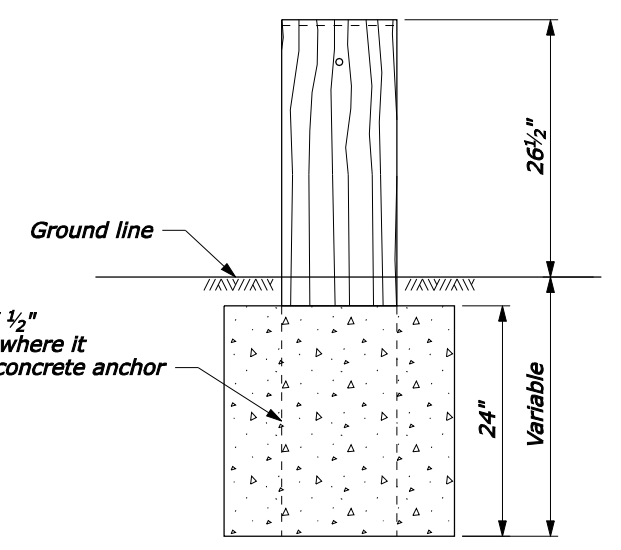
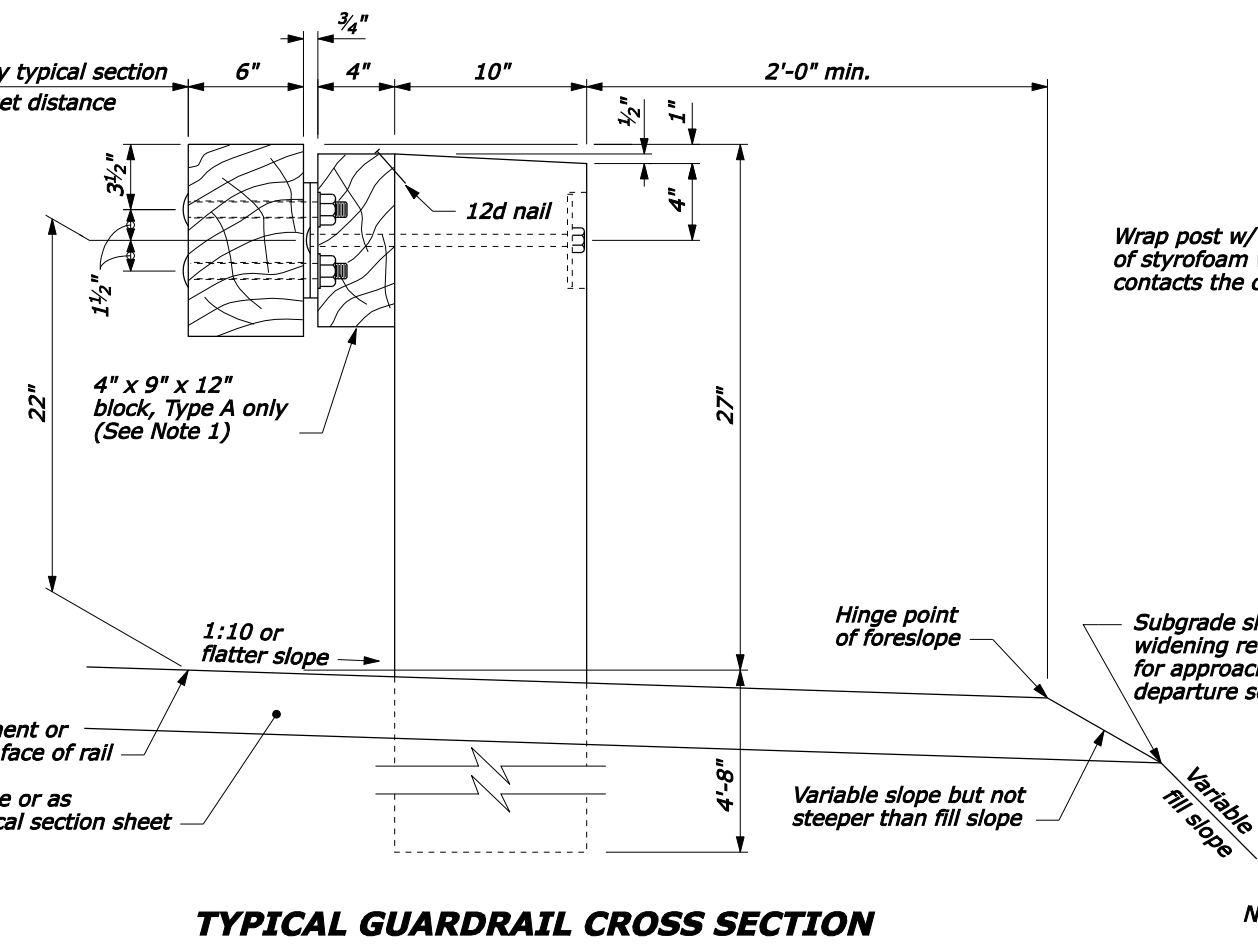
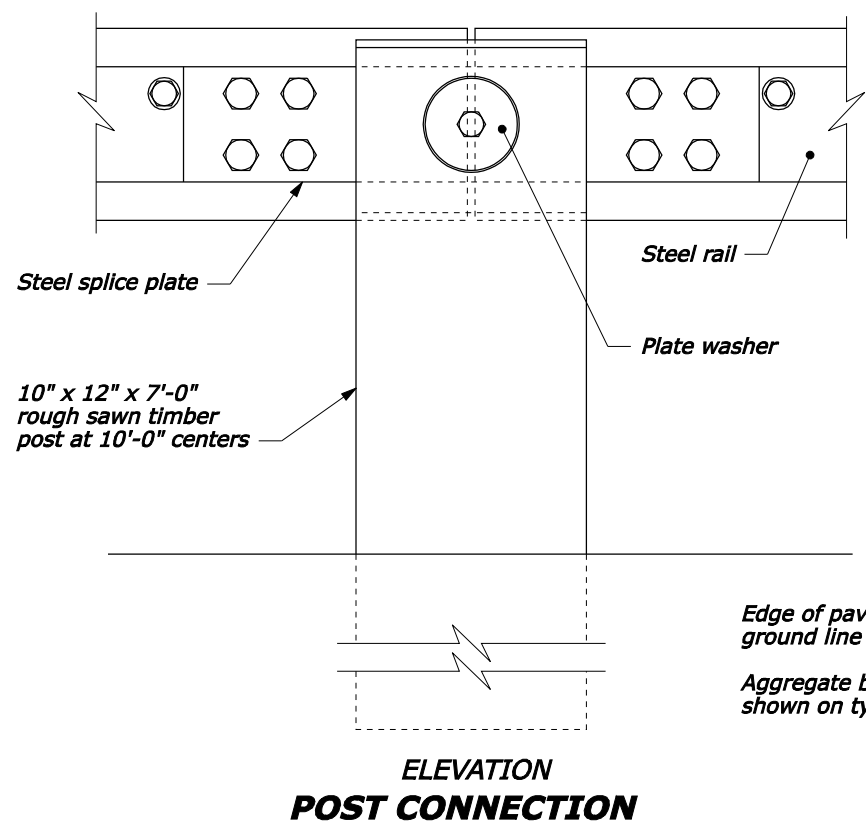
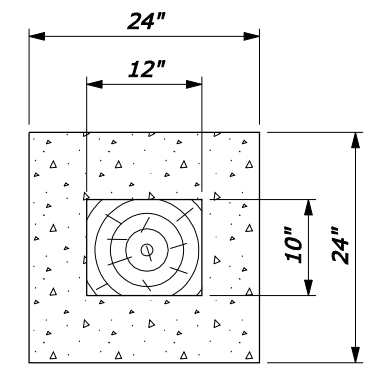
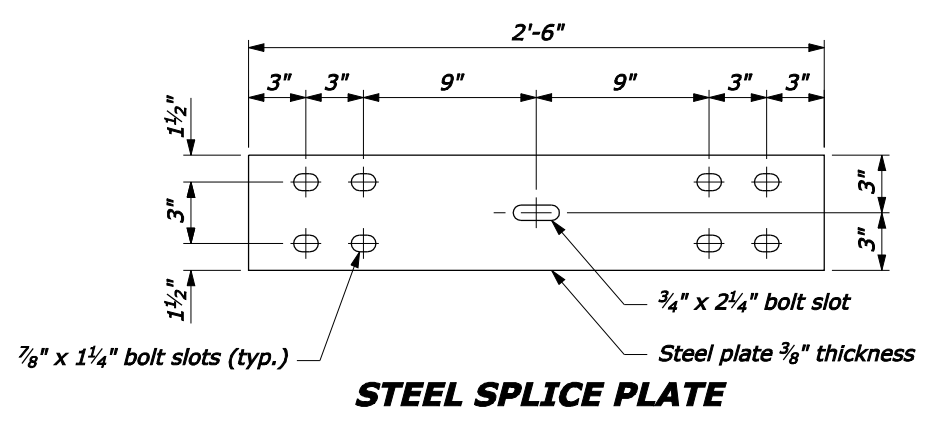
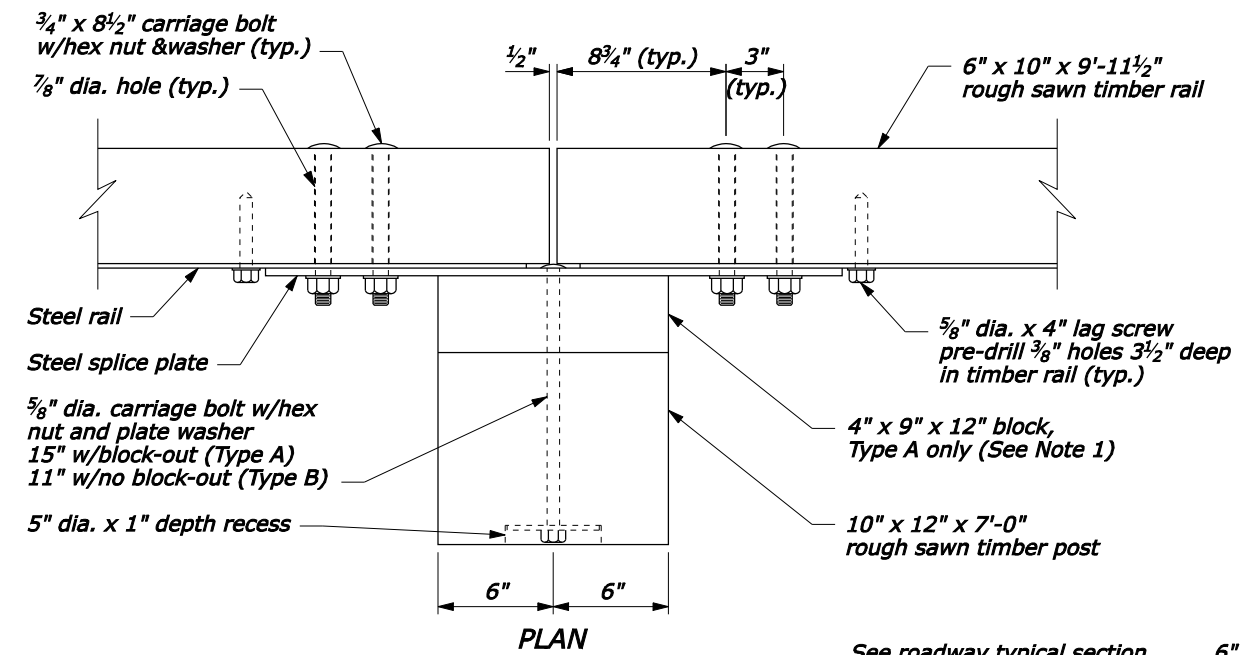


- NOTE:**
1. Use the Type A, blocked-out, system or the Type B, non-blocked-out, system as specified in the plans.
  2. Use weathering steel for all structural steel and fastener hardware as specified.
  3. Place a terminal section (See Standards 617-61 and 617-62) on both approach and trailing ends of barrier installations.



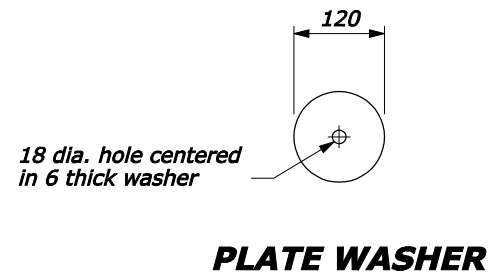
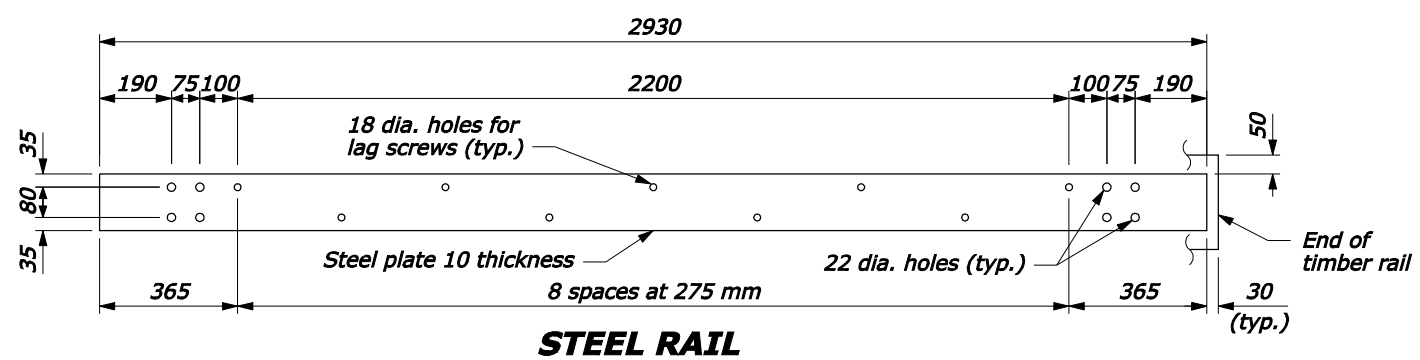
24" dia. round anchor is an acceptable alternative. Reduced size acceptable in solid rock.

**CONCRETE ANCHOR FOR SHORT GUARDRAIL POST**

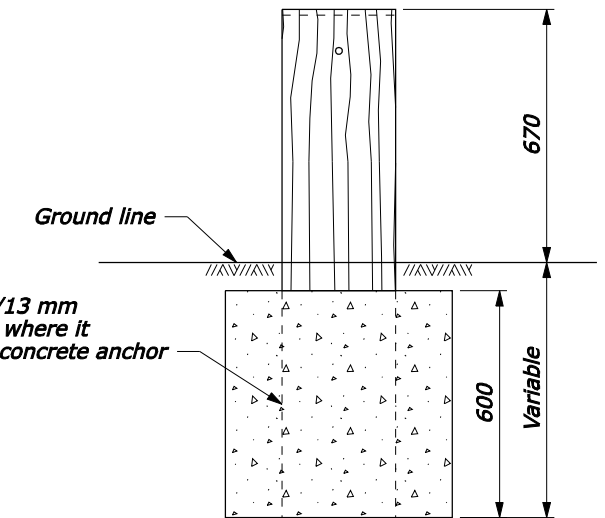
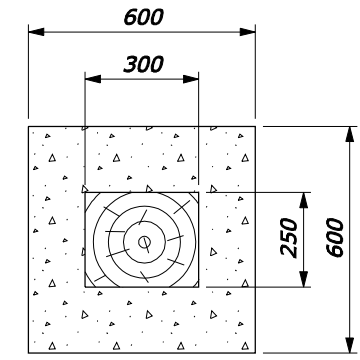
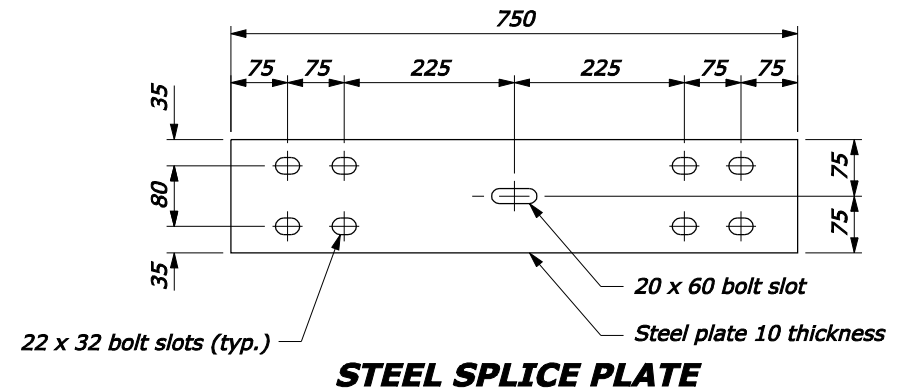
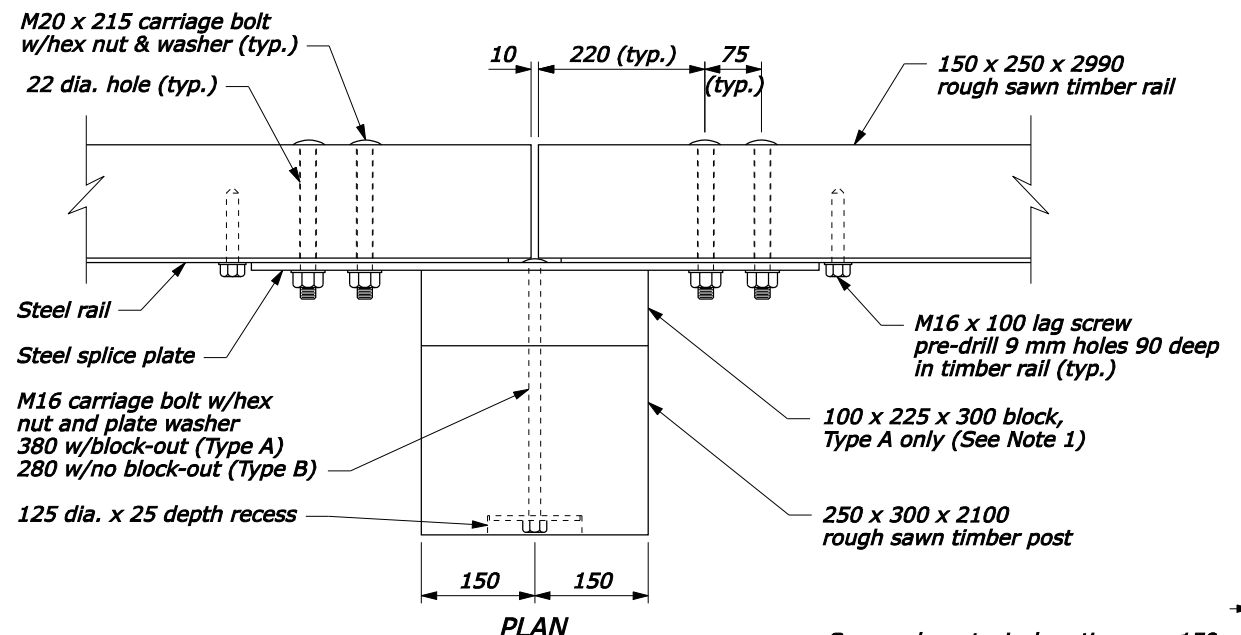
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD	
<b>STEEL-BACKED TIMBER GUARDRAIL TYPE A &amp; TYPE B</b>	
STANDARD APPROVED FOR USE 3/1990 REVISED: 4/1994 6/2005	STANDARD 617-60

NO SCALE

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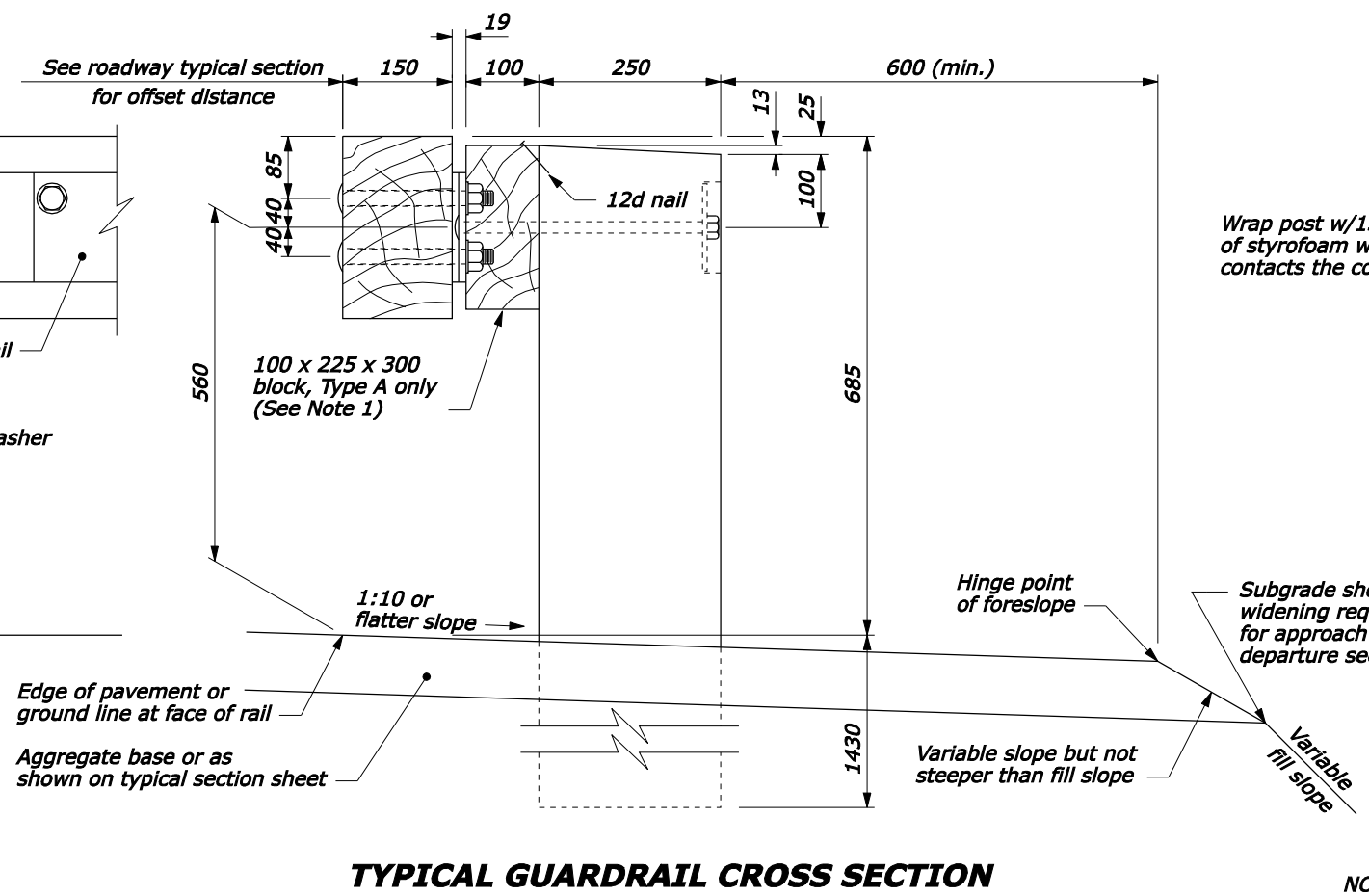
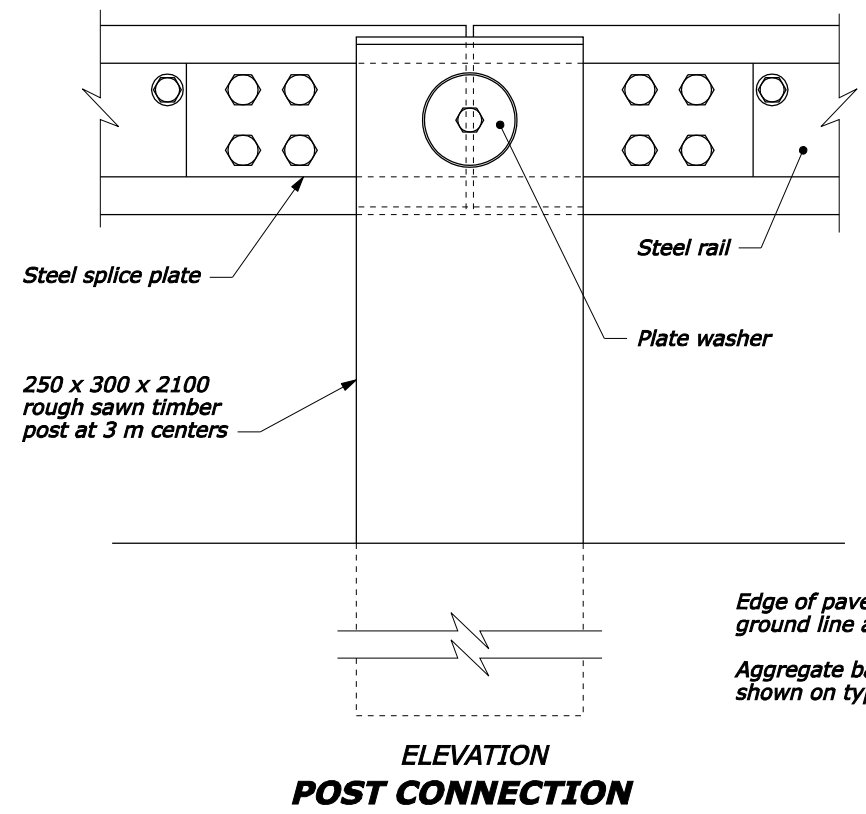


- NOTE:**
1. Use the Type A, blocked-out, system or the Type B, non-blocked-out, system as specified in the plans.
  2. Use weathering steel for all structural steel and fastener hardware as specified.
  3. Place a terminal section (See Standards M617-61 and M617-62) on both approach and trailing ends of barrier installations.
  4. Furnish hardware in the metric sizes shown. Equivalent imperial sizes may be used when metric sizes are not available.
  5. Dimensions without units are millimeters.



600 dia. round anchor is an acceptable alternative. Reduced size acceptable in solid rock.

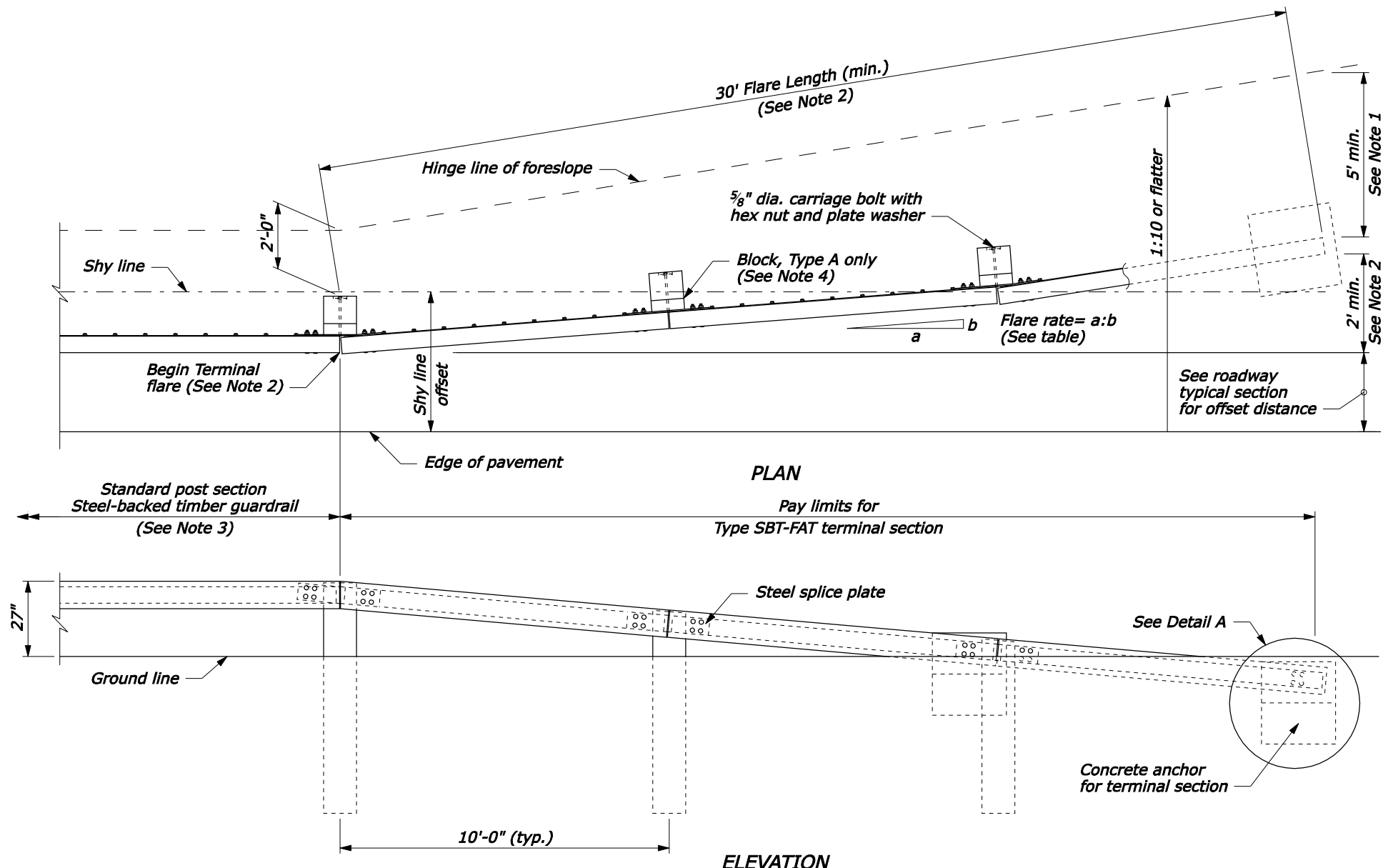
**CONCRETE ANCHOR FOR SHORT GUARDRAIL POST**



NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
METRIC STANDARD	
<b>STEEL-BACKED TIMBER GUARDRAIL TYPE A &amp; TYPE B</b>	
STANDARD APPROVED FOR USE 3/1996	STANDARD
REVISED: 5/1997 6/2005	M617-60

20-Sep-2007 06:41 AM  
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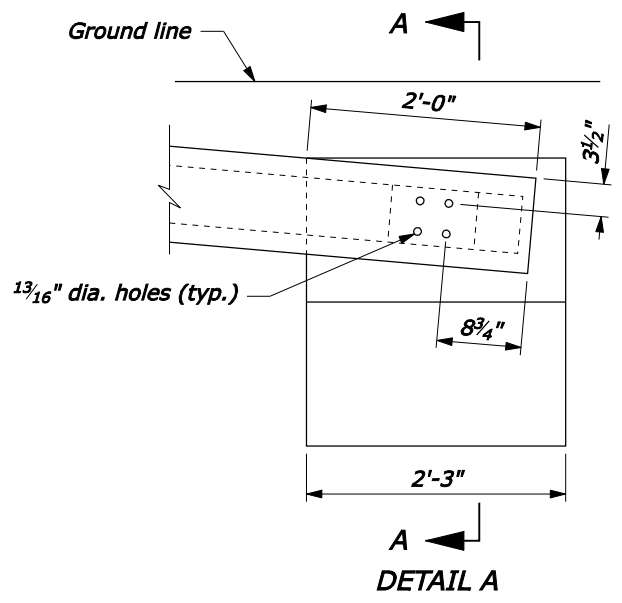


**APPROACH & DEPARTURE FLARE WITH FLARED ANCHOR TERMINAL (FAT)**

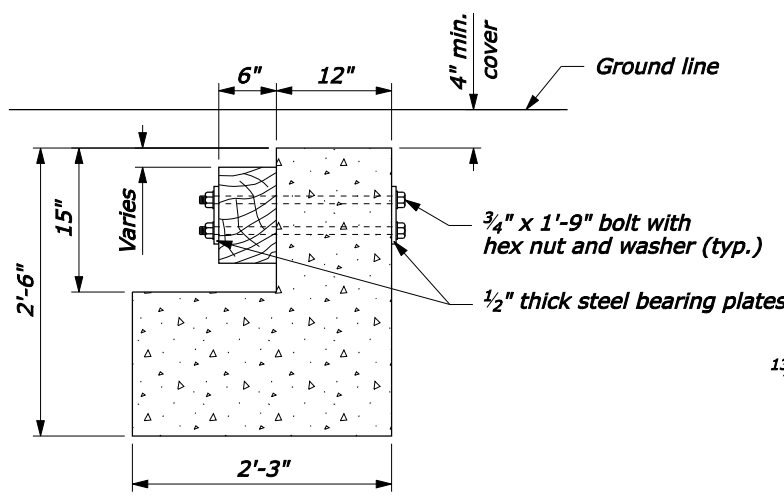
Design Speed (mph)	Shy line offset (ft)	Flare rate inside shy line (a:b)	Flare rate outside shy line (a:b)
60	8.0	26:1	14:1
50	6.5	21:1	11:1
40	5.0	16:1	8:1
30 and less	3.5	13:1	7:1

**NOTE:**

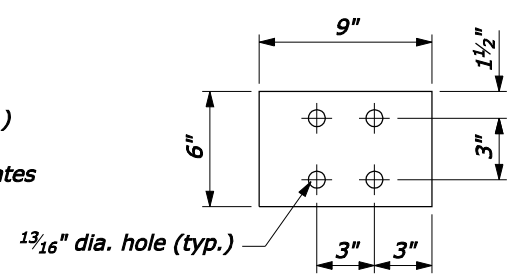
1. Extend the fill widening a minimum of 5 feet behind the guardrail, unless otherwise directed by the CO.
2. The guardrail flare shown in the plan view is the minimum length and rate required. As directed by the CO, flare the guardrail so that the terminal section is outside the clear zone. If the terminal section cannot be located outside the clear zone, it should be flared as far as practical from the road at the maximum rate indicated on the Guardrail Flare Rates table.
3. See Standard 617-60, Steel-Backed Timber Guardrail, Type SBTA and SBTB, for timber, structural steel, and hardware details.
4. On the Type A, blocked-out guardrail, include the blocks in terminal section, except on the concrete anchor. For the Type B, non-blocked-out guardrail, no blocks are included.



**CONCRETE ANCHOR**



**SECTION A-A**



**STEEL BEARING PLATE**

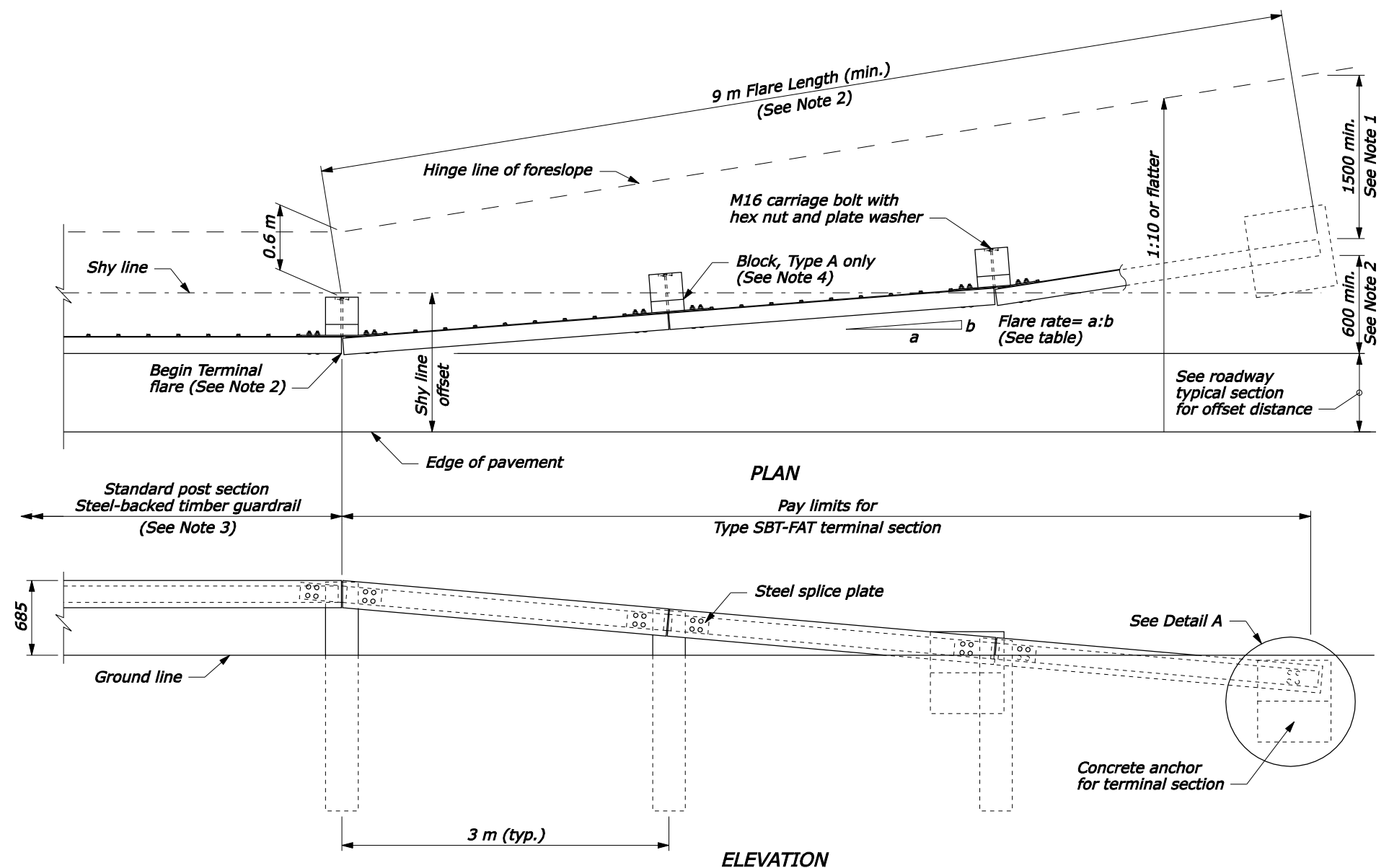
NO SCALE

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

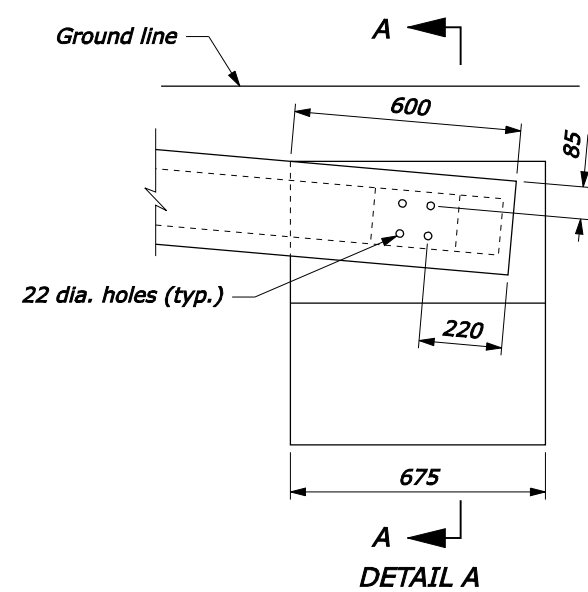
U.S. CUSTOMARY STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
 TERMINAL SECTION  
 TYPE SBT-FAT**

STANDARD APPROVED FOR USE 1/1990	STANDARD
REVISED: 4/1994 6/2005	617-61
DRAFT: 9/2007	

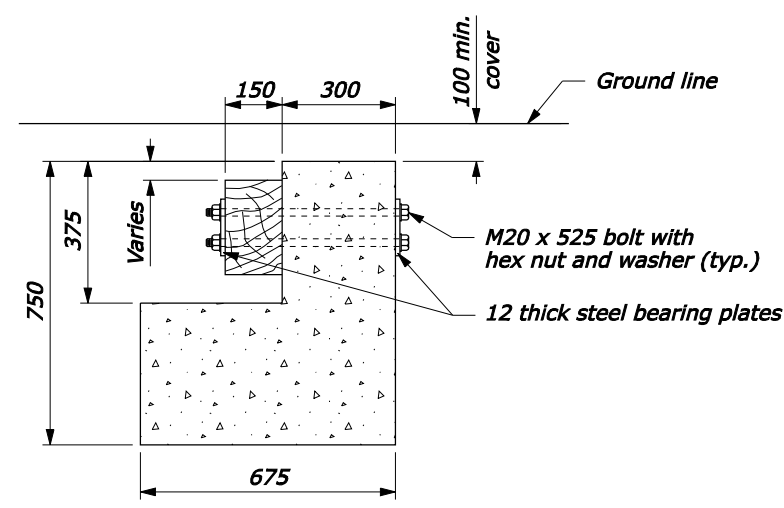
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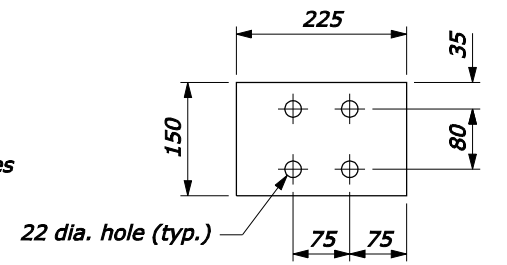
**APPROACH & DEPARTURE FLARE WITH FLARED ANCHOR TERMINAL (FAT)**



**CONCRETE ANCHOR**



**SECTION A-A**



**STEEL BEARING PLATE**

Design Speed (km/h)	Shy line offset (m)	Flare rate inside shy line (a:b)	Flare rate outside shy line (a:b)
100	2.5	26:1	14:1
80	2.0	21:1	11:1
60	1.5	16:1	8:1
50 or less	1.0	13:1	7:1

**NOTE:**

1. Extend the fill widening a minimum of 1.5 m behind the guardrail, unless otherwise directed by the CO.
2. The guardrail flare shown in the plan view is the minimum length and rate required. As directed by the CO, flare the guardrail so that the terminal section is outside the clear zone. If the terminal section cannot be located outside the clear zone, it should be flared as far as practical from the road at the maximum rate indicated on the Guardrail Flare Rates table.
3. See Standard M617-60, Steel-Backed Timber Guardrail, Type SBT-A and SBT-B, for timber, structural steel, and hardware details.
4. On the Type A, blocked-out guardrail, include the blocks in terminal section, except on the concrete anchor. For the Type B, non-blocked-out guardrail, no blocks are included.
5. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are not available.
6. Dimensions without units are millimeters.

