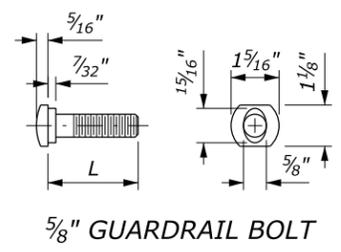


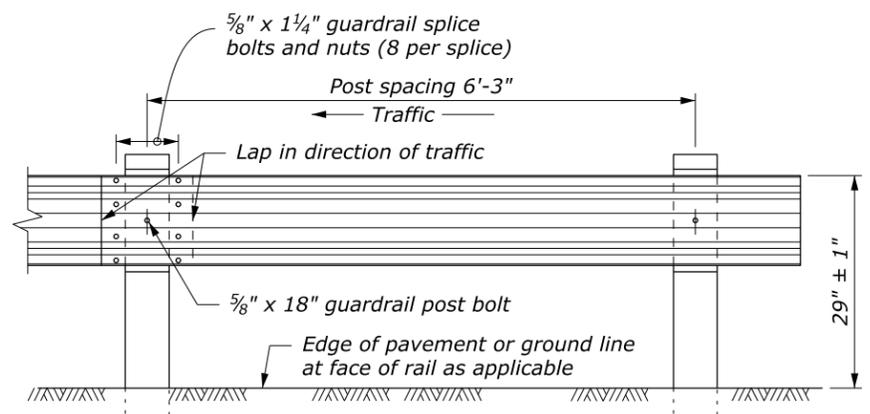
- NOTE:**
- When encountering impenetrable material, see Standards 617-13 or 617-24.
  - See Special Contract Requirements when 7 foot or longer posts are specified.
  - See Special Contract Requirements when the alternative hole arrangement is specified.
  - Install delineator every fourth post. Fasten delineator to post using two 2" x 3/8" lag screws with washers, along centerline of post; or fasten as specified by the manufacturer.
  - Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.

**W BEAM RAIL**

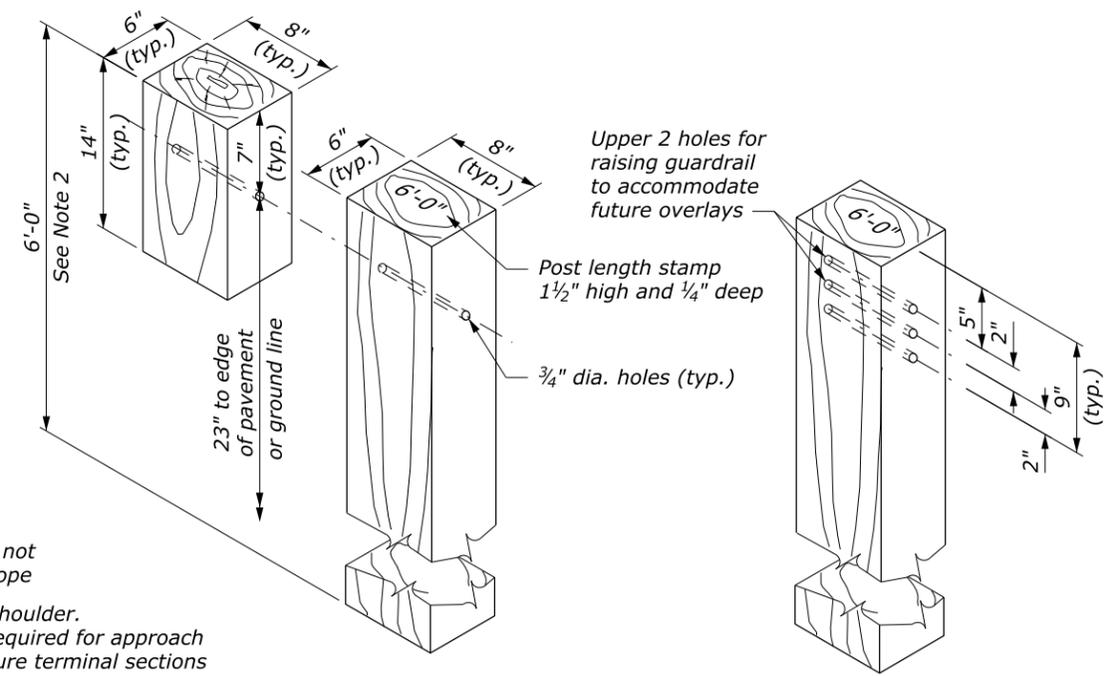
L	Thread Length
1 1/4"	1 1/8" minimum
2"	1 3/4" minimum
10"	4" minimum
18"	4" minimum
25"	4" minimum



**GUARDRAIL BOLT AND RECESS NUT**

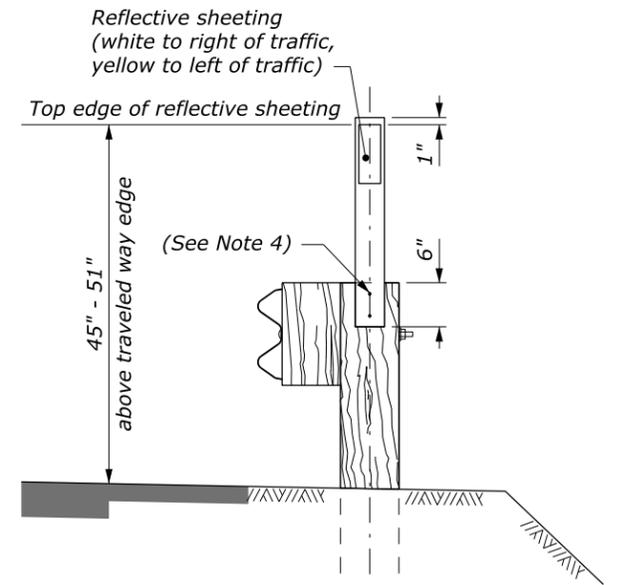


**POST SPACING STANDARD POST SECTION**

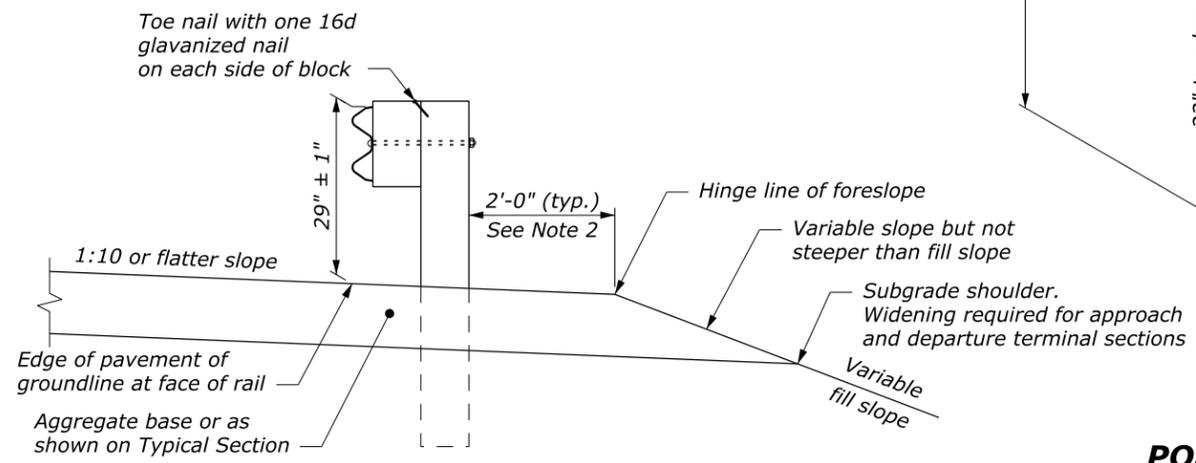


**STANDARD HOLE ARRANGEMENT POST AND BLOCK DETAIL**

**ALTERNATE HOLE ARRANGEMENT POST AND BLOCK DETAIL**



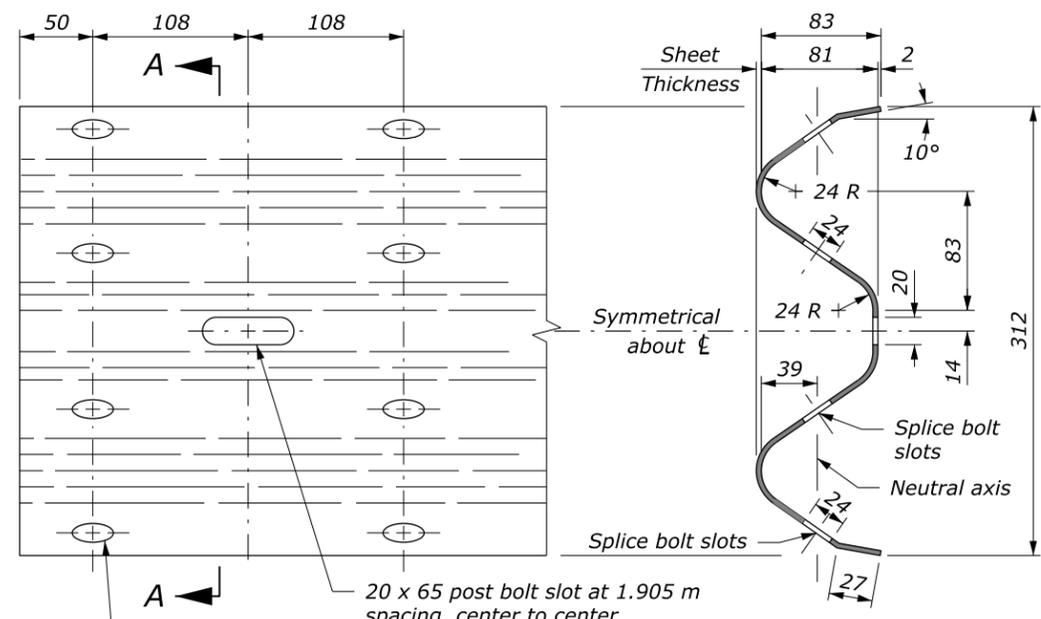
**FLEXIBLE GUIDE POST GUARDRAIL MOUNT**



**TYPICAL GUARDRAIL CROSS SECTION**

NO SCALE

8 September 2017 11:14 AM c:\myfiles\pw\_production\dmms67487\std617-10.dgn [USC]

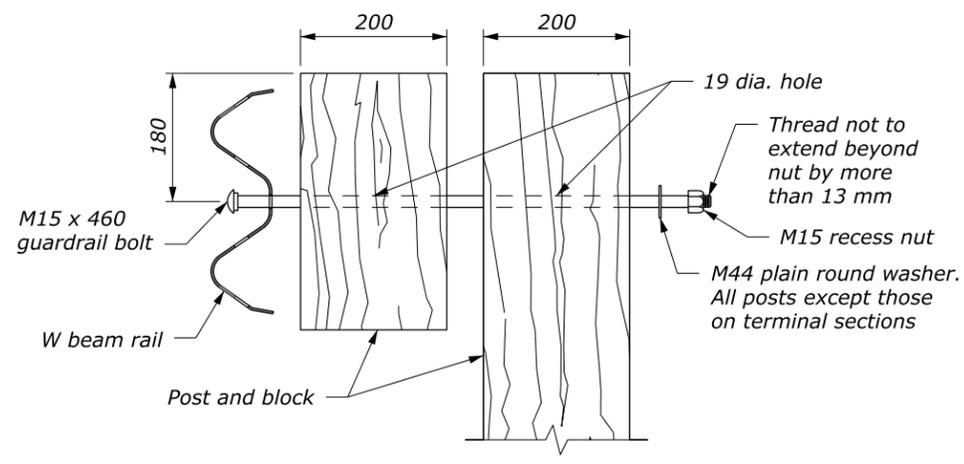


**RAIL ELEVATION**

20 x 65 post bolt slot at 1.905 m spacing, center to center  
 24 x 30 splice bolt slot.  
 8 required, each end of rail

**W BEAM RAIL**

**SECTION A-A**

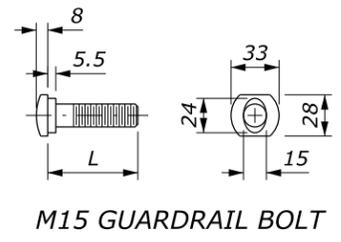


**POST BOLT ASSEMBLY**

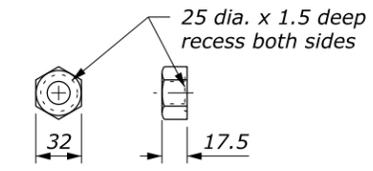
**NOTE:**

1. When encountering impenetrable material, see Standards M617-13 or M617-24.
2. See Special Contract Requirements when 2 m or longer posts are specified.
3. See Special Contract Requirements when the alternative hole arrangement is specified.
4. Install delineator every fourth post. Fasten delineator to post using two 50 mm x 10 mm lag screws with washers, along centerline of post; or fasten as specified by the manufacturer.
5. Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.
6. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are unavailable.
7. Dimensions without units are millimeters.

L	Thread Length
32	30 minimum
50	45 minimum
255	100 minimum
460	100 minimum
640	100 minimum

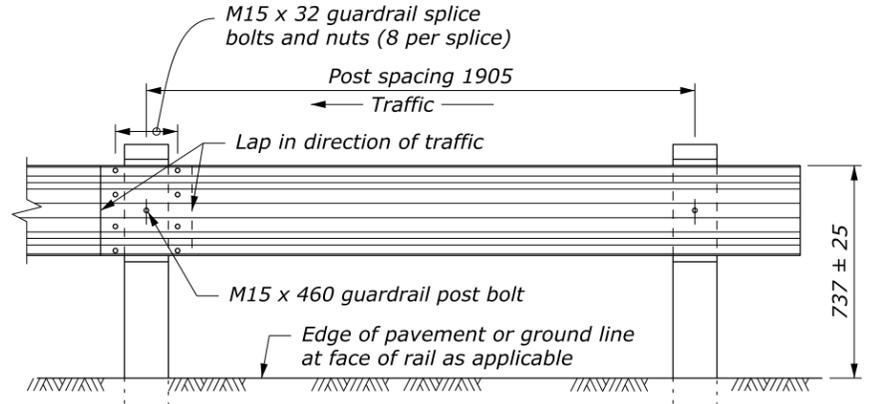


**M15 GUARDRAIL BOLT**

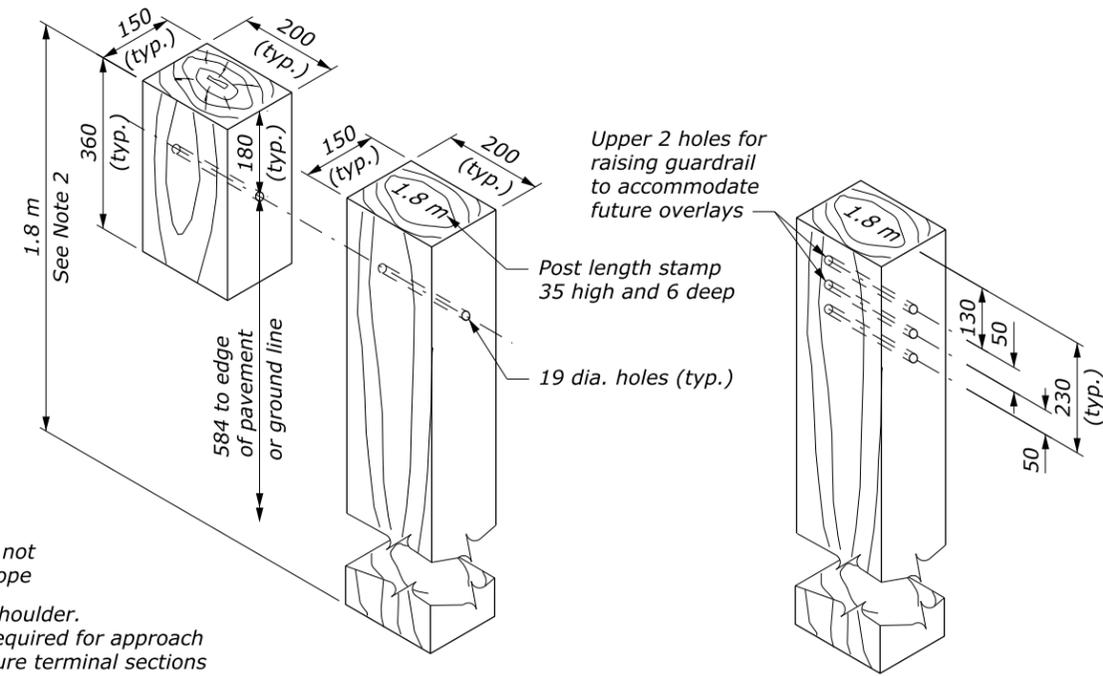


**M15 RECESS NUT**

**GUARDRAIL BOLT AND RECESS NUT**

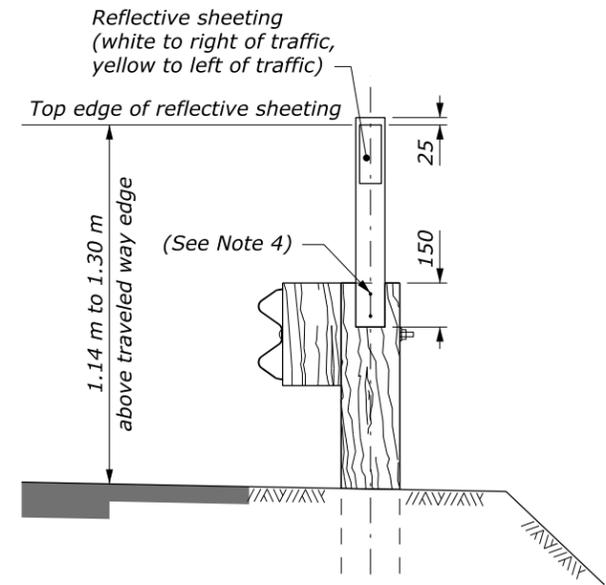


**POST SPACING STANDARD POST SECTION**

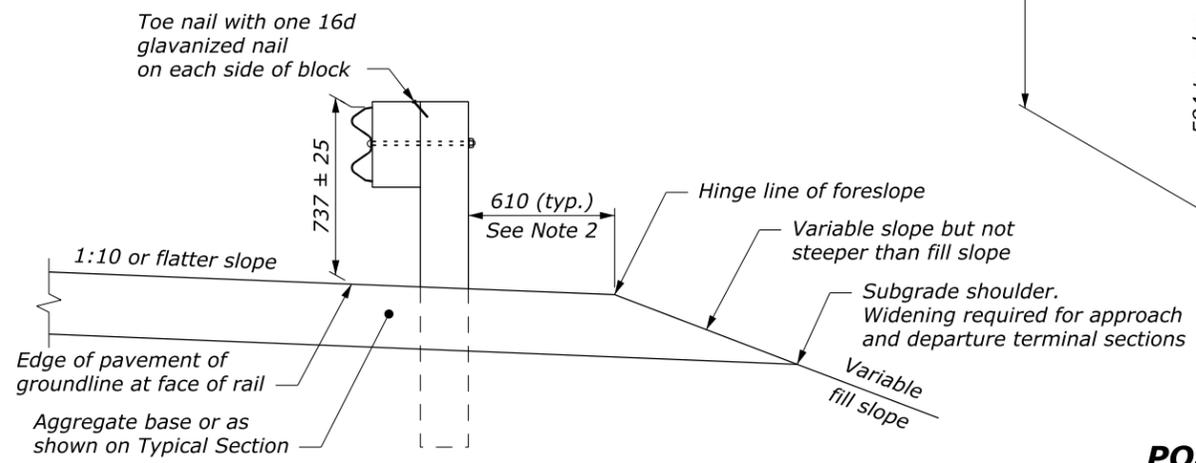


**STANDARD HOLE ARRANGEMENT POST AND BLOCK DETAIL**

**ALTERNATE HOLE ARRANGEMENT POST AND BLOCK DETAIL**



**FLEXIBLE GUIDE POST GUARDRAIL MOUNT**



**TYPICAL GUARDRAIL CROSS SECTION**

U.S. DEPARTMENT OF TRANSPORTATION  
 FEDERAL HIGHWAY ADMINISTRATION  
 FEDERAL LANDS HIGHWAY

METRIC STANDARD

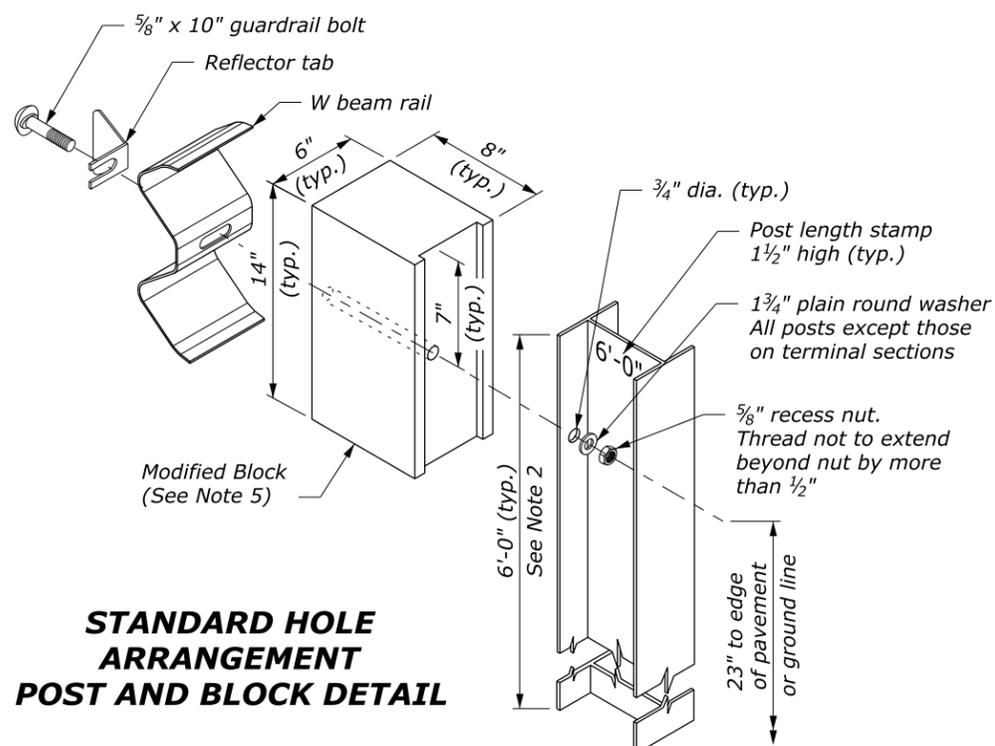
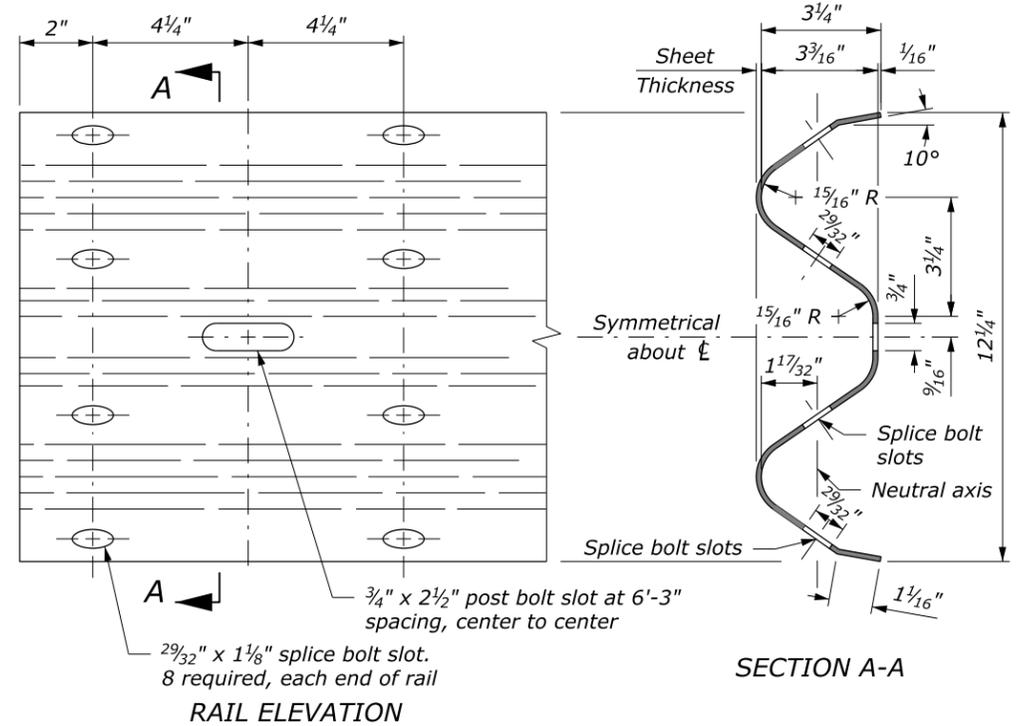
**G4 W-BEAM GUARDRAIL  
 WOOD POSTS**

STANDARD APPROVED FOR USE 3/1996  
 REVISED: 8/1997 6/2005  
 DRAFT: 9/2017

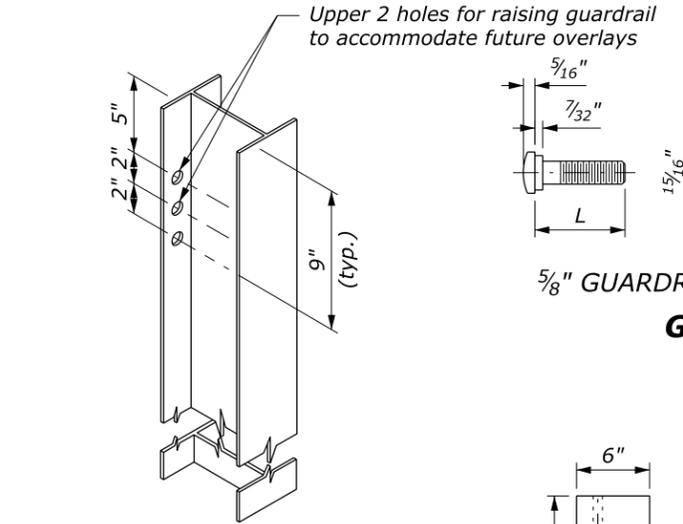
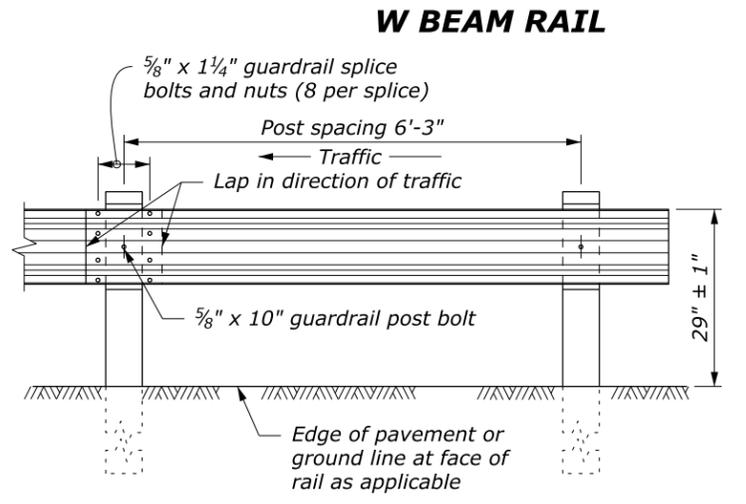
STANDARD  
**M617-10**

NO SCALE

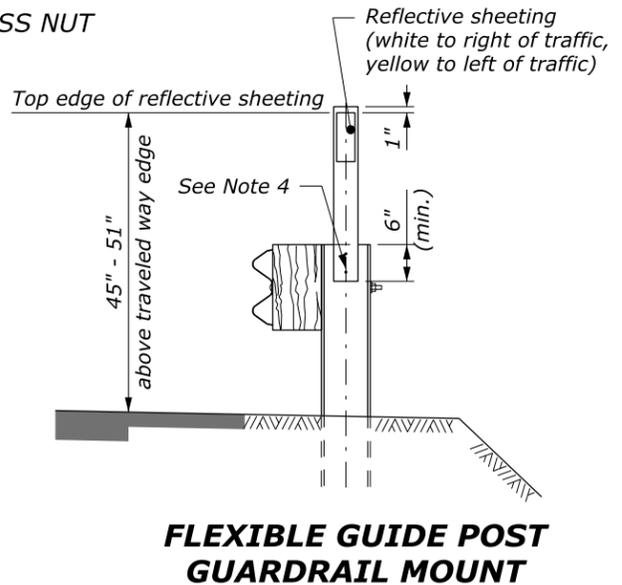
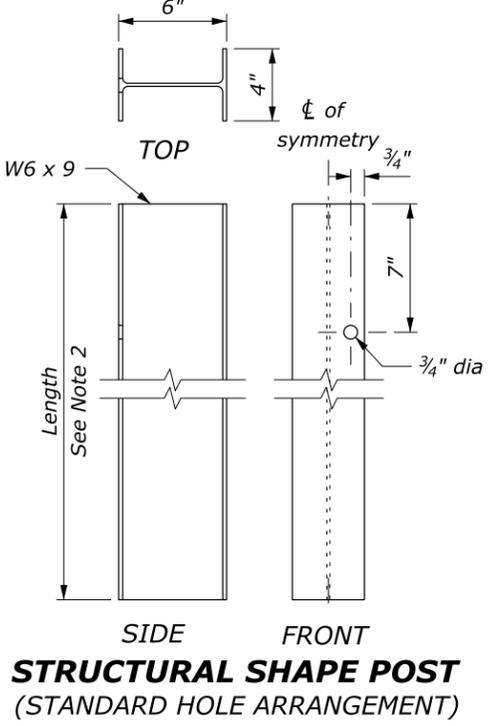
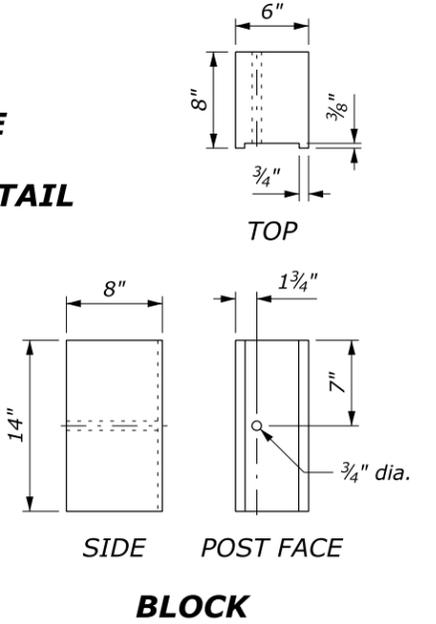
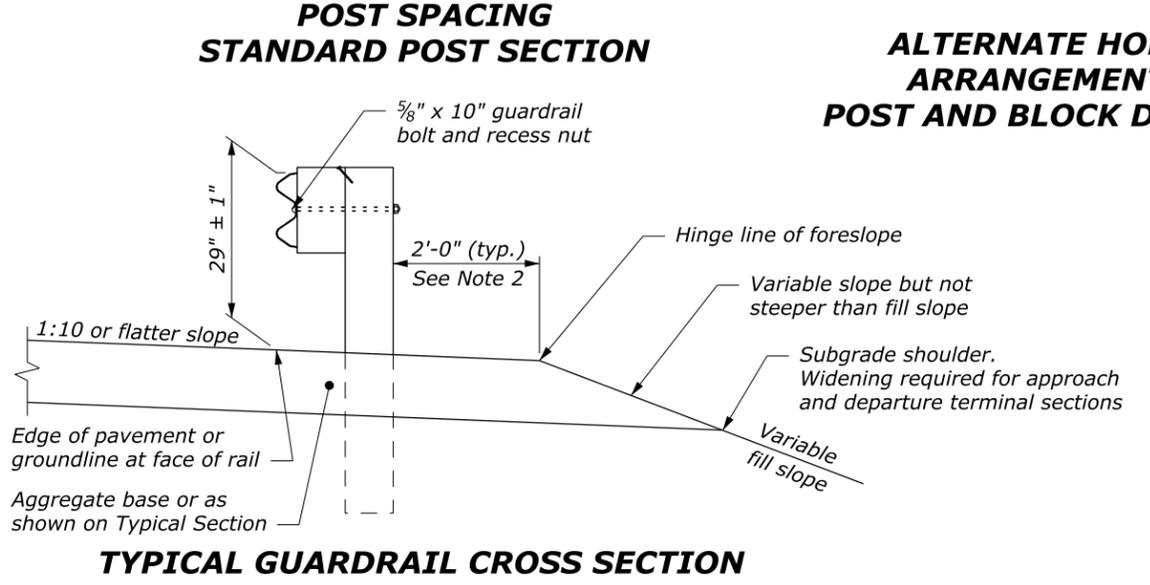
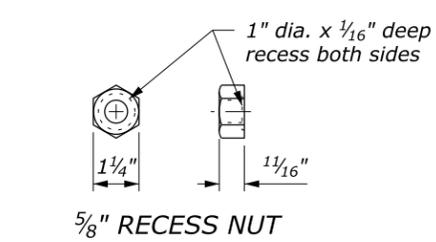
8 September 2017 11:13 AM c:\myfiles\pw\_production\dms67487\Std617-10.dgn [Metric]



- NOTE:**
- When encountering impenetrable material, see Standards 617-13 or 617-24.
  - See Special Contract Requirements when 7 foot or longer posts are specified.
  - See Special Contract Requirements when the alternative hole arrangement is specified.
  - Install delineator every fourth post. Fasten delineator to post using two galvanized 2" x 3/8" bolts with a washer on both sides, a lock washer, and nut; or fasten as specified by the manufacturer.
  - Modified block may be wood, plastic, or composite material. Use consistent material throughout the length of guardrail run.
  - Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.



