



COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1401 EAST BROAD STREET
RICHMOND, VIRGINIA 23219 2000

Charles A. Kilpatrick, P.E.
Commissioner

February 5, 2014

MEMORANDUM

To: All Holders of the Virginia Department of Transportation's 2008 Road and Bridge Standards

The following is a list of sheets contained in the 2008 Road and Bridge Standards that have been revised. Please add these pages to your copy of the standards. An interim standard sheet will not be required in plan assemblies for the following sheets only. Changes to these sheets will not affect the basis of payment or estimates.

<u>PAGE</u>	<u>REVISION</u>
803.20	Corrected variables in the Lr (Alt. Multi-Lane) equation, "W" to "Wn" and "m" to "M", clarified note for Alternate Lane Method.

The following is a list of revised standards to the 2008 Road and Bridge Standards that *require* an interim standard sheet to be included in your plan assembly until the next edition of the standards is published. Please add these pages to your copy of the standards. The respective interim standard sheet number has been placed with the revised standard. The interim standard sheets are available on VDOT's web site, on the FTP server, and in Falcon DMS for VDOT personnel. These interim standard sheets will be required in plan assemblies for Tier 1 projects advertised May 27, 2014 (Non Federally Eligible), June 10, 2014 (Federally Eligible) and later, along with Tier 2 projects advertised September 9, 2014 and later.

<u>PAGE</u>	<u>INTERIM</u>	<u>STANDARD</u>	<u>REVISION</u>
501.01	IIS05_04	GR-HDW	REVISED NOTE IN DETAIL OF SPLICE JOINT REMOVING WASHER ON LAST 50' ON RUN OFF END. ADDED L = 2" FOR BUTTON HEAD BOLT USED ON NESTED W BEAMS.

<u>PAGE</u>	<u>INTERIM</u>	<u>STANDARD</u>	<u>REVISION</u>
501.05	IIS05_10	GR-2, 2A	ADDED NOTE ON WOOD POSTS 5/8" WASHER REQUIRED
501.13	IIS05_23	GR-7	ADDED NOTE "TRANSITION TO PROPOSED SLOPE" AND REPLACED "HINGE" WITH "TOE OF SLOPE" IN PLAN VIEW
501.17	IIS05_24	GR-9	ADDED NOTE "TRANSITION TO PROPOSED SLOPE" AND REPLACED "HINGE" WITH "TOE OF SLOPE" IN BOTH PLAN VIEWS, ADJUSTED LOCATION OF SECTION B-B IN THE PLAN VEIW
501.25	IIS05_12	GR-FOA-1	REVISED NOTE ABOUT MC-4 TO "IF REQUIRED" IN ELEVATION VIEW, SECTION A-A AND NOTE 5 CHANGED "CARRIAGE BOLT" TO "GUARDRAIL BOLT", NOTE 6 CHANGED "A325" TO "A449"
501.26	IIS05_13	GR-FOA-1	REVISED NOTE ABOUT MC-4 TO "IF REQUIRED" IN ELEVATION VIEW, SECTION A-A AND NOTE 5 CHANGED "CARRIAGE BOLT" TO "GUARDRAIL BOLT", NOTE 6 CHANGED "A325" TO "A449", REVISED ITEM 1 TO GUARDRAIL BOLT AND DELETED ITEM 10 IN THE MATERIALS LIST
501.28	IIS05_14	GR-FOA-2	SECTION A-A AND NOTE 5 CHANGED "CARRIAGE BOLT" TO "GUARDRAIL BOLT", NOTE 7 CHANGED "A325" TO "A449", DELETED NOTE IN ELEVATION VIEW REQUIRING COMPRESSED SPACER TUBE

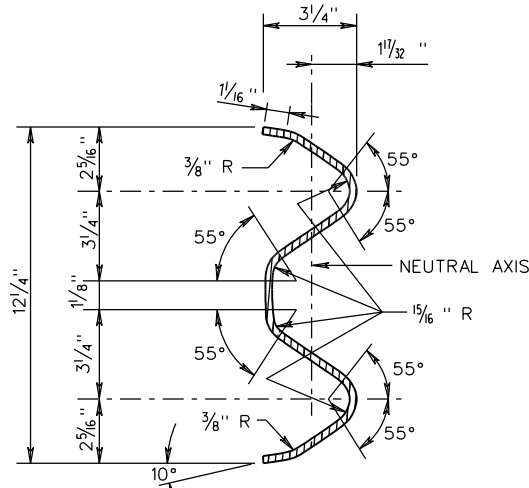
<u>PAGE</u>	<u>INTERIM</u>	<u>STANDARD</u>	<u>REVISION</u>
501.29	IIS05_15	GR-FOA-2	SECTION A-A AND NOTE 5 CHANGED “CARRIAGE BOLT” TO “GUARDRAIL BOLT”, NOTE 7 CHANGED “A325” TO “A449”, DELETED ITEM 1 AND REVISED ITEM 8 TO GUARDRAIL BOLT IN THE MATERIALS LIST DELETED NOTE IN ELEVATION VIEW REQUIRING COMPRESSED SPACER TUBE
501.30	IIS05_25	GR-FOA-2 & 4	DELETED W-BEAM TERMINAL CONNECTOR DETAIL, ADDED NOTE TO ITEM 8 DETAIL
501.31	IIS05_16	GR-FOA-4	NOTE 6 CHANGED “A325” TO “A449”, DELETED ITEM 1 AND REVISED NUMBERING OF MATERIALS LIST, DELETED NOTE 5 DELETED NOTE IN ELEVATION VIEW REQUIRING COMPRESSED SPACER TUBE ADDED NOTE FOR BOLTING END OF RUBRAIL TO POSTS
501.39	IIS05_08	GR-INS	REMOVED “4:1 SLOPE MAX” FROM DETAIL AT BOTTOM OF PAGE, REVISED DESIGN SPEED NOTE FOR GR-2 INSTALLATION WITH CG-3 OR CG-7 CURB

If you have any questions or comments regarding this revision, please contact Chuck Patterson P.E., at (804) 786-1805, of the Standards and Special Design Section.

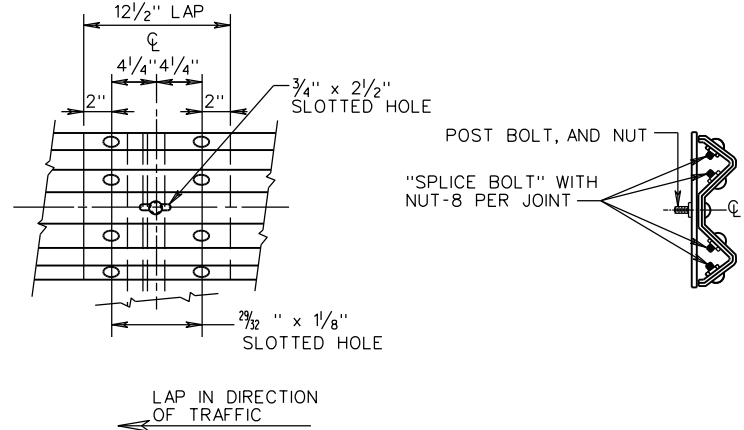
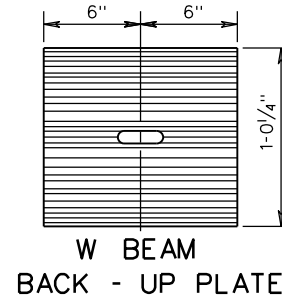
Sincerely,

Signature on File _____ Date: February 5, 2014

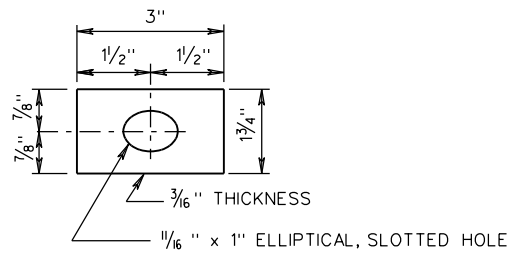
B. A. Thrasher, P.E.
State Location & Design Engineer



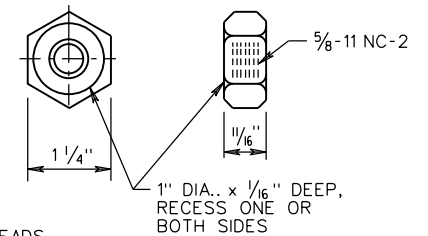
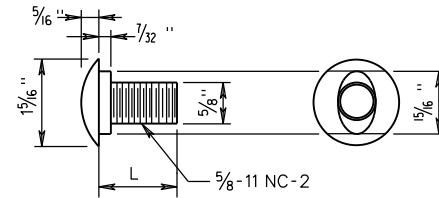
SECTION THRU RAIL ELEMENT AND W BEAM BACK-UP PLATE



DETAIL OF SPLICE JOINT



DETAIL OF STANDARD WASHER



- L = 1 1/4" FOR SPLICE BOLT-FULL LENGTH THREADS
- L = 2" FOR SPLICE BOLT-FULL LENGTH THREADS ON NESTED W BEAMS.
- L = 10" FOR STEEL POST BOLT-1 1/2" MIN. THREADS
- L = 18" FOR WOOD AND CONCRETE POST BOLT-2 1/2" MIN. THREADS
- L = 26" FOR MB WOOD OR CONCRETE POST-2" MIN. THREADS

DETAIL OF BUTTON HEAD BOLT AND RECESS NUT (GUARDRAIL BOLT)

NOTES:

ALL HARDWARE IS TO BE GALVANIZED IN ACCORDANCE WITH THE SPECIFICATIONS.

