SECTION 500

GUARDRAIL, MEDIAN BARRIER, FENCING & MARKERS
<table>
<thead>
<tr>
<th>STANDARD</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR-HDW</td>
<td>STANDARD W-BEAM GUARDRAIL HARDWARE</td>
</tr>
<tr>
<td></td>
<td>STANDARD W-BEAM GUARDRAIL HARDWARE</td>
</tr>
<tr>
<td></td>
<td>STANDARD THREE BEAM GUARDRAIL HARDWARE</td>
</tr>
<tr>
<td>GR-2, 2A</td>
<td>STANDARD BLOCKED-OUT W-BEAM GUARDRAIL (STRONG POST SYSTEM)</td>
</tr>
<tr>
<td></td>
<td>STANDARD BLOCKED-OUT W-BEAM GUARDRAIL (STRONG POST SYSTEM) POST AND BLOCKOUT DETAILS</td>
</tr>
<tr>
<td>GR-3</td>
<td>CABLE GUARDRAILS</td>
</tr>
<tr>
<td></td>
<td>CABLE GUARDRAILS</td>
</tr>
<tr>
<td>GR-6</td>
<td>TERMINAL TREATMENT FOR W-BEAM GUARDRAIL</td>
</tr>
<tr>
<td></td>
<td>TERMINAL TREATMENT FOR W-BEAM GUARDRAIL</td>
</tr>
<tr>
<td>GR-7</td>
<td>BREAKWAY CABLE TERMINAL - 4' FLARE</td>
</tr>
<tr>
<td></td>
<td>BREAKWAY CABLE TERMINAL - 4' FLARE</td>
</tr>
<tr>
<td></td>
<td>BREAKWAY CABLE TERMINAL - 4' FLARE (SITE PREPARATION)</td>
</tr>
<tr>
<td>GR-8, 6A, 6B, 6C</td>
<td>STANDARD W-BEAM GUARDRAIL (WEAK POST SYSTEM)</td>
</tr>
<tr>
<td>GR-9</td>
<td>STANDARD W-BEAM GUARDRAIL (WEAK POST SYSTEM)</td>
</tr>
<tr>
<td></td>
<td>ALTERNATE BREAKAWAY CABLE TERMINAL - NO FLARE</td>
</tr>
<tr>
<td></td>
<td>ALTERNATE BREAKAWAY CABLE TERMINAL - NO FLARE (SITE PREPARATION)</td>
</tr>
<tr>
<td>GR-10</td>
<td>GUARDRAIL AT LOW-FILL CULVERT</td>
</tr>
<tr>
<td></td>
<td>GUARDRAIL AT LOW-FILL CULVERT</td>
</tr>
<tr>
<td>GR-11</td>
<td>TRAILING END TERMINAL TREATMENT</td>
</tr>
<tr>
<td>BGR-01</td>
<td>STANDARD BOX CULVERT GUARDRAIL (TEXAS T6)</td>
</tr>
<tr>
<td></td>
<td>STANDARD BOX CULVERT GUARDRAIL (TEXAS T6)</td>
</tr>
<tr>
<td>GR-FOA-1</td>
<td>W-BEAM GUARDRAIL-FIXED OBJECT ATTACHMENT FOR USE WITH VERTICAL FIXED OBJECTS AND GUARDRAIL (WOOD POSTS)</td>
</tr>
<tr>
<td></td>
<td>W-BEAM GUARDRAIL-FIXED OBJECT ATTACHMENT FOR USE WITH VERTICAL FIXED OBJECTS AND GUARDRAIL (STEEL POSTS)</td>
</tr>
<tr>
<td>GR-FOA-2</td>
<td>W-BEAM GUARDRAIL-FIXED OBJECT ATTACHMENT RUBRAIL AND HARDWARE DETAILS</td>
</tr>
<tr>
<td>GR-FOA-2, &amp; 4</td>
<td>W-BEAM GUARDRAIL-FIXED OBJECT ATTACHMENT RUBRAIL AND HARDWARE DETAILS</td>
</tr>
<tr>
<td>GR-FOA-4</td>
<td>BLOCKED-OUT W-BEAM MEDIAN BARRIER - FIXED OBJECT ATTACHMENT FOR USE BETWEEN MB-7 AND MB-3</td>
</tr>
<tr>
<td></td>
<td>BLOCKED-OUT W-BEAM MEDIAN BARRIER - FIXED OBJECT ATTACHMENT RUBRAIL AND HARDWARE DETAILS</td>
</tr>
<tr>
<td>FOA-C2</td>
<td>W-BEAM GUARDRAIL INSTALLATION CRITERIA (FIXED OBJECT ATTACHMENT METHODS FOR CONSTRUCTION ZONES)</td>
</tr>
<tr>
<td>GR-INS</td>
<td>W-BEAM GUARDRAIL INSTALLATION CRITERIA</td>
</tr>
<tr>
<td></td>
<td>W-BEAM GUARDRAIL INSTALLATION CRITERIA</td>
</tr>
<tr>
<td></td>
<td>W-BEAM GUARDRAIL INSTALLATION CRITERIA</td>
</tr>
<tr>
<td></td>
<td>W-BEAM GUARDRAIL INSTALLATION CRITERIA</td>
</tr>
<tr>
<td></td>
<td>W-BEAM GUARDRAIL INSTALLATION CRITERIA</td>
</tr>
</tbody>
</table>

INDEX OF SHEETS
SECTION 500-GUARDRAIL, BARRIER AND FENCE
VIRGINIA DEPARTMENT OF TRANSPORTATION

2016 ROAD & BRIDGE STANDARDS
<table>
<thead>
<tr>
<th>STANDARD</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR-INS</td>
<td>W BEAM GUARDRAIL INSTALLATION CRITERIA</td>
</tr>
<tr>
<td>MB-3</td>
<td>STANDARD W BEAM MEDIAN BARRIER</td>
</tr>
<tr>
<td>MB-5</td>
<td>STANDARD W BEAM MEDIAN BARRIER (WEAK POST SYSTEM)</td>
</tr>
<tr>
<td>MB-7D, 7E, 7F</td>
<td>CONCRETE MEDIAN BARRIER</td>
</tr>
<tr>
<td>MB-7D PC</td>
<td>PRECAST TRAFFIC BARRIER CONCRETE SERVICE</td>
</tr>
<tr>
<td>MB-8A</td>
<td>CONCRETE MEDIAN BARRIER TYPE I, II, OR III</td>
</tr>
<tr>
<td>MB-8A PC</td>
<td>STANDARD W BEAM MEDIAN BARRIER 12 FOOT TERMINAL SECTION</td>
</tr>
<tr>
<td>MB-9A</td>
<td>CAST IN PLACE CONCRETE MEDIAN BARRIER 12 FOOT TERMINAL SECTION</td>
</tr>
<tr>
<td>MB-10A</td>
<td>TRAFFIC BARRIER SERVICE CONCRETE PARAPET (SINGLE FACE) (FOR TEMPORARY INSTALLATION ON BRIDGE DECK EXTERIOR)</td>
</tr>
<tr>
<td>MB-11A</td>
<td>TRAFFIC BARRIER SERVICE CONCRETE PARAPET (DOUBLE FACE) (FOR TEMPORARY INSTALLATION ON BRIDGE DECK EXTERIOR)</td>
</tr>
<tr>
<td>MB-12A, B, C</td>
<td>CONCRETE MEDIAN BARRIER (TALL WALL)</td>
</tr>
<tr>
<td>MB-13</td>
<td>CONCRETE MEDIAN BARRIER TYPE I, II, OR III</td>
</tr>
<tr>
<td>MB-INS</td>
<td>BUTTING TRAFFIC BARRIER SERVICE TO SINGLE FACE PARAPET SERVICE</td>
</tr>
<tr>
<td>FE-A PC</td>
<td>STANDARD FENCE BARRED WIRE</td>
</tr>
<tr>
<td>FE-B</td>
<td>STANDARD FENCE CHAIN LINK</td>
</tr>
<tr>
<td>FE-C</td>
<td>STANDARD FENCE GATES</td>
</tr>
<tr>
<td>FE-4</td>
<td>WATER GATES IN FENCE LINES</td>
</tr>
<tr>
<td>FE-6</td>
<td>STANDARD METHOD OF FENCE AND HANDRAIL GROUNDING</td>
</tr>
<tr>
<td>RM-1</td>
<td>STANDARD PLAN AND METHOD OF SETTING RIGHT-OF-WAY MONUMENTS</td>
</tr>
<tr>
<td>RM-2</td>
<td>STANDARD PLAN AND METHOD OF SETTING RIGHT-OF-WAY MONUMENTS</td>
</tr>
</tbody>
</table>

INDEX OF SHEETS

SECTION 500-GUARDRAIL, BARRIER AND FENCE

VIRGINIA DEPARTMENT OF TRANSPORTATION

2016 ROAD & BRIDGE STANDARDS
<table>
<thead>
<tr>
<th>STANDARD</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA-1</td>
<td>IMPACT ATTENUATOR TYPE 1 RE-DIRECTIVE PERMANENT INSTALLATION (TL-3 &gt; 40 MPH)</td>
</tr>
<tr>
<td>IA-1</td>
<td>IMPACT ATTENUATOR TYPE 1 RE-DIRECTIVE PERMANENT INSTALLATION (TL-3 &gt; 40 MPH)</td>
</tr>
<tr>
<td>IA-2</td>
<td>IMPACT ATTENUATOR TYPE 1 RE-DIRECTIVE PERMANENT INSTALLATION (TL-2 &lt; 40 MPH)</td>
</tr>
<tr>
<td>IA-LM</td>
<td>IMPACT ATTENUATOR TYPE 1 RE-DIRECTIVE LOW MAINTENANCE PERMANENT INSTALLATION (TL-3 &gt; 40 MPH)</td>
</tr>
<tr>
<td>MGS-HDW</td>
<td>MGS STANDARD GUARDRAIL HARDWARE</td>
</tr>
<tr>
<td>GR-MGS1, A</td>
<td>MIDWEST GUARDRAIL SYSTEM (STANDARD AND REDUCED POST SPACING)</td>
</tr>
<tr>
<td>GR-MGS2</td>
<td>MIDWEST GUARDRAIL SYSTEM (TANGENT END TERMINAL)</td>
</tr>
<tr>
<td>GR-MGS3</td>
<td>MIDWEST GUARDRAIL SYSTEM (TRAILING END ANCHORAGE)</td>
</tr>
<tr>
<td>GR-MGS4</td>
<td>MIDWEST GUARDRAIL SYSTEM (TRANSITION FROM MGS 30&quot; HEIGHT TO GR-2 27 3/4&quot; HEIGHT)</td>
</tr>
<tr>
<td>GR-MGS-BNS</td>
<td>MGS W-BEAM GUARDRAIL INSTALLATION CRITERIA</td>
</tr>
<tr>
<td>GR-FOA-5</td>
<td>MGS W-BEAM GUARDRAIL INSTALLATION CRITERIA (LEAVE-OUT FOR STANDARD GUARDRAIL POST INSTALLATION)</td>
</tr>
<tr>
<td></td>
<td>THREE-BEAM - FIXED OBJECT ATTACHMENT (FOR USE WITH VERTICAL FACE TERMINAL WALLS AND MGS GUARDRAIL)</td>
</tr>
</tbody>
</table>

