

**CORRUGATED BEAM GUARDRAIL STANDARD PLAN  
INDEX OF SHEETS**

**SHEET TOPIC**

**LAYOUT DETAILS**

- 1 General Requirements
- 2 Guardrail Placement around Fixed Object Hazards
- 3 Grading Requirements
- 4 Grading Requirements (continued)

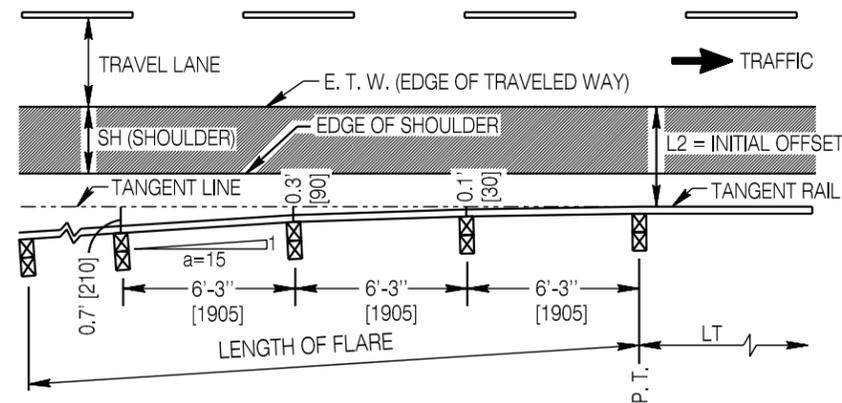
**INSTALLATION DETAILS**

- 5 Standard Run of Corrugated Beam (W-Beam) Guardrail
- 6 Transition Sections - Bridge Rail & Concrete Barrier Connections
- 7 Narrow Median Installations
- 8 End Anchorage Type A Alternate #1 - FLEAT 350
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- 10 End Anchorage Type C - Trailing End
- 11 End Anchorage Type D - For Radius
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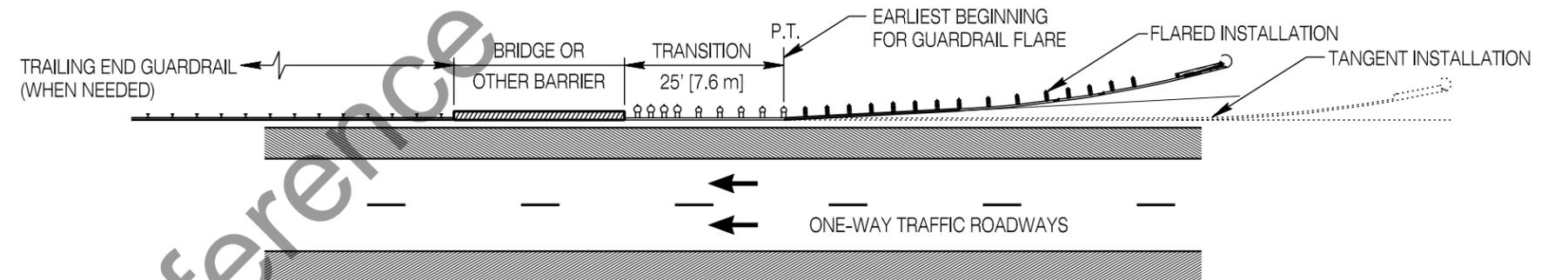
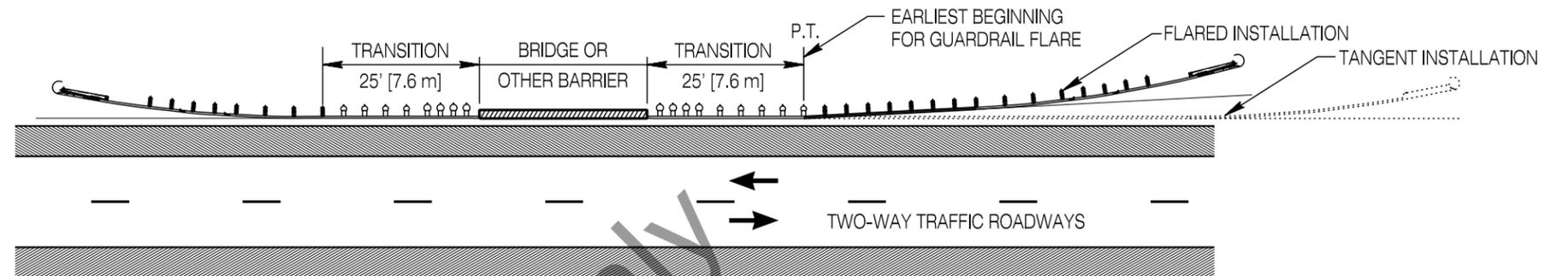
**FABRICATION DETAILS**

- 14 Standard Cable Anchorage Details
- 15 Standard Rail and End Sections
- 16 Standard Post and Misc. Hardware Details

**Initiating a straight guardrail flare** - Initiate a 15L:1W guardrail flare (typical for high speed roadways) as shown below:



**TYPICAL 15L:1W FLARE LAYOUT**



**CONNECTIONS TO BRIDGE RAILING AND OTHER TRAFFIC BARRIERS**

Connect guardrail to another type of traffic barrier with a transition section (see installation details for transitions). Use transitions on both the upstream and downstream ends of two-way traffic bridges and the upstream ends only for one-way traffic bridges typically found on interstates and freeways. Ensure the transition section is tangent with the roadway where possible.

Designed by: WBW  
 Drawn by: GLD  
 Checked by: WBW  
 Previous Div. No. 606-01C

LAYOUT DETAILS AND  
 GENERAL REQUIREMENTS



WYOMING DEPARTMENT  
 OF  
 TRANSPORTATION



CORRUGATED BEAM GUARDRAIL

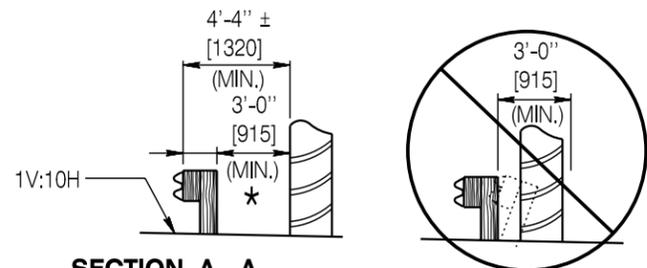
STANDARD PLAN

STANDARD PLAN NUMBER  
**606-1**  
 SHEET 1 of 16  
 Issued by: ENGINEERING SERVICES  
 Date Issued: NOVEMBER, 2004

Note: Units shown in brackets [ ] are metric and are in millimeters (mm) unless other units are shown.

**NOTES**

① **Shielding Fixed Object Hazards** - Extend tangent run of guardrail a minimum of four standard post spaces 25 ft. [7.6 m] on each side of the fixed object hazard. For standard post spacing, locate the back of guardrail posts a minimum of 3 ft. [915] from the fixed object.



**SECTION A - A  
PROPER GUARDRAIL  
PLACEMENT**

**INCORRECT GUARDRAIL  
PLACEMENT**

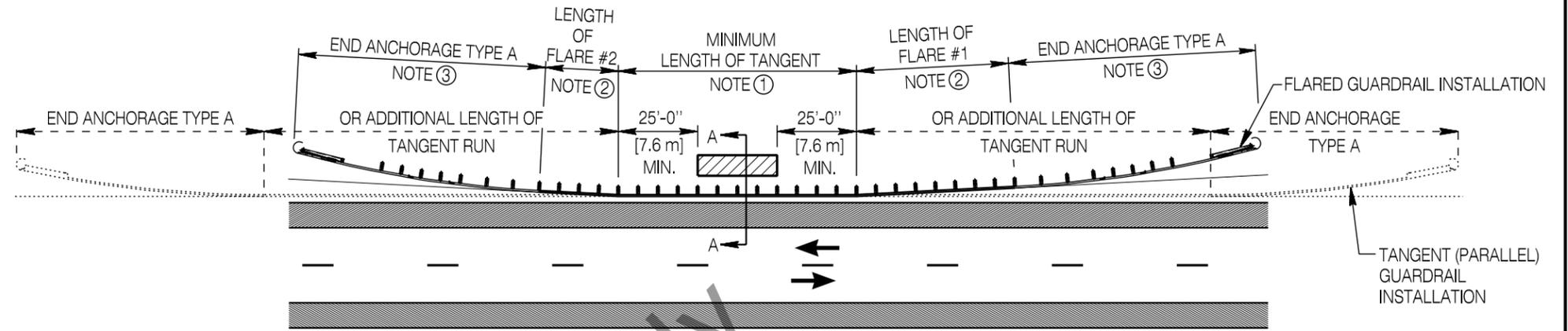
\* The minimum provided deflection distance may be reduced by decreasing post spacing and/or adding double nested sections of guardrail. Start reduced post spacing, when required, and double nested guardrail 25 ft. [7.6 m] before the hazard and extend 25 ft. [7.6 m] beyond the hazard.

* Deflection Distance	Post Spacing	Rail Elements
3 ft. [915]	6'-3" [1905] (Standard)	Single Rail
2 ft. [610]	3'-1 1/2" [952]	Single Rail
1.5 ft. [460]	3'-1 1/2" [952]	Double Nested Rail

② **Flared vs. Tangent (Parallel) Installation** - Drawing depicts flared guardrail runs with solid lines and tangent (parallel) installations in dashed lines.

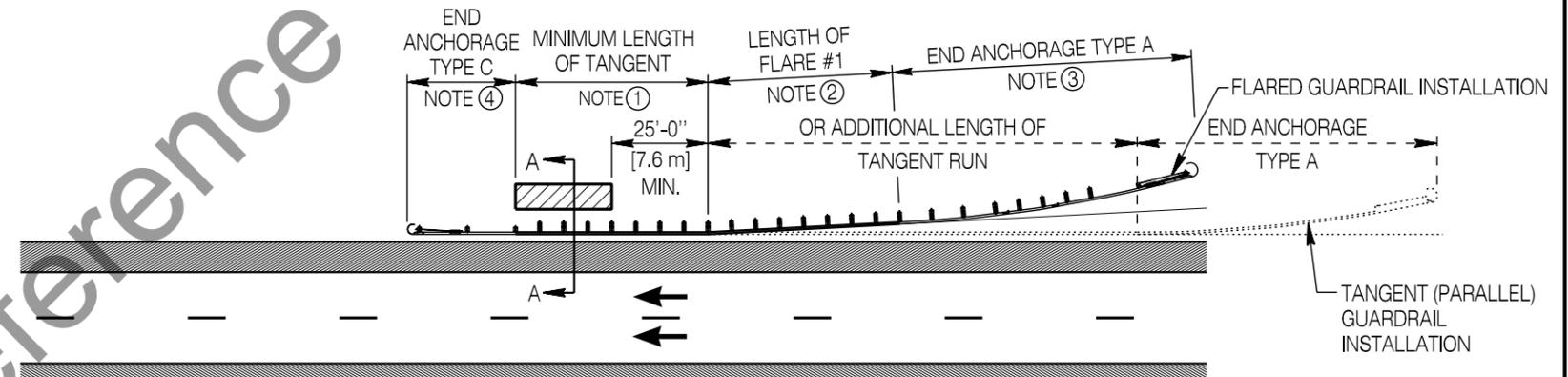
③ **End Anchorage Flares** - Where an end anchorage such as the Type A requires a flare, construct terminal flare in addition to the guardrail flare (if present).

④ **Post Spacing Reduction** - Where a tighter post spacing is required to limit guardrail deflection, add 25 ft. [7.6 m] downstream tangent guardrail as indicated in asterisk (\*) above. Do not use Type C end anchorages unless shielded or far outside clear zone.



**TYPICAL GUARDRAIL PLACEMENT AROUND A FIXED OBJECT**

TWO WAY TRAFFIC ROADWAYS



**TYPICAL GUARDRAIL PLACEMENT AROUND A FIXED OBJECT**

ONE WAY TRAFFIC ROADWAYS SUCH AS DIVIDED HIGHWAYS

For Reference Only

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**GUARDRAIL PLACEMENT AROUND FIXED OBJECT HAZARDS**

Note: Units shown in brackets [ ] are metric and are in millimeters (mm) unless other units are shown.



**CORRUGATED BEAM GUARDRAIL**

STANDARD PLAN

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**GRADING NOTES**

If necessary, modify the earthwork shown in the plans and as staked to provide these minimum grading requirements at guardrail installations. The engineer will pay for this work using standard grading bid items as provided in the plans.

- ① Ensure the cross-slope of the earthwork in the area approaching a guardrail installation, the area around the terminal and the area of the guardrail flare is a 1V:10H surface or flatter.
- ② Ensure cross slope of grading from roadway to the barrier face is 1V:10H or flatter. Extend 1V:10H a minimum of 2 ft. [600] behind the guardrail posts. The department may specify 1V:8H for the guardrail installation where drainage and/or snow accumulation must be mitigated.
- ③ Ensure the area immediately behind and beyond the terminal is traversable and free from fixed object hazards or at least similar in character to upstream, unshielded slopes located within the clear-zone. Ensure a slope of 1V:4H or flatter; if not practical, use a maximum slope of 1V:3H. Extend the traversable slope for a distance X beyond post 3 of the end terminal.

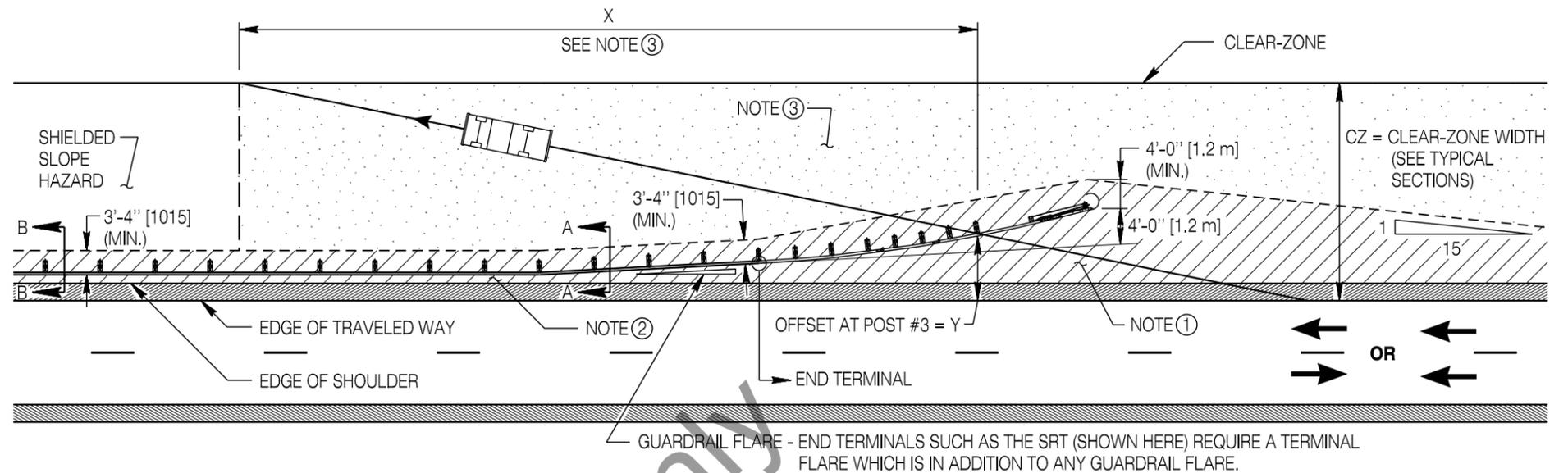
If not shown in the plans, calculate X from the formula below:

$$X = (CZ - Y) (L_R) / (CZ)$$

DESIGN SPEED (mph)	L <sub>R</sub> Runout Length (ft)			
	ADT OVER 6000	ADT 2000 to 6000	ADT 800 to 2000	ADT Under 800
80	480	440	400	360
70	480	440	400	360
60	400	360	330	300
50	320	290	260	240
40	240	220	200	180
30	170	160	140	130

