

March 4, 2002

MEMORANDUM

To: All Holders of the Virginia Department of Transportation's 2001 Road and Bridge Standards

The following is a list of revised standards contained in the 2001 Road and Bridge Standards that have a revision date of 7/01. These pages replace the previously issued pages in your copy of the standards. An insertable sheet will not be required in plan assemblies.

STANDARD	PAGE	REVISION
EW-7S	101.19	Corrected the concrete quantity for 42" Dia. concrete pipe with a 2:1 fill slope.
DI-3D, E, F	104.12	Revised the 2'-0" Utility Space dimension in the Plan View.
MH-1	106.01	Revised Note 7.
PC-1, Sheet 1 of 17	107.05	Revised minimum heights of cover note.
PC-1, Sheet 16 of 17	107.20	Added 42" and 48" diameter polyethylene pipes.
SB-1	110.01	Revised pipe size and material. Added note.
SB-1 PC	110.02	Revised pipe size and material. Revised Pipe Connection detail. Added pipe connection note.
MS-1A	202.03	Added depth of curb dimension to Alternative With Extruded Curb detail.
CG-11	203.04	Deleted CG-12 detail from Plan View. Revised 4' sidewalk dimension.
RW-3	401.02	Corrected formula for base thickness in table.
GR-2, 2A	501.05	Deleted duplicate blockout thickness dimension in Steel Post detail.
GR-SP	501.16 501.17	Deleted Note 4. Revised Note 4 and deleted Note 6.
GR-INS, Sheet 2 of 8	501.34	Corrected B and C dimensions for 40' median width.

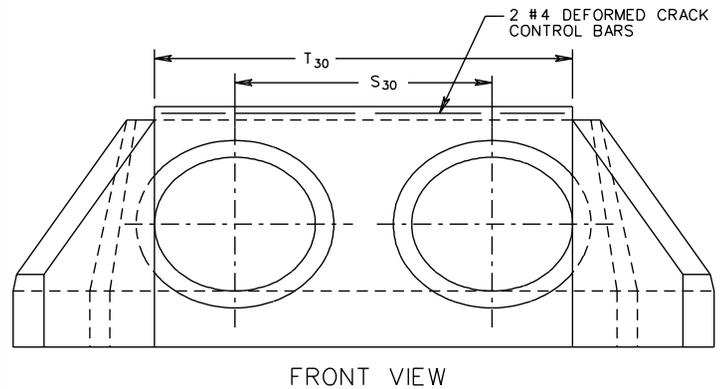
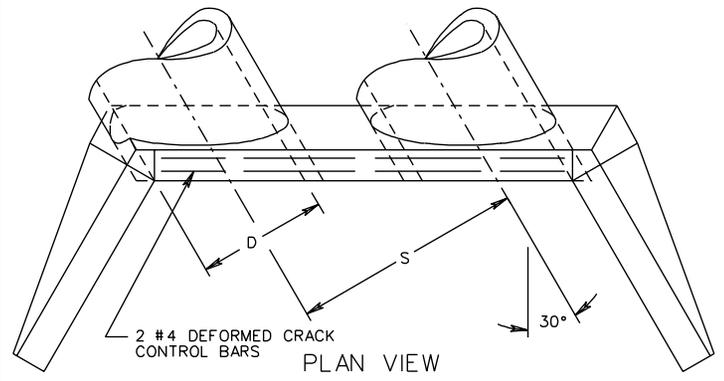
STANDARD	PAGE	REVISION
GS-11	702.01	Revised Graded Median Shoulders Low Side – Superelevation detail.
TC-5	801.12	Corrected typographical error in note.

The following is a list of revised standards to the 2001 Road and Bridge Standards, with a revision date of 7/01, that do require an insertable sheet to be included in your plan assembly until the next edition of the imperial standards is published. Please replace the previously issued pages in your standards with the pages listed below. The respective insertable sheet number has been placed with the revised standard in parenthesis. An insertable sheet is available for each of these revised standards. The insertable sheets are available on VDOT's web site on the FTP server and in Falcon DMS for VDOT personnel. These insertable sheets will be required in plan assemblies for projects utilizing the standard items listed below that have not been turned in for first submission.

STANDARD	PAGE	REVISION
ES-1 (A142)	102.01	Revised length of pipe dimension.
ES-1A (A130)	102.02	Revised length of pipe dimension.
ES-2 (A142)	102.03	Revised length of pipe and pay line dimensions.
DI-10J, K, L (A100)	104.29	Added Note 25.
DI-14D, E, F (A102)	104.40 104.41	Corrected Note 1. Deleted Note 15 and renumbered remaining notes. Added new Note 25 (IS- 1 shaping).
EC-6 (isd 414_2)	114.07	Deleted Note 1 and renumbered remaining notes.
CG-12A (A59)	203.05	Revised slope dimension in Section A-A.
GR-6 (A132)	501.09 501.10	Revised maximum ditch fore slope. Revised end anchorage. Revised anchor bolt size for rock cut installations.
GR-8A, B, C (A91)	501.14 501.15	Revised to meet NCHRP 350 Test Level 3 Test Criteria.
GR-FOA-1 (A65_1 & A65_2)	501.25 501.26 501.27	Revised to meet NCHRP 350 Test Level 3 Test Criteria.
GR-FOA-2 (A66_1 & A66_2)	501.28 501.29 501.30	Revised to meet NCHRP 350 Test Level 3 Test Criteria.

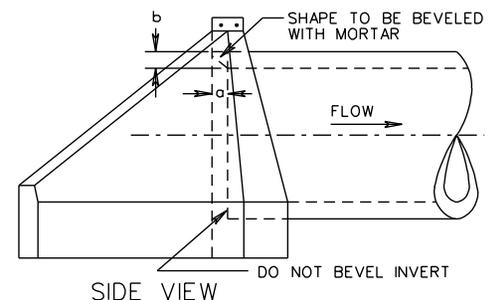
STANDARD	PAGE	REVISION
GR-INS, Sheet 7 of 8 (A93)	501.39	Revised GR-8 guardrail height.
GR-INS, Sheet 8 of 8 (A93)	501.40	Revised GR-8/MB-5 guardrail heights.
MB-5 (A95)	501.42	Revised to meet NCHRP 350 Test Level 3 Test Criteria.
JB-1B, 2B, 3B, 4B, 5B (A140)	1301.50	Revised concrete collar thickness.
JB-1C, 2C, 3C, 4C, 5C (A141)	1301.51	Revised concrete collar thickness.

If you have any questions or comments regarding the listed revisions to this publications, please contact Mr. Bryant Lowery of the Engineering Services Section at (804) 786-9468.



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"

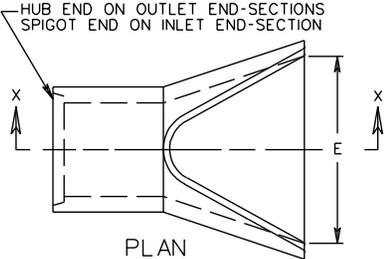
FOR CONCRETE PIPE							
D	S	S30	T30	FILL SLOPE 1 1/2:1		FILL SLOPE 2:1	
				CONCRETE IN ONE DOUBLE ENDWALL CUBIC YDS.	INCREASE FOR EACH ADDITIONAL PIPE CUBIC YDS.	CONCRETE IN ONE DOUBLE ENDWALL CUBIC YDS.	INCREASE FOR EACH ADDITIONAL PIPE CUBIC YDS.
42"	6'-0"	6'-11 1/8"	10'-11 5/8"	5.098	1.467	5.759	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

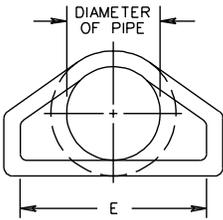
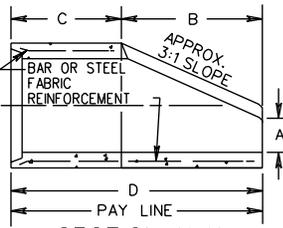
SPECIFICATION REFERENCE
105
302

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

END-SECTION 12" - 60" PIPE

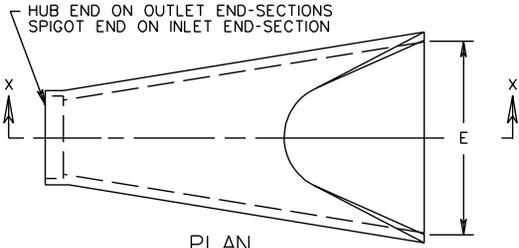


CONCRETE TO BE 4000 PSI MINIMUM

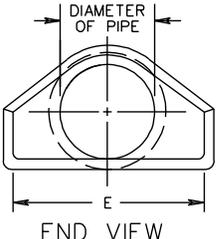
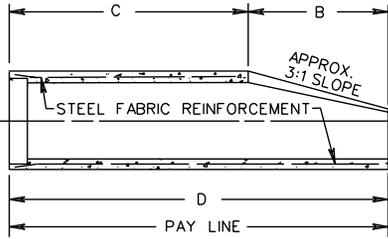


END SECTION DIMENSIONS					
PIPE DIAMETER	A	B	C	D	E
12"	4"	2'-0"	2'-0"	4'-0"	2'-0"
15"	6"	2'-3"	1'-9"	4'-0"	2'-6"
18"	9"	2'-3"	1'-9"	4'-0"	3'-0"
21"	9 1/4"	2'-11"	2'-1"	5'-0"	3'-6"
24"	9 1/2"	3'-7"	2'-6"	6'-1"	4'-0"
27"	10 3/4"	4'-0"	2'-1"	6'-1"	4'-6"
30"	1'-0"	4'-6"	1'-7 3/4"	6'-1 3/4"	5'-0"
33"	1'-1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

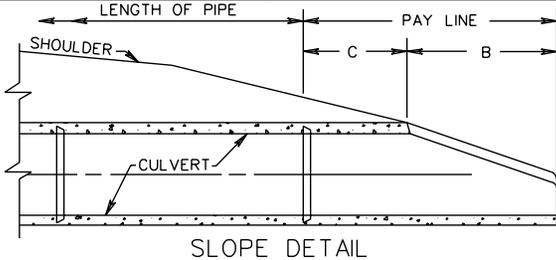
ALTERNATE END-SECTION 12" - 60" PIPE



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"



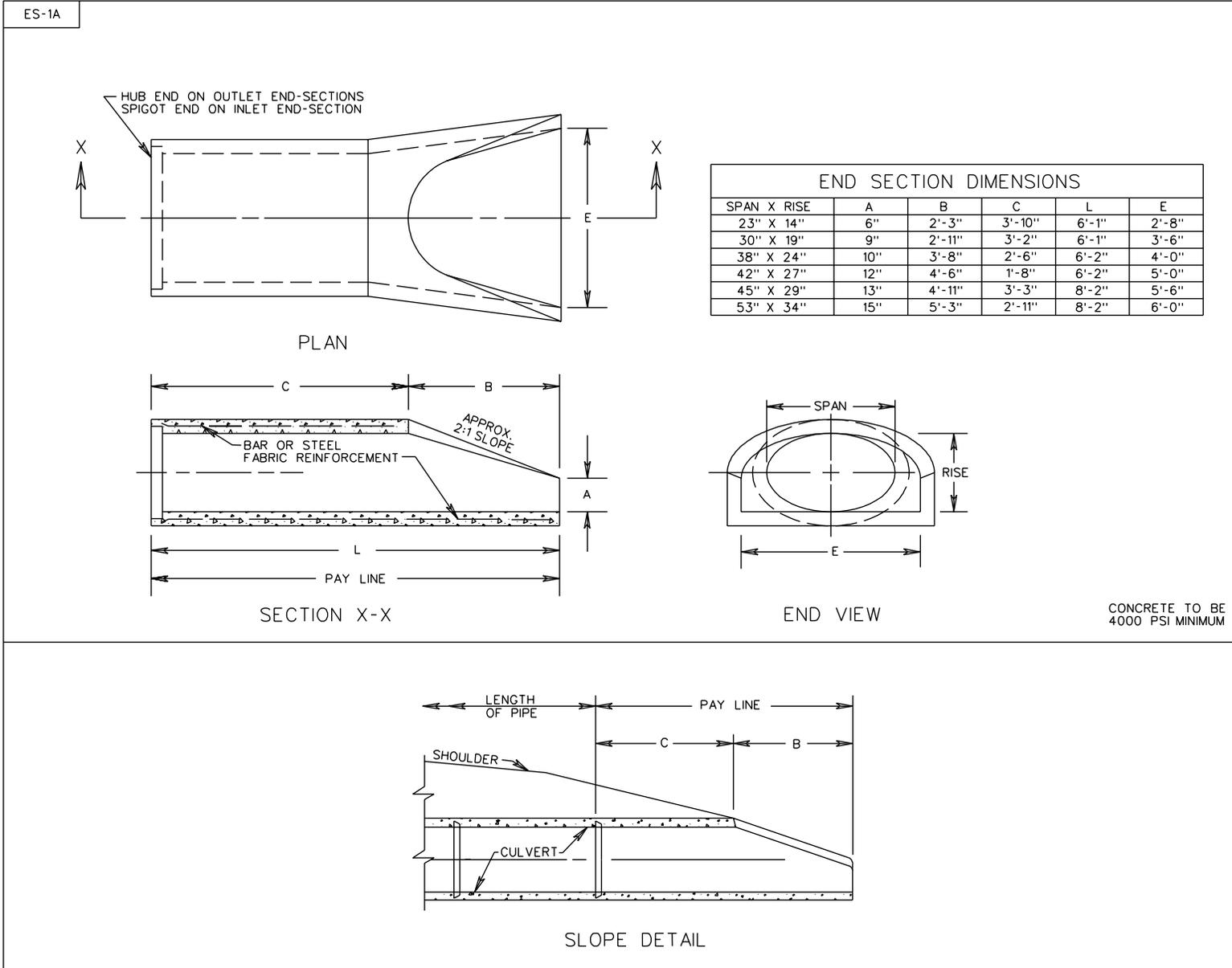
NOTES:
 PIPE LENGTHS SHOWN ON PLANS ARE BASED ON END-SECTION DESIGN SHOWN ON THE LEFT. IF THE CONTRACTOR ELECTS TO USE THE ALTERNATE DESIGN SHOWN ON THE RIGHT, LENGTHS WILL BE REDUCED BY THE DIFFERENCE IN DIMENSION "D".