INDEX OF SHEETS

SECTION 500 - GUARDRAIL, BARRIER AND FENCE

VIRGINIA DEPARTMENT OF TRANSPORTATION

2016 ROAD & BRIDGE STANDARDS
SECTION THRU RAIL ELEMENT AND W BEAM BACK-UP PLATE

DETAIL OF SPLICING JOINT

DETAIL OF STANDARD WASHER

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.
**W BEAM TERMINAL CONNECTOR**

- **Neutral Axis**: 3"
- **Lap in Direction of Traffic**: 25/8" Bend Req'd, only for use in GR-7.
- **1" Holes**: Bend and hole only if required to modify connector for use in GR-7.
- **3/8" x 3" Slots**: 3/8" x 2½" post bolt slot (optional)

**W BEAM END SECTION (FLARED)**

- **Post Bolt Slot**: ¾" x 1½"
- **Splice Bolt Slot**: ¾" x 2 ½"

**THE GUARDRAIL MEDIAN BARRIER COMPONENTS DEPICTED IN A.R.T.B.A. TECHNICAL BULLETIN NUMBER 288 MAY BE SUBSTITUTED IF INTERCHANGEABLE WITH THE STANDARDS FOR GUARDRAIL (GR) OR MEDIAN BARRIER (MB) AND APPROVED BY THE ENGINEER.**

**W BEAM END SECTION (BUFFER)**

- **30°**: 2½" 8½" 7½"
- **2½" 8½" 7½"**: APPROX.
- **1½"**: SLOTTED HOLES ¾" x 1½"

**W BEAM END SECTION (ROUND)**

- **3" Min.**: 6½" R
- **2½"**: APPROX.
- **1½"**: APPROX.
- **¾" x ¾"**: Splice Bolt Slot

**STANDARD GUARDRAIL HARDWARE**

- **W-BEAM GUARDRAIL HARDWARE**

---

**SPECIFICATION REFERENCE**

- **221**
- **505**

**Virginia Department of Transportation**

---

**2016 ROAD & BRIDGE STANDARDS**
SECTION THRU THRIE BEAM RAIL ELEMENT

NOTES:

The guardrail and median barrier components depicted in ARTBA Technical Bulletin Number 288B may be substituted if interchangeable with the standards for guardrail (GR) or median barrier (MB) and approved by the engineer.

LAP IN DIRECTION OF TRAFFIC

DISTANCE BETWEEN POST SLOTS AND THE SUM OF POST BOLT SLOT CENTERS TO BE DESIGNATED.

THRIE BEAM TERMINAL CONNECTOR DETAIL

SPlice DETAIL

TRANSITION SECTION DETAIL (W-BEAM TO THRIE BEAM)
**GR-2**

(6'-3" POST SPACING)

MAX DYNAMIC DEFORMATION = 3"

**GR-2A**

(3'-1½" POST SPACING)

MAX DYNAMIC DEFORMATION = 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 ½" 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 27⅞" min - 28⅞" max as measured per standard GR-2NS.

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.

**FLARE RATES**

<table>
<thead>
<tr>
<th>DESIGN SPEED</th>
<th>INSIDE FLARE RATE</th>
<th>BEYOND FLARE RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPH</td>
<td>SHY LINE FLARE</td>
<td>FLARE RATE</td>
</tr>
<tr>
<td>70</td>
<td>9'</td>
<td>30:1</td>
</tr>
<tr>
<td>60</td>
<td>8'</td>
<td>26:1</td>
</tr>
<tr>
<td>50</td>
<td>6.5'</td>
<td>21:1</td>
</tr>
<tr>
<td>40</td>
<td>5'</td>
<td>16:1</td>
</tr>
<tr>
<td>30</td>
<td>4'</td>
<td>13:1</td>
</tr>
</tbody>
</table>

* Suggested maximum flare rate for semi-rigid barrier systems.
THE CRT POST IS FOR USE WITH THE STANDARD GR-10 TYPE III OR WHERE SPECIFIED BY THE ENGINEER IN THE PLANS.

CRT POST

6" x 8" WOOD POST

STEEL POST

6" x 8" WIDE BLOCKOUT

FOR USE WHEN REPAIRING DAMAGED GUARDRAIL CONTAINING STEEL BLOCKOUTS.

BLOCKOUT FOR MAINTENANCE REPAIR ONLY

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 NO. 501.01 AND 501.02.
4. DRIVE NAIL ON BOTH SIDES WITHIN 2" OF THE TOP OR BOTTOM OF BLOCKOUT AFTER 3/8" x 18 BOLT IS INSTALLED.

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

2016 ROAD & BRIDGE STANDARDS
NOTES:

1. A second rail is required where the distance between the ground and bottom of the top rail exceeds 10' (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 required, 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).

ATTACH LOWER W-BEAM RAIL TO POST W/¾" BOLT

ATTACH LOWER W-BEAM RAIL TO BACK OF POST W/¾" BOLT

3" BETWEEN RAILS

2'-0" MAX.

EDGE OF SHOULDER

EDGE OF TRAVEL LANE

PLAN

W-BEAM RAIL HEIGHT CONSTANT RELATIVE TO ROADWAY

PROFILE GRADE - SEE NOTES 1, 2 & 4

ELEVATION

SEE NOTES 3 & 4

SEE END ANCHORAGE DETAIL A SHEET 501.10

SECTION A-A

SECTION B-B

SECTION C-C
SECTION D-D

DETAIL E

SEE NOTE 1

DETAIL A

SEE NOTE 1

2" THICK STEEL PLATE

NOTE:
1. 1/2" STEEL PLATE MAY BE WELDED OR BOLTED TO POST. IF PLATE IS BOLTED TO POST USE 4-5/8" X 1/2" LG. HEX HEAD BOLTS W/ HEX NUTS. IF PLATE IS WELDED TO POST DO NOT DRILL 1/4" HOLE IN PLATE OR IN POST FLANGES.
2. CONCRETE END ANCHORAGE MAY BE USED IN PLACE OF STEEL POST AT 8'-0" OFFSET.

PAVED DITCH DETAIL

SECTION D-D

SECTION E-E

TERMINAL TREATMENT FOR W-BEAM GUARDRAIL

VIRGINIA DEPARTMENT OF TRANSPORTATION

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

2016 ROAD & BRIDGE STANDARDS

SPECIFICATION

REFERENCE

501.10

505

2016 ROAD & BRIDGE STANDARDS
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 TO 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 27\(\frac{3}{4}\)" MIN. - 28\(\frac{3}{4}\)" 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.
Flared End Terminal

(4' Flare)

Flared terminal placement on inside of curve - less than 3000 ft. radius.
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 super-elevation 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.

NOTES:

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

2016 ROAD & BRIDGE STANDARDS
**TYPICAL INSTALLATION**

**SQUARE WASHER**

**GUARDRAIL POST CONNECTION DETAIL**

**BACKUP PLATE REQUIRED EACH POST**

**S 3 X 5.7 STEEL POST**

**STANDARD W-BEAM GUARDRAIL (WEAK POST SYSTEM)**

**TL-3 (>45 MPH)**

**SPECIFICATION REFERENCE**

<table>
<thead>
<tr>
<th>STANDARD</th>
<th>POST SPACING</th>
<th>DEFLECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR-8</td>
<td>12' - 6&quot;</td>
<td>7' - 0&quot;</td>
</tr>
<tr>
<td>GR-8A</td>
<td>8' - 3&quot;</td>
<td>5' - 0&quot;</td>
</tr>
<tr>
<td>GR-8B</td>
<td>3' - 1½&quot;</td>
<td>4' - 0&quot;</td>
</tr>
<tr>
<td>GR-BC</td>
<td>4' - 2&quot;</td>
<td>4' - 6&quot;</td>
</tr>
</tbody>
</table>

**FOR ROCK INSTALLATION, 8" X 24" X ½" 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 26B8 MAY BE SUBSTITUTED IF INTERCHANGEABLE WITH THE STANDARDS FOR GUARDRAIL (GR) OR MEDIAN BARRIER (MB) AND APPROVED BY THE ENGINEER.**

**POST SPACING ON CURVES**

<table>
<thead>
<tr>
<th>PAVEMENT § RADIUS</th>
<th>POST SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 220 FT. R</td>
<td>12' - 6&quot;</td>
</tr>
<tr>
<td>210 FT. - 111 FT.</td>
<td>8' - 3&quot;</td>
</tr>
<tr>
<td>110 FT. - 76 FT.</td>
<td>4' - 2&quot;</td>
</tr>
<tr>
<td>75 FT. - 50 FT.</td>
<td>3' - 1½&quot;</td>
</tr>
<tr>
<td>&lt; 50 FT.</td>
<td>USF. NOT RECOMMENDED</td>
</tr>
</tbody>
</table>

**2-SQUARE WASHERS REQUIRED EACH POST (SEE DETAIL THIS SHEET)**

**5/8" BOLT AND NUT (SEE DETAIL THIS SHEET)**

**5/8" DIAMETER HOLE FOR 1/4" SUPPORT BOLT 1/4" LONG; 2 NUTS, NO WASHER.**

**TYPICAL INSTALLATION**

* HEIGHT TOLERANCE : 3⁄8"
2016 ROAD & BRIDGE STANDARDS
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 27¾" MIN. - 28¾" 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.
SITE PREPARATION REQUIREMENTS FOR GR-9

1. The cross slope of the grade approaching the guardrail terminal, and adjacent to it, is flatter. If the existing grade is flat or is a positive slope due to the super elevation 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.

NOTES:

1. Precendence over this standard.

2. Suitable material as approved by the Engineer, at roadway shoulders.

3. See note 2.

4. See note 4.

5. See note 5.
GR-10

(2) 12'-6" SECTIONS OF W-BEAM EA HAVING A
SECTION NESTED INSIDE THE OTHER

DEGREE OF SKEW

TABLE OF MAXIMUM ALLOWABLE STRUCTURE
WIDTHS FOR THIS DESIGN

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

<table>
<thead>
<tr>
<th>TYPE</th>
<th>ONE POST Omitted</th>
<th>TWO POST Omitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKEW</td>
<td>MAX. PERPENDICULAR</td>
<td>MAX. PERPENDICULAR</td>
</tr>
<tr>
<td></td>
<td>WIDTH (FEET)</td>
<td>WIDTH (FEET)</td>
</tr>
<tr>
<td>0°</td>
<td>5°</td>
<td>10°</td>
</tr>
<tr>
<td>5°</td>
<td>10.5</td>
<td>5°</td>
</tr>
<tr>
<td>10°</td>
<td>12.2</td>
<td>10°</td>
</tr>
<tr>
<td>15°</td>
<td>13.9</td>
<td>15°</td>
</tr>
<tr>
<td>20°</td>
<td>15.5</td>
<td>20°</td>
</tr>
<tr>
<td>25°</td>
<td>17.2</td>
<td>25°</td>
</tr>
<tr>
<td>30°</td>
<td>18.9</td>
<td>30°</td>
</tr>
<tr>
<td>35°</td>
<td>20.6</td>
<td>35°</td>
</tr>
<tr>
<td>40°</td>
<td>22.2</td>
<td>40°</td>
</tr>
<tr>
<td>45°</td>
<td>23.9</td>
<td>45°</td>
</tr>
</tbody>
</table>

ELEVATION

TYPE II - TWO POSTS OMITTED

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.
GUARDRAIL AT LOW-FILL CULVERTS

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

NOTE: "A" is the minimum allowable distance between closest point of post to structure.