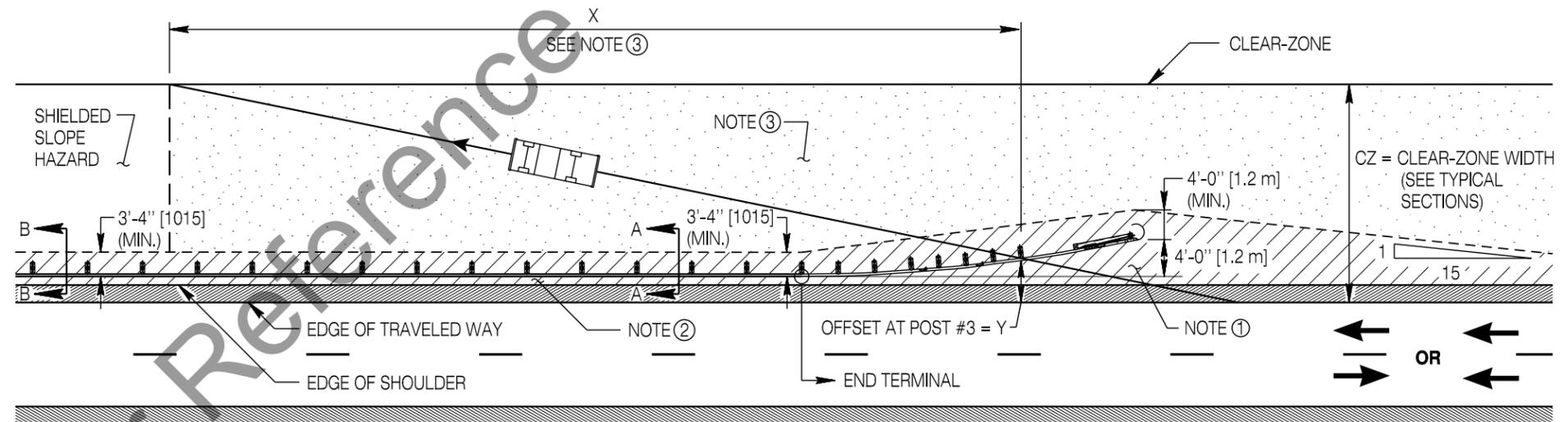
**METRIC TABLE**

DESIGN SPEED (km/h)	L <sub>R</sub> Runout Length [meters]			
	ADT OVER 6000	ADT 2000 to 6000	ADT 800 to 2000	ADT Under 800
120	145	135	120	110
110	145	135	120	110
100	130	120	105	100
90	110	105	90	85
80	100	90	80	75
70	80	75	65	60
60	70	60	55	50
50	50	50	45	40



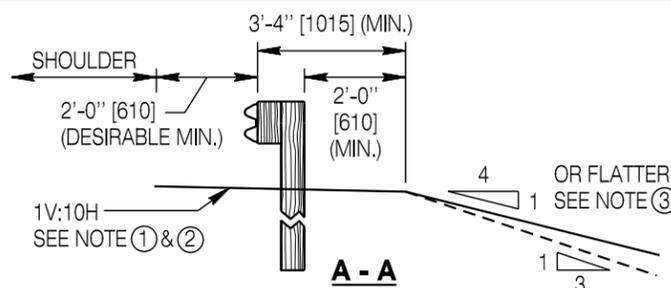
**APPROACH END GRADING - FLARED GUARDRAIL INSTALLATION**

(APPLIES TO TWO WAY TRAFFIC AND ONE WAY TRAFFIC ROADWAYS SUCH AS DIVIDED HIGHWAYS)

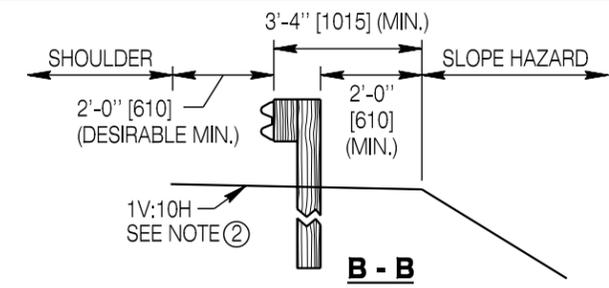


**APPROACH END GRADING - TANGENT GUARDRAIL INSTALLATION**

(APPLIES TO TWO WAY TRAFFIC AND ONE WAY TRAFFIC ROADWAYS SUCH AS DIVIDED HIGHWAYS)



**RUNOUT GRADING BEHIND GUARDRAIL**



**FILL SLOPE HAZARD PROTECTION**

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**GRADING REQUIREMENTS**

Note: Units shown in brackets [ ] are metric and are in millimeters (mm) unless other units are shown.



**CORRUGATED BEAM GUARDRAIL**

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**GRADING NOTES**

If necessary, modify the earthwork shown in the plans and as staked to provide these minimum grading requirements at guardrail installations. The engineer will pay for this work using standard grading bid items as provided in the plans.

- ① Ensure the cross-slope of the earthwork in the area approaching a guardrail installation, the area around the terminal and the area of the guardrail flare is a 1V:10H surface or flatter.
- ② Ensure cross slope of grading from roadway to the barrier face is 1V:10H or flatter. Extend 1V:10H a minimum of 2 ft. [600] behind the guardrail posts. The department may specify 1V:8H for the guardrail installation where drainage and/or snow accumulation must be mitigated.
- ③ Ensure the area immediately behind and beyond the terminal is traversable and free from fixed object hazards or at least similar in character to upstream, unshielded slopes located within the clear-zone. Ensure a slope of 1V:4H or flatter; if not practical, use a maximum slope of 1V:3H. Extend the traversable slope for a distance X beyond post 3 of the end terminal.

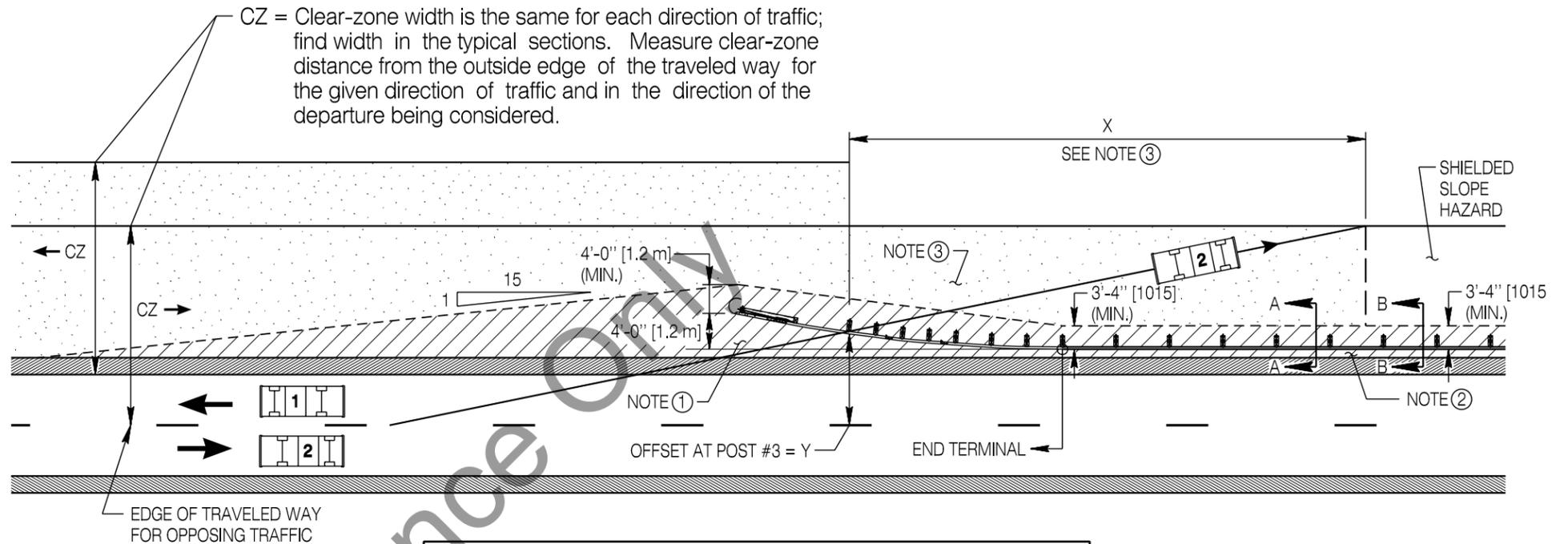
If not shown in the plans, calculate X from the formula below:

$$X = (CZ - Y) (L_R) / (CZ)$$

DESIGN SPEED (mph)	L <sub>R</sub> Runout Length (ft.)			
	ADT OVER 6000	ADT 2000 to 6000	ADT 800 to 2000	ADT Under 800
80	480	440	400	360
70	480	440	400	360
60	400	360	330	300
50	320	290	260	240
40	240	220	200	180
30	170	160	140	130

**METRIC TABLE**

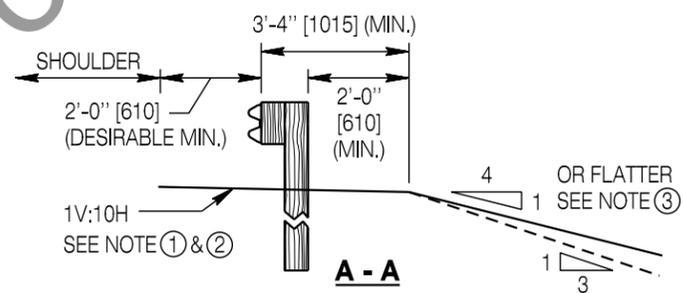
DESIGN SPEED (km/h)	L <sub>R</sub> Runout Length [meters]			
	ADT OVER 6000	ADT 2000 to 6000	ADT 800 to 2000	ADT Under 800
120	145	135	120	110
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100	130	120	105	100
90	110	105	90	85
80	100	90	80	75
70	80	75	65	60
60	70	60	55	50
50	50	50	45	40



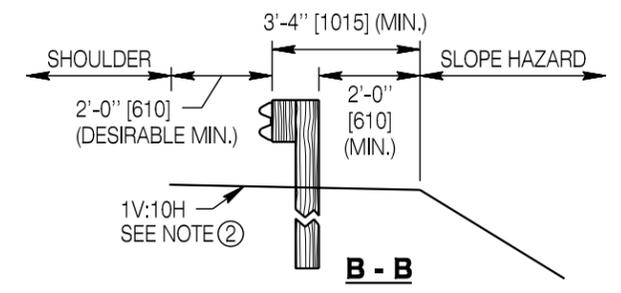
**APPROACH END GRADING FOR OPPOSING TRAFFIC LANES**

(APPLIES TO TWO WAY TRAFFIC ROADWAYS)

NOTE: Tangent installation shown, apply same concept for flared installations



**RUNOUT GRADING BEHIND GUARDRAIL**



**FILL SLOPE HAZARD PROTECTION**

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**GRADING REQUIREMENTS (CONTINUED)**

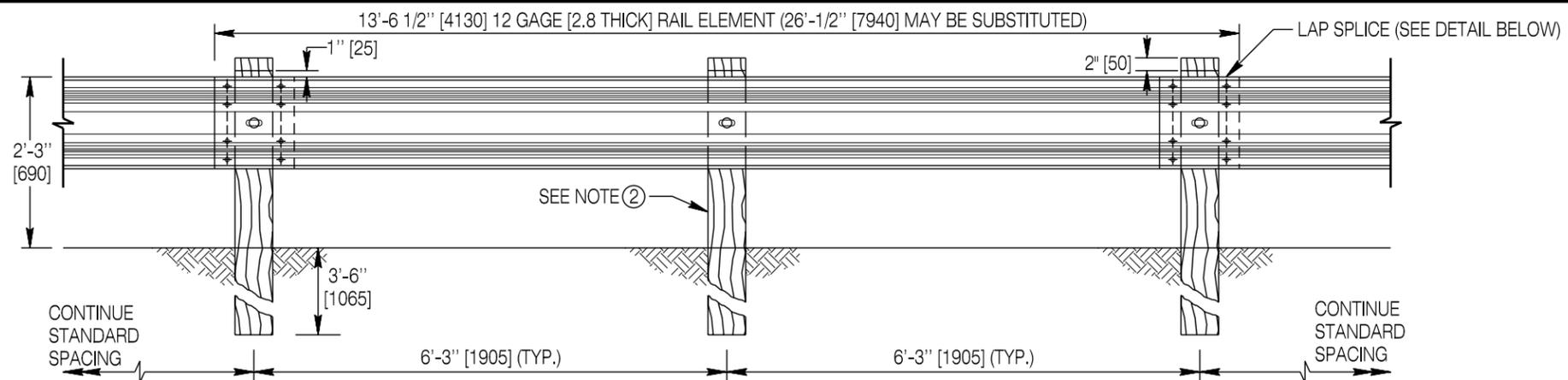
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**CORRUGATED BEAM GUARDRAIL**

STANDARD PLAN

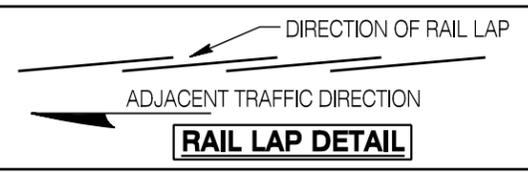
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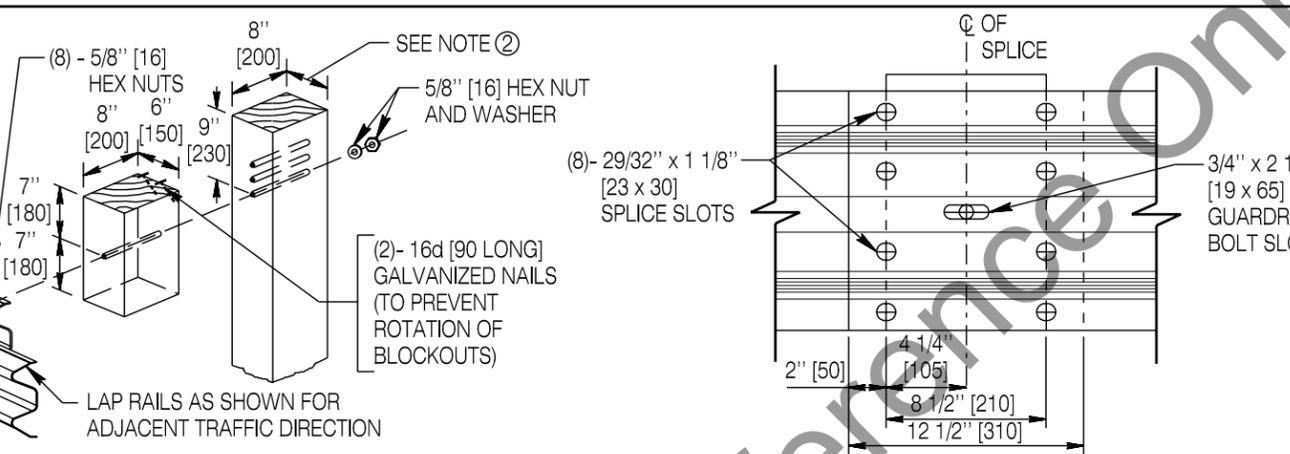
**STANDARD W-BEAM GUARDRAIL**

**GENERAL NOTES**

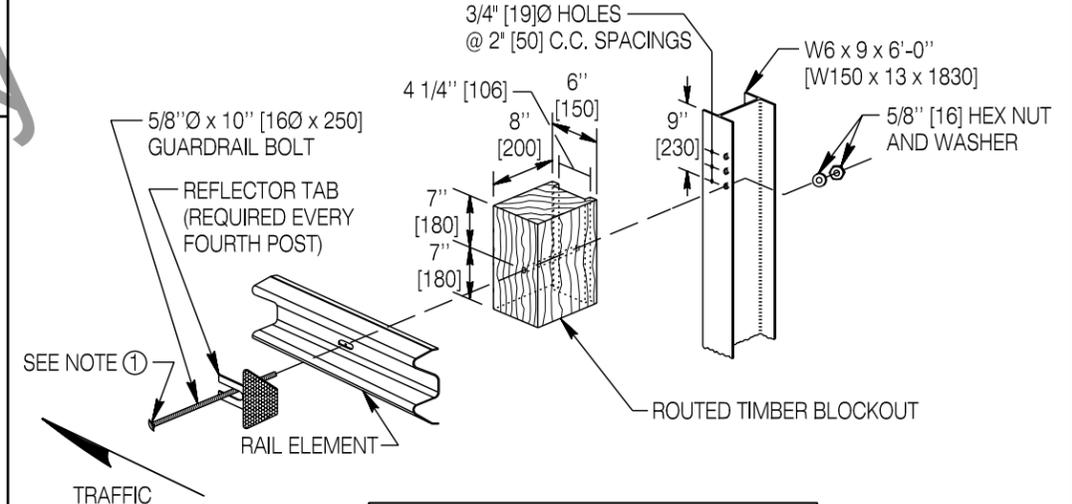
- ① DO NOT use washers between the head of the guardrail bolt and rail element unless specifically shown in the plans.
- ② Use post dimensions based on timber species in accordance with the material requirements in the Standard Specifications.
- ③ All wood cross-section dimensions shown are nominal dimensions.