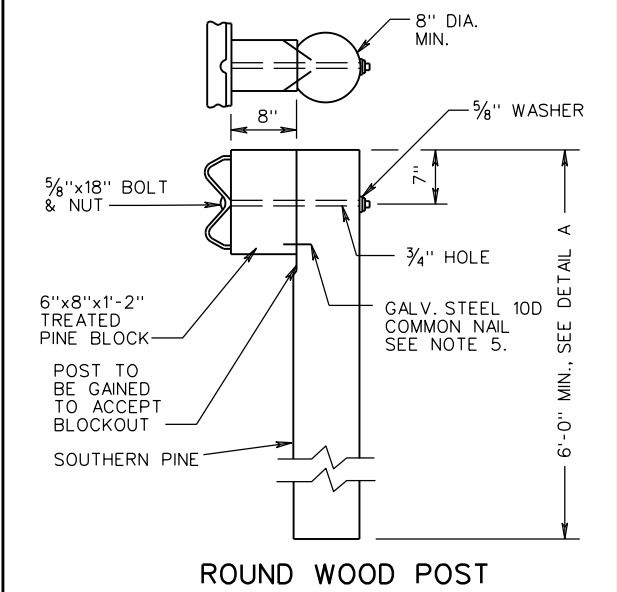
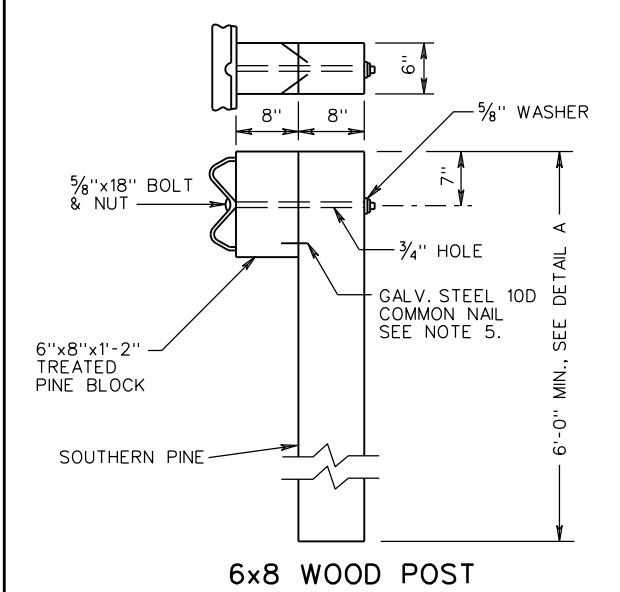
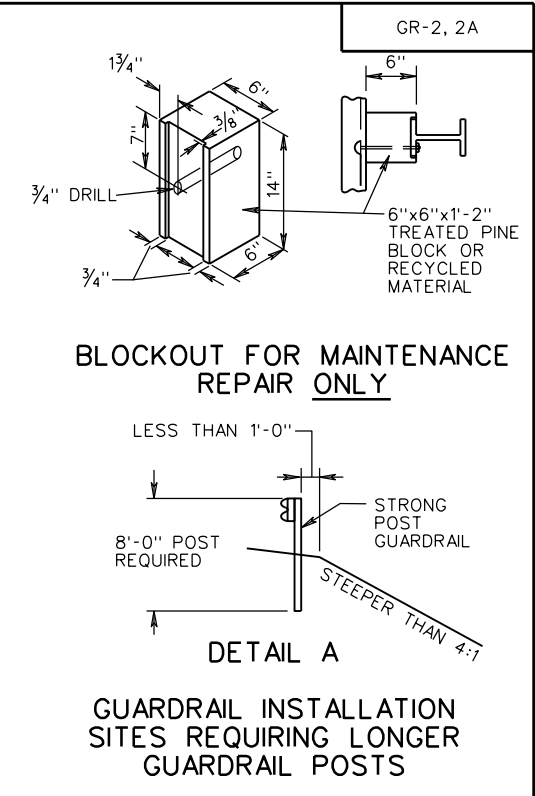
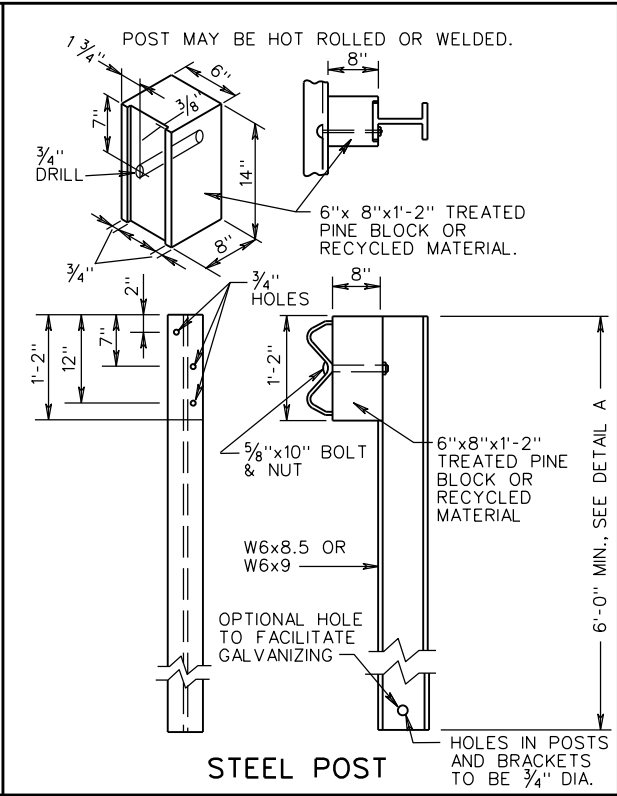
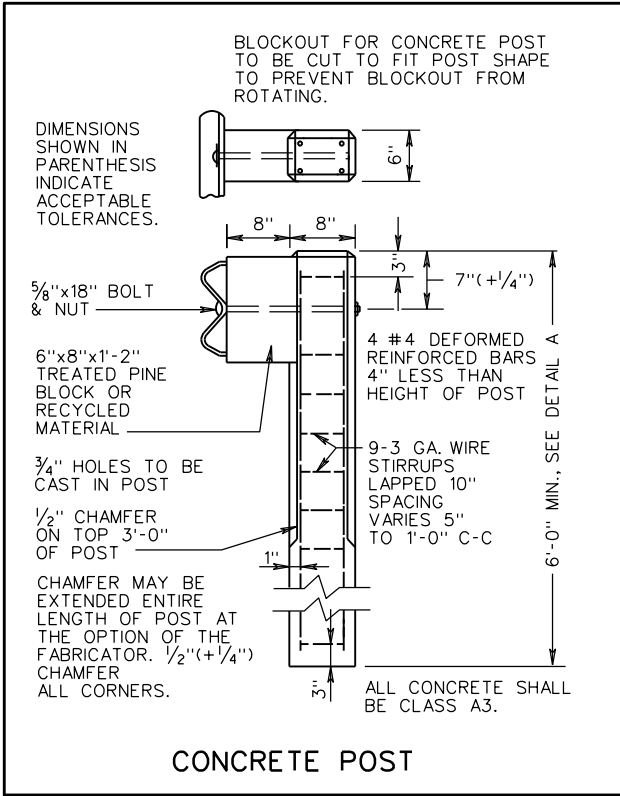
THE GUARDRAIL AND MEDIAN BARRIER COMPONENTS DEPICTED IN ARTBA TECHNICAL BULLETIN NUMBER 268B MAY BE SUBSTITUTED IF INTERCHANGEABLE WITH THE STANDARDS FOR GUARDRAIL (GR) OR MEDIAN BARRIER (MB) AND APPROVED BY THE ENGINEER.