NO SCALE

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

METRIC STANDARD

**STEEL-BACKED TIMBER GUARDRAIL  
 TERMINAL SECTION  
 TYPE SBT-FAT**

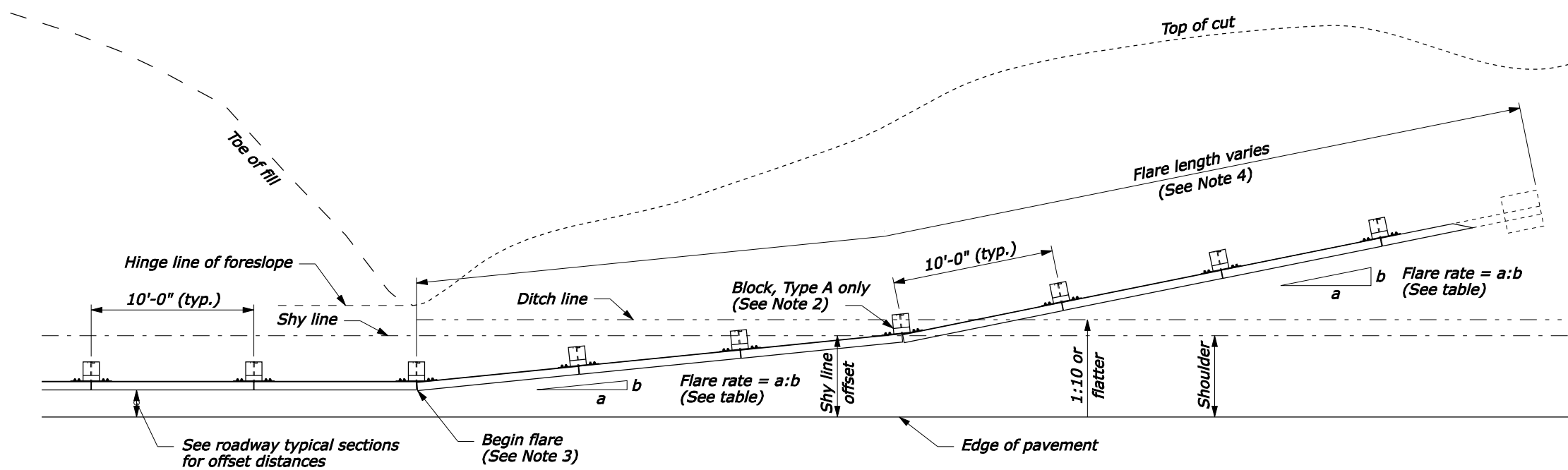
STANDARD APPROVED FOR USE 3/1996

REVISÉD: 6/2005  
 DRAFT: 9/2007

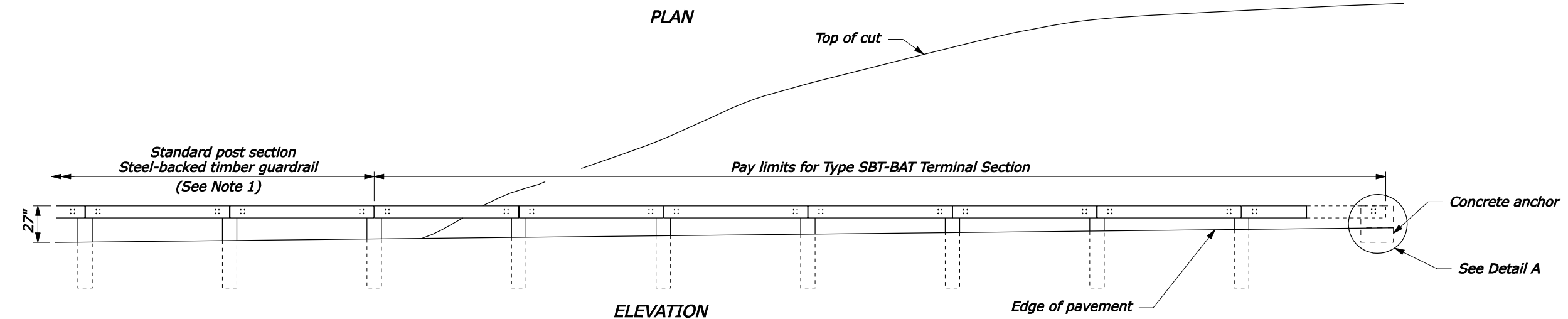
STANDARD  
**M617-61**

01-Oct-2007 06:22 AM

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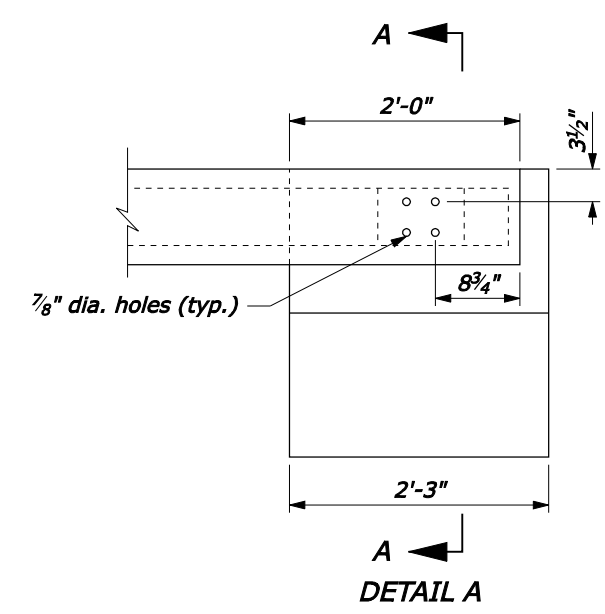


- NOTE:**
1. See Standard 617-60, SBTA and SBTB for timber, structural steel, and hardware details.
  2. On the Type A, blocked-out guardrail, include the blocks in the terminal section, except on the concrete anchor. For the Type B, non-blocked-out guardrail, no blocks are included.
  3. Begin the cut flares at the nearest post to a transition point between fill and cut as directed by the CO.
  4. Extend the flare into the cut until a minimum 1-foot cover is obtained over the guardrail end.

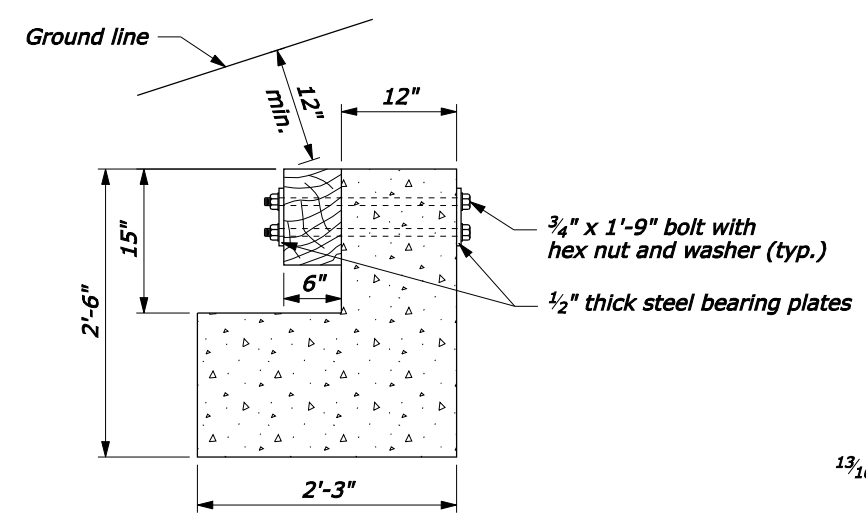


**APPROACH & DEPARTURE FLARE WITH BACK SLOPE ANCHOR TERMINAL (BAT)**

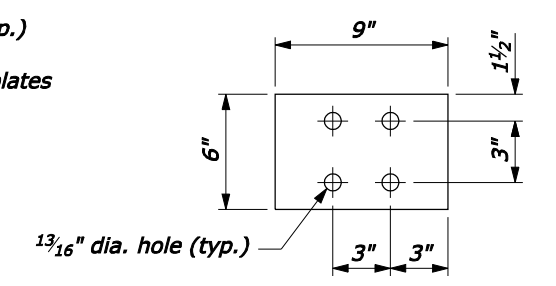
Design Speed (mph)	Shy line offset (ft)	Flare rate inside shy line (a:b)	Flare rate outside shy line (a:b)
60	8.0	26:1	14:1
50	6.5	21:1	11:1
40	5.0	16:1	8:1
30 and less	3.5	13:1	7:1



**CONCRETE ANCHOR**



**SECTION A-A**



**STEEL BEARING PLATE**

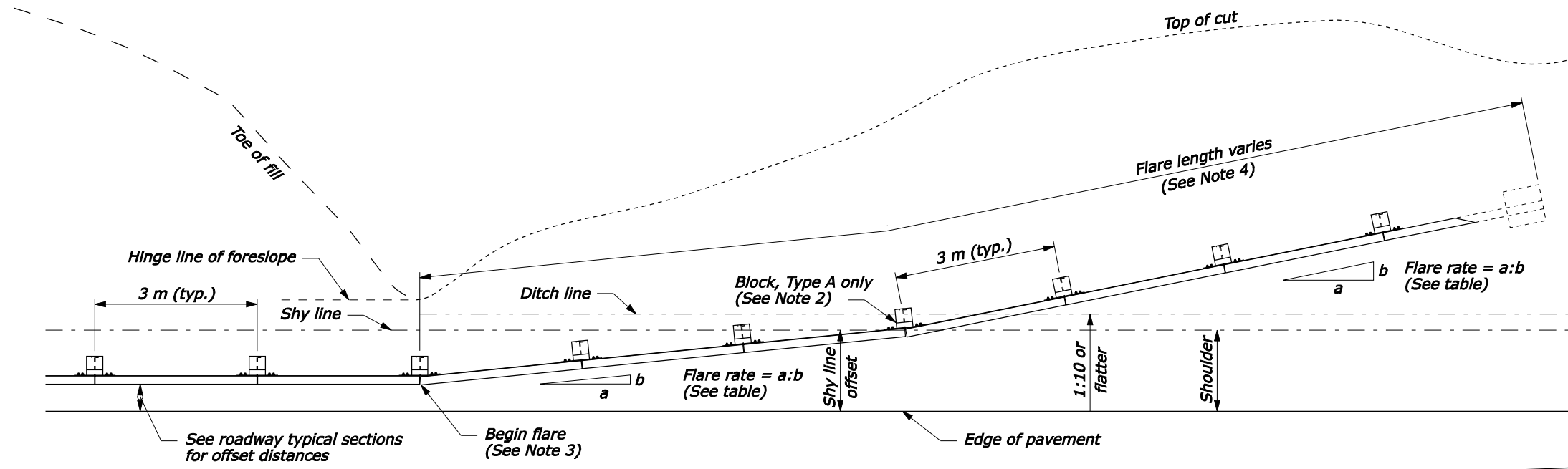
NO SCALE

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

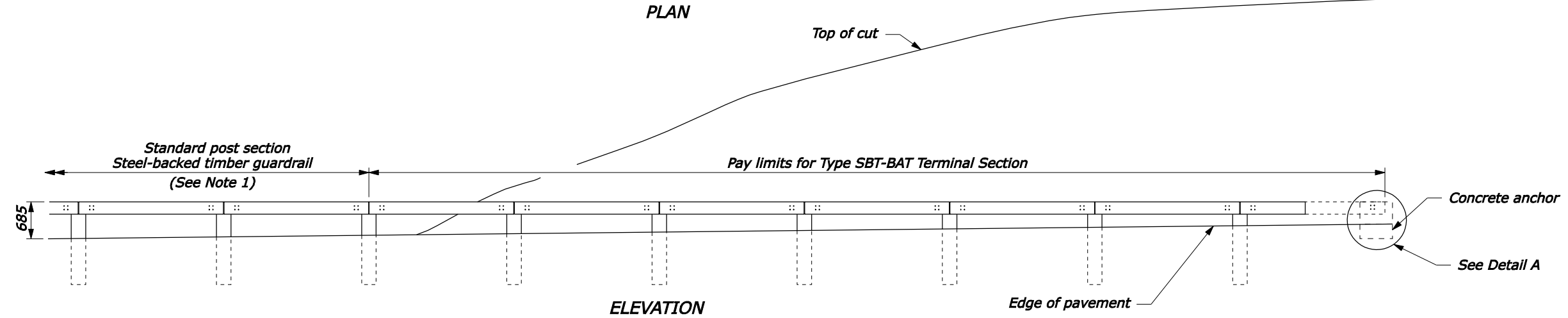
**U.S. CUSTOMARY STANDARD  
 STEEL-BACKED TIMBER GUARDRAIL  
 TERMINAL SECTION  
 TYPE SBT-BAT**

STANDARD APPROVED FOR USE 3/1990	STANDARD
REVISED: 4/1994 6/2005	617-62

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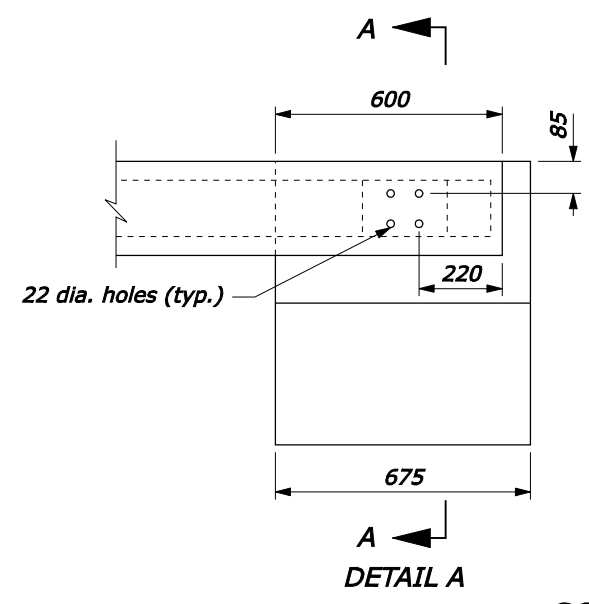


- NOTE:**
1. See Standard M617-60, SBTA and SBTB for timber, structural steel, and hardware details.
  2. On the Type A, blocked-out guardrail, include the blocks in the terminal section, except on the concrete anchor. For the Type B, non-blocked-out guardrail, no blocks are included.
  3. Begin the cut flares at the nearest post to a transition point between fill and cut as directed by the CO.
  4. Extend the flare into the cut until a minimum 300 mm cover is obtained over the guardrail end.
  5. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are not available.
  6. Dimensions without units are millimeters.

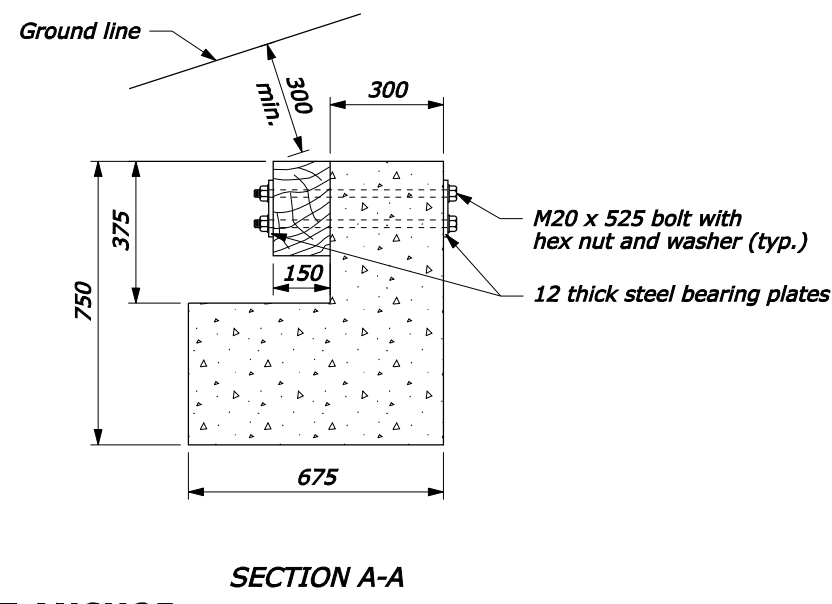


**APPROACH & DEPARTURE FLARE WITH BACK SLOPE ANCHOR TERMINAL (BAT)**

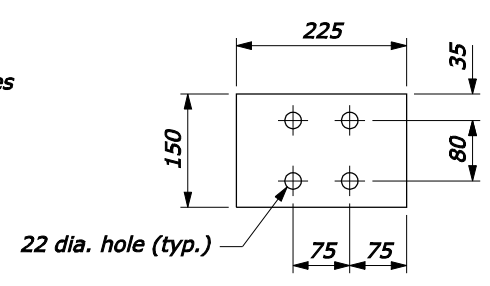
Design Speed (km/h)	Shy line offset (m)	Flare rate inside shy line (a:b)	Flare rate outside shy line (a:b)
100	2.5	26:1	14:1
80	2.0	21:1	11:1
60	1.5	16:1	8:1
50 or less	1.0	13:1	7:1



**CONCRETE ANCHOR**



**SECTION A-A**



**STEEL BEARING PLATE**

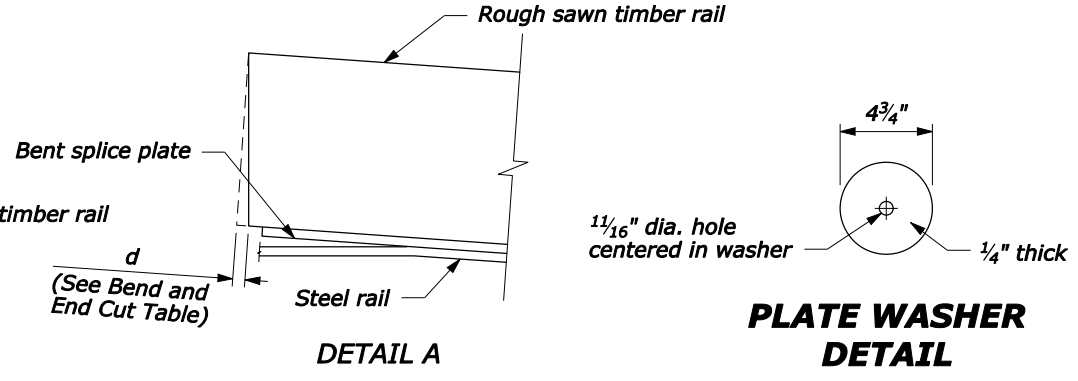
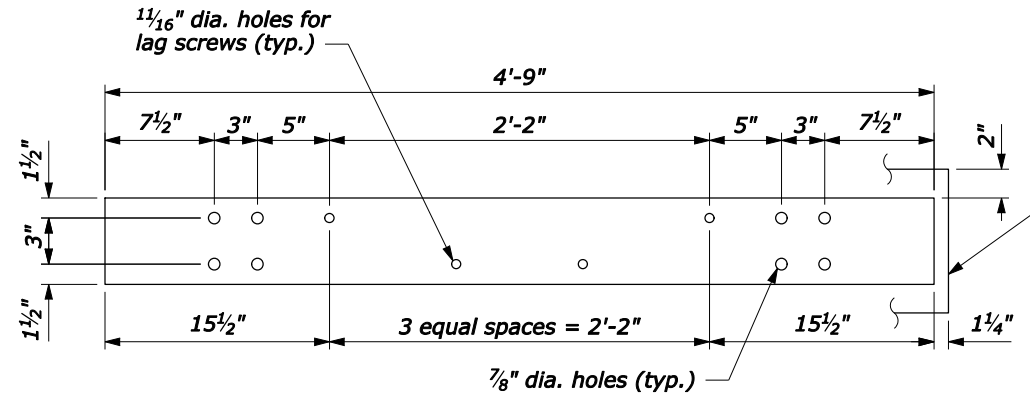
U.S. DEPARTMENT OF TRANSPORTATION  
 FEDERAL HIGHWAY ADMINISTRATION  
 FEDERAL LANDS HIGHWAY  
 METRIC STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
 TERMINAL SECTION  
 TYPE SBT-BAT**

STANDARD APPROVED FOR USE 3/1996  
 REVISED: 6/2005

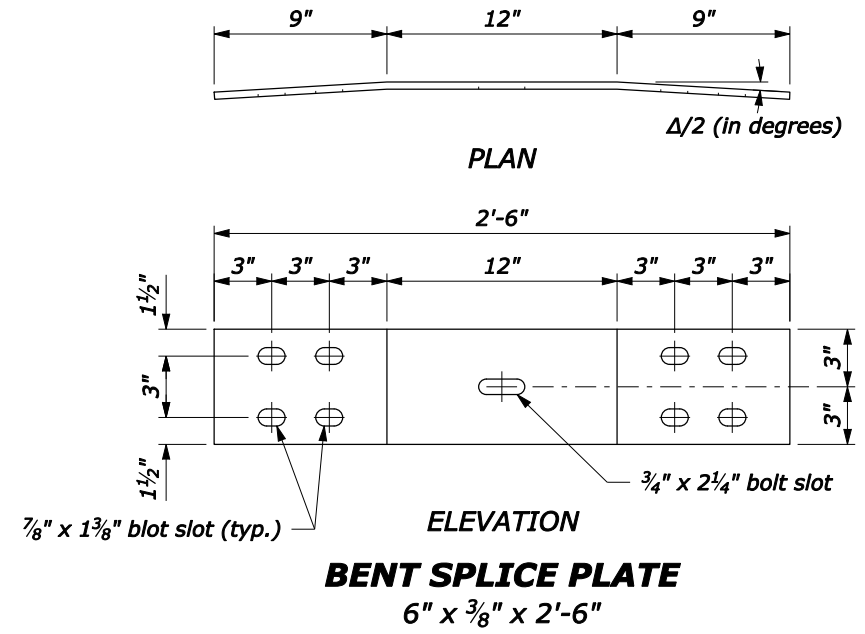
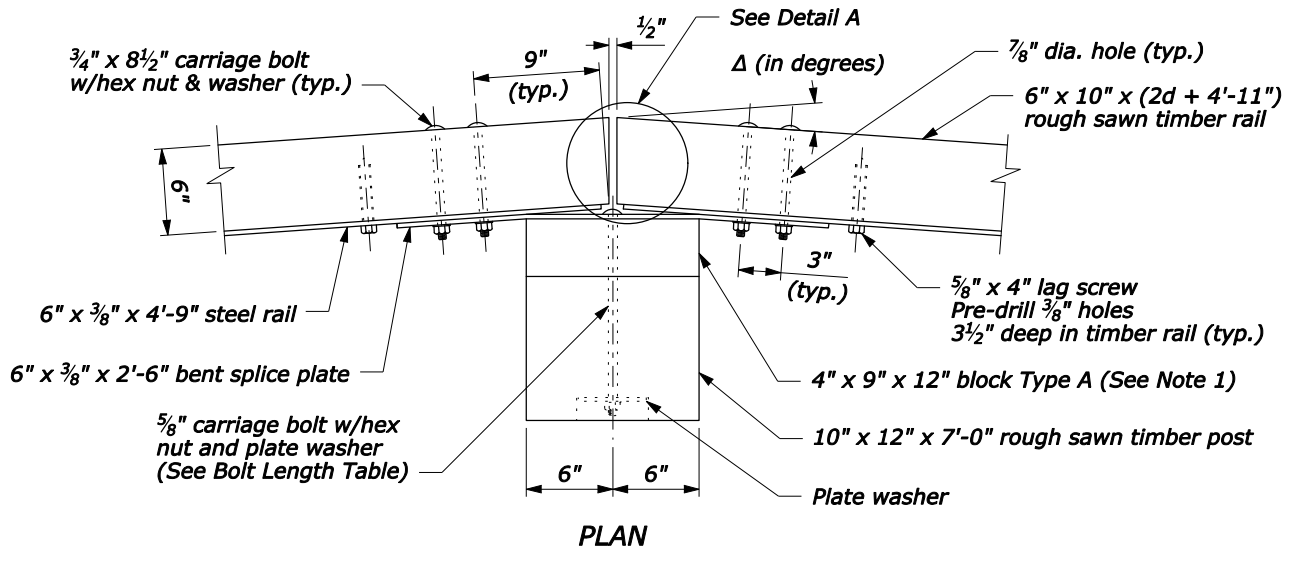
STANDARD  
**M617-62**

NO SCALE

24-Sep-2007 06:32 AM F:\StandDraw\std61762.dgn [Metric]

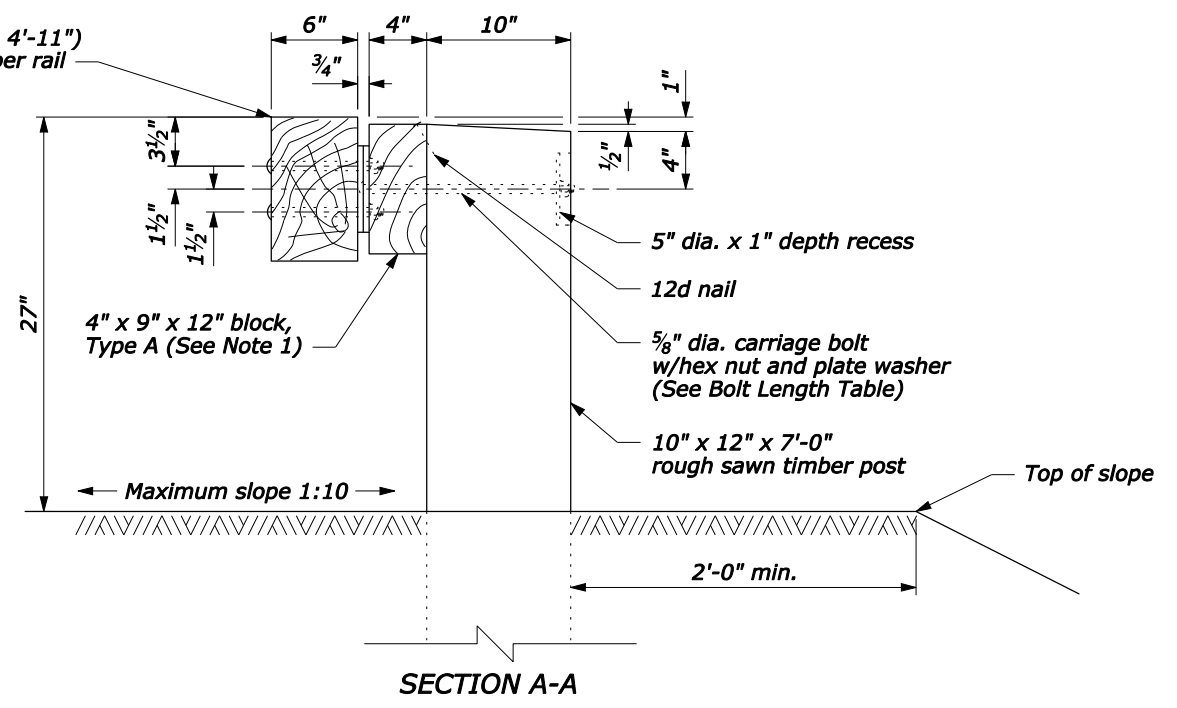
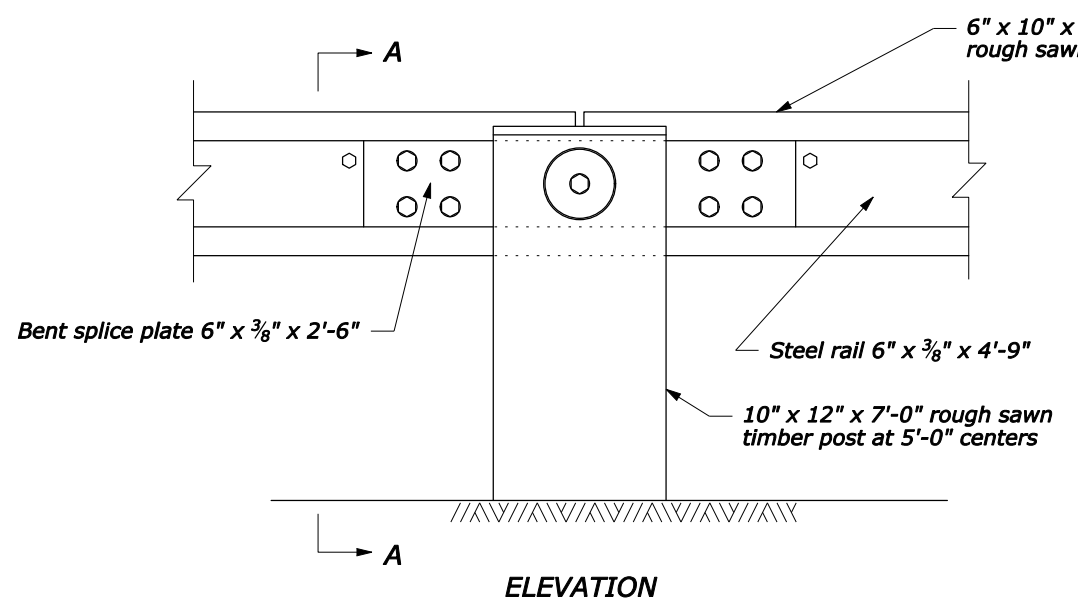


- NOTE:**
1. Use the Type A, blocked-out, system or the Type B, non-blocked-out, system as specified.
  2. Use the weathering steel for all structural steel and fastener hardware.
  3. Furnish shop bent splice plates. Use the minimum bend angle shown in the table below.
  4. See Sheet 2 of 2 for Plan View Layout.



Radius R ft	Δ/2 degrees	d in
20	7.18	3/4
25	5.74	5/8
30	4.78	1/2
35	4.10	7/16
40	3.58	3/8
45	3.18	1/3
50	2.87	5/16
55	2.61	1/4
60	2.39	1/4
65	2.20	1/4
70	2.05	1/4
over 70	flat	0

Type A (Block-out)	Type B (No Block-out)
15"	11"



**POST CONNECTION**

NO SCALE

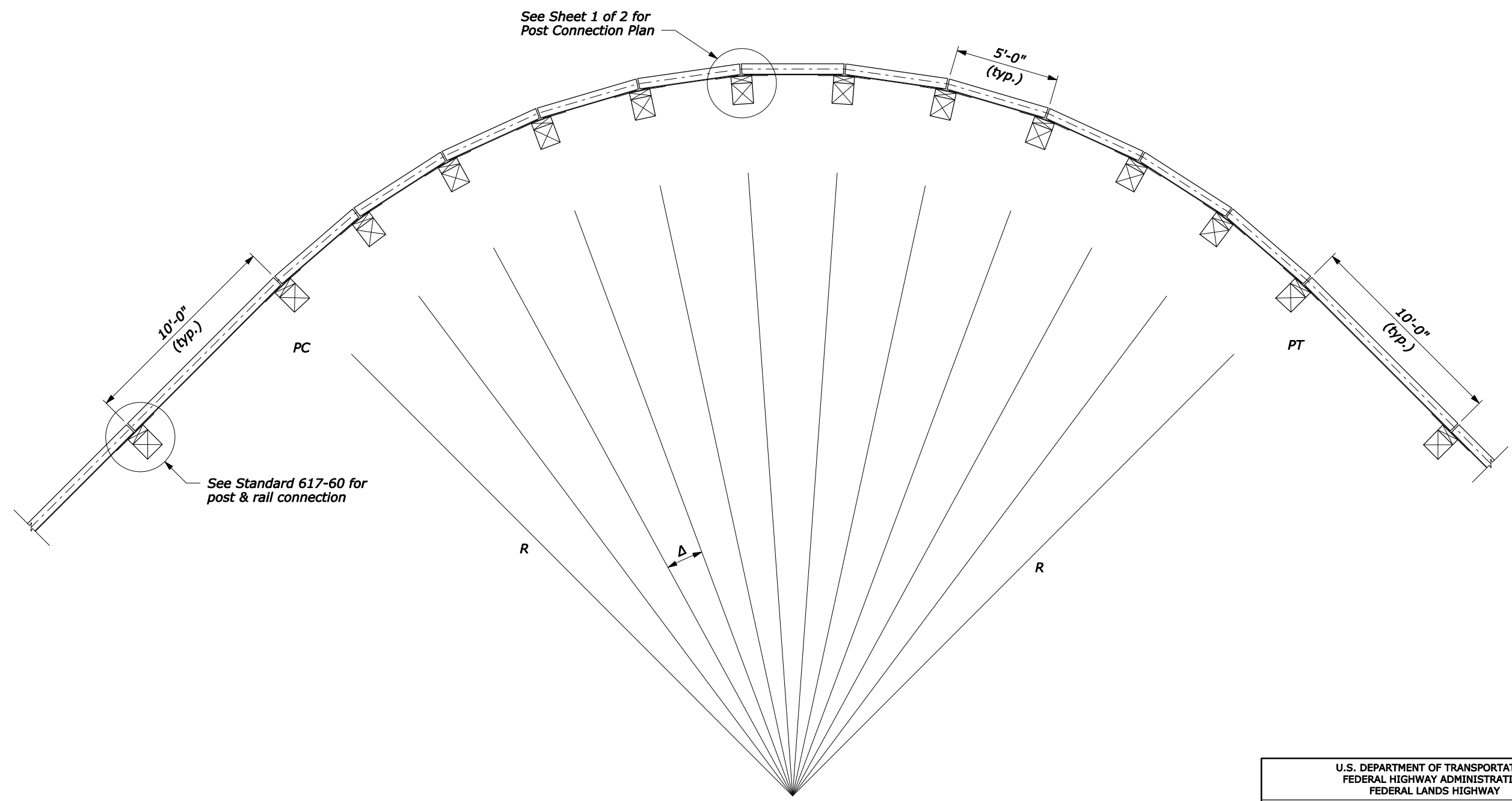
U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
FEDERAL LANDS HIGHWAY

U.S. CUSTOMARY STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
AROUND CIRCULAR CURVES  
70 FOOT RADIUS AND BELOW**  
Sheet 1 of 2

STANDARD APPROVED FOR USE 6/2005	STANDARD
REVISED:	617-63

**NOTE:**

1.  $\Delta$  is the central angle which subtends a 5'-0" chord.
2.  $R$  is measured from the center of the circle to the back surface of the rough sawn timber rail.



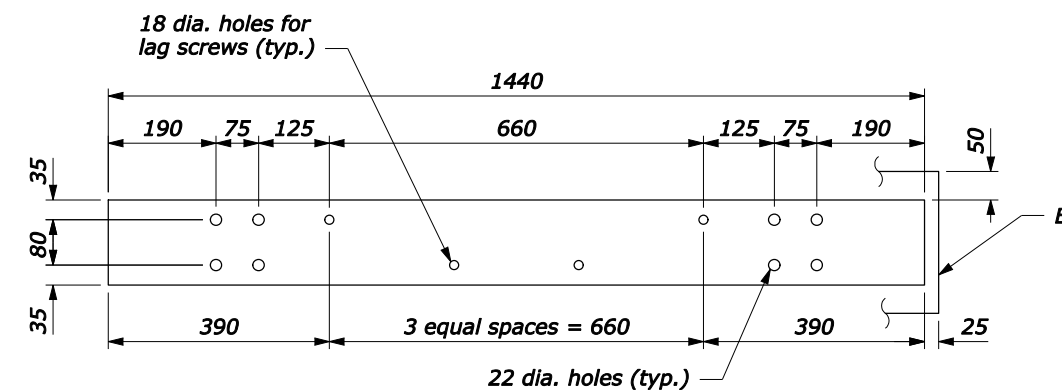
**PLAN VIEW LAYOUT**

NO SCALE

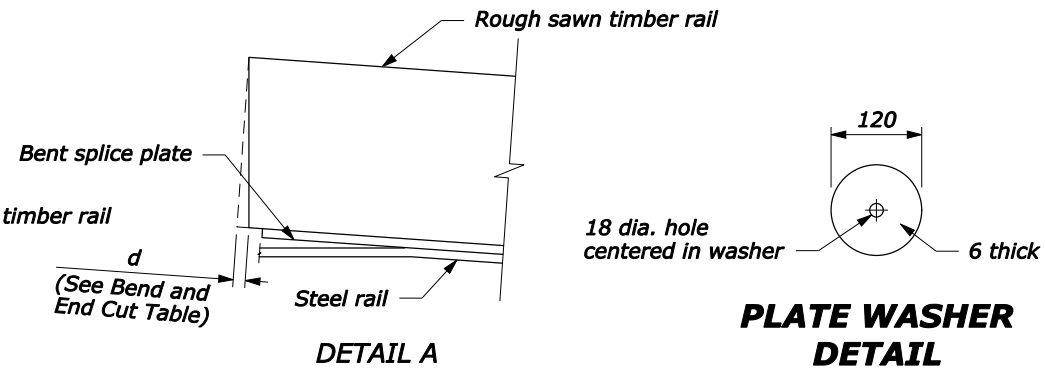
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD <b>STEEL-BACKED TIMBER GUARDRAIL AROUND CIRCULAR CURVES 70 FOOT RADIUS AND BELOW</b> Sheet 2 of 2	
STANDARD APPROVED FOR USE 6/2005	STANDARD
REVISED:	617-63

2 September 2009 3:05 PM  
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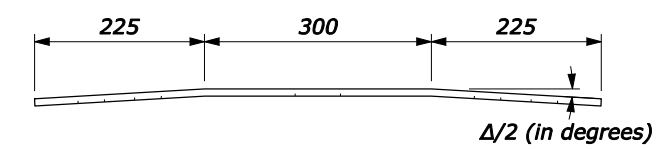
**STEEL RAIL**  
150 x 10 x 1440



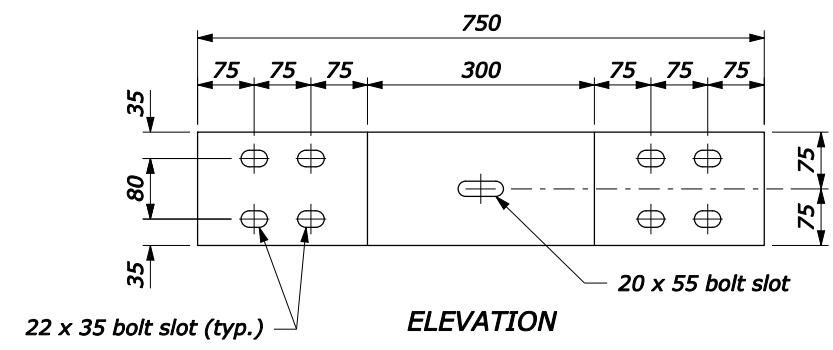
**DETAIL A**

**PLATE WASHER**  
DETAIL

- NOTE:**
1. Use the Type A, blocked-out, system or the Type B, non-blocked-out, system as specified.
  2. Use the weathering steel for all structural steel and fastener hardware.
  3. Furnish shop bent splice plates. Use the minimum bend angle shown in the table below.
  4. See Sheet 2 of 2 for Plan View Layout.
  5. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are not available.
  6. Dimensions without units are millimeters.

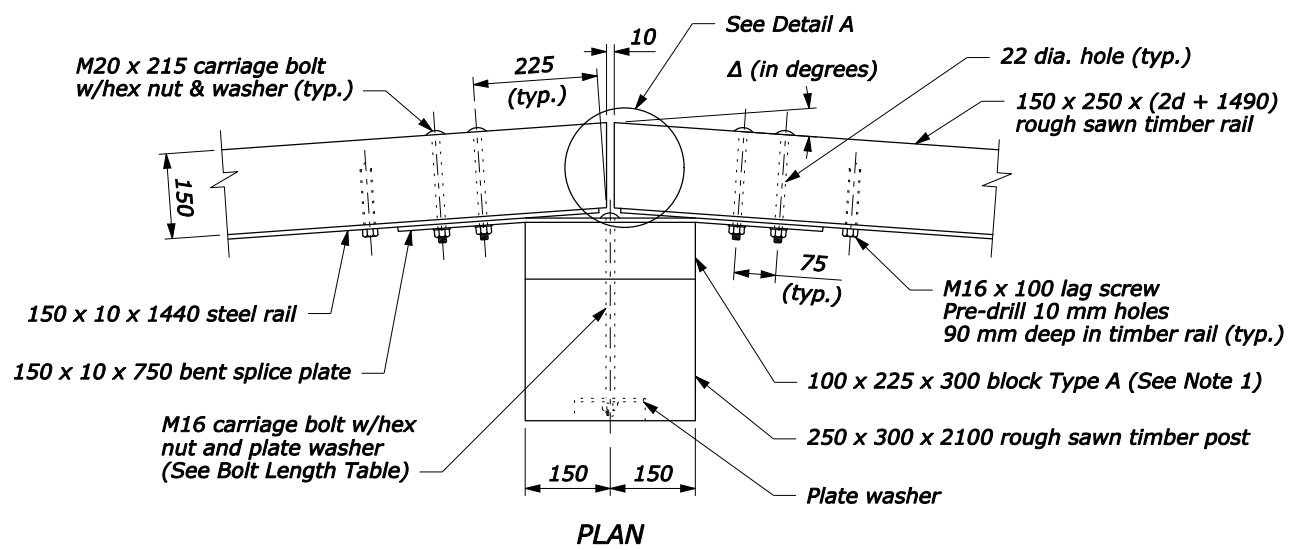


**PLAN**



**ELEVATION**

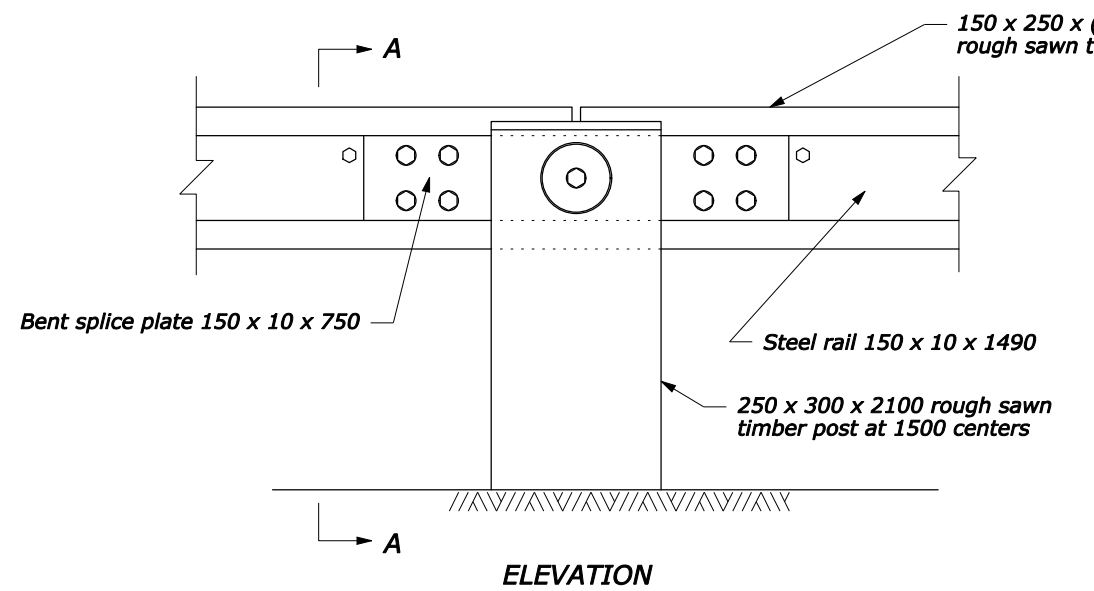
**BENT SPLICE PLATE**  
150 x 10 x 750



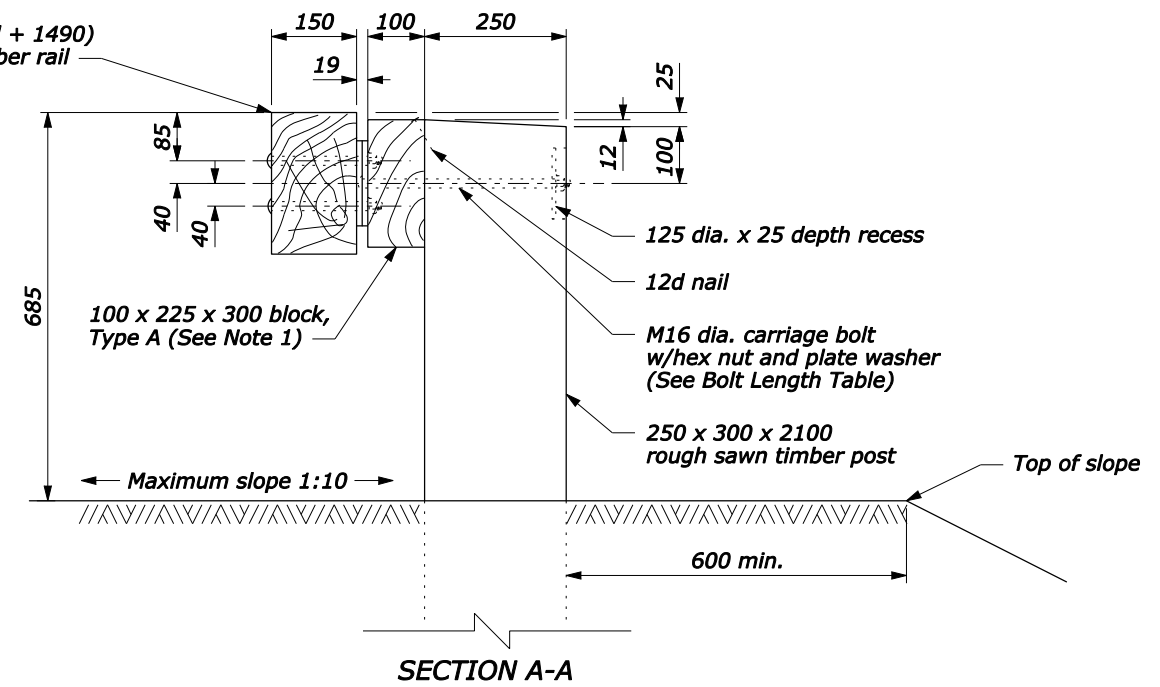
**PLAN**

Radius R meters	Δ/2 degrees	d mm
5	8.63	23
6	7.18	19
8	5.38	14
10	4.30	11
12	3.58	9
14	3.07	8
16	2.69	7
18	2.39	6
20	2.15	6
22	1.95	5
over 22	flat	0

Type A (Block-out)	Type B (No Block-out)
375	275



**ELEVATION**



**SECTION A-A**

**POST CONNECTION**

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

METRIC STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL**  
**AROUND CIRCULAR CURVES**  
**22 m RADIUS AND BELOW**  
Sheet 1 of 2

STANDARD APPROVED FOR USE 3/1996  
REVISED: 6/2005

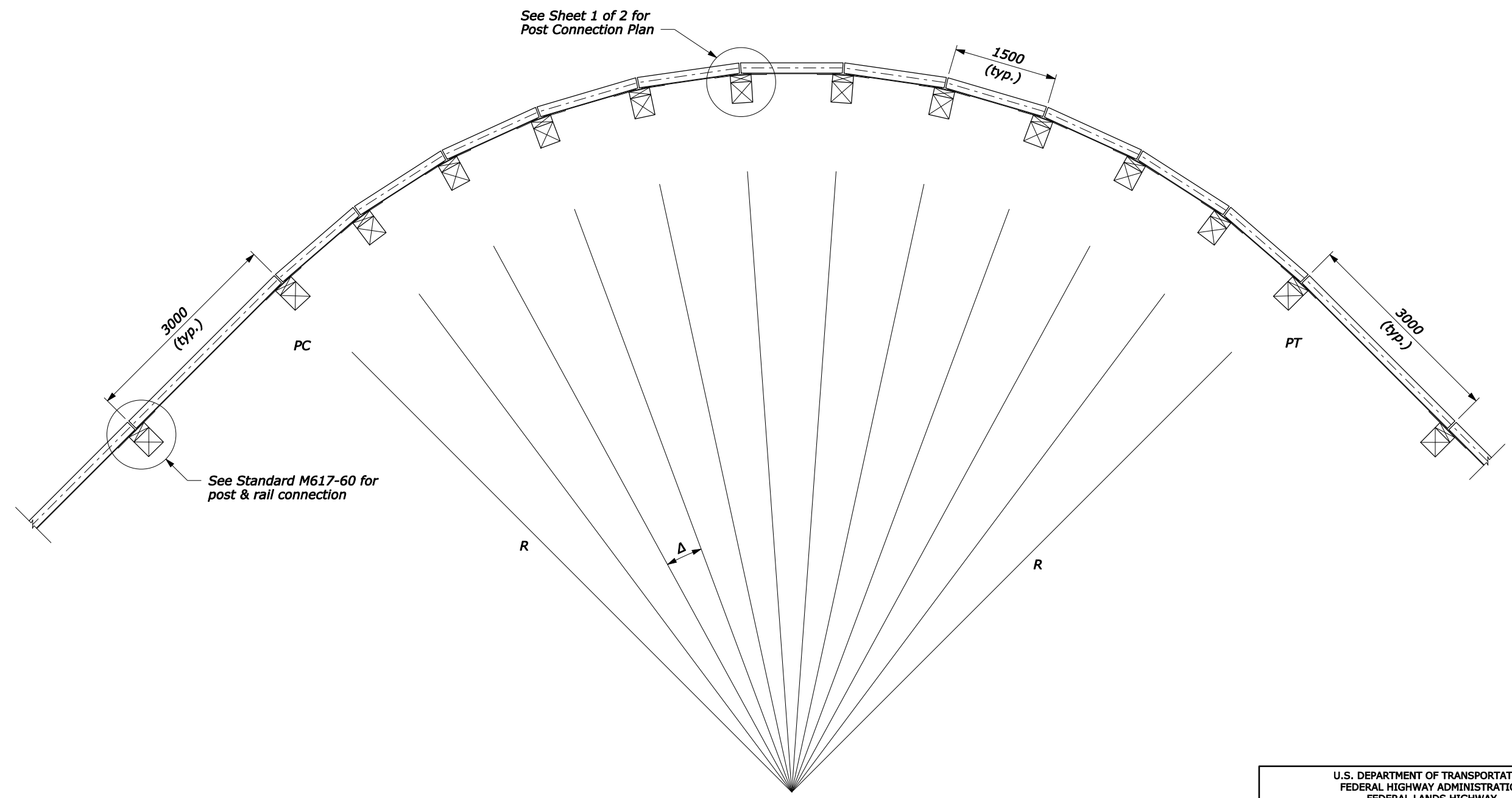
STANDARD  
**M617-63**

NO SCALE

H:\StanDraw\st61763.dgn [Metric] 2 September 2009 1:46 PM

**NOTE:**

1.  $\Delta$  is the central angle which subtends a 1500 mm chord.
2.  $R$  is measured from the center of the circle to the back surface of the rough sawn timber rail.
3. Dimensions without units are millimeters.