**RAIL LAP DETAIL**

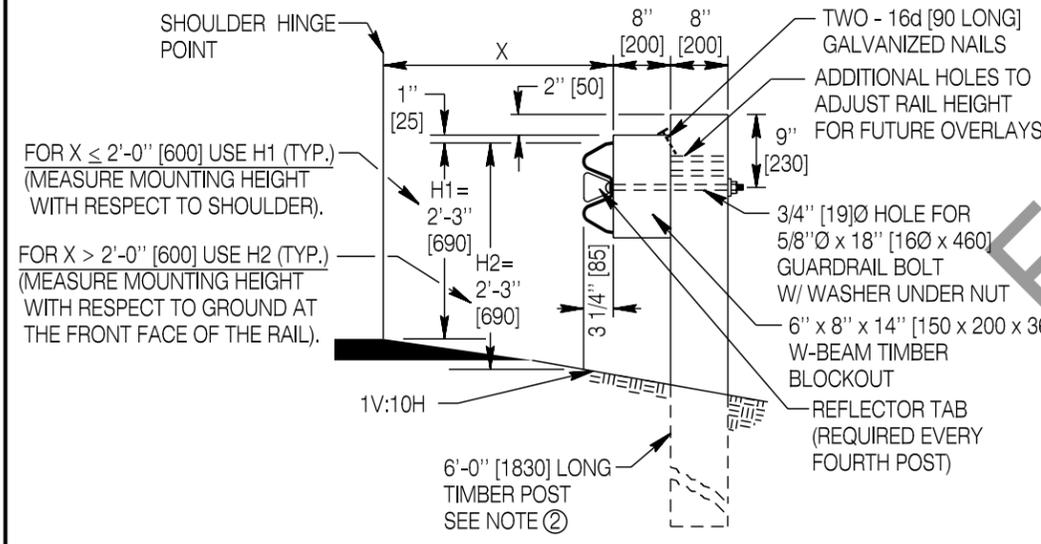


**WOOD POST AND W-BEAM LAP SPLICE DETAIL**

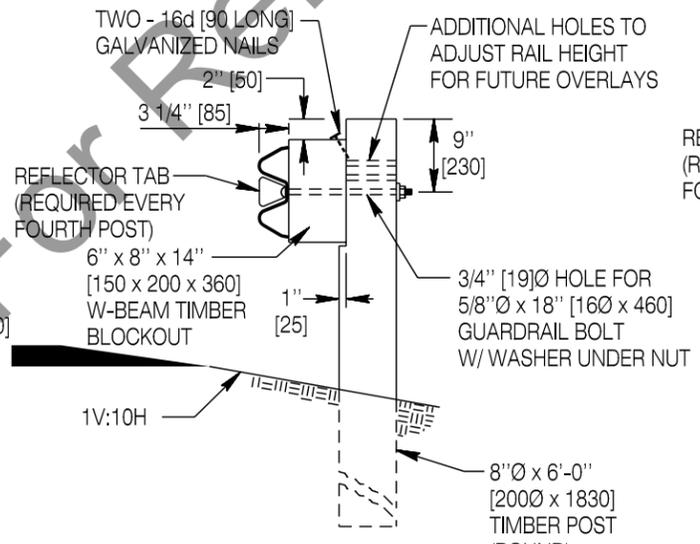


**STANDARD STEEL POST DETAIL**

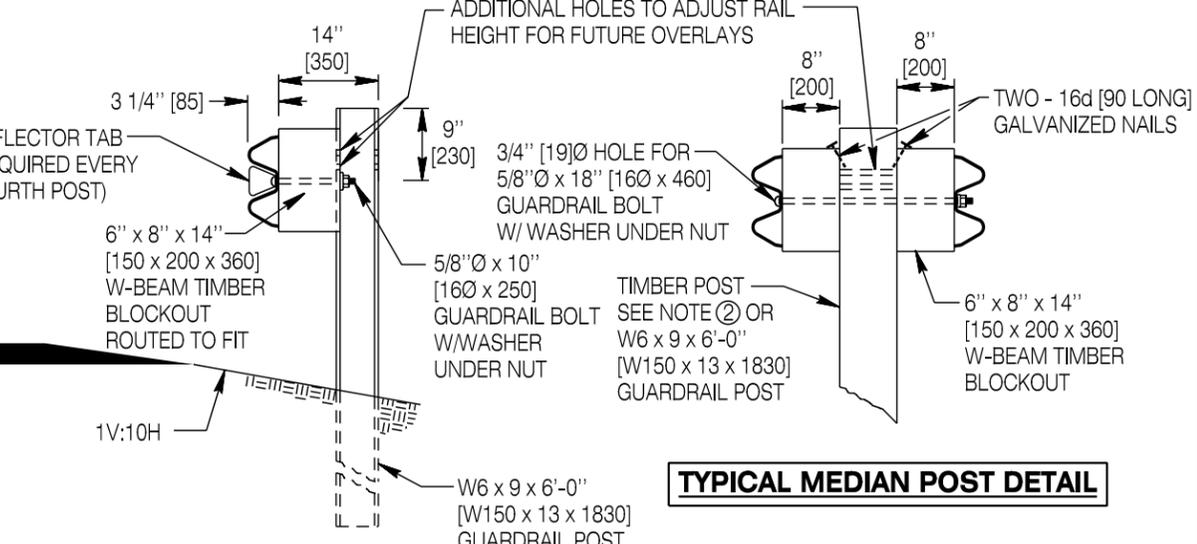
NOTE: BACK-UP PLATES NOT REQUIRED



**STANDARD W-BEAM WOOD POST DETAIL**



**ALTERNATE W-BEAM ROUND WOOD POST DETAIL**



**TYPICAL MEDIAN POST DETAIL**

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**STANDARD RUN OF CORRUGATED BEAM (W-BEAM) GUARDRAIL**

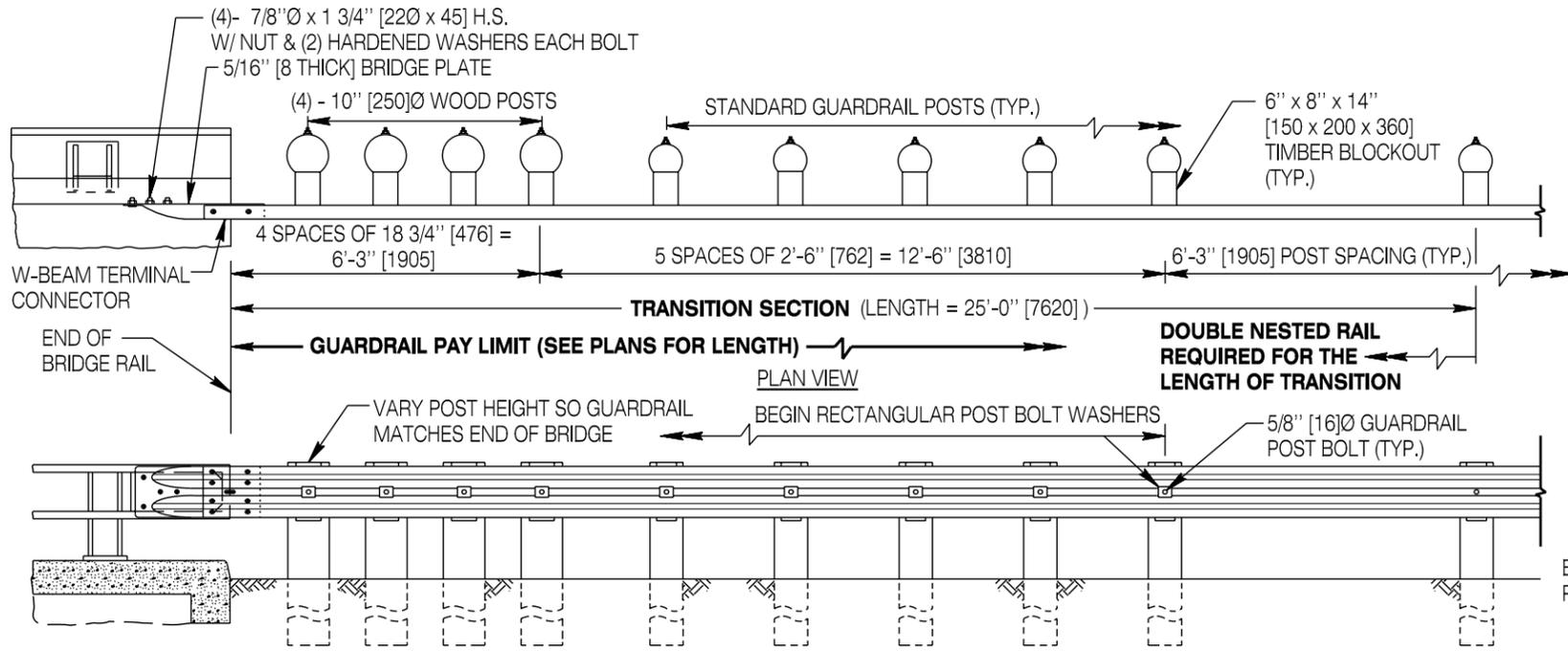
Note: Units shown in brackets [ ] are metric and are in millimeters (mm) unless other units are shown.



**CORRUGATED BEAM GUARDRAIL**

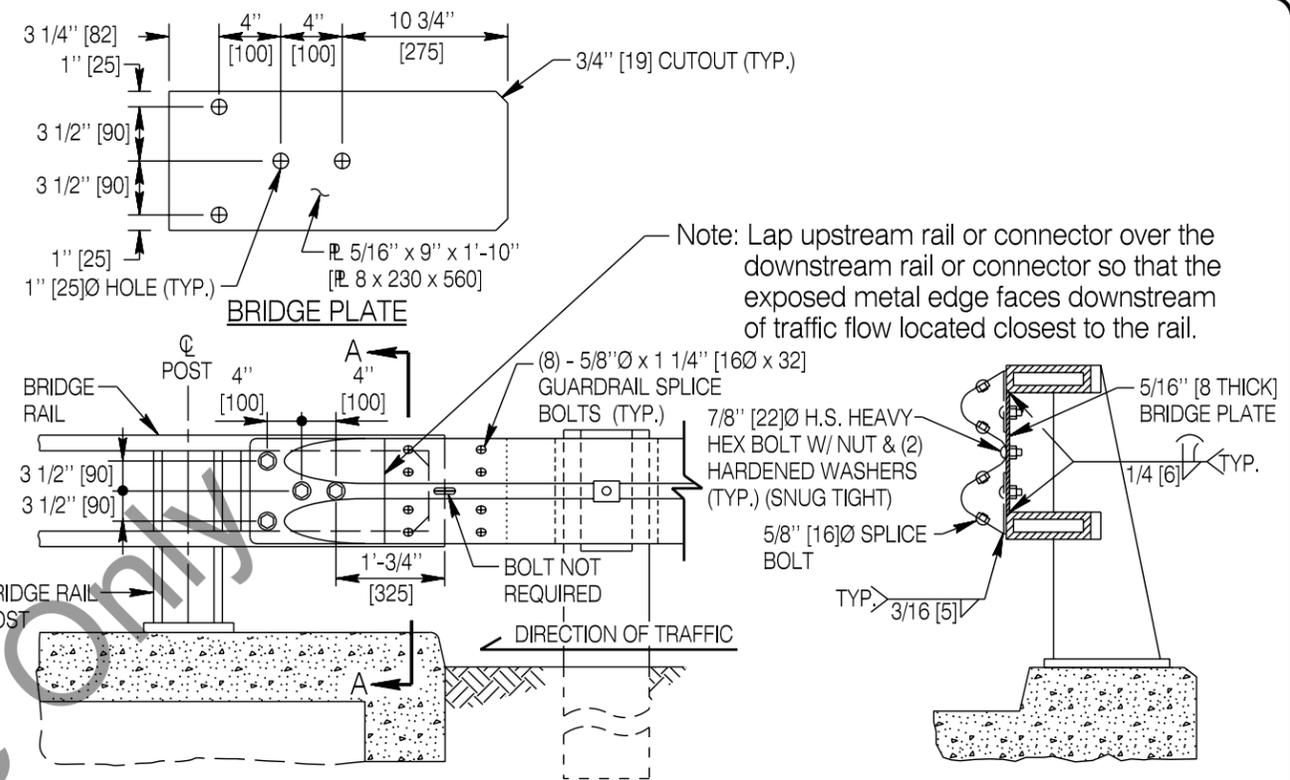
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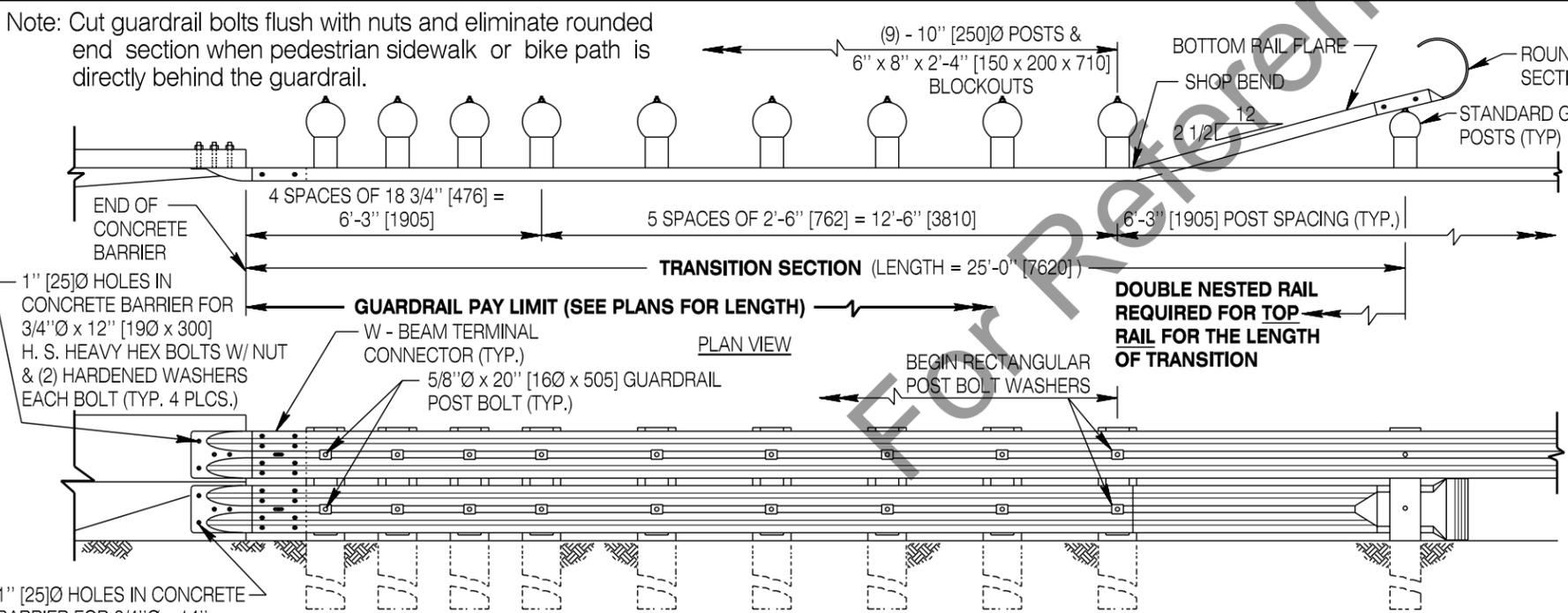
**CONNECTION TO STEEL BRIDGE RAILING (TRANSITION SECTION)**

- Notes: ① Install transition section on tangent (parallel) with the road. Do not begin guardrail flares within the transition section.  
 ② Use transition sections on exit ends of one way traffic bridges only when specified.



