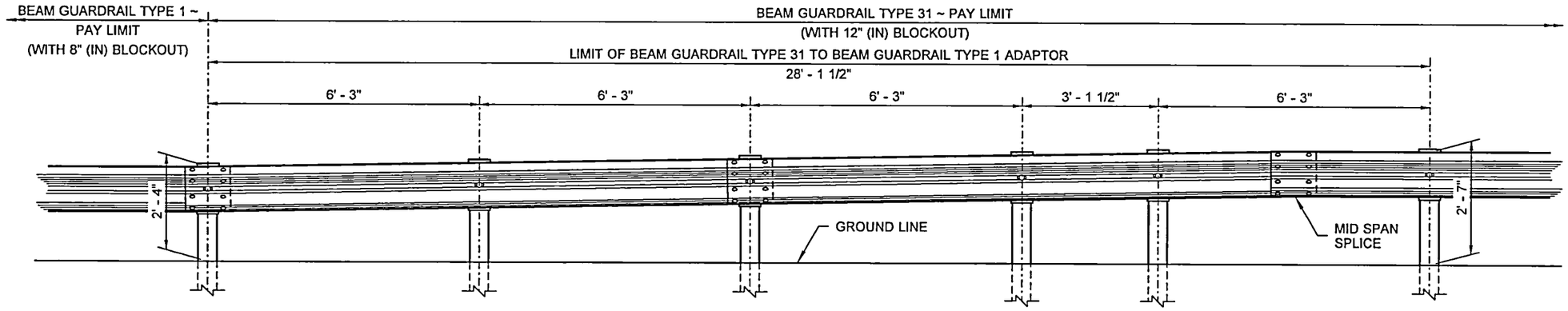
Washington State Department of Transportation

NOTES

1. Refer to **Standard Plans C-1** and **C-1b** for component details for Beam Guardrail Type 1 (not shown on this plan).
2. Refer to **Standard Plan C-20.10** for component details for Beam Guardrail Type 31 (not shown on this plan).
3. Accomodating the wider blockout (12" (in) width) used with Type 31 guardrail will require widening the embankment by 4" (in) or narrowing the shoulder by 4" (in).
4. Wood blocks shown. Blocks of alternate material may be used. See **Standard Specification 9-16.3(2).**
5. All posts for any standard barrier run shall be of the same type: timber or steel.



PLAN VIEW



ELEVATION VIEW ~ PROFILE TAPER

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jun 30 2016 7:16 AM

BEAM GUARDRAIL TYPE 31 TO BEAM GUARDRAIL TYPE 1 ADAPTOR

STANDARD PLAN C-25.80-04

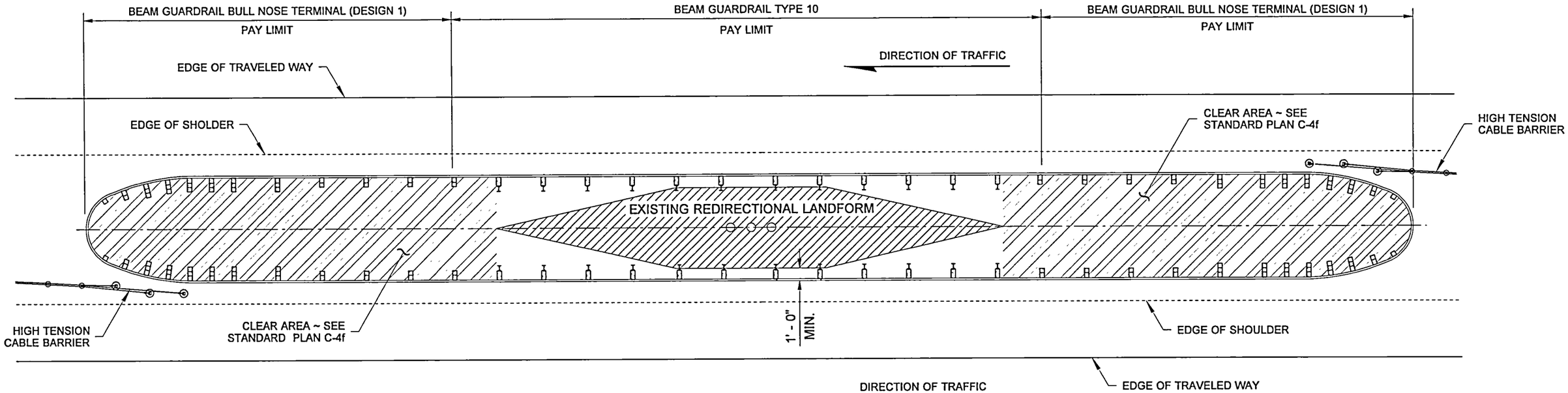
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Carpenter, Jeff
Jul 15 2016 2:26 PM

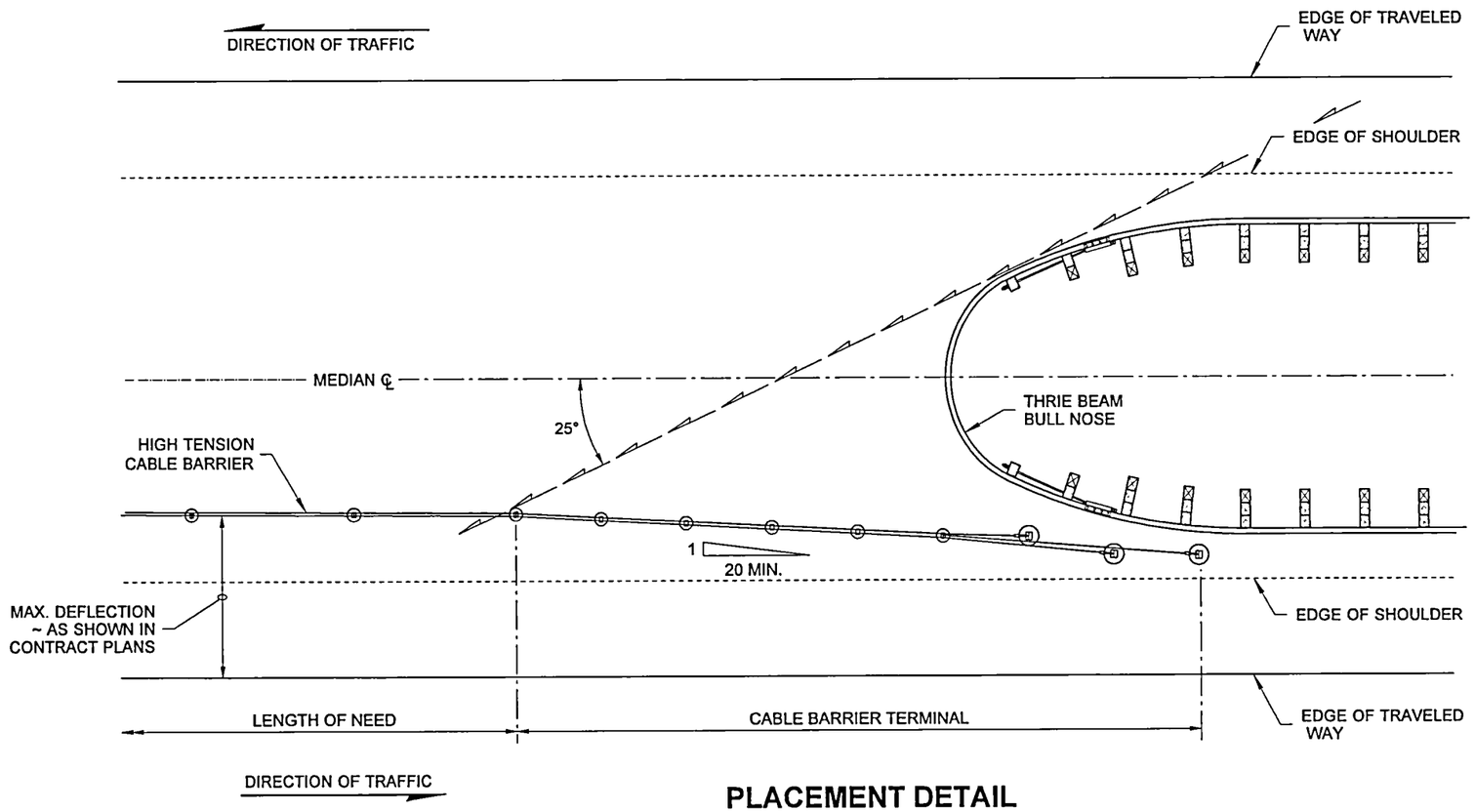
STATE DESIGN ENGINEER

Washington State Department of Transportation



PLAN VIEW

CASE 9A



PLACEMENT DETAIL

LEGEND

Design Layout Line

DRAWN BY: FERN LIDDELL

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

7-2-2012

BARRIER PLACEMENT CABLE TO THRIE BEAM BULL NOSE CONNECTION STANDARD PLAN C-40.14-02

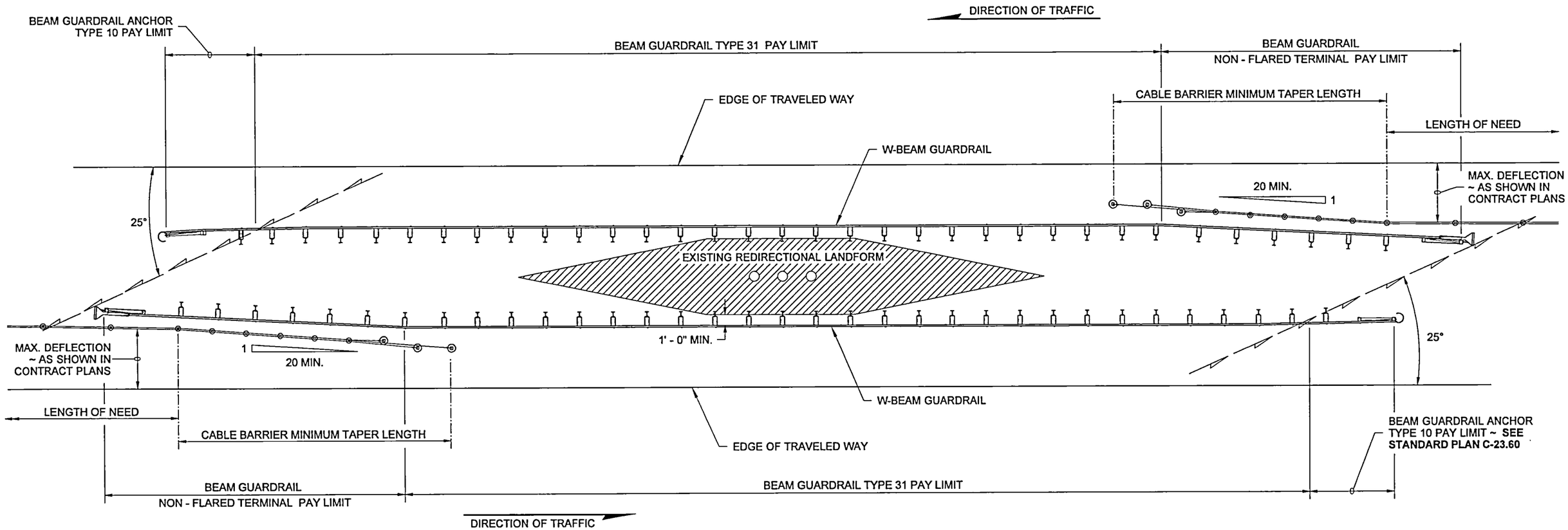
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 7/2/12

Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



PLAN VIEW

LEGEND

Design Layout Line

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

7-2-2012

BARRIER PLACEMENT ~ CABLE TO W-BEAM SHIELDING FOR REDIRECTIONAL LANDFORM
STANDARD PLAN C-40.16-02

SHEET 1 OF 1 SHEET

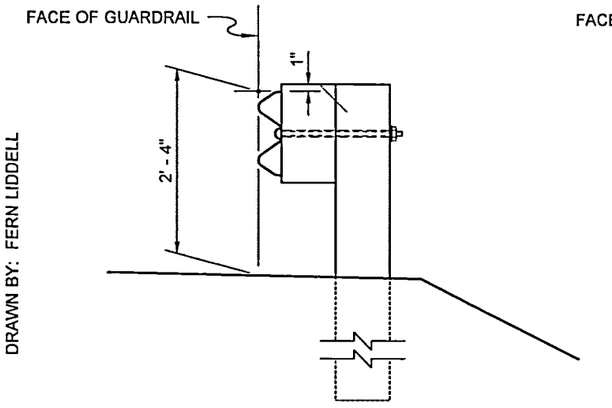
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 7/2/12

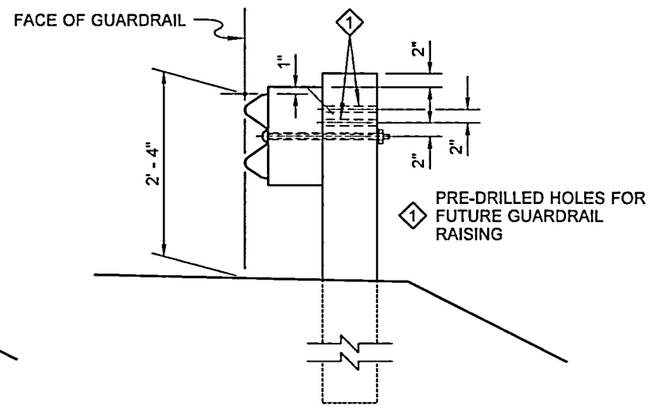
Washington State Department of Transportation

This page left blank intentionally.

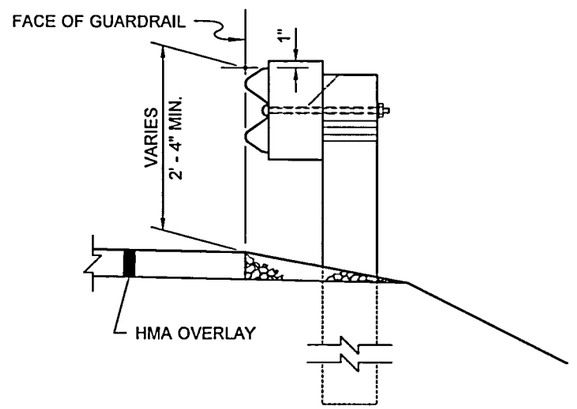
DRAWN BY: FERN LIDDELL



TYPE 1

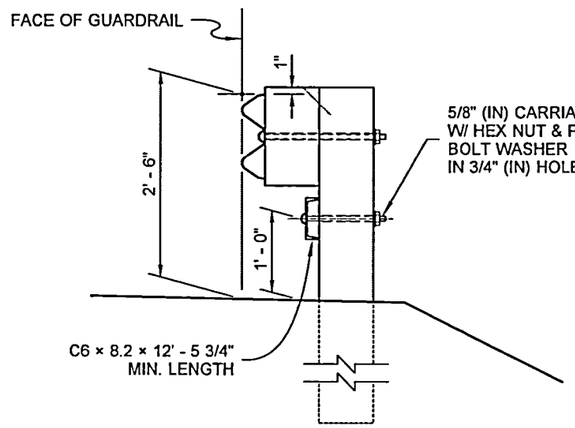


INITIAL INSTALLATION

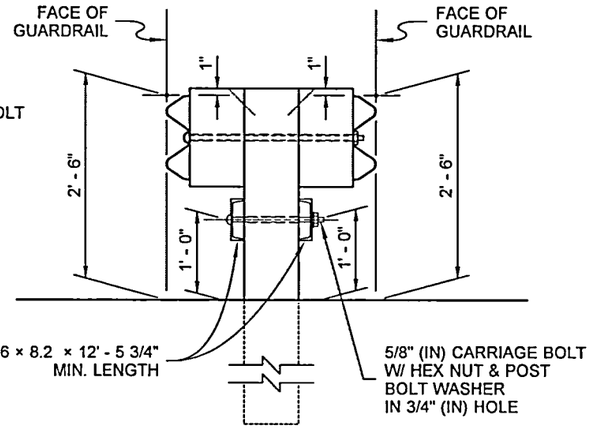


RAIL ELEMENT RAISED

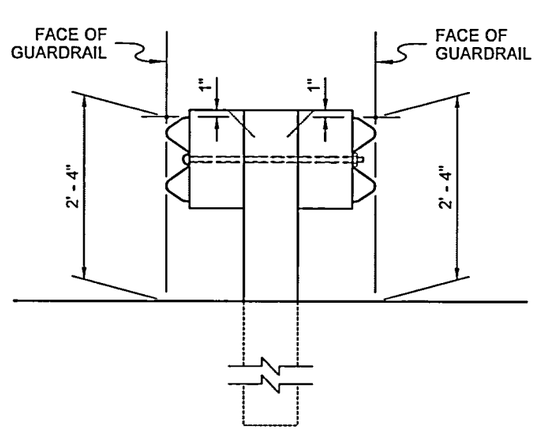
TYPE 1 ALTERNATIVE



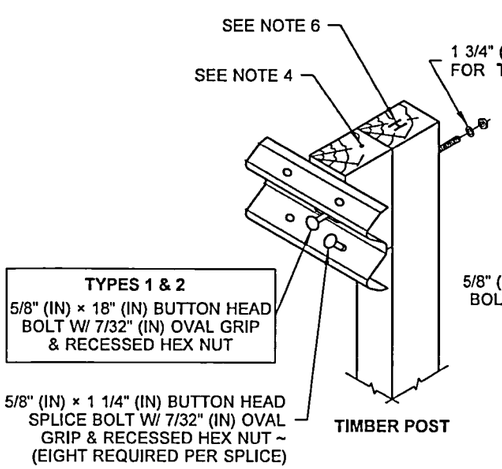
TYPE 2



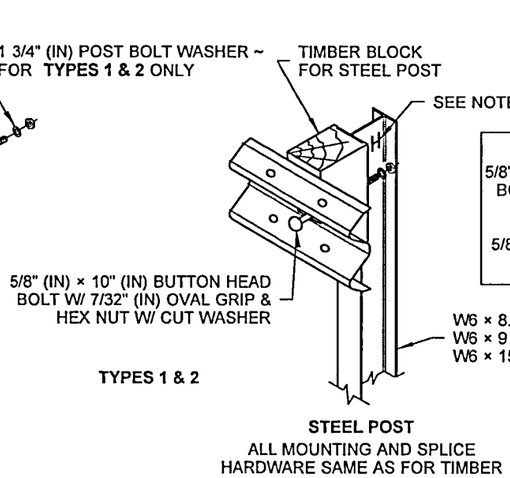
TYPE 3



TYPE 4

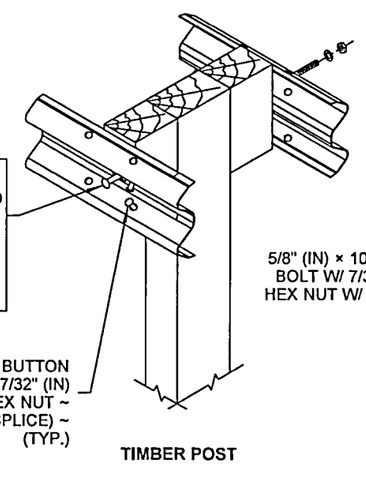


TIMBER POST

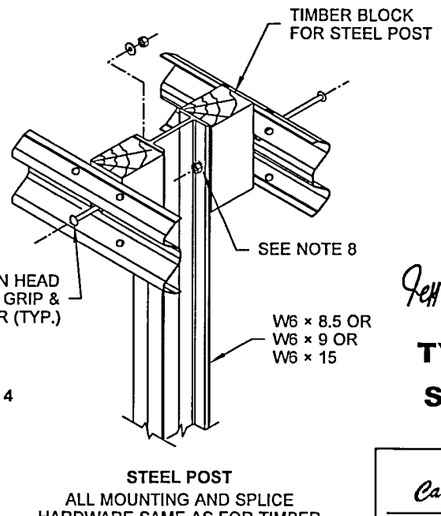


STEEL POST
ALL MOUNTING AND SPLICE HARDWARE SAME AS FOR TIMBER POST EXCEPT AS NOTED

ASSEMBLY DETAIL
TYPE 1 AND 2



TIMBER POST



STEEL POST
ALL MOUNTING AND SPLICE HARDWARE SAME AS FOR TIMBER POST EXCEPT AS NOTED

ASSEMBLY DETAIL
TYPE 3 AND 4

NOTES

1. When required by the Contract, a Snow Load Post Washer shall be used on the backside of the post (in lieu of the 1 3/4" (in) Post Bolt Washer) and a Snow Load Rail Washer shall be placed on the face side of Beam Guardrail Types 1 and 2. Snow Load Rail Washers shall not be installed on terminals.
2. Rail Washers, also called "Snow Load Rail Washers", are not required on new installation, except as called for in Note 1. Unnecessary Rail washers need not be removed from existing installations, except those on posts 2 through 8 of a BCT installation shall be removed.
3. Beam Guardrail post spacing for Types 1 through 4 shall be 6' - 3" on centers.
4. Timber blocks shall be toe-nailed to the post with a 16d galvanized nail to prevent block rotation.
5. For post and block details, see **Standard Plan C-1b**.
6. When "Beam Guardrail Type - ___ Ft. Long Post" is specified in the Contract, the post length shall be stamped with numbers, 1 1/2" (in) min. high and 3/4" (in) wide at the location where the letter "H" is shown in the ASSEMBLY DETAIL. For wood post applications, the letter shall be stamped to a minimum depth of 1/4" (in). For steel post applications, the letter shall be legible after the post is galvanized. After post installation, it shall be the Contractor's responsibility to ensure the stamped numbers remain visible.
7. Existing posts shall not be raised. Replace posts as necessary to achieve required guardrail height.
8. Holes shall be located on approaching traffic side of web.

JEFFREY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jun 30 2016 7:19 AM

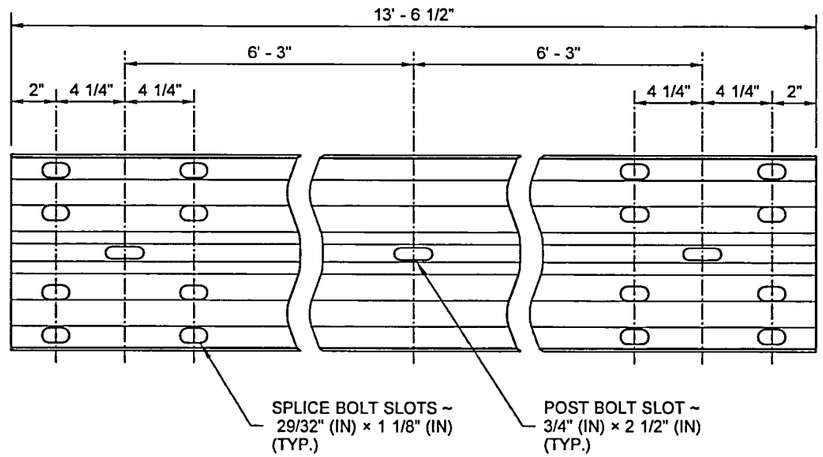
BEAM GUARDRAIL TYPES 1 - 4 (W-BEAM)

STANDARD PLAN C-1

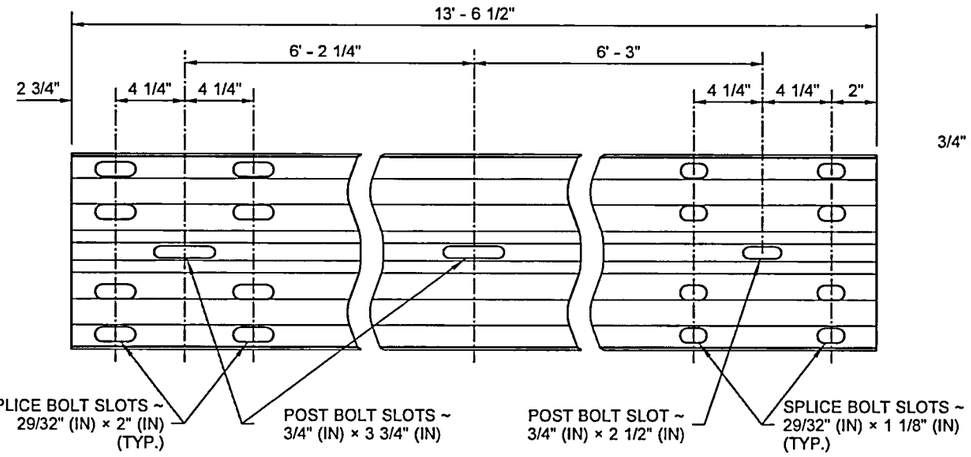
SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 12 2016 11:52 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

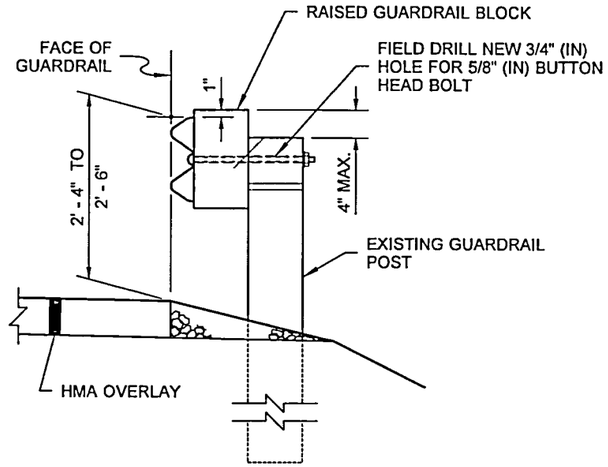
DRAWN BY: FERN LIDDELL



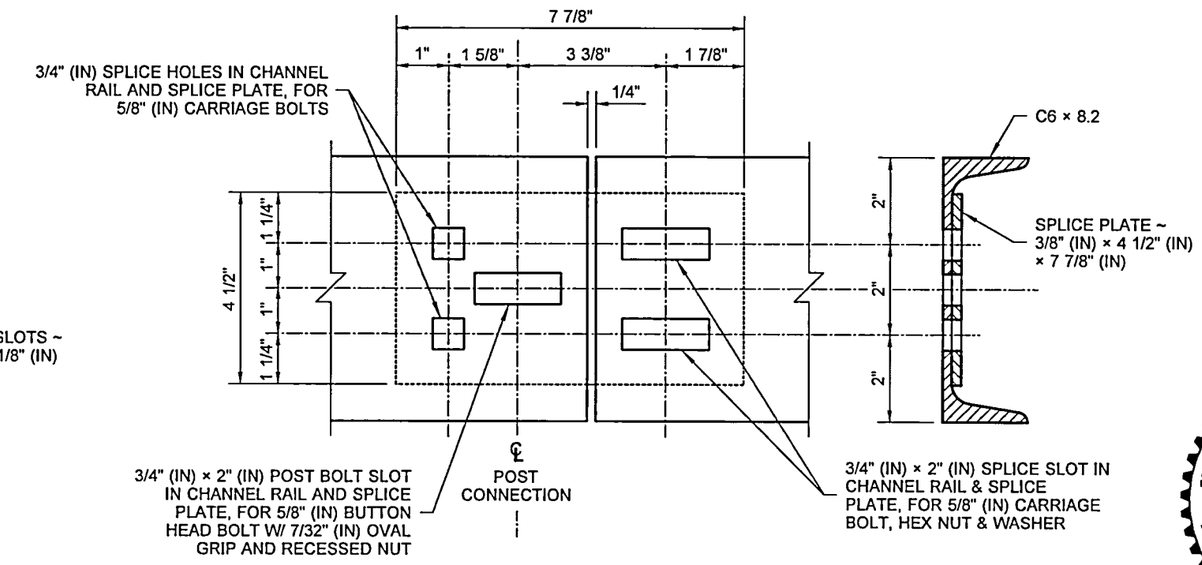
TYPICAL RAIL ELEMENT



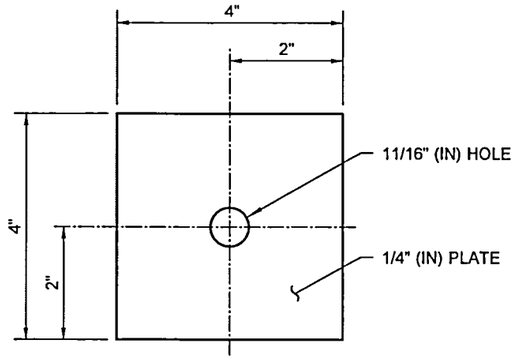
EXPANSION SECTION



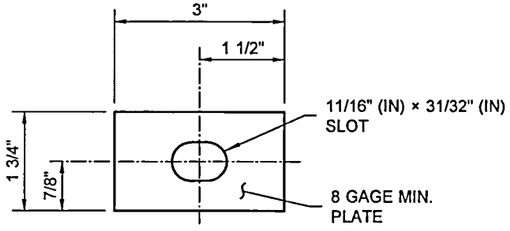
BEAM GUARDRAIL RAISING FOR HMA OVERLAYS



CHANNEL RAIL SPLICE



SNOW LOAD POST WASHER
SEE NOTE 1



SNOW LOAD RAIL WASHER
SEE NOTES 1 & 2

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jun 30 2016 7:20 AM

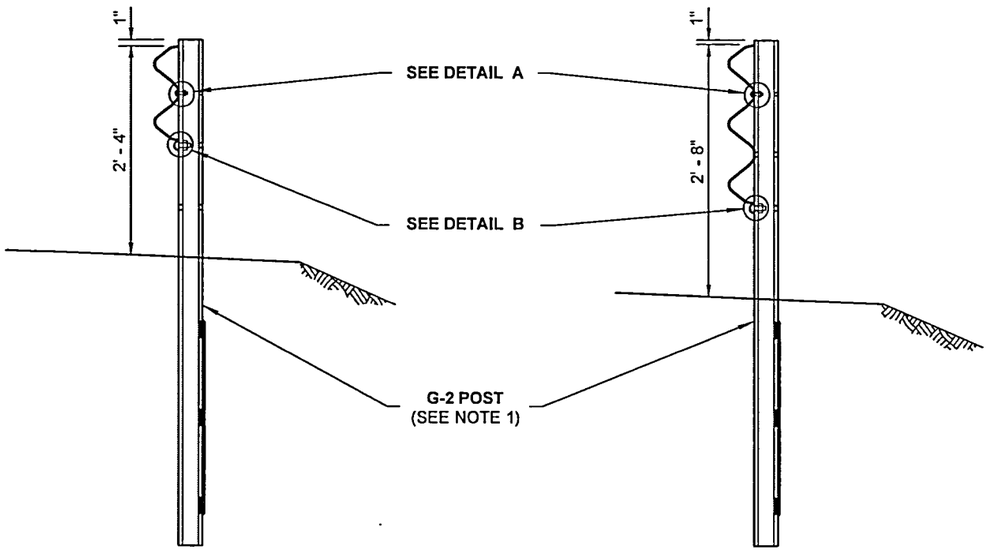
BEAM GUARDRAIL TYPES 1 - 4 (W-BEAM)

STANDARD PLAN C-1

SHEET 2 OF 2 SHEETS

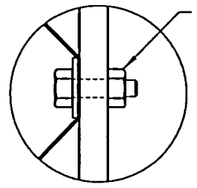
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 12 2016 11:53 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

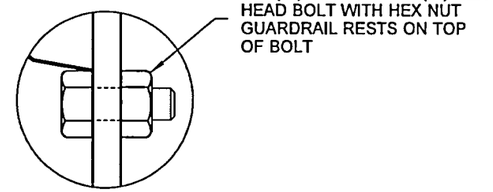


TYPE 20

TYPE 21



DETAIL A



DETAIL B

NOTES

1. For post details see **Standard Plan C-1b.**

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

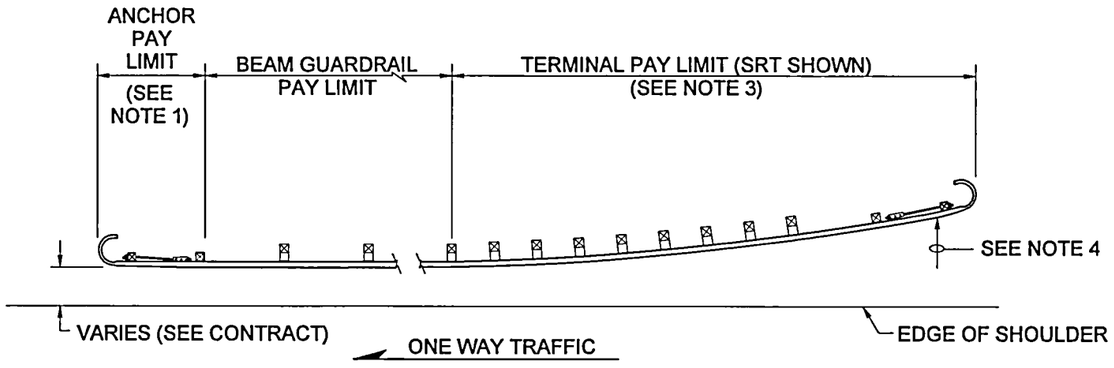
Petterson, Jeff (IIQ Design)
Jun 30 2016 9.48 AM

BEAM GUARDRAIL

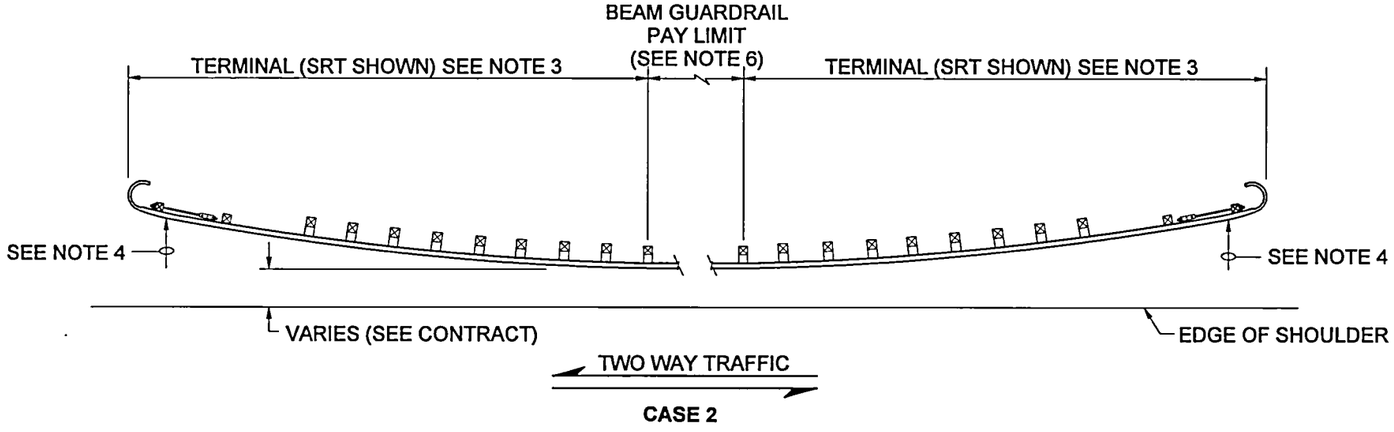
STANDARD PLAN C-1c

SHEET 1 OF 1 SHEET

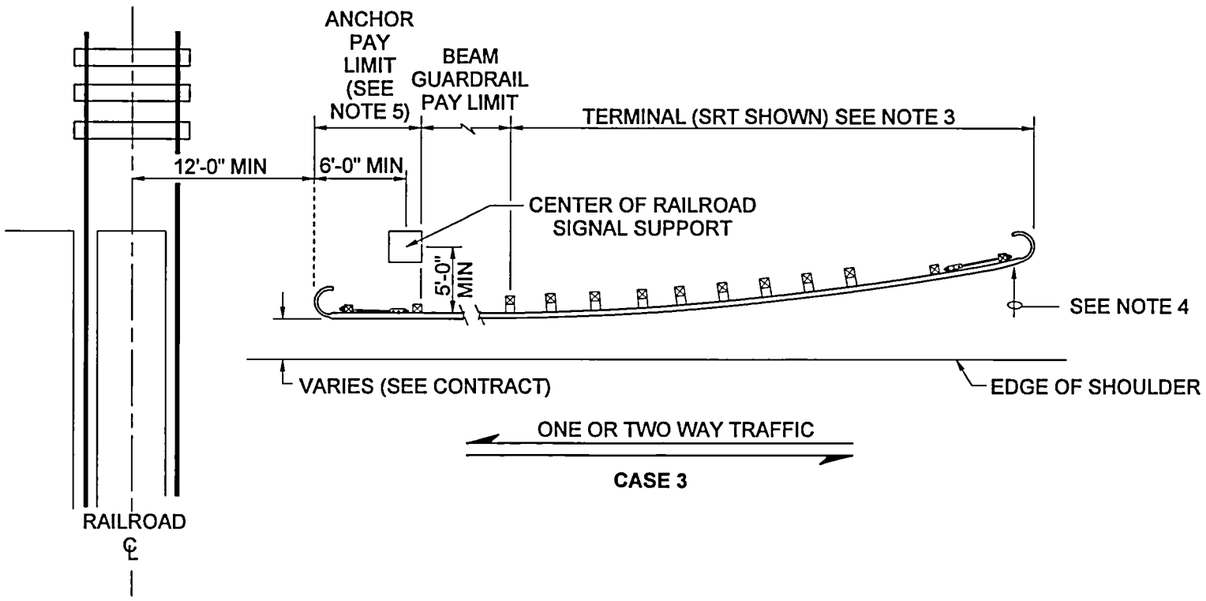
APPROVED FOR PUBLICATION
Carpenter, Jeff
Carpenter, Jeff
Jul 12 2016 11:54 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation



CASE 1



CASE 2



CASE 3

NOTES

1. Type 4 anchor required. For details, see Standard Plan C-6c.
2. Post spacing is 6'-3" unless otherwise shown.
3. For Terminal type and details, see Contract Plans and applicable Standard Plan(s).
4. The slope from the edge of the shoulder into the face of the guardrail should not exceed 10:1 when the face of the guardrail is less than 12'-0" from the edge of the shoulder.
5. For one-way traffic, use Type 4 anchor. For two-way traffic, use Type 1 anchor. See applicable Standard Plan(s) for details.
6. When Beam Guardrail Flared Terminals are used on both ends a minimum of 25'-0" of Beam Guardrail shall be installed.

CLIFFORD E. MANSFIELD
STATE OF WASHINGTON
15224
REGISTERED
PROFESSIONAL ENGINEER

Clifford E Mansfield 12/27/99

EXPIRES MAY 3, 2000

GUARDRAIL PLACEMENT

STANDARD PLAN C-2

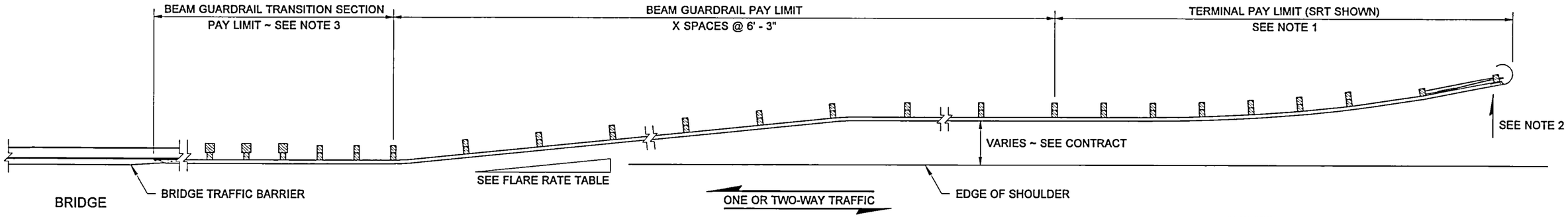
DATE	REVISION	BY
12/99	ADDED NOTE 6. MODIFIED THE END SECTIONS TO DESIGN "C".	TWS

APPROVED FOR PUBLICATION

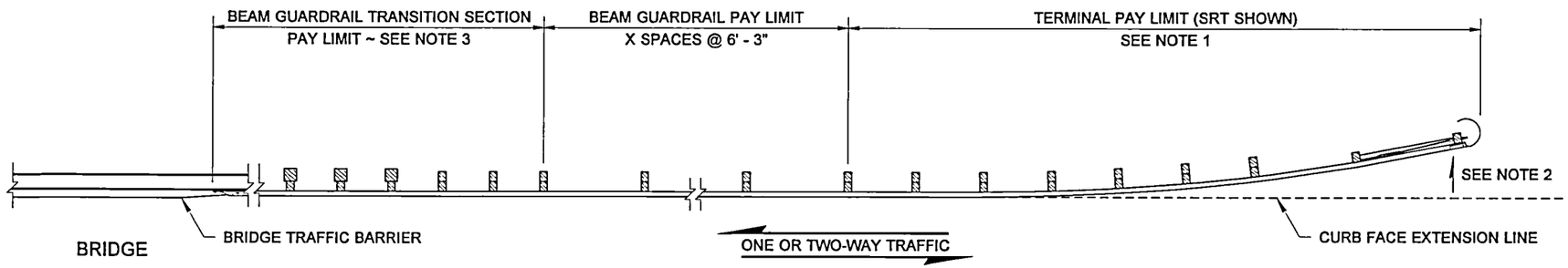
Clifford E Mansfield 1/6/00

DEPUTY STATE DESIGN ENGINEER — DATE

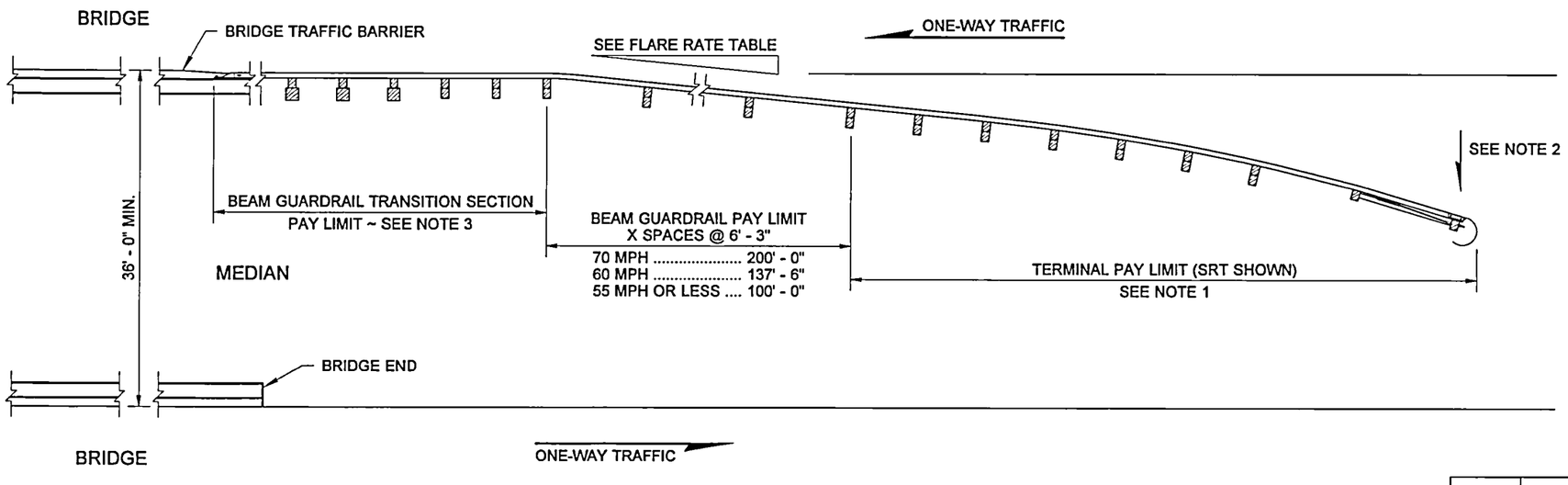
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
OLYMPIA, WASHINGTON



CASE 4



CASE 5



CASE 6

DRAWN BY: MARK SUJKA

NOTES

1. For terminal type and details, see Contract and applicable Standard Plan(s).
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10H:1V when the guardrail is within 12' - 0" from the edge of the shoulder.
3. See Contract for Beam Guardrail Transition Section type and Connection to Bridge Traffic Barrier or Concrete Barrier.

FLARE RATE TABLE	
POSTED SPEED (MPH)	**RATE**
70	15 : 1
60	14 : 1
55	12 : 1
50	11 : 1
45	10 : 1
40 OR LESS	9 : 1

RICHARD BARSTOW MIN — STATE OF WASHINGTON — 34042 — REGISTERED PROFESSIONAL ENGINEER

6/21/2006

EXPIRES JULY 24, 2006

GUARDRAIL PLACEMENT

STANDARD PLAN C-2a

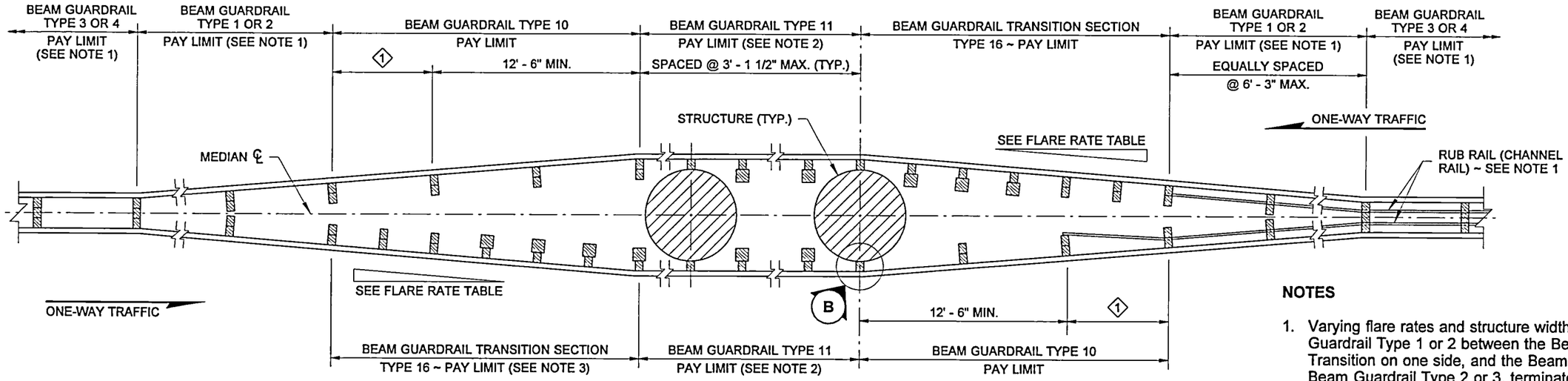
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 6-21-06

Washington State Department of Transportation

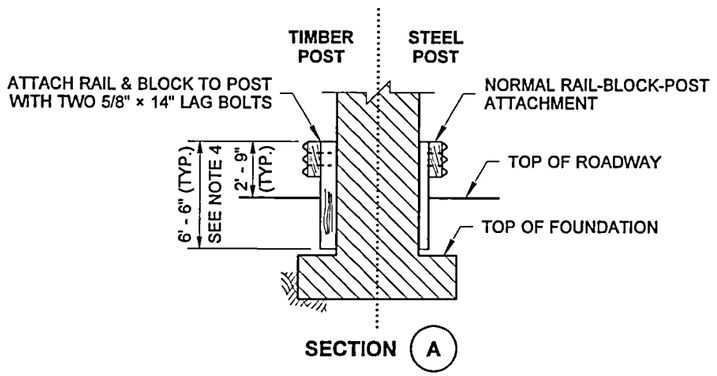
DATE	REVISION	BY
05/2006	APPLIED CURRENT DRAFTING STANDARDS	MAS



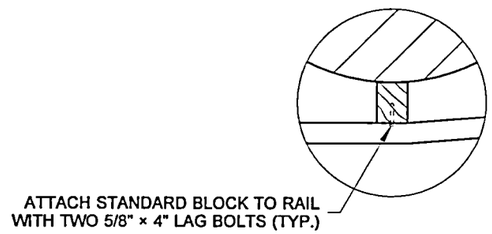
PLAN VIEW
(WOOD POST AND BLOCK SHOWN)

CASE 7

FLARE RATE TABLE	
POSTED SPEED (MPH)	RATE
70	15 : 1
60	14 : 1
55	12 : 1
50	11 : 1
45	10 : 1
40 OR LESS	9 : 1



SECTION (A)



DETAIL (B)

1 THRIE BEAM GUARDRAIL REDUCER SECTION TYPE B

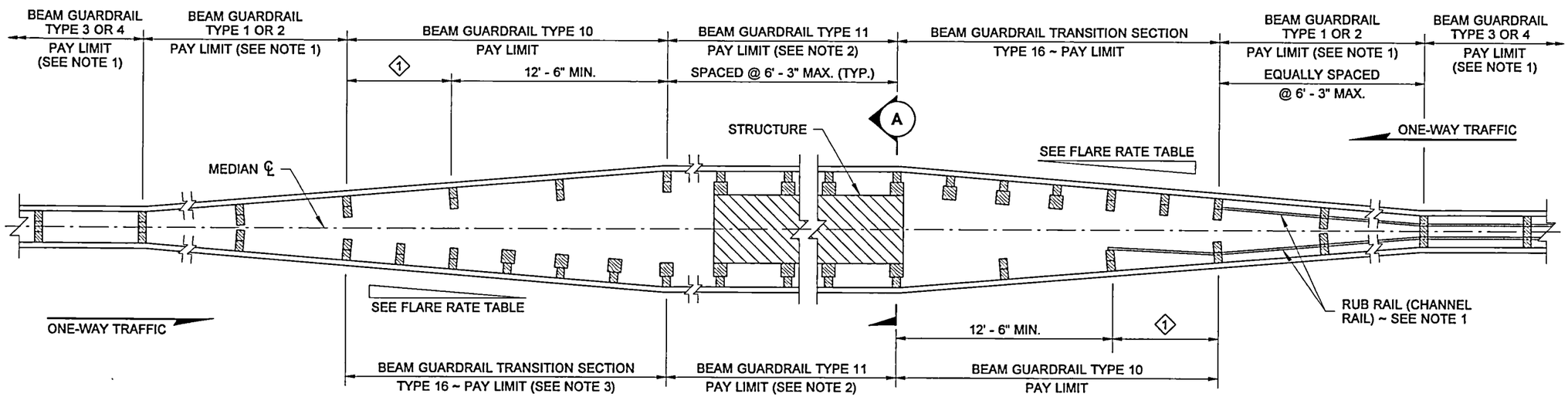
NOTES

1. Varying flare rates and structure widths may require a length of Beam Guardrail Type 1 or 2 between the Beam Guardrail Type 3 or 4 and the Transition on one side, and the Beam Guardrail Type 10 on the other. For Beam Guardrail Type 2 or 3, terminate the rub rail (channel rail) at the first 6×8 post of the Beam Guardrail Transition Section Type 16, and by lapping it behind the second 6×8 post on the Beam Guardrail Type 10 side, or as approved by the Engineer.

2. Use the minimum number of nested 12' - 6" thrie beam sections needed to span the structure. This run may extend past the end of the structure, and an excess of 6' - 3" maximum is acceptable. If the last 12' - 6" section extends more than 6' - 3" (but less than 12' - 6"), use a nested 6' - 3" thrie beam section in its place.

3. The Beam Guardrail Transition Section Type 16 on this end shall terminate at a 10×10 post. Place nested thrie beam with 10×10 posts at 3' - 1 1/2" maximum spacing between the end of the transition and the structure.

4. If full post depth cannot be achieved due to the structure foundation, post length shall be adjusted to the top of foundation. The Beam Guardrail Type 11 post height shall be 2' - 9".



PLAN VIEW
(WOOD POST AND BLOCK SHOWN)

CASE 8

RICHARD BARSTOW ALBIN
STATE OF WASHINGTON
34042
REGISTERED PROFESSIONAL ENGINEER
6/21/2006
EXPIRES JULY 24, 2006

GUARDRAIL PLACEMENT

STANDARD PLAN C-2b

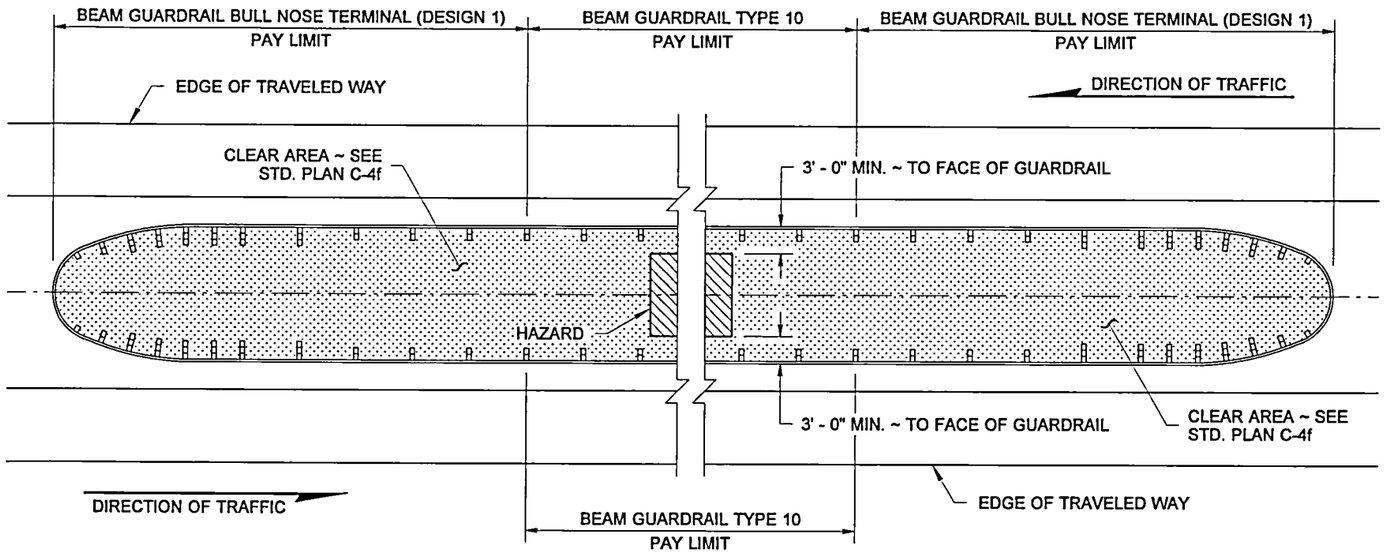
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Harold Peterson 6-21-06
STATE DESIGN ENGINEER — DATE

Washington State Department of Transportation

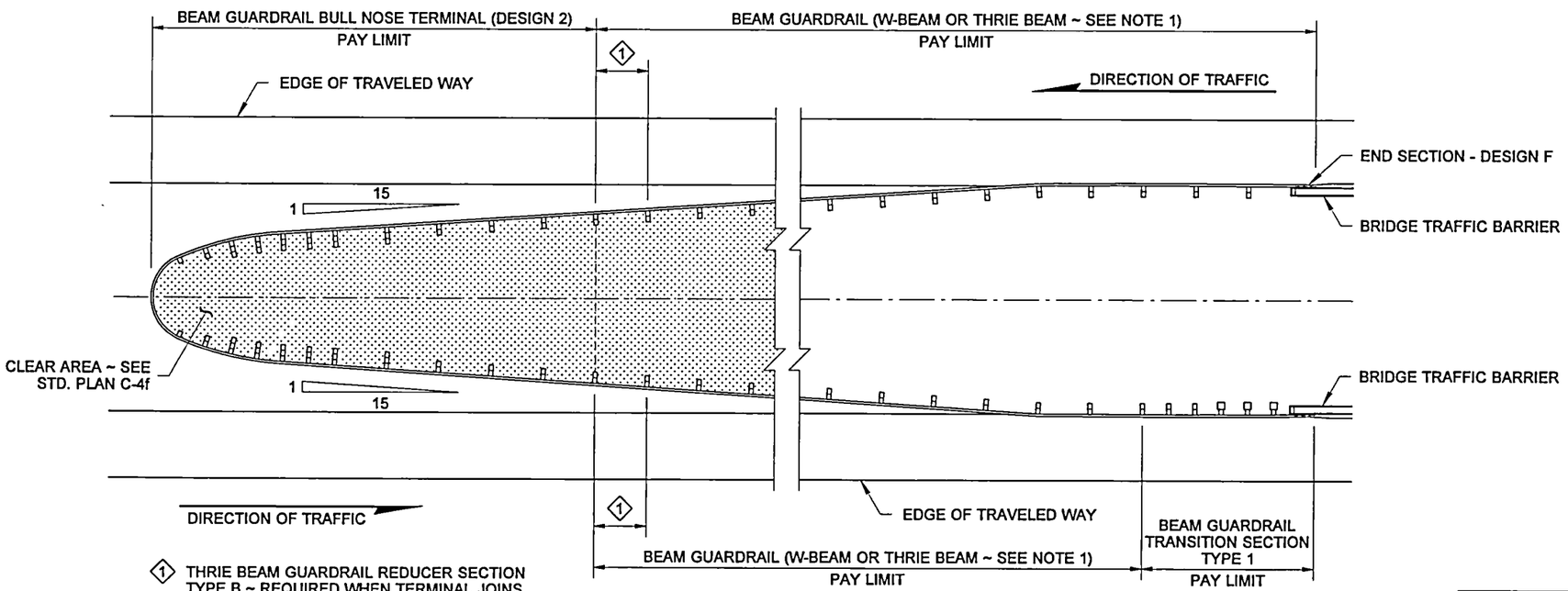
DATE	REVISION	BY
05/2006	OMITTED ATTACHMENT TO STRUCTURE (NOTE 1)	EAB

DRAWN BY: ELENA BRUNSTEIN



CASE 9A

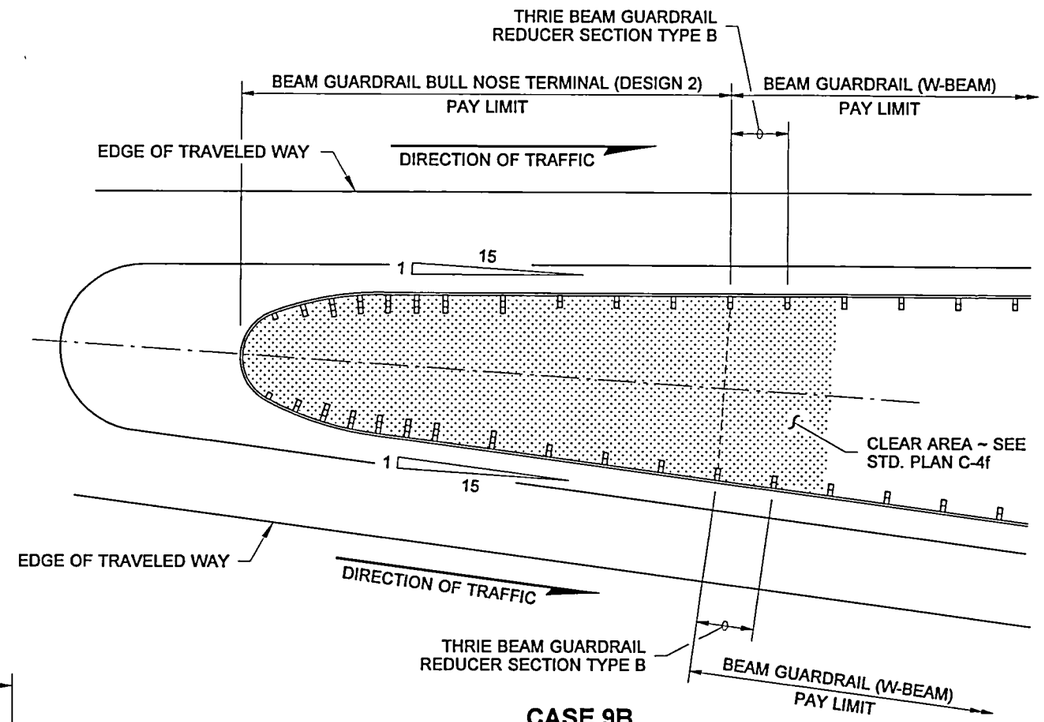
DRAWN BY: BILL BERENS



CASE 9C

NOTE

1. **CASE 9C:** Thrie Beam Guardrail is used when the distance from the end of the Bullnose Terminal to the beginning of the transition of the Bridge Rail is less than 100 feet.



CASE 9B

RICHARD BARSTOW BILLBIN
STATE OF WASHINGTON
34042
REGISTERED
PROFESSIONAL ENGINEER

6/19/2006

EXPIRES JULY 24, 2006

GUARDRAIL PLACEMENT MEDIAN BULL NOSE

STANDARD PLAN C-2c

SHEET 1 OF 1 SHEET

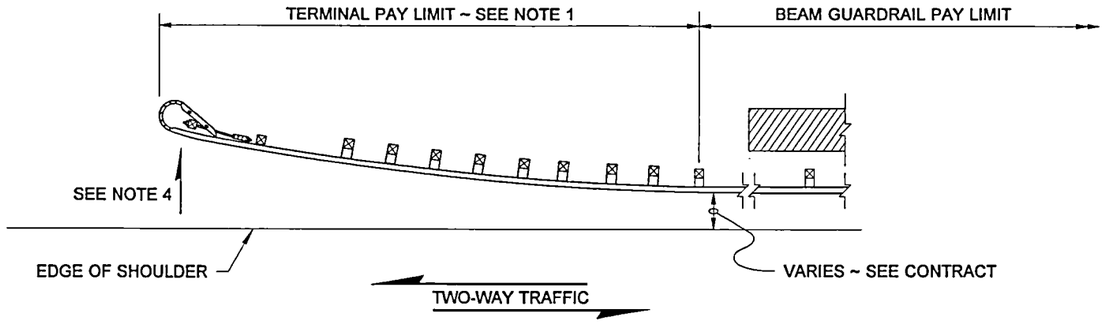
DATE	REVISION	BY
05/2006	CLARIFIED DIMENSION OF CLEARANCE TO HAZARD IN CASE 9A	WJB

APPROVED FOR PUBLICATION

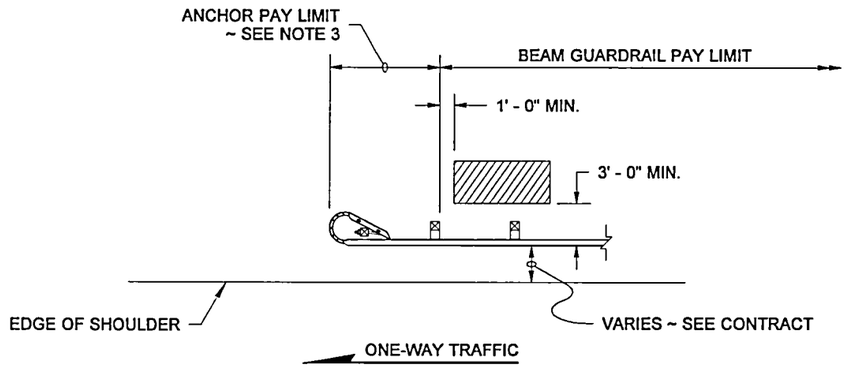
Harold Petrasek 6-21-06

STATE DESIGN ENGINEER — DATE

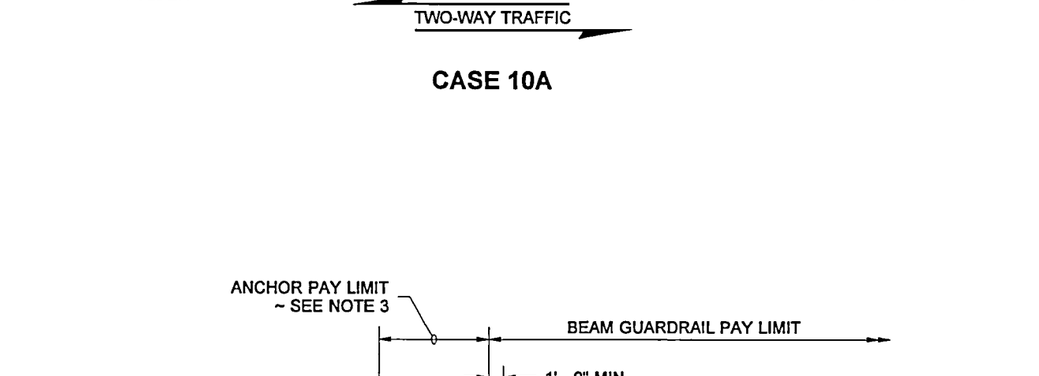
Washington State Department of Transportation



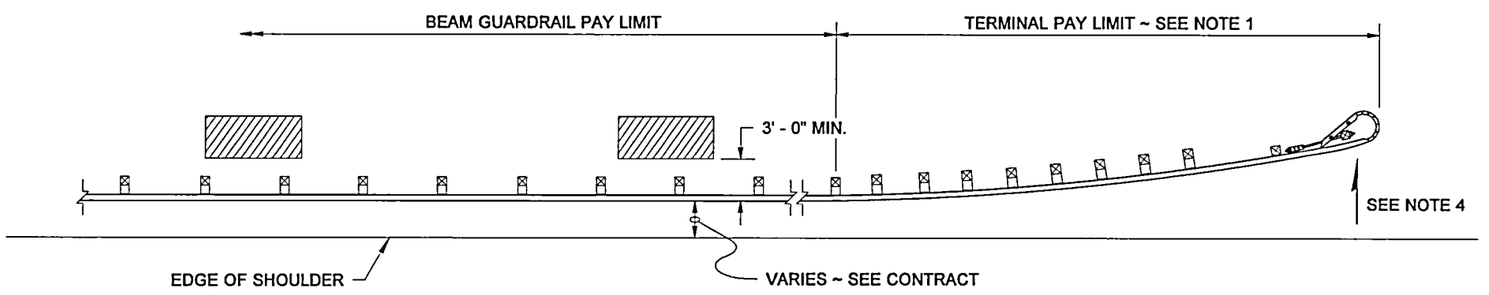
CASE 10A



CASE 10B



CASE 10C



ONE-WAY TRAFFIC

OR

TWO-WAY TRAFFIC

CASE 10 A, B, or C

NOTES

1. SRT Terminal shown, for terminal type and details, see Contract or applicable Standard Plan(s).
2. Post spacing is 6' - 3" except where noted.
3. Type 4 anchor required. See applicable Standard Plan(s).
4. The slope from the edge of the shoulder into the face of the guardrail should not exceed 10H:1V when the guardrail is within 12' - 0" from the edge of the shoulder.

RICHARD BARSTOW BIN
STATE OF WASHINGTON
34042
REGISTERED
PROFESSIONAL ENGINEER

6/19/2006

EXPIRES JULY 24, 2006

GUARDRAIL PLACEMENT

STANDARD PLAN C-2d

SHEET 1 OF 1 SHEET

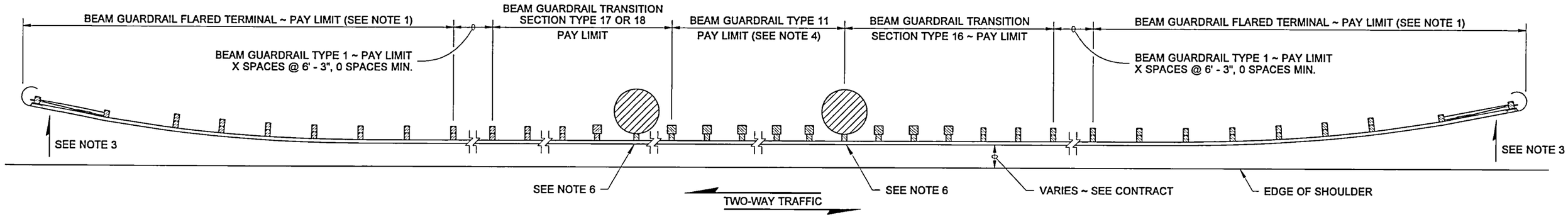
APPROVED FOR PUBLICATION

Harold Pitzpatrick 6-21-06

STATE DESIGN ENGINEER — DATE

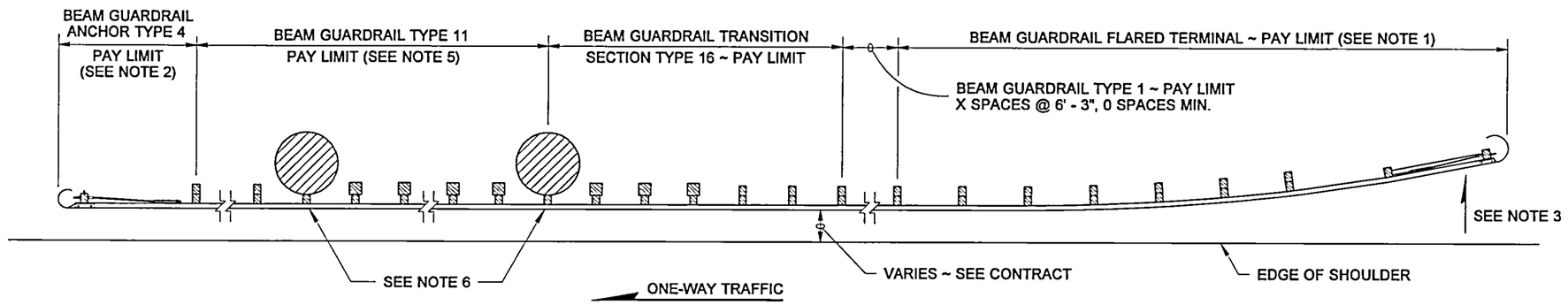
Washington State Department of Transportation

DATE	REVISION	BY
05/2006	CLARIFIED DIMENSION OF CLEARANCE FOR HAZARD	MAS

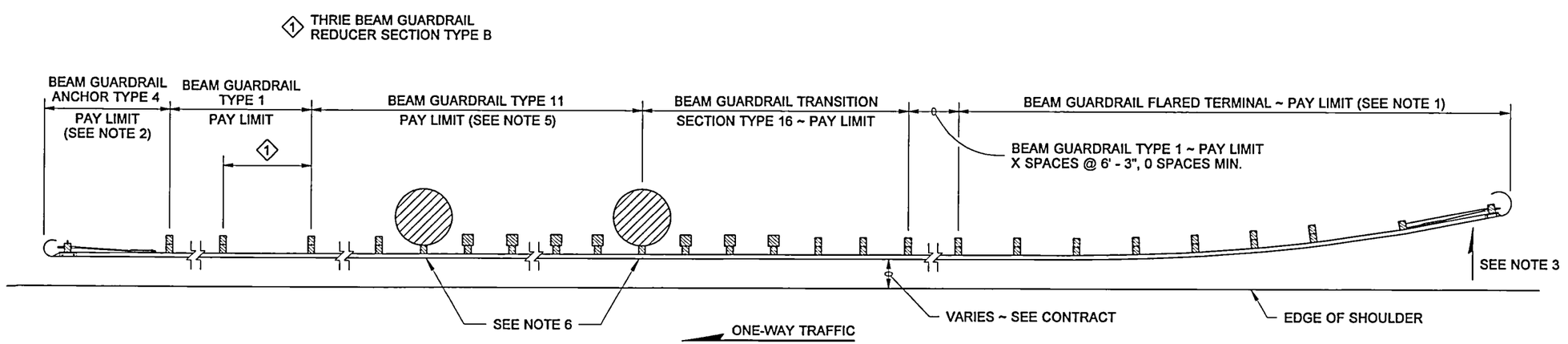


CASE 11A

DRAWN BY: ELENA BRUNSTEIN



CASE 11B



CASE 11C

NOTES

1. SRT Terminal shown. For terminal type and details see Contract and applicable Standard Plan(s).
2. Beam Guardrail Anchor Type 4 (W-Beam) or Type 4 (Thrie Beam) required.
3. The slope from the edge of the shoulder into the face of the guardrail should not exceed 10H:1V when the guardrail is within 12' - 0" from the edge of the shoulder.
4. If the distance from end of Beam Guardrail Type 11 to the structure exceeds 6' - 3" using 12' - 6" thrie beam sections, add a 6' - 3" nested section of thrie beam with 10×10 posts, spaced at 3' - 1 1/2" maximum, and begin transition.
5. Guardrail post spacing for Beam Guardrail Type 11 past the end of the structure shall be spaced at 6' - 3" maximum with 6×8 post and standard block.
6. Attach the standard wood block to the rail using two 5/8" × 4" lag bolts.

RICHARD BARSTOW LEBRUN — STATE OF WASHINGTON — 34042 — REGISTERED PROFESSIONAL ENGINEER — 6/21/2006

EXPIRES JULY 24, 2006

GUARDRAIL PLACEMENT

STANDARD PLAN C-2e

SHEET 1 OF 1 SHEET

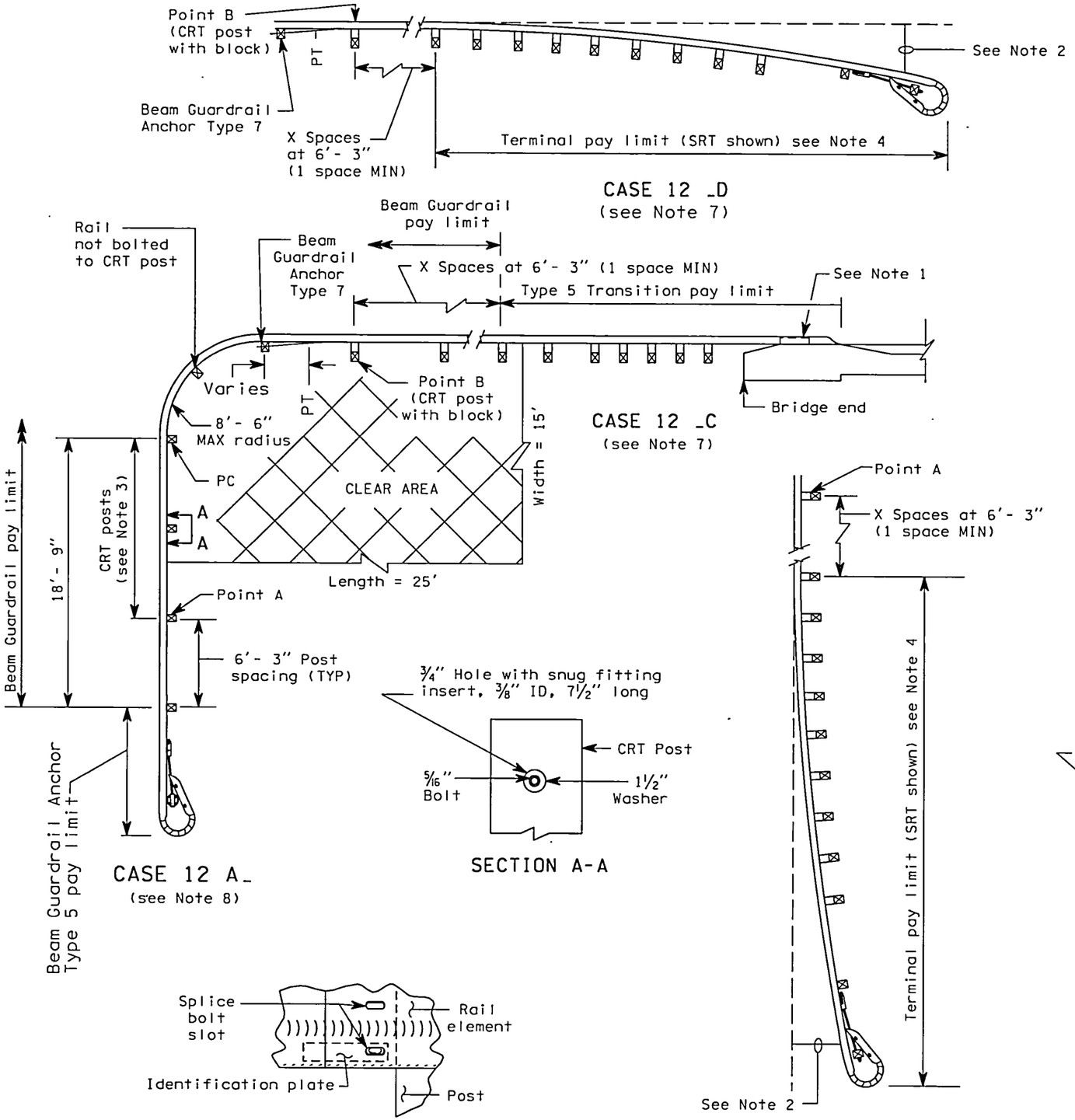
APPROVED FOR PUBLICATION

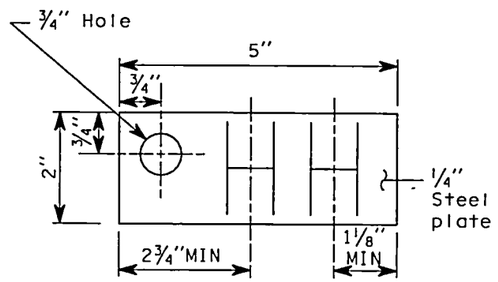
Harold Peterson 6-21-06

STATE DESIGN ENGINEER — DATE

Washington State Department of Transportation

DATE	REVISION	BY
05/2006	OMITTED ATTACHMENT TO STRUCTURE (NOTE 2)	EAB





IDENTIFICATION PLATE
(see Note 5)

NOTES

1. See Contract for guardrail connection to bridge rail and concrete barrier.
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.
3. Attach to rail with 5/16" x 9" long bolt, nut and 1½" washer on back of post.
4. For terminal type and details, see Contract and applicable Standard Plan(s).
5. Radius dimensions shall be etched into plate replacing the letters "HH", shown on the Identification Plate Detail. Digits shall be 1½" MIN height and ¾" MAX width. The plate shall be galvanized after etching.
6. The guardrail radius Identification Plate shall be mounted on the back side of the Rail Element using the lowest splice bolt at the P.C. of the guardrail radius.
7. First letter of case designation placement indicates end treatment on side road. Second letter indicates end treatment on main road. For instance, a Type 5 Anchor on the side road and a bridge connection on the main road would be Case 12 AC.
8. For the 8'- 6" radius, five CRT posts are required including the CRT post at point B.
9. For CRT post details, see Standard Plan "Beam Guardrail Posts and Blocks".

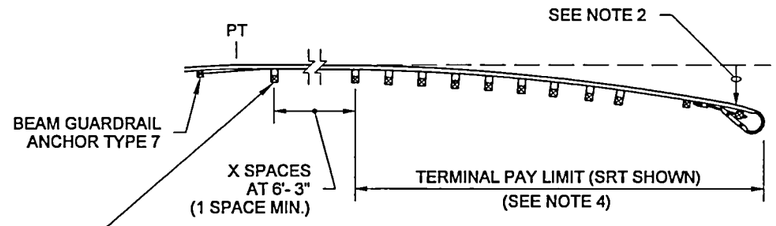
GUARDRAIL PLACEMENT
WEAK POST INTERSECTION DESIGN (8'- 6" MAX RADIUS)

CLIFFORD B. MANSFIELD
STATE OF WASHINGTON
15224
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES MAY 3, 1998

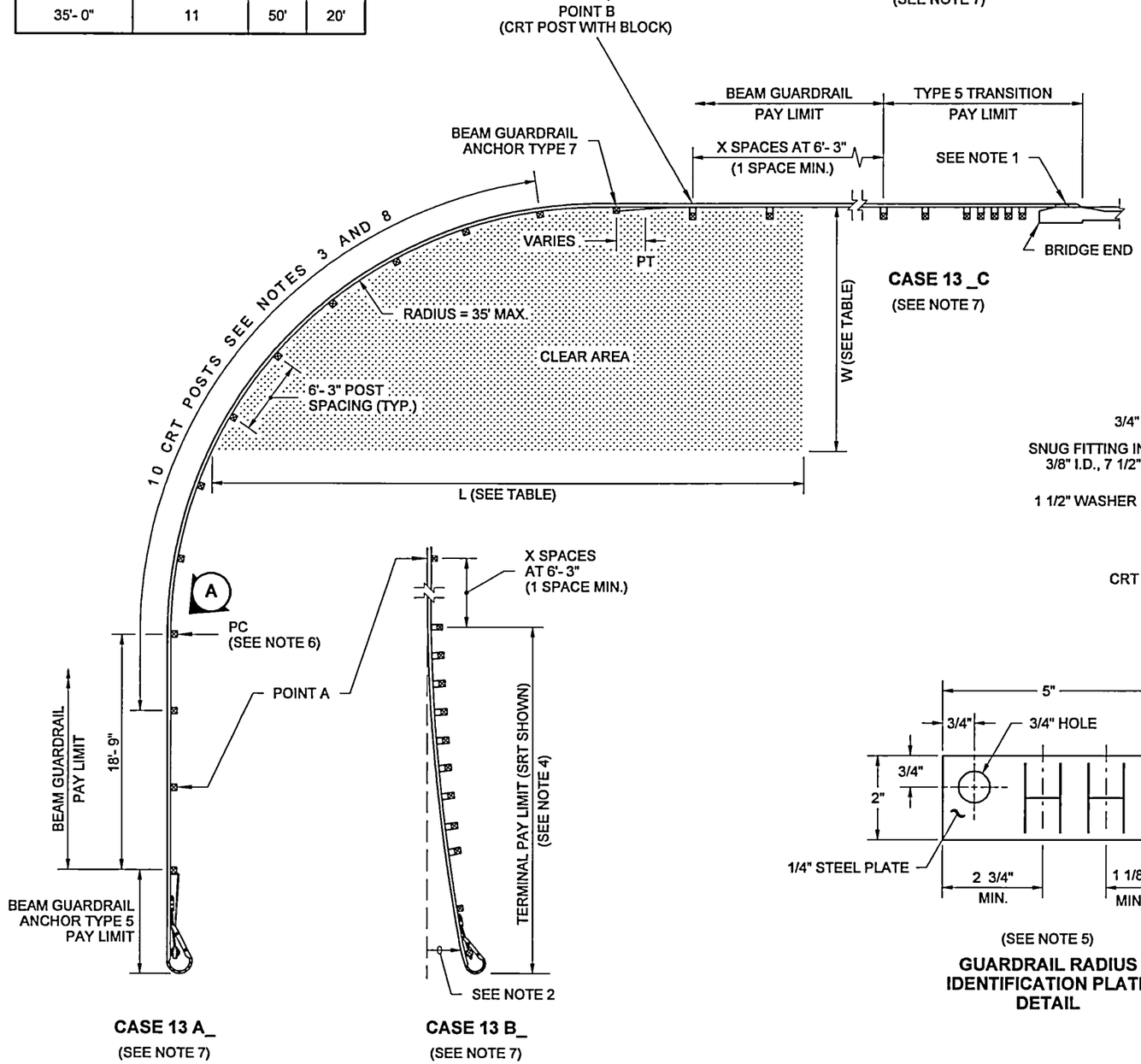
STANDARD PLAN C-2f

APPROVED FOR PUBLICATION
STATE DESIGN ENGINEER — DATE 3/14/97
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
OLYMPIA, WASHINGTON

REQUIREMENTS			
RADIUS	NUMBER OF CRT POSTS (SEE NOTE 3)	CLEAR AREA	
		L	W
17'- 0"	6	30'	15'
25'- 6"	8	40'	20'
35'- 0"	11	50'	20'



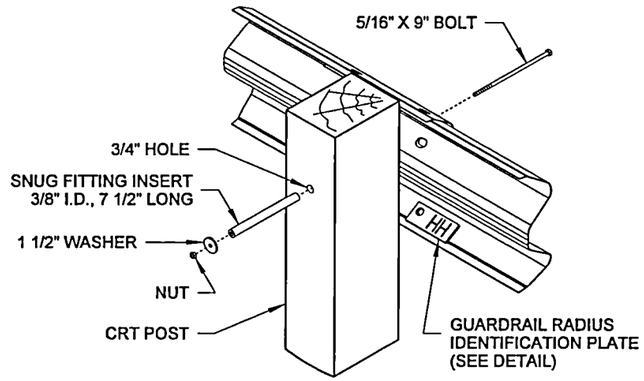
CASE 13 _D
(SEE NOTE 7)



CASE 13 _C
(SEE NOTE 7)

CASE 13 A_
(SEE NOTE 7)

CASE 13 B_
(SEE NOTE 7)



(SEE NOTES 3, 6 & 8)

VIEW (A)

(SEE NOTE 5)

GUARDRAIL RADIUS IDENTIFICATION PLATE DETAIL

NOTES

1. See Contract Plans for guardrail connection to bridge rail and concrete barrier.
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.
3. Fewer CRT posts are required for smaller radii; include CRT Post at Point B. Attach guardrail to post with a 5/16" x 9" long bolt, a 3/8" I.D. x 7 1/2" snug fitting insert, and a 1 1/2" washer with nut on back of post.
4. For terminal type and details, see Contract and applicable Standard Plan(s).
5. Radius dimensions shall be etched into plate replacing the letters "HH", shown on the GUARDRAIL RADIUS IDENTIFICATION PLATE DETAIL. Digits shall be 1 1/2" minimum height and 3/4" maximum width. Plate shall be galvanized after etching.
6. The guardrail radius Identification Plate shall be mounted on the back side of the rail element using the lowest splice bolt nearest the PC of the guardrail radius (See View A).
7. The first letter of the Case Designation indicates the end treatment on the side road. The second letter indicates the end treatment on the main road. For example, a Type 5 Anchor on the side road with a bridge connection on the main road would be Case 13 AC, the combination shown.
8. For CRT post details, see Standard Plan C-1b.

EXPIRES MAY 3, 2002

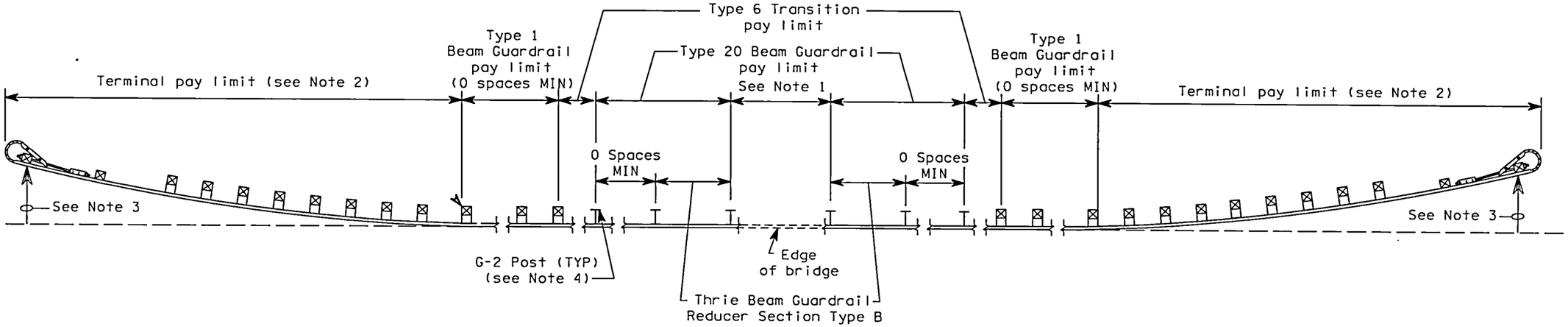
GUARDRAIL PLACEMENT WEAK POST INTERSECTION DESIGN (35' MAX. RADIUS) STANDARD PLAN C-2g

APPROVED FOR PUBLICATION
Clifford E. Mansfield 7-27-01
STATE DESIGN ENGINEER — DATE
Washington State Department of Transportation

DATE	REVISION	BY
7/01	CORRECTED NOTES; ADDED "VIEW A"	MAS

NOTES

1. For Service Level 1, Weak Post Bridge Rail System, see Contract.
2. SRT Terminal shown. For Terminal type and details, see Contract and applicable Standard Plan(s).
3. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.
4. See Standard Plan "Beam Guardrail Posts and Blocks".



Direction of Traffic

CASE 14

GUARDRAIL PLACEMENT

CLIFFORD E. MANSFIELD
STATE OF WASHINGTON
15224
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES MAY 3, 1998

STANDARD PLAN C-2h

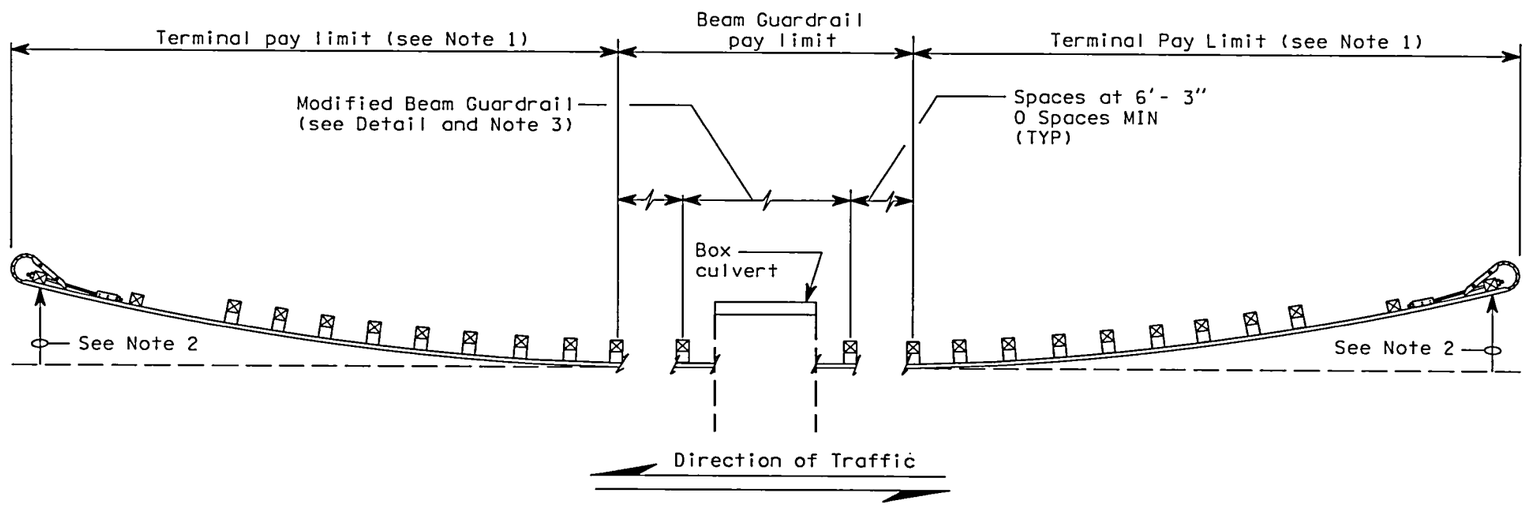
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 3/28/97

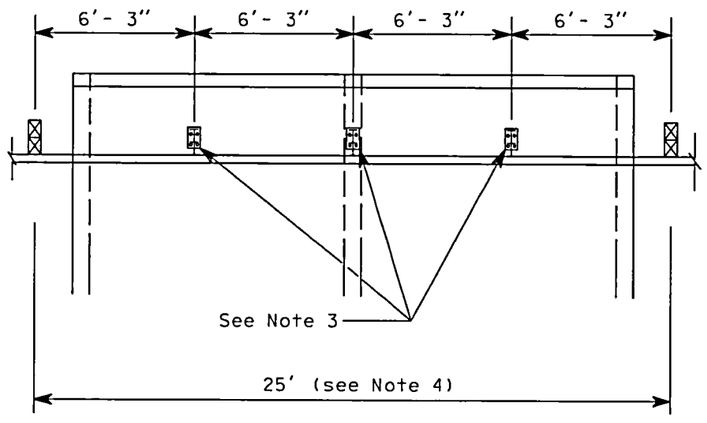
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
OLYMPIA, WASHINGTON

NOTES

1. SRT Terminal shown. For Terminal type and details, see Contract and applicable Standard Plan(s).
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1 .
3. See Standard Plan for Box Culvert Guardrail Steel Post.
4. For spans up to 18'- 9", see Standard Plan for Guardrail Placement Cases 19, 20, and 21.



CASE 15



DETAIL

GUARDRAIL PLACEMENT

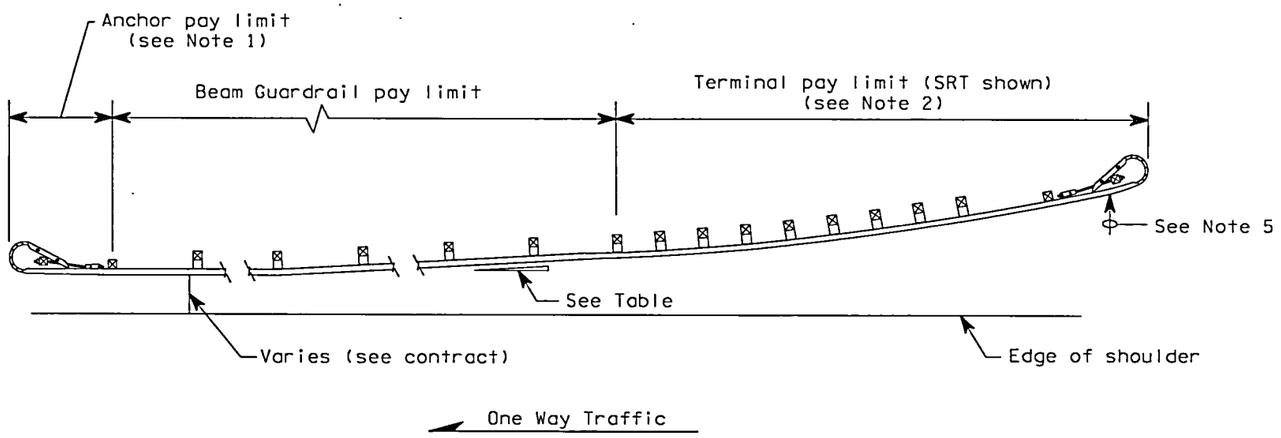
CLIFFORD E. MANSFIELD
STATE OF WASHINGTON
15224
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES MAY 3, 1998

STANDARD PLAN C-2i

APPROVED FOR PUBLICATION

, STATE DESIGN ENGINEER — 3/28/97 DATE

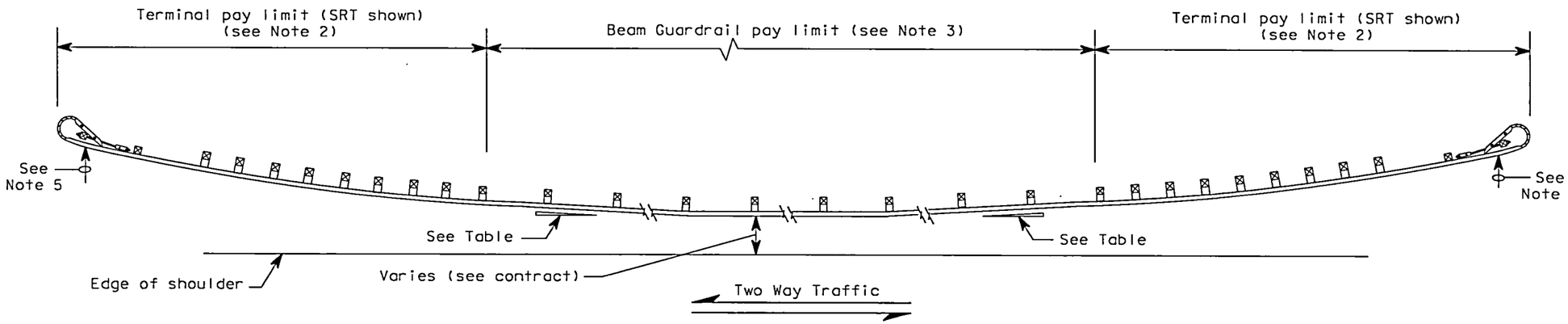
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
OLYMPIA, WASHINGTON



CASE 16

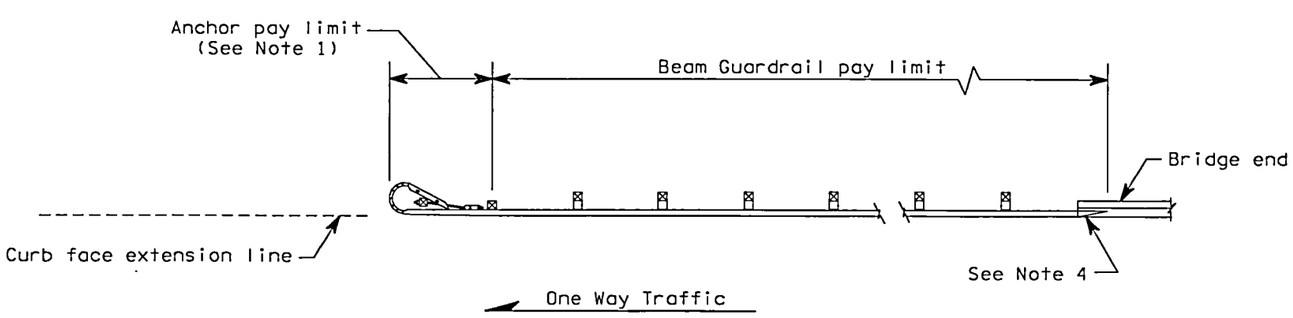
NOTES

1. Type 4 anchor required. For details, see applicable Standard Plan(s).
2. For terminal type and details, see contract and applicable Standard Plan(s).
3. Post spacing is 6'-3" except where noted.
4. For guardrail to bridge rail connection see applicable Standard Plan(s) or Contract.
5. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1 when the guardrail is within 12'-0" from the edge of the shoulder. Beyond 12'-0", the slope shall not be steeper than 6:1.



CASE 17

FLARE RATE TABLE	
Rate	Posted Speed (MPH)
15:1	70
14:1	60
12:1	55
11:1	50
10:1	45
9:1	40 or less



CASE 18

CLIFFORD E. MANSFIELD
STATE OF WASHINGTON
15224
REGISTERED
PROFESSIONAL ENGINEER
Clifford E Mansfield 6/2/98

EXPIRES MAY 3, 2000

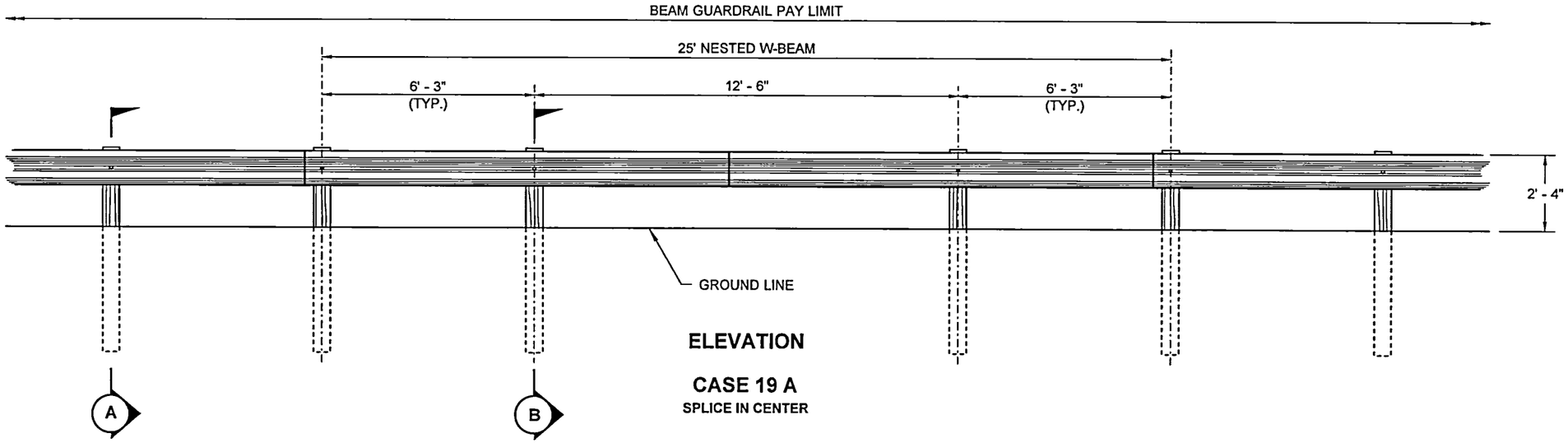
GUARDRAIL PLACEMENT

STANDARD PLAN C-2j

APPROVED FOR PUBLICATION
Clifford E Mansfield 6/2/98
DEPUTY STATE DESIGN ENGINEER — DATE
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
OLYMPIA, WASHINGTON

DATE	REVISION	BY
5/98	Revise Flair Rate Table.	RBA

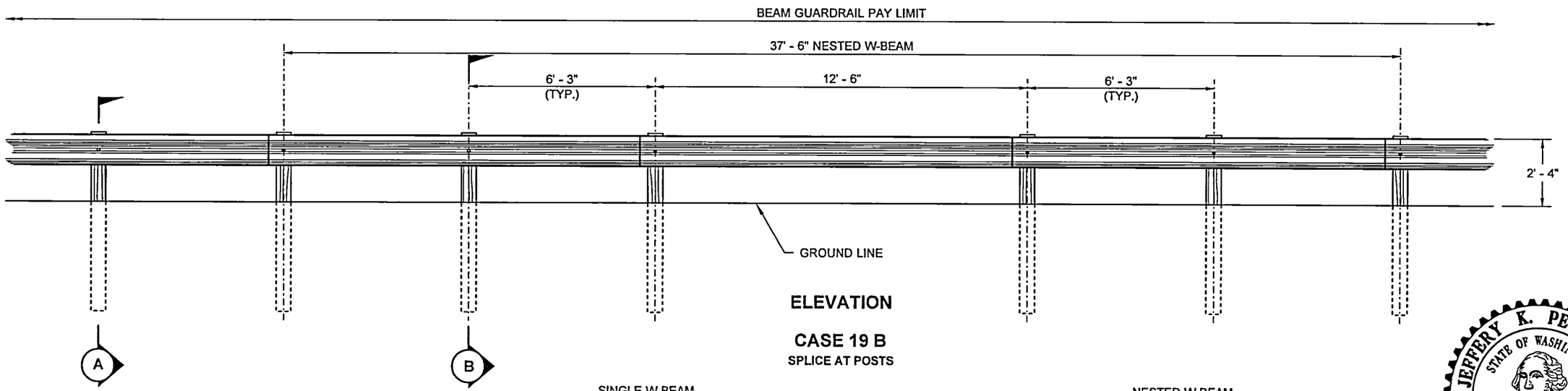
DRAWN BY: MARK SUJKA



ELEVATION

CASE 19 A

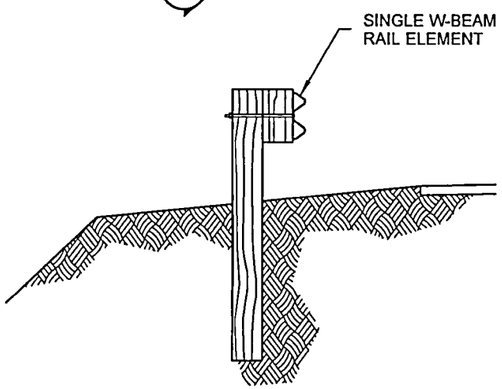
SPLICE IN CENTER



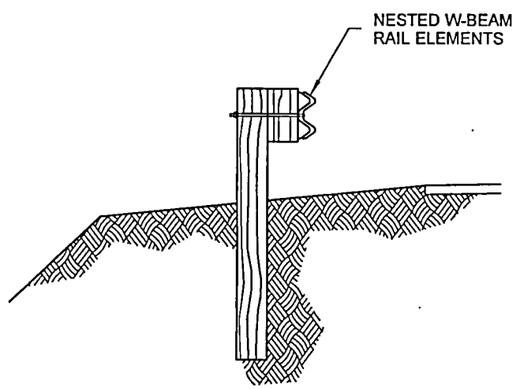
ELEVATION

CASE 19 B

SPLICE AT POSTS



SECTION (A)



SECTION (B)

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jun 24 2016 1:51 PM

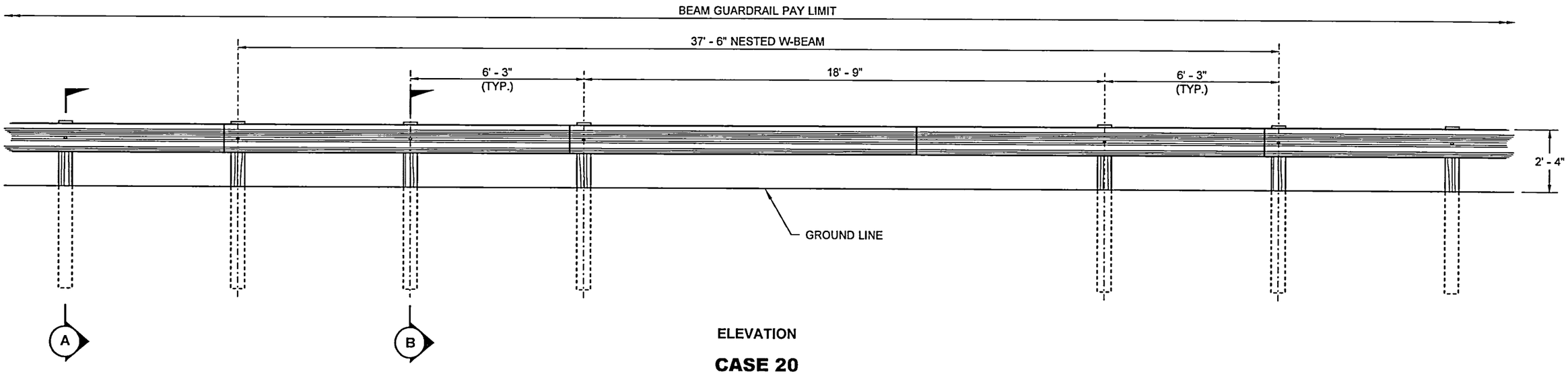
GUARDRAIL PLACEMENT 12'-6" SPAN

STANDARD PLAN C-2k

SHEET 1 OF 1 SHEET

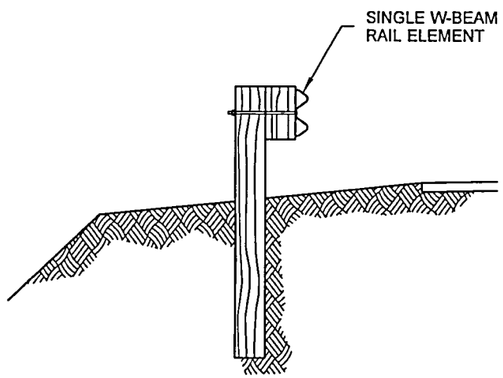
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 12 2016 11:55 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: MARK SUJKA

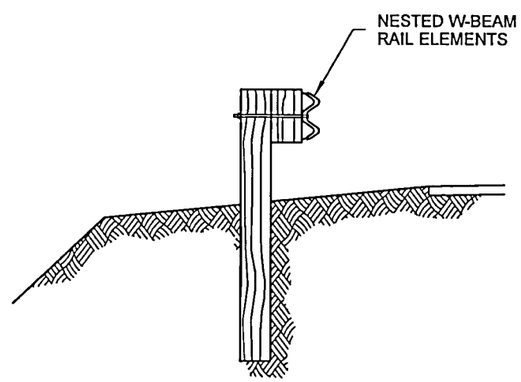


ELEVATION

CASE 20



SECTION (A)



SECTION (B)

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jun 29 2016 2:29 PM

GUARDRAIL PLACEMENT
18'-9" SPAN

STANDARD PLAN C-2n

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

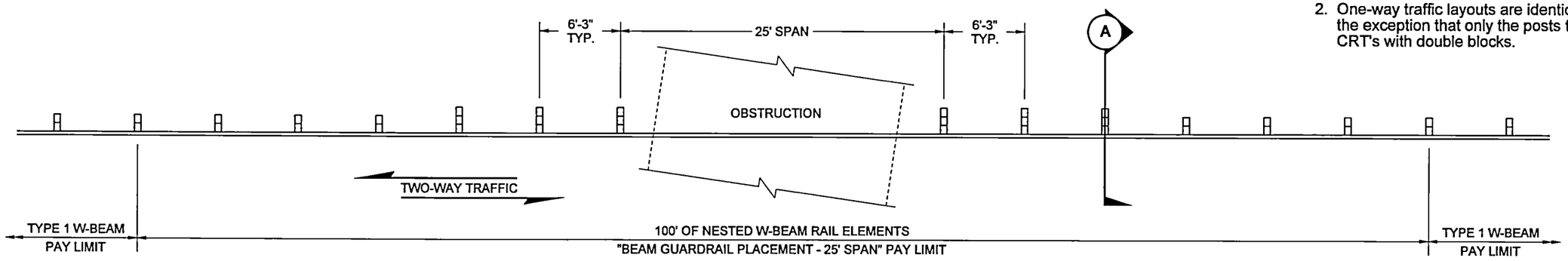
Carpenter, Jeff
Jul 12 2016 11:59 AM

STATE DESIGN ENGINEER

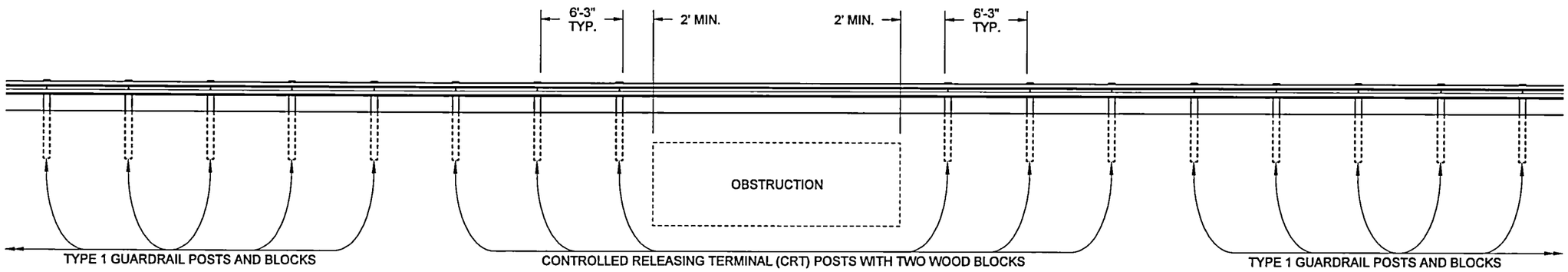
Washington State Department of Transportation

NOTES

1. See Standard Plan C-1b for additional details.
2. One-way traffic layouts are identical to the two-way layout with the exception that only the posts trailing the span need to be CRT's with double blocks.