SPECIFICATION REFERENCE
 302

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

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/01
 102.01



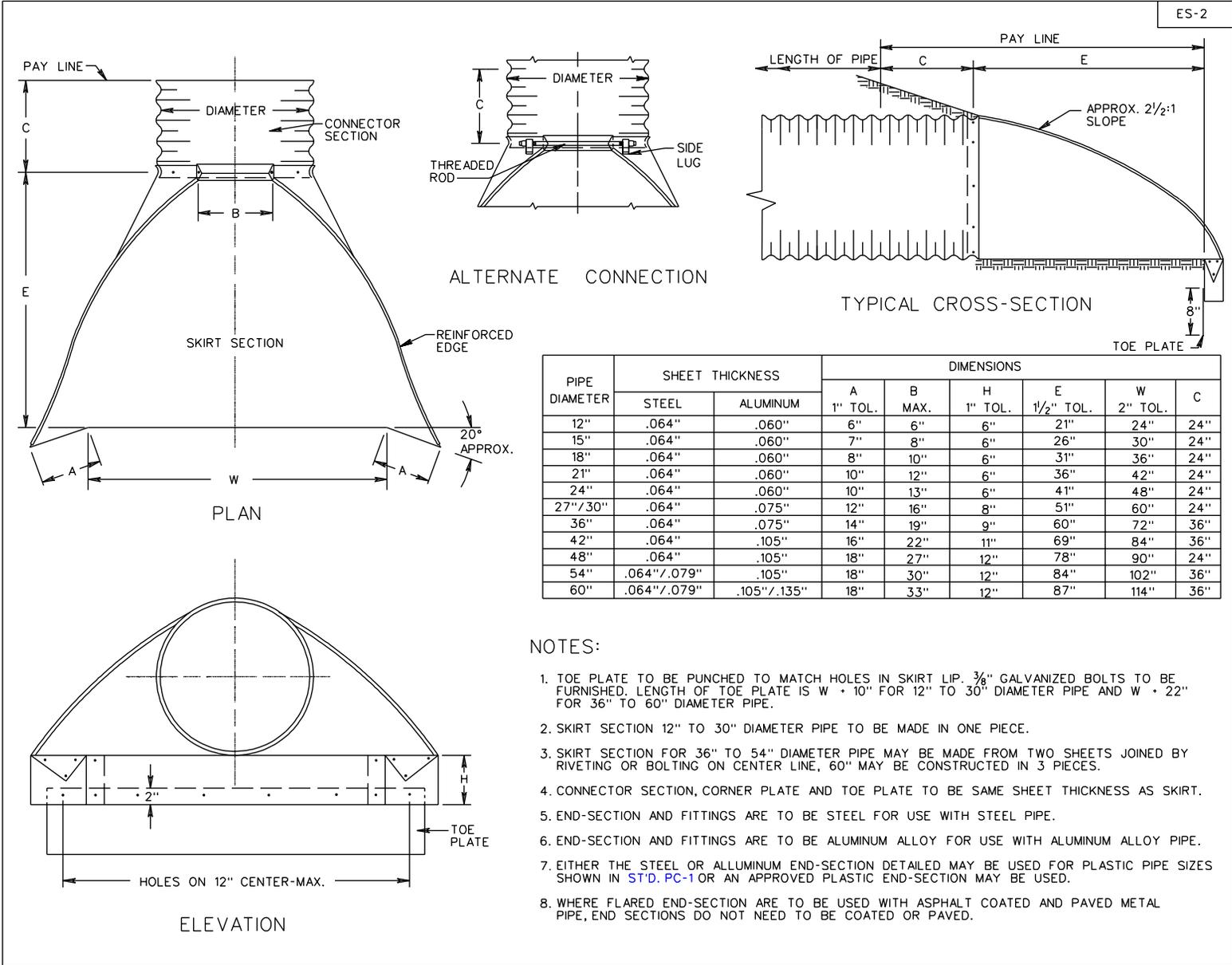
FLARED END-SECTION FOR 23" X 14" TO 53" X 34"
ELLIPTICAL CONCRETE PIPE CULVERTS

REV. 7/01
102.02

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
REFERENCE

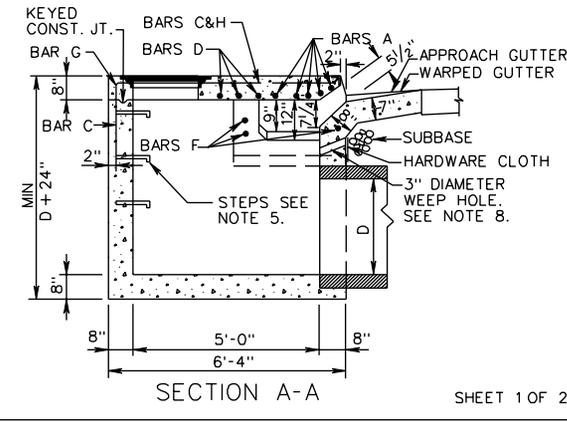
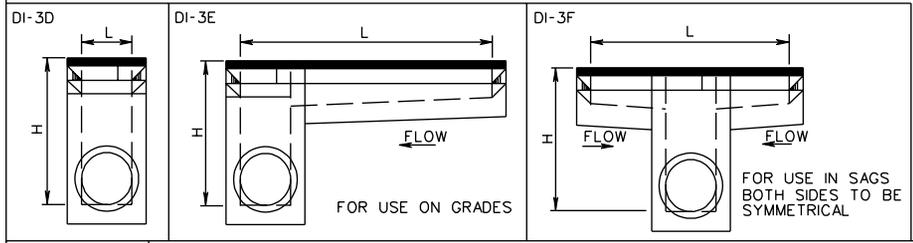
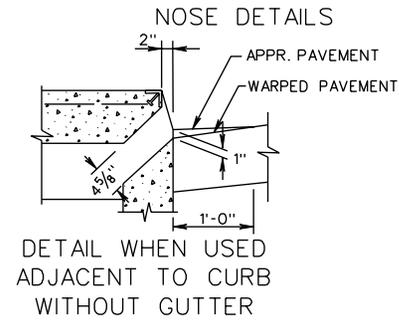
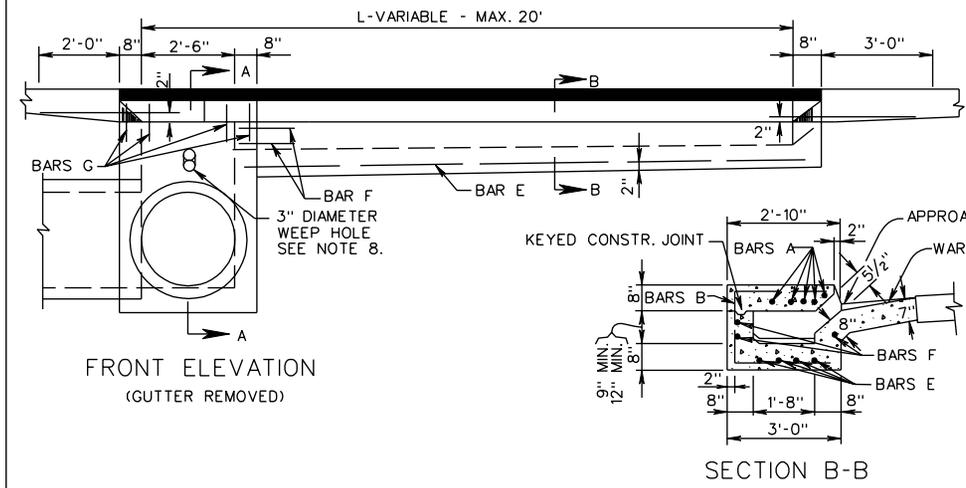
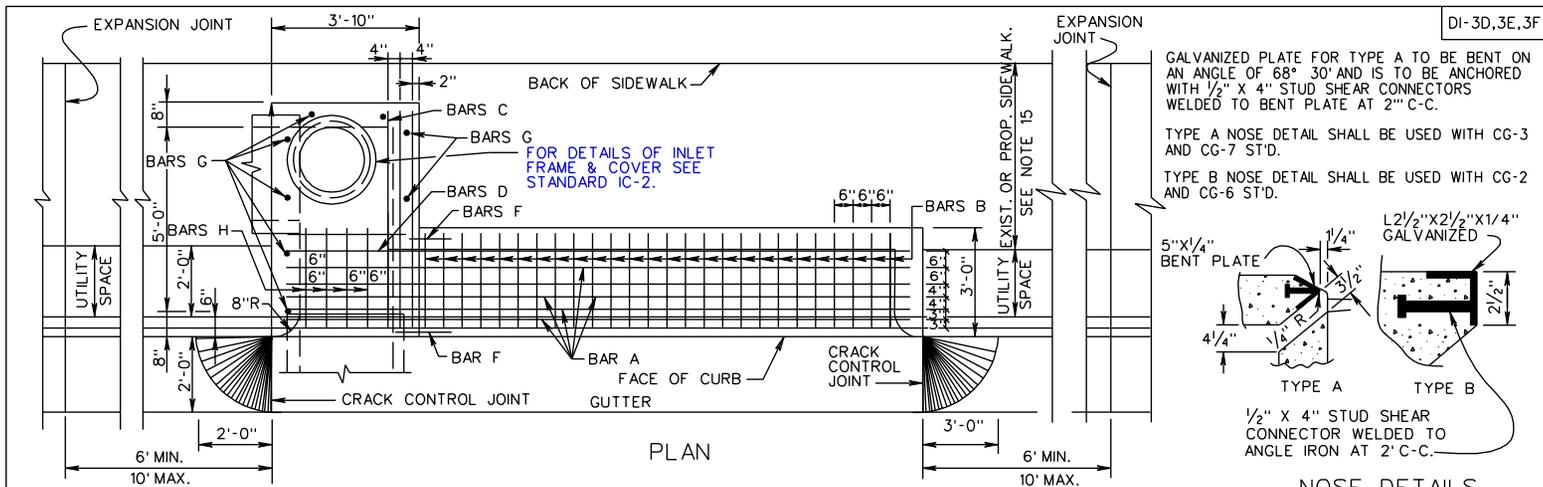
302



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.



SPECIFICATION REFERENCE	STANDARD CURB DROP INLET (WITH UTILITY SPACE)		
233 302	12" - 30" PIPE: MAXIMUM DEPTH (H) = 8'		REV. 7/01
	VIRGINIA DEPARTMENT OF TRANSPORTATION		104.12

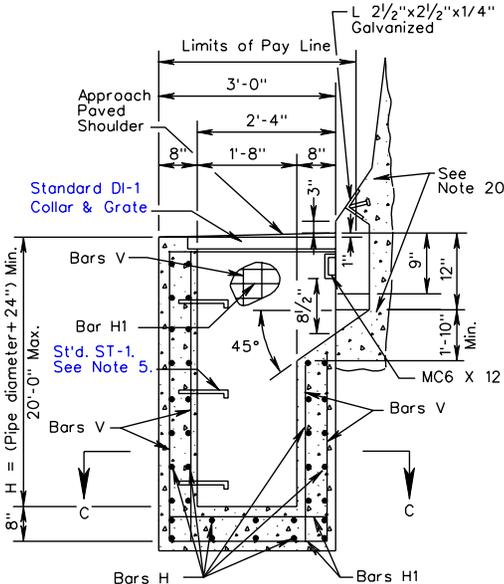
DI-10J,10K,10L

TYPE I & III INLET

REINFORCING STEEL				
MARK	SIZE	NO.	LENGTH	SPACE
A	#4	6	L - 2'-6"	AS SHOWN
See Note 9	#4	See Note 7	See Note 8	
A-1	#4	(2xL)+2	4'-0"	12
See Note 11				
B	#3	2x(L-4)	1'-1"	12
See Note 9				
B-1	#4	9	L+(2'-4")	8
See Note 11				
DOWELS	#4	See Note 6	1'-0"	6
F	#5	3	1'-6"	6
See Note 9		See Note 10		
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	16 See Note 12	7'-8"	10"
V-1	#4	12	H - (1'-2")	8"
V-2	#4	30	LENGTH = H	8"
A	#4	12	L - (2'-6")	AS SHOWN
See Note 15		See Note 14	See Note 8	
B	#3	4(L-4)	1'-1"	12"
See Note 15				
DOWELS	#4	DOUBLE NO. SHOWN FOR TYPE I	1'-0"	6"
F	#5	6 See Note 13	1'-6"	6"
See Note 15				
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"

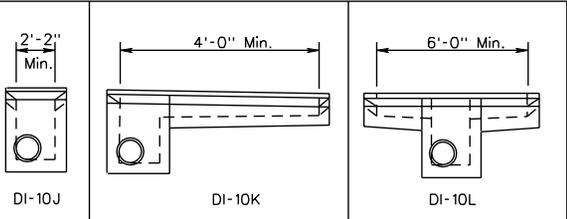


FOR USE ADJACENT TO WALL OR BARRIER WITH SAFETY SHAPE (TYPE III)

- 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.

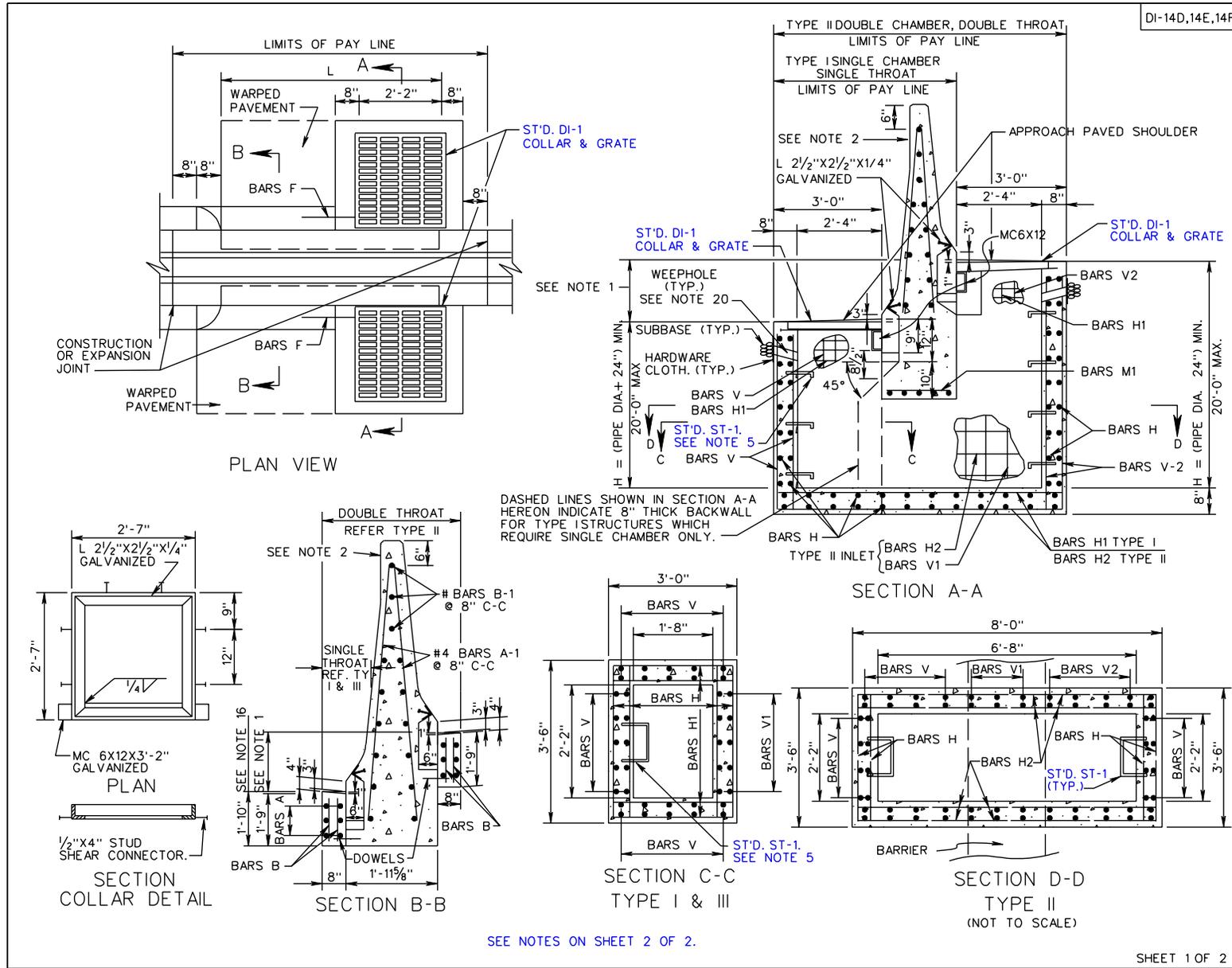


CONCRETE BARRIER DROP INLET (WITH MB-8A)
12"-24" PIPE: DEPTH (H) = 20' MAX.
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/01
104.29

Sheet 2 of 2

SPECIFICATION REFERENCE
233 302



SEE NOTES ON SHEET 2 OF 2.

SHEET 1 OF 2

SPECIFICATION REFERENCE	
233	
302	

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

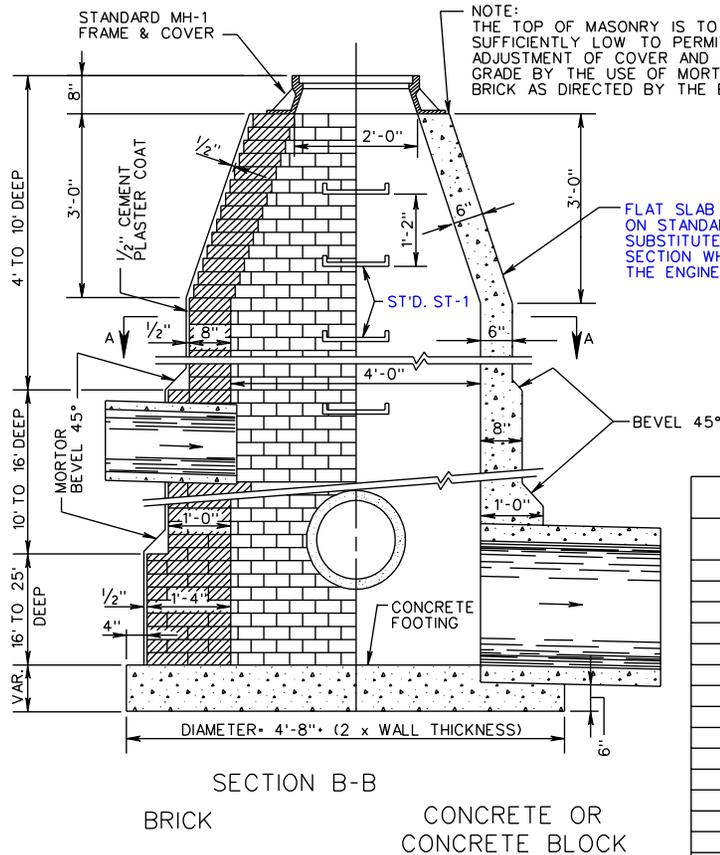
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/01

104.40

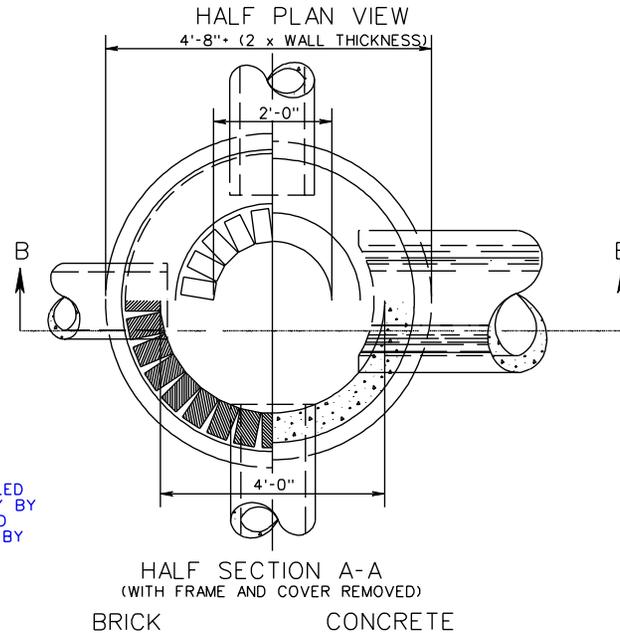
MH-1

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.



- 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	CONCRETE
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 $\frac{D+3}{2}$ 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 $\frac{D+2}{2}$ 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 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.

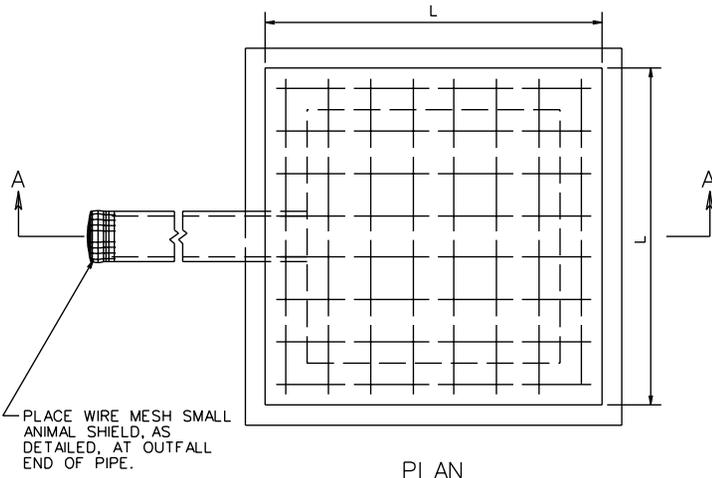
** THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL IS TO EXTEND A MINIMUM OF (10)(DIAMETER + 1/2 DIAMETER) ON EACH SIDE OF THE STRUCTURE, OR TO THE INTERSECTION WITH A CUT.