**CONNECTION TO STEEL BRIDGE RAILING**

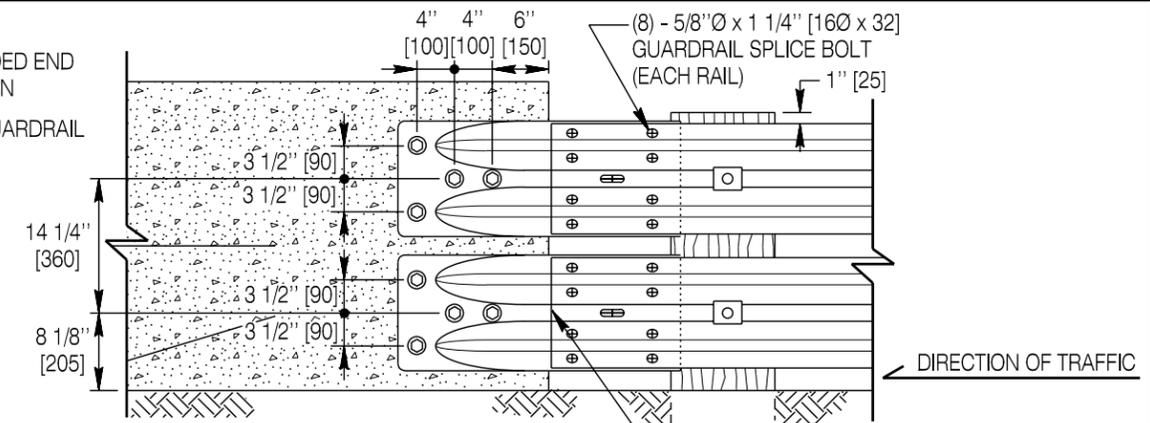
**SECTION A-A**



**CONNECTION TO PERMANENT CONCRETE BARRIER (TRANSITION SECTION)**

1" [25]Ø HOLES IN CONCRETE BARRIER FOR 3/4"Ø x 14" [190 x 355] H. S. HEAVY HEX BOLTS W/ NUT & (2) HARDENED WASHERS EACH BOLT (TYP. 4 PLCS.)

- Notes: ① Install transition section on tangent (parallel) with the road. Do not begin guardrail flares within the transition section.  
 ② Use transition sections on exit ends of one way traffic bridges only when specified.



**CONNECTION TO CONCRETE BARRIER**

Note: Lap upstream rail or connector over the downstream rail or connector so that the exposed metal edge faces downstream of traffic flow located closest to the rail.

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**TRANSITION SECTIONS - BRIDGE RAIL AND CONCRETE BARRIER CONNECTIONS**

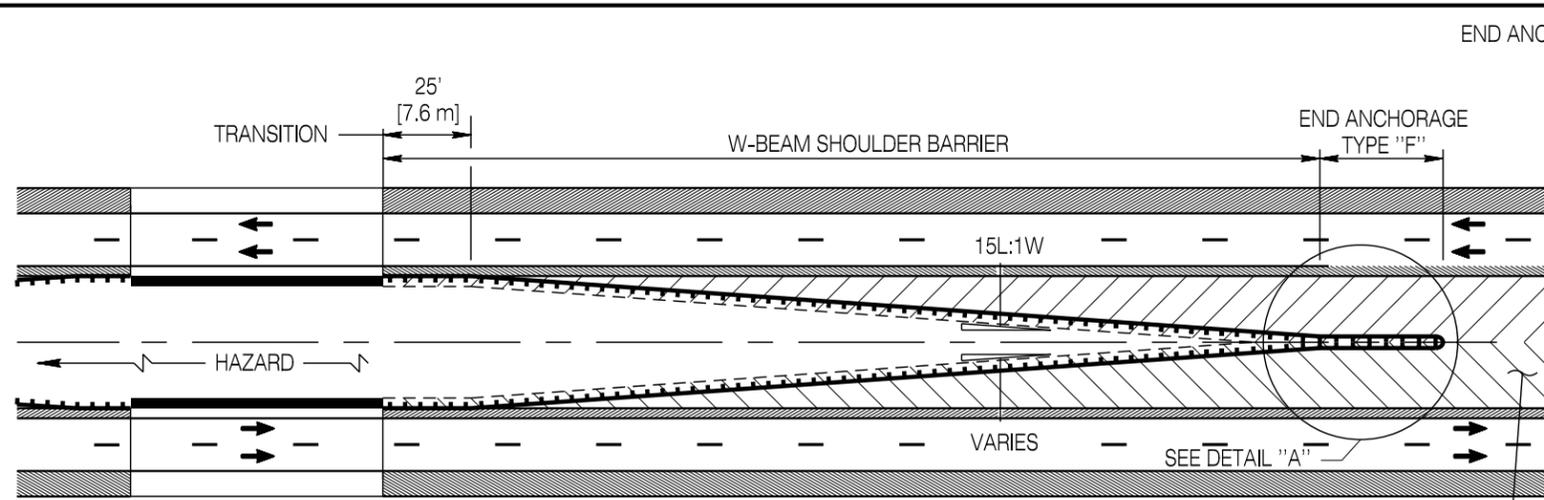
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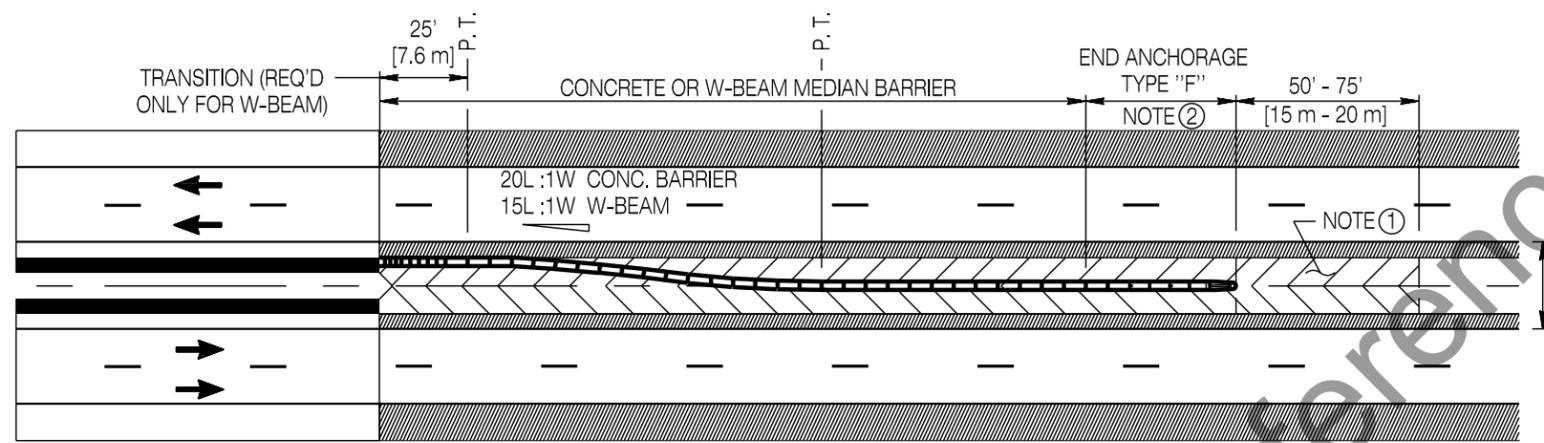
**CORRUGATED BEAM GUARDRAIL**

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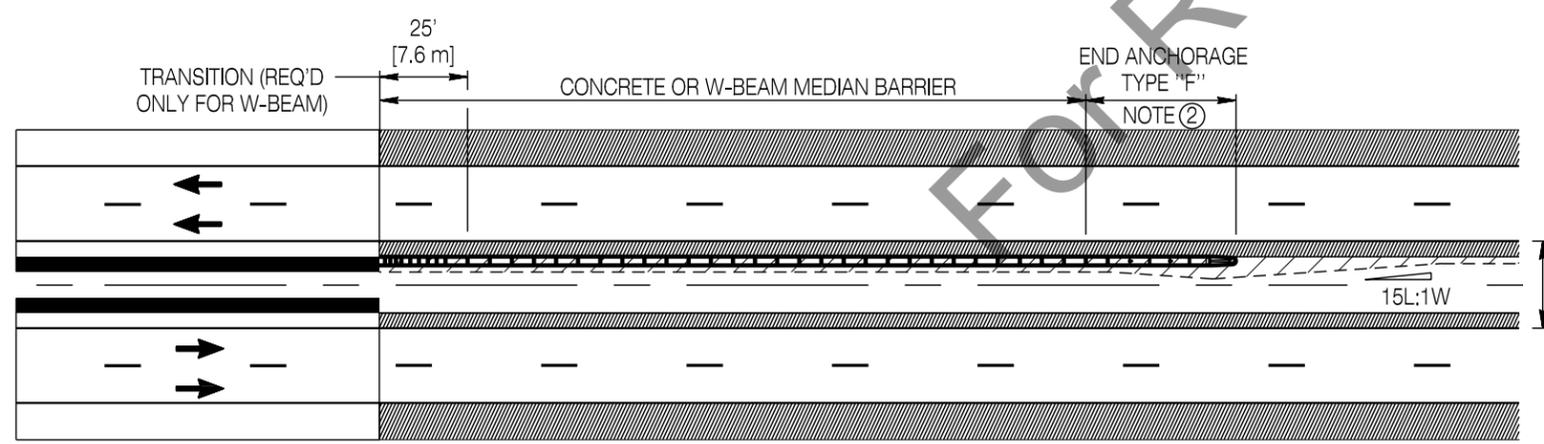
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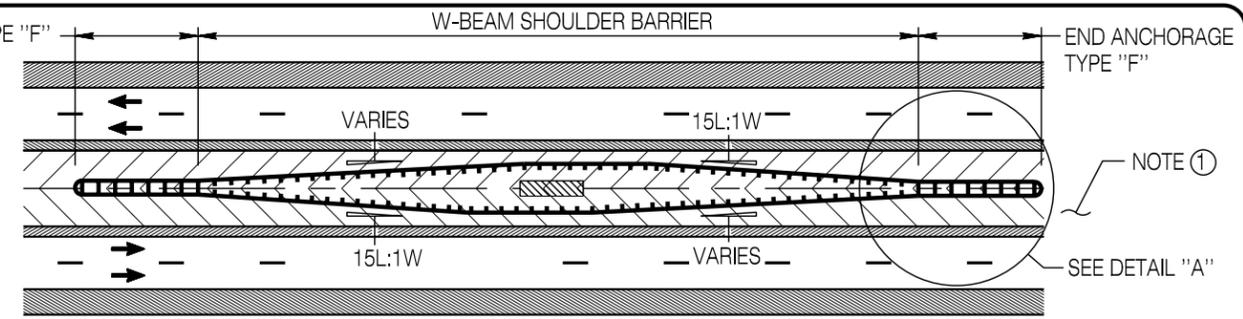
**BRIDGE END AND SLOPE PROTECTION WITH W-BEAM SHOULDER BARRIER**



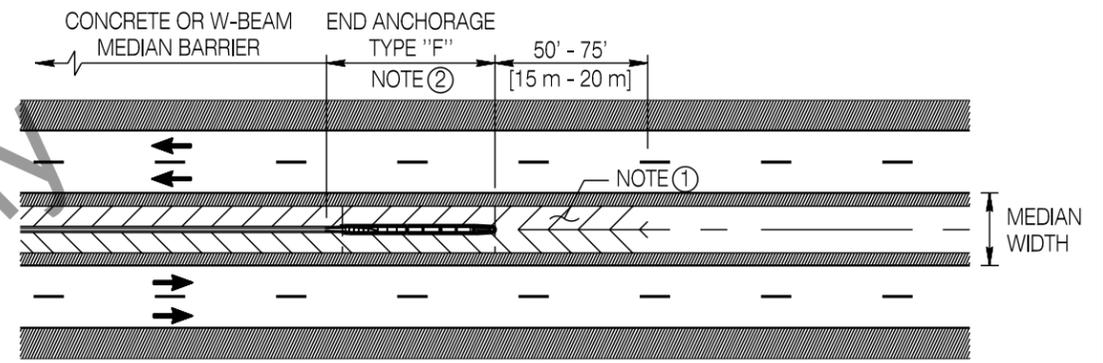
**BRIDGE END PROTECTION WITH FLARED MEDIAN BARRIER**



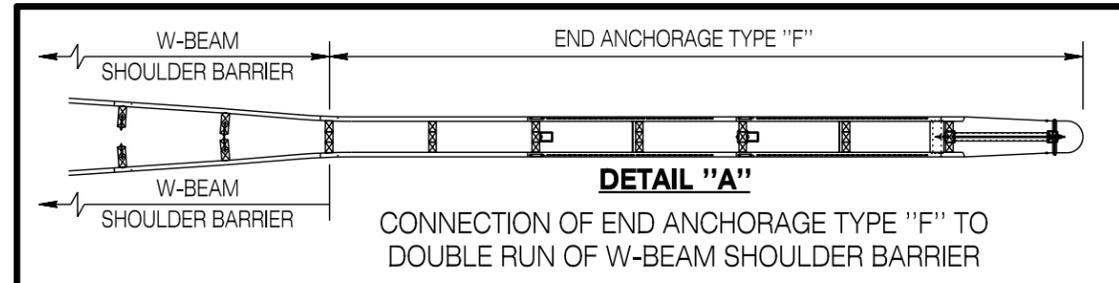
**BRIDGE END PROTECTION - NON-FLARED MEDIAN BARRIER**



