

SECTION 500

GUARDRAIL, MEDIAN BARRIER,
FENCING & MARKERS

STANDARD

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ROAD AND BRIDGE STANDARDS

SHEET 1 OF 1

REVISION DATE

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VIRGINIA DEPARTMENT OF TRANSPORTATION

2016 ROAD & BRIDGE STANDARDS

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ROAD AND BRIDGE STANDARDS

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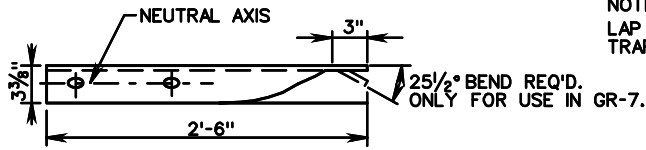
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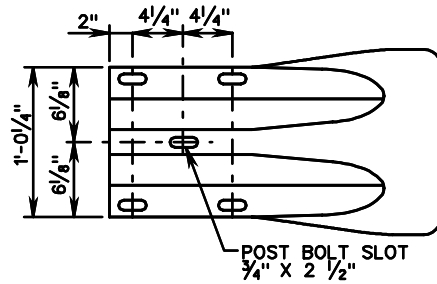
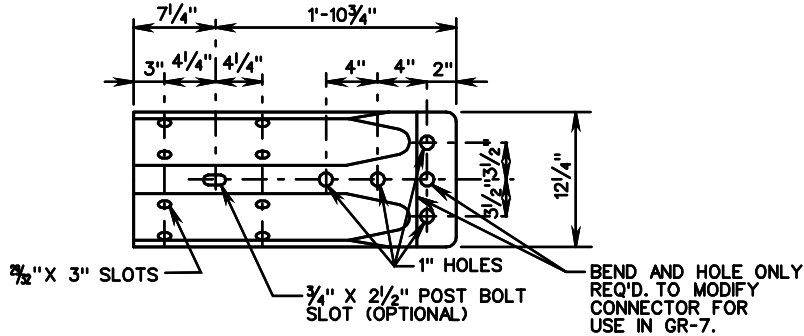
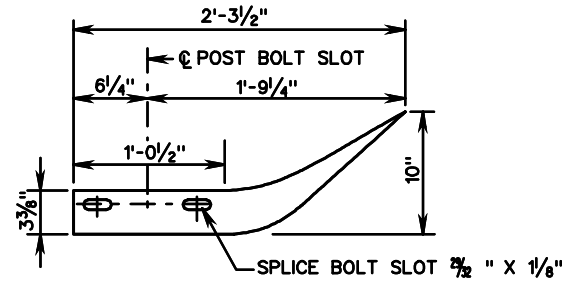
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GR-HDW

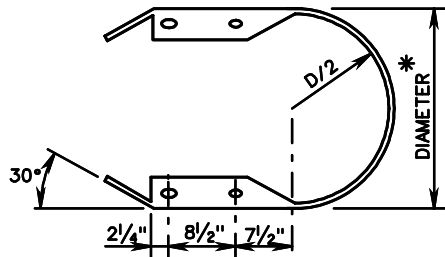


NOTE:
LAP IN DIRECTION OF TRAFFIC AT SPLICE JOINT.

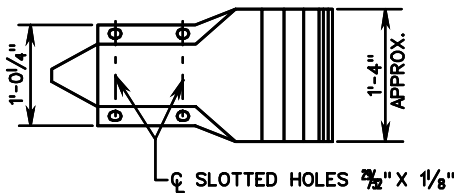
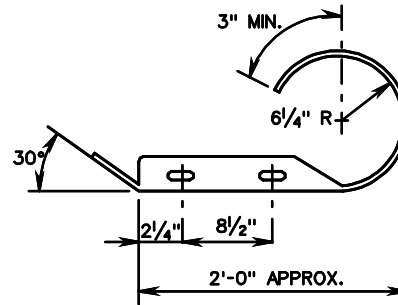


W BEAM TERMINAL CONNECTOR

W BEAM END SECTION (FLARED)

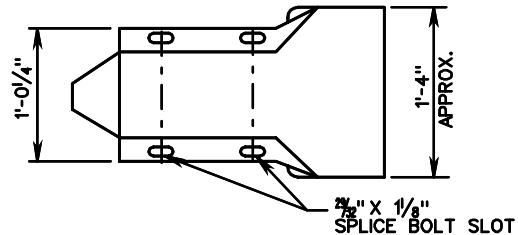


* THE GUARDRAIL MEDIAN BARRIER COMPONENTS DEPICTED IN A.R.T.B.A. TECHNICAL BULLETIN NUMBER 268B MAY BE SUBSTITUTED IF INTERCHANGEABLE WITH THE STANDARDS FOR GUARDRAIL (GR) OR MEDIAN BARRIER (MB) AND APPROVED BY THE ENGINEER.



* STANDARD DIMENSIONS OF 12 1/2", 24" AND 30" ARE SUGGESTED.

W BEAM END SECTION (BUFFER)



W BEAM END SECTION (ROUNDED)



ROAD AND BRIDGE STANDARDS

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STANDARD GUARDRAIL HARDWARE
W-BEAM GUARDRAIL HARDWARE

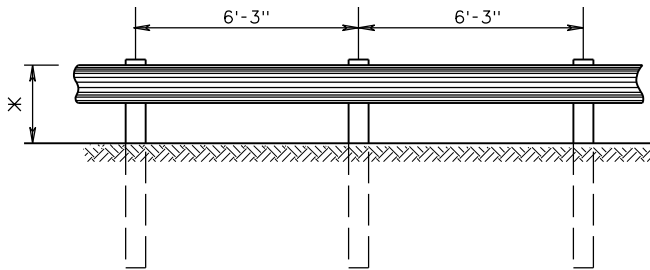
VIRGINIA DEPARTMENT OF TRANSPORTATION

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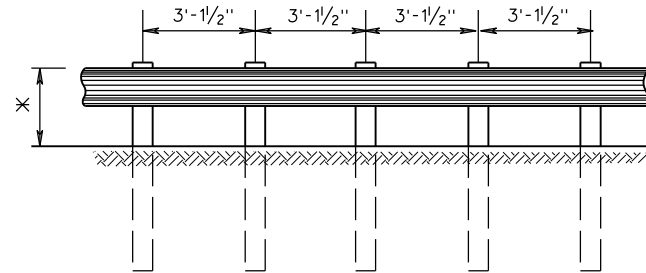
GR-2, 2A

* 27³/₄" MIN - 28³/₄" MAX RAIL HEIGHT



GR-2

(6'-3" POST SPACING)
MAX DYNAMIC DEFLECTION = 3'



GR-2A

(3'-1/2" POST SPACING)
MAX DYNAMIC DEFLECTION = 2'

NOTES:

GUARDRAIL LOCATIONS SHOWN ON PLANS ARE APPROXIMATE ONLY AND CAN BE ADJUSTED DURING CONSTRUCTION IF AND AS DIRECTED BY THE ENGINEER.

FOR DETAILS OF POST AND BLOCKOUTS SEE SHEET NO. 501.05.

FOR DETAILS OF RAIL ELEMENT, RAIL SPLICE JOINT, AND ASSOCIATED HARDWARE SEE SHEET NOS. 501.01 AND 501.02.

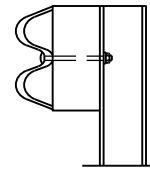
RAIL ELEMENTS ARE FURNISHED SHOP CURVED FOR RADII BETWEEN 5 FEET AND 150 FEET.

ALL GUARDRAIL POSTS SHALL BE SET PLUMB. POST SHALL NOT BE SET WITH A VARIATION OF MORE THAN 1/8" PER FOOT FROM VERTICAL. W-BEAM, BLOCKOUTS, AND POSTS SHALL BE SET AND ALIGNED WITHOUT ALTERATION OR FORCE, AS PER SECTION 505 OF THE SPECIFICATIONS.

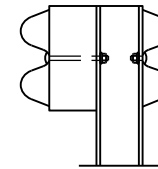
ALL GR-2 AND GR-2A RAIL SHALL BE MAINTAINED AT A HEIGHT OF 27³/₄" MIN - 28³/₄" MAX AS MEASURED PER STANDARD GR-INS.

ALL W-BEAM RAILS SHALL BE LAPPED IN THE DIRECTION OF VEHICULAR TRAVEL FOR THE FINISHED ROADWAY.

THE OPTIONAL GR-2A METHODS OF NESTING THE RAIL OR USE OF AN ADDITIONAL RAIL ON THE BACK OF THE POST FOR STANDARD GR-2A SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.



* OPTIONAL GR-2A METHOD USING NESTED RAIL



* OPTIONAL GR-2A METHOD USING ADDITIONAL RAIL ON BACK OF POST

* WHEN NESTED RAIL OR ADDITIONAL RAIL IS PLACED ON BACK OF POST FOR GR-2A THE POST SPACING WILL BE 6'-3".

DESIGN SPEED	FLARE RATES		
	INSIDE SHY LINE	BEYOND SHY LINE	
MPH	SHY LINE LS	FLARE RATE	FLARE RATE
70	9'	30:1	15:1 *
60	8'	26:1	14:1 *
50	6.5'	21:1	11:1 *
40	5'	16:1	8:1 *
30	4'	13:1	7:1 *

* SUGGESTED MAXIMUM FLARE RATE FOR SEMI-RIGID BARRIER SYSTEMS.



ROAD AND BRIDGE STANDARDS

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.
STANDARD BLOCKED-OUT W-BEAM GUARDRAIL
(STRONG POST SYSTEM)

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

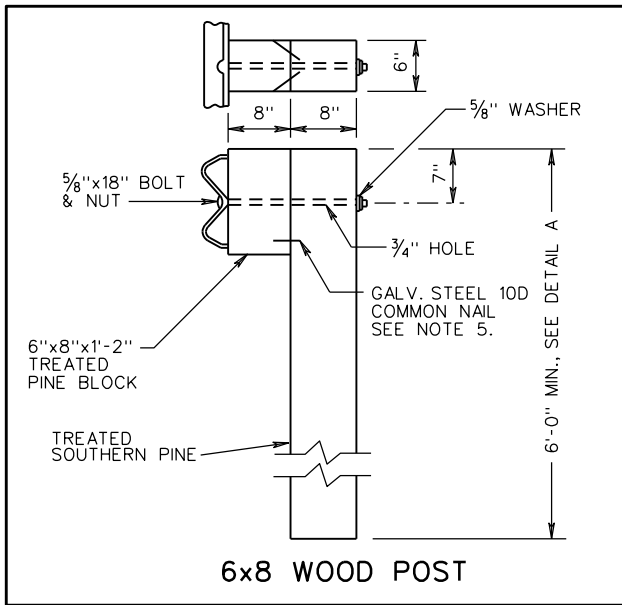
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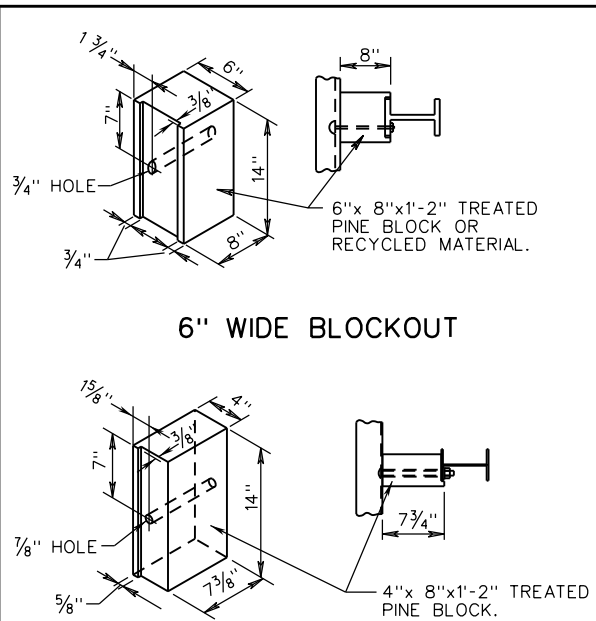
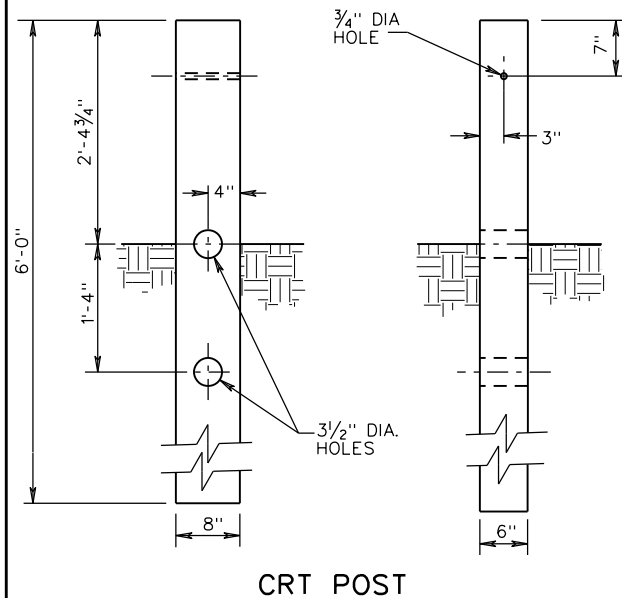
REVISION DATE

501.04

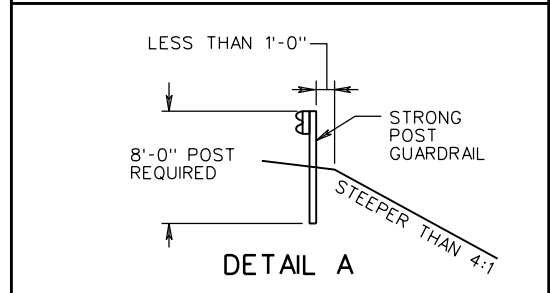
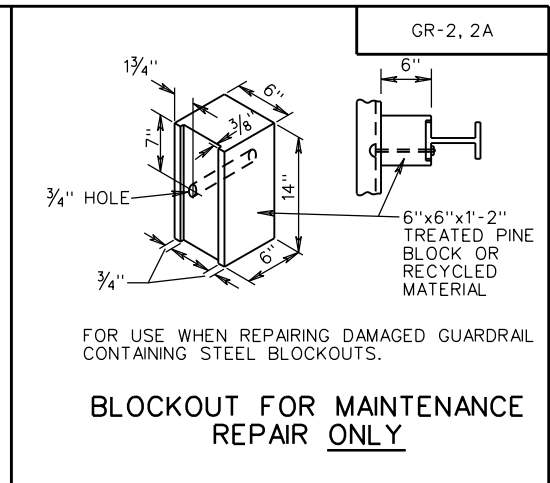
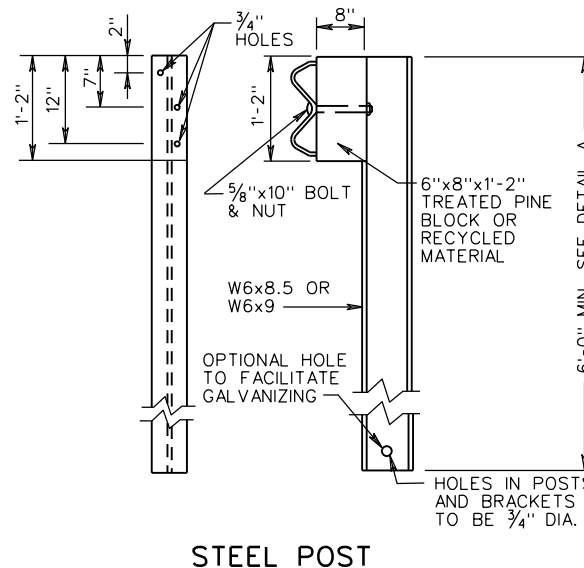
08/14



THE CRT POST IS FOR USE WITH THE STANDARD GR-10 TYPE III OR WHERE SPECIFIED BY THE ENGINEER IN THE PLANS.



POST MAY BE HOT ROLLED OR WELDED.



GUARDRAIL INSTALLATION SITES REQUIRING LONGER GUARDRAIL POSTS

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 AND 501.02.
4. DRIVE NAIL ON BOTH SIDES WITHIN 2" OF THE TOP OR BOTTOM OF BLOCKOUT AFTER 5/8" x 18 BOLT IS INSTALLED.

SPECIFICATION REFERENCE

221
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505

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

STANDARD BLOCKED-OUT W-BEAM GUARDRAIL
(STRONG POST SYSTEM, POST AND BLOCKOUT DETAILS)

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT

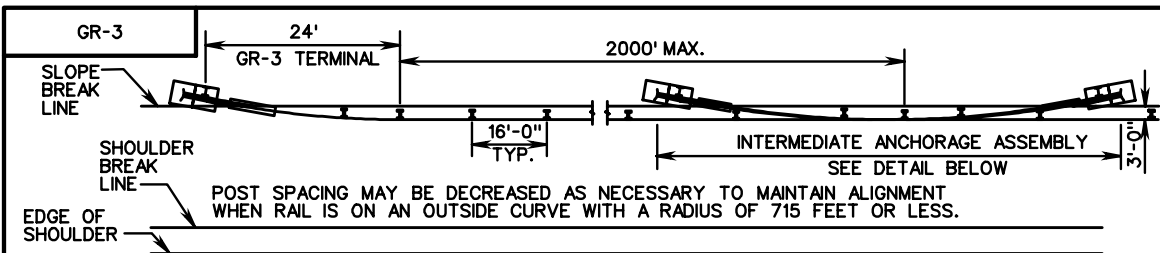
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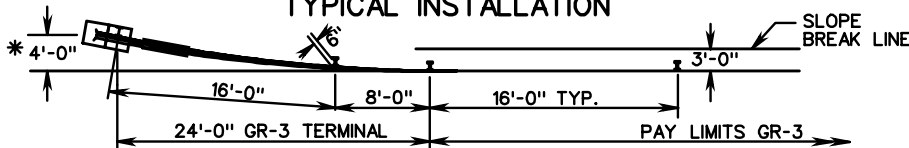
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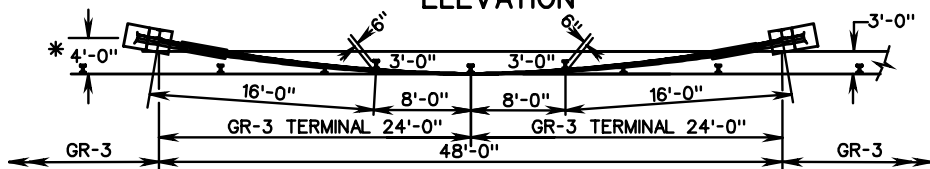
TYPICAL INSTALLATION



GUARDRAIL TERMINAL PLAN VIEW



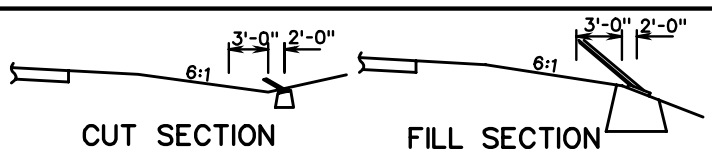
ELEVATION



INTERMEDIATE ANCHORAGE PLAN VIEW



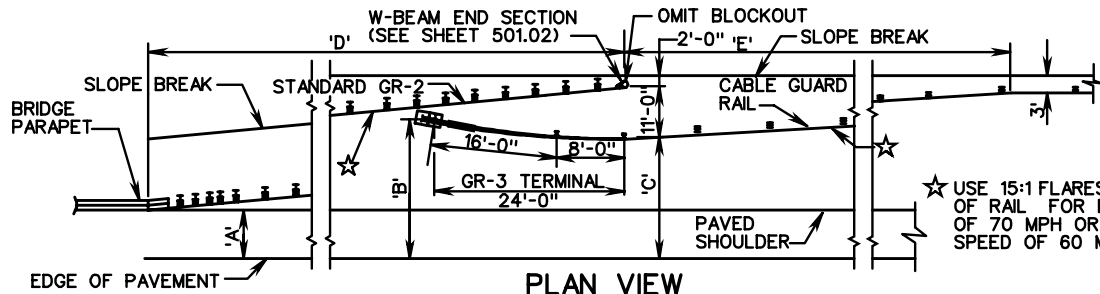
ELEVATION



* WHEN BURYING GR-3 CABLE GUARDRAIL IN THE BACKSLOPE, THE CONCRETE ANCHOR ASSEMBLY MUST BE PLACED AT A HEIGHT ON THE BACKSLOPE TO MAINTAIN THE 27" MIN./28" MAX. CABLE HEIGHT AT THE ANCHORAGE.

NOTES:

- FOR ARRANGEMENTS OF SPRING CABLE END ASSEMBLIES (COMPENSATING DEVICES) AND TURNBUCKLE CABLE END ASSEMBLIES, THE FOLLOWING CRITERIA SHALL APPLY:
- LENGTH OF CABLE RUNS:
- TO 1000'-USE COMPENSATING DEVICE ON ONE END AND USE TURNBUCKLE ON THE OTHER END OF EACH INDIVIDUAL CABLE.
- OVER 1000' TO 2000'-USE COMPENSATING DEVICE ON EACH END OF EACH INDIVIDUAL CABLE.
- OVER 2000'-START NEW STRETCH BY INTERLACING AT LAST PARALLEL POST. SEE TYP. INSTALLATION.
- FITTINGS: ALL FITTINGS SHALL BE SO DESIGNED AND BE OF SUCH SECTION AS TO DEVELOP THE FULL STRENGTH OF A SINGLE CABLE OR CABLE ASSEMBLIES, AS THE CASE MAY BE.
SINGLE CABLE ANCHOR ASSEMBLY-
MIN. TENSILE STRENGTH.....25,000 LBS.
THREE CABLE ANCHOR ASSEMBLY-
MIN. TENSILE STRENGTH.....100,000 LBS.
ALL FITTINGS SHALL BE HOT DIPPED GALVANIZED.
- THE DYNAMIC DEFLECTION FOR STANDARD GR-3 IS 11 FEET.
- FOR ROCK INSTALLATION, 8"x24"x1/4" PLATE SHALL BE ELIMINATED. DRILL OR EXCAVATE HOLE FOR POST AND BACKFILL WITH CRUSHER RUN AGGREGATE TO LEVEL OF ROCK.
- 5/8" ANSIB18.2.2 HEX. BACKING NUT OR APPROVED SHOULDER MUST EQUAL BEARING AREA OF 5/16" STANDARD NUT.
- THE GUARDRAIL AND MEDIAN BARRIER COMPONENTS DEPICTED IN AASHTO-AGC-ARTBA "A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE" MAY BE SUBSTITUTED IF INTERCHANGEABLE WITH THE STANDARDS FOR GUARDRAIL (GR) OR MEDIAN BARRIER (MB) AND APPROVED BY THE ENGINEER.



METHOD OF TRANSITION FROM CABLE GUARDRAIL TO W-BEAM GUARDRAIL AT BRIDGE APPROACHES

RECOVERABLE AREA WIDTH	LT. OR RT. OF C	70 MPH D.S.				
		A	B	C	D	E
24'	12'	27'	26'	375'	150'	
24'	6'	27'	26'	465'	150'	
21'	12'	24'	23'	330'	150'	
21'	6'	24'	23'	420'	150'	

★ USE 15:1 FLARES ON BOTH TYPES OF RAIL FOR DESIGN SPEED OF 70 MPH OR 13:1 FOR DESIGN SPEED OF 60 MPH OR LESS.

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ROAD AND BRIDGE STANDARDS

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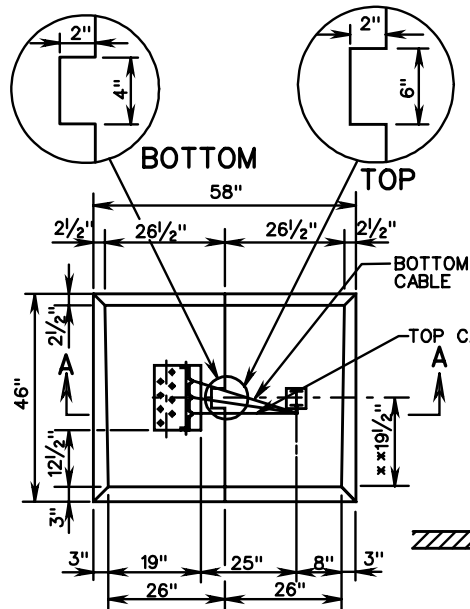
CABLE GUARDRAIL

VIRGINIA DEPARTMENT OF TRANSPORTATION

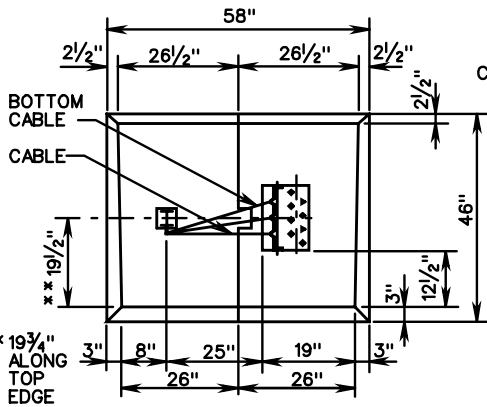
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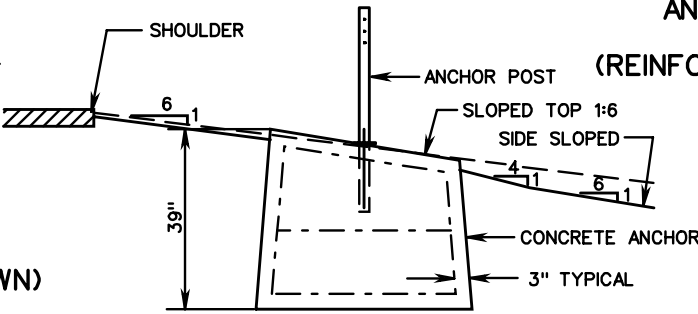
GR-3



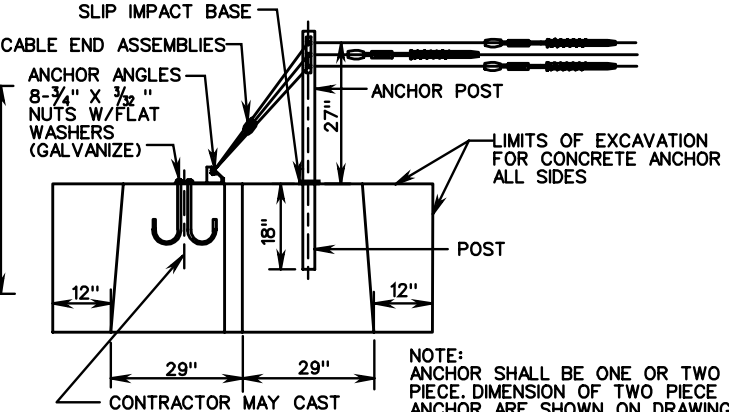
ANCHOR UNIT DETAIL
TOP VIEW LEFT HAND
(REINFORCEMENT NOT SHOWN)



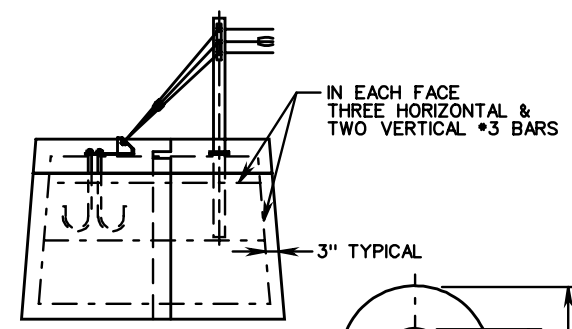
ANCHOR UNIT DETAIL
TOP VIEW RIGHT HAND
(REINFORCEMENT NOT SHOWN)
TWO PIECE



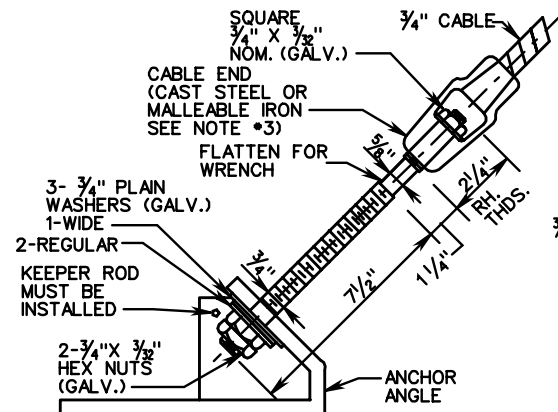
ANCHOR UNIT DETAIL & RE-BAR
INSTALLATION DETAIL



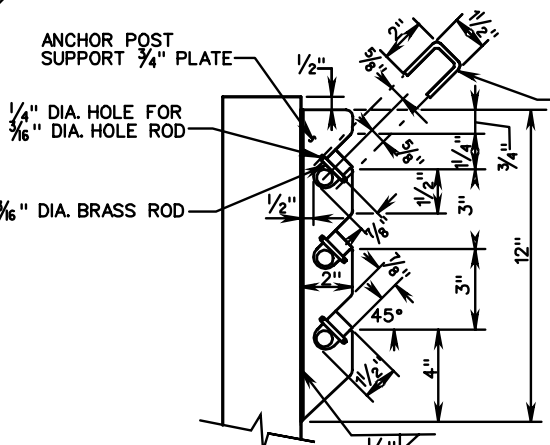
SECTION AA
ANCHOR UNIT DETAIL
LEFT HAND
(REINFORCEMENT NOT SHOWN)



TWO PIECE



CABLE END ASSEMBLY TO
ANCHOR ANGLE DETAIL



SIDE VIEW OF POST TOP



PLACE 3/16" DIA. BRASS ROD IN HOLES AND BEND OVER ENDS.

WASHER	WASHER SERIES	A		B		C	
		INSIDE DIA.	MIN.	MAX.	MIN.	MAX.	MIN.
3/4"	REGULAR	7/8"	55/64"	2"	1 15/16"	3/16"	9/64"
	WIDE	7/8"	55/64"	2 19/32"	2 35/64"	19/64"	5/32"
1/2"	NARROW	1 1/32"	1/2"	1"	63/64"	7/64"	1/16"

CABLE GUARDRAIL

VIRGINIA DEPARTMENT OF TRANSPORTATION

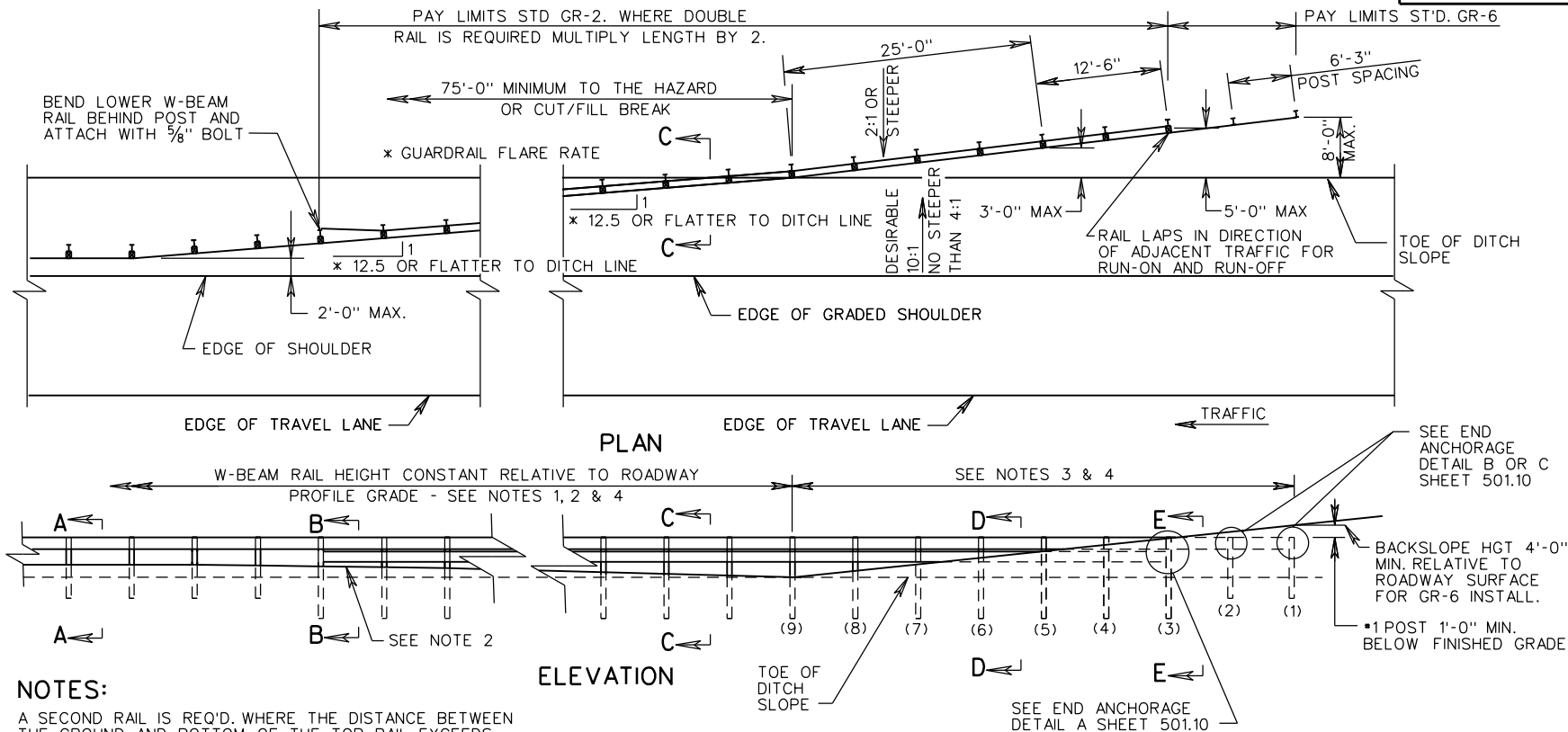
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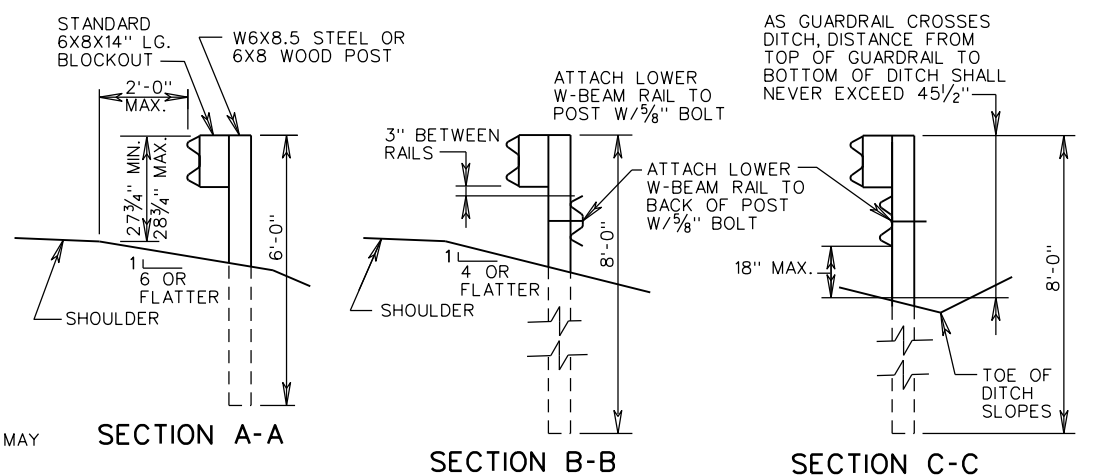
VDOT
ROAD AND BRIDGE STANDARDS

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501.08



- NOTES:**
1. A SECOND RAIL IS REQ'D. WHERE THE DISTANCE BETWEEN THE GROUND AND BOTTOM OF THE TOP RAIL EXCEEDS 18" (UP TO THE POINT WHERE THE RAIL CROSSES THE DITCH LINE). THE DOUBLE RAIL WILL EXTEND TO POST #3.
 2. MAXIMUM DISTANCE BETWEEN BOTTOM OF THE LOWER W-BEAM RAIL AND GROUND LINE IS 18". WHEN DOUBLE RAIL IS REQ'D., TAPER BOTH W-BEAM RAILS TO MAINTAIN THE 18" DISTANCE FROM THE GROUND.
 3. BOTH W-BEAM RAILS TO BE 1'-0" BELOW FINISHED GRADE AT POST #1 (8'-0" OFFSET).
 4. A 8'-0" LONG POST MUST BE USED WHEN UPPER AND LOWER W-BEAM RAILS ARE REQUIRED. FROM THE BEGINNING OF THE LOWER RAIL THROUGH POST #3.
 5. STANDARD GR-6 TERMINAL TREATMENT MAY BE USED AT THE RUN-ON END OF DIVIDED HIGHWAYS (LEFT AND RIGHT OF TRAFFIC) AND AT THE RUN-ON AND RUN-OFF ENDS ON UNDIVIDED HIGHWAYS.
 6. ALL POST SPACING 6'-3" C-C UNLESS OTHERWISE NOTED. THE POST MAY BE W6 X 8.5 STEEL OR 6 X 8 WOOD EXCEPT THE LAST 3 TERMINAL POSTS MUST BE W6 X 8.5 STEEL.
 7. FOR SECTIONS D-D & E-E, AND END ANCHORAGE DETAILS SEE SHEET 501.10.
 8. ALL TERMINAL RUN-ON OR RUN-OFF INSTALLATIONS SHALL BE INSTALLED WITH RAILS LAPPED IN THE DIRECTION OF ADJACENT TRAFFIC.
 9. IF THE BACKSLOPE IS ROCK AND 1:1 OR STEEPER, THE W-BEAM MAY BE ANCHORED PER SOLID ROCK CUT INSTALLATION (DETAIL F).



SPECIFICATION REFERENCE
221 505

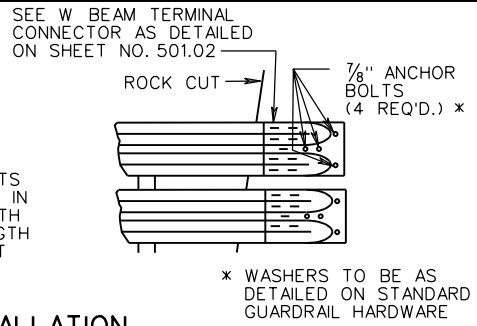
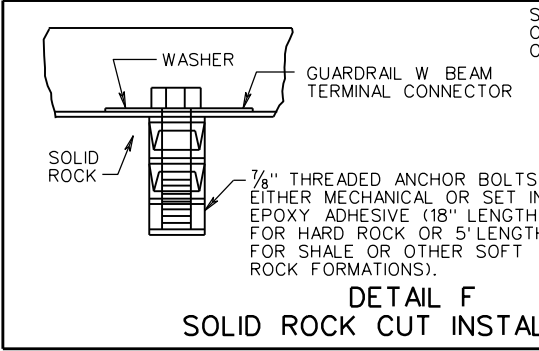
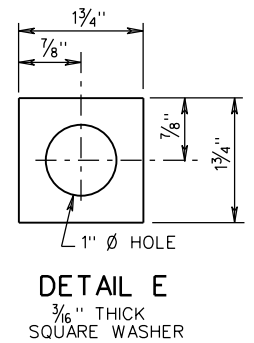
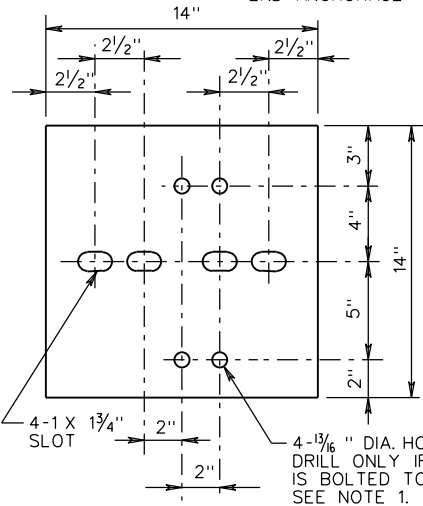
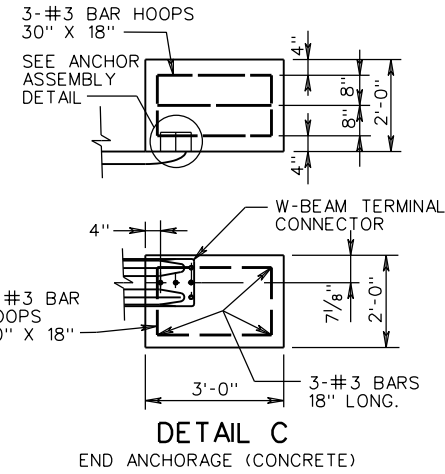
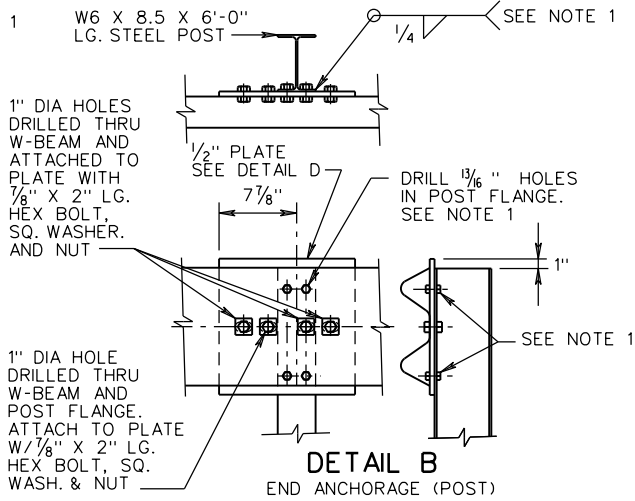
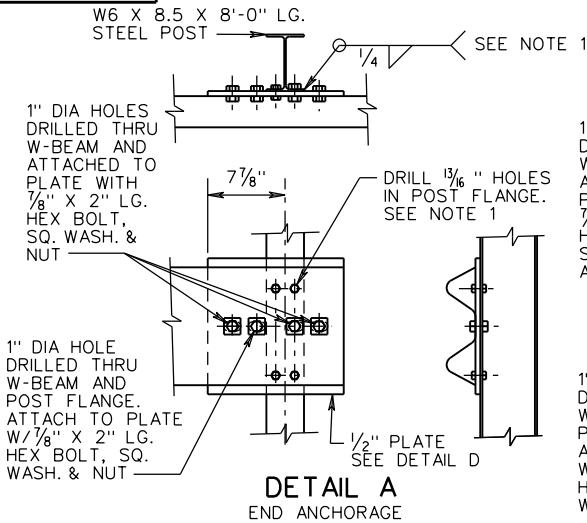
A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

TERMINAL TREATMENT FOR W-BEAM GUARDRAIL

VIRGINIA DEPARTMENT OF TRANSPORTATION

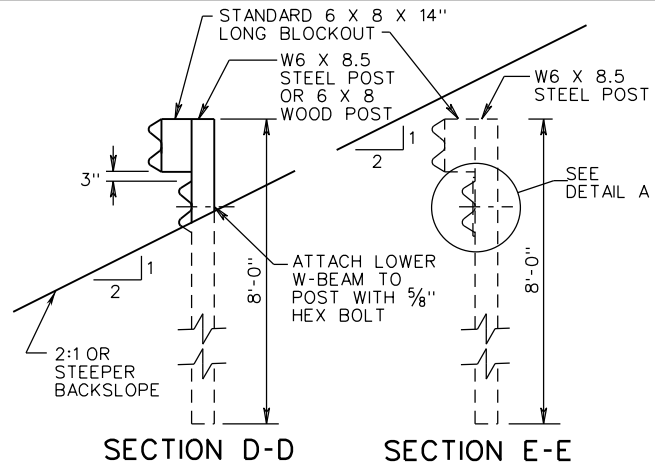
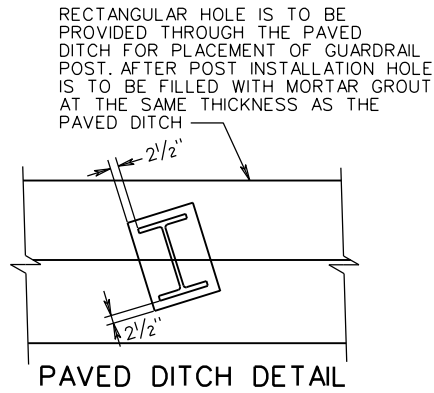
VDOT	
ROAD AND BRIDGE STANDARDS	
REVISION DATE	SHEET 1 OF 2
7/12	501.09

GR-6



NOTE:

- 1/2" STEEL PLATE MAY BE WELDED OR BOLTED TO POST. IF PLATE IS BOLTED TO POST USE 4 - 3/8" X 1 1/2" LG. HEX HEAD BOLTS W/ HEX NUTS. IF PLATE IS WELDED TO POST DO NOT DRILL 13/16" HOLES IN PLATE OR IN POST FLANGES.
- CONCRETE END ANCHORAGE MAY BE USED IN PLACE OF STEEL POST AT 8'-0" OFFSET.



VDOT	
ROAD AND BRIDGE STANDARDS	
SHEET 2 OF 2	REVISION DATE
501.10	7/12

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

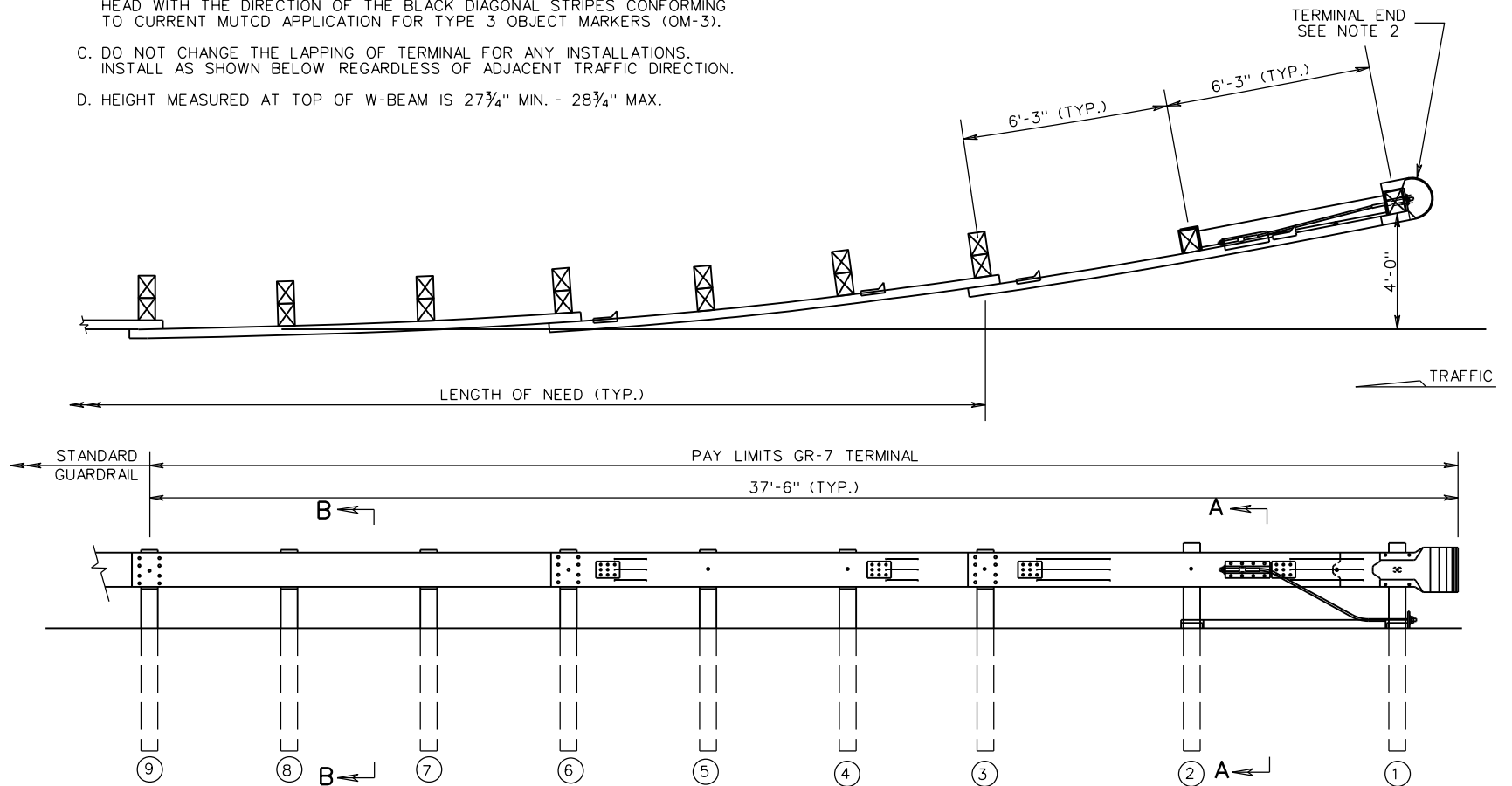
TERMINAL TREATMENT FOR W-BEAM GUARDRAIL

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
221
505

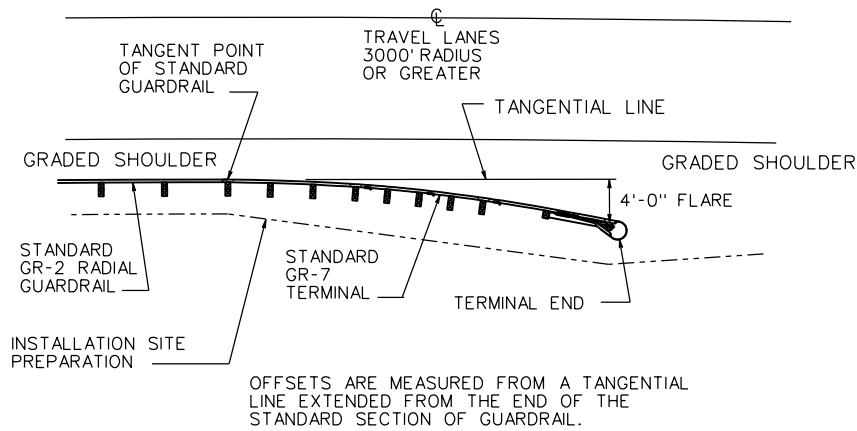
NOTES:

1. GUARDRAIL TERMINAL, STD. GR-7 SHALL BE FROM VDOT'S APPROVED PRODUCTS LIST.
2. ALL TERMINALS SHALL BE INSTALLED ACCORDING TO THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND THE FOLLOWING VDOT REQUIREMENTS:
 - A. ALL STANDARD GR-7 TERMINALS SHALL BE INSTALLED WITH A 4 FT. OFFSET.
 - B. YELLOW 8" X 36" REFLECTIVE SHEETING, IN ACCORDANCE WITH VDOT SPECIFICATIONS, SHOULD BE APPLIED IN TERMINALS EMPLOYING W-BEAM END SECTIONS. FOR TERMINALS EMPLOYING IMPACT (EXTRUDER) HEADS, AMBER (YELLOW) REFLECTIVE SHEETING WITH BLACK DIAGONAL STRIPES SHOULD BE APPLIED TO THE FULL AREA INSIDE THE IMPACT HEAD WITH THE DIRECTION OF THE BLACK DIAGONAL STRIPES CONFORMING TO CURRENT MUTCD APPLICATION FOR TYPE 3 OBJECT MARKERS (OM-3).
 - C. DO NOT CHANGE THE LAPPING OF TERMINAL FOR ANY INSTALLATIONS. INSTALL AS SHOWN BELOW REGARDLESS OF ADJACENT TRAFFIC DIRECTION.
 - D. HEIGHT MEASURED AT TOP OF W-BEAM IS 27³/₄" MIN. - 28³/₄" MAX.
3. IF THE NECESSARY CLEAR RUNOUT AREA FOR THE GR-7 TERMINAL CANNOT BE OBTAINED, CONSIDER ALTERNATIVE TERMINAL OPTIONS.
4. THIS DRAWING IS REPRESENTATIONAL ONLY. DETAILS, DIMENSIONS, QUANTITIES, AND OTHER INFORMATION NOT SHOWN WILL VARY FOR EACH MANUFACTURER. SEE INDIVIDUAL MANUFACTURER'S PLANS FOR THIS INFORMATION.