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

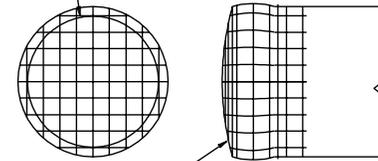
VITRIFIED CLAY AND PLASTIC PIPE
MAXIMUM COVER TABLE FOR H-20 LIVE LOAD

SB-1



PLAN

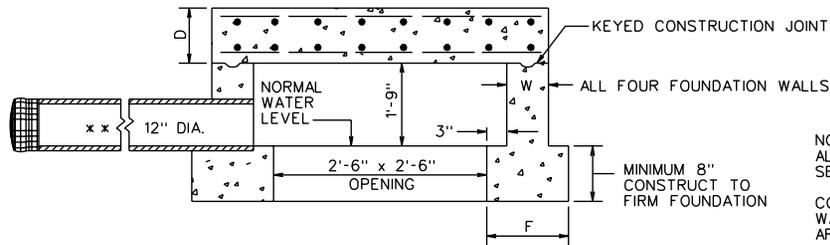
3/4" x 3/4" MESH,
HARDWARE CLOTH
MIN. 17 GAUGE,
GALVANIZED
AFTER WEAVING.



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.

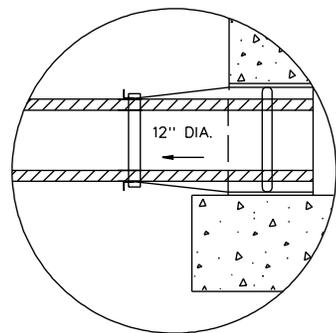
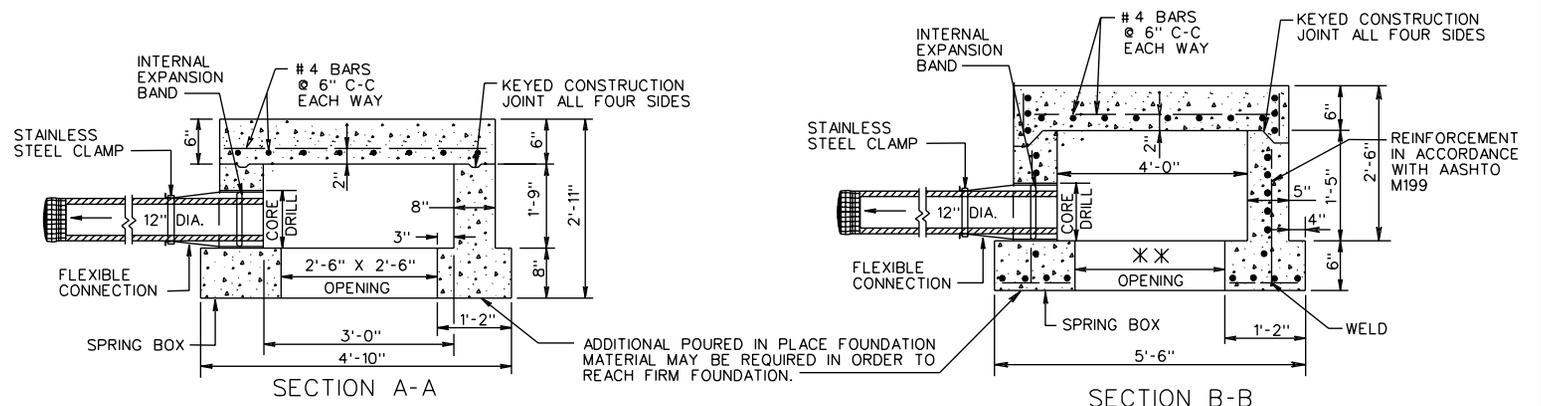
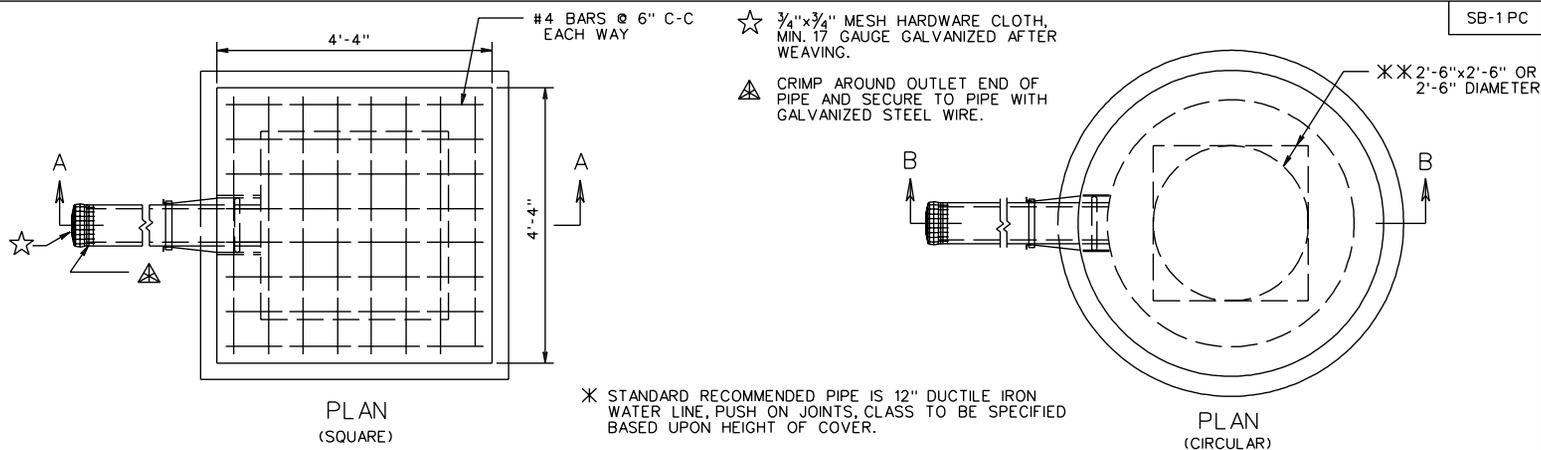
STANDARD SPRING BOX

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/01
110.01

SPECIFICATION
REFERENCE

105
232
302



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 $\frac{3}{8}$ " 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.

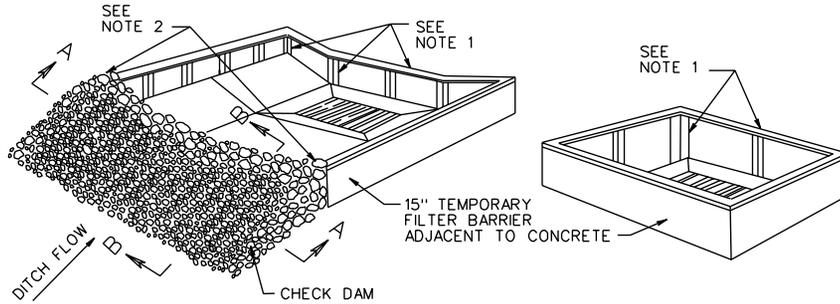
DIMENSIONS SHOWN ARE MINIMUM. ACTUAL MEASUREMENTS MAY VARY WITH MANUFACTURER'S TOLERANCES.

SPECIFICATION REFERENCE
105

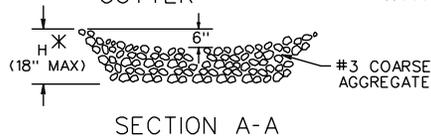
PRECAST SPRING BOX
VIRGINIA DEPARTMENT OF TRANSPORTATION

EC-6

DROP INLET SILT TRAP (TYPE A)

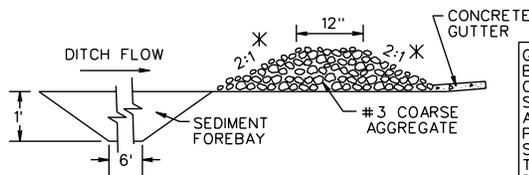


TYPICAL TREATMENT FOR DROP INLET WITH CONCRETE GUTTER



SECTION A-A

* IF CHECK DAM IS LOCATED INSIDE CLEAR ZONE AND ADJACENT TO A TRAVELWAY, SLOPE FACING ON COMING TRAFFIC IS TO BE 6:1 AND MAXIMUM H IS TO BE 12".

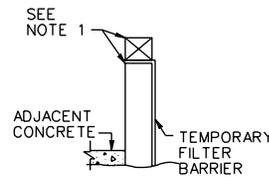


SECTION B-B

NOTES

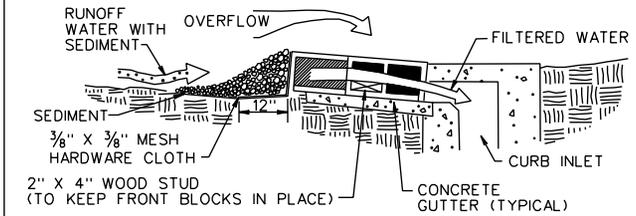
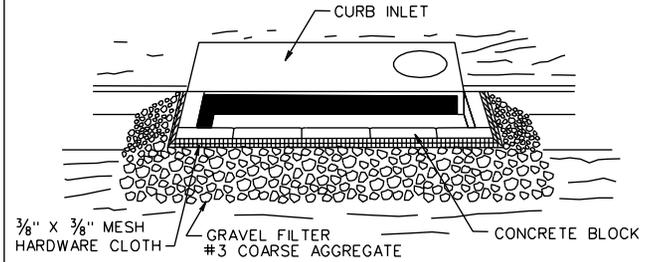
1. POSTS AND TOP RAIL SHALL BE A NOMINAL 2 1/2" X 2 1/2" OR A 3" DIA. NO. 2 SOUTHERN PINE, A NOMINAL 2" X 2" OAK, OR STEEL HAVING A MIN. WEIGHT OF 1.25 LBS. PER LINEAR FOOT AND A MIN. LENGTH OF 5' FOR TEMPORARY SILT FENCES.
2. END OF FILTER BARRIER TO BE EMBEDDED INTO AGGREGATE.
3. IF A DROP INLET IS LOCATED IN A SAG IN THE DITCH GRADE, A CHECK DAM IS REQUIRED FOR EACH SIDE OF THE INLET THAT RECEIVES DITCH FLOW.
4. WHERE DRAINAGE AREAS EXCEED ONE ACRE OR DITCH GRADE EXCEEDS 3%, A TEMPORARY SEDIMENT FOREBAY SHALL BE INSTALLED WITH MINIMUM DIMENSIONS OF 12" DEPTH, 2' WIDTH AND 6' LENGTH.

TYPICAL TREATMENT FOR DROP INLET WITHOUT CONCRETE GUTTER



GEOTEXTILE PRODUCTS DESIGNED TO BE INSERTED INTO GRATED DROP INLETS OR DESIGNED TO COVER THE SLOTS OF SLOT DROP INLETS, THAT HAVE BEEN APPROVED FOR USE ON VDOT'S SPEL LIST, MAY BE SUBSTITUTED FOR THE DROP INLET PROTECTION DEVICES DETAILED HEREON.

DROP INLET SILT TRAP TYPE B (BLOCK AND GRAVEL)

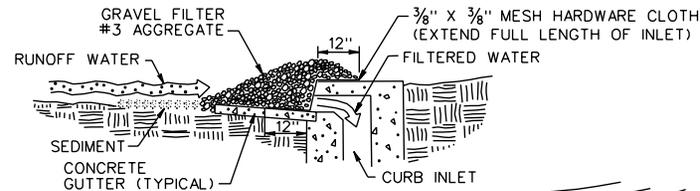


SECTION VIEW

SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE AT CURB INLETS WHERE AN OVERFLOW CAPABILITY IS NECESSARY TO PREVENT EXCESSIVE PONDING IN FRONT OF THE STRUCTURE.

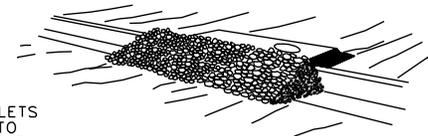
ALTERNATE DROP INLET SILT TRAP TYPE B (GRAVEL)



SECTION VIEW

SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE AT CURB INLETS WHERE PONDING IN FRONT OF THE STRUCTURE IS NOT LIKELY TO CAUSE INCONVENIENCE OR DAMAGE TO ADJACENT STRUCTURES AND UNPROTECTED AREAS.



SPECIFICATION REFERENCE

- 107
- 242
- 303

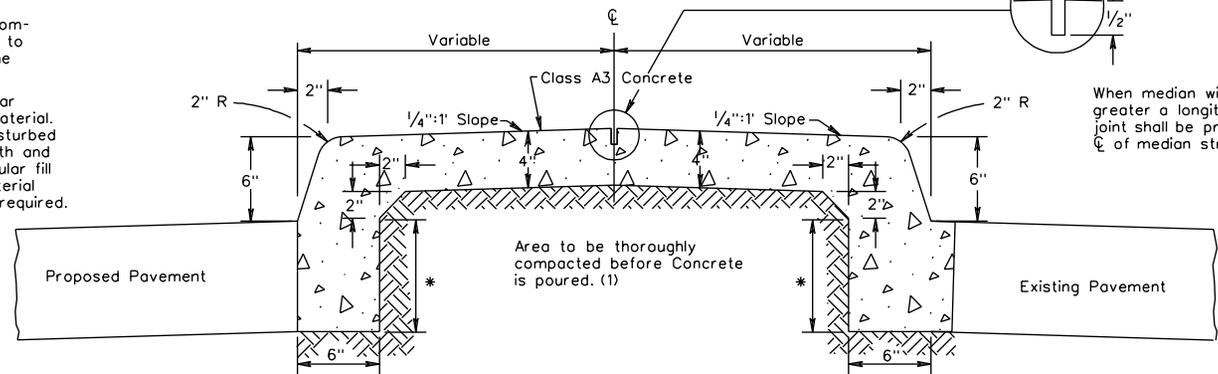
DROP INLET SILT TRAP (TYPE A AND B)

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/01

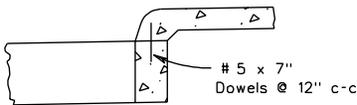
114.07

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

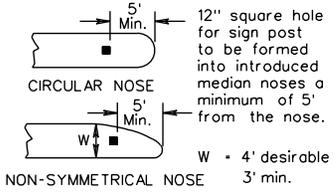
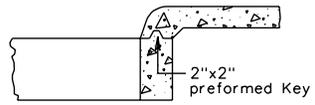


When median width is 3 feet or greater a longitudinal contraction joint shall be provided along C of median strip.

SUGGESTED CONSTRUCTION METHOD IF TOP SLAB IS POURED SEPARATELY

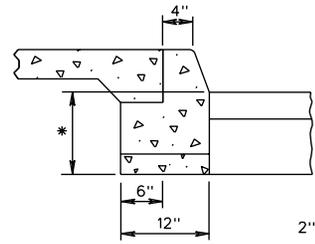


ALTERNATE CONSTRUCTION METHOD IF TOP SLAB IS POURED SEPARATELY

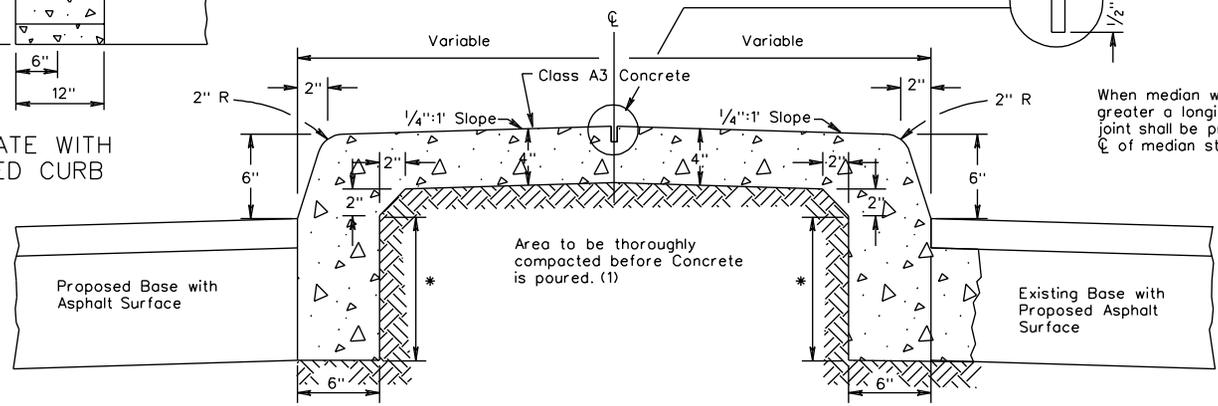


* The depth of curb may be reduced as much as 3" (9" depth) or increased as much as 3" (15" depth) in order that the bottom of curb will coincide with the top of a course of the pavement substructure. Otherwise the depth is to be 12" as shown. No adjustment in the price bid is to be made for a decrease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

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



ALTERNATE WITH EXTRUDED CURB



When median width is 3 feet or greater a longitudinal contraction joint shall be provided along C of median strip.

