WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

STANDARD DETAILS BOOK
VOLUME 1
DRAINAGE, GUARDRAIL, PAVEMENT FENCE, AND MARKERS

ISSUE DATE: JANUARY 1, 2000

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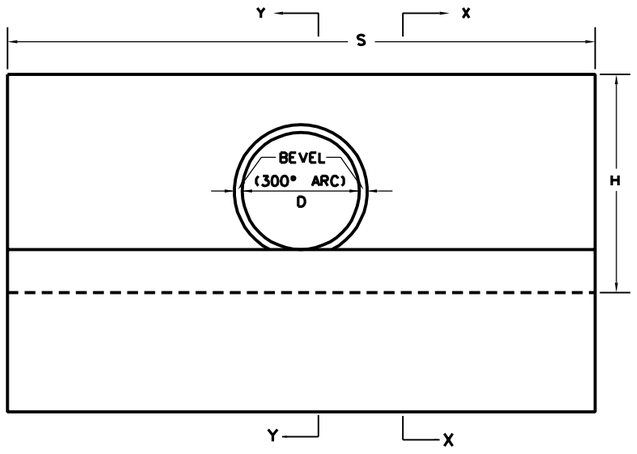
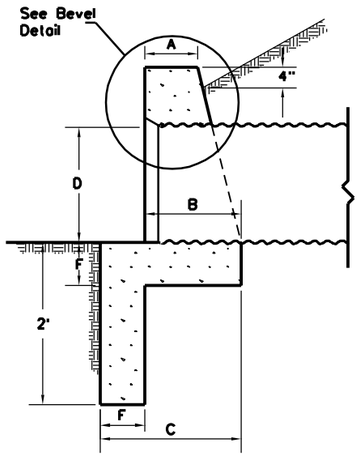
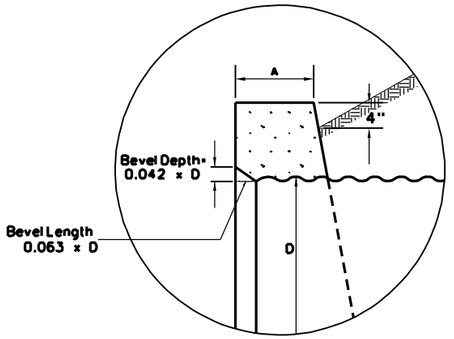


ELEVATION



SECTION Y-Y



BEVEL DETAIL
(Section Thru Center Of Pipe)

BEVEL DIMENSIONS								
	DIAMETER OF PIPE							
	12"	15"	18"	24"	30"			
Depth	1/2"	3/4"	3/4"	1"	1 1/4"			
Length	3/4"	1"	1 1/4"	1 1/2"	2"			

NOTES

All concrete shall be Class "B" Concrete.

All concrete edges shall have a 3/4" x 45° chamfer. Chamfer on vertical edges shall be continued a minimum of one foot below finished ground line.

When headwalls are placed on the inlet end of corrugated metal pipe or skewed concrete pipe, a bevel shall be used at the inlet opening. The end of the pipe shall be set in from the face of the wall, as shown on the "Bevel Detail", and the bevel constructed from the end of the pipe to the face of the wall.

When headwalls are placed on the inlet end of concrete pipe, the "bell" or "groove" of the pipe shall be placed in the wall in lieu of the bevel, except when the pipe is to be cut for placing in skewed headwalls. The inside of the "bell" or "groove" shall be filled with concrete up to the flow line.

Bevels are not required on outlet headwalls.

Reinforcing fabric shall conform to the requirements of 709.3 and 709.4 of the Specifications.

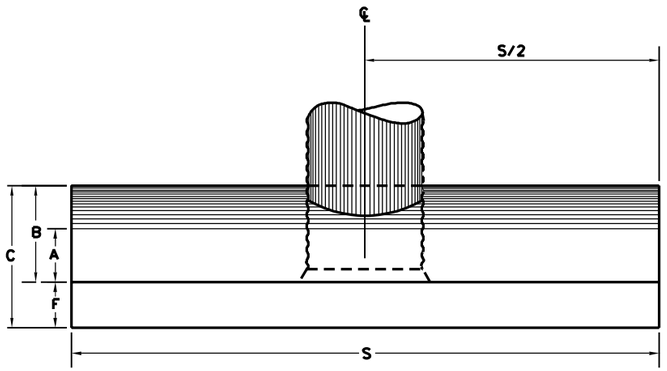
Reinforcing fabric, as detailed herein, shall be used in all walls of all headwall structures. The covering for the fabric shall be two inches, measured from the surface of the concrete to the face of the wire, unless otherwise specified. The fabric shall be cut as necessary to accommodate the pipe opening in the wall and may be otherwise cut or field bent to fit the structure.

In lieu of the reinforcing fabric described above, as shown reinforcing steel bars, meeting the requirements of 709.1 of the Specification, may be used in these structures. Covering for the reinforcing shall be two inches, measured from the surface of the concrete to the face of the bars, unless otherwise specified. Bars shall be furnished in such lengths, or field bent or cut as necessary, to fit the structures and to accommodate the pipe opening in the walls.

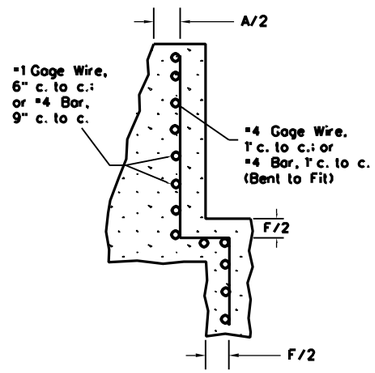
Keyed or doweled type construction joints, acceptable to the Engineer, may be used during construction.

The pay quantity for Straight Headwalls, constructed in accordance with the details herein, will be the cubic yards of Class B Concrete specified herein.

Cost of all reinforcing fabric and reinforcing bars shall be included in the unit price bid for "Class B Concrete".



PLAN VIEW



SECTION X-X
(Showing Reinforcing Details)

STRAIGHT HEADWALL
(Corrugated Metal Pipe Shown)

DIMENSIONS								
	DIAMETER OF PIPE							
	12"	15"	18"	24"	30"			
A	0'-6"	0'-8"	0'-9"	0'-11"	1'-0"			
B	0'-11"	1'-2"	1'-4"	1'-8"	1'-10"			
C	1'-5"	1'-9"	2'-0"	2'-5"	2'-8"			
D	1'-0"	1'-3"	1'-6"	2'-0"	2'-6"			
F	0'-6"	0'-7"	0'-8"	0'-9"	0'-10"			
H	2'-3"	2'-10"	3'-2"	3'-9"	4'-4"			
S	5'-0"	6'-3"	7'-6"	10'-0"	12'-6"			
QUANTITIES								
CU. YDS. CLASS B CONCRETE								
R.C.P.	0.46	0.82	1.22	2.20	3.35			
C.M.P.	0.47	0.85	1.27	2.29	3.48			

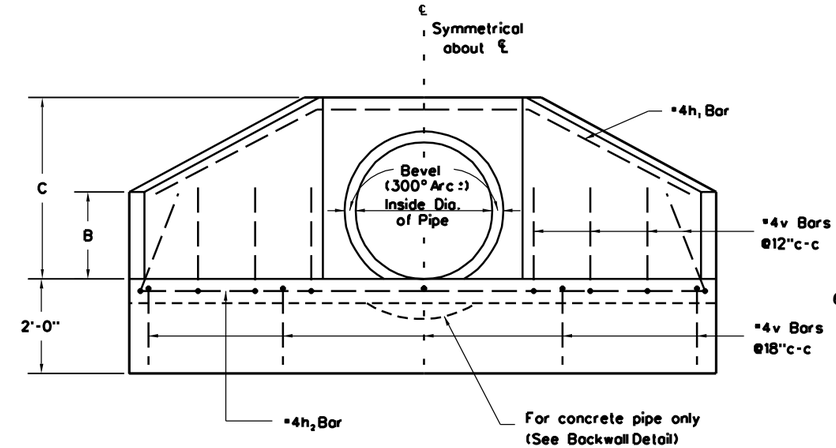
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

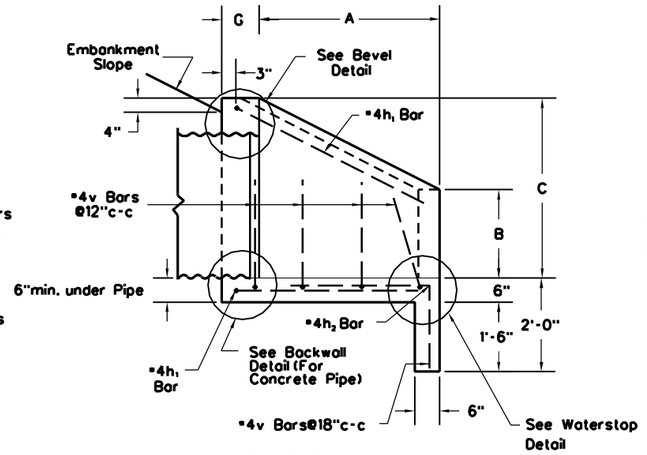
REVISION DATE

PIPE CULVERT HEADWALLS

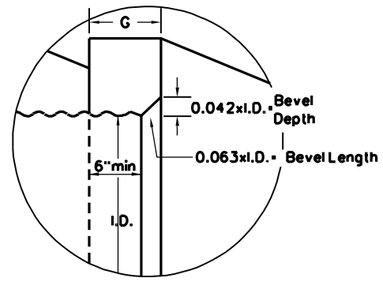
STANDARD SHEET DR1



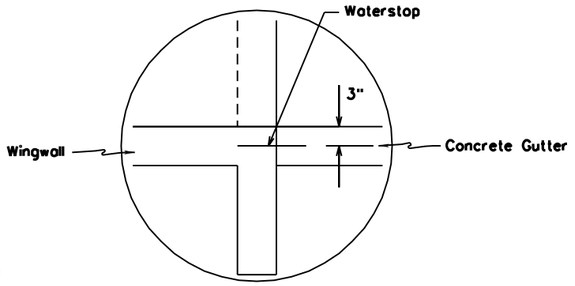
ELEVATION



SECTION A-A



BEVEL DETAIL



WATERSTOP DETAIL

NOTES

All concrete shall be Class B Concrete.

Reinforcing steel shall be new billet steel and shall conform to the requirements of 709.1 of the Specifications.

The covering for Reinforcing Steel shall be 2" measured from the surface of the concrete to the face of the bar, unless otherwise noted on the Plans. Reinforcement in members where concrete is deposited on the ground shall have 3" of concrete from the face of the bar to the ground contact surface.

All exposed edges shall have a 3/4" x 45° chamfer. Chamfer on vertical edges shall be continued a minimum of one foot below finished ground line.

When wingwalls are placed on the inlet end of corrugated metal or structural plate pipe, a bevel shall be used at the inlet opening. The end of the pipe shall be set in from the face of the wall as shown on the "Bevel Detail", and the bevel constructed from the end of the pipe to the face of the wall.

When wingwalls are placed on the inlet end of concrete pipe, the "bell" or "groove" of the pipe shall be placed in the wall, and the inside of the "bell" or "groove" shall be filled with concrete up to the flow line.

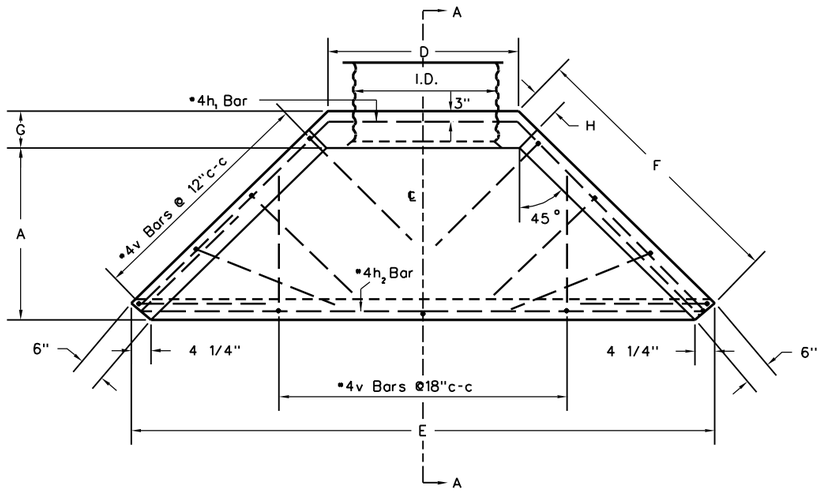
Bevels are not required on outlet wingwalls or on inlet wingwalls for concrete pipe.

Keyed or doweled type construction joints, acceptable to the Engineer, may be used during construction.

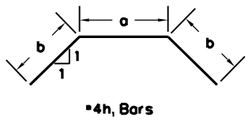
If embankment slope above wingwalls is flatter than 2:1, provide wings for 2:1 slope and warp embankment to 2:1 slope at wingwall.

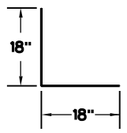
The pay quantity for wingwalls, constructed in accordance with the details herein, will be the cubic yards of Class B Concrete specified on this sheet. Cost of all reinforcing steel shall be included in the unit price bid for Class B Concrete.

Waterstop meeting the requirements of 708.10 shall be placed as shown when concrete gutter is to abut the wingwall.

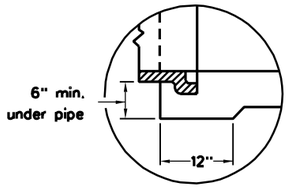


PLAN VIEW

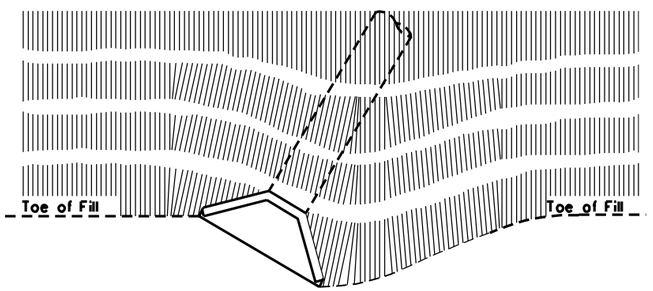




DETAIL OF BENT BARS



BACKWALL DETAIL
(For Concrete Pipe)



CONSTRUCTION DETAIL - SKEWED PIPE

Inside Dia. of Pipe	Slope of Fill	DIMENSIONS								REINFORCEMENT							QUANTITIES		
		A	B	C	D	E	F	G	H	Mark	Size	No. of Bars	LENGTH a	LENGTH b	LENGTH Total	Type	CONC (R.C.P.) C.Y.	CONC (C.M.P.) C.Y.	STEEL LBS.
15"	2:1	*2'-0"	0'-10"	1'-11"	2'-0"	6'-7 1/2"	3'-3 1/4"	*0'-8"	*0'-5 3/8"	h_1	#4	2	1'-10"	3'-2 1/2"	8'-3"	BENT	0.61	0.62	41.2
		t2'-2"						t0'-6"	t0'-2 1/2"	h_2	#4	1			6'-1"	ST.			
		BEVEL: DEPTH = 3/4" LENGTH = 1"								v	#4	13			3'-0"	BENT			
18"	2:1	*2'-0"	1'-1"	2'-2"	2'-3"	6'-10 1/2"	3'-3 1/4"	*0'-8"	*0'-5 3/8"	h_1	#4	2	2'-1"	3'-2 1/2"	8'-6"	BENT	0.67	0.68	41.8
		t2'-2"						t0'-6"	t0'-2 1/2"	h_2	#4	1			6'-4"	ST.			
		BEVEL: DEPTH = 3/4" LENGTH = 1 1/4"								v	#4	13			3'-0"	BENT			
24"	2:1	*2'-8"	1'-4"	2'-9"	2'-11"	8'-10 1/2"	4'-2 1/2"	*0'-8"	*0'-5 3/8"	h_1	#4	2	2'-9"	4'-1 1/2"	11'-0"	BENT	1.01	1.02	52.4
		t2'-10"						t0'-6"	t0'-2 1/2"	h_2	#4	1			8'-4"	ST.			
		BEVEL: DEPTH = 1" LENGTH = 1 1/2"								v	#4	16			3'-0"	BENT			
30"	2:1	*3'-1"	1'-7"	3'-3"	3'-5"	10'-4 1/2"	4'-11"	*0'-9"	*0'-6 3/4"	h_1	#4	2	3'-3"	4'-10 1/2"	13'-0"	BENT	1.32	1.37	58.1
		t3'-4"						t0'-6"	t0'-2 1/2"	h_2	#4	1			9'-10"	ST.			
		BEVEL: DEPTH = 1 1/4" LENGTH = 2"								v	#4	17			3'-0"	BENT			
36"	2:1	*3'-9"	1'-10"	3'-10"	4'-1"	12'-4 1/2"	5'-10 1/2"	*0'-9"	*0'-6 3/4"	h_1	#4	2	3'-11"	5'-9 1/2"	15'-6"	BENT	1.79	1.86	70.8
		t4'-0"						t0'-6"	t0'-2 1/2"	h_2	#4	1			11'-10"	ST.			
		BEVEL: DEPTH = 1 1/2" LENGTH = 2 1/4"								v	#4	21			3'-0"	BENT			

* DIMENSIONS FOR INLET WINGWALLS ON CORRUGATED METAL PIPE (TO ACCOMMODATE THE BEVEL).
t DIMENSIONS FOR INLET WINGWALLS ON CONCRETE PIPE AND ALL OUTLET WINGWALLS.

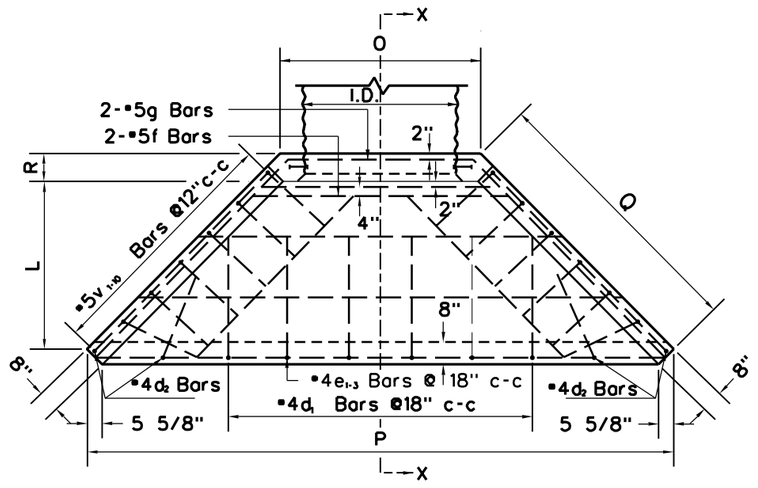
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

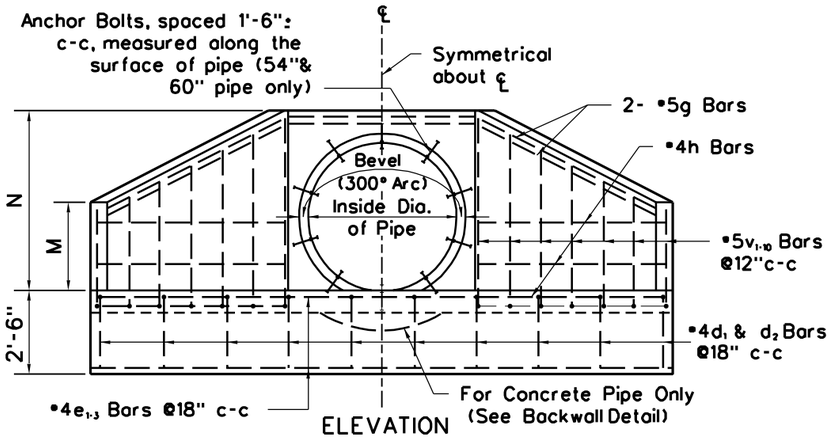
REVISION DATE

PIPE CULVERT WINGWALLS (SHEET 1 OF 4)

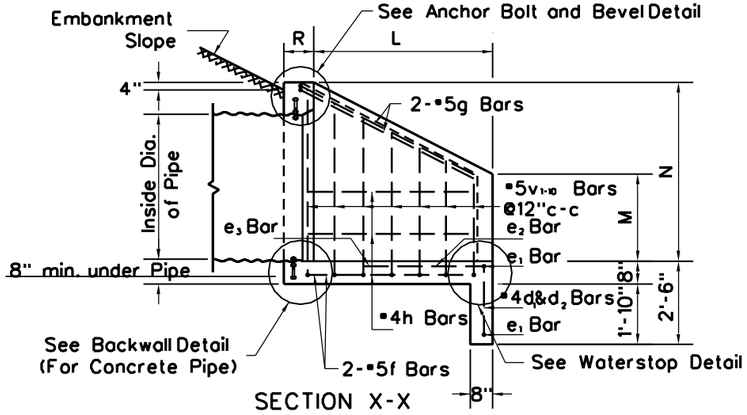
STANDARD SHEET DR2



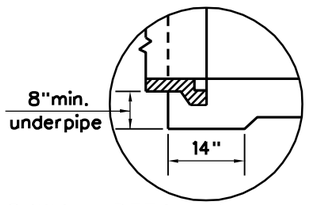
PLAN VIEW



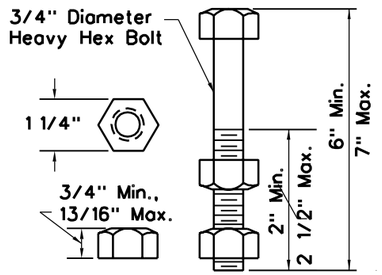
ELEVATION



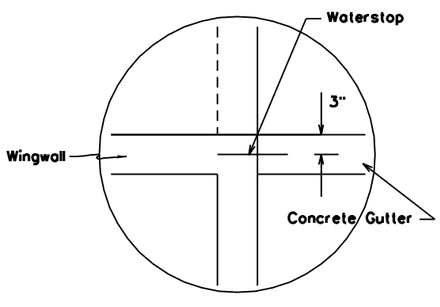
SECTION X-X



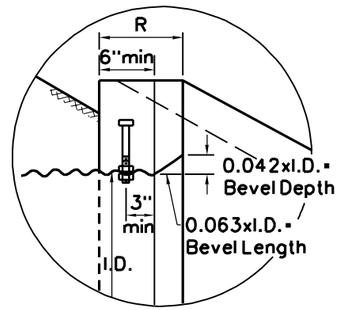
BACKWALL DETAIL (for concrete pipe)



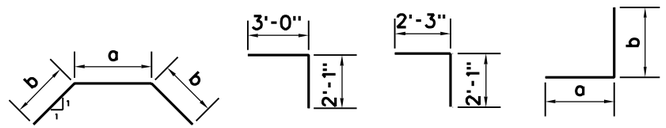
ANCHOR BOLT DIMENSIONS



WATERSTOP DETAIL



ANCHOR BOLT AND BEVEL DETAIL



DETAIL OF BENT BARS

Inside Dia. of Pipe	Slope of Fill	DIMENSIONS L	M	N	O	P	Q	R	S	REINFORCEMENT Mark	Size	No. of Bars	LENGTH a	b	Total	Type	QUANTITIES Conc. (RCP) C.Y.	Conc. (C.M.P. or S.P.P.) C.Y.	Steel Lbs.
42"	2:1	×4'-3"	2'-2"	4'-4½"	4'-10"	14'-½"	6'-6⅛"	×0'-10"	×0'-6⅝"	d_1	•4	6			5'-1"	Bent	3.17	3.23	225.0
		+4'-5"						+ 0'-8"	+0'-3¼"	d_2	•4	4			4'-4"	Bent			
										e_1	•4	2			13'-6"	St.			
		Bevel: Depth = 1¼"								e_2	•4	1			11'-0"	St.			
		Length= 2¾"								e_3	•4	1			8'-0"	St.			
										f	•5	2			5'-10"	St.			
										g	•5	2	4'-4"	6'-9"	17'-10"	Bent			
										h	•4	8			6'-0"	St.			
										v_1	•5	2	2'-0"	2'-6"	4'-6"	Bent			
										v_2	•5	2	2'-0"	2'-10"	4'-10"	Bent			
										v_3	•5	2	2'-0"	3'-2"	5'-2"	Bent			
										v_4	•5	2	2'-0"	3'-7"	5'-7"	Bent			
										v_5	•5	2	2'-0"	3'-11"	5'-11"	Bent			
										v_6	•5	2	2'-0"	4'-2"	6'-2"	Bent			
										v_7	•5	2	2'-0"	4'-6"	6'-6"	Bent			
48"	2:1	•4'-10"	2'-5"	4'-11"	5'-5"	15'-9½"	7'-4¼"	×0'-10"	×0'-6⅝"	d_1	•4	7			5'-1"	Bent	3.89	3.97	262.0
		•5'-0"						+0'-8"	+0'-3¼"	d_2	•4	4			4'-4"	Bent			
										e_1	•4	2			15'-3"	St.			
		Bevel: Depth= 2"								e_2	•4	1			12'-9"	St.			
		Length= 3"								e_3	•4	1			9'-9"	St.			
										f	•5	2			6'-5"	St.			
										g	•5	2	4'-11"	7'-8"	20'-3"	Bent			
										h	•4	8			6'-9"	St.			
										v_1	•5	2	2'-0"	2'-9"	4'-9"	Bent			
										v_2	•5	2	2'-0"	3'-1"	5'-1"	Bent			
										v_3	•5	2	2'-0"	3'-5"	5'-5"	Bent			
										v_4	•5	2	2'-0"	3'-9"	5'-9"	Bent			
										v_5	•5	2	2'-0"	4'-2"	6'-2"	Bent			
										v_6	•5	2	2'-0"	4'-6"	6'-6"	Bent			
										v_7	•5	2	2'-0"	4'-10"	6'-10"	Bent			
										v_8	•5	2	2'-0"	5'-2"	7'-2"	Bent			

Inside Dia. of Pipe	Slope of Fill	DIMENSIONS L	M	N	O	P	Q	R	S	REINFORCEMENT Mark	Size	No. of Bars	LENGTH a	b	Total	Type	QUANTITIES Conc. (RCP) C.Y.	Conc. (C.M.P. or S.P.P.) C.Y.	Steel Lbs.
54"	2:1	×5'-5"	2'-8"	5'-5½"	6'-0"	17'-6½"	8'-2"	×0'-10"	×0'-6⅝"	d_1	•4	8			5'-1"	Bent	4.64	4.74	300.0
		+5'-7"						+ 0'-8"	+0'-3¼"	d_2	•4	4			4'-4"	Bent			
										e_1	•4	2			17'0"	St.			
		Bevel: Depth = 2½"								e_2	•4	1			14'-6"	St.			
		Length= 3½"								e_3	•4	1			11'-6"	St.			
										f	•5	2			7'-0"	St.			
										g	•5	2	5'-6"	8'-7"	22'-8"	Bent			
										h	•4	8			7'-8"	St.			
										v_1	•5	2	2'-0"	3'-0"	5'-0"	Bent			
										v_2	•5	2	2'-0"	3'-4"	5'-4"	Bent			
										v_3	•5	2	2'-0"	3'-8"	5'-8"	Bent			
										v_4	•5	2	2'-0"	4'-0"	6'-0"	Bent			
										v_5	•5	2	2'-0"	4'-4"	6'-4"	Bent			
										v_6	•5	2	2'-0"	4'-8"	6'-8"	Bent			
										v_7	•5	2	2'-0"	5'-0"	7'-0"	Bent			
										v_8	•5	2	2'-0"	5'-4"	7'-4"	Bent			
										v_9	•5	2	2'-0"	5'-8"	7'-8"	Bent			
60"	2:1	×6'-0"	2'-11"	6'-0"	6'-7"	19'-3½"	9'-0"	×0'-10"	×0'-6⅝"	d_1	•4	9			5'-1"	Bent	5.54	5.66	341.0
		+6'-2"						+ 0'-8"	+0'-3¼"	d_2	•4	4			4'-4"	Bent			
										e_1	•4	2			18'-9"	St.			
		Bevel: Depth = 2½"								e_2	•4	1			16'-3"	St.			
		Length= 3¾"								e_3	•4	1			13'-3"	St.			
										f	•5	2			7'-7"	St.			
										g	•5	2	6'-1"	9'-5"	24'-11"	Bent			
										h	•4	8			8'-6"	St.			
										v_1	•5	2	2'-0"	3'-3"	5'-3"	Bent			
										v_2	•5	2	2'-0"	3'-7"	5'-7"	Bent			
										v_3	•5	2	2'-0"	3'-11"	5'-11"	Bent			
										v_4	•5	2	2'-0"	4'-3"	6'-3"	Bent			
										v_5	•5	2	2'-0"	4'-8"	6'-8"	Bent			
										v_6	•5	2	2'-0"	5'-0"	7'-0"	Bent			
										v_7	•5	2	2'-0"	5'-4"	7'-4"	Bent			
										v_8	•5	2	2'-0"	5'-8"	7'-8"	Bent			
										v_9	•5	2	2'-0"	6'-0"	8'-0"	Bent			
										v_{10}	•5	2	2'-0"	6'-3"	8'-3"	Bent			

× Dimensions for inlet wingwalls on corrugated metal or structural plate pipe (to accommodate bevel).
+ Dimensions for inlet wingwalls on concrete pipe and all outlet wingwalls.

NOTES

The "Notes" and the "Construction Detail-Skewed Pipe" on Standard Sheet DR2 (Sheet 1 of 2) shall apply to this sheet.

Anchor bolts shall be used on wingwalls for corrugated metal and structural plate pipe greater than 48" in diameter. Anchor bolts are not required for concrete pipe.

Anchor bolts and nuts shall conform to the requirements for "Headwall Anchorage" hardware as stipulated in AASHTO Specification M-167. Anchor bolts and nuts shall be cleaned after galvanizing to provide a free running fit.

Cost of the anchor bolts and nuts shall be included in the unit price bid for the pipe.

Right-of-way fence hardware inserts shall be installed in the sidewalls during the construction of wingwalls for pipes over 48" in diameter. Dimensions and location of inserts shall conform to the "Drainage Structure Terminal Installation" detail of the applicable right-of-way fence standard.

Waterstop meeting the requirements of 708.10 shall be placed as shown when concrete gutter is to abut the wingwall.

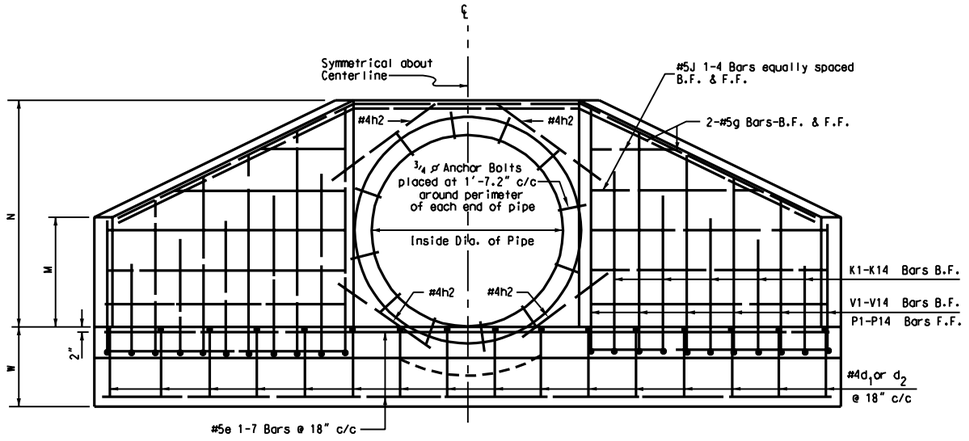
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

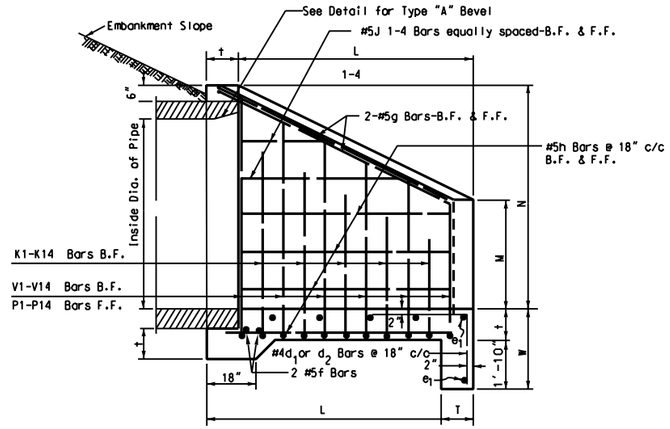
REVISION DATE

PIPE CULVERT WINGWALLS (SHEET 2 OF 4)

STANDARD SHEET DR2



END VIEW



SECTION X-X

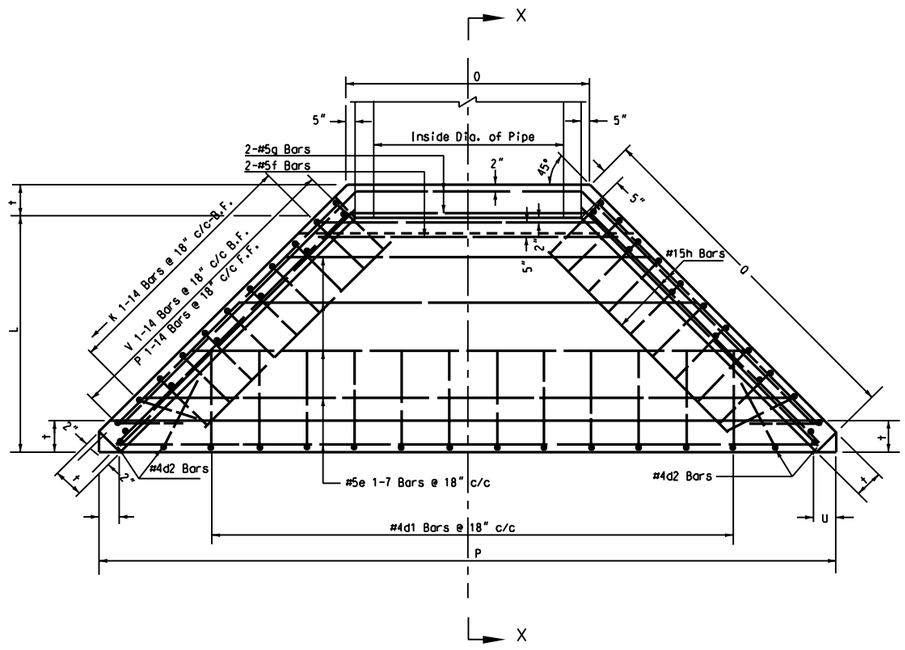
NOTES

REINFORCING BAR DETAILS AND QUANTITIES ARE SHOWN ON SHEET 4 OF 4

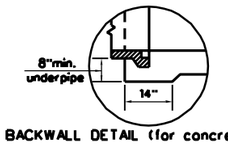
B.F. DENOTES BACK FACE

F.F. DENOTES FRONT FACE

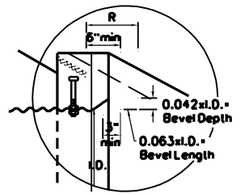
INSIDE DIA OF PIPE	SLOPE OF FILL	DIMENSIONS								
		L	M	N	O	P	Q	t	u	w
72"	2:1	7' - 4"	3' - 6"	7' - 1"	8' - 0"	23' - 3"	10' - 9"	12"	8½"	2' - 10"
84"	2:1	8' - 6"	4' - 0"	8' - 2"	9' - 2"	26' - 9"	12' - 5"	12"	8½"	2' - 10"
96"	2:1	9' - 8"	4' - 6"	9' - 3"	10' - 4"	30' - 3"	14' - 1"	12"	8½"	2' - 10"
108"	2:1	10'-10"	5' - 0"	10' - 4"	11' - 6"	33' - 9"	15' - 9"	12"	8½"	2' - 10"
120"	2:1	12' - 0"	5' - 6"	11' - 5"	12' - 8"	37' - 4"	17' - 5"	14"	9⅞"	3' - 0"
144"	2:1	14' - 4"	6' - 6"	13' - 6"	14' - 10"	44' - 3"	20' - 9"	16"	11⅜"	3' - 2"



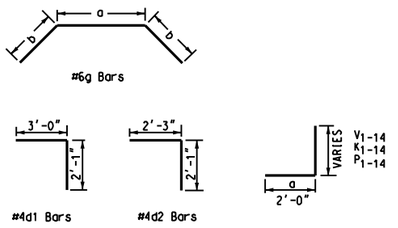
PLAN



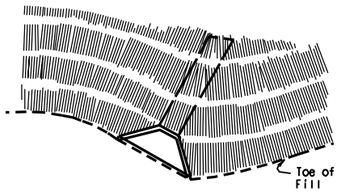
BACKWALL DETAIL (for concrete pipe)



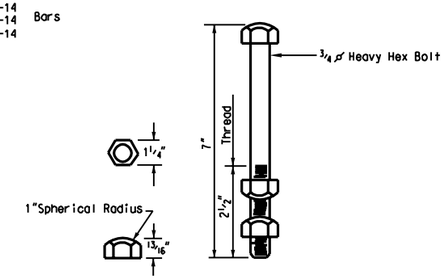
ANCHOR BOLT AND BEVEL DETAIL



DETAIL OF BENT BARS



SKEWED PIPE CONSTRUCTION DETAIL



ANCHOR BOLT DETAIL

NOTES

NOTES ON THE STANDARD DETAIL DR2 (SHEETS 1 OF 2 AND 2 OF 2) SHALL APPLY TO THIS SHEET.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7/1/99

REVISION DATE

PIPE CULVERT WINGWALLS (SHEET 3 OF 4)

STANDARD SHEET DR2

I.D. PIPE	F:L SLOPE	DIMENSIONS L	M	N	O	P	Q	T	REINFORCEMENT MK	SIZE	NO.	a	b	TOTAL	QUANTITY SPAC.	TYPE	CONC. (C.Y.)	STEEL (LBS.)
72"	2:1	7'-4"	3'-6"	7'-1"	8'-0"	23'-3"	10'-9"	12"	DI	4	12			5'-1"	18" cc	BENT	11.22	972
									D2	4	4			4'-4"	18" cc	BENT		
									E1	5	2			22'-9"	18" cc	STR.		
									E2	5	1			20'-8"	18" cc	STR.		
									E3	5	1			17'-8"	18" cc	STR.		
									E4	5	1			14'-8"	18" cc	STR.		
									F	5	2			9'-11"	5" cc	STR.		
									G	5	4	7'-7"	11'-9"	37'-1"		BENT		
									H	5	18			10'-1"		STR.		
									V1	5	2	2'-0"	4'-2"	6'-2"	18" cc	BENT		
									THRU				6" INCREMENTS					
									V6	5	2	2'-0"	6'-8"	8'-8"	18" cc	BENT		
									V7	6	2	2'-0"	7'-2"	9'-2"	18" cc	BENT		
									H2	4	8			5'-0"		STR.		
									K1	5	2	2'-0"	2'-7"	4'-7"	18" cc	BENT		
									THRU				6" INCREMENTS					
									K6	5	2	2'-0"	5'-1"	7'-1"	18" cc	BENT		
									K7	6	2	2'-0"	5'-7"	7'-7"	18" cc	BENT		
									P1	5	2	2'-0"	4'-2"	6'-2"	18" cc	BENT		
									THRU				6" INCREMENTS					
									P7	5	2	2'-0"	7'-2"	9'-2"	18" cc	BENT		
									J1	5	4			1'-3"	18" cc	STR.		
									J2	5	4			2'-6"	18" cc	STR.		
84"	2:1	8'-6"	4'-0"	8'-2"	9'-2"	26'-9"	12'-5"	12"	DI	4	14			5'-1"	18" cc	BENT	14.25	1095
									D2	4	4			4'-4"	18" cc	BENT		
									E1	5	2			26'-3"	18" cc	STR.		
									E2	5	1			24'-2"	18" cc	STR.		
									E3	5	1			21'-2"	18" cc	STR.		
									E4	5	1			18'-2"	18" cc	STR.		
									F	5	2			11'-1"	5" cc	STR.		
									G	5	4	8'-9"	13'-8"	36'-1"		BENT		
									H	5	18			11'-9"		STR.		
									V1	5	2	2'-0"	4'-8"	6'-8"	18" cc	BENT		
									THRU				6" INCREMENTS					
									V5	5	2	2'-0"	6'-8"	8'-8"	18" cc	BENT		
									V6	6	2	2'-0"	7'-2"	9'-2"	18" cc	BENT		
									V7	6	2	2'-0"	7'-8"	9'-8"	18" cc	BENT		
									V8	7	2	2'-0"	8'-3"	10'-3"	18" cc	BENT		
									K1	5	2	2'-0"	2'-10"	4'-10"	18" cc	BENT		
									THRU				6" INCREMENTS					
									K5	5	2	2'-0"	4'-10"	6'-10"	18" cc	BENT		
									K6	6	2	2'-0"	5'-4"	7'-4"	18" cc	BENT		
									K7	6	2	2'-0"	5'-10"	7'-10"	18" cc	BENT		
									K8	7	2	2'-0"	6'-4"	8'-4"	18" cc	BENT		
									P1	5	2	2'-0"	4'-8"	6'-8"	18" cc	BENT		
									THRU				6" INCREMENTS					
									P8	5	2	2'-0"	8'-2"	10'-2"	18" cc	BENT		
									J1	5	4			1'-5"	18" cc	STR.		
									J2	5	4			2'-10"	18" cc	STR.		
									H2	4	8			6'-6"		STR.		
96"	2:1	9'-8"	4'-6"	9'-3"	10'-4"	30'-3"	14'-1"	12"	DI	4	16			5'-1"	18" cc	BENT	18.30	1485
									D2	4	4			4'-4"	18" cc	BENT		
									E1	5	2			29'-9"	18" cc	STR.		
									E2	5	1			27'-8"	18" cc	STR.		
									E3	5	1			24'-8"	18" cc	STR.		
									E4	5	1			21'-8"	18" cc	STR.		
									E5	5	1			18'-8"	18" cc	STR.		
									F	5	2			12'-3"	5" cc	STR.		
									G	5	4	9'-11"	15'-5"	40'-9"		BENT		
									H	5	18			13'-5"		STR.		
									V1	5	2	2'-0"	5'-2"	7'-2"	18" cc	BENT		
									THRU				6" INCREMENTS					
									V4	5	2	2'-0"	6'-8"	8'-8"	18" cc	BENT		
									V5	6	2	2'-0"	7'-3"	9'-3"	18" cc	BENT		
									V6	6	2	2'-0"	7'-9"	9'-9"	18" cc	BENT		
									V7	7	2	2'-0"	8'-3"	10'-3"	18" cc	BENT		
									V8	7	2	2'-0"	8'-10"	10'-10"	18" cc	BENT		
									V9	8	2	2'-0"	9'-4"	11'-4"	18" cc	BENT		
									V0	8	2	2'-0"	9'-10"	11'-10"	18" cc	BENT		
									K1	5	2	2'-0"	3'-1"	5'-1"	18" cc	BENT		
									THRU				6" INCREMENTS					
									K4	5	2	2'-0"	4'-7"	6'-7"	18" cc	BENT		
									K5	6	2	2'-0"	5'-1"	7'-1"	18" cc	BENT		
									K6	6	2	2'-0"	5'-7"	7'-7"	18" cc	BENT		
									H2	4	8			8'-0"		STR.		

I.D. PIPE	F:L SLOPE	DIMENSIONS L	M	N	O	P	Q	T	REINFORCEMENT MK	SIZE	NO.	a	b	TOTAL	QUANTITY SPAC.	TYPE	CONC. (C.Y.)	STEEL (LBS.)
96"	2:1								K7	7	2	2'-0"	6'-1"	8'-1"	18" cc	BENT		
									K8	7	2	2'-0"	6'-7"	8'-7"	18" cc	BENT		
									K9	8	2	2'-0"	7'-1"	9'-1"	18" cc	BENT		
									P1	5	2	2'-0"	5'-2"	7'-2"	18" cc	BENT		
									THRU				6" INCREMENTS					
									P10	5	2	2'-0"	9'-8"	11'-8"	18" cc	BENT		
									J1	5	4			1'-7"	18" cc	STR.		
									J2	5	4			3'-2"	18" cc	STR.		
108"	2:1	10'-10"	5'-0"	10'-4"	11'-6"	33'-9"	15'-9"	12"	DI	4	19			5'-1"	18" cc	BENT	22.48	1927
									D2	4	4			4'-4"	18" cc	BENT		
									E1	5	2			33'-3"	18" cc	STR.		
									E2	5	1			31'-2"	18" cc	STR.		
									E3	5	1			28'-2"	18" cc	STR.		
									E4	5	1			25'-2"	18" cc	STR.		
									E5	5	1			22'-2"	18" cc	STR.		
									F	5	2			13'-5"	5" cc	STR.		
									G	5	4	11'-1"	17'-4"	45'-9"		BENT		
									H	5	22			15'-1"		STR.		
									V1	5	2	2'-0"	5'-8"	7'-8"	18" cc	BENT		
									THRU				6" INCREMENTS					
									V4	5	2	2'-0"	7'-2"	9'-2"	18" cc	BENT		
									V5	6	2	2'-0"	7'-8"	9'-8"	18" cc	BENT		
									V6	6	2	2'-0"	8'-2"	10'-2"	18" cc	BENT		
									V7	7	2	2'-0"	8'-9"	10'-9"	18" cc	BENT		
									V8	8	2	2'-0"	9'-3"	11'-3"	18" cc	BENT		
									V9	8	2	2'-0"	9'-9"	11'-9"	18" cc	BENT		
									V10	9	2	2'-0"	10'-4"	12'-4"	18" cc	BENT		
									V1	9	2	2'-0"	10'-10"	12'-10"	18" cc	BENT		
									H2	4	8			9'-0"		STR.		
									K1	5	2	2'-0"	3'-4"	5'-4"	18" cc	BENT		
									THRU				6" INCREMENTS					
									K3	5	2	2'-0"	4'-4"	6'-4"	18" cc	BENT		
									K4	6	2	2'-0"	4'-10"	6'-10"	18" cc	BENT		
									K5	6	2	2'-0"	5'-4"	7'-4"	18" cc	BENT		
									K6	7	2	2'-0"	5'-10"	7'-10"	18" cc	BENT		
									K7	7	2	2'-0"	6'-4"	8'-4"	18" cc	BENT		
									K8	8	2	2'-0"	6'-10"	8'-10"	18" cc	BENT		
									K9	8	2	2'-0"	7'-4"	9'-4"	18" cc	BENT		
									K10	9	2	2'-0"	7'-10"	9'-10"	18" cc	BENT		
									P1	5	2	2'-0"	5'-8"	7'-8"	18" cc	BENT		
									THRU				6" INCREMENTS					
									P11	5	2	2'-0"	10'-8"	12'-8"	18" cc	BENT		
									J1	5	4			1'-4"	18" cc	STR.		
									J2	5	4			2'-9"	18" cc	STR.		
									J3	5	4			4'-1"	18" cc	STR.		
120"	2:1	12'-0"	5'-6"	11'-5"	12'-8"	37'-4"	17'-5"	14"	DI	4	21			5'-1"	18" cc	BENT	31.78	2492
									D2	4	4			4'-4"	18" cc	BENT		
									E1	5	2			36'-10"	18" cc	STR.		
									E2	5	1			35'-0"	18" cc	STR.		
									E3	5	1			32'-0"	18" cc	STR.		
									E4	5	1			29'-0"	18" cc	STR.		
									E5	5	1			26'-0"	18" cc	STR.		
									E6	5	1			23'-0"	18" cc	STR.		
									F	5	2			14'-7"	5" cc	STR.		
									G	5	4	12'-3"	19'-2"	50'-7"		BENT		
									H	5	22			16'-9"	18" cc	STR.		
									V1	5	2	2'-0"	6'-4"	8'-4"	18" cc	BENT		
									V2	5	2	2'-0"	6'-10"	8'-10"	18" cc	BENT		
									V3	6	2	2'-0"	7'-4"	9'-4"	18" cc	BENT		
									V4	6	2	2'-0"	7'-10"	9'-10"	18" cc	BENT		
									V5	7	2	2'-0"	8'-5"	10'-5"	18" cc	BENT		
									V6	7	2	2'-0"	8'-11"	10'-11"	18" cc	BENT		
									V7	8	2	2'-0"	9'-5"	11'-5"	18" cc	BENT		
									V8	8	2	2'-0"	9'-11"	11'-11"	18" cc	BENT		
									V9	9	2	2'-0"	10'-6"	12'-6"	18" cc	BENT		
									V10	9	2	2'-0"	11'-0"	13'-0"	18" cc	BENT		
									V11	10	2	2'-0"	11'-6"	13'-6"	18" cc	BENT		
									V12	10	2	2'-0"	12'-0"	14'-0"	18" cc	BENT		
									K1	5	2	2'-0"	3'-9"	5'-9"	18" cc	BENT		
									K2	5	2	2'-0"	4'-3"	6'-3"	18" cc	BENT		
									K3	6	2	2'-0"	4'-9"	6'-9"	18" cc	BENT		
									K4	6	2	2'-0"	5'-3"	7'-3"	18" cc	BENT		
									K5	7	2	2'-0"	5'-9"	7'-9"	18" cc	BENT		

I.D. PIPE	F:L SLOPE	DIMENSIONS L	M	N	O	P	Q	T	REINFORCEMENT MK	SIZE	NO.	a	b	TOTAL	QUANTITY SPAC.	TYPE	CONC. (C.Y.)	STEEL (LBS.)
120"									K6	7	2	2'-0"	6'-3"	8'-3"	18" cc	BENT		
									K7	8	2	2'-0"	6'-9"	8'-9"	18" cc	BENT		
									K8	8	2	2'-0"	7'-3"	9'-3"	18" cc	BENT		
									K9	9	2	2'-0"	7'-9"	9'-9"	18" cc	BENT		
									K10	9	2	2'-0"	8'-3"	10'-3"	18" cc	BENT		
									K11	10	2	2'-0"	8'-9"	10'-9"	18" cc	BENT		
									H2	4	8			10'-0"		STR.		
									P1	5	2	2'-0"	6'-4"	8'-4"	18" cc	BENT		
									THRU				6" INCREMENTS					
									P12	5	2	2'-0"	11'-10"	13'-10"	18" cc	BENT		
									J1	5	4			1'-6"	18" cc	STR.		
									J2	5	4			3'-0"	18" cc	STR.		
									J3	5	4			4'-6"	18" cc	STR.		
144"	2:1	14'-4"	6'-6"	13'-6"	14'-10"	44'-3"	20'-9"	16"	DI	4	26			5'-1"	18" cc	BENT	49.71	3958
									D2	4	4			4'-4"	18" cc	BENT		
									E1	5	2			43'-9"	18" cc	STR.		
									E2	5	1			41'-11"	18" cc	STR.		
									E3	5	1			38'-11"	18" cc	STR.		
									E4	5	1			36'-11"	18" cc	STR.		
									E5	5	1			33'-11"	18" cc	STR.		
									E6	5	1			30'-1"	18" cc	STR.		
									E7	5	1			27'-1"	18" cc	STR.		
									F	5	2			16'-9"	5" cc	STR.		
									G	5	4	14'-5"	22'-11"	60'-3"		BENT		
									H	5	26			20'-1"		STR.		
									H2	4	8			13'-6"		STR.		
									V1	6	2	2'-0"	7'-6"	9'-6"	18" cc	BENT		
									V2	6	2	2'-0"	8'-0"	10'-0"	18" cc	BENT		
									V3	6	2	2'-0"	8'-6"	10'-6"	18" cc	BENT		
									V4	7	2	2'-0"	9'-0"	11'-0"	18" cc	BENT		
									V5	7	2	2'-0"	9'-6"	11'-6"	18" cc	BENT		
									V6	8	2	2'-0"	10'-0"	12'-0"	18" cc	BENT		
									V7	8	2	2'-0"	10'-6"	12'-6"	18" cc	BENT		
									V8	9	2	2'-0"	11'-0"	13'-0"	18" cc	BENT		
									V9	9	2	2'-0"	11'-6"	13'-6"	18" cc	BENT		
									V10	10	2	2'-0"	12'-0"	14'-0"	18" cc	BENT		
									V11	10	2	2'-0"	12'-6"	14'-6"	18" cc	BENT		
									V12	11	2	2'-0"	13'-0"	15'-0"	18" cc	BENT		
									V13	11	2	2'-0"	13'-6"	15'-6"	18" cc	BENT		
									V14	11	2	2'-0"	14'-0"	16'-0"	18" cc	BENT		
									K1	6	2	2'-0"	4'-5"	6'-5"	18" cc	BENT		
									K2	6	2	2'-0"	4'-11"	6'-11"	18" cc	BENT		
									K3	7	2	2'-0"	5'-5"	7'-5"	18" cc	BENT		
									K4	7	2	2'-0"	5'-11"	7'-11"	18" cc	BENT		
									K5	7	2	2'-0"	6'-5"	8'-5"	18" cc	BENT		
									K6	8	2	2'-0"	6'-11"	8'-11"	18" cc	BENT		
									K7	8	2	2'-0"	7'-5"	9'-5"	18" cc	BENT		
									K8	9	2	2'-0"	7'-11"	9'-11"	18" cc	BENT		
									K9	9	2	2'-0"	8'-5"	10'-5"	18" cc	BENT		
									K10	10	2	2'-0"	8'-11"	10'-11"	18" cc	BENT		
									K11	10	2	2'-0"	9'-5"	11'-5"	18" cc	BENT		
									K12	11	2	2'-0"	9'-11"	11'-11"	18" cc	BENT		
									K13	11	2	2'-0"	10'-5"	12'-5"	18" cc	BENT		
									K14	11	2	2'-0"	10'-5"	12'-11"	18" cc	BENT		
									P1	5	2	2'-0"	10'-11"	9'-6"	18" cc	BENT		
									THRU				6" INCREMENTS					
									P14	5	2	2'-0"	14'-0"	16'-0"	18" cc	BENT		
									J1	5	4			1'-5"	18" cc	STR.		
									J2	5	4			2'-10"	18" cc	STR.		
									J3	5	4			4'-3"	18" cc	STR.		
									J4	5	4			5'-9"	18" cc	STR.		

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7/1/99

REVISION DATE

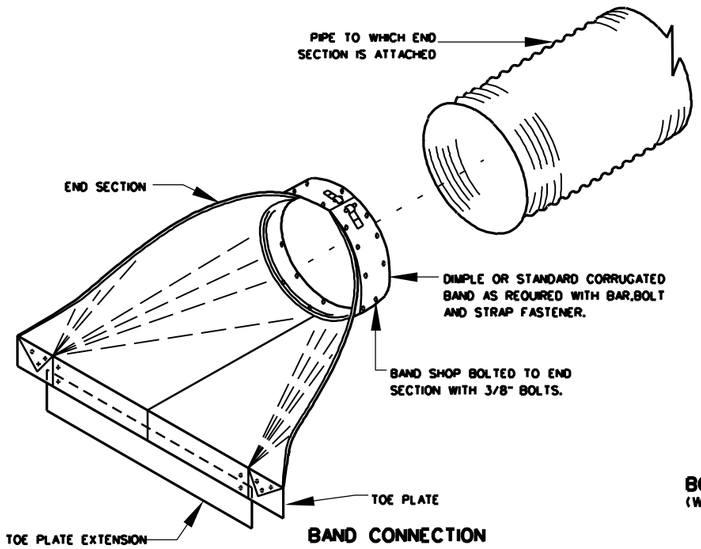
PIPE CULVERT WINGWALLS (SHEET 4 OF 4)

STANDARD SHEET DR2

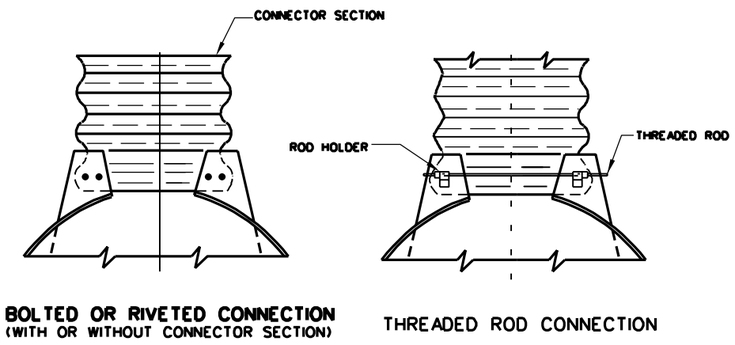
DIMENSIONS OF GALVANIZED STEEL END SECTION FOR ROUND PIPE								
PIPE DIAM. (INCHES)	METAL THK. (INCHES)	DIMENSIONS (INCHES) A ± 1"	B MAX	H ± 1"	L ±1 1/2"	W ± 2"	APPROX. SLOPE	BODY
12	.064	6	6	6	21	24	2 1/2	1 PC.
15	.064	7	8	6	26	30	2 1/2	1 PC.
18	.064	8	10	6	31	36	2 1/2	1 PC.
21	.064	9	12	6	36	42	2 1/2	1 PC.
24	.064	10	13	6	41	48	2 1/2	1 PC.
30	.079	12	16	8	51	60	2 1/2	1 PC.
36	.079	14	19	9	60	72	2 1/2	2 PC.
42	.109	16	22	11	69	84	2 1/2	2 PC.
48	.109	18	27	12	78	90	2 1/4	2 PC.
54	.109	18	30	12	84	102	2	2 PC.
60	.109	18	33	12	87	114	1 3/4	3 PC.
66	.109	18	36	12	87	120	1 1/2	3 PC.
72	.109	18	39	12	87	126	1 1/3	3 PC.
78	.109	18	42	12	87	132	1 1/4	3 PC.
84	.109	18	45	12	87	138	1 1/6	3 PC.

DIMENSIONS OF GALVANIZED STEEL END SECTION FOR PIPE ARCH									
PIPE ARCH SPAN X RISE (INCHES)	EQUIV. DIAM. (INCHES)	METAL THK. (INCHES)	DIMENSIONS (INCHES) A ± 1"	B MAX	H ± 1"	L ±1 1/2"	W ± 2"	APPROX. SLOPE	BODY
17X13	15	.064	7	9	6	19	30	2 1/2	1 PC.
21X15	18	.064	7	10	6	23	36	2 1/2	1 PC.
24X18	21	.064	8	12	6	28	42	2 1/2	1 PC.
28X20	24	.064	9	14	6	32	48	2 1/2	1 PC.
35X24	30	.079	10	16	6	39	60	2 1/2	1 PC.
42X29 (40X31)	36	.079	12	18	8	46	75	2 1/2	1 PC.
49X33 (46X36)	42	.109	13	21	9	53	85	2 1/2	2 PC.
57X38 (53X41)	48	.109	18	26	12	63	90	2 1/2	2 PC.
64X43 (60X46)	54	.109	18	30	12	70	102	2 1/4	2 PC.
71X47 (66X51)	60	.109	18	33	12	77	114	2 1/4	3 PC.
77X52 (73X55)	66	.109	18	36	12	77	126	2	3 PC.
83X57 (81X59)	72	.109	18	39	12	77	138	2	3 PC.

