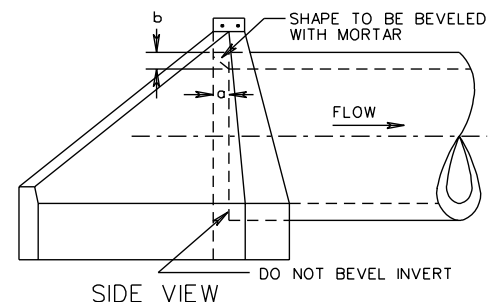


NOTES:

1. QUANTITIES GIVEN ARE FOR ONE ENDWALL.
2. PLEASE REFER TO STANDARD EW-2S, SHEETS 101.08 AND 101.09, FOR ALL DIMENSIONS NOT GIVEN IN TABLES.
3. THIS ITEM MAY BE PRECAST OR CAST IN PLACE.
4. ON SHALLOW FILLS, WHERE ENDWALLS ARE 1' OR LESS BELOW SHOULDER LINE, THE TOP OF THE ENDWALL SHALL BE CONSTRUCTED PARALLEL TO THE GRADE OF ROAD.
5. ALL CAST IN PLACE CONCRETE TO BE CLASS A3. FOR PRECAST SEE SHEET 101.21.
6. IN NO CASE SHALL TOP OF ENDWALL PROJECT ABOVE FILL SLOPE, DITCH SLOPE, OR SHOULDER.
7. THIS STANDARD TO BE USED WITH SKEW ANGLES FROM 15° TO 37° 30'.
8. COST OF BARS FOR CRACK CONTROL TO BE INCLUDED IN PRICE PER BID PER CUBIC YARD CONCRETE.
9. HEADWALL TO BE BEVELED IN ALL AREAS EXCEPT WHERE A CONFLICT WITH INVERT AND WINGWALLS OCCUR.
10. BEVEL EDGE IS REQUIRED ON THE HEADWALL AT THE INLET END OF THE CULVERT (WHERE THE FLOW ENTERS THE CULVERT). HEADWALL AT THE OUTLET END OF THE CULVERT MAY BE EITHER SQUARE EDGE OR BEVEL EDGE.
11. 3/4" CHAMFER MAY BE PROVIDED ON ALL EDGES AT MANUFACTURER'S OPTION.



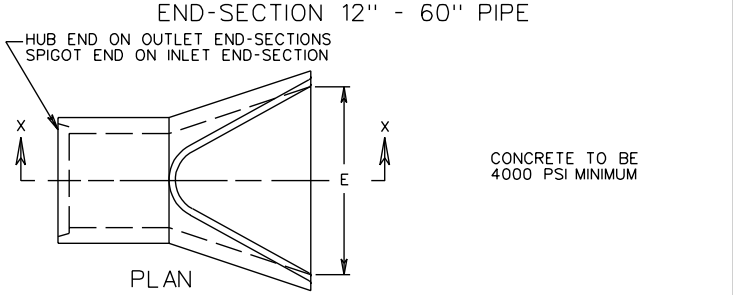
FOR CONCRETE PIPE OR CORRUGATED METAL PIPE		
PIPE I.D.	a	b
42"	0'-4 1/2"	0'-3 1/2"
48"	0'-5"	0'-4"
54"	0'-5 3/4"	0'-4 1/2"
60"	0'-6 1/4"	0'-5"
66"	0'-7"	0'-5 1/2"
72"	0'-7 1/2"	0'-6"
78"	0'-8 1/4"	0'-6 1/2"
84"	0'-8 3/4"	0'-7"
90"	0'-9 1/2"	0'-7 1/2"
96"	0'-10"	0'-8"

FOR CONCRETE PIPE							
D	S	S30	T30	FILL SLOPE 1 1/2:1		FILL SLOPE 2:1	
				CONCRETE IN ONE DOUBLE ENDWALL CUBIC YDS.	INCREASE FOR EACH ADDITIONAL PIPE CUBIC YDS.	CONCRETE IN ONE DOUBLE ENDWALL CUBIC YDS.	INCREASE FOR EACH ADDITIONAL PIPE CUBIC YDS.
42"	6'-0"	6'-11 1/8"	10'-11 5/8"	5.098	1.467	5.759	1.449
48"	6'-10"	7'-10 5/8"	12'-6 1/8"	6.295	1.836	7.129	1.814
54"	7'-8"	8'-10 1/4"	14'-0 5/8"	8.121	2.376	9.218	2.350
60"	8'-6"	9'-9 3/4"	15'-7"	10.224	3.001	11.640	2.971
66"	9'-4"	10'-9 3/8"	17'-1 1/2"	12.663	3.729	14.450	3.693
72"	10'-2"	11'-8 1/8"	18'-8"	15.437	4.552	17.650	4.512
78"	11'-0"	12'-8 3/8"	20'-2 1/2"	18.558	5.482	21.261	5.438
84"	11'-10"	13'-8"	21'-9"	22.081	6.537	25.351	6.488
90"	12'-8"	14'-7 1/2"	23'-3 1/2"	26.445	8.207	30.302	7.934
96"	13'-6"	15'-7"	24'-10"	30.998	9.654	35.556	9.348

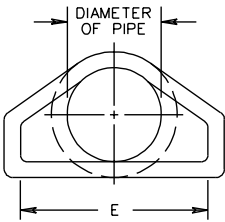
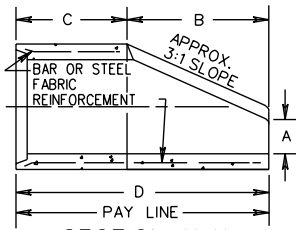
FOR CORRUGATED METAL PIPE							
D	S	S30	T30	FILL SLOPE 1 1/2:1		FILL SLOPE 2:1	
				CONCRETE IN ONE DOUBLE ENDWALL CUBIC YDS.	INCREASE FOR EACH ADDITIONAL PIPE CUBIC YDS.	CONCRETE IN ONE DOUBLE ENDWALL CUBIC YDS.	INCREASE FOR EACH ADDITIONAL PIPE CUBIC YDS.
42"	5'-3 1/2"	6'-1 3/8"	10'-1 7/8"	5.364	1.464	6.021	1.445
48"	6'-0 1/2"	6'-11 3/4"	11'-7 1/8"	6.663	1.849	7.494	1.827
54"	6'-9 1/2"	7'-10 1/8"	13'-0 1/2"	8.737	2.409	9.731	2.382
60"	7'-6 1/2"	8'-8 1/2"	14'-5 3/4"	10.927	3.066	12.339	3.035
66"	8'-3 1/2"	9'-6 1/8"	15'-11 1/8"	13.585	3.827	15.354	3.777
72"	9'-0 1/2"	10'-5 1/4"	17'-4 3/8"	16.666	4.738	18.834	4.659
78"	9'-9 1/2"	11'-3 5/8"	18'-9 3/4"	20.066	5.693	22.761	5.647
84"	10'-6 1/2"	12'-2 1/8"	20'-3 1/8"	23.954	6.822	27.214	6.770
90"	11'-3 1/2"	13'-0 1/2"	21'-8 1/2"	28.395	8.174	32.232	8.115
96"	12'-0 1/2"	13'-10 1/8"	23'-1 3/4"	33.328	9.647	37.863	9.582

SPECIFICATION REFERENCE
105
302

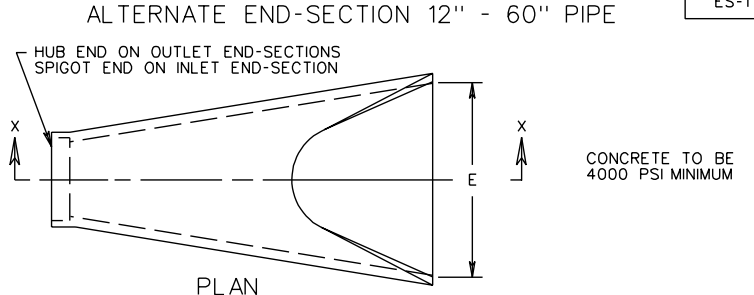
STANDARD ENDWALLS FOR MULTIPLE PIPE CULVERTS
42"-96" PIPE-30° SKEW



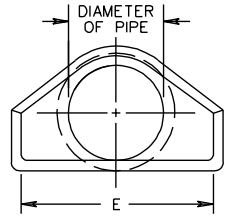
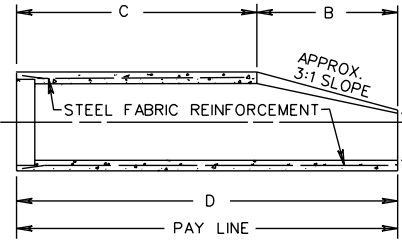
CONCRETE TO BE 4000 PSI MINIMUM



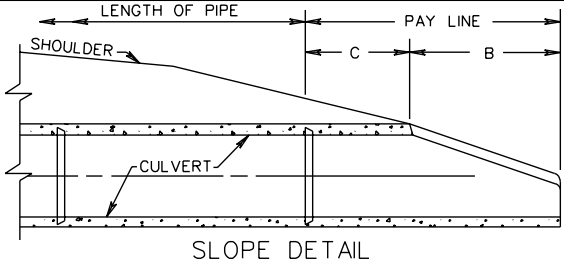
END SECTION DIMENSIONS					
PIPE DIAMETER	A	B	C	D	E
12"	4"	2'-0"	2'-0"	4'-0"	2'-0"
15"	6"	2'-3"	1'-9"	4'-0"	2'-6"
18"	9"	2'-3"	1'-9"	4'-0"	3'-0"
21"	9 1/4"	2'-11"	2'-1"	5'-0"	3'-6"
24"	9 1/2"	3'-7"	2'-6"	6'-1"	4'-0"
27"	10 3/4"	4'-0"	2'-1"	6'-1"	4'-6"
30"	1'-0"	4'-6"	1'-7 3/4"	6'-1 3/4"	5'-0"
33"	1'-1 1/2"	4'-10 1/2"	2'-3 1/4"	7'-1 3/4"	5'-6"
36"	1'-3"	5'-3"	2'-10 3/4"	8'-1 3/4"	6'-0"
42"	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"
48"	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"
54"	2'-3"	5'-5"	2'-9 1/4"	8'-2 1/4"	7'-6"
60"	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"



CONCRETE TO BE 4000 PSI MINIMUM



END SECTION DIMENSIONS					
PIPE DIAMETER	A	B	C	D	E
12"	4"	2'-0"	4'-1"	6'-1"	2'-0"
15"	6"	2'-3"	3'-10"	6'-1"	2'-6"
18"	9"	2'-3"	3'-10"	6'-1"	3'-0"
21"	9"	2'-11"	3'-2"	6'-1"	3'-6"
24"	10"	3'-7"	2'-8"	6'-3"	4'-0"
27"	10 1/2"	4'-0"	2'-1 1/2"	6'-1 1/2"	4'-6"
30"	1'-0"	4'-6"	1'-7 3/4"	6'-1 3/4"	5'-0"
33"	1'-1 1/2"	4'-10 1/2"	3'-3 1/4"	8'-1 3/4"	5'-6"
36"	1'-3"	5'-3"	2'-10 3/4"	8'-1 3/4"	6'-0"
42"	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"
48"	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"
54"	2'-3"	5'-5"	2'-11"	8'-4"	7'-6"
60"	2'-6"	5'-0"	3'-3"	8'-3"	8'-0"



NOTES:
PIPE LENGTHS SHOWN ON PLANS ARE BASED ON END-SECTION DESIGN SHOWN ON THE LEFT. IF THE CONTRACTOR ELECTS TO USE THE ALTERNATE DESIGN SHOWN ON THE RIGHT, LENGTHS WILL BE REDUCED BY THE DIFFERENCE IN DIMENSION "D".

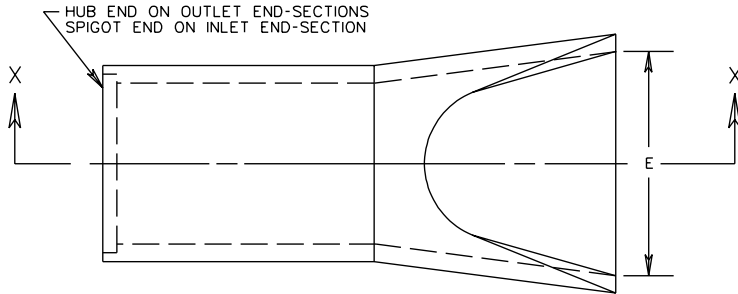
SPECIFICATION REFERENCE
302

FLARED END-SECTION FOR 12''-60'' CONCRETE PIPE CULVERTS

VIRGINIA DEPARTMENT OF TRANSPORTATION

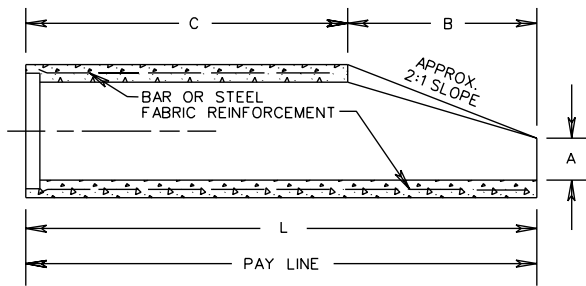
REV. 7/01
102.01

ES-1A

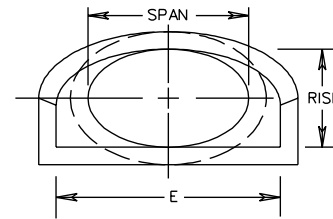


PLAN

END SECTION DIMENSIONS					
SPAN X RISE	A	B	C	L	E
23" X 14"	6"	2'-3"	3'-10"	6'-1"	2'-8"
30" X 19"	9"	2'-11"	3'-2"	6'-1"	3'-6"
38" X 24"	10"	3'-8"	2'-6"	6'-2"	4'-0"
42" X 27"	12"	4'-6"	1'-8"	6'-2"	5'-0"
45" X 29"	13"	4'-11"	3'-3"	8'-2"	5'-6"
53" X 34"	15"	5'-3"	2'-11"	8'-2"	6'-0"

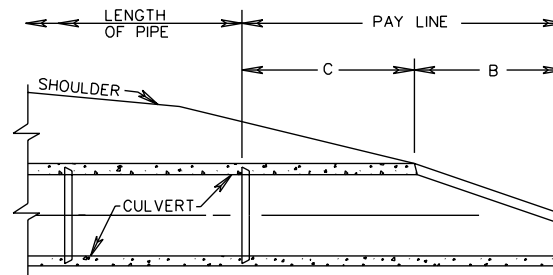


SECTION X-X



END VIEW

CONCRETE TO BE
4000 PSI MINIMUM



SLOPE DETAIL

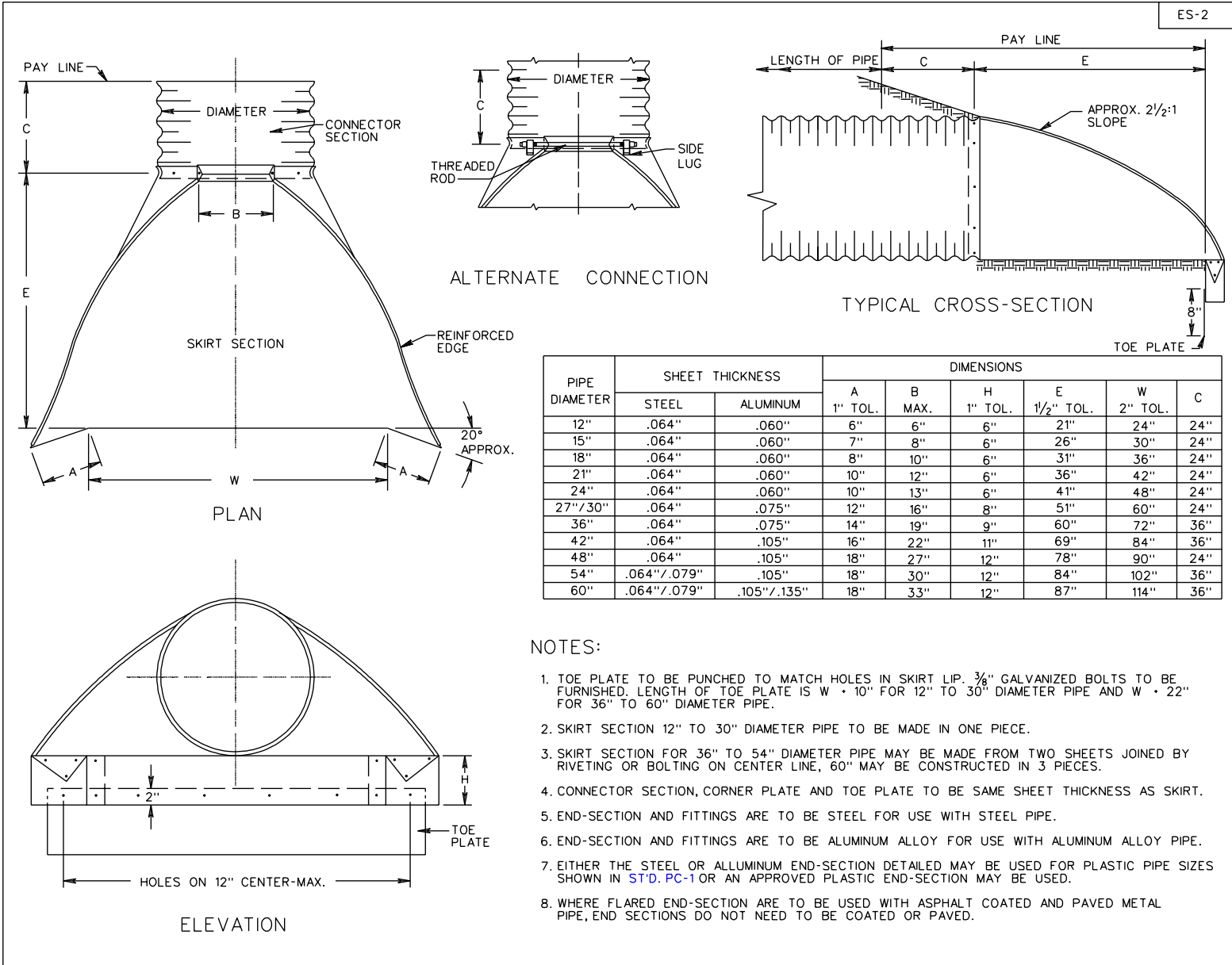
FLARED END-SECTION FOR 23" X 14" TO 53" X 34"
ELLIPTICAL CONCRETE PIPE CULVERTS

REV. 7/01
102.02

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
REFERENCE

302



PIPE DIAMETER	SHEET THICKNESS		DIMENSIONS					
	STEEL	ALUMINUM	A 1" TOL.	B MAX.	H 1" TOL.	E 1 1/2" TOL.	W 2" TOL.	C
12"	.064"	.060"	6"	6"	6"	21"	24"	24"
15"	.064"	.060"	7"	8"	6"	26"	30"	24"
18"	.064"	.060"	8"	10"	6"	31"	36"	24"
21"	.064"	.060"	10"	12"	6"	36"	42"	24"
24"	.064"	.060"	10"	13"	6"	41"	48"	24"
27"/30"	.064"	.075"	12"	16"	8"	51"	60"	24"
36"	.064"	.075"	14"	19"	9"	60"	72"	36"
42"	.064"	.105"	16"	22"	11"	69"	84"	36"
48"	.064"	.105"	18"	27"	12"	78"	90"	24"
54"	.064"/.079"	.105"	18"	30"	12"	84"	102"	36"
60"	.064"/.079"	.105"/.135"	18"	33"	12"	87"	114"	36"

- NOTES:
1. TOE PLATE TO BE PUNCHED TO MATCH HOLES IN SKIRT LIP. 3/8" GALVANIZED BOLTS TO BE FURNISHED. LENGTH OF TOE PLATE IS W + 10" FOR 12" TO 30" DIAMETER PIPE AND W + 22" FOR 36" TO 60" DIAMETER PIPE.
 2. SKIRT SECTION 12" TO 30" DIAMETER PIPE TO BE MADE IN ONE PIECE.
 3. SKIRT SECTION FOR 36" TO 54" DIAMETER PIPE MAY BE MADE FROM TWO SHEETS JOINED BY RIVETING OR BOLTING ON CENTER LINE, 60" MAY BE CONSTRUCTED IN 3 PIECES.
 4. CONNECTOR SECTION, CORNER PLATE AND TOE PLATE TO BE SAME SHEET THICKNESS AS SKIRT.
 5. END-SECTION AND FITTINGS ARE TO BE STEEL FOR USE WITH STEEL PIPE.
 6. END-SECTION AND FITTINGS ARE TO BE ALUMINUM ALLOY FOR USE WITH ALUMINUM ALLOY PIPE.
 7. EITHER THE STEEL OR ALUMINUM END-SECTION DETAILED MAY BE USED FOR PLASTIC PIPE SIZES SHOWN IN [STD. PC-1](#) OR AN APPROVED PLASTIC END-SECTION MAY BE USED.
 8. WHERE FLARED END-SECTION ARE TO BE USED WITH ASPHALT COATED AND PAVED METAL PIPE, END SECTIONS DO NOT NEED TO BE COATED OR PAVED.

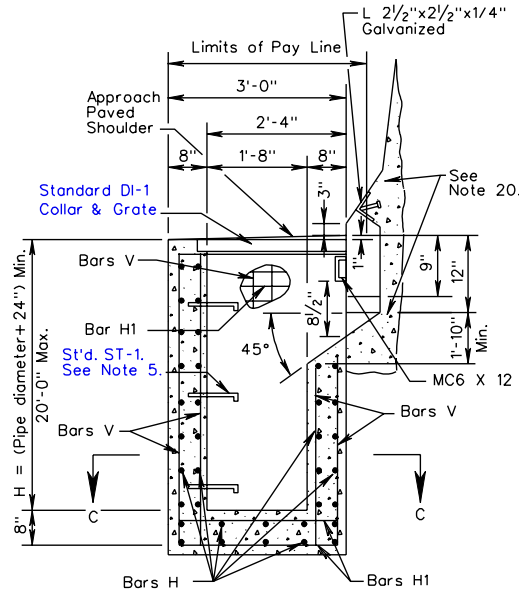
DI-10J,10K,10L

TYPE I & III INLET

REINFORCING STEEL				
MARK	SIZE	NO.	LENGTH	SPACE
A See Note 9	#4	6	L - 2'-6"	AS SHOWN
A-1 See Note 11	#4	(2xL)+2	4'-0"	12
B See Note 9	#3	2x(L-4)	1'-1"	12
B-1 See Note 11	#4	9	L+(2'-4")	8
DOWELS	#4	See Note 6	1'-0"	6
F See Note 9	#5	See Note 3	1'-6"	6
H	#5	(4xH)+10	3'-2"	12
H1	#5	(4xH)+8	2'-8"	10

TYPE - II INLET

REINFORCING STEEL				
MARK	SIZE	NO.	LENGTH	SPA.
A-1	#4	(2xL) 2	4'-0"	12"
B-1	#4	9	L+(2'-4")	8"
H-2	#5	See Note 16	7'-8"	10"
V-1	#4	12	H - (1'-2")	8"
V-2	#4	30	LENGTH = H	8"
A See Note 15	#4	See Note 12	L - (2'-6")	AS SHOWN
B See Note 15	#3	4(L-4)	1'-1"	12"
DOWELS	#4	DOUBLE NO. SHOWN FOR TYPE I	1'-0"	6"
F See Note 15	#5	See Note 6	1'-6"	6"
H	#5	(4 + H)+8	3'-2"	12"
H-1	#5	(4 + H)+16	2'-8"	10"
V	#4	30	LENGTH = H	8"
M-1	#5	5	3'-2"	5"
M	#4	4	1'-8"	12"



FOR USE ADJACENT TO WALL OR BARRIER WITH SAFETY SHAPE (TYPE III)

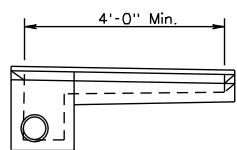
- TYPE I DENOTES INLET WITH SINGLE THROAT AND CHAMBER. TYPE II DENOTES INLET WITH DOUBLE THROAT AND CHAMBER. TYPE III DENOTES INLET WITH SINGLE THROAT AND CHAMBER ADJACENT TO WALL OR BARRIER.
- MAXIMUM PIPE SIZE IS 24" DIAMETER.
- 3" DIAMETER WEEP HOLE TO BE LOCATED TO DRAIN SUBBASE MATERIAL. WEEP HOLE WITH 12" X 12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALV. STEEL WIRE, MIN. WIRE DIAMETER 0.03", #4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO OUTSIDE OF THE STRUCTURE.
- PROVIDE SAFETY SLABS WHEN SPECIFIED ON THE PLANS.
- WHEN SPECIFIED ON THE PLANS, THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH THE STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.