<table>
<thead>
<tr>
<th>Type III - Three Posts Omitted</th>
<th>Skew</th>
<th>A</th>
<th>Max. Perpendicular Width (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>9&quot;</td>
<td></td>
<td>23.00</td>
</tr>
<tr>
<td>5°</td>
<td>9&quot;</td>
<td></td>
<td>22.90</td>
</tr>
<tr>
<td>10°</td>
<td>9&quot;</td>
<td></td>
<td>22.60</td>
</tr>
<tr>
<td>15°</td>
<td>9&quot;</td>
<td></td>
<td>22.10</td>
</tr>
<tr>
<td>20°</td>
<td>9&quot;</td>
<td></td>
<td>21.40</td>
</tr>
<tr>
<td>25°</td>
<td>9&quot;</td>
<td></td>
<td>20.60</td>
</tr>
<tr>
<td>30°</td>
<td>9&quot;</td>
<td></td>
<td>19.60</td>
</tr>
<tr>
<td>35°</td>
<td>9&quot;</td>
<td></td>
<td>18.40</td>
</tr>
<tr>
<td>40°</td>
<td>9&quot;</td>
<td></td>
<td>17.10</td>
</tr>
<tr>
<td>45°</td>
<td>9&quot;</td>
<td></td>
<td>15.60</td>
</tr>
</tbody>
</table>

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. TWO NESTED W-BEAM GUARDRAILS, SEE TABLE FOR ALLOWABLE WIDTHS (25'-0" MAXIMUM).
5. TWO NESTED W-BEAM GUARDRAILS, CRT WOODPOST 6'-3" SPACING, WITH TWO 6"x8"x14" WOOD OR RECYCLED MATERIAL BLOCKOUTS.
6. 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.
ALL STRUCTURAL STEEL, INCLUDING BOLTS, NUTS, AND WASHERS SHALL BE GALVANIZED.

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.

DETAILS ON THIS SHEET ARE TO BE USED FOR BOTH STRAIGHT AND 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'-1½" 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 (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 OF THE SPECIFICATIONS. BR SERIES BARS SHALL BE 4½ IN SIZE.

END OF BOX CULVERT

ANCHOR BOLTS SHALL BE 1/2" 83207 (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 UNIT IS ONLY TO BE USED WHEN DESIGN SPEED IS 45 MPH OR LESS.

TESTED - NCHRP 350 TEST LEVEL 2

NOTE: MAINTAIN 6'-3" POST SPACING WHEREVER POSSIBLE FOR USE WITH 25' STANDARD RAIL SECTION. SYMMETRY OF POST SPACING IS NOT NECESSARY.
NOTES:
TUBULAR W-BEAM RAIL MEMBER IS TO BE FABRICATED FROM STANDARD 20 NOMINAL W-BEAM SECTIONS. TOP AND BOTTOM SEAMS SHALL BE BUTT WELDED 8" 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 SPICE ADDITIONAL POST MOUNTING SLOTS ARE TO BE MADE IN EACH MEMBER 1'-3" FROM THE STANDARD SLOTS AT 6'-3" CENTERS.

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

WASHER FOR 1" BOLT
4 SPACES AT 1'-6"
4 SPACES AT 3'-6"
MIN. 4 SPACES GR-2 OR TERMINAL END TREATMENT

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 1" GUARDRAIL BOLTS (LENGTH AS REQUIRED).
6. APPROPRIATE LENGTH 3/4 DIAMETER ASTM A449 HEX BOLTS WITH WASHERS MUST BE USED WITH THRU DRILLED HOLES AND A 1/2" 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 1" X 18 BOLT IS INSTALLED.
8. SEE SHEET 3 OF 3 FOR RUBRAIL BLOCKOUT DETAILS.

SECTION A-A
SECTION B-B
SECTION C-C

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

WASHER FOR 3/4" BOLT

2016 ROAD & BRIDGE STANDARDS
### 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**

See Sheet 3 of 3 for Bearing Plate Details

### 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 3/4" guardrail bolts (length as required).

6. Appropriate length 3/4" diameter ASTM A449 hex bolts with washers must be used with thru drilled holes and a 3/4" bearing plate on the back side of the bridge parapet or terminal wall.

7. See Sheet 3 of 3 for Rubrail Blockout Details

<table>
<thead>
<tr>
<th>Item</th>
<th>Material/Specifications/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3/8&quot; X 10&quot; Long Guardrail Bolt &amp; Recessed Nut</td>
</tr>
<tr>
<td>2</td>
<td>Std. W6X8.5 or W6X9 Steel Post</td>
</tr>
<tr>
<td>3</td>
<td>Standard W-Beam Terminal Connector</td>
</tr>
<tr>
<td>4</td>
<td>Standard W-Beam Rail</td>
</tr>
<tr>
<td>5</td>
<td>3/4&quot; X 2&quot; Long Guardrail Bolt &amp; Recessed Nut (See Standard GR-HDW)</td>
</tr>
<tr>
<td>6</td>
<td>Rectangular Plate Washer (See Std. GR-HDW)</td>
</tr>
<tr>
<td>7</td>
<td>Bent Plate Rubrail (See Sheet 3 of 3)</td>
</tr>
<tr>
<td>8</td>
<td>C6 X 8.2 Rubrail (See Sheet 3 of 3)</td>
</tr>
<tr>
<td>9</td>
<td>W8 X 13 X 7'-6&quot; Long Steel Post With Standard 6&quot; X 8&quot; X 14&quot; Long Treated Pine Block or Recycled Material</td>
</tr>
</tbody>
</table>

---

**W-Beam Guardrail - Fixed Object Attachment**

For use between vertical fixed objects and guardrail (steel posts)
**ITEM 7 DETAIL**

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.

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

**ITEM 8 DETAIL**

W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT (RUBRAIL AND HARDWARE DETAILS)

ROAD AND BRIDGE STANDARDS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

505

W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT

(RUBRAIL AND HARDWARE DETAILS)

ELEVATION
W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT

FOR USE BETWEEN SAFETY SHAPE AND GUARDRAIL (WOOD POSTS)

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 ½" 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 ½" ASTM A449 HEX BOLTS WITH WASHERS MUST BE USED WITH THRU DRILLED HOLES AND A ½" 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 ½" X 18 BOLT IS INSTALLED.
9. SEE SHEET 3 OF 3 FOR RUBRAIL BLOCKOUT DETAILS.

ITEM | MATERIAL/SPECIFICATIONS/NOTES
--- | ---
1 | ½" 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 | ½" 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 ½" BOLT
W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT
FOR USE WITH SAFETY SHAPE - (STEEL POSTS)

Virginia Department of Transportation

2016 ROAD & BRIDGE STANDARDS

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

Item | Material/Specifications/Notes
--- | ---
1 | STD W6 X 8.5 OR W6 X 9 STEEL POST W/ STD 6" X 6" X 14" LG TREATED PINE BLOCK OR RECYCLED MATERIAL
2 | STANDARD W-BEAM TERMINAL CONNECTOR
3 | STANDARD W-BEAM RAIL
4 | 3/4" X 2" LONG GUARDRAIL BOLT AND RECESS 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 | 3/4" X 10" LONG GUARDRAIL BOLT AND RECESS NUT
9 | WOOD BLOCKOUT FOR RUBRAIL (SEE SHEET 3 OF 3)
10 | W8 X 13 X 7-6" LG STEEL POST W/ STD 6" X 6" X 14" LG TREATED PINE BLOCK OR RECYCLED MATERIAL

NOTES:
1. FIXED OBJECTS MAY CONSIST OF SAFETY SHAPED BRIDGE PARAPETS OR CONCRETE BARRIERS.
2. BRIDGE RAIL ENDS AND BRIDGE PARAPETS MUST BE OF ADEQUATE STRENGTH TO ACCEPT FULL IMPACT LOADING.
3. GUARDRAIL COMPONENTS SHALL BE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE STANDARDS.
4. POSTS 1, 2, 3, 4, AND 5 REQUIRE AN ADDITIONAL HOLE TO ATTACH LOWER BLOCKS AND/OR RUBRAIL. RUBRAIL IS NOT BOLTED TO POSTS 2 AND 4.
5. BOTTOM WOOD BLOCKS LOCATED ON POSTS 1 THROUGH 4 ARE CENTER DRILLED AND SECURED WITH 3/4" 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 3/4" ASTM A449 HEX BOLTS WITH WASHERS MUST BE USED WITH THRU DRILLED HOLES AND A 3/4" 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, 2-GR-FOA-2, TYPE I
EXISTING BRIDGE ATTACHMENTS AS SHOWN ON PLANS.

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

Virginia Department of Transportation

2016 ROAD & BRIDGE STANDARDS
W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT

RUBRAIL AND HARDWARE DETAILS

BEARING PLATE

ITEM 10 DETAIL

ITEM 7 DETAIL

ITEM 8 DETAIL

RUBRAIL BLOCKOUT 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.

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

Virginia Department of Transportation

2016 ROAD & BRIDGE STANDARDS

Sheet 3 of 3
Revision Date 01/14

501.30

2016 ROAD & BRIDGE STANDARDS
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)

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 rubber rail. 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 3/4" guardrail bolts (length as required).
5. Appropriate length 3/8" 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.

A copy of the original sealed and signed drawing is on file in the central office.
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

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

ITEM 8 DETAIL

DRILL THRU 3/8" DIA. HOLE (TYP. 6 PLACES)

W BEAM TERMINAL CONNECTOR (MOD.)

BLOCKED-OUT W-BEAM MEDIAN BARRIER
FIXED OBJECT ATTACHMENT
(RUBRAIL AND HARDWARE DETAILS)

2016 ROAD & BRIDGE STANDARDS
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 3/8" dia. hex head machine bolts with beveled washers and self-locking nuts.

3. For two-way traffic design, use run-on end transition (Type II).

4. Run off (Type I) 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.

SECTION D-D

RUN ON END TRANSITION

SAFETY-SHAPE BRIDGE PARAPET OR CONCRETE BARRIER SERVICE

SEE NOTE 1

FINISHED GRADE

27½" MIN. 28½" MAX.

W-BEAM GUARDRAIL INSTALLATION CRITERIA
FIXED OBJECT ATTACHMENT METHODS FOR CONSTRUCTION ZONES

VIRGINIA DEPARTMENT OF TRANSPORTATION
W-BEAM GUARDRAIL INSTALLATION CRITERIA

TYPICAL SECTION

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.