L	Thread Length
1 1/4"	1 1/8" minimum
2"	1 3/4" minimum
10"	4" minimum
18"	4" minimum
25"	4" minimum



U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
FEDERAL LANDS HIGHWAY

U.S. CUSTOMARY STANDARD

**G4 W-BEAM GUARDRAIL STEEL POSTS**

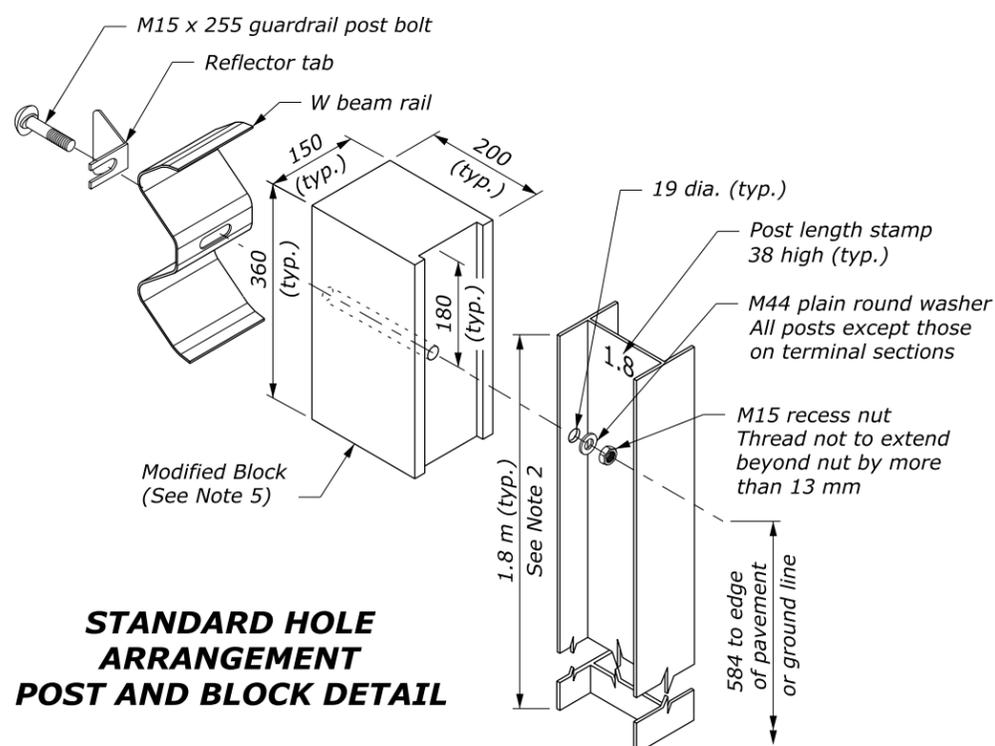
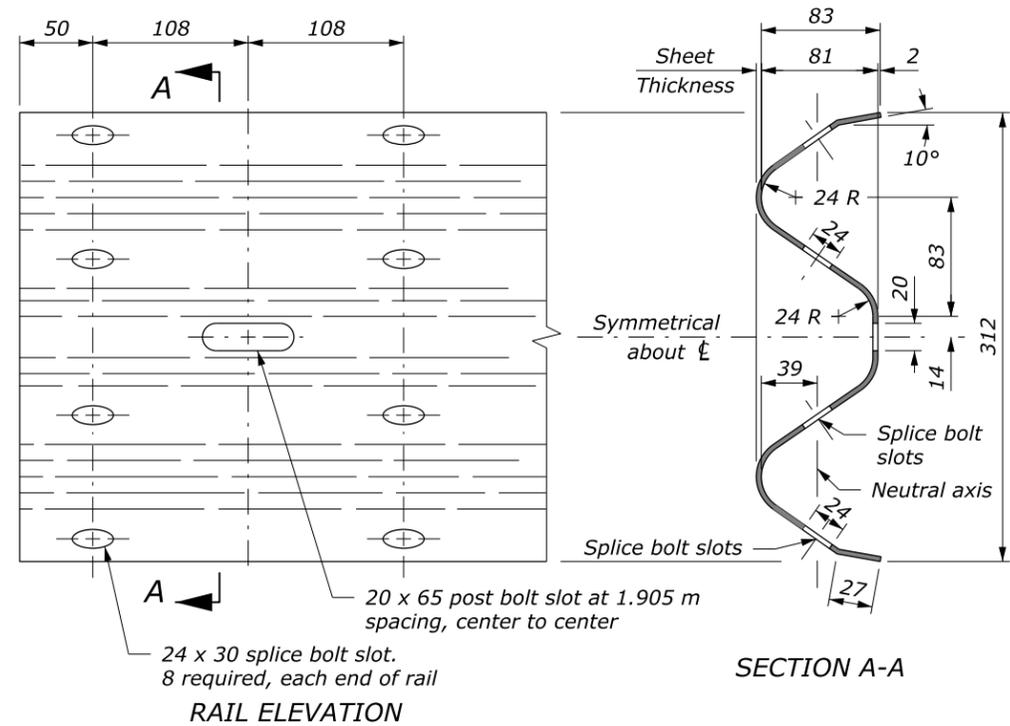
STANDARD APPROVED FOR USE 1/1994

REVISD: 4/1994 6/2005  
DRAFT: 9/2017

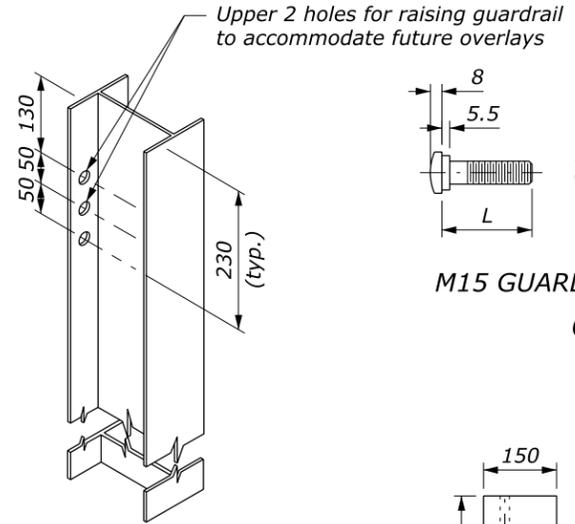
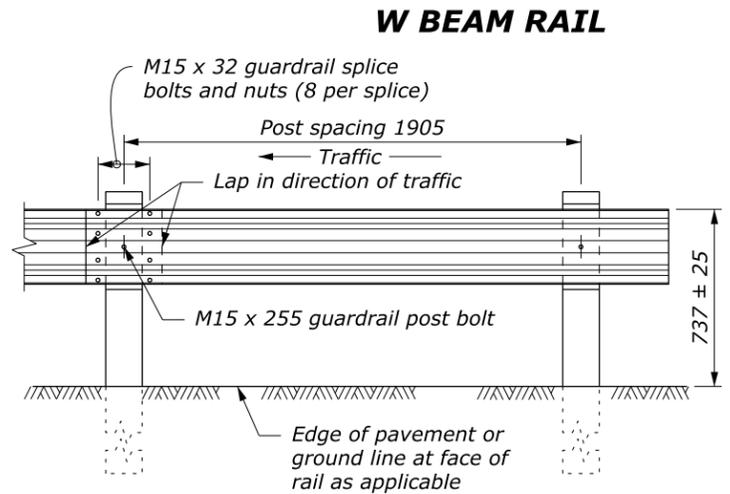
STANDARD 617-11

NO SCALE

8 September 2017 5:21 PM c:\myfiles\pw\_production\dms67487\std617-11.dgn [USC]

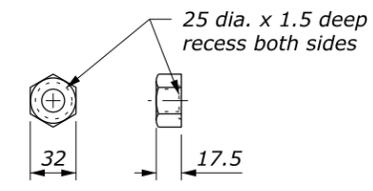


- NOTE:**
- When encountering impenetrable material, see Standards M617-13 or M617-24.
  - See Special Contract Requirements when 2 m or longer posts are specified.
  - See Special Contract Requirements when the alternative hole arrangement is specified.
  - Install delineator every fourth post. Fasten delineator to post using two galvanized 50 mm x 9.5 mm bolts with a washer on both sides, a lock washer, and nut; or fasten as specified by the manufacturer.
  - Modified block may be wood, plastic, or composite material. Use consistent material throughout the length of guardrail run.
  - Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.
  - Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are unavailable.
  - Dimensions without units are millimeters.

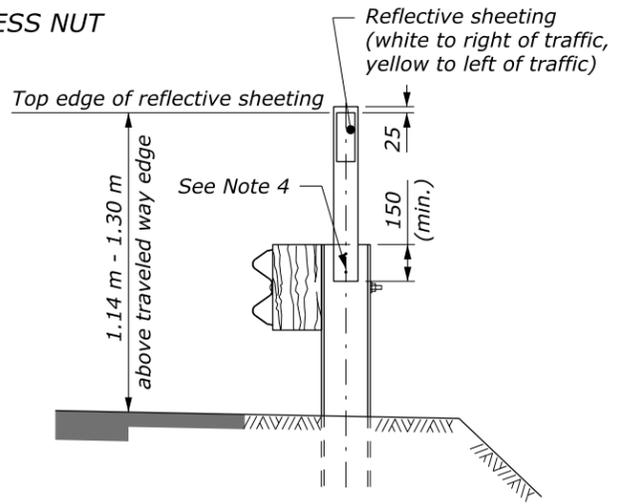
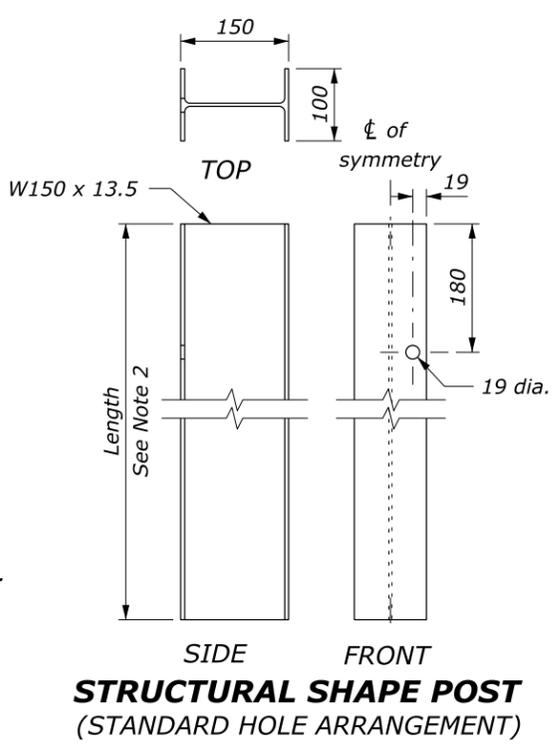
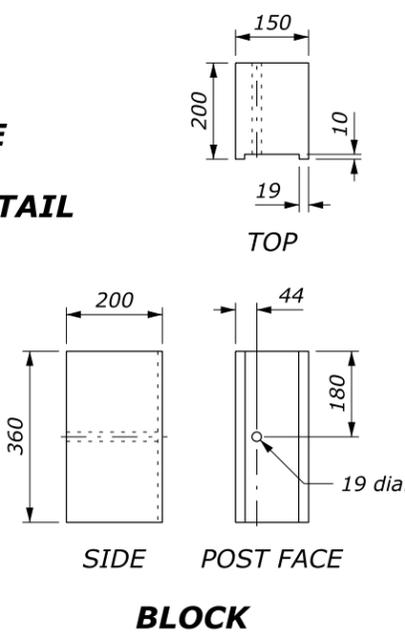
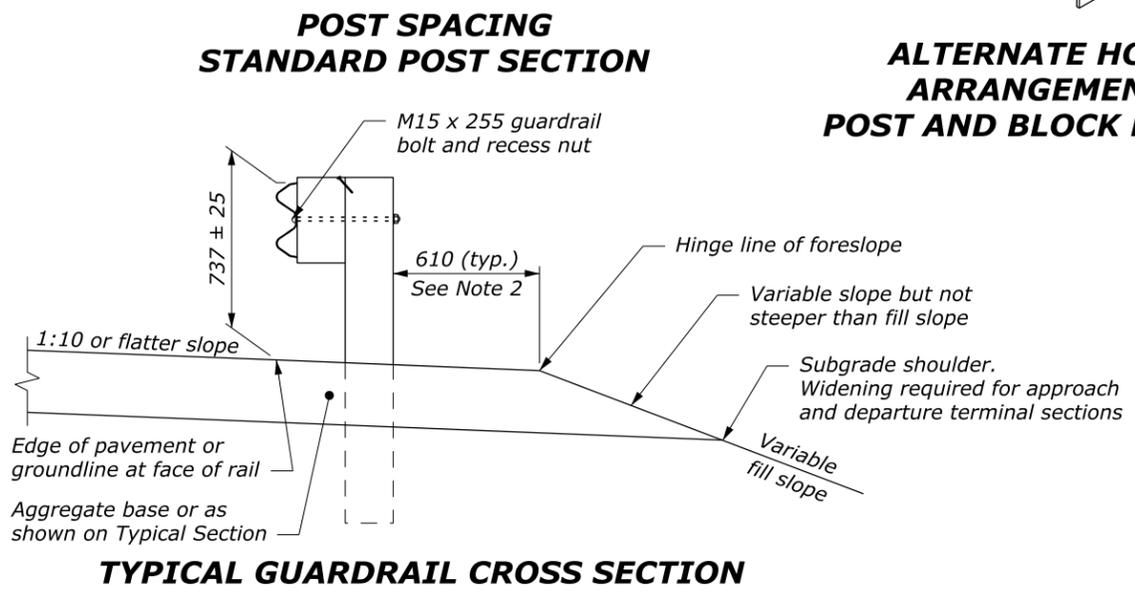


**M15 GUARDRAIL BOLT**

L	Thread Length
32	30 minimum
50	45 minimum
255	100 minimum
460	100 minimum
640	100 minimum



**GUARDRAIL BOLT AND RECESS NUT**



U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
FEDERAL LANDS HIGHWAY

METRIC STANDARD

**G4 W-BEAM GUARDRAIL STEEL POSTS**

STANDARD APPROVED FOR USE 3/1996

REVISD: 6/1997 12/1998 6/2005  
DRAFT: 9/2017

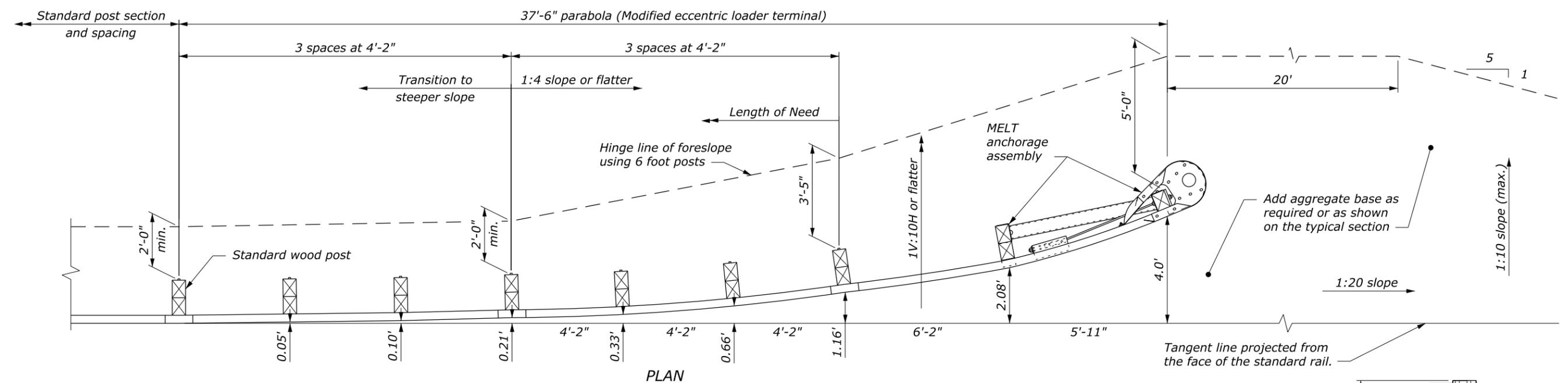
STANDARD M617-11

NO SCALE

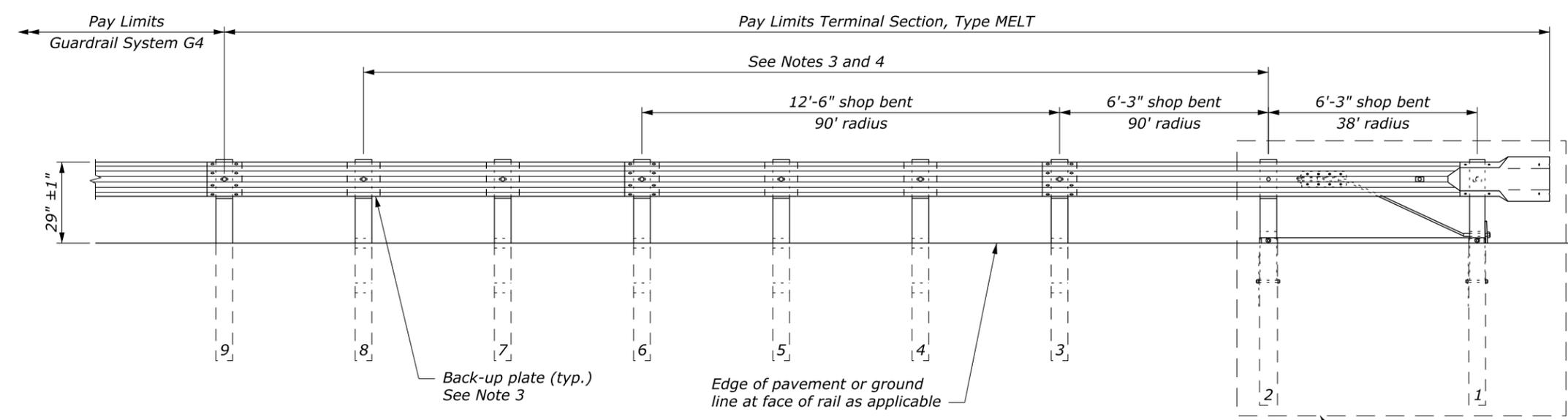
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**NOTE:**

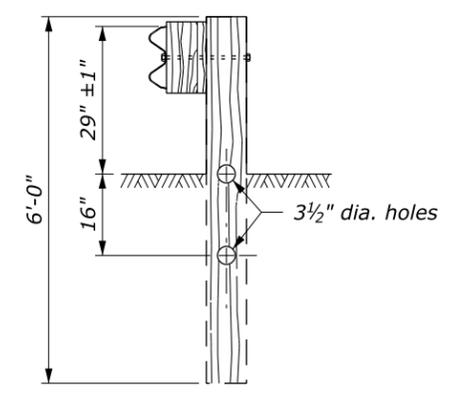
1. Do not use terminal where speeds are in excess of 45 MPH.
2. Extend bolts through the post and block, but not through the W beam rail for Posts #2-8. Extend bolts through the W-Beam rail for Posts #1 and #9.
3. Use Back-up plates on posts #4, 5, 7, and 8.
4. Use Shelf angle on post #2.



PLAN



ELEVATION



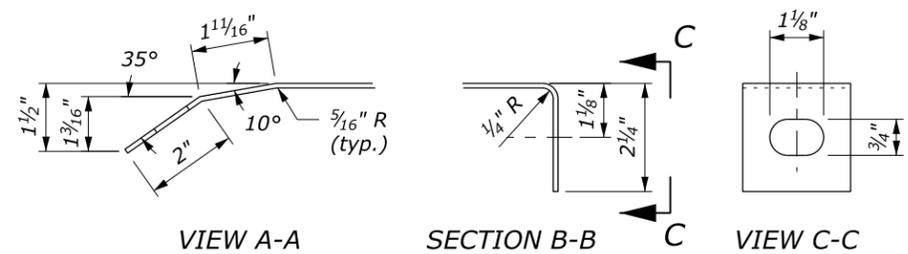
**BREAKAWAY LINE  
POST AND BLOCK  
POSTS #3 - #8**

**APPROACH & DEPARTURE FLARE  
WITH MODIFIED ECCENTRIC LOADER TERMINAL**

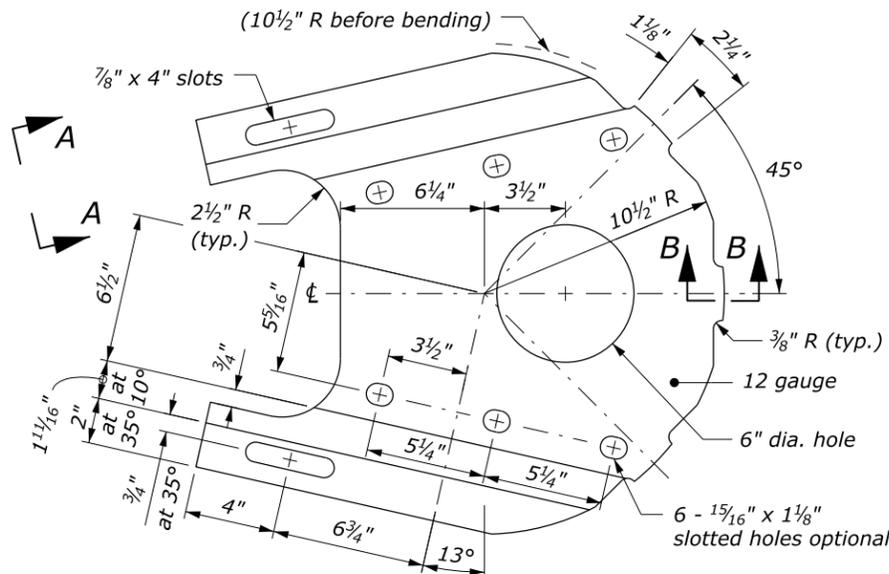
NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD <b>G4 W-BEAM GUARDRAIL MODIFIED ECCENTRIC LOADER TERMINAL, TYPE MELT</b> Sheet 1 of 2	
STANDARD APPROVED FOR USE 1/1994	STANDARD
REVISED: 4/1994 6/2005 DRAFT: 4/2016	617-12

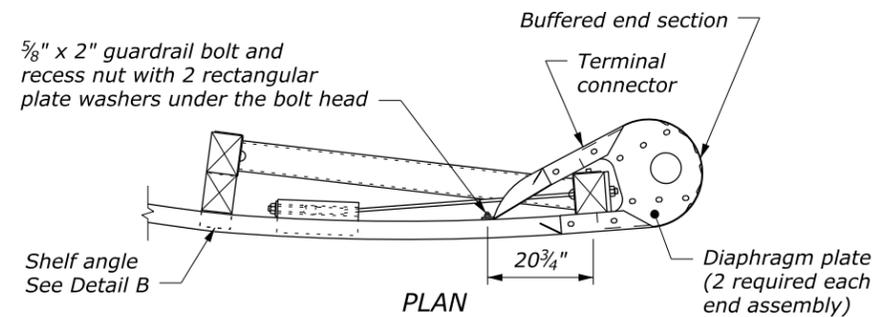
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13 April 2016 7:17 AM



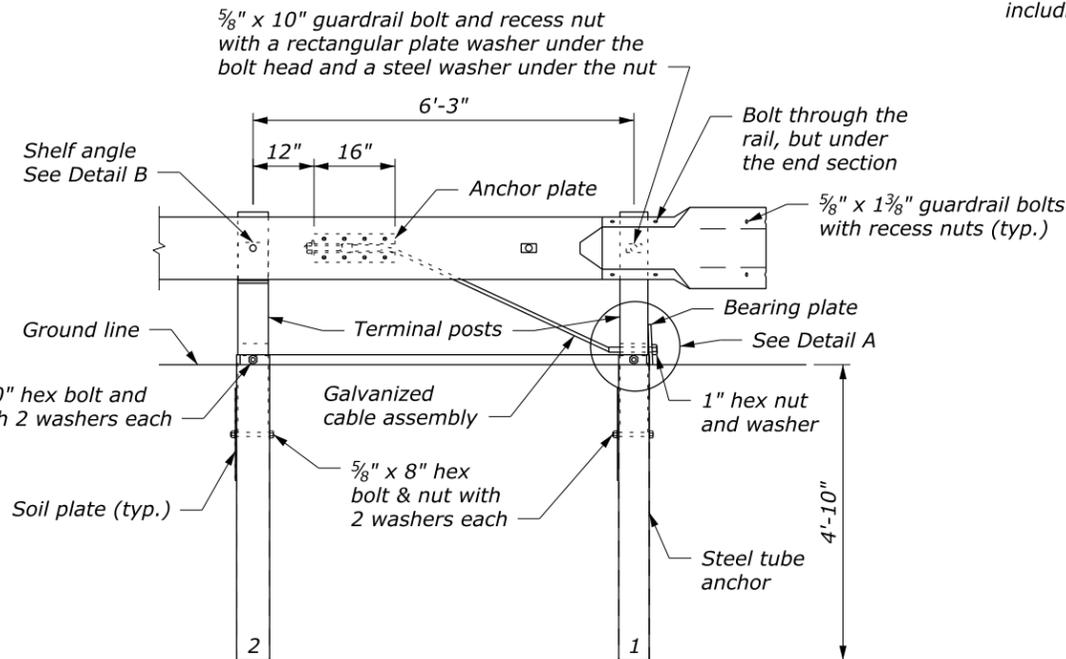
**DIAPHRAGM PLATE DETAILS**



**DIAPHRAGM PLATE**  
(2 required each terminal)

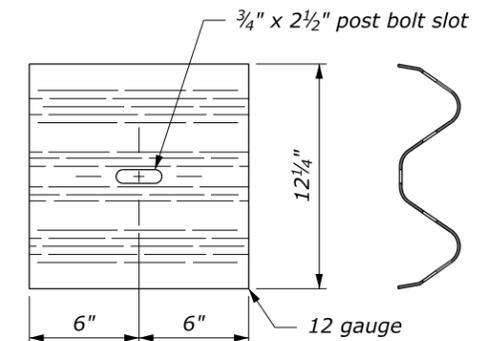


**PLAN**

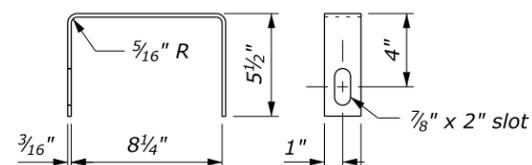


**ELEVATION**

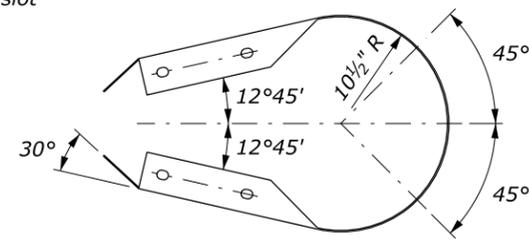
**ANCHORAGE ASSEMBLY**



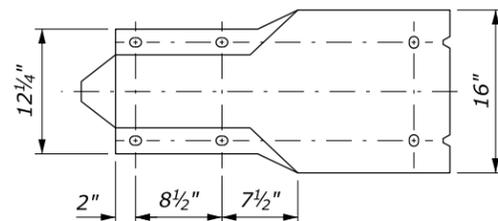
**W-BEAM BACK UP PLATE**  
POSTS #4, 5, 7, & 8



**YOKE DETAILS**

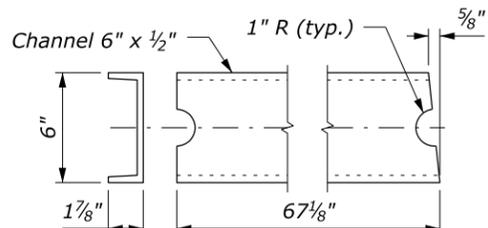


**PLAN**

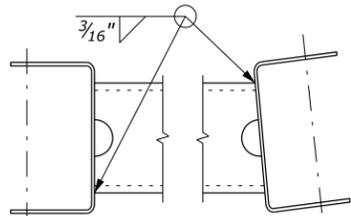


**ELEVATION**

**BUFFERED END SECTION**

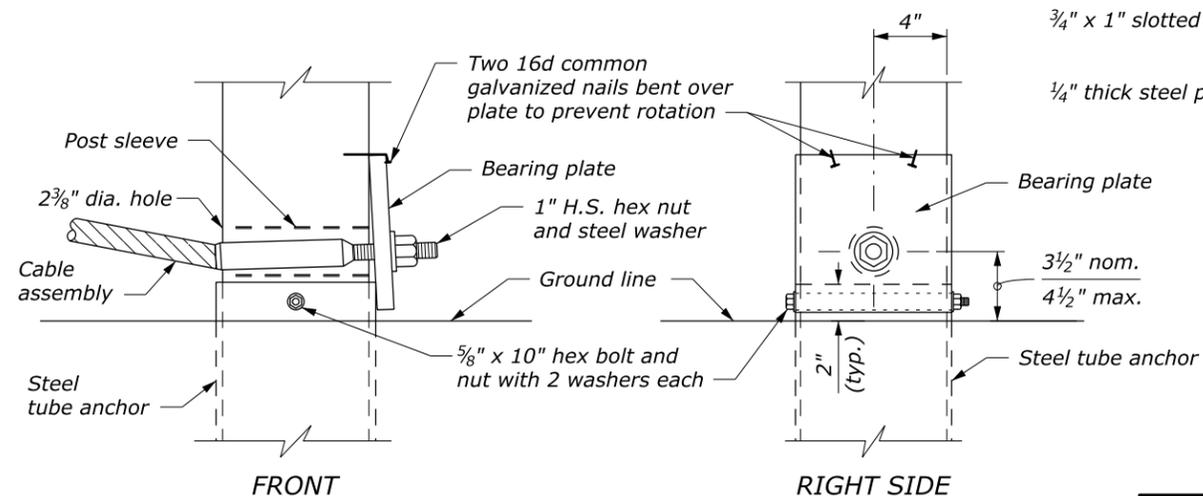


**STRUT DETAILS**



Shown with legs down. For opposite hand, install legs up.

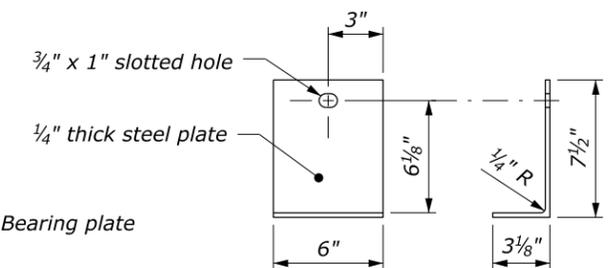
**STRUT AND YOKE ASSEMBLY**



**FRONT**

**RIGHT SIDE**

**DETAIL A**  
POST #1 ASSEMBLY



**DETAIL B**  
POST #2 SHELF ANGLE

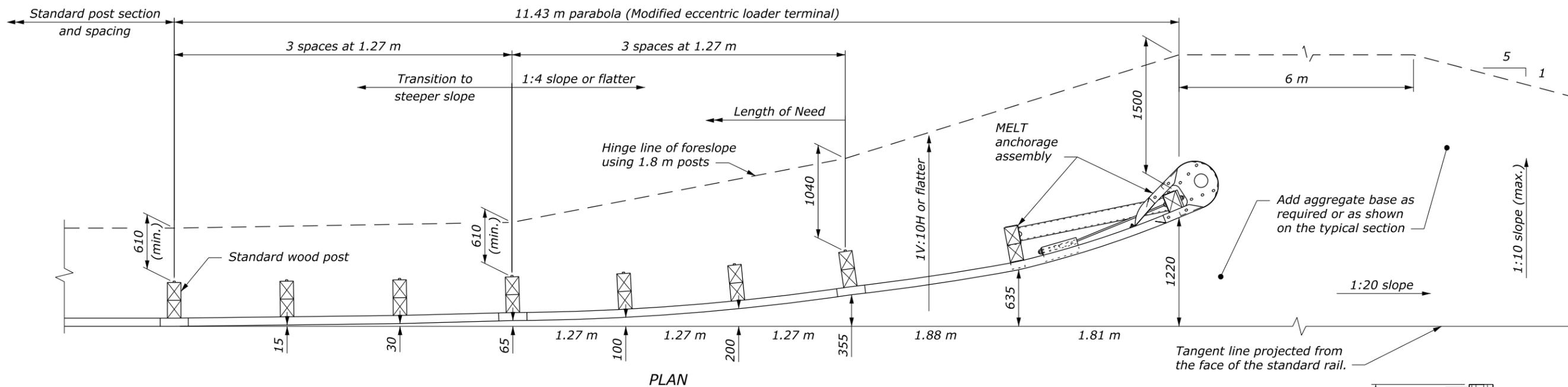
**NOTE:**

1. See Standard 617-15 for other details.
2. Extend bolts through the post and block, but not through the W-Beam rail for Posts #2-8. Extend bolts through the W-Beam rail for Posts #1 and #9.
3. Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.

