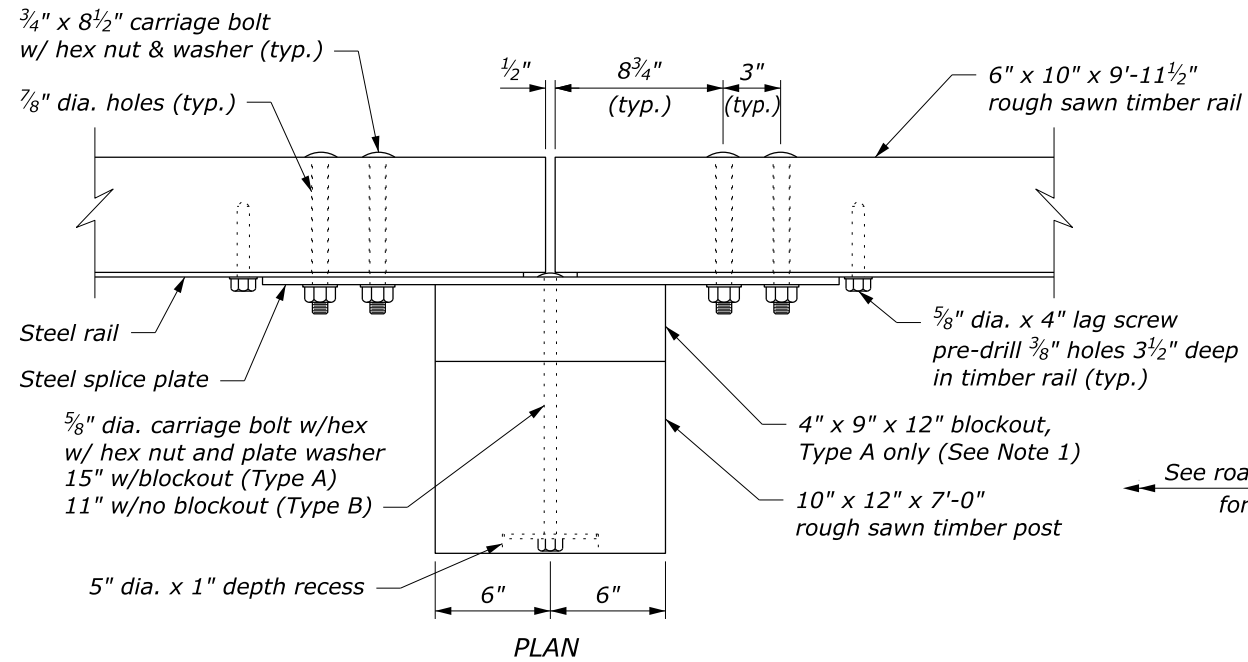


STEEL RAIL

NOTE:

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



STEEL SPLICE PLATE

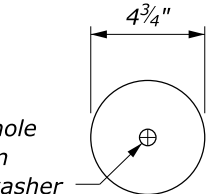
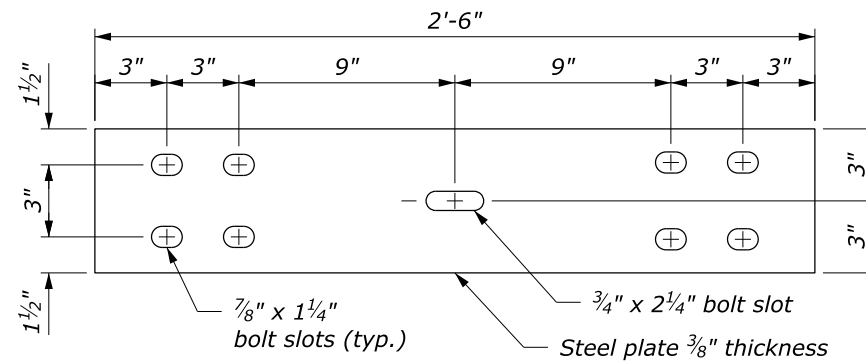
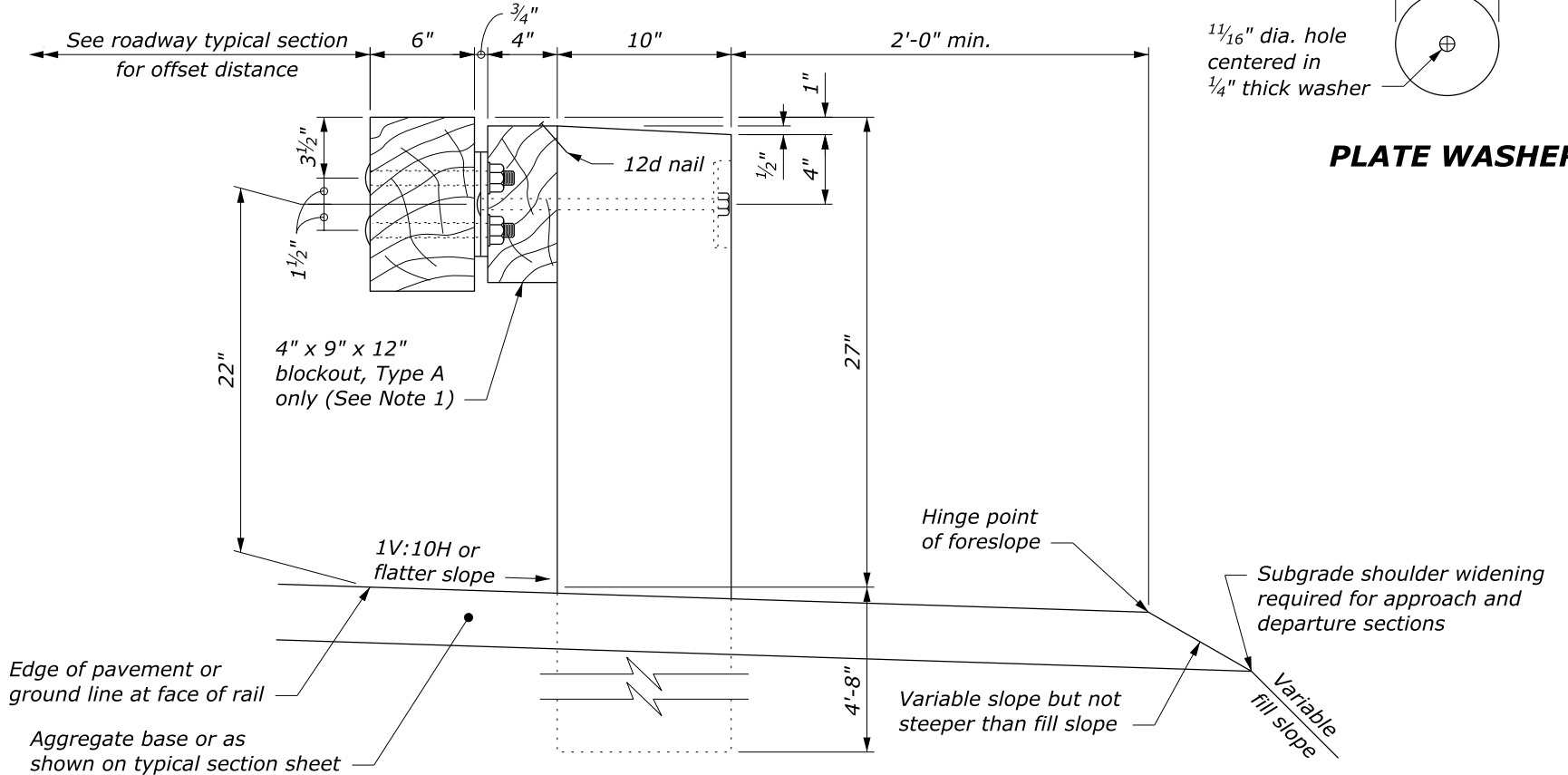
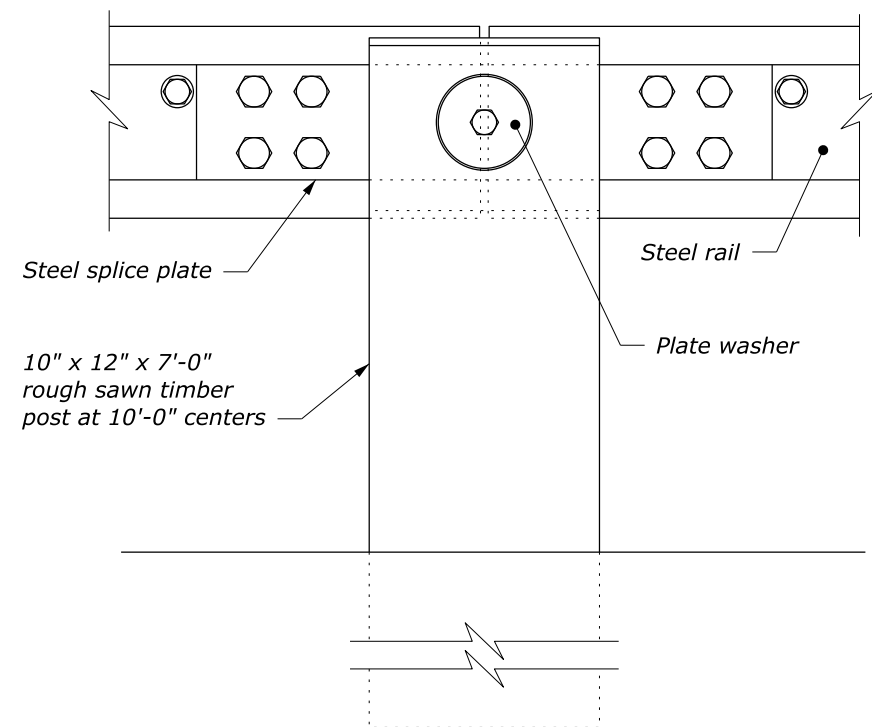


PLATE WASHER



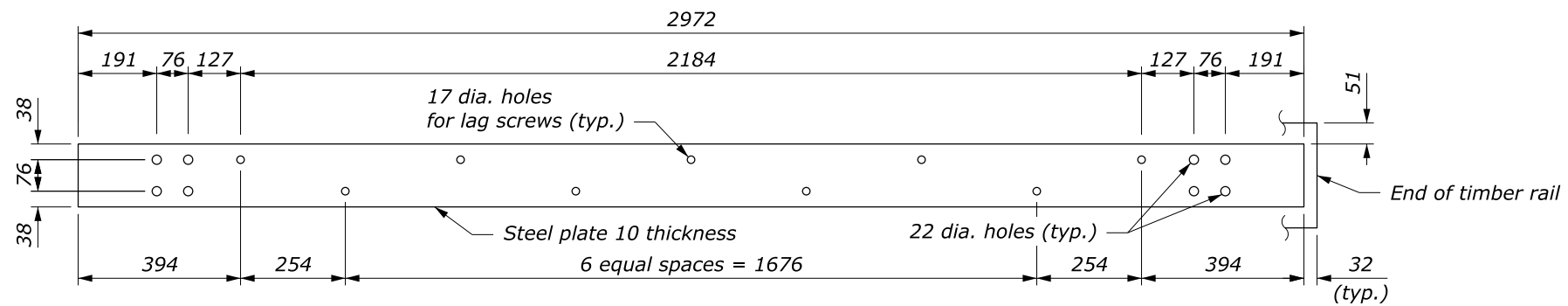
TYPICAL GUARDRAIL CROSS SECTION



POST CONNECTION

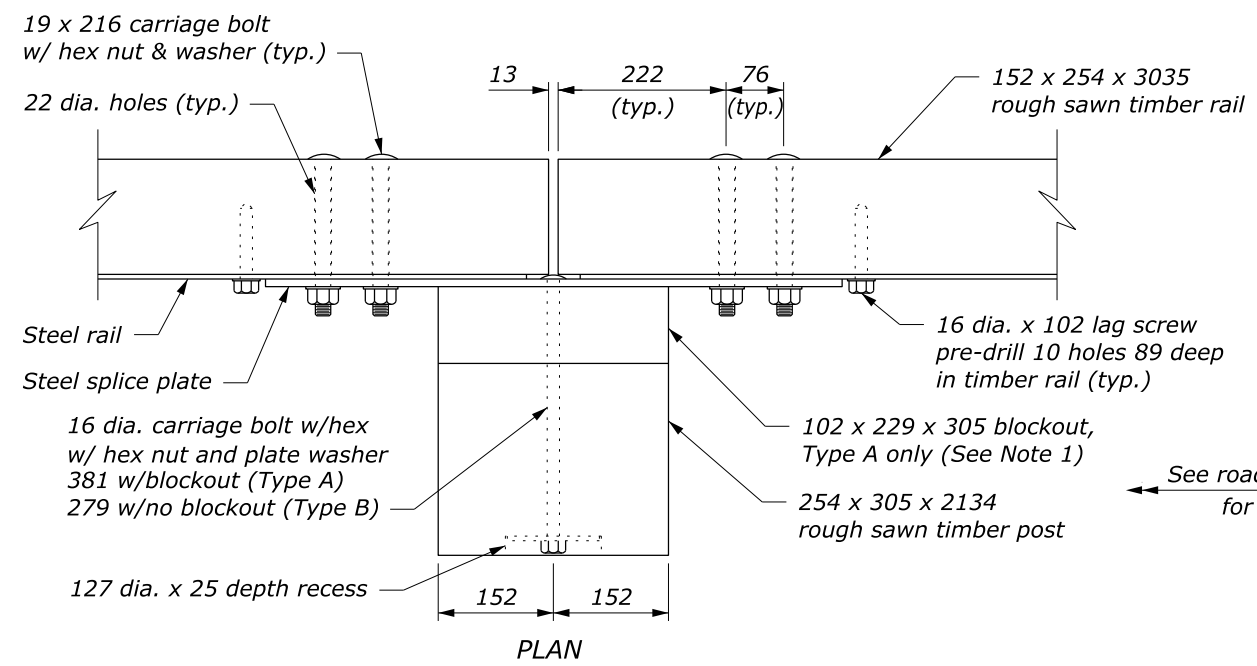
NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD 617-60
STEEL-BACKED TIMBER GUARDRAIL TYPE A & TYPE B	SPECIFICATION FP-14, FP-24
	APPROVED FOR USE 2/2024

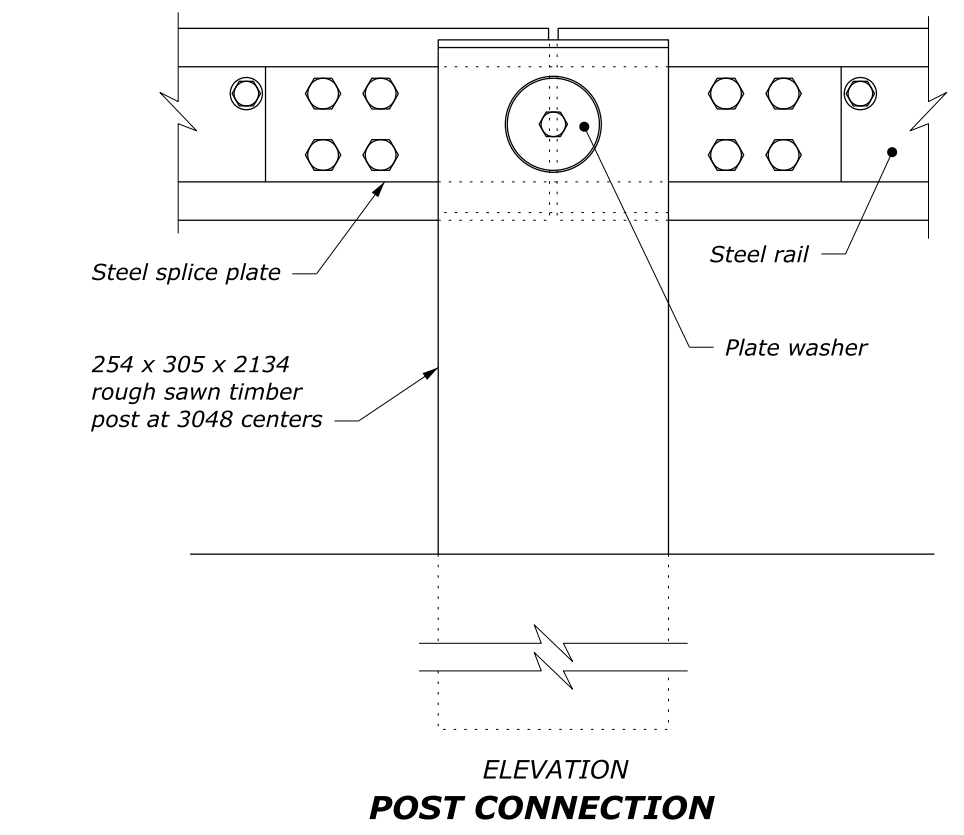


STEEL RAIL

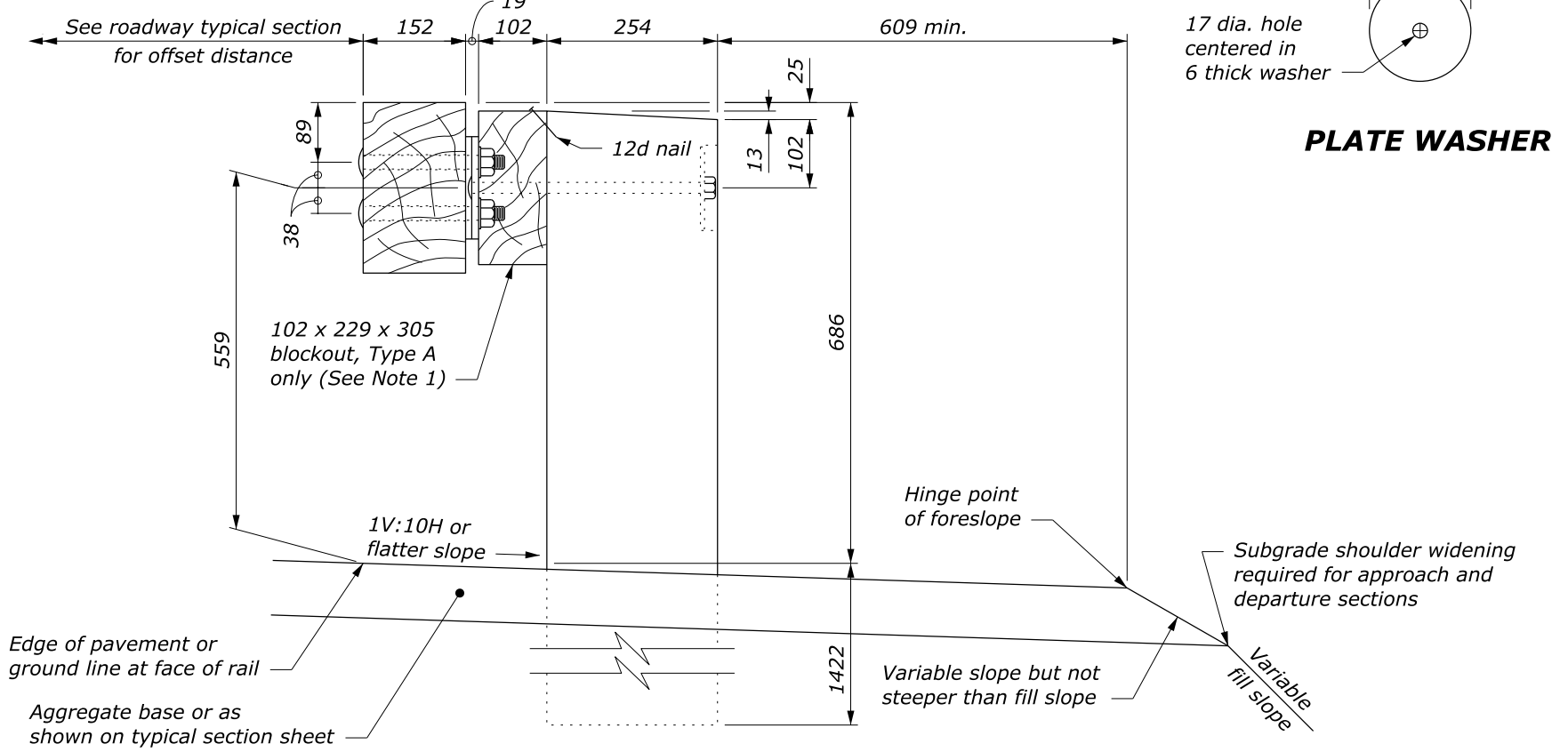
- NOTE:**
1. Use the Type A, blocked-out, system or the Type B, non-blocked-out, system as specified.
 2. Use weathering steel for all structural steel and fastener hardware.
 3. Place a terminal (see Standards M617-61 and M617-62) on both approach and trailing ends of barrier installations.
 4. Provide hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are unavailable.



STEEL SPLICE PLATE



POST CONNECTION



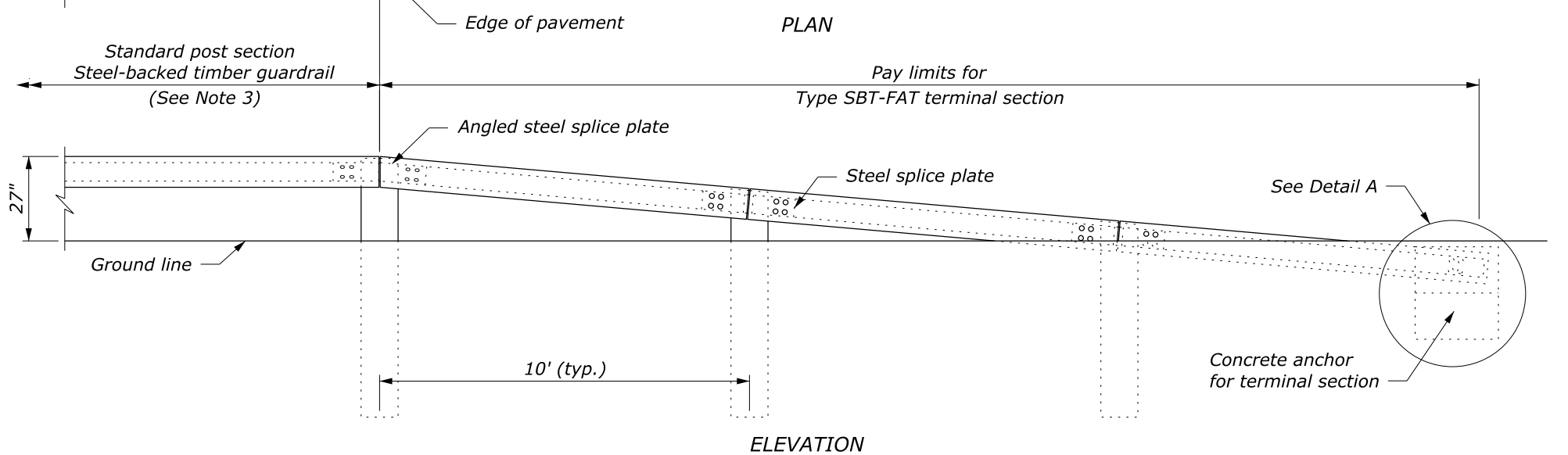
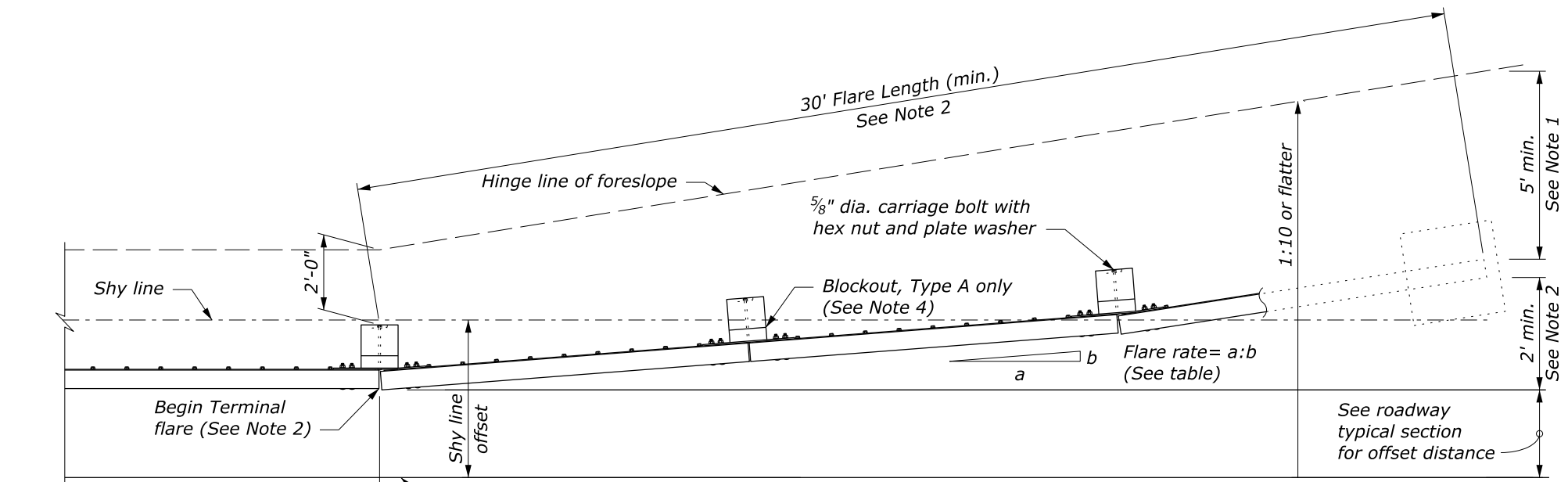
TYPICAL GUARDRAIL CROSS SECTION

This drawing contains **Metric** units of measure. Dimensions without units are millimeters.

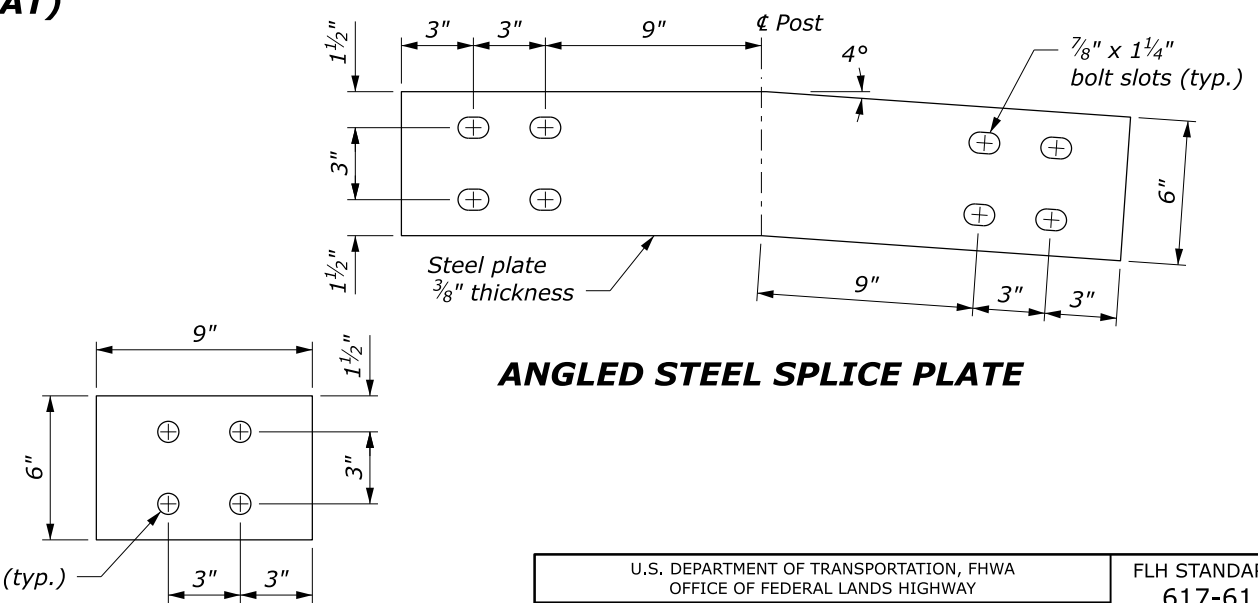
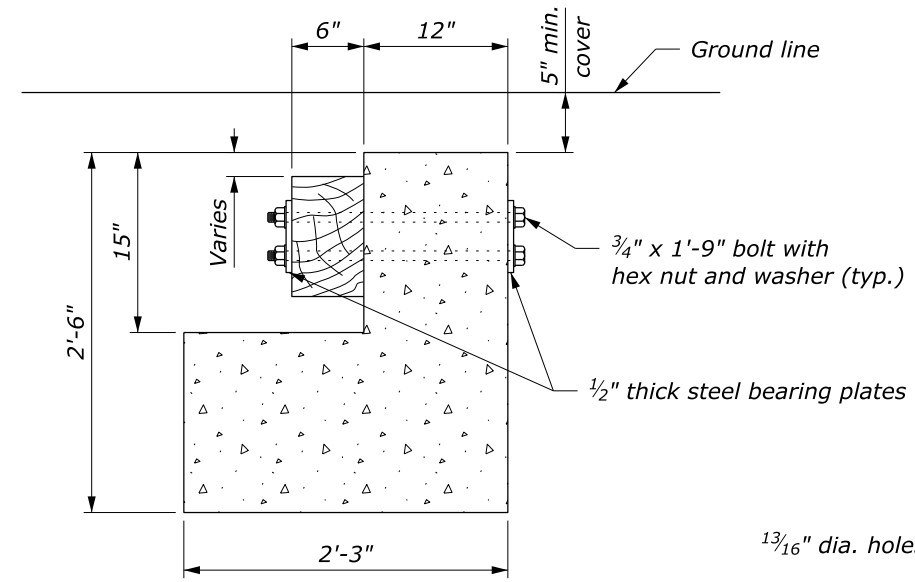
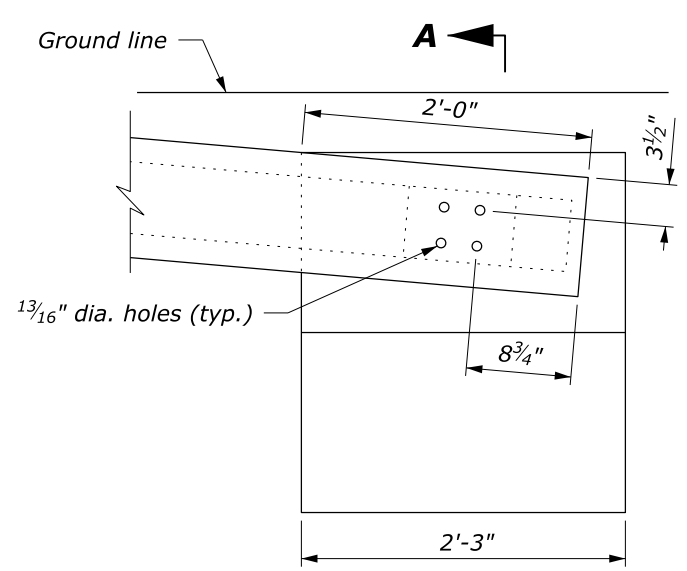
U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-60
STEEL-BACKED TIMBER GUARDRAIL TYPE A & TYPE B	SPECIFICATION FP-14, FP-24
	APPROVED FOR USE 2/2024

NO SCALE

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APPROACH & DEPARTURE FLARE WITH FLARED ANCHOR TERMINAL (FAT)



ANGLED STEEL SPLICE PLATE

STEEL BEARING PLATE

NO SCALE

NOTE:

1. Extend the fill widening a minimum of 5 feet behind the guardrail, unless otherwise directed.
2. The guardrail flare shown in the plan view is the minimum length and rate required. As directed 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 Rate 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 blockouts in terminal section, except on the concrete anchor. For the Type B, non-blocked-out guardrail, no blockouts are included.