SECTION E-E

NOTES:
1. DISTANCE "A" MUST BE GREATER THAN REQ'D CLEAR ZONE.
2. DISTANCE "B" IS LESS THAN REQ'D CLEAR ZONE.
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 501.3+ IF BACK OF GUARDRAIL FROM THE OPPOSING LANES IS WITHIN THE REQUIRED CLEAR ZONE.

DETAIL OF GUARDRAIL AT DUAL BRIDGES

W-BEAM GUARDRAIL INSTALLATION CRITERIA

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
221
505

ROAD AND BRIDGE STANDARDS
REVISION DATE SHEET 2 OF 8
501.35
W BEAM GUARDRAIL INSTALLATION CRITERIA

NOTE:
If ground level or underground fixed object necessitates the elimination of one or more posts, a GR-10 or a special design will be required.

ONE OR MORE POSTS AS REQUIRED TO AVOID OBJECT

COST OF ADDITIONAL BLOCKOUT BRACKETS TO BE INCLUDED IN PRICE BID PER LINEAR FOOT OF GUARDRAIL.

SECTION D-D

DETAIL OF MULTIPLE BLOCK-OUT TO AVOID UNDERGROUND OR LOW PROFILE OBSTRUCTION

2016 ROAD & BRIDGE STANDARDS

W VDOT
ROAD AND BRIDGE STANDARDS
REVISED DATE
501.36

2016 ROAD & BRIDGE STANDARDS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
REFERENCE
221
505
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 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

<table>
<thead>
<tr>
<th>TRAFFIC</th>
<th>W-2'</th>
<th>W-3'</th>
<th>W-4'</th>
<th>W-5'</th>
<th>W-6'</th>
<th>W-7'</th>
<th>W-8'</th>
<th>W-9'</th>
<th>W-10'</th>
<th>W-11'</th>
<th>W-12'</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN ON</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RUN OFF</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RUN ON</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RUN OFF</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RUN ON</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RUN OFF</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RUN ON</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RUN OFF</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RUN ON</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RUN OFF</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RUN ON</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RUN OFF</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**W-BEAM GUARDRAIL INSTALLATION CRITERIA**

**2016 ROAD & BRIDGE STANDARDS**
**TABLE I**

**Normal Guardrail Location—Through Traffic Lanes Left of Traffic**

<table>
<thead>
<tr>
<th>Total Shoulder Width (S)</th>
<th>Paved Shoulder Width (P₀)</th>
<th>Offset from Edge of Travelled Way to Face of Guardrail (O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17'</td>
<td>12'</td>
<td>14'</td>
</tr>
<tr>
<td>15'</td>
<td>3', 4', or 10'</td>
<td>12'</td>
</tr>
<tr>
<td>13'</td>
<td>3', 4', or 8'</td>
<td>10'</td>
</tr>
<tr>
<td>11'</td>
<td>3' or 4'</td>
<td>8'</td>
</tr>
<tr>
<td>9'</td>
<td>3' or 4'</td>
<td>6'</td>
</tr>
<tr>
<td>8'</td>
<td>3' or 4'</td>
<td>5'</td>
</tr>
<tr>
<td>7'</td>
<td>0 or 2'</td>
<td>4'</td>
</tr>
<tr>
<td>5'</td>
<td>0</td>
<td>2'</td>
</tr>
</tbody>
</table>

**TABLE II**

**Normal Guardrail Location—Through Traffic Lanes Right of Traffic**

<table>
<thead>
<tr>
<th>Total Shoulder Width (S)</th>
<th>Paved Shoulder Width (P₀)</th>
<th>Offset from Edge of Travelled Way to Face of Guardrail (O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17'</td>
<td>12'</td>
<td>14'</td>
</tr>
<tr>
<td>15'</td>
<td>6' or 10'</td>
<td>12'</td>
</tr>
<tr>
<td>13'</td>
<td>8'</td>
<td>10'</td>
</tr>
<tr>
<td>11'</td>
<td>3', 4', or 6'</td>
<td>8'</td>
</tr>
<tr>
<td>9'</td>
<td>0, 3', or 4'</td>
<td>6'</td>
</tr>
<tr>
<td>8'</td>
<td>0 or 3'</td>
<td>5'</td>
</tr>
<tr>
<td>7'</td>
<td>0 or 2'</td>
<td>4'</td>
</tr>
<tr>
<td>5'</td>
<td>0</td>
<td>2'</td>
</tr>
</tbody>
</table>

**Note:**
- Paved shoulder widths shown are minimum.
- The paved shoulder may be extended to the edge of the rail. The extended 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**

1. **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.

2. **Guardrail Location on Recoverable Slope**
   - Shoulder hinge point: 12’ minimum.
   - Recoverable area: 6:1 slope.

3. **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.

4. **Shoed Shoulder Widths shown are minimum**
   - Shoulder may be extended to the edge of the rail.

5. **Table I**
   - Normal Guardrail Location—Through Traffic Lanes Left of Traffic.

6. **Table II**

**Reference:**
- A Copy of the original sealed and signed drawing is on file in the central office.

**Specification Reference:**
- 221
- 505

**Virginia Department of Transportation**

**2016 Road & Bridge Standards**
TRANSITION FROM WEAK POST (STANDARD GR-8) GUARDRAIL TO FIXED OBJECT

TRANSITION FROM FIXED OBJECT TO WEAK POST (STANDARD GR-8) GUARDRAIL

TRANSITION FROM WEAK POST (STANDARD GR-8) TO STRONG POST (STANDARD GR-2) GUARDRAIL

W-BEAM GUARDRAIL INSTALLATION CRITERIA
STANDARD MB-3 POST SPACING IS 6'-3".

W BEAM BACK UP PLATE, AND ASSOCIATED HARDWARE SEE SHEET NO. 501.01.

POST, AND BLOCKOUTS ARE TO BE GALVANIZED.

BOLT ALL HOLES IN POST AND BRACKET TO STEEL POST

METHOD OF TREATMENT AT BRIDGE PIER OR MEDIAN OBSTRUCTION

IMPACT ATTENUATOR, CAT, BRAKEMASTER OR STANDARD GR-HDW W BEAM END SECTION (BUFFER). (BUFFER END SECTION MAY ONLY BE USED WHEN LOCATED OUTSIDE OF CLEAR ZONE.)

FLARE RATES

<table>
<thead>
<tr>
<th>DESIGN SPEED</th>
<th>INSIDE SHY LINE FLARE RATE</th>
<th>BEYOND SHY LINE FLARE RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPH</td>
<td>5'</td>
<td>4.5'</td>
</tr>
<tr>
<td>70</td>
<td>9'</td>
<td>30/1</td>
</tr>
<tr>
<td>60</td>
<td>8'</td>
<td>26/1</td>
</tr>
<tr>
<td>50</td>
<td>6.5'</td>
<td>21/1</td>
</tr>
<tr>
<td>40</td>
<td>5'</td>
<td>16/1</td>
</tr>
<tr>
<td>30</td>
<td>4'</td>
<td>13/1</td>
</tr>
</tbody>
</table>

SUGGESTED MAXIMUM FLARE RATE FOR SEMI-RIGID BARRIER SYSTEMS.

FOR USE WHEN REPAIRING DAMAGED GUARDRAIL CONTAINING STEEL BLOCKOUTS.

NOTE:

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.

NOTES:

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

IMPACT ATTENUATOR, CAT, BRAKEMASTER OR STANDARD GR-HDW W BEAM END SECTION (BUFFER). (BUFFER END SECTION MAY ONLY BE USED WHEN LOCATED OUTSIDE OF CLEAR ZONE.)
**2016 ROAD & BRIDGE STANDARDS**

**MB-5**

**SQUARE WASHER**

**5/16" HEX BOLT AND NUT**

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

**ROUND WASHER**

2 SQUARE WASHERS

3/8" X 2 3/4"

LONG HEX. BOLT

W-BEAM RAIL

W-BEAM BACK UP PLATE

S3 X 5.7 POST FLANGE

GUARDRAIL POST CONNECTION DETAIL

**TYPICAL INSTALLATION**

- **HEIGHT TOLERANCE** : 1/4"

- SUPPORT BOLT TO BE LOCATED UNDER BOTH RAIL BEAMS.

- 2-SQUARE WASHERS REQUIRED EACH POST (SEE DETAIL THIS SHEET)

- 3/8" BOLT AND NUT (SEE DETAIL THIS SHEET)

**NOTES:**

- STANDARD MB-5 POST SPACING IS 12"-6"
- STANDARD MB-5A POST SPACING IS 6"-3"
- STANDARD MB-5B POST SPACING IS 3"-1/2"
- STANDARD MB-5 DEFLECTION IS 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.

**S3X5.7 STEEL POST**

**STANDARD W-BEAM MEDIAN BARRIER**

(WEAK POST SYSTEM)

TL-3 (>45 MPH)

VIRGINIA DEPARTMENT OF TRANSPORTATION

**SPECIFICATION REFERENCE**

221

505

**ROAD AND BRIDGE STANDARDS**

REVISION DATE

SHEET 1 OF 2

502.02
TREATMENT FOR MEDIAN BARRIER CROSS-OVER

TRANSITION FROM WEAK POST
AS PER STANDARD GR-INS SHEET B OF 8

TRAFFIC →

MEDIAN OPENING 20' (TYPICAL)

AN APPROVED IMPACT ATTENUATOR
CAT OR BRAKEMASTER

ST'D. MB-5
4 SPACES @ 6'-3"
ST'D. MB-5A

ST'D. MB-5B
8 SPACES @ 3'-11/2"

ST'D. MB-3
5 SPACES @ 6'-3"

STANDARD W-BEAM MEDIAN BARRIER
(WEAK POST SYSTEM)
NOTES:

F 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 CONFLICT 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.

CONCRETE MEDIAN BARRIER
**Plan View**

**Elevation View**

**Section A-A**

**Notes:**
1. At the option of the manufacturer, additional reinforcing may be added to the precast concrete barrier for handling.
2. Concrete shall be 4000 P.S.I. minimum.
3. Barrier delineator size, color and spacing shall be in accordance with the specifications.
4. Cost of delineator shall be included in the price bid for traffic barrier service.
5. Other precast traffic barrier service concrete designs that have been approved by VDOT as an acceptable alternate to the standard design may be substituted.
6. A "radius may be used as an alternate for the 1/3" chamfer.
7. Barrier delineator reflective surface in all instances shall be facing oncoming traffic.

**Flare Rates**

<table>
<thead>
<tr>
<th>Design Speed (MPH)</th>
<th>Inside Shy Line</th>
<th>Beyond Shy Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>10' 30:1</td>
<td>20:1</td>
</tr>
<tr>
<td>60</td>
<td>8' 26:1</td>
<td>18:1</td>
</tr>
<tr>
<td>50</td>
<td>6.5' 21:1</td>
<td>14:1</td>
</tr>
<tr>
<td>40</td>
<td>5' 16:1</td>
<td>10:1</td>
</tr>
<tr>
<td>30</td>
<td>3.5 13:1</td>
<td>8:1</td>
</tr>
</tbody>
</table>

* Suggested maximum flared rate for rigid barrier systems.