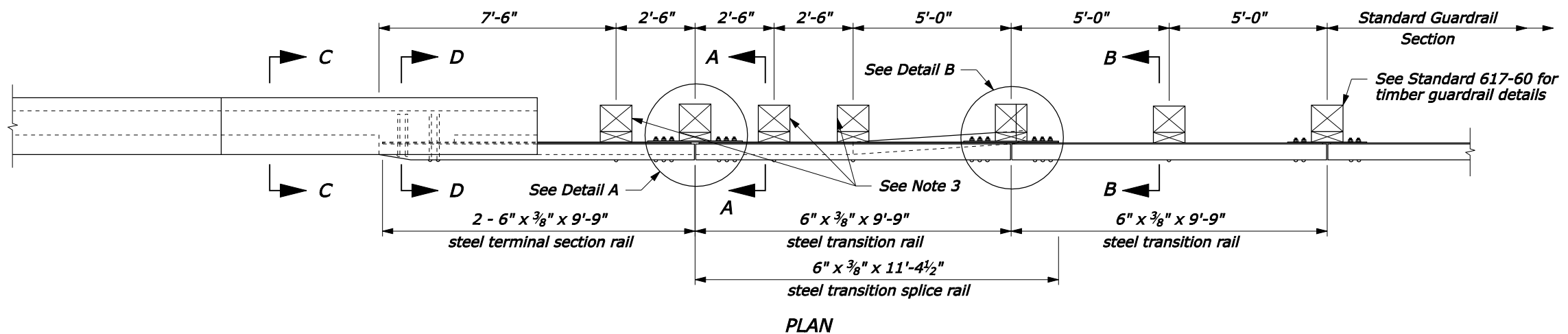
**PLAN VIEW LAYOUT**

NO SCALE

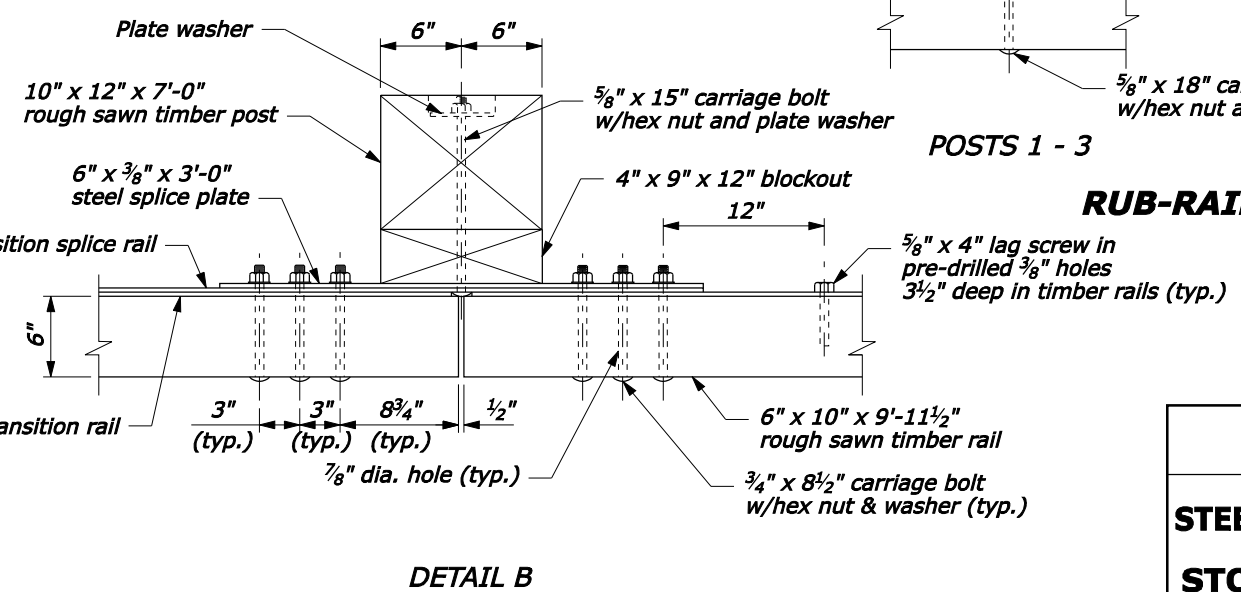
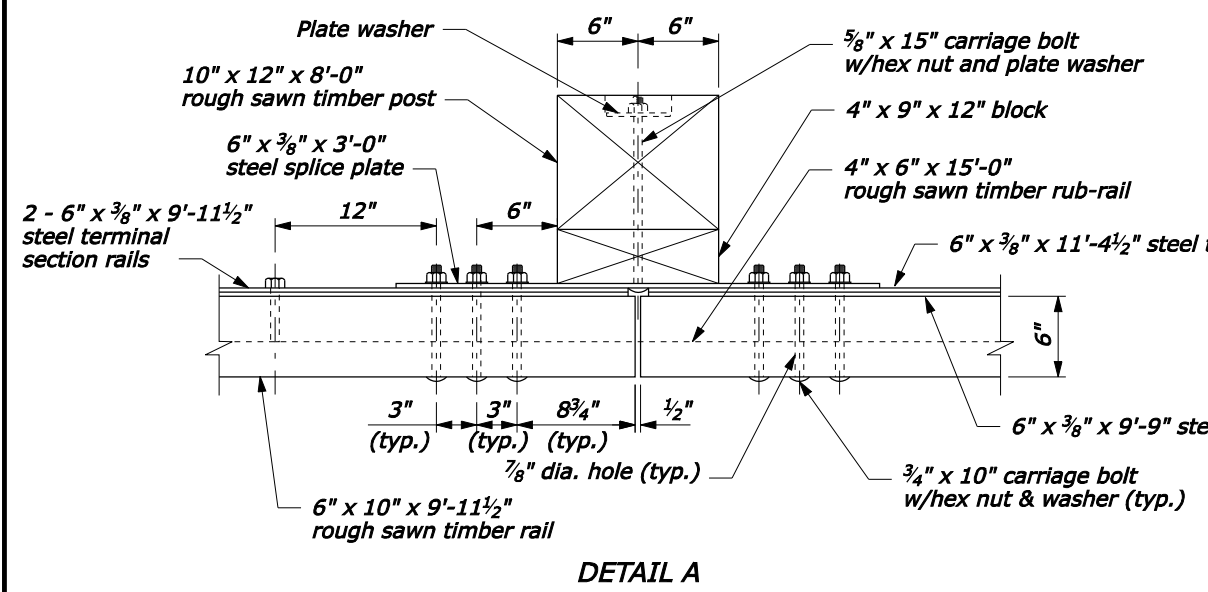
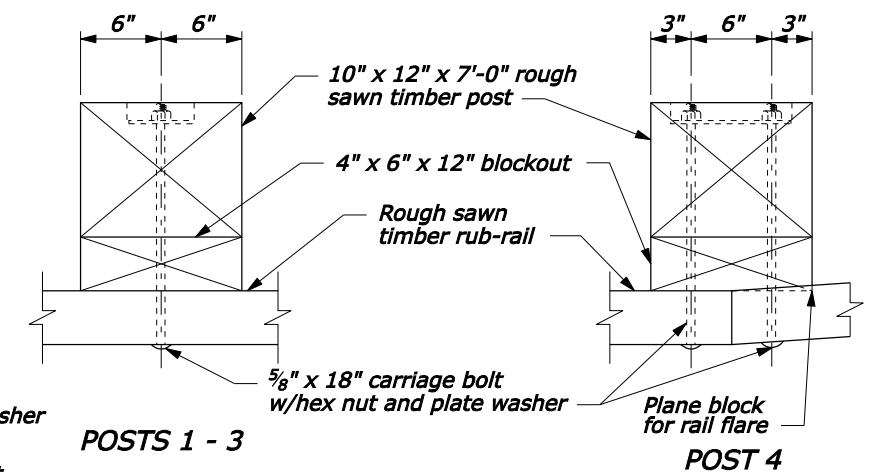
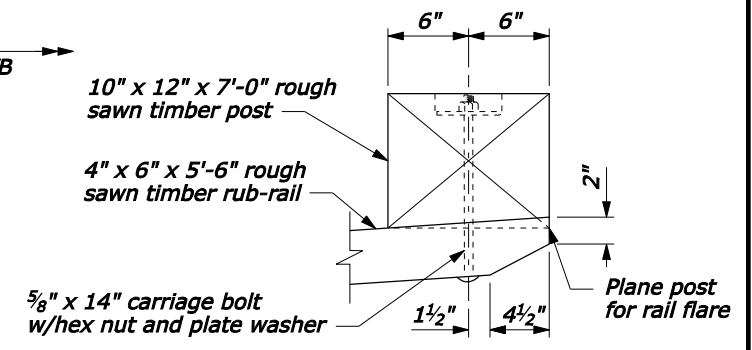
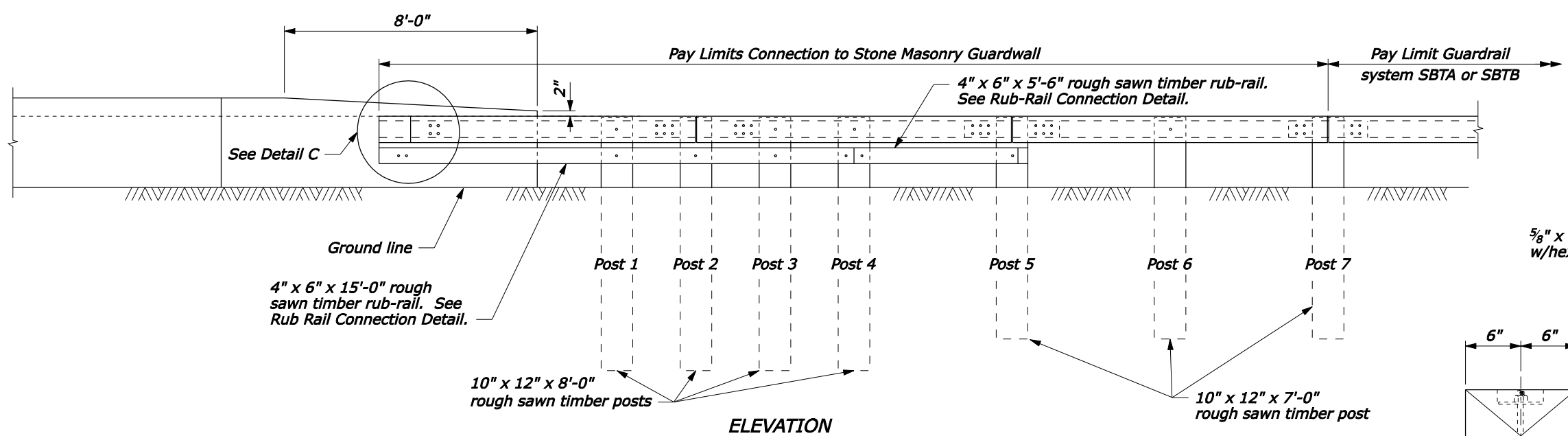
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
METRIC STANDARD	
<b>STEEL-BACKED TIMBER GUARDRAIL AROUND CIRCULAR CURVES 22 m RADIUS AND BELOW</b>	
Sheet 2 of 2	
STANDARD APPROVED FOR USE 3/1996	STANDARD
REVISED: 6/2005	<b>M617-63</b>

2 September 2009 1:46 PM

H:\StanDraw\st61763.dgn [Metric]



- NOTE:**
1. See the following sheets for Sections A-A through C-C, steel rail layouts, and other details.
  2. Use weathering steel for all structural steel and fastener hardware.
  3. For posts 1, 3, and 4, use an 8" x 9" x 12" block for the blockout, and a 5/8" x 2'-1 1/2" carriage bolt with hex nut and plate washer.



**RUB-RAIL CONNECTION**

NO SCALE

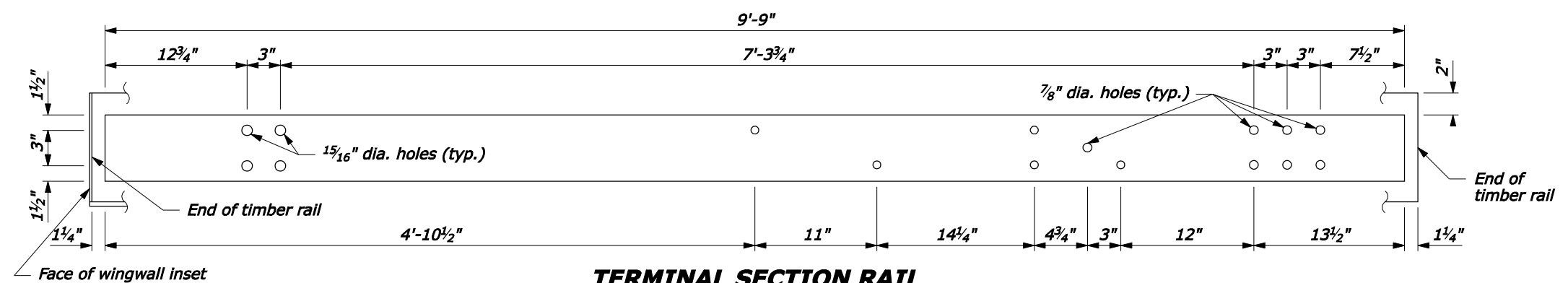
**POST CONNECTION**

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

U.S. CUSTOMARY STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
TL-2 CONNECTION TO  
STONE MASONRY GUARDWALL**  
Sheet 1 of 3

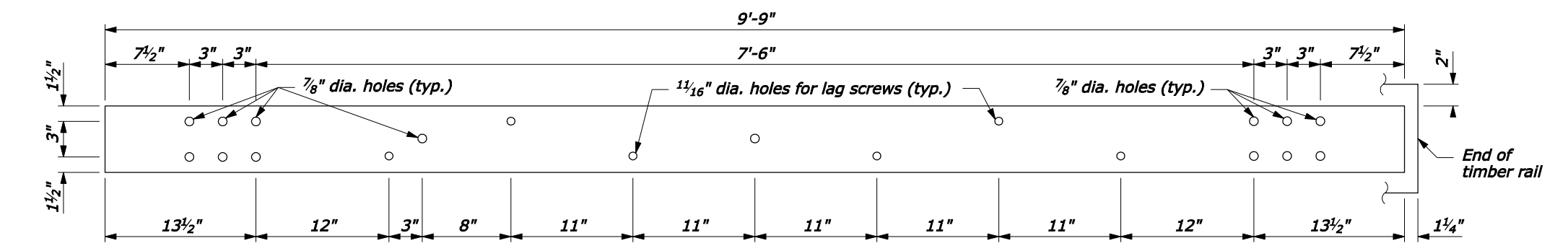
STANDARD APPROVED FOR USE --/----	STANDARD
REVISED:	617-64
DRAFT: 1/2008	

14-Jan-2008 04:06 PM Rpt://198.145.186.2/std.pln/651764.dgn [US Customary]

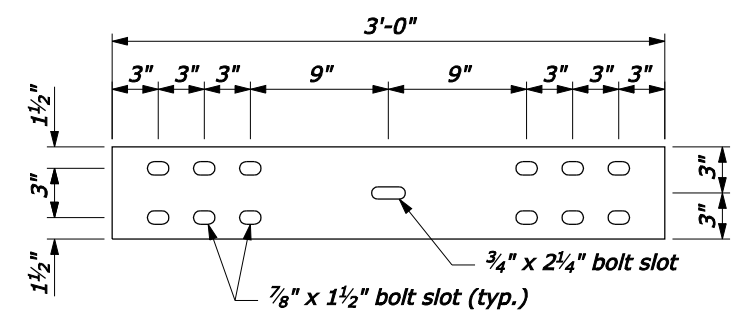


**TERMINAL SECTION RAIL**  
 6" x 3/8" x 9'-9"

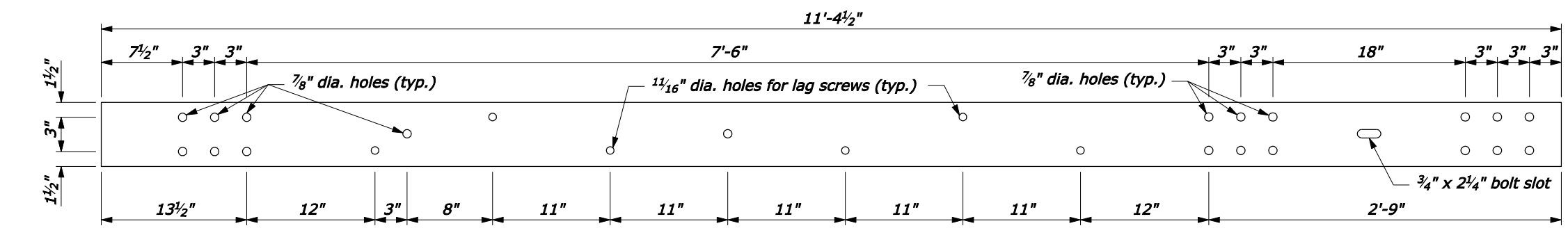
**NOTE:**  
 1. Pre-drill 3/4" holes in blocks outs and posts.



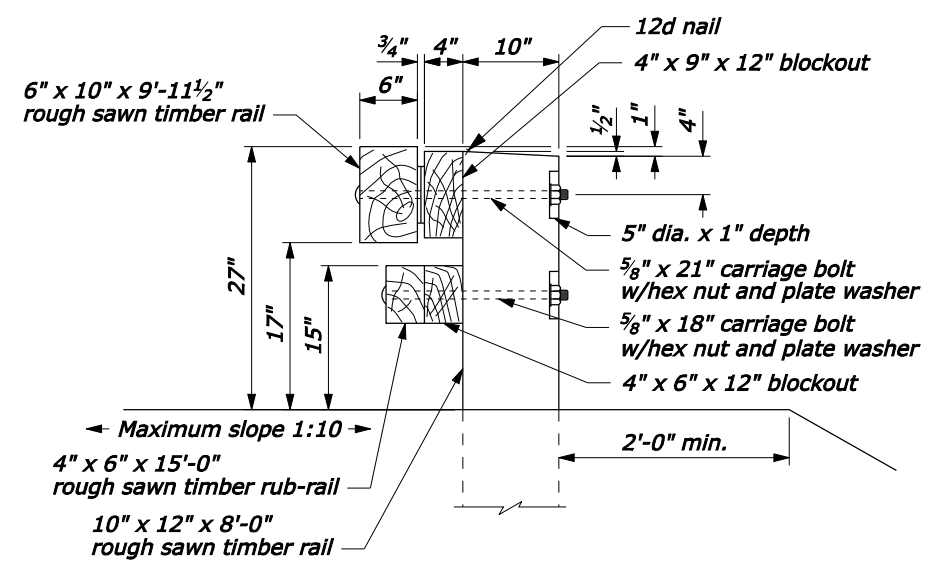
**TRANSITION RAIL**  
 6" x 3/8" x 9'-9"



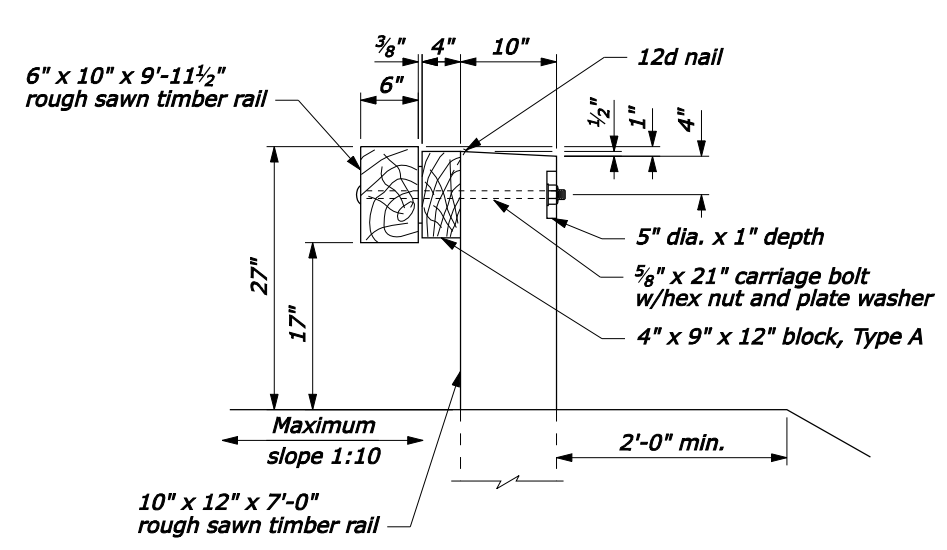
**SPLICE PLATE**  
 6" x 3/8" x 3'-0"



**TRANSITION SPLICE RAIL**  
 6" x 3/8" x 11'-4 1/2"



**SECTION A-A**



**SECTION B-B**

NO SCALE

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

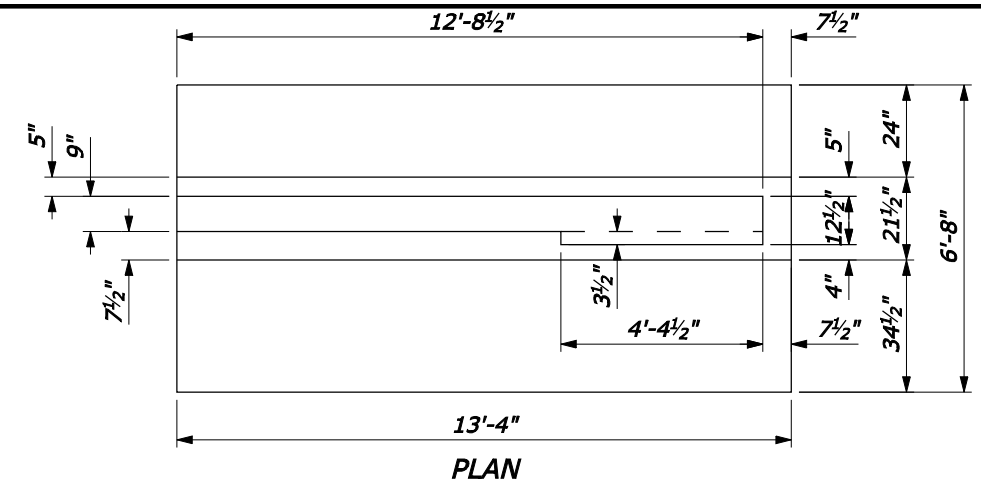
U.S. CUSTOMARY STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
 TL-2 CONNECTION TO  
 STONE MASONRY GUARDWALL**  
 Sheet 2 of 3

STANDARD APPROVED FOR USE --/----

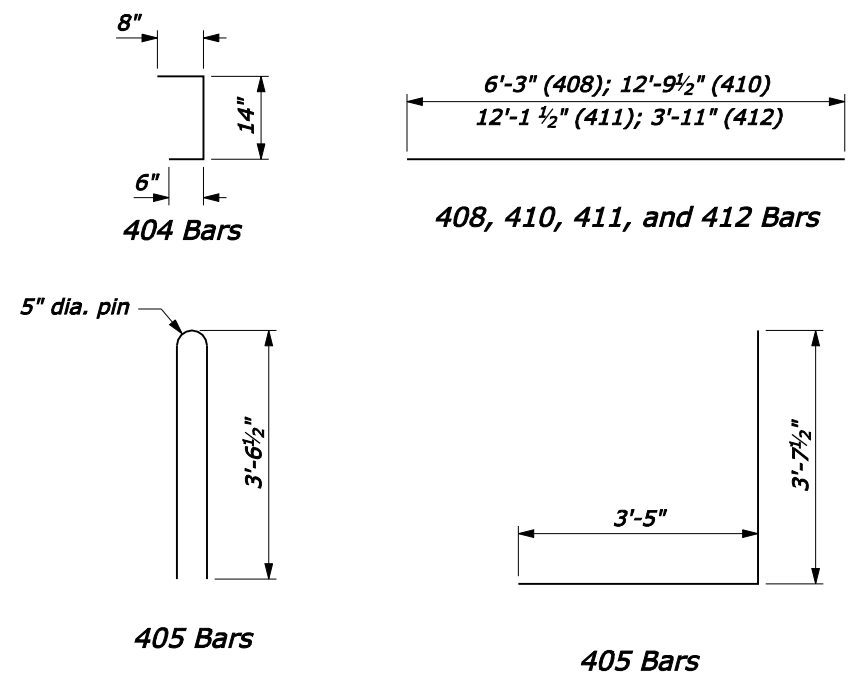
REVISID: DRAFT: 1/2008

STANDARD  
 617-64

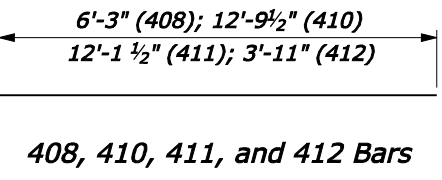
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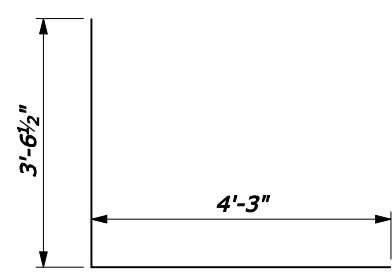
PLAN



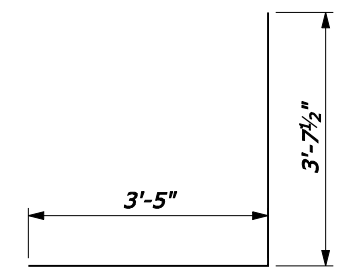
404 Bars



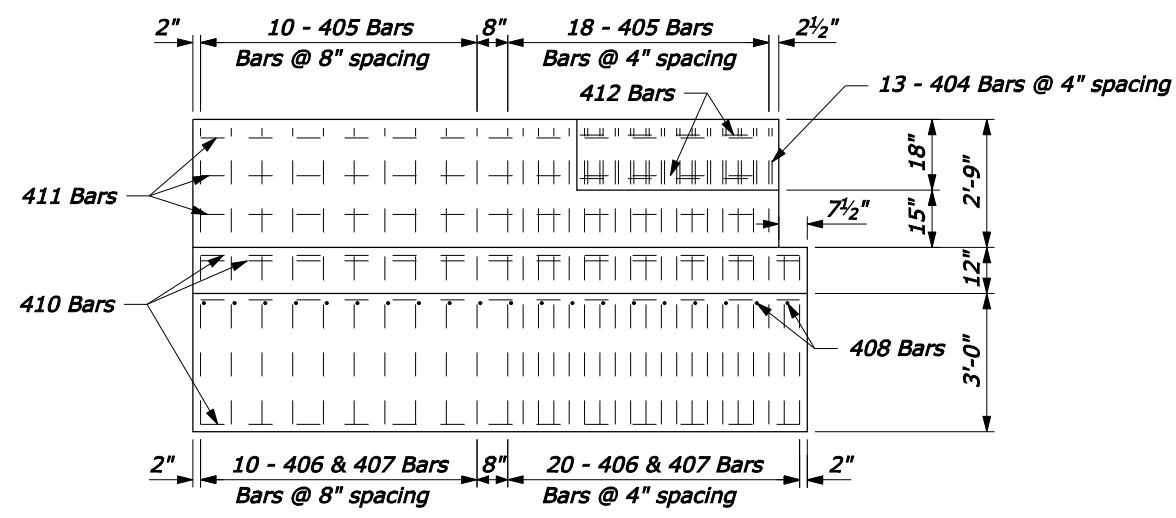
408, 410, 411, and 412 Bars



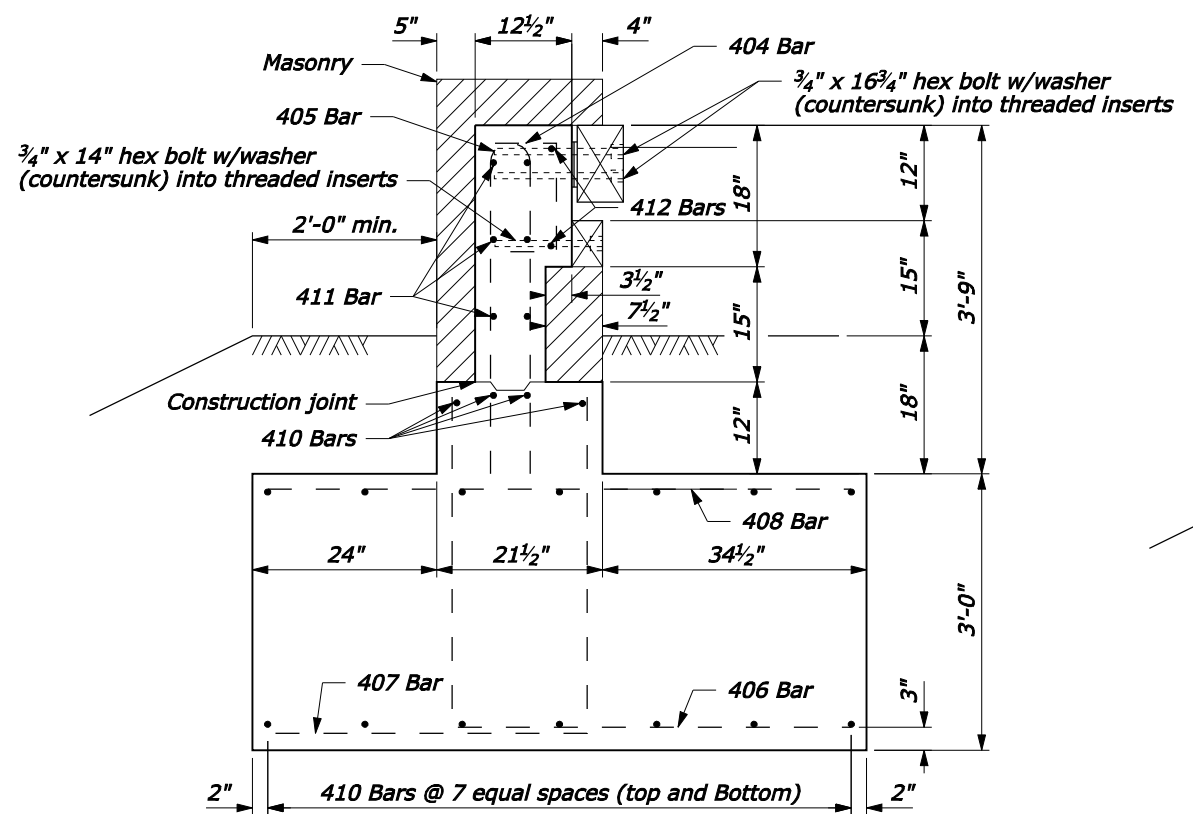
405 Bars



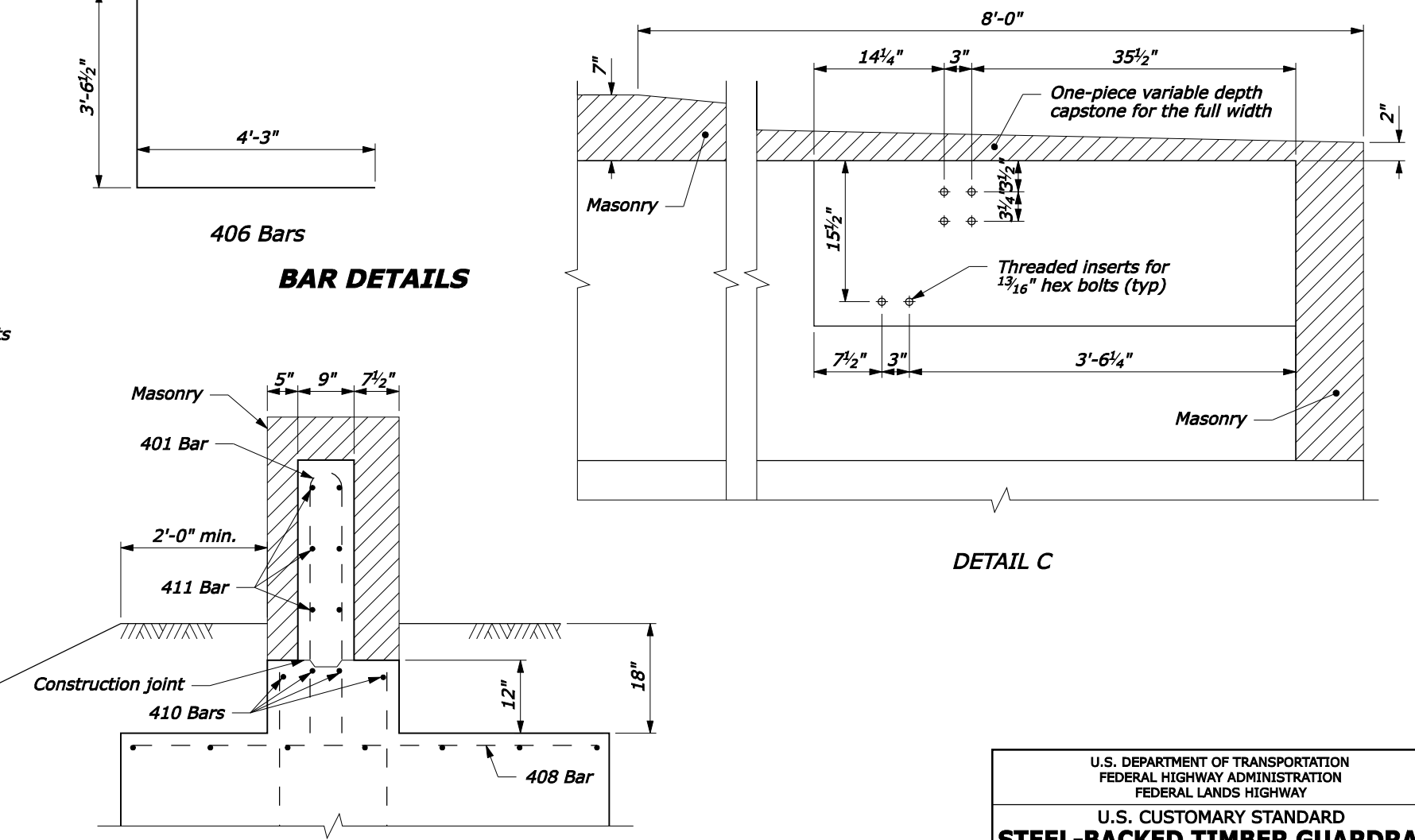
406 Bars



ELEVATION



SECTION D-D  
PARAPET END BLOCK



SECTION C-C

DETAIL C

**NOTE:**

1. CONCRETE: Structural concrete Class A(AE), with a specified minimum 28-day compressive strength  $F'_c=4350$  psi. Vibrate all concrete. Chamfer exposed edges  $3/4$ " unless otherwise shown. Do not use calcium chloride additives in the concrete.
2. REINFORCING STEEL: Reinforcing steel Grade 420 (ASTM A615M-96a, Grade 420) deformed billet steel bars conforming to AASHTO M31M. The minimum concrete covering to the face of any bar is 2" unless otherwise shown. All bars are US Customary size #5.
3. Construct footing against undisturbed material or backfill with well compacted granular material.

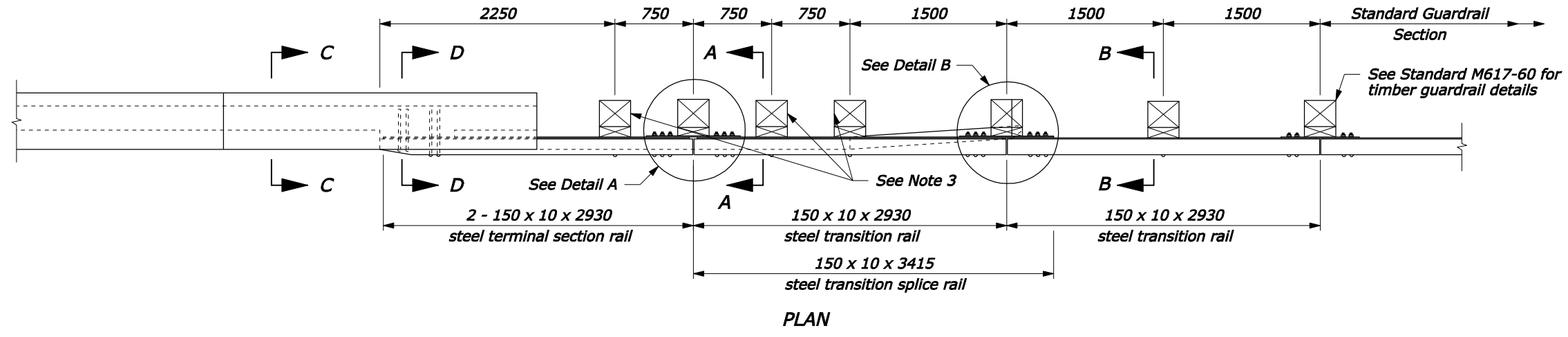
NO SCALE

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

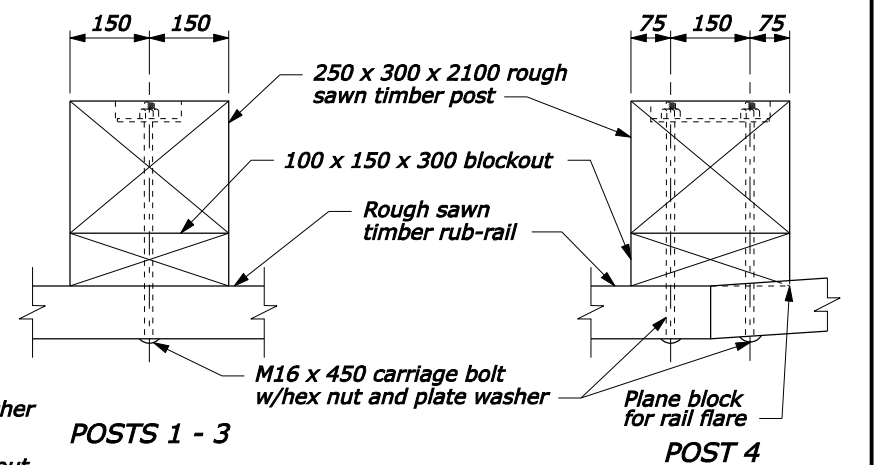
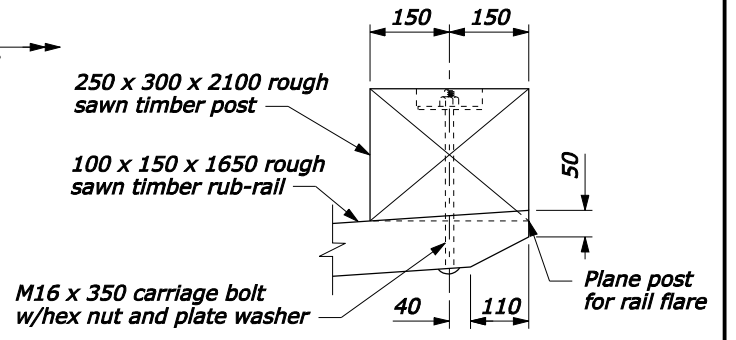
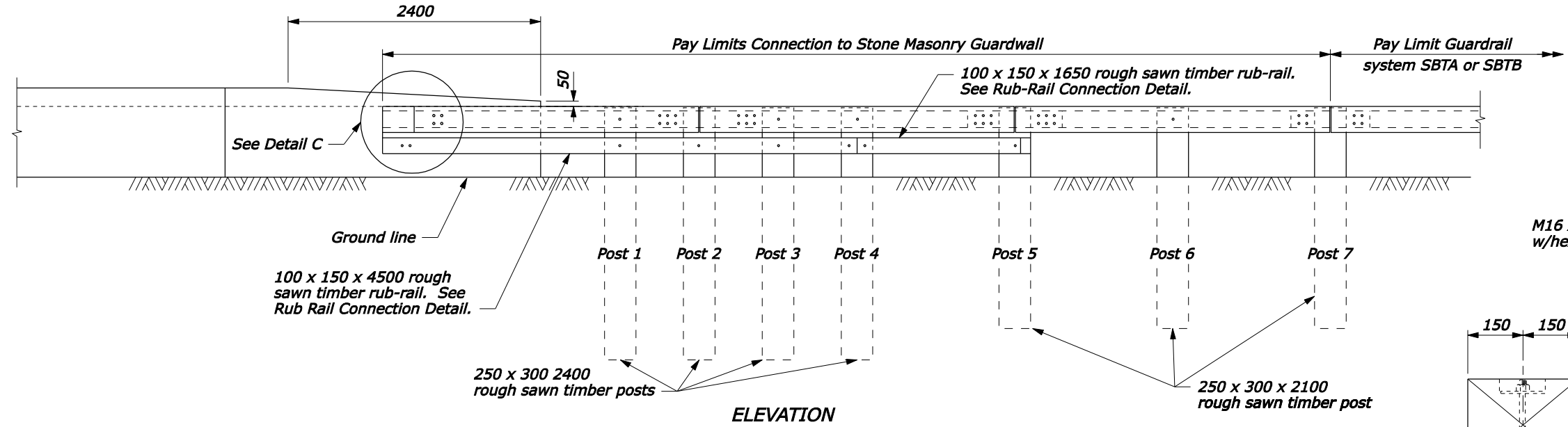
U.S. CUSTOMARY STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
TL-2 CONNECTION TO  
STONE MASONRY GUARDWALL**  
Sheet 3 of 3

STANDARD APPROVED FOR USE --/----	STANDARD
REVISED:	617-64
DRAFT: 1/2008	

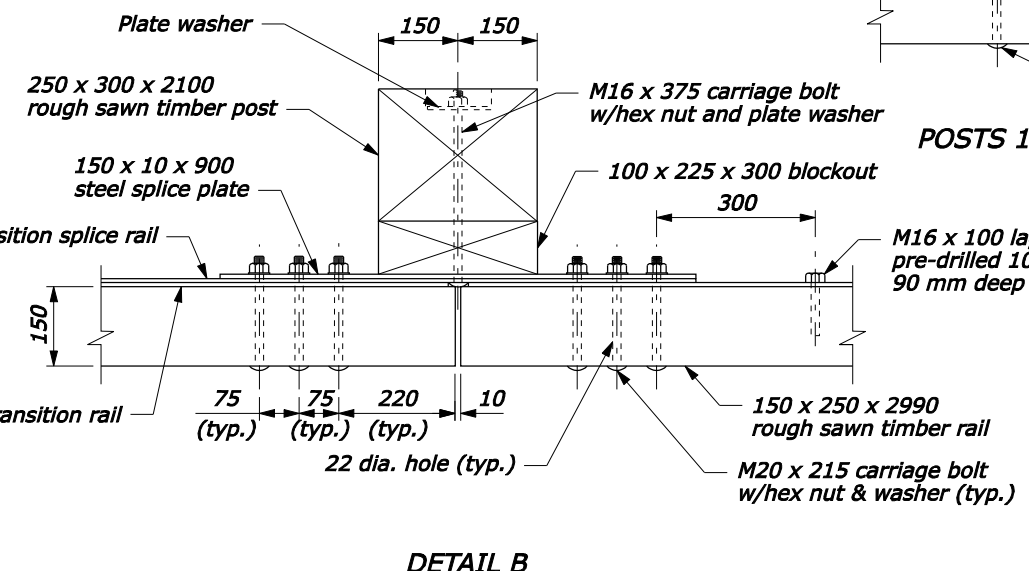
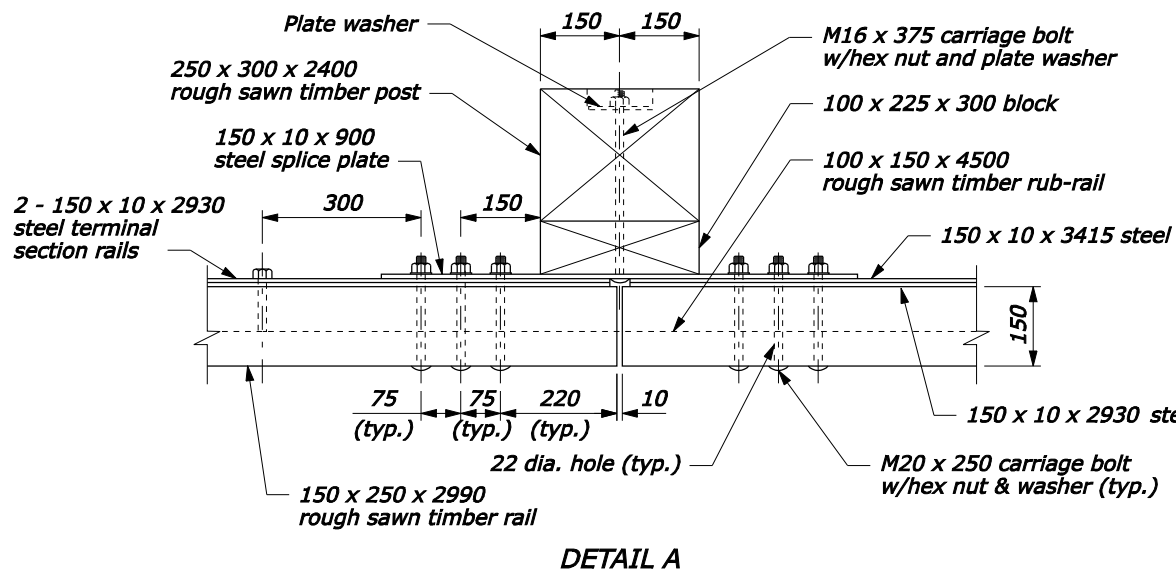
23-Jan-2008 11:37 AM  
 P:\198.145.186.2\std.pln\std61764.dgn [US Customary]



- NOTE:**
1. See the following sheets for Sections A-A through C-C, steel rail layouts, and other details.
  2. Use weathering steel for all structural steel land fastener hardware.
  3. For posts 1, 3, and 4, use a 200 x 225 x 300 mm block for the blockout, and an M16 x 650 mm carriage bolt with hex nut and plate washer.
  4. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are not available.
  5. Dimensions without units are millimeters.