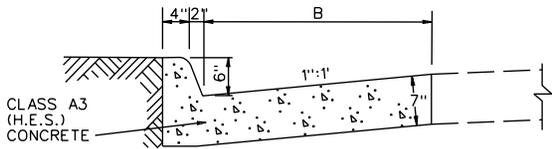
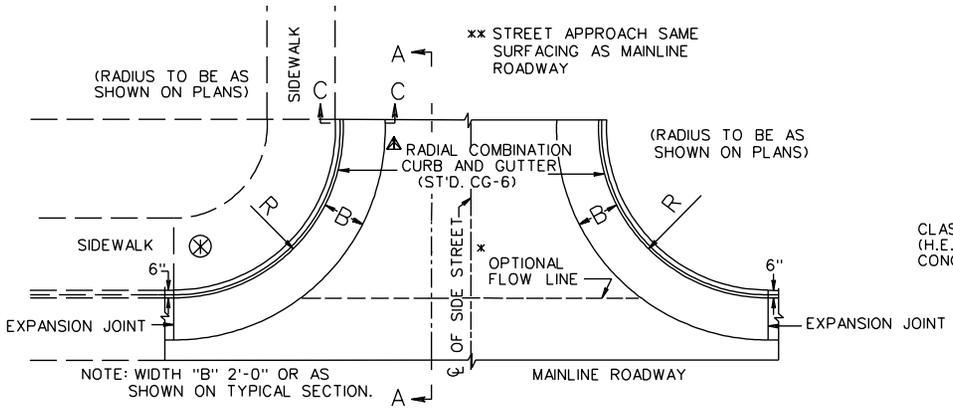
SPECIFICATION REFERENCE
502

STANDARD SOLID CONCRETE RAISED MEDIAN STRIP

VIRGINIA DEPARTMENT OF TRANSPORTATION

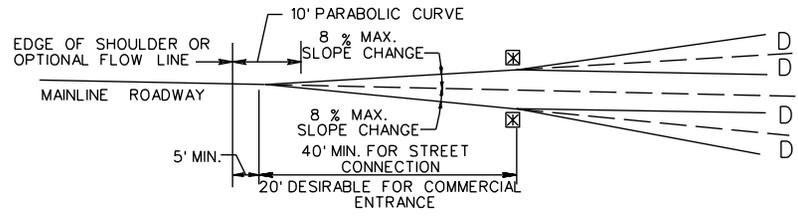
REV. 7/01

202.03



SECTION C-C

PLAN VIEW



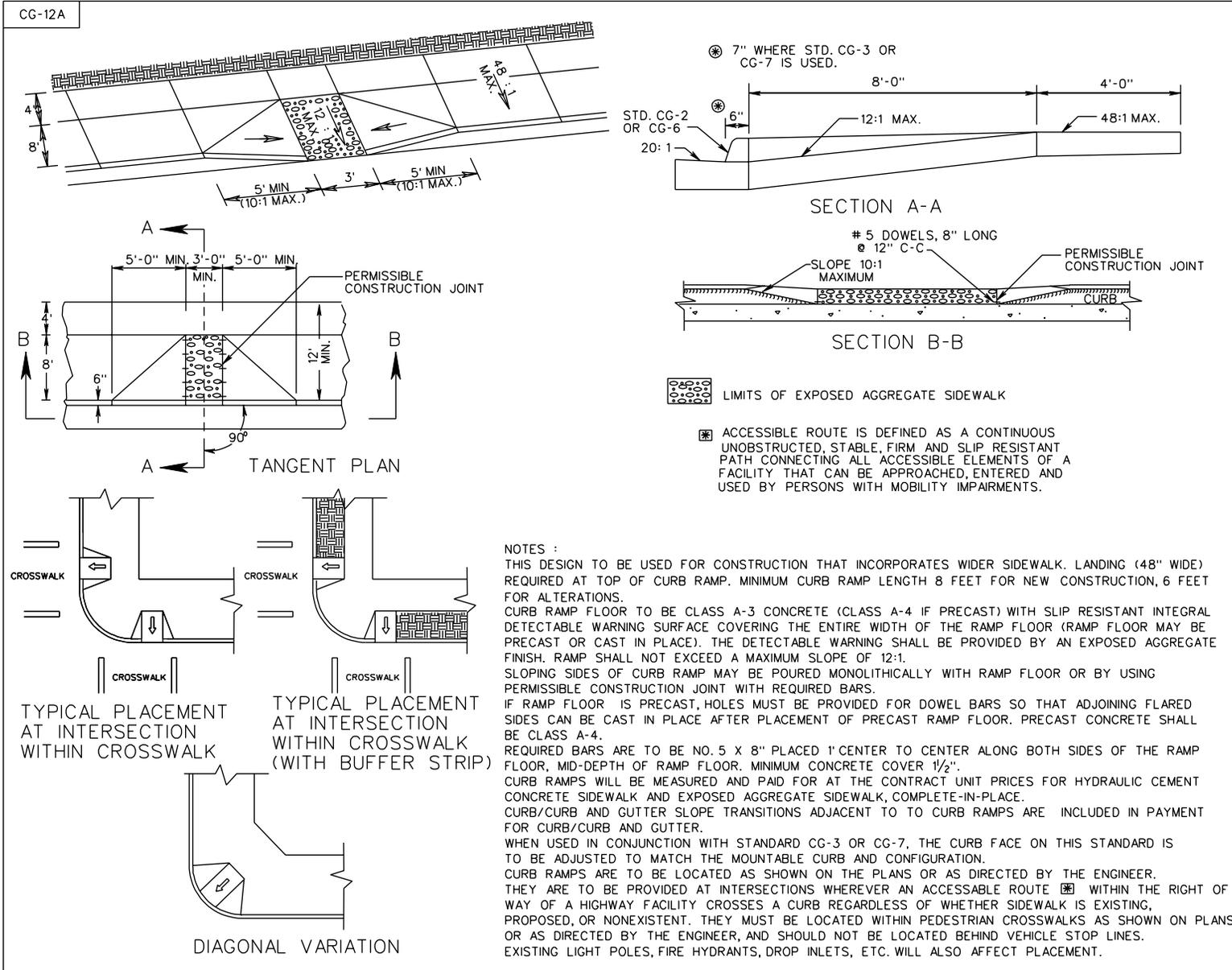
SECTION A - A
GUIDELINES FOR GRADE CHANGE D

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 RADII 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



PERPENDICULAR CURB RAMP
(ACCESS FOR MOBILITY IMPAIRMENTS)

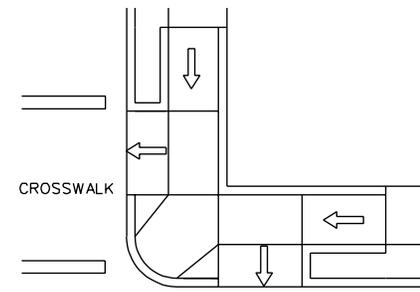
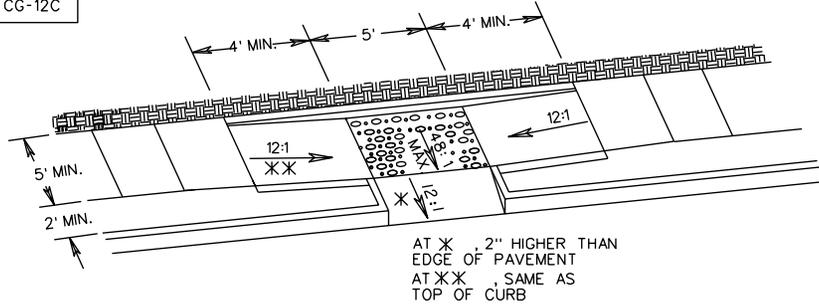
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/01
203.05

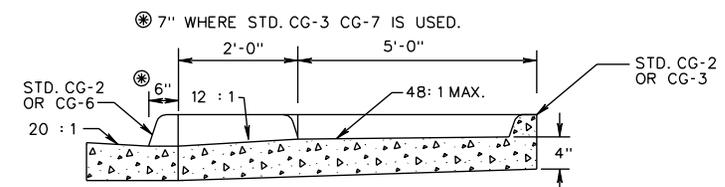
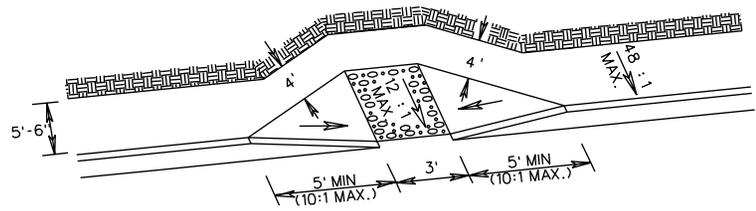
SPECIFICATION
REFERENCE

105
502

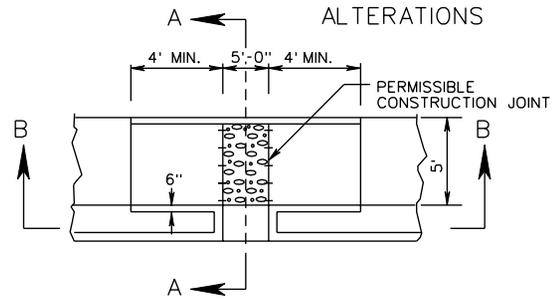
CG-12C



TYPICAL PLACEMENT AT INTERSECTION WITH BUFFER STRIP

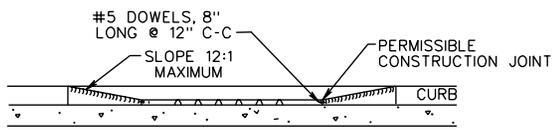


SECTION A-A



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.



SECTION B-B

⊗ 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)

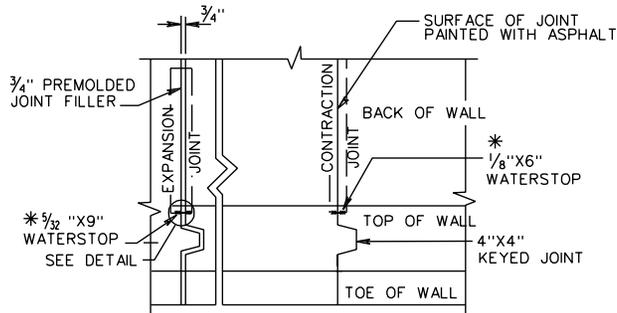
REV. 7/01
203.07

VIRGINIA DEPARTMENT OF TRANSPORTATION

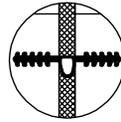
SPECIFICATION REFERENCE

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

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

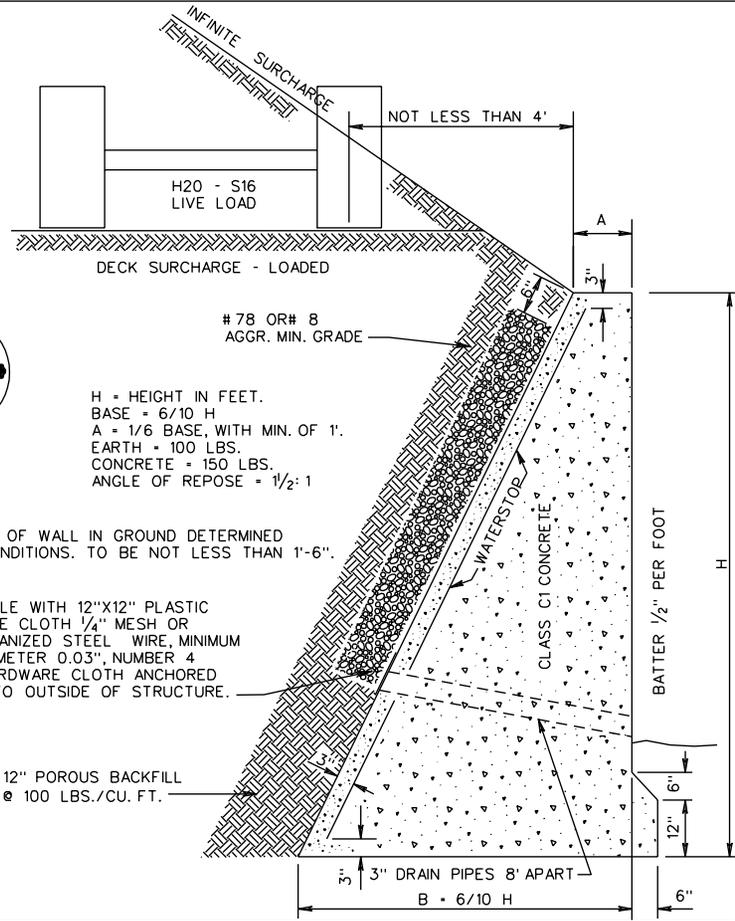
WEEP HOLE WITH 12"X12" PLASTIC
 HARDWARE CLOTH 1/4" MESH OR
 OR GALVANIZED STEEL WIRE, MINIMUM
 WIRE DIAMETER 0.03", NUMBER 4
 MESH HARDWARE CLOTH ANCHORED
 FIRMLY TO OUTSIDE OF STRUCTURE.

12" POROUS BACKFILL
 @ 100 LBS./CU. FT.

3" DRAIN PIPES 8' APART
 B = 6/10 H

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.



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 3/8"	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 3/8"	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 3/8"	3709	59.78
14	1'-4 3/4 "	8'-4 3/4"	3995	69.23
15	1'-6"	9'-0"	4280	79.38

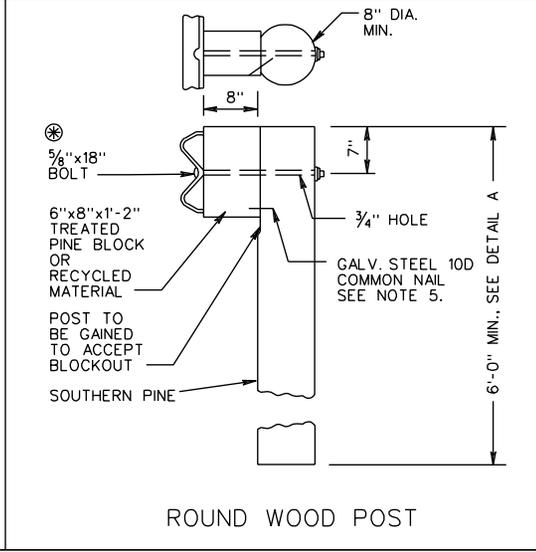
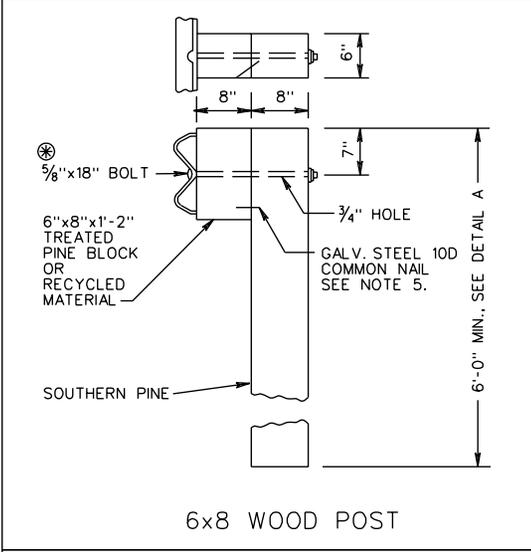
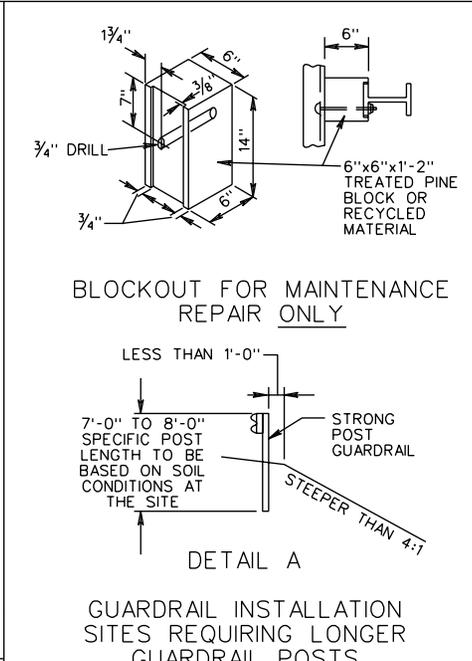
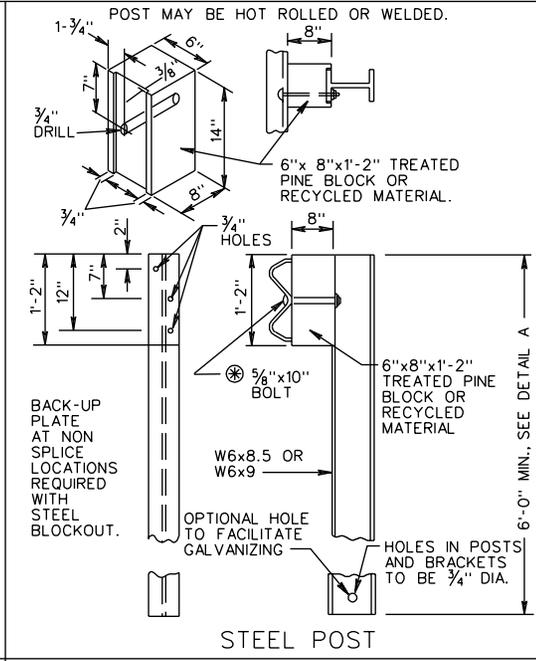
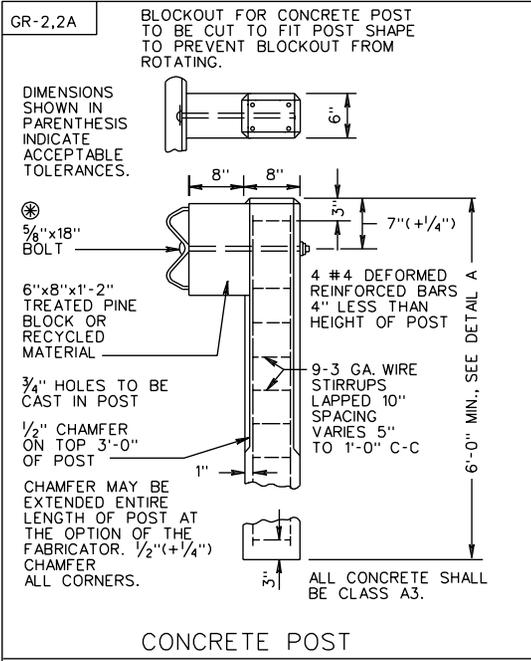
CONCRETE GRAVITY RETAINING WALLS INFINITE SURCHARGE AND DECK SURCHARGE - LOADED