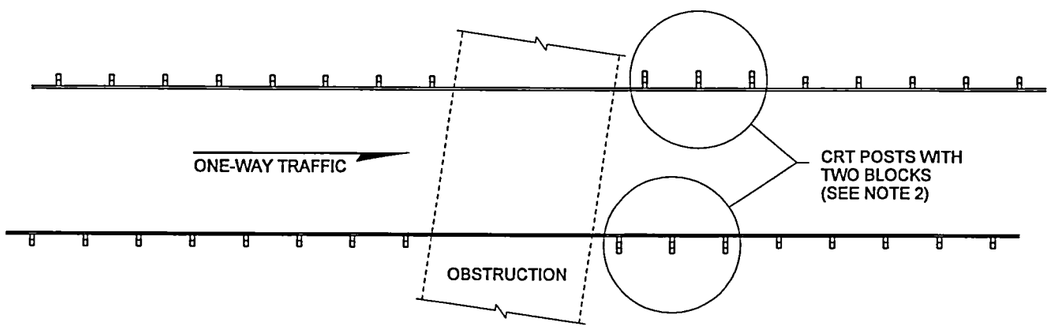


PLAN

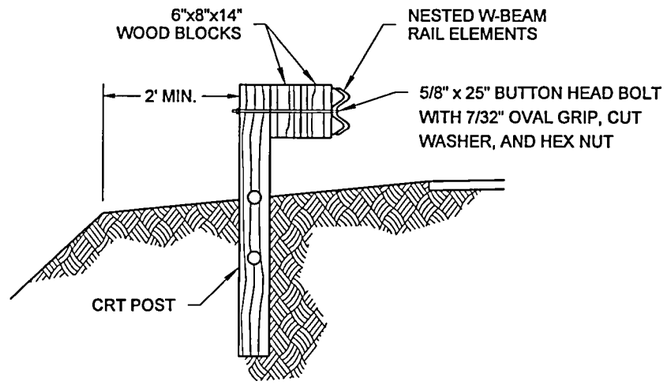


ELEVATION

CASE 21



ONE-WAY TRAFFIC LAYOUT



SECTION (A)

CLIFFORD E. MANSFIELD
STATE OF WASHINGTON
15224
REGISTERED PROFESSIONAL ENGINEER

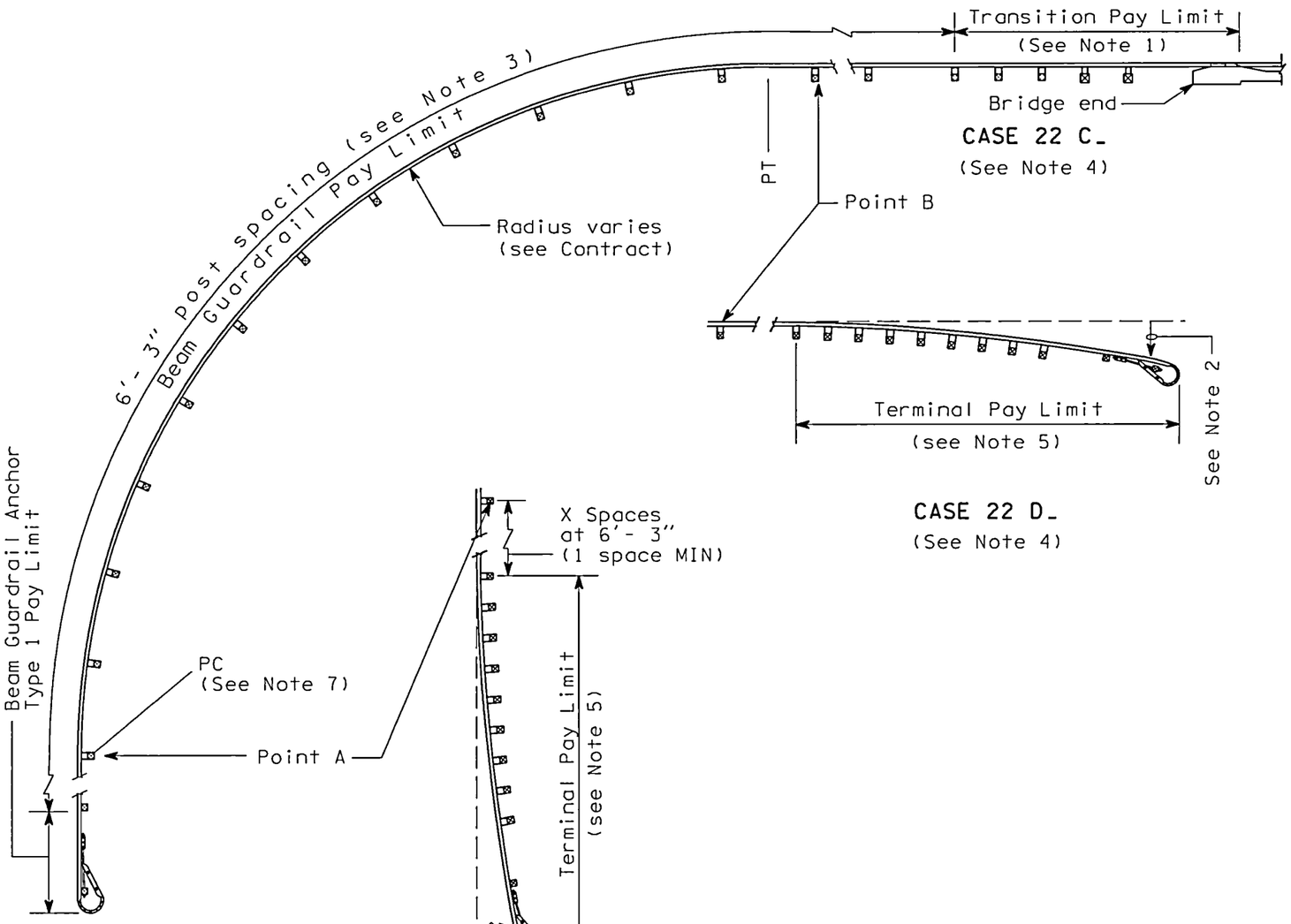
EXPIRES MAY 3, 2002

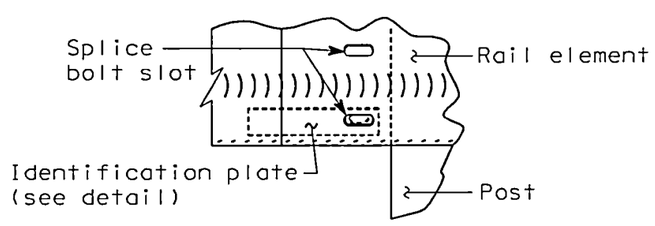
GUARDRAIL PLACEMENT 25' SPAN STANDARD PLAN C-2o

APPROVED FOR PUBLICATION

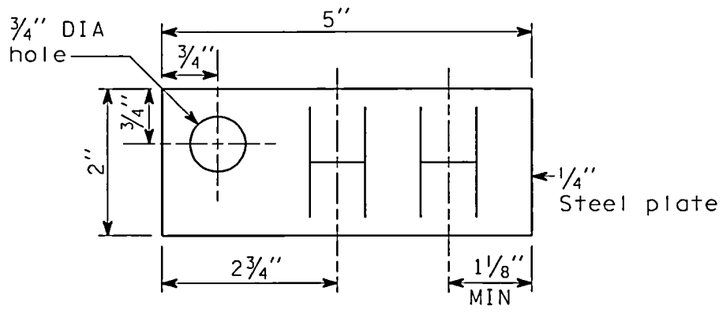
STATE DESIGN ENGINEER — DATE 2/13/01

Washington State Department of Transportation





IDENTIFICATION PLATE MOUNTING DETAIL
(See Note 7)



IDENTIFICATION PLATE DETAIL
(See Note 6)

NOTES

1. See Contract for transition and connection type.
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.
3. Guardrail installation shall be Beam Guardrail Type 1 with standard post and block.
4. First letter of case designation indicates end treatment on side road. Second letter indicates end treatment on main road. For instance a terminal on the side road and a bridge connection on the main road would be Case 22 BC.
5. For terminal type and details, see Contract and applicable Standard Plan(s).
6. Radius dimensions shall be etched into plate replacing the letters "HH" shown on the Identification Plate Detail. Digits shall be 1½" MIN height and ¾" MAX width. Plate shall be galvanized after etching.
7. The guardrail Identification Plate shall be mounted at the lower splice bolt on the back side of the rail element at the PC of the guardrail radius.

RICHARD BARSTOW ALBIN
STATE OF WASHINGTON
34042
REGISTERED
PROFESSIONAL ENGINEER
10/30/03
EXPIRES JULY 24, 2004

GUARDRAIL PLACEMENT STRONG POST INTERSECTION DESIGN STANDARD PLAN C-2p

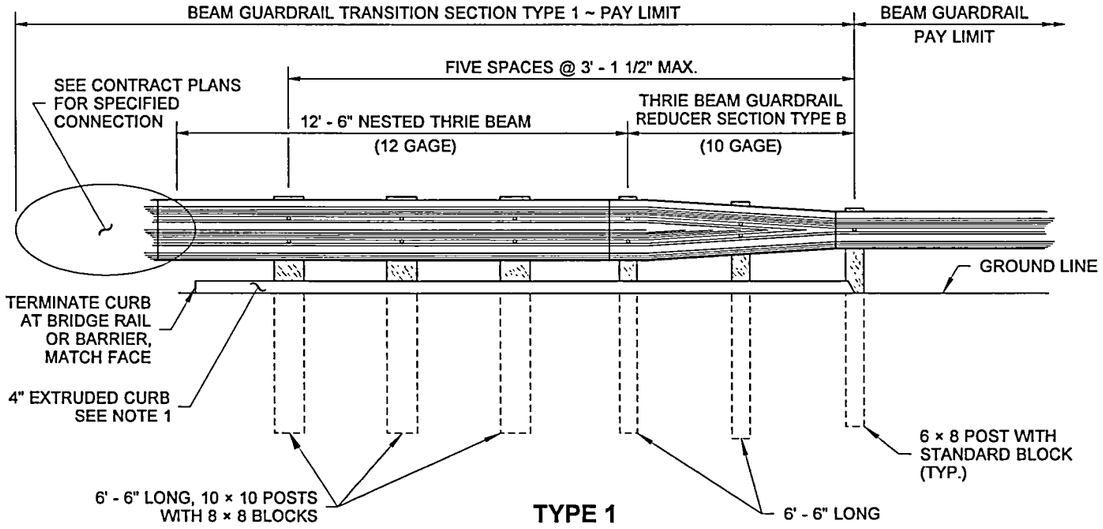
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
STATE DESIGN ENGINEER 10.31.03
DATE

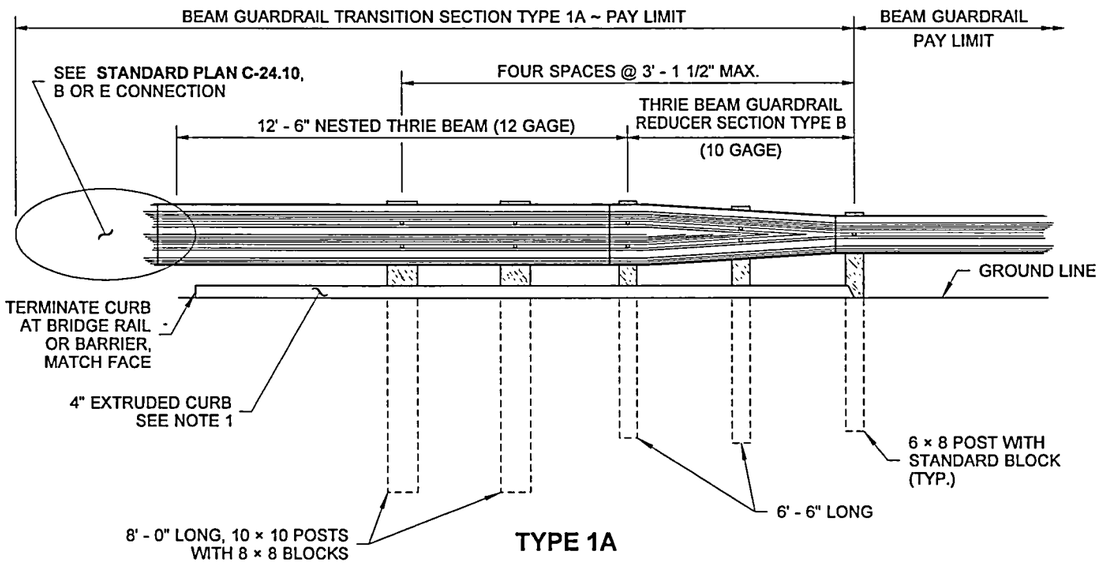
DATE	REVISION	BY
09/2003	CORRECTED REFERENCES TO NOTES.	MHG

Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



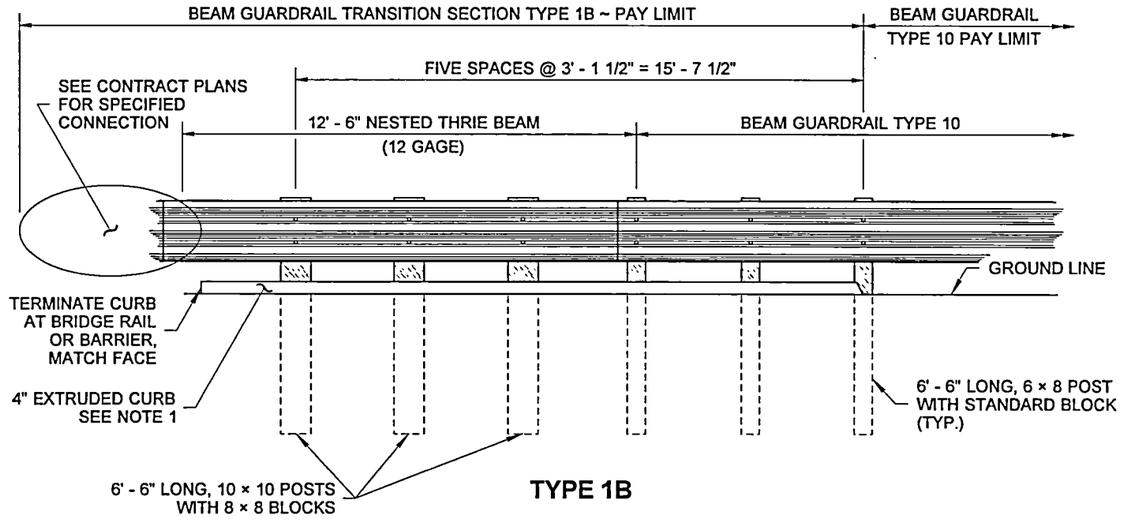
TYPE 1



TYPE 1A

NOTE

1. Install Extruded Curb at face of Guardrail. See **Standard Plan F-10.40** for details.



TYPE 1B

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

7. 2. 2012

BEAM GUARDRAIL TRANSITION SECTIONS

STANDARD PLAN C-3

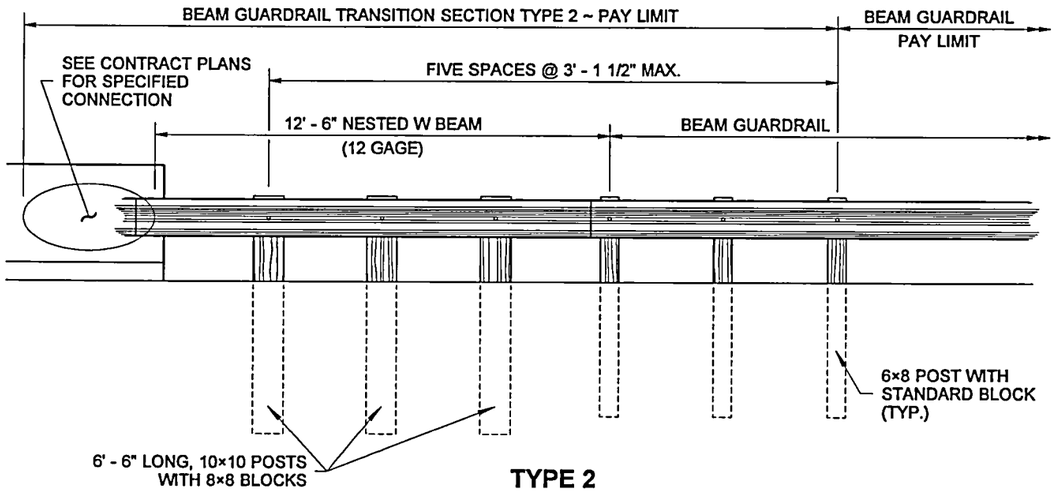
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

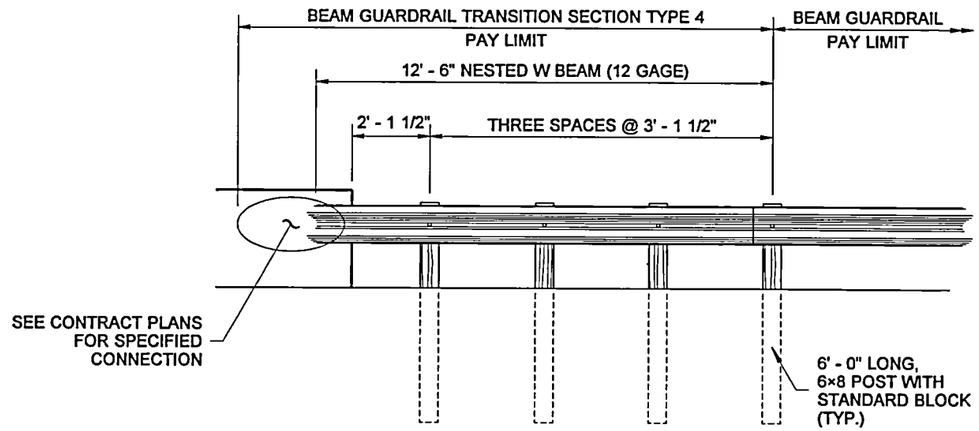
STATE DESIGN ENGINEER — DATE 7/2/12

Washington State Department of Transportation

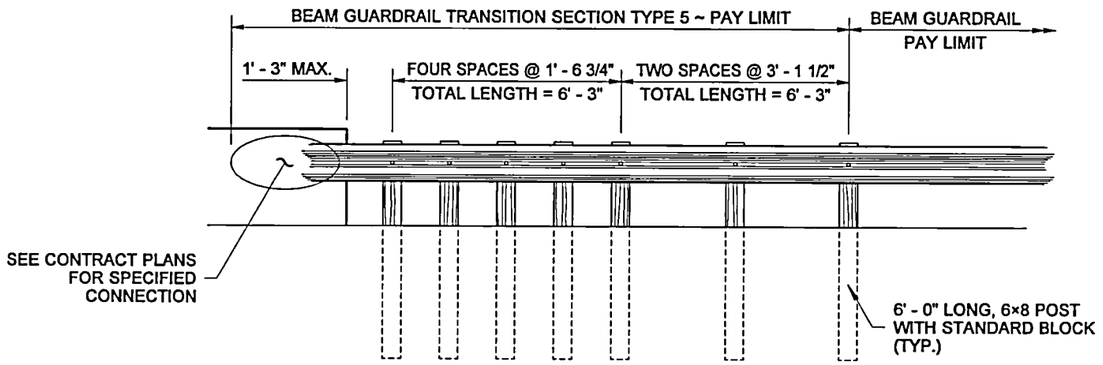
DRAWN BY: MARK SUJKA



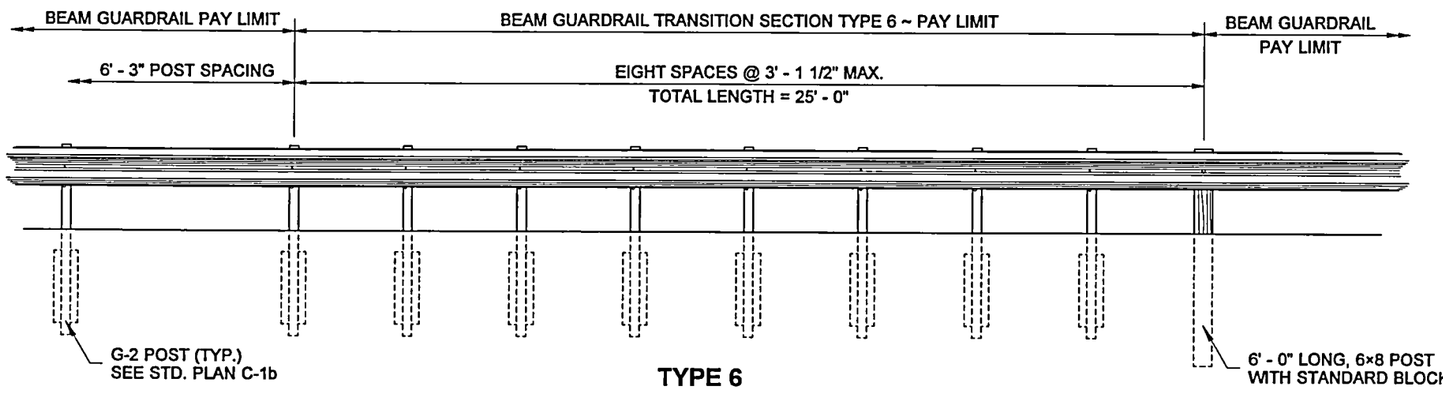
TYPE 2



TYPE 4
FOR 45 MPH AND BELOW



TYPE 5



TYPE 6

RICHARD BARSTOW BIN
STATE OF WASHINGTON
34042
REGISTERED
PROFESSIONAL ENGINEER

Richard Barstow 9/1/05

EXPIRES JULY 24, 2006

BEAM GUARDRAIL TRANSITION SECTIONS

STANDARD PLAN C-3a

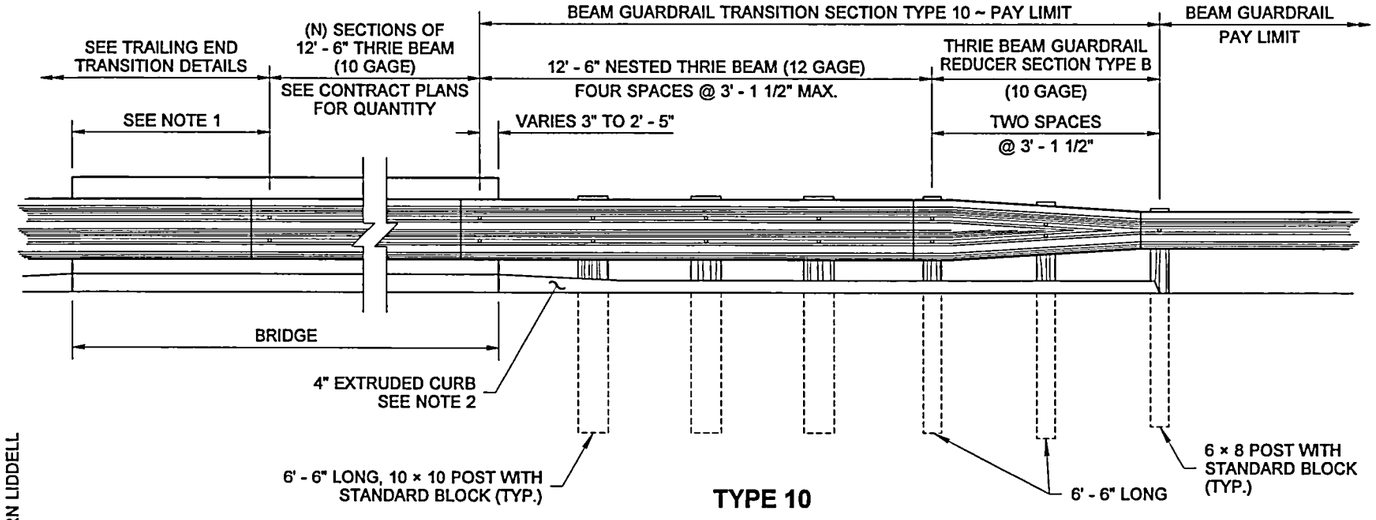
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Harold Peterson 10-4-05

STATE DESIGN ENGINEER — DATE

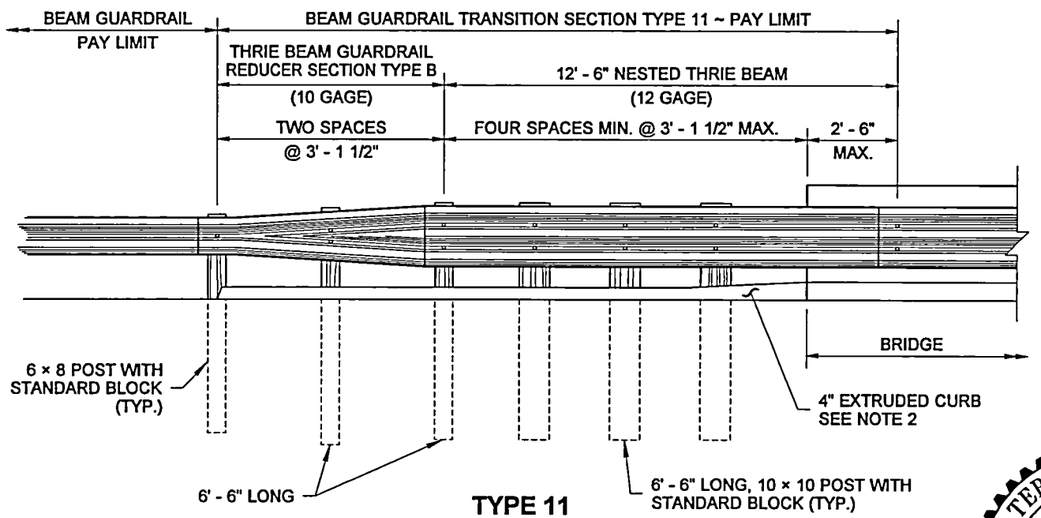
Washington State Department of Transportation



TYPE 10

APPROACH END

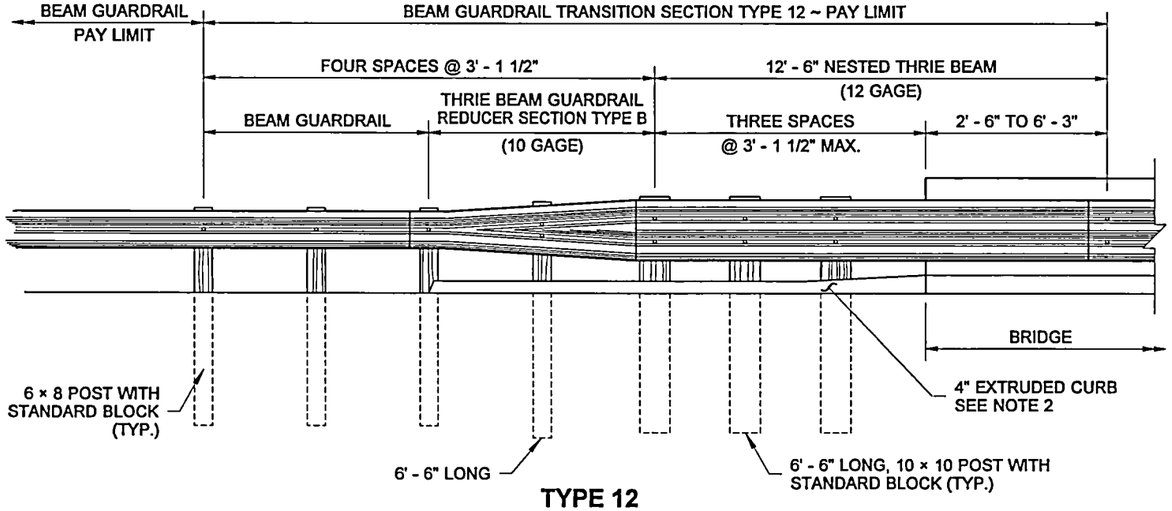
THRIE BEAM INSTALLED AT FACE OF BRIDGE CURB



TYPE 11

TRAILING END

THRIE BEAM INSTALLED AT FACE OF BRIDGE CURB



TYPE 12

TRAILING END

THRIE BEAM INSTALLED AT FACE OF BRIDGE CURB

NOTES

1. If the distance from the end of the bridge to the end of the thrie beam bridge rail section exceeds 6' - 3" using 12' - 6" thrie beam sections, add a 6' - 3" section of thrie beam bridge rail to reduce the length to less than 6' - 3".
2. When thrie beam is installed at the face of the bridge curb, install Extruded Curb at face of Guardrail. See **Standard Plan F-10.40** for details. Match the height of existing bridge curb with a 20H : 1V transition.
3. When thrie beam is installed at the face of rigid bridge rail, an HMA ramp is required from the roadway surface to the top of the bridge curb or sidewalk. The slope of the ramp shall be 20H : 1V or flatter.

DRAWN BY: FERN LIDDELL

BEAM GUARDRAIL TRANSITION SECTIONS

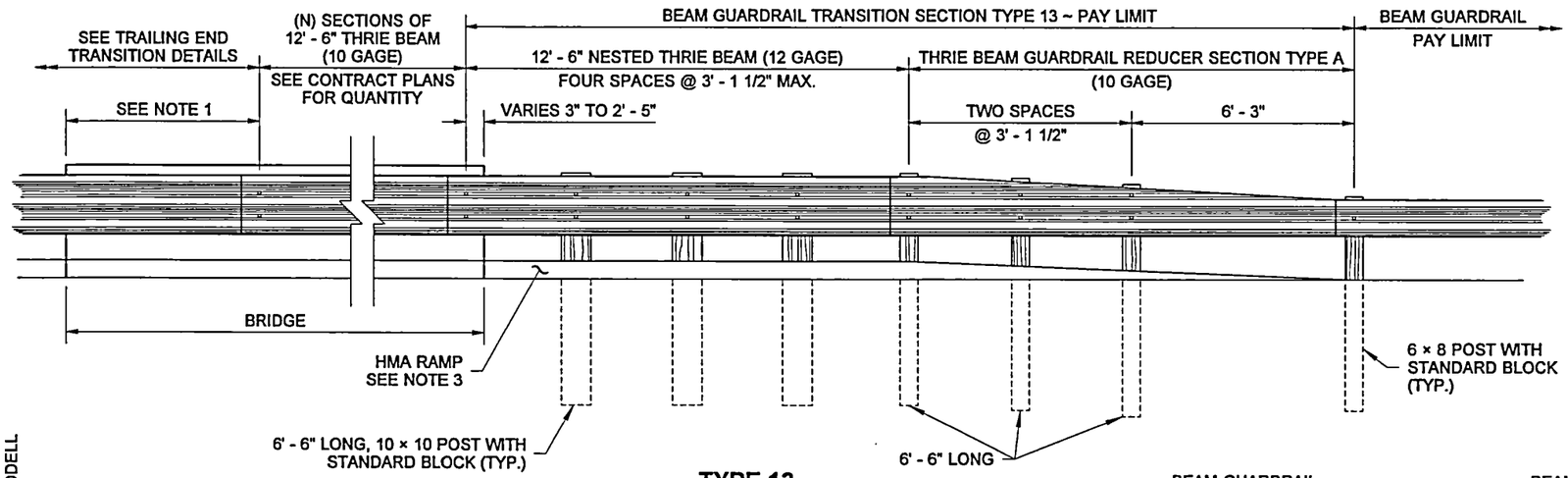
STANDARD PLAN C-3b

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 6/22/11

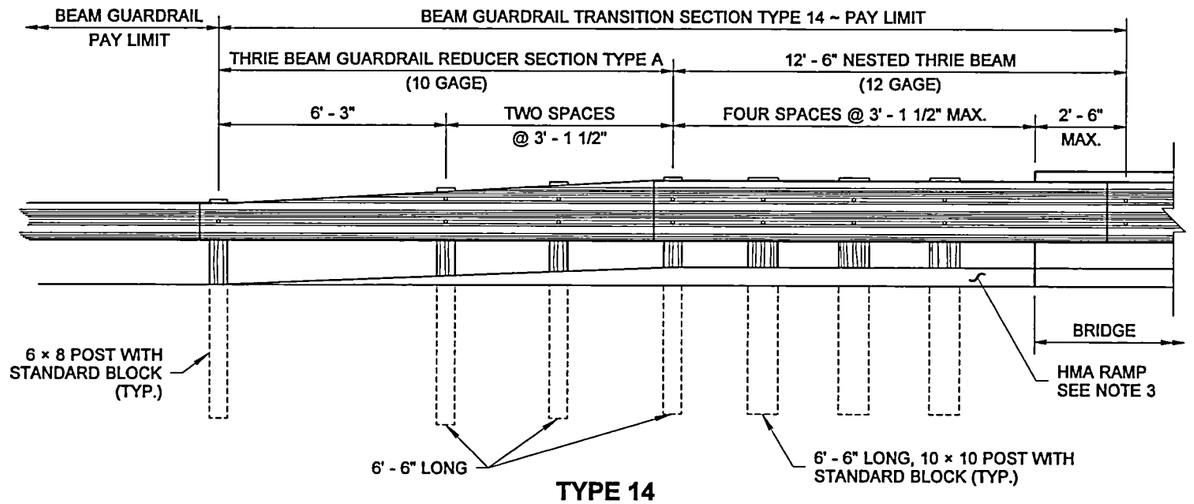
Washington State Department of Transportation



TYPE 13

APPROACH END

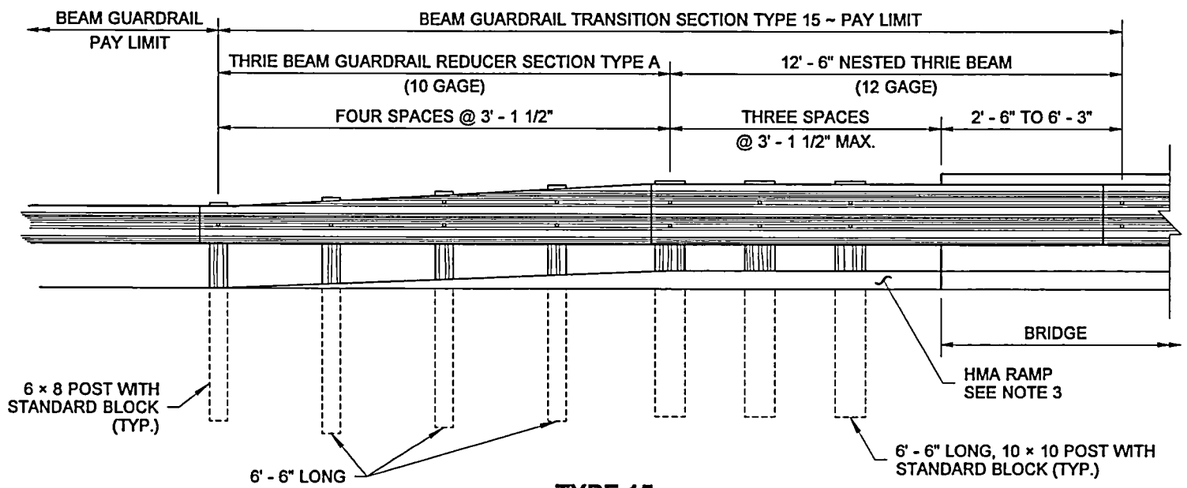
THRIE BEAM INSTALLED AT FACE OF BRIDGE RAIL



TYPE 14

TRAILING END

THRIE BEAM INSTALLED AT FACE OF BRIDGE RAIL



TYPE 15

TRAILING END

THRIE BEAM INSTALLED AT FACE OF BRIDGE RAIL

DRAWN BY: FERN LIDDELL

TERRY L. BERENDS
STATE OF WASHINGTON
32350
REGISTERED
PROFESSIONAL ENGINEER
6-17-2011

BEAM GUARDRAIL TRANSITION SECTIONS

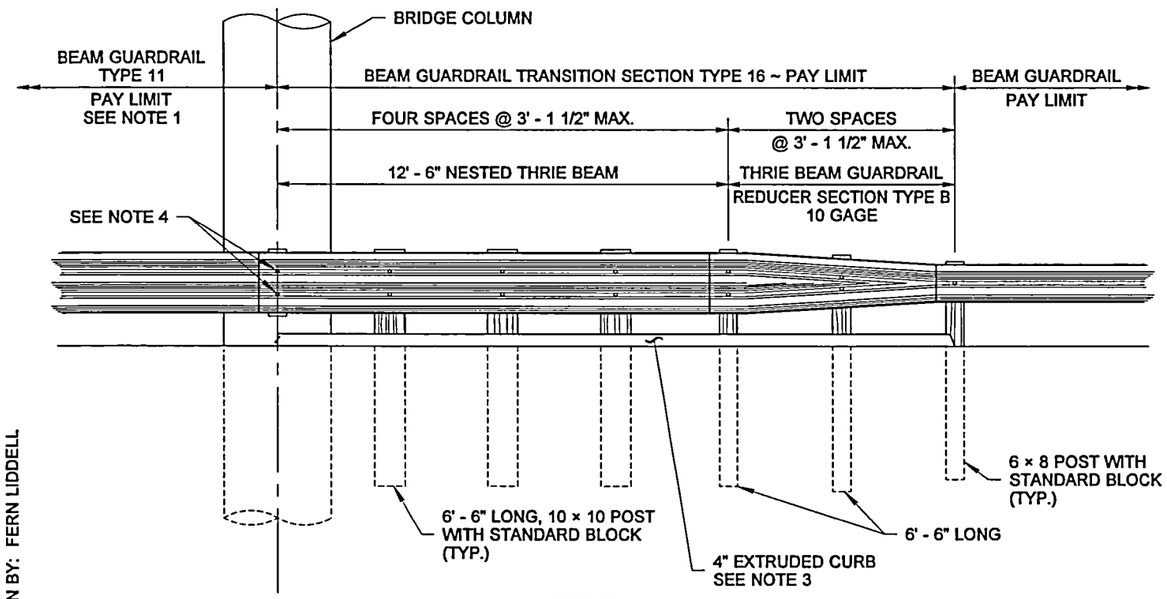
STANDARD PLAN C-3b

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

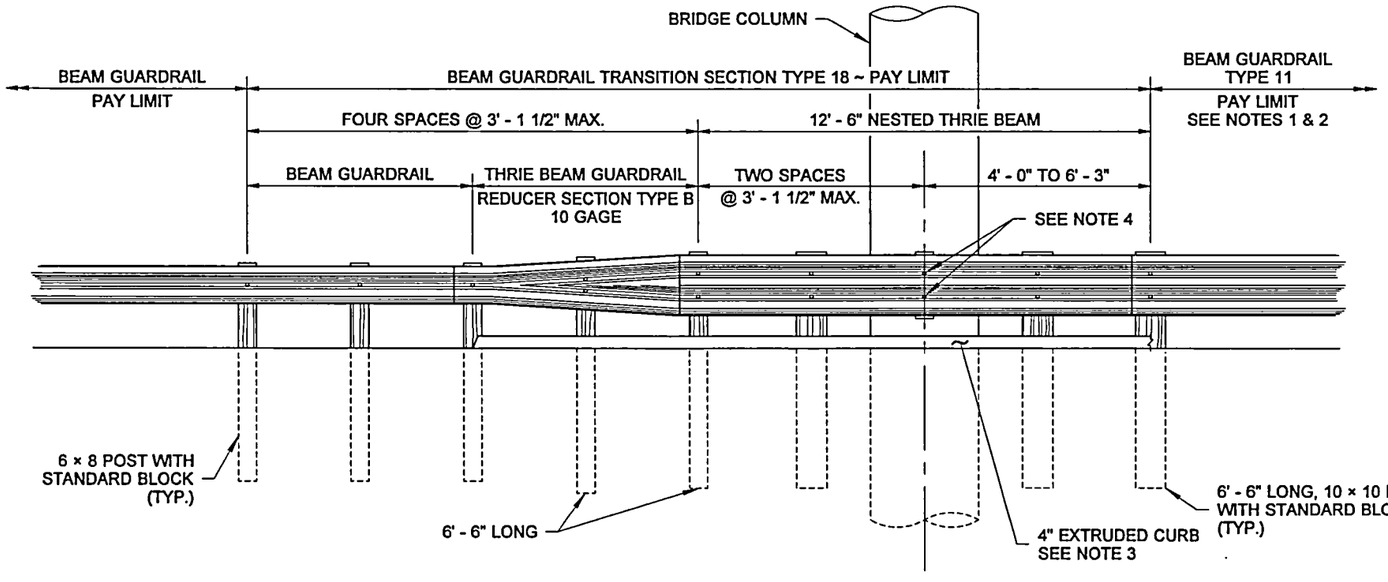
STATE DESIGN ENGINEER — DATE 6/22/11

Washington State Department of Transportation



TYPE 16
APPROACH END

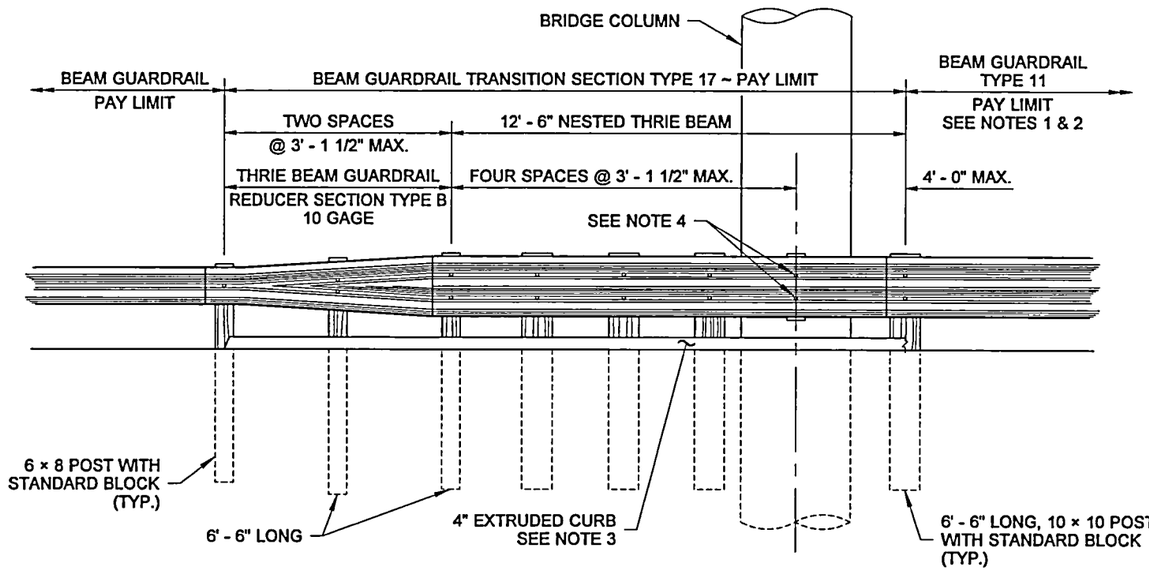
DRAWN BY: FERN LIDDELL



TYPE 18
TRAILING END

NOTES

1. See Contract for the number of thrie beam sections for Beam Guardrail Type 11.
2. If the distance from the end of the Beam Guardrail Type 11 to the column/structure exceeds 6' - 3" using 12' - 6" thrie beam sections, add a 6' - 3" nested section of thrie beam to reduce the distance to less than 6' - 3".
3. Install Extruded Curb (See **Standard Plan F-10.40)** at face of Guardrail.
4. Attach the standard block to the rail using two 5/8" × 4" lag bolts.



TYPE 17
TRAILING END

6-17-2011

BEAM GUARDRAIL TRANSITION SECTIONS

STANDARD PLAN C-3c

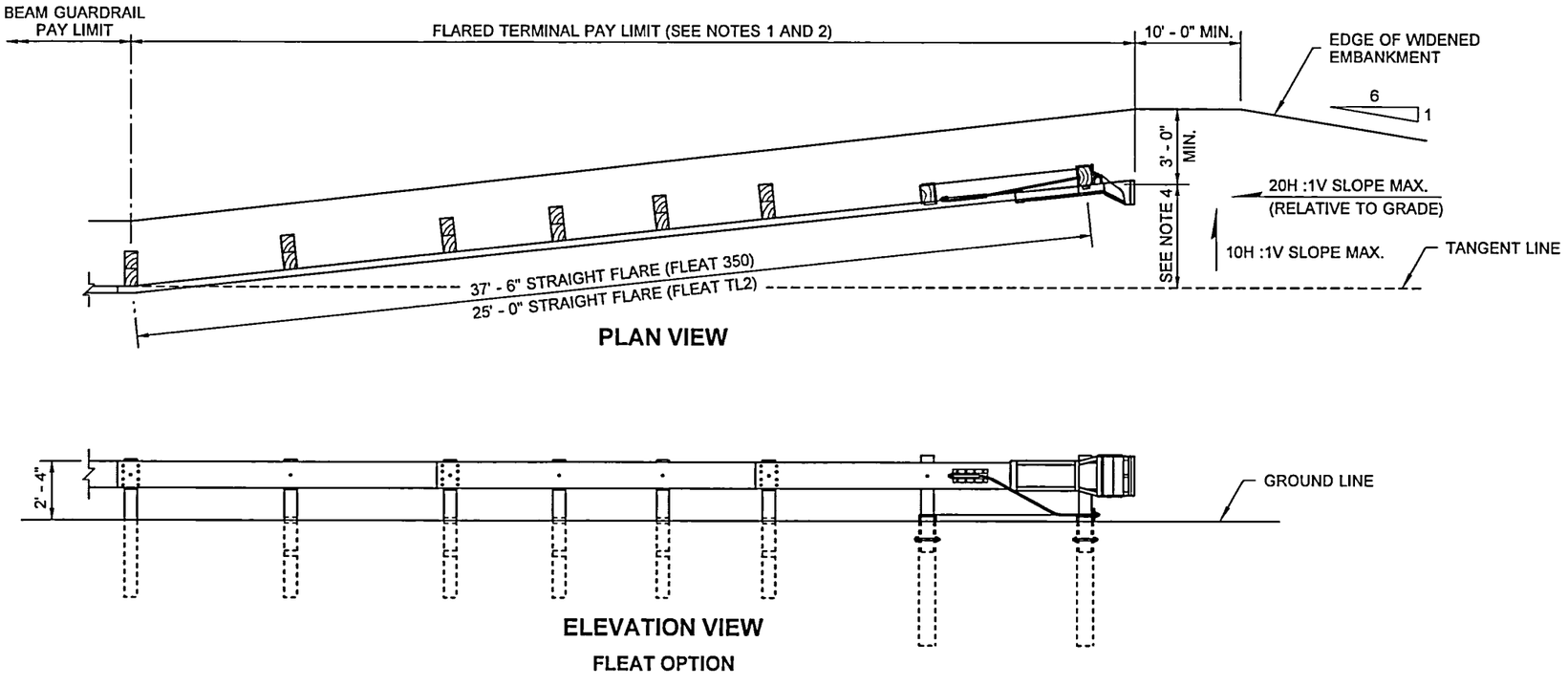
SHEET 1 OF 1 SHEET

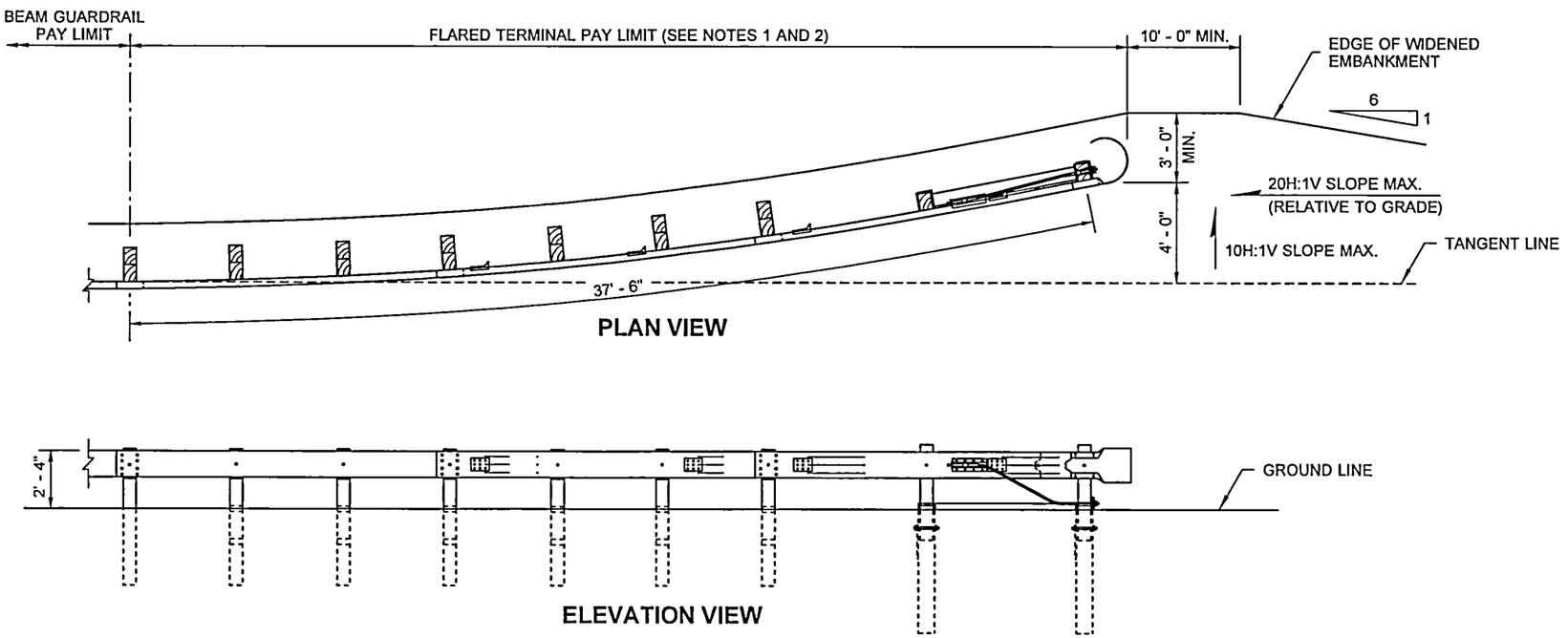
APPROVED FOR PUBLICATION

Paco Bandstra 6/22/11

STATE DESIGN ENGINEER — DATE

Washington State Department of Transportation





NOTES

1. Unless otherwise indicated in the contract, the SRT - 350 (12.5, 8 Post) as manufactured by Trinity Industries, Inc., or a FLEAT 350 as manufactured by Road Systems Inc., shall be installed per manufacturer's recommendations. If specified in the Contract, the FLEAT TL2 as manufactured by Road Systems, Inc. shall be installed per manufacturer's recommendations.

2. Where terminal is placed on a curve, and post offsets would result in the rail encroaching onto the shoulder (e.g., the inside of a curve), the posts shall be installed so that the face of the rail is at the edge of the shoulder.

3. When snow load post washers and snow load rail washers are called for in the contract, the snow load rail washers must be omitted within the terminal limits.

4. Offset distances:

   FLEAT 350 ..... 4' - 0"

   FLEAT TL2 ..... 1' - 8" minimum

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jun 29 2016 3:35 PM

BEAM GUARDRAIL FLARED TERMINAL

STANDARD PLAN C-4b

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Carpenter, Jeff
Jul 15 2016 2:21 PM

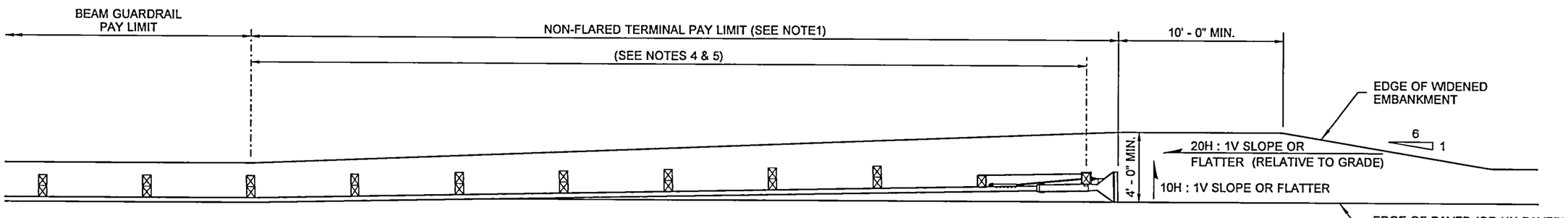
STATE DESIGN ENGINEER

Washington State Department of Transportation

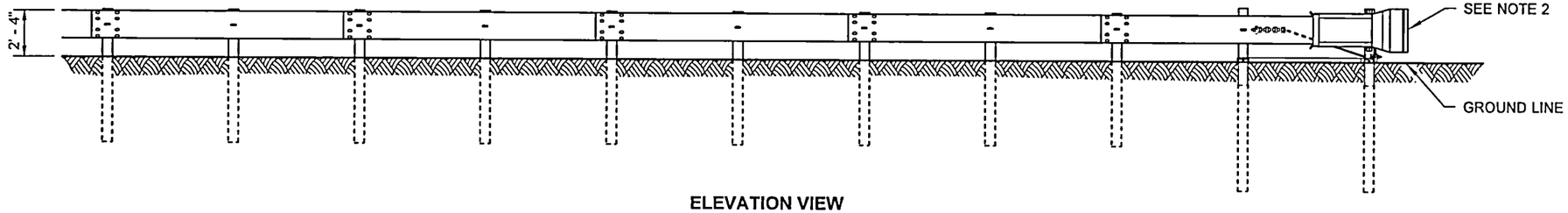
DRAWN BY: FERN LIDDELL

NOTES

1. An SKT-350 as manufactured by Road Systems, Inc. shall be installed according to manufacturer's recommendations. When a TL2 terminal is specified in the Contract an SKT-TL2 as manufactured by Road Systems, Inc. shall be installed according to the manufacturer's recommendations.
2. A reflectorized object marker shall be installed according to manufacturer's recommendations.
3. When snow load post washers and snow load rail washers are required by the Contract, the snow load rail washers must not be installed within the terminal limits.
4. Terminal shall be installed at a taper, ensuring that end piece is entirely off the shoulder.
5. Length for SKT-350 is 50' (ft). Length for SKT-TL2 is 25' (ft).



PLAN VIEW



ELEVATION VIEW

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jun 30 2016 7:01 AM

BEAM GUARDRAIL NON-FLARED TERMINAL

STANDARD PLAN C-4e

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

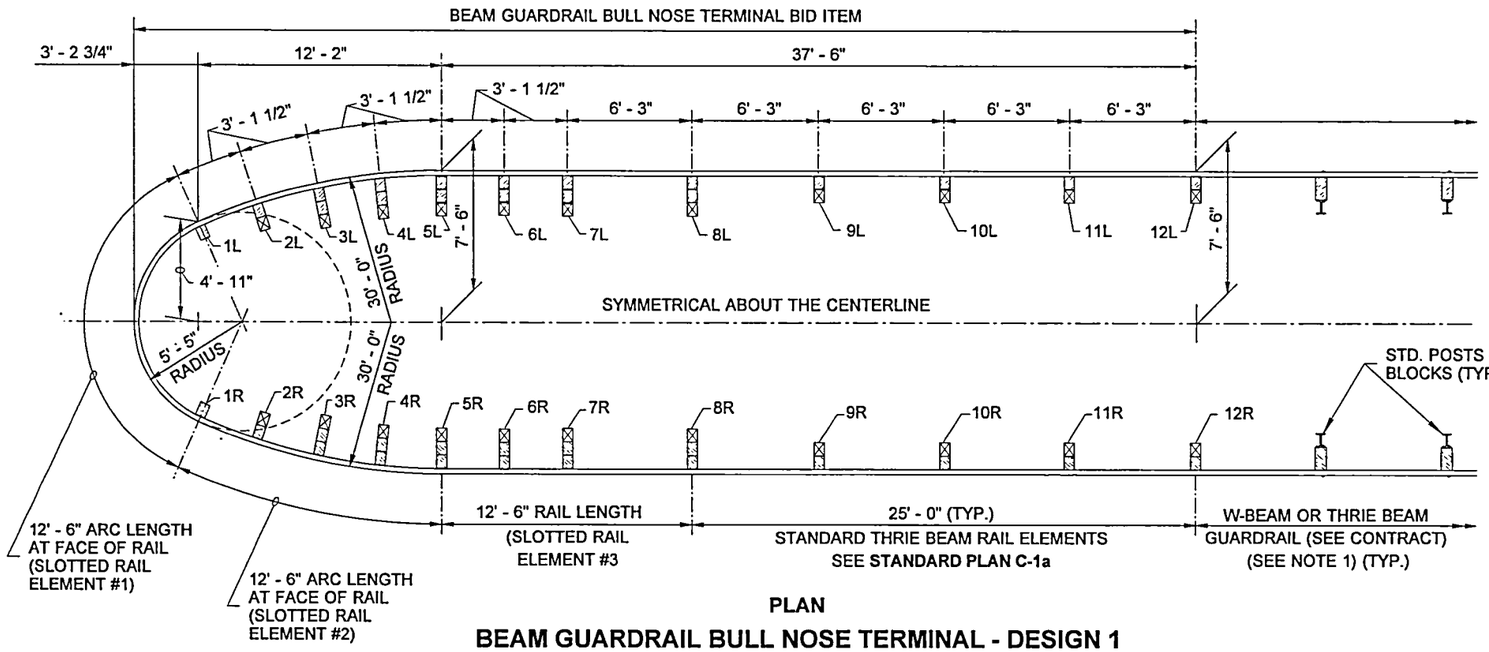
Carpenter, Jeff
Jul 15 2016 2:21 PM

STATE DESIGN ENGINEER

Washington State Department of Transportation

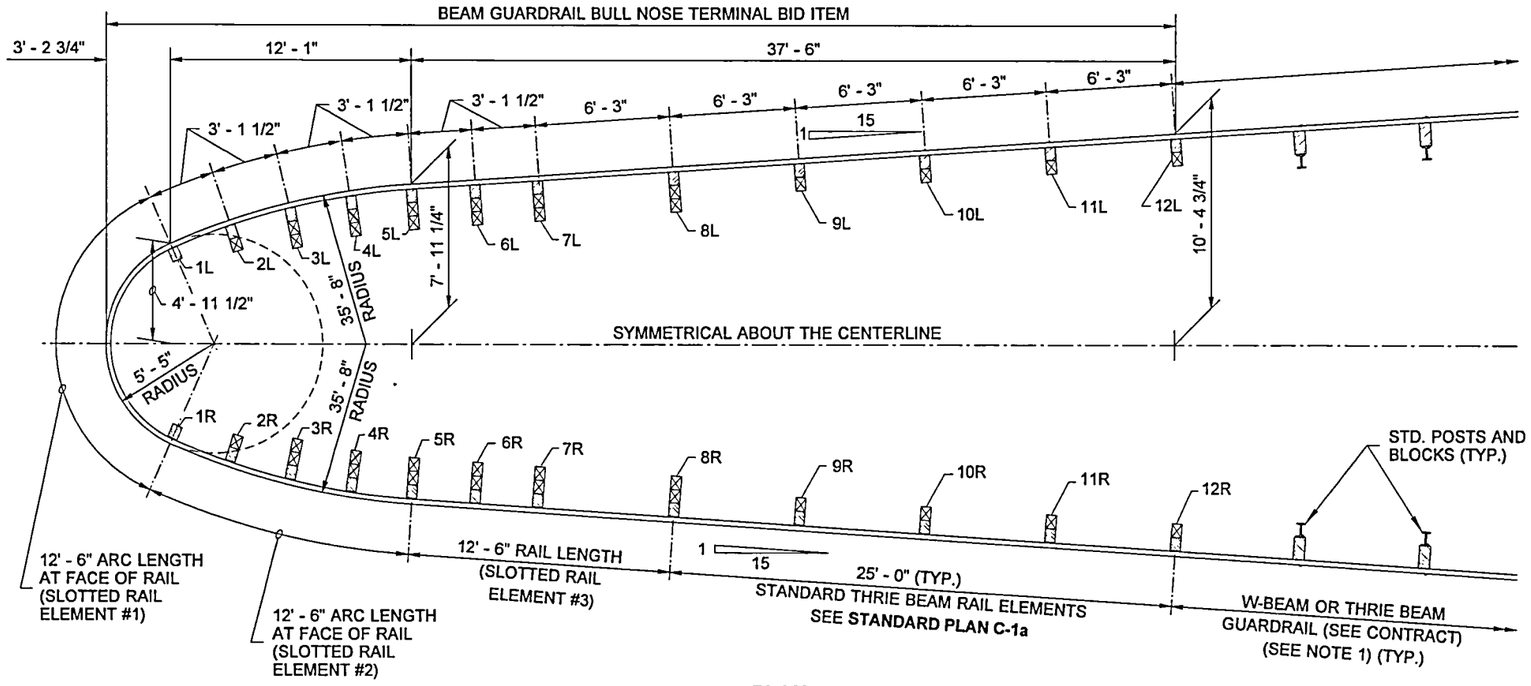
This page left blank intentionally.

DRAWN BY: FERN LIDDELL



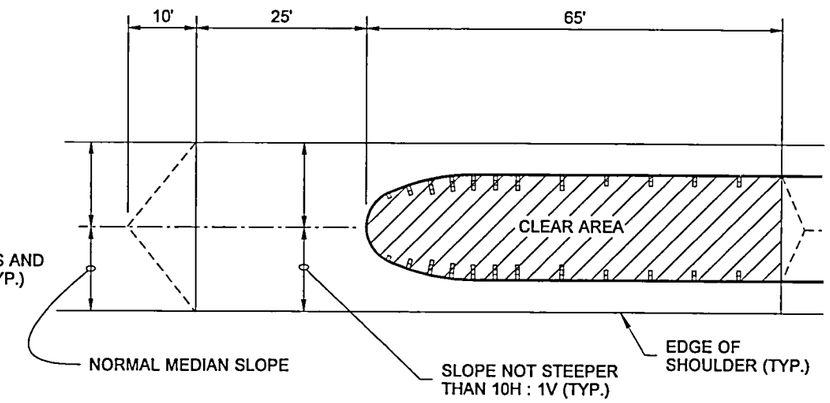
PLAN

BEAM GUARDRAIL BULL NOSE TERMINAL - DESIGN 1



PLAN

BEAM GUARDRAIL BULL NOSE TERMINAL - DESIGN 2



BULL NOSE GRADING PLAN

NOTE

1. For W-Beam applications extend the rail from the bullnose terminal by using a "Reducer Element Type C" followed by a standard Post and Block, spaced at 3' - 1 1/2". Continue runs with standard 6' - 3" post spacing. For additional Details see **Standard Plans C-20.10 and C-25.20.**

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

7-2-2012

BEAM GUARDRAIL BULL NOSE TERMINAL

STANDARD PLAN C-4f

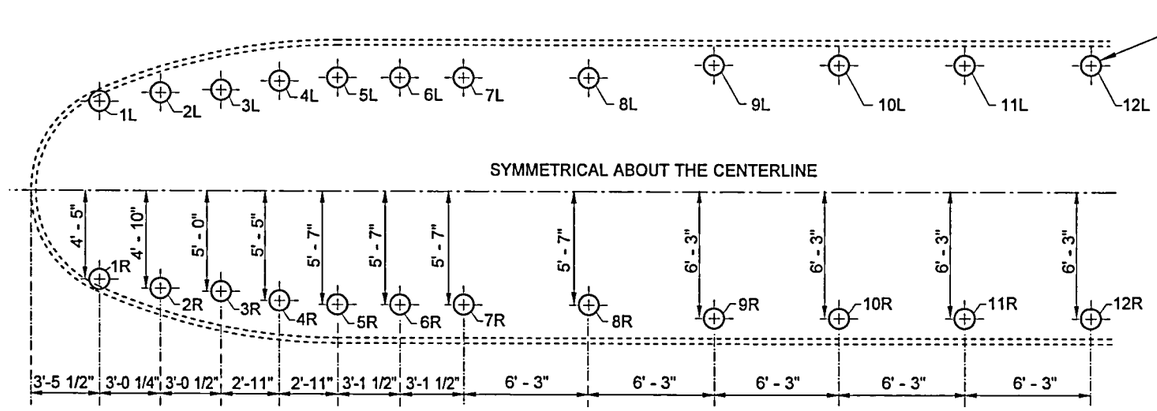
SHEET 1 OF 4 SHEETS

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 7/2/12

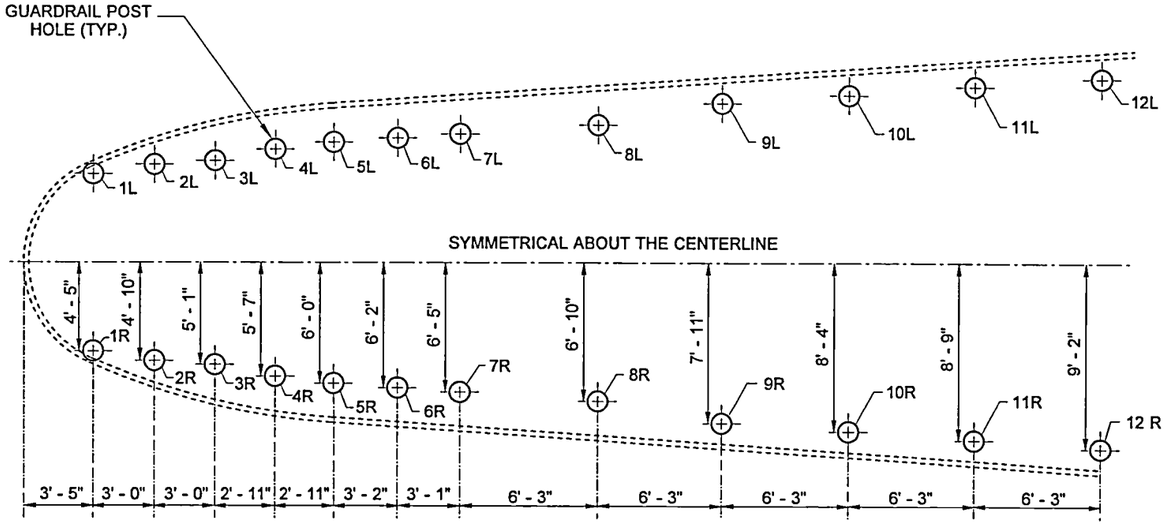
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



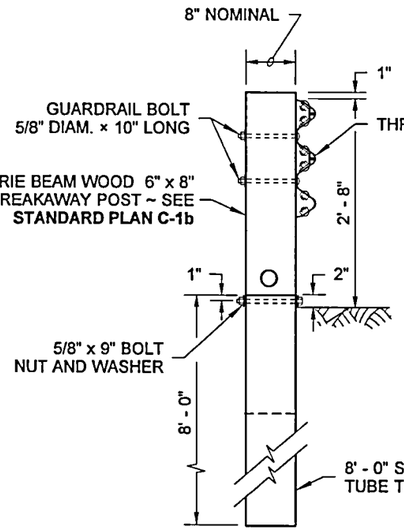
PLAN

GUARDRAIL POST LAYOUT - DESIGN 1

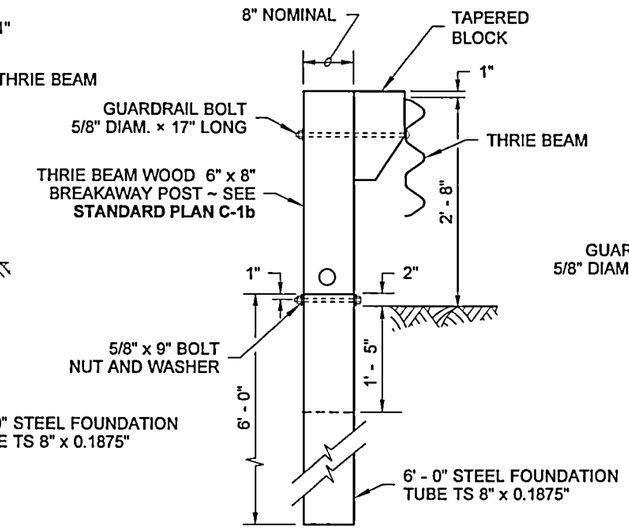


PLAN

GUARDRAIL POST LAYOUT - DESIGN 2

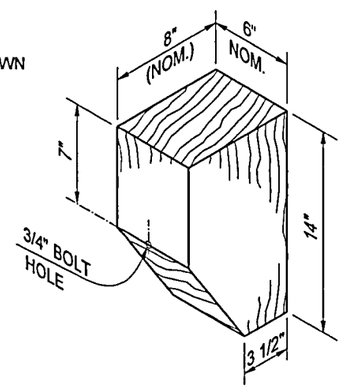


POST
1R & 1L

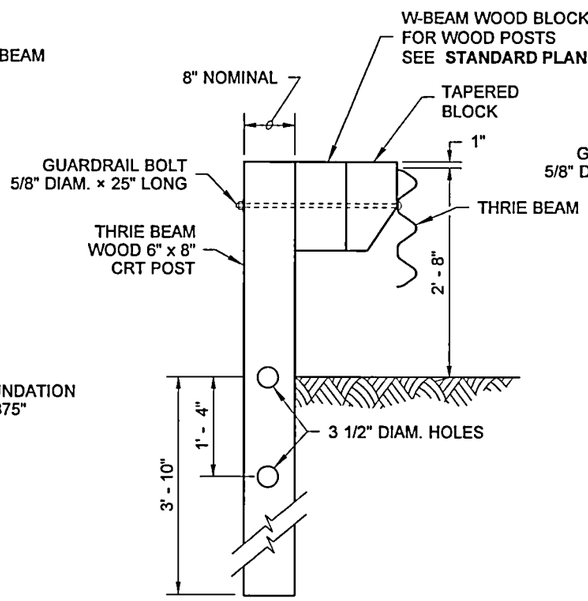


POST
2R & 2L

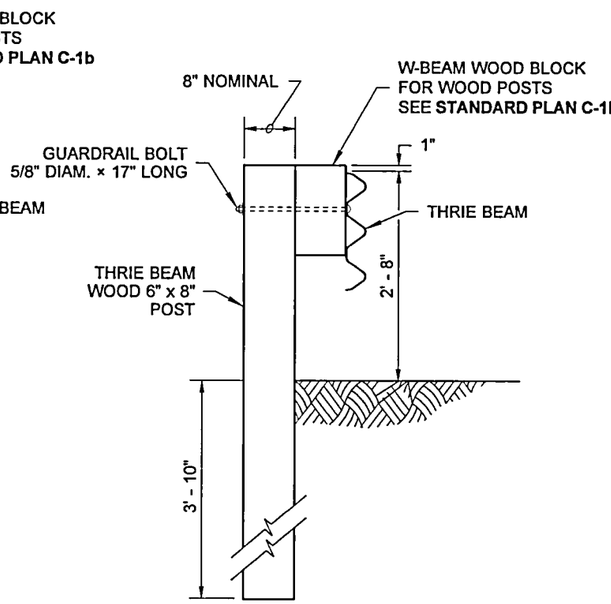
NOTE : CABLE BEARING
PLATE NOT SHOWN



TAPERED BLOCK



POST
3R TO 8R
3L TO 8L



POST
9R TO 12R
9L TO 12L

EDWARD PATRICK BARAD
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

7·2·2012

BEAM GUARDRAIL BULL NOSE TERMINAL

STANDARD PLAN C-4f

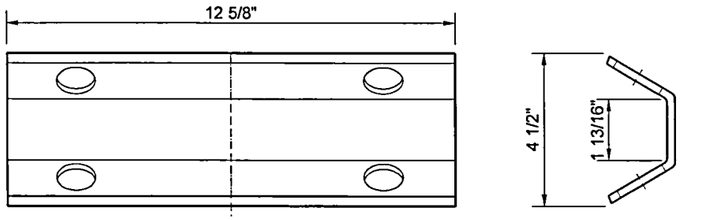
SHEET 2 OF 4 SHEETS

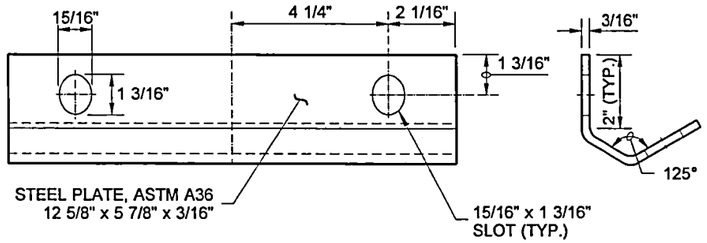
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 7/2/12

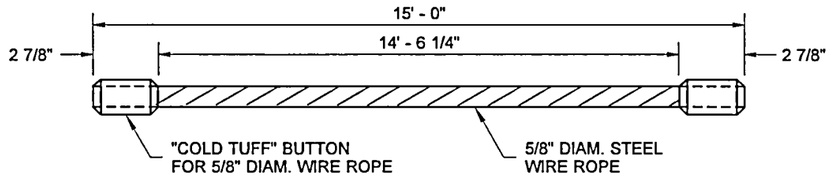
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

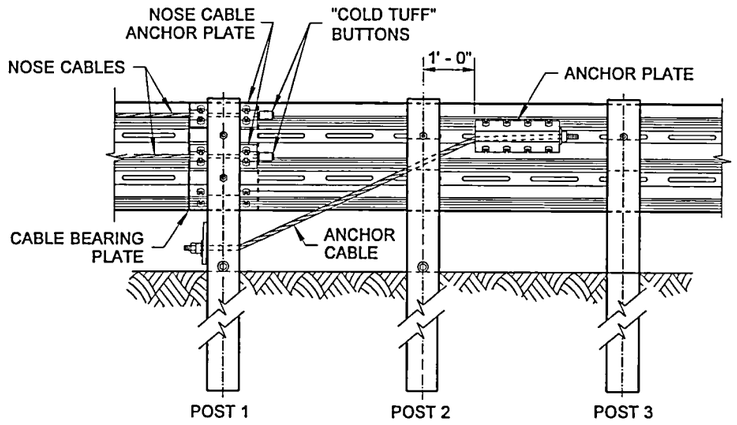




NOSE CABLE ANCHOR PLATE

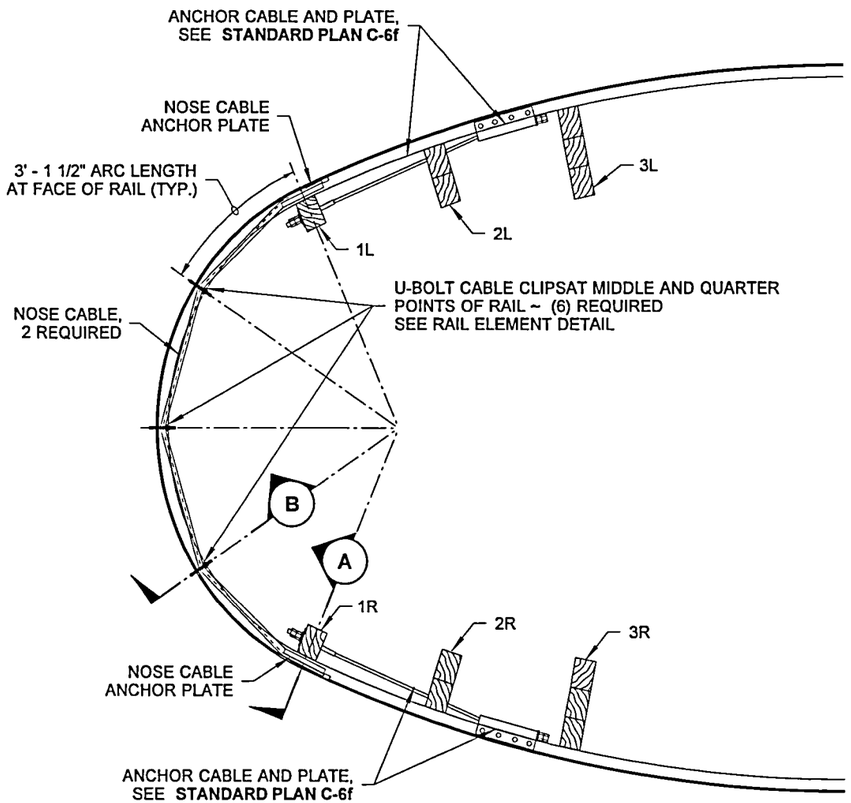


NOSE CABLE

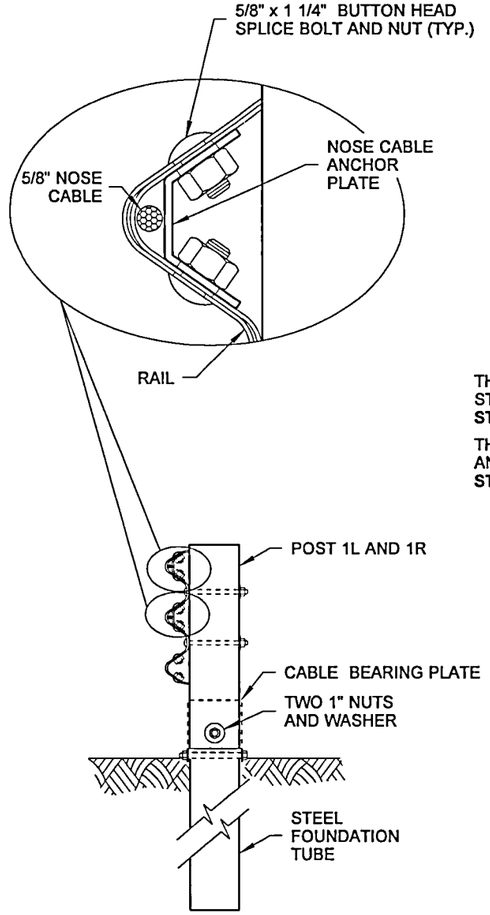


CABLE ANCHOR & BRACKET ASSEMBLY

FOR ANCHOR PLATE, CABLE END PLATE, AND ANCHOR CABLE ~ SEE **STANDARD PLAN C-6f**

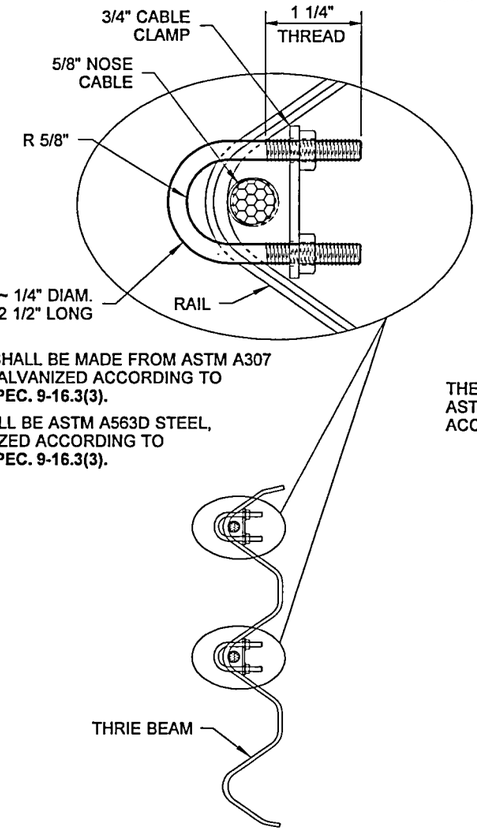


PLAN - THRIE BEAM NOSE



NOSE CABLE ASSEMBLY

SECTION (A)

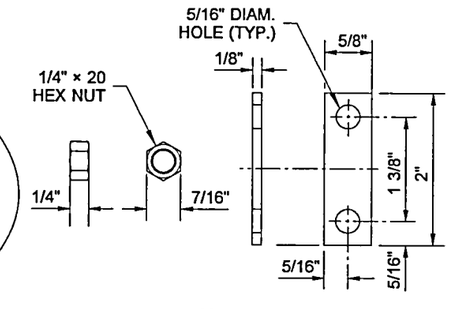


THE U-BOLT SHALL BE MADE FROM ASTM A307 STEEL AND GALVANIZED ACCORDING TO **STANDARD SPEC. 9-16.3(3).**

THE NUT SHALL BE ASTM A563D STEEL, AND GALVANIZED ACCORDING TO **STANDARD SPEC. 9-16.3(3).**

U-BOLT CABLE CLIP ASSEMBLY

SECTION (B)



U-BOLT PLATE WASHER

THE U-BOLT PLATE WASHER SHALL BE MADE FROM ASTM A36 OR A36M PLATE STEEL, AND GALVANIZED ACCORDING TO **STANDARD SPEC. 9-16.3(3).**

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

7-2-2012

BEAM GUARDRAIL BULL NOSE TERMINAL

STANDARD PLAN C-4f

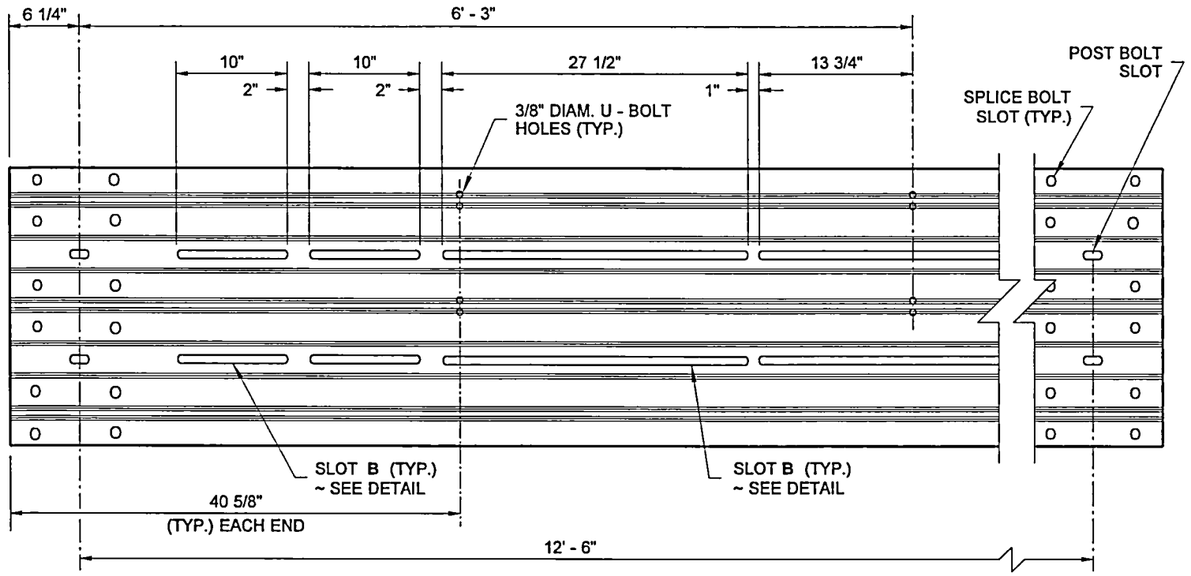
SHEET 3 OF 4 SHEETS

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 7/2/12

Washington State Department of Transportation

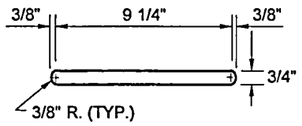
DRAWN BY: FERN LIDDELL



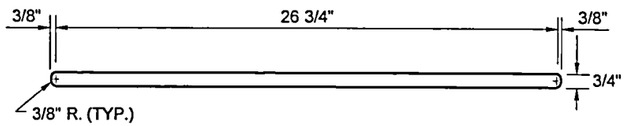
SLOTTED THRIE BEAM RAIL ELEMENT #1

SEE **STANDARD PLAN C-1a** FOR RAIL ELEMENT DETAILS

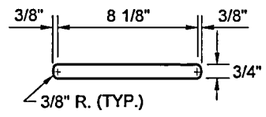
(RAIL DIMENSIONS SHOWN ARE BEFORE BENDING TO RADIUS SHOWN IN PLAN)



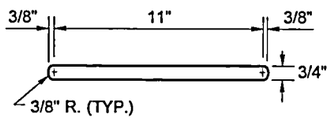
SLOT A DETAIL



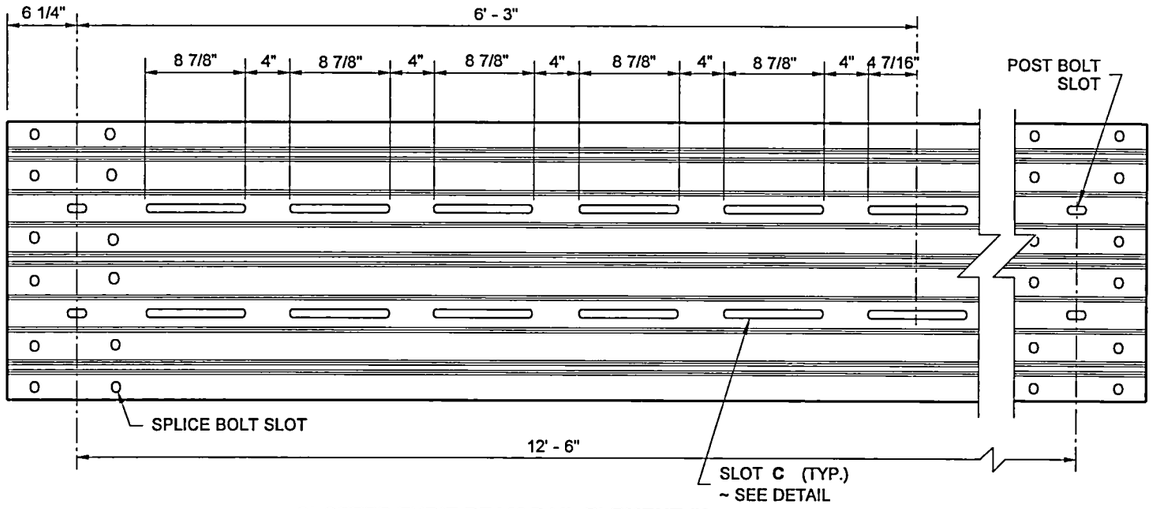
SLOT B DETAIL



SLOT C DETAIL



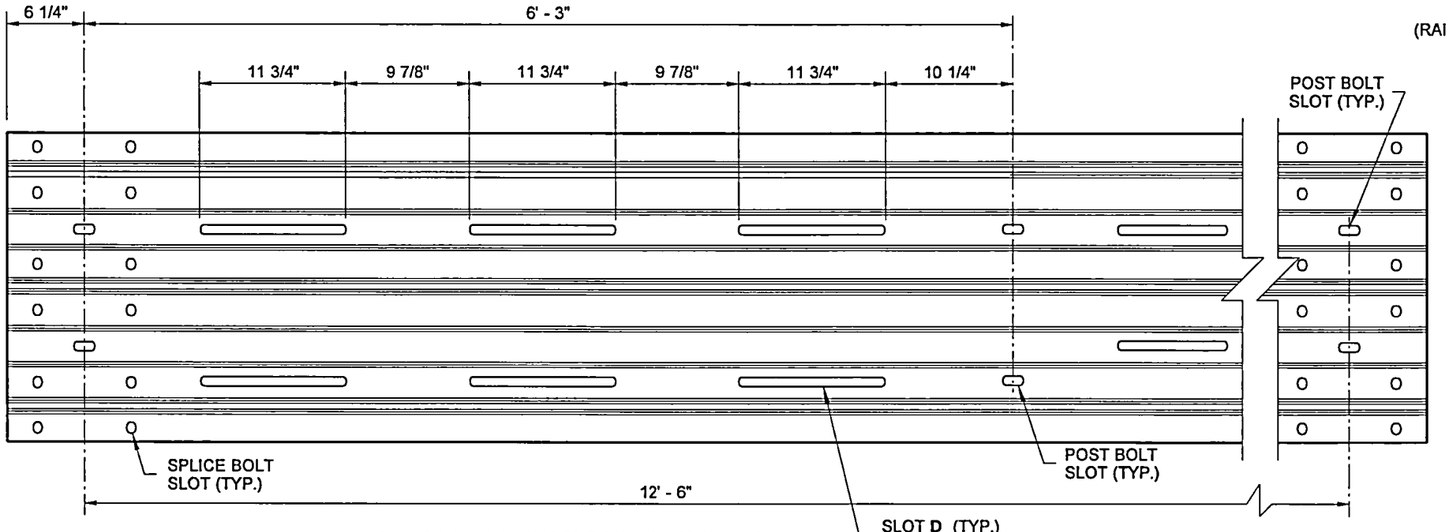
SLOT D DETAIL



SLOTTED THRIE BEAM RAIL ELEMENT #2

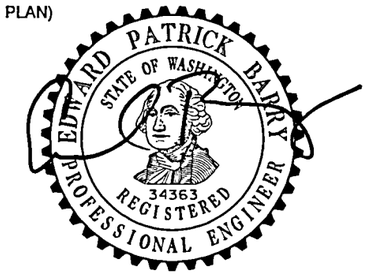
SEE **STANDARD PLAN C-1a** FOR RAIL ELEMENT DETAILS

(RAIL DIMENSIONS SHOWN ARE BEFORE BENDING TO RADIUS SHOWN IN PLAN)



SLOTTED THRIE BEAM RAIL ELEMENT #3

SEE **STANDARD PLAN C-1a** FOR RAIL ELEMENT DETAILS



7-2-2012

BEAM GUARDRAIL BULL NOSE TERMINAL

STANDARD PLAN C-4f

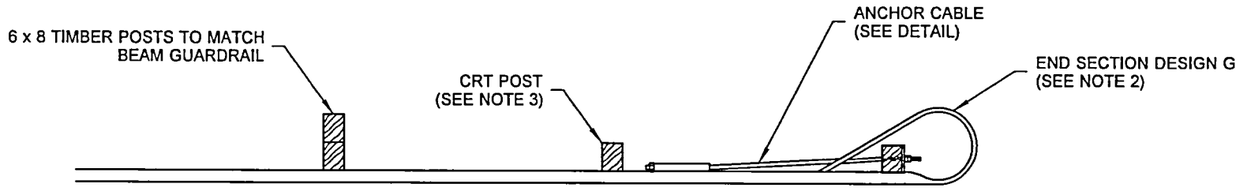
SHEET 4 OF 4 SHEETS

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 7/2/12

Washington State Department of Transportation

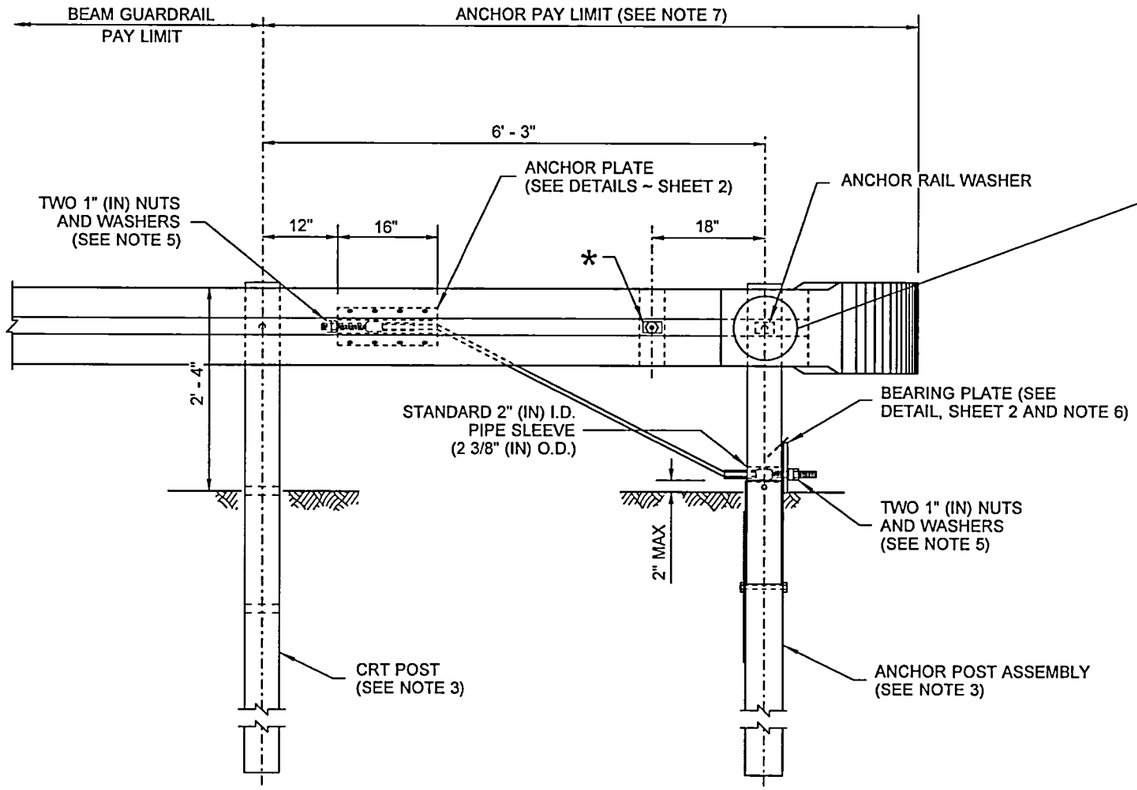
DRAWN BY: FERN LIDDELL



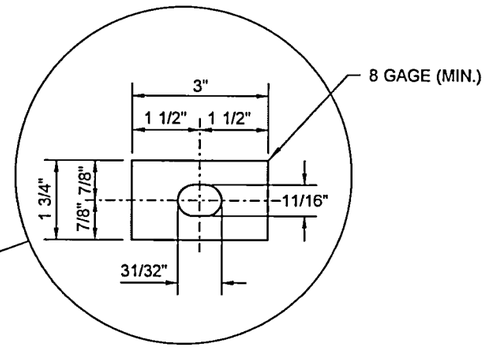
PLAN

NOTES

1. Anchor plate may be constructed from 1/4" (in) plates welded to equal strength and dimensions as shown.
2. For end section details see **Standard Plan C-7.**
3. For post details, see **Standard Plan C-1b.**
4. Eight 5/8" (in) x 1/2" (in) machine bolts with hex nut and washer. Place washer on face side of rail.
5. Outside nut shall be torqued against inside nut a minimum of 100 ft-lbs.
6. Toenail bearing plate with 10d nail at corners to prevent turning.
7. Anchor pay limit does not apply when anchor is included in a Beam Guardrail Terminal.



TYPE 1 ANCHOR



ANCHOR RAIL WASHER

* 5/8" (IN) x 2" (IN) BUTTON HEAD BOLT OR 5/8" (IN) x 1 1/2" (IN) HEX HEAD BOLT AND HEX NUT WITH ANCHOR RAIL WASHERS UNDER BOLT HEAD AND NUT

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

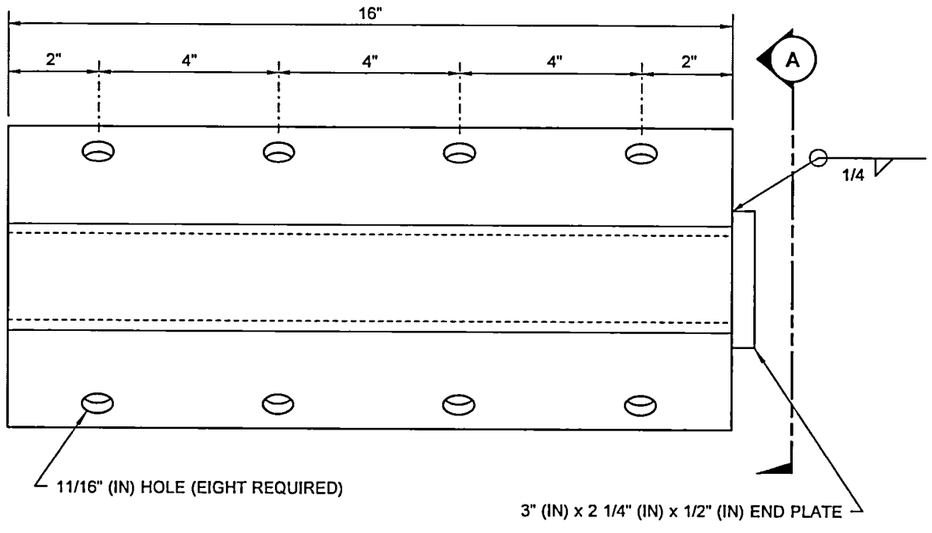
Petterson, Jeff (HQ Design)
Jun 30 2016 7:05 AM

BEAM GUARDRAIL TYPE 1

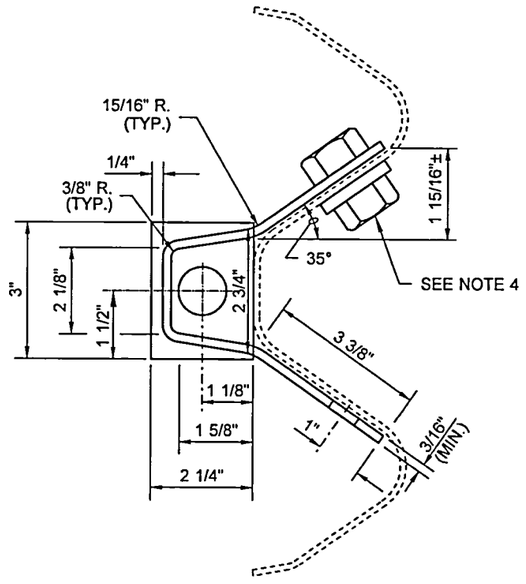
STANDARD PLAN C-6

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 15 2016 2:22 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

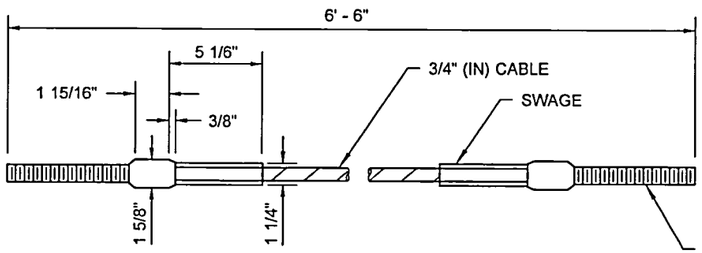


ELEVATION

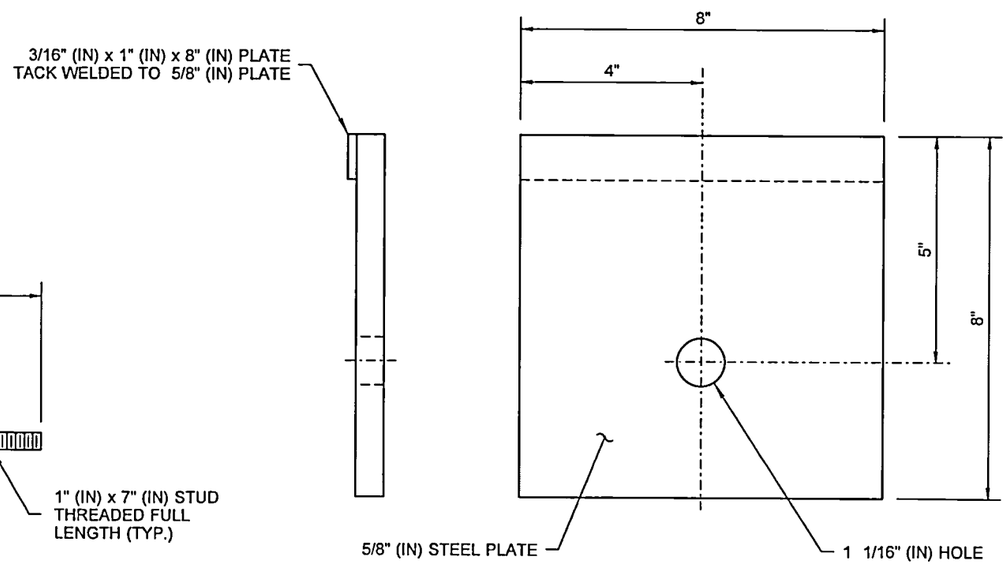


SECTION (A)

ANCHOR PLATE
(SEE NOTE 1)



ANCHOR CABLE



BEARING PLATE

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (IIQ Design)
Jun 30 2016 7:04 AM

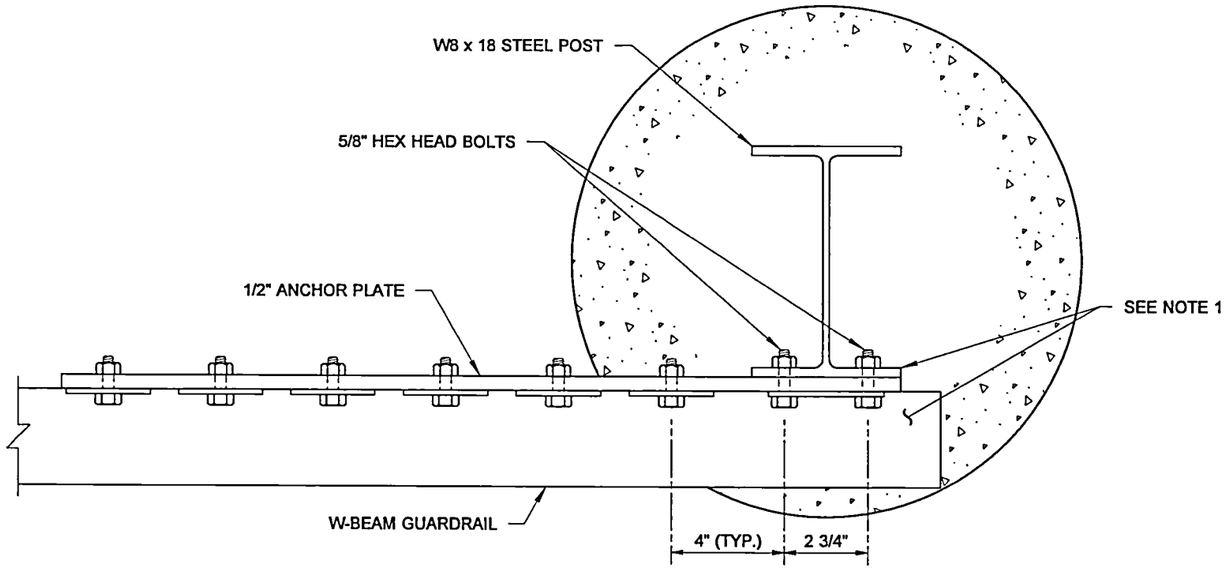
BEAM GUARDRAIL TYPE 1

STANDARD PLAN C-6

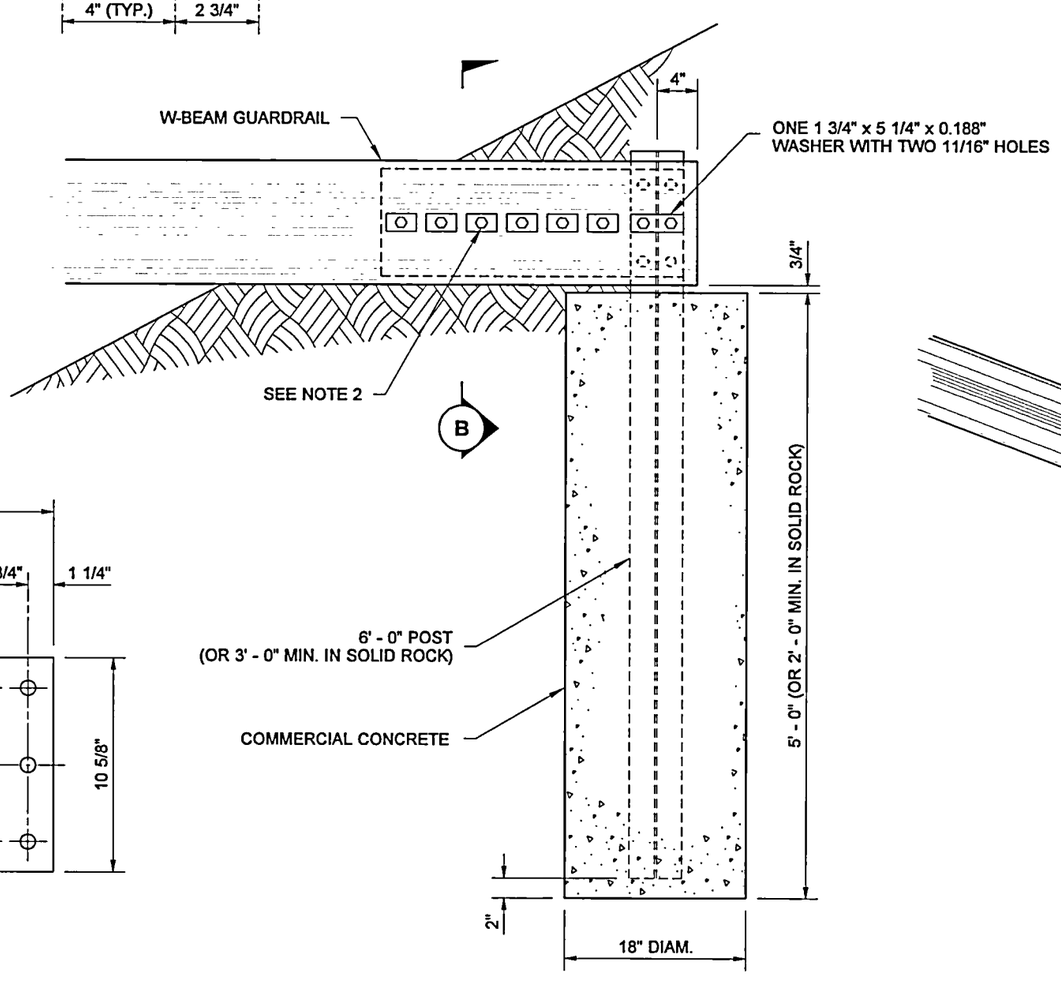
SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Carpenter, Jeff
Jul 15 2016 2:22 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

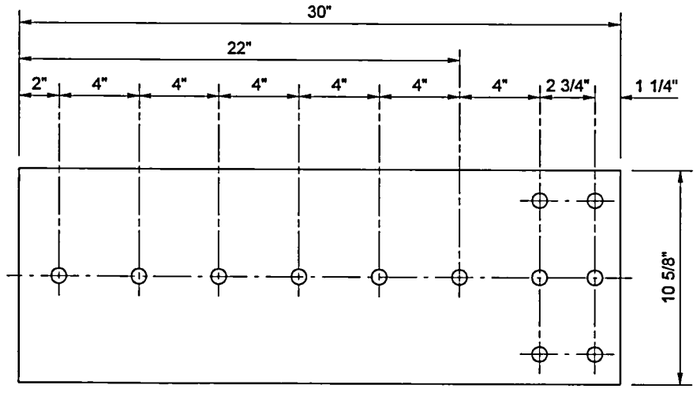
DRAWN BY: BILL BERENS



PLAN



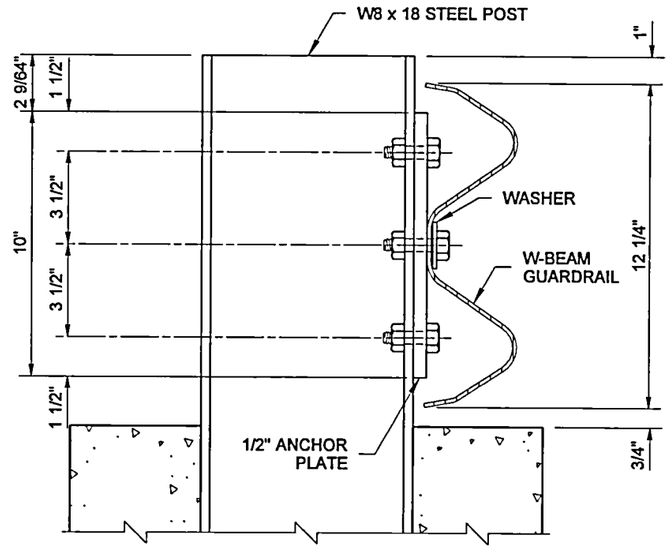
ELEVATION



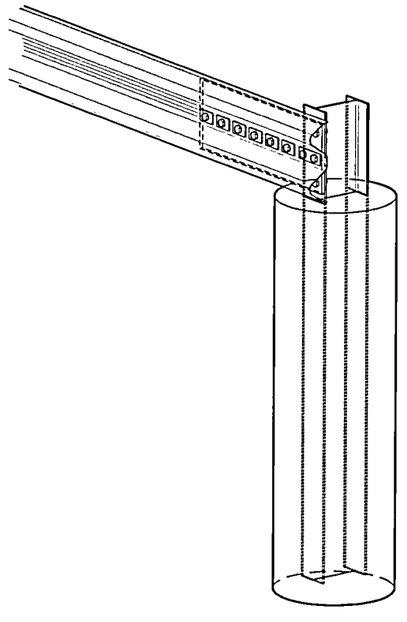
BACKING PLATE

NOTES

1. Rail section and W8 x 18 steel post shall be fabricated to receive 5/8" hex head bolts as shown.
2. All bolts shall be high strength 5/8" hex head bolts with anchor rail washers.