**RUB-RAIL CONNECTION**



**POST CONNECTION**

NO SCALE

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

METRIC STANDARD

**STEEL-BACKED TIMBER GUARDRAIL  
TL-2 CONNECTION TO  
STONE MASONRY GUARDWALL**

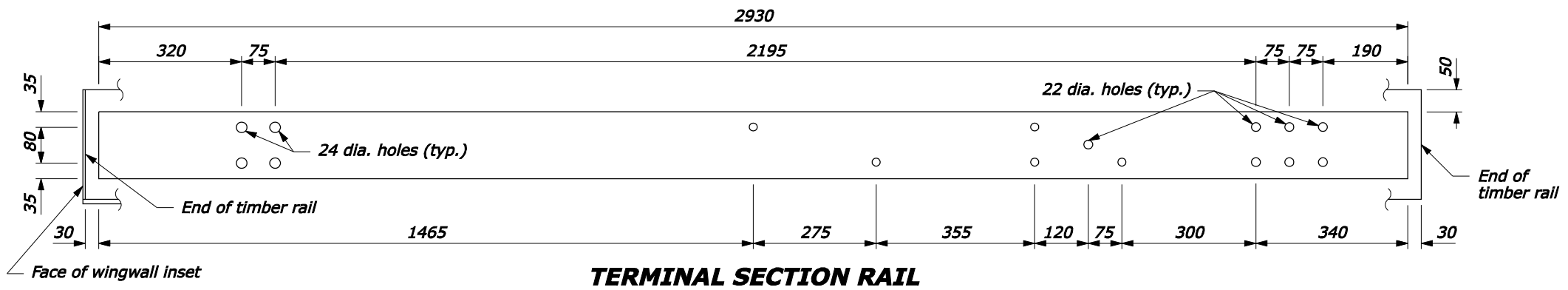
Sheet 1 of 3

STANDARD APPROVED FOR USE --/----

REVISD: 1/2008  
DRAFT: 1/2008

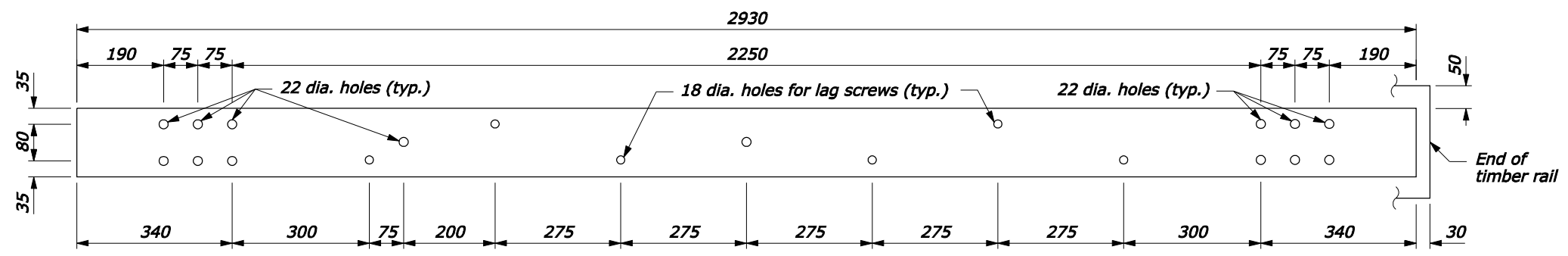
STANDARD  
M617-64

14-Jan-2008 03:43 PM  
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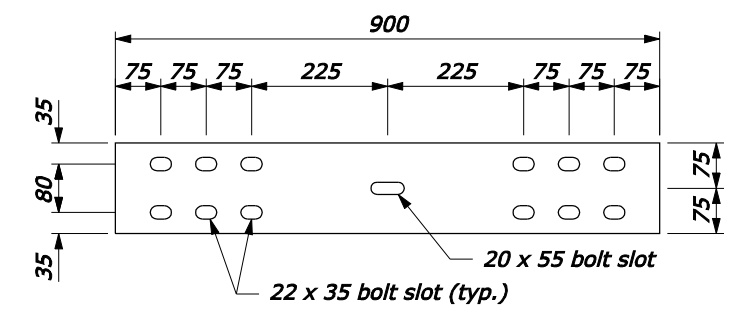


**TERMINAL SECTION RAIL**  
150 x 10 x 2930

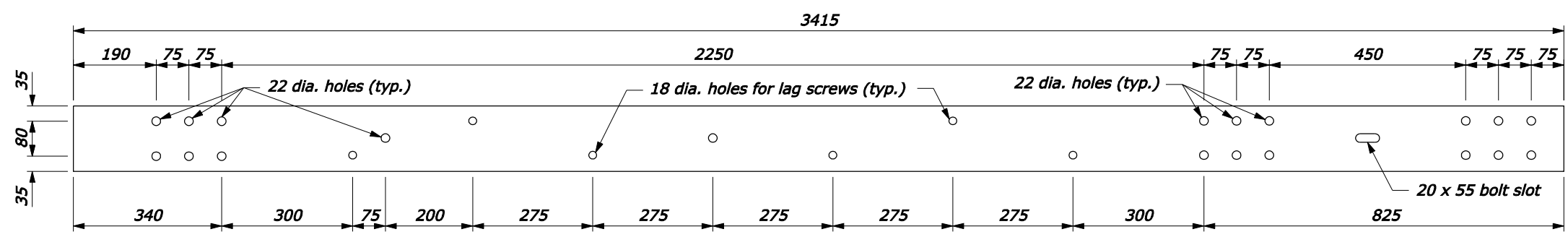
- NOTE:**
1. Pre-drill 18 mm holes in blocks outs and posts.
  2. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are not available.
  3. Dimensions without units are millimeters.



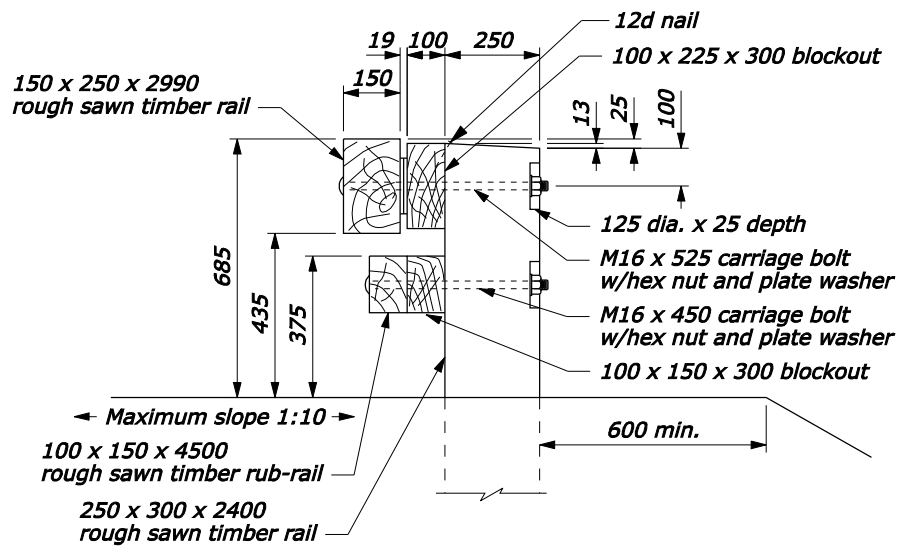
**TRANSITION RAIL**  
150 x 10 x 2930



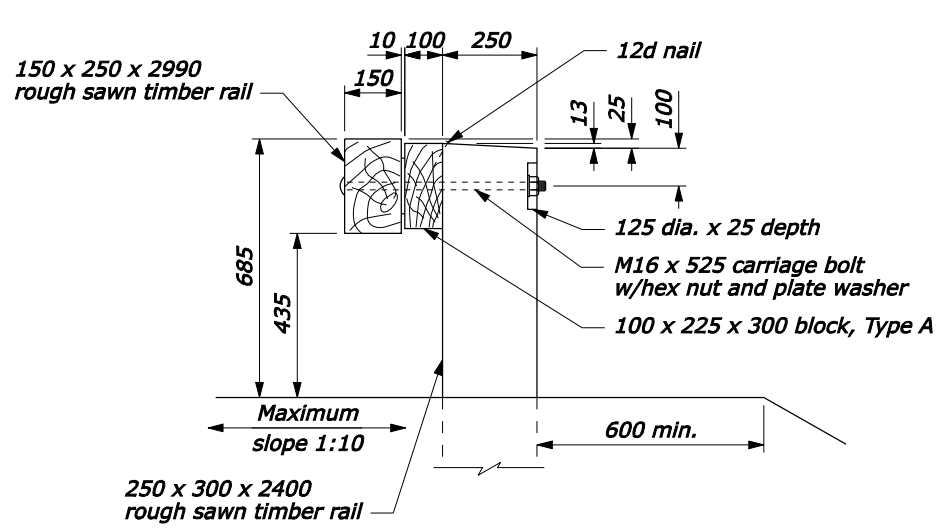
**SPLICE PLATE**  
150 x 10 x 900



**TRANSITION SPLICE RAIL**  
150 x 10 x 3415



**SECTION A-A**



**SECTION B-B**

NO SCALE

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

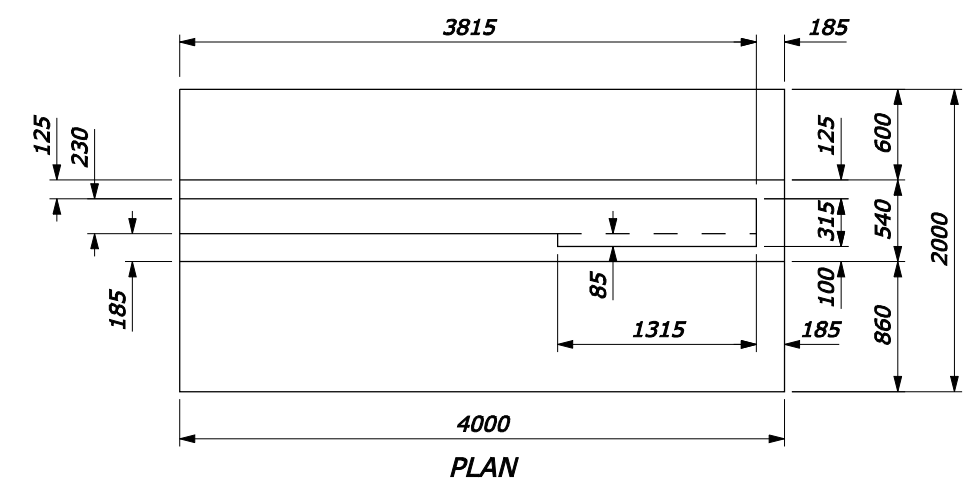
METRIC STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
TL-2 CONNECTION TO  
STONE MASONRY GUARDWALL**  
Sheet 2 of 3

STANDARD APPROVED FOR USE --/----

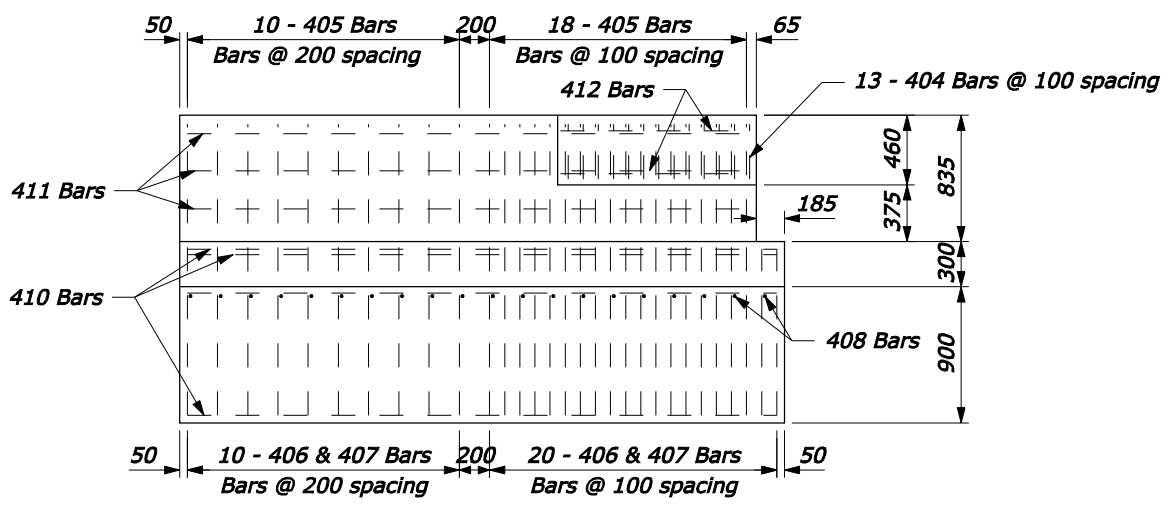
REVISOR: 1/2008  
DRAFT: 1/2008

STANDARD  
M617-64

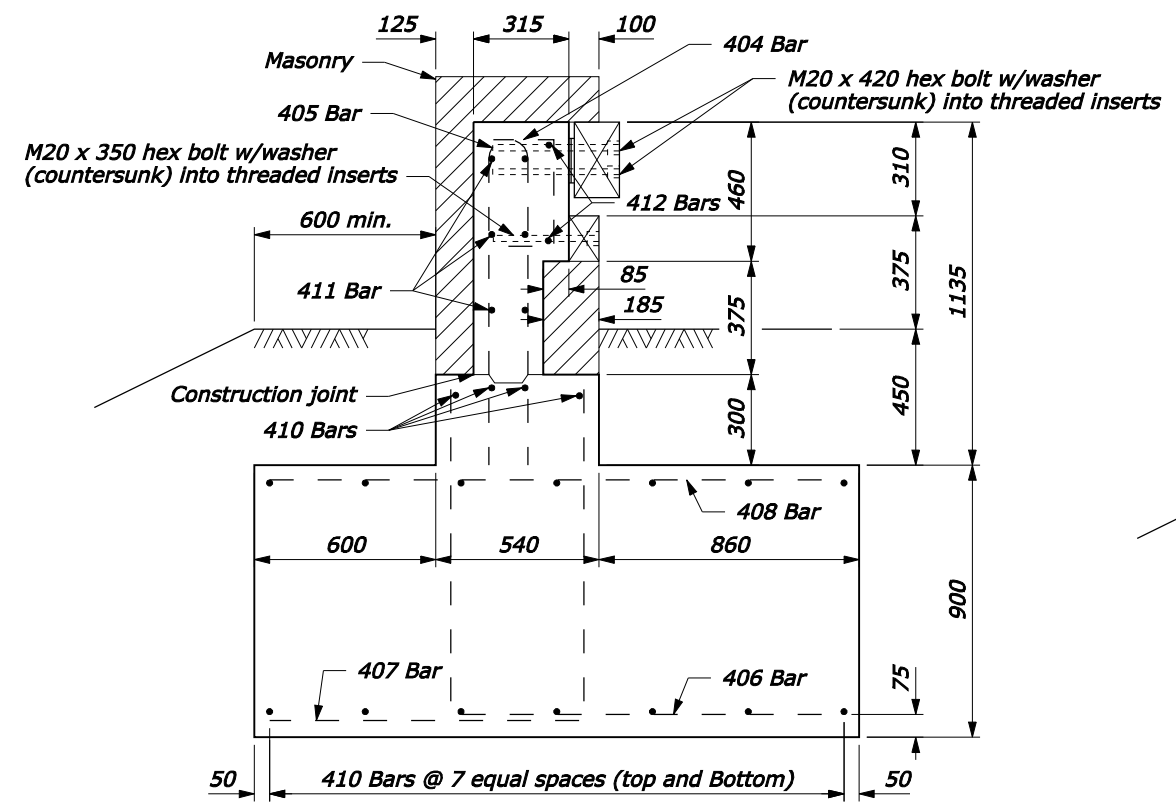
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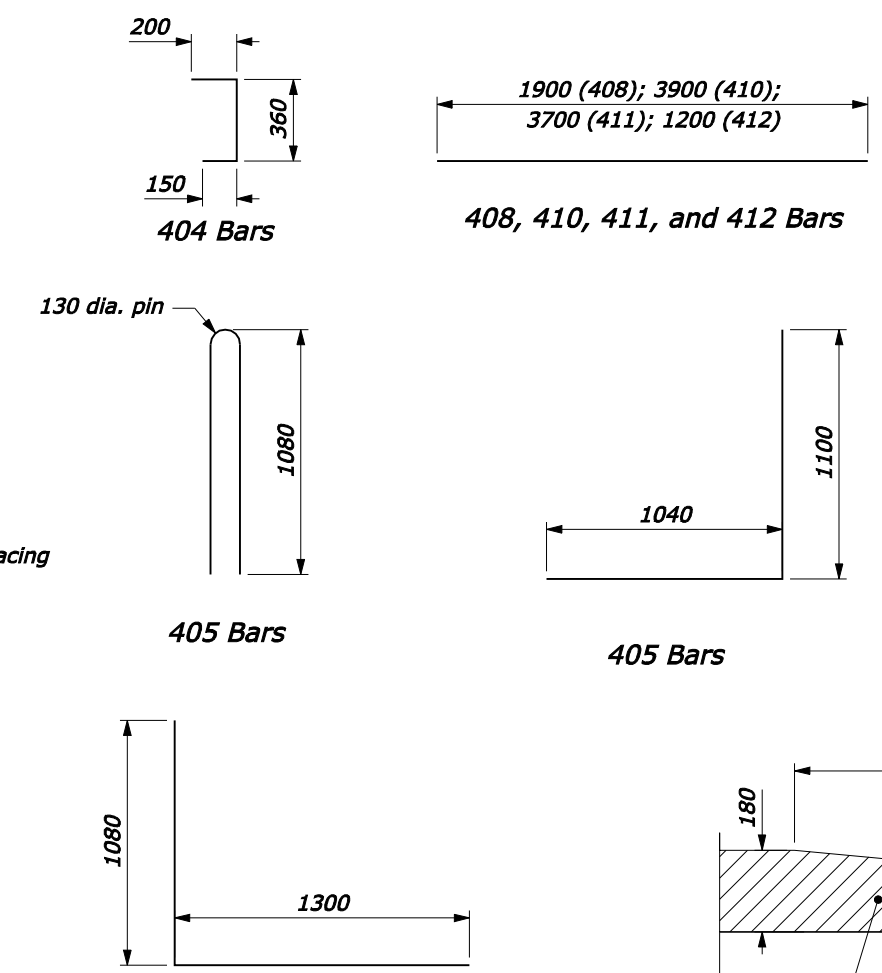
PLAN



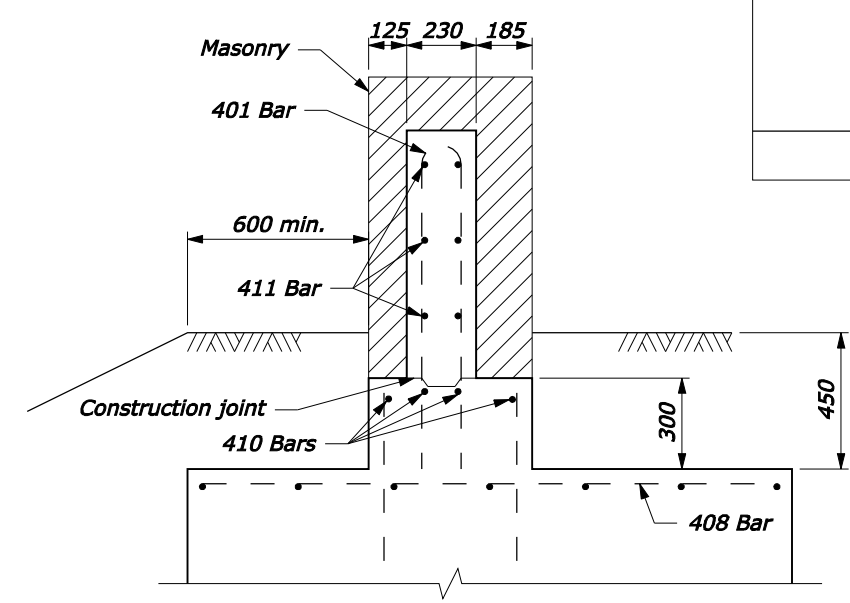
ELEVATION



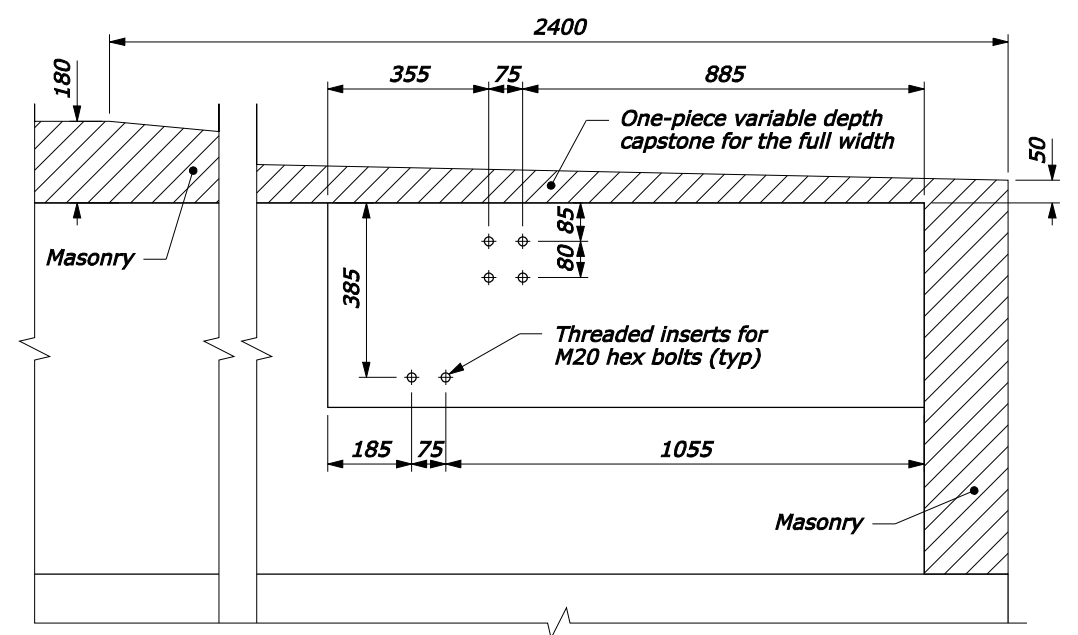
SECTION D-D  
PARAPET END BLOCK



BAR DETAILS



SECTION C-C



DETAIL C

**NOTE:**

1. **CONCRETE:** Structural concrete Class A(AE), with a specified minimum 28-day compressive strength  $F'c=30$  MPa. Vibrate all concrete. Chamfer exposed edges 20 mm unless otherwise shown. Do not use calcium chloride additives in the concrete.
2. **REINFORCING STEEL:** Reinforcing steel Grade 420 (ASTM A615M-96a, Grade 420) deformed billet steel bars conforming to AASHTO M31M. The minimum concrete covering to the face of any bar is 50 mm unless otherwise shown. All bars are Metric size #16.
3. Construct footing against undisturbed material or backfill with well compacted granular material.
4. Dimensions without units are millimeters.

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

METRIC STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
TL-2 CONNECTION TO  
STONE MASONRY GUARDWALL**  
Sheet 3 of 3

STANDARD APPROVED FOR USE --/----

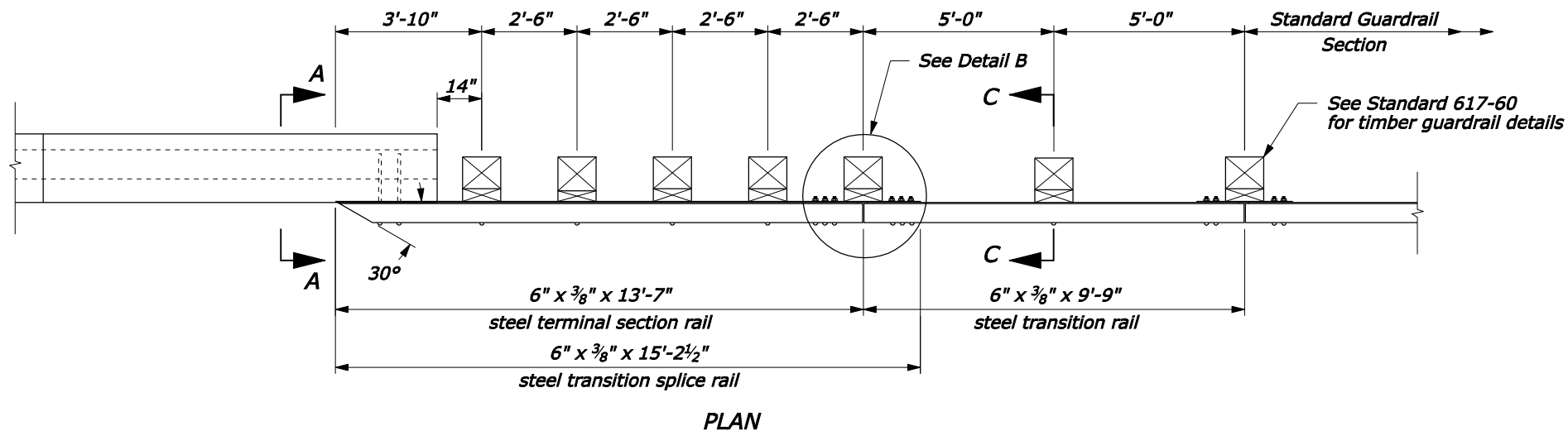
REVISID: 1/2008  
DRAFT: 1/2008

STANDARD  
M617-64

NO SCALE

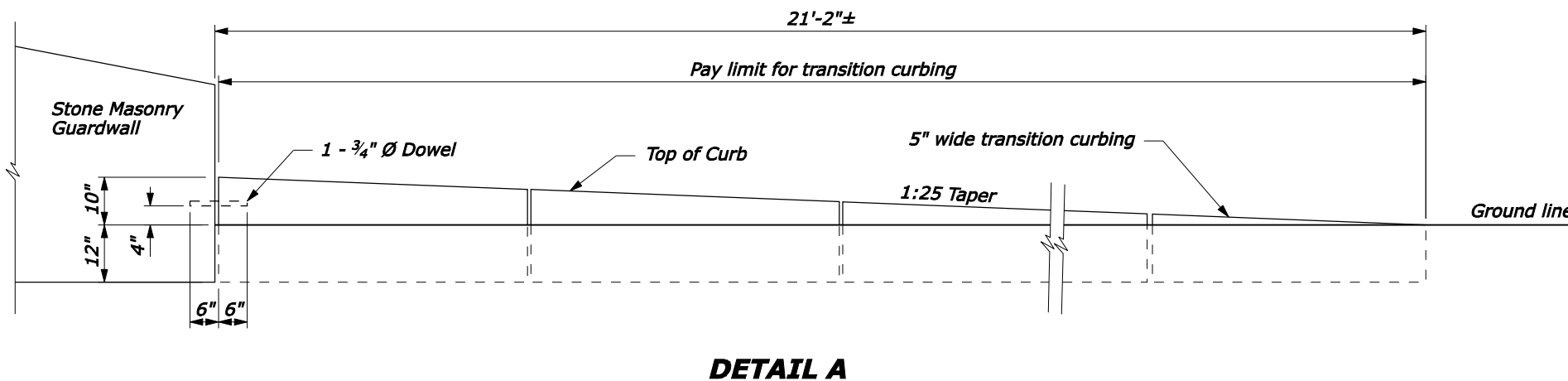
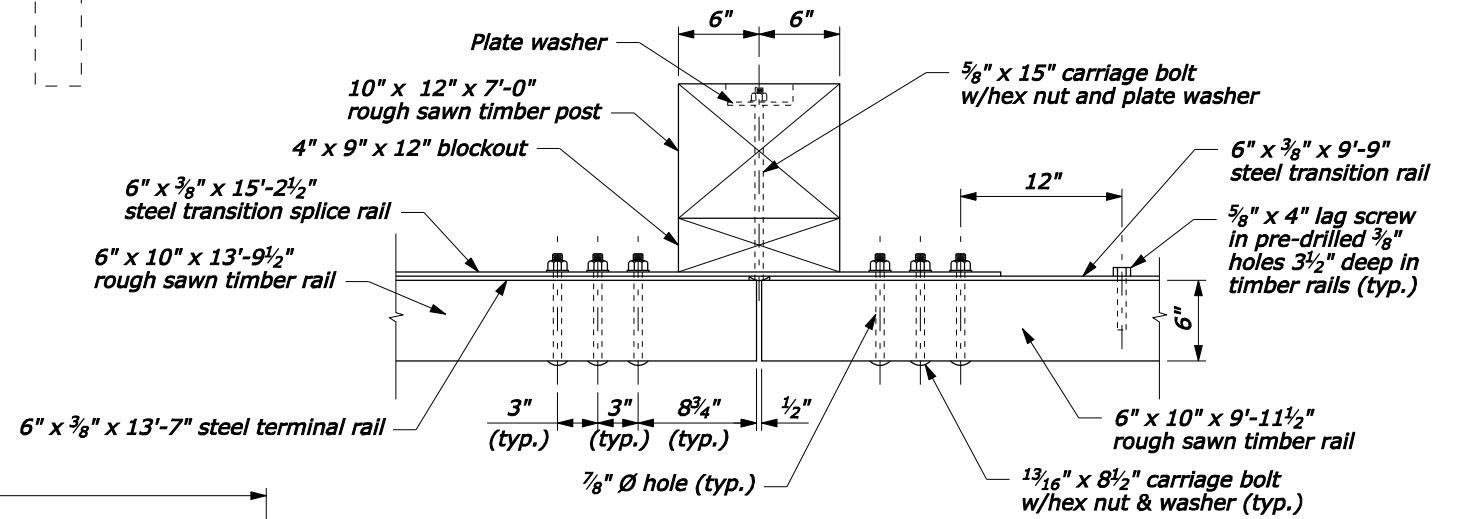
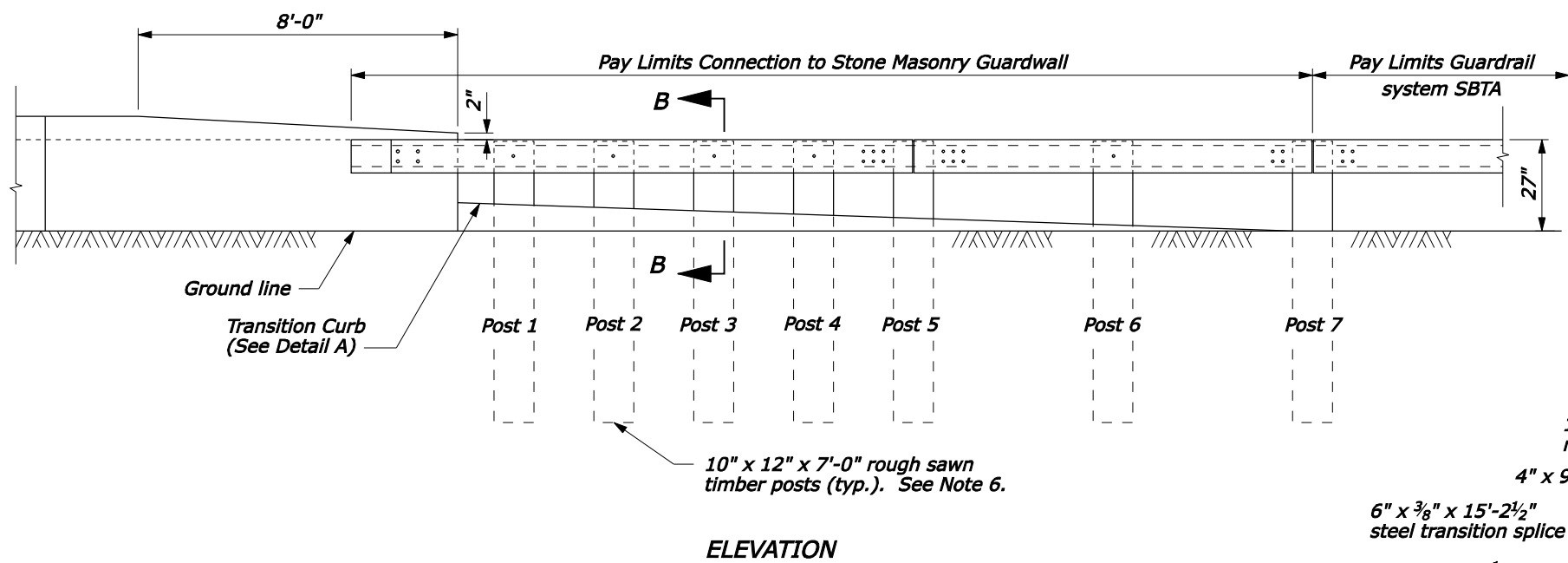
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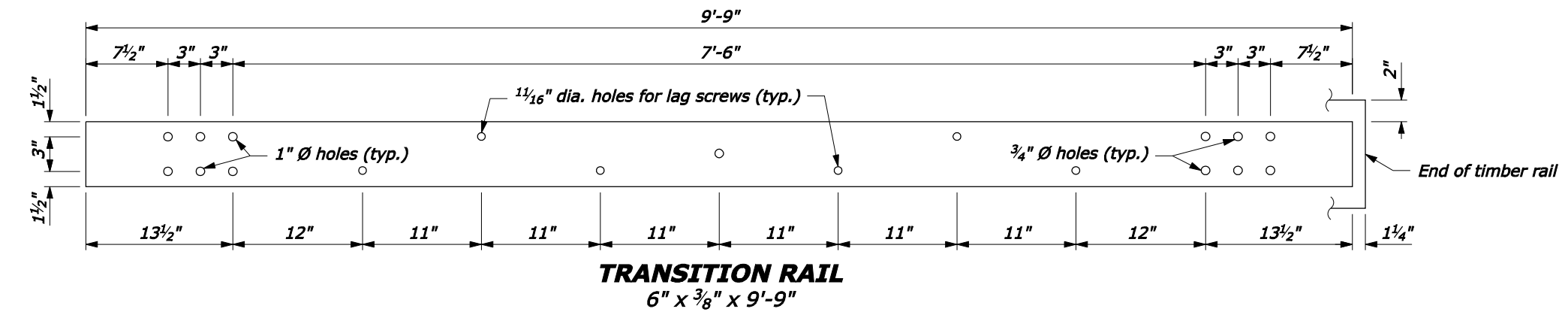
**NOTE:**

1. See Sheet 2 of 2 for Sections A-A through C-C, steel rail layouts, and other details.
2. Use weathering steel for all structural steel and fastener hardware.
3. Transition curbing (including dowel) will be paid for at the contract unit price for transition curbing.
4. Install transition curbing of material type specified in plans.
5. Curb may be continuous or slabs at least 4'-11" in length. Install faces of slabs evenly and with maximum 1/8" separation.
6. If contract requires steel post, substitute wood post with 6" x 9" x 6'-6" long steel post.