GUARDRAIL FLARE RATE			
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	4.0	13:1	7:1

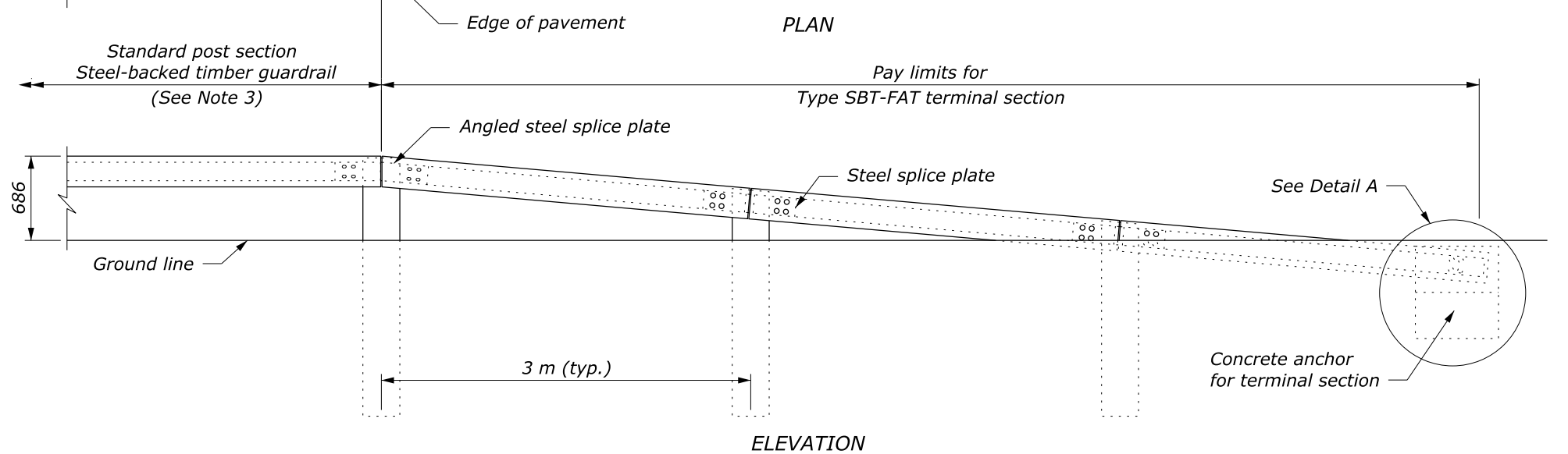
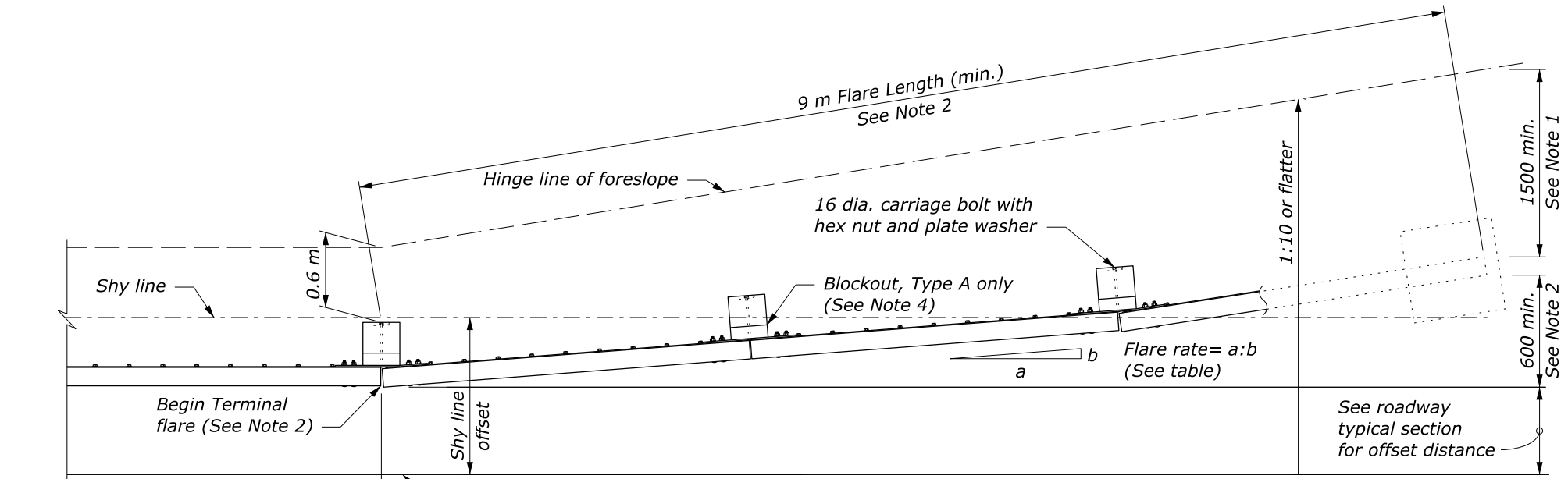
U.S. DEPARTMENT OF TRANSPORTATION, FHWA
OFFICE OF FEDERAL LANDS HIGHWAY

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

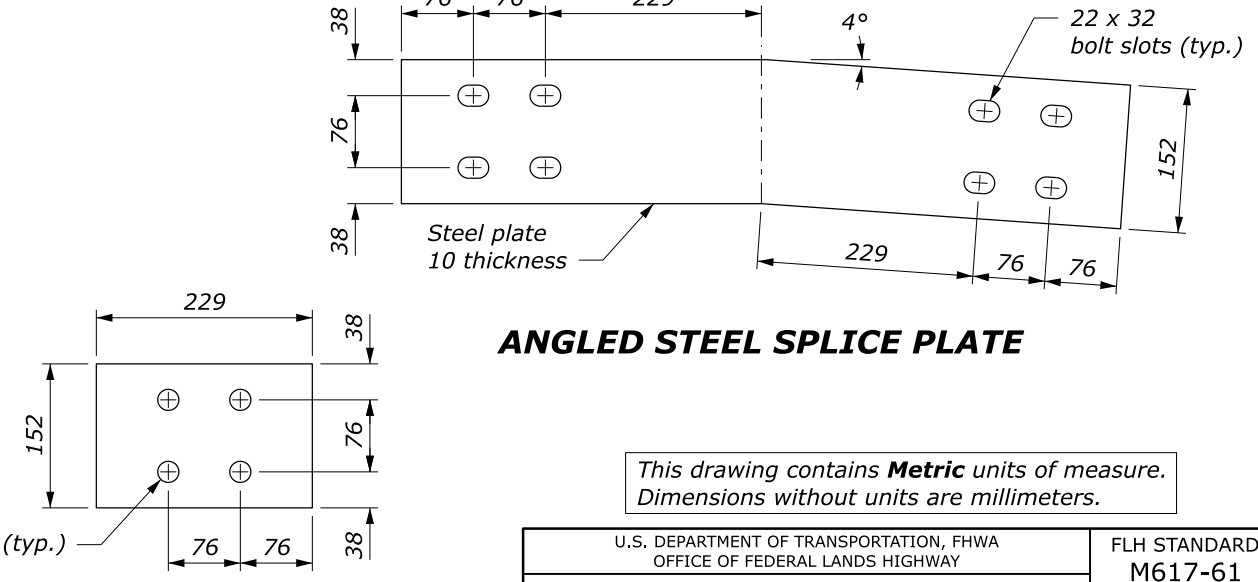
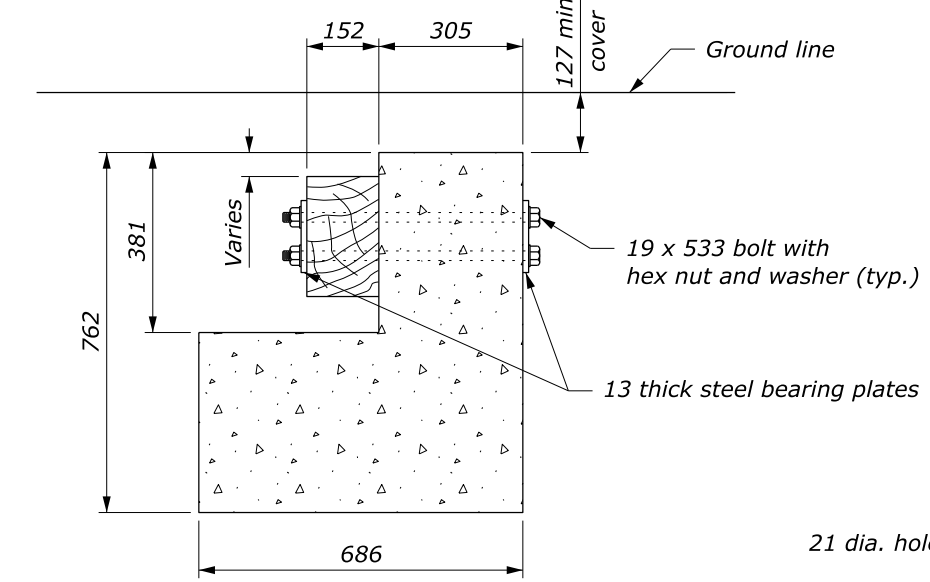
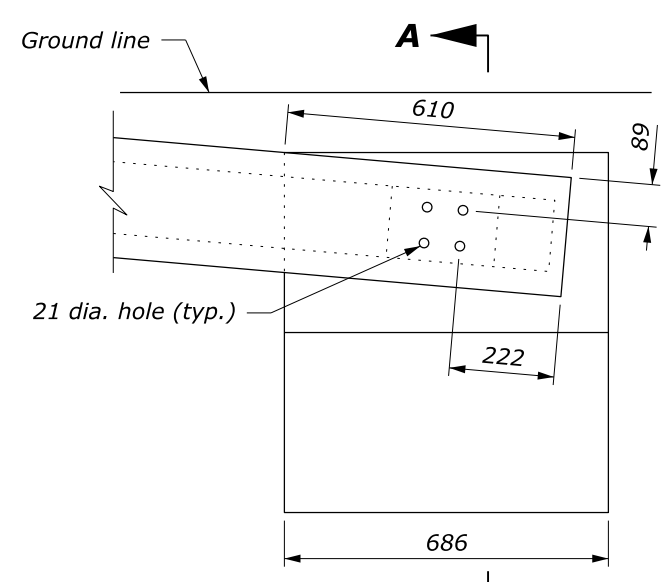
FLH STANDARD
617-61

SPECIFICATION
FP-14

APPROVED FOR USE
1/2024



APPROACH & DEPARTURE FLARE WITH FLARED ANCHOR TERMINAL (FAT)



ANGLED STEEL SPLICE PLATE

STEEL BEARING PLATE

NO SCALE

NOTE:

1. Extend the fill widening a minimum of 1.5 m behind the guardrail, unless otherwise directed.
2. The guardrail flare shown in the plan view is the minimum length and rate required. As directed 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 Rate table.
3. See Standard M617-60, 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 blockouts in terminal section, except on the concrete anchor. For the Type B, non-blocked-out guardrail, no blockouts are included.
5. Provide hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are unavailable.

GUARDRAIL FLARE RATE			
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 and less	1.2	13:1	7:1

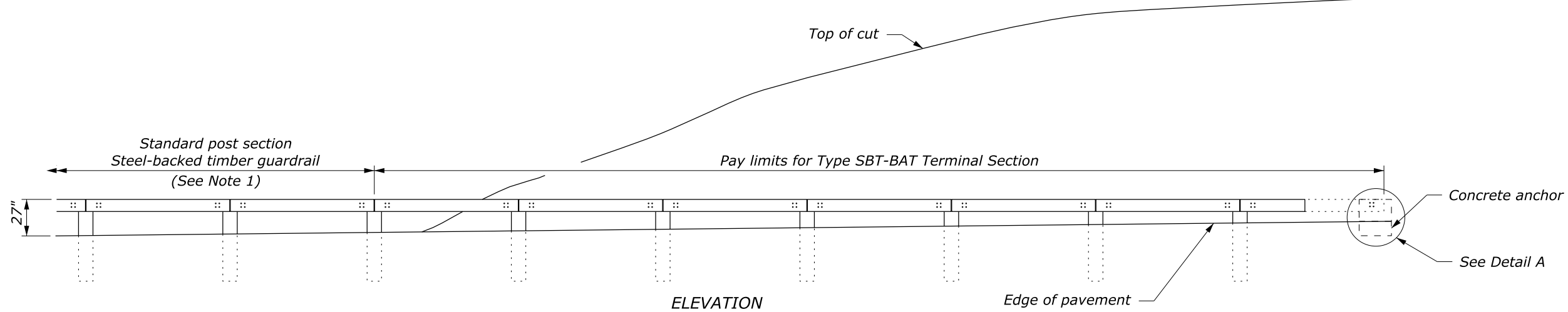
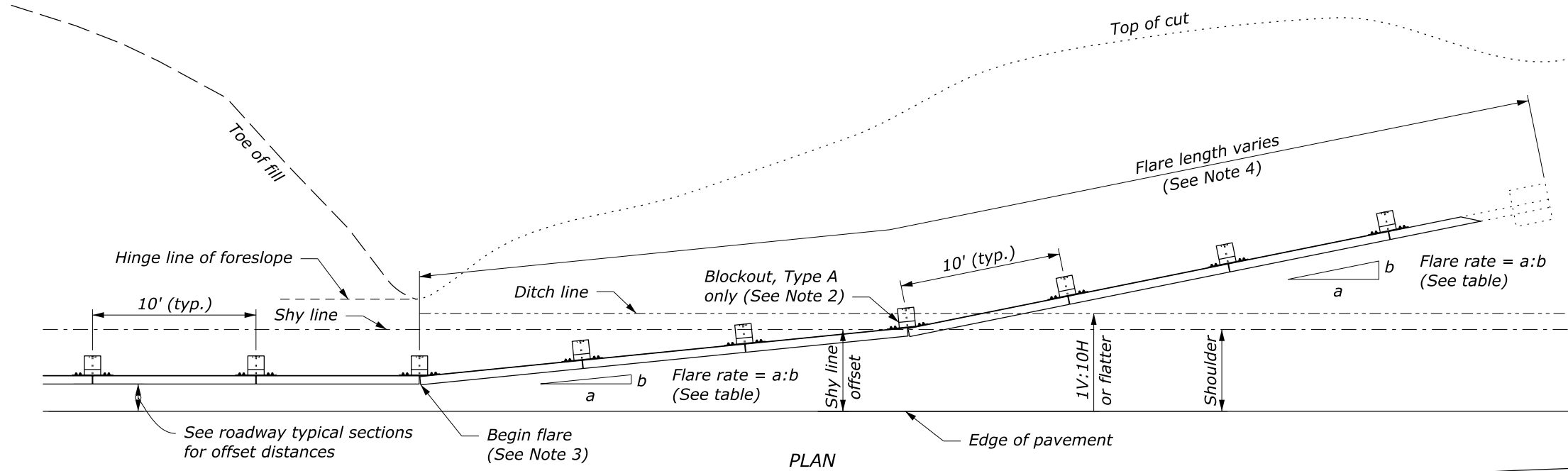
This drawing contains **Metric** units of measure. Dimensions without units are millimeters.

U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-61
STEEL-BACKED TIMBER GUARDRAIL TERMINAL SECTION TYPE SBT-FAT	SPECIFICATION FP-14
	APPROVED FOR USE 1/2024

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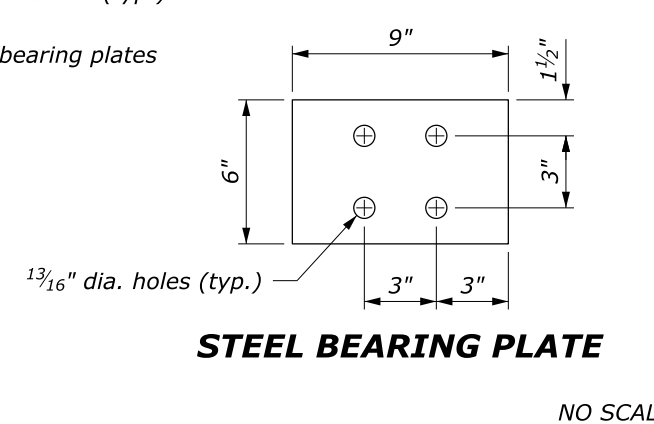
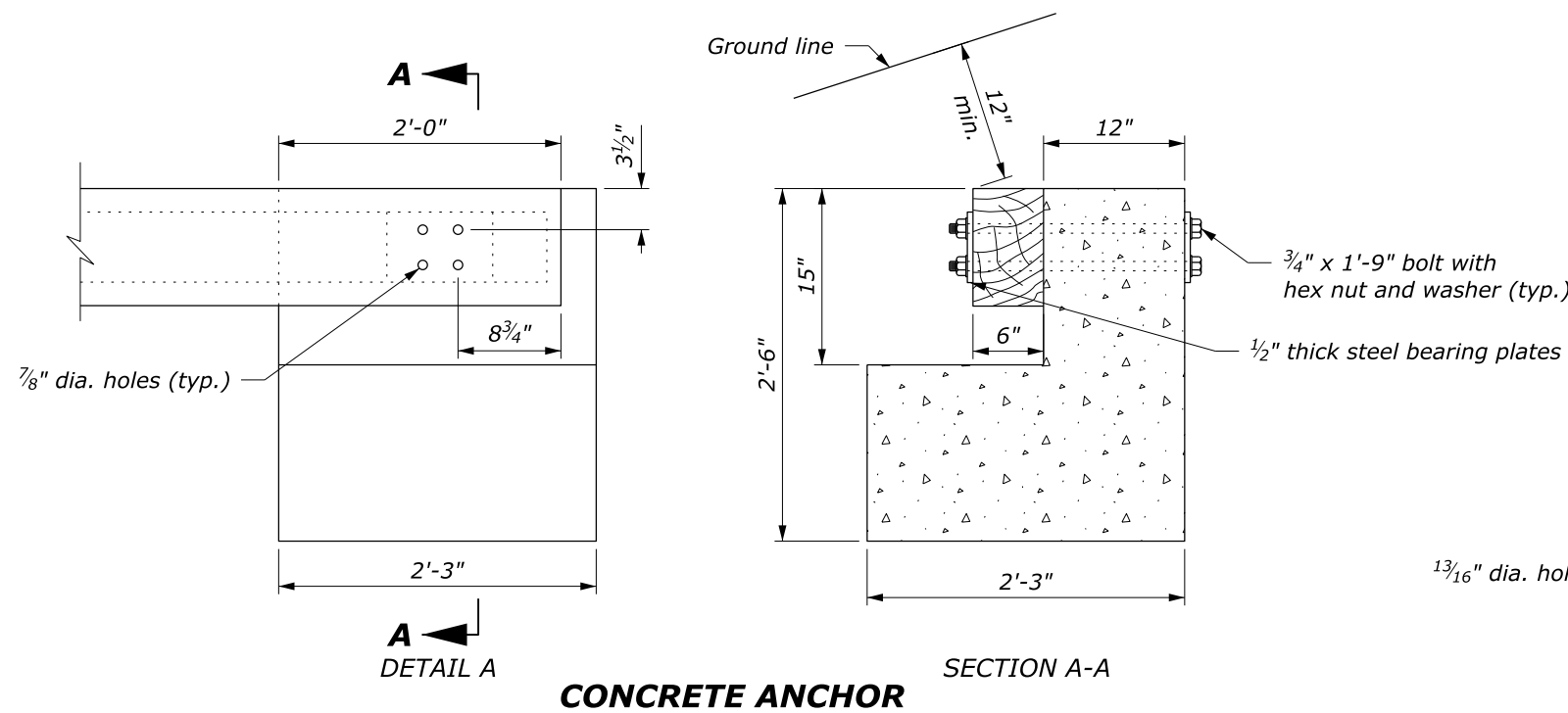
NOTE:

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 blockouts in the terminal section, except on the concrete anchor. For the Type B, non-blocked-out guardrail, no blockouts are included.
3. Begin the cut flares at the nearest post to a transition point between fill and cut as directed.
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)

GUARDRAIL FLARE RATE			
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	4.0	13:1	7:1

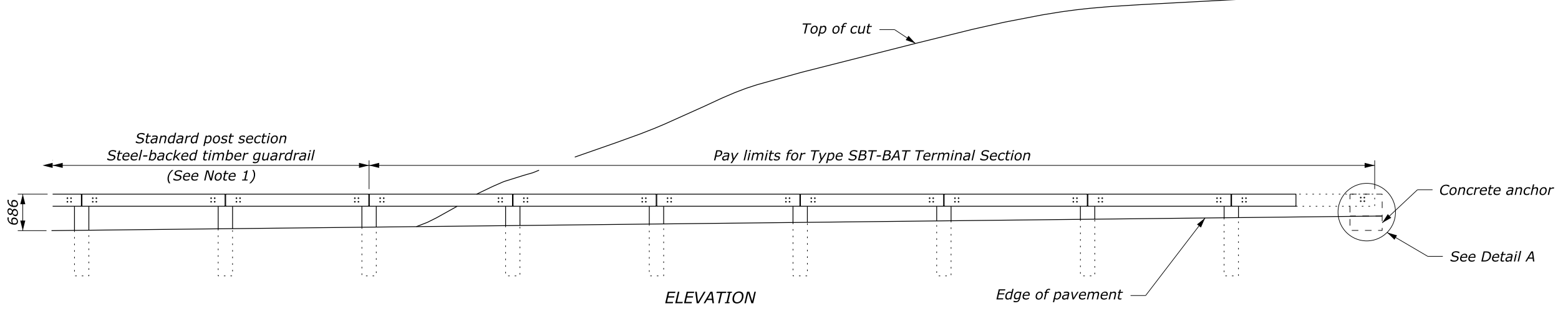
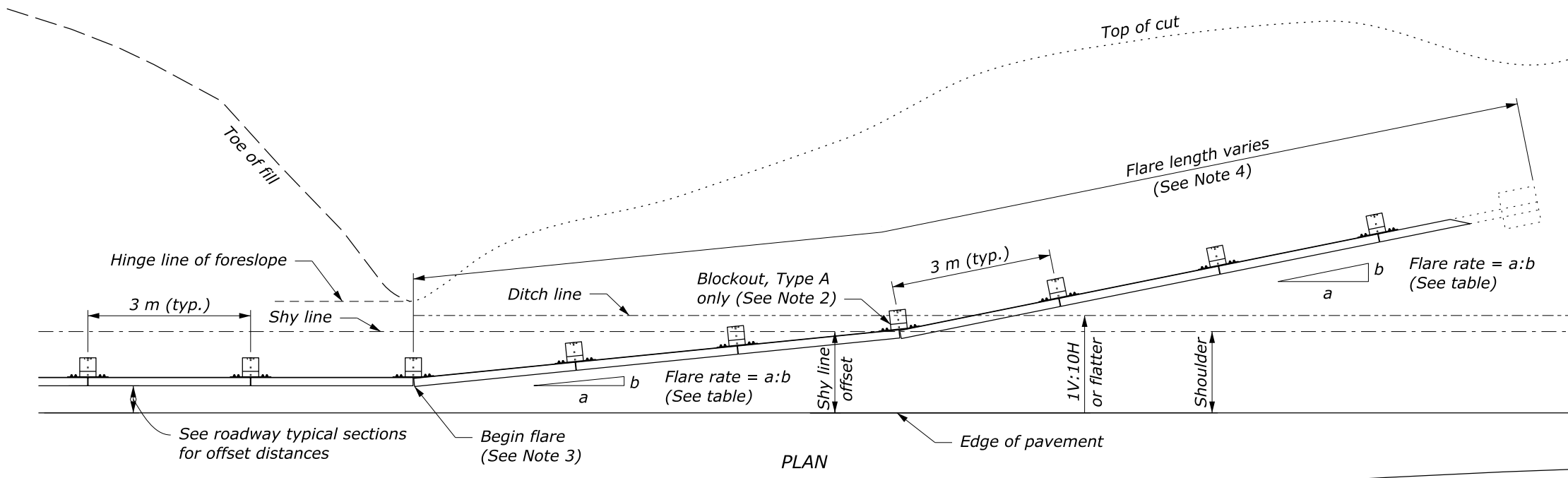


U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD 617-62
STEEL-BACKED TIMBER GUARDRAIL TERMINAL SECTION TYPE SBT-BAT	SPECIFICATION FP-14
	APPROVED FOR USE 1/2024

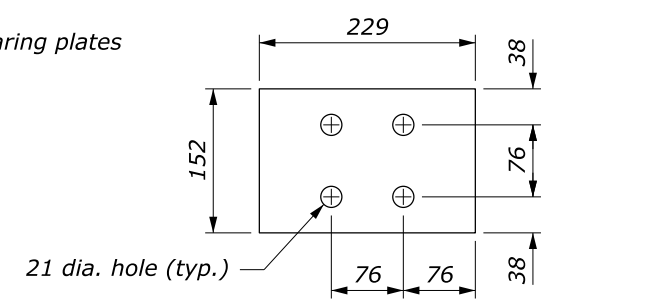
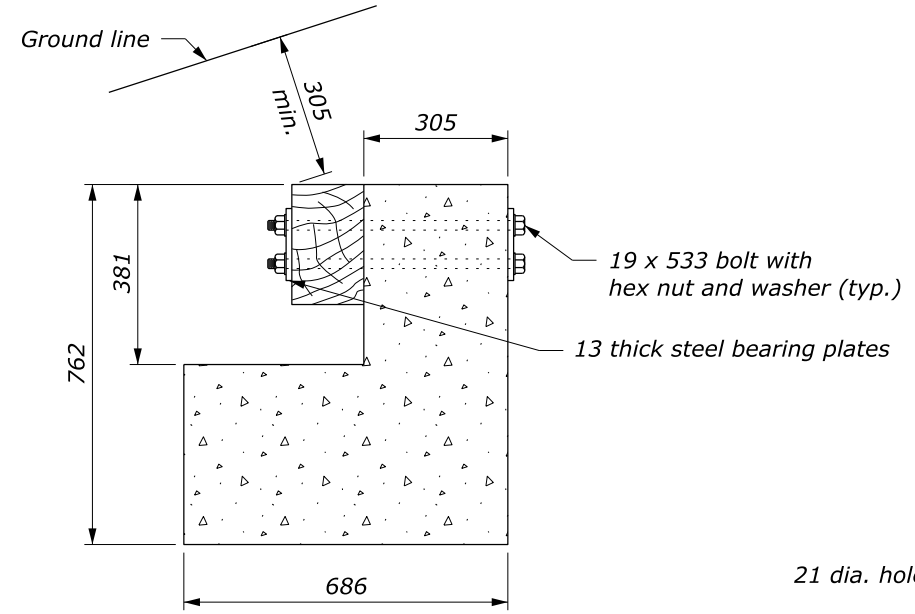
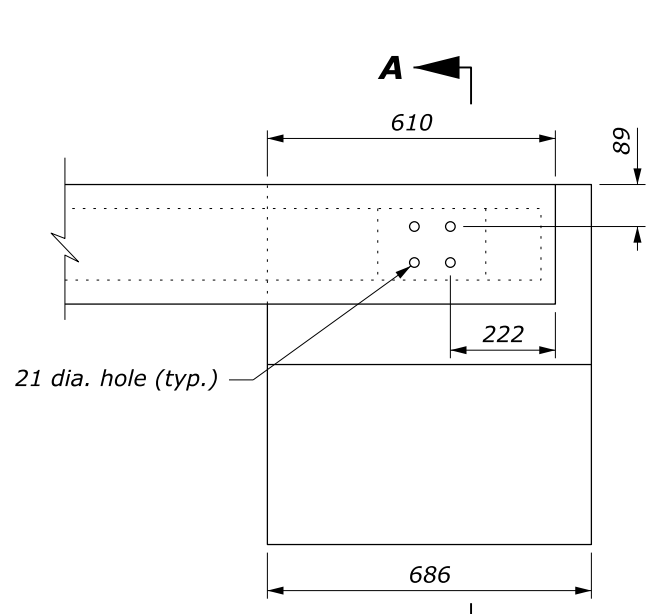
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 24 June 2024 7:59 AM

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 blockouts in the terminal section, except on the concrete anchor. For the Type B, non-blocked-out guardrail, no blockouts are included.
3. Begin the cut flares at the nearest post to a transition point between fill and cut as directed.
4. Extend the flare into the cut until a minimum 305 mm cover is obtained over the guardrail end.
5. Provide hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are unavailable.



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



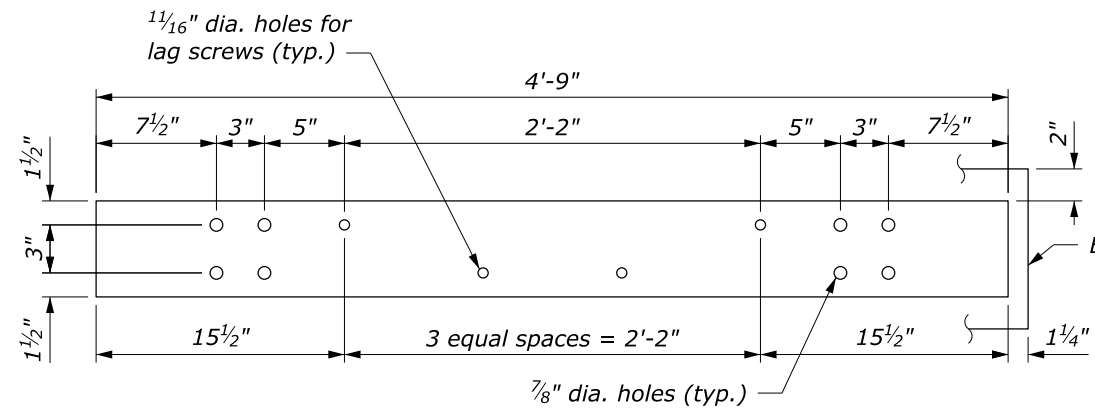
GUARDRAIL FLARE RATE			
DESIGN SPEED km/h	SHY LINE OFFSET m	FLARE RATE INSIDE SHY LINE (a:b)	FLARE RATE OUTSIDE SHY LINE (a:b)
100	2.5	26:1	14:1
80	2.0	21:1	11:1
60	1.5	16:1	8:1
50 and less	1.2	13:1	7:1

This drawing contains **Metric** units of measure. Dimensions without units are millimeters.

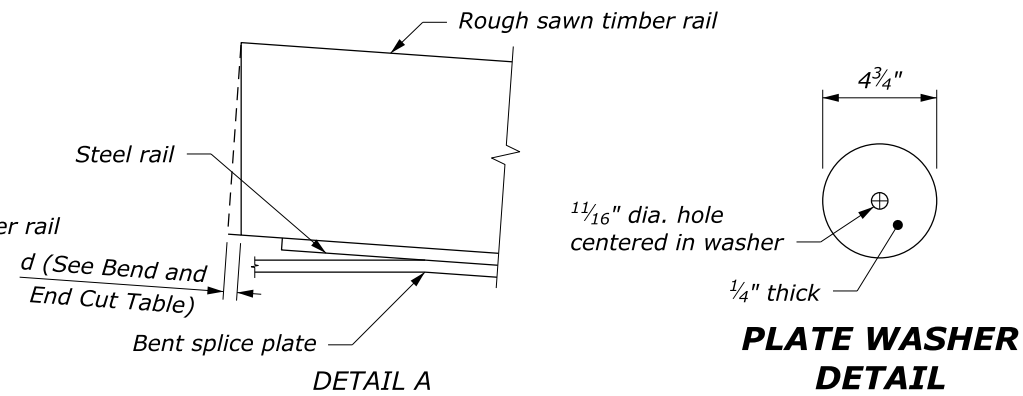
U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-62
STEEL-BACKED TIMBER GUARDRAIL TERMINAL SECTION TYPE SBT-BAT	SPECIFICATION FP-14
	APPROVED FOR USE 1/2024

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NO SCALE

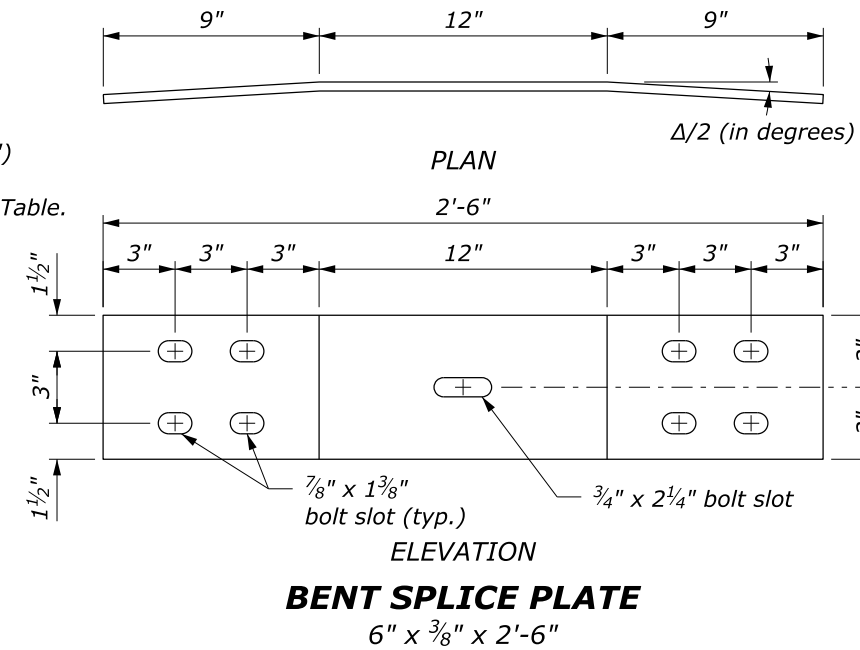
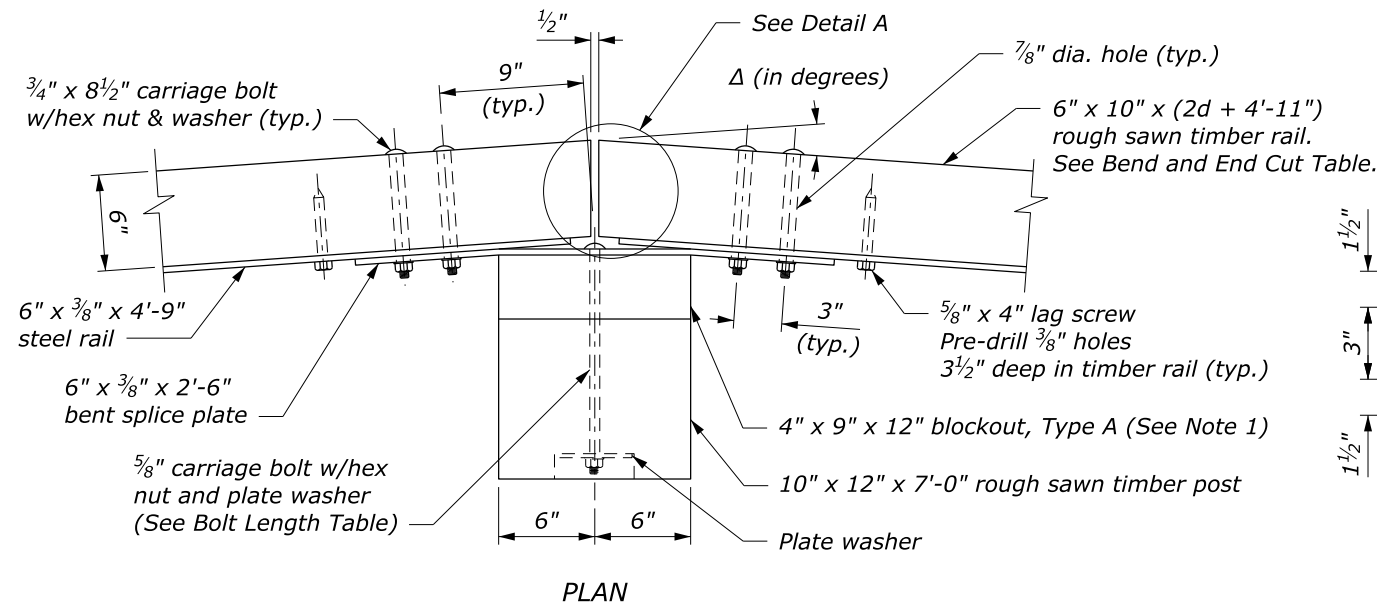


STEEL RAIL
6" x 3/8" x 4'-9"



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.

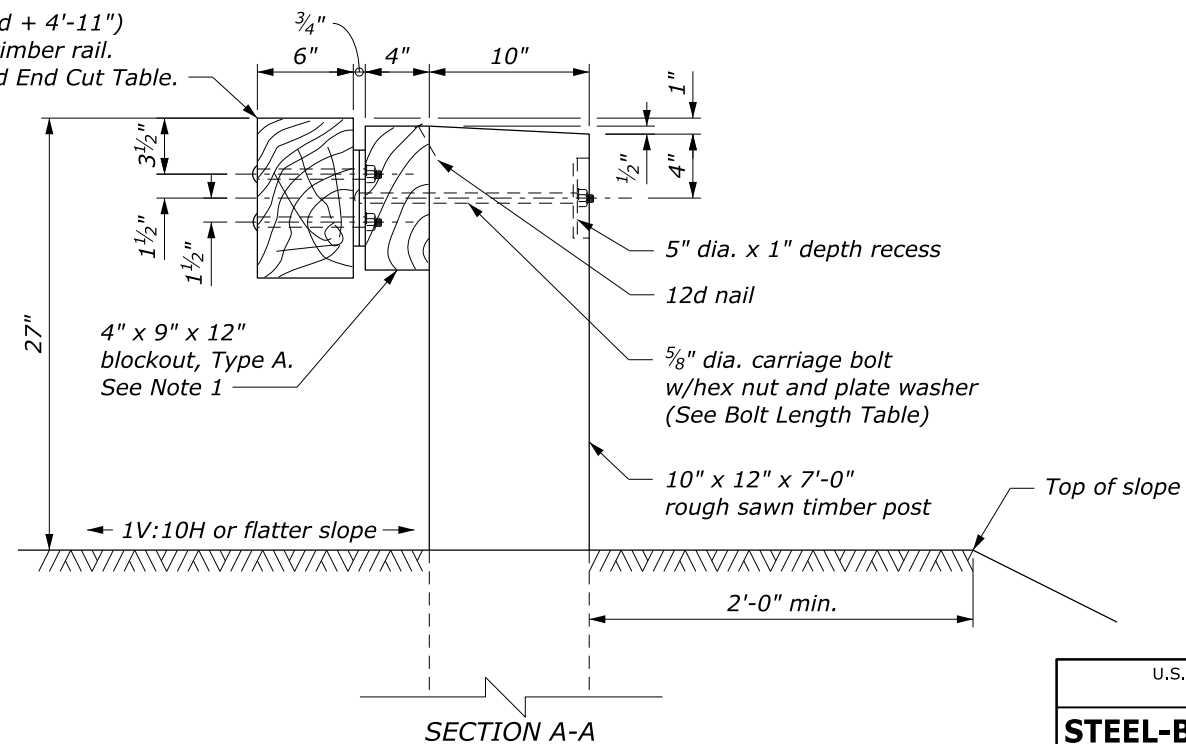
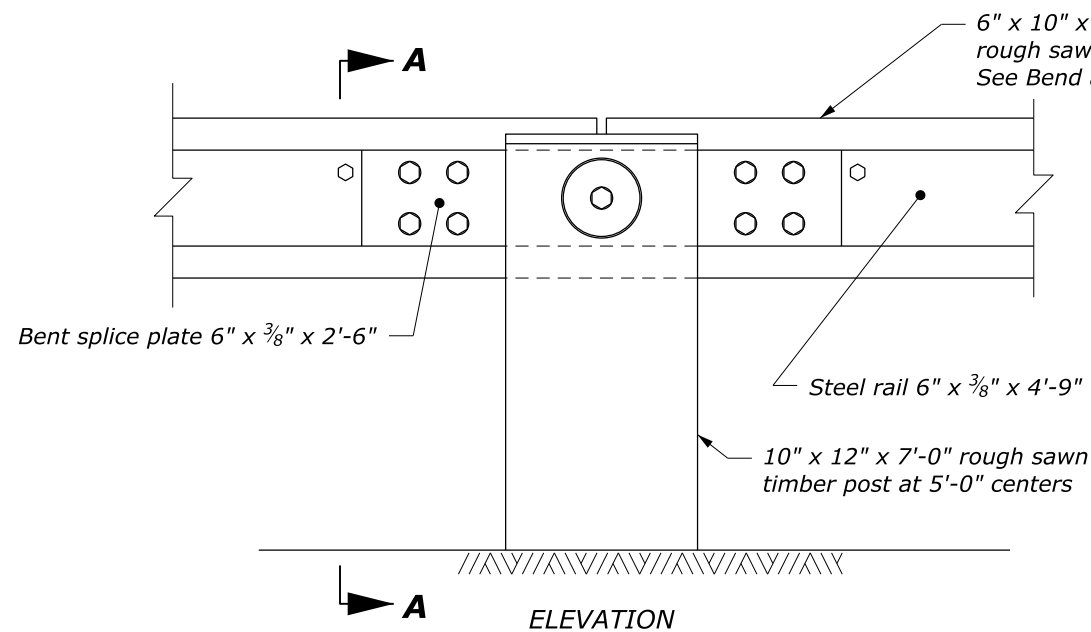


BEND AND END CUT TABLE

Radius R feet	Δ/2 degrees	d inch
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

BOLT LENGTH TABLE

Type A (Blockout)	Type B (No Blockout)
15"	11"



POST CONNECTION

SECTION A-A

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION, FHWA
OFFICE OF FEDERAL LANDS HIGHWAY

**STEEL-BACKED TIMBER GUARDRAIL
AROUND CIRCULAR CURVES
70 FOOT RADIUS AND BELOW**

Sheet 1 of 2

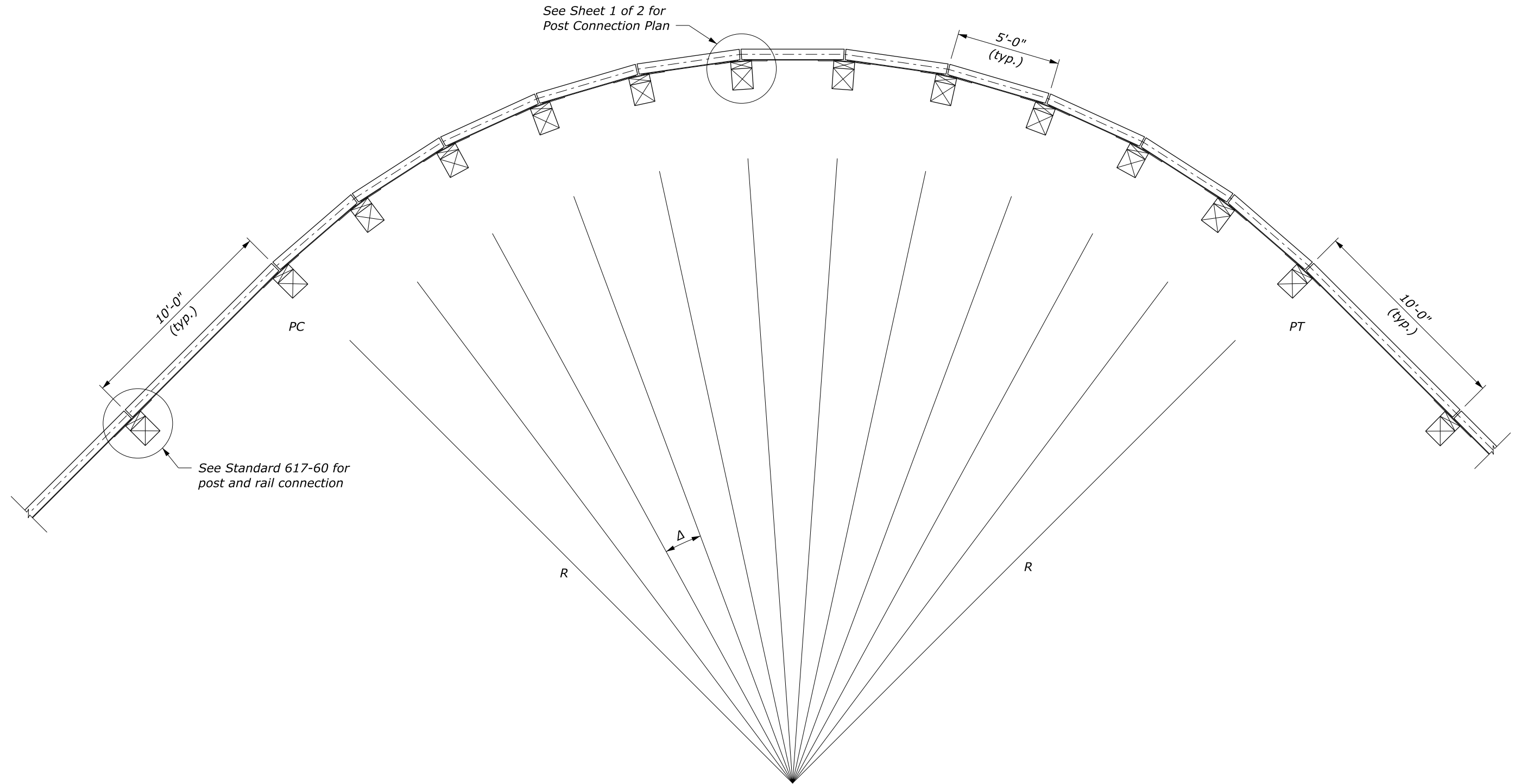
FLH STANDARD
617-63

SPECIFICATION
FP-24, FP-14

APPROVED FOR USE
2/2024

NOTE:

1. Δ is the central angle which subtends a 5 foot chord.
2. R is measured from the center of the circle to the back surface of the rough sawn timber rail.