NOTES

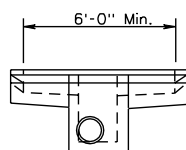
- VARIES GREATER THAN: 0' TO 18" MAX. TYPE II CHAMBER. 4' TO 3' MAX. TYPE I CHAMBER.
- FOR DETAILS AND DIMENSIONS NOT SHOWN FOR MEDIAN BARRIER, SEE STANDARD MB-8A.
- GALVANIZED MC-6 X 12 IS TO BE WELDED UNDER THE COLLAR AND EXTENDED INTO SIDEWALLS TO WITHIN 2" OF OUTSIDE FACE.
- ALL REINFORCING BARS ARE TO BE GRADE 60 STEEL WITH MIN. OF 1/2" CONCRETE COVER. ANY BAR IN CONFLICT WITH PIPE SHELL AND/OR TOP SLAB OPENING ARE TO BE FIELD CUT TO PROVIDE THE REQUIRED COVER.
- DO NOT LOCATE STANDARD ST-1 STEPS ON CHAMBER WALLS THAT HAVE PIPES WHEN POSSIBLE.
- 8 DOWELS REQUIRED FOR DI-10L, MIN. L = 7'-0". ADD 2 DOWELS FOR EACH ADDITIONAL FOOT. 4 DOWELS REQUIRED FOR DI-10K, MIN. L = 4'-0". ADD 2 DOWELS FOR EACH ADDITIONAL FOOT.
- 12 BARS A REQUIRED FOR DI-10L.
- LENGTH OF BARS A, DI-10L = $\frac{L - (2'-6")}{2}$
- DO NOT USE WITH DI-10J.
- USE 6 BARS F FOR DI-10L TYPE I.
- DO NOT USE WITH TYPE III.
- ADD 4 ADDITIONAL BARS FOR EACH EXTRA FOOT OF DEPTH.
- USE 12 BARS F FOR DI-10L TYPE II.
- 24 BARS A ARE REQUIRED FOR DI-10L.
- DO NOT USE WITH DI-10J.
- A MINIMUM 22" FOOTING DEPTH IS REQUIRED FOR FORMING THE INLET SLOT. SEE PLANS FOR LENGTH "L".
- REFER TO PLANS FOR STRUCTURE LOCATIONS, DATA AND DIMENSIONS.
- REFER TO PLANS FOR LOCATIONS OF PIPES AND INVERTS.
- FOR TYPE III, COST OF ACCOMMODATION OF INLET THROAT IS TO BE INCLUDED IN COST OF WALL BARRIER.
- FOR TYPE III, SEE WALL PLANS FOR WALL FOOTING DETAILS.



DI-10J



DI-10K



DI-10L

Sheet 2 of 2

CONCRETE BARRIER DROP INLET (WITH MB-8A)

12"-24" PIPE: DEPTH (H) = 20' MAX.

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/01
104.29

SPECIFICATION REFERENCE

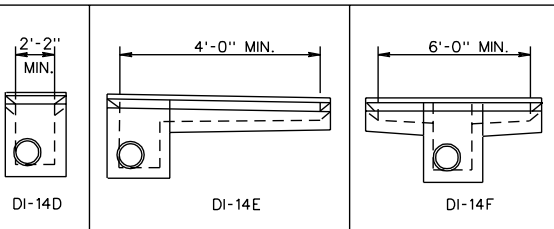
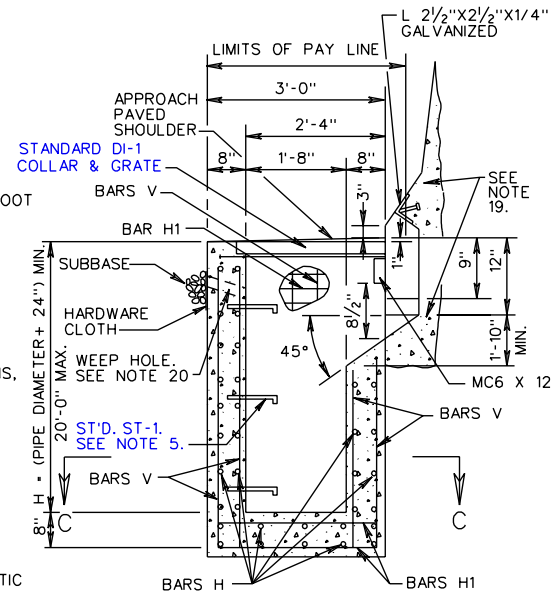
233
302

DI-14D,14E,14F

TYPE I & III INLET				
REINFORCING STEEL				
MARK	SIZE	NO.	LENGTH	SPACE
A SEE NOTE 9	#4	6 SEE NOTE 7	L - 2'-6" SEE NOTE 8	AS SHOWN
A-1 SEE NOTE 11	#4	(2XL)+2	5'-6"	12"
B SEE NOTE 9	#3	2X(L-4)	1'-1"	12"
B-1 SEE NOTE 11	#4	11	L+ (2'-4")	8"
DOWELS	#4	SEE NOTE 6	1'-0"	6"
F SEE NOTE 9	#5	3 SEE NOTE 10	1'-6"	6"
H	#5	(4XH)+10	3'-2"	12"
H1	#5	(4XH)+8	2'-8"	10"
TYPE - II INLET				
A-1	#4	(2XL)+2	5'-6"	12"
B-1	#4	11	L+ (2'-4")	8"
H-2	#3	16 SEE NOTE 12	7'-8"	10"
V-1	#5	12	H - (1'-2")	8"
V-2	#4	30	LENGTH = H	8"
A SEE NOTE 15	#4	12 SEE NOTE 14	L - (2'-6") SEE NOTE 8	AS SHOWN
B SEE NOTE 15	#4	4(L-4)	1'-1"	12"
DOWELS	#3	DOUBLE NO. SHOWN FOR TYPE I	1'-0"	6"
F SEE NOTE 15	#5	6 SEE NOTE 13	1'-6"	6"
H	#5	(4 + H)+8	3'-2"	12"
H-1	#5	(4 + H)+16	2'-8"	10"
V	#4	30	LENGTH = H	8"
M-1	#5	5	3'-2"	5"
M	#4	4	1'-8"	12"

NOTES

- VARIES GREATER THAN: 0' TO 18" MAX. TYPE II CHAMBER 4" TO 3' MAX. TYPE I CHAMBER.
- FOR DETAILS AND DIMENSIONS NOT SHOWN FOR MEDIAN BARRIER, SEE STANDARD MB-13.
- GALVANIZED MC-6 X 12 IS TO BE WELDED UNDER THE COLLAR AND EXTENDED INTO SIDEWALLS TO WITHIN 2" OF OUTSIDE FACE.
- ALL REINFORCING BARS ARE TO BE GRADE 60 STEEL WITH MIN. OF 1 1/2" CONCRETE COVER. ANY BARS IN CONFLICT WITH PIPE SHELL AND/OR TOP SLAB OPENING ARE TO BE FIELD CUT TO PROVIDE THE REQUIRED COVER.
- DO NOT LOCATE STANDARD ST-1 STEPS ON CHAMBER WALLS THAT HAVE PIPES WHEN POSSIBLE.
- 8 DOWELS REQUIRED FOR DI-14F, MIN. L = 7'-0". ADD 2 DOWELS FOR EACH ADDITIONAL FOOT. 4 DOWELS REQUIRED FOR DI-14E, MIN. L = 4'-0". ADD 2 DOWELS FOR EACH ADDITIONAL FOOT.
- 12 BARS A REQUIRED FOR DI-14F.
- LENGTH OF BARS A, DI-14F = $\frac{L - (2' - 6")}{2}$
- DO NOT USE WITH DI-14D.
- USE 6 BARS F FOR DI-14F TYPE I.
- DO NOT USE WITH TYPE III
- ADD 4 ADDITIONAL BARS FOR EACH EXTRA FOOT OF DEPTH.
- USE 12 BARS F FOR DI-14F TYPE II.
- 24 BARS A ARE REQUIRED FOR DI-14F.
- A MINIMUM 22" FOOTING DEPTH IS REQUIRED FOR FORMING THE INLET SLOT. SEE PLANS FOR LENGTH "L".
- REFER TO PLANS FOR STRUCTURE LOCATIONS, DATA AND DIMENSIONS.
- REFER TO PLANS FOR LOCATIONS OF PIPES AND INVERTS.
- FOR TYPE III, COST OF ACCOMMODATION OF INLET THROAT IS TO BE INCLUDED IN COST OF WALL BARRIER.
- FOR TYPE III SEE WALL PLANS FOR WALL FOOTING DETAILS.
- 3" DIAMETER WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH, 1/4" MESH OR GALV. STEEL WIRE, MIN. WIRE DIA. 0.03", NO. 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
- TYPE I DENOTES INLET WITH SINGLE THROAT AND CHAMBER. TYPE II DENOTES INLET WITH DOUBLE THROAT AND CHAMBER. TYPE III DENOTES INLET WITH SINGLE THROAT AND CHAMBER ADJACENT TO WALL OR BARRIER.
- MAXIMUM PIPE SIZE IS 24" DIAMETER.
- CONCRETE MEDIAN BARRIER (TALL WALL) SHALL HAVE DELINEATORS INSTALLED ON BARRIER WALL ORIENTED TOWARDS ONCOMING TRAFFIC AT APPROXIMATELY 25" ABOVE THE ROADWAY.
- PROVIDE SAFETY SLABS WHEN SPECIFIED ON THE PLANS.
- WHEN SPECIFIED ON THE PLANS, THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.



FOR USE ADJACENT TO WALL OR BARRIER WITH SAFETY SHAPE (TYPE III)

SHEET 2 OF 2

REV. 7/01
104.41

CONCRETE BARRIER DROP INLET
12"-24" PIPE: DEPTH (H) = 20' MAX.

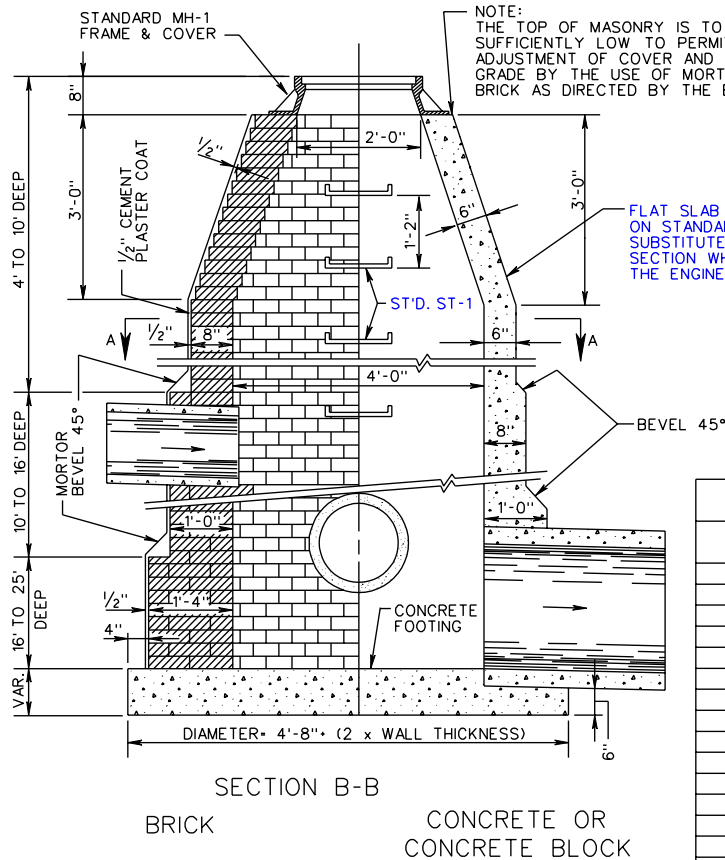
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

233
302

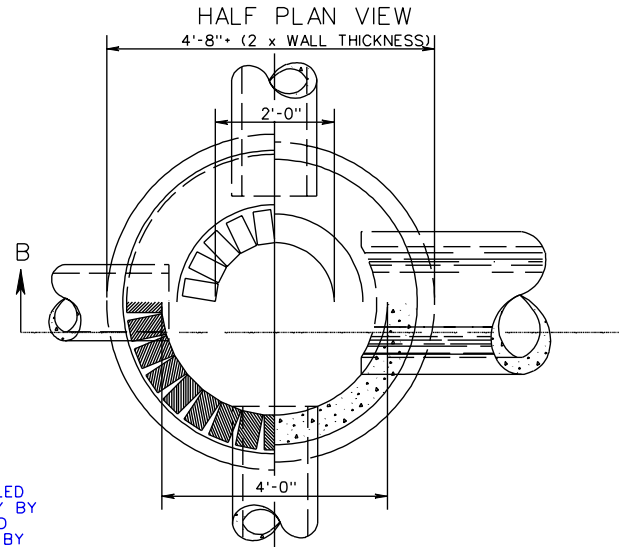
MH-1

SEE STANDARD SL-1 FOR APPLICABILITY OF SAFETY SLABS.



NOTE:
THE TOP OF MASONRY IS TO BE LEFT
SUFFICIENTLY LOW TO PERMIT PROPER
ADJUSTMENT OF COVER AND FRAME TO
GRADE BY THE USE OF MORTAR OR
BRICK AS DIRECTED BY THE ENGINEER.

FLAT SLAB TOP AS DETAILED
ON STANDARD T-MH-2 MAY BE
SUBSTITUTED FOR TAPERED
SECTION WHEN APPROVED BY
THE ENGINEER.



HALF SECTION A-A
(WITH FRAME AND COVER REMOVED)
BRICK CONCRETE

- NOTES:
1. QUANTITIES SHOWN ARE FOR MANHOLE WITHOUT PIPES. THE AMOUNT DISPLACED BY PIPES MUST BE DEDUCTED TO OBTAIN TRUE QUANTITIES.
 2. A BASE THICKNESS OF 9" WAS USED IN COMPUTING CONCRETE QUANTITIES.
 3. INCREMENTS TO BE ADDED FOR EACH ADDITIONAL FOOT OF DEPTH.
 4. MATERIALS MAY BE BRICK, CONCRETE OR APPROVED CONCRETE MANHOLE BLOCK.
 5. IF BLOCKS ARE USED THE MINIMUM THICKNESS OF SAME IS TO BE 5". OTHER THICKNESSES ARE TO CONFORM TO WALL THICKNESS SHOWN FOR CONCRETE.
 6. ALL CONCRETE TO BE CLASS A3.
 7. WHEN SPECIFIED ON PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.

TABLE OF QUANTITIES			
DEPTH	BRICK	MANHOLE	CONCRETE
	THOUSANDS	CONCRETE	MANHOLE
FEET	THOUSANDS	CU. YARDS	CONCRETE
		CU. YARDS	CU. YARDS
4	0.5	0.785	1.437
5	0.7	0.785	1.699
6	0.9	0.785	1.961
7	1.0	0.785	2.223
8	1.2	0.785	2.485
9	1.4	0.785	2.747
10	1.6	0.785	3.009
11	1.9	0.970	3.455
12	2.2	0.970	3.817
13	2.5	0.970	4.179
14	2.8	0.970	4.541
15	3.1	0.970	4.903
16	3.4	0.970	5.265
17	4.0	1.173	6.032
INCREMENT	0.45	-	0.582

SHEET 1 OF 5

REV. 7/01
106.01

MANHOLE FOR 12" - 48" PIPE CULVERTS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
REFERENCE

302

CONCRETE PIPE CULVERT CRUSHING STRENGTH (LBS. PER LIN. FT. ULTIMATE STRENGTH, OR CLASS)

PC - 1

DIAMETER (IN.)	AREA (SQ. FT.)	METHOD A BEDDING				DIAMETER (IN.)
		MAXIMUM HEIGHT OF COVER IN FEET				
		STRENGTH OR CLASS				
		NON REINF.	III	IV	V	
12	0.8	1800 (14')	14'	19'	29'	12
15	1.2	2125 (14')	14'	19'	29'	15
18	1.8	2400 (14')	14'	20'	29'	18
21	2.4	2700 (13')	14'	20'	29'	21
24	3.1	3000 (13')	14'	20'	29'	24
27	4.0		14'	20'	29'	27
30	4.9		14'	20'	29'	30
33	5.9		14'	20'	29'	33
36	7.1		14'	20'	30'	36
42	9.6		14'	21'	30'	42
48	12.6		14'	21'	30'	48
54	15.9		14'	21'	30'	54
60	19.6		14'	21'	30'	60
66	23.8		14'	21'	30'	66
72	28.3		14'	21'	30'	72
78	33.2		14'	21'	30'	78
84	38.5		14'	21'	30'	84
90	44.4		14'	21'	30'	90
96	50.3		14'	21'	30'	96
102	56.7		14'	21'	30'	102
108	63.6		14'	21'	30'	108

Heights of cover shown in table are for finished construction.

To protect pipe during construction, minimum heights of cover prior to allowing construction traffic to cross installation are to be $\frac{Dia}{2}$ or 3.0' whichever is greater. This cover shall extend the full length of the pipe culvert. The approach fill ramp is to extend a minimum of 10(Dia.+3') on each side of the culvert, or to the intersection with a cut.

Minimum finished height of cover to be $\frac{Dia}{2}$ or 2.0' whichever is greater, except pipe under entrances and median crossovers where a 9" min. will be permitted.

Sheet 1 of 17

SPECIFICATION
REFERENCE

302
232

CONCRETE PIPE
CLASS TABLE FOR H-20 LIVE LOAD
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/01
107.05

EXTRA STRENGTH CLAY PIPE		
DIAMETER (IN.)	AREA (SQ. FT.)	ALLOWABLE MAXIMUM COVER (FT.)
12	0.8	15
15	1.2	15
18	1.8	15
21	2.4	15
24	3.1	15
30	4.9	13
36	7.1	13

NOTES:

ALL VITRIFIED CLAY PIPE IS TO BE EXTRA STRENGTH. MAXIMUM HEIGHTS OF COVER SHOWN IN TABLE ARE FOR FINISHED CONSTRUCTION.

TO PROTECT PIPE DURING CONSTRUCTION MINIMUM HEIGHT OF COVER PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION IS TO BE 3.0 FT. THIS COVER IS TO EXTEND THE FULL LENGTH OF THE PIPE CULVERT. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 10(DIA.+3.0') ON EACH SIDE OF THE CULVERT, OR TO THE INTERSECTION WITH A CUT.

MINIMUM FINISHED HEIGHT OF COVER TO BE 2.0', EXCEPT PIPE UNDER ENTRANCES AND MEDIAN CROSSOVERS WHERE A 9" MINIMUM WILL BE PERMITTED).

METHOD "A" BEDDING IS TO BE USED FOR ALL INSTALLATIONS UNLESS OTHERWISE DESIGNATED ON PLANS.

VITRIFIED CLAY

POLYETHYLENE CORRUGATED PIPE CULVERT		
DIAMETER (IN.)	AREA (SQ. FT.)	ALLOWABLE MAXIMUM COVER (FT.)
12	0.8	21
15	1.2	21
18	1.8	20
24	3.1	20
30	4.9	19
36	7.1	18
X 42"	9.6	18
X 48"	12.6	17

X FOR TYPE D ONLY.

NOTE: FOR DETAILS OF BEDDING FOR POLYETHYLENE PIPE CULVERT SEE STANDARD PB-1.

POLYVINYLCHLORIDE RIBBED PIPE CULVERT		
DIAMETER (IN.)	AREA (SQ. FT.)	ALLOWABLE MAXIMUM COVER (FT.)
18	1.7	20
21	2.3	19
24	3.0	19
30	4.7	18
36	6.9	18
48	12.3	18

NOTES:

COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.

TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER TO BE AS FOLLOWS PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION.

PIPE DIAMETER	** MINIMUM COVER HEIGHT DURING CONSTRUCTION
12" TO 30"	1'-6"
36" AND ABOVE	$\frac{\text{DIAMETER}}{2}$

MINIMUM FINISHED HEIGHT OF COVER TO BE $\frac{1}{8}$ DIAMETER OR 1'-0" WHICHEVER IS GREATER, EXCEPT PIPE UNDER ENTRANCES AND MEDIAN CROSSOVERS WHERE A 9" MINIMUM WILL BE PERMITTED FOR PIPE UP TO 24" DIAMETER.

** THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL IS TO EXTEND A MINIMUM OF (10)(DIAMETER + $\frac{1}{2}$ DIAMETER) ON EACH SIDE OF THE STRUCTURE, OR TO THE INTERSECTION WITH A CUT.

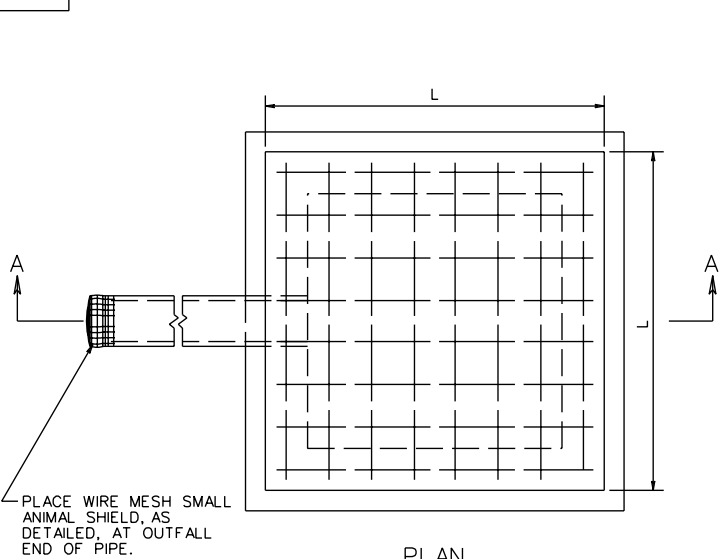
THE ALLOWABLE COVER TABLES SHOWN ARE BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL THERMOPLASTIC PIPE INTERACTION SYSTEMS.

PLASTIC PIPE

VITRIFIED CLAY AND PLASTIC PIPE
MAXIMUM COVER TABLE FOR H-20 LIVE LOAD

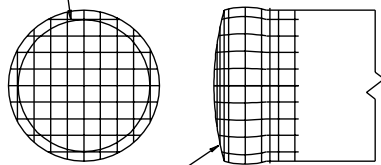
INSERTABLE SHEET A143

SB-1



PLAN

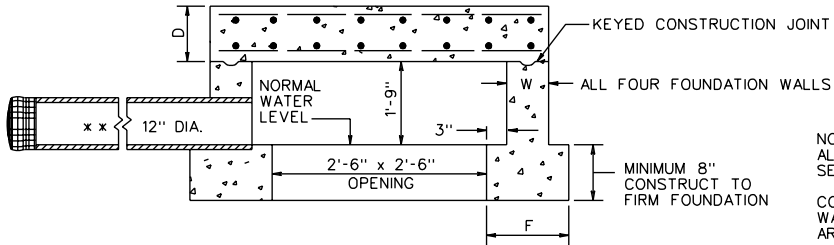
3/4" x 3/4" MESH,
HARDWARE CLOTH
MIN. 17 GAUGE,
GALVANIZED
AFTER WEAVING.



CRIMP AROUND OUTLET END OF
PIPE AND SECURE TO PIPE WITH
GALVANIZED STEEL WIRE

ANIMAL SHIELD DETAIL

PLACE WIRE MESH SMALL
ANIMAL SHIELD, AS
DETAILED, AT OUTFALL
END OF PIPE.



SECTION A-A

NOTES:
ALL CONCRETE TO BE CLASS A3 IF CAST IN PLACE. FOR PRECAST
SEE SHEET 110.02.

CONCRETE QUANTITIES SHOWN ARE BASED ON A 12" DUCTILE IRON
WATER LINE. IF OTHER SIZE OR TYPE OF PIPE IS USED QUANTITIES
ARE TO BE ADJUSTED ACCORDINGLY.

COST OF WIRE MESH SHIELD AT OUTFALL END OF PIPE IS TO BE
INCLUDED IN PRICE BID FOR PIPE.

THIS ITEM MAY BE PRECAST OR CAST IN PLACE.

** STANDARD RECOMMENDED PIPE IS 12" DUCTILE IRON WATER LINE,
PUSH ON JOINTS-CLASS TO BE SPECIFIED BASED UPON HEIGHT
OF COVER.