NOTE: SPAN AND RISE DIMENSIONS IN PARENTHESES ARE FOR 3"X1" CORRUGATED PIPE ARCHES; ALL OTHER SPAN AND RISE VALUES ARE FOR 2 1/2"X1/2" CORRUGATED PIPE ARCHES.



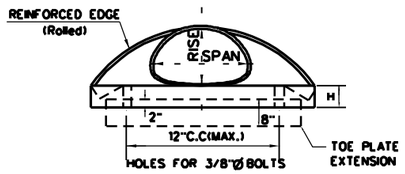
BAND CONNECTION



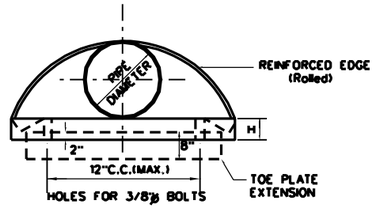
BOLTED OR RIVETED CONNECTION
(WITH OR WITHOUT CONNECTOR SECTION)

THREADED ROD CONNECTION

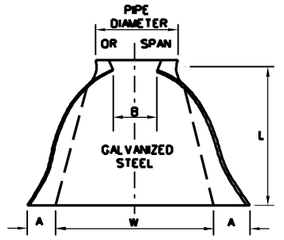
TYPICAL CROSS SECTION
(PIPE AND PIPE ARCH)



ELEVATION
(PIPE ARCH)



ELEVATION
(PIPE)



PLAN
(PIPE AND PIPE ARCH)

NOTES

TYPICAL END SECTIONS FOR PIPES AND PIPE ARCHES ARE DETAILED HEREIN. OTHER SIMILAR DESIGNS MAY BE USED IF ACCEPTABLE TO THE ENGINEER.

GALVANIZED STEEL END SECTIONS SHALL BE USED ON THE ENDS OF CORRUGATED STEEL PIPES AND/OR PIPE ARCHES AT THOSE LOCATIONS SPECIFIED ON THE PLANS. END SECTIONS SHALL BE MEASURED AS THE NUMBER OF UNITS INSTALLED OF EACH SIZE AND TYPE AND SHALL BE PAID FOR IN ACCORDANCE WITH 604 OF THE SPECIFICATIONS.

TWO-PIECE AND THREE-PIECE END SECTIONS SHALL BE OF LAP SEAM CONSTRUCTION. TIGHTLY JOINED WITH 3/8" DIAMETER GALVANIZED RIVETS OR BOLTS.

FOR 60" THRU 84" PIPES, THE REINFORCED EDGES OF THE END SECTIONS SHALL BE SUPPLEMENTED WITH GALVANIZED STIFFENER ANGLES FASTENED BY 3 /8 " DIAMETER GALVANIZED BOLTS AND NUTS. THIS REQUIREMENT SHALL ALSO BE APPLICABLE TO THE END SECTIONS FOR 77"X52", 73"X 55", 83"X 57", AND 81"X 59" PIPE ARCH SIZES. IN ADDITION, FOR THOSE PIPE ARCH SIZES, ANGLE REINFORCEMENT SHALL BE USED UNDER THE CENTER PANEL SEAMS.

THE END SECTION CONNECTION DETAILS SHALL BE AS SHOWN ON THIS PLAN SHEET OR OF A SIMILAR DESIGN AS RECOMMENED BY THE MANUFACTURER. ALL SIMILAR DESIGNS SHALL PROVIDE A SECURE ATTACHMENT OF THE END SECTION TO THE PIPE OR PIPE ARCH.

ALTHOUGH A PIPE OR PIPE ARCH MAY HAVE A BITUMINOUS COATING AND/OR PAVED INVERT, IT WILL NOT BE NECESSARY TO BITUMINOUS COAT OR PAVE THE END SECTION, CONNECTORS, OR CONNECTOR SECTION.

TOE PLATE EXTENSIONS SHALL BE THE SAME THICKNESS AS THE END SECTIONS AND SHALL BE FASTENED TO TOE PLATES WITH 3/8" DIAMETER GALVANIZED BOLTS. LENGTH OF TOE PLATE EXTENSION SHALL BE W+10"(approx.) FOR 12" THRU 30" DIAMETER PIPES AND FOR PIPE ARCHES WITH RISE VALUES UP TO AND INCLUDING 29". THE LENGTH SHALL BE W+22"(approx.) FOR LARGER PIPE SIZES AND W+18" (approx.) FOR LARGER PIPE ARCHES.

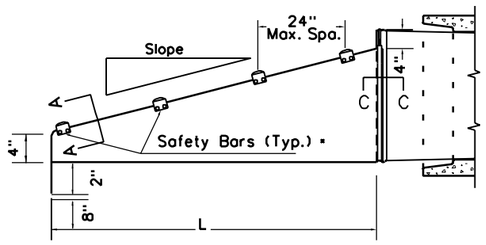
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

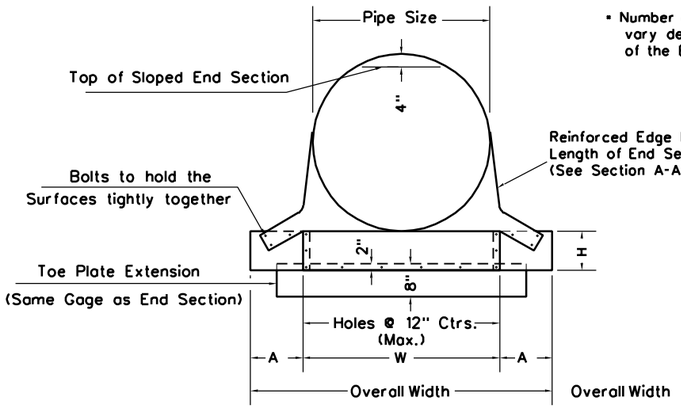
REVISION DATE

END SECTIONS FOR CORRUGATED STEEL PIPES AND PIPE ARCHES

STANDARD SHEET DR3

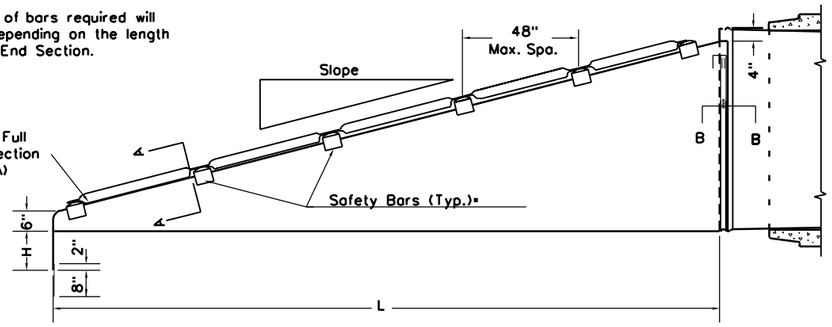


SIDE ELEVATION OF PARALLEL DRAINAGE STRUCTURE



FRONT VIEW

* Number of bars required will vary depending on the length of the End Section.



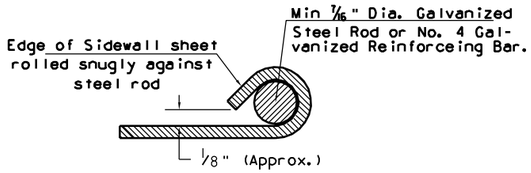
SIDE ELEVATION FOR CROSS DRAINAGE STRUCTURE

NOTES

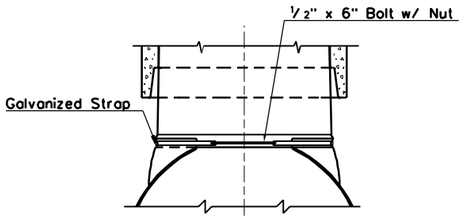
All notes on Standard Sheet DR3 are applicable to this Standard Sheet.

Slotted holes for safety bar attachment shall be provided for all end sections.

Safety bars shall be Schedule 40 Galvanized Steel Pipe conforming to ASTM A 53. Pipe to be galvanized after forming.



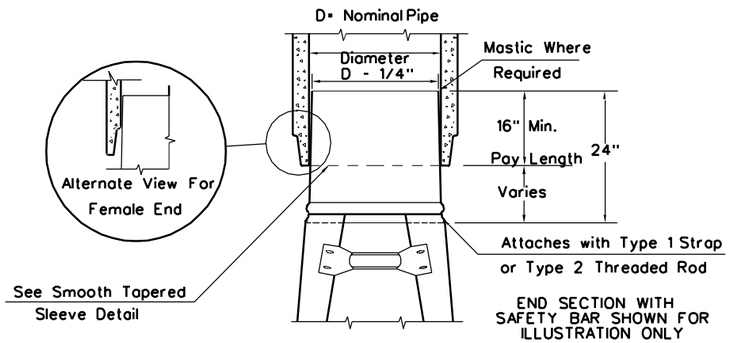
SECTION A-A

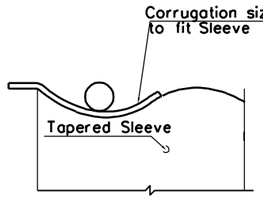


SECTION C-C

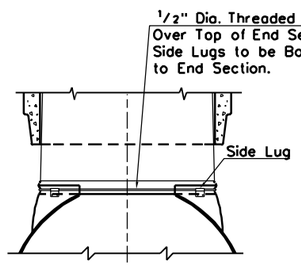
TYPE *1 CONNECTOR DETAIL

Thru 24"





SECTION B-B

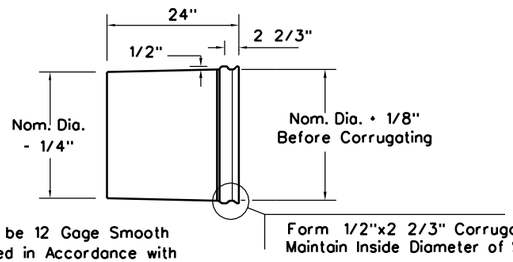


TYPE *2 CONNECTOR DETAILS

For 30" and Larger

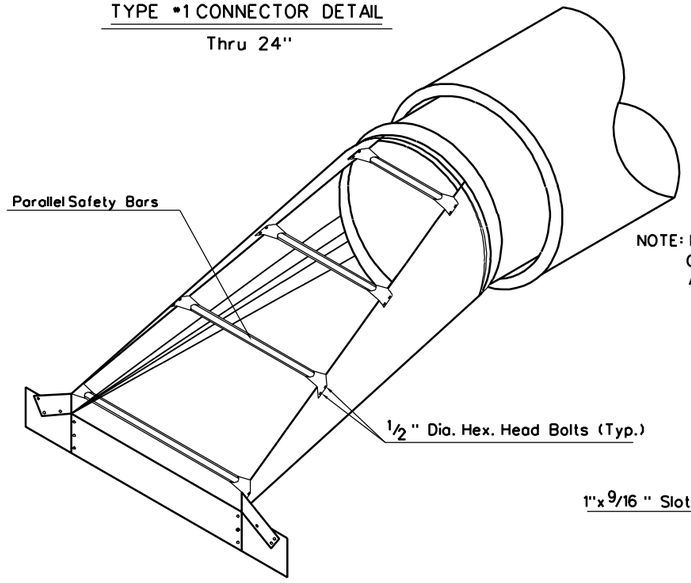
METAL END SECTIONS FOR CONCRETE PIPES										
Pipe Dia. (In.)	Min. Thick. In.	Gage	Dimensions (Inches) A	H	W	Overall Width	L Dimensions Slope	Length (In.)	Slope	Length (In.)
15	.064	16	8	6	21	37	4:1	20	6:1	30
18	.064	16	8	6	24	40	4:1	32	6:1	48
21	.064	16	8	6	27	43	4:1	44	6:1	66
24	.064	16	8	6	30	46	4:1	56	6:1	84
27	.109	12	12	9	33	57	4:1	68	6:1	102
30	.109	12	12	9	36	60	4:1	80	6:1	120
33	.109	12	12	9	36	63	4:1	92	6:1	138
36	.109	12	12	9	42	66	4:1	104	6:1	156
42	.109	12	16	12	48	80	4:1	128	6:1	192
48	.109	12	16	12	54	86	4:1	152	6:1	228
54	.109	12	16	12	60	92	4:1	176	6:1	264
60	.109	12	16	12	66	98	4:1	200	6:1	300

TAPERED SLEEVE FOR ATTACHING STEEL END SECTIONS TO CONCRETE PIPE

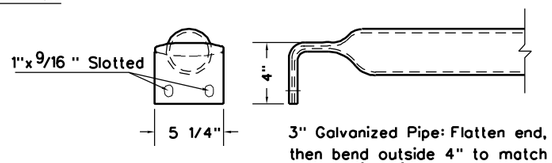


NOTE: Metal to be 12 Gage Smooth Galvanized in Accordance with AASHTO M218.

SMOOTH TAPERED SLEEVE DETAIL

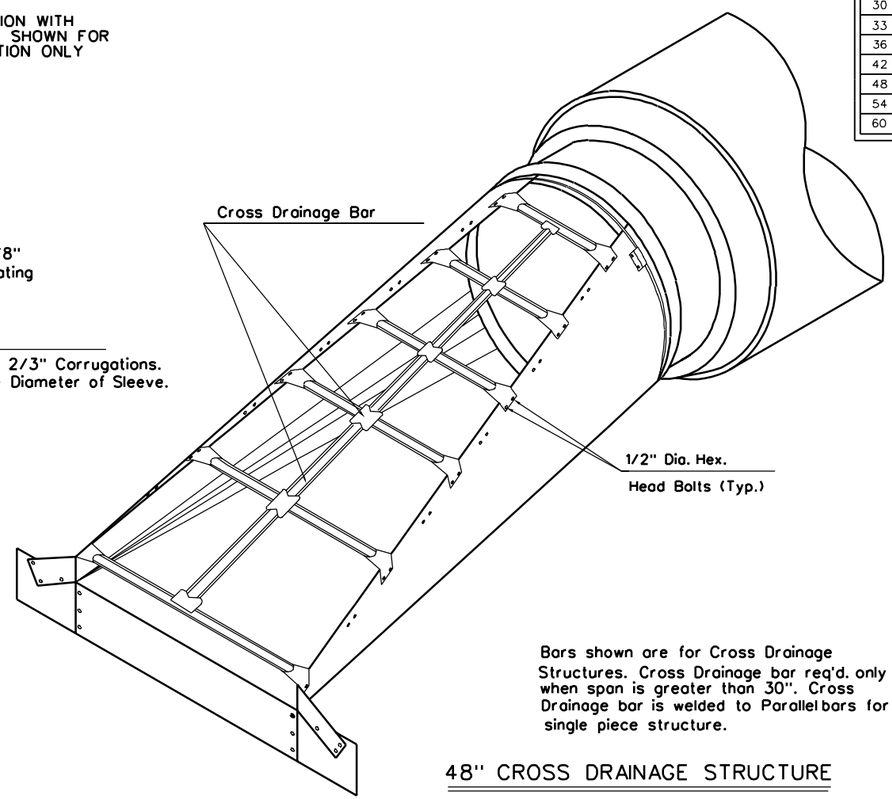


24" PARALLEL DRAINAGE STRUCTURE



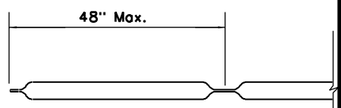
PARALLEL BARS

DETAIL OF SAFETY BARS



Bars shown are for Cross Drainage Structures. Cross Drainage bar req'd. only when span is greater than 30". Cross Drainage bar is welded to Parallel bars for single piece structure.

48" CROSS DRAINAGE STRUCTURE



CROSS DRAINAGE BAR

DETAIL OF SAFETY BARS

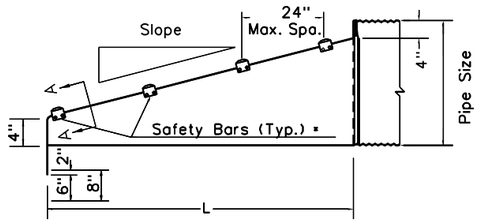
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

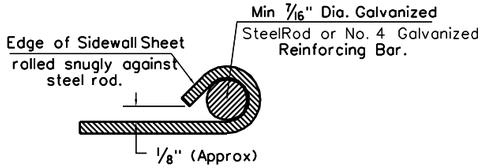
REVISION DATE

SAFETY SLOPE END SECTION FOR CONCRETE PIPE

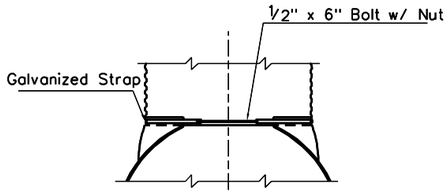
STANDARD SHEET DR4



SIDE ELEVATION OF PARALLEL DRAINAGE STRUCTURE

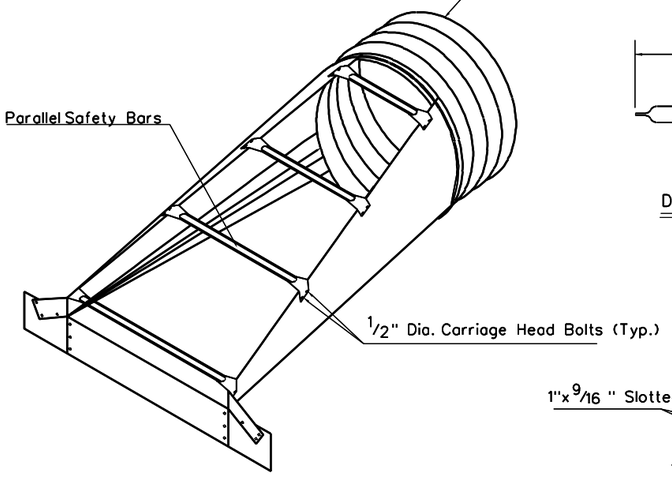


SECTION A-A

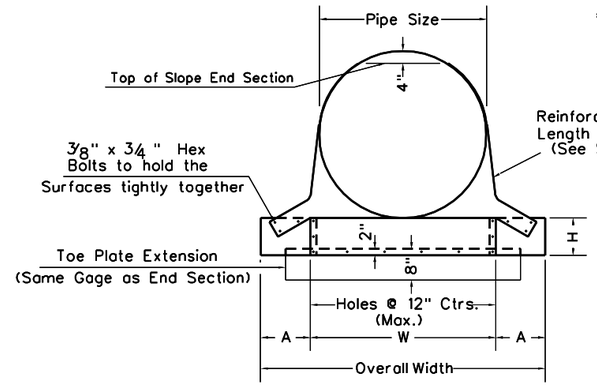


TYPE #1 CONNECTOR DETAIL

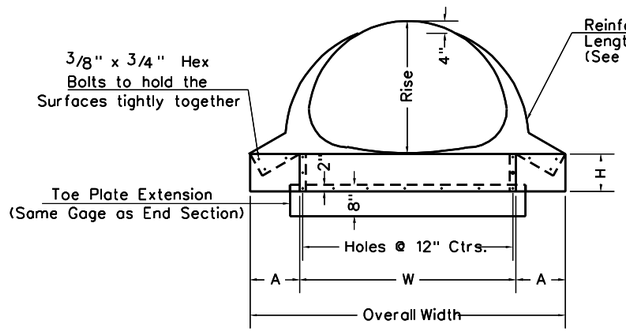
Thru 24"



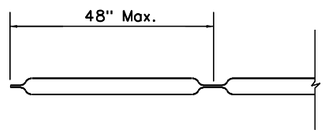
24" PARALLEL DRAINAGE STRUCTURE



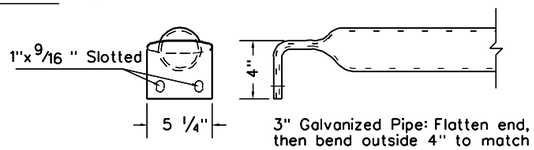
FRONT VIEW



FRONT VIEW



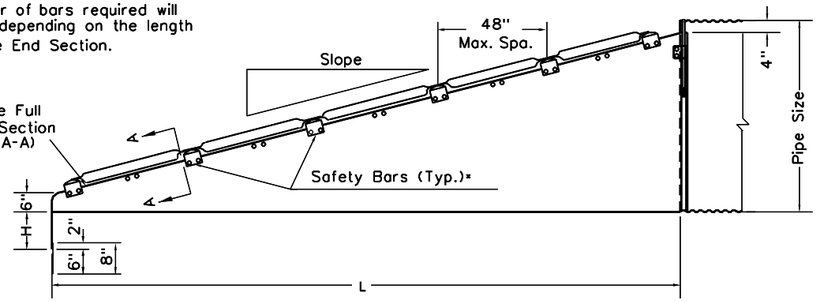
CROSS DRAINAGE BAR
DETAIL OF SAFETY BARS



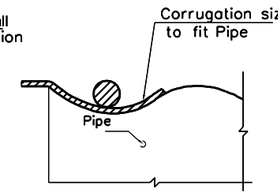
3" Galvanized Pipe: Flatten end, then bend outside 4" to match end section sides.

PARALLEL BARS
DETAIL OF SAFETY BARS

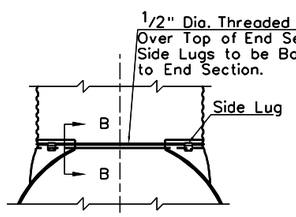
* Number of bars required will vary depending on the length of the End Section.



SIDE ELEVATION FOR CROSS DRAINAGE STRUCTURE

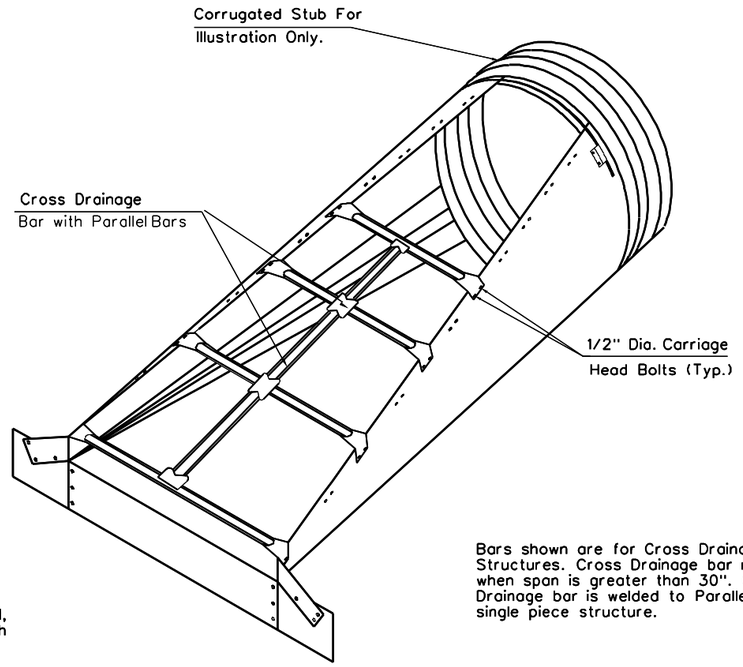


SECTION B-B



TYPE #2 CONNECTOR DETAILS

For 30" and Larger
21"x15" and Larger



CROSS DRAINAGE STRUCTURE

Bars shown are for Cross Drainage Structures. Cross Drainage bar req'd. when span is greater than 30". Cross Drainage bar is welded to Parallel bars for single piece structure.

NOTES

All notes on Standard Sheet DR3 are applicable to this Standard Sheet.

Slotted holes for safety bar attachment shall be provided for all end sections.

Safety bars shall be Schedule 40 Galvanized Steel Pipe conforming to ASTM A 53. Pipe to be galvanized after forming.

METAL END SECTIONS FOR CIRCULAR PIPES

Pipe Dia. (In.)	Min. Thick. In.	Min. Thick. Gage	Dimensions (Inches) A	H	W	Overall Width	L Dimensions Slope	Length (In.)	Slope	Length (In.)
15	.064	16	8	6	21	37	4:1	20	6:1	30
18	.064	16	8	6	24	40	4:1	32	6:1	48
21	.064	16	8	6	27	43	4:1	44	6:1	66
24	.064	16	8	6	30	46	4:1	56	6:1	84
30	.109	12	12	9	36	60	4:1	80	6:1	120
36	.109	12	12	9	42	66	4:1	104	6:1	156
42	.109	12	16	12	48	80	4:1	128	6:1	192
48	.109	12	16	12	54	86	4:1	152	6:1	228
54	.109	12	16	12	60	92	4:1	176	6:1	264
60	.109	12	16	12	66	98	4:1	200	6:1	300

METAL END SECTIONS FOR ARCHED PIPES

Equv. Dia. (In.)	(Inches) Span	Rise	Min. Thick. In.	Gage	Dimensions (Inches) A	H	W	Overall Width	L Dimensions Slope	Length (In.)	Slope	Length (In.)
18	21	15	.064	16	8	6	27	43	4:1	20	6:1	30
21	24	18	.064	16	8	6	30	46	4:1	32	6:1	48
24	28	20	.064	16	8	6	34	50	4:1	40	6:1	60
30	35	24	.079	14	12	9	41	65	4:1	56	6:1	84
36	42	29	.109	12	12	9	48	72	4:1	76	6:1	114
42	49	33	.109	12	16	12	55	87	4:1	92	6:1	138
48	57	38	.109	12	16	12	63	95	4:1	112	6:1	168
54	64	43	.109	12	16	12	70	102	4:1	132	6:1	198
60	71	47	.109	12	16	12	77	109	4:1	148	6:1	222
72	83	57	.109	12	16	12	89	121	4:1	188	6:1	282

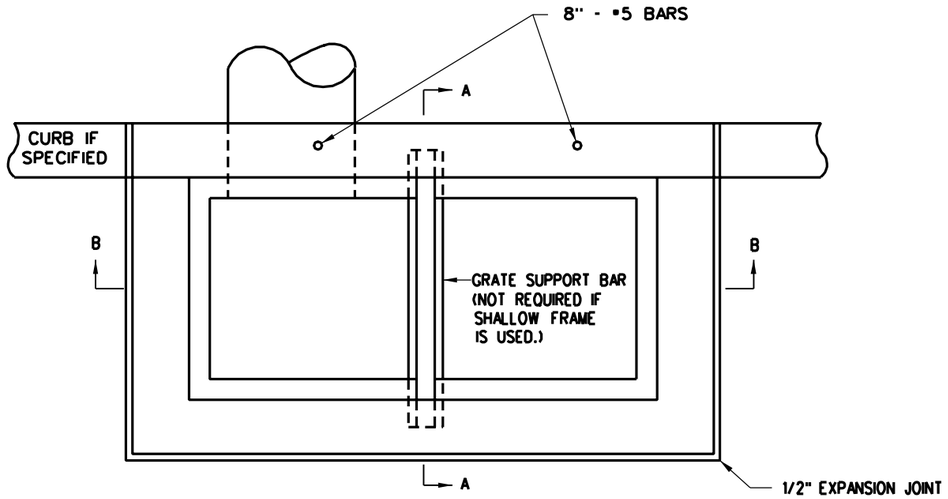
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

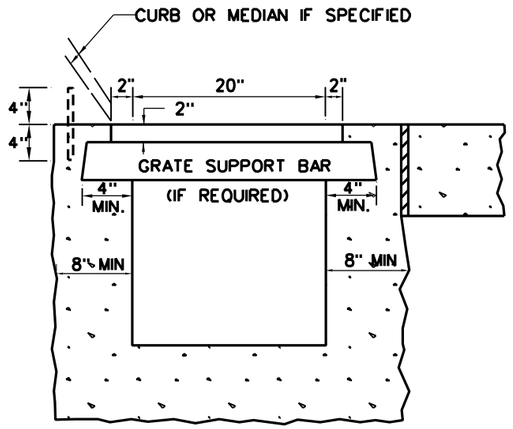
REVISION DATE

SAFETY SLOPE END SECTION FOR CIRCULAR & ARCHED STEEL PIPES

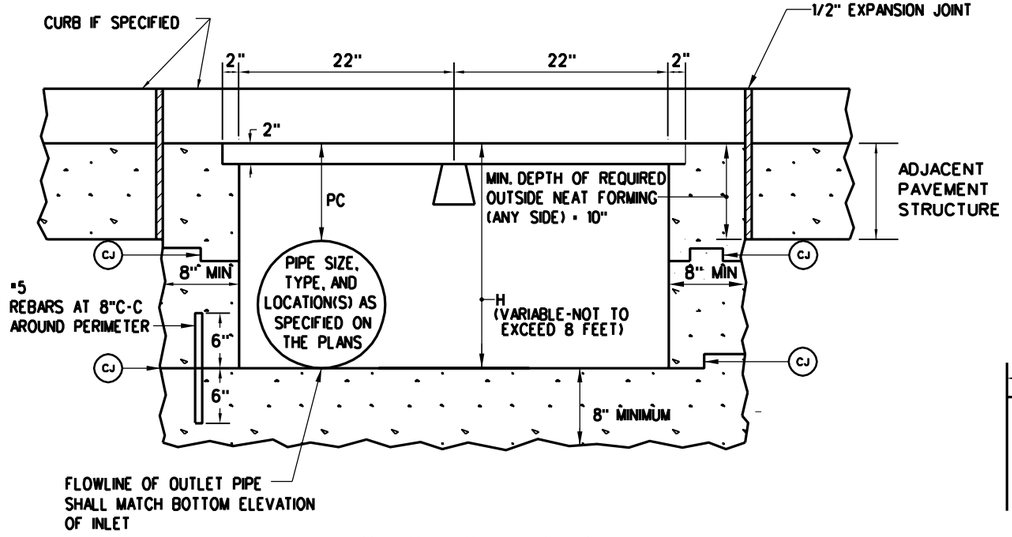
STANDARD SHEET DR5



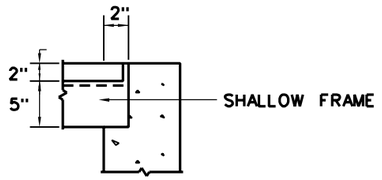
PLAN



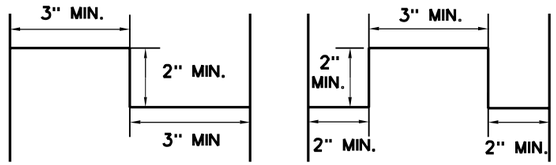
SECTION A-A



SECTION B-B



PARTIAL SECTION A-A
(WITH OPTIONAL SHALLOW FRAME)



CONSTRUCTION JOINT DETAILS

NOTES

THIS INLET SHOULD ONLY BE SPECIFIED WHEN ABUTTING CONCRETE PAVEMENT

THE FINAL INSTALLED TOP SURFACE OF INLET AND GRATE SHALL BE FLUSH WITH ADJACENT FINISHED SURFACES SUCH AS PAVEMENT, GUTTERS, CURBS, AND SIDEWALKS. TOP OF GRATE ELEVATION, IF SHOWN ON THE PLANS, IS FOR INFORMATION ONLY.

CONSTRUCTION MAY BE CAST-IN-PLACE, PRECAST IN ONE OR MULTIPLE SECTIONS, OR ANY COMBINATION OF CAST-IN-PLACE AND PRECAST.

REBARS ARE TO BE INSTALLED AT THE THIRD POINTS TO CONNECT CURB TO INLET. REBARS ARE NOT REQUIRED IF CURB IS POURED MONOLITHICALLY WITH INLET OR IF TYPE V OR VI MEDIAN IS SPECIFIED ON THE PLANS.

FOR DETAILS OF GRATE SUPPORT BAR, SHALLOW FRAME, AND GRATES (TWO REQUIRED), SEE INLET CASTINGS STANDARD SHEET DR6-X. USE OF THE SHALLOW FRAME WILL BE LIMITED TO ROADWAYS CONSTRUCTED OF CONCRETE PAVEMENT. IF ADJACENT ROADWAY IS BUILT OF HOT MIX ASPHALT PAVEMENT, THE FRAME AS REQUIRED FOR A TYPE F INLET (STANDARD SHEET DR6F) WILL BE REQUIRED.

THE CONTRACTOR MAY, AT HIS OPTION, OMIT USE OF THE FRAME BY FORMING A LEDGE IN THE CONCRETE.

SPECIAL CARE SHALL BE EXERCISED IN FORMING THE 2" WIDE CONCRETE LEDGE TO PROVIDE A SMOOTH, EVEN SURFACE FOR SUPPORTING THE GRATES IF THE SHALLOW FRAME IS NOT USED. NO PROJECTIONS SHALL EXIST ON THE BEARING SURFACES OF THE LEDGE OR THE GRATES, AND THE GRATES SHALL SEAT ON THE LEDGE WITHOUT ROCKING.

OPTIONAL CONSTRUCTION JOINTS LABELED "CJ" MAY BE ROUGHENED CONCRETE, KEYED OR DOWELED AS PER THE TYPICAL DETAILS SHOWN HEREIN OR AS APPROVED BY THE ENGINEER. NON SHRINK GROUT MEETING THE REQUIREMENTS OF SUBSECTION 715.5 OF THE SPECIFICATIONS MAY BE USED TO A DEPTH OF ½" FOR LEVELING BETWEEN PRECAST SECTIONS. THICKER DEPTHS WILL BE ALLOWED IF AS PER THE MANUFACTURER'S RECOMMENDATIONS.

PC (MINIMUM PIPE COVER) SHALL BE 12" BELOW INLET TOP FOR PIPES PLACED UNDER SIDEWALK OR GRASSED AREA OR 24" BELOW INLET TOP FOR PIPES PLACED UNDER PAVEMENT OR SHOULDER.

CURB, IF SPECIFIED, MAY BE EITHER CONCRETE PLACED ON THE INLET BACKWALL AS DETAILED HEREIN OR AN APPROVED CURB BOX AS MANUFACTURED WITH THE GRATE AND FRAME. DIMENSIONS OF THE CURB BOX SHOULD REASONABLY CONFORM TO THE STANDARD CURB AS SPECIFIED ON THE PLANS. THE CURB WILL BE PAID FOR PER SECTION 610, IN EITHER CASE

THIS INLET SHALL NOT BE PLACED IN A PEDESTRIAN CROSS WALK.

THE MINIMUM DISTANCE FROM THE TOP OF ANY PIPE OPENING TO ANY CONSTRUCTION JOINT ABOVE THE OPENING SHALL BE FOUR (4) INCHES.

THE NUMBER AND LOCATION OF PIPE OPENINGS SHALL BE AS SHOWN IN THE PLANS. THE CONTRACTOR AT NO ADDITIONAL COST, SHALL BE RESPONSIBLE FOR ANY TEMPORARY BRACING REQUIRED TO TRANSPORT PRECAST INLET SECTIONS DUE TO MUTIPLE OPENINGS.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

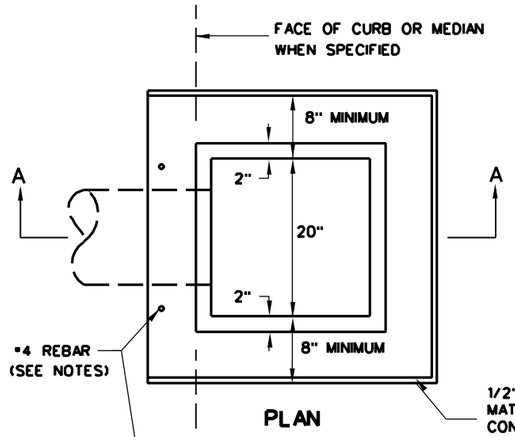
PREPARED 7-1-99

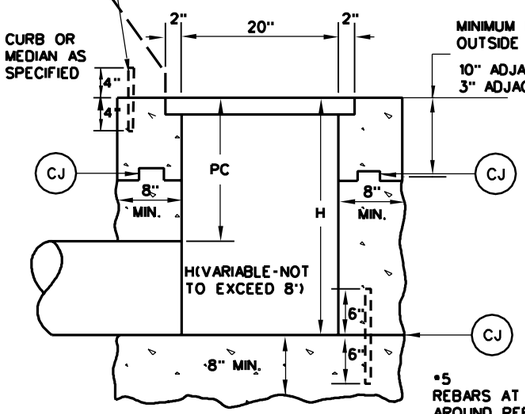
REVISION DATE

TYPE A INLET

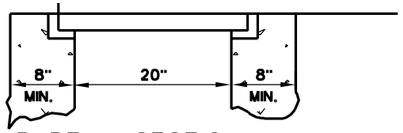
STANDARD SHEET DR6-A

SQUARE STYLE

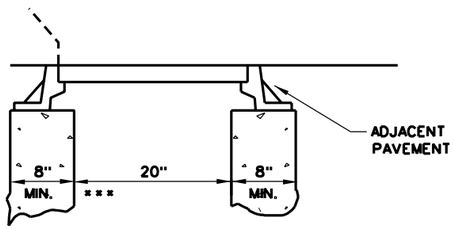




SECTION A-A
WITHOUT SHALLOW FRAME



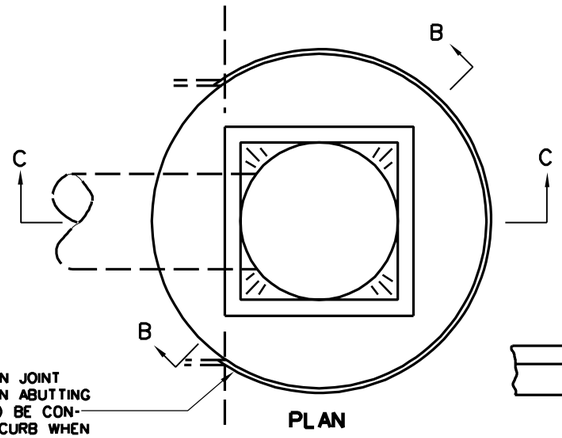
PARTIAL SECTION A-A
WITH SHALLOW FRAME

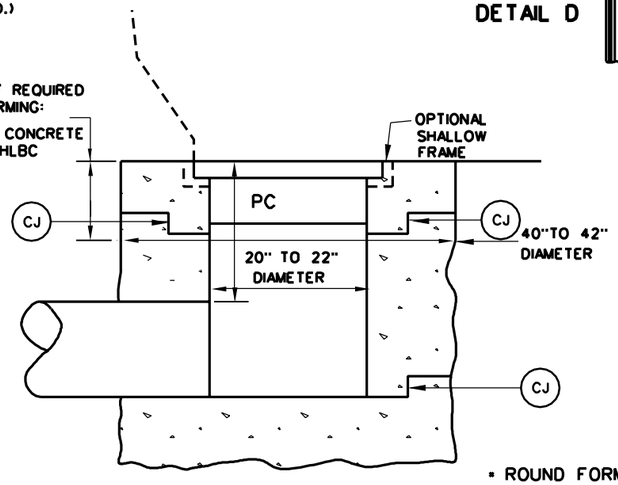


PARTIAL SECTION A-A
WITH DEEP FRAME

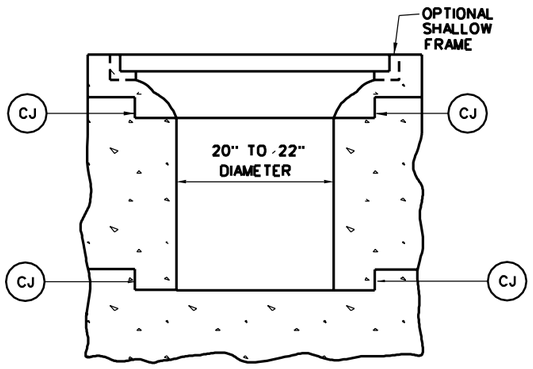
*** OPENING WILL BE 24" FOR 24" DIAMETER OUTLET PIPE

CIRCULAR STYLE 1



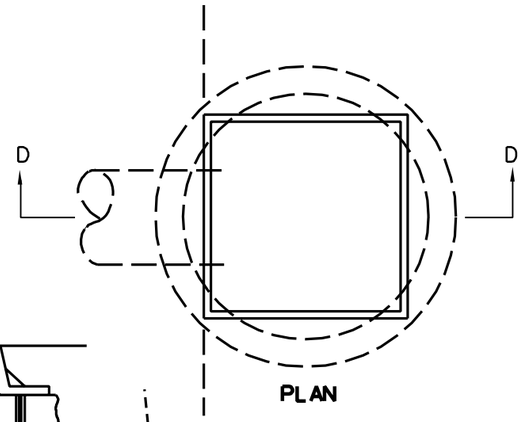


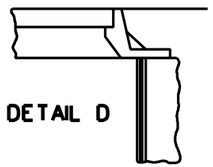
SECTION C-C

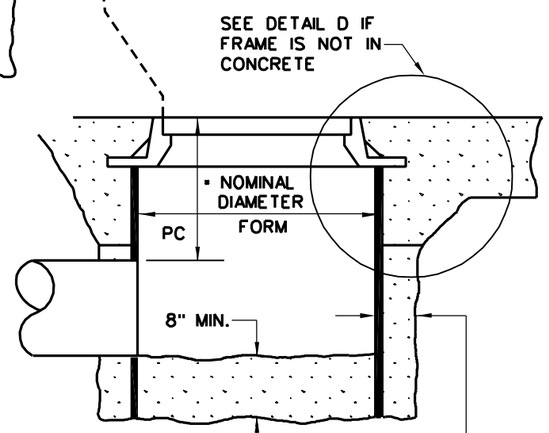


SECTION B-B

CIRCULAR STYLE 2



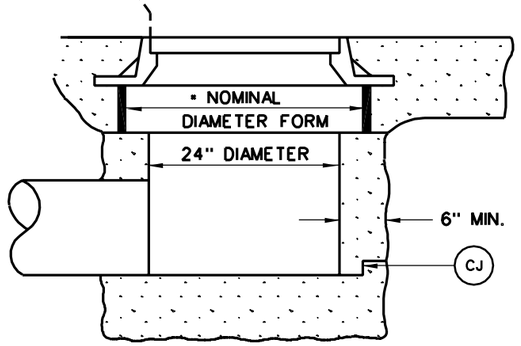




SECTION D-D

* ROUND FORM NOMINAL DIAMETERS:
CORRUGATED PIPE : 30"
FIBRE FORM : 28"

4" MIN. WITH PIPE FORM
6" MIN. WITH FIBRE FORM



SECTION D-D
OPTIONAL METHOD

NOTES

UNLESS OTHERWISE SPECIFIED ON THE PLANS, TYPE B INLETS MAY BE CONSTRUCTED IN ANY OF THE SHAPES SHOWN WHEN THE OUTLET PIPE DIAMETERS IS 21" OR LESS AND THE ADJACENT PAVEMENT IS CONCRETE.

IF THE OUTLET PIPE DIAMETER IS 24" OR THE ADJACENT PAVEMENT IS HOT MIX ASPHALT, ONLY THE SQUARE STYLE WITH THE DEEP FRAME WILL BE USED. THE INSIDE OPENING OF THE INLET WILL BE ADJUSTED TO ACCOMODATE THE 24" PIPE.

CONSTRUCTION MAY BE CAST-IN-PLACE, PRECAST IN ONE OR MULTIPLE SECTIONS, OR ANY COMBINATION OF CAST-IN-PLACE AND PRECAST.

OPTIONAL CONSTRUCTION JOINTS LABELED "CJ" MAY BE ROUGHENED CONCRETE, KEYED OR DOWELED AS PER THE TYPICAL DETAILS SHOWN HEREIN, OR AS APPROVED BY THE ENGINEER. NON SHRINK GROUT MEETING THE REQUIREMENTS OF SUBSECTION 715.5 OF THE SPECIFICATIONS MAY BE USED TO A DEPTH OF ½" FOR LEVELING BETWEEN PRECAST SECTIONS. THICKER DEPTHS WILL BE ALLOWED AS PER THE MANUFACTURER'S RECOMMENDATIONS.

THE FINAL INSTALLED TOP SURFACE OF INLET AND GRATE SHALL BE FLUSH WITH ADJACENT FINISHED SURFACES SUCH AS PAVEMENT, GUTTERS, CURBS, AND SIDEWALKS. TOP OF GRATE ELEVATION, IF SHOWN ON THE PLANS, IS FOR INFORMATION ONLY.

REBARS ARE TO BE INSTALLED AT THE QUARTER POINTS TO CONNECT CURB TO INLET. REBARS ARE NOT REQUIRED IF CURB IS POURED MONOLITHICALLY WITH THE INLET OR IF TYPE V OR VI MEDIAN IS SPECIFIED ON THE PLANS.

FOR DETAILS OF GRATES AND FRAMES, SEE INLET CASTING STANDARD SHEET DR6-X.

THE CONTRACTOR MAY, AT HIS OPTION, OMIT USE OF THE SHALLOW FRAME BY FORMING A LEDGE IN THE CONCRETE.

SPECIAL CARE SHALL BE EXERCISED IN FORMING THE 2" WIDE CONCRETE LEDGE TO PROVIDE A SMOOTH, EVEN SURFACE FOR SUPPORTING THE GRATE IF A FRAME IS NOT USED. NO PROJECTIONS SHALL EXIST ON THE GRATE AND THE GRATE SHALL SEAT ON THE LEDGE WITHOUT ROCKING.

FIBRE FORM SHALL BE REMOVED PRIOR TO COMPLETION OF THE PROJECT.

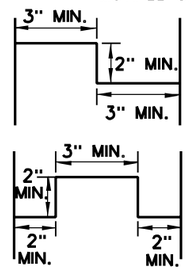
PC(MINIMUM PIPE COVER) SHALL BE 12" BELOW INLET TOP FOR PIPES PLACED UNDER SIDEWALK OR GRASSED AREA OR 24" BELOW INLET TOP FOR PIPES PLACED UNDER PAVEMENT OR SHOULDER.

CURB, IF SPECIFIED, MAY BE EITHER CONCRETE PLACED ON THE INLET BACKWALL AS DETAILED HEREIN OR AN APPROVED CURB BOX AS MANUFACTURED WITH THE GRATE AND FRAME. DIMENSIONS OF THE CURB BOX SHOULD REASONABLY CONFORM TO THE STANDARD CURB AS SPECIFIED ON THE PLANS. THE CURB WILL BE PAID FOR PER SECTION 610, IN EITHER CASE.

THIS INLET SHALL NOT BE PLACED IN A PEDESTRIAN CROSS WALK.

THE MINIMUM DISTANCE FROM THE TOP OF ANY PIPE OPENING TO ANY CONSTRUCTION JOINT ABOVE THE OPENING SHALL BE FOUR (4) INCHES.

THE NUMBER AND LOCATION OF PIPE OPENINGS SHALL BE AS SHOWN IN THE PLANS. THE CONTRACTOR AT NO ADDITIONAL COST, SHALL BE RESPONSIBLE FOR ANY TEMPORARY BRACING REQUIRED TO TRANSPORT PRECAST INLET SECTIONS DUE TO MUTIPLE OPENINGS.



CONSTRUCTION JOINT DETAILS

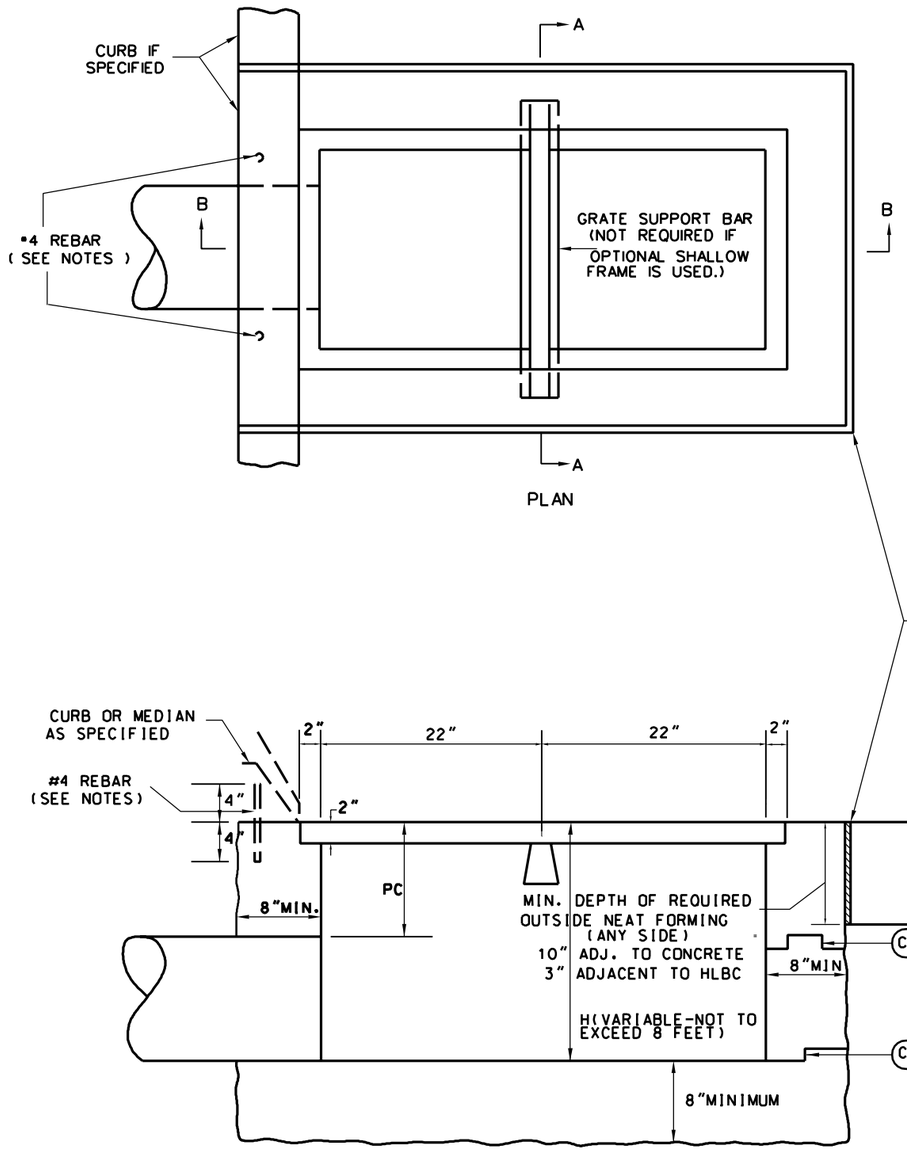
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

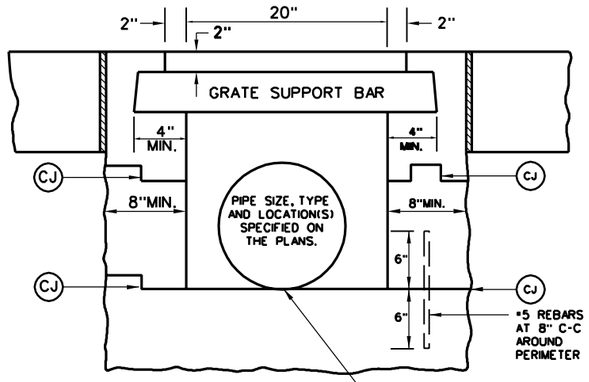
REVISION DATE

TYPE B INLET

STANDARD SHEET DR6-B

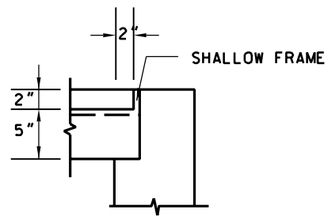


SECTION B-B



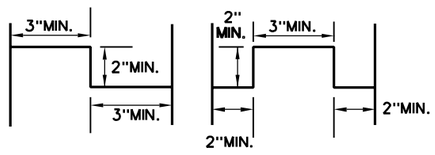
SECTION A-A

FLOWLINE OF OUTLET PIPE SHALL MATCH BOTTOM ELEVATION OF INLET.



PARTIAL SECTION A-A

(WITH OPTIONAL SHALLOW FRAME)



CONSTRUCTION JOINT DETAILS

NOTES

THE FINAL INSTALLED TOP SURFACE OF INLET AND GRATE SHALL BE FLUSH WITH ADJACENT FINISHED SURFACES SUCH AS PAVEMENT, GUTTERS, CURBS, AND SIDEWALKS. TOP OF GRATE ELEVATION, IF SHOWN ON THE PLANS, IS FOR INFORMATION ONLY.

CONSTRUCTION MAY BE CAST-IN-PLACE, PRECAST IN ONE OR MULTIPLE SECTIONS, OR ANY COMBINATION OF CAST-IN-PLACE AND PRECAST.

REBARS ARE TO BE INSTALLED AT THE QUARTER POINTS TO CONNECT CURB TO INLET. REBARS ARE NOT REQUIRED IF CURB IS POURED MONOLITHICALLY WITH INLET OR IF TYPE V OR VI MEDIAN IS SPECIFIED ON THE PLANS.

FOR DETAILS OF GRATE SUPPORT BAR, SHALLOW FRAME, AND GRATES (TWO REQUIRED), SEE INLET CASTINGS STANDARD SHEET DR6-X.

THE CONTRACTOR MAY, AT HIS OPTION, OMIT USE OF THE FRAME BY FORMING A LEDGE IN THE CONCRETE.

SPECIAL CARE SHALL BE EXERCISED IN FORMING THE 2" WIDE CONCRETE LEDGE TO PROVIDE A SMOOTH, EVEN SURFACE FOR SUPPORTING THE GRATES IF THE SHALLOW FRAME IS NOT USED. NO PROJECTIONS SHALL EXIST ON THE BEARING SURFACES OF THE LEDGE OR THE GRATES AND THE GRATES SHALL SEAT ON THE LEDGE WITHOUT ROCKING.

OPTIONAL CONSTRUCTION JOINTS LABELED "CJ" MAY BE ROUGHENED CONCRETE, KEYED OR DOWELED AS PER THE TYPICAL DETAILS SHOWN HEREIN OR AS APPROVED BY THE ENGINEER. NON SHRINK GROUT MEETING THE REQUIREMENTS OF SUBSECTION 715.5 OF THE SPECIFICATIONS MAY BE USED TO A DEPTH OF $\frac{1}{2}$" FOR LEVELING BETWEEN PRECAST SECTIONS. THICKER DEPTHS WILL BE ALLOWED AS PER THE MANUFACTURER'S RECOMMENDATIONS.

PC (MINIMUM PIPE COVER) SHALL BE 12" BELOW INLET TOP FOR PIPES PLACED UNDER SIDEWALK OR GRASSED AREA OR 24" BELOW INLET TOP FOR PIPES PLACED UNDER PAVEMENT OR SHOULDER.

CURB, IF SPECIFIED, MAY BE EITHER CONCRETE PLACED ON THE INLET BACKWALL AS DETAILED HEREIN OR AN APPROVED CURB BOX AS MANUFACTURED WITH THE GRATE AND FRAME. DIMENSIONS OF THE CURB BOX SHOULD REASONABLY CONFORM TO THE STANDARD CURB AS SPECIFIED ON THE PLANS. THE CURB WILL BE PAID FOR PER SECTION 610, IN EITHER CASE.

THIS INLET SHALL NOT BE PLACED IN A PEDESTRIAN CROSS WALK.

THE MINIMUM DISTANCE FROM THE TOP OF ANY PIPE OPENING TO ANY CONSTRUCTION JOINT ABOVE THE OPENING SHALL BE FOUR (4) INCHES.

THE NUMBER AND LOCATION OF PIPE OPENINGS SHALL BE AS SHOWN IN THE PLANS. THE CONTRACTOR AT NO ADDITIONAL COST, SHALL BE RESPONSIBLE FOR ANY TEMPORARY BRACING REQUIRED TO TRANSPORT PRECAST INLET SECTIONS DUE TO MUTIPLE OPENINGS.

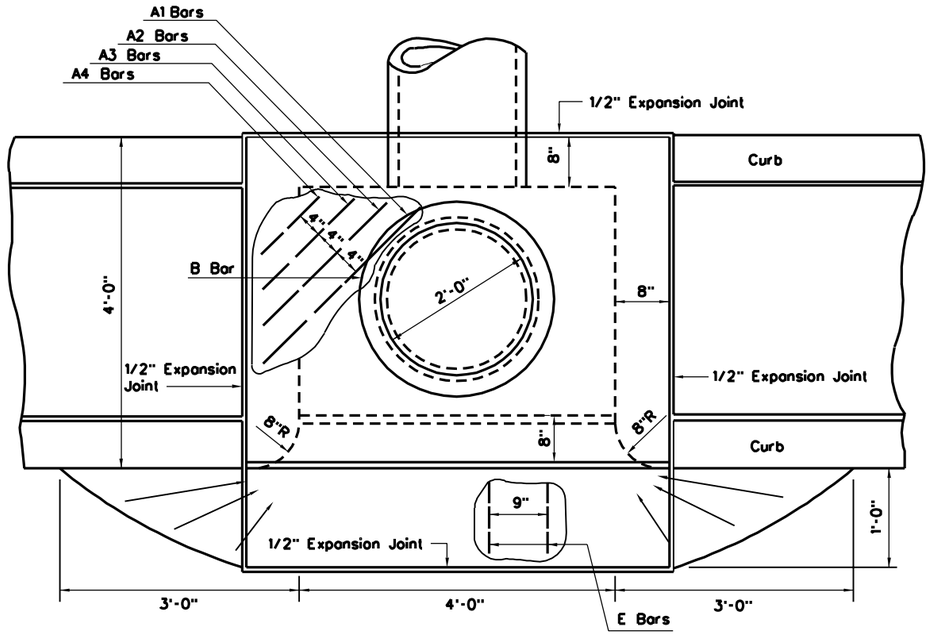
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

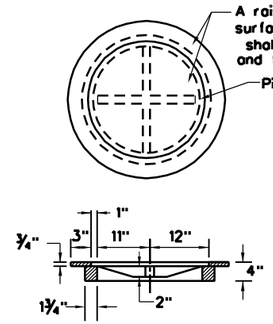
REVISION DATE

TYPE C INLET

STANDARD SHEET DR6-C



PLAN



DETAIL OF FRAME AND COVER CASTING (RING TYPE)

NOTES

Optional construction joints labeled "CJ" may be roughened concrete, keyed or doweled as per the typical details shown herein or as approved by the Engineer. Non shrink grout meeting the requirements of subsection 715.5 of the specifications may be used to a depth of 1/2" for leveling between precast sections. Thicker depths will be allowed if as per the manufacturer's recommendations.

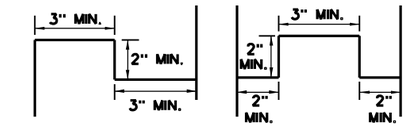
The covering for reinforcing steel shall be two inches, measured from the surface of the concrete to the face of the bar, unless otherwise shown. All reinforcing steel shall be epoxy coated and meet the requirements of section 602 of the specifications.

This inlet shall not be placed in a pedestrian cross walk.