REV. 7/01
 401.02

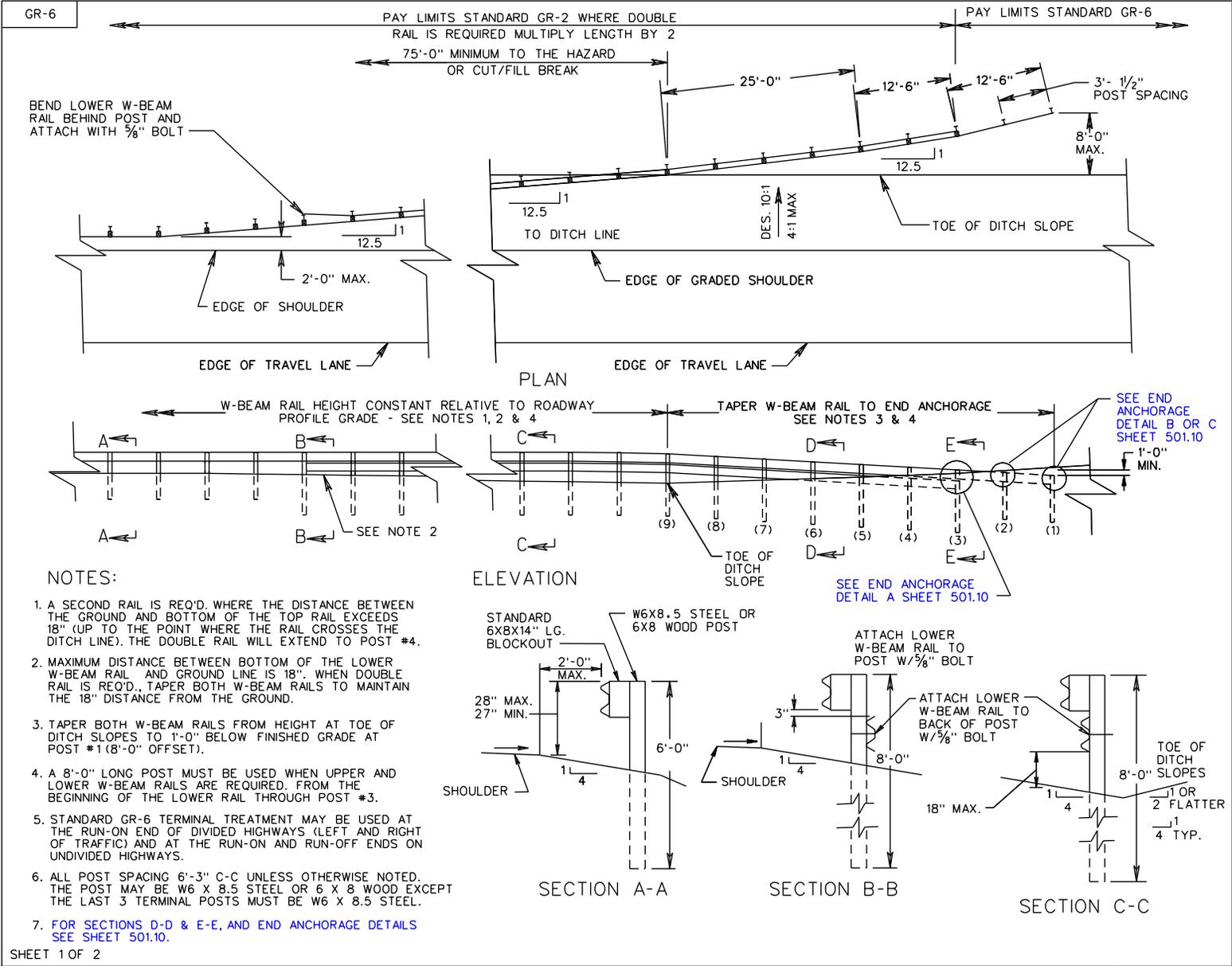
VIRGINIA DEPARTMENT OF TRANSPORTATION

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.

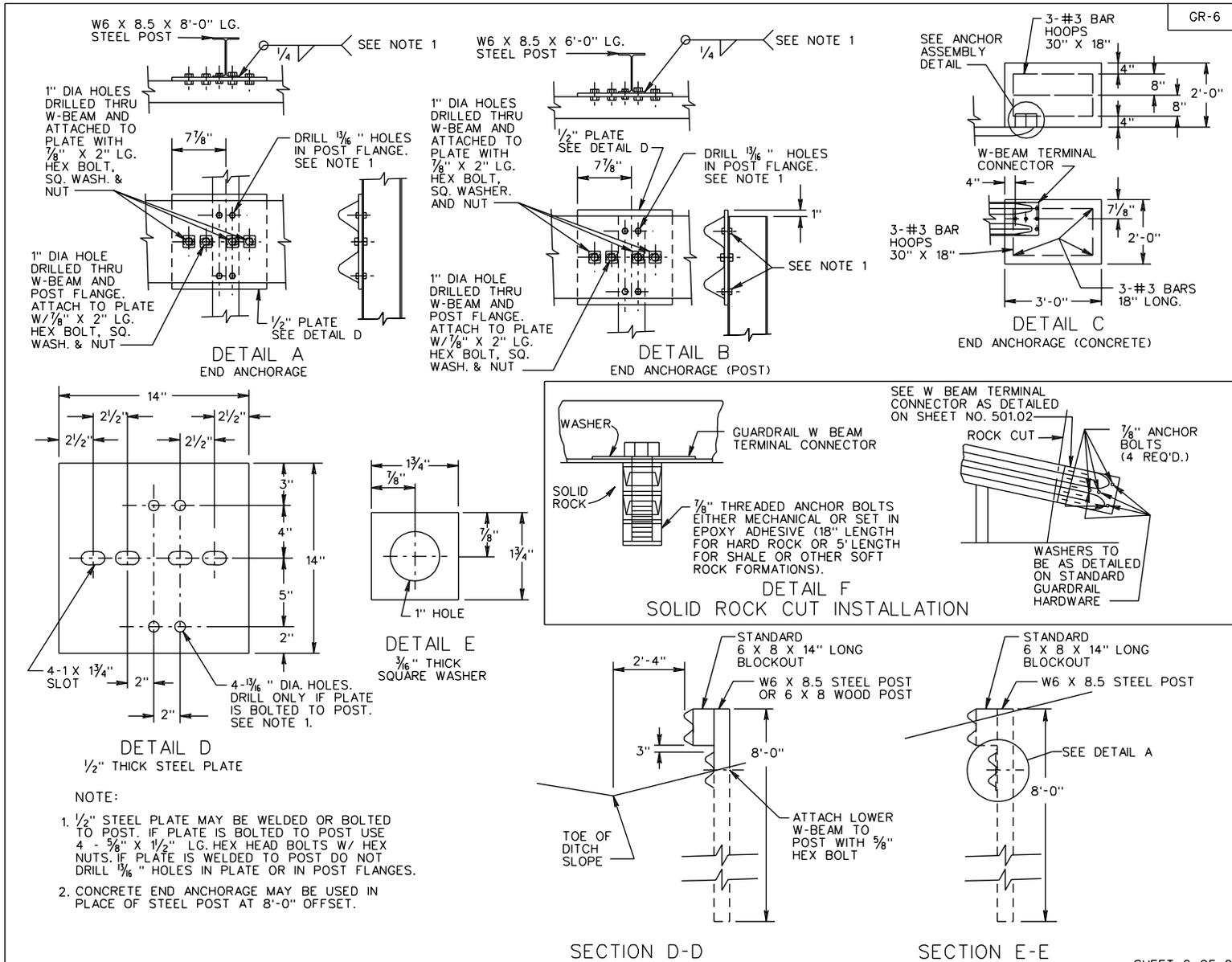


TERMINAL TREATMENT FOR W BEAM GUARDRAIL

REV. 7/01
501.09

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
505 221

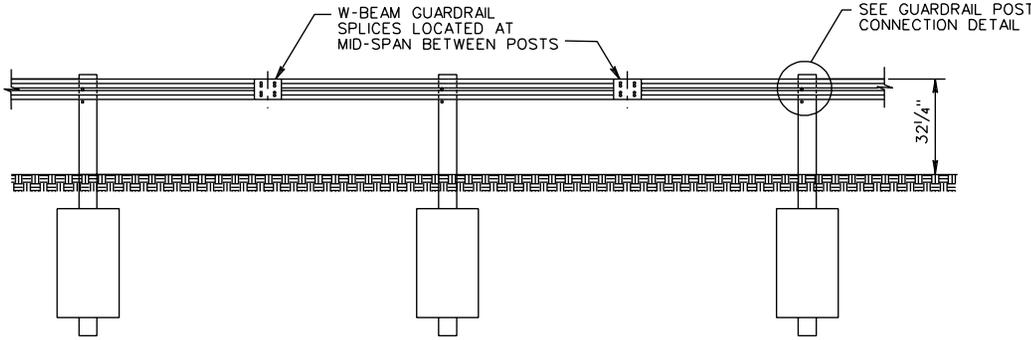


GR-6

<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

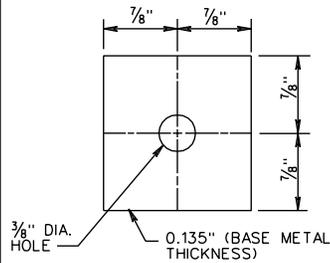
STANDARD	POST SPACING	DEFLECTION
GR-8	12' - 6"	7' - 0"
GR-8A	6' - 3"	5' - 0"
GR-8B	3' - 1 1/2"	4' - 0"
GR-8C	4' - 2"	4' - 6"

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.

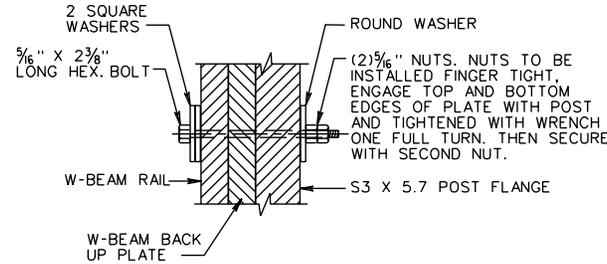
ALL POSTS, BOLTS, NUTS AND WASHERS ARE TO BE GALVANIZED.

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.

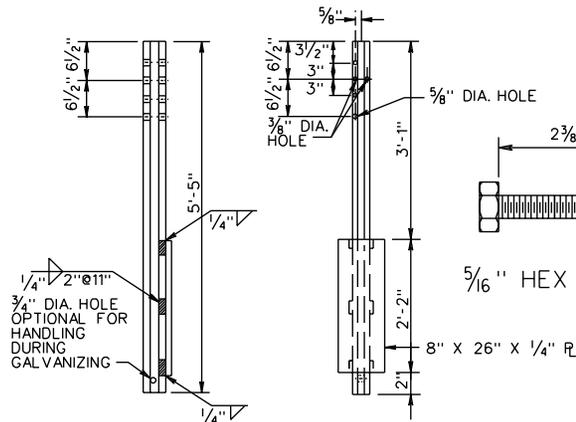


SQUARE WASHER

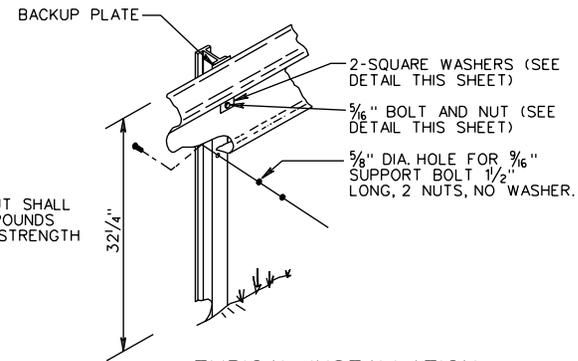
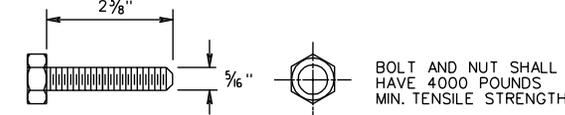


GUARDRAIL POST CONNECTION DETAIL

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



TYPICAL INSTALLATION

SHEET 1 OF 2

SPECIFICATION REFERENCE

221
505

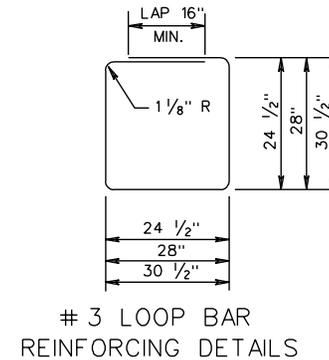
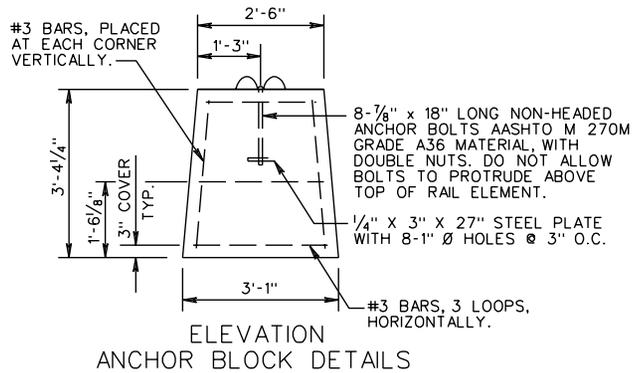
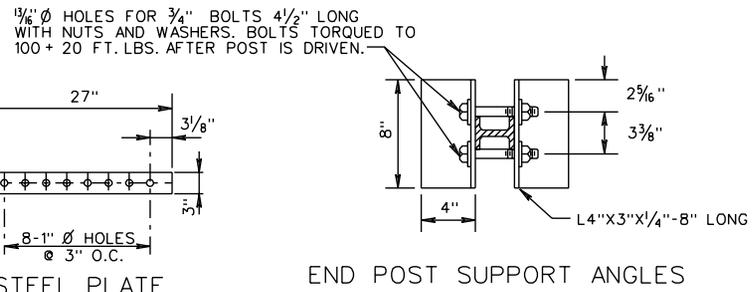
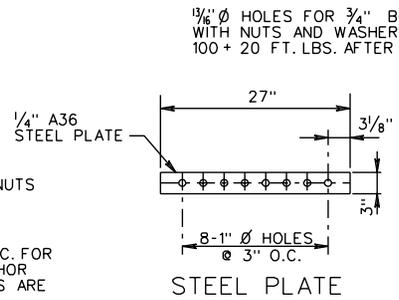
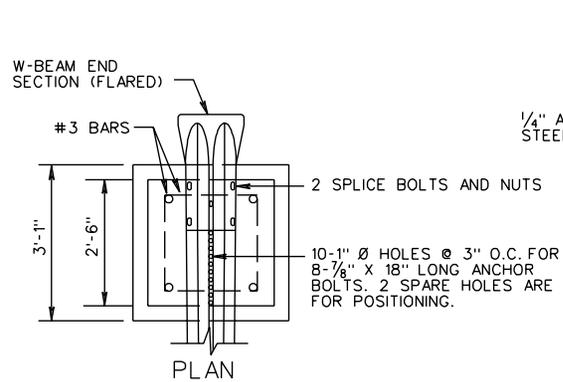
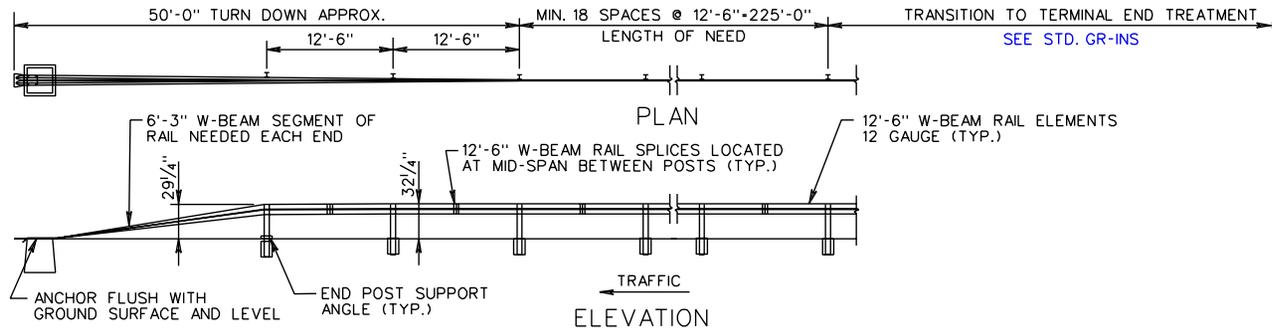
STANDARD W BEAM GUARDRAIL (WEAK POST SYSTEM)
TL-3 (>45 MPH)

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

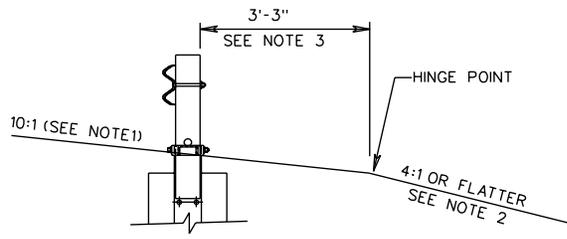
STANDARD W BEAM GUARDRAIL (WEAK POST SYSTEM)
TL-3 (>45 MPH)