HEIGHT OF FILL	SIZE (L)	TOP SLAB (D)	SIDEWALLS (W)	FOOTING WIDTH (F)	REINFORCING STEEL				QUANTITIES		
					NO. REQ'D.	LENGTH	SIZE	SPACING C-C	CU. YDS. CONC.	REINF. STEEL LBS.	INCREMENT * CU. YDS.
BELOW 25'	4'	8"	6"	12"	32	3'-9"	#4	6"	1,189	80	0.043
25' - 50'	4'-4"	8"	8"	14"	32	4'-1"	#5	6"	1,512	136	0.053

* QUANTITIES SHOWN ARE BASED ON A 8" DEPTH OF FOOTING, ADD
INCREMENTAL QUANTITY FOR EACH ADDITIONAL 1" OF DEPTH.

STANDARD SPRING BOX

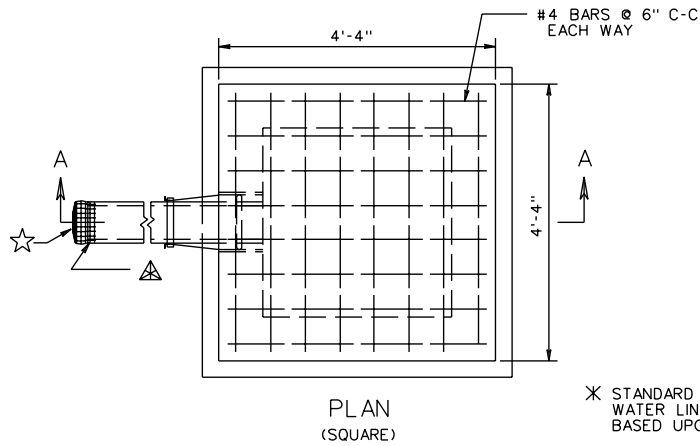
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/01
110.01

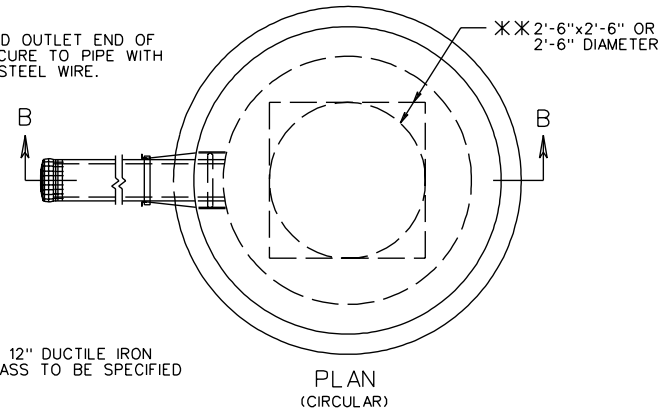
SPECIFICATION REFERENCE
105
232
302

INSERTABLE SHEET A143

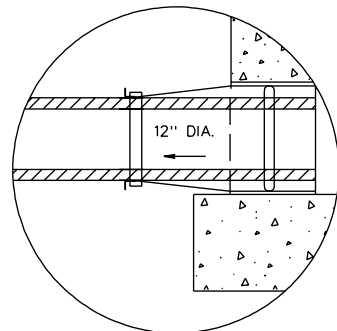
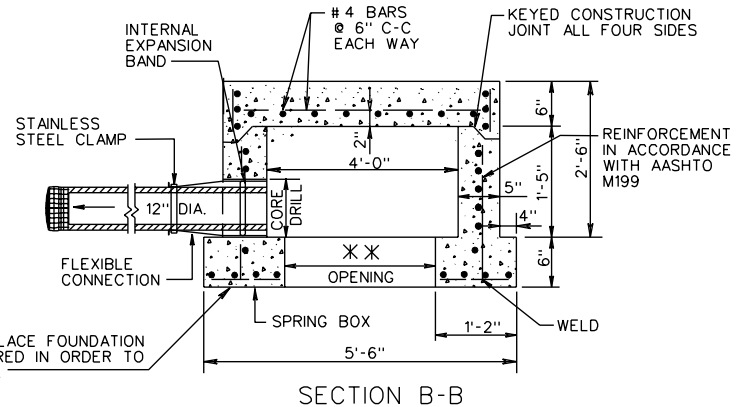
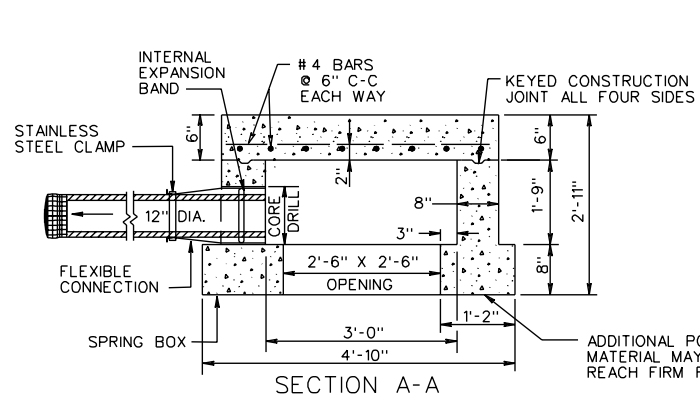
SB-1 PC



- ☆ 3/4" x 3/4" MESH HARDWARE CLOTH, MIN. 17 GAUGE GALVANIZED AFTER WEAVING.
- ▲ CRIMP AROUND OUTLET END OF PIPE AND SECURE TO PIPE WITH GALVANIZED STEEL WIRE.



* STANDARD RECOMMENDED PIPE IS 12" DUCTILE IRON WATER LINE, PUSH ON JOINTS, CLASS TO BE SPECIFIED BASED UPON HEIGHT OF COVER.



NOTES:

CONCRETE TO BE 4000 PSI MINIMUM COMPRESSIVE STRENGTH.

REINFORCING STEEL IN ACCORDANCE WITH A.S.T.M. A-615 (REINFORCING BARS).

PIPE(S) SHALL BE CONNECTED TO SPRING BOX WITH A FLEXIBLE BOOT MEETING ASTM SPECIFICATION C-923. COST OF FLEXIBLE CONNECTION TO BE INCLUDED IN BID PRICE FOR SPRING BOX. BOOT SHALL BE MADE FROM NEOPRENE RUBBER AND HAVE A 3/8" MINIMUM WALL THICKNESS THROUGHOUT. THE INTERNAL EXPANSION BAND TO SECURE THE BOOT IN PLACE SHALL CONFORM TO ALUMINUM MATERIAL SPECIFICATION 6061-T6. THE EXTERNAL BAND TO CLAMP AND SEAL THE BOOT TO THE PIPE SHALL BE STAINLESS STEEL-CORROSION RESISTANT CONFORMING TO ASTM SPECIFICATION A-167. THE OPENING TO RECEIVE THE FLEXIBLE CONNECTION SHALL BE CORE DRILLED AND IS TO BE CONSTRUCTED TO ALLOW FOR LATERAL AND VERTICAL MOVEMENT, AS WELL AS ANGULAR ADJUSTMENT THRU 20 DEGREES. ALL FIELD INSTALLATION OF PIPE TO SPRING BOX USING FLEXIBLE BOOT SHALL BE COMPLETED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND SPECIFICATIONS.

DIMENSIONS SHOWN ARE MINIMUM. ACTUAL MEASUREMENTS MAY VARY WITH MANUFACTURER'S TOLERANCES.

SPECIFICATION REFERENCE

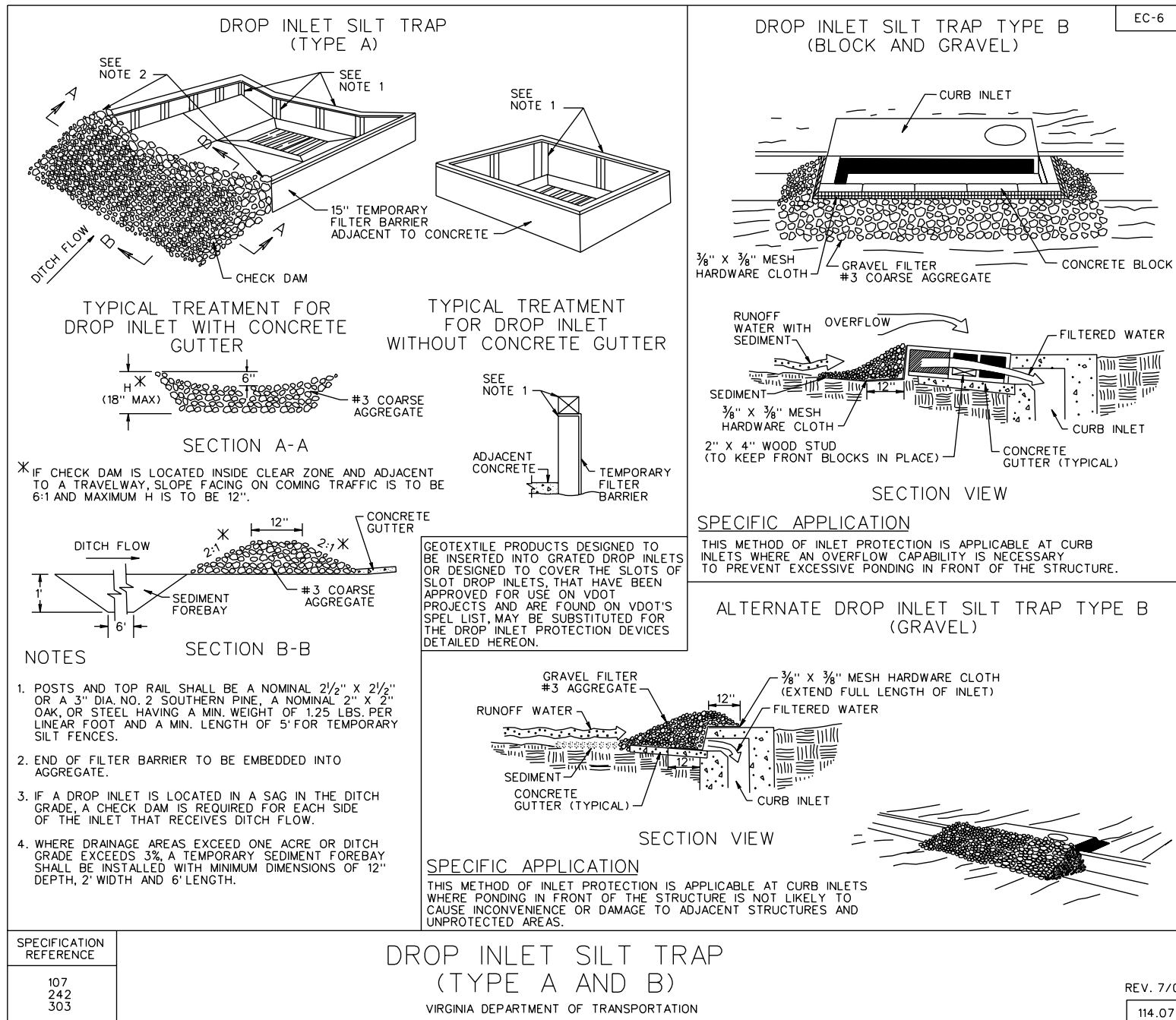
105

PRECAST SPRING BOX

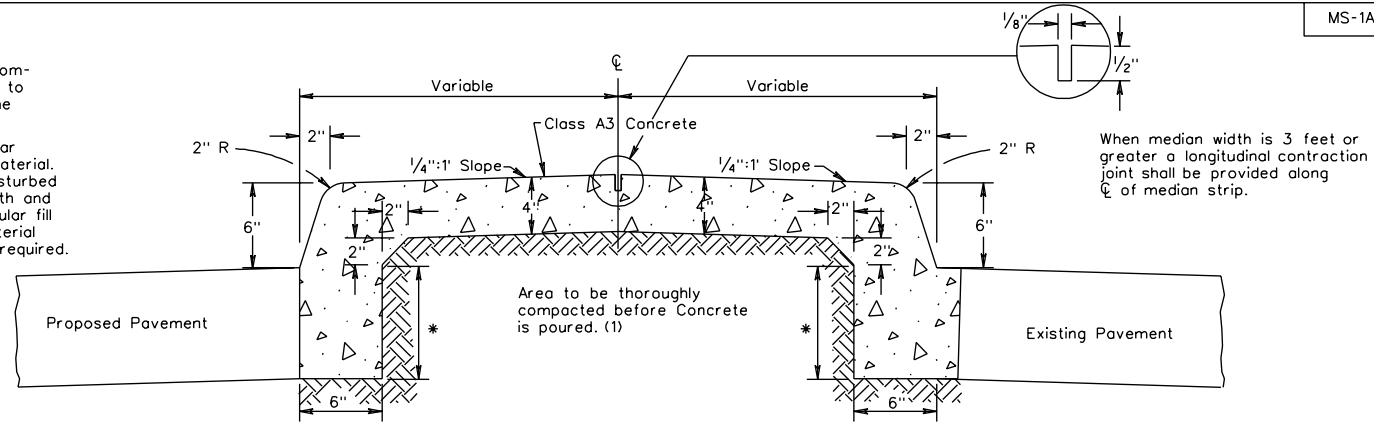
VIRGINIA DEPARTMENT OF TRANSPORTATION

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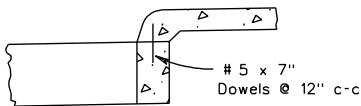
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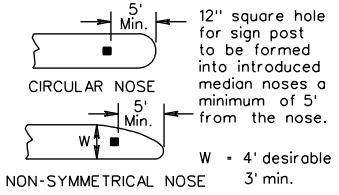
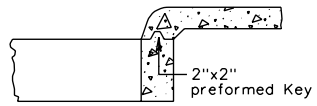
(1) Thoroughly compacted area to consist of the following:
 In Fills-Regular fill material.
 In Cuts-Undisturbed earth and regular fill material as required.



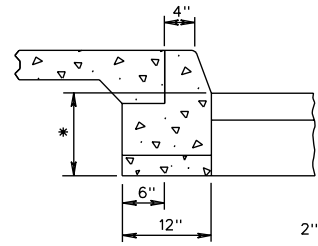
SUGGESTED CONSTRUCTION METHOD IF TOP SLAB IS POURED SEPARATELY



ALTERNATE CONSTRUCTION METHOD IF TOP SLAB IS POURED SEPARATELY



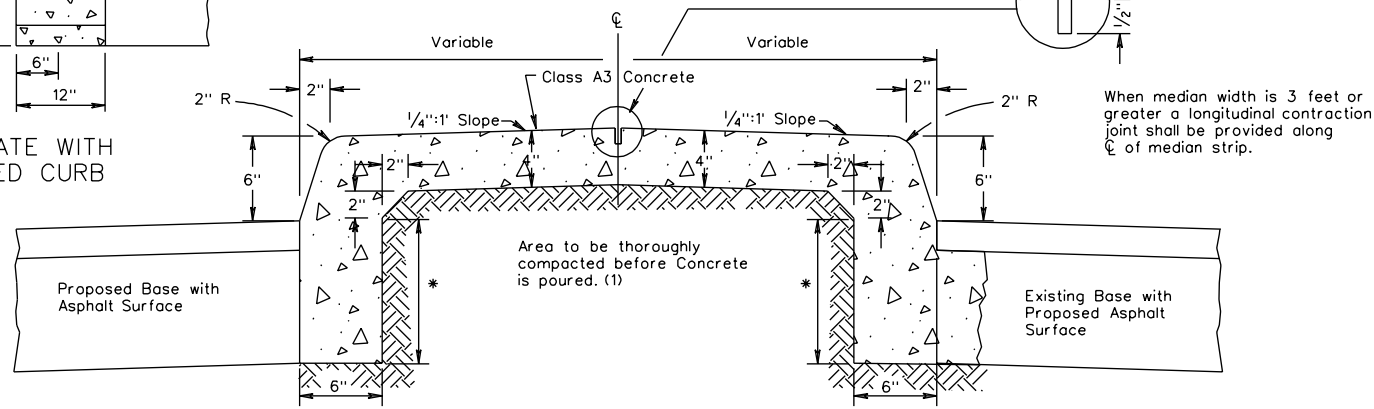
* The depth of curb may be reduced as much as 3" (9" depth) or increased as much as 3" (15" depth) in order that the bottom of curb will coincide with the top of a course of the pavement substructure. Otherwise the depth is to be 12" as shown. No adjustment in the price bid is to be made for a decrease or an increase in depth.



ALTERNATE WITH EXTRUDED CURB

Where design speed is greater than 40 MPH on Rural Highways and 45 MPH in developed Urban and Suburban areas, median curb is to be in accordance with Standard CG-3.

Additional holes of adequate size to be provided for sign posts, delineator posts, etc. as shown on the plans or directed by the Engineer.

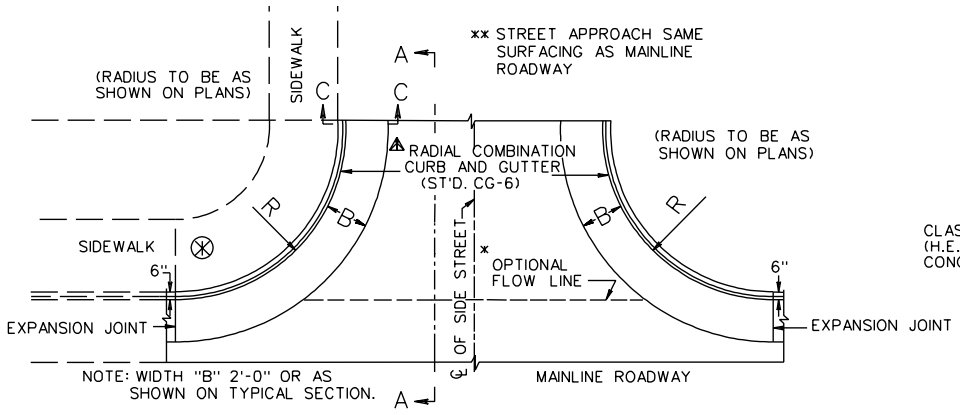


SPECIFICATION REFERENCE
502

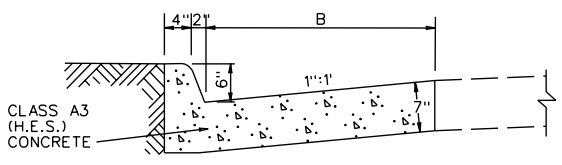
STANDARD SOLID CONCRETE RAISED MEDIAN STRIP

VIRGINIA DEPARTMENT OF TRANSPORTATION

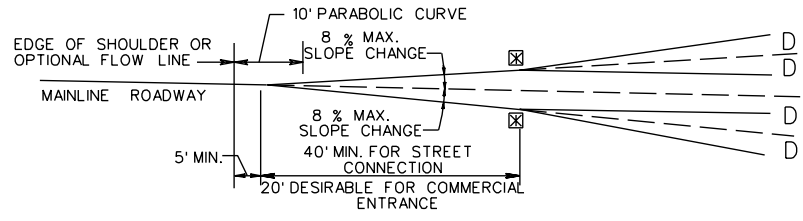
REV. 7/01
202.03



PLAN VIEW



SECTION C-C



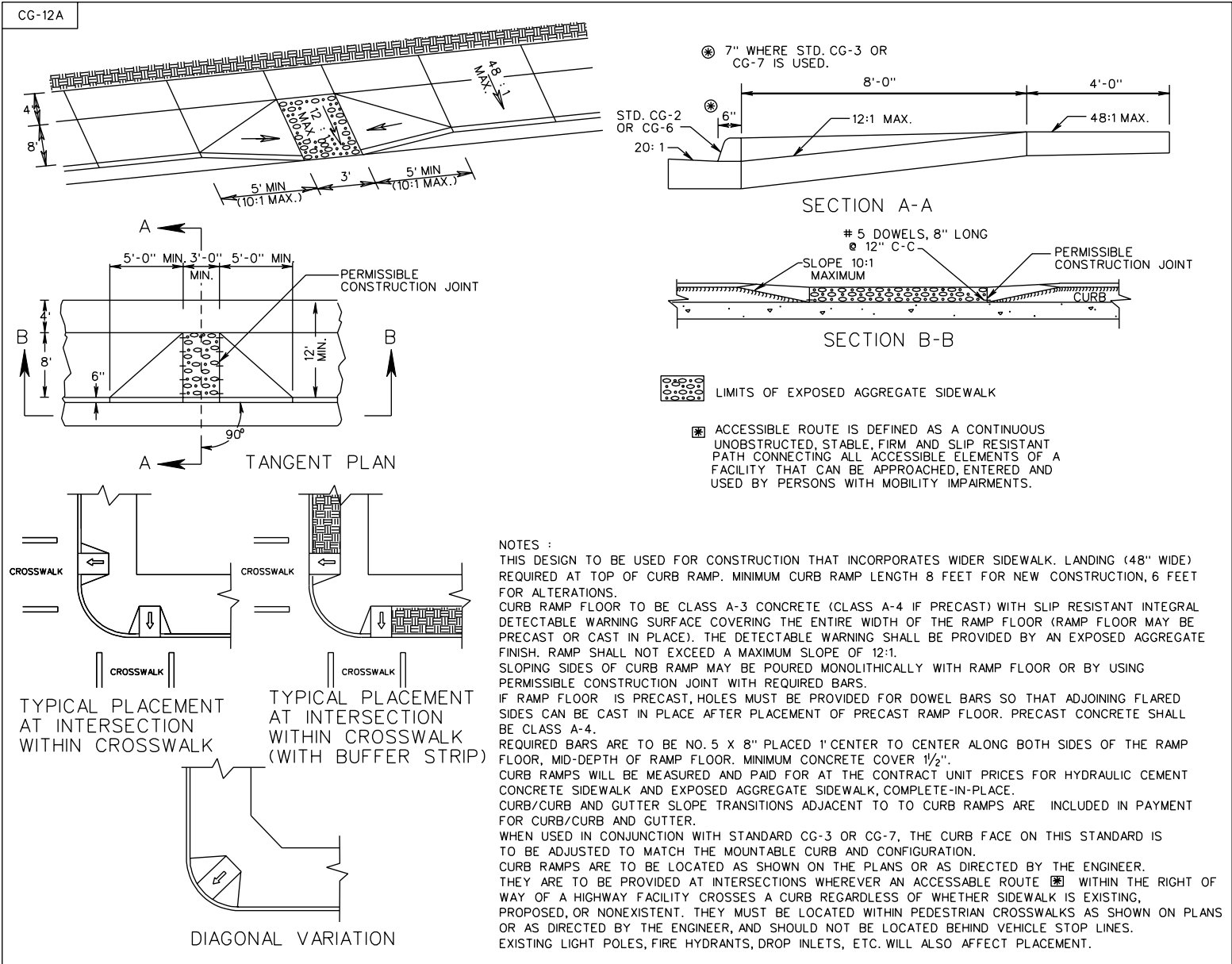
SECTION A - A
GUIDELINES FOR GRADE CHANGE D

ENTRANCE VOLUME	DESIRABLE	MAXIMUM
HIGH (MORE THAN 1500 VPD)	0 %	3 %
MEDIUM (500-1500 VPD)	≤ 3 %	6 %
LOW (LESS THAN 500 VPD)	≤ 6 %	8 %

- ☒ CONSTRUCT GRADE CHANGES WITH A PARABOLIC CURVE.
- ⊗ WHEN THE ENTRANCE RADIUS CANNOT ACCOMMODATE THE TURNING REQUIREMENTS OF ANTICIPATED HEAVY TRUCK TRAFFIC, THE DEPTH FOR SIDEWALK & CURB RAMPS WITHIN THE LIMITS OF THE RADII SHOULD BE INCREASED TO 7".
- WHEN ST'D. CG-11 IS USED FOR ENTRANCES BUILT IN CONJUNCTION WITH VDOT PROJECTS, PLEASE NOTE THE FOLLOWING:
- ** MAINLINE PAVEMENT SHALL BE CONSTRUCTED TO THE R/W LINE (EXCEPT ANY SUBGRADE STABILIZATION REQUIRED FOR MAINLINE PAVEMENT WHICH CAN BE OMITTED IN THE ENTRANCE.)
- ▲ RADIAL CURB OR COMBINATION CURB AND GUTTER SHALL NOT BE CONSTRUCTED BEYOND THE R/W LINE EXCEPT FOR REPLACEMENT PURPOSES.
- WHEN USED IN CONJUNCTION WITH STANDARD CG-3 OR CG-7, THE CURB FACE ON THIS STANDARD IS TO BE ADJUSTED TO MATCH THE MOUNTABLE CURB CONFIGURATION.
- SEE STANDARD CG-12 FOR CURB RAMP DESIGN TO BE USED WITH THIS STANDARD.
- * PLANS ARE TO INDICATE WHEN CONSTRUCTION OF A FLOW LINE IS REQUIRED TO PROVIDE POSITIVE DRAINAGE ACROSS THE ENTRANCE.
- OPTIONAL FLOWLINE MAY REQUIRE WARPING OF A PORTION OF GUTTER TO PRECLUDE PONDING OF WATER.