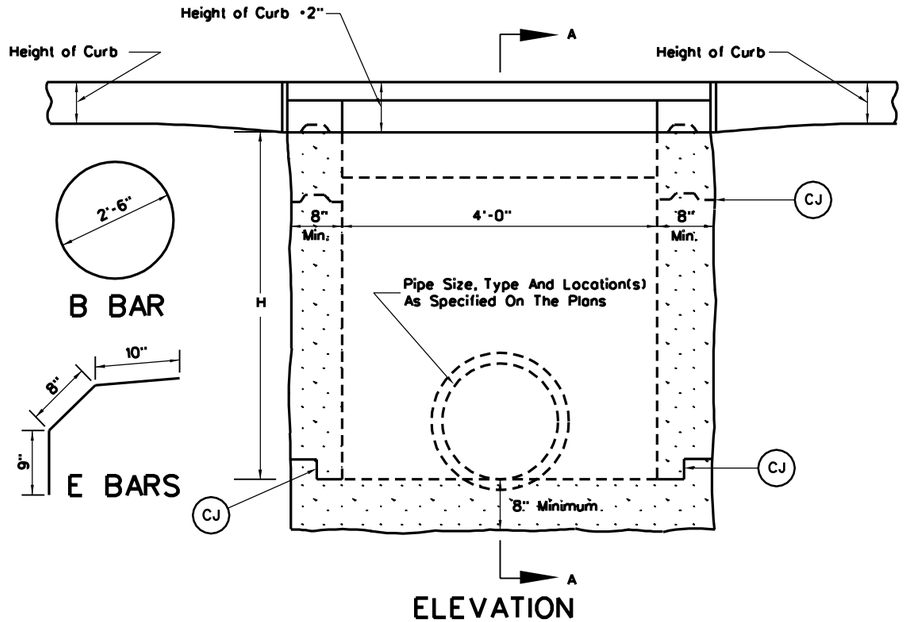
Construction may be cast-in-place, precast in one or multiple sections, or any combination of cast-in-place and precast.

The minimum distance from the top of any pipe opening to any construction joint above the opening shall be four (4) inches.

The number and location of pipe openings shall be as shown in the plans. The contractor at no additional cost, shall be responsible for any temporary bracing required to transport precast inlet sections due to multiple openings.



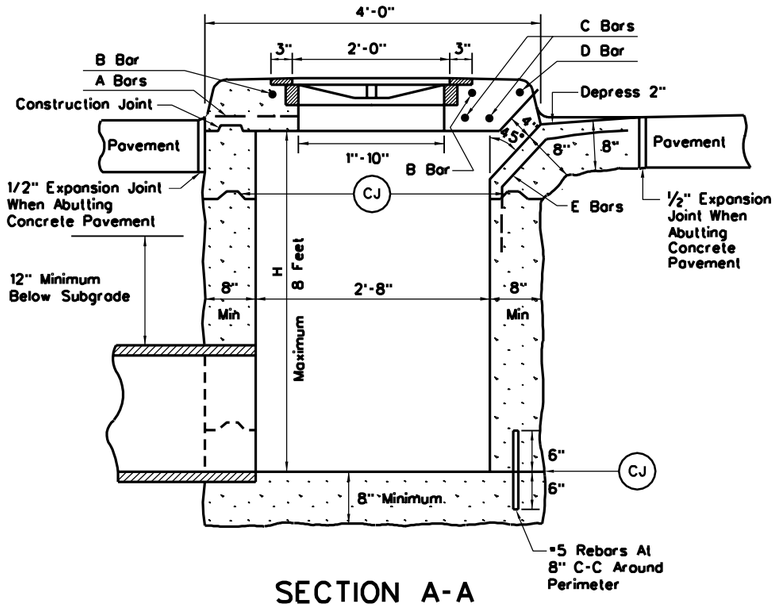
CONSTRUCTION JOINT DETAILS



B BAR

E BARS

ELEVATION



SECTION A-A

BILL OF STEEL

Mark	Size Bar	No.	Length	Weight
A1	#5	2	3'-11"	8 lbs.
A2	#5	2	3'-3"	7
A3	#5	2	2'-7"	5
A4	#5	2	1'-11"	6
B	#5	1	8'-0"	8
C	#8	2	5'-0"	27
D	#5	1	5'-0"	5
E	#5	6	2'-3"	14
			Total	80 lbs.

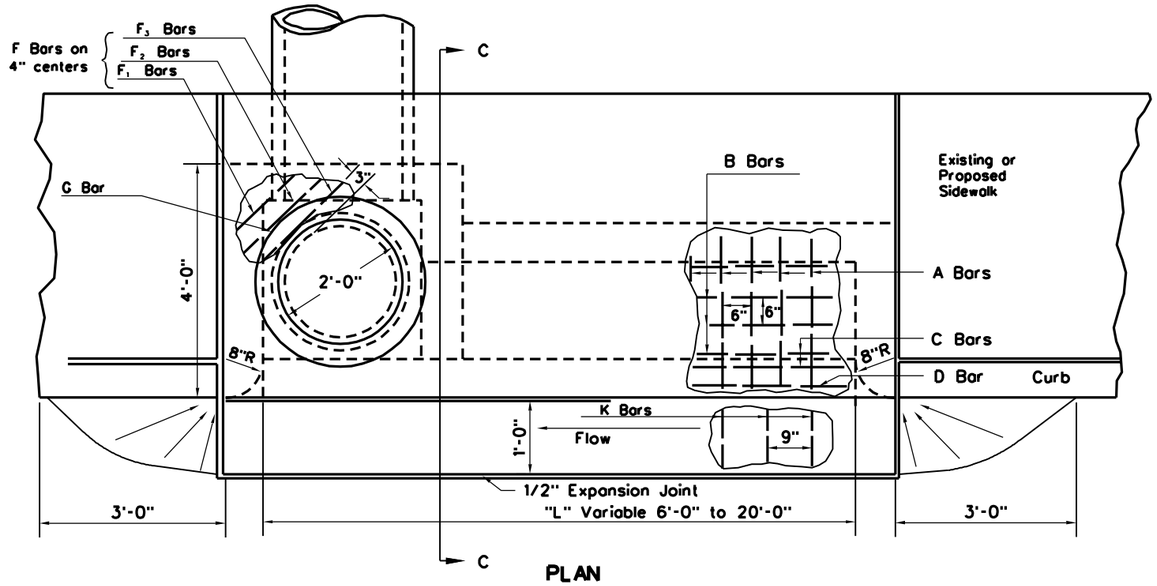
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

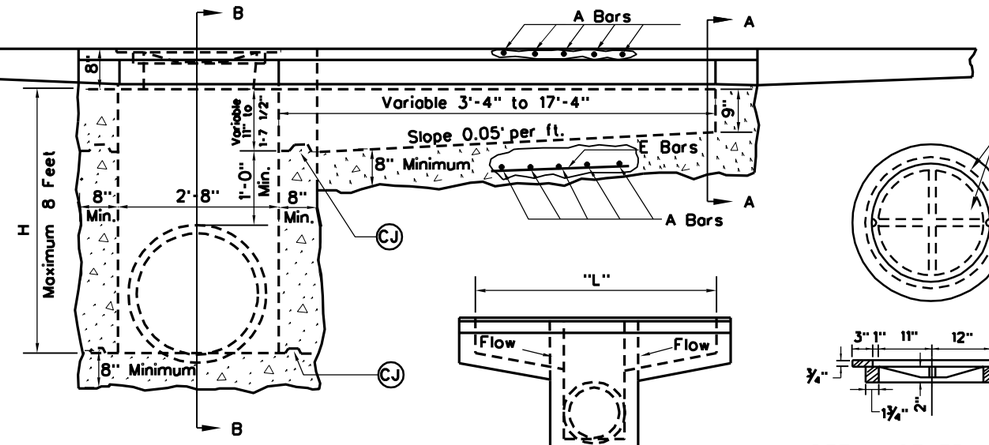
REVISION DATE

TYPE D INLET

STANDARD SHEET DR6-D

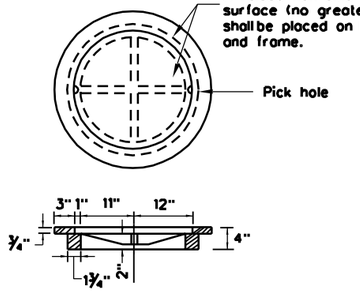


PLAN

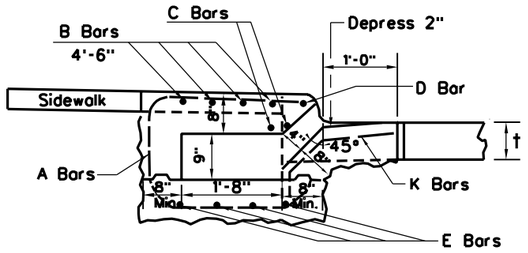


ELEVATION

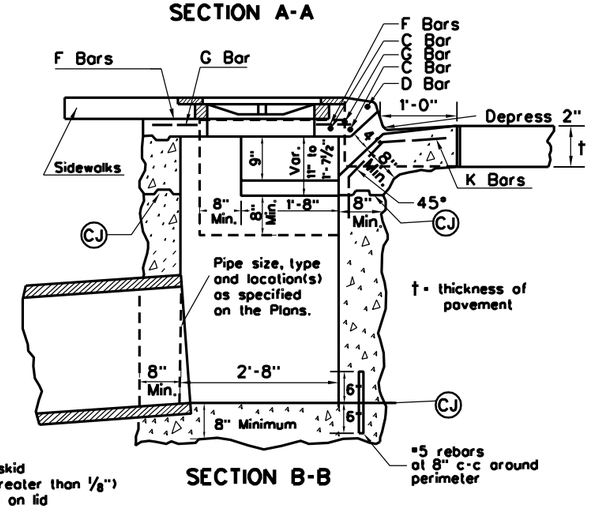
SKETCH SHOWING USE OF INLET IN SAGS. BOTH SIDES TO BE SYMMETRICAL.



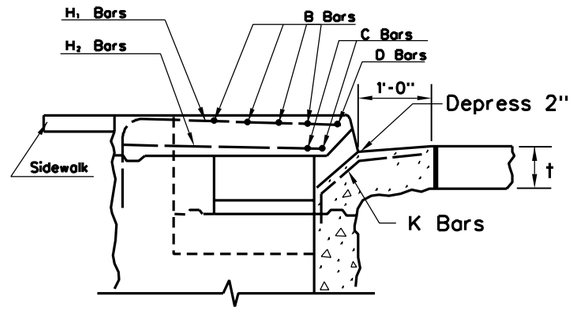
DETAIL OF FRAME AND COVER CASTING



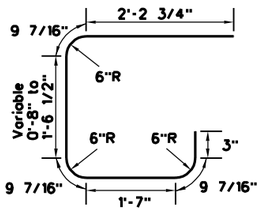
SECTION A-A



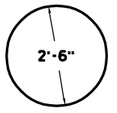
SECTION B-B



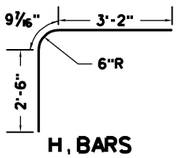
SECTION C-C



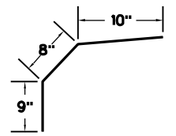
A BARS



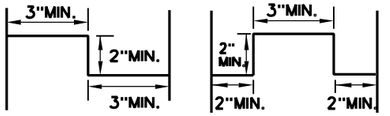
G BAR



H, BARS



K BARS



CONSTRUCTION JOINT DETAILS

NOTES

Type E inlet detailed herein is for use on a grade. If it is to be used in a sag (see sketch herein) it should be built symmetrically about centerline of pipe and length of opening specified.

The covering for reinforcing steel shall be two inches, measured from the surface of the concrete to the face of the bar, unless otherwise shown. All reinforcing steel shall be epoxy-coated and meet the requirements of Section 602 of the Specifications.

Optional construction joints labeled "CJ" may be keyed or doweled as per the typical details shown herein or as approved by the Engineer.

If Type E Inlet is to be constructed along with a sidewalk, the sidewalk shall be constructed monolithic with the top slab on the inlet. The sidewalk shall be reinforced with Type B Fabric placed 2" from bottom of sidewalk and extended into the top slab of the inlet a minimum distance of 8". Cost of Type B Fabric shall be included in the unit price bid for Concrete Sidewalk.

This inlet shall not be placed in a pedestrian cross walk.

CONCRETE AND REINFORCING STEEL QUANTITIES

"L" Feet	Concrete C.Y.*	Reinforcing Steel lbs.	A Bars (Bent)			B Bars (Straight)			C Bars (Straight)			D Bars (Straight)			E Bars (Straight)			F1 Bars (Straight)			F2 Bars (Straight)			F3 Bars (Straight)			G Bar (Bent)			H1 Bars (Straight)			H2 Bars (Straight)			K Bars (Bent)		
			No.	Size	Length	No.	Size	Length	No.	Size	Length	No.	Size	Length	No.	Size	Length	No.	Size	Length	No.	Size	Length	No.	Size	Length	No.	Size	Length	No.	Size	Length	No.	Size	Length	No.	Size	Length
6	2.59	189	5	#5	7'-1" to 7'-3"	4	#5	3'-9"	2	#5	7'-1"	1	#5	7'-1"	4	#5	3'-6"	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	10	#5	2'-3"
8	3.07	250	9	#5	7'-1" to 7'-4"	4	#5	5'-9"	2	#5	9'-1"	1	#5	9'-1"	4	#5	5'-6"	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	13	#5	2'-3"
10	3.57	308	13	#5	7'-1" to 7'-5"	4	#5	7'-9"	2	#5	11'-1"	1	#5	11'-1"	4	#5	7'-6"	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	15	#5	2'-3"
12	4.09	369	17	#5	7'-1" to 7'-6"	4	#5	9'-9"	2	#5	13'-1"	1	#5	13'-1"	4	#5	9'-6"	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	18	#5	2'-3"
14	4.62	444	21	#5	7'-1" to 7'-7"	4	#5	11'-9"	2	#6	15'-1"	1	#5	15'-1"	4	#5	11'-6"	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	21	#5	2'-3"
16	5.17	506	25	#5	7'-1" to 7'-9"	4	#5	13'-9"	2	#6	17'-1"	1	#5	17'-1"	4	#5	13'-6"	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	23	#5	2'-3"
18	5.74	570	29	#5	7'-1" to 7'-10"	4	#5	15'-9"	2	#6	19'-1"	1	#5	19'-1"	4	#5	15'-6"	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	26	#5	2'-3"
20	6.19	636	33	#5	7'-1" to 8'-0"	4	#5	17'-9"	2	#6	21'-1"	1	#5	21'-1"	4	#5	17'-6"	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	29	#5	2'-3"

* The quantities shown above are for an H of five feet. If deeper inlets are required the quantities must be adjusted accordingly.

The above table to be used for estimating purposes only.

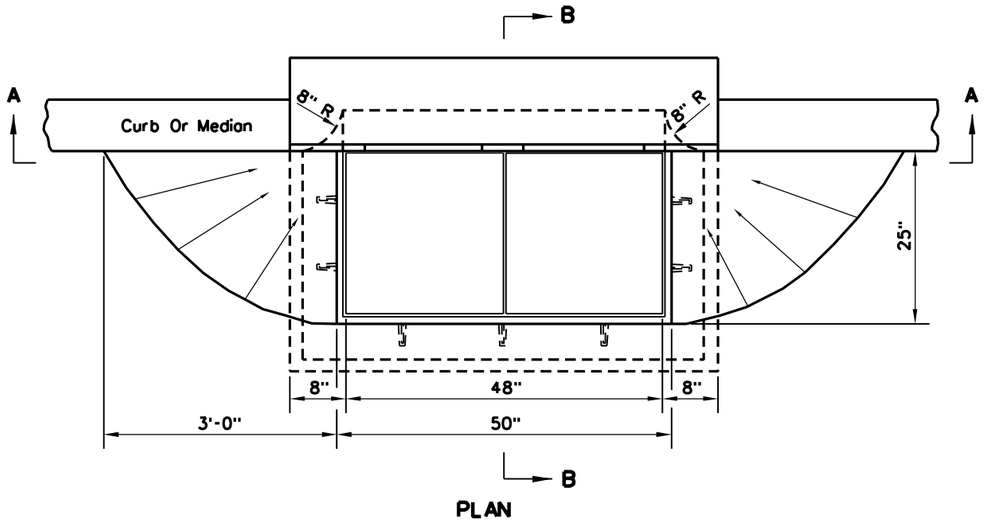
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

REVISION DATE

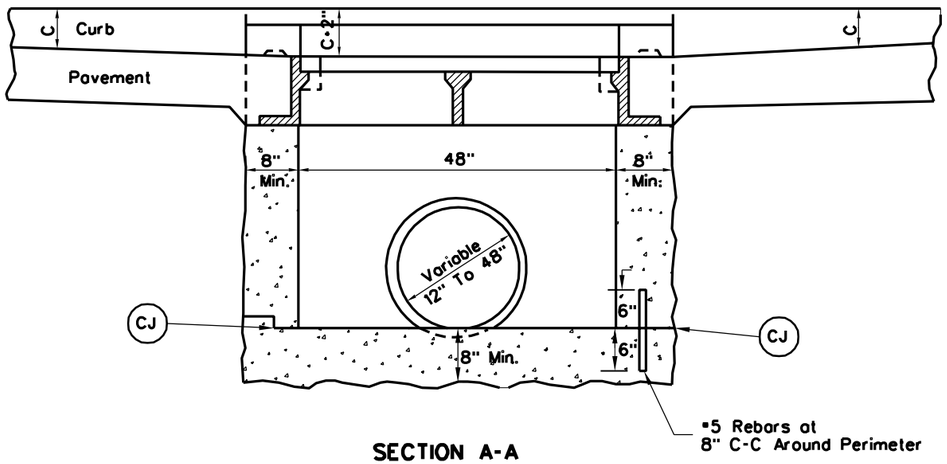
TYPE E INLET

STANDARD SHEET DR6-E

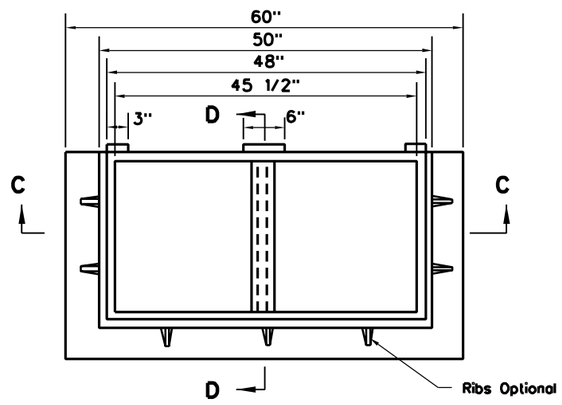


PLAN

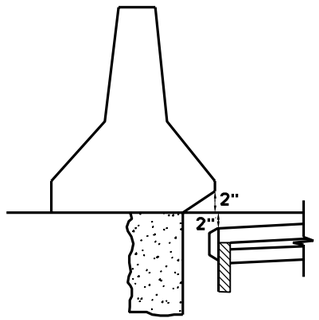
C = Curb Height



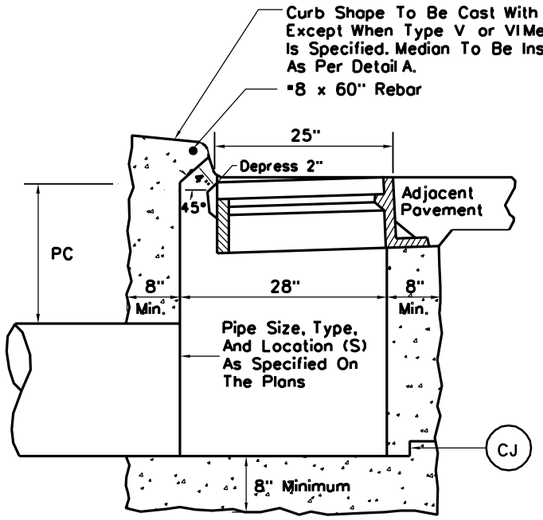
SECTION A-A
(Grates Not Shown)



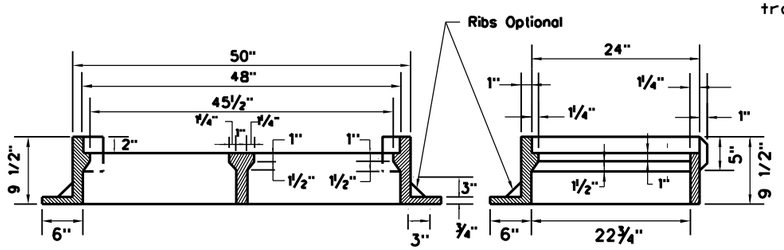
PLAN



DETAIL A

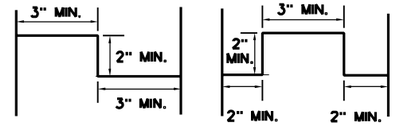


SECTION B-B
(Grates Not Shown)



SECTION C-C SECTION D-D

DETAIL OF FRAME



CONSTRUCTION JOINT DETAILS

NOTES

The final installed top surface of inlet and grate shall be flush with adjacent finished surfaces such as pavement, gutters, curbs, and sidewalks. Top of grate elevation, if shown on the plans, is for information only.

Construction may be cast-in place, precast in one or multiple sections, or any combination of cast-in-place and precast.

Optional construction joints labeled" CJ" may be roughened concrete, keyed or doweled as per the typical details shown herein or as approved by the Engineer. Non shrink grout meeting the requirements of subsection 715.5 of the specifications may be used to a depth of ½" for leveling between precast sections. Thicker depths will be allowed if as per the manufacturer's recommendations.

The covering for reinforcing steel shall be two inches, measured from the surface of the concrete to the face of the bar, unless otherwise shown.

For details of grates (two required), see Inlet Castings Standard Sheet DR6-X.

PC (minimum pipe cover) shall be 12" below inlet top for pipes placed under sidewalk or grassed area or 24" below inlet top for pipes placed under pavement or shoulder.

Curb, if specified, may be either concrete placed on the inlet backwall as detailed herein or an approved curb box as manufactured with the grate and frame. Dimensions of the curb box should reasonablyconform to the standard curb as specified on the plans.The curb will be paid for per section 610, in either case.

This inlet shall not be placed in a pedestrian cross walk.

The minimum distance from the top of any pipe opening to any construction joint above the opening shall be four (4) inches.

The number and location of pipe openings shall be as shown in the plans. The contractor at no additional cost, shall be responsible for any temporary bracing required to transport precast inlet sections due to multiple openings.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

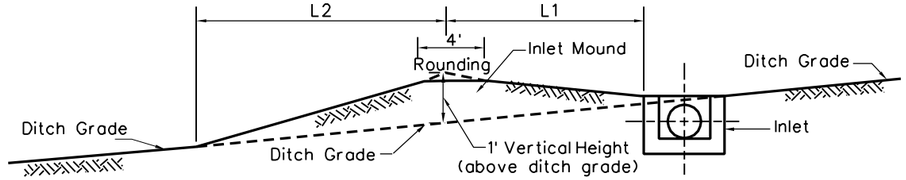
PREPARED 7-1-99

REVISION DATE

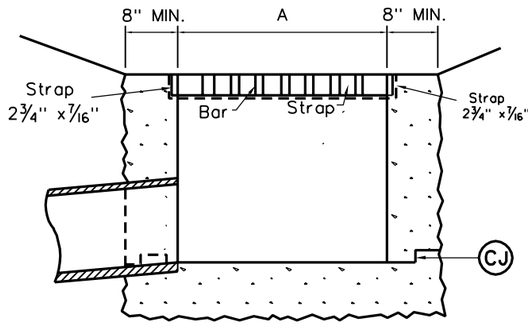
TYPE F INLET

STANDARD SHEET DR6-F

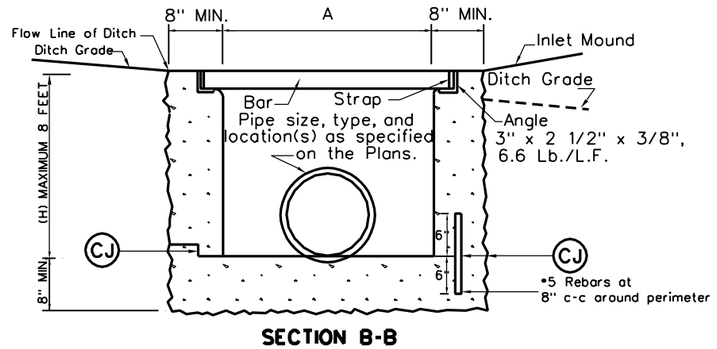
INLET MOUNDING TABLE			
DITCH GRADE (Z)		L1, HORIZONTAL LENGTH (FT.)	L2, HORIZONTAL LENGTH (FT.)
FROM	TO		
0	3	10	15
3	5	9	20
5	7.5	8	40
7.5	UP	SPECIAL DESIGN	SPECIAL DESIGN



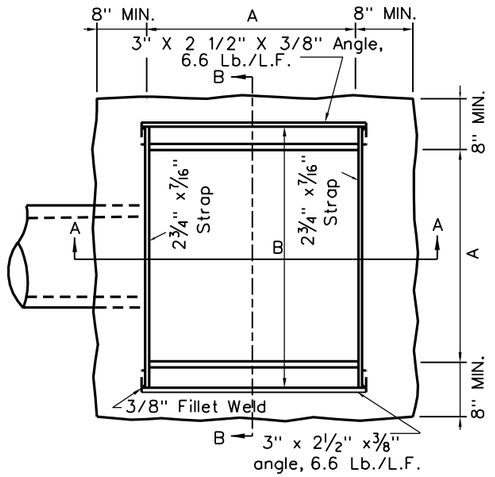
MOUNDING DETAIL
Median and Side Ditches



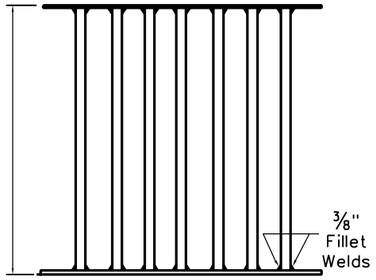
SECTION A-A
(Type 2 Grate Shown)



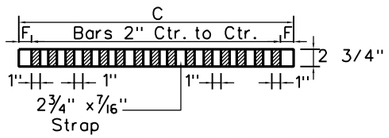
SECTION B-B



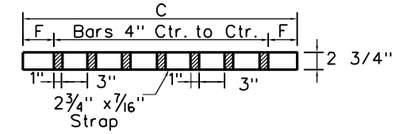
PLAN



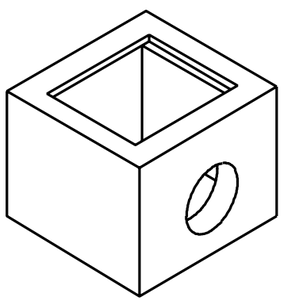
PLAN VIEW-TYPE 2 GRATE



SECTION THROUGH TYPE 1 GRATE



SECTION THROUGH TYPE 2 GRATE



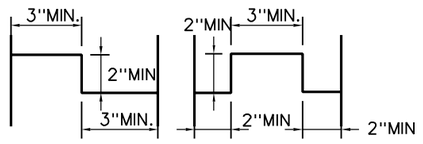
EXPLODED DETAIL

DIMENSIONS						TYPE 2 GRATE			FRAME	TYPE 1 GRATE		
Pipe Size	A	B	C	D	H(Min)	F	Bars	WT.	WT.	F	Bars	WT.
18"	2'-8"	3'-2"	2'-7 3/4"	3'-1 3/4"	2'-0"	3 3/8"	7	223	62	1 3/8"	15	453
21"	2'-8"	3'-2"	2'-7 3/4"	3'-1 3/4"	2'-3"	3 3/8"	7	223	62	1 3/8"	15	453
24"	2'-8"	3'-2"	2'-7 3/4"	3'-1 3/4"	2'-6"	3 3/8"	7	223	62	1 3/8"	15	453
27"	3'-0"	3'-6"	2'-11 3/4"	3'-5 3/4"	2'-9"	3 3/8"	8	279	69	1 3/8"	17	566
30"	3'-6"	4'-0"	3'-5 3/4"	3'-11 3/4"	3'-0"	3 3/8"	9	357	80	1 3/8"	21	797
33"	3'-9"	4'-3"	3'-8 3/4"	4'-2 3/4"	3'-3"	3 7/8"	10	419	85	1 7/8"	21	847
36"	4'-0"	4'-6"	3'-11 3/4"	4'-5 3/4"	3'-6"	3 3/8"	11	486	90	1 3/8"	23	981
42"	4'-6"	5'-0"	4'-5 3/4"	4'-11 3/4"	4'-0"	3 3/8"	12	587	101	1 3/8"	27	1277
48"	5'-0"	5'-6"	4'-11 3/4"	5'-5 3/4"	4'-6"	3 3/8"	14	748	112	1 3/8"	29	1507

Table Note: Grate and frame weights are for information only and will increase if larger straps and bars are used.

The following substitutions in dimensions are acceptable for fabricating the grate and frame:

Strap Thickness: 1/2" Strap Depth: 3" Bar Depth: 3"



CONSTRUCTION JOINT DETAILS

NOTES

The final installed top surface of inlet and grate shall be flush with adjacent finished surfaces such as pavement, gutters, curbs, and sidewalks. Top of grate elevation, if shown on the plans, is for information only.

Construction may be cast-in place, precast in one or multiple sections, or any combination of cast-in-place and precast.

Type 2 Grate shall be used at all locations unless otherwise specified on the Plans. Type 1 Urban Grates shall be used only at specially designated locations as shown on the plans.

The Contractor, at his option, may omit use of the frame by forming a ledge in the concrete.

Special care shall be execised in forming the 2" wide concrete ledge to provide a smooth, even surface for supporting the grates if the shallow frame is not used. no projections shall exist on the bearing surfaces of the ledge or the grates, and the grates shall seat on the ledge without rocking.

The Mounding Detail as shown is not required when an inlet is placed in a sag.

Optional construction joints labeled "CJ" may be roughened concrete, keyed or doweled as per the typical details shown herein or as approved by the Engineer. Non shrink grout meeting the requirements of subsection 715.5 of the specifications may be used to a depth of 1/2" for leveling between precast sections. Thicker depths will be allowed as per the manufacturer's recommendations.

This inlet is to be installed in roadside or median ditches only. It is not to be placed adjacent to pavement or in the gutter pan of combination curb and gutter.

The minimum distance from the top of any pipe opening to any construction joint above the opening shall be four (4) inches.

The number and location of pipe openings shall be as shown in the plans. The contractor at no additional cost, shall be responsible for any temporary bracing required to transport precast inlet sections due to multiple openings.

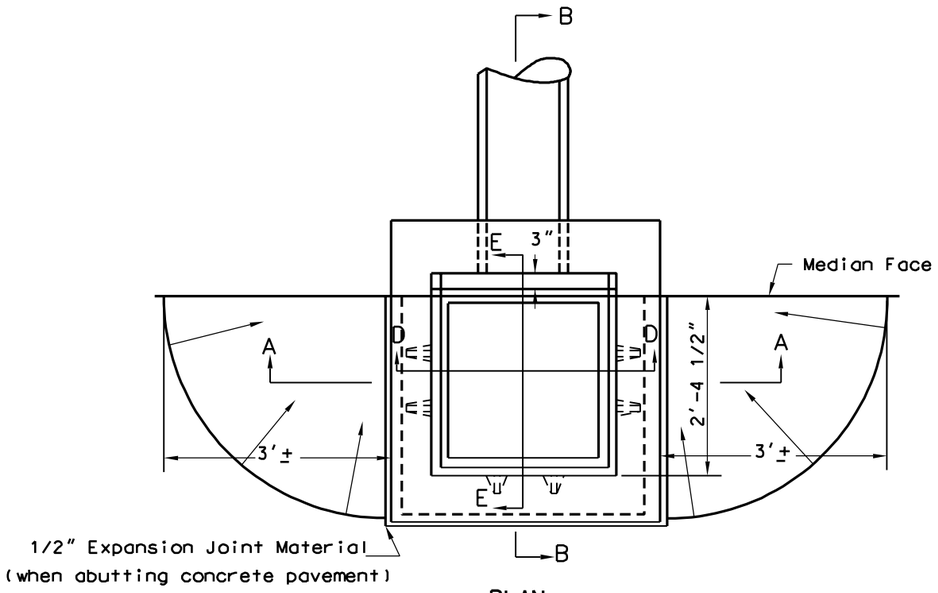
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

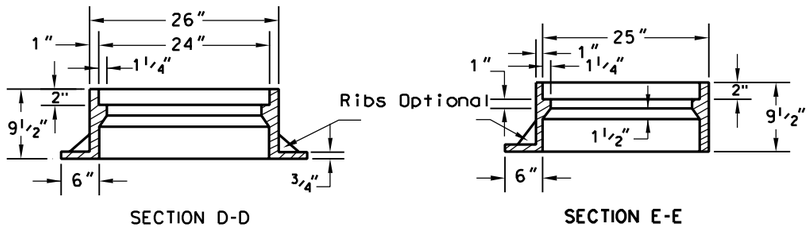
REVISION DATE

TYPE G INLET

STANDARD SHEET DR6-G



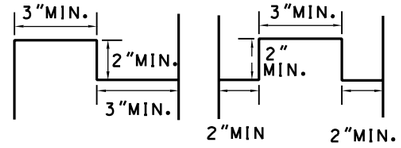
PLAN
(Grate not shown)



SECTION D-D

SECTION E-E

DETAIL OF FRAME



CONSTRUCTION JOINT DETAILS

NOTES

The final installed top surface of inlet and grate shall be flush with adjacent finished surfaces such as pavement, gutters, curbs, and sidewalks. Top of grate elevation, if shown on the plans, is for information only.

Construction may be cast-in place, precast in one or multiple sections, or any combination of cast-in-place and precast.

This inlet is intended for use with type V and VI medians (concrete barrier medians) as specified on the plans.

Optional construction joints labeled" CJ" may be roughened concrete, keyed or doweled as per the typical details shown herein or as approved by the Engineer. Non shrink grout meeting the requirements of subsection 715.5 of the specifications may be used to a depth of 1/2" for leveling between precast sections. Thicker depths will be allowed as per the manufacturer's recommendations.

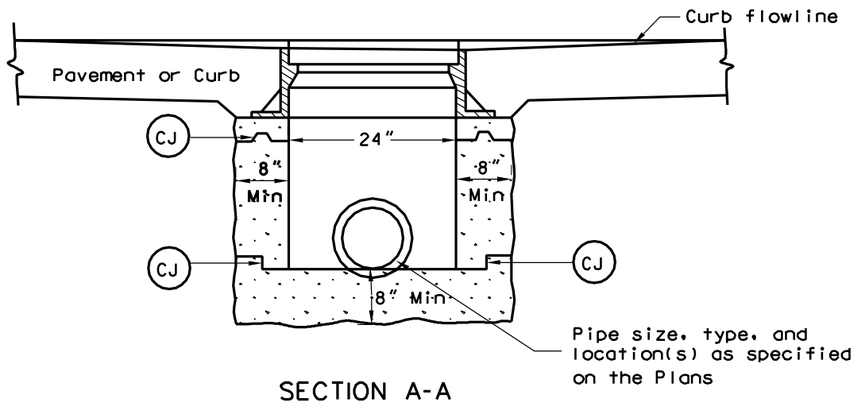
Grate as shown on Standard Sheet DR6-X to be used with this inlet.

PC (minimum pipe cover) shall be 12" below inlet top for pipes placed under sidewalk or grassed area or 24" below inlet top for pipes placed under pavement or shoulder.

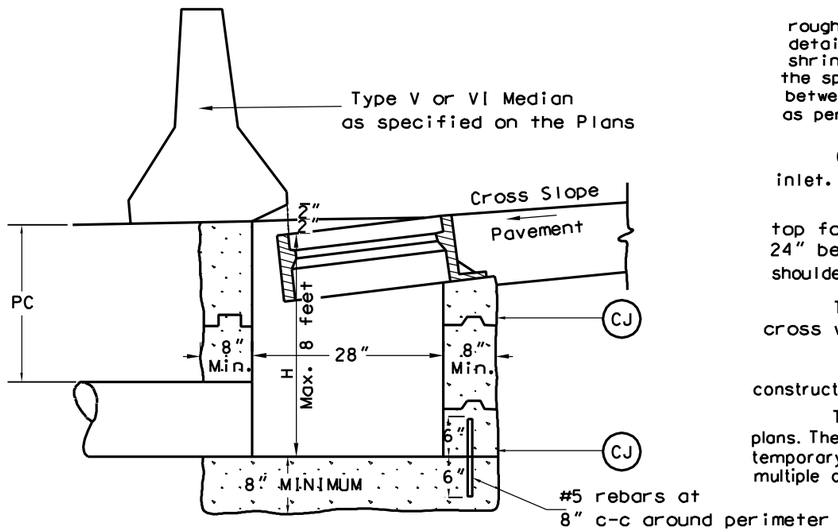
This inlet shall not be placed in a pedestrian cross walk.

The minimum distance from the top of any pipe opening to any construction joint above the opening shall be four (4) inches.

The number and location of pipe openings shall be as shown in the plans. The contractor at no additional cost, shall be responsible for any temporary bracing required to transport precast inlet sections due to multiple openings.



SECTION A-A



SECTION B-B

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

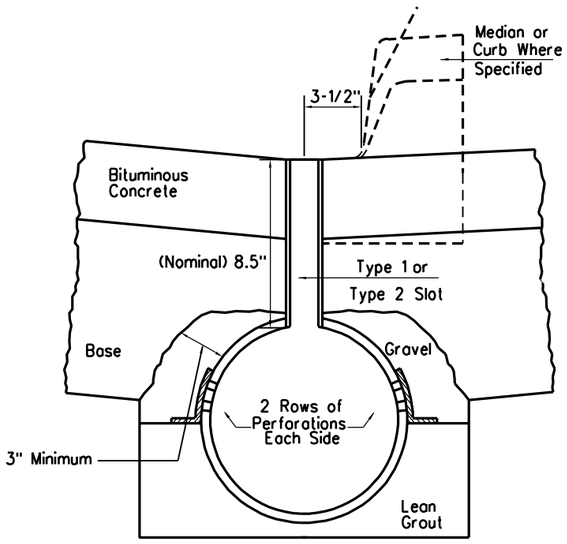
PREPARED 7-1-99

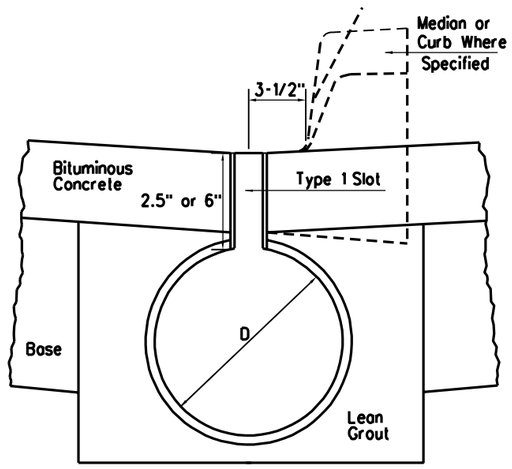
REVISION DATE

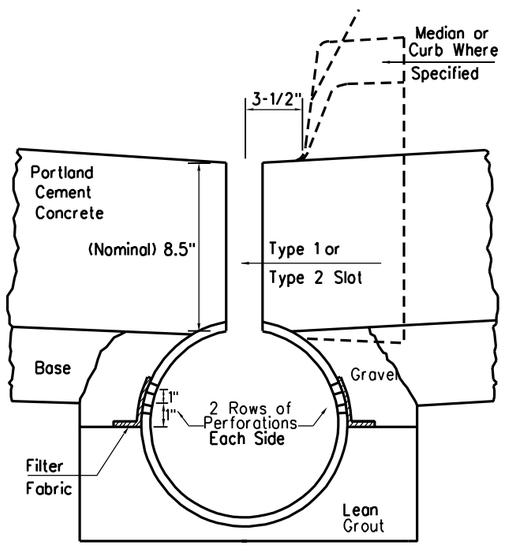
TYPE H INLET

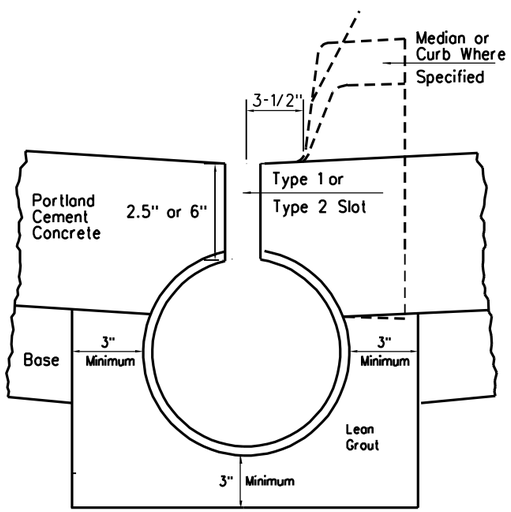
STANDARD SHEET DR6-H

TYPICAL INSTALLATIONS

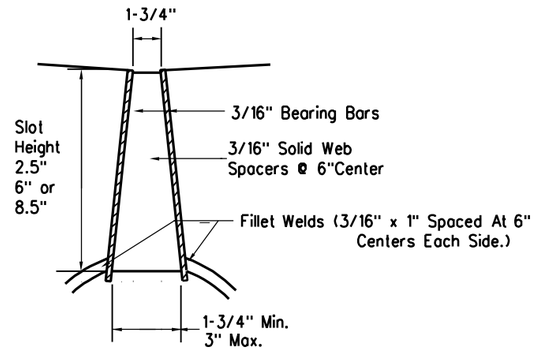




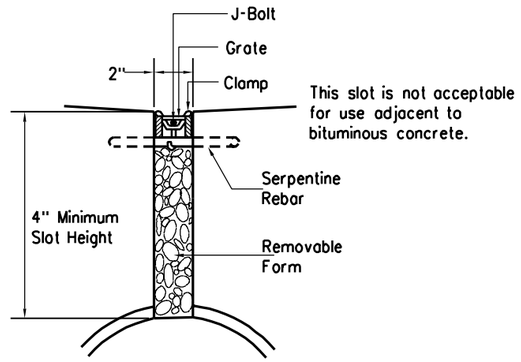




SLOT DETAILS



TYPE 1 SLOT



TYPE 2 SLOT

NOTES

The contractor may, at his option but subject to the limit-ations as noted on this sheet and elsewhere on the plans, install Type 1 or 2 Slots or approved equals.

When specified on the plans, Type 1 slots shall include expanded steel mesh heel guards tack welded to the spacer bars.

Gravel shall be omitted from the perforated slot inlet install-lation when free-draining base is specified and will be placed against the inlet.

When slot heights of 8.5" are specified, the Type 1 slots may be fabricated by stacking a 2.5" slot on top of a 6" slot. The assembly shall then be joined by minimum 3/16" x 1" fillet welds at 6" centers along each side of the horizontal joint. The resultant slot height may be slightly less than 8½".

Slot inlet shall not be placed across a pedestrian cross walk.

SLOTS NOTES

TYPE 1 SLOT

BEARING BARS AND SPACERS: These elements are to be 3/16" structural steel suitably welded to form the open slot and hot-dip galvanized as per ASTM A-123. Spacer may be vertical or tilted at approximately 30° from vertical. If the slot inlet is placed on a grade and adjacent to a curb or median, the inlet is to be in-stalled to position tilted spacers to tilt upgrade toward the incoming gutter flow.

TYPE 2 SLOT

GRATE AND CLAMP: These parts are to be hot-dip galvanized mild carbon steel conforming to ASTM A569. Grating, measuring ¾" deep by 1-3/4" wide, shall extend the full length of each pipe section slot.

REBARS: The rebar shall be serpentine bent to cross the slotted opening on 6" centers and shall be coated with 7 mils of fusion-bonded epoxy powder.

J-BOLT: The J-bolt shall be 5/16 inch diameter, plated, ASTM A307 steel supplied with self-locking nuts.

REMOVABLE FORMS: Forms are to be cellular foam with a wood or plastic cap.

SLOT HEIGHT: 4" minimum slot height acceptable where 2.5" slot height is specified.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
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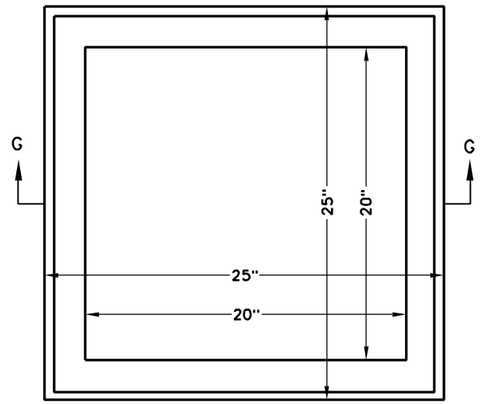
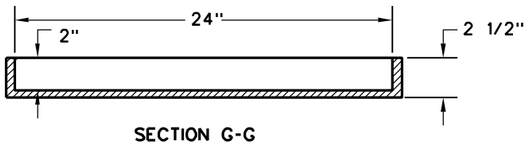
SLOT INLET

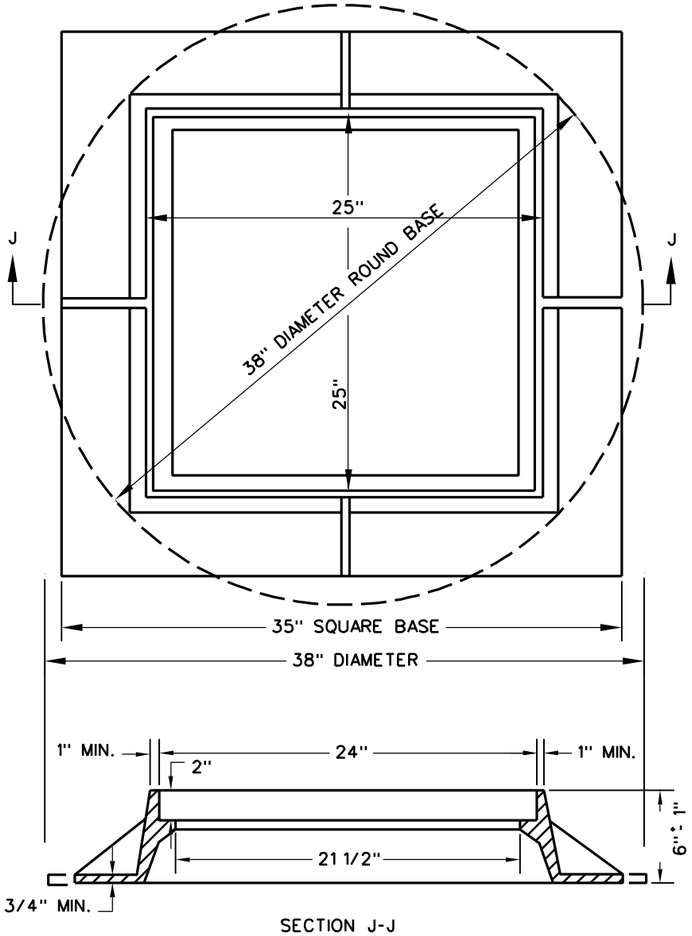
STANDARD SHEET DR6-S





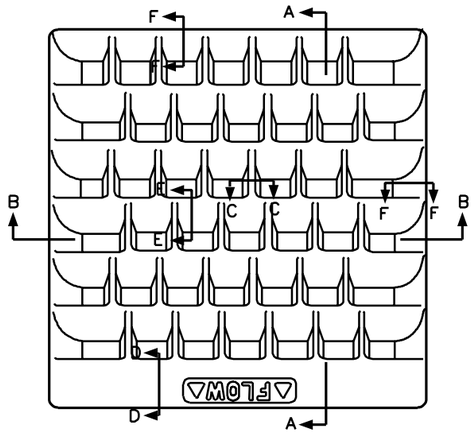
SECTION G-G

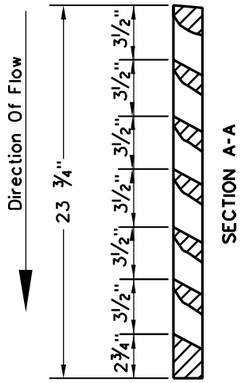
SINGLE-GRATE SHALLOW FRAME



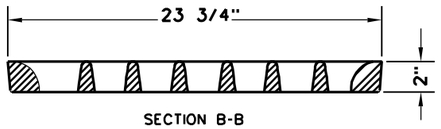
SECTION J-J

SINGLE- GRATE DEEP FRAME (ROUND OR SQUARE BASE)

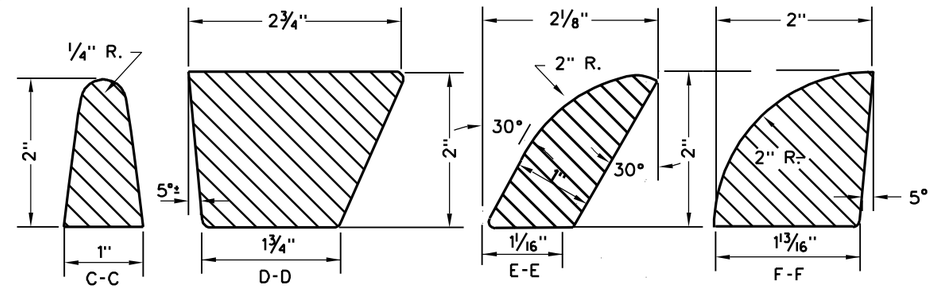




SECTION A-A

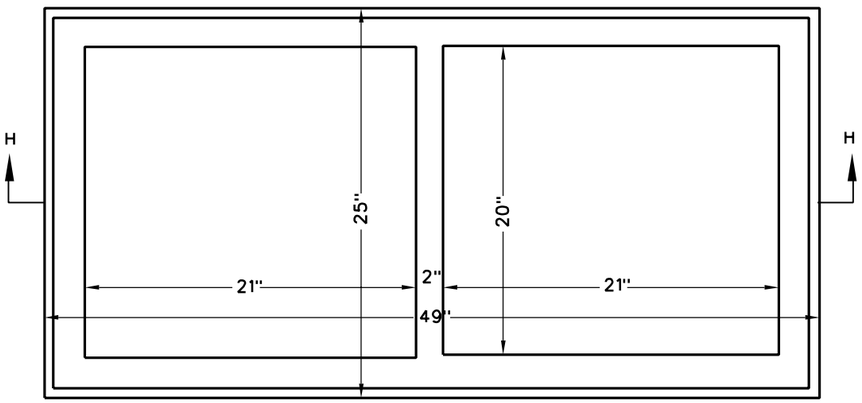


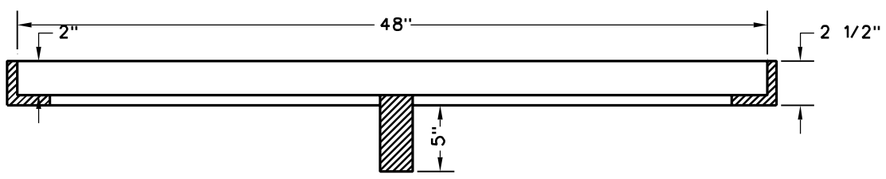
SECTION B-B



ENLARGED SECTIONS

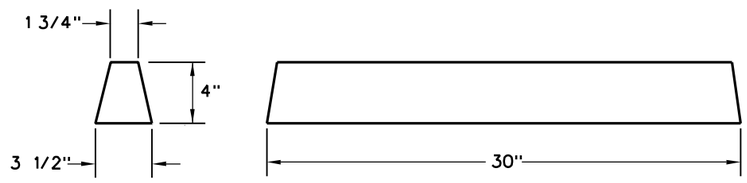
TILT-BAR GRATE





SECTION H-H

DOUBLE-GRATE SHALLOW FRAME



GRATE SUPPORT BAR

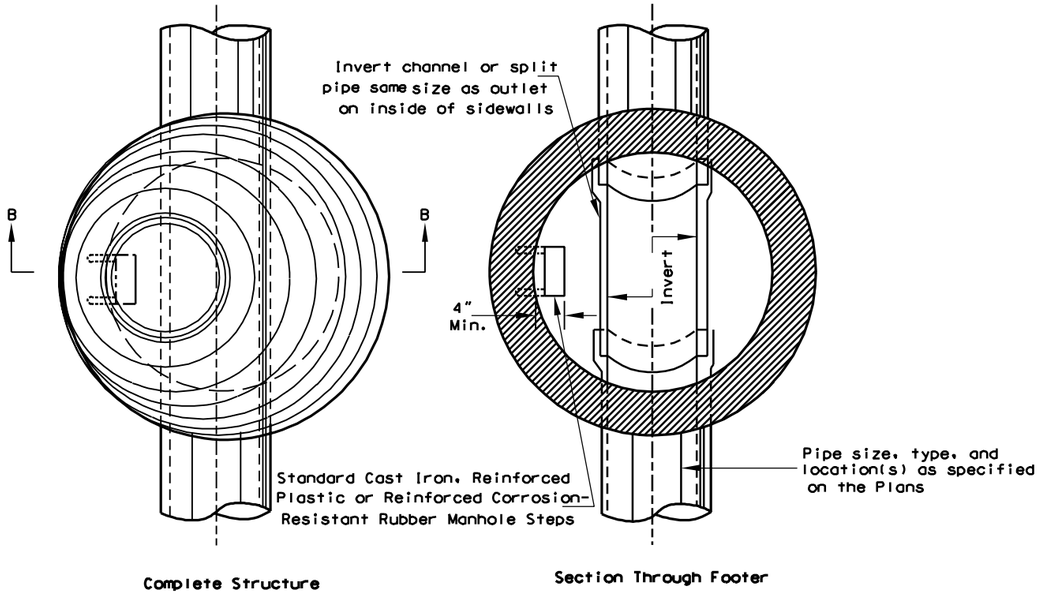
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

REVISION DATE

INLET CASTINGS

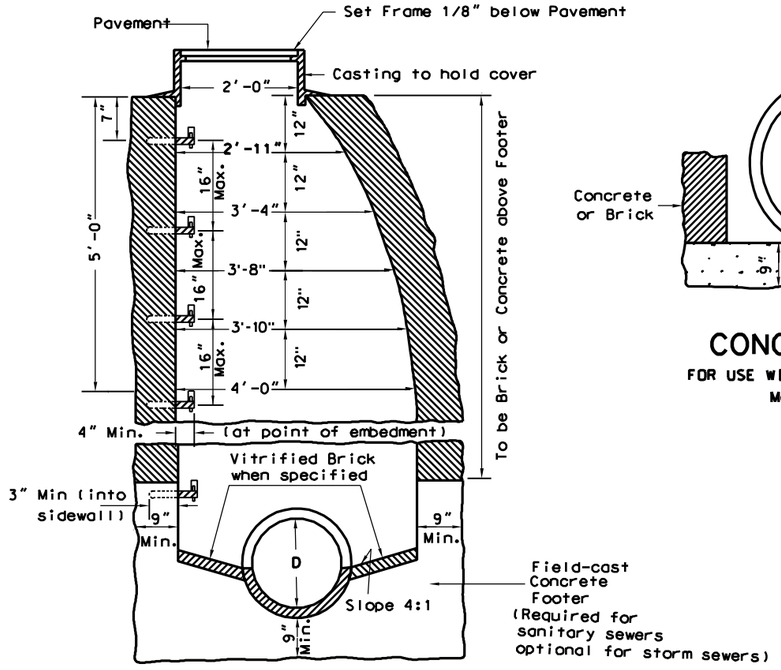
STANDARD SHEET DR6-X



Complete Structure

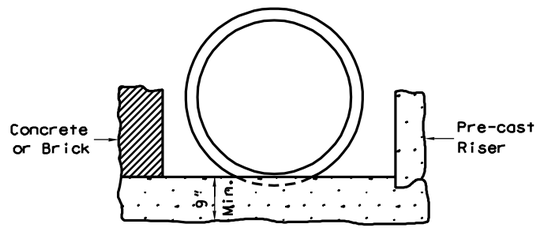
Section Through Footer

PLAN VIEWS



Section B-B

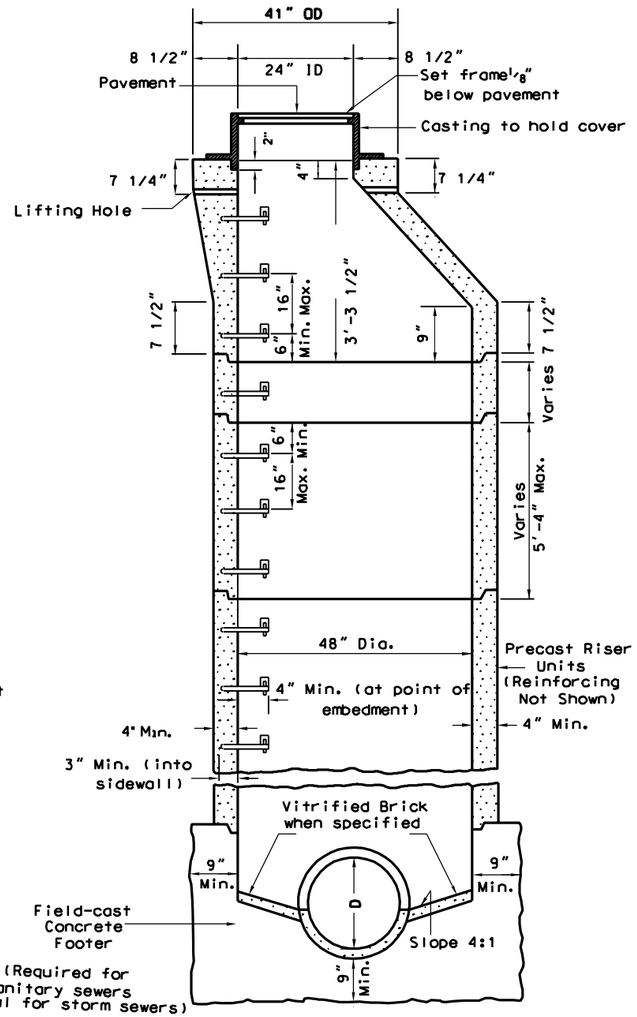
CAST-IN-PLACE OPTION



CONCRETE BASE

FOR USE WITH STORM SEWERS ONLY

May Be Precast



Section B-B

PRE-CAST

NOTES

Type A Manholes, when specified on the Plans, may be constructed in either method (cast-in-place or pre-cast option) as shown herein.

Steps, frames, and covers shall be as shown on Standard Sheet DR7-X.

"Keyed" or "doweled" type construction joints, acceptable to the Engineer, may be used in the construction of concrete manholes.

If the cast-in-place manhole is over twelve feet (12') in depth, the sidewalls below that depth will be double thickness.

Pipe at elevations other than shown may be joined to the manhole by cutting a hole the size of the connecting pipe in the manhole, inserting the pipe the thickness of the manhole shell and closing all openings around the connecting pipe with joint mortar.

Drawing shows pipe entering and leaving manhole in a straight line. However, the pipes may enter or leave at an angle or place as called for or shown on the Plans.