VIRGINIA DEPARTMENT OF TRANSPORTATION

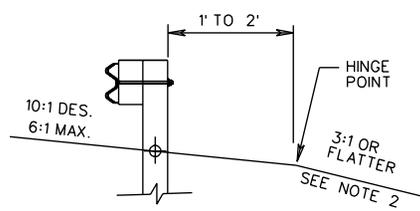
SPECIFICATION REFERENCE

221
505

REV. 7/01
501.15

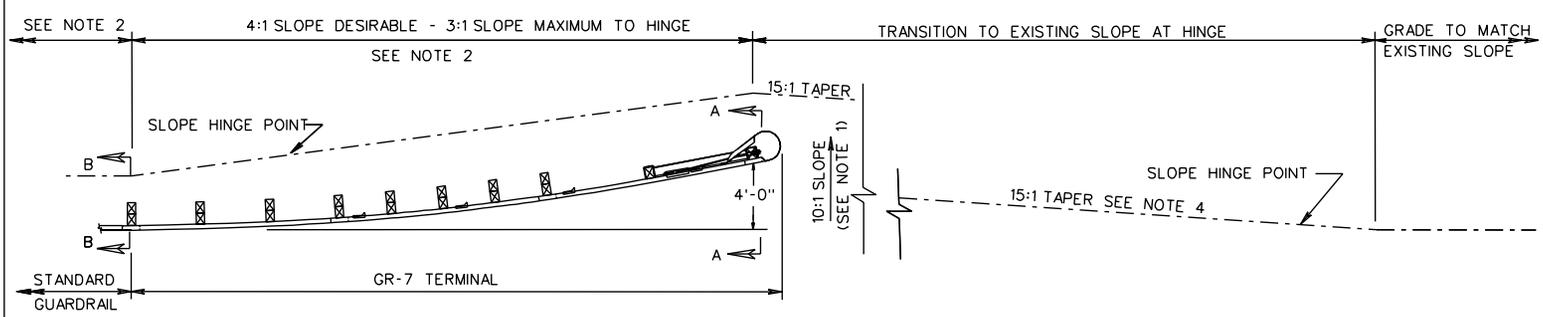


SECTION A-A

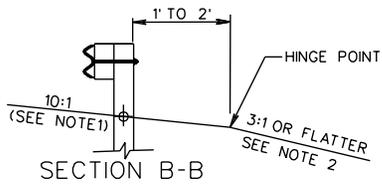
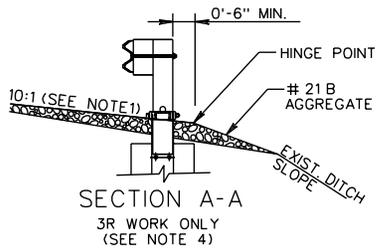
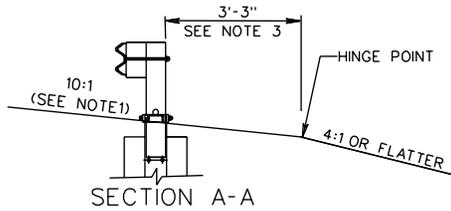


SECTION B-B

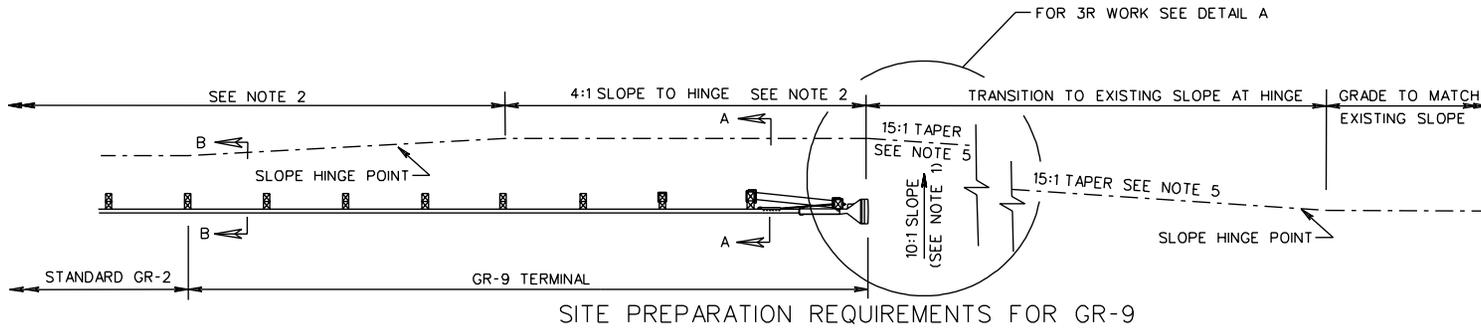
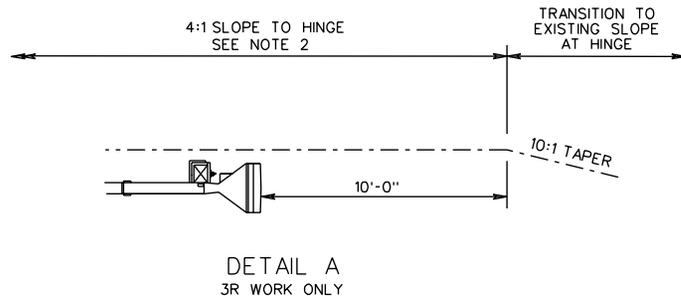
- NOTES:
1. DESIRABLY, THE CROSS SLOPE OF THE GRADE APPROACHING THE GUARDRAIL TERMINAL, AND ADJACENT TO FOR ITS FULL LENGTH, MUST BE 10:1. IF THE EXISTING GRADE IS FLAT OR IS A POSITIVE SLOPE DUE TO THE SUPERELEVATION OF THE ROADWAY PAVEMENT, THE MINIMUM OFFSET FROM BEHIND THE POST TO THE HINGE POINT, 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



<p>SPECIFICATION REFERENCE</p>	<p>GUARDRAIL TERMINAL INSTALLATION SITE PREPARATION REQUIREMENTS FOR GR-7 VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	<p>REV. 7/01 501.16</p>
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- 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.



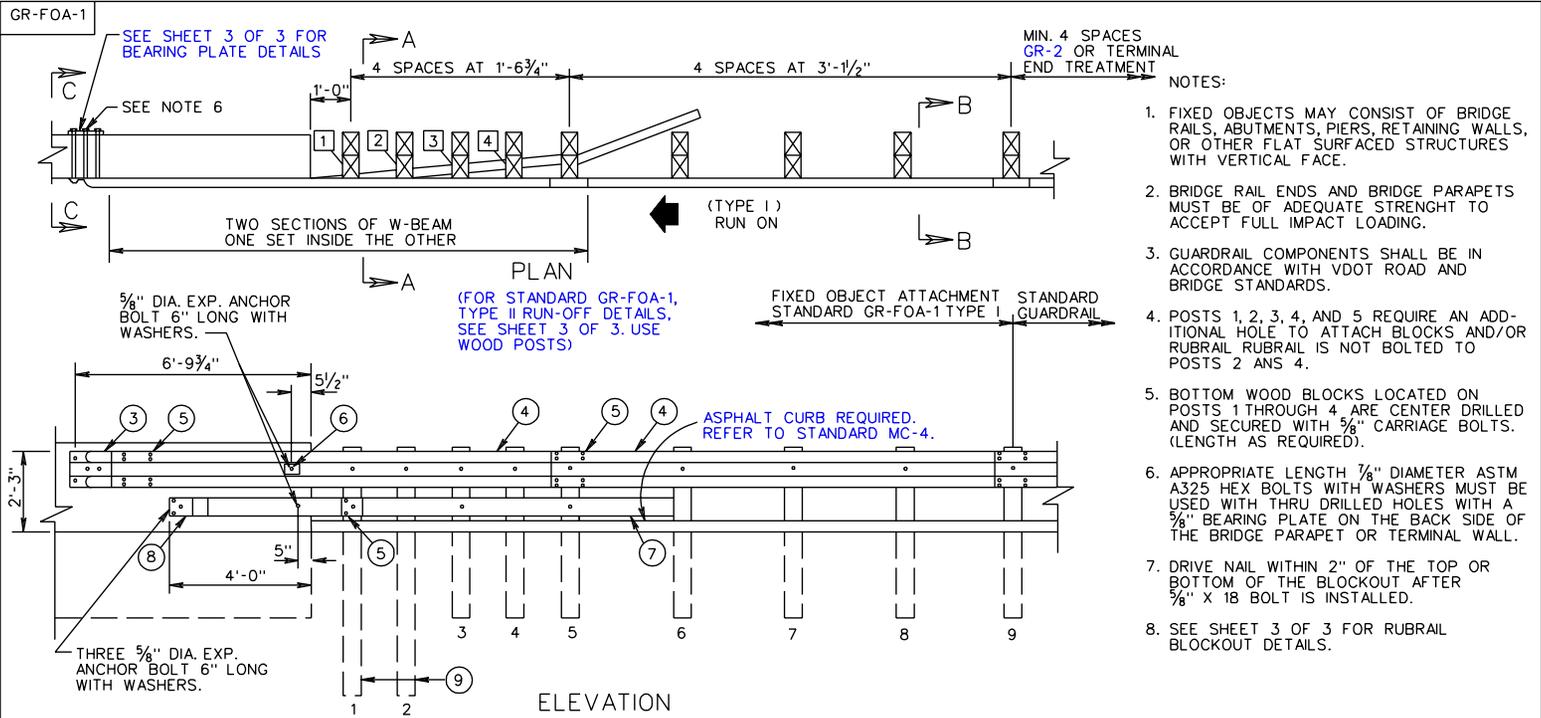
SHEET 2 OF 2

GUARDRAIL TERMINAL INSTALLATION SITE PREPARATION REQUIREMENTS FOR GR-9

REV. 7/01
501.17

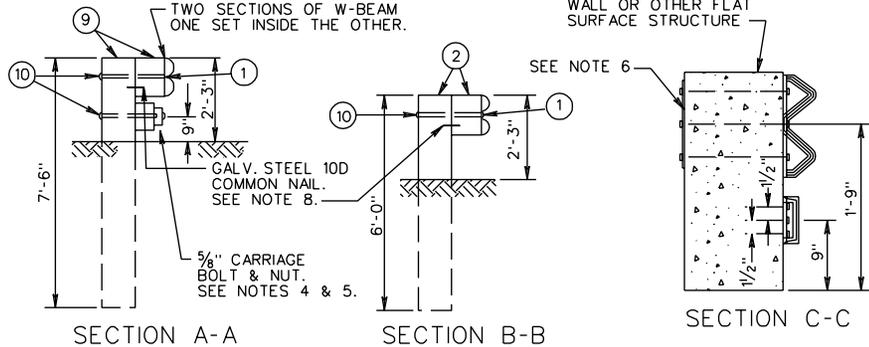
VIRGINIA DEPARTMENT OF TRANSPORTATION

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

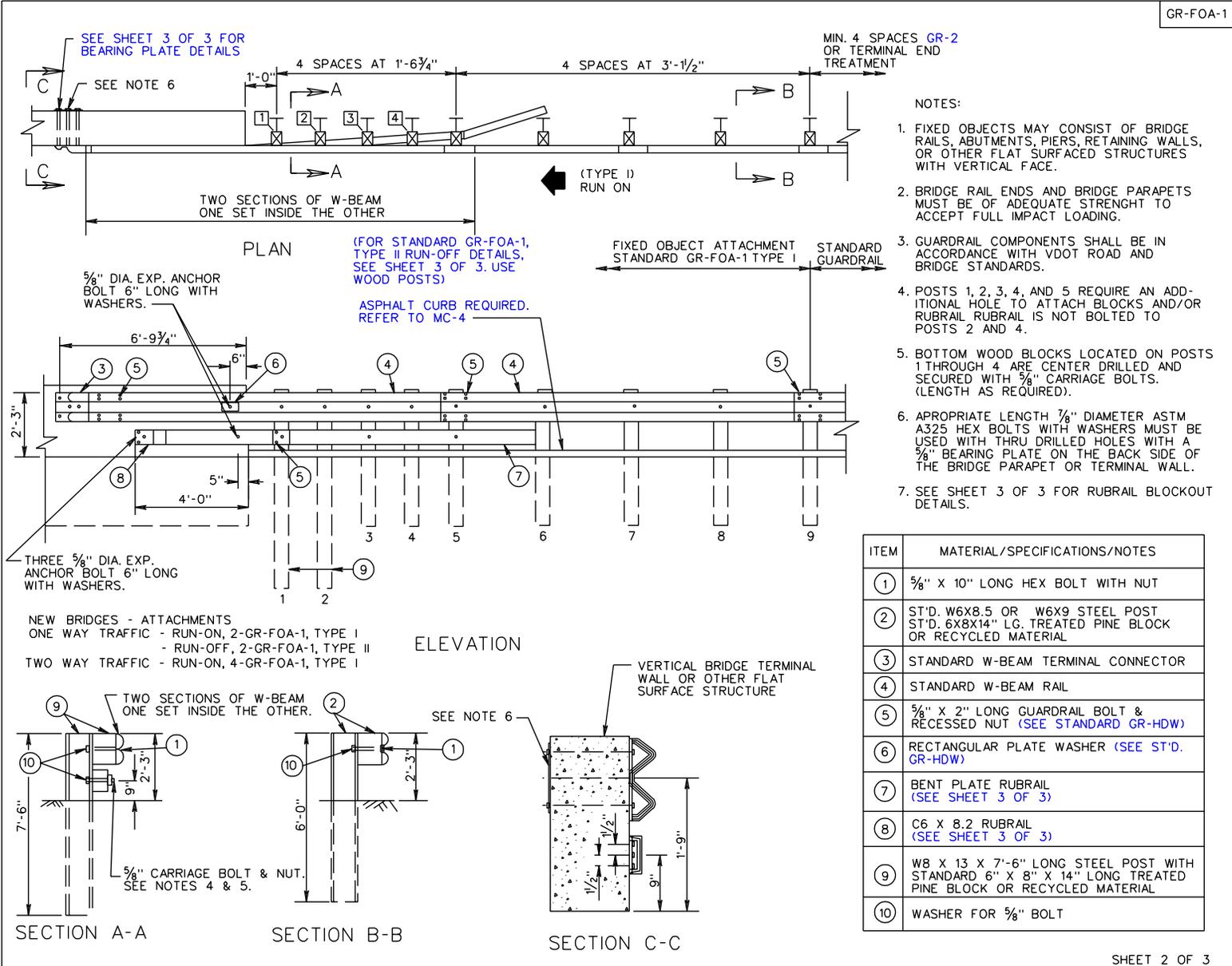
REV. 7/01

SHEET 1 OF 3

W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT
 FOR USE BETWEEN VERTICAL FIXED OBJECTS AND GUARDRAIL (WOOD POSTS)

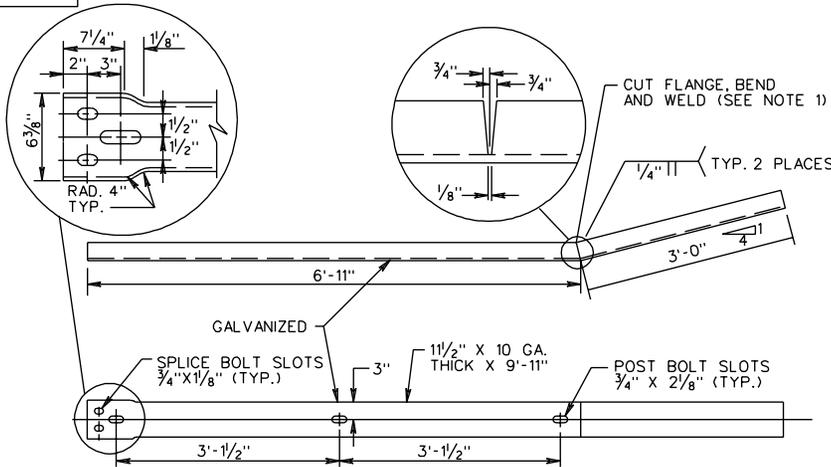
SPECIFICATION REFERENCE

505

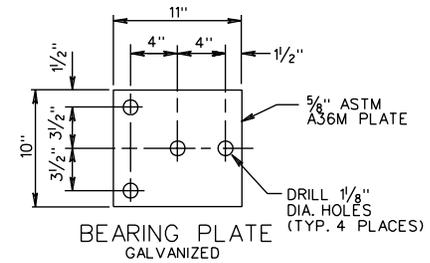


SPECIFICATION REFERENCE	W-BEAM GUARDRAIL-FIXED OBJECT ATTACHMENT FOR USE BETWEEN VERTICAL FIXED OBJECTS AND GUARDRAIL (STEEL POSTS)	REV. 7/01
505	VIRGINIA DEPARTMENT OF TRANSPORTATION	501.26

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.