SPECIFICATION REFERENCE
221
505

STANDARD GUARDRAIL HARDWARE

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT	
ROAD AND BRIDGE STANDARDS	
REVISION DATE	SHEET 1 OF 3
01/14	501.01

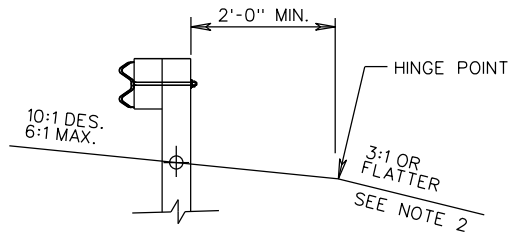
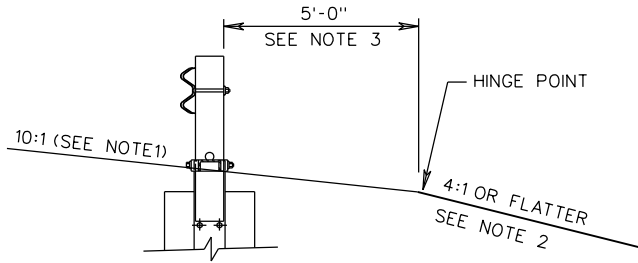


- NOTES:
1. ALL BOLTS, NUTS, WASHERS, AND OTHER STEEL ITEMS ARE TO BE GALVANIZED.
 2. ALTERNATE TYPE POSTS AND BLOCKOUT MAY BE INTERCHANGED ON ANY ONE PROJECT WITH THE RESTRICTION THAT THE SAME TYPE OF POST AND BLOCKOUT MUST BE USED IN ANY SINGLE RUN OF GUARDRAIL.
 3. FOR DETAILS OF GUARDRAIL ELEMENT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

SPECIFICATION REFERENCE
221
236
505

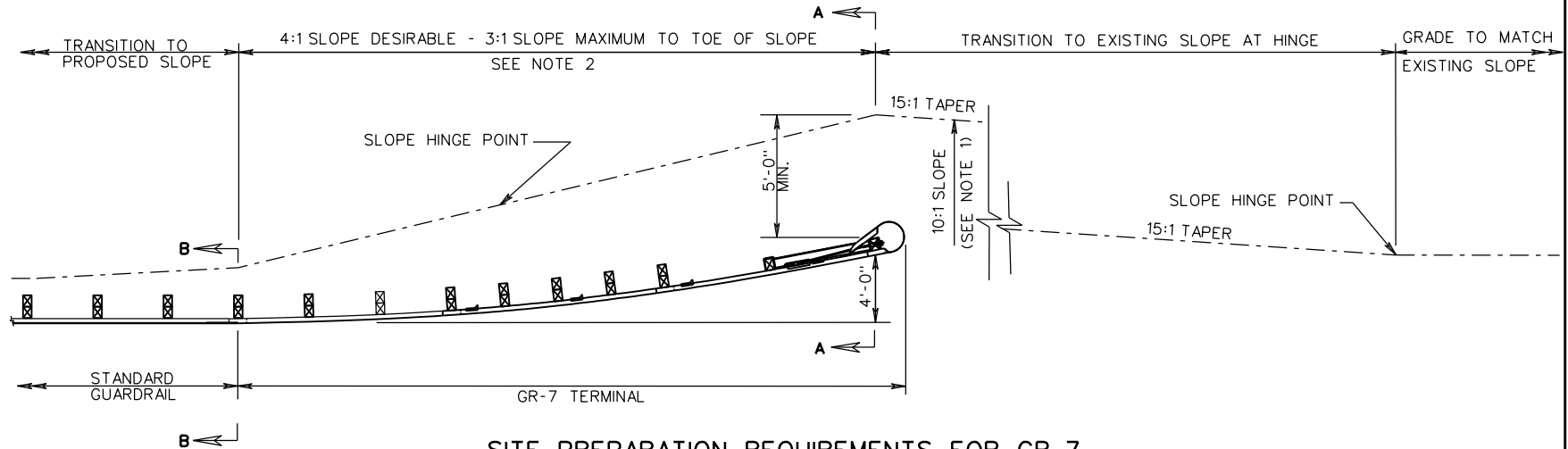
STANDARD BLOCKED-OUT W-BEAM GUARDRAIL
(STRONG POST SYSTEM, POST AND BLOCKOUT DETAILS)
 VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT ROAD AND BRIDGE STANDARDS	
REVISION DATE	SHEET 2 OF 2
01/14	501.05



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.
GUARDRAIL TERMINAL INSTALLATION SITE PREPARATION REQUIREMENTS FOR GR-7

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT

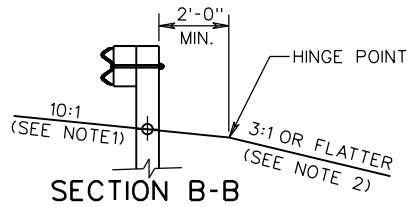
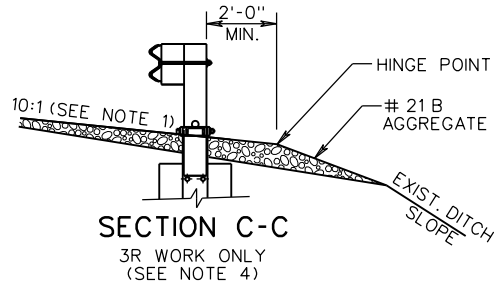
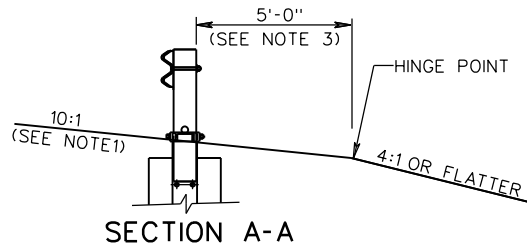
ROAD AND BRIDGE STANDARDS

REVISION DATE

01/14

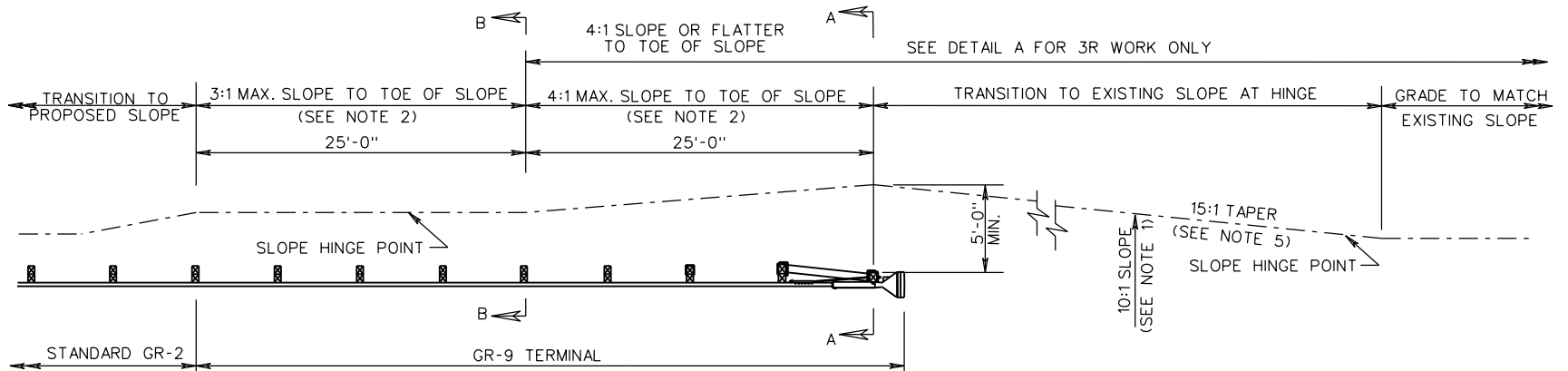
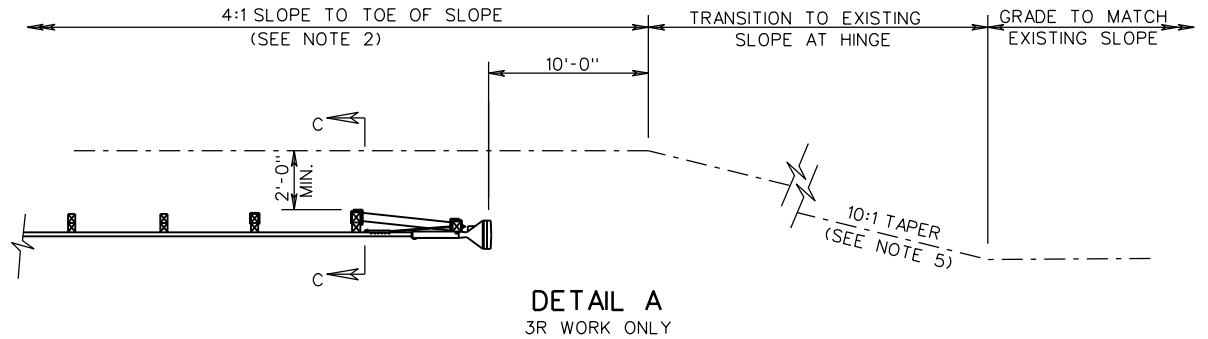
SHEET 3 OF 3