SECTION (B)



ISOMETRIC

TERRY L. BERENDS
STATE OF WASHINGTON
32350
REGISTERED
PROFESSIONAL ENGINEER

10-5-09

BEAM GUARDRAIL ANCHOR TYPE 2

STANDARD PLAN C-6a

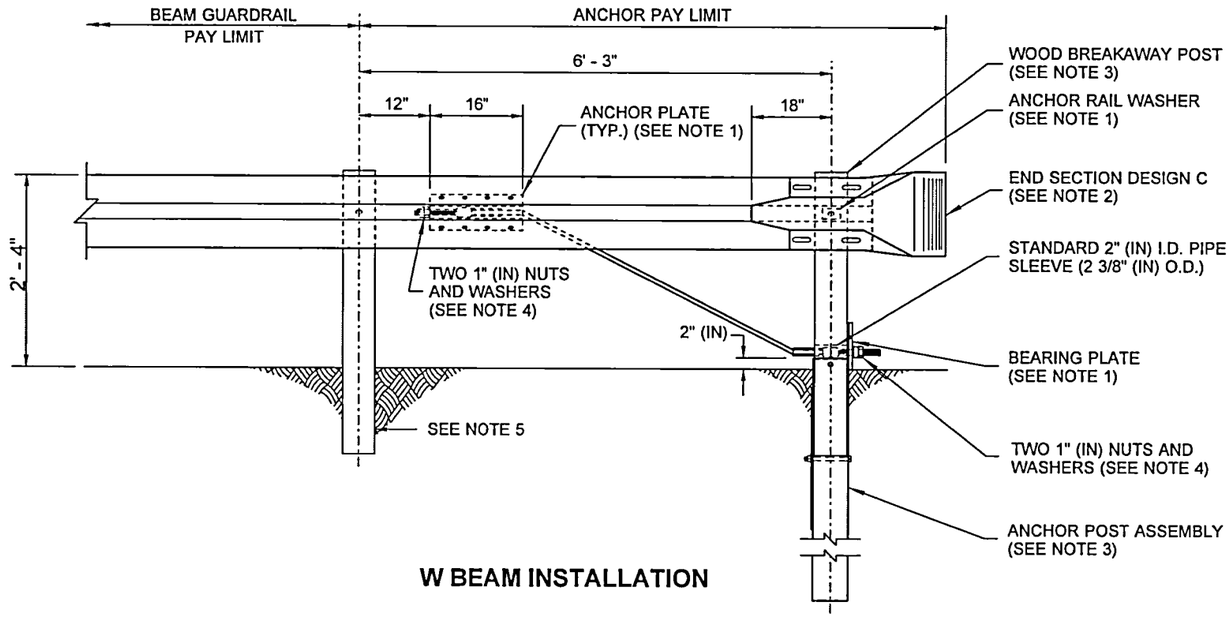
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

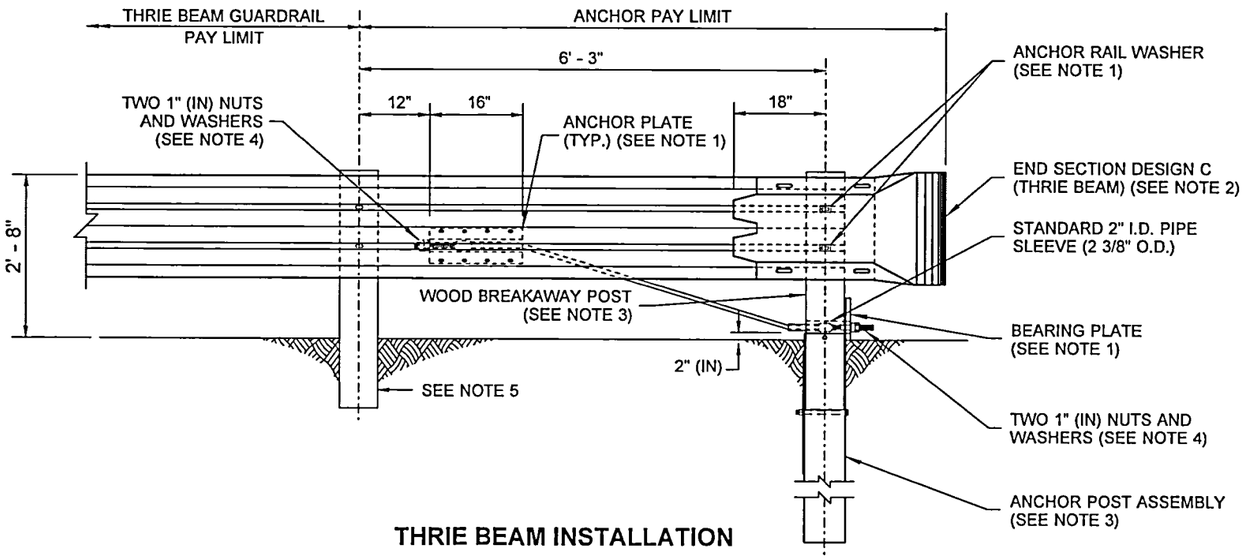
STATE DESIGN ENGINEER — DATE 10/14/09

Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



W BEAM INSTALLATION



THRIE BEAM INSTALLATION

NOTES

1. For anchor details, see **Standard Plan C-6.**
2. For end section details see **Standard Plan C-7 or C-7a.**
3. For post details, see **Standard Plan C-1b.**
4. Outside nut shall be torqued against inside nut a minimum of 100 ft.-lbs.
5. Post and block shall match beam guardrail posts.

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jun 30 2016 7 08 AM

BEAM GUARDRAIL ANCHOR TYPE 4

STANDARD PLAN C-6c

SHEET 1 OF 1 SHEET

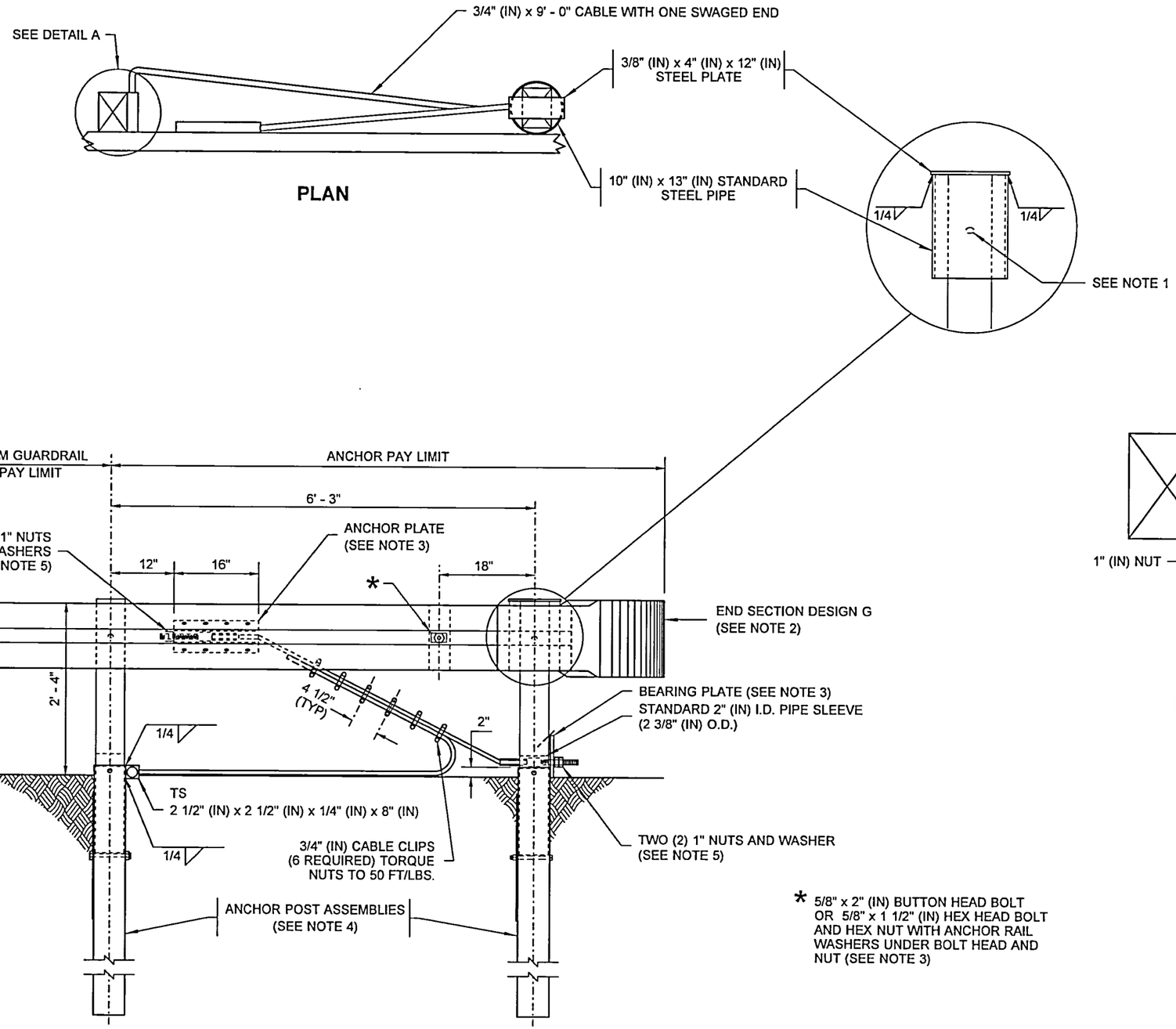
APPROVED FOR PUBLICATION

Carpenter, Jeff
Jul 15 2016 2:22 PM

STATE DESIGN ENGINEER

Washington State Department of Transportation

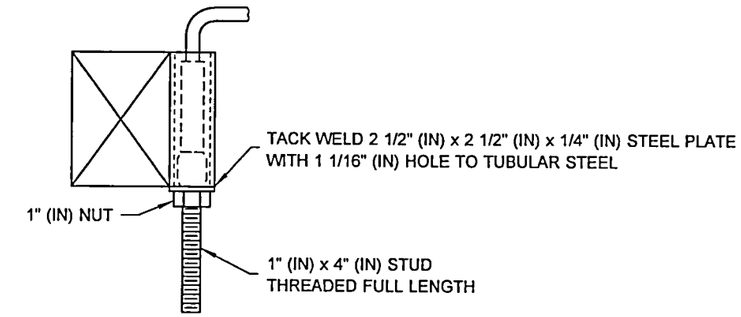
DRAWN BY: FERN LIDDELL



PLAN

TYPE 5 ANCHOR

* 5/8" x 2" (IN) BUTTON HEAD BOLT OR 5/8" x 1 1/2" (IN) HEX HEAD BOLT AND HEX NUT WITH ANCHOR RAIL WASHERS UNDER BOLT HEAD AND NUT (SEE NOTE 5)



DETAIL A

NOTES

1. Attach W-beam to steel pipe with 5/8" (in) x 1 1/4" (in) button head bolt with no washer. No connection to the post is required.
2. For end section details see **Standard Plan C-7.**
3. For anchor details see **Standard Plan C-6.**
4. For post details see **Standard Plan C-1b.**
5. Outside nut shall be torqued against inside nut a minimum of 100 ft/lbs.

JEFFREY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

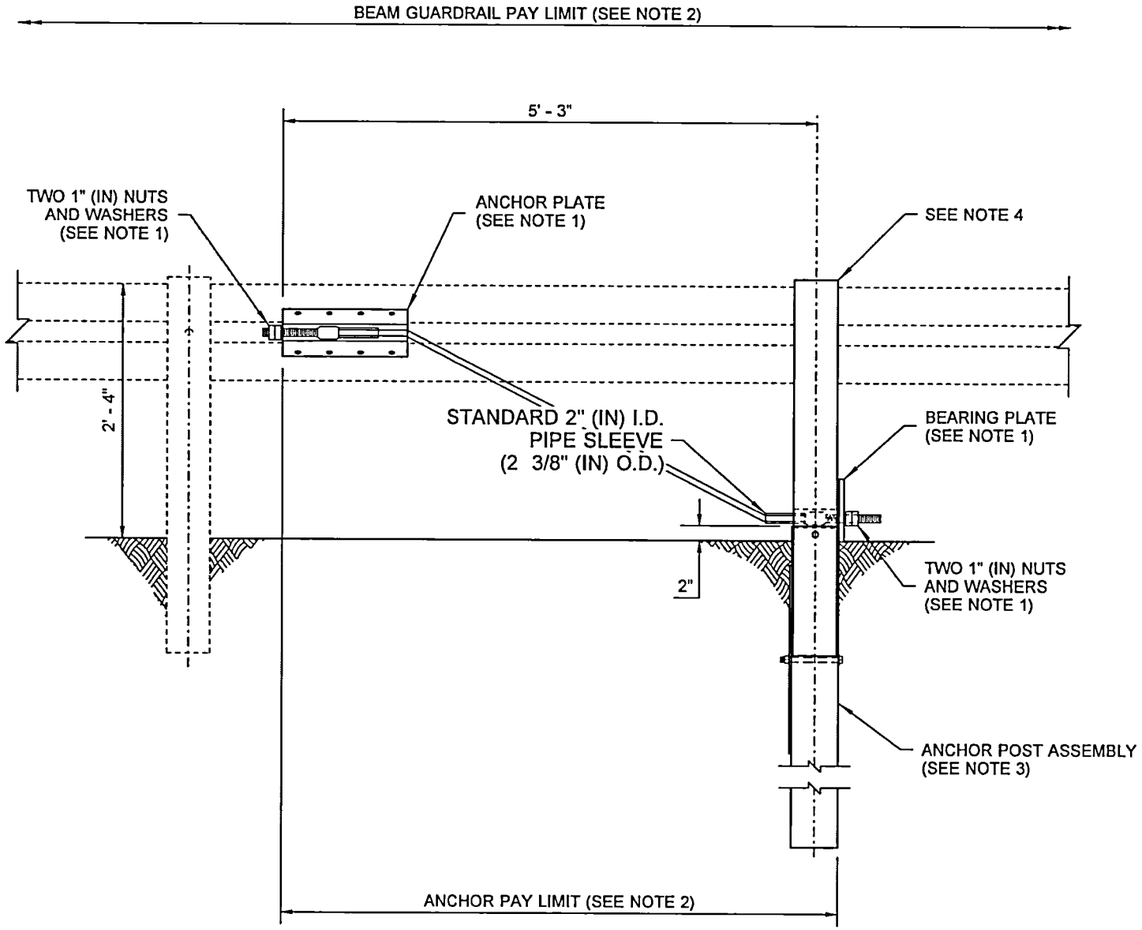
Petterson, Jeff (HQ Design)
Jun 30 2016 7.11 AM

BEAM GUARDRAIL TYPE 5

STANDARD PLAN C-6d

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 15 2016 2:23 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation



TYPE 7 ANCHOR

NOTES

1. For anchor details, see **Standard Plan C-6.**
2. The rail element is to be included in the "Beam Guardrail" pay item. The "Anchor" pay item includes the anchor post, anchor plate, anchor cable, bearing plate, nuts and washers.
3. For post details, see **Standard Plan C-1b.**
4. Post material shall match beam guardrail posts on rest of guardrail run.

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

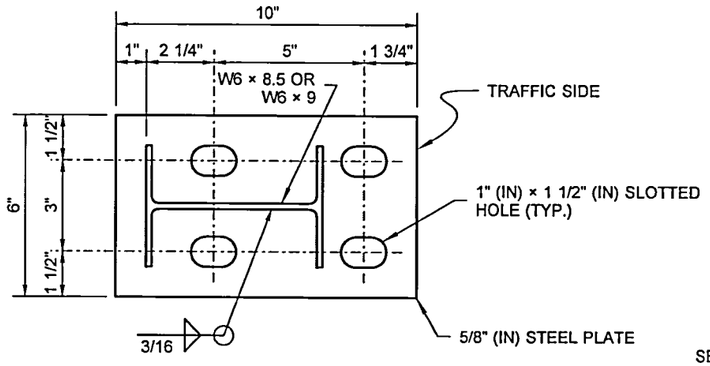
Petterson, Jeff (IIQ Design)
Jun 30 2016 7:12 AM

BEAM GUARDRAIL ANCHOR TYPE 7

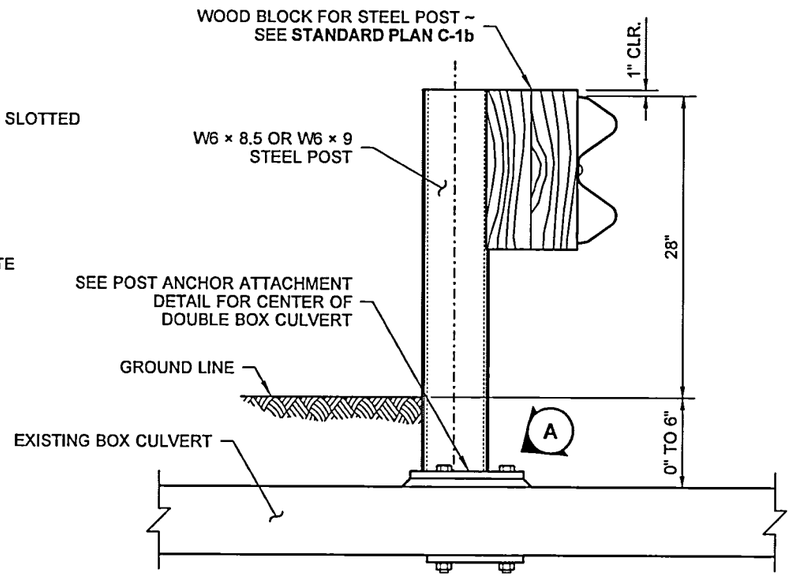
STANDARD PLAN C-6f

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 15 2016 2:23 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

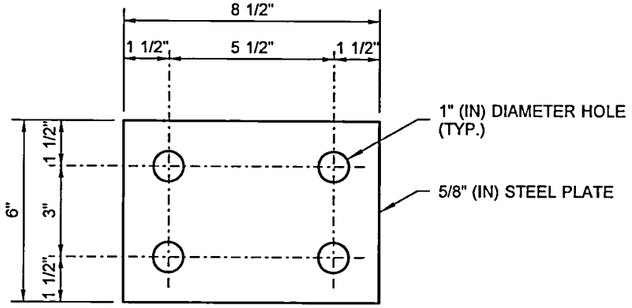


POST BASE PLATE DETAIL

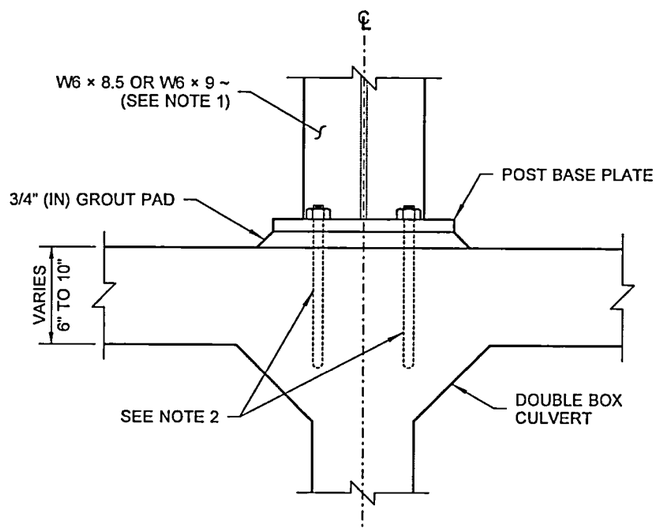


BOX CULVERT GUARDRAIL STEEL POST TYPE 2

(0" (IN) TO 6" (IN) GROUND COVER)



POST BEARING PLATE DETAIL

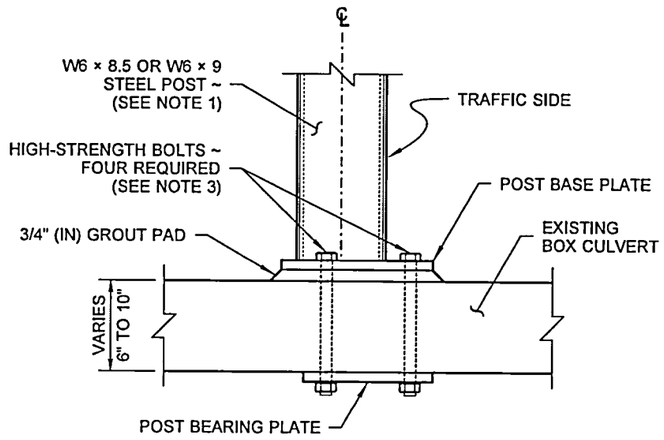


POST ANCHOR ATTACHMENT DETAIL

(SEE NOTE 4)

NOTES

1. Length of W8 × 35, W6 × 8.5 or W6 × 9 shall be determined by measurement from ground line to top of grout pad. This distance shall be verified by the Contractor.
2. Attach Guardrail Post to Box Culvert with 3/4" (in) diameter high-strength bolts with resin-bonded anchors.
3. Drill 1 1/4" (in) diameter hole in concrete slab for 7/8" (in) diameter high-strength bolt. Length of bolt is determined by top slab of Box Culvert thickness, which shall be verified by the Contractor.
4. For details of post attachment to Double Box Culvert, see **Standard Plan C-2i**.



DETAIL (A)

POST BASE ATTACHMENT

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jun 30 2016 7:13 AM

BOX CULVERT GUARDRAIL STEEL POST

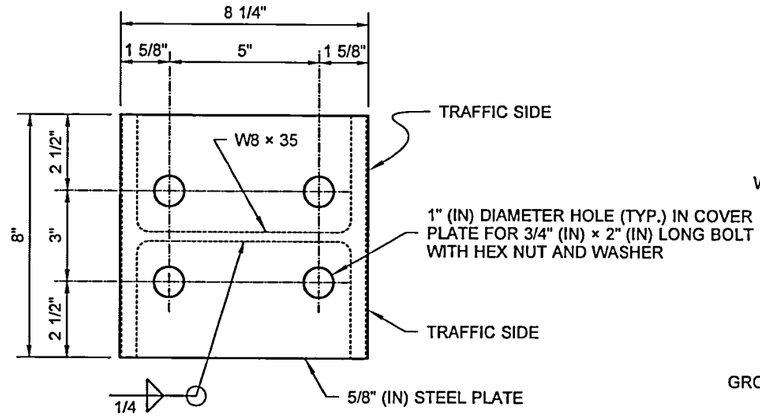
STANDARD PLAN C-10

SHEET 1 OF 2 SHEETS

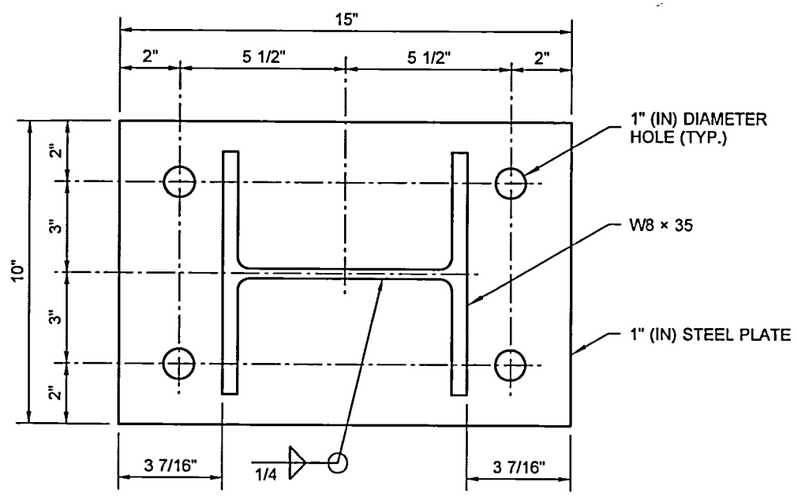
APPROVED FOR PUBLICATION
Carpenter, Jeff
Carpenter, Jeff
Jul 15 2016 2:23 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: COLBY FLETCHER

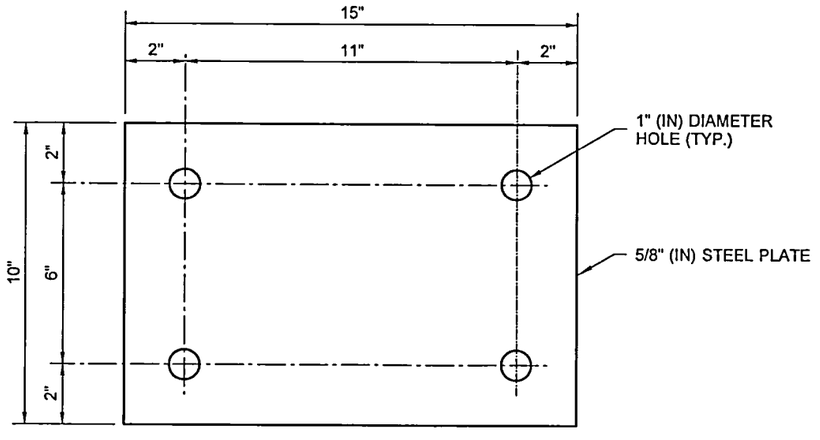
DRAWN BY: COLBY FLETCHER



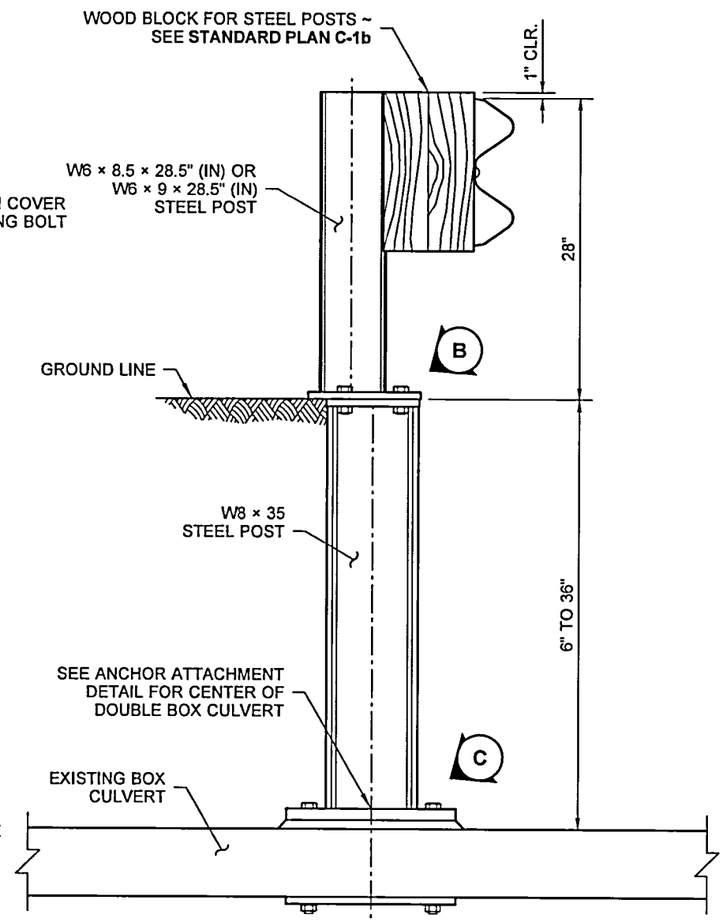
COVER PLATE DETAIL



BASE PLATE DETAIL

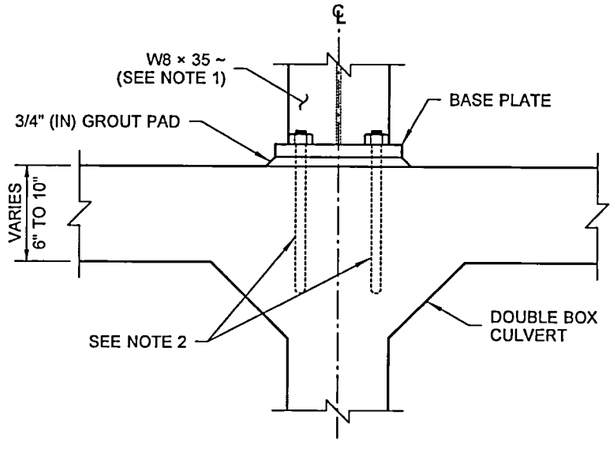


BEARING PLATE DETAIL



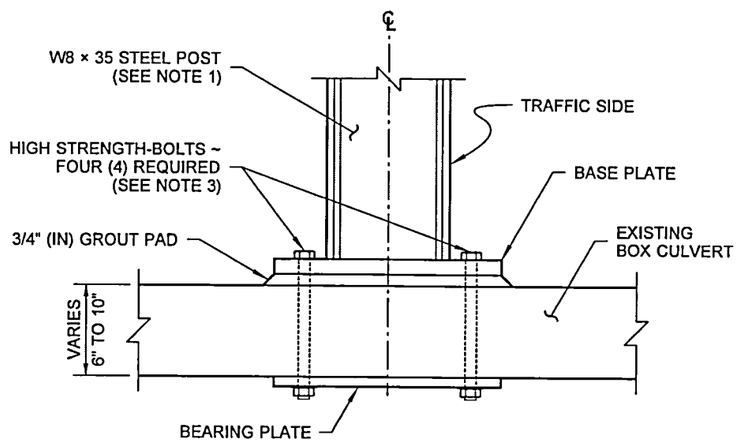
BOX CULVERT GUARDRAIL STEEL POST TYPE 1

(6" (IN) TO 36" (IN) GROUND COVER)



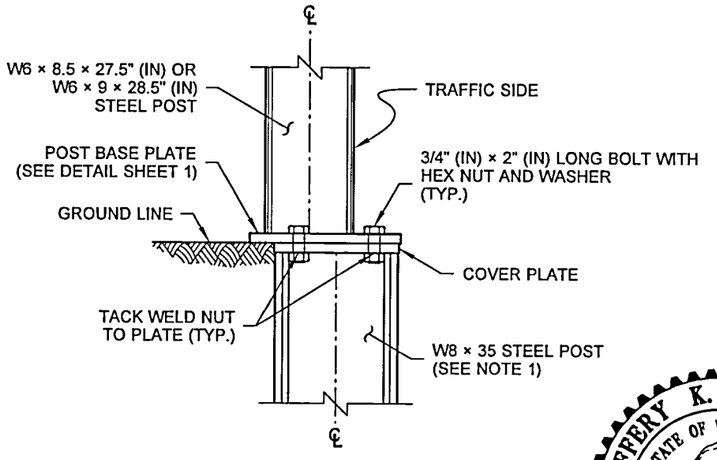
ANCHOR ATTACHMENT DETAIL

(SEE NOTE 4)



DETAIL (C)

POST ATTACHMENT



DETAIL (B)

BASE ATTACHMENT

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (IIQ Design)
Jun 30 2016 7:13 AM

BOX CULVERT GUARDRAIL STEEL POST

STANDARD PLAN C-10

SHEET 2 OF 2 SHEETS

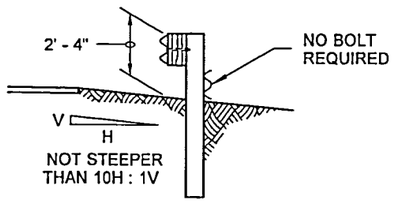
APPROVED FOR PUBLICATION

Carpenter, Jeff
Jul 15 2016 2:24 PM

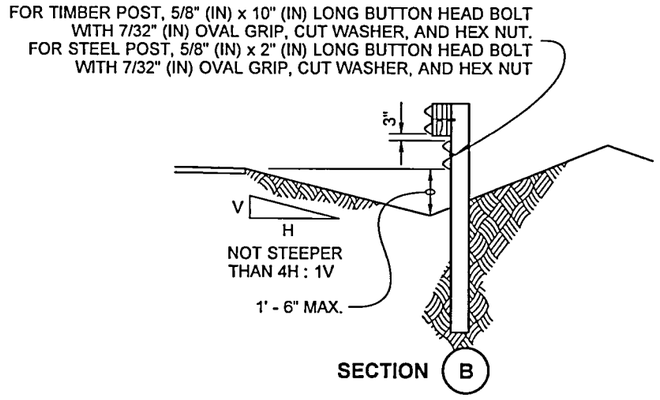
STATE DESIGN ENGINEER

Washington State Department of Transportation

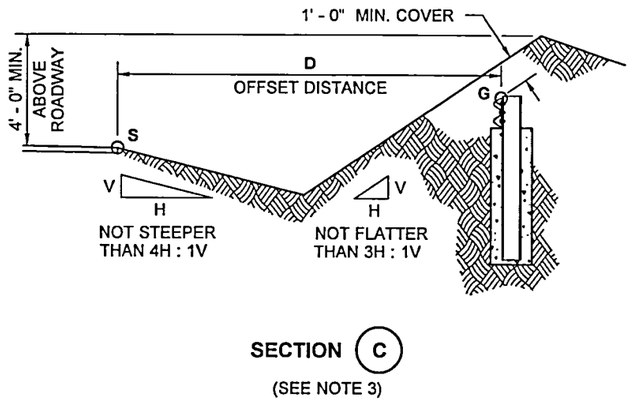
DRAWN BY: FERN LIDDELL



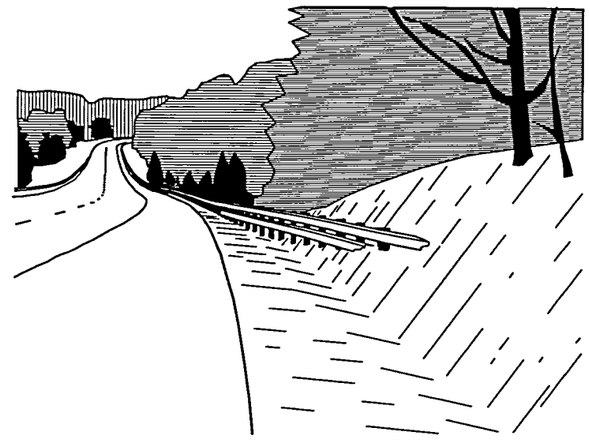
SECTION (A)



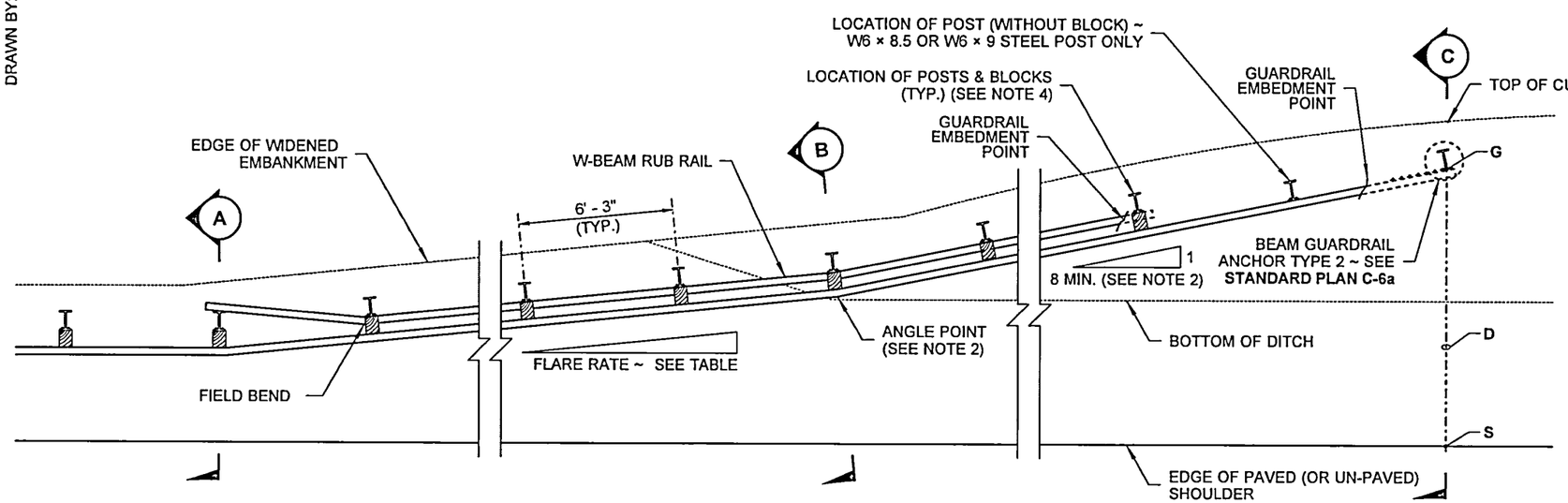
SECTION (B)



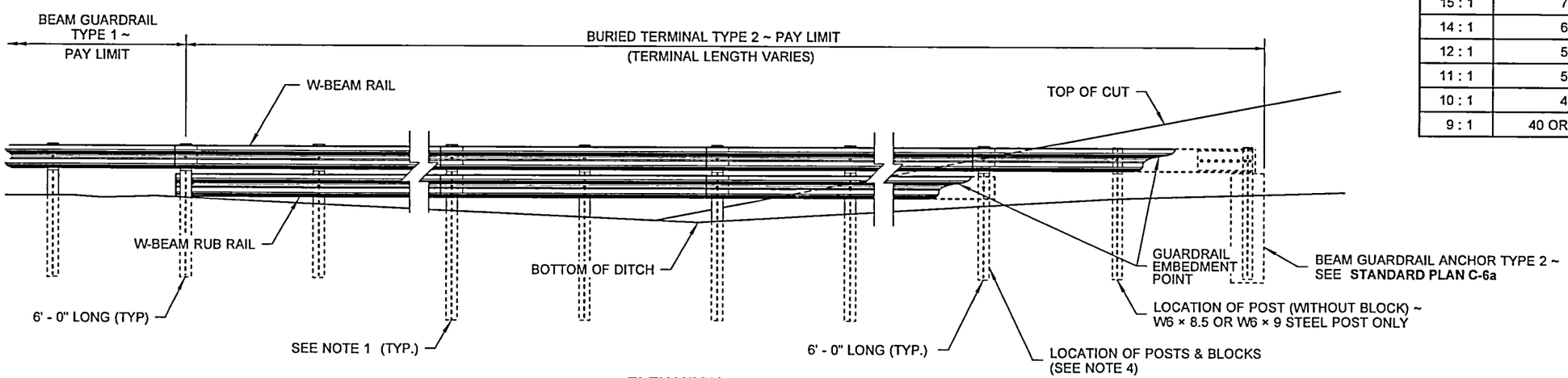
SECTION (C)
(SEE NOTE 3)



PERSPECTIVE



PLAN



ELEVATION
(PROFILE ALONG RAIL)

NOTES

1. Posts installed on shoulder slopes steeper than 10 : 1 shall be 8' (ft) long.
2. The flare rate of the guardrail may be increased after crossing the ditch bottom to shorten the length of the terminal.
3. Determine the height of the W-Beam at the Anchor (**G**) by first calculating the perpendicular offset distance (**D**) from the edge of shoulder (**S**) to the Anchor (on station). Multiply that distance by 0.1, then subtract the product from the elevation of the same point (**S**) on the edge of shoulder used to obtain the offset distance (at the same station). Add Beam Guardrail design height (28" (in)) to that remainder for a sum that equals the elevation of the top of the W-Beam at the Anchor.

   Refer to SECTION "C":

   $$\text{Elevation}_{G} = (\text{Elevation}_{S} - D \times (0.1)) + 28$$

4. Timber or steel post. Steel post shown.

FLARE RATE TABLE	
RATE (FT)	POSTED SPEED (MPH)
15 : 1	70
14 : 1	60
12 : 1	55
11 : 1	50
10 : 1	45
9 : 1	40 OR LESS

JEFFREY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (IIQ Design)
Jun 30 2016 7:16 AM

BEAM GUARDRAIL TYPE 1
BURIED TERMINAL TYPE 2

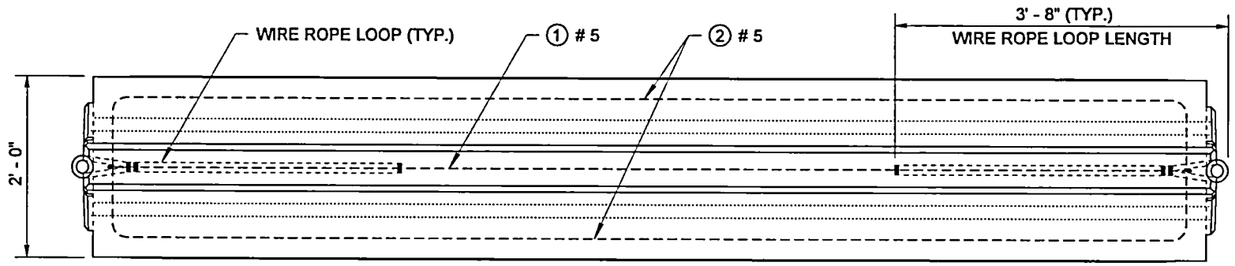
STANDARD PLAN C-22.14-04

SHEET 1 OF 1 SHEET

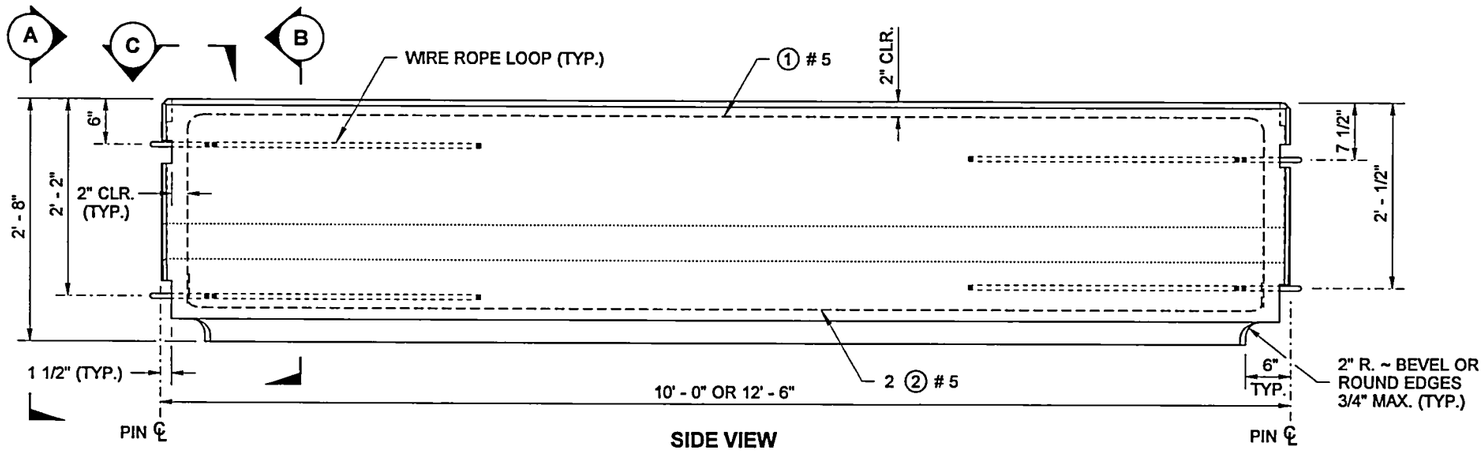
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 15 2016 2:24 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

This page left blank intentionally.

DRAWN BY: MARK SUJKA



TOP VIEW

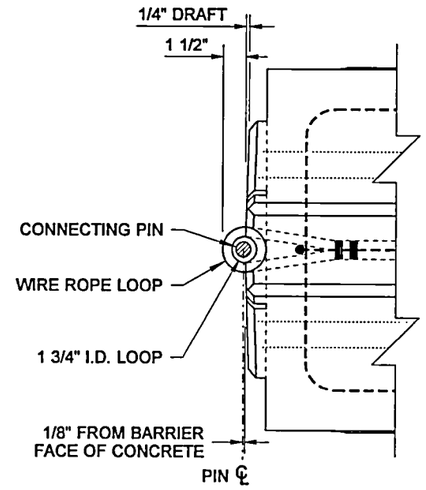


SIDE VIEW

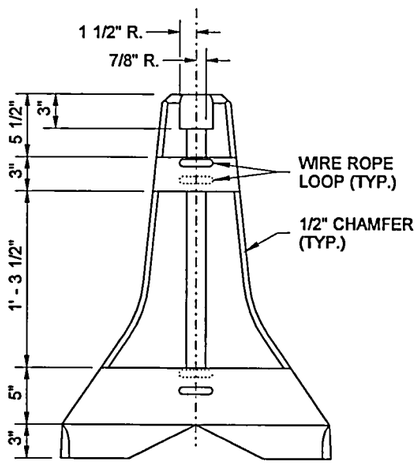
BARRIER SECTION

NOTES

1. Wire rope loops shall be 3' - 8" long, except for the top loop of the Barrier Terminal, which shall be 2' - 0" long.
2. Except for the locations of the wire rope loops, the dimensions shown in END VIEW "A" are typical for both ends of a Barrier Section or opposing ends of Barrier Terminals.
3. Connecting and Drift Pin head designs vary among different manufacturers. Pin designs that are shaped differently than those shown in the detail are acceptable, if the bearing surface is within the minimum and maximum widths specified.
4. The vertical spacing of the Wire Rope Loops in a Barrier Terminal is determined by the end of the Barrier Segment to which it is being connected. See BARRIER CONNECTION DETAIL (Sheet 2).

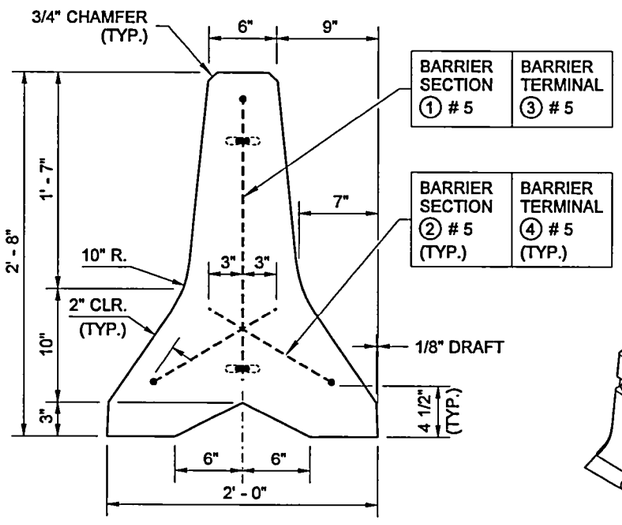


DETAIL C

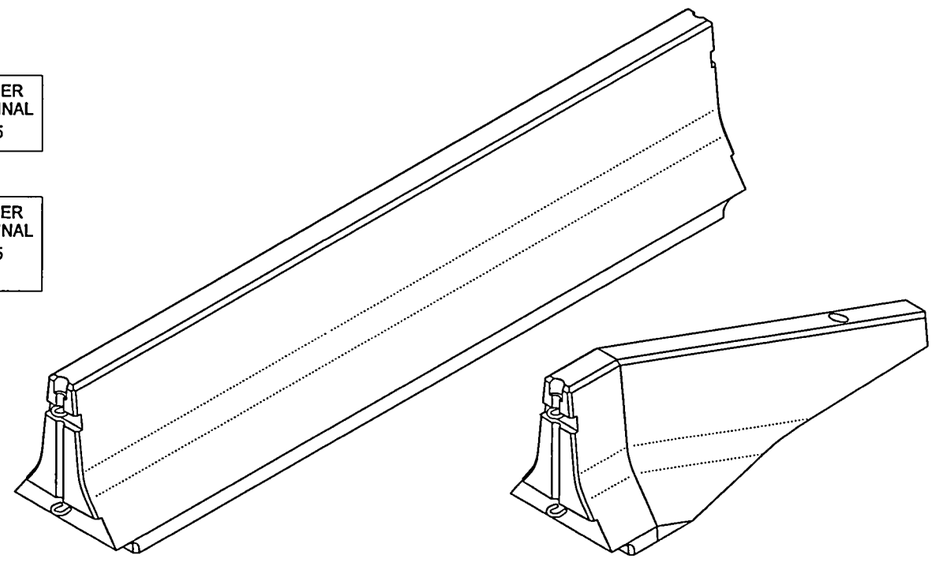


SEE NOTE 2

END VIEW (A)



SECTION (B)



BARRIER SECTION

BARRIER TERMINAL

ISOMETRIC VIEWS

CONCRETE BARRIER TYPE 2

STANDARD PLAN C-8

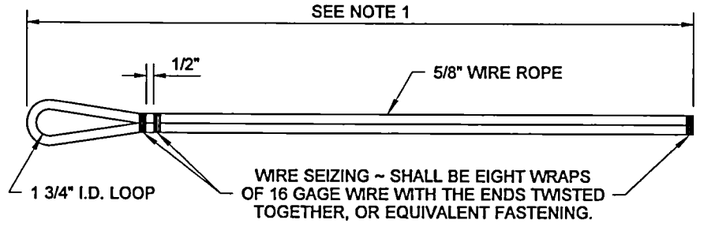
SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

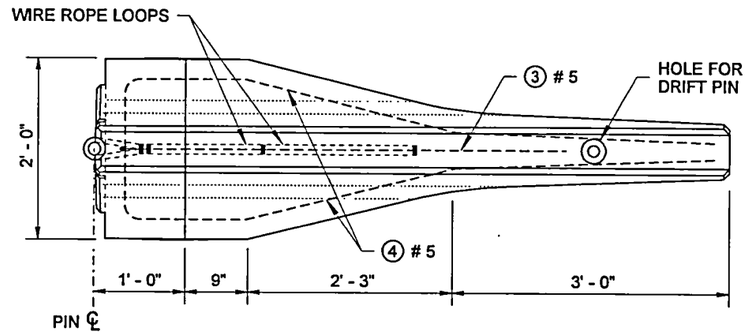
STATE DESIGN ENGINEER — DATE 2/10/09

Washington State Department of Transportation

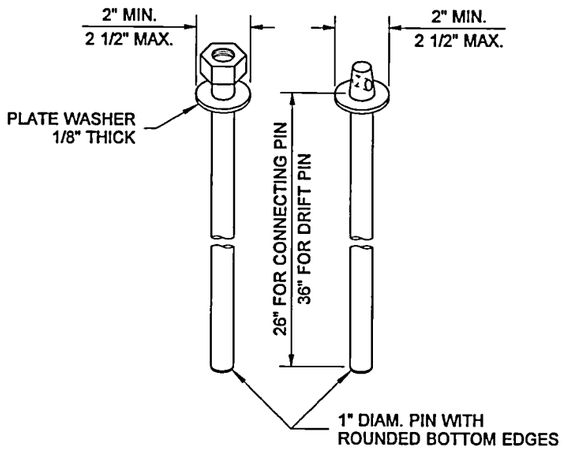
DRAWN BY: MARK SUJKA



WIRE ROPE LOOP DETAIL

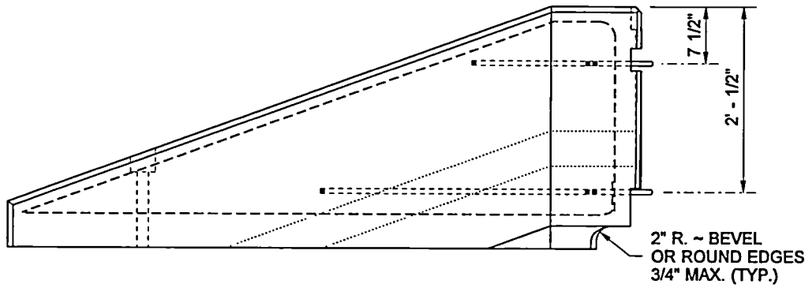


TOP VIEW

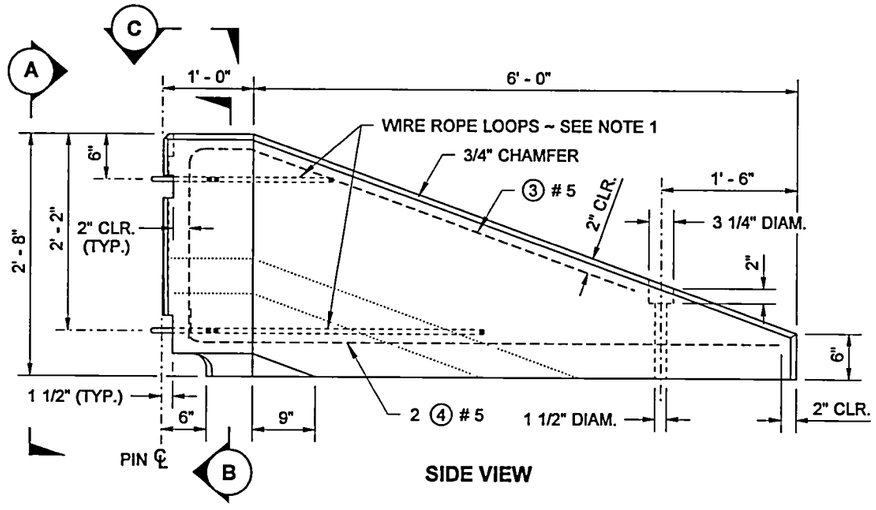


SEE NOTE 3

CONNECTING PINS AND DRIFT PINS



SIDE VIEW

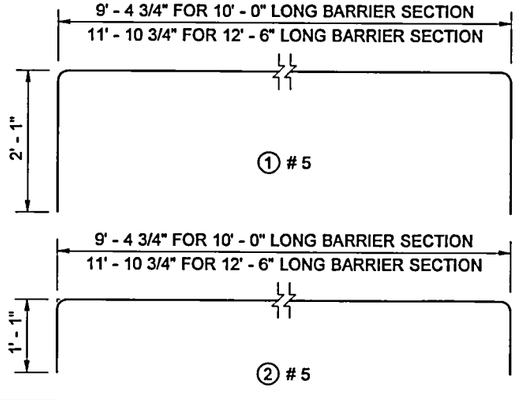


SIDE VIEW

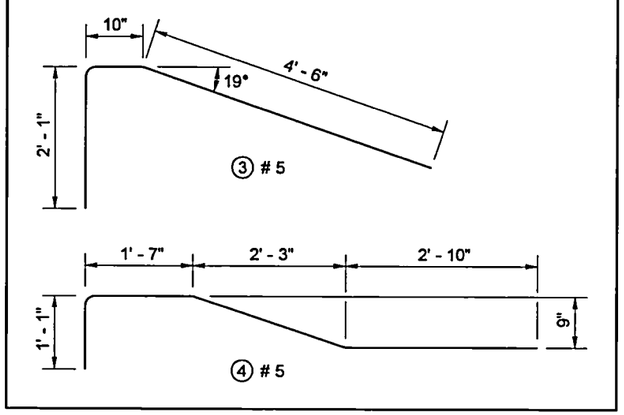
SEE NOTE 4

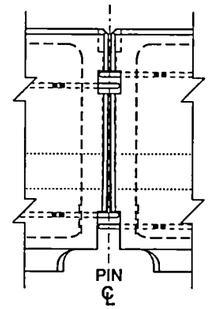
BARRIER TERMINAL

BARRIER SECTION REINFORCING STEEL BENDING DIAGRAM



BARRIER TERMINAL REINFORCING STEEL BENDING DIAGRAM





BARRIER CONNECTION DETAIL

MICHAEL S. FLEMING
STATE OF WASHINGTON
38777
REGISTERED
PROFESSIONAL ENGINEER
2/9/09

CONCRETE BARRIER TYPE 2

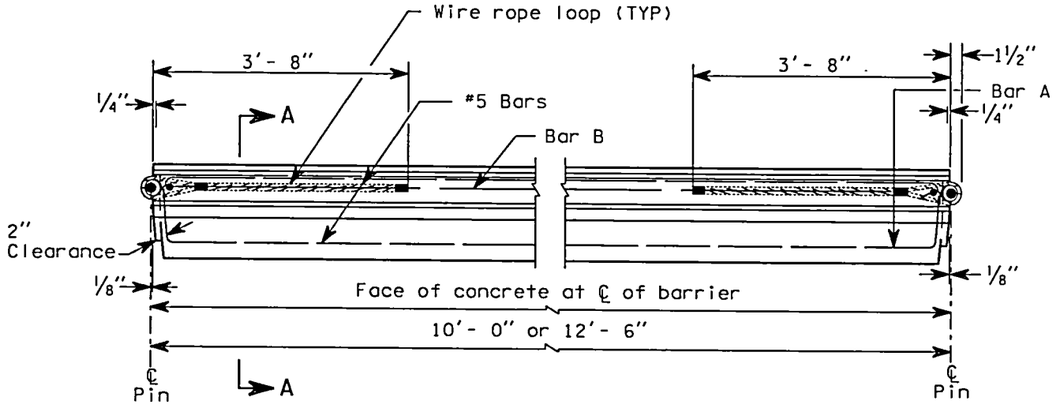
STANDARD PLAN C-8

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 2/10/09

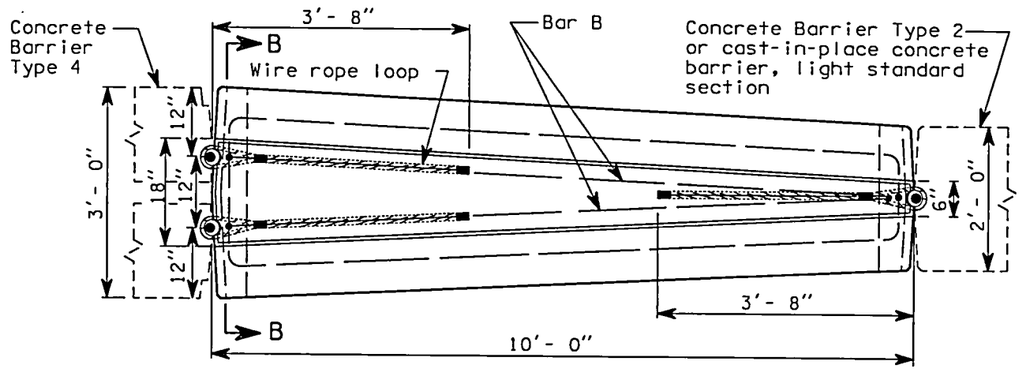
Washington State Department of Transportation



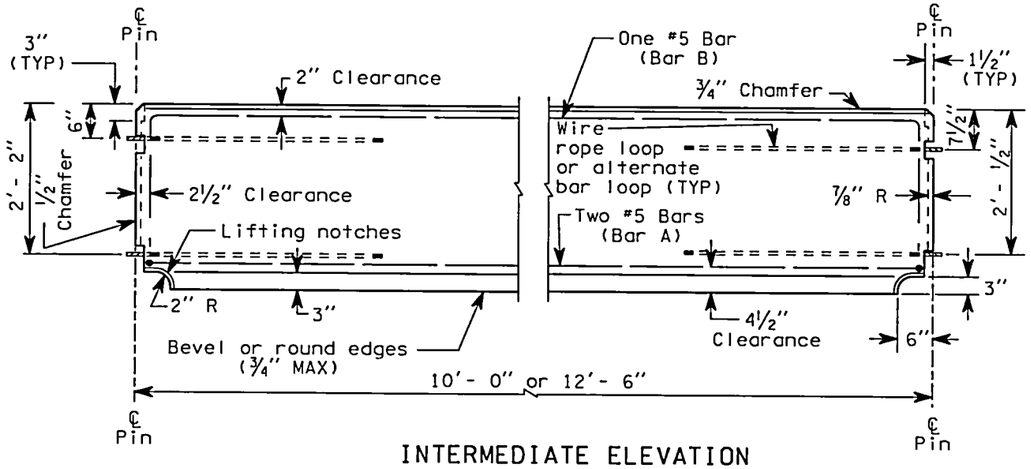
INTERMEDIATE PLAN

NOTE

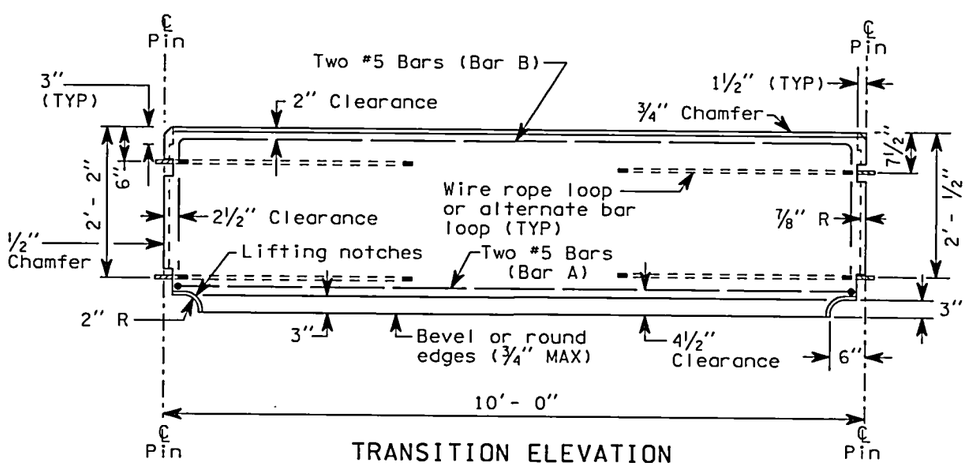
1. For details on wire rope loop, connecting pin and end notches see Standard Plan "Concrete Barrier Type 2."



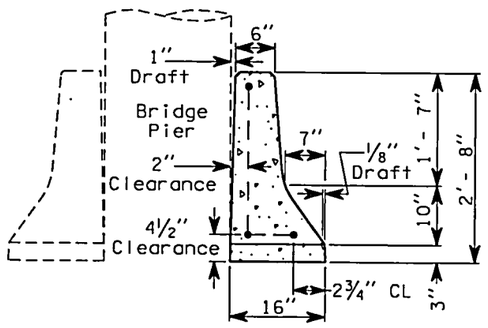
TRANSITION PLAN



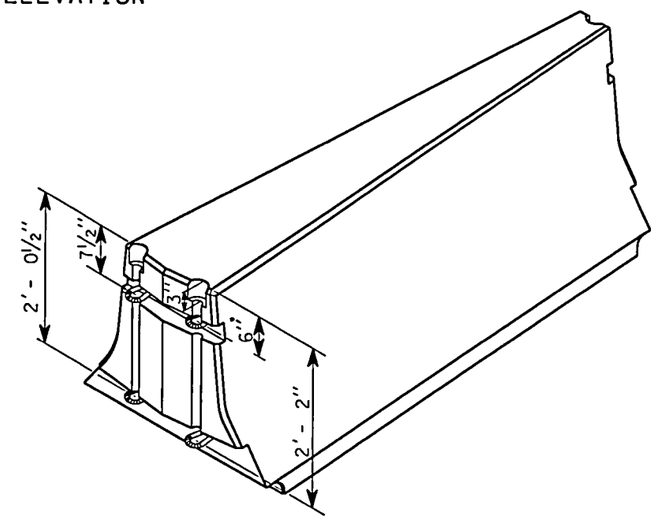
INTERMEDIATE ELEVATION



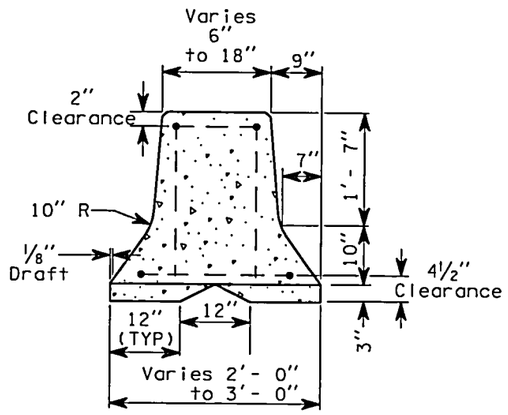
TRANSITION ELEVATION



SECTION A-A
TYPE 4



TRANSITION END VIEW



SECTION B-B
TRANSITION SECTION

CONCRETE BARRIER TYPE 4 AND TRANSITION SECTION

CLIFFORD E. MANSFIELD
STATE OF WASHINGTON
15224
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES MAY 3, 1998

STANDARD PLAN C-8a

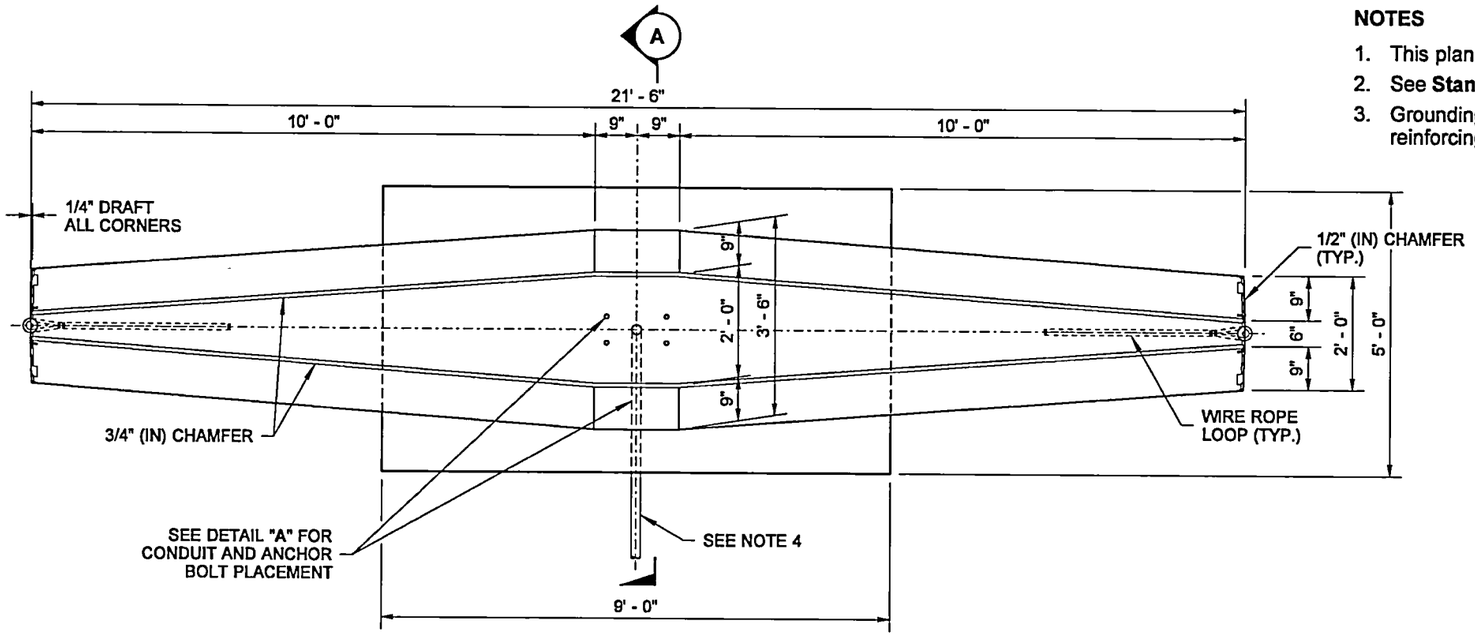
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 7/25/97

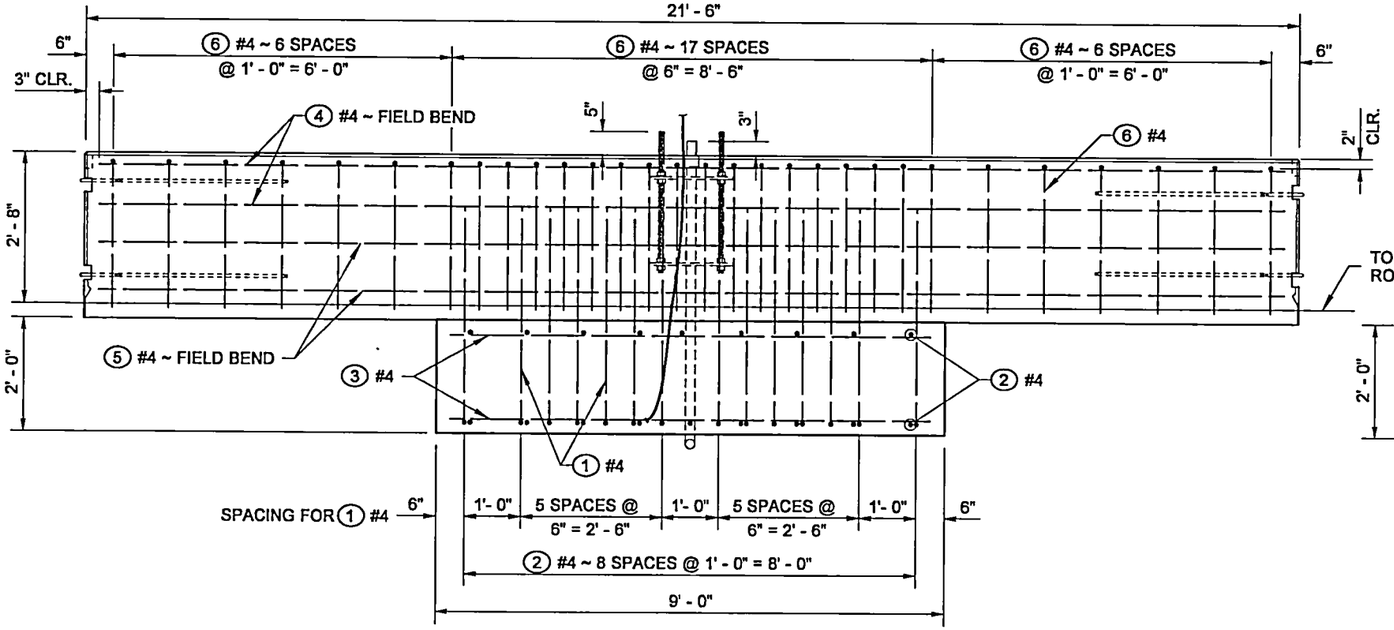
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
OLYMPIA, WASHINGTON

This page left blank intentionally.

DRAWN BY: COLBY FLETCHER

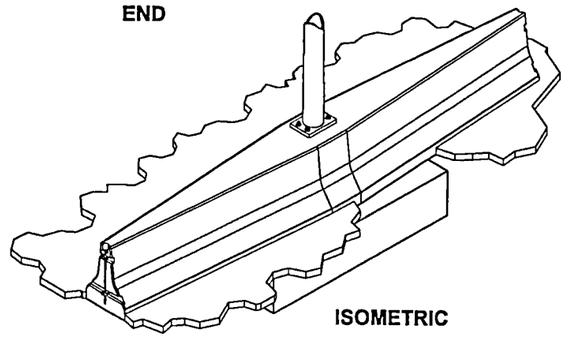


PLAN



ELEVATION

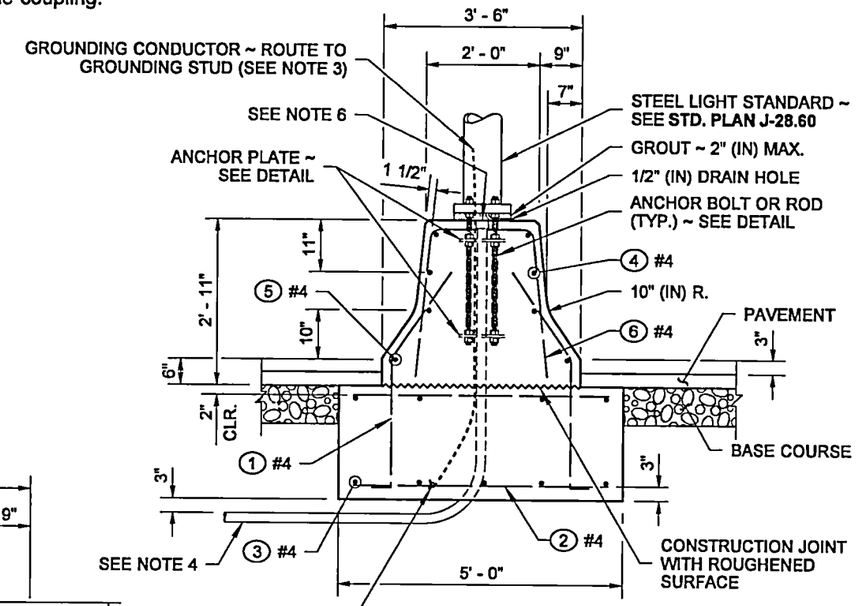
END



ISOMETRIC

NOTES

1. This plan shall be used for 40' (ft) and 50' (ft) Light Standards with 16' (ft) max. length double mast arms.
2. See **Standard Plan C-8** for details on barrier ends, Wire Rope Loops, and Connecting Pins.
3. Grounding Conductor shall be non-insulated #4 AWG stranded copper; provide 3' - 0" min. slack. Clamp to steel reinforcing bar with connnector suitable for use embedded in concrete.
4. See the Contract Plans for conduit size and placement.
5. Concrete shall be Class 4000.
6. Install conduit couplings on all conduits. Place coupling tops flush with top of concrete. If PVC conduits are specified, the conduit stub and end bell bushing shall not be glued to the coupling.



SECTION (A)

Zeldenrust, Richard
Feb 2 2016 11:51 AM
cosign

CONCRETE BARRIER LIGHT STANDARD SECTION

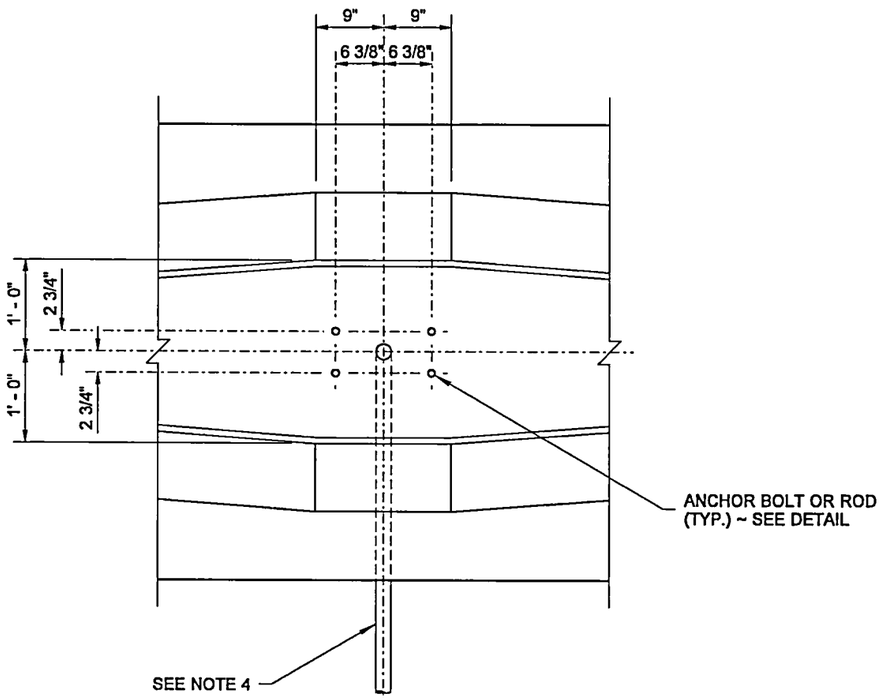
STANDARD PLAN C-8b

SHEET 1 OF 2 SHEETS

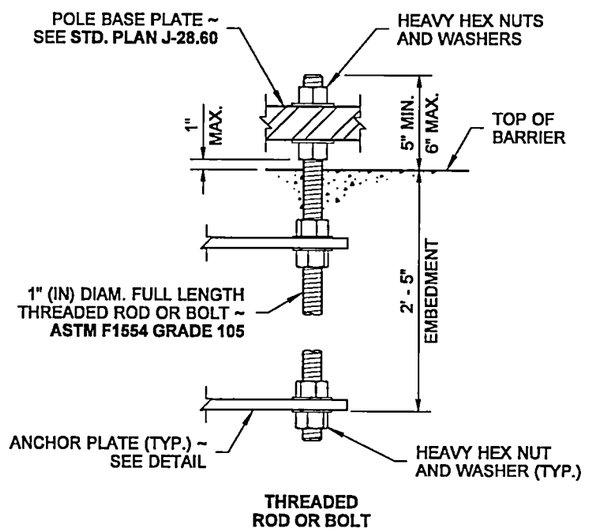
APPROVED FOR PUBLICATION
Carpenter, Jeff
Feb 29 2016 12:30 PM
STATE DESIGN ENGINEER
cosign

Washington State Department of Transportation

DRAWN BY: COLBY FLETCHER

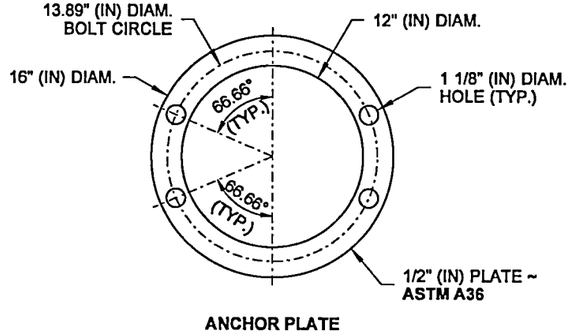


DETAIL "A"



THREADED ROD OR BOLT

ANCHOR BOLT DETAIL



ANCHOR PLATE

ALL NUTS, BOLTS, WASHERS, AND RODS SHALL BE FULLY GALVANIZED IN ACCORDANCE WITH **ASTM F2329**

BAR LIST					BENDING DIAGRAM
MARK	LOCATION	QTY.	SIZE	LENGTH	(ALL DIMENSIONS ARE OUT TO OUT)
①	FOOTING - DOWEL	28	#4	4' - 3"	10 7, 1' - 9", 2' - 3 1/2", 4", ①
②	FOOTING	18		4' - 8"	
③	FOOTING	9		8' - 8"	
④	BARRIER	4		21' - 0"	9' - 9", 1' - 6", 9' - 9", (FIELD BEND), ④
⑤	BARRIER	4		21' - 0"	
⑥	BARRIER	30		5' - 3" TO 6' - 9"	3" TO 1' - 9", 84°, 5' - 3" TO 6' - 9", ⑥

RICHARD P. ZELDENRUST
STATE OF WASHINGTON
25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
Feb 2 2016 4:20 PM
cosign

CONCRETE BARRIER LIGHT STANDARD SECTION

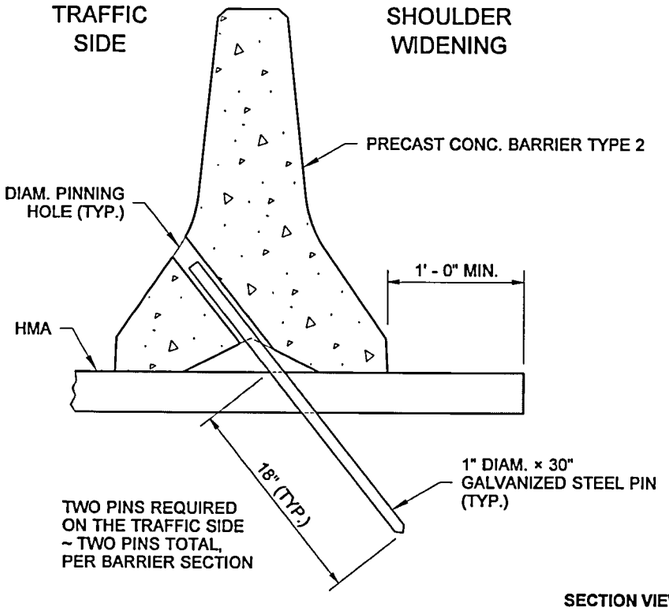
STANDARD PLAN C-8b

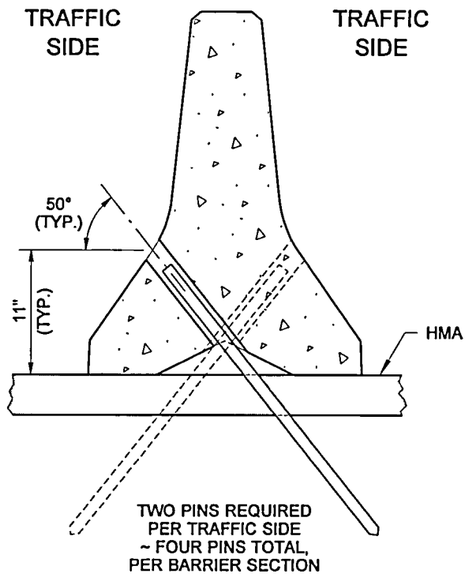
SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Carpenter, Jeff
Feb 29 2016 12:31 PM
STATE DESIGN ENGINEER
cosign

Washington State Department of Transportation

DRAWN BY: MARK SUJKA



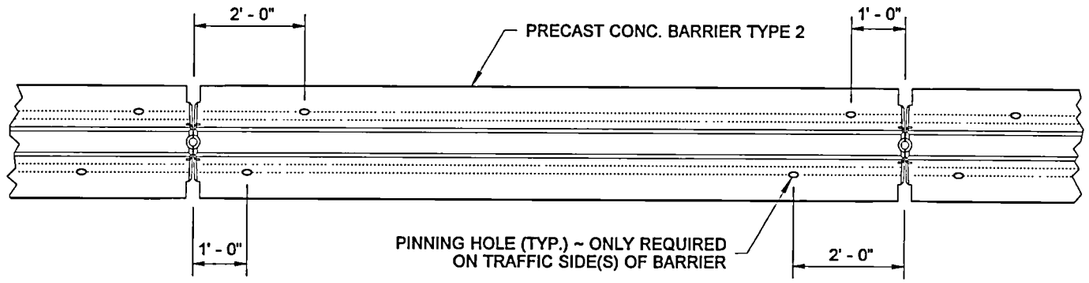


SECTION VIEWS

TYPE 3 ANCHOR
PIN LOCATIONS

NOTES

1. The intended use of this plan is for the permanent anchoring of Precast Concrete Barrier Type 2 (see Standard Plan C-8) on hot mix asphalt pavement.
2. Remove the Type 3 Anchors by first driving the steel pins down through the barrier further into the pavement to allow lifting the barrier without interference, then remove the pins from the pavement.
3. After removing the Type 3 Anchors, clean the pin holes and fill them with sealant according to Standard Specification 9-04.2.



PLAN VIEW

TYPE 3 ANCHOR
PIN LOCATIONS

RICHARD BARSTOW ALBIN
STATE OF WASHINGTON
34042
REGISTERED
PROFESSIONAL ENGINEER

2/21/2007

EXPIRES JULY 24, 2008

PRECAST CONC. BARRIER ANCHOR ~ TYPE 3 (PERMANENT)
STANDARD PLAN C-8e

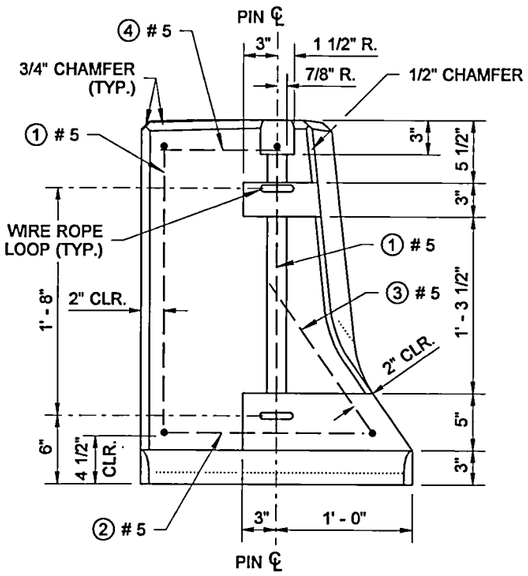
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 02/21/07

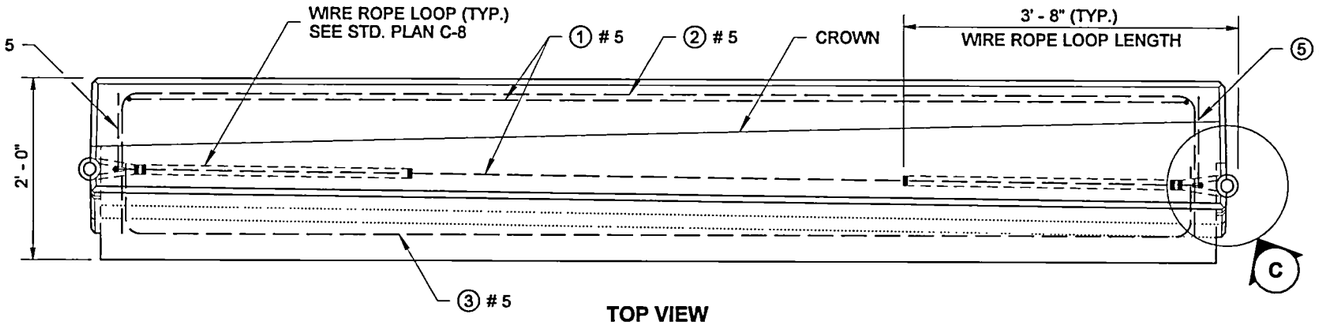
Washington State Department of Transportation

DATE	REVISION	BY
02/2007	REMOVED TEMPORARY ANCHORS	MAS

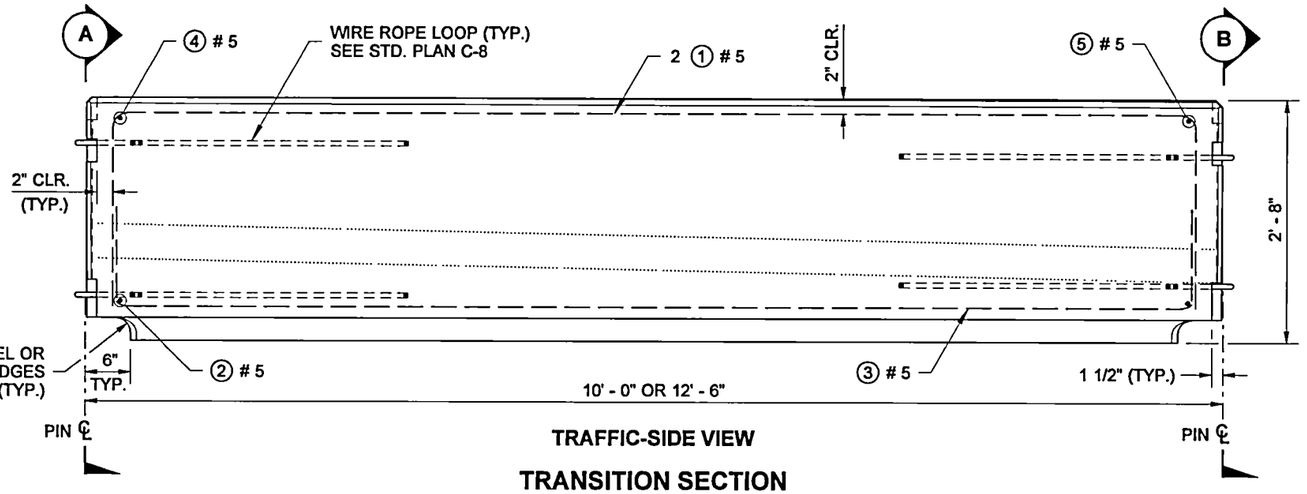


CONCRETE BARRIER TYPE 2 (NJ-SHAPE)

END VIEW

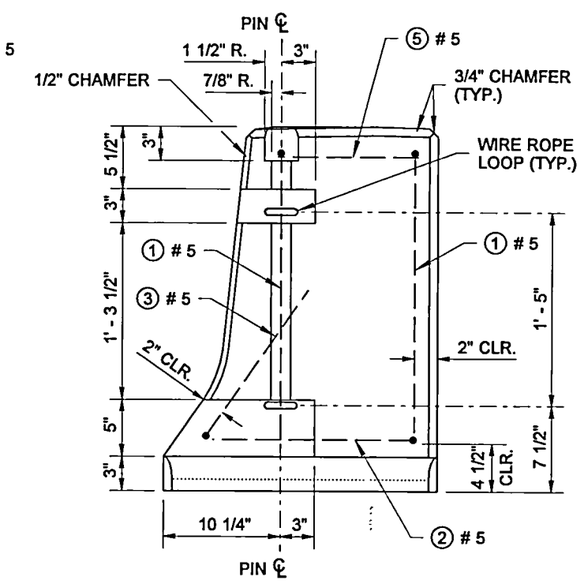


TOP VIEW



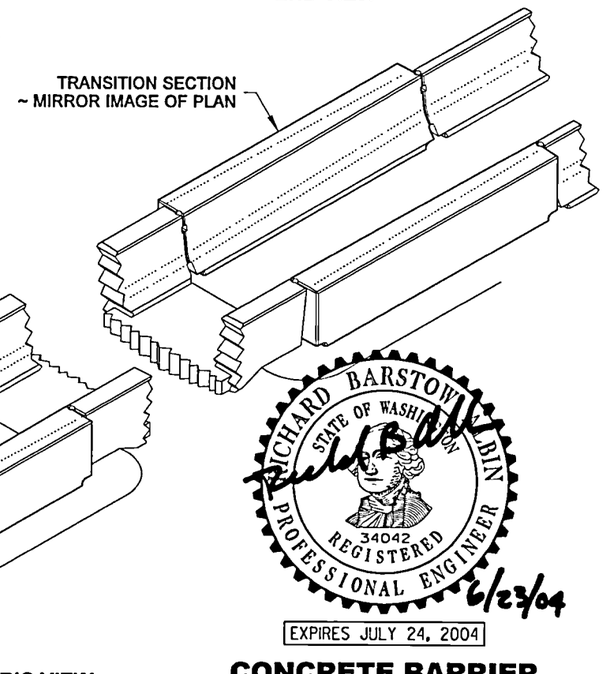
TRAFFIC-SIDE VIEW

TRANSITION SECTION

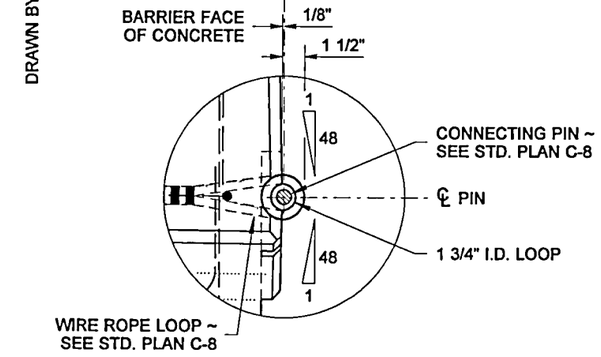


BRIDGE F-SHAPE TRAFFIC BARRIER

END VIEW

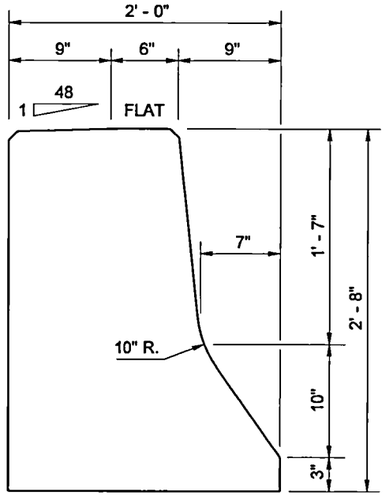


ISOMETRIC VIEW



TYPICAL ~ BOTH ENDS

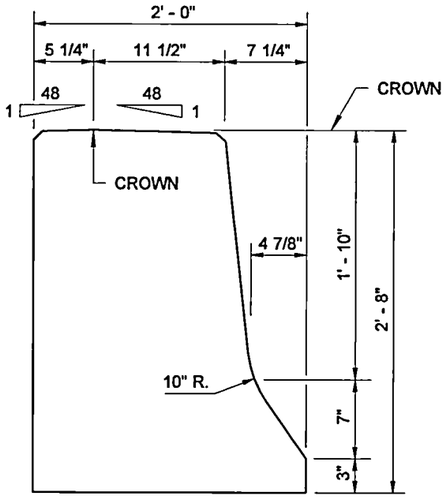
DETAIL (C)



CONCRETE BARRIER TYPE 2 (NJ-SHAPE)

SECTION (A)

(SHOWN AT LIMIT OF TRANSITION)

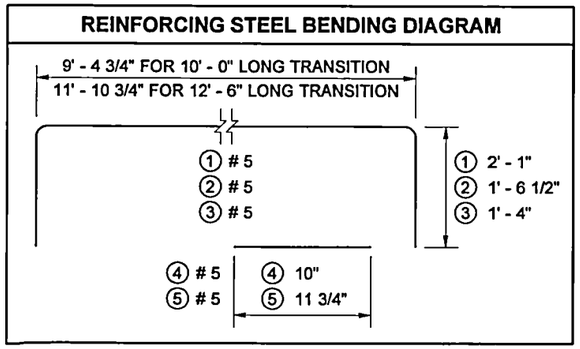


BRIDGE F-SHAPE TRAFFIC BARRIER

SECTION (B)

(SHOWN AT LIMIT OF TRANSITION)

REINFORCING STEEL BENDING DIAGRAM



NOTE

The vertical locations of the Wire Rope Loops at one end compose a set that shall not vary; however, which set is applied to an end is determined by the end to which it is being connected. A set with loops 1' - 5" apart connects to a set with loops 1' - 8" apart. See Standard Plan C-8, BARRIER CONNECTION DETAIL.

DRAWN BY: MARK SUJKA

RICHARD BARSTOW BIN — STATE OF WASHINGTON — 34042 — REGISTERED PROFESSIONAL ENGINEER

6/23/04

EXPIRES JULY 24, 2004

CONCRETE BARRIER TRANSITION TYPE 2 TO BRIDGE F-SHAPE STANDARD PLAN C-8f

SHEET 1 OF 1 SHEET

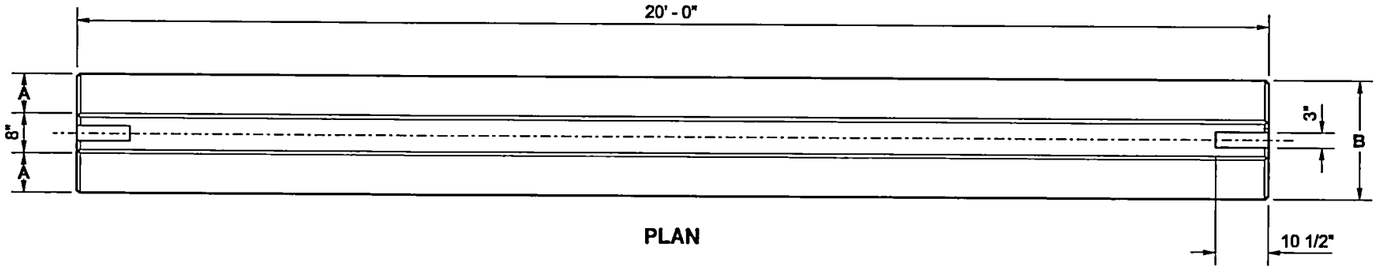
APPROVED FOR PUBLICATION

Harold Pitzer 6-30-04

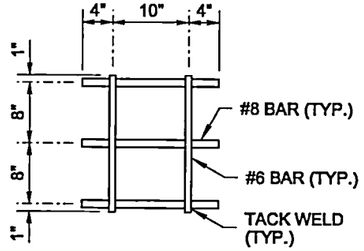
STATE DESIGN ENGINEER — DATE

Washington State Department of Transportation

DRAWN BY: LISA CYFORD



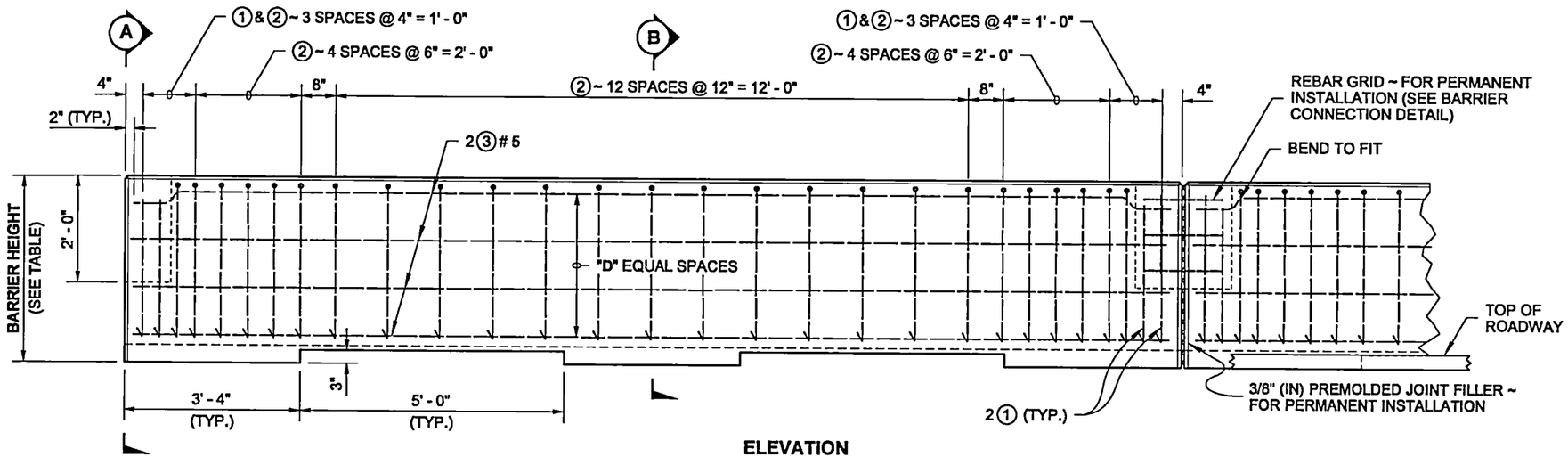
PLAN



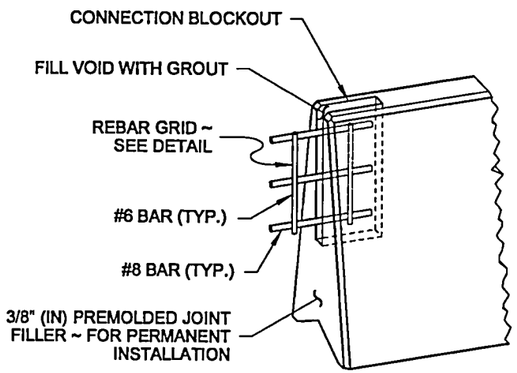
REBAR GRID DETAIL
FOR PERMANENT INSTALLATION

NOTES

1. PERMANENT INSTALLATION requirements: Embed barrier 3" (in) minimum; install 3/8" (in) Premolded Joint Filler between segments; fill the Connection Blockout with grout, centering the Rebar Grid in the blockout before adding grout.
2. TEMPORARY INSTALLATION requirement: Place a Rebar Grid in the Connection Blockout between barrier segments.
3. Installation on a horizontal curve with a radius less than 2,000' (ft) requires a modified end design.
4. For Barrier with a 2' - 10" reveal, see Sheet 2.
   For High-Performance Barrier with a 3' - 6" reveal, see Sheet 3.