Minimum height of bench wall above flowline of pipe is 25% of the diameter of the pipes.

The use of brick for manhole construction will not be allowed when a manhole is located in the roadway.

The following additional notes are applicable for pre-cast manholes:

Manhole steps shall be placed into plastic concrete wall during manufacture or mortared into holes after the concrete has set.

Sidewall sections may be used in any combination to produce a manhole of desired depth, except the tapered top section shall be retained as shown.

The tapered top section shall be manufactured and meet the same requirements as the manhole's sidewalls, but shall conform to the dimensions detailed herein.

Lifting holes in the tapered top section and the circumferential notches in the manhole cover are for handling purposes only.

The pre-cast sidewall units shall be set in joint mortar or sealed with O-ring gaskets.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
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PREPARED 7-1-99

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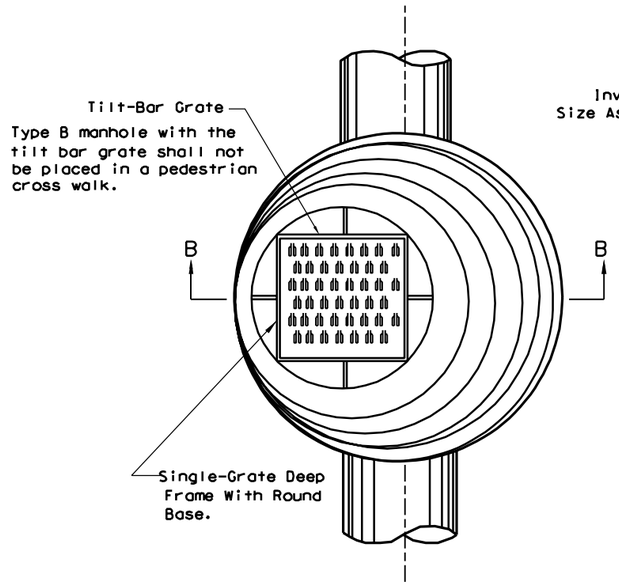
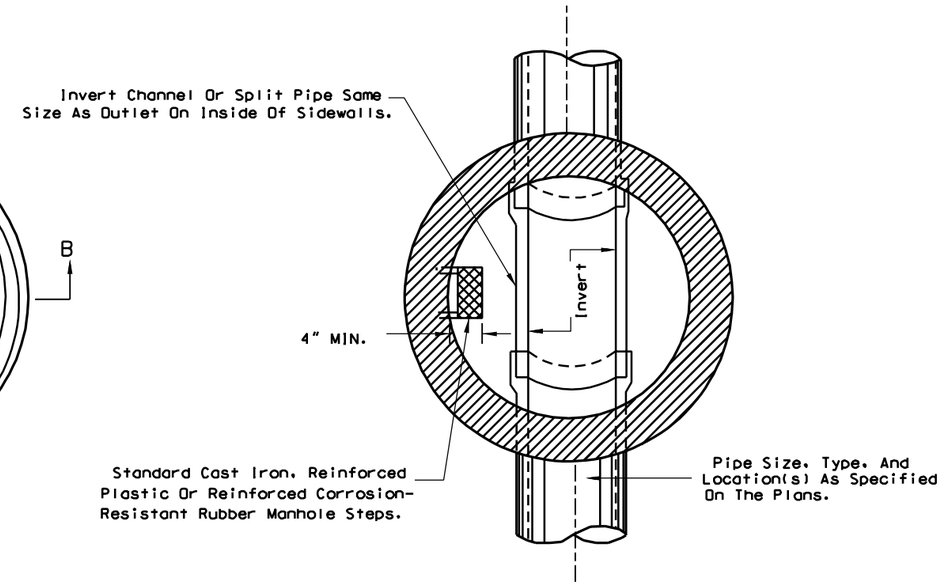
TYPE A MANHOLE

STANDARD SHEET DR7-A

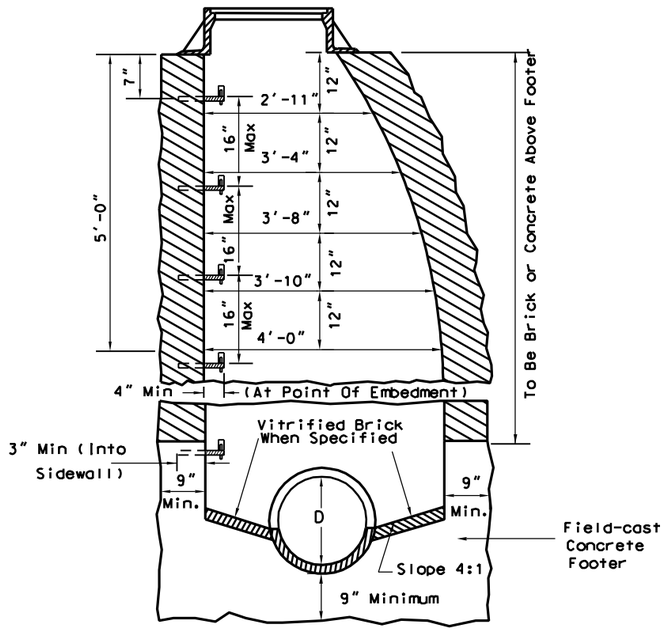


COMPLETE STRUCTURE

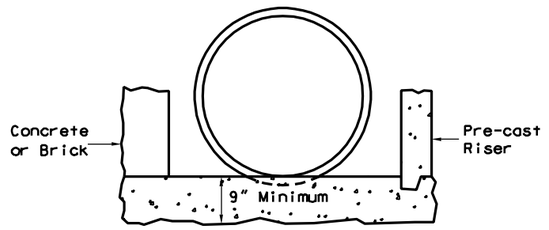


SECTION THROUGH FOOTER

PLAN VIEWS



SECTION B-B



CONCRETE BASE
Optional Precast Or Field-cast
(For Use With Storm Sewers Only)

NOTES

"Keyed" Or "Doweled" Type Construction Joints, Acceptable To The Engineer, May Be Used In The Construction Of Concrete Manholes.

If Cast-In-Place Manhole Is Over Twelve Feet (12') In Depth. The Sidewalls Below That Depth Will Be Double Thickness.

Pipe At Elevations Other Than Shown May Be Joined To The Manhole By Cutting A Hole The Size Of The Connecting Pipe In The Manhole, Inserting The Pipe The Thickness Of The Manhole Shell And Closing All Openings Around The Connecting Pipe With Joint Mortar.

Either This Manhole Or The Precast Manhole On Standard Sheet DR7-A May Be Furnished When Type B Manhole Is Called For In The Contract. The Frame And Grate Shall Be As Shown On Standard Sheet DR6-X INLET CASTINGS. Steps Shall Be As Shown On Standard Sheet DR7-X.

Minimum Height Of Bench Wall Above Flowline Of Pipe Is 25% Of The Diameter Of The Pipes.

The use of brick for manhole construction will not be allowed when a manhole is located in the roadway.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
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PREPARED 7-1-99

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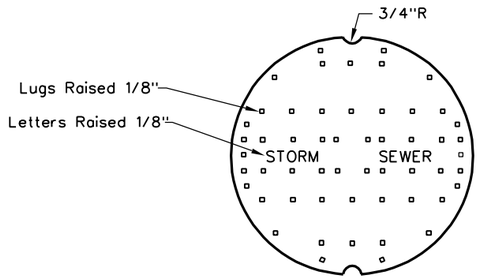
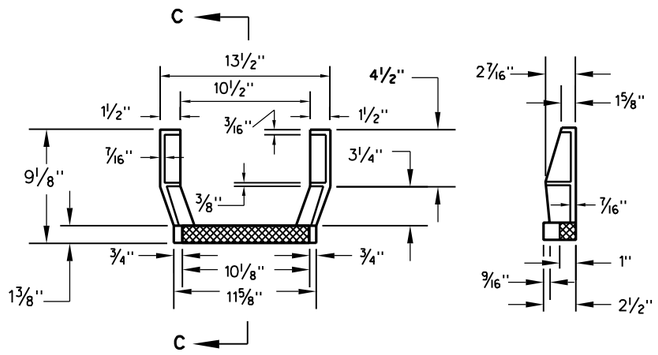
TYPE B MANHOLE

STANDARD SHEET DR7-B



PLAN

Top Of Step To Be Non-Skid
Surface (Rough Diamond Design)
Raised 1/8" Above Metal Elevations Shown.



PLAN SECTION C-C

GRAY IRON STEP

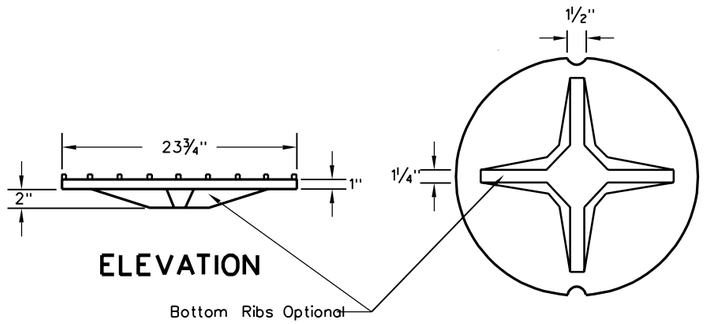
NOTES

Lettering on covers shall denote STORM SEWER or SANITARY SEWER as applicable.

Bottom ribs may be deleted from manhole cover castings.

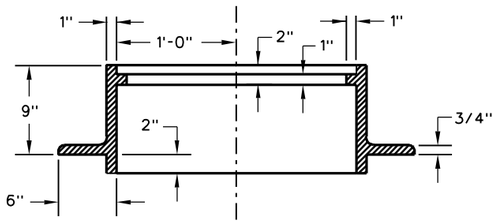
The 1/8" raised lugs are a skid resistant measure. Alternative measures will require approval by the Engineer.

Shop Drawings shall be submitted if details and dimensions vary.



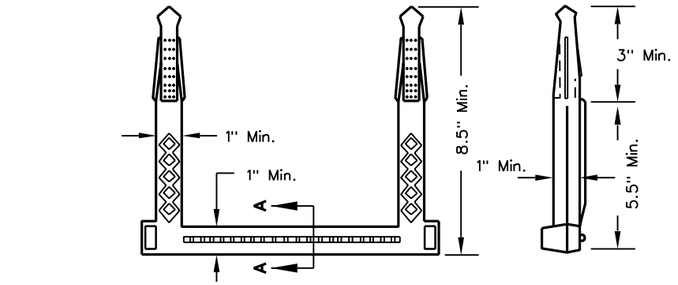
INVERTED PLAN

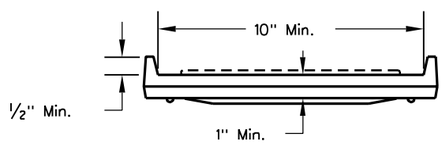
MANHOLE COVER

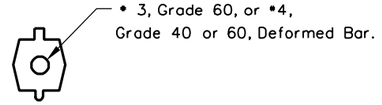


SECTION

MANHOLE FRAME







SECTION A-A

(Enlarged)

REINFORCED PLASTIC AND REINFORCED CORROSION - RESISTANT RUBBER MANHOLE STEPS

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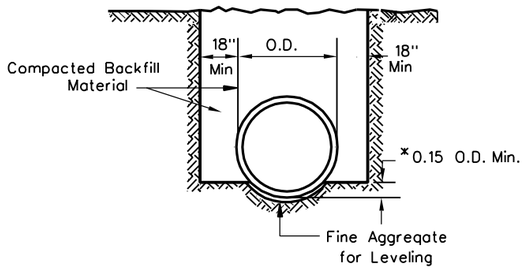
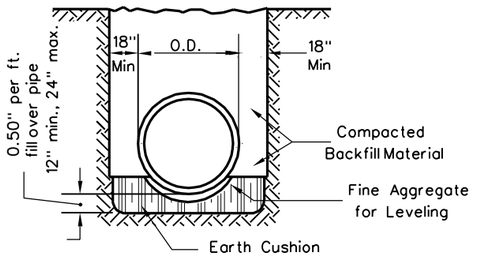
MANHOLE CASTINGS

STANDARD SHEET DR7-X

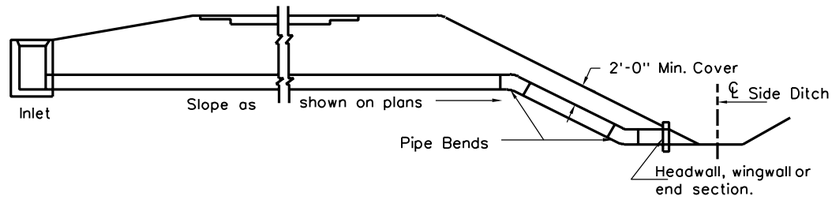
* Except for structural plate pipe where length of bedding arc need not exceed width of bottom plate However, if structural. plate pipe is first assembled and then placed in the trench, the 0.15 O.D. minimum value will apply.



Class B Bedding



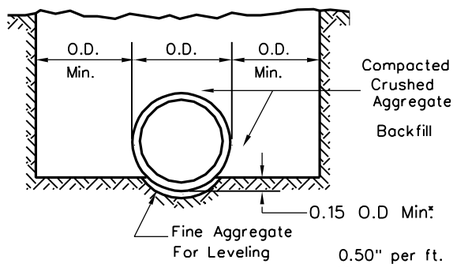
Class B Bedding On Rock Foudation



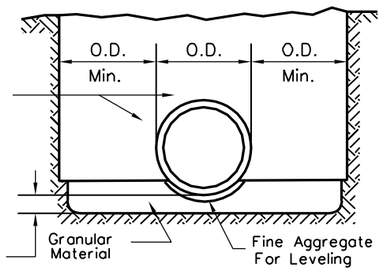
MEDIAN OUTLET IN HIGH FILL

To be used where called for on the plans or as shown on the cross sections.

(Trench shown is for 18" thru 54" Pipe)

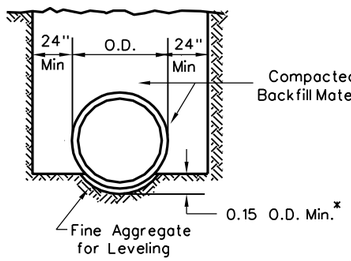


Class B Bedding

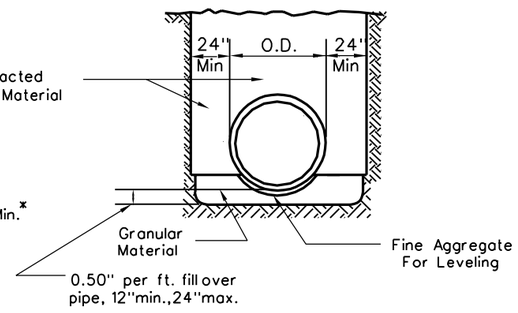


Class B Bedding On Rock Foundation

(Trench shown is for 60" thru 108" flexible pipe in soil cut fill sections)



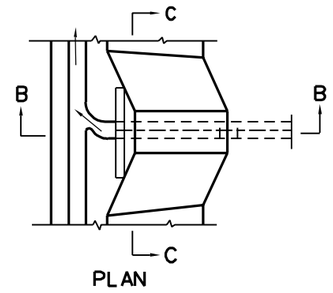
Class B Bedding



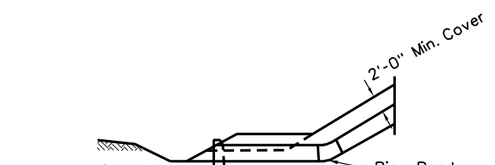
Class B Bedding On Rock Foundation

(Trench shown is for 60" thru 108" rigid pipe in cut sections)

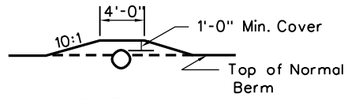
TYPICAL PIPE BEDDING



PLAN



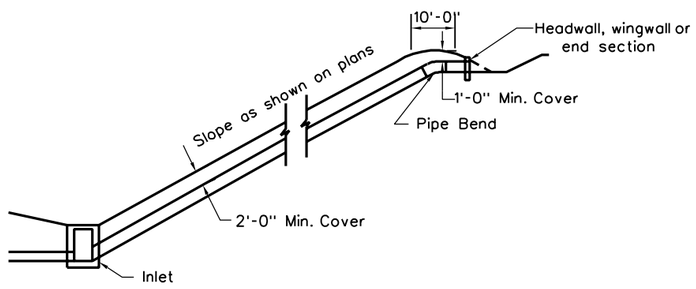
SECTION B-B



SECTION C-C

OUTLET THROUGH BERM

To be used where called for on the plans or as shown on the cross sections.



PIPE FLUME

Earth Cut or Shallow Rock Cuts

NOTES

For pipe without corrugations, a one inch layer of fine aggregate for leveling will normally be adequate to achieve a uniform bearing surface. For corrugated pipe, layers shall be 1" minimum for 1/2" depth corrugations, 2" minimum for 1" depth corrugations, and 3" minimum for 2" or 2-1/2" depth corrugations.

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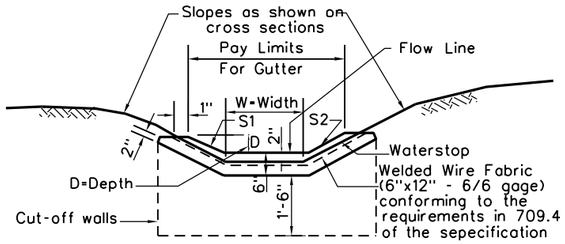
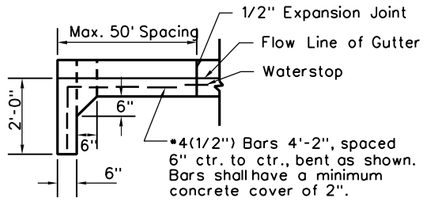
MISCELLANEOUS DRAINAGE (sheet 1 of 4)

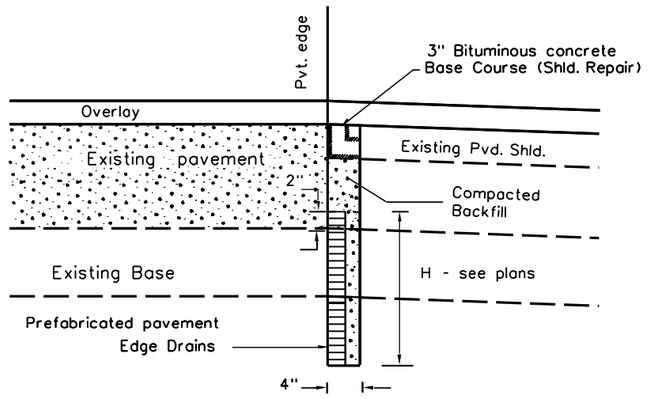
STANDARD SHEET DR8



CONCRETE GUTTER



CUT - OFF WALL

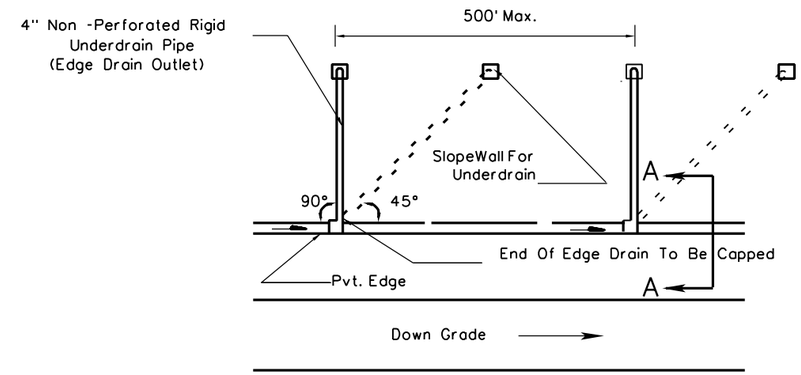


SECTION A-A

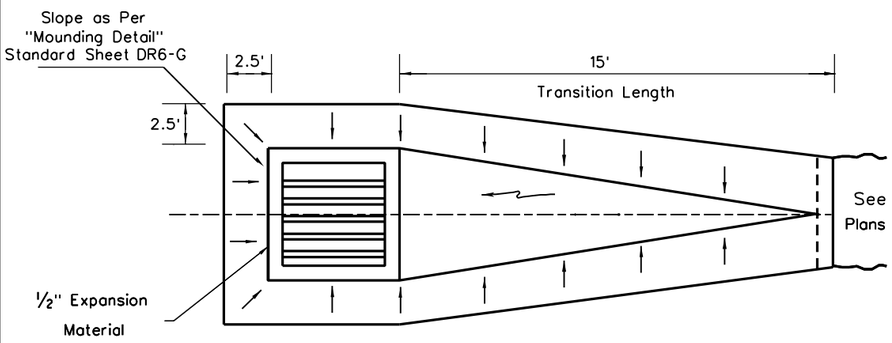
STANDARD CONCRETE GUTTER TYPES

Gutter Type	Gutter Side Slopes S1*	Gutter Side Slopes S2	Gutter Depths ans Widths
1	2:1	2:1	Gutter depths shall be specified in 6-inch increments. Gutter widths shall be in 1-foot increments for widths of two to six feet and in 2-foot increments for widths of over six feet. A change in width shall be transitioned at the rate of 1' in 10' each side.
2	4:1	2:1	
3	4:1	1-1/2:1	
4	6:1	2:1	
5	6:1	1-1/2:1	
6	5:1	5:1	
7	6:1	6:1	
8	4:1	4:1	

*Shall be inside gutter slope for roadside ditches, unless otherwise specified.



PLAN
PREFABRICATED EDGE DRAIN



CONCRETE GUTTER TREATMENT AT INLETS
PLAN VIEW

NOTES

Waterstop shall be 5" wide min; web min. thickness 3/16"; end section and / or ribs less than 1.67 web thickenss.

The waterstop diagrams are for informational purposes only. All waterstops shall conform to the general shape shown and meet the requirements of Section 708.10 of the Specifications.

Concrete gutter types, depths and widths shall be specified on the plans and shall conform with the table shown. Only one concrete gutter type and depth shall be used in each individual run of gutter.

The "Concrete Gutter Treatment at Inlets" detail as shown is for transi--tioning a V ditch section to the width of the inlet. The 15' length is to be be used to make this transition regardless of the width of the approach ditch.

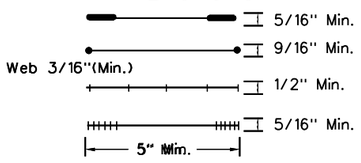
Cut-off walls for concrete gutter shall be constructed and paid for in accordance with Section 633 of the Specifications.

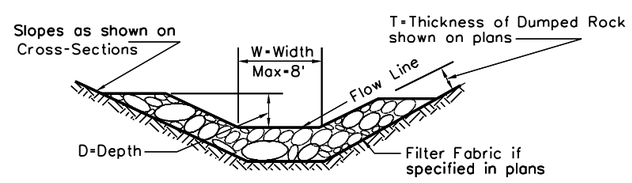
There will be no separate payment for Select Embankment Channel if the material is obtained from the unclassified excavation. If select embankment is not available from unclassified excavation, payment will be made under Section 211 for Rock Borrow Excavation. Unless otherwise specified on the plans, the maximum rock size will be "T" and the minimum rock size will be one-half "T".

All edge drain outlets are to be equipped with a Slopewall for Underdrain and Varmint Screen as detailed on Standard Sheet DR8, 3 of 4 or tied to existing inlets or pipes. Underdrain pipe tied to inlets or fastened to culvert pipe by pipe saddle, grouting, cementing, or other means that will provide a secure attach--ment satisfactory to the engineer shall be included in the the cost of the underdrain pipe. The cost of the Slopewall or tie to inlet or pipe will be included in the unit price bid for edge drain.

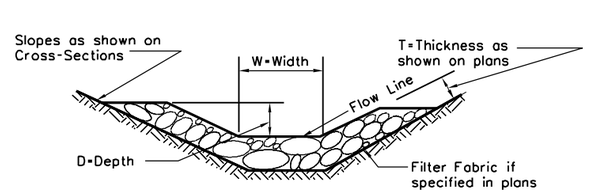
When edge drain outlets can not be outletted at 90° or 45° to pavement edge as shown, appropriate details as shown for Free Draining Base outlet on Standard Sheet DR8, 3 of 4 are to be used.

TYPICAL
WATERSTOPS





DUMPED ROCK GUTTER
(For Maximum Width of 8 Feet)
Stone sizes as per Section 704.4 of the Specifications



SELECT EMBANKMENT CHANNEL
(For Widths Exceeding 8 Feet)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
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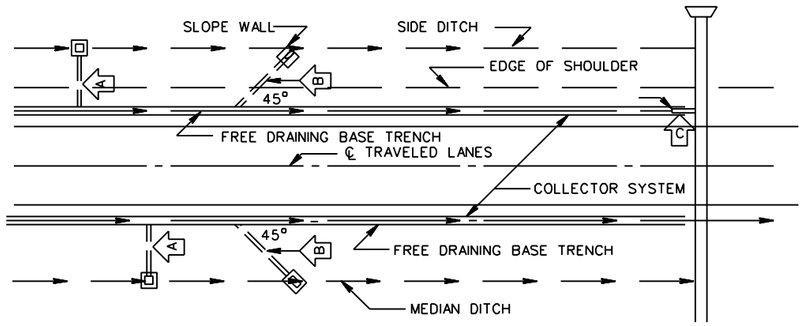
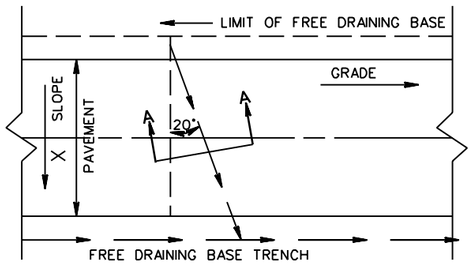
MISCELLANEOUS DRAINAGE
(sheet 2 of 4)

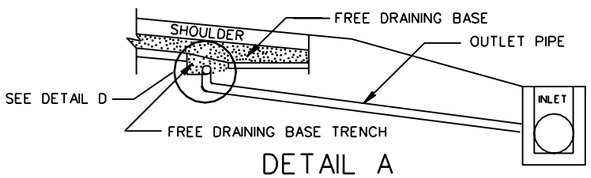
STANDARD SHEET DR8



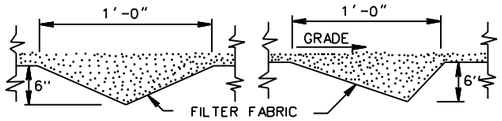
PLAN VIEW



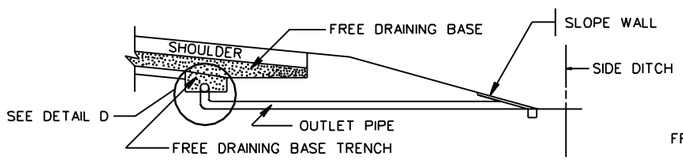
PLAN VIEW



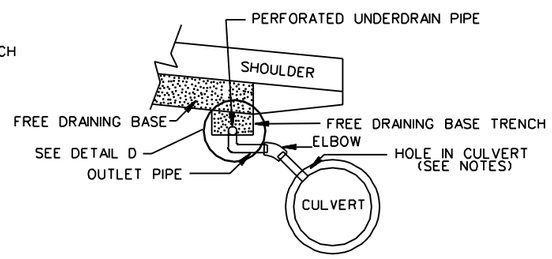
DETAIL A
(ELEVATION)



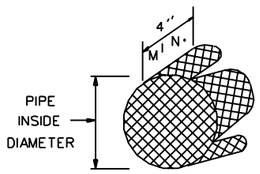
SECTION A-A
TYPICAL LATERAL TRENCH SECTION
FREE DRAIN BASE



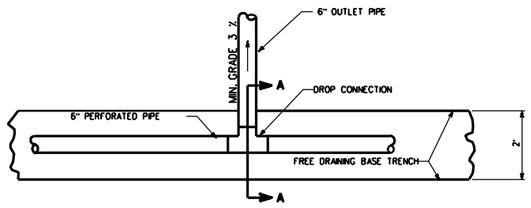
DETAIL B
(ELEVATION)



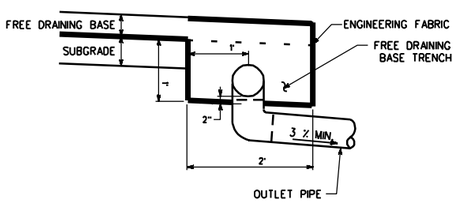
DETAIL C
(ELEVATION)



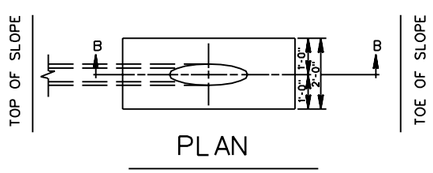
VARMINT SCREEN



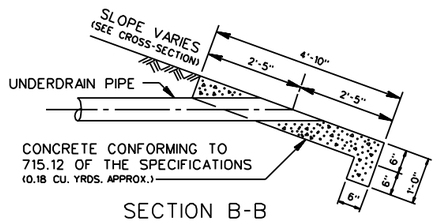
PLAN VIEW



DETAIL D



PLAN



SECTION B-B

SLOPEWALL FOR UNDERDRAIN

NOTES

Payment for the outlet pipe includes drop connections in the free draining base trench and slopewalls or connections to drainage structures as required. Maximum outlet spacing is to be 250' in embankments. Outlets in cut sections will be made to the nearest drainage structure. Slopewall details will be in accordance with Standard DR8 (sheet 3 of 4). At vertical sags, one outlet shall be constructed at the low point and additional outlets shall be constructed at 25 feet and 50 feet each way from the low point.

Underdrain pipe as detailed to be 6" diameter non-perforated rigid pipe except for the 5' of pipe placed in the free draining base trench unless otherwise specified in the plans.

All outlets are to equipped with a Slopewall for Underdrain and **Varmint Screen as detailed.** Slopewalls will not be paid for separately but shall be included in the cost of the underdrain pipe. Underdrain pipe tied to inlets or fastened to culvert pipe by pipe saddle, grouting, cementing, or other means that will provide a secure attachment satisfactory to the engineer shall be included in the cost of the under--drain pipe.

Commercially available galvanized hardware screen is to be snuggly fitted inside each Slopewall. The screen is to have the capability of being removed and reinstalled for maintenance operations. The screen wires shall be welded at a spacing in each direction of ⅜" to ⅝". The cost of the screen to be included in the cost of the underdrain pipe or edge drain.

Crossovers shall have outlets coordinated with regular roadway outlets to insure that all areas shall be free draining.

Typical lateral trench sections shown are possible selections, other configurations may be utilized if depth and width are obtained. Spacing shall be 100' maximum in areas designated as requiring lateral trench.

Lateral trench sections shall be installed at locations as follows:

Cross Slope = 0.0156% Grade = 4% and above
Cross Slope = 0.0208% Grade = 5% and above
Cross Slope = 0.0400% Grade = 8% and above
Cross Slope = 0.0600% and greater no trench required

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
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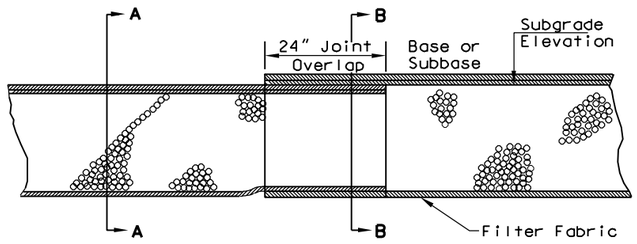
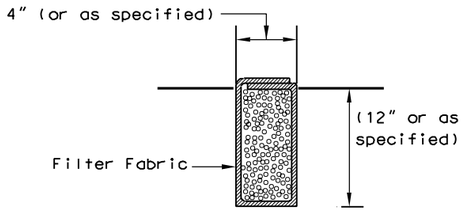
MISCELLANEOUS DRAINAGE
(sheet 3 of 4)

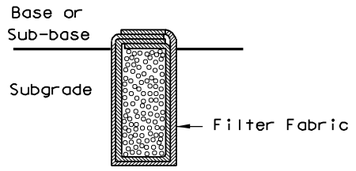
STANDARD SHEET DR8



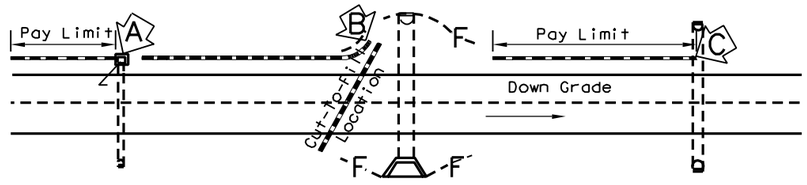
LONGITUDINAL ELEVATION VIEW



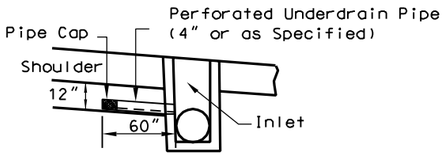
SECTION A-A



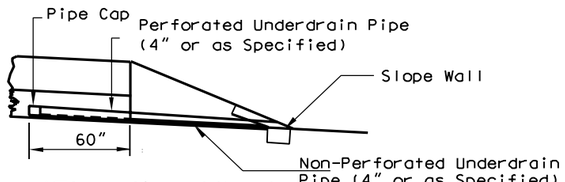
SECTION B-B



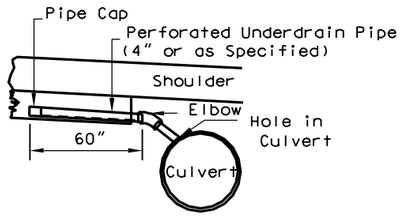
TYPICAL PLAN VIEW



(Elevation View)
DETAIL A

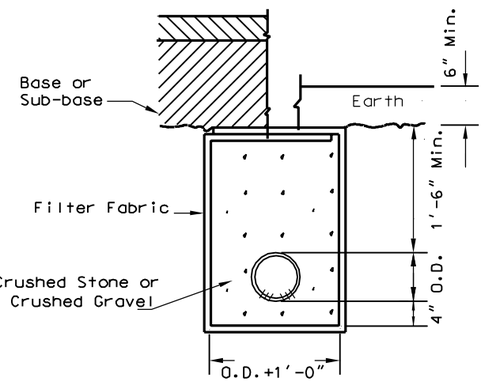


(Elevation View)
DETAIL B

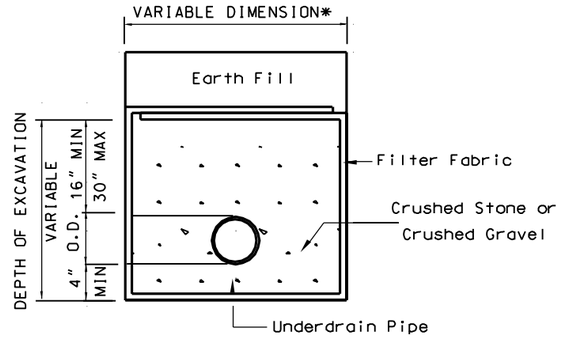


(Elevation View)
DETAIL C

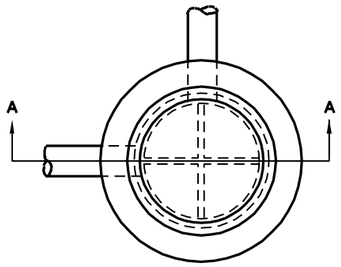
FILTER FABRIC UNDERDRAIN
(Typical Installations)



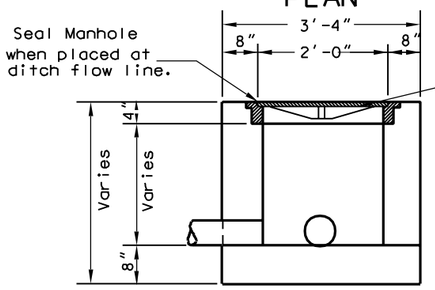
PIPE UNDERDRAIN SECTION



METHOD OF SPRING CONTROL
(TYPICAL SECTION)



PLAN



Manhole frame and cover. See Standard Sheet DR6-D for details.

Above footing may be brick laid in joint mortar, meeting the requirements of 708.8 of the Standard Specifications.

All concrete to be Class "B" or Class "C".

SECTION A-A

UNDERDRAIN JUNCTION BOX

NOTES

Filter fabric and aggregate for filter fabric underdrain shallconform to the requirements of Section 606.2 of the Specifications. All costs associated with the 5' perforated Underdrain pipe required in the Filter Fabric Underdrain installation to be included in the contract price bid for Filter Fabric Underdrain.

Underdrain shall generally follow the grade of the pavement where the grade is not less than 1 %. A desirable minimum of1% and an absolute minimum of 0.5% with 18" of cover shall control in the placement of Underdrain unless otherwise noted on the plans.

The top of underdrain pipe shall be placed at the same elevation as the top of the outlet pipe at all Inlets or Manholes unless otherwise noted on the plans.

Spring Control shall be used where noted on the Plans or as directed by the Engineer. Cost of excavation, filter fabric and installation shall be included in the contract price bid for "Crushed Stone, Crushed Gravel, or Silica Sand for Underdrain."
Diensions as indicated variable shallbe as shown on the plans or determined in the field.

For pipe cap detail, see Standard Sheet DR8, Sheet 3 of 4.

All Underdrain outlets are to be equipped with a Slopewall for Underdrain and Varmint Screen as detailed on Standard Sheet DR8, 3 of 4 or tied to existing inlets or culvert pipes. Slopewall for Underdrain will not be paid for separately but shall be included in the cost of the Underdrain pipe, or Filter Fabric Underdrain. Underdrain pipe tied to inlets or fastened to culvert pipe by pipe saddle, grouting, cementing, or other means that will provide a secure attachment satisfactory to engineer shall be included in the cost of the Underdrain pipe, or Filter Fabric Underdrain.

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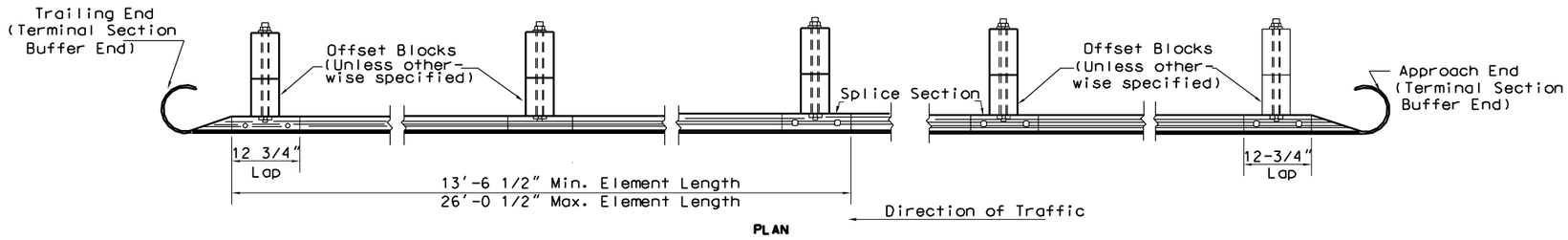
MISCELLANEOUS DRAINAGE

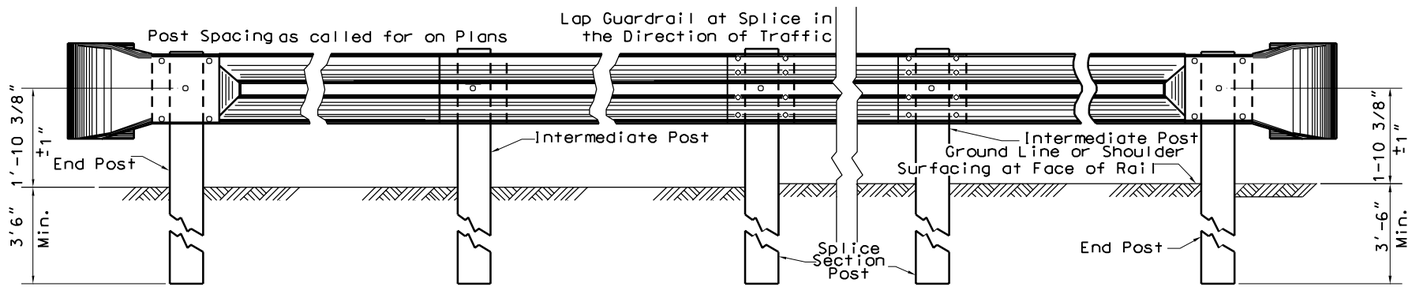
(sheet 4 of 4)

STANDARD SHEET DR8

TYPICAL GUARDRAIL INSTALLATION
(UNANCHORED ENDS - WOOD POSTS AND BLOCKS SHOWN)



PLAN



ELEVATION

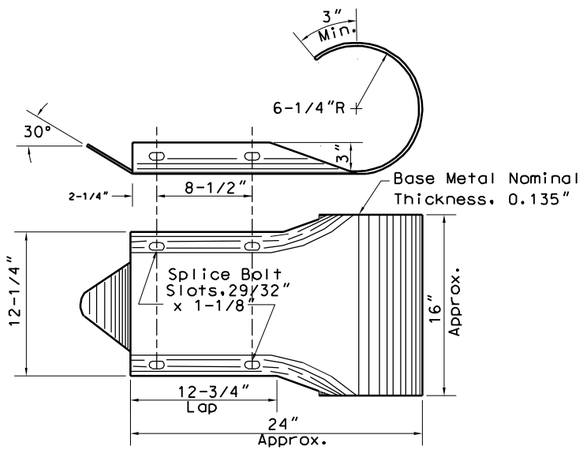
NOTES

Guardrail shall be secured to the blocks, posts and to other elements by 5/8" dia. bolts and nuts conforming to the details herein and to the requirements of 712.4 of the Standard Specifications, except that the material for nuts shall conform to ASTM A563, Grade A or better.

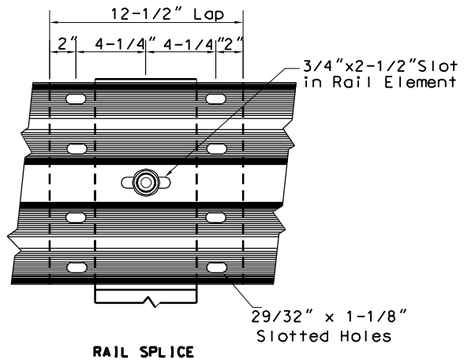
Approach and Trailing End Treatments shall be as shown or specified on the Plans or directed by the Engineer. Approach and trailing ends shall be anchored unless otherwise specified on the Plans; the specific anchor terminal to be utilized shall be as shown or specified.

The pay quantity of guardrail will be the Linear Feet of guardrail measured along the face of the rail from center to center of end posts. Cost of the Terminal Section Buffer End shall be included in the cost of the Guardrail.

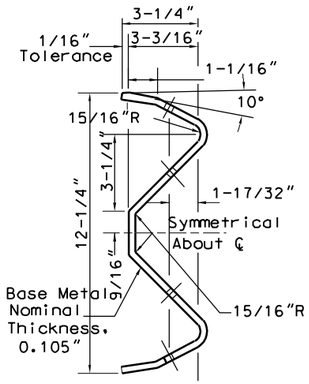
The approach slope to the face of all guardrail shall be 10:1 or flatter.



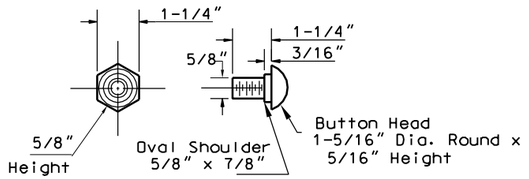
TERMINAL SECTION BUFFER END
(For Use Only on Unanchored Ends And on Special Trailing End Terminal)



RAIL SPLICE
Eight (8) Splice Bolts are to be used at all Rail Splices



SECTION
RAIL ELEMENT



NUT **SPLICE BOLT**
POST BOLT: Similar Except Length

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
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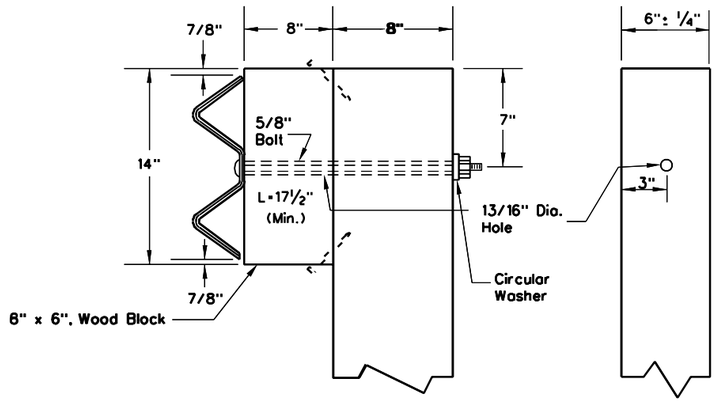
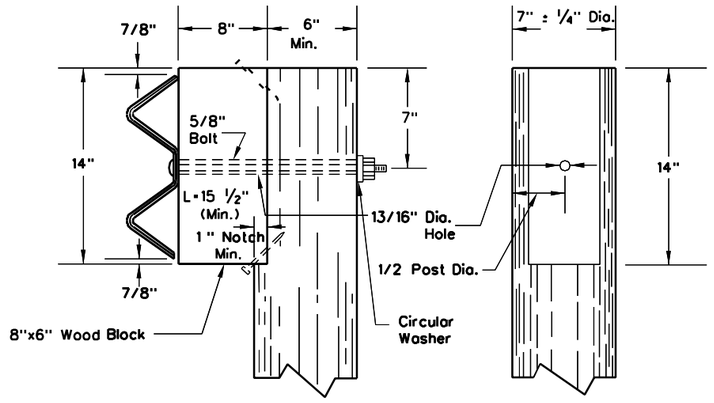
GUARDRAIL ELEMENT

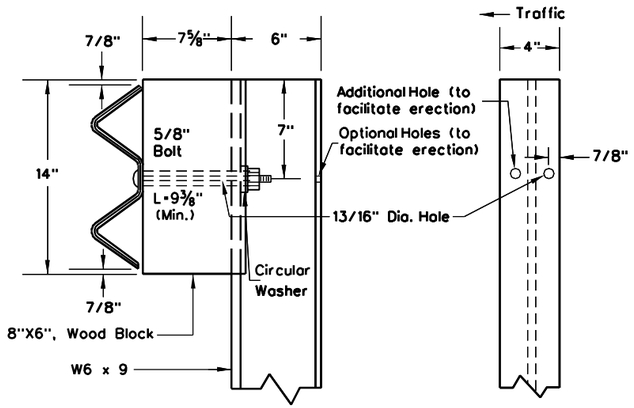
STANDARD SHEET GR1



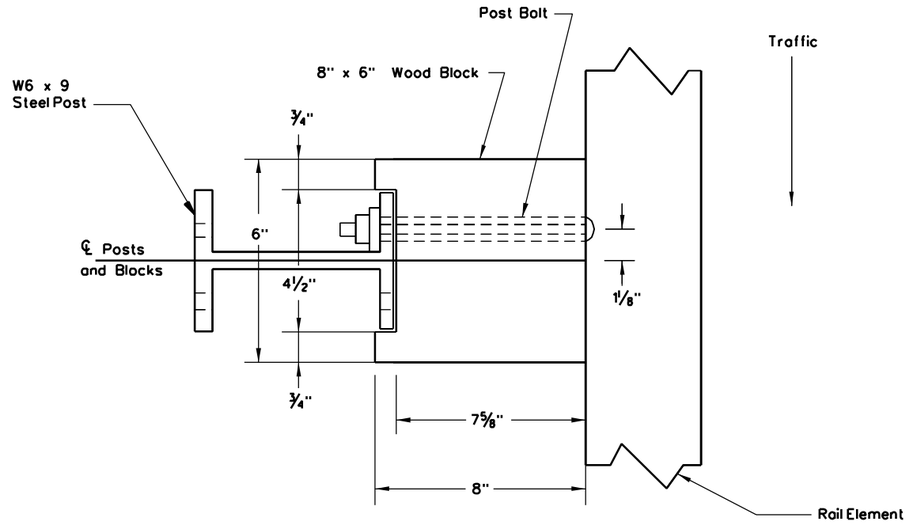
WOOD GUARDRAIL POST (RECTANGULAR)



WOOD GUARDRAIL POST (ROUND)



STEEL GUARDRAIL POST
(WOOD BLOCK)



PLAN

NOTES

GENERAL:

Only one type of block, steel or wood, shall be used throughout any project, unless otherwise specifed." Blocks for block-outs" shall be used on all posts except when otherwise noted on Plans. When blocks are not provided, the post details will be as shown herein, except the 5/8" bolt minimum length will be reduced as required, the 1" minimum notch for the wood guardrail post (round) will not be used, and nails for block stability will not be needed. For steel posts without blocks, details of the posts shall conform to the "Steel Guardrail Post (Wood Block)" details herein, with the additional holes (to facilitate erection) being optional.

The circular washers shall be made of steel and galvanized in accordance with the in accordance with the requirements of AASHTO M232.

WOOD POSTS:

Wood posts and blocks shall be the same type (specie).

Wood posts shall be pressure-treated after notching, in accordance with Section 710.5 of the specifications.

The 1" (minimum) notch dimension as shown for round wooden posts shall be located along the vertical centerline for the entire upper 14" of the post and shall apply regardless of whether the post is notched (as shown) or otherwise cut or sawed to form a vertical flat plane and then, at some location below the top 14", is angularly sliced out to the surface of the post.

Post length will be 6' ± 1/2" unless otherwise noted.

STEEL POSTS:

Blocks shall be centered on their posts and the center of the block holes, for bolts connecting rails to blocks, shall be horizontally offset 1-1/8" from the center of the steel posts toward the post edge facing approaching traffic for both steel and wood blocks, as shown for wood blocks on the Plan view of the Block Stop Detail. Post length will be 6' ± 1/2" unless otherwise noted.

WOOD BLOCKS:

The type (specie) of wood for blocks is to be one of the types (species) permitted by specifications for wood posts. Wood blocks shall be pressure-treated in conformance with the requirements for wood posts. However, creosote oil is not permitted as a preservative in the pressure treatment of wood blocks to be erected on steel posts. 8" x 6" wood blocks shall be positioned so that the 6" x 14" faces of the blocks are the contact faces for the rail elements and the posts in order to achieve the blockout dimension shown. When wood block is used adjacent to a wood post, the block shall be nailed to the post with a galvanized steel 10d common nail. The nail is to be driven into the center of the top or bottom of the block.

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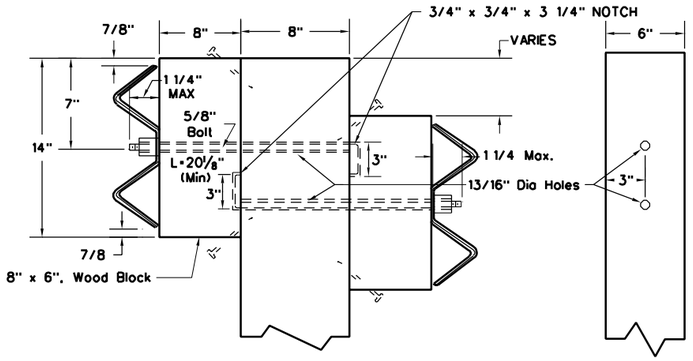
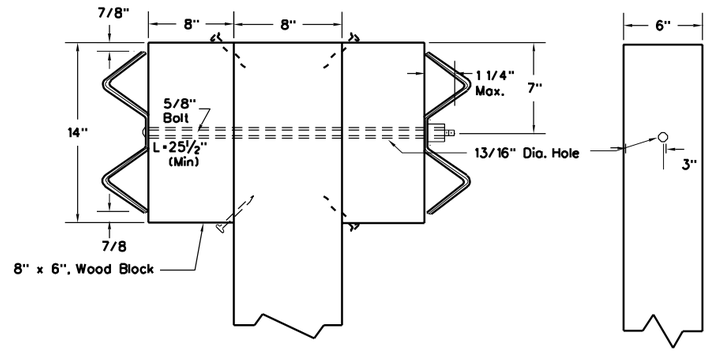
GUARDRAIL POSTS AND BLOCKS

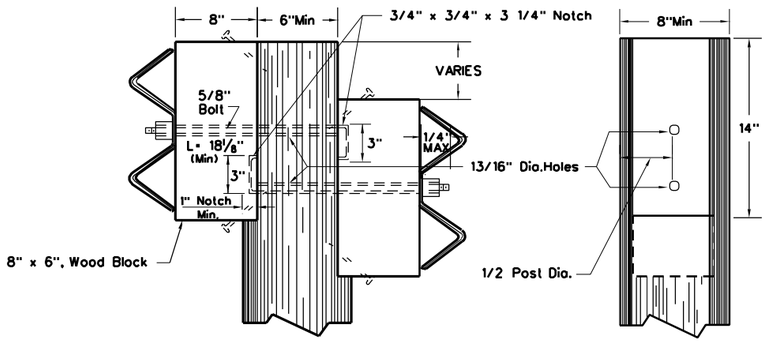
STANDARD SHEET GR2



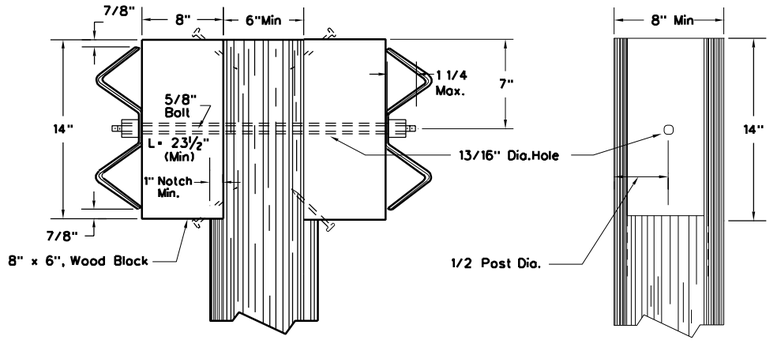
WOOD GUARDRAIL POST (RECTANGULAR)
(BEAMS AT DIFFERENT ELEVATIONS)



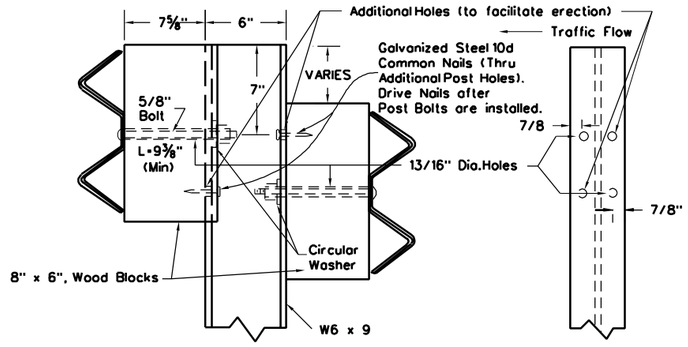
WOOD GUARDRAIL POST (RECTANGULAR)
(BEAMS AT SAME ELEVATION)



WOOD GUARDRAIL POST (ROUND)
(BEAMS AT DIFFERENT ELEVATIONS)



WOOD GUARDRAIL POST (ROUND)
(BEAMS AT SAME ELEVATION)



STEEL GUARDRAIL POST (WOOD BLOCK)
(BEAMS AT DIFFERENT ELEVATIONS)

NOTES

The blocks shall be bolted to the steel posts in the same manner when the beams are at the same elevation as they would when the beams are at different elevations.

The standard bolt shall be used for wood guardrail post when possible.

The applicable details and notes of Standard Sheet GR2 shall apply to this sheet.

The 1" (minimum) notch dimension as shown for round Wooden Posts shall be located along the vertical centerline for the entire upper 14" of the post and shall apply regardless of whether the Post is notched (as shown) or otherwise cut or sawed to form a vertical flat plane and then, at some location below the top 14", is angularly sliced out to the surface of the post.

When a wood block is used adjacent to a wood post, the block shall be nailed to the post with a galvanized steel 10d common nail. The nail is to be driven in the center of the top or bottom of the block.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
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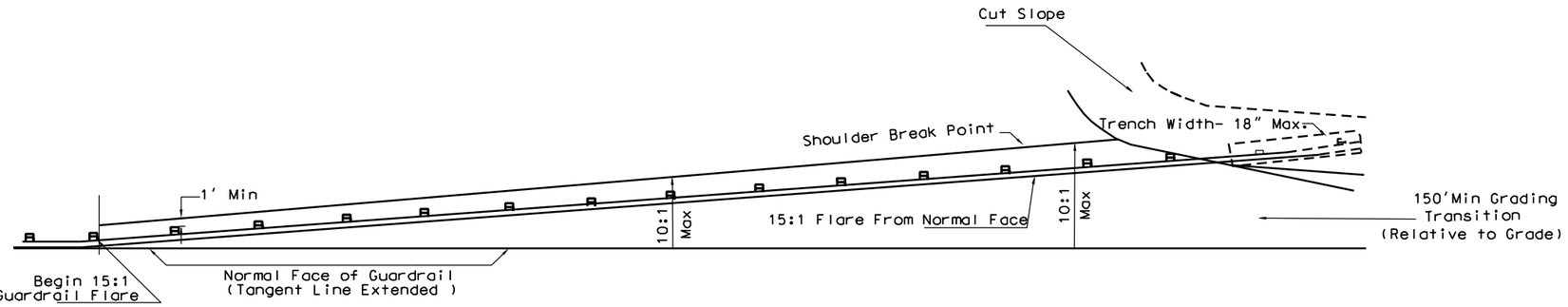
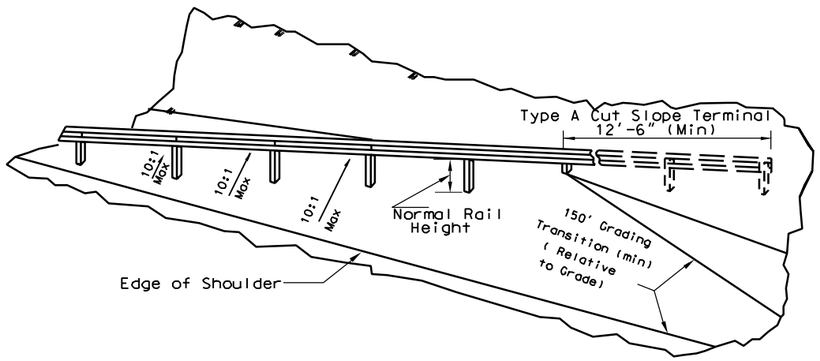
REVISION DATE

DOUBLE-FACED GUARDRAIL POSTS

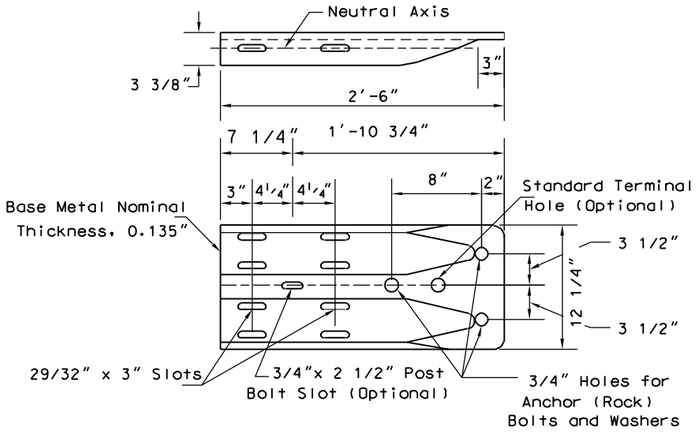
STANDARD SHEET GR3



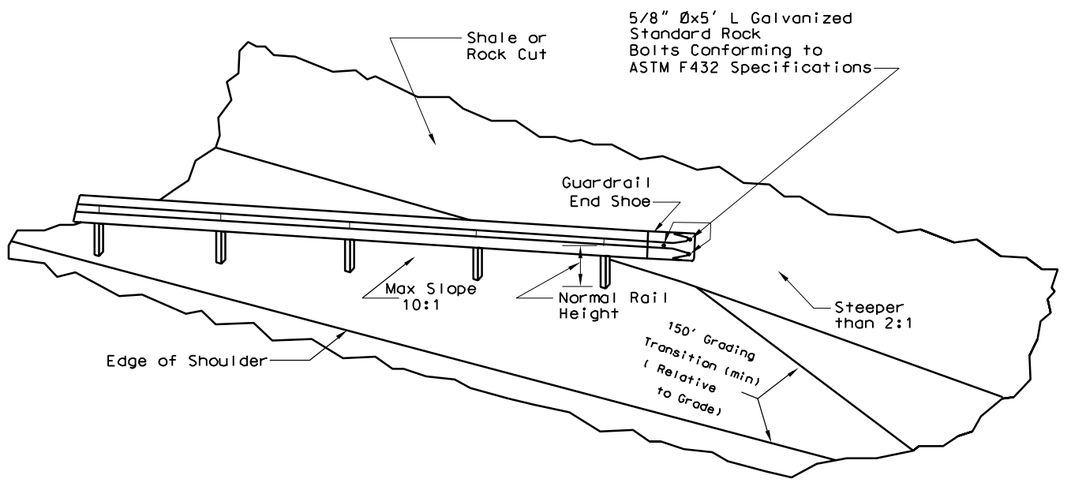
APPROACH END TREATMENT (MULTI-LANE DIVIDED AND 2-LANE HIGHWAYS)



TYPE A (SOFT SHALE OR SOIL) CUT SLOPE TERMINAL INSTALLATION



GUARDRAIL END SHOE DETAIL



TYPE B (SHALE OR ROCK) CUT SLOPE TERMINAL INSTALLATION

NOTES

For fill-to-cut guardrail terminals (trailing ends, two-lane highways, and all approach ends) where anchored ends are specified, the details and requirements herein shall be applicable.