**When using VDOT standard MB-7D PC with the pin and loop positive connection, allow for a 5'-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.
1. 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.
DOWELS 5, LENGTH 12"

POROUS BACKFILL

SEE ST'D. RW-3 FOR ALL DETAILS OF POROUS BACKFILL WEEP HOLES AND RELATED ITEMS.

BARS A @ 12" C-C

BARS A-1 @ 12" C-C

TOE 18"

DENOTES FINISHED GRADE ELEVATION COMPACTED.

WATERSTOP GREATER THAN 1'-0" VARIES MAX. 2'-0"

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

MB-7D BARRIER FACE

xx DENOTES FINISHED GRADE ELEVATION

FOUNDATION MATERIAL UNDER MEDIAN BARRIER IS TO BE COMPACTED.

FLARE RATES

<table>
<thead>
<tr>
<th>MPH</th>
<th>SHY LINE</th>
<th>BEYOND SHY LINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>10&quot;</td>
<td>30 : 1</td>
</tr>
<tr>
<td>60</td>
<td>8&quot;</td>
<td>26 : 1</td>
</tr>
<tr>
<td>50</td>
<td>6.5&quot;</td>
<td>21 : 1</td>
</tr>
<tr>
<td>40</td>
<td>5&quot;</td>
<td>16 : 1</td>
</tr>
<tr>
<td>30</td>
<td>3.5&quot;</td>
<td>13 : 1</td>
</tr>
</tbody>
</table>

* MAXIMUM FLARE RATE FOR RIGID BARRIER SYSTEMS.

SECTION A-A (FOUNDATION NOT SHOWN)

SECTION B-B (STD. MB-7E)

CONCRETE MEDIAN BARRIER

TYPE I, II OR III

VIRGINIA DEPARTMENT OF TRANSPORTATION

2016 ROAD & BRIDGE STANDARDS
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 I AND II BARRIERS.

FOR DETAILS OF HOW JOINTS ARE TO BE FORMED & WATER STOP DETAILS SEE STD. 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.

PERMISSIBLE CONSTRUCTION JOINT TO BE BONDED IN STRICT ACCORDANCE WITH SECTION 404 OF THE CURRENT VDOT ROAD AND BRIDGE Specs.

Measurement and Payment

Median barrier MB-BA 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 AJ 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.

Reinforcing Steel Schedule

<table>
<thead>
<tr>
<th>Panel</th>
<th>No.</th>
<th>Length</th>
<th>No.</th>
<th>Length</th>
<th>No.</th>
<th>Length</th>
<th>No.</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>20</td>
<td>4'-0&quot;</td>
<td>20</td>
<td>4'-0&quot;</td>
<td>9</td>
<td>19'-8&quot;</td>
<td>40</td>
<td>1'-0&quot;</td>
</tr>
<tr>
<td>Type II</td>
<td>20</td>
<td>4'-0&quot;</td>
<td>20</td>
<td>4'-0&quot;</td>
<td>9</td>
<td>19'-8&quot;</td>
<td>40</td>
<td>1'-0&quot;</td>
</tr>
<tr>
<td>Type III</td>
<td>20</td>
<td>4'-0&quot;</td>
<td>20</td>
<td>4'-0&quot;</td>
<td>9</td>
<td>19'-8&quot;</td>
<td>40</td>
<td>1'-0&quot;</td>
</tr>
</tbody>
</table>

Concrete Median Barrier

Type I, II or III

Virginia Department of Transportation

2016 ROAD & BRIDGE STANDARDS
**Cast In Place Concrete Median Barrier**

**12 Ft. Terminal Section**

**Virginia Department of Transportation**

---

**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.

---

**Basis of Payment:** Concrete median barrier 12' terminal section is to be measured and paid for in lin. ft. std. MB-70, or lin. ft. of traffic barrier service concrete.

---

**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.

---

**SECTION C-C**
- Class C-1 concrete may be used below construction joint if base is poured separately.

---

**Optional Construction Joint**

---

**Isometric View**
- Alternate Top
PLAN 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.

CONCRETE 4000 P.S.I. MIN.

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

ELEVATION VIEW

4" x 4" - W4 x W4 WELDED WIRE FABRIC OR EQUIVALENT REQUIRED FOR HANDLING.

CONCRETE TO BE 4000 P.S.I.

REINFORCING STEEL TO BE GRADE 60.

ALL REINFORCING IS TO HAVE A MINIMUM CONCRETE COVER OF 3/4".

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.
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 ¾" 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 ¾" 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.

2016 ROAD & BRIDGE STANDARDS

TRAFFIC BARRIER SERVICE CONCRETE PARAPET
(DOUBLE FACE)
(FOR TEMPORARY INSTALLATION ON BRIDGE DECK EXTERIOR)

SECTION A-A
END VIEW
ALTERNATE SLOT DETAIL
ALTERNATE TOP

2016 ROAD & BRIDGE STANDARDS
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 LINEAL 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.
8. FOR POSITIVE CONNECTION DETAILS AND DIMENSIONS SEE STANDARD MB-INS.

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

ALL ENDS OPTIONAL CHAMFER
(1/2" x 1/2"

3/4" x 3/4" x 1/2" SQUARE WASHER
(A36 OR A572) WITH 3/4" 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.

TRAFFIC BARRIER SERVICE CONCRETE PARAPET
(DOUBLE FACE)
(FOR TEMPORARY INSTALLATION ON BRIDGE DECK EXTERIOR)

SPECIFICATION
REFERENCE
105
512

ROAD AND BRIDGE STANDARDS
REVISION DATE
01/09
SHEET 2 OF 3
502.14
STAKE LOCATIONS WHEN STAKING STANDARD MB-11A, NOT TO BE USED ON BRIDGE DECKS.
4 PER PRECAST UNIT.
1 AT EACH CORNER.

10'-0" AND 20'-0" VDOT STANDARD MB-11A
FOR PROPRIETARY MB-11A LENGTHS, REFER TO MANUFACTURER

2'-7" NOMINAL DRAINAGE SLOT

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.

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.

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)

FOR CONC. PAVEMENT PRE-DRILL HOLES
ASPHALT CONC. PAVEMENT, COMPACTED BASE MATERIAL, CONCRETE PAVEMENT, OR ASPHALT OVER CONCRETE PAVEMENT:
1'-0" MIN. BEYOND EACH SIDE OF BARRIER.

1" Ø X 24" GALV. A36 STEEL STAKE.
4 PER PRECAST UNIT. 1 AT EACH CORNER. SEE NOTE 3.

4'-0" MIN.

SEE NOTE 2
CONCRETE MEDIAN BARRIER (TALL WALL)

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.
NOTES:

IF THE CONTRACTOR ELECTS TO USE THE OPTIONAL CONSTRUCTION METHOD, 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 CONFORM 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 DELINERATOR SIZE, COLOR AND SPACING SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS. COST OF DELINERATOR SHALL BE INCLUDED IN THE PRICE BID FOR MEDIAN BARRIER. REFLECTIVE SURFACE OF BARRIER DELINERATOR, IN ALL INSTANCES, SHALL BE FACING THE ONCOMING TRAFFIC.

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

DEPTH OF CONCRETE BASE MAY BE EXTENDED AT THE CONTRACTOR'S OPTION TO CONFORM 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**

<table>
<thead>
<tr>
<th>DESIGN SPEED (MPH)</th>
<th>SHY LINE INSIDE SHY LINE FLARE RATE</th>
<th>FLARE RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>10'</td>
<td>30'</td>
</tr>
<tr>
<td>60</td>
<td>8'</td>
<td>26'</td>
</tr>
<tr>
<td>50</td>
<td>6.5'</td>
<td>21'</td>
</tr>
<tr>
<td>40</td>
<td>5'</td>
<td>16/1</td>
</tr>
<tr>
<td>30</td>
<td>3.5'</td>
<td>13/1</td>
</tr>
</tbody>
</table>

* SUGGESTED MAXIMUM FLARE RATE FOR Rigid BARRIER SYSTEMS.

**AGGREGATE**

- 68, 78, 8, or local material available within the limits of project consisting of coarse sand, sandy loam, sandy gravel, or crushed glass meeting 78 or 8 gradation requirements.

**CONCRETE MEDIAN BARRIER (TALL WALL)**

2016 ROAD & BRIDGE STANDARDS
**CONCRETE MEDIAN BARRIER**

**TYPE I, II OR III**

**BENDING DIAGRAM**

- BARS A
  - DO NOT USE BENT BARS A
  - WITHIN LIMITS OF DROP INLETS.

**MEASUREMENT AND PAYMENT**

MEDIAN BARRIER MB-13 TYPE I, II OR III

WILL BE PAID FOR AT THE CONTRACT UNIT PRICE PER LIN. FT., WHICH SHALL BE FULL COMPENSATION FOR FURNISHING AND INSTALLING CLASS A 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**

<table>
<thead>
<tr>
<th>PANEL</th>
<th>NO. LENGTH</th>
<th>NO. LENGTH</th>
<th>NO. LENGTH</th>
<th>NO. LENGTH</th>
<th>NO. LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE I</td>
<td>2</td>
<td>19'-8&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TYPE II</td>
<td>20</td>
<td>5'-10&quot;/4&quot;</td>
<td>20</td>
<td>5'-6&quot;</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19'-8&quot;</td>
<td>40</td>
<td>1'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>TYPE III</td>
<td>20</td>
<td>5'-10&quot;/4&quot;</td>
<td>20</td>
<td>5'-6&quot;</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19'-8&quot;</td>
<td>40</td>
<td>1'-0&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**SPECIFICATION REFERENCE**

105
404
502
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 I AND III BARRIERS.

FOR DETAILS OF HOW JOINTS ARE TO BE FORMED & WATER STOPS SEE STD. 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 II OR III.

② MAXIMUM FLARE RATE FOR RIGID BARRIER SYSTEMS.

<table>
<thead>
<tr>
<th>- FLARE RATES</th>
</tr>
</thead>
<tbody>
<tr>
<td><em><strong>DESIGN SPEED</strong></em></td>
</tr>
<tr>
<td>MPH</td>
</tr>
<tr>
<td>70</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>30</td>
</tr>
</tbody>
</table>
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-7D PC.

3. FOR DIMENSIONS NOT SHOWN, REFER TO STDS. MB-7D PC AND MB-10A.

PLAN OF POSITIVE CONNECTION

ELEVATION OF POSITIVE CONNECTION
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 (TBSC 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-70 PC.

3. FOR DIMENSIONS NOT SHOWN, REFER TO STD.
   MB-70 PC AND MB-10A.

20'-0" MIN. TRAFFIC BARRIER SERVICE CONCRETE LATERAL SUPPORT
FULL LENGTH OF TBSC LATERAL SUPPORT WITH SAND BAGS

PLAN VIEW
METHOD B

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

VINRGINIA 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.
**STANDARD FENCE**

**WOVEN WIRE FABRIC**

**VIRGINIA DEPARTMENT OF TRANSPORTATION**

**ROAD AND BRIDGE STANDARDS**

**SHEET 1 OF 1**

**503.02**

**REVISION DATE**

**7/13**

**507**

**242**

**236**

**METHOD OF ATTACHING ANGLE BRACES TO STRETCHER POSTS**

**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"
- FOR USE IN LIEU OF SETTING POSTS IN CONCRETE DEVICES SHOWN ARE REPRESENTATIONAL ONLY SEE GENERAL NOTES.
- METAL LINE POST
- ALTERNATE ANCHOR DEVICES

**REFERENCE**

**SPECIFICATION**

**2016 ROAD & BRIDGE STANDARDS**
WOOD POST

- L2\(\frac{1}{2}\)x2\(\frac{1}{2}\)x4\(\frac{1}{4}\) POST WITH L2\(\times\)2\(\times\)\(\frac{3}{4}\)x7-0"
- BRACES OR 2\(\frac{1}{2}\) O.D. POST @ 3.65±5% LBS./FT.
- WITH 1 \(\frac{1}{4}\) O.D. BRACES @ 2.27 ±5% LBS./FT.