501.13



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

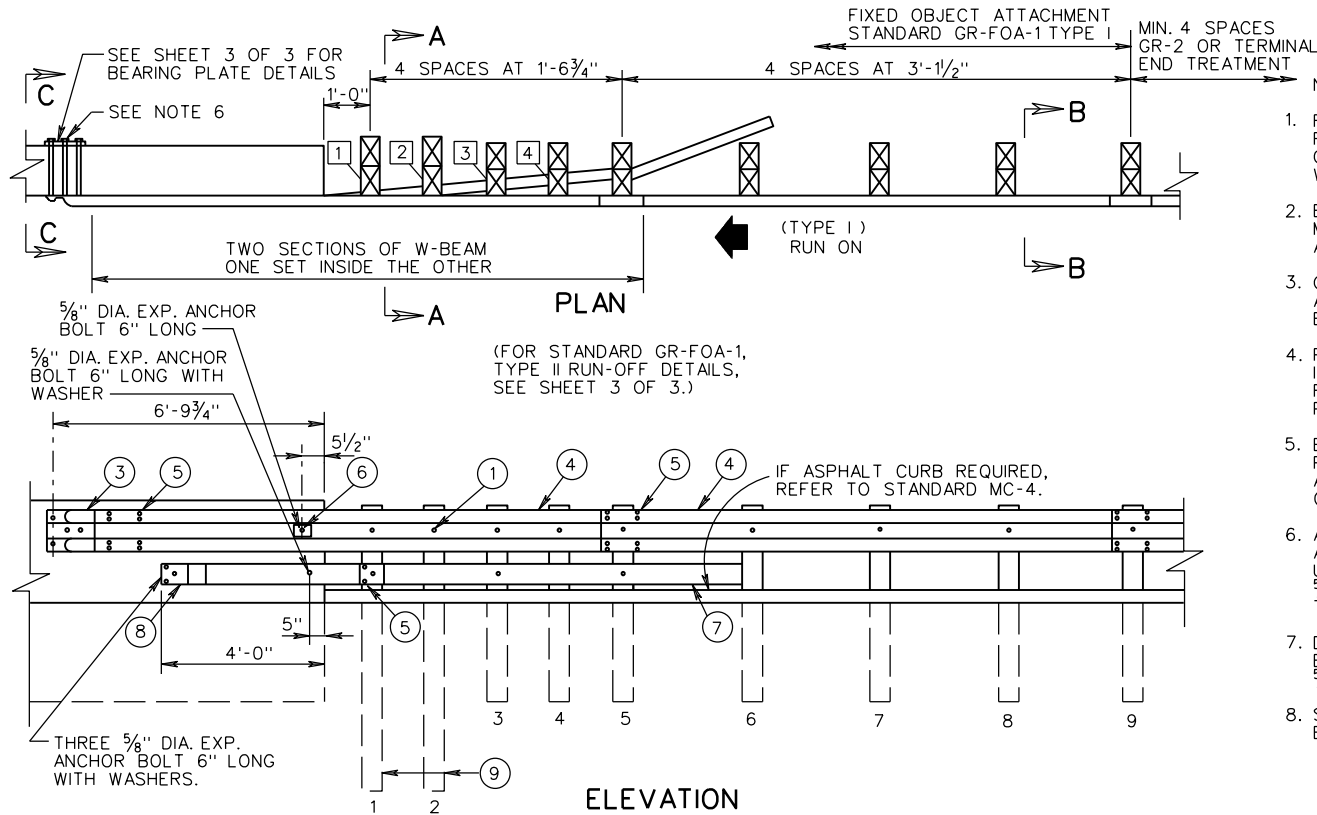
ROAD AND BRIDGE STANDARDS

REVISION DATE

01/14

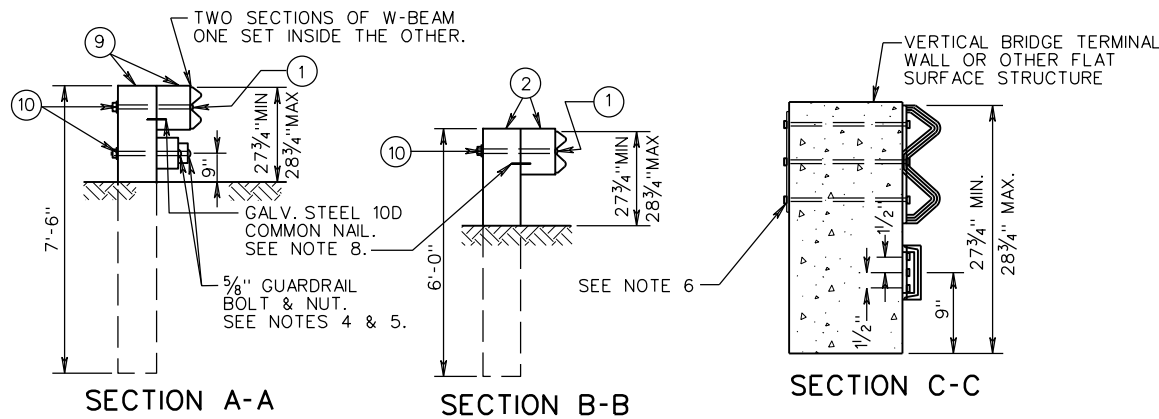
SHEET 2 OF 2

501.17



- 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.

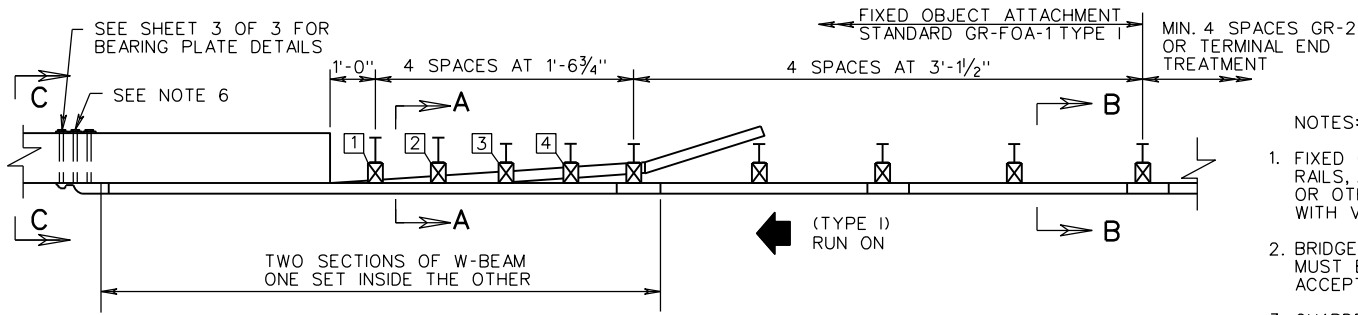


ITEM	MATERIAL/SPECIFICATIONS/NOTES
①	5/8" X 18" LONG GUARDRAIL BOLT AND RECESSED NUT
②	STANDARD 6" X 8" WOOD POST AND BLOCK
③	STANDARD W-BEAM TERMINAL CONNECTOR
④	STANDARD W-BEAM RAIL
⑤	5/8" X 2" LONG GUARDRAIL BOLT & RECESSED NUT (SEE ST'D. GR-HDW)
⑥	RECTANGULAR PLATE WASHER (SEE ST'D. GR-HDW)
⑦	BENT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