Prior to placing guardrail, a final check of existing conditions will be made by the Engineer and any adjustment necessary to insure the proper functioning of the guardrail for the purpose for which it is intended will be made accordingly.

Type A (Soft Shale or Soil) Cut Slope Terminal guardrail shall be that guardrail which (1) is to extend a minimum of two 6'-3" spans into the cut slope, from the first post beyond the toe of the cut slope, as detailed herein, and (2) is to terminate a minimum of 1'-0" below the ground elevation of the back slope, as detailed herein, except in areas of heavy rock outcropping where the minimum depth may be six inches.

Posts, blocks and rail elements shall be the same types used in the normal guardrail installation, unless otherwise noted. All posts shall be of standard length except underground posts may be W6x8.5 or W6x9.0, 2'-6" in length, in areas of heavy rock outcropping. Guardrail blocks shall not be used on any posts completely underground.

A trench no greater than 18" in width shall be excavated into the cut slope to accommodate the Type A Terminal installation. The Contractor shall so arrange his work sequence to provide that each Type A Cut Slope Terminal installation shall be excavated: posts driven: rail elements and guardrail components assembled: the trench backfilled: and disturbed slope shaped, seeded and mulched: all in one continuous operation.

Type B (Shale or Rock) Cut Slope Terminal installation shall consist of anchoring the guardrail against the face of the cut slope utilizing guardrail end shoes and rock bolts, as detailed herein.

The final decision as to the type of Cut Slope Terminal installation (Type A or Type B) at each location will be based on the actual materials encountered during construction.

The cost of furnishing and installing Cut Slope Terminals shall include excavating and backfilling the trench, and reshaping, seeding and mulching of the cut slope for Type A Cut Slope Terminal: shall include drilling holes into the cut slope, and furnishing and installing rock bolts, end shoes, and hardware for Type B Cut Slope Terminal: and shall be paid for as "Cut Slope Terminal", Type A or B per each. Normal guardrail components: i.e., posts, blocks, rail elements, hardware, etc., including special length guardrail posts in heavy rock outcroppings: shall be paid for as guardrail per linear foot.

Cut Slope Terminal installation can interfere with normal drainage through a cut section. When this occurs, details for maintaining positive drainage will be shown on the project plans.

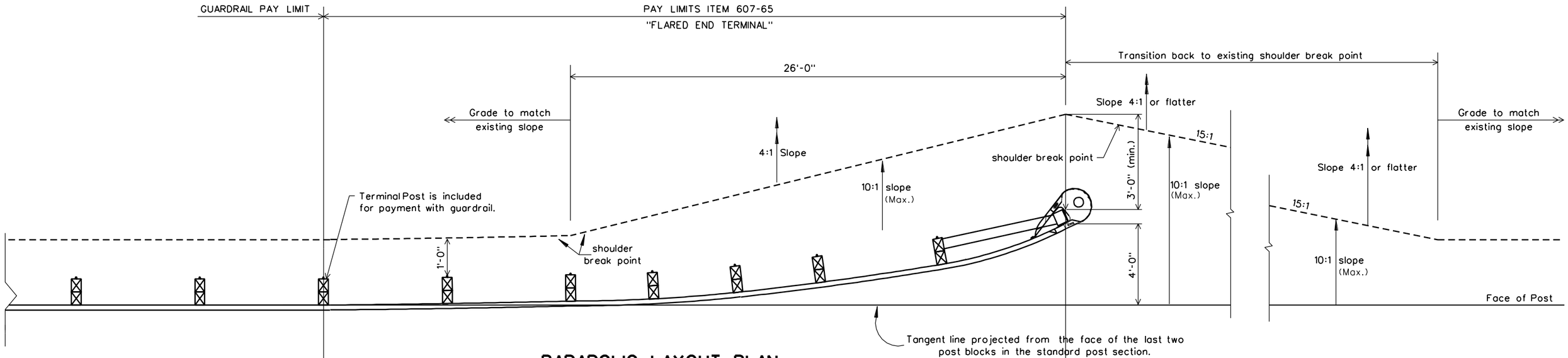
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

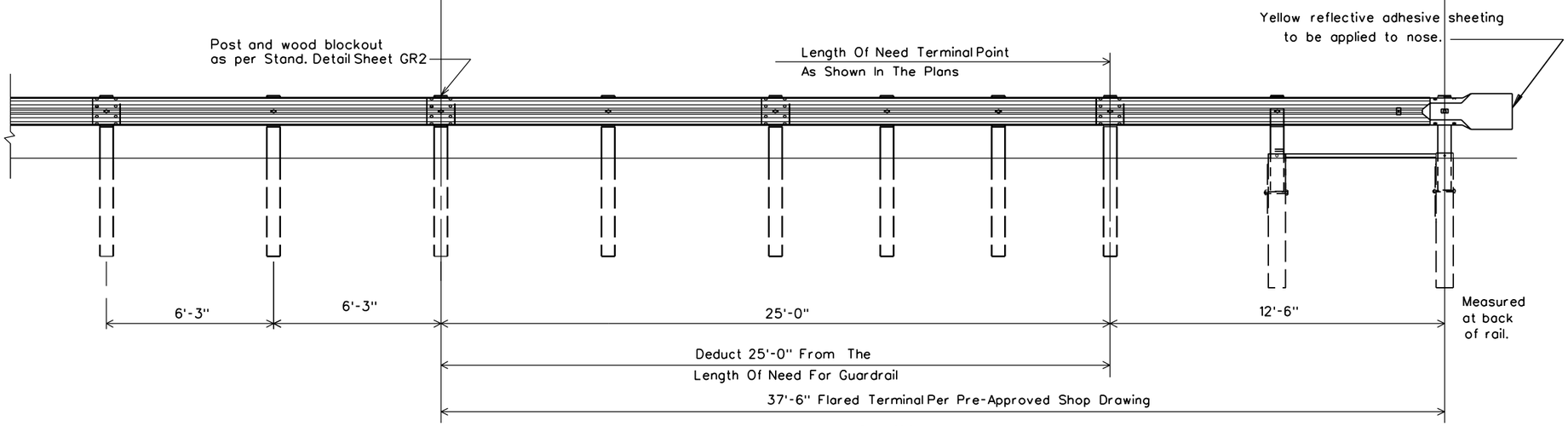
REVISION DATE

CUT SLOPE TERMINAL

STANDARD SHEET GR4



PARABOLIC LAYOUT PLAN



ELEVATION

NOTES

For details of Flared End Terminal see pre approved shop drawings.

All materials used shall meet the applicable requirements of Section 607 of the Standard Specifications Road and Bridges.

The post offset dimensions are given to the center of the traffic face of the blockouts; except at the first post, where the dimension is to the center of the traffic face of the post. Offset points are to be located by measurements at the back of rail equal to the nominal post spacings shown on pre-approved shop drawings. Posts are to be set approximately radial to the railing at each location.

When a wood block is used adjacent to a wood post, the block shall be nailed to the post with a galvanized steel 10d common nail. The nail is to be driven into the center of the top or bottom of the block.

The cost of furnishing and installing the Flared End Terminal, complete with all miscellaneous hardware and parts as detailed on the pre-approved shop drawings , is to be included in the unit price bid for "Flared End Terminal".

Yellow reflective sheeting shall cover the entire nose of those terminals with a flat impact head. Those terminals with a rounded impact head shall be covered with a 1'-0" X 3'-0" yellow reflective sheet.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

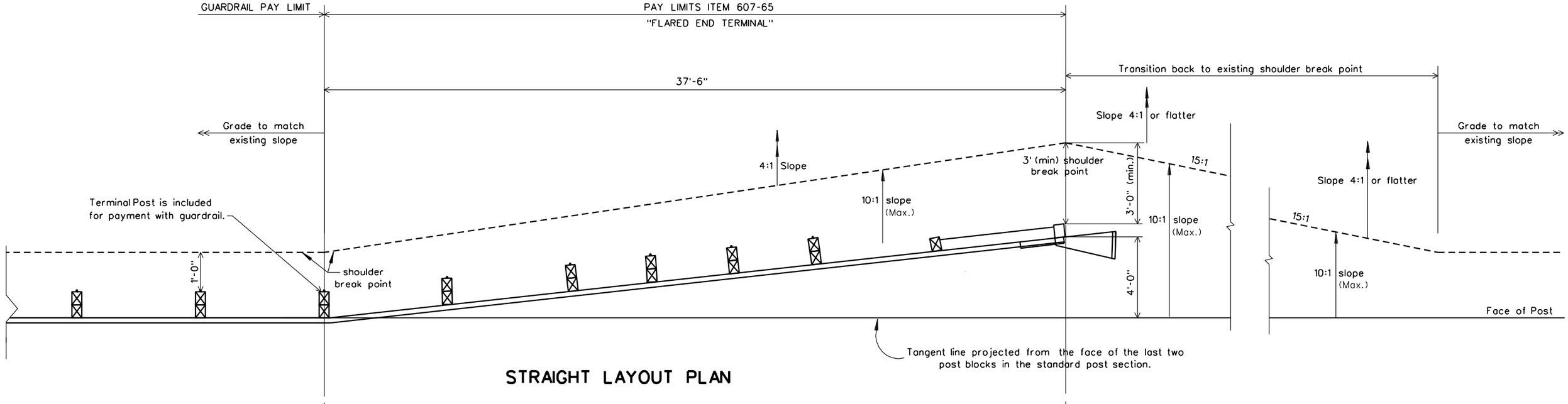
PREPARED 7-1-99

REVISION DATE

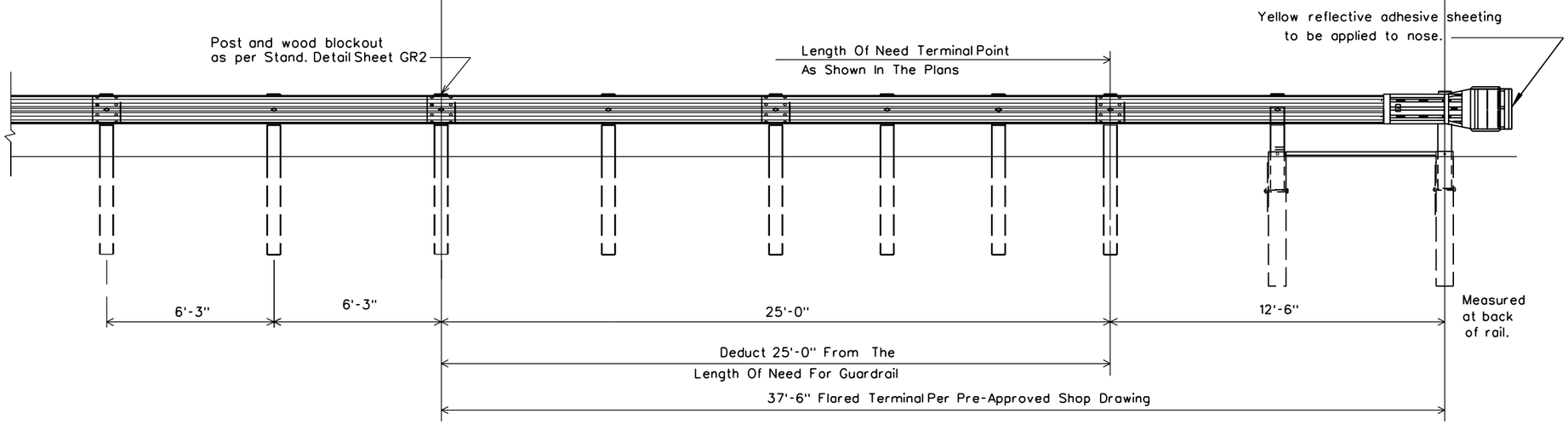
FLARED END TERMINAL PARABOLIC LAYOUT

(SHEET 1 OF 2)

STANDARD SHEET GR5



STRAIGHT LAYOUT PLAN



ELEVATION

NOTES

For details of Flared End Terminal see pre approved shop drawings.

All materials used shall meet the applicable requirements of Section 607 of the Standard Specifications Road and Bridges.

The post offset dimensions are given to the center of the traffic face of the blockouts; except at the first post, where the dimension is to the center of the traffic face of the post. Offset points are to be located by measurements at the back of rail equal to the nominal post spacings shown on pre-approved shop drawings. Posts are to be set approximately radial to the railing at each location.

When a wood block is used adjacent to a wood post, the block shall be nailed to the post with a galvanized steel 10d common nail. The nail is to be driven into the center of the top or bottom of the block.

The cost of furnishing and installing the Flared End Terminal, complete with all miscellaneous hardware and parts as detailed on the pre-approved shop drawings , is to be included in the unit price bid for "Flared End Terminal".

Yellow reflective sheeting shall cover the entire nose of those terminals with a flat impact head. Those terminals with a rounded impact head shall be covered with a 1'-0" X 3'-0" yellow reflective sheet.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

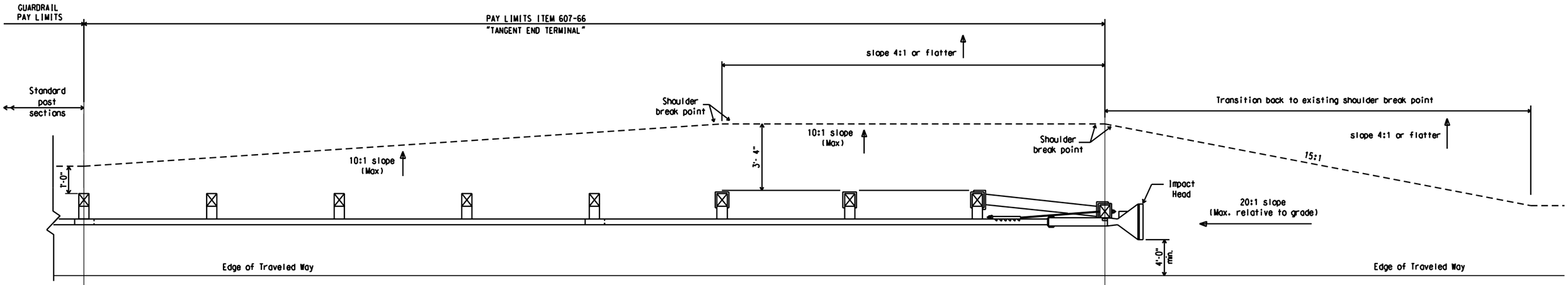
PREPARED 7-1-99

REVISION DATE

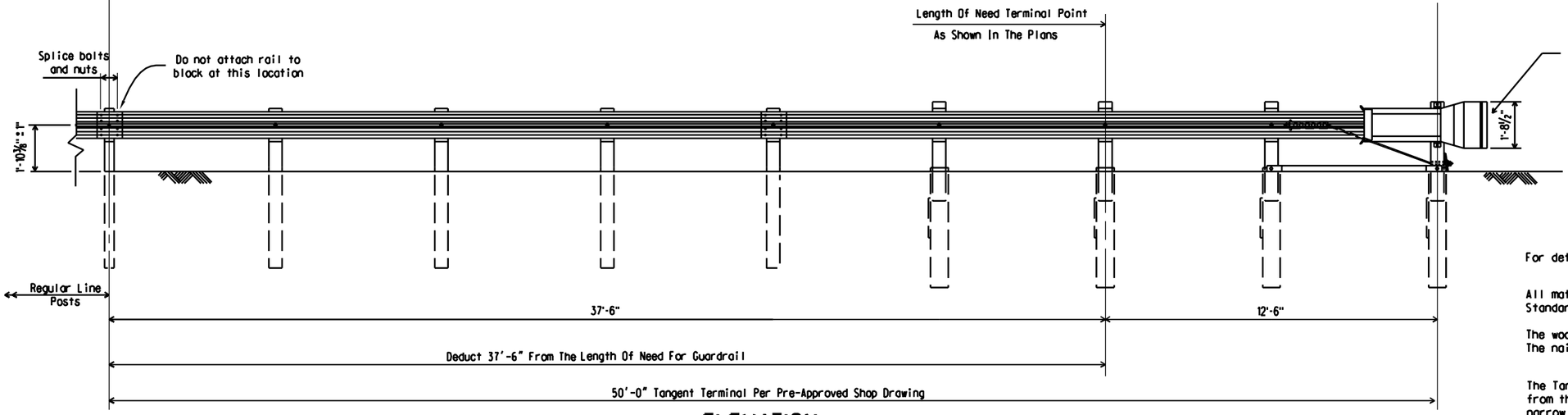
FLARED END TERMINAL STRAIGHT LAYOUT

(SHEET 2 OF 2)

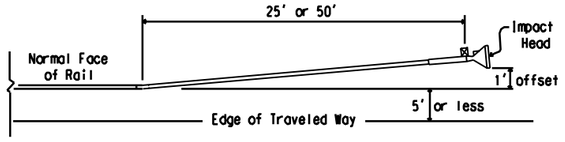
STANDARD SHEET GR5



TANGENT END TERMINAL PLAN



ELEVATION



FLARE DETAIL

NOTES:

For details of Tangent End Terminal, see pre-appoved shop drawings.

All materials used shall meet the applicable requirements of Section 607 of the Standard Specifications Roads and Bridges.

The wood block shall be nailed to the post with a galvanized steel 10d common nail. The nails are to be driven into the center of the top or bottom of the block.

The Tangent End Terminal installation shall maintain a 4' minimum offset from the edge of the impact head to the edge of the traveled way. For narrow existing shoulders that have an offset of 5' or less from the face of the rail element to the edge of the traveled way, the rail and terminal may be flared from the normal face of rail. The flared offset distance shall be 1' at a taper rate of 25:1, for a total flare length of 25'; or a taper rate of 50:1, for a total flare length of 50' (see Flare Detail).

Rail element panel lengths shall be 25' only. Shorter lengths shall not be used.

The cost of furnishing and installing the Tangent End Terminal, complete with all miscellaneous hardware and parts as detailed on the pre-approved shop drawings, is to be included in the unit price bid for "Tangent End Terminal".

Yellow reflective sheeting shall cover the entire nose of those terminals with a flat impact head. Those terminals with a rounded impact head shall be covered with a 1'-0" X 3'-0" yellow reflective sheet.

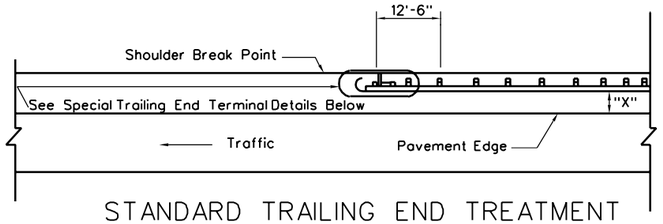
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

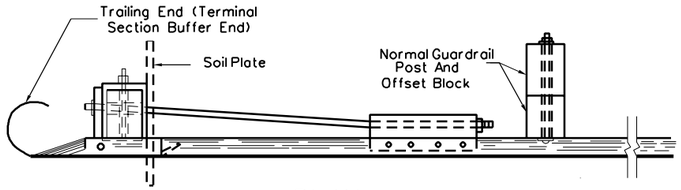
REVISION DATE

TANGENT END TERMINAL

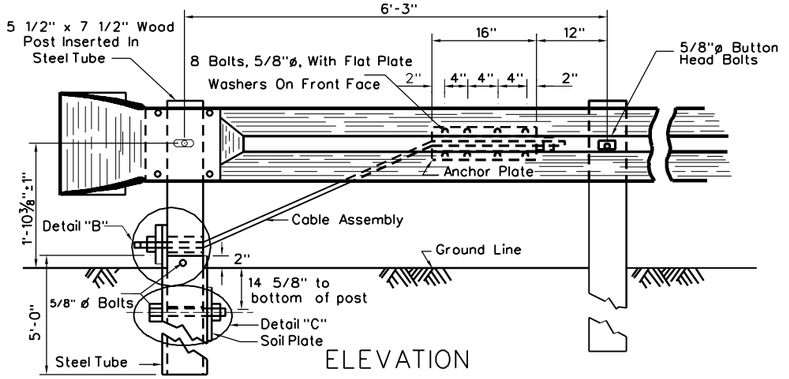
STANDARD SHEET GR6



STANDARD TRAILING END TREATMENT
(MULTI-LANE DIVIDED HIGHWAY)



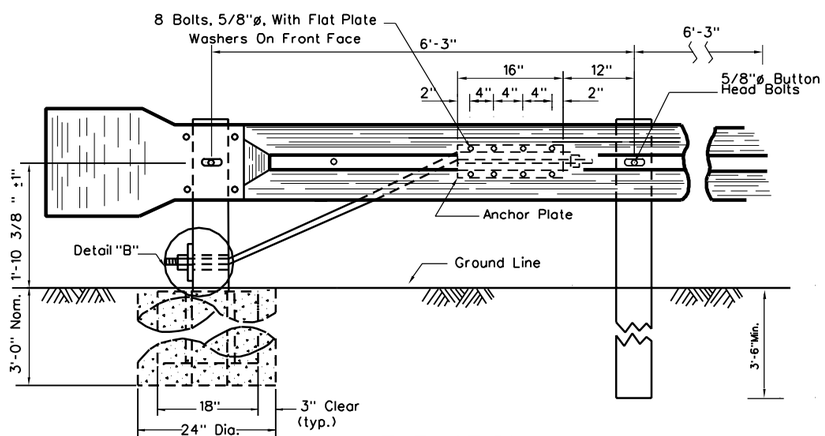
PLAN



ELEVATION

SPECIAL TRAILING END TERMINAL(STET)

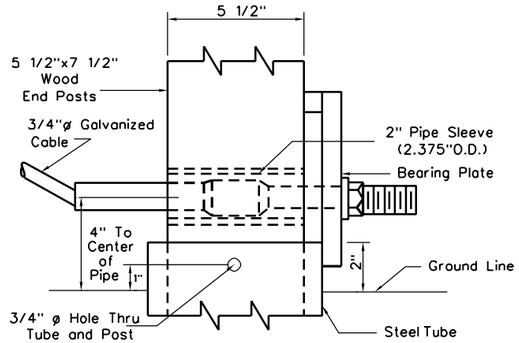
(TUBULAR STEEL END FOUNDATION)



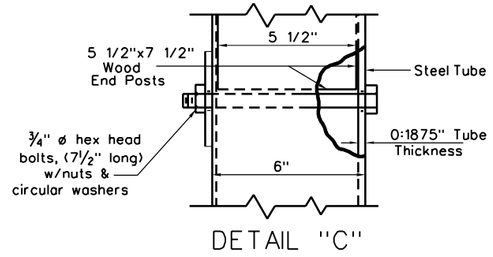
ELEVATION

SPECIAL TRAILING END TERMINAL(STET)

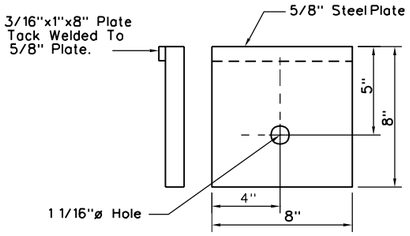
(CONCRETE FOOTER END FOUNDATION)



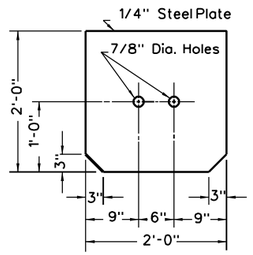
DETAIL "B"



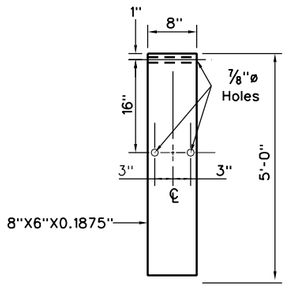
DETAIL "C"



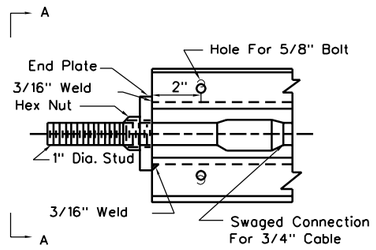
BEARING PLATE



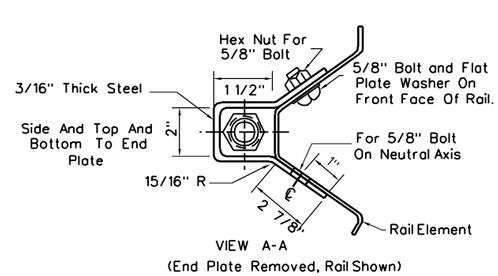
SOIL PLATE



STEEL TUBE

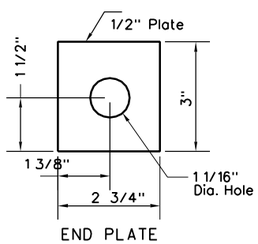


FRONT VIEW
(Rail Removed)

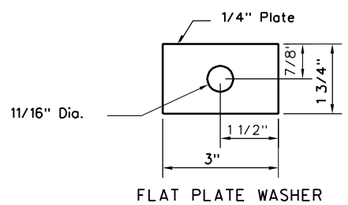


VIEW A-A
(End Plate Removed, Rail Shown)

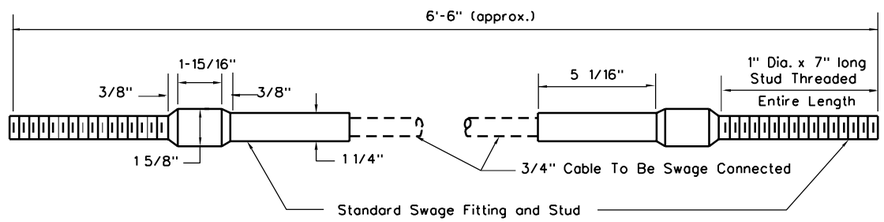
ANCHOR PLATE DETAIL



END PLATE



FLAT PLATE WASHER



CABLE ASSEMBLY

NOTES

Steel tubes shall meet the requirements of ASTM Specification A500, Grade B, and shall be galvanized after fabrication in accordance with the requirements of AASHTO Specification M111. Other terminal components; such as anchor plates, cable assemblies, hardware, plates, pipe sleeves, etc; shall conform to the detail and requirements of section 607 of the Specifications.

For each STET end treatment installation it shall be the Contractor's option whether to utilize the Tubular Steel End Foundation design detailed herein or Concrete Footer End Foundation design detailed , unless one type is specified in the plans. When the Concrete Footer End Foundation is used, the embedded portion of the Endpost is to be double wrapped with Composition Paper or single wrapped with sheet metal or other material acceptable to the Engineer before concrete placement to facilitate replacement of damaged posts.

The cost of furnishing and installing the Special Trailing End Terminal; including structural tubing, soil plates, and welded bearing plates for Tubular Steel End Foundations; concrete footers, welded wire fabric, all necessary excavation, composition paper and sheetmetal for Concrete Footer End Foundations; and all "terminal" hardware, cables, studs, plates, and pipe sleeves shall be included in the unit price bid for "Special Trailing End Terminal", per each. Normal guardrail components; i.e., posts, blocks, rail elements, hardware, etc; along with the special size and/or special length wood guardrail end post and the terminal section buffer end, shall be paid for as guardrail per linear foot.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

REVISION DATE

SPECIAL TRAILING END TERMINAL

STANDARD SHEET GR7

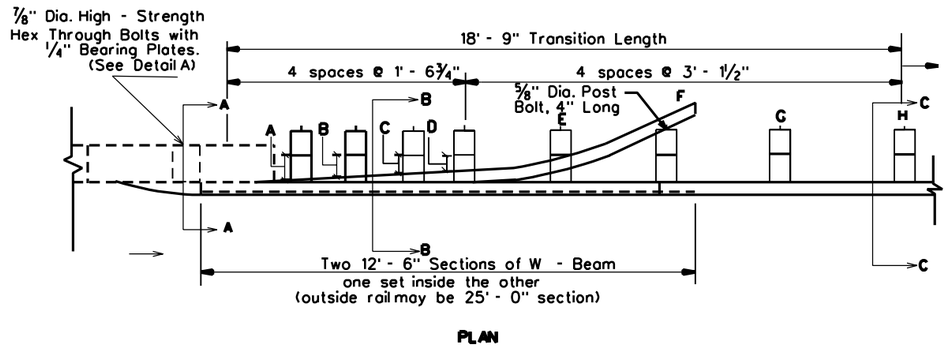
THIS SHEET WAS
LEFT BLANK
INTENTIONALLY

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

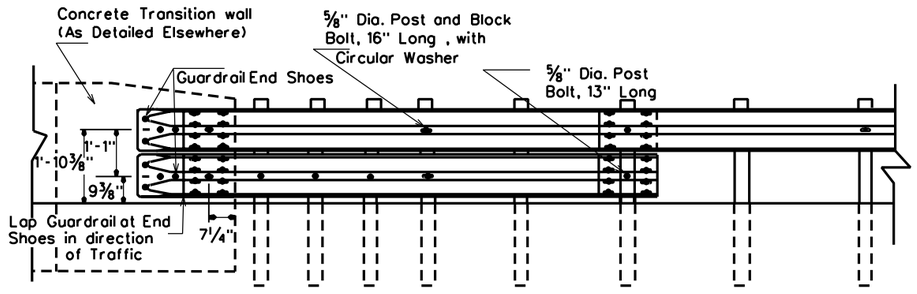
REVISION DATE

GUARDRAIL AT MEDIAN BRIDGES, GUARDRAIL FOR MEDIAN OBSTACLE

STANDARD SHEET GR8

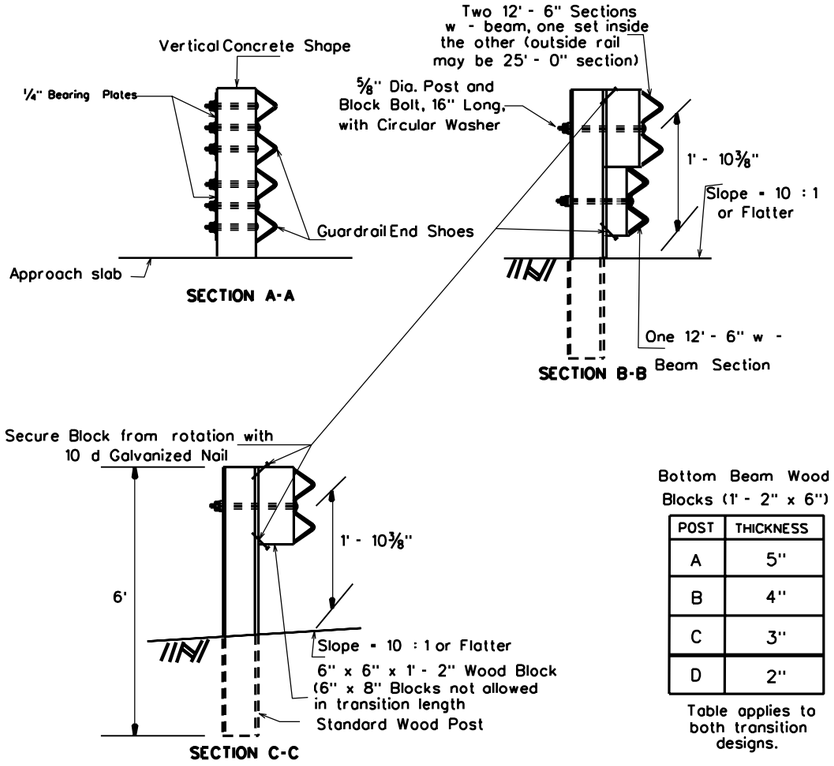


PLAN



ELEVATION

Guardrail - Bridge Transition and Connection (Wood Post Design)



Bottom Beam Wood Blocks (1' - 2" x 6")

POST	THICKNESS
A	5"
B	4"
C	3"
D	2"

Table applies to both transition designs.

NOTES

These guardrail transitions are appropriate for connection to a vertical concrete shape and should not be connected directly to a concrete saftey shape. Concrete saftey shape bridge rails or barriers shall be transitioned to a vertical shape at the guardrail connection in a manner detailed elsewhere in the Project Plans.

Although these details may appear to apply strictly to guardrail-to-bridge transitions and connections, they actually can apply to guardrail transitions and connections to concrete barriers, concrete rigid walls or other structures as specified and detailed on the Project Plans.

These details are not required for transitioning guardrail to a bridge when the guardrail is located on the trailing end of a divided highway bridge. Normal guardrail details shall apply.

Installation shall be performed in such a manner as to maintain the rail elements (top w-beams) parallel to the roadway centerline throughout the length of the 18'- 9" transition for both designs.

Posts A,B,C,and D require an additional hole to attach bottom blocks and bottom beams. For wood post design the bottom beam wood blocks shall be center drilled and attached with 5/8" diameter post bolts. For steel post design the bottom beam wood blocks shall be offset drilled to sit squarelly on the post flange and attached with 5/8" diameter bolts.

For both transitions, the sixth post from the vertical concrete wall shall require an additional hole on the back face of the post to attach the bottom w-beam with 5/8" diameter bolts.

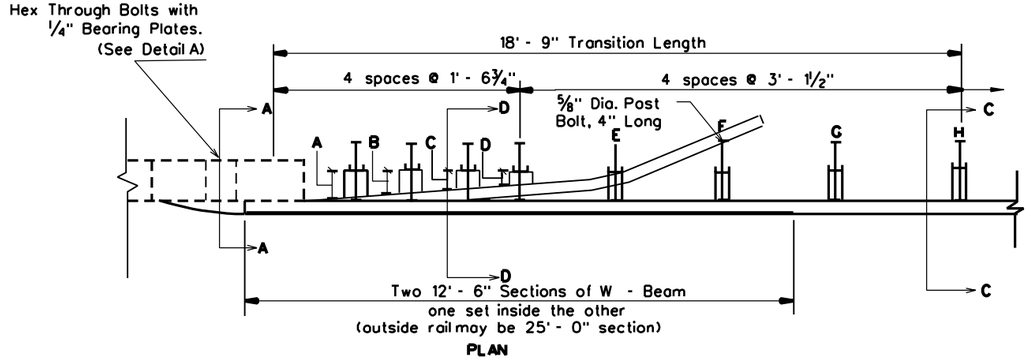
The rubrail (bottom w-beam) may be shop bent for approximately the last three feet to facilitate installation.

A,B,C,E,and G posts and blocks shall not be bolted to the top rail elements; however, posts and blocks shall be bolted and carefully erected to provide firm contact of the blocks against the top rails at these posts.

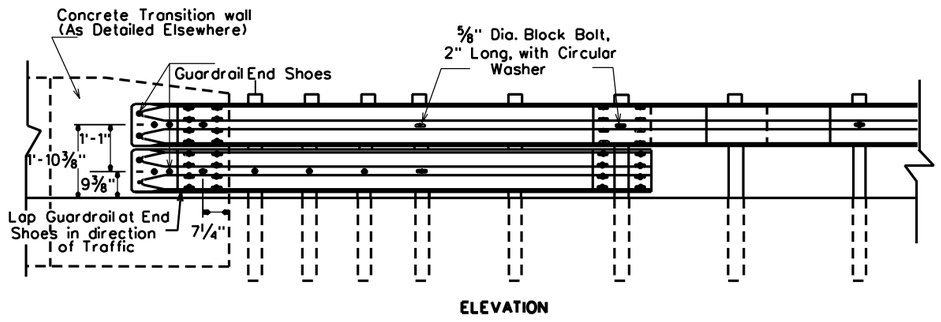
All bolt holes in all rail sections shall be shop fabricated.

These details are for transitioning 6' 3" post spacing guardrail to a vertical concrete shape. When transitioning 12' 6" post spacing guardrail to a vertical concrete shape, the 25' of rail prior to this 18' 9" transition shall have 6' 3" post spacing.

There is no separate pay item for this connection and all components as detailed herein shall be included in the contract price for guardrail.

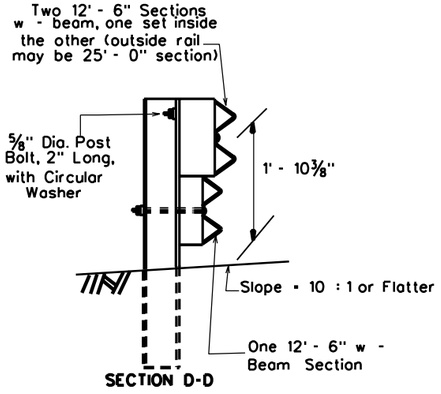


PLAN

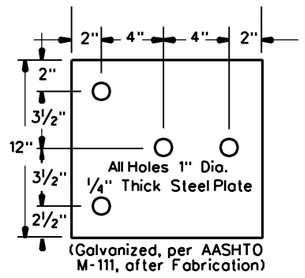


ELEVATION

Guardrail - Bridge Transition and Connection (Steel Post Design)

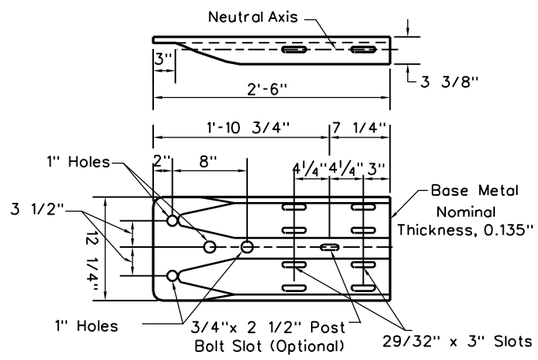


SECTION D-D



(Galvanized, per AASHTO M-111, after Fabrication)

DETAIL A



GUARDRAIL END SHOE DETAIL

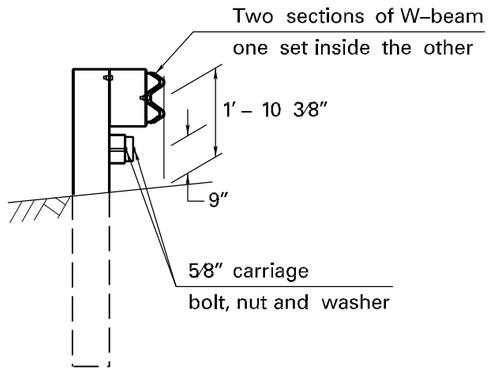
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREDARED 7-1-99

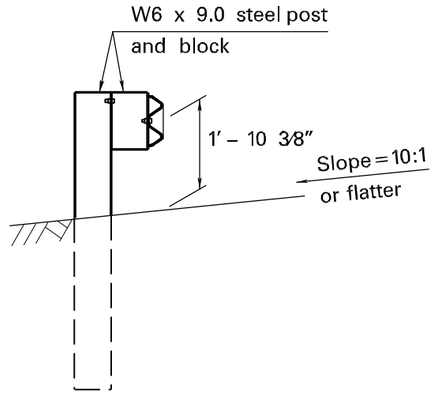
REVISION DATE

GUARDRAIL BRIDGE TRANSITIONS AND CONNECTIONS

STANDARD SHEET GR9



SECTION A–A



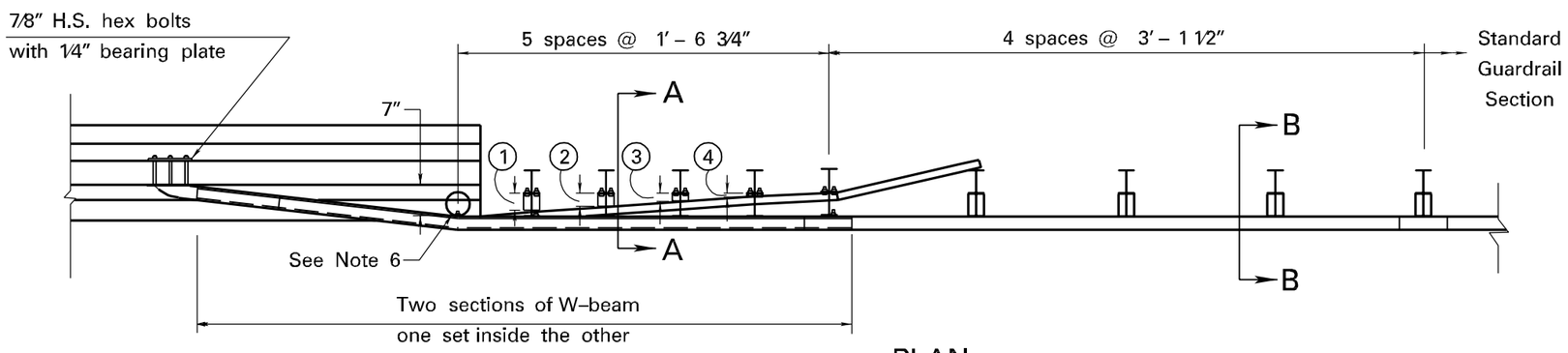
SECTION B–B

RUBRAIL
WOOD BLOCKS
7″ X 4″

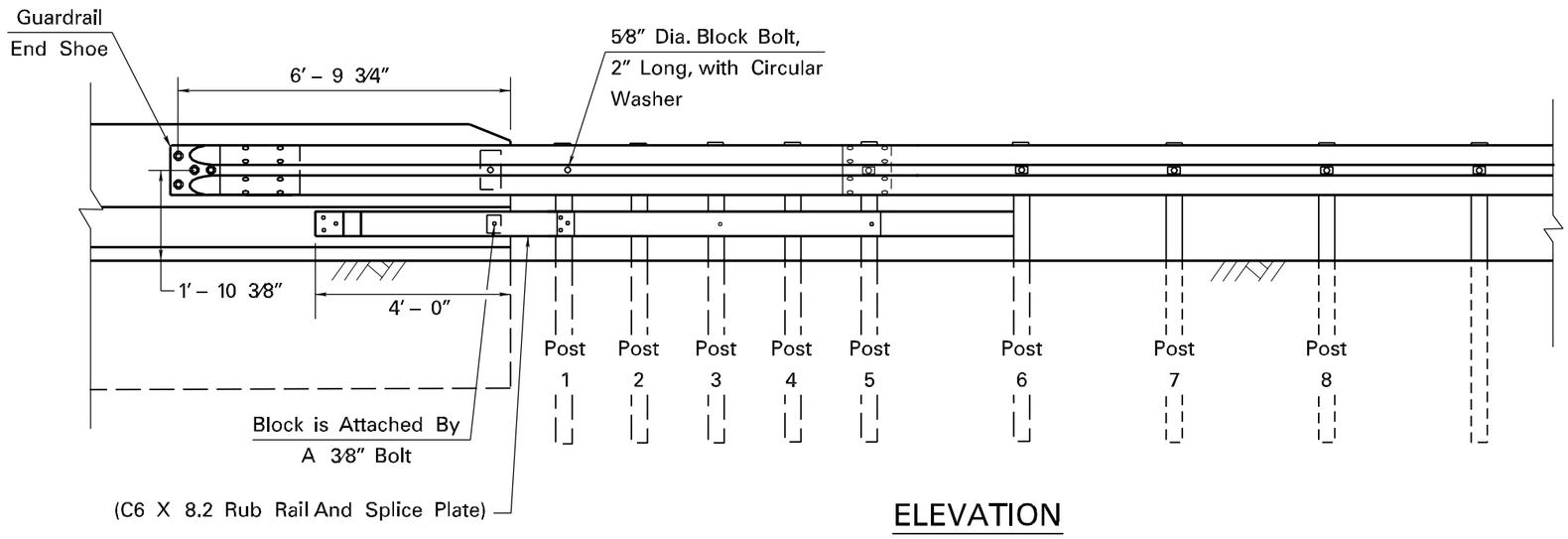
POST	THICKNESS
1	4 1⁄2″
2	3 1⁄2″
3	2″
4	1″

NOTES

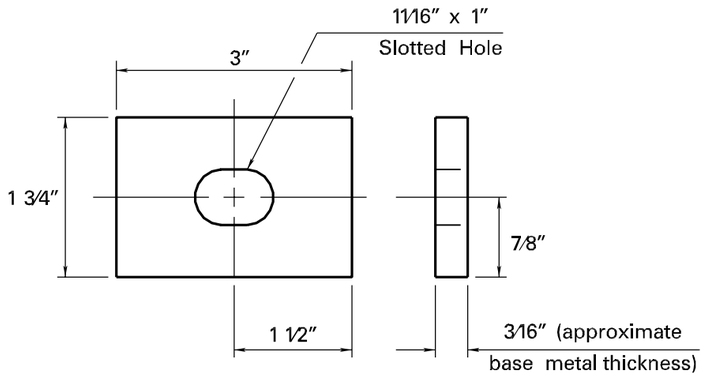
1. This guardrail transition is appropriate for connection to a concrete safety shape.
2. Bridge rail ends and bridge parapets must be of adequate strength to accept full impact loading.
3. Posts 1–6 require an additional hole to attach lower blocks and/or rubrail.
4. Rubrail wood blocks located on posts 1 through 4 are offset drilled and secured with 5⁄8″ carriage bolts to posts 2 and 4. : rubrail and posts of posts 1, 3 and 5.
5. W–beam is not bolted to posts at posts 2 through 4 and posts 6 and 8.
6. Steel spacer tube, schedule 40 galvanized pipe, 6″ (I.D.) x 9″, and attached by a 5⁄8″ carriage bolt and rectangular plate washer.
7. See sheet 3 of 3 for detail. Block is attached by 3⁄8″ X 3″ bolt.
8. There is no separate pay item for this connection and all components as detailed herein shall be included in the contract price for guardrail.



PLAN



ELEVATION



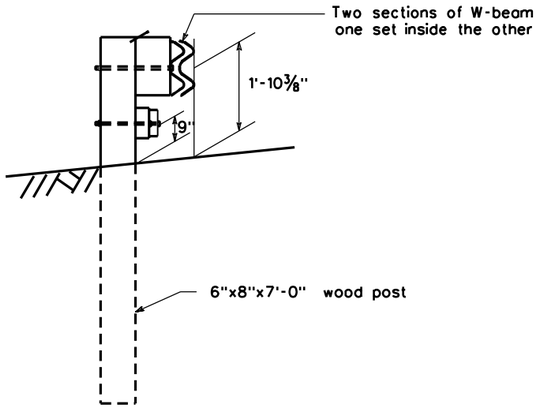
RECTANGULAR PLATE WASHER DETAIL

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

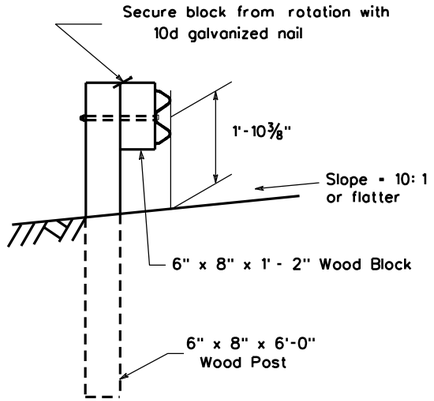
PREPARED 7-1-99
REVISION DATE

W–BEAM TRANSITION TO SAFETY SHAPE WOOD POST WITH RUBRAIL

SHEET 1 OF 3
STANDARD SHEET GR10



SECTION A-A



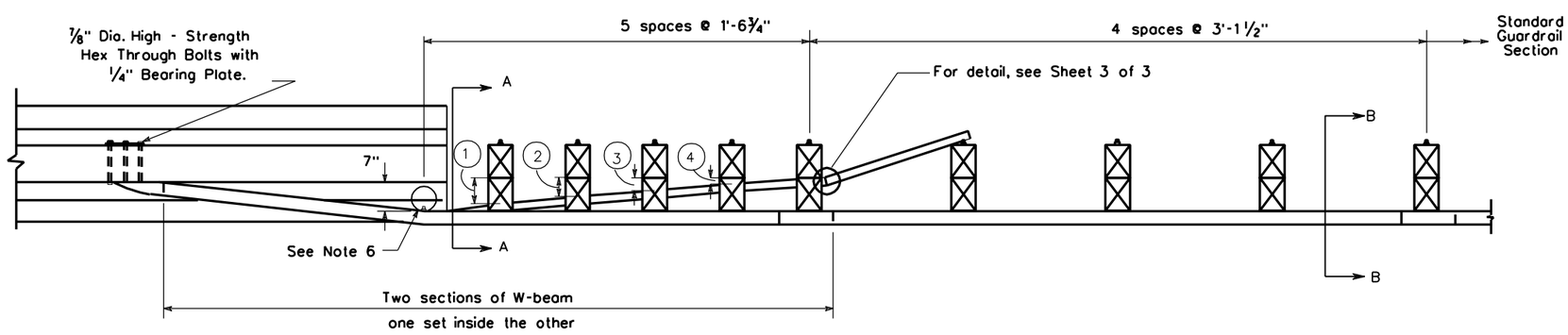
SECTION B-B

Rubrail
Wood Blocks 7" x 6"

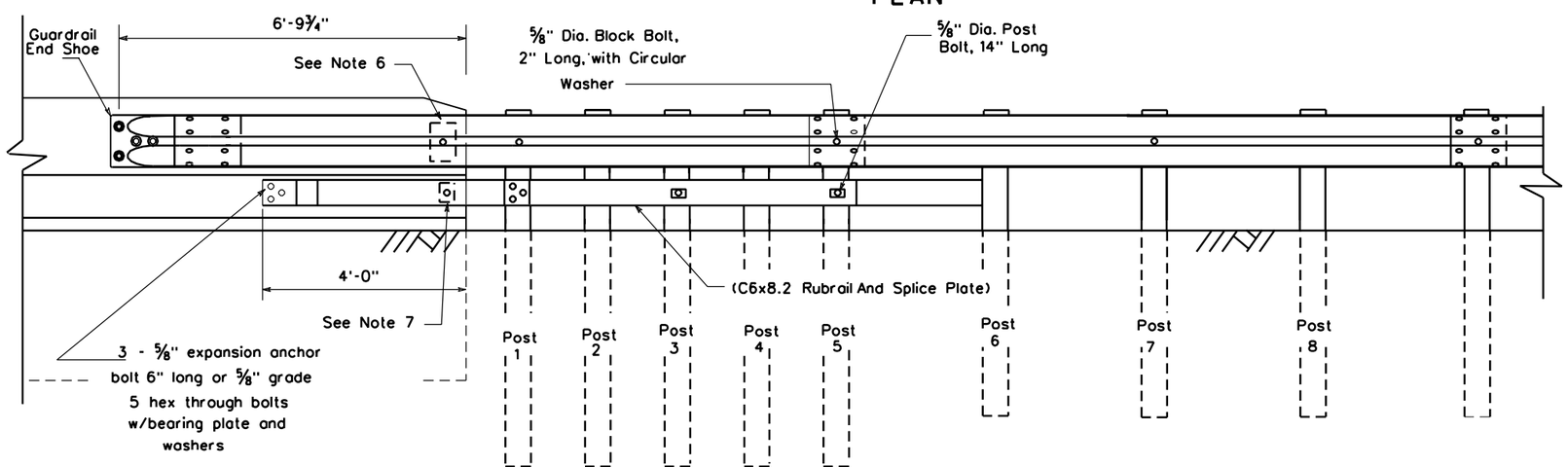
POST	THICKNESS
1	6 1/4"
2	4 5/8"
3	3 1/8"
4	1 1/2"

NOTES

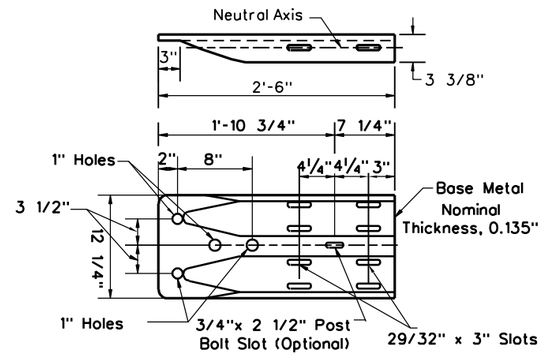
1. This guardrail transition is appropriate for connection to a concrete safety shape.
2. Bridge rail ends and bridge parapets must be of adequate strength to accept full impact loading.
3. Rubrail wood bocks, located on posts 1 through 4 are center drilled and secured with 5/8" carriage bolts.
4. Posts 1 through 5 require an additional hole to attach lower blocks and/or lower rubrail.
5. W-beam is not bolted to posts and blocks at posts 2, 3, 4, 6, and 8. Blocks are bolted directly to posts.
6. Steel spacer tube, schedule 40 galvanized pipe, 6" (I.D.) x 9", attached by a 5/8" carriage bolt, and rectangular plate washer.
7. See Sheet 3 of 3 for detail. Block is attached by a 3/8" x 3" bolt.
8. There is no separate pay item for this connection and all components as detailed herein shall be included in the contract price for guardrail.



PLAN



ELEVATION



GUARDRAIL END SHOE DETAIL

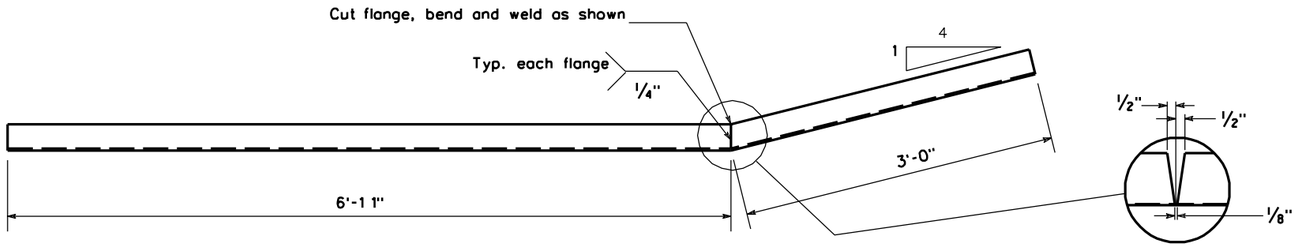
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

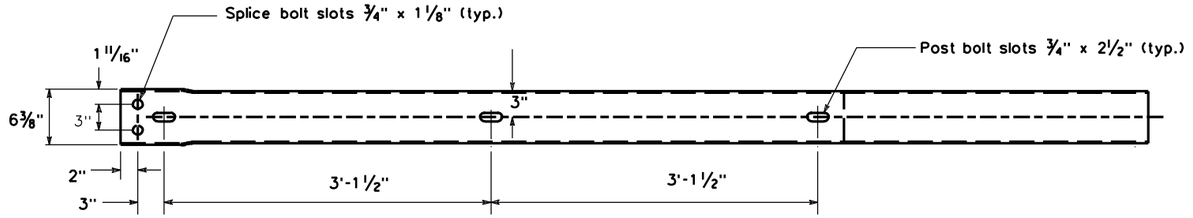
PREPARED 7-1-99
REVISION DATE

W-BEAM TRANSITION TO SAFETY SHAPE WOOD POST WITH RUBRAIL

SHEET 2 OF 3

STANDARD SHEET GR10





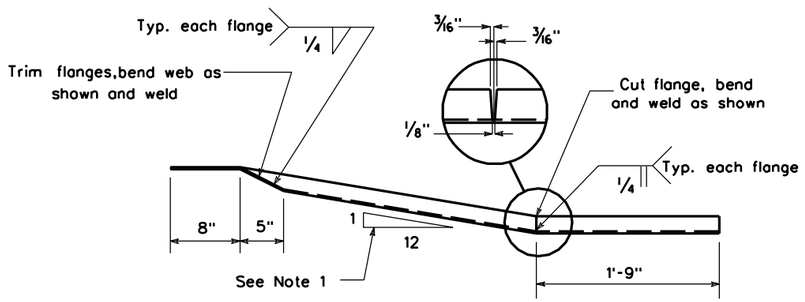
BENT PLATE RUBRAIL DETAIL

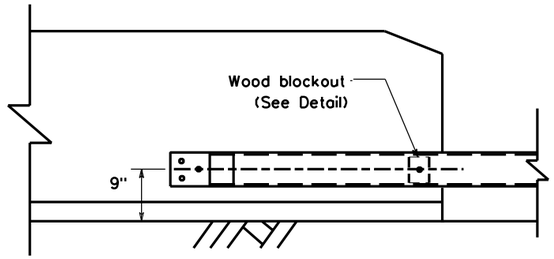
NOTES

1. Rubrail end must be attached flush with sloped toe of safety shape. Installation can be greatly simplified by fabricating or shop twisting the rubrail end to be consistent with the the slope of safety shape. Rubrail ends twisted both clockwise and counterclockwise may be required in most situations.