SPECIFICATION REFERENCE
502

METHOD OF TREATMENT-
CONNECTION FOR STREET INTERSECTIONS
AND COMMERCIAL ENTRANCES
VIRGINIA DEPARTMENT OF TRANSPORTATION



NOTES :

THIS DESIGN TO BE USED FOR CONSTRUCTION THAT INCORPORATES WIDER SIDEWALK. LANDING (48" WIDE) REQUIRED AT TOP OF CURB RAMP. MINIMUM CURB RAMP LENGTH 8 FEET FOR NEW CONSTRUCTION, 6 FEET FOR ALTERATIONS.

CURB RAMP FLOOR TO BE CLASS A-3 CONCRETE (CLASS A-4 IF PRECAST) WITH SLIP RESISTANT INTEGRAL DETECTABLE WARNING SURFACE COVERING THE ENTIRE WIDTH OF THE RAMP FLOOR (RAMP FLOOR MAY BE PRECAST OR CAST IN PLACE). THE DETECTABLE WARNING SHALL BE PROVIDED BY AN EXPOSED AGGREGATE FINISH. RAMP SHALL NOT EXCEED A MAXIMUM SLOPE OF 12:1.

SLOPING SIDES OF CURB RAMP MAY BE POURED MONOLITHICALLY WITH RAMP FLOOR OR BY USING PERMISSIBLE CONSTRUCTION JOINT WITH REQUIRED BARS.

IF RAMP FLOOR IS PRECAST, HOLES MUST BE PROVIDED FOR DOWEL BARS SO THAT ADJOINING FLARED SIDES CAN BE CAST IN PLACE AFTER PLACEMENT OF PRECAST RAMP FLOOR. PRECAST CONCRETE SHALL BE CLASS A-4.

REQUIRED BARS ARE TO BE NO. 5 X 8" PLACED 1' CENTER TO CENTER ALONG BOTH SIDES OF THE RAMP FLOOR, MID-DEPTH OF RAMP FLOOR. MINIMUM CONCRETE COVER 1/2".

CURB RAMPS WILL BE MEASURED AND PAID FOR AT THE CONTRACT UNIT PRICES FOR HYDRAULIC CEMENT CONCRETE SIDEWALK AND EXPOSED AGGREGATE SIDEWALK, COMPLETE-IN-PLACE.

CURB/CURB AND GUTTER SLOPE TRANSITIONS ADJACENT TO CURB RAMPS ARE INCLUDED IN PAYMENT FOR CURB/CURB AND GUTTER.

WHEN USED IN CONJUNCTION WITH STANDARD CG-3 OR CG-7, THE CURB FACE ON THIS STANDARD IS TO BE ADJUSTED TO MATCH THE MOUNTABLE CURB AND CONFIGURATION.

CURB RAMPS ARE TO BE LOCATED AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

THEY ARE TO BE PROVIDED AT INTERSECTIONS WHEREVER AN ACCESSIBLE ROUTE [A] WITHIN THE RIGHT OF WAY OF A HIGHWAY FACILITY CROSSES A CURB REGARDLESS OF WHETHER SIDEWALK IS EXISTING, PROPOSED, OR NONEXISTENT. THEY MUST BE LOCATED WITHIN PEDESTRIAN CROSSWALKS AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER, AND SHOULD NOT BE LOCATED BEHIND VEHICLE STOP LINES.

EXISTING LIGHT POLES, FIRE HYDRANTS, DROP INLETS, ETC. WILL ALSO AFFECT PLACEMENT.

PERPENDICULAR CURB RAMP
(ACCESS FOR MOBILITY IMPAIRMENTS)

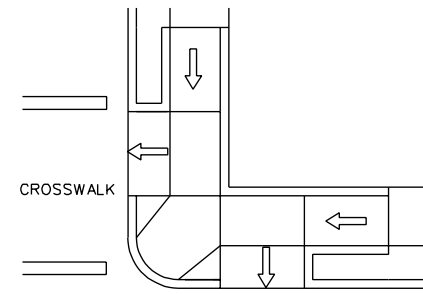
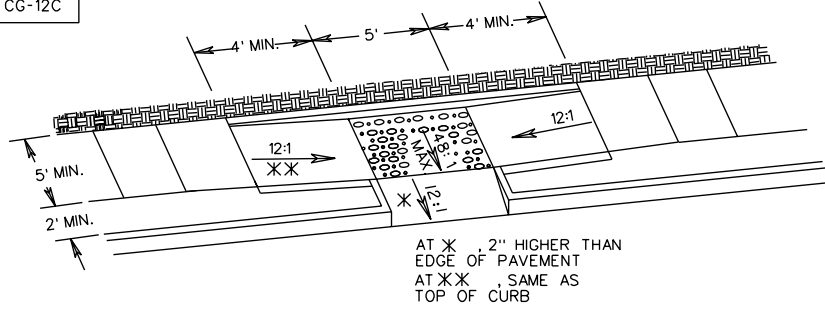
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/01
203.05

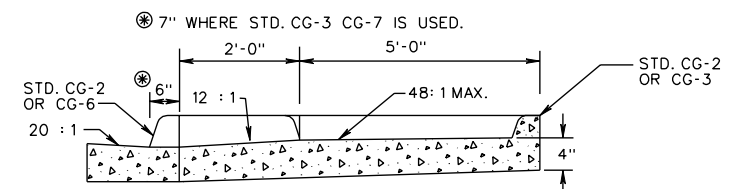
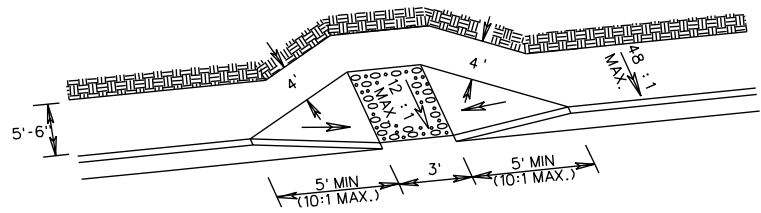
SPECIFICATION
REFERENCE

105
502

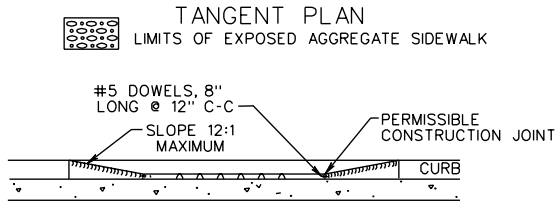
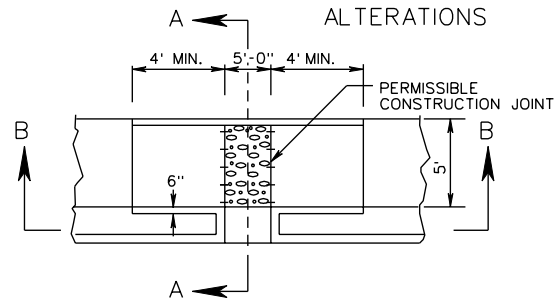
CG-12C



TYPICAL PLACEMENT AT INTERSECTION WITH BUFFER STRIP



SECTION A-A



NOTES :

THIS COMBINED (PARALLEL & PERPENDICULAR) DESIGN FOR ALTERATIONS CAN BE USED WITH ADJOINING BUFFER STRIP. LANDING AT BOTTOM OF TWO SLOPING SIDES WITH 60" X 60" MIN. DIMENSIONS. THE SHORT PERPENDICULAR RUN TO THE STREET CAN BE PROTECTED BY A LANDSCAPED SETBACK OR CONNECTED TO THE SIDEWALK WITH A WARPED SURFACE. CURB RAMP FLOOR TO BE CLASS A-3 CONCRETE (CLASS A-4 IF PRECAST) WITH SLIP RESISTANT INTEGRAL DETECTABLE WARNING SURFACE COVERING THE ENTIRE WIDTH OF THE RAMP FLOOR (RAMP FLOOR MAY BE PRECAST OR CAST IN PLACE). THE DETECTABLE WARNING SHALL BE PROVIDED BY AN EXPOSED AGGREGATE FINISH. RAMP SHALL NOT EXCEED A MAXIMUM SLOPE OF 12:1. SLOPING SIDES OF CURB RAMP MAY BE POURED MONOLITHICALLY WITH RAMP FLOOR OR BY USING PERMISSIBLE CONSTRUCTION JOINT WITH REQUIRED BARS. IF RAMP FLOOR IS PRECAST, HOLES MUST BE PROVIDED FOR DOWEL BARS SO THAT ADJOINING FLARED SIDES CAN BE CAST IN PLACE AFTER PLACEMENT OF PRECAST RAMP FLOOR. PRECAST CONCRETE SHALL BE CLASS A-4. REQUIRED BARS ARE TO BE NO. 5 X 8" PLACED 1' CENTER TO CENTER ALONG BOTH SIDES OF THE RAMP FLOOR, MID-DEPTH OF RAMP FLOOR. MINIMUM CONCRETE COVER 1/2". CURB RAMPS WILL BE MEASURED AND PAID FOR AT THE CONTRACT UNIT PRICES FOR HYDRAULIC CEMENT CONCRETE SIDEWALK AND EXPOSED AGGREGATE SIDEWALK, COMPLETE-IN-PLACE. CURB/CURB AND GUTTER SLOPE TRANSITIONS ADJACENT TO TO CURB RAMPS ARE INCLUDED IN PAYMENT FOR CURB/CURB AND GUTTER. WHEN USED IN CONJUNCTION WITH STANDARD CG-3 OR CG-7. THE CURB FACE ON THIS STANDARD IS TO BE ADJUSTED TO MATCH THE MOUNTABLE CURB AND CONFIGURATION. CURB RAMPS ARE TO BE LOCATED AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. THEY ARE TO BE PROVIDED AT INTERSECTIONS WHEREVER AN ACCESSIBLE ROUTE (⊗) WITHIN THE RIGHT OF WAY OF A HIGHWAY FACILITY CROSSES A CURB REGARDLESS OF WHETHER SIDEWALK IS EXISTING, PROPOSED, OR NONEXISTENT. THEY MUST BE LOCATED WITHIN PEDESTRIAN CROSSWALKS AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER, AND SHOULD NOT BE LOCATED BEHIND VEHICLE STOP LINES. EXISTING LIGHT POLES, FIRE HYDRANTS, DROP INLETS, ETC. WILL ALSO AFFECT PLACEMENT.

⊗ ACCESSIBLE ROUTE IS DEFINED AS A CONTINUOUS UNOBSTRUCTED, STABLE, FIRM AND SLIP RESISTANT PATH CONNECTING ALL ACCESSIBLE ELEMENTS OF A FACILITY THAT CAN BE APPROACHED, ENTERED AND USED BY PERSONS WITH MOBILITY IMPAIRMENTS.

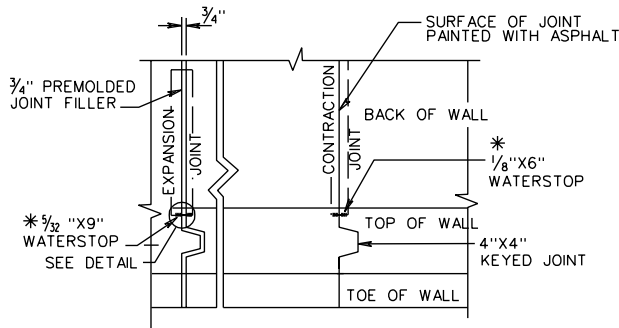
COMBINED (PARALLEL & PERPENDICULAR) CURB RAMP (ACCESS FOR MOBILITY IMPAIRMENTS)

REV. 7/01
203.07

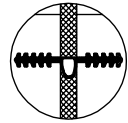
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
105 502

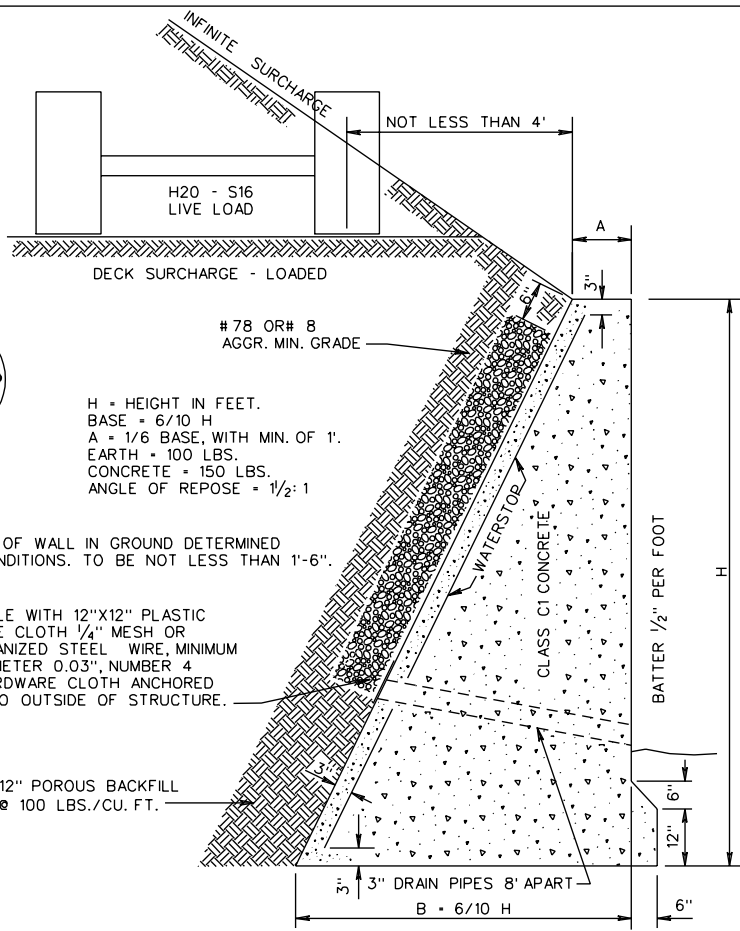
RW-3



CONTRACTION JOINTS AT INTERVALS NOT EXCEEDING 30'.
 EXPANSION JOINTS AT INTERVALS NOT EXCEEDING 90'.
 * WATER STOPS TO BE ELASTOMERIC OR OTHER APPROVED MATERIAL. DIMENSIONS SHOWN ARE ABSOLUTE MINIMUM.



WATERSTOP DETAIL



H = HEIGHT IN FEET.
 BASE = 6/10 H
 A = 1/6 BASE, WITH MIN. OF 1'.
 EARTH = 100 LBS.
 CONCRETE = 150 LBS.
 ANGLE OF REPOSE = 1/2:1

NOTE:
 DEPTH OF WALL IN GROUND DETERMINED BY CONDITIONS. TO BE NOT LESS THAN 1'-6".

WEEP HOLE WITH 12" X 12" PLASTIC HARDWARE CLOTH 1/4" MESH OR OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO OUTSIDE OF STRUCTURE.

HEIGHT OF WALL "H" IN FEET	THICKNESS AT TOP "A" IN FEET	THICKNESS AT BASE B = .6H	COMPRESSION AT TOE LBS. SQ. FT.	AREA OF SECTION SQ. FT.
3	1'-0"	1'-9 5/8"	856	4.83
4	1'-0"	2'-4 3/4"	1141	7.43
5	1'-0"	3'-0"	1427	10.63
6	1'-0"	3'-7 1/4"	1712	14.43
7	1'-0"	4'-2 3/8"	1997	18.83
8	1'-0"	4'-9 5/8"	2283	23.83
9	1'-0"	5'-4 3/4"	2568	29.43
10	1'-0"	6'-0"	2853	35.63
11	1'-1 1/4 "	6'-7 1/4"	3139	42.98
12	1'-2 3/8 "	7'-2 3/8"	3424	51.03
13	1'-3 5/8 "	7'-9 5/8"	3709	59.78
14	1'-4 3/4 "	8'-4 3/4"	3995	69.23
15	1'-6"	9'-0"	4280	79.38

SAFE BEARING CAPACITY OF SOIL	
ROCK MINIMUM	10,000 - 20,000 LBS. SQ. FT.
GRAVEL AND COARSE SAND, WELL CEMENTED	16,000 - 20,000 LBS. SQ. FT.
CLAY IN THICK BEDS, ALWAYS DRY	12,000 - 16,000 LBS. SQ. FT.
CLAY IN THICK BEDS, MODERATELY DRY	8,000 - 12,000 LBS. SQ. FT.
CLAY, SOFT	2,000 - 4,000 LBS. SQ. FT.
SAND, DRY, COMPACT, AND WELL CEMENTED	8,000 - 12,000 LBS. SQ. FT.
SAND, CLEAN, DRY	4,000 - 8,000 LBS. SQ. FT.
ALLUVIAL SOILS, ETC	1,000 - 2,000 LBS. SQ. FT.

NOTE: IF COMPRESSION AT TOE EXCEEDS SAFE BEARING CAPACITY OF SOIL, A SPECIAL FOOTING IS TO BE USED.

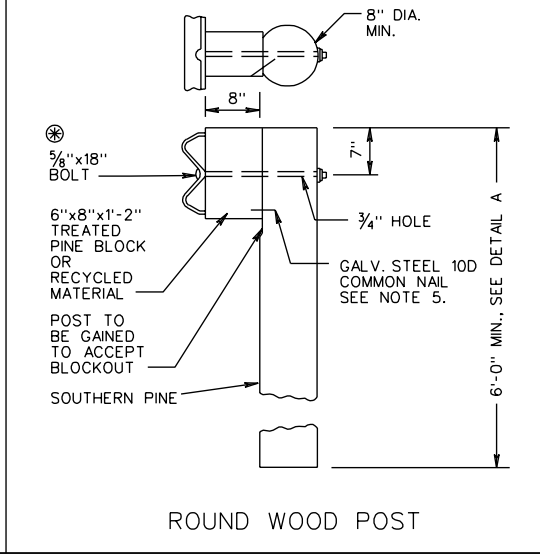
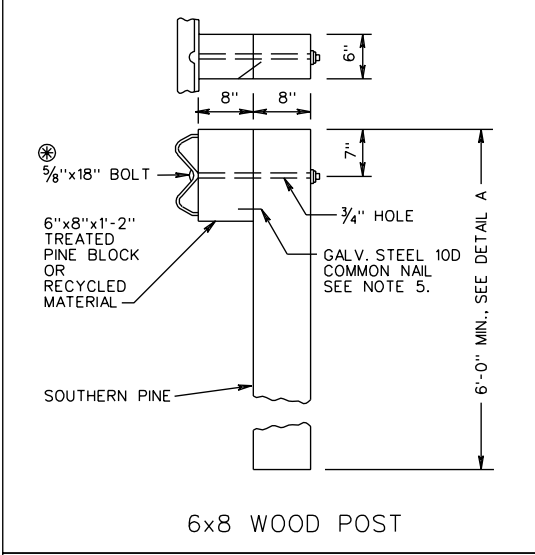
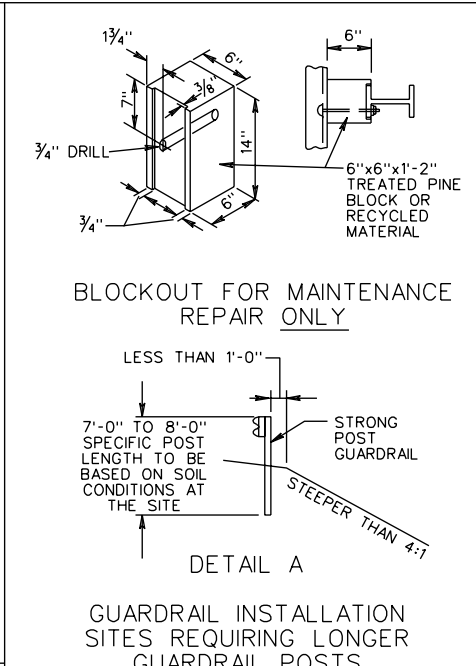
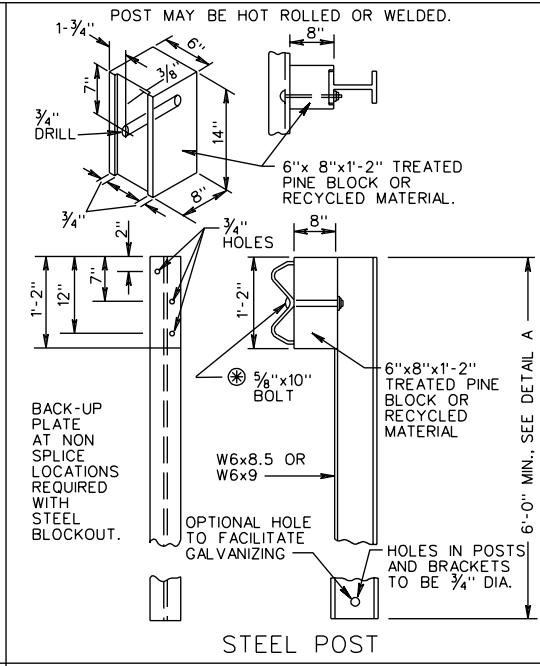
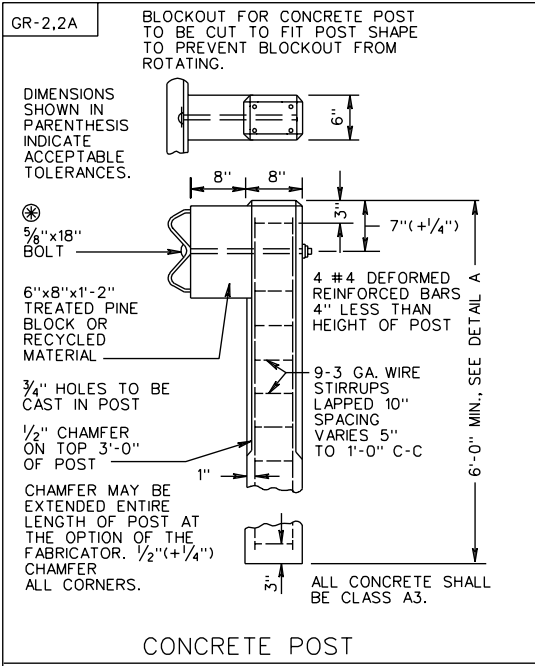
CONCRETE GRAVITY RETAINING WALLS
 INFINITE SURCHARGE AND DECK SURCHARGE - LOADED

REV. 7/01
 401.02

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

506

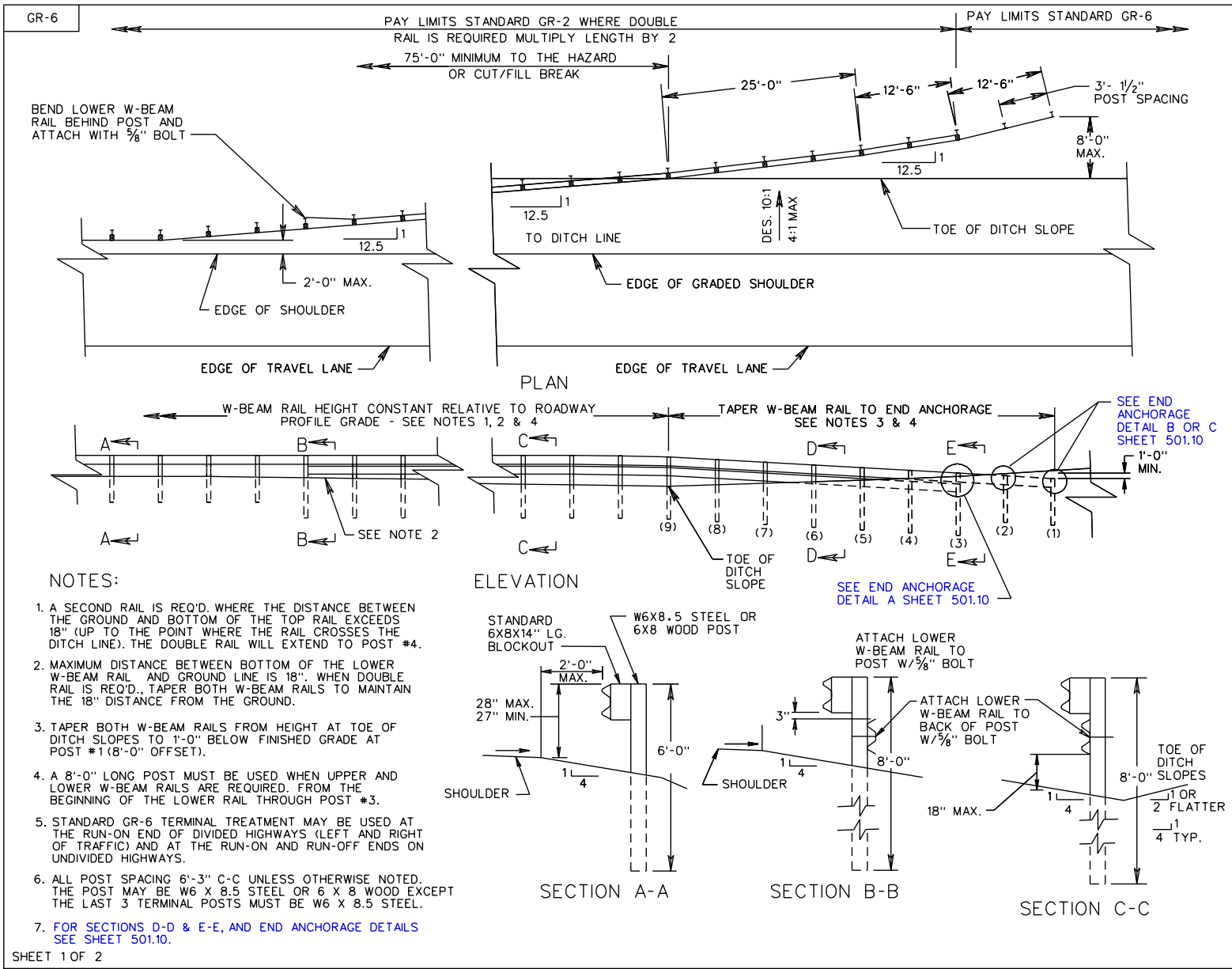


NOTES:

1. ALL BOLTS, NUTS, WASHERS, AND OTHER STEEL ITEMS ARE TO BE GALVANIZED.
2. ALTERNATE TYPE POSTS AND BLOCKOUT MAY BE INTERCHANGED ON ANY ONE PROJECT WITH THE RESTRICTION THAT THE SAME TYPE OF POST AND BLOCKOUT MUST BE USED IN ANY SINGLE RUN OF GUARDRAIL.
3. FOR DETAILS OF GUARDRAIL ELEMENT SPLICE JOINT, HARDWARE, ETC. SEE SHEET NOS. 501.01 & 501.02.
4. THE GUARDRAIL AND MEDIAN BARRIER COMPONENTS DEPICTED IN A.R.T.B.A. TECHNICAL BULLETIN NUMBER 268B MAY BE SUBSTITUTED IF INTERCHANGEABLE WITH THE STANDARDS FOR GUARDRAIL (GR) OR MEDIAN BARRIER (MB) AND APPROVED BY THE ENGINEER.
5. DRIVE NAIL WITHIN 2" OF THE TOP OR BOTTOM OF BLOCKOUT AFTER 5/8" x 18 BOLT IS INSTALLED.