**FIXED OBJECT SHIELDING IN MEDIAN**

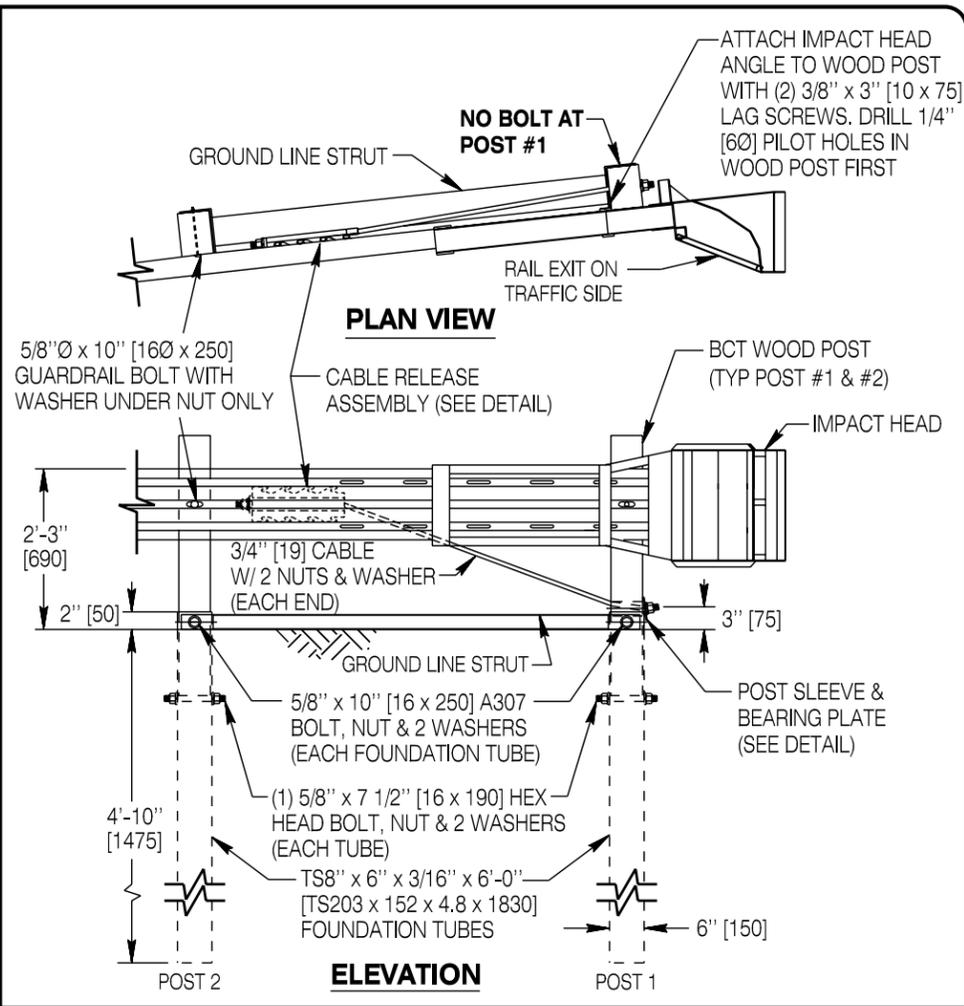
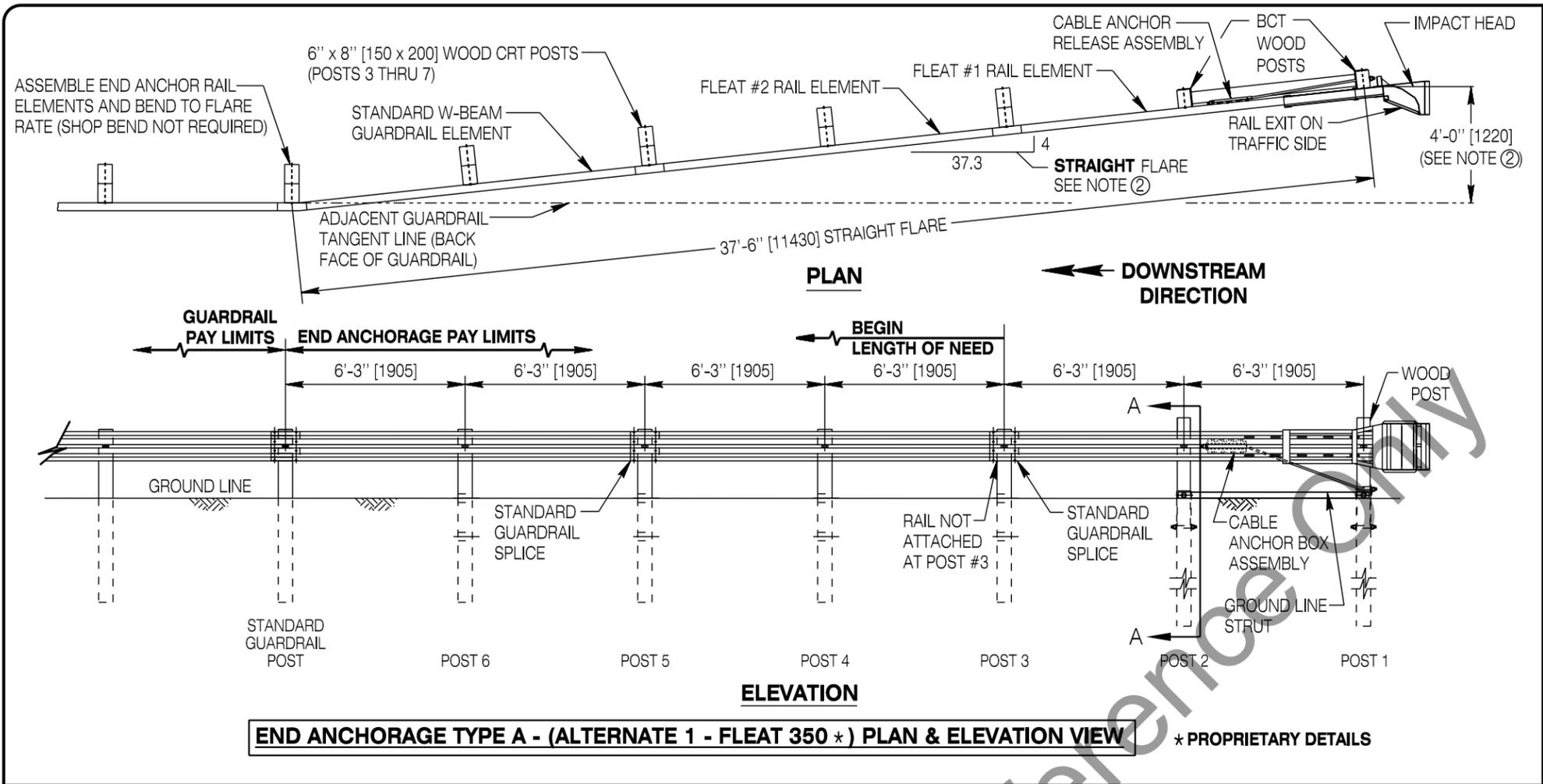


**TERMINATION OF CONCRETE OR W-BEAM MEDIAN BARRIER**



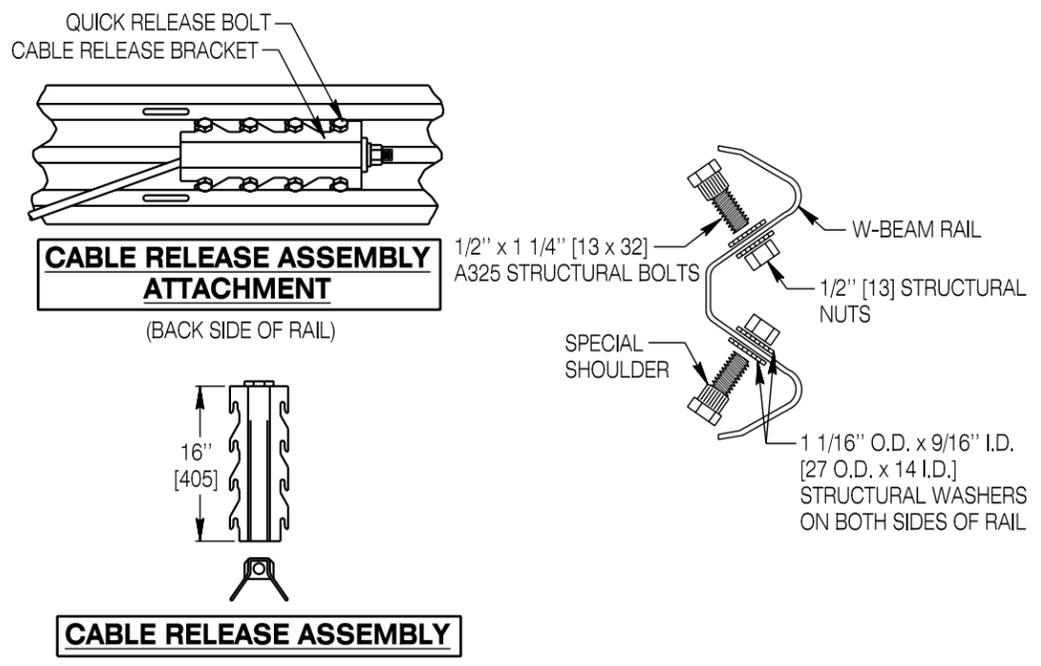
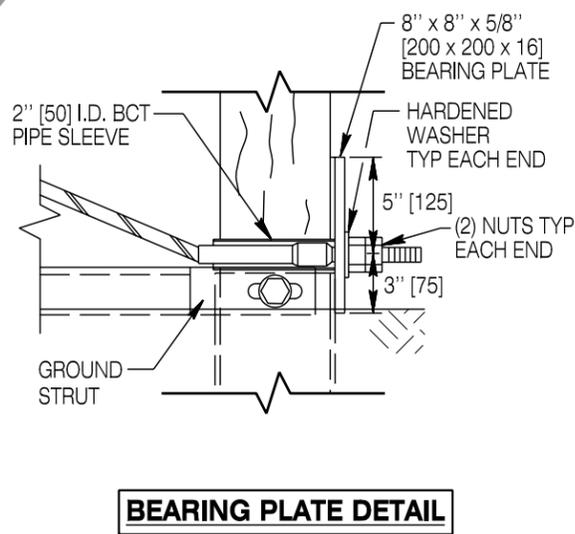
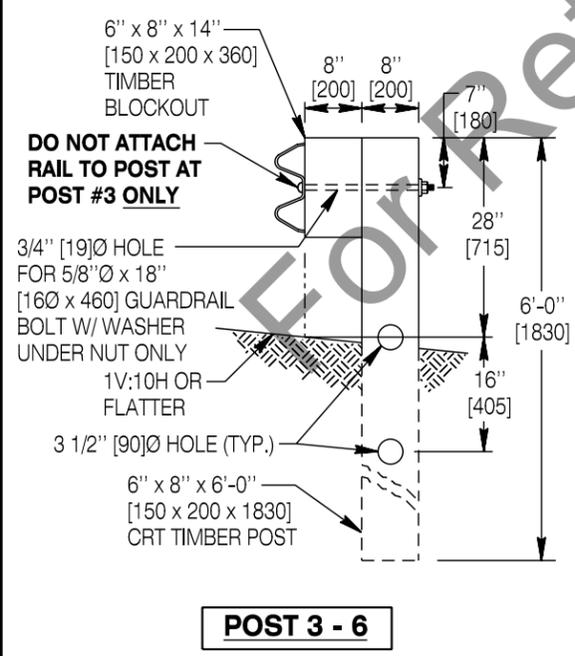
**DETAIL "A"**  
CONNECTION OF END ANCHORAGE TYPE "F" TO DOUBLE RUN OF W-BEAM SHOULDER BARRIER

- NOTES:**
- Details are typical for narrow medians - medians less than 60 feet [18 m] measured from edge of traveled way to edge of traveled way. Locate End Anchorages as specified, not necessarily at the ditch bottom.
- Ensure grading requirements and requirements for placement of guardrail around fixed object hazards are met for median installations.
- ① Grade cross-slopes 50 to 75 feet [15 to 20 m] in approach of, and extending around, median installations 1V:10H or flatter (shown in cross-hatched areas) into the face of the guardrail and terminal. Smoothly transition slopes into this relatively flat grading section. When the terminal is located within 3 feet [1 m] laterally from the ditch bottom or crosses the ditch bottom, grade immediately in front of, and near, the terminal 1V:20H. Maintain adequate drainage in the median.
  - ② The length for End Anchorage Type F varies depending on whether it transitions to w-beam or concrete barrier. See Type F installation details for lengths.

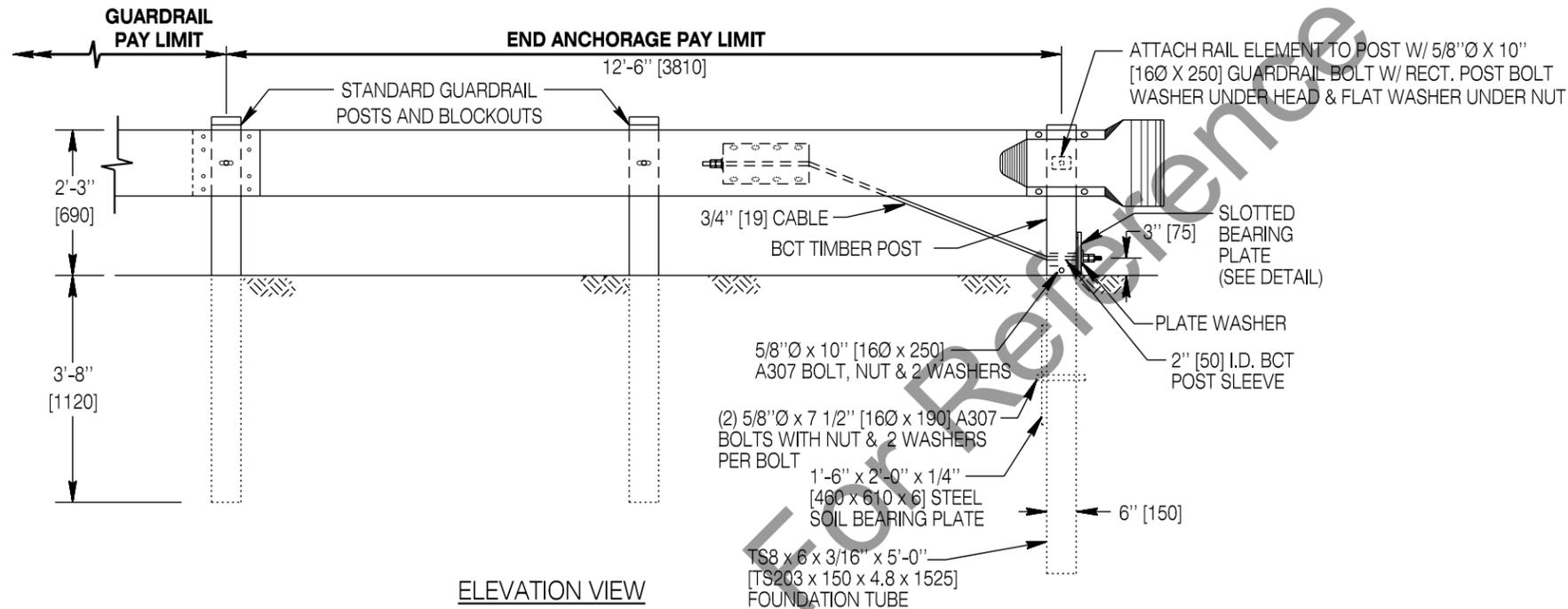
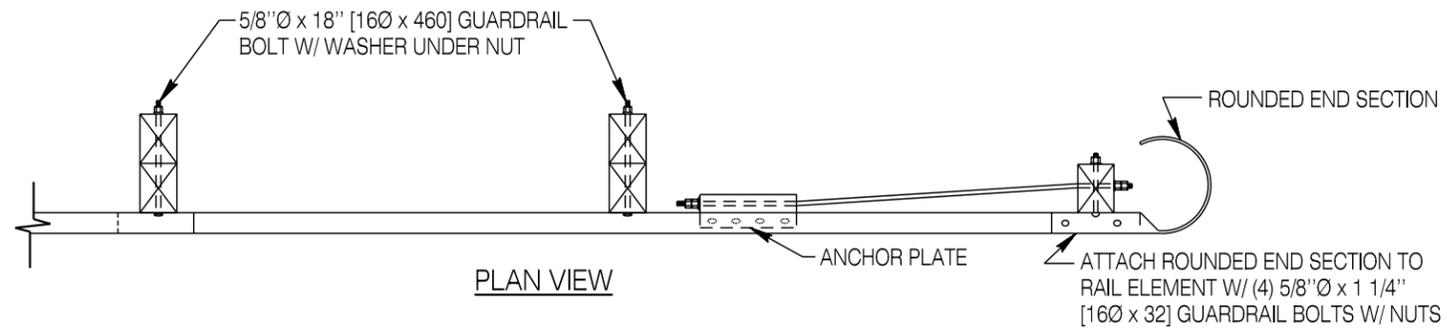


**NOTES**

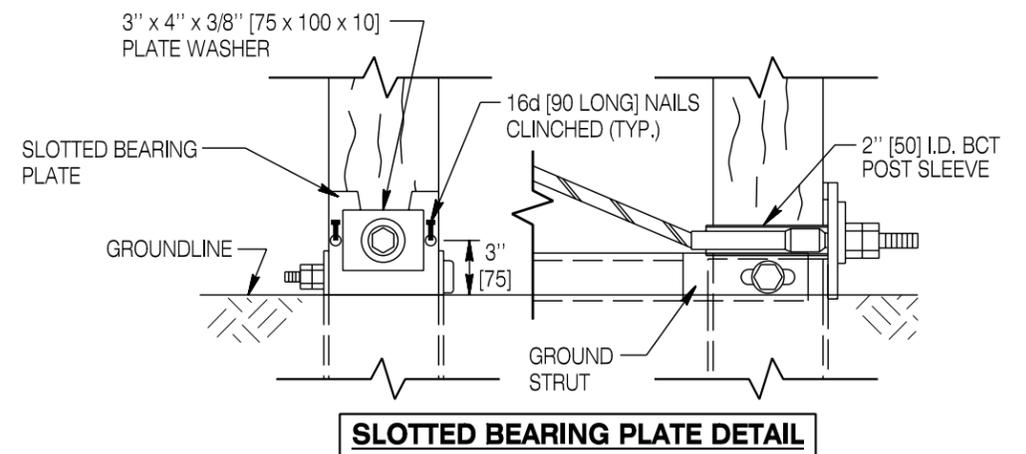
- ① Alternate #1 - FLEAT 350 End Terminal may be provided when End Anchorage Type A is specified.
- ② Flare the FLEAT End Terminal on a straight line from the tangent line of the adjacent guardrail run to provide a 4 foot [1.2 m] offset to the rear face of the rail at the impact head. The offset can be reduced to 2 1/2 feet [760] in special conditions. This applies **only to this end anchorage alternate** and will only be done when specifically called for in the plans.
- ③ Delineate the entire end plate of the impact head with reflective diagonal sheeting with alternating diagonal black and yellow stripes.