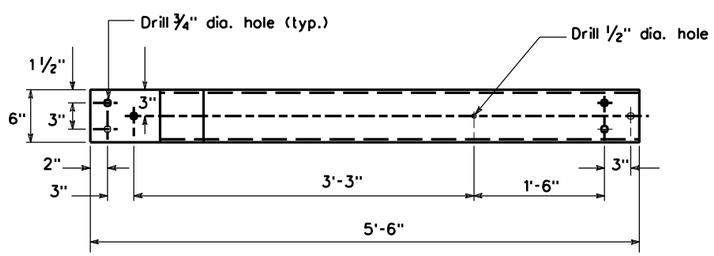
2. The rubrail end attachment to the concrete safety shope requires three closely drilled holes. approprite epoxy bolt anchors should be used to reduce the risk of splitting the concrete.

3. There is no separate pay item for this connection and all components as detailed herein shall be included in the contract price for guardrail.

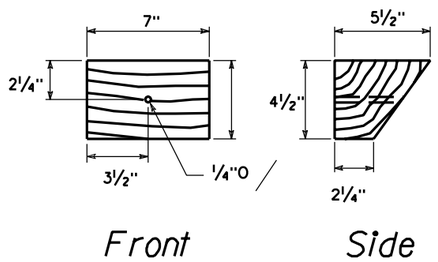




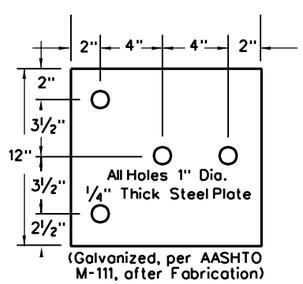
RUBRAIL ATTACHMENT
TO SAFETY SHAPE



C6X8.2 RUBRAIL
DETAIL



WOOD BLOCKOUT FOR RUBRAIL
DETAIL



BEARING PLATE
DETAIL

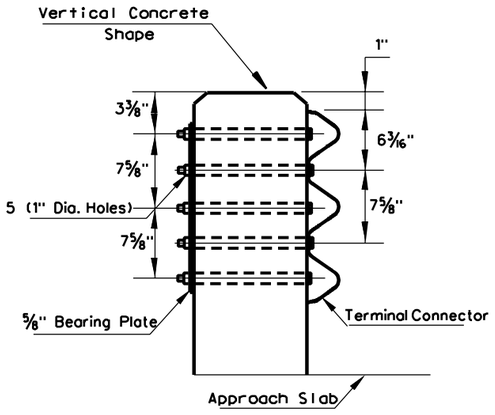
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99
REVISION DATE

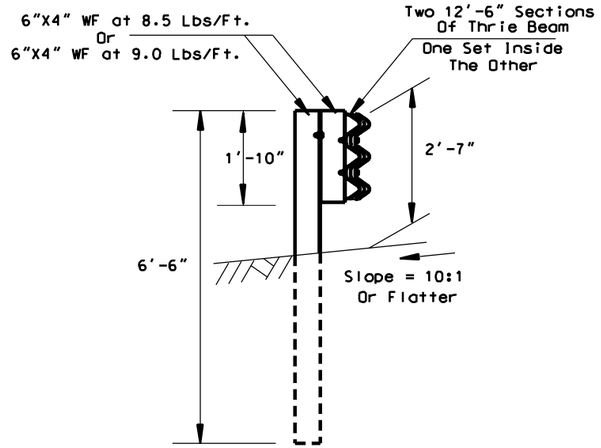
W-BEAM TRANSITION TO SAFETY SHAPE RUBRAIL DETAILS

SHEET 3 OF 3

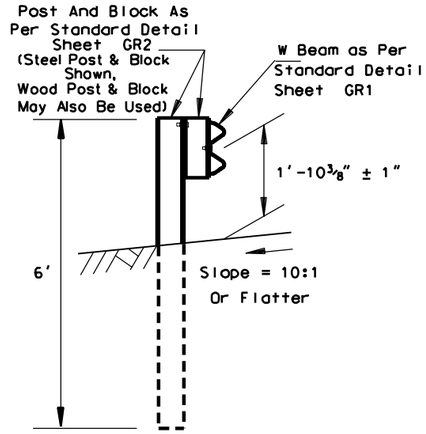
STANDARD SHEET GR10



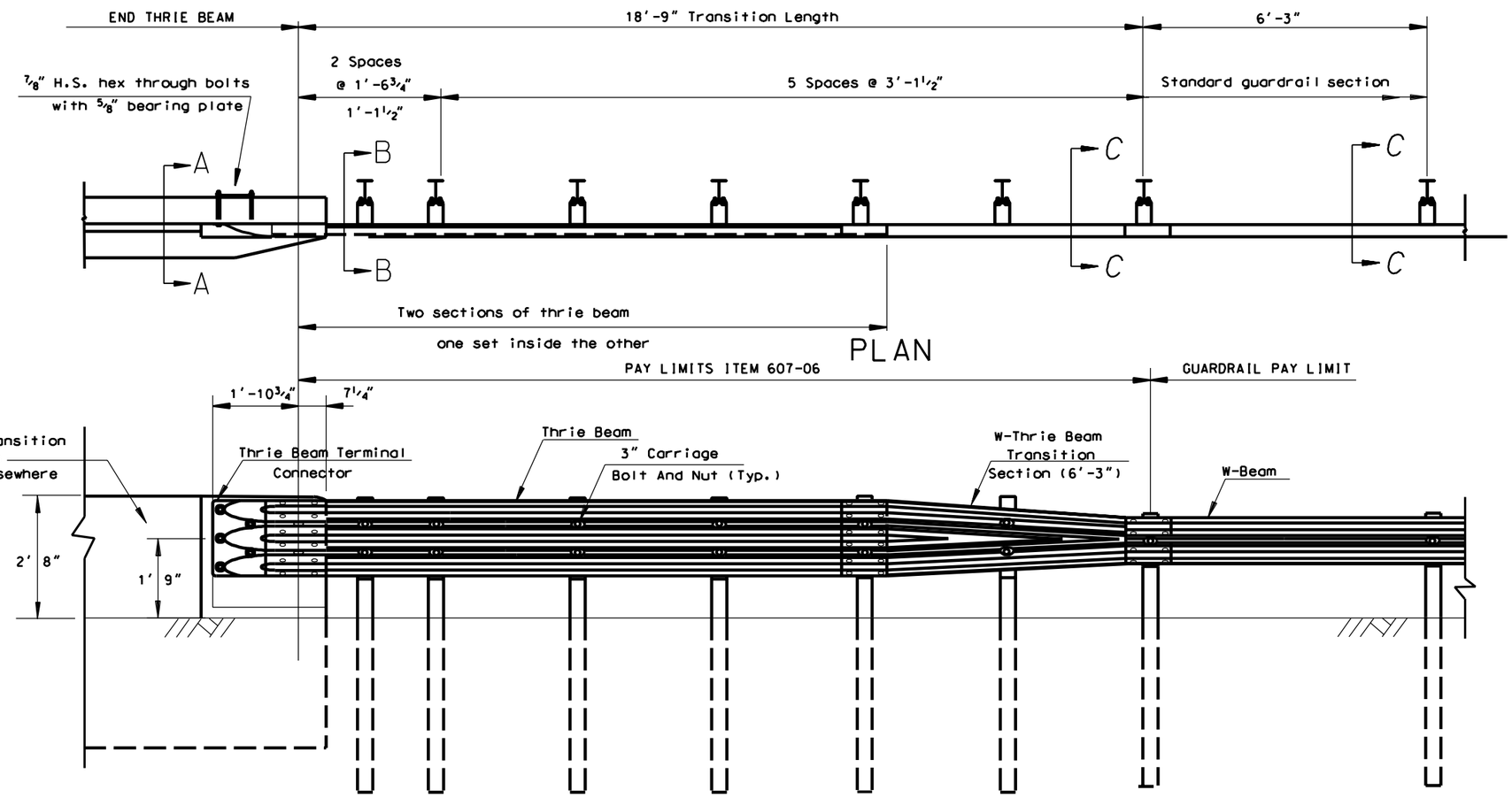
SECTION A-A



SECTION B-B



SECTION C-C



PLAN

ELEVATION

NOTES

This guardrail transition is appropriate for connection to a vertical concrete shape and should not be connected directly to a concrete safety shape. Concrete safety shape bridge rails or barriers shall be transitioned to a vertical shape at the guardrail connection in a manner detailed elsewhere in the Project Plans.

The two sections of 12'6" thrie beam require additional holes in order to mount the beam to the post nearest to the concrete wall.

See sheet 2 of 2 for details not shown on this sheet.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

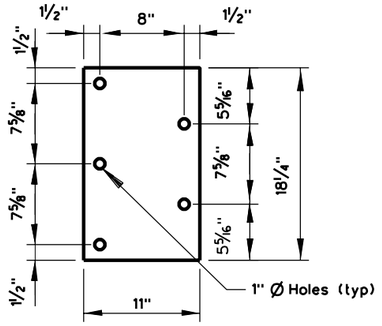
PREPARED 7-1-99

REVISION DATE

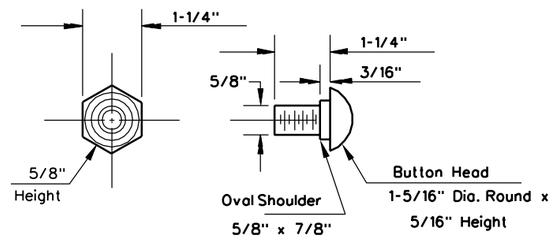
THRIE BEAM GUARDRAIL BRIDGE TRANSITION AND CONNECTION

SHEET 1 OF 2

STANDARD SHEET GR11

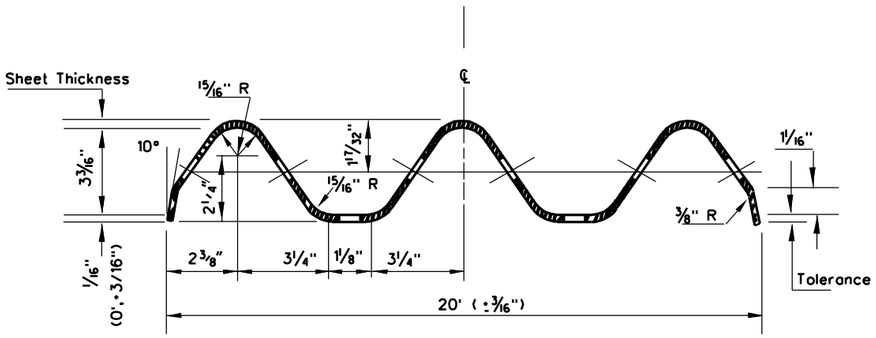


5/8" BEARING PLATE DETAIL

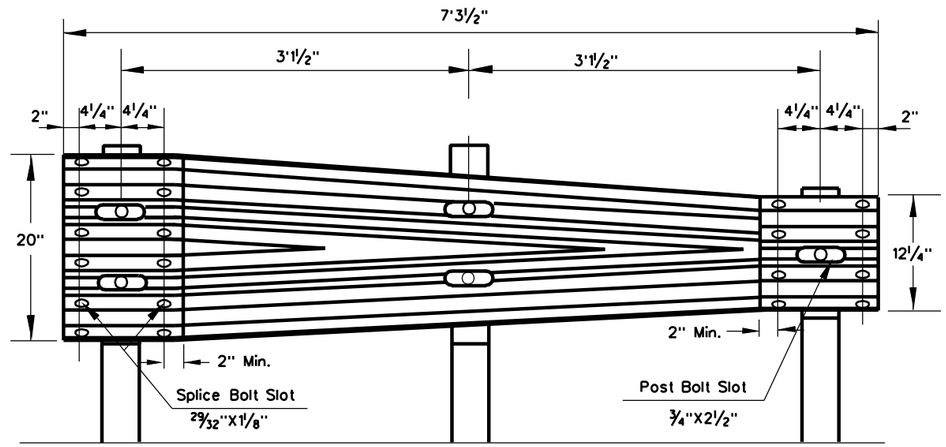


NUT SPLICE BOLT

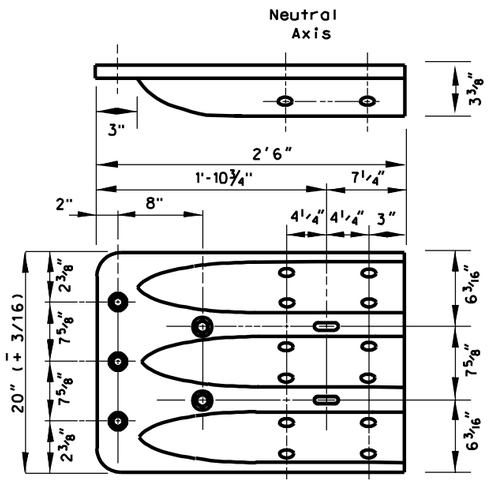
NUT AND SPLICE BOLT DETAIL
(POST BOLT: Similar Except Length)



SECTION THRU THRIE BEAM RAIL ELEMENT



TRANSITION SECTION DETAIL
(W- THRIE BEAM)



THRIE BEAM TERMINAL
CONNECTOR DETAIL

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

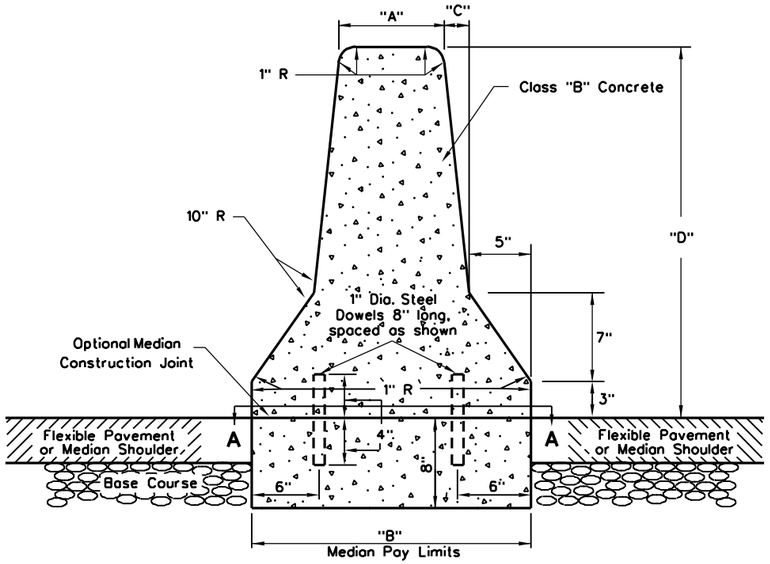
PREPARED 7-1-99

REVISION DATE

THRIE BEAM GUARDRAIL BRIDGE TRANSITION AND CONNECTION

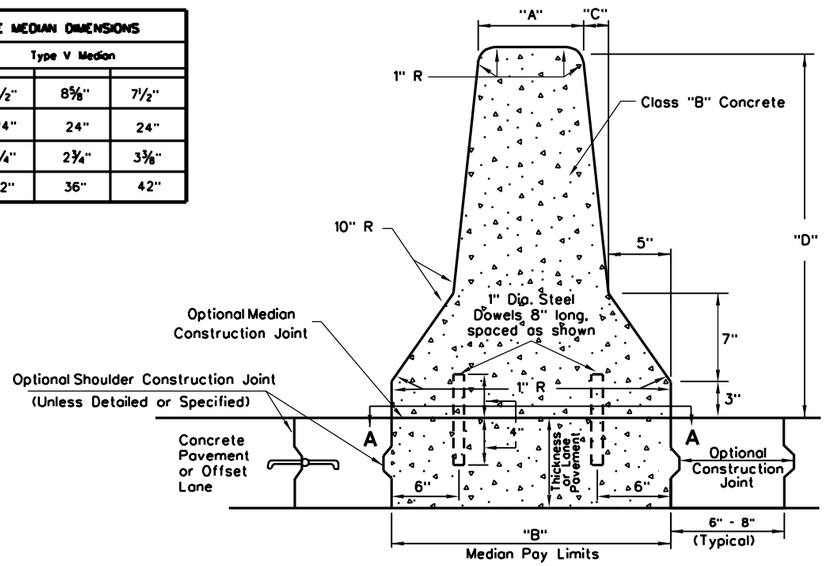
SHEET 2 OF 2

STANDARD SHEET GR11



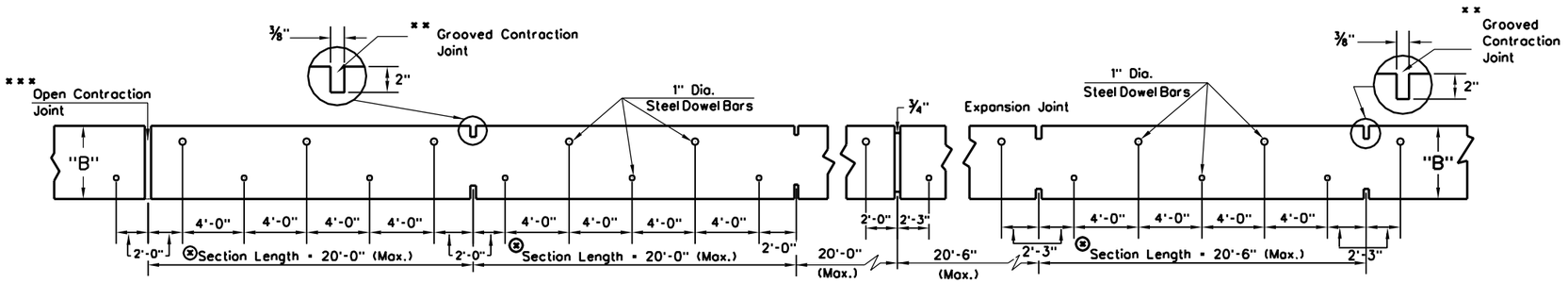
(Adjacent to Bituminous Paving)

F-SHAPE MEDIAN DIMENSIONS			
Designation	Type V Median		
"A"	9½"	8⅝"	7½"
"B"	24"	24"	24"
"C"	2¼"	2¾"	3⅜"
"D"	32"	36"	42"



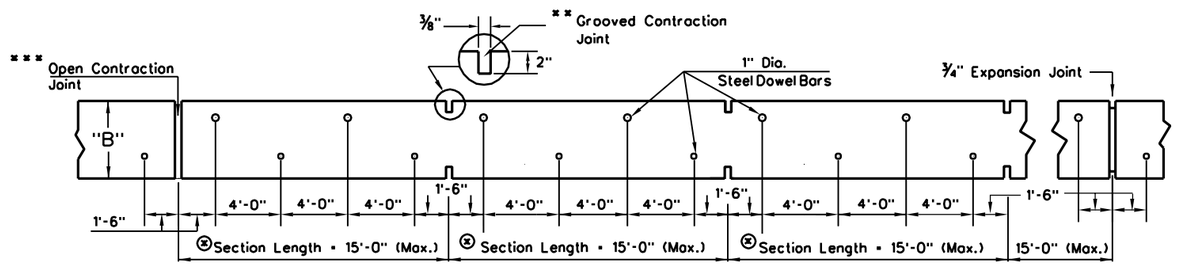
(Adjacent to Concrete Paving)

F-SHAPE



SECTION A-A (39'-4" Joint Spacing)

SECTION A-A (60'-8" Joint Spacing)



SECTION A-A (15' Joint Spacing)

NOTES

The median and footer can be poured monolithically. When the median is poured on existing concrete pavement, the median shall be secured with dowel bars drilled and grouted in the existing concrete pavement, as shown.
When the median and footer are to be poured separately, a median construction joint shall be used.

Where the median is placed over existing pavement contraction joints, median sections shall be separated by open joints having the same width as the pavement joints for the full median height. At all other median contraction joints, a ⅜" wide and 2" deep groove shall be sawed or formed across the top and along the sides for the entire height (including footer depth) of the median, or a full depth butt joint shall be formed at approximately 15' - 20' intervals along the length of the median. In addition these grooved or butt joints shall transversely align within a plus or minus one-foot tolerance with the contraction joints in abutting concrete pavement.

Expansion joints shall be placed in the median at structures when so indicated, opposite expansion joints in abutting concrete pavement, over existing expansion joints in underlying concrete pavement, and at other locations as shown on the Plans or directed by the Engineer. At expansion joints, median sections shall be ¾" apart and the opening filled for the entire depth of the median with ¾" preformed joint filler which complies with the requirements of section 610 of the Standard Specifications Roadways and Bridges. The filler shall be recessed ¼" in from the sides and the top of the median and the completed joint shall recieve no further treatment: e.g., sealing with a waterproof sealer is prohibited. The median shall be adequately terminated at each end of median installations as shown or specified elsewhere in the Plans.

Drainage openings shall be provided in the medians where indicated on the Plans or directed by the Engineer.

Unless otherwise specified, bi-directional delineators meeting the requirements of Section 661 of the Standard Specifications Roads and Bridges and mounted on suitable supports, shall be secured to, and spaced along the length of the median as shown and specified on Standard Sheet TE 11-5 of the Standard Details Book, Volume II. The cost of concrete, steel dowel bars, preformed joint filler, delineators and delineator mountings shall be included in the cost of the median.

Type of surface adjacent to the median, whether normal width or widened pavement, offset lane, median shoulder, etc., shall be specified in the Plans and shall not be included in the cost of the median but shall be paid for separately.

The contractor shall have the option to install either the N-J Shape or the F-Shape median unless otherwise specified in the Plans.

For additional dimensions, notes and details see sheet 2 and 3.

⊗ center-to-center of Contraction Joints, except where Expansion Joints are Specified.

** formed full-depth butt joint.

*** open (separated) joint over existing ridged pavement contraction joint. Median joint width equal to pavement joint width.

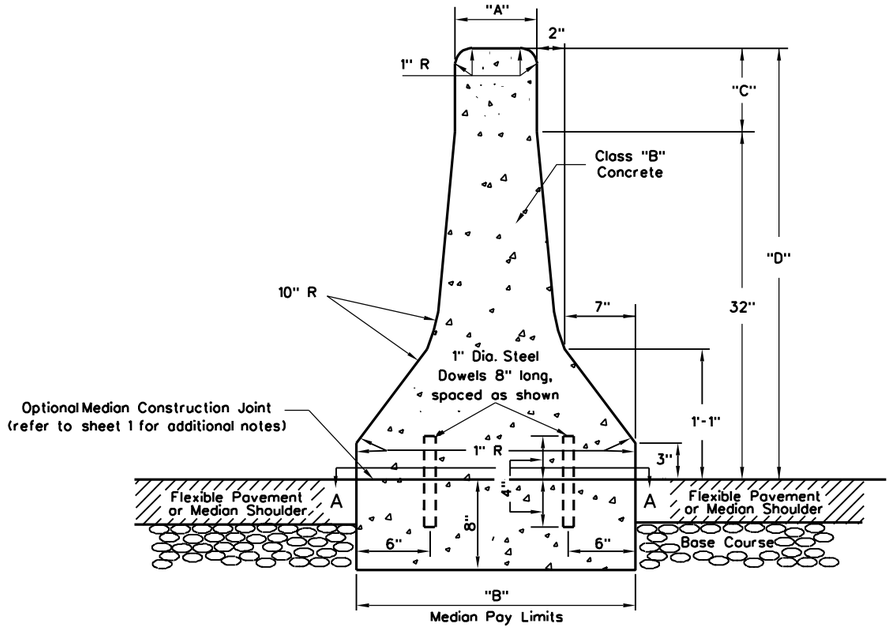
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

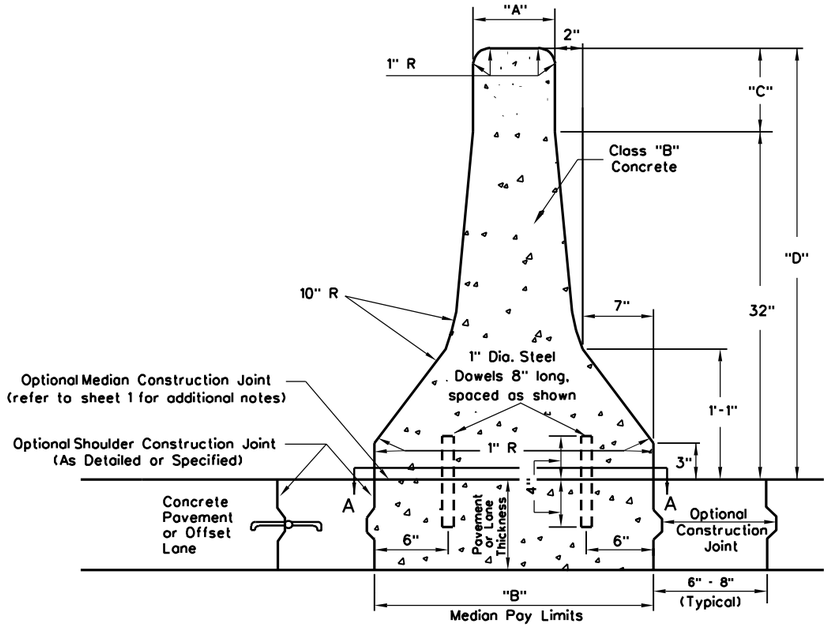
REVISION DATE

TYPE V MEDIAN
F-SHAPE
(Sheet 1 of 4)

STANDARD SHEET GR12



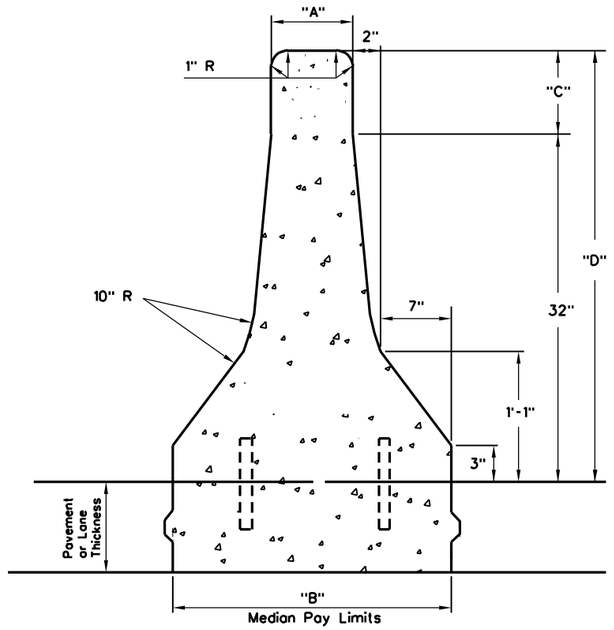
(Adjacent to Bituminous Paving)



(Adjacent to Concrete Paving)

N-J SHAPE

N-J SHAPE MEDIAN DIMENSIONS			
Designation	Type V Median		
"A"	6"	6"	6"
"B"	24"	24"	24"
"C"	-0-	4"	10"
"D"	32"	36"	42"



Raised Median

NOTES

Height of the median, dimension "D", shall be included in the Plans.

Additional height of median, dimension "C" shall be vertical.

The contractor shall have the option to install either the N-J Shape or the F-Shape median unless otherwise specified in the Plans.

For additional dimensions, notes and details, see Sheet 1 and 3.

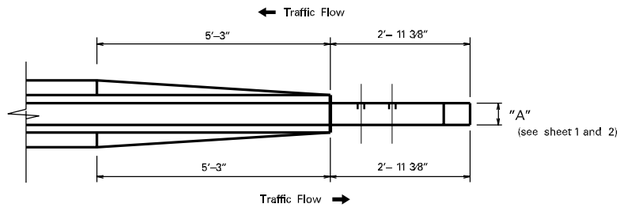
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99
REVISION DATE

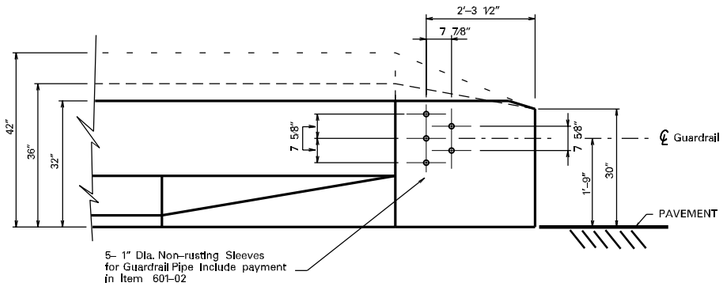
TYPE V MEDIAN
N-J SHAPE

(Sheet 2 of 4)

STANDARD SHEET GR12

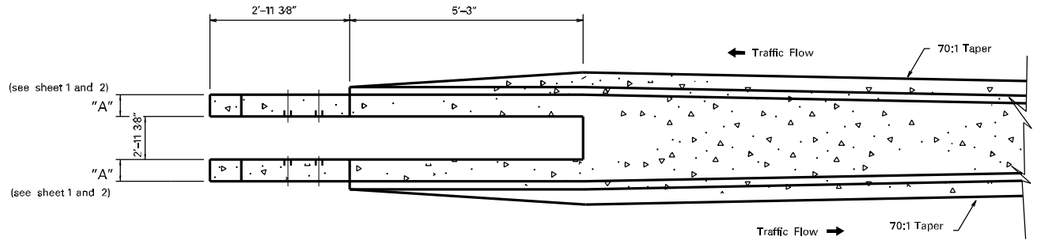


PLAN

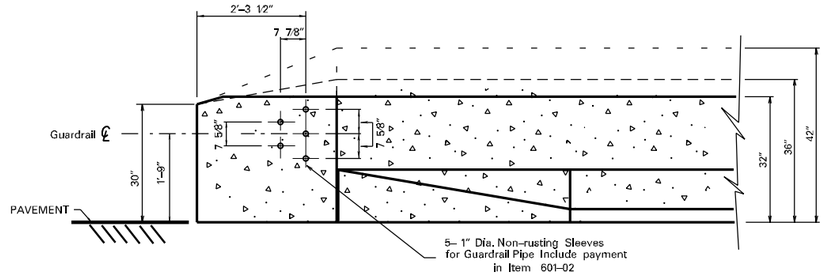


ELEVATION

DOUBLE FACE TRANSITION

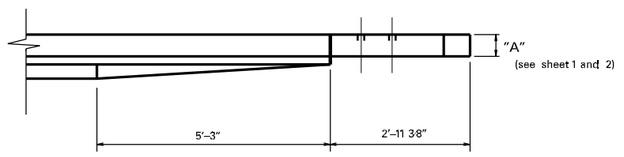


PLAN

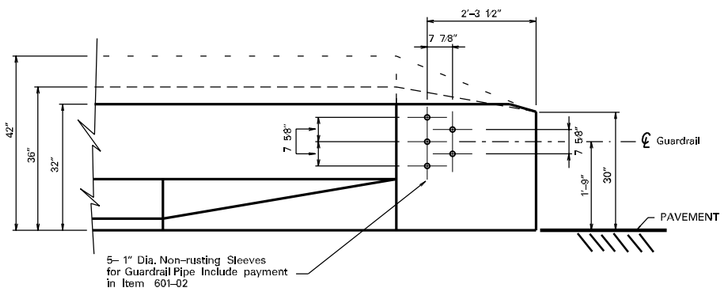


ELEVATION

DOUBLE MEDIAN TRANSITION

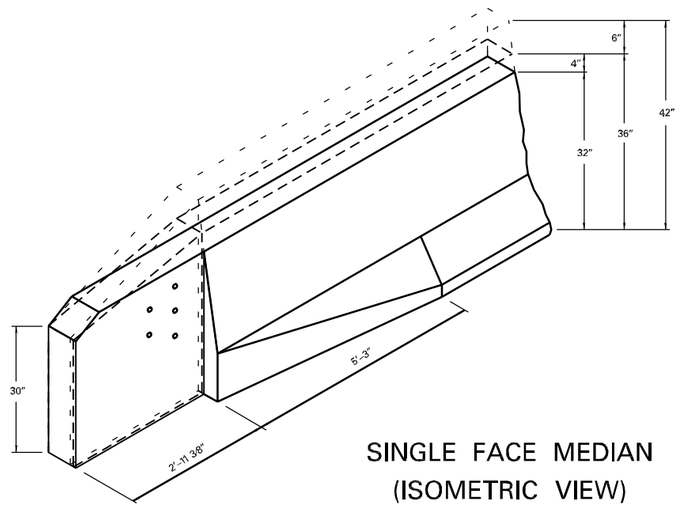


PLAN



ELEVATION

SINGLE FACE TRANSITION



SINGLE FACE MEDIAN
(ISOMETRIC VIEW)

NOTES

The contractor shall have the option to install either the N-J Shape or the F-Shape median unless otherwise specified on the Plans.

For additional dimensions, notes and details see Sheet 1 and 2.

For additional notes and details of the guardrail bolt pattern, see Standard Detail Sheet GR10.

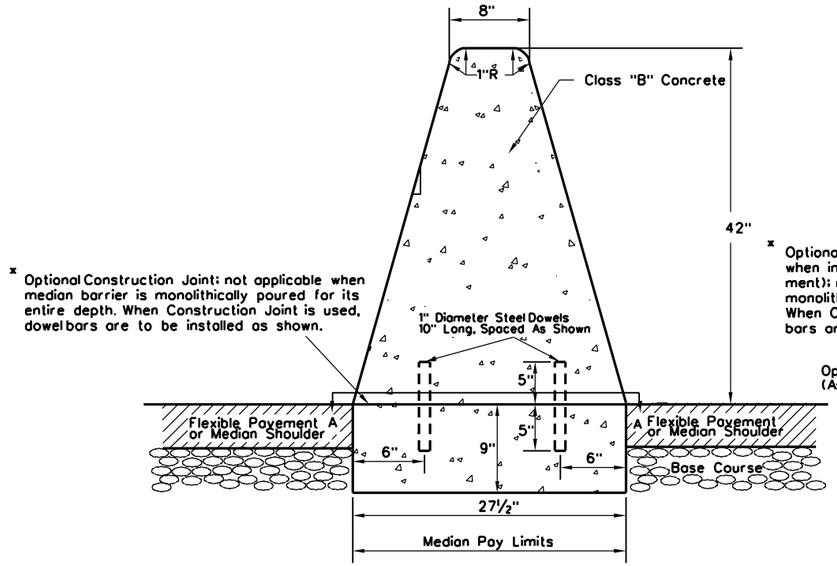
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99
REVISION DATE

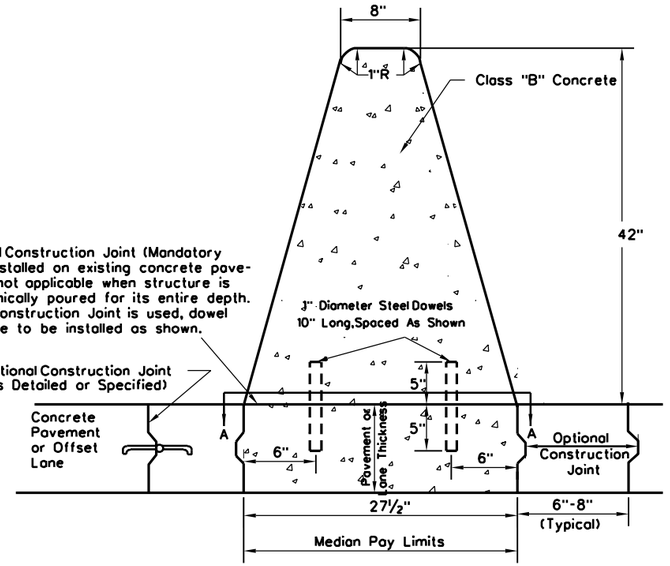
TYPE V MEDIAN GUARDRAIL ATTACHMENT F–SHAPE OR N–J SHAPE

(Sheet 3 of 4)

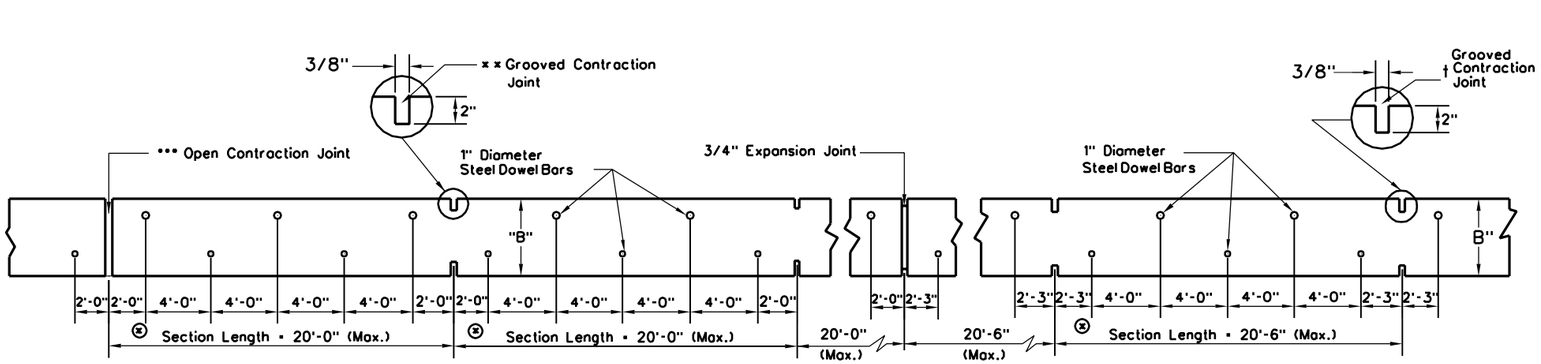
STANDARD SHEET GR12



TYPE VII MEDIAN
SINGLE SLOPE CONCRETE BARRIER
(Adjacent to Bituminous Paving)

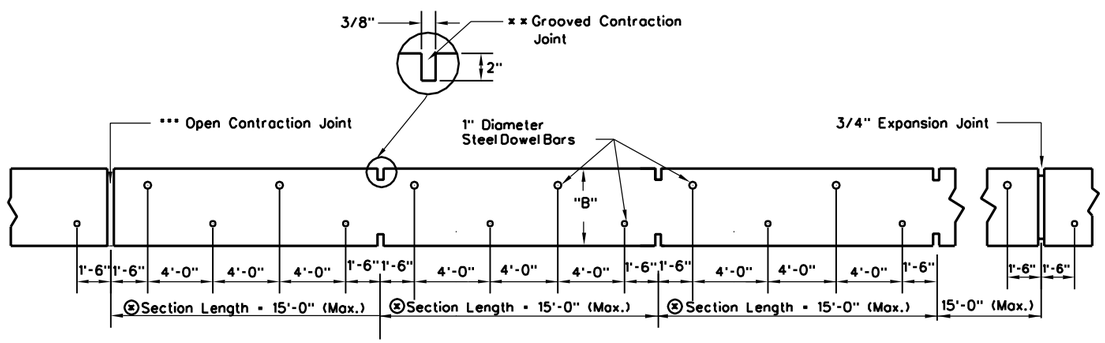


TYPE VII MEDIAN
SINGLE SLOPE CONCRETE BARRIER
(Adjacent to Concrete Paving)



SECTION A-A (40' Joint Spacing)

SECTION A-A (61'-6" Joint Spacing)



SECTION A-A (15' Joint Spacing)

⊗ Center to Center of Contraction Joints, except where Expansion Joints are Specified.

† or a formed full-depth butt joint. Also, 1/4" open (separated) joint over existing pavement contraction joint.

x x or a formed full-depth butt joint.

x x x open (separated) joint over existing rigid pavement contraction joint, with median joint width equal to pavement joint width.

NOTES

Cast-in-place concrete barrier medians shall be constructed in sections as shown herein and shall be constructed in accordance with the applicable provisions of Section 610 of the Specifications.

At barrier median contraction joints over existing pavement contraction joints, median sections shall be separated by open joints, having the same width as the pavement joints, for the full exposed depth of the median. At all other barrier median contraction joints, a groove, 3/8" wide and 2" deep, shall be sawed or formed across the top and along the sides for the entire depth of the median or a full depth butt joint shall be formed, at approximately 15'-20'. intervals along the length of the median. In addition, these grooved or butt joints shall transversely align, within a plus or minus one-foot tolerance, with the contraction joints in abutting concrete pavement.

Expansion joints shall be placed in the barrier median at structures when so indicated, opposite expansion joints in abutting concrete pavement, over existing expansion joints in underlying concrete pavement, and at other locations as shown on the Plans or directed by the Engineer. At expansion joints, barrier median sections shall be 3/4" apart and the opening filled, for the entire depth of the median, with 3/4" preformed joint filler which complies with the requirements of section 610 of the Specifications. The filler shall be recessed 1/4" in from the sides and the top of the median and the completed joint shall receive no further treatment; e.g., sealing with a waterproof sealer is prohibited.

The finished surface of the barrier median shall be smooth, dense, unpitted and free from air bubble pockets, depressions, and honeycomb. If deemed necessary by the Engineer, the above mentioned finished surface will be obtained by the use of water and a wood block or Carborundum brick.

At each end of barrier median installations, the median shall be adequately terminated as shown or specified elsewhere in the Project Plans.

Drainage openings shall be provided in the barrier medians where indicated on the Plans or directed by the Engineer.

Unless otherwise specified, bi-directional delineators, meeting the requirements of 661 of the Specifications and mounted on suitable supports, shall be secured to, and spaced along the length of, the barrier median as shown and specified on Standard Sheet TE 11-5 of the Standard Details Book, Volume II.

The cost of median concrete, steel dowel bars, preformed joint filler, delineators and delineator mountings shall be included in the cost of the median.

Type of surface adjacent to the barrier median, whether normal width or widened pavement, offset lane, median shoulder, etc., shall be specified in the Plans and shall not be included in the cost of barrier median but shall be paid for separately.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

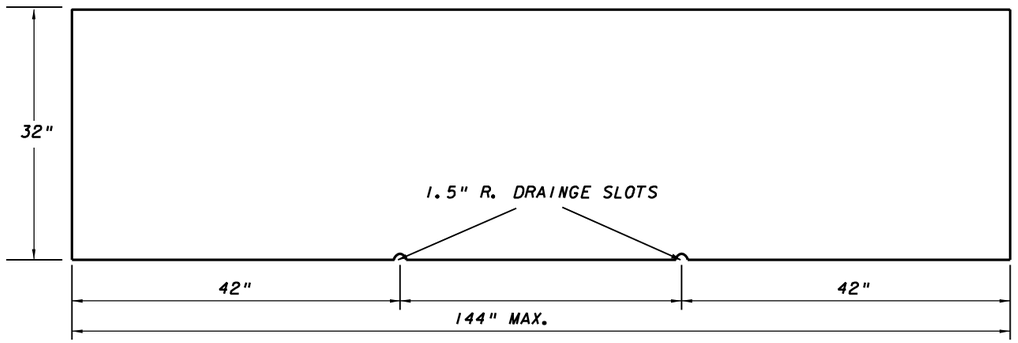
PREPARED 7-1-99

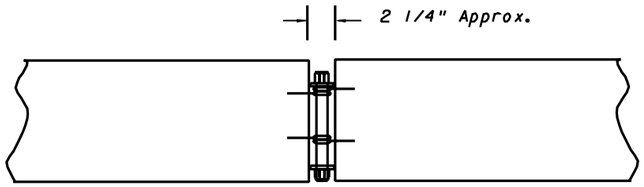
REVISION DATE

TYPE VII MEDIAN

(Sheet 4 of 4)

STANDARD SHEET GR12





TYPICAL CONNECTION

NOTES

The materials used in manufacturing temporary concrete barrier are to provide minimum strength of 3000 p.s.i.

The cost of all materials detailed herein are to be included in the unit bid price for temporary concrete barrier.

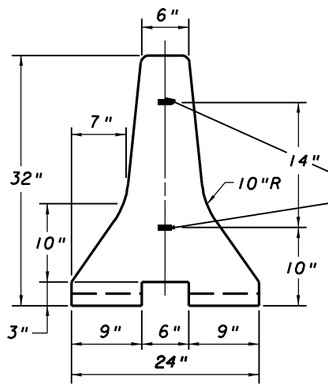
The finished surface of the barrier shall be smooth, dense, unpitted and free from air bubble pockets, depressions and honeycombs.

The materials utilized for detail 'A' shall provide a minimum safe working load of 4500lbs.

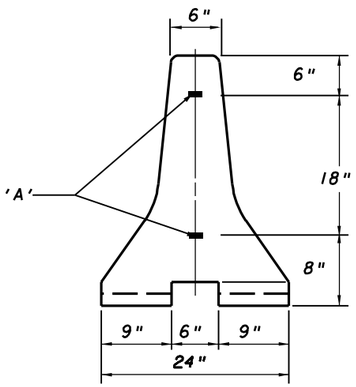
An approved equal pin and eye detail, as approved by the engineer, may be substituted for this detail. Shop drawings will be required.

All corners to have 1" radius unless otherwise specified.

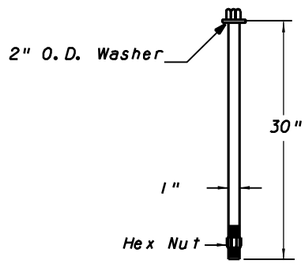
For additional guardrail details see the GR series of Standard Details.



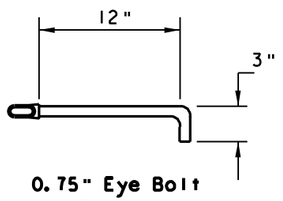
LEFT END



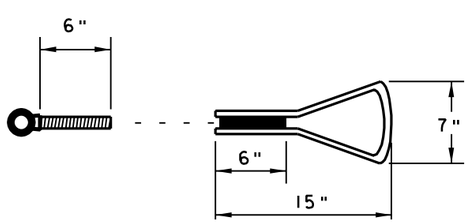
RIGHT END



PIN DETAIL

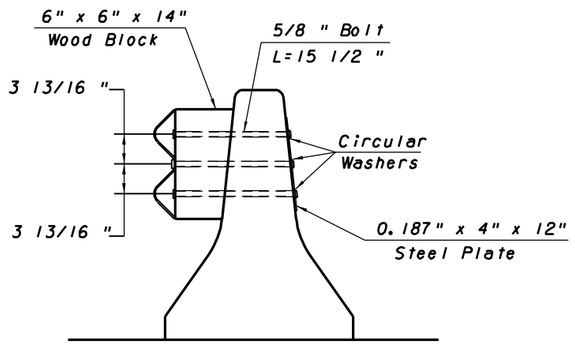


0.75" Eye Bolt
1.5" Eye



Coil Loop (Optional)
0.75" Threaded Bolt
1.5" eye

DETAIL 'A'



GUARDRAIL TIE TO TEMPORARY CONCRETE BARRIER

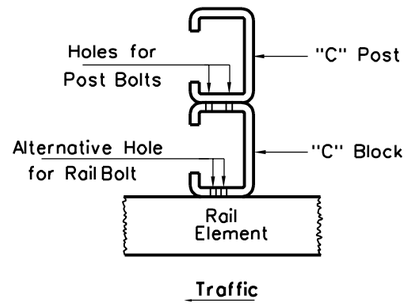
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREDARED 7-1-99

REVISION DATE

TEMPORARY CONCRETE BARRIER

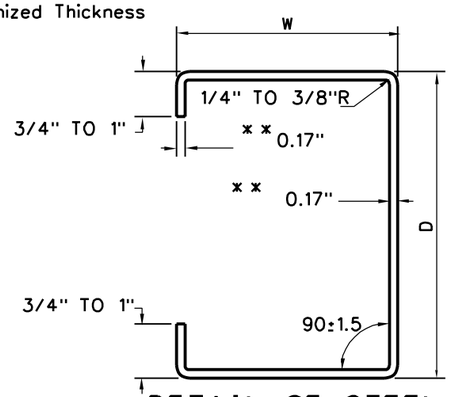
STANDARD SHEET GR13



PLAN VIEW-SINGLE-FACED, TYPE 1 (CLASS I OR II) GUARDRAIL

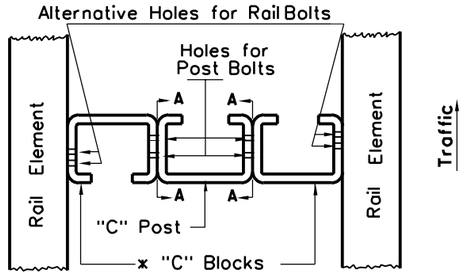
("C" Post and Block)

* *Ungalvanized Thickness



DETAIL OF STEEL "C" POST AND BLOCK

* "C" Blocks shown, but 8"x6" or 6"x6" Wood Blocks may be used.



PLAN VIEW-DOUBLE-FACED, TYPE 5 GUARDRAIL

("C" Post and Blocks)

TABLE OF DIMENSIONS AND TOLERANCES FOR STEEL "C" POSTS AND BLOCKS			
	DIMENSIONS (INCHES)	TOLERANCES (INCHES)	
		PLUS	MINUS
W	4.340	0.125	0.063
D	5.875	0.125	0.063

NOTES

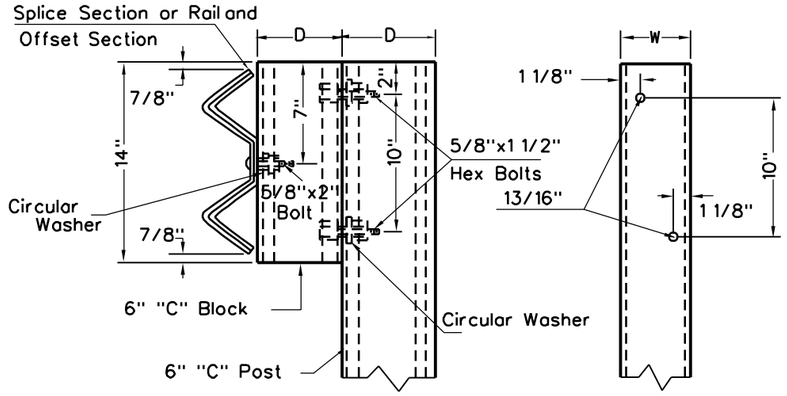
Details and Notes of Standard Sheets in the GR Series shall be applicable to this Standard Sheet, except as otherwise modified herein.

Steel "C" post and blocks may be used in place of Steel wide flange post and blocks for all guardrail installations. Mixing of steel post and/or steel block types is not permitted within a particular run of Guardrail. Only one type of steel post and block shall be used throughout any project.

Steel "C" posts and blocks shall conform to the requirements of ASTM A570 with mechanical properties equal to AASHTO M-183. The weight of galvanizing for posts and blocks shall be two ounces per square foot; galvanizing shall conform to the requirements of AASHTO M-111.

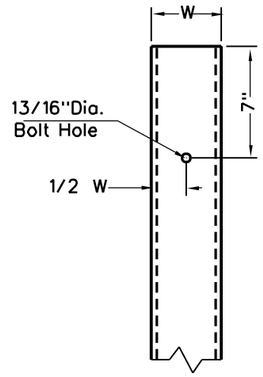
For "C" posts used in double-faced guardrail installations, the " closed" side of the post may be located facing either direction of traffic; however, the direction selected shall be used for the entire run of the guardrail. Regardless of the positioning of the posts, the closed side of "C" blocks, used in double-faced guardrail installations, shall face approaching traffic, as shown in the "Plan-View-Double-Faced, Type 5 Guardrail ("C" Post And Blocks)" Detail herein.

Double-faced guardrail details shown herein are for deep beam rails at the same elevation. When the rails on opposite sides of the post are at different elevations, the bolting of the blocks to the post shall be done in a similar manner but vertically located on the post as required.



STEEL "C" GUARDRAIL POST

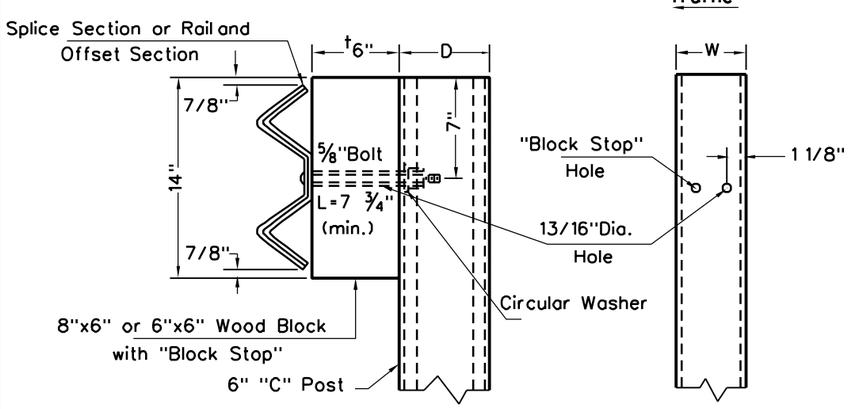
(Steel "C" Block)



STEEL "C" POST FOR TYPE 1, CLASS III GUARDRAIL

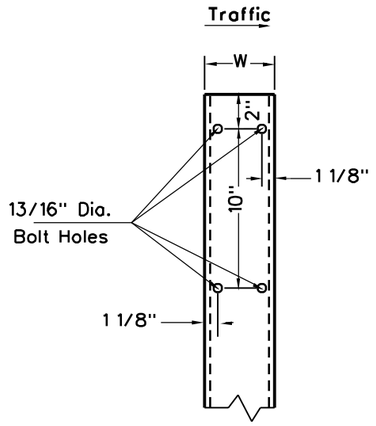
(No Blocks)

† 8" When 8"x6" Wood Blocks are used. Also, Minimum Bolt Length (L) will increase 2".



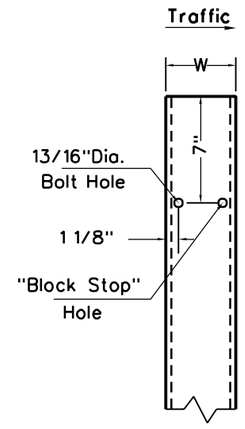
STEEL "C" GUARDRAIL POST

(Wood Block)



SECTIONS A-A STEEL "C" GUARDRAIL POST

(Steel "C" Block)



SECTIONS A-A STEEL "C" GUARDRAIL POST

(Wood Block)

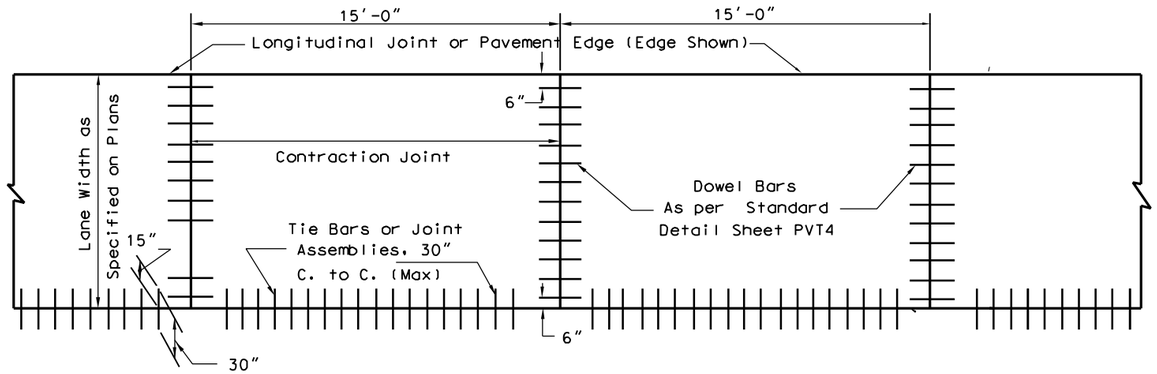
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

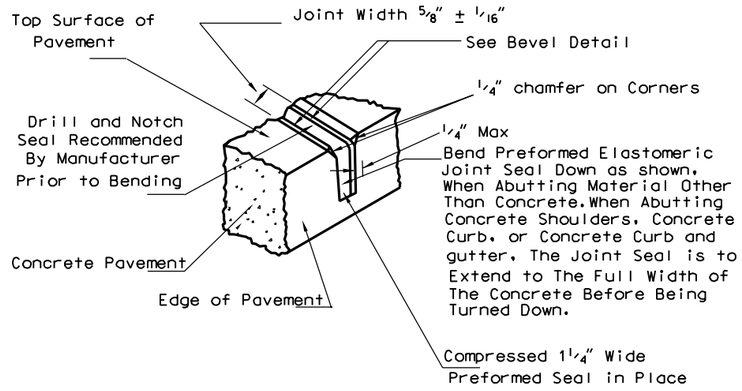
REVISION DATE

STEEL GUARDRAIL POST AND BLOCK ("C" TYPE)

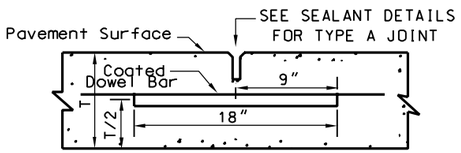
STANDARD SHEET GR14



TYPICAL JOINT LAYOUT FOR CONCRETE PAVEMENT

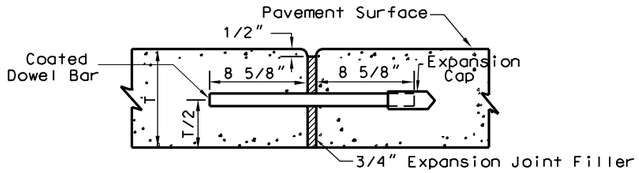


PAVEMENT EDGE TREATMENT FOR TRANSVERSE CONTRACTION OR CONSTRUCTION JOINT (TYPE A) WHEN USING PREFORMED SEALS



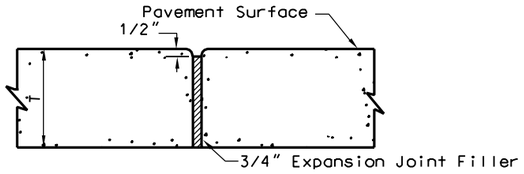
CONTRACTION OR CONSTRUCTION JOINT

TYPE A



EXPANSION JOINT

TYPE B



EXPANSION JOINT
(Without Dowel Bars)

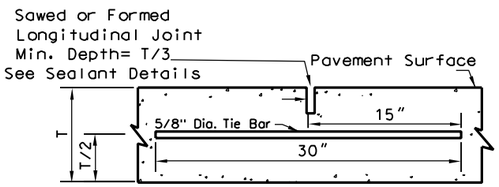
TYPE C

NOTES

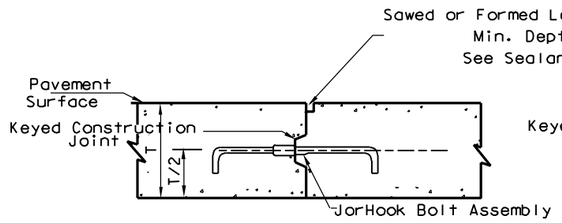
For additional details and requirements concerning dowel bars and dowel baskets for Type A & B Joints, see Standard Sheet PVT4.

Type D Longitudinal Joint may be used as an alternate to Type E Longitudinal Joint for lane-at-a-time construction . When so used, the construction joint between lanes shall be keyed as shown for Type E Joint. Type F joint is not intended, in lane-at-a-time construction, as an alternate to Type D or E Longitudinal Joints between main-line pavement slabs. For additional details and requirements concerning Types D and E Joints and the keyway for Type F Joint, see Standard Sheet PVT3, Longitudinal Tie Bolt Assembly.