⊗ STANDARD WASHER TO BE USED ON LAST 50' OF RUN OFF END ONLY.

SHEET 2 OF 2

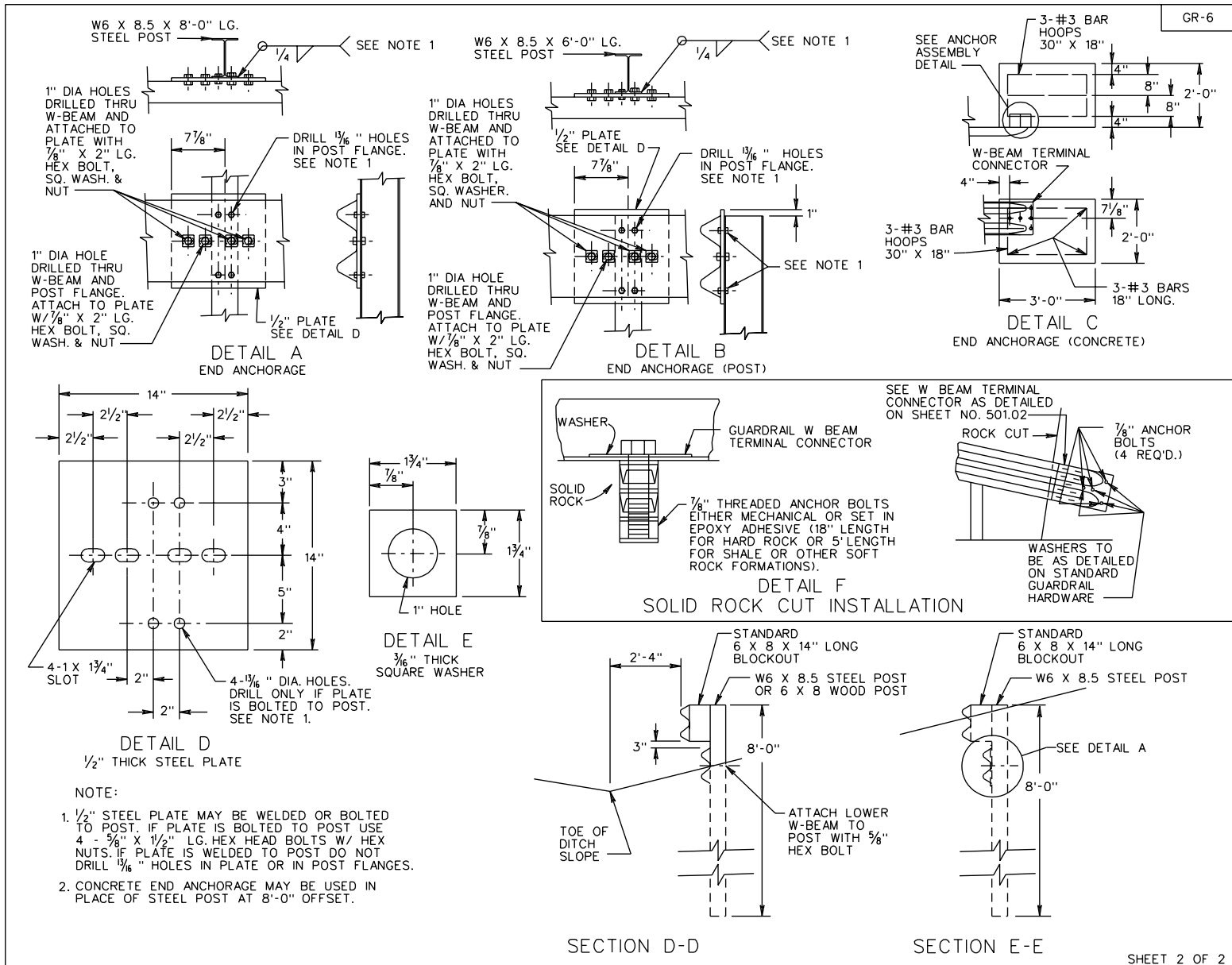


REV. 7/01
501.09

TERMINAL TREATMENT FOR W BEAM GUARDRAIL

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
505 221

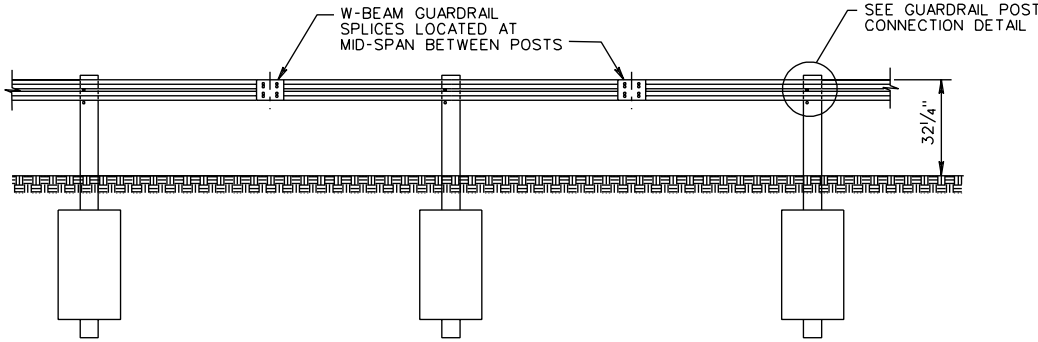


GR-6

<p>SPECIFICATION REFERENCE</p> <p>505 221</p>	<p>TERMINAL TREATMENT FOR W BEAM GUARDRAIL</p> <p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	<p>REV. 7/01</p> <p>501.10</p>
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INSERTABLE SHEET A91

GR-8,8A,8B,8C



TYPICAL INSTALLATION

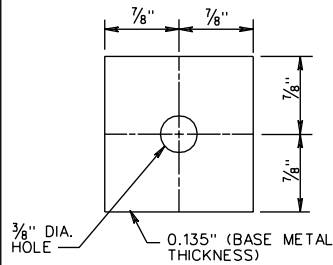
STANDARD	POST SPACING	DEFLECTION
GR-8	12' - 6"	7' - 0"
GR-8A	6' - 3"	5' - 0"
GR-8B	3' - 1 1/2"	4' - 0"
GR-8C	4' - 2"	4' - 6"

FOR ROCK INSTALLATION, 8" X 26" X 1/4" PLATE IS TO BE ELIMINATED. DRILL OR EXCAVATE HOLE FOR POST, PLACE POST AND BACKFILL WITH CRUSHER RUN AGGREGATE TO LEVEL OF ROCK.

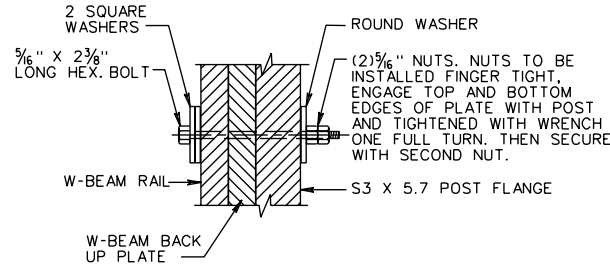
ALL POSTS, BOLTS, NUTS AND WASHERS ARE TO BE GALVANIZED.

FOR DETAILS OF GUARDRAIL ELEMENT, SPLICE JOINT, HARDWARE, ETC. SEE SHEET NO. 501.01.

⊗ THE GUARDRAIL AND MEDIAN BARRIER COMPONENTS DEPICTED IN A.R.T.B.A. TECHNICAL BULLETIN NUMBER 268B MAY BE SUBSTITUTED IF INTERCHANGEABLE WITH THE STANDARDS FOR GUARDRAIL (GR) OR MEDIAN BARRIER (MB) AND APPROVED BY THE ENGINEER.

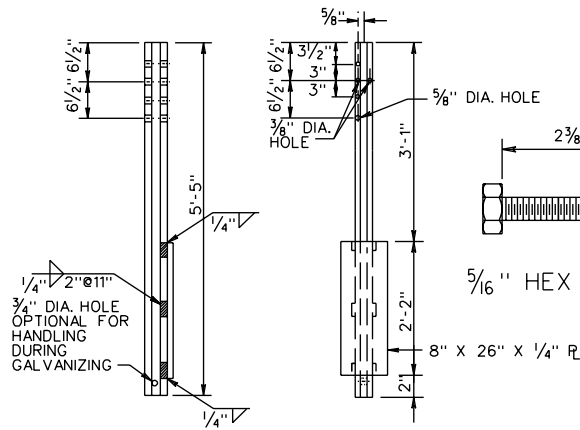


SQUARE WASHER

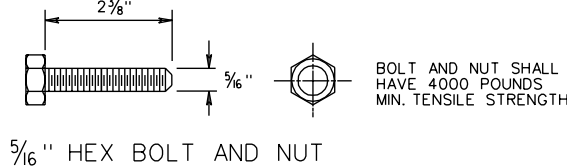


GUARDRAIL POST CONNECTION DETAIL

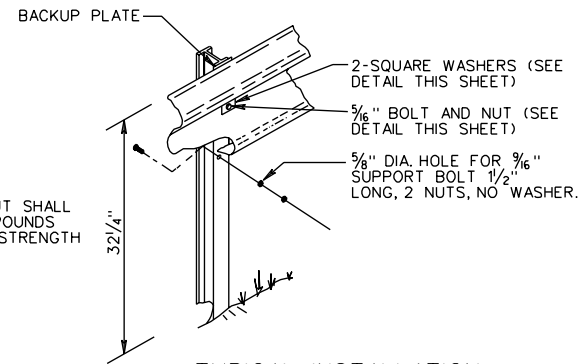
POST SPACING ON CURVES	
PAVEMENT \bar{C} RADIUS	POST SPACING
> 220 FT. R	12' - 6"
219 FT. - 111 FT.	6' - 3"
110 FT. - 76 FT.	4' - 2"
75 FT. - 50 FT.	3' - 1 1/2"
< 50 FT.	USE NOT RECOMMENDED



S 3 X 5.7 STEEL POST



5/16" HEX BOLT AND NUT



TYPICAL INSTALLATION

SHEET 1 OF 2

SPECIFICATION REFERENCE

221
505

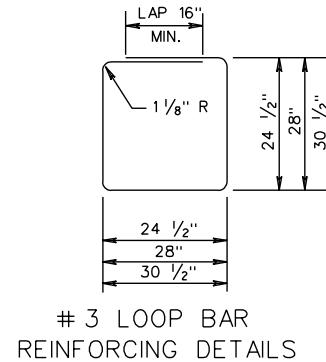
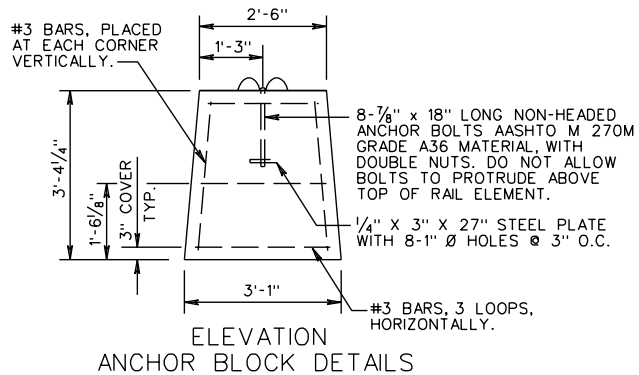
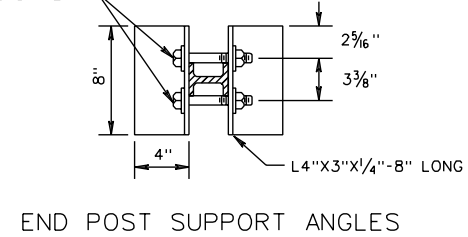
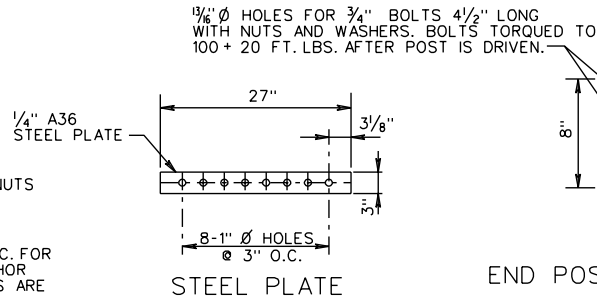
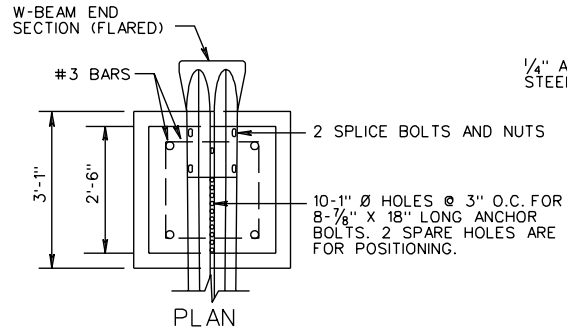
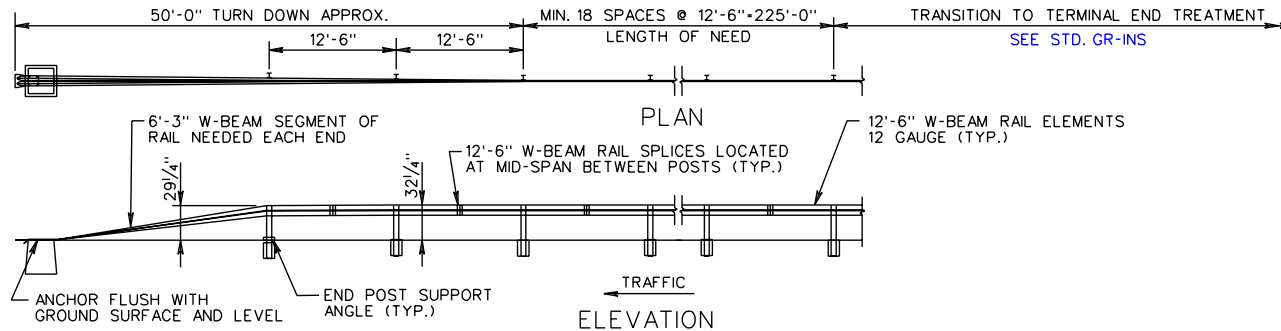
STANDARD W BEAM GUARDRAIL (WEAK POST SYSTEM) TL-3 (>45 MPH)

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/01

501.14

GR-8,8A,8B,8C



GR-8 TYPE II TERMINAL TREATMENT
(RUN-OFF ANCHORAGE)

SHEET 2 OF 2

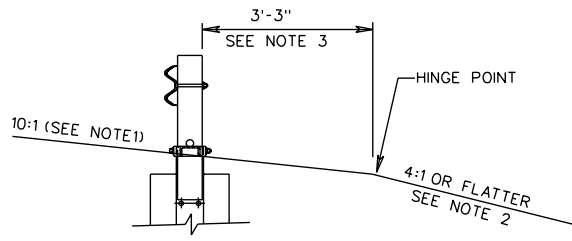
STANDARD W BEAM GUARDRAIL (WEAK POST SYSTEM)
TL-3 (>45 MPH)

VIRGINIA DEPARTMENT OF TRANSPORTATION

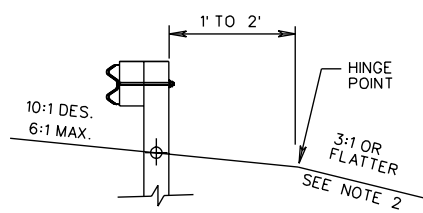
SPECIFICATION
REFERENCE

221
505

REV. 7/01
501.15

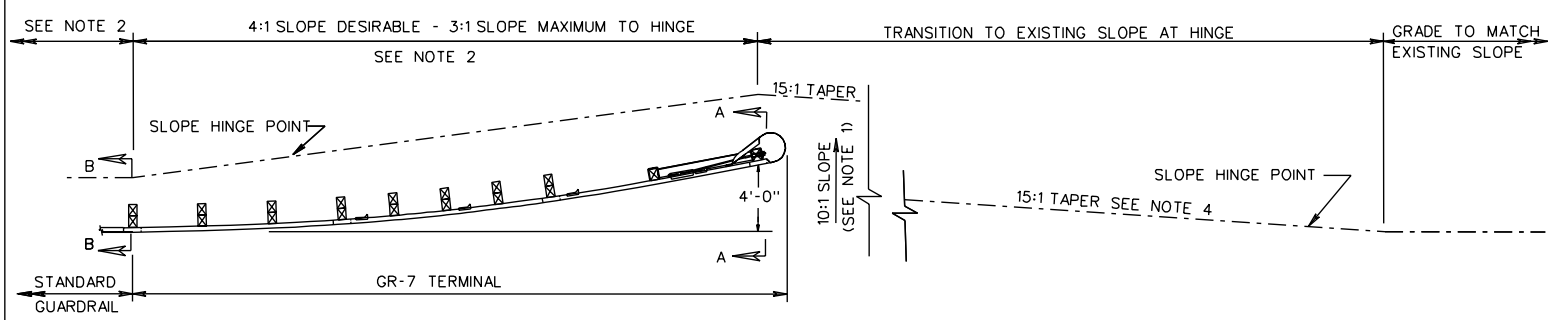


SECTION A-A



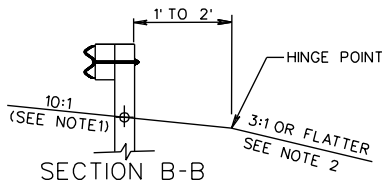
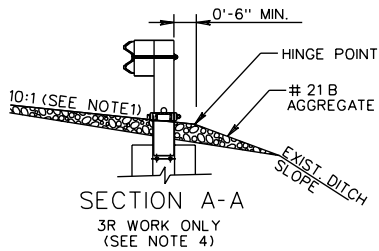
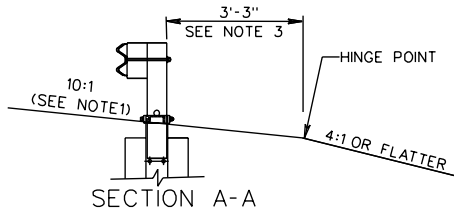
SECTION B-B

- NOTES:
1. DESIRABLY, THE CROSS SLOPE OF THE GRADE APPROACHING THE GUARDRAIL TERMINAL, AND ADJACENT TO FOR ITS FULL LENGTH, MUST BE 10:1. IF THE EXISTING GRADE IS FLAT OR IS A POSITIVE SLOPE DUE TO THE SUPERELEVATION OF THE ROADWAY PAVEMENT, THE MINIMUM OFFSET FROM BEHIND THE POST TO THE HINGE POINT, AS SHOWN, IS REQUIRED.
 2. THE AREA IMMEDIATELY BEHIND AND BEYOND THE TERMINAL SHOULD BE TRAVERSABLE AND FREE FROM FIXED OBJECTS. IF A CLEAR RUN OUT IS NOT ATTAINABLE THIS AREA SHOULD AT LEAST BE SIMILAR IN CHARACTER TO THE UPSTREAM UNSHIELDED ROADSIDE AREAS.
 3. FOR NEW CONSTRUCTION AND RECONSTRUCTION THE 10:1 SLOPE GRADING MUST EXTEND A MINIMUM OF 3'-3" BEHIND THE END POST. FOR 3R WORK THE GRADING SHOULD BE AS CLOSE AS POSSIBLE

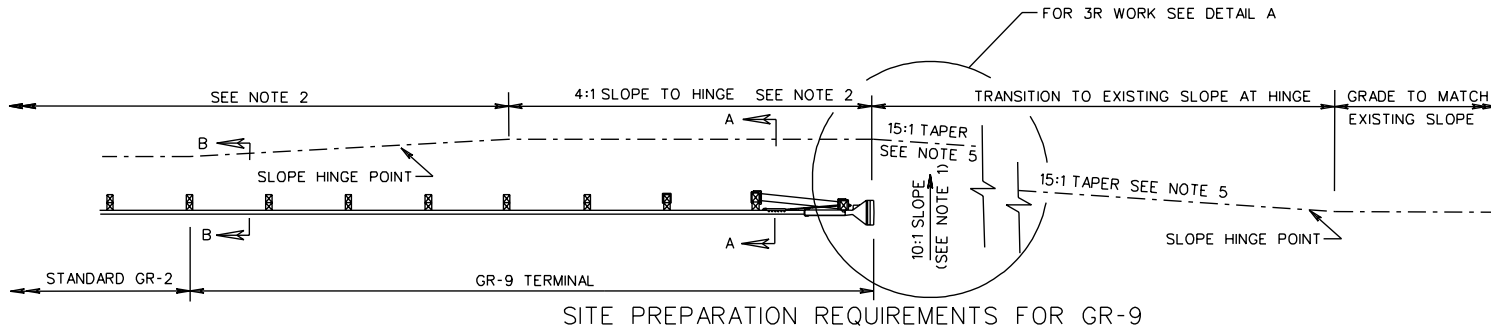
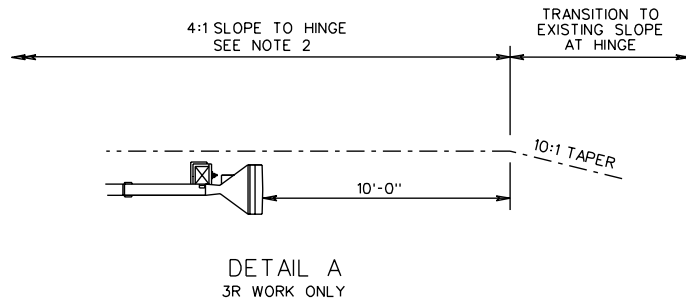


SPECIFICATION REFERENCE

GUARDRAIL TERMINAL INSTALLATION SITE PREPARATION
 REQUIREMENTS FOR GR-7
 VIRGINIA DEPARTMENT OF TRANSPORTATION



- NOTES:
1. THE CROSS SLOPE OF THE GRADE APPROACHING THE GUARDRAIL TERMINAL, AND ADJACENT TO FOR ITS FULL LENGTH, MUST BE 10:1. IF THE EXISTING GRADE IS FLAT OR IS A POSITIVE SLOPE DUE TO THE SUPERELEVATION OF THE ROADWAY PAVEMENT, THE MINIMUM OFFSET FROM BEHIND THE POST TO THE HINGE POINT, AS SHOWN, IS REQUIRED.
 2. THE AREA IMMEDIATELY BEHIND AND BEYOND THE TERMINAL SHOULD BE TRAVERSABLE AND FREE FROM FIXED OBJECTS. IF A CLEAR RUN OUT IS NOT ATTAINABLE THIS AREA SHOULD AT LEAST BE SIMILAR IN CHARACTER TO THE UPSTREAM UNSHIELDED ROADSIDE AREAS.
 3. FOR NEW CONSTRUCTION AND RECONSTRUCTION THE 10:1 SLOPE GRADING MUST EXTEND A MINIMUM OF 3'-3" BEHIND THE END POST.
 4. FOR 3R WORK, THE GRADING SHOULD BE AS CLOSE AS POSSIBLE TO THE NEW CONSTRUCTION WITH SLOPE EXTENDING A MINIMUM OF 6" BEHIND THE END POST. FROM THE HINGE POINT, TIE THE GRADED SLOPE INTO THE EXISTING DITCH SLOPE TO COVER THE FOUNDATION TUBES AND SOIL PLATES WITHOUT EXTENDING THIS SLOPE BEYOND THE DITCH BOTTOM. USE #21B AGGREGATE, OR OTHER SUITABLE MATERIAL AS APPROVED BY THE ENGINEER, AT ROADWAY SHOULDERS.
 5. THE TAPER FOR NEW CONSTRUCTION WILL BE 15:1. FOR 3R WORK THE MINIMUM ALLOWABLE TAPER IS 10:1.