METAL POST

- L2\(\times\)2\(\times\)\(\frac{3}{4}\)
- TO BE CUT TO FIT AROUND L2\(\times\)2\(\times\)\(\frac{3}{4}\)
- L2\(\frac{1}{4}\)x2\(\frac{1}{4}\)x4 2" LONG BRACKET BOLTED TO BRACKET POST

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.
- METAL LINE POST

METHOD OF ATTACHING ANGLE BRACES TO STRETCHER POSTS

- ALTERNATE
- ALTERNATE ANCHOR DEVICES

STANDARD FENCE

BARBED WIRE

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
REFERENCE
242
507
236

ROAD AND BRIDGE STANDARDS

REVISION DATE
503.03

SHEET 1 OF 1

2016 ROAD & BRIDGE STANDARDS
**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.

**GROUND LINE**

- CONCRETE FOOTING
- LINE POST
- CONCRETE FOOTING
- LINE POST
- CONCRETE FOOTING
- LINE POST

**MINIMUM PIPE SIZES O.D.**

<table>
<thead>
<tr>
<th>POST TYPE</th>
<th>MINIMUM PIPE SIZES O.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINE POST</td>
<td>2.575&quot;</td>
</tr>
<tr>
<td>END/CORNER POST</td>
<td>2.875&quot;</td>
</tr>
<tr>
<td>GATE POST (SINGLE SWING)</td>
<td>2.875&quot;</td>
</tr>
<tr>
<td>GATE POST (SINGLE SWING)</td>
<td>4.000&quot;</td>
</tr>
<tr>
<td>GATE POST (DOUBLE SWING)</td>
<td>2.875&quot;</td>
</tr>
<tr>
<td>BRACE</td>
<td>1.66&quot;</td>
</tr>
<tr>
<td>GATE FRAME</td>
<td>1.90&quot;</td>
</tr>
</tbody>
</table>

**GATE POST**

- GATE POST
- 1" MIN. O.D.
- GROUND LINE

**SINGLE SWING GATE**

- 1/2" MIN. ROUND ROD
- VAR. 3', 5', 6', 8', 10'
- CONCRETE FOOTING
- 14" 14"

**DOUBLE SWING GATE**

- GATE POST
- 1/2" MIN. ROUND ROD
- VAR. 10', 12', 14'
- CONCRETE FOOTING
- 12"

**STANDARD FENCE**

**CHAIN LINK**

**C-HD**

**REFERENCE**

**SPECIFICATION REFERENCE**

- 242
- 507
METAL GATE - METAL POSTS - WOVEN WIRE

WOOD GATE - WOOD POSTS - WOVEN WIRE

WOOD GATE - WOOD POSTS - BARBED WIRE

METAL GATE - WOOD POSTS - WOVEN WIRE

WOOD GATE

* 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.

- BRACES ARE TO BE BOLTED AT EXTREMITIES AND INTERSECTIONS WITH A MIN. OF (2) 3/4" 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-154 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.

**SUGGESTED HINGE ASSEMBLY**

**Hinge Bolt**
(2 Req’d)

**Curved to fit dia. of bolt hinge.**

**Hinge Clamp**
(2 Req’d)

**Curved to fit dia./of frame.**

**2016 ROAD & BRIDGE STANDARDS**
COMPRESSION CONNECTOR SUITABLE FOR COPPER AND ALUMINUM.

FOR CHAIN LINK FENCE GROUNDING, SEE DETAIL BELOW.

GROUND ELECTRODE 8 MINIMUM CONTACT WITH SOIL

ELEVATION

GROUND 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 HANDBRAIL FENCES WILL BE GROUNDED ONLY WHEN INDICATED ON THE PLANS OR AS RECOMMENDED BY THE ENGINEER.

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

CAST BRONZE PLAIN FINISH

COPPER GROUNDING CONDUCTOR

RAILING POST

DRILL & TAP COPPER BOLT

COPPER LUG

ALTERNATE

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.

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

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

MINIMUM CLEARANCE 1"

GROUND LINE

FORWARD 3200 P.S.I. MINIMUM CONCRETE

12" MAX.

4 #3 STEEL RODS 3'-0" LONG

W 4 WIRE

4"

V DOT

NOTES:

THE LETTERS "V DOT" 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

WIRES ON ALL 4 SIDES WELDED TO ALL 4 BARS.

WIRES ON 3 SIDES WELDED TO ALL 4 BARS.

ALL LETTERING TO BE 1/4" STANDARD FOUNDRY LETTERS.

GUARD STAKE

HUB TO BE ACCURATELY SET BY SURVEY PARTY.

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 TRUE IN HUB TOPS OF STAKES TO BE MORE THAN 9" ABOVE GROUND AT MONUMENT.

RIGHT-OF-WAY MONUMENTS

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.

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

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

503

2016 ROAD & BRIDGE STANDARDS
CAP TO BE SET FLUSH WITH GROUND LINE

STEEL PIN OR REINFORCING BAR

1.5" "Diameter for use with metal caps.
0.75" "Diameter for use with plastic caps.

LANDOWNER SIDE

RW LINE

HIGHWAY SIDE

NOTES:
Locator post to be U-type rolled rail steel @ 2 lbs./ft. for aluminum alloy 6063-T6 @ 0.78 lbs./ft., in accordance with the specifications.
Steel posts to be galvanized in accordance with ASTM A123.
Locator post and pin to be set by the survey party at the time of original staking.

PIN TO BE ACCURATELY SET BY SURVEY PARTY AND CAP PUNCHED TO INDICATE R/W LINE.

R/W LINE

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.

2016 ROAD & BRIDGE STANDARDS
THIS PAGE INTENTIONALLY LEFT BLANK
NOTES

1. DESIGN SHOWN IS REPRESENTATIONAL ONLY. SEE MANUFACTURER'S DRAWINGS FOR COMPONENTS AND INSTALLATION INSTRUCTIONS.

2. IMPACT ATTENUATOR SHALL BE SELECTED FROM VDOT'S PROVISIONALLY APPROVED MASH LIST. ALL UNITS MUST HAVE SUCCESSFULLY PASSED THE MASH 2016 TL-3 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. 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.

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 STD. IA-1 IMPACT ATTEN. (TL-3 > 40 MPH DES.SP.) EACH

ROAD AND BRIDGE STANDARDS
REVISION DATE 12/18
SHEET 1 OF 3

105
221
505
122

IMPACT ATTENUATOR
TYPE 1 RE-DIRECTIVE PERMANENT INSTALLATION (TL-3 > 40 MPH)
VIRGINIA DEPARTMENT OF TRANSPORTATION
MASH 2016
**PLAN VIEW**

**TRAFFIC**

VARIABLE BASED ON MANUFACTURER

VARIABLE BASED ON MANUFACTURER

VARIABLE 4' MIN.

VARIABLE BASED ON MANUFACTURER

VARIABLE BASED ON MANUFACTURER

VARIABLE 4' MIN.

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.

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)**

MASH 2016

VIRGINIA DEPARTMENT OF TRANSPORTATION

**2016 ROAD & BRIDGE STANDARDS**
SITE PREPARATION REQUIREMENTS FOR IMPACT ATTENUATOR ON A SHOULDER

IMPACT ATTENUATOR

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

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

2016 ROAD & BRIDGE STANDARDS

VIRGINIA DEPARTMENT OF TRANSPORTATION

MASH 2016

2016 ROAD & BRIDGE STANDARDS

VIRGINIA DEPARTMENT OF TRANSPORTATION

MASH 2016

2016 ROAD & BRIDGE STANDARDS

VIRGINIA DEPARTMENT OF TRANSPORTATION

MASH 2016

2016 ROAD & BRIDGE STANDARDS

VIRGINIA DEPARTMENT OF TRANSPORTATION

MASH 2016

2016 ROAD & BRIDGE STANDARDS

VIRGINIA DEPARTMENT OF TRANSPORTATION

MASH 2016

2016 ROAD & BRIDGE STANDARDS

VIRGINIA DEPARTMENT OF TRANSPORTATION

MASH 2016

2016 ROAD & BRIDGE STANDARDS

VIRGINIA DEPARTMENT OF TRANSPORTATION

MASH 2016

2016 ROAD & BRIDGE STANDARDS

VIRGINIA DEPARTMENT OF TRANSPORTATION

MASH 2016

2016 ROAD & BRIDGE STANDARDS

VIRGINIA DEPARTMENT OF TRANSPORTATION

MASH 2016

2016 ROAD & BRIDGE STANDARDS

VIRGINIA DEPARTMENT OF TRANSPORTATION

MASH 2016
NOTES

1. DESIGN SHOWN IS REPRESENTATIONAL ONLY, SEE MANUFACTURER’S DRAWINGS FOR COMPONENTS AND INSTALLATION INSTRUCTIONS.

2. IMPACT ATTENUATOR SHALL BE SELECTED FROM VDOT’S PROVISIONALLY APPROVED MASH LIST. ALL UNITS MUST HAVE SUCCESSFULLY PASSED THE MASH 2016 TL-2 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 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.

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

ITEM CODE 13606 STD. IA-2 IMPACT ATTEN. (TL-2, < 40 MPH DES.SP.) EACH
**Impact Attenuator**

**Type 1 Re-directive Permanent Installation (TL-2 < 40 MPH)**

**Plan View**

- **Bi-directional**
- **Unidirectional**

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.