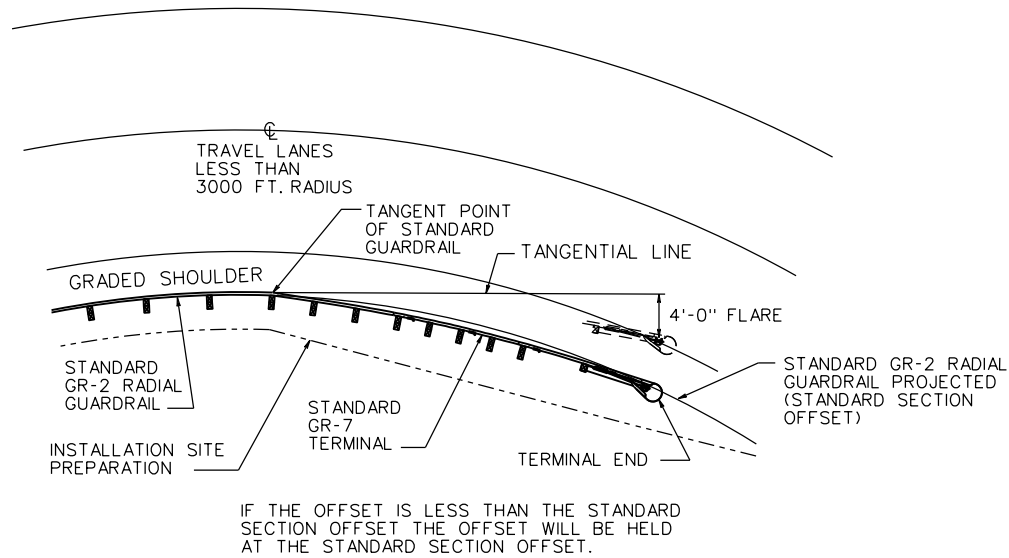


SPECIFICATION REFERENCE	A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.	FLARED END TERMINAL	
		(4' FLARE)	
221 505		VDOT ROAD AND BRIDGE STANDARDS	REVISION DATE 07/16
			SHEET 1 OF 3 501.11

GR-7



**FLARED TERMINAL PLACEMENT
3000 FT. RADIUS OR GREATER**



**FLARED TERMINAL PLACEMENT ON
INSIDE OF CURVE - LESS THAN
3000 FT. RADIUS**



ROAD AND BRIDGE STANDARDS

SHEET 2 OF 3

REVISION DATE

501.12

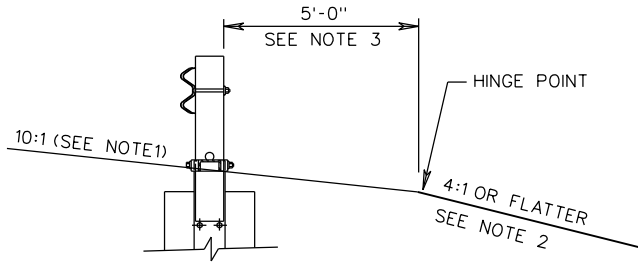
07/16

**FLARED END TERMINAL
(4' FLARE)**

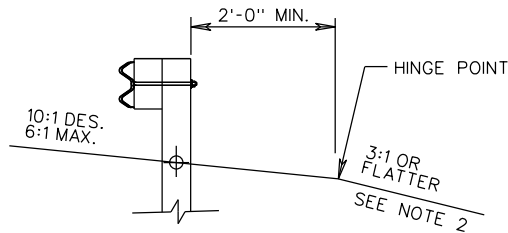
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
REFERENCE

221
505



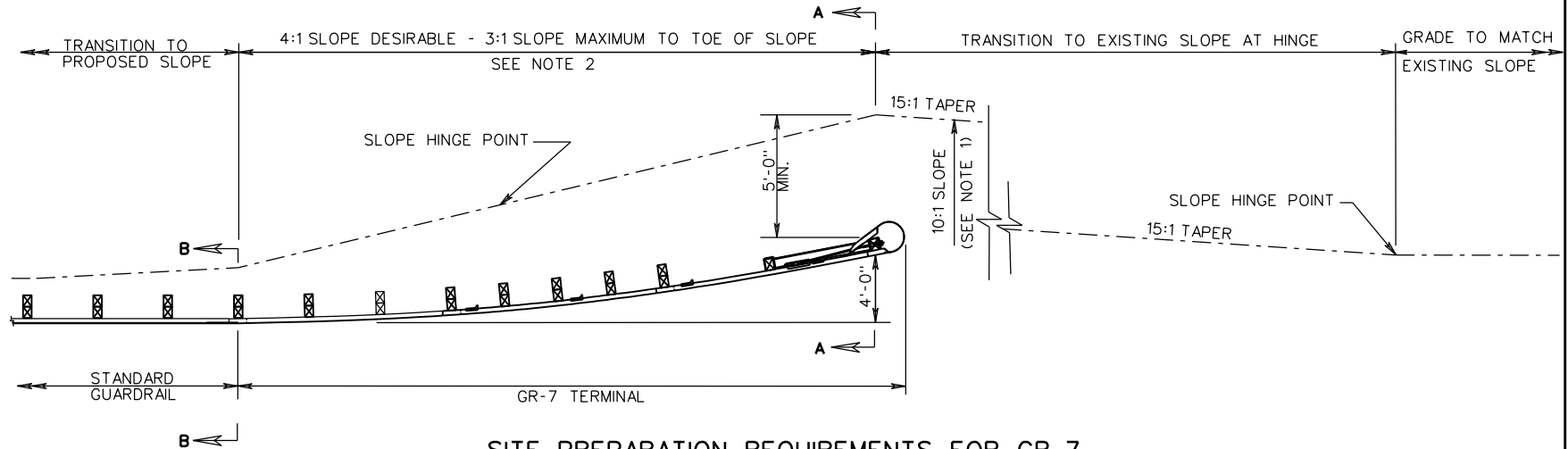
SECTION A-A



SECTION B-B

NOTES:

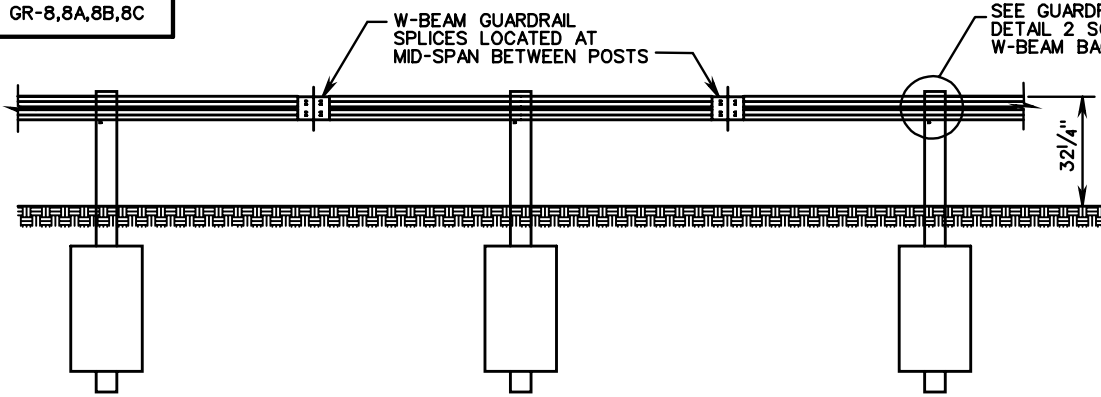
1. THE CROSS SLOPE OF THE GRADE APPROACHING THE GUARDRAIL TERMINAL, AND ADJACENT TO FOR ITS FULL LENGTH, MUST BE 10:1. IF THE EXISTING GRADE IS FLAT OR IS A POSITIVE SLOPE DUE TO THE SUPERELEVATION OF THE ROADWAY PAVEMENT, THE MIN. OFFSET FROM BEHIND THE POST TO THE HINGE POINT, AS SHOWN, IS REQUIRED.
2. THE AREA IMMEDIATELY BEHIND AND BEYOND THE TERMINAL SHOULD BE TRAVERSABLE (3:1 OR FLATTER) 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 UN-SHIELDED ROADSIDE AREAS.
3. FOR NEW CONSTRUCTION, RECONSTRUCTION, AND 3R WORK THE 10:1 SLOPE GRADING MUST EXTEND A MINIMUM OF 5'-0" BEHIND THE END POST.
4. FOR PROPRIETARY GUARDRAIL TERMINALS THE MANUFACTURER'S SITE PREPARATION REQUIREMENTS TAKE PRECEDENCE OVER THIS STANDARD.



SITE PREPARATION REQUIREMENTS FOR GR-7

SPECIFICATION REFERENCE 221 505	A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.		VDOT ROAD AND BRIDGE STANDARDS
	<p>GUARDRAIL TERMINAL INSTALLATION SITE PREPARATION REQUIREMENTS FOR GR-7</p> <p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>		
			SHEET 3 OF 3 501.13

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



TYPICAL INSTALLATION

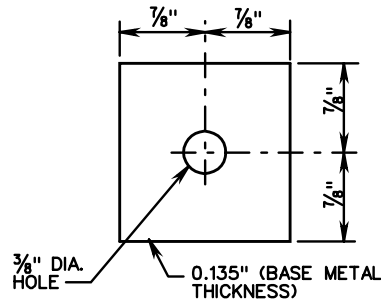
STANDARD	POST SPACING	DEFLECTION
GR-8	12' - 6"	7' - 0"
GR-8A	6' - 3"	5' - 0"
GR-8B	3' - 1/2"	4' - 0"
GR-8C	4' - 2"	4' - 6"

FOR ROCK INSTALLATION, 8" X 24" 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.

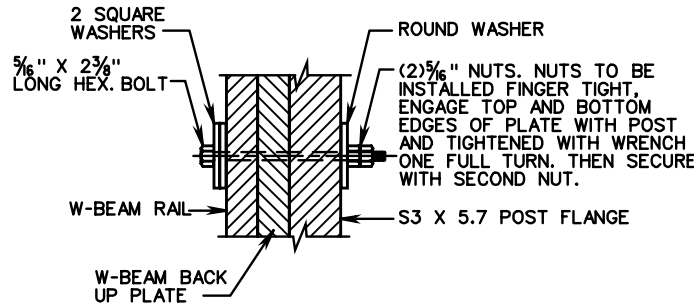
ALL POSTS, BOLTS, NUTS AND WASHERS ARE TO BE GALVANIZED.

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.

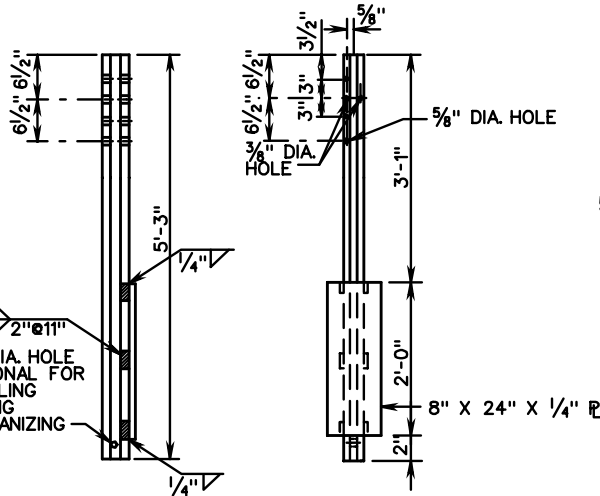


SQUARE WASHER

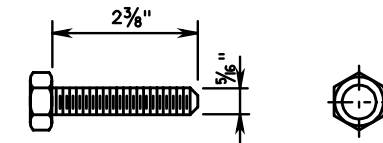


GUARDRAIL POST CONNECTION DETAIL

POST SPACING ON CURVES	
PAVEMENT ϕ 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' - 1/2"
< 50 FT.	USE NOT RECOMMENDED

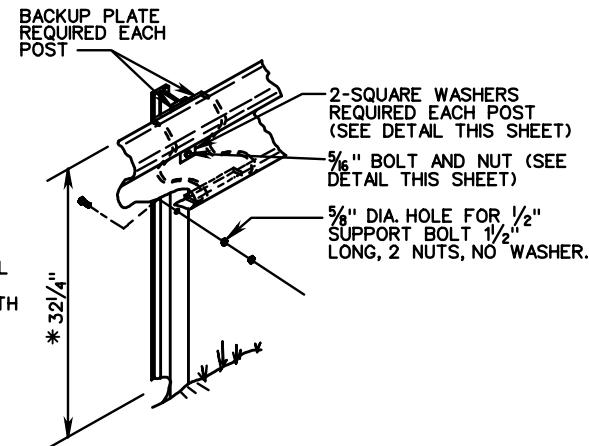


S 3 X 5.7 STEEL POST



5/16" HEX BOLT AND NUT

BOLT AND NUT SHALL HAVE 4000 POUNDS MIN. TENSILE STRENGTH



TYPICAL INSTALLATION

* HEIGHT TOLERANCE $\pm 3/4$ "



ROAD AND BRIDGE STANDARDS

STANDARD W-BEAM GUARDRAIL (WEAK POST SYSTEM)

SPECIFICATION REFERENCE

SHEET 1 OF 2

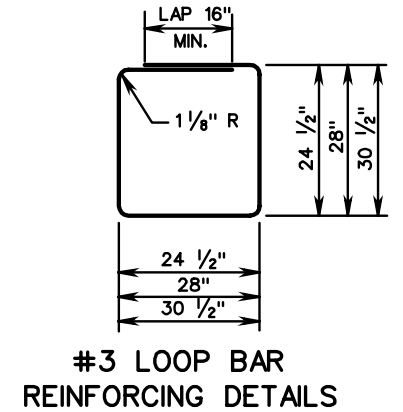
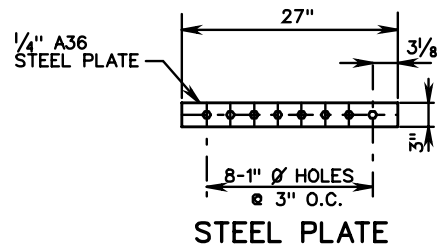
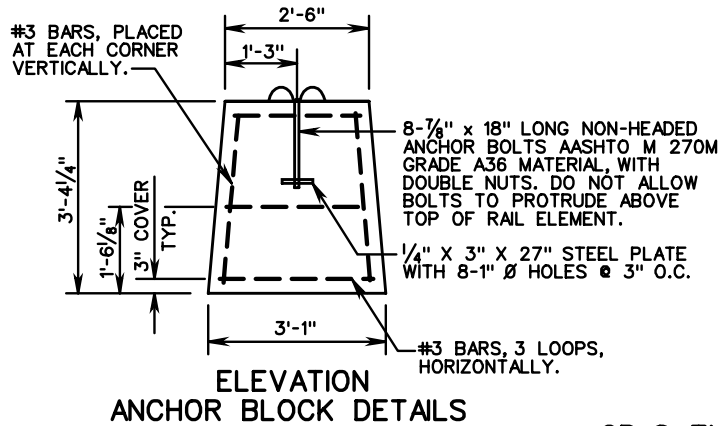
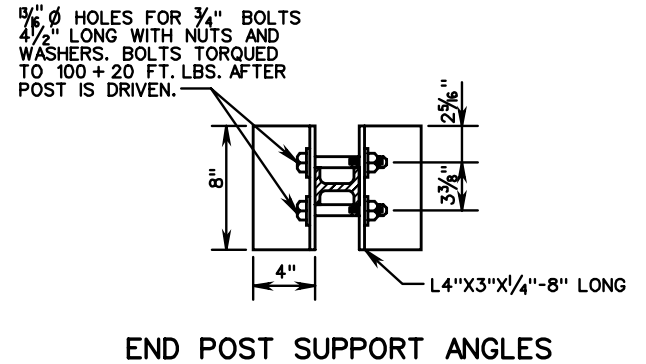
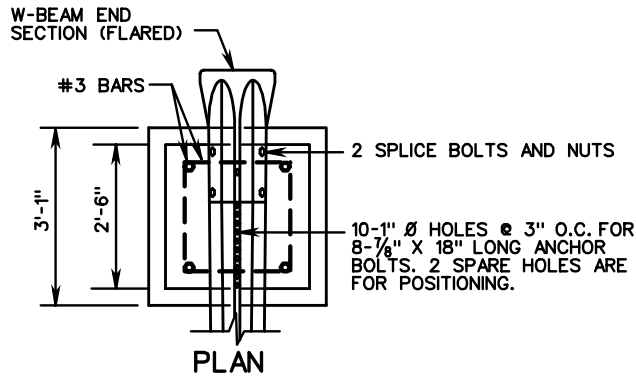
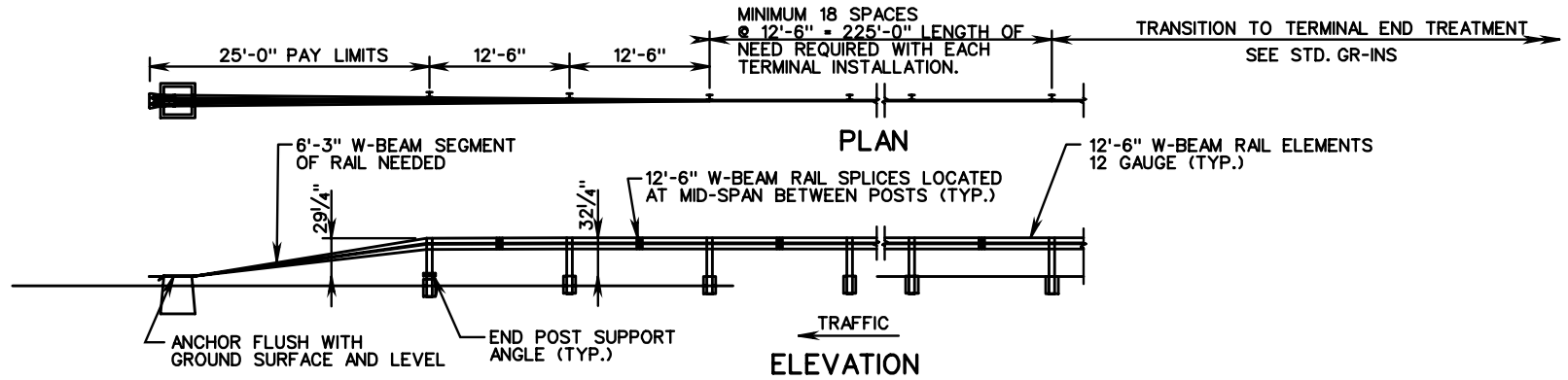
REVISION DATE

TL-3 (>45 MPH)

221
505

501.14

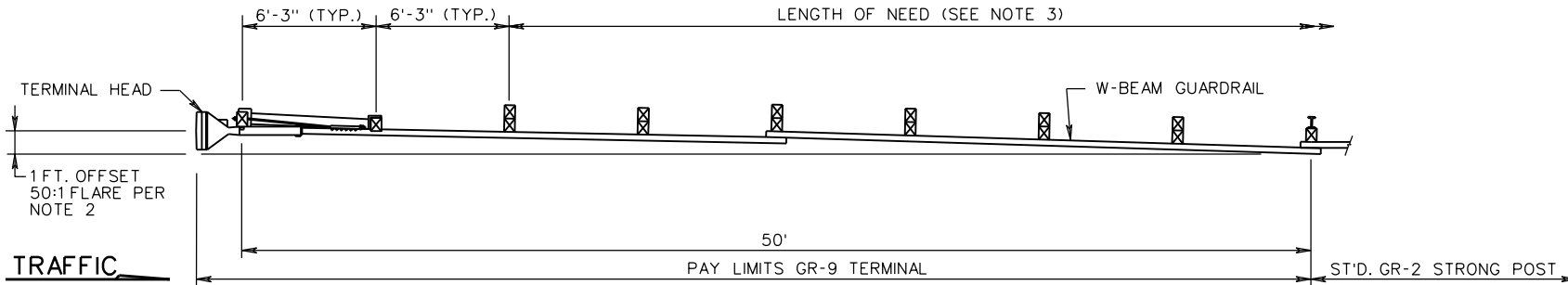
VIRGINIA DEPARTMENT OF TRANSPORTATION



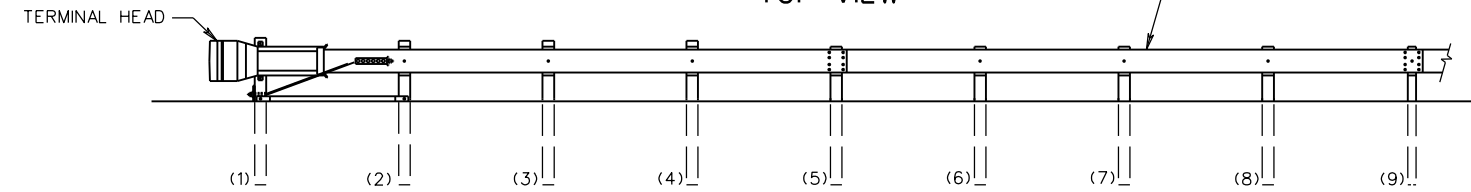
GR-8 TYPE II TERMINAL TREATMENT
(RUN-OFF ANCHORAGE)

SPECIFICATION REFERENCE 221 505	STANDARD W-BEAM GUARDRAIL (WEAK POST SYSTEM) TL-3 (>45 MPH) VIRGINIA DEPARTMENT OF TRANSPORTATION	VDOT ROAD AND BRIDGE STANDARDS	
		REVISION DATE	SHEET 2 OF 2 501.15

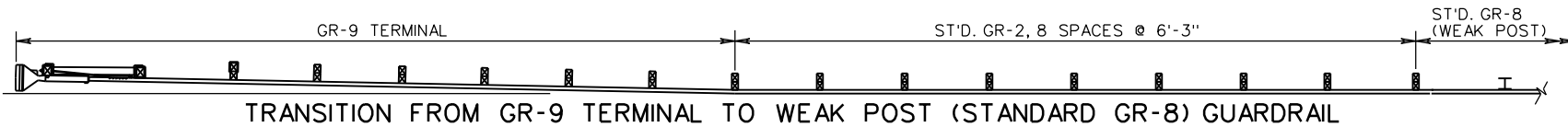
GR-9



TOP VIEW



ELEVATION



NOTES:

1. TANGENT END TERMINAL (GR-9) SHALL BE A VDOT APPROVED PRODUCT MEETING NCHRP 350 OR MASH TESTING CRITERIA. ANY TERMINAL USED FOR THE GR-9 SHALL BE FROM THE VDOT APPROVED PRODUCTS LIST. STANDARD MB-3 TERMINAL OPTIONS ARE INCLUDED WITH THE GR-9 TERMINALS ON THE APPROVED PRODUCTS LIST.
2. ALL TERMINALS SHALL BE INSTALLED ACCORDING TO THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND THE FOLLOWING VDOT REQUIREMENTS:
 - A. ALL STANDARD GR-9 TERMINALS (SIMILAR TO AS SHOWN ABOVE) SHALL BE INSTALLED WITH A 1 FT. OFFSET ACCOMPLISHED WITH A 50:1 FLARE TO PREVENT THE GUARDRAIL TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER FOR 3R WORK WHERE RIGHT OF WAY IS LIMITED, THE OFFSET CAN BE DECREASED AS DIRECTED BY THE ENGINEER.
 - B. DIRECTION OF THE REFLECTIVE TAPE ON THE TERMINAL HEAD SHALL CONFORM TO MUTCD APPLICATION FOR DIAGONAL STRIPES ON OBJECT MARKERS AND BRIDGE END PANELS. COLOR OF TAPE SHALL BE AMBER (YELLOW).
 - C. DO NOT CHANGE THE LAPPING OF TERMINAL FOR ANY INSTALLATIONS. INSTALL AS SHOWN ABOVE REGARDLESS OF ADJACENT TRAFFIC DIRECTION.
 - D. HEIGHT MEASURED AT TOP OF W-BEAM IS $27\frac{3}{4}$ " MIN. - $28\frac{3}{4}$ " MAX.
3. THIS DRAWING IS REPRESENTATIONAL ONLY. DETAILS, DIMENSIONS, QUANTITIES, AND OTHER INFORMATION NOT SHOWN WILL VARY FOR EACH MANUFACTURER. SEE INDIVIDUAL MANUFACTURER'S PLANS FOR THIS INFORMATION.



ROAD AND BRIDGE STANDARDS

SHEET 1 OF 2

REVISION DATE

501.16

07/16

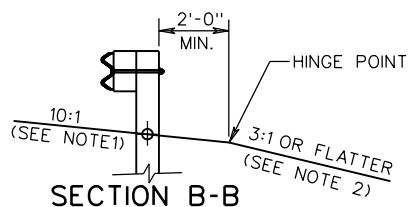
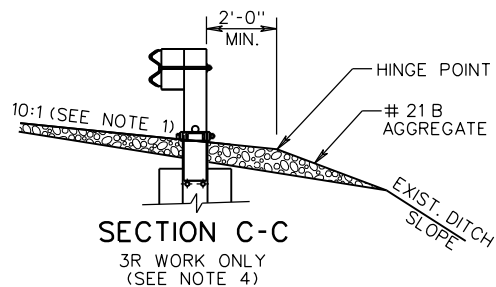
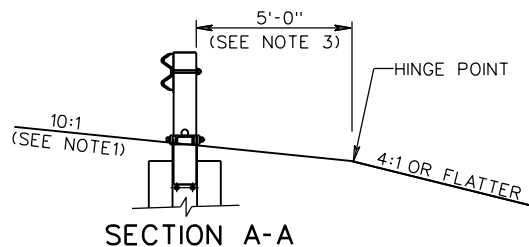
A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

TANGENT END TERMINAL
NO FLARE

VIRGINIA DEPARTMENT OF TRANSPORTATION

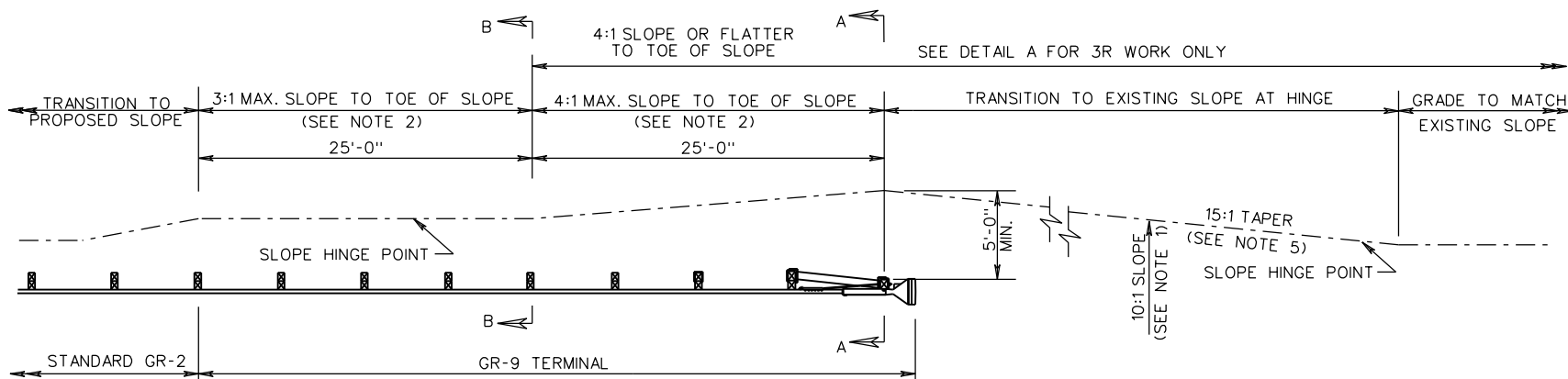
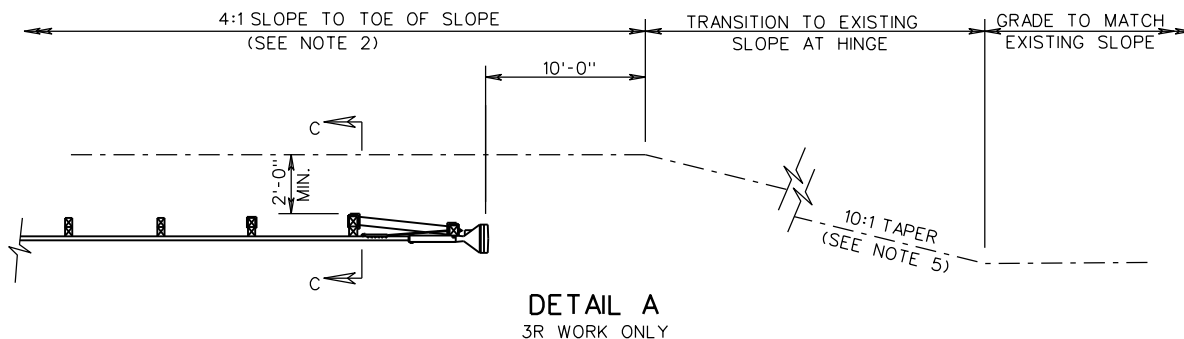
SPECIFICATION
REFERENCE

505



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 5'-0" 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 2'-0" BEHIND THE BLOCKED OUT 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.
6. FOR PROPRIETARY GUARDRAIL TERMINALS THE MANUFACTURER'S SITE PREPARATION REQUIREMENTS TAKE PRECEDENCE OVER THIS STANDARD.



SITE PREPARATION REQUIREMENTS FOR GR-9

SPECIFICATION REFERENCE

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.
GUARDRAIL TERMINAL INSTALLATION SITE PREPARATION REQUIREMENTS FOR GR-9

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT

ROAD AND BRIDGE STANDARDS

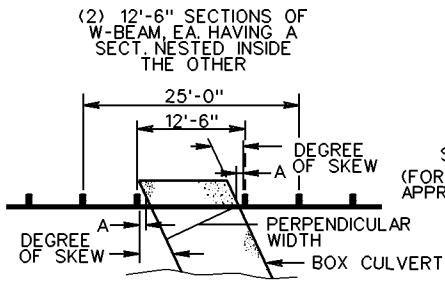
REVISION DATE

SHEET 2 OF 2

01/14

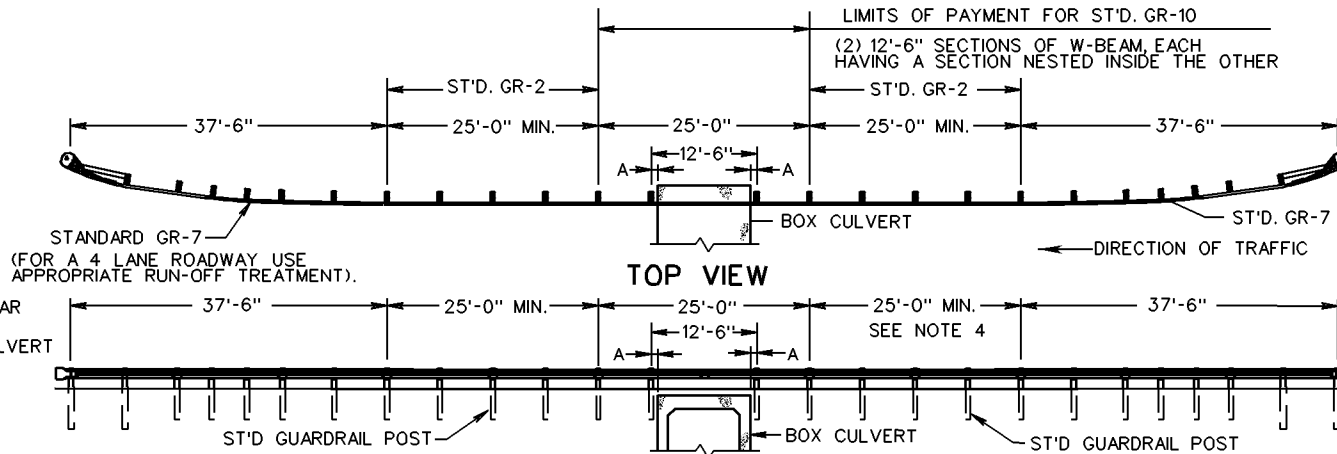
501.17

GR-10



ONE POST OMITTED TOP VIEW

FOR DETAILS OF GUARDRAIL POSTS AND BLOCKOUTS, SEE STANDARD GR-2, 2A.



ELEVATION TYPE I-ONE POST OMITTED

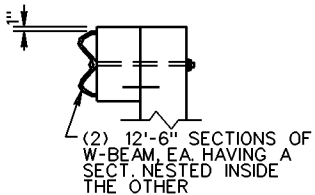
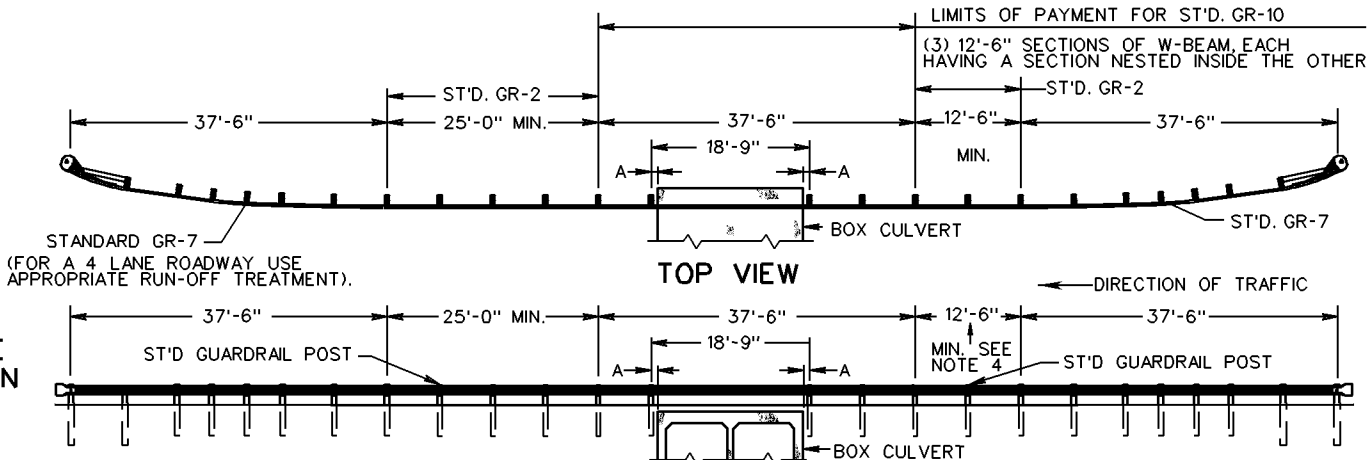


TABLE OF MAXIMUM ALLOWABLE STRUCTURE WIDTHS FOR THIS DESIGN

* "A" THE MINIMUM ALLOWABLE DISTANCE BETWEEN CLOSEST POINT OF POST TO STRUCTURE.



ELEVATION TYPE II-TWO POSTS OMITTED

TYPE I- ONE POST OMITTED			TYPE II- TWO POST OMITTED		
SKEW	A*	MAX. PERPENDICULAR WIDTH (FEET)	SKEW	A*	MAX. PERPENDICULAR WIDTH (FEET)
0°	9"	10.5	0°	9"	16.75
5°	9"	10.4	5°	9"	16.6
10°	9"	10.2	10°	9"	16.4
15°	9"	10.0	15°	9"	16.0
20°	9"	9.6	20°	9"	15.5
25°	9"	9.2	25°	9"	14.9
30°	9"	8.8	30°	9"	14.2
35°	9"	8.2	35°	9"	13.2
40°	9"	7.6	40°	9"	12.4
45°	9"	7.0	45°	9"	11.4

NOTES:

1. THIS SHEET IS APPLICABLE WHEN GUARDRAIL IS REQUIRED AND THE DEPTH OF FILL ABOVE THE TOP SLAB OF THE BOX CULVERT IS LESS THAN 4'-0".
2. GUARDRAIL INSTALLATION SHALL BE IN ACCORDANCE WITH SECTION 505 OF THE SPECIFICATIONS. MATERIAL REQUIREMENT FOR COMPONENTS SHALL BE IN ACCORDANCE WITH SECTION 221 OF THE SPECIFICATIONS.
3. GUARDRAIL POST SPACING SHALL BE IN ACCORDANCE WITH STANDARD GR-2.
4. THIS DISTANCE SHALL BE IN ACCORDANCE WITH VDOT POLICY ON DETERMINING THE LENGTH OF NEED FOR GUARDRAIL WITH A MINIMUM DISTANCE AS SHOWN.
5. ALL SPLICES IN NESTED W-BEAM SECTIONS MUST COINCIDE AT A COMMON POINT AND BE BOLTED TOGETHER USING ONE SET OF BOLTS AT EACH SPLICE.



ROAD AND BRIDGE STANDARDS

GUARDRAIL AT LOW-FILL CULVERTS

SPECIFICATION REFERENCE

SHEET 1 OF 2

REVISION DATE

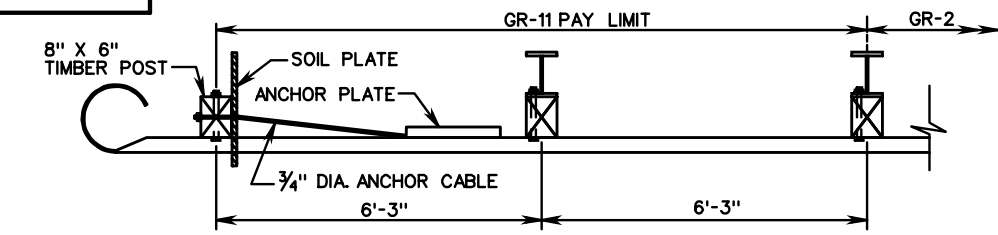
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08/10

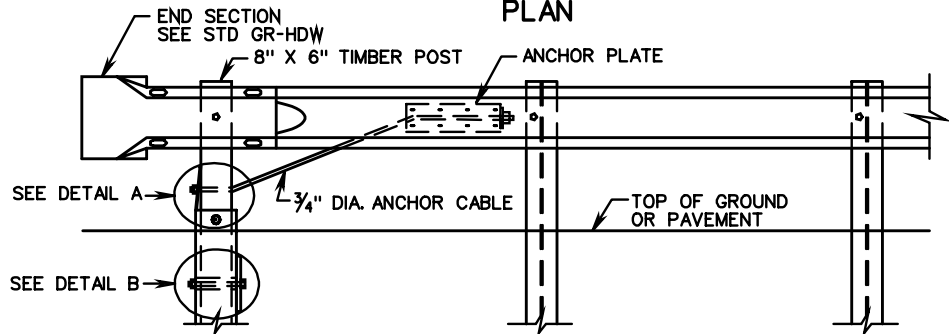
VIRGINIA DEPARTMENT OF TRANSPORTATION

221
505

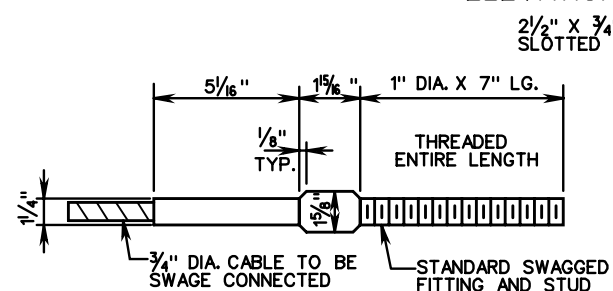
GR-11



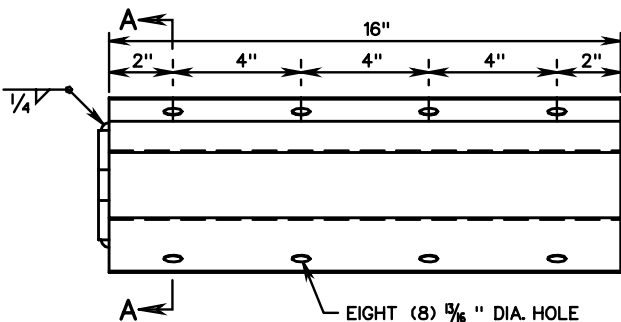
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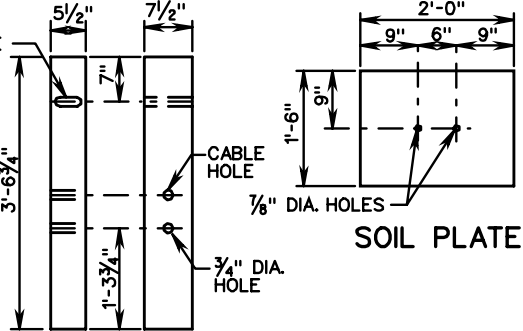
ELEVATION



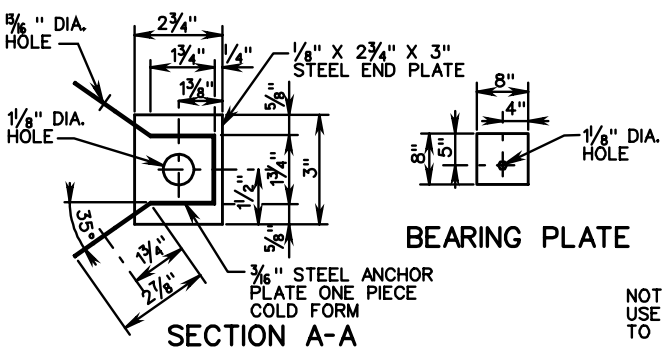
ANCHOR CABLE SWAGE CONNECTION TO THREADED STUD



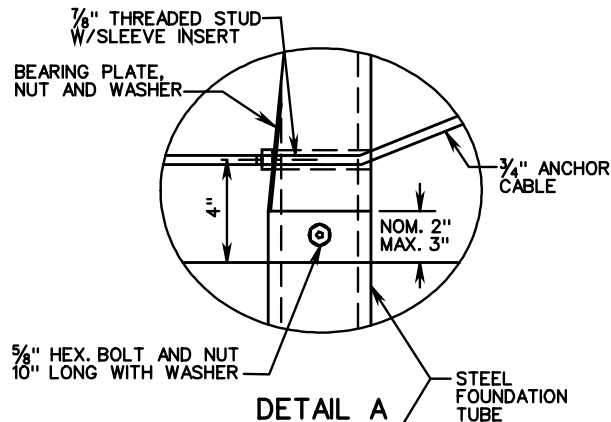
ANCHOR PLATE DETAILS



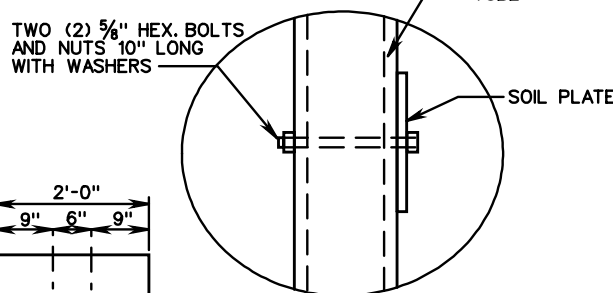
SHORT WOODEN POST



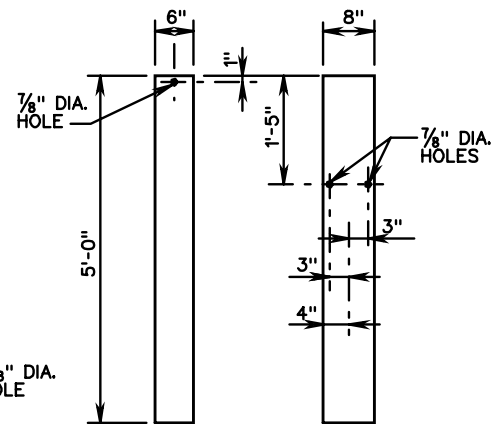
SECTION A-A



DETAIL A



DETAIL B



BEARING PLATE

STEEL FOUNDATION TUBE

NOTE: USE OF THIS TERMINAL TREATMENT IS RESTRICTED TO RUN-OFF CONDITIONS ON DIVIDED HIGHWAYS.



ROAD AND BRIDGE STANDARDS

TRAILING END TERMINAL TREATMENT

SPECIFICATION REFERENCE

SHEET 1 OF 1

REVISION DATE

VIRGINIA DEPARTMENT OF TRANSPORTATION

505
221

501.20

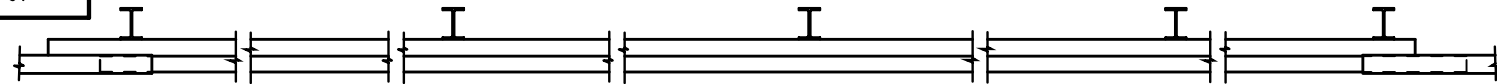
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SPECIFICATION REFERENCE

TITLE
VIRGINIA DEPARTMENT OF TRANSPORTATION

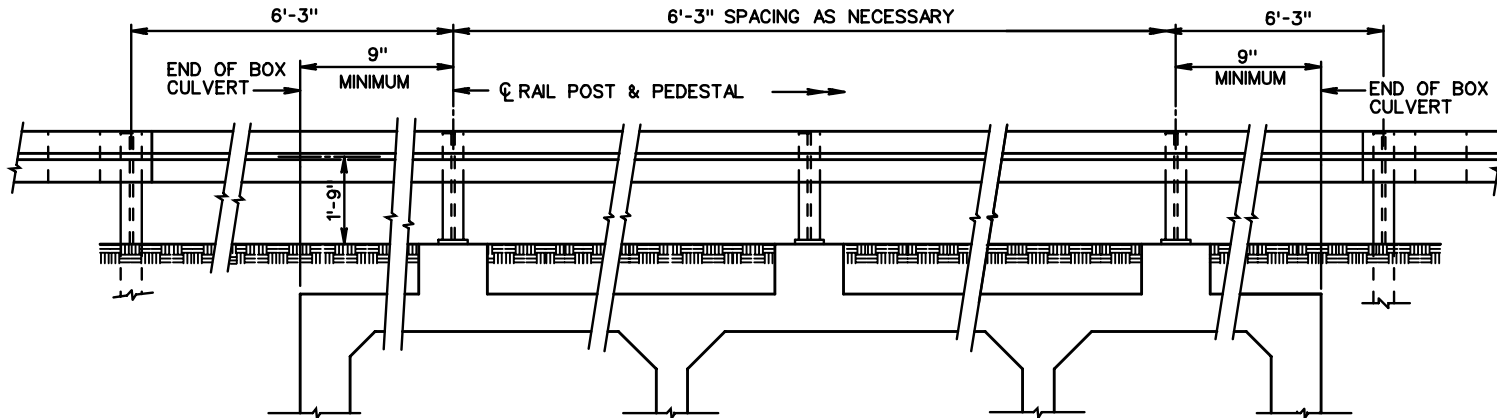
VDOT ROAD AND BRIDGE STANDARDS	
REVISION DATE	SHEET 1 OF 1

BGR-01



PLAN

NOTE: MAINTAIN 6'-3" POST SPACING WHEREVER POSSIBLE FOR USE WITH 25' STANDARD RAIL SECTION. SYMMETRY OF POST SPACING IS NOT NECESSARY.



LONGITUDINAL SECTION

GENERAL NOTE:

ALL STRUCTURAL STEEL, INCLUDING BOLTS, NUTS, AND WASHERS SHALL BE GALVANIZED.

FOR DETAILS OF GUARDRAIL, SEE GR-2 OF THE ROAD AND BRIDGE STANDARDS.

THE GUARDRAIL INSTALLATION SHALL CONFORM WITH SECTION 505 OF THE CURRENT VIRGINIA DEPARTMENT OF TRANSPORTATION ROAD AND BRIDGE SPECIFICATIONS.

RAIL POSTS MAY BE VERTICAL OR PERPENDICULAR TO ADJACENT ROADWAY GRADE AND CROSS SLOPE. TOP OF PEDESTAL SHALL BE SLOPED AS NECESSARY FOR PERPENDICULAR INSTALLATION.

DETAILS ON THIS SHEET ARE TO BE USED FOR BOTH STRAIGHT AND SKEWED BOXES.

ANCHOR BOLTS SHALL BE 7/8" ØA307 (OR A36 THREADED RODS WITH TACK WELDED NUTS) WITH HEX NUTS AND WASHERS AS SHOWN. THREADED RODS MAY BE 0.781 MIN. DIAMETER WITH ROLLED THREADS. NUTS SHALL CONFORM TO A307 REQUIREMENTS AND SHALL BE TAPPED OR CHASED AFTER GALVANIZING. BOLTS AND NUTS SHALL HAVE CLASS 2A AND 2B FIT TOLERANCES. BOLTS SHALL BE EMBEDDED 8" INTO THE CONCRETE.

THIS RAIL HAS BEEN SUCCESSFULLY EVALUATED BY FULL SCALE IMPACT TESTS CONDUCTED IN ACCORDANCE WITH NCHRP REPORT 153. TEST DOCUMENTATION MAY BE FOUND IN RESEARCH REPORT 230-1, "TUBULAR W-BEAM BRIDGE RAIL", OF RESEARCH STUDY 2-5-78-230 "BRIDGE RAIL TO CONTAIN HEAVY TRUCKS AND BUSES", TEXAS TRANSPORTATION INSTITUTE, OCTOBER 1978.

TUBULAR GUARD RAIL SHALL BE FURNISHED AND INSTALLED IN 25 FT. SECTIONS. TUBULAR RAIL MEMBER SHALL BE EXTENDED AND CONNECTED TO AT LEAST THE FIRST SOIL EMBEDDED POST AT EACH END OF THE STRUCTURE. MORE SUCH POSTS SHALL BE USED TO UTILIZE 25 FT. STANDARD SECTIONS. APPROACH GUARDRAIL POSTS SHALL BE SPACED AT 6'-3" ADJACENT TO THE TUBULAR RAIL SINCE ITS FLEXIBILITY IS SIMILAR TO THE STANDARD METAL BEAM GUARDRAIL. DO NOT INSTALL ADDITIONAL POSTS AT 3'-1/2" CENTERS. FULLY ANCHORED GUARDRAIL MUST BE ATTACHED AT BOTH ENDS OF TUBULAR RAIL.

TESTS HAVE SHOWN THAT ALTHOUGH THIS RAIL DEFLECTS HORIZONTALLY TWO OR THREE FEET, ADEQUATE VEHICLE CONTAINMENT AND RE-DIRECTION IS ACHIEVED. THE RESULTING MORE GRADUAL DECELERATION THUS PRODUCES A SAFER CONDITION THAN AFFORDED BY OTHER BRIDGE RAILINGS.

THE CONTRACTOR SHALL DETERMINE THE NUMBER OF PEDESTALS REQUIRED FOR GUARDRAIL INSTALLATION ACROSS THE BOX, PEDESTAL HEIGHT AND DIMENSIONS OF THE BR SERIES REINFORCING BARS. THE QUANTITY OF CONCRETE (CLASS A4) AND REINFORCING STEEL USED IN THE PEDESTALS SHALL BE FIELD VERIFIED AND PAID FOR AT THE UNIT PRICE BID FOR THE CORRESPONDING BOX QUANTITIES. THE RAILING (TEXAS T-6) SHALL BE MEASURED IN 25 FT. SECTIONS AND PAID FOR AT THE CONTRACT UNIT PRICE PER LINEAR FOOT IN ACCORDANCE WITH SECTION 410.04 OF THE SPECIFICATIONS. BR SERIES BARS SHALL BE #5 IN SIZE.

FOR DETAILS OF BOX CULVERTS, SEE THE BOX CULVERT STANDARDS.

THIS SHEET IS APPLICABLE WHEN GUARDRAIL IS REQUIRED AND THE DEPTH OF FILL ABOVE THE TOP SLAB OF THE BOX CULVERT IS LESS THAN 3'-7".

DETAILS SHOWN ARE FOR INSTALLATION ON NEW BOX CULVERTS. INSTALLATION OF PEDESTALS ON EXISTING BOX CULVERTS SHALL BE IN ACCORDANCE WITH SEC. 412.03 OF THE SPECIFICATIONS EXCEPT THAT DOWELS SHALL BE PLACED BETWEEN 3 AND 6 INCHES FROM THE EDGE OF THE PEDESTAL.

PRECAST BOXES SHALL BE TREATED AS AN EXISTING BOX FOR PEDESTAL INSTALLATION.