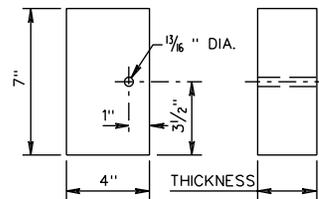
WOOD POSTS
RUBRAIL BLOCKOUTS
7" X 4" X THICKNESS

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

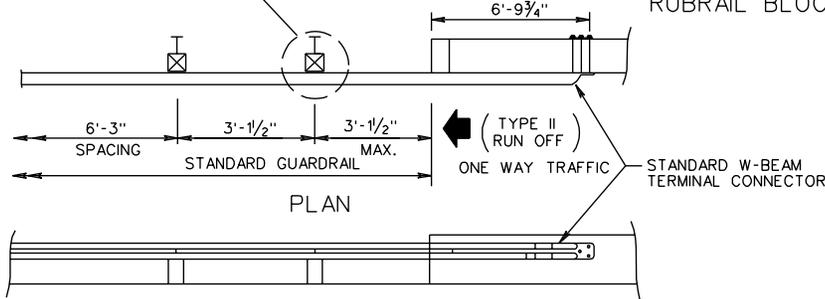
POST	THICKNESS
1	5"
2	3 13/16"
3	2 5/8"
4	1 7/16"

ITEM ⑦ DETAIL

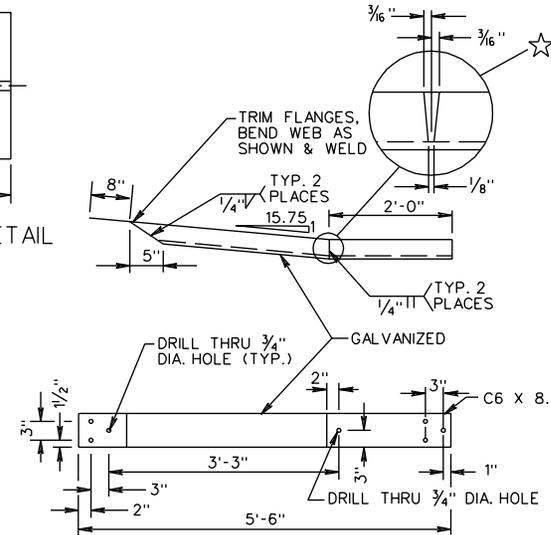


RUBRAIL BLOCKOUT DETAIL

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



ELEVATION



ITEM ⑧ DETAIL

SHEET 3 OF 3

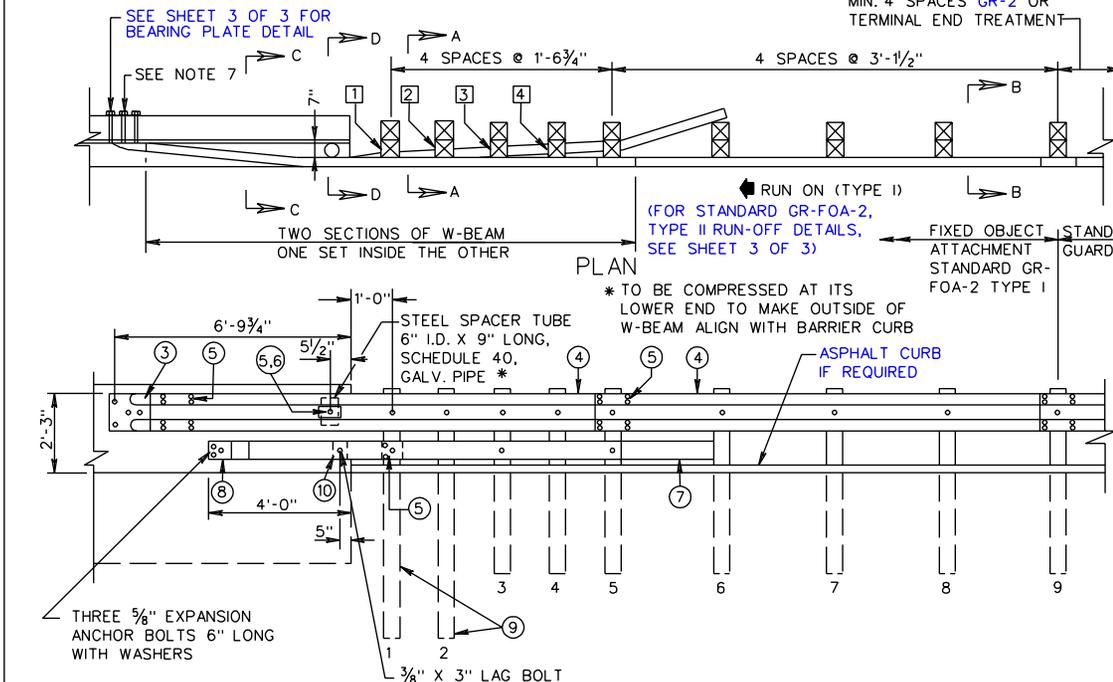
W BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT
RUBRAIL AND HARDWARE DETAILS

SPECIFICATION REFERENCE

505

REV. 7/01
501.27

GR-FOA-2



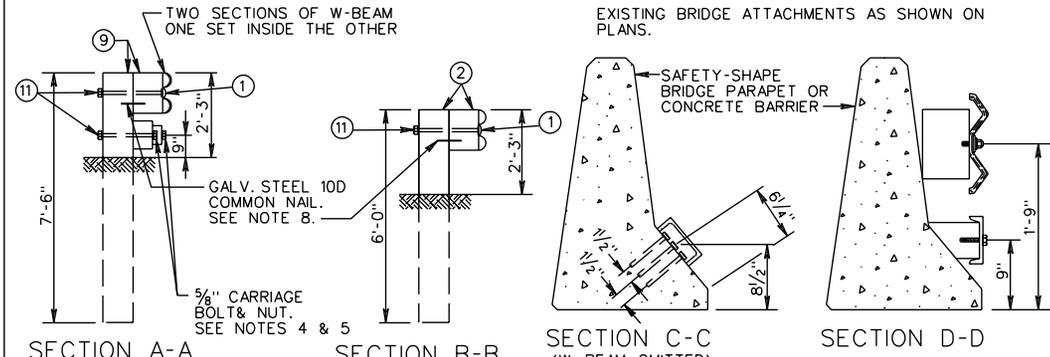
- NOTES:
1. FIXED OBJECTS MAY CONSIST OF SAFETY SHAPED BRIDGE PARAPETS OR CONCRETE BARRIERS.
 2. BRIDGE RAIL ENDS AND BRIDGE PARAPETS MUST BE OF ADEQUATE STRENGTH TO ACCEPT FULL IMPACT LOADING.
 3. GUARDRAIL COMPONENTS SHALL BE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE STANDARDS.
 4. POSTS 1, 2, 3, 4, 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 SECTION C-C AND D-D. SHOP FABRICATION MAY BE REQUIRED. RIGHT HAND AND LEFT HAND TWISTS WILL BE NECESSARY.
 7. APPROPRIATE LENGTH 5/8" 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. DRIVE NAIL WITHIN 2" OF THE TOP OR BOTTOM OF BLOCKOUT AFTER 5/8" 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.



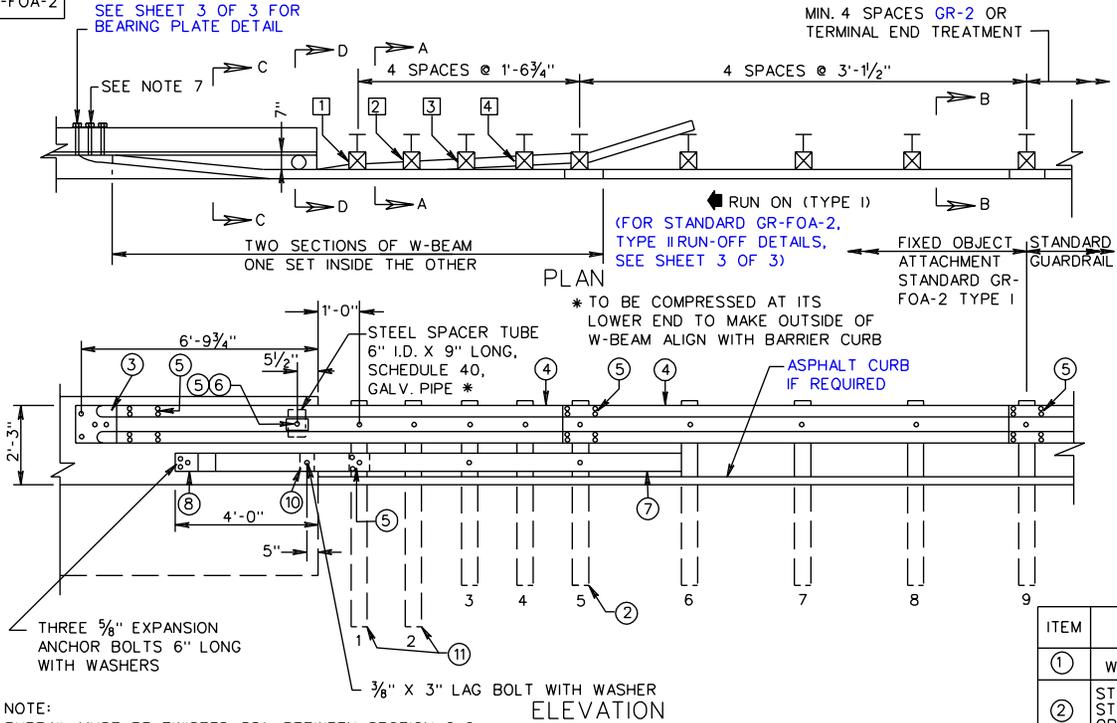
ITEM	MATERIAL/SPECIFICATIONS/NOTES
①	5/8" x 18" LG. GUARDRAIL BOLT AND RECESSED NUT.
②	STANDARD 6" x 8" WOOD POST AND BLOCK.
③	STANDARD W-BEAM TERMINAL CONNECTOR
④	STANDARD W-BEAM RAIL
⑤	5/8" X 2" LONG GUARDRAIL BOLT AND RECESSED NUT (SEE STANDARD GR-HDW)
⑥	RECTANGULAR PLATE WASHER (SEE STANDARD GR-HDW)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

Sheet 1 of 3

<p>SPECIFICATION REFERENCE</p> <p>506</p>	<h2 style="margin: 0;">W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT</h2> <h3 style="margin: 0;">FOR USE BETWEEN SAFETY SHAPE AND GUARDRAIL (WOOD POSTS)</h3> <p style="margin: 0; font-size: small;">VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	<p>REV. 7/01</p> <p>501.28</p>
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GR-FOA-2

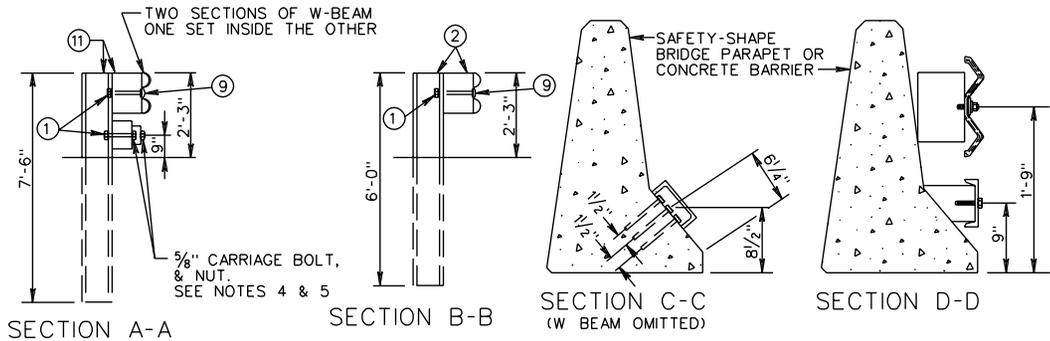
SEE SHEET 3 OF 3 FOR BEARING PLATE DETAIL



- 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

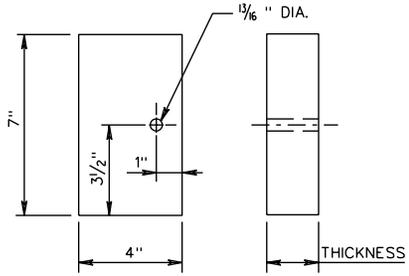
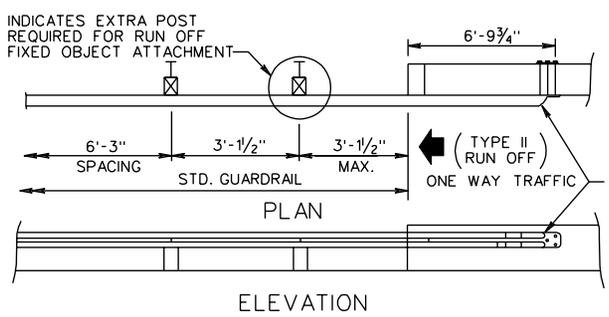
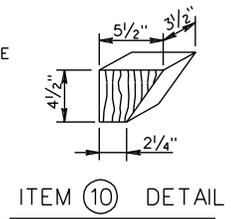
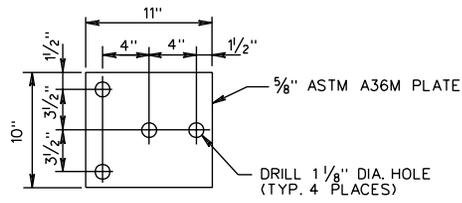
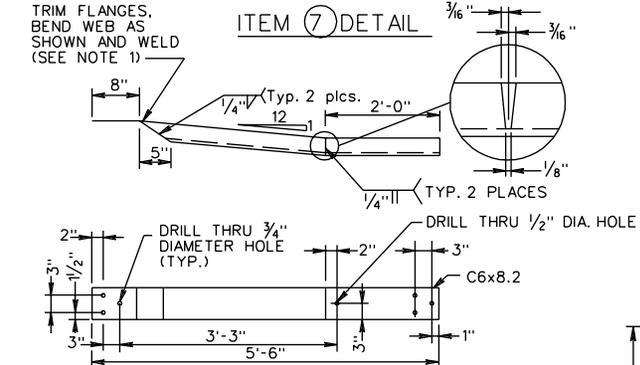
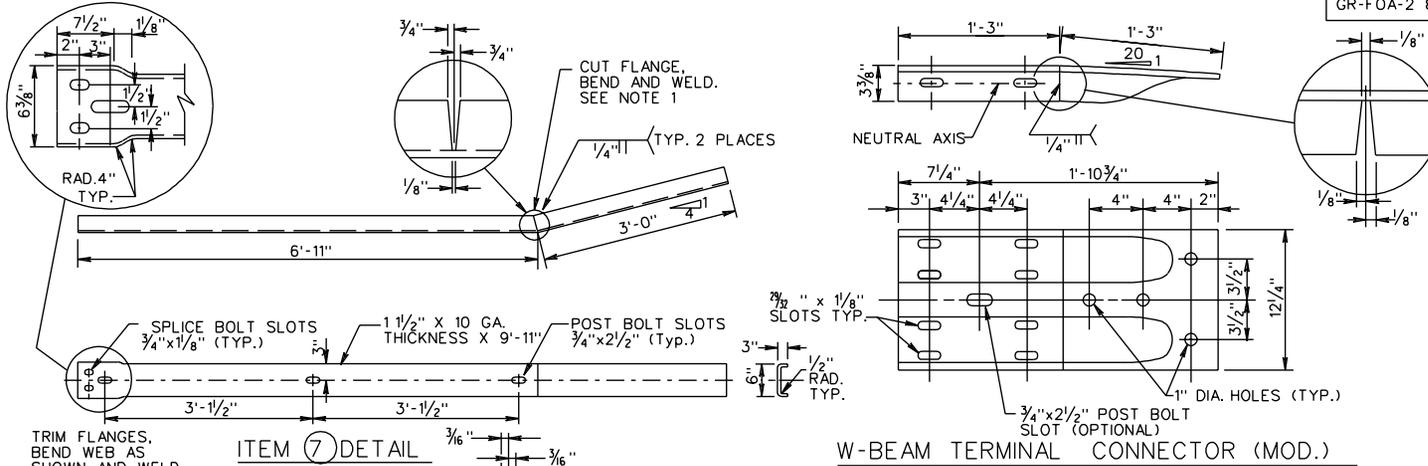
W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT FOR USE WITH SAFETY SHAPE - STEEL POSTS

REV. 7/01
501.29

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

506



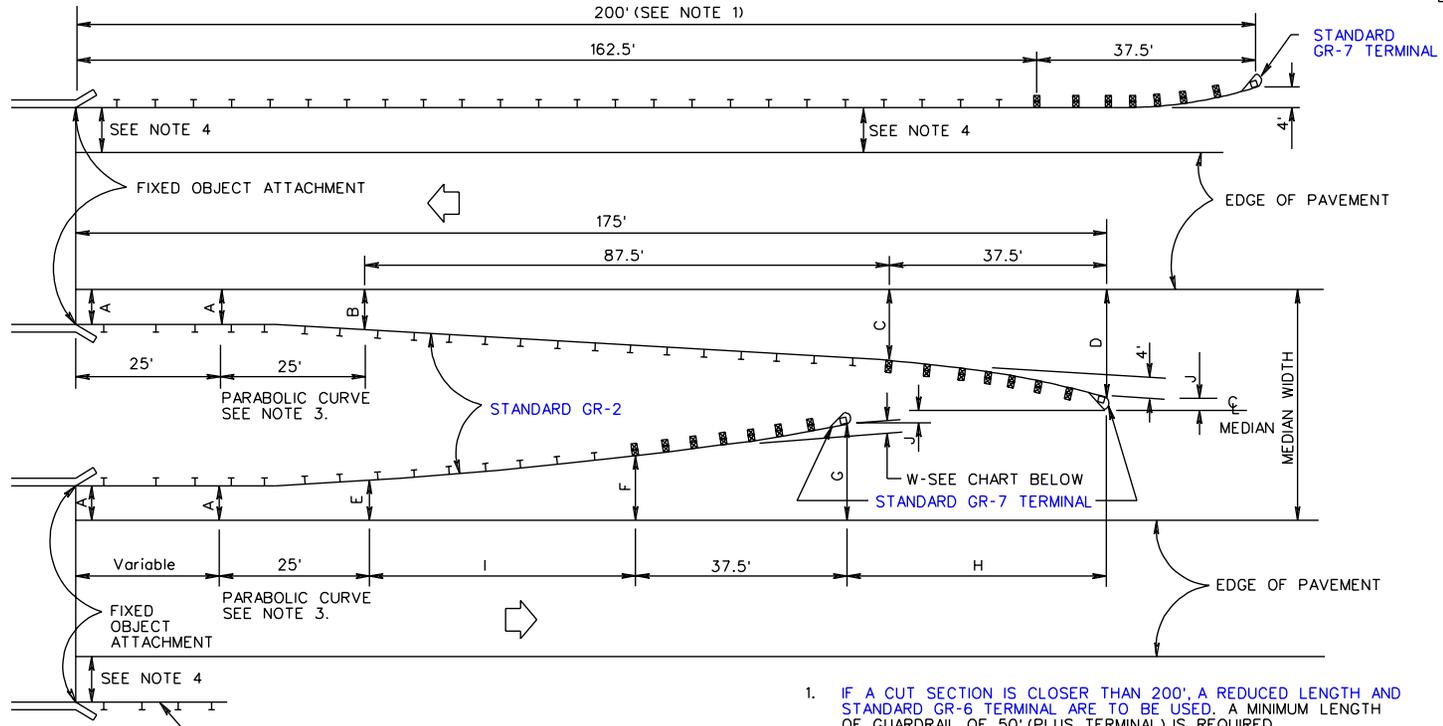
STEEL POSTS RUBRAIL BLOCKOUTS 7" X 4" X THICKNESS

POST	THICKNESS
1	4 1/4"
2	3 1/4"
3	2"
4	1"

WOOD POSTS RUBRAIL BLOCKOUTS 7" X 4" X THICKNESS

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

NOTES:
 1. 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.