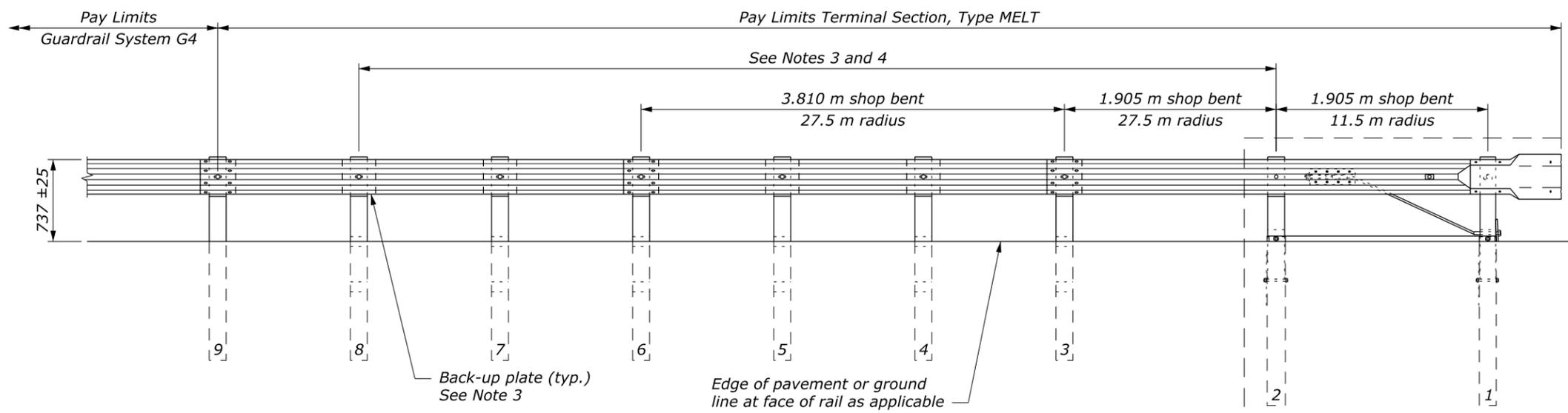
NO SCALE

**NOTE:**

1. Do not use terminal where speeds are in excess of 70 kph.
2. Extend bolts through the post and block, but not through the W beam rail for Posts #2-8. Extend bolts through the W-Beam rail for Posts #1 and #9.
3. Use Back-up plates on posts #4, 5, 7, and 8.
4. Use Shelf angle on post #2.
5. Dimensions without units are millimeters.

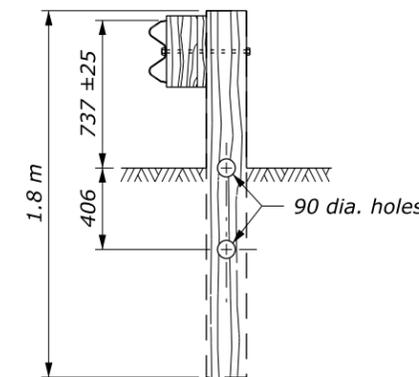


PLAN



ELEVATION

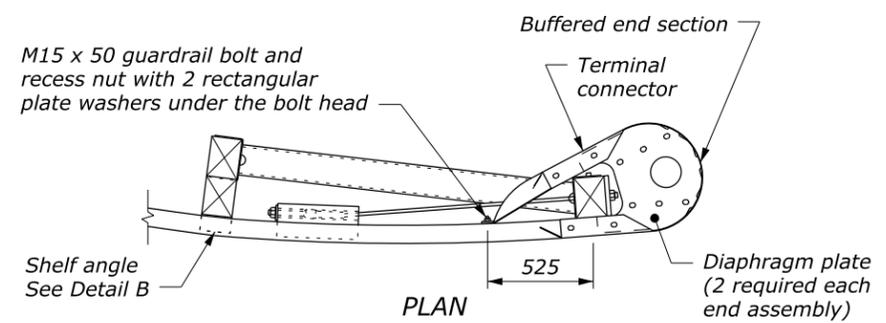
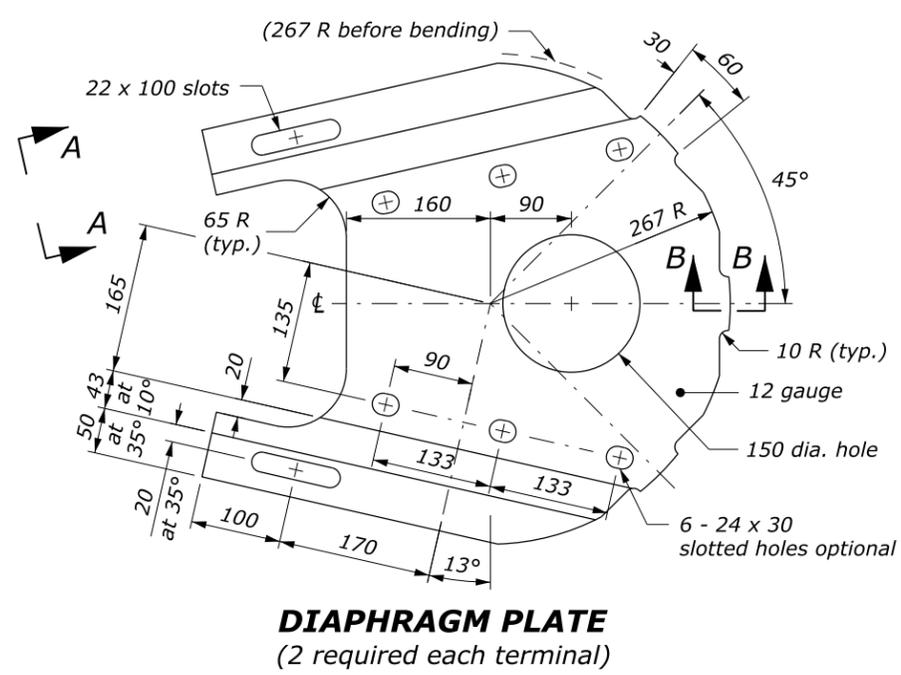
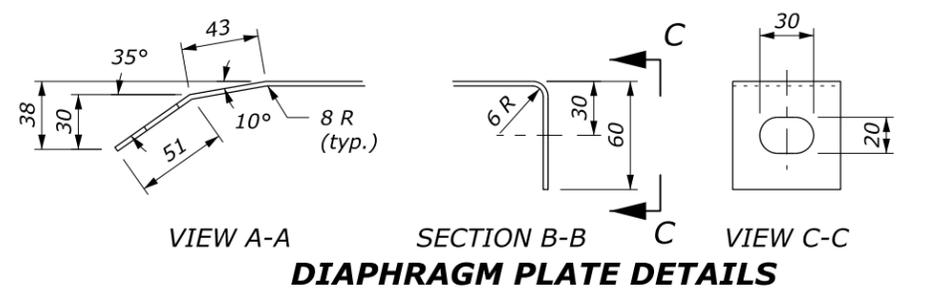
**APPROACH & DEPARTURE FLARE  
WITH MODIFIED ECCENTRIC LOADER TERMINAL**



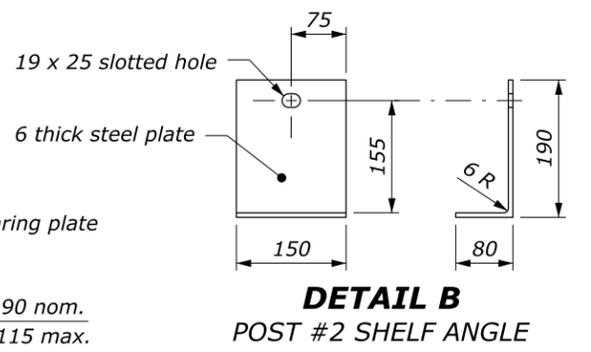
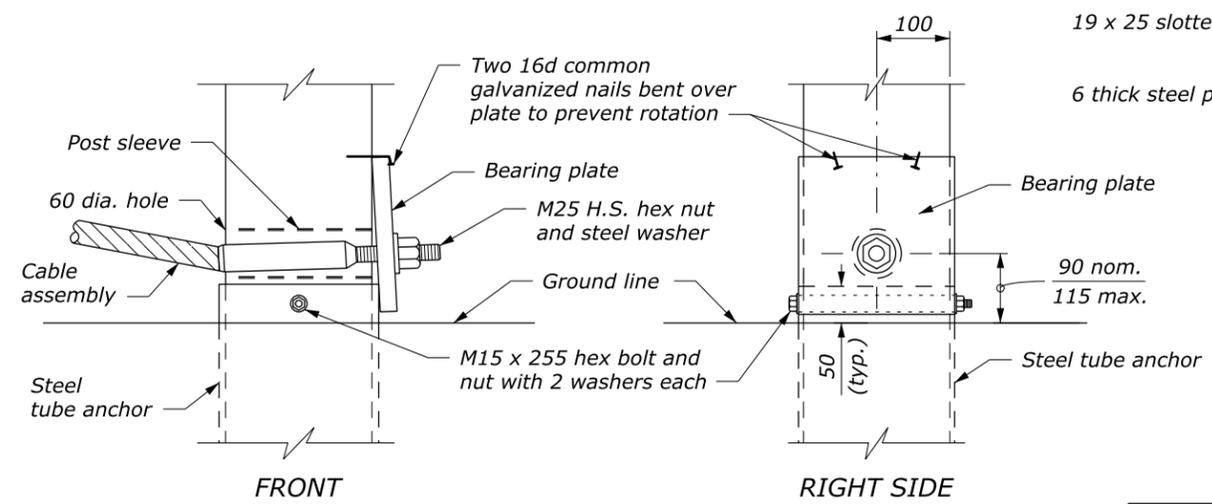
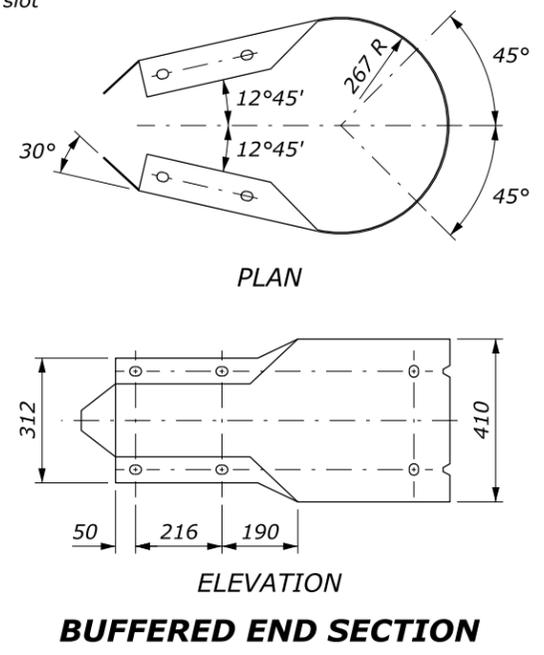
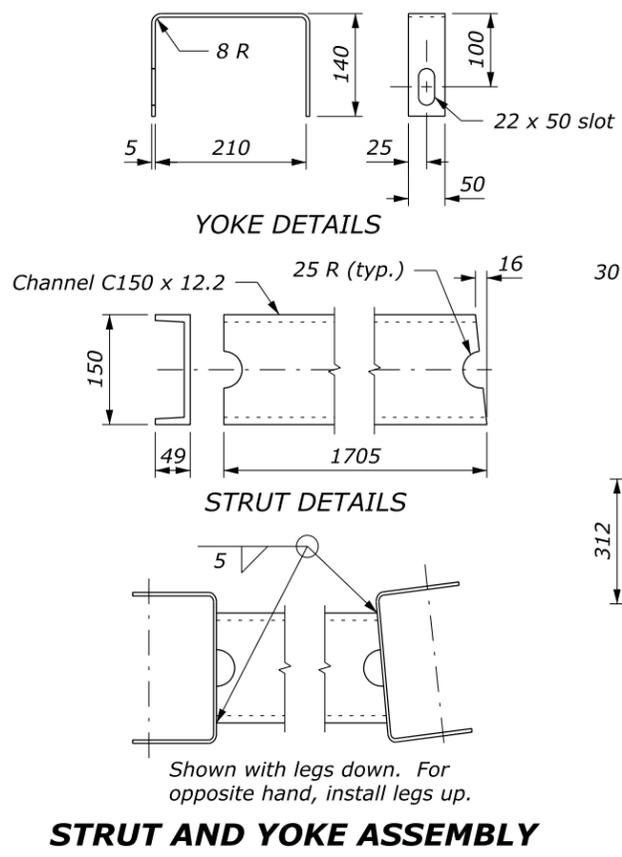
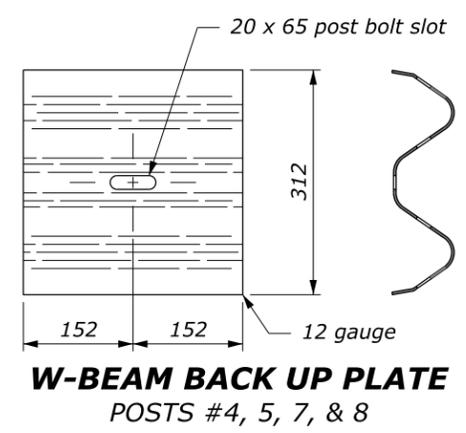
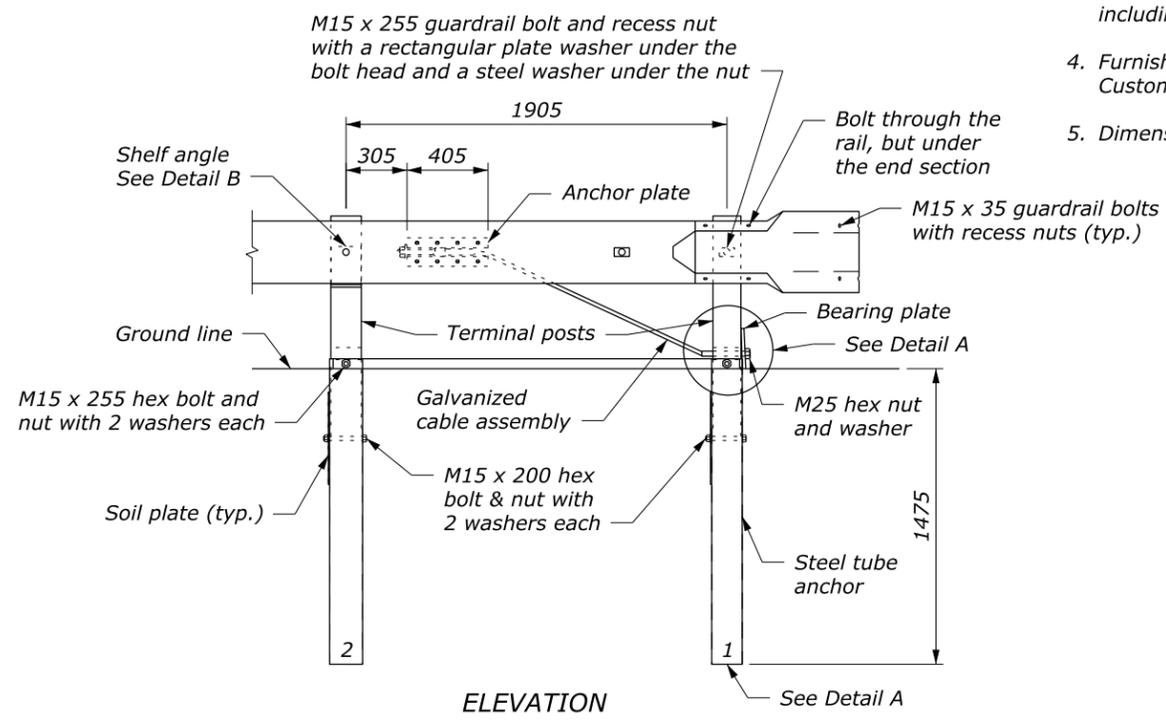
**BREAKAWAY LINE  
POST AND BLOCK  
POSTS #3 - #8**

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
METRIC STANDARD <b>G4 W-BEAM GUARDRAIL MODIFIED ECCENTRIC LOADER TERMINAL, TYPE MELT</b> Sheet 1 of 2	
STANDARD APPROVED FOR USE 3/1996	STANDARD
REVISED: 12/1998 6/2005 DRAFT: 4/2016	M617-12

NO SCALE



- NOTE:**
1. See Standard M617-15 for other details.
  2. Extend bolts through the post and block, but not through the W-Beam rail for Posts #2-8. Extend bolts through the W-Beam rail for Posts #1 and #9.
  3. Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.
  4. Furnish hardware in metric sizes shown. Equivalent U.S. Customary sizes may be used when metric sizes are unavailable.
  5. Dimensions without units are millimeters.



U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
FEDERAL LANDS HIGHWAY

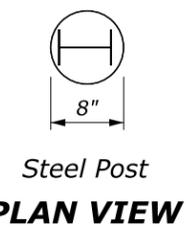
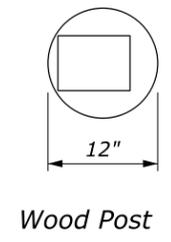
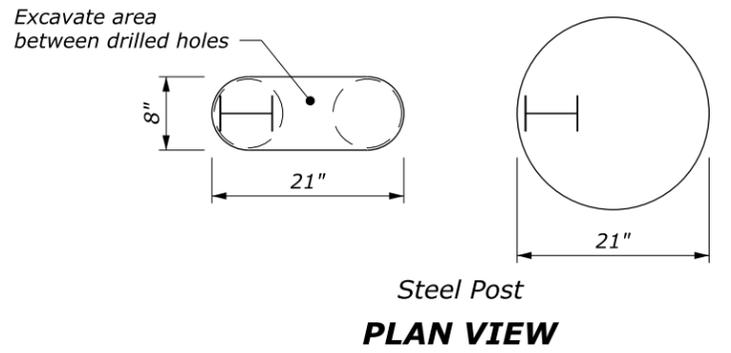
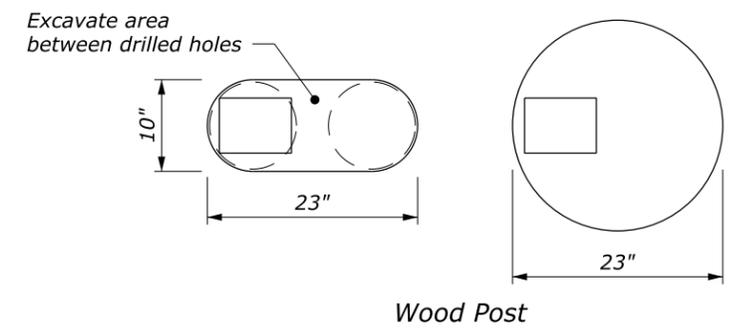
METRIC STANDARD  
**G4 W-BEAM GUARDRAIL  
MODIFIED ECCENTRIC LOADER  
TERMINAL, TYPE MELT**  
Sheet 2 of 2

STANDARD APPROVED FOR USE 3/1996  
REVISED: 12/1998 6/2005  
DRAFT: 5/2014

STANDARD  
M617-12

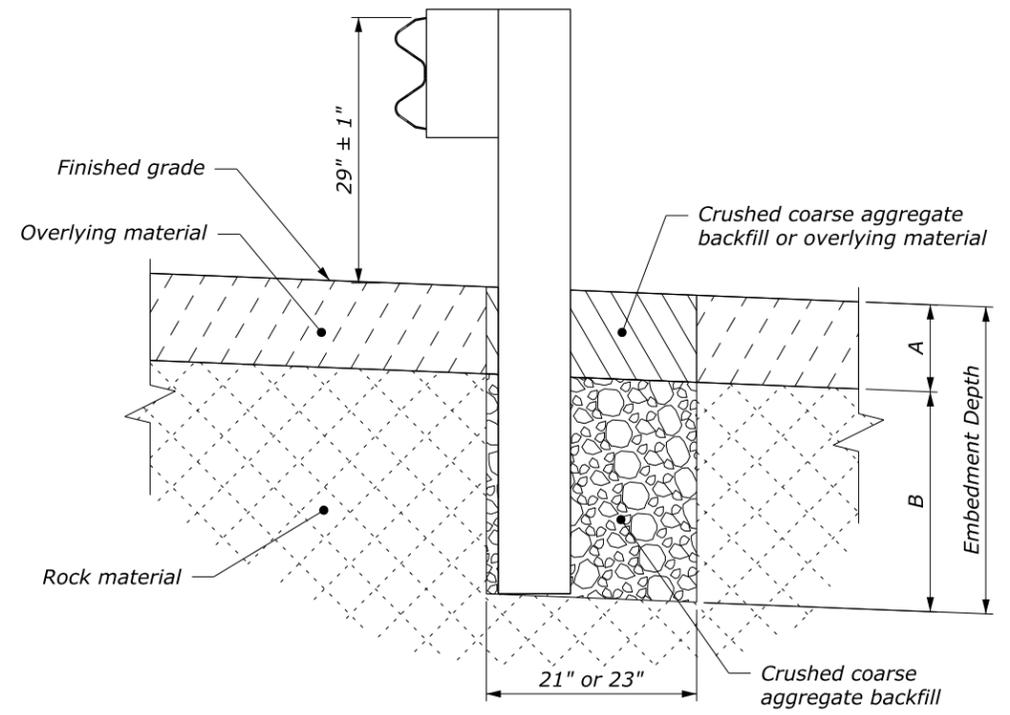
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13 April 2016 7:12 AM



**NOTE:**

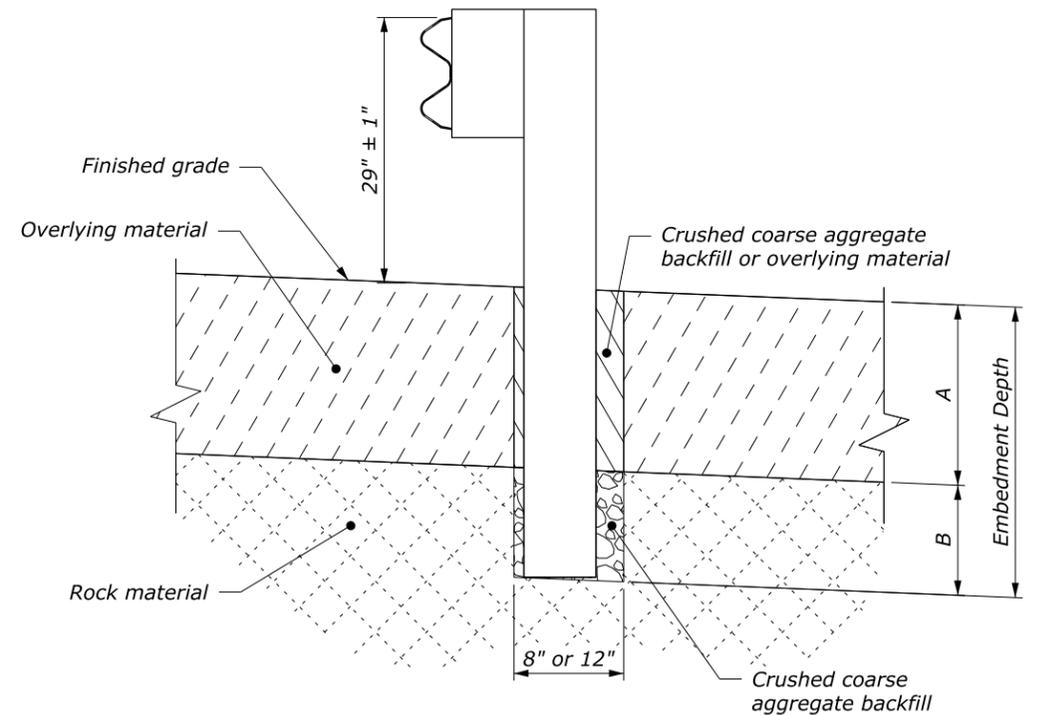
1. Use this standard when posts cannot be embedded to the minimum depth shown on Standards 617-10 or 617-11.
2. Unless otherwise specified use either the circular or the oblong hole configuration for Case 1 conditions.
3. Crushed coarse aggregate backfill conforms to "coarse aggregate for concrete" or "granular backfill for underdrain pipe with geotextile" in Section 703.
4. Place crushed coarse aggregate according to the post requirements in Section 617.
5. Treat field cut galvanized steel post surfaces that expose the base metal with two coats of zinc-oxide paint.



**ELEVATION**

Case 1: Overlying material depth (A) is 18" or less.

POST EMBEDMENT DIMENSIONS			
HOLE TYPE	EMBEDMENT DEPTH	OVERLYING MATERIAL (A)	DRILLING DEPTH (B)
Case 1	24" to 42"	0 to 18"	24"
Case 2	30" to 42"	> 18" to 30"	12"
	42"	> 30"	42" - A

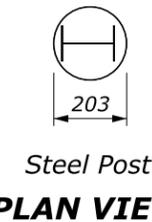
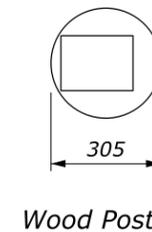
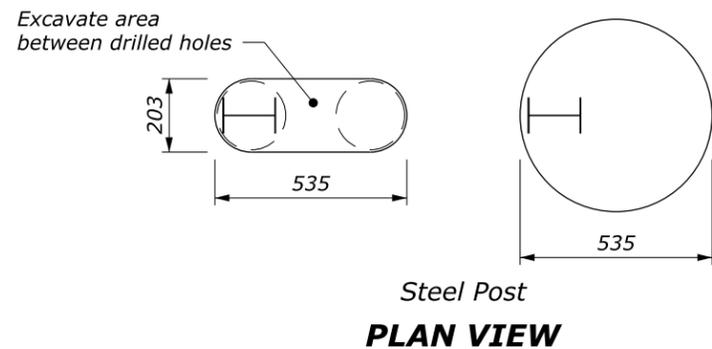
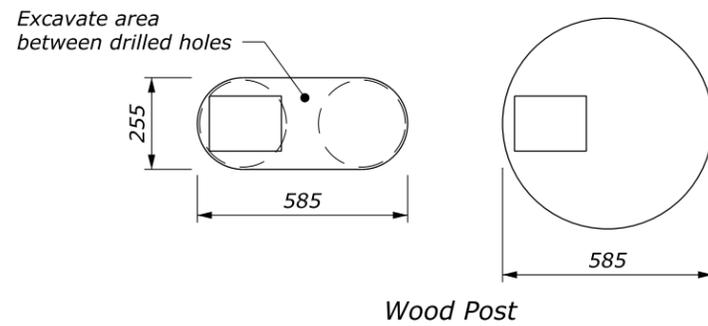


**ELEVATION**

Case 2: Overlying material depth (A) is greater than 18".

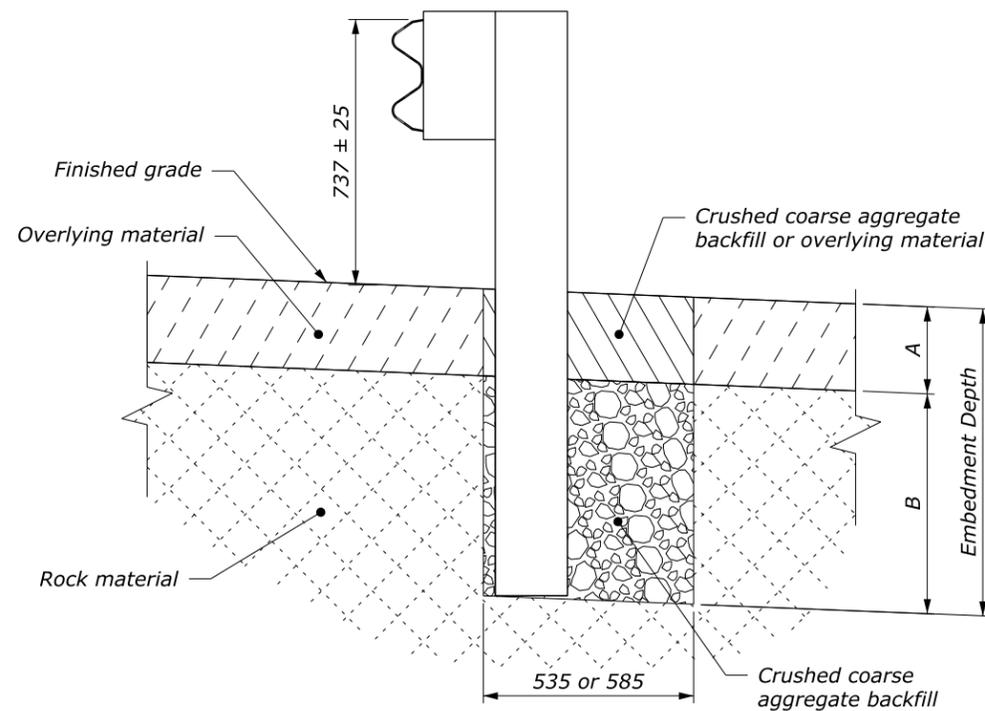
NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
<b>G4 W-BEAM GUARDRAIL INSTALLATION IN ROCK</b>	
STANDARD APPROVED FOR USE --/----	STANDARD
REVISED: DRAFT: 6/2014	617-13



**NOTE:**

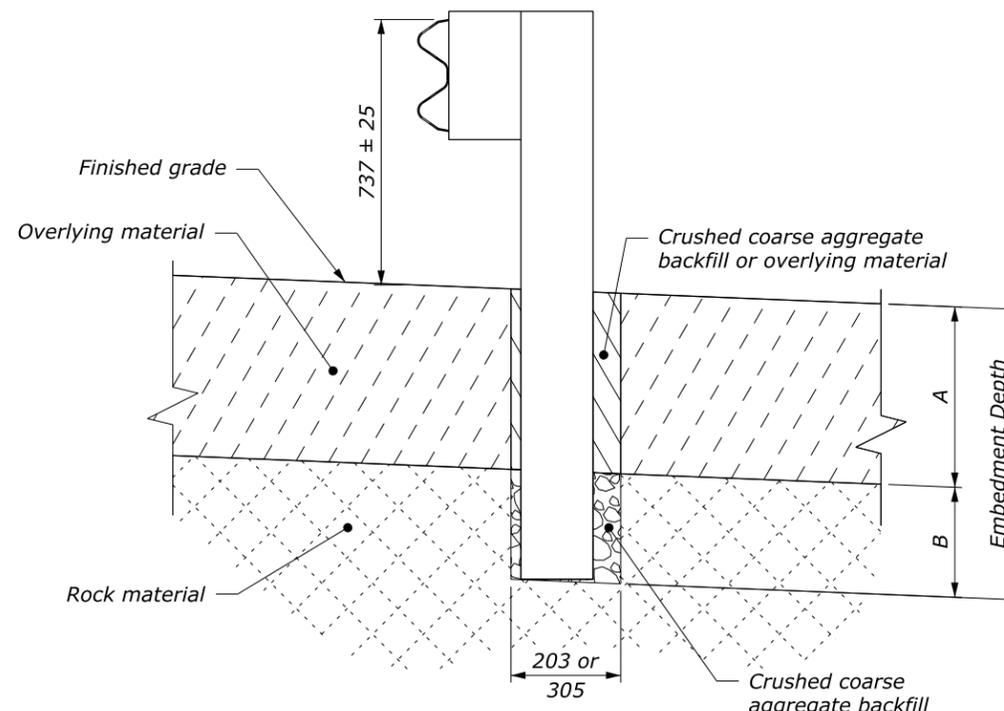
1. Use this standard when posts cannot be embedded to the minimum depth shown on Standards M617-10 or M617-11.
2. Unless otherwise specified use either the circular or the oblong hole configuration for Case 1 conditions.
3. Crushed coarse aggregate backfill conforms to "coarse aggregate for concrete" or "granular backfill for underdrain pipe with geotextile" in Section 703.
4. Place crushed coarse aggregate according to the post requirements in Section 617.
5. Treat field cut galvanized steel post surfaces that expose the base metal with two coats of zinc-oxide paint.
6. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are unavailable.
7. Dimensions without units are millimeters.



**ELEVATION**

Case 1: Overlying material depth (A) is 457 mm or less.

POST EMBEDMENT DIMENSIONS			
HOLE TYPE	EMBEDMENT DEPTH	OVERLYING MATERIAL (A)	DRILLING DEPTH (B)
Case 1	610 to 1065	0 to 457	610
Case 2	760 to 1065	> 457 to 760	305
	1065	> 760	1065 - A

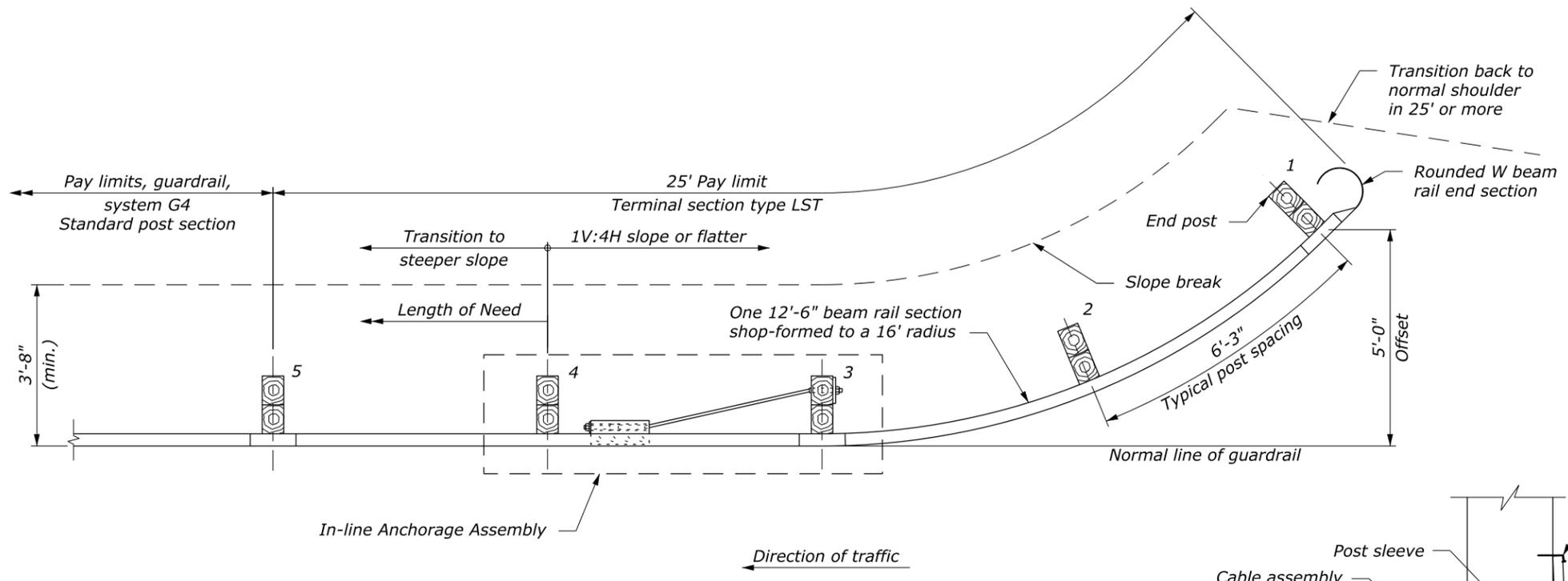


**ELEVATION**

Case 2: Overlying material depth (A) is greater than 457 mm.