THIS UNIT IS ONLY TO BE USED WHEN DESIGN SPEED IS 45 MPH OR LESS. TESTED - NCHRP 350 TEST LEVEL 2



ROAD AND BRIDGE STANDARDS

STANDARD BOX CULVERT GUARDRAIL

(TEXAS T-6)

VIRGINIA DEPARTMENT OF TRANSPORTATION

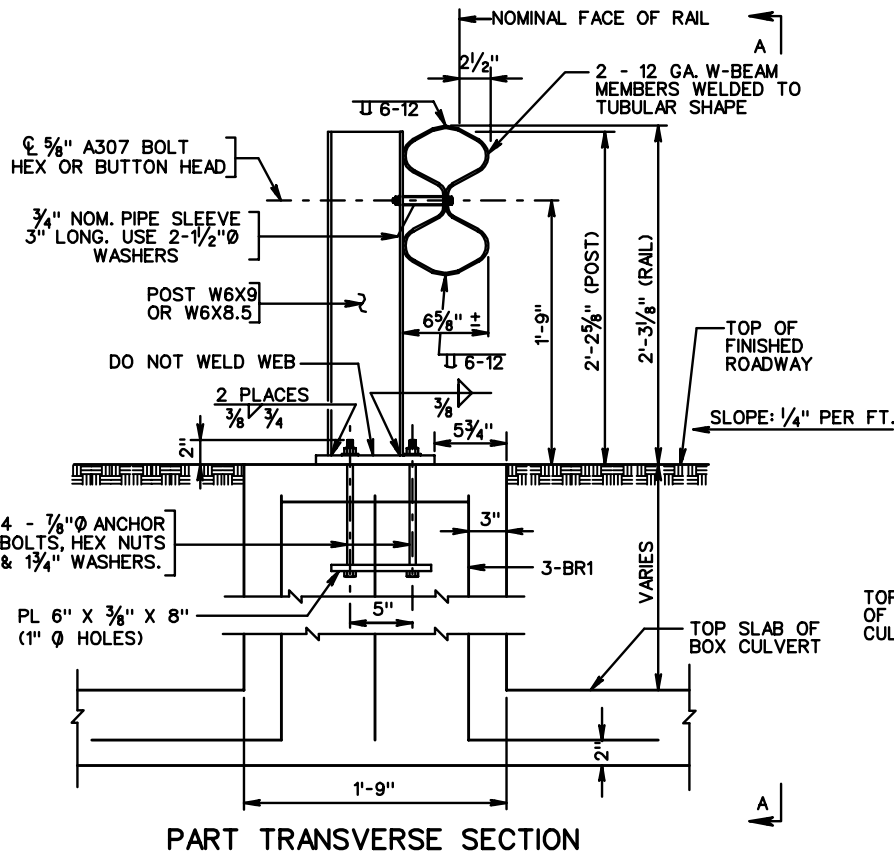
SPECIFICATION REFERENCE

STRUCTURE AND BRIDGE DIVISION

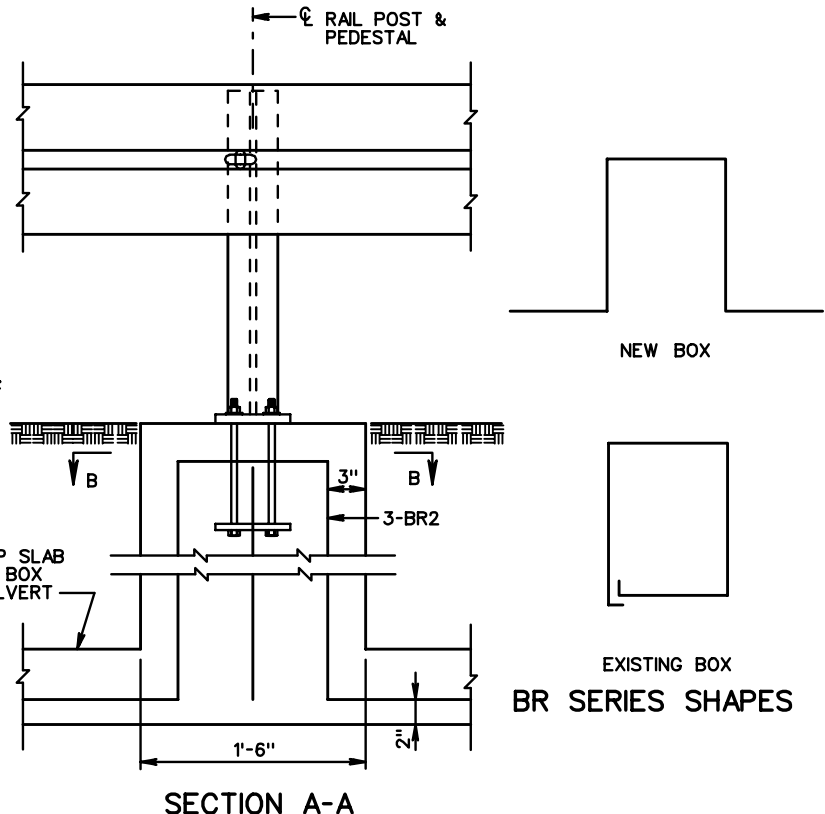
SHEET 1 OF 3

REVISION DATE

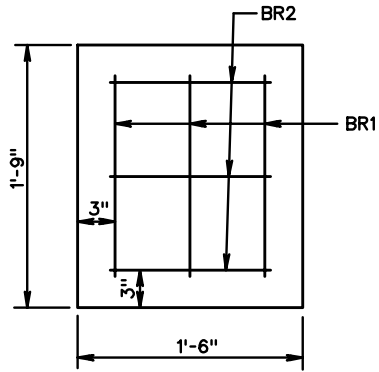
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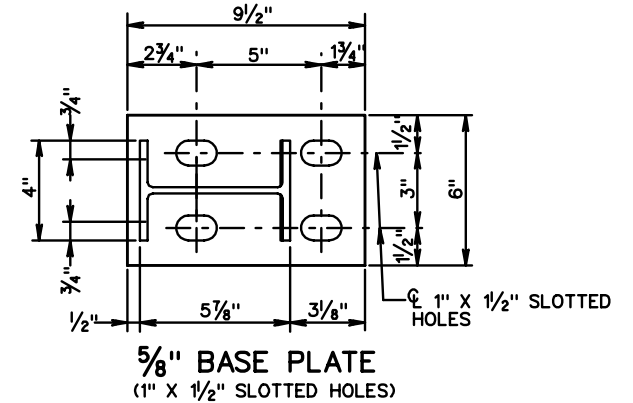
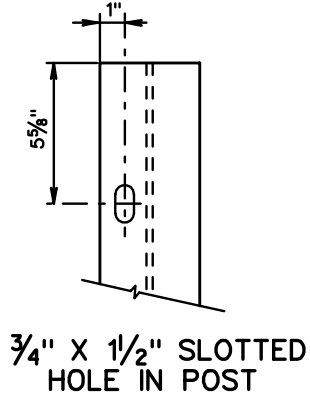
PART TRANSVERSE SECTION



SECTION A-A



SECTION B-B (ANCHOR BOLTS NOT SHOWN)



SPECIFICATION REFERENCE

STRUCTURE AND BRIDGE DIVISION

STANDARD BOX CULVERT GUARDRAIL (TEXAS T-6)

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT

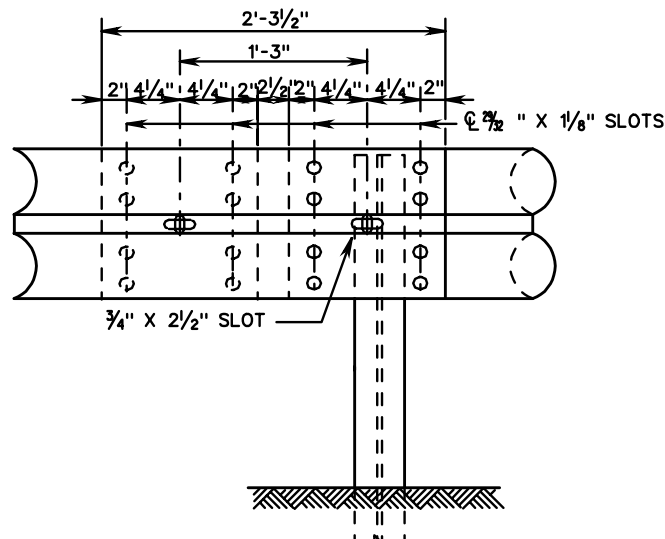
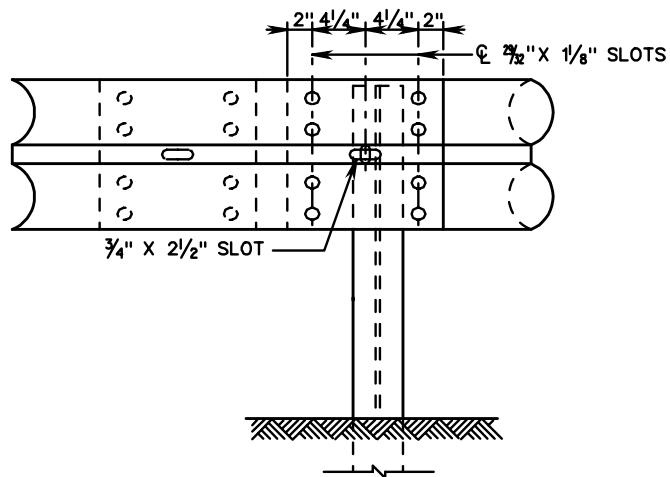
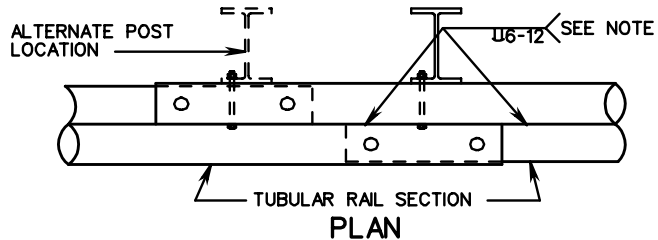
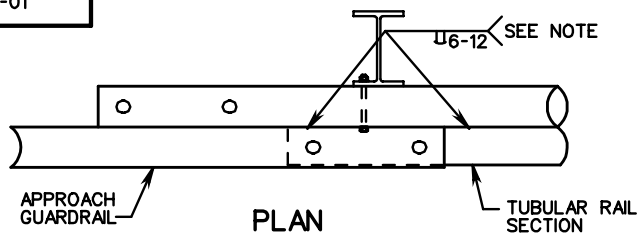
ROAD AND BRIDGE STANDARDS

REVISION DATE

SHEET 2 OF 3

501.23

BGR-01



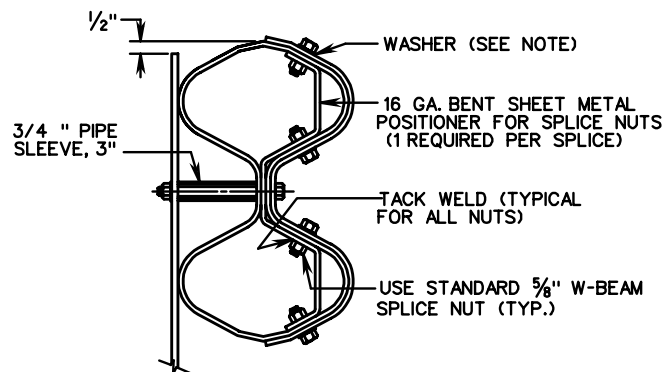
GUARDRAIL-TUBULAR RAIL SPLICE

TUBULAR RAIL SPLICE

NOTES:

TUBULAR W-BEAM RAIL MEMBER IS TO BE FABRICATED FROM STANDARD 25' NOMINAL W-BEAM SECTIONS. TOP AND BOTTOM SEAMS SHALL BE BUTT WELDED 6" AT 12" SPACING. CONTINUOUS SEAM WELDING IS ALSO ACCEPTABLE. WELDS SHALL BE CHIPPED AND CLEANED AND THE COMPLETE 25 FT. TUBULAR MEMBER SHALL BE GALVANIZED AFTER FABRICATION. FOR TUBULAR RAIL SPLICE ADDITIONAL POST MOUNTING SLOTS ARE TO BE MADE IN EACH MEMBER 1'-3" FROM THE STANDARD SLOTS AT 6'-3" CENTERS.

8-5/8" SPLICE NUTS SHALL BE TACK WELDED TO A BENT SHEET METAL POSITIONER AS SHOWN. OTHER SUITABLE POSITIONING METHODS OR DEVICES MAY BE SUBSTITUTED. THE COMPLETED SPLICE SHALL HAVE 8 BOLTS (16 BOLTS IF A TUBULAR RAIL SPLICE). EACH BOLT WILL INCLUDE A 1 3/4" X 3" X 3/16" PLATE WASHER OR A 2 INCH DIAMETER WASHER.



SPLICE DETAIL



ROAD AND BRIDGE STANDARDS

STANDARD BOX CULVERT GUARDRAIL

(TEXAS T-6)

SPECIFICATION REFERENCE

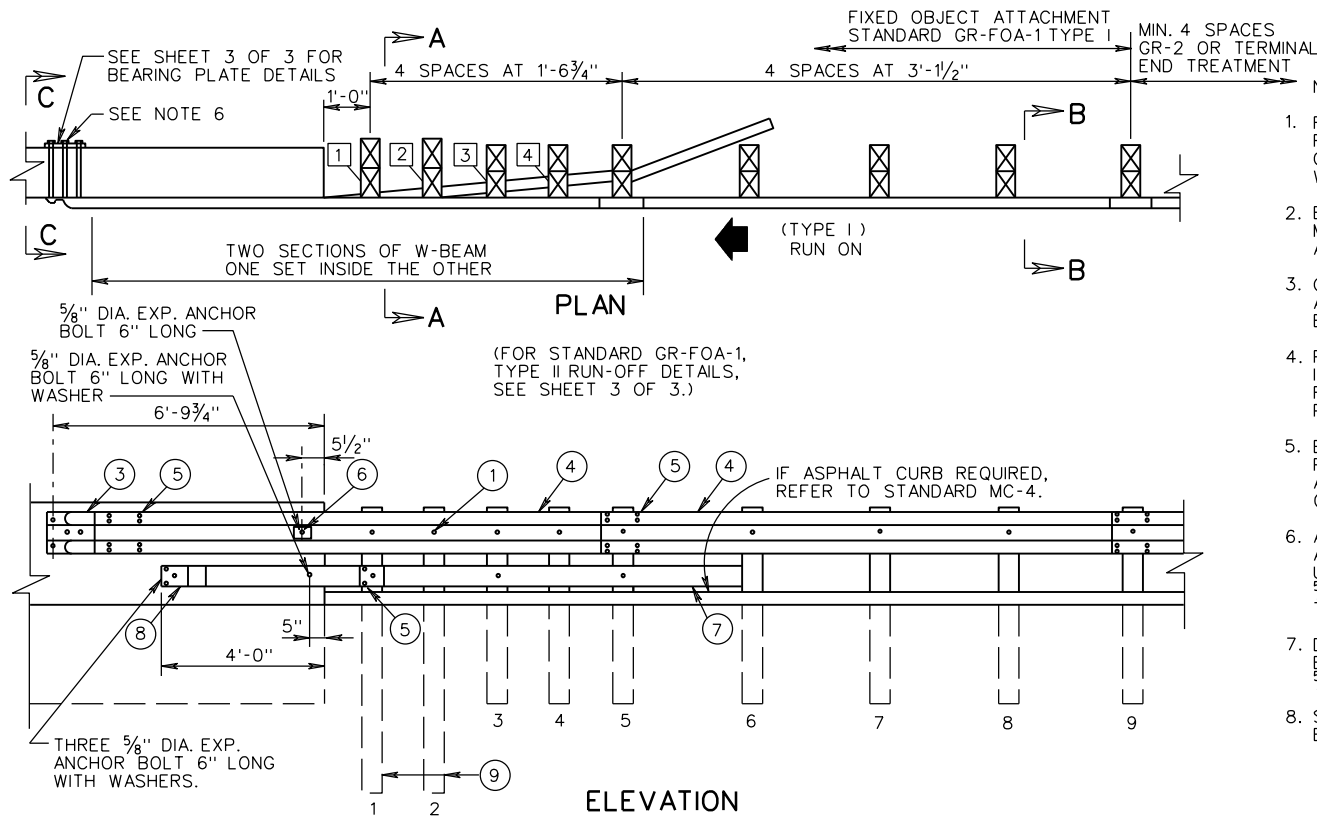
SHEET 3 OF 3

REVISION DATE

STRUCTURE AND BRIDGE DIVISION

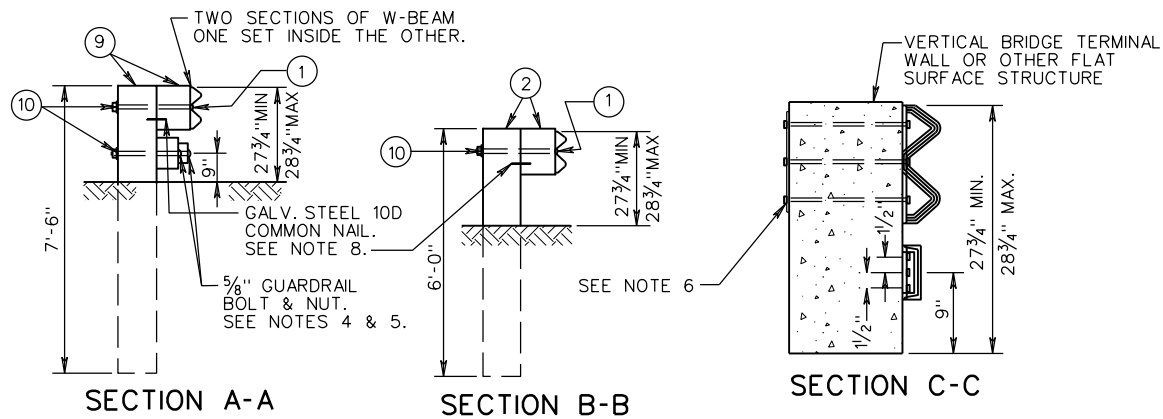
501.24

VIRGINIA DEPARTMENT OF TRANSPORTATION



- 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" GUARDRAIL BOLTS (LENGTH AS REQUIRED).
 6. APPROPRIATE LENGTH 7/8" DIAMETER ASTM A449 HEX BOLTS WITH WASHERS MUST BE USED WITH THRU DRILLED HOLES AND 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.



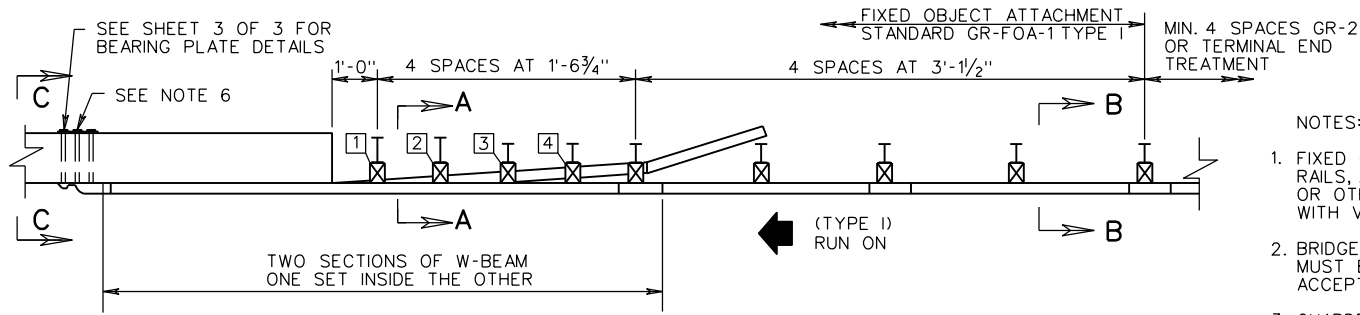
ITEM	MATERIAL/SPECIFICATIONS/NOTES
①	5/8" X 18" LONG GUARDRAIL BOLT AND RECESSED NUT
②	STANDARD 6" X 8" WOOD POST AND BLOCK
③	STANDARD W-BEAM TERMINAL CONNECTOR
④	STANDARD W-BEAM RAIL
⑤	5/8" X 2" LONG GUARDRAIL BOLT & RECESSED NUT (SEE ST'D. GR-HDW)
⑥	RECTANGULAR PLATE WASHER (SEE ST'D. GR-HDW)
⑦	BENT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

SPECIFICATION REFERENCE	505
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A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.
W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT
 FOR USE BETWEEN VERTICAL FIXED OBJECTS AND GUARDRAIL (WOOD POSTS)
 VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT ROAD AND BRIDGE STANDARDS	
REVISION DATE	SHEET 1 OF 3
01/14	501.25

GR-FOA-1



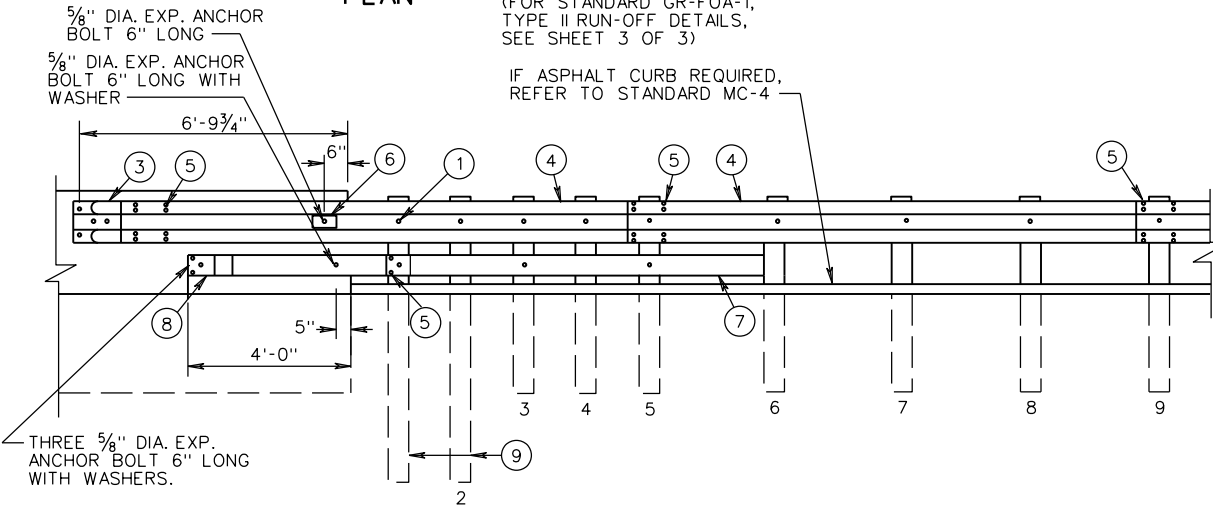
PLAN

(FOR STANDARD GR-FOA-1, TYPE II RUN-OFF DETAILS, SEE SHEET 3 OF 3)

IF ASPHALT CURB REQUIRED, REFER TO STANDARD MC-4

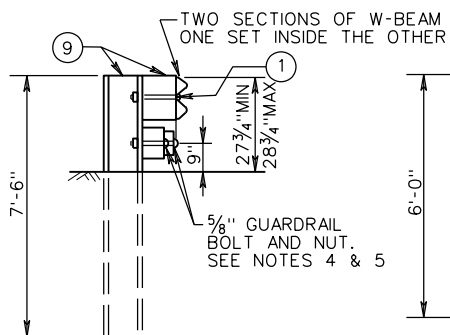
NOTES:

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" GUARDRAIL BOLTS (LENGTH AS REQUIRED).
6. APPROPRIATE LENGTH 7/8" DIAMETER ASTM A449 HEX BOLTS WITH WASHERS MUST BE USED WITH THRU DRILLED HOLES AND A 5/8" BEARING PLATE ON THE BACK SIDE OF THE BRIDGE PARAPET OR TERMINAL WALL.
7. SEE SHEET 3 OF 3 FOR RUBRAIL BLOCKOUT DETAILS.

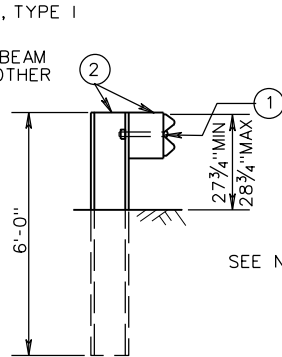


ELEVATION

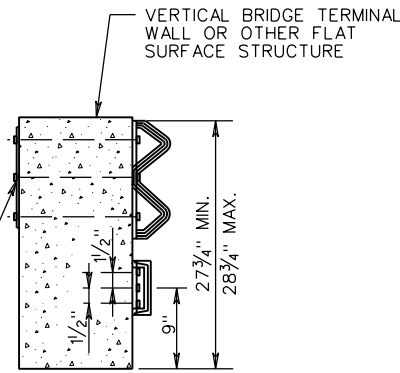
NEW BRIDGES - ATTACHMENTS
 ONE WAY TRAFFIC - RUN-ON, 2-GR-FOA-1, TYPE I
 - RUN-OFF, 2-GR-FOA-1, TYPE II
 TWO WAY TRAFFIC - RUN-ON, 4-GR-FOA-1, TYPE I



SECTION A-A



SECTION B-B



SECTION C-C

ITEM	MATERIAL/SPECIFICATIONS/NOTES
①	5/8" X 10" LONG GUARDRAIL BOLT & RECESSED 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	W8 X 13 X 7'-6" LONG STEEL POST WITH STANDARD 6" X 8" X 14" LONG TREATED PINE BLOCK OR RECYCLED MATERIAL



ROAD AND BRIDGE STANDARDS

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

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

SPECIFICATION REFERENCE

SHEET 2 OF 3

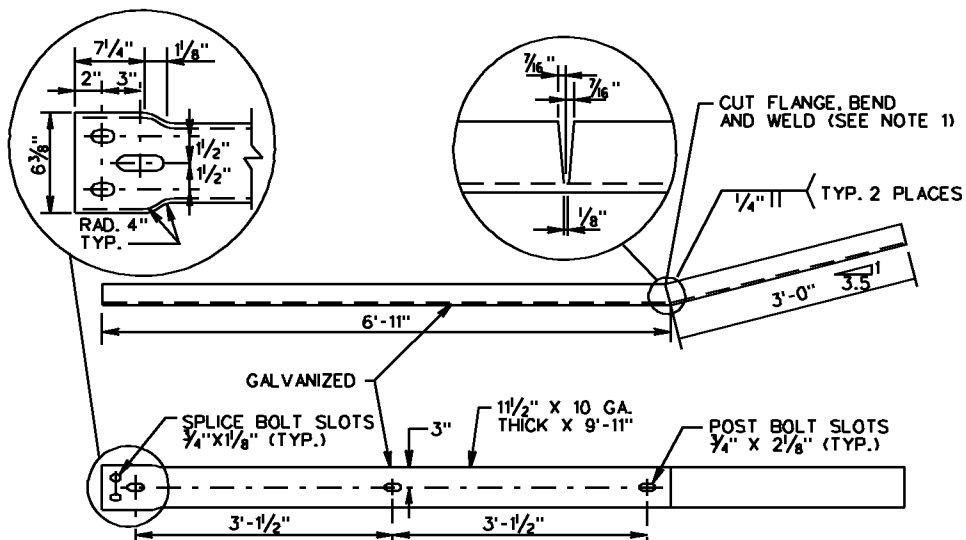
REVISION DATE

501.26

01/14

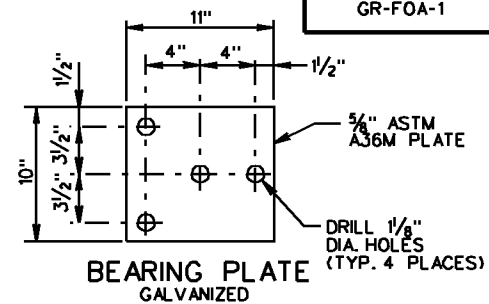
VIRGINIA DEPARTMENT OF TRANSPORTATION

505



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



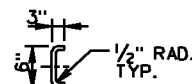
☆ CAN BE FIELD CUT AND BENT USING HEAT.

WOOD POSTS
RUBRAIL BLOCKOUTS
7" X 4" X THICKNESS

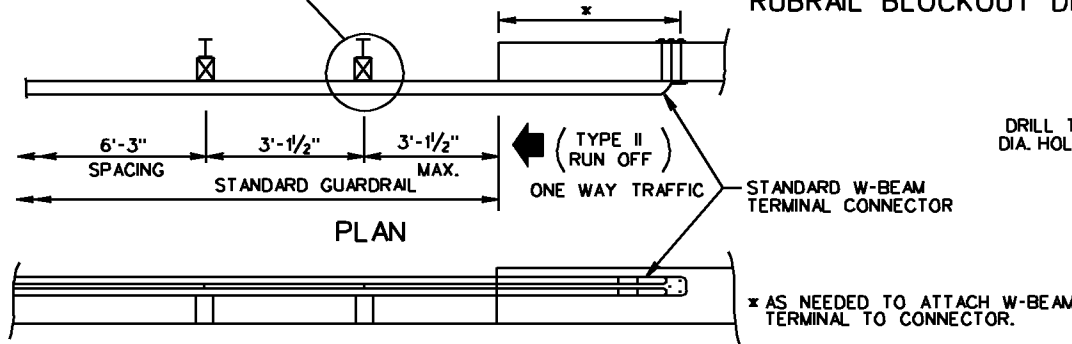
STEEL POSTS
RUBRAIL BLOCKOUTS
7" X 4" X THICKNESS

POST	THICKNESS
1	6 7/8"
2	4 3/8"
3	3 3/4"
4	1 3/4"

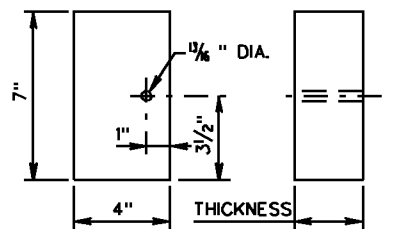
POST	THICKNESS
1	5 3/4"
2	4 1/4"
3	2 7/8"
4	1 3/8"



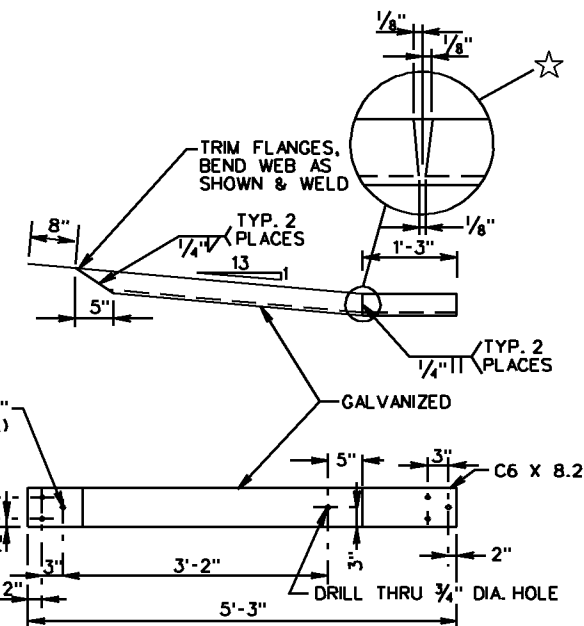
INDICATES EXTRA POST REQ'D FOR
RUN-OFF FIXED OBJECT ATTACHMENT
ST'D. GR-FOA-1 TYPE II



ELEVATION



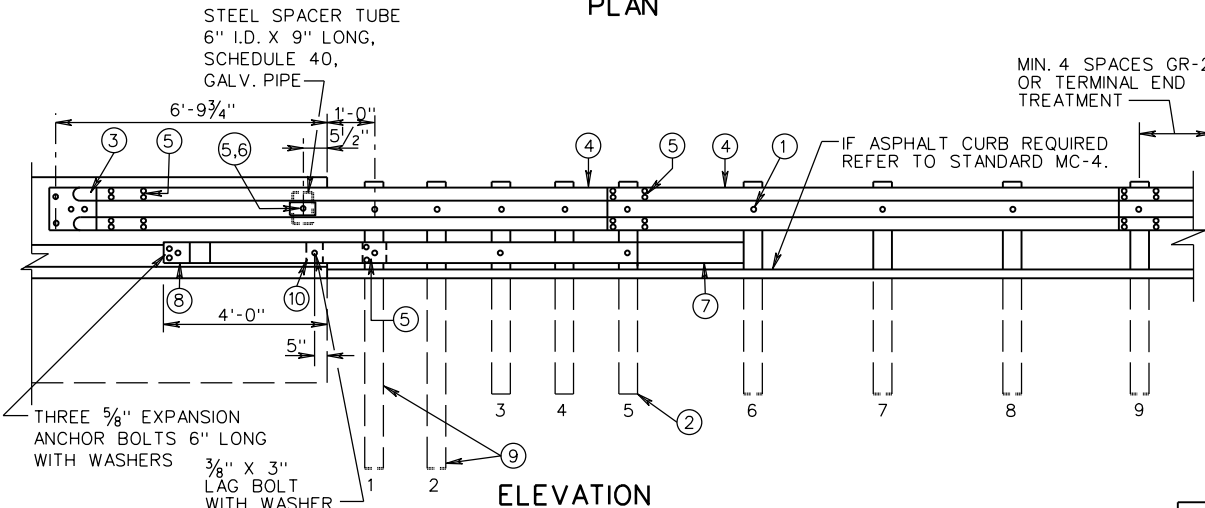
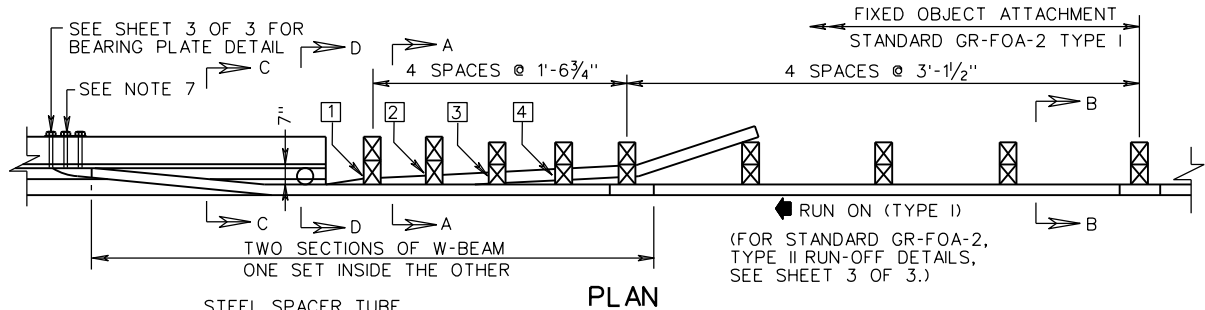
RUBRAIL BLOCKOUT DETAIL



ITEM 8 DETAIL

SPECIFICATION REFERENCE	505	<p>W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT (RUBRAIL AND HARDWARE DETAILS)</p> <p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	<p>VDOT ROAD AND BRIDGE STANDARDS</p>	
			REVISION DATE 4/09	SHEET 3 OF 3 501.27

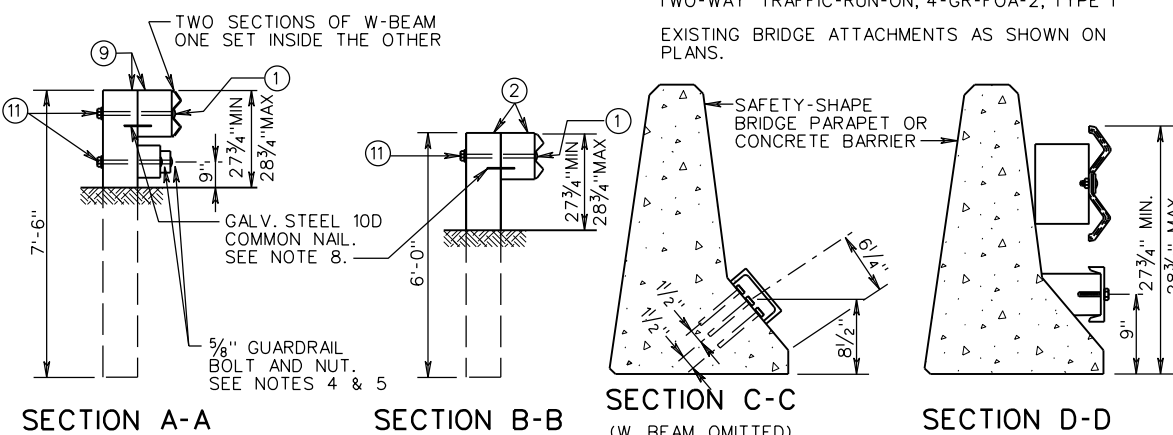
GR-FOA-2



- 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" GUARDRAIL 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 7/8" ASTM A449 HEX BOLTS WITH WASHERS MUST BE USED WITH THRU DRILLED HOLES AND 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.

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

VDOT
ROAD AND BRIDGE STANDARDS

SHEET 1 OF 3
501.28

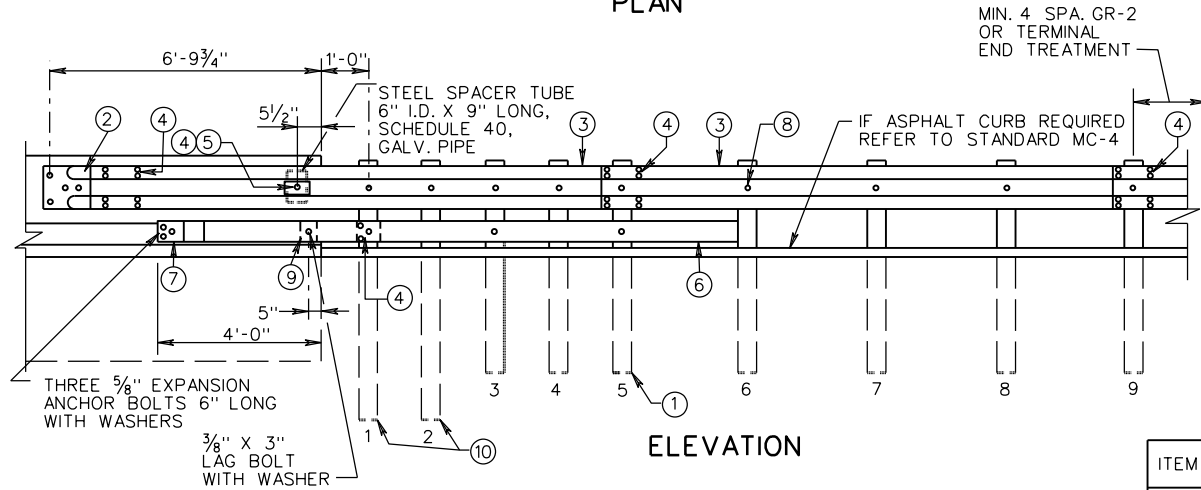
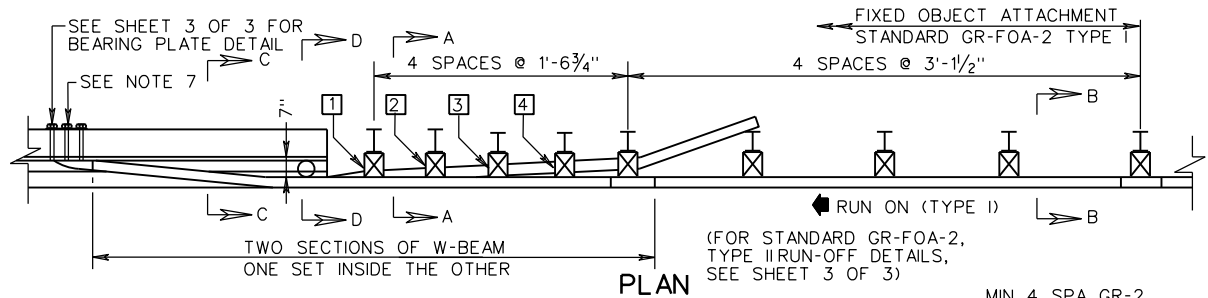
REVISION DATE
01/14

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT
FOR USE BETWEEN SAFETY SHAPE AND GUARDRAIL (WOOD POSTS)

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
505

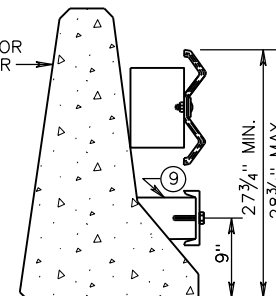
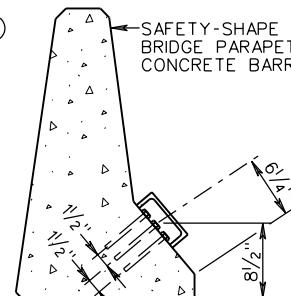
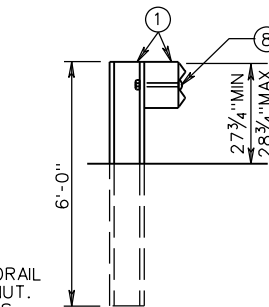
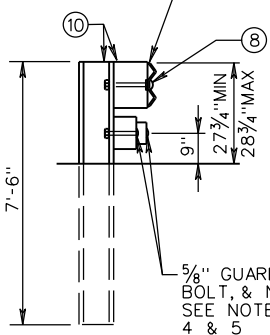


- NOTES:
1. FIXED OBJECTS MAY CONSIST OF SAFETY SHAPED BRIDGE PARAPETS OR CONCRETE BARRIERS.
 2. BRIDGE RAIL ENDS AND BRIDGE PARAPETS MUST BE OF ADEQUATE STRENGTH TO ACCEPT FULL IMPACT LOADING.
 3. GUARDRAIL COMPONENTS SHALL BE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE STANDARDS.
 4. POSTS 1, 2, 3, 4, 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 5/8" GUARDRAIL 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 A449 HEX BOLTS WITH WASHERS MUST BE USED WITH THRU DRILLED HOLES AND 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.

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.

TWO SECTIONS OF W-BEAM
ONE SET INSIDE THE OTHER



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

SPECIFICATION REFERENCE
505

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

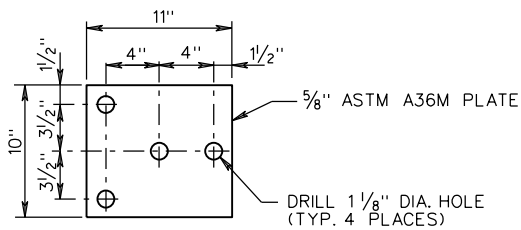
W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT

FOR USE WITH SAFETY SHAPE - (STEEL POSTS)

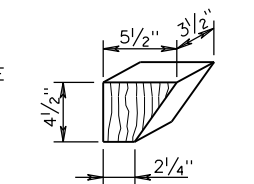
VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT	
ROAD AND BRIDGE STANDARDS	
REVISION DATE	SHEET 2 OF 3
01/14	501.29

GR-FOA-2 & 4

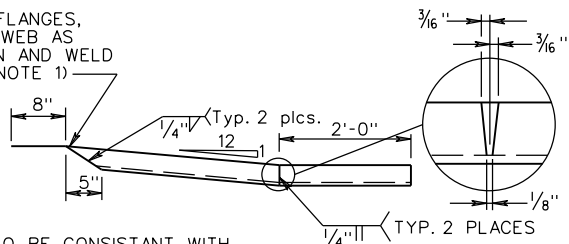


BEARING PLATE

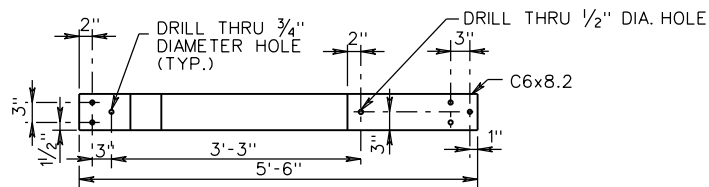


ITEM 10 DETAIL

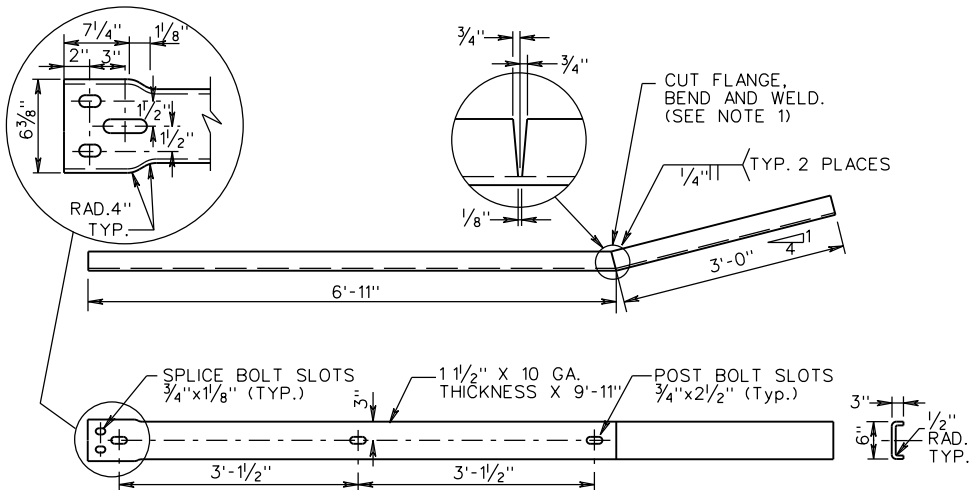
TRIM FLANGES, BEND WEB AS SHOWN AND WELD (SEE NOTE 1)



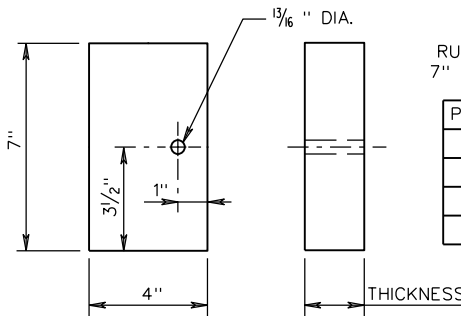
FABRICATE TO BE CONSISTANT WITH THE SLOPE OF THE PARAPET OR BARRIER AND ATTACH FLUSH TO SLOPE.



ITEM 8 DETAIL



ITEM 7 DETAIL



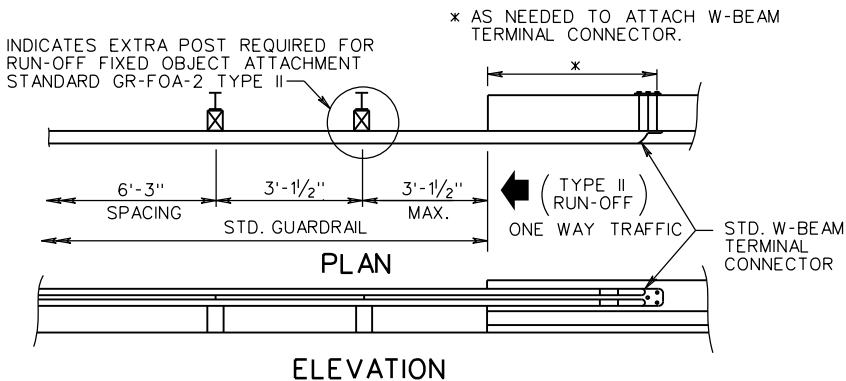
RUBRAIL BLOCKOUT DETAIL

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	1/2"



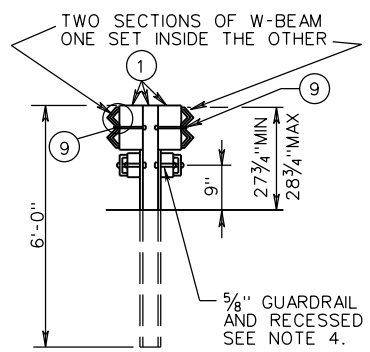
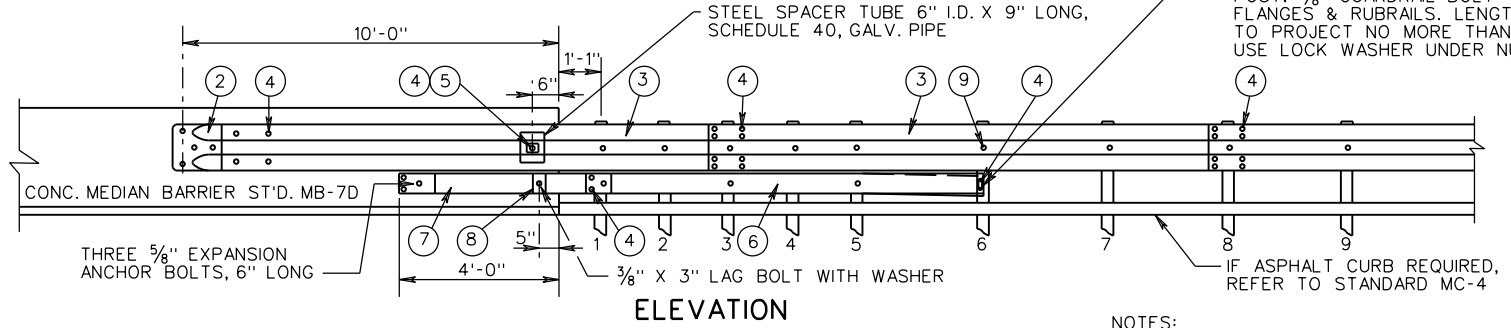
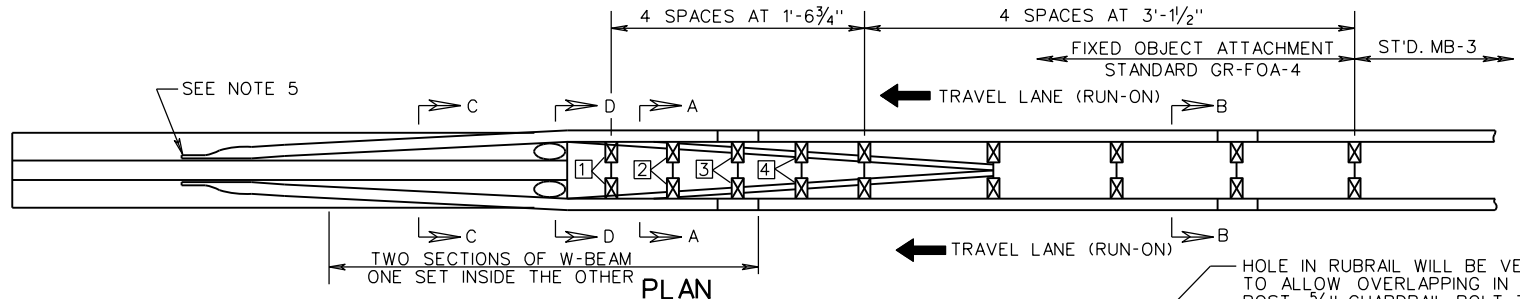
ELEVATION

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.

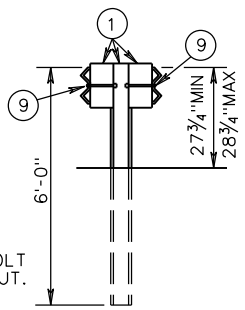
VDOT ROAD AND BRIDGE STANDARDS	
SHEET 3 OF 3	REVISION DATE
501.30	01/14

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.
W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT
RUBRAIL AND HARDWARE DETAILS
 VIRGINIA DEPARTMENT OF TRANSPORTATION

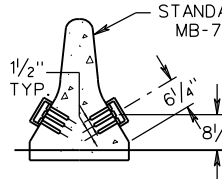
SPECIFICATION REFERENCE
505



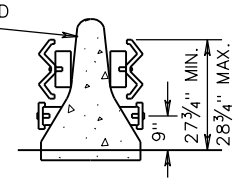
SECTION A-A



SECTION B-B



SECTION C-C
(W-BEAM OMITTED)



SECTION D-D

NOTES:

1. ALL GUARDRAIL POSTS ARE TO BE STEEL.
2. ALL GUARDRAIL COMPONENTS ARE TO BE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE STANDARDS.
3. 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.
4. BOTTOM WOOD BLOCKS LOCATED ON POSTS 1 THROUGH 4 ARE TO BE DRILLED AND SECURED WITH 5/8" GUARDRAIL BOLTS (LENGTH AS REQUIRED)
5. APPROPRIATE LENGTH 7/8" ASTM A449 HEX BOLTS WITH WASHERS ARE TO BE USED WITH HOLES DRILLED THROUGH THE CONCRETE MEDIAN BARRIER ATTACHING THE W-BEAM TERMINAL CONNECTORS ON EACH SIDE. BOLTS TO PROJECT NO MORE THAN 1/2" BEYOND NUTS. USE LOCK WASHERS UNDER NUTS.