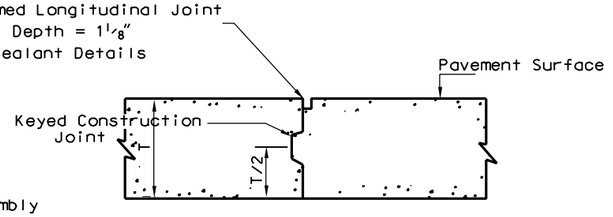
The shape shown for preformed elastomeric seals used in Type A Joints is an example only. All seals must conform to the requirements of 708.2 of the Specifications, in addition to the 1-1/4" (normal) width requirement, to be acceptable.



LONGITUDINAL JOINT
(Full-Width Construction)
TYPE D

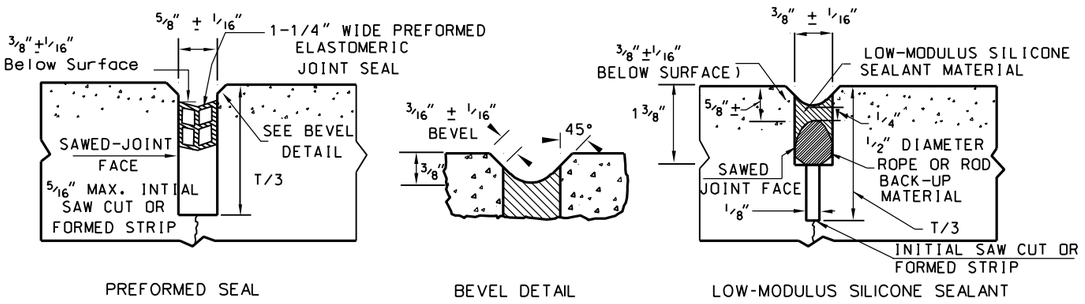


LONGITUDINAL JOINT
(Lane-At-A-Time Construction)
TYPE E

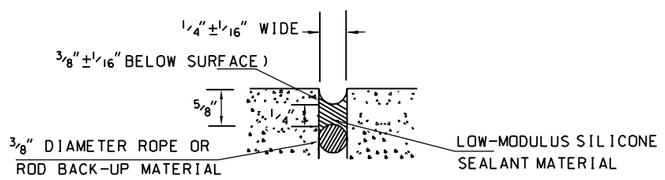


KEYED JOINT

TYPE F



SEALANT DETAILS FOR CONTRACTION OR CONSTRUCTION JOINT (TYPE A JOINT)



SEALANT DETAILS FOR LONGITUDINAL JOINT

TYPE D,E,F

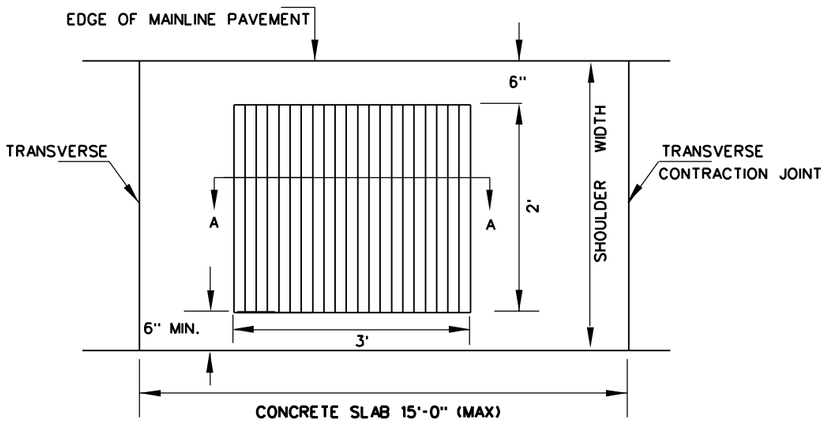
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

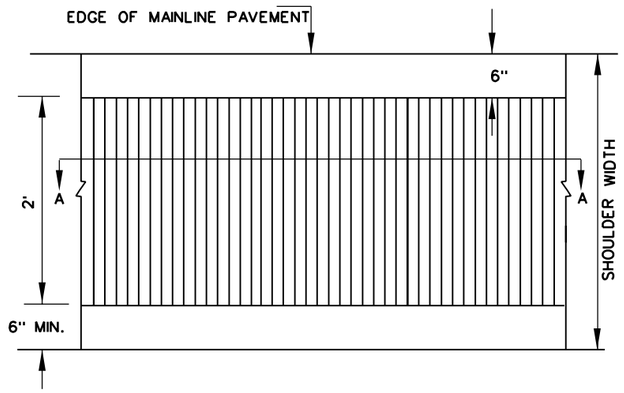
REVISION DATE

JOINT LAYOUT AND TYPES

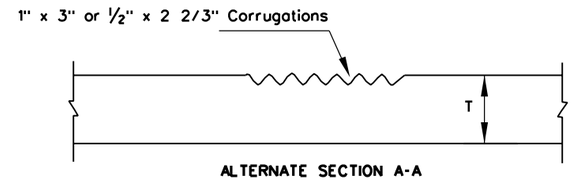
STANDARD SHEET PVT1



RUMBLE STRIPS FOR PORTLAND CEMENT CONCRETE SHOULDERS



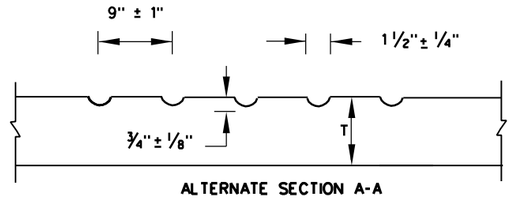
RUMBLE STRIPS FOR HOT LAID BITUMINOUS CONCRETE SHOULDERS



ALTERNATE SECTION A-A

RUMBLE STRIPS FOR PAVED SHOULDERS

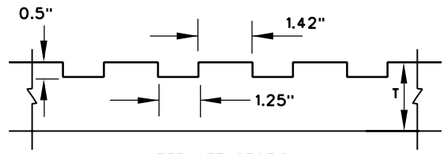
(FORMED OR ROLLED IN)



ALTERNATE SECTION A-A

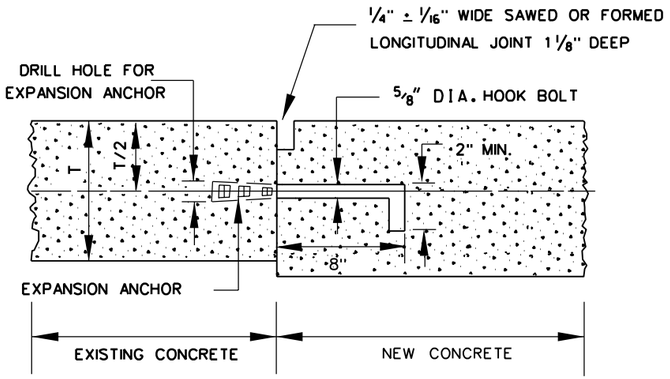
RUMBLE STRIPS FOR PAVED SHOULDERS

(FORMED OR ROLLED IN)

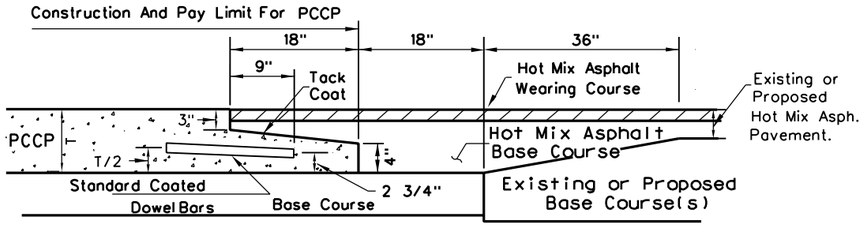


ALTERNATE SECTION A-A

OPTIMAL OR SPECIFIED SAWED RUMBLE STRIP



MODIFIED TYPE E JOINT



TYPE H JOINT

NOTES

Rumble strip placement will be continuous on hot mix asphalt shoulders and intermittent on portland cement concrete shoulders, except as noted below. Spacing on portland cement shoulders will be 30' centers except for ramps where spacing will be 15' centers.

Rumble strips shall not be placed at the following areas for non-freeway projects only: on shoulders of narrow climbing lanes that are 5' or less in width, right of traffic flow; in the shoulder transition area, right of traffic flow, between a full paved shoulder width of 10' and narrow bridge width of 4'.

Rumble strip width is to be 2'.

Rumble strips may be formed or sawed unless otherwise indicated. The top of the rumble strips will be no higher than the top surface of the pavement. Any faulty or incorrectly installed rumble strips will be corrected by the contractor at his expense. Payment for rumble strip placement is to be incidental to the applicable paved shoulder bid item.

Other alternate rumble strip details may be approved by the Engineer.

The longitudinal joint as shown on the plan view of the Rumble Strip Detail is to be Type E on new construction, unless otherwise indicated. It is to be sawed and sealed as per Standard Sheet PVT1. The transverse contraction joint, as shown in the Rumble Strip detail, is to line up with the transverse joint in the traveled way pavement. This joint is to be sawed and sealed as per the Transverse Contraction Joint detail on Standard Sheet PVT1. Dowel basket assemblies will not be required for the shoulder transverse contraction joint unless otherwise specified.

The Modified Type E Joint as detailed is not to be used in lieu of the Longitudinal Joint as detailed on Standard Sheet PVT1. It is to be used when tying new concrete pavement to existing pavement (pavement placed prior to the project in which new pavement is placed) unless otherwise specified. The expansion anchor and the ⅝" hook bolt are to meet the requirements of Section 709.7 of the Specifications. The joint is to be sealed as per the longitudinal joint sealant details on Standard Sheet PVT1.

Expansion Anchor / Hook Bolt assemblies are to be placed on 30" centers unless otherwise specified. All costs involved in the Modified Type E joint is to be included in the unit price bid for the new concrete.

The Type H Joint is to be used for connecting portland cement concrete pavement to hot mix asphalt pavement. The standard coated dowel bars are to meet the applicable requirements of Standard Sheet PVT4.

All tie bars and J or Hook Bolt assemblies shall be epoxy coated in accordance with section 709.1 of the Standard Specifications.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

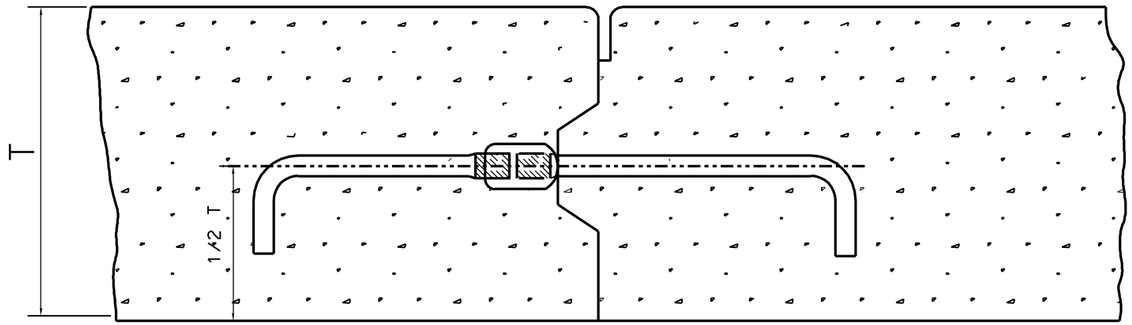
PREPARED 7-1-99

REVISION DATE

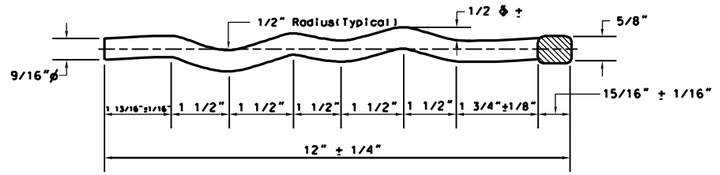
SHOULDER RUMBLE STRIPS, TYPE H JOINT, MODIFIED E JOINT

STANDARD DETAIL SHEET PVT2

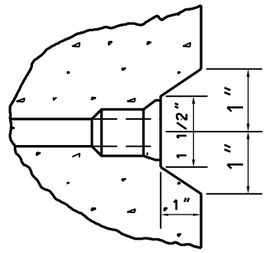
TYPICAL HOOK BOLT DETAILS



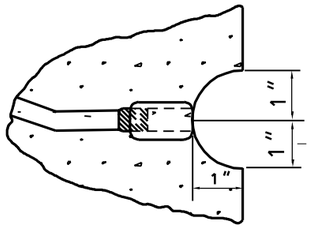
PAVEMENT SECTION



ALTERNATE HOOK BOLT

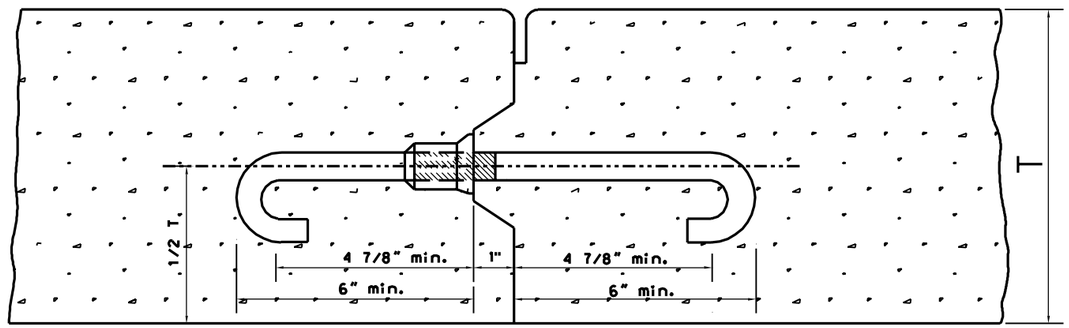


TRAPEZOIDAL KEY
(J Bolt Shown)



ALTERNATE (HALF-ROUND) KEY
(Alternate Hook Bolt Shown)

TYPICAL J BOLT DETAILS



PAVEMENT SECTION

NOTES

Tie bolts shall meet the requirements of Section 709.7 of the Specifications.

Tie bolts shall be placed on 30" centers(max.)

Tie bolts shall be placed 15" from each end of form.

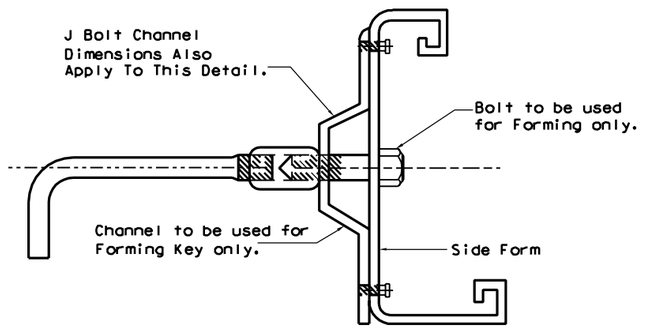
Metal channel shall run the full length of forms.

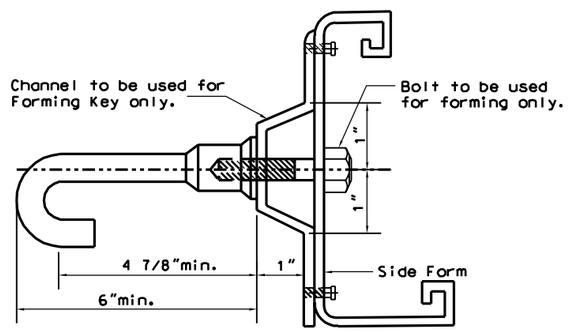
5/8" diameter tie bars: 30" long, placed longitudinally on 30" centers (max.), and centered across the joint or pavement edge; may be used in place of the bolt assemblies.

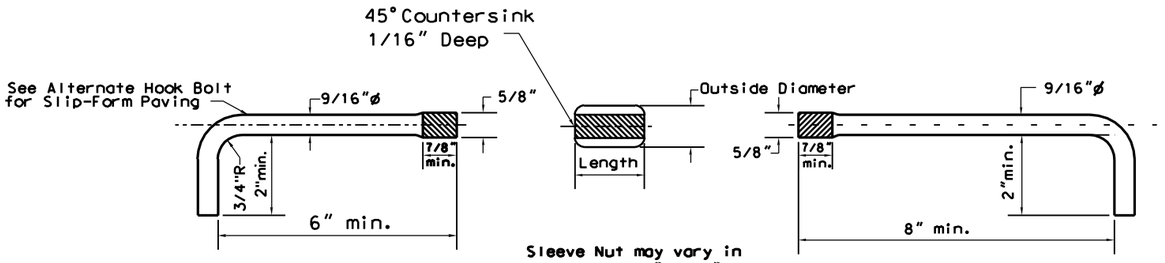
The longitudinal tie bolt assembly for slip-form paving shall consist of one sleeve nut, one 8" long hook bolt or J bolt, and 12" long alternate hook bolt. As an initial step in installing this assembly, the 12" long alternate hook bolt, with sleeve nut attached, shall be positioned in its proper location in the pavement by appropriate slip-form paving equipment.

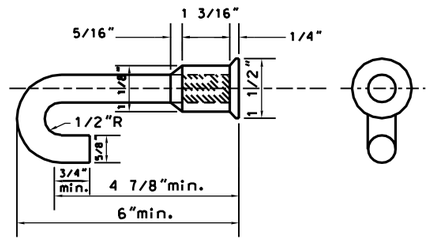
Typical tie bolt assemblies are shown herein. Minor variations in details and dimensional tolerances are permitted; however, minimum values specified herein shall be complied with.

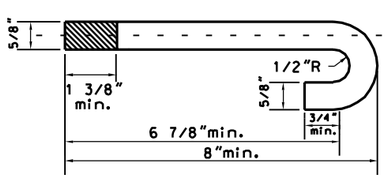
All tie bars and J or Hook Bolt Assemblies shall be epoxy coated in accordance with section 709.1 of the Standard Specifications.











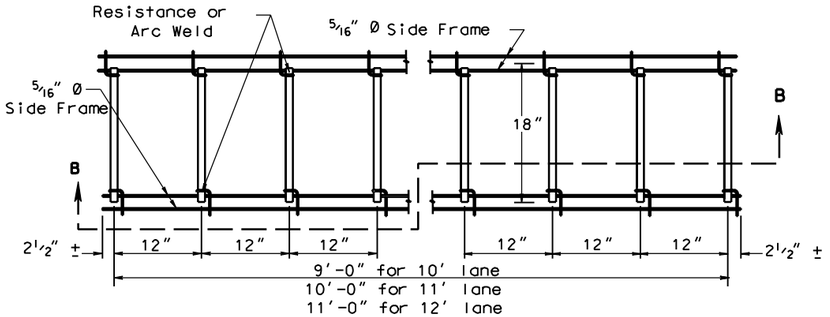
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

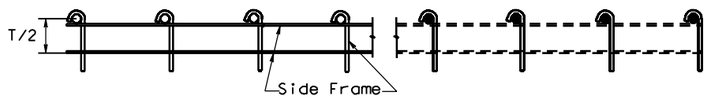
REVISION DATE

LONGITUDINAL TIE BOLT ASSEMBLY

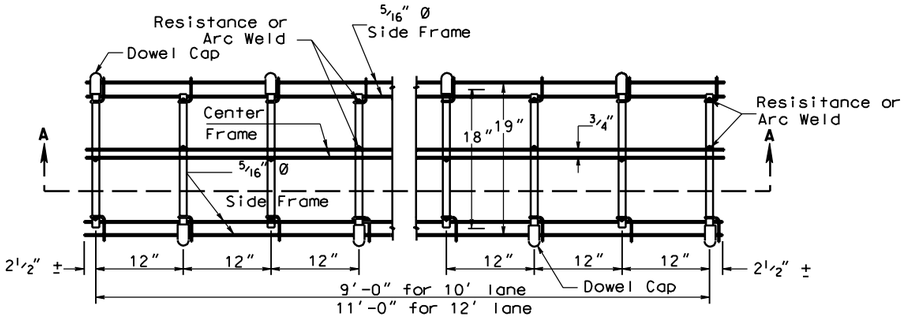
STANDARD SHEET PVT3



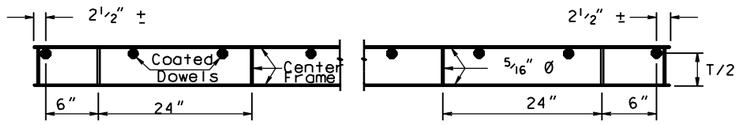
PLAN OF DOWEL UNIT FOR CONTRACTION JOINT



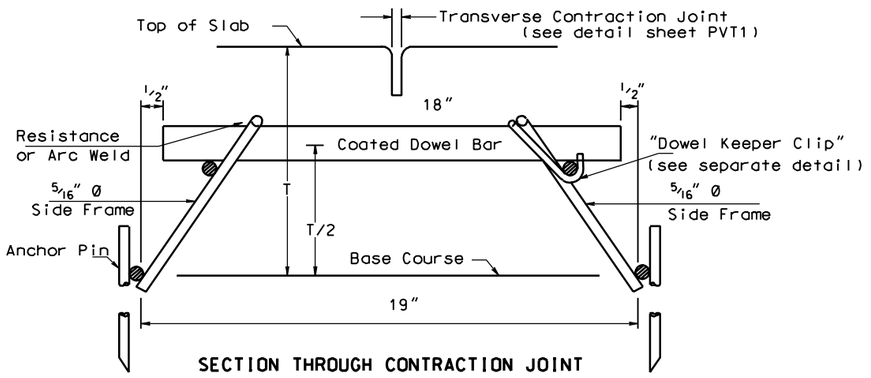
SECTION B-B



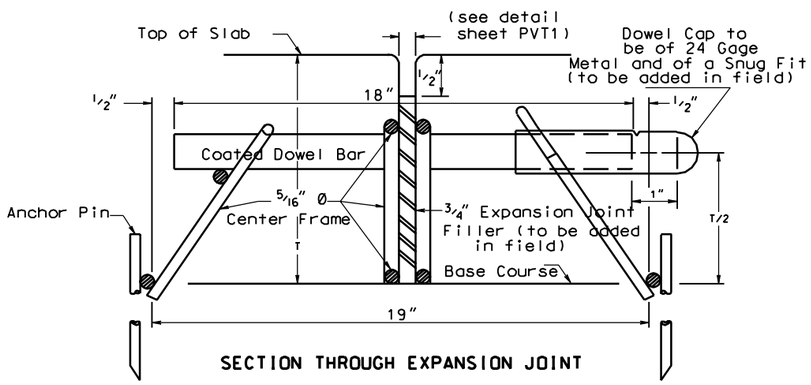
PLAN OF DOWEL UNIT FOR EXPANSION JOINT
(JOINT FILLER NOT SHOWN)



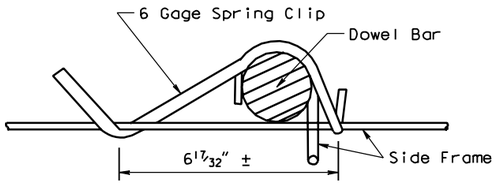
SECTION A-A



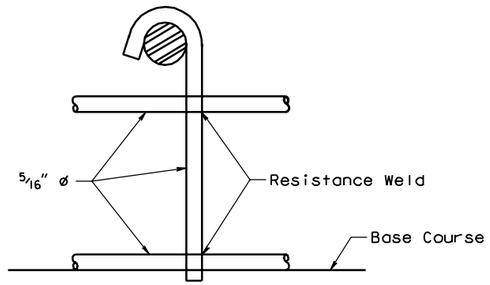
SECTION THROUGH CONTRACTION JOINT



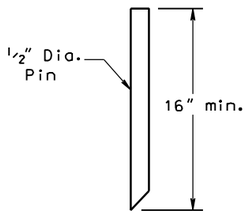
SECTION THROUGH EXPANSION JOINT



DOWEL KEEPER CLIP
(4 TO EACH CONTRACTION JOINT ASSEMBLY)



SIDE FRAME DETAIL



ANCHOR PIN

NOTES

All dowel bars shall have a Department approved coating and shall meet the requirements of Section 709.15 of the Specifications.

Dowel bar uncoated diameter to be 1/8 of the pavement thickness with minimum diameter of 1 1/4" . Dowel bars to be 18" long and spaced on 1' c:c.

The units are to be shop assembled as to dowels, side frames, and center frames, and shipped nested.

The units are to be fabricated to fit the crown of the base course.

Wire used in the expansion and contraction joint load transfer units shall have a minimum ultimate tensile strength of 50,000 P.S.I..

The expansion joint load transfer unit detailed herein shall be used at specially designated locations only.

Anchor pins are to be 1/2" round bars and 16" minimum length to hold the unit rigidly in place. A minimum of 8 pins per unit shall be used.

The units as detailed are shown as examples only. Initial approval of load transfer units shall be by submission of shop drawings. Approval will be valid until the standard drawing is revised or the supplier changes his design. All notes as shown above are to apply.

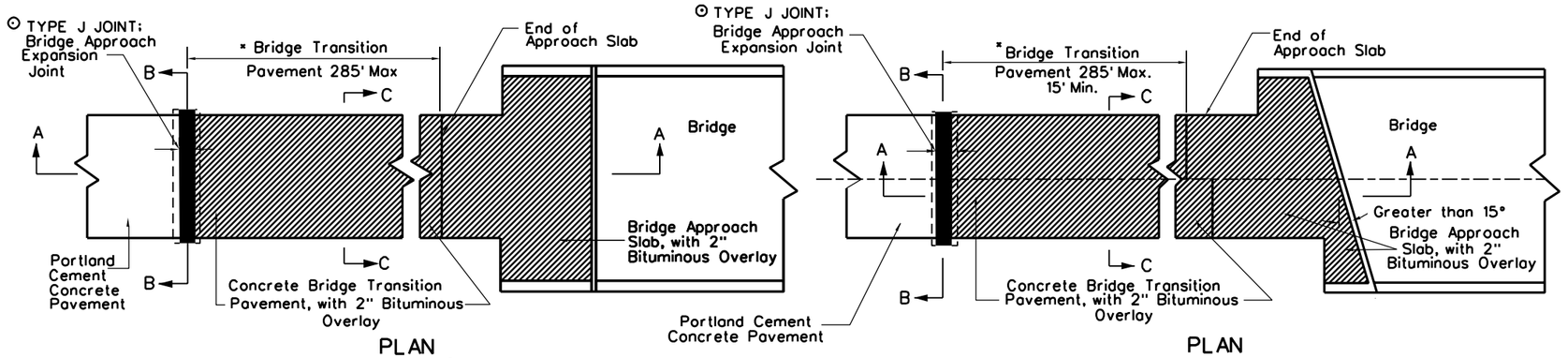
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

REVISION DATE

LOAD TRANSFER UNIT

STANDARD SHEET PVT4



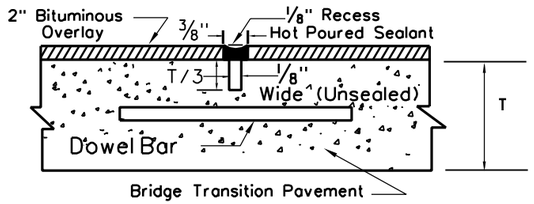
PLAN
(Bridge Skew 15° or less)

PLAN
(Bridge Skew Greater Than 15°)

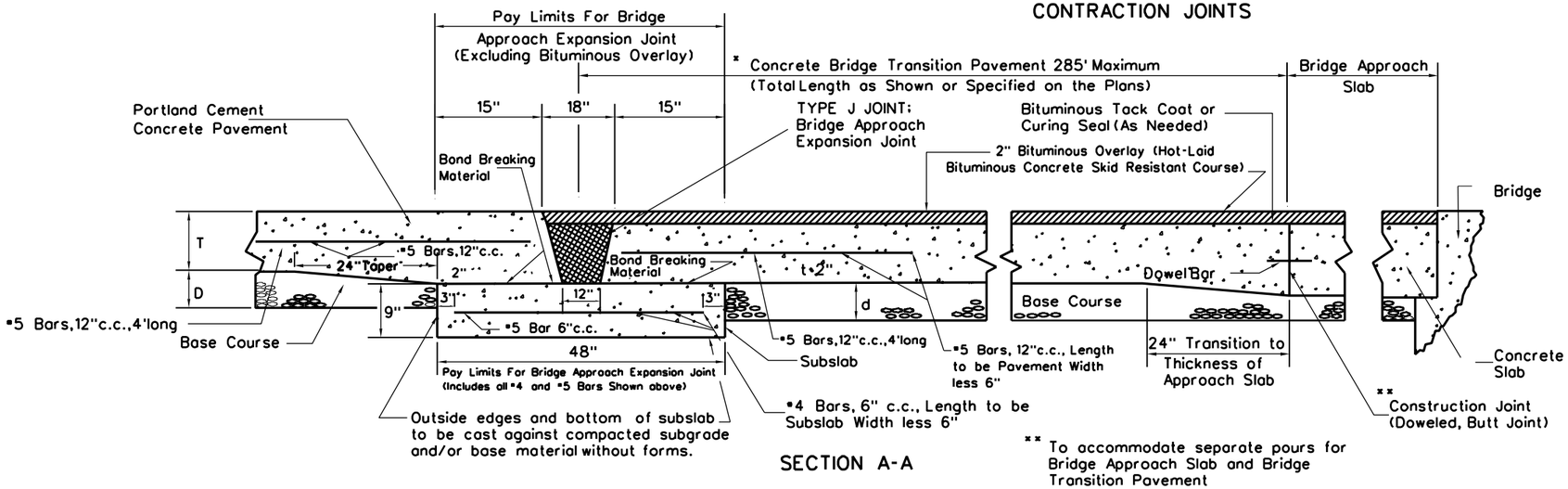
▨ 2" Hot-Laid Bituminous Concrete Skid Resistant Overlay

▩ Hot-Laid Bituminous Concrete Course (Base 2, Wearing, or Skid Resistant Course)

* Bridge Transition Pavement shall be Portland Cement Concrete Pavement having transverse, unsealed contraction joints, as detailed herein, at a maximum spacing of 15', unless otherwise designated on the Plans or specified.

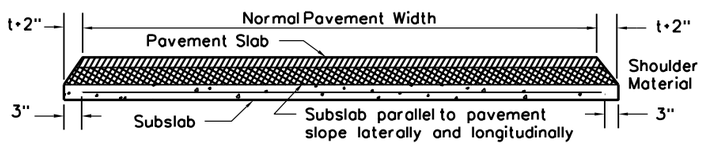


BRIDGE TRANSITION PAVEMENT CONTRACTION JOINTS



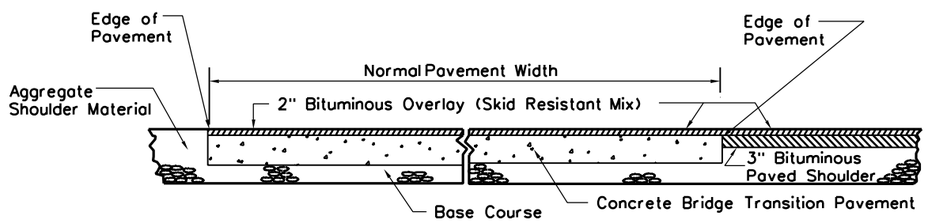
SECTION A-A

** To accommodate separate pours for Bridge Approach Slab and Bridge Transition Pavement



"t" is equal to pavement thickness

SECTION B-B



BRIDGE TRANSITION PAVEMENT AND SHOULDER DETAILS (For Untreated Aggregate Shoulders)

BRIDGE TRANSITION PAVEMENT AND SHOULDER DETAILS (For Bituminous Paved Shoulders)

SECTION C-C

NOTES

Material and Construction for hot-laid bituminous concrete course (bridge approach expansion joint filler) shall be in accordance with 401 or 402 of the Specifications, as applicable. Materials and construction for the 2" hot-laid bituminous concrete skid resistant overlay shall be in accordance with 402 of the Specifications.

Concrete in subslab shall be Class B or pavement concrete, meeting the requirements of 601 or 501, respectively, of the Specifications.

Bond-breaking material between concrete subslab and pavement may be bituminous material meeting the requirements of 705 or 706 of the Specifications, polyethylene sheeting, asphalt roofing paper, or other acceptable material, which will not be detrimental to the concrete.

Reinforcing steel shall be new billet steel of the size and length shown and shall conform to the requirements of 709.1 of the Specifications.

The cost of the completed four-foot wide joint; including the bitu-minous expansion joint filler, the 1'-3" wide strip of concrete pavement, the 1'-3" wide strip of concrete bridge transition pavement, the concrete subslab and additional excavation therefor, all reinforcing steel, and the bond breaking material between pavement and subslab; shall be included in the unit price bid for the bridge approach expansion joint.

Concrete bridge transition pavement shall meet the requirements for concrete pavement in 501 of the Specifications, except final finish (fine tex-turing) requirements are waived, pavement contraction and longitudinal joints need not be sealed, and bituminous (tack coat) curing seal conforming to 408 of the Specifications, shall be used between the transition pavement and the bituminous overlay in lieu of any other concrete pavement curing material except as permitted hereinafter. If deemed necessary by the Engineer, an add-itional tack coat may be required just prior to placement of the bituminous overlay. Other pavement curing materials and methods; e.g., wet curing methods, resin-base curing compound having self-removal properties (disappears follow-ing curing), etc.; which would be compatible with the pavement and overlay and which would not interfere with the bond between the two surfaces, may be used in place of the bituminous curing seal; however, a bituminous tack coat would then be necessary just prior to placement of the bituminous over-lay. Transition pavement, along with the bituminous curing seal and/or tack coat as needed, shall be paid for as portland cement concrete pavement, except for the 1'-3" wide strip included in the cost of the bridge approach expansion joint.

The 2" overlay shall be measured and paid for as Hot Mix Asphalt Skid Resistant Pavement.

The 2" overlay shall be sawed at the same location of the contraction joints in the concrete pavement. The joint shall then be filled with hot-poured elastic type joint sealer meeting the requirements of AASHTO M173. The cost of sawing and sealing the overlay joint will not be paid for separately, but shall be included in the cost of the overlay.

Requirements for bridge approach slabs shall be as detailed and specified elsewhere in the Contract and will be paid for as "Portland Cement Concrete Approach Slab".

Details and requirements for bridge approach expansion joints used in conjunction with concrete medians, concrete shoulders and concrete curbs and gutters are located on Standard Sheet PVT5 (Sheet 2 of 2).

To provide adequate drainage and prevent entrapment of water in the base course at the concrete subslab, adequate cross drainage installation; e.g., filter fabric underdrains; shall be provided on the upgrade end of the subslab as shown elsewhere on the Plans or directed by the Engineer.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

BRIDGE APPROACH EXPANSION JOINT; BRIDGE TRANSITION PAVEMENT WITH SKID RESISTANT OVERLAY, TYPE J JOINT

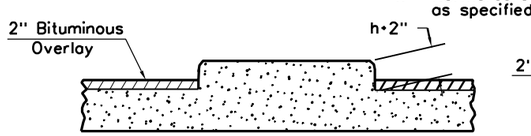
(sheet 1 of 2)

PREPARED 7-1-99

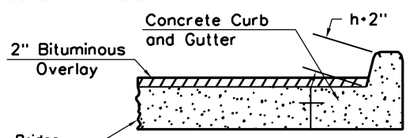
REVISION DATE

STANDARD SHEET PVT5

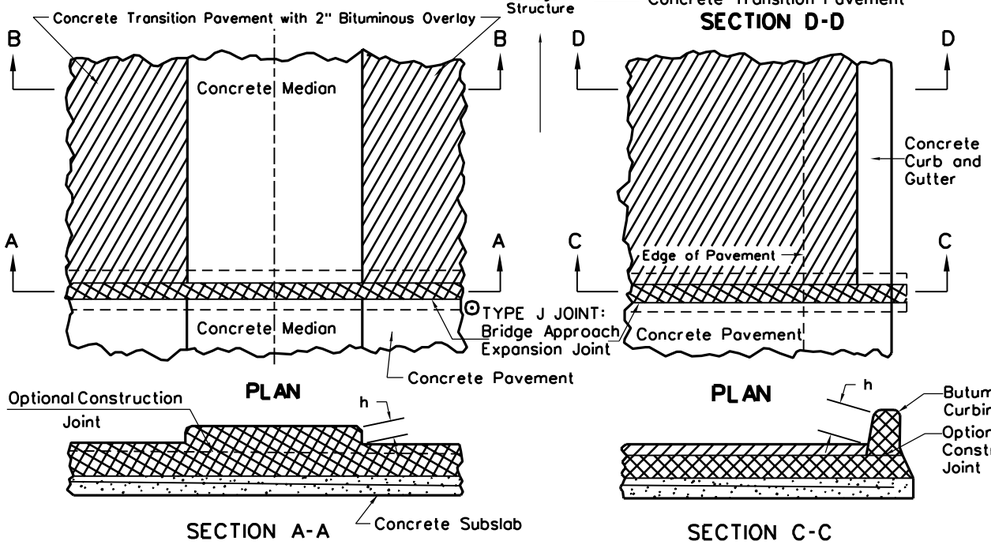
h = Normal curb or median height as specified on the Plans



SECTION B-B



SECTION D-D



PLAN

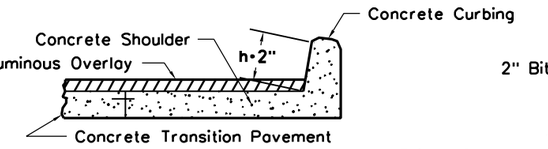
PLAN

SECTION A-A

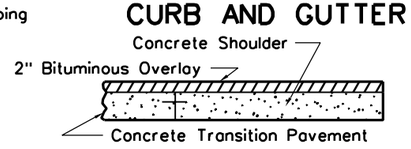
SECTION C-C

JOINT THRU MEDIAN

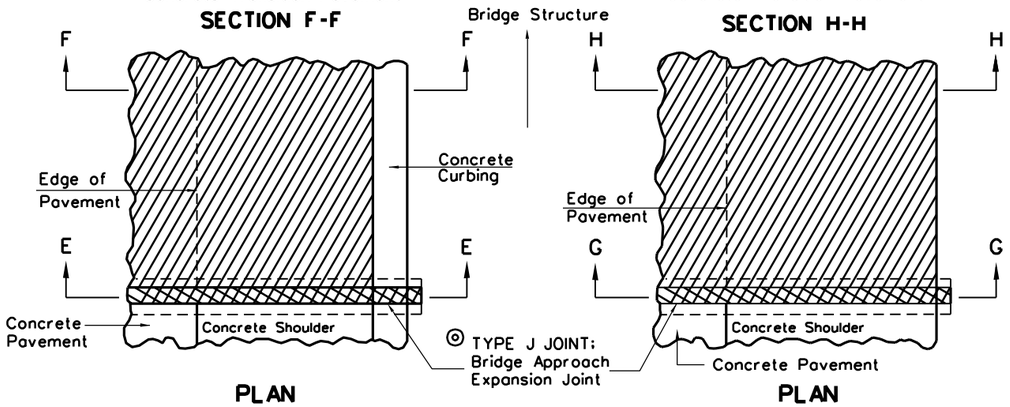
JOINT THRU CONCRETE CURB AND GUTTER



SECTION F-F

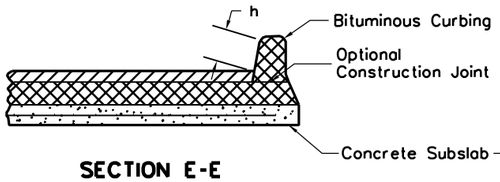


SECTION H-H



PLAN

PLAN



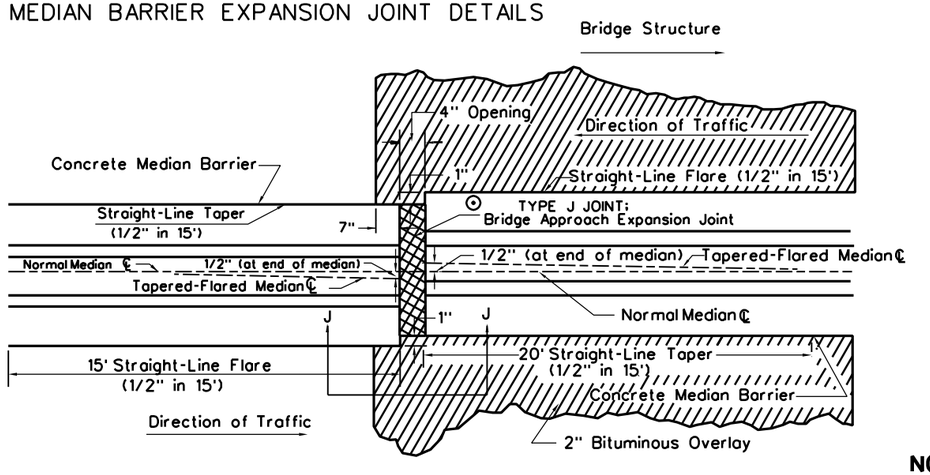
SECTION E-E

JOINT THRU CONCRETE SHOULDER (With Concrete Curbing)

SECTION G-G

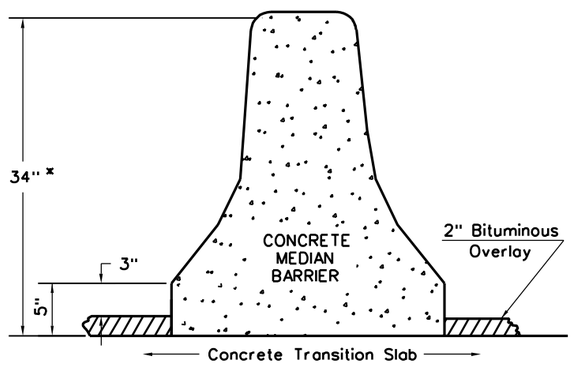
JOINT THRU CONCRETE SHOULDER (Without Concrete Curbing)

MEDIAN BARRIER EXPANSION JOINT DETAILS

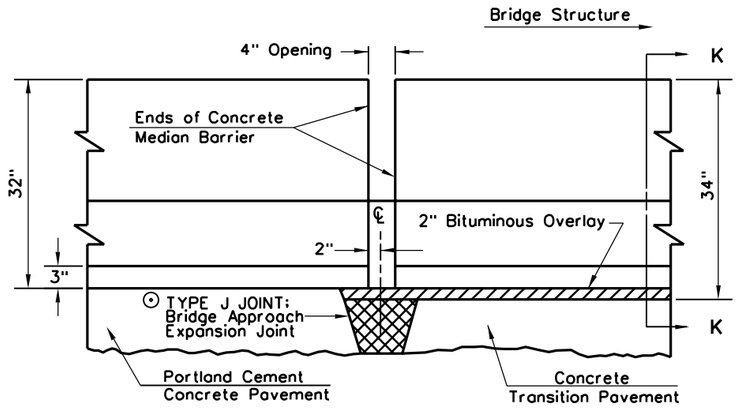


PLAN

x Standard Height + 2" to accommodate Bituminous Overlay



SECTION K-K



SECTION J-J

NOTES

The appropriate details and notes of Standard Sheet PVT5 (Sheet 1 of 2) shall apply to this Standard Sheet.

The cost of the extension of the bridge approach expansion joints through concrete shoulders, concrete medians, curbs, and curbs and gutters shall be included in the cost of the joints per each.

The cost of forming the 15' tapers-flares in the median barrier shall be included in the unit price bid for the median barrier.

Concrete paved shoulders, adjacent to bridge transition pavement and receiving the 2" bituminous overlay, shall be built in accordance with normal concrete shoulder construction, except, as with the bridge transition pavement, the final finish requirements are waived, the concrete paved shoulder joints need not be sealed, the bituminous curing seal and/or tack coat requirements - and alternate curing material requirements - are applicable as needed, and the 1'-3" wide strip of shoulder at the joint shall be included in the cost of the bridge approach expansion joint. Also, where the concrete shoulders are overlaid, the rumble strip (jiggle bar) requirements are waived.

2" Hot-Laid Bituminous Concrete Skid Resistant Overlay

Hot-Laid Bituminous Concrete Course (Base 2, Wearing, or Skid Resistant Course)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

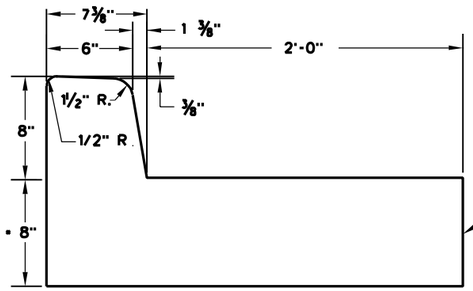
REVISION DATE

BRIDGE APPROACH EXPANSION JOINT; BRIDGE TRANSITION PAVEMENT WITH SKID RESISTANT OVERLAY, TYPE J JOINT (sheet 2 of 2)

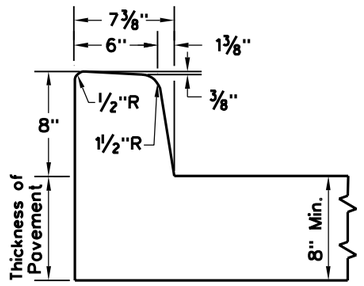
STANDARD SHEET PVT5

• or thickness of pavement, when abutting concrete pavement.

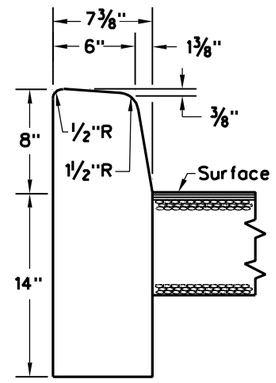
•• Does not apply, when abutting concrete pavement. Instead a longitudinal joint with tie bars or tie bolt assemblies shall be constructed at this location.



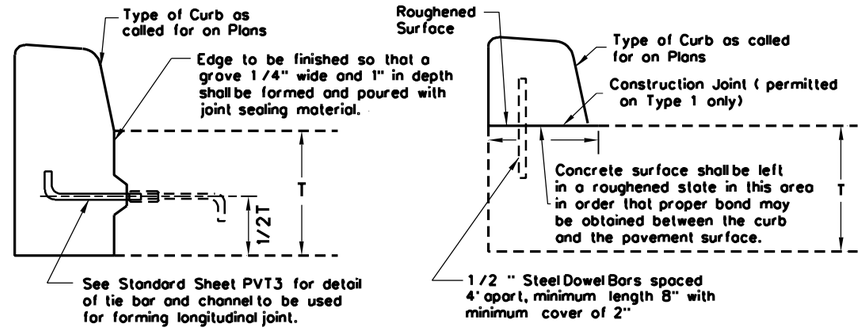
COMBINATION CONCRETE CURB AND GUTTER
TYPE I



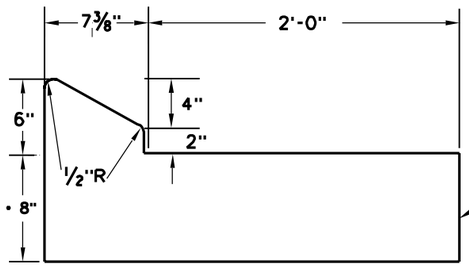
INTEGRAL CONCRETE CURBING
TYPE I



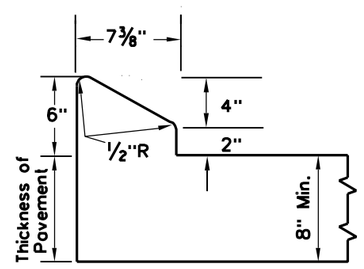
PLAIN CONCRETE CURBING
TYPE I



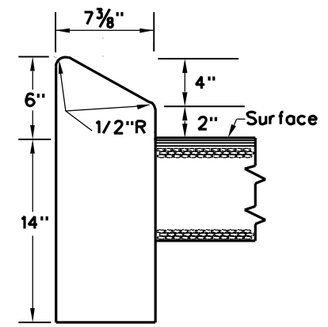
DETAILS SHOWING PLACING OF CONCRETE CURB BY SEPARATE METHODS



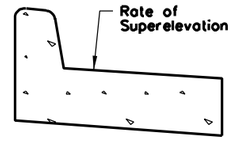
COMBINATION CONCRETE CURB AND GUTTER
TYPE II



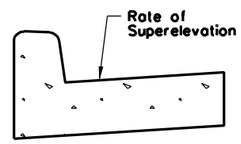
INTEGRAL CONCRETE CURBING
TYPE II



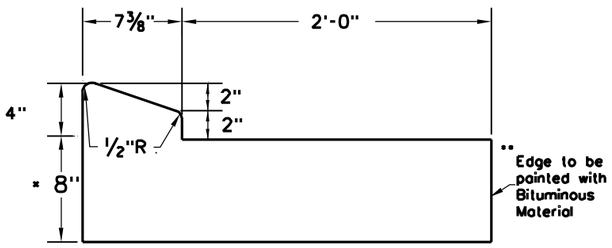
PLAIN CONCRETE CURBING
TYPE II



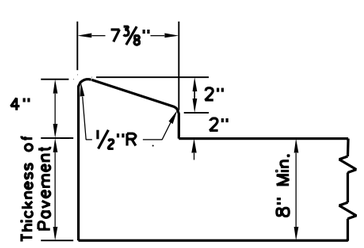
SKETCH SHOWING METHOD OF PLACING CURB ON HIGH SIDE OF SUPERELEVATED SECTION



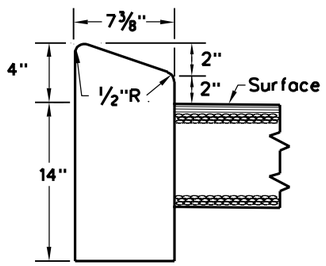
SKETCH SHOWING METHOD OF PLACING CURB ON LOW SIDE OF SUPERELEVATED SECTION



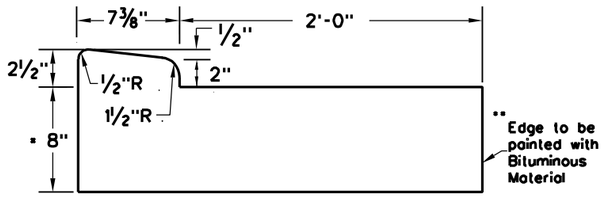
COMBINATION CONCRETE CURB AND GUTTER
TYPE III



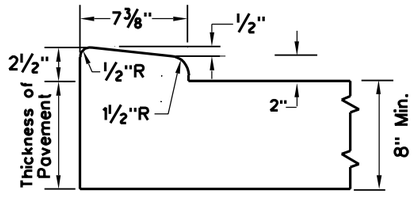
INTEGRAL CONCRETE CURBING
TYPE III



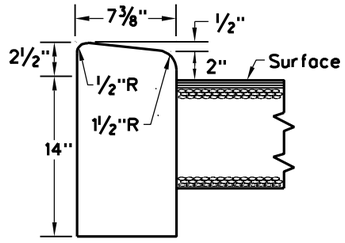
PLAIN CONCRETE CURBING
TYPE III



COMBINATION CONCRETE CURB AND GUTTER
TYPE IV



INTEGRAL CONCRETE CURBING
TYPE IV



PLAIN CONCRETE CURBING
TYPE IV

NOTES

For all Concrete Curbing, the face of the curbing shall be offset a minimum of two feet from the edge of traffic lane, unless otherwise shown on the Plans.

Construction of Concrete Curbing shall be by the "Separate Method" when sawed joints are constructed in the pavement.

All curb joints shall be made by acceptable forming methods.

For Combination Concrete Curbs And Gutters, the slope of the 2'-0" wide concrete gutter shall conform to the pavement slope or as otherwise specified on the Plans. For Integral and Plain Concrete Curbing, the slope of the concrete or bituminous surface abutting the raised portion of the curb shall be as specified on the plans.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

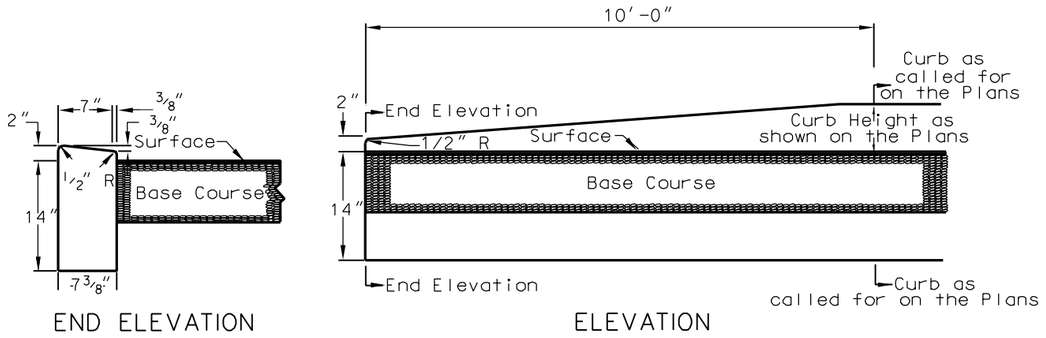
PREPARED 7-1-99

REVISION DATE

CONCRETE CURBING AND SIDEWALK

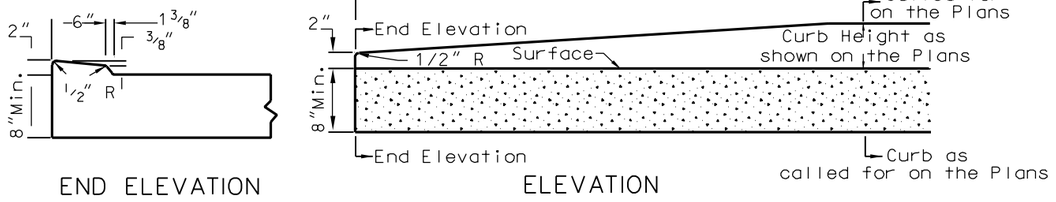
(sheet 1 of 2)

STANDARD SHEET PVT6



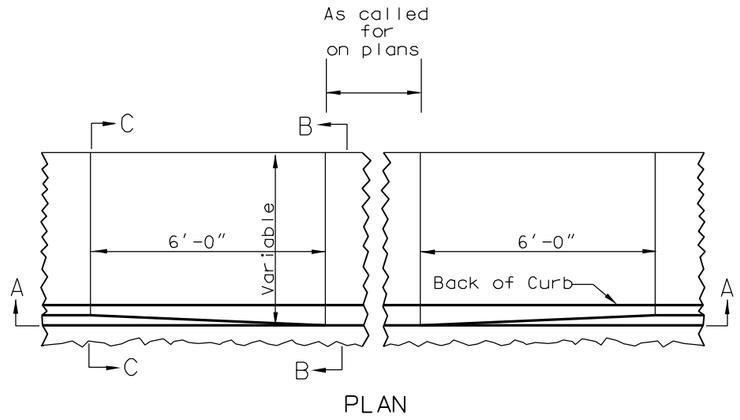
END ELEVATION ELEVATION

STANDARD CURB TAPER
CLASS I

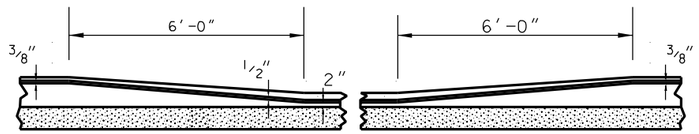


END ELEVATION ELEVATION

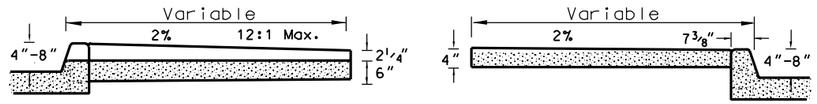
STANDARD CURB TAPER
CLASS II



PLAN



SECTION A-A



SECTION B-B SECTION C-C

SIDEWALK AND CURB
TREATMENT AT DRIVEWAYS

NOTES

The Standard Curb Taper, Class I, shall be used at the ends of all Plain Concrete Curbing, unless otherwise called for on the Plans.

The Standard Curb Taper, Class II, shall be used at the ends of all Combination Curb and Gutter, and all Integral Concrete Curbing, unless otherwise called for on the Plans

The details as shown for Sidewalk and Curb Treatment at Driveways are to be utilized unless otherwise called for on the Plans.

Section A-A details a 6' transition length in the height of the curb where driveways and Type IV curbing are encountered.

Section B-B details additional depth of sidewalk at driveways and section C-C details standard depth sidewalk. Payment for the extra depth of the sidewalk in section B-B will be 1.5 times the standard depth price.