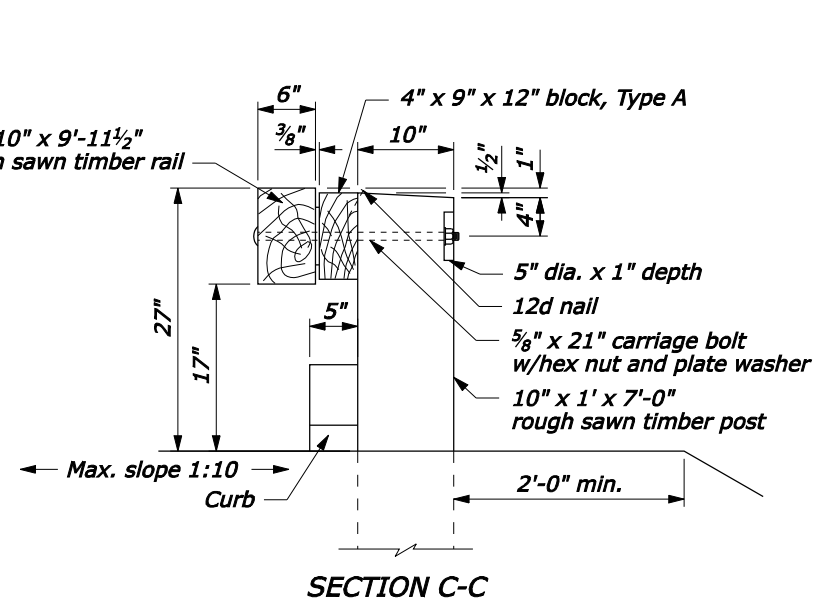
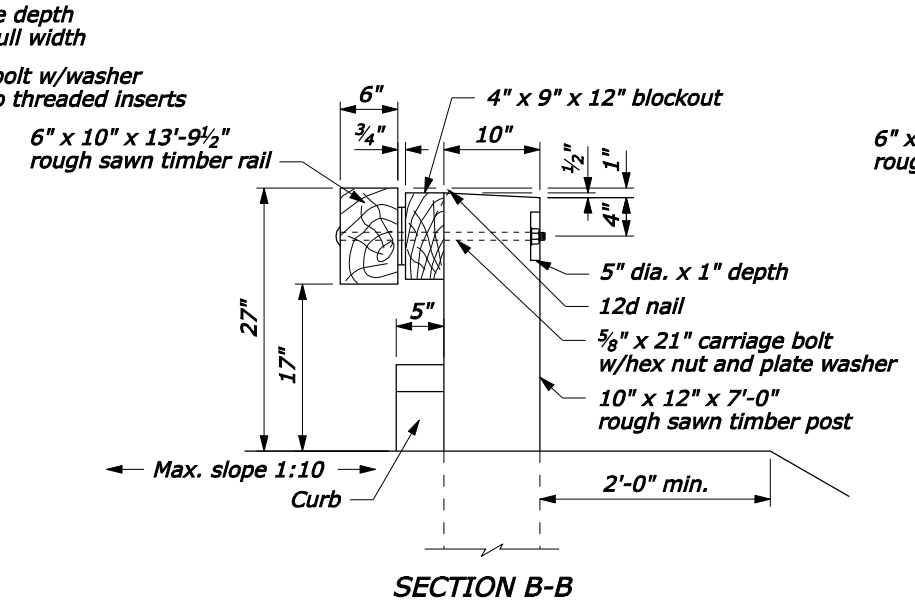
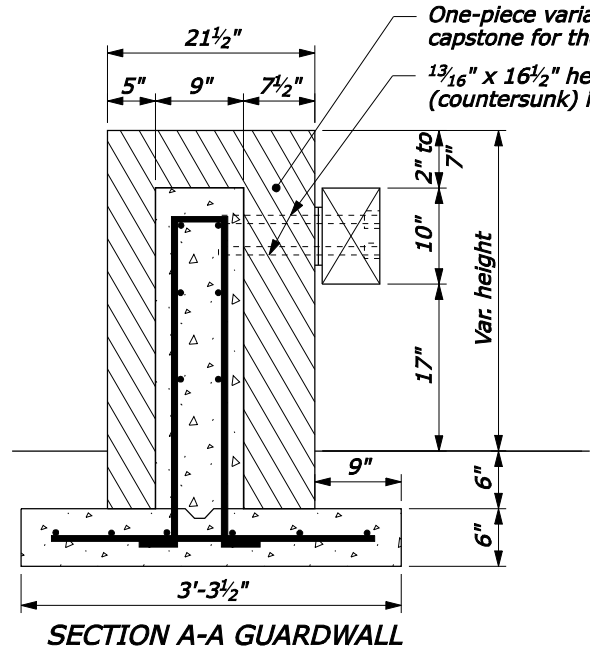
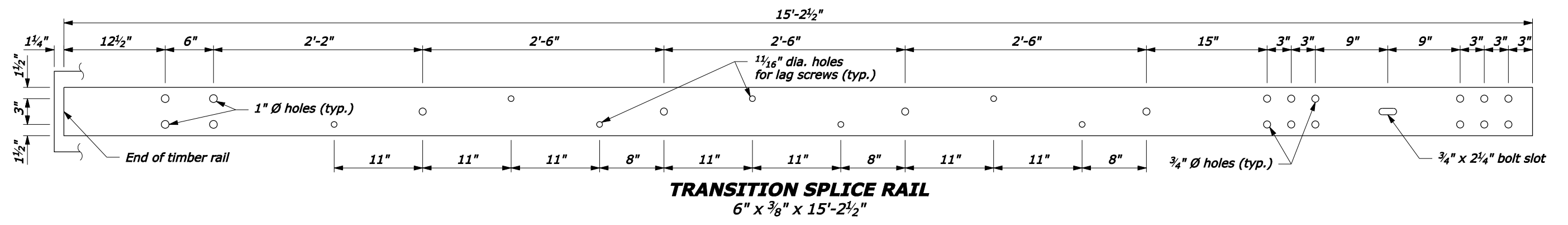
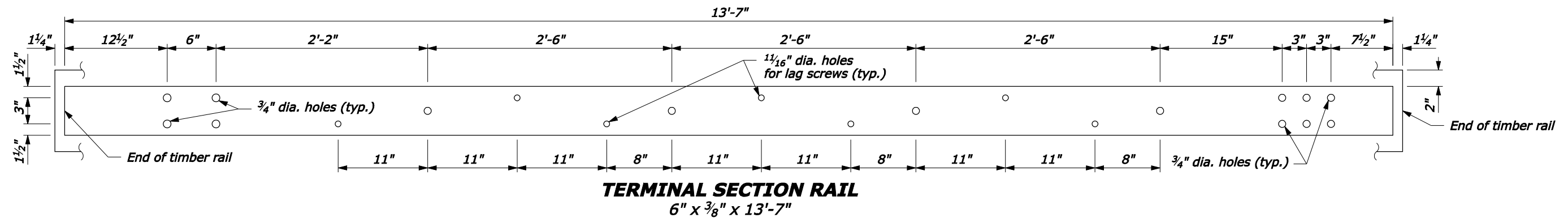


NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD <b>STEEL-BACKED TIMBER GUARDRAIL TL-3 CONNECTION TO STONE MASONRY GUARDWALL</b> Sheet 1 of 2	
STANDARD APPROVED FOR USE --/----	STANDARD 617-65
REVISED: DRAFT: 1/2008	



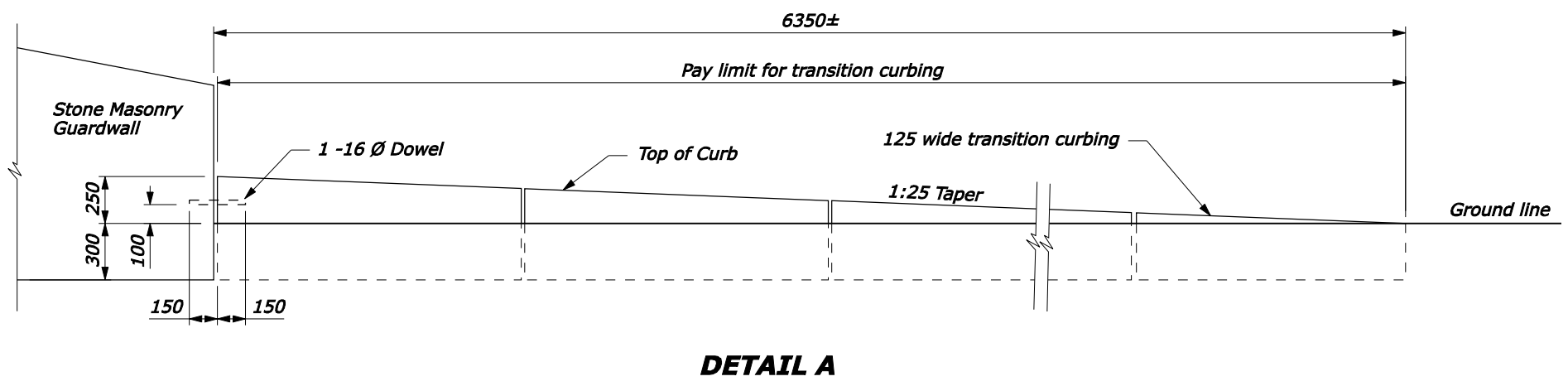
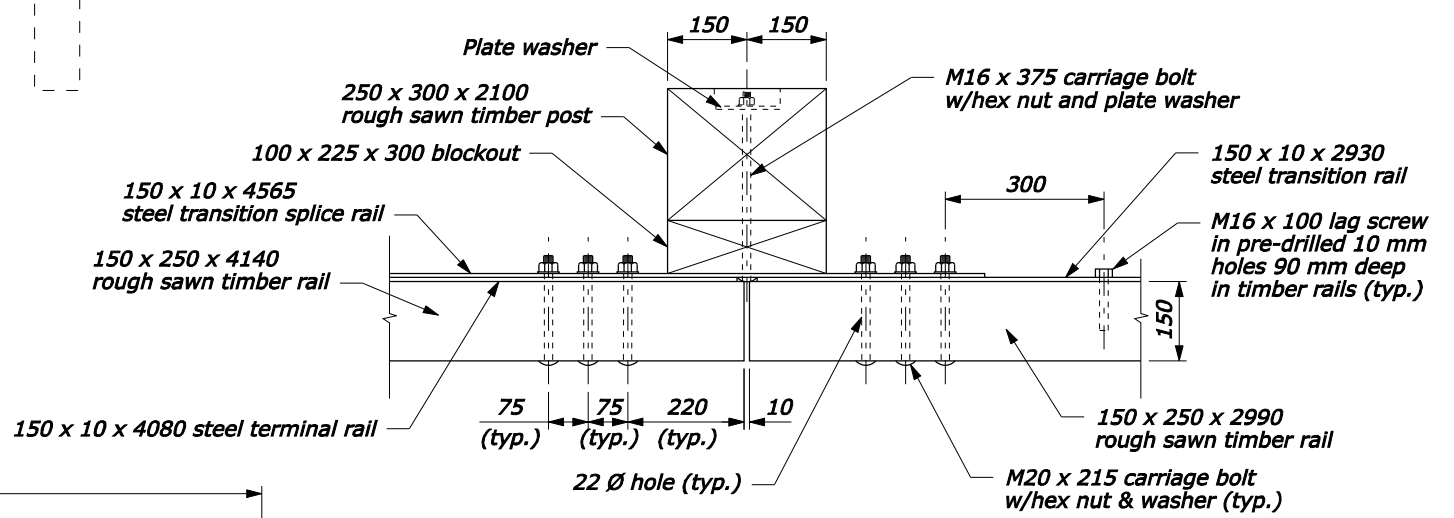
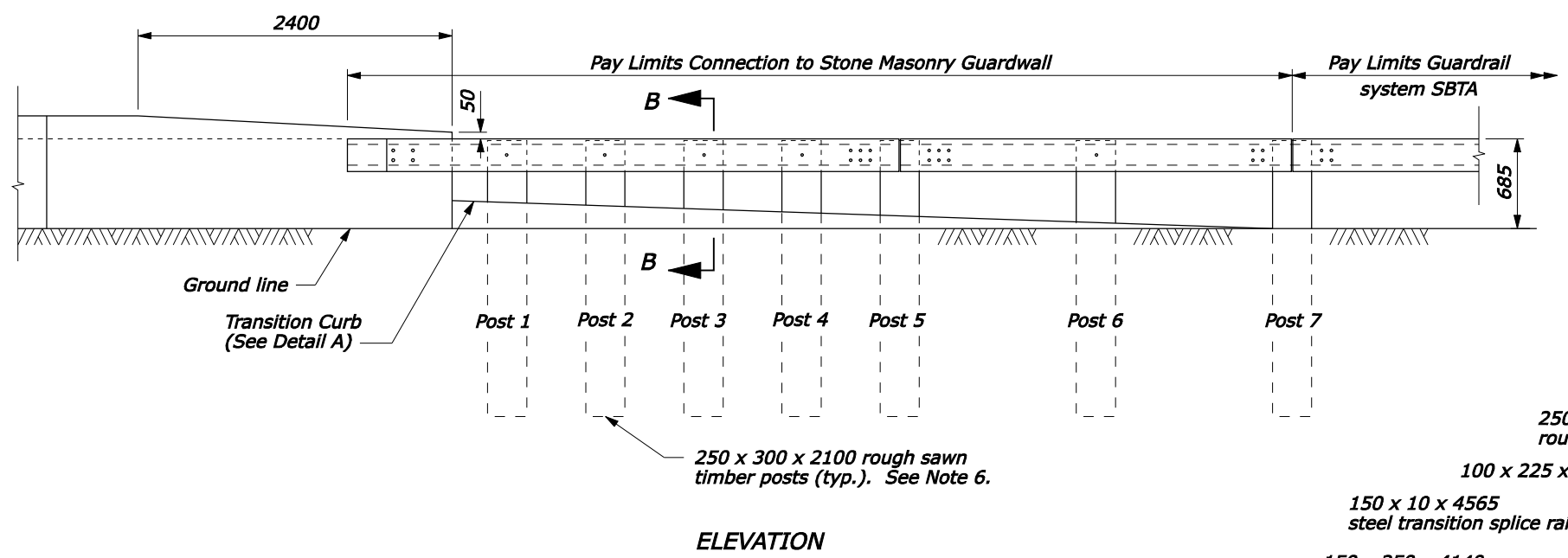
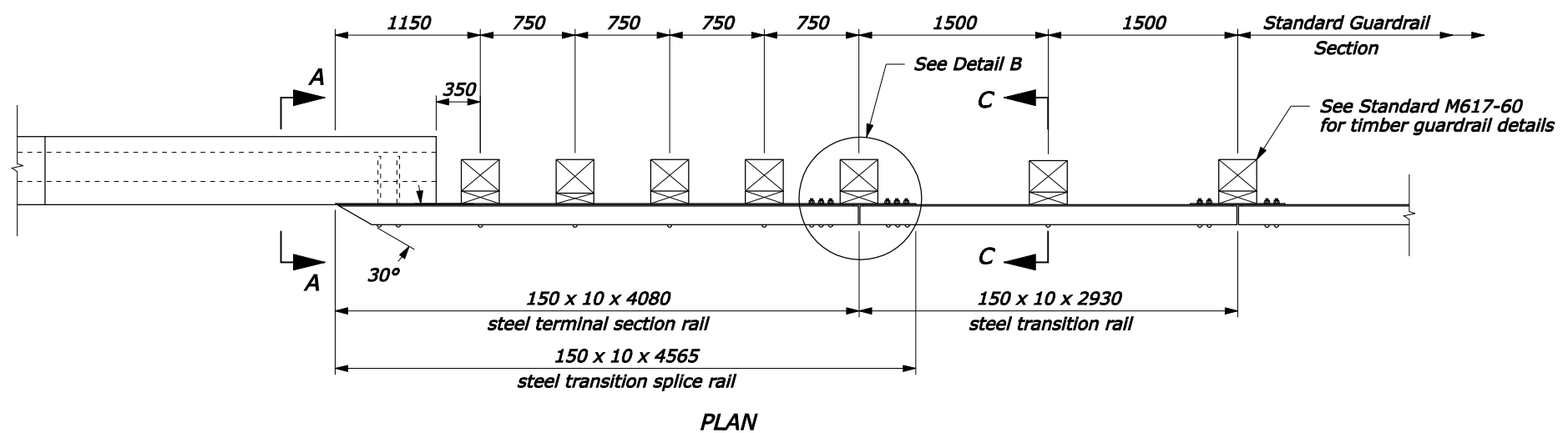
**NOTE:**  
1. Pre-drill 1 1/16" holes in blocks outs and posts.



U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
<b>U.S. CUSTOMARY STANDARD STEEL-BACKED TIMBER GUARDRAIL TL-3 CONNECTION TO STONE MASONRY GUARDWALL</b> Sheet 2 of 2	
STANDARD APPROVED FOR USE --/---	STANDARD 617-65
REVISED: DRAFT: 1/2008	

NO SCALE

23-Jan-2008 11:21 AM Rpt://198.145.186.2/std.pln/651765.dgn [US Customary]



**NOTE:**

1. See Sheet 2 of 2 for Sections A-A through C-C, steel rail layouts, and other details.
2. Use weathering steel for all structural steel and fastener hardware.
3. Transition curbing (including dowel) will be paid for at the contract unit price for transition curbing.
4. Install transition curbing of material type specified in plans.
5. Curb may be continuous or slabs at least 1.5 m in length. Install faces of slabs evenly and with maximum 2.5 mm separation.
6. If contract requires steel post, substitute wood post with  $W150 \times 225 \times 2.0$  m long.
7. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are not available.
8. Dimensions without units are millimeters.

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

METRIC STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
TL-3 CONNECTION TO  
STONE MASONRY GUARDWALL**  
Sheet 1 of 2

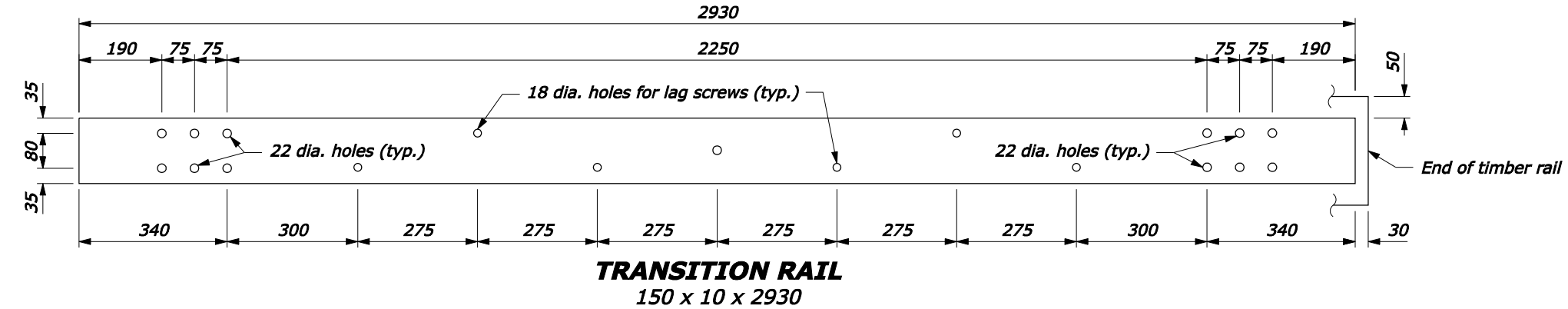
STANDARD APPROVED FOR USE --/----

REVISED: DRAFT: 1/2008

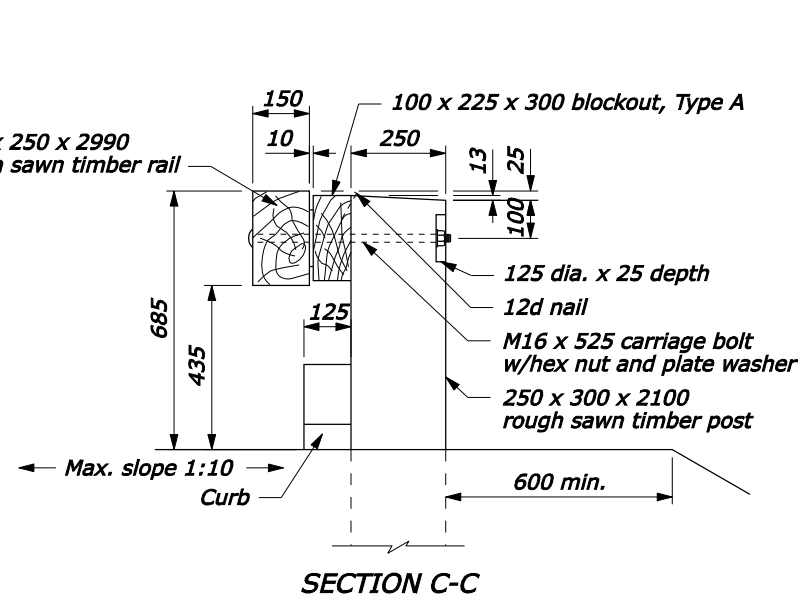
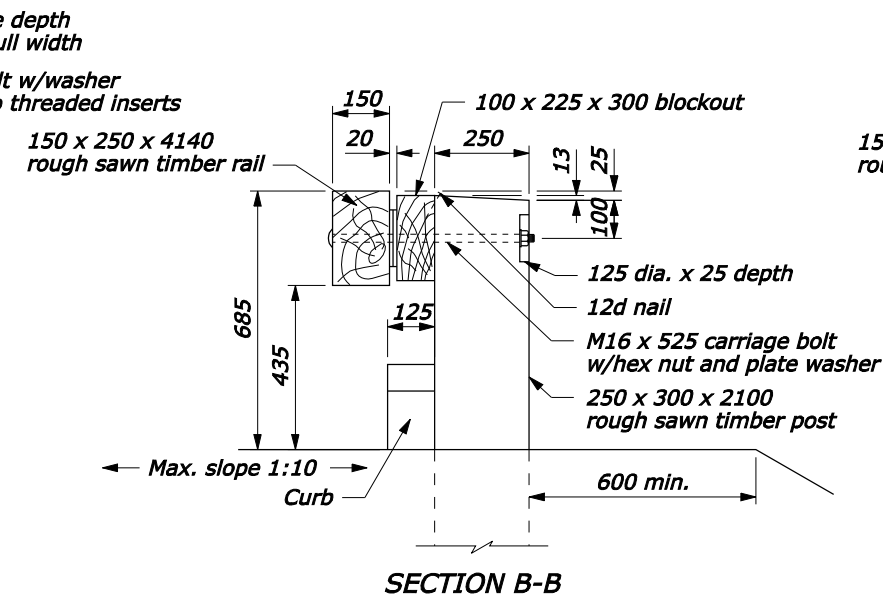
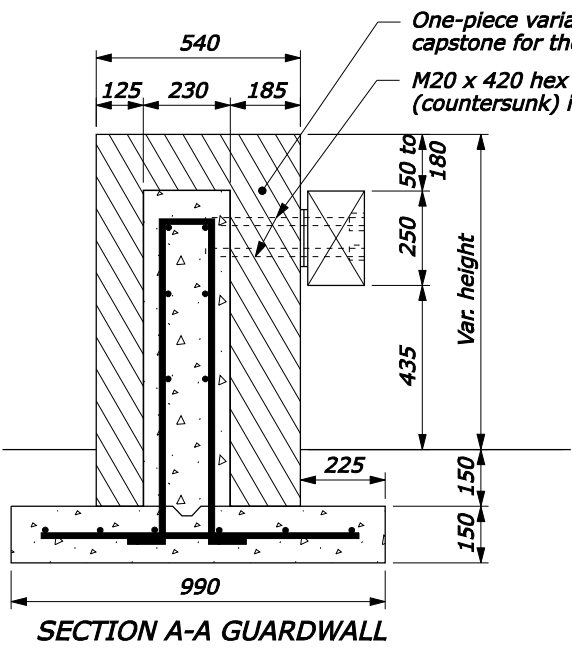
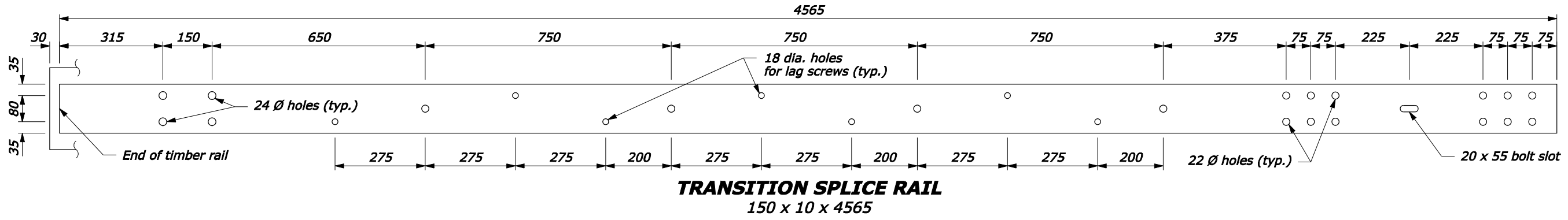
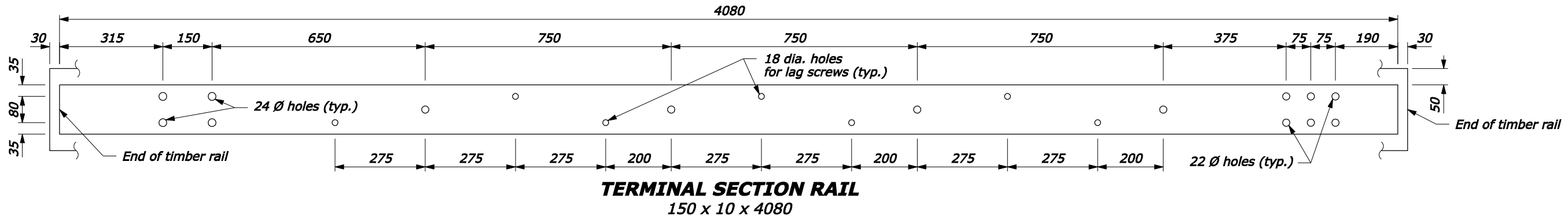
STANDARD  
**M617-65**

NO SCALE

23-Jan-2008 11:16 AM  
 fpp://196.145.188.2/scr\_plan/m61765.dgn [Metric]



- NOTE:**
1. Pre-drill 18 mm holes in blocks outs and posts.
  2. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are not available.
  3. Dimensions without units are millimeters.



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

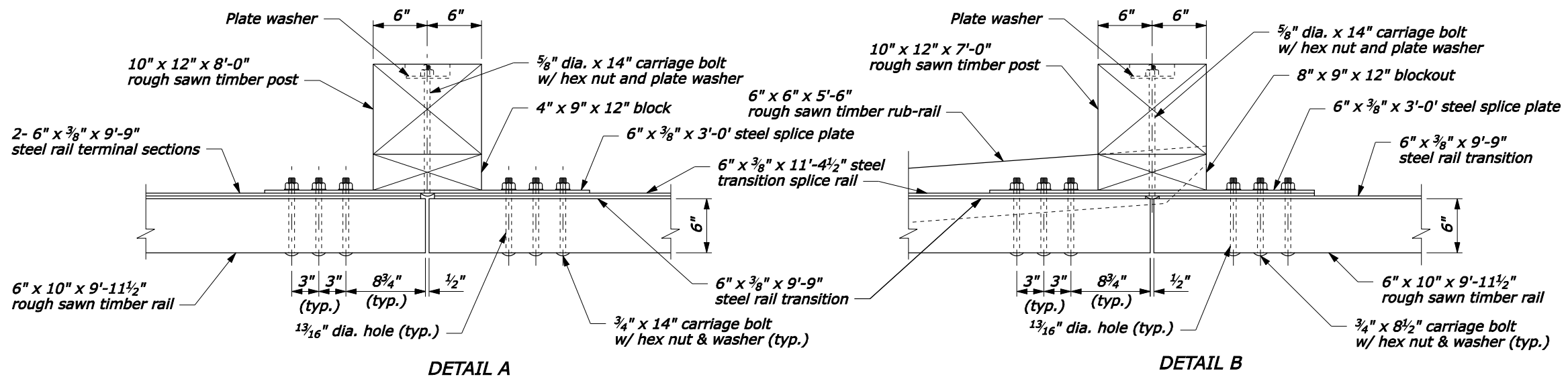
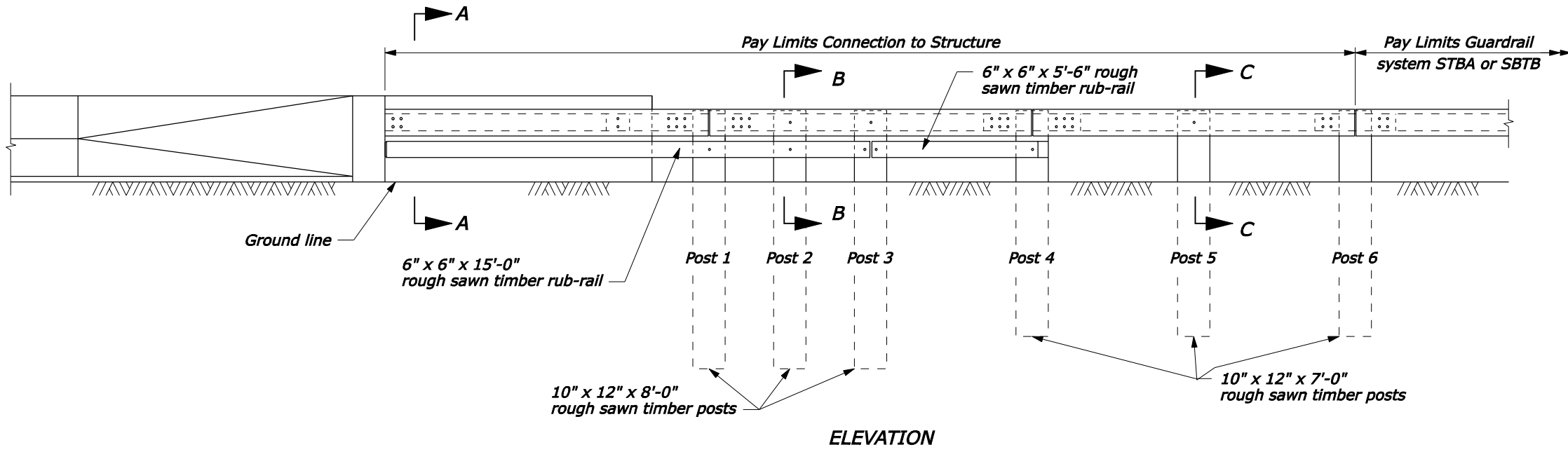
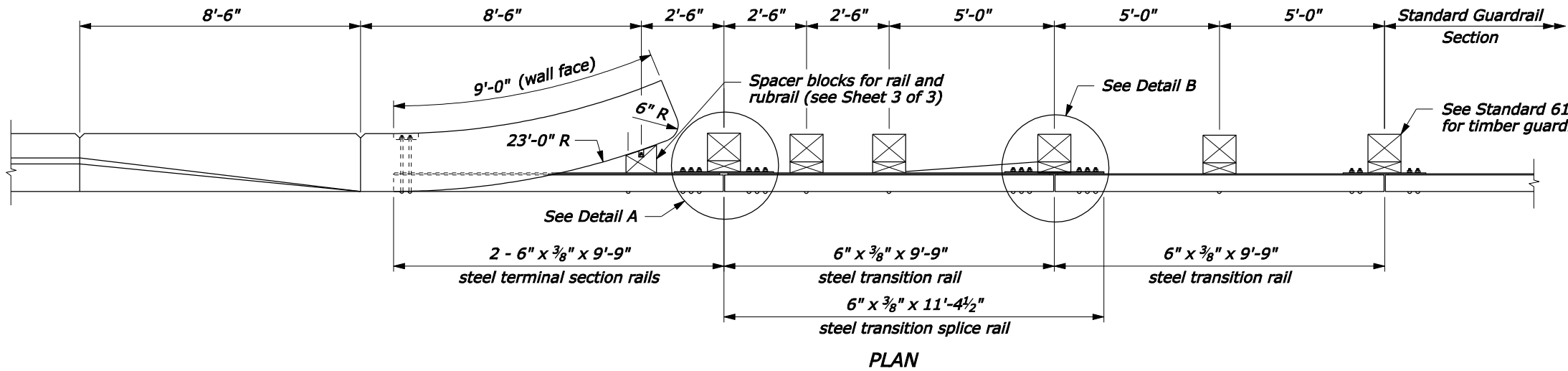
METRIC STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
TL-3 CONNECTION TO  
STONE MASONRY GUARDWALL**  
Sheet 2 of 2

STANDARD APPROVED FOR USE --/--  
REVISED: --/--  
DRAFT: 1/2008

STANDARD  
M617-65

NO SCALE

23-Jan-2008 11:16 AM  
 fpp://196.145.188.2/xc\_d/plan/661765.dgn [Metric]



**POST CONNECTION**

NO SCALE

**NOTE:**

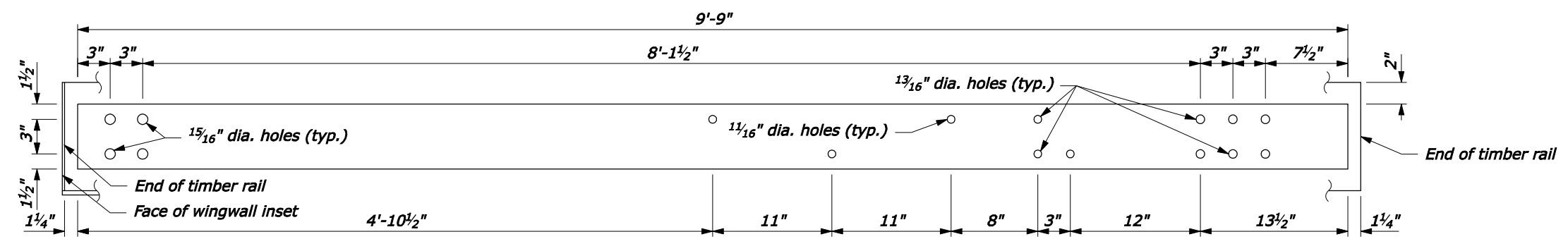
1. See the following sheets for Sections A-A through C-C, steel rail layouts, and other details.
2. Use weathering steel for all structural steel and fastener hardware.

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

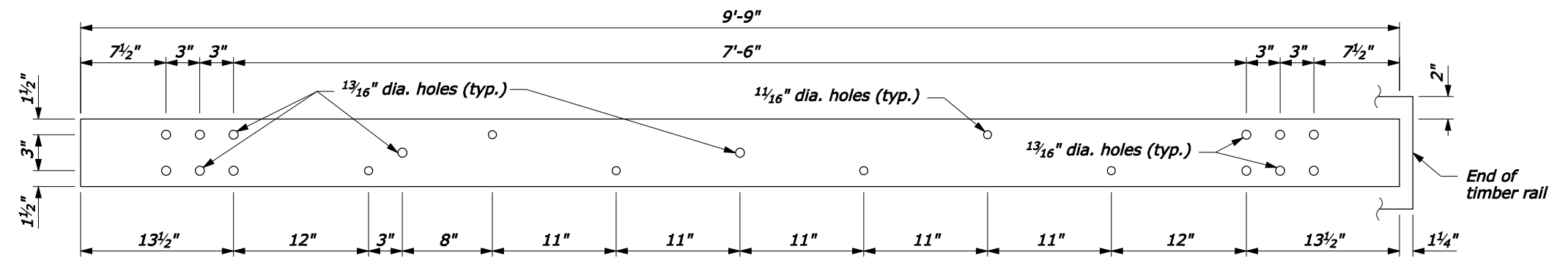
U.S. CUSTOMARY STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
CONNECTION TO  
CURVED BACK STRUCTURE**  
Sheet 1 of 3

STANDARD APPROVED FOR USE 1/1994	STANDARD
REVISED: 4/1994	617-66
DRAFT: 1/2008	

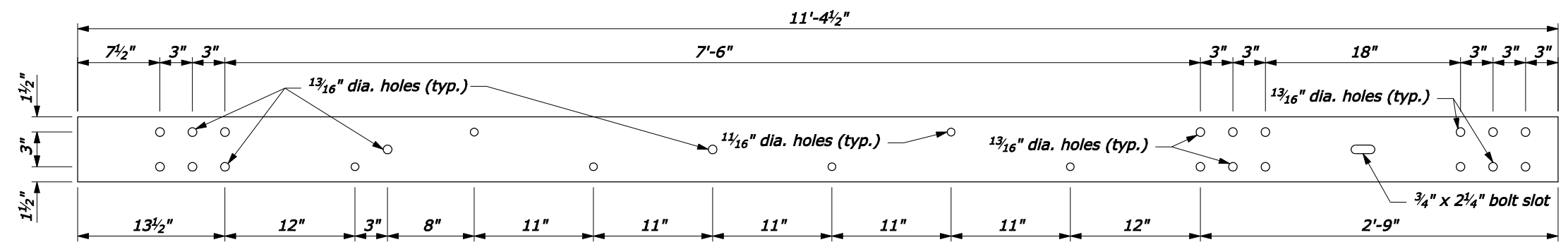
P:\198.145.186.2\std.pln\std61766.dgn [US Customary] 23-Jan-2008 04:08 PM



**TERMINAL SECTION RAIL**  
6" x 3/8" x 9'-9"

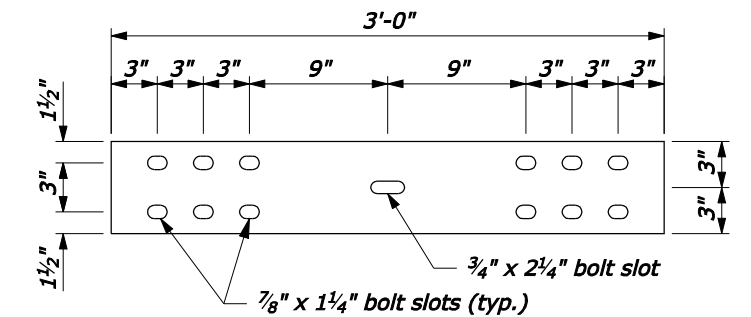


**TRANSITION RAIL**  
6" x 3/8" x 9'-9"

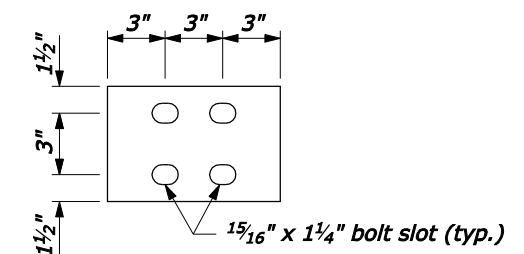


**TRANSITION SPLICE RAIL**  
6" x 3/8" x 11'-4 1/2"

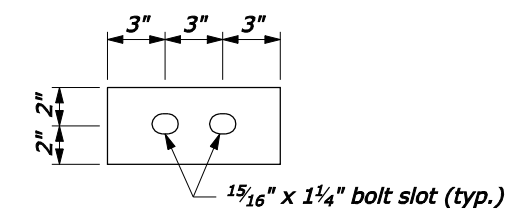
**NOTE:**  
1. Pre-drill 5/8-inch holes in timber rail and 3/8-inch holes in the wood spacer block for the 5/8-inch lag screws.



**SPLICE PLATE**  
6" x 3/8" x 3'-0"

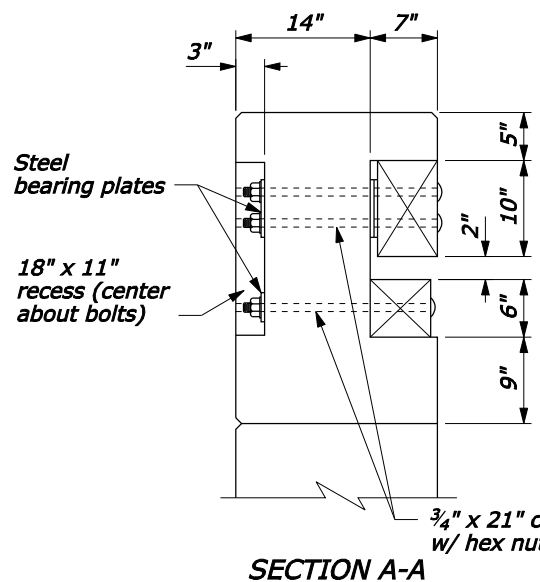


6" x 3/8" x 9"

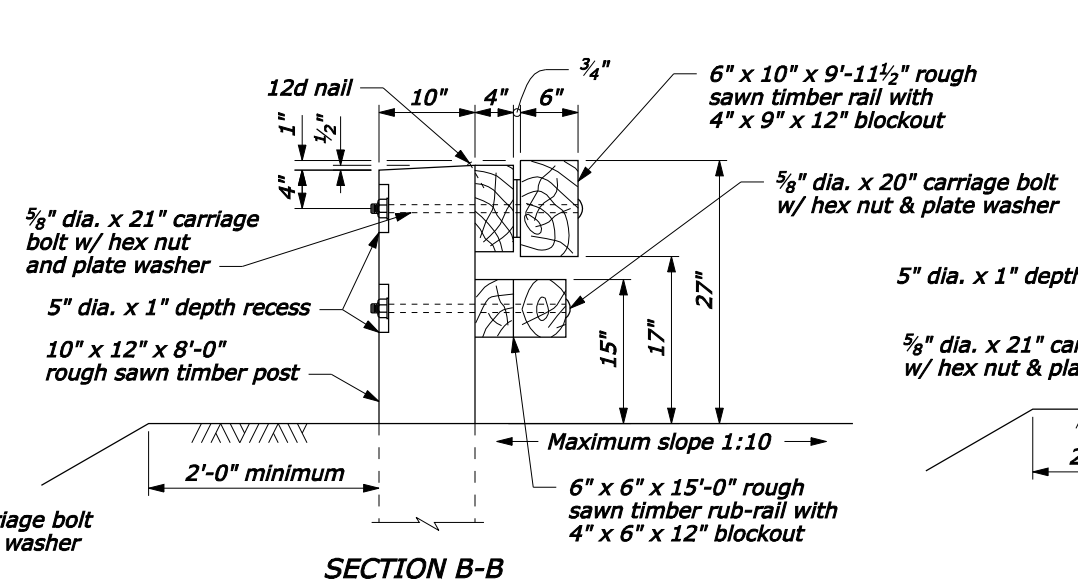


4" x 3/8" x 9"

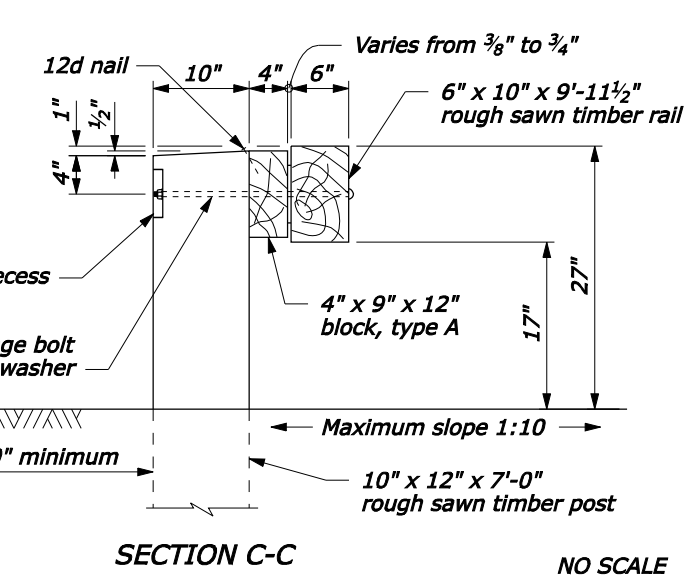
**BEARING PLATE DETAILS**



**SECTION A-A**



**SECTION B-B**



**SECTION C-C**

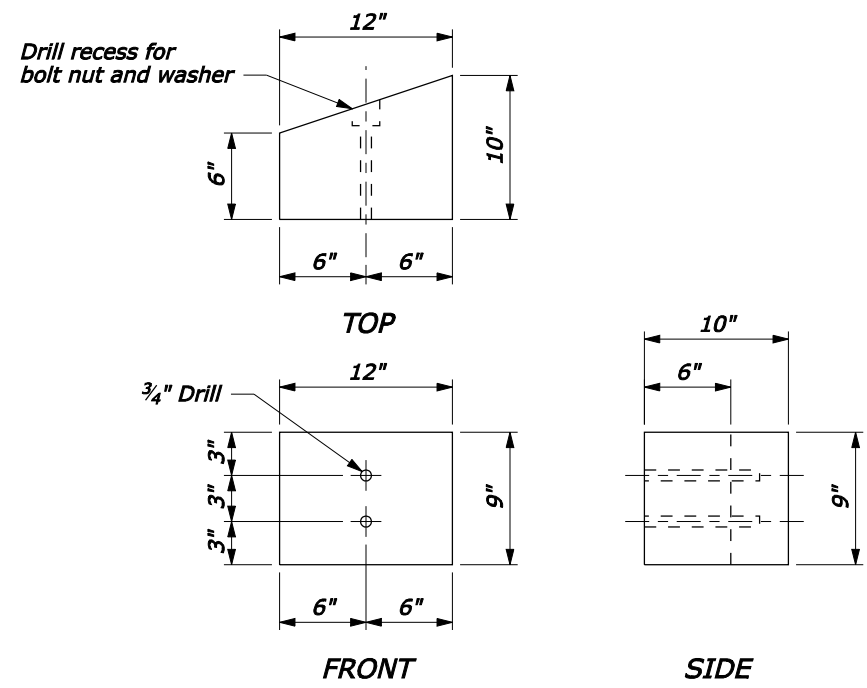
NO SCALE

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

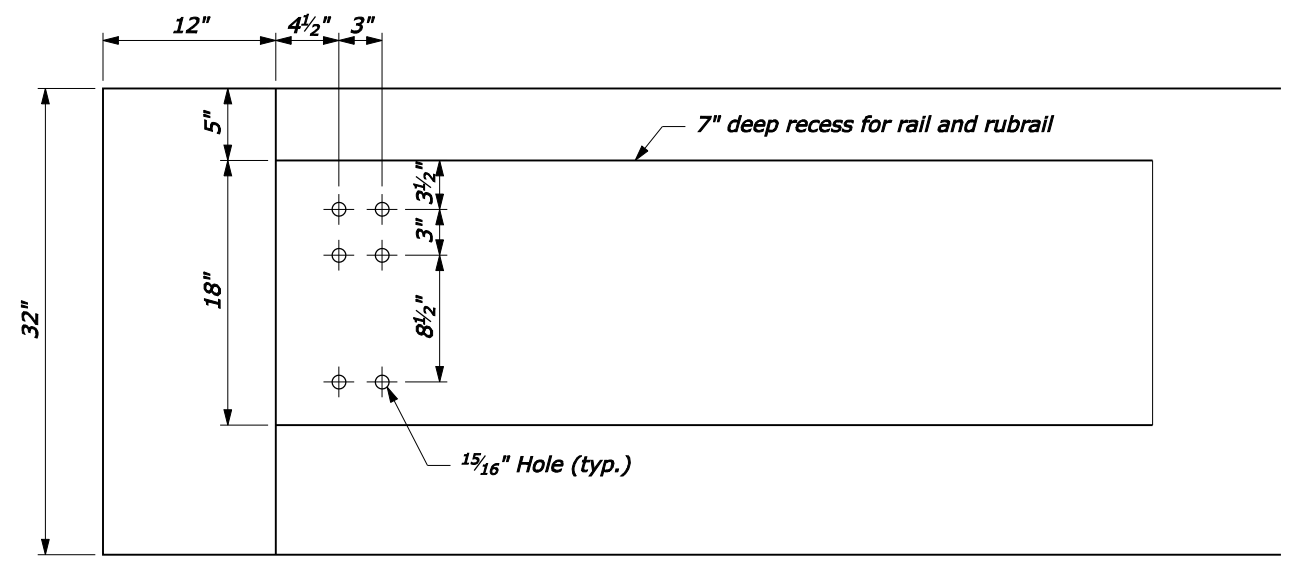
U.S. CUSTOMARY STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
CONNECTION TO  
CURVED BACK STRUCTURE**  
Sheet 2 of 3

STANDARD APPROVED FOR USE 1/1994	STANDARD
REVISED: 4/1994	617-66
DRAFT: 1/2008	

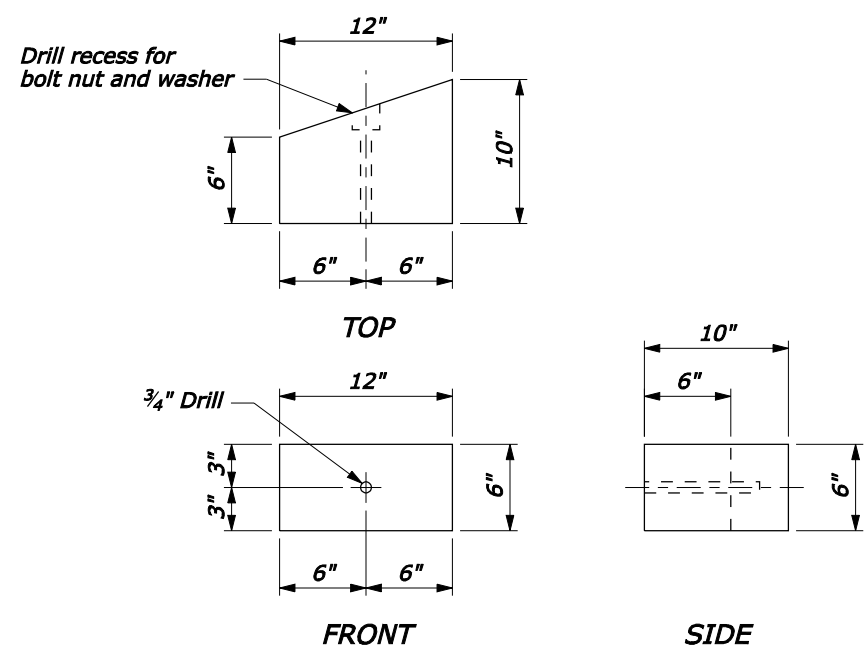
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Rpt://198.145.186.2/std.pln/st61766.dgn [US Customary]