TYPE I TWO RUN-ON SECTIONS (WITH 2 RUBRAILS SHOWN)

TYPE II ONE RUN-ON SECTION (WITH 1 RUBRAIL RETAINED)
ONE RUN-OFF SECTION (WITH 1 RUBRAIL REMOVED)

TYPE III TWO RUN-OFF SECTIONS (WITH 2 RUBRAILS REMOVED)

RUBRAIL WOOD BLOCKS 7" x 4"	
POST	THICKNESS
1	4 1/4"
2	3 3/4"
3	2"
4	1"

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

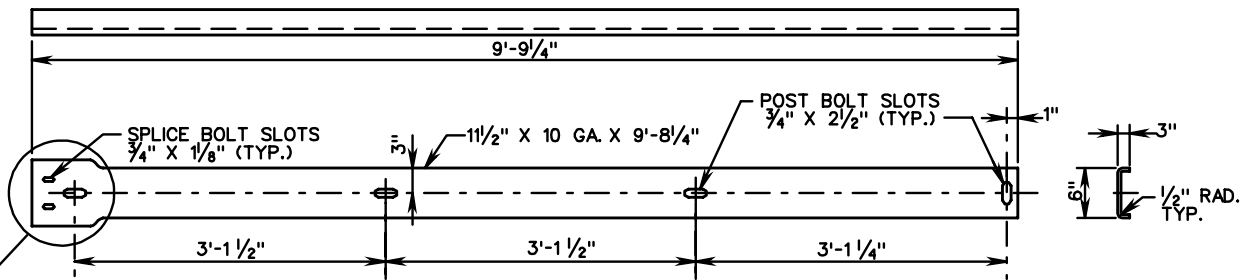
A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

SPECIFICATION REFERENCE
505

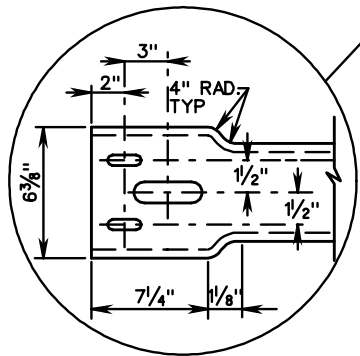
**BLOCKED-OUT W-BEAM MEDIAN
BARRIER-FIXED OBJECT ATTACHMENT**
(FOR USE BETWEEN STANDARD MB-7D AND STANDARD MB-3)
VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT ROAD AND BRIDGE STANDARDS	
REVISION DATE	SHEET 1 OF 2
01/14	501.31

GR-FOA-4

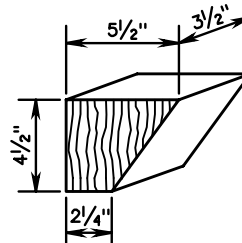


ITEM ⑦ DETAIL

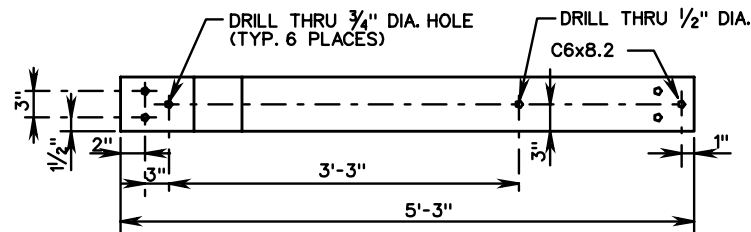
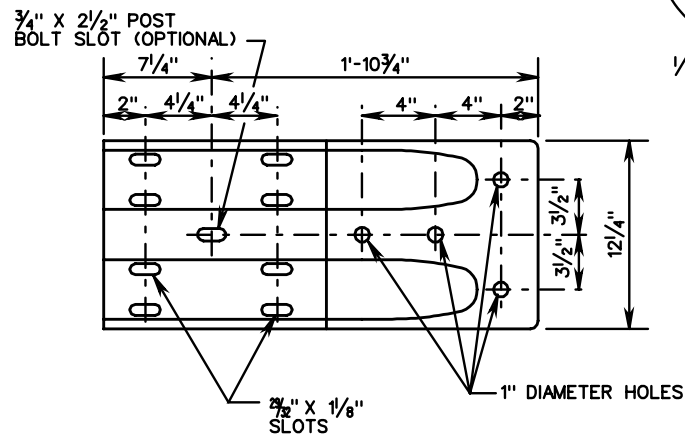
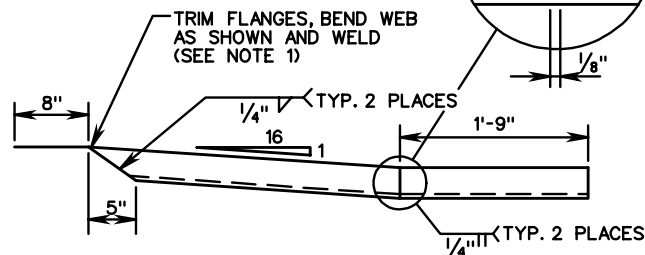
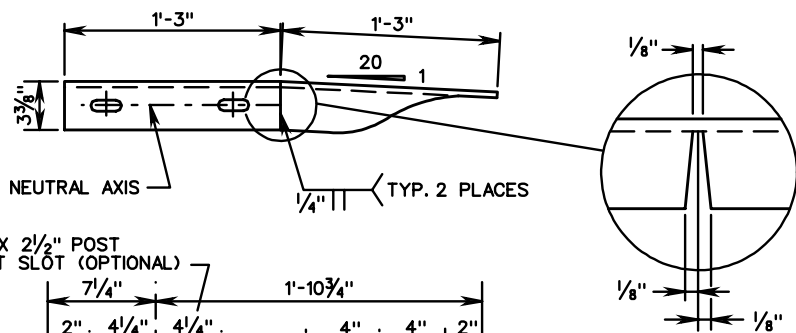
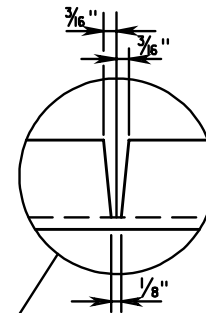


NOTES:

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.



ITEM ⑨ DETAIL



W BEAM TERMINAL CONNECTOR (MOD.)

ITEM ⑧ DETAIL



ROAD AND BRIDGE STANDARDS

**BLOCKED-OUT W-BEAM MEDIAN BARRIER
FIXED OBJECT ATTACHMENT**
(RUBRAIL AND HARDWARE DETAILS)
VIRGINIA DEPARTMENT OF TRANSPORTATION

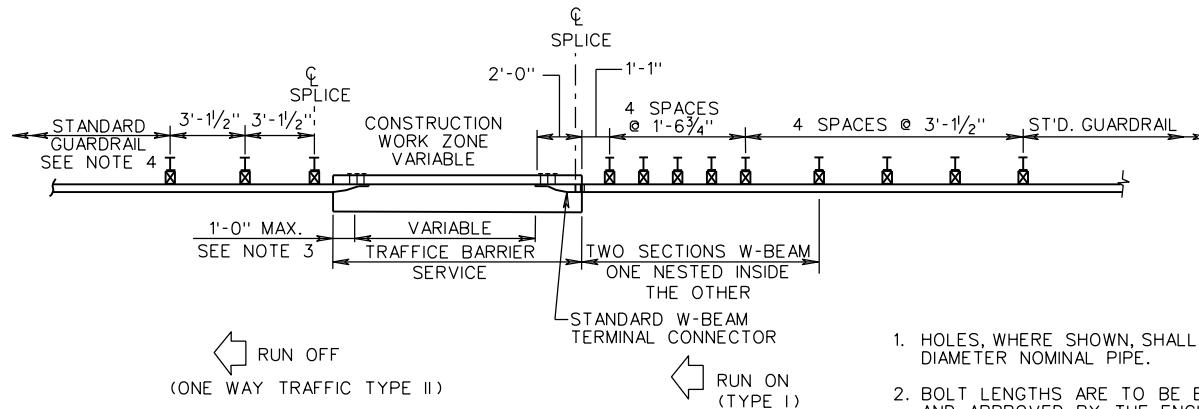
SPECIFICATION
REFERENCE

SHEET 2 OF 2

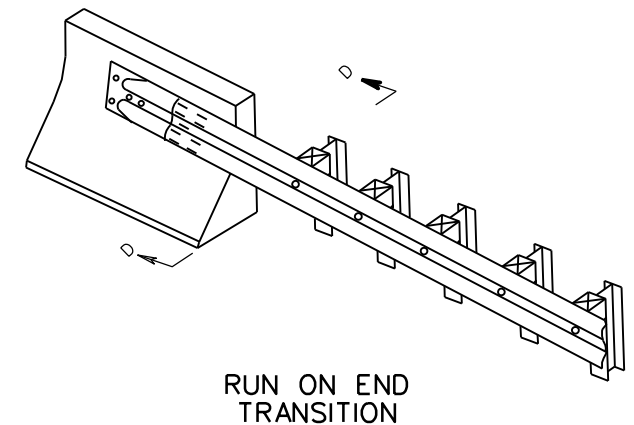
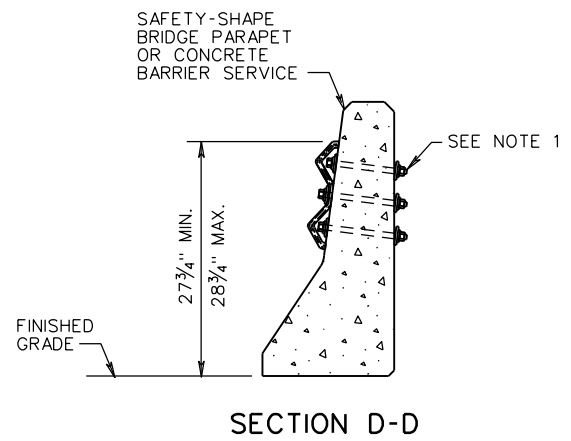
REVISION DATE

505

501.32



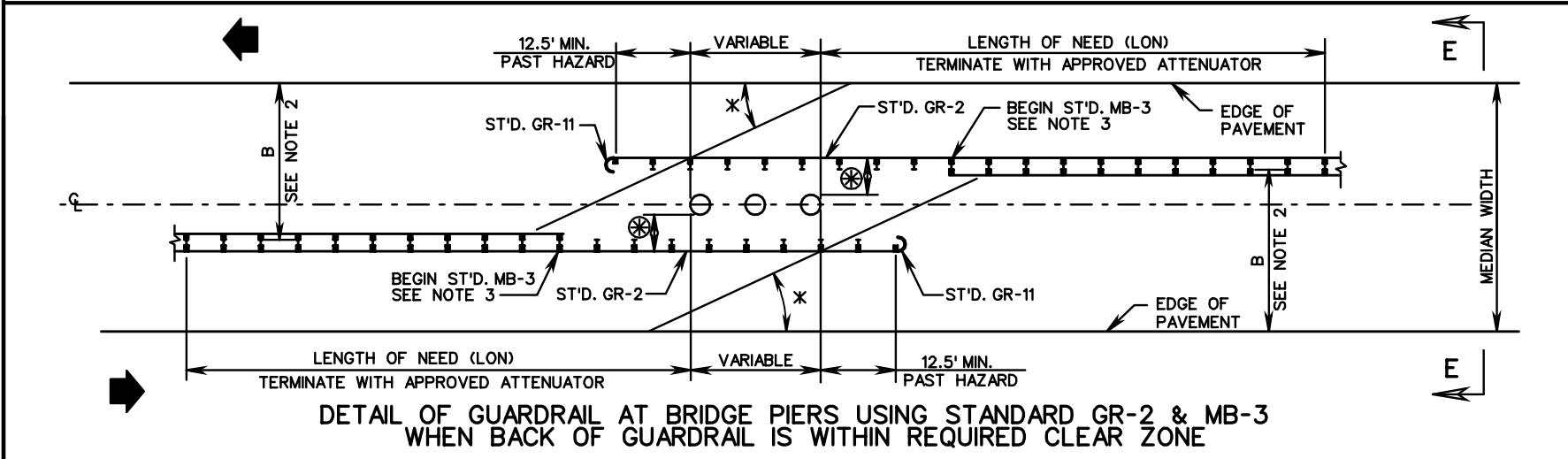
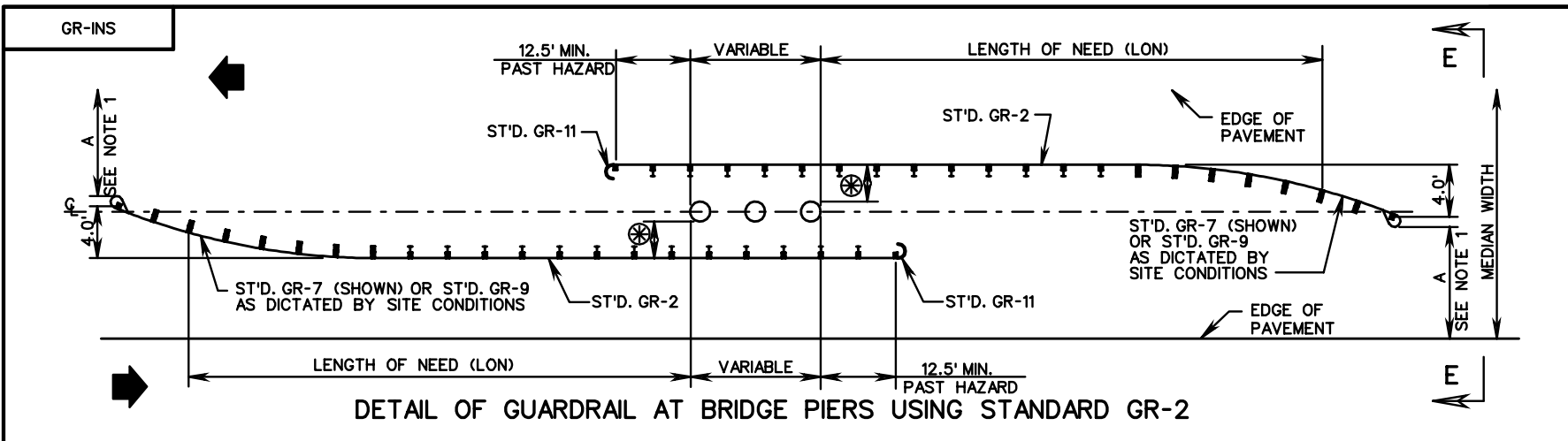
1. HOLES, WHERE SHOWN, SHALL BE FORMED WITH SLEEVES OF 1/2" DIAMETER NOMINAL PIPE.
2. BOLT LENGTHS ARE TO BE ESTABLISHED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER. ALL BOLTS ARE TO BE 7/8" DIA. HEX HEAD MACHINE BOLTS WITH BEVELED WASHERS AND SELF-LOCKING NUTS.
3. FOR TWO-WAY TRAFFIC DESIGN, USE RUN-ON END TRANSITION (TYPE I).
4. RUN OFF (TYPE II) GUARDRAIL TO BE USED ONLY WHEN REQUIRED FOR OTHER REASONS.
5. COST OF TRANSITION TO BE INCLUDED IN PRICE BID PER FOOT OF TRAFFIC BARRIER SERVICE CONCRETE.
6. THESE INSTRUCTIONS APPLICABLE FOR TEMPORARY INSTALLATION IN CONSTRUCTION ZONES ONLY. REFER TO STANDARD GR-FOA FOR INSTRUCTIONS ON PERMANENT INSTALLATION.



SPECIFICATION REFERENCE
505

W-BEAM GUARDRAIL INSTALLATION CRITERIA
FIXED OBJECT ATTACHMENT METHODS FOR CONSTRUCTION ZONES
 VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT ROAD AND BRIDGE STANDARDS	
REVISION DATE 7/11	SHEET 1 OF 1 501.33



⊗ GUARDRAIL SHALL BE PLACED SO THAT A HAZARD IS NOT WITHIN THE DEFLECTION LIMIT OF THE GUARDRAIL. THE GUARDRAIL DESIGN AND PLACEMENT SHOWN ABOVE MAY ALSO BE USED FOR SHIELDING AN OVERHEAD SIGN SUPPORT, FIXED OBJECTS OR OTHER TYPES OF ROAD SIDE OBSTRUCTIONS.

X 25° ANGLE OF VEHICLE DEPARTURE.

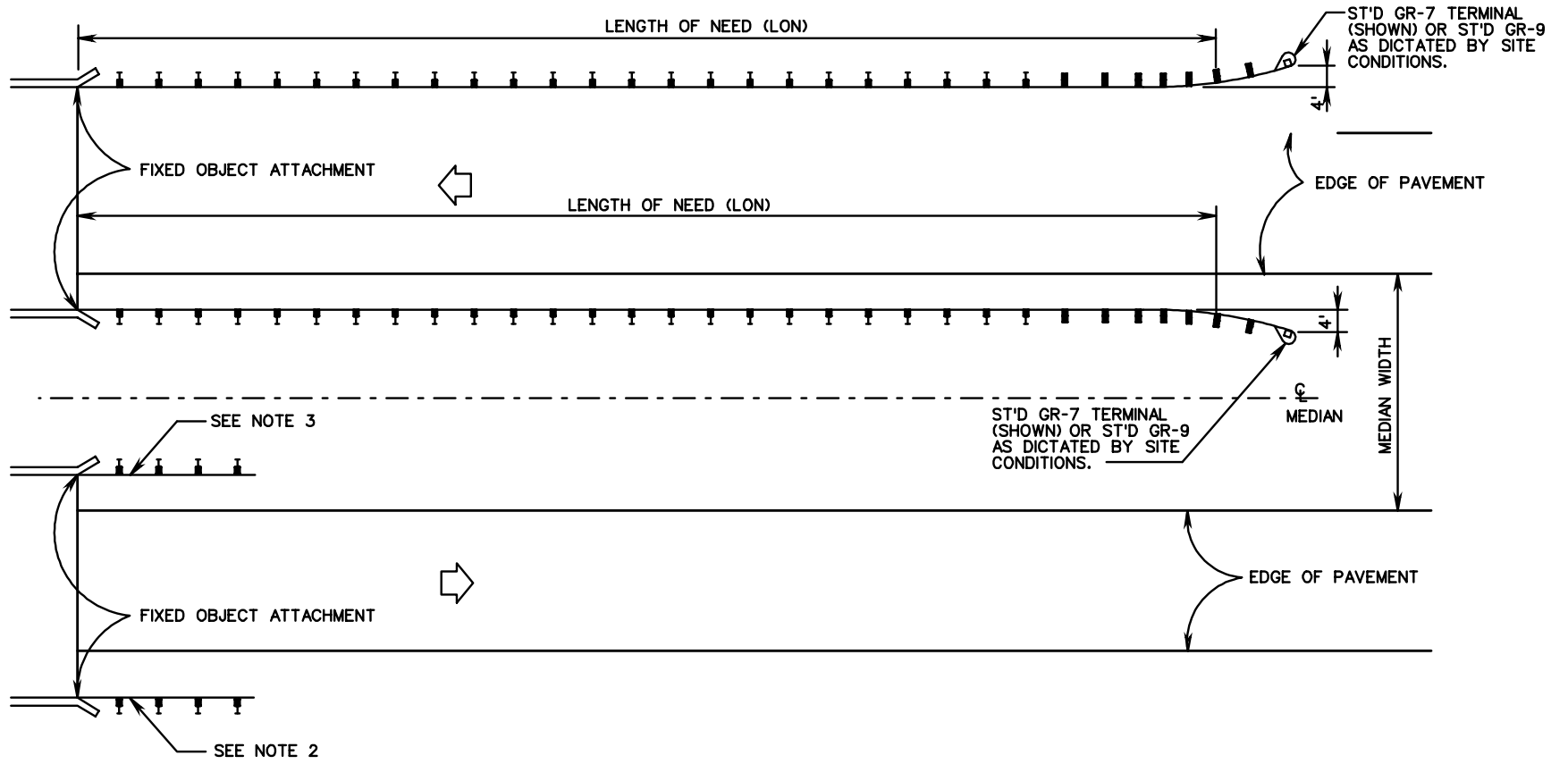
- NOTES:
1. DISTANCE "A" MUST BE GREATER THAN REQ'D. CLEAR ZONE.
 2. DISTANCE "B" IS LESS THAN REQ'D. CLEAR ZONE.
 3. BEGIN ST'D MB-3 AT THE POST PRIOR TO THE POINT WHERE THE 25° ANGLE OF VEHICLE DEPARTURE WILL INTERSECT THE MB-3.

VDOT	
ROAD AND BRIDGE STANDARDS	
SHEET 1 OF 8	REVISION DATE
501.34	

W-BEAM GUARDRAIL INSTALLATION CRITERIA

VIRGINIA DEPARTMENT OF TRANSPORTATION

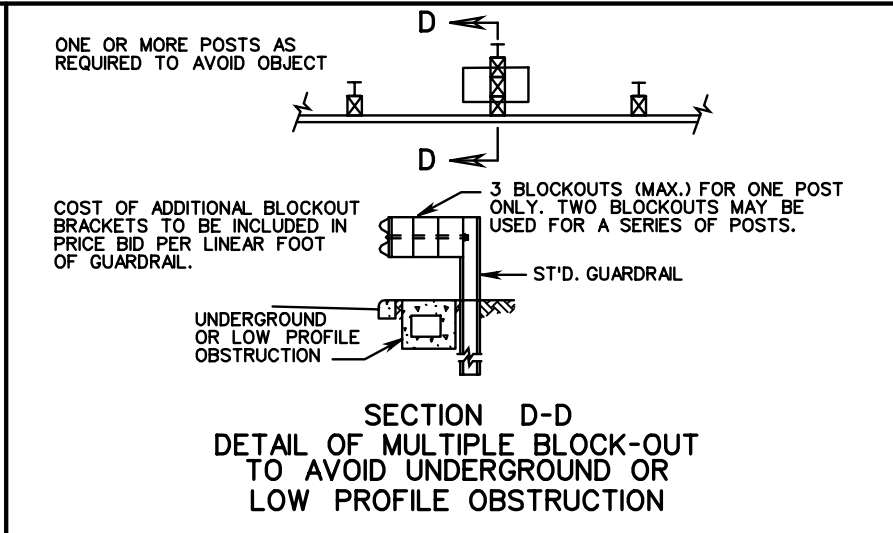
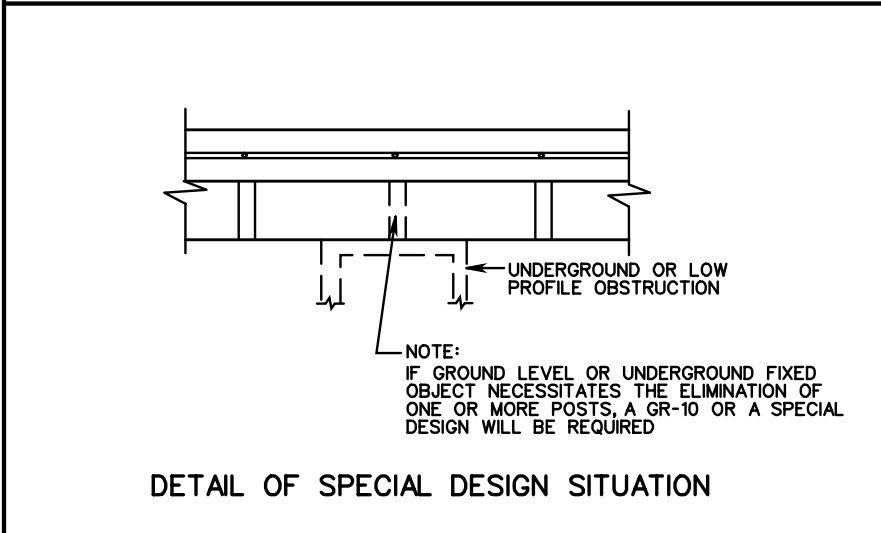
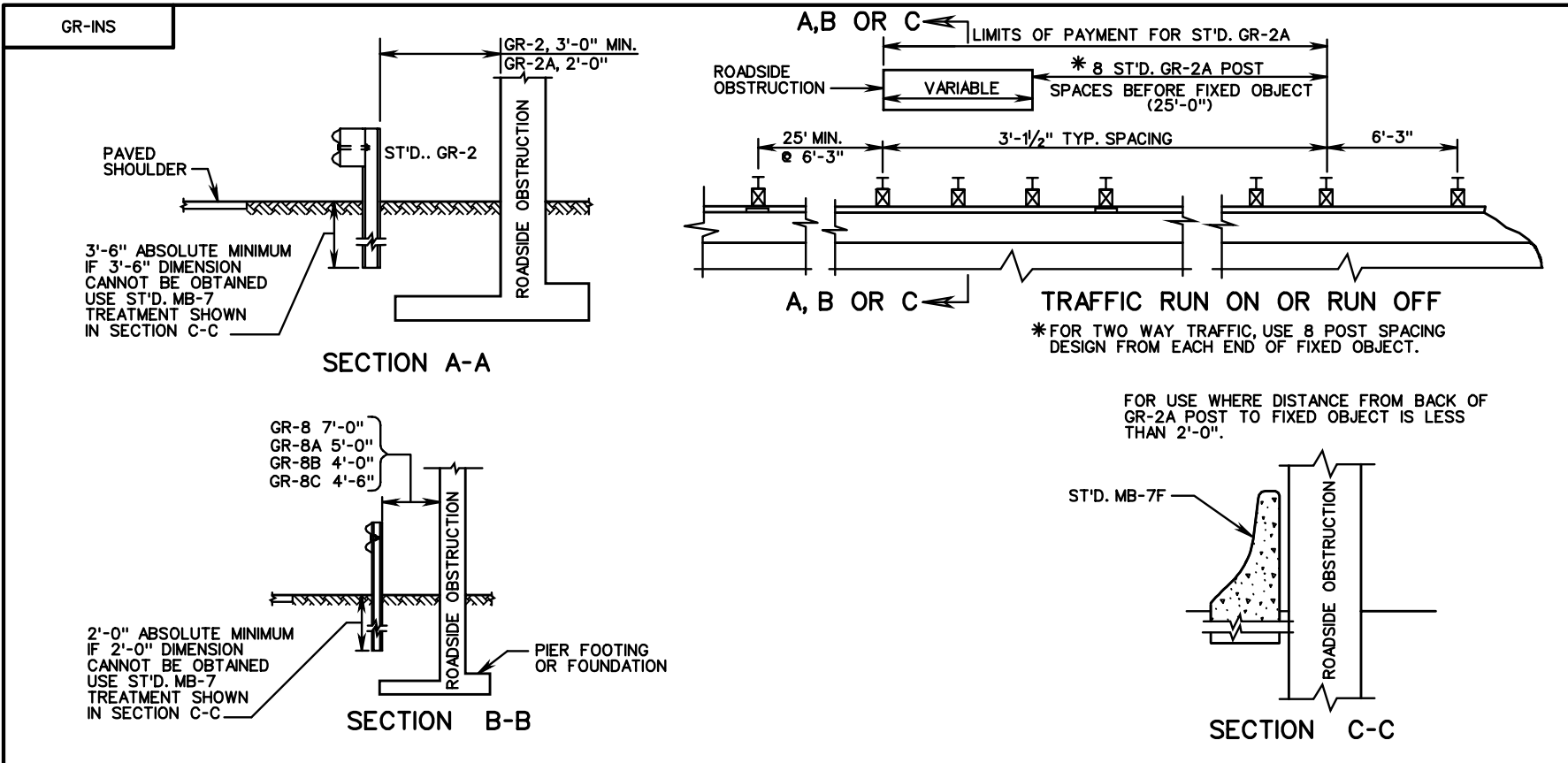
SPECIFICATION REFERENCE
221 505



- NOTES:
1. IF A CUT SECTION IS CLOSER THAN 200', A STANDARD GR-6 TERMINAL IS PREFERRED.
 2. NO GUARDRAIL IS REQUIRED ON RUN-OFF UNLESS NEEDED TO SHIELD A HAZARD WITHIN THE REQUIRED CLEAR ZONE.
 3. NO GUARDRAIL IS REQUIRED ON RUN-OFF UNLESS NEEDED TO SHIELD A HAZARD WITHIN THE REQUIRED CLEAR ZONE. REFER TO SHEET 501.34 IF BACK OF GUARDRAIL FROM THE OPPOSING LANES IS WITHIN THE REQUIRED CLEAR ZONE.

DETAIL OF GUARDRAIL AT DUAL BRIDGES

SPECIFICATION REFERENCE 221 505	<h2 style="margin: 0;">W-BEAM GUARDRAIL INSTALLATION CRITERIA</h2> <p style="margin: 0;">VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	ROAD AND BRIDGE STANDARDS REVISION DATE SHEET 2 OF 8 501.35
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VDOT	
ROAD AND BRIDGE STANDARDS	
SHEET 3 OF 8	REVISION DATE
501.36	

W BEAM GUARDRAIL INSTALLATION CRITERIA	
VIRGINIA DEPARTMENT OF TRANSPORTATION	

SPECIFICATION REFERENCE
221 505

NOTES:

GUARDRAIL INSTALLATION CRITERIA AS SHOWN ON THESE SHEETS IS TO APPLY TO THOSE LOCATIONS WHERE GUARDRAIL HAS TO BE TRANSITIONED FROM THE NORMAL LOCATION.

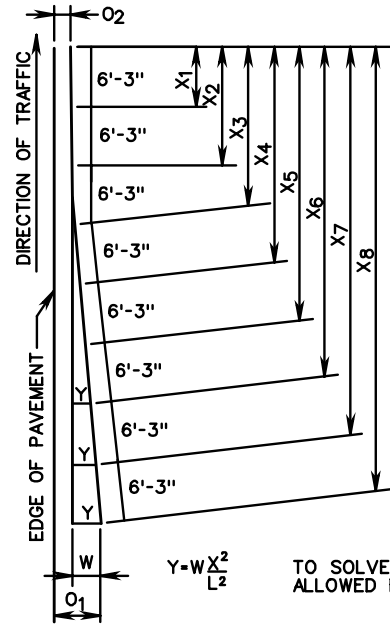
LENGTH OF TRANSITION (L) IS TO BE IN ACCORDANCE WITH TABLE III OR IV FOR APPLICABLE VALUES OF W OR AS DIRECTED BY THE ENGINEER.

RAIL TERMINAL SECTIONS IN ACCORDANCE WITH STANDARD GR-6, GR-7 OR GR-8 ARE TO BE INSTALLED AT EACH TERMINUS OF GUARDRAIL WHERE SPECIFIED ON PLANS.

ALL LENGTHS (L) ARE APPLIED ALONG FACE OF GUARDRAIL.

OFFSETS SHOWN IN TABLES ARE FOR 6'-3" SPACING. FOR 12'-6" SPACING (GR-8) USE EVERY SECOND VALUE FOR Y.

INSTALLATION METHODS SHOWN ON THESE SHEETS ARE APPLICABLE TO STANDARD PLANS GR-2, GR-2A AND GR-8.



W = TOTAL LATERAL TRANSITION OF GUARDRAIL O1- O2
 O1 = OFFSET FROM EDGE OF PAVEMENT TO FACE OF GUARDRAIL MAX.
 O2 = OFFSET FROM EDGE OF PAVEMENT TO FACE OF GUARDRAIL MIN.
 X1 = ...Xn CUMULATIVE DISTANCE IN INCREMENTS OF 6'-3" FROM FIRST GUARDRAIL POST MEASURED ALONG FACE OF GUARDRAIL.
 Y = LATERAL OFFSET FROM FACE OF GUARDRAIL OF POST NEAREST TO PAVEMENT EDGE TO FACE OF GUARDRAIL AT EACH SUCCESSIVE POST.
 L = TOTAL LENGTH OF TRANSITIONAL PORTION OF GUARDRAIL.

TO SOLVE FOR "Y", USE THE MAXIMUM "L" ALLOWED FOR THE APPROPRIATE "W".

**TABLE III
 OFFSETS (Y) FOR INTRODUCED GUARDRAIL TRANSITIONS**

LENGTH L IN FEET	X IN FEET	W																		
		W-2'	W-3'	W-4'	W-5'	W-6'	W-7'	W-8'	W-9'	W-10'	W-11'	W-12'	W-13'	W-14'	W-15'	W-16'	W-17'	W-18'	W-19'	W-20'
37.50	X1 6.25	0.06	0.05	0.03	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03
	X2 12.50	0.22	0.19	0.11	0.08	0.06	0.05	0.06	0.06	0.07	0.08	0.09	0.10	0.10	0.11	0.12	0.13	0.13	0.13	0.14
	X3 18.75	0.50	0.42	0.25	0.18	0.14	0.11	0.12	0.14	0.16	0.17	0.19	0.20	0.22	0.23	0.25	0.27	0.28	0.30	0.31
	X4 25.00	0.89	0.75	0.44	0.31	0.24	0.19	0.22	0.25	0.28	0.31	0.33	0.36	0.39	0.42	0.44	0.47	0.50	0.53	0.56
	X5 31.25	1.39	1.17	0.69	0.49	0.38	0.30	0.35	0.39	0.43	0.48	0.52	0.56	0.61	0.65	0.69	0.74	0.78	0.82	0.87
	X6 37.50	2.00	1.69	1.00	0.70	0.54	0.44	0.50	0.56	0.62	0.69	0.75	0.81	0.87	0.94	1.00	1.06	1.13	1.19	1.25
50.00	X7 43.75		2.30	1.36	0.96	0.74	0.60	0.68	0.77	0.85	0.94	1.02	1.11	1.19	1.28	1.36	1.45	1.53	1.62	1.70
	X8 50.00		3.00	1.78	1.25	0.96	0.78	0.89	1.00	1.11	1.22	1.33	1.44	1.56	1.67	1.78	1.89	2.00	2.11	2.22
	X9 56.25			2.25	1.58	1.22	0.98	1.12	1.27	1.41	1.55	1.69	1.83	1.97	2.11	2.25	2.39	2.53	2.67	2.81
75.00	X10 62.50			2.78	1.95	1.50	1.22	1.39	1.56	1.74	1.91	2.08	2.26	2.43	2.60	2.78	2.95	3.13	3.30	3.47
	X11 68.75			3.36	2.36	1.82	1.47	1.68	1.89	2.10	2.31	2.52	2.73	2.94	3.15	3.36	3.57	3.78	3.99	4.20
	X12 75.00			4.00	2.81	2.16	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00
87.50	X13 82.25				3.30	2.54	2.05	2.35	2.64	2.93	3.23	3.52	3.81	4.11	4.40	4.69	4.99	5.28	5.57	5.87
	X14 87.50				3.83	2.94	2.38	2.72	3.06	3.40	3.74	4.08	4.42	4.76	5.10	5.44	5.78	6.13	6.47	6.81
100.00	X15 93.75				4.39	3.38	2.73	3.12	3.52	3.91	4.30	4.69	5.08	5.47	5.86	6.25	6.64	7.03	7.42	7.81
	X16 100.00				5.00	3.84	3.11	3.56	4.00	4.44	4.89	5.33	5.78	6.22	6.67	7.11	7.56	8.00	8.44	8.89
	X17 106.25					4.33	3.51	4.01	4.52	5.02	5.52	6.02	6.52	7.02	7.53	8.03	8.53	9.03	9.53	10.03
125.00	X18 112.50					4.86	3.94	4.50	5.06	5.62	6.19	6.75	7.31	7.87	8.44	9.00	9.56	10.13	10.69	11.25
	X19 118.75					5.41	4.39	5.01	5.64	6.27	6.89	7.52	8.15	8.77	9.40	10.03	10.65	11.28	11.91	12.53
	X20 125.00					6.00	4.86	5.56	6.25	6.94	7.64	8.33	9.03	9.72	10.42	11.11	11.81	12.50	13.19	13.89
150.00	X21 131.25						5.36	6.12	6.89	7.66	8.42	9.19	9.95	10.72	11.48	12.25	13.02	13.78	14.55	15.31
	X22 137.50						5.88	6.72	7.56	8.40	9.24	10.08	10.92	11.76	12.60	13.44	14.28	15.13	15.97	16.81
	X23 143.75						6.43	7.35	8.27	9.18	10.10	11.02	11.94	12.86	13.78	14.69	15.61	16.53	17.45	18.37
	X24 150.00						7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00

SPECIFICATION REFERENCE

221
505

W-BEAM GUARDRAIL INSTALLATION CRITERIA

VIRGINIA DEPARTMENT OF TRANSPORTATION



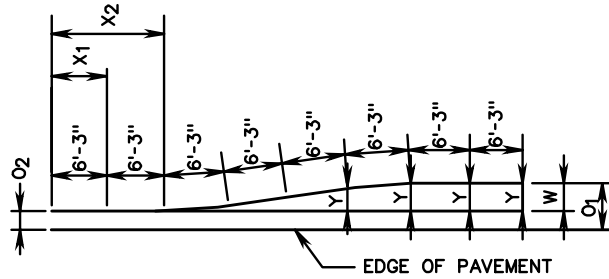
ROAD AND BRIDGE STANDARDS

REVISION DATE

SHEET 4 OF 8

501.37

GR-INS



NOTE:
GUARDRAIL INSTALLATION CRITERIA AS SHOWN ON THESE SHEETS IS TO APPLY TO THOSE LOCATIONS WHERE GUARDRAIL HAS TO BE TRANSITIONED FROM THE NORMAL LOCATION.

LENGTH OF TRANSITION (L) IS TO BE IN ACCORDANCE WITH TABLE III OR IV FOR APPLICABLE VALUES OF W OR AS DIRECTED BY THE ENGINEER.

RAIL TERMINAL SECTIONS IN ACCORDANCE WITH STANDARD GR-6, GR-7 OR GR-8 ARE TO BE INSTALLED AT EACH TERMINUS OF GUARDRAIL WHERE SPECIFIED ON PLANS.

ALL LENGTHS (L) ARE APPLIED ALONG FACE OF GUARDRAIL.

OFFSETS SHOWN IN TABLES ARE FOR 6'-3" SPACING, FOR 12'-6" SPACING (GR-8) USE EVERY SECOND VALUE OF Y.

INSTALLATION METHODS SHOWN ON THESE SHEETS ARE APPLICABLE TO STANDARD PLANS GR-2, GR-2A AND GR-8.

TABLE IV
OFFSETS (Y) FOR CONTINUOUS RUN-ON GUARDRAILS AND ALL RUN-OFF TRANSITIONS

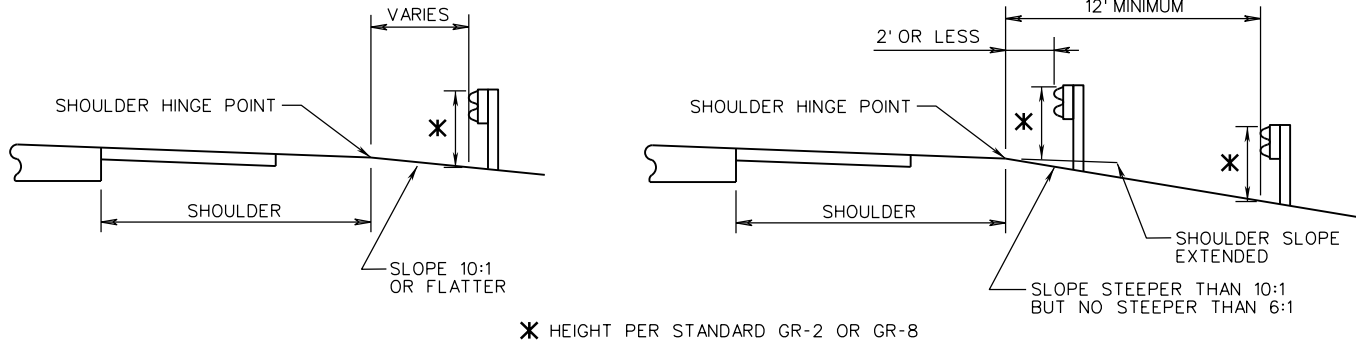
LENGTH L IN FEET	X IN FEET	W-2'		W-3'		W-4'		W-5'		W-6'		W-7'		W-8'		W-9'		W-10'		W-11'		W-12'	
		RUN ON	RUN OFF	RUN ON	RUN OFF	RUN ON	RUN OFF	RUN ON	RUN OFF	RUN ON	RUN OFF	RUN ON	RUN OFF	RUN ON	RUN OFF	RUN ON	RUN OFF	RUN ON	RUN OFF	RUN ON	RUN OFF	RUN ON	RUN OFF
37.50	X1 6.25	0.04	0.04	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
	X2 12.50	0.30	0.30	0.19	0.19	0.03	0.03	0.02	0.04	0.01	0.05	0.01	0.05	0.01	0.06	0.01	0.07	0.01	0.08	0.01	0.09	0.01	0.09
	X3 18.75	1.00	1.00	0.63	0.63	0.11	0.11	0.07	0.13	0.05	0.16	0.03	0.18	0.03	0.21	0.03	0.24	0.03	0.26	0.04	0.29	0.04	0.32
	X4 25.00	1.70	1.70	1.50	1.50	0.25	0.25	0.16	0.31	0.11	0.38	0.08	0.44	0.06	0.50	0.07	0.56	0.08	0.63	0.09	0.69	0.09	0.75
	X5 31.25	1.96	1.96	2.37	2.37	0.49	0.49	0.31	0.61	0.22	0.73	0.16	0.85	0.12	0.98	0.14	1.10	0.15	1.22	0.17	1.34	0.18	1.46
	X6 37.50	2.00	2.00	2.81	2.81	0.84	0.84	0.54	1.05	0.38	1.27	0.28	1.48	0.21	1.69	0.24	1.90	0.26	2.11	0.29	2.32	0.32	2.53
50.00	X7 43.75			2.98	2.98	1.34	1.34	0.86	1.67	0.60	2.01	0.44	2.34	0.33	2.68	0.38	3.01	0.42	3.35	0.46	3.68	0.50	4.02
	X8 50.00			3.00	3.00	2.00	2.00	1.28	2.50	0.89	3.00	0.65	3.50	0.50	4.00	0.56	4.50	0.63	5.00	0.69	5.50	0.75	6.00
100.00	X9 56.25					2.66	2.66	1.82	3.33	1.27	3.99	0.93	4.66	0.71	5.32	0.80	5.99	0.89	6.65	0.98	7.32	1.07	7.98
	X10 62.50					3.16	3.16	2.50	3.95	1.74	4.73	1.28	5.52	0.98	6.31	1.10	7.10	1.22	7.89	1.34	8.68	1.46	9.47
	X11 68.75					3.51	3.51	3.18	4.39	2.31	5.27	1.70	6.15	1.30	7.02	1.46	7.90	1.62	8.78	1.79	9.66	1.95	10.54
	X12 75.00					3.75	3.75	3.72	4.69	3.00	5.63	2.20	6.56	1.69	7.50	1.90	8.44	2.11	9.38	2.32	10.31	2.53	11.25
	X13 81.25					3.89	3.89	4.14	4.87	3.69	5.84	2.80	6.82	2.15	7.79	2.41	8.76	2.68	9.74	2.95	10.71	3.22	11.68
	X14 87.50					3.97	3.97	4.46	4.96	4.26	5.95	3.50	6.95	2.68	7.94	3.01	8.93	3.35	9.92	3.68	10.91	4.02	11.91
	X15 93.75					4.00	4.00	4.69	5.00	4.73	5.99	4.20	6.99	3.30	7.99	3.71	8.99	4.12	9.99	4.53	10.99	4.94	11.99
	X16 100.00					4.00	4.00	4.84	5.00	5.11	6.00	4.80	7.00	4.00	8.00	4.50	9.00	5.00	10.00	5.50	11.00	6.00	12.00
125.00	X17 106.25							4.93	5.40		5.30		4.70		5.29		5.88		6.47		7.06		
	X18 112.50							4.98	5.63		5.72		5.32		5.99		6.65		7.32		7.98		
	X19 118.75							5.00	5.78		6.07		5.85		6.59		7.32		8.05		8.78		
	X20 125.00							5.00	5.89		6.35		6.31		7.10		7.89		8.68		9.47		
150.00	X21 131.25								5.95		6.56		6.70		7.54		8.38		9.21		10.05		
	X22 137.50								5.99		6.72		7.02		7.90		8.78		9.66		10.54		
	X23 143.75								6.00		6.84		7.29		8.20		9.11		10.02		10.93		
	X24 150.00								6.00		6.92		7.50		8.44		9.38		10.31		11.25		
175.00	X25 156.25										6.97		7.67		8.62		9.58		10.54		11.50		
	X26 162.50										6.99		7.79		8.76		9.74		10.71		11.68		
	X27 168.75										7.00		7.88		8.86		9.85		10.83		11.82		
	X28 175.00										7.00		7.94		8.93		9.92		10.91		11.91		
200.00	X29 181.25												7.97		8.97		9.97		10.96		11.96		
	X30 187.50												7.99		8.99		9.99		10.99		11.99		
	X31 193.75												8.00		9.00		10.00		11.00		12.00		
	X32 200.00												8.00		9.00		10.00		11.00		12.00		

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ROAD AND BRIDGE STANDARDS
SHEET 5 OF 8
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W-BEAM GUARDRAIL INSTALLATION CRITERIA
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
221
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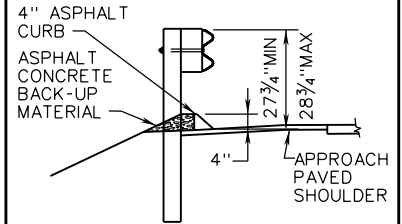
GR-INS



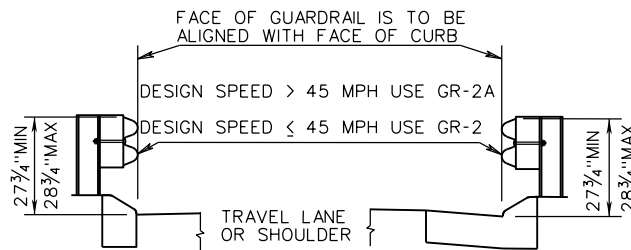
MEASURING GUARDRAIL HEIGHT ON FRONT SLOPE RELATIVE TO SHOULDER HINGE POINT

FACE OF GUARDRAIL IS TO BE ALIGNED WITH FACE OF CURB.
 DESIGN SPEED > 45 MPH
 USE GR-2A

DESIGN SPEED ≤ 45 MPH
 USE GR-2.



ASPHALT CURB SECTION



GR-2 INSTALLATION WITH CG-3 OR CG-7 CURB

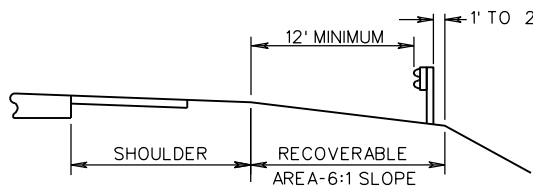
FOR GUARDRAIL DESIGN POLICIES USING CURB & GUTTER OR URBAN DESIGNS WITH SIDEWALK OR SIDEWALK SPACE SEE APPENDIX I OF THE ROAD DESIGN MANUAL

TABLE I
 NORMAL GUARDRAIL LOCATION-THROUGH TRAFFIC LANES LEFT OF TRAFFIC

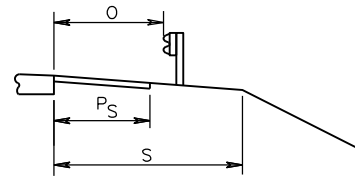
TOTAL SHOULDER WIDTH (S) (PAVED & GRADED)	PAVED SHOULDER WIDTH (P _S) (SEE NOTE)	OFFSET FROM EDGE OF TRAVELED WAY TO FACE OF GUARDRAIL (O)
17'	12'	14'
15'	3', 4', or 10'	12'
13'	3', 4', or 8'	10'
11'	3' or 4'	8'
9'	3' or 4'	6'
8'	3' or 4'	5'
7'	0 or 2'	4'
5'	0	2'

TABLE II
 NORMAL GUARDRAIL LOCATION-THROUGH TRAFFIC LANES RIGHT OF TRAFFIC

TOTAL SHOULDER WIDTH (S) (PAVED & GRADED)	PAVED SHOULDER WIDTH (P _S) (SEE NOTE)	OFFSET FROM EDGE OF TRAVELED WAY TO FACE OF GUARDRAIL (O)
17'	12'	14'
15'	6' or 10'	12'
13'	8'	10'
11'	3', 4' or 6'	8'
9'	0, 3', or 4'	6'
8'	0 or 3'	5'
7'	0 or 2'	4'
5'	0	2'



GUARDRAIL LOCATION ON RECOVERABLE SLOPE



NOTE:
 PAVED SHOULDER WIDTHS SHOWN ARE MINIMUM. THE PAVED SHOULDER MAY BE EXTENDED TO THE FACE OF THE RAIL THE PAVED WIDTH USED SHALL BE IN ACCORDANCE WITH THE ROADWAY CLASSIFICATION AS DEFINED IN THE ROAD DESIGN MANUAL.

SEE STANDARD MC-4 FOR PAVING UNDER GUARDRAIL.

NORMAL GUARDRAIL LOCATION

SPECIFICATION REFERENCE

221
 505

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

W-BEAM GUARDRAIL INSTALLATION CRITERIA

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT

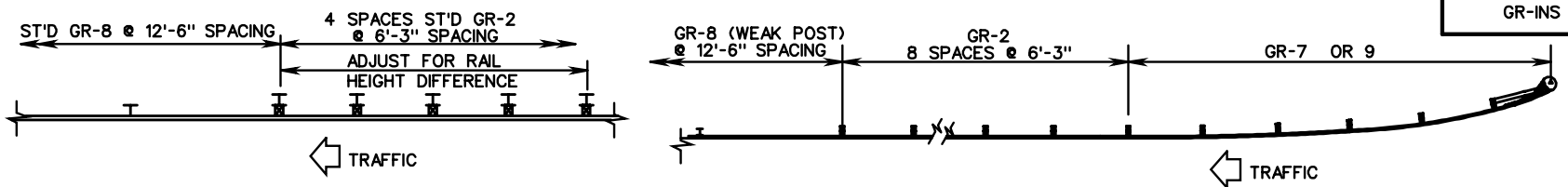
ROAD AND BRIDGE STANDARDS

REVISION DATE

07/15

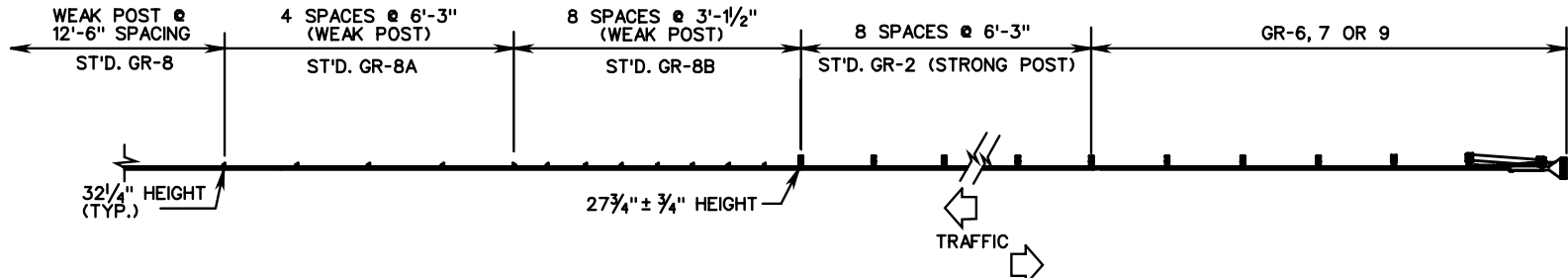
SHEET 6 OF 8

501.39

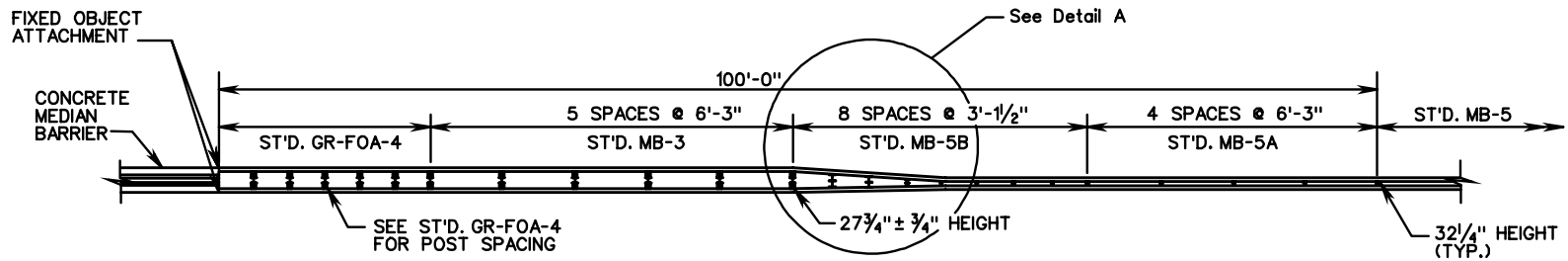


TRANSITION FROM STRONG POST TO WEAK POST GUARDRAIL

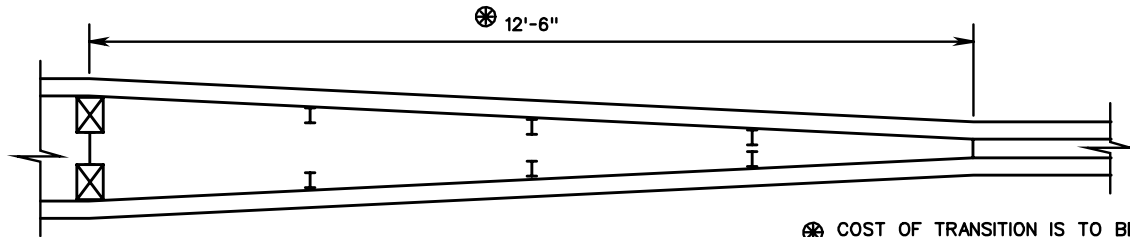
TRANSITION FROM GR-7 & GR-9 TERMINAL TO WEAK POST GUARDRAIL



TRANSITION FROM GR-6, GR-7, OR GR-9 TERMINAL TO WEAK POST GUARDRAIL



TRANSITION FROM WEAK POST MEDIAN BARRIER TO CONCRETE MEDIAN BARRIER

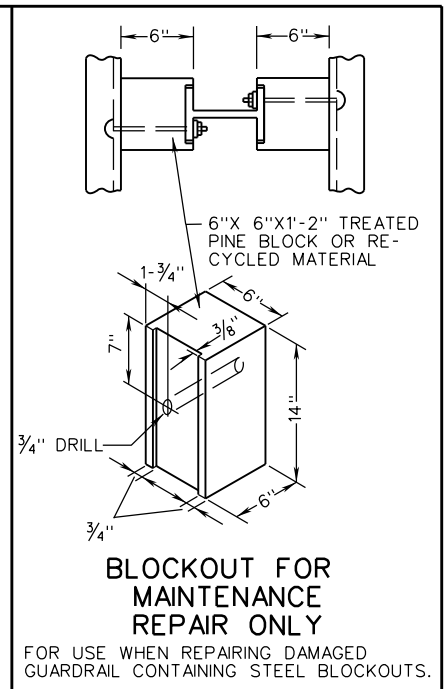
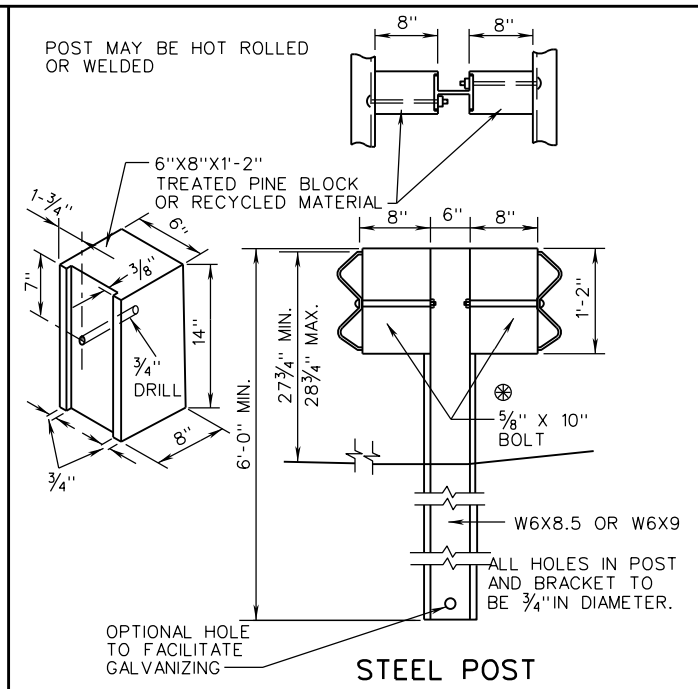
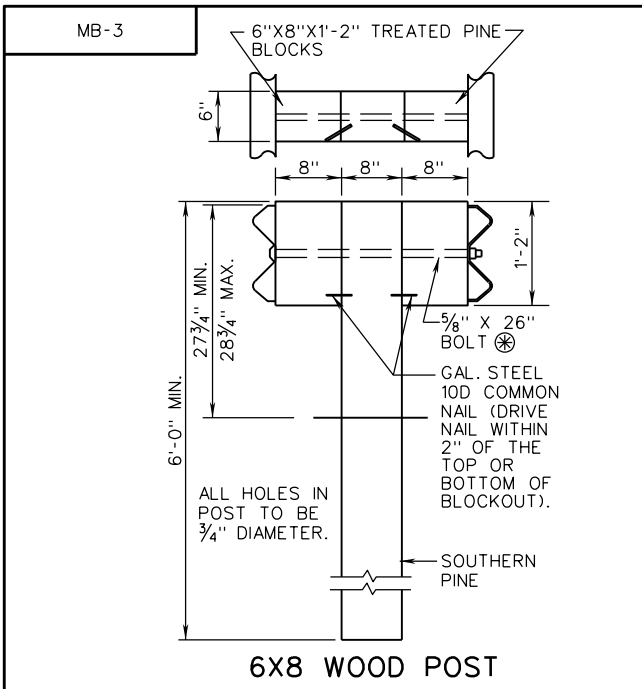


DETAIL A

⊗ COST OF TRANSITION IS TO BE INCLUDED IN PRICE BID FOR ST'D. MB-5B MEDIAN BARRIER.