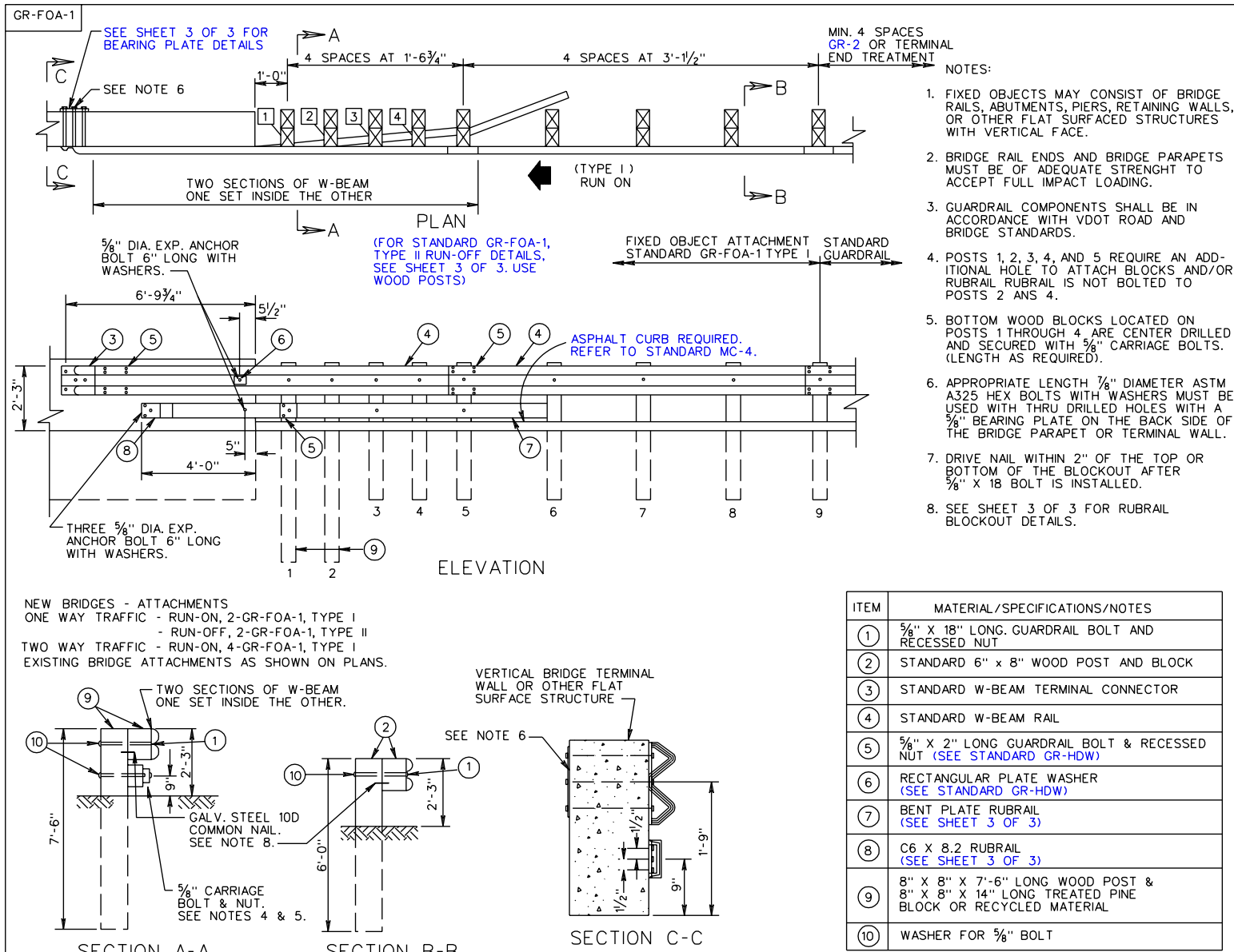
SHEET 2 OF 2

GUARDRAIL TERMINAL INSTALLATION SITE PREPARATION REQUIREMENTS FOR GR-9

REV. 7/01
501.17

VIRGINIA DEPARTMENT OF TRANSPORTATION

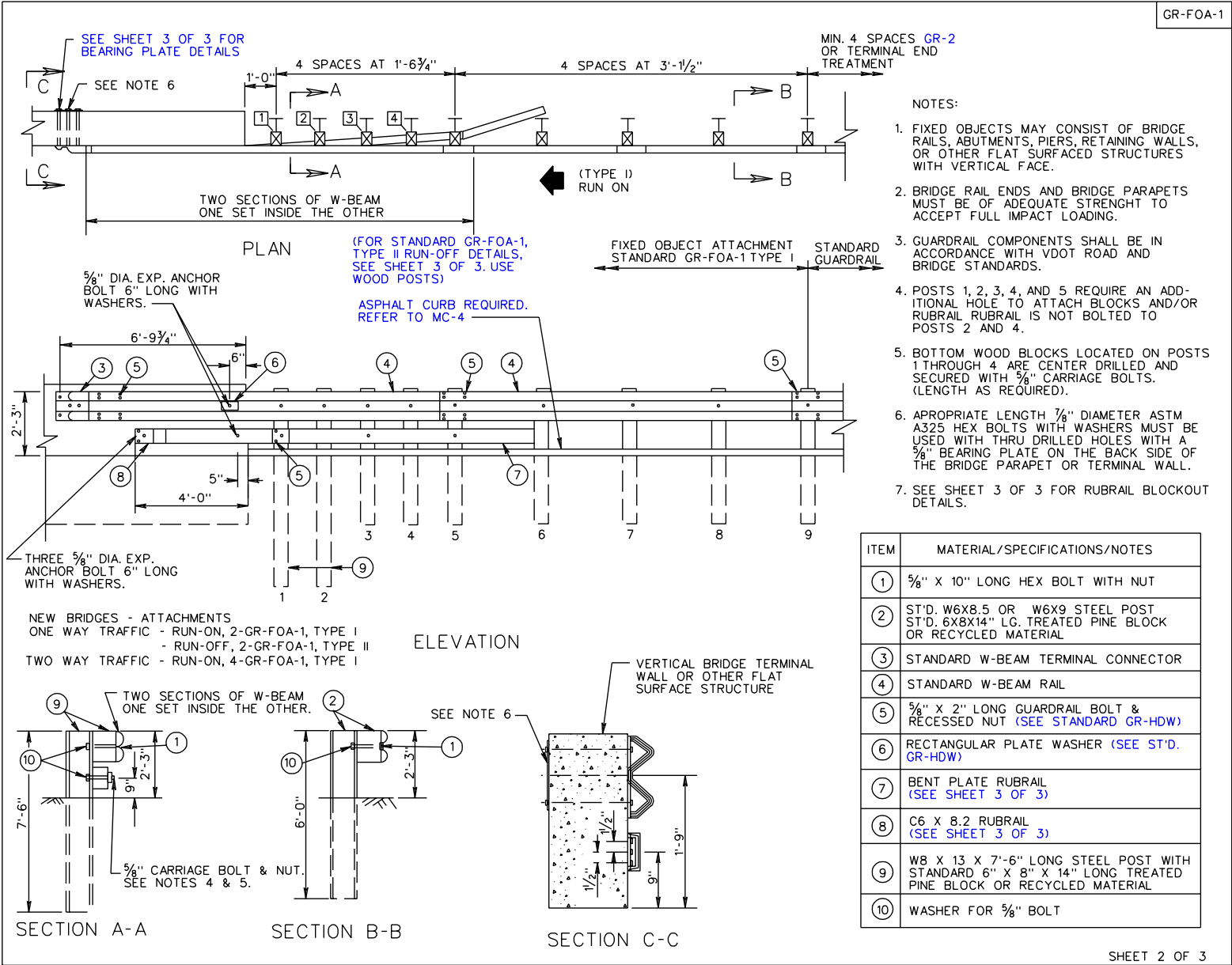
SPECIFICATION REFERENCE



- NOTES:
1. FIXED OBJECTS MAY CONSIST OF BRIDGE RAILS, ABUTMENTS, PIERS, RETAINING WALLS, OR OTHER FLAT SURFACED STRUCTURES WITH VERTICAL FACE.
 2. BRIDGE RAIL ENDS AND BRIDGE PARAPETS MUST BE OF ADEQUATE STRENGTH TO ACCEPT FULL IMPACT LOADING.
 3. GUARDRAIL COMPONENTS SHALL BE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE STANDARDS.
 4. POSTS 1, 2, 3, 4, AND 5 REQUIRE AN ADDITIONAL HOLE TO ATTACH BLOCKS AND/OR RUBRAIL RUBRAIL IS NOT BOLTED TO POSTS 2 AND 4.
 5. BOTTOM WOOD BLOCKS LOCATED ON POSTS 1 THROUGH 4 ARE CENTER DRILLED AND SECURED WITH 5/8" CARRIAGE BOLTS. (LENGTH AS REQUIRED).
 6. APPROPRIATE LENGTH 7/8" DIAMETER ASTM A325 HEX BOLTS WITH WASHERS MUST BE USED WITH THRU DRILLED HOLES WITH A 5/8" BEARING PLATE ON THE BACK SIDE OF THE BRIDGE PARAPET OR TERMINAL WALL.
 7. DRIVE NAIL WITHIN 2" OF THE TOP OR BOTTOM OF THE BLOCKOUT AFTER 5/8" X 18 BOLT IS INSTALLED.
 8. SEE SHEET 3 OF 3 FOR RUBRAIL BLOCKOUT DETAILS.

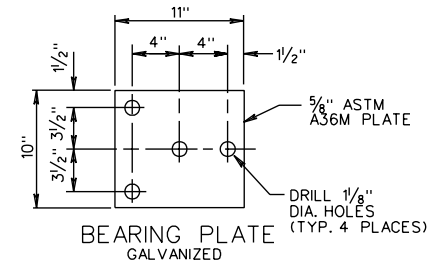
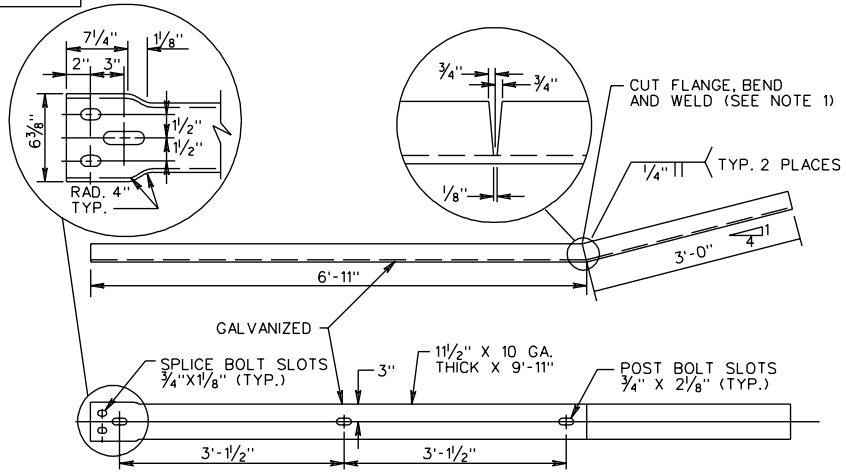
NEW BRIDGES - ATTACHMENTS
 ONE WAY TRAFFIC - RUN-ON, 2-GR-FOA-1, TYPE I
 - RUN-OFF, 2-GR-FOA-1, TYPE II
 TWO WAY TRAFFIC - RUN-ON, 4-GR-FOA-1, TYPE I
 EXISTING BRIDGE ATTACHMENTS AS SHOWN ON PLANS.

ITEM	MATERIAL/SPECIFICATIONS/NOTES
①	5/8" X 18" LONG. GUARDRAIL BOLT AND RECESSED NUT
②	STANDARD 6" X 8" WOOD POST AND BLOCK
③	STANDARD W-BEAM TERMINAL CONNECTOR
④	STANDARD W-BEAM RAIL
⑤	5/8" X 2" LONG GUARDRAIL BOLT & RECESSED NUT (SEE STANDARD GR-HDW)
⑥	RECTANGULAR PLATE WASHER (SEE STANDARD GR-HDW)
⑦	BENT PLATE RUBRAIL (SEE SHEET 3 OF 3)
⑧	C6 X 8.2 RUBRAIL (SEE SHEET 3 OF 3)
⑨	8" X 8" X 7'-6" LONG WOOD POST & 8" X 8" X 14" LONG TREATED PINE BLOCK OR RECYCLED MATERIAL
⑩	WASHER FOR 5/8" BOLT



ITEM	MATERIAL/SPECIFICATIONS/NOTES
①	5/8" X 10" LONG HEX BOLT WITH NUT
②	ST'D. W6X8.5 OR W6X9 STEEL POST ST'D. 6X8X14" LG. TREATED PINE BLOCK OR RECYCLED MATERIAL
③	STANDARD W-BEAM TERMINAL CONNECTOR
④	STANDARD W-BEAM RAIL
⑤	5/8" X 2" LONG GUARDRAIL BOLT & RECESSED NUT (SEE STANDARD GR-HDW)
⑥	RECTANGULAR PLATE WASHER (SEE ST'D. GR-HDW)
⑦	BENT PLATE RUBRAIL (SEE SHEET 3 OF 3)
⑧	C6 X 8.2 RUBRAIL (SEE SHEET 3 OF 3)
⑨	WB X 13 X 7'-6" LONG STEEL POST WITH STANDARD 6" X 8" X 14" LONG TREATED PINE BLOCK OR RECYCLED MATERIAL
⑩	WASHER FOR 5/8" BOLT

GR-FOA-1



☆ CAN BE FIELD CUT AND BENT USING HEAT.

WOOD POSTS RUBRAIL BLOCKOUTS 7" X 4" X THICKNESS

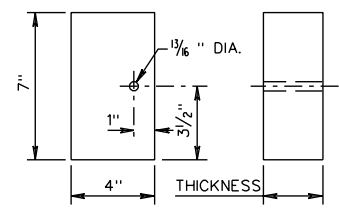
POST	THICKNESS
1	6 5/8"
2	5 1/16"
3	3 3/16"
4	2"

STEEL POSTS RUBRAIL BLOCKOUTS 7" X 4" X THICKNESS

POST	THICKNESS
1	5"
2	3 13/16"
3	2 5/8"
4	1 7/16"

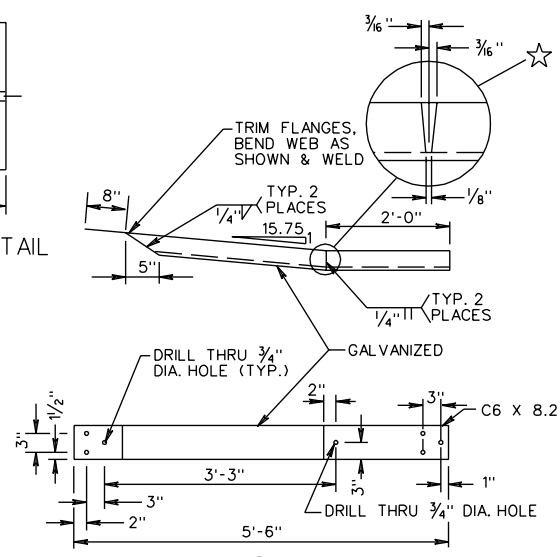
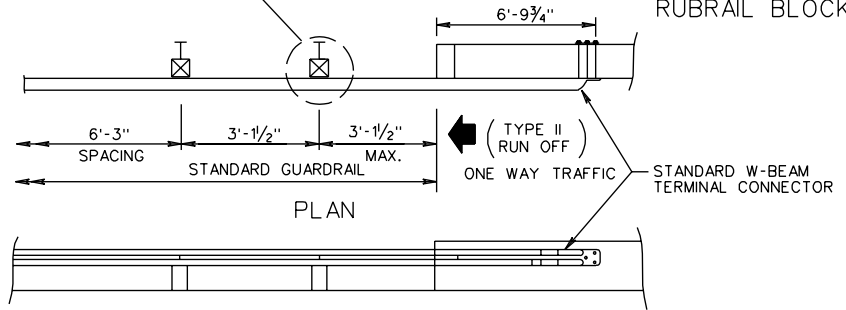
NOTE:
CAN BE FIELD CUT AND BENT USING HEAT. IF SHOP CUT AND BENT, RIGHT HAND OR LEFT HAND MUST BE SPECIFIED DEPENDING ON WHICH SIDE OF THE ROADWAY THE TRANSITION IS USED.

ITEM ⑦ DETAIL



RUBRAIL BLOCKOUT DETAIL

INDICATES EXTRA POST REQ'D. FOR RUN-OFF FIXED OBJECT ATTACHMENT ST'D. GR-FOA-1 TYPE II



ITEM ⑧ DETAIL

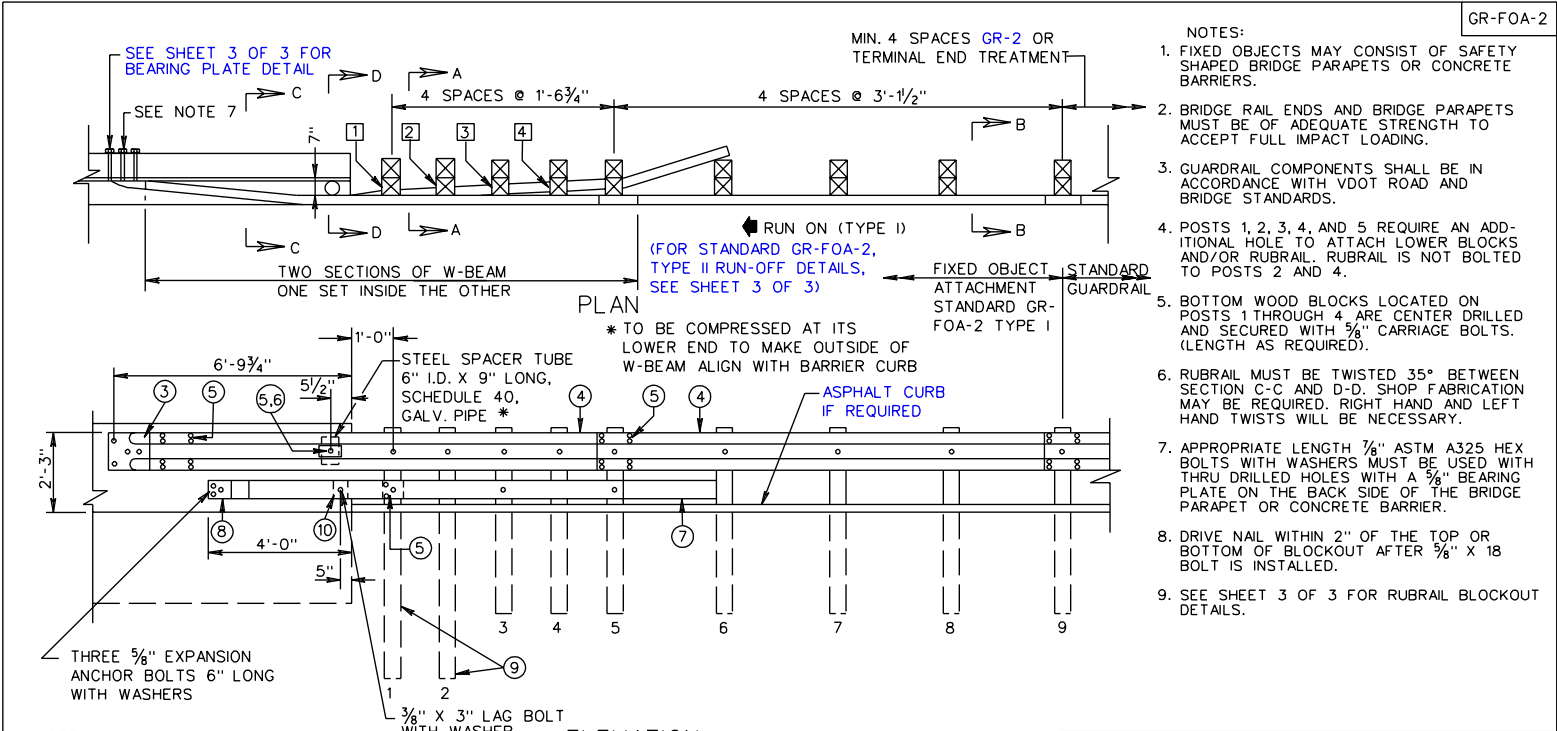
SHEET 3 OF 3

W BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT RUBRAIL AND HARDWARE DETAILS

REV. 7/01
501.27

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
505

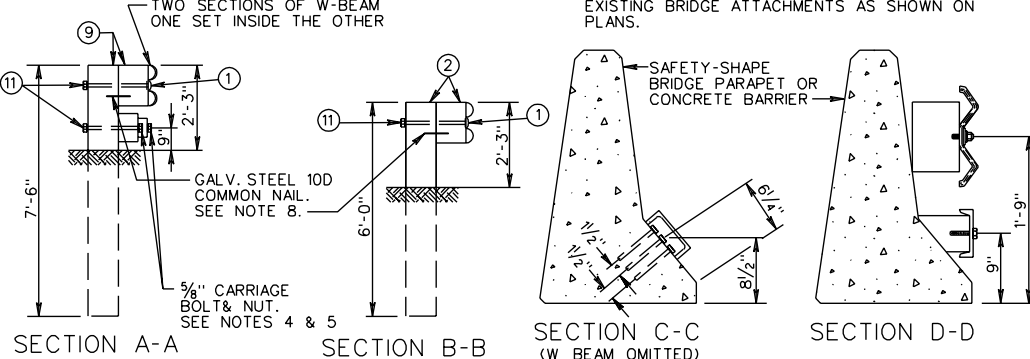


- NOTES:
1. FIXED OBJECTS MAY CONSIST OF SAFETY SHAPED BRIDGE PARAPETS OR CONCRETE BARRIERS.
 2. BRIDGE RAIL ENDS AND BRIDGE PARAPETS MUST BE OF ADEQUATE STRENGTH TO ACCEPT FULL IMPACT LOADING.
 3. GUARDRAIL COMPONENTS SHALL BE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE STANDARDS.
 4. POSTS 1, 2, 3, 4, AND 5 REQUIRE AN ADDITIONAL HOLE TO ATTACH LOWER BLOCKS AND/OR RUBRAIL. RUBRAIL IS NOT BOLTED TO POSTS 2 AND 4.
 5. BOTTOM WOOD BLOCKS LOCATED ON POSTS 1 THROUGH 4 ARE CENTER DRILLED AND SECURED WITH 3/8" CARRIAGE BOLTS. (LENGTH AS REQUIRED).
 6. RUBRAIL MUST BE TWISTED 35° BETWEEN SECTION C-C AND D-D. SHOP FABRICATION MAY BE REQUIRED. RIGHT HAND AND LEFT HAND TWISTS WILL BE NECESSARY.
 7. APPROPRIATE LENGTH 1/8" ASTM A325 HEX BOLTS WITH WASHERS MUST BE USED WITH THRU DRILLED HOLES WITH A 3/8" BEARING PLATE ON THE BACK SIDE OF THE BRIDGE PARAPET OR CONCRETE BARRIER.
 8. DRIVE NAIL WITHIN 2" OF THE TOP OR BOTTOM OF BLOCKOUT AFTER 3/8" X 18 BOLT IS INSTALLED.
 9. SEE SHEET 3 OF 3 FOR RUBRAIL BLOCKOUT DETAILS.