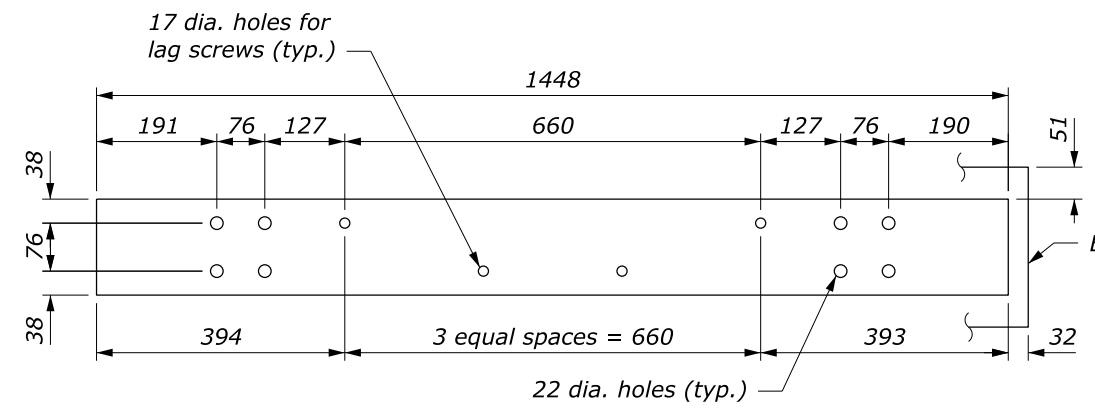


PLAN VIEW LAYOUT

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION, FHWA
OFFICE OF FEDERAL LANDS HIGHWAY
**STEEL-BACKED TIMBER GUARDRAIL
AROUND CIRCULAR CURVES
70 FOOT RADIUS AND BELOW**
Sheet 2 of 2

FLH STANDARD
617-63
SPECIFICATION
FP-24, FP-14
APPROVED FOR USE
2/2024



STEEL RAIL
152 x 10 x 1448

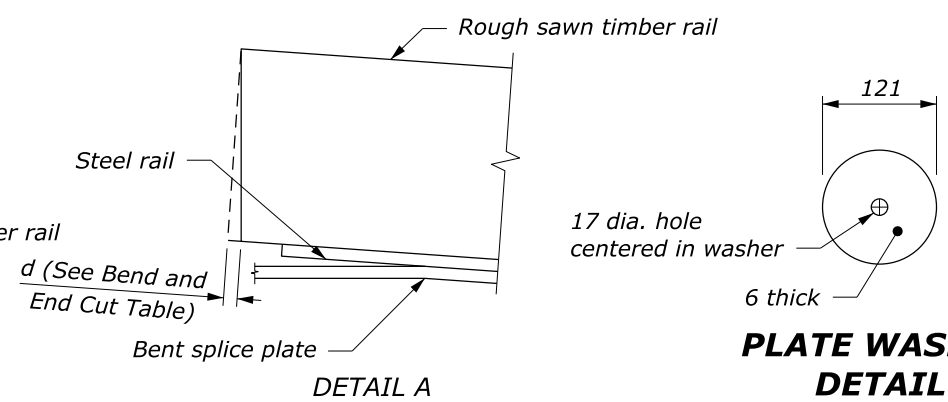
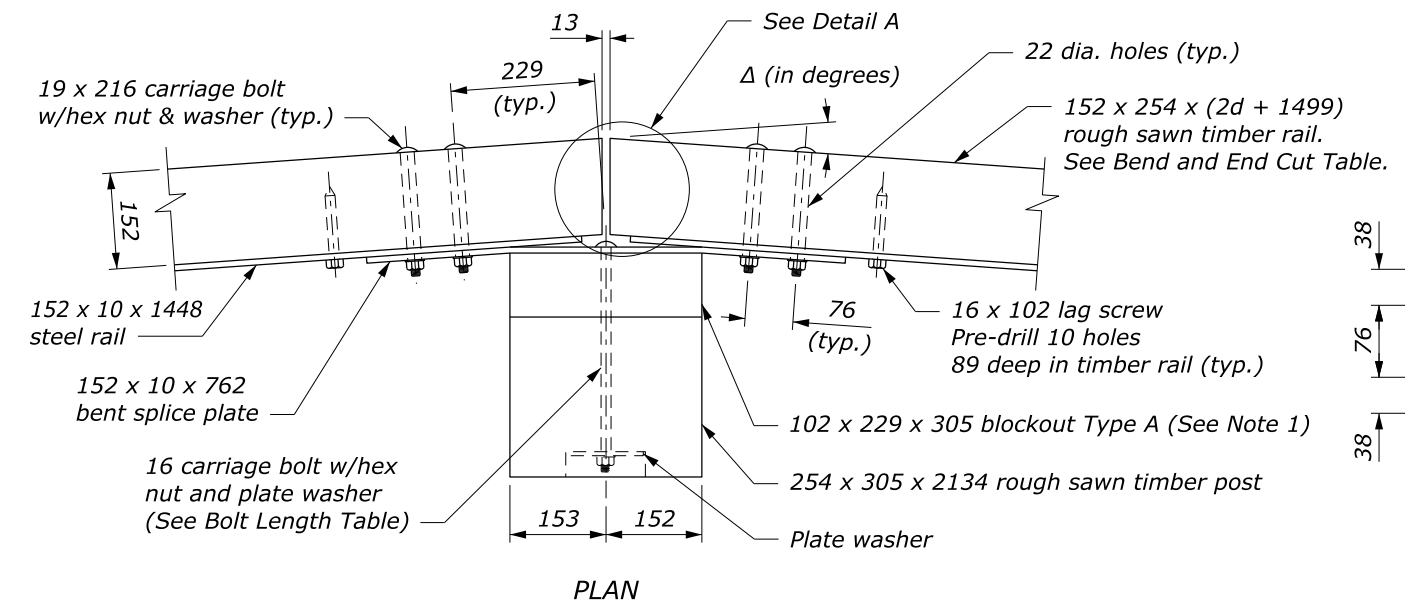
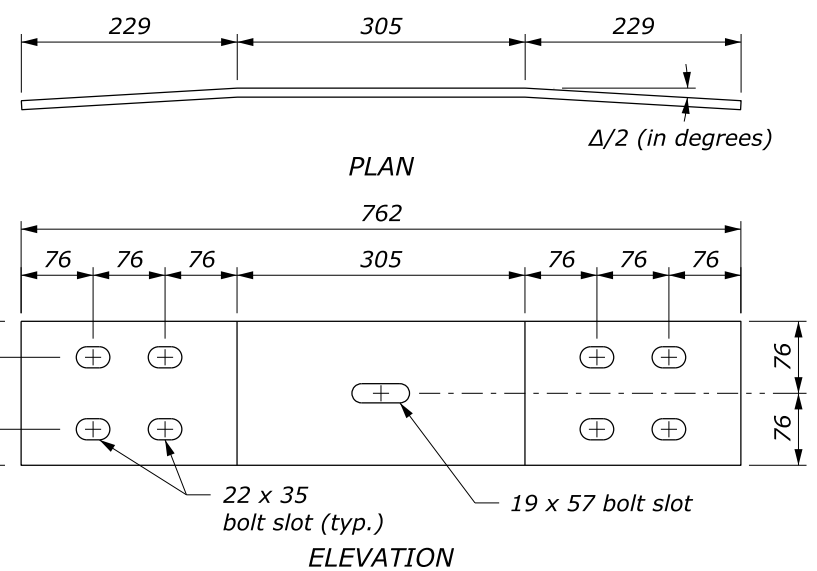


PLATE WASHER DETAIL

- 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.



BENT SPLICE PLATE
152 x 10 x 762

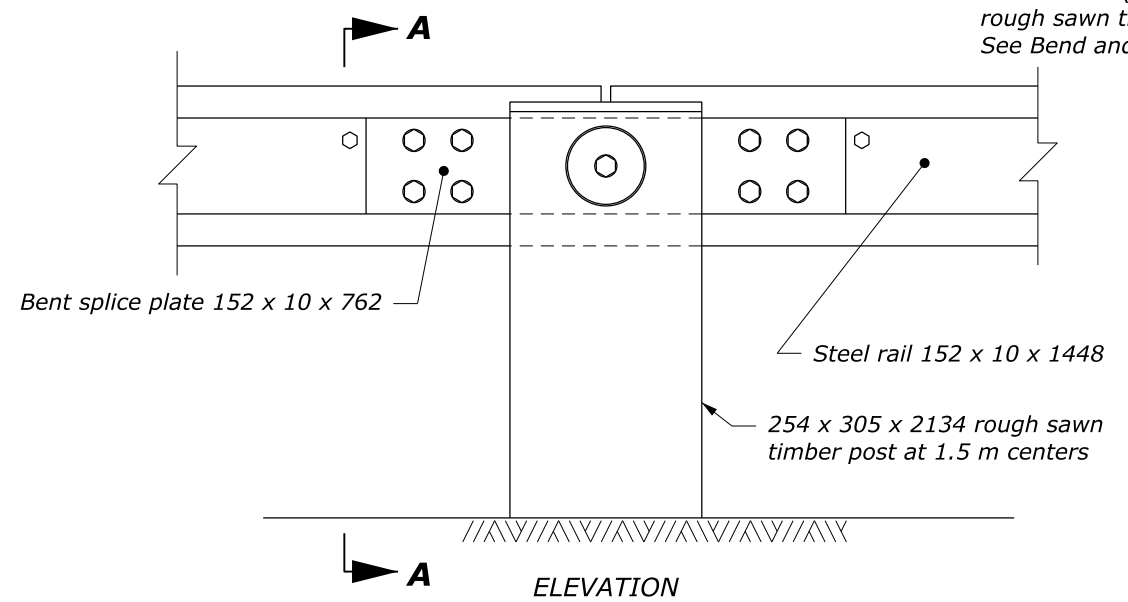


BEND AND END CUT TABLE

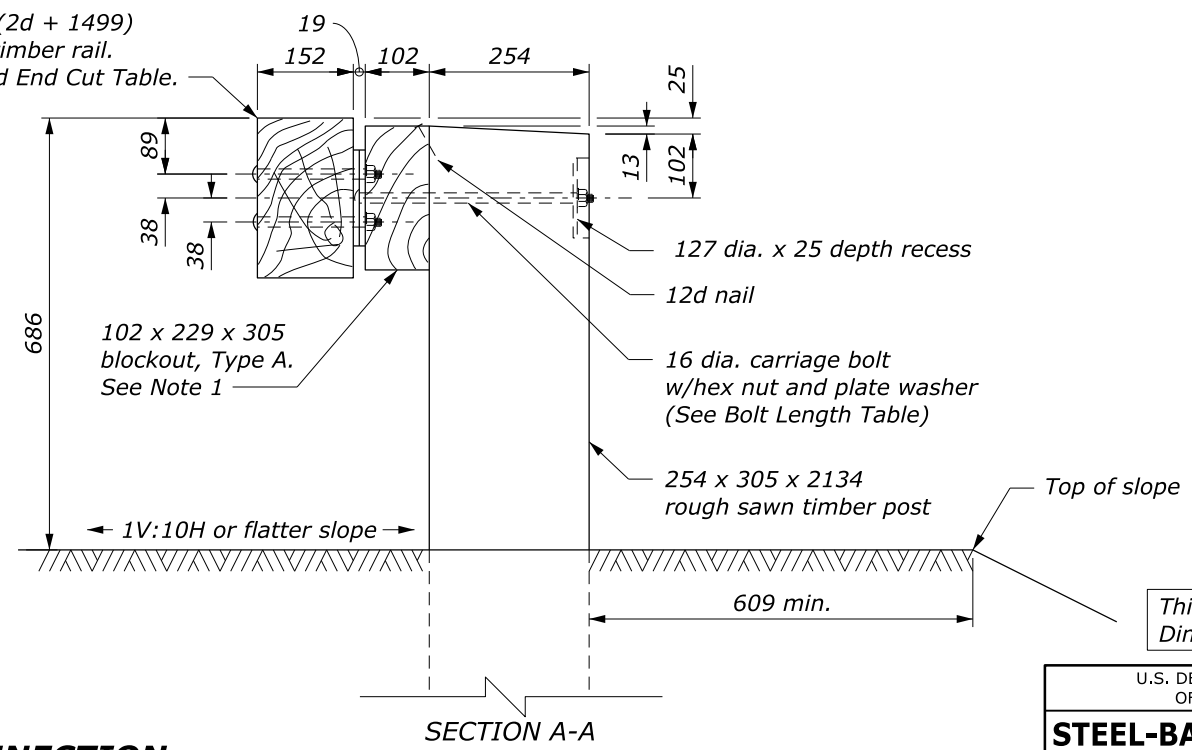
Radius R m	Δ/2 degrees	d mm
5	8.63	23
6	7.18	19
8	5.38	14
10	4.30	11
12	3.58	9
14	3.07	8
16	2.69	7
18	2.39	6
20	2.15	6
22	1.95	5
over 22	flat	0

BOLT LENGTH TABLE

Type A (Blockout)	Type B (No Blockout)
381	279



POST CONNECTION



SECTION A-A

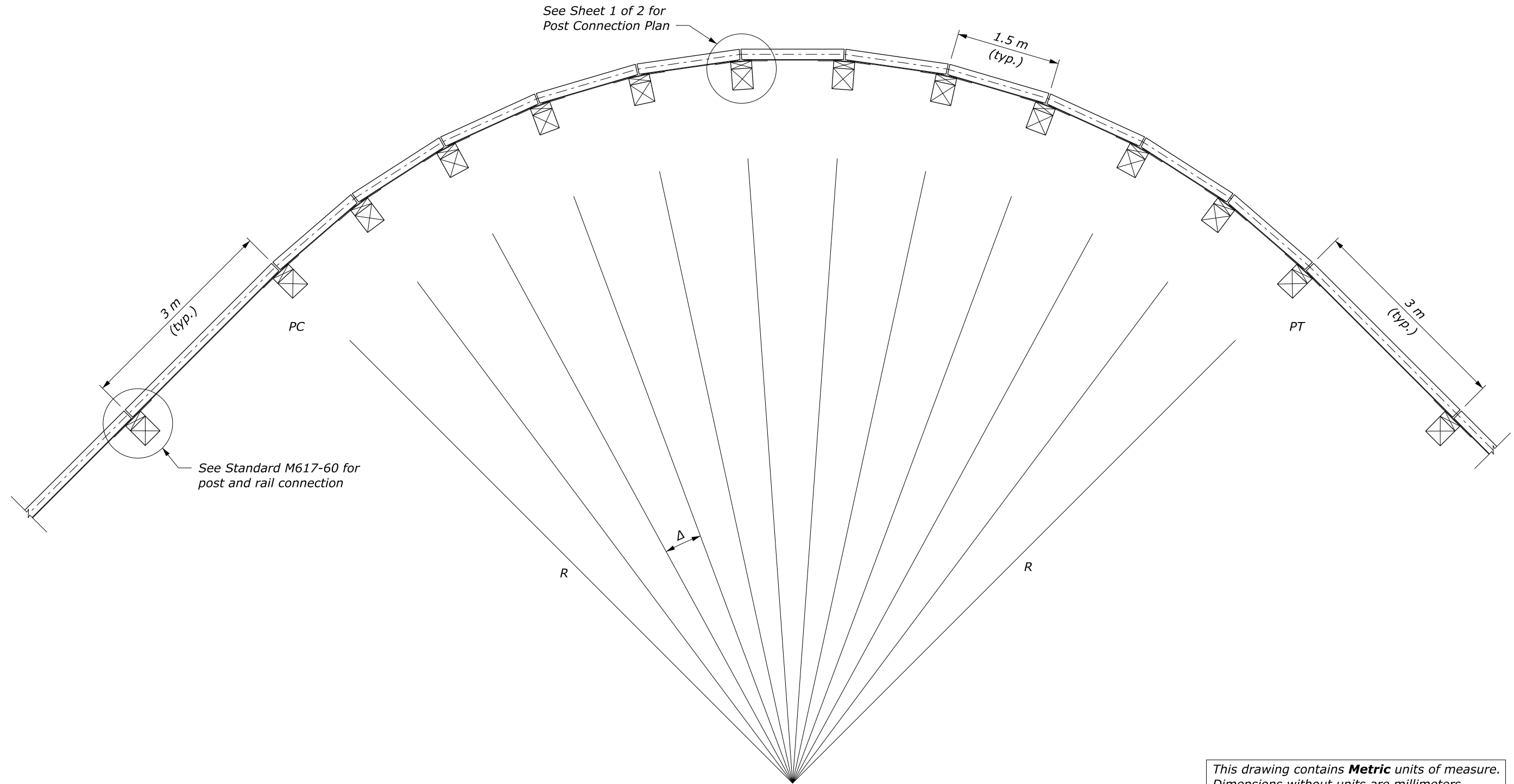
This drawing contains **Metric** units of measure. Dimensions without units are millimeters.

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-63
STEEL-BACKED TIMBER GUARDRAIL AROUND CIRCULAR CURVES 22 m RADIUS AND BELOW	SPECIFICATION FP-24, FP-14
Sheet 1 of 2	APPROVED FOR USE 2/2024

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- NOTE:**
- Δ is the central angle which subtends a 1.5 m chord.
 - R is measured from the center of the circle to the back surface of the rough sawn timber rail.

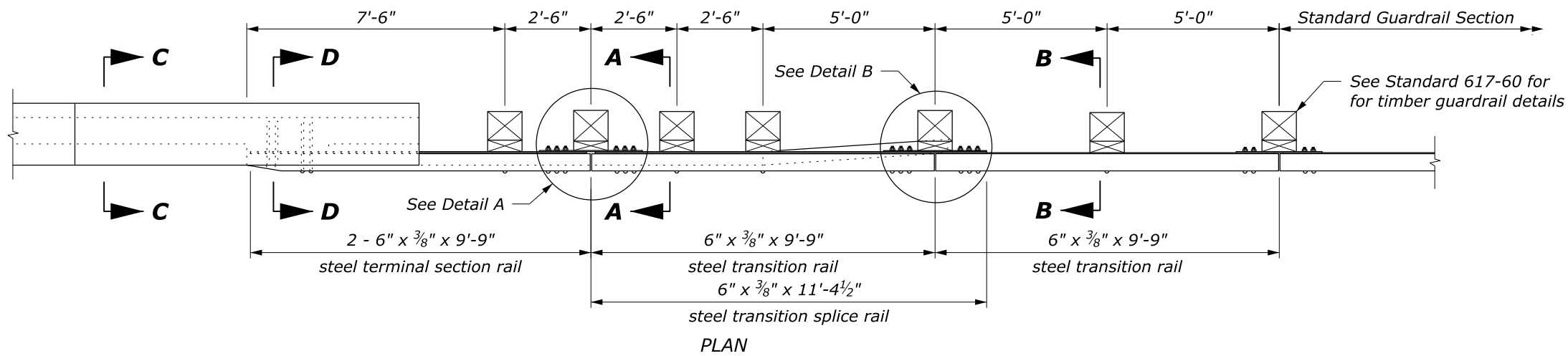


PLAN VIEW LAYOUT

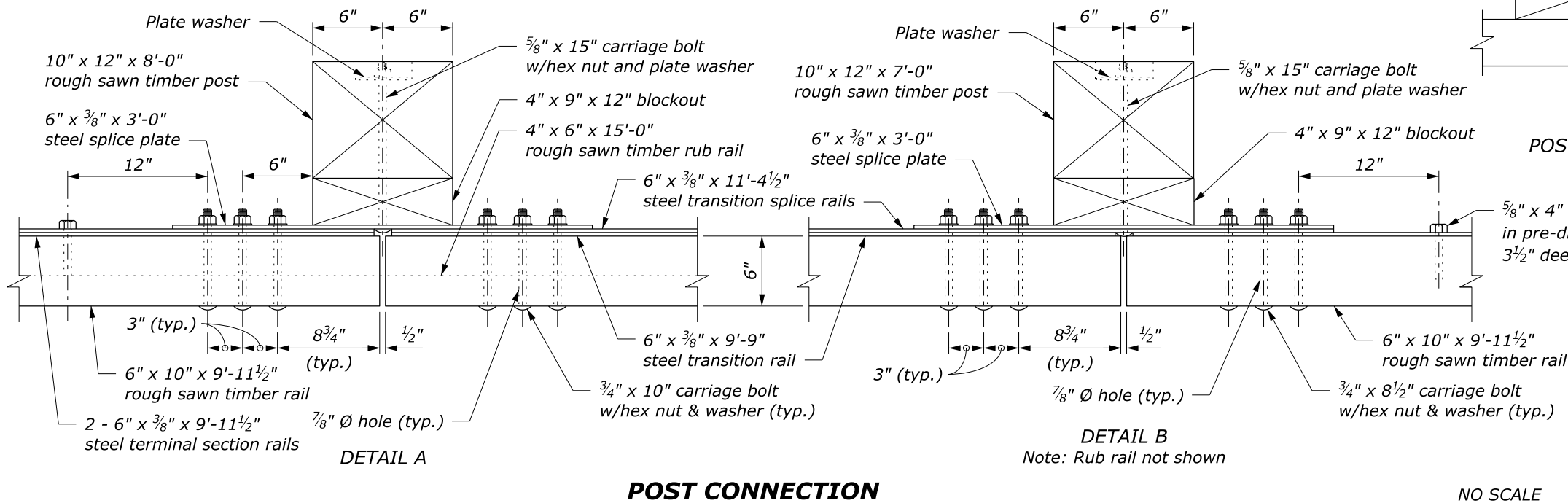
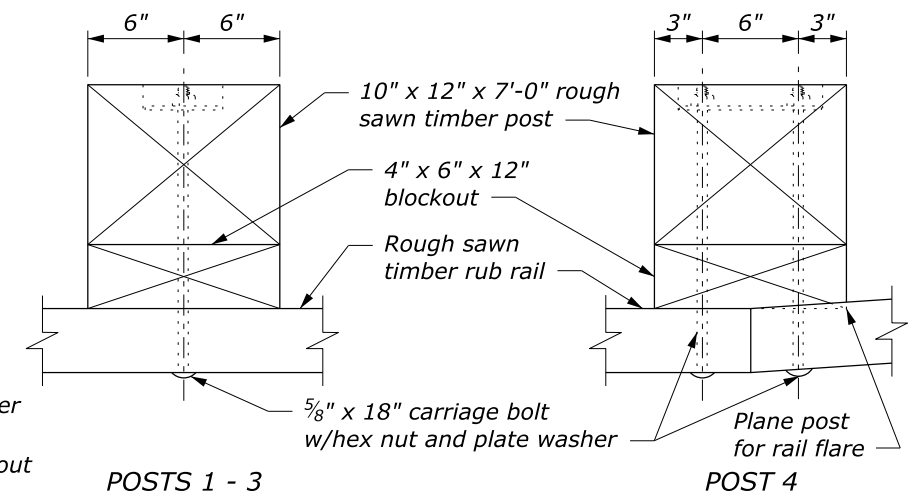
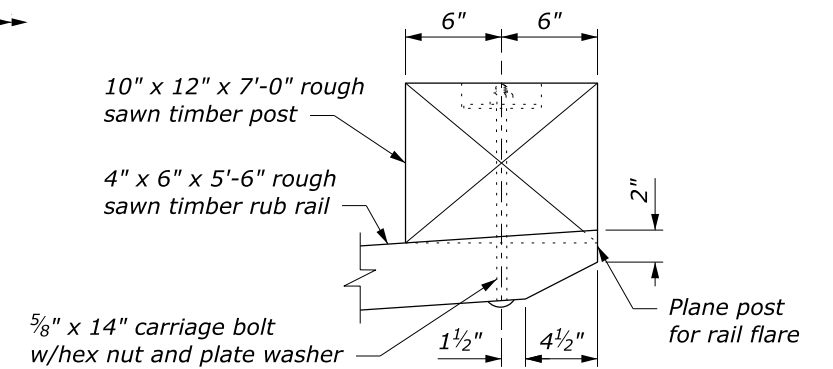
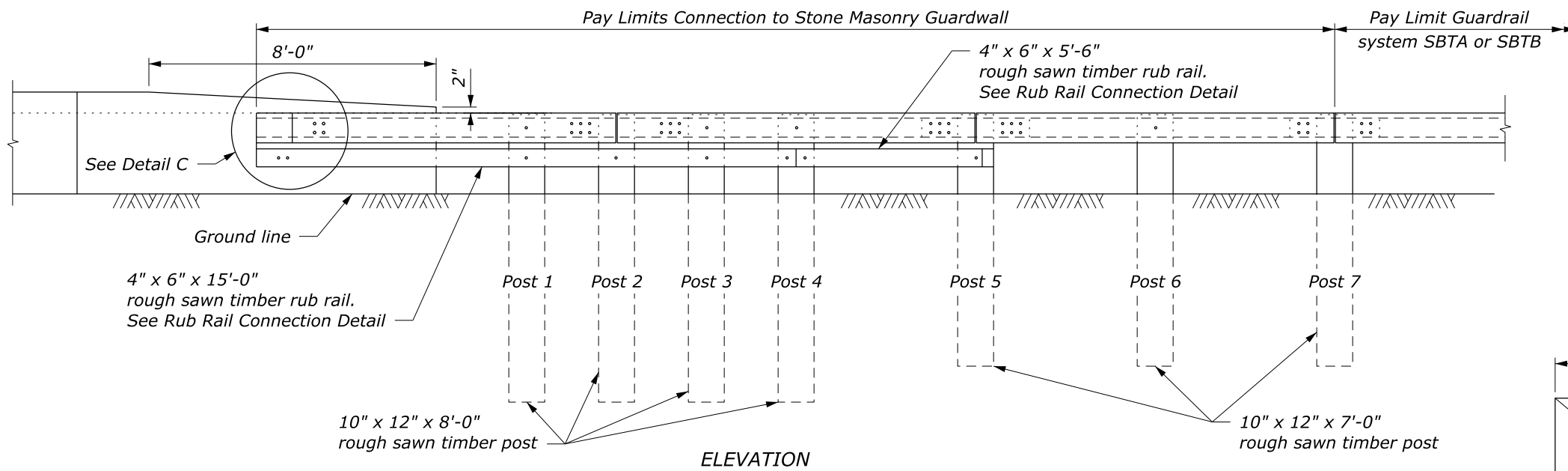
NO SCALE

This drawing contains **Metric** units of measure.
Dimensions without units are millimeters.

U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-63
STEEL-BACKED TIMBER GUARDRAIL AROUND CIRCULAR CURVES 22 m RADIUS AND BELOW	SPECIFICATION FP-24, FP-14
Sheet 2 of 2	APPROVED FOR USE 2/2024



- 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.



RUB RAIL CONNECTION

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION, FHWA
OFFICE OF FEDERAL LANDS HIGHWAY

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

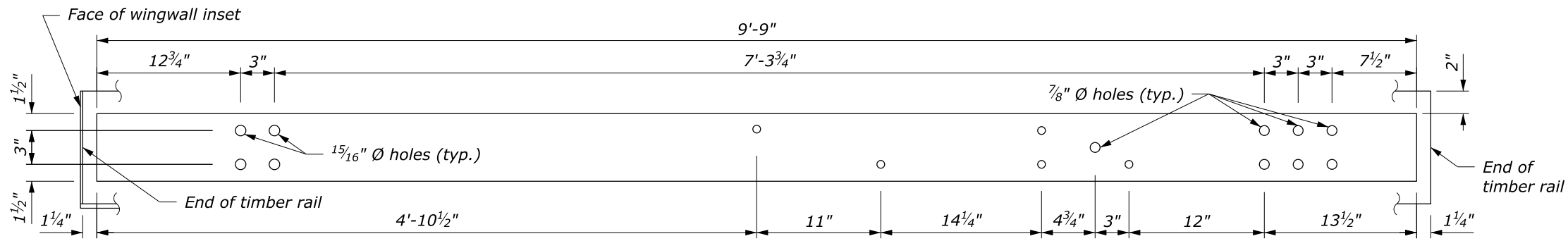
Sheet 1 of 3

FLH STANDARD
617-64

SPECIFICATION
FP-24, FP-14

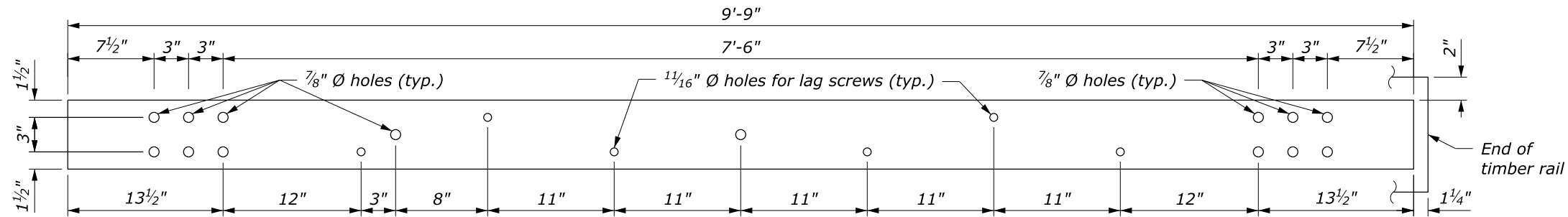
APPROVED FOR USE
2/2024

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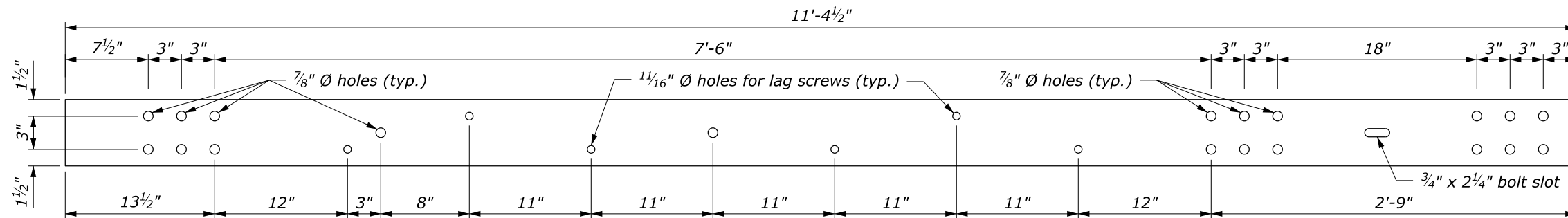


TERMINAL SECTION RAIL
6" x 3/8" x 9'-9"

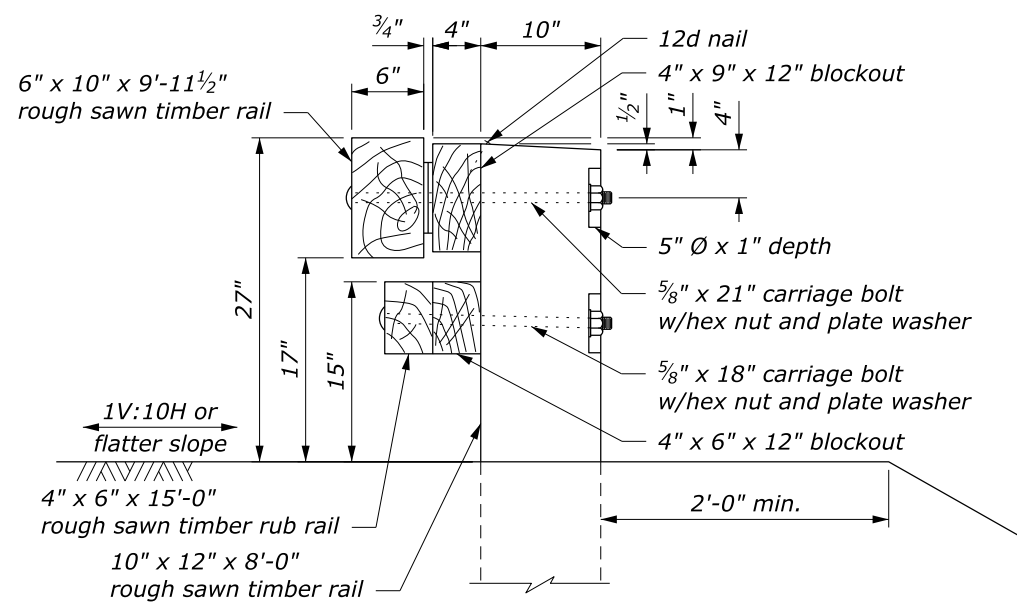
NOTE:
1. Pre-drill 3/4" holes in blockouts and posts.