SPECIFICATION REFERENCE	221 505	<h2 style="text-align: center;">W-BEAM GUARDRAIL AND MEDIAN BARRIER INSTALLATION CRITERIA</h2> <p style="text-align: center;">VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	<p>ROAD AND BRIDGE STANDARDS</p>	
			REVISION DATE	SHEET 8 OF 8
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2016 ROAD & BRIDGE STANDARDS



NOTES:

STANDARD MB-3 POST SPACING IS 6'-3".

FOR DETAILS OF RAIL ELEMENT, RAIL SPLICE JOINT, W BEAM BACK UP PLATE, AND ASSOCIATED HARDWARE SEE SHEET NO. 501.01.

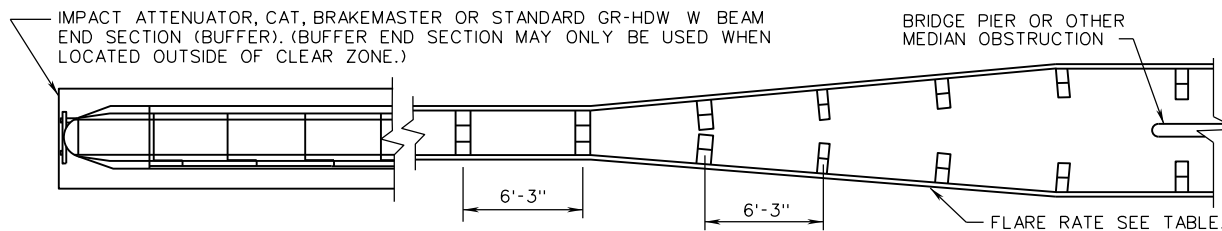
ALTERNATE TYPE POSTS AND BLOCKOUTS MAY BE INTERCHANGED ON ANY ONE PROJECT WITH THE RESTRICTION THAT THE SAME TYPE OF POST AND BLOCKOUT MUST BE USED IN ANY SINGLE RUN OF MEDIAN BARRIER.

ALL BOLTS, NUTS, WASHERS, STEEL POSTS, BENT PLATE POST, AND BLOCKOUTS ARE TO BE GALVANIZED.

⊗ STANDARD GR-11 TO BE USED ON RUN OFF END ONLY.

FLARE RATES			
DESIGN SPEED	INSIDE SHY LINE		BEYOND SHY LINE
	SHY LINE LS	FLARE RATE	FLARE RATE
70	9'	30:1	15:1 *
60	8'	26:1	14:1 *
50	6.5'	21:1	11:1 *
40	5'	16:1	8:1 *
30	4'	13:1	7:1 *

* SUGGESTED MAXIMUM FLARE RATE FOR SEMI-RIGID BARRIER SYSTEMS.

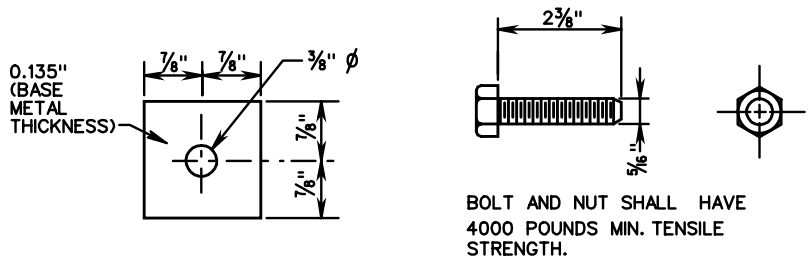


METHOD OF TREATMENT AT BRIDGE PIER OR MEDIAN OBSTRUCTION

VDOT	
ROAD AND BRIDGE STANDARDS	
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502.01	07/16

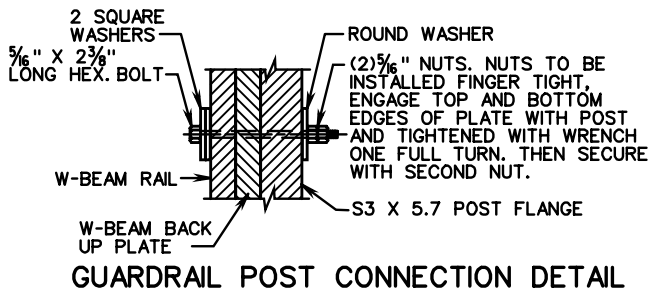
A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.
BLOCKED-OUT W-BEAM MEDIAN BARRIER
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
221 505

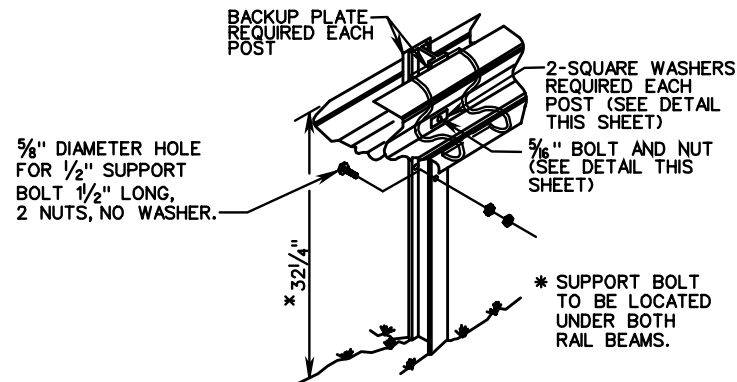


SQUARE WASHER $\frac{5}{16}$ " HEX BOLT AND NUT

⊗ 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.

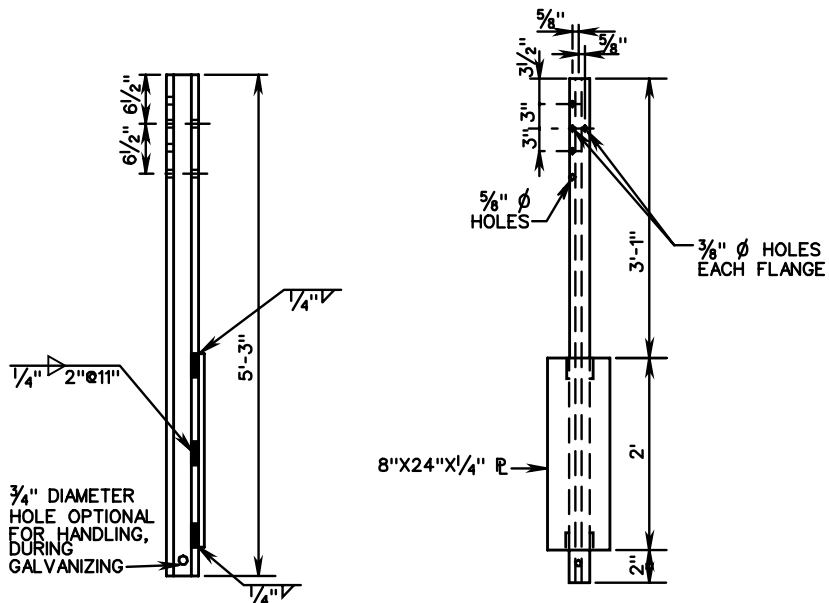


GUARDRAIL POST CONNECTION DETAIL



TYPICAL INSTALLATION

* HEIGHT TOLERANCE $\pm \frac{3}{4}$ "



FOR ROCK INSTALLATION, 8" X 26" X $\frac{1}{4}$ " 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

NOTES:

- STANDARD MB-5 POST SPACING IS 12'-6"
- STANDARD MB-5A POST SPACING IS 6'-3"
- STANDARD MB-5B POST SPACING IS 3'- $\frac{1}{2}$ "
- STANDARD MB-5 DEFLECTION IS 7'-0"

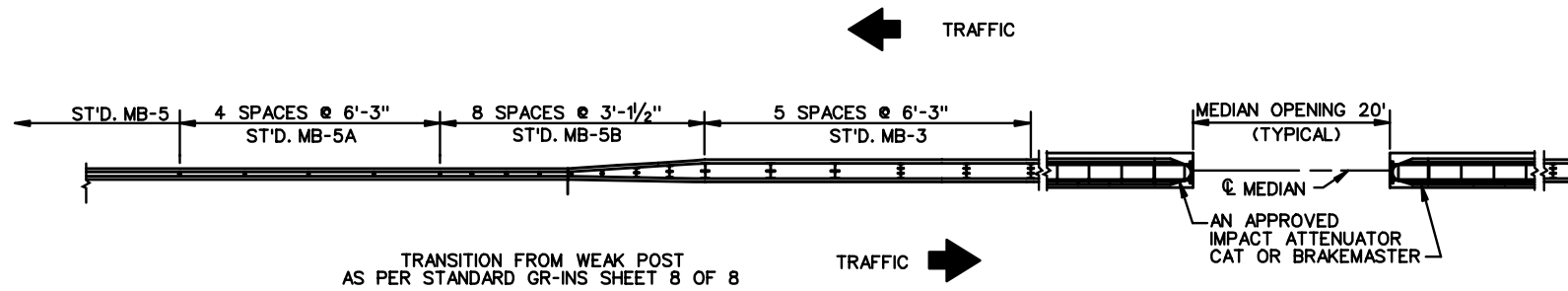
ALL POSTS, BOLTS, NUTS AND WASHERS ARE TO BE GALVANIZED.

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.

SPECIFICATION REFERENCE	<p align="center">STANDARD W-BEAM MEDIAN BARRIER (WEAK POST SYSTEM) TL-3 (>45 MPH)</p> <p align="center">VIRGINIA DEPARTMENT OF TRANSPORTATION</p>		<p>ROAD AND BRIDGE STANDARDS</p>	
			REVISION DATE	SHEET 1 OF 2
221 505			502.02	

MB-5



TREATMENT FOR MEDIAN BARRIER CROSS-OVER



ROAD AND BRIDGE STANDARDS

STANDARD W-BEAM MEDIAN BARRIER
(WEAK POST SYSTEM)

SPECIFICATION REFERENCE

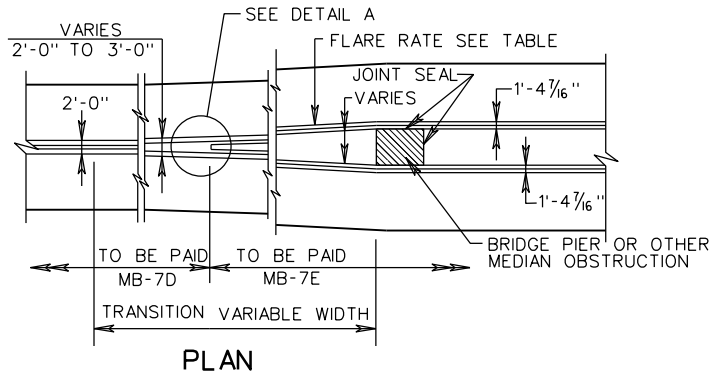
SHEET 2 OF 2

REVISION DATE

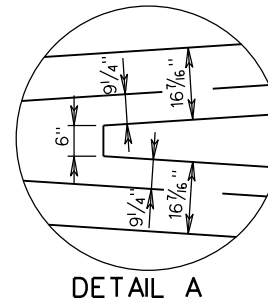
VIRGINIA DEPARTMENT OF TRANSPORTATION

502.03

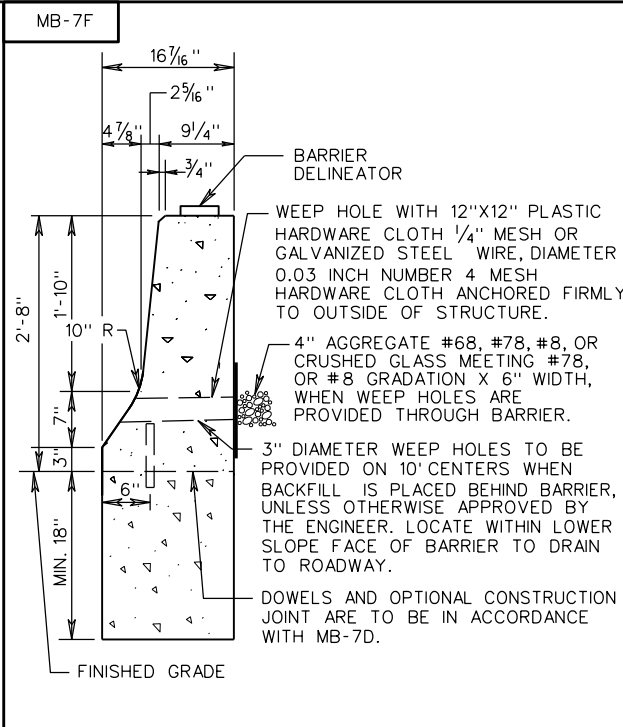
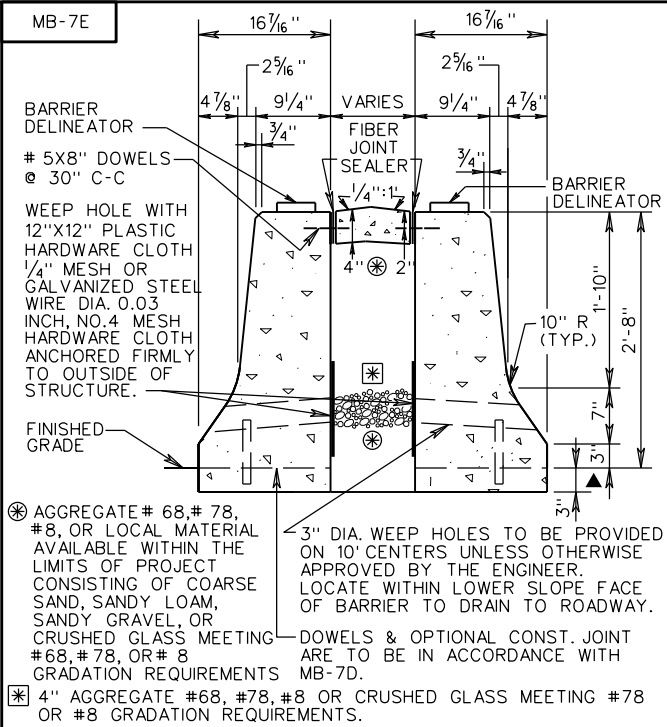
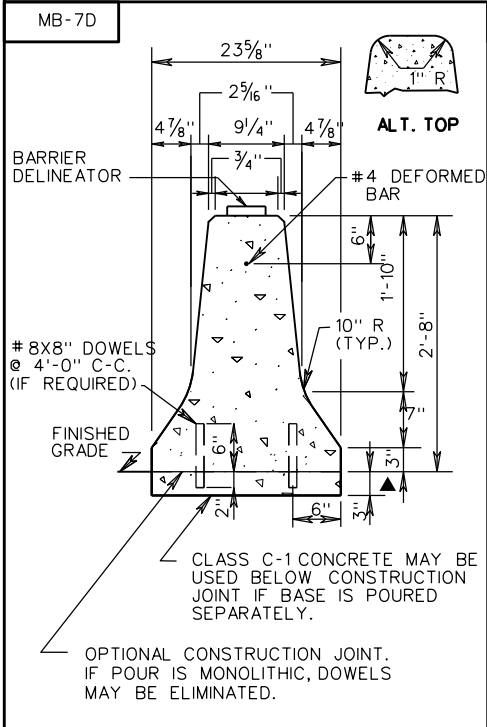
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505



* SUGGESTED MAXIMUM FLARE RATE FOR RIGID BARRIER SYSTEMS.



DESIGN SPEED	FLARE RATES		
	INSIDE SHY LINE	BEYOND SHY LINE	
MPH	SHY LINE LS	FLARE RATE	FLARE RATE
70	10'	30:1	20:1 *
60	8'	26:1	18:1 *
50	6.5'	21:1	14:1 *
40	5'	16:1	10:1 *
30	3.5'	13:1	8:1 *



NOTES:

IF THE CONTRACTOR ELECTS TO USE THE OPTIONAL CONSTRUCTION JOINT, TRANSVERSE JOINTS FOR CRACK CONTROL AND EXPANSION JOINTS ARE TO BE PROVIDED IN BOTH FOOTING AND BARRIER AT THE SAME LOCATION.

TRANSVERSE JOINTS ARE TO COINCIDE WITH JOINTS IN ADJACENT PAVEMENT WITH A MAXIMUM SPACING OF 20 FEET C-C.

CONCRETE MEDIAN BARRIER MAY BE CAST IN PLACE OR SLIP-FORMED. PRECAST BARRIER IS NOT PERMITTED FOR PERMANENT INSTALLATIONS. HORIZONTAL REINFORCING STEEL BARS ARE TO BE SEPARATED AT ALL EXPANSION AND CONTRACTION JOINTS. A 2" CONCRETE COVER IS REQUIRED OVER THE ENDS OF THE REINFORCING STEEL.

BARRIER DELINEATOR SIZE, COLOR, AND SPACING TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.

COST OF DELINEATOR TO BE INCLUDED IN THE PRICE BID FOR MEDIAN BARRIER. REFLECTIVE SURFACE OF BARRIER DELINEATOR IN ALL INSTANCES, TO BE FACING ONCOMING TRAFFIC.

ALTERNATE TOP DESIGN SHOWN ON MB-7D. MAY ALSO BE APPLIED TO MB-7E AND MB-7F. CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.

▲ DEPTH OF CONCRETE BASE MAY BE EXTENDED AT THE CONTRACTOR'S OPTION TO COINCIDE WITH BOTTOM OF PAVEMENT COURSE IN WHICH BASE TERMINATES; HOWEVER, THE COST OF ADDITIONAL CONCRETE SHALL BE INCLUDED IN UNIT PRICE BID PER LINEAR FOOT OF BARRIER.

SPECIFICATION REFERENCE
105 502

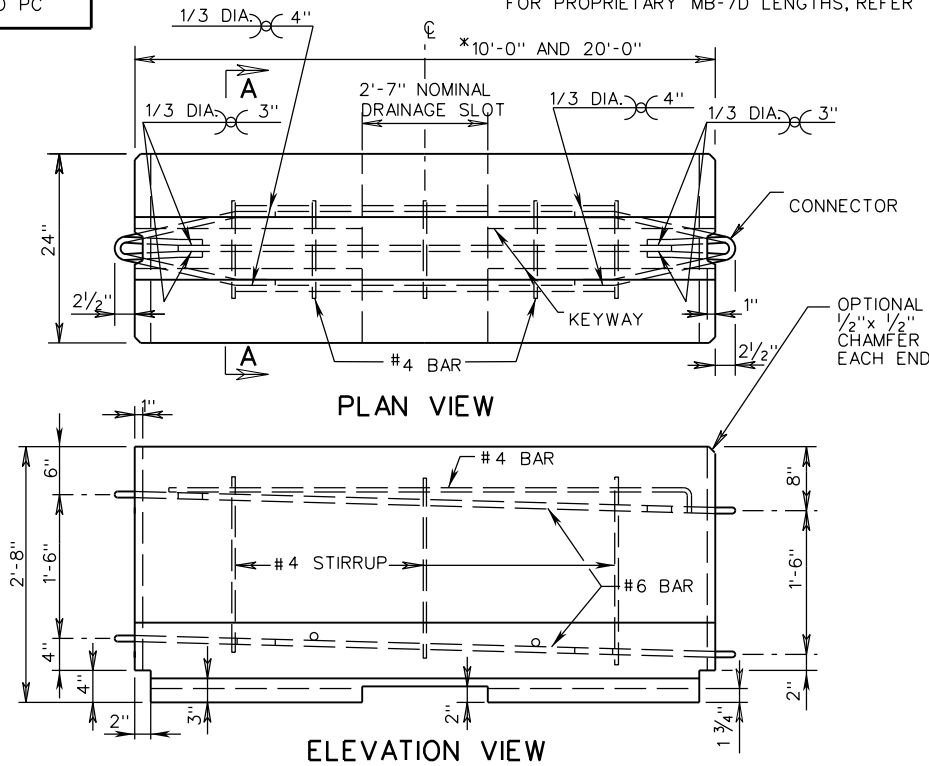
CONCRETE MEDIAN BARRIER

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT	
ROAD AND BRIDGE STANDARDS	
REVISION DATE	SHEET 1 OF 1
7/16	502.04

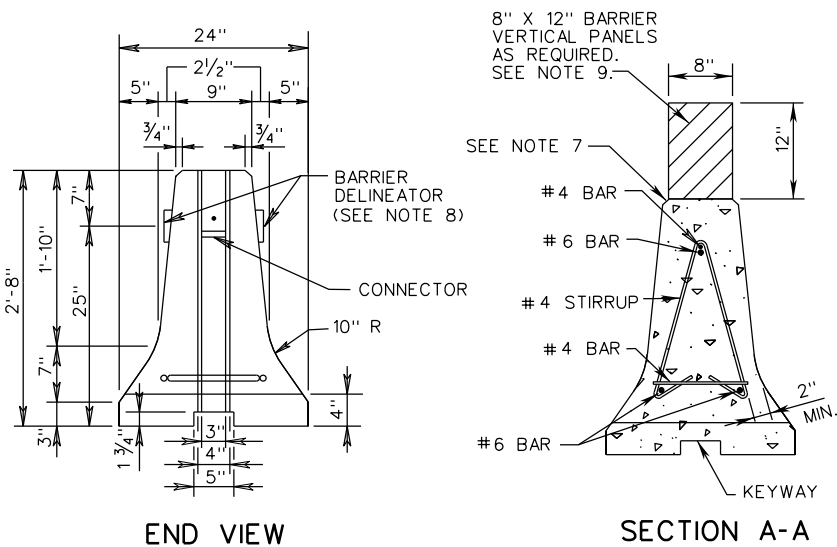
MB-7D PC

*FOR PROPRIETARY MB-7D LENGTHS, REFER TO MANUFACTURER



NOTES:

1. FOR POSITIVE CONNECTION DETAILS AND DIMENSIONS SEE SHEETS 502.23 - 502.24.
2. AT THE OPTION OF THE MANUFACTURER, ADDITIONAL REINFORCING MAY BE ADDED TO THE PRECAST CONCRETE BARRIER FOR HANDLING.
3. CONCRETE SHALL BE 4000 P.S.I. MINIMUM.
4. BARRIER DELINEATOR SIZE, COLOR AND SPACING SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.
5. COST OF DELINEATOR SHALL BE INCLUDED IN THE PRICE BID FOR TRAFFIC BARRIER SERVICE.
6. OTHER PRECAST TRAFFIC BARRIER SERVICE CONCRETE DESIGNS THAT HAVE BEEN APPROVED BY VDOT AS AN ACCEPTABLE ALTERNATE TO THE STANDARD DESIGN MAY BE SUBSTITUTED.
7. A 1" RADIUS MAY BE USED AS AN ALTERNATE FOR THE 3/4" CHAMFER.
8. BARRIER DELINEATOR REFLECTIVE SURFACE IN ALL INSTANCES SHALL BE FACING ONCOMING TRAFFIC.
9. BARRIER VERTICAL PANELS SHALL BE SPACED IN ACCORDANCE WITH VIRGINIA WORK AREA PROTECTION MANUAL.



WHEN USING VDOT STANDARD MB-7D PC WITH THE PIN AND LOOP POSITIVE CONNECTION, ALLOW FOR A 6'-0" DYNAMIC DEFLECTION. PROVIDE MIN. 60' OF BARRIER UPSTREAM AND DOWNSTREAM OF WORK ZONE FOR ANCHORAGE. FOR APPROVED NON-VDOT DESIGNS, REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR DEFLECTIONS AND ANCHORAGE.

DESIGN SPEED	* FLARE RATES		
	INSIDE SHY LINE	BEYOND SHY LINE	
MPH	SHY LINE LS	FLARE RATE	FLARE RATE
70	10'	30:1	20:1
60	8'	26:1	18:1
50	6.5'	21:1	14:1
40	5'	16:1	10:1
30	3.5	13:1	8:1

* SUGGESTED MAXIMUM FLARED RATE FOR RIGID BARRIER SYSTEMS.



ROAD AND BRIDGE STANDARDS

SHEET 1 OF 2

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7/16

PRECAST TRAFFIC BARRIER SERVICE CONCRETE

(FOR TEMPORARY USE)

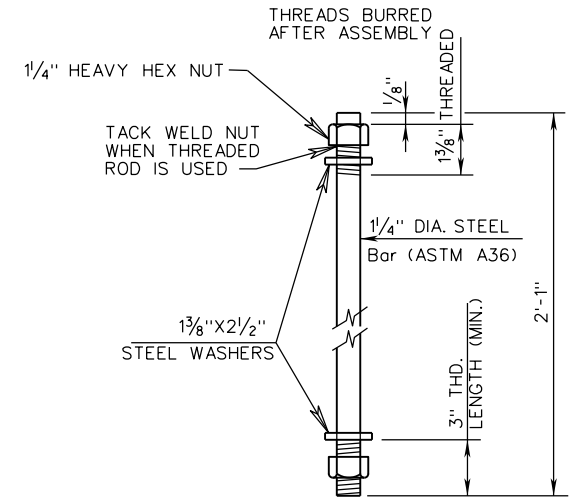
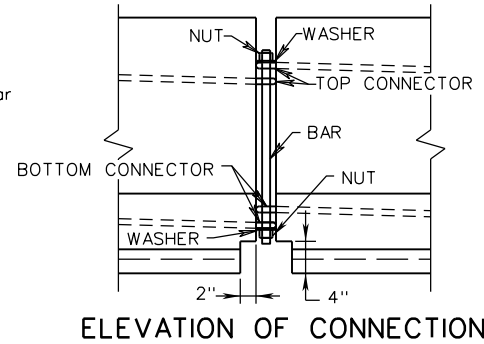
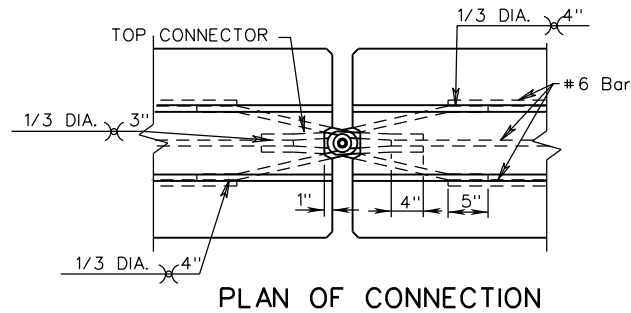
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

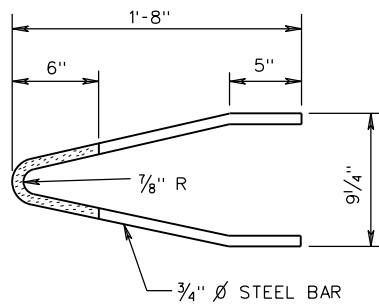
105
512

NOTES:

- PIN AND CONNECTORS SHALL BE ASTM-A36. REINFORCING STEEL BARS SHALL BE ASTM A 615 GRADE 60. ONE CONNECTOR PIN ASSEMBLY WITH EACH BARRIER SECTION.

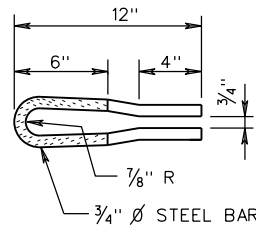


CONNECTOR PIN ASSEMBLY
GALVANIZE AFTER FABRICATION

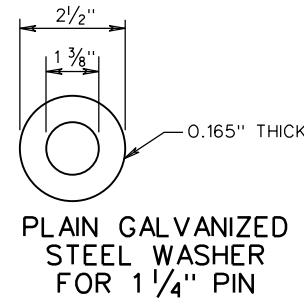


BOTTOM CONNECTOR
GALVANIZE AFTER FORMING

NOTE: ENTIRE CONNECTOR MAY BE GALVANIZED.



TOP CONNECTOR



SPECIFICATION REFERENCE

105
512

PRECAST TRAFFIC BARRIER SERVICE CONCRETE

(FOR TEMPORARY USE)
VIRGINIA DEPARTMENT OF TRANSPORTATION



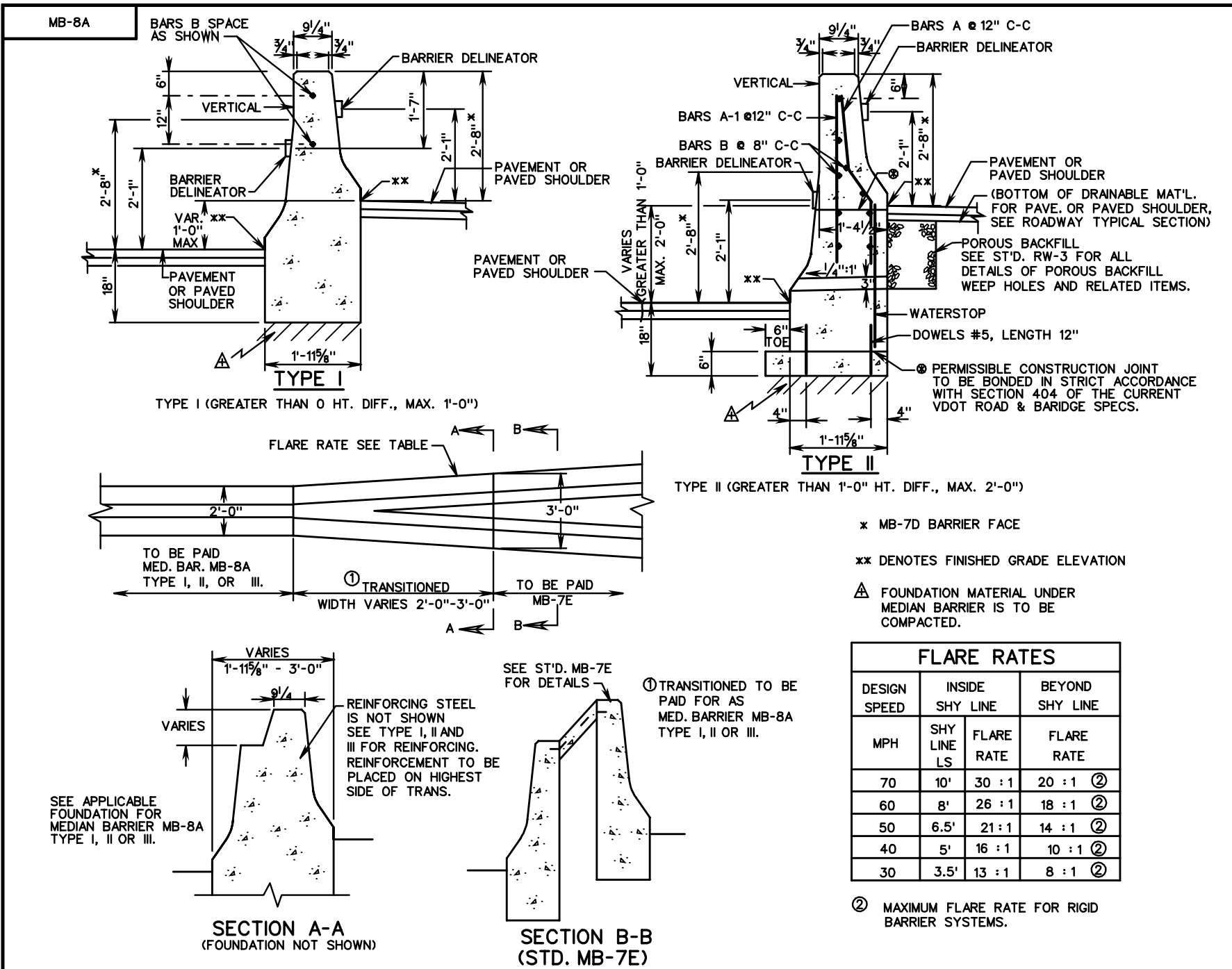
ROAD AND BRIDGE STANDARDS

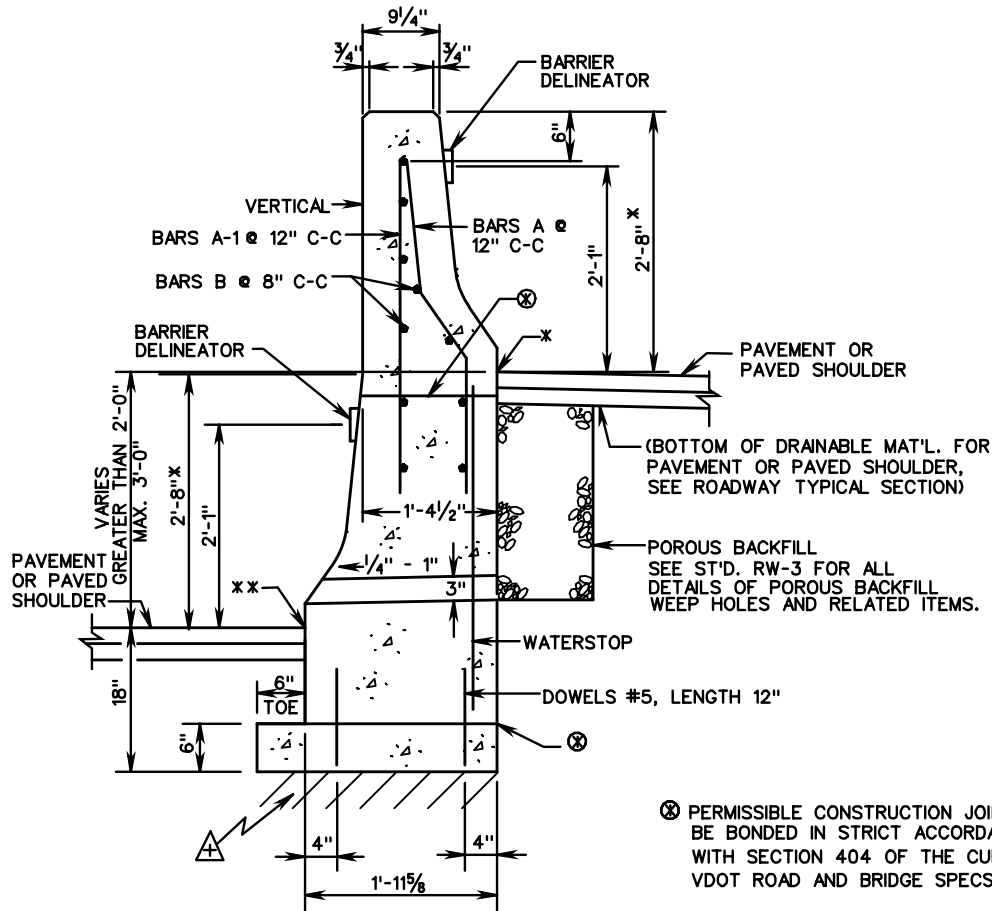
REVISION DATE

7/16

SHEET 2 OF 2

502.06





TYPE III

TYPE III (GREATER THAN 2'-0" HT. DIFF., MAX. 3'-0")

MEASUREMENT AND PAYMENT

MEDIAN BARRIER MB-8A TYPE I, II OR III WILL BE PAID FOR AT THE CONTRACT UNIT PRICE PER LIN. FOOT, WHICH SHALL BE FULL COMPENSATION FOR FURNISHING AND INSTALLING CLASS A3 CONCRETE, REINFORCING STEEL, POROUS BACKFILL AND ALL TOOLS, LABOR, EQUIPMENT AND INCIDENTALS NECESSARY TO COMPLETE THE WORK. ANY ADDITIONAL EXCAVATION, BACKFILL WITH SUITABLE MATERIAL AND COMPACTION WORK NECESSARY FOR THE CONCRETE MEDIAN BARRIER INSTALLATION IS TO BE CONSIDERED INCIDENTAL IN THE PRICE BID FOR THE CONCRETE MEDIAN BARRIER.

NOTE:

REINFORCING STEEL BARS SHOWN ARE BASED ON A 20' PANEL LENGTH.

ALL REINFORCING BARS ARE TO BE SIZE #4 GRADE 60 STEEL WITH A MINIMUM 1/2" CONCRETE COVER.

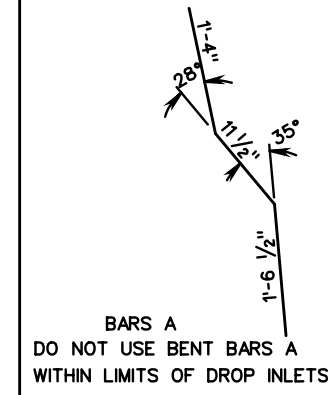
THE TYPICAL JOINT SPACING FOR CONSTRUCTION JOINTS IS 20' AND 80' FOR EXPANSION JOINTS FOR TYPE II AND III BARRIERS.

FOR DETAILS OF HOW JOINTS ARE TO BE FORMED & WATER STOP DETAILS SEE ST'D. RW-3.

TRANSVERSE JOINTS FOR TYPE I BARRIERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE ROAD AND BRIDGE SPECIFICATIONS EXCEPT NO SCORING OR SAWING WILL BE ALLOWED.

HORIZONTAL REINFORCING STEEL BARS B ARE TO BE SEPARATED AT ALL EXPANSION & CONTRACTION JOINTS. A 2" CONCRETE COVER IS REQUIRED OVER THE ENDS OF REINFORCING STEEL.

BENDING DIAGRAM



* MB-7D BARRIER FACE

** DENOTES FINISHED GRADE ELEVATION

△ FOUNDATION MATERIAL UNDER MEDIAN BARRIER IS TO BE COMPACTED.

REINFORCING STEEL SCHEDULE

	BARS "A"		BARS A-1		BARS "B"		DOWELS	
PANEL	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
TYPE I					2	19'-8"		
TYPE II	20	4'-0"	20	4'-0"	9	19'-8"	40	1'-0"
TYPE III	20	4'-0"	20	4'-0"	9	19'-8"	40	1'-0"

SPECIFICATION REFERENCE

105
404
502

CONCRETE MEDIAN BARRIER

TYPE I, II OR III

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT

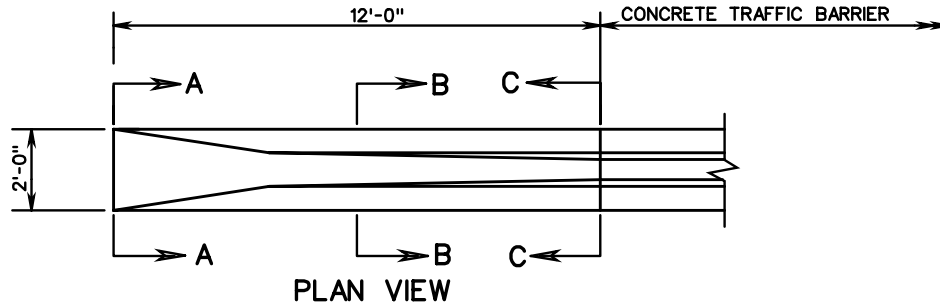
ROAD AND BRIDGE STANDARDS

REVISION DATE

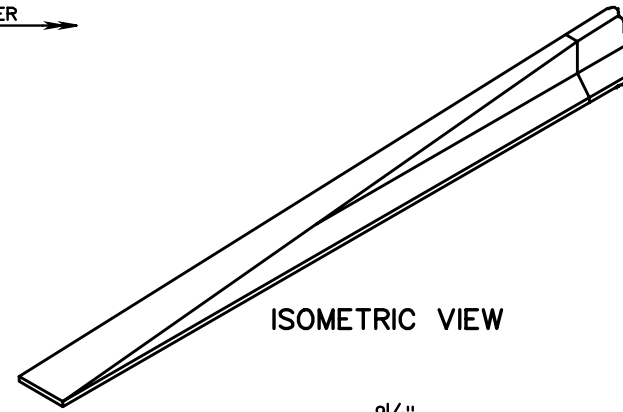
SHEET 2 OF 2

502.08

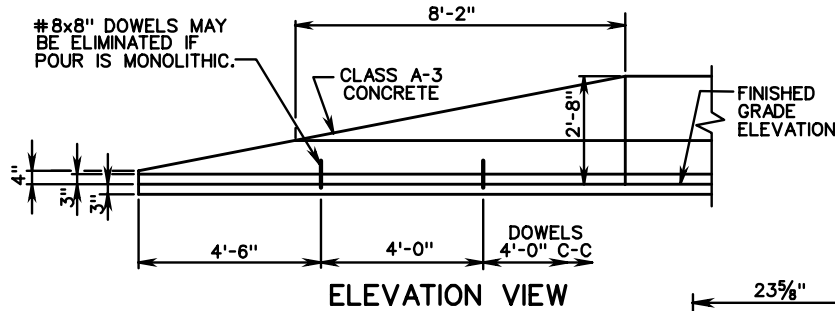
MB-9A



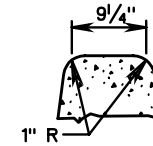
PLAN VIEW



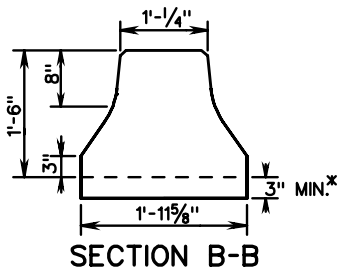
ISOMETRIC VIEW



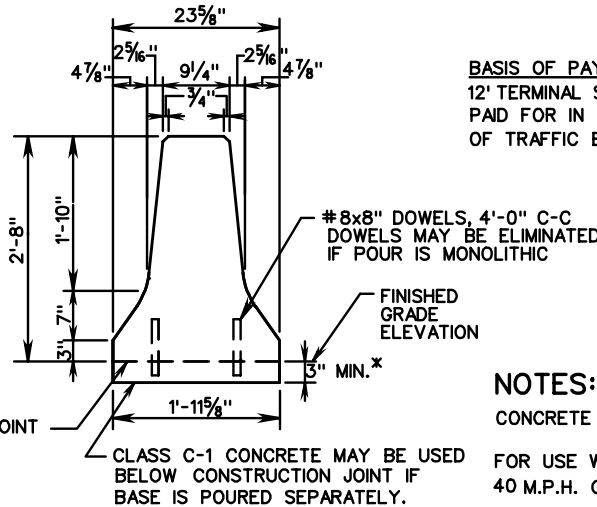
ELEVATION VIEW



ALTERNATE TOP



SECTION B-B

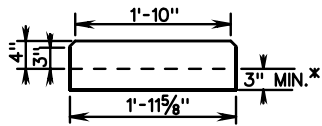


SECTION C-C

BASIS OF PAYMENT: CONCRETE MEDIAN BARRIER 12' TERMINAL SECTION IS TO BE MEASURED AND PAID FOR IN LIN. FT. ST'D. MB-7D, OR LIN. FT. OF TRAFFIC BARRIER SERVICE CONCRETE.

NOTES:

- CONCRETE TO BE CLASS A3.
- FOR USE WHERE THE OPERATING SPEED IS 40 M.P.H. OR LESS.
- LOCATION OF THE BARRIER END SECTIONS TO BE AS NOTED ON PLANS OR AS APPROVED BY THE ENGINEER.
- FOR POSITIVE CONNECTION DETAILS AND DIMENSIONS SEE STANDARD MB-INS.
- ONLY FOR USE OUTSIDE OF CLEAR ZONE.



SECTION A-A

* DEPTH OF CONCRETE BASE MAY BE EXTENDED AT THE CONTRACTOR'S OPTION TO COINCIDE WITH BOTTOM OF PAVEMENT COURSE IN WHICH BASE TERMINATES; HOWEVER, THE COST OF ADDITIONAL CONCRETE SHALL BE INCLUDED IN UNIT PRICE BID PER LIN. FT. OF BARRIER.

CAST IN PLACE CONCRETE MEDIAN BARRIER
12 FT. TERMINAL SECTION

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

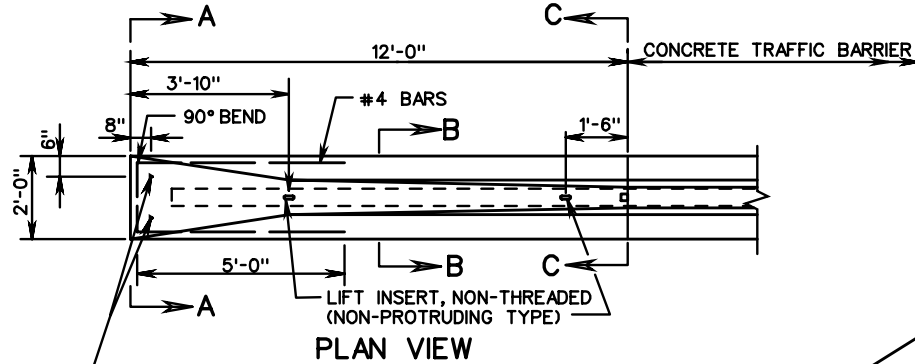


ROAD AND BRIDGE STANDARDS

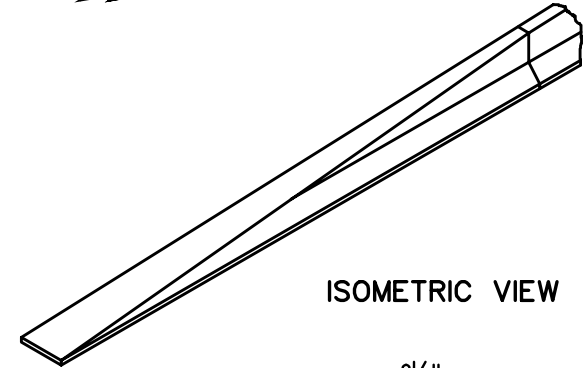
SHEET 1 OF 1

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502.09



PLAN VIEW

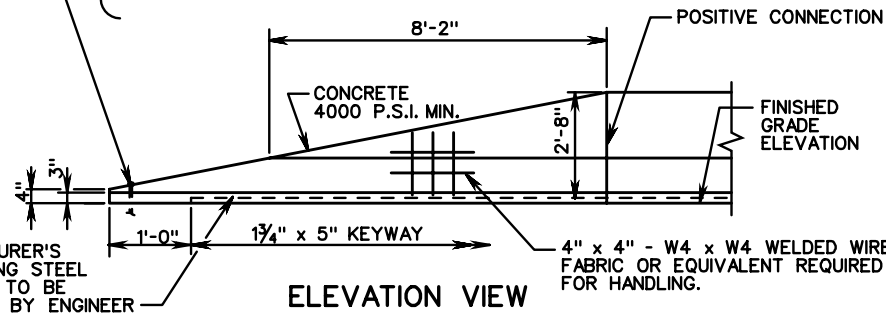


ISOMETRIC VIEW

1" I.D. METAL SLEEVE
(REINFORCING STEEL
SHALL SURROUND
1" I.D. METAL SLEEVE)

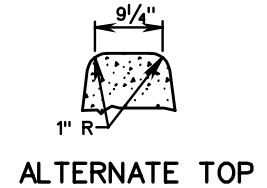
USE 3/4" x 9" EXPANSION BOLTS FOR RIGID PAVEMENT
INSTALLATION ONLY (BOLTS TO BE REMOVABLE)

USE 3/4" x 3'-0" DRIFT PINS FOR FLEXIBLE
PAVEMENT INSTALLATIONS.



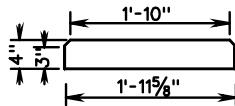
ELEVATION VIEW

MANUFACTURER'S
REINFORCING STEEL
DESIGN IS TO BE
APPROVED BY ENGINEER

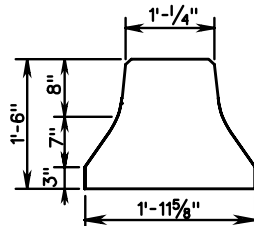


ALTERNATE TOP

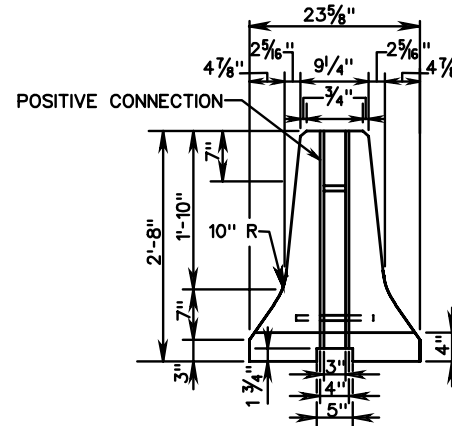
BASIS OF PAYMENT: CONCRETE MEDIAN BARRIER
12' TERMINAL SECTION IS TO BE MEASURED AND
PAID FOR IN LIN. FT. ST'D. MB-7D, OR LIN. FT.
OF TRAFFIC BARRIER SERVICE CONCRETE.



SECTION A-A



SECTION B-B



SECTION C-C

NOTES:

CONCRETE TO BE 4000 P.S.I..