NO SCALE

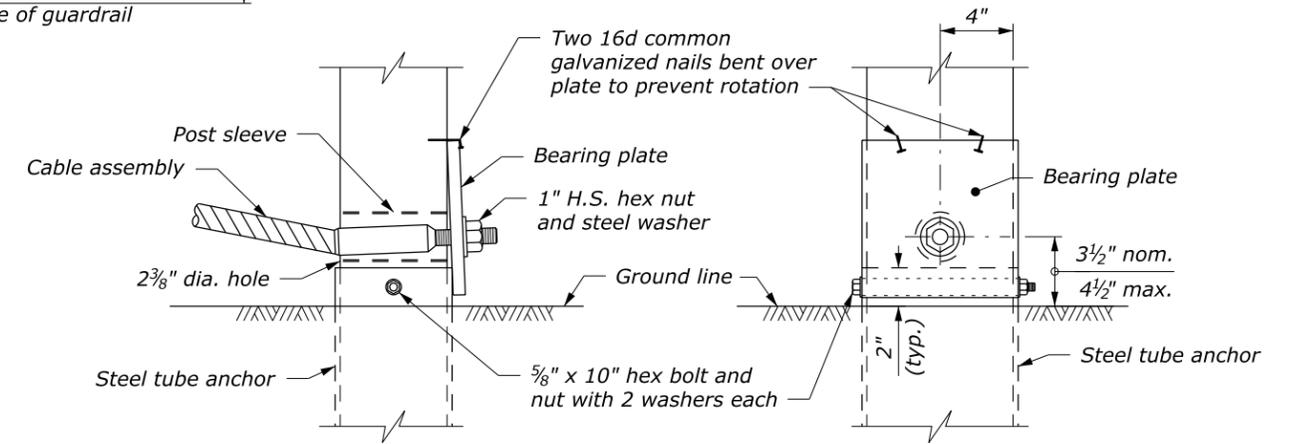
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
METRIC STANDARD	
<b>G4 W-BEAM GUARDRAIL INSTALLATION IN ROCK</b>	
STANDARD APPROVED FOR USE --/----	STANDARD
REVISED: DRAFT: 6/2014	M617-13



**PLAN**

**NOTE:**

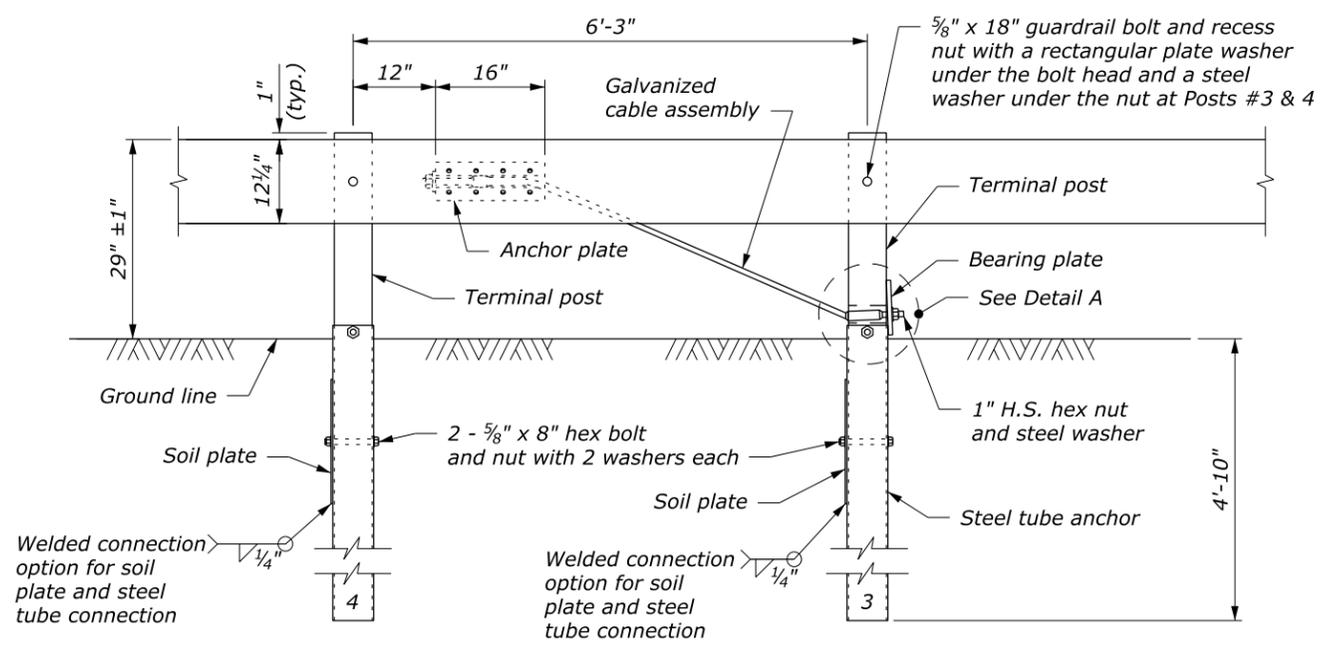
1. Pay limits for terminal section type LST include the in-line anchorage assembly and posts 1-5.
2. Use offset from face of rail to slope break as shown unless otherwise shown on plan.
3. Posts 1, 2 and 5 are standard guardrail posts. See Standard 617-10 for details.
4. See Standard 617-15 for other details.
5. Do not use LST terminal where speeds are in excess of 45 MPH.



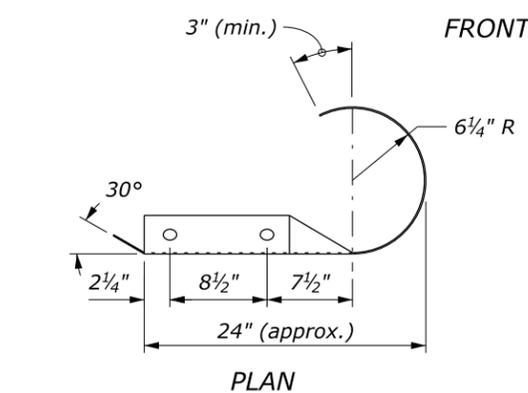
**FRONT**

**RIGHT SIDE**

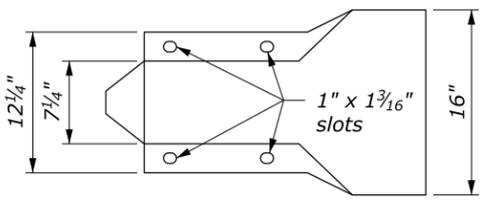
**DETAIL A  
POST #3 ASSEMBLY**



**ELEVATION  
IN-LINE ANCHORAGE ASSEMBLY**



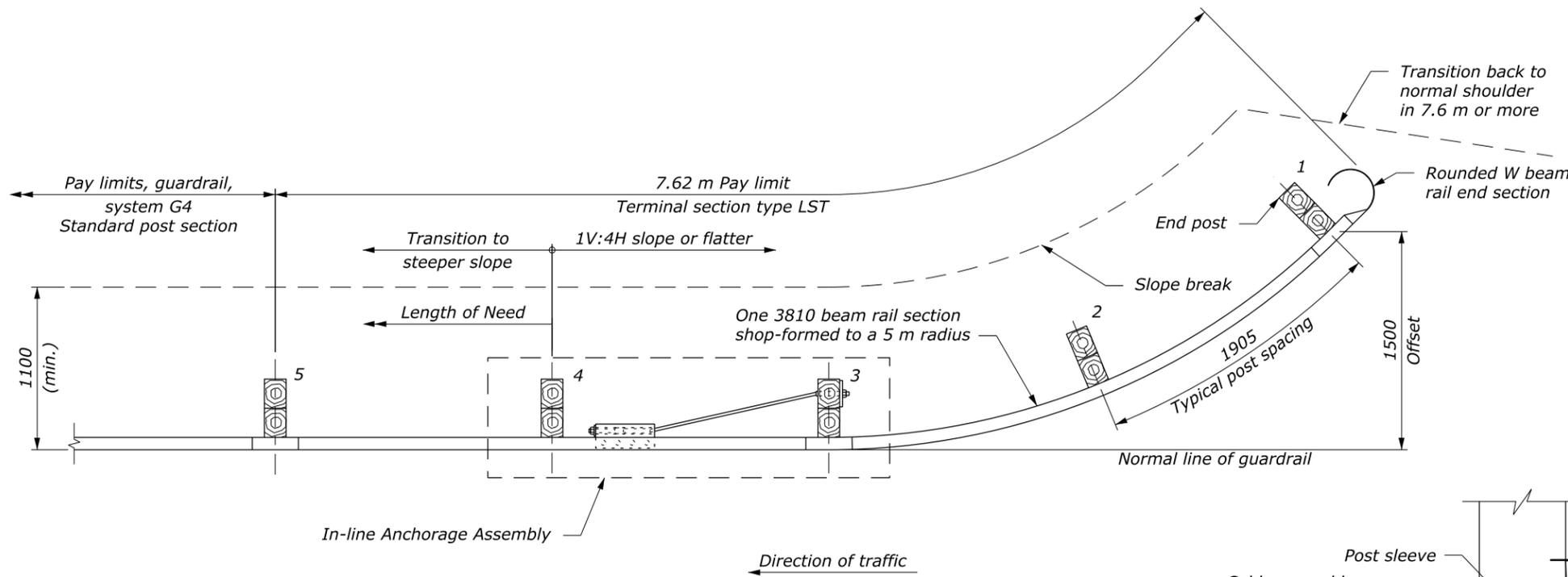
**PLAN**



**ELEVATION  
ROUNDED END SECTION**

NO SCALE

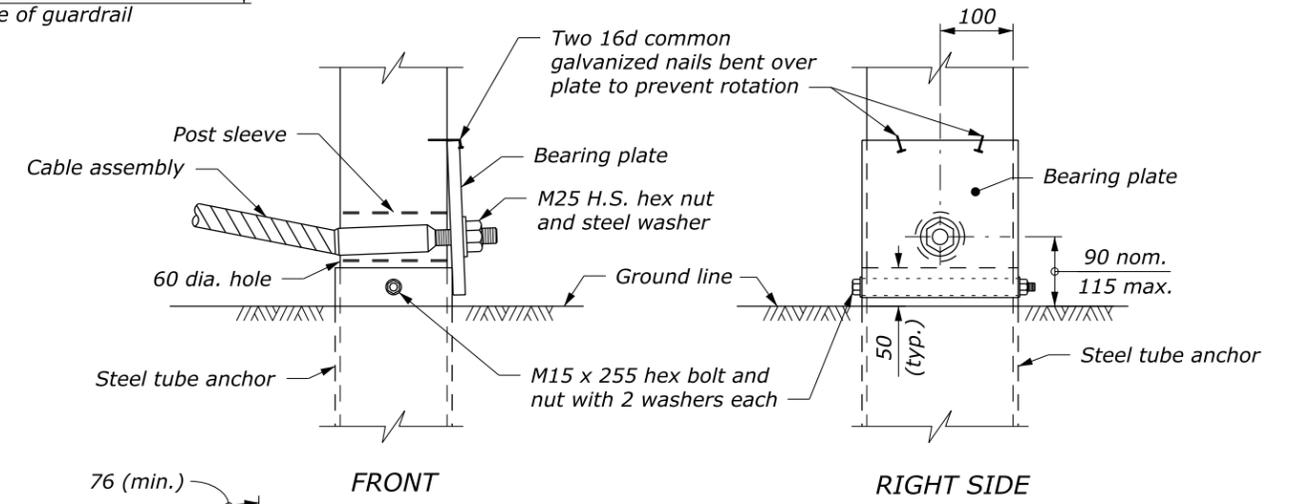
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD <b>G4-W BEAM GUARDRAIL LOW SPEED TERMINAL TYPE LST, WOOD POSTS</b>	
STANDARD APPROVED FOR USE 6/2005	STANDARD
REVISED: DRAFT: 12/2014	617-14



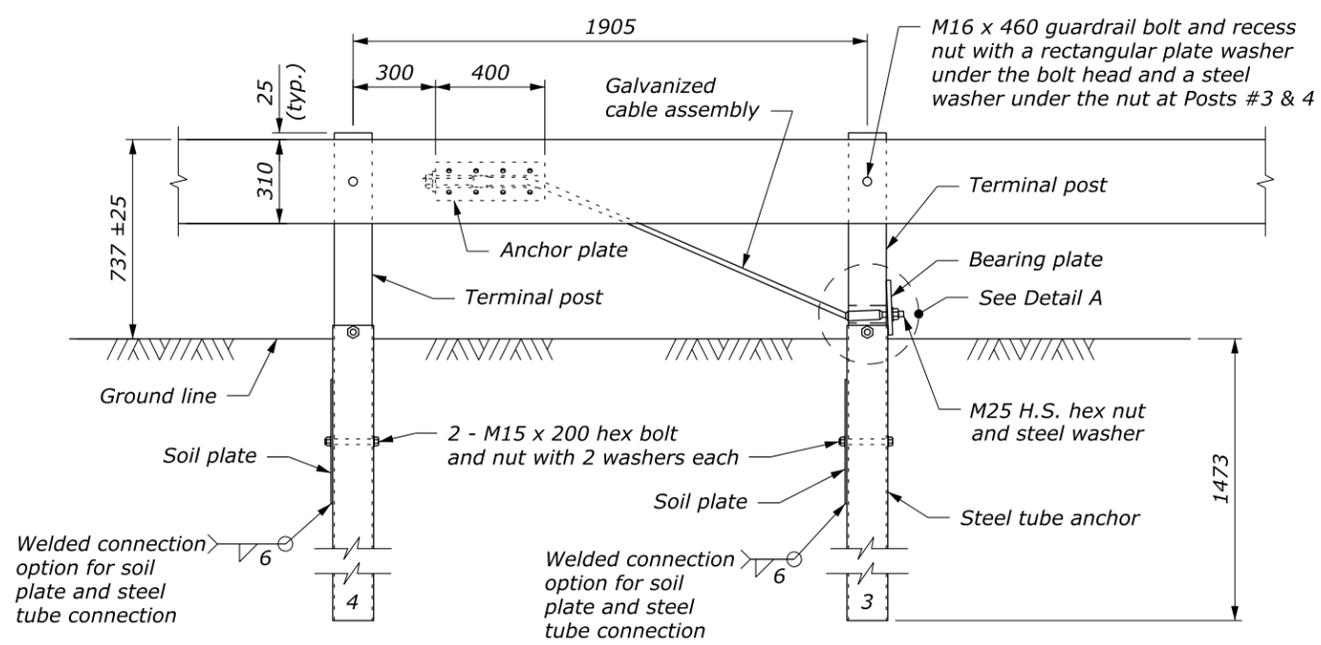
**PLAN**

**NOTE:**

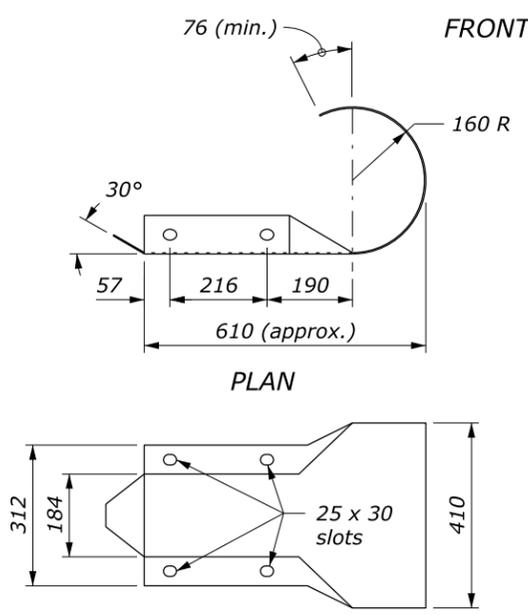
1. Pay limits for terminal section type LST include the in-line anchorage assembly and posts 1-5.
2. Use offset from face of rail to slope break as shown unless otherwise shown on plan.
3. Posts 1, 2 and 5 are standard guardrail posts. See Standard M617-10 for details.
4. See Standard M617-15 for other details.
5. Do not use LST terminal where speeds are in excess of 70 km/h [45 MPH].
6. Dimensions without units are millimeters.



**DETAIL A  
POST #3 ASSEMBLY**



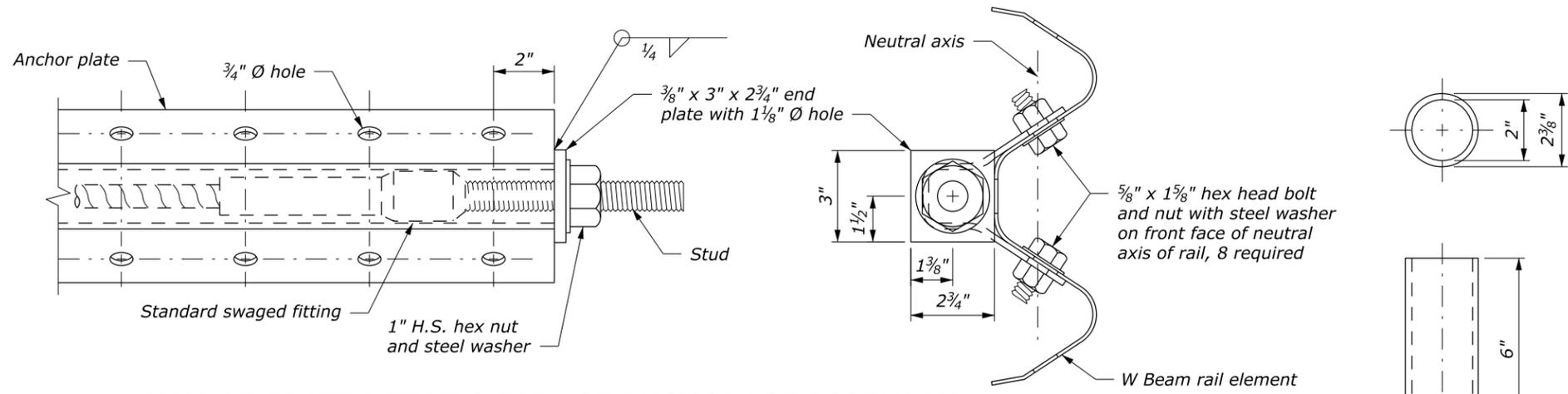
**ELEVATION  
IN-LINE ANCHORAGE ASSEMBLY**



**ELEVATION  
ROUNDED END SECTION**

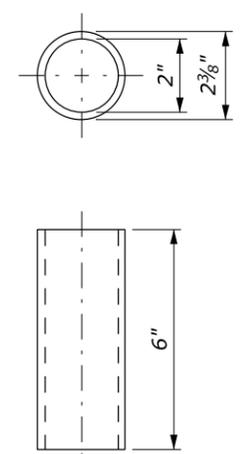
NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
METRIC STANDARD	
<b>G4-W BEAM GUARDRAIL LOW SPEED TERMINAL TYPE LST, WOOD POSTS</b>	
STANDARD APPROVED FOR USE 6/2005	STANDARD
REVISED: DRAFT: 12/2014	M617-14

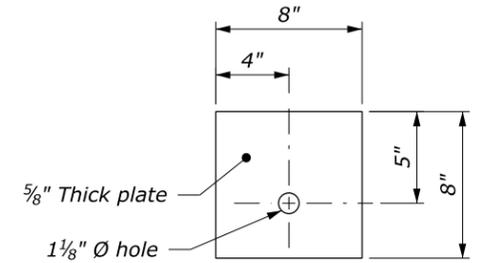


**ANCHOR PLATE DETAILS FOR LST ANCHORAGE ASSEMBLY**

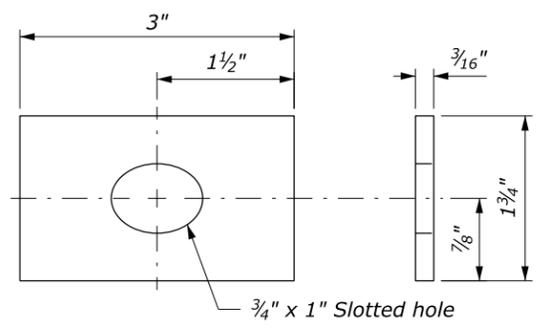
**NOTE:**  
 1. Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.



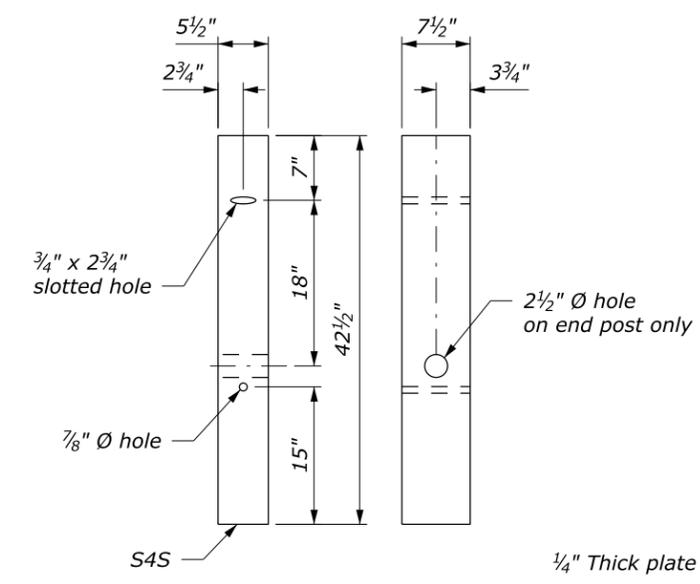
**POST SLEEVE**



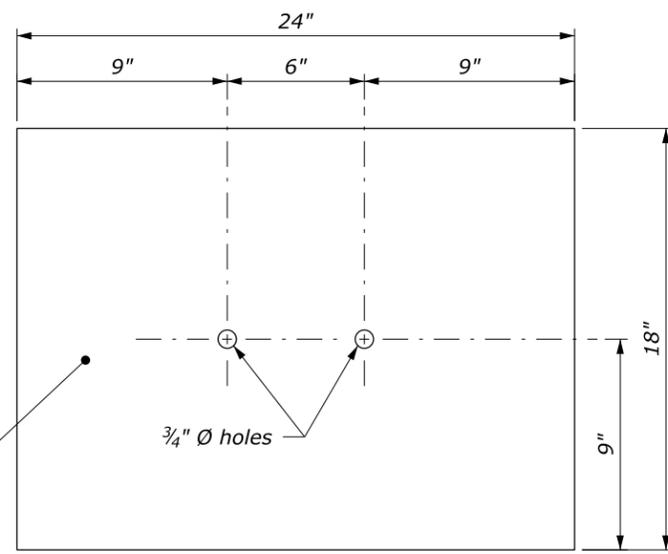
**BEARING PLATE**



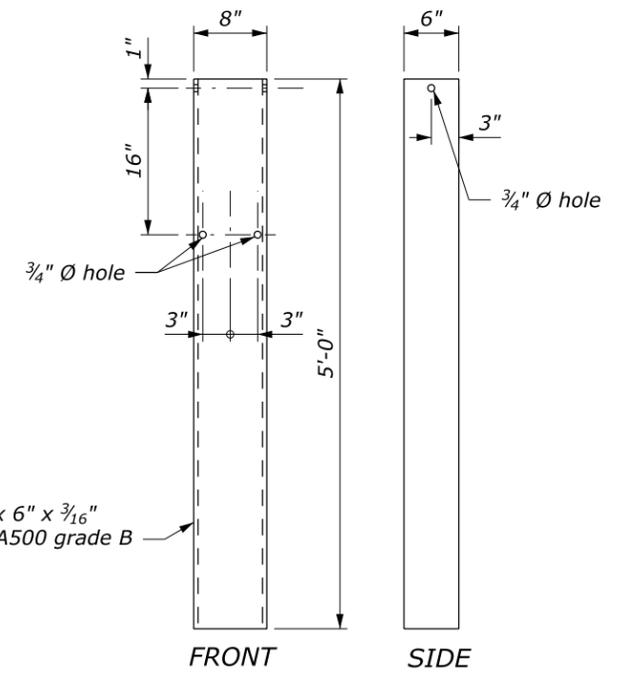
**RECTANGULAR PLATE WASHER**  
 (Use to attach the section to the post of anchorage assembly)



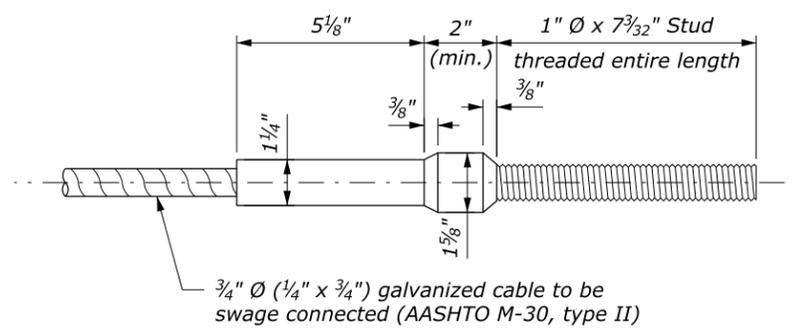
**TERMINAL POST**



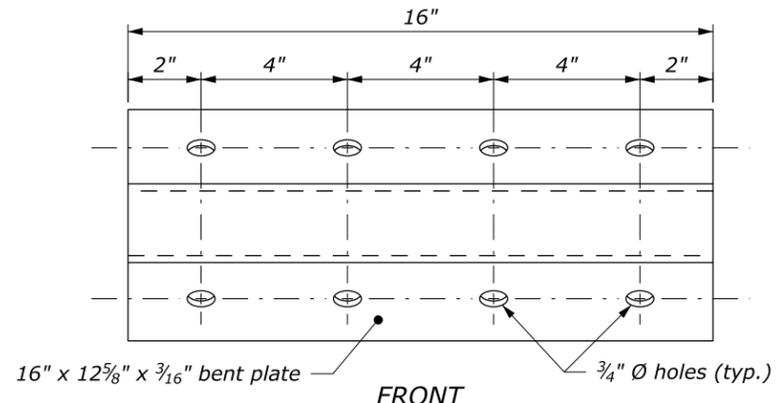
**SOIL PLATE**  
 (2 REQUIRED)



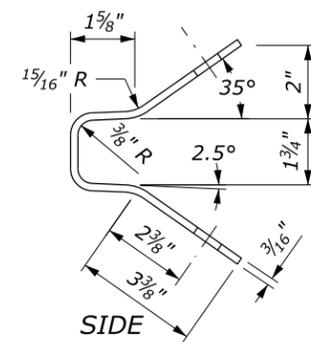
**STEEL TUBE ANCHOR**



**CABLE ASSEMBLY**  
 (Standard swaged fitting and stud)

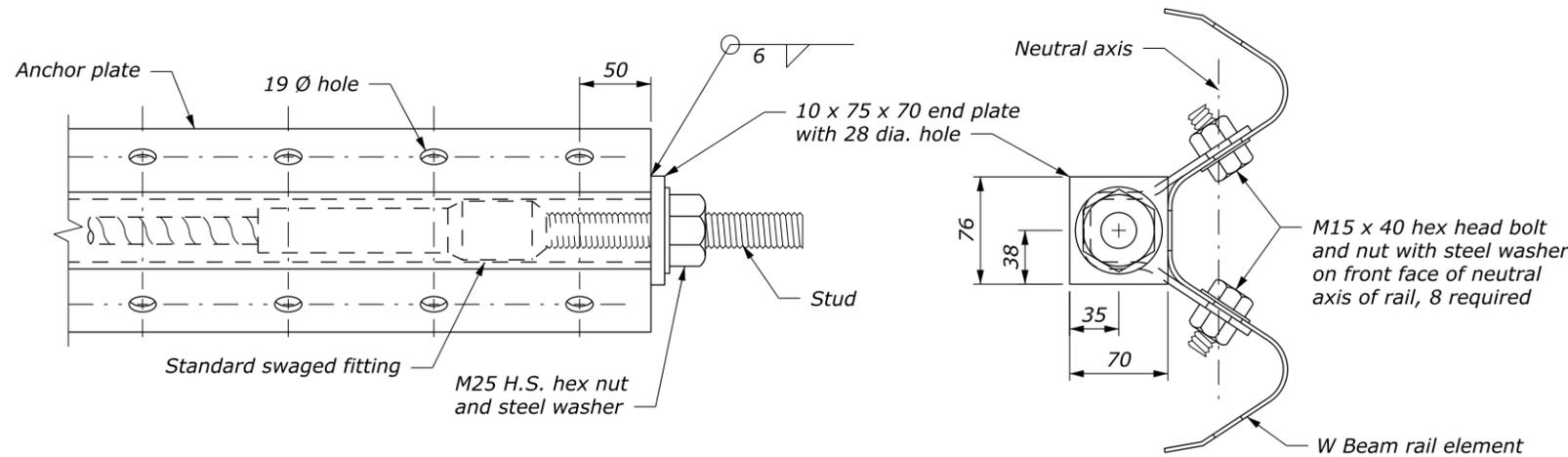


**GUARDRAIL ANCHOR PLATE**



NO SCALE

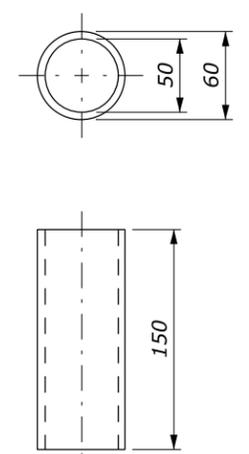
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
<b>G4 W-BEAM GUARDRAIL MELT, LST &amp; CRT ANCHORAGE ASSEMBLY DETAILS</b>	
STANDARD APPROVED FOR USE 1/1994	STANDARD
REVISED: 4/1994 6/2005	617-15
DRAFT: 5/2014	



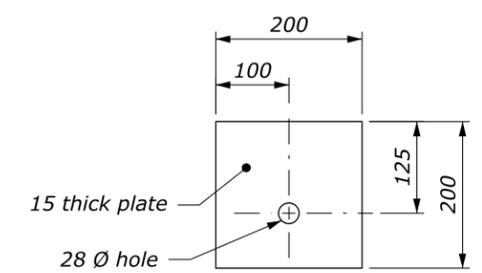
**ANCHOR PLATE DETAILS FOR LST ANCHORAGE ASSEMBLY**

**NOTE:**

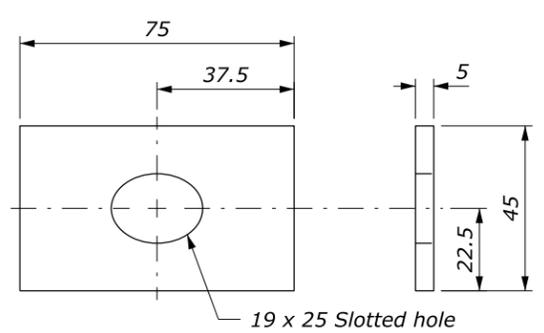
1. Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.
2. Furnish hardware in the metric sizes shown. Equivalent U.S. Customary sizes may be used when metric sizes are unavailable.
3. Dimensions without units are millimeters.