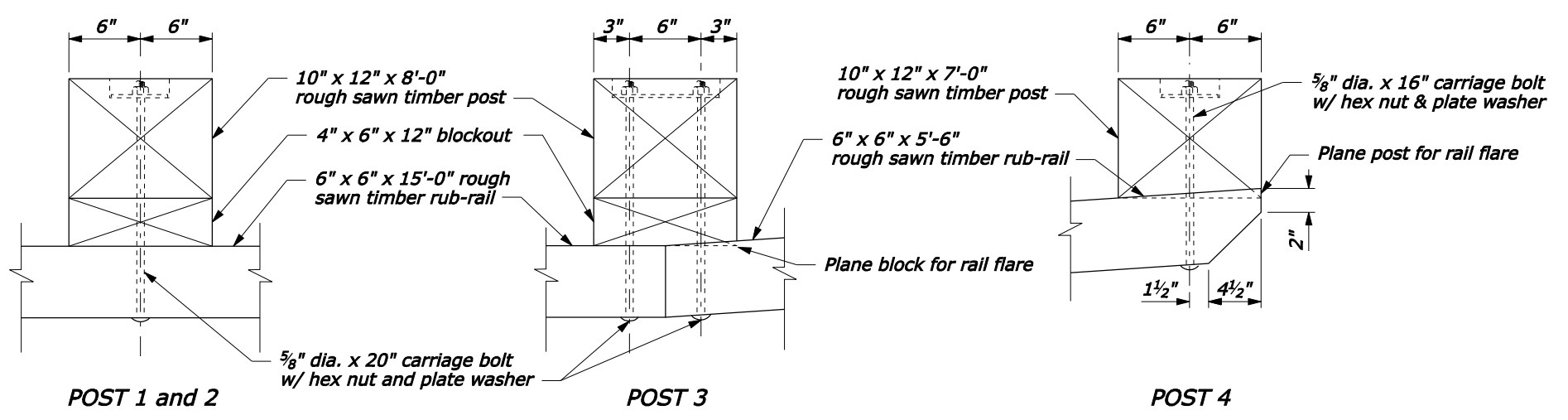
**SPACER BLOCK FOR RAIL**



**PARAPET ATTACHMENT DETAIL**



**SPACER BLOCK FOR RUB-RAIL**

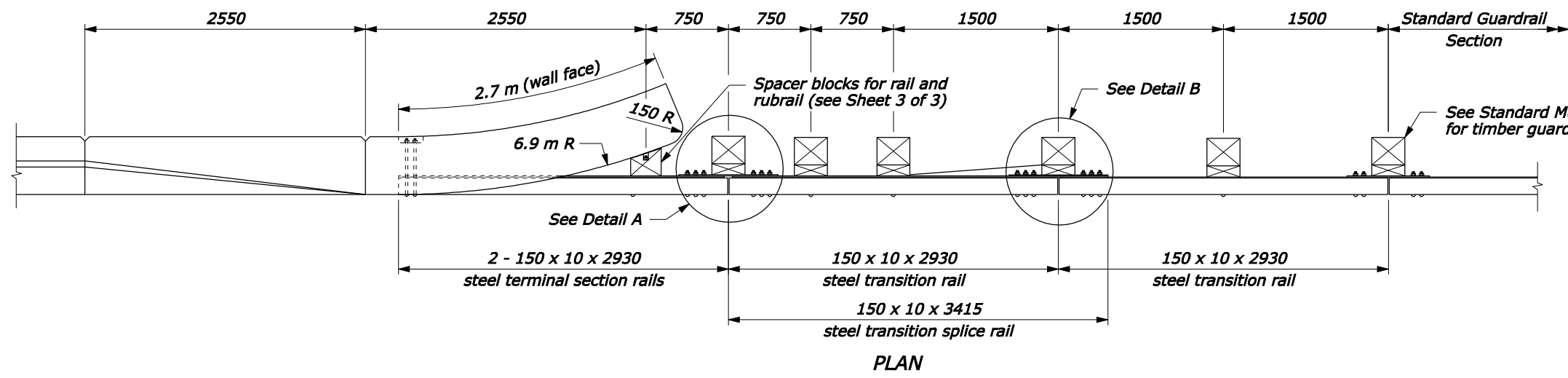


**RUB-RAIL CONNECTIONS**

NO SCALE

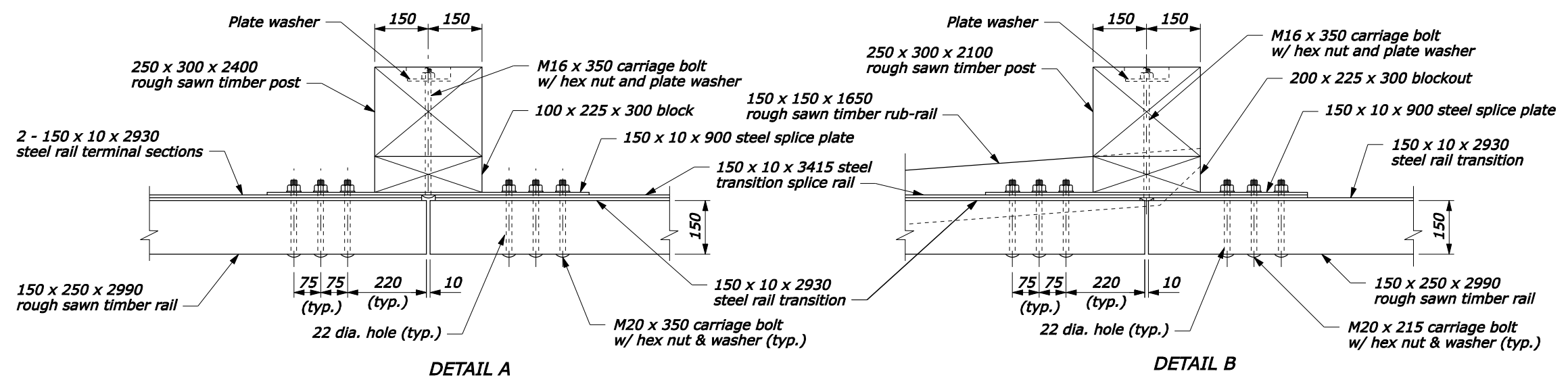
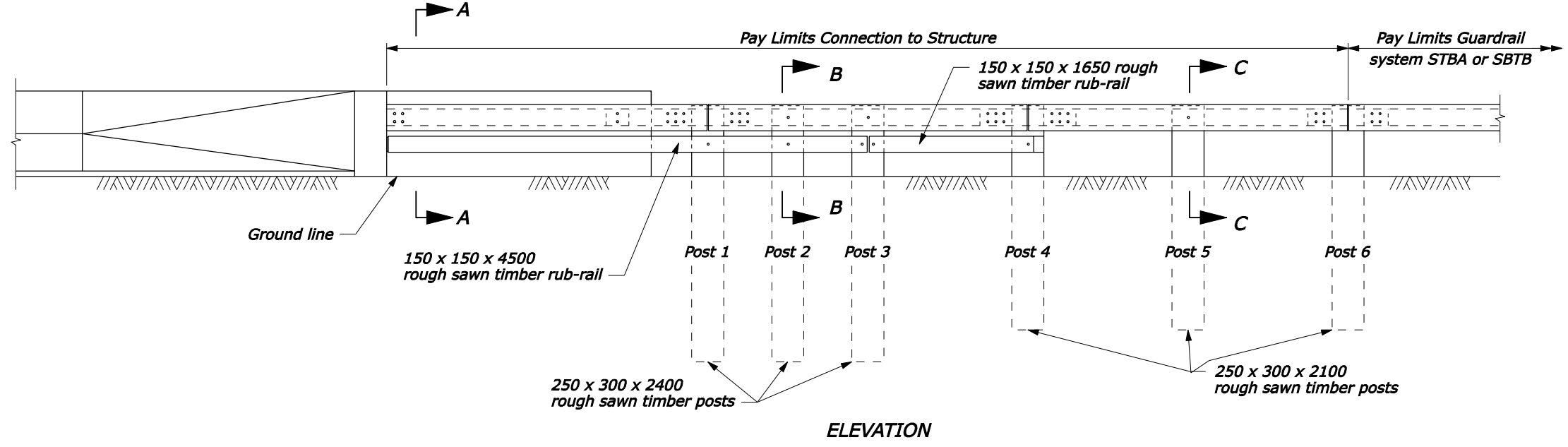
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD <b>STEEL-BACKED TIMBER GUARDRAIL CONNECTION TO CURVED BACK STRUCTURE</b> Sheet 3 of 3	
STANDARD APPROVED FOR USE 1/1994	STANDARD 617-66
REVISED: 4/1994 DRAFT: 1/2008	

P:\198.145.186.2\std\_plan\std61766.dgn [US Customary] 23-Jan-2008 04:09 PM



**NOTE:**

1. See the following sheets for Sections A-A through C-C, steel rail layouts, and other details.
2. Use weathering steel for all structural steel and fastener hardware.
3. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are not available.
4. Dimensions without units are millimeters.



**POST CONNECTION**

NO SCALE

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

METRIC STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
 CONNECTION TO  
 CURVED BACK STRUCTURE**  
 Sheet 1 of 3

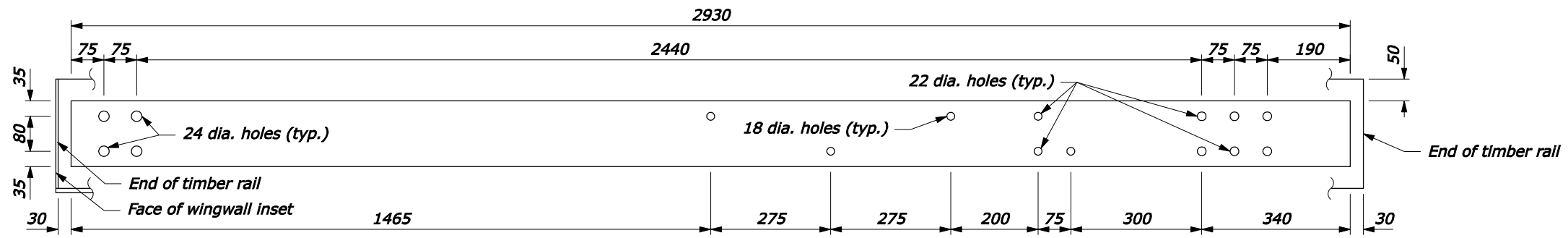
STANDARD APPROVED FOR USE 3/1996

REVISOR: 1/2008  
 DRAFT: 1/2008

STANDARD  
**M617-66**

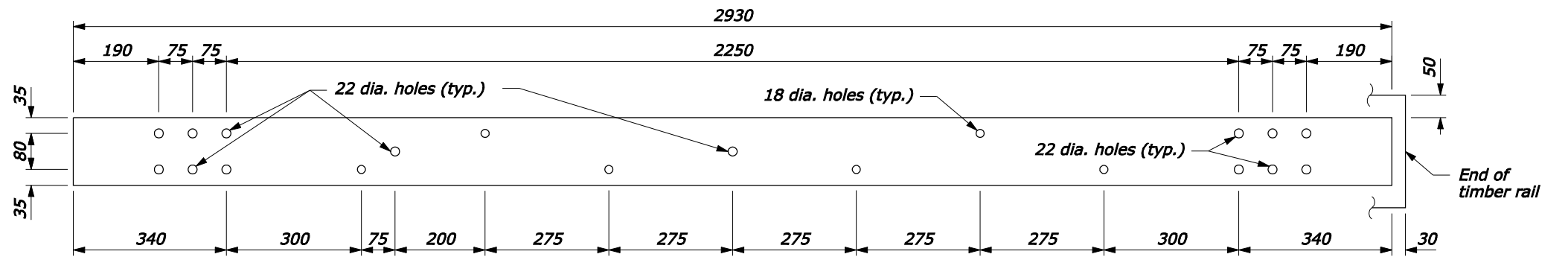
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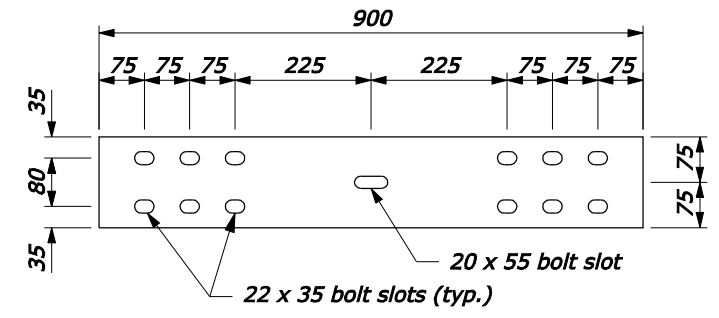


**TERMINAL SECTION RAIL**  
150 x 10 x 2930

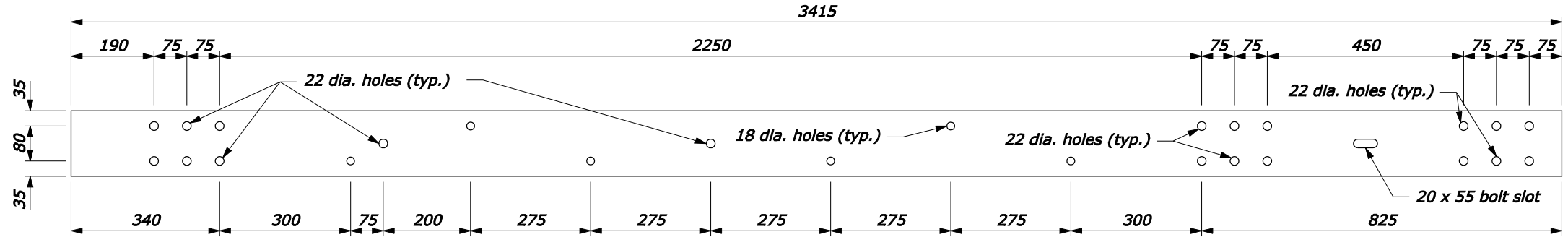
- NOTE:**
1. Pre-drill 16 mm holes in timber rail and 10 mm holes in the wood spacer block for the 16 mm lag screws.
  2. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are not available.
  3. Dimensions without units are millimeters.



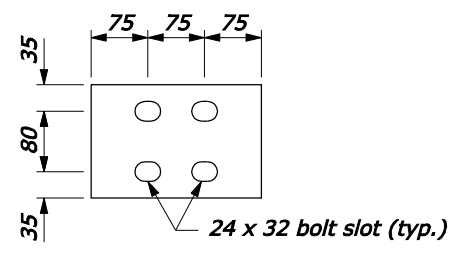
**TRANSITION RAIL**  
150 x 10 x 2930



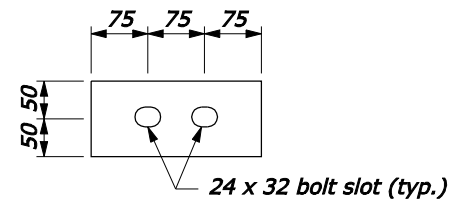
**SPLICE PLATE**  
150 x 10 x 900



**TRANSITION SPLICE RAIL**  
150 x 10 x 3415



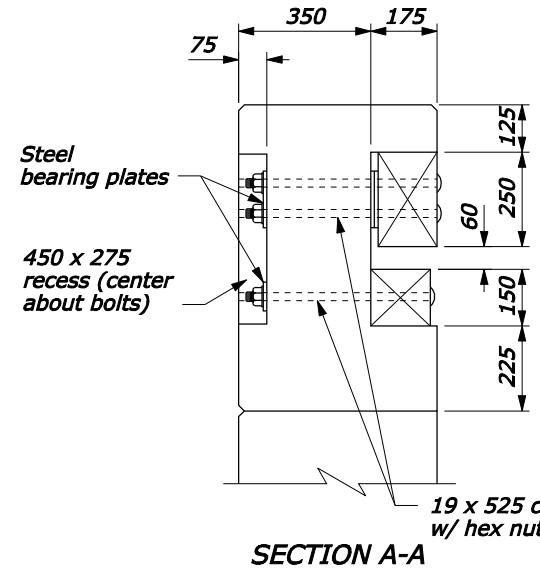
150 x 10 x 225



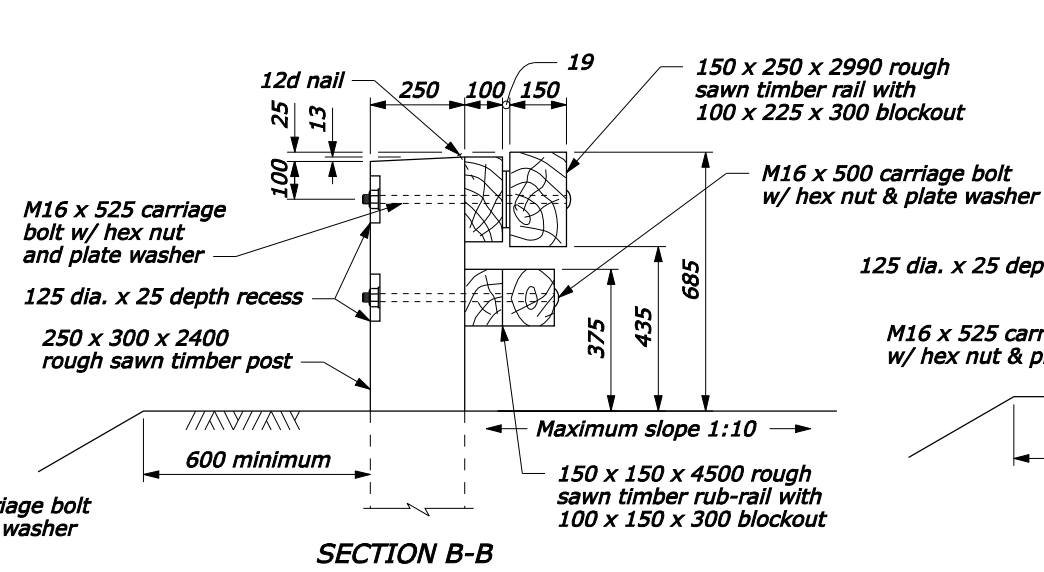
100 x 10 x 225

**BEARING PLATE DETAILS**

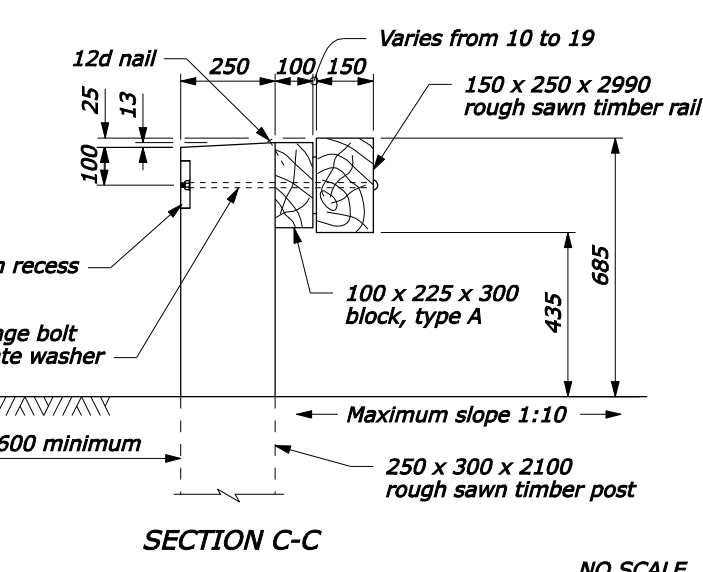
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SECTION A-A



SECTION B-B



SECTION C-C

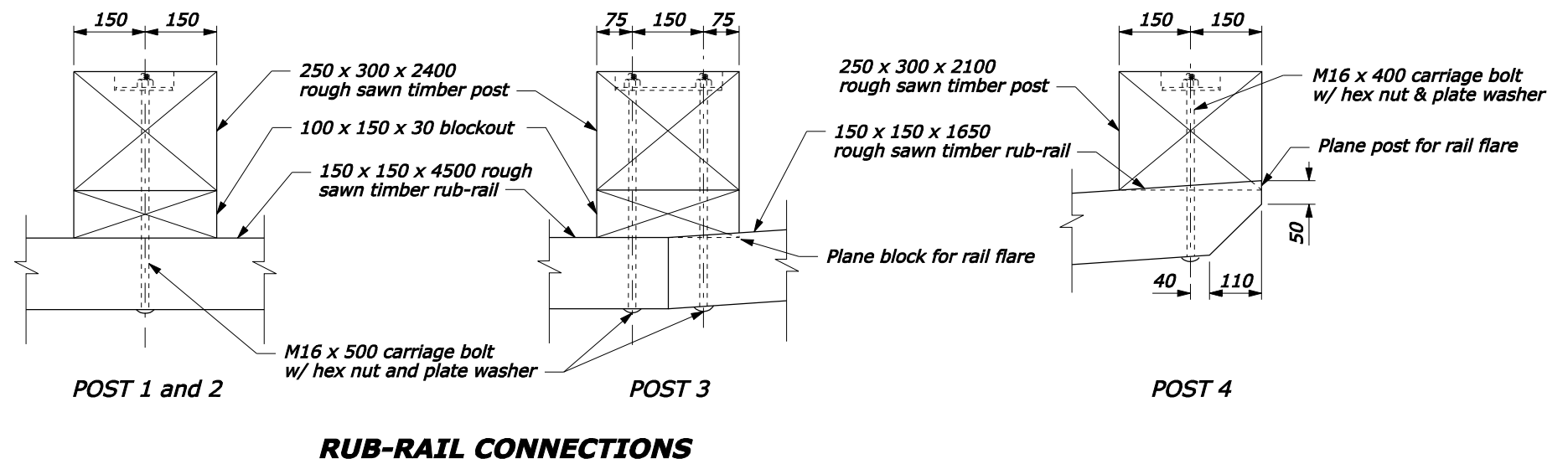
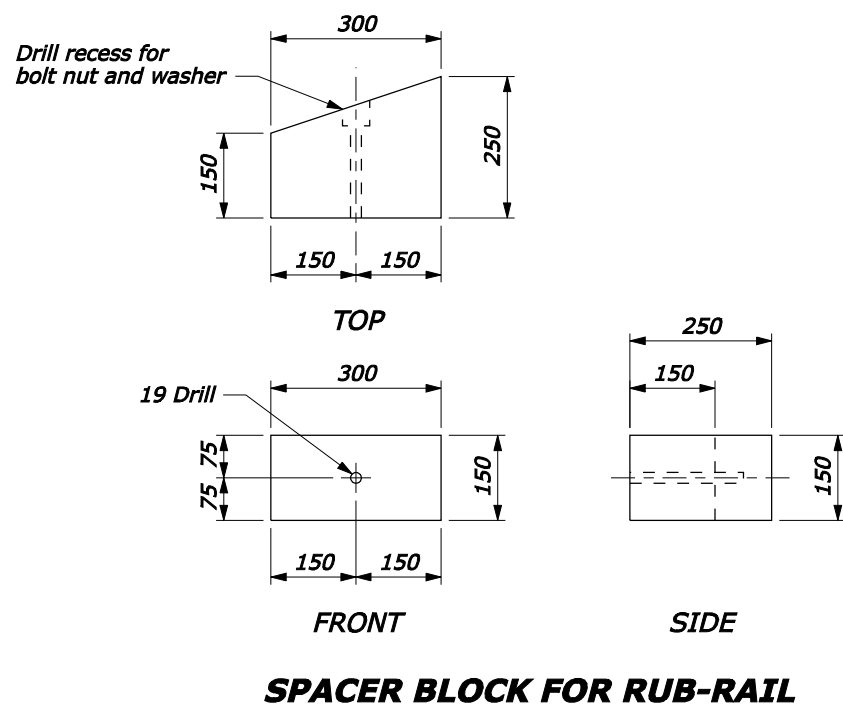
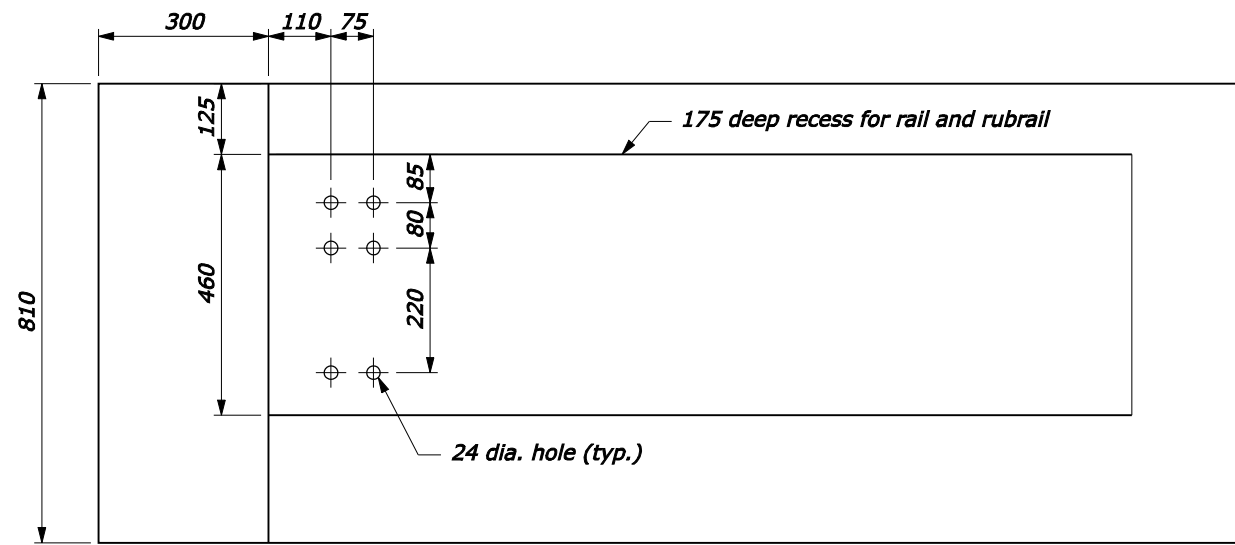
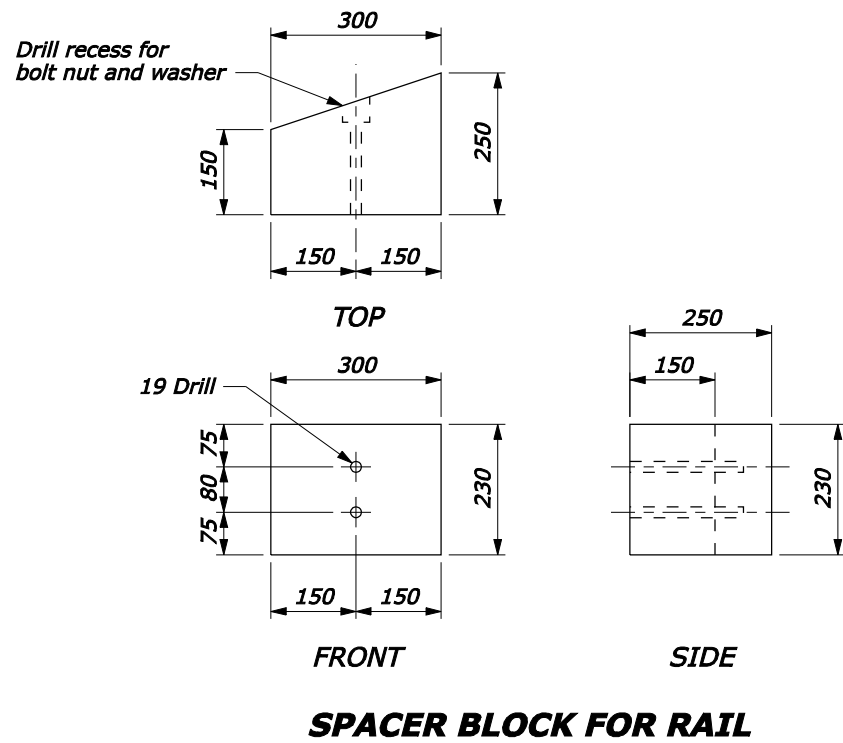
NO SCALE

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

METRIC STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
 CONNECTION TO  
 CURVED BACK STRUCTURE**  
 Sheet 2 of 3

STANDARD APPROVED FOR USE 3/1996  
 REVISIONS:  
 DRAFT: 1/2008

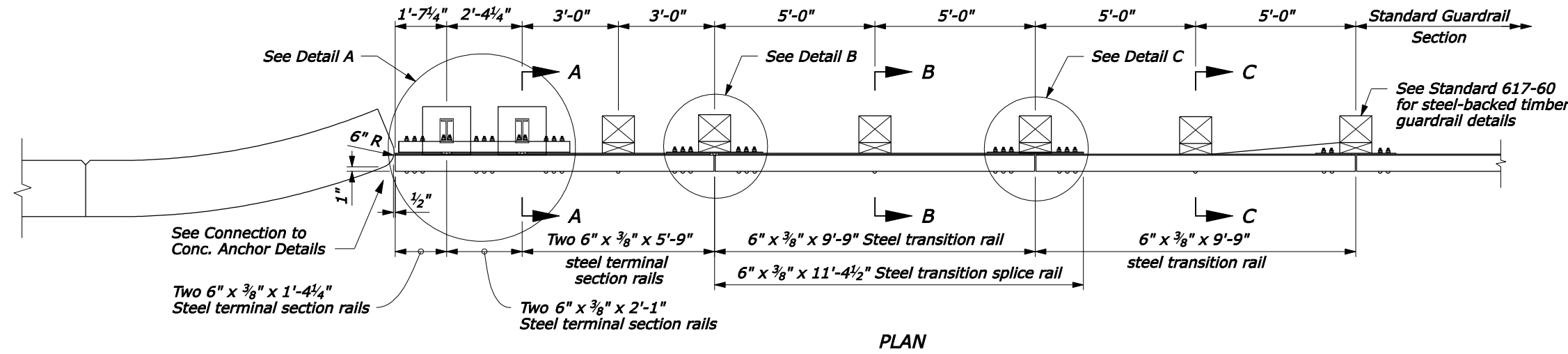
STANDARD  
**M617-66**



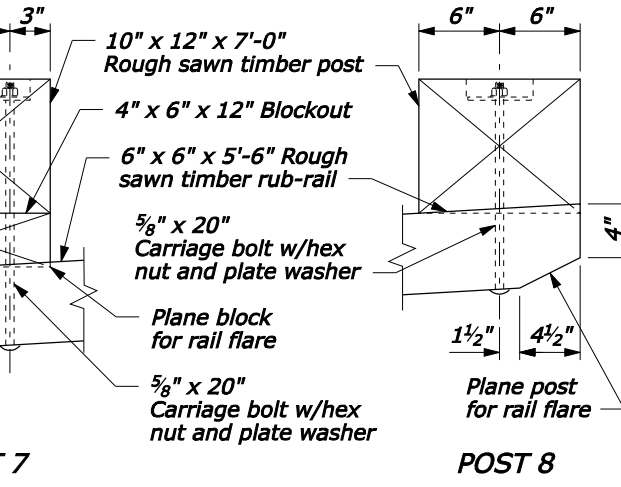
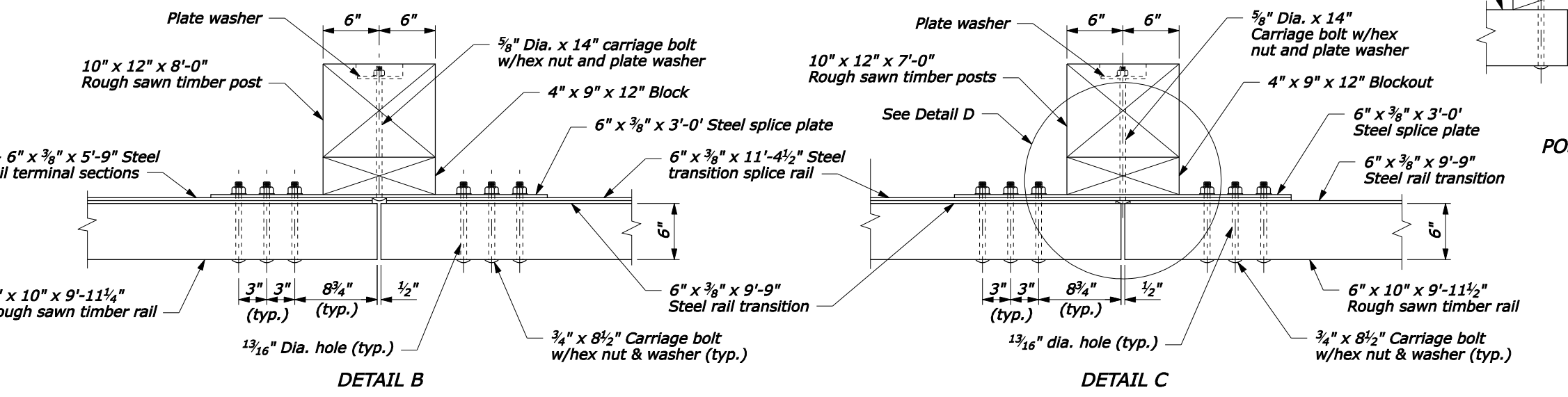
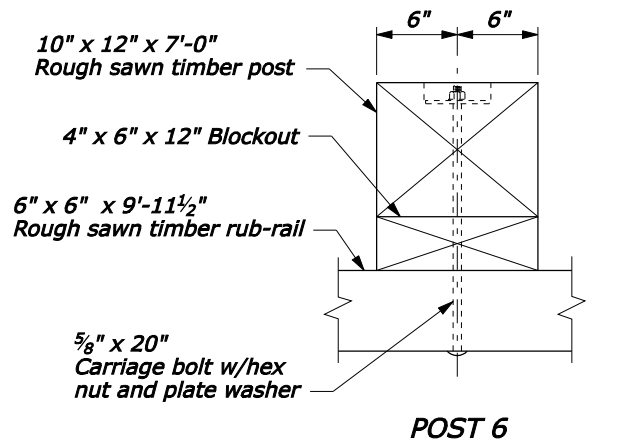
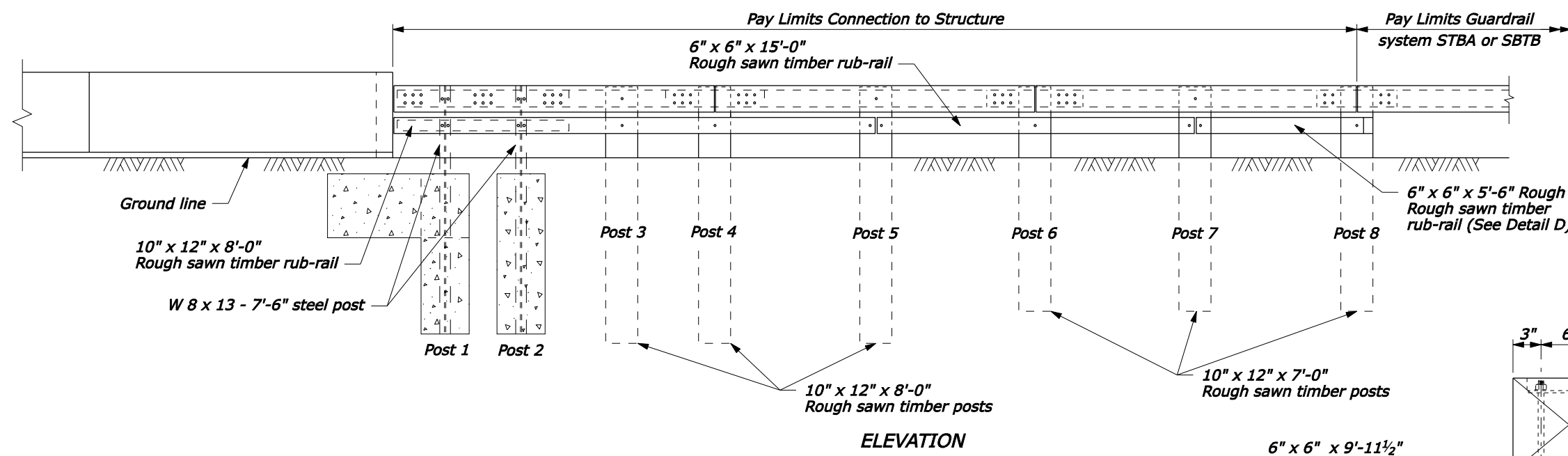
NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
METRIC STANDARD <b>STEEL-BACKED TIMBER GUARDRAIL CONNECTION TO CURVED BACK STRUCTURE</b> Sheet 3 of 3	
STANDARD APPROVED FOR USE 3/1996	STANDARD M617-66
REVISED: DRAFT: 1/2008	

23-Jan-2008 04:11 PM  
 ftp://196.145.188.2/sxd\_plan/s61766.dgn [Metric]



- NOTE:**
1. See the following sheets for Sections A-A through C-C, steel rail layouts, and other details.
  2. Use weathering steel for all structural steel and fastener hardware.
  3. Transition shown for curved end structure. For transition to a straight parapet end, install the timber rail so that the face of the timber rail is offset 1 inch towards the roadway.



**RUBRAIL CONNECTION PLAN**

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

U.S. CUSTOMARY STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
 TL-2 TRANSITION TO STRAIGHT  
 OR CURVED-END STRUCTURE**  
 Sheet 1 of 3

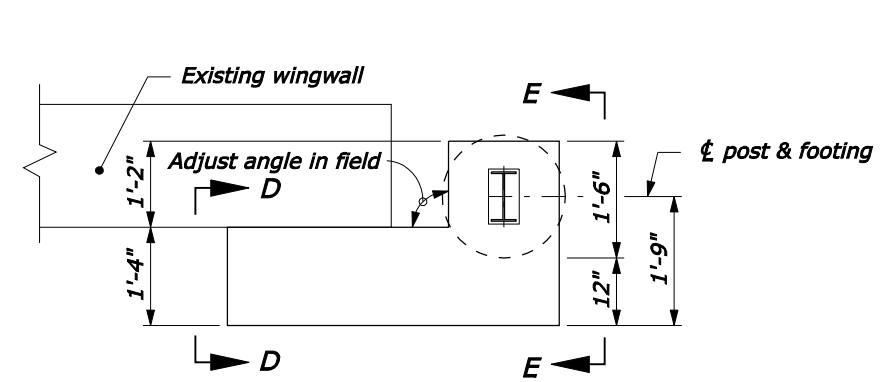
STANDARD APPROVED FOR USE --/----

REVISD:  
 DRAFT: 3/2008

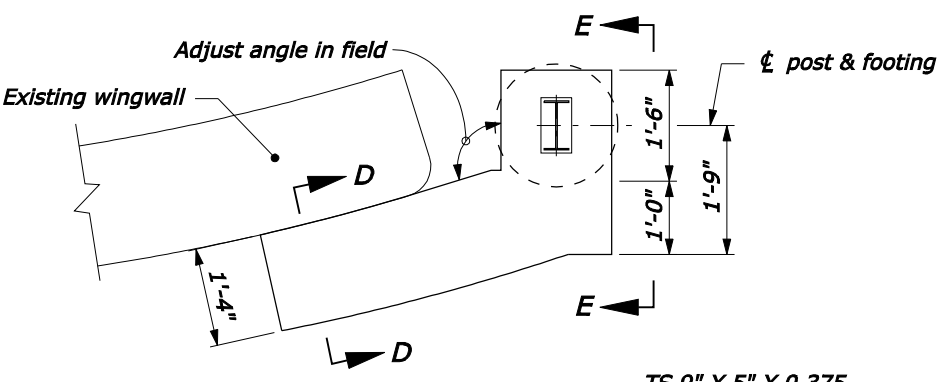
STANDARD  
**617-67**

NO SCALE

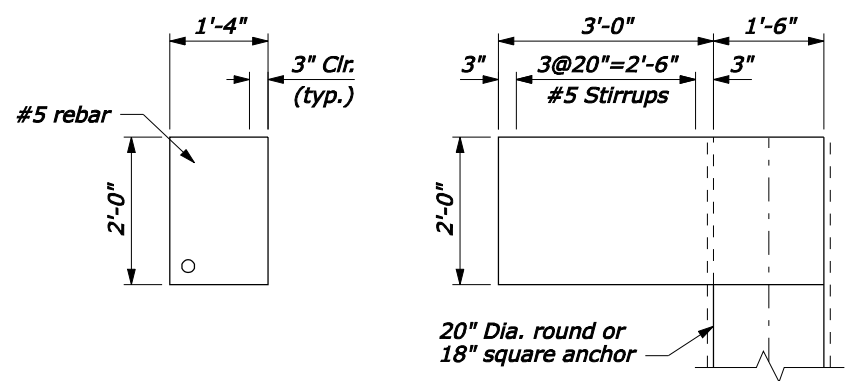
05-May-2008 04:07 PM  
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**NON-FLARED WINGWALL**

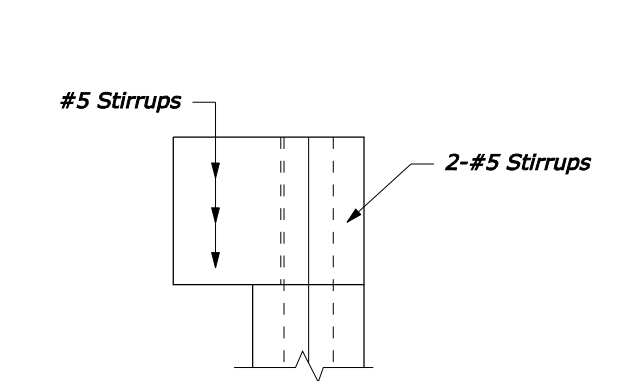


**FLARED WINGWALL**



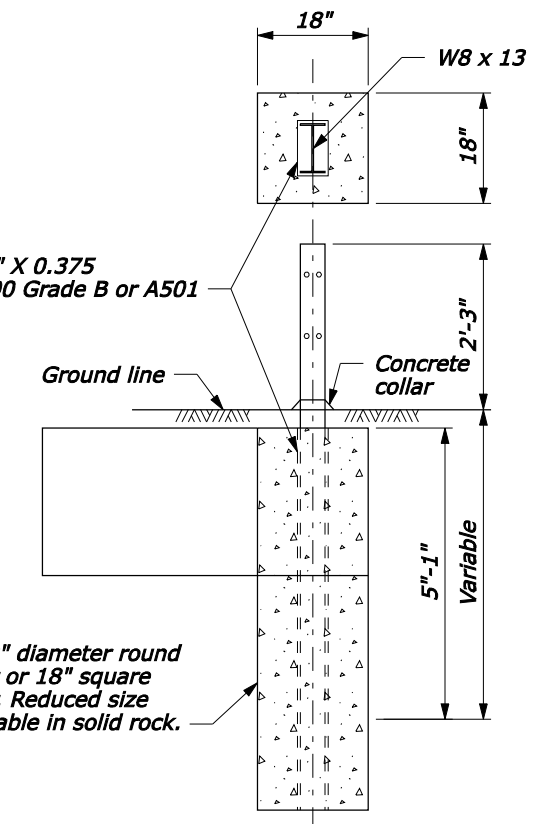
SECTION D-D

**CONNECTION TO CONCRETE ANCHOR**



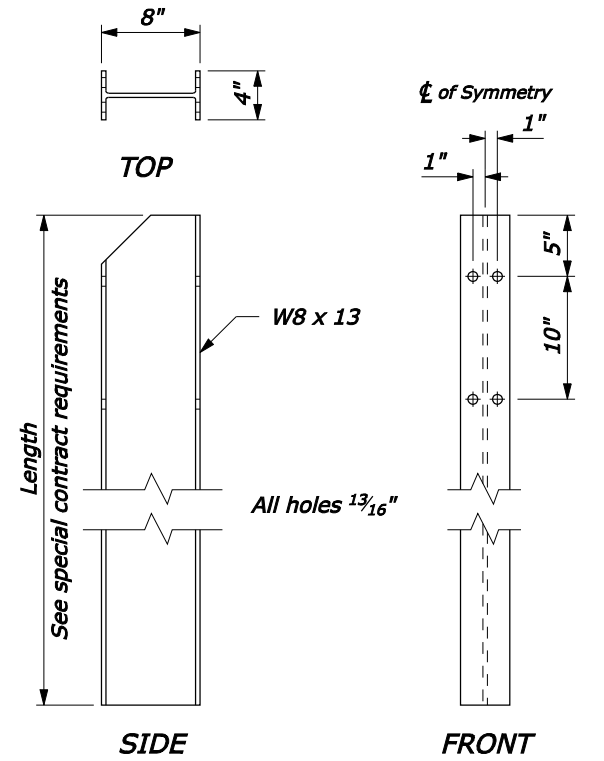
SECTION E-E

TS 9" X 5" X 0.375  
ASTM A500 Grade B or A501

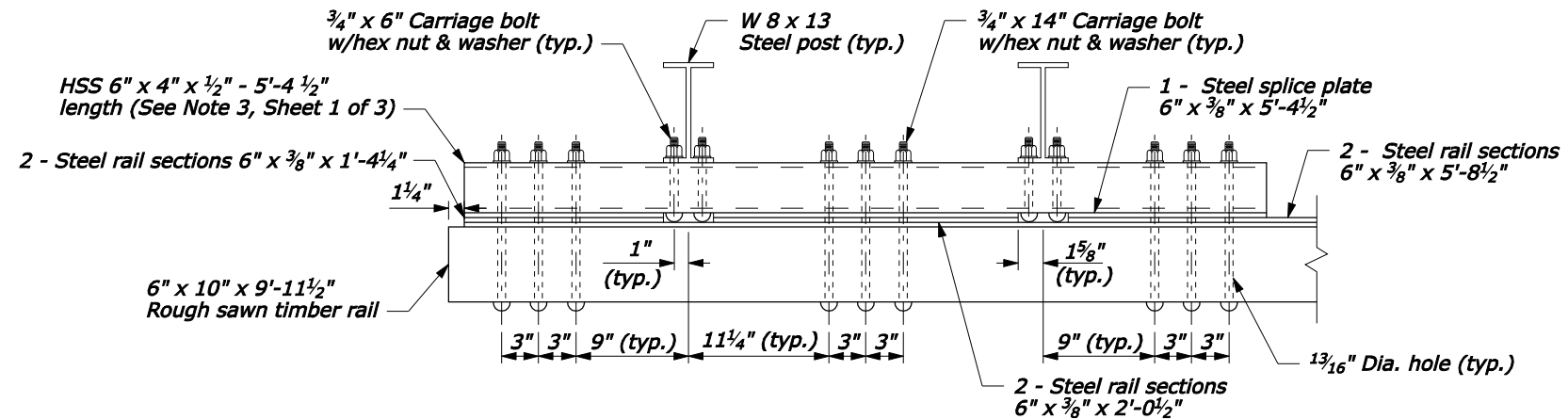


Use 20" diameter round anchor or 18" square anchor. Reduced size acceptable in solid rock.