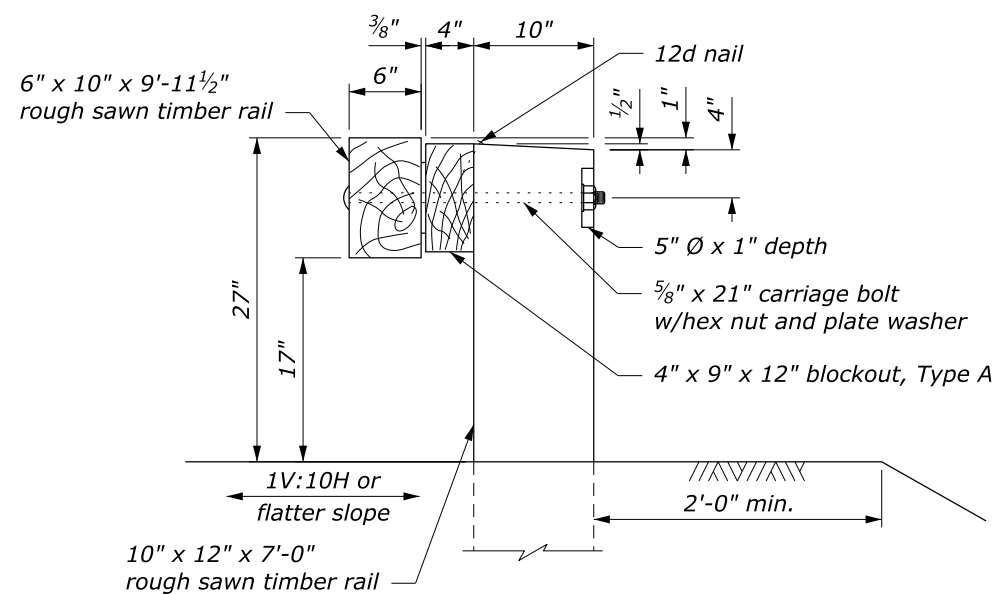
TRANSITION RAIL
6" x 3/8" x 9'-9"



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

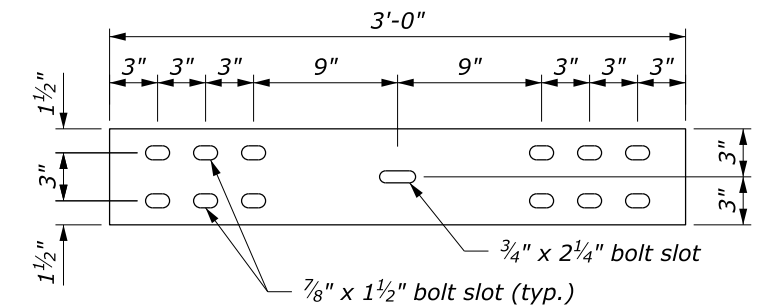


SECTION A-A



SECTION B-B

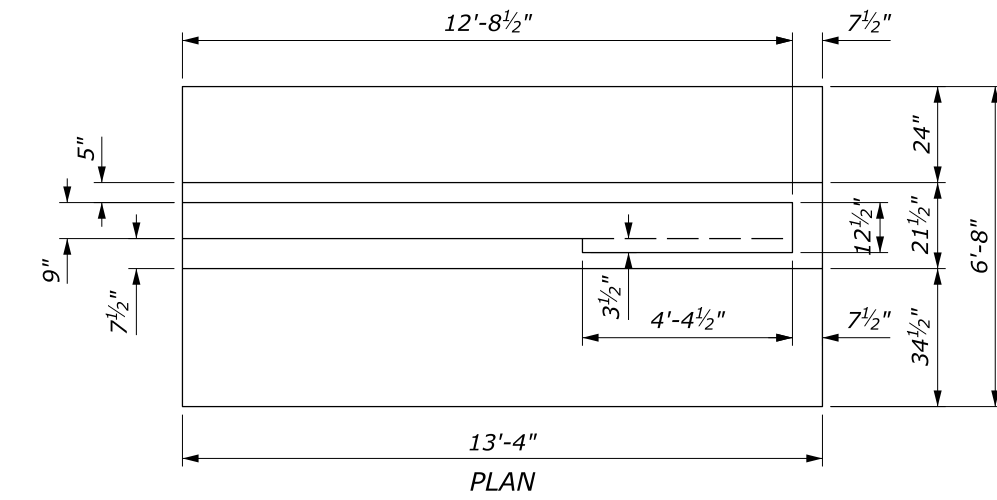
NO SCALE



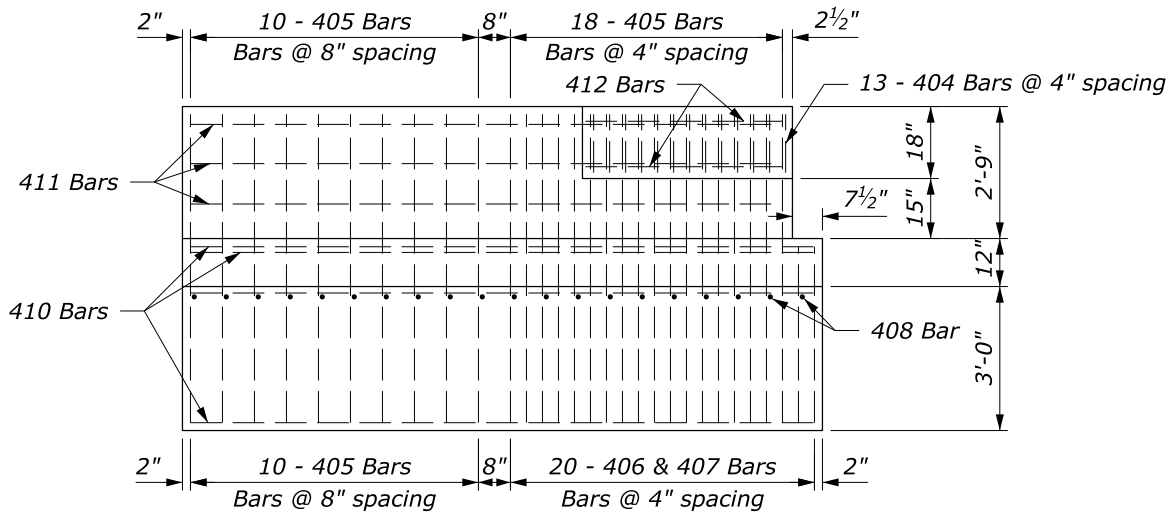
SPLICE PLATE
6" x 3/8" x 3'-0"

U.S. DEPARTMENT OF TRANSPORTATION, FHWA
OFFICE OF FEDERAL LANDS HIGHWAY
**STEEL-BACKED TIMBER GUARDRAIL
TL-2 CONNECTION TO STONE
MASONRY GUARDWALL**
Sheet 2 of 3

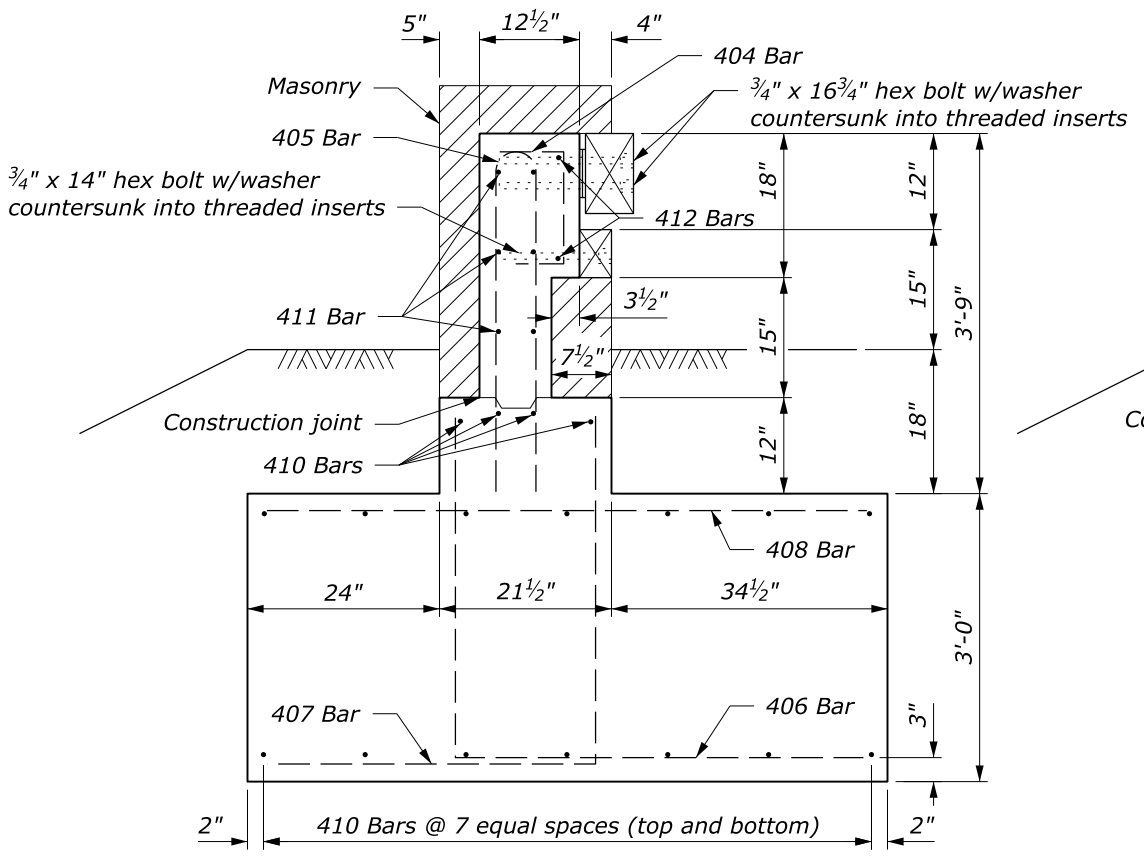
FLH STANDARD
617-64
SPECIFICATION
FP-24, FP-14
APPROVED FOR USE
2/2024



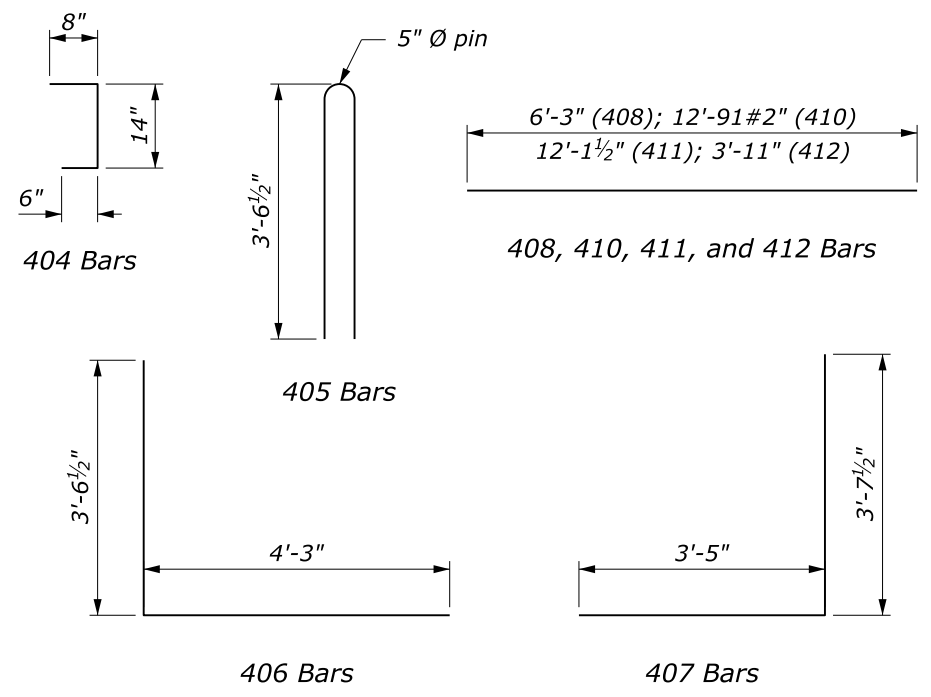
PLAN



ELEVATION

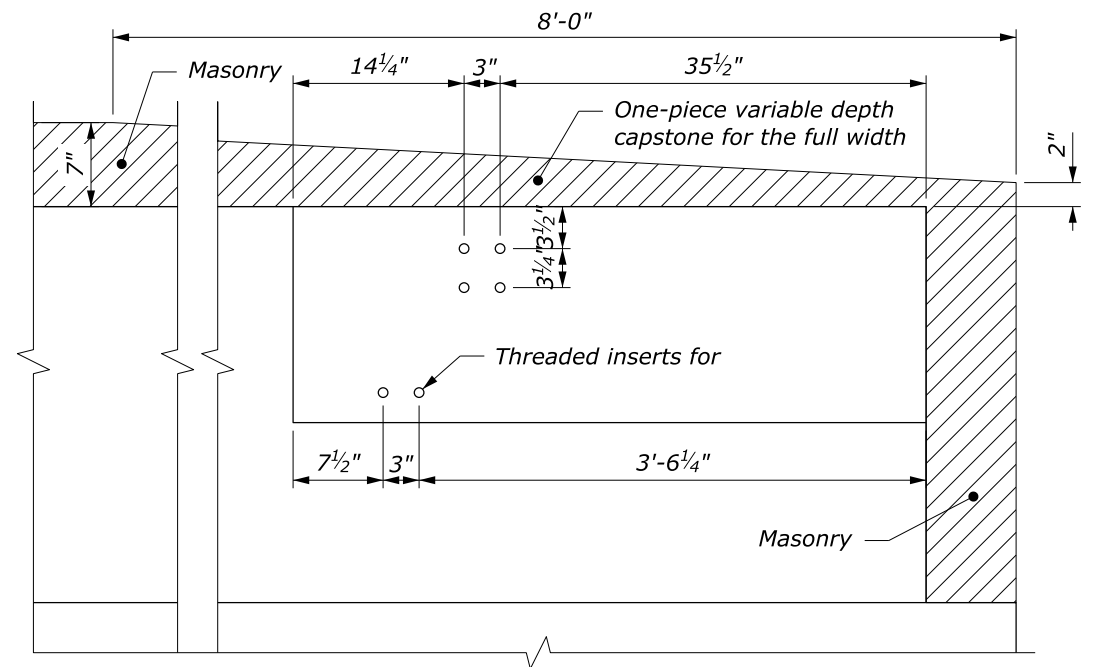


SECTION D-D
PARAPET END BLOCK

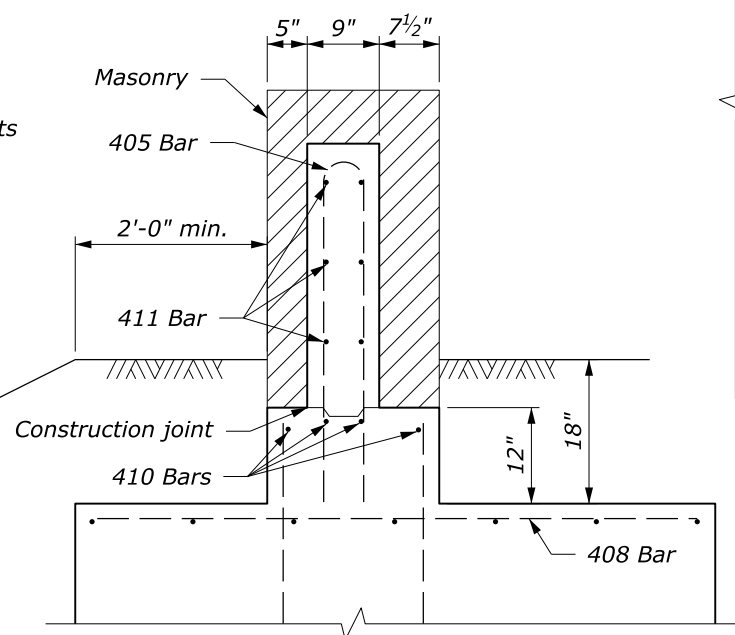


BAR DETAILS

- NOTE:**
1. Provide 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. Provide 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 inches unless otherwise shown. All bars are US Customary size #5.
 3. Construct footing against undisturbed material or backfill with well compacted granular material.



DETAIL C

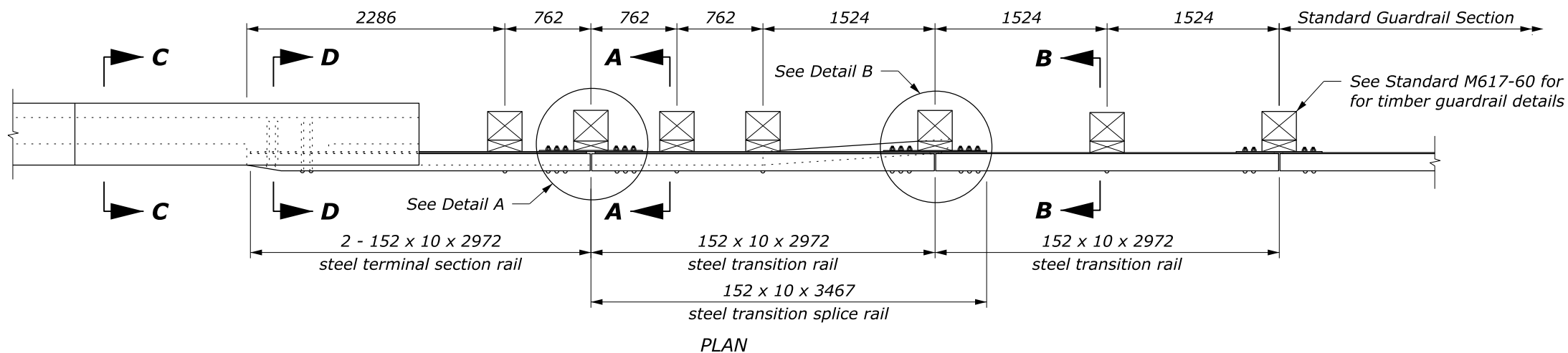


SECTION C-C

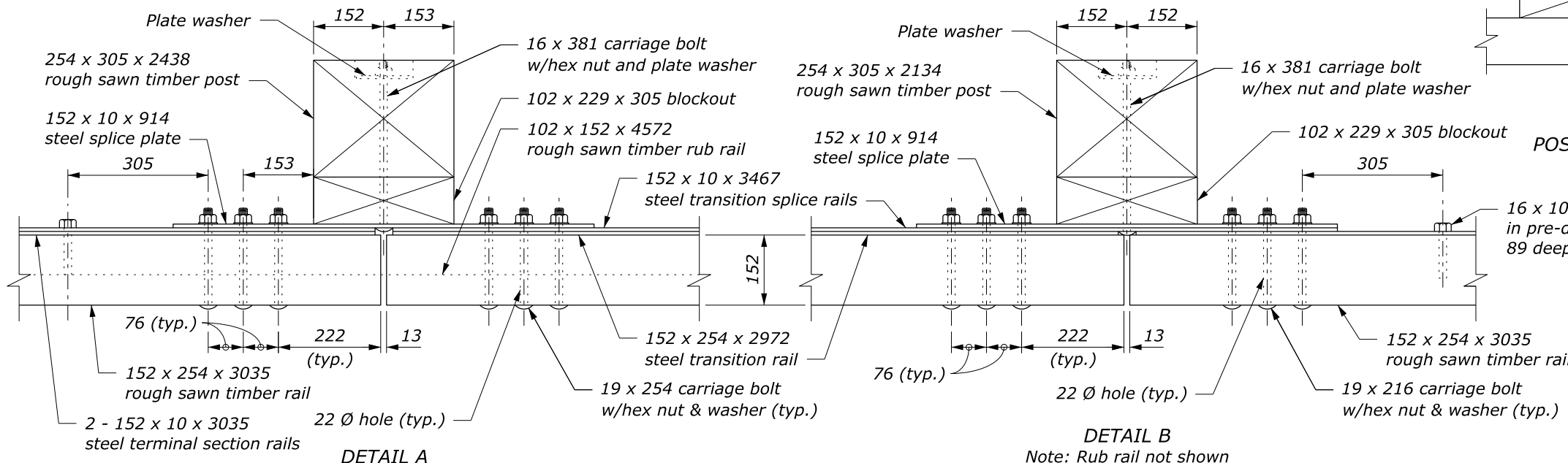
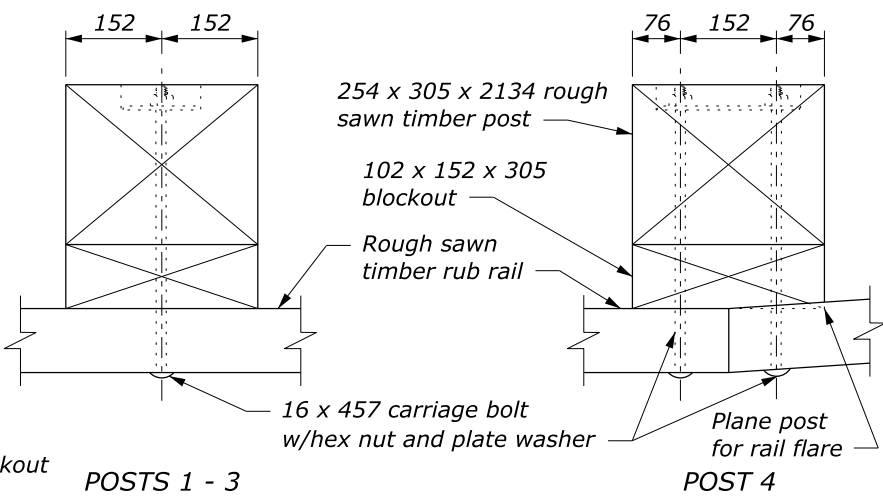
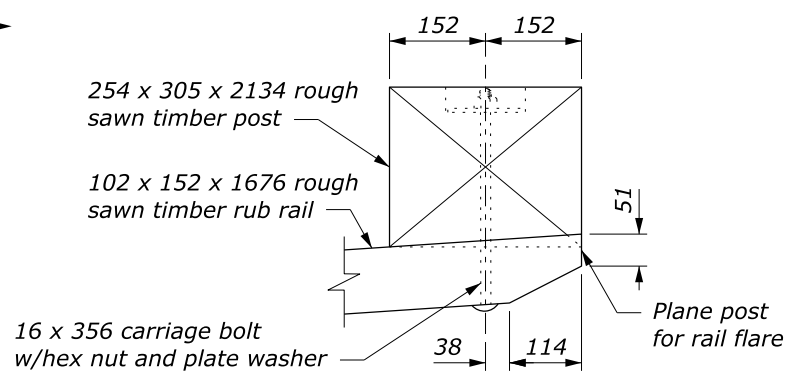
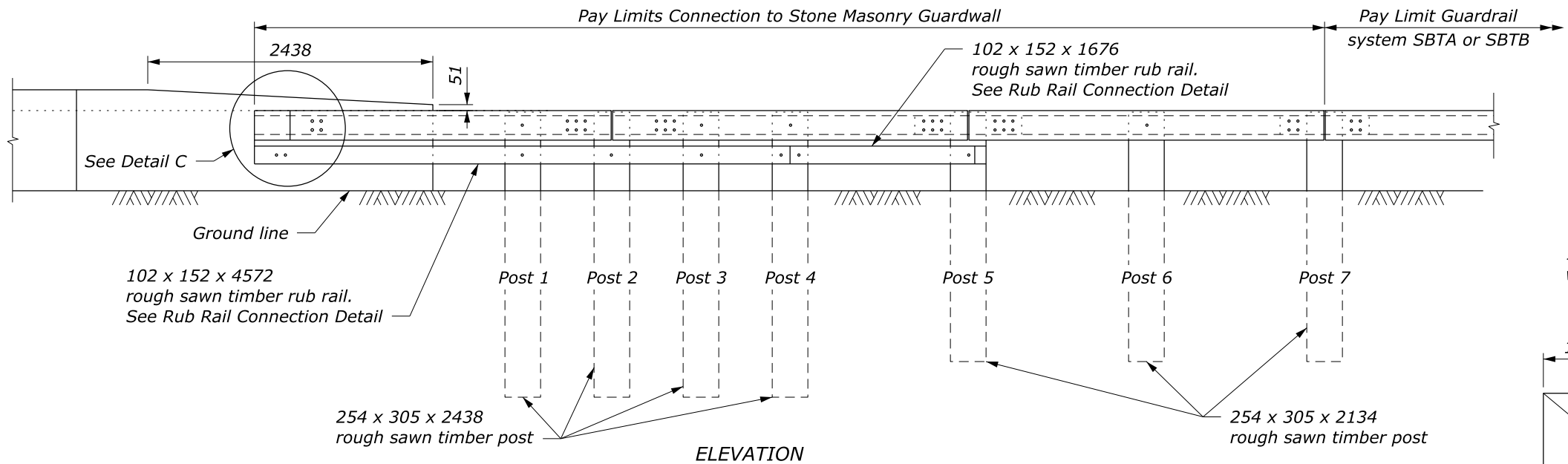
NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD 617-64
STEEL-BACKED TIMBER GUARDRAIL TL-2 CONNECTION TO STONE MASONRY GUARDWALL	SPECIFICATION FP-24, FP-14
Sheet 3 of 3	APPROVED FOR USE 2/2024

c:\pwwork\0419223\Std617-64.dgn [Std 617-64] 24 June 2024 8:43 AM



- 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 unavailable.



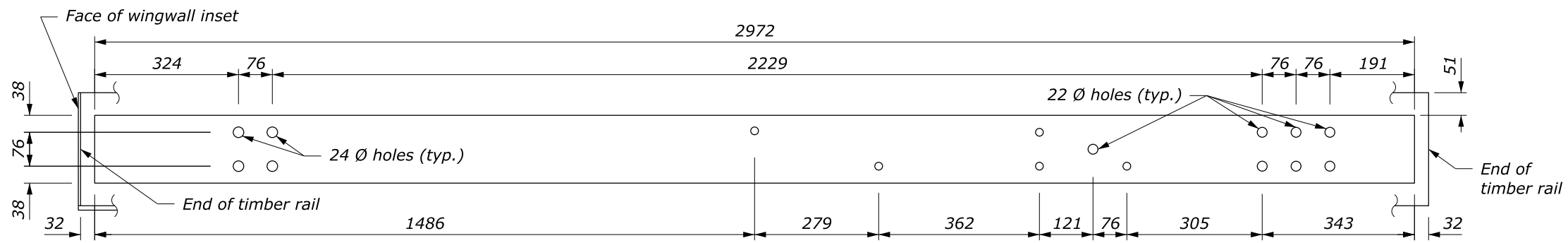
RUB RAIL CONNECTION

This drawing contains **Metric** units of measure. Dimensions without units are millimeters.

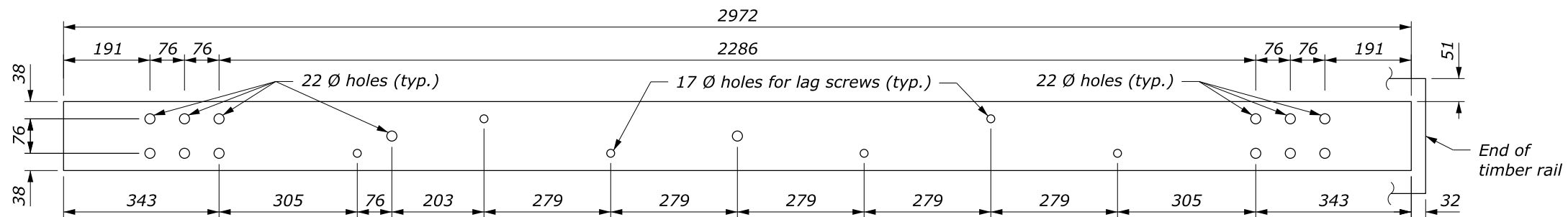
U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-64
STEEL-BACKED TIMBER GUARDRAIL TL-2 CONNECTION TO STONE MASONRY GUARDWALL	SPECIFICATION FP-24, FP-14
Sheet 1 of 3	APPROVED FOR USE 2/2024

NO SCALE

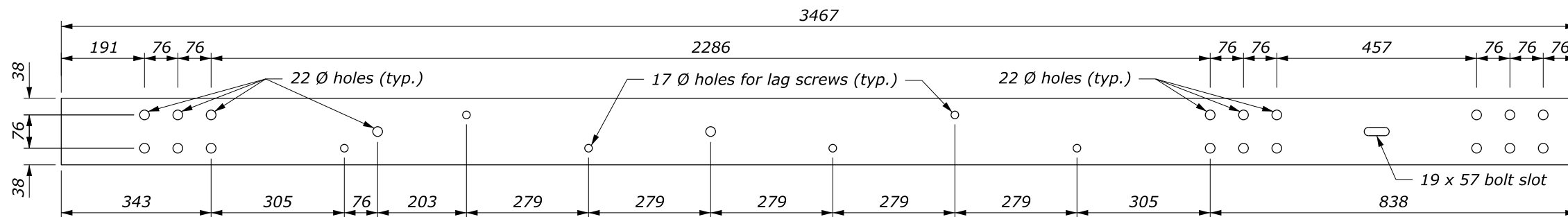
c:\pwwork\0419223\Std617-64.dgn [Std M617-64a] 24 June 2024 8:43 AM



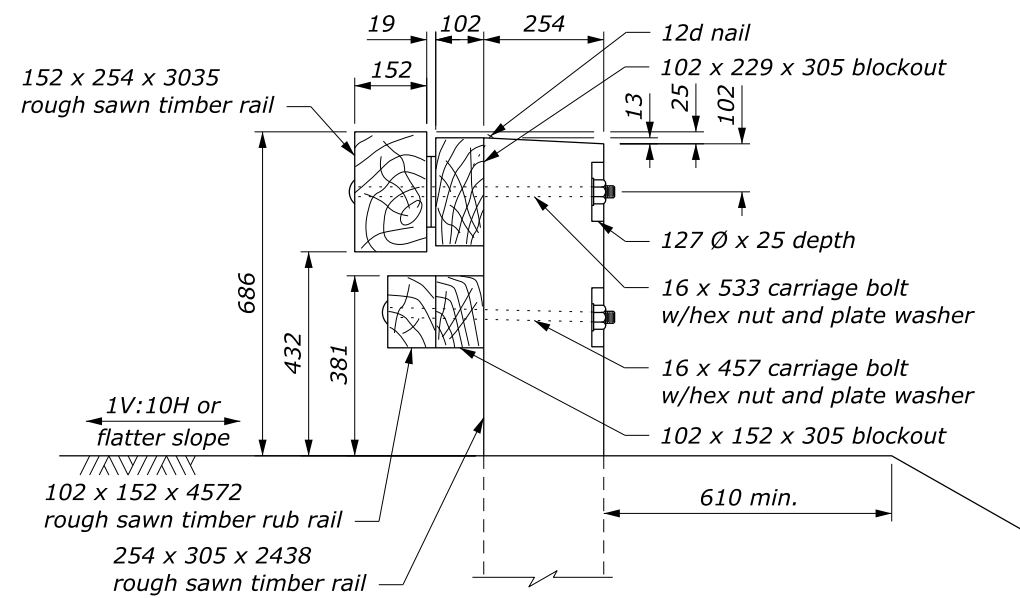
TERMINAL SECTION RAIL
152 x 10 x 2972



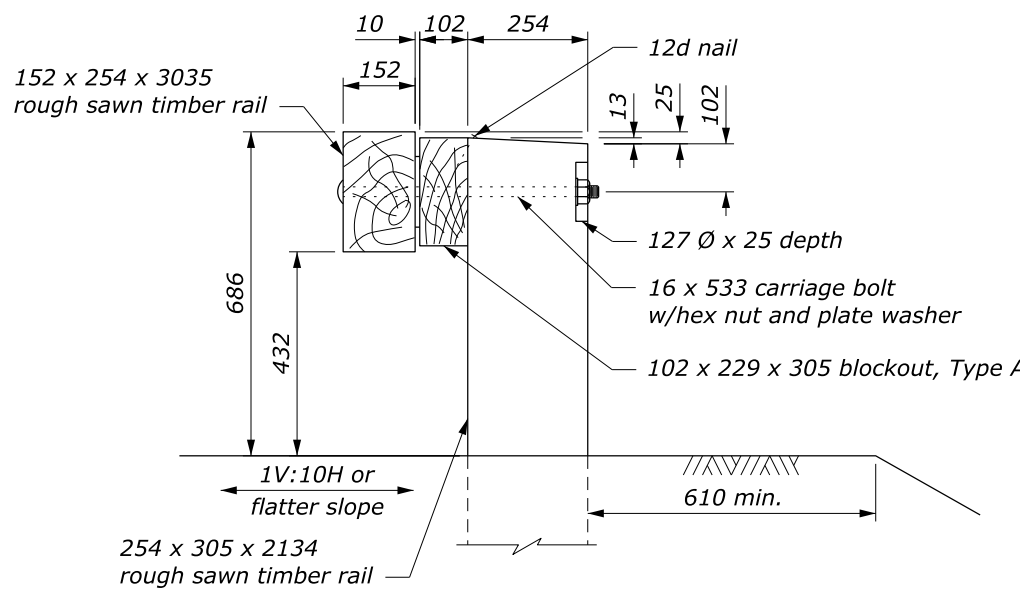
TRANSITION RAIL
152 x 10 x 2972



TRANSITION SPLICE RAIL
152 x 10 x 3467



SECTION A-A

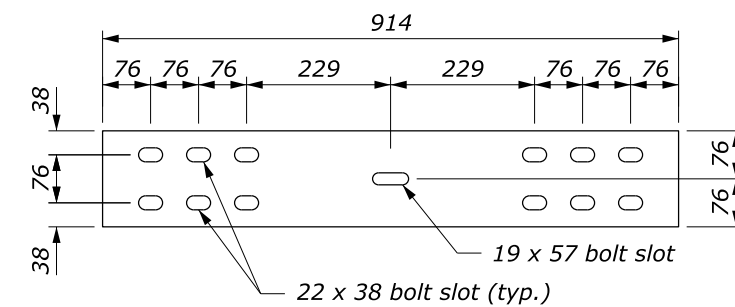


SECTION B-B

NO SCALE

NOTE:

1. Predrill 19 mm holes in blockouts and posts.
2. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are unavailable.

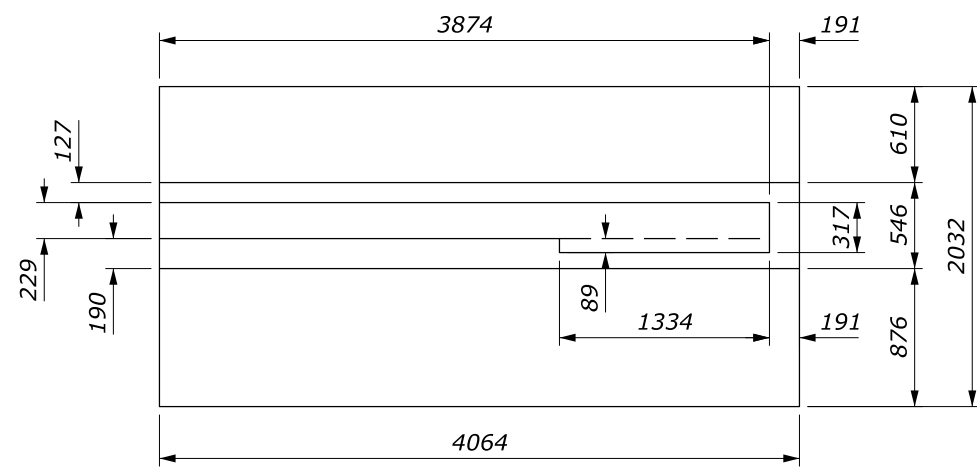


SPLICE PLATE
152 x 10 x 914

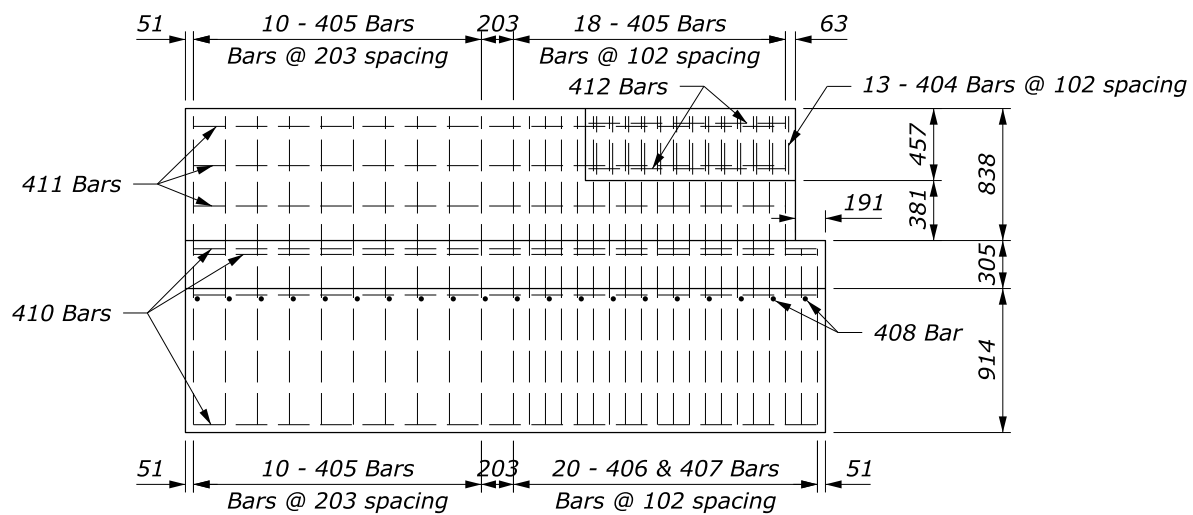
This drawing contains **Metric** units of measure. Dimensions without units are millimeters.