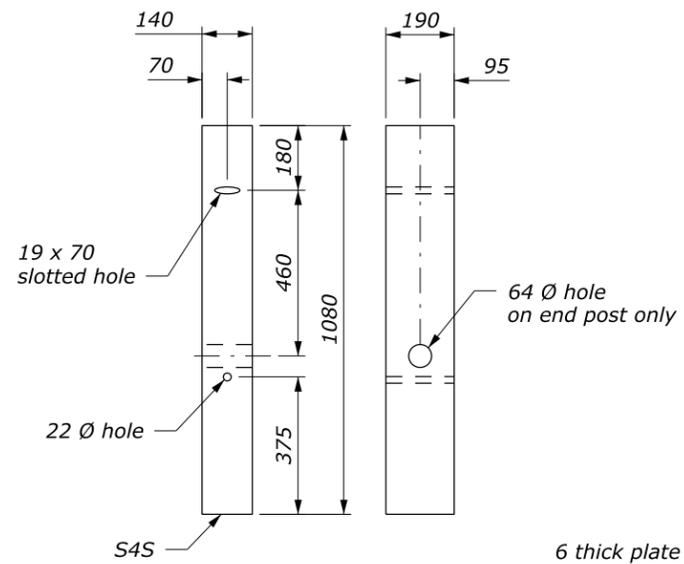
**POST SLEEVE**



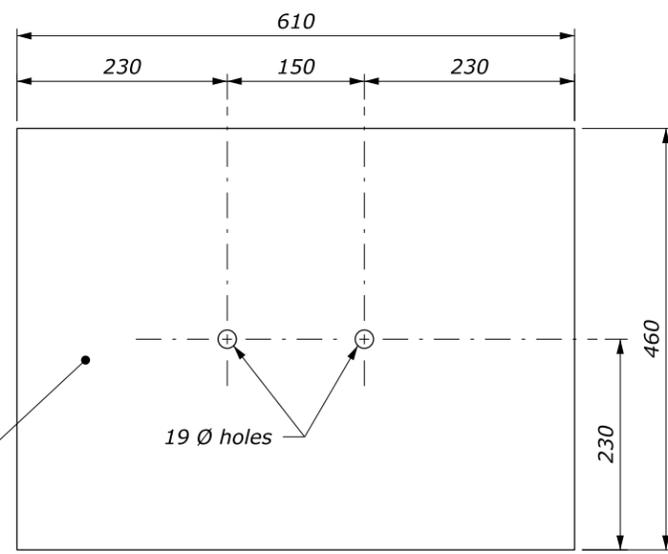
**BEARING PLATE**



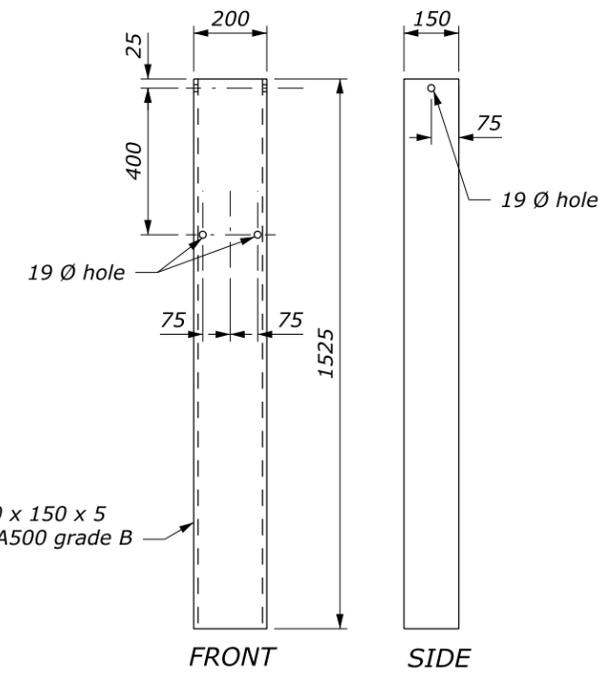
**RECTANGULAR PLATE WASHER**  
(Use to attach the section to the post of anchorage assembly)



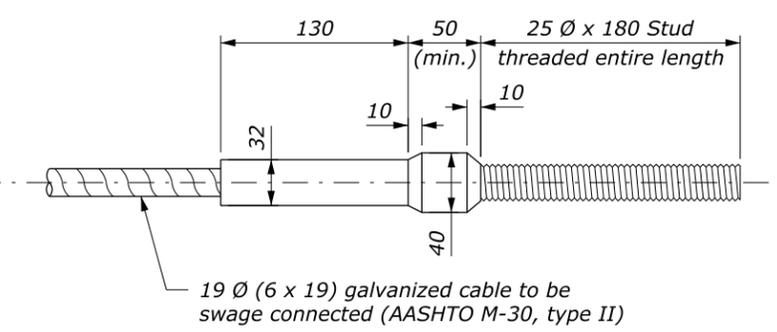
**TERMINAL POST**



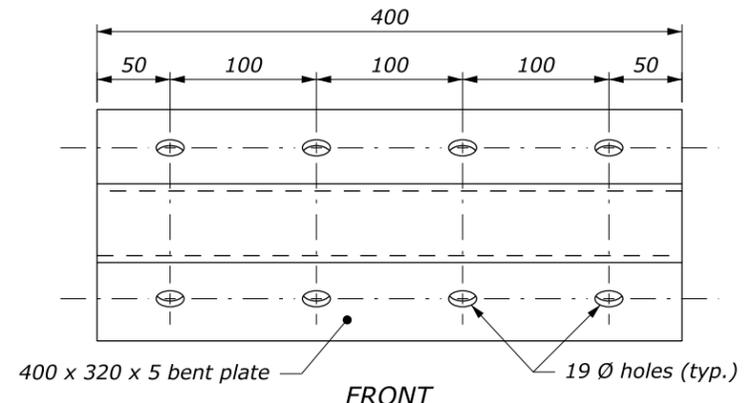
**SOIL PLATE**  
(2 REQUIRED)



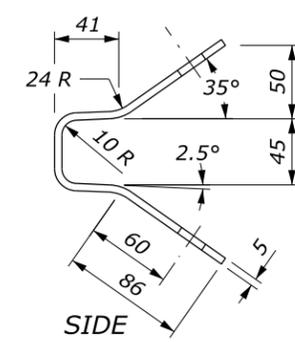
**STEEL TUBE ANCHOR**



**CABLE ASSEMBLY**  
(Standard swaged fitting and stud)

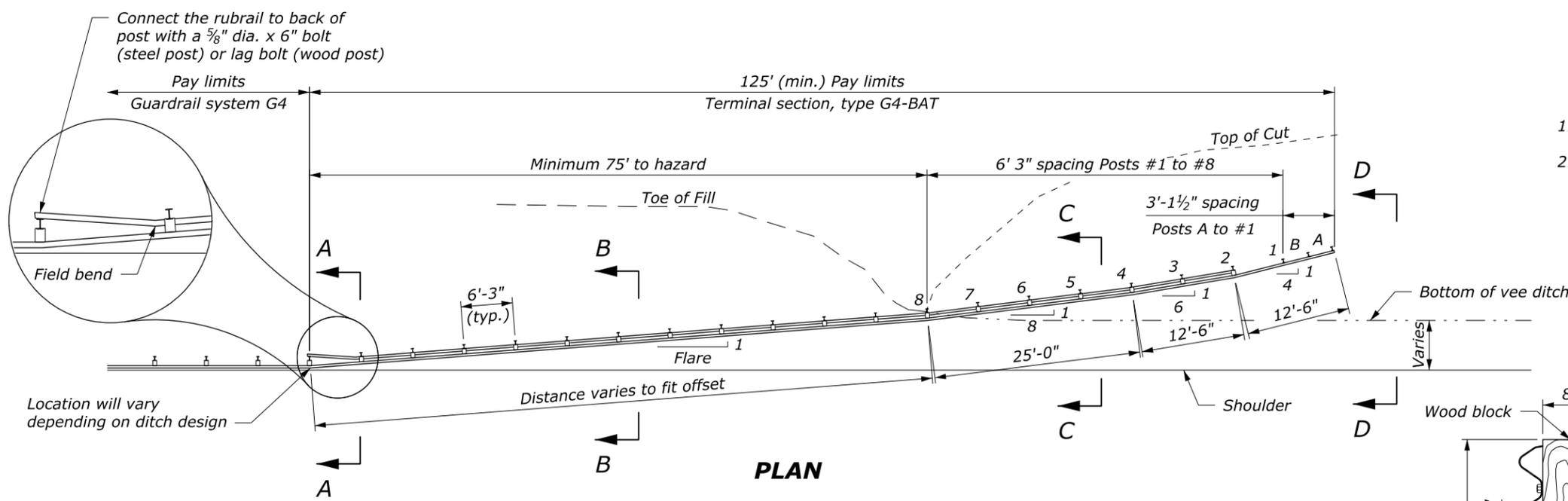


**GUARDRAIL ANCHOR PLATE**



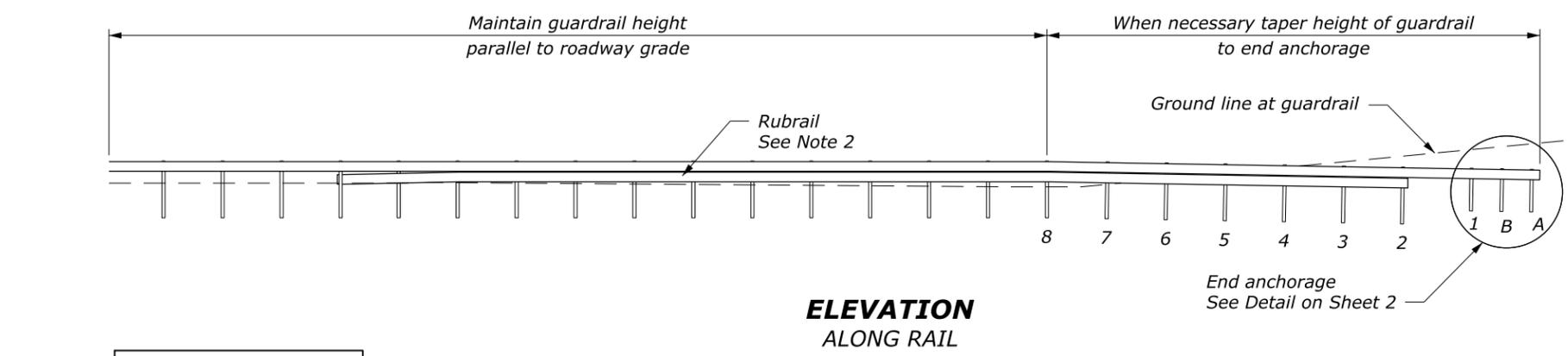
NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
METRIC STANDARD	
<b>G4 W-BEAM GUARDRAIL MELT, LST &amp; CRT ANCHORAGE ASSEMBLY DETAILS</b>	
STANDARD APPROVED FOR USE 3/1996	STANDARD
REVISED: 8/1997 12/1998 6/2005	M617-15
DRAFT: 5/2014	



**NOTE:**

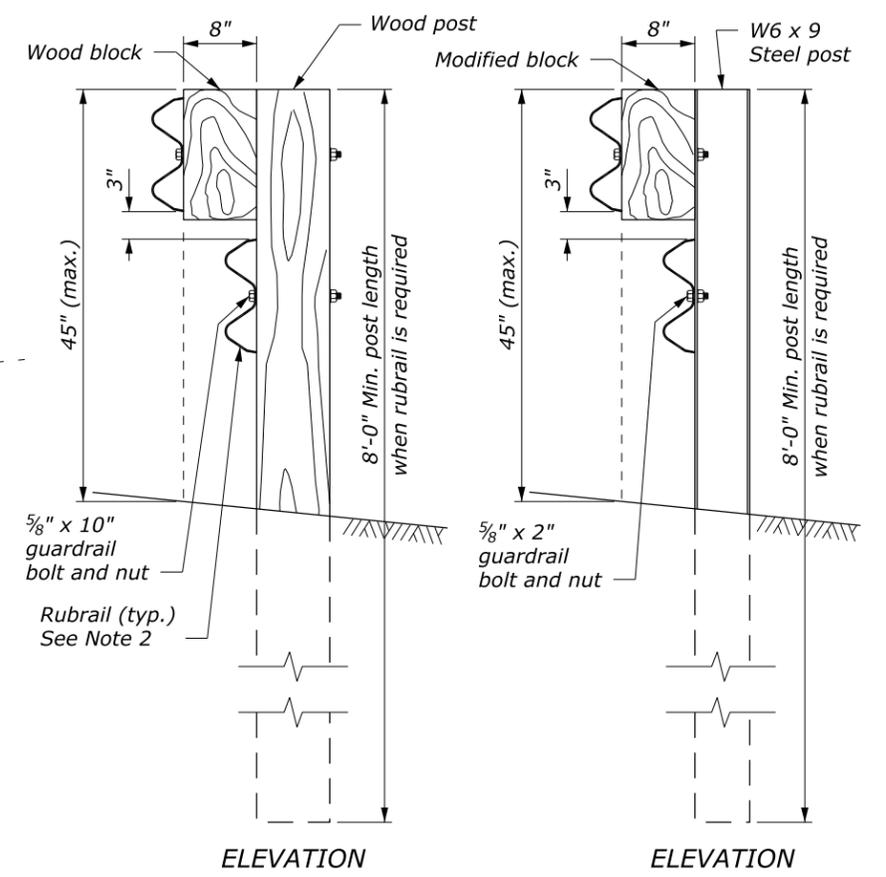
1. See Standards 617-10 and 617-11 for other details.
2. Hold the height of the W-beam rail constant in relation to the roadway shoulder elevation until the barrier crosses the ditch bottom. Add the rubrail when the distance from the ground to the bottom of the W-beam exceeds 18".



**ELEVATION  
ALONG RAIL**

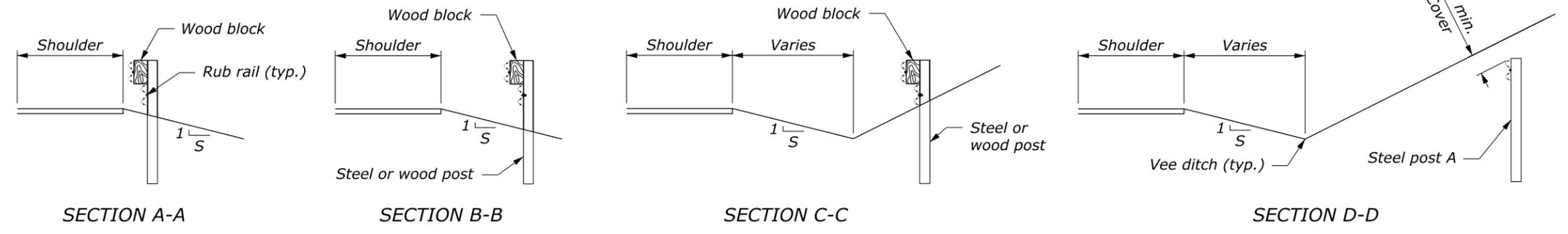
GUARDRAIL FLARE	
DESIGN SPEED MPH	FLARE
70	15
60	14
55	12
50	11
45	10
< 35	8

POST OFFSETS FROM VEE DITCH BOTTOM	
POST	DISTANCE
A	8'
#2	5'
#4	3'
#8	0



**WOOD POST  
AND BLOCK DETAIL**

**STEEL POST  
AND BLOCK DETAIL**



SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

NO SCALE

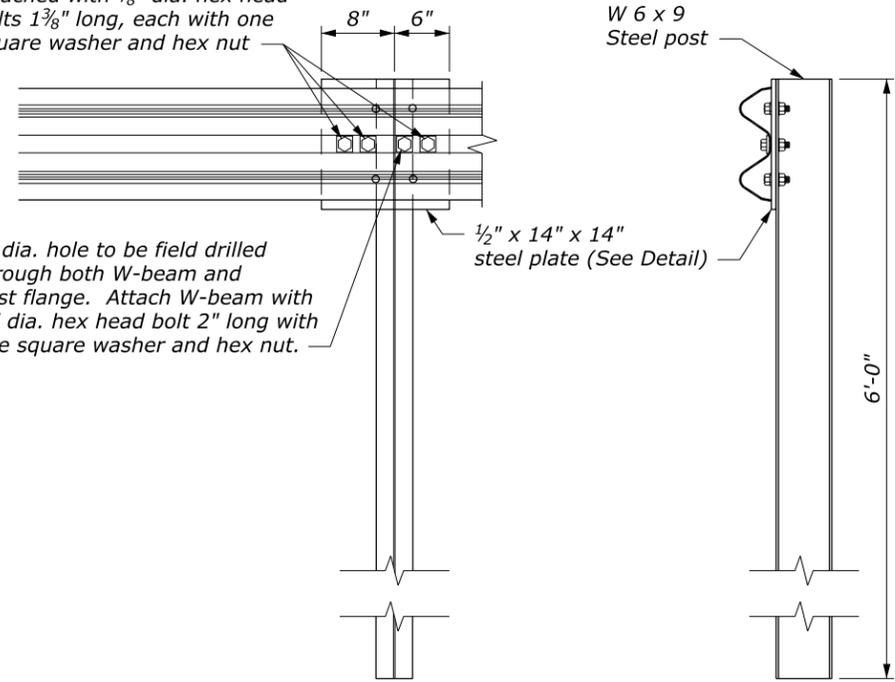
U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
FEDERAL LANDS HIGHWAY

U.S. CUSTOMARY STANDARD  
**G4 W-BEAM GUARDRAIL  
BACK SLOPE ANCHOR TERMINAL  
TYPE G4-BAT**  
Sheet 1 of 2

STANDARD APPROVED FOR USE 1/1994	STANDARD
REVISED: 4/1994 6/2005	617-17
DRAFT: 5/2014	

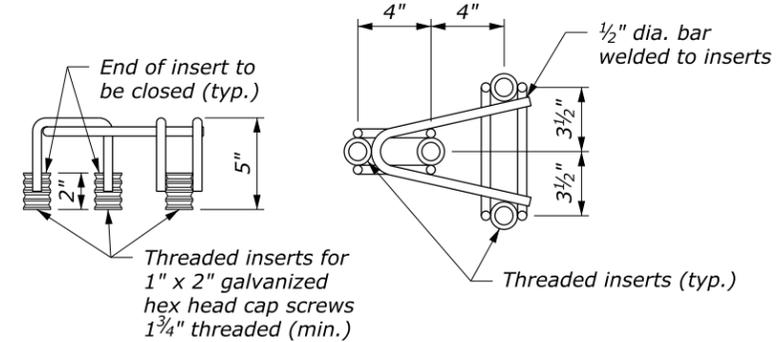
7 March 2017 10:50 AM c:\myfiles\pw\_production\dmms67487\Std617-17.dgn [USC]

3 - 1" dia. holes to be field drilled in W-beam element and attached with 7/8" dia. hex head bolts 1 3/8" long, each with one square washer and hex nut



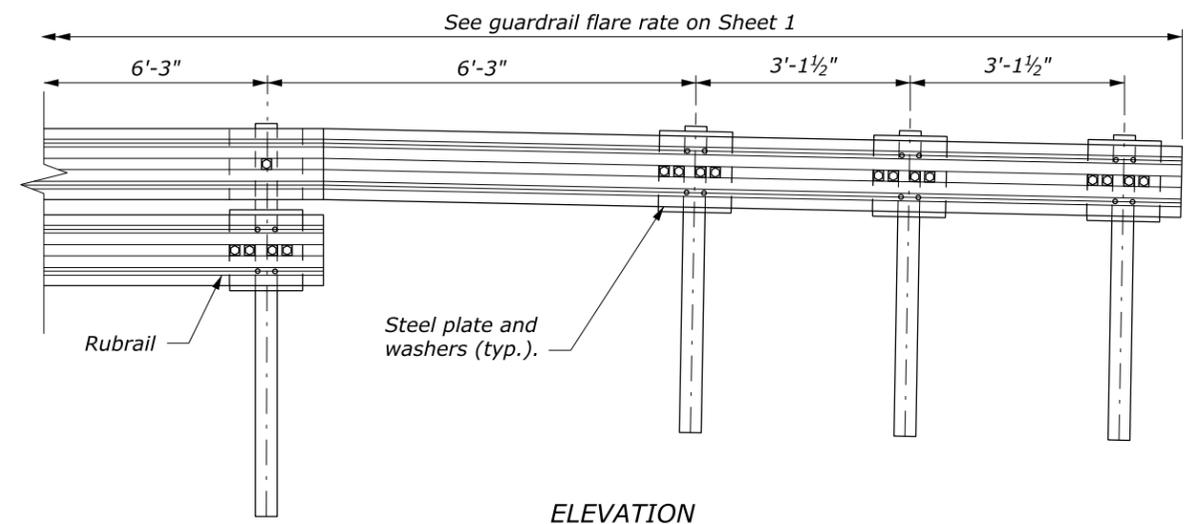
1" dia. hole to be field drilled through both W-beam and post flange. Attach W-beam with 7/8" dia. hex head bolt 2" long with one square washer and hex nut.

**SPECIAL RAIL TO POST CONNECTION AT POSTS A, B, AND 1**



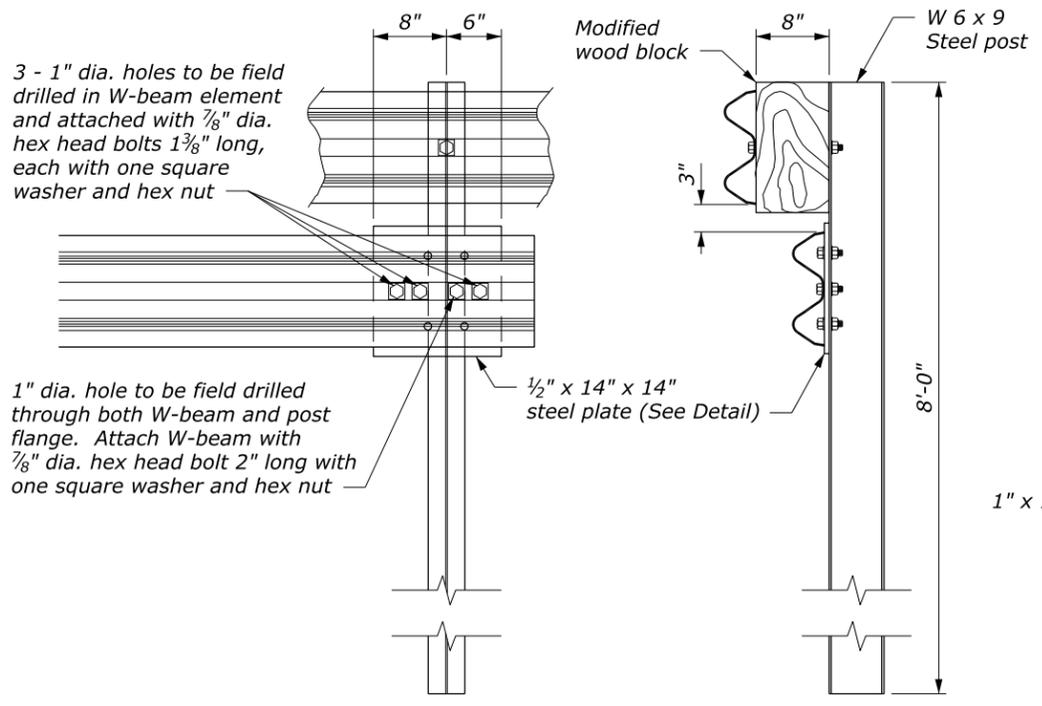
**FRAMEWORK FOR THREADED INSERTS**

- NOTE:**
1. See Standard 617-10 and 617-11 for block detail and attachment.
  2. See Sheet 1 of 2 for terminal layout.
  3. For posts #3 and higher, match post material of adjacent guardrail run, unless otherwise noted.
  4. Use zinc rich paint to coat field drilled holes.



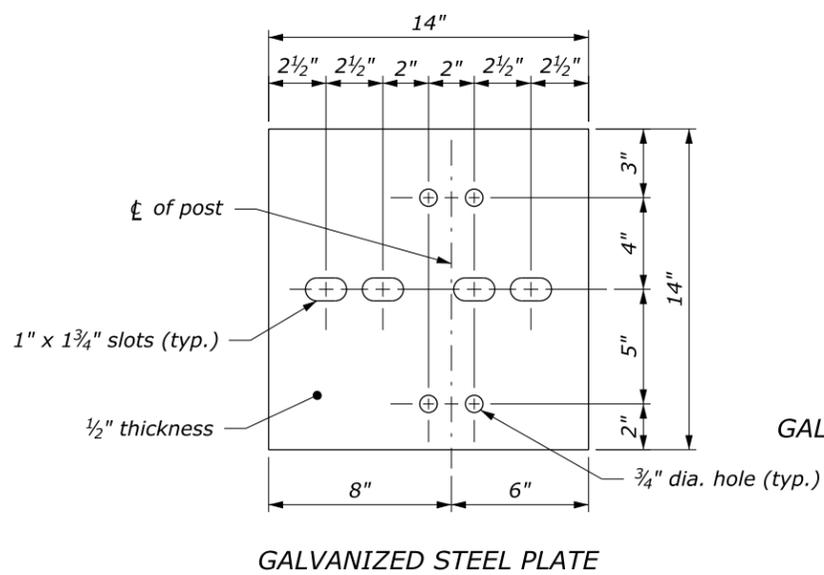
**ELEVATION**

3 - 1" dia. holes to be field drilled in W-beam element and attached with 7/8" dia. hex head bolts 1 3/8" long, each with one square washer and hex nut



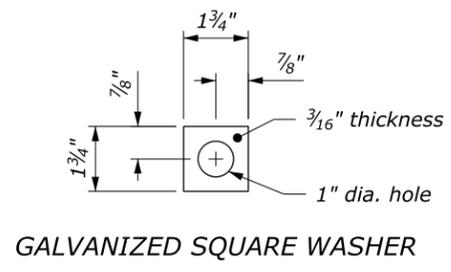
1" dia. hole to be field drilled through both W-beam and post flange. Attach W-beam with 7/8" dia. hex head bolt 2" long with one square washer and hex nut

**SPECIAL RUBRAIL TO POST CONNECTION AT POST 2**



**STEEL PLATE AND WASHER**

**END ANCHORAGE DETAIL POSTS A, B, 1, 2**

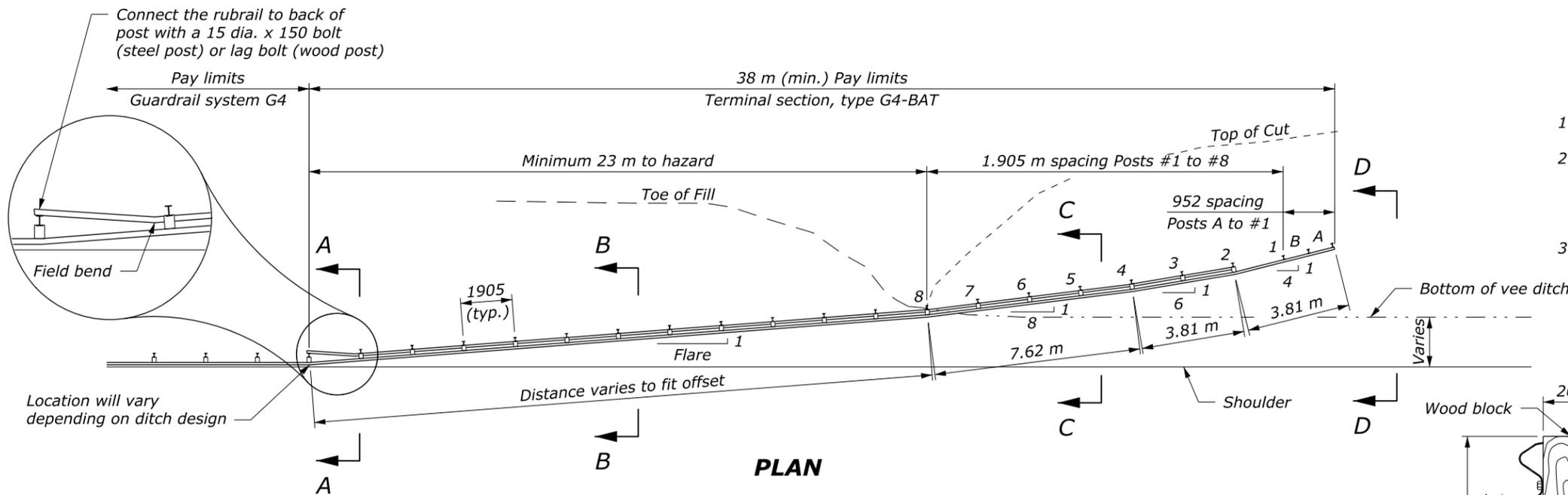


**GALVANIZED SQUARE WASHER**

c:\myfiles\pw\_production\dm67487\std617-17.dgn [USC2] 7 March 2017 10:37 AM

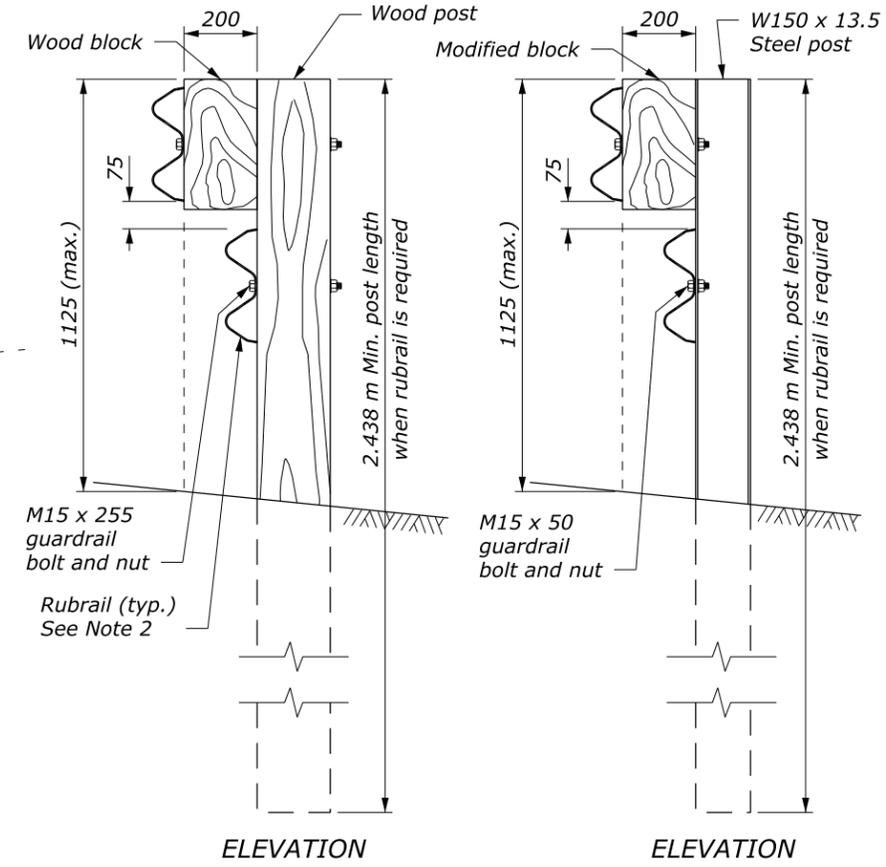
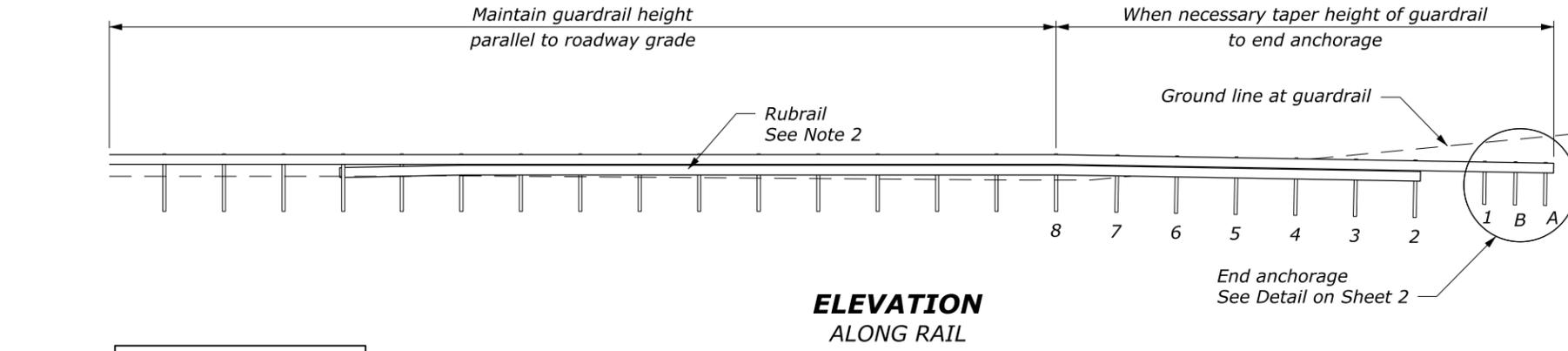
NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD <b>G4 W-BEAM GUARDRAIL BACK SLOPE ANCHOR TERMINAL TYPE G4-BAT</b> Sheet 2 of 2	
STANDARD APPROVED FOR USE 1/1994	STANDARD
REVISED: 4/1994 6/2005 DRAFT: 5/2014	617-17



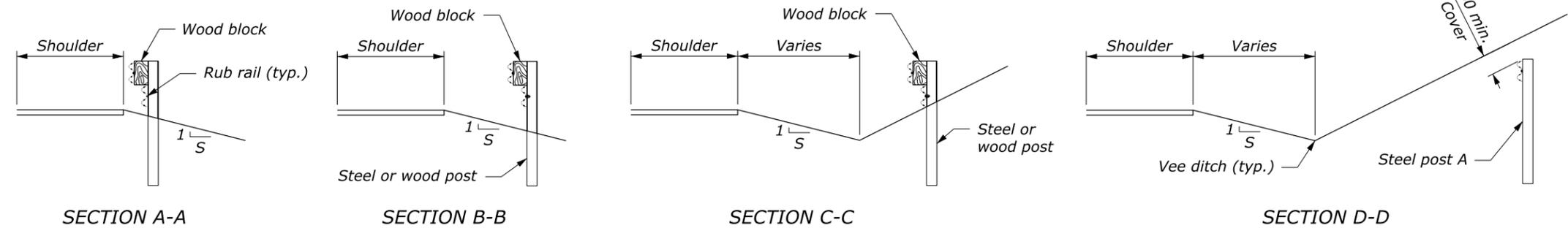
**NOTE:**

1. See Standards M617-10 and M617-11 for other details.
2. Hold the height of the W-beam rail constant in relation to the roadway shoulder elevation until the barrier crosses the ditch bottom. Add the rubrail when the distance from the ground to the bottom of the W-beam exceeds 457 mm.
3. Dimensions without units are millimeters.