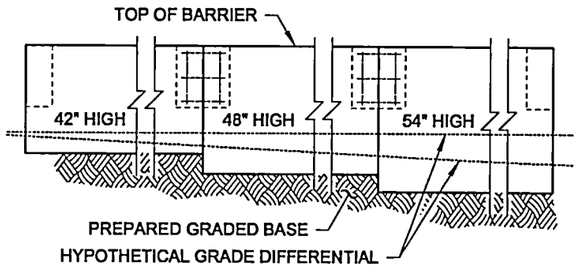


ELEVATION



BARRIER CONNECTION DETAIL
FOR PERMANENT INSTALLATION

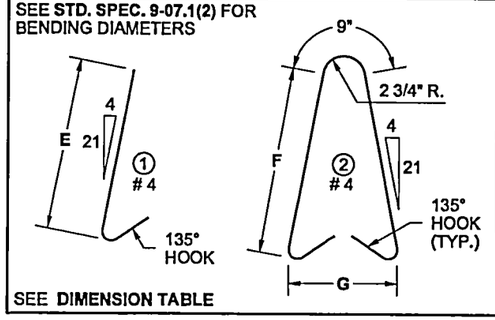
NOTE:
STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE WITH **STANDARD SPECIFICATION 6-10.3**



BARRIER TRANSITION DETAIL

REINFORCING STEEL BENDING DIAGRAM

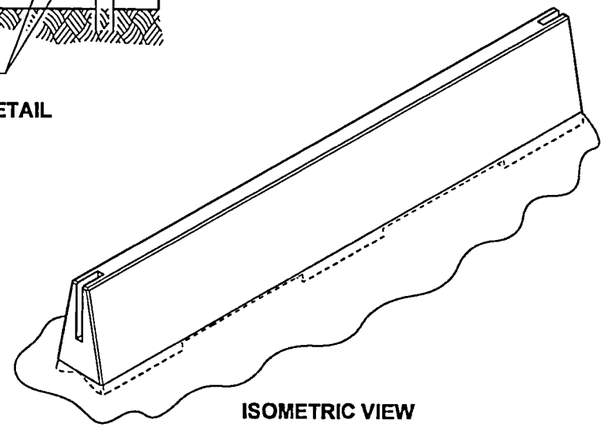
SEE **STD. SPEC. 9-07.1(2)** FOR BENDING DIAMETERS



SEE **DIMENSION TABLE**

DIMENSION TABLE

BARRIER HEIGHT	A	B	D	E	F	G	HORIZONTAL BARS (QTY.)
3' - 6"	8"	2' - 0"	3	2' - 8"	2' - 10"	1' - 7"	8
4' - 0"	9 1/8"	2' - 2 1/4"	4	3' - 2"	3' - 4"	1' - 9"	10
4' - 6"	10 1/4"	2' - 4 1/2"	5	3' - 8"	3' - 10"	1' - 11"	12



ISOMETRIC VIEW

PATRICK EDWARD BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 19 2014 8:24 AM
Design

SINGLE-SLOPE CONCRETE BARRIER (PRECAST)

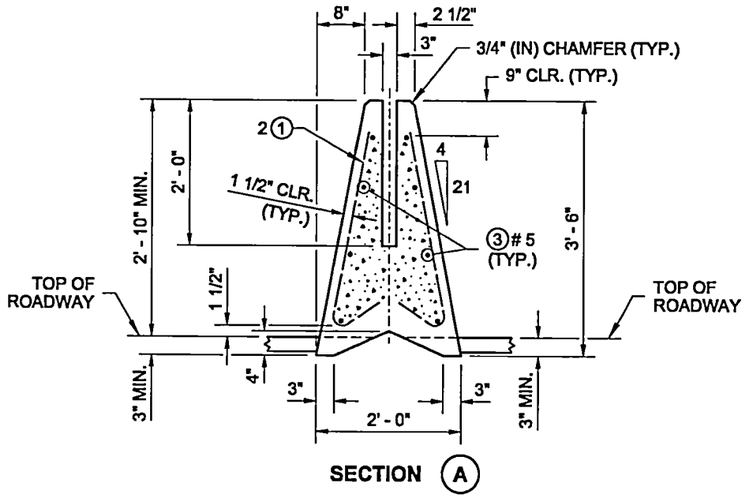
STANDARD PLAN C-70.10-01

SHEET 1 OF 3 SHEETS

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 17 2014 9:34 AM
Date
STATE DESIGN ENGINEER

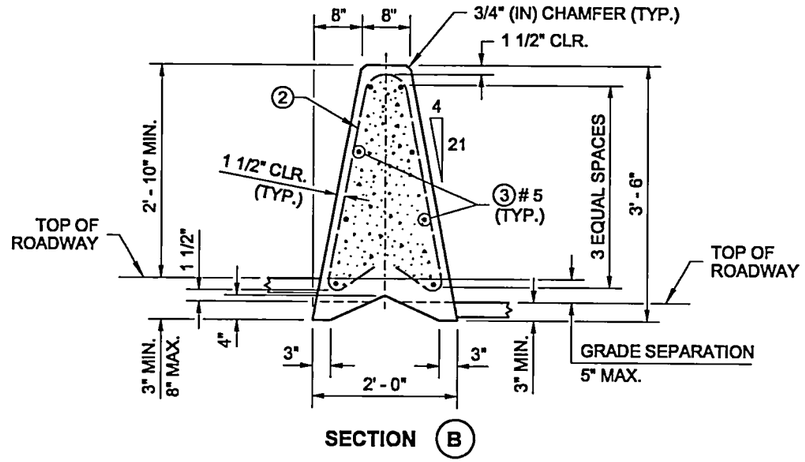
Washington State Department of Transportation

DRAWN BY: LISA CYFORD



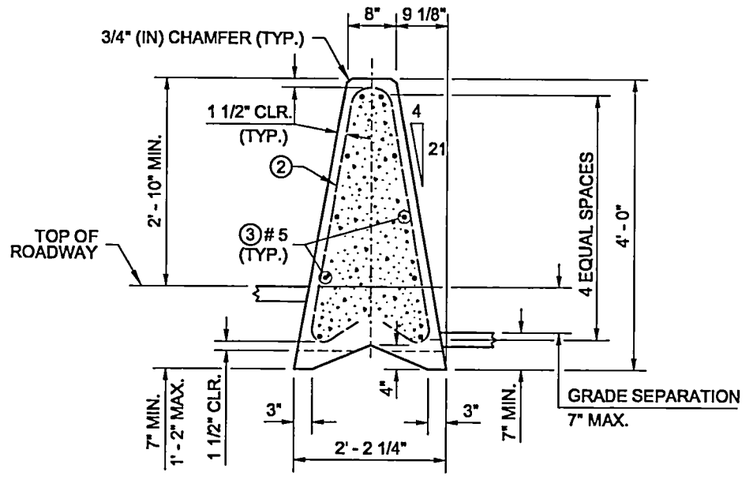
SECTION (A)

3' - 6" BARRIER
SHOWN LEVEL



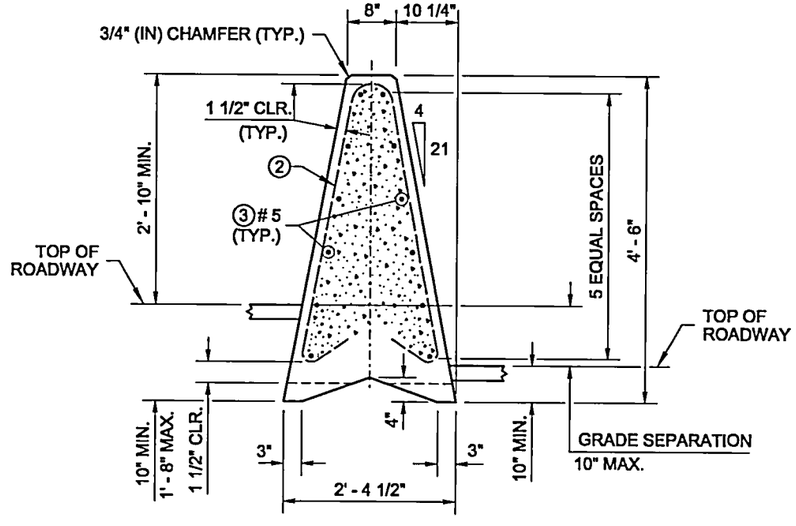
SECTION (B)

3' - 6" BARRIER FOR USE WITH A
0" (IN) TO 5" (IN) MAX. GRADE SEPARATION



SECTION (B)

4' - 0" BARRIER FOR USE WITH A
GREATER THAN 5" (IN) TO 7" (IN) MAX.
GRADE SEPARATION



SECTION (B)

4' - 6" BARRIER FOR USE WITH A
GREATER THAN 7" (IN) TO 10" (IN) MAX.
GRADE SEPARATION

STANDARD MOUNTING HEIGHT

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 19 2014 8:25 AM

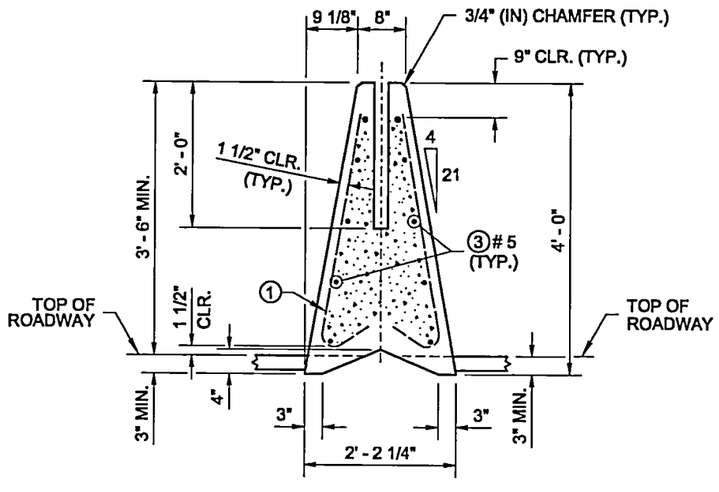
SINGLE-SLOPE CONCRETE BARRIER (PRECAST)

STANDARD PLAN C-70.10-01

SHEET 2 OF 3 SHEETS

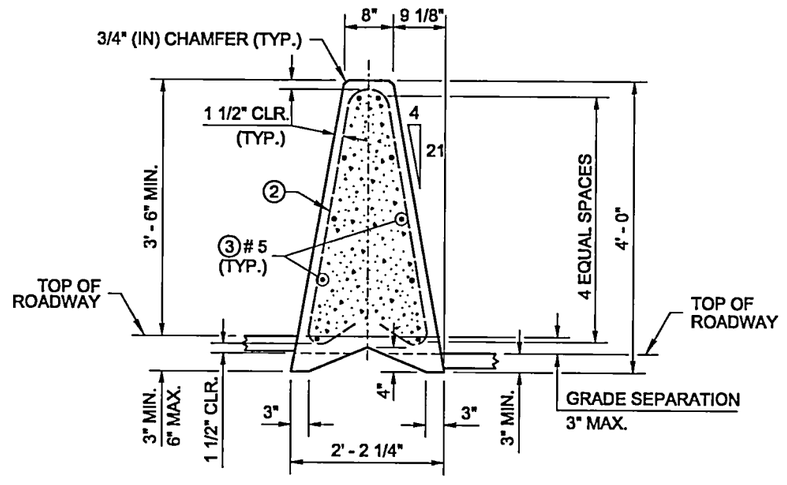
APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 17 2014 9:34 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: LISA CYFORD



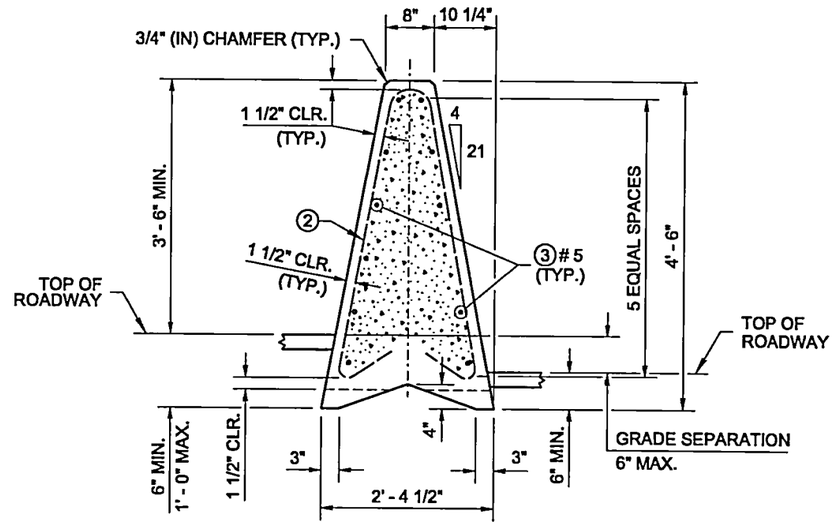
SECTION (A)

4' - 0" BARRIER
SHOWN LEVEL



SECTION (B)

4' - 0" BARRIER FOR USE WITH A
0" (IN) TO 3" (IN) MAX. GRADE SEPARATION



SECTION (B)

4' - 6" BARRIER FOR USE WITH A
GREATER THAN 3" (IN) TO 6" (IN) MAX.
GRADE SEPARATION

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 19 2014 8:26 AM

SINGLE-SLOPE CONCRETE BARRIER (PRECAST)

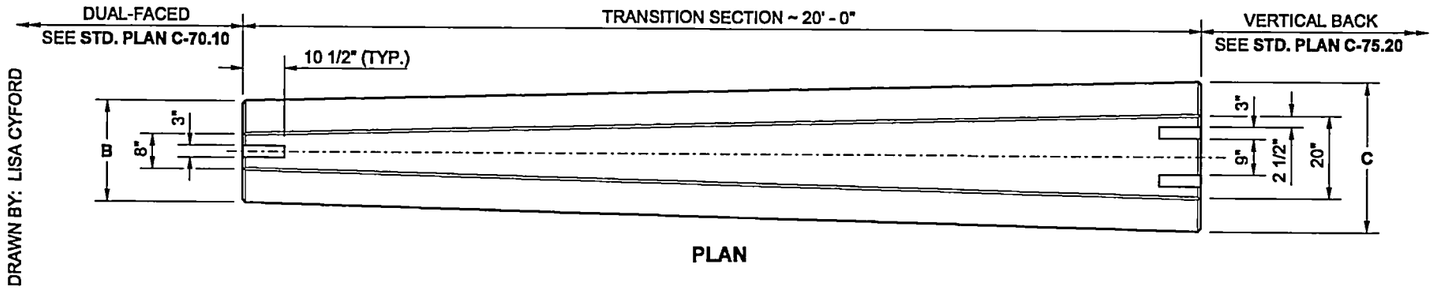
STANDARD PLAN C-70.10-01

SHEET 3 OF 3 SHEETS

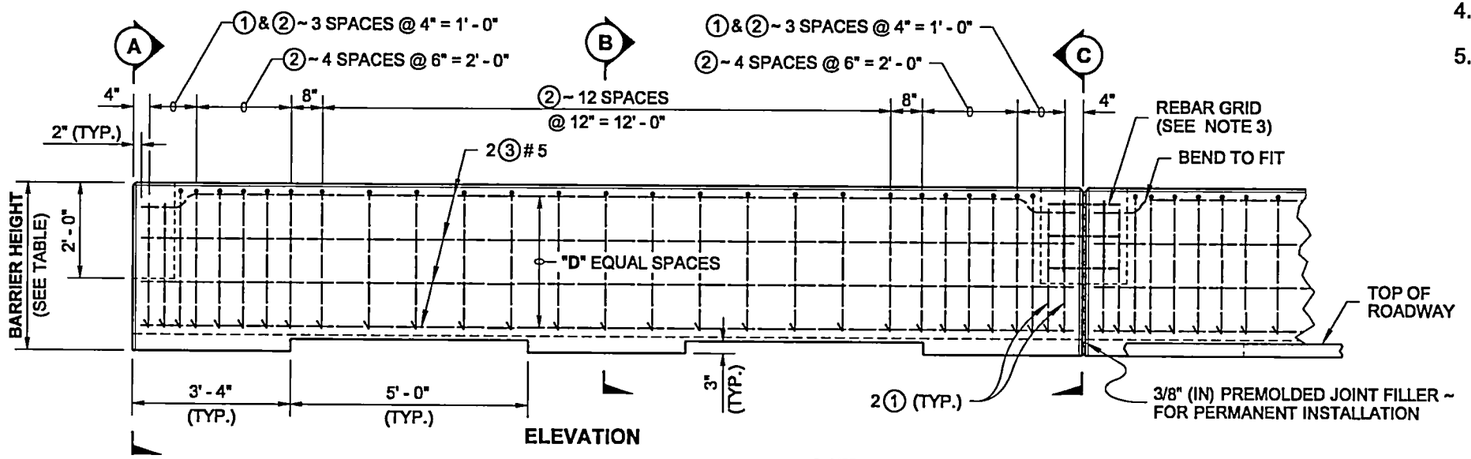
APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 17 2014 9:34 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

HIGH-PERFORMANCE BARRIER

DRAWN BY: LISA CYFORD



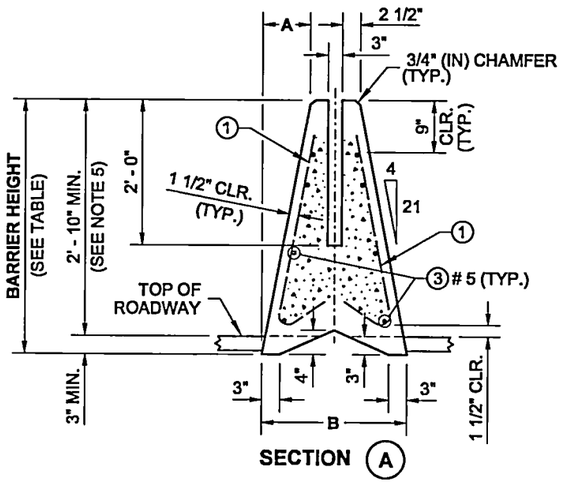
PLAN



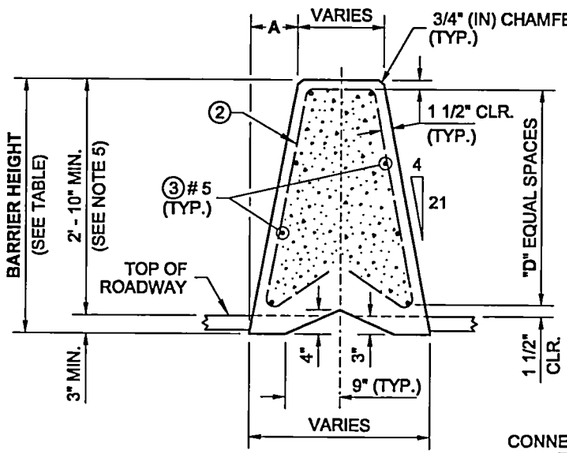
ELEVATION

NOTES

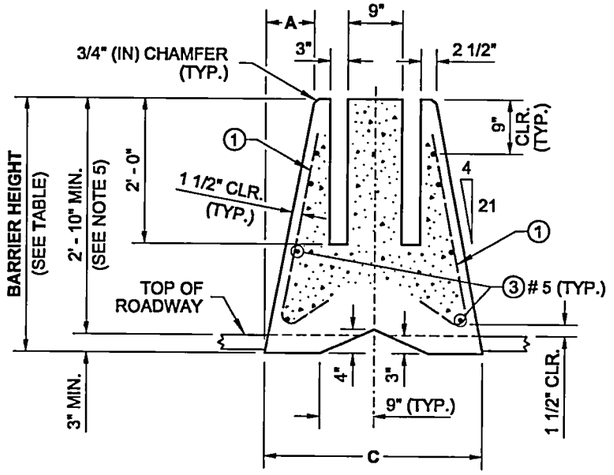
1. PERMANENT INSTALLATION requirements: Embed barrier 3" (in) minimum; install 3/8" (in) Premolded Joint Filler between segments; fill the Connection Blockout with grout, centering the Rebar Grid in the blockout before adding grout.
2. TEMPORARY INSTALLATION requirement: Place a Rebar Grid in the Connection Blockout between barrier segments.
3. See **Standard Plan C-70.10** for REBAR GRID DETAIL and BARRIER CONNECTION DETAIL.
4. This plan is for transitions to precast concrete barriers only.
5. When **High-Performance Concrete Barrier** is specified in the Contract, use the dimensions given in the H/P row in the DIMENSION TABLE, with a minimum height above roadway of 3' - 6" and a minimum embedment of 3" (in).



SECTION (A)



SECTION (B)

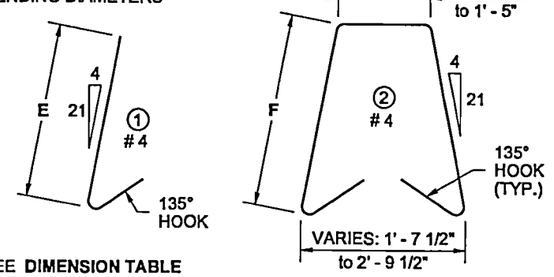


SECTION (C)

NOTE:
STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE WITH **STANDARD SPECIFICATION 6-10.3**

REINFORCING STEEL BENDING DIAGRAM

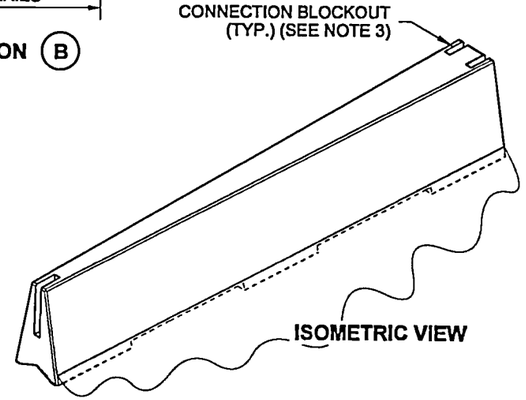
SEE **STD. SPEC. 9-07.1(2)** FOR BENDING DIAMETERS



SEE **DIMENSION TABLE**

DIMENSION TABLE (SEE NOTE 5)

	BARRIER HEIGHT	A	B	C	D	E	F	HORIZONTAL BARS (QTY.)
STD.	3' - 6"	8"	2' - 0"	3' - 0"	3	2' - 8"	2' - 9"	8
H/P	4' - 0"	9 1/8"	2' - 2 1/4"	3' - 2 1/4"	4	3' - 2"	3' - 3"	10



ISOMETRIC VIEW

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 19 2014 8:27 AM

SINGLE-SLOPE CONCRETE BARRIER (PRECAST) TRANSITION SECTION

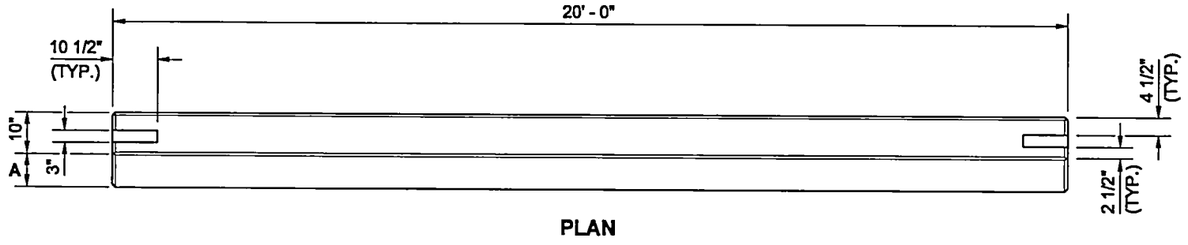
STANDARD PLAN C-75.10-01

SHEET 1 OF 1 SHEET

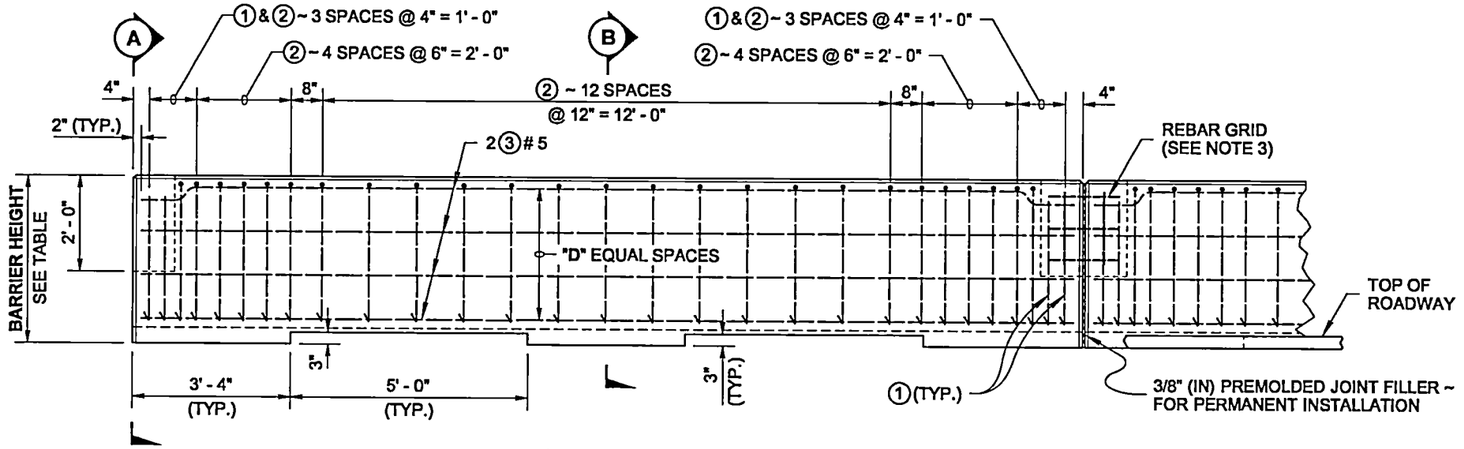
APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:13 PM
STATE DESIGN ENGINEER

Washington State Department of Transportation

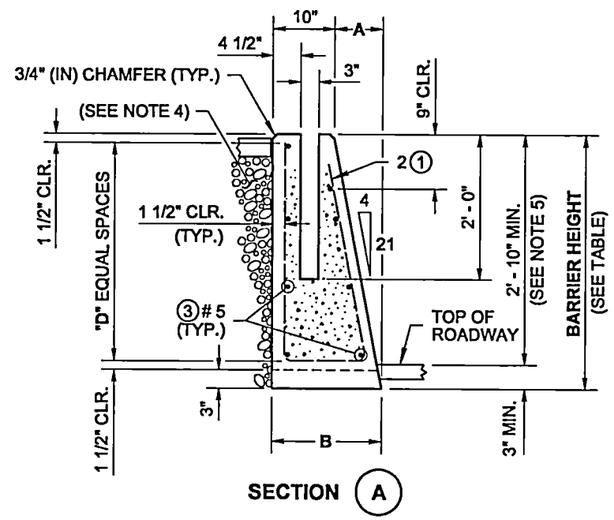
DRAWN BY: LISA CYFORD



PLAN



ELEVATION

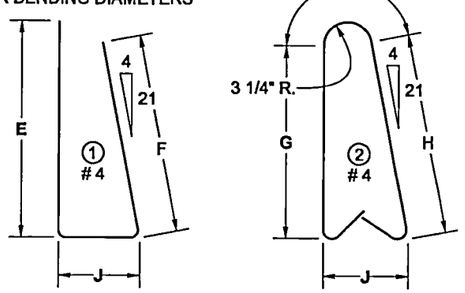


SECTION (A)

NOTE:
STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE WITH **STANDARD SPECIFICATION 6-10.3**

REINFORCING STEEL BENDING DIAGRAM

SEE **STD. SPEC. 9-07.1(2)** FOR BENDING DIAMETERS

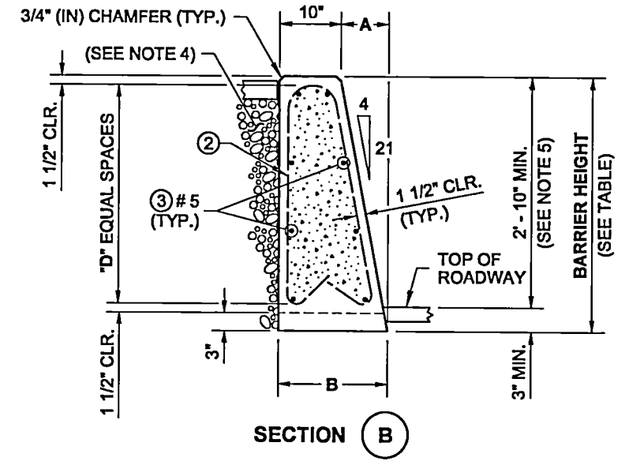


DIMENSION TABLE (SEE NOTE 5)

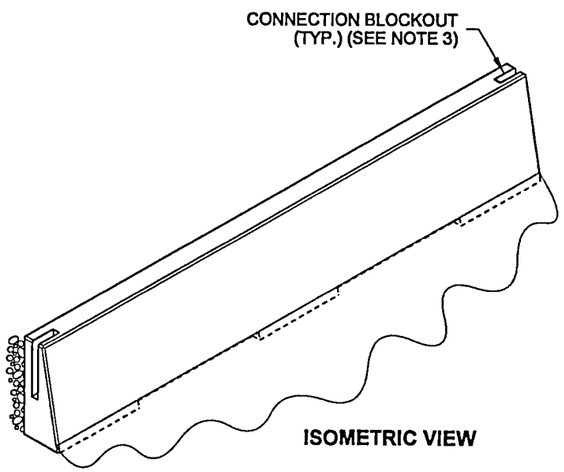
	BARRIER HEIGHT	A	B	D	E	F	G	H	J	HORIZONTAL BARS (QTY.)
STD.	3' - 6"	8"	1' - 6"	3	3' - 0"	2' - 8 1/2"	2' - 8"	2' - 9 1/2"	1' - 2"	8
H/P	4' - 0"	9 1/8"	1' - 7 1/8"	4	3' - 6"	3' - 2 1/2"	3' - 2"	3' - 3 1/2"	1' - 3"	10

NOTES

1. PERMANENT INSTALLATION requirements: Embed barrier 3" (in) minimum; install 3/8" (in) Premolded Joint Filler between segments; fill the Connection Blockout with grout, centering the Rebar Grid in the blockout before adding grout.
2. TEMPORARY INSTALLATION requirement: Place a Rebar Grid in the Connection Blockout between barrier segments.
3. See **Standard Plan C-70.10** for REBAR GRID DETAIL and BARRIER CONNECTION DETAIL.
4. Vertical Back barrier is used only in the configurations shown in **Standard Plans C-85.10** and **C-85.20,** and when placed against a retaining wall.
5. When **High-Performance Concrete Barrier** is specified in the Contract, use the dimensions given in the H/P row in the DIMENSION TABLE, with a minimum height above roadway of 3' - 6" and a minimum embedment of 3" (in).



SECTION (B)



ISOMETRIC VIEW

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 19 2014 8.28 AM

SINGLE-SLOPE CONCRETE BARRIER (PRECAST) VERTICAL BACK

STANDARD PLAN C-75.20-01

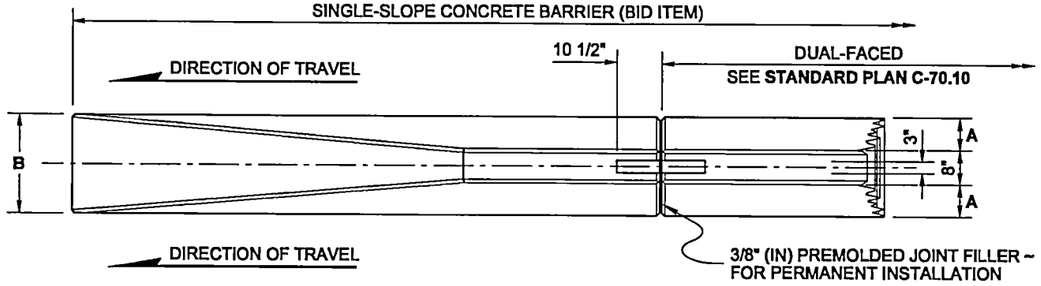
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:13 PM

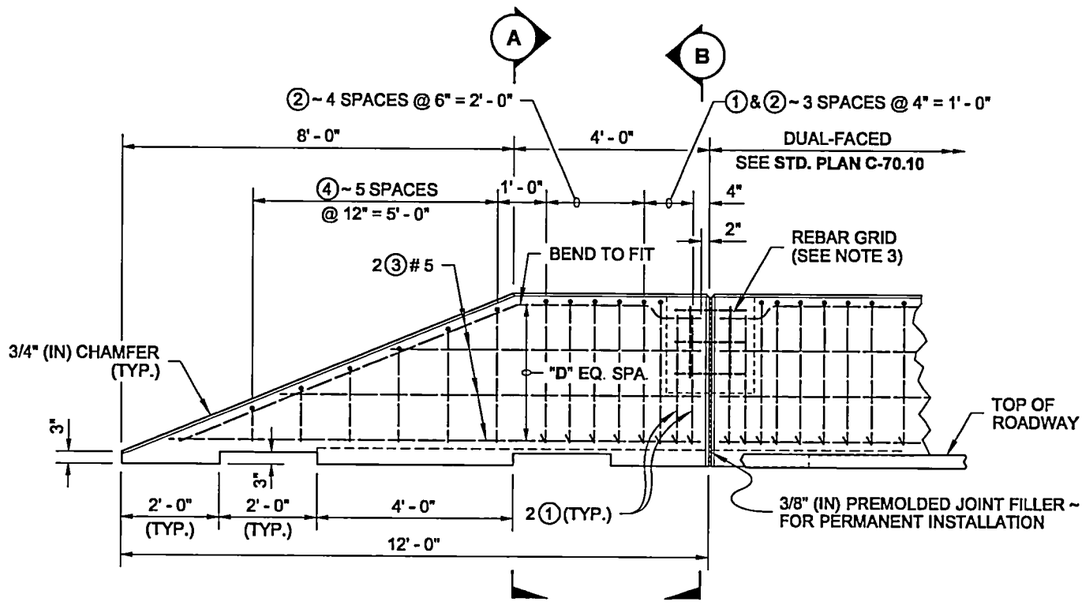
STATE DESIGN ENGINEER

Washington State Department of Transportation

DRAWN BY: LISA CYFORD



PLAN

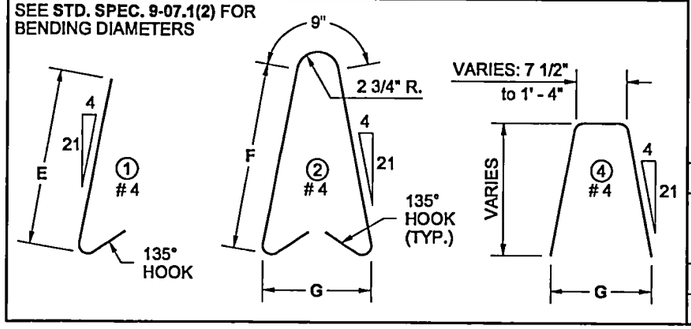


ELEVATION

NOTE:
STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE WITH **STANDARD SPECIFICATION 6-10.3**

REINFORCING STEEL BENDING DIAGRAM

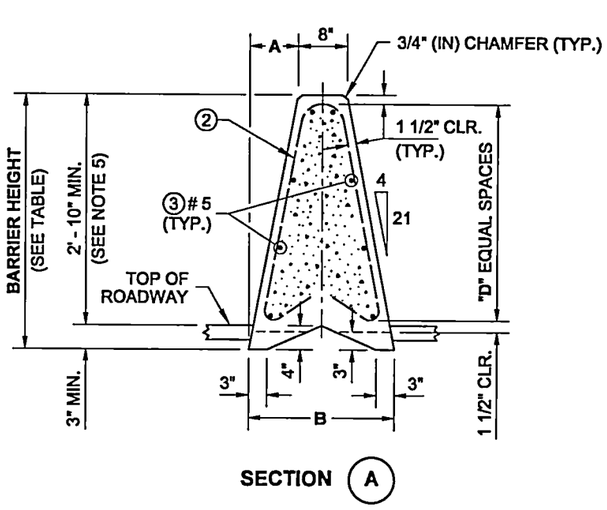
SEE **STD. SPEC. 9-07.1(2)** FOR BENDING DIAMETERS



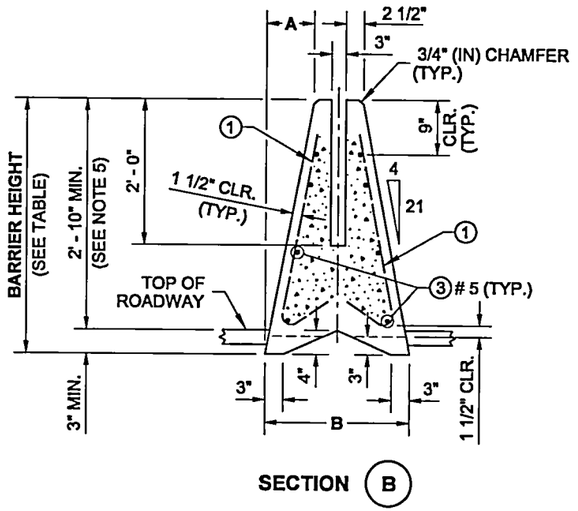
DIMENSION TABLE (SEE NOTE 5)								
	BARRIER HEIGHT	A	B	D	E	F	G	HORIZONTAL BARS (QTY.)
STD.	3' - 6"	8"	2' - 0"	3	2' - 8"	2' - 9"	1' - 7"	8
H/P	4' - 0"	9 1/8"	2' - 2 1/4"	4	3' - 2"	3' - 3"	1' - 9"	10

NOTES

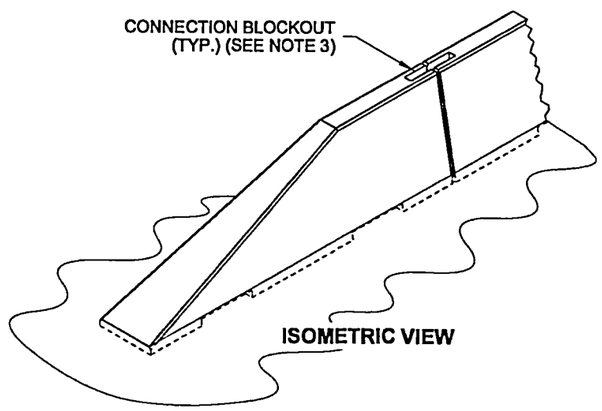
1. PERMANENT INSTALLATION requirements: Embed barrier 3" (in) minimum; install 3/8" (in) Premolded Joint Filler between segments; fill the Connection Blockout with grout, centering the Rebar Grid in the blockout before adding grout.
2. TEMPORARY INSTALLATION requirement: Place a Rebar Grid in the Connection Blockout between barrier segments.
3. See **Standard Plan C-70.10** for REBAR GRID DETAIL and BARRIER CONNECTION DETAIL.
4. The Terminal is used only on the trailing end of a barrier, unless otherwise shown in the Contract.
5. When **High-Performance Concrete Barrier** is specified in the Contract, use the dimensions given in the H/P row in the DIMENSION TABLE, with a minimum height above roadway of 3' - 6" and a minimum embedment of 3" (in).



SECTION (A)



SECTION (B)



ISOMETRIC VIEW

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 19 2014 8:28 AM

SINGLE-SLOPE CONCRETE BARRIER (PRECAST) TERMINAL

STANDARD PLAN C-75.30-01

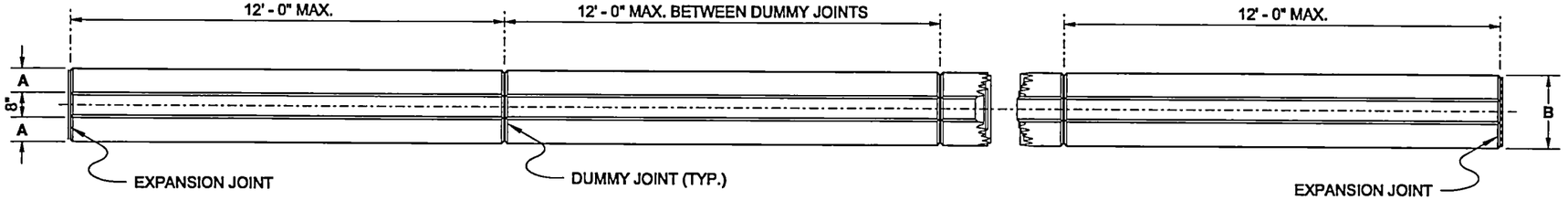
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:13 PM

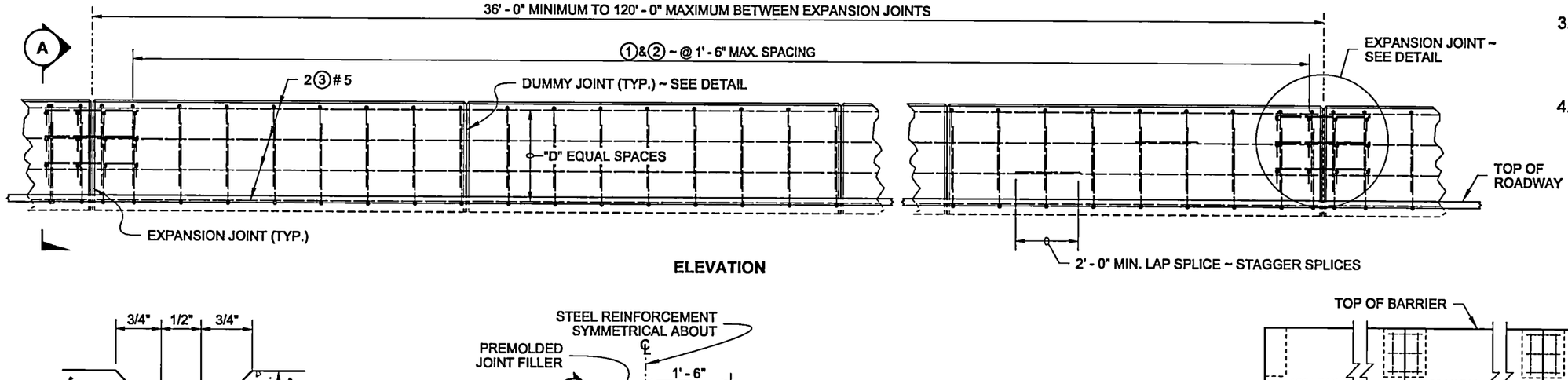
STATE DESIGN ENGINEER

Washington State Department of Transportation

DRAWN BY: LISA CYFORD



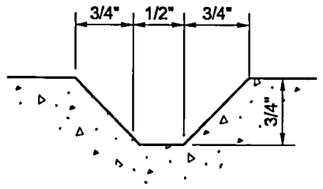
PLAN



ELEVATION

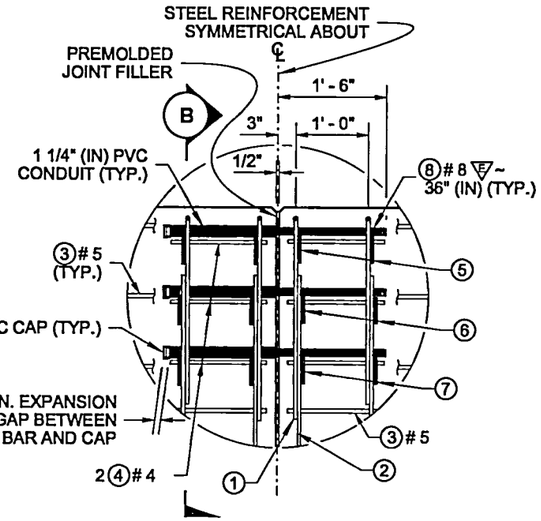
NOTES

1. Reinforcing steel dimensions and clearances are shown for stationary form construction. When slipform construction is used, increase reinforcing steel clearances to the outside surfaces of the barrier to 2 1/2" (in) and adjust the rebar dimensions as required.
2. When connecting between cast-in-place and pre-cast single-slope barrier, provide a Blockout, Rebar Grid, and added rebar, as shown in **Standard Plan C-70.10.**
3. The actual dimensions will vary as the grades change and the barrier transitions in height and width. The dimensions may be interpolated for intermediate barrier heights.
4. For barrier with a 2' - 10" reveal, see Sheet 2. For High-Performance Barrier with a 3' - 6" reveal, see Sheet 3.



TYPICAL SECTION

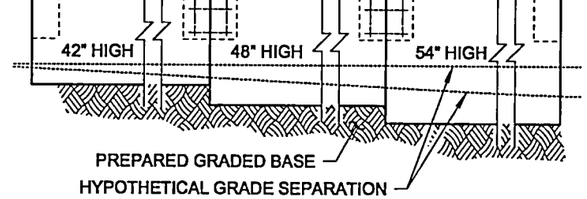
DUMMY JOINT DETAIL



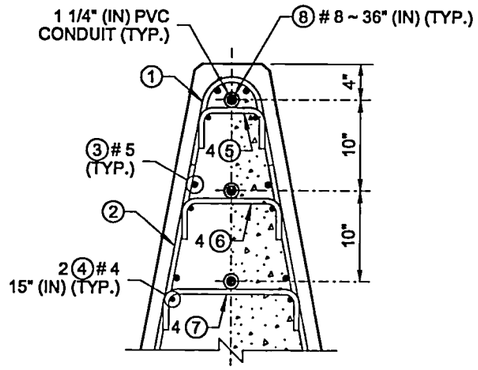
ENSURE NO CEMENT CONCRETE ENTERS THE PVC CONDUIT WHEN POURING

▽ = EPOXY COATED

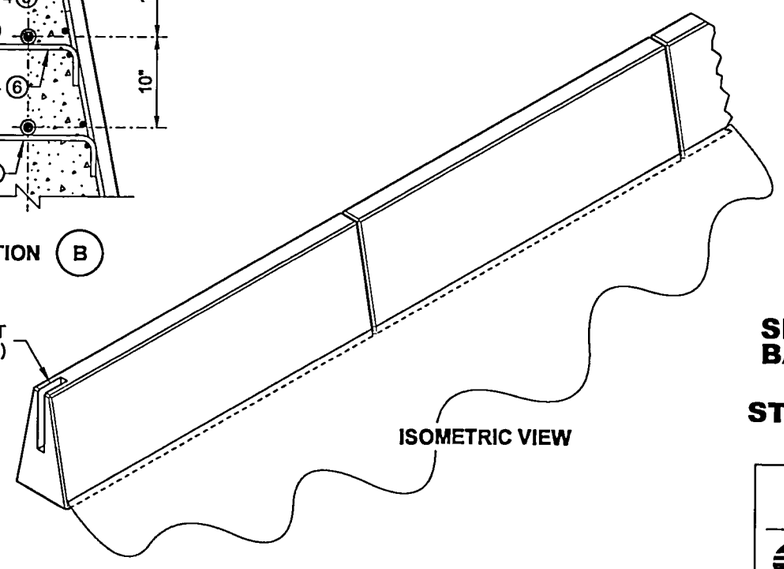
EXPANSION JOINT DETAIL



BARRIER TRANSITION DETAIL



SECTION (B)

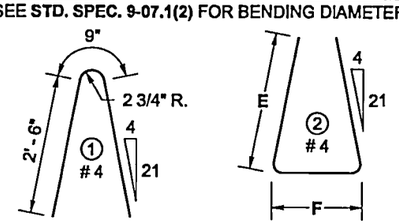


ISOMETRIC VIEW

NOTE:
STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE WITH **STANDARD SPECIFICATION 6-10.3**

REINFORCING STEEL BENDING DIAGRAM

SEE **STD. SPEC. 9-07.1(2)** FOR BENDING DIAMETERS



⑤ 7 1/4"
⑥ 11"
⑦ 15"

⑤ #4
⑥ #4
⑦ #4

(SEE NOTE 3)

DIMENSION TABLE (SEE NOTE 3)

BARRIER HEIGHT	A	B	D	E	F	HORIZONTAL BARS (QTY.)
3' - 6"	8"	2' - 0"	3	2' - 6"	1' - 8"	8
4' - 0"	9 1/8"	2' - 2 1/4"	4	3' - 0"	1' - 10"	10
4' - 6"	10 1/4"	2' - 4 1/2"	5	3' - 6 1/2"	2' - 0"	12

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 19 2014 8:30 AM

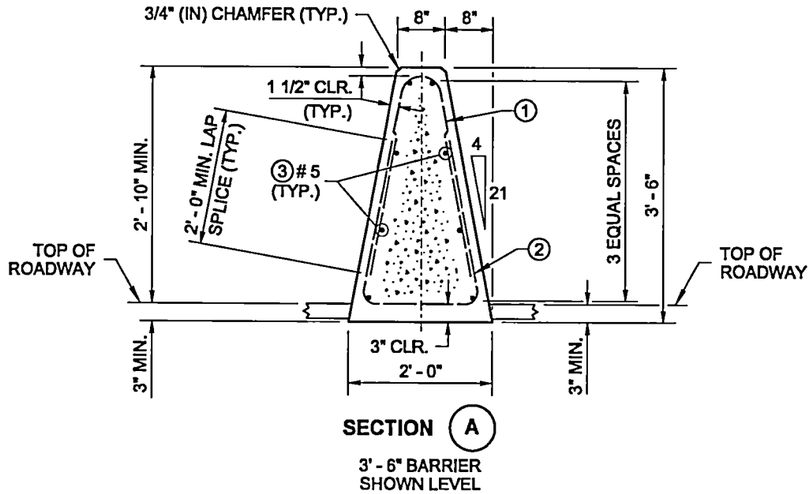
SINGLE-SLOPE CONCRETE BARRIER (CAST-IN-PLACE) DUAL-FACED

STANDARD PLAN C-80.10-01

SHEET 1 OF 3 SHEETS

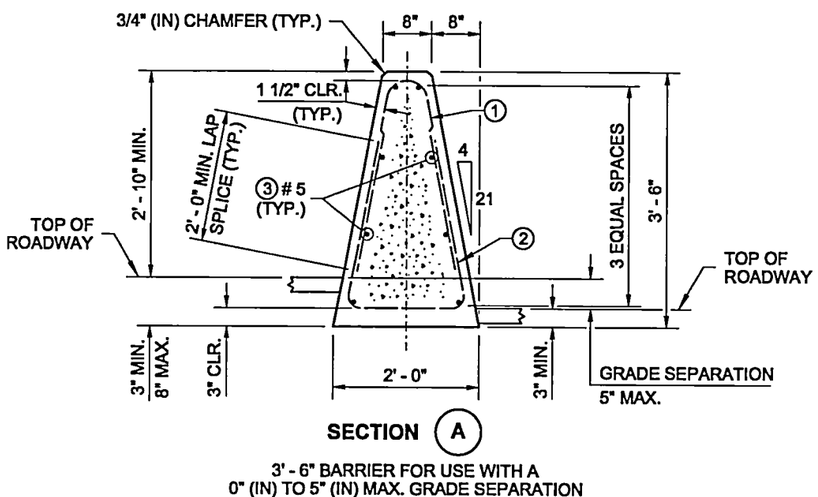
APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:14 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: LISA CYFORD



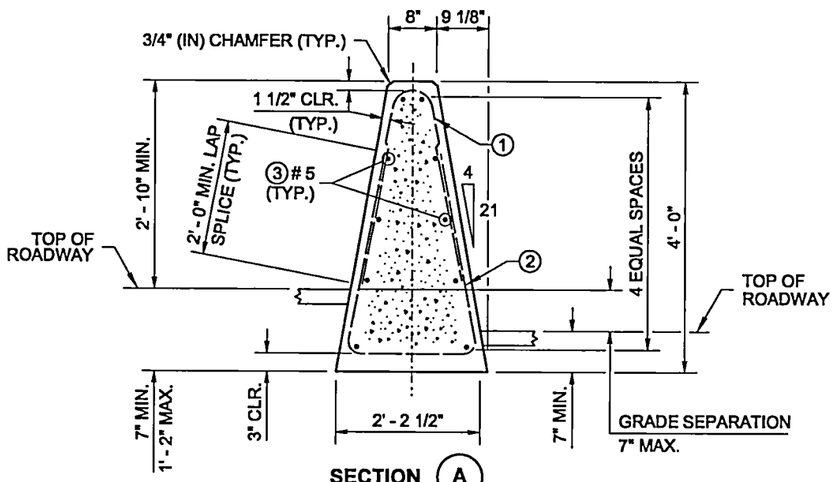
SECTION (A)

3' - 6" BARRIER
SHOWN LEVEL



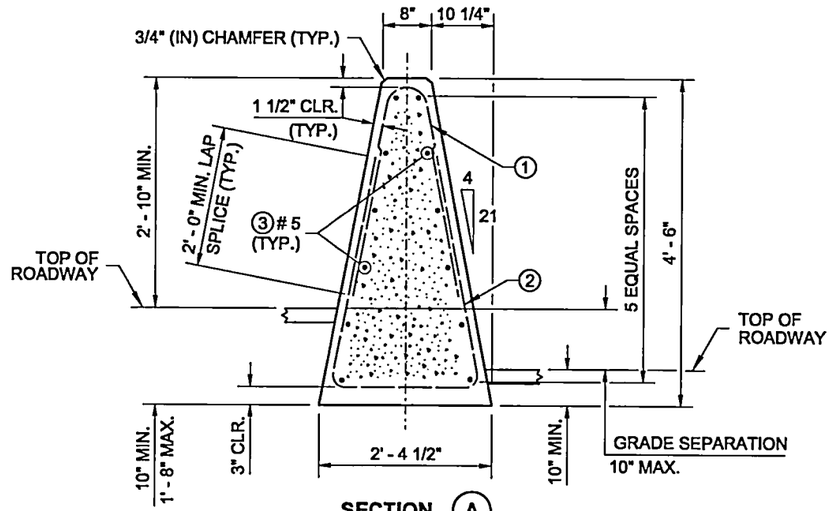
SECTION (A)

3' - 6" BARRIER FOR USE WITH A
0" (IN) TO 5" (IN) MAX. GRADE SEPARATION
(SEE NOTE 3)



SECTION (A)

4' - 0" BARRIER FOR USE WITH A
GREATER THAN 5" (IN) TO 7" (IN) MAX.
GRADE SEPARATION
(SEE NOTE 3)



SECTION (A)

4' - 6" BARRIER FOR USE WITH A
GREATER THAN 7" (IN) TO 10" (IN) MAX.
GRADE SEPARATION
(SEE NOTE 3)

STANDARD MOUNTING HEIGHT

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 19 2014 8:30 AM

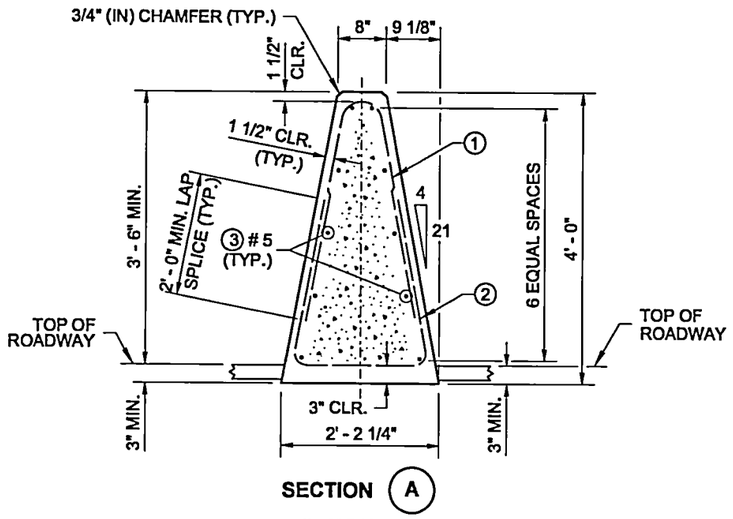
SINGLE-SLOPE CONCRETE BARRIER (CAST-IN-PLACE) DUAL-FACED

STANDARD PLAN C-80.10-01

SHEET 2 OF 3 SHEETS

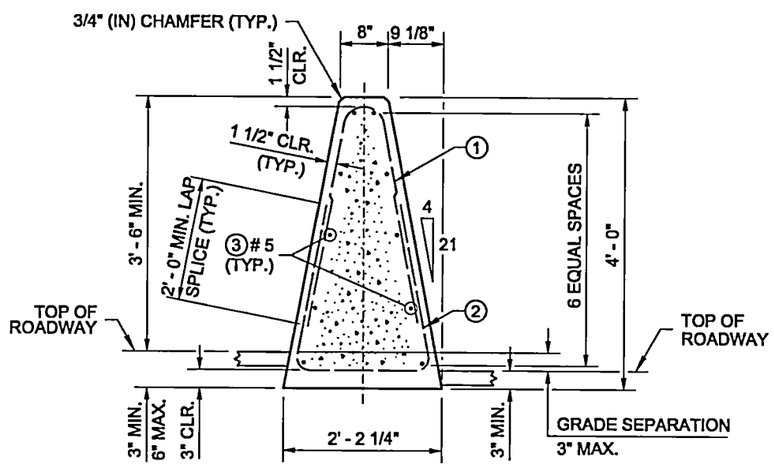
APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:14 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: LISA CYFORD



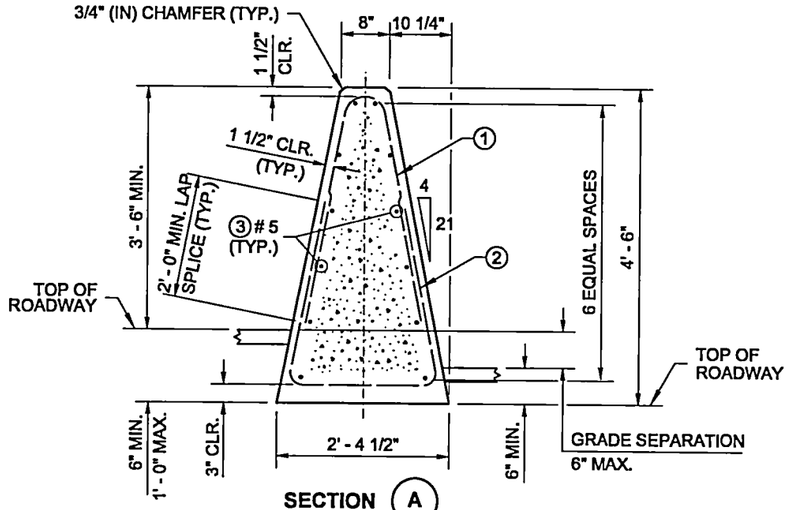
SECTION (A)

4' - 0" BARRIER SHOWN LEVEL



SECTION (A)

4' - 0" BARRIER FOR USE WITH A 0" (IN) TO 3" (IN) MAX. GRADE SEPARATION (SEE NOTE 3)



SECTION (A)

4' - 6" BARRIER FOR USE WITH A GREATER THAN 3" (IN) TO 6" (IN) MAX. GRADE SEPARATION (SEE NOTE 3)

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 19 2014 8:30 AM

SINGLE-SLOPE CONCRETE BARRIER (CAST-IN-PLACE) DUAL-FACED

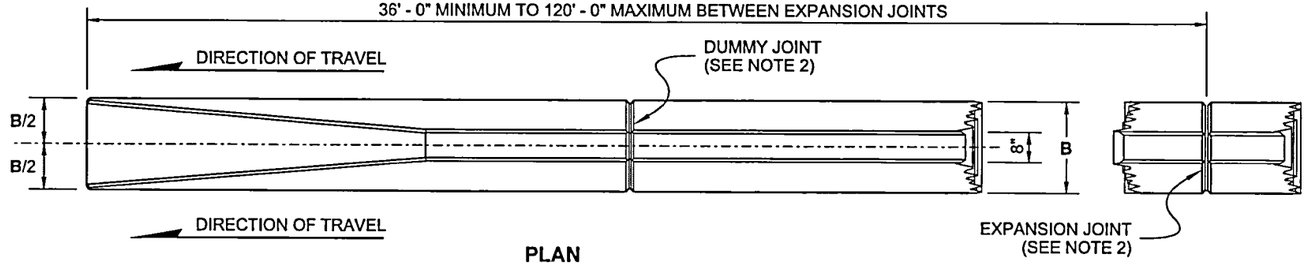
STANDARD PLAN C-80.10-01

SHEET 3 OF 3 SHEETS

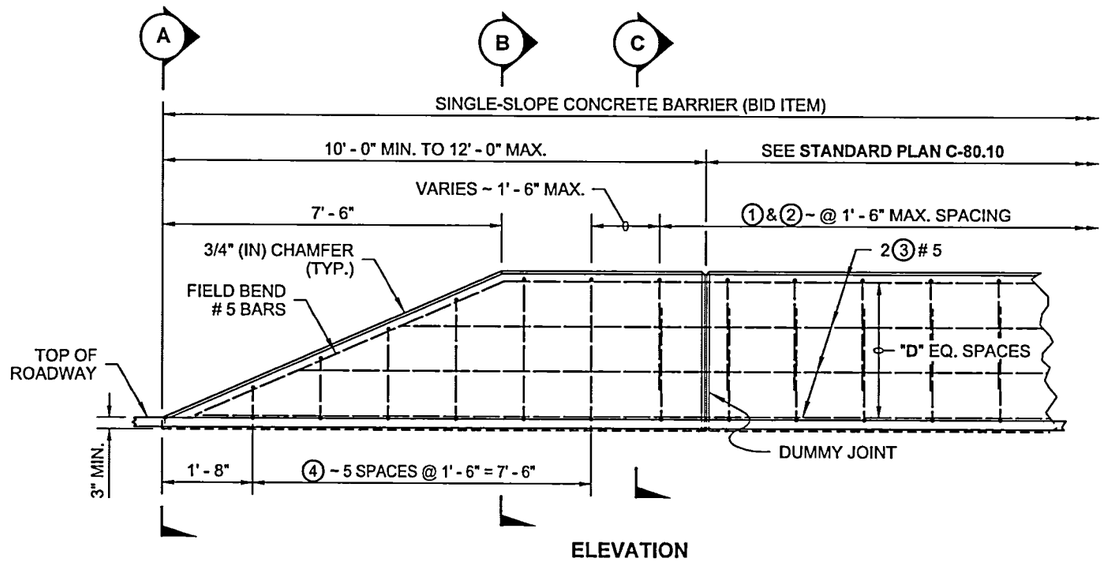
APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:14 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

HIGH-PERFORMANCE BARRIER

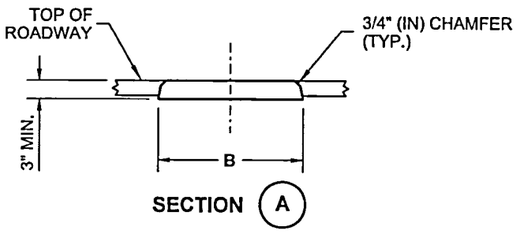
DRAWN BY: LISA CYFORD



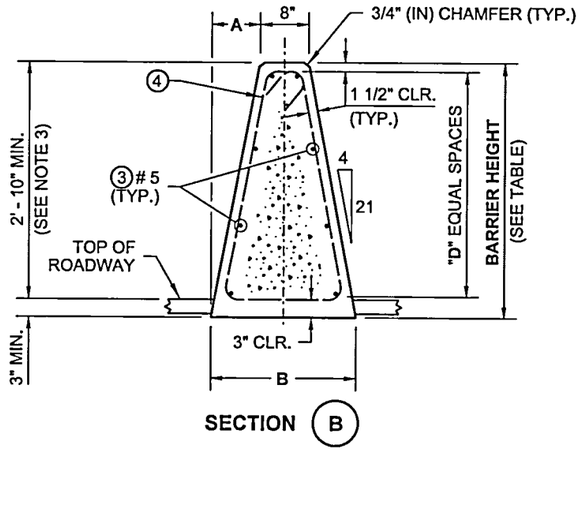
PLAN



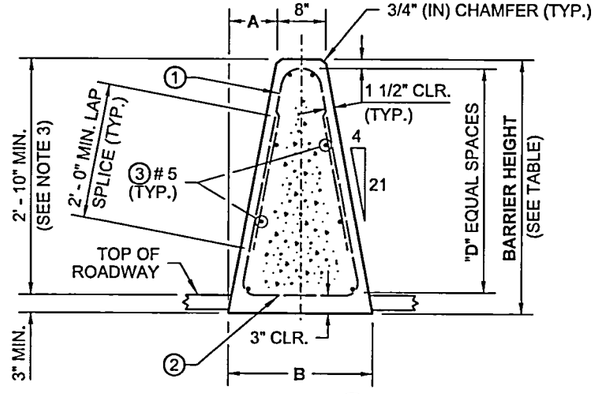
ELEVATION



SECTION (A)



SECTION (B)



SECTION (C)

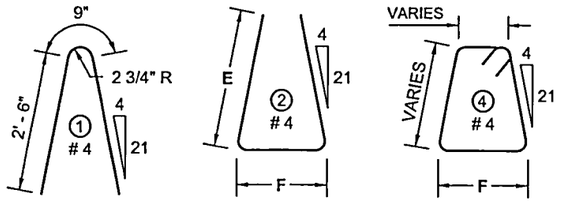
NOTES

1. The Terminal is used only on the trailing end of a barrier, unless otherwise shown in the Contract.
2. See **Standard Plan C-80.10**, Sheet 1, for EXPANSION JOINT and DUMMY JOINT details.
3. When **High-Performance Concrete Barrier** is specified in the Contract, use the dimensions given in the H/P row in the DIMENSION TABLE, with a minimum height above roadway of 3' - 6" and a minimum embedment of 3" (in).

NOTE:
STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE WITH **STANDARD SPECIFICATION 6-10.3**

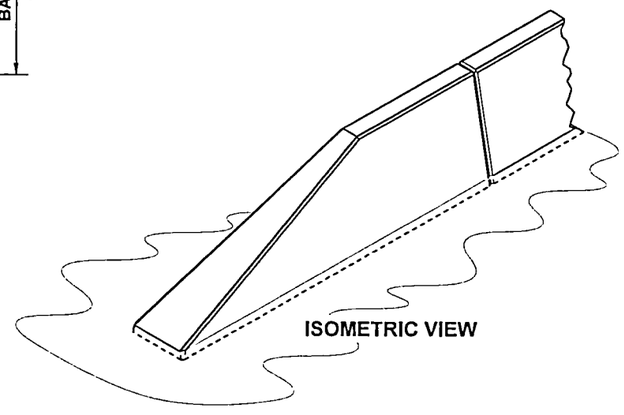
REINFORCING STEEL BENDING DIAGRAM

SEE **STD. SPEC. 9-07.1(2)** FOR BENDING DIAMETERS



DIMENSION TABLE (SEE NOTE 3)

	BARRIER HEIGHT	A	B	D	E	F	HORIZONTAL BARS (QTY.)
STD.	3' - 6"	8"	2' - 0"	3	2' - 6"	1' - 8"	8
H/P	4' - 0"	9 1/8"	2' - 2 1/4"	4	3' - 0"	1' - 10"	10



ISOMETRIC VIEW

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 19 2014 8:31 AM

SINGLE-SLOPE CONCRETE BARRIER (CAST-IN-PLACE) TERMINAL

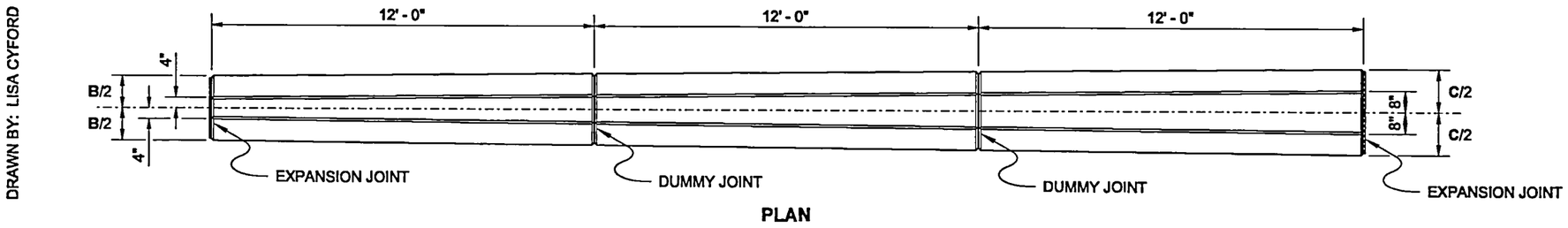
STANDARD PLAN C-80.20-01

SHEET 1 OF 1 SHEET

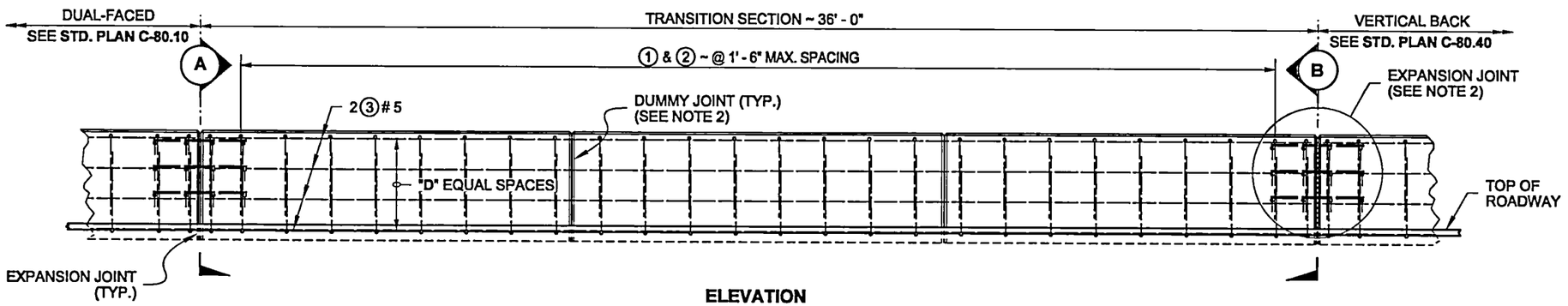
APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:18 PM
STATE DESIGN ENGINEER

Washington State Department of Transportation

DRAWN BY: LISA CYFORD



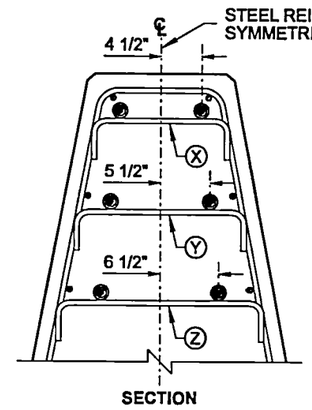
PLAN

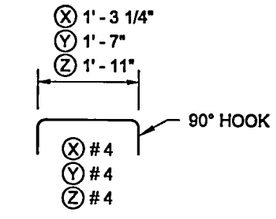


ELEVATION

NOTES

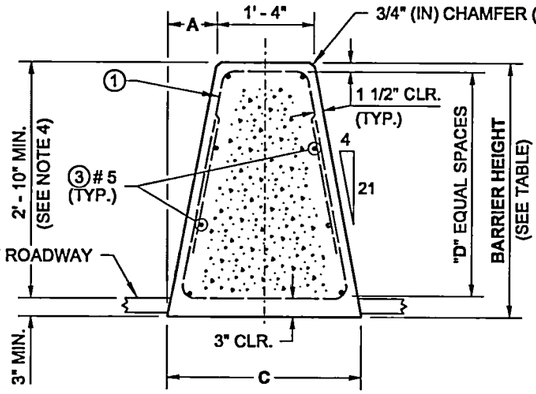
1. The Transition Section is used in the configurations shown in **Standard Plans C-85.10** and **C-85.11.**
2. See **Standard Plan C-80.10,** Sheet 1, for EXPANSION JOINT and DUMMY JOINT details. Modify rebar on wider end as shown in EXPANSION JOINT MODIFICATION.
3. Reinforcing steel dimensions and clearances are shown for stationary form construction. When slip-form construction is used, increase reinforcing steel clearances to the outside surfaces of the barrier to 2 1/2" (in) and adjust steel dimensions as required.
4. When **High-Performance Concrete Barrier** is specified in the Contract, use the dimensions given in the H/P row in the DIMENSION TABLE, with a minimum height above roadway of 3' - 6" and a minimum embedment of 3" (in).



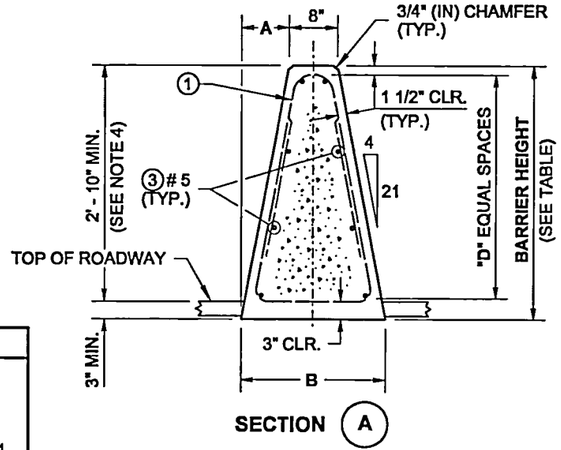


REINFORCING STEEL BENDING DIAGRAM

EXPANSION JOINT MODIFICATION
(SEE NOTE 2)



SECTION (B)

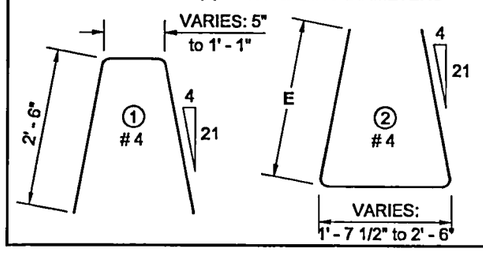


SECTION (A)

NOTE:
STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE WITH **STANDARD SPECIFICATION 6-10.3**

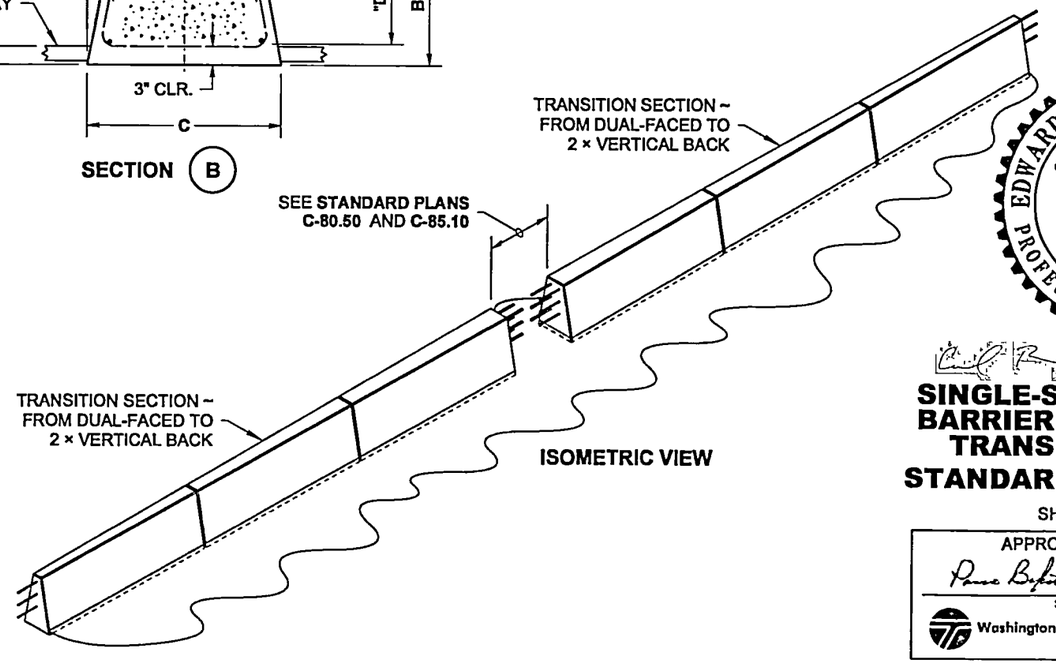
REINFORCING STEEL BENDING DIAGRAM

SEE **STD. SPEC. 9-07.1(2)** FOR BENDING DIAMETERS



DIMENSION TABLE (SEE NOTE 4)

	BARRIER HEIGHT	A	B	C	D	E	HORIZONTAL BARS (QTY.)
STD.	3' - 6"	8"	2' - 0"	2' - 8"	3	2' - 6"	8
H/P	4' - 0"	9 1/8"	2' - 2 1/4"	2' - 10 1/4"	4	3' - 0"	10



ISOMETRIC VIEW

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 19 2014 8:32 AM

SINGLE-SLOPE CONCRETE BARRIER (CAST-IN-PLACE) TRANSITION SECTION

STANDARD PLAN C-80.30-01

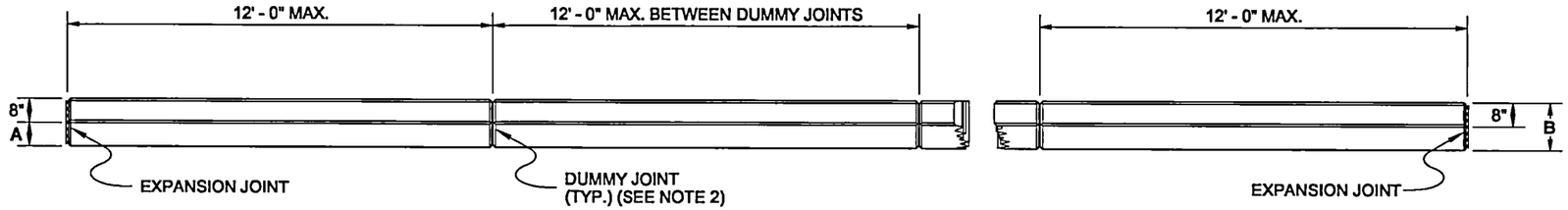
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:19 PM

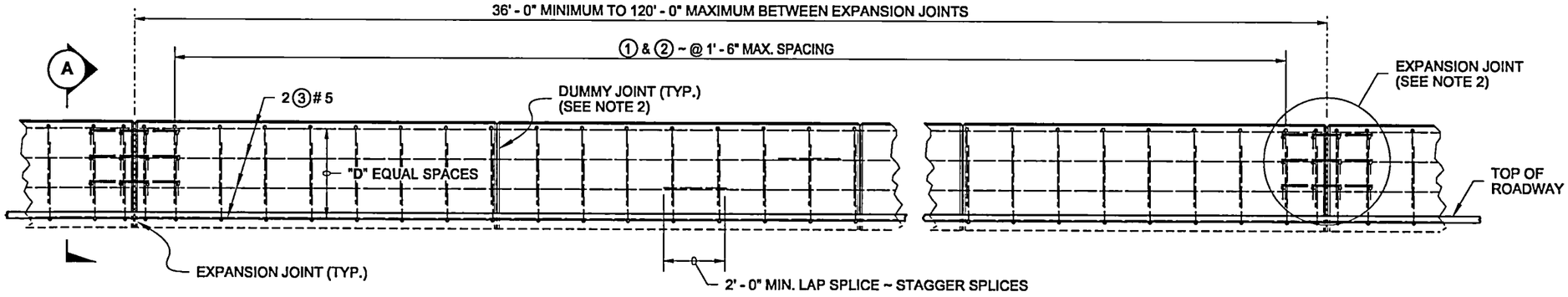
STATE DESIGN ENGINEER

Washington State Department of Transportation

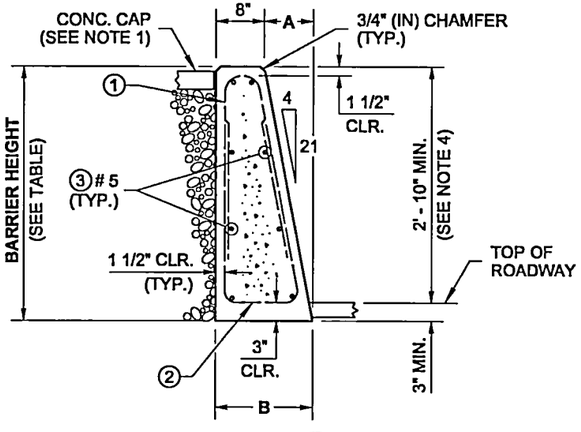
DRAWN BY: LISA CYFORD



PLAN



ELEVATION

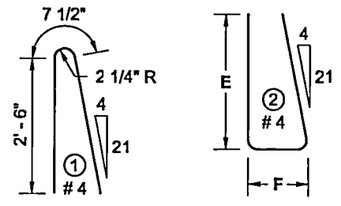


SECTION (A)

NOTE:
STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE WITH **STANDARD SPECIFICATION 6-10.3**

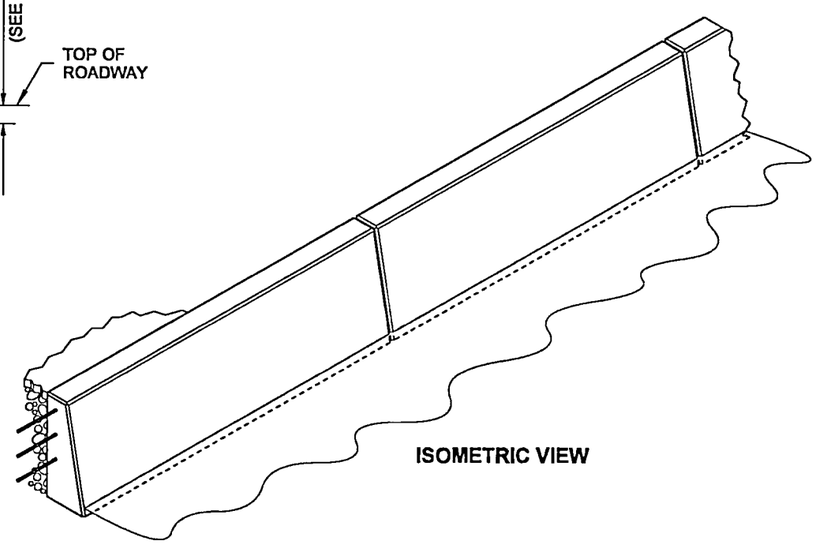
REINFORCING STEEL BENDING DIAGRAM

SEE STD. SPEC. 9-07.1(2) FOR BENDING DIAMETERS



DIMENSION TABLE (SEE NOTE 4)

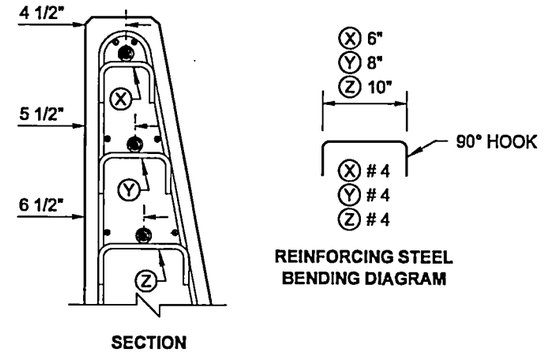
	BARRIER HEIGHT	A	B	D	E	F	HORIZONTAL BARS (QTY.)
STD.	3' - 6"	8"	1' - 4"	3	2' - 6"	1' - 0 1/4"	8
H/P	4' - 0"	9 1/8"	1' - 5 1/8"	4	3' - 0"	1' - 1 1/2"	10



ISOMETRIC VIEW

NOTES

1. The Vertical Back barrier is used only in the configurations shown in **Standard Plans C-85.10** and **C-85.11,** and when placed against a retaining wall.
2. See **Standard Plan C-80.10,** Sheet 1, for EXPANSION JOINT and DUMMY JOINT details. Modify rebar as shown in EXPANSION JOINT MODIFICATION.
3. Reinforcing steel dimensions and clearances are shown for stationary form construction. When slip-form construction is used, increase reinforcing steel clearances to the outside surfaces of the barrier to 2 1/2" (in) and adjust steel dimensions as required.
4. When **High-Performance Concrete Barrier** is specified in the Contract, use the dimensions given in the H/P row in the DIMENSION TABLE, with a minimum height above roadway of 3' - 6" and a minimum embedment of 3" (in).



EXPANSION JOINT MODIFICATION
(SEE NOTE 2)

EDWARD PATRICK BARRY
STATE OF WASHINGTON
34363
REGISTERED
PROFESSIONAL ENGINEER

Barry, Ed
May 19 2014 8:33 AM

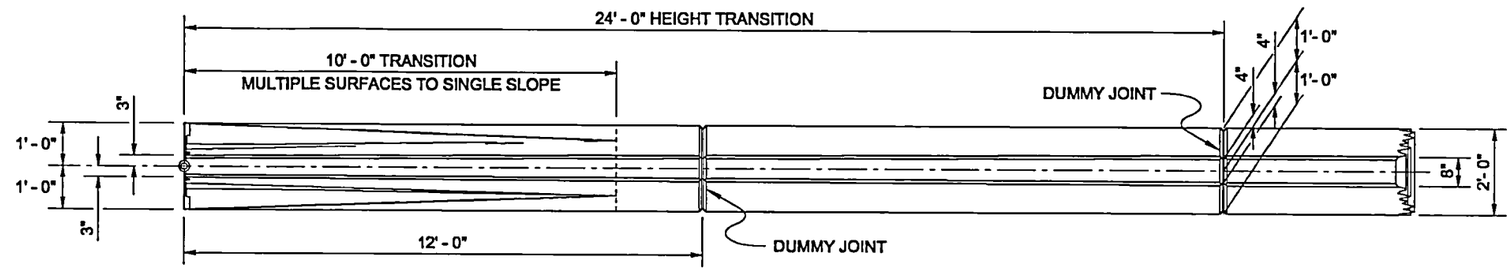
SINGLE-SLOPE CONCRETE BARRIER (CAST-IN-PLACE) VERTICAL BACK

STANDARD PLAN C-80.40-01

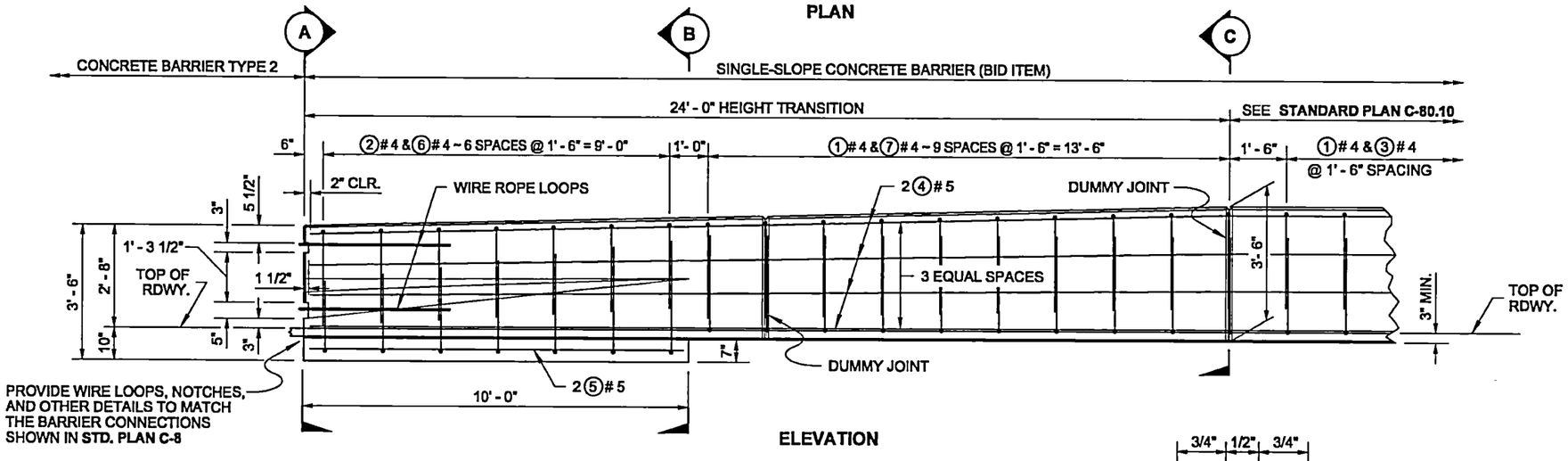
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:19 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: LISA CYFORD



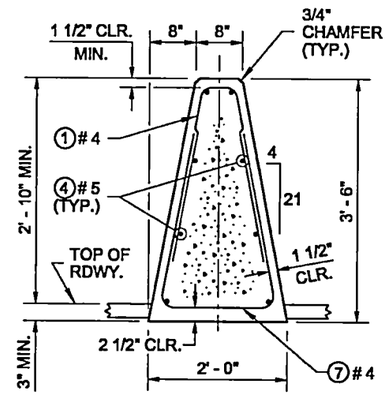
PLAN



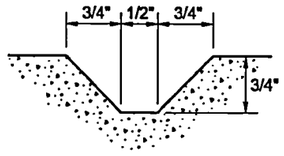
ELEVATION

NOTE

This plan is for transitions to Precast Concrete Barrier Type 2 only. See contract for transitions to other barrier shapes and bridge rails.



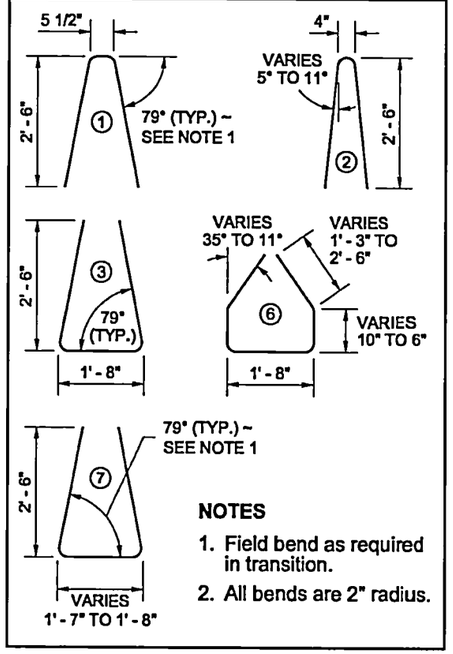
SECTION (C)



DUMMY JOINT

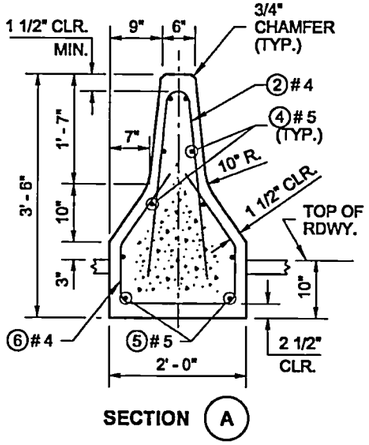
ISOMETRIC VIEW

REINFORCING STEEL BENDING DIAGRAM

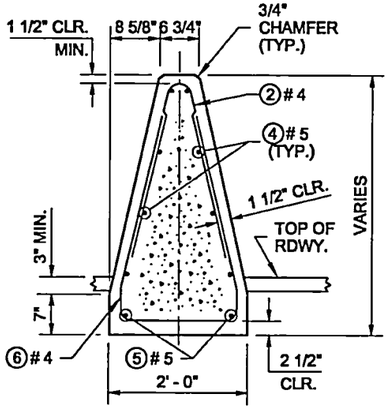


NOTES

1. Field bend as required in transition.
2. All bends are 2" radius.



SECTION (A)



SECTION (B)

TERRY L. BERENDS
STATE OF WASHINGTON
22350
REGISTERED
PROFESSIONAL ENGINEER
4/16/12

CONCRETE BARRIER TRANSITION TYPE 2 TO SINGLE-SLOPE STANDARD PLAN C-80.50-00

SHEET 1 OF 1 SHEET

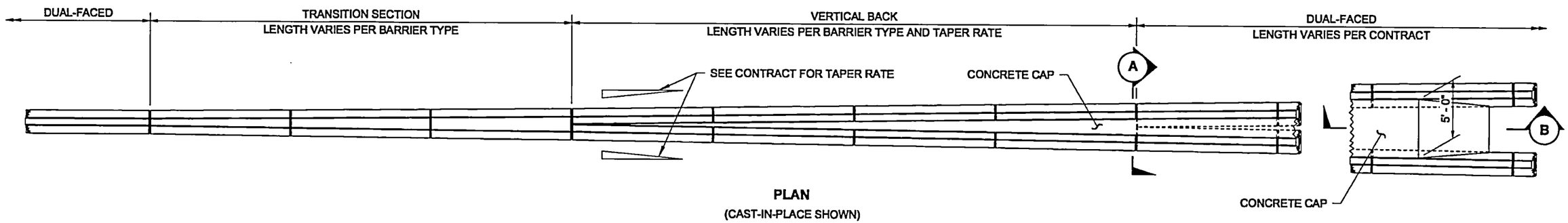
APPROVED FOR PUBLICATION

Lasso Bozorthuu 4/18/12

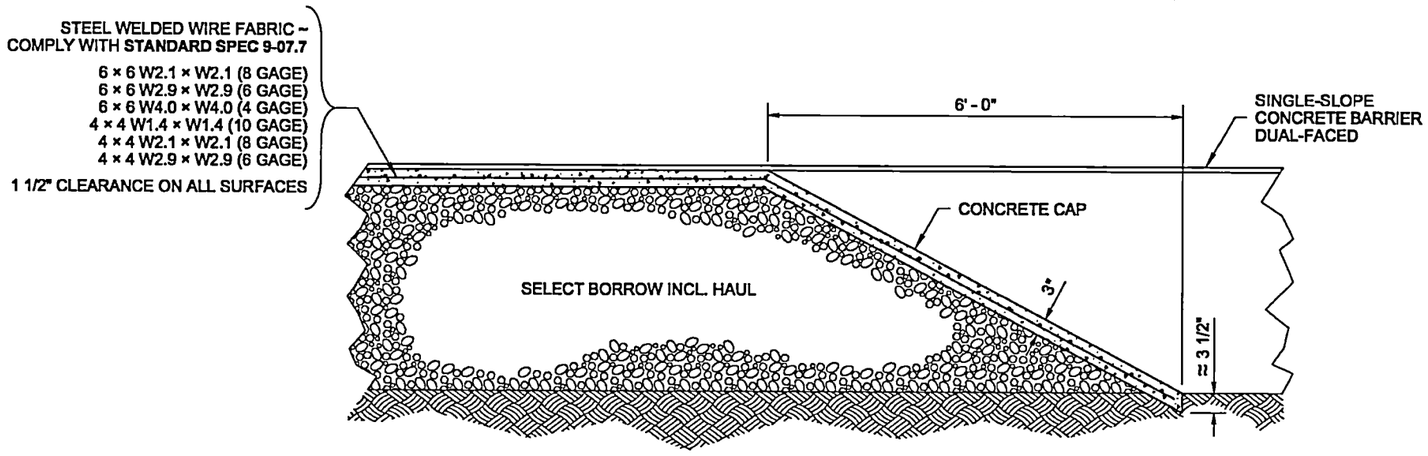
STATE DESIGN ENGINEER — DATE

Washington State Department of Transportation

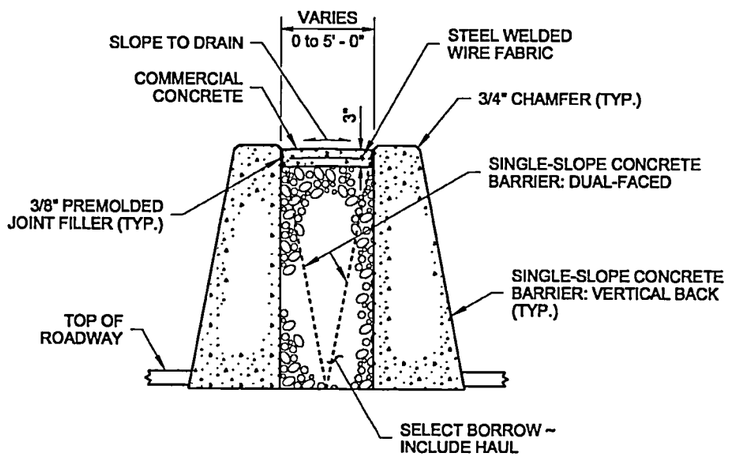
DRAWN BY: LISA CYFORD



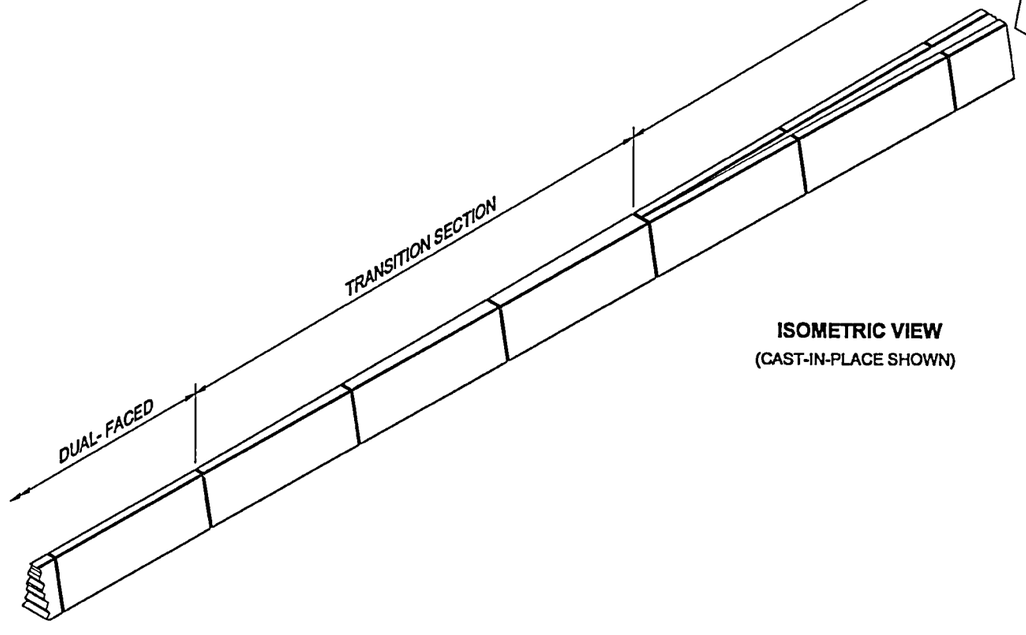
PLAN
(CAST-IN-PLACE SHOWN)



SECTION (B)



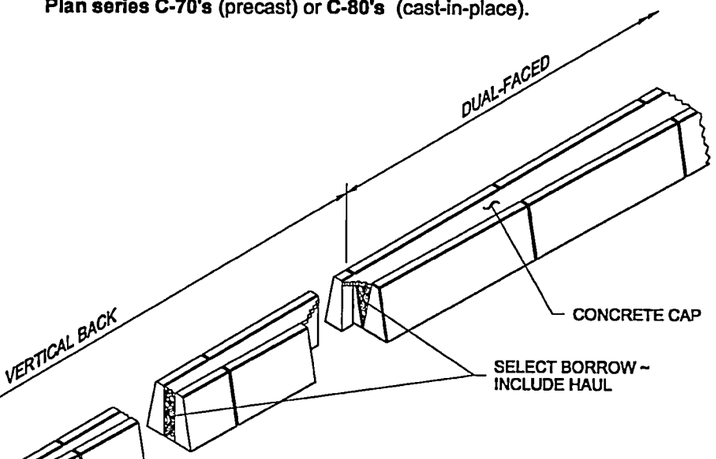
SECTION (A)

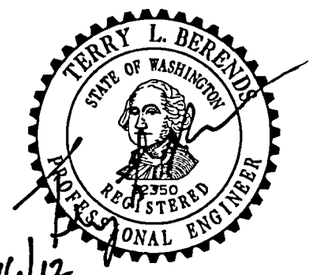


ISOMETRIC VIEW
(CAST-IN-PLACE SHOWN)

NOTES

1. Use the barrier type, precast or cast-in-place, as specified in the Contract.
2. For Single-Slope Concrete Barrier details, see **Standard Plan series C-70's** (precast) or **C-80's** (cast-in-place).





4/16/12

SINGLE-SLOPE CONCRETE BARRIER PLACEMENT (SPLIT)

STANDARD PLAN C-85.10-00

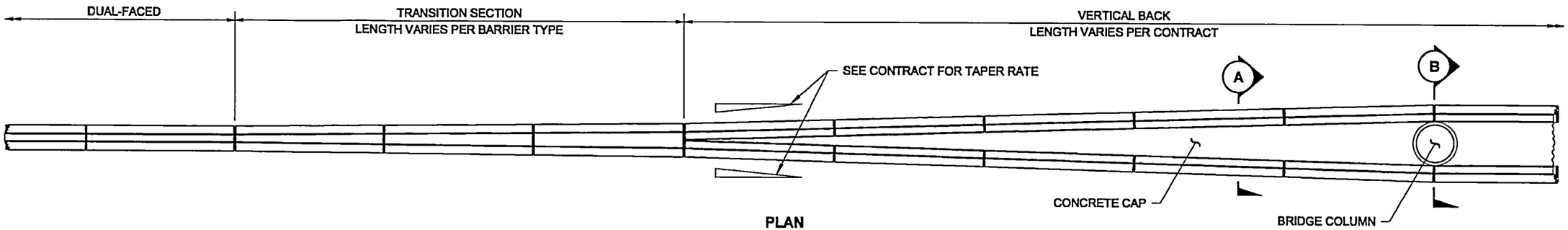
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

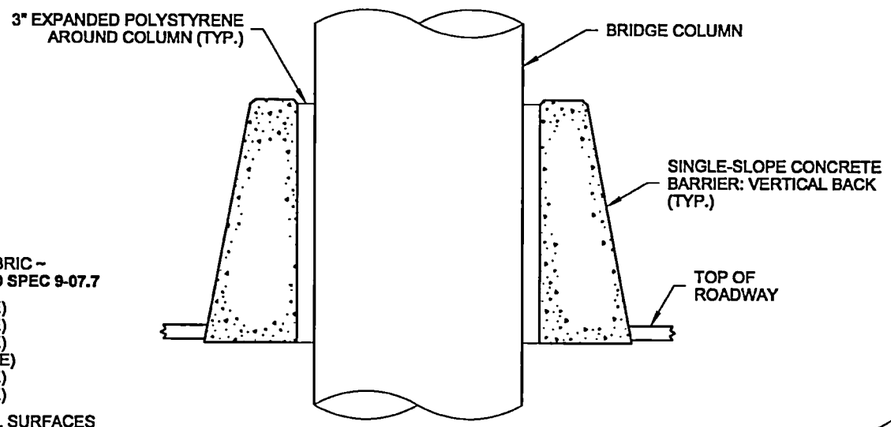
STATE DESIGN ENGINEER — DATE 4/18/12

Washington State Department of Transportation

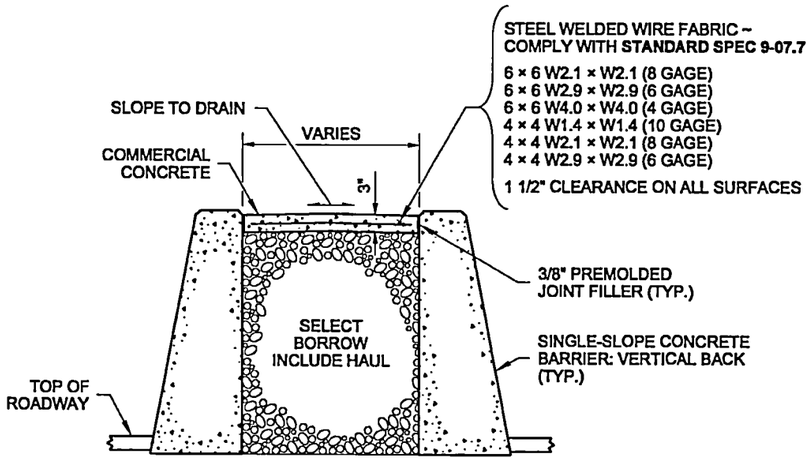
DRAWN BY: LISA CYFORD



PLAN
(CAST-IN-PLACE SHOWN)



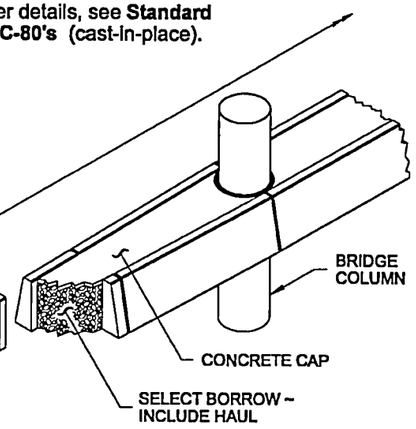
SECTION (B)

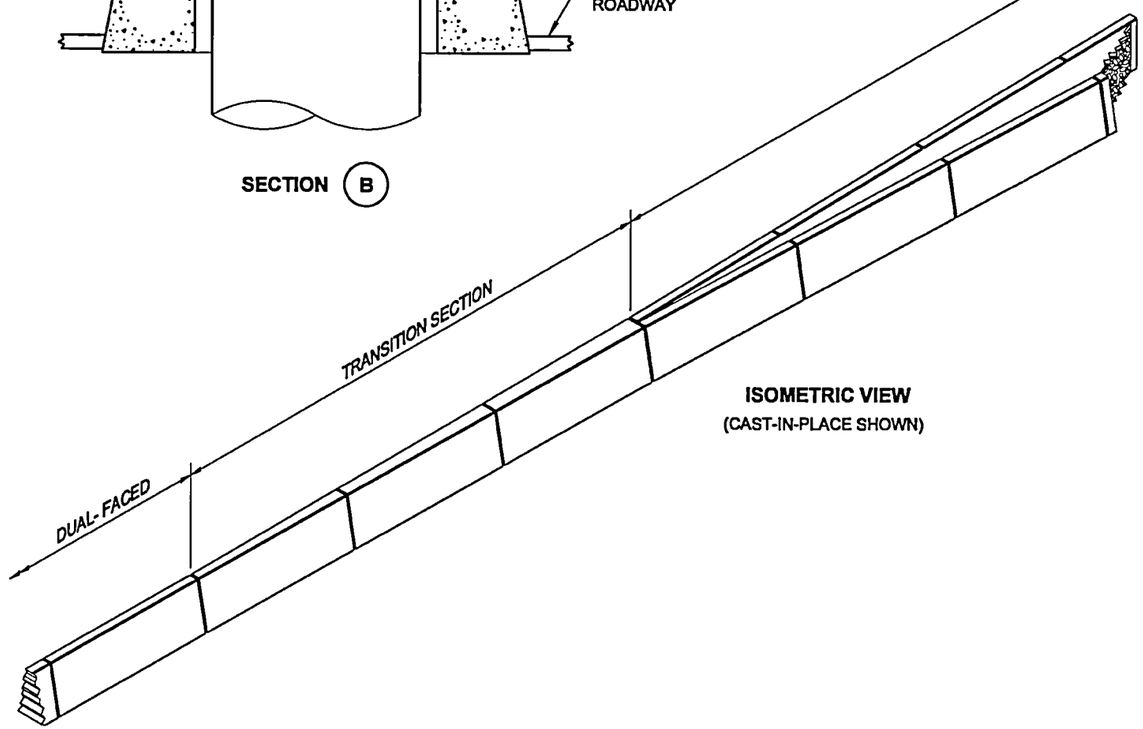


SECTION (A)

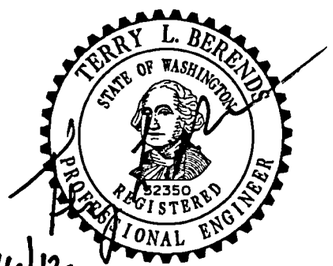
NOTES

1. Use the barrier type, precast or cast-in-place, as specified in the Contract.
2. For Single-Slope Concrete Barrier details, see **Standard Plan series C-70's** (precast) or **C-80's** (cast-in-place).





ISOMETRIC VIEW
(CAST-IN-PLACE SHOWN)



4/16/12

SINGLE-SLOPE CONCRETE BARRIER PLACEMENT (WRAP)

STANDARD PLAN C-85.11-00

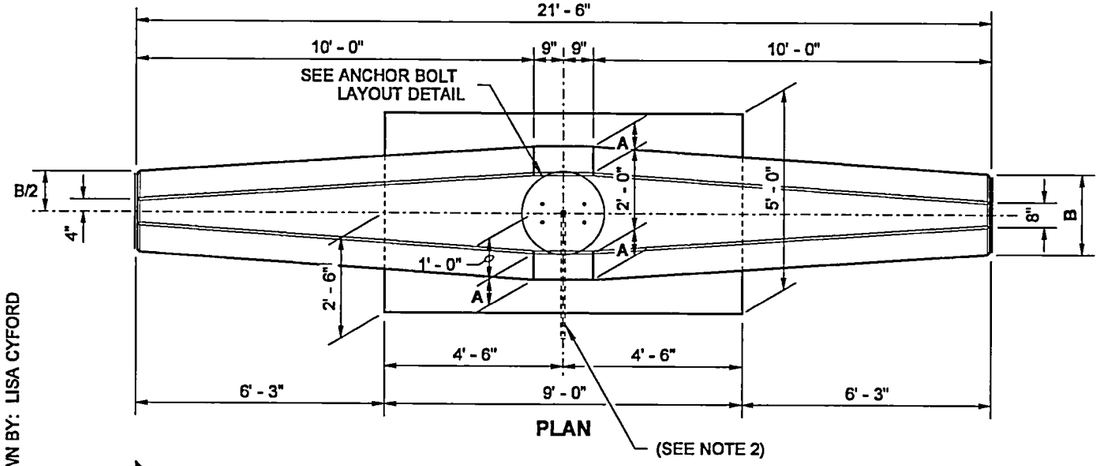
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

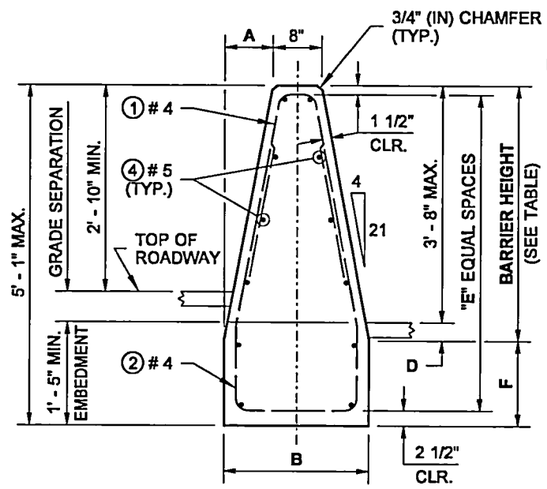
STATE DESIGN ENGINEER — DATE 4/18/12

Washington State Department of Transportation

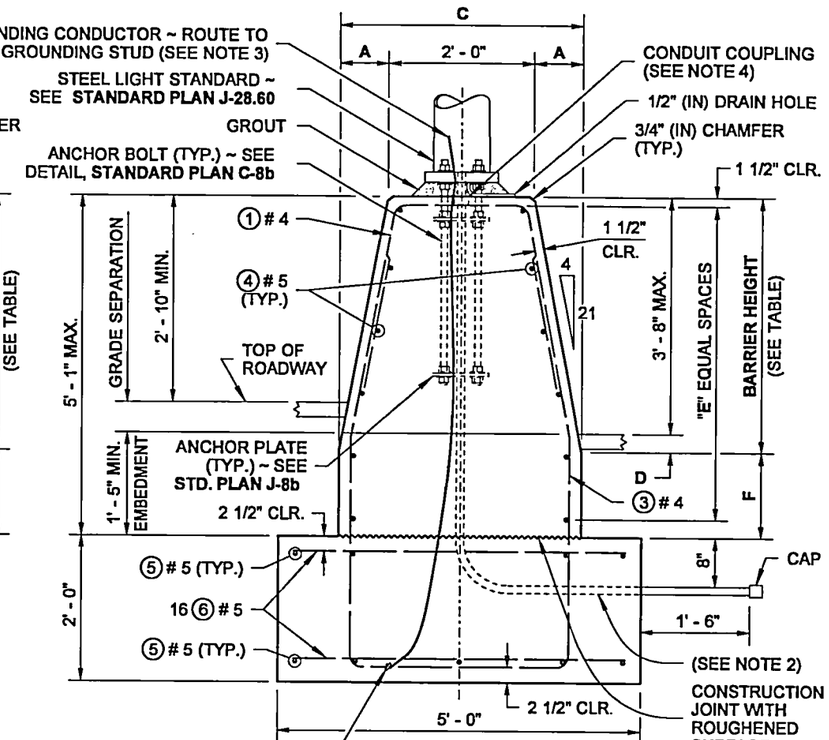
DRAWN BY: LISA CYFORD



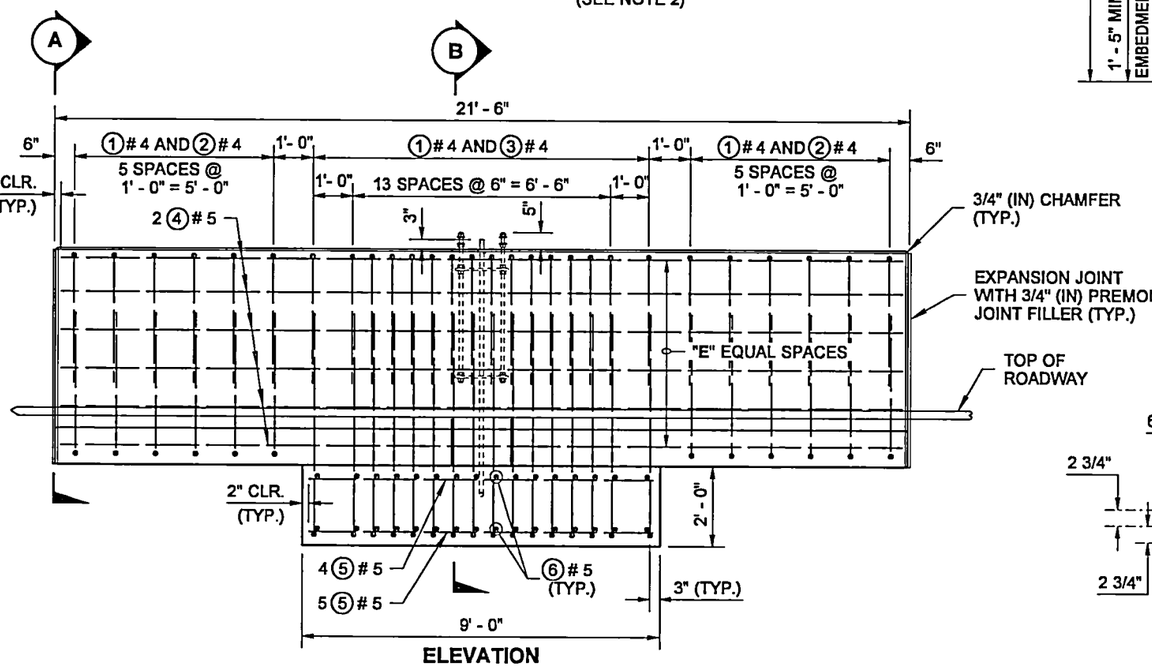
PLAN



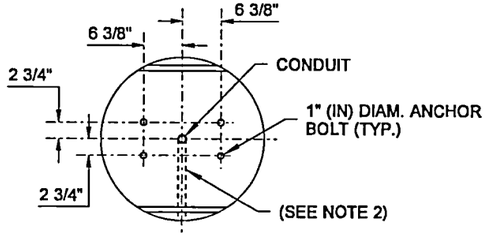
SECTION (A)



SECTION (B)



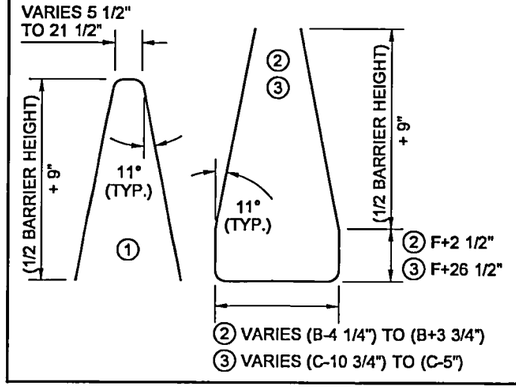
ELEVATION



PLAN VIEW

ANCHOR BOLT LAYOUT DETAIL

ALL DIMENSIONS ARE OUT TO OUT
ALL BENDS ARE 2" (IN) RADIUS

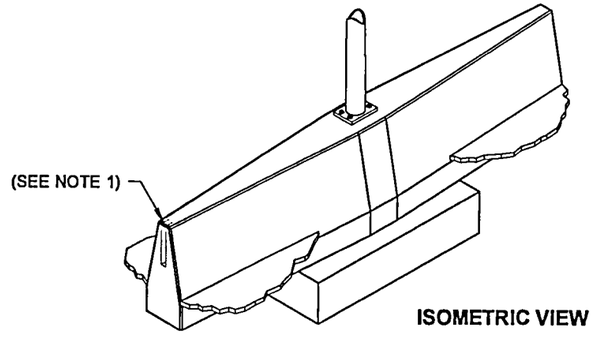


BAR LIST

MARK NO.	LOCATION	SIZE	QUANTITY
①	BARRIER ~ TOP VERTICAL	# 4	28
②	BARRIER ~ BOTTOM VERTICAL	# 4	12
③	FND. & BARRIER ~ VERTICAL	# 4	16
④	BARRIER ~ HORIZONTAL	# 5	"Q"
⑤	FOUNDATION	# 5	9
⑥	FOUNDATION	# 5	32

TABLE

GRADE SEPARATION	BARRIER HEIGHT	A	B	C	D	E	F	Q
0 TO 5"	3' - 6"	8"	2' - 0"	3' - 4"	3" MIN.	5	1' - 2"	12
UP TO 7"	4' - 0"	9 1/8"	2' - 2 1/4"	3' - 6 1/4"	7" MIN.	5	10"	12
UP TO 10"	4' - 6"	10 1/4"	2' - 4 1/2"	3' - 8 1/2"	10" MIN.	6	7"	14



ISOMETRIC VIEW

NOTES

1. When connecting between cast-in-place and precast Single-Slope Barrier, provide a Connection Blockout and Rebar Grid as shown on **Standard Plan C-70.10.**
2. See the Contract Plans for conduit placement.
3. Grounding Conductor shall be non-insulated #4 AWG stranded copper; provide 3' - 0" min. slack. Clamp steel reinforcing bar with connector suitable for use embedded in concrete.
4. Install Conduit Coupling flush with top of foundation. Do not glue PVC stubout.
5. This plan shall be used for 40' (ft) and 50' (ft) Light Standards with 16' (ft) max. length double mast arms.
6. Concrete shall be Class 4000.
7. This spread footing is designed for an allowable soil bearing pressure of 2500 psf or better.