U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-64
STEEL-BACKED TIMBER GUARDRAIL TL-2 CONNECTION TO STONE MASONRY GUARDWALL	SPECIFICATION FP-24, FP-14
Sheet 2 of 3	APPROVED FOR USE 2/2024

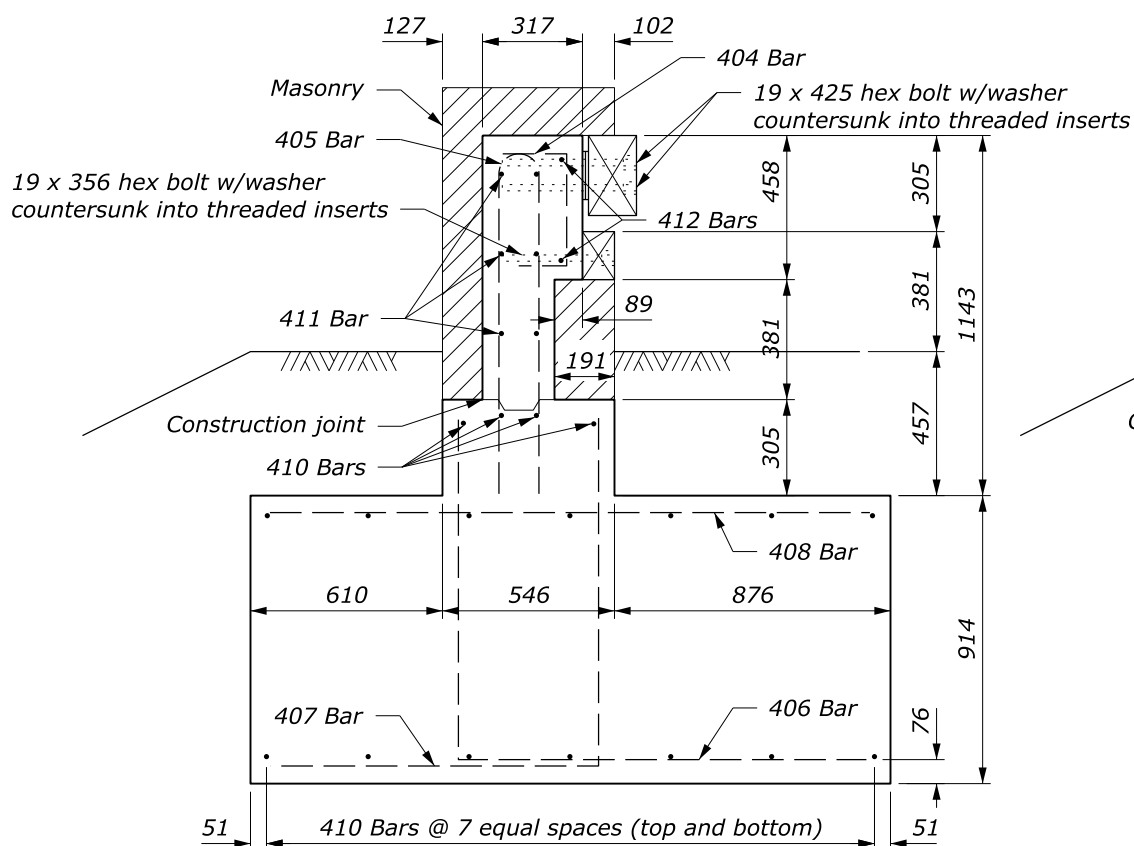
c:\pwwork\0419223\Std617-64.dgn [Std: M617-64b] 24 June 2024 8:43 AM



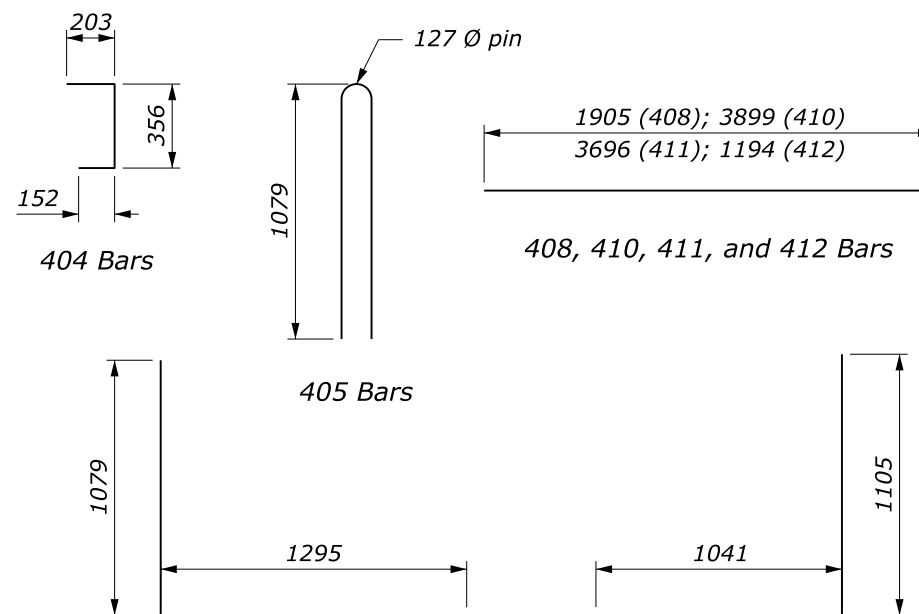
PLAN



ELEVATION



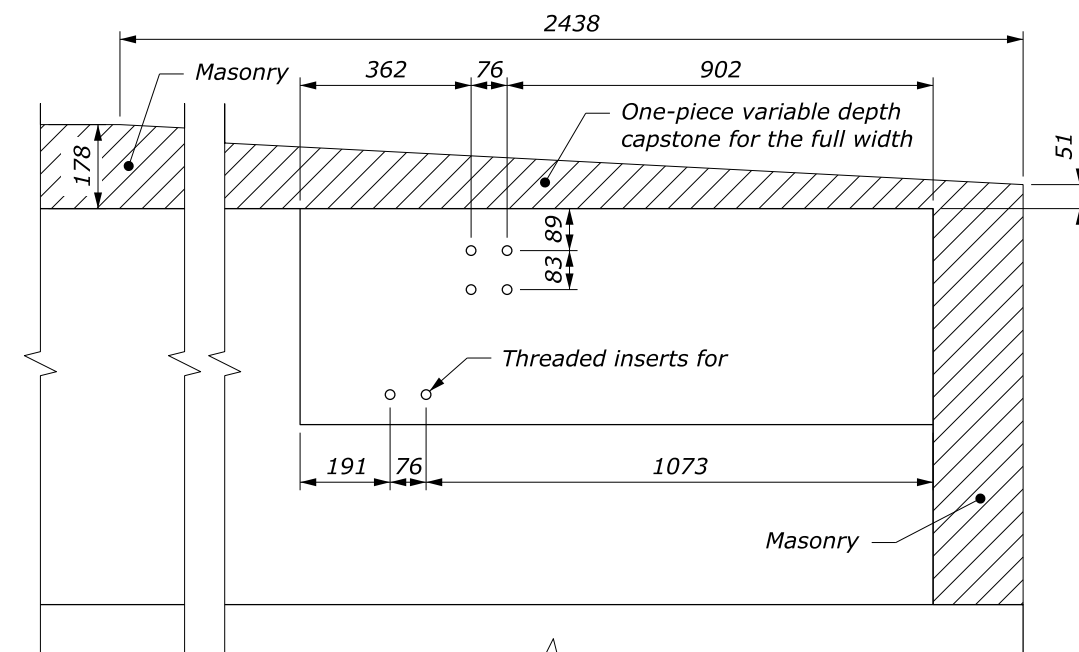
SECTION D-D
PARAPET END BLOCK



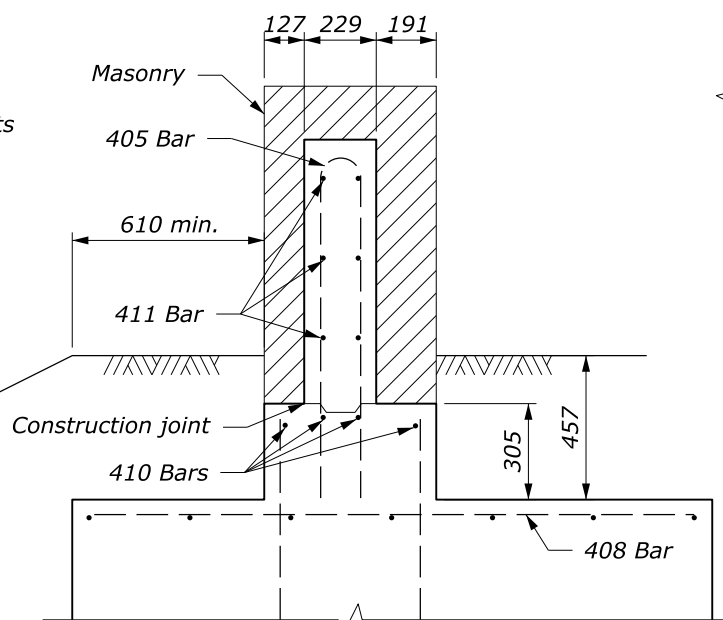
BAR DETAILS

NOTE:

1. Provide structural concrete Class A(AE), with a specified minimum 28-day compressive strength $F_c=30$ MPa. Vibrate all concrete. Chamfer exposed edges 19 mm unless otherwise shown. Do not use calcium chloride additives in the concrete.
2. Provide 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 51 mm unless otherwise shown. All bars are Metric size #16.
3. Construct footing against undisturbed material or backfill with well compacted granular material.



DETAIL C

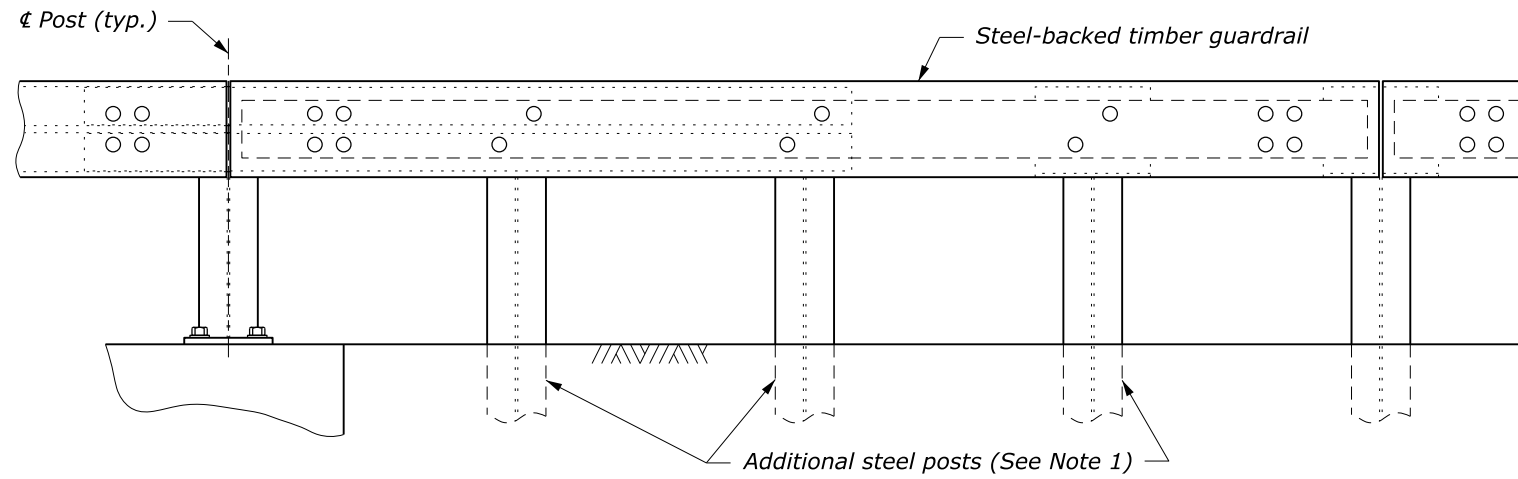


SECTION C-C

This drawing contains **Metric** units of measure. Dimensions without units are millimeters.

NO SCALE

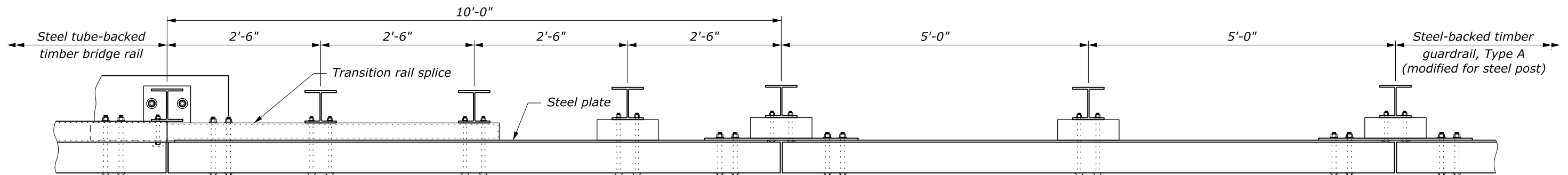
U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-64
STEEL-BACKED TIMBER GUARDRAIL TL-2 CONNECTION TO STONE MASONRY GUARDWALL	SPECIFICATION FP-24, FP-14
Sheet 3 of 3	APPROVED FOR USE 2/2024



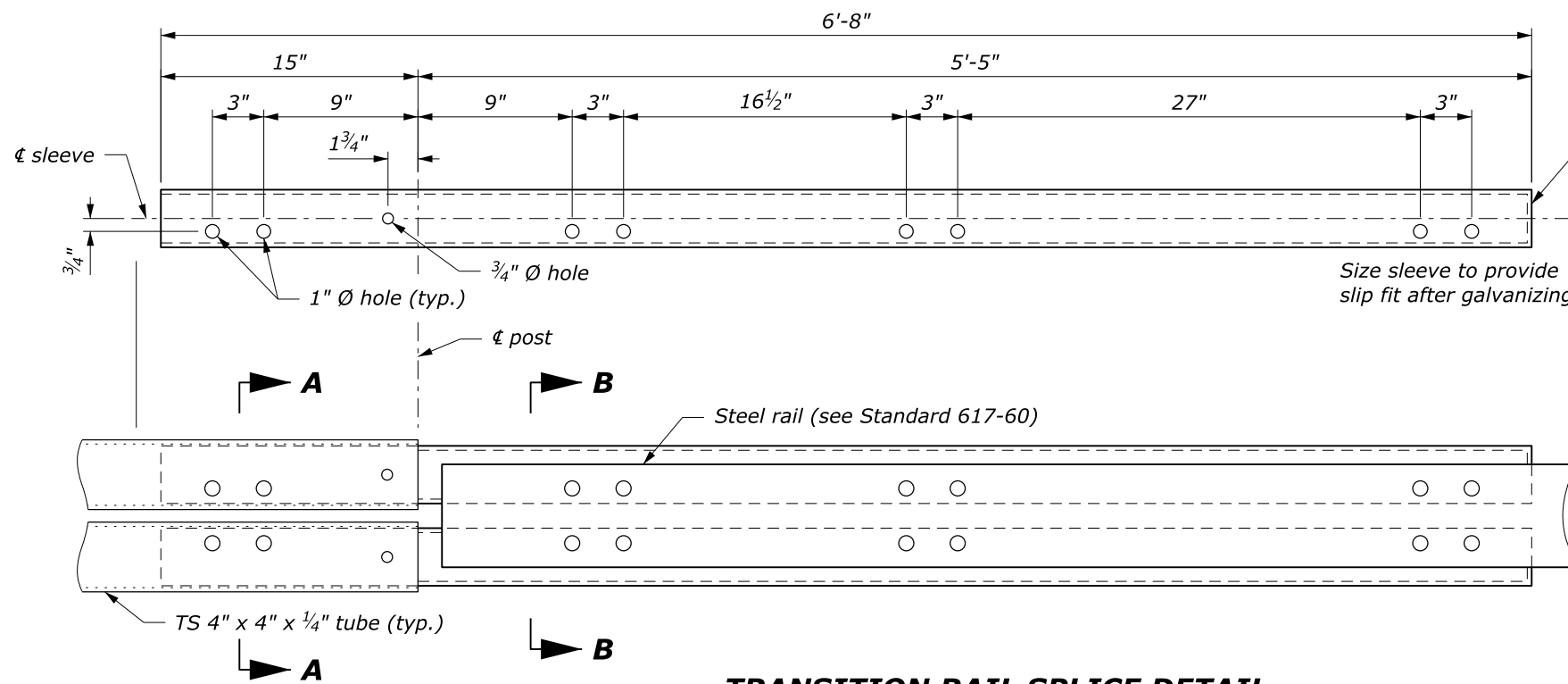
RAIL TRANSITION ELEVATION

NOTE:

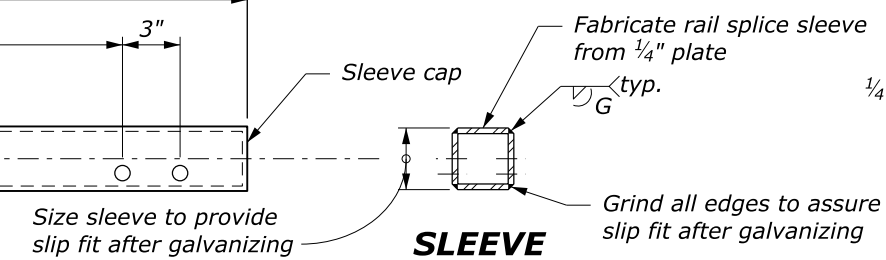
1. At each additional post provide 2⁵/₈" diameter round head square neck bolts with plate washer and hex nut, a 3/4" x 2 1/2" slot in steel plate, and 3/4" Ø holes in timber rail, steel post, and timber blockout. See Standard 617-60, Steel-backed timber guardrail, Type A (modified for steel post).



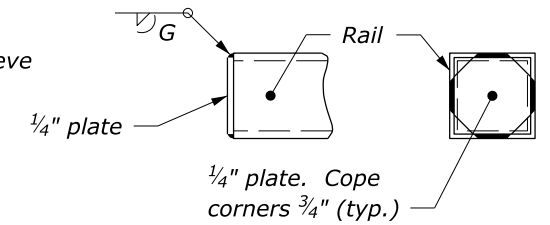
RAIL TRANSITION PLAN



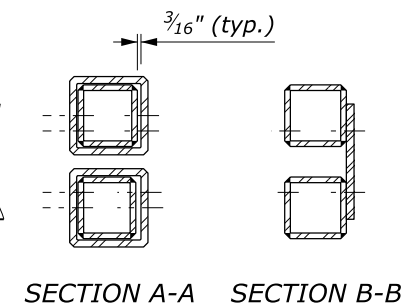
TRANSITION RAIL SPLICE DETAIL



SLEEVE



SLEEVE CAP DETAIL

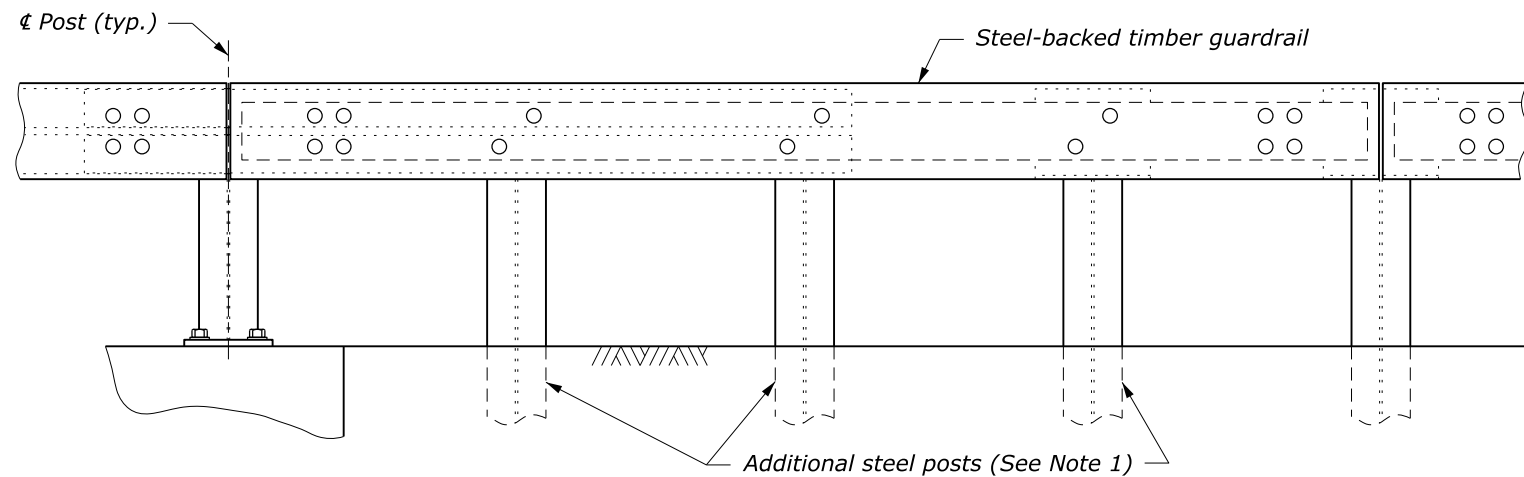


SECTION A-A SECTION B-B

NO SCALE

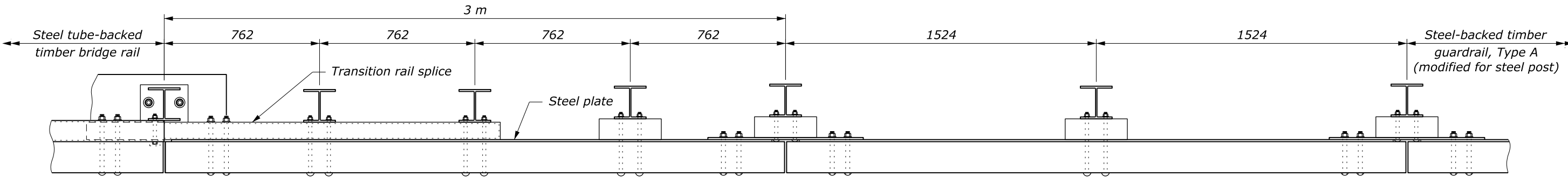
U.S. DEPARTMENT OF TRANSPORTATION, FHWA
OFFICE OF FEDERAL LANDS HIGHWAY
**STEEL-BACKED TIMBER GUARDRAIL
CONNECTION TO TUBULAR STEEL-
BACKED TIMBER BRIDGE RAIL**

FLH STANDARD
617-68
SPECIFICATION
FP-24, FP-14
APPROVED FOR USE
2/20204

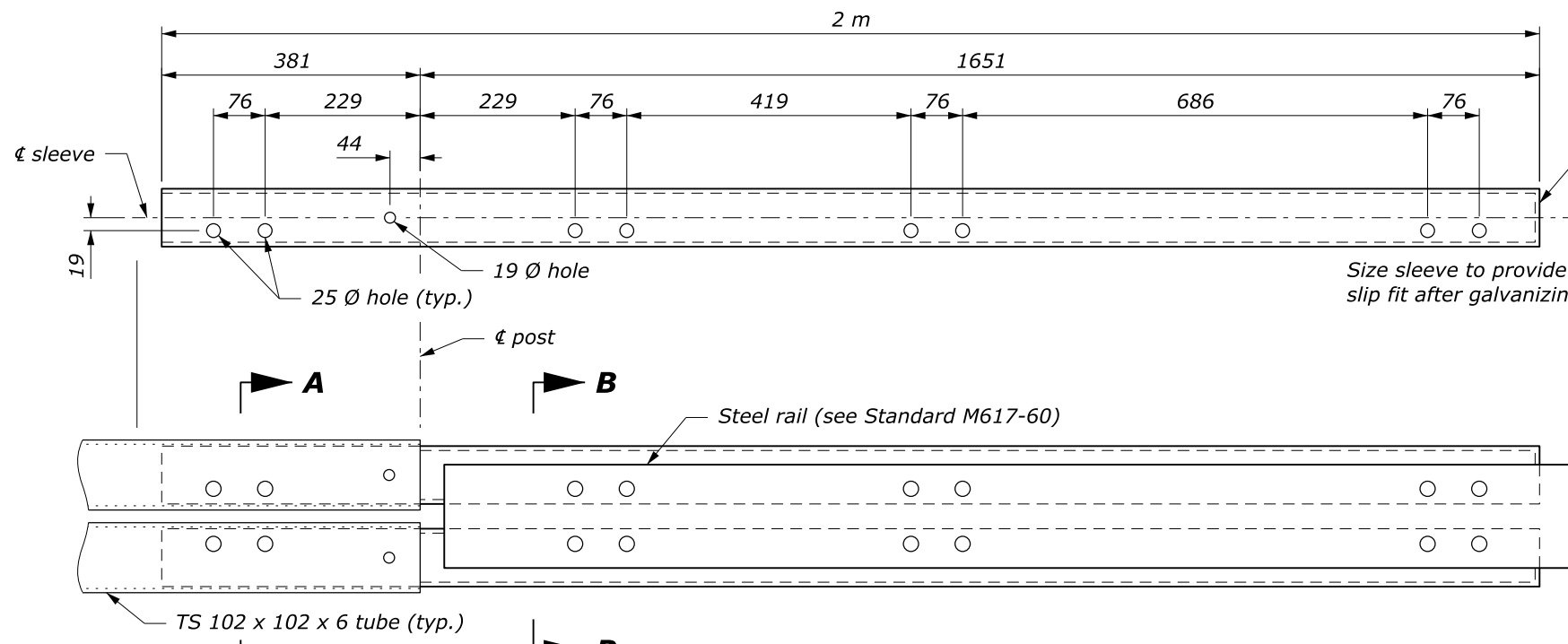


RAIL TRANSITION ELEVATION

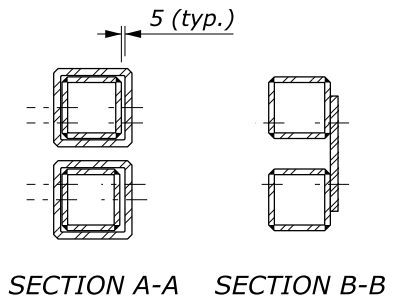
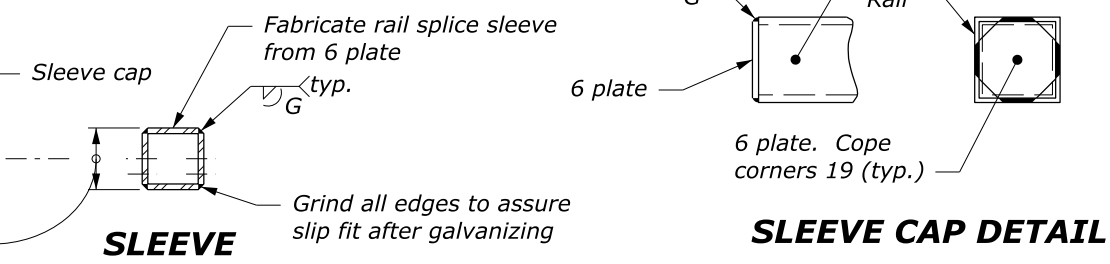
NOTE:
 1. At each additional post provide 67 mm diameter round head square neck bolts with plate washer and hex nut, a 19 x 64 mm slot in steel plate, and 19 mm Ø holes in timber rail, steel post, and timber blockout. See Standard M617-60, Steel-backed timber guardrail, Type A (modified for steel post).



RAIL TRANSITION PLAN



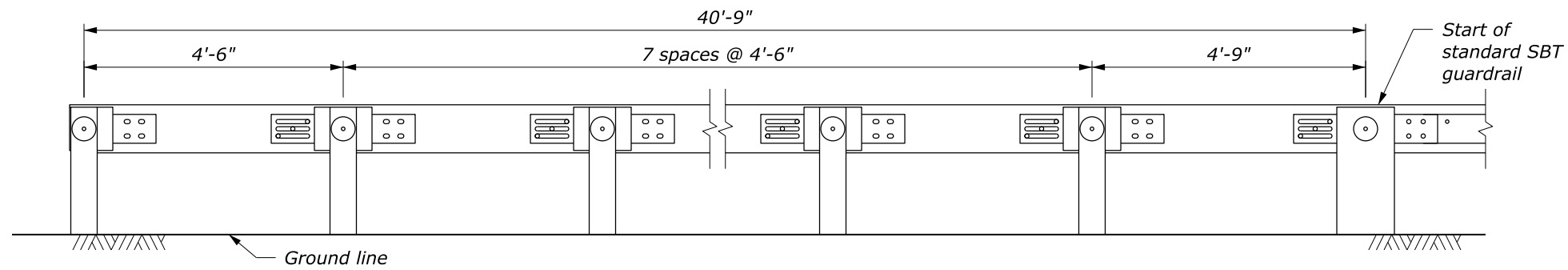
TRANSITION RAIL SPLICE DETAIL



This drawing contains **Metric** units of measure. Dimensions without units are millimeters.

U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-68
STEEL-BACKED TIMBER GUARDRAIL CONNECTION TO TUBULAR STEEL- BACKED TIMBER BRIDGE RAIL	SPECIFICATION FP-24, FP-14
	APPROVED FOR USE 2/2024

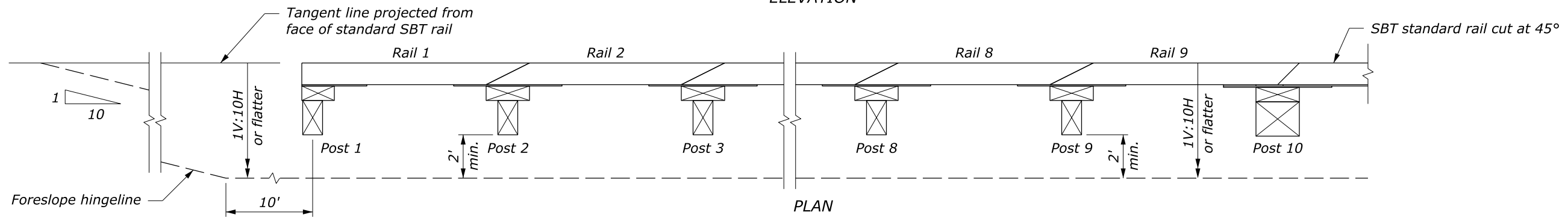
c:\pwwork\0419223\Std617-68.dgn [Std M617-68] 2.1 June 2024 2:43 PM



ELEVATION

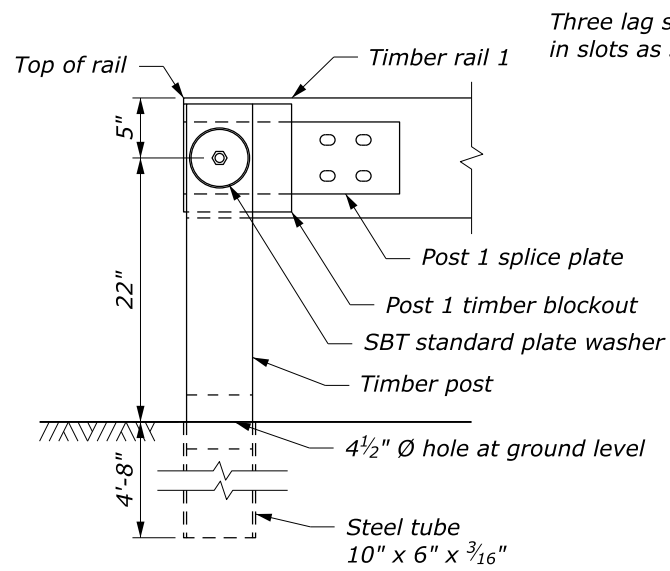
NOTE:

1. See Standard 617-60 for standard SBT guardrail details.
2. Use weathering steel for all structural steel and fastener hardware.