**END ANCHORAGE TYPE C**



**SLOTTED BEARING PLATE DETAIL**

Designed by: WBW  
 Drawn by: GLD  
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**END ANCHORAGE TYPE C - TRAILING END**

Note: Units shown in brackets [ ] are metric and are in millimeters (mm) unless other units are shown.



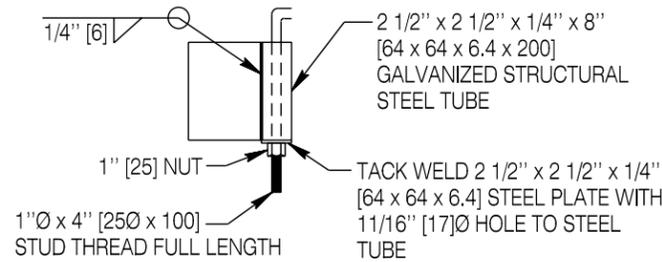
**CORRUGATED BEAM GUARDRAIL**

STANDARD PLAN

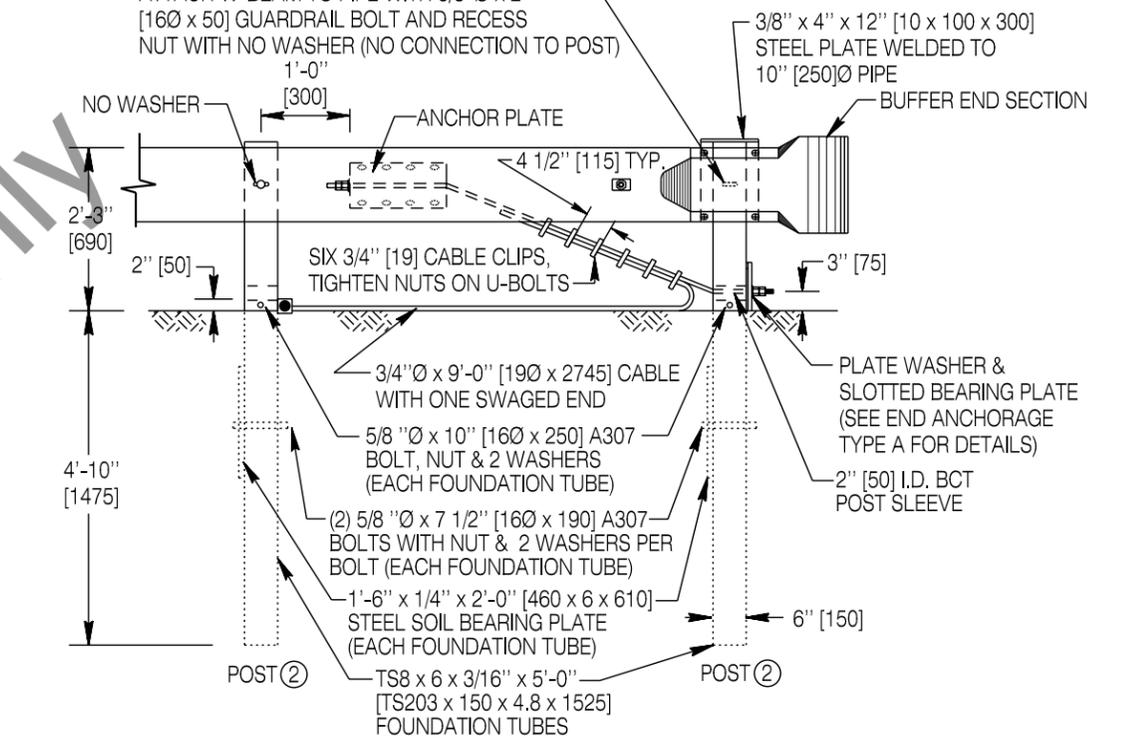
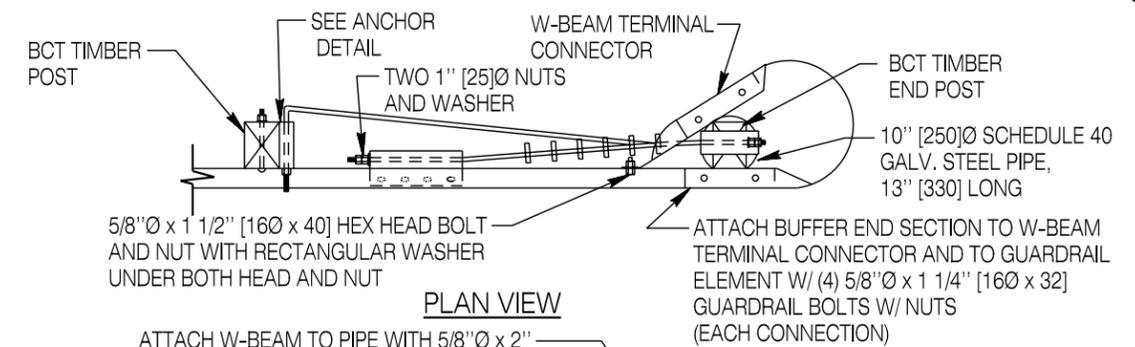
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**GENERAL NOTES**

- Application: When necessary, use the short radius transition to shield hazards at the intersection of two roadways. Typical applications include, but not limited to, the following:
  - Canal service roads at bridge ends.
  - Interruptions in guardrail runs by intersecting roadways, etc.
- Only use the low speed end anchorage on driveways and low speed service roads. Whenever an approved crash-tested end treatment is required, use an End Anchorage Type A.
- Grade terrain to 1V:10H or flatter in front of rail and for 2 ft. [610] beyond posts, then 1V:2H or flatter
- Do not bolt the rail to the CRT post at the center of the curve for the 8'-6" [2.6 m], 17' [5.2 m] and 25'-6" [7.8 m] radii.
- Tighten outside nut against inside nut with the cable installed taut between the anchor plate and first post.
- Shop bend all curved guardrail.



**ANCHOR DETAIL**

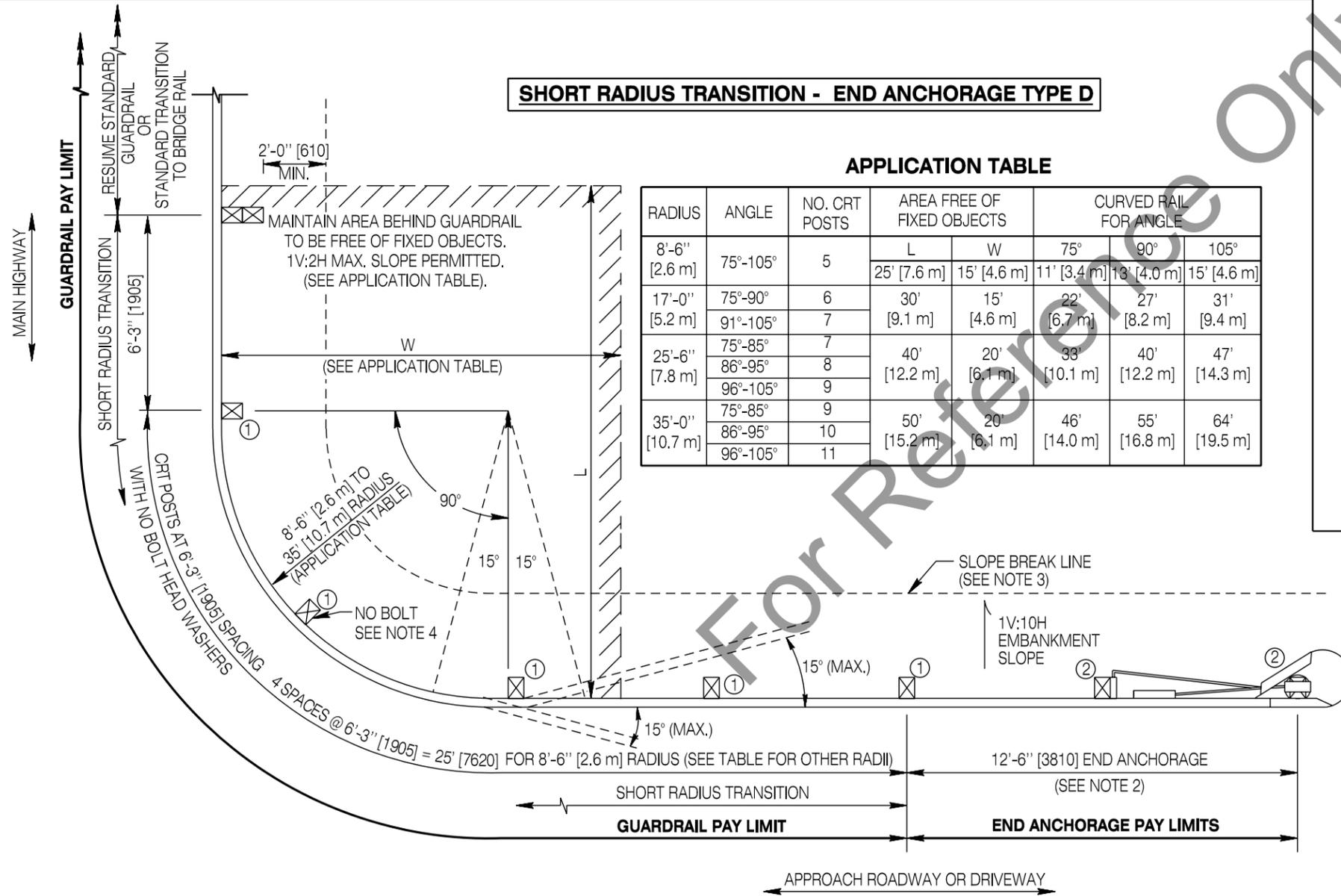


**END ANCHORAGE TYPE D LOW SPEED TERMINAL**

**SHORT RADIUS TRANSITION - END ANCHORAGE TYPE D**

**APPLICATION TABLE**

RADIUS	ANGLE	NO. CRT POSTS	AREA FREE OF FIXED OBJECTS		CURVED RAIL FOR ANGLE		
			L	W	75°	90°	105°
8'-6" [2.6 m]	75°-105°	5	25' [7.6 m]	15' [4.6 m]	11' [3.4 m]	13' [4.0 m]	15' [4.6 m]
17'-0" [5.2 m]	75°-90°	6	30'	15'	22'	27'	31'
			91°-105°	7	[9.1 m]	[4.6 m]	[6.7 m]
25'-6" [7.8 m]	75°-85°	7	40'	20'	33'	40'	47'
	86°-95°	8	[12.2 m]	[6.1 m]	[10.1 m]	[12.2 m]	[14.3 m]
	96°-105°	9					
35'-0" [10.7 m]	75°-85°	9	50'	20'	46'	55'	64'
	86°-95°	10	[15.2 m]	[6.1 m]	[14.0 m]	[16.8 m]	[19.5 m]
	96°-105°	11					



Designed by: WBW  
 Drawn by: GLD  
 Checked by: WBW  
 Previous Dwg. No. 606-01C