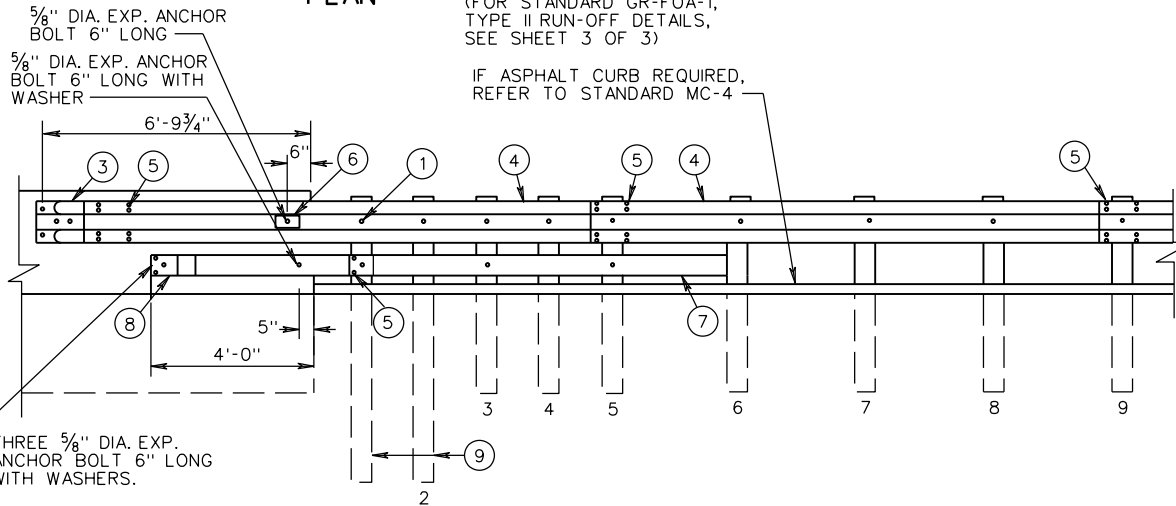
VDOT ROAD AND BRIDGE STANDARDS	
REVISION DATE	SHEET 1 OF 3
01/14	501.25



PLAN

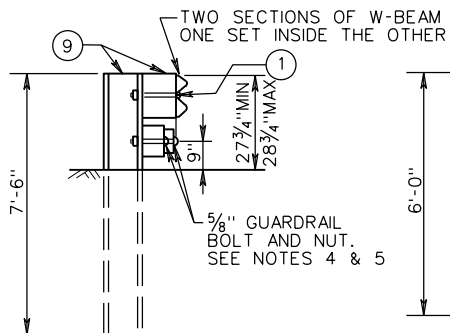
(FOR STANDARD GR-FOA-1, TYPE II RUN-OFF DETAILS, SEE SHEET 3 OF 3)

IF ASPHALT CURB REQUIRED, REFER TO STANDARD MC-4

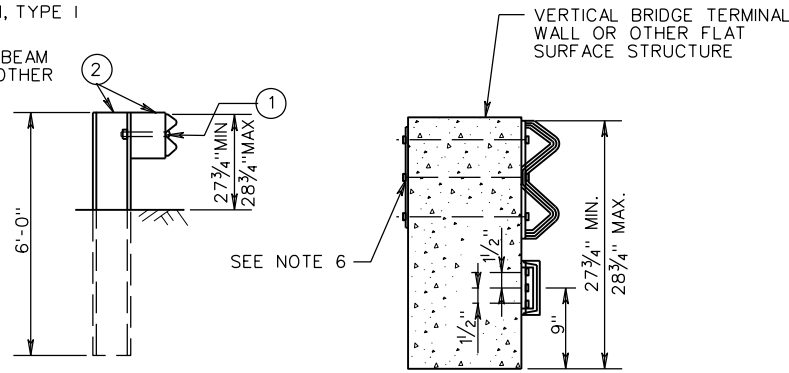


ELEVATION

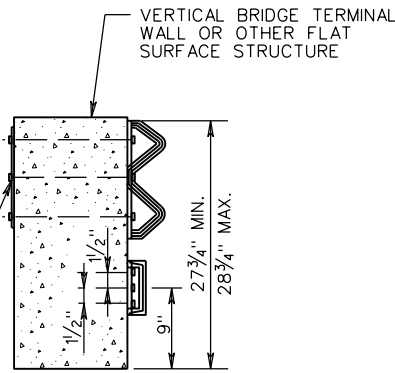
NEW BRIDGES - ATTACHMENTS
 ONE WAY TRAFFIC - RUN-ON, 2-GR-FOA-1, TYPE I
 - RUN-OFF, 2-GR-FOA-1, TYPE II
 TWO WAY TRAFFIC - RUN-ON, 4-GR-FOA-1, TYPE I



SECTION A-A



SECTION B-B



SECTION C-C

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.

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

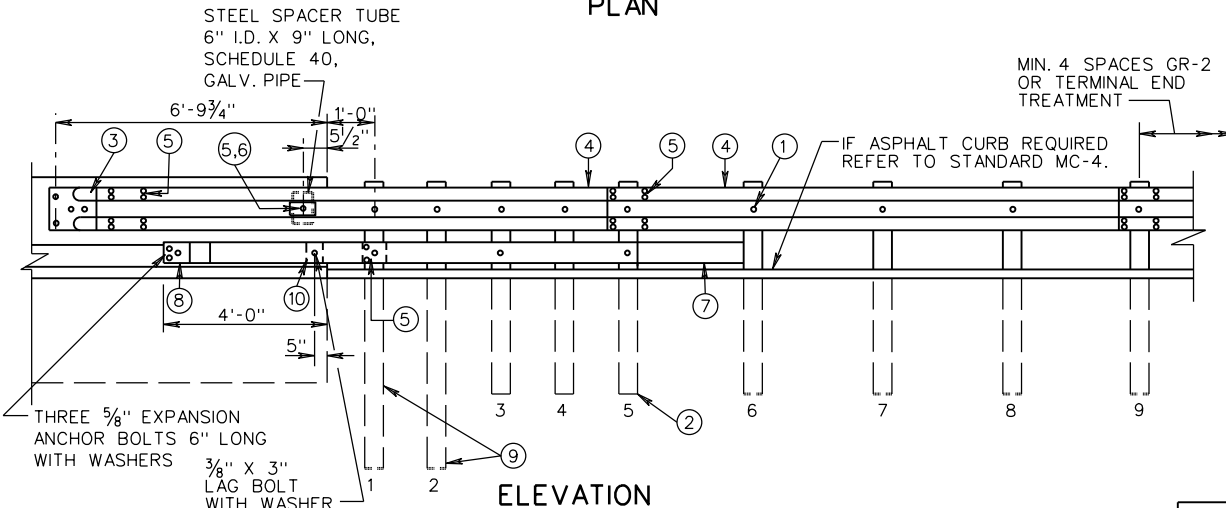
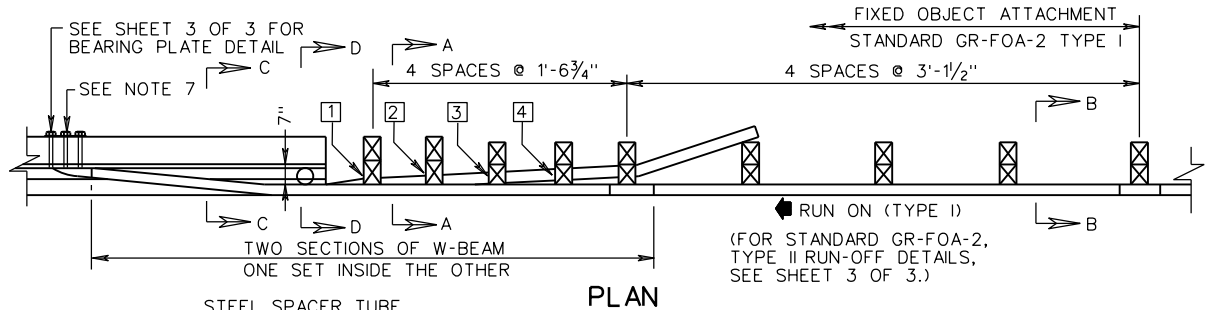
REVISION DATE

505

501.26

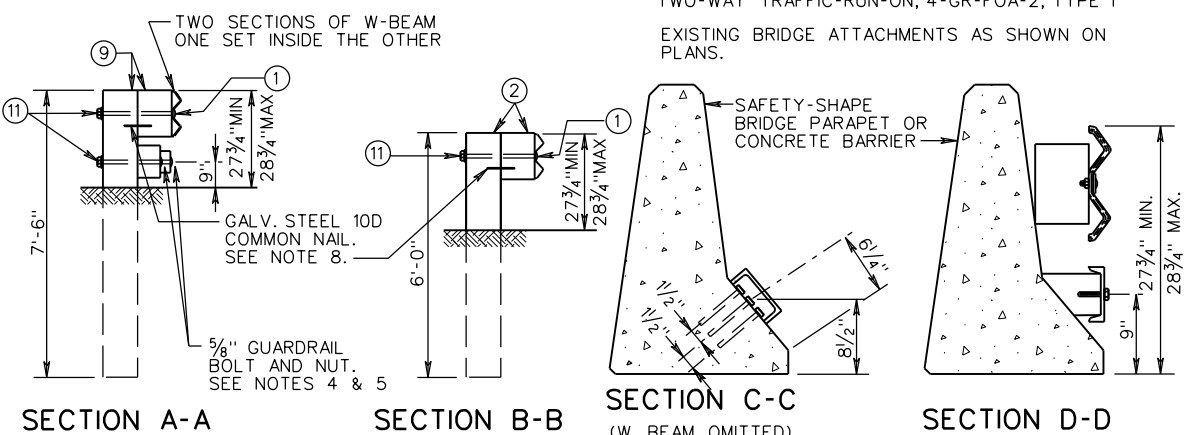
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VIRGINIA DEPARTMENT OF TRANSPORTATION