NOTE:
RUBRAIL MUST BE TWISTED 35° BETWEEN SECTION C-C AND D-D. SHOP FABRICATION MAY BE REQUIRED. RIGHT HAND AND LEFT HAND TWISTS WILL BE NECESSARY.

ELEVATION

NEW BRIDGE - ATTACHMENTS
ONE-WAY TRAFFIC-RUN-ON, 2-GR-FOA-2, TYPE I
-RUN-OFF, 2-GR-FOA-2, TYPE II
TWO-WAY TRAFFIC-RUN-ON, 4-GR-FOA-2, TYPE I
EXISTING BRIDGE ATTACHMENTS AS SHOWN ON PLANS.



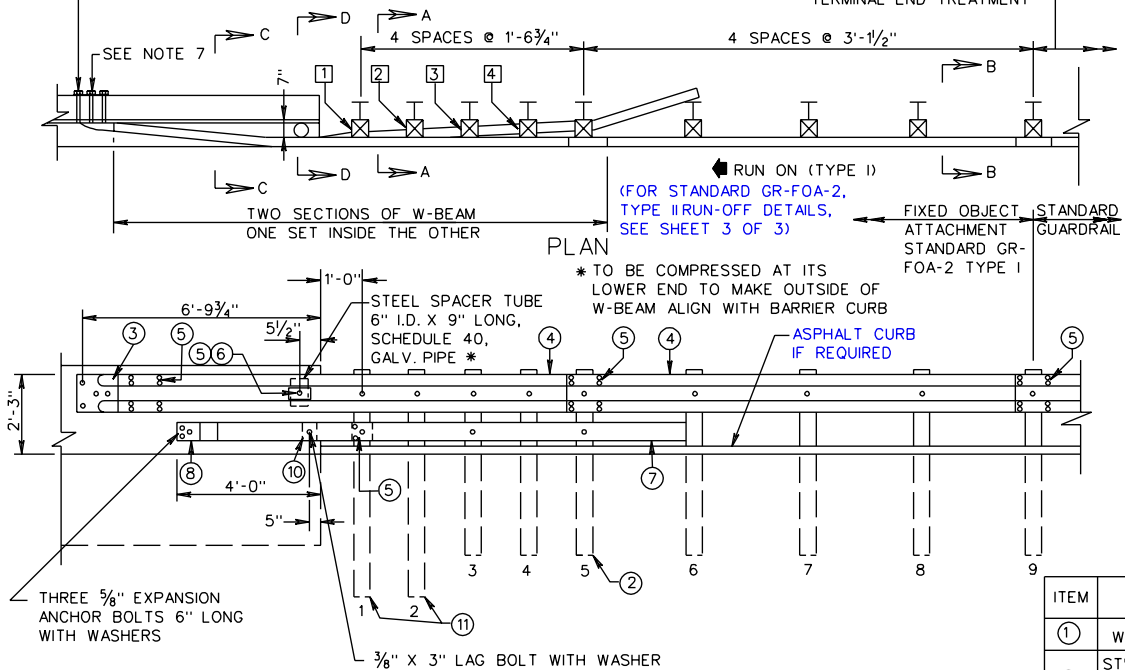
ITEM	MATERIAL/SPECIFICATIONS/NOTES
①	5/8" X 18" LG. GUARDRAIL BOLT AND RECESSED NUT.
②	STANDARD 6" X 8" WOOD POST AND BLOCK.
③	STANDARD W-BEAM TERMINAL CONNECTOR
④	STANDARD W-BEAM RAIL
⑤	3/8" X 2" LONG GUARDRAIL BOLT AND RECESSED NUT (SEE STANDARD GR-HDW)
⑥	RECTANGULAR PLATE WASHER (SEE STANDARD GR-HDW)
⑦	BENT PLATE RUBRAIL (SEE SHEET 3 OF 3)
⑧	C6 X 8.2 RUBRAIL (SEE SHEET 3 OF 3)
⑨	8" X 8" X 7'-6" LONG WOOD POST AND 8" X 8" X 14" LONG TREATED PINE BLOCK OR RECYCLED MATERIAL
⑩	WOOD BLOCKOUT FOR RUBRAIL (SEE SHEET 3 OF 3)
⑪	WASHER FOR 5/8" BOLT

<p>SPECIFICATION REFERENCE</p> <p>506</p>	<p>W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT FOR USE BETWEEN SAFETY SHAPE AND GUARDRAIL (WOOD POSTS)</p> <p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	<p>REV. 7/01 501.28</p>
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GR-FOA-2

SEE SHEET 3 OF 3 FOR BEARING PLATE DETAIL

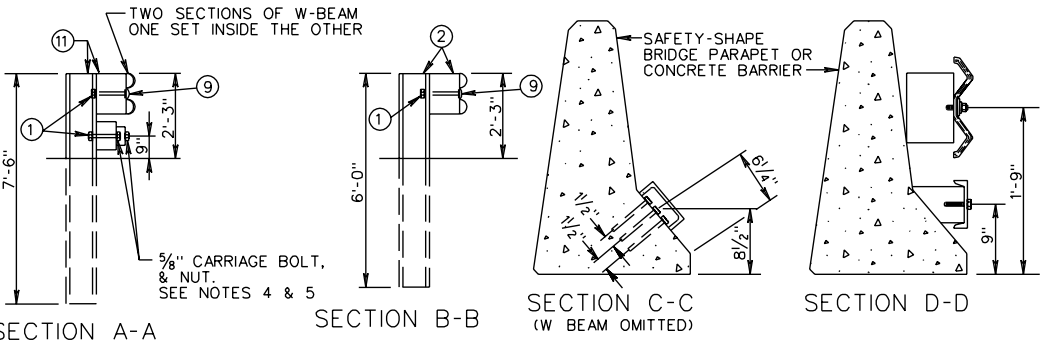
MIN. 4 SPACES GR-2 OR TERMINAL END TREATMENT



- NOTES:
1. FIXED OBJECTS MAY CONSIST OF SAFETY SHAPED BRIDGE PARAPETS OR CONCRETE BARRIERS.
 2. BRIDGE RAIL ENDS AND BRIDGE PARAPETS MUST BE OF ADEQUATE STRENGTH TO ACCEPT FULL IMPACT LOADING.
 3. GUARDRAIL COMPONENTS SHALL BE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE STANDARDS.
 4. POSTS 1, 2, 3, 4, AND 5 REQUIRE AN ADDITIONAL HOLE TO ATTACH LOWER BLOCKS AND/OR RUBRAIL. RUBRAIL IS NOT BOLTED TO POSTS 2 AND 4.
 5. BOTTOM WOOD BLOCKS LOCATED ON POSTS 1 THROUGH 4 ARE CENTER DRILLED AND SECURED WITH 5/8" CARRIAGE BOLTS. (LENGTH AS REQUIRED).
 6. RUBRAIL MUST BE TWISTED 35° BETWEEN SECTIONS C-C AND D-D. SHOP FABRICATION MAY BE REQUIRED. RIGHT HAND AND LEFT HAND TWISTS WILL BE NECESSARY.
 7. APPROPRIATE LENGTH 7/8" ASTM A325 HEX BOLTS WITH WASHERS MUST BE USED WITH THRU DRILLED HOLES WITH A 5/8" BEARING PLATE ON THE BACK SIDE OF THE BRIDGE PARAPET OR CONCRETE BARRIER.
 8. SEE SHEET 3 OF 3 FOR RUBRAIL BLOCKOUT DETAILS.

NOTE:
RUBRAIL MUST BE TWISTED 35° BETWEEN SECTION C-C AND D-D. SHOP FABRICATION MAY BE REQUIRED. RIGHT HAND AND LEFT HAND TWISTS WILL BE NECESSARY.

NEW BRIDGE - ATTACHMENTS
ONE-WAY TRAFFIC-RUN-ON, 2-GR-FOA-2, TYPE I
-RUN-OFF, 2-GR-FOA-2, TYPE II
TWO-WAY TRAFFIC-RUN-ON, 4-GR-FOA-2, TYPE I
EXISTING BRIDGE ATTACHMENTS AS SHOWN ON PLANS.



ITEM	MATERIAL/SPECIFICATIONS/NOTES
①	WASHER FOR 5/8" BOLT
②	ST'D. W6 X 8.5 OR W6 X 9 STEEL POST W/ ST'D. 6" X 8" X 14" LG. TREATED PINE BLOCK OR RECYCLED MATERIAL
③	STANDARD W-BEAM TERMINAL CONNECTOR
④	STANDARD W-BEAM RAIL
⑤	5/8" X 2" LONG GUARDRAIL BOLT AND RECESSED NUT (SEE STANDARD GR-HDW)
⑥	RECTANGULAR PLATE WASHER (SEE STANDARD GR-HDW)
⑦	BENT PLATE RUBRAIL (SEE SHEET 3 OF 3)
⑧	C6 X 8.2 RUBRAIL (SEE SHEET 3 OF 3)
⑨	5/8" X 10" LG. HEX BOLT, NUT AND WASHER
⑩	WOOD BLOCKOUT FOR RUBRAIL (SEE SHEET 3 OF 3)
⑪	W8 X 13 X 7'-6" LG. STEEL POST WITH STD. 6" X 8" X 14" LG. TREATED PINE BLOCK OR RECYCLED MATERIAL.

SHEET 2 OF 3

W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT FOR USE WITH SAFETY SHAPE - STEEL POSTS

REV. 7/01
501.29

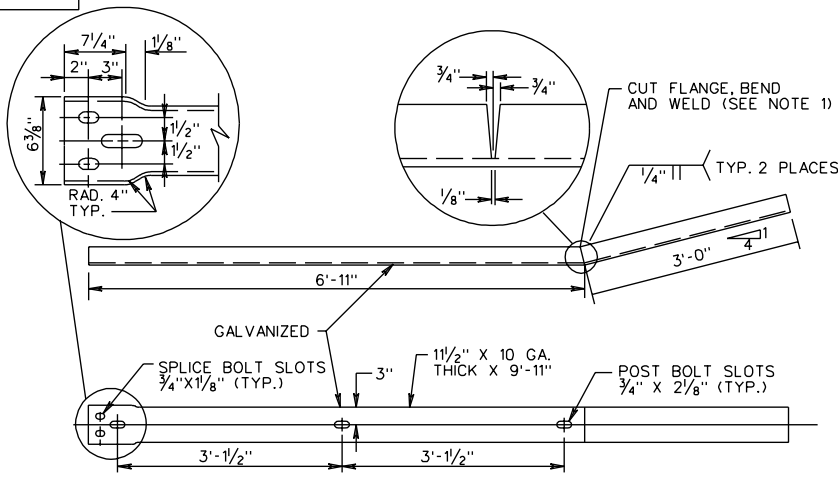
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

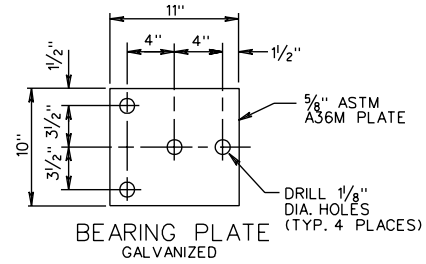
506

REVISED ON 7/02

GR-FOA-1



NOTE:
 CAN BE FIELD CUT AND BENT USING HEAT.
 IF SHOP CUT AND BENT, RIGHT HAND OR LEFT
 HAND MUST BE SPECIFIED DEPENDING ON
 WHICH SIDE OF THE ROADWAY THE TRANSITION
 IS USED.



☆ CAN BE FIELD CUT AND BENT USING HEAT.

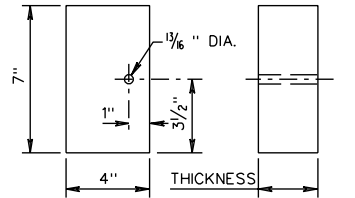
WOOD POSTS
 RUBRAIL BLOCKOUTS
 7" X 4" X THICKNESS

POST	THICKNESS
1	6 5/8"
2	5 1/16"
3	3 3/16"
4	2"

STEEL POSTS
 RUBRAIL BLOCKOUTS
 7" X 4" X THICKNESS

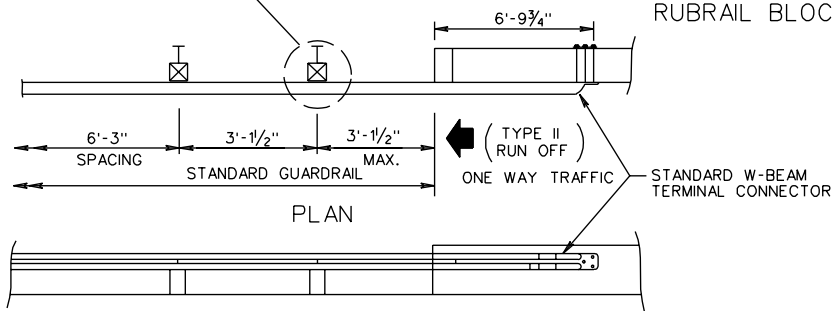
POST	THICKNESS
1	5"
2	3 3/16"
3	2 5/8"
4	1 7/16"

ITEM (7) DETAIL

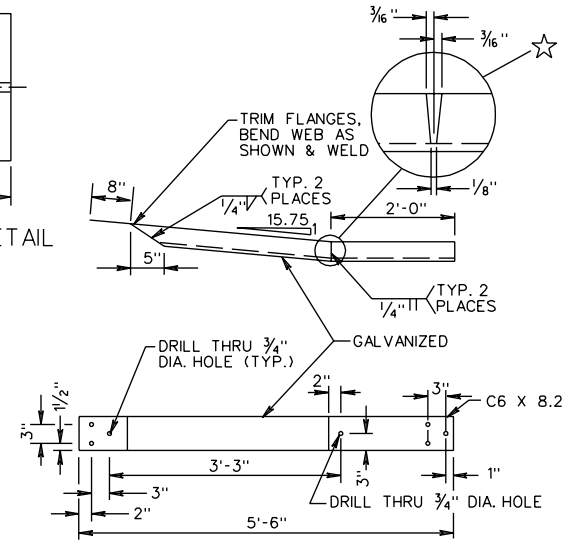


RUBRAIL BLOCKOUT DETAIL

INDICATES EXTRA POST REQ'D. FOR
 RUN-OFF FIXED OBJECT ATTACHMENT
 STD. GR-FOA-1 TYPE II



ELEVATION



ITEM (8) DETAIL

SHEET 3 OF 3

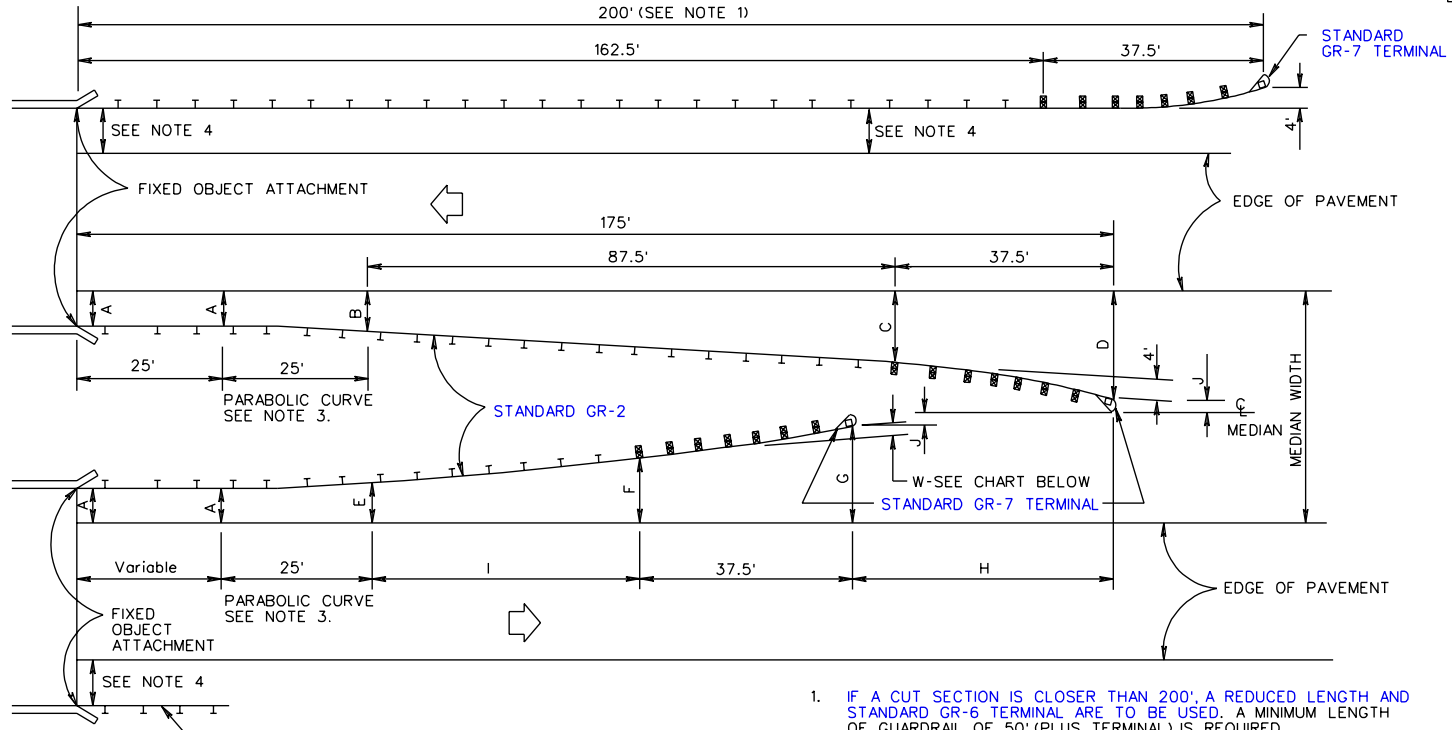
W BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT
 RUBRAIL AND HARDWARE DETAILS

SPECIFICATION
 REFERENCE

505

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 501.27

VIRGINIA DEPARTMENT OF TRANSPORTATION



1. IF A CUT SECTION IS CLOSER THAN 200', A REDUCED LENGTH AND STANDARD GR-6 TERMINAL ARE TO BE USED. A MINIMUM LENGTH OF GUARDRAIL OF 50' (PLUS TERMINAL) IS REQUIRED.
2. SEE TABLE III, PAGE 501.36 OF THE ROAD AND BRIDGE STANDARDS FOR DEFINITION OF "X" AND "Y".
3. VALUES LESS THAN 0.5 BETWEEN A AND B, A AND E ARE NOT ON PARABOLIC CURVE.
4. RIGHT BRIDGE OFFSET VALUES ARE GIVEN IN GEOMETRIC STANDARDS FOR CORRESPONDING LEFT BRIDGE OFFSET ("A" DIMENSIONS) SHOWN.

DIMENSIONS											
MEDIAN WIDTH	LEFT BRIDGE RAIL OFFSET(A)	B	C	D	E	F	G	H	I	J	W
30'	5'	5.5'	7.0'	11.0'	5.4'	6.0'	8.0'	54.0'	33.5'	4.0'	2.0'
40'	5'	6.0'	10.5'	16.0'	6.0'	10.0'	16.0'	44.0'	43.0'	4.0'	2.5'
40'	8'	8.4'	11.4'	17.0'	8.8'	10.8'	17.0'	48.0'	39.0'	3.0'	3.5'
40'	12'	12.2'	13.0'	17.0'	12.4'	13.0'	17.0'	48.5'	38.0'	3.0'	3.0'

OFFSETS (Y) FOR INTRODUCED GUARDRAIL TRANSITIONS										
LENGTH L	X	Y								
		W=0.50'	W=0.75'	W=1.00'	W=2.00'	W=2.50'	W=3.00'	W=3.50'	W=4.00'	
25.00'	X ₁	6.25	0.03'	0.05'	0.06'	0.07'	0.08'	0.10'	0.11'	
	X ₂	12.50	0.13'	0.19'	0.25'	0.28'	0.33'	0.39'	0.44'	
	X ₃	18.75	0.28'	0.42'	0.56'	0.63'	0.75'	0.88'	1.0'	
	X ₄	25.00	0.50'	0.75'	1.00'	0.89'	1.11'	1.33'	1.56'	1.78'
37.50'	X ₅	31.25				1.39'	1.74'	2.08'	2.43'	2.78'
	X ₆	37.50			2.00'	2.50'	3.00'	3.50'	4.00'	