**END ANCHORAGE TYPE D - FOR RADIUS**

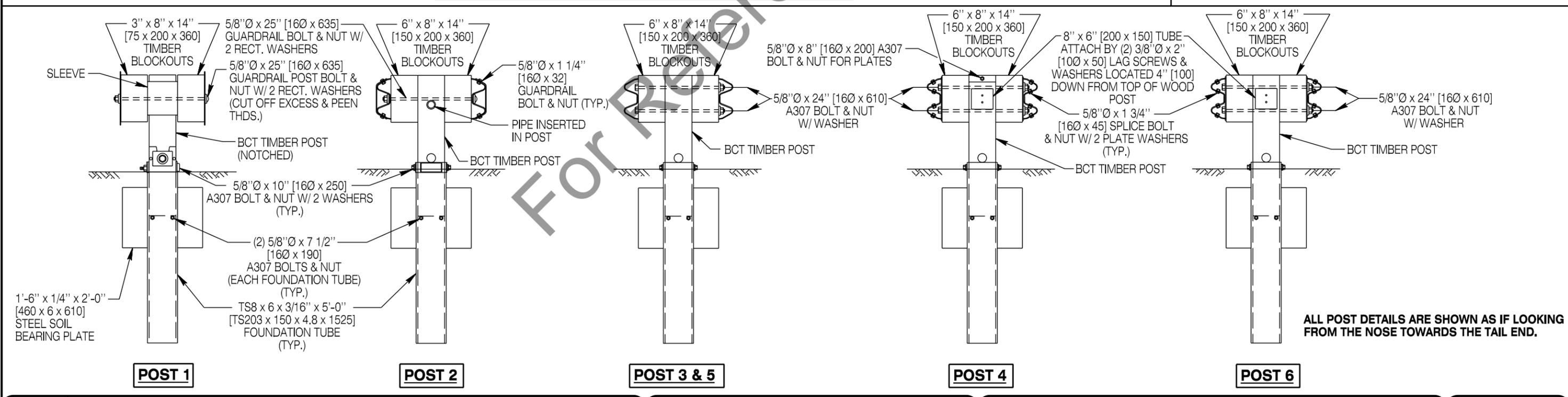
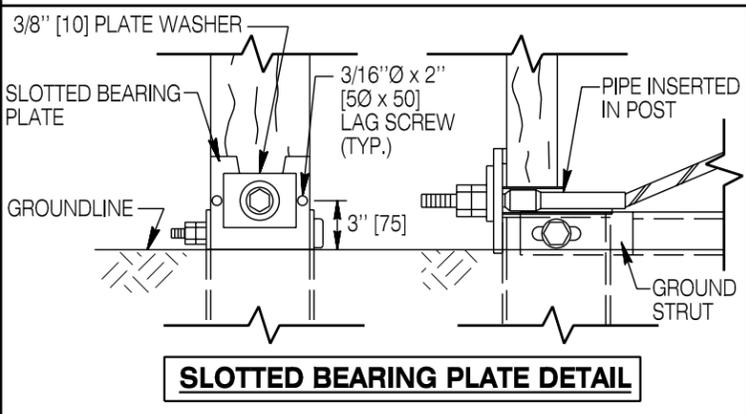
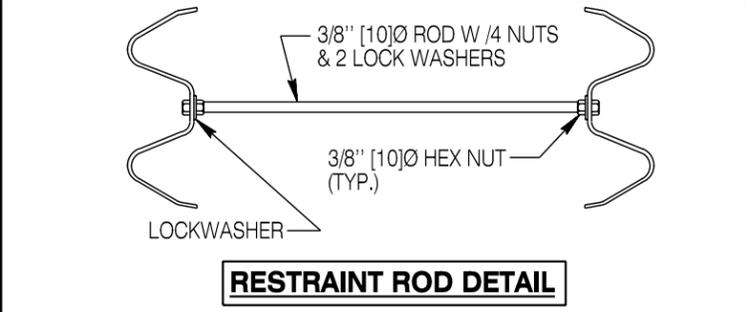
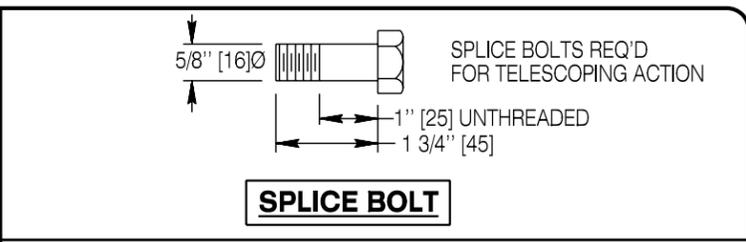
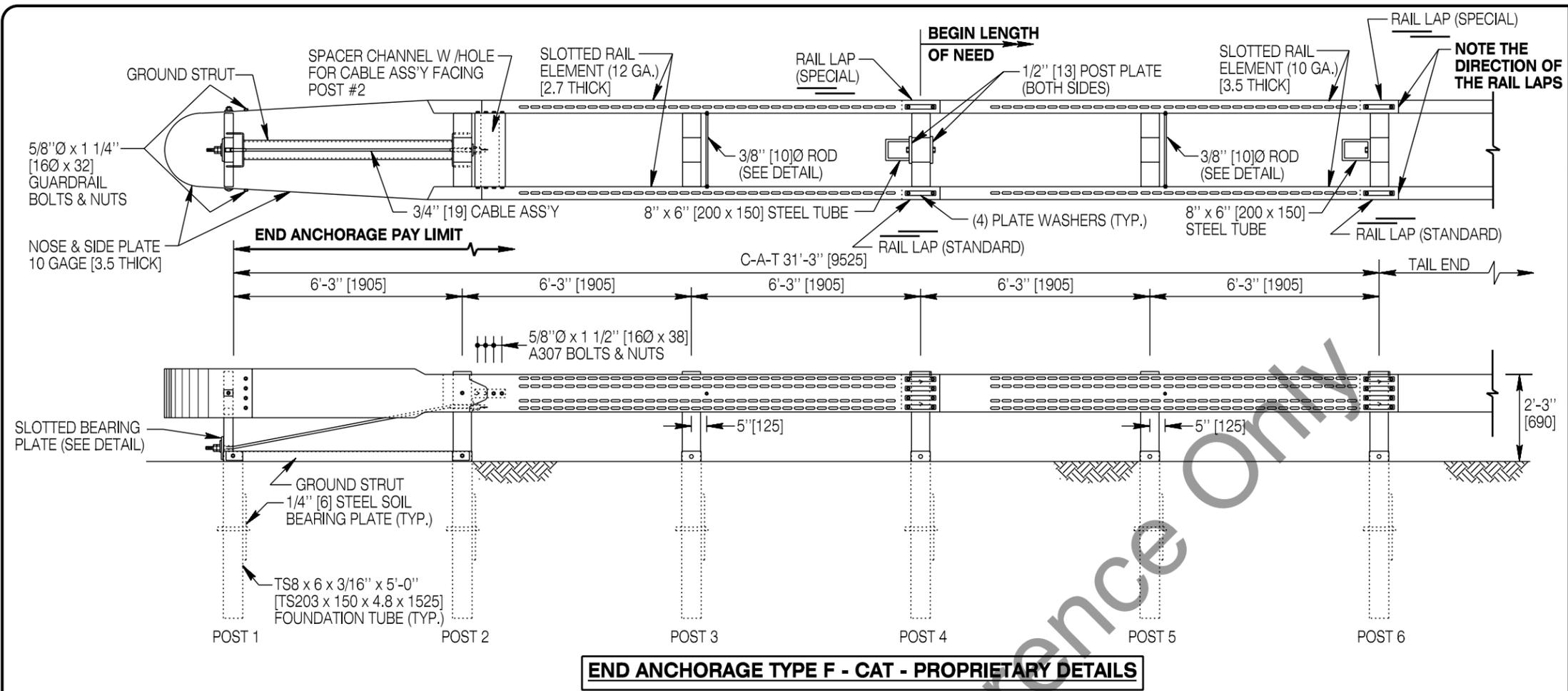
Note: Units shown in brackets [ ] are metric and are in millimeters (mm) unless other units are shown.

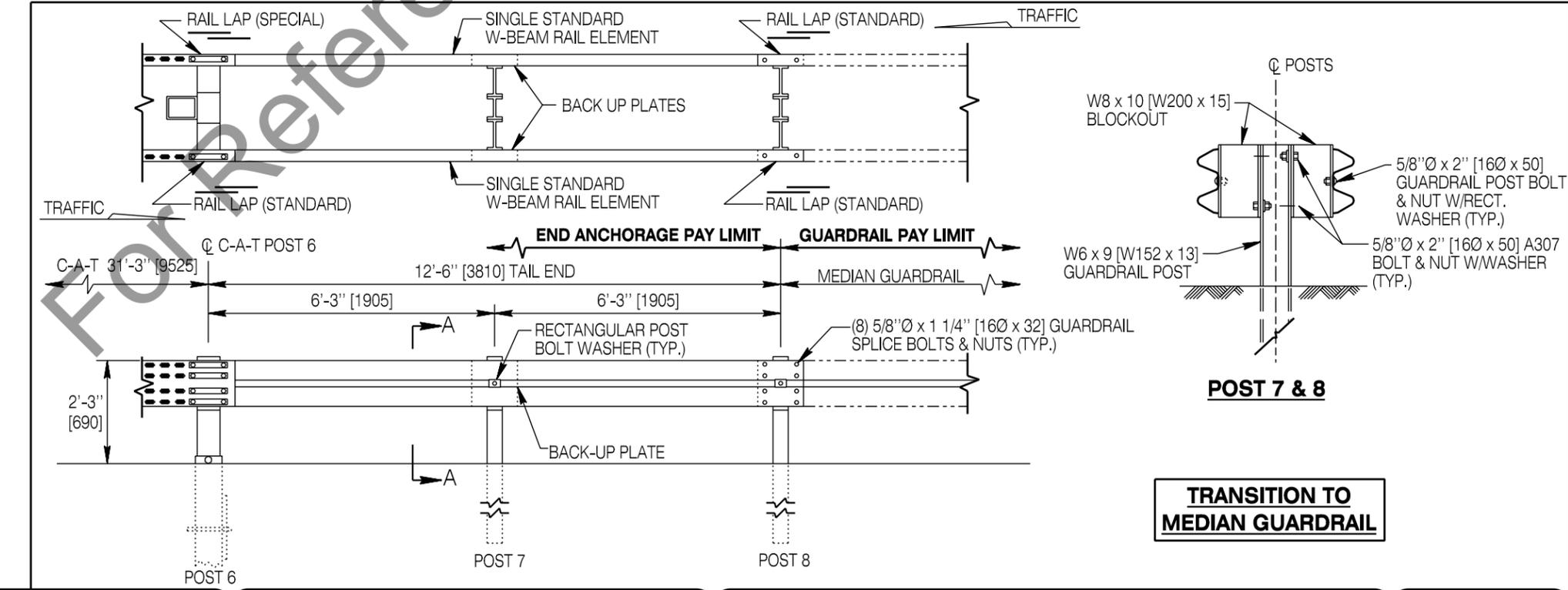
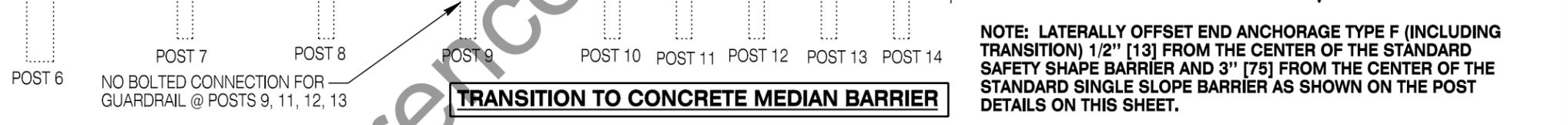
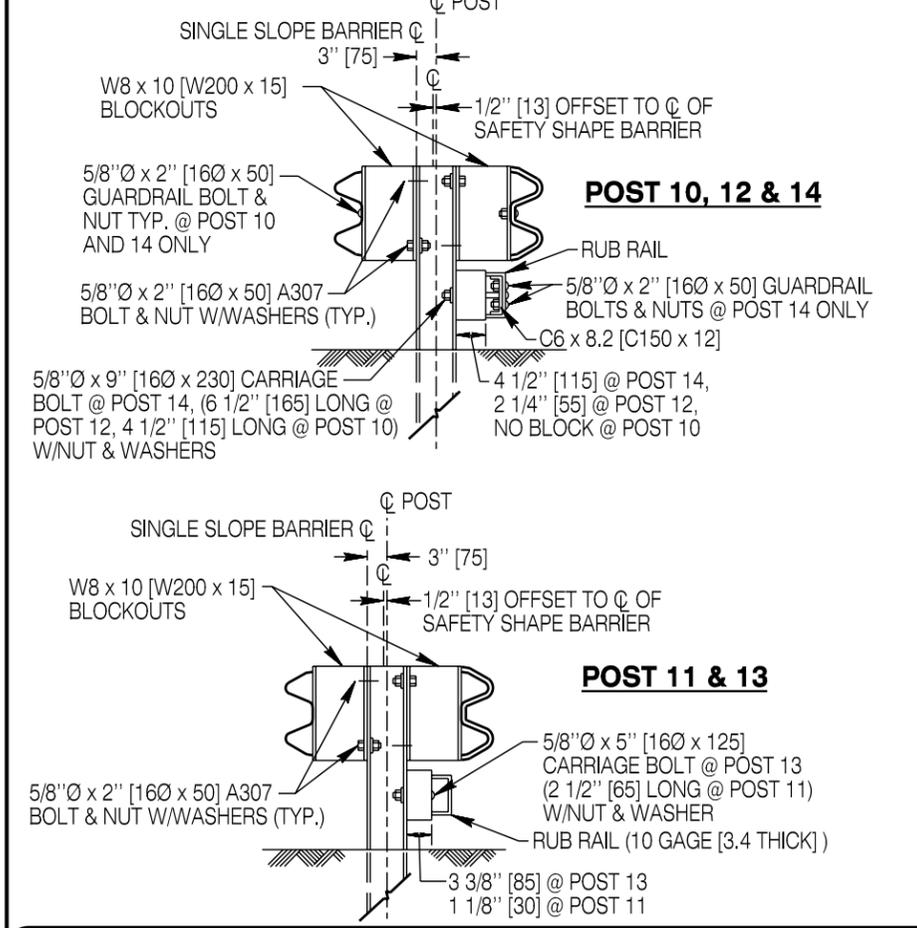
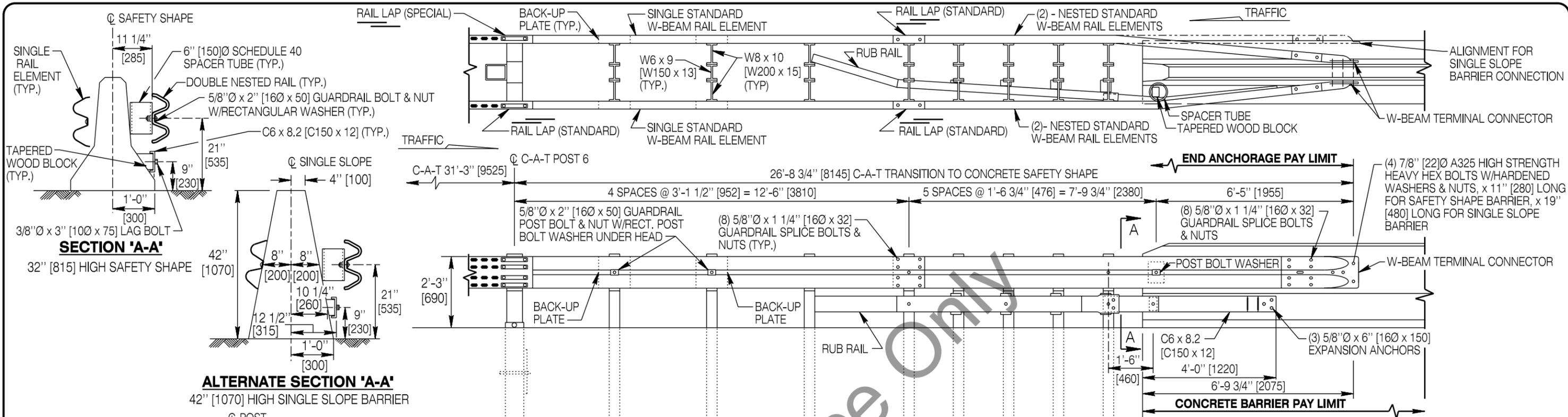