REINFORCING STEEL TO BE GRADE 60.
ALL REINFORCING IS TO HAVE A MINIMUM
CONCRETE COVER OF 1/2".

FOR USE WHERE THE OPERATING SPEED IS
40 M.P.H. OR LESS.

LOCATION OF THE BARRIER END SECTIONS TO
BE AS NOTED ON PLANS OR AS APPROVED
BY THE ENGINEER.

FOR POSITIVE CONNECTION DETAILS AND
DIMENSIONS SEE STANDARD MB-INS.

ONLY FOR USE OUTSIDE OF CLEAR ZONE.

SPECIFICATION
REFERENCE

105

PRECAST CONCRETE MEDIAN BARRIER

12 FT. TERMINAL SECTION

VIRGINIA DEPARTMENT OF TRANSPORTATION

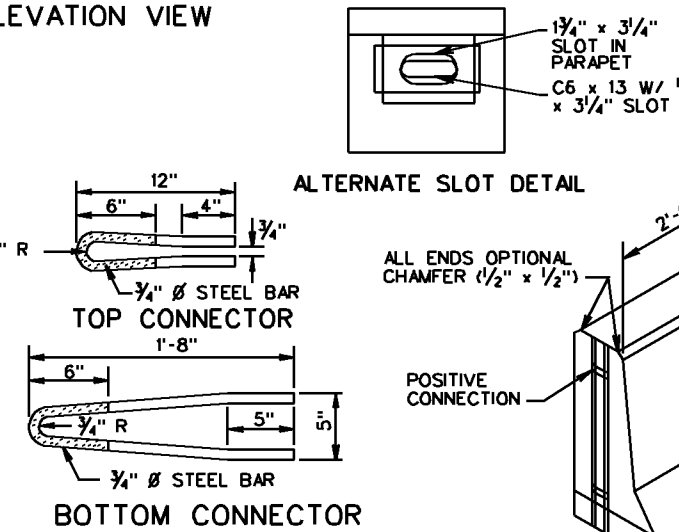
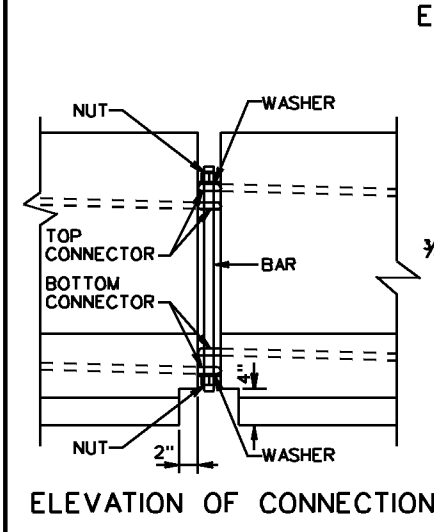
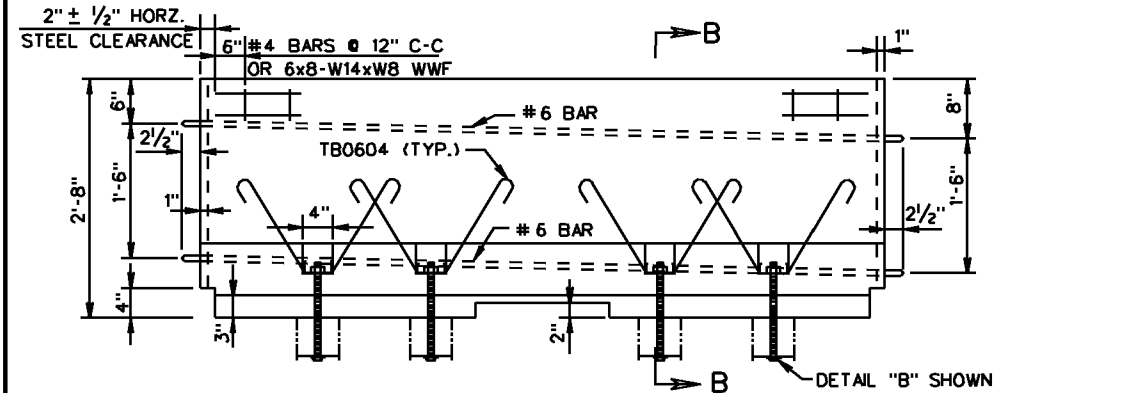
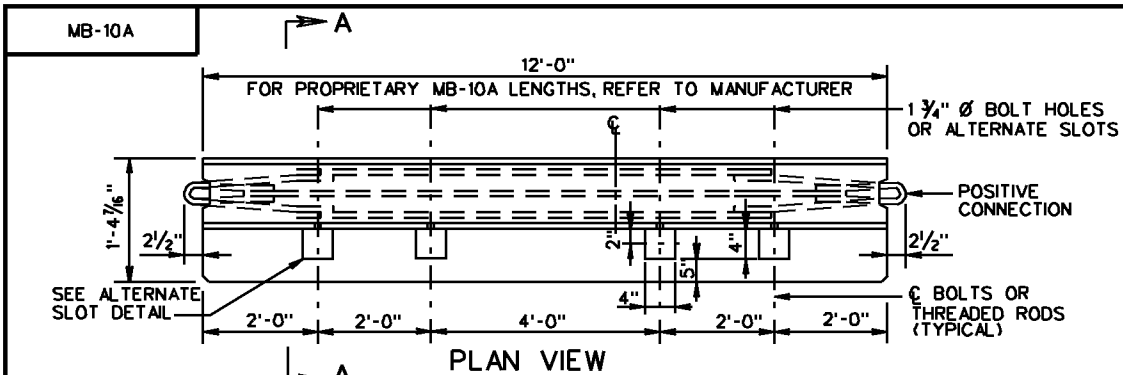


ROAD AND BRIDGE STANDARDS

REVISION DATE

SHEET 1 OF 1

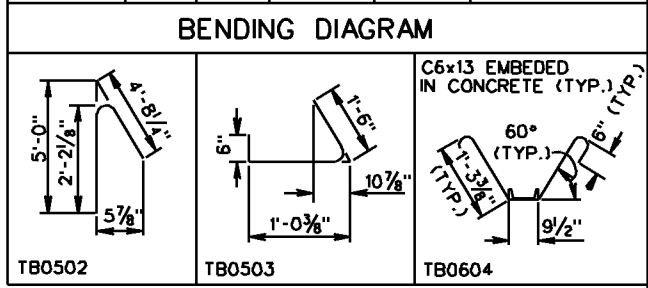
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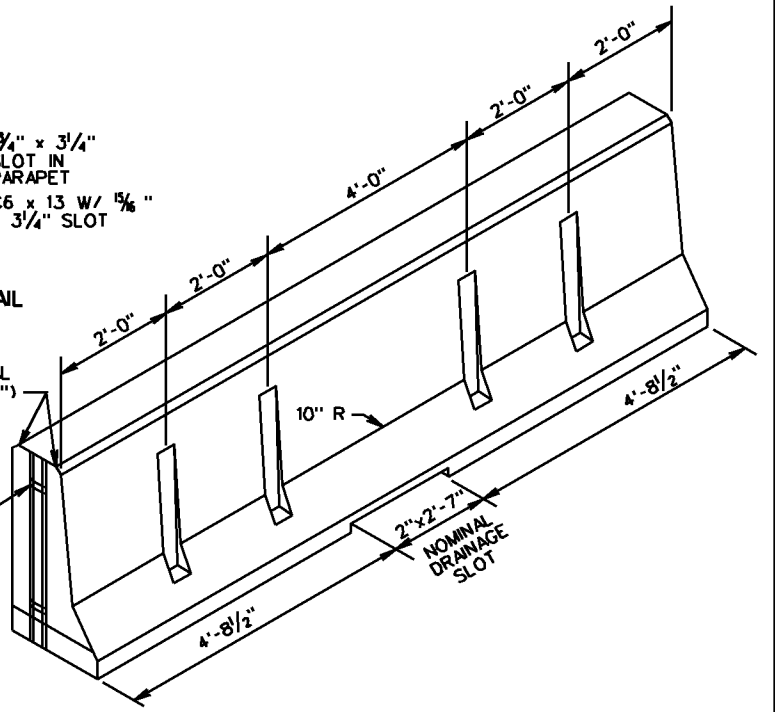
REINFORCING STEEL SCHEDULE

FOR ONE (1) SECTION

MARK	No.	SIZE	LENGTH	PIN Ø	LOCATION
TB0401	8	4	1'-5"	—	TEMP. PARAPET
TB0502	12	5	4'-3"	2 1/2"	"
TB0503	12	5	2'-8"	2 1/2"	"
TB0604	8	6	4'-8"	4 1/2"	"



DIMENSIONS IN BENDING DIAGRAMS ARE OUT-TO-OUT OF BARS, EXCEPT AS SHOWN.
POUNDS OF REINFORCING STEEL = 202
REINFORCING SCHEDULE BASED ON 12'-0" UNIT LENGTH.



VDOT
ROAD AND BRIDGE STANDARDS

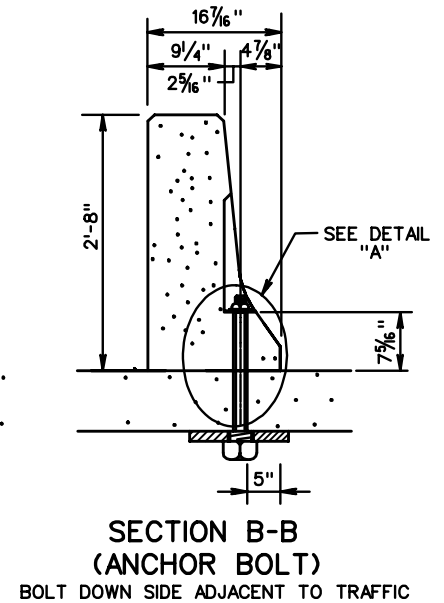
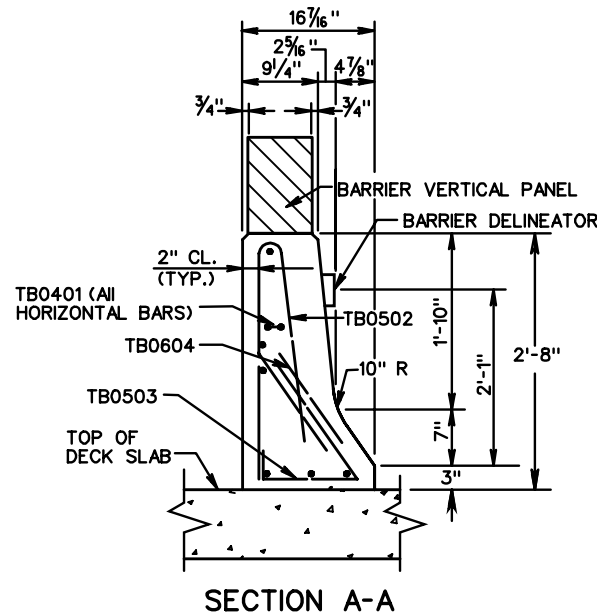
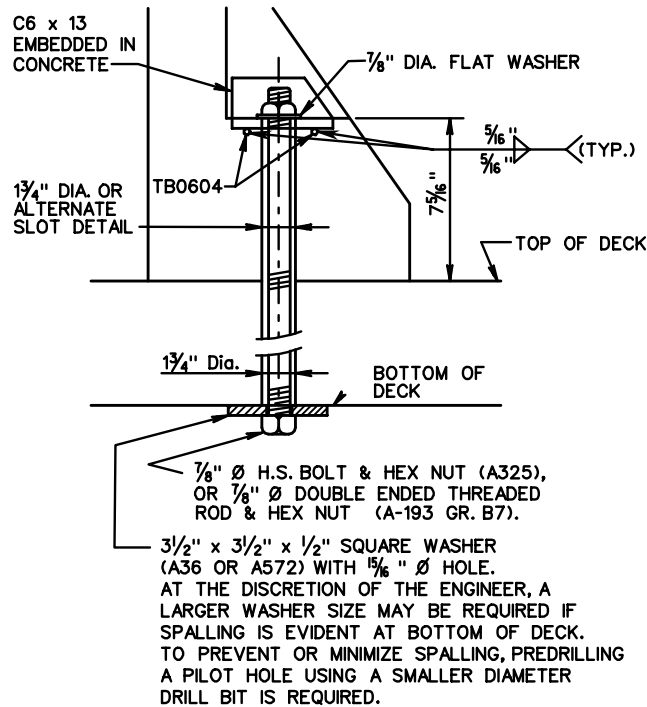
SHEET 1 OF 2
502.11

REVISION DATE
01/09

TRAFFIC BARRIER SERVICE CONCRETE PARAPET (SINGLE FACE)
(FOR TEMPORARY INSTALLATION ON BRIDGE DECK EXTERIOR)
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

105
502



DETAIL "A" NOTES:

1. BARRIER DELINEATOR TO BE SPACED IN ACCORDANCE WITH SECTION 702, OF THE ROAD AND BRIDGE SPECIFICATIONS AND THE BARRIER VERTICAL PANELS TO BE SPACED IN ACCORDANCE WITH VIRGINIA WORK AREA PROTECTION MANUAL. REFLECTIVE SURFACE, IN ALL INSTANCES, TO BE FACING ONCOMING TRAFFIC.
2. CONCRETE 4000 PSI(MIN.). REINFORCING STEEL GRADE 60.
3. AFTER REMOVING TEMPORARY BARRIER, CUT 7/8" Ø BOLT OR THREADED ROD AS LOW AS PRACTICAL BELOW ROADWAY SURFACE AND FILL RECESS WITH EPOXY BONDING COMPOUND EP-4 (DETAIL "A") OR REMOVE 7/8" Ø BOLTS OR THREADED RODS AND FILL HOLES WITH GROUT BONDED WITH EPOXY BONDING COMPOUND EP-4 (DETAIL "A").
4. COST OF BARRIER DELINEATOR AND BARRIER VERTICAL PANELS TO BE INCLUDED IN PRICE BID PER LINEAR FOOT OF BARRIER SERVICE.
5. WHEN BARRIER IS LOCATED ON VERTICAL AND/OR HORIZONTAL CURVES, THE OPENING AT THE JOINT IS NOT TO EXCEED 1".
6. DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT.
7. FOR POSITIVE CONNECTION DETAILS AND DIMENSIONS SEE STANDARD SHEETS 502.20 - 502.24.

SPECIFICATION REFERENCE

TRAFFIC BARRIER SERVICE CONCRETE PARAPET (SINGLE FACE)

(FOR TEMPORARY INSTALLATION ON BRIDGE DECK EXTERIOR)

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT

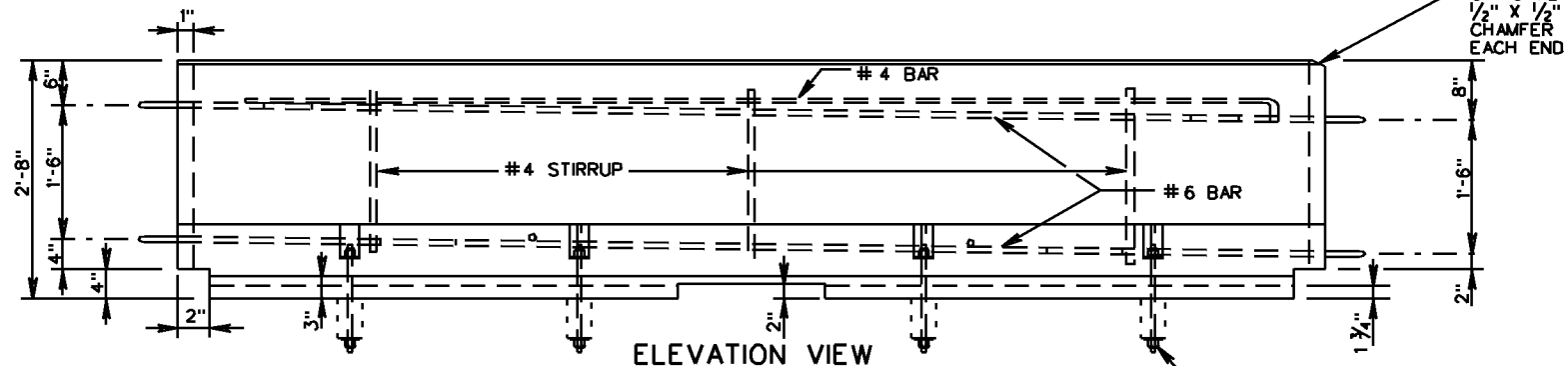
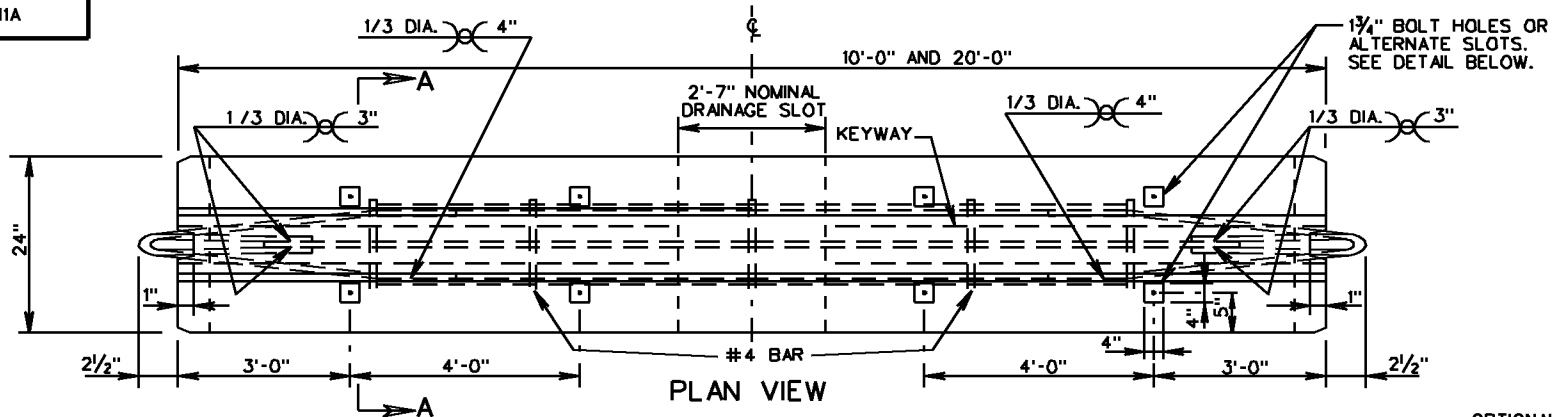
ROAD AND BRIDGE STANDARDS

REVISION DATE

SHEET 2 OF 2

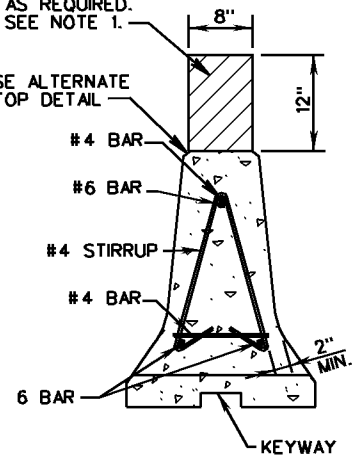
502.12

MB-11A

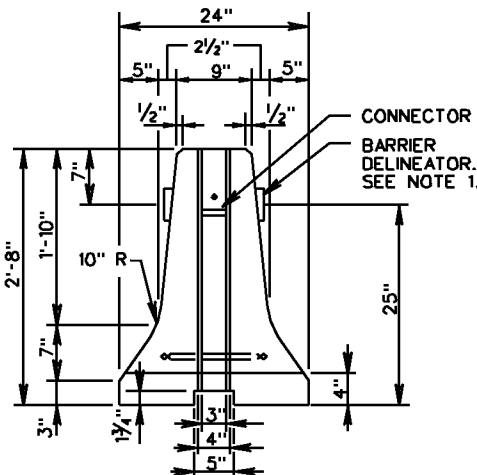


8" X 12" BARRIER VERTICAL PANELS AS REQUIRED. SEE NOTE 1.

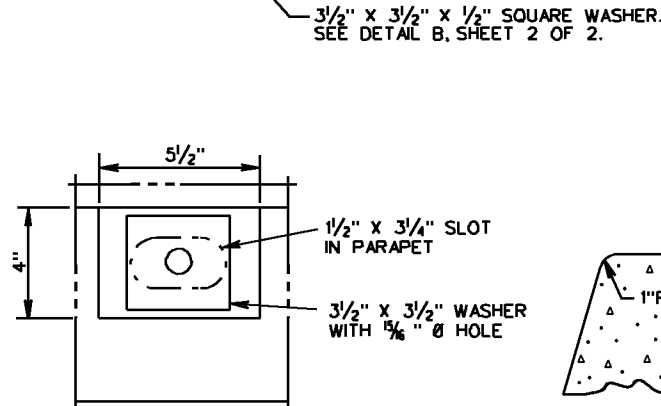
SEE ALTERNATE TOP DETAIL



SECTION A-A



END VIEW



ALTERNATE SLOT DETAIL

ALTERNATE TOP

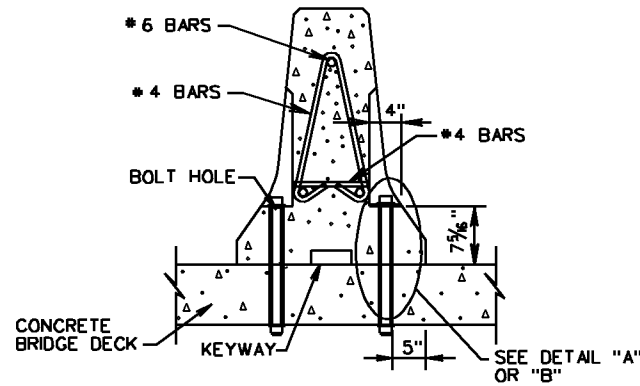
VDOT ROAD AND BRIDGE STANDARDS	
SHEET 1 OF 3	REVISION DATE 01/09
502.13	

**TRAFFIC BARRIER SERVICE CONCRETE PARAPET
(DOUBLE FACE)**
(FOR TEMPORARY INSTALLATION ON BRIDGE DECK EXTERIOR)
VIRGINIA DEPARTMENT OF TRANSPORTATION

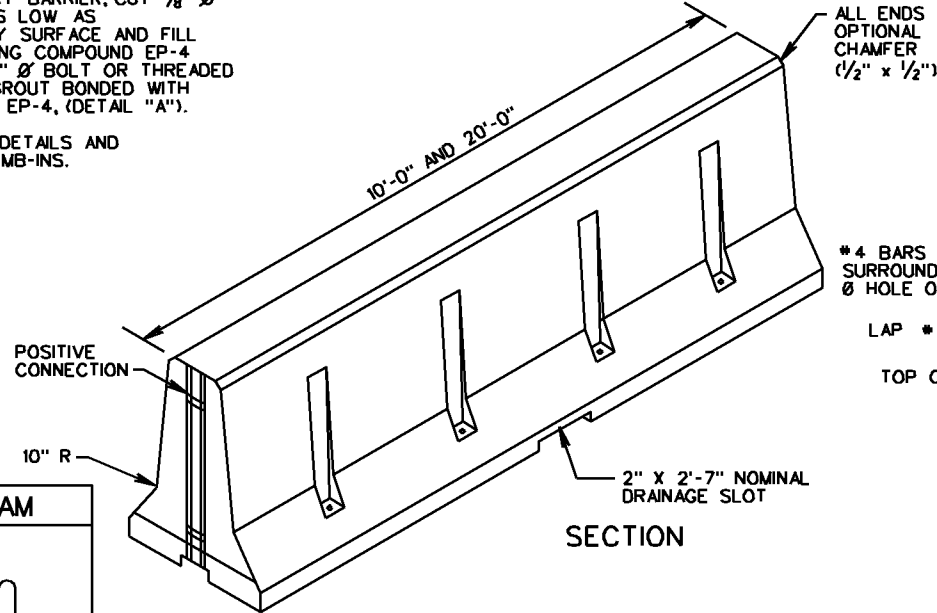
SPECIFICATION REFERENCE
105 512

NOTES:

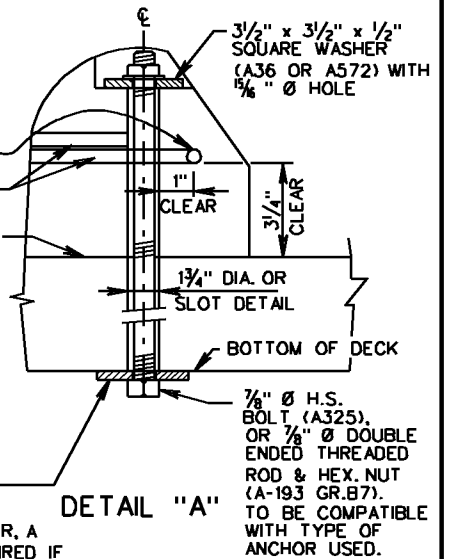
1. BARRIER DELINEATOR IS TO BE SPACED IN ACCORDANCE WITH SECTION 702 OF THE ROAD AND BRIDGE SPECIFICATIONS AND THE BARRIER VERTICAL PANELS ARE TO BE SPACED IN ACCORDANCE WITH THE VIRGINIA WORK AREA PROTECTION MANUAL.
2. REFLECTIVE SURFACE, IN ALL INSTANCES, ARE TO BE FACING ONCOMING TRAFFIC.
3. COST OF BARRIER DELINEATOR AND BARRIER VERTICAL PANELS ARE TO BE INCLUDED IN PRICE BID PER LINEAR FOOT OF BARRIER SERVICE.
4. ANCHOR BOLTS SHALL BE INSTALLED ON TRAFFIC SIDE.
5. CONCRETE 4000 PSI. (MIN.)
6. WELDED WIRE FABRIC MAY BE ONE SHEET BENT TO FIT CONFIGURATION OR TWO SEPARATE SHEETS, ONE ON EACH FACE.
7. AFTER REMOVING TEMPORARY BARRIER, CUT $\frac{7}{8}$ " \emptyset BOLT OR THREADED ROD AS LOW AS PRACTICAL BELOW ROADWAY SURFACE AND FILL RECESS WITH EPOXY BONDING COMPOUND EP-4 (DETAIL "A") OR REMOVE $\frac{7}{8}$ " \emptyset BOLT OR THREADED ROD AND FILL HOLE WITH GROUT BONDED WITH EPOXY BONDING COMPOUND EP-4, (DETAIL "A").
8. FOR POSITIVE CONNECTION DETAILS AND DIMENSIONS SEE STANDARD MB-INS.



**SECTION B-B
(ANCHOR BOLT)**
BOLT DOWN SIDE ADJACENT TO TRAFFIC

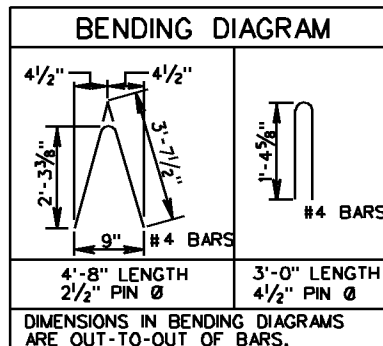


SECTION



DETAIL "A"

3/2" x 3/2" x 1/2" SQUARE WASHER (A36 OR A572) WITH 5/16" Ø HOLE. AT THE DISCRETION OF THE ENGINEER, A LARGER WASHER SIZE MAY BE REQUIRED IF SPALLING IS EVIDENT AT BOTTOM OF DECK. TO PREVENT OR MINIMIZE SPALLING, PREDRILLING A PILOT HOLE USING A SMALLER DIAMETER DRILL BIT IS REQUIRED.



SPECIFICATION REFERENCE
105 512

**TRAFFIC BARRIER SERVICE CONCRETE PARAPET
(DOUBLE FACE)**

(FOR TEMPORARY INSTALLATION ON BRIDGE DECK EXTERIOR)

VIRGINIA DEPARTMENT OF TRANSPORTATION



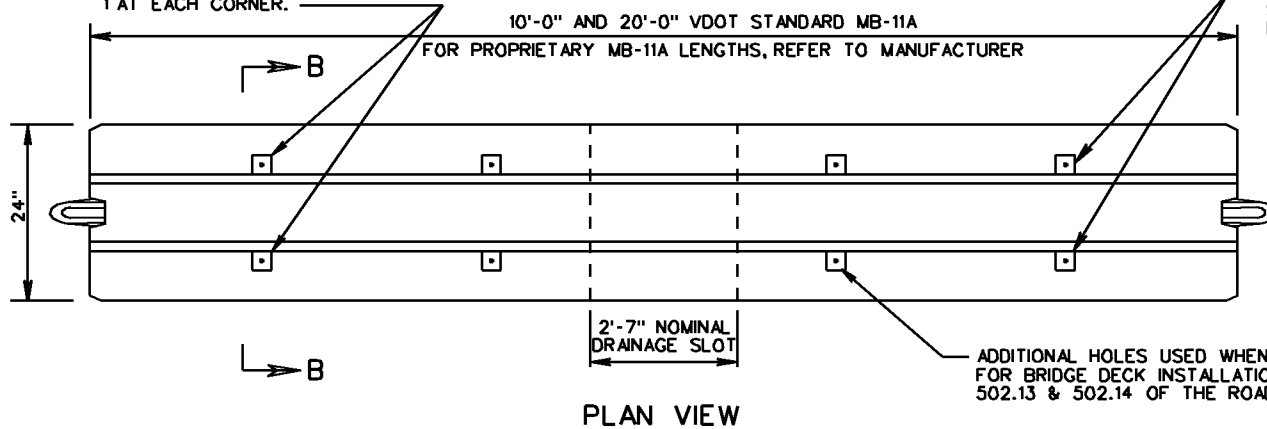
ROAD AND BRIDGE STANDARDS

REVISION DATE	SHEET 2 OF 3
01/09	502.14

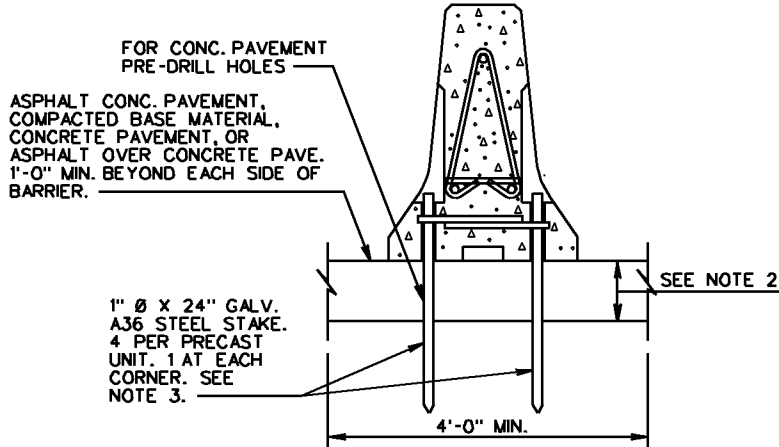
MB-11A

STAKE LOCATIONS WHEN STAKING STANDARD MB-11A.
NOT TO BE USED ON BRIDGE DECKS.
4 PER PRECAST UNIT.
1 AT EACH CORNER.

STAKE LOCATIONS WHEN STAKING
STANDARD MB-11A.
NOT TO BE USED ON BRIDGE DECKS.
4 PER PRECAST UNIT.
1 AT EACH CORNER.



ADDITIONAL HOLES USED WHEN BOLTING TO BRIDGE DECKS.
FOR BRIDGE DECK INSTALLATIONS, REFER TO SHEETS
502.13 & 502.14 OF THE ROAD AND BRIDGE STANDARDS.



SECTION B-B

TEMPORARY INSTALLATION ON ASPHALT CONCRETE
PAVEMENT, COMPACTED BASE MATERIAL, CONCRETE
PAVEMENT, OR ASPHALT OVER CONCRETE PAVEMENT
(NOT TO BE USED ON BRIDGE DECKS)

NOTES:

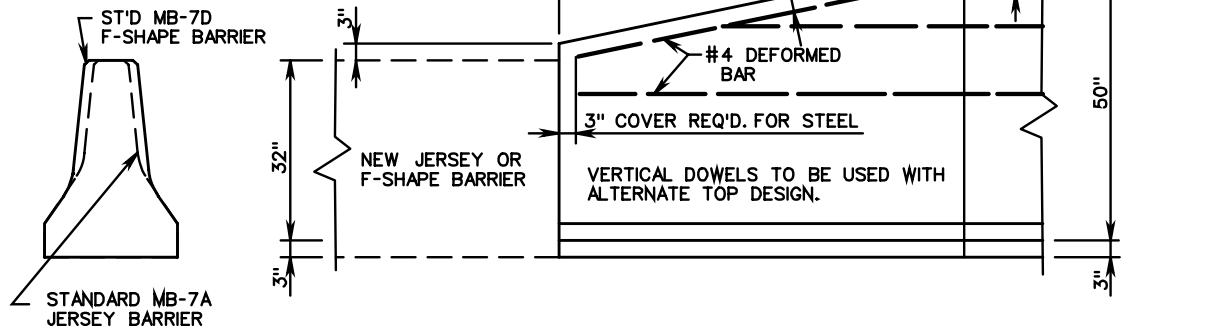
1. STAKING OF STANDARD MB-11A TO ASPHALT CONCRETE PAVEMENT, COMPACTED BASE MATERIAL, CONCRETE PAVEMENT, OR ASPHALT OVER CONCRETE PAVEMENT IS REQUIRED WHEN TRAFFIC BARRIER SERVICE CONCRETE IS PLACED WITHIN THE TWO (2) FOOT OFFSET OF A TRENCHING OPERATION (4' OR GREATER IN DEPTH) OR WHEN DETERMINED BY THE ENGINEER.
2. 2" MIN. FOR ASPHALT CONCRETE.
6" MIN. FOR COMPACTED BASE MATERIAL.
3. DRIVE STAKE HEAD BELOW FACE OF BARRIER TO PREVENT SNAGGING.
4. CONTRACTOR TO VERIFY PAVEMENT STRUCTURE PRIOR TO PLACING STAKES.
5. UPON REMOVAL OF THE STAKES AND BARRIERS, REPAIR THE RESULTING HOLES AS FOLLOWS OR AS DIRECTED BY THE ENGINEER. CLEAN AND FILL WITH TYPE EP-4 OR EP-5 EPOXY MORTAR CONFORMING TO THE REQUIREMENTS OF SECTION 24.3 FOR HYDRAULIC CEMENT CONCRETE PAVEMENT AND ASPHALT CONCRETE PAVEMENT. CARE SHALL BE TAKEN NOT TO TRAP AIR WITHIN OR AT THE BOTTOM OF THE EPOXY MORTAR.

VDOT	
ROAD AND BRIDGE STANDARDS	
SHEET 3 OF 3	REVISION DATE
502.15	01/09

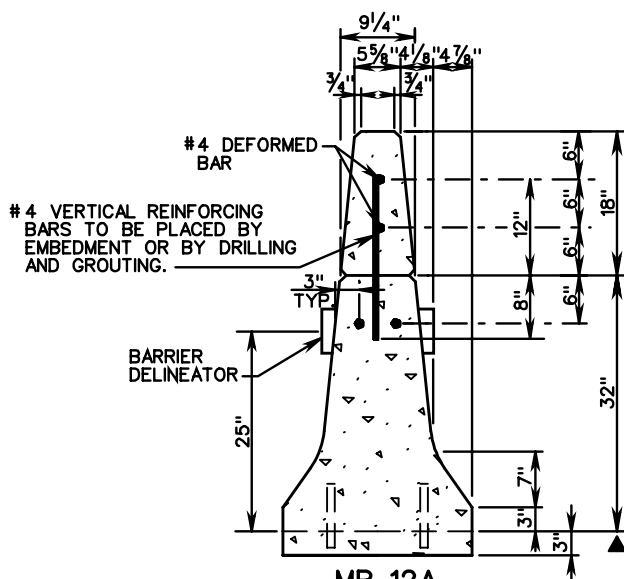
**TRAFFIC BARRIER SERVICE CONCRETE PARAPET
(DOUBLE FACE)**
(FOR TEMPORARY INSTALLATION ON ROADWAYS)
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
105 512

BARRIER TAPER FROM 50" TALL F-SHAPE TO A STANDARD MB-7A OR MB-7D BARRIER TO BE ACCOMPLISHED WITHIN THE 6'-0" AS INDICATED.



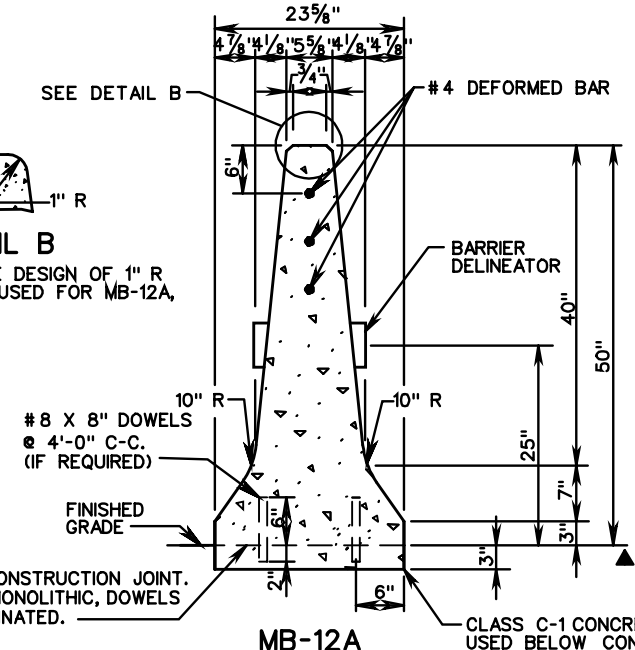
TRANSITION FROM 50" TALL WALL TO 32" JERSEY OR F-SHAPE BARRIER



MB-12A
ALTERNATE TOP DESIGN



DETAIL B
THE ALTERNATE DESIGN OF 1" R MAY ALSO BE USED FOR MB-12A, 12B OR 12C.



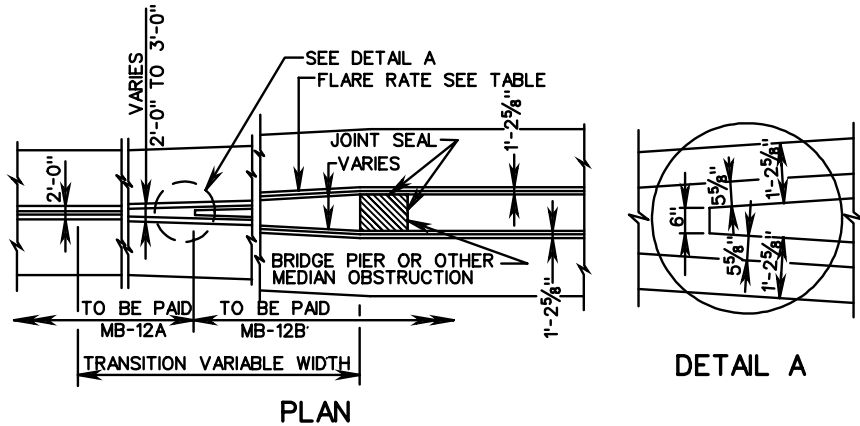
MB-12A

IF BARRIER EXTENSION IS CONSTRUCTED AS A SEPARATE ITEM, ALL JOINTS ARE TO BE CONSTRUCTED AT THE SAME INTERVAL AS CONCRETE BARRIER. ALL VERTICAL BARS ARE #4 AT 24" MAX. SPACING. LENGTH OF DOWELS SHALL BE 20". VERTICAL BARS MAY BE PLACED IN THE CONCRETE OR BONDED INTO DRILLED HOLES IN HARDENED CONCRETE. WHEN HOLES ARE DRILLED NON-SHRINK GROUT SHALL BE USED TO BOND THE BARS IN PLACE.

▲ DEPTH OF CONCRETE BASE MAY BE EXTENDED AT THE CONTRACTOR'S OPTION TO COINCIDE WITH BOTTOM OF PAVEMENT COURSE IN WHICH BASE TERMINATES; HOWEVER, THE COST OF ADDITIONAL CONCRETE SHALL BE INCLUDED IN UNIT PRICE BID PER LINEAR FT. OF BARRIER.

SPECIFICATION REFERENCE	<h1>CONCRETE MEDIAN BARRIER (TALL WALL)</h1>	VDOT	
		ROAD AND BRIDGE STANDARDS	
105 502	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE	SHEET 1 OF 2
			502.16

MB-12A, B, C



NOTES:

IF THE CONTRACTOR ELECTS TO USE THE OPTIONAL CONSTRUCTION JOINTS, TRANSVERSE JOINTS FOR CRACK CONTROL AND EXPANSION JOINTS ARE TO BE PROVIDED IN BOTH FOOTING AND BARRIER AT THE SAME LOCATION.

TRANSVERSE JOINTS ARE TO COINCIDE WITH JOINTS IN ADJACENT PAVEMENT WITH A MAXIMUM SPACING OF 20 FT. C-C.

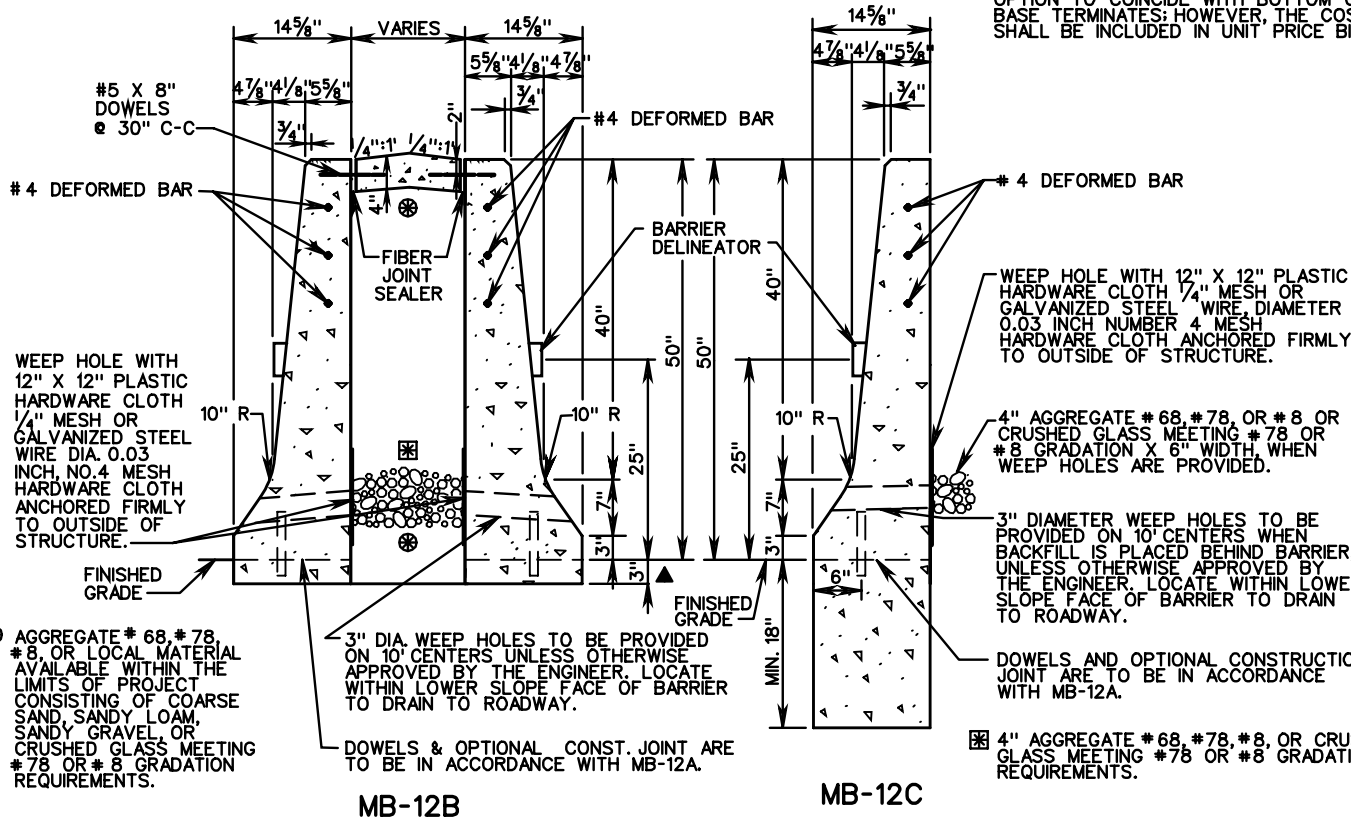
CONCRETE MEDIAN BARRIER MAY BE CAST IN PLACE OR SLIP-FORMED.

HORIZONTAL REINFORCING STEEL BARS ARE TO BE SEPARATE AT ALL EXPANSION AND CONTRACTION JOINTS. A 2" CONCRETE COVER IS REQUIRED OVER THE ENDS OF THE REINFORCING STEEL.

BARRIER DELINEATOR SIZE, COLOR AND SPACING SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS. COST OF DELINEATOR SHALL BE INCLUDED IN THE PRICE BID FOR MEDIAN BARRIER. REFLECTIVE SURFACE OF BARRIER DELINEATOR, IN ALL INSTANCES, SHALL BE FACING THE ONCOMING TRAFFIC.

CONCRETE SHALL BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.

▲ DEPTH OF CONCRETE BASE MAY BE EXTENDED AT THE CONTRACTOR'S OPTION TO COINCIDE WITH BOTTOM OF PAVEMENT COURSE IN WHICH BASE TERMINATES; HOWEVER, THE COST OF ADDITIONAL CONCRETE SHALL BE INCLUDED IN UNIT PRICE BID PER LINEAR FT. OF BARRIER.



FLARE RATES			
DESIGN SPEED	INSIDE SHY LINE		BEYOND SHY LINE
MPH	SHY LINE LS	FLARE RATE	FLARE RATE
70	10'	30:1	20:1 *
60	8'	26:1	18:1 *
50	6.5'	21:1	14:1 *
40	5'	16:1	10:1 *
30	3.5'	13:1	8:1 *

* SUGGESTED MAXIMUM FLARE RATE FOR RIGID BARRIER SYSTEMS.

CONCRETE MEDIAN BARRIER (TALL WALL)

SPECIFICATION REFERENCE

105
502



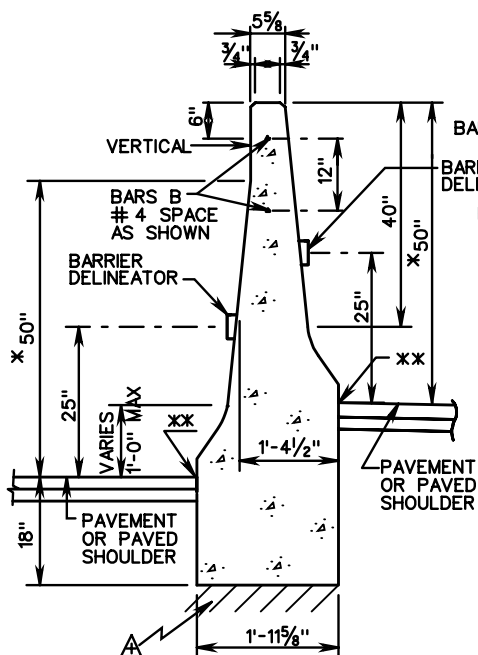
ROAD AND BRIDGE STANDARDS

SHEET 2 OF 2

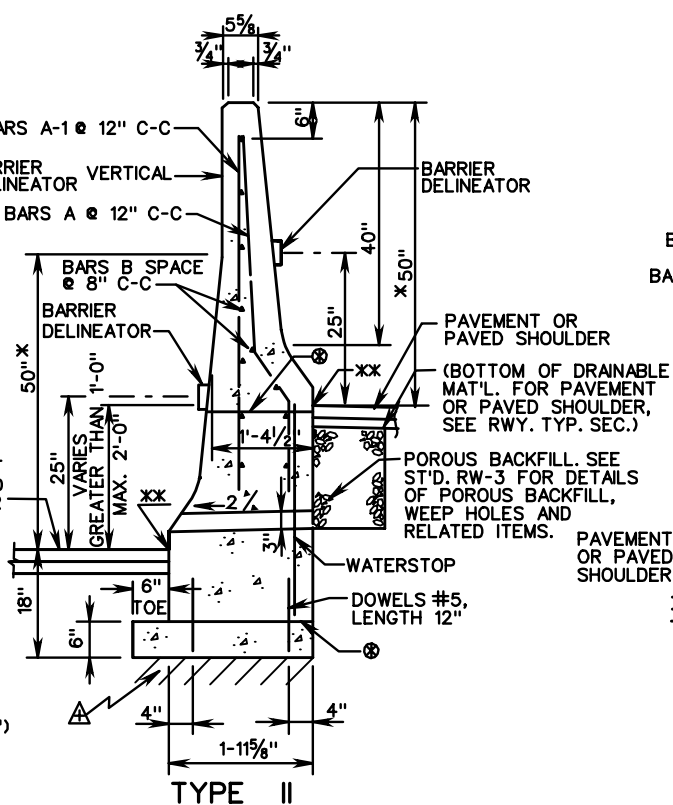
REVISION DATE

502.17

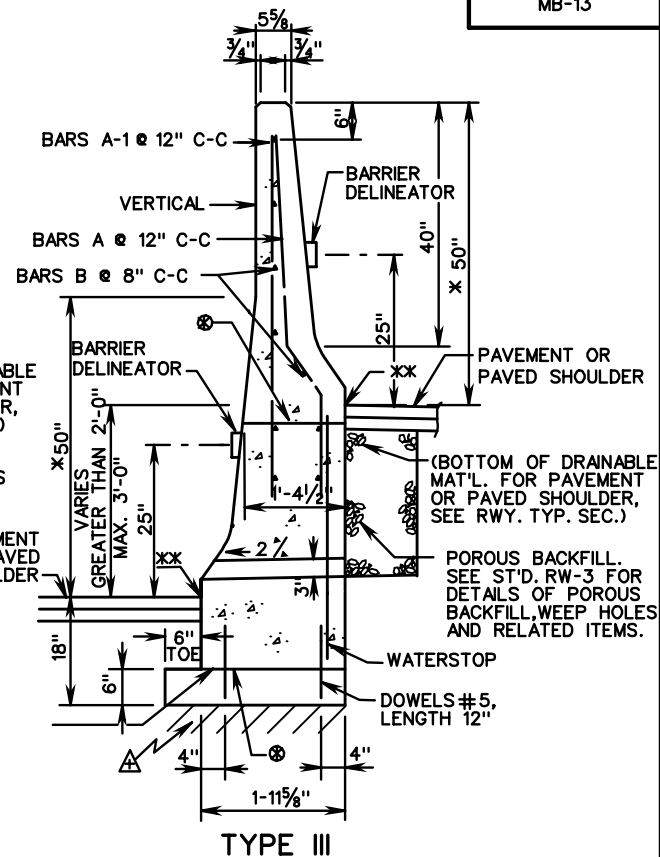
VIRGINIA DEPARTMENT OF TRANSPORTATION



TYPE I
TYPE I (GREATER THAN 0 HT. DIFF., MAX. 1'-0")



TYPE II
TYPE II (GREATER THAN 1'-0" HT. DIFF., MAX. 2'-0")



TYPE III
TYPE III (GREATER THAN 2'-0" HT. DIFF., MAX. 3'-0")

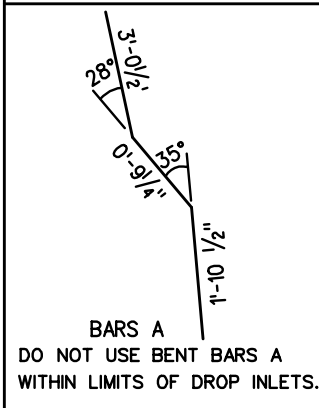
* FOR DETAILS OF BARRIER FACE SEE STANDARD MB-12A.

XX DENOTES FINISHED GRADE ELEVATION

△ FOUNDATION MATERIAL UNDER CONCRETE MEDIAN BARRIER IS TO BE COMPACTED

⊗ PERMISSIBLE CONSTRUCTION JOINT TO BE BONDED IN STRICT ACCORDANCE WITH SEC. 404 OF THE CURRENT VDOT ROAD AND BRIDGE SPECIFICATIONS.

BENDING DIAGRAM



MEASUREMENT AND PAYMENT

MEDIAN BARRIER MB-13 TYPE I, II OR III WILL BE PAID FOR AT THE CONTRACT UNIT PRICE PER LIN. FOOT, WHICH SHALL BE FULL COMPENSATION FOR FURNISHING AND INSTALLING CLASS A3 CONC., REINFORCING STEEL, POROUS BACKFILL AND ALL TOOLS, LABOR, EQUIPMENT AND INCIDENTALS NECESSARY TO COMPLETE THE WORK. ANY ADDITIONAL EXCAVATION, BACKFILL WITH SUITABLE MATERIAL AND COMPACTION WORK NECESSARY FOR THE CONCRETE MEDIAN BARRIER INSTALLATION IS TO BE CONSIDERED INCIDENTAL IN THE PRICE BID FOR THE CONCRETE MEDIAN BARRIER.