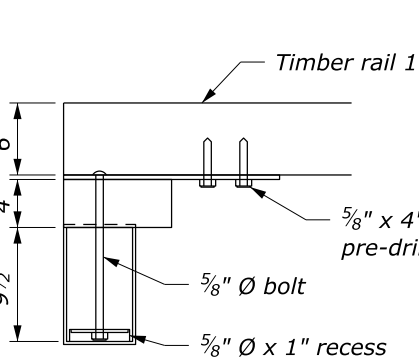


PLAN

TERMINAL LAYOUT

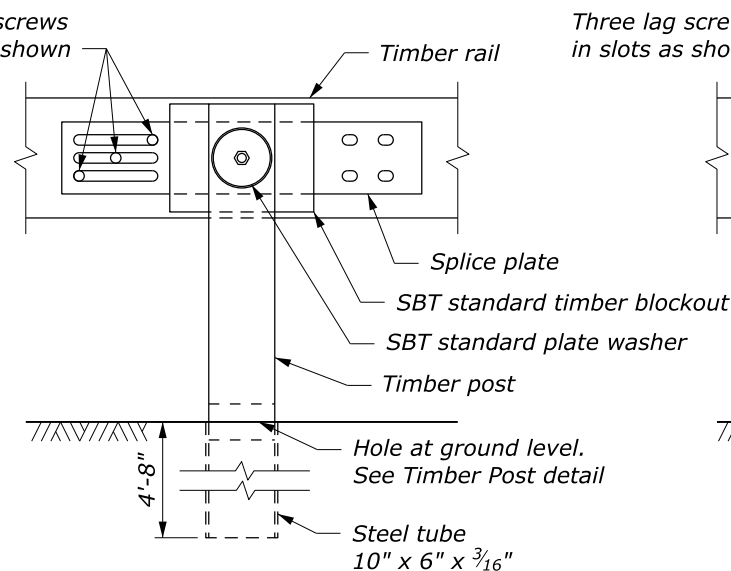


ELEVATION

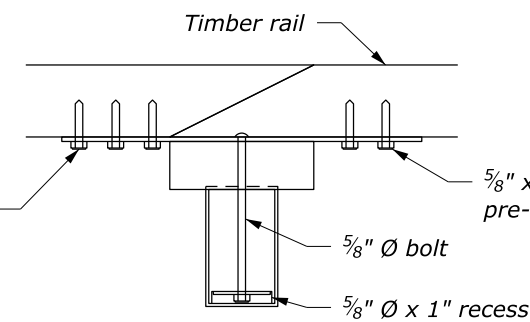


PLAN

POST 1/RAIL CONNECTION

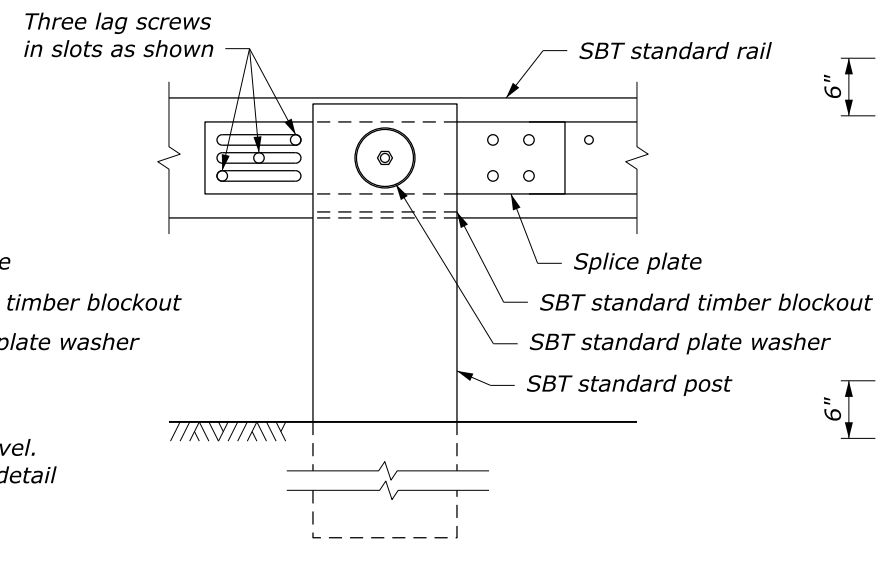


ELEVATION

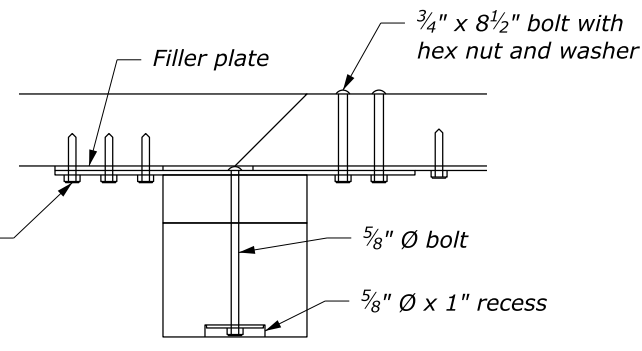


PLAN

POSTS 2-9/RAIL CONNECTION

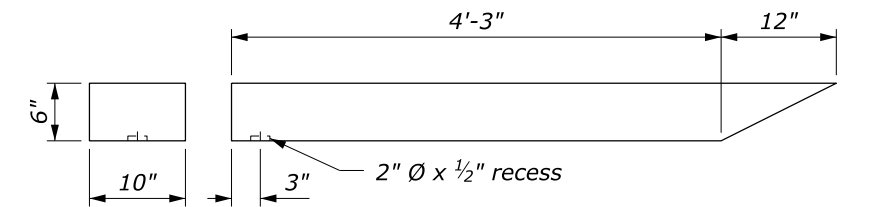


ELEVATION

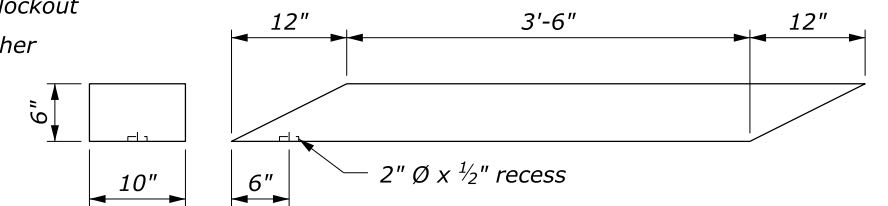


PLAN

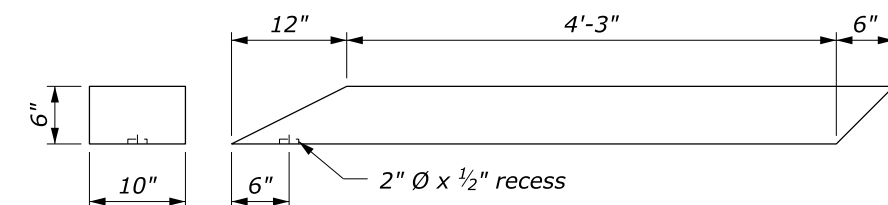
POST 10/RAIL CONNECTION



TIMBER RAIL 1



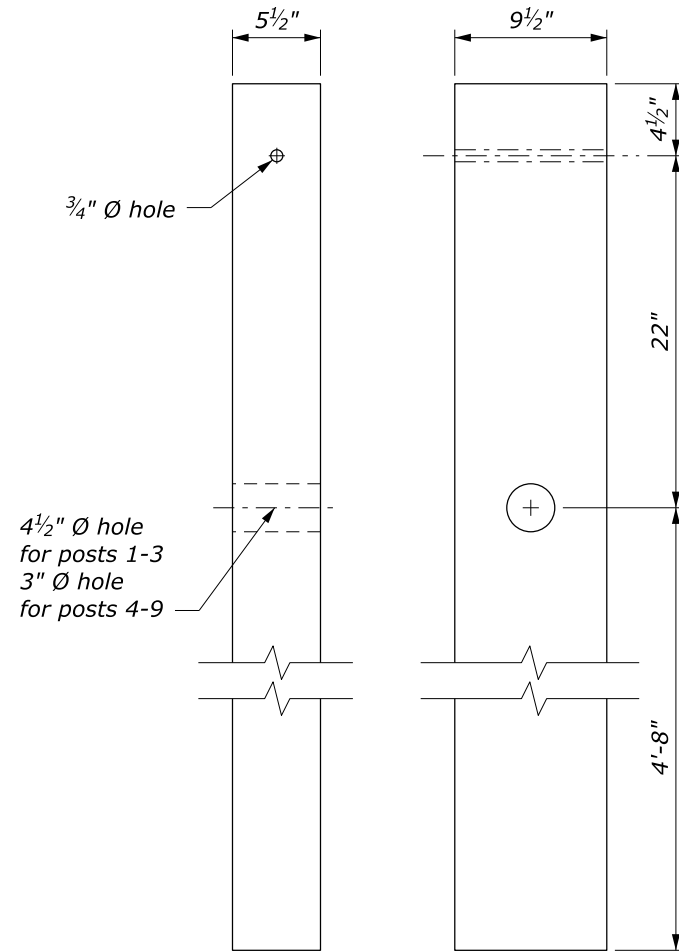
TIMBER RAILS 2 - 8



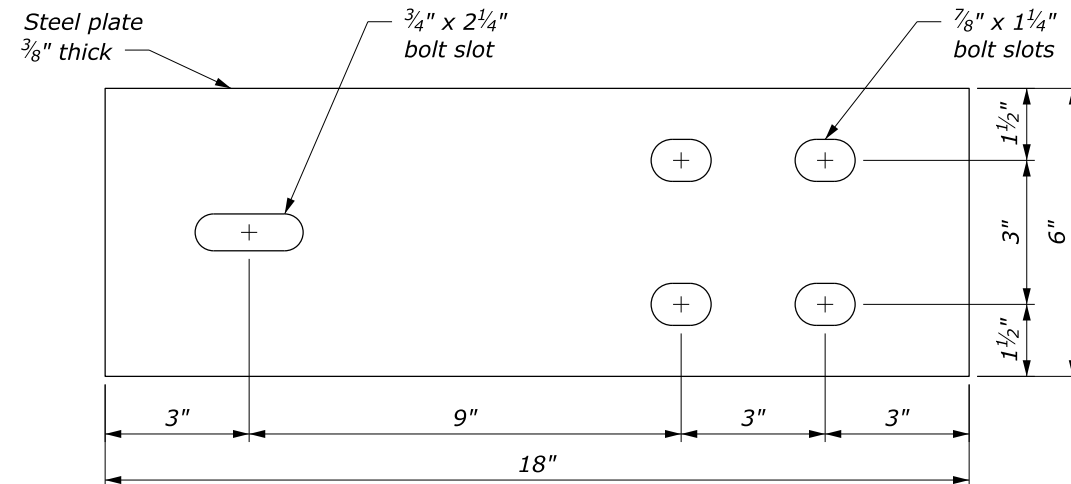
TIMBER RAIL 9

NO SCALE

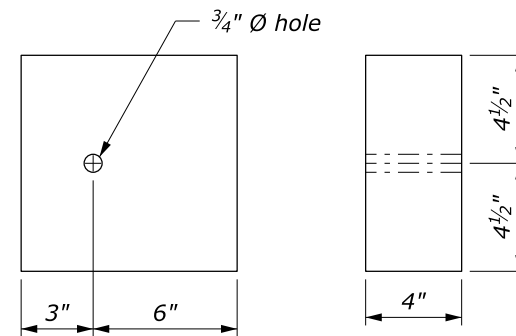
U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD 617-69
STEEL-BACKED TIMBER GUARDRAIL TL-2 END TERMINAL	SPECIFICATION FP-24, FP-14
Sheet 1 of 2	APPROVED FOR USE 2/2024



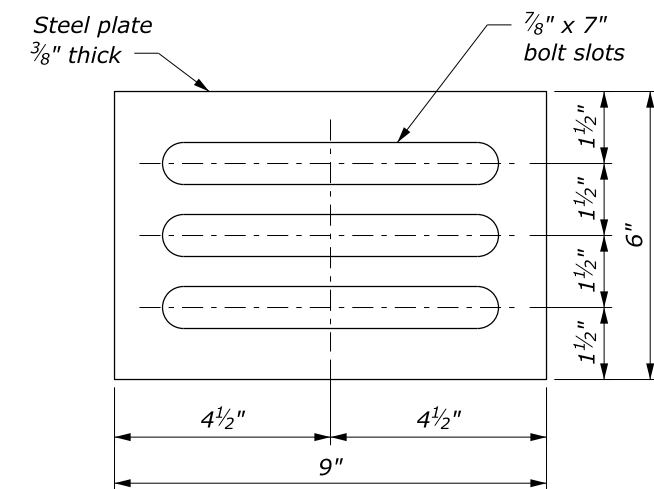
TIMBER POSTS
Posts 1 to 9



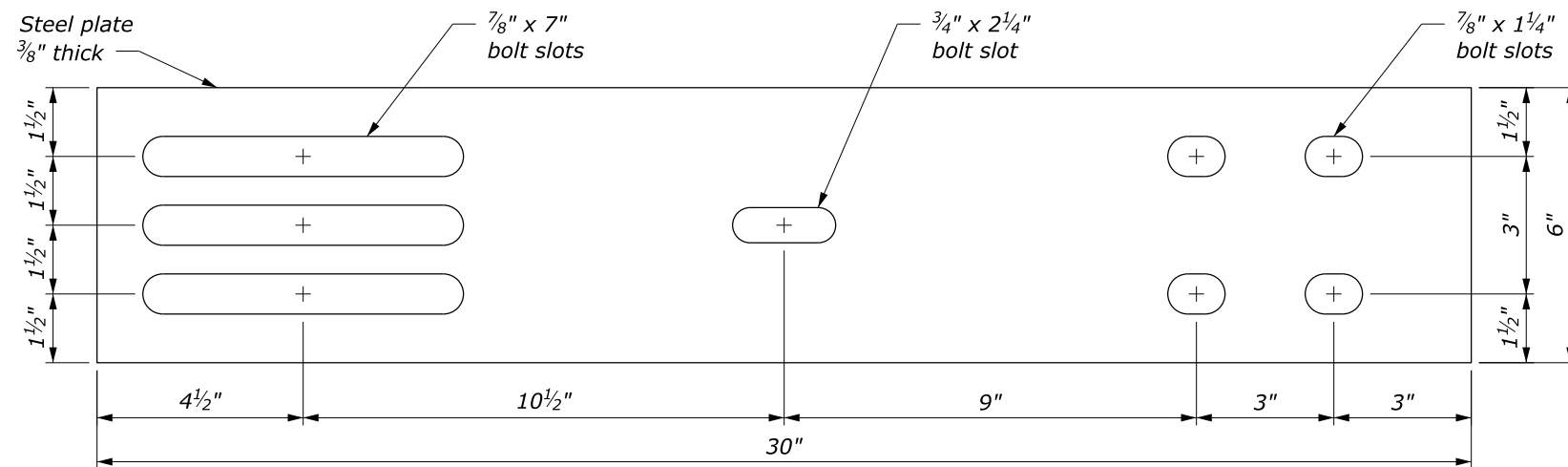
POST 1 SPLICE PLATE



POST 1 TIMBER BLOCKOUT



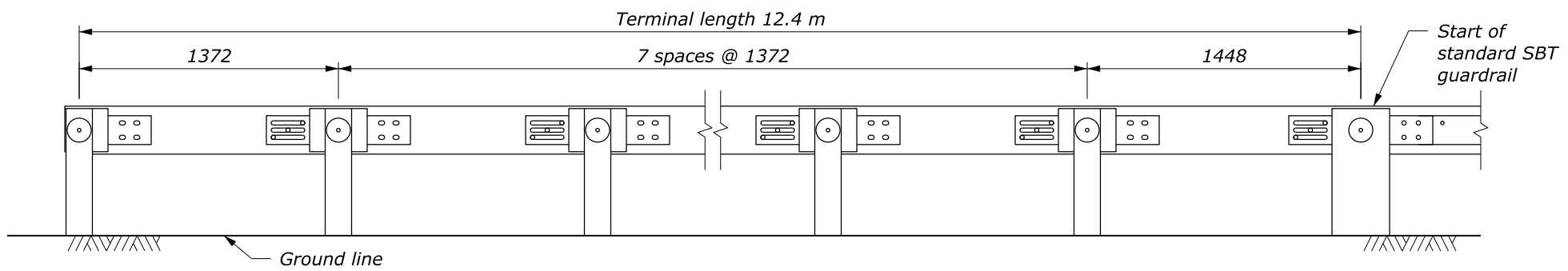
FILLER PLATE
Post 10



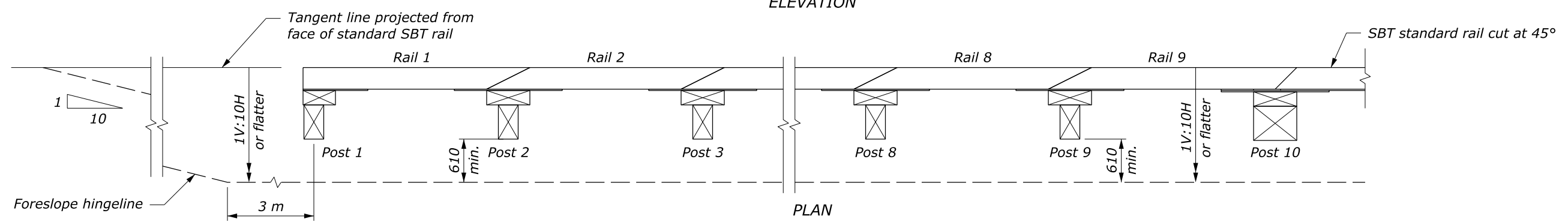
SPLICE PLATE
Posts 2 to 10

c:\pwwork\00419223\Std617-69.dgn [Std 617-69b] 21 June 2024 1:39 PM

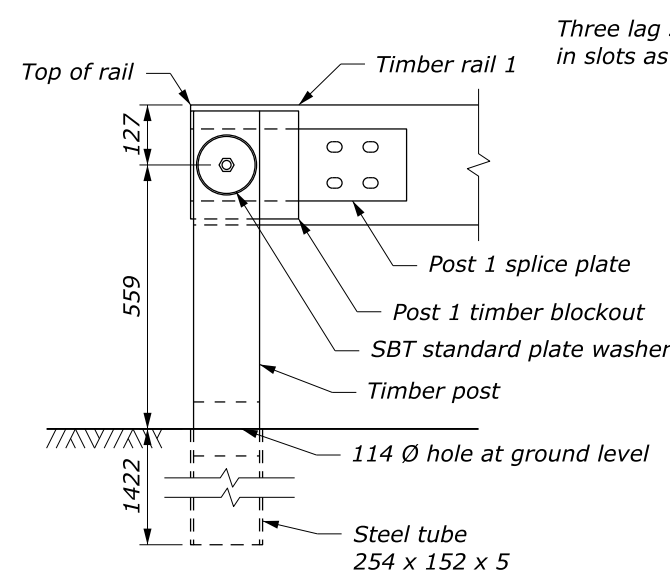
U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD 617-69
STEEL-BACKED TIMBER GUARDRAIL TL-2 END TERMINAL	SPECIFICATION FP-24, FP-14
Sheet 2 of 2	APPROVED FOR USE 2/2024



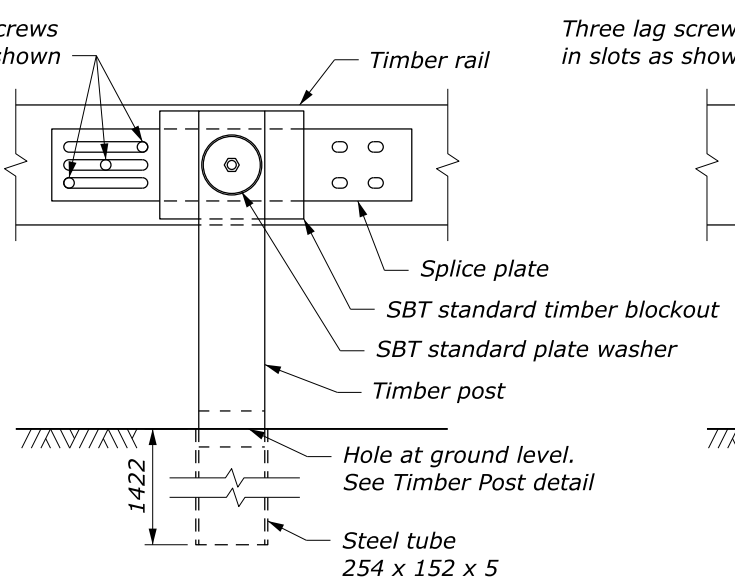
- NOTE:**
1. See Standard M617-60 for standard SBT guardrail details.
 2. Use weathering steel for all structural steel and fastener hardware.



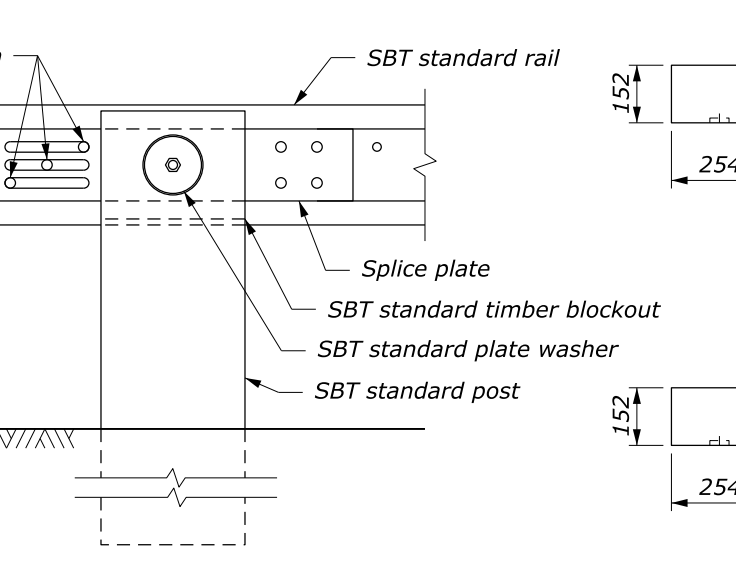
TERMINAL LAYOUT



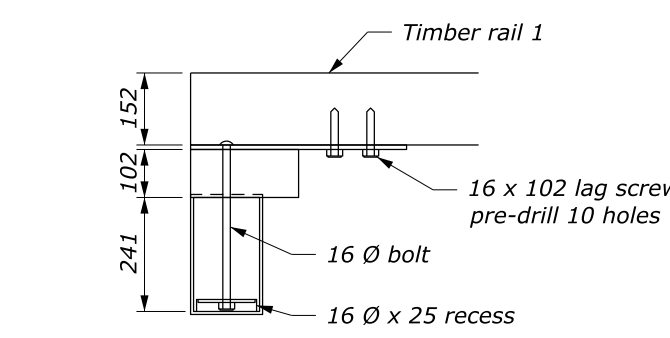
POST 1/RAIL CONNECTION



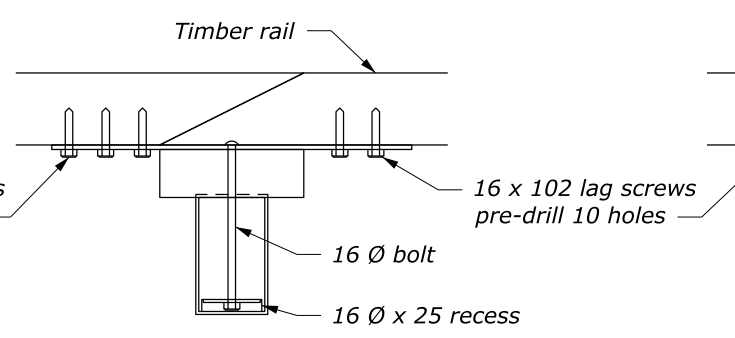
POSTS 2-9/RAIL CONNECTION



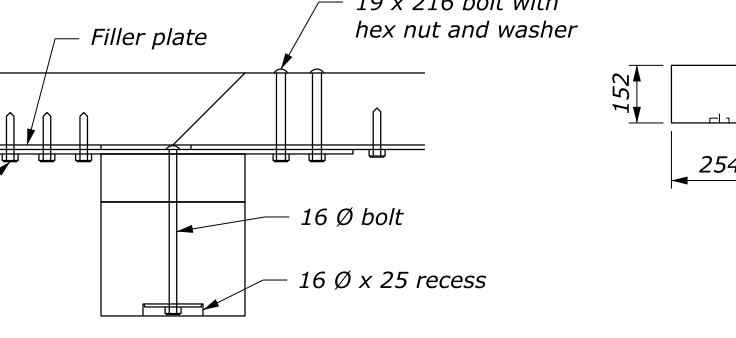
POST 10/RAIL CONNECTION



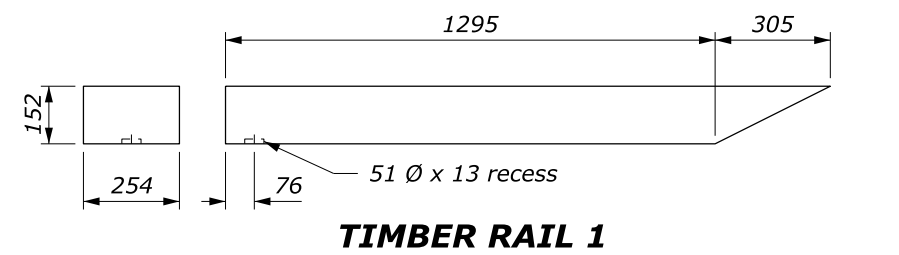
POST 1/RAIL CONNECTION



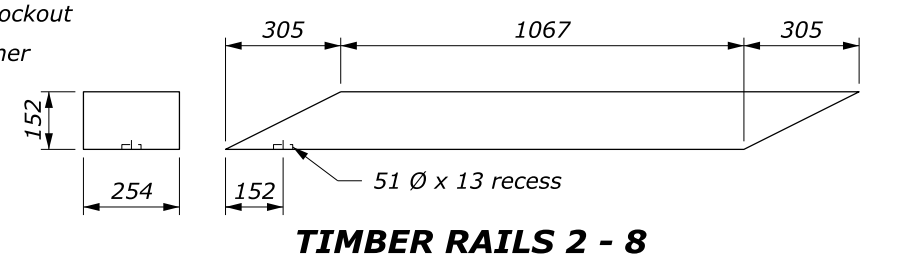
POSTS 2-9/RAIL CONNECTION



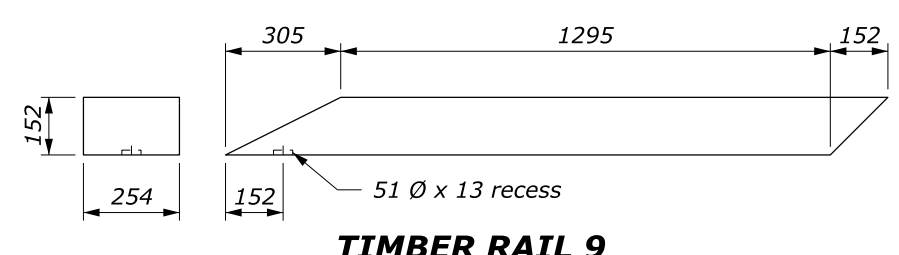
POST 10/RAIL CONNECTION



TIMBER RAIL 1



TIMBER RAILS 2 - 8



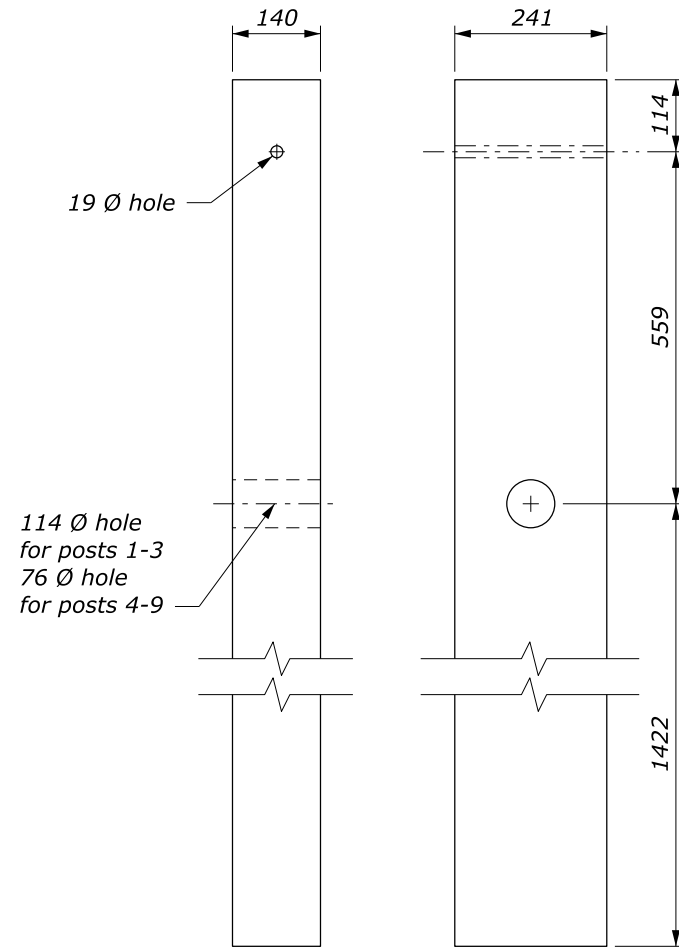
TIMBER RAIL 9

This drawing contains **Metric** units of measure. Dimensions without units are millimeters.

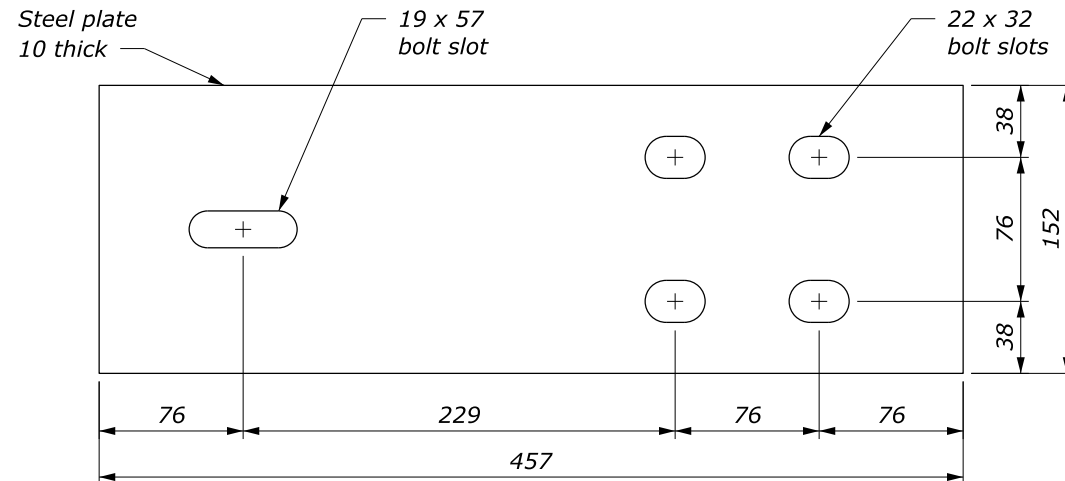
U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-69
STEEL-BACKED TIMBER GUARDRAIL TL-2 END TERMINAL	SPECIFICATION FP-24, FP-14
Sheet 1 of 2	APPROVED FOR USE 2/2024

NO SCALE

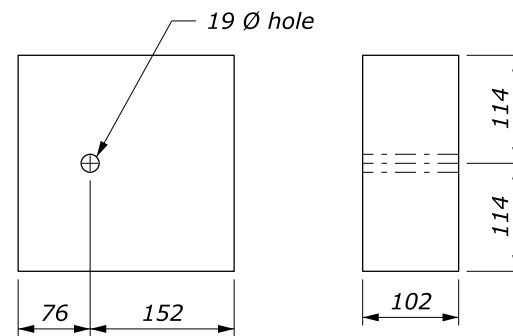
c:\pwwork\0419223\Std617-69.dgn [Std M617-69a] 21 June 2024 1:57 PM