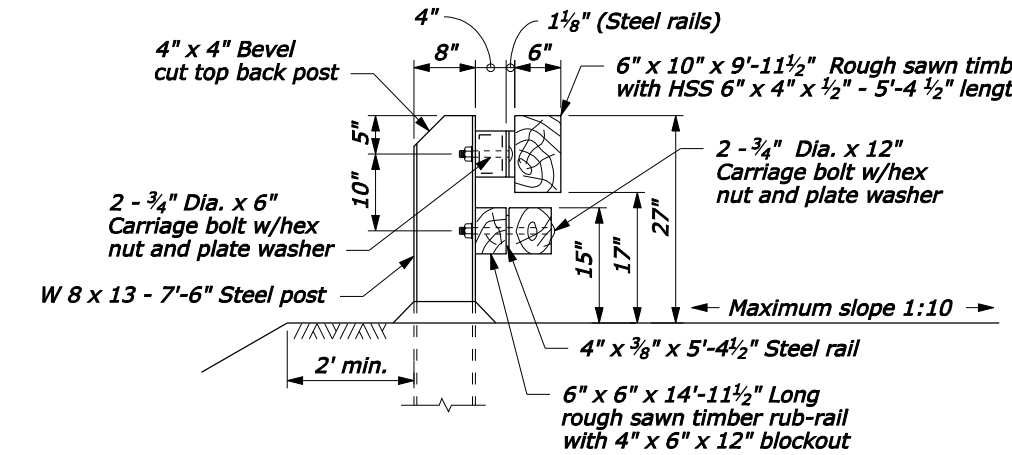
**CONCRETE ANCHOR FOR GUARDRAIL POST**



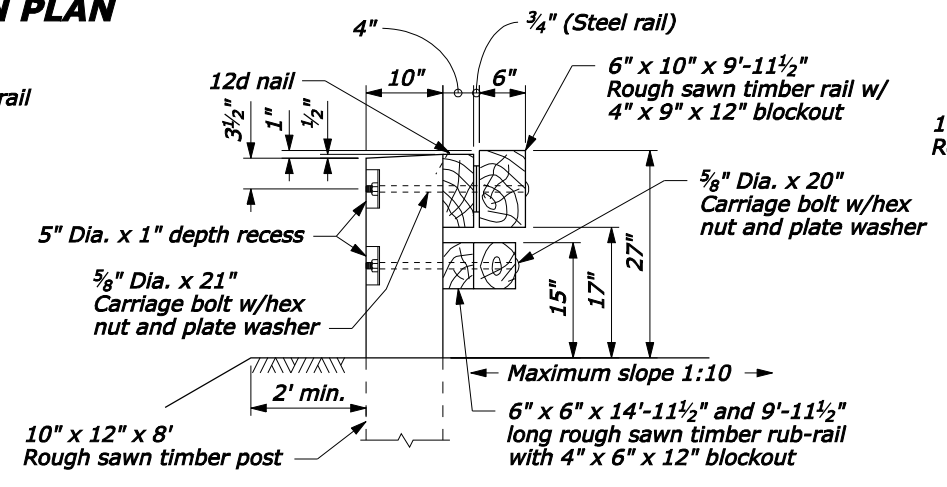
**STEEL POST**



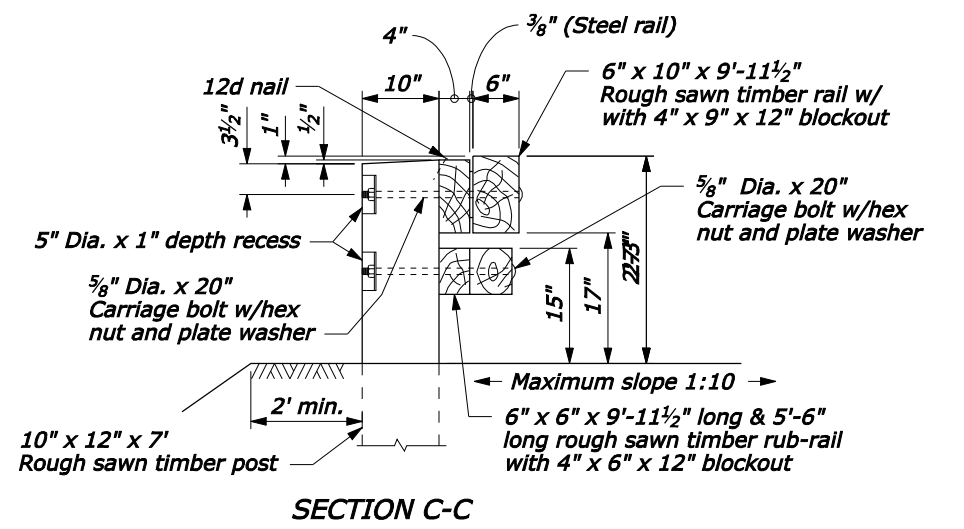
**DETAIL A POST CONNECTION PLAN**



SECTION A-A



SECTION B-B



SECTION C-C

NO SCALE

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

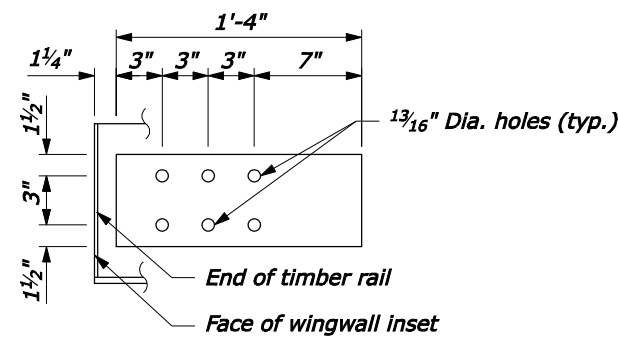
U.S. CUSTOMARY STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
TL-2 TRANSITION TO STRAIGHT  
OR CURVED-END STRUCTURE**  
Sheet 2 of 3

STANDARD APPROVED FOR USE --/---

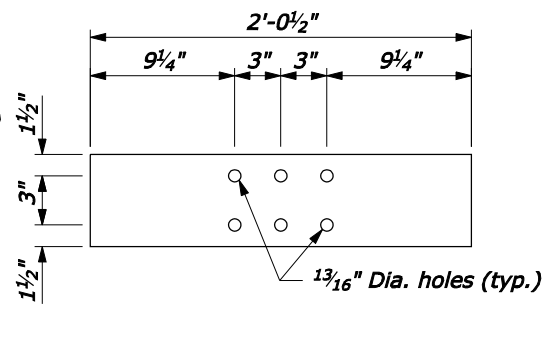
REVISD:  
DRAFT: 3/2008

STANDARD  
617-67

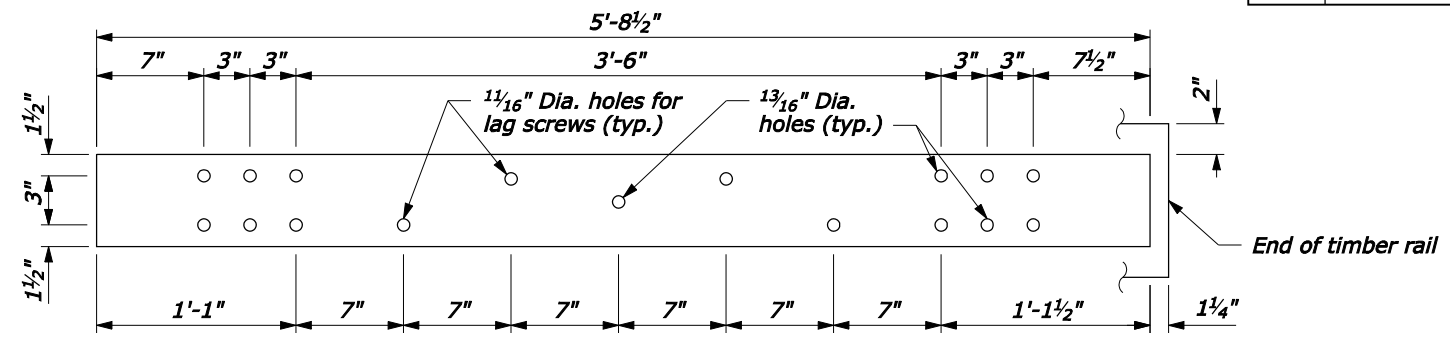
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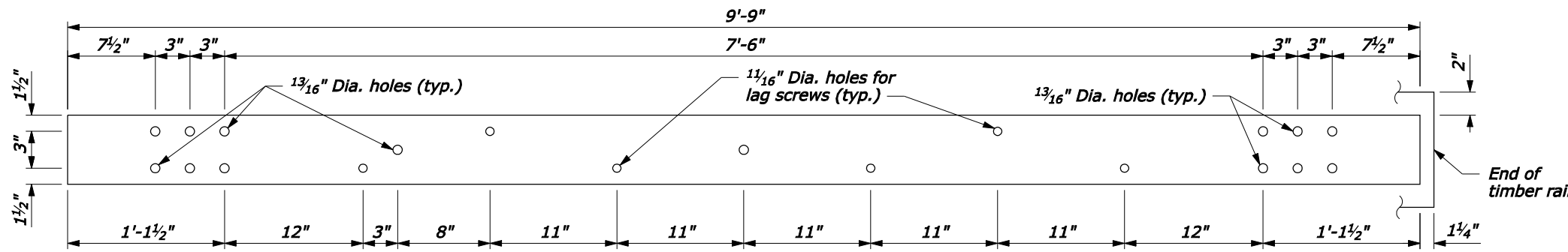
**TERMINAL SECTION**  
6" x 3/8" x 1'-4"



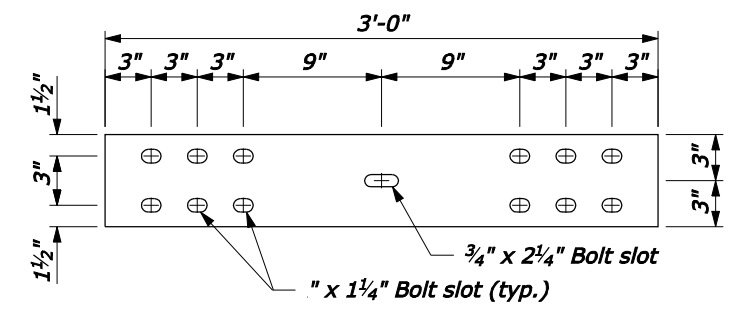
**TERMINAL SECTION**  
6" x 3/8" x 2'-0 1/2"



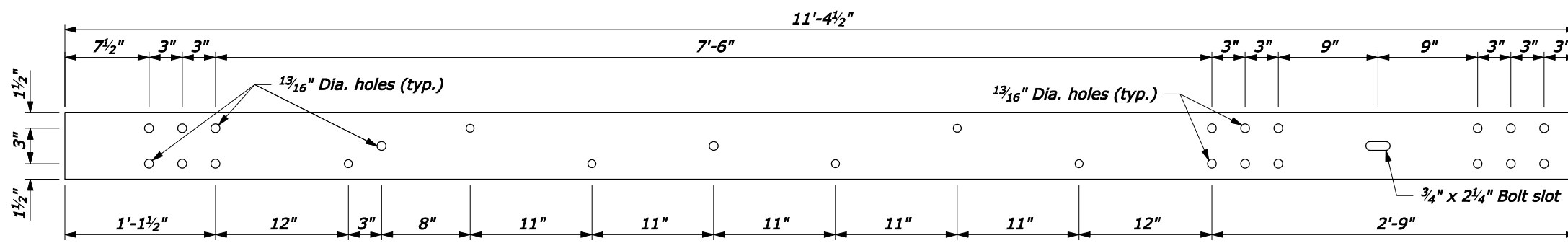
**TERMINAL SECTION**  
6" x 3/8" x 5'-8 1/2"



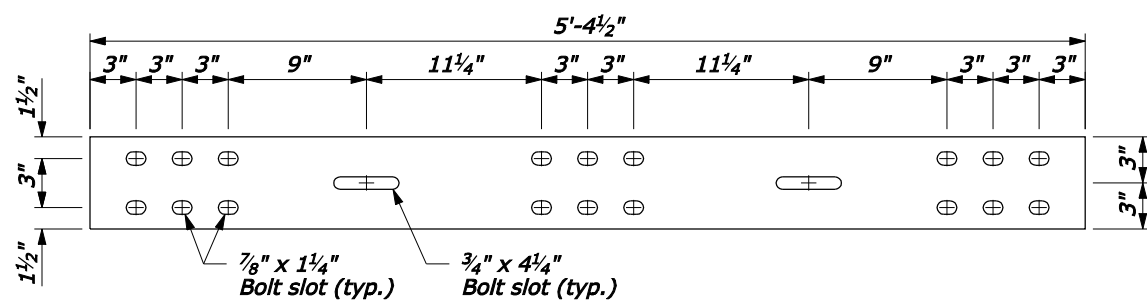
**TRANSITION SECTION**  
6" x 3/8" x 9'-9"



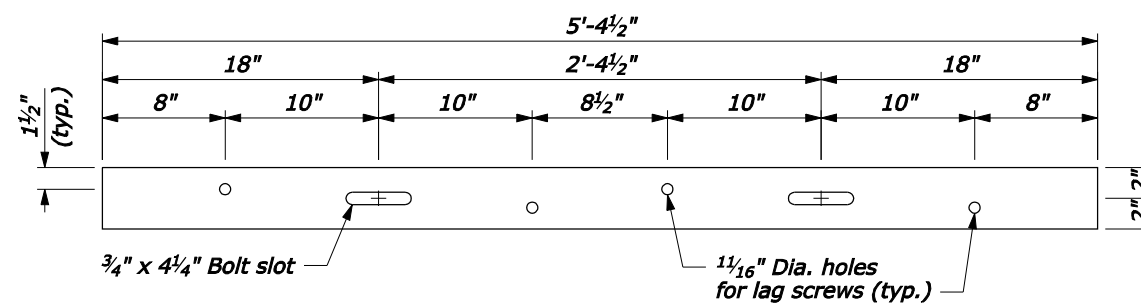
**STEEL SPLICE PLATE**  
6" x 3/8" x 3'-0"



**TRANSITION SECTION**  
6" x 3/8" x 11'-4 1/2"



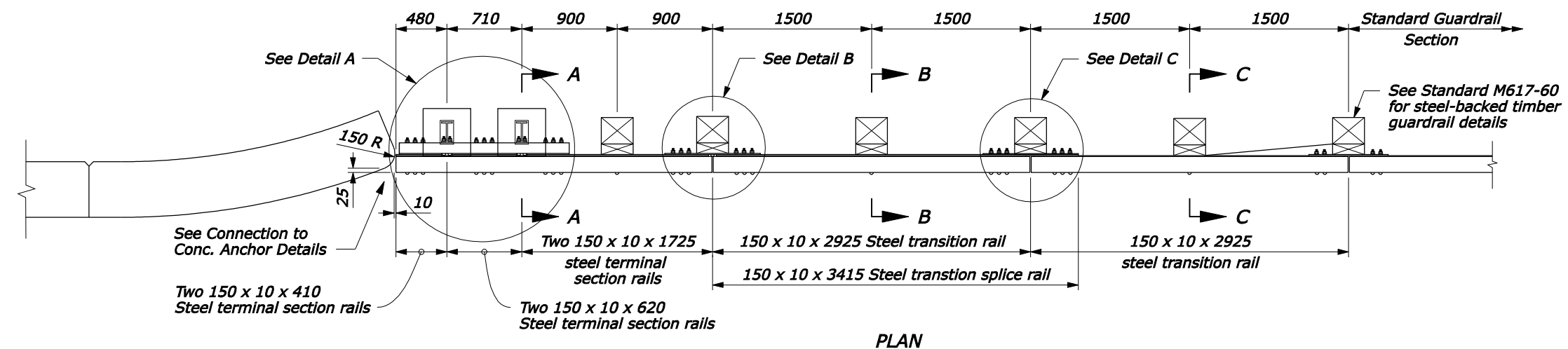
**STEEL SPLICE PLATE**  
6" x 3/8" x 5'-4 1/2"



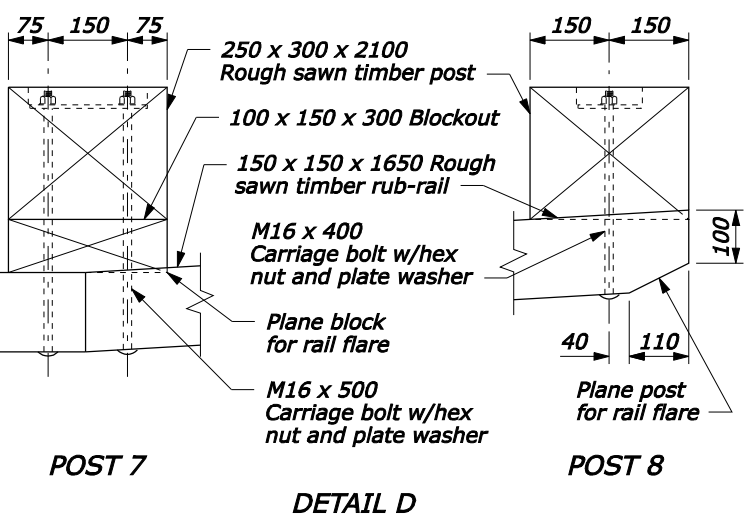
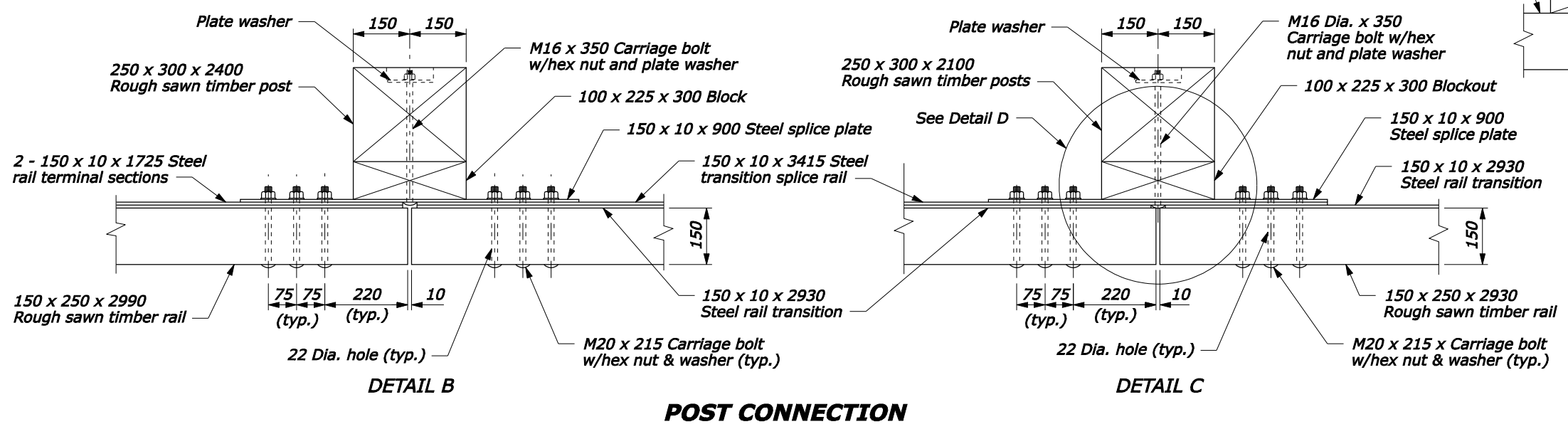
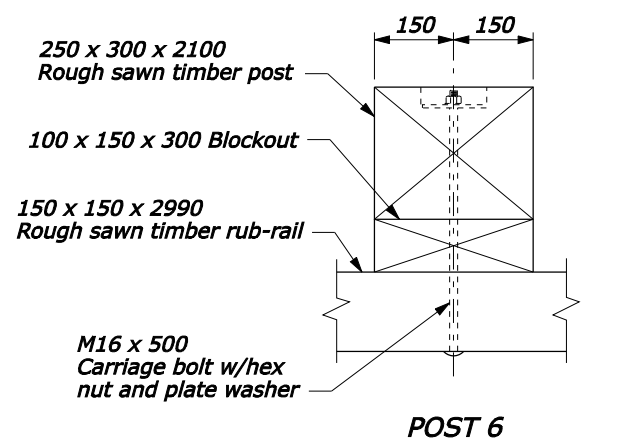
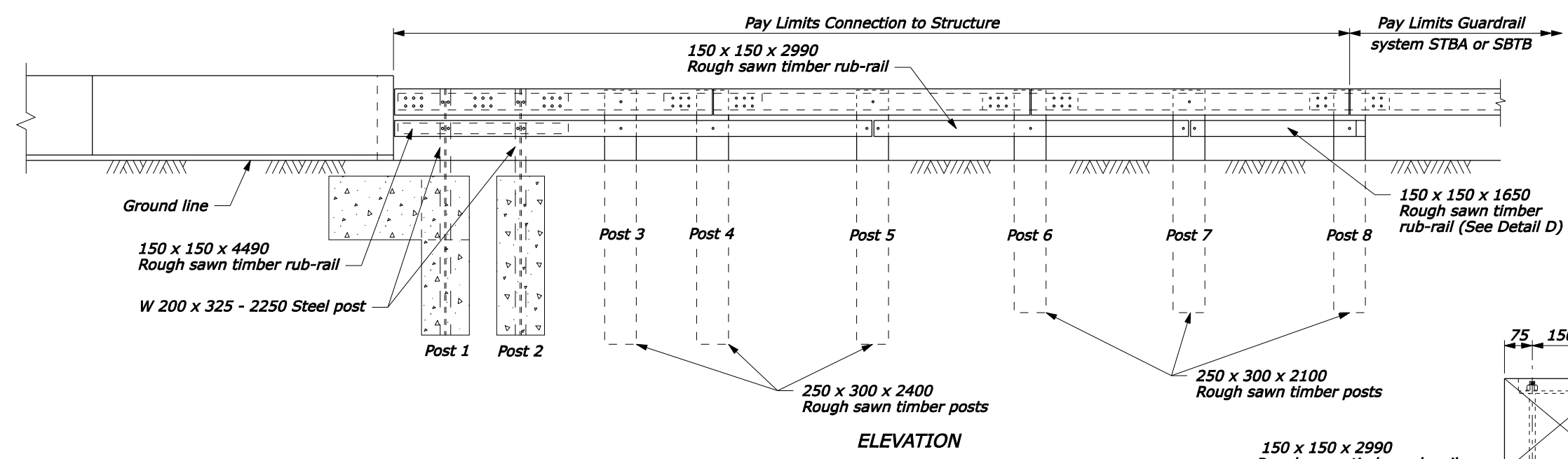
**RUB-RAIL TRANSITION SECTION**  
4" x 3/8" x 5'-4 1/2"

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD <b>STEEL-BACKED TIMBER GUARDRAIL TL-2 TRANSITION TO STRAIGHT OR CURVED-END STRUCTURE</b> Sheet 3 of 3	
STANDARD APPROVED FOR USE --/----	STANDARD 617-67
REVISED: DRAFT: 3/2008	



- NOTE:**
1. See the following sheets for Sections A-A through C-C, steel rail layouts, and other details.
  2. Use weathering steel for all structural steel and fastener hardware.
  3. Transition shown for curved end structure. For transition to a straight parapet end, install the timber rail so that the face of the timber rail is offset 25 mm towards the roadway.
  4. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are not available.
  5. Dimensions without units are millimeters.



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

METRIC STANDARD

**STEEL-BACKED TIMBER GUARDRAIL  
TL-2 TRANSITION TO STRAIGHT  
OR CURVED-END STRUCTURE**

Sheet 1 of 3

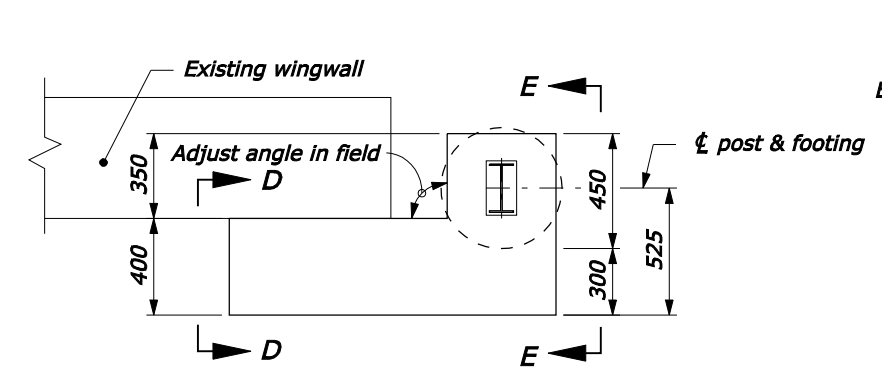
STANDARD APPROVED FOR USE --/----

REVIS: DRAFT: 5/2008

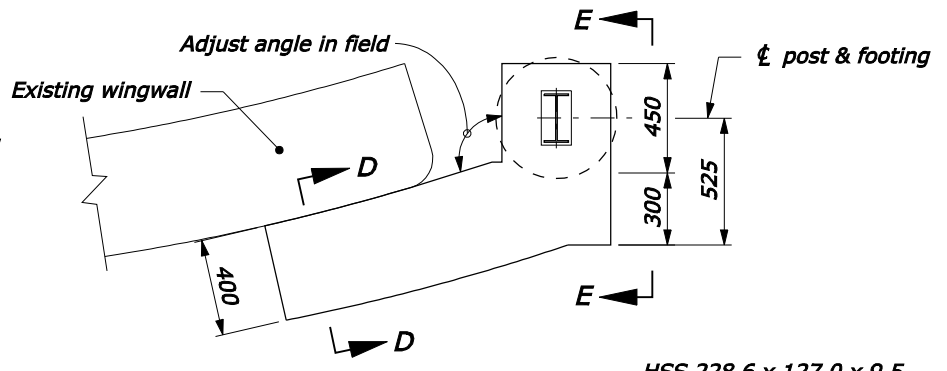
STANDARD M617-67

NO SCALE

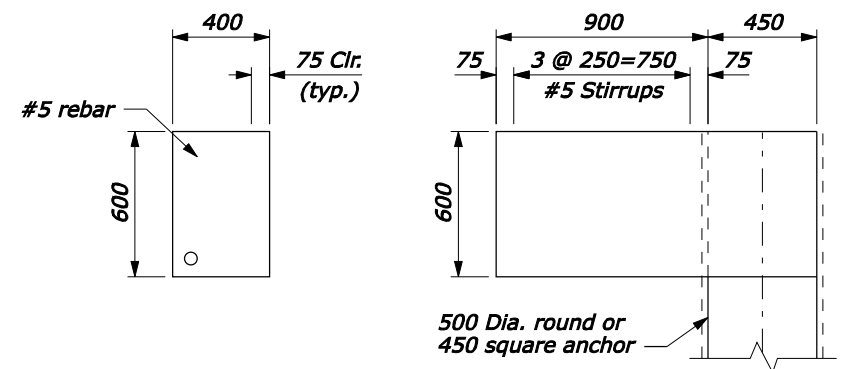
05-May-2008 03:24 PM  
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**NON-FLARED WINGWALL**

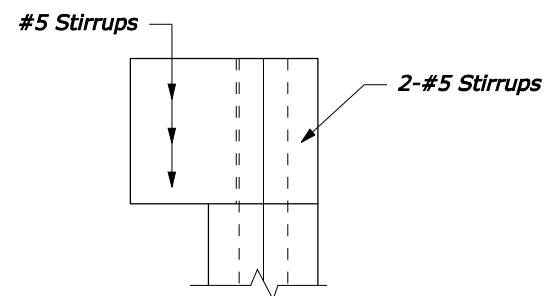


**FLARED WINGWALL**



SECTION D-D

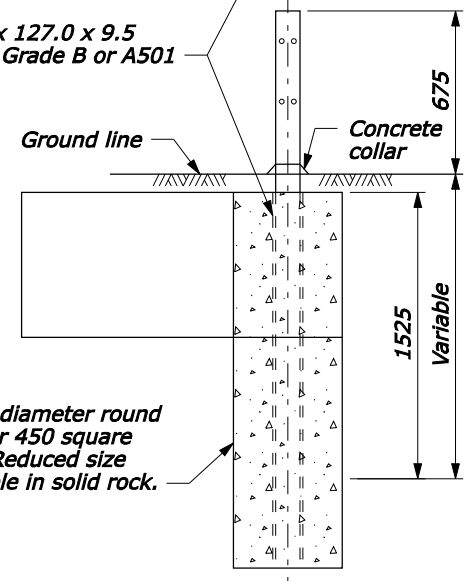
ELEVATION



SECTION E-E

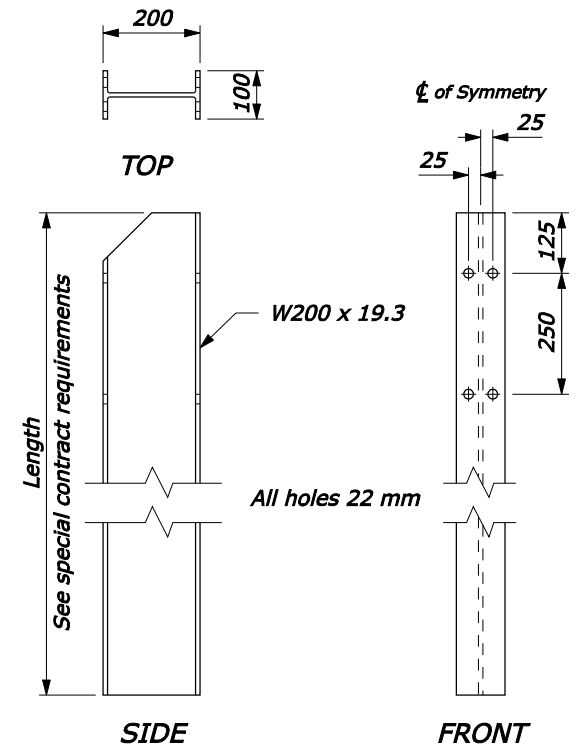
**CONNECTION TO CONCRETE ANCHOR**

HSS 228.6 x 127.0 x 9.5  
ASTM A500 Grade B or A501



Use 500 diameter round anchor or 450 square anchor. Reduced size acceptable in solid rock.

**CONCRETE ANCHOR FOR GUARDRAIL POST**

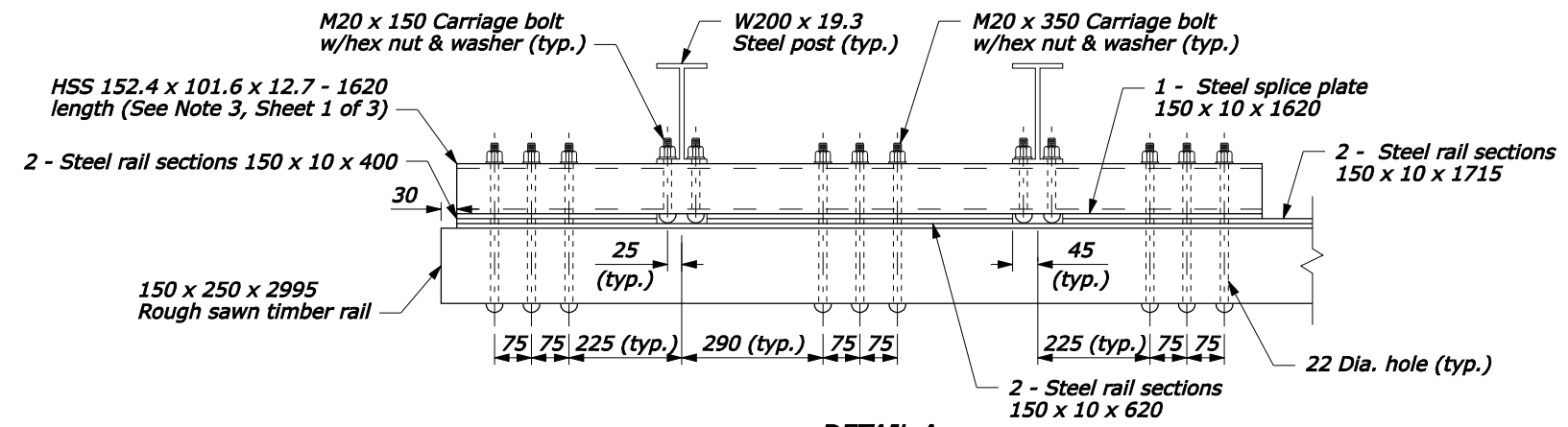


TOP

SIDE

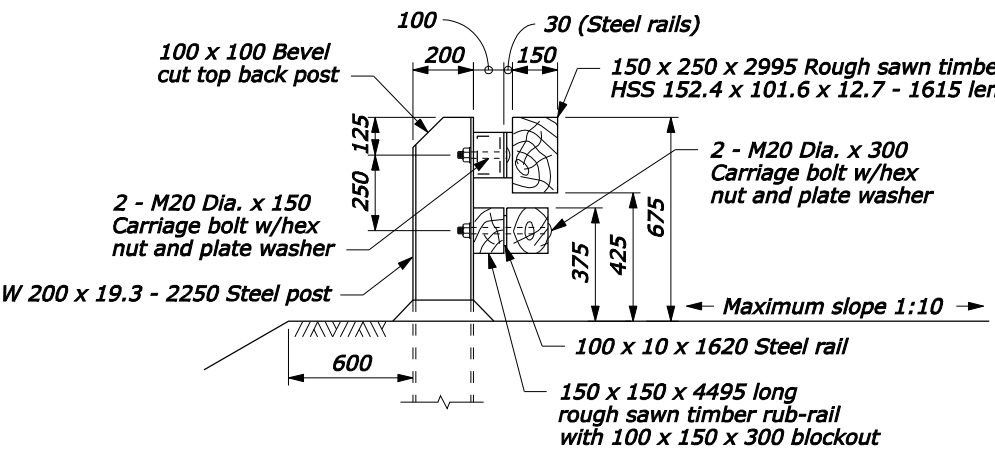
FRONT

**STEEL POST**

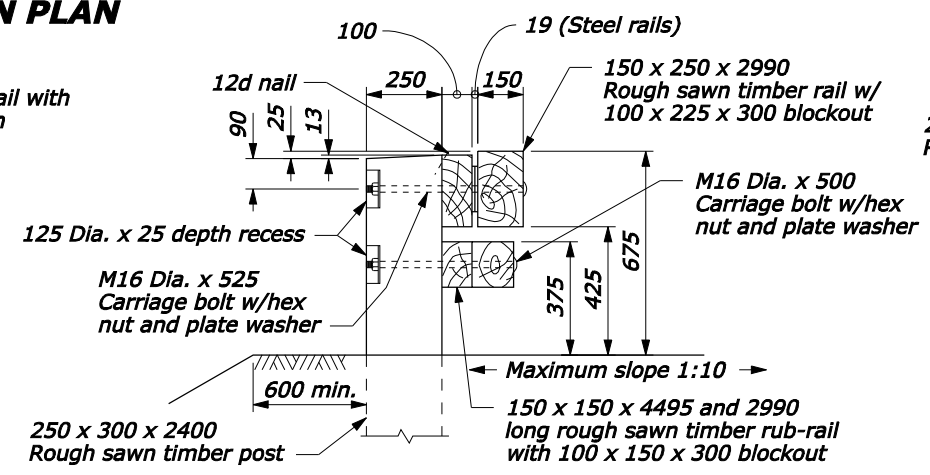


DETAIL A

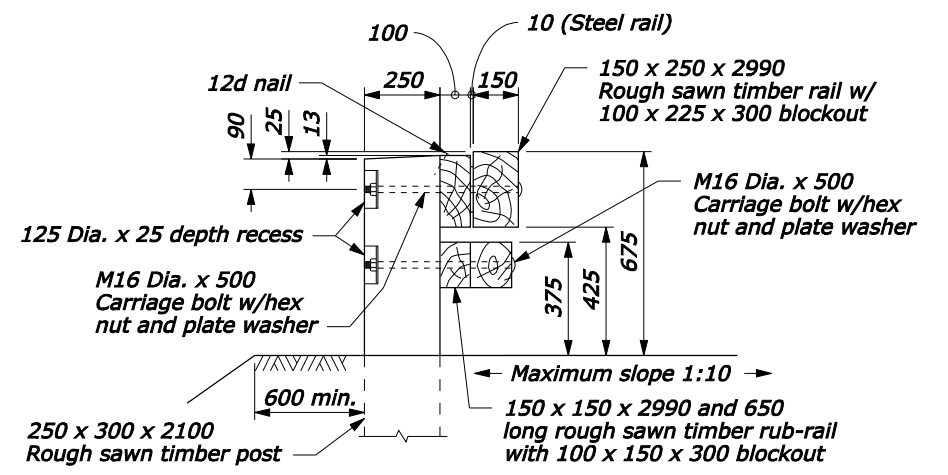
**POST CONNECTION PLAN**



SECTION A-A



SECTION B-B



SECTION C-C

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

METRIC STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
TL-2 TRANSITION TO STRAIGHT  
OR CURVED-END STRUCTURE**  
Sheet 2 of 3

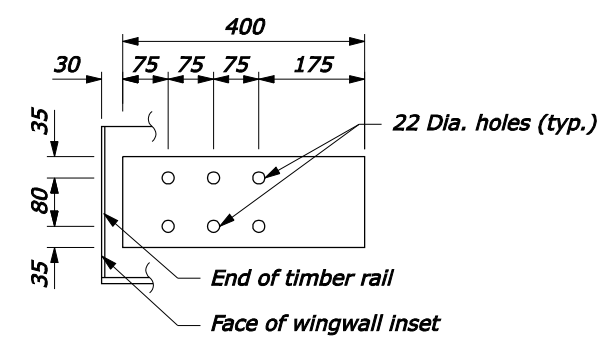
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REVISID: 3/2008  
DRAFT: 3/2008

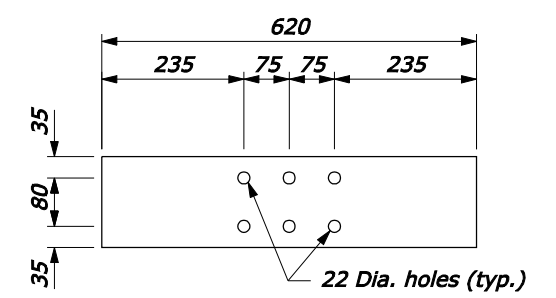
STANDARD  
M617-67

NO SCALE

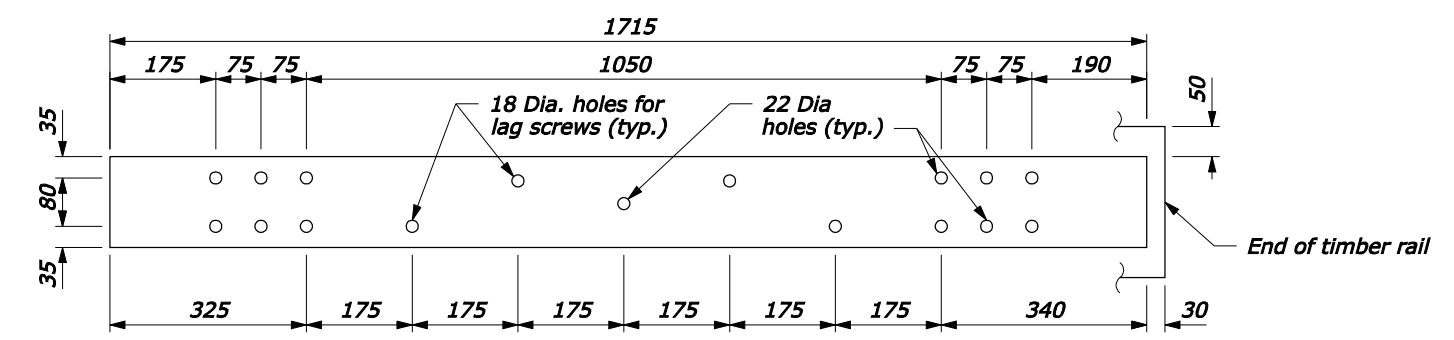
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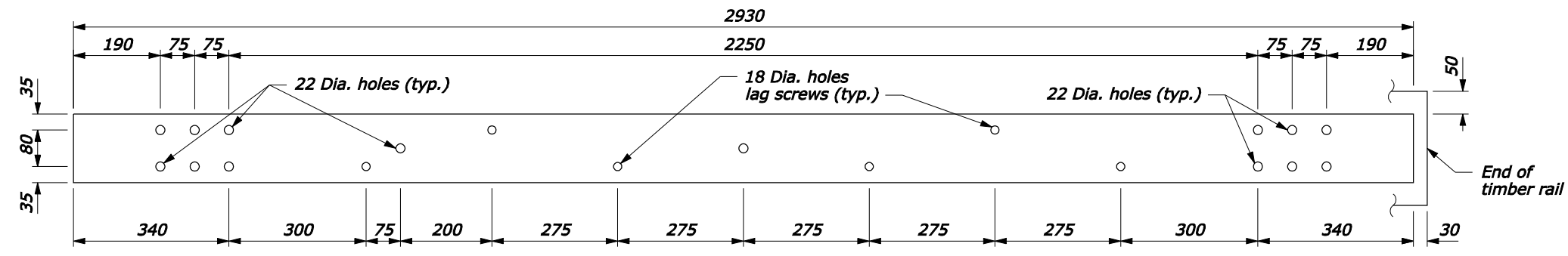
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150 x 10 x 400



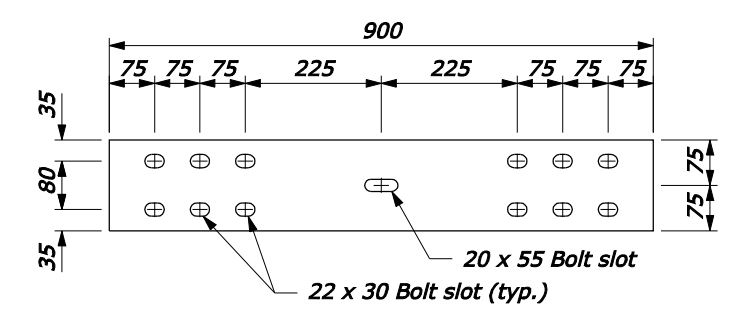
**TERMINAL SECTION**  
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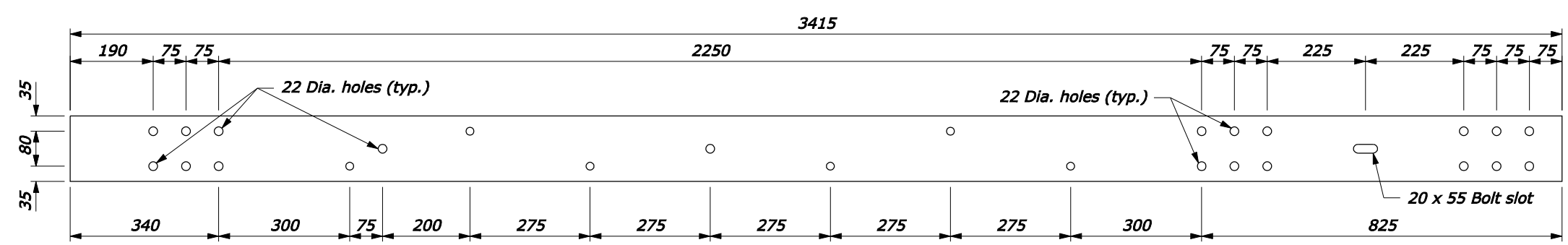
**TERMINAL SECTION**  
150 x 10 x 1715