GUARDRAIL FLARE	
DESIGN SPEED km/h	FLARE
110	15
100	14
90	12
80	11
70	10
< 60	8

POST OFFSETS FROM VEE DITCH BOTTOM	
POST	DISTANCE
A	2400
#2	1500
#4	900
#8	0



U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
FEDERAL LANDS HIGHWAY

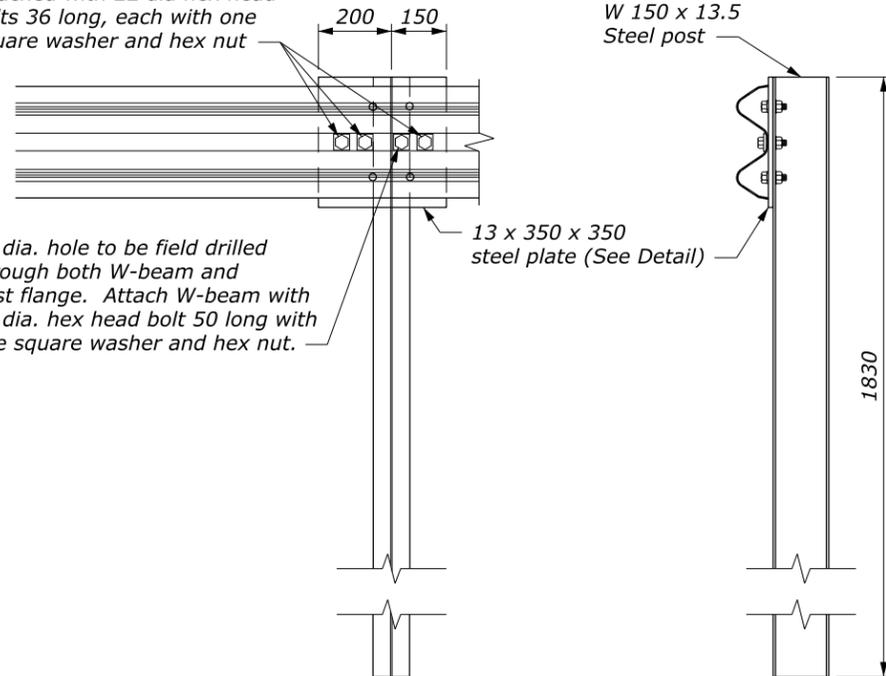
METRIC STANDARD  
**G4 W-BEAM GUARDRAIL  
BACK SLOPE ANCHOR TERMINAL  
TYPE G4-BAT**  
Sheet 1 of 2

STANDARD APPROVED FOR USE 3/1996  
REVISED: 6/1997 6/2005  
DRAFT: 5/2014

STANDARD  
M617-17

NO SCALE

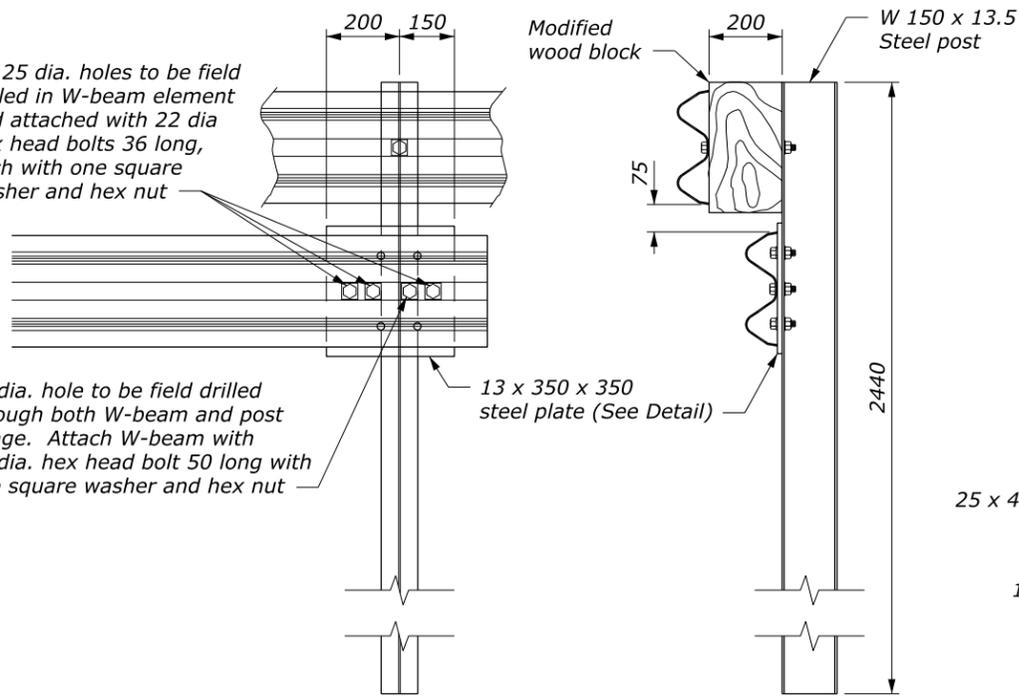
3 - 25 dia. holes to be field drilled in W-beam element and attached with 22 dia hex head bolts 36 long, each with one square washer and hex nut



25 dia. hole to be field drilled through both W-beam and post flange. Attach W-beam with 22 dia. hex head bolt 50 long with one square washer and hex nut.

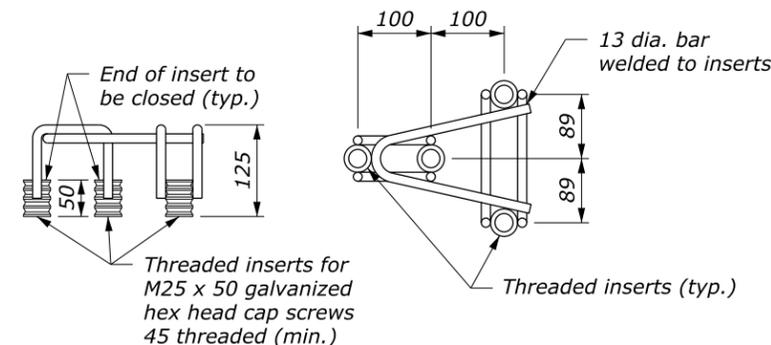
**SPECIAL RAIL TO POST CONNECTION AT POSTS A, B, AND 1**

3 - 25 dia. holes to be field drilled in W-beam element and attached with 22 dia hex head bolts 36 long, each with one square washer and hex nut



25 dia. hole to be field drilled through both W-beam and post flange. Attach W-beam with 22 dia. hex head bolt 50 long with one square washer and hex nut

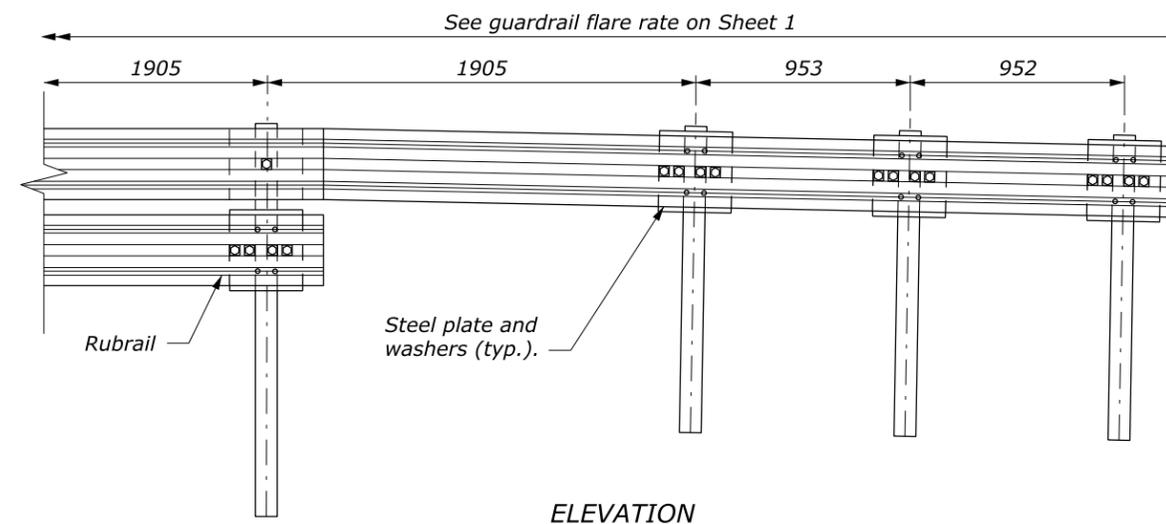
**SPECIAL RUBRAIL TO POST CONNECTION AT POST 2**



**FRAMEWORK FOR THREADED INSERTS**

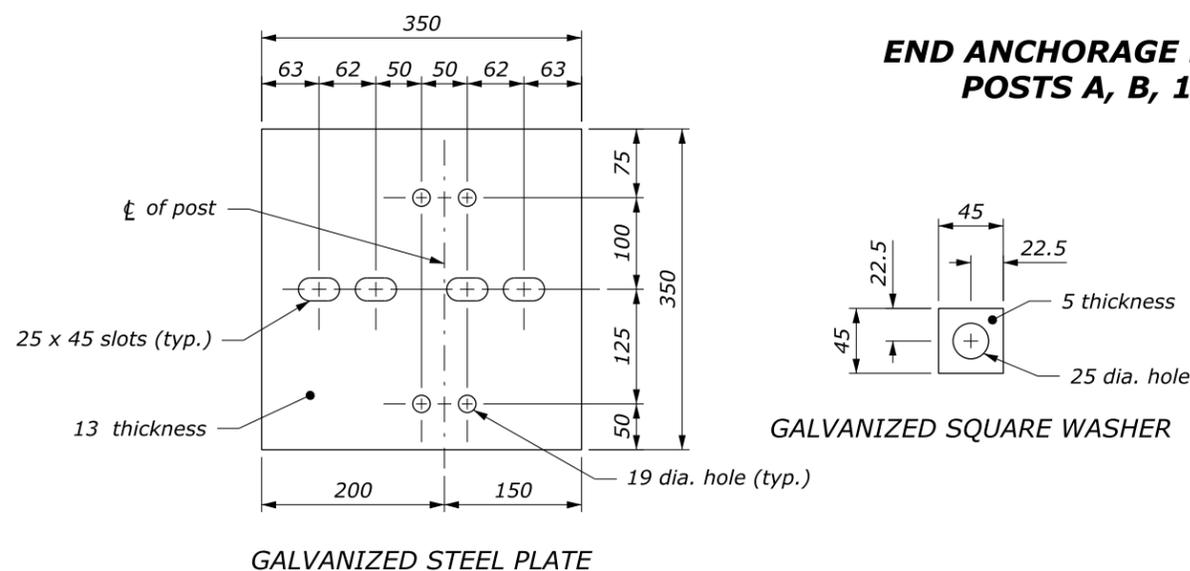
**NOTE:**

1. See Standard M617-10 and M617-11 for block detail and attachment.
2. See Sheet 1 of 2 for terminal layout.
3. For posts #3 and higher, match post material of adjacent guardrail run, unless otherwise noted.
4. Use zinc rich paint to coat field drilled holes.
5. Dimensions without units are millimeters.



**ELEVATION**

**END ANCHORAGE DETAIL POSTS A, B, 1, 2**

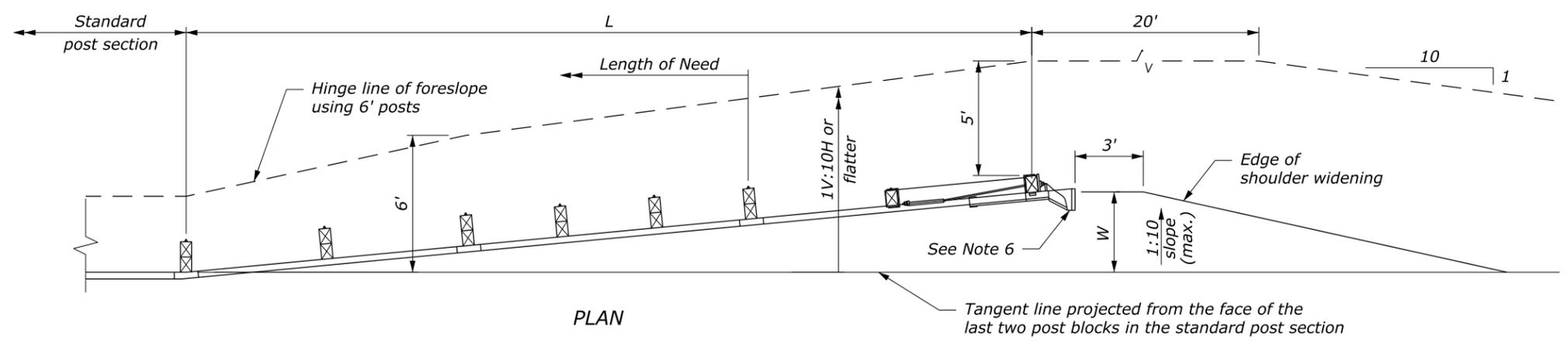


**STEEL PLATE AND WASHER**

**GALVANIZED SQUARE WASHER**

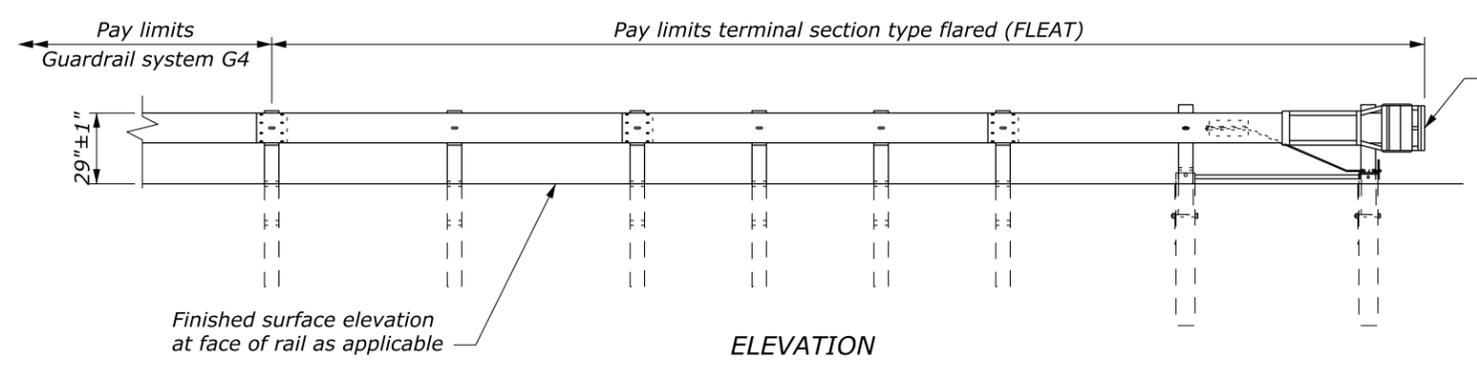
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
METRIC STANDARD <b>G4 W-BEAM GUARDRAIL BACK SLOPE ANCHOR TERMINAL TYPE G4-BAT</b> Sheet 2 of 2	
STANDARD APPROVED FOR USE 3/1996	STANDARD
REVISED: 6/1997 6/2005 DRAFT: 5/2014	<b>M617-17</b>

NO SCALE



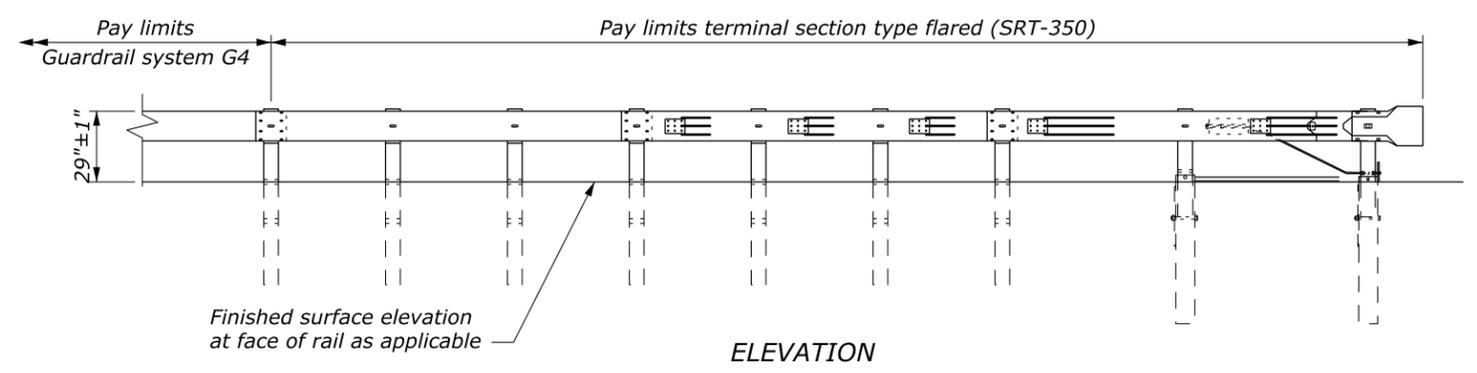
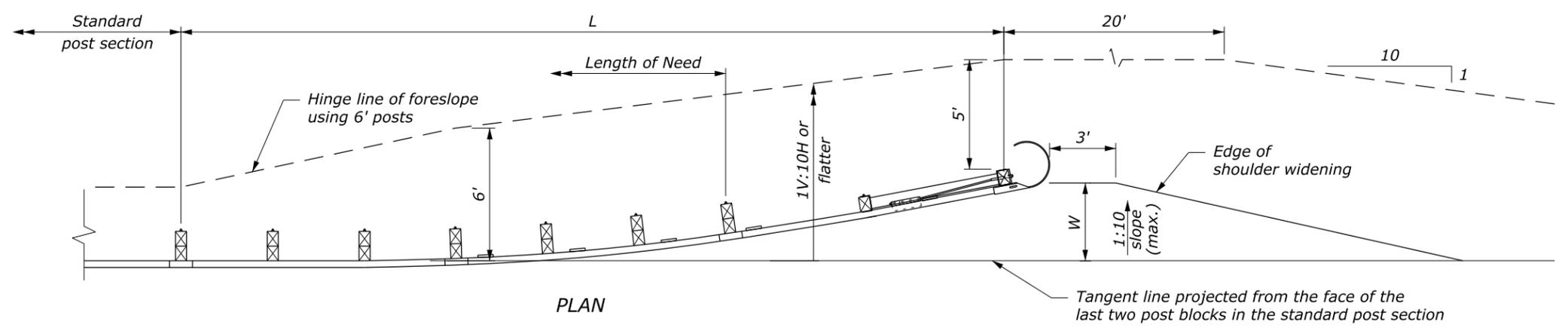
**NOTE:**

1. Use details shown as a general guide since manufacturer's details vary. Install a flared G4 W-beam guardrail terminal that meets NCHRP-350 or MASH requirements per manufacturer's recommendations. Ensure that terminal meets appropriate test level for the project.
2. When placing terminal on a curve and post offsets would result in the rail encroaching onto the shoulder (e.g., the inside of a curve), install the posts so that the face of the rail is at the edge of the shoulder.
3. Pave widened shoulder on both ends of guardrail runs when indicated on the plans.
4. See manufacturer's drawings for other details.
5. Construction of widening for terminal installation is incidental to the terminal.
6. A flat attenuator terminal head is shown. A rounded W-beam rail end section may be used.
7. Install a reflectorized object marker according to the manufacturer's recommendations.



TEST LEVEL	L (ft)	W (ft)
2 (≤ 45 mph)	25.0	1.67-2.67
3 (> 45 mph)	37.5	2.5-4.0

**STRAIGHT FLARED OPTION**



TEST LEVEL	L (ft)	W (ft)
3 (> 45 mph)	37.5	3.0 or 4.0

**PARABOLIC FLARED OPTION**

NO SCALE

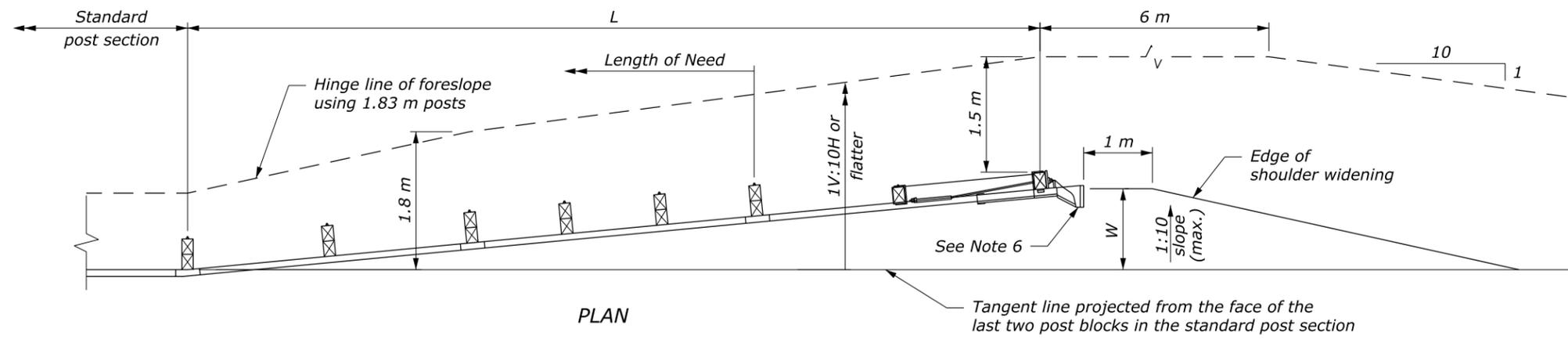
U.S. DEPARTMENT OF TRANSPORTATION  
 FEDERAL HIGHWAY ADMINISTRATION  
 FEDERAL LANDS HIGHWAY

U.S. CUSTOMARY STANDARD

**G4 W-BEAM GUARDRAIL  
 TYPE FLARED TERMINAL**

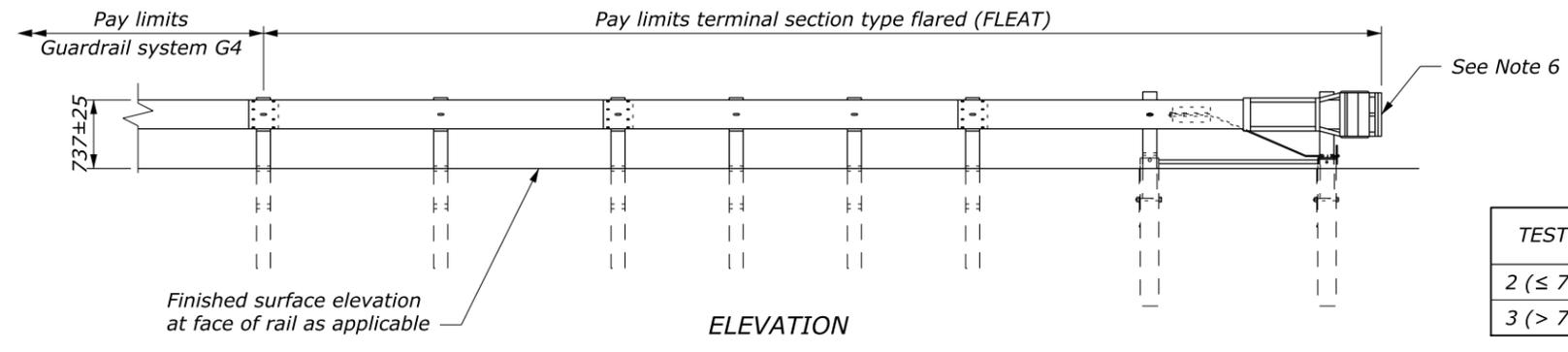
STANDARD APPROVED FOR USE 6/2005	STANDARD
REVISED: DRAFT: 3/2016	617-19

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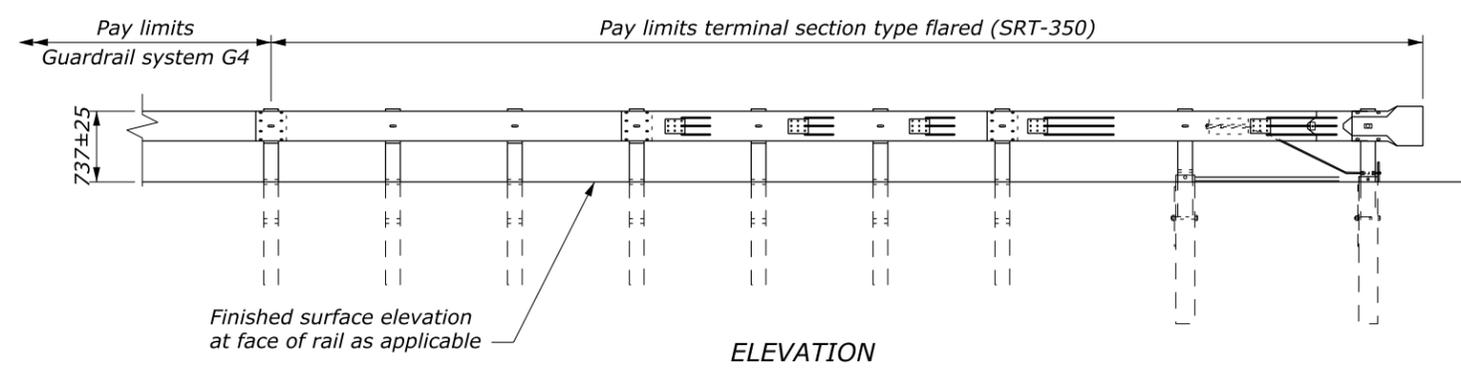
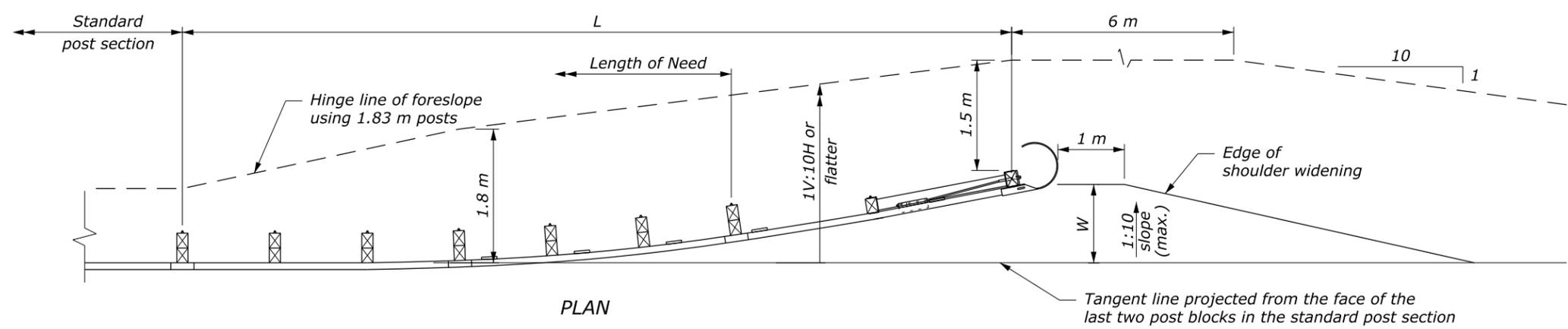
**NOTE:**

1. Use details shown as a general guide since manufacturer's details vary. Install a flared G4 W-beam guardrail terminal that meets NCHRP-350 or MASH requirements per manufacturer's recommendations. Ensure that terminal meets appropriate test level for the project.
2. When placing terminal on a curve and post offsets would result in the rail encroaching onto the shoulder (e.g., the inside of a curve), install the posts so that the face of the rail is at the edge of the shoulder.
3. Pave widened shoulder on both ends of guardrail runs when indicated on the plans.
4. See manufacturer's drawings for other details.
5. Construction of widening for terminal installation is incidental to the terminal.
6. A flat attenuator terminal head is shown. A rounded W-beam rail end section may be used.
7. Install a reflectorized object marker according to the manufacturer's recommendations.
8. Dimensions without units are millimeters.



TEST LEVEL	L (m)	W (m)
2 (≤ 70 km/h)	7.62	0.51-0.81
3 (> 70 km/h)	11.43	0.76-1.22

**STRAIGHT FLARED OPTION**



TEST LEVEL	L (m)	W (m)
3 (> 70 km/h)	11.43	0.9 or 1.22

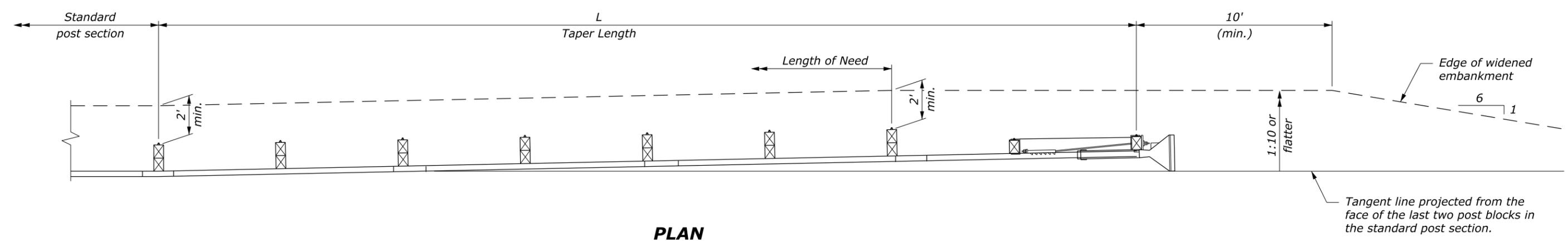
**PARABOLIC FLARED OPTION**

NO SCALE

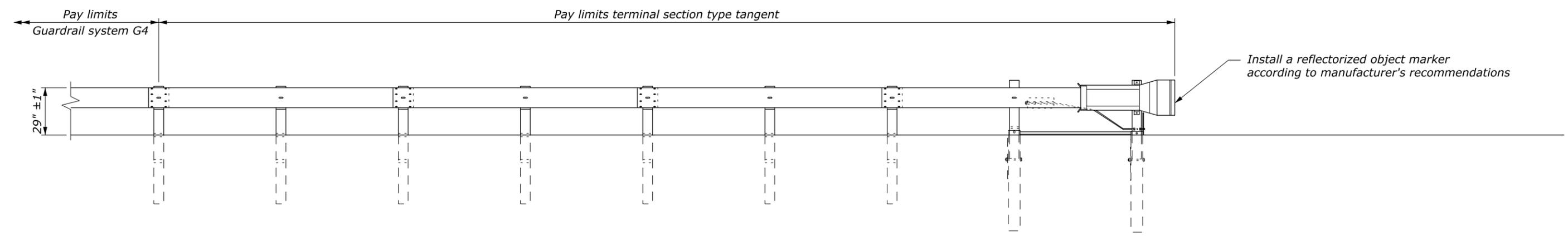
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
METRIC STANDARD	
<b>G4 W-BEAM GUARDRAIL          TYPE FLARED TERMINAL</b>	
STANDARD APPROVED FOR USE 6/2005 REVISED: DRAFT: 3/2016	STANDARD <b>M617-19</b>

**NOTE:**

1. Use details shown as a general guide since manufacturer's details may vary. Install a tangent G4 W-beam guardrail terminal that meets NCHRP-350 or MASH requirements per manufacturer's recommendations. Ensure that terminal meets appropriate test level for the project.
2. Install terminal at a 1:25 taper or flatter, to position the end farther away from the edge of the shoulder, or use a taper per manufacturer's recommendations.
3. See manufacturer's drawings for other details.



**PLAN**



**ELEVATION**

TEST LEVEL	L (ft)
2 (≤ 45 mph)	25
3 (> 45 mph)	37.5 or 50

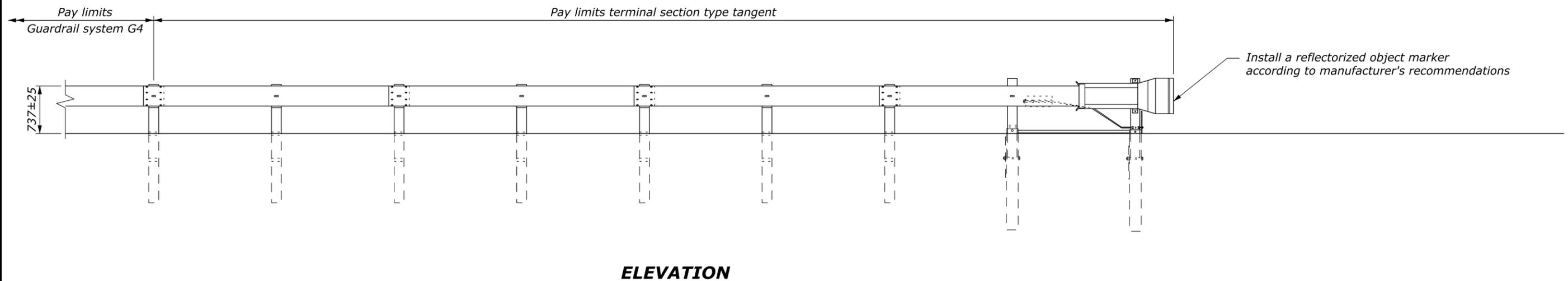
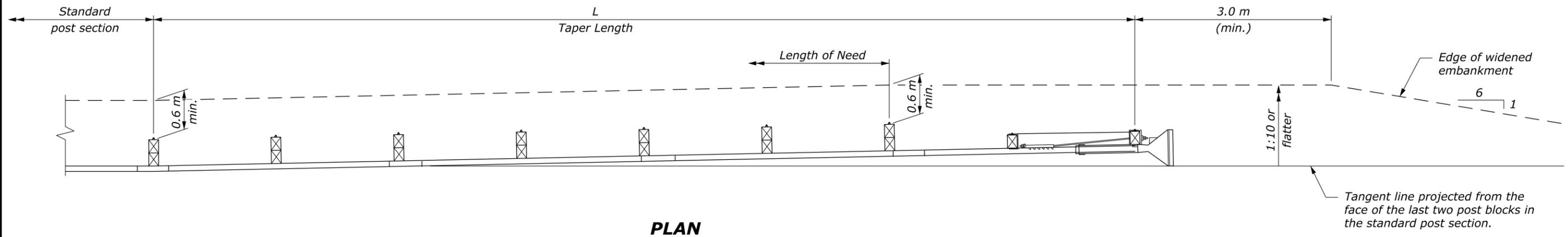
NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
<b>G4 W-BEAM GUARDRAIL TYPE TANGENT TERMINAL</b>	
STANDARD APPROVED FOR USE 6/2005	STANDARD
REVISED: DRAFT: 3/2016	617-20

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**NOTE:**

1. Use details shown as a general guide since manufacturer's details may vary. Install a tangent G4 W-beam guardrail terminal that meets NCHRP-350 or MASH requirements per manufacturer's recommendations. Ensure that terminal meets appropriate test level for the project.
2. Install terminal at a 1:25 taper or flatter, to position the end farther away from the edge of the shoulder, or use a taper per manufacturer's recommendations.
3. See manufacturer's drawings for other details.
4. Dimensions without units are millimeters.