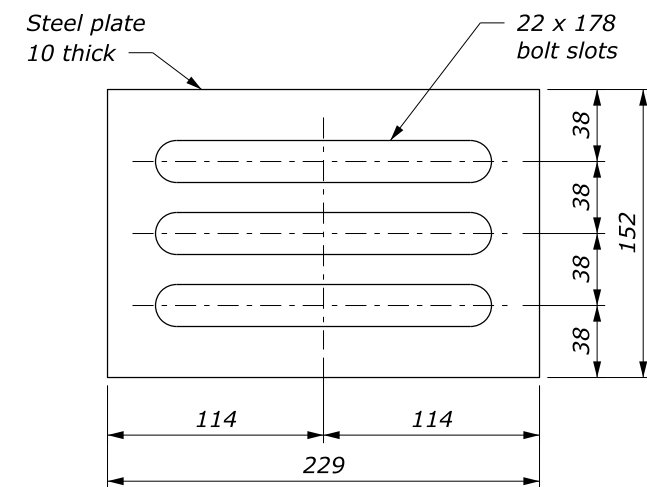
TIMBER POSTS
Posts 1 to 9



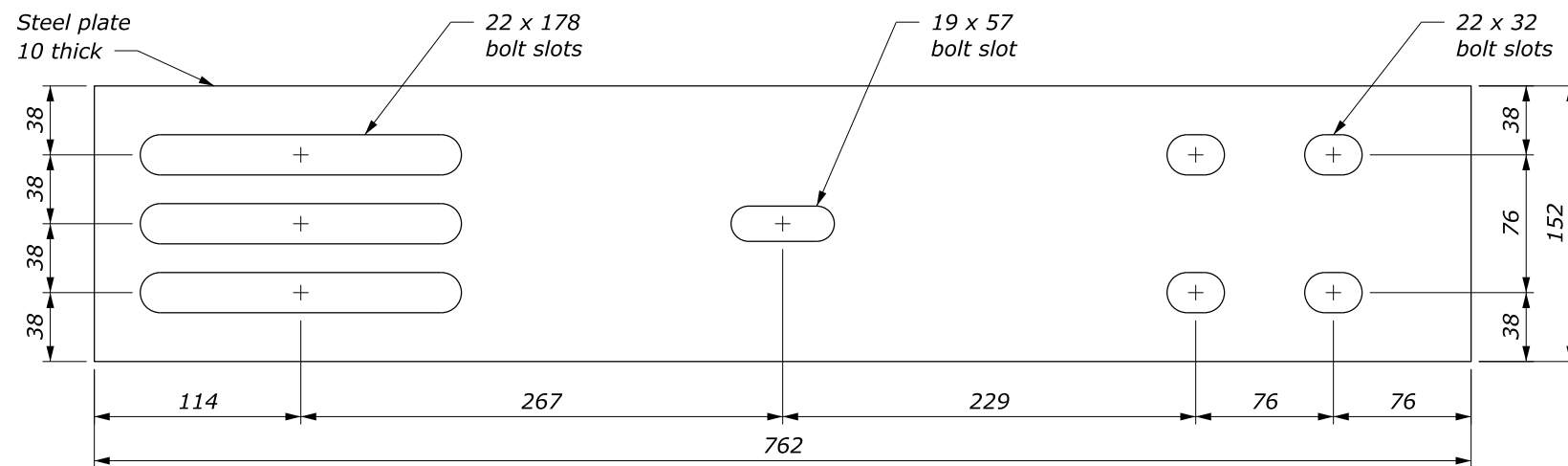
POST 1 SPLICE PLATE



POST 1 TIMBER BLOCKOUT



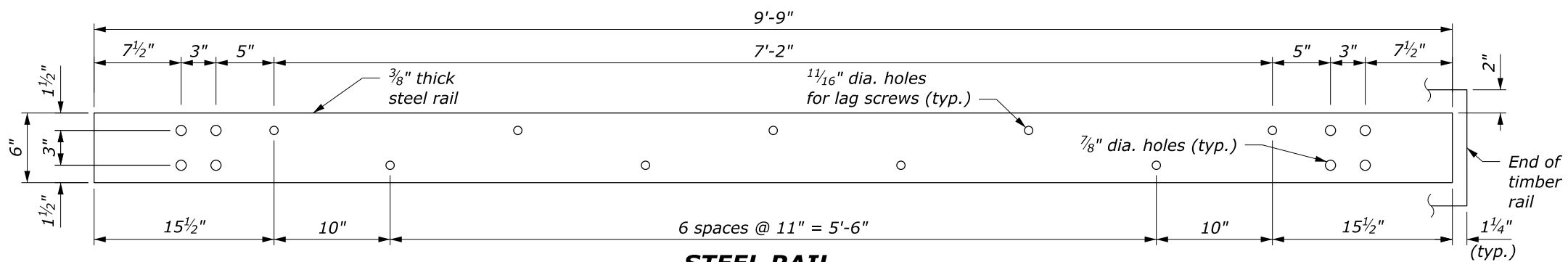
FILLER PLATE
Post 10



SPLICE PLATE
Posts 2 to 10

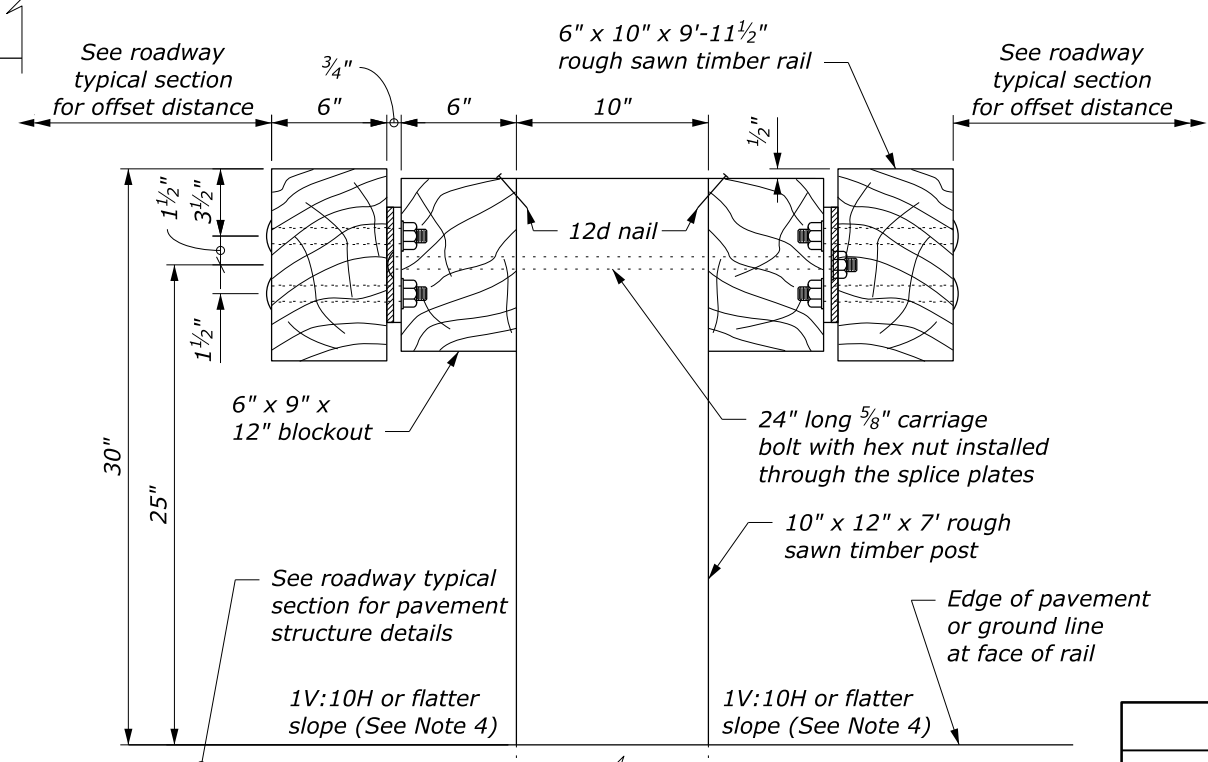
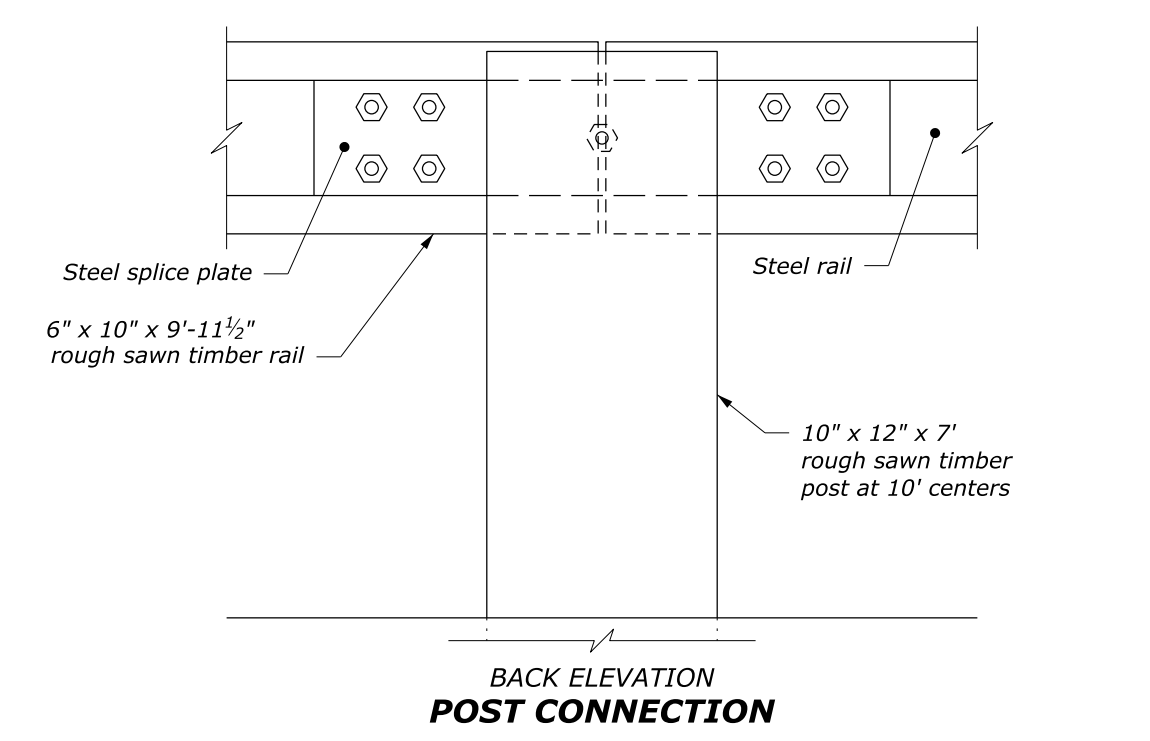
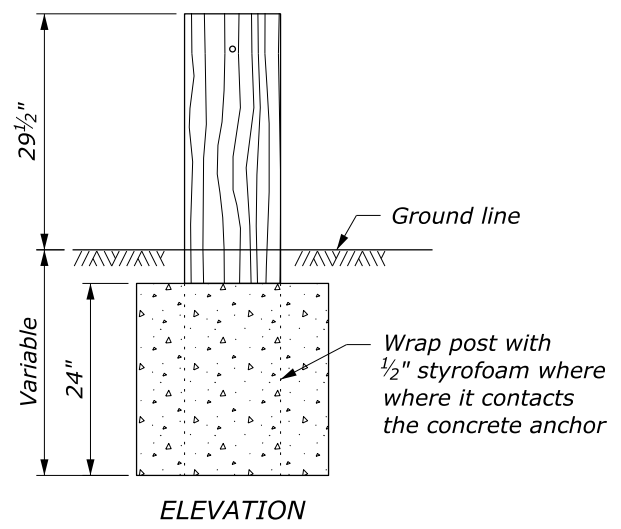
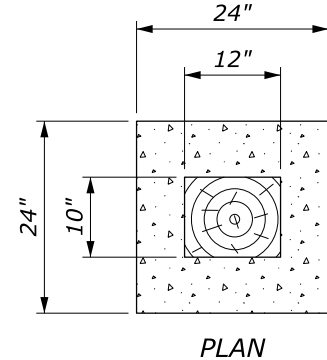
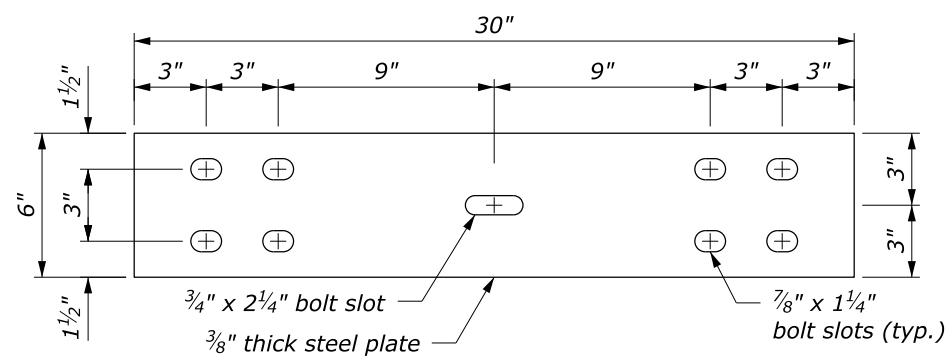
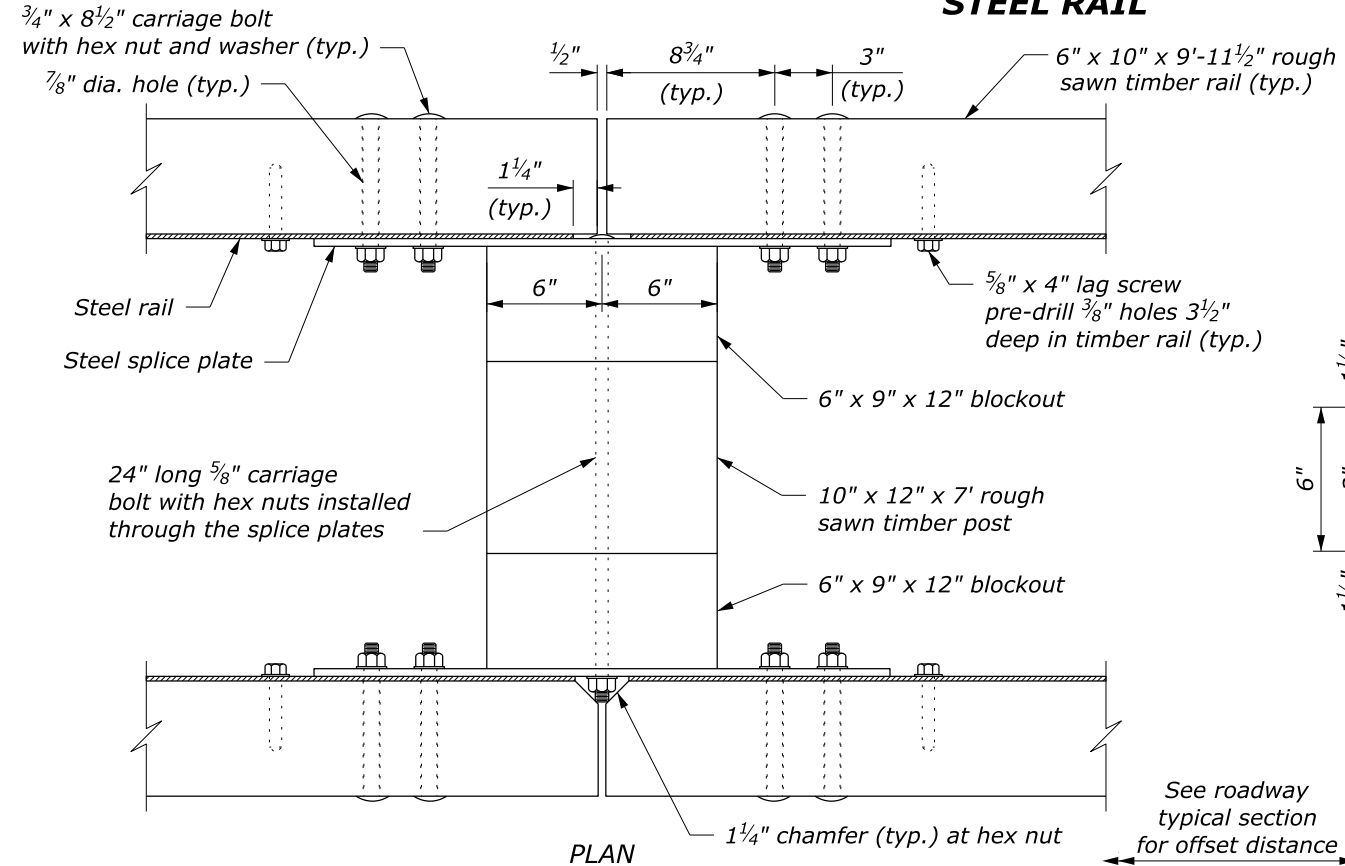
This drawing contains **Metric** units of measure.
Dimensions without units are millimeters.

U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-69
STEEL-BACKED TIMBER GUARDRAIL TL-2 END TERMINAL	SPECIFICATION FP-24, FP-14
Sheet 2 of 2	APPROVED FOR USE 2/2024



NOTE:

1. Use weathering steel for all structural steel and fastener hardware as specified.
2. Place terminal on both approach and trailing ends of median barrier installations. Use Type A blocked-out systems as shown in Standards 617-61 and 617-62.
3. Use no more than 3 short guardrail posts in a row. 25 inch diameter round anchors may be used instead of the square anchor shown. A reduced size is acceptable in solid rock as approved.
4. In areas where the rail face is offset a minimum of 20 feet from the edge of travel lane, a maximum approach shoulder slope of 1V:6H may be used.

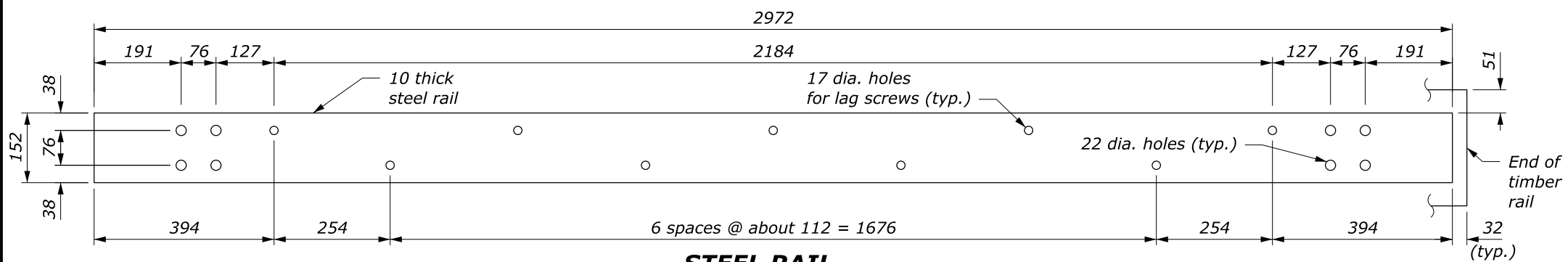


CONCRETE ANCHOR FOR SHORT GUARDRAIL POST
See Note 3

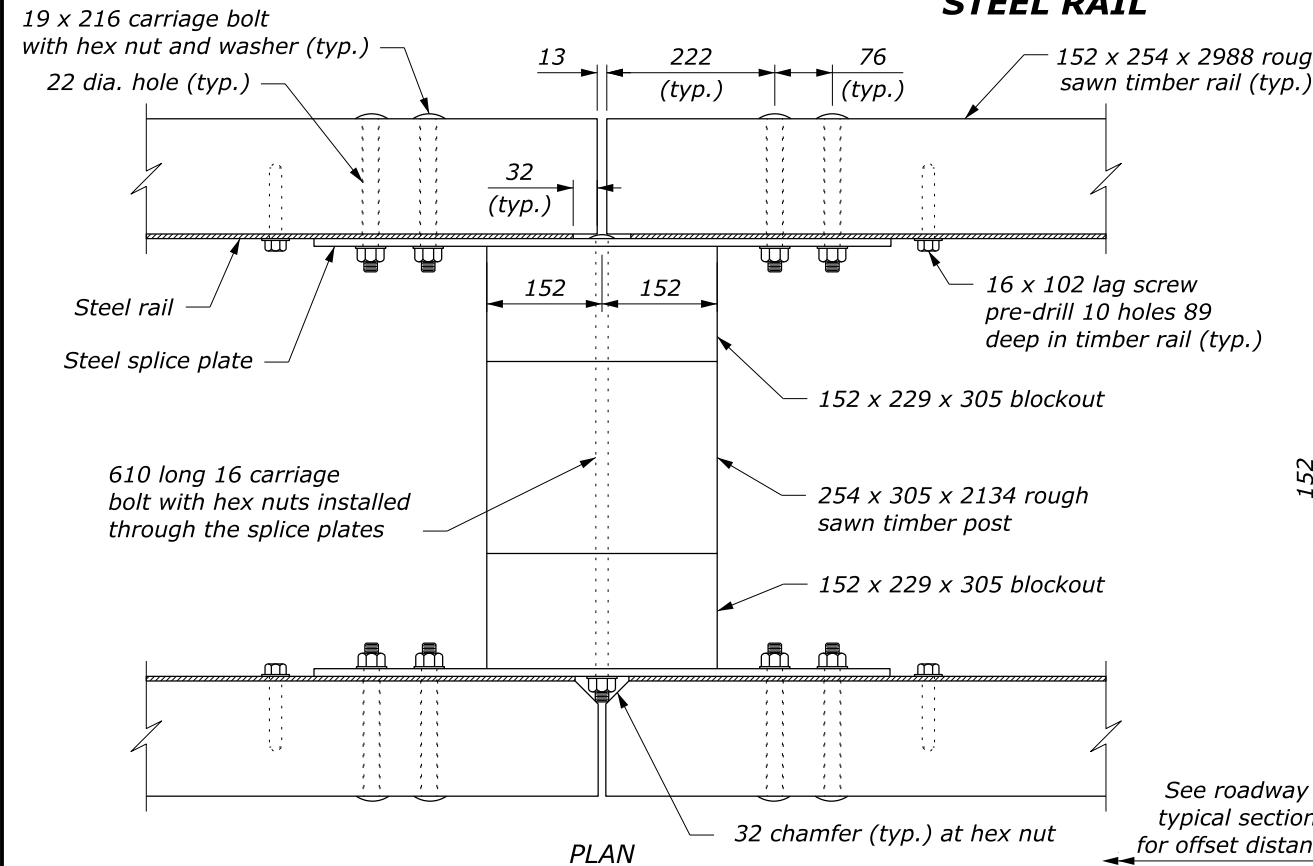
U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD 617-70
STEEL-BACKED TIMBER GUARDRAIL, MEDIAN TYPE A	SPECIFICATION FP-24, FP-14
	APPROVED FOR USE 1/2024

NO SCALE

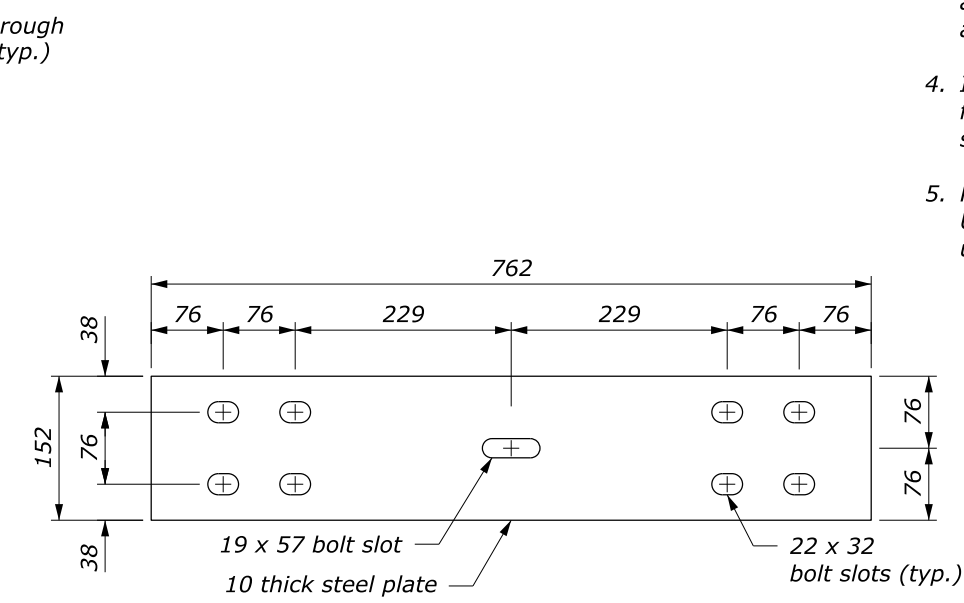
c:\pwwork\00419223\Std617-70.dgn [Std 617-70] 21 June 2024 12:32 PM



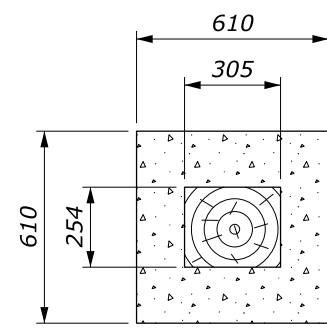
STEEL RAIL



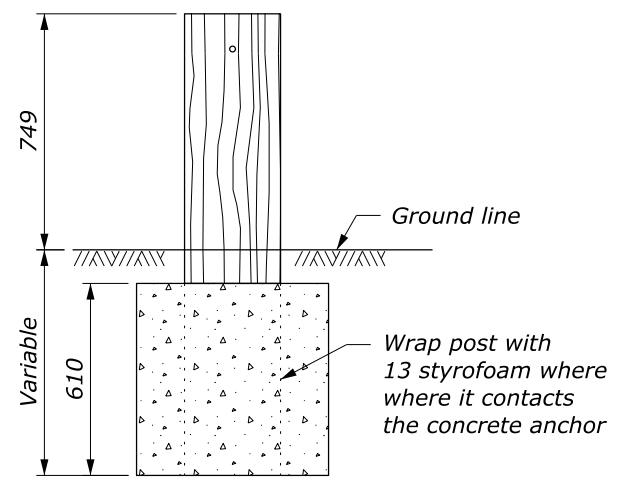
PLAN



STEEL SPLICE PLATE



PLAN

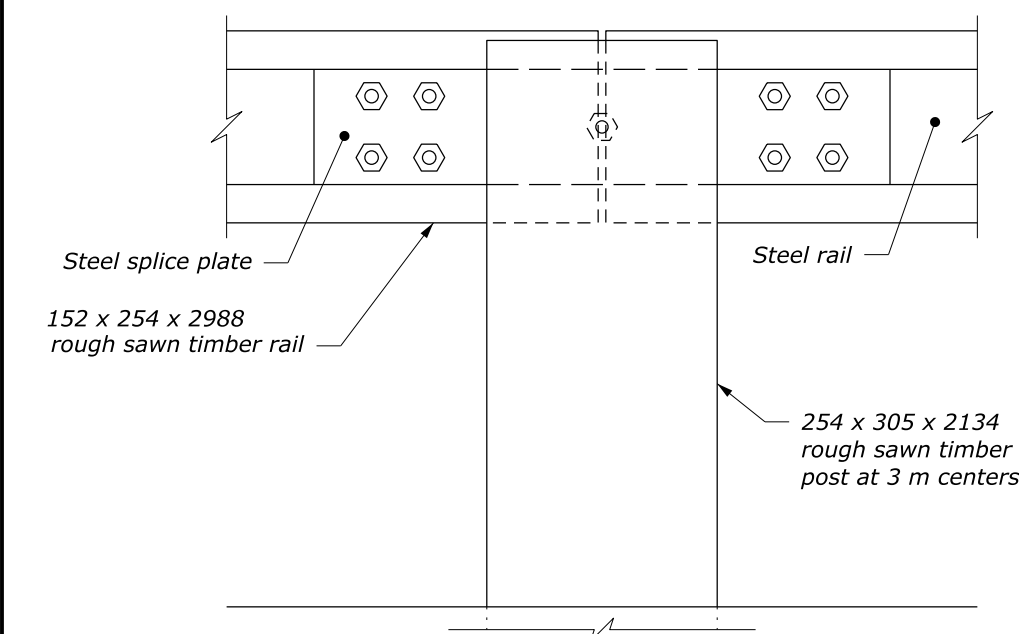


ELEVATION

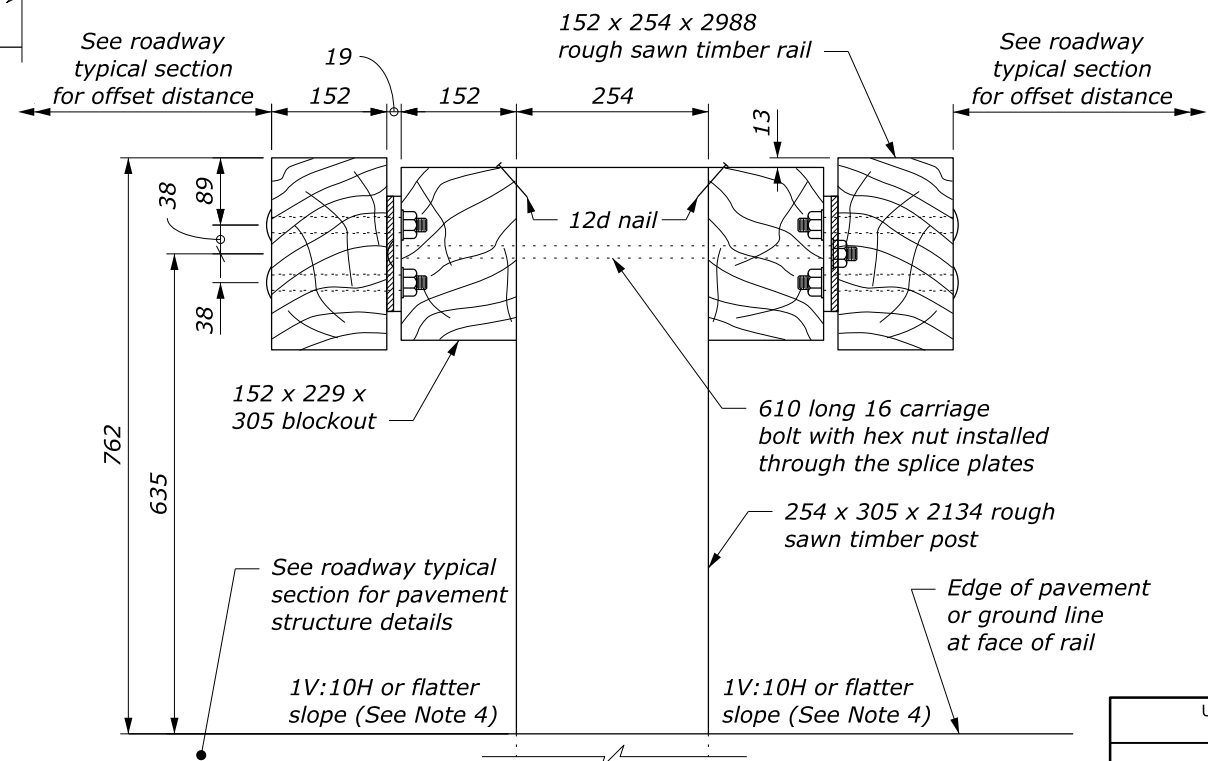
CONCRETE ANCHOR FOR SHORT GUARDRAIL POST

See Note 3

This drawing contains **Metric** units of measure. Dimensions without units are millimeters.



BACK ELEVATION POST CONNECTION



TYPICAL GUARDRAIL CROSS SECTION

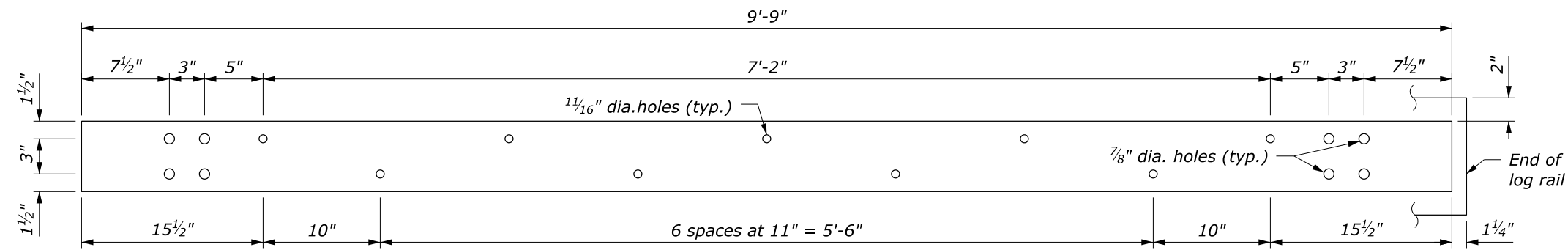
NO SCALE

NOTE:

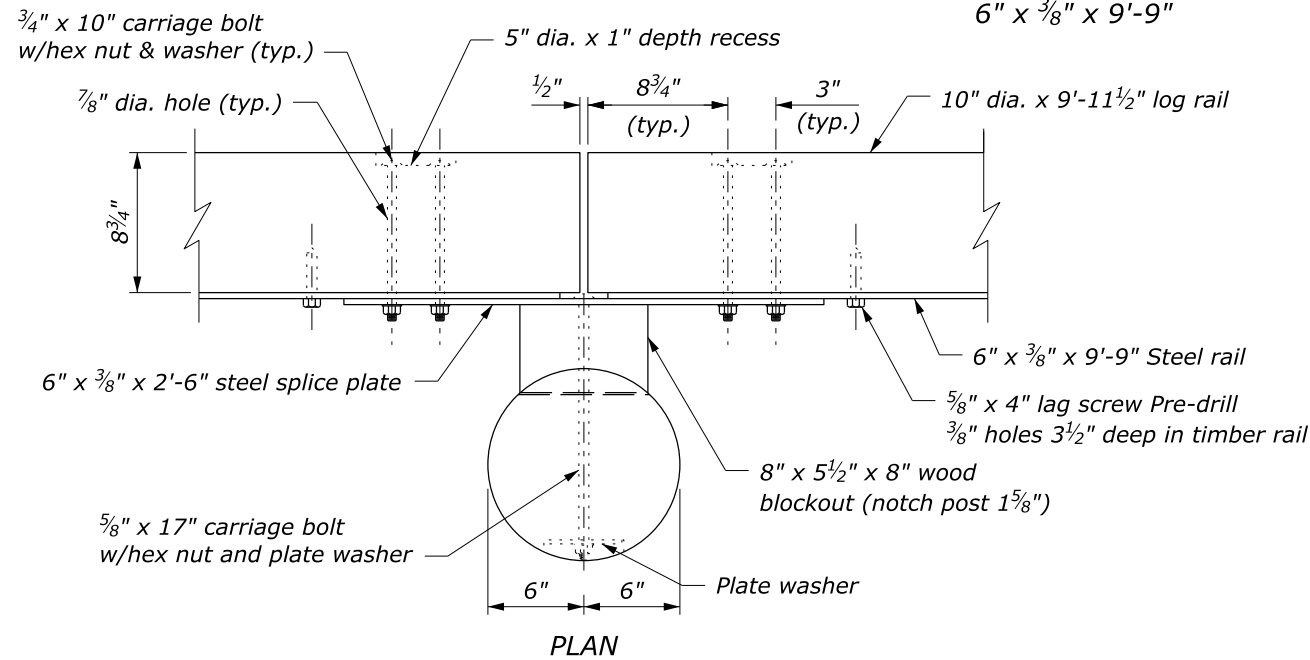
1. Use weathering steel for all structural steel and fastener hardware as specified.
2. Place terminal on both approach and trailing ends of median barrier installations. Use Type A blocked-out systems as shown in Standards M617-61 and M617-62.
3. Use no more than 3 short guardrail posts in a row. 635 mm diameter round anchors may be used instead of the square anchor shown. A reduced size is acceptable in solid rock as approved.
4. In areas where the rail face is offset a minimum of 6 m from the edge of travel lane, a maximum approach shoulder slope of 1V:6H may be used.
5. Provide hardware in the Metric sizes shown. Equivalent US Customary sizes may be used when Metric sizes are unavailable.

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U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-70
STEEL-BACKED TIMBER GUARDRAIL, MEDIAN TYPE A	SPECIFICATION FP-24, FP-14
	APPROVED FOR USE 1/2024



STEEL RAIL
6" x 3/8" x 9'-9"



PLAN

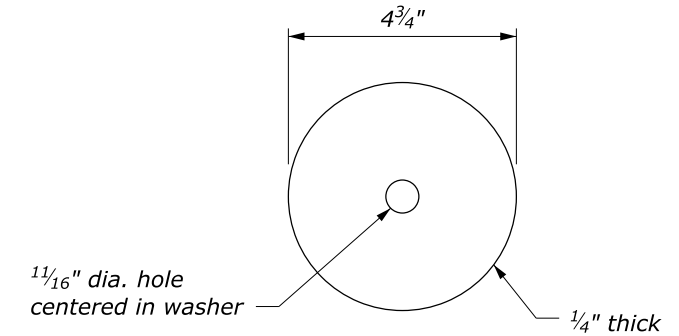
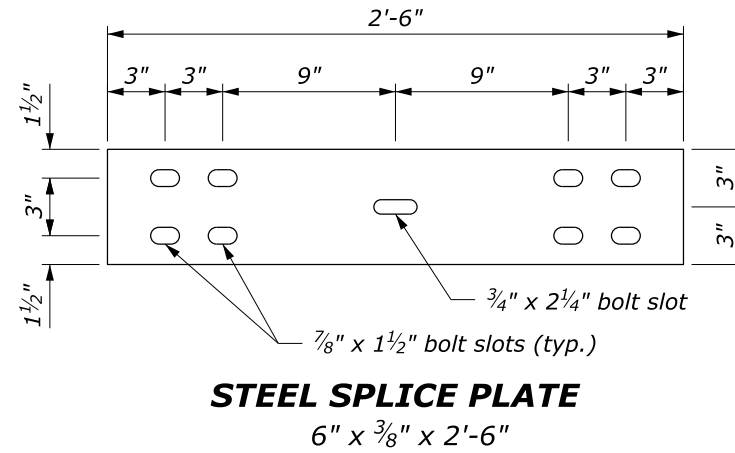
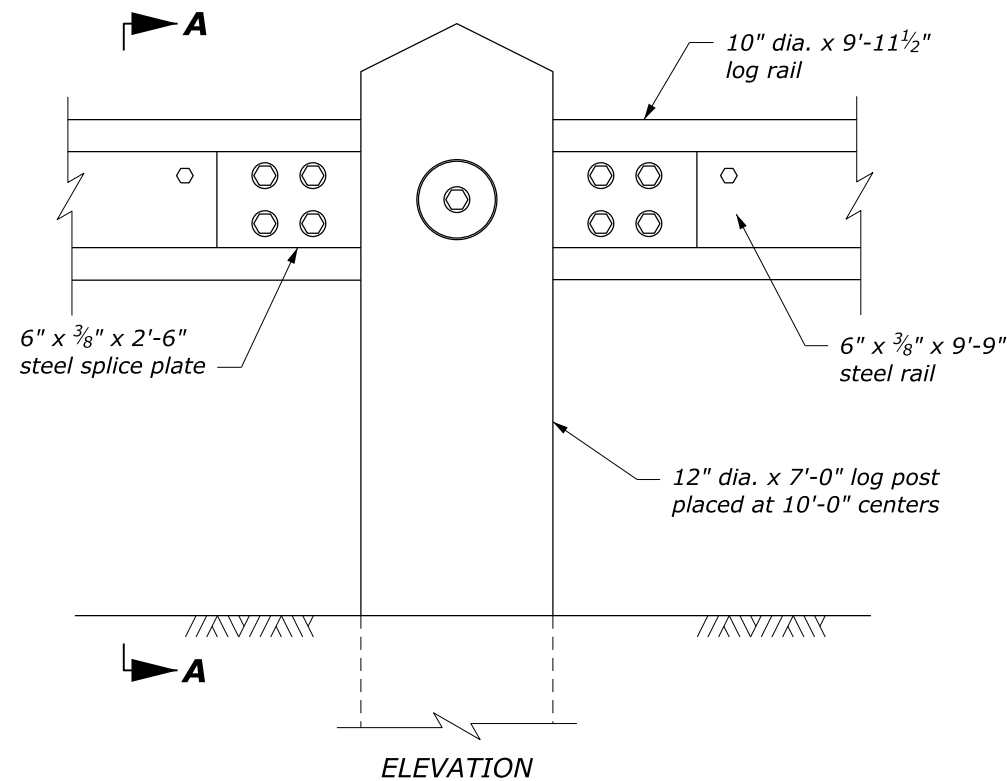
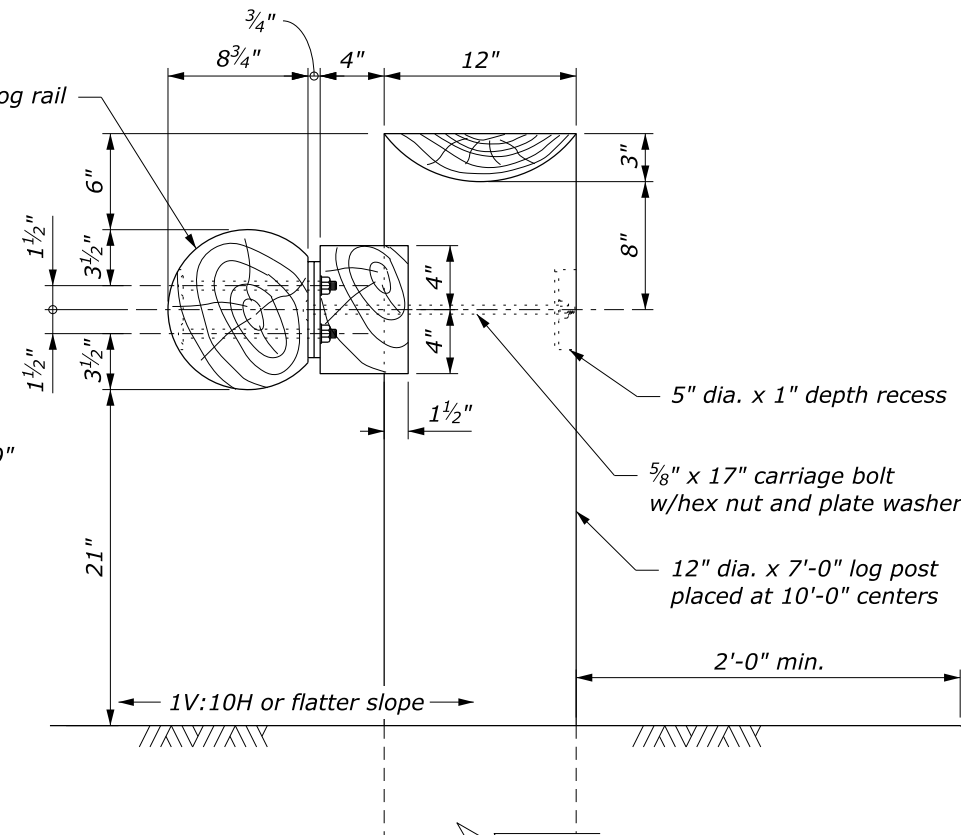


PLATE WASHER



ELEVATION



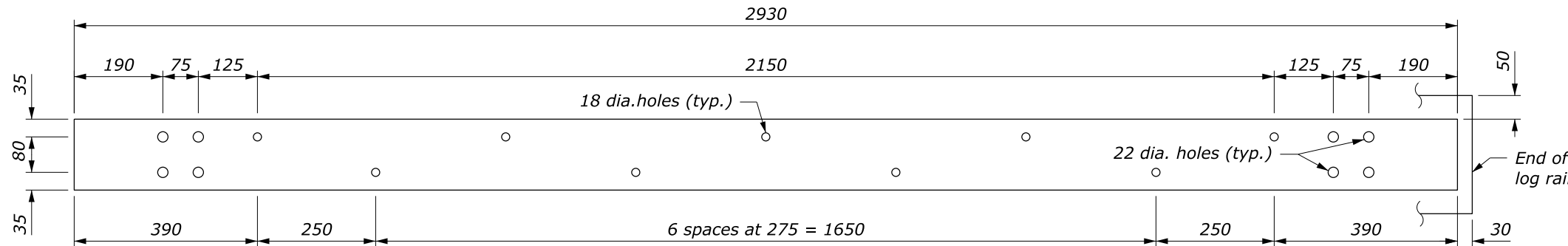
SECTION A-A

POST CONNECTION

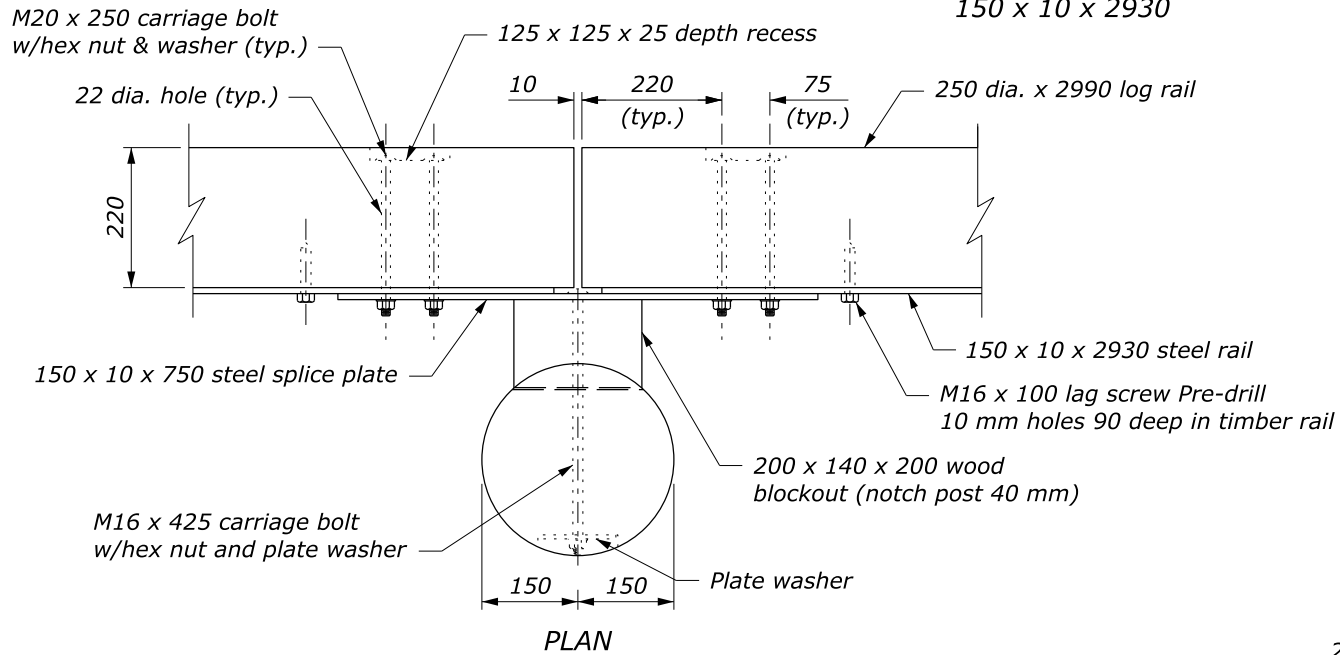
NO SCALE

NOTE:
1. See Standard 617-81 for details of the wood blockout, post notch, and general notes for Steel-Backed Log Guardrail.