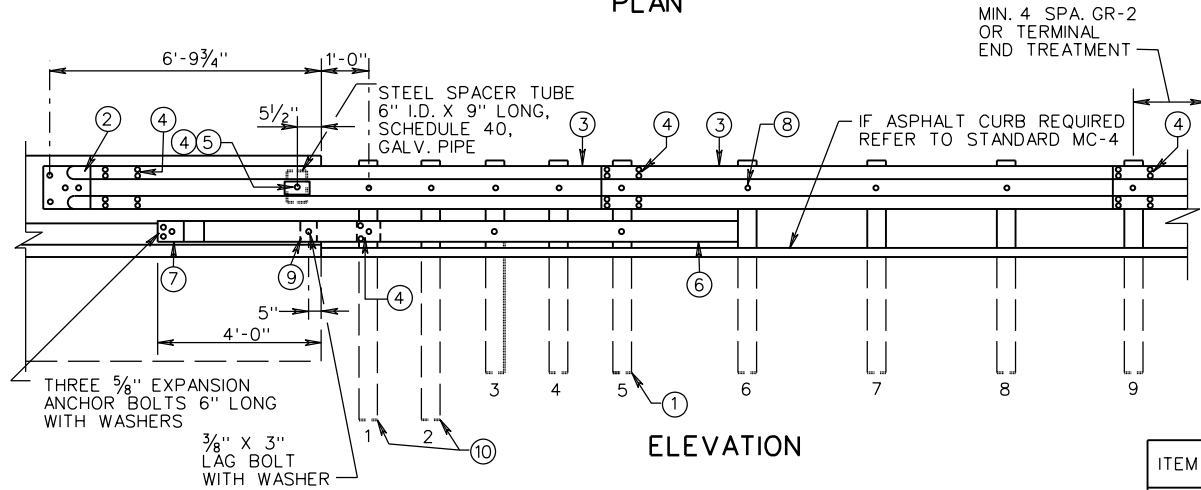
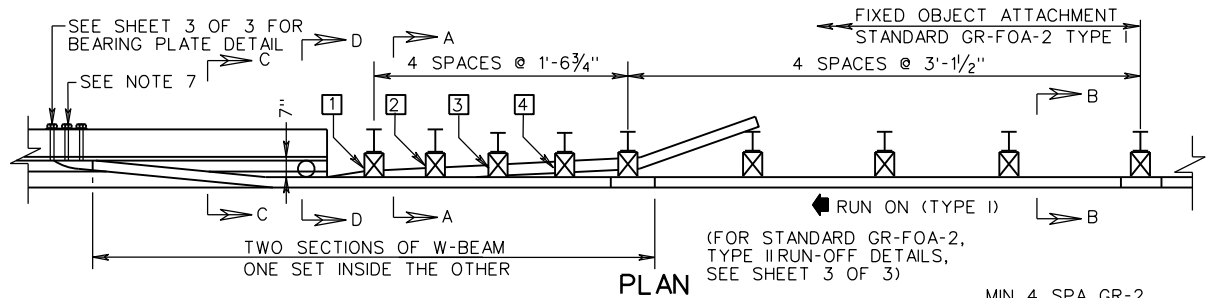


- NOTES:
1. FIXED OBJECTS MAY CONSIST OF SAFETY SHAPED BRIDGE PARAPETS OR CONCRETE BARRIERS.
 2. BRIDGE RAIL ENDS AND BRIDGE PARAPETS MUST BE OF ADEQUATE STRENGTH TO ACCEPT FULL IMPACT LOADING.
 3. GUARDRAIL COMPONENTS SHALL BE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE STANDARDS.
 4. POSTS 1, 2, 3, 4, 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.

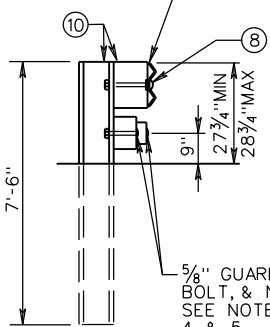


ITEM	MATERIAL/SPECIFICATIONS/NOTES
①	5/8" X 18" LG. GUARDRAIL BOLT AND RECESSED NUT.
②	STANDARD 6" X 8" WOOD POST AND BLOCK.
③	STANDARD W-BEAM TERMINAL CONNECTOR
④	STANDARD W-BEAM RAIL
⑤	5/8" X 2" LONG GUARDRAIL BOLT AND RECESSED NUT (SEE STANDARD GR-HDW)
⑥	RECTANGULAR PLATE WASHER (SEE STANDARD GR-HDW)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

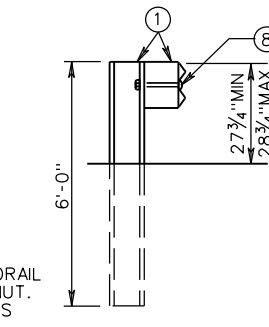


- NOTES:
1. FIXED OBJECTS MAY CONSIST OF SAFETY SHAPED BRIDGE PARAPETS OR CONCRETE BARRIERS.
 2. BRIDGE RAIL ENDS AND BRIDGE PARAPETS MUST BE OF ADEQUATE STRENGTH TO ACCEPT FULL IMPACT LOADING.
 3. GUARDRAIL COMPONENTS SHALL BE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE STANDARDS.
 4. POSTS 1, 2, 3, 4, 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.

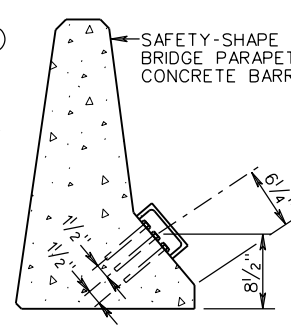
TWO SECTIONS OF W-BEAM ONE SET INSIDE THE OTHER



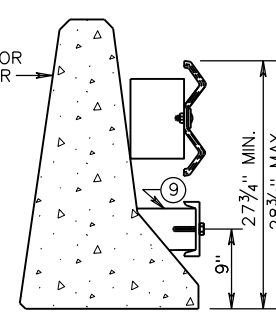
SECTION A-A



SECTION B-B



SECTION C-C
(W BEAM OMITTED)



SECTION D-D

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	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 2" 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

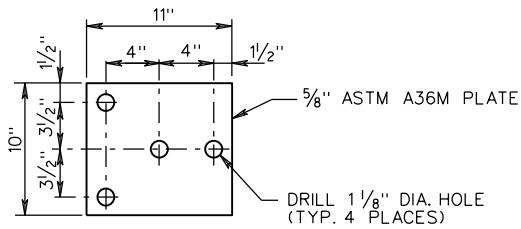
ROAD AND BRIDGE STANDARDS

REVISION DATE

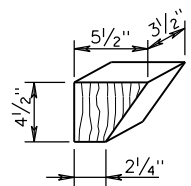
01/14

SHEET 2 OF 3

501.29

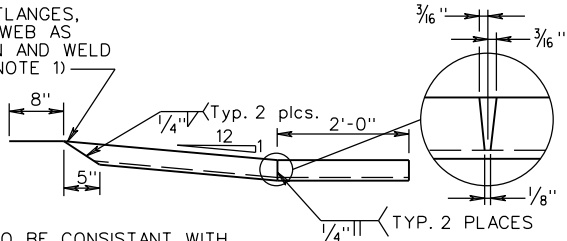


BEARING PLATE

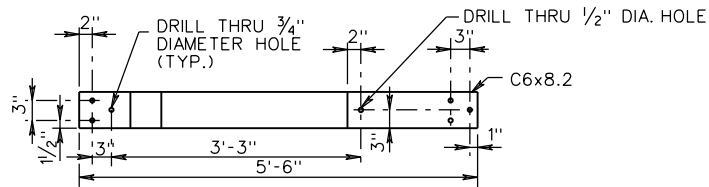


ITEM 10 DETAIL

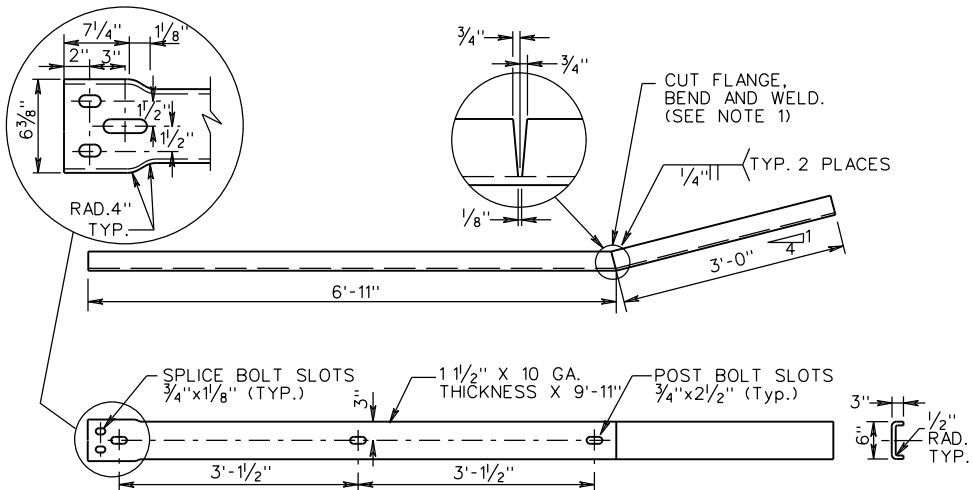
TRIM FLANGES, BEND WEB AS SHOWN AND WELD (SEE NOTE 1)