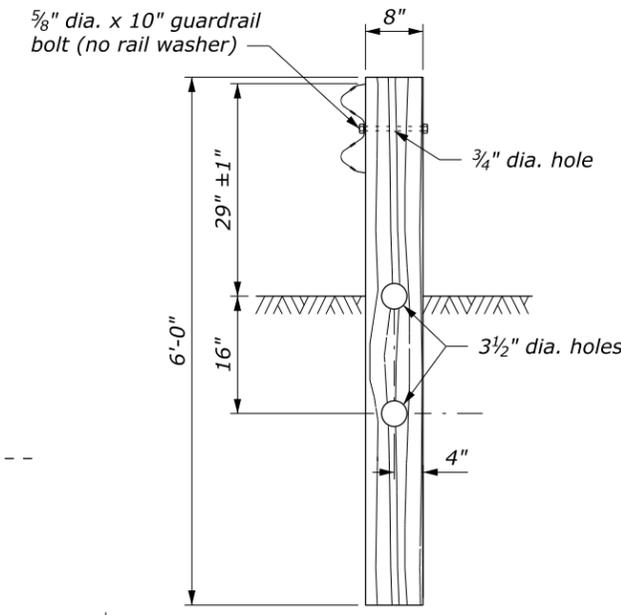


TEST LEVEL	L (m)
2 ( $\leq 70$ km/h)	7.62
3 ( $> 70$ km/h)	11.43 or 15.24

NO SCALE

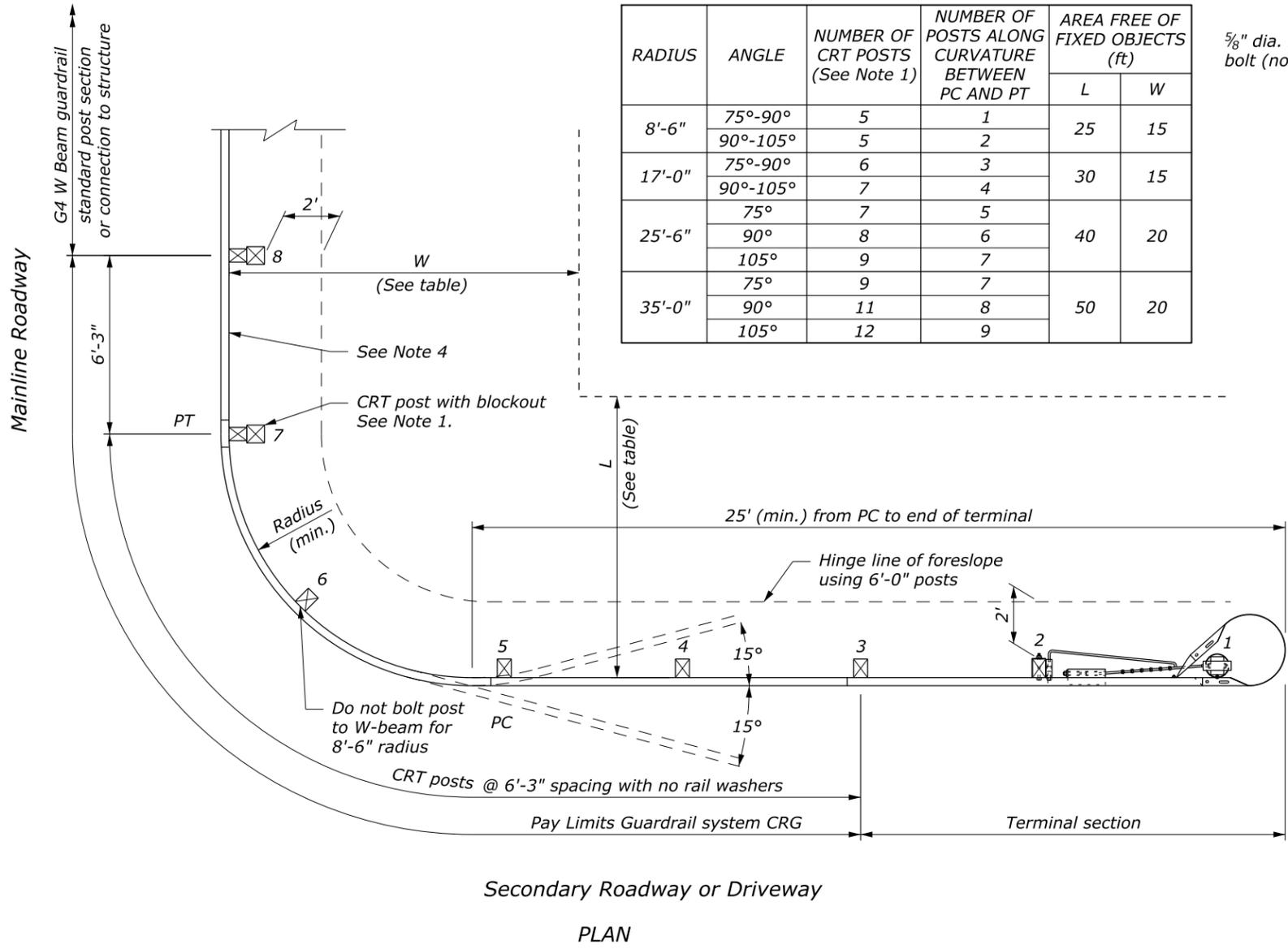
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
METRIC STANDARD	
<b>G4 W-BEAM GUARDRAIL TYPE TANGENT TERMINAL</b>	
STANDARD APPROVED FOR USE 6/2005	STANDARD
REVISED: DRAFT: 3/2016	M617-20

RADIUS	ANGLE	NUMBER OF CRT POSTS (See Note 1)	NUMBER OF POSTS ALONG CURVATURE BETWEEN PC AND PT	AREA FREE OF FIXED OBJECTS (ft)	
				L	W
8'-6"	75°-90°	5	1	25	15
	90°-105°	5	2		
17'-0"	75°-90°	6	3	30	15
	90°-105°	7	4		
25'-6"	75°	7	5	40	20
	90°	8	6		
	105°	9	7		
35'-0"	75°	9	7	50	20
	90°	11	8		
	105°	12	9		

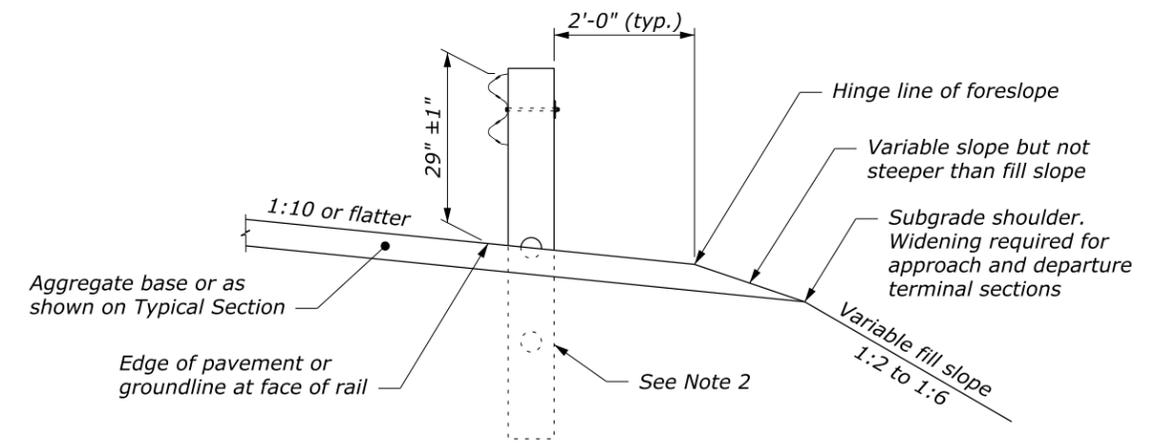


**CRT POST DETAIL**  
POSTS #3 - #7  
See Note 1

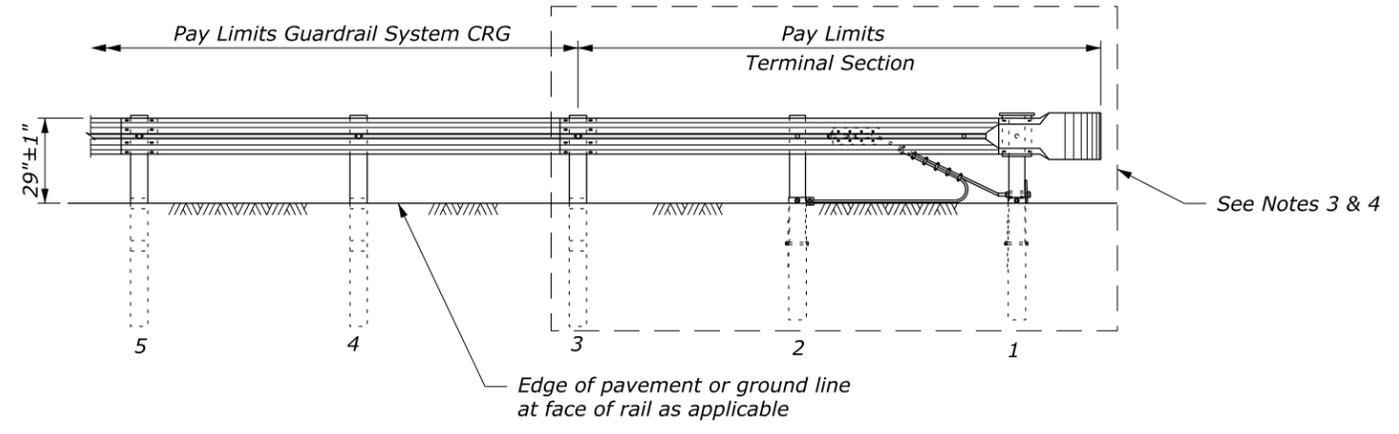
- NOTE:**
- CRT posts include those posts between the terminal and PT, plus the post with block at Post #7. See Standard 617-10 for block details.
  - See Special Contract Requirements when 7 foot or longer posts are specified.
  - See Standard 617-22 for terminal section, Type CRT details. The use of the CRT terminal is limited to driveways, service roads, and low speed minor road approaches. Use the appropriate TL-2 or TL-3 terminal on all other roadway approaches.
  - If the CRG will be connected to transition rail at Post 8, add a standard post and block midway between Posts 7 and 8.
  - Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.



**PLAN**



**TYPICAL GUARDRAIL CROSS SECTION**

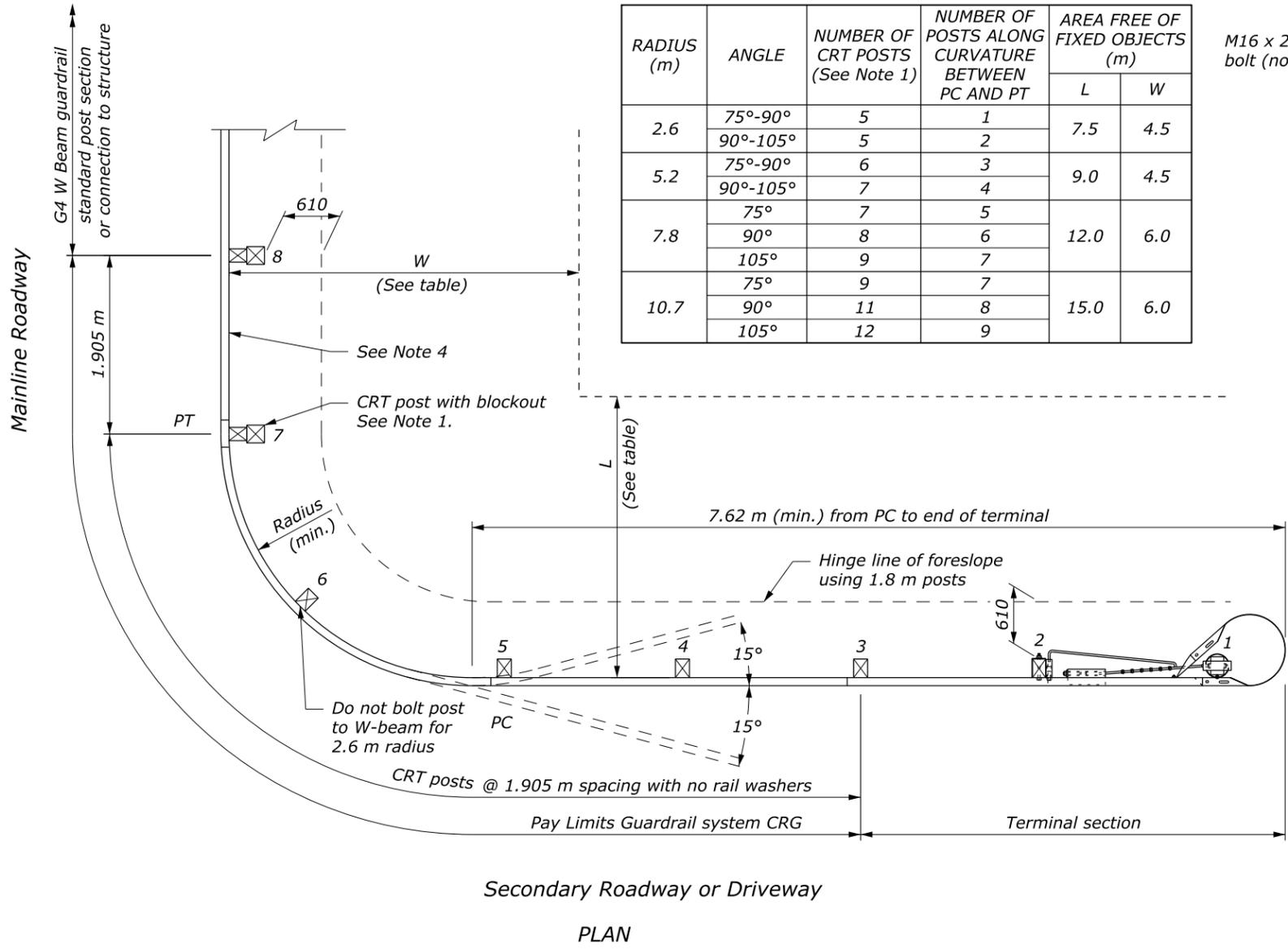


**ELEVATION**  
**GUARDRAIL SYSTEM CRG WITH CRT POSTS**

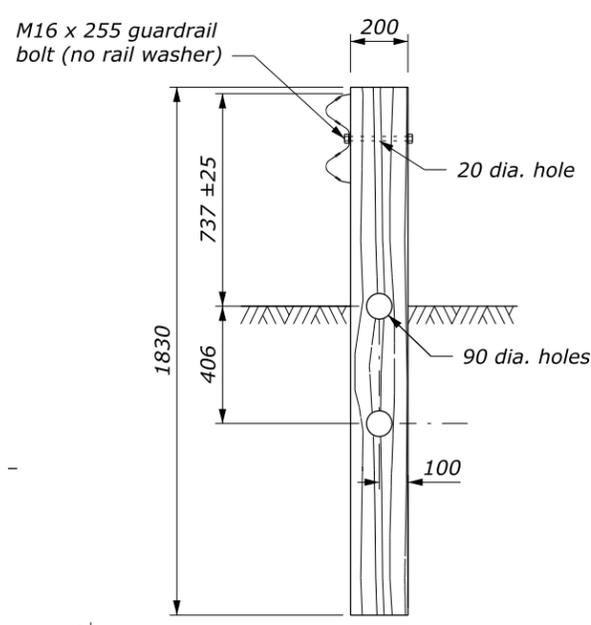
NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
<b>CRG W-BEAM GUARDRAIL WOOD POSTS</b>	
STANDARD APPROVED FOR USE 1/1994	STANDARD
REVISED: 4/1994 6/2005	617-21
DRAFT: 3/2016	

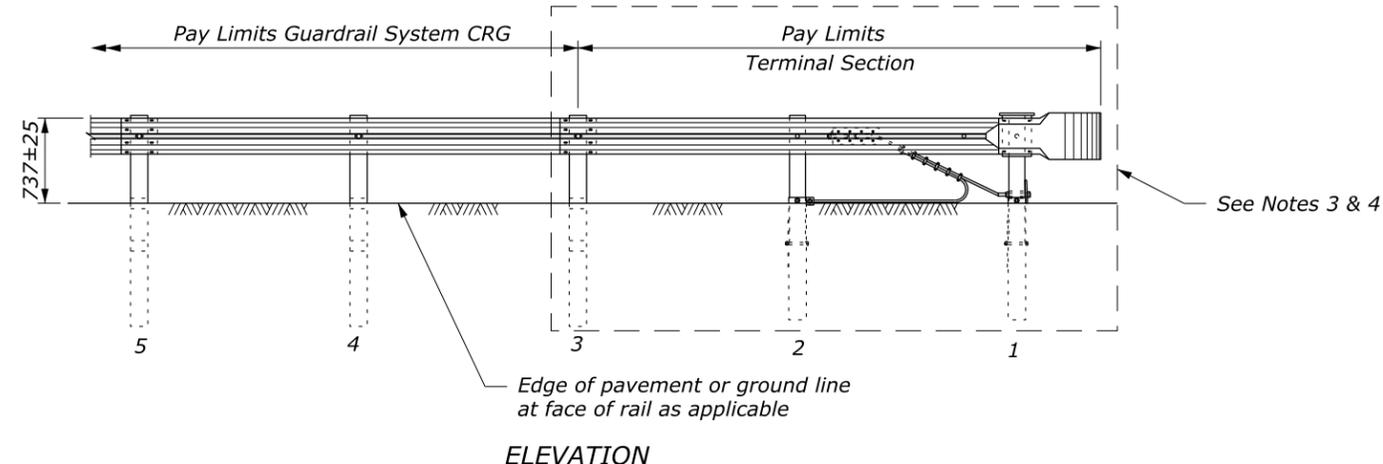
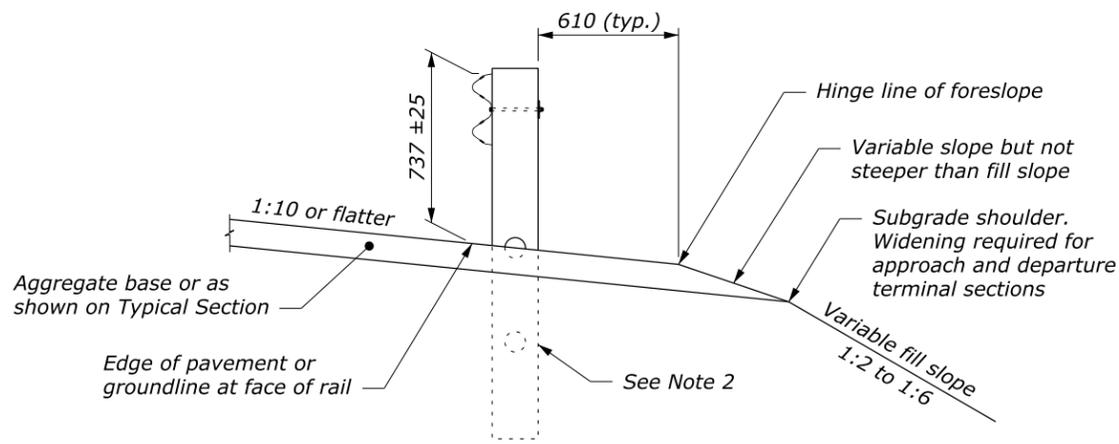
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15 March 2016 7:54 AM



RADIUS (m)	ANGLE	NUMBER OF CRT POSTS (See Note 1)	NUMBER OF POSTS ALONG CURVATURE BETWEEN PC AND PT	AREA FREE OF FIXED OBJECTS (m)	
				L	W
2.6	75°-90°	5	1	7.5	4.5
	90°-105°	5	2		
5.2	75°-90°	6	3	9.0	4.5
	90°-105°	7	4		
7.8	75°	7	5	12.0	6.0
	90°	8	6		
	105°	9	7		
10.7	75°	9	7	15.0	6.0
	90°	11	8		
	105°	12	9		



- NOTE:**
- CRT posts include those posts between the terminal and PT, plus the post with block at Post #7. See Standard M617-10 for block details.
  - See Special Contract Requirements when 2 meter or longer posts are specified.
  - See Standard M617-22 for terminal section, Type CRT details. The use of the CRT terminal is limited to driveways, service roads, and low speed minor road approaches. Use the appropriate TL-2 or TL-3 terminal on all other roadway approaches.
  - If the CRG will be connected to transition rail at Post 8, add a standard post and block midway between Posts 7 and 8.
  - Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.
  - Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are unavailable.
  - Dimensions without units are millimeters.



**GUARDRAIL SYSTEM CRG WITH CRT POSTS**

U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
FEDERAL LANDS HIGHWAY

METRIC STANDARD

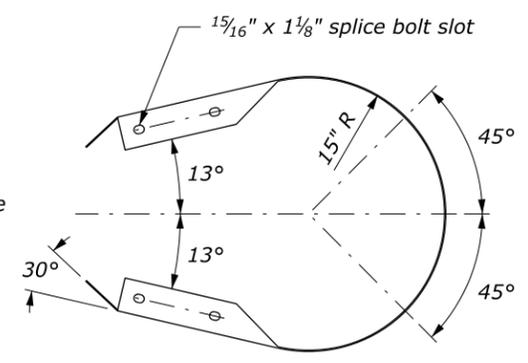
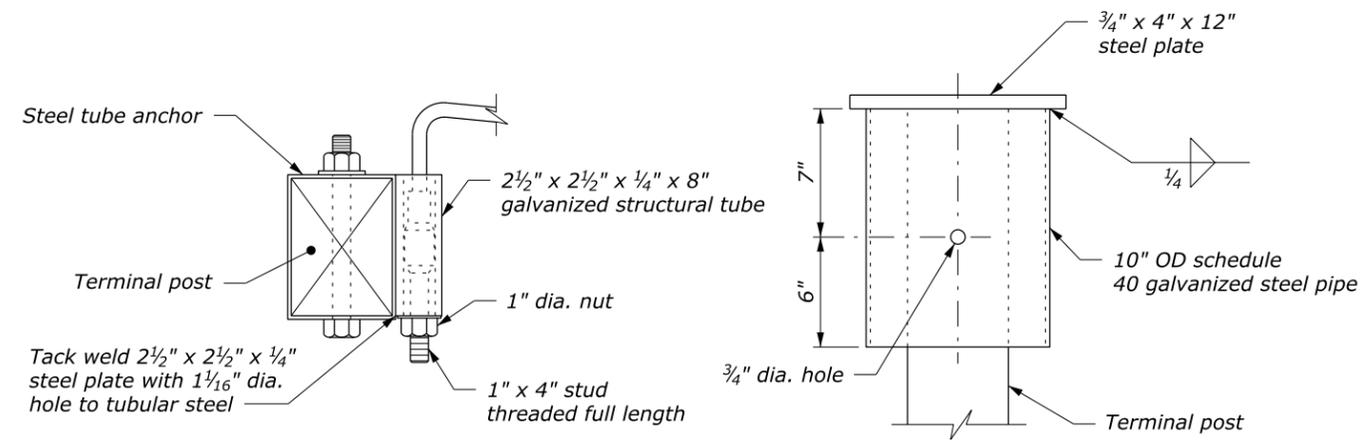
**CRG W-BEAM GUARDRAIL  
WOOD POSTS**

STANDARD APPROVED FOR USE 3/1996

REVISOR: 12/1998 6/2005  
DRAFT: 3/2016

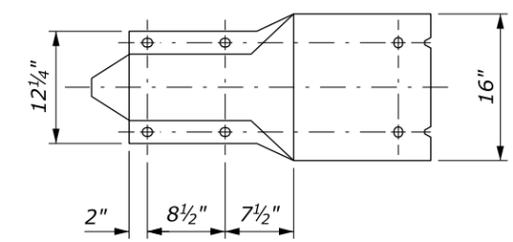
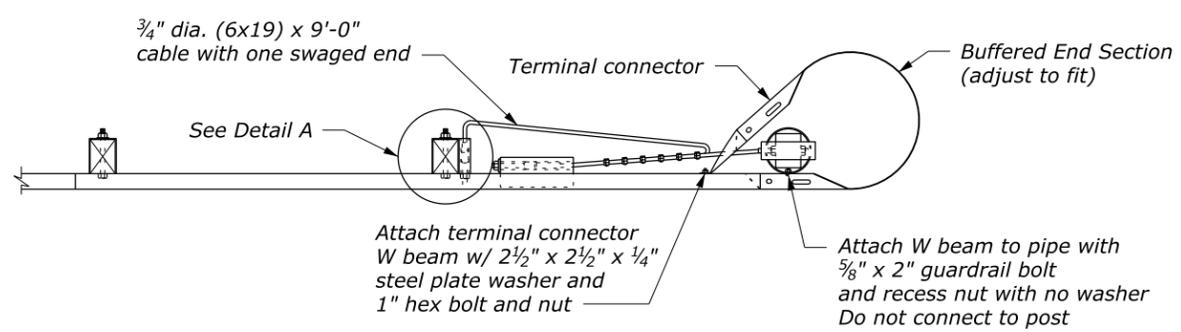
STANDARD  
M617-21

NO SCALE

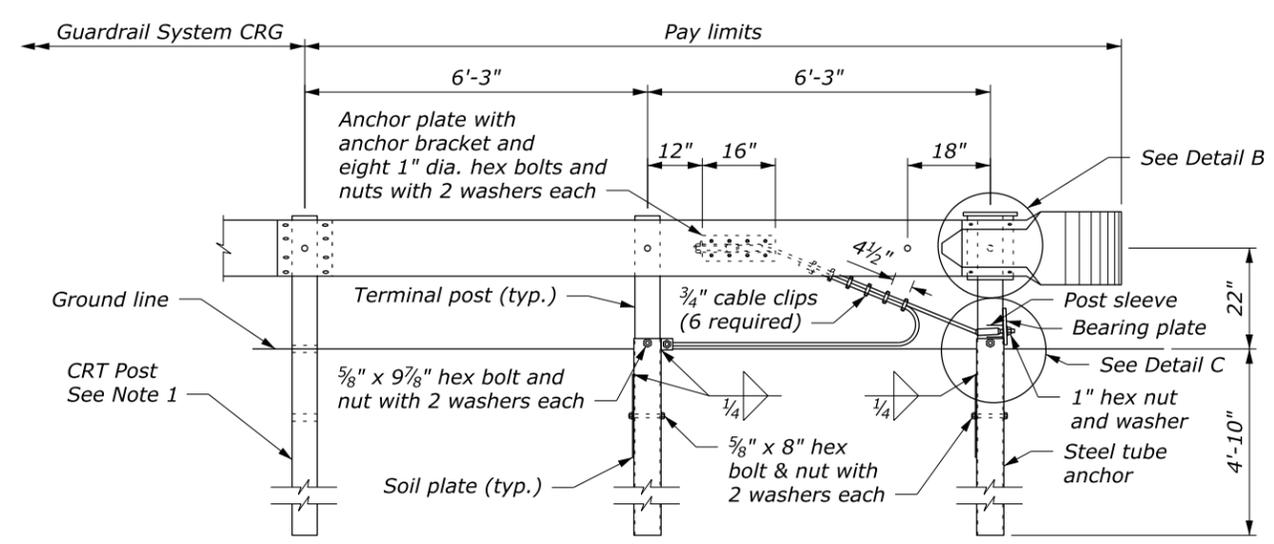


**NOTE:**

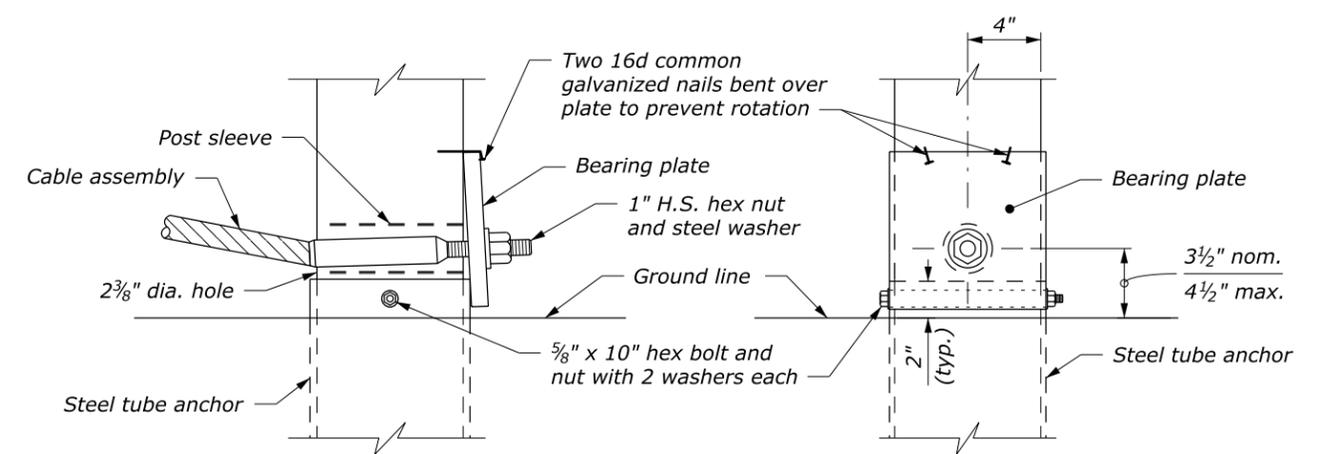
- See Standards 617-15 and 617-21 for other details.
- Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.