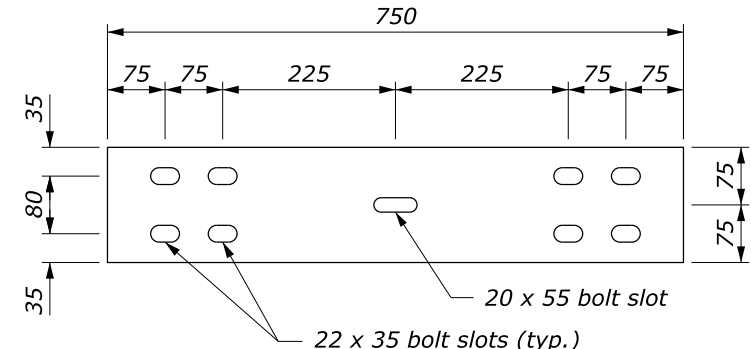
U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD 617-80
STEEL-BACKED LOG RAIL	SPECIFICATION FP-24, FP-14
	APPROVED FOR USE 1/2024



STEEL RAIL
150 x 10 x 2930



PLAN



STEEL SPLICE PLATE
150 x 10 x 750

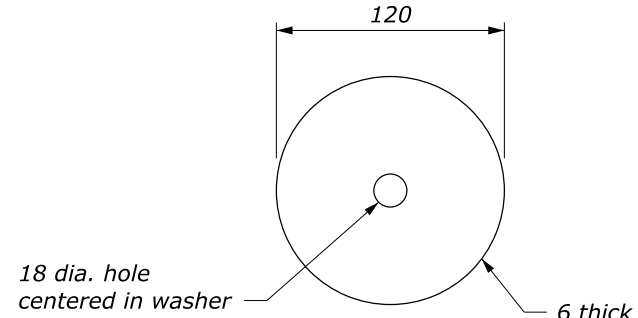
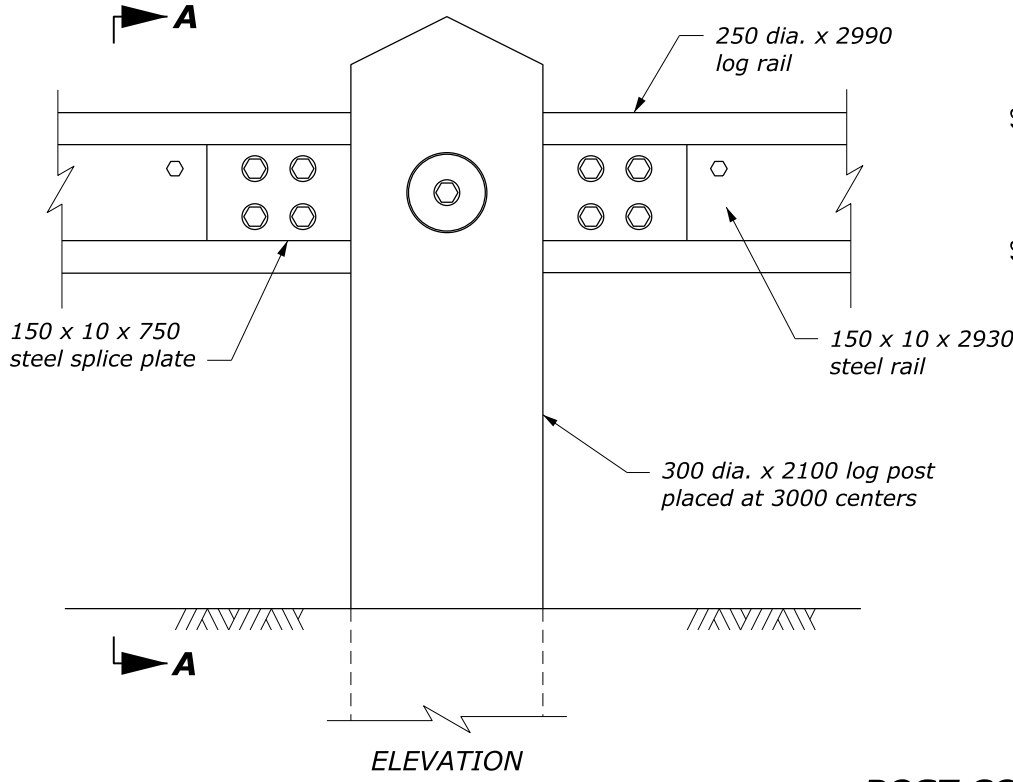
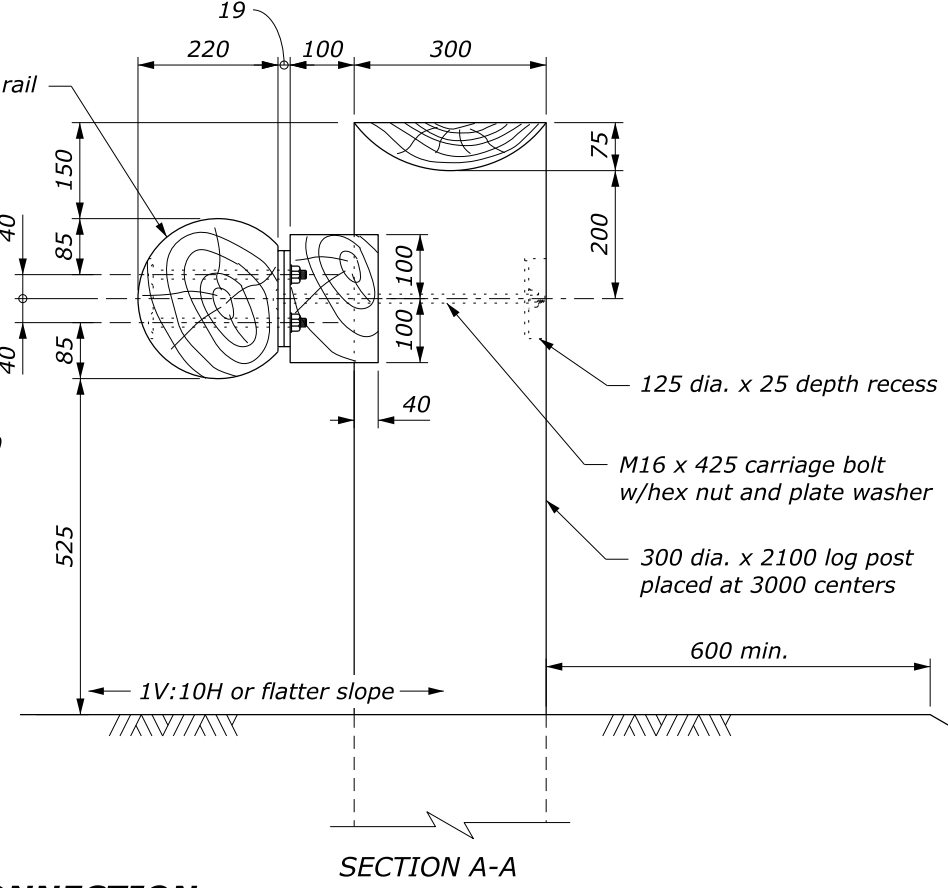


PLATE WASHER



ELEVATION

POST CONNECTION



SECTION A-A

This drawing contains **Metric** units of measure. Dimensions without units are millimeters.

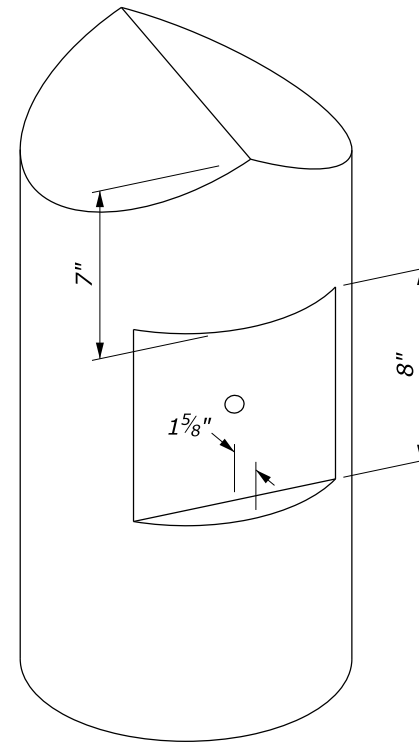
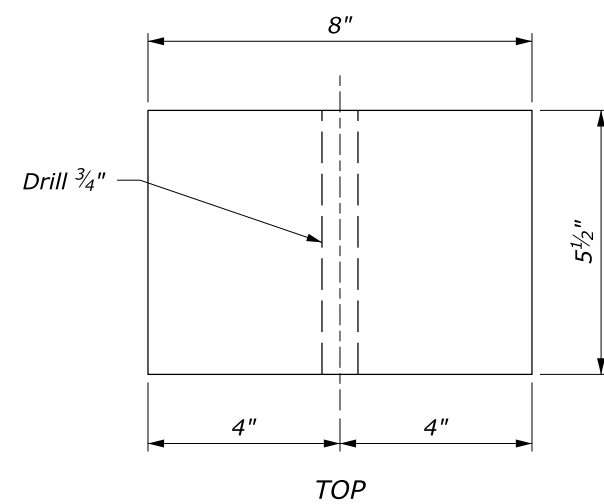
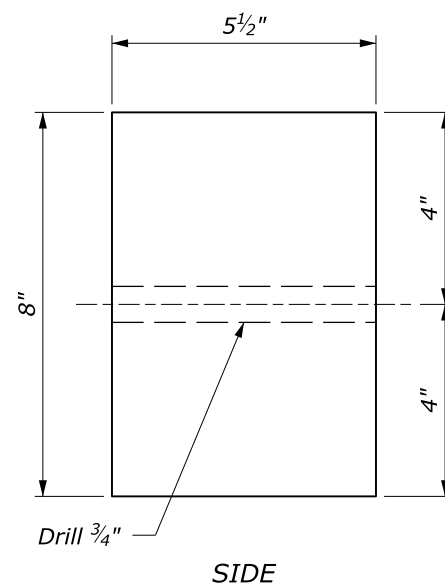
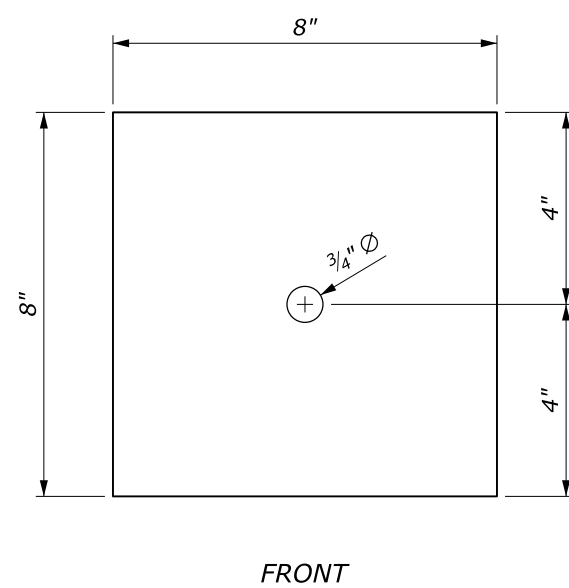
U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-80
STEEL-BACKED LOG RAIL	SPECIFICATION FP-24, FP-14
	APPROVED FOR USE 1/2024

NO SCALE

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NOTE:

1. Install logs for rails butt to butt and tip to tip. A 2 inch maximum taper between the butt and tip ends of individual logs is permitted.
2. 20 foot logs are acceptable for rails provided the 2 inch maximum taper requirement is met and roadway curvature permits.
3. Make splices in rail elements at posts only.
4. Field cut log ends and dress as necessary to obtain tight fitting butt joints in full contact with each other at the log ends. Trim traffic exposed faces of log ends at the joints and elsewhere and dress as necessary to obtain a smooth surface with no protrusions.
5. Dress back face of log rail members to provide a flat surface wide enough to accommodate a 6 inch steel rail.
6. Apply an approved tinted brown color stain to all exposed surfaces of logs. Apply stain either as a part of or subsequent to preservative treatment.
7. Treat all field cuts and drill holes with two applications of the same preservative and stain as the rails and posts.
8. The nominal bolt length is 16 inch. Bolt lengths will vary according to log size. Extra long threaded bolts may be used, provided they are field cut so that none of the shank protrudes beyond the back of the post.

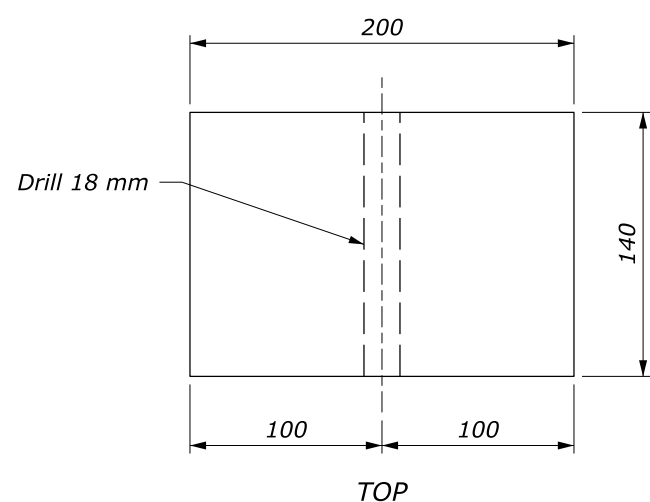
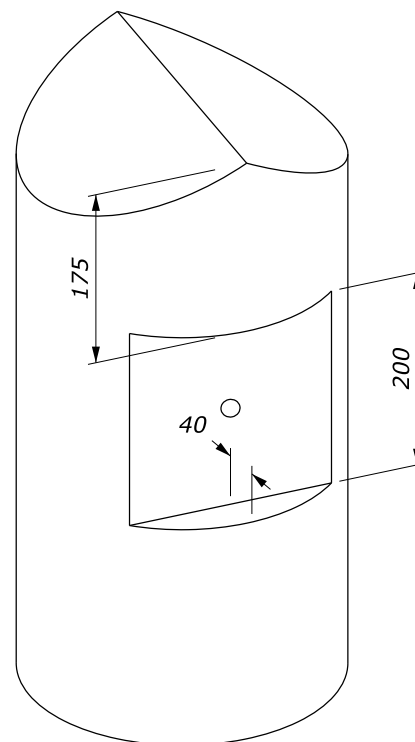
**POST NOTCH FOR WOOD BLOCKOUT****WOOD BLOCKOUT**
8" x 5 $\frac{1}{2}$ " x 8"

NO SCALE

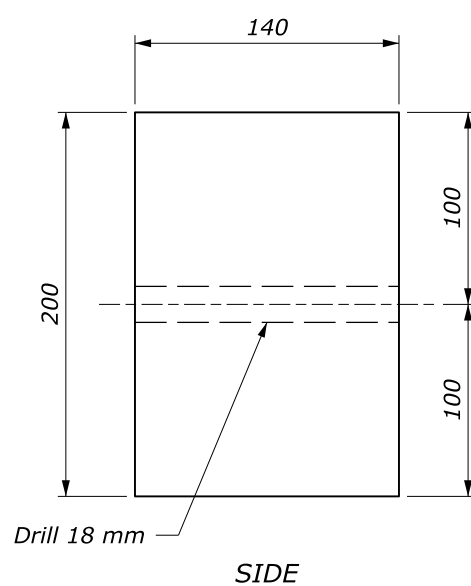
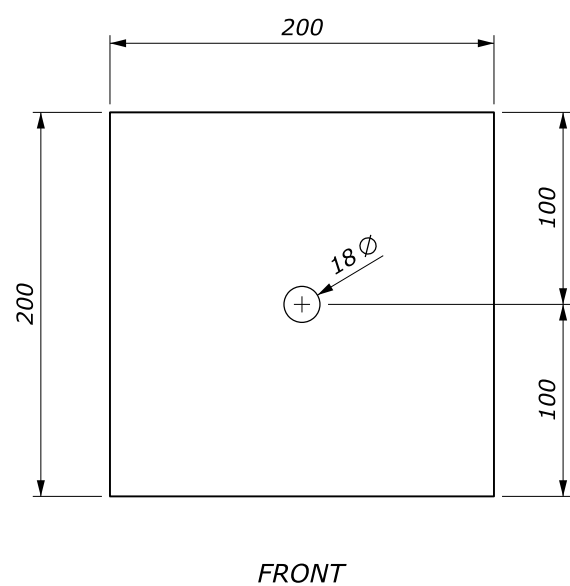
U.S. DEPARTMENT OF TRANSPORTATION, FHWA
OFFICE OF FEDERAL LANDS HIGHWAY**STEEL-BACKED LOG RAIL
BLOCKOUT**FLH STANDARD
617-81SPECIFICATION
FP-24, FP-14APPROVED FOR USE
1/2024

NOTE:

1. Install logs for rails butt to butt and tip to tip. A 50 mm maximum taper between the butt and tip ends of individual logs is permitted.
2. 6 meter logs are acceptable for rails provided the 50 mm maximum taper requirement is met and roadway curvature permits.
3. Make splices in rail elements at posts only.
4. Field cut log ends and dress as necessary to obtain tight fitting butt joints in full contact with each other at the log ends. Trim traffic exposed faces of log ends at the joints and elsewhere and dress as necessary to obtain a smooth surface with no protrusions.
5. Dress back face of log rail members to provide a flat surface wide enough to accommodate a 150 mm steel rail.
6. Apply an approved tinted brown color stain to all exposed surfaces of logs. Apply stain either as a part of or subsequent to preservative treatment.
7. Treat all field cuts and drill holes with two applications of the same preservative and stain as the rails and posts.
8. The nominal bolt length is 400 mm. Bolt lengths will vary according to log size. Extra long threaded bolts may be used, provided they are field cut so that none of the shank protrudes beyond the back of the post.



POST NOTCH FOR WOOD BLOCKOUT

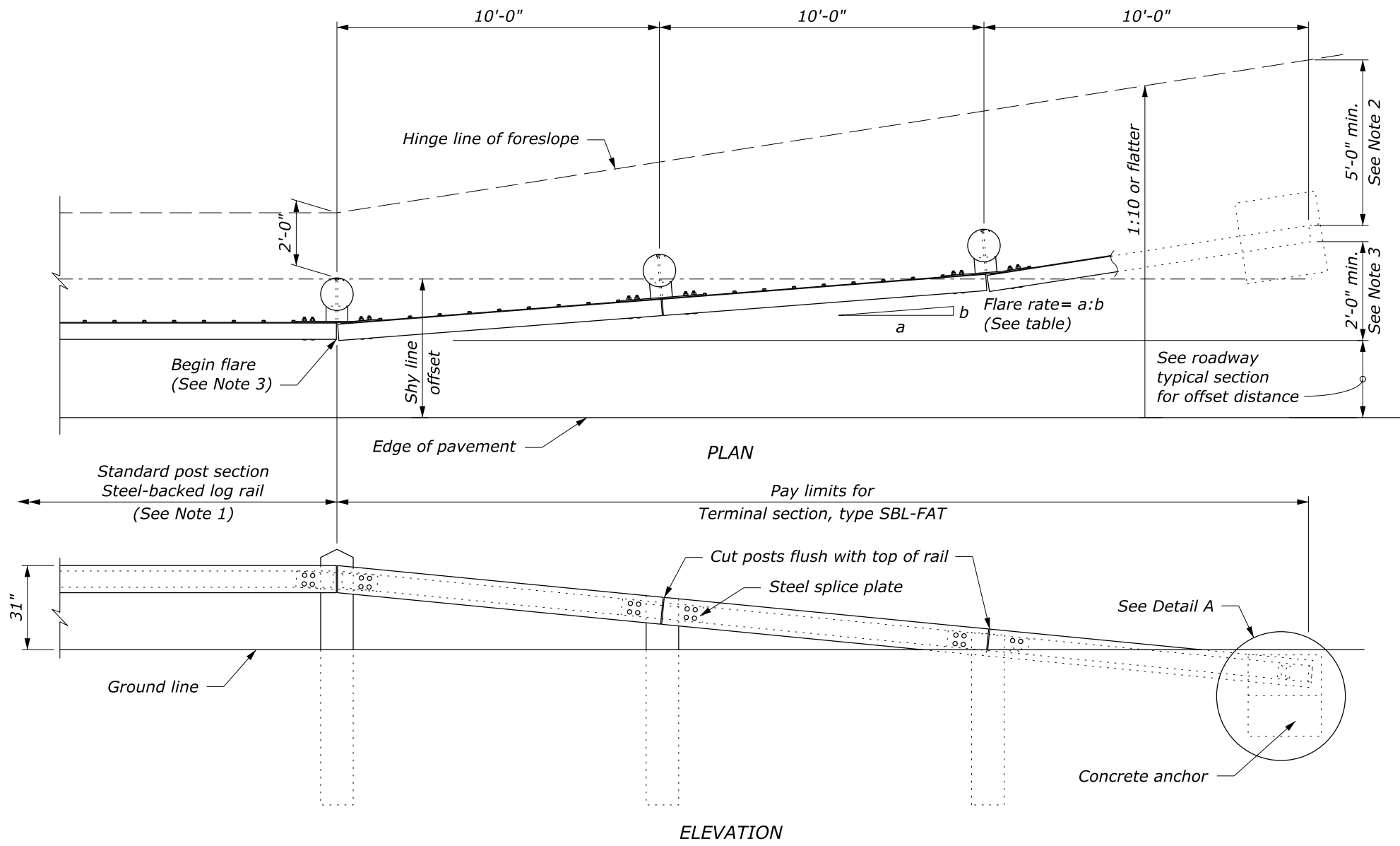


WOOD BLOCKOUT
200 x 140 x 200

This drawing contains **Metric** units of measure.
Dimensions without units are millimeters.

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-81
STEEL-BACKED LOG RAIL BLOCKOUT	SPECIFICATION FP-24, FP-14
	APPROVED FOR USE 1/2024

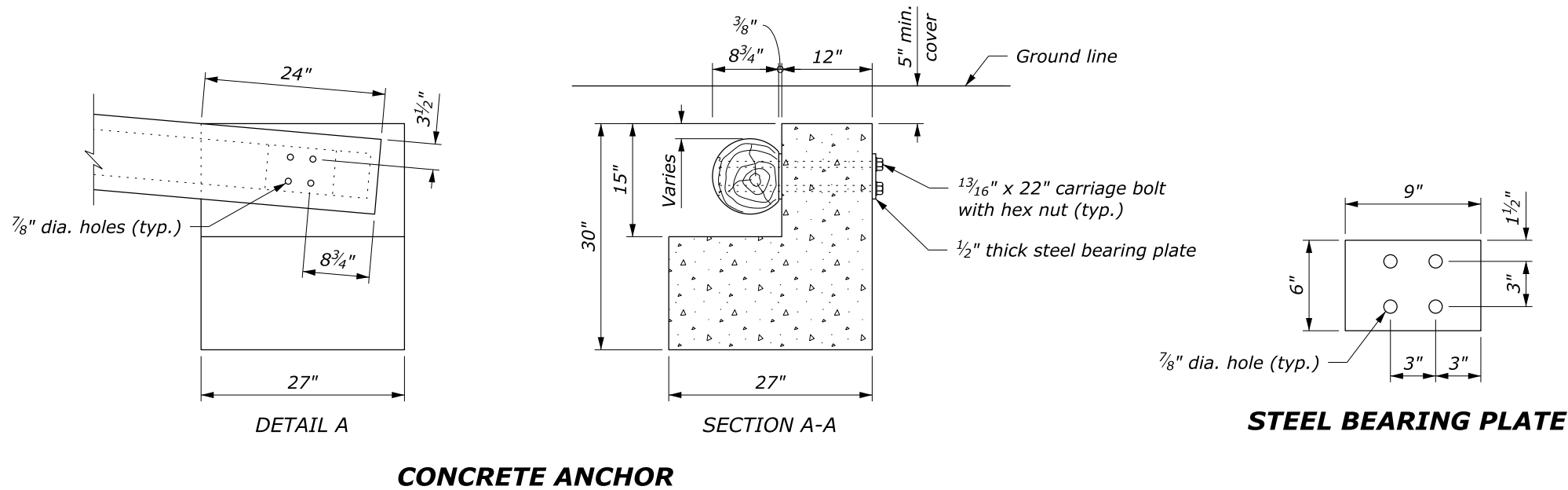


NOTE:

1. See Standard 617-80 and 617-81, Steel-Backed Log Rail, for timber, structural steel, and hardware details.
2. Extend the fill widening a minimum of 5 feet behind the guardrail, unless otherwise directed.
3. The guardrail flare shown in the plan view is the minimum length and rate required. As directed, 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 Rate table.

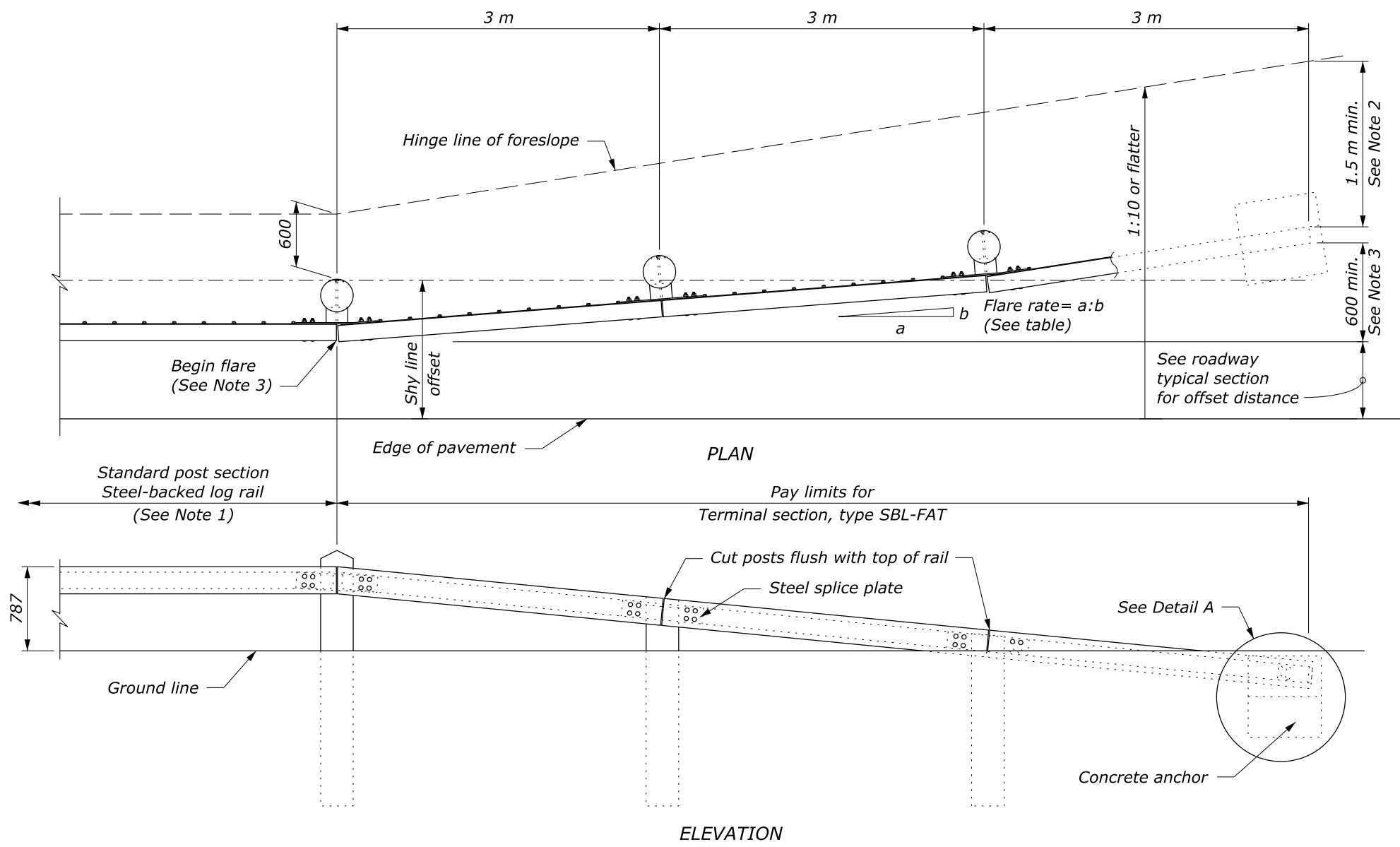
APPROACH & DEPARTURE FLARE WITH FLARED ANCHOR TERMINAL (FAT)

GUARDRAIL FLARE RATE TABLE			
DESIGN SPEED MPH	SHY LINE OFFSET FEET	FLARE RATE (a:b)	
		INSIDE SHY LINE	OUTSIDE SHY LINE
60	8.0	26:1	14:1
50	6.5	21:1	11:1
40	5.0	16:1	8:1
30 and less	4.0	13:1	7:1



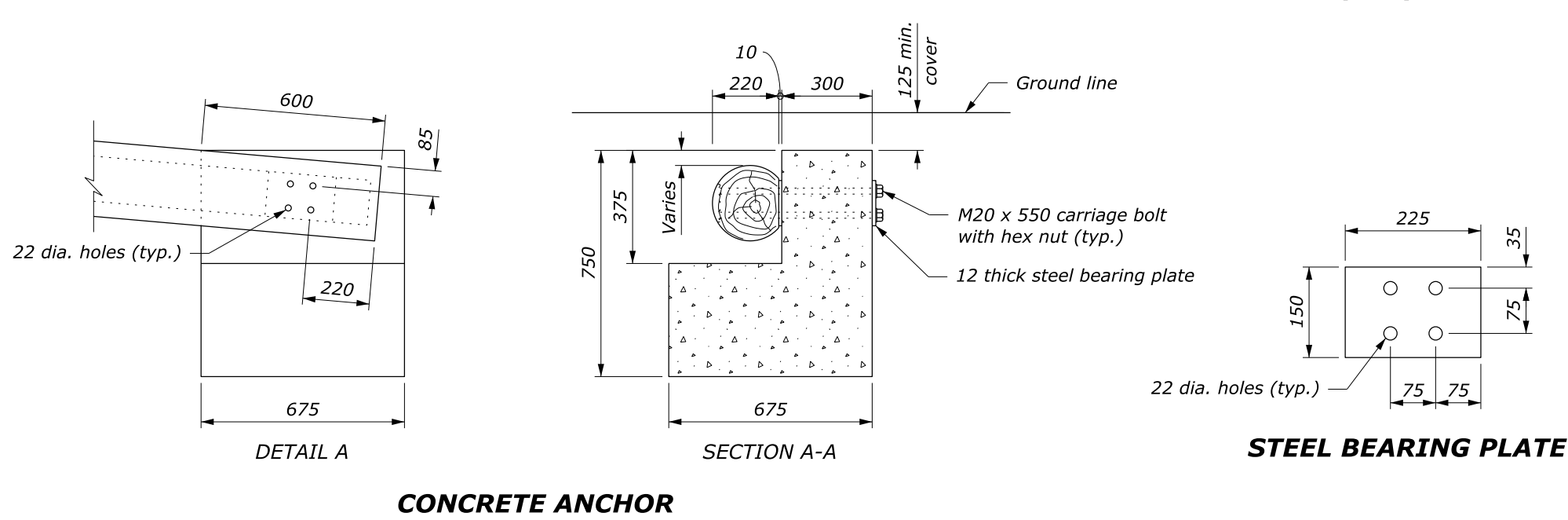
NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD 617-82
STEEL-BACKED LOG RAIL TERMINAL SECTION TYPE SBL-FAT	SPECIFICATION FP-14
	APPROVED FOR USE 1/2024



APPROACH & DEPARTURE FLARE WITH FLARED ANCHOR TERMINAL (FAT)

GUARDRAIL FLARE RATE TABLE			
DESIGN SPEED km/h	SHY LINE OFFSET m	FLARE RATE (a:b)	
		INSIDE SHY LINE	OUTSIDE SHY LINE
100	2.5	26:1	14:1
80	2.0	21:1	11:1
60	1.5	16:1	8:1
50 and less	1.2	13:1	7:1



This drawing contains **Metric** units of measure. Dimensions without units are millimeters.

U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	FLH STANDARD M617-82
STEEL-BACKED LOG RAIL TERMINAL SECTION TYPE SBL-FAT	SPECIFICATION FP-14
	APPROVED FOR USE 1/2024

NO SCALE