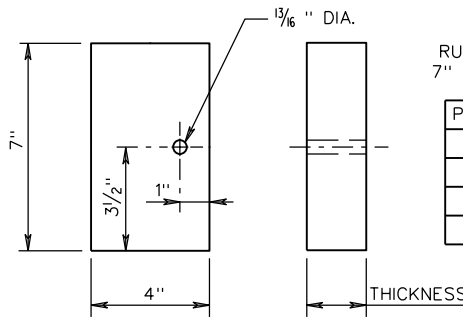
FABRICATE TO BE CONSISTANT WITH THE SLOPE OF THE PARAPET OR BARRIER AND ATTACH FLUSH TO SLOPE.



ITEM 8 DETAIL



ITEM 7 DETAIL



RUBRAIL BLOCKOUT DETAIL

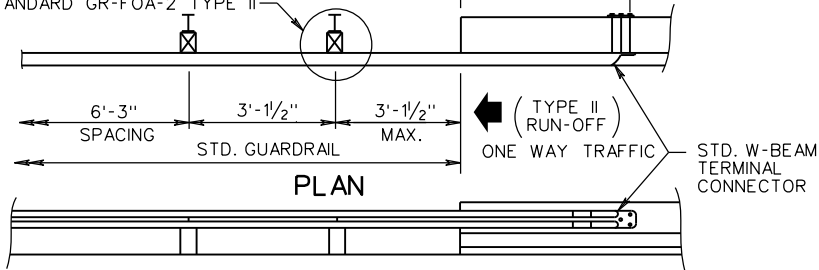
STEEL POSTS
RUBRAIL BLOCKOUTS
7" X 4" X THICKNESS

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 1/2"

INDICATES EXTRA POST REQUIRED FOR RUN-OFF FIXED OBJECT ATTACHMENT STANDARD GR-FOA-2 TYPE II * AS NEEDED TO ATTACH W-BEAM TERMINAL CONNECTOR.



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.

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



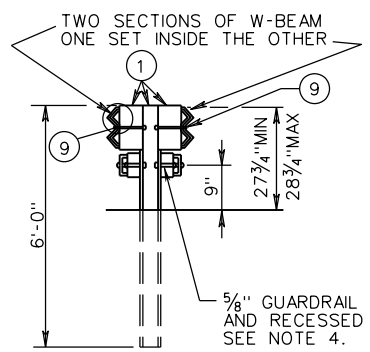
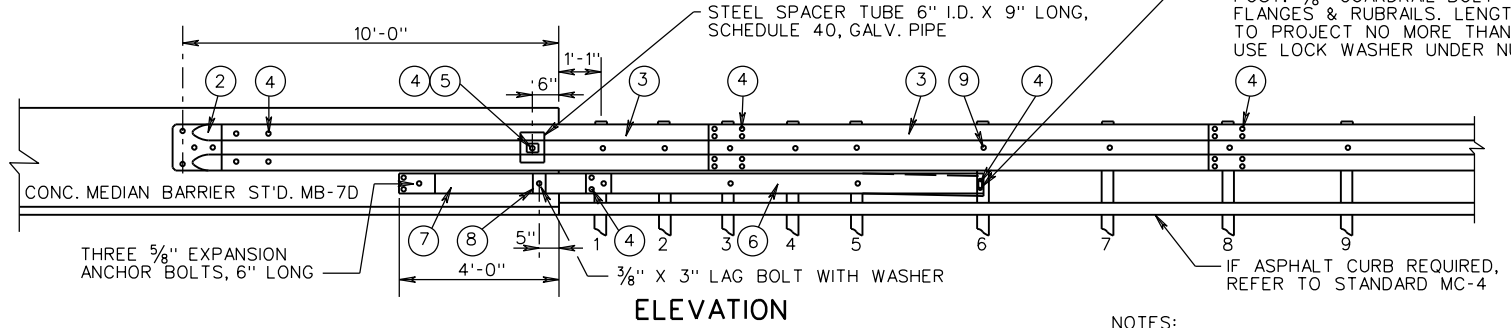
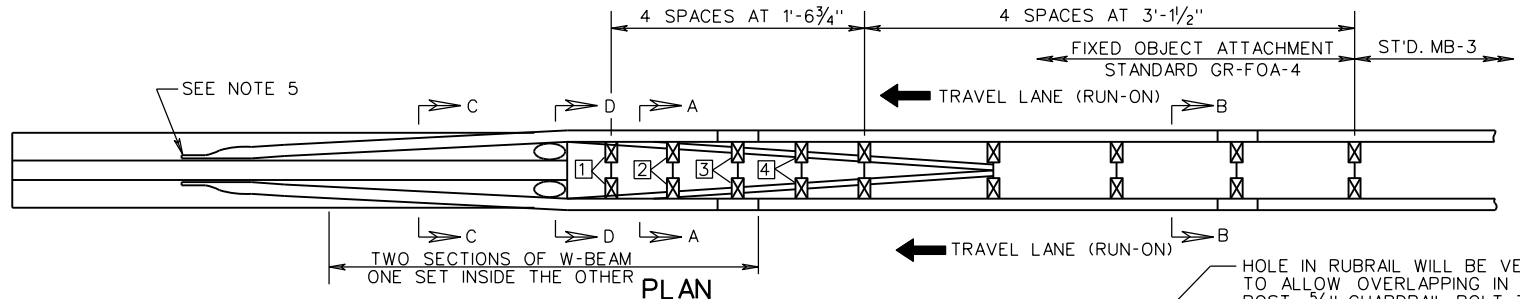
ROAD AND BRIDGE STANDARDS

SHEET 3 OF 3

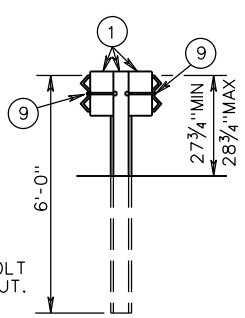
REVISION DATE

501.30

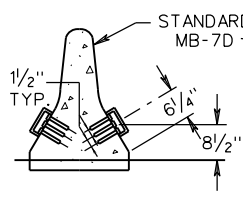
01/14



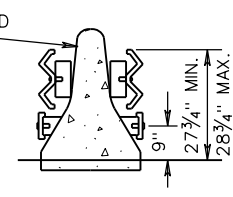
SECTION A-A



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)

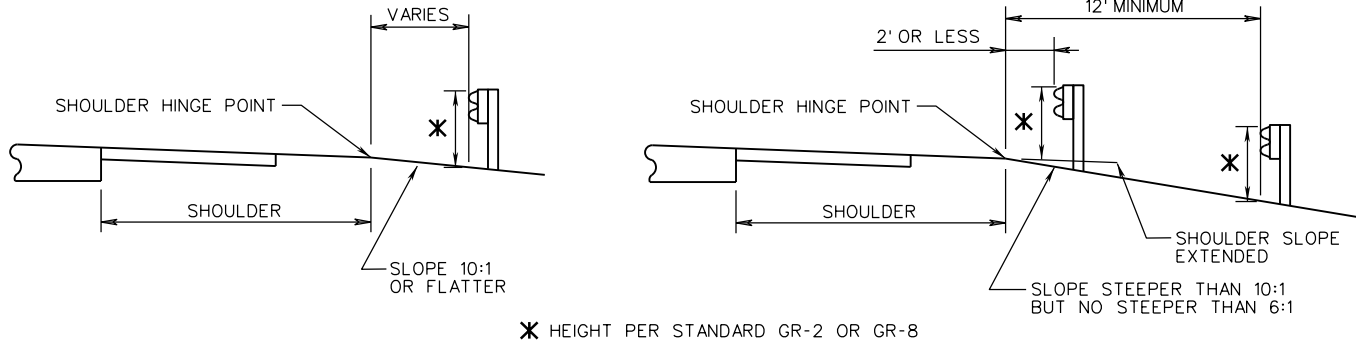
TYPE III TWO RUN-OFF SECTIONS (WITH 2 RUBRAILS REMOVED)

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.