RICHARD P. ZELDENRUST — STATE OF WASHINGTON — 25470 — STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jun 10 2014 10:11 AM

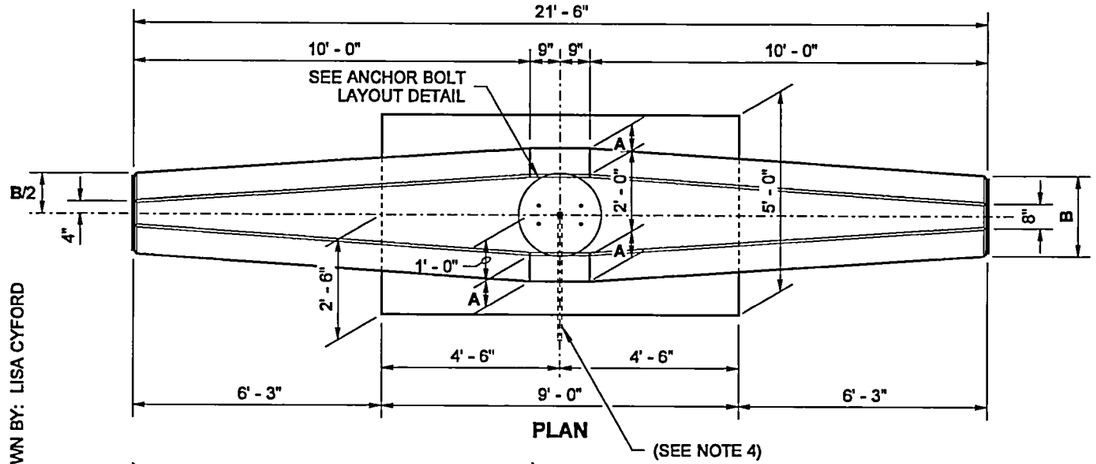
SINGLE-SLOPE CONCRETE BARRIER LIGHT STANDARD FOUNDATION

STANDARD PLAN C-85.14-01

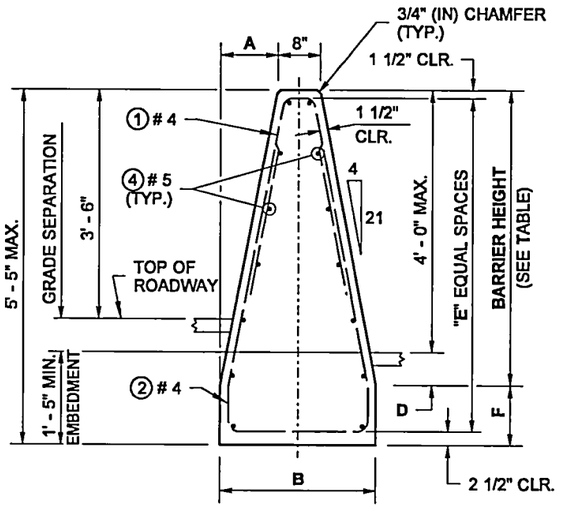
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:20 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

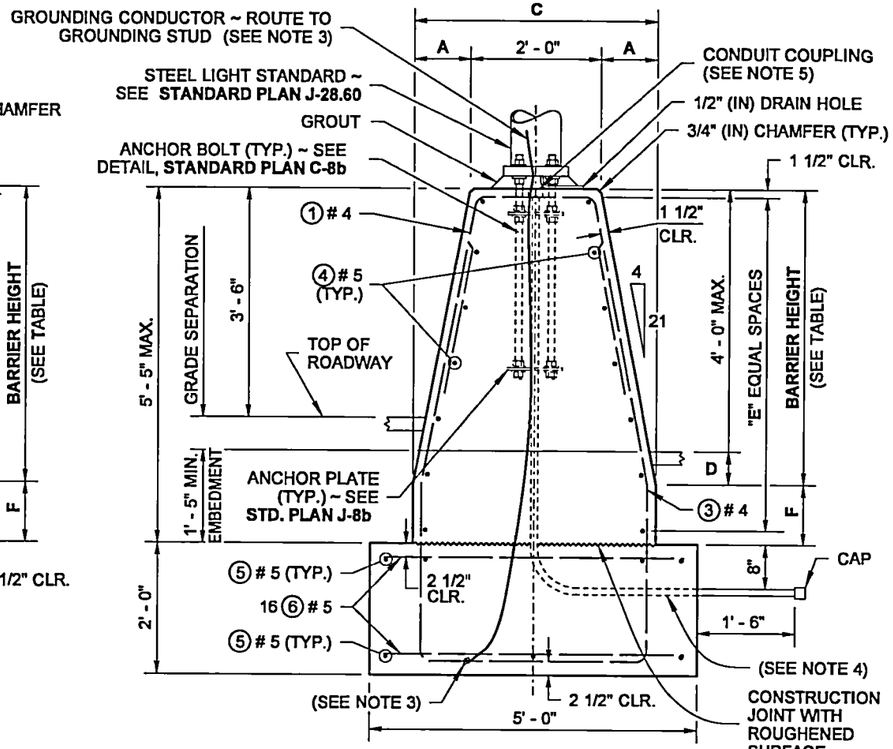
DRAWN BY: LISA CYFORD



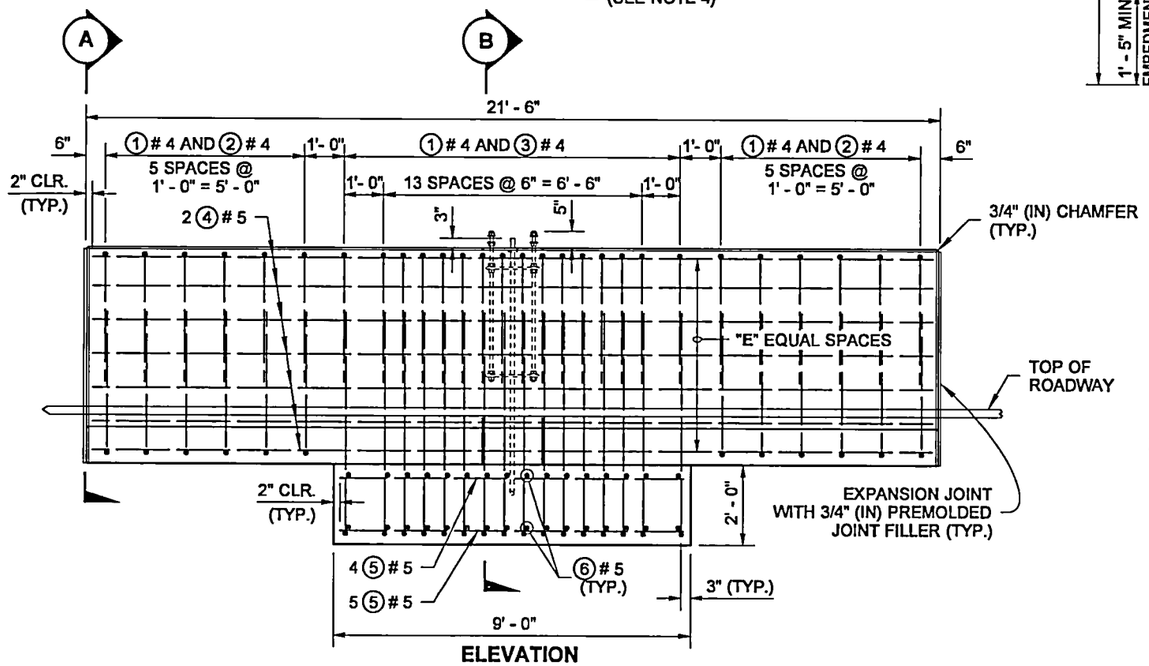
PLAN



SECTION (A)



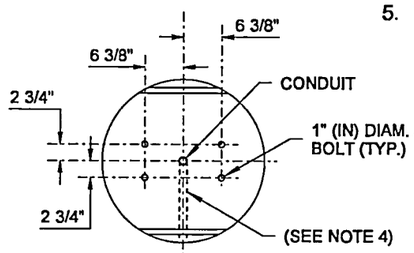
SECTION (B)



ELEVATION

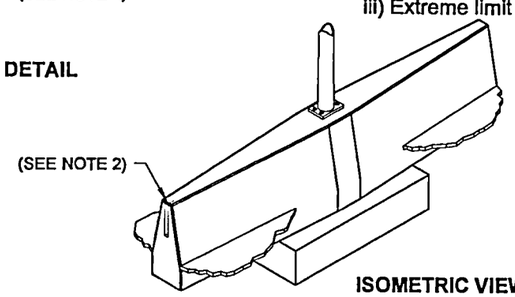
NOTES

1. This Barrier/Foundation combination has been designed in accordance with AASHTO LRFD Test Level 4 requirements. The horizontal vehicle impact force at the top of the barrier is taken at 54 kips for Strength and Extreme Limit States, and 10 kips for footing stability (overturning and sliding) in the Service Limit State.
2. When connecting between cast-in-place and precast Single-Slope Barrier, provide a Connection Blockout and Rebar Grid as shown on **Standard Plan C-70.10.**
3. Grounding conductor shall be non-insulated #4 AWG stranded copper; provide 3' - 0" min. slack. Clamp steel reinforcing bar with connector suitable for use embedded in concrete.
4. See the Contract Plans for conduit placement.
5. Install Conduit Coupling flush with top of foundation. Do not glue PVC stubout.
6. This plan shall be used for 40' (ft) and 50' (ft) Light Standards with 16' (ft) max. length double mast arms.
7. Concrete shall be Class 4000.
8. The factored soil bearing resistance shall equal or exceed the following:
   - I) Service limit state = 6 ksf
   - II) Strength limit state = 24 ksf
   - III) Extreme limit state = 48 ksf



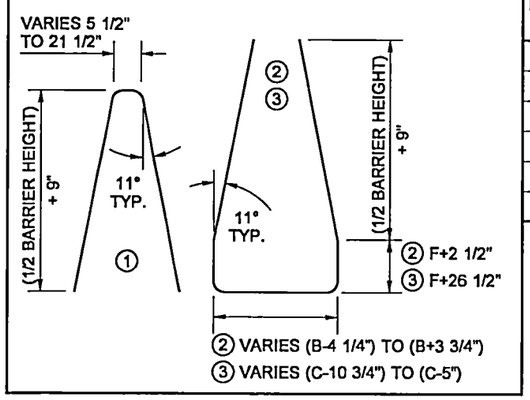
PLAN VIEW

ANCHOR BOLT LAYOUT DETAIL



ISOMETRIC VIEW

ALL DIMENSIONS ARE OUT TO OUT
ALL BENDS ARE 2" (IN) RADIUS



BAR LIST

MARK NO.	LOCATION	SIZE	QUANTITY
①	BARRIER ~ TOP VERTICAL	# 4	28
②	BARRIER ~ BOTTOM VERTICAL	# 4	12
③	FND. & BARRIER ~ VERTICAL	# 4	16
④	BARRIER ~ HORIZONTAL	# 5	"Q"
⑤	FOUNDATION	# 5	9
⑥	FOUNDATION	# 5	32

TABLE

GRADE SEPARATION	BARRIER HEIGHT	A	B	C	D	E	F	Q
0 TO 3"	4' - 0"	9 1/8"	2' - 2 1/4"	3' - 6 1/4"	VARIES 6" TO 9"	6	1' - 2"	14
UP TO 6" MAX.	4' - 6"	10 1/4"	2' - 4 1/2"	3' - 8 1/2"	VARIES 6" TO 9"	6	11"	14

Zeldenrust, Richard
Jun 30 2014 7:44 AM

SINGLE-SLOPE CONCRETE BARRIER (42") LIGHT STANDARD FOUNDATION

STANDARD PLAN C-85.15-01

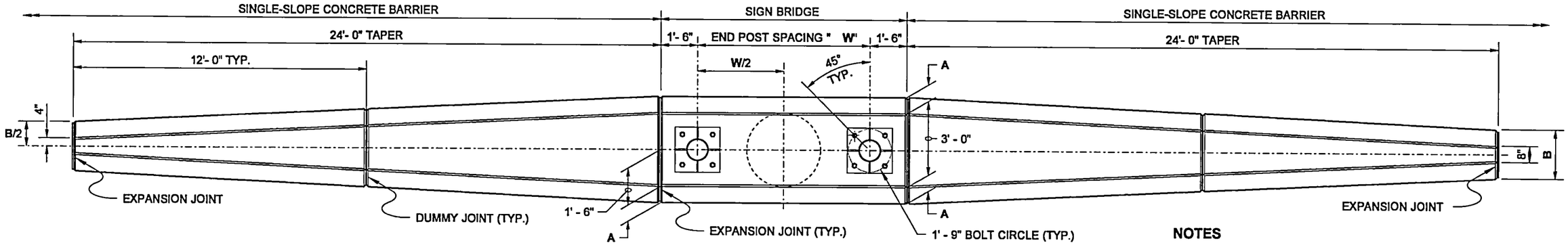
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 30 2014 3:08 PM

STATE DESIGN ENGINEER

Washington State Department of Transportation

This page left blank intentionally.

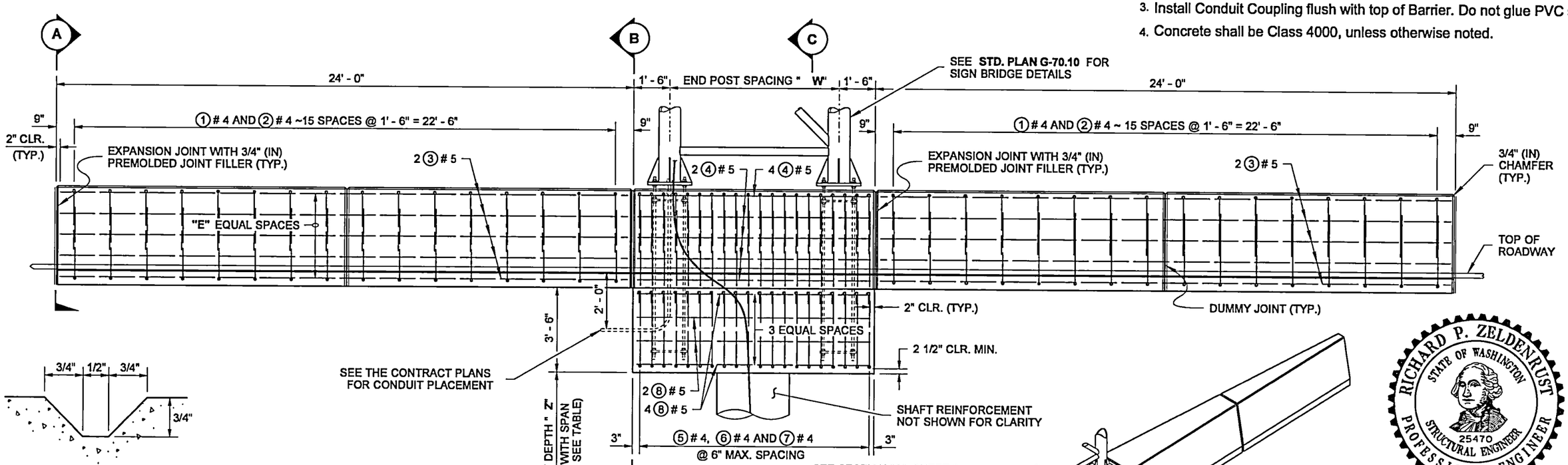


PLAN

DRAWN BY: LISA CYFORD

NOTES

1. When connecting between Cast-in-Place and Precast Single-Slope Barrier, provide a Connection Blockout and Rebar Grid as shown in **Standard Plan C-70.10.**
2. Grounding Conductor shall be non-insulated #4 AWG stranded copper; provide 3' - 0" min. slack. Clamp steel reinforcing bar with connector suitable for use embeded in concrete.
3. Install Conduit Coupling flush with top of Barrier. Do not glue PVC stubout.
4. Concrete shall be Class 4000, unless otherwise noted.



ELEVATION

ISOMETRIC VIEW

DUMMY JOINT

DIMENSIONS "W" AND "Z"		
SIGN BRIDGE SPAN LENGTH	W	Z
60' OR LESS	4' - 0"	11' - 6"
61' TO 90'	5' - 0"	13' - 6"
91' TO 120'	6' - 0"	15' - 0"
121' TO 150'	7' - 0"	16' - 6"

SHAFT DEPTH "Z" IS BASED ON ALLOWABLE LATERAL BEARING PRESSURE IN EXCESS OF 1500 PSF WITH Ø = 28 DEGREES OR GREATER

RICHARD P. ZELDENRUST
STATE OF WASHINGTON
25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jun 10 2014 10:20 AM

SINGLE-SLOPE CONCRETE BARRIER SIGN BRIDGE FOUNDATION

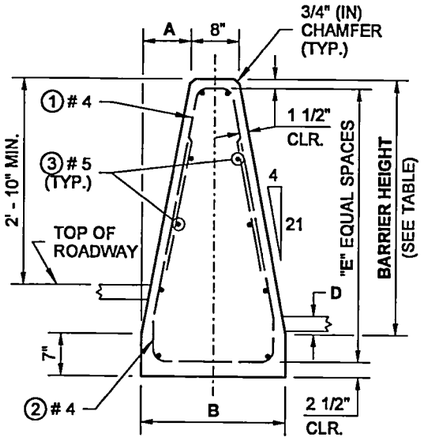
STANDARD PLAN C-85.16-01

SHEET 1 OF 2 SHEETS

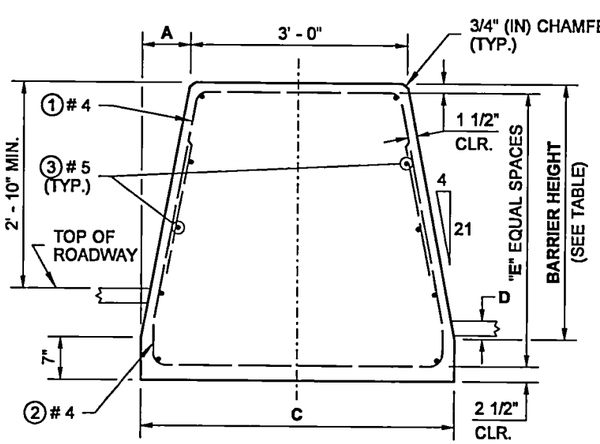
APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 17 2014 9:35 AM
STATE DESIGN ENGINEER

Washington State Department of Transportation

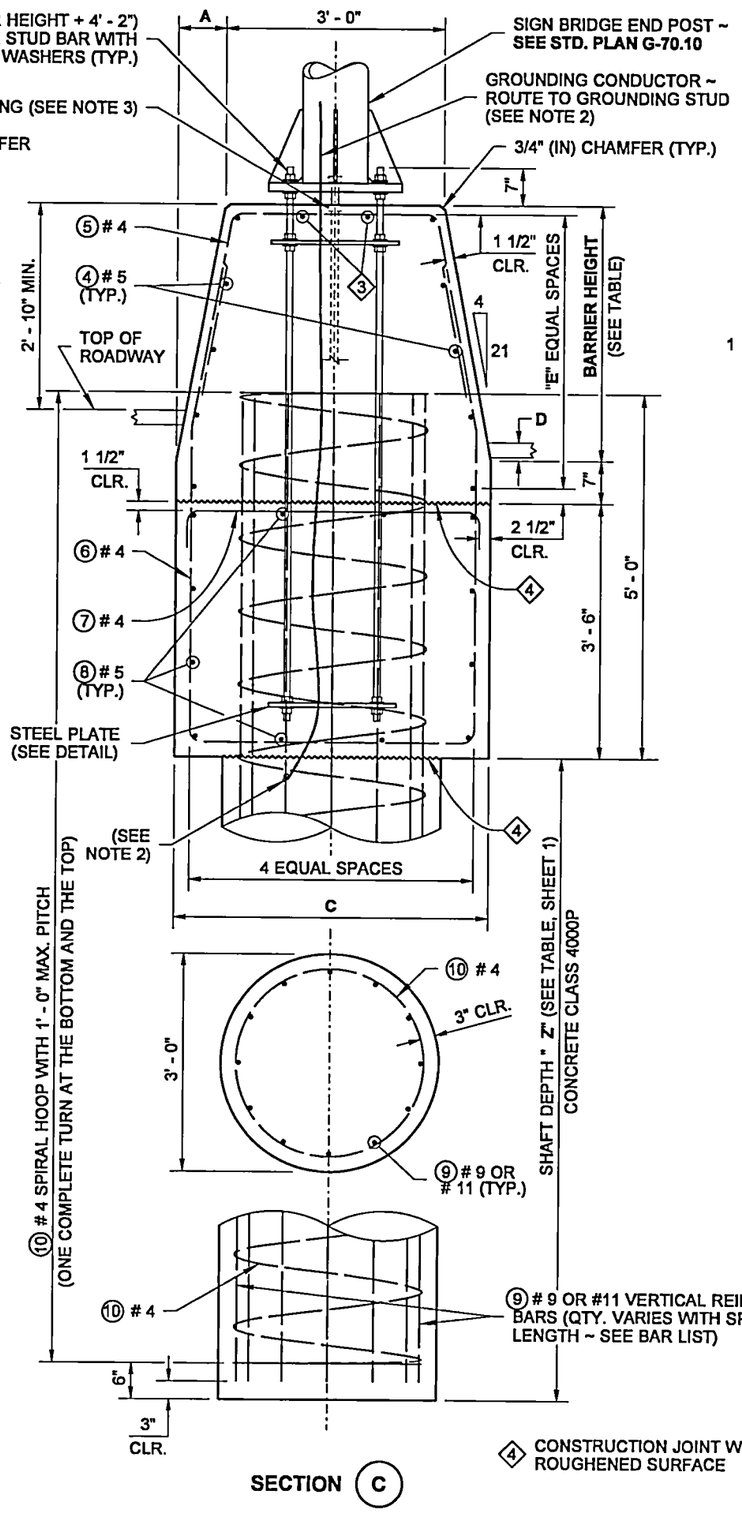
DRAWN BY: LISA CYFORD



SECTION (A)



SECTION (B)

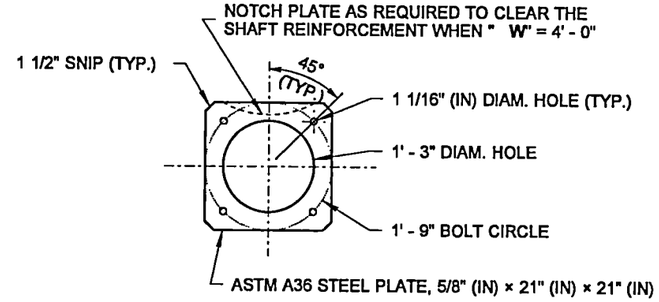


SECTION (C)

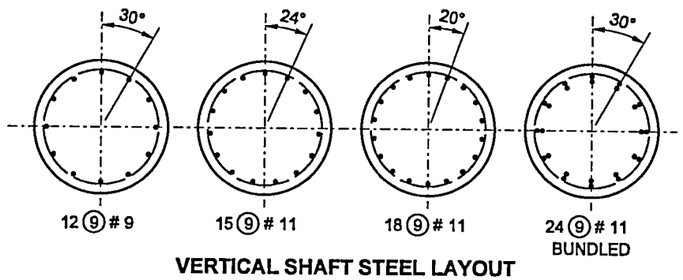
◇4 CONSTRUCTION JOINT WITH ROUGHENED SURFACE

TABLE							
GRADE SEPARATION	BARRIER HEIGHT	A	B	C	D	E	Q
0" TO 5"	3' - 6"	8"	2' - 0"	4' - 4"	3" MIN.	4	10 ◇3
UP TO 7"	4' - 0"	9 1/8"	2' - 2 1/4"	4' - 6 1/4"	7" MIN.	5	12 ◇3
UP TO 10"	4' - 6"	10 1/4"	2' - 4 1/2"	4' - 8 1/2"	10" MIN.	6	14 ◇3

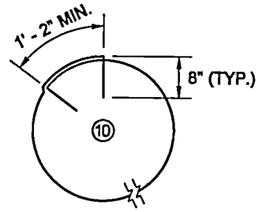
◇3 ADD TWO ④ # 5 BARS, EQUALLY SPACED, AT THE TOP OF THE FOUNDATION BARRIER



STEEL PLATE DETAIL



VERTICAL SHAFT STEEL LAYOUT

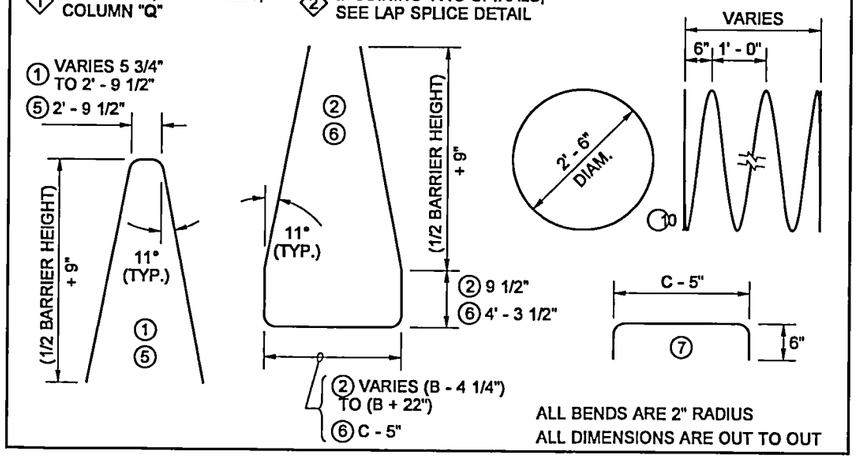


LAP SPLICE DETAIL

BAR LIST									
MARK NO.	LOCATION	SPAN LENGTH							
		60' OR LESS		61' TO 90'		91' TO 120'		121' TO 150'	
		SIZE	QTY.	SIZE	QTY.	SIZE	QTY.	SIZE	QTY.
①	BARRIER ~ TOP VERTICAL	# 4	32	# 4	32	# 4	32	# 4	32
②	BARRIER ~ BOTTOM VERTICAL	# 4	28	# 4	28	# 4	28	# 4	28
③	BARRIER ~ HORIZONTAL	# 5	◇1	# 5	◇1	# 5	◇1	# 5	◇1
④	BARRIER ~ HORIZONTAL	# 5	◇1	# 5	◇1	# 5	◇1	# 5	◇1
⑤	BARRIER ~ TOP VERTICAL	# 4	14	# 4	16	# 4	18	# 4	20
⑥	CAP & BARRIER ~ VERTICAL	# 4	14	# 4	16	# 4	18	# 4	20
⑦	CAP ~ TOP TRANSVERSE	# 4	14	# 4	16	# 4	18	# 4	20
⑧	CAP ~ HORIZONTAL	# 5	12	# 5	12	# 5	12	# 5	12
⑨	SHAFT ~ VERTICAL	# 9	12	# 11	15	# 11	18	# 11	24
⑩	SHAFT ~ SPIRAL	# 4	1 ◇2	# 4	1 ◇2	# 4	1 ◇2	# 4	1 ◇2

◇1 SEE TABLE, THIS SHEET, COLUMN "Q"

◇2 IF JOINING TWO SPIRALS, SEE LAP SPLICE DETAIL



Zeldenrust, Richard
Jun 10 2014 10:21 AM

SINGLE-SLOPE CONCRETE BARRIER SIGN BRIDGE FOUNDATION

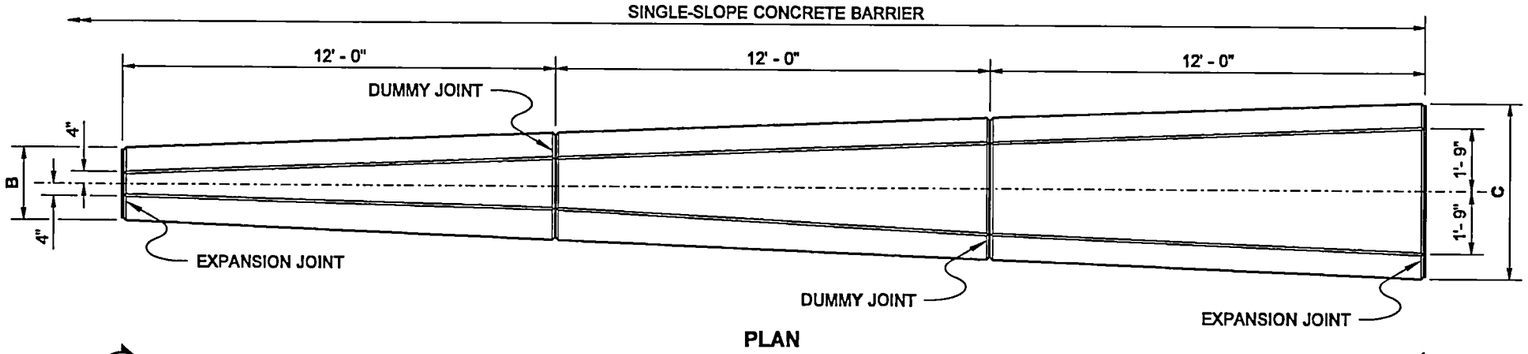
STANDARD PLAN C-85.16-01

SHEET 2 OF 2 SHEETS

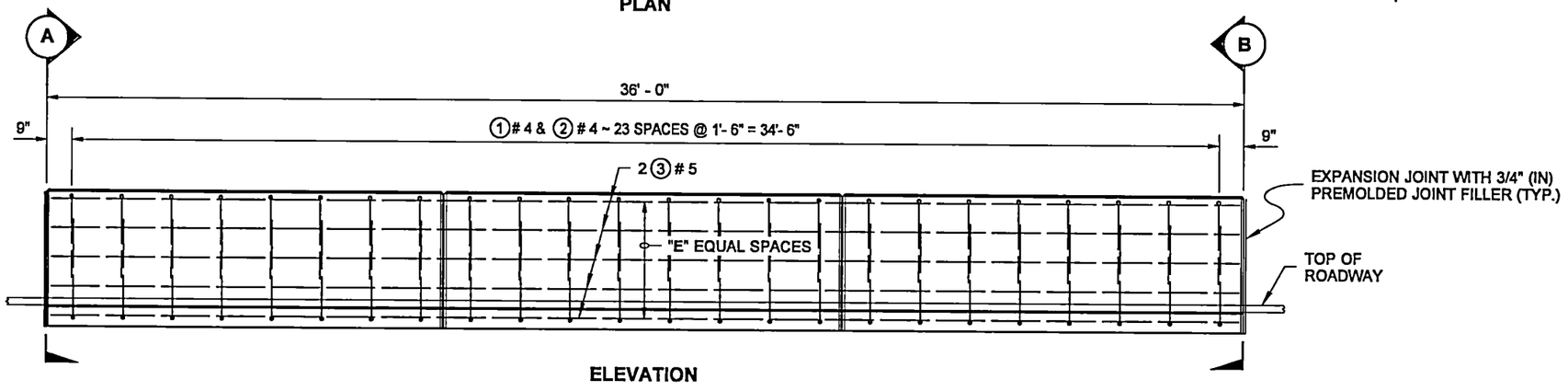
APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 17 2014 9:35 AM
STATE DESIGN ENGINEER

Washington State Department of Transportation

DRAWN BY: LISA CYFORD



PLAN



ELEVATION

NOTES

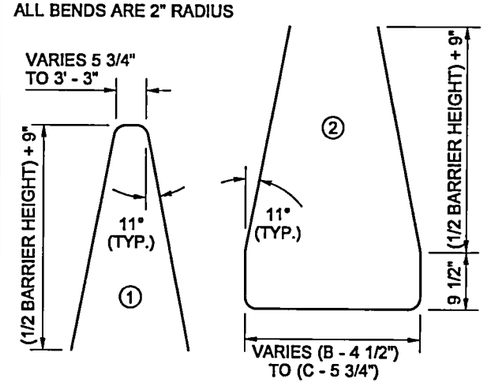
1. When connecting between Cast-in-Place and Precast Single-Slope Barrier, provide a Connection Blockout and Rebar Grid as shown in **Standard Plan C-70.10**.
2. All concrete shall be class 4000.
3. This barrier transition section is designed for an allowable soil bearing pressure of 2500 psf or better.

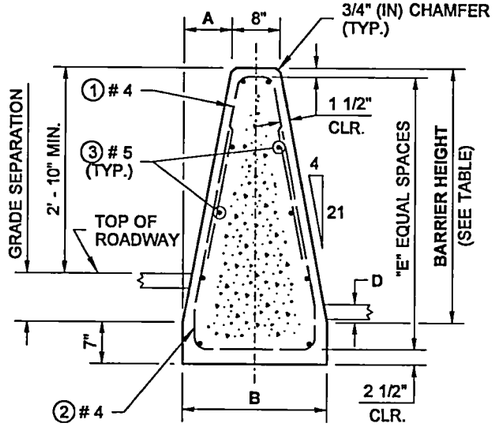
BAR LIST

MARK NO.	LOCATION	SIZE	QTY.
①	BARRIER ~ TOP VERTICAL	# 4	24
②	BARRIER ~ BOTTOM VERTICAL	# 4	24
③	BARRIER ~ HORIZONTAL	# 5	◇1

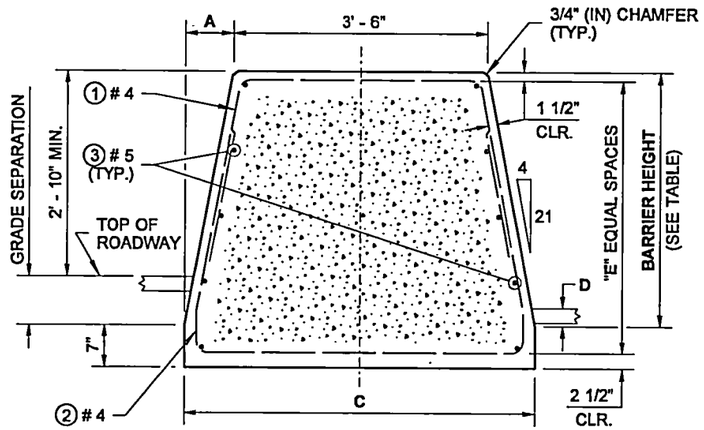
◇1 SEE DIMENSION TABLE ~ NOT COUNTING SPLICES

ALL DIMENSIONS ARE OUT TO OUT
ALL BENDS ARE 2" RADIUS

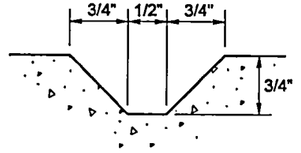




SECTION (A)



SECTION (B)



DUMMY JOINT

ISOMETRIC VIEW

TABLE							
GRADE SEPARATION	BARRIER HEIGHT	A	B	C	D	E	HORIZONTAL BARS (QTY.)
0" TO 5"	3' - 6"	8"	2' - 0"	4' - 10"	3" MIN.	4	10
UP TO 7"	4' - 0"	9 1/8"	2' - 2 1/4"	5' - 0 1/4"	7" MIN.	5	12
UP TO 10"	4' - 6"	10 1/4"	2' - 4 1/2"	5' - 2 1/2"	10" MIN.	6	14

RICHARD P. ZELDENRUST — STATE OF WASHINGTON — 25470 — STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jun 10 2014 10:26 AM

SINGLE-SLOPE CONCRETE BARRIER TRANSITION FOR MONOTUBE SIGN SUPPORT

STANDARD PLAN C-85.18-01

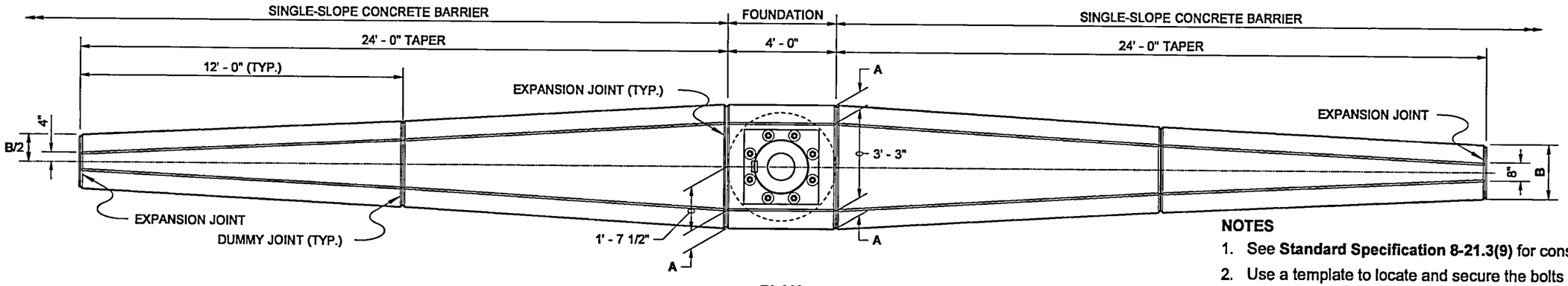
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:21 PM
STATE DESIGN ENGINEER

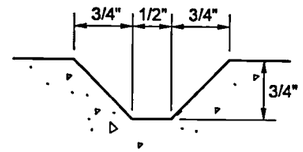
Washington State Department of Transportation

This page left blank intentionally.

DRAWN BY: LISA CYFORD



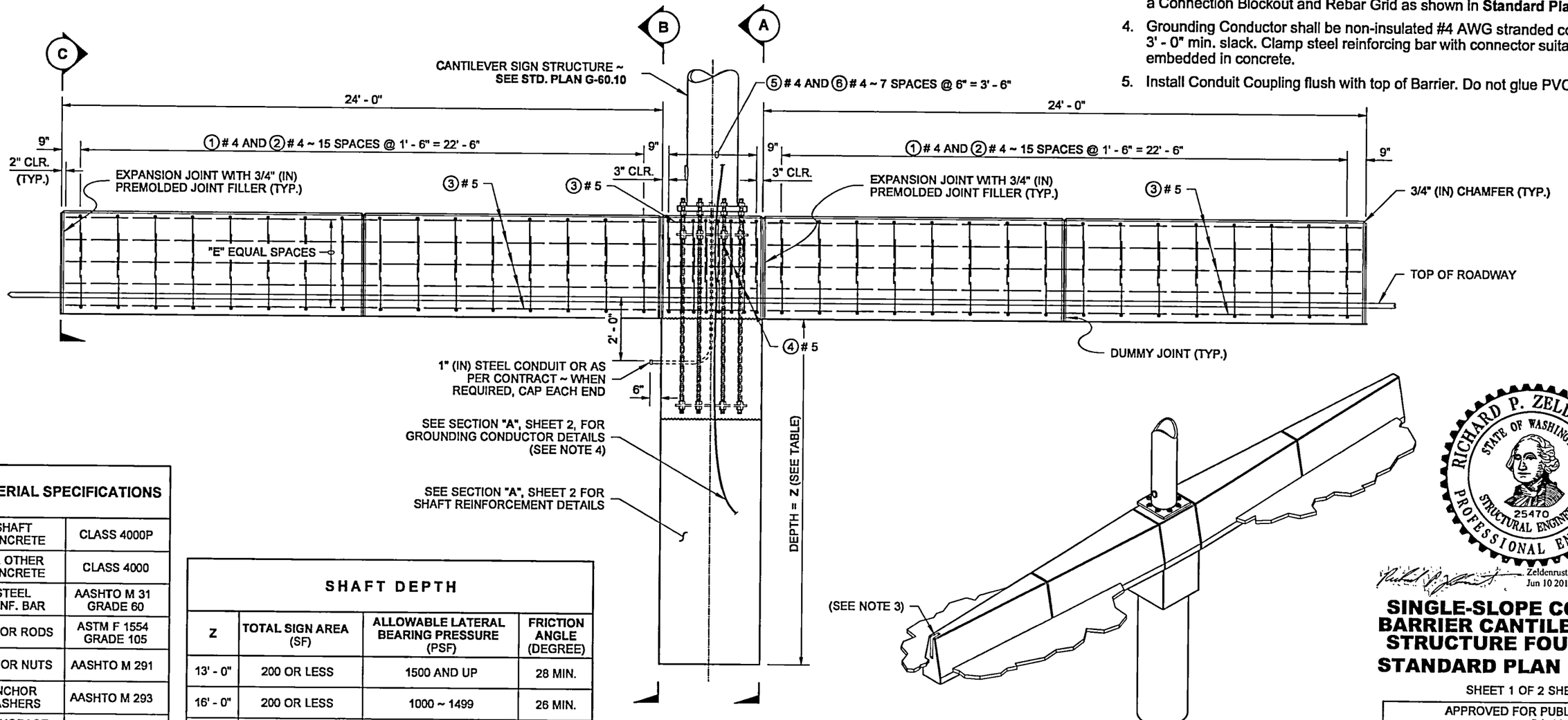
PLAN



DUMMY JOINT

NOTES

1. See **Standard Specification 8-21.3(9)** for construction requirements.
2. Use a template to locate and secure the bolts during foundation installation.
3. When connecting between cast-in-place and precast Single-Slope Barrier, provide a Connection Blockout and Rebar Grid as shown in **Standard Plan C-70.10.**
4. Grounding Conductor shall be non-insulated #4 AWG stranded copper; provide 3' - 0" min. slack. Clamp steel reinforcing bar with connector suitable for use embedded in concrete.
5. Install Conduit Coupling flush with top of Barrier. Do not glue PVC stubout.



ELEVATION

ISOMETRIC

MATERIAL SPECIFICATIONS	
SHAFT CONCRETE	CLASS 4000P
ALL OTHER CONCRETE	CLASS 4000
STEEL REINF. BAR	AASHTO M 31 GRADE 60
ANCHOR RODS	ASTM F 1554 GRADE 105
ANCHOR NUTS	AASHTO M 291
ANCHOR WASHERS	AASHTO M 293
ANCHORAGE GALVANIZING	AASHTO M 232
STEEL PLATE	ASTM A 36

SHAFT DEPTH			
Z	TOTAL SIGN AREA (SF)	ALLOWABLE LATERAL BEARING PRESSURE (PSF)	FRICTION ANGLE (DEGREE)
13' - 0"	200 OR LESS	1500 AND UP	28 MIN.
16' - 0"	200 OR LESS	1000 ~ 1499	26 MIN.
18' - 0"	200 ~ 400	1500 AND UP	28 MIN.
22' - 0"	200 ~ 400	1000 ~ 1499	26 MIN.

RICHARD P. ZELDENRUST
STATE OF WASHINGTON
25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jun 10 2014 10:27 AM

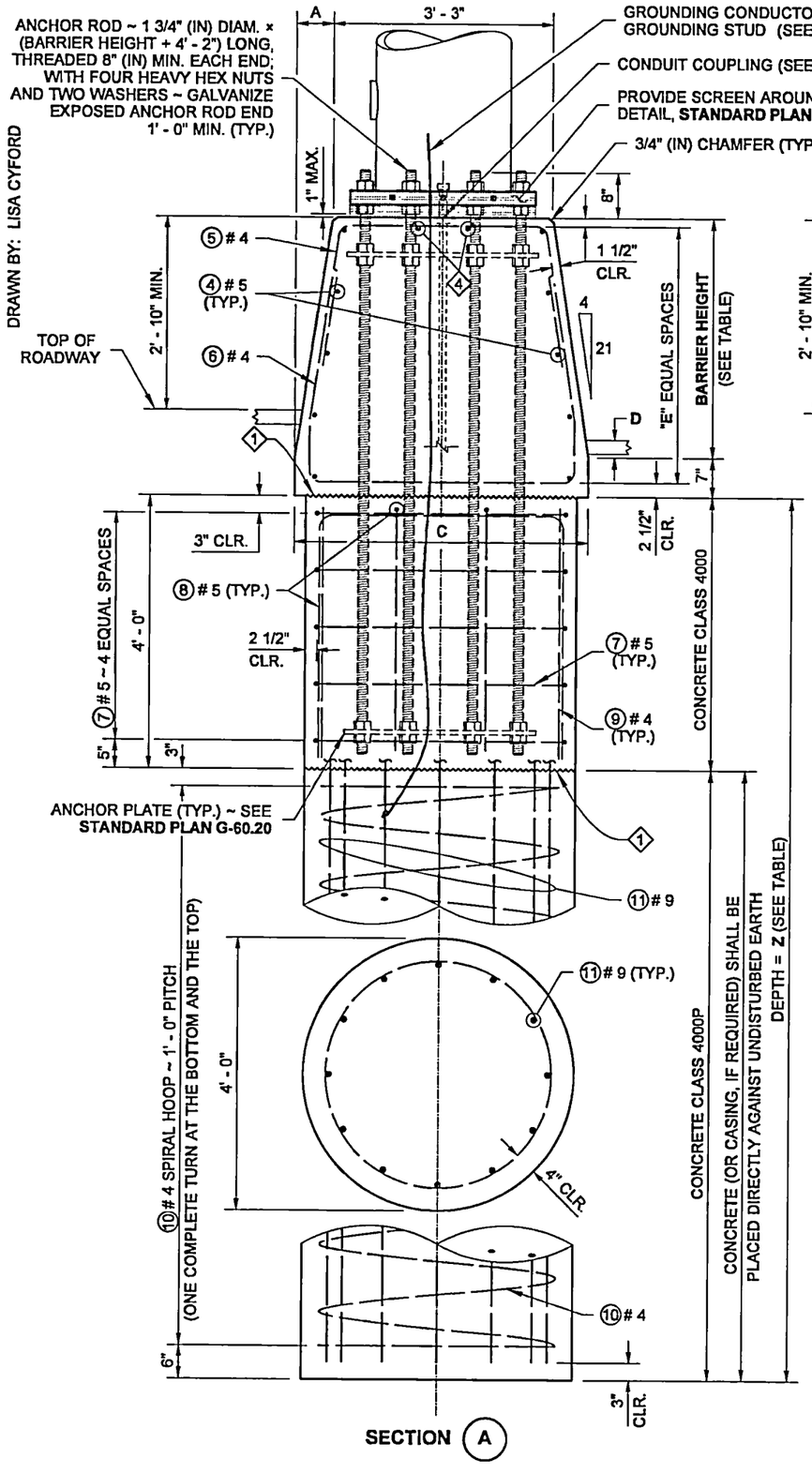
SINGLE-SLOPE CONCRETE BARRIER CANTILEVER SIGN STRUCTURE FOUNDATION

STANDARD PLAN C-85.20-01

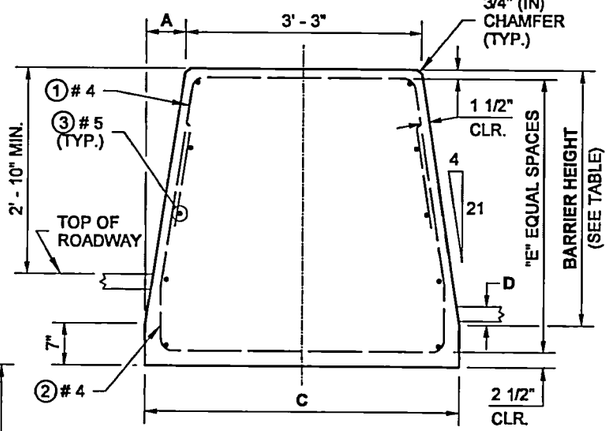
SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:21 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

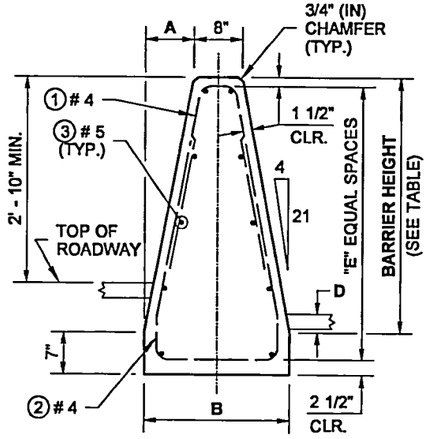
DRAWN BY: LISA CYFORD



SECTION (A)



SECTION (B)



SECTION (C)

TABLE							
GRADE SEPARATION	BARRIER HEIGHT	A	B	C	D	E	Q
0 TO 5"	3' - 6"	8"	2' - 0"	4' - 7"	3" MIN.	4	10 ◇4
UP TO 7"	4' - 0"	9 1/8"	2' - 2 1/4"	4' - 9 1/4"	7" MIN.	5	12 ◇4
UP TO 10"	4' - 6"	10 1/4"	2' - 4 1/2"	4' - 11 1/2"	10" MIN.	6	14 ◇4

BAR LIST					
MARK NO.	LOCATION	QTY.	LENGTH	SIZE	TYPE
①	BARRIER ~ TOP VERTICAL	32	VARIES	# 4	
②	BARRIER ~ BOTTOM VERTICAL	32	VARIES	# 4	
③	BARRIER ~ HORIZONTAL	◇2	23' - 8"	# 5	STR.
④	BARRIER ~ HORIZONTAL	◇2	3' - 8"	# 5	STR.
⑤	BARRIER ~ TOP VERTICAL	8	VARIES	# 4	
⑥	BARRIER ~ BOTTOM VERTICAL	8	VARIES	# 4	
⑦	CAP ~ HOOP	5	15' - 9"	# 5	
⑧	CAP ~ TOP	4	10' - 10"	# 5	
⑨	CAP ~ VERTICAL, EACH CORNER	4	3' - 4"	# 4	STR.
⑩	SHAFT ~ SPIRAL	1 ◇3	AS REQ'D	# 4	
⑪	SHAFT ~ VERTICAL	12	"Z" MINUS CLEARANCES	# 9	STR.

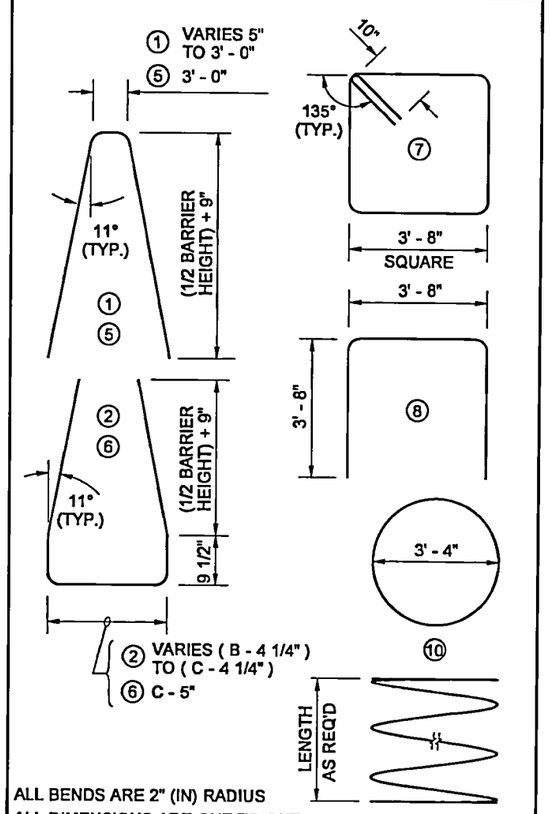
◇1 CONSTRUCTION JOINT WITH ROUGHENED SURFACE

◇2 SEE TABLE, THIS SHEET, COLUMN "Q"

◇3 IF JOINING TWO SPIRALS, SEE LAP SPLICE DETAIL, STANDARD PLAN G-60.20, SHEET 2

◇4 ADD TWO ④ #5 BARS, EQUALLY SPACED, AT THE TOP OF THE FOUNDATION BARRIER

BENDING DIAGRAM



ALL BENDS ARE 2" (IN) RADIUS
ALL DIMENSIONS ARE OUT TO OUT

RICHARD P. ZELDENRUST
STATE OF WASHINGTON
25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jun 10 2014 10:46 AM

SINGLE-SLOPE CONCRETE BARRIER CANTILEVER SIGN STRUCTURE FOUNDATION

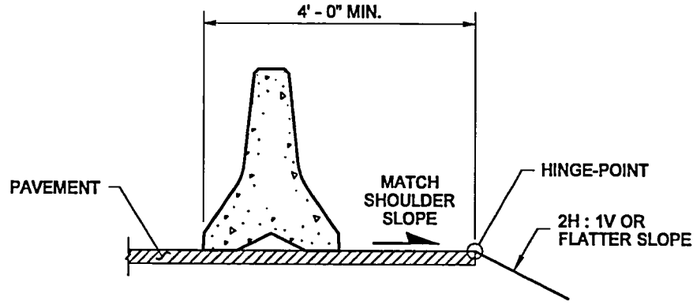
STANDARD PLAN C-85.20-01

SHEET 2 OF 2 SHEETS

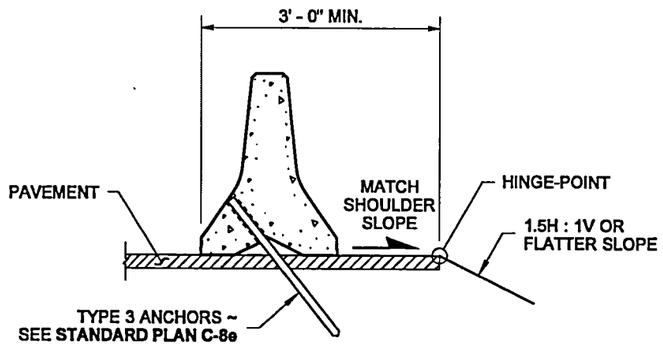
APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 11 2014 1:22 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

This page left blank intentionally.

DRAWN BY: FERN LIDDELL



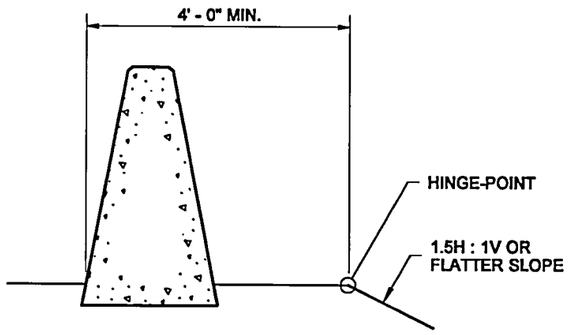
PRECAST CONC. BARRIER TYPE 2



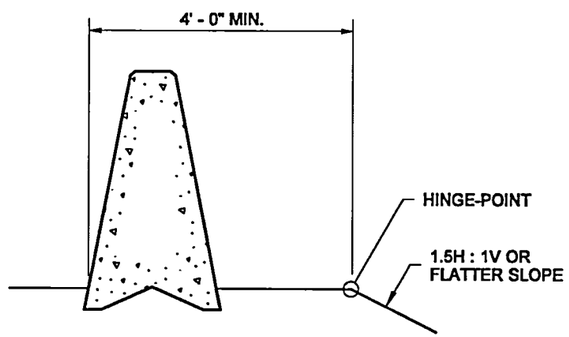
ANCHORED PRECAST CONC. BARRIER TYPE 2

NOTE

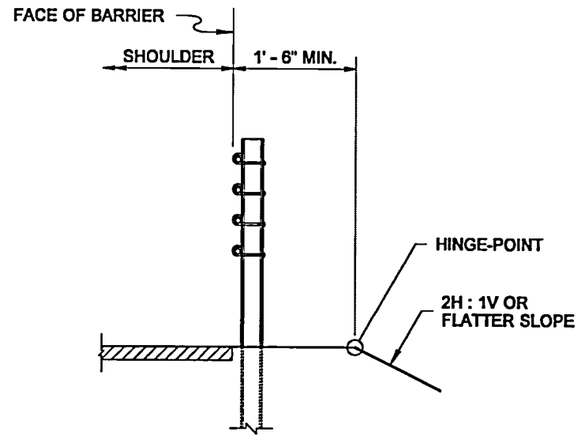
1. For W-Beam Type 31 shoulder application, see **Standard Plan C-20.10.**
2. See Contract Plans for Barrier location.



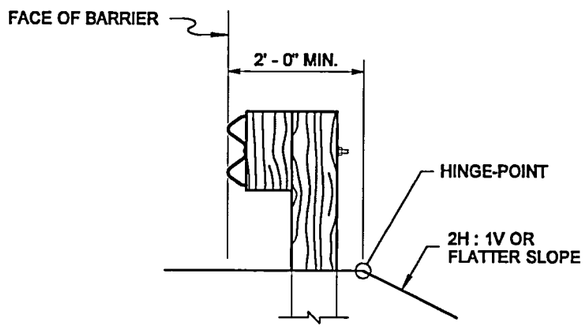
SINGLE SLOPE CONC. BARRIER CAST-IN-PLACE



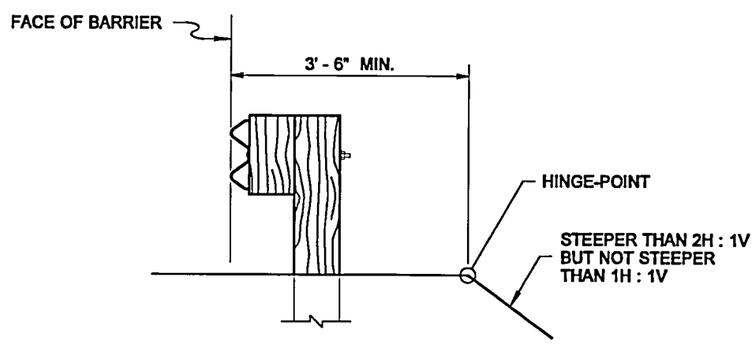
SINGLE SLOPE CONC. BARRIER PRECAST



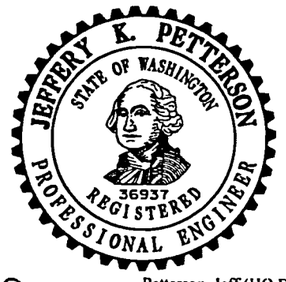
CABLE BARRIER



BEAM GUARDRAIL TYPE 1
(SEE NOTE 1)



BEAM GUARDRAIL TYPE 1 ON STEEP SLOPES
(SEE NOTE 1)



Petterson, Jeff (HQ Design)
Jul 6 2017 3:07 PM

TRAFFIC BARRIER SHOULDER WIDENING

STANDARD PLAN C-16a

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:42 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

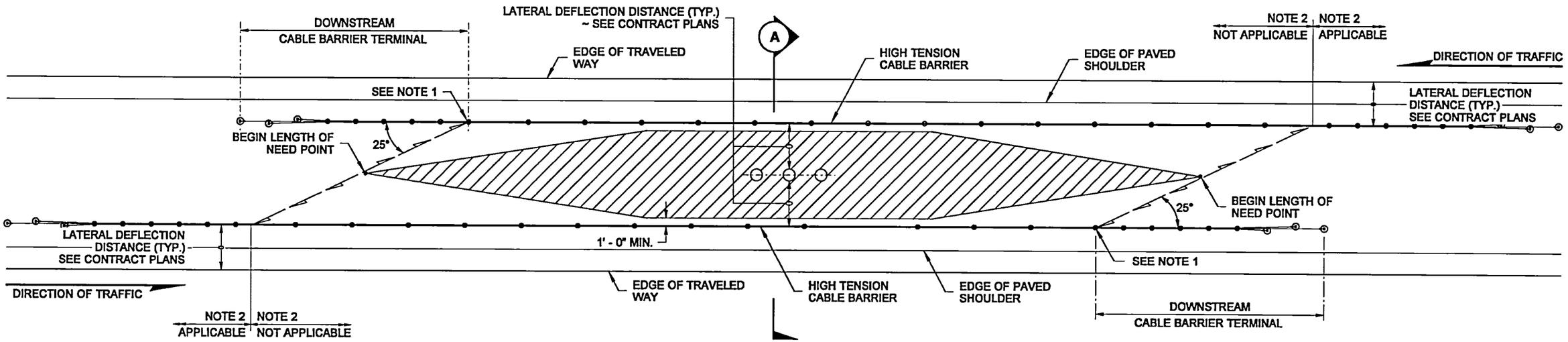
DRAWN BY: BILL BERENS

LEGEND

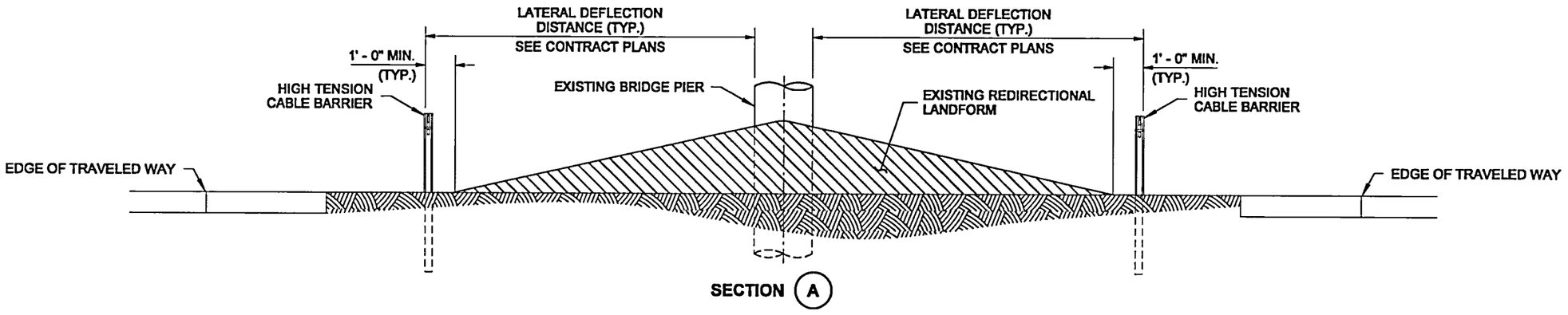
Design Layout Line

NOTES

1. From the End of Landform, use the Design Layout Line to determine the location of the downstream (with traffic) Cable Barrier Terminal.
2. Provide the Lateral Deflection Distance and show in the Contract Plans to accommodate potential opposing traffic encroachments.



PLAN VIEW



SECTION (A)

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jul 6 2017 3:16 PM

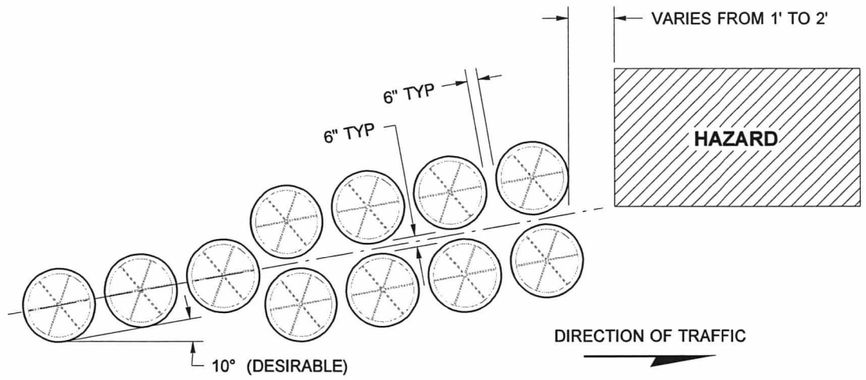
BARRIER PLACEMENT ~ CABLE BARRIER SHIELDING FOR REDIRECTIONAL LANDFORM

STANDARD PLAN C-40.18-03

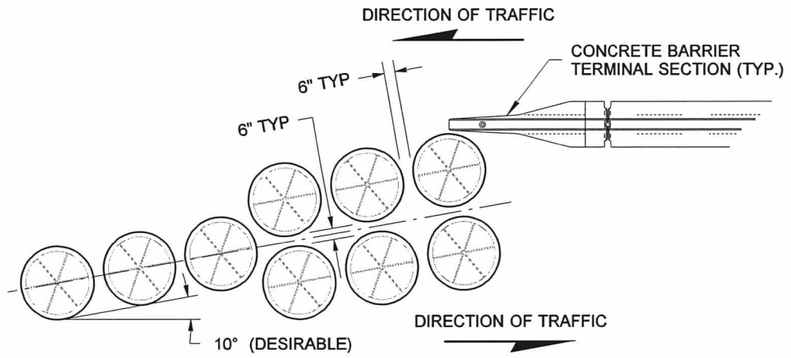
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:22 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

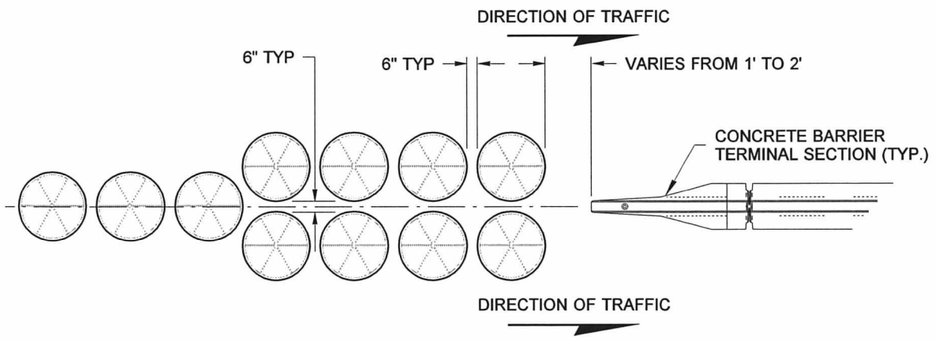
This page left blank intentionally.



ROADSIDE INSTALLATION DETAIL

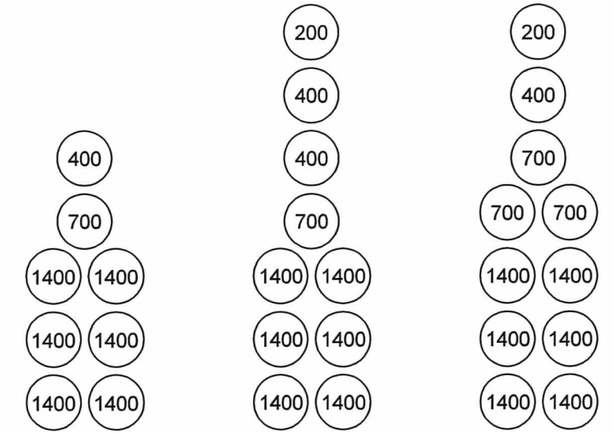


MEDIAN INSTALLATION DETAIL



GORE INSTALLATION DETAIL

INSTALLATION DETAILS

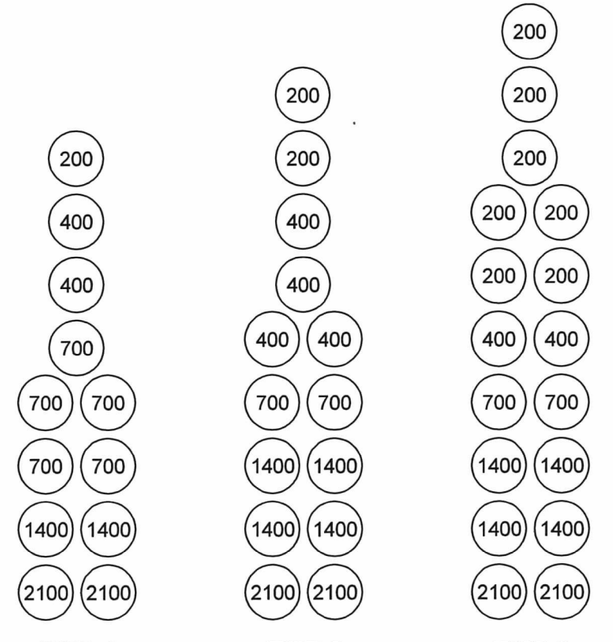


TYPE 1
POSTED SPEED
40 MPH OR LESS

TYPE 2
POSTED SPEED
45 MPH

TYPE 3
POSTED SPEED
50 MPH

PLAN VIEW



TYPE 4
POSTED SPEED
55 MPH

TYPE 5
POSTED SPEED
60 MPH

TYPE 6
POSTED SPEED
70 MPH

PLAN VIEW

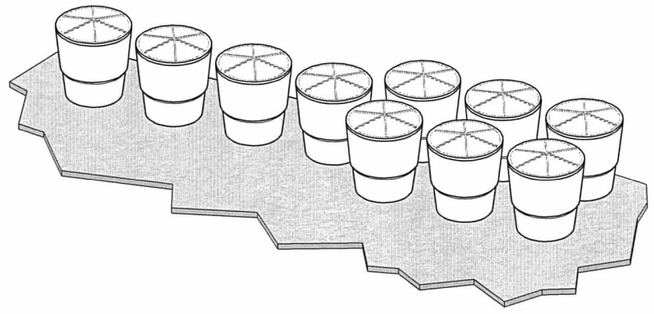
ATTENUATOR CONFIGURATIONS

(NUMBERS INSIDE BARRELS INDICATE LBS.)

NOTES

1. Approved Inertial Barrier Systems (sand barrel arrays) are listed in the Qualified Products List and shall be installed in accordance with the manufacturer's recommendations. When products not listed on the Qualified Products List are considered, a Request of Approval of Materials (RAM) form is required.

2. For temporary installations, the inertial barriers may be placed on wood pallets that are 4" or less in height.



EXAMPLE CONFIGURATION

RICHARD BARSTOW ALBIN
STATE OF WASHINGTON
34042
REGISTERED
PROFESSIONAL ENGINEER

6/10/2008

EXPIRES JULY 24, 2008

IMPACT ATTENUATOR INERTIAL BARRIER CONFIGURATIONS STANDARD PLAN C-90.10-00

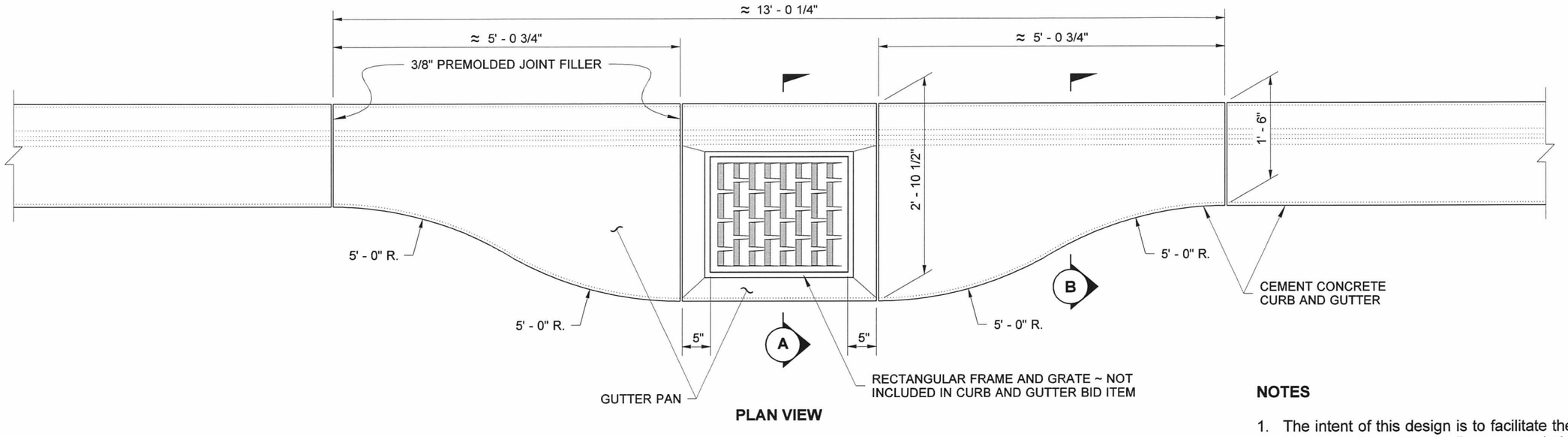
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 7/3/08

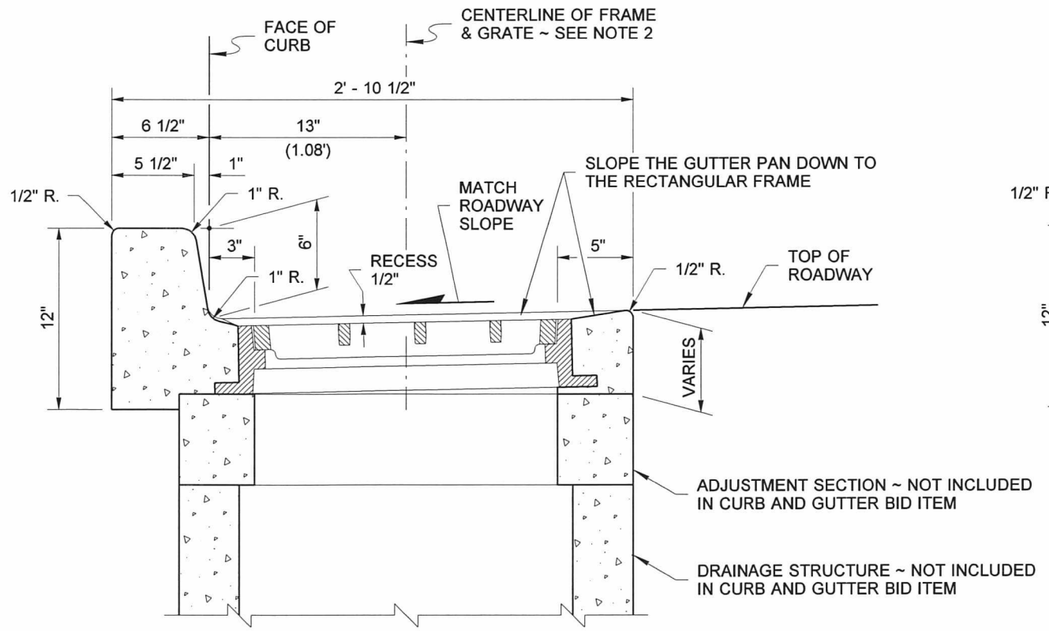
Washington State Department of Transportation

DRAWN BY: MARK SUJKA

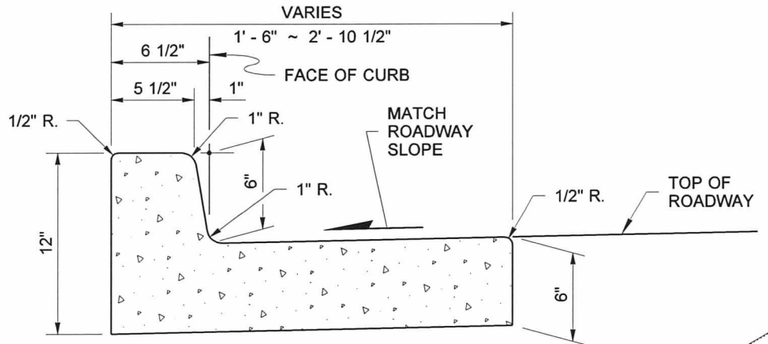


PLAN VIEW

CATCH BASIN GUTTER PAN



SECTION (A)



SECTION (B)

ISOMETRIC VIEW

NOTES

1. The intent of this design is to facilitate the compaction of Hot Mix Asphalt pavement adjacent to a drainage structure.
2. The centerline of the drainage structure may differ from the centerline of the frame and grate.

EXPIRES JULY 27, 2007

CEMENT CONCRETE CURB AND GUTTER PAN

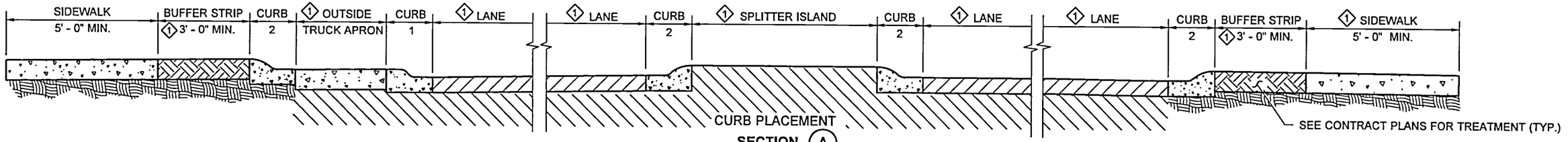
STANDARD PLAN F-10.16-00

SHEET 1 OF 1 SHEET

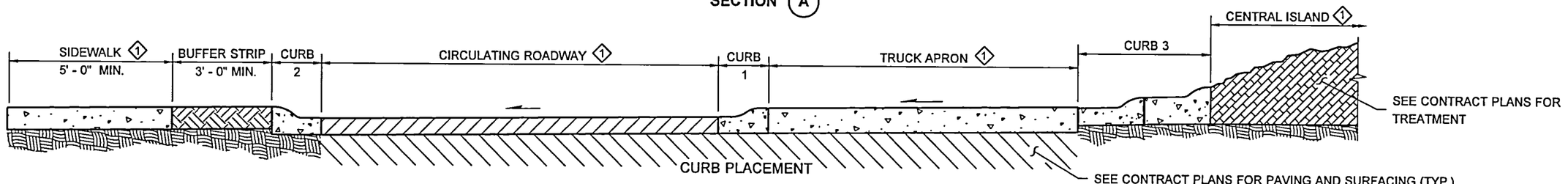
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 12/20/06

Washington State Department of Transportation

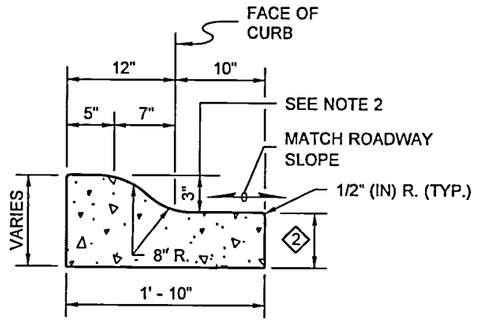


SECTION (A)

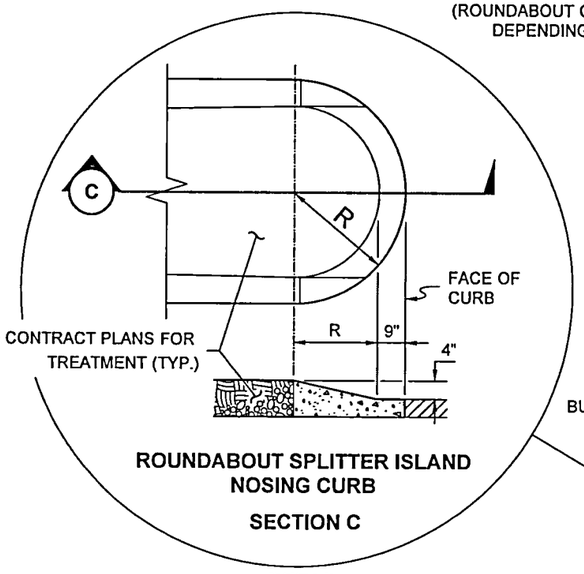


SECTION (B)

(ROUNDABOUT CONFIGURATION WILL VARY DEPENDING ON CONTRACT PLANS)



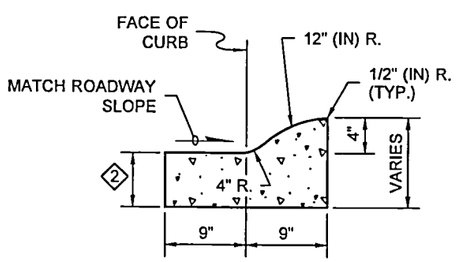
CURB 1
ROUNDABOUT TRUCK APRON
CEMENT CONCRETE CURB & GUTTER
(ROLLED CURB)



ROUNDABOUT SPLITTER ISLAND NOSING CURB

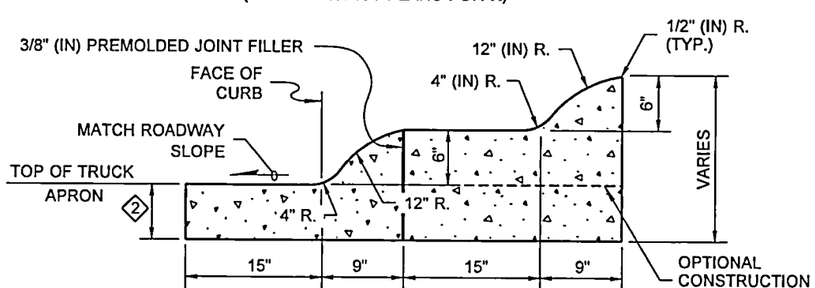
SECTION C

DETAIL
(SEE CONTRACT PLANS FOR R)

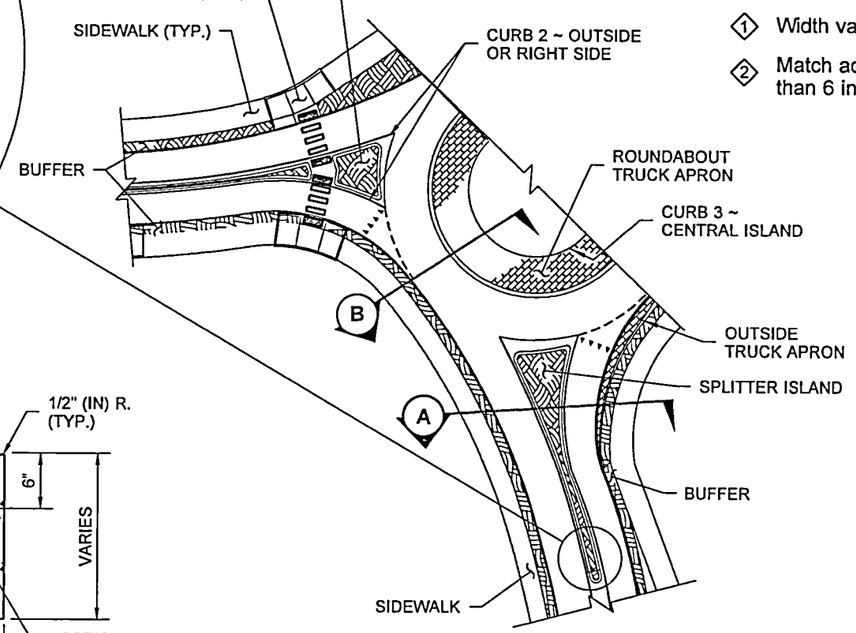


CURB 2
(OUTSIDE, RIGHT SIDE OR SPLITTER ISLAND)

ROUNDABOUT CEMENT CONCRETE CURB AND GUTTER
(ROLLED CURB)



CURB 3
ROUNDABOUT CENTRAL ISLAND
CEMENT CONCRETE CURB
(ROLLED CURB)



PARTIAL PLAN

NOTES

1. Construct curb joints at cement concrete pavement transverse joint locations. If all adjacent pavement is HMA, see **Standard Plan F-30.10** for Curb Expansion and Contraction Joint Spacing.
2. A 2 inch vertical curb may be used where low clearance vehicles or trucks are present.

LEGEND

1 Width varies ~ See Contract Plans.

2 Match adjacent pavement thickness but not less than 6 inches.

BRIAN J. WALSH
STATE OF WASHINGTON
36103
REGISTERED
PROFESSIONAL ENGINEER

Walsh, Brian
Jul 11 2017 10:10 AM

ROUNDABOUT CEMENT CONCRETE CURBS

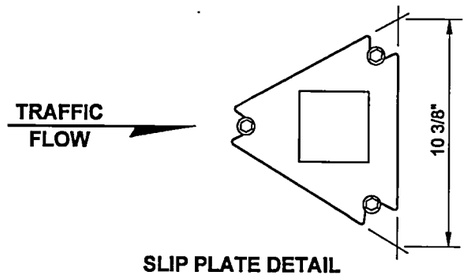
STANDARD PLAN F-10.18-01

SHEET 1 OF 1 SHEET

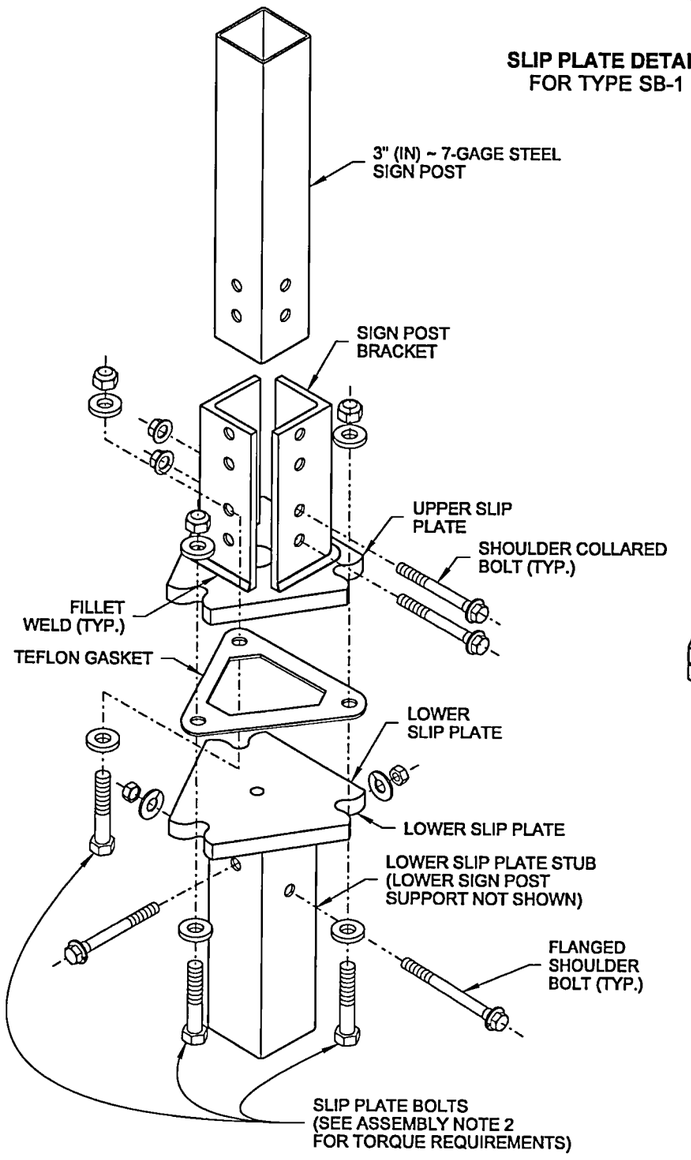
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 11 2017 1:21 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

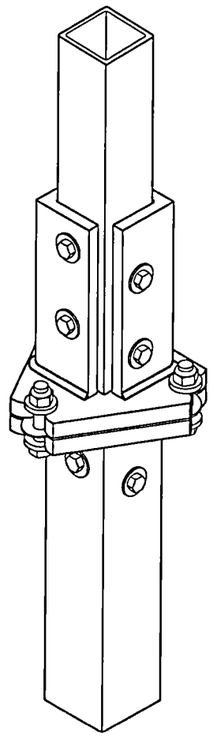
DRAWN BY: FERN LIDDELL



SLIP PLATE DETAIL
FOR TYPE SB-1



EXPLODED VIEW

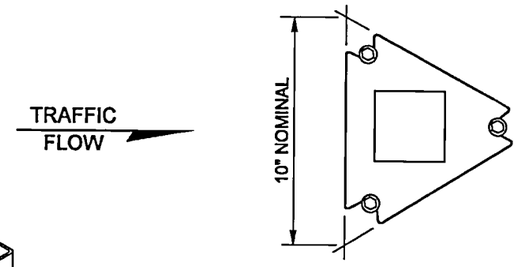


ISOMETRIC VIEW

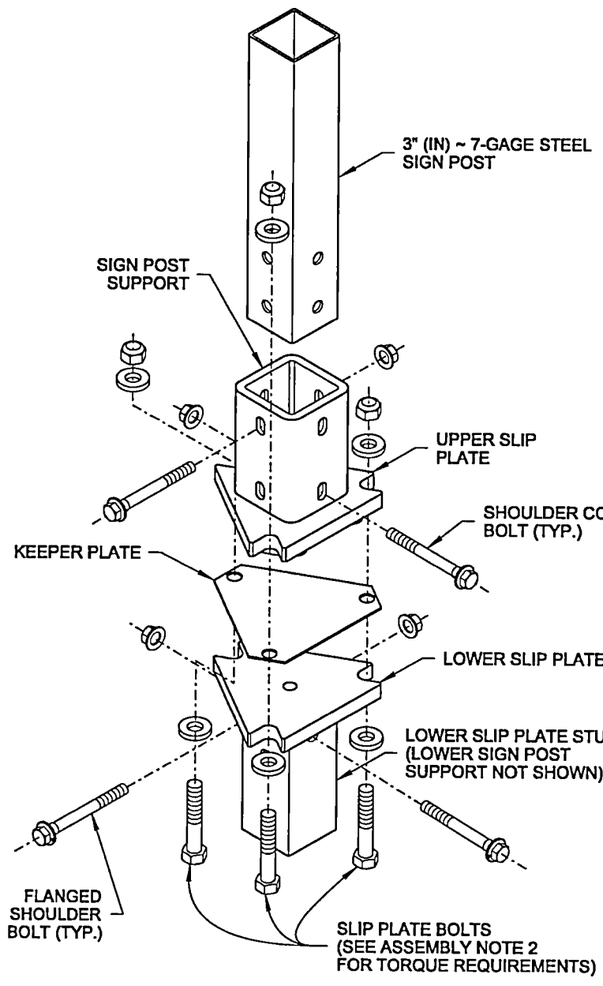
TYPE SB-1
SLIP BASE ASSEMBLY

ASSEMBLY NOTES

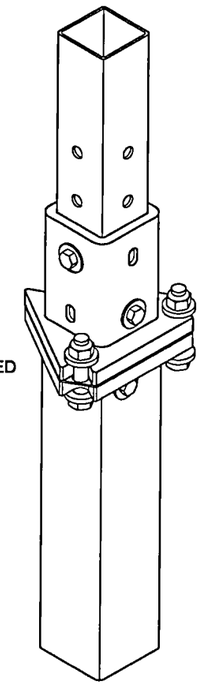
1. Dimensions for the parts used to assemble the base connections are intentionally not shown. Base connections are patented, manufactured products that are in compliance with NCHRP 350 crash test criteria. The base connection details are shown on this plan only to illustrate how the parts are assembled.
2. Do not tighten any single Slip Plate Bolt to the recommended torque before pretightening the other bolts. Progressively tighten the three Slip Plate Bolts in 10 ft-lb increments, alternately, to a final torque of 40 ft-lbs on each.
3. Use only Slip Base manufacturer supplied hardware that meets the requirements of **Standard Specifications 9-06** and **9-28**.



SLIP PLATE DETAIL
FOR TYPE SB-3



EXPLODED VIEW



ISOMETRIC VIEW

TYPE SB-3
SLIP BASE ASSEMBLY

JOHN C. NISBET
STATE OF WASHINGTON
29115
REGISTERED
PROFESSIONAL ENGINEER

Nisbet, John
Nisbet, John Feb 29 2016 9:19 AM
cosign

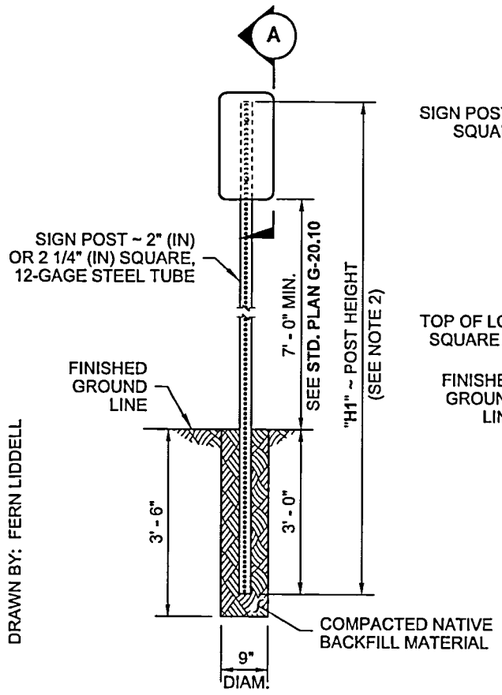
STEEL SIGN SUPPORT TYPES SB-1, SB-2 & SB-3 INSTALLATION DETAILS STANDARD PLAN G-24.40-06

SHEET 4 OF 4 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Carpenter, Jeff Feb 29 2016 12:35 PM
STATE DESIGN ENGINEER
cosign
Washington State Department of Transportation

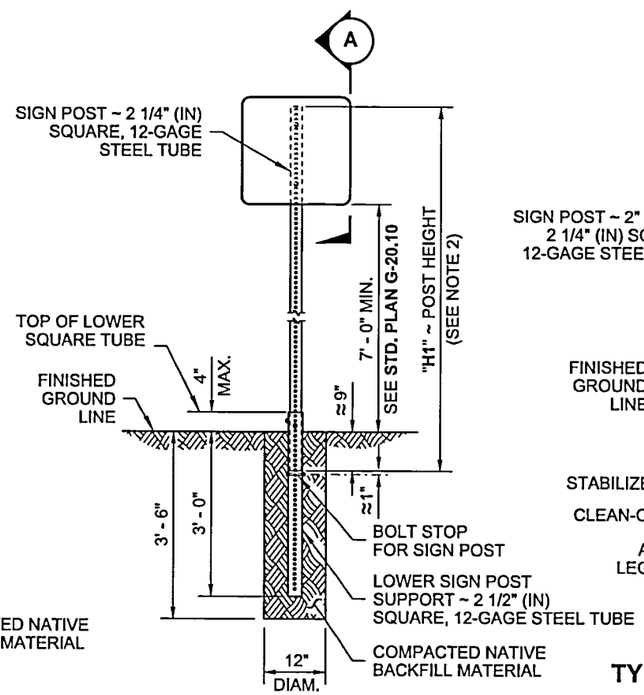
STEEL SIGN SUPPORT TYPES SB-1 & SB-3 ~ 10" (IN)

DRAWN BY: FERN LIDDELL



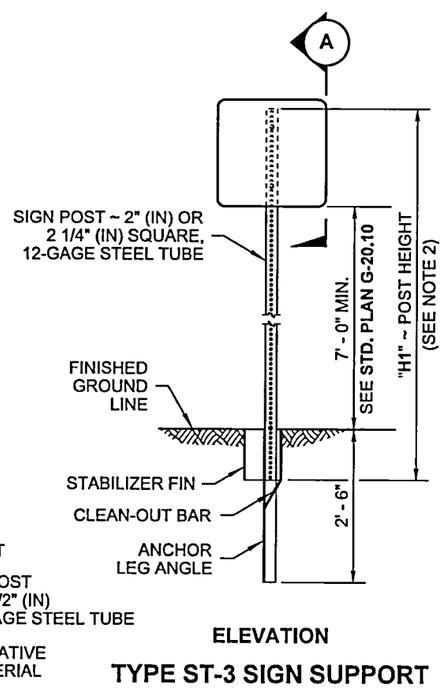
ELEVATION

TYPE ST-1 SIGN SUPPORT



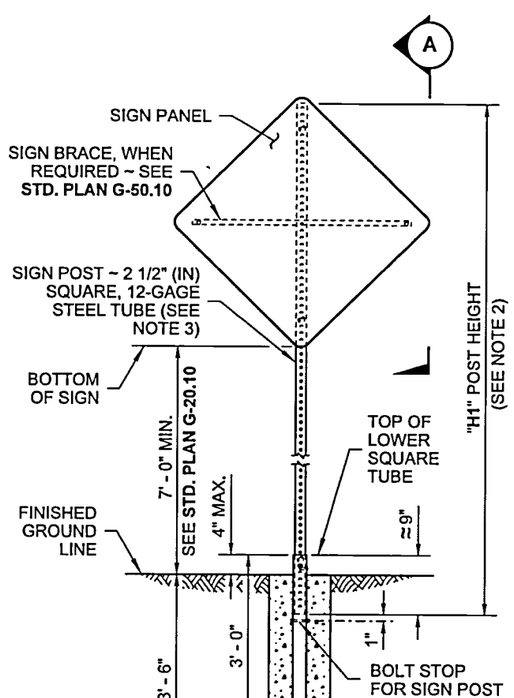
ELEVATION

TYPE ST-2 SIGN SUPPORT



ELEVATION

TYPE ST-3 SIGN SUPPORT

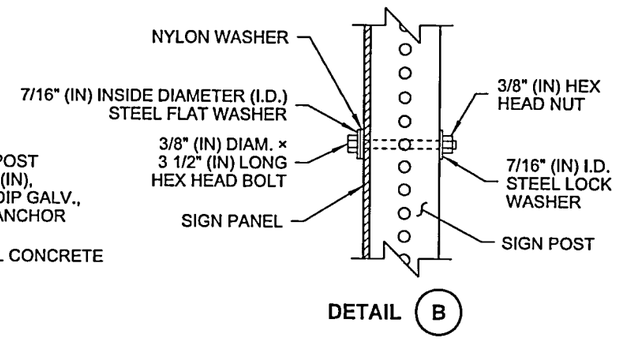


ELEVATION

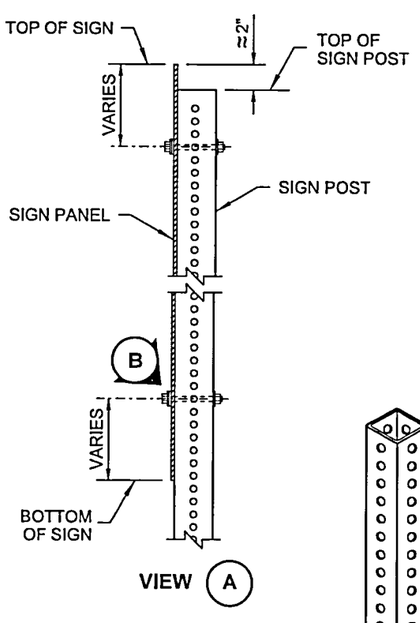
TYPE ST-4 SIGN SUPPORT

NOTES

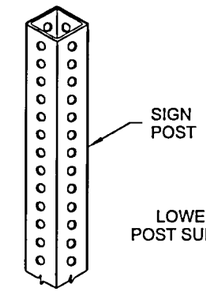
1. Dimensions for the parts used to assemble the base connections are intentionally not shown. Base connections are patented, manufactured products that are in compliance with NCHRP 350 crash test criteria. The base connection details are shown on this plan only to illustrate how the parts are assembled.
2. For "**H1**", refer to the Sign Specification Sheet in the Contract.
3. A 2" (in) post with a 2 1/4" (in) PSST anchor or a 2 1/4" (in) post with a 2 1/2" (in) PSST anchor may be substituted. See Contract Plans.
4. Perforated square steel post shall meet the requirements of **Standard Specification 9-06**.
5. Use only base connection manufacturer supplied hardware that meets the requirements of **Standard Specifications 9-06** and **9-28**.