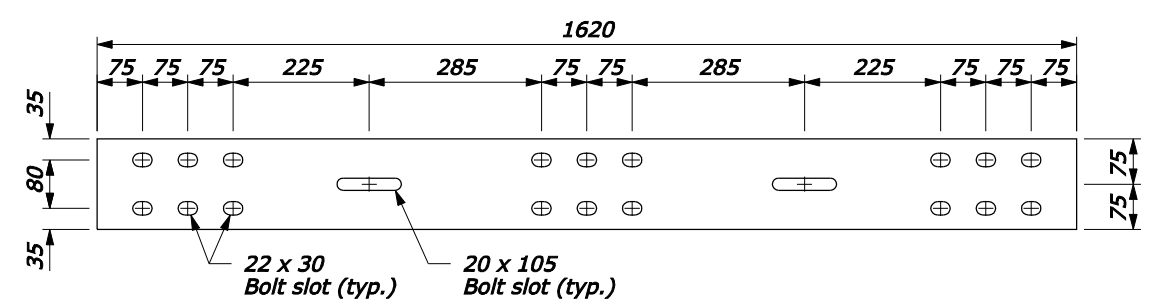
**TRANSITION SECTION**  
150 x 10 x 2930



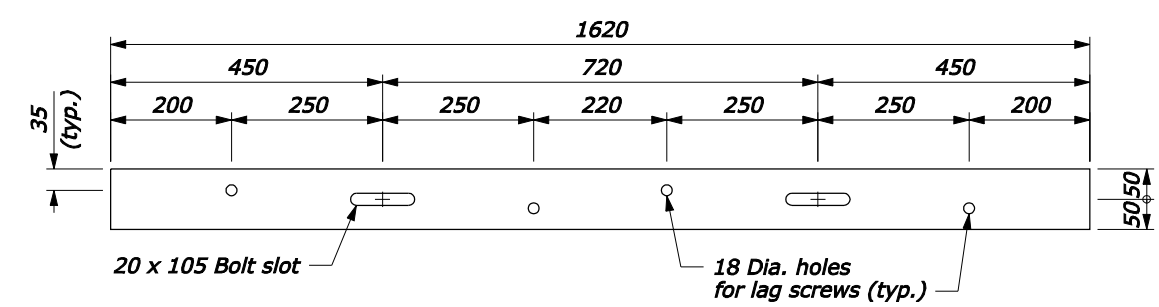
**STEEL SPLICE PLATE**  
150 x 10 x 900



**TRANSITION SECTION**  
150 x 10 x 3415



**STEEL SPLICE PLATE**  
150 x 10 x 1620



**RUB-RAIL TRANSITION SECTION**  
100 x 10 x 1620

NO SCALE

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

METRIC STANDARD  
**STEEL-BACKED TIMBER GUARDRAIL  
TL-2 TRANSITION TO STRAIGHT  
OR CURVED-END STRUCTURE**  
Sheet 3 of 3

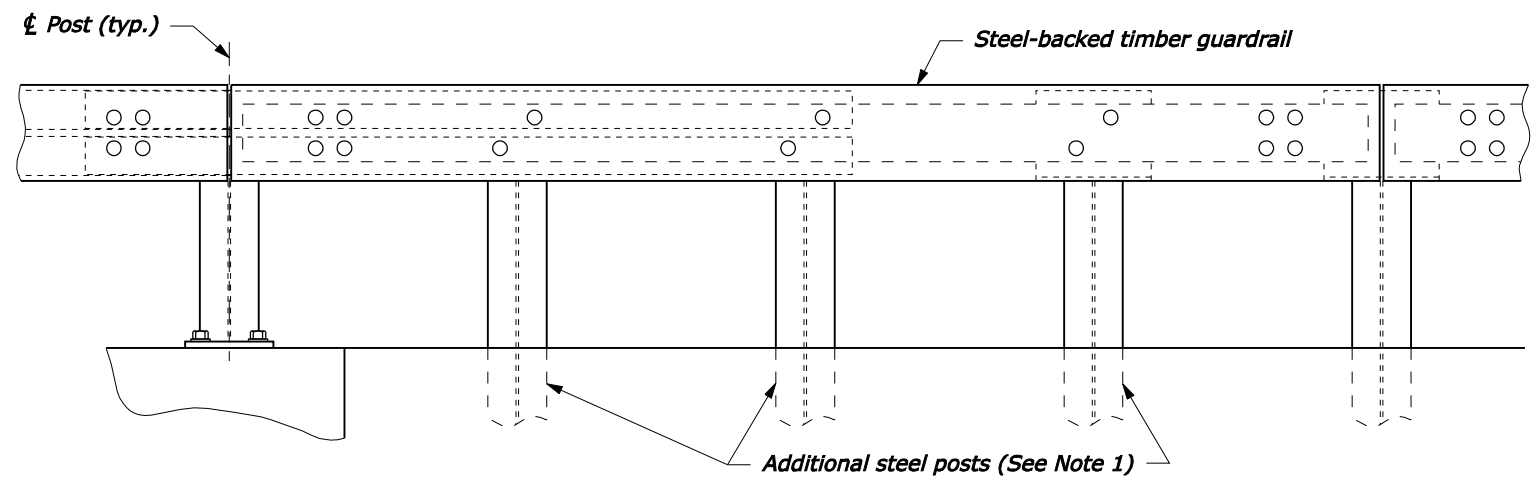
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REVISI  
DRAFT: 3/2008

STANDARD  
M617-67

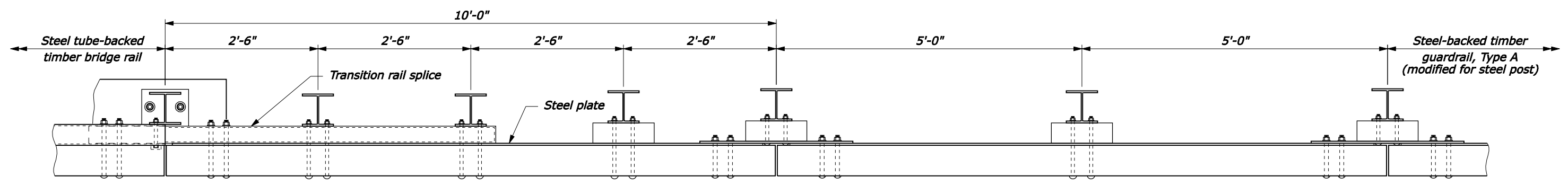
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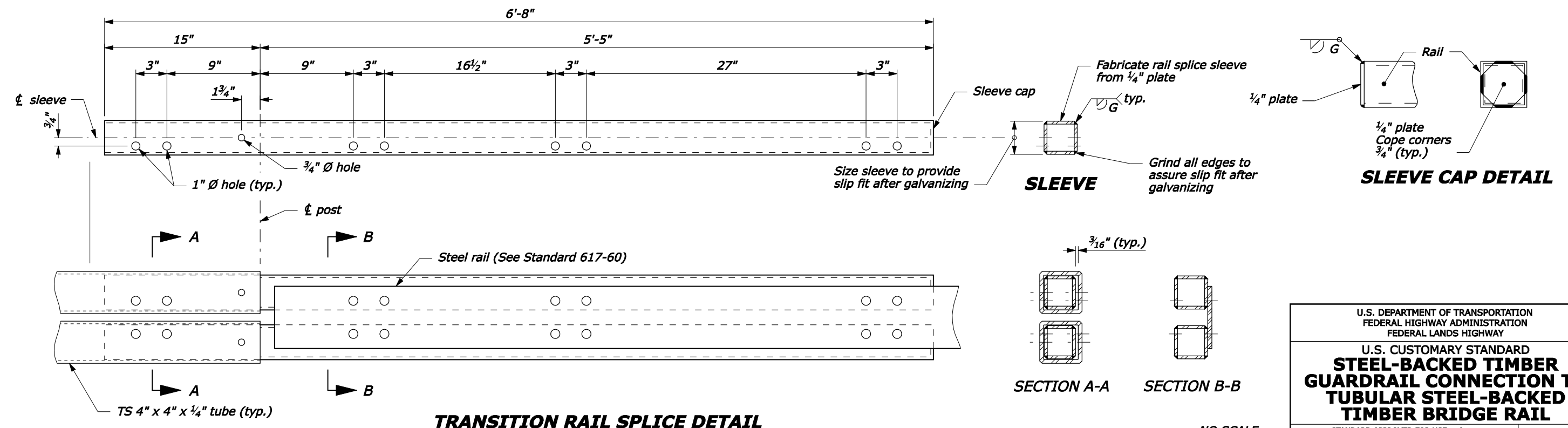


**RAIL TRANSITION ELEVATION**

**NOTE:**  
 1. At each additional post provide 2 5/8" Ø round head square neck bolts with plate washer and hex nut, a 3/4" x 2 1/2" slot in steel plate, and 3/4" Ø holes in timber rail, steel post, and timber block. See Standard 617-60, Steel-backed timber guardrail, Type A (modified for steel post).



**RAIL TRANSITION PLAN**



**TRANSITION RAIL SPLICE DETAIL**

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

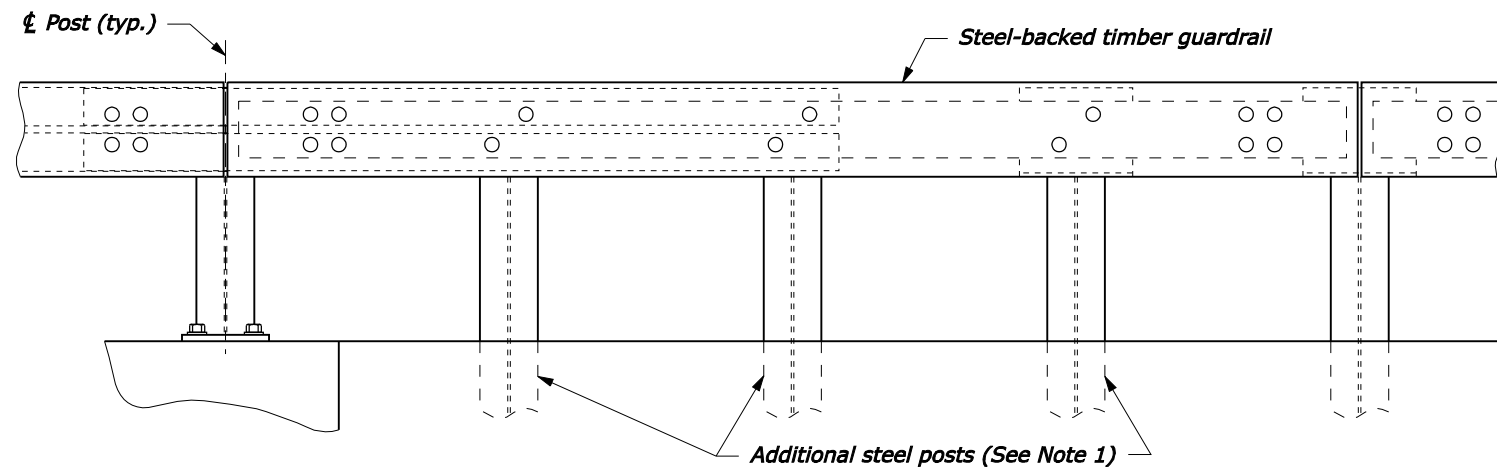
U.S. CUSTOMARY STANDARD  
**STEEL-BACKED TIMBER  
 GUARDRAIL CONNECTION TO  
 TUBULAR STEEL-BACKED  
 TIMBER BRIDGE RAIL**

STANDARD APPROVED FOR USE --/----

REVISID: DRAFT: 12/2007

STANDARD  
 617-68

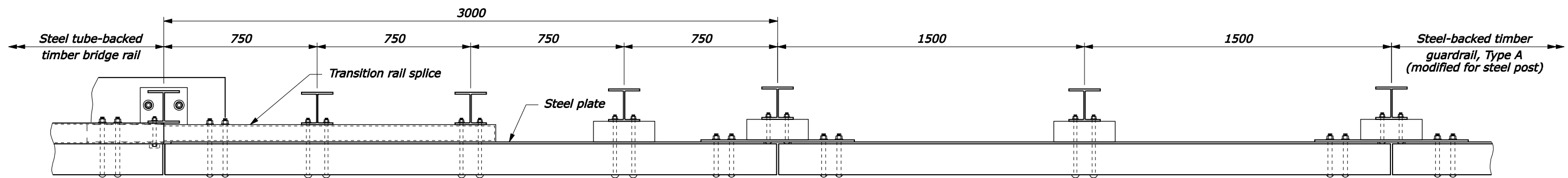
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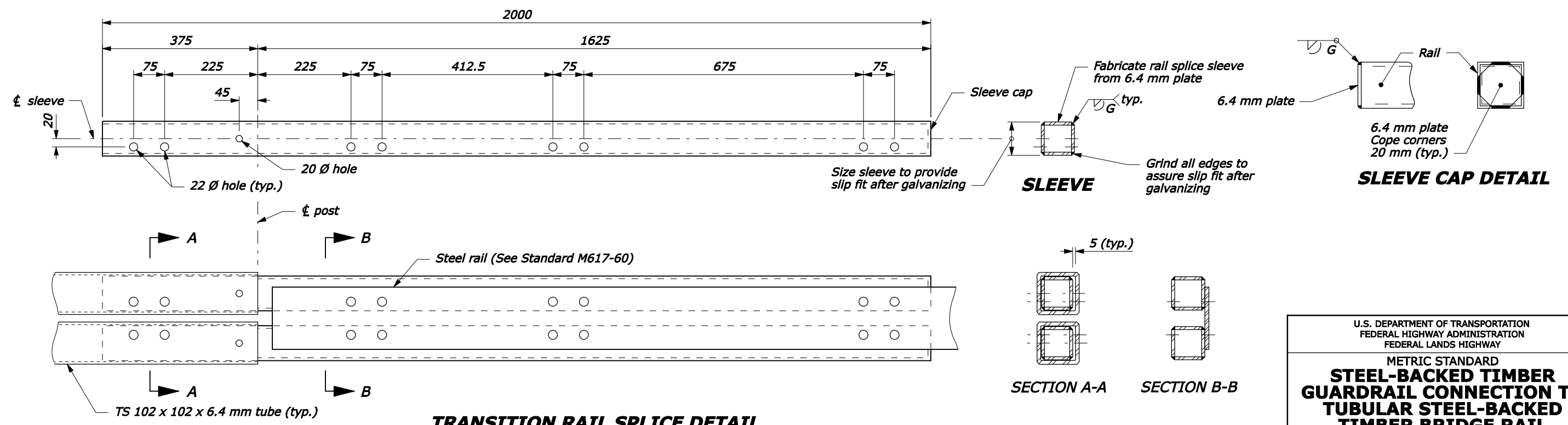
**RAIL TRANSITION ELEVATION**

**NOTE:**

1. At each additional post provide 2-M16 round head square neck bolts with plate washer and hex nut, a 20 x 60 slot in steel plate, and 18 mm Ø holes in timber rail, steel post, and timber block. See Standard M617-60, Steel-backed timber guardrail, Type A (modified for steel post).
2. Dimensions without units are millimeters.



**RAIL TRANSITION PLAN**



**TRANSITION RAIL SPLICE DETAIL**

**SLEEVE**

**SLEEVE CAP DETAIL**

**SECTION A-A**

**SECTION B-B**

NO SCALE

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

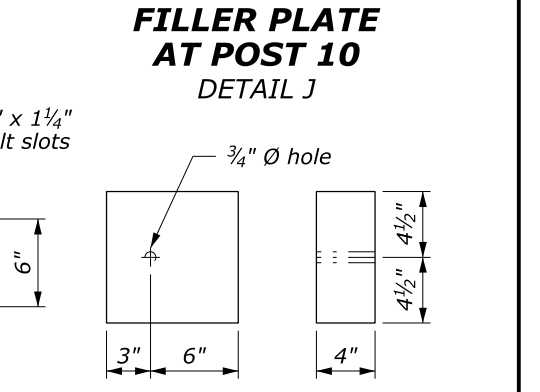
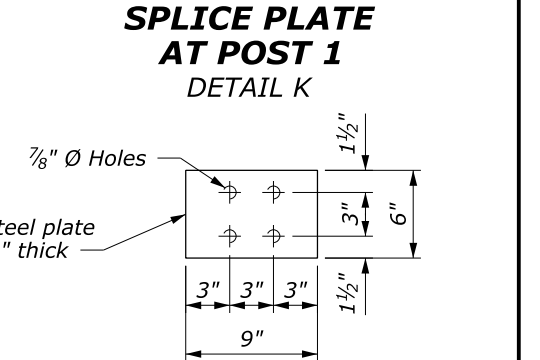
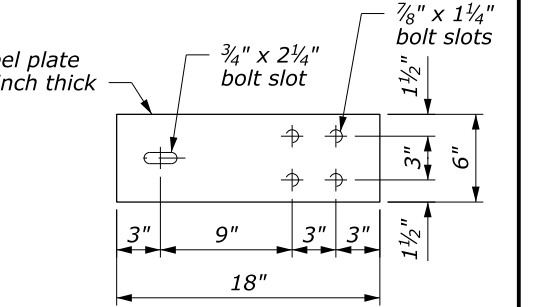
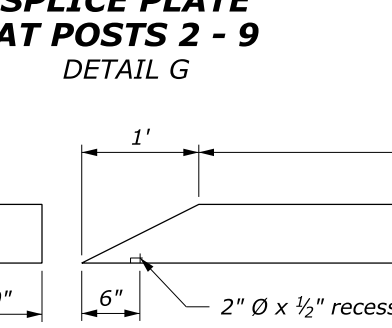
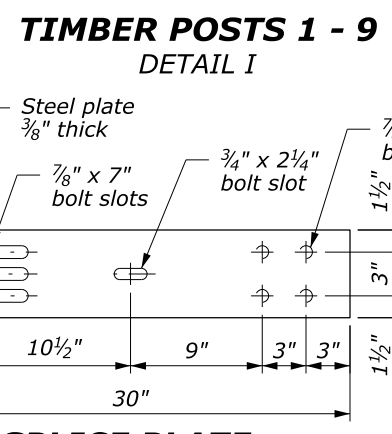
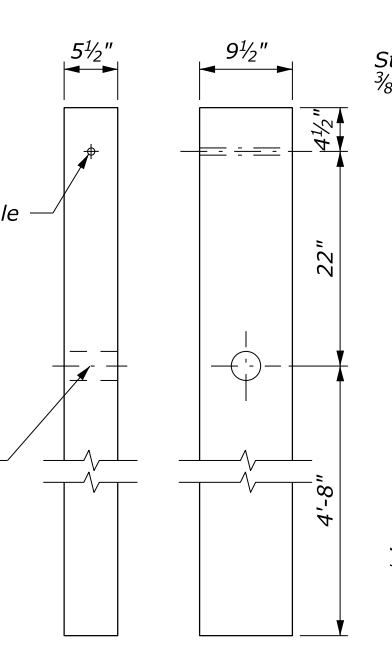
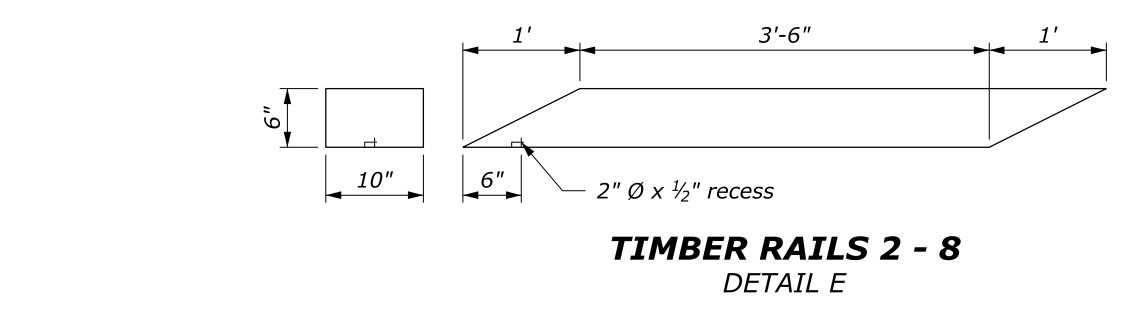
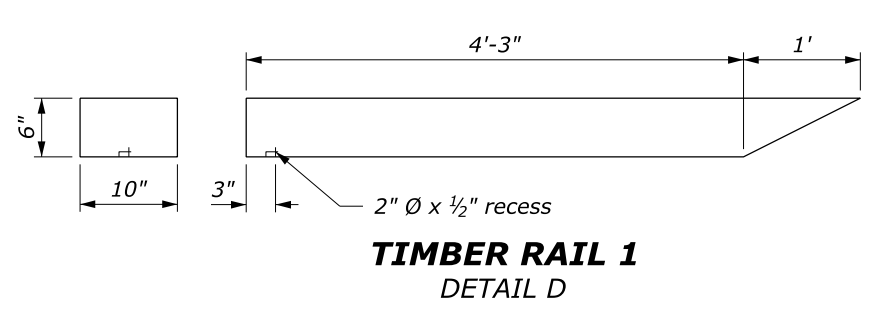
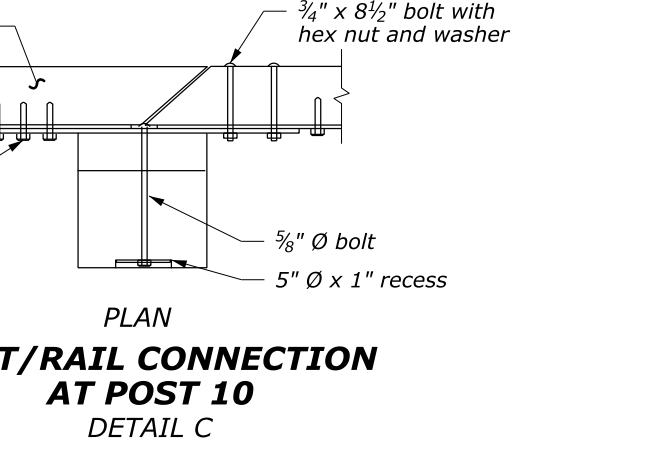
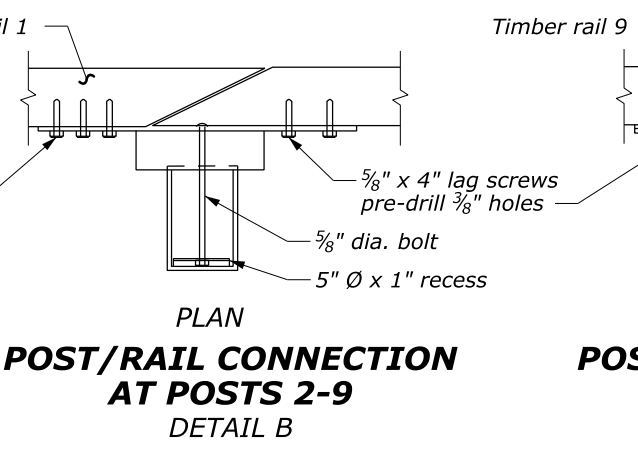
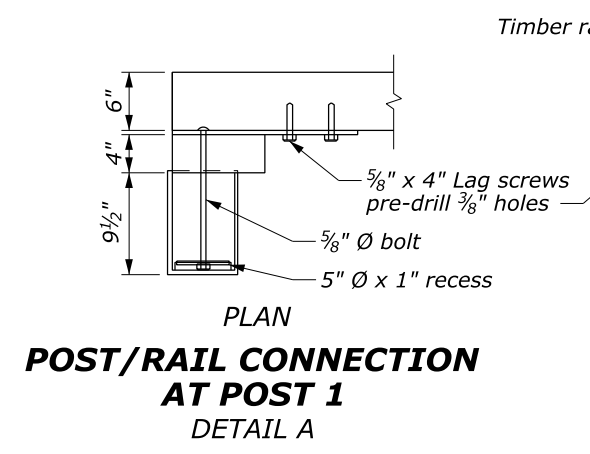
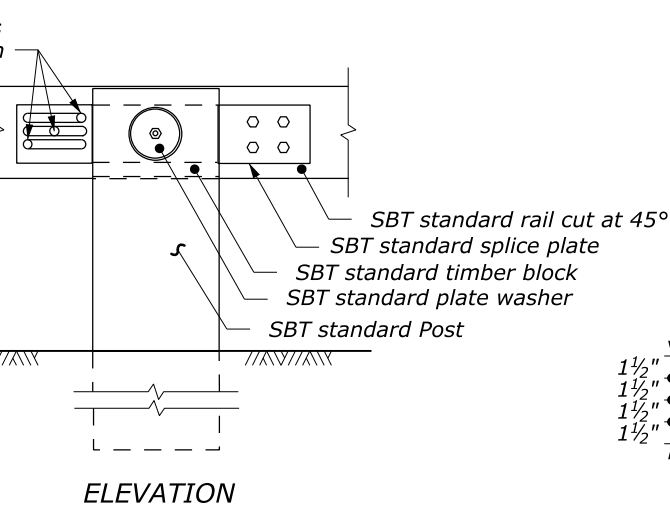
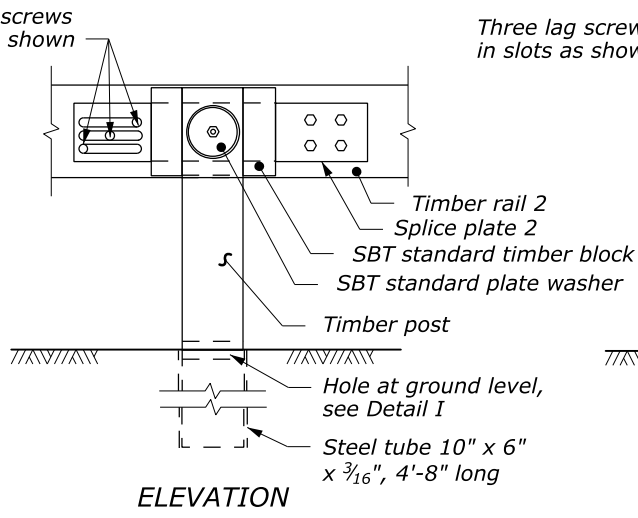
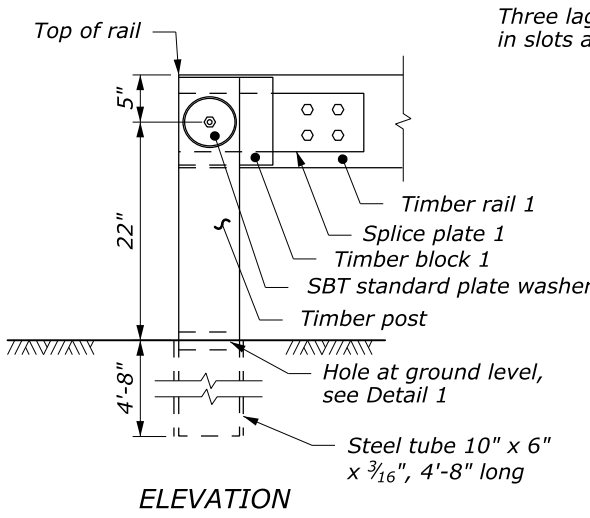
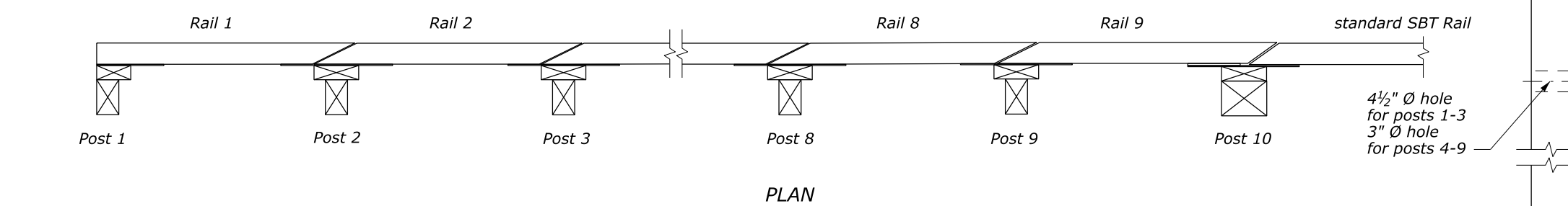
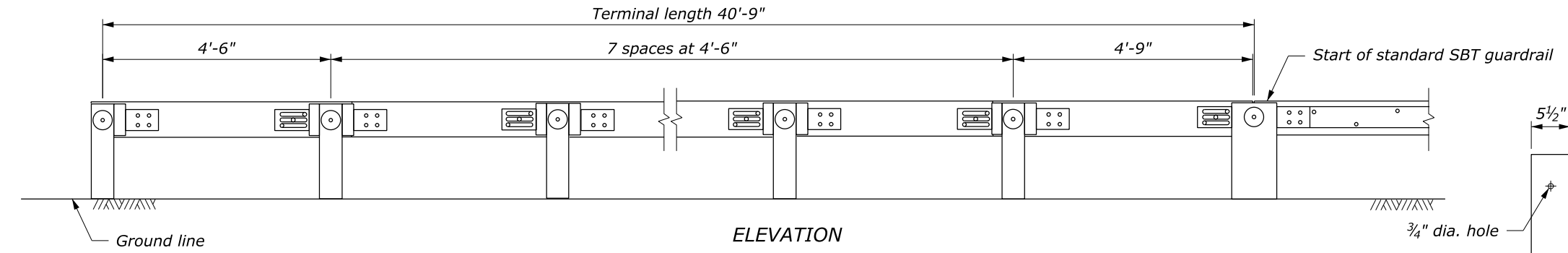
METRIC STANDARD  
**STEEL-BACKED TIMBER  
 GUARDRAIL CONNECTION TO  
 TUBULAR STEEL-BACKED  
 TIMBER BRIDGE RAIL**

STANDARD APPROVED FOR USE --/----

REVISED: 12/2007  
 DRAFT: 12/2007

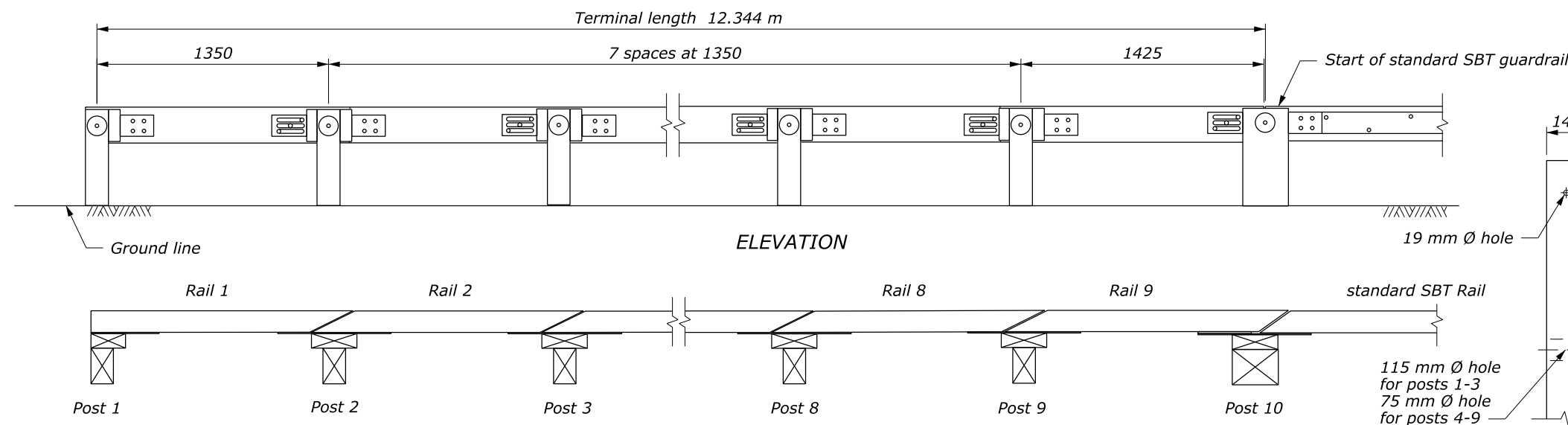
STANDARD  
**M617-68**

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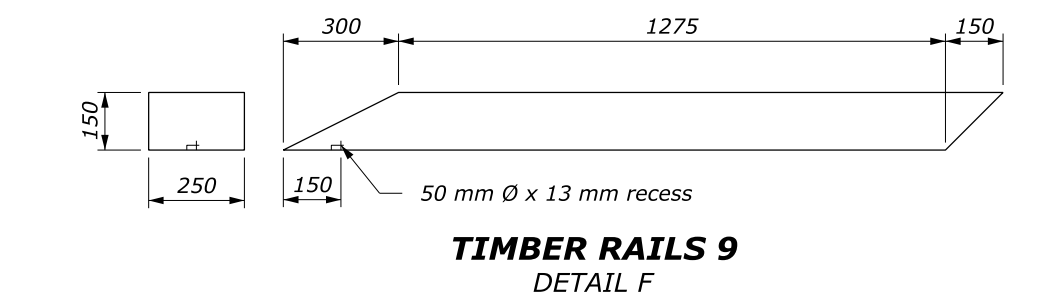
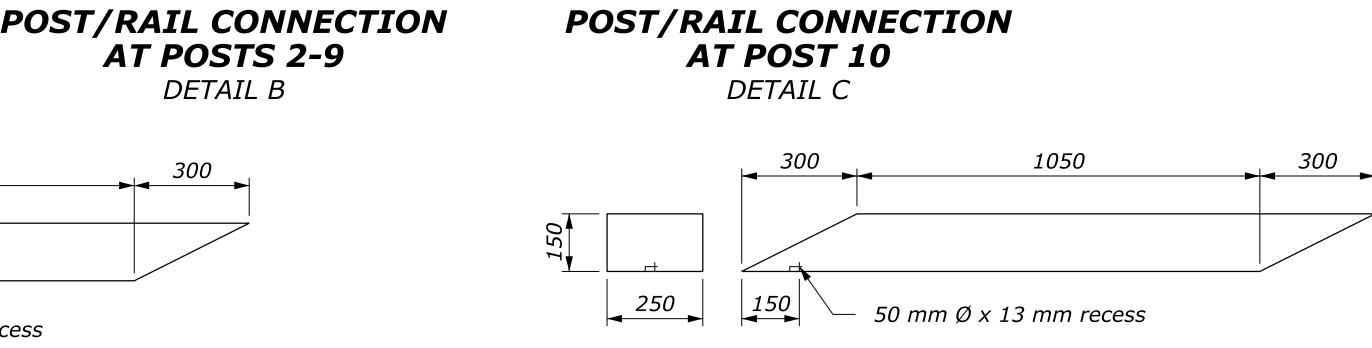
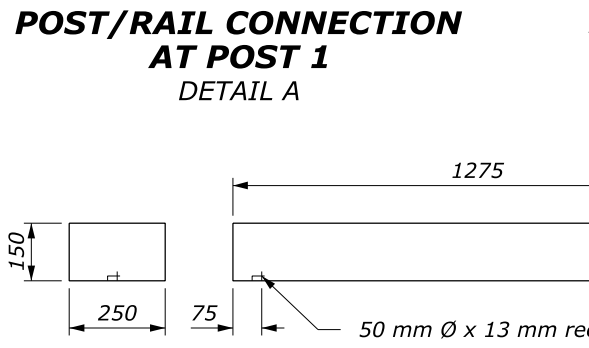
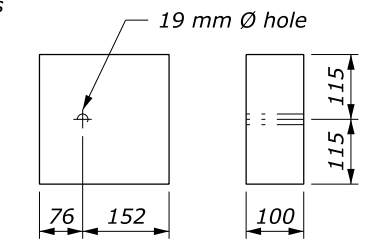
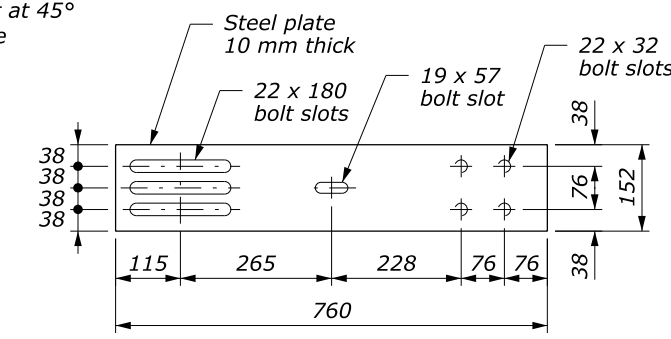
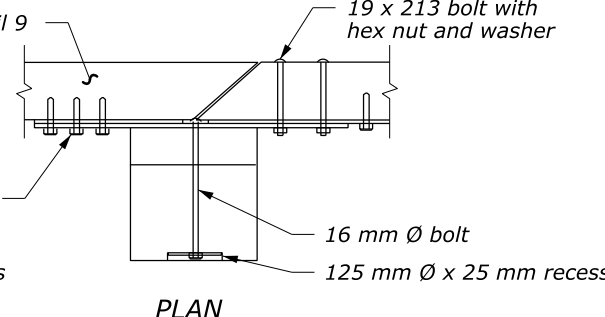
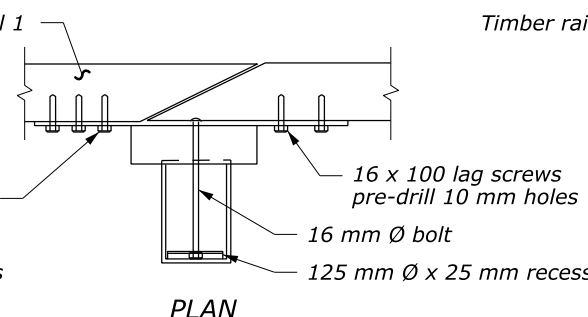
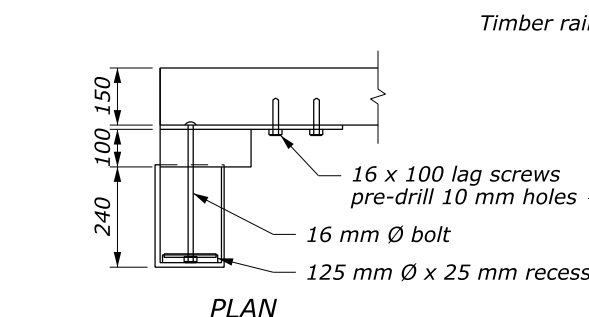
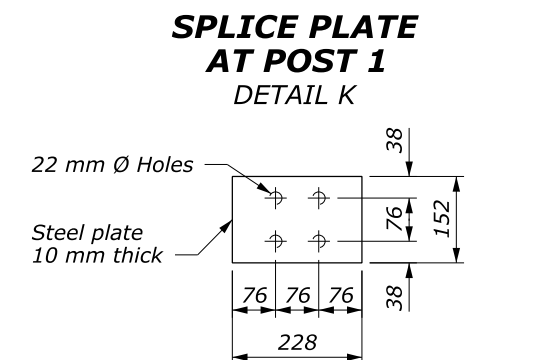
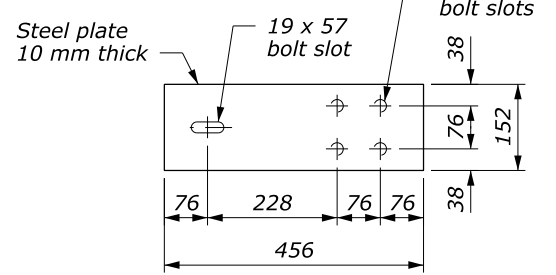
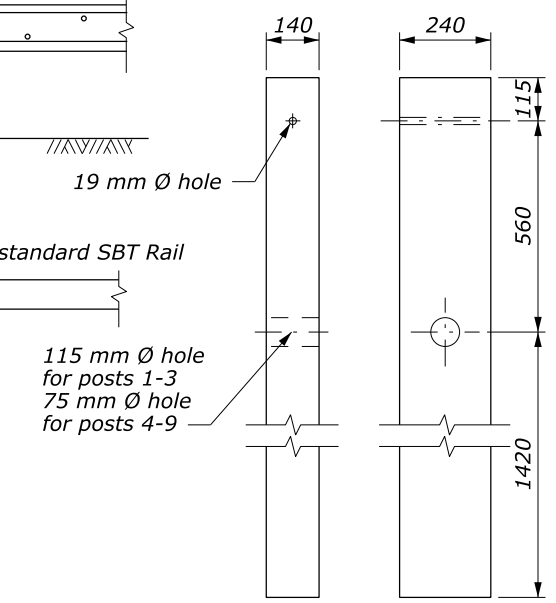
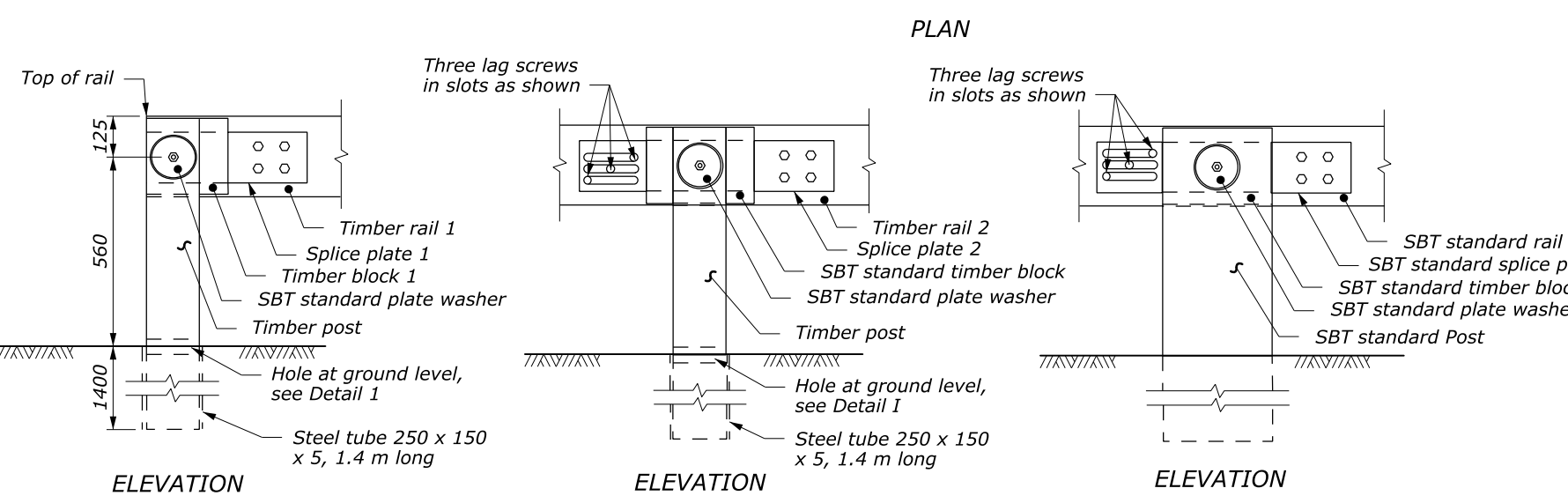


U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION FEDERAL LANDS HIGHWAY	
U.S. CUSTOMARY STANDARD <b>TL-2 END TERMINAL FOR STEEL-BACKED TIMBER GUARDRAIL</b>	
STANDARD APPROVED FOR USE --/--	STANDARD
REVISED: DRAFT: 9/2011	617-69

NO SCALE



**NOTE:**  
 1. Dimensions without units are millimeters.



U.S. DEPARTMENT OF TRANSPORTATION  
 FEDERAL HIGHWAY ADMINISTRATION  
 FEDERAL LANDS HIGHWAY  
 METRIC STANDARD  
**TL-2 END TERMINAL FOR STEEL-BACKED TIMBER GUARDRAIL**  
 STANDARD APPROVED FOR USE --/--  
 REVISED: 9/2011  
 DRAFT: 9/2011  
 STANDARD M617-69

NO SCALE