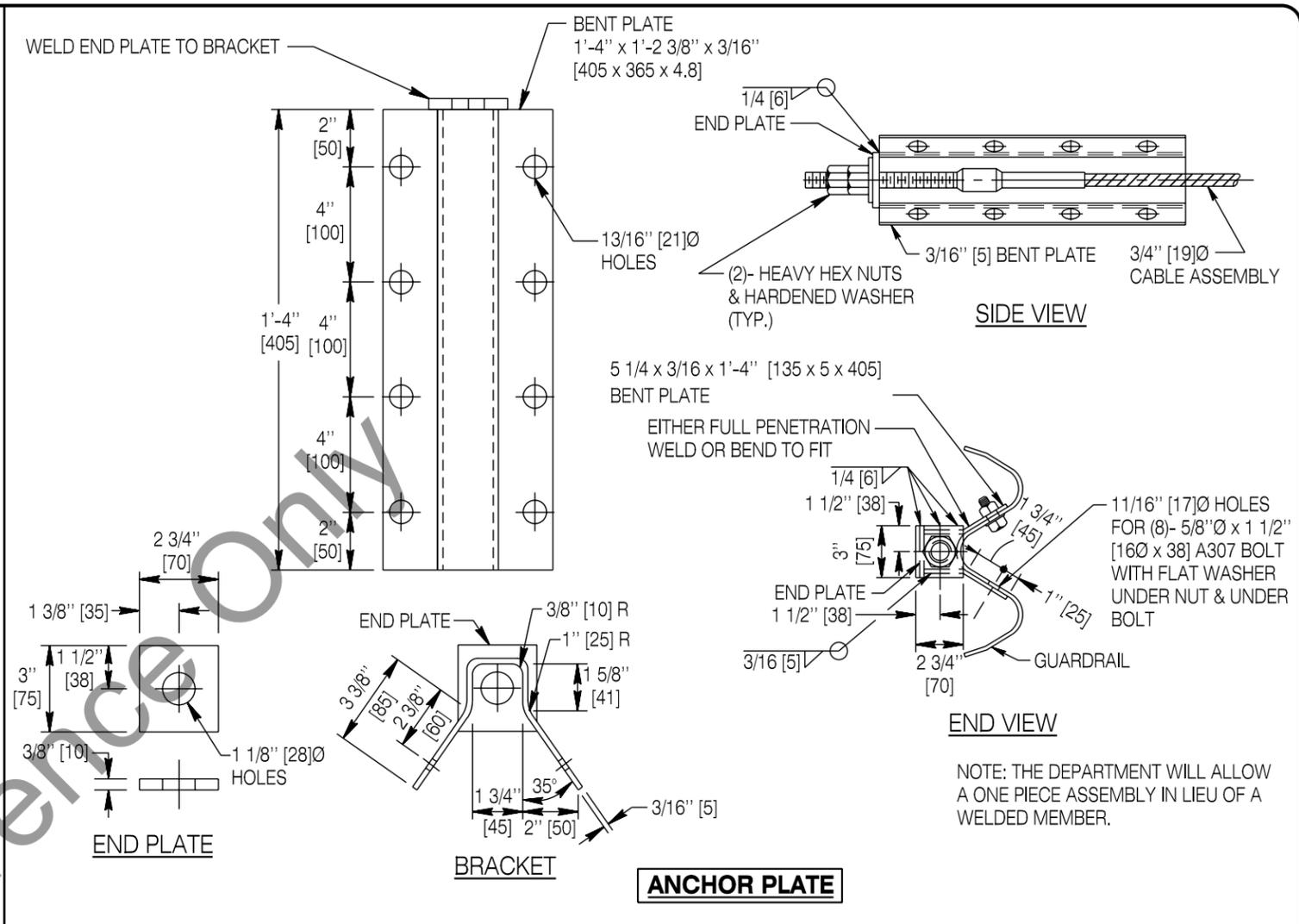
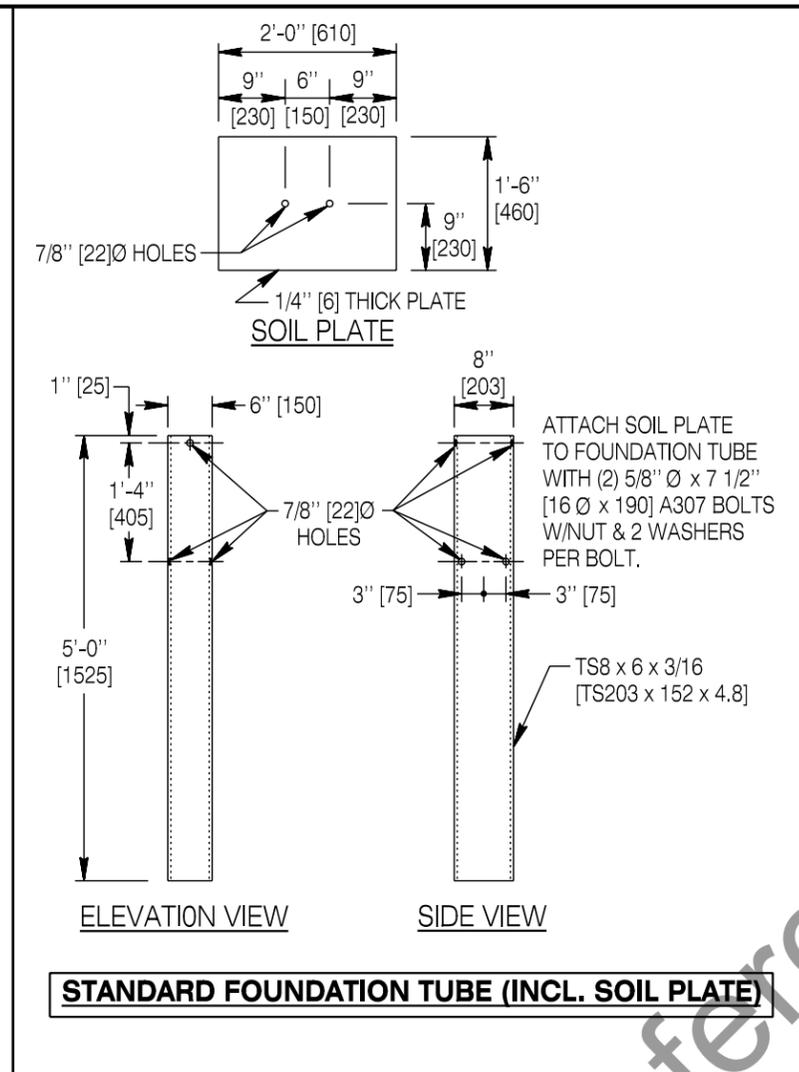
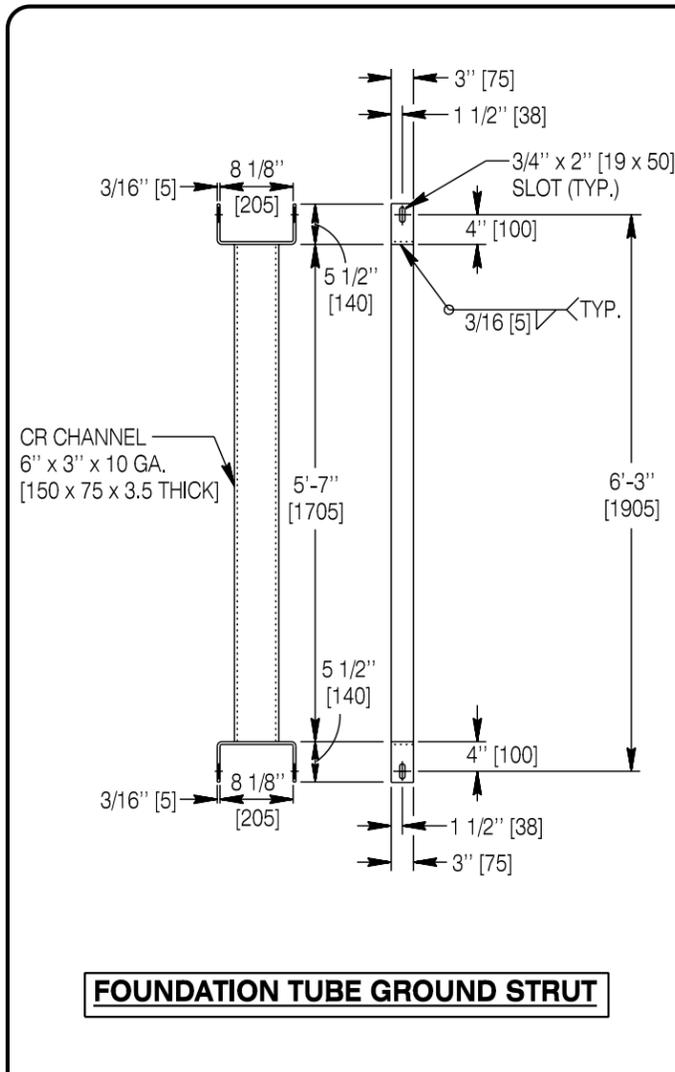
**CORRUGATED BEAM GUARDRAIL**

STANDARD PLAN

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**606-1**  
 SHEET 11 of 16  
 Issued by: ENGINEERING SERVICES  
 Date Issued: NOVEMBER, 2004

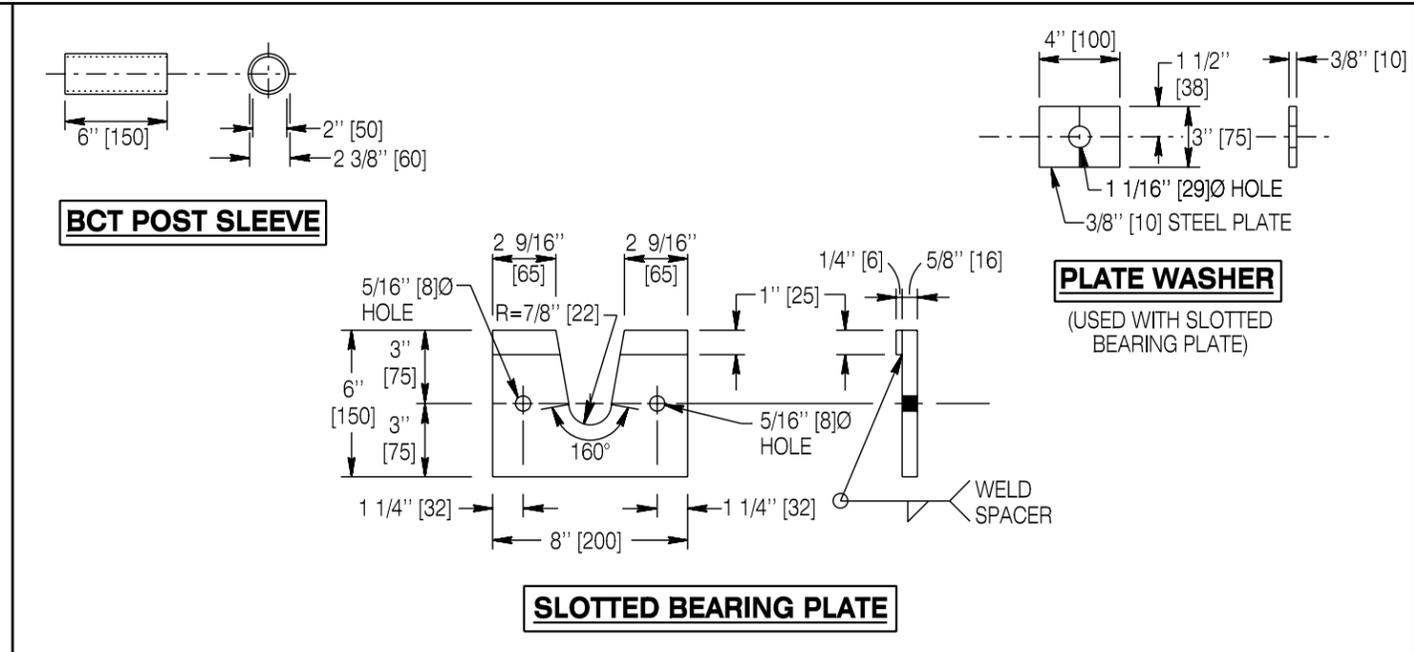
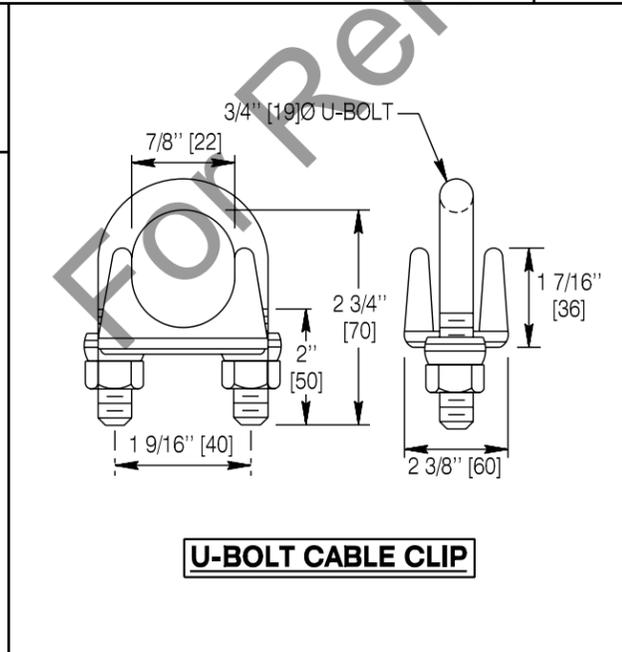
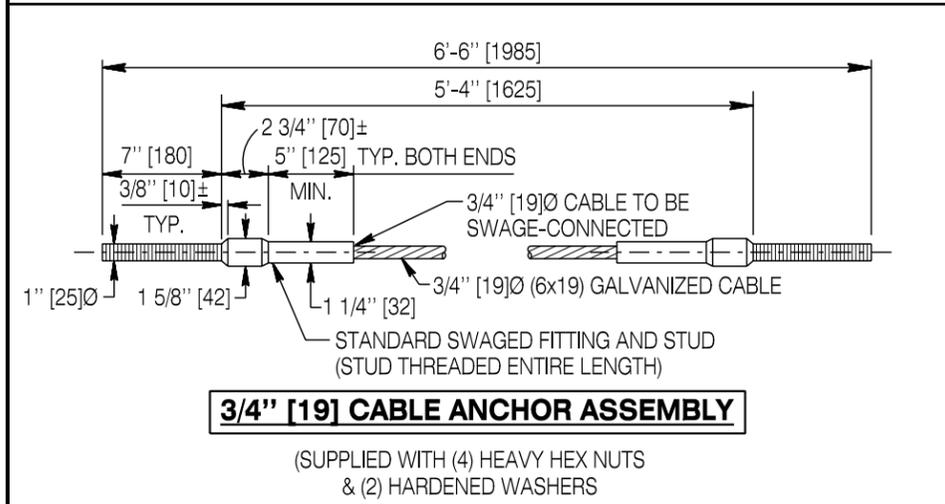


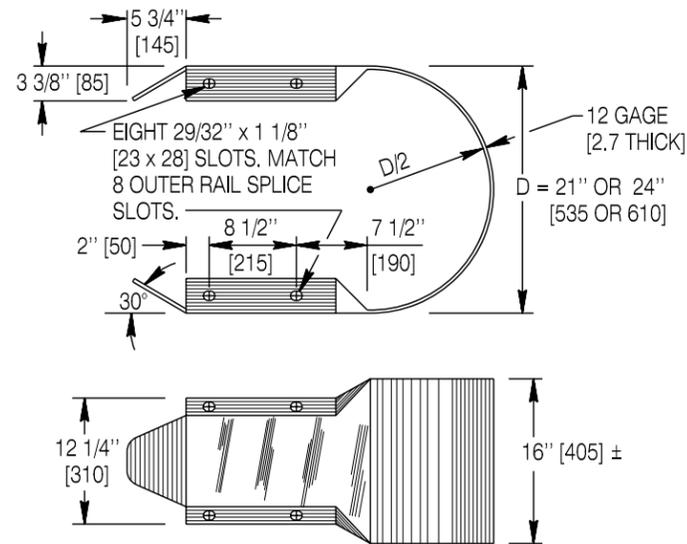




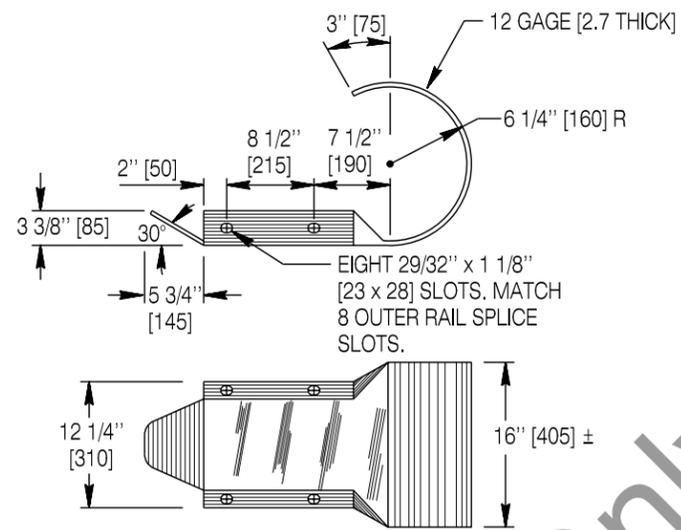
**GENERAL NOTE**

Proprietary End Anchorages may require different components than shown here.

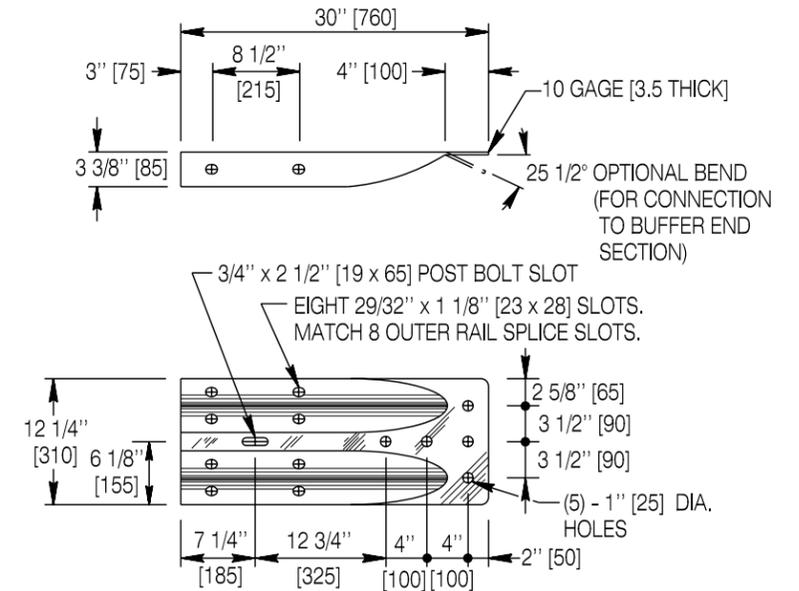