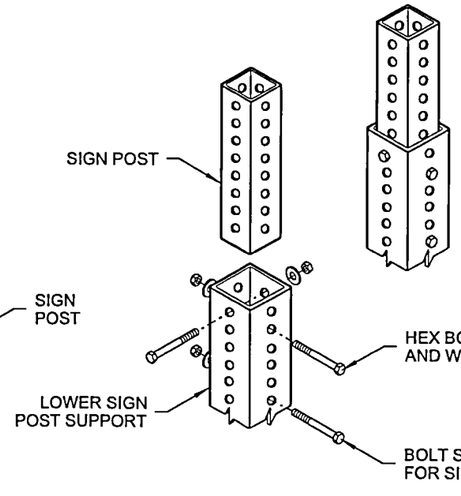
DETAIL B



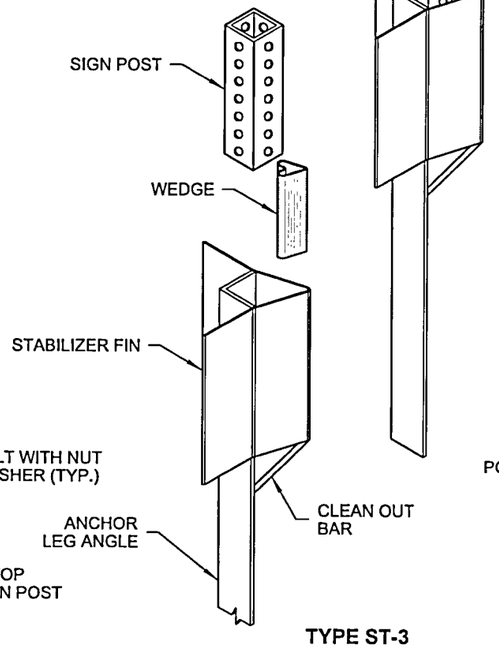
VIEW A



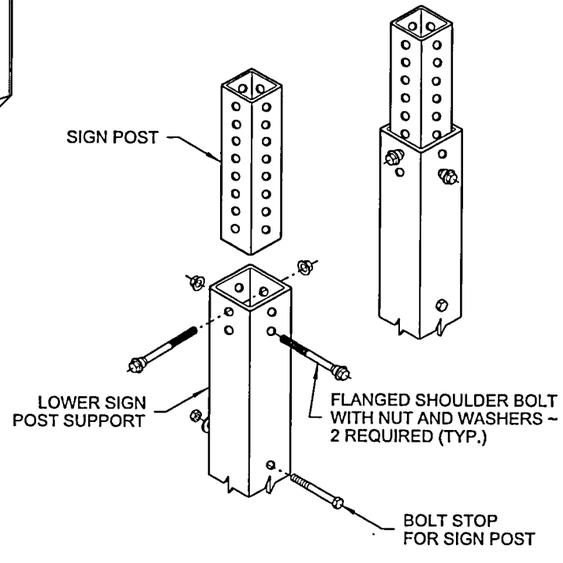
TYPE ST-1



TYPE ST-2



TYPE ST-3



TYPE ST-4

JOHN C. NISBET
STATE OF WASHINGTON
29115
REGISTERED
PROFESSIONAL ENGINEER

Nisbet, John
Jun 27 2017 3:24 PM

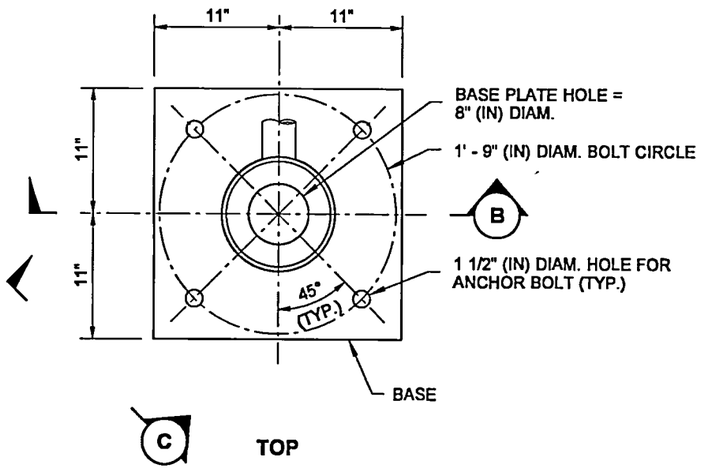
STEEL SIGN SUPPORT TYPES ST-1 - ST-4 INSTALLATION DETAILS

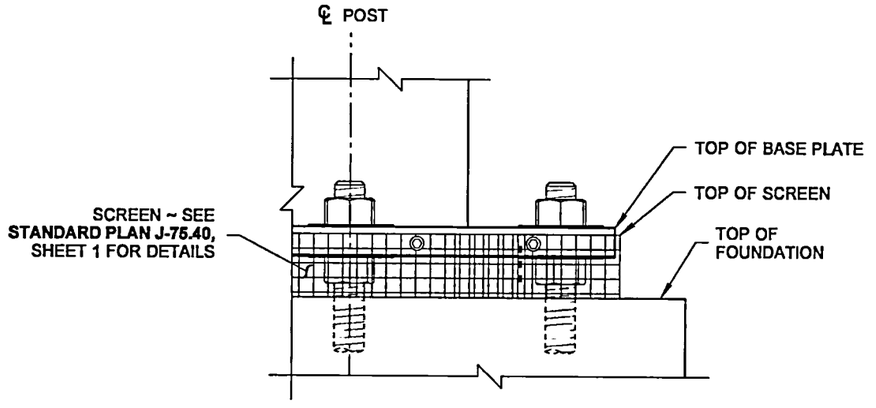
STANDARD PLAN G-24.50-04

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 11 2017 1:21 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

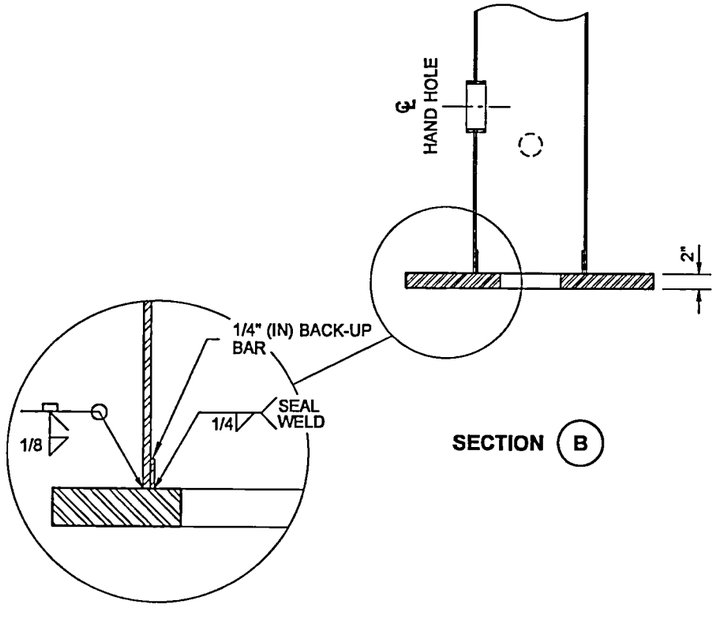
DRAWN BY: FERN LIDDELL



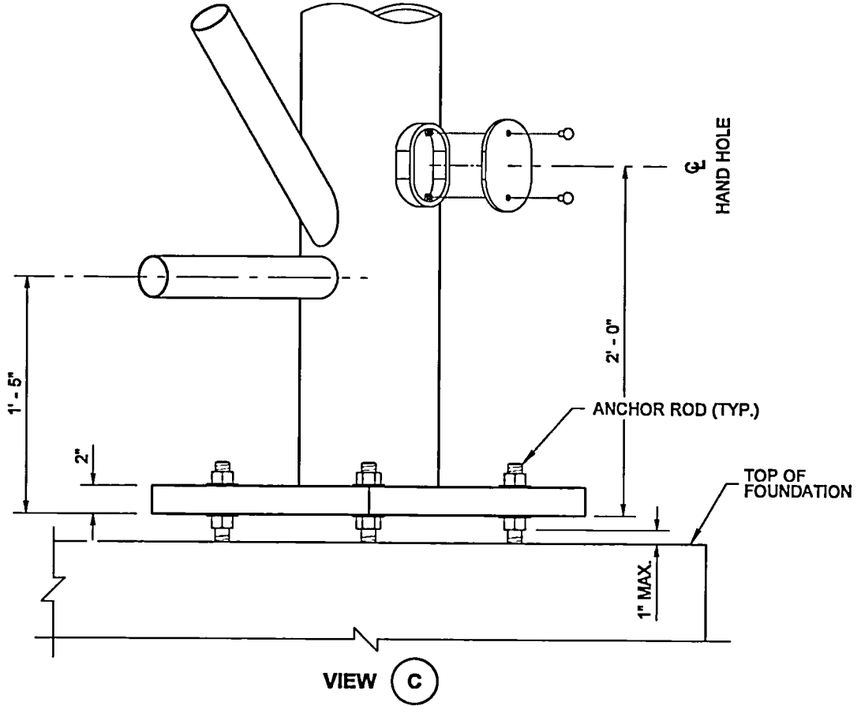


SCREEN DETAIL

CONDUIT OMITTED FOR CLARITY ~ FOR ELECTRICAL REQUIREMENTS SEE **STANDARD PLAN J-75.45**



BASE WELD DETAIL



POST BASE DETAILS

CONDUIT OMITTED FOR CLARITY ~ FOR ELECTRICAL REQUIREMENTS SEE **STANDARD PLAN J-75.45**

RICHARD P. ZELDENRUST
STATE OF WASHINGTON
25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
2015.06.11 14:11:56 -07'00'

SIGN BRIDGE (TRUSS-TYPE)

STANDARD PLAN G-70.10-03

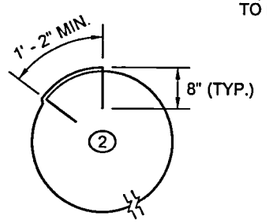
SHEET 4 OF 4 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jun 18 2015 7:53 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

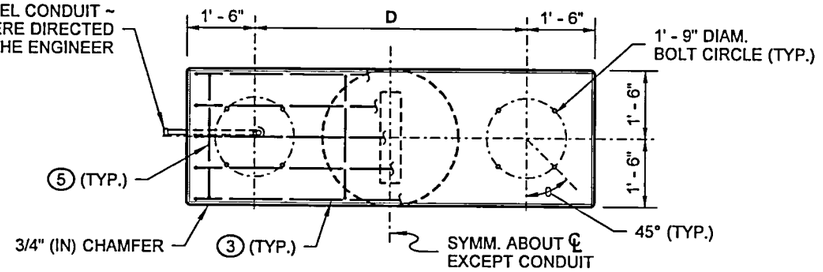
DRAWN BY: COLBY FLETCHER

MATERIAL SPECIFICATIONS	
SHAFT CONCRETE	CLASS 4000P ◇1
ALL OTHER CONCRETE	CLASS 4000
STEEL REINF. BAR	AASHTO M 31 GRADE 60
ANCHOR RODS	ASTM F 1554 GRADE 105
ANCHOR NUTS	AASHTO M 291
ANCHOR WASHERS	AASHTO M 293
ANCHORAGE GALVANIZING	AASHTO M 232
ANCHOR PLATE	ASTM A 36

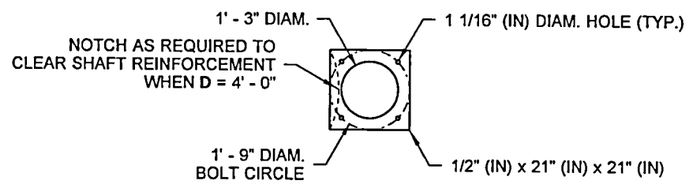
◇1 CASE THE EXCAVATION AND PLACE USING TREMIE METHOD WHEN WATER IS PRESENT



LAP SPLICE DETAIL



TOP

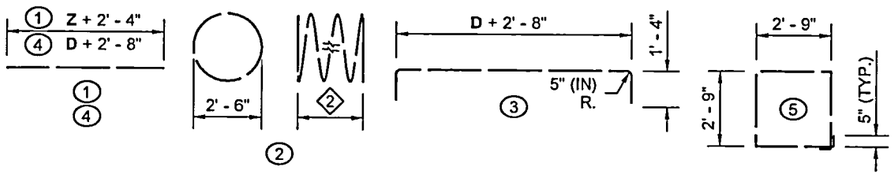


ANCHOR PLATE DETAIL

TABLE					ALLOWABLE LATERAL BEARING PRESSURE (PSF)
VARIABLES	SPAN LENGTH				
	60' OR LESS	61' TO 90'	91' TO 120'	121' TO 150'	
DIMENSION ~ D	4' - 0"	5' - 0"	6' - 0"	7' - 0"	
BAR SPACES ~ N	2	3	6	10	
SHAFT DEPTH ~ Z	11' - 6"	13' - 6"	15' - 0"	16' - 6"	2500 OR BETTER

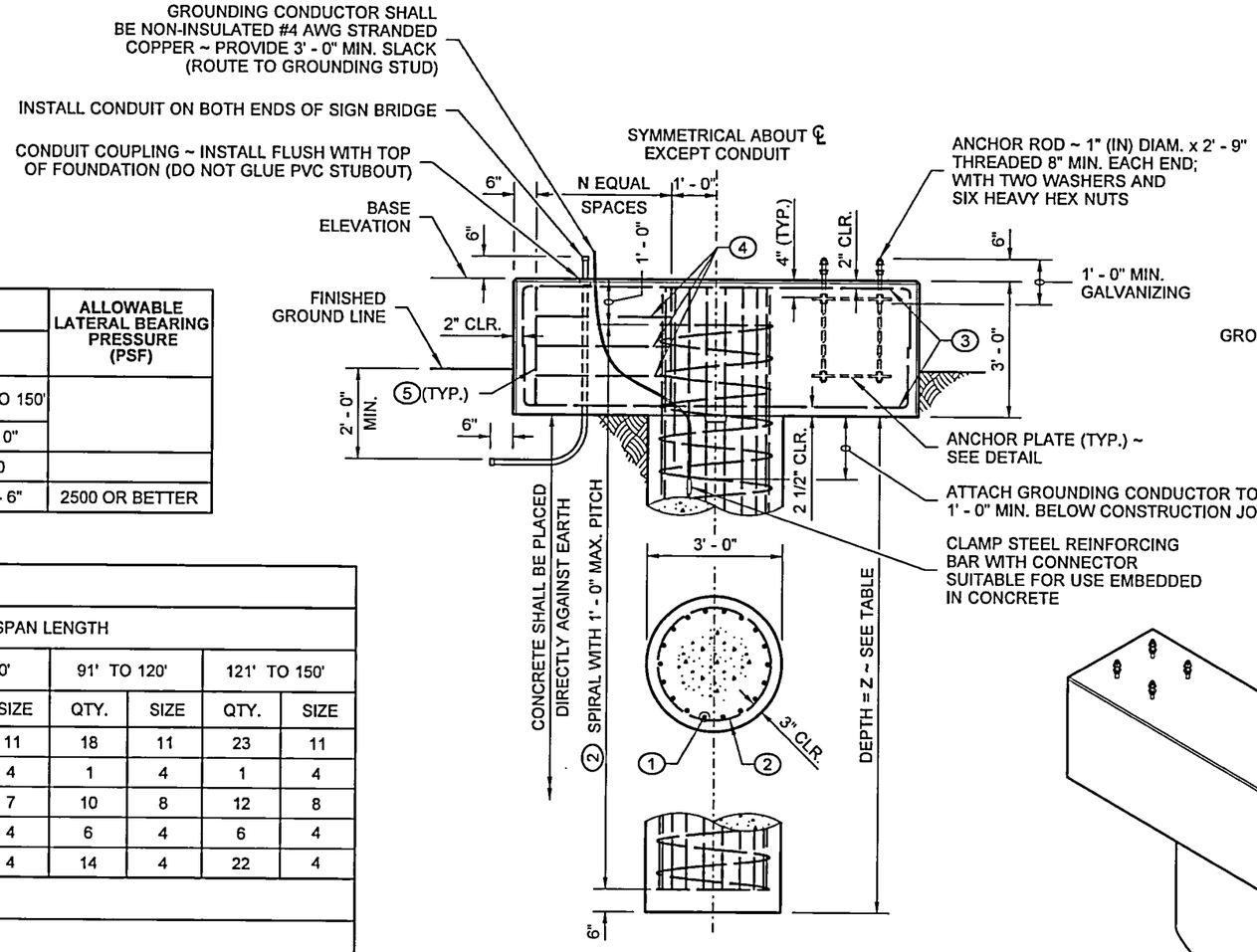
BAR LIST									
MARK	LOCATION	SPAN LENGTH							
		60' OR LESS		61' TO 90'		91' TO 120'		121' TO 150'	
		QTY.	SIZE	QTY.	SIZE	QTY.	SIZE	QTY.	SIZE
1	SHAFT - VERTICAL	11	9	14	11	18	11	23	11
2	SHAFT - SPIRAL	1	4	1	4	1	4	1	4
3	CAP - TOP AND BOTTOM	8	6	8	7	10	8	12	8
4	CAP - SIDES	6	4	6	4	6	4	6	4
5	CAP - HOOPS	6	4	8	4	14	4	22	4

BENDING DIAGRAM



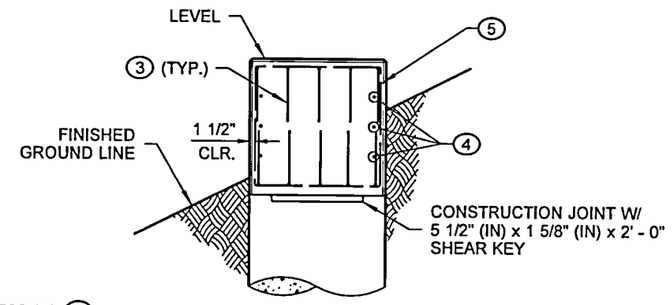
(ALL DIMENSIONS ARE OUT TO OUT)
2" (IN) RADIUS, UNLESS OTHERWISE NOTED

◇2 DETERMINE LENGTH FROM PLANS

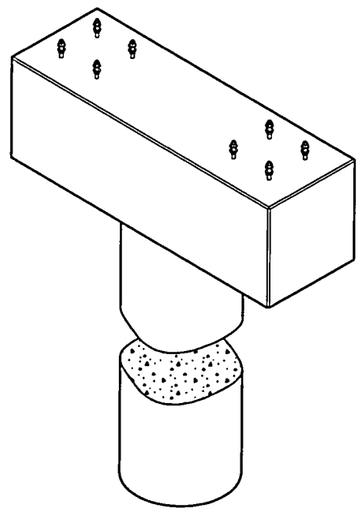


ELEVATION

FOUNDATION TYPE 1



END



ISOMETRIC

RICHARD P. ZELDENRUST
STATE OF WASHINGTON
25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jul 6 2017 7:39 AM

cosign

SIGN BRIDGE (TRUSS-TYPE) FOUNDATION TYPE 1

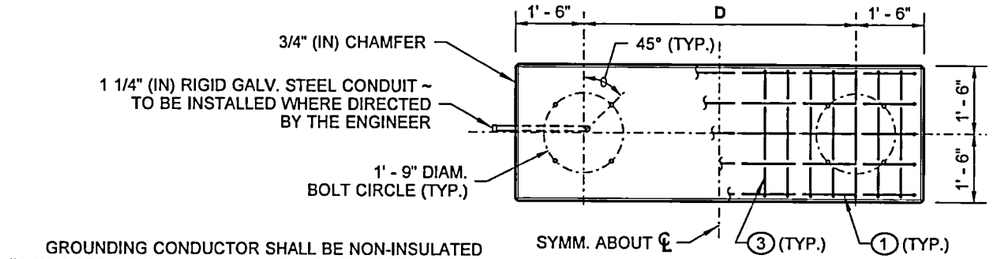
STANDARD PLAN G-70.20-04

SHEET 1 OF 1 SHEET

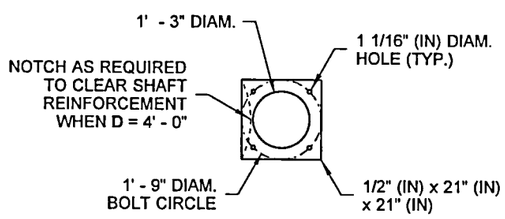
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:22 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: COLBY FLETCHER

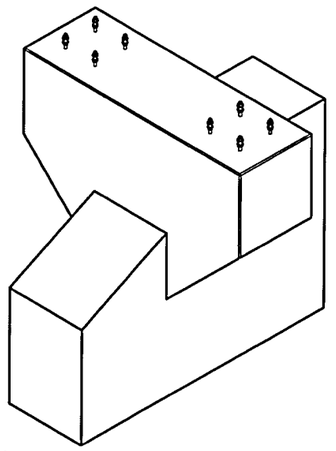
MATERIAL SPECIFICATIONS	
CONCRETE	CLASS 4000P
STEEL REINF. BAR	AASHTO M 31 GRADE 60
ANCHOR RODS	ASTM F 1554 GRADE 105
ANCHOR NUTS	AASHTO M 291
ANCHOR WASHERS	AASHTO M 293
ANCHORAGE GALVANIZING	AASHTO M 232
ANCHOR PLATE	ASTM A 36



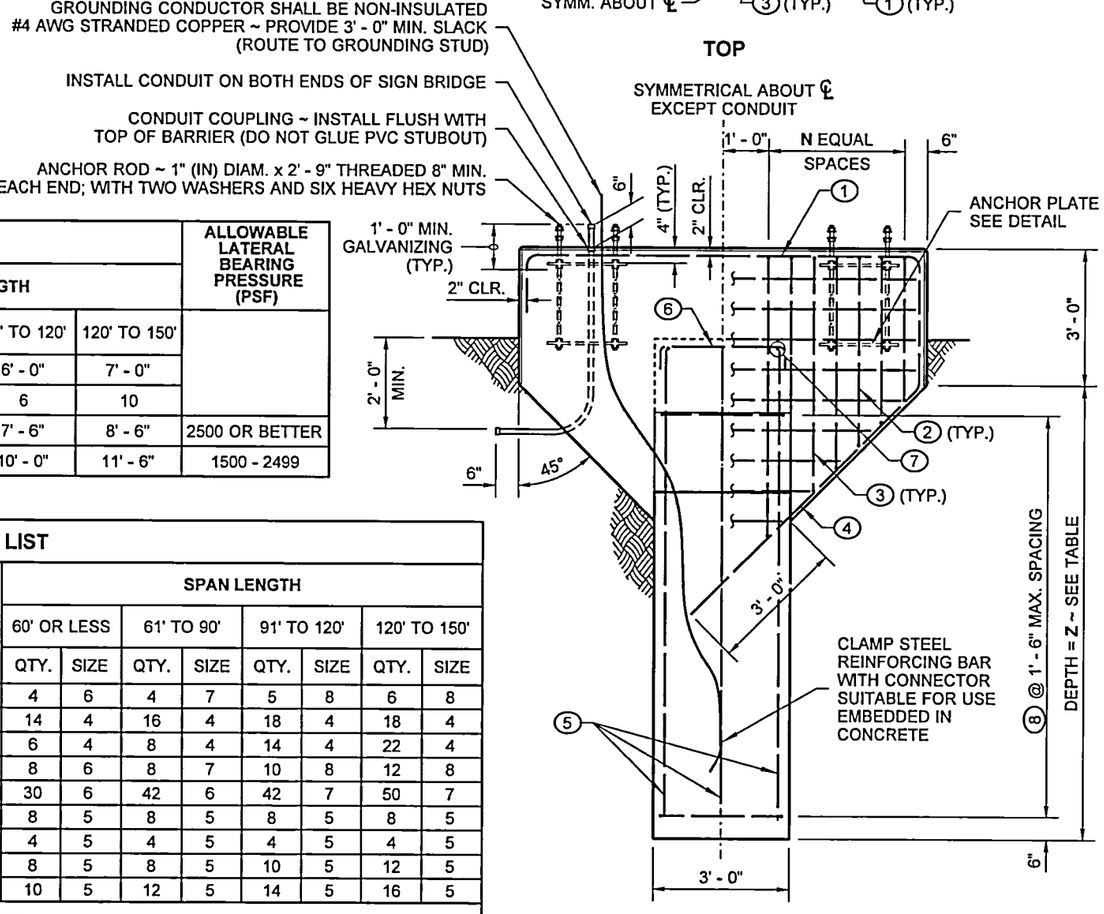
TOP



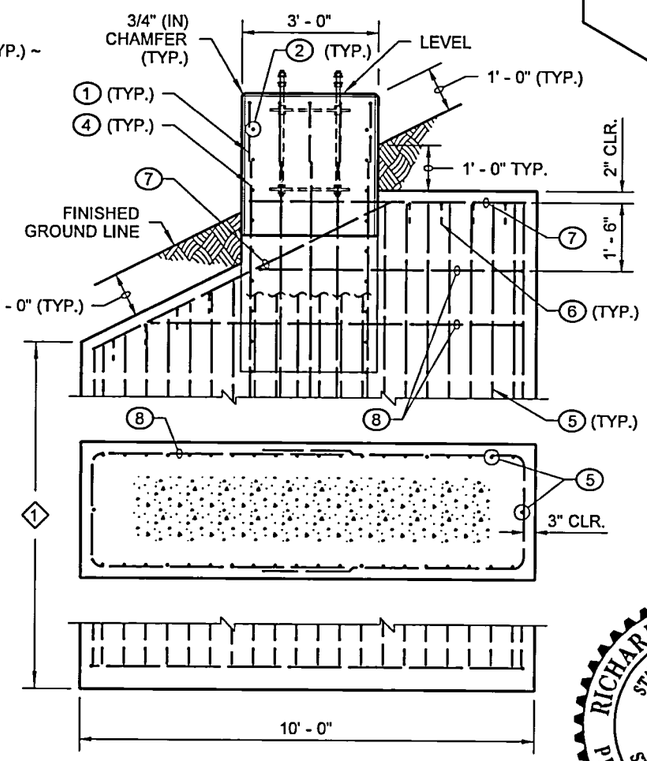
ANCHOR PLATE DETAIL



ISOMETRIC



END

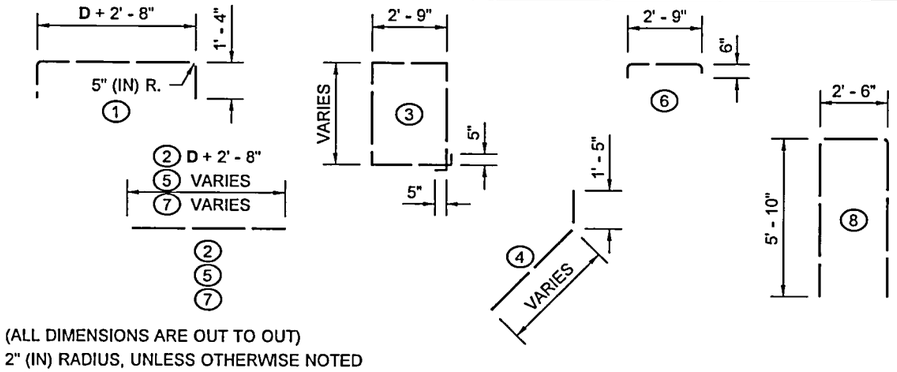


SIDE

TABLE						ALLOWABLE LATERAL BEARING PRESSURE (PSF)
VARIABLES			SPAN LENGTH			
			60' OR LESS	61' TO 90'	91' TO 120'	120' TO 150'	
DIMENSION ~ D			4' - 0"	5' - 0"	6' - 0"	7' - 0"	
BAR SPACES ~ N			2	3	6	10	
SHAFT DEPTH ~ Z	TYPE	2	5' - 6"	6' - 6"	7' - 6"	8' - 6"	2500 OR BETTER
		3	7' - 0"	8' - 6"	10' - 0"	11' - 6"	1500 - 2499

BAR LIST										
FOUNDATION TYPE	MARK	LOCATION	SPAN LENGTH							
			60' OR LESS		61' TO 90'		91' TO 120'		120' TO 150'	
			QTY.	SIZE	QTY.	SIZE	QTY.	SIZE	QTY.	SIZE
2 AND 3	1	CAP - TOP	4	6	4	7	5	8	6	8
	2	CAP - SIDES	14	4	16	4	18	4	18	4
	3	CAP - HOOPS	6	4	8	4	14	4	22	4
	4	CAP - BOTTOM	8	6	8	7	10	8	12	8
	5	FND. WALL - VERTICAL	30	6	42	6	42	7	50	7
	6	FND. WALL - TIES	8	5	8	5	8	5	8	5
	7	FND. WALL - HORIZONTAL	4	5	4	5	4	5	4	5
2	8	FND. WALL - HORIZONTAL	8	5	8	5	10	5	12	5
3	8	FND. WALL - HORIZONTAL	10	5	12	5	14	5	16	5

BENDING DIAGRAM



(ALL DIMENSIONS ARE OUT TO OUT)
2" (IN) RADIUS, UNLESS OTHERWISE NOTED

1 Concrete below finished ground line shall be placed directly against undisturbed earth, or alternately, backfill placed around foundation shall be compacted in conformance with **Standard Specification 2-09.3(1)e**, method 1 or 4. All formwork shall be removed.

FOUNDATION TYPES 2 & 3

RICHARD P. ZELDENRUST — STATE OF WASHINGTON — 25470 — STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jul 6 2017 7.43 AM

SIGN BRIDGE (TRUSS-TYPE) FOUNDATION TYPE 2 & 3

STANDARD PLAN G-70.30-04

SHEET 1 OF 1 SHEET

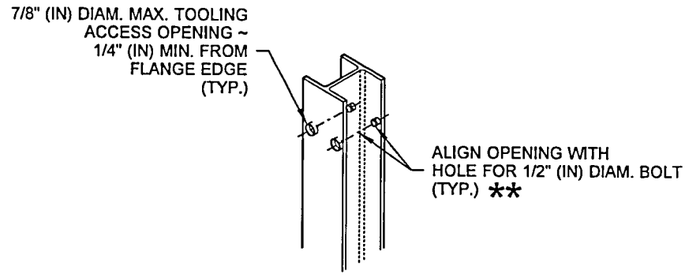
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8.21 AM

STATE DESIGN ENGINEER

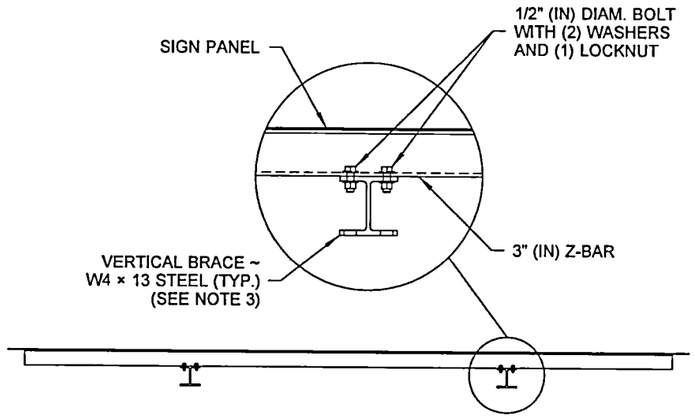
Washington State Department of Transportation

This page left blank intentionally.

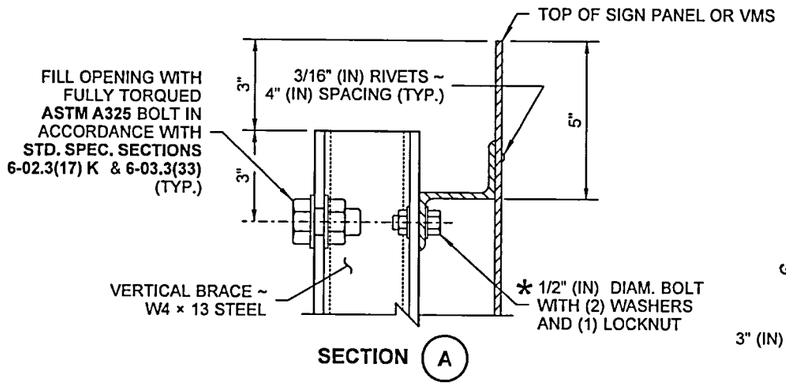
DRAWN BY: BILL BERENS



PARTIAL VERTICAL BRACE @ Z-BAR CONNECTION

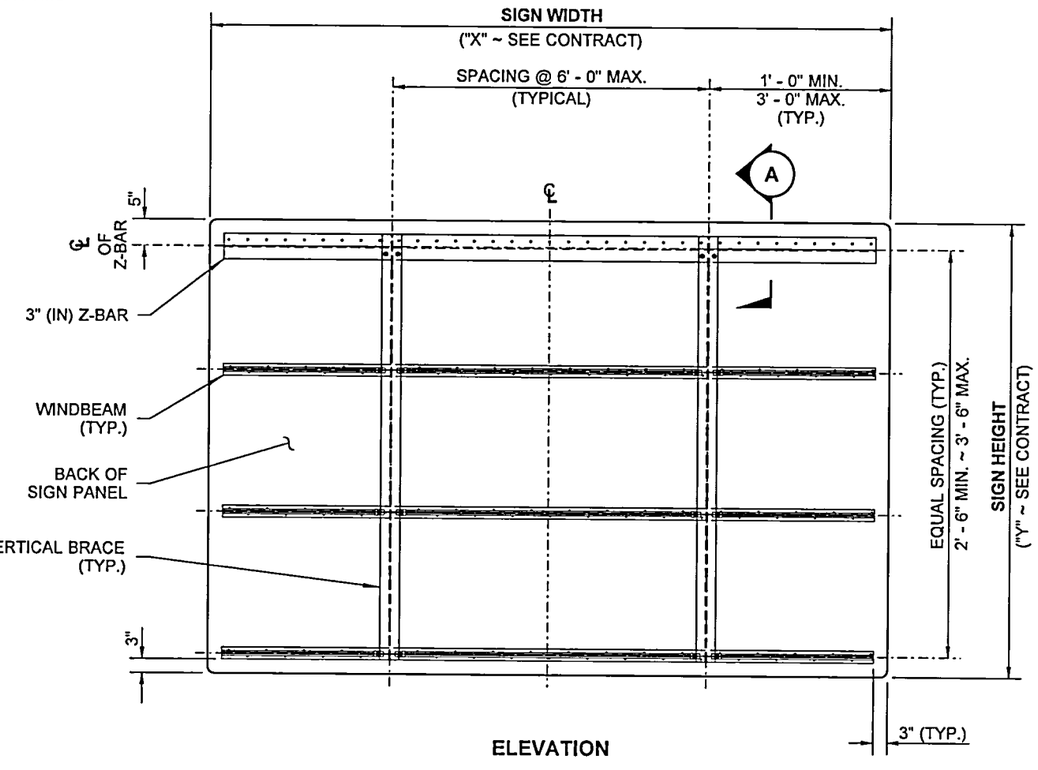


TOP

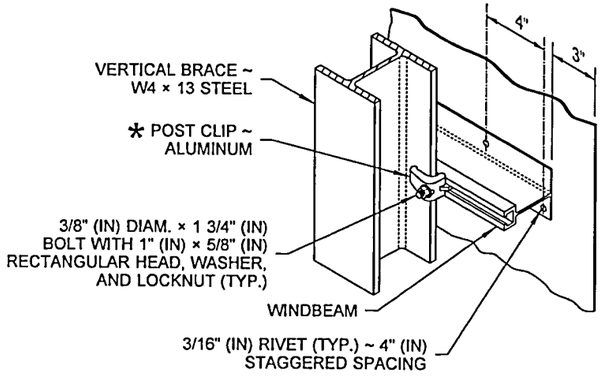


SECTION (A)

*ATTACH ON BOTH SIDES OF WIDE FLANGE STEEL POST
**TOOLING ACCESS OPENING AND HOLE FOR 1/2" (IN) DIAM. BOLT MAY BE FIELD DRILLED



ELEVATION



WINDBEAM CONNECTION DETAIL

* ATTACH ON BOTH SIDES OF WIDE FLANGE STEEL POST

ASSEMBLY NOTES

All parts shall be plumb and square.

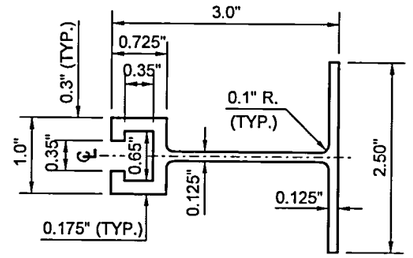
Bring all parts into full contact with each other.

Fasteners and associated hardware shall be in a snug tight condition when assembled.

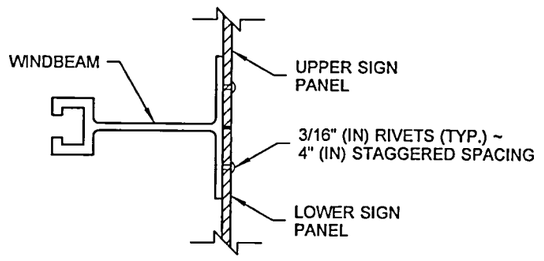
Bolted parts shall fit solidly together.

NOTES

1. Windbeam and 3" (IN) Z-Bar are aluminum. All nuts, bolts, washers, and other hardware shall be stainless steel per **Standard Specification Section 9-28.11**, except as noted. Galvanize all non-stainless steel parts.
2. See **Standard Plan G-90.20** (Monotube), or G-**90.30** (Truss) for additional Overhead Sign Mounting details.
3. For VMS mounting, the Contractor may substitute W6 × 12 steel or W8 × 13 steel sections for the Vertical Brace W4 × 13 steel.



WINDBEAM DETAIL



HORIZONTAL SIGN PANEL SPLICE

RICHARD P. ZELDENRUST
STATE OF WASHINGTON
25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jul 6 2017 7:45 AM
cosign

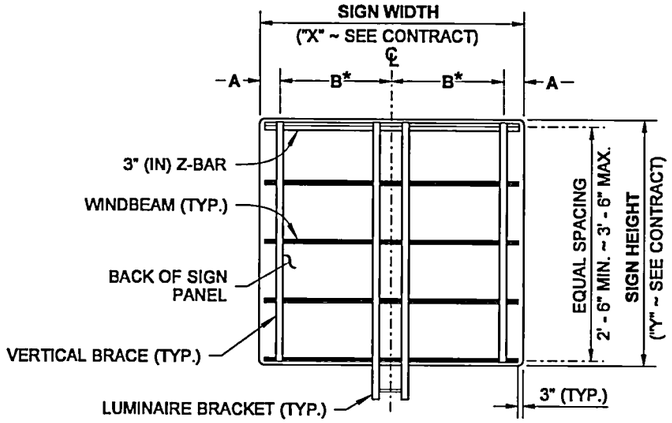
OVERHEAD SIGN BRACING AND MOUNTING

STANDARD PLAN G-90.10-03

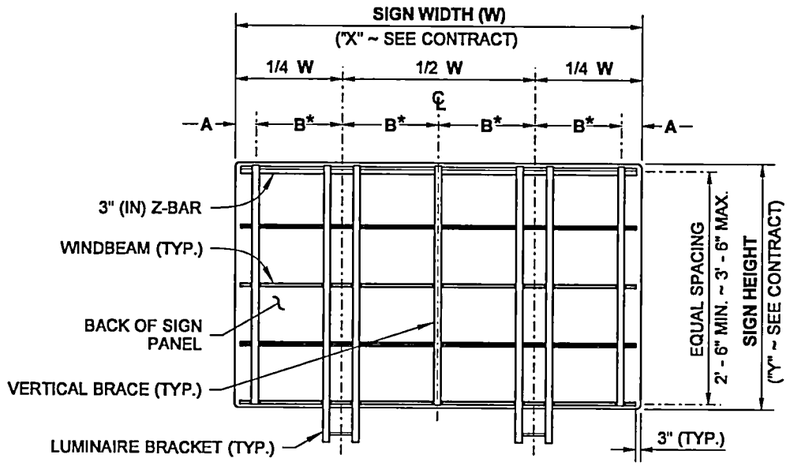
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 11 2017 1:20 PM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

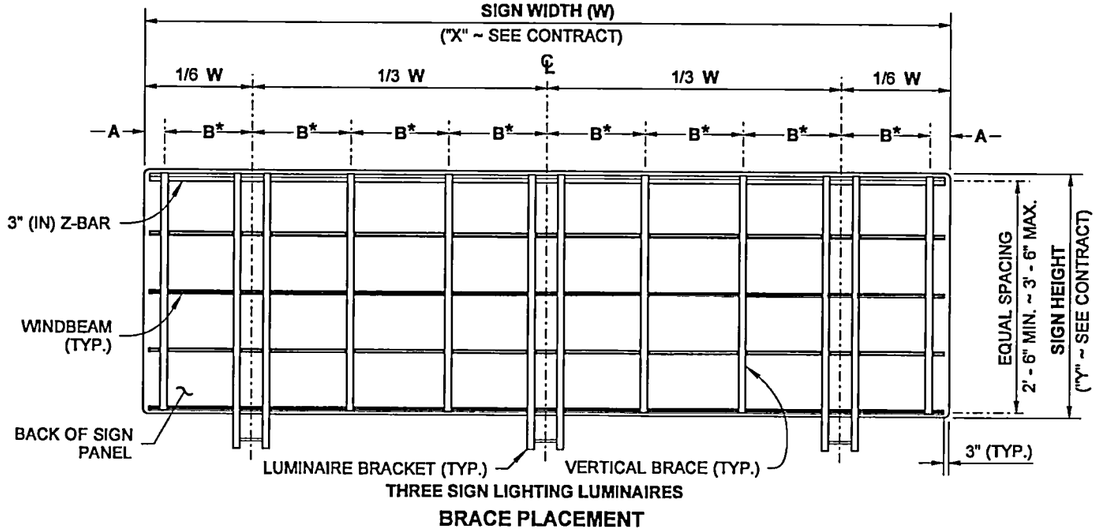
DRAWN BY: BILL BERENS



ONE SIGN LIGHTING LUMINAIRE
BRACE PLACEMENT



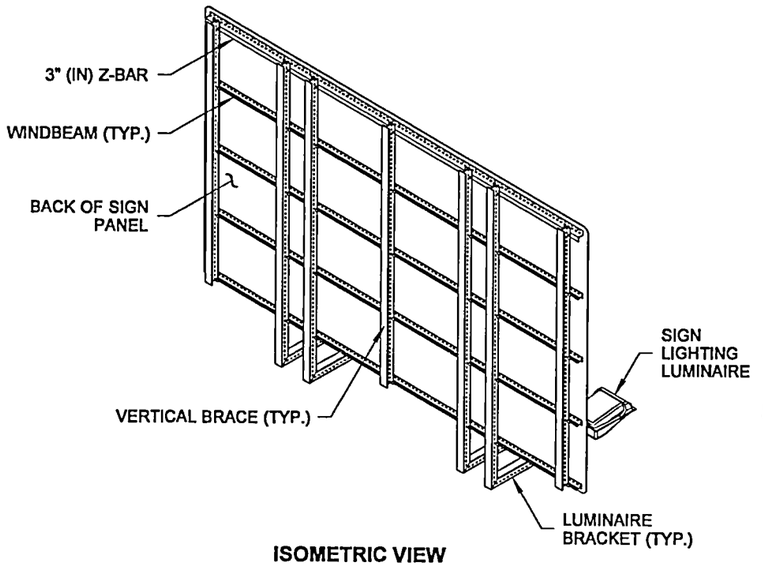
TWO SIGN LIGHTING LUMINAIRES
BRACE PLACEMENT



THREE SIGN LIGHTING LUMINAIRES
BRACE PLACEMENT

VERTICAL BRACE SPACING WITH SIGN LIGHTING		
SIGN WIDTH	A	B*
ONE SIGN LIGHTING LUMINAIRE		
8' - 0"	6"	3' - 6"
10' - 0"	6"	4' - 6"
12' - 0"	6"	5' - 6"
14' - 0"	1' - 0"	6' - 0"
16' - 0"	2' - 0"	6' - 0"
TWO SIGN LIGHTING LUMINAIRES		
18' - 0"	6"	4' - 3"
20' - 0"	6"	4' - 9"
22' - 0"	6"	5' - 3"
24' - 0"	6"	5' - 9"
26' - 0"	6"	6' - 3"
28' - 0"	6"	6' - 9"
30' - 0"	1' - 0"	7' - 0"
32' - 0"	2' - 0"	7' - 0"
THREE SIGN LIGHTING LUMINAIRES		
34' - 0"	6"	4' - 1 1/2"
36' - 0"	6"	4' - 4 1/2"

* IF " B" EXCEEDS THE SPACING LISTED ON THE VERTICAL BRACE SPACING TABLE, ADD AN ADDITIONAL VERTICAL BRACE



ISOMETRIC VIEW

NOTES

1. Install Sign Lighting Luminaires (and Brackets) only when required in the Contract.
2. All nuts, bolts, washers, and other hardware shall be stainless steel per **Standard Specification Section 9-28.11**, except as noted. Galvanize all non-stainless steel parts.
3. See **Standard Plan G-90.20** (Monotube), or **G-90.30** (Truss) for additional Overhead Sign Lighting details.

RICHARD P. ZELDENRUST
STATE OF WASHINGTON
25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
Apr 21 2016 1:09 PM

cosign

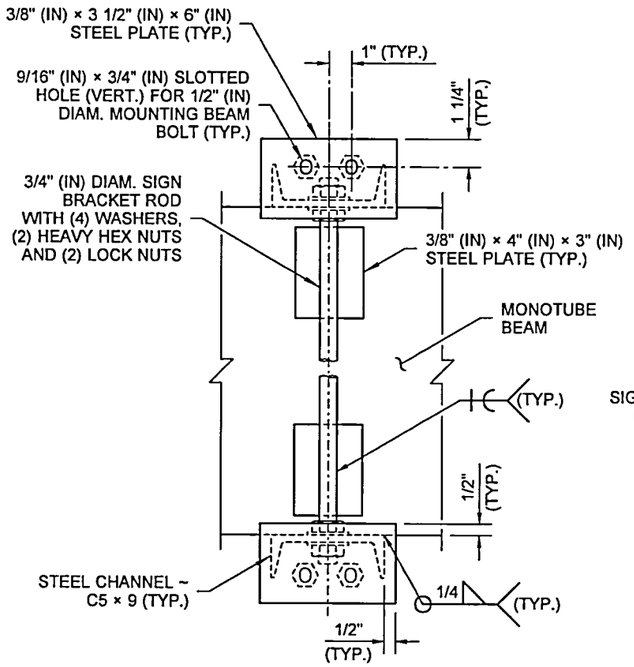
OVERHEAD SIGN LIGHTING BRACING

STANDARD PLAN G-90.11-00

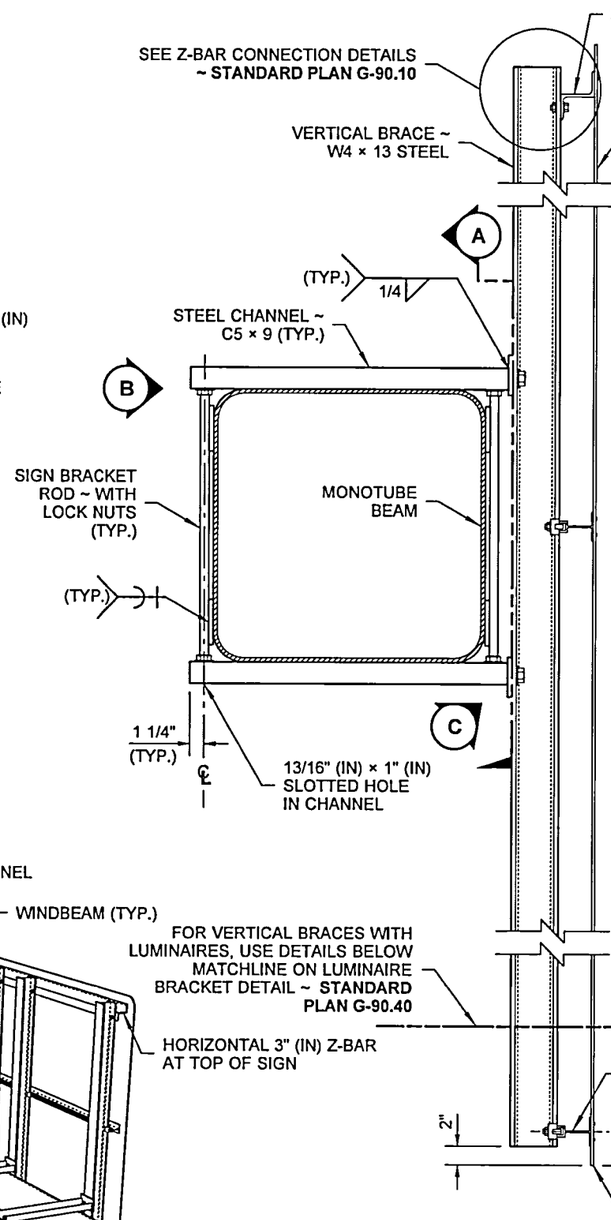
SHEET 1 OF 1 SHEET

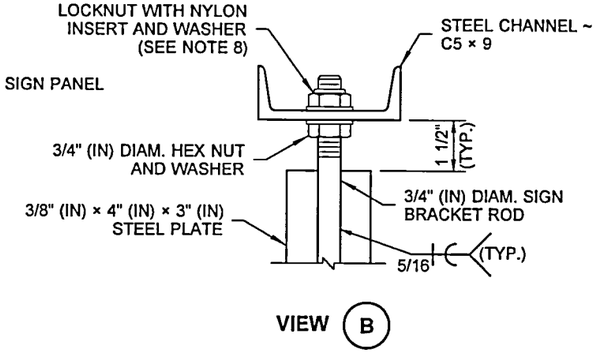
APPROVED FOR PUBLICATION
Carpenter, Jeff
Apr 28 2016 3:10 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: BILL BERENS

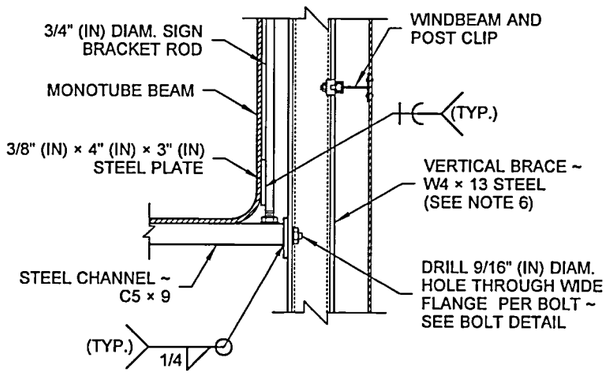


SECTION (A)

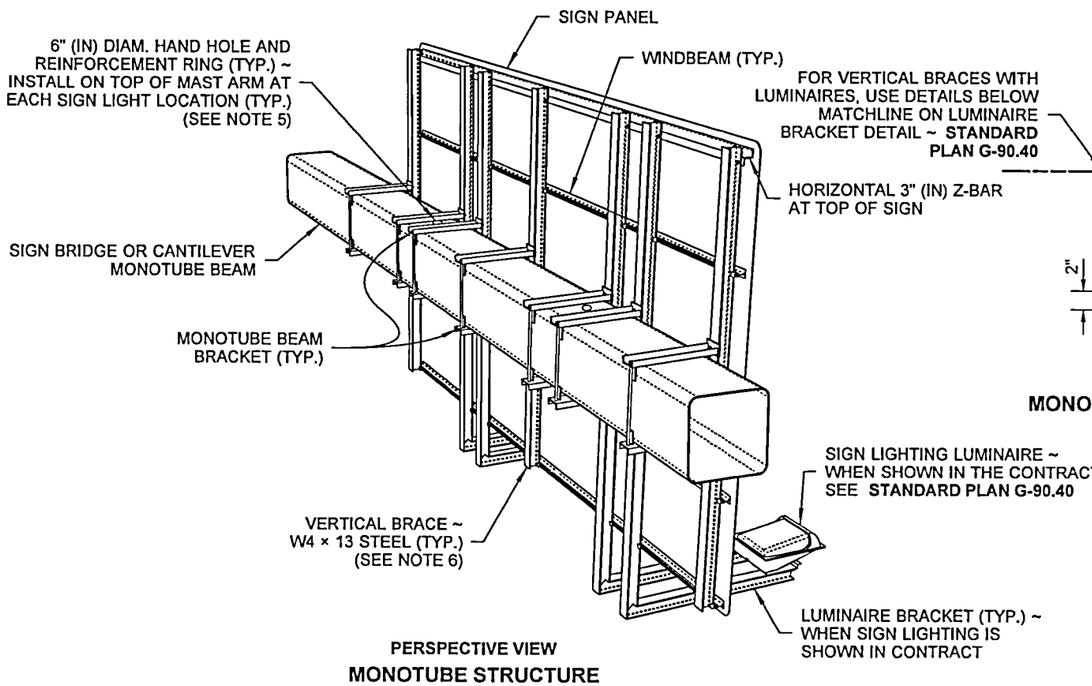




VIEW (B)

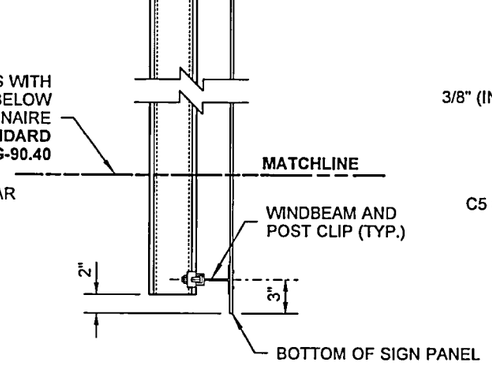


DETAIL (C)



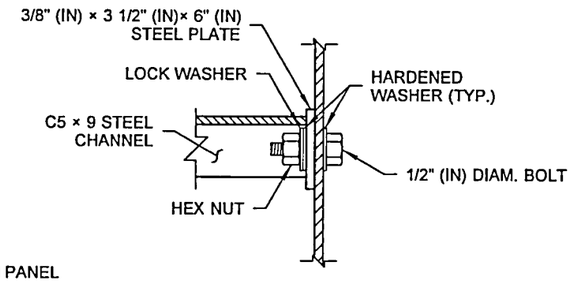
PERSPECTIVE VIEW

MONOTUBE STRUCTURE



SIDE VIEW

MONOTUBE CONNECTION



BOLT DETAIL

NOTES

1. Refer to Contract Plans for Monotube Beam Bracket element sizes, dimensions, and weld symbols.
2. See **Standard Plan G-90.10** for Sign Bracing and Mounting details. For Sign Bridge Structure parts, see **Standard Specification Section 9-28.14(2)**.
3. Galvanize all non-stainless steel parts. See **Standard Specification Section 9-28.14(2)** for requirements.
4. See **Standard Plan G-90.40** for Sign Lighting details.
5. Hand holes shall be installed at the time of fabrication. Only additional conduits for lighting accommodations to previously non-illuminated structures may be installed in field as long as the proper repairs are made to the structure. For details notshown, see **Standard Plan J-75.40**.
6. For VMS mounting, the Contractor may substitute W6 × 12 steel or W8 × 13 steel sections for the Vertical Brace W4 × 13 steel.
7. 3' - 0" max. Vertical Brace and Monotube Beam Bracket spacing for walk-in cabinet Type VMS installation.
8. All locknuts shall conform to **Standard Specification Section 9-28.11** as supplemented in the Special Provisions.
9. For all sign lighting bracing details not shown, see **Standard Plan G-90.11**.

RICHARD P. ZELDENRUST — STATE OF WASHINGTON — 25470 — STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jul 6 2017 7:46 AM

OVERHEAD SIGN MOUNTING (MONOTUBE STRUCTURE)

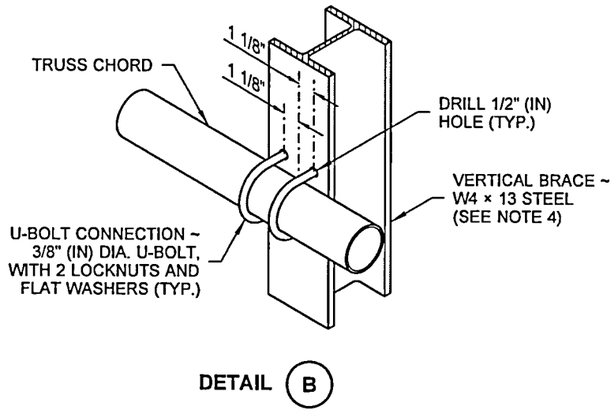
STANDARD PLAN G-90.20-05

SHEET 1 OF 1 SHEET

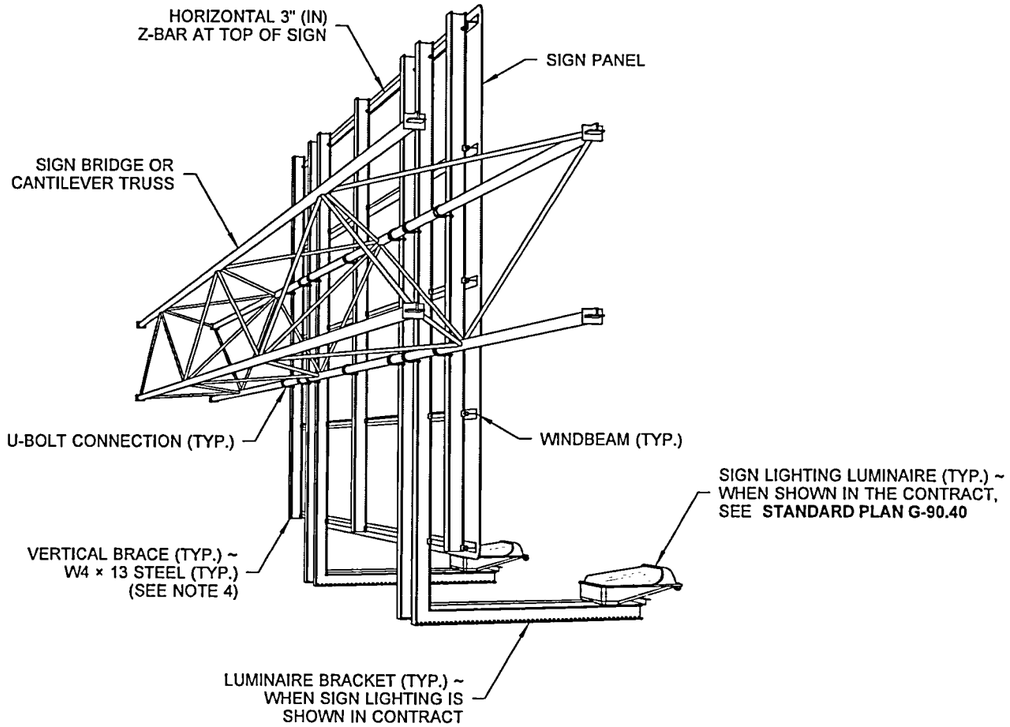
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 11 2017 1:20 PM

STATE DESIGN ENGINEER
Washington State Department of Transportation

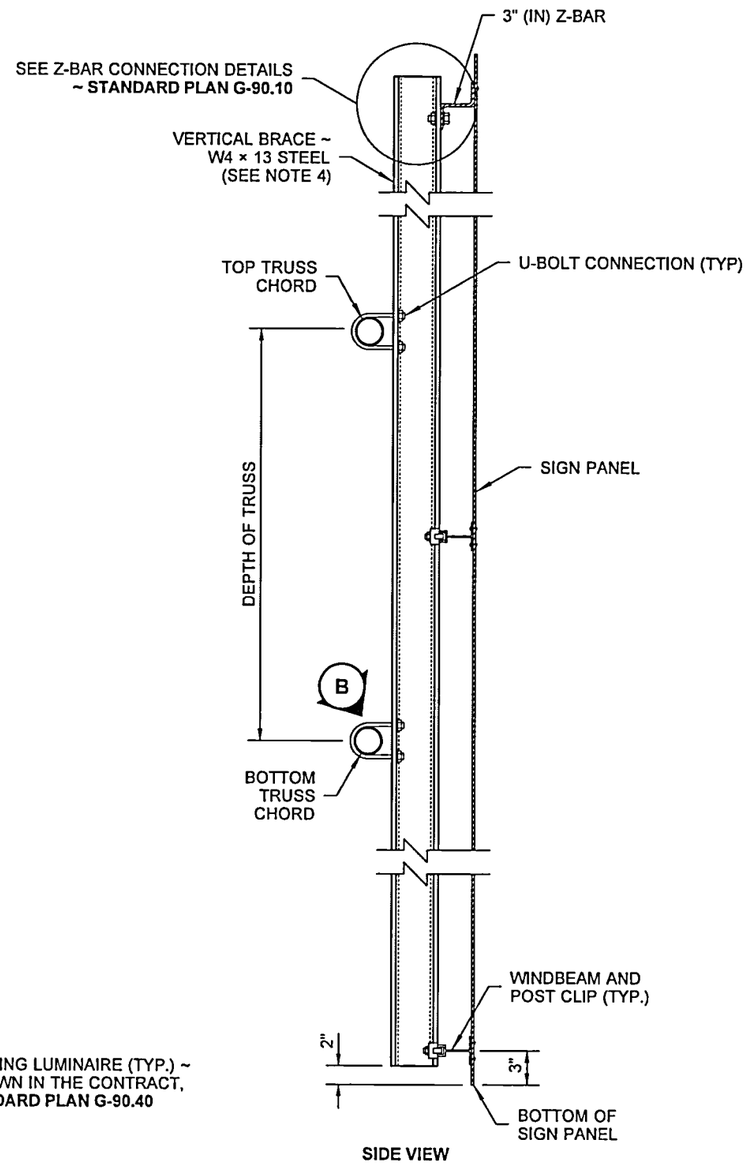
DRAWN BY: BILL BERENS



DETAIL (B)



PERSPECTIVE VIEW
TRUSS STRUCTURE



SIDE VIEW
TRUSS CONNECTION

NOTES

1. U-Bolts, Washers and Nuts shall be stainless steel, except as noted.
2. See **Standard Plan G-90.10** for Sign Bracing and Mounting details. For Sign Bridge Structure parts, see **Standard Specification Section 9-28.14(2)**.
3. Galvanize all non-stainless steel parts. See **Standard Specification Section 9-28.14(2)** for requirements.
4. For VMS mounting, the contractor may substitute W6 x 12 Steel or W8 x 13 Steel sections for the Vertical Brace W4 x 13 Steel.
5. 3' - 0" MAX. Vertical Brace spacing for Walk-In Cabinet Type VMS installation.
6. All locknuts shall conform to **Standard Specification Section 9-28.11** as supplemented in the Special Provisions.
7. For all sign lighting bracing details not shown, See **Standard Plan G-90.11**.

RICHARD P. ZELDENRUST
STATE OF WASHINGTON
25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jul 6 2017 7:46 AM

cosign

OVERHEAD SIGN MOUNTING (TRUSS STRUCTURE)

STANDARD PLAN G-90.30-04

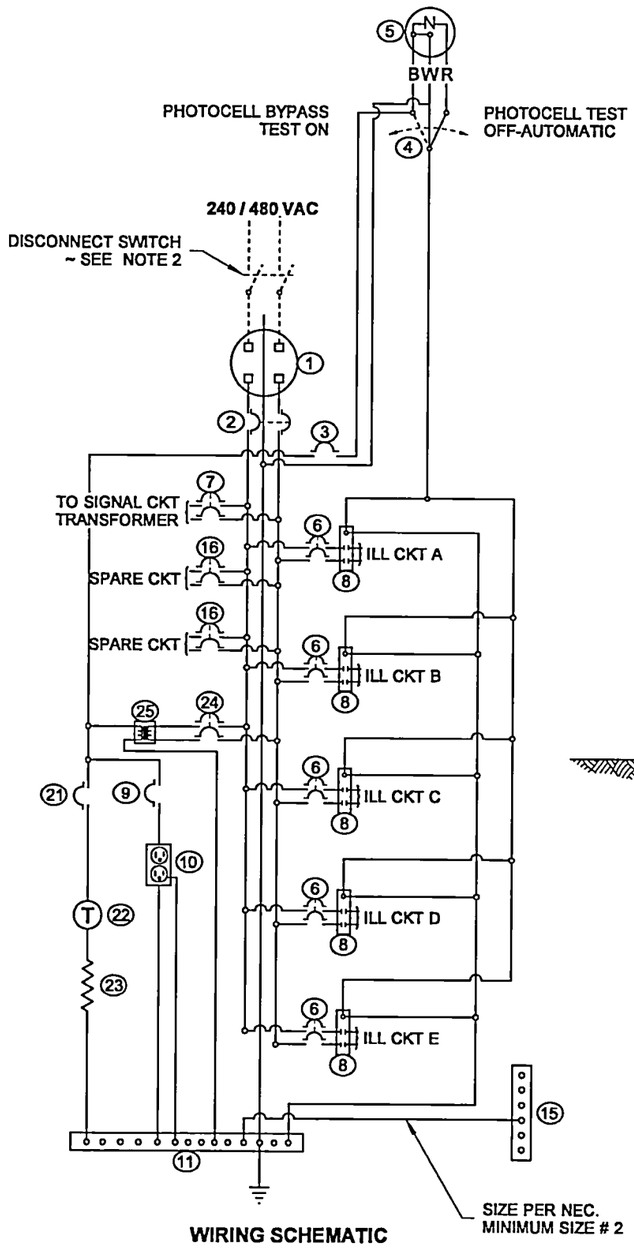
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 11 2017 1:19 PM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

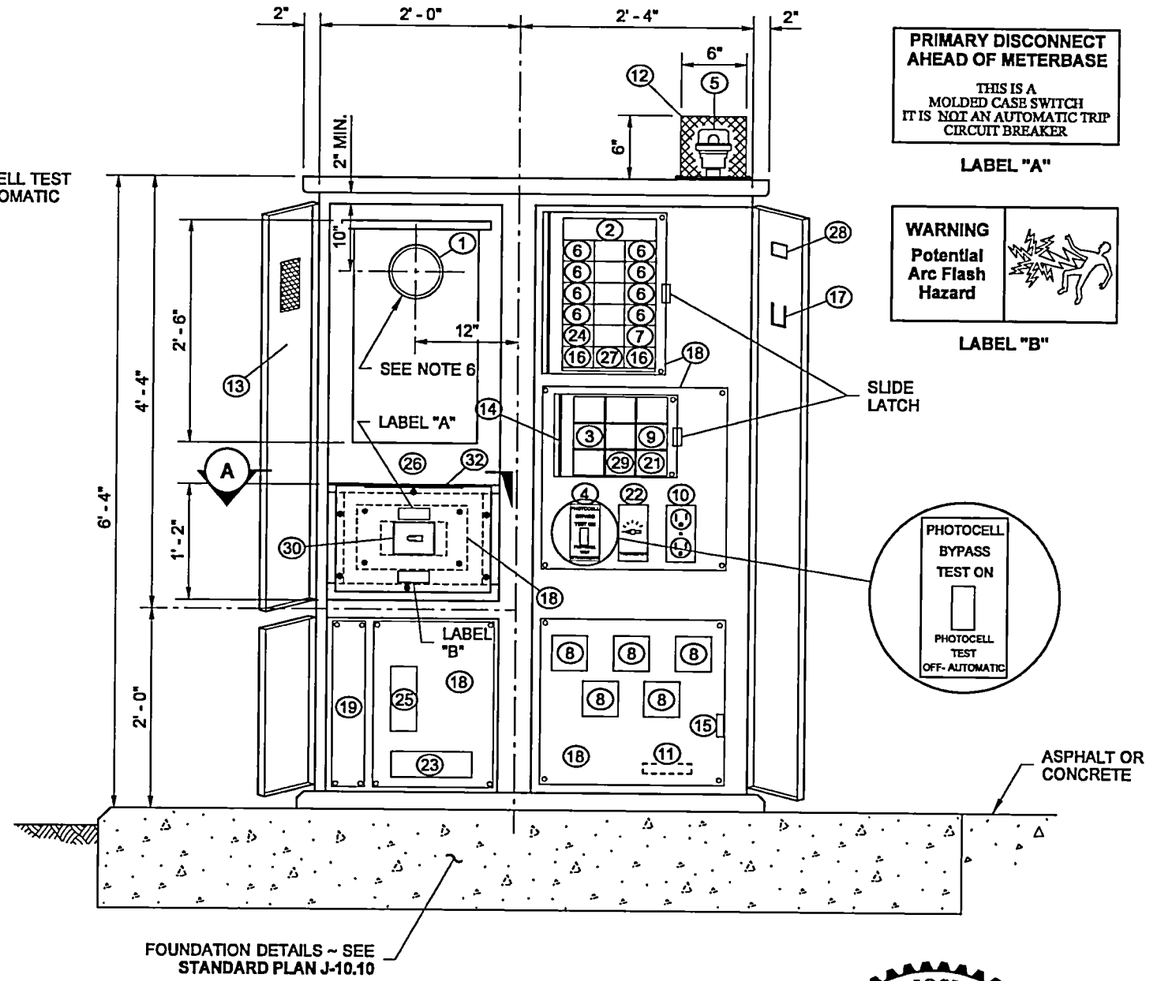
DRAWN BY: LISA CYFORD

KEY

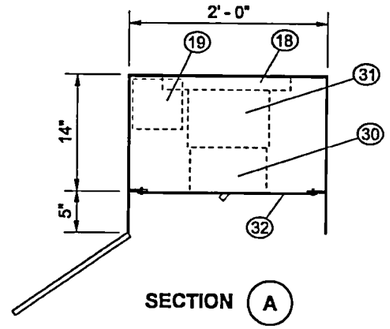
1. Meter base per serving utility requirements. As a minimum, the meter base shall be safety socket box with factory installed test bypass facility that meets the requirements of Euserc Drawing 305.
2. Main Breaker (See Breaker Schedule).
3. Photocell Breaker (SPST 15 AMP - 120/240 volt).
4. Test With (SPDT snap action, positive close 15 AMP - 120/277 volt "T" rated).
5. Photoelectric Control, **Standard Specification 9-29.11(2).**
6. Branch Breaker (see Breaker Schedule).
7. Signal Transformer Breaker (see Breaker Schedule).
8. Contactor (see Breaker Schedule).
9. Receptacle Breaker (SPST 20 AMP - 120/240 volt).
10. Receptacle, Grounded (GFCI 20 AMP - 125 volt).
11. Neutral Buss, 14 lug copper with stainless steel Allen head screws.
12. Photocell Enclosure - enclosure to be fabricated from 5/8" expanded steel mesh with welded seams and mounting flanges. Hot dip galvanized after fabrication. Type 5052 - H32 aluminum with 5/8" × 5/8" openings equivalent to 5/8" expanded steel mesh may be used was alternative material. See Photocell Enclosure Mounting details, **Standard Plan J-3b.**
13. Hinged front facing door with 4" × 4" min. polished wire glass window.
14. Hinged dead front with 1/4 turn fasteners or slide latch.
15. Cabinet Main Bonding Jumper. Buss shall be 4 lug tinned copper. See Cabinet Main bonding Jumper detail, **Standard Plan J-3b.**
16. Spare Branch Breaker (DPST 20 AMP - 240/480 volt).
17. Metal Wiring Diagram Holder.
18. Removable Equipment Mounting Pan.
19. 6" × 6" min, underground feed - service wire-way (left rear corner).
20. Screened Vents, 2 required, 1 each side, louvered plates.
21. Heater Breaker (SPST 15 AMP - 120/240 volt).
22. Thermostat, 40°F closure 3 differential.
23. Strip Heater (100 watt nominal), with terminal strip cover.
24. Transformer Breaker (DPST 15 AMP - 480 volt).
25. Dry Transformer (480/120 volt) 3 KVA copper bussed and copper wound..
26. Reserved for meter, current transformer and/or disconnect switch as required by the utility.
27. 24 circuit panel board - minimum size with separate main breaker.
28. Label Cabinet with Buss work rating.
29. 6 Circuit Panel Board - minimum size.
30. Molded Case Switch, Rating of switch shall equal or exceed main breaker rating. Provide landing lugs rated to accept 350 Kcmil conductors. (Omit if utility requires the disconnect switch to be mounted externally, or if the utility does not require the disconnect switch).
31. Molded case switch standoff bracket. (Omit if utility requires the disconnect switch to be mounted externally, or if the utility does not require the disconnect switch).
32. Molded case switch enclosure with cover. (Omit if utility requires the disconnect switch to be mounted externally, or if the utility does not require the disconnect switch).



WIRING SCHEMATIC



SERVICE CABINET DETAILS



SECTION (A)

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

5-29-13

SERVICE CABINET TYPE E (0 - 200 AMP TYPE 240/480 SINGLE PHASE

STANDARD PLAN J-10.22-00

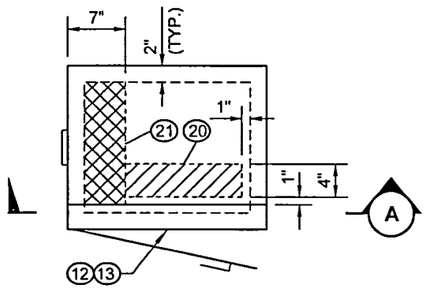
SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

Dana Baker Kuhl 5/29/13

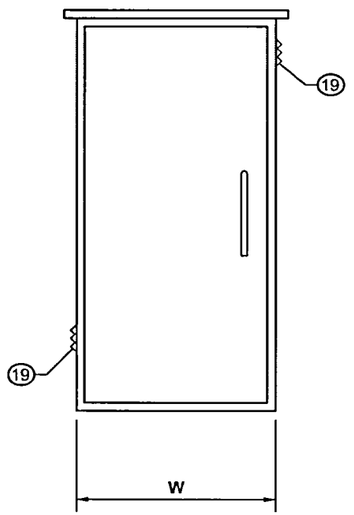
STATE DESIGN ENGINEER — DATE

Washington State Department of Transportation

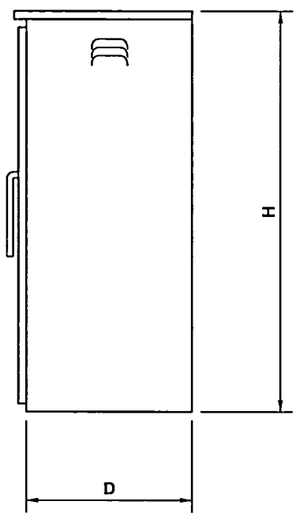


PLAN VIEW

TRANSFORMER SIZE (KVA)	CABINET DIMENSIONS		
	H	W	D
UP TO 12.5	48"	24"	20"
12.6 TO 37.5	60"	32"	30"

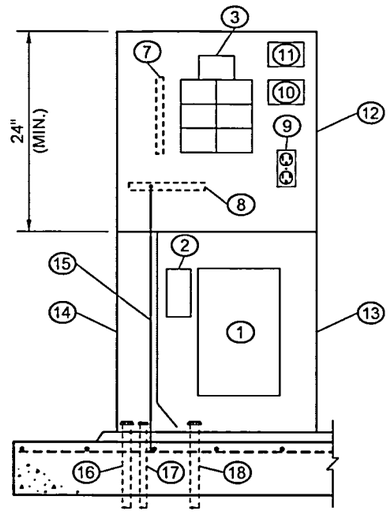


ELEVATION VIEW



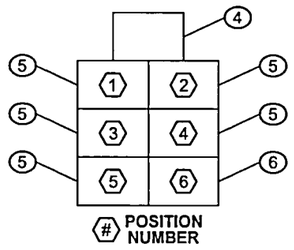
SIDE VIEW

TRANSFORMER CABINET HOUSING

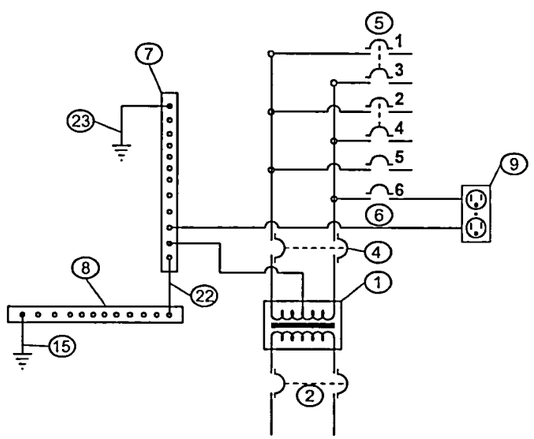


SECTION (A)

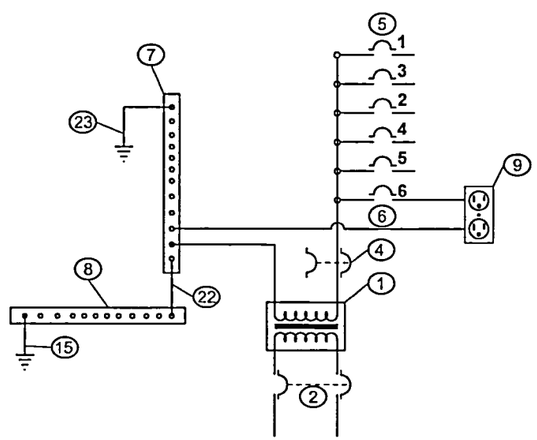
TRANSFORMER CABINET DETAILS



BREAKER PANEL DETAIL



480V OR 240V INPUT - 240V/120V OUTPUT



480V OR 240V INPUT - 120V OUTPUT

WIRING SCHEMATICS

NOTES

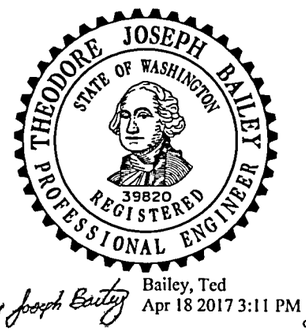
1. Cabinet construction shall meet the requirements of **Standard Specification 9-29.25**. Aluminum cabinets shall have mill finish.
2. Busswork shall be rated for 100 Amps minimum.
3. Transformer size, input voltage, and output voltage shall be as shown in the Contract Plans.
4. Secondary branch breakers shall be bolt in type. See Contract Plans for breaker schedule.
5. Secondary branch breakers may be either single or double pole breakers. Only two double pole breakers may be used.
6. Cabinet anchor bolt pattern is determined by the cabinet manufacturer. All anchor bolts shall either be hot dip galvanized or stainless steel cinch bolts. Bolts shall extend a minimum of 1.5 inches above the concrete pad. See **Standard Plan J-10.10** for Foundation details.
7. Transformers 7.5 KVA and larger shall be supplied with two full capacity taps, one at 5%, and one at 10% below normal capacity.
8. Engraved phenolic nameplate shall read "SUPPLIED FROM SERVICE CABINET S?? ????". See Contract Plans for service cabinet S number. Nameplate shall be attached with screws or rivets.
9. Cabinet shall be oriented such that it opens away from traffic.
10. Available fault current label shall meet the requirements of **National Electrical Code Article 110.24.**

KEY

1. TRANSFORMER
2. PRIMARY MAIN BREAKER ~ DPST
3. SECONDARY MAIN BREAKER AND 6 CIRCUIT BREAKER PANEL ~ SEE BREAKER PANEL DETAIL
4. SECONDARY MAIN BREAKER ~ DPST; ONE POLE UN-USED FOR 120V ONLY SECONDARY
5. SECONDARY BREAKER(S) - SPST OR DPST (DPST BREAKERS USE TWO POSITIONS)
6. RECEPTACLE BREAKER ~ SPST 20 AMP
7. ISOLATED NEUTRAL BUSS ~ 12 LUG TINNED COPPER
8. GROUND BUSS ~ 12 LUG COPPER
9. RECEPTACLE (GROUNDED) ~ GFCI 20 AMP
10. ENGRAVED PHENOLIC LABEL PLATE (SEE NOTE 8)
11. AVAILABLE FAULT CURRENT LABEL (SEE NOTE 10)
12. UPPER SECTION HINGED DEAD FRONT ~ ONLY BREAKERS AND RECEPTACLE FRONT ACCESSIBLE WHEN CLOSED
13. LOWER SECTION HINGED DEAD FRONT ~ ONLY MAIN BREAKER ACCESSIBLE WHEN CLOSED
14. ENCLOSED LOW VOLTAGE WIREWAY
15. SUPPLEMENTAL GROUND ~ CONNECT GROUND BUSS TO PAD FOUNDATION REBAR
16. LOW VOLTAGE POWER CONDUIT(S) TO LOADS
17. GROUND ELECTRODE CONDUIT ~ SEE STANDARD PLAN J-60.05, SHEET 3 (SUPPLEMENTAL GROUND)
18. HIGH VOLTAGE INPUT POWER CONDUIT
19. SCREENED VENT LOUVERS ~ MINIMUM 2 REQUIRED (1 EACH SIDE)
20. HIGH VOLTAGE INPUT CONDUIT RESERVE AREA

KEY CONT.

21. LOW VOLTAGE AND GROUND CONDUIT RESERVE AREA
22. CABINET BONDING JUMPER AND LUG
23. GROUND ELECTRODE ~ SEE STANDARD PLAN J-60.05, SHEET 3



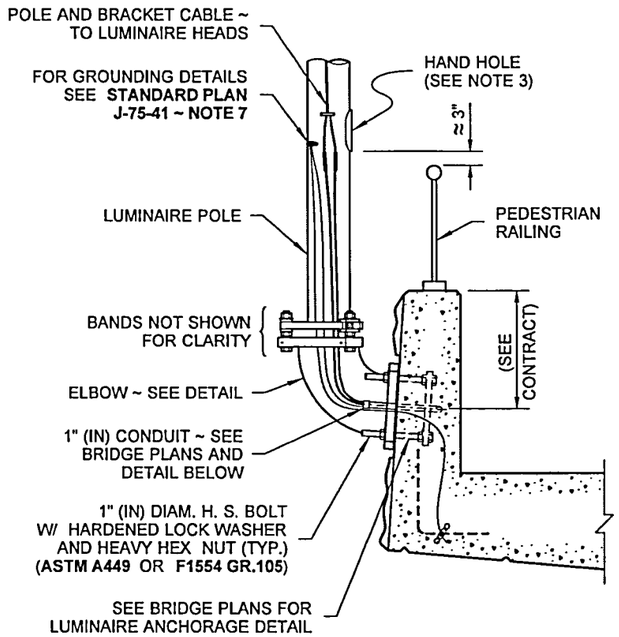
Theodore Joseph Bailey
Bailey, Ted
Apr 18 2017 3:11 PM
cosign

TRANSFORMER CABINET (480V/240V - 240V/120V)

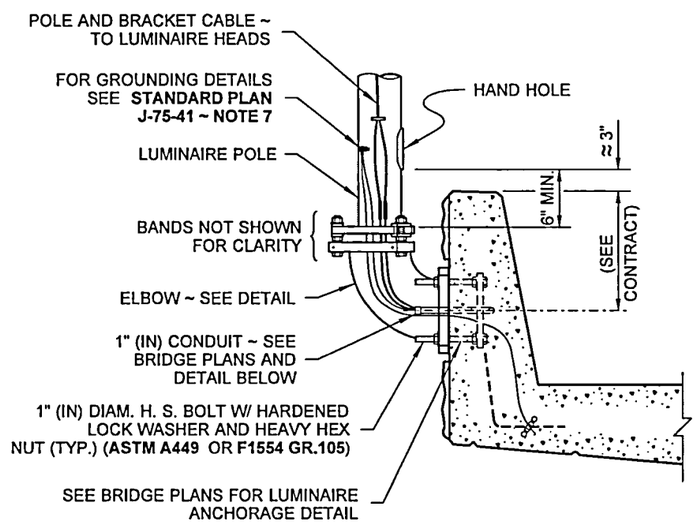
STANDARD PLAN J-10.25-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 11 2017 1:19 PM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation



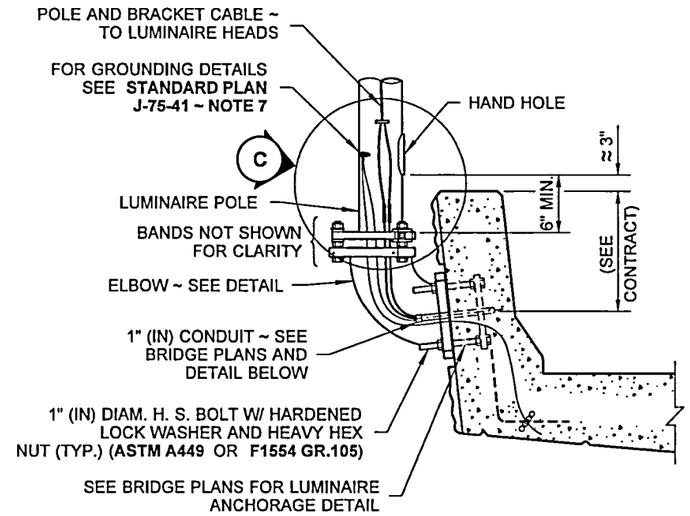
BRIDGE PEDESTRIAN BARRIER



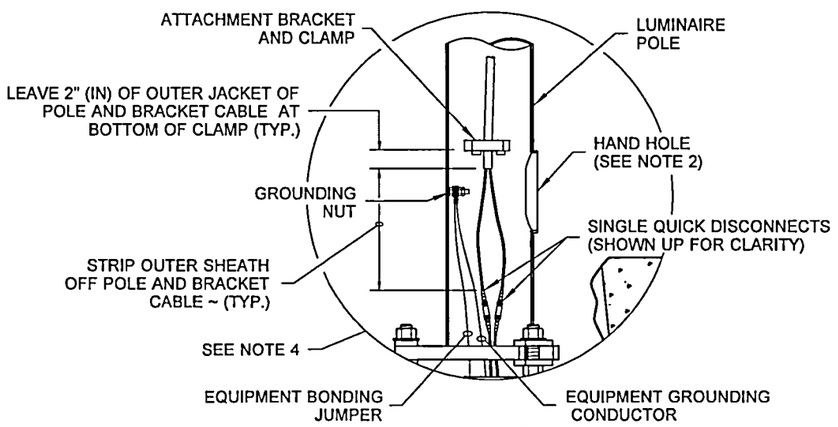
WHEN TRAFFIC BARRIER HEIGHT IS 42" (IN), MAINTAIN APPROXIMATE HEIGHT FROM TOP OF BARRIER TO HAND HOLE SHOWN.

SINGLE-SLOPE BRIDGE TRAFFIC BARRIER

TYPICAL SECTIONS

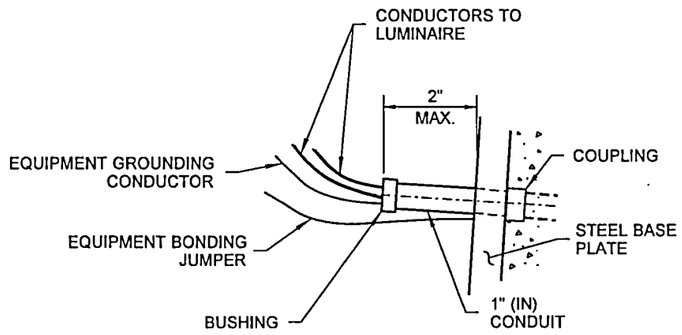


F-SHAPE BRIDGE TRAFFIC BARRIER



DETAIL (C)

(TYPICAL FOR ALL VIEWS)



CONDUIT DETAIL

ROUTE CONDUCTORS TO LUMINAIRES AND BONDING CONNECTION AT HAND HOLE ~ SEE CONTRACT FOR QUANTITY (TYPICAL FOR ALL VIEWS)

RICHARD P. ZELDENRUST — STATE OF WASHINGTON — 25470 — STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jul 20 2016 8:31 AM

STEEL LIGHT STANDARD ELBOW MOUNTING ON BRIDGE & RETAINING WALL

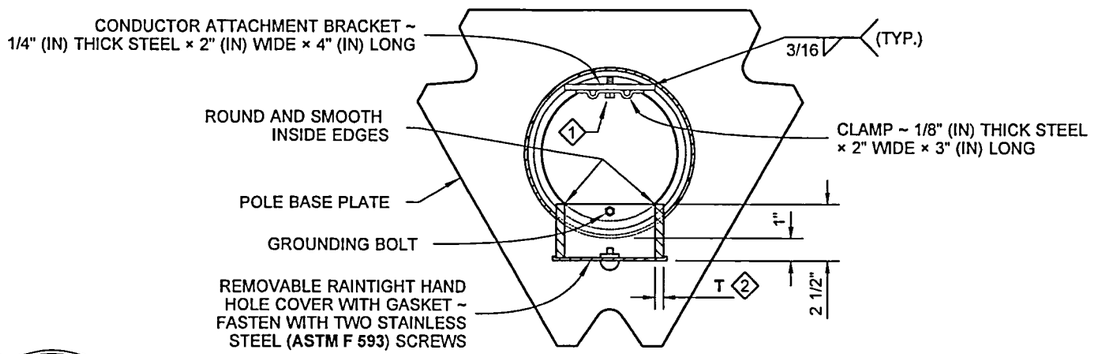
STANDARD PLAN J-28.45-03

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Carpenter, Jeff
Jul 21 2016 8:28 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

DRAWN BY: FERN LIDDELL

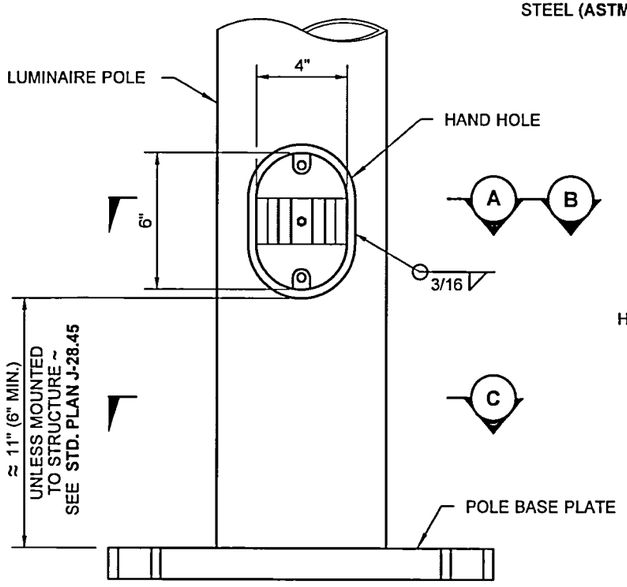


TYPICAL HAND HOLE ORIENTATION

VIEW (A)

◇1 THE **CONDUCTOR ATTACHMENT** CONFIGURATIONS VARY AMONG DIFFERENT MANUFACTURERS. CONDUCTOR ATTACHMENTS ARE REQUIRED ON ALL POLES, FIXED OR SLIP BASE.

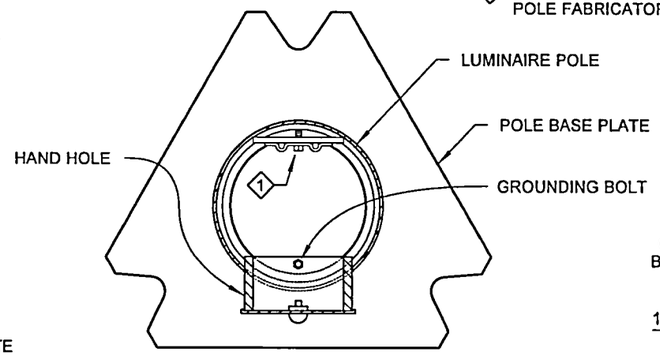
◇2 **T** = RIM PLATE THICKNESS BY LUMINAIRE POLE FABRICATOR .



(COVER NOT SHOWN FOR CLARITY)

ELEVATION VIEW

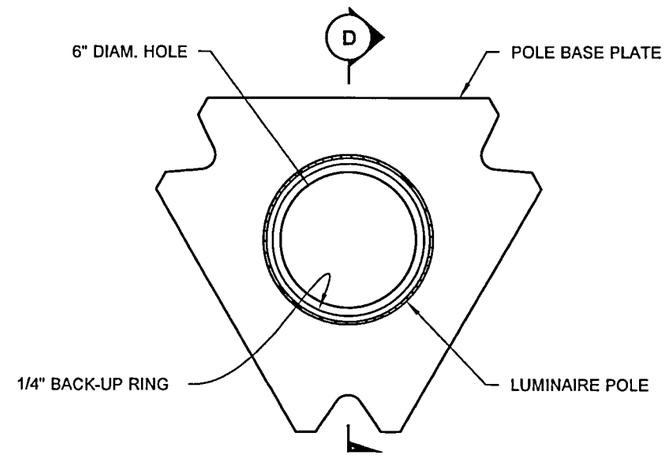
CONFIGURATION AND LOCATION OF THE HAND HOLE VARIES AMONG MANUFACTURERS ~ MINIMUM SIZE OPENING SHOWN



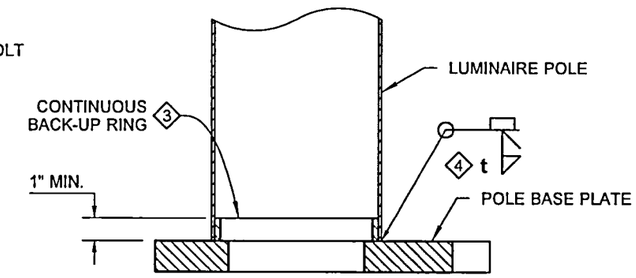
FOR DETAILS NOT SHOWN, SEE VIEW (A) ABOVE

ORIENTATION FOR INSTALLATION ON BRIDGE OR RETAINING WALL ~ SEE **STANDARD PLAN J-28.45**

VIEW (B)



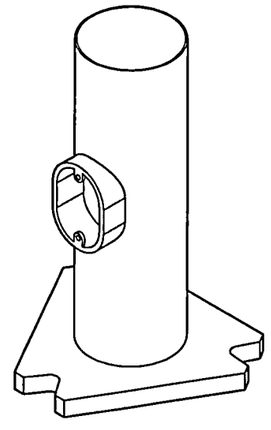
VIEW (C)



◇3 1/4" (IN) THICK, OR NO THINNER THAN POLE WALL THICKNESS. TACK WELD IN ROOT OR CONTINUOUS SEAL WELD TO BASE PLATE OR POLE WALL.

◇4 **t** = SIZE OF FILLET WELD BY LUMINAIRE POLE FABRICATOR.

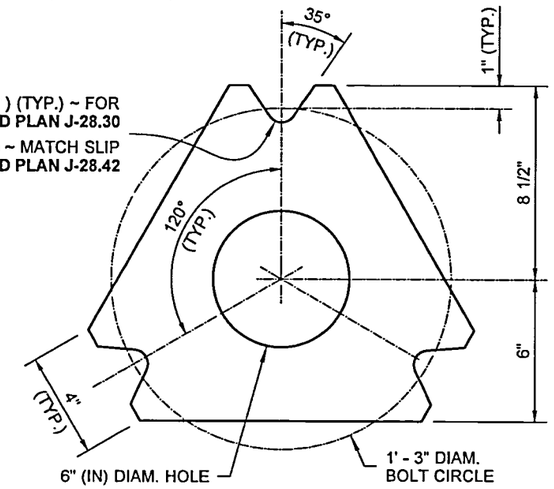
SECTION (D)



ISOMETRIC VIEW

NOTES

1. Pole Base Plate for a Slip Base design shall be 1 1/4" (in) steel manufactured from **ASTM A572 GR.50** or **ASTM A588.** Pole Base Plate for a Fixed Base design shall be either 1 1/4" (in) steel manufactured from **ASTM A572 GR. 50, ASTM A588,** or 1 1/2" (in) manufactured from **ASTM A36.** All Pole Base Plate notched surfaces shall be finished smooth.
2. Round and smooth all edges along wire-way to protect conductors. See **Standard Plan J-28.70** for wiring details.
3. Galvanizing shall be in accordance with **AASHTO M 111.**
4. See **Standard Plans C-8b, C-85.14,** and **J-28.60** for foundation and base plate requirements when steel light standards are mounted on concrete traffic barrier.
5. See **Standard Plan J-28.42** for details when Slip Base is required.



FOR PLATE THICKNESS, REFER TO NOTE 1

TOP VIEW

POLE BASE PLATE DETAIL

RICHARD P. ZELDENRUST
STATE OF WASHINGTON
25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jul 20 2016 8:29 AM

STEEL LIGHT STANDARD POLE BASE AND HAND HOLE DETAILS

STANDARD PLAN J-28.50-03

SHEET 1 OF 1 SHEET

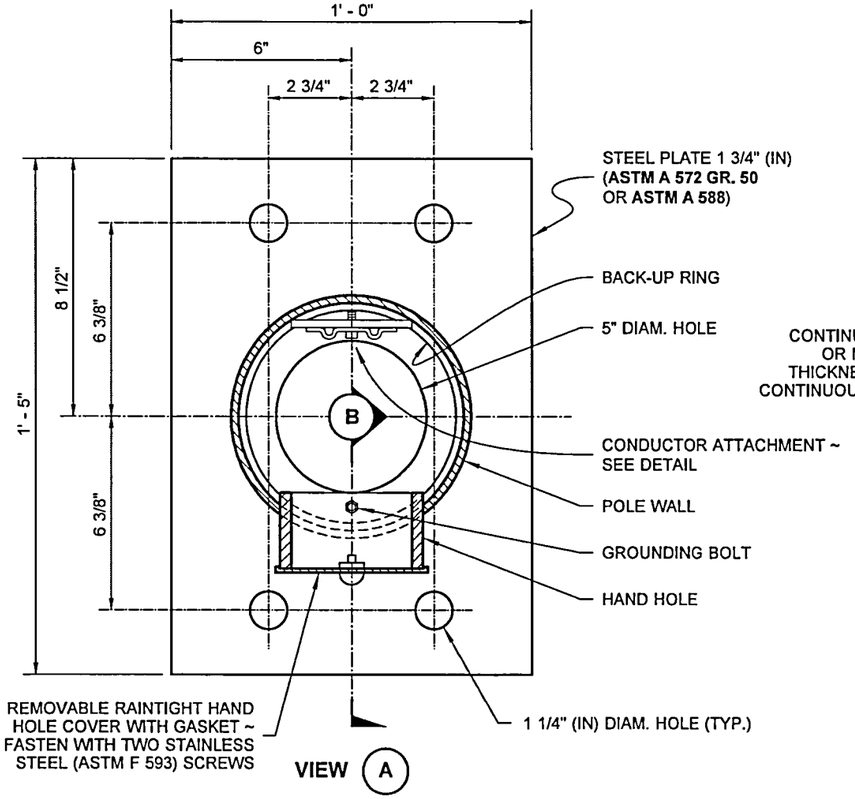
APPROVED FOR PUBLICATION

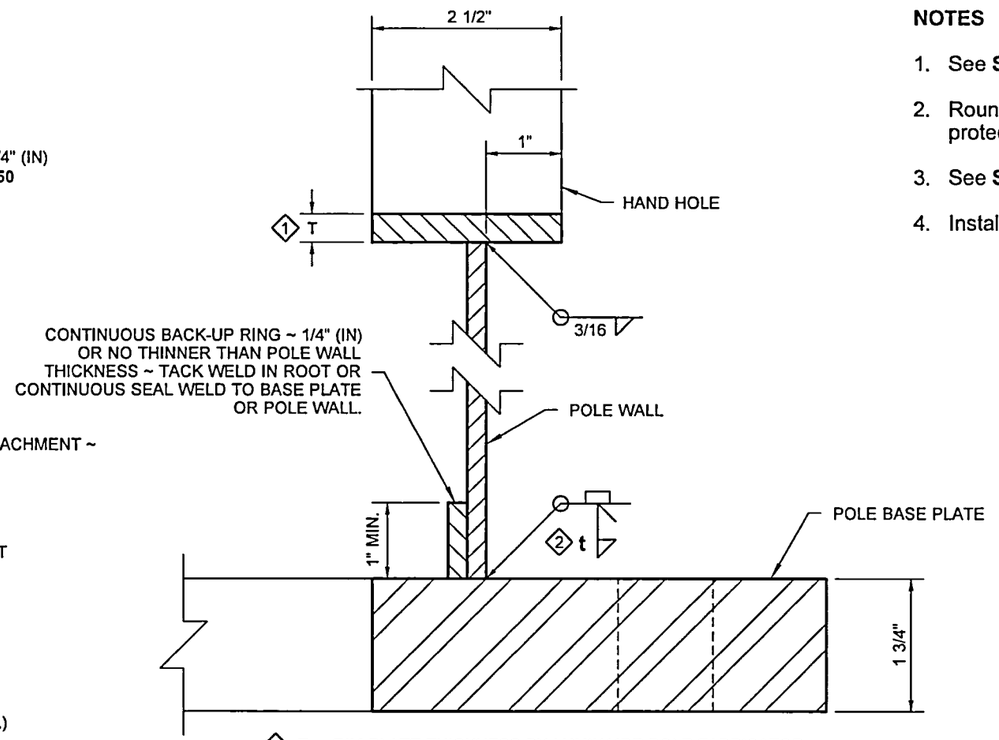
Carpenter, Jeff
Jul 21 2016 8:29 AM

STATE DESIGN ENGINEER

Washington State Department of Transportation

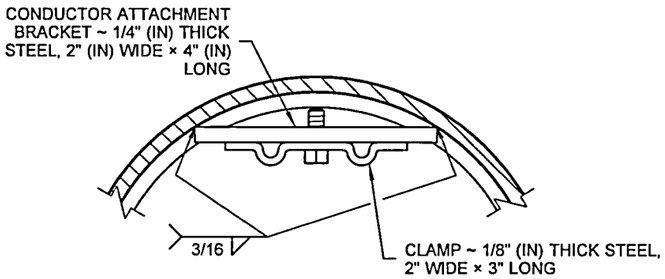
DRAWN BY: FERN LIDDELL





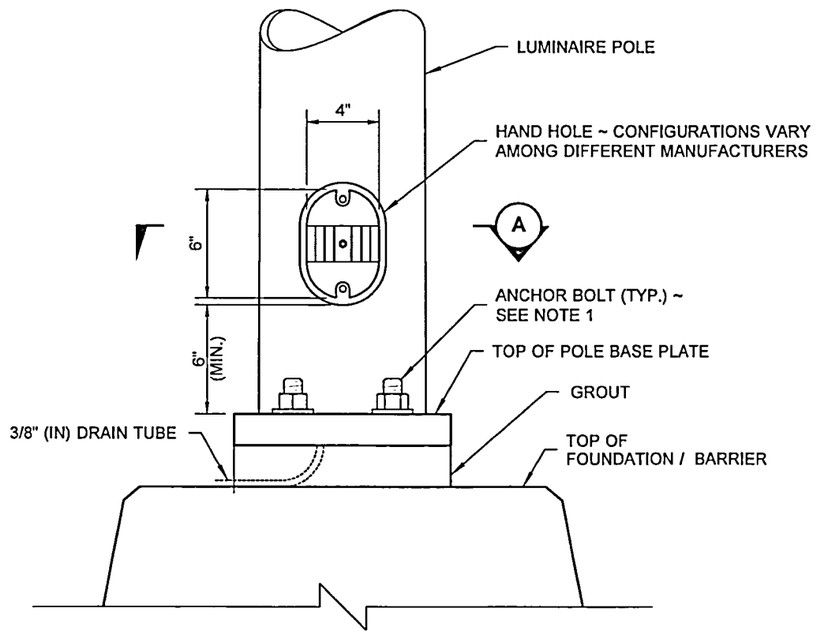
NOTES

1. See **Standard Plans C-8b** and **C-85.14** for foundation and anchor bolt details.
2. Round and smooth all edges around hand hole and along the wire-way to protect the conductors.
3. See **Standard Plan J-28.70** for wiring details.
4. Install grout after plumbing the pole.



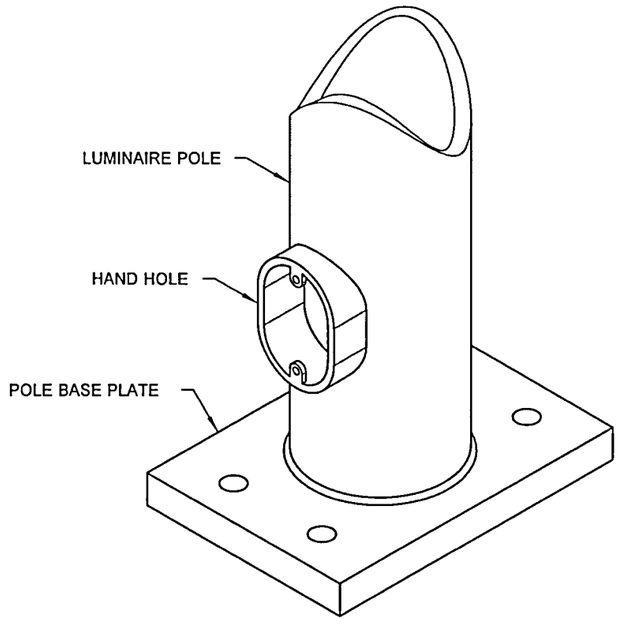
CONDUCTOR ATTACHMENT DETAIL

CONFIGURATIONS VARY AMONG
DIFFERENT MANUFACTURERS



PLACEMENT DETAIL

SECTION B



ISOMETRIC VIEW

RICHARD P. ZELDENRUST
STATE OF WASHINGTON
25470
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jul 20 2016 8:32 AM

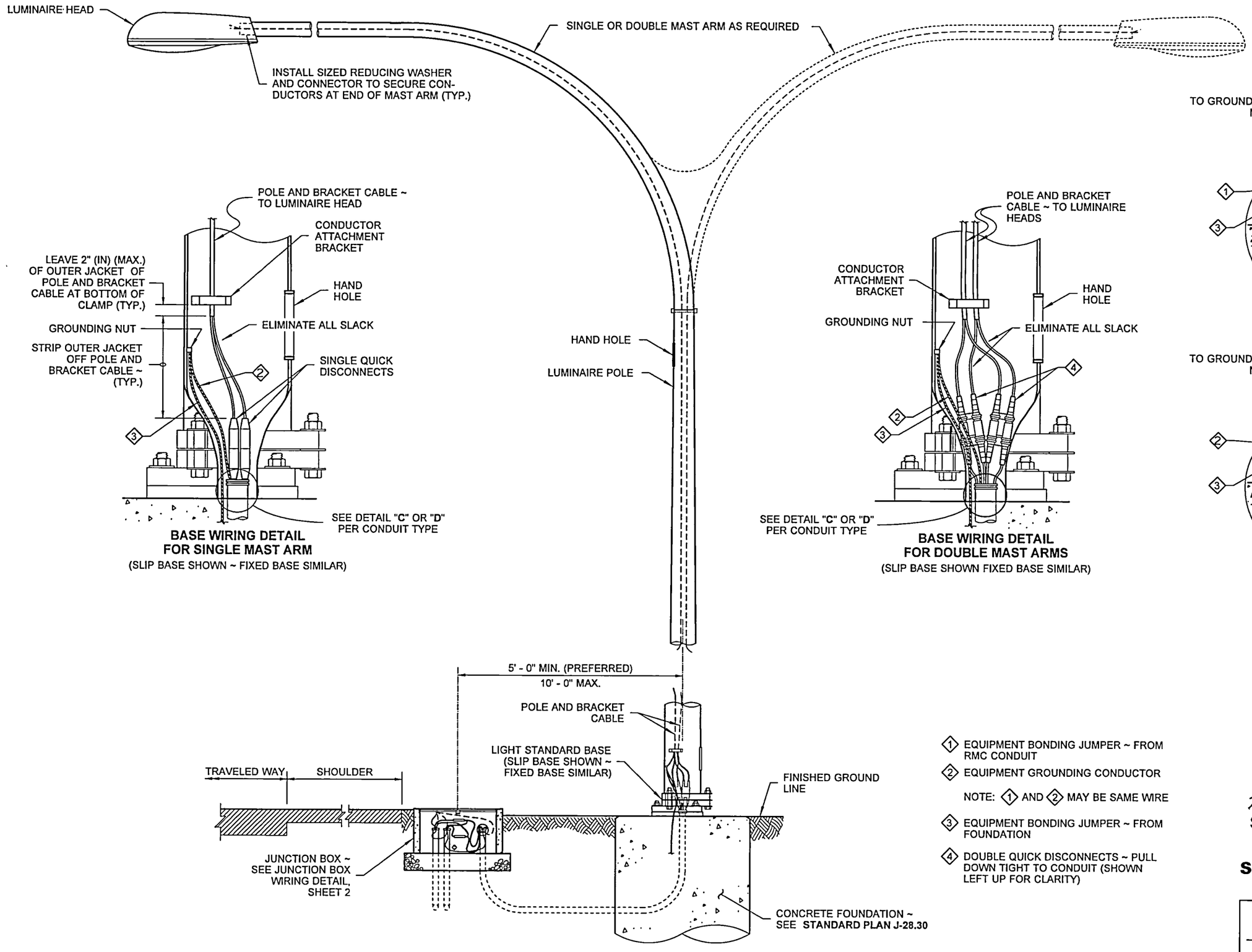
STEEL LIGHT STANDARD BARRIER MOUNTED BASE

STANDARD PLAN J-28.60-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2016 8:29 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



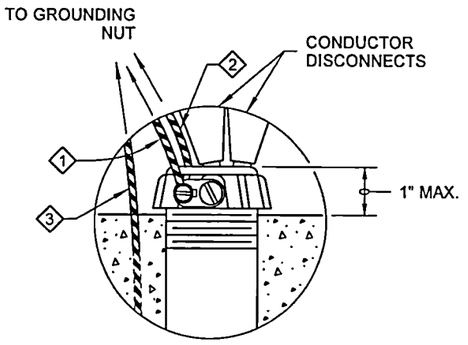
TYPICAL LOCATION OF JUNCTION BOX AND FOUNDATION

BASE WIRING DETAIL FOR SINGLE MAST ARM

(SLIP BASE SHOWN ~ FIXED BASE SIMILAR)

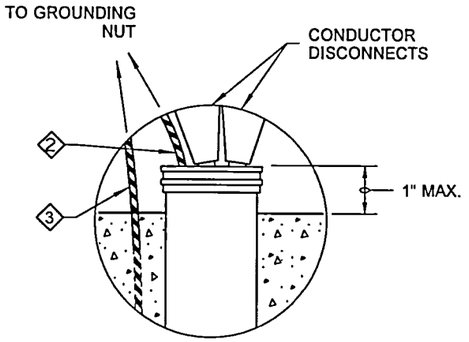
BASE WIRING DETAIL FOR DOUBLE MAST ARMS

(SLIP BASE SHOWN FIXED BASE SIMILAR)



DETAIL "C"

RMC CONDUIT



DETAIL "D"

PVC CONDUIT

1. EQUIPMENT BONDING JUMPER ~ FROM RMC CONDUIT
2. EQUIPMENT GROUNDING CONDUCTOR

   NOTE: 1 AND 2 MAY BE SAME WIRE
3. EQUIPMENT BONDING JUMPER ~ FROM FOUNDATION
4. DOUBLE QUICK DISCONNECTS ~ PULL DOWN TIGHT TO CONDUIT (SHOWN LEFT UP FOR CLARITY)

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

Bailey, Ted
Jul 18 2017 9:51 AM

STEEL LIGHT STANDARD WIRING DETAILS

STANDARD PLAN J-28.70-03

SHEET 1 OF 2 SHEETS

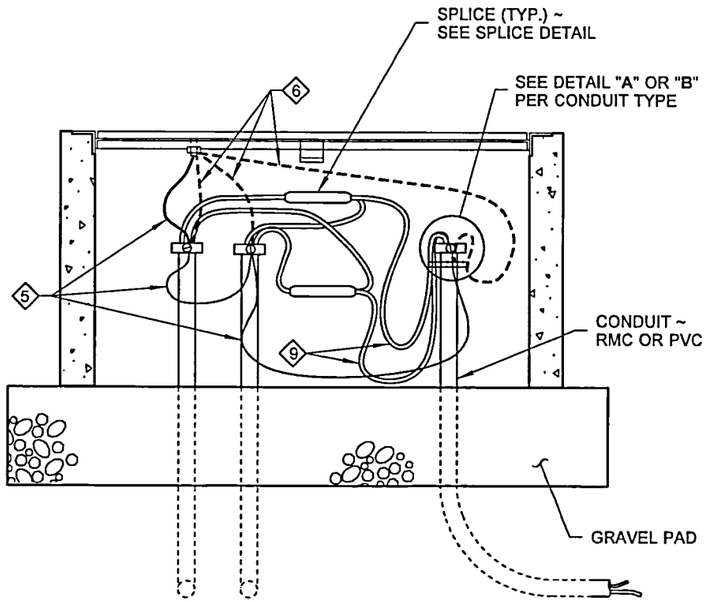
APPROVED FOR PUBLICATION

Carpenter, Jeff
Jul 21 2017 8:19 AM

STATE DESIGN ENGINEER

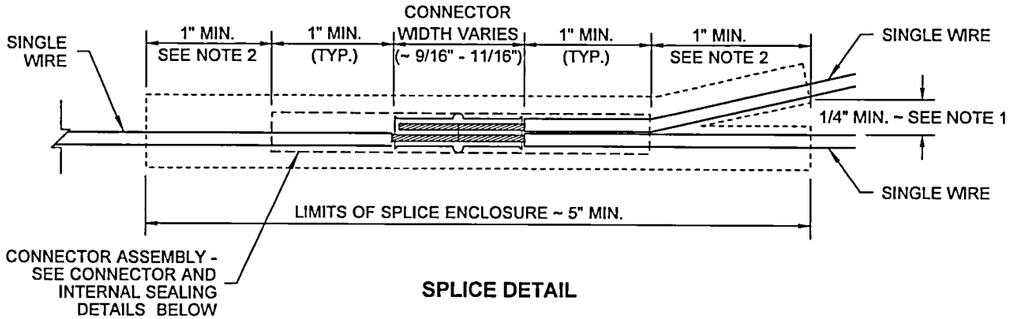
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



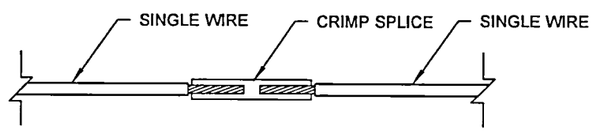
JUNCTION BOX WIRING DETAIL

FOR GROUNDING REQUIREMENTS, SEE **STANDARD PLAN J-60.05**

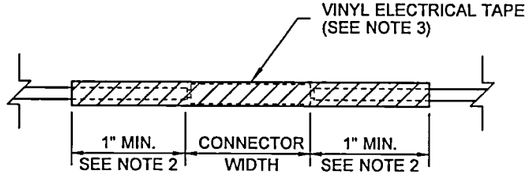


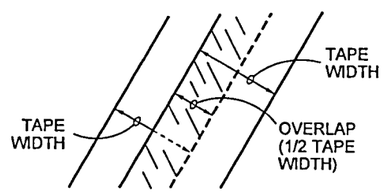
SPLICE DETAIL

STEP 1 - CRIMP CONNECTION



STEP 2 - WRAP CONNECTION



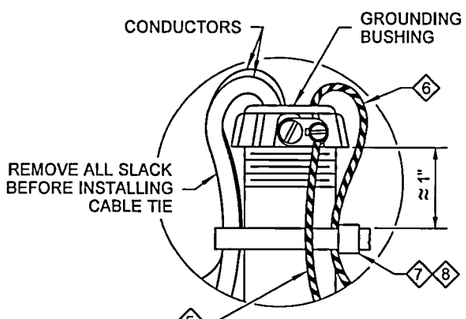


TAPE OVERLAP DIAGRAM

WHEN USING WRAPPED VINYL ELECTRICAL TAPE:

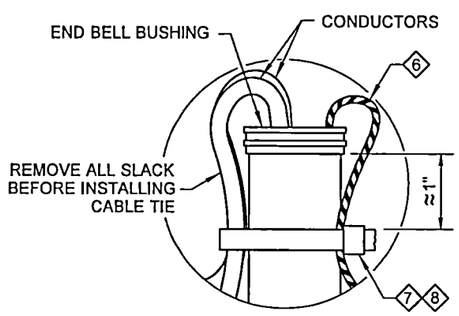
- INSTALL TWO LAYERS OF SPIRAL WRAPPED TAPE.
- EACH SPIRAL LAYER SHALL HAVE AN OVERLAP OF 1/2 OF THE TAPE WIDTH (SEE DIAGRAM ABOVE).