REINFORCING STEEL SCHEDULE

	BARS "A"		BARS A-1		BARS "B"		DOWELS	
PANEL	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
TYPE I					2	19'-8"		
TYPE II	20	5'-10 1/4"	20	5'-6"	11	19'-8"	40	1'-0"
TYPE III	20	5'-10 1/4"	20	5'-6"	11	19'-8"	40	1'-0"

SPECIFICATION REFERENCE

105
404
502

CONCRETE MEDIAN BARRIER

TYPE I, II OR III

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT

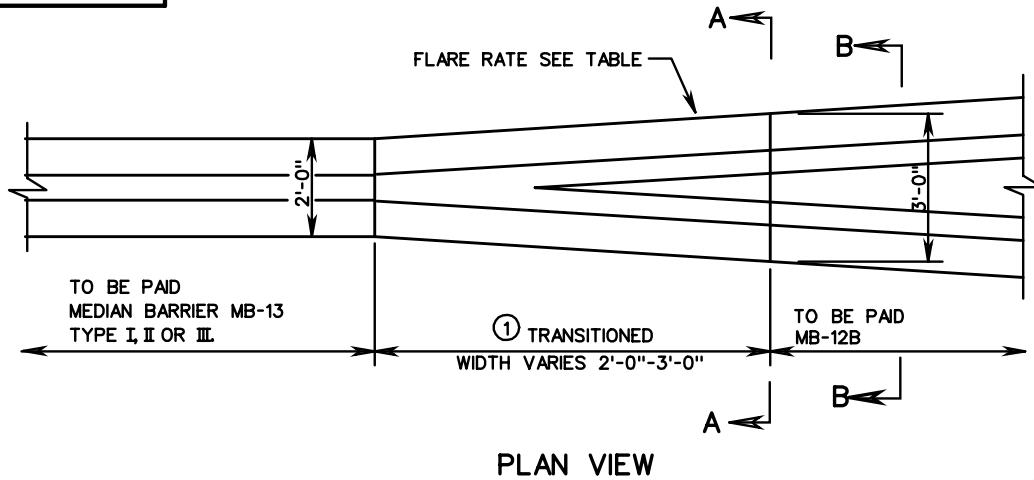
ROAD AND BRIDGE STANDARDS

REVISION DATE

SHEET 1 OF 2

502.18

MB-13



NOTE:

REINFORCING STEEL BARS SHOWN ARE BASED ON A 20' PANEL LENGTH.

ALL REINFORCING BARS ARE TO BE SIZE #4 GRADE 60 STEEL WITH A MINIMUM 1 1/2" CONCRETE COVER.

THE TYPICAL JOINT SPACING FOR CONSTRUCTION JOINTS IS 20' AND 80' FOR EXPANSION JOINTS FOR TYPE II AND III BARRIERS.

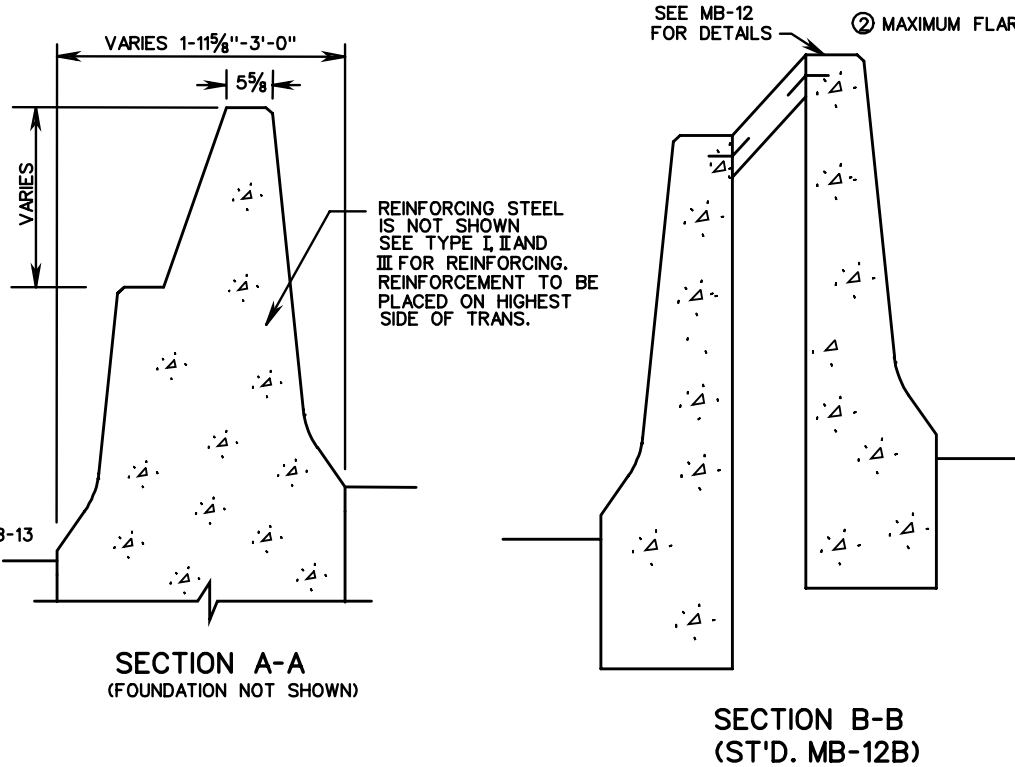
FOR DETAILS OF HOW JOINTS ARE TO BE FORMED & WATER STOPS SEE ST'D. RW-3.

TRANSVERSE JOINTS FOR TYPE I BARRIERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE ROAD AND BRIDGE SPECIFICATIONS EXCEPT NO SCORING OR SAWING WILL BE ALLOWED.

HORIZONTAL REINFORCING STEEL BARS B ARE TO BE SEPARATED AT ALL EXPANSION & CONTRACTION JOINTS. A 2" CONCRETE COVER IS REQUIRED OVER THE ENDS OF REINFORCING STEEL.

① TRANSITIONED TO BE PAID FOR AS MEDIAN BARRIER MB-13 TYPE I, II OR III.

② MAXIMUM FLARE RATE FOR RIGID BARRIER SYSTEMS.



FLARE RATES

DESIGN SPEED	INSIDE SHY LINE		Beyond SHY LINE
	SHY LINE LS	FLARE RATE	FLARE RATE
70	10'	30 : 1	20 : 1 ②
60	8'	26 : 1	18 : 1 ②
50	6.5'	21 : 1	14 : 1 ②
40	5'	16 : 1	10 : 1 ②
30	3.5'	13 : 1	8 : 1 ②



ROAD AND BRIDGE STANDARDS

SHEET 2 OF 2

REVISION DATE

502.19

CONCRETE MEDIAN BARRIER

TYPE I, II OR III

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

105
404
502

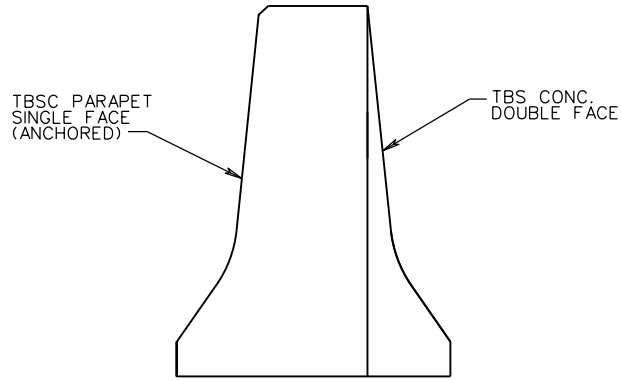
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SPECIFICATION REFERENCE

TITLE
VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT ROAD AND BRIDGE STANDARDS	
REVISION DATE	SHEET 1 OF 1

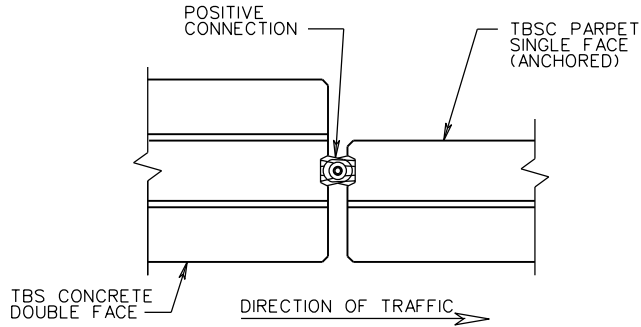
MB-INS



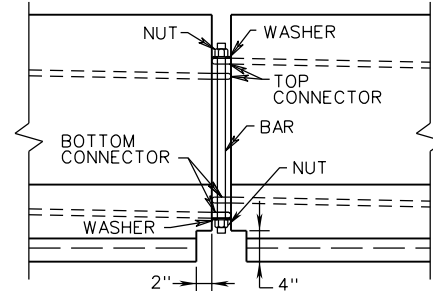
SECTION B-B

NOTES:

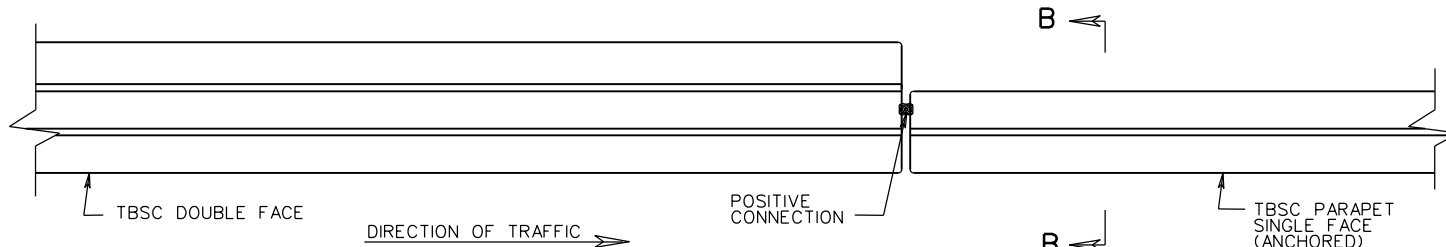
1. BASIS OF PAYMENT:
TRAFFIC BARRIER SERVICE LATERAL SUPPORT WILL BE MEASURED AND PAID FOR IN UNITS OF EACH COMPLETE IN PLACE AND SHALL INCLUDE FURNISHING AND PLACING PRECAST CONCRETE BARRIERS (TBS CONCRETE) AND MAINTENANCE, REMOVAL WHEN NO LONGER NECESSARY, AND ALL MATERIALS, LABOR, TOOLS, EQUIPMENT, AND INCIDENTALS NECESSARY TO COMPLETE THE WORK.
2. FOR POSITIVE CONNECTION DETAILS AND DIMENSIONS SEE STANDARD MB-INS, SHEETS 502.20 - 502.22
3. FOR DIMENSIONS NOT SHOWN, REFER TO ST'D. MB-7D AND MB-10A.



PLAN OF POSITIVE CONNECTION



ELEVATION OF POSITIVE CONNECTION



PLAN VIEW METHOD A



ROAD AND BRIDGE STANDARDS

BUTTING TRAFFIC BARRIER SERVICE TO SINGLE FACE PARAPET SERVICE

SPECIFICATION REFERENCE

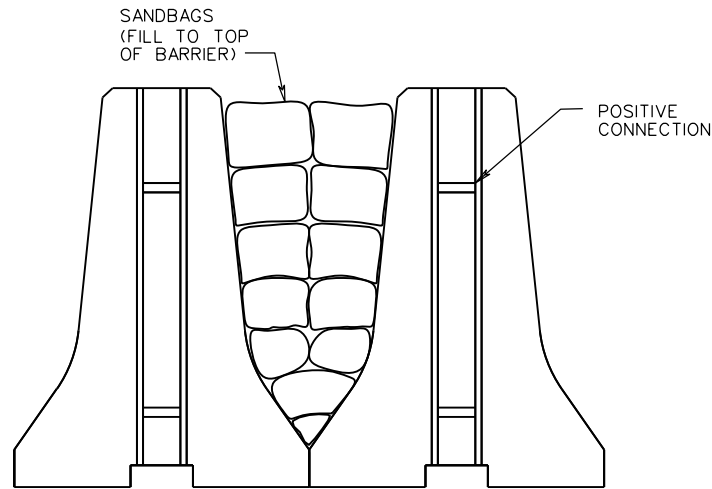
SHEET 4 OF 5

REVISION DATE

VIRGINIA DEPARTMENT OF TRANSPORTATION

502.23

7/12

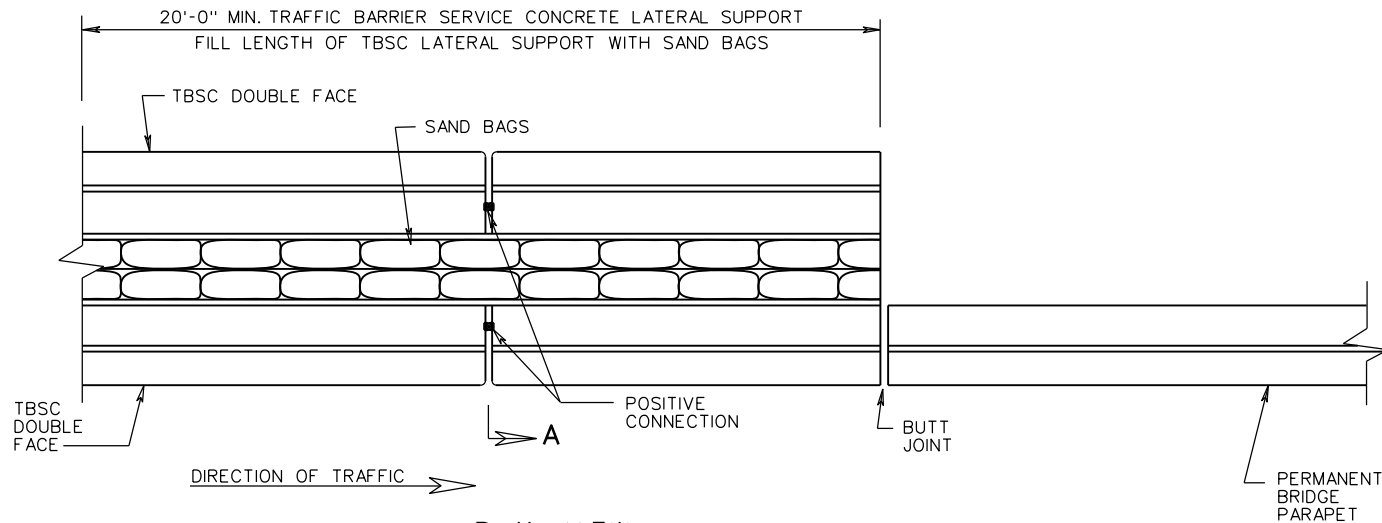


SECTION A-A



NOTES:

1. BASIS OF PAYMENT:
TRAFFIC BARRIER SERVICE LATERAL SUPPORT WILL BE MEASURED AND PAID FOR IN UNITS OF EACH COMPLETE IN PLACE AND SHALL INCLUDE FURNISHING AND PLACING PRECAST CONCRETE BARRIERS (TBS CONCRETE) AND SAND BAGS, MAINTENANCE, REMOVAL WHEN NO LONGER NECESSARY, AND ALL MATERIALS, LABOR, TOOLS, EQUIPMENTS, AND INCIDENTALS NECESSARY TO COMPLETE THE WORK.
2. FOR POSITIVE CONNECTION DETAILS AND DIMENSIONS SEE STANDARD MB-INS, SHEETS 502.20 - 502.22
3. FOR DIMENSIONS NOT SHOWN, REFER TO ST'D. MB-7D AND MB-10A.



PLAN VIEW
METHOD B

SPECIFICATION
REFERENCE

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

**BUTTING TRAFFIC BARRIER SERVICE
TO SINGLE FACE PARAPET SERVICE**

VIRGINIA DEPARTMENT OF TRANSPORTATION



ROAD AND BRIDGE STANDARDS

REVISION DATE

SHEET 5 OF 5

7/11

502.24

STANDARD

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ROAD AND BRIDGE STANDARDS

SHEET 1 OF 1

REVISION DATE

TITLE

SPECIFICATION
REFERENCE

VIRGINIA DEPARTMENT OF TRANSPORTATION

GENERAL NOTES - FENCING

FARM FENCE

BARBED WIRE

BARBED WIRE IS TO CONFORM TO ONE OF THE TYPES ALLOWED BY THE SPECIFICATIONS. UNLESS OTHERWISE NOTED ON PLANS FOUR STRANDS WILL BE PROVIDED. SPACING OF STRANDS SHOWN IS SUGGESTED ONLY. ANY OTHER SPACING APPROVED BY THE ENGINEER MAY BE USED.

WOOD POSTS

WOOD POSTS TO BE SQUARE CUT OR ROUND TO THE DIMENSIONS SHOWN ON THE DRAWINGS. POSTS TOPS MAY BE FLAT OR CUT AT A 30° ANGLE. FOR WOVEN WIRE FABRIC, STAPLES ARE TO BE USED AT TOP AND BOTTOM STRANDS AND AT A MINIMUM OF THREE INTERMEDIATE STRANDS PER POST. ONE STAPLE PER STRAND IS TO BE USED FOR BARBED WIRE FENCE. WHERE GATE, CORNER, OR BRACE POSTS FALL IN ROCK OR MARSHY AREAS THEY SHALL BE SET IN CLASS A3 OR C1 CONCRETE.

METAL POSTS

METAL POSTS ARE TO BE ONE OF THE TYPES SHOWN ON THE STANDARD DRAWINGS AND CONFORMING TO THE SPECIFICATIONS. AT EACH CORNER AND STRETCHER POST WIRE FABRIC IS TO BE CUT AND ALL HORIZONTAL STRANDS SECURELY WRAPPED AROUND POST. BRACES ON CORNER, STRETCHER AND END POSTS ARE TO BE SECURED 1'-6" FROM TOP OF POST WITH 1/2" BOLTS. IN LIEU OF SETTING POSTS IN CONCRETE, MANUFACTURER'S ANCHORING DEVICES MEETING THE SPECIFICATION REQUIREMENTS MAY BE USED WHEN APPROVED BY THE ENGINEER.

BRACES

MAXIMUM SPACING BETWEEN BRACES TO BE 500'. CORNER BRACES TO BE PROVIDED WHERE CORNER ANGLE IS 15° OR OVER. LINE BRACES TO BE PROVIDED WHERE VERTICAL ALIGNMENT CHANGES 15° OR MORE AND WHERE SPACING REACHES 500'.

MISCELLANEOUS

FENCE IS TO BE LOCATED AS SHOWN ON THE PLANS OR DIRECTED BY THE ENGINEER. THE SIDE OF THE POST TO WHICH FABRIC IS TO BE ATTACHED WILL BE DETERMINED BY THE ENGINEER. FENCE TO BE GROUNDED IN ACCORDANCE WITH DETAIL SHOWN ON STANDARD FE-6 WHERE REQUIRED. UNLESS SPECIFIED ON PLANS, THE CONTRACTOR WILL HAVE THE OPTION OF FURNISHING EITHER METAL OR WOOD POSTS. POSTS TYPES ARE NOT TO BE INTERMIXED ON ANY ONE INSTALLATION.

CHAIN LINK FENCE

WIRE FABRIC

WIRE FABRIC SHALL HAVE A 2" MESH.

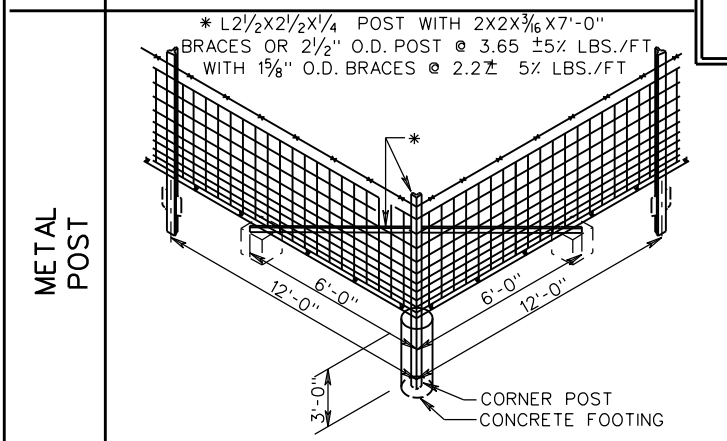
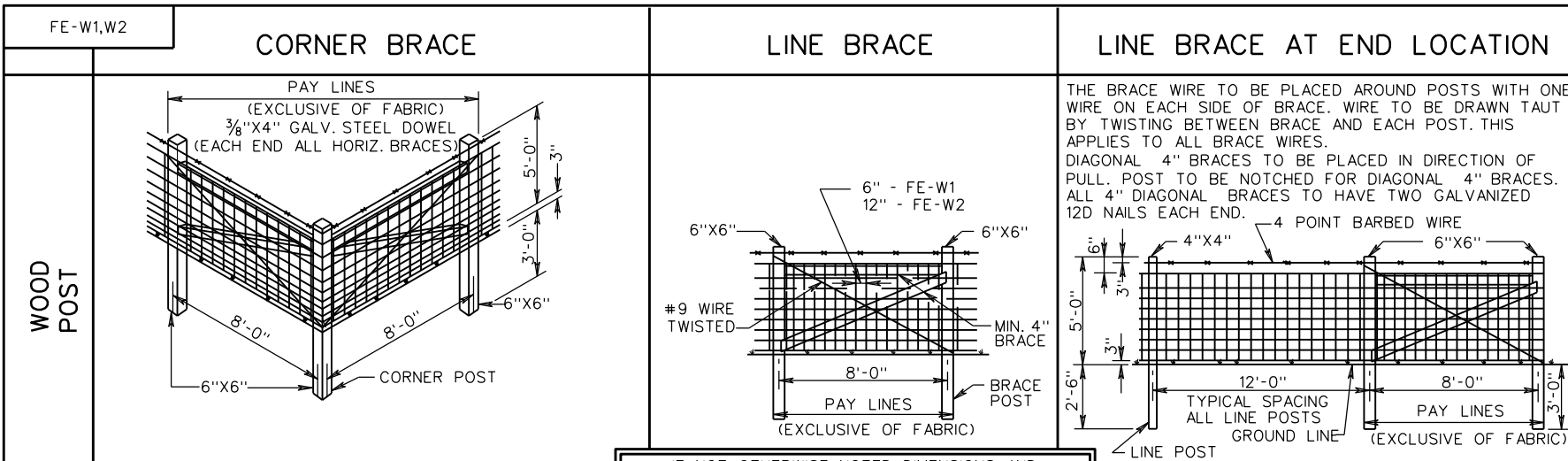
MISCELLANEOUS

IN LIEU OF SETTING POSTS IN CONCRETE, MANUFACTURER'S ANCHORING DEVICES MEETING THE SPECIFICATION REQUIREMENTS MAY BE USED WHEN APPROVED BY THE ENGINEER. FOR GATES EXCEEDING 6'-0" IN WIDTH ROLLED FORMED STEEL POST WILL NOT BE ALLOWED. CHAIN LINK FENCE TO BE GROUNDED IN ACCORDANCE WITH DETAILS SHOWN ON STANDARD FE-6, WHERE REQUIRED.

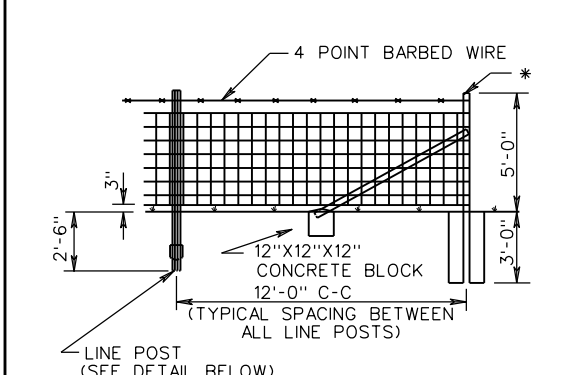
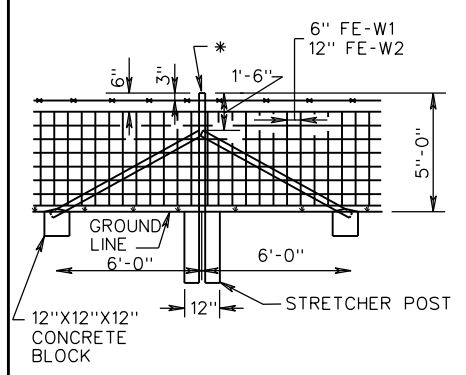
SPECIFICATION REFERENCE

STANDARD FENCE
GENERAL NOTES
VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT ROAD AND BRIDGE STANDARDS	
REVISION DATE	SHEET 1 OF 1
503.01	



IF NOT OTHERWISE NOTED DIMENSIONS AND DESCRIPTIONS SHOWN ON ONE DRAWING APPLY TO OTHER DETAILS WITH THE SAME POST TYPE.



NOTES:

SEE GENERAL NOTES-FENCING FOR ADDITIONAL DETAILS AND INSTRUCTIONS.

LINE POSTS ARE TO BE OF THE TYPES SHOWN OR EQUIVALENT MEETING THE APPROVAL OF THE ENGINEER.

ALL POSTS ARE TO HAVE A MINIMUM WEIGHT OF 1.25 LBS./FT.

A MINIMUM OF FIVE CLAMPS FOR ATTACHING FABRIC TO POST ARE TO BE INCLUDED IN COST OF EACH LINE POST.

FLANGED FLANGE TYPE "U" TYPE "T"

METAL LINE POST

ALTERNATE ANCHOR DEVICES

FOR USE IN LIEU OF SETTING POSTS IN CONCRETE. DEVICES SHOWN ARE REPRESENTATIONAL ONLY. SEE GENERAL NOTES.

L2X2X¾ TO BE CUT TO FIT AROUND L2½X2½X¼ STRETCHER POST.

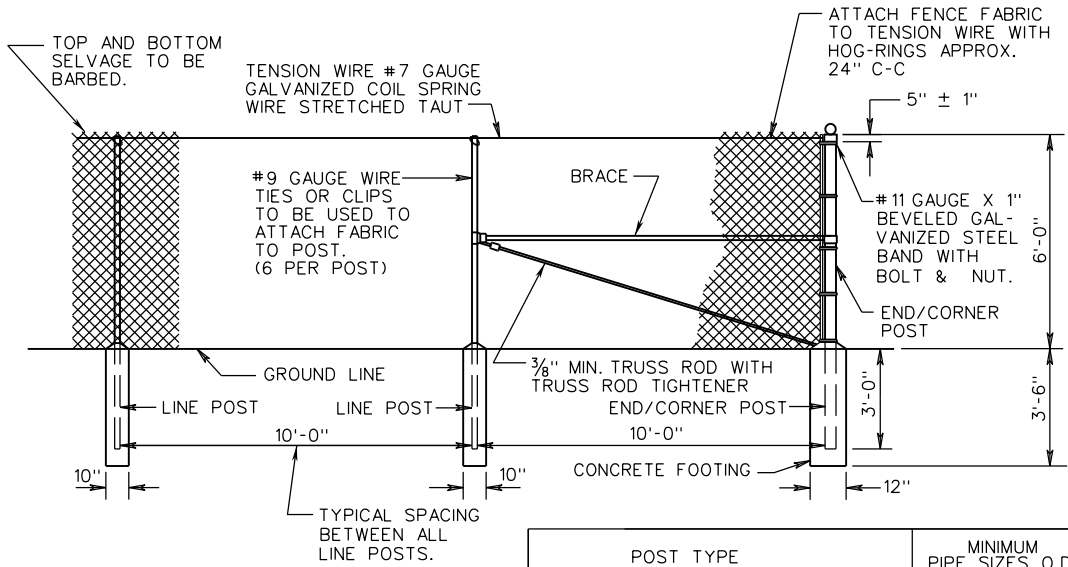
L2½X2½X¼, 2" LONG BRACKET BOLTED TO STRETCHER POST.

METHOD OF ATTACHING ANGLE BRACES TO STRETCHER POSTS

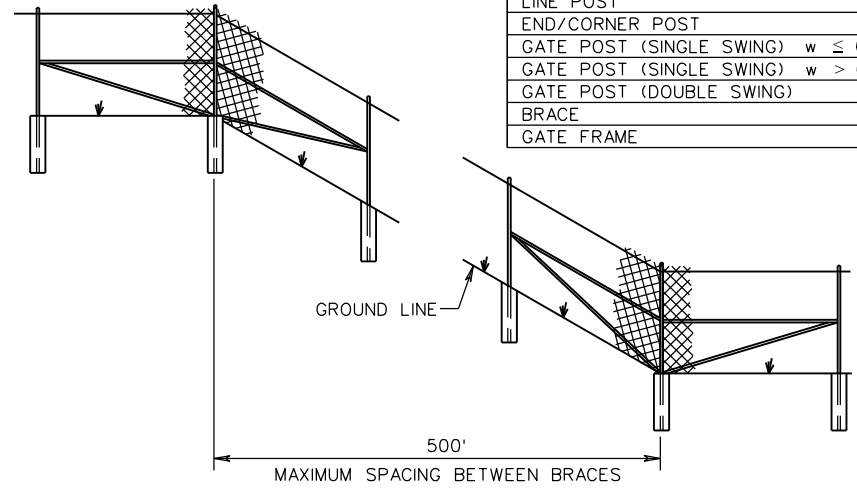
ALTERNATE

		CORNER BRACE	LINE BRACE	LINE BRACE AT END LOCATION	FE-B
WOOD POST		<p>PAY LINES (EXCLUSIVE OF WIRE) $\frac{3}{8}$"X4" GALVANIZED STEEL DOWL (ALL ENDS) MIN. 4" BRACE 4'-6" 3'-0" 6"X6" 8'-0" 8'-0" 6"X6" 6"X6" CORNER POST #9 WIRE TWISTED</p>	<p>DIAGONAL 4" BRACE TO BE PLACED IN DIRECTION OF PULL.</p> <p>POST TO BE NOTCHED FOR DIAGONAL 4" BRACES. ALL DIAGONAL 4" BRACES TO HAVE TWO GALVANIZED 12D NAILS AT EACH END.</p> <p>6" 10" 10" 10" 16" 8'-0" PAY LINES (EXCLUSIVE OF FABRIC) GROUND LINE #9 WIRE TWISTED</p>	<p>THE BRACE WIRE TO BE PLACED AROUND POSTS WITH ONE WIRE ON EACH SIDE OF BRACE. WIRE TO BE DRAWN TAUT BY TWISTING BETWEEN BRACE AND EACH POST. THIS APPLIES TO ALL BRACE WIRES.</p> <p>$\frac{3}{8}$"X4" GALVANIZED STEEL DOWELS 4" 6" 6" 4" 4'-6" 4 POINT BARBED WIRE GROUND LINE 12'-0" (TYP. SPACING BETWEEN ALL LINE POSTS) LINE POST 8'-0" BRACE POST PAY LINES (EXCLUSIVE OF FABRIC)</p>	
		<p>IF NOT OTHERWISE NOTED DIMENSIONS AND DESCRIPTIONS SHOWN ON ONE DRAWING APPLY TO OTHER DETAILS WITH THE SAME POST TYPE.</p>			
METAL POST		<p>* L2$\frac{1}{2}$X2$\frac{1}{2}$X$\frac{1}{4}$ POST WITH L2X2X$\frac{3}{16}$X7'-0" BRACES OR 2$\frac{1}{2}$" O.D. POST @ 3.65+5% LBS./FT. WITH 1$\frac{5}{8}$" O.D. BRACES @ 2.27 ± 5% LBS./FT.</p> <p>4'-6" 2'-6" 12'-0" 6'-0" 6'-0" 12'-0" 3'-0" CORNER POST CONCRETE FOOTING</p>	<p>1'-6" 4 POINT BARBED WIRE 10" 10" 10" 16" 6'-0" 6'-0" STRETCHER POST 12" 12"X12"X12" CONCRETE BLOCK</p>	<p>* 4'-6" 2'-6" 12'-0" (TYPICAL SPACING BETWEEN ALL LINE POSTS) LINE POST (SEE DETAIL BELOW) 12"X12"X12" CONC. BLOCK 12'-0" 4'-6" 3'-0" PAY LINES (EXCLUSIVE OF FABRIC)</p>	
		<p>FLANGED "U" TYPE "T" TYPE</p> <p>LINE POSTS ARE TO BE OF THE TYPES SHOWN OR EQUIVALENT MEETING THE APPROVAL OF THE ENGINEER.</p> <p>ALL POSTS ARE TO HAVE A MINIMUM WEIGHT OF 1.25 LBS./FT.</p> <p>A MINIMUM OF FIVE CLAMPS FOR ATTACHING FABRIC TO POST ARE TO BE INCLUDED IN COST OF EACH LINE POST.</p> <p>NOTES: SEE GENERAL NOTES FENCING FOR ADDITIONAL DETAILS AND INSTRUCTIONS.</p> <p>METAL LINE POST</p>	<p>L2X2X$\frac{3}{16}$ TO BE CUT TO FIT AROUND L2$\frac{1}{2}$X2$\frac{1}{2}$X$\frac{1}{4}$ STRETCHER POST.</p> <p>L2$\frac{1}{2}$X2$\frac{1}{2}$X$\frac{1}{4}$, 2" LONG BRACKET BOLTED TO STRETCHER POST</p> <p>ALTERNATE</p> <p>METHOD OF ATTACHING ANGLE BRACES TO STRETCHER POSTS</p>	<p>FOR USE IN LIEU OF SETTING POSTS IN CONCRETE. DEVICES SHOWN ARE REPRESENTATIONAL ONLY. SEE GENERAL NOTES.</p> <p>ALTERNATE ANCHOR DEVICES</p>	
SPECIFICATION REFERENCE	<h2>STANDARD FENCE</h2> <h3>BARBED WIRE</h3> <p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>				<p>ROAD AND BRIDGE STANDARDS</p>
242 507 236					REVISION DATE SHEET 1 OF 1 503.03

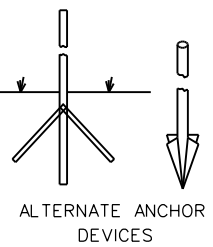
FE-CL



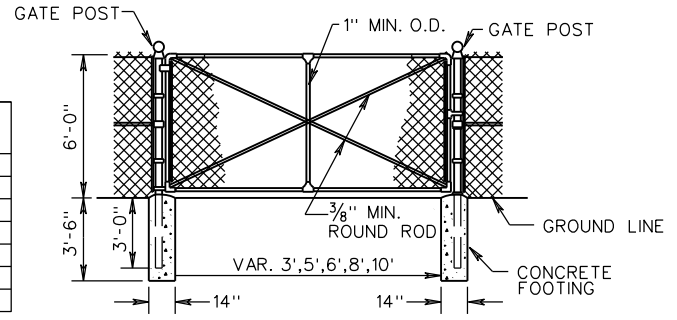
POST TYPE	MINIMUM PIPE SIZES O.D.
LINE POST	2.375"
END/CORNER POST	2.875"
GATE POST (SINGLE SWING) w ≤ 6ft.	2.875"
GATE POST (SINGLE SWING) w > 6ft.	4.00"
GATE POST (DOUBLE SWING)	2.875"
BRACE	1.66"
GATE FRAME	1.90"



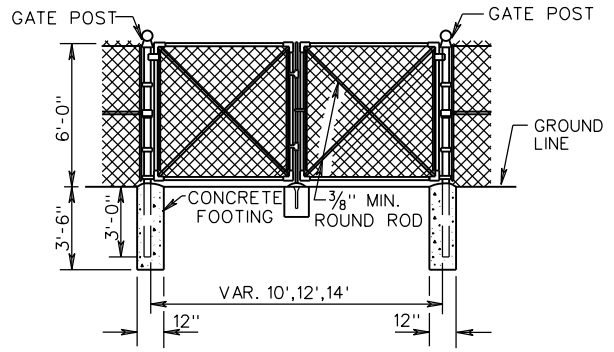
ALTERNATE ANCHOR DEVICES MAY BE USED IN LIEU OF SETTING POST IN CONCRETE. DEVICES SHOWN ARE REPRESENTATIONAL ONLY. SEE GENERAL NOTES.



NOTES:
 SEE GENERAL NOTES-FENCING FOR ADDITIONAL DETAILS AND INSTRUCTIONS
 A MOISTURE-EXCLUDING CAP IS REQUIRED ON TUBULAR POSTS.
 MATERIAL FOR CAP SHALL CONFORM TO THE ALLOWABLE TYPES FOR OTHER LISTED FITTINGS.
 CORNER BRACE - TO BE USED WHEN HORIZONTAL ALIGNMENT CHANGES 15° OR MORE.
 LINE BRACE - TO BE USED WHEN VERTICAL ALIGNMENT CHANGES 15° OR MORE
 END/ CORNER POSTS SHALL BE USED WITH ALL LINE AND CORNER BRACES
 BRACES SHALL BE INSTALLED HALF THE HEIGHT ABOVE THE GROUND LINE OF THE POST WHEN A TOP RAIL IS USED, OR TWO THIRDS THE HEIGHT ABOVE THE GROUND LINE WHEN A TENSION WIRE IS USED IN LIEU OF A TOP RAIL.
 CHAIN LINK FENCE GREATER THAN 6 FEET IN HEIGHT SHALL BE SUBMITTED TO THE STANDARDS & SPECIAL DESIGN SECTION FOR APPROVAL.



SINGLE SWING GATE



DOUBLE SWING GATE

(TO BE USED WHERE SWINGING CLEARANCE IS LIMITED)

VDOT
 ROAD AND BRIDGE STANDARDS

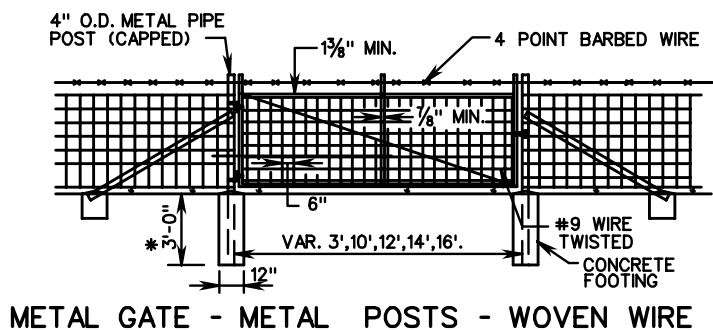
SHEET 1 OF 1 REVISION DATE
 503.04 7/11

STANDARD FENCE
CHAIN LINK

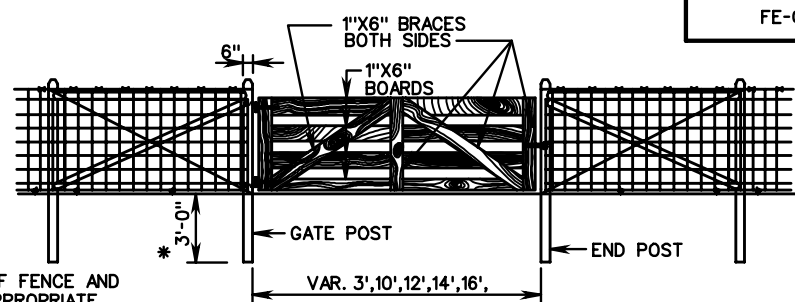
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

242
 507



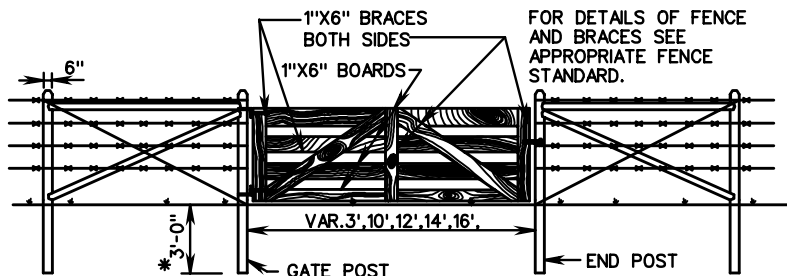
METAL GATE - METAL POSTS - WOVEN WIRE



WOOD GATE - WOOD POSTS - WOVEN WIRE

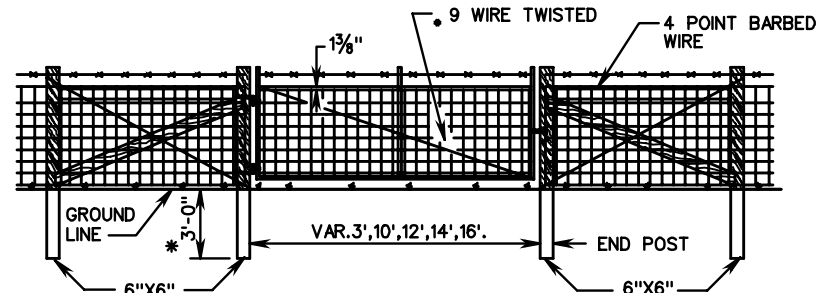
FOR DETAILS OF FENCE AND BRACES SEE APPROPRIATE FENCE STANDARD.

* IF GATE WIDTH EXCEEDS 12', GATE POST IS TO BE SET 3'-6" INTO GROUND HEIGHT OF GATE POST ABOVE GROUND DEPENDS ON TYPE OF FENCE USED- 5'-0", WOVEN WIRE FABRIC, 4'-6", BARBED WIRE.

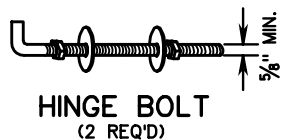


WOOD GATE - WOOD POSTS - BARBED WIRE

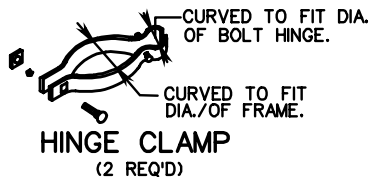
FOR DETAILS OF FENCE AND BRACES SEE APPROPRIATE FENCE STANDARD.



METAL GATE - WOOD POSTS - WOVEN WIRE



HINGE BOLT
(2 REQ'D)



HINGE CLAMP
(2 REQ'D)

SUGGESTED HINGE ASSEMBLY

WOOD GATE

BRACES ARE TO BE BOLTED AT EXTREMITIES AND INTERSECTIONS WITH A MIN. OF (2) 5/8" DIA. GALV. BOLTS, NUTS, AND WASHERS. ALL OTHER POINTS OF CONTACT ARE TO BE NAILED FROM BOTH SIDES WITH A MIN. OF 3-10D GALV. NAILS.

LUMBER FOR GATE IS TO BE ANY DRESSED, TRUE TYPE MEETING THE APPROVAL OF THE ENGINEER IT IS TO BE TREATED WITH PRESERVATIVES OTHER THAN CREOSOTE.

WOOD GATE IS TO HAVE TWO COATS OF EXTERIOR WHITE PAINT UNLESS OTHERWISE DIRECTED BY THE ENGINEER. PAINT IS TO MEET THE REQUIREMENTS OF THE CURRENT ROAD AND BRIDGE SPECIFICATIONS.

METAL GATE

GATE FRAME AND CENTER BRACE TO BE TO THE DIMENSIONS SHOWN ON THE DRAWING EXCEPT THAT A 3" WIDTH GATE CAN HAVE A MIN. 1" FRAME WITH NO CENTER BRACE.

GATE IS TO BE HOT DIPPED GALVANIZED OR ELECTROPLATE GALVANIZED IN ACCORDANCE WITH ASTM A-164 TYPE GS.

GATE FABRIC IS TO BE ALL #11 GAUGE EXCEPT TOP AND BOTTOM STRANDS WHICH ARE TO BE #9 VERTICAL STRANDS ARE TO BE SPACED 6" APART.

MISCELLANEOUS

IF LOCATIONS OF GATES ARE NOT SPECIFIED ON PLANS, THEY ARE TO BE ERECTED AT THE SITES DESIGNATED BY THE ENGINEER.

GATE HINGE AND LATCH ASSEMBLIES MAY BE OF ANY TYPE MEETING THE APPROVAL OF THE ENGINEER, EXCEPT THAT ALL HINGES ARE TO BE OF A BOLT-THROUGH TYPE. ALL FITTINGS ARE TO BE HOT DIPPED GALVANIZED.

ANY COMBINATION OF GATE AND FENCE TYPES MEETING THE APPROVAL OF THE ENGINEER WILL BE ACCEPTABLE AND IS NOT LIMITED TO THE EXAMPLES SHOWN HEREON.

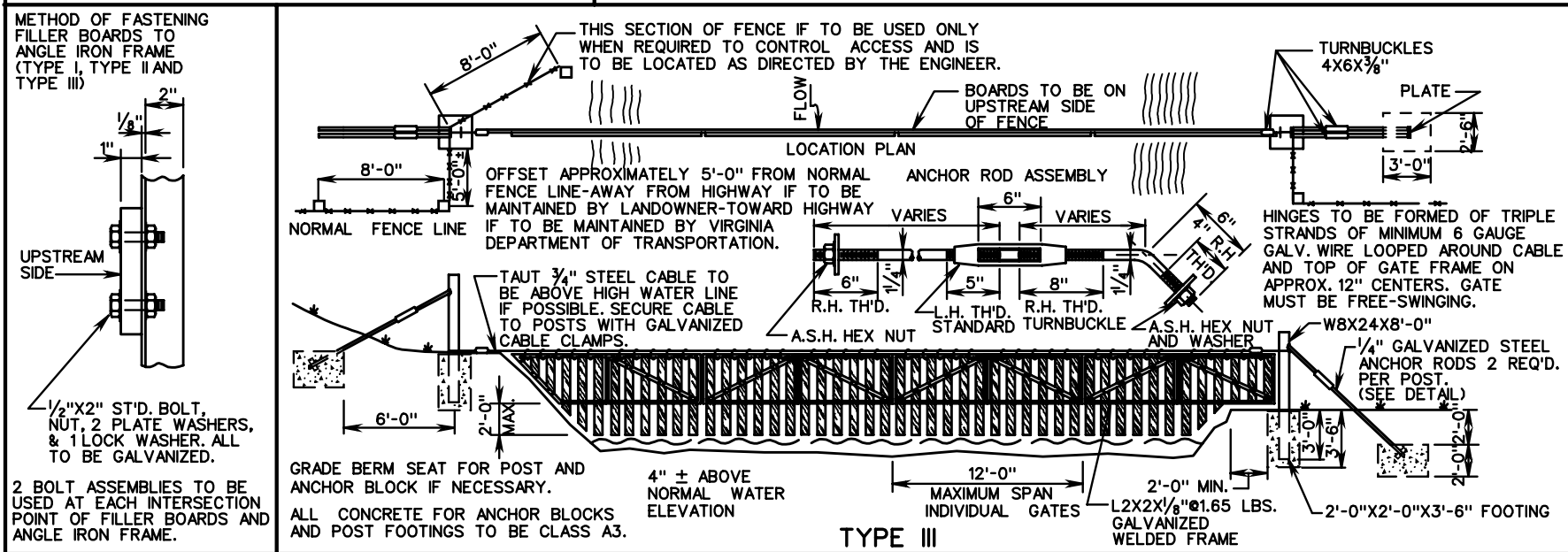
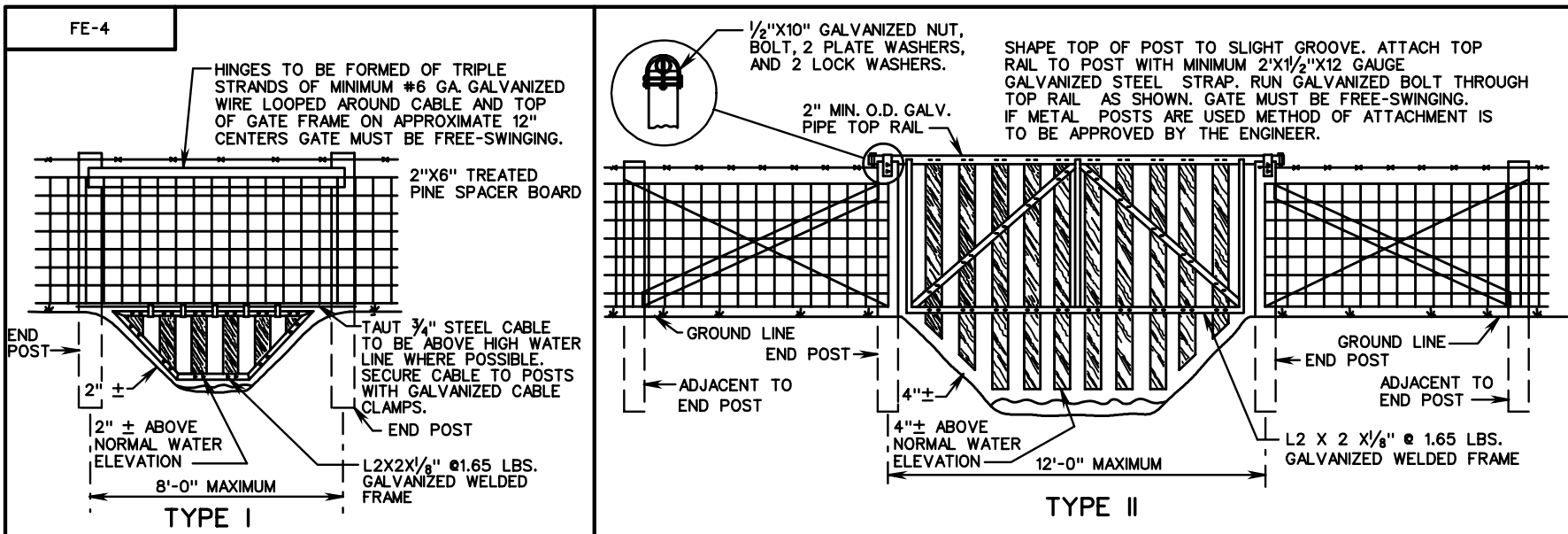
WHERE WOOD GATES POSTS FALL IN ROCK OR MARSHY AREAS THEY ARE TO BE SET IN CLASS A3 OR C1 CONCRETE.

SPECIFICATION REFERENCE
242
507
236

STANDARD FENCE GATES

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT ROAD AND BRIDGE STANDARDS	
REVISION DATE	SHEET 1 OF 1
503.05	



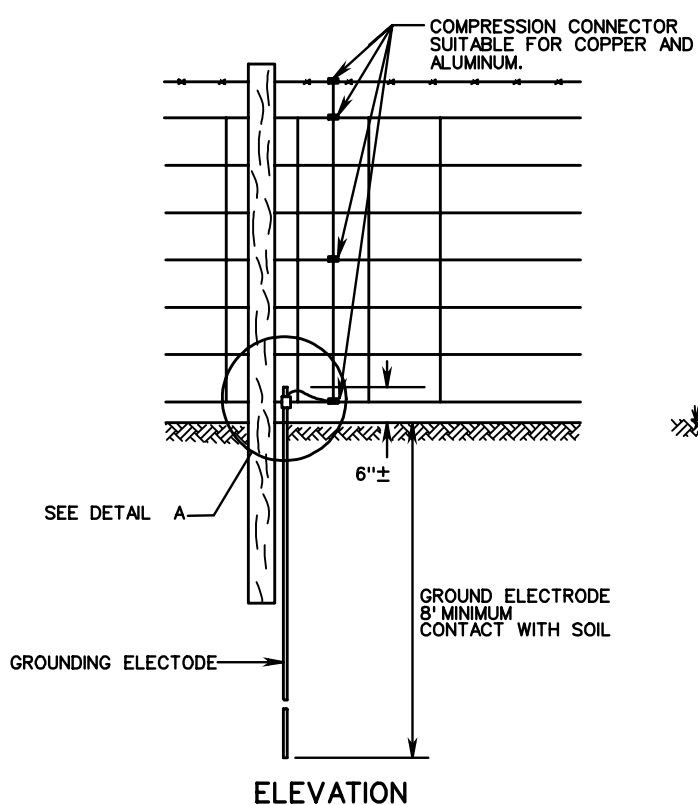
NOTES: WATER GATES MAY BE USED WITH STANDARD FE-W1, FE-W2 OR FE-B FENCE.
 GATE IS TO BE FABRICATED TO CONFORM TO INDIVIDUAL CHANNEL REQUIREMENTS.
 WOOD FILLER BOARDS TO BE 1" TREATED PINE BOLTED TO FRAME. SMOOTH WOOD SIDE IS TO FACE UPSTREAM.
 TYPE I GATE IS TO HAVE TWO 8" END POSTS AS SPECIFIED FOR THE TYPE OF FENCE USED. THE ADJACENT TO END POST AND BRACING MAY BE ELIMINATED.
 TYPE II GATE IS TO HAVE TWO 8" END POSTS, ADJACENT TO END POSTS, BRACING, ETC. AS SPECIFIED FOR THE TYPE OF FENCE USED.