DETAIL OF GUARDRAIL AT DUAL BRIDGES

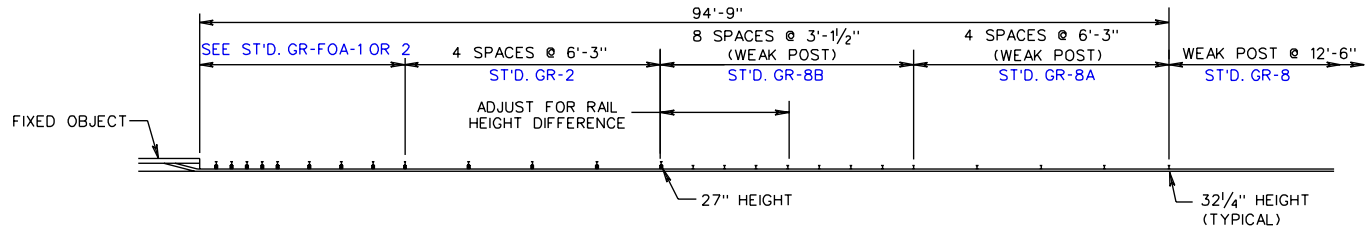
SPECIFICATION REFERENCE
221 505

W BEAM GUARDRAIL INSTALLATION CRITERIA

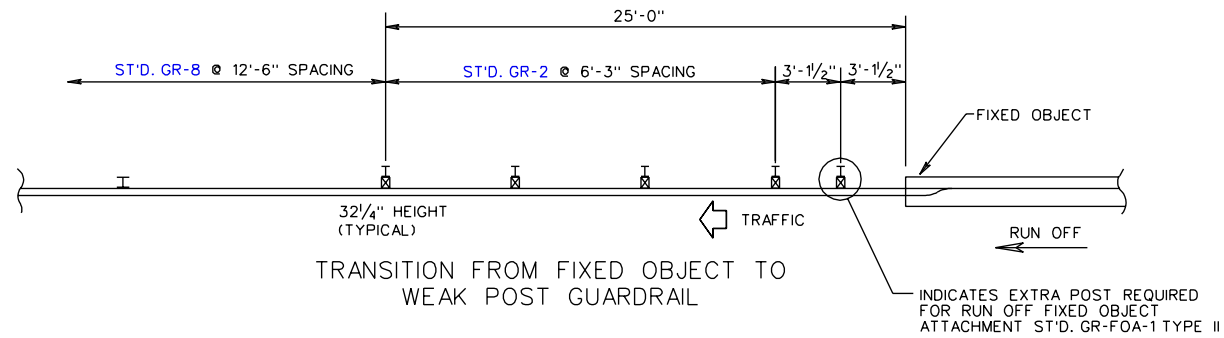
VIRGINIA DEPARTMENT OF TRANSPORTATION

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501.34

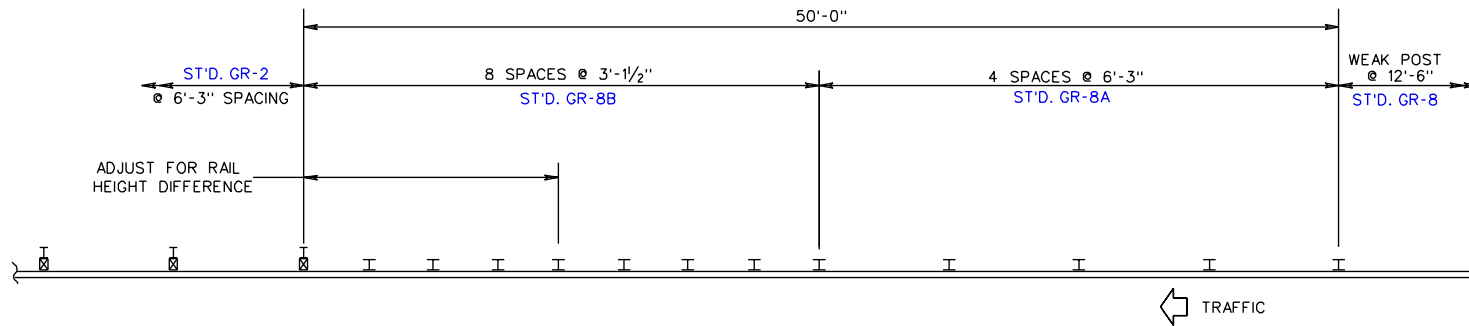
GR-INS



TRANSITION FROM WEAK POST GUARDRAIL TO FIXED OBJECT



TRANSITION FROM FIXED OBJECT TO WEAK POST GUARDRAIL



TRANSITION FROM WEAK POST TO STRONG POST GUARDRAIL

SHEET 7 OF 8

REV. 7/01

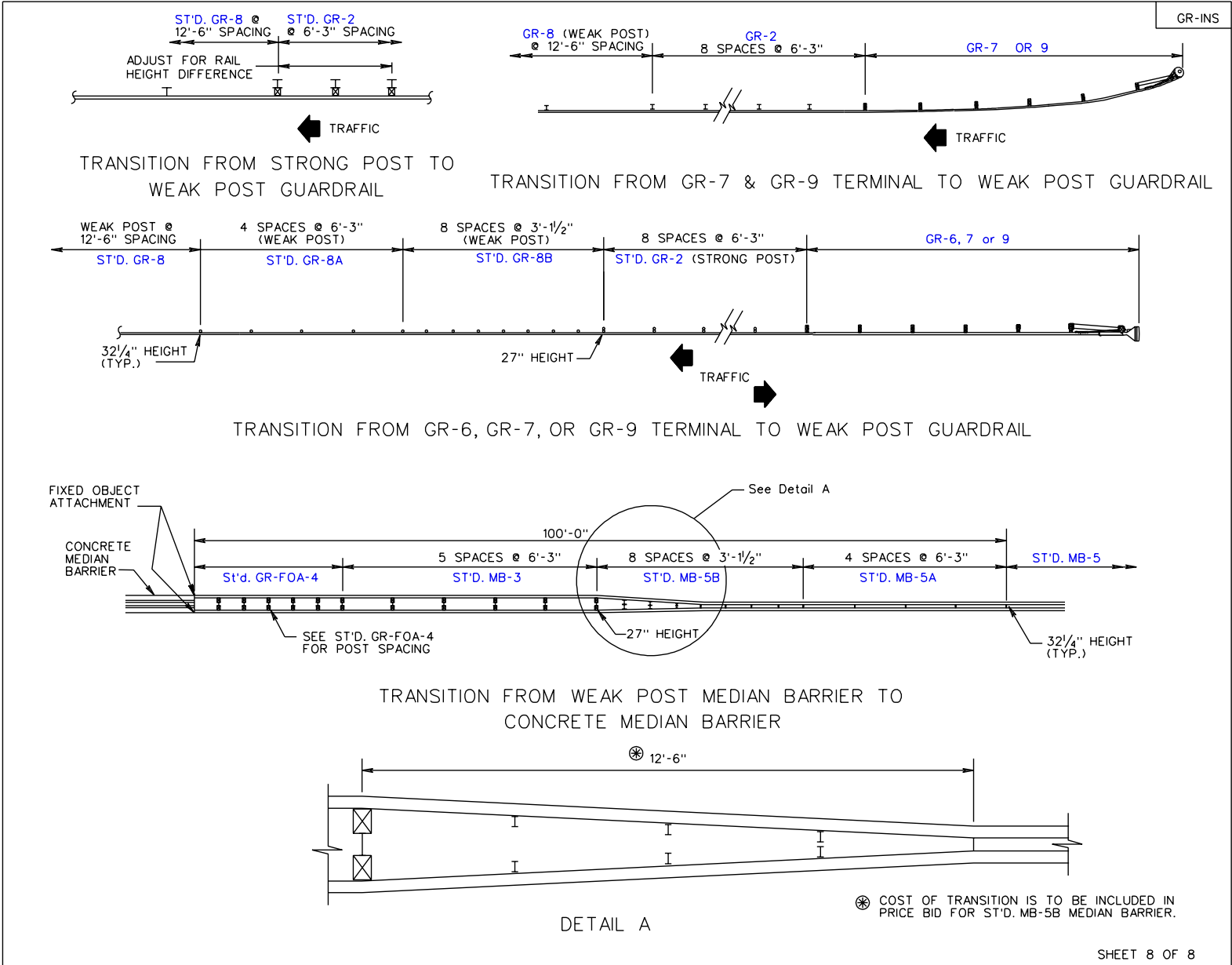
501.39

W BEAM GUARDRAIL INSTALLATION CRITERIA

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

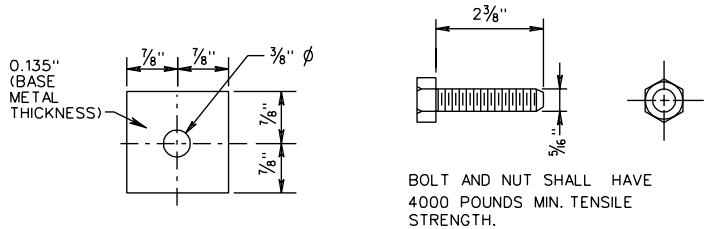
221
505



<p>SPECIFICATION REFERENCE</p> <p>221</p> <p>505</p>	<p>W BEAM GUARDRAIL AND MEDIAN BARRIER INSTALLATION CRITERIA</p> <p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	<p>REV. 7/01</p> <p>501.40</p>
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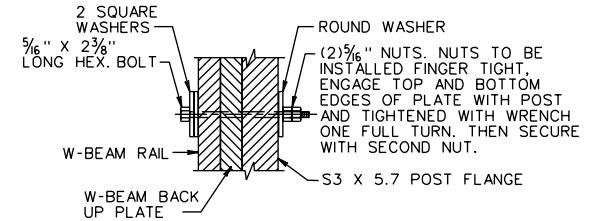
INSERTABLE SHEET A95

MB-5

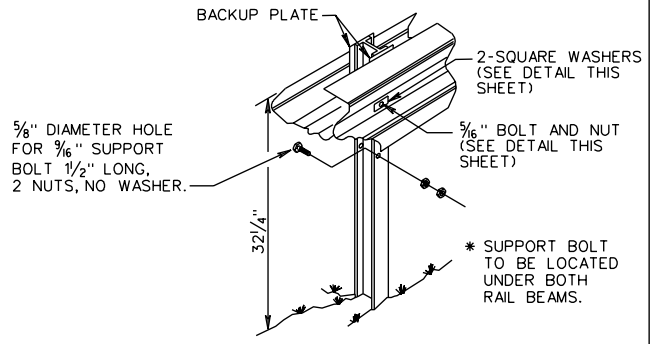


SQUARE WASHER 5/16" HEX BOLT AND NUT

⊗ THE GUARDRAIL AND MEDIAN BARRIER COMPONENTS DEPICTED IN A.R.T.B.A. TECHNICAL BULLETIN NUMBER 268B MAY BE SUBSTITUTED IF INTERCHANGEABLE WITH THE STANDARDS FOR GUARDRAIL (GR) OR MEDIAN BARRIER (MB) AND APPROVED BY THE ENGINEER.

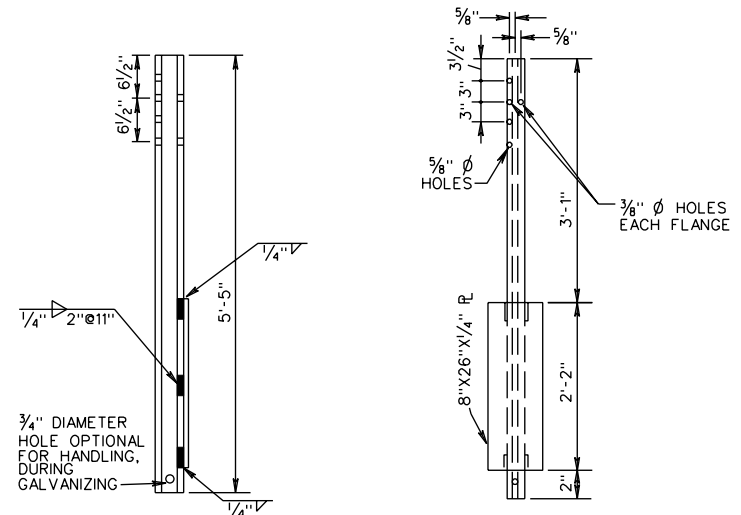


GUARDRAIL POST CONNECTION DETAIL



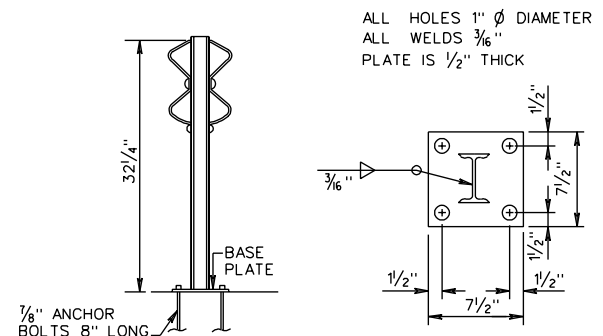
TYPICAL INSTALLATION

NOTES:
 STANDARD MB-5 POST SPACING IS 12'-6"
 STANDARD MB-5A POST SPACING IS 6'-3"
 STANDARD MB-5B POST SPACING IS 3'-1 1/2"
 STANDARD MB-5 DEFLECTION IS 8'-0"
 ALL POSTS, BOLTS, NUTS AND WASHERS ARE TO BE GALVANIZED.
 FOR DETAILS OF GUARDRAIL ELEMENT, HARDWARE, ETC. SEE SHEET NO. 501.01.
 FOR DETAILS OF GUARDRAIL SPLICE JOINT, SEE STD. GR-8 DEPICTING AN NCHRP 350 TL-3 INSTALLATION.



FOR ROCK INSTALLATION, 8" X 26" X 1/4" PLATE IS TO BE ELIMINATED. DRILL OR EXCAVATE HOLE FOR POST, PLACE AND BACKFILL WITH CRUSHER RUN AGGREGATE TO LEVEL OF ROCK.

S3X5.7 STEEL POST



BASE PLATE

STRUCTURE MOUNTED BARRIER

SPECIFICATION REFERENCE	221 505
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STANDARD W BEAM MEDIAN BARRIER (WEAK POST SYSTEM) TL-3 (>45 MPH)

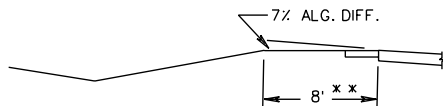
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/01 501.42

GS-11

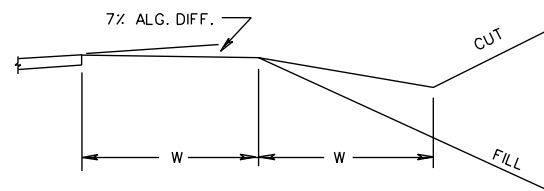
GRADED MEDIAN SHOULDERS

OUTSIDE SHOULDERS

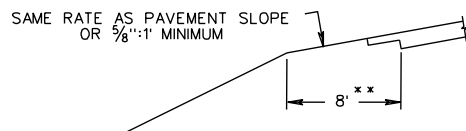


** WHERE MAINLINE IS 6 OR MORE LANES GRADED SHOULDER WIDTH IS TO BE THE SAME AS THAT SHOWN FOR FILL SHOULDER FOR INDEPENDENT GRADING.

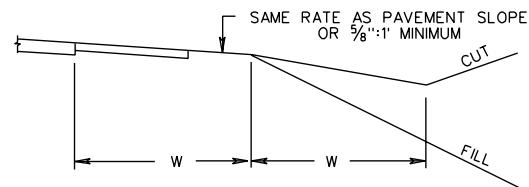
HIGH SIDE - SUPERELEVATED



HIGH SIDE - SUPERELEVATED



LOW SIDE - SUPERELEVATED



LOW SIDE - SUPERELEVATED

NOTE: FOR WIDTH OF SHOULDERS AND DITCHES (W) SEE GEOMETRIC DESIGN STANDARDS.

STANDARD SHOULDER DESIGN FOR ALL SYSTEMS
EXCEPT LOCAL ROADS AND STREETS

REV. 7/01

702.01

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRANSITION TABLE

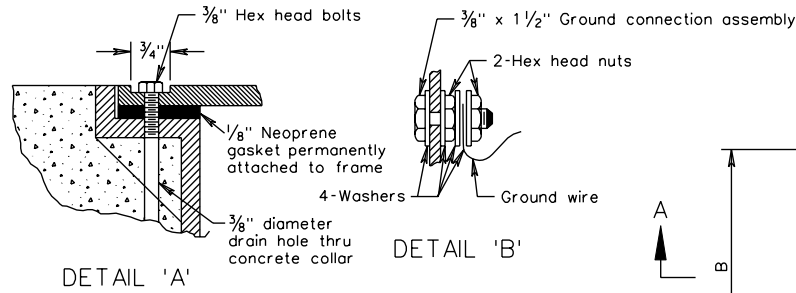
LENGTH OF CROWN RUNOFF (CR)	START/END OF TRANSITION (LS)	DISTANCE IN FEET FROM START/END OF TRANSITION (LS)				NORMAL CROWN
		1	2	3	4	
220	0	44	88	132	176	220
200	0	40	80	120	140	200
180	0	36	72	108	144	180
160	0	32	64	96	128	160
140	0	28	56	84	112	140
120	0	24	48	72	96	120
100	0	20	40	60	80	100
90	0	18	36	54	72	90
80	0	16	32	48	64	80
60	0	15	30	45	——	60
40	0	20	——	——	——	40

NOTE:

TABLE LISTS POSITIONS ON TRANSITIONS AT WHICH SLOPE STAKES SHOULD BE SET, CONSTRUCTION AND FINAL CROSS-SECTIONS TAKEN, FINE GRADING STAKES (BLUE TOP) SET, AND FORM STAKES SET (CONCRETE PAVEMENT ONLY).

CROWN TRANSITION / CROWN RUNOFF (CR) TABLE

JB-1B,2B,3B,4B & 5B



STANDARD	DIMENSIONS	
	A	B
JB-1B	12"	12"
JB-2B	12"	18"
JB-3B	18"	18"
JB-4B	18"	24"
JB-5B	24"	24"

Notes:

Conduit entrances shall be located as shown on the plans. Conduits shall extend 2" min. to 3" max. beyond the inside wall of the junction box.

Bellends shall be installed on the ends of PVC conduits. Grounding bushings shall be installed on the ends of metal conduits. Bellends & bushings shall be plugged to prevent moisture & rodent entry.

*Depth of conduit entrances for magnetic detectors shall be in accordance with Standard TD-2.

The cover shall have a non-skid surface with letters cast in the depression on top. The letters "VDOT ELEC", "VDOT TRAF", "VDOT COMM" or "UTILITY" as applicable are to be 1" wide and raised 1/4" high. Covers used for junction boxes installed within municipalities shall not require the VDOT reference.

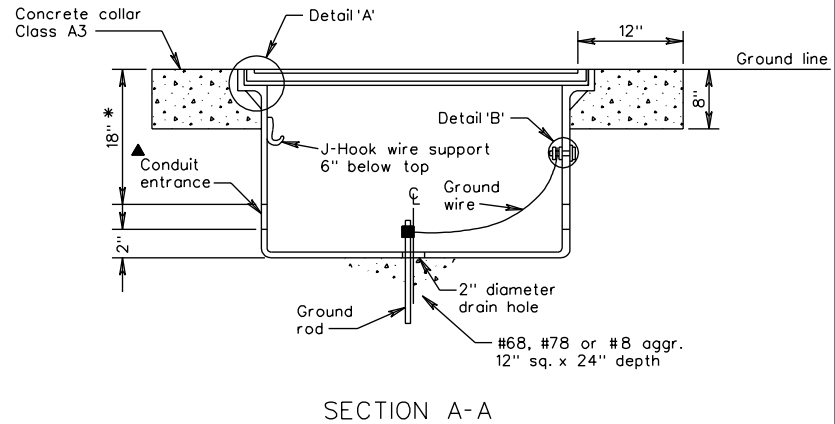
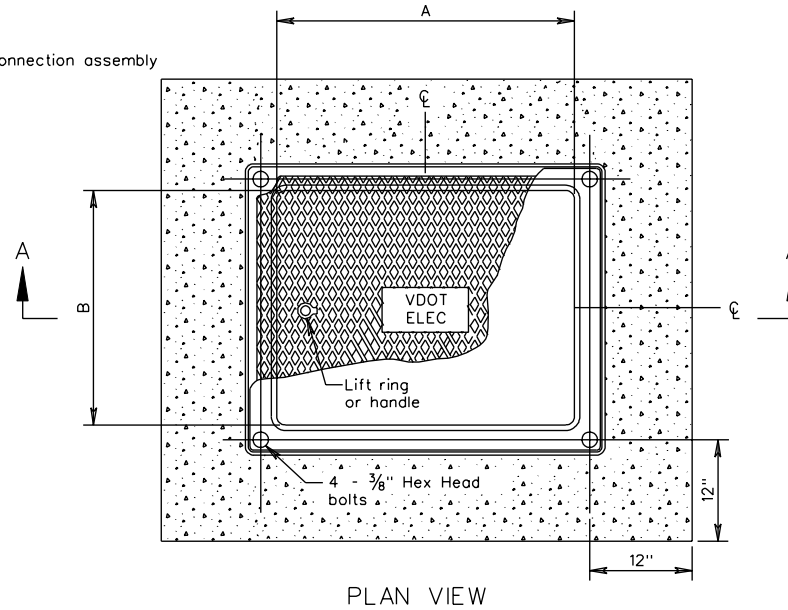
▲ A minimum 2" diameter conduit entrance is required, unless otherwise specified on plans.

A concrete collar is required only when junction box is installed in earth areas.

All junction boxes shall be installed with a ground rod unless box houses only communication/interconnect cable.

VOIDS resulting from entrance of conduits into junction boxes shall be completely filled with an appropriate material.

Junction box shall be a gray-iron casting with an asphalt coating on exterior surface except cover.

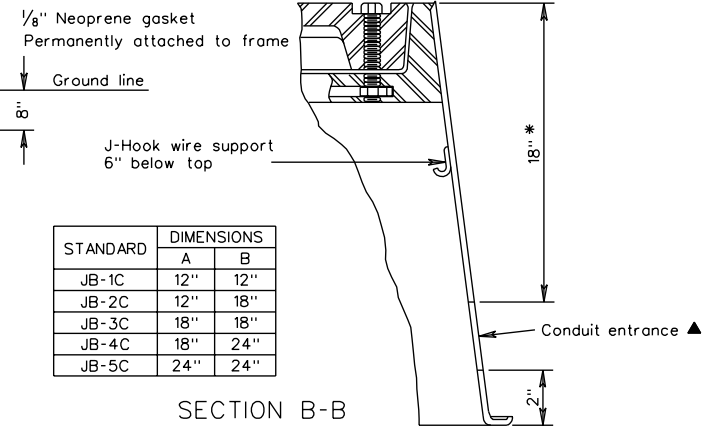
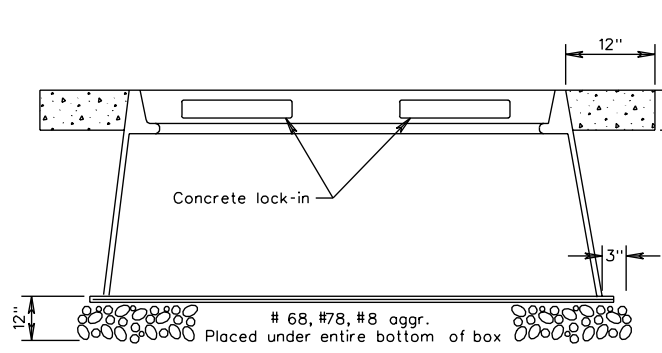
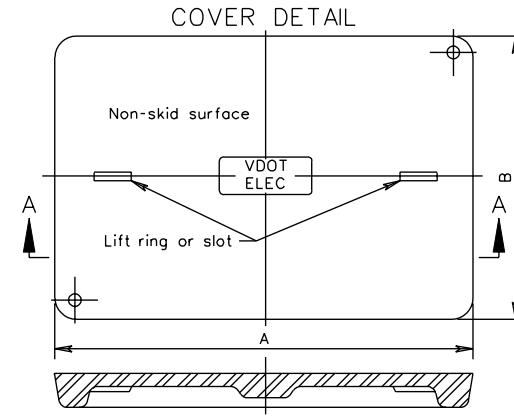
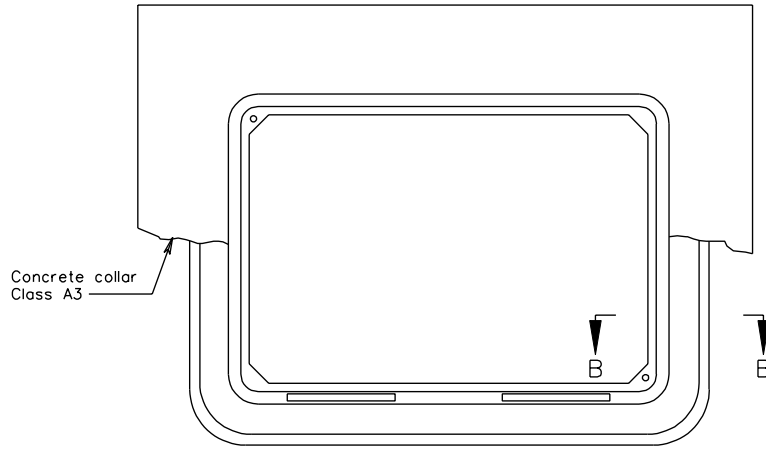


JUNCTION BOX

REV. 7/01
1301.50

INSERTABLE SHEET A141

JB-1C, 2C,
3C, 4C & 5C



STANDARD	DIMENSIONS	
	A	B
JB-1C	12"	12"
JB-2C	12"	18"
JB-3C	18"	18"
JB-4C	18"	24"
JB-5C	24"	24"

Notes:

- Conduit entrances shall be located as shown on the plans.
- Bellends shall be installed on the ends of PVC conduits.
- Grounding bushings shall be installed on the ends of metal conduits.
- Bellends and bushings shall be plugged to prevent moisture and rodent entry.
- Depth of conduit entrance for use of magnetic detectors shall be in accordance with Standard TD-2.
- The junction box shall be of a polymer concrete with fiberglass sides.
- The cover shall have a non-skid surface with letters cast in the depression on top. The letters "VDOT ELEC", "VDOT TRAF", "VDOT COMM" or "UTILITY" as applicable are to be 1" wide and raised 1/4" high. Covers used for junction boxes installed within municipalities shall not require the VDOT reference.
- All junction boxes shall be installed with a ground rod unless box houses only communication/interconnect cable.

- Two recessed 3/8" Hex head bolts are required for each cover.
- ▲ A minimum 2" diameter conduit entrance is required, unless otherwise specified on the plans.
- A concrete collar is required only when junction box is installed in earth areas.
- Conduits shall extend 2" to 3" max. beyond the inside wall of the junction box.
- The junction box may be a two piece design with the top section no less than 17" in depth.
- voids resulting from entrance of conduits into junction boxes shall be completely filled with an appropriate material.

JUNCTION BOX

VIRGINIA DEPARTMENT OF TRANSPORTATION

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