CONNECTOR AND INTERNAL SEALING DETAILS



DETAIL "A"

RMC CONDUIT



DETAIL "B"

PVC CONDUIT

⑤ EQUIPMENT BONDING JUMPER ~ FROM RMC CONDUIT

NOTE: ⑤ AND ⑥ MAY BE SAME WIRE

⑥ EQUIPMENT GROUNDING CONDUCTOR

⑦ CABLE TIE ~ 120 POUND TENSILE STRENGTH, BLACK

⑧ APPLICATION FOR FIXED BASE SIMILAR, EXCEPT NO CABLE TIE IS REQUIRED AT JUNCTION BOX

⑨ 24" (IN) MIN. SLACK REQUIRED TO ALLOW QUICK DISCONNECTS TO BE PULLED OUTSIDE HAND HOLE 6" (IN) MIN.

NOTES

1. Each wire shall be physically separated by at least 1/4" (in) so that sealing material can fill in between the wires; where heat shrink tubing is used for the outer splice enclosure, it shall meet one of the following requirements:

   a. Have separate ports for each conductor ("WYE" or "X" shaped tubing). ~ or ~

   b. Have rubber electrical mastic tape wrapped around each conductor to ensure a weather-proof seal. See Rubber Electrical Mastic Tape Installation Detail, **Standard Plan J-50.05**.

2. Heat shrink tubing shall extend a minimum of one inch onto the original wire insulation of each wire in the splice. Rigid splice enclosures shall be centered over the crimped connection.

3. Electrical tape used in splicing applications shall be 3/4" (in) wide, be UL listed under UL 510, and be CSA Certified under C22.2 NO. 197-M1983.

4. Crimp splices shall be installed with an approved crimping tool for the type and size of crimp splice used. Pliers and similar multi-purpose tools may not be used.

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

Theodore Joseph Bailey
Bailey, Ted
Jul 18 2017 9:52 AM
ecosign

STEEL LIGHT STANDARD WIRING DETAILS

STANDARD PLAN J-28.70-03

SHEET 2 OF 2 SHEETS

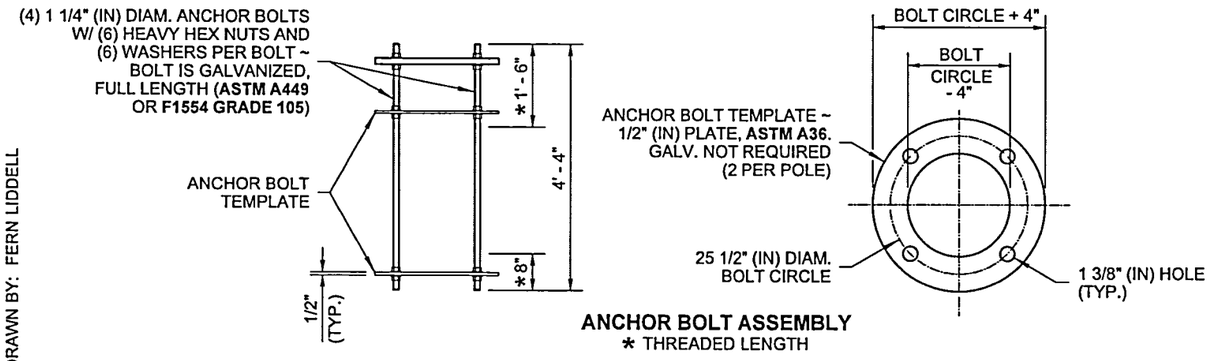
APPROVED FOR PUBLICATION

Carpenter, Jeff
Jul 21 2017 8:19 AM
ecosign

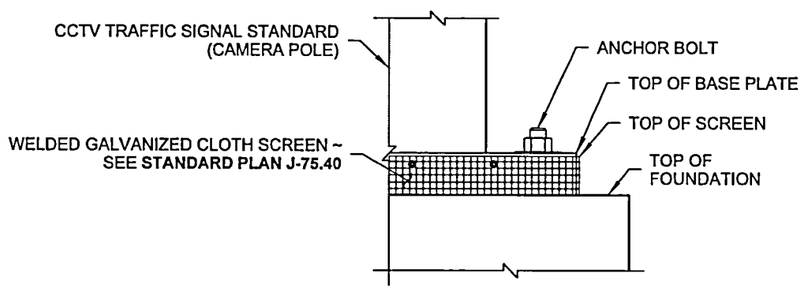
STATE DESIGN ENGINEER

Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

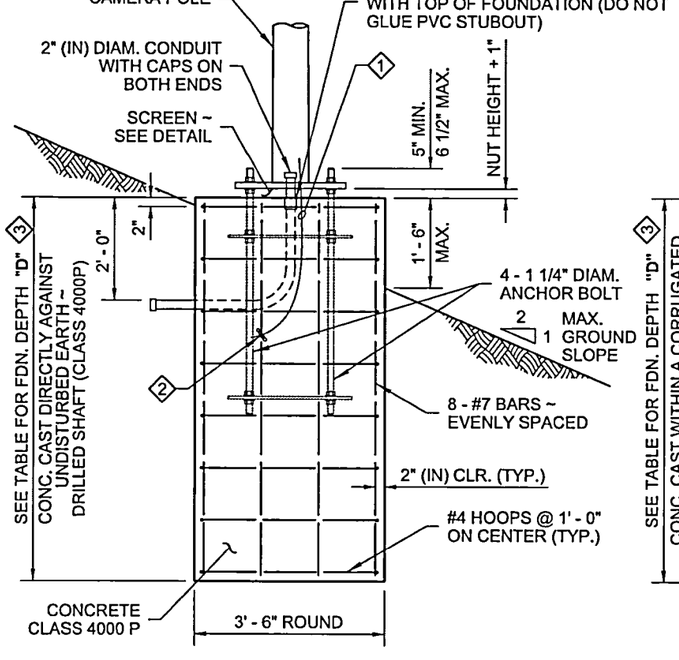


ANCHOR BOLT ASSEMBLY
* THREADED LENGTH

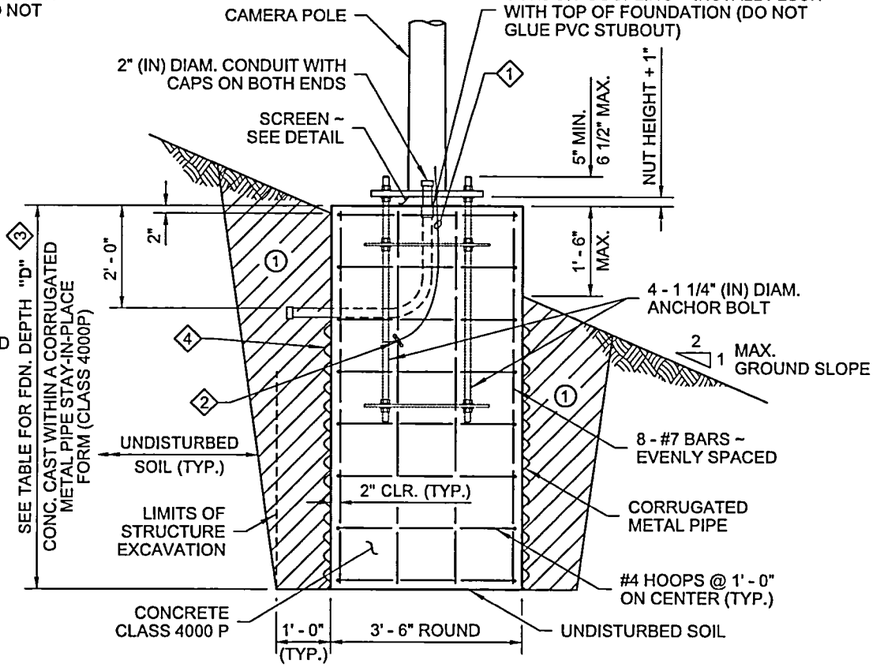


WELDED GALVANIZED CLOTH SCREEN

CAMERA POLE HEIGHT FOR LOAD CASES #1 and #2	DEPTH OF FOUNDATION "D"		ANCHOR BOLT ASTM A449 OR F1554 GR 105		
	3H : 1V OR FLATTER	2H : 1V	DIAMETER	LENGTH	BOLT CIRCLE
20' - 30'	4' - 6"	6' - 6"	1 1/4"	4' - 4"	25 1/2"
40'	5' - 6"	7' - 6"	1 1/4"	4' - 4"	25 1/2"
50'	7' - 0"	9' - 0"	1 1/4"	4' - 4"	25 1/2"



FOUNDATION REINFORCEMENT DETAIL
(CONCRETE CAST DIRECTLY AGAINST UNDISTURBED EARTH)
ALTERNATE # 1



FOUNDATION REINFORCEMENT AND BACKFILL DETAIL
(4) (CONCRETE CAST INSIDE CORRUGATED METAL PIPE STAY-IN-PLACE FORM) (SEE NOTE 5)
ALTERNATE # 2

NOTES

1. These Foundations are designed for a minimum of 1,500 PSF allowable lateral bearing pressure for the soil. A Special Foundation shall be required for soil with allowable lateral bearing pressure lower than 1,500 PSF.
2. These Foundations are designed for installation on level ground, or on sloping ground, not to exceed 2H : 1V slopes. Slopes steeper than 2H : 1V require a special design.
3. Where a foundation is constructed within a Media Filter Drain, the foundation depth shown in the Contract Plans shall be increased by the depth of the Media filter Drain.
4. Foundations not within the parameters of this standard require Special Design. Contact the **WSDOT Bridge and Structures Office** through the Engineer for Special Foundation Designs.
5. The top 2' - 0" of the foundation shall use a smooth form (such as paper or cardboard). After the concrete has cured, this entire form shall be removed.

DESIGN CRITERIA:

This structure has been designed according to the Fifth Edition **2009 AASHTO Standard Specifications** for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. Basic wind velocity is 90 MPH. Design Life/Recurrence Interval 50 years and Fatigue Category III.

WIND VELOCITY:

90 MPH
Maximum Pole Deflection shall not exceed 0.7" in 30 MPH and 1.4" in 70 MPH wind.

LOAD CASE # 1

Camera (1) - EPA = 4.00 sq. ft. @ 2' - 0" above pole top, and:

Dish (1) - 1' - 0" diameter @ pole top level.

LOAD CASE # 2

Camera (1) - EPA = 4.00 sq. ft. @ 2' - 0" above pole top, and:

Camera (2) - EPA = 0.54 sq. ft. each @ 1' - 0" and 2' - 0" from pole top, and:

NEMA Cabinet (2) - EPA = 1.33 sq. ft. each @ 3' - 8" from pole top, install both NEMA cabinets back to back, and:

Radio Equipment (2) - EPA = 2.25 sq ft. each @ 2' - 0" and 9' - 0" from pole top.

EPA = Effective Projected Area

ALTERNATE #2 - CONSTRUCTION METHOD

(1) Shoring or Extra Excavation as required. Excavated area shall be backfilled with Controlled-Density Fill (CDF), or with soil in accordance with **Standard Specification Section 8-20.3(2)** and Compaction Method 1 of **Standard Specification Section 2-09.3(1)E.**

(1) GROUNDING CONDUCTOR # 4 AWG STRANDED COPPER WITH 3' (FT) MIN. SLACK. ROUTE CONDUCTOR TO CCTV TRAFFIC SIGNAL STANDARD (CAMERA POLE) GROUNDING STUD.

(2) CLAMP CONDUCTOR TO STEEL REINFORCING WITH LISTED CONNECTOR SUITABLEFOR USE EMBEDDED IN CONCRETE.

(3) SEE NOTE 3.

RICHARD P. ZELDENRUST — STATE OF WASHINGTON — 25470 — STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER

Zeldenrust, Richard
Jul 20 2016 8:34 AM

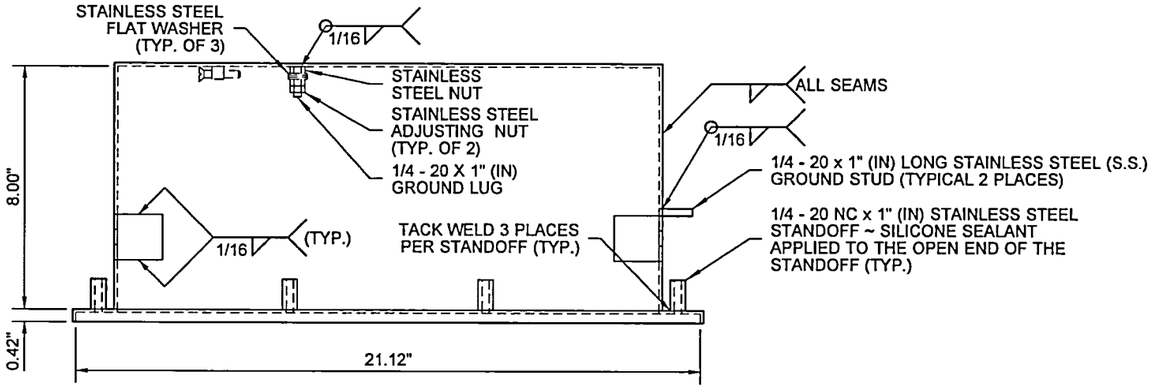
design

TYPE CCTV TRAFFIC SIGNAL STANDARD (CAMERA POLE) FOUNDATION DETAILS
STANDARD PLAN J-29.10-01

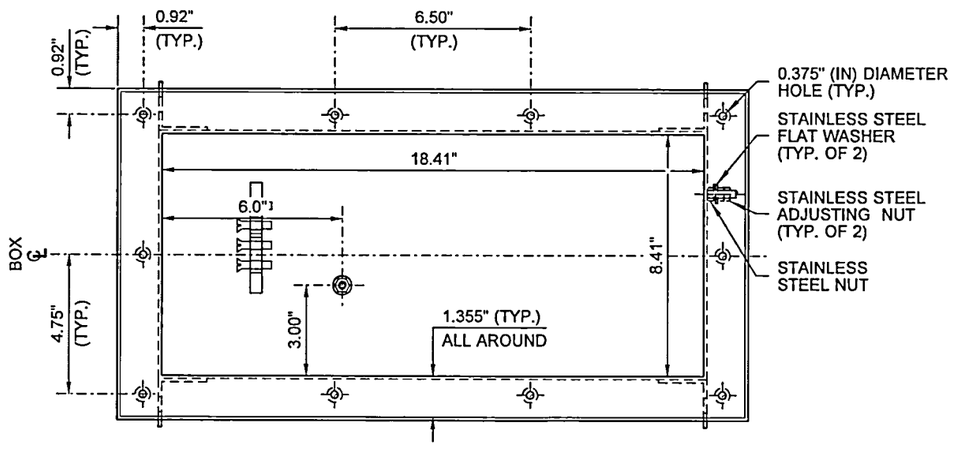
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2016 8:30 AM
design
STATE DESIGN ENGINEER
Washington State Department of Transportation

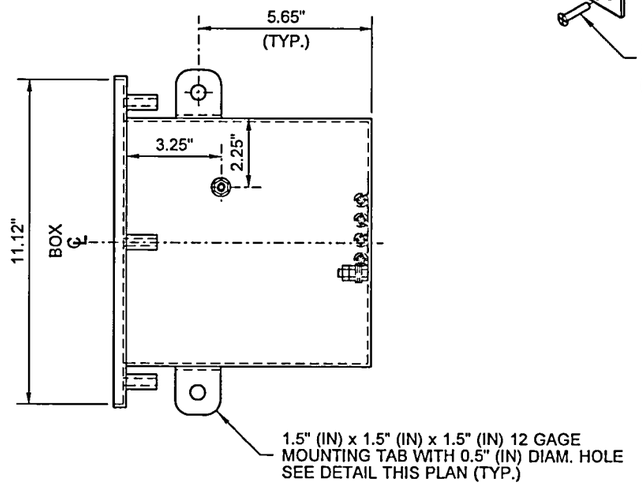
DRAWN BY: BILL BERENS



PLAN VIEW



ELEVATION VIEW

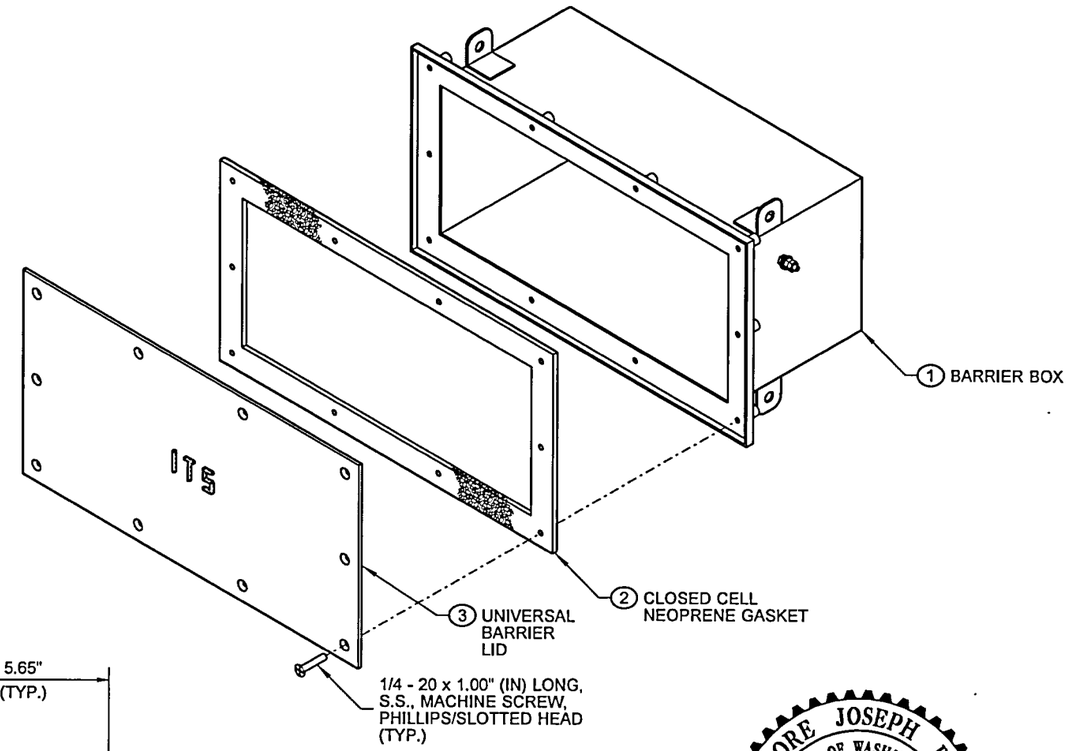


SIDE VIEW

① BARRIER BOX

NOTES

1. Junction Box shall be constructed of 12-gage, Type 304 stainless with steel welded seam construction. Finish shall be # 2B for backbox and # 4 for the cover. Mounting Tabs shall be constructed of 12-gage, Type 304 stainless steel. All hardware shall be Type A304 Stainless Steel.
2. The System Identification letters shall be 1/8" line thickness formed by engraving, stamping, or with a stainless steel weld bead. See **Standard Specification 9-29.2(4)** for details.
3. Conduit Capacity = 8" (4" per end).



EXPLODED ISOMETRIC VIEW
ASSEMBLY DETAIL

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

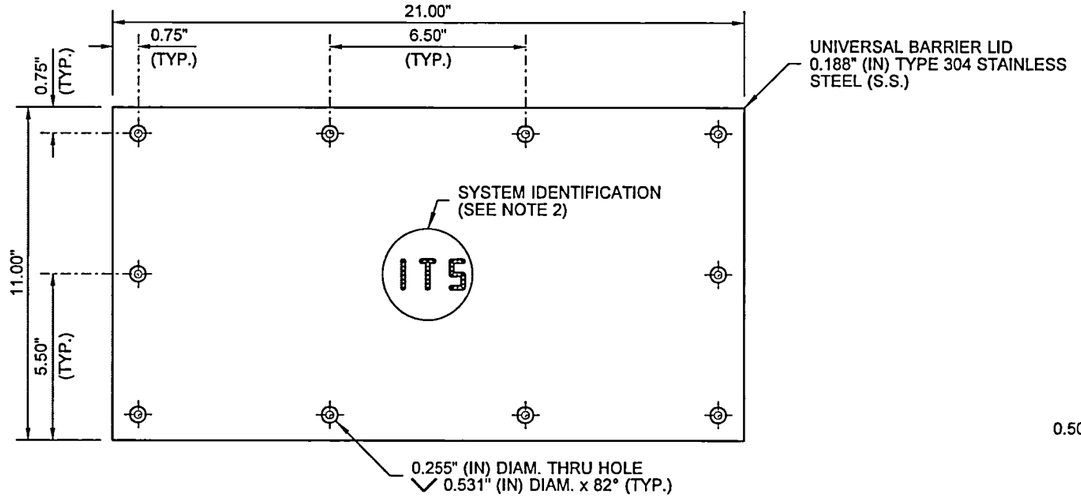
Bailey, Ted
Jul 18 2017 9:53 AM

NEMA 4X NON-ADJUSTABLE FLUSH-MOUNT JUNCTION BOX STANDARD PLAN J-40.36-02

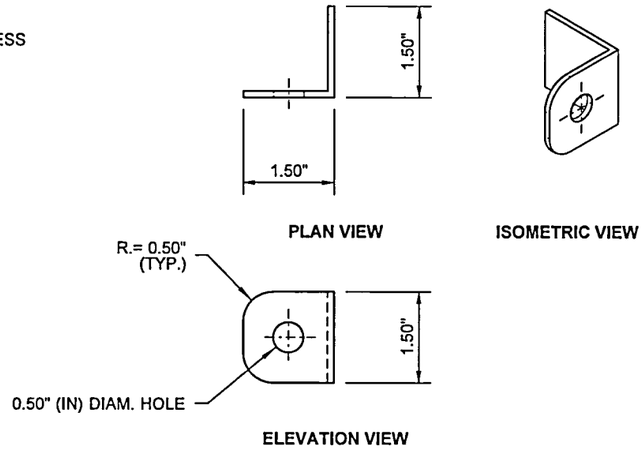
SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:18 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

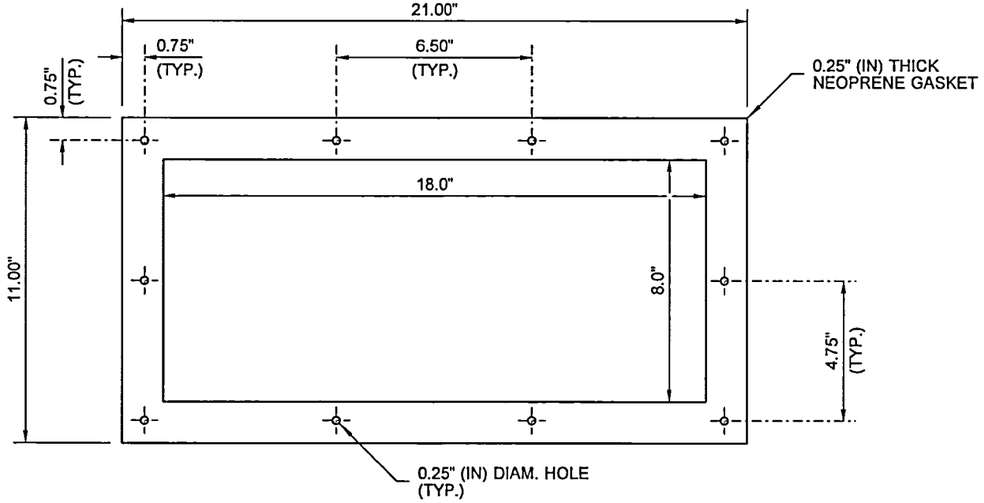
DRAWN BY: BILL BERENS



③ UNIVERSAL LID



MOUNTING TAB DETAILS



② GASKET

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

Bailey, Ted
Jul 18 2017 9.53 AM

NEMA 4X NON-ADJUSTABLE FLUSH-MOUNT JUNCTION BOX STANDARD PLAN J-40.36-02

SHEET 2 OF 2 SHEETS

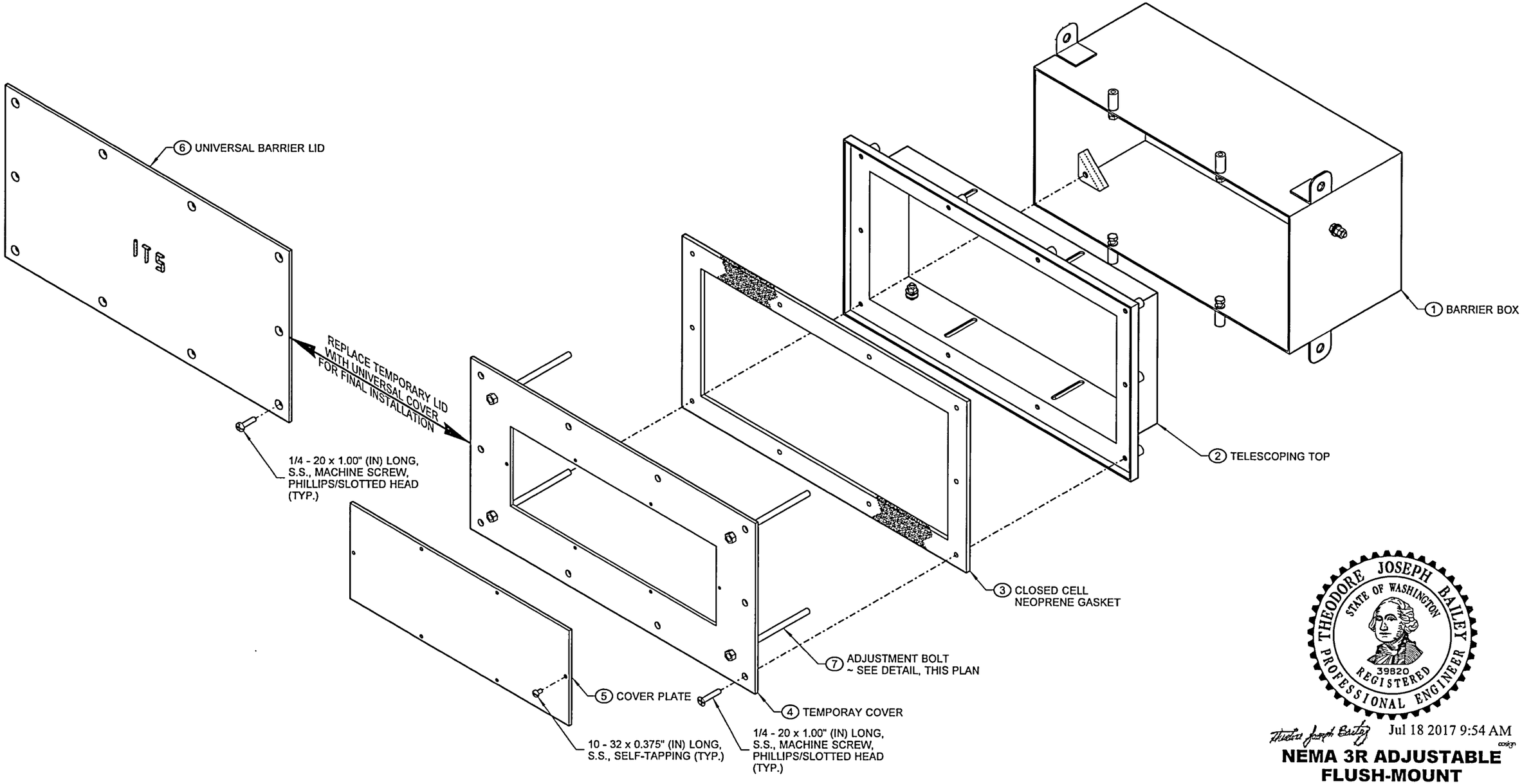
APPROVED FOR PUBLICATION

Carpenter, Jeff
Jul 21 2017 8 18 AM

STATE DESIGN ENGINEER

Washington State Department of Transportation

DRAWN BY: BILL BERENS



EXPLODED ISOMETRIC VIEW
ASSEMBLY DETAIL

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

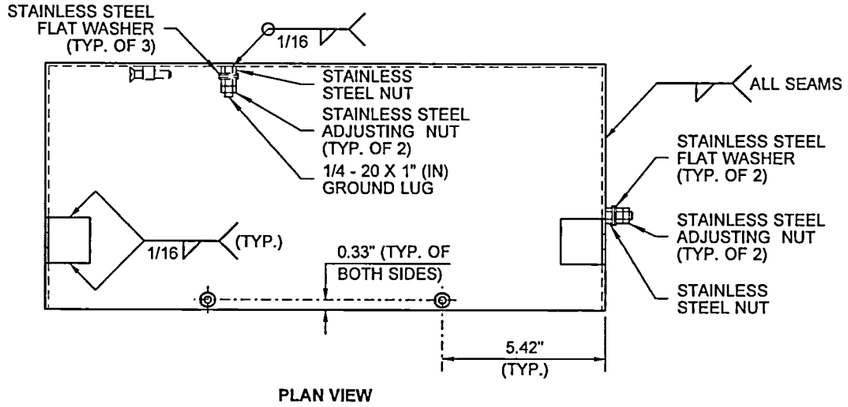
Theodore Joseph Bailey Jul 18 2017 9:54 AM

NEMA 3R ADJUSTABLE FLUSH-MOUNT JUNCTION BOX STANDARD PLAN J-40.37-02

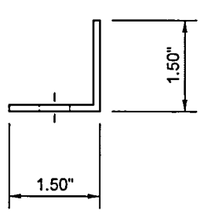
SHEET 1 OF 3 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8.17 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

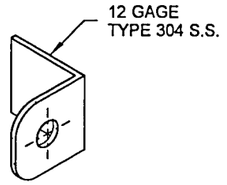
DRAWN BY: BILL BERENS



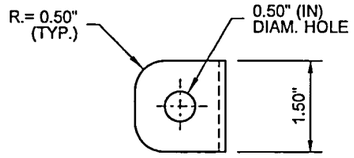
PLAN VIEW



PLAN VIEW

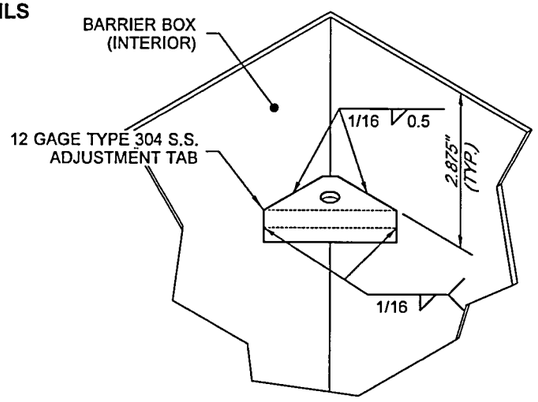


ISOMETRIC VIEW



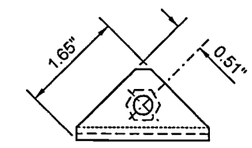
ELEVATION VIEW

MOUNTING TAB DETAILS

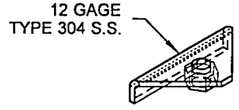


OBLIQUE VIEW

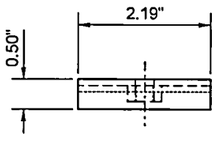
ADJUSTMENT TAB WELD DETAIL



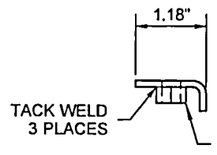
PLAN VIEW



ISOMETRIC

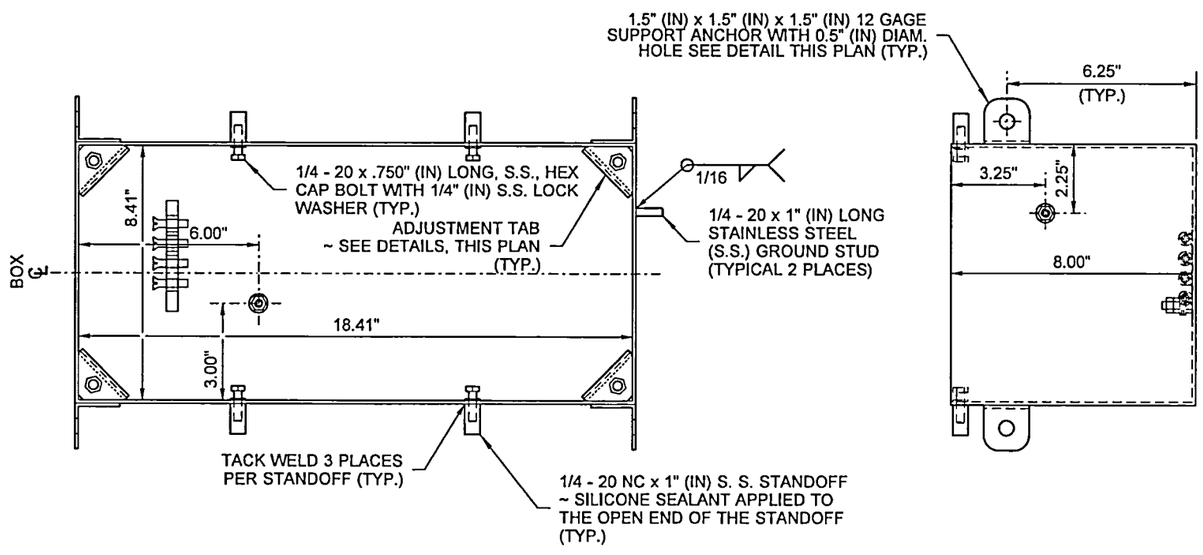


ELEVATION VIEW



END VIEW

ADJUSTMENT TAB



ELEVATION VIEW

END VIEW

① BARRIER BOX

NOTES

1. Junction Box shall be constructed of 12-gage, Type 304 stainless steel with steel welded seam construction. Finish shall be # 2B for barrier box and # 4 for the cover. Support anchor shall be constructed of 12-gage, Type 304 stainless steel. All hardware shall be Type A304 Stainless Steel.
2. The System Identification letters shall be 1/8" line thickness formed by engraving, stamping, or with a stainless steel weld bead. See **Standard Specification 9-29.2(4)** for details.
3. Conduit capacity = 8" (4" per end).
4. Box shall include # 8 AWG (min.) x 1 foot tinned, braided copper Bonding Jumper for bonding Box and Telescoping Top.

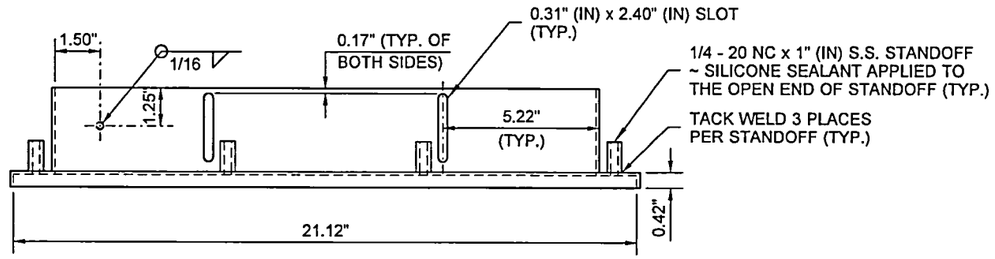
THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

Bailey, Ted
Jul 18 2017 9:54 AM

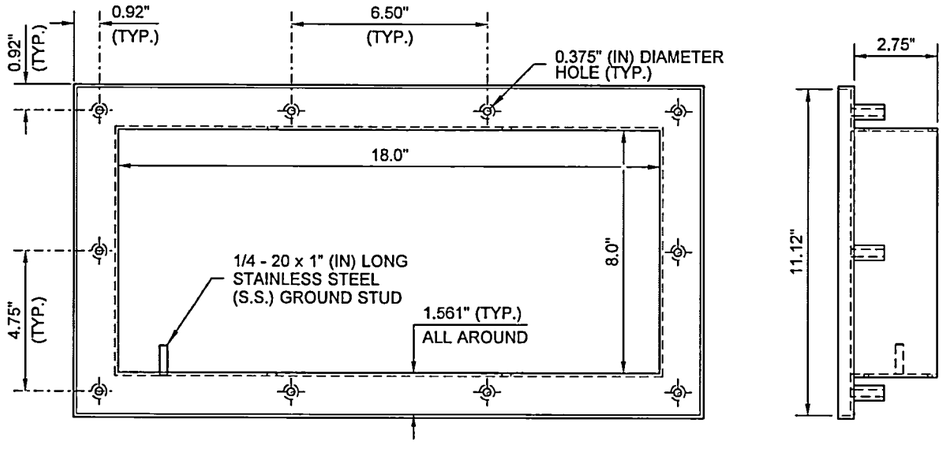
NEMA 3R ADJUSTABLE FLUSH-MOUNT JUNCTION BOX STANDARD PLAN J-40.37-02

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:17 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: BILL BERENS



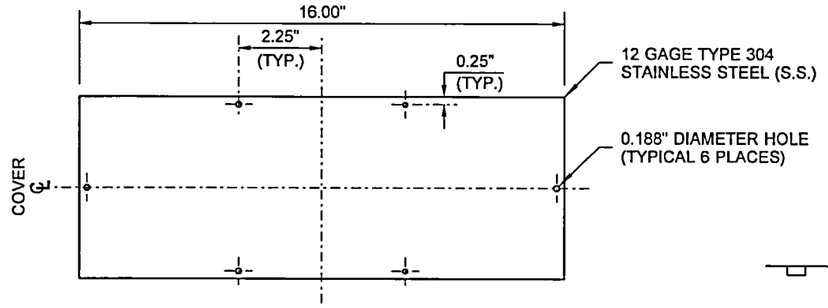
TOP VIEW



ELEVATION VIEW

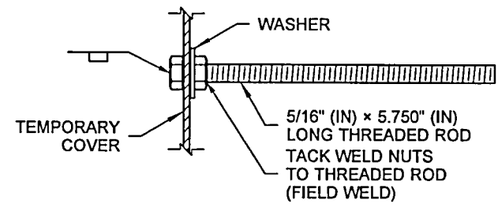
END VIEW

② TELESCOPING TOP

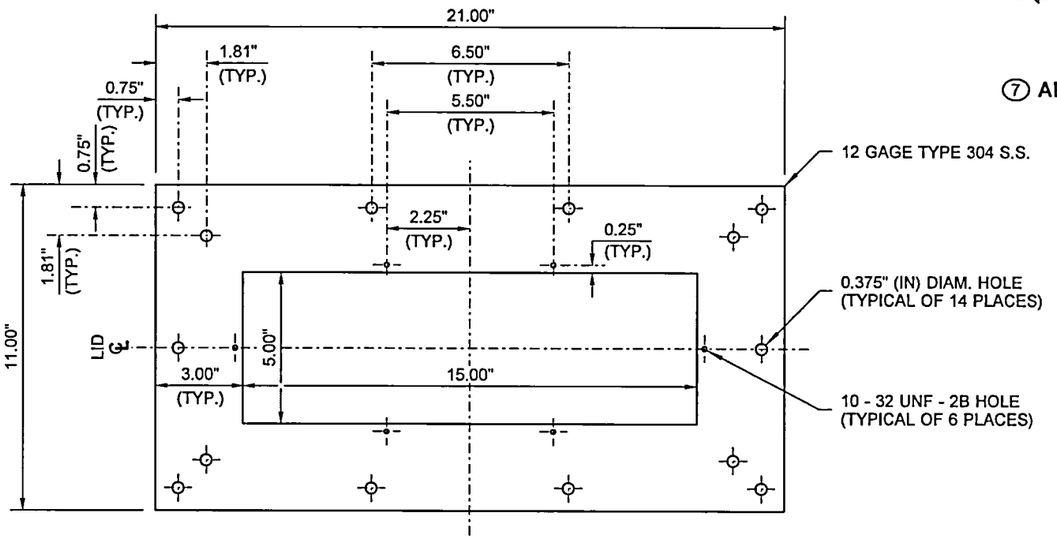


ELEVATION VIEW

⑤ COVER PLATE

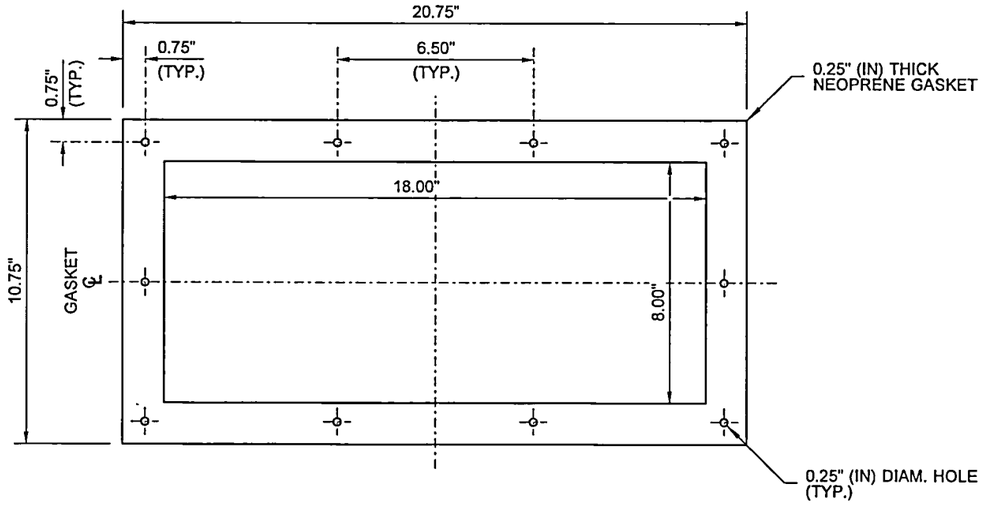


⑦ ADJUSTMENT BOLT DETAIL



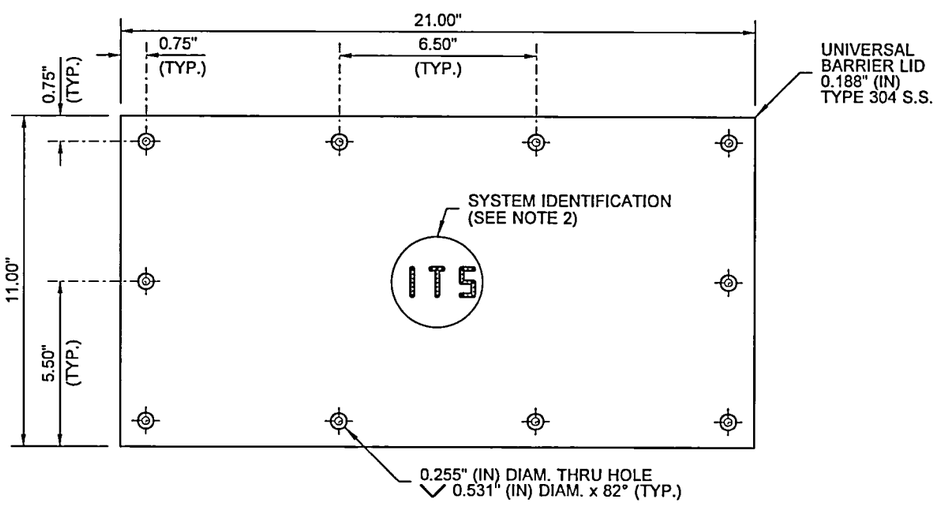
ELEVATION VIEW

④ TEMPORARY LID



ELEVATION VIEW

③ GASKET



ELEVATION VIEW

⑥ UNIVERSAL LID

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

Bailey, Ted
Jul 18 2017 9:54 AM

NEMA 3R ADJUSTABLE FLUSH-MOUNT JUNCTION BOX STANDARD PLAN J-40.37-02

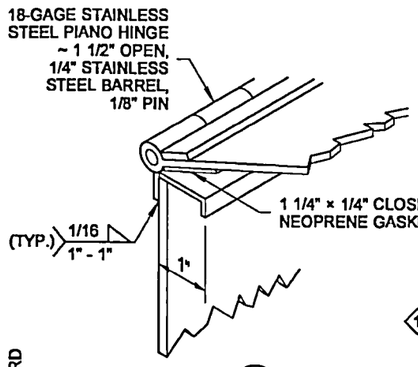
SHEET 3 OF 3 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:17 AM

STATE DESIGN ENGINEER

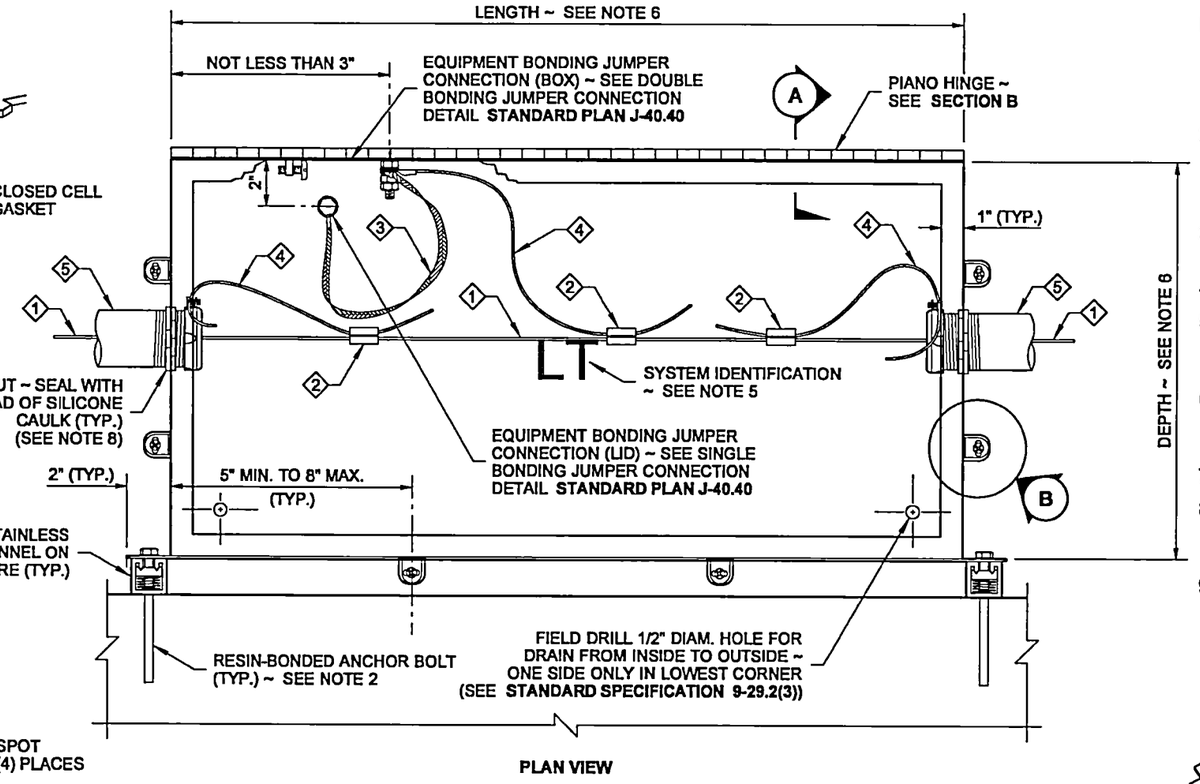
Washington State Department of Transportation

DRAWN BY: LISA CYFORD

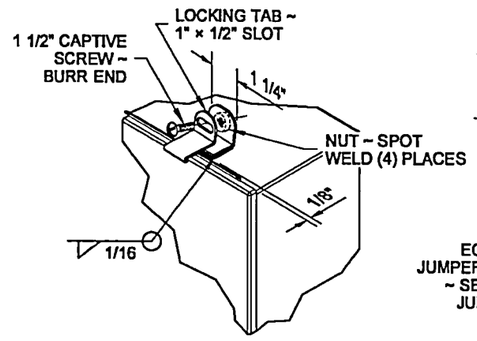


SECTION (A)

ISOMETRIC VIEW

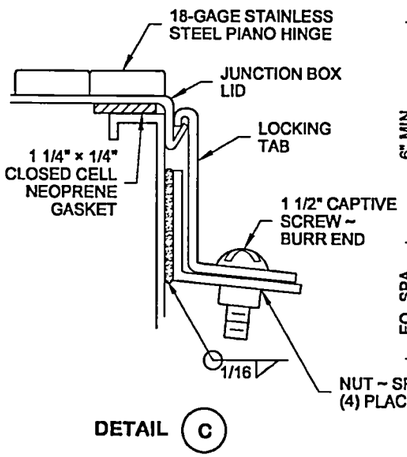


PLAN VIEW

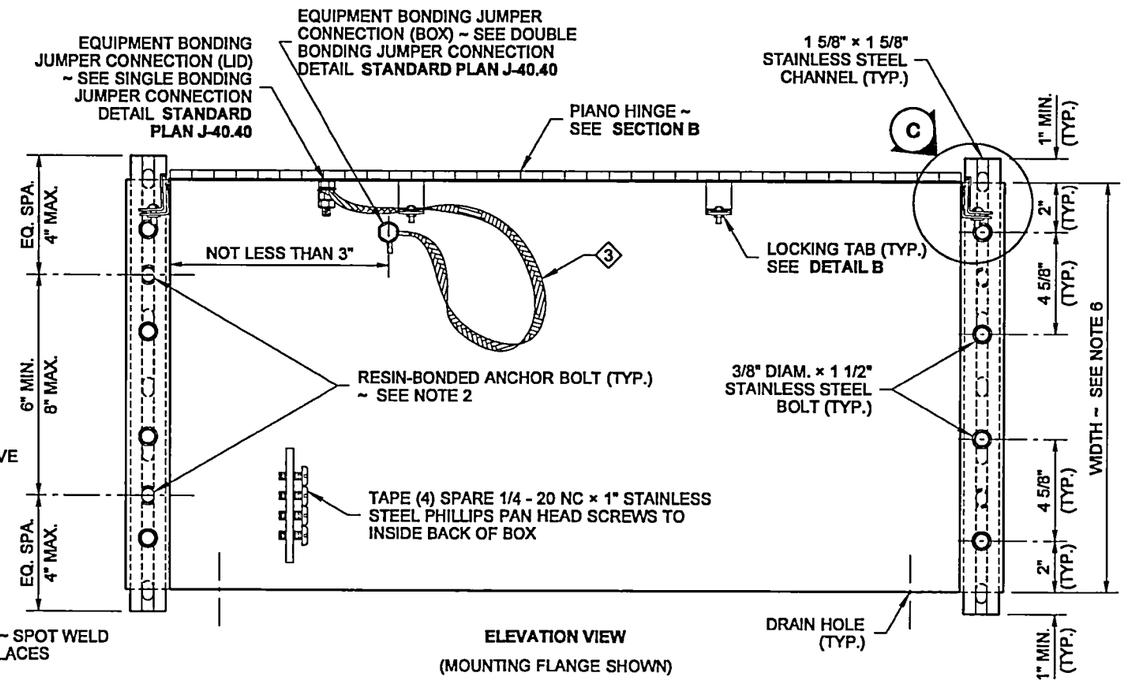


DETAIL (B)

LOCKING TAB DETAIL



DETAIL (C)

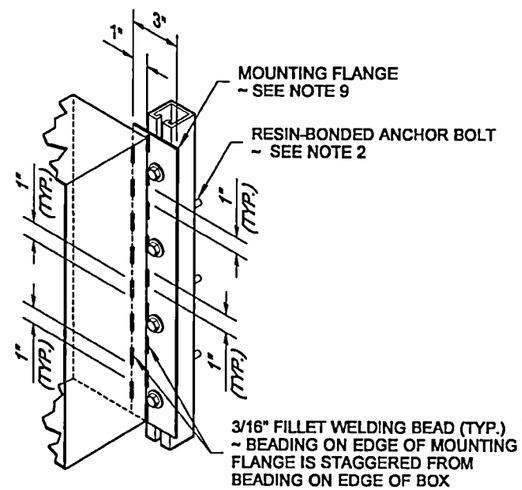


ELEVATION VIEW

(MOUNTING FLANGE SHOWN)

NOTES

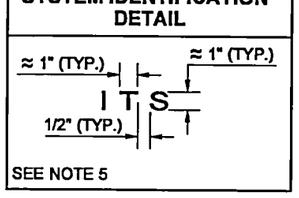
1. Drilling through reinforcing steel is not allowed. If steel is hit while drilling, the location shall be moved and the abandoned hole filled with grout conforming to **Standard Specification 6-02.3(20).**
2. Mount the stainless steel support using an approved resin-bonded anchor system installed per manufacturer's recommendation. Anchor bolt embedment shall be 4 1/2" minimum. Resin-bonded anchors shall be stainless steel and shall be 3/8" diameter. Expansion Anchors are not allowed.
3. There shall be a minimum of 3" edge distance to the centerline of anchor holes in the concrete.
4. See **Standard Plan J-60.13** for Stainless Steel Channel details.
5. The System Identification letters on the box lid shall be 1/8" line thickness formed by engraving, stamping, or with a stainless steel weld bead. See System Identification Detail and **Standard Specifications 9-29.2(4).**
6. Junction Box shall be dimensioned as shown in the Contract. If the conduit sizes shown in the Contract are changed, the box dimensions shall be revised in accordance with **NEC 314.28** using the 8 times multiplier for length and width dimensions.
7. Equipment Bonding Jumper shall be # 8 AWG (min.) × 1 foot of tinned, braided copper.
8. Fittings shall be UL listed and CSA-certified watertight on the outside of the Junction Box conduit connection. An insulated grounded end bushing shall be used to terminate Rigid Metal Conduit.
9. Junction Box shall be constructed of 12-gage, Type 304 stainless steel with welded seam construction and # 4 finish. Mounting Flange shall also be 12-gage, Type 304 stainless steel.



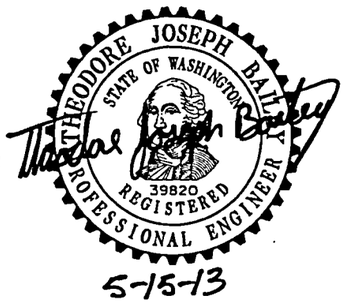
ISOMETRIC VIEW

(MOUNTING STRIP SHOWN)

SYSTEM IDENTIFICATION DETAIL



SEE NOTE 5



1. Equipment Grounding Conductor
2. Copper Solderless Crimp Connector
3. Equipment Bonding Jumper ~ See Note 7
4. Equipment Bonding Jumper
5. See Contract for conduit size and number

TOP ENTRY NEMA 4X SURFACE-MOUNT JUNCTION BOX

STANDARD PLAN J-40.38-01

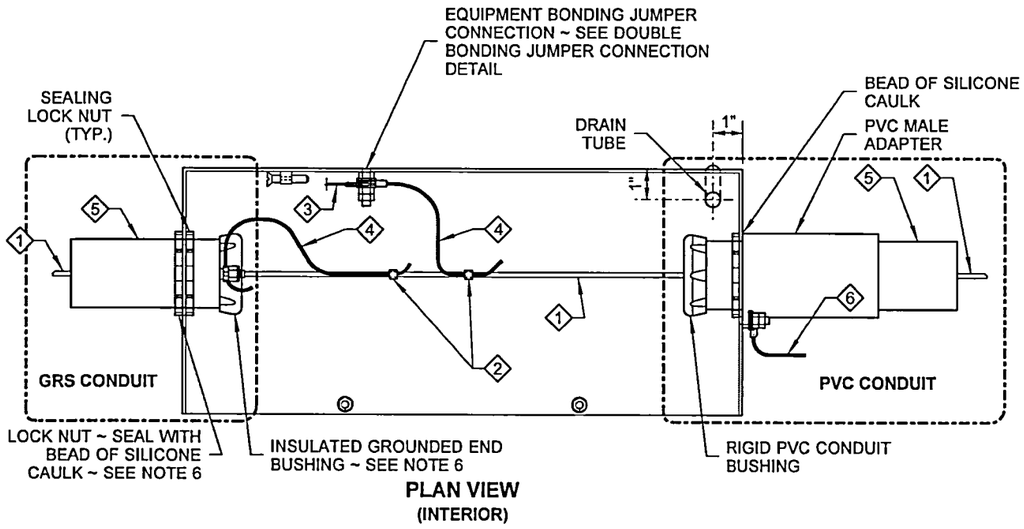
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

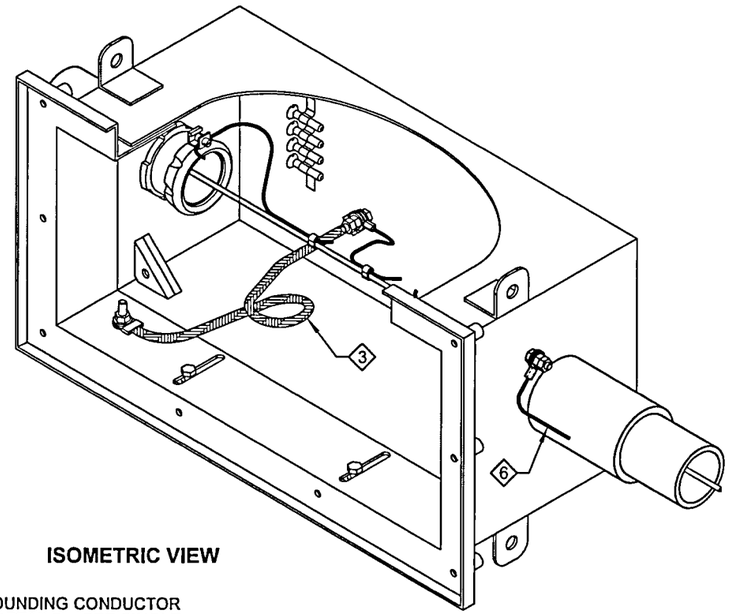
STATE DESIGN ENGINEER — DATE 5/20/13

Washington State Department of Transportation

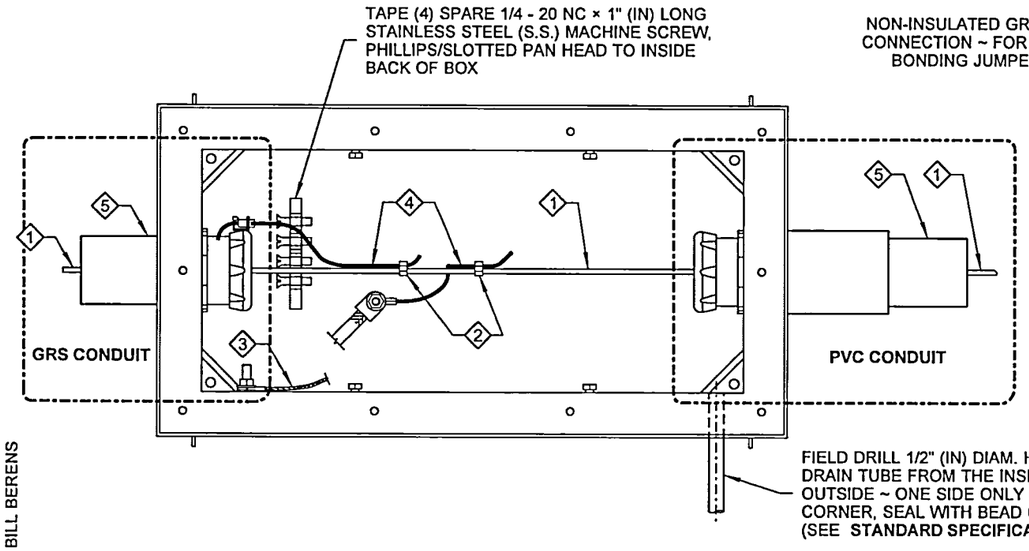
This page left blank intentionally.



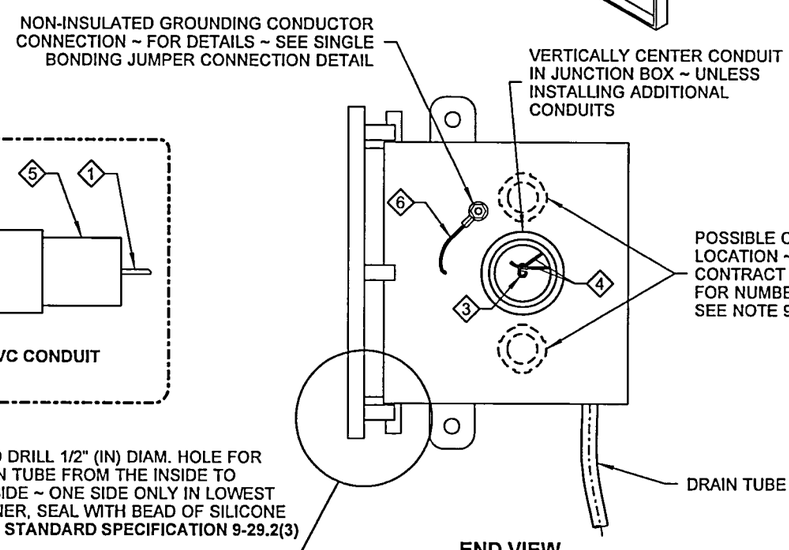
PLAN VIEW
(INTERIOR)



ISOMETRIC VIEW

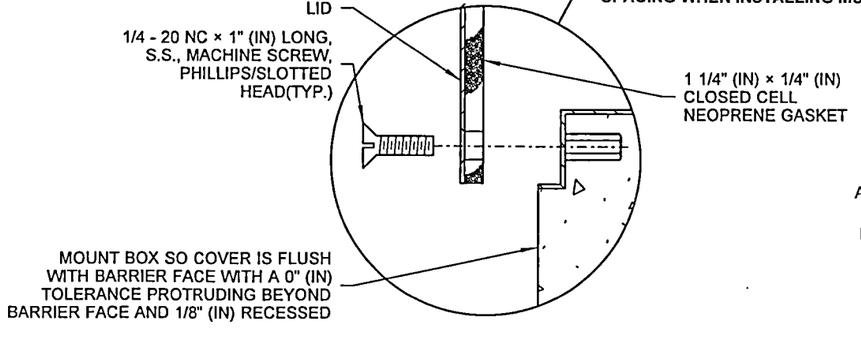


ELEVATION VIEW

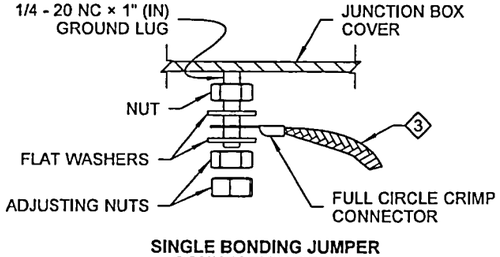


END VIEW

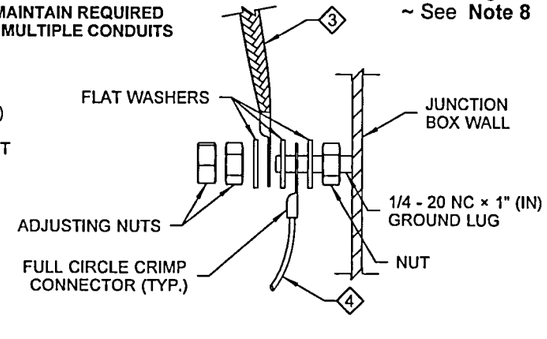
VERTICALLY CENTER AND MAINTAIN REQUIRED SPACING WHEN INSTALLING MULTIPLE CONDUITS



DETAIL



SINGLE BONDING JUMPER CONNECTION DETAIL
(ALL HARDWARE TYPE A304 STAINLESS STEEL)



DOUBLE BONDING JUMPER CONNECTION DETAIL
(ALL HARDWARE TYPE A304 STAINLESS STEEL)

DRAWN BY: BILL BERENS

NOTES

1. This Junction Box type shall not be surface mounted. For Surface-Mounted Junction Boxes, see **Standard Plans J-40.38 and J-40.39**.
2. Nema 4X Non-Adjustable Junction Boxes must be used in barriers with stationary forms. Nema 3R Adjustable Junction Boxes must be used in barriers with slip forms.
3. Conduits shall enter the Junction Box from the ends as shown.
4. Conduit capacity = 8".
5. Holes for conduit(s) shall be field drilled or punched in box ends. See **END VIEW**.
6. Fittings shall be UL listed and CSA-certified concrete tight on the outside of the Junction Box conduit connection. A sealing lock-nut must be used on the inside of the junction box. GRS conduit shall be terminated with an insulated Grounded End Bushing. PVC conduit shall be terminated with a rigid PVC Conduit End Bushing.
7. Liberally coat the threads of the cover fasteners with anti-seize compound during construction and before final closure.
8. When converting RMC to PVC in Stationary-Form Barriers, route a # 8 Stranded, Non-Insulated Grounding Conductor along Conduit, secure Conductor to Conduit with clamp as shown on Conduit Deflection Fitting "B" detail, convert RMC to PVC in Stationary-Form Barrier (per **Standard Plan J-60.11**): omit Conductor when this detail is not used.
9. When additional Conduits are required, Bonding and Grounding wiring shall match configuration as shown in the perspective view. See Contract for number and size of additional Conduits.
10. Adjustable Box Equipment Bonding Jumper shall be # 8 AWG (min.) × 1 foot of tinned, braided copper. For Nema 3R Adjustable Boxes Only.
11. Apply a 3/16" bead of silicone caulk around Junction Box body and Adjustable Face to provide a proper seal prior to installation. For Nema 3R Adjustable Boxes Only.

1. Equipment Grounding Conductor
2. Copper Solderless Crimp Connector
3. Equipment Bonding Jumper ~ See note 10
4. Equipment Bonding Jumper
5. See Contract for conduit size and number
6. # 8 AWG Stranded, Non-insulated Grounding Conductor ~ See **Note 8**

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

Bailey, Ted
Jul 18 2017 9:55 AM

NEMA 3R AND 4X FLUSH-MOUNT JUNCTION BOX - GROUNDING

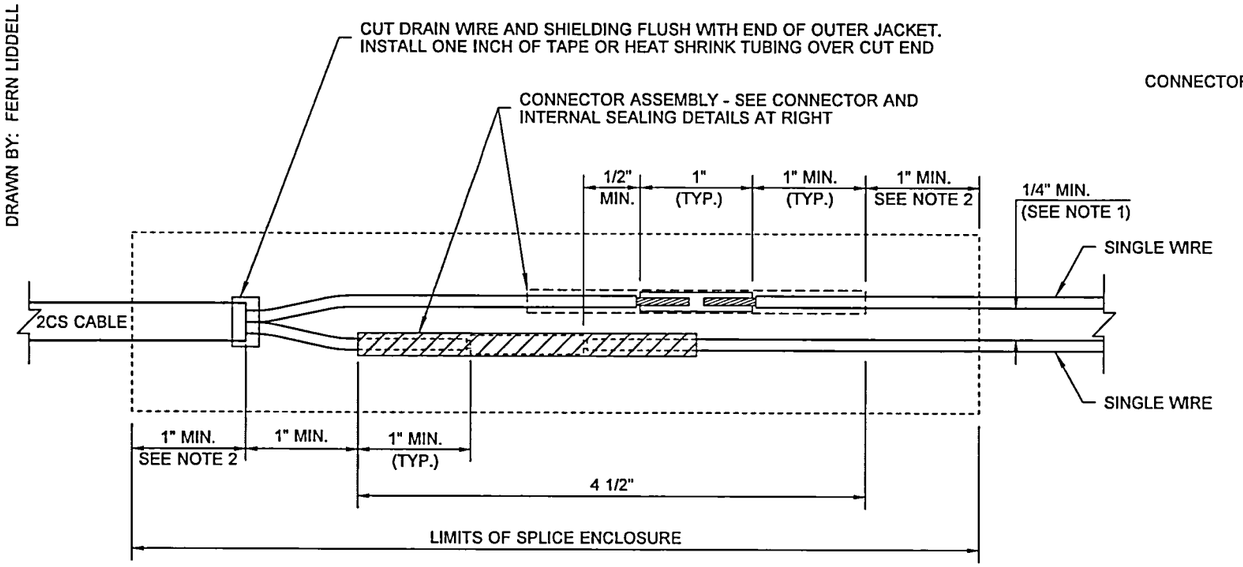
STANDARD PLAN J-45.36-00

SHEET 1 OF 1 SHEET

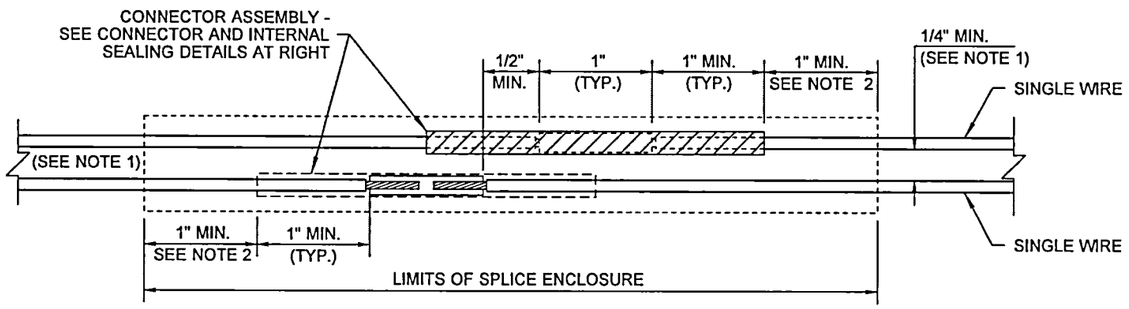
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:16 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

This page left blank intentionally.

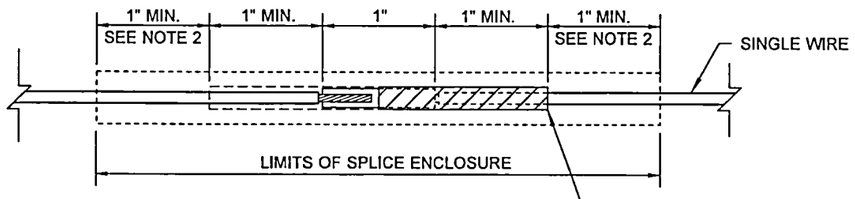
DRAWN BY: FERN LIDDELL



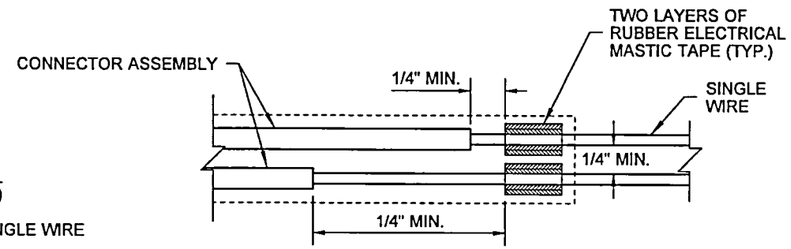
TWO CONDUCTOR SHIELDED TO TWO SINGLE WIRES



TWO SINGLE WIRE SPLICES IN SAME ENCLOSURE



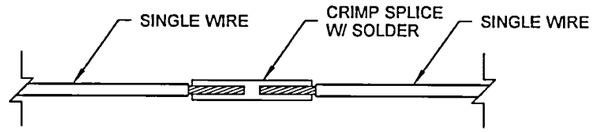
SINGLE WIRE SPLICE



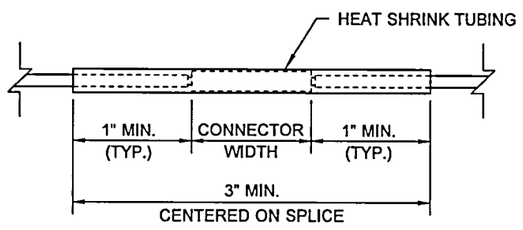
RUBBER ELECTRICAL MASTIC TAPE INSTALLATION DETAIL

CONNECTOR AND INTERNAL SEALING DETAILS

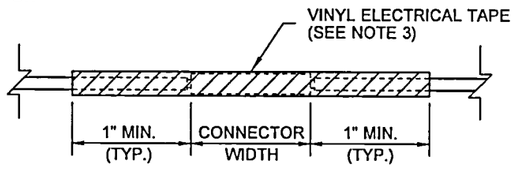
STEP 1: CRIMP AND SOLDER CONNECTION

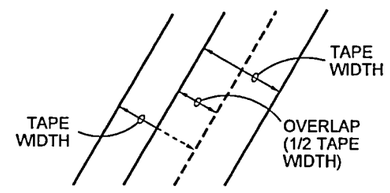


STEP 2: SEAL / WRAP CONNECTION



OR





WHEN USING WRAPPED VINYL ELECTRICAL TAPE:

- INSTALL TWO LAYERS OF SPIRAL WRAPPED TAPE.
- EACH SPIRAL LAYER SHALL HAVE AN OVERLAP OF 1/2 OF THE TAPE WIDTH (SEE DIAGRAM ABOVE).

TAPE OVERLAP DIAGRAM

NOTES

1. Each wire shall be physically separated by at least 1/4" (in) so that sealing material can fill in between the wires; where heat shrink tubing is used for the outer splice enclosure, it shall meet one of the following requirements:

   a. Have separate ports for each conductor ("WYE" or "X" shaped tubing). ~ or ~

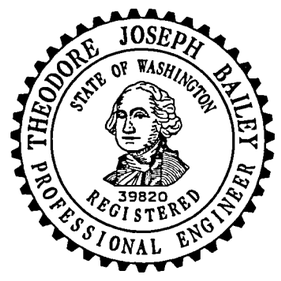
   b. Have rubber electrical mastic tape wrapped around each conductor to ensure a weather-proof seal. See Rubber Electrical Mastic Tape Installation Detail.

2. Heat shrink tubing shall extend a minimum of one inch onto the original wire insulation of each wire in the splice. Rigid splice enclosures shall be centered over the crimped connection(s).

3. Electrical tape used in splicing applications shall be 3/4" (in) wide, be UL listed under UL 510, and be CSA certified under C22.2 No. 197-M1983.

4. No more than two splices may be installed in the same splice enclosure.

5. Crimp splices shall be installed with an approved crimping tool for the type and size of crimp splice used. Pliers and similar multi-purpose tools may not be used.



Bailey, Ted
Jul 18 2017 9:55 AM

LOOP SPLICE DETAILS

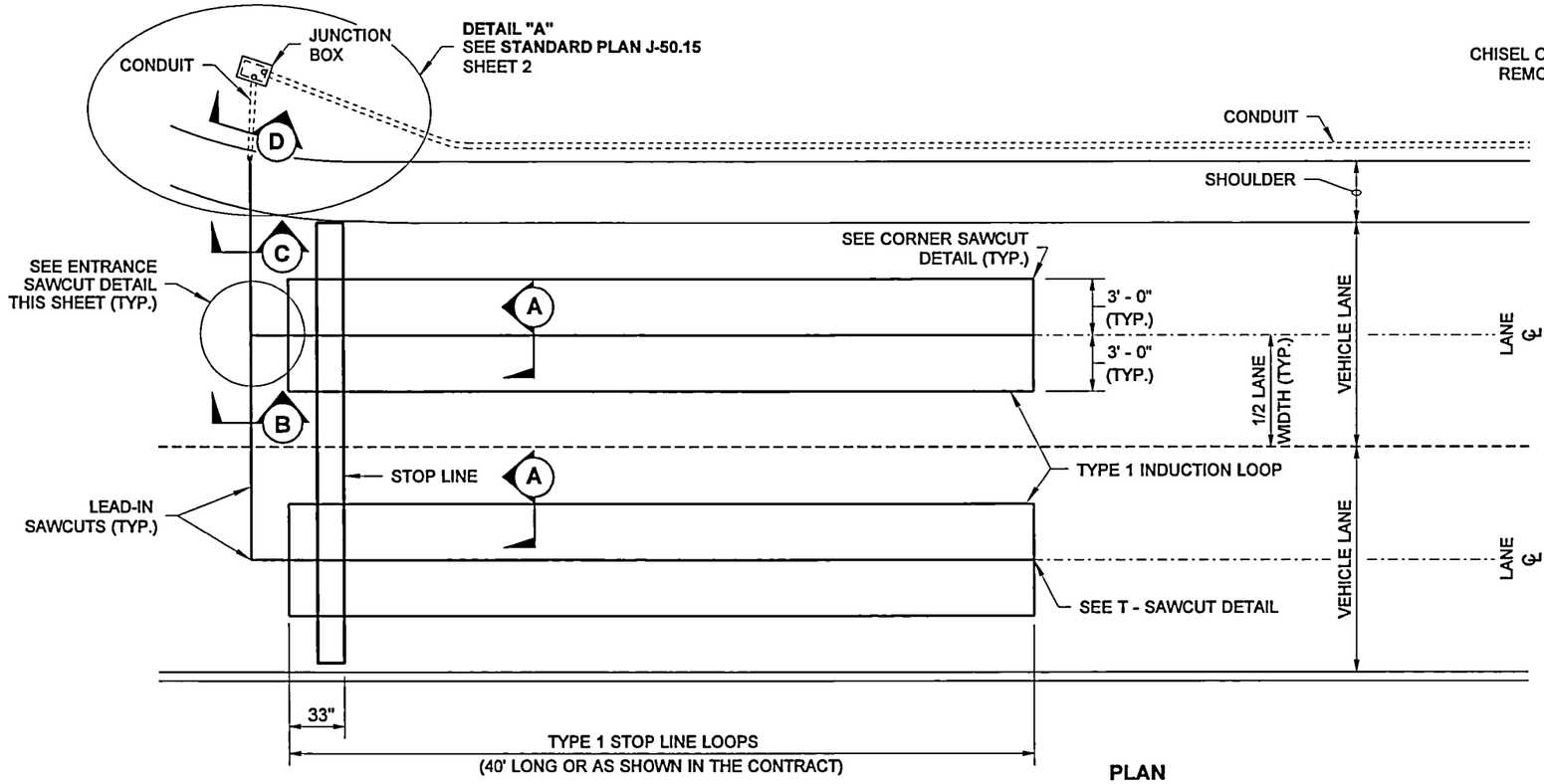
STANDARD PLAN J-50.05-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:15 AM

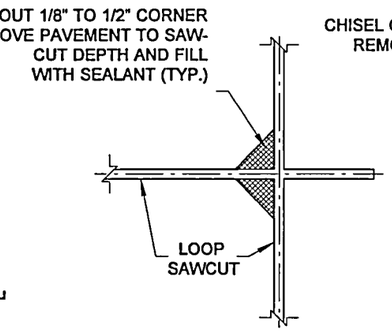
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

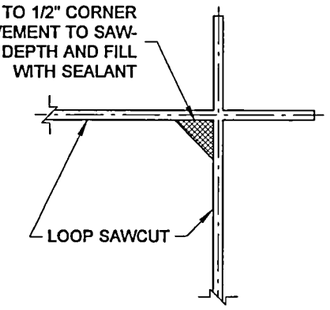


PLAN

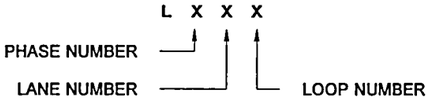
TYPE 1 STOP LINE LOOPS



T - SAWCUT DETAIL



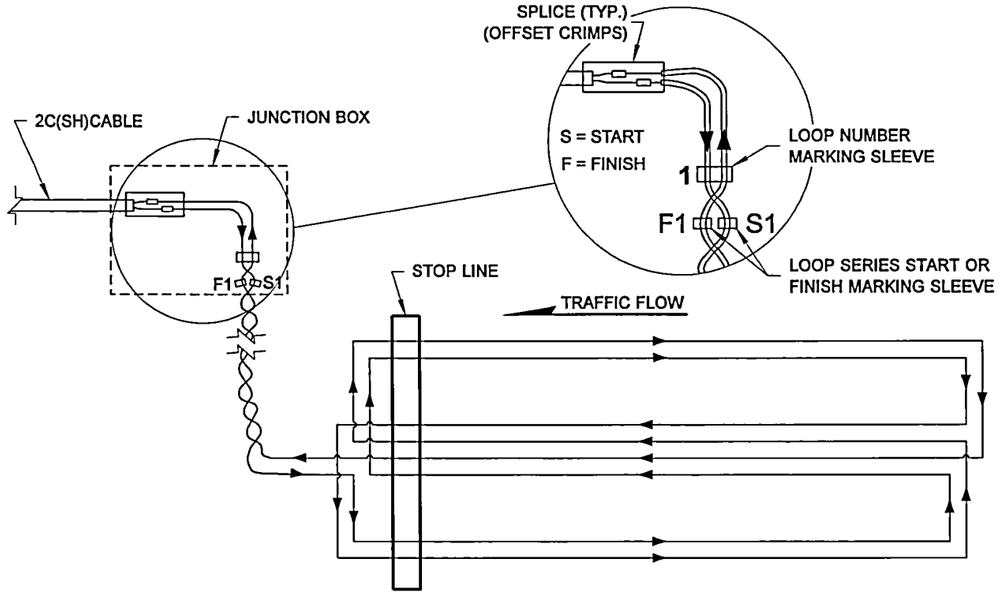
CORNER SAWCUT DETAIL



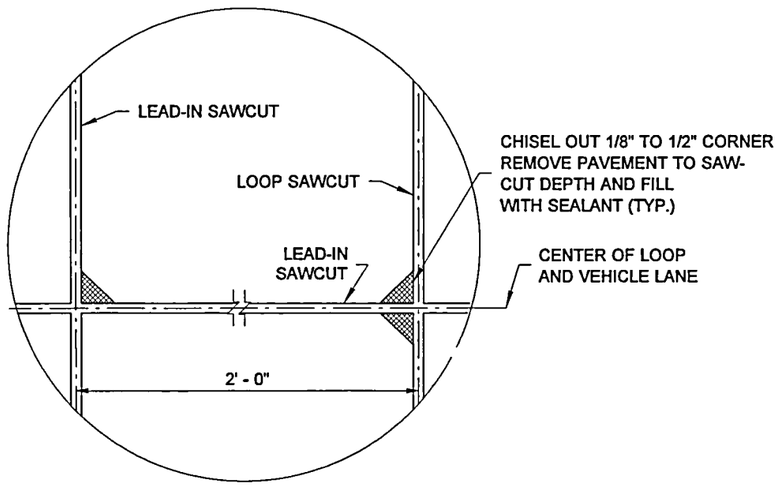
LOOP NUMBER MARKING DETAIL

NOTES

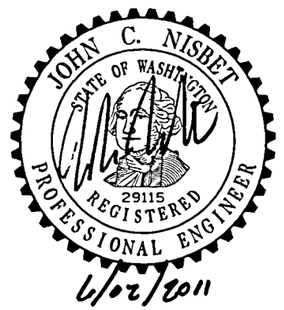
1. For Installation Notes and Details see **Standard Plan J-50.15.**
2. For Sections A, B, C, and D, see **Standard Plan J-50.15.**



TYPE 1 STOP LINE LOOP WIRING DIAGRAM



ENTRANCE SAWCUT DETAIL



TYPE 1 INDUCTION LOOP

STANDARD PLAN J-50.10-00

SHEET 1 OF 1 SHEET

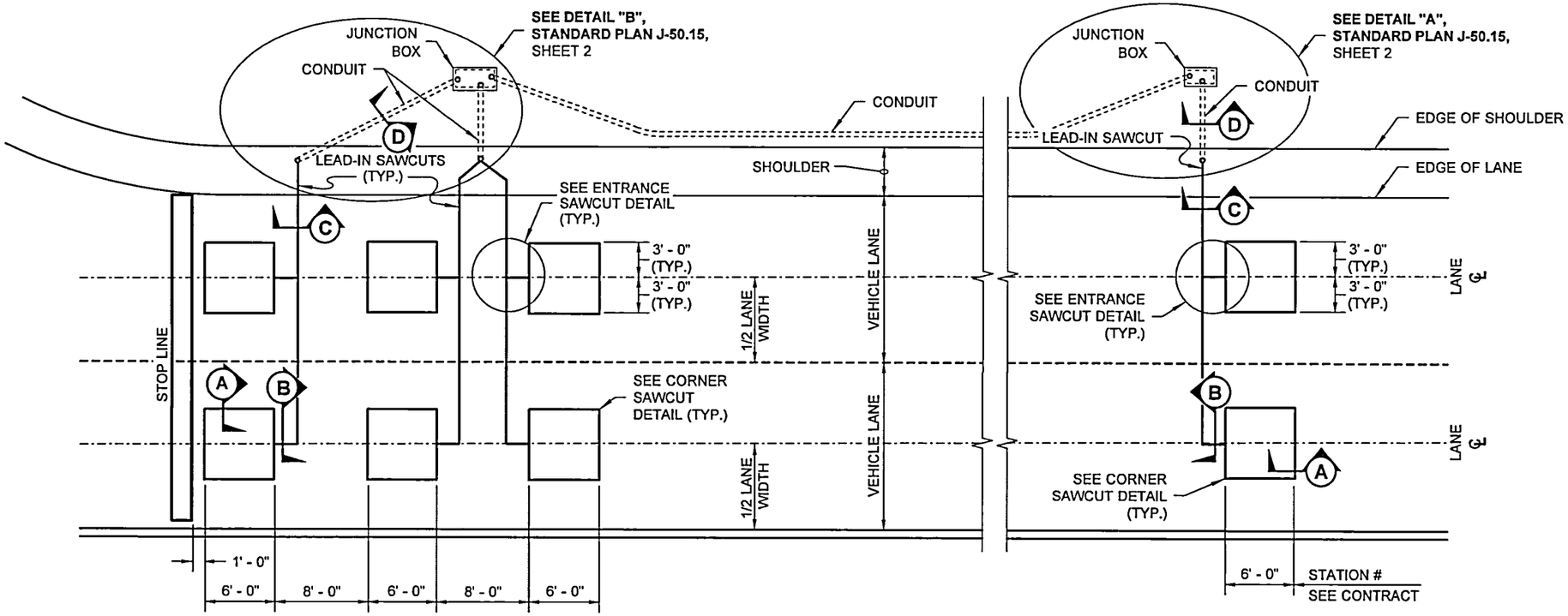
APPROVED FOR PUBLICATION

6/3/11

STATE DESIGN ENGINEER — DATE

Washington State Department of Transportation

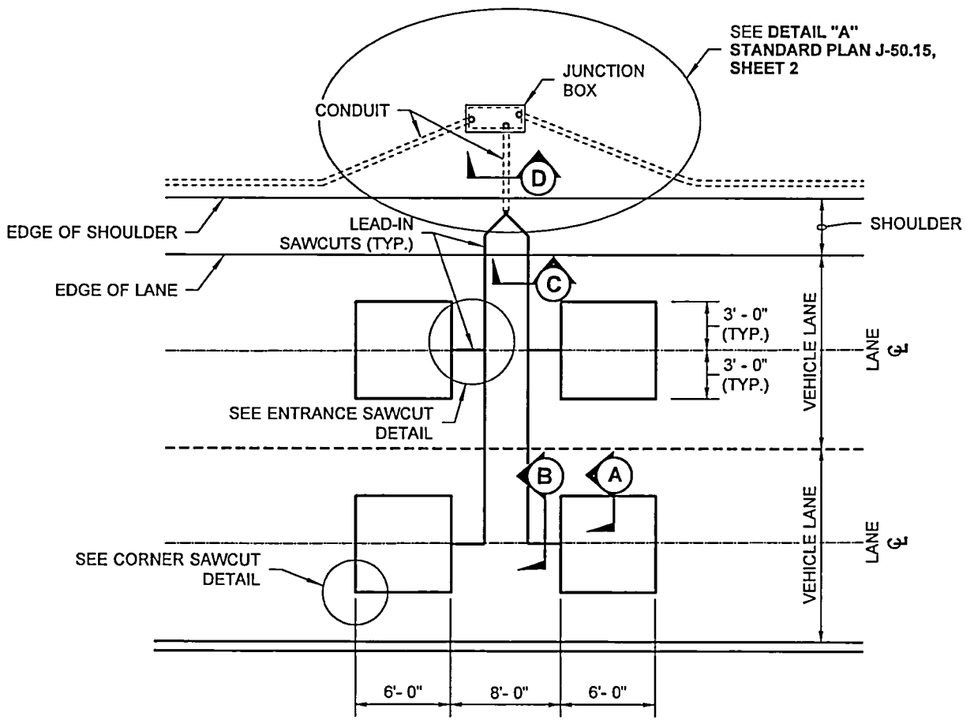
DRAWN BY: FERN LIDDELL



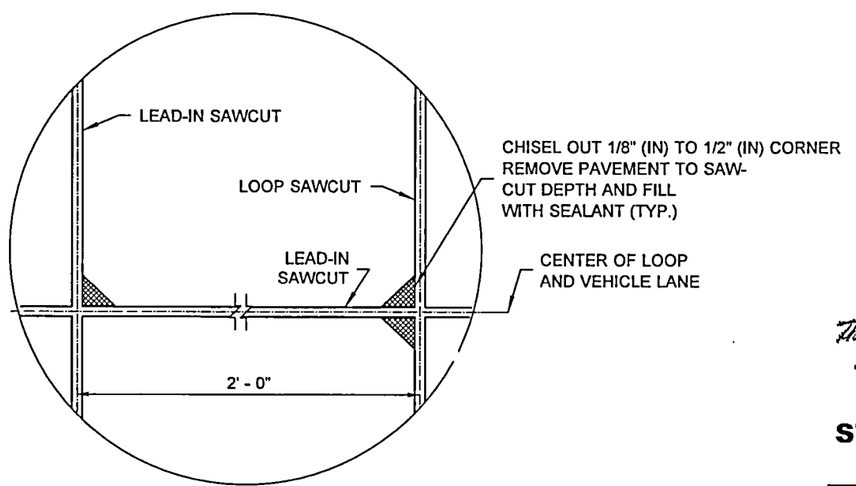
TYPE 2 STOP LINE LOOPS

PLAN

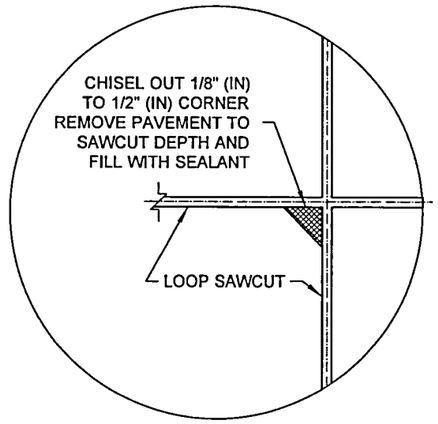
TYPE 2 ADVANCE LOOPS



TYPE 2 SAMPLING LOOPS



ENTRANCE SAWCUT DETAIL



CORNER SAWCUT DETAIL

NOTES

1. For Installation Notes and Details see **Standard Plan J-50.15.**
2. For Sections A, B, C, and D, see **Standard Plan J-50.15.**
3. All of the loop lead-in wires shall return to the Junction Box.
4. For Splice Detail, see **Standard Plan J-50.05.**
5. For additional Induction Loop details, see **Standard Plan J-50.15.**

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

Bailey, Ted
Jul 18 2017 9:56 AM
cosign

TYPE 2 INDUCTION LOOP

STANDARD PLAN J-50.11-01

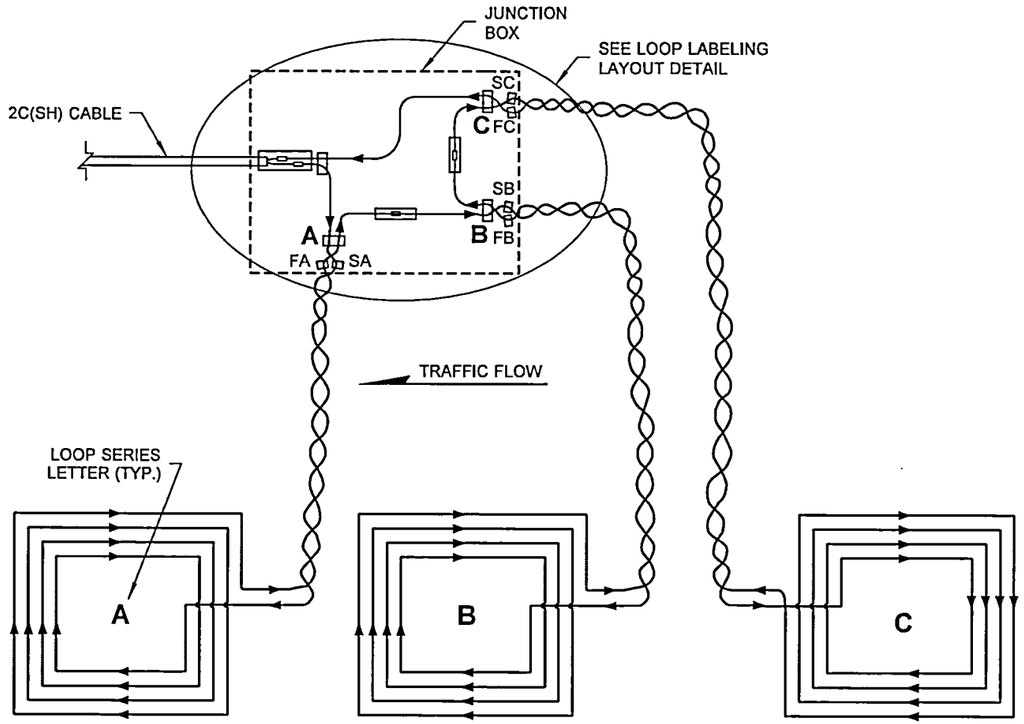
SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:15 AM
cosign

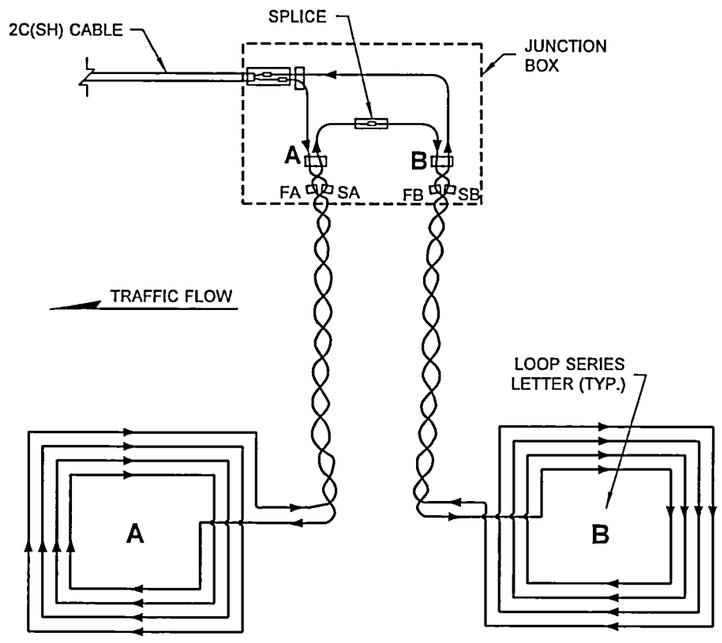
STATE DESIGN ENGINEER

Washington State Department of Transportation

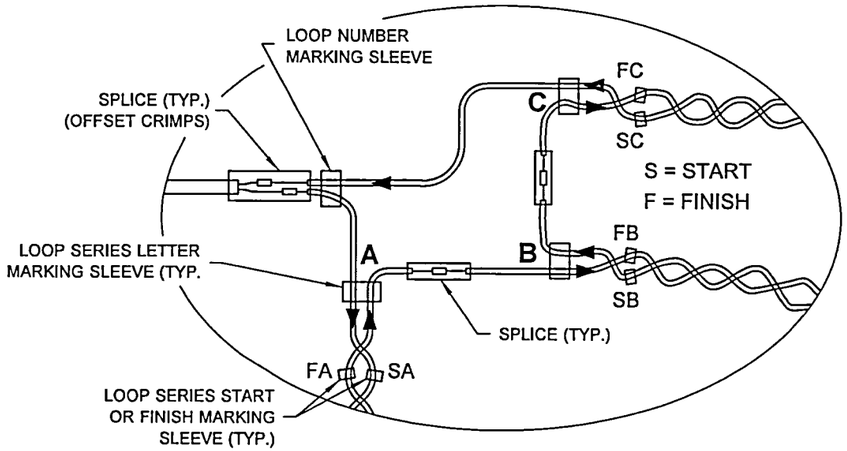
DRAWN BY: FERN LIDDELL



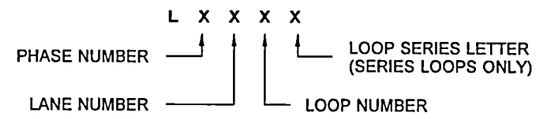
TYPE 2 STOP LINE LOOP WIRING DIAGRAM
SERIES SPLICE SHOWN



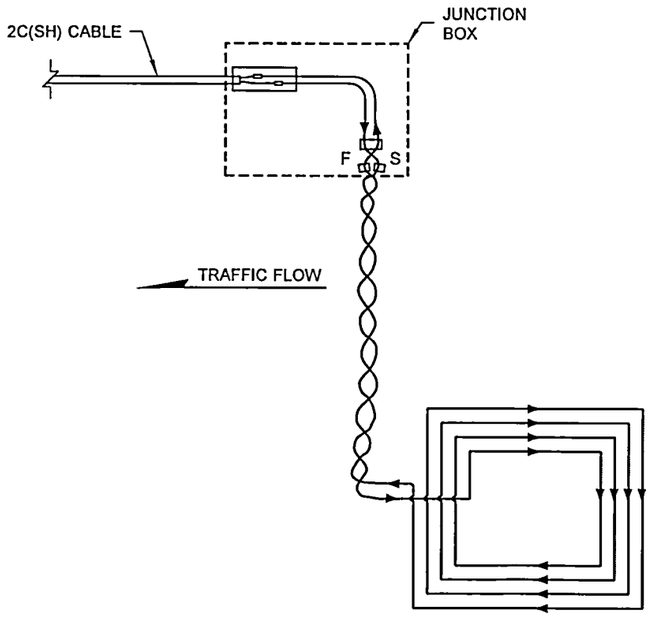
TYPE 2 SAMPLING LOOP WIRING DIAGRAM
SERIES SPLICE SHOWN



LOOP LABELING LAYOUT DETAIL



LOOP NUMBER MARKING DETAIL



TYPE 2 ADVANCE LOOP WIRING DIAGRAM

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

Theodore Joseph Bailey
Bailey, Ted
Jul 18 2017 9:56 AM
cosign

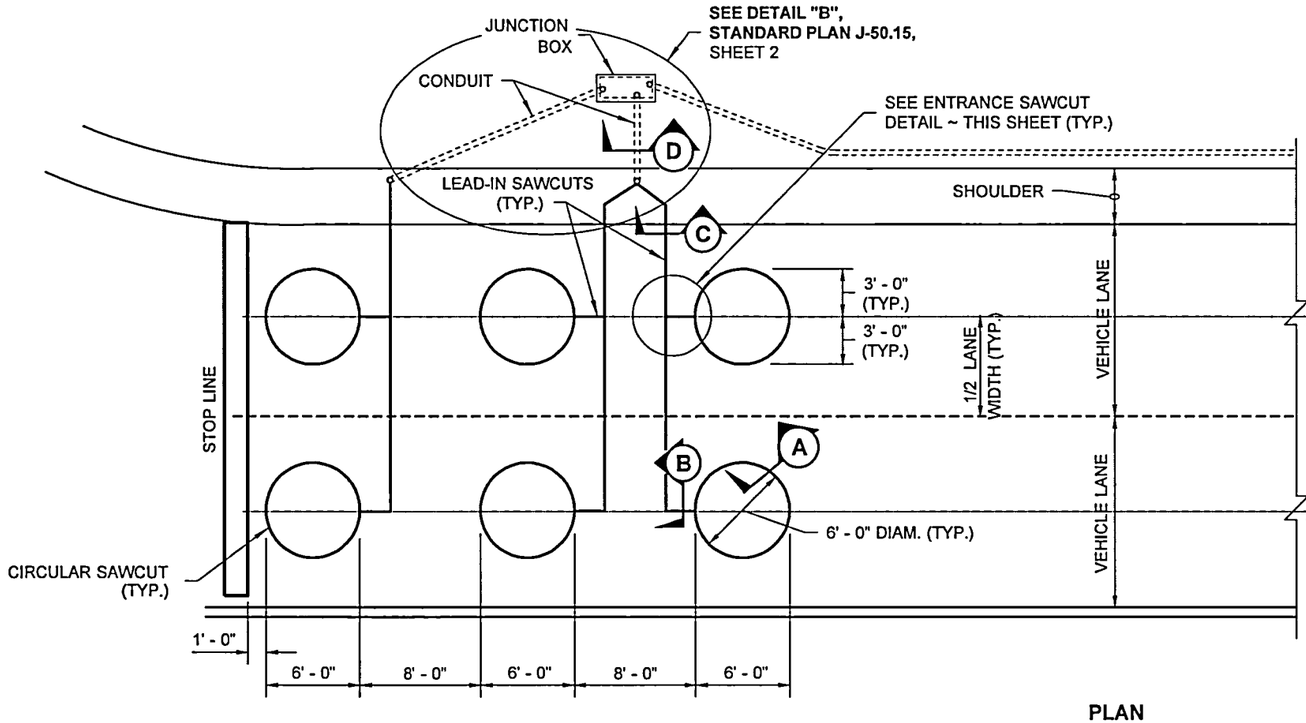
TYPE 2 INDUCTION LOOP

STANDARD PLAN J-50.11-01

SHEET 2 OF 2 SHEETS

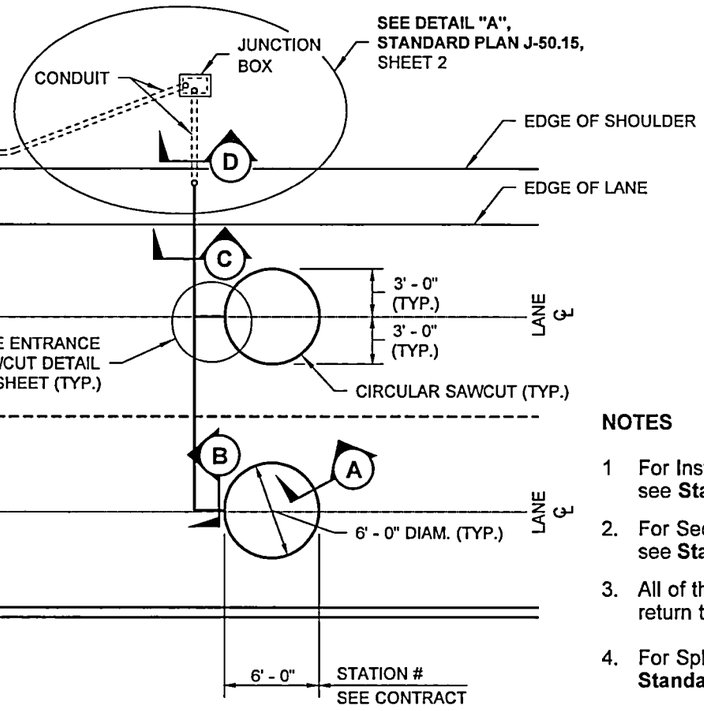
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:15 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

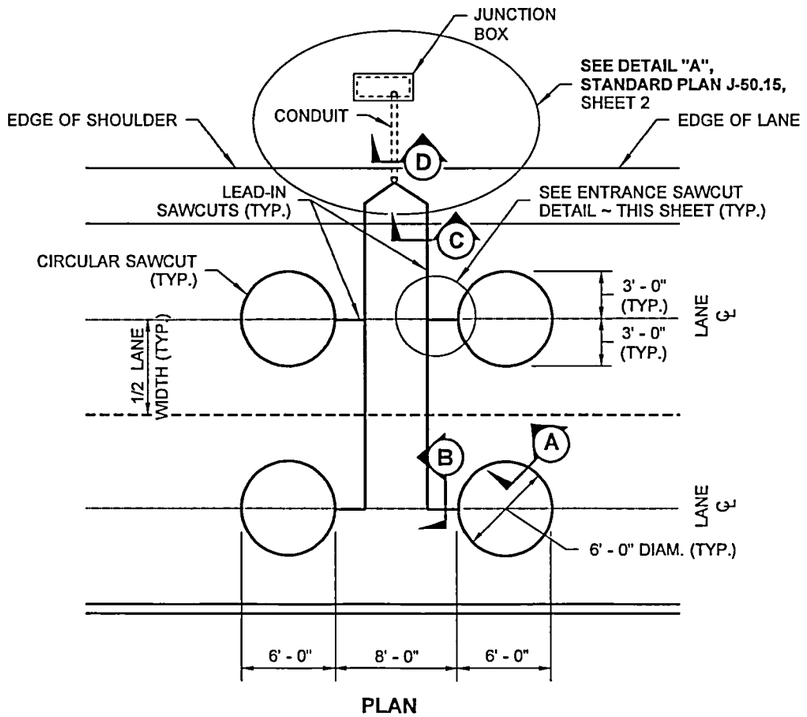


PLAN

TYPE 3 STOP LINE LOOPS

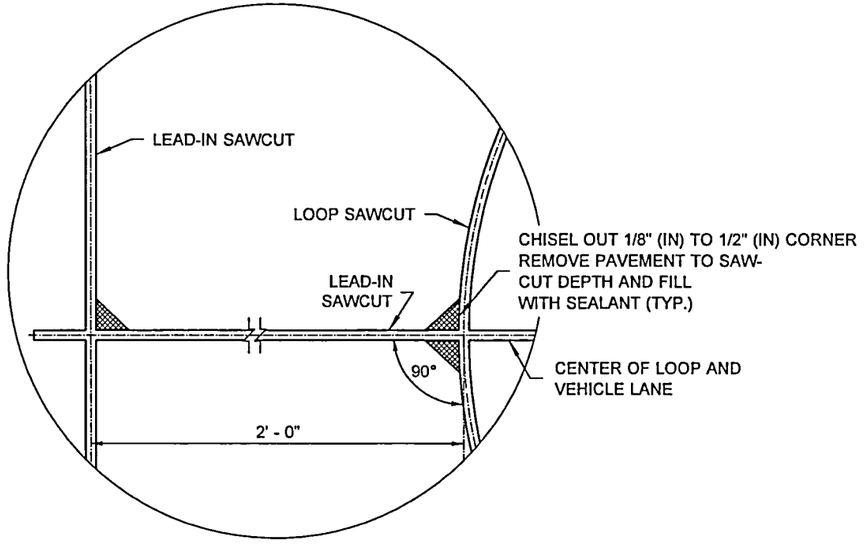


TYPE 3 ADVANCE LOOPS



PLAN

TYPE 3 SAMPLING LOOPS



ENTRANCE SAWCUT DETAIL

NOTES

1. For Installation Notes and Details see **Standard Plan J-50.15.**
2. For Sections A, B, C, and D, see **Standard Plan J-50.15.**
3. All of the loop lead-in wires shall return to the Junction Box.
4. For Splice Detail, see **Standard Plan J-50.05.**
5. For Loop numbering Layout Details, see **sheet 3.**
6. For additional Induction Loop Details, see **Standard Plan J-50.15.**

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

Bailey, Ted
Jul 18 2017 9:56 AM
cosign

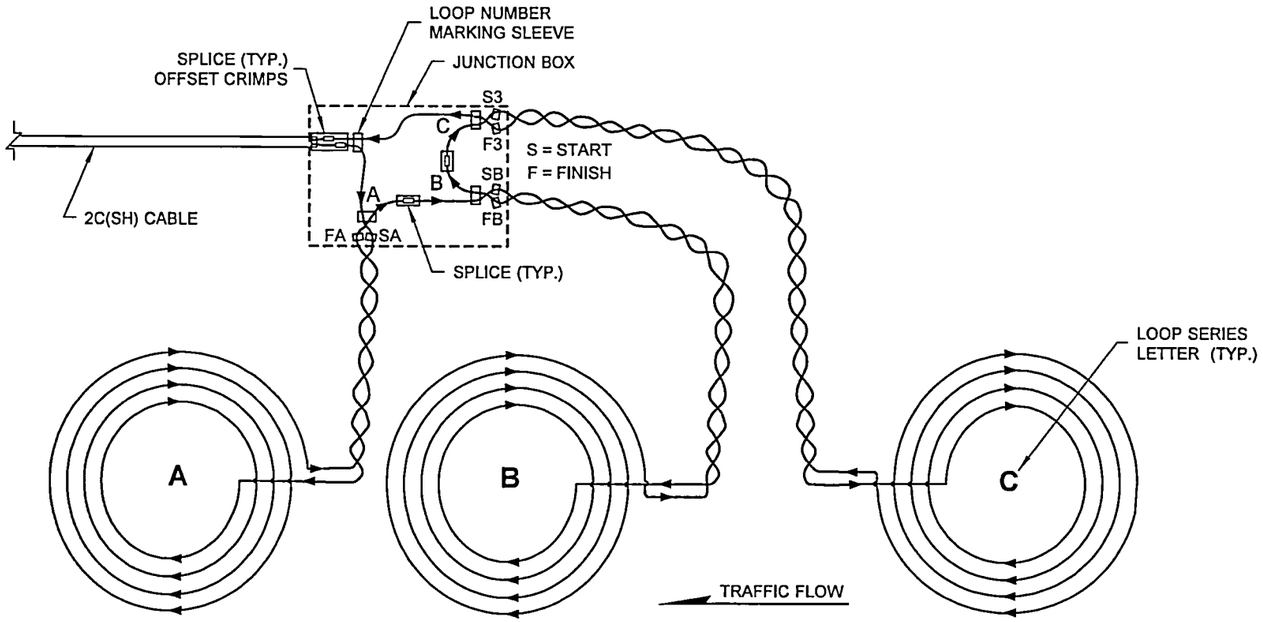
TYPE 3 INDUCTION LOOP

STANDARD PLAN J-50.12-01

SHEET 1 OF 3 SHEETS

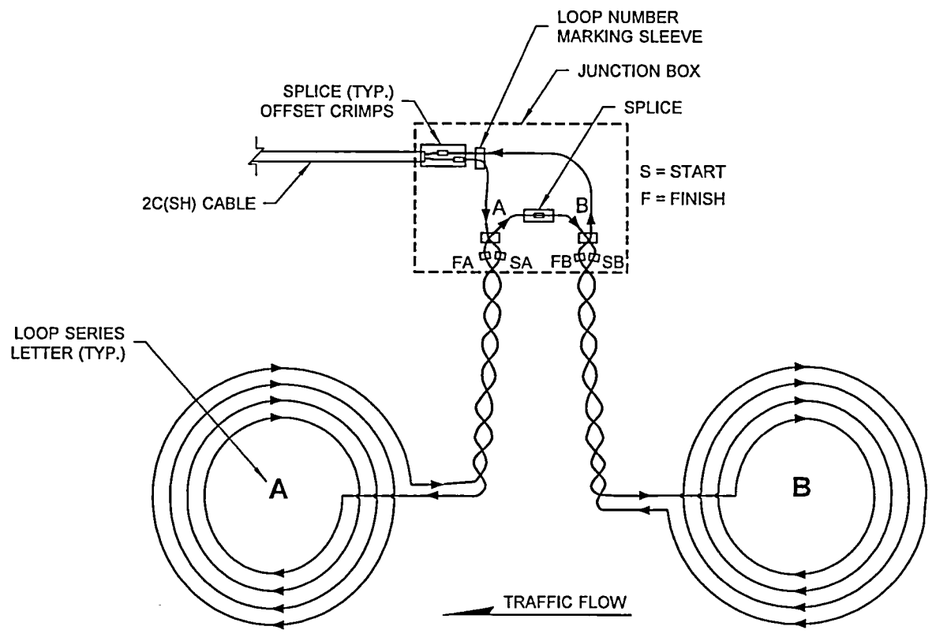
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:14 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



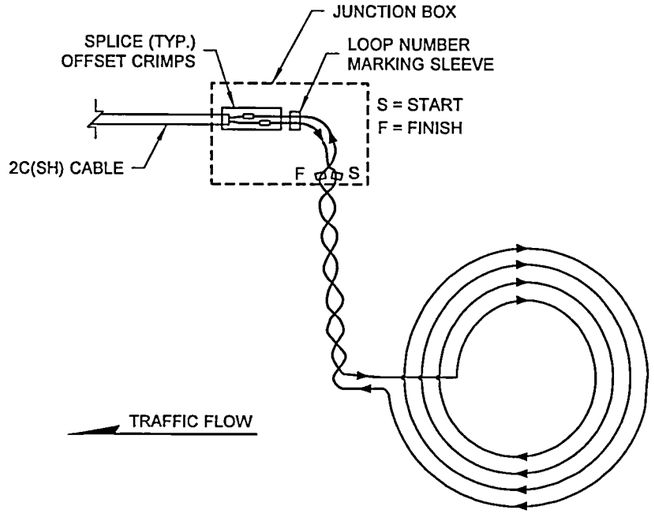
TYPE 3 STOP LINE LOOP WIRING DIAGRAM

SERIES SPLICE SHOWN

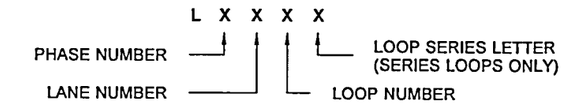


TYPE 3 SAMPLING LOOP WIRING DIAGRAM

SERIES SPLICE SHOWN



TYPE 3 ADVANCE LOOP WIRING DIAGRAM



LOOP NUMBER MARKING DETAIL

NOTES

Loop numbering layout will be simillar to Loop Numbering Layout Detail, Sheet 3.