VDOT	
ROAD AND BRIDGE STANDARDS	
SHEET 1 OF 1	REVISION DATE
503.06	

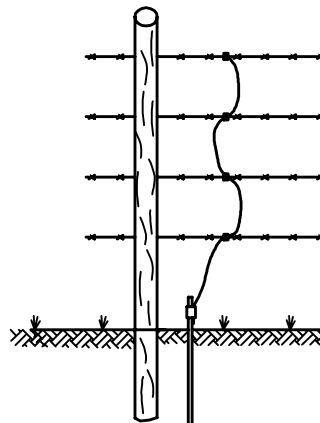
WATER GATES IN FENCE LINES

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
242 507 236



FOR CHAIN LINK FENCE GROUNDING, SEE DETAIL BELOW.



ELEVATION

NOTES:
 APPROXIMATE MATERIALS PER INSTALLATION:
 1-3/4" DIAMETER BY 10'-0" LONG COPPER CLAD GROUNDING ELECTRODE.
 1 GROUNDING ELECTRODE CLAMP
 1-7'-0" # 6 AWG SOLID COPPER CONDUCTOR
 3* COMPRESSION CONNECTORS (SUITABLE FOR COPPER AND ALUMINUM)

* MINIMUM 3 CONNECTORS FOR 47" FENCE FABRIC TO BE SECURED TO TOP, BOTTOM AND ONE INTERMEDIATE HORIZONTAL WIRE STRAND. ONE ADDITIONAL CONNECTOR TO BE FURNISHED FOR EACH STRAND OF BARBED WIRE.

ON BARBED WIRE INSTALLATIONS, ONE CONNECTOR IS TO BE FURNISHED FOR EACH STRAND.

GROUNDING CONDUCTOR IS TO BE IN CONTACT WITH HORIZONTAL WIRE OF FENCE BY COMPRESSION CONNECTORS AS SHOWN.

GROUNDING ELECTRODE TO BE LOCATED ON POST SIDE OF FENCE AND AS CLOSE AS POSSIBLE TO POST AND FENCE.

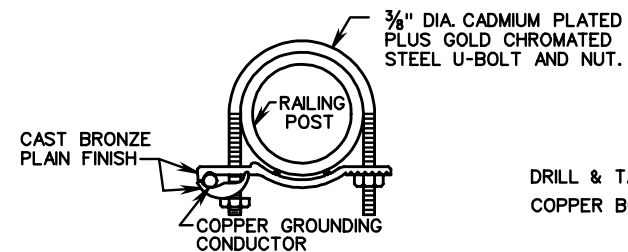
UNLESS OTHERWISE CALLED FOR IN THE PLANS OR DIRECTED BY THE ENGINEER, FENCE GROUNDING WILL BE REQUIRED FOR METAL FENCES INCLUDING PLASTIC COATED FENCE FABRIC AT THE FOLLOWING LOCATIONS.

-WHEN HIGH VOLTAGE LINES CROSS ABOVE THE FENCE. GROUNDING SYSTEMS SHALL BE INSTALLED 50' BEYOND THE OVERHEAD CROSSING POINT OF THE OUTER MOST CONDUCTORS OF THE HIGH VOLTAGE LINES.

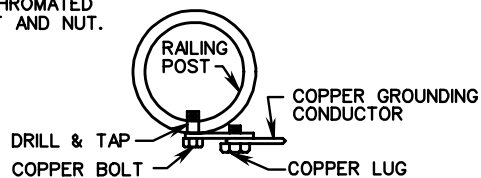
-WHEN THE HIGH VOLTAGE LINES ARE PARALLEL TO AND WITHIN 50' HORIZONTALLY OF THE FENCE. GROUNDING SYSTEMS SHALL BE INSTALLED AT 50' INTERVALS ALONG THE PARALLEL SECTIONS OF FENCE AND HIGH VOLTAGE LINES.

COST FOR FURNISHING AND PLACING ALL GROUNDING MATERIALS IS TO BE INCLUDED IN PRICE BID PER LINEAR FOOT OF FENCE.

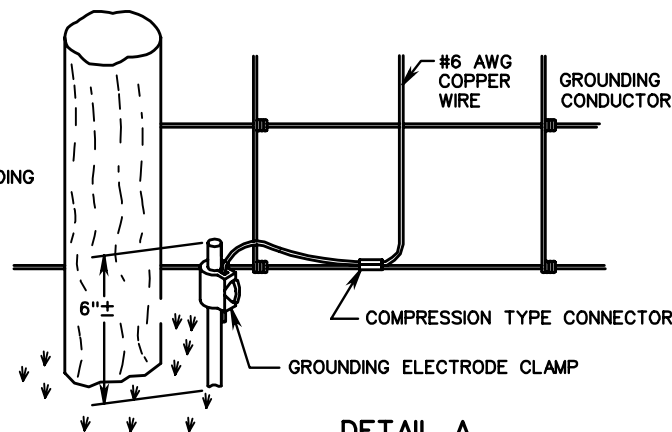
DETAILS SHOWN HEREON ARE TO APPLY TO ALL METAL FENCES AND HANDRAILS. FENCES WILL BE GROUNDED ONLY WHEN INDICATED ON THE PLANS OR AS RECOMMENDED BY THE ENGINEER.



CHAIN LINK FENCE SHALL 3 CONNECTIONS FOR EACH GROUNDING CONDUCTOR/ELECTRODE: ONE CLAMP CONNECTION AT POST BASE AND TWO COMPRESSION CONNECTORS ON THE CHAIN LINK AT MIDDLE AND TOP.



ALTERNATE



DETAIL A

DETAIL FOR GROUNDING STEEL POST OF CHAIN LINK FENCE & HANDRAIL (HR-1)

SPECIFICATION REFERENCE

507
238

STANDARD METHOD OF FENCE & HANDRAIL GROUNDING

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT

ROAD AND BRIDGE STANDARDS

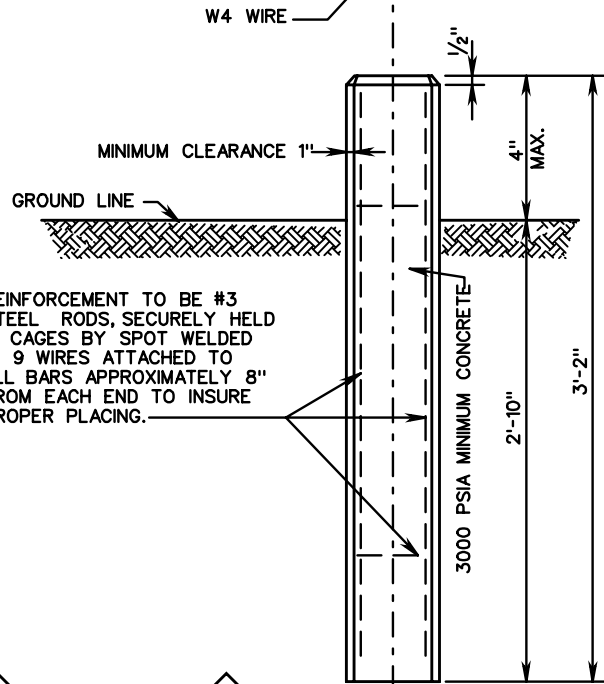
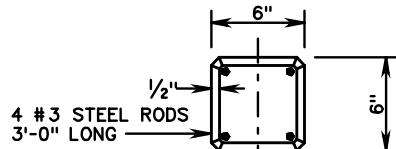
REVISION DATE

SHEET 1 OF 1

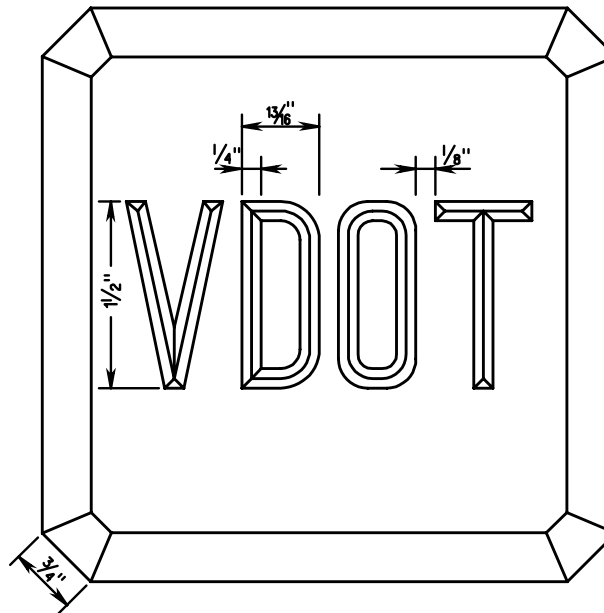
503.07

RM-1

CENTER OF BACK OF MONUMENT TO BE CORRECT FOR STATION AND ALIGNMENT.

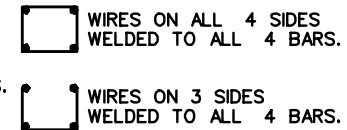


REINFORCEMENT TO BE #3 STEEL RODS, SECURELY HELD IN CAGES BY SPOT WELDED W 9 WIRES ATTACHED TO ALL BARS APPROXIMATELY 8" FROM EACH END TO INSURE PROPER PLACING.

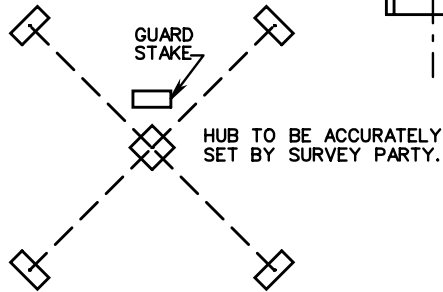


NOTES:
THE LETTERS "VDOT" ARE TO BE INDENTED IN THE TOP OF EACH RIGHT-OF-WAY MONUMENT.
IN ENTRANCES AND YARDS WHERE THE MONUMENTS WOULD BE UNSIGHTLY, THEY MAY BE SET WITH THE TOP FLUSH WITH THE GROUND.

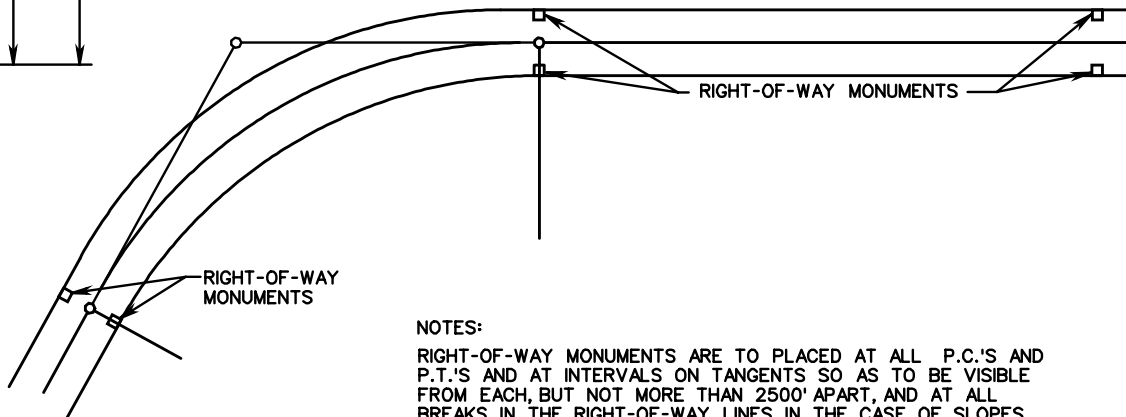
ALTERNATE METHODS OF PLACING WIRES



ALL LETTERING TO BE 1/2" STANDARD FOUNDRY LETTERS.



BEFORE HUB IS DISTURBED IN SETTING MONUMENTS FOUR LINER STAKES ARE TO BE SET, SO THAT TWO LINES STRETCHED BETWEEN STAKES WILL INTERSECT EXACTLY OVER TACK IN HUB. TOPS OF STAKES TO BE MORE THAN 9" ABOVE GROUND AT MONUMENT.



NOTES:
RIGHT-OF-WAY MONUMENTS ARE TO BE PLACED AT ALL P.C.'S AND P.T.'S AND AT INTERVALS ON TANGENTS SO AS TO BE VISIBLE FROM EACH, BUT NOT MORE THAN 2500' APART, AND AT ALL BREAKS IN THE RIGHT-OF-WAY LINES. IN THE CASE OF SLOPES ACQUIRED AS EASEMENT, THE MONUMENTS ARE TO BE SET ON NORMAL RIGHT-OF-WAY LINES.

RIGHT-OF-WAY MONUMENTS ARE TO BE SET PLUMB.



ROAD AND BRIDGE STANDARDS

SHEET 1 OF 1

REVISION DATE

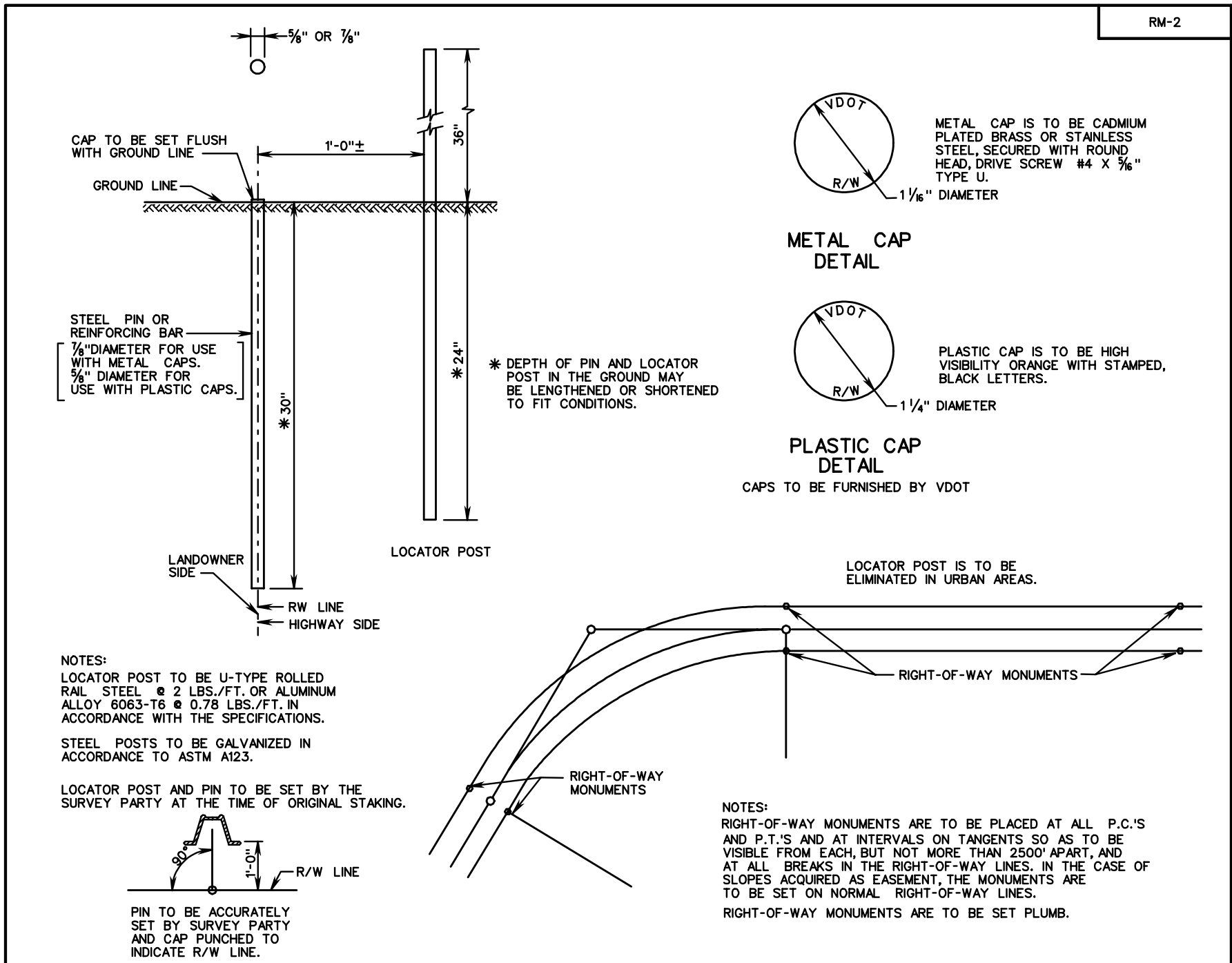
504.01

STANDARD PLAN AND METHOD OF SETTING RIGHT-OF-WAY MONUMENTS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

503



SPECIFICATION REFERENCE	STANDARD PLAN AND METHOD OF SETTING RIGHT-OF-WAY MONUMENTS	VDOT	
		ROAD AND BRIDGE STANDARDS	
219 503	VIRGINIA DEPARTMENT OF TRANSPORTATION		REVISION DATE
			SHEET 1 OF 1
			504.02

STANDARD

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ROAD AND BRIDGE STANDARDS

SHEET 1 OF 1

REVISION DATE

TITLE

SPECIFICATION
REFERENCE

VIRGINIA DEPARTMENT OF TRANSPORTATION

NOTES

1. DESIGN SHOWN IN THIS STANDARD IS FOR EXAMPLE PURPOSES ONLY, SEE MANUFACTURER'S DRAWINGS FOR COMPONENTS AND INSTALLATION INSTRUCTIONS.
2. IMPACT ATTENUATOR SHALL BE SELECTED FROM VDOT'S NCHRP 350 APPROVED LIST OR PROVISIONALLY APPROVED MASH LIST. ALL UNITS MUST HAVE SUCCESSFULLY PASSED THE NCHRP 350 TL-3 OR MASH TESTING CRITERIA AND DEEMED REIMBURSABLE BY FHWA.
3. ALL STEEL HARDWARE COMPONENTS SHALL BE GALVANIZED.
4. IMPACT ATTENUATOR MANUFACTURER MUST FURNISH DETAILS FOR REQUIRED ANCHORING SYSTEM. FOR DIMENSIONS OF UNIT AND CONCRETE FOUNDATION SEE MANUFACTURER'S DRAWINGS AND SPECIFICATIONS.
5. CROSS SLOPE OF THE PAD SHALL NOT EXCEED A 8% (12:1) SLOPE.
6. ANY LOCATION WHERE THERE IS REVERSE DIRECTION TRAFFIC, A TRANSITION PANEL SHALL BE SUPPLIED BY THE MANUFACTURER AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S DRAWINGS AND SPECIFICATIONS.
7. DUE TO THE VARYING LENGTHS OF PROPRIETARY IMPACT ATTENUATORS THE DESIGNER SHOULD ALLOW 30' FOR THE LENGTH OF THE ATTENUATOR.
8. FLUORESCENT PRISMATIC LENS YELLOW SHEETING SHALL BE USED ON THE REFLECTIVE MARKERS. ALL REFLECTIVE SHEETING IS TO BE IN ACCORDANCE WITH SECTION 701 OF THE ROAD AND BRIDGE SPECIFICATIONS. STRIPES SHALL SLOPE DOWN TOWARD THE SIDE OF THE OBSTRUCTION ON WHICH TRAFFIC IS TO PASS.



THROUGH ROADWAY MARKER POSITION LEFT OF TRAFFIC



THROUGH ROADWAY MARKER POSITION RIGHT OF TRAFFIC



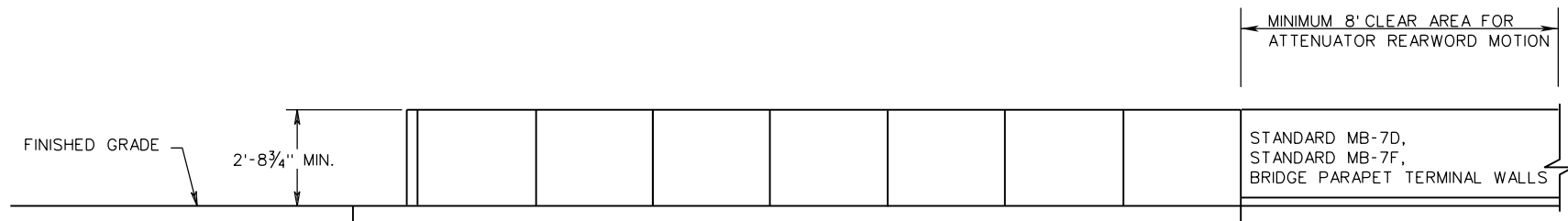
GORE AREA REFLECTIVE MARKER

COLOR:

FIELD - YELLOW (REFLECTORIZED)

MESSAGE - BLACK STRIPES (NON-REFLECTORIZED)

9. PAINT CHEVRON STRIPES AND INSTALL REFLECTIVE MARKERS ON PAVEMENT AT THE FRONT OF THE UNIT FOR MAXIMUM VISIBILITY.
10. MEASUREMENT AND PAYMENT:
TYPE 1 IMPACT ATTENUATOR WILL BE MEASURED IN UNITS OF EACH COMPLETE-IN-PLACE. PAYMENT SHALL BE FULL COMPENSATION FOR FURNISHING AND INSTALLING IMPACT ATTENUATOR, REFLECTORIZED MARKER, PORTLAND CONCRETE FOUNDATION, REQUIRED BACKUP, TRANSITION PANEL, AND ALL MATERIALS, LABOR, EXCAVATION, TOOLS, EQUIPMENT AND ANY INCIDENTALS NECESSARY TO COMPLETE THE WORK.

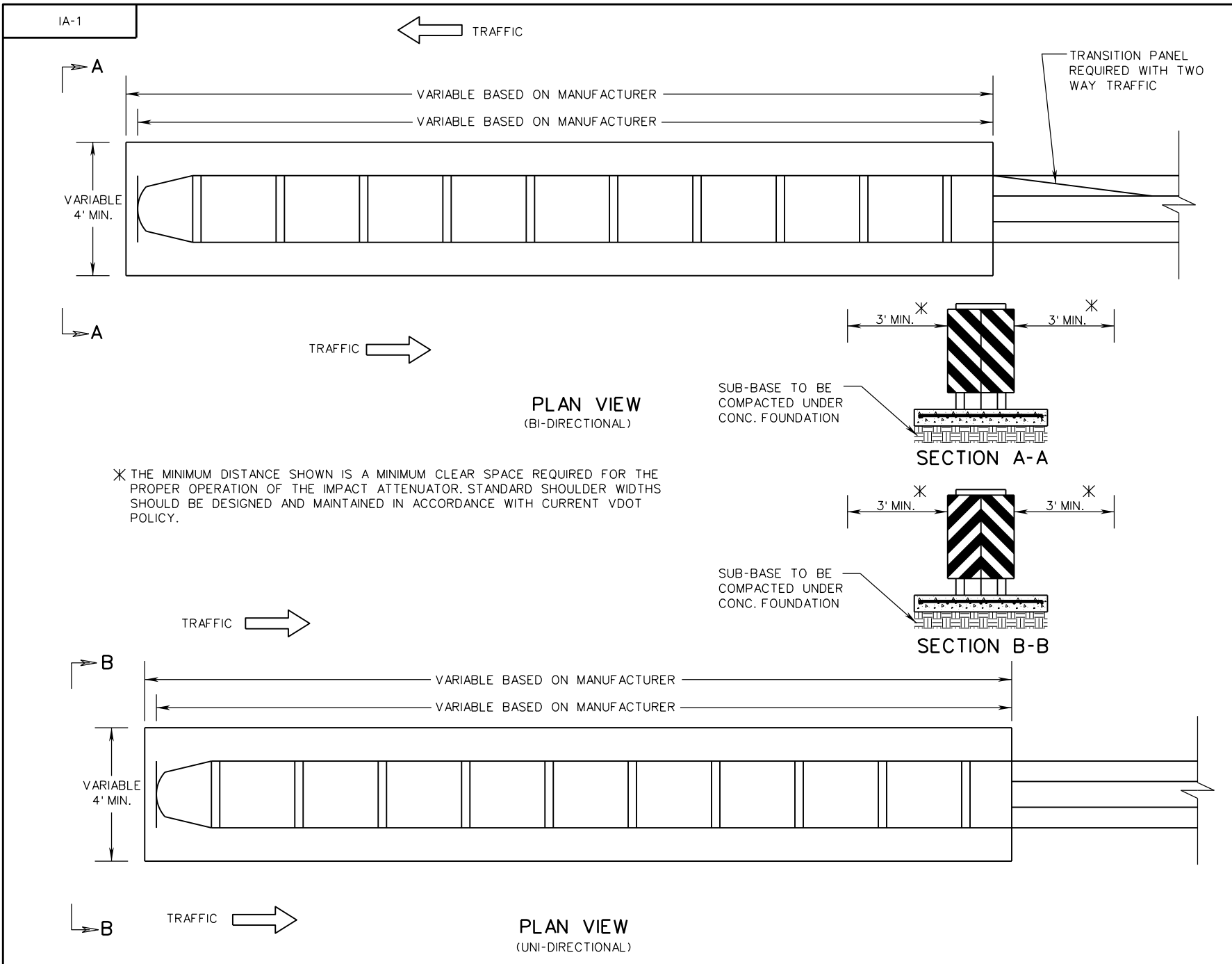


A REINFORCED CONCRETE FOUNDATION IS REQUIRED, DESIGN DETAILS ARE TO BE FURNISHED BY THE IMPACT ATTENUATOR MANUFACTURER. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 4000 PSI.

ELEVATION VIEW

ITEM CODE 13607 IMPACT ATTEN. TY. 1 (TL-3, \geq 40 MPH) EACH

SPECIFICATION REFERENCE 105 221 505 512	A COPY OF THE ORIGINAL SEALED AND SIGNED STANDARD DRAWING IS ON FILE IN THE CENTRAL OFFICE <h2 style="margin: 0;">IMPACT ATTENUATOR</h2> <h3 style="margin: 0;">TYPE 1 RE-DIRECTIVE PERMANENT INSTALLATION (TL-3 \geq 40 MPH)</h3> VIRGINIA DEPARTMENT OF TRANSPORTATION	ROAD AND BRIDGE STANDARDS REVISION DATE NEW 07/16
		SHEET 1 OF 3 505.01



ROAD AND BRIDGE STANDARDS	
SHEET 2 OF 3	REVISION DATE
505.02	NEW 07/16

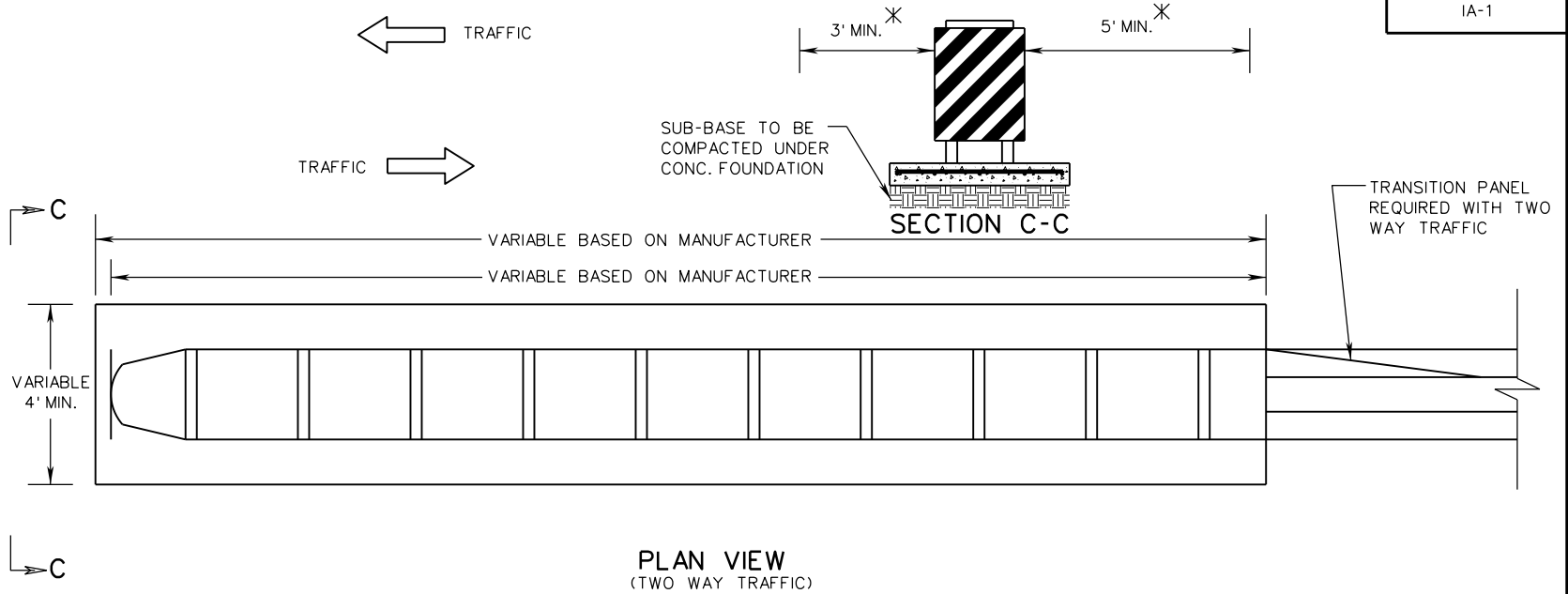
A COPY OF THE ORIGINAL SEALED AND SIGNED STANDARD DRAWING IS ON FILE IN THE CENTRAL OFFICE

IMPACT ATTENUATOR

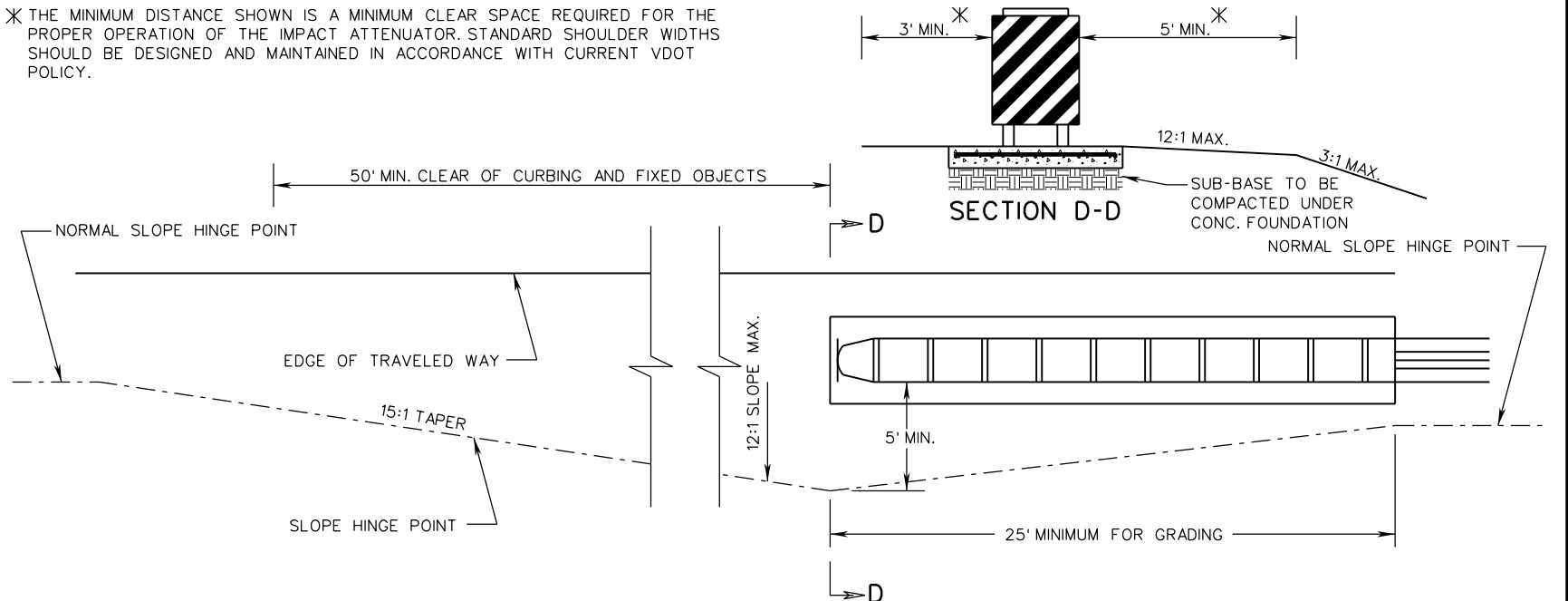
TYPE 1 RE-DIRECTIVE PERMANENT INSTALLATION (TL-3 ≥ 40 MPH)

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
105
221
505
512



* THE MINIMUM DISTANCE SHOWN IS A MINIMUM CLEAR SPACE REQUIRED FOR THE PROPER OPERATION OF THE IMPACT ATTENUATOR. STANDARD SHOULDER WIDTHS SHOULD BE DESIGNED AND MAINTAINED IN ACCORDANCE WITH CURRENT VDOT POLICY.



SITE PREPARATION REQUIREMENTS FOR IMPACT ATTENUATOR ON A SHOULDER

SPECIFICATION REFERENCE	A COPY OF THE ORIGINAL SEALED AND SIGNED STANDARD DRAWING IS ON FILE IN THE CENTRAL OFFICE		VDOT ROAD AND BRIDGE STANDARDS
	IMPACT ATTENUATOR		
105 221 505 512	TYPE 1 RE-DIRECTIVE PERMANENT INSTALLATION (TL-3 ≥ 40 MPH)		REVISION DATE NEW 07/16
	VIRGINIA DEPARTMENT OF TRANSPORTATION		SHEET 3 OF 3 505.03

STANDARD

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ROAD AND BRIDGE STANDARDS

SHEET 1 OF 1

REVISION DATE

TITLE

SPECIFICATION
REFERENCE

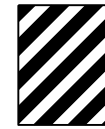
VIRGINIA DEPARTMENT OF TRANSPORTATION

NOTES

1. DESIGN SHOWN IN THIS STANDARD IS FOR EXAMPLE PURPOSES ONLY, SEE MANUFACTURER'S DRAWINGS FOR COMPONENTS AND INSTALLATION INSTRUCTIONS.
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3. ALL STEEL HARDWARE COMPONENTS SHALL BE GALVANIZED.
4. IMPACT ATTENUATOR MANUFACTURER MUST FURNISH DETAILS FOR REQUIRED ANCHORING SYSTEM. FOR DIMENSIONS OF UNIT AND CONCRETE FOUNDATION SEE MANUFACTURER'S DRAWINGS AND SPECIFICATIONS.
5. CROSS SLOPE OF THE PAD SHALL NOT EXCEED A 8% (12:1) SLOPE.
6. ANY LOCATION WHERE THERE IS REVERSE DIRECTION TRAFFIC, A TRANSITION PANEL SHALL BE SUPPLIED BY THE MANUFACTURER AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S DRAWINGS AND SPECIFICATIONS.
7. DUE TO THE VARYING LENGTHS OF PROPRIETARY IMPACT ATTENUATORS THE DESIGNER SHOULD ALLOW 15' FOR THE LENGTH OF THE ATTENUATOR.
8. FLUORESCENT PRISMATIC LENS YELLOW SHEETING SHALL BE USED ON THE REFLECTIVE MARKERS. ALL REFLECTIVE SHEETING IS TO BE IN ACCORDANCE WITH SECTION 701 OF THE ROAD AND BRIDGE SPECIFICATIONS. STRIPES SHALL SLOPE DOWN TOWARD THE SIDE OF THE OBSTRUCTION ON WHICH TRAFFIC IS TO PASS.



THROUGH ROADWAY MARKER
POSITION LEFT OF TRAFFIC



THROUGH ROADWAY MARKER
POSITION RIGHT OF TRAFFIC



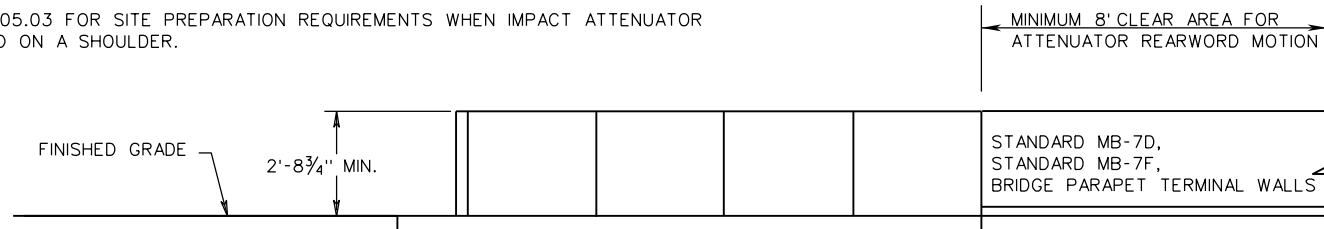
GORE AREA REFLECTIVE MARKER

COLOR:

FIELD - YELLOW (REFLECTORIZED)

MESSAGE - BLACK STRIPES (NON-REFLECTORIZED)

9. PAINT CHEVRON STRIPES AND INSTALL REFLECTIVE MARKERS ON PAVEMENT AT THE FRONT OF THE UNIT FOR MAXIMUM VISIBILITY.
10. MEASUREMENT AND PAYMENT:
TYPE 1 IMPACT ATTENUATOR WILL BE MEASURED IN UNITS OF EACH COMPLETE-IN-PLACE. PAYMENT SHALL BE FULL COMPENSATION FOR FURNISHING AND INSTALLING IMPACT ATTENUATOR, REFLECTORIZED MARKER, PORTLAND CONCRETE FOUNDATION, REQUIRED BACKUP, TRANSITION PANEL, AND ALL MATERIALS, LABOR, EXCAVATION, TOOLS, EQUIPMENT AND ANY INCIDENTALS NECESSARY TO COMPLETE THE WORK.
11. SEE PAGE 505.03 FOR SITE PREPARATION REQUIREMENTS WHEN IMPACT ATTENUATOR IS INSTALLED ON A SHOULDER.



A REINFORCED CONCRETE FOUNDATION IS REQUIRED, DESIGN DETAILS ARE TO BE FURNISHED BY THE IMPACT ATTENUATOR MANUFACTURER. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 4000 PSI.

ELEVATION VIEW

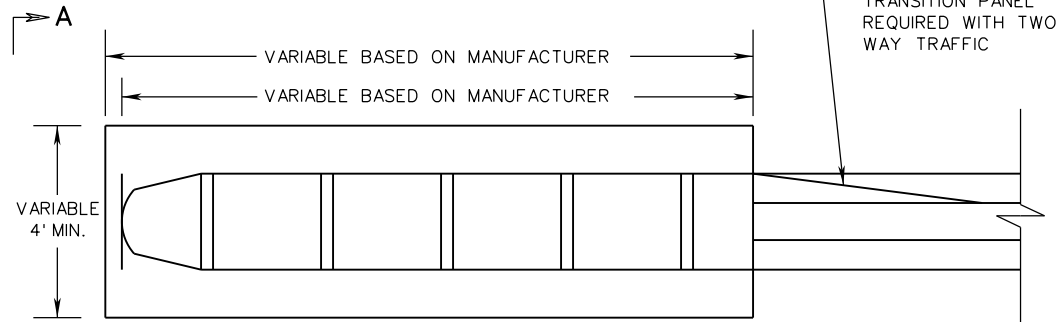
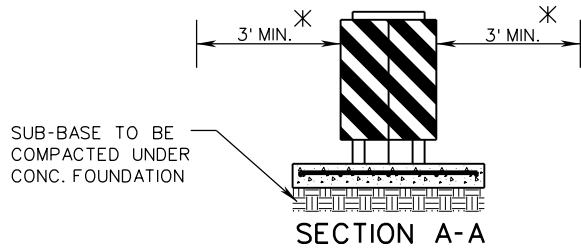
← MINIMUM 8' CLEAR AREA FOR
ATTENUATOR REARWARD MOTION →

STANDARD MB-7D,
STANDARD MB-7F,
BRIDGE PARAPET TERMINAL WALLS

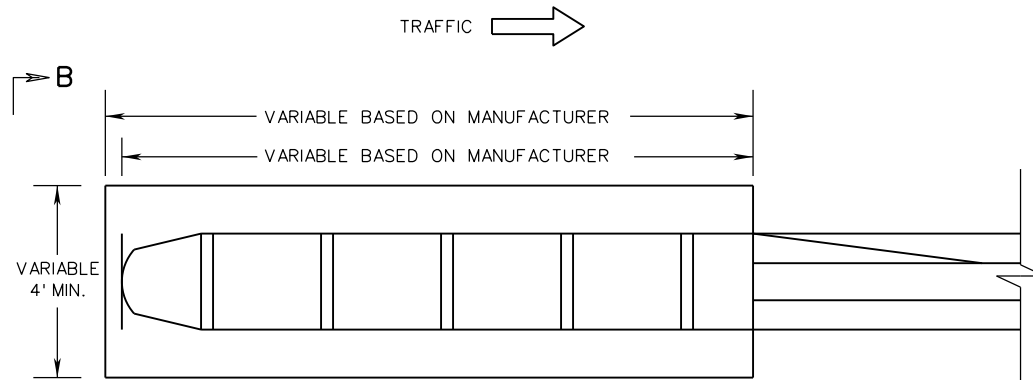
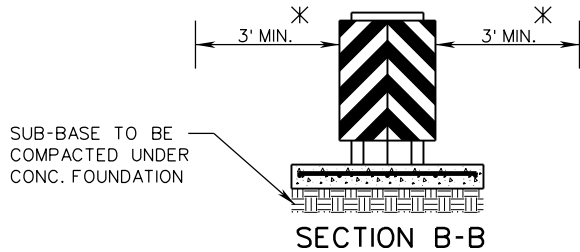
ITEM CODE 13606 IMPACT ATTEN. TY. 1 (TL-2, < 40 MPH) EACH

SPECIFICATION REFERENCE	A COPY OF THE ORIGINAL SEALED AND SIGNED STANDARD DRAWING IS ON FILE IN THE CENTRAL OFFICE	IMPACT ATTENUATOR	
		TYPE 1 RE-DIRECTIVE PERMANENT INSTALLATION (TL-2 < 40 MPH)	
105 221 505 512	VIRGINIA DEPARTMENT OF TRANSPORTATION	VDOT ROAD AND BRIDGE STANDARDS	REVISION DATE NEW 07/16
		SHEET 1 OF 2	505.04

1A-2



* THE MINIMUM DISTANCE SHOWN IS A MINIMUM CLEAR SPACE REQUIRED FOR THE PROPER OPERATION OF THE IMPACT ATTENUATOR. STANDARD SHOULDER WIDTHS SHOULD BE DESIGNED AND MAINTAINED IN ACCORDANCE WITH CURRENT VDOT POLICY.



ROAD AND BRIDGE STANDARDS

A COPY OF THE ORIGINAL SEALED AND SIGNED STANDARD DRAWING IS ON FILE IN THE CENTRAL OFFICE

IMPACT ATTENUATOR

SPECIFICATION REFERENCE

TYPE 1 RE-DIRECTIVE PERMANENT INSTALLATION (TL-2 < 40 MPH)

SHEET 2 OF 2

REVISION DATE

105
221
505
512

505.05

NEW 07/16

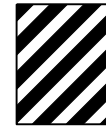
VIRGINIA DEPARTMENT OF TRANSPORTATION

NOTES

1. DESIGN SHOWN IN THIS DRAWING IS FOR EXAMPLE PURPOSES ONLY, SEE MANUFACTURER'S DRAWINGS FOR COMPONENTS AND INSTALLATION INSTRUCTIONS.
 2. IMPACT ATTENUATOR SHALL BE SELECTED FROM VDOT'S NCHRP 350 APPROVED OR PROVISIONAL MASH LIST FOR TYPE I RE-DIRECTIVE LOW MAINTENANCE CATEGORY. ALL UNITS MUST HAVE SUCCESSFULLY PASSED MASH OR THE NCHRP 350 TL-3 TESTING CRITERIA AND BEEN ACCEPTED BY FHWA.
 3. ALL STEEL HARDWARE COMPONENTS SHALL BE GALVANIZED.
 4. IMPACT ATTENUATOR MANUFACTURER MUST FURNISH DETAILS FOR REQUIRED ANCHORING SYSTEM. FOR DIMENSIONS OF UNIT AND CONCRETE FOUNDATION SEE MANUFACTURER'S DRAWINGS AND SPECIFICATIONS.
 5. CROSS SLOPE OF THE PAD SHALL NOT EXCEED A 8% (12:1) SLOPE.
 6. ANY LOCATION WHERE THERE IS REVERSE DIRECTION TRAFFIC A TRANSITION PANEL SHALL BE SUPPLIED BY THE MANUFACTURER AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS DRAWINGS AND SPECIFICATIONS.
 7. DUE TO THE VARYING LENGTHS OF PROPRIETARY IMPACT ATTENUATORS THE DESIGNER SHOULD ALLOW 30' FOR THE LENGTH OF THE ATTENUATOR.
 8. FLUORESCENT PRISMATIC LENS YELLOW SHEETING SHALL BE USED ON THE REFLECTIVE MARKERS. ALL REFLECTIVE SHEETING IS TO BE IN ACCORDANCE WITH SECTION 701 OF THE ROAD AND BRIDGE SPECIFICATIONS. STRIPES SHALL SLOPE DOWN TOWARD THE SIDE OF THE OBSTRUCTION ON WHICH TRAFFIC IS TO PASS.
- COLOR:
- FIELD - YELLOW (REFLECTORIZED)
- MESSAGE - BLACK STRIPES (NON-REFLECTORIZED)
9. PAINT CHEVRON STRIPES AND INSTALL REFLECTIVE MARKERS ON PAVEMENT AT THE FRONT OF THE UNIT FOR MAXIMUM VISIBILITY.
 10. MEASUREMENT AND PAYMENT:
LOW MAINTENANCE TYPE 1 IMPACT ATTENUATOR WILL BE MEASURED IN UNITS OF EACH COMPLETE-IN-PLACE. PAYMENT SHALL BE FULL COMPENSATION FOR FURNISHING AND INSTALLING IMPACT ATTENUATOR, REFLECTORIZED MARKER, PORTLAND CONCRETE FOUNDATION, REINFORCING STEEL, REQUIRED BACKUP, TRANSITION PANEL, AND ALL MATERIALS, LABOR, EXCAVATION, TOOLS, EQUIPMENT AND ANY INCIDENTALS NECESSARY TO COMPLETE THE WORK.
 11. SEE PAGE 505.03 FOR SITE PREPARATION REQUIREMENTS WHEN IMPACT ATTENUATOR IS INSTALLED ON A SHOULDER.



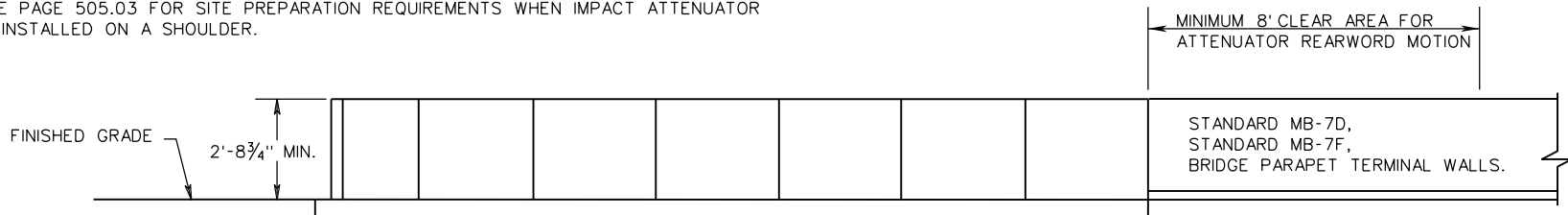
THROUGH ROADWAY MARKER
POSITION LEFT OF TRAFFIC



THROUGH ROADWAY MARKER
POSITION RIGHT OF TRAFFIC



GORE AREA REFLECTIVE MARKER

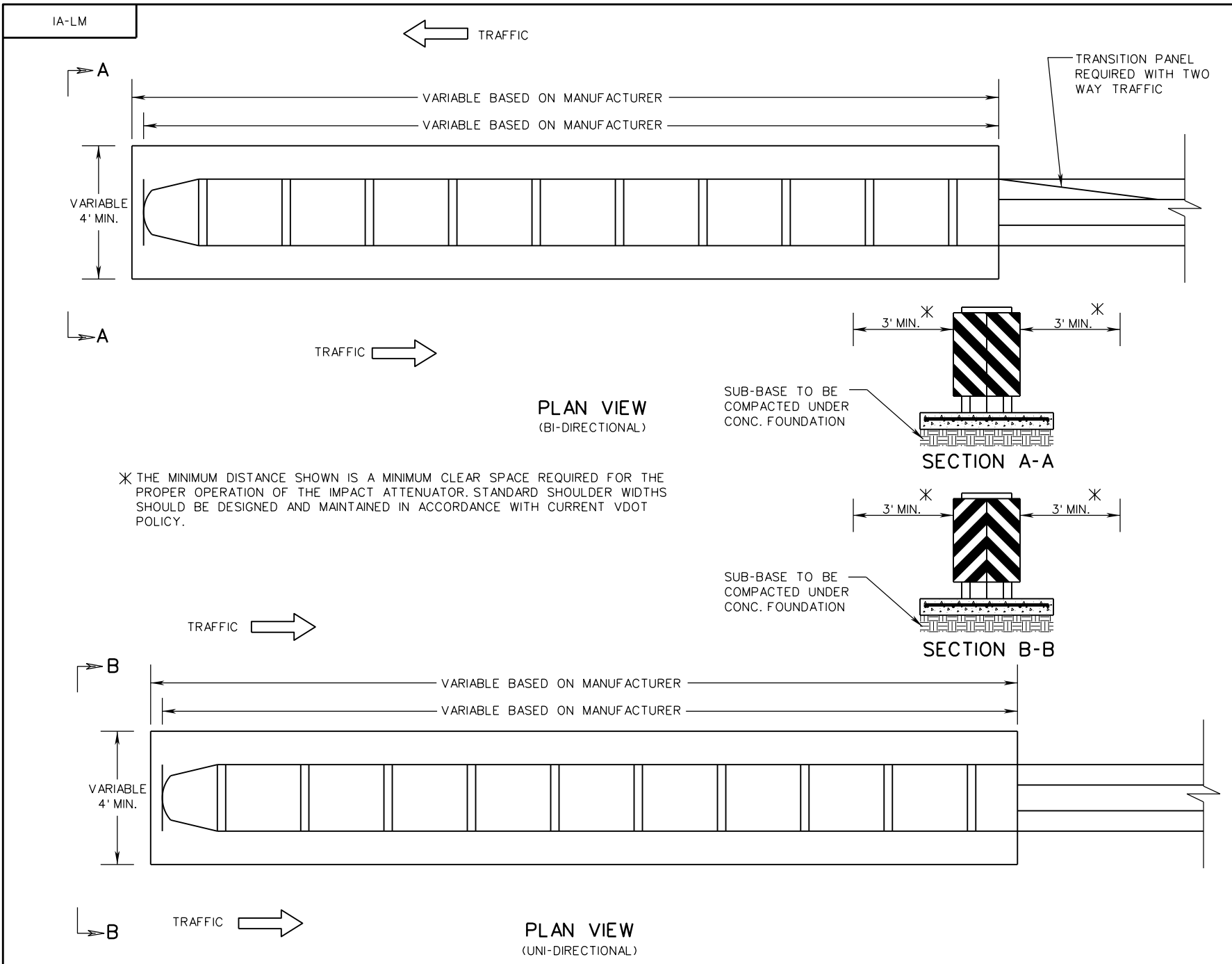


A REINFORCED CONCRETE FOUNDATION IS REQUIRED, DESIGN DETAILS ARE TO BE FURNISHED BY THE IMPACT ATTENUATOR MANUFACTURER. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 4000 PSI.

ELEVATION VIEW

ITEM CODE 13603 IMPACT ATTEN. TY. 1 (TL-3, LOW MAINTENANCE) EACH

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		LOW MAINTENANCE TYPE 1 RE- DIRECTIVE IMPACT ATTENUATOR (TL-3 ≥ 40 MPH)	
105	VIRGINIA DEPARTMENT OF TRANSPORTATION	VDOT ROAD AND BRIDGE STANDARDS	REVISION DATE
221			SHEET 1 OF 2
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ROAD AND BRIDGE STANDARDS	
SHEET 2 OF 2	REVISION DATE
505.11	NEW 07/16

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IMPACT ATTENUATOR

LOW MAINTENANCE TYPE 1 RE-DIRECTIVE IMPACT ATTENUATOR

(TL-3 ≥ 40 MPH)

VIRGINIA DEPARTMENT OF TRANSPORTATION

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