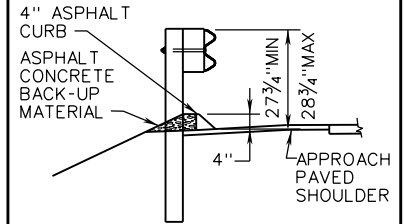
SPECIFICATION REFERENCE 505	BLOCKED-OUT W-BEAM MEDIAN BARRIER-FIXED OBJECT ATTACHMENT (FOR USE BETWEEN STANDARD MB-7D AND STANDARD MB-3) VIRGINIA DEPARTMENT OF TRANSPORTATION		VDOT ROAD AND BRIDGE STANDARDS
	REVISION DATE 01/14		



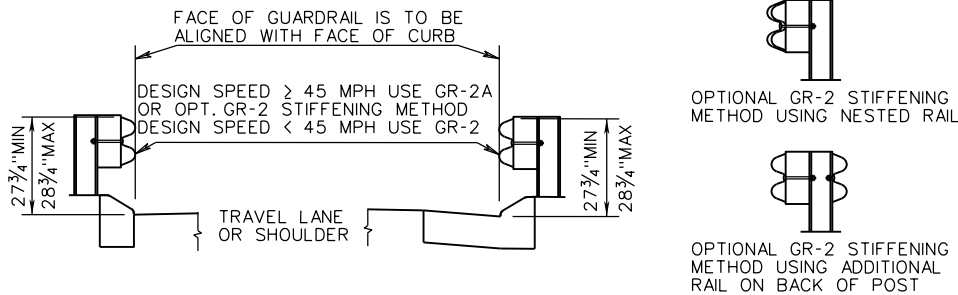
MEASURING GUARDRAIL HEIGHT ON FRONT SLOPE RELATIVE TO SHOULDER HINGE POINT

FACE OF GUARDRAIL IS TO BE ALIGNED WITH FACE OF CURB.

DESIGN SPEED ≥ 45 MPH
USE GR-2A OR OPTIONAL GR-2 STIFFENING METHOD.
DESIGN SPEED < 45 MPH
USE GR-2.



ASPHALT CURB SECTION



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

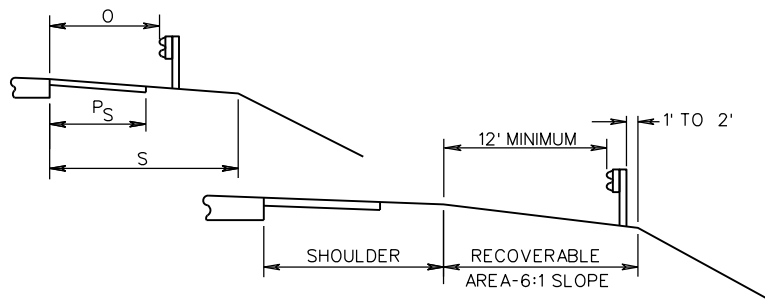
FOR GUARDRAIL DESIGN POLICIES USING CURB & GUTTER OR URBAN DESIGNS WITH SIDEWALK OR SIDEWALK SPACE SEE APPENDIX A OF THE ROAD DESIGN MANUAL

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

TOTAL SHOULDER WIDTH (S) (PAVED & GRADING)	PAVED SHOULDER WIDTH (P _S)	OFFSET FROM EDGE OF PAVEMENT TO FACE OF GUARDRAIL (O)
17'	12'	14'
15'	3', 4', OR 10'	12'
13'	3'	10'
11'	3'	8'
8' (MED.)	3' or 4'	5'

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

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



GUARDRAIL LOCATION ON RECOVERABLE SLOPE

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

01/14

SHEET 6 OF 9

501.39

RELATIVE GRADIENTS

ADJUSTMENT FACTORS

NUMBER OF LANES ROTATED n_1	ADJUSTMENT FACTOR (b_w)
1	1.00
1.5	0.8333
2	0.75
2.5	0.70
3	0.6667
3.5	0.6425

DESIGN SPEED V_D MPH	MAXIMUM RELATIVE GRADIENT (rg) 12' LANE	MIN. TRANSITION LENGTH IN FEET RURAL CONDITIONS WITH PAVEMENT WIDENING AND REVERSE CURVES FOR ALL CONDITIONS (2 SECOND RULE)	MAXIMUM RELATIVE GRADIENT (rg) RAMPS AND LOOPS		
			16' LANE	18' LANE	24' LANE
			20	0.74	59
25	0.70	74	0.80	0.84	0.93
30	0.66	88	0.75	0.80	0.88
35	0.62	103	0.71	0.75	0.83
40	0.58	117	0.66	0.70	0.77
45	0.54	132	0.61	0.65	0.72
50	0.50	147	0.57	0.60	0.67
55	0.47	161	0.54	0.57	0.63
60	0.45	176	0.51	0.54	0.60
65	0.43	191	0.49	0.52	0.57
70	0.40	205	0.45	0.48	0.53
75	0.38	220	0.43	0.46	0.51
80	0.35	235	0.39	0.42	0.47

DEFINITIONS

- A - FRONT OVERHANG OF DESIGN VEHICLE FROM APPROPRIATE TABLE.
- b_w - ADJUSTMENT FACTOR FROM TABLE.
- C - LATERAL CLEARANCE OF DESIGN VEHICLE FROM APPROPRIATE TABLE.
- E - SUPERELEVATION RATE FROM APPROPRIATE TABLE.
- e_d - DESIGN SUPERELEVATION RATE, PERCENT
- e_{nc} - NORMAL CROSS SLOPE RATE, PERCENT
- F_A - CALCULATED WIDTH OF OVERHANG FOR DESIGN VEHICLE.
- L - WHEELBASE OF DESIGN VEHICLE FROM APPROPRIATE TABLE.
- L_r - LENGTH OF SUPERELEVATION RUNOFF SECTION.
- L_t - LENGTH OF TANGENT RUNOUT SECTION
- M - MULTIPLE LANE FACTOR.
- N - NUMBER OF LANES.
- n_1 - NUMBER OF LANES ROTATED (FROM TABLES).
- P_w - PAVEMENT WIDTH.
- R - RADIUS OF CURVE.
- rg - RELATIVE GRADIENT FROM APPROPRIATE TABLE.
- U - CALCULATED TRACK WIDTH OF DESIGN VEHICLE.
- u - TRACK WIDTH OF DESIGN VEHICLE FROM APPROPRIATE TABLE.
- V_D - DESIGN VELOCITY.
- w - CALCULATED WIDENING.
- W - PAVEMENT WIDTH
- W_c - CALCULATED TOTAL CURVE WIDTH.
- W_n - WIDTH OF LANE.
- Z - CALCULATED EXTRA WIDTH ALLOWANCE.

FORMULAS USED TO CALCULATE SUPERELEVATION RUNOFF (L_r) AND CROWN RUNOUT (L_t)

NO WIDENING REQUIRED

$$L_r = b_w (W_n n_1 E / rg)$$

$$L_r = M(W_n E / rg) \quad (\text{ALT. MULTI-LANE})$$

WIDENING REQUIRED

$$L_r = b_w [E n_1 (W_n + w/N) / rg]$$

$$L_r = MEE(W_n + w/N) / rg \quad (\text{ALT. MULTI-LANE})$$

$$L_t = \left(\frac{e_{nc}}{e_d} \right) L_r$$

FOR SOLVED PROBLEMS USING THIS METHODOLOGY FOR L_r , SEE THE EXAMPLES ON PAGE 803.22

NOTE: AN ALTERNATE METHOD FOR MULTI-LANE ROADWAYS. FOR FOUR LANE UNDIVIDED PAVEMENTS (48') THE L_r IS 1.5 TIMES (M=1.5) THE CORRESPONDING LENGTH FOR TWO LANE HIGHWAYS; AND FOR SIX LANE UNDIVIDED PAVEMENTS (72'), THE L_r IS TWO TIMES (M=2) THE CORRESPONDING LENGTH FOR TWO LANE HIGHWAYS.



ROAD AND BRIDGE STANDARDS

METHODOLOGIES FOR CALCULATING TC-5.11 VALUES

SPECIFICATION REFERENCE

SHEET 1 OF 1

REVISION DATE

803.20

01/14

VIRGINIA DEPARTMENT OF TRANSPORTATION