**BUFFERED END SECTION**



**ANCHORAGE ASSEMBLY**

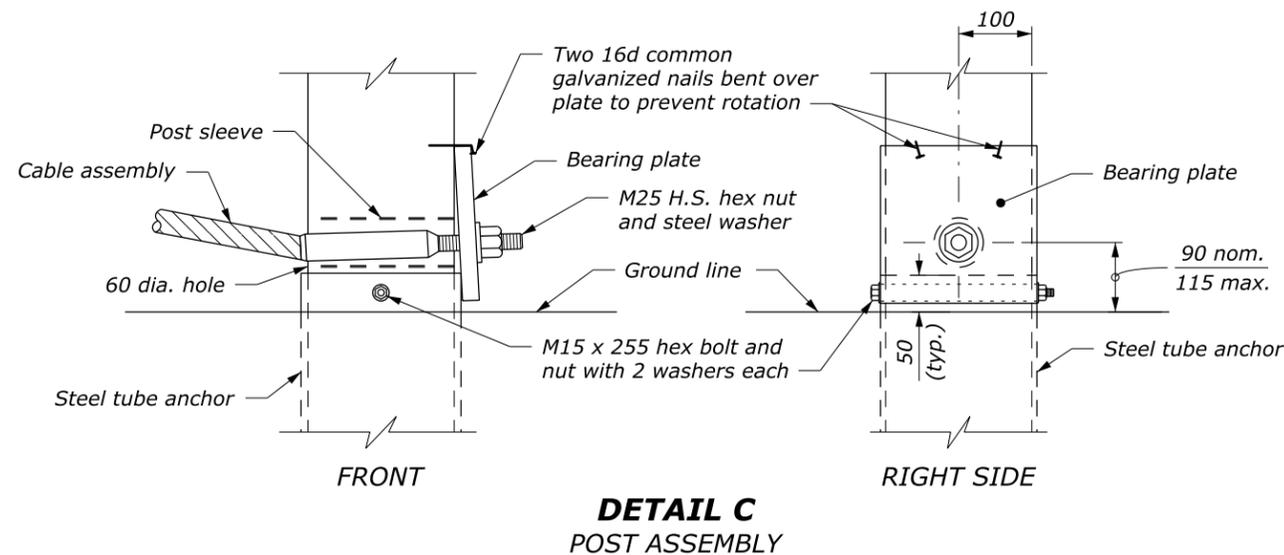
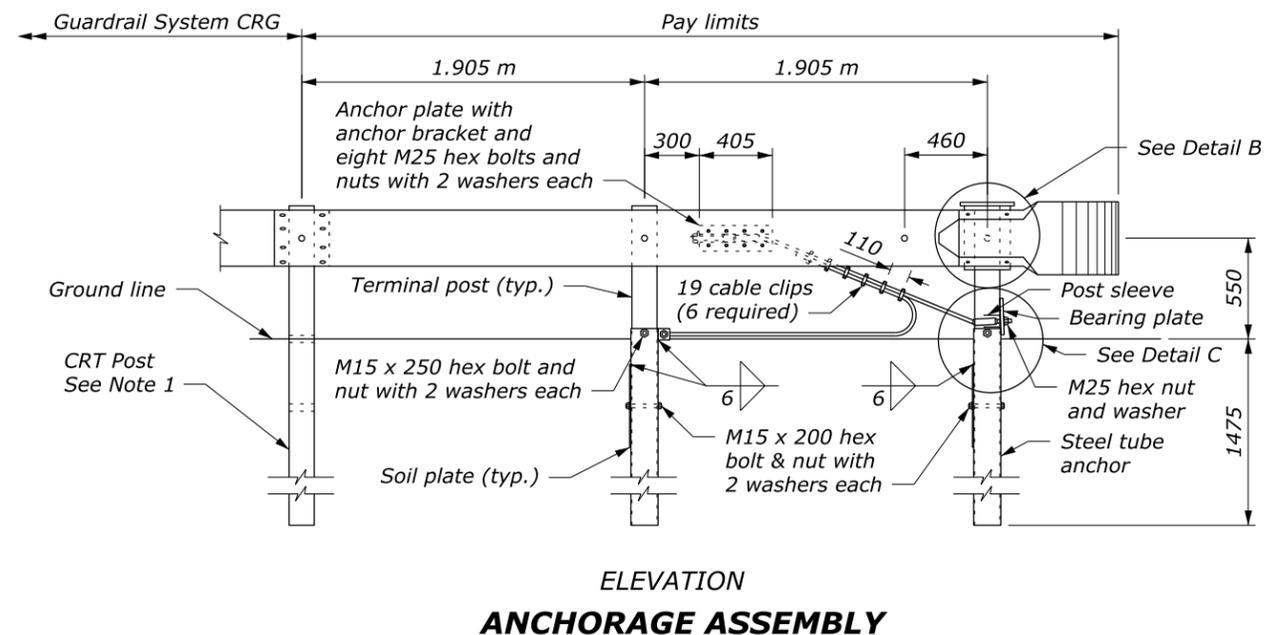
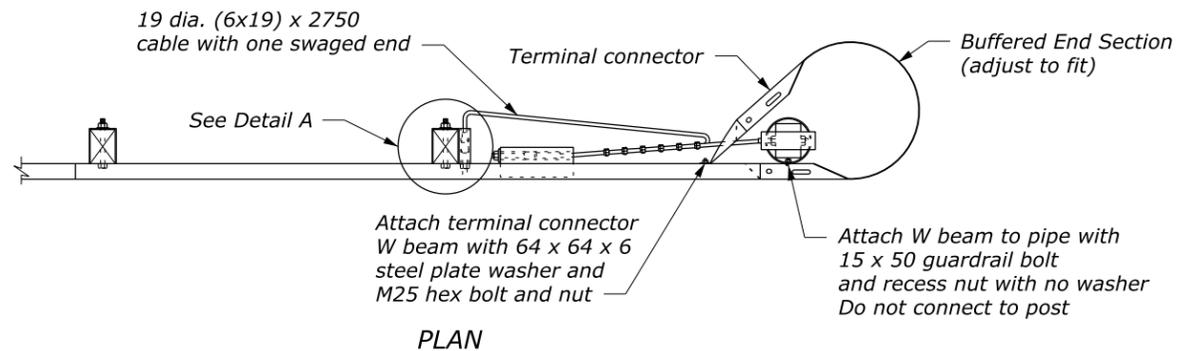
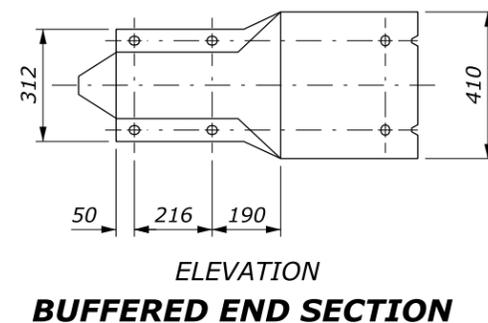
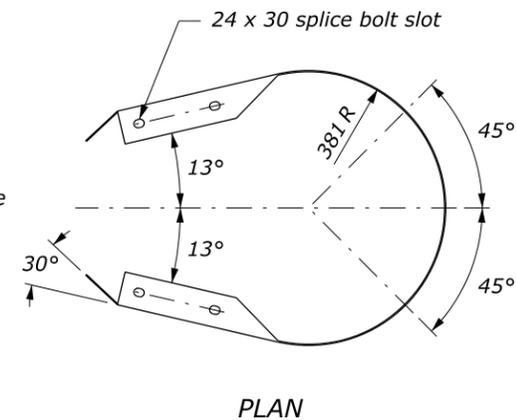
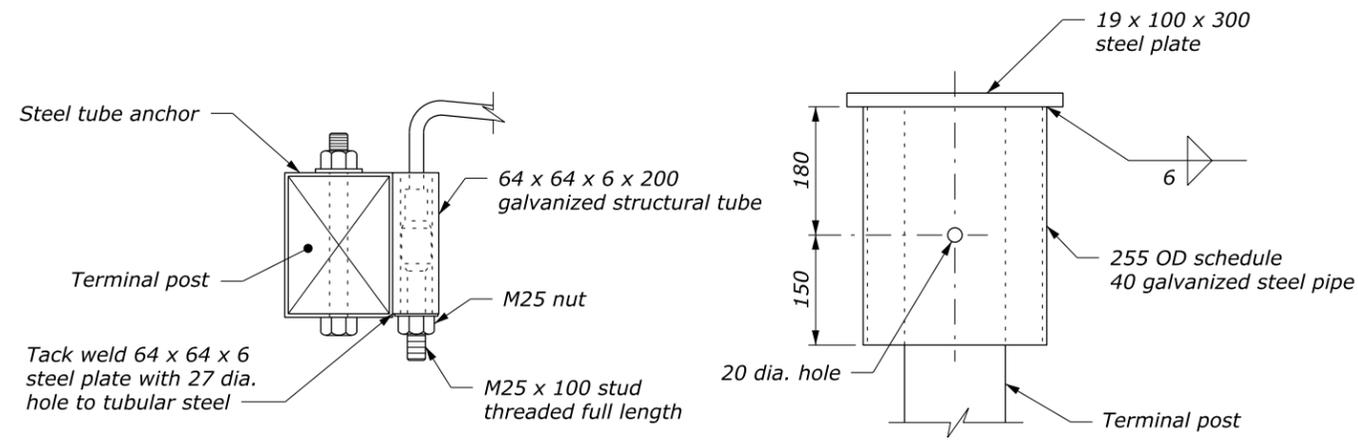


**DETAIL C POST ASSEMBLY**

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD <b>G4 W-BEAM GUARDRAIL CABLE RELEASING TERMINAL TYPE CRT, WOOD POSTS</b>	
STANDARD APPROVED FOR USE 1/1994	STANDARD
REVISED: 4/1994 6/2005 DRAFT: 2/2014	617-22

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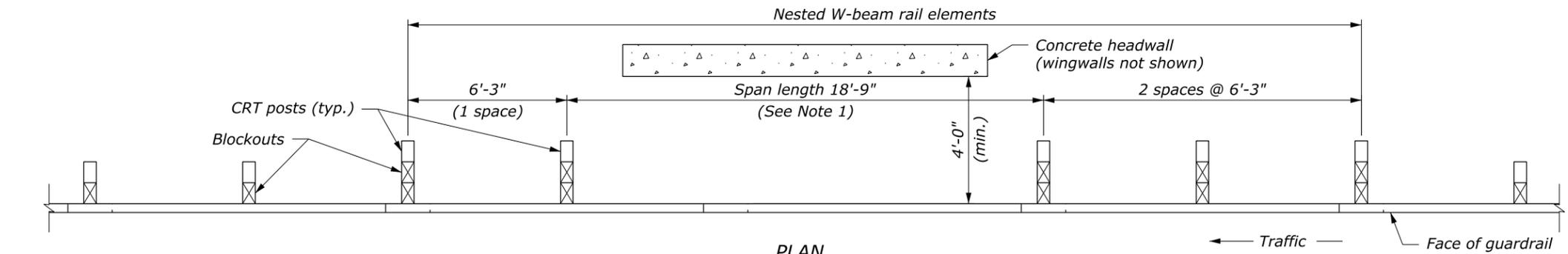


**NOTE:**

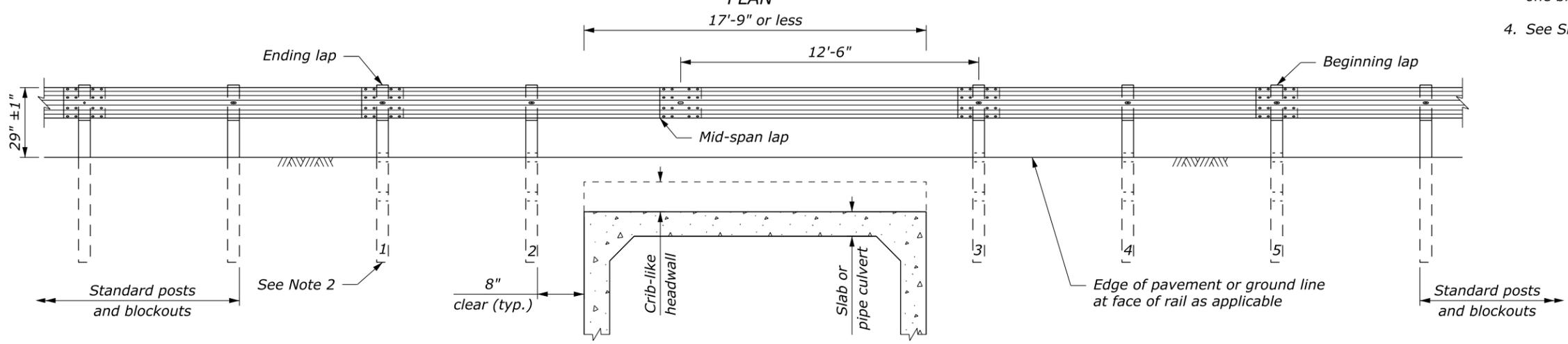
1. See Standards M617-15 and M617-21 for other details.
2. Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.
3. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are unavailable.
4. Dimensions without units are millimeters.

NO SCALE

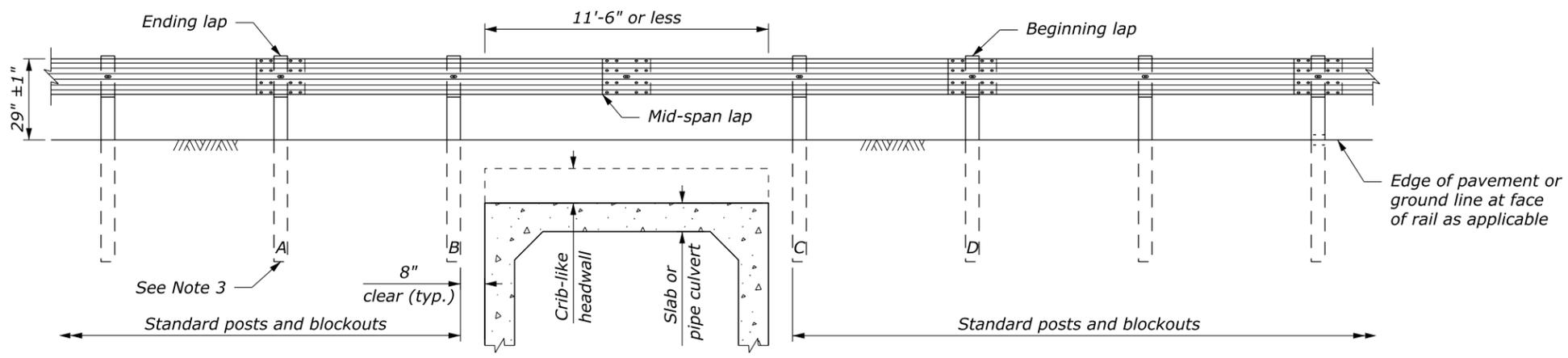
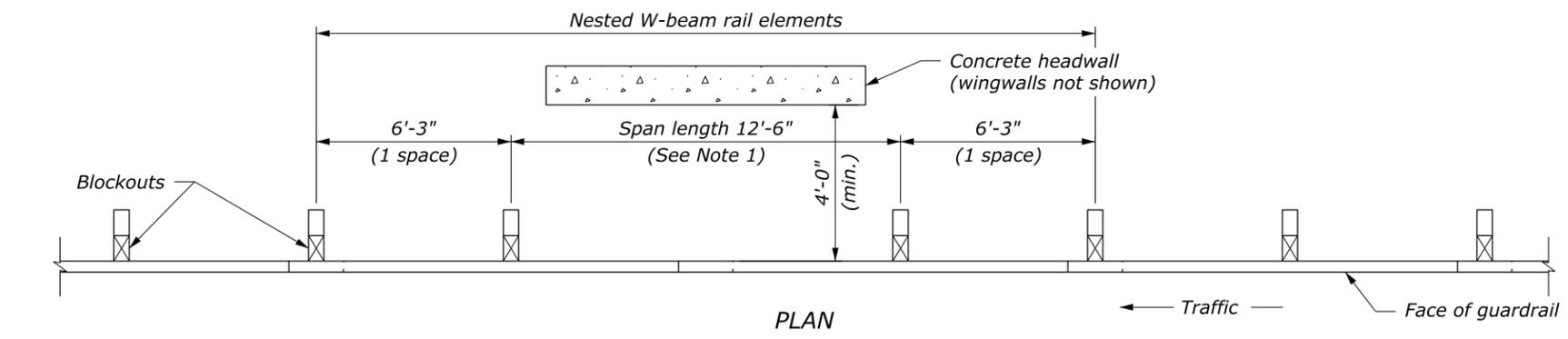
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
METRIC STANDARD	
<b>G4 W-BEAM GUARDRAIL CABLE RELEASING TERMINAL TYPE CRT, WOOD POSTS</b>	
STANDARD APPROVED FOR USE 3/1996	STANDARD
REVISED: 6/2005 DRAFT: 2/2014	M617-22



- NOTE:**
1. 25'-0" rail lengths may be used to eliminate the intermediate lap without a post. Do not place a lap without a post unless needed due to gap length.
  2. Posts 1 thru 5 are CRT posts with two blockouts. All other posts are wood or steel.
  3. Posts A thru D are standard wood posts with one blockout. All other posts are wood or steel.
  4. See Sheet 2 of 2 for additional details.



**ELEVATION  
18'-9" GUARDRAIL SPAN**

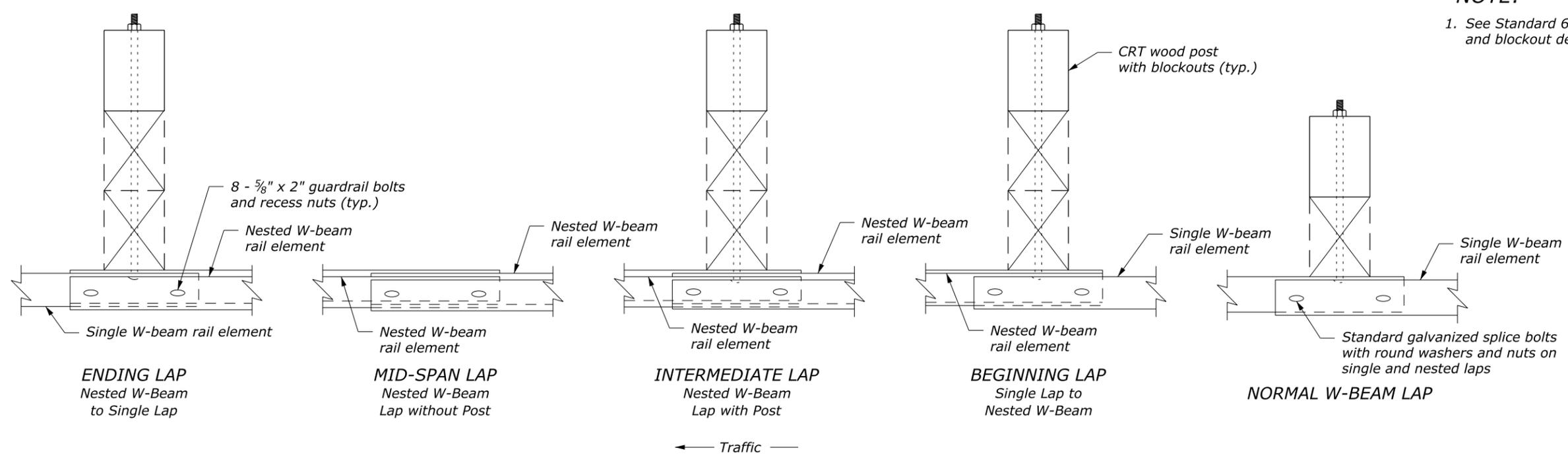


**ELEVATION  
12'-6" GUARDRAIL SPAN**

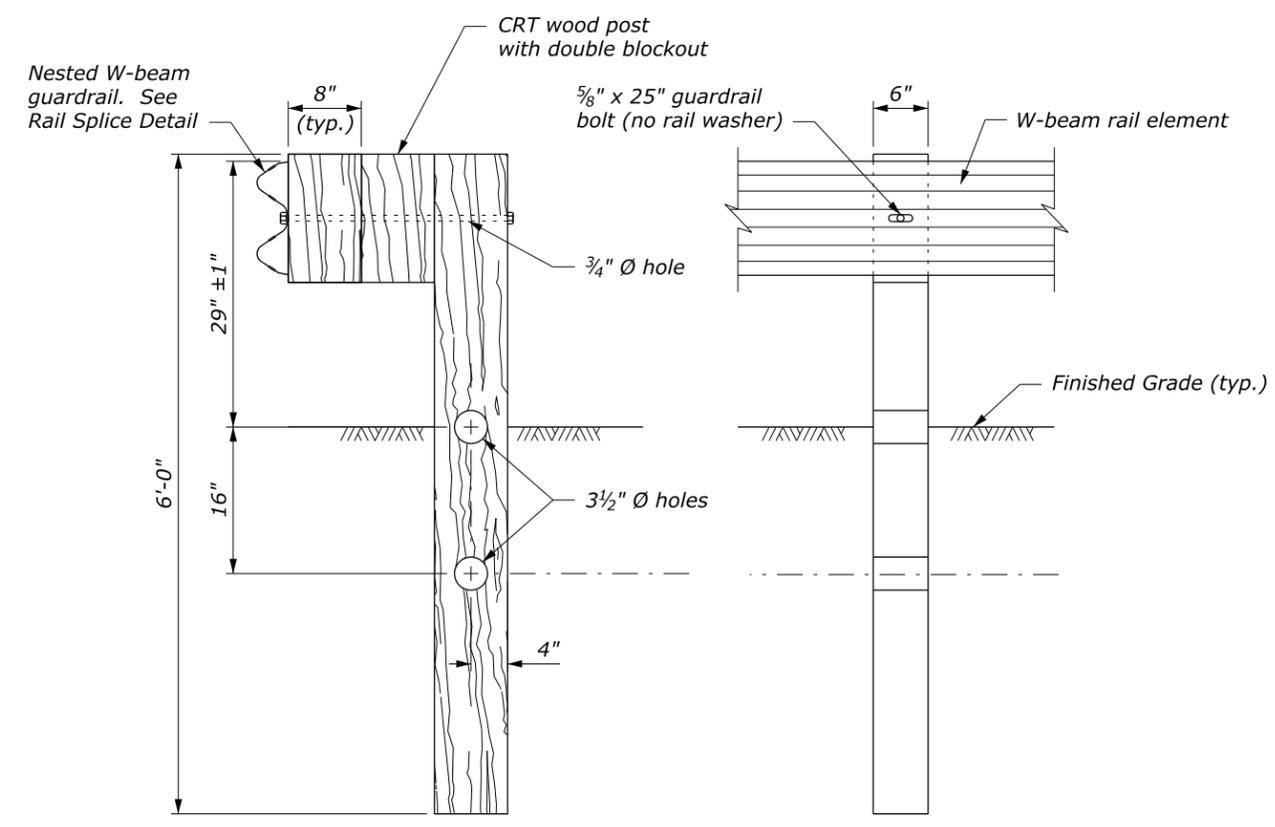
NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD <b>G4 W-BEAM GUARDRAIL LONG SPAN SYSTEM, TL-2</b> Sheet 1 of 2	
STANDARD APPROVED FOR USE 1/1994 REVISED: 4/1994 6/2005 DRAFT: 9/2014	STANDARD 617-24

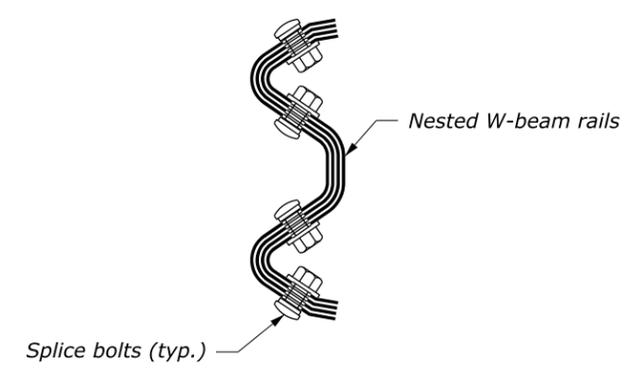
**NOTE:**  
 1. See Standard 617-10 for standard wood post and blockout details.



**LAPPING DETAILS**



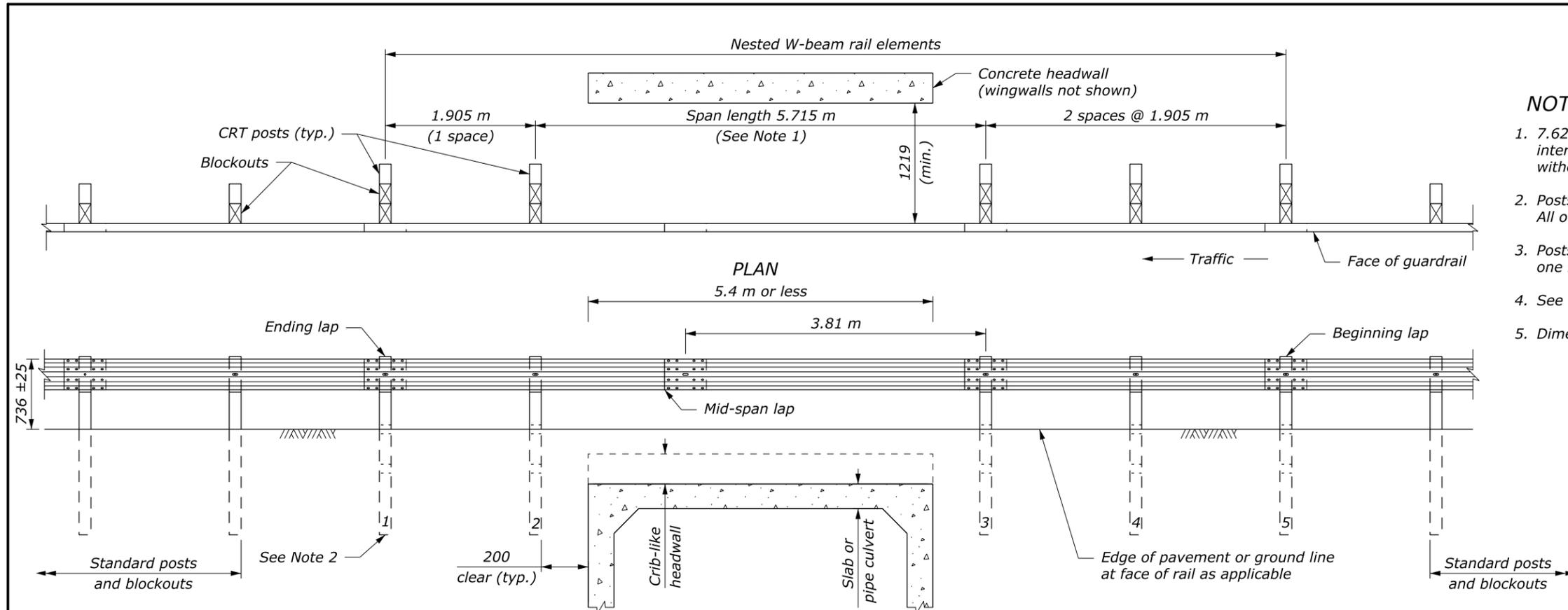
**CRT POST DETAIL**



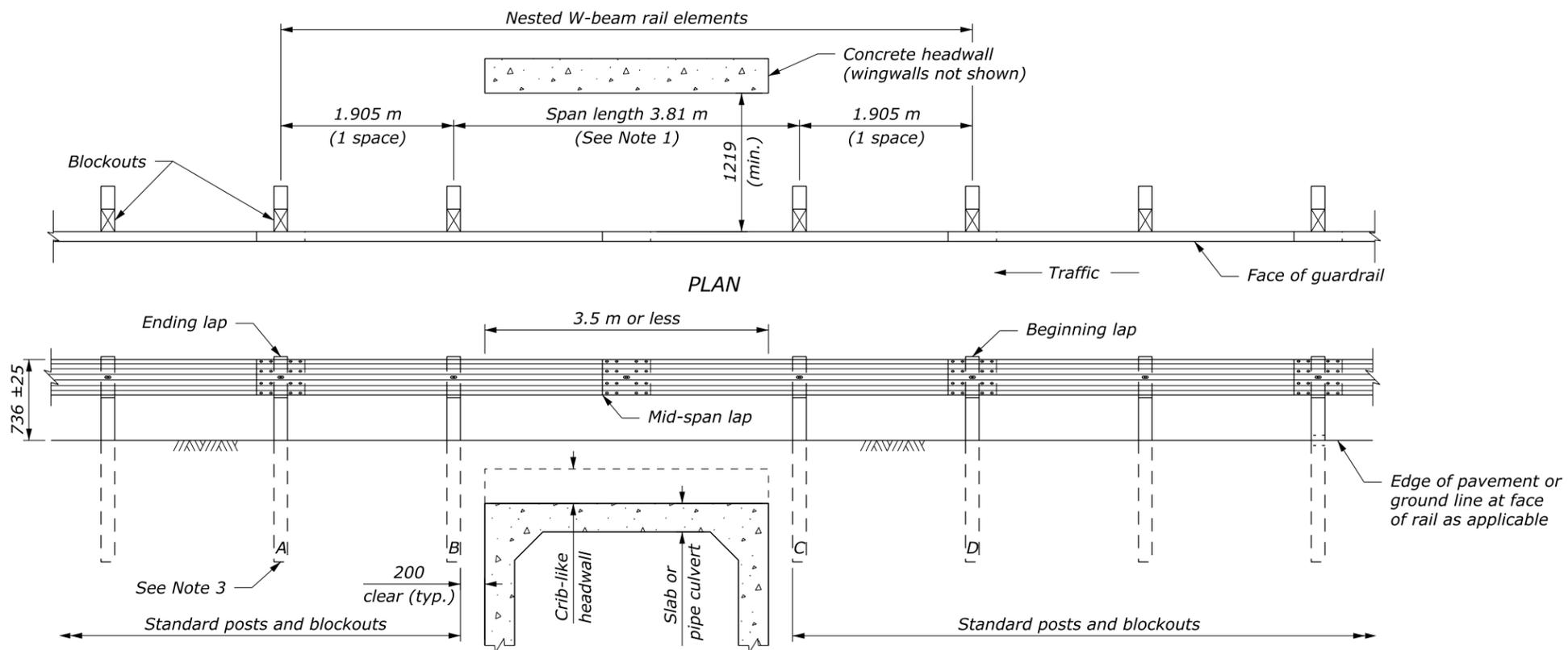
**RAIL SPLICE DETAIL AT MID-SPAN LAP**

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
<b>G4 W-BEAM GUARDRAIL LONG SPAN SYSTEM, TL-2</b>	
Sheet 2 of 2	
STANDARD APPROVED FOR USE 1/1994	STANDARD
REVISED: 4/1994 6/2005	617-24
DRAFT: 9/2014	

NO SCALE



**ELEVATION  
5.715 m GUARDRAIL SPAN**



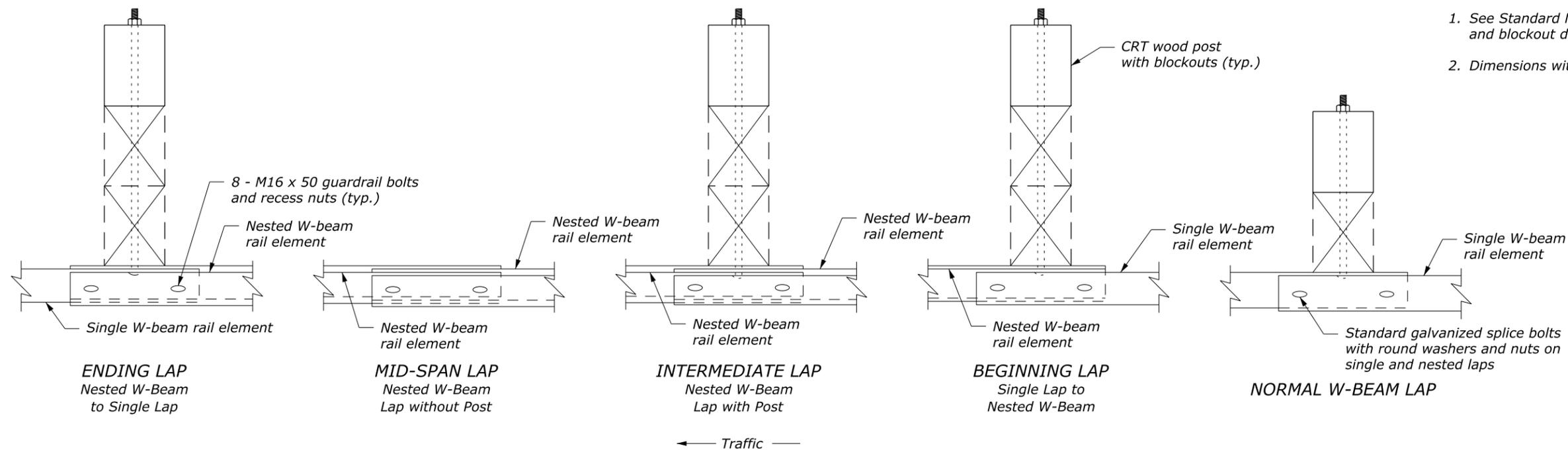
**ELEVATION  
3.81 m GUARDRAIL SPAN**

- NOTE:**
- 7.62 m rail lengths may be used to eliminate the intermediate lap without a post. Do not place a lap without a post unless needed due to gap length.
  - Posts 1 thru 5 are CRT posts with two blockouts. All other posts are wood or steel.
  - Posts A thru D are standard wood posts with one blockout. All other posts are wood or steel.
  - See Sheet 2 of 2 for additional details.
  - Dimensions without units are millimeters.

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
METRIC STANDARD	
<b>G4 W-BEAM GUARDRAIL LONG SPAN SYSTEM, TL-2</b>	
Sheet 1 of 2	
STANDARD APPROVED FOR USE 3/1996	STANDARD
REVISED: 8/1997 6/2005 DRAFT: 9/2014	<b>M617-24</b>

NO SCALE

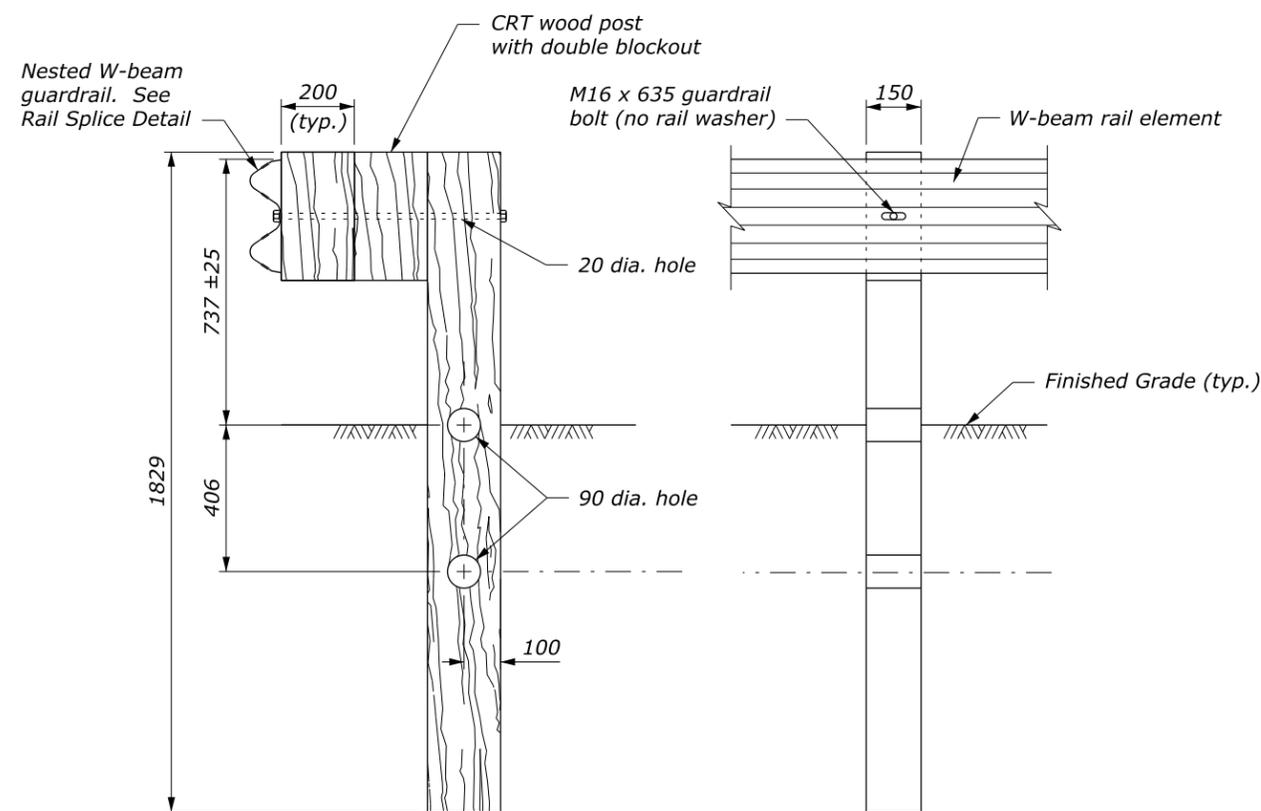
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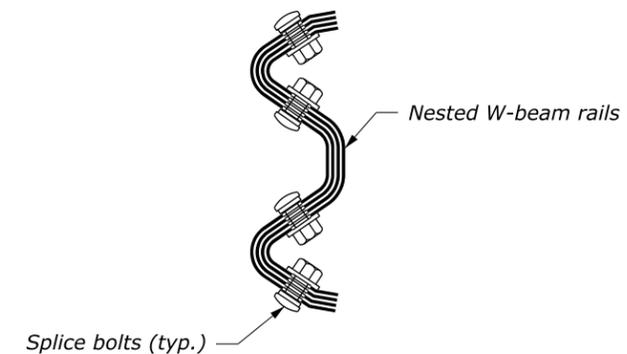
**NOTE:**

1. See Standard M617-10 for standard wood post and blockout details.
2. Dimensions without units are millimeters.

**LAPPING DETAILS**



**CRT POST DETAIL**



**RAIL SPLICE DETAIL AT MID-SPAN LAP**

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
METRIC STANDARD	
<b>G4 W-BEAM GUARDRAIL LONG SPAN SYSTEM, TL-2</b>	
Sheet 2 of 2	
STANDARD APPROVED FOR USE 3/1996	STANDARD
REVISED: 8/1997 6/2005 DRAFT: 9/2014	<b>M617-24</b>