*Sub-base to be compacted under conc. foundation.*

*A copy of the original sealed and signed standard drawing is on file in the central office.*

**Specifications Reference**

- VDOT 105
- VDOT 221
- VDOT 509
- VDOT 512

**Road and Bridge Standards**

**Sheet 2 of 2**

**Revision Date**

12/18
NOTES

1. DESIGN SHOWN IS REPRESENTATIONAL ONLY, SEE MANUFACTURER’S DRAWINGS FOR COMPONENTS AND INSTALLATION INSTRUCTIONS.

2. IMPACT ATTENUATOR SHALL BE SELECTED FROM VDOT’S PROVISIONALLY APPROVED MASH LIST FOR TYPE I RE-DIRECTIVE LOW MAINTENANCE CATEGORY. ALL UNITS MUST HAVE SUCCESSFULLY PASSED MASH 2016 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 I 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.
IMPACT ATTENUATOR

LOW MAINTENANCE TYPE 1 RE-DIRECTIVE IMPACT ATTENUATOR
(TL-3 ≥ 40 MPH)

VIRGINIA DEPARTMENT OF TRANSPORTATION
ROAD AND BRIDGE STANDARDS

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

2016 ROAD & BRIDGE STANDARDS

MASH 2016

VDO-T ROAD AND BRIDGE STANDARDS

SHEET 2 OF 2

REVISION DATE

12/18

SPECIFICATION
REFERENCE
SECTION THRU RAIL ELEMENT AND W BEAM BACK-UP PLATE

DETAIL OF MID-SPAN SPLICE JOINT

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

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

L= 1/4" FOR SPLICE BOLT-FULL LENGTH THREADS
L= 2" FOR SPLICE BOLT-FULL LENGTH THREADS ON NESTED W BEAMS.
L= 14" FOR STEEL POST WITH 12" BLOCKOUT BOLT-1/2" MIN. THREADS
L= 18" FOR STEEL POST WITH 16" BLOCKOUT DEPTH BOLT-2" MIN. THREADS
L= 26" FOR STEEL POST WITH 24" BLOCKOUT DEPTH BOLT-2" MIN. THREADS

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

MGS STANDARD GUARDRAIL HARDWARE

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
REFERENCE

221
505

ROAD AND BRIDGE STANDARDS
REVISED DATE
NEW 02/17

2016 ROAD & BRIDGE STANDARDS
506.01
W BEAM TERMINAL CONNECTOR

STANDARD 12'-6" W-BEAM SECTION

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

W BEAM END SECTION (BUFFER)

STANDARD 25' W-BEAM SECTION

W BEAM END SECTION (ROUNDED)
ASYMPTOMATIC TRANSITION SECTION DETAIL (W-BEAM TO THRIE BEAM)

SYMMETRICAL TRANSITION SECTION DETAIL (W-BEAM TO THRIE BEAM)

SECTION THRU THRIE BEAM RAIL ELEMENT

THRIE BEAM TERMINAL CONNECTOR DETAIL

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

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

2. FOR DETAILS OF POST AND BLOCKOUTS SEE SHEET NO. 506.05.

3. FOR DETAILS OF RAIL ELEMENT, AND ASSOCIATED HARDWARE SEE SHEETS 506.01 AND 506.02.

4. RAIL ELEMENTS WITH RADIUS LESS THAN OR EQUAL TO 150 FEET SHALL BE SHOP CURVED AND PAID FOR AS RADIAL GR-MGS1, OR 1A.

5. ALL GR-MGS1 AND GR-MGS1A RAIL SHALL BE MAINTAINED AT A HEIGHT OF 30" MIN - 32" MAX AS MEASURED PER STANDARD GR-INS.

6. ALL GUARDRAIL POSTS SHALL BE SET PLUMB. POST SHALL NOT BE SET WITH A VARIATION OF MORE THAN 1/2" 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.

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

8. ADJUSTING EXISTING GUARDRAIL TO MEET THE MGS1 STANDARD IS NOT PERMITTED.

FLARE RATES

<table>
<thead>
<tr>
<th>DESIGN SPEED</th>
<th>INSIDE SHY LINE</th>
<th>BEYOND SHY LINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPH</td>
<td>FLARE RATE</td>
<td>FLARE RATE</td>
</tr>
<tr>
<td>70</td>
<td>9'</td>
<td>30:1</td>
</tr>
<tr>
<td>60</td>
<td>8'</td>
<td>26:1</td>
</tr>
<tr>
<td>50</td>
<td>6.5'</td>
<td>21:1</td>
</tr>
<tr>
<td>40</td>
<td>5'</td>
<td>16:1</td>
</tr>
<tr>
<td>30</td>
<td>4'</td>
<td>13:1</td>
</tr>
</tbody>
</table>

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

rail splice shall be placed mid-span for standard post spacing (6'-3")

rail splice mid-span

w-beam rail

splice detail

rail splice shall be placed mid-span for standard post spacing (6'-3")
506.05

REVISION DATE

2016 ROAD & BRIDGE STANDARDS

NOTE:
1. ALL BOLTS, NUTS, WASHERS, AND OTHER STEEL ITEMS ARE TO BE GALVANIZED.
2. BLOCKOUTS OTHER THAN SHOWN SHALL BE A VDOT APPROVED PRODUCT MEETING MASH TESTING CRITERIA. BLOCKOUTS SHALL BE FROM THE VDOT APPROVED PRODUCTS LIST. APPROVED BLOCKOUTS MAY BE INTERCHANGED ON ANY ONE PROJECT WITH THE RESTRICTION THAT THE SAME TYPE OF BLOCKOUT MUST BE USED IN ANY SINGLE RUN OF GUARDRAIL.
3. WOOD BLOCKOUTS SHALL BE TREATED WITH A WOOD PRESERVATIVE IN ACCORDANCE WITH THE SPECIFICATIONS.
4. DIMENSIONS MAY VARY PLUS OR MINUS ¼" DUE TO MANUFACTURING TOLERANCES IN GUARDRAIL COMPONENTS.
NOTES:

1. TANGENT END TERMINAL (GR-MGS2) SHALL BE A VDOT APPROVED PRODUCT MEETING MASH TESTING CRITERIA. ANY TERMINAL USED FOR THE GR-MGS2 SHALL BE FROM THE VDOT 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-MGS2 TERMINALS (SIMILAR TO AS SHOWN ABOVE) SHALL BE INSTALLED WITHOUT AN OFFSET.
   B. INSTALLING GR-MGS2 TERMINAL ON A RADIUS IS NOT PERMITTED.
   C. DIRECTION OF THE REFLECTIVE TAPE ON THE TERMINAL HEAD SHALL CONFORM TO MUTCD APPLICATION FOR DIAGONAL STRIPES ON OBJECT MARKERS AND BRIDGE END PANELS. (SEE NOTE 4)
   D. DO NOT CHANGE THE LAPPING OF TERMINAL FOR ANY INSTALLATIONS. INSTALL AS SHOWN IN THE MANUFACTURER'S INSTALLATION INSTRUCTIONS REGARDLESS OF ADJACENT TRAFFIC DIRECTION. (SEE DETAIL THIS SHEET)
   E. HEIGHT MEASURED AT TOP OF W-BEAM IS 30" MIN. - 32" 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.

4. 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)

THROUGH ROADWAY MARKER
POSITION LEFT OF TRAFFIC
ITEM CODE 13286 EACH

THROUGH ROADWAY MARKER
POSITION RIGHT OF TRAFFIC

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.
**SITE PREPARATION REQUIREMENTS FOR GR-MGS2**

**NOTES:**


2. THE AREA IMMEDIATELY BEHIND AND BEYOND THE TERMINAL SHALL BE TRAVERSABLE AND FREE FROM FIXED OBJECTS. IF A CLEAR RUN OUT IS NOT ATTAINABLE THIS AREA SHALL AT LEAST BE SIMILAR IN CHARACTER TO THE UPSTREAM UNSHIELDED ROADSIDE AREAS.

3. FOR NEW CONSTRUCTION AND RECONSTRUCTION, THE 10:1 SLOPE GRADING SHALL EXTEND A MINIMUM OF 6'-0" MEASURED FROM THE FACE OF RAIL.

4. FOR PROPRIETARY GUARDRAIL TERMINALS, THE MANUFACTURER’S SITE PREPARATION REQUIREMENTS TAKE PRECEDENCE OVER THIS STANDARD IF ADDITIONAL GRADING IS REQUIRED.
NOTES:


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. NOT FOR USE ON INTERSTATES, FREEWAYS, OR NEW CONSTRUCTION, UNLESS APPROVED BY THE ENGINEER. MAY BE USED WHEN SPECIFIED IN THE PLANS FOR 3R WORK THAT CANNOT CONFORM TO THE SITE PREPARATION REQUIREMENTS ON PAGE 506.07.

4. FOR LIMITED APPLICATIONS AS DESCRIBED IN NOTE 3, THE GRADING SHOULD BE AS CLOSE AS POSSIBLE TO THE SITE PREPARATION REQUIREMENTS ON PAGE 506.07. THE SLOPE SHALL EXTEND A MINIMUM OF 4'-0" FROM THE FACE OF RAIL AND GRADING SHALL CONFORM TO THE DETAILS ABOVE USE 21B AGGREGATE, OR OTHER SUITABLE MATERIAL AS APPROVED BY THE ENGINEER.
**NOTES:**

1. USE OF THIS TRAILING END ANCHORAGE IS RESTRICTED TO RUN-OFF CONDITIONS ON DIVIDED HIGHWAYS.
2. STEEL POST, BLOCKOUT, AND SPLICE SHALL BE IN ACCORDANCE WITH THE GR-MGS1 STANDARD AND LOCATED AS SHOWN IN THE DETAILS ABOVE.
3. ALL BOLTS, NUTS, WASHERS, AND OTHER STEEL ITEMS ARE TO BE GALVANIZED.
4. WOOD POSTS SHALL BE TREATED WITH A WOOD PRESERVATIVE IN ACCORDANCE WITH THE SPECIFICATIONS.

**ITEM CODE 13287 EACH**

---

**MIDWEST GUARDRAIL SYSTEM**

**(TRAILING END ANCHORAGE)**

**VIRGINIA DEPARTMENT OF TRANSPORTATION**

---

**2016 ROAD & BRIDGE STANDARDS**
GR-MGS4 REFERENCE SPECIFICATION

VIRGINIA DEPARTMENT OF TRANSPORTATION

ROAD AND BRIDGE STANDARDS

REVISION DATE 506.11

MIDWEST GUARDRAIL SYSTEM

(TRANSITION FROM MGS 31" HEIGHT TO GR-2 27\(\frac{3}{4}\)" HEIGHT)

NOTES:
1. HEIGHT TRANSITION FROM 31" GR-MGS1 TO 27\(\frac{3}{4}\)" GR-2 WILL REQUIRE 2 - STANDARD 12'-6" SECTIONS OF W-BEAM (SPICES AS SHOWN) OR A SINGLE 25' W-BEAM WITH \(\frac{3}{4}\)" x 2\(\frac{3}{4}\)" SLOTTED HOLES AT 3' - 1\(\frac{1}{2}\)" SPACING.
2. POSTS, BLOCKOUTS, AND SPICES WILL BE IN ACCORDANCE WITH THE GR-MGS1 STANDARD AND LOCATED AS SHOWN IN THE DETAILS ABOVE.
3. STANDARD 6 FOOT POSTS WILL BE USED UNLESS OTHERWISE NOTED ON PLANS
4. STANDARD GR-MGS4 TRANSITION WILL BE PAID FOR AS EACH COMPLETE IN PLACE.
5. END TERMINAL WILL BE A VDOT APPROVED PRODUCT MEETING MASH TESTING CRITERIA.

PLAN

PAY LIMITS GR-MGS4 HEIGHT TRANSITION

34' - 4\(\frac{1}{2}\)"

ELEVATION

POST (9) OF GR-MGS2 TERMINAL WHEN TERMINAL CONNECTS DIRECTLY TO HEIGHT TRANSITION.