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

Theodore Joseph Bailey
Bailey, Ted
Jul 18 2017 9:56 AM

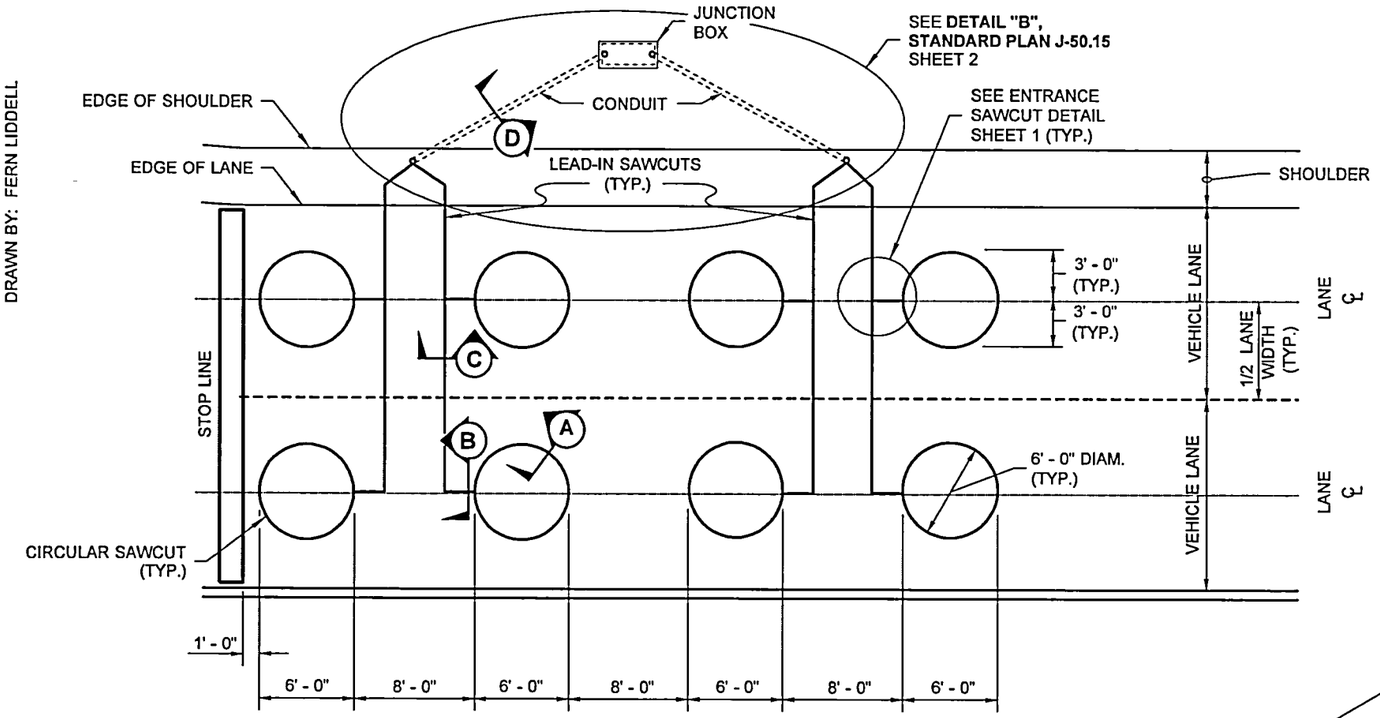
TYPE 3 INDUCTION LOOP

STANDARD PLAN J-50.12-01

SHEET 2 OF 3 SHEETS

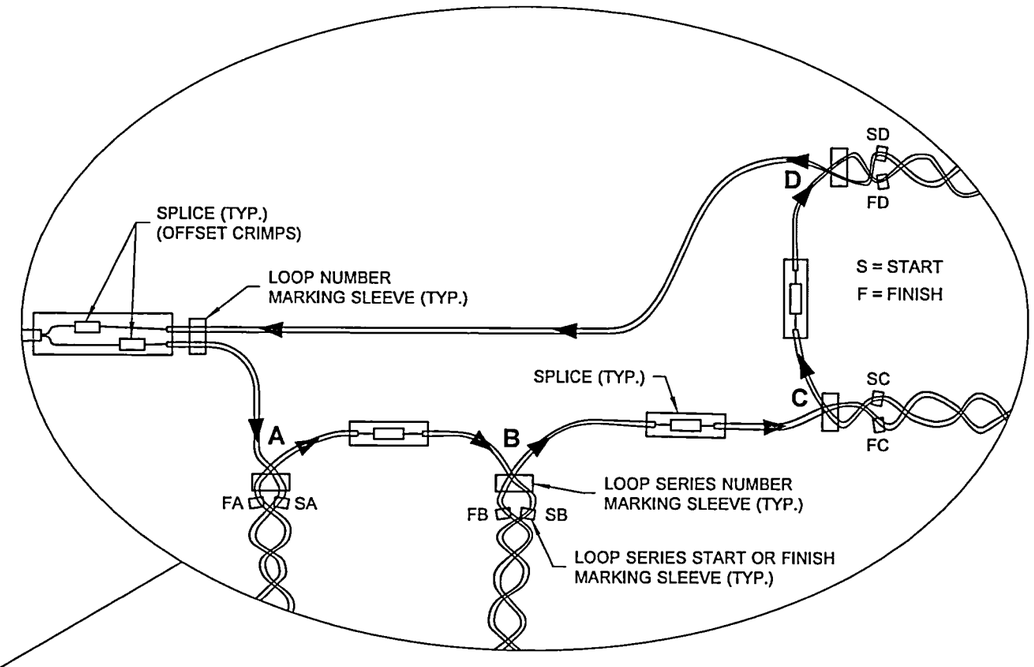
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:14 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

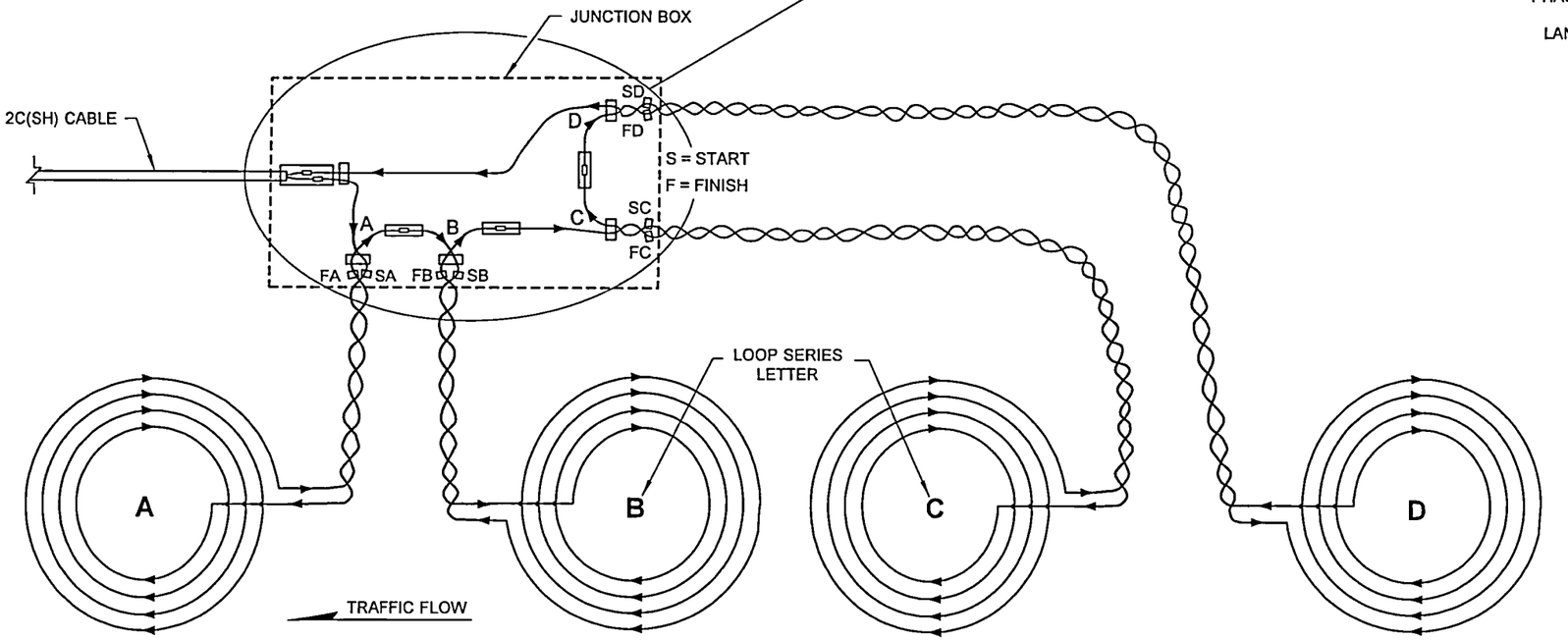


PLAN

TYPE 3A STOP LINE LOOPS

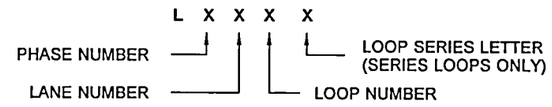


LOOP LABELING LAYOUT DETAIL



TYPE 3A STOP LINE LOOP WIRING DIAGRAM

SERIES SPLICE SHOWN



LOOP NUMBER MARKING DETAIL

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

Bailey, Ted
Jul 18 2017 9:57 AM

TYPE 3 INDUCTION LOOP

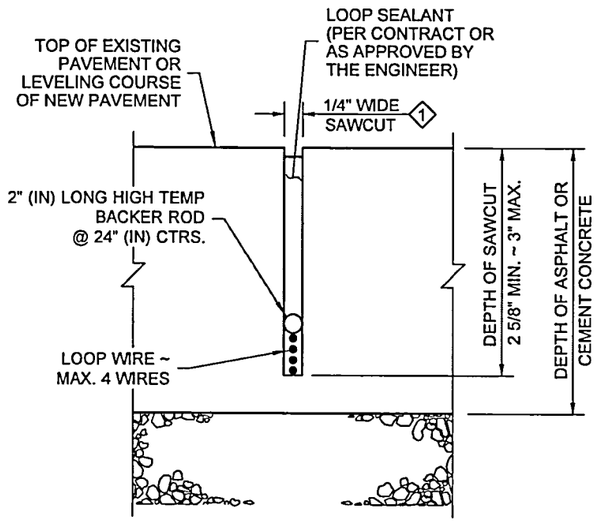
STANDARD PLAN J-50.12-01

SHEET 3 OF 3 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:14 AM

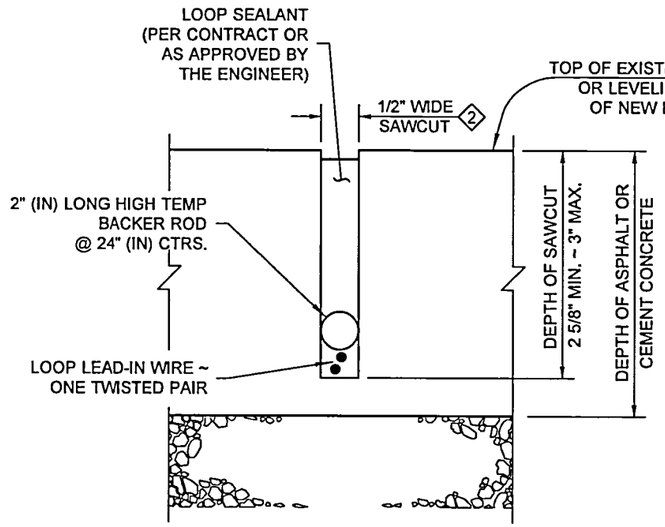
STATE DESIGN ENGINEER

Washington State Department of Transportation

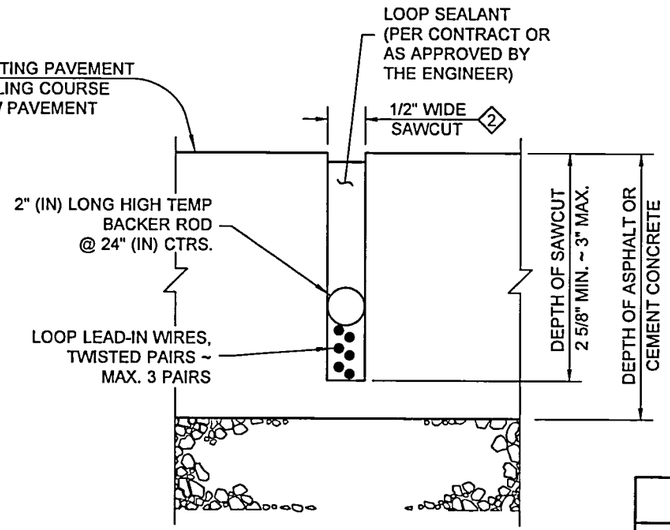


SECTION A

SECTIONS A AND B FROM **STANDARD PLAN J-50.10, J-5-.11, OR J-50.12**



SECTION B



SECTION C

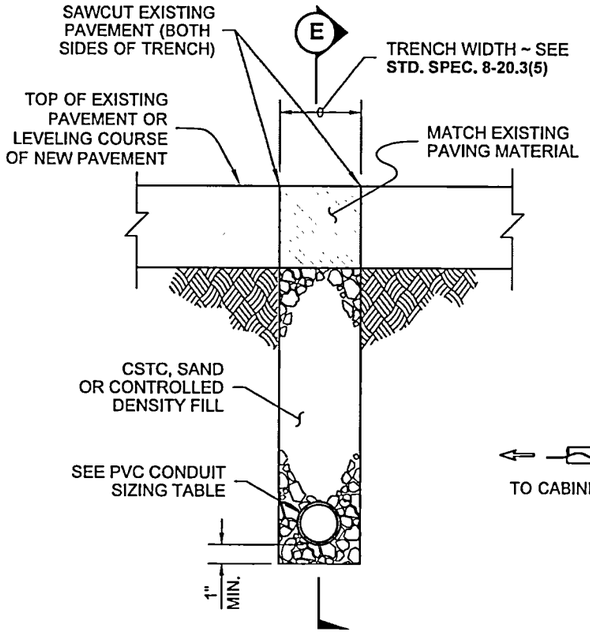
NOTES

1. Fill the conduit trench to the bottom of the existing or new surfacing with CSTC, sand or controlled density fill. See **Standard Specifications Section 2-09.3(1)E**.
2. Minor Regional variations are allowed in the soft pocket closure. Consult with the Engineer or see the Contract for additional requirements.
3. Conductors shall be snug to the bottom of the sawcut. High temperature backer rod shall be snug to the conductors and sides of cut.
4. Fill the sealant to within 1/8" (in) to 3/16" (in) from top of saw cut.
5. See **Standard Plan J-40.10** for additional Junction Box details.
6. See **Standard Plan J-50.05** for splice details.

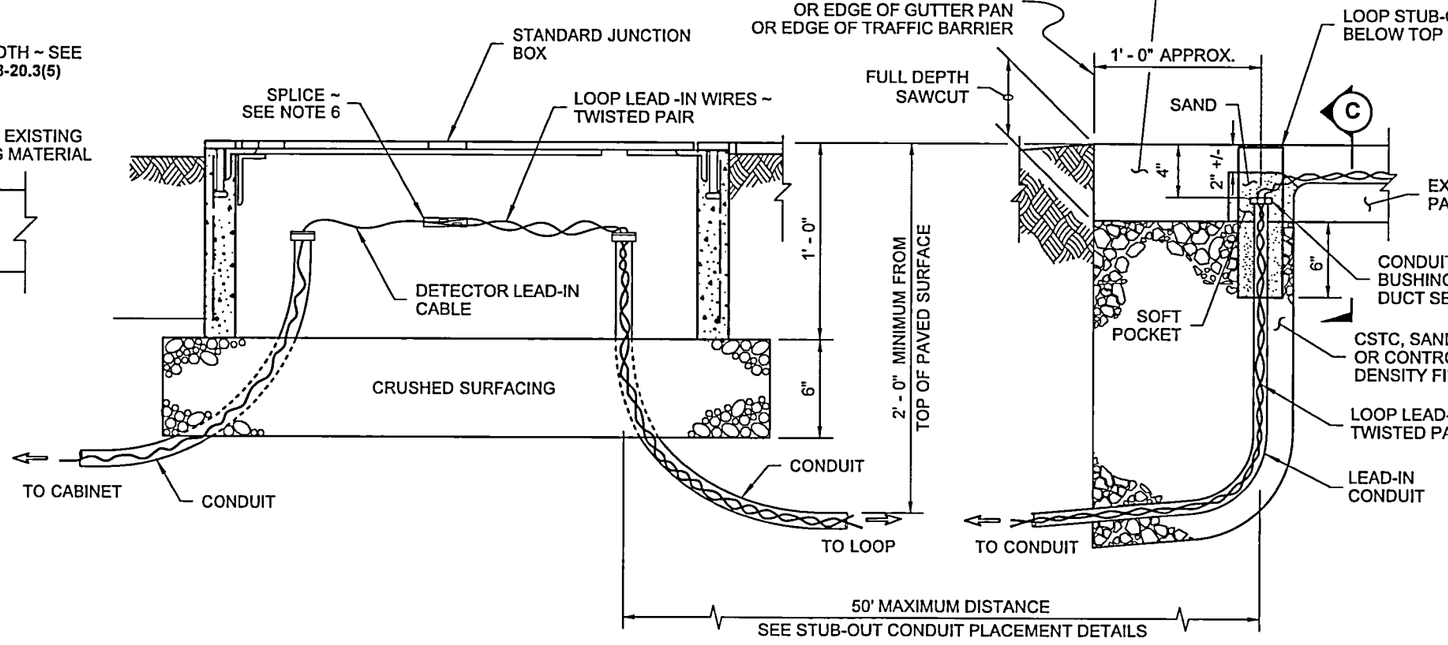
PVC CONDUIT SIZING TABLE					
LOOP LEAD PAIRS	1 - 4	5 - 10	11 - 16	17 - 22	23 - 28
NUMBER AND SIZE OF CONDUITS	1 - 2"	2 - 2"	3 - 2"	4 - 2"	3 - 3"

1 ADD 1/16" (IN) TO THE SAWCUT FOR IMSA 51 - 7 CONDUCTORS

2 ADD 1/8" (IN) TO THE SAWCUT FOR IMSA 51 - 7 CONDUCTORS



SECTION D



← JUNCTION BOX PLACEMENT
SEE NOTE 5

LEAD-IN CONDUIT SECTION →
MAX. 50 FT POCKET SECTION

SECTION E

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

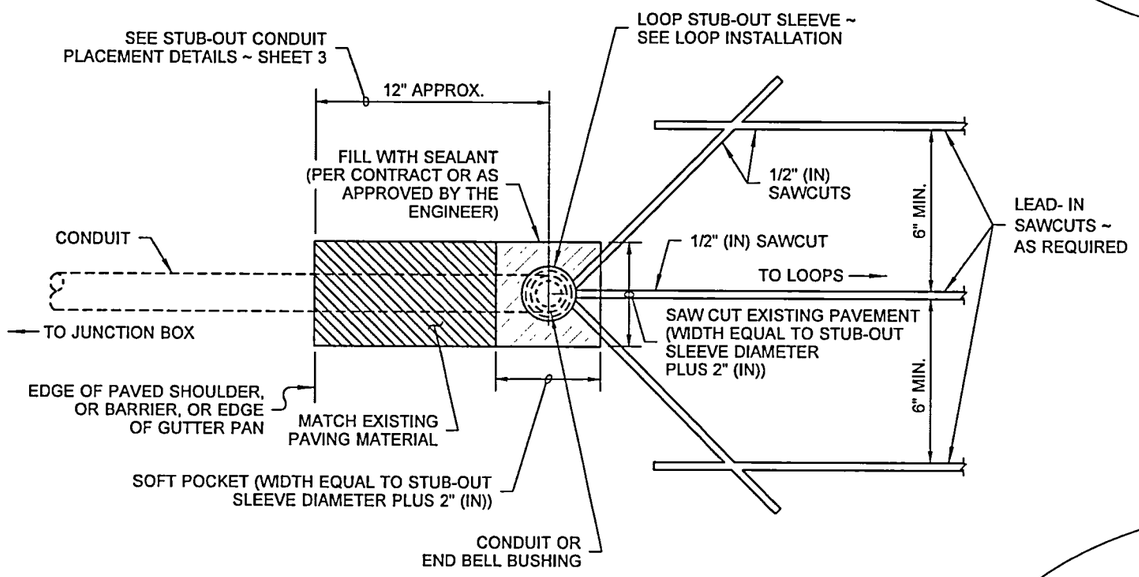
Theodore Joseph Bailey
Bailey, Ted
Jul 18 2017 9:57 AM

INDUCTION LOOP DETAILS

STANDARD PLAN J-50.15-01

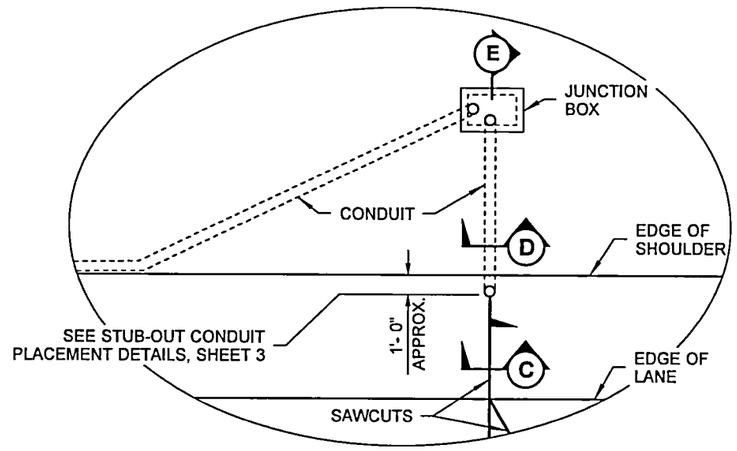
SHEET 1 OF 3 SHEETS

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8 12 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

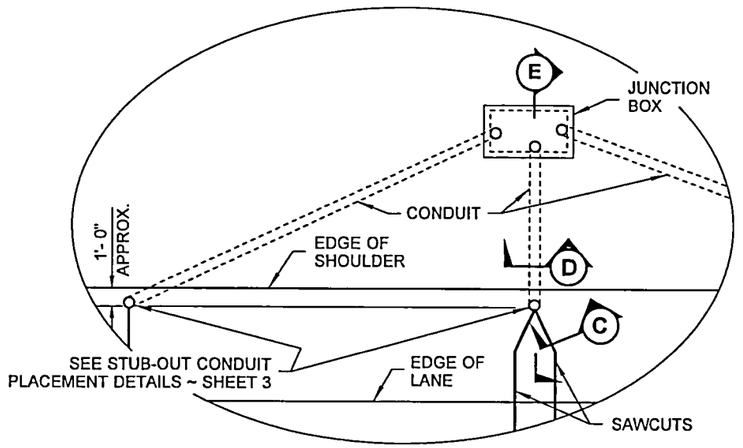


PLAN

SAWCUT AND CONDUIT CONNECTION



DETAIL "A"



DETAIL "B"

LOOP INSTALLATION NOTES

1. Install the Junction Box and the stub-out conduit with Sch. 80 PVC stub-out sleeve. Conduit for the loop stub-out shall be as required in the conduit size table shown on sheet 1 of this set.
2. Lay out loops and loop lead-ins to miss cracks/joints in road, when possible. Maintain 18" (in) minimum clearance from manholes and valve boxes.
3. The opening around the loop stub shall be patched with matching paving material if opened larger than PVC sleeve + 2" (in).
4. Sawcut the loop slots and the lead-in slots. Wash/dry cuts. File edges to remove burr of all saw-cuts into stub out sleeve.
5. Lay out the loop wire starting at the Junction Box, allowing 5' (ft) minimum slack.
6. Install the wire in the loop slot as shown.
7. Finish laying out the wire at the Junction Box and identify the leads with the loop number, the "S" for start and the "F" for the finish, the loop series number, and the loop lead-in conductor number.
8. Twist each pair of the lead-in wires a minimum of two times per foot each foot, from the loop to the Junction Box. Reverse the direction of the twist for each successive pair installed. Seal loops/sawcuts.
9. Construct a supplemental splice containing any series loop connect-ions in the adjacent junction box as required in the plans. Supplemental splices are subject to the same requirements shown for the loop lead-in and the shielded cable splice.
10. Splice the loop lead-ins to the shielded cable as noted in the Contract. See **Standard Plan J-50.05** for Loop Splice details.
11. All loop circuits shall be tested per **Standard Specification Section 8-20.3(14)D** once installation is complete.
12. Existing stub-out shall be upgraded as necessary to conform to the conduit size table shown on sheet 1.
13. All loop lead-in sawcuts parallel to lane edge shall be at least 12" (in) from edge of pavement and within six inches outside of lane or fog line when possible. Maintain 12" (in) separation between parallel cuts or joints.
14. The loop stub-out sleeve shall have an inside diameter 1" (in) larger than the outside diameter of the End Bell Bushing. Sleeve shall be notched 5/8" (in) to 3/4" (in) to accommodate loop wires. Plug conduit and fill sleeve with sand untill loops are installed to keep out Hot Asphalt during paving operations.

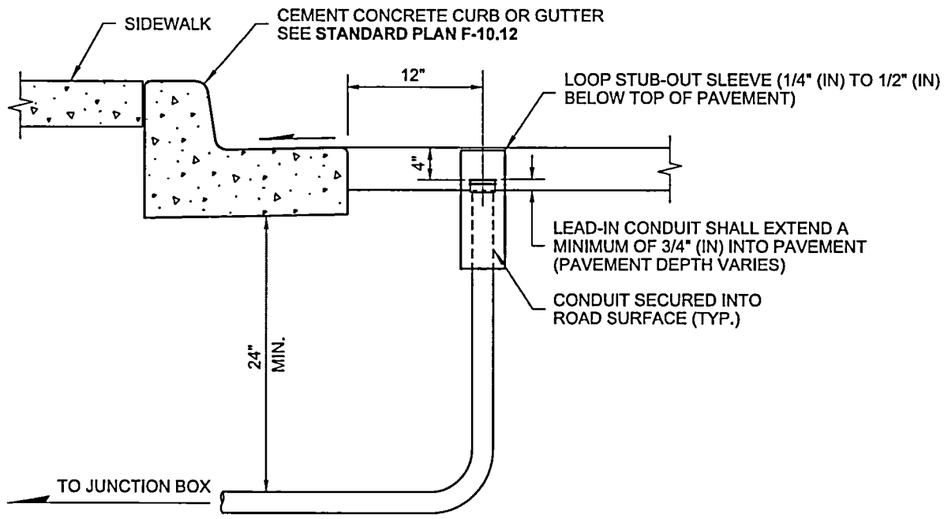
THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

Bailey, Ted
Jul 18 2017 9:57 AM

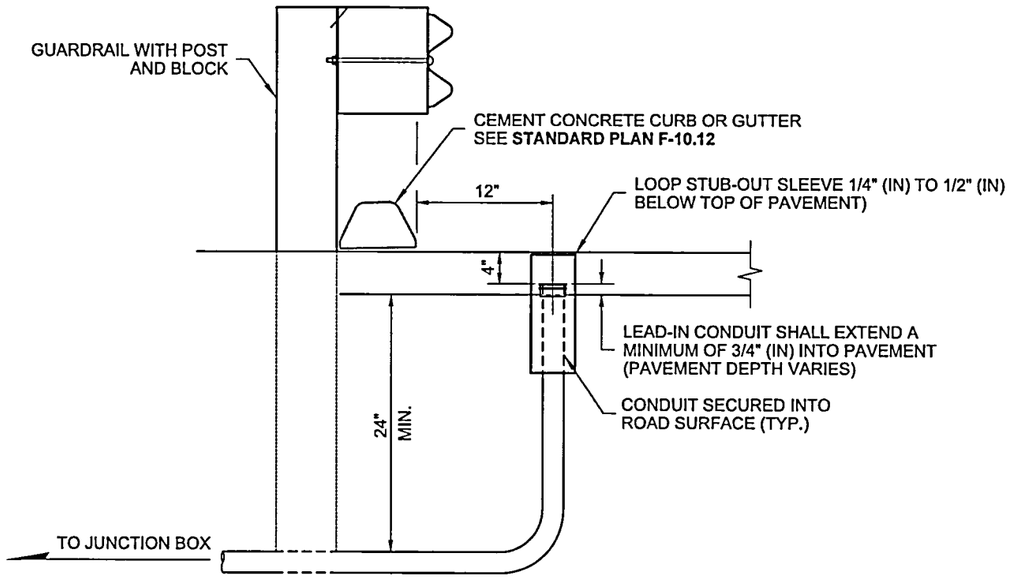
INDUCTION LOOP DETAILS

STANDARD PLAN J-50.15-01

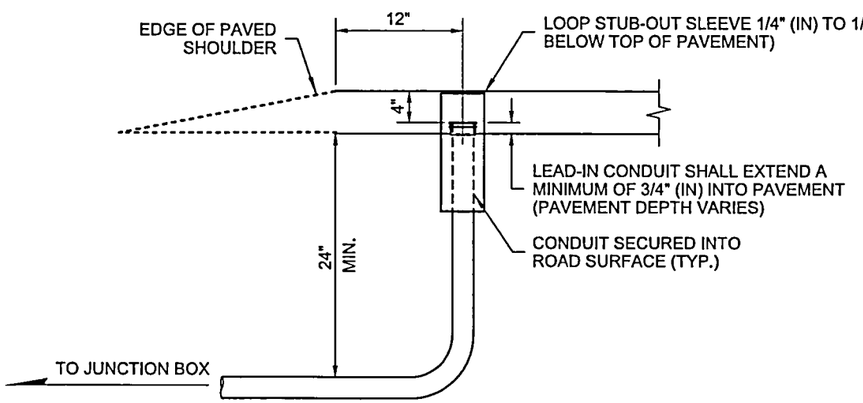
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:12 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation



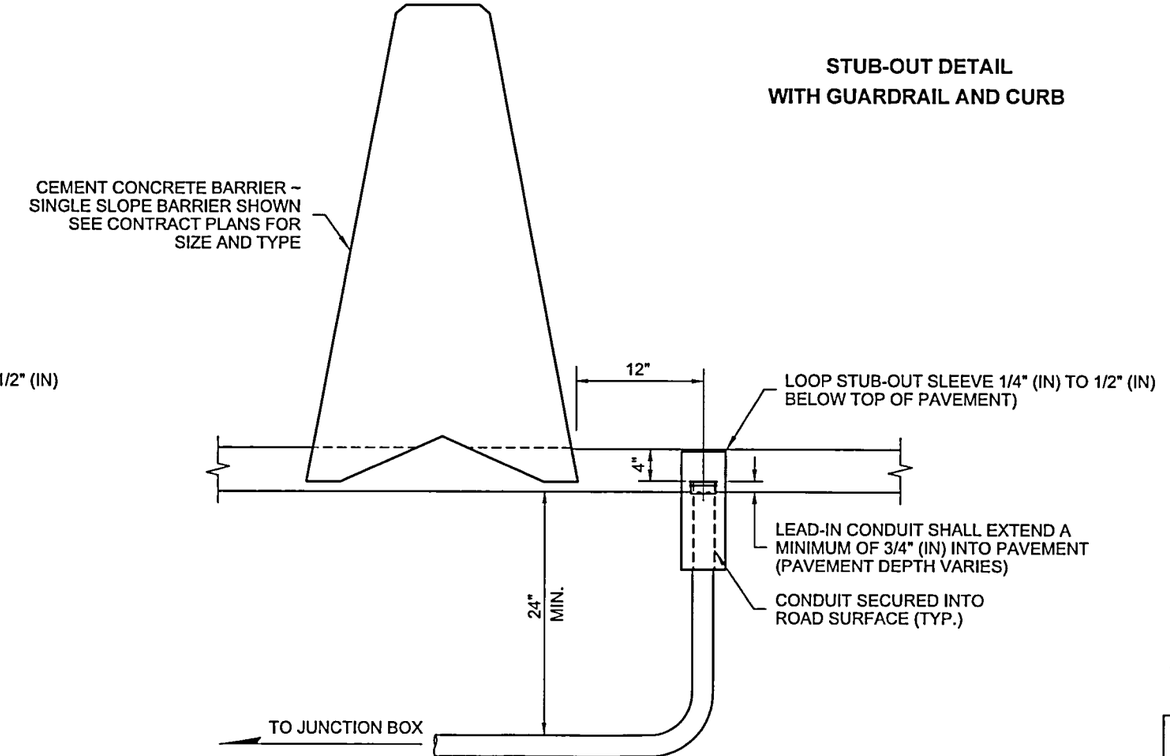
STUB-OUT DETAIL
WITH CEMENT CONCRETE CURB OR GUTTER



STUB-OUT DETAIL
WITH GUARDRAIL AND CURB



STUB-OUT DETAIL
WITH ROADWAY



STUB-OUT DETAIL WITH
CEMENT CONCRETE BARRIER

STUBOUT CONDUIT PLACEMENT DETAILS

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

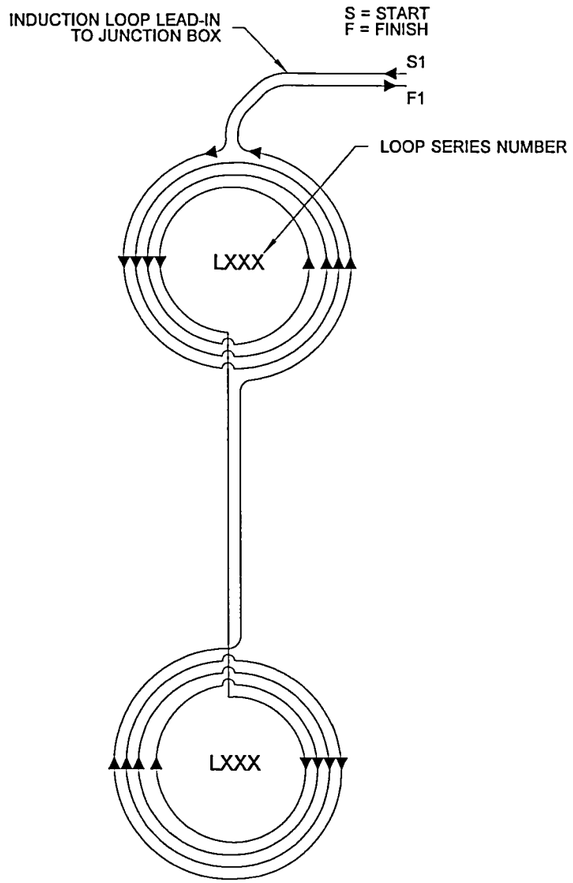
Bailey, Ted
Jul 18 2017 9:57 AM
cosign

INDUCTION LOOP DETAILS

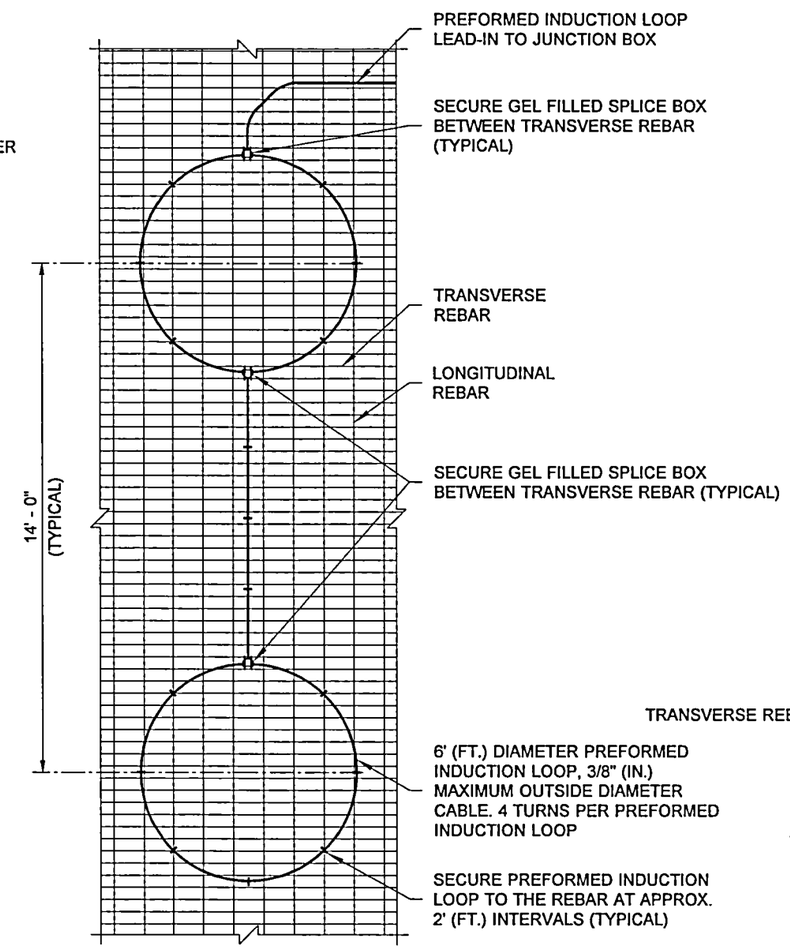
STANDARD PLAN J-50.15-01

SHEET 3 OF 3 SHEETS

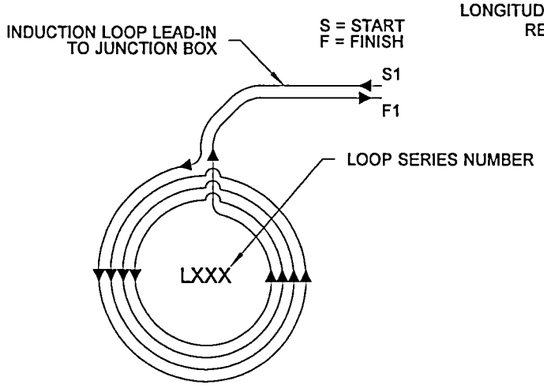
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:12 AM
cosign
STATE DESIGN ENGINEER
Washington State Department of Transportation



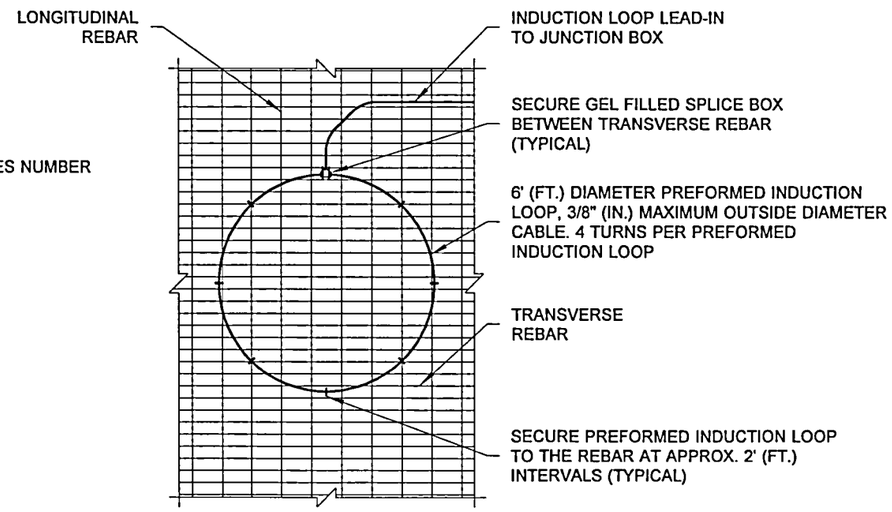
WIRING DIAGRAM FOR PREFORMED INDUCTION LOOP 2-LOOP ARRAY



PLAN VIEW



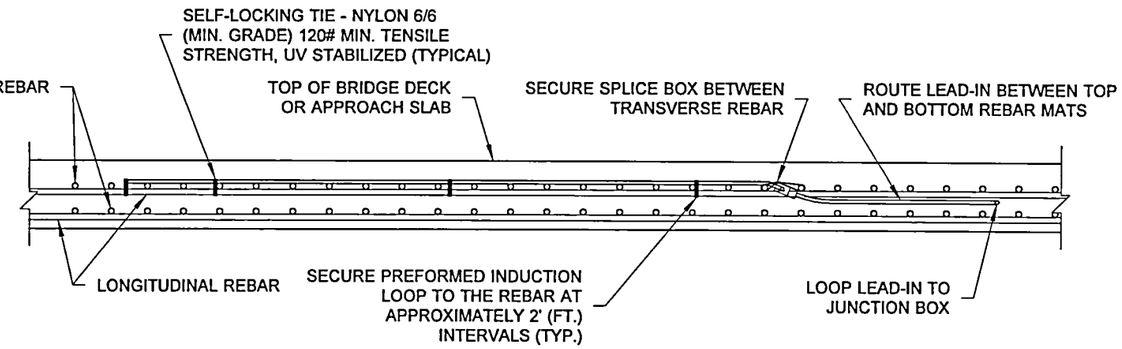
WIRING DIAGRAM FOR PREFORMED INDUCTION LOOP



PLAN VIEW

NOTES

1. Installation of signal detection loops in the bridge deck shall be cast-in-place and installation by saw cutting an existing bridge deck shall not be allowed. **This plan is intented for new construction only (not allowed for existing structures).**
2. For Supplemental Splice in adjacent junction box, see Splice Detail, per **Standard Plan J-50.15.**
3. Preformed loops shall conform to the layouts, numbering details, marking requirements, and wiring diagrams of **Standard Plan J-50.12** for the number and types of loops shown in the Contract Plans.
4. Loops shall be tested immediately prior to pouring concrete, per **Standard Specification 8-20.3(14)D.**
5. Layout Preformed loops and loop lead-ins to maintain 1' (ft.) clearance from joints.
6. Construct a supplemental splice containing any series loop connections in adjacent Junction Box as required in the Plans. Supplemental splices are subject to the same requirements shown for the loop lead-in and the shielded cable splice, as shown in **Standard Plan J-50.12**.
7. Barrier Junction Box ~ 8" × 8" × 18" NEMA 4X in stationary-form barrier, adjustable NEMA 3R in slip-form barrier. (Junction Box can be recessed up to 1/8".) See **Standard Plan J-40.36 or J-40.37**.
8. For installation of Junction Box in the sidewalk, see **Standard Plan J-40.40.**



ELEVATION VIEW

THEODORE JOSEPH BAILEY
STATE OF WASHINGTON
39820
REGISTERED
PROFESSIONAL ENGINEER

3/11/2013

PREFORMED LOOP INSTALLATION DETAILS FOR NEW BRIDGE DECKS

STANDARD PLAN J-50.16-01

SHEET 1 OF 2 SHEETS

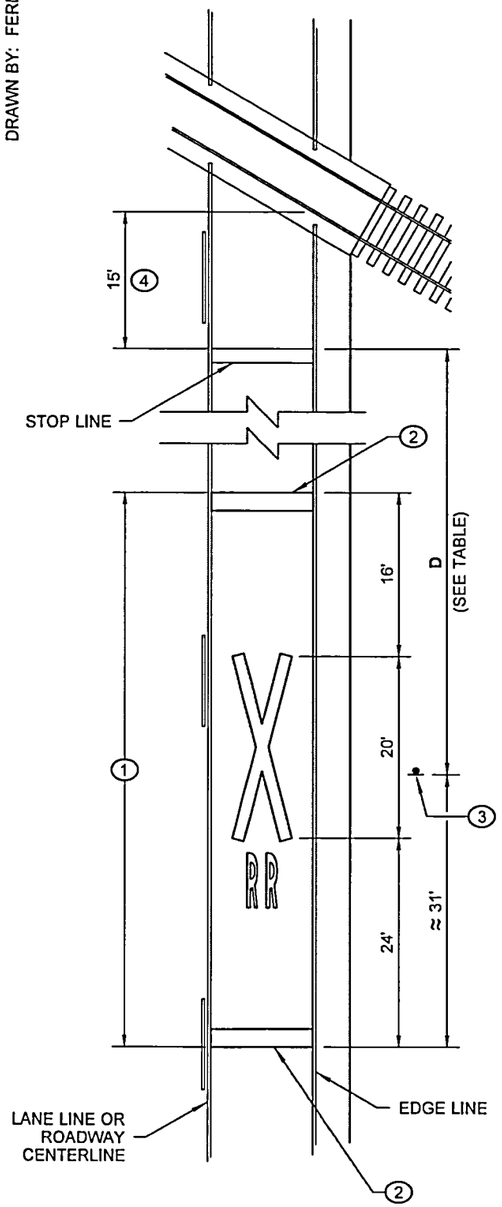
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 3/22/13

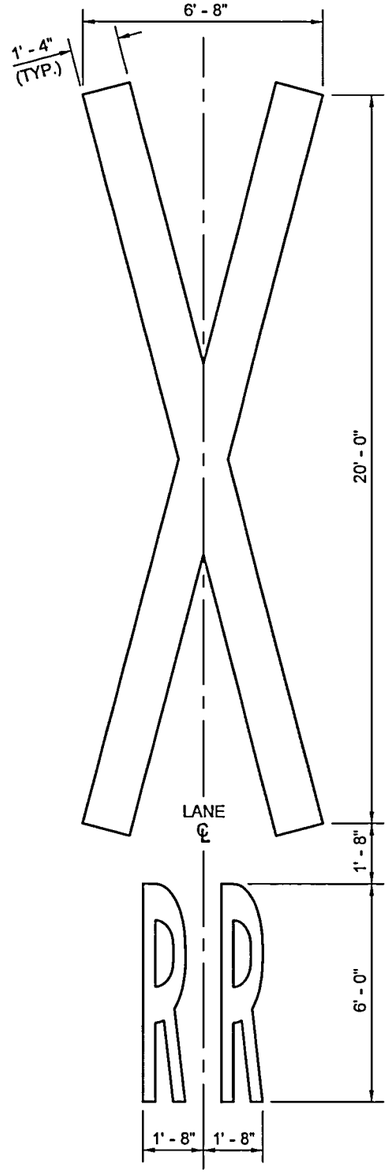
Washington State Department of Transportation

DRAWN BY: BILL BERENS

DRAWN BY: FERN LIDDELL



LAYOUT



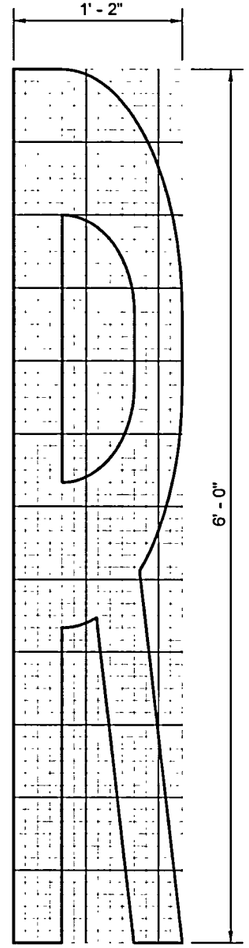
SYMBOL DETAIL

① TOTAL MARKING AREA
(PER 12' (FT) WIDE LANE)
= 109.75 SQ.FT.

STANDARD SYMBOL

NOTE

See contract for location and material requirements.



GRID IS 1" (IN) SQUARE

"R" DETAIL

MPH	D*
25	50 Ft.
30	100 Ft.
35	150 Ft.
40	225 Ft.
45	300 Ft.
50	375 Ft.
55	450 Ft.
60	550 Ft.
65	650 Ft.

* DIMENSIONS SHOWN ARE APPROXIMATE SEE CONTRACT

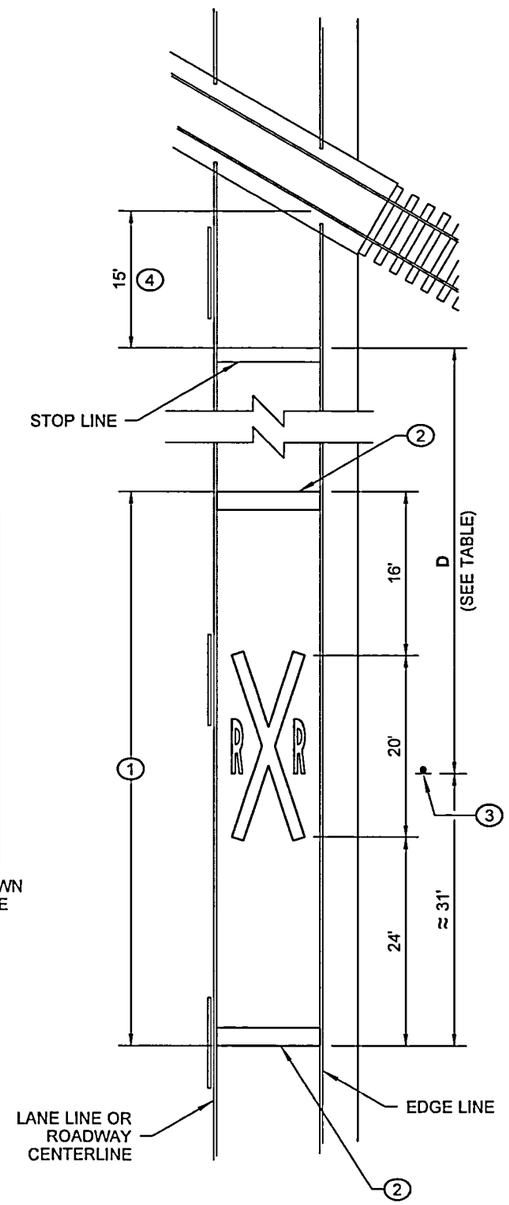
KEY NOTES

① Bid Item "Railroad Crossing Symbol" includes "X" symbol, letters, and two 24" (in) white transverse lines.

② 24" (in) white transverse line.

③ W-10-1 Advance Warning sign (not included in RR crossing Symbol Bid Item).

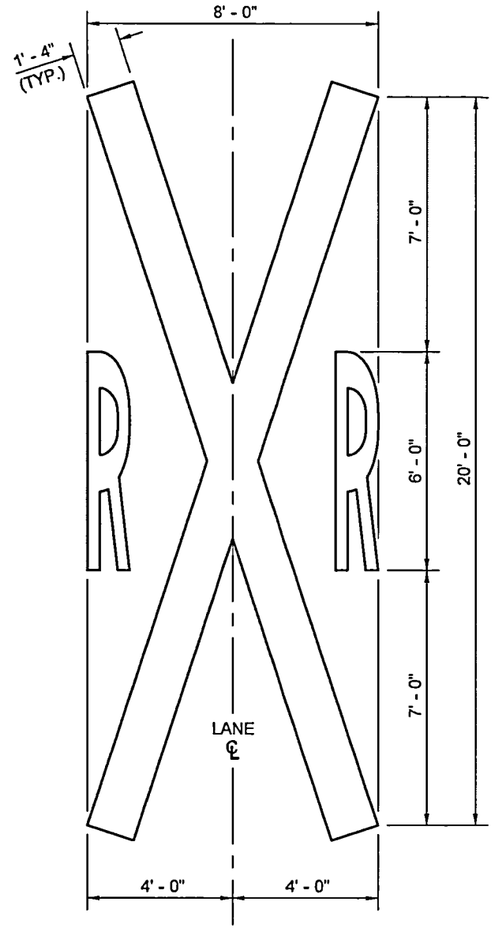
④ Place Stop Line 15' (ft) from RR gate, if present.



LAYOUT

① TOTAL MARKING AREA
(PER 12' (FT) WIDE LANE)
= 111.59 SQ.FT.

ALTERNATIVE SYMBOL



SYMBOL DETAIL

BRIAN J. WALSH
STATE OF WASHINGTON
36103
REGISTERED
PROFESSIONAL ENGINEER

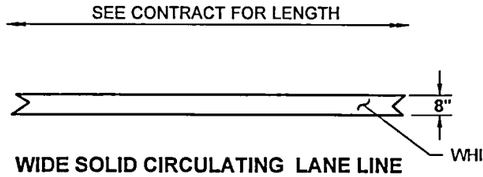
Walsh, Brian
May 19 2017 9:20 AM

RAILROAD CROSSING LAYOUT

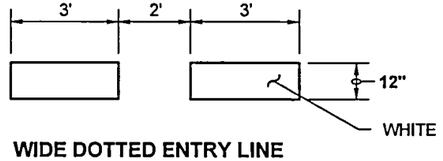
STANDARD PLAN M-11.10-02

SHEET 1 OF 1 SHEET

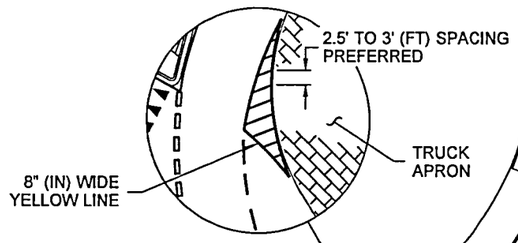
APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 11 2017 1:18 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation



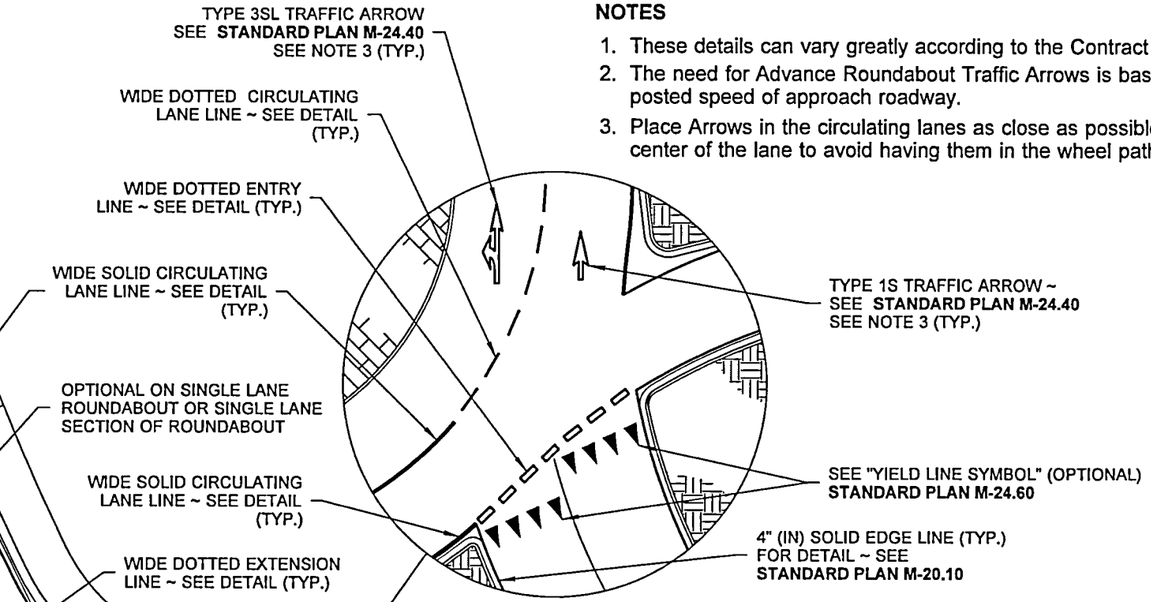
WIDE SOLID CIRCULATING LANE LINE DETAIL



WIDE DOTTED ENTRY LINE DETAIL



TYPICAL ROUNDABOUT HATCHING DETAIL



TYPICAL ROUNDABOUT MARKING DETAIL

NOTES

1. These details can vary greatly according to the Contract Plans.
2. The need for Advance Roundabout Traffic Arrows is based upon posted speed of approach roadway.
3. Place Arrows in the circulating lanes as close as possible to the center of the lane to avoid having them in the wheel paths.

WIDE DOTTED CIRCULATING LANE LINE DETAIL

WIDE DOTTED EXTENSION LINE DETAIL

DRAWN BY: FERN LIDDELL

BRIAN J. WALSH STATE OF WASHINGTON 36103 REGISTERED PROFESSIONAL ENGINEER

Walsh, Brian
May 30 2017 2:19 PM

ROUNDABOUT PAVEMENT MARKINGS

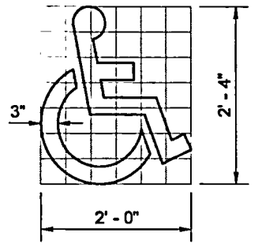
STANDARD PLAN M-12.10-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 11 2017 1 18 PM

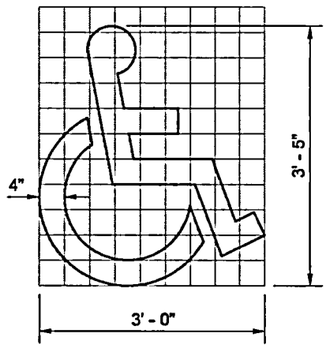
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: LISA CYFORD



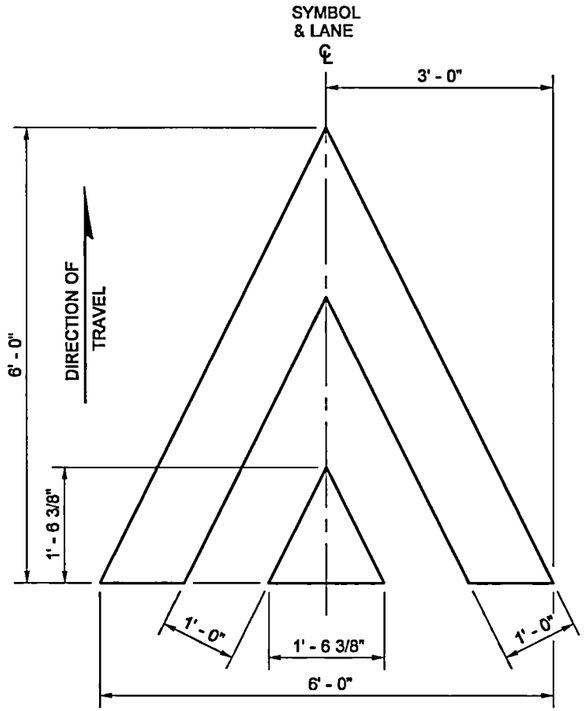
GRID IS 4" (IN) SQUARE MARKING AREA = 1.41 SQ.FT.

ACCESS PARKING SPACE SYMBOL (MINIMUM)



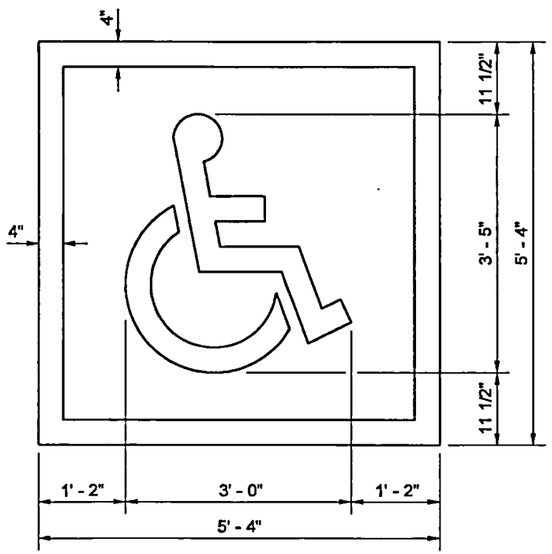
GRID IS 4" (IN) SQUARE MARKING AREA = 3.09 SQ.FT.

ACCESS PARKING SPACE SYMBOL (STANDARD)



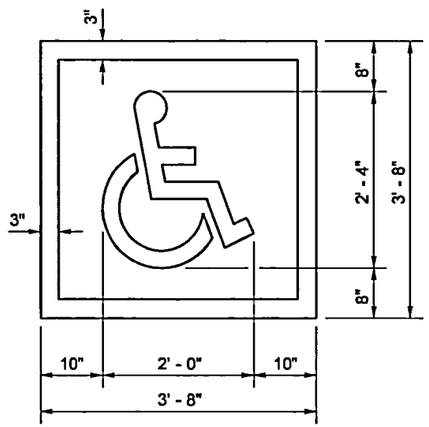
MARKING AREA = 12.08 SQ.FT.

SPEED BUMP SYMBOL



TOTAL MARKING AREA = 28.44 SQ.FT.
WHITE = 9.76 SQ.FT. BLUE = 18.69 SQ.FT.

ACCESS PARKING SPACE SYMBOL (STANDARD)
WITH BLUE BACKGROUND AND WHITE BORDER
(REQUIRED FOR CEMENT CONCRETE SURFACES)

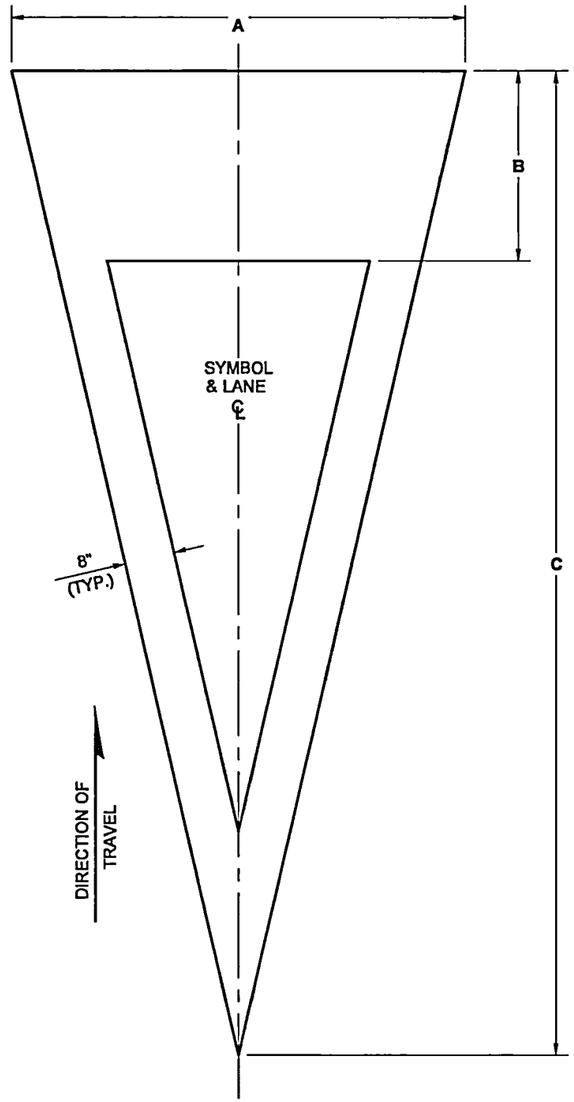


TOTAL MARKING AREA = 13.44 SQ.FT.
WHITE = 4.82 SQ.FT. BLUE = 8.62 SQ.FT.

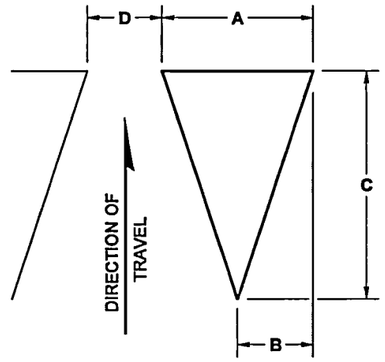
ACCESS PARKING SPACE SYMBOL (MINIMUM)
WITH BLUE BACKGROUND AND WHITE BORDER
(REQUIRED FOR CEMENT CONCRETE SURFACES)

SYMBOL MARKING		A	B	C	D	USE	MARKING AREA
YIELD AHEAD SYMBOL	TYPE 1	6' - 0"	2' - 6"	13' - 0"	N/A	LESS THAN 45 MPH	25.90 SQ.FT.
	TYPE 2	6' - 0"	3' - 0"	20' - 0"	N/A	45 MPH OR GREATER	36.54 SQ.FT.
YIELD LINE SYMBOL	TYPE 1	1' - 0"	6"	1' - 6"	6"	LESS THAN 45 MPH	0.75 SQ.FT.
	TYPE 2	2' - 0"	1' - 0"	3' - 0"	1' - 0"	45 MPH OR GREATER	3.00 SQ.FT.
	TYPE 2	2' - 0"	1' - 0"	3' - 0"	1' - 0"	ROUNDABOUT ENTRY *	3.00 SQ.FT.

* MINIMUM OF 4 IN LANE



YIELD AHEAD SYMBOL



YIELD LINE SYMBOL
(MULTIPLE SYMBOLS REQUIRED FOR TRANSVERSE YIELD LINE ~ SEE CONTRACT)

BRIAN J. WALSH
STATE OF WASHINGTON
36103
REGISTERED
PROFESSIONAL ENGINEER

Walsh, Brian
Jun 24 2014 2:37 PM

SYMBOL MARKINGS MISCELLANEOUS

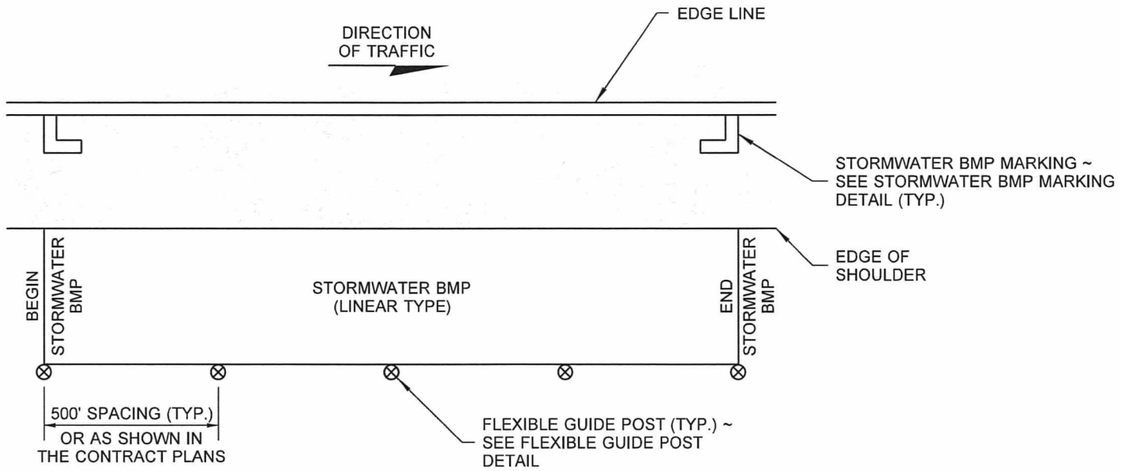
STANDARD PLAN M-24.60-04

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 24 2014 4.43 PM
STATE DESIGN ENGINEER

Washington State Department of Transportation

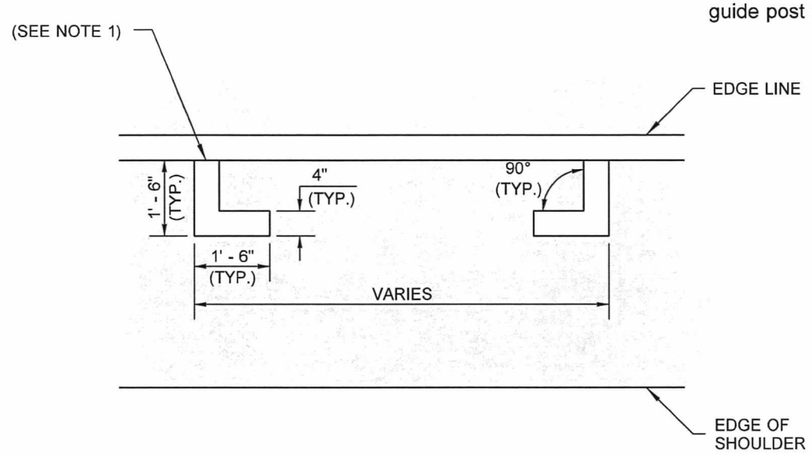
DRAWN BY: FERN LIDDELL



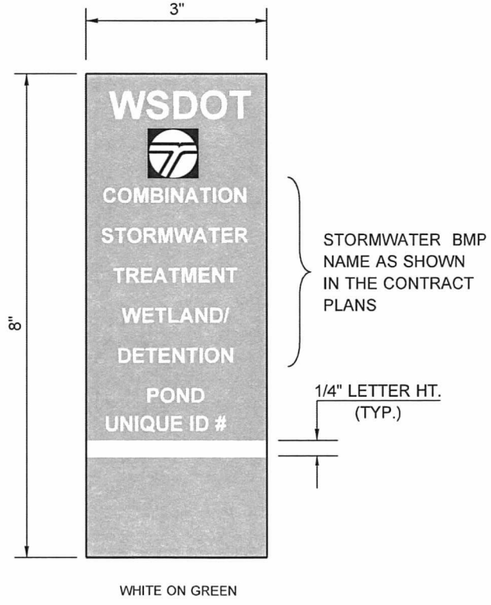
STORMWATER BMP DELINEATION DETAIL

NOTES:

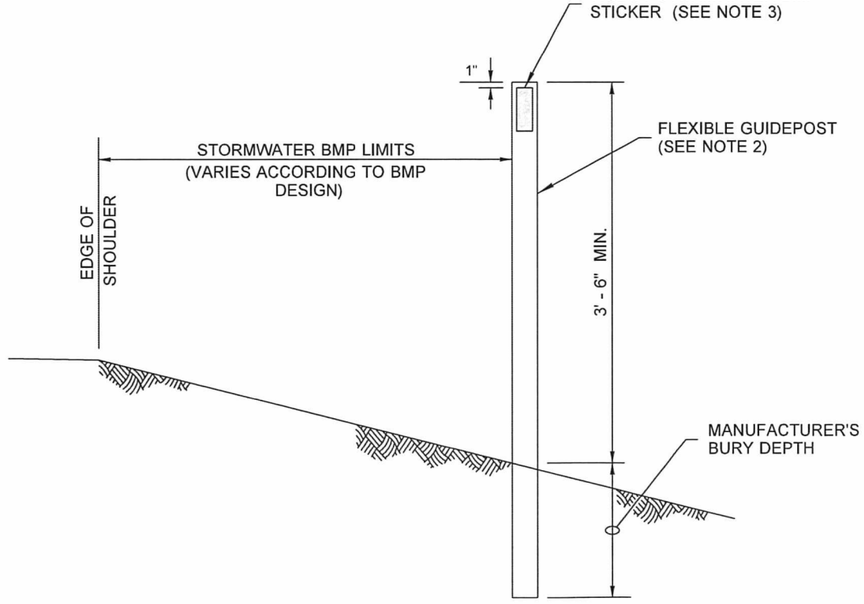
1. If rumble strips are present, install marking outside of the rumble strip.
2. The flexible guide post shall be brown in color. See **Standard Specification Section 9-17.**
3. WSDOT BMP sticker to be placed on first flexible guide post only.



STORMWATER BMP MARKING DETAIL
MARKING AREA = 1.78 SQ. FT. FOR PAIR



WSDOT STORMWATER BMP STICKER
(FACING TRAFFIC) NTS



FLEXIBLE GUIDE POST DETAIL

TYPICAL FOR ALL STORMWATER BMP GUIDE POSTS AS DETAILED ON THIS SHEET

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jun 22 2017 10:07 AM
casign

BMP DELINEATION LINEAR TYPE

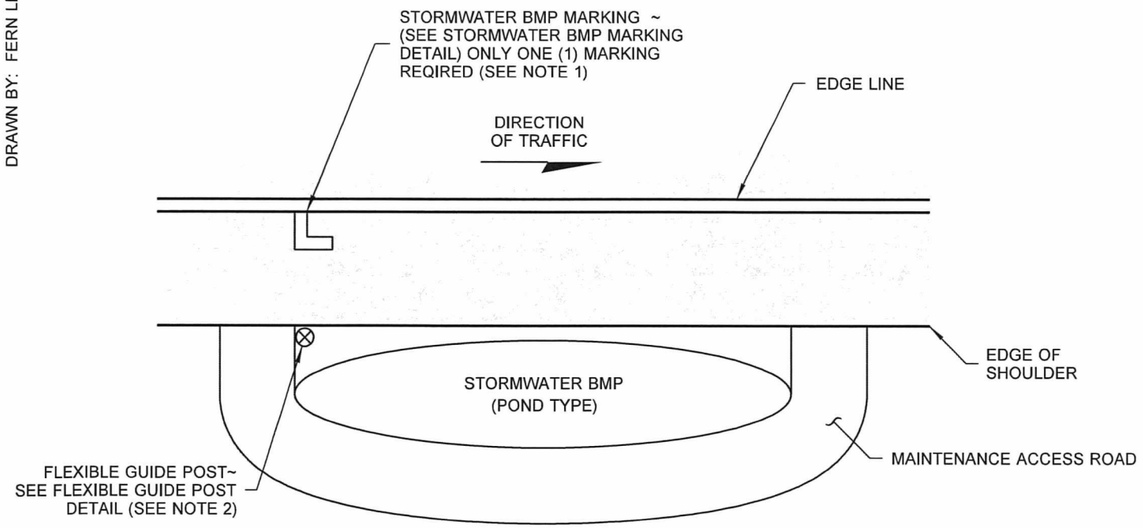
STANDARD PLAN M-24.65-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 11 2017 1:18 PM
casign

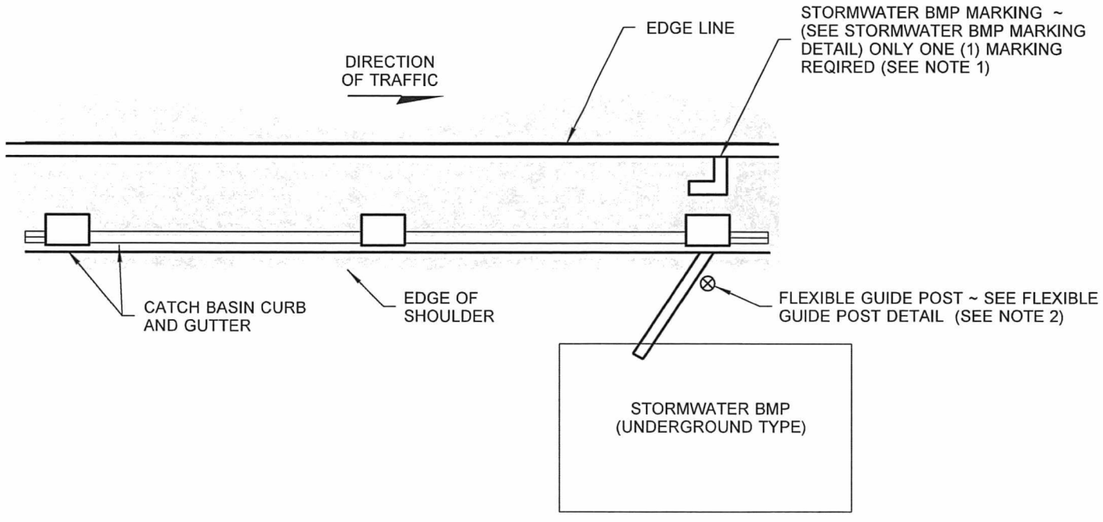
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL



STORMWATER BMP DELINEATION DETAIL

POND TYPE

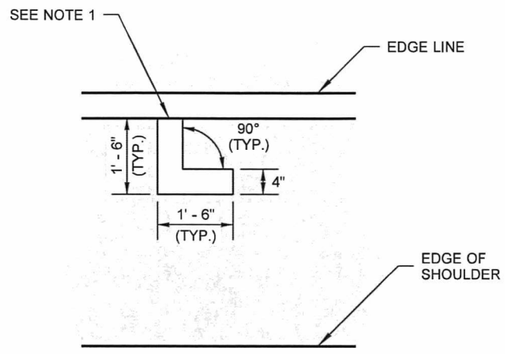


STORMWATER BMP DELINEATION DETAIL

UNDERGROUND TYPE

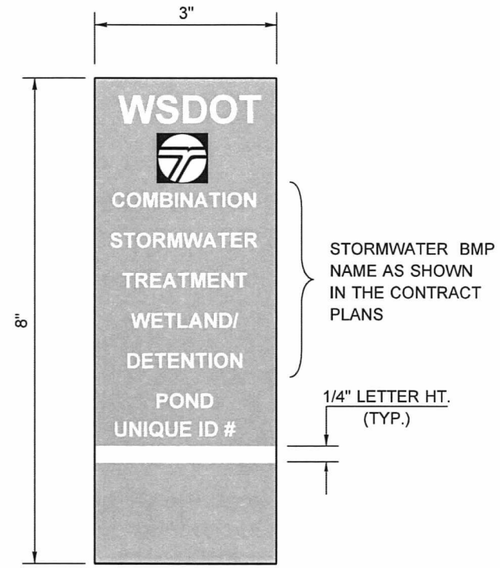
NOTES:

1. If rumble strips are present, install marking outside of the rumble strip.
2. The flexible guide post shall be brown in color. See **Standard Specification Section 9-17.**



STORMWATER BMP MARKING DETAIL

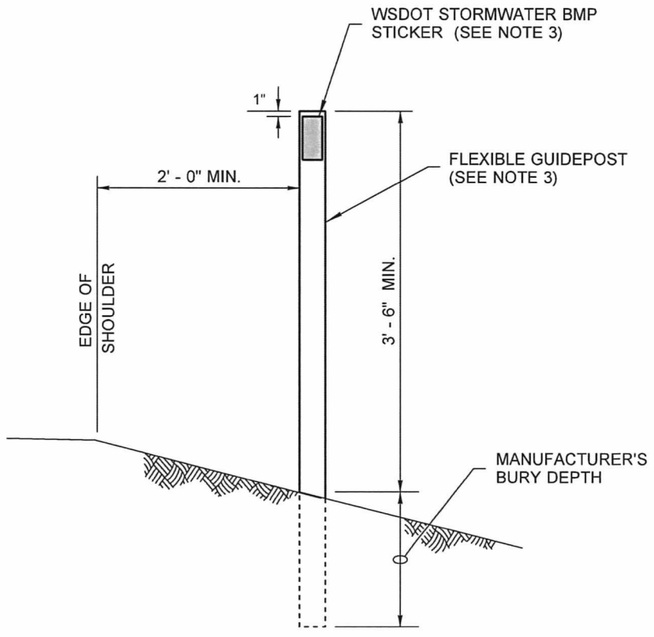
MARKING AREA = 0.89 SQ. FT.



WHITE ON GREEN

WSDOT STORMWATER BMP STICKER

(FACING TRAFFIC) NTS



FLEXIBLE GUIDE POST DETAIL

TYPICAL FOR ALL STORMWATER BMP GUIDE POSTS AS DETAILED ON THIS SHEET

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Jun 22 2017 10:09 AM

BMP DELINEATION UNDERGROUND AND POND TYPES

STANDARD PLAN M-24.66-00

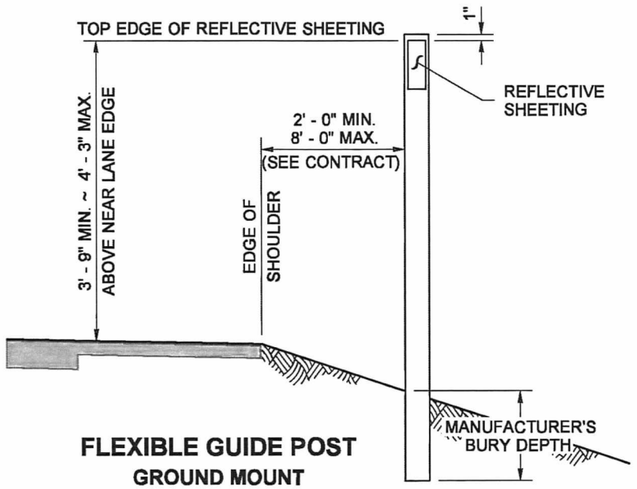
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 11 2017 1:17 PM

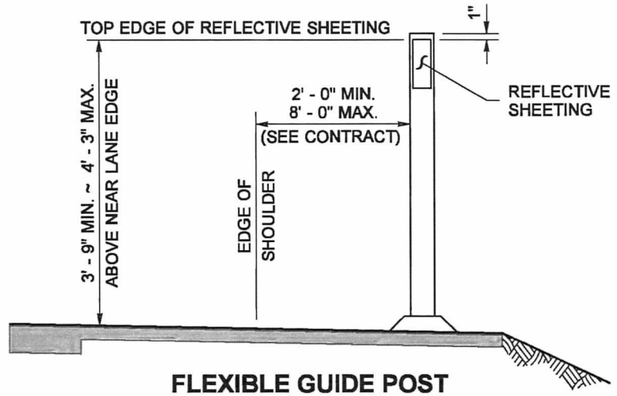
STATE DESIGN ENGINEER

Washington State Department of Transportation

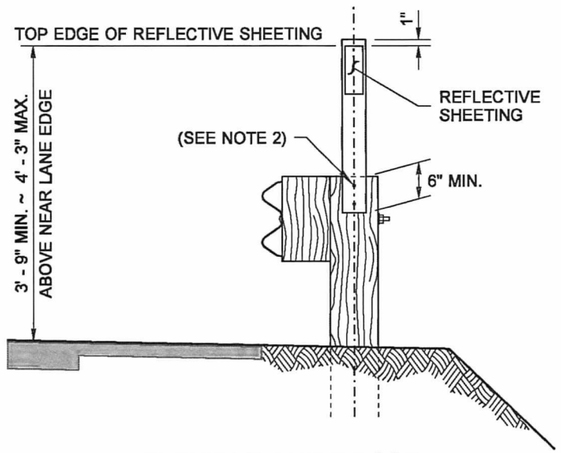
DRAWN BY: LISA CYFORD



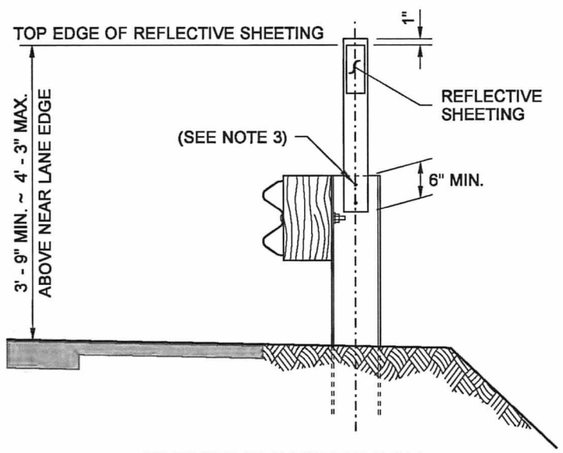
FLEXIBLE GUIDE POST
GROUND MOUNT



FLEXIBLE GUIDE POST
SURFACE MOUNT



FLEXIBLE GUIDE POST
GUARDRAIL MOUNT
(USE FOR WOODEN GUARDRAIL POSTS)



FLEXIBLE GUIDE POST
GUARDRAIL MOUNT
(USE FOR STEEL GUARDRAIL POSTS)

NOTES

1. When the Contract Plans requires a guide post with concurrent guardrail runs, the Contractor shall either:
   - **A.** Drive the flexible guide post in line with the guardrail posts, or
   - **B.** Mount the shorter flexible guide post onto the guardrail post.
2. Guide posts shall be fastened to the wooden guardrail post using two 2" (in) × 3/8" (in) lag screws with washers, along centerline of post. Also acceptable is any approved attachment method submitted by the guide post manufacturer.
3. Guide posts shall be fastened to the steel guardrail posts using two galvanized 2" (in) × 3/8" (in) bolts with a washer on both sides, a lock washer, and nut. The nut shall be tightened to properly compress the lock washer. The drilled holes in the guardrail post web shall be painted with galvanizing repair paint as described in **Standard Specification Section 8-11.3(1)B**. Also acceptable is any approved attachment method submitted by the guide post manufacturer.
4. When concrete barrier runs concurrent, the Contractor shall mount Barrier Delineators where guide posts are required.

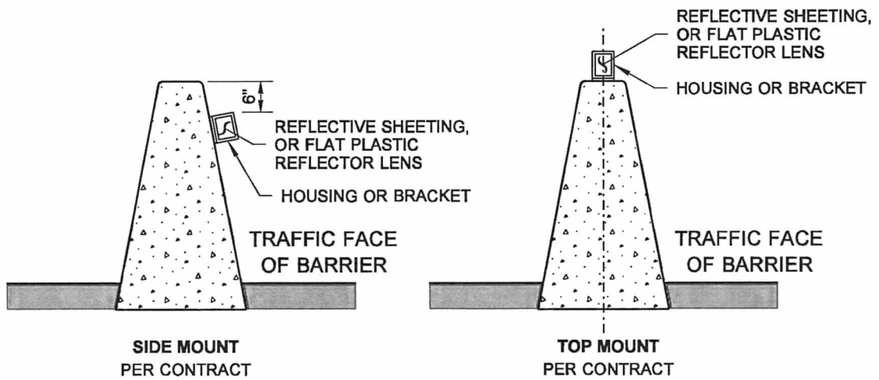
GUIDE POST TYPE DEFINITIONS ~ REFLECTIVE SHEETING APPLICATIONS

TYPE W	TYPE WW	TYPE Y	TYPE YY
○	◐	●	⊕
FACING TRAFFIC: 3" × 8" WHITE	FACING TRAFFIC: 3" × 8" WHITE; BACK SIDE: 3" × 4" WHITE, 4" gap, 4" WHITE	FACING TRAFFIC: 3" × 8" YELLOW	FACING TRAFFIC: 3" × 8" YELLOW; BACK SIDE: 3" × 8" YELLOW

BARRIER DELINEATOR REQUIREMENTS

- Spacing of Barrier Delineators shall be as shown in the Plans.
- The housing or bracket can be flexible or rigid, molded from a durable plastic or other durable material approved by the Engineer, and shall be attached to the barrier with an adhesive recommended by the manufacturer. The attachment point on the barrier surface shall be free of dirt, curing compound, moisture, paint, or any other matter that would adversely affect the adhesive bond.
- Barrier Delineators shall be one-sided for single direction traffic, or two-sided for bi-directional traffic.
- Color shall be white on the right of traffic, and yellow on the left of traffic.
- The reflective surface shall be rectangular or trapezoidal.
- Reflective Sheeting: 12 square inches minimum surface area; Type III, IV, V, or VI, selected from approved materials listed in the Qualified Products List.
- Plastic Reflector: 9 square inches minimum surface area; acrylic or polycarbonate conforming to AASHTO M 290. Reflectors shall equal or exceed the following minimum values of Specific Intensity:

OBSERVATION ANGLE	ENTRANCE ANGLE	SPECIFIC INTENSITY (cd/ft-c)	
		WHITE	YELLOW
0.1°	0°	126	75
0.1°	20°	50	30



BARRIER DELINEATORS

(CONCRETE BARRIER TYPES AND LOCATIONS VARY, SINGLE SLOPE IN MEDIAN SHOWN)

BRIAN J. WALSH
STATE OF WASHINGTON
36103
REGISTERED
PROFESSIONAL ENGINEER

Walsh, Brian
Jun 24 2014 2:07 PM

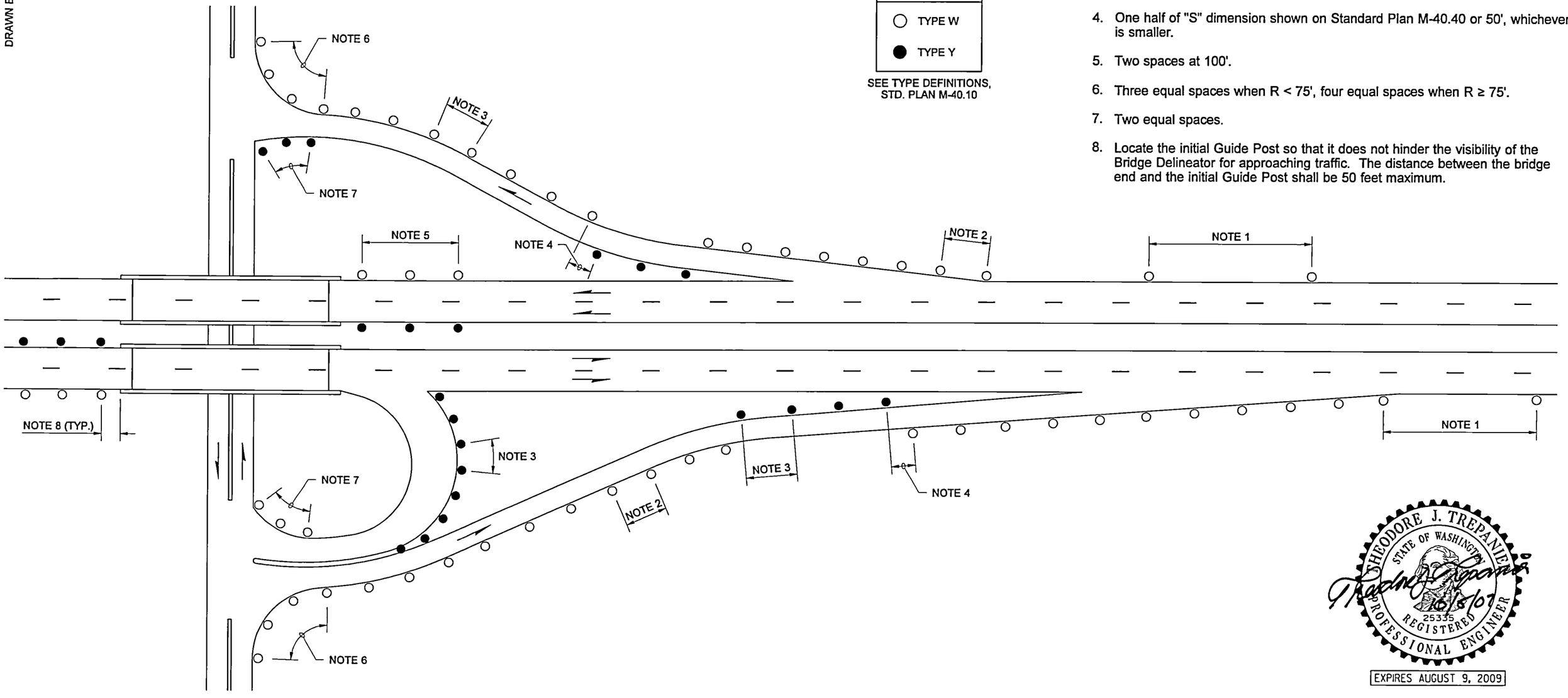
GUIDE POSTS AND BARRIER DELINEATORS

STANDARD PLAN M-40.10-03

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Bakotich, Pasco
Jun 24 2014 4:44 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation

DRAWN BY: ADAM COCHRAN



LEGEND
○ TYPE W
● TYPE Y

SEE TYPE DEFINITIONS, STD. PLAN M-40.10

NOTES

1. See Standard Plan M-40.10 for Guide Post details. See plans for guide post requirements between interchanges.
2. Guide posts shall be placed at 100' spacing on ramp tangents and tapers.
3. "S" dimension shown on Standard Plan M-40.40 or 100', whichever is smaller.
4. One half of "S" dimension shown on Standard Plan M-40.40 or 50', whichever is smaller.
5. Two spaces at 100'.
6. Three equal spaces when R < 75', four equal spaces when R ≥ 75'.
7. Two equal spaces.
8. Locate the initial Guide Post so that it does not hinder the visibility of the Bridge Delineator for approaching traffic. The distance between the bridge end and the initial Guide Post shall be 50 feet maximum.

THEODORE J. TREPANIER
STATE OF WASHINGTON
25335
REGISTERED
PROFESSIONAL ENGINEER
10/5/07

EXPIRES AUGUST 9, 2009

GUIDE POST PLACEMENT INTERCHANGES

STANDARD PLAN M-40.20-00

SHEET 1 OF 1 SHEET

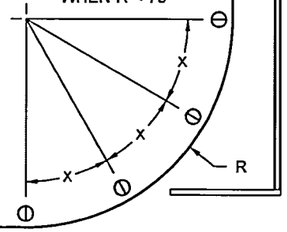
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER — DATE 10/12/07

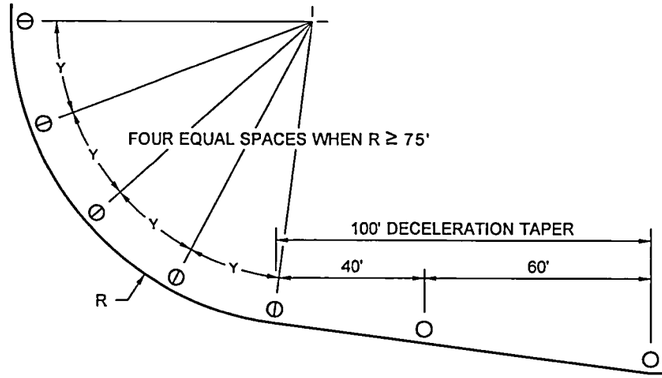
Washington State Department of Transportation

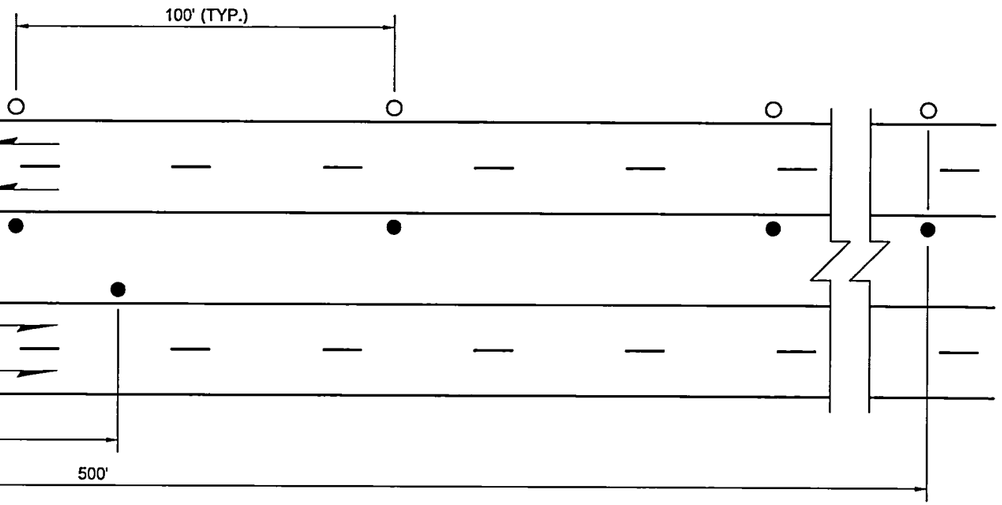
DRAWN BY: FERN LIDDELL

THREE EQUAL SPACES WHEN R < 75'



FOUR EQUAL SPACES WHEN R ≥ 75'





DIVIDED HIGHWAY

NOTE

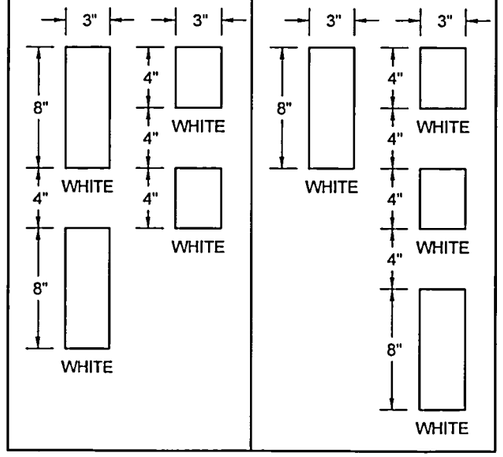
See **Standard Plan M-40.10** for Guide Post details.

LEGEND
○ TYPE W
◐ TYPE WW
● TYPE Y

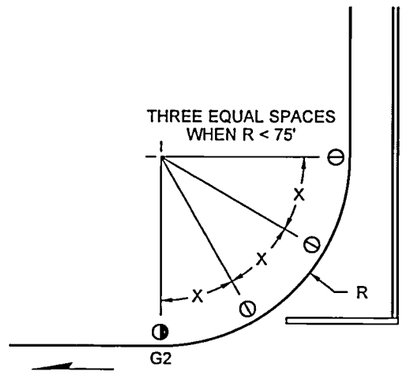
SEE TYPE DEFINITIONS, STANDARD PLAN M-40.10

REFLECTIVE SHEETING APPLICATIONS

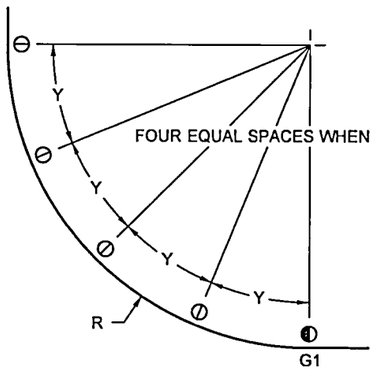
TYPE G1		TYPE G2	
G1		G2	
FACING TRAFFIC	BACK SIDE	FACING TRAFFIC	BACK SIDE

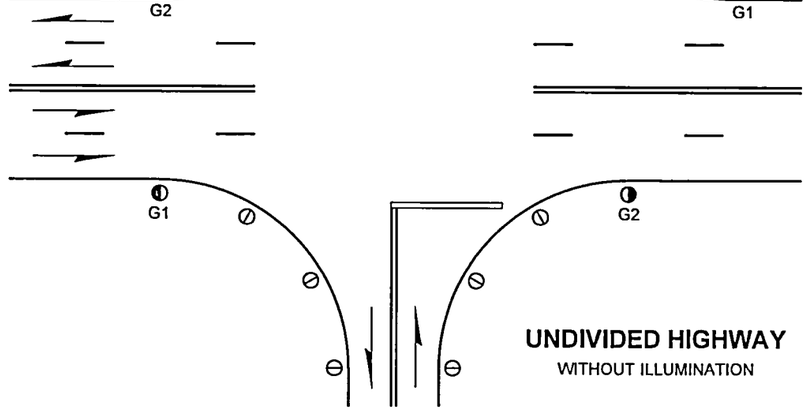


THREE EQUAL SPACES WHEN R < 75'



FOUR EQUAL SPACES WHEN R ≥ 75'





UNDIVIDED HIGHWAY
WITHOUT ILLUMINATION

BRIAN J. WALSH
STATE OF WASHINGTON
36103
REGISTERED
PROFESSIONAL ENGINEER

Walsh, Brian
May 19 2017 9:24 AM

GUIDE POST PLACEMENT GRADE INTERSECTIONS

STANDARD PLAN M-40.30-01

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 11 2017 1:17 PM

STATE DESIGN ENGINEER
Washington State Department of Transportation