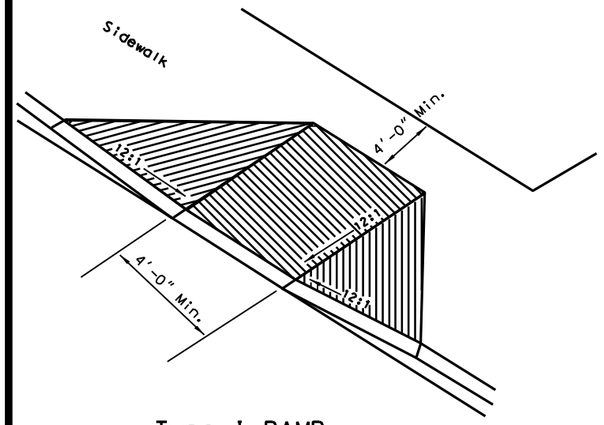
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

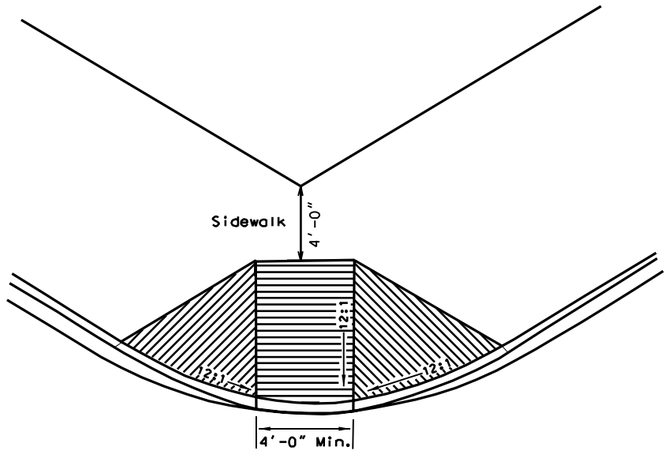
REVISION DATE

CONCRETE CURBING AND SIDEWALK (sheet 2 of 2)

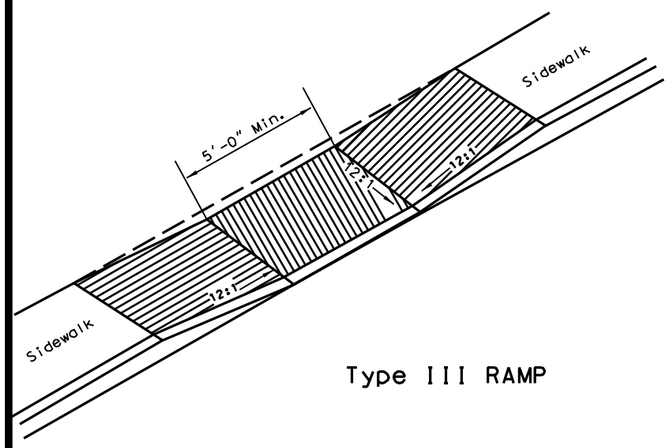
STANDARD SHEET PVT6



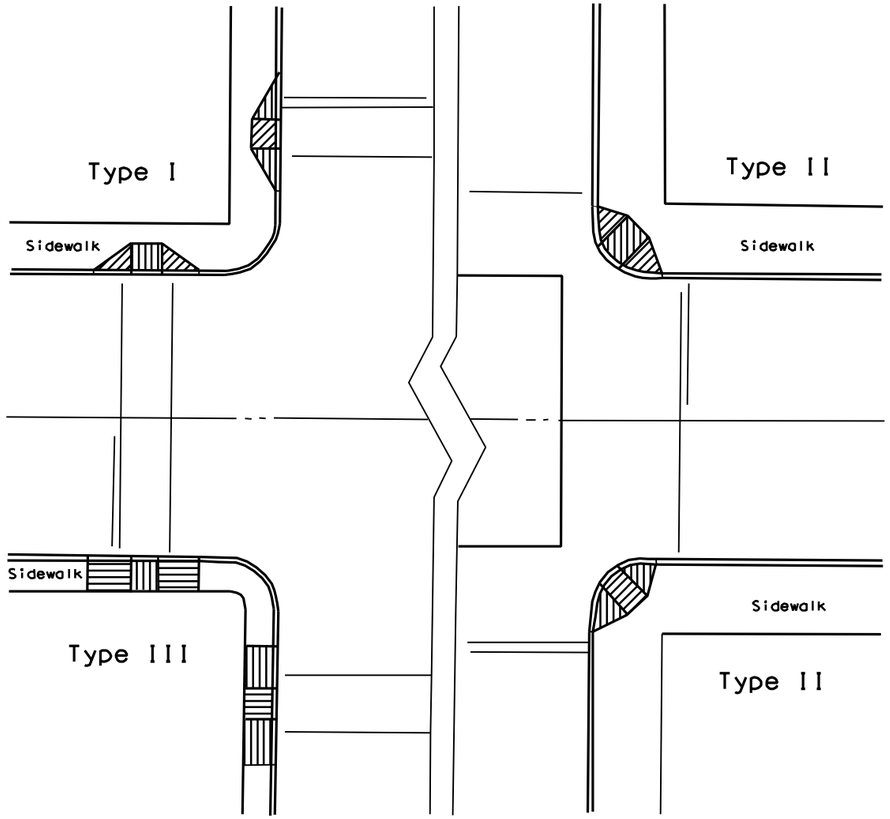
Type I RAMP



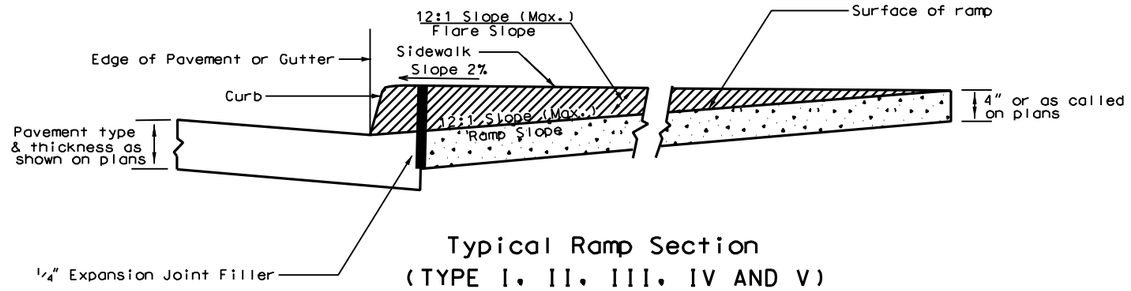
Type II RAMP



Type III RAMP



TYPICAL RAMP LAYOUT AT INTERSECTIONS



Typical Ramp Section
(TYPE I, II, III, IV AND V)

NOTES

Ramp and flare slopes shall not be steeper than 12:1 unless otherwise shown or specified.
Ramp concrete shall meet the requirements of Section 609 of the specifications. A coarse broom finish, transverse to ramp slopes and flare slopes, or equal non-skid finish shall be provided.
Normal gutter flow line and profile shall be maintained through the ramp area, unless otherwise shown or specified.
1/4" preformed expansion joint filler, meeting the requirements of Section 609 of the Specifications, shall be placed at all locations where curb contacts the ramp, the gutter line between the sidewalk ramp and concrete pavement for Type VI Ramps, and in addition, when the ramp is poured separately from the side walk, the expansion material shall be placed at all locations where the normal sidewalk and the ramp abut. Drainage structures shall not be placed in line with ramps.

Location of the ramp shall normally take precedence over location of the drainage structure, except where existing structures are being utilized in the new construction.
Payment for the construction of sidewalk ramps shall be included in the cost of the sidewalk per square yard.

The type of ramp to be used shall be as specified on the plans. The following can be considered guidelines in selecting ramp types, but are included here for information only.

If the 12:1 slope cannot be obtained due to grade of the adjacent roadway the sloped portion of the ramp shall be extended to a maximum length of 8'-0".

NORMAL RAMPS
(For general use)

TYPE I

Ramp is for general use at intersections or anywhere in the block where the sidewalk extends to the curb side.

TYPE II

Ramp is for general use at intersections, especially where pedestrians are allowed to cross diagonally.

SPECIALTY RAMPS
(For occasional use where space is limited or obstructions unavoidably encountered)

TYPE III

Ramp is for use where a narrow width sidewalk exists or is necessary, and widening of the sidewalk is not feasible.

TYPE IV

Ramp is for use where wheelchair access can occur from only one side of the ramp.

TYPE V

Ramp is for use where features of Ramp Types III and IV must be combined.

TYPE VI

Ramp is for use in areas where the sidewalk is set back from the street, and wheelchair access from either side of the ramp is not likely to occur because the side approach area is unpaved; i.e. covered by grass, gravel, etc. Also ramp is for use where area for providing ramp is very limited due to obstructions on both sides of the ramp.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

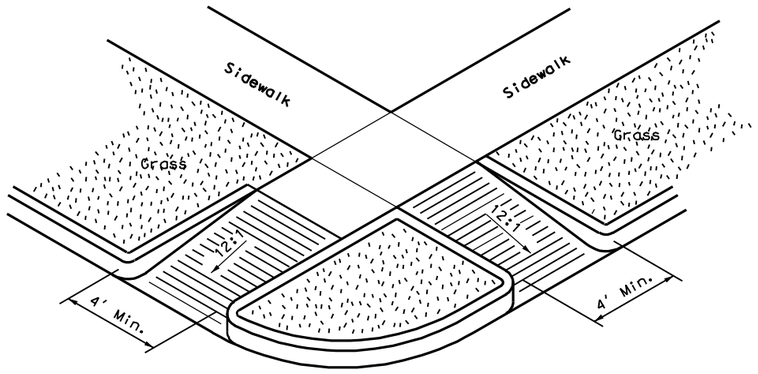
Prepared 7-1-99

REVISION DATE

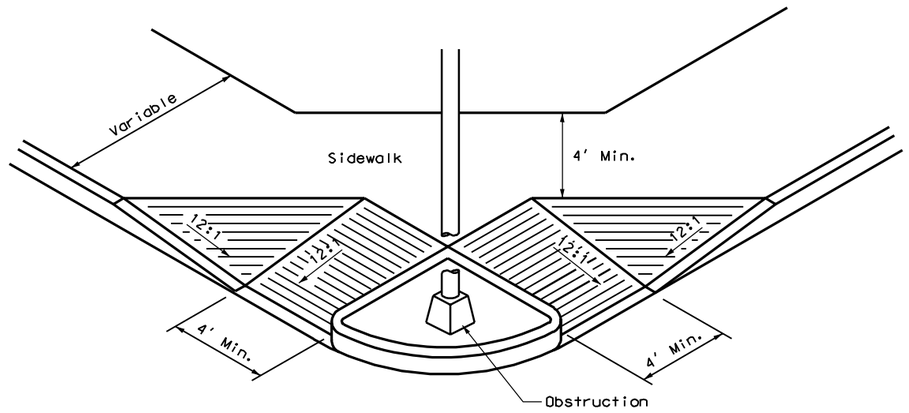
SIDEWALK RAMPS

(SHEET 1 OF 2)

STANDARD SHEET PVT7



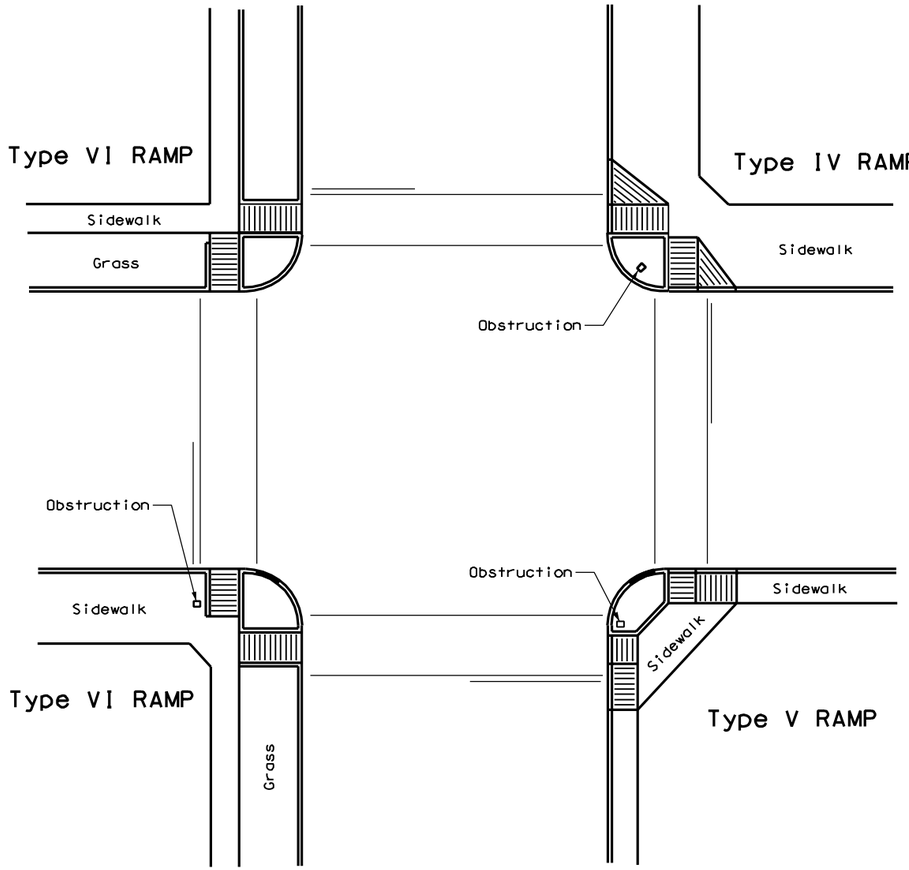
Type VI RAMP



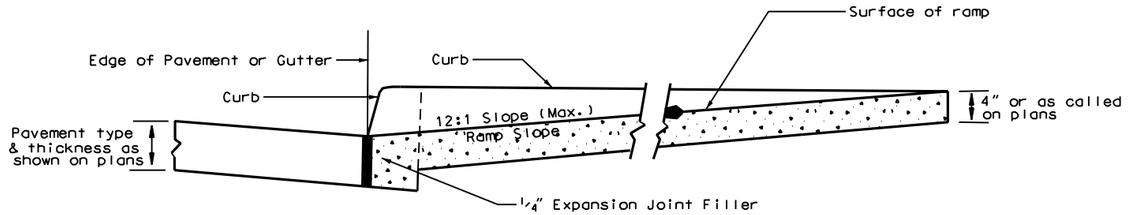
Type IV RAMP

NOTES

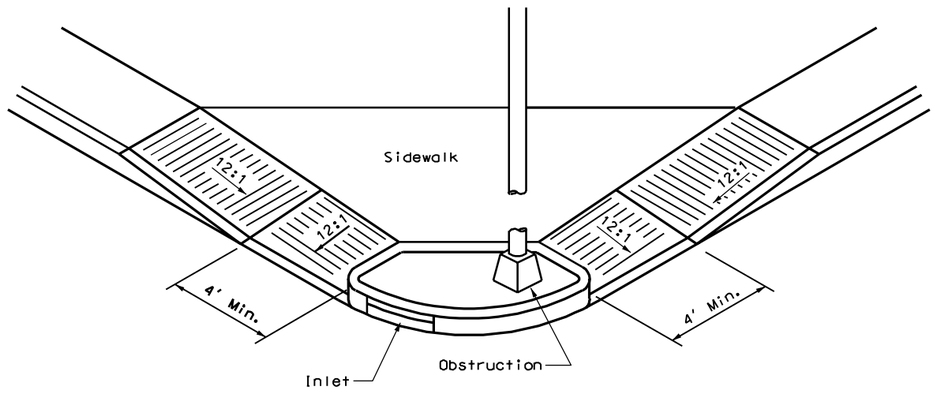
The appropriate details and notes of Standard Sheet PVT7, sheet 1 of 2, shall apply to this Standard Sheet.



TYPICAL RAMPS LAYOUT AT INTERSECTIONS



Typical Ramp Section
(TYPE VI Ramp Only)



Type V RAMP

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

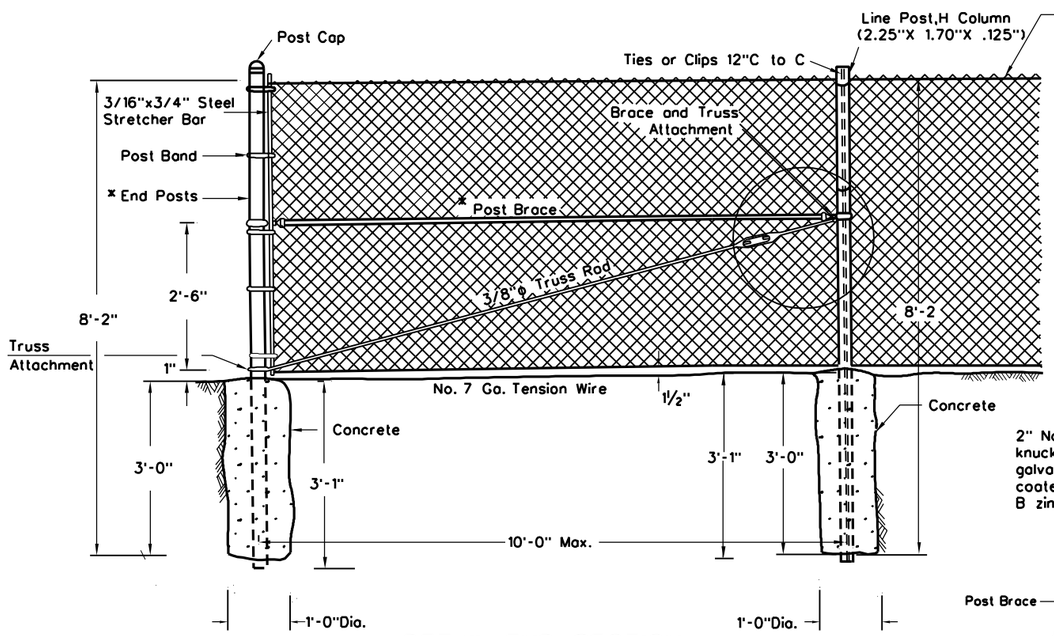
PREPARED 7-1-99

REVISION DATE

SIDEWALK RAMPS

(SHEET 2 OF 2)

STANDARD SHEET PVT7

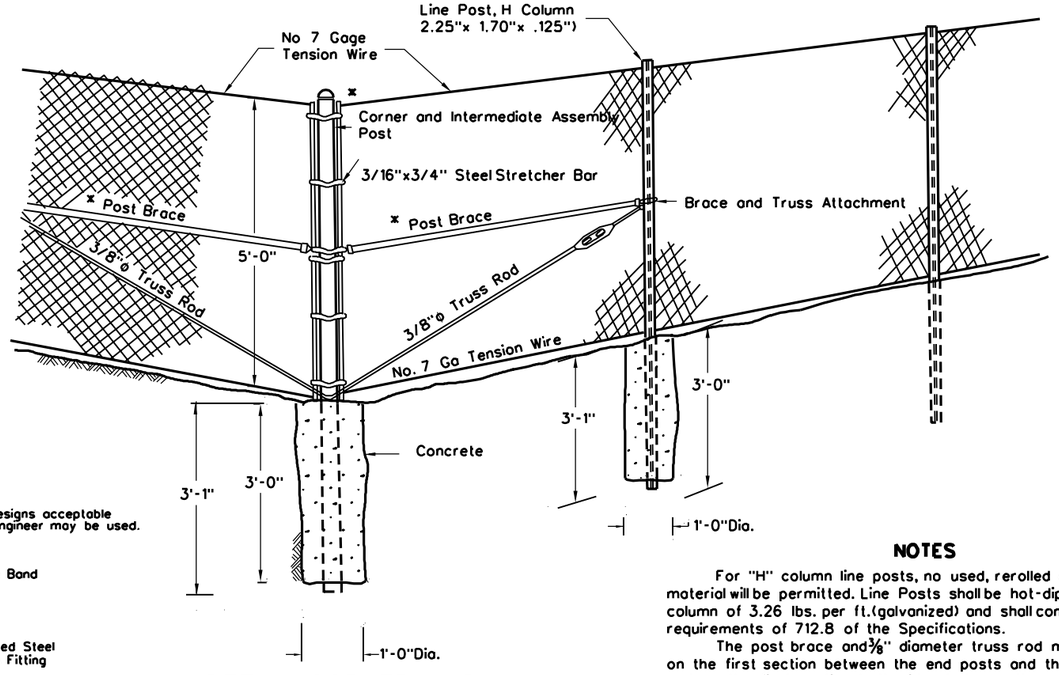


DETAIL-END SECTION

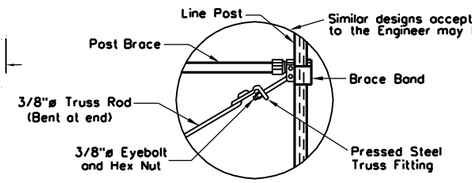
Spacing of line posts shall be 10'-0" maximum from center to center of posts.

2" No. 9 Gage diamond mesh knuckled on both selvages, galvanized or aluminum-coated. When galvanized, Class B zinc coating shall be used.

* For Type and Size, see Fence members table on sheet 2 of 2.

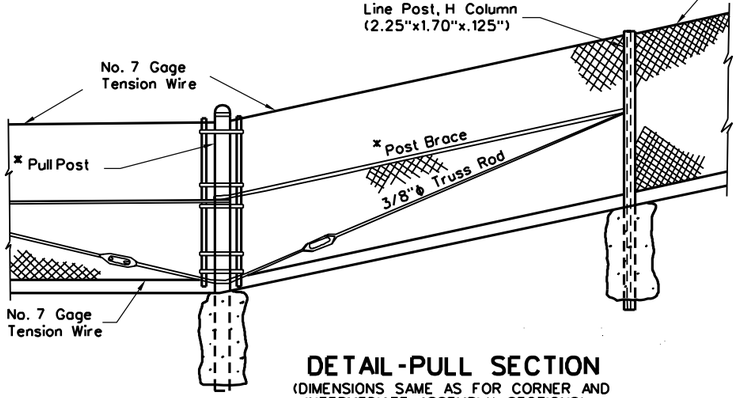


DETAIL-CORNER AND INTERMEDIATE ASSEMBLY SECTIONS



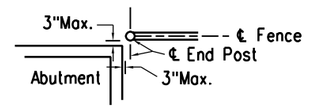
TRUSS TIGHTENER ASSEMBLY

(Alternate to turnbuckle connection in end, corner, scale pull, gate and intermediate assembly installations.)

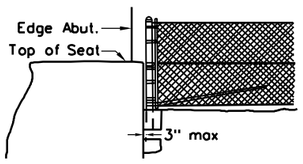


DETAIL-PULL SECTION

(DIMENSIONS SAME AS FOR CORNER AND INTERMEDIATE ASSEMBLY SECTIONS)

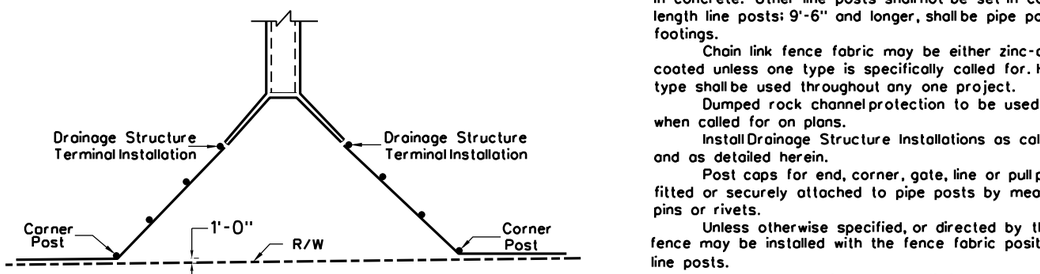


PLAN

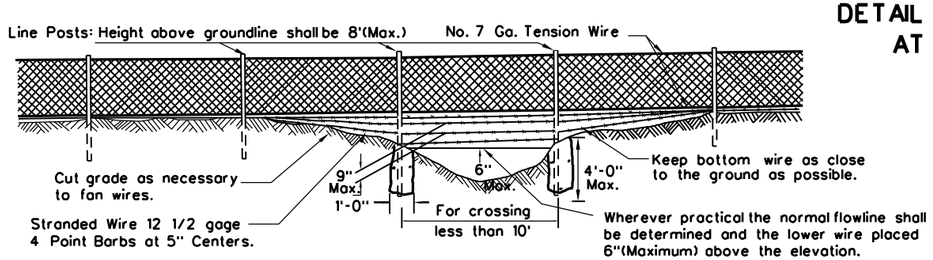


ELEVATION

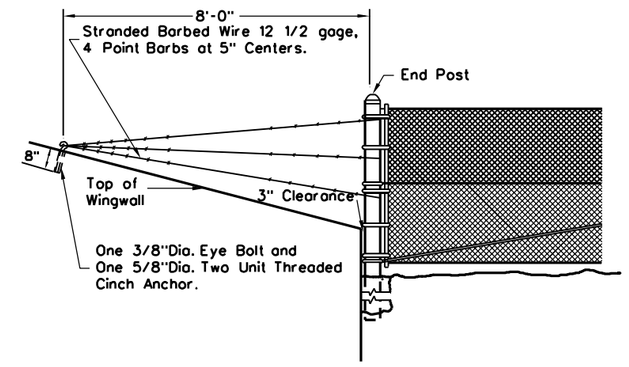
DETAIL OF R/W FENCE AT ABUTMENTS



TYPICAL FENCE ALIGNMENT AT WINGWALLS FOR PIPES OR BOX CULVERTS



DETAIL SHOWING TYPICAL SECTION AT MINOR DEPRESSIONS AND WET WEATHER CROSSINGS



DRAINAGE STRUCTURE TERMINAL INSTALLATION

NOTES

For "H" column line posts, no used, rerolled or open seam material will be permitted. Line Posts shall be hot-dip galvanized "H" column of 3.26 lbs. per ft.(galvanized) and shall conform to the requirements of 712.8 of the Specifications.

The post brace and⅜" diameter truss rod must be used on the first section between the end posts and the first line post, and on the first section both sides between the corner, intermediate assembly or pull post and the first line post. Line posts adjacent to end, pull, corner, gate and intermediate assembly posts shall be set in concrete. Other line posts shall not be set in concrete: except length line posts: 9'-6" and longer, shall be pipe posts set in concrete footings.

Chain link fence fabric may be either zinc-coated or aluminum-coated unless one type is specifically called for. However, only one type shall be used throughout any one project.

Dumped rock channel protection to be used at channel crossings when called for on plans.

Install Drainage Structure Installations as called for on the plans and as detailed herein.

Post caps for end, corner, gate, line or pull posts shall be swage fitted or securely attached to pipe posts by means of set screws, pins or rivets.

Unless otherwise specified, or directed by the Engineer, chain link fence may be installed with the fence fabric positioned on either side line posts.

Hardware and miscellaneous fittings, not specifically designated herein as to type or dimensions, shall conform to the applicable requirements of 608 of the Specifications and shall be good-quality commercial design acceptable to the Engineer.

In lieu of the barbed wire detail herein, the following additional types are acceptable, provided they retain the "4-point barb at 5-inch centers" requirement and provided they meet or exceed the strength and coating requirements for the stranded, 12½gage, barbed wire as called for in 712.10 of the Specifications:

(a) stranded, 15 1/2 gage, high carbon steel barbed wire.

(b) one-strand, 12 gage, steel barbed wire.

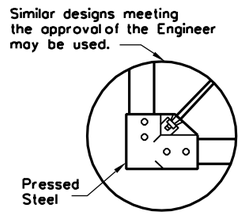
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

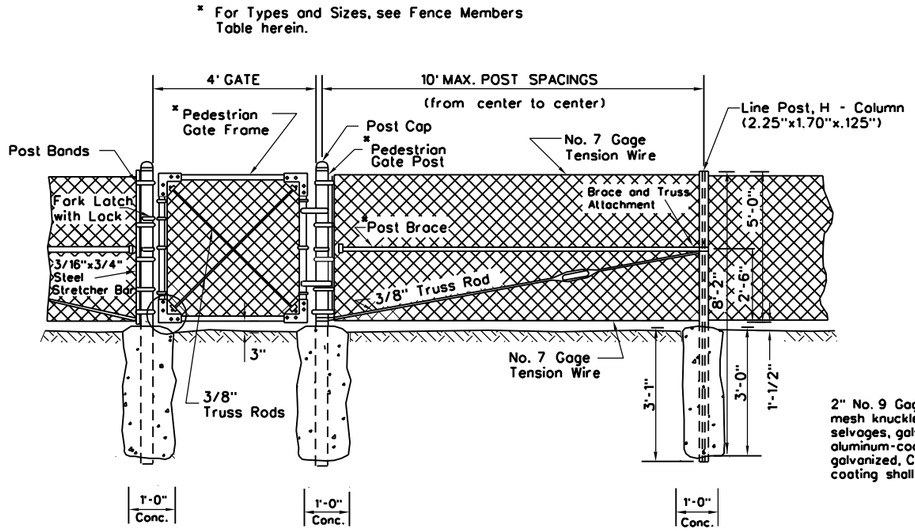
REVISION DATE

R/W FENCE–CHAIN LINK 5' FENCE FABRIC HEIGHT (sheet 1 of 2)

STANDARD SHEET F1

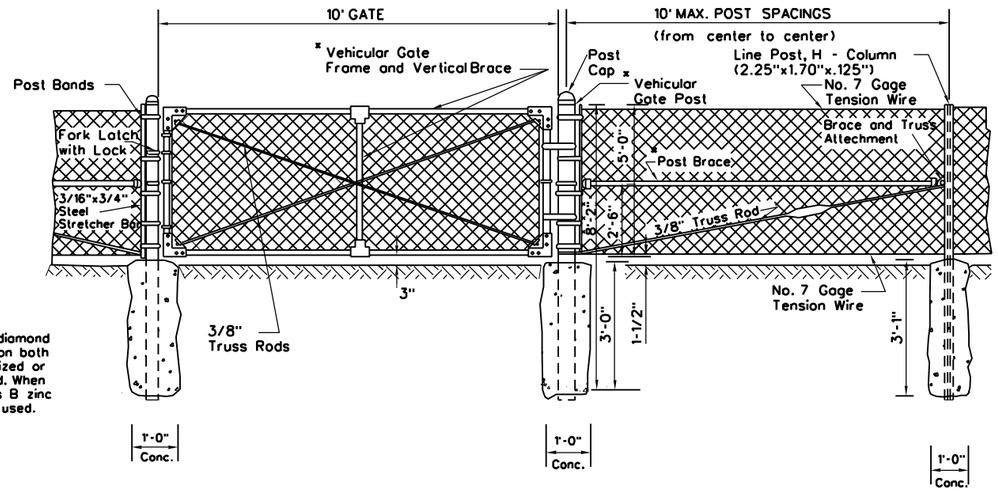


PEDESTRIAN & VEHICULAR GATE CORNER ATTACHMENT

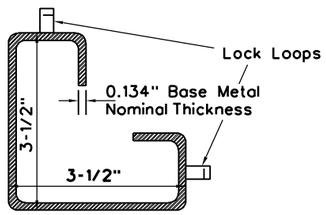


PEDESTRIAN GATE DETAIL

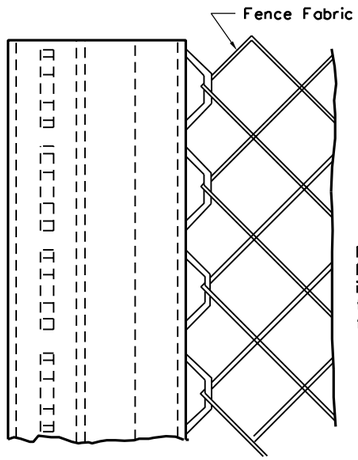
2" No. 9 Gage diamond mesh knuckled on both selvages, galvanized or aluminum-coated. When galvanized, Class B zinc coating shall be used.



VEHICULAR GATE DETAIL



PLAN

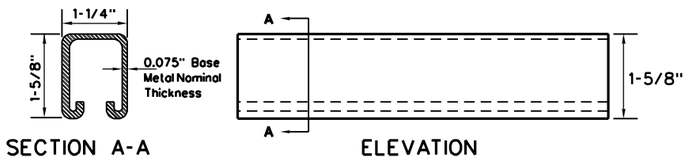


Note:
Fabric to be woven into the lock loops for the entire height of fence.

ELEVATION

POST DETAIL
(Galvanized Weight = 5.14 Lbs./Ft.)

ROLL FORMED MEMBERS



SECTION A-A ELEVATION

BRACE DETAIL
(Galvanized Weight = 1.35 Lbs./Ft.)

FENCE MEMBERS TABLE

Member Designation	Galvanized Pipe			Triple Cooted Pipe			Galv. Roll Formed Members		
	I.D. in.	Wall Thk. in.	Wt. lbs/ft.	I.D. in.	Wall Thk. in. (min.)	Wt. lbs/ft. (min.)	Dimensions in.	Wall Thk in.	Wt. lbs/ft.
End,Pull,Corner and Intermediate Assembly Post	2	0.154	3.65	2	0.130	3.11	3.5 x 3.5	0.134	5.14
Post Brace	1.25	0.140	2.27	1.25	0,11	1.83	1.250x1.625	0.075	1.35
Pedestrian Gate Post	2.5	0.203	5.79	2.5	0.160	4.64	3.5 x 3.5	0.134	5.14
Pedestrian Gate Frame	1.25	0.140	2.27	1.25	0,11	1.83	-	-	-
Vehicular Gate Post	3.5	0.226	9.11	-	-	-	-	-	-
Vehicular Gate Frame (and Vertical Brace)	1.5	0.145	2.72	1.5	0.120	2.28	-	-	-
Special Length Line Post (For 9'-6" and over)	2	0.154	3.65	2	0.130	3.11	3.5 x 3.5	0.134	5.14

NOTES

The applicable details and notes of Standard Sheet F1 (Sheet 1 of 2) shall apply to this Standard Sheet.

Except for "normal length" line posts, all other posts and braces shall be galvanized steel pipe members or galvanized steel roll formed members as shown in the "Fence Members Table" herein. When galvanized pipe posts are used, galvanized post braces shall be used.

When roll formed posts are used, roll formed post braces shall be employed.

Roll formed posts and braces shall meet the requirements of 712.8 of the Specifications.

Stretcher bars, and their accompanying post bands, shall not be used with the roll formed posts. Instead, the fence fabric shall be integrally woven into the lock loops of the posts.

Post caps shall not be used on roll formed posts.

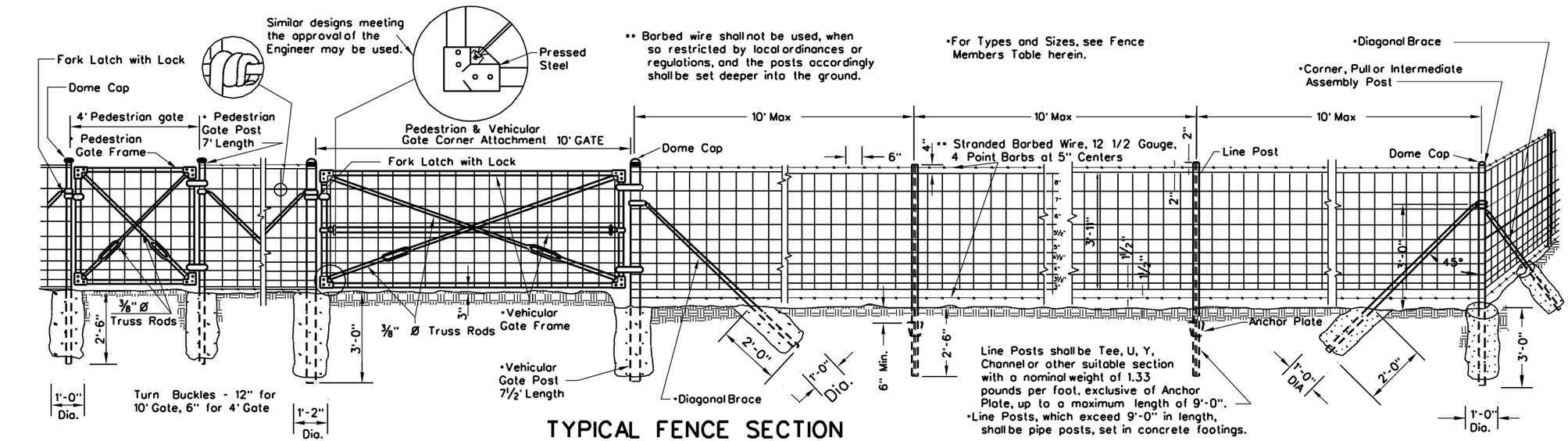
Gate frames and gate vertical braces shall be galvanized pipe members . Gate fabric shall have the same coating as the fence fabric. All other metal components of gates shall be galvanized, with the exception of die-cast aluminum corner fittings, or pressed steel corner fittings.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99
REVISION DATE

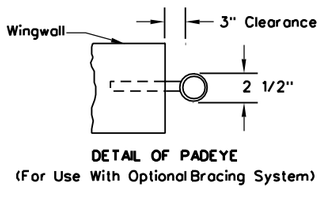
R/W FENCE-CHAIN LINK
5' FENCE FABRIC HEIGHT
(sheet 2 of 2)

STANDARD SHEET F1

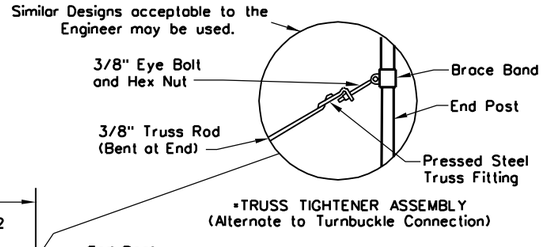


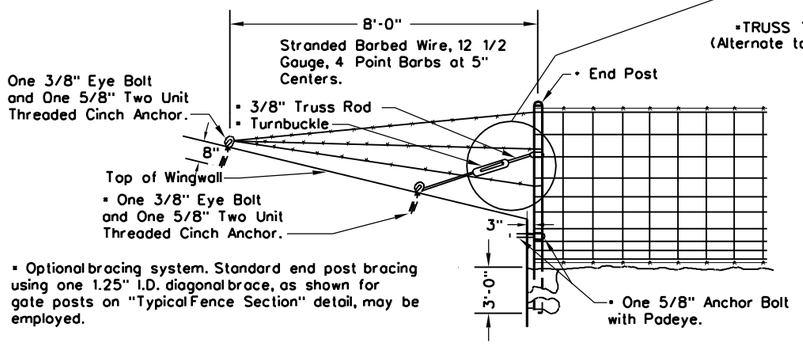
TYPICAL FENCE SECTION

Line Posts shall be Tee, U, Y, Channel or other suitable section with a nominal weight of 1.33 pounds per foot, exclusive of Anchor Plate, up to a maximum length of 9'-0".
•Line Posts, which exceed 9'-0" in length, shall be pipe posts, set in concrete footings.



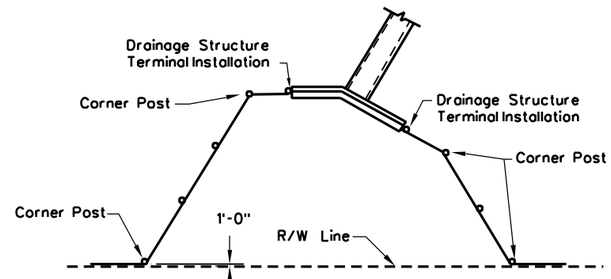
DETAIL OF PADEYE
(For Use With Optional Bracing System)



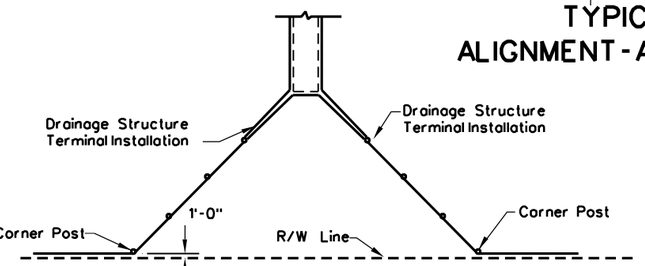


• Optional bracing system. Standard end post bracing using one 1.25" I.D. diagonal brace, as shown for gate posts on "Typical Fence Section" detail, may be employed.

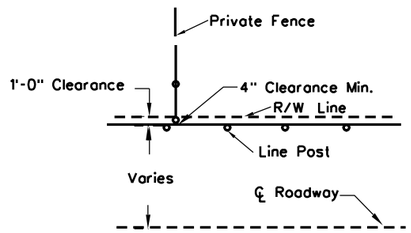
DRAINAGE STRUCTURE TERMINAL INSTALLATION



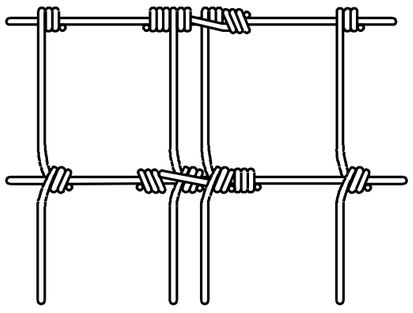
TYPICAL FENCE ALIGNMENT-ANGLE HEADWALLS



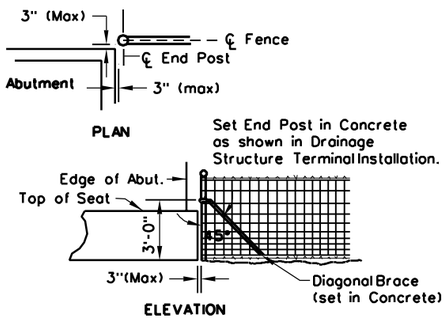
TYPICAL FENCE ALIGNMENT AT WINGWALLS FOR PIPES OR BOX CULVERTS



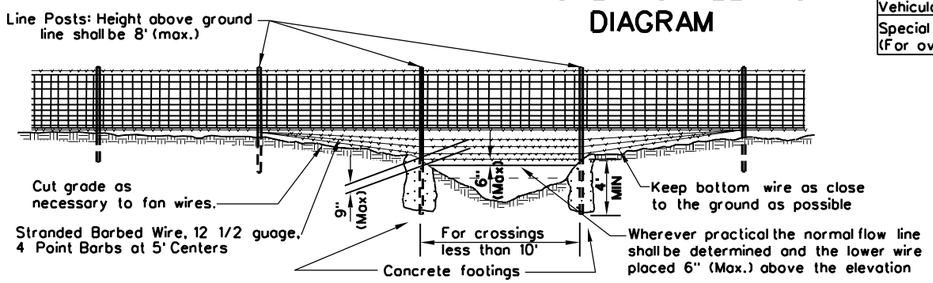
TYPICAL INSTALLATION DIAGRAM



TYPICAL WIRE FENCE SPLICE



DETAIL OF R/W FENCE AT ABUTMENTS



DETAIL SHOWING TYPICAL SECTION AT MINOR DEPRESSIONS AND WET WEATHER CROSSINGS

NOTES

Except for "normal length" line posts, all other posts and their diagonal braces shall be either galvanized steel pipe members or triple -coated steel pipe members as shown in the "Fence Members Table" herein.
When galvanized pipe posts are used, galvanized pipe diagonal braces shall be used. When triple-coated pipe posts are used, triple-coated pipe diagonal braces shall be employed.

Gate frames may be either galvanized pipe members or triple-coated pipe members. All other metal components of gates shall be galvanized, with the exception of die-cast aluminum corner fittings, pressed steel corner fittings.

Unless otherwise specified, or directed by the Engineer, the farm field fence may be installed with the fence fabric and barbed wire postitioned on either side of the fence posts.

In lieu of the barbed wire detailed herein, the following additional types are acceptable, provided they retain the "4-point barb at 5-inch centers" requirement and provided they meet or exceed the strength and coating requirements for the stranded, 12 1/2 gauge, barbed wire as called for in 712.10 of the specifications:

(a) stranded, 15½gauge, high carbon steel barbed wire.

(b) one-strand, 12 guage, steel barbed wire.

Dome caps for end, corner gate, line or pullposts, shall be swage fitted or securely attached to the posts by means of set screws, pins or rivets.

Hardware and miscellaneous fittings, not specifically designated herein as to type or dimensions, shall conform to the applicable requirements of 608 of the Specifications and shall be a good quality commercial design acceptable to the Engineer.

Drainage structure terminal installations shall be installed as called for on the Plans and/or as shown on typical fence details.

Dumped rock channel protection shall be used at channel crossing when called for on the Plans.

Type FW-4-5 Nicopress Oval Sleeve Wire Splices, or other equal sleeve splices approved by the Engineer, may be used in lieu of the "Typical Wire Fence Splice" shown herein.

FENCE MEMBERS TABLE

Member Designation	Galvanized Pipe			Triple-Coated Pipe		
	I.D. In.	Wall Thk. In.	Wt. lb/ft.	I.D. In.	Wall Thk. In (min.)	Wt. lb/ft. (min.)
End, Pull, Corner and Intermediate Assembly Post	2	0.154	3.65	2	0.130	3.11
Diagonal Brace	1.25	0.140	2.27	1.25	0.111	1.83
Pedestrian Gate Post	2	0.154	3.65	2	0.130	3.11
Pedestrian Gate Frame	1	0.133	1.68	1	0.104	1.34
Vehicular Gate Post	3.5	0.226	9.11	-	-	-
Vehicular Gate Frame	1.5	0.145	2.72	1.5	0.120	2.28
Special Length Line Post (For over 9'-0")	2	0.154	3.65	2	0.130	3.11

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
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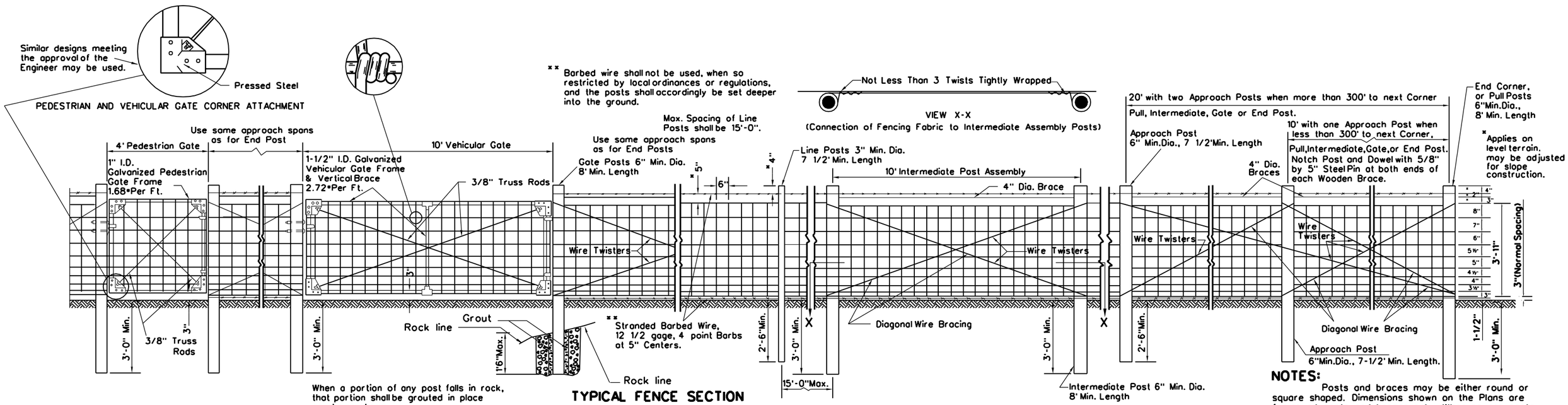
STANDARD DETAIL

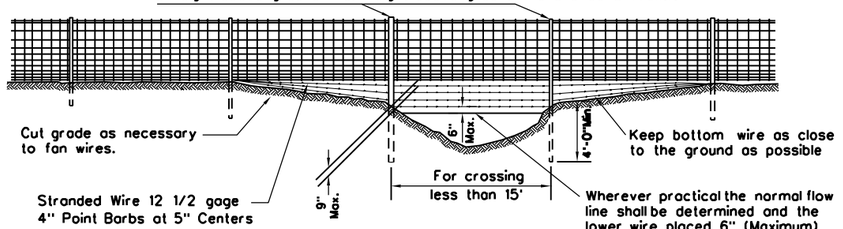
PREPARED 7-1-99

REVISION DATE

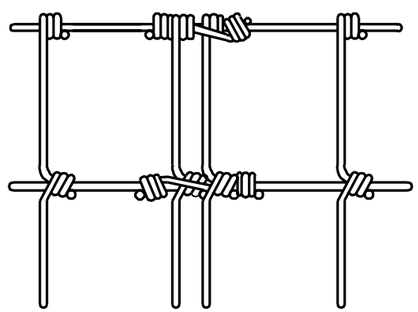
R/W FENCE-FARM FIELD WITH STEEL POSTS (3'-11" fence fabric height)

STANDARD SHEET F2



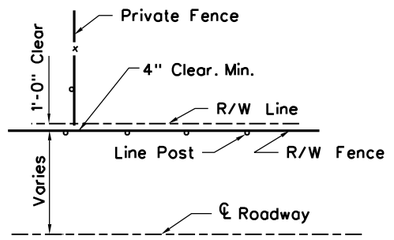


DETAIL SHOWING TYPICAL SECTION AT MINOR DEPRESSIONS AND WET WEATHER CROSSINGS

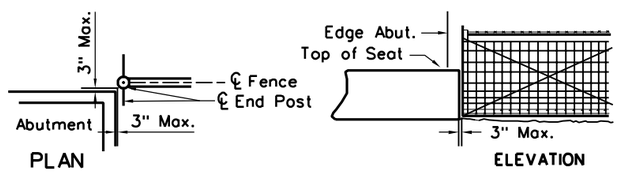


Note: Type FW-4-5 Nicopress Oval Sleeve Wire Splices, or other equal sleeve splices approved by the Engineer, may be used in lieu of the above wrapped wire splices.

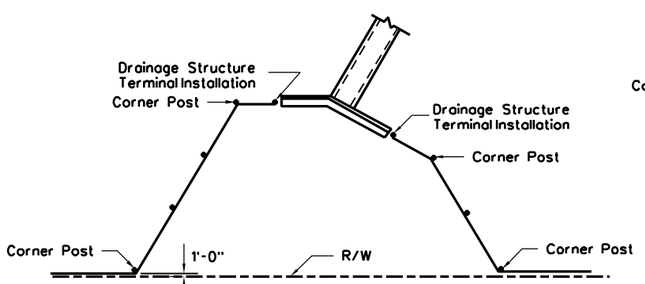
TYPICAL WIRE FENCE SPLICE



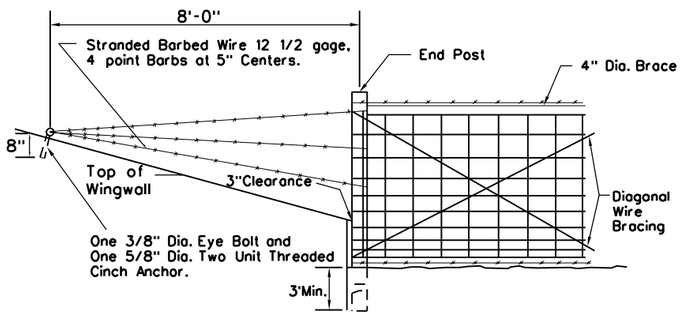
TYPICAL INSTALLATION DIAGRAM



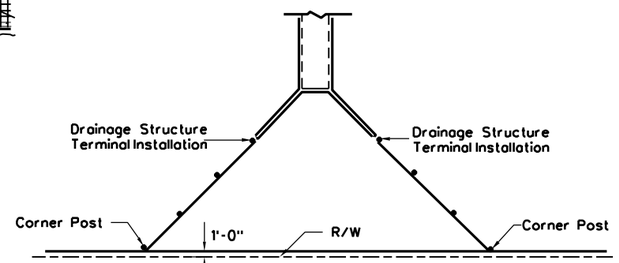
DETAIL OF R/W FENCE AT ABUTMENTS



TYPICAL FENCE ALIGNMENT AT ANGLE HEADWALLS



DRAINAGE STRUCTURE TERMINAL INSTALLATION



TYPICAL FENCE ALIGNMENT AT WINGWALLS FOR PIPES OR BOX CULVERTS

NOTES:

Posts and braces may be either round or square shaped. Dimensions shown on the Plans are for round posts and braces only. When square posts are used, line posts shall be 3" square (min.); braces 4" square (min.); corner, end, pull, gate, approach, and intermediate posts 6" square (min).

The positioning of the fence fabric and barbed wire on the posts, as shown on the "Typical Fence Section" detail, applies for level and gentle sloping terrain. For fence erected on slopes, the positioning may be adjusted to meet the slope conditions as long as the adjustment is continued from post to post in a uniform manner. Trenching on slopes may be warranted. On slopes, posts will continue to be erected vertically, unless otherwise directed, and the ends of the fencing fabric shall be cut on a skew as may be necessary for proper connection to the posts.

Dumped rock channel protection will be used at channel crossings when called for on the plans.

Install drainage structure terminal installations as called for on the plans and/or as shown on typical fence details.

Unless otherwise specified, or directed by the Engineer, the farm field fence may be installed with the fence fabric and barbed wire positioned on either side of the fence posts.

Hardware and miscellaneous fittings, not specifically designated herein as to type or dimensions, shall conform to the applicable requirements of Section. 608 of the Specifications and shall be of good quality commercial design acceptable to the Engineer.

In lieu of the barbed wire detailed herein, the following additional types are acceptable, provided they retain the "4-point barb at 5-inch centers" requirement and provided they meet or exceed the strength and coating requirements for the standard, 12-1/2 gage, barbed wire as called for in 712.10 of the Specifications:

(a) stranded, 15-1/2 gage, high carbon steel barbed wire.
(b) one-strand, 12 gage, steel barbed wire.

Pedestrian and vehicular gate frames (and vertical braces) may be either galvanized steel pipe members as shown herein or may be triple-coated steel pipe members meeting the requirements specified on Standard Sheet F2. All other metal components of the gate shall be galvanized, with the exception of die-cast aluminum corner fittings, or pressed steel corner fittings.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
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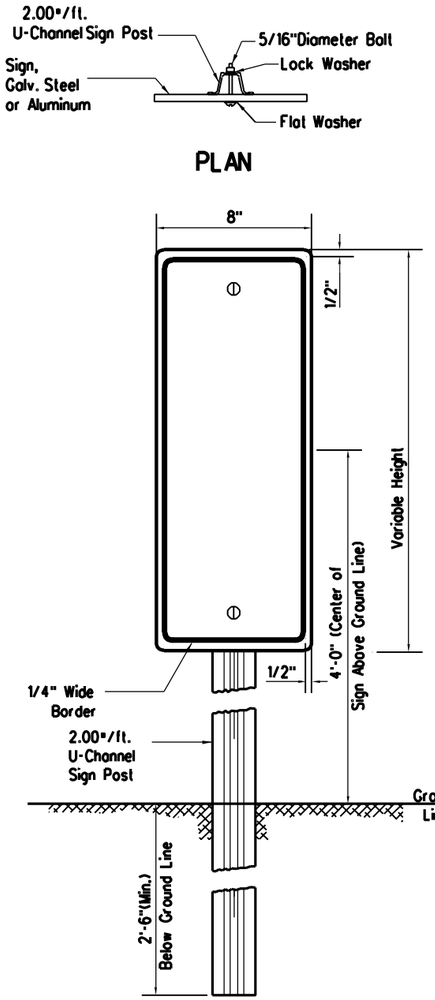
PREPARED 7-1-99
REVISION DATE

R/W FENCE–FARM FIELD WITH TREATED WOOD POSTS (3'–11" fence fabric height)

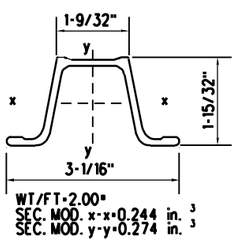
STANDARD SHEET F3

PROJECT MARKER

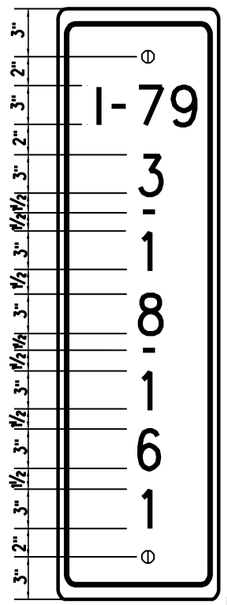


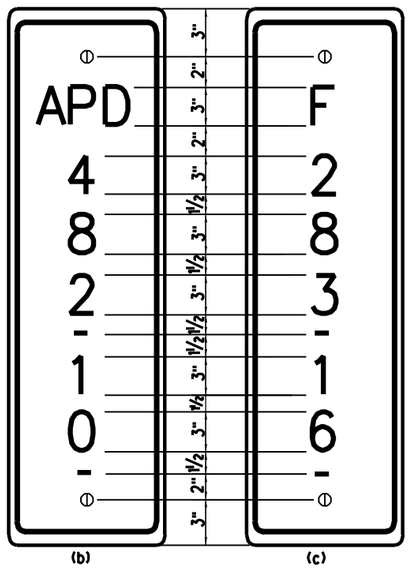
ELEVATION

Mounting Detail



U CHANNEL SIGN POST DETAIL





Example Project Signs
(a) Interstate [I-79-3(18)161]
(b) Appalachian[APD 482(10)]
(c) Federal[F-283(16)]

TYPICAL SIGNING DETAILS

NOTES

Signs shall be fabricated from 0.08" thick aluminum sheets or #16 gauge galvanized steel sheets. Reflectorization is not required.

Signs shall have black legends and borders on white backgrounds. The letters and numerals are to be of the size and style shown herein.

U-Channel posts shall meet the requrements of Section 657.2 of the Specifications.

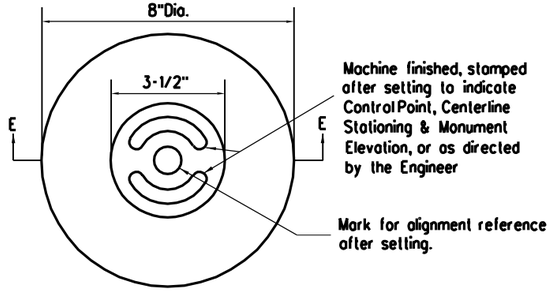
Steel signs and posts shall be galvanized in accordance with ASTM A-123.

Steel hardware shall conform with Subsection 709.23 of the Specifications; aluminum hardware with Subsections 709.36 and 709.37. Steel hardware shall be galvanized in accordance with ASTM A-153.

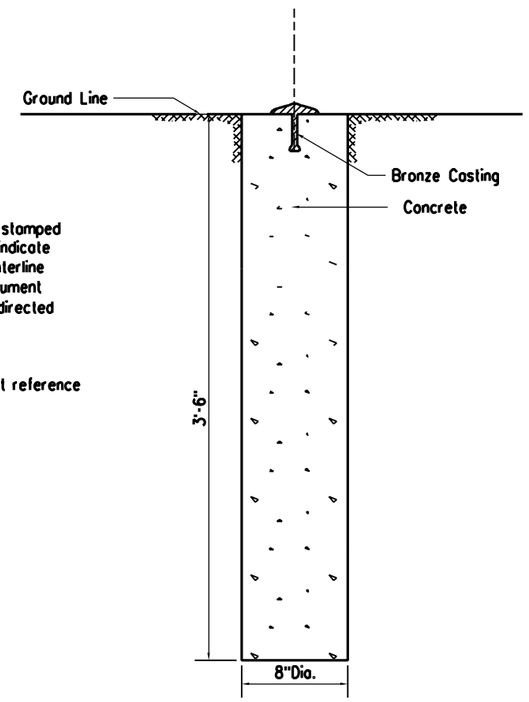
Top of posts shall extend to the top of signs.

All posts and signs shall be punched with 3/8-inch holes on their vertical centerlines. Holes shall be so located that the signs can be attached to the posts at three inches below the top of the signs and three inches above the bottom of the signs.

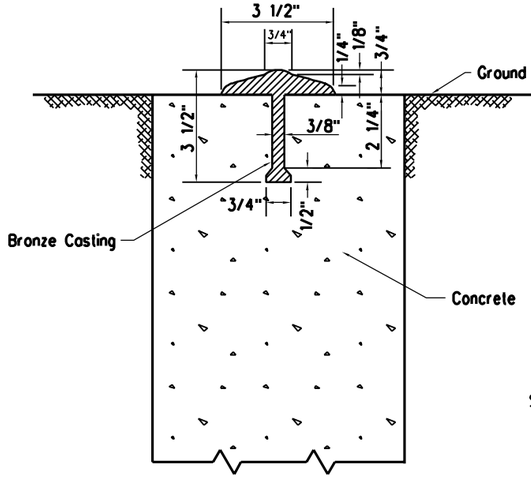
SURVEY MARKER



PLAN VIEW



ELEVATION VIEW



SECTION E-E

NOTES

Survey markers shall conform to the requirements of the Standard Specifications.

Sufficient reinforcement will be included in precast survey markers to resist handling stresses.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99

REVISION DATE

PROJECT MARKER
SURVEY MARKER

STANDARD SHEET M1