W-BEAM RAIL SPLICE MID-SPAN

W-BEAM RAIL SPLICE AT POST

W-BEAM RAIL SPLICE AT POST

12'-6" W-BEAM SECTION

SEE NOTE 1

SEE NOTE 1

STANDARD 12'-6"

W-BEAM SECTION

5 \(\frac{3}{8}\)" x 2\(\frac{3}{4}\)" SLOTTED HOLES AT 3'-1\(\frac{1}{2}\)" SPACING

STANDARD GR-MGS1

OR STANDARD GR-MGS2

ITEM CODE 13288 GUARDRAIL HEIGHT TRANSITION GR-MGS4 EACH

2016 ROAD & BRIDGE STANDARDS
MEASURING GUARDRAIL HEIGHT ON FRONT SLOPE RELATIVE TO SHOULDER HINGE POINT

* HEIGHT PER STANDARD GR-MGS1

MEASURING GUARDRAIL HEIGHT & RAIL OFFSET FROM FACE OF CURB OR CURB & GUTTER
APPLICABLE FOR DESIGN SPEEDS OF 45 MPH AND LESS.

* HEIGHT PER STANDARD GR-MGS1

THE HEIGHT OF THE GUARDRAIL SHALL BE MEASURED AT THE FACE OF RAIL WHEN OFFSET FROM THE FACE OF CURB.

FOR GUARDRAIL DESIGN POLICIES USING CURB OR CURB & GUTTER SEE CHAPTER 2E OF THE VDOT ROAD DESIGN MANUAL

MEASURING GUARDRAIL HEIGHT ADJACENT TO CURB OR CURB & GUTTER

APPLICABLE FOR DESIGN SPEEDS OF 45 MPH AND LESS.
**Table I: Normal Guardrail Location—Through Traffic Lanes Left of Traffic**

<table>
<thead>
<tr>
<th>TOTAL SHOULDER WIDTH (S) (PAVED &amp; GRADED)</th>
<th>PAVED SHOULDER WIDTH (P) (SEE NOTE)</th>
<th>OFFSET FROM EDGE OF TRAVELED WAY TO FACE OF GUARDRAIL (O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18'</td>
<td>12'</td>
<td>14'</td>
</tr>
<tr>
<td>16'</td>
<td>4' or 10'</td>
<td>12'</td>
</tr>
<tr>
<td>14'</td>
<td>4' or 8'</td>
<td>10'</td>
</tr>
<tr>
<td>12'</td>
<td>3', 4', 5', or 6'</td>
<td>8'</td>
</tr>
<tr>
<td>10'</td>
<td>3' or 4'</td>
<td>6'</td>
</tr>
<tr>
<td>8'</td>
<td>0 or 2'</td>
<td>4'</td>
</tr>
<tr>
<td>6'</td>
<td>0</td>
<td>2'</td>
</tr>
</tbody>
</table>

**Table II: Normal Guardrail Location—Through Traffic Lanes Right of Traffic**

<table>
<thead>
<tr>
<th>TOTAL SHOULDER WIDTH (S) (PAVED &amp; GRADED)</th>
<th>PAVED SHOULDER WIDTH (P) (SEE NOTE)</th>
<th>OFFSET FROM EDGE OF TRAVELED WAY TO FACE OF GUARDRAIL (O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18'</td>
<td>12'</td>
<td>14'</td>
</tr>
<tr>
<td>16'</td>
<td>6' or 10'</td>
<td>12'</td>
</tr>
<tr>
<td>14'</td>
<td>8'</td>
<td>10'</td>
</tr>
<tr>
<td>12'</td>
<td>4', 5', or 6'</td>
<td>8'</td>
</tr>
<tr>
<td>10'</td>
<td>0 or 4'</td>
<td>6'</td>
</tr>
<tr>
<td>9'</td>
<td>0 or 4'</td>
<td>5'</td>
</tr>
<tr>
<td>8'</td>
<td>0 or 2'</td>
<td>4'</td>
</tr>
<tr>
<td>6'</td>
<td>0</td>
<td>2'</td>
</tr>
</tbody>
</table>

**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 Roadway Manual.
- See Standard MC-4 for paving under guardrail.

**Detail of Multiple Block-Out to Avoid Underground or Low Profile Obstruction**

- For two way traffic, use 8 post spacing design from each end of fixed object.
- If the minimum deflection for guardrail cannot be met, a permanent concrete barrier or bridge pier protection system (BPPS) shall be used.
- 3'-4" absolute minimum if 3'-4" dimension cannot be obtained. Use permanent concrete barrier.
- 2-12" blockouts for one post only. (24" maximum blockout depth).
- Double standard blockouts or combinations of blockouts greater than 16" up to 24" deep shall be limited to one in any 100 ft length of guardrail.
- Blockout depth of 16" may be used for a series of posts. This will be accomplished with a combination of a 4" and a 12" blockout or 2 MASH approved 8" blockouts.
- Cost of additional blockouts to be included in price bid per linear foot of guardrail.
GR-MGS2 TERMINAL TO GR-MGS4 HEIGHT TRANSITION

TRANSITION FROM GR-MGS1 GUARDRAIL TO WEAK POST GUARDRAIL

TRANSITION FROM GR-MGS2 TERMINAL TO WEAK POST GUARDRAIL

TRANSITION FROM GR-MGS2 TERMINAL TO WEAK POST GUARDRAIL
TRANSITION FROM WEAK POST (STANDARD GR-8) TO GR-MGS1 GUARDRAIL
MGS W-BEAM GUARDRAIL INSTALLATION CRITERIA

LEAVE-OUT FOR STANDARD GUARDRAIL POST INSTALLATION

NOTES:

1. LEAVE-OUT ALLOWS FOR PROPER POST ROTATION.
2. DO NOT SHORTEN POST. POST SHALL HAVE FULL EMBEDMENT.
3. INSTALL POST AFTER OPENING IS BACKFILLED AND COMPACTED IN 6" LIFTS.
### Material/Specifications/Notes

<table>
<thead>
<tr>
<th>Item</th>
<th>Material/Specifications/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STANDARD THRIE-BEAM TERMINAL CONNECTOR</td>
</tr>
<tr>
<td>2</td>
<td>7/8&quot; x 2&quot; LONG GUARDRAIL SPLICE BOLT &amp; RECESSED NUT (SEE STD. MGS-HDW)</td>
</tr>
<tr>
<td>3</td>
<td>5/8&quot; x 10&quot; LONG GUARDRAIL BOLT &amp; RECESSED NUT (SEE STD. MGS-HDW)</td>
</tr>
<tr>
<td>4</td>
<td>6'3&quot; x 12-GAUGE THRIE-BEAM SECTION</td>
</tr>
<tr>
<td>5</td>
<td>THRIE-BEAM TRANSITION</td>
</tr>
<tr>
<td>6</td>
<td>STANDARD W-BEAM RAIL</td>
</tr>
<tr>
<td>7</td>
<td>5/8&quot; x 14&quot; LONG GUARDRAIL BOLT &amp; RECESSED NUT (SEE STD. MGS-HDW)</td>
</tr>
<tr>
<td>8</td>
<td>STANDARD W-BEAM RAIL</td>
</tr>
<tr>
<td>9</td>
<td>W6x15, B4&quot; LONG STEEL POST WITH 6&quot;x8&quot;x19&quot; TIMBER BLOCKOUT (POSTS 1, 2, &amp; 3)</td>
</tr>
<tr>
<td>10</td>
<td>W6 x 8.5 OR W6 x 9.72&quot; LONG STEEL POST WITH 6&quot; x 12&quot; x 19&quot; LG. TREATED PINE BLOCK (POSTS 4, 5, 6, 7, 8, &amp; 9)</td>
</tr>
<tr>
<td>11</td>
<td>7/8&quot; x 14&quot; LONG HEAVY HEX BOLT AND NUT</td>
</tr>
<tr>
<td>12</td>
<td>W6 x 8.5 OR W6 x 9.72&quot; LONG STEEL POST WITH 6&quot; x 12&quot; x 14&quot; LG. TREATED PINE BLOCK (POSTS 10 &amp; 11)</td>
</tr>
<tr>
<td>13</td>
<td>3&quot; x 3&quot; x 0.315&quot; SQUARE PLATE WASHER ASTM A572 GR. 50</td>
</tr>
</tbody>
</table>

### Notes:

1. THRIE-BEAM FIXED OBJECT ATTACHMENT IS FOR USE WITH THE CPSR, SSCP, AND KANSAS CORRAL VERTICAL FACE TERMINAL WALLS.
2. 7/8" BOLTS SHALL BE ASTM A325 A449 HEX BOLTS WITH ASTM A663 OR DH OR A194 GR. 2H NUTS. A 3" x 3" x 0.315" A36 SQUARE PLATE WASHER IS REQUIRED FOR EACH BOLT ON THE BACK SIDE OF THE BRIDGE TERMINAL WALL.
3. NO BOLT PLACED IN LOWER HOLE OF GR-FOA-5 POST 9.
5. SPlice LOCATION IS DEPENDENT ON THE LENGTH OF W-BEAM RAIL USED. IF 12'-6" RAIL IS USED A SPLICE WILL BE AT THIS LOCATION.
6. STANDARD CG-3 CURB IS REQUIRED FROM POST 11 TO THE TERMINAL WALL.
7. STANDARD CG-3 CURB IS NOT INCLUDED WITH THE FOA-5 AND WILL BE QUANTIFIED AND PAID AS A SEPARATE BID ITEM IN ACCORDANCE WITH THE SPECIFICATIONS.
9. GUARDRAIL COMPONENTS SHALL BE IN ACCORDANCE WITH VDOT ROAD AND BRIDGE STANDARDS.
10. ALL BOLTS, NUTS, WASHERS, AND OTHER STEEL ITEMS ARE TO BE GALVANIZED.
11. INSTALLATION OF THE FOA-5 ON A RADIUS OR FLARE IS NOT PERMITTED.
12. 4'-WIDE GRADING FROM THE FACE OF RAIL TO THE HINGE POINT SHALL EXTEND A MINIMUM OF 3' PAST THE END OF THE TERMINAL WALL TO SUPPORT FOA POSTS.
**THRIE-BEAM - FIXED OBJECT ATTACHMENT**

FOR USE WITH VERTICAL FACE TERMINAL WALLS AND MGS GUARDRAIL

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

**2016 ROAD & BRIDGE STANDARDS**

**VIRGINIA DEPARTMENT OF TRANSPORTATION**

**ROAD AND BRIDGE STANDARDS**

**SHEET 2 OF 2**

**508.02**

**NEW 04/19**

**GR-FOA-5**

**STEEL POST**

6"x12"x19" TREATED WOOD BLOCKOUT

6"x8"x19" TREATED WOOD BLOCKOUT

A36 SQUARE PLATE WASHER

1/4" x 2 1/2" SLOTTED HOLES AT 1'-6" SPACING

STANDARD 12'-6" THRIE-BEAM SECTION

STEEL POST

W6x15 STEEL POST 7' LENGTH

W6x9 OR W6x8.5 STEEL POST 6' LENGTH

12'-6"

7'-3"

6'-3"

7" x 2 1/2" SLOTTED HOLES AT 1'-6 1/4" SPACING

STANDARD 6'-3" THRIE-BEAM SECTION