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'	0.06'	0.07'	0.08'	0.10'	0.11'
	X ₂	12.50	0.13'	0.19'	0.25'	0.22'	0.28'	0.33'	0.39'	0.44'
	X ₃	18.75	0.28'	0.42'	0.56'	0.55'	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

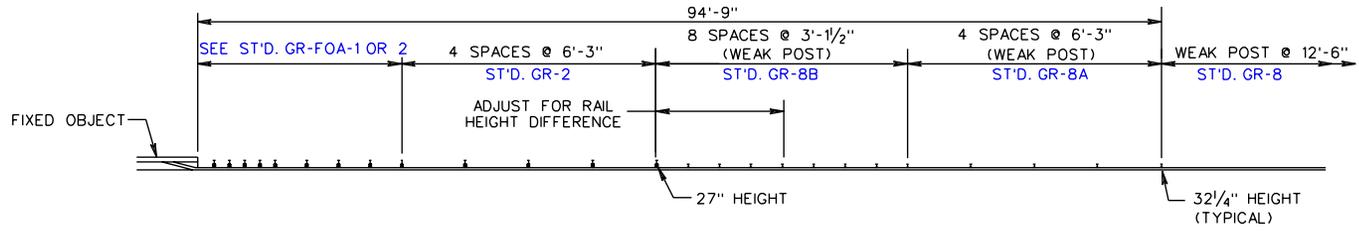
SPECIFICATION REFERENCE
221 505

W BEAM GUARDRAIL INSTALLATION CRITERIA

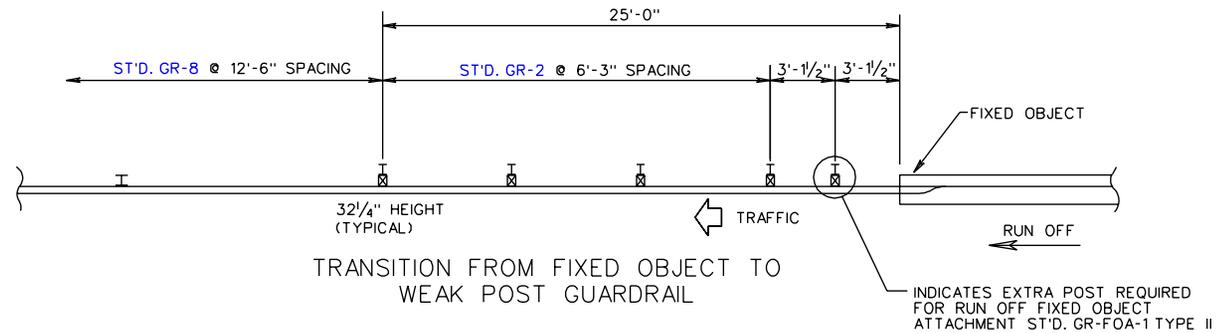
VIRGINIA DEPARTMENT OF TRANSPORTATION

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501.34

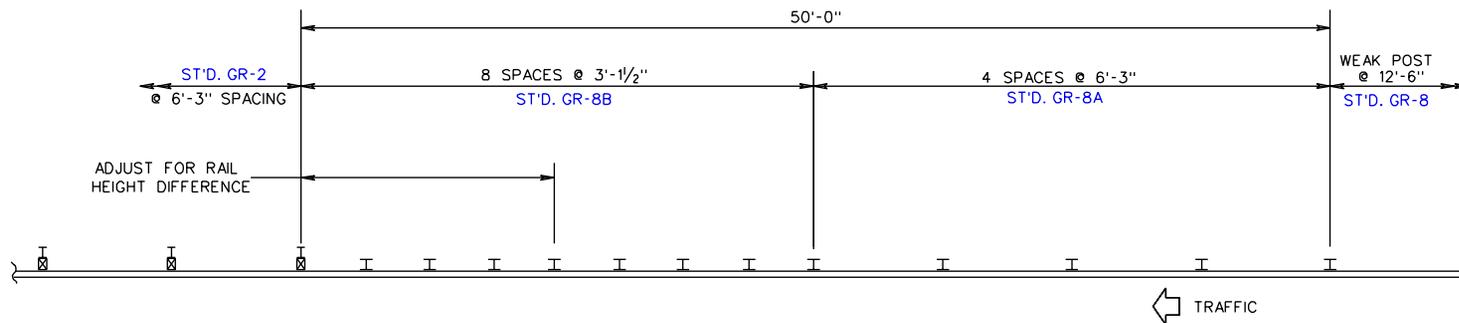
GR-INS



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

W BEAM GUARDRAIL INSTALLATION CRITERIA

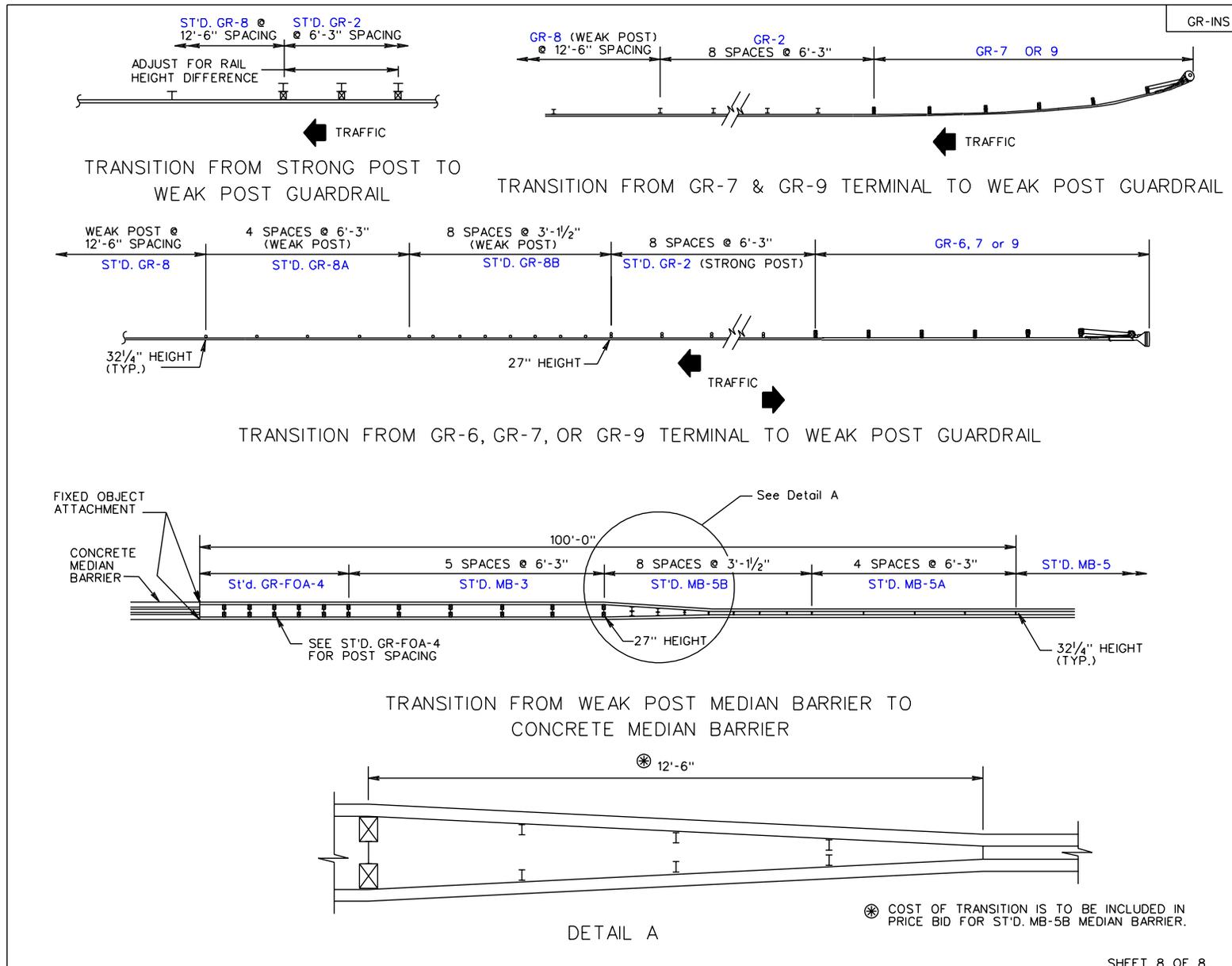
REV. 7/01

501.39

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

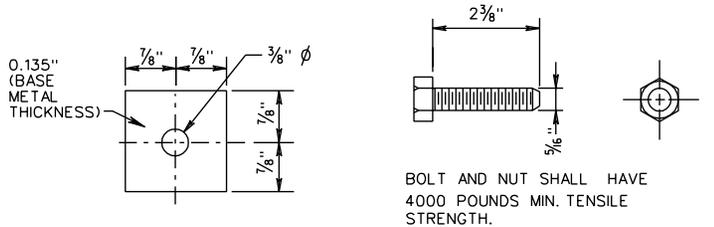
221
505



SPECIFICATION REFERENCE 221 505	W BEAM GUARDRAIL AND MEDIAN BARRIER INSTALLATION CRITERIA VIRGINIA DEPARTMENT OF TRANSPORTATION	SHEET 8 OF 8 REV. 7/01 501.40
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INSERTABLE SHEET A95

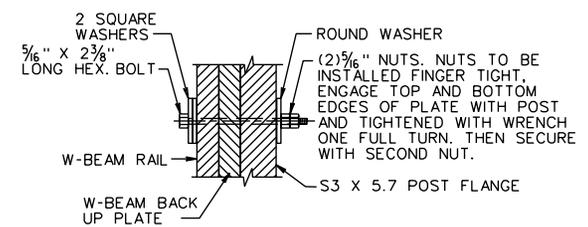
MB-5



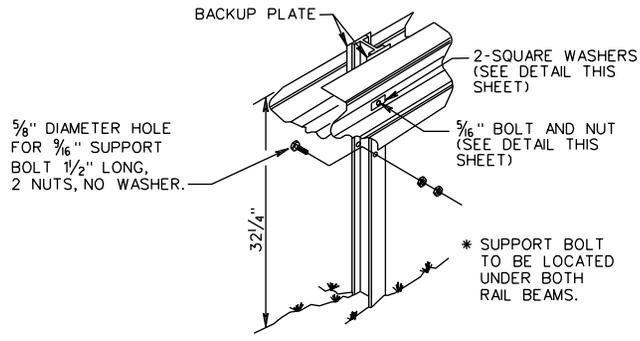
SQUARE WASHER 5/16" HEX BOLT AND NUT

BOLT AND NUT SHALL HAVE 4000 POUNDS MIN. TENSILE STRENGTH.

⊗ 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.

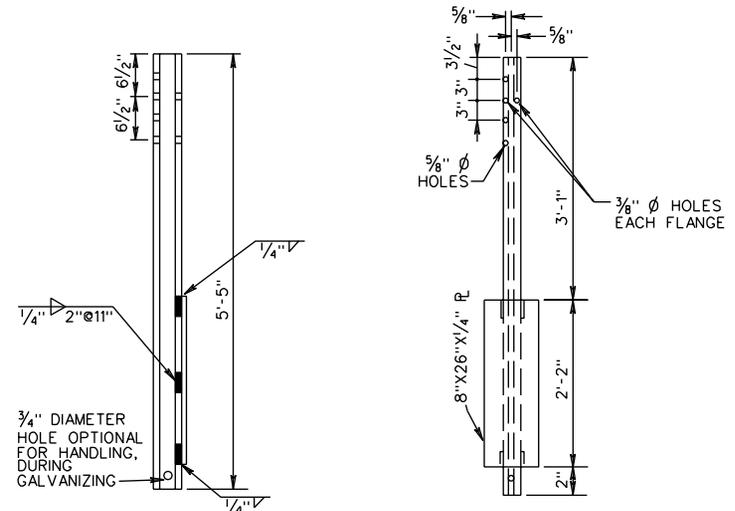


GUARDRAIL POST CONNECTION DETAIL



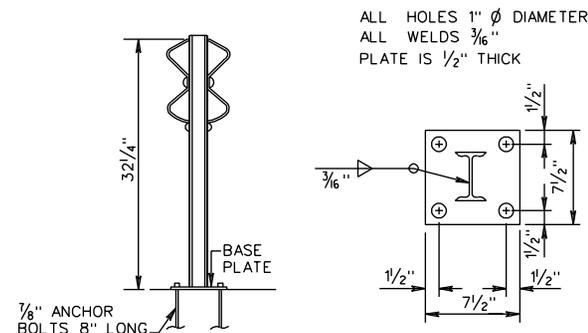
TYPICAL INSTALLATION

NOTES:
 STANDARD MB-5 POST SPACING IS 12'-6"
 STANDARD MB-5A POST SPACING IS 6'-3"
 STANDARD MB-5B POST SPACING IS 3'-1/2"
 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

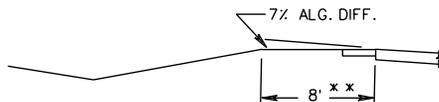
SHEET 1 OF 2

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 501.42

GS-11

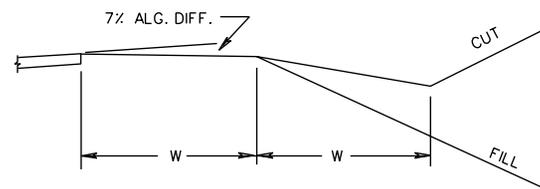
GRADED MEDIAN SHOULDERS

OUTSIDE SHOULDERS

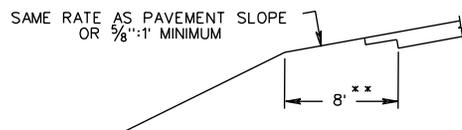


** WHERE MAINLINE IS 6 OR MORE LANES GRADED SHOULDER WIDTH IS TO BE THE SAME AS THAT SHOWN FOR FILL SHOULDER FOR INDEPENDENT GRADING.

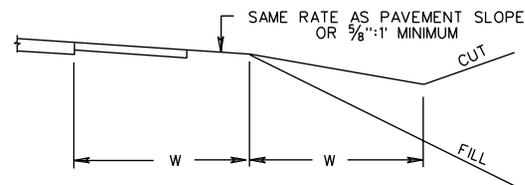
HIGH SIDE - SUPERELEVATED



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

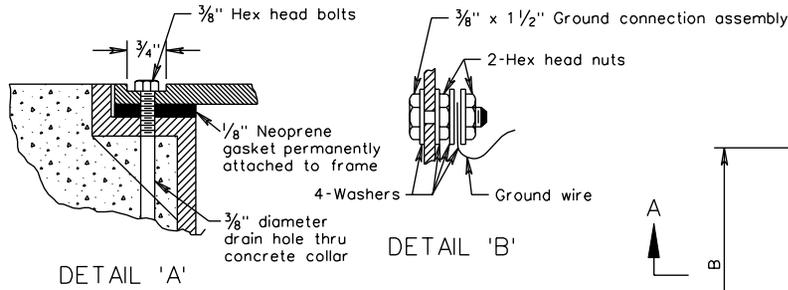
LENGTH OF CROWN RUNOFF (CR)	START/END OF TRANSITION (LS)	DISTANCE IN FEET FROM START/END OF TRANSITION (LS)				NORMAL CROWN
		1	2	3	4	
220	0	44	88	132	176	220
200	0	40	80	120	140	200
180	0	36	72	108	144	180
160	0	32	64	96	128	160
140	0	28	56	84	112	140
120	0	24	48	72	96	120
100	0	20	40	60	80	100
90	0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

NOTE:

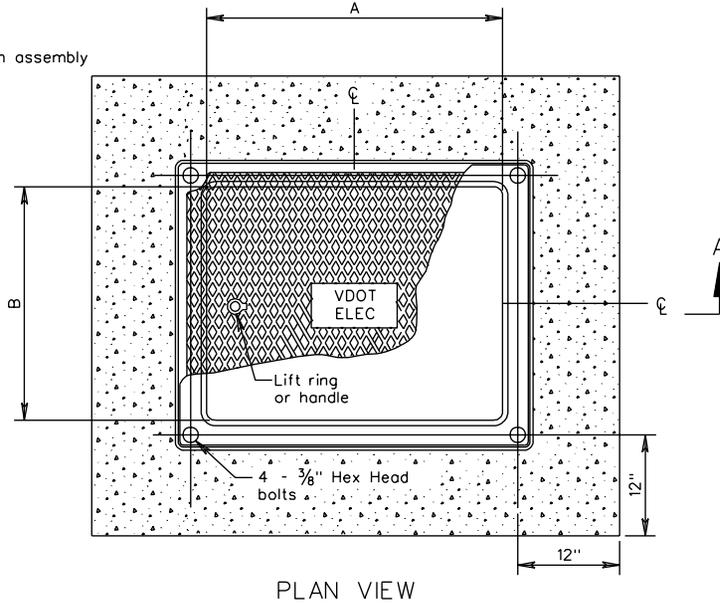
TABLE LISTS POSITIONS ON TRANSITIONS AT WHICH SLOPE STAKES SHOULD BE SET, CONSTRUCTION AND FINAL CROSS-SECTIONS TAKEN, FINE GRADING STAKES (BLUE TOP) SET, AND FORM STAKES SET (CONCRETE PAVEMENT ONLY).

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.

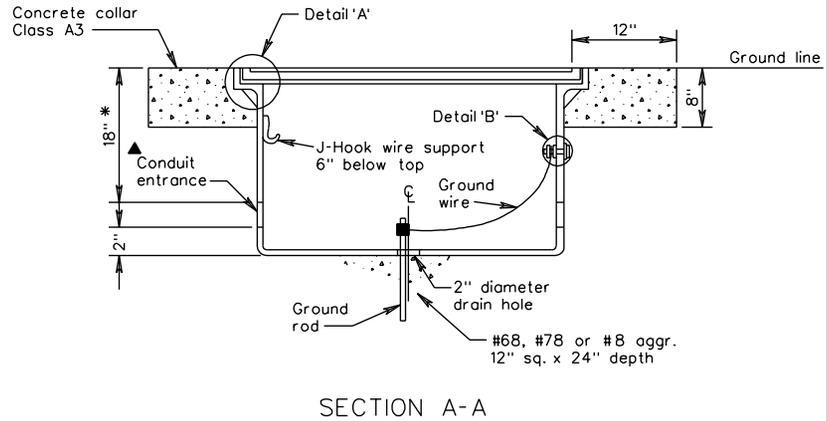
▲ A minimum 2" diameter conduit entrance is required, unless otherwise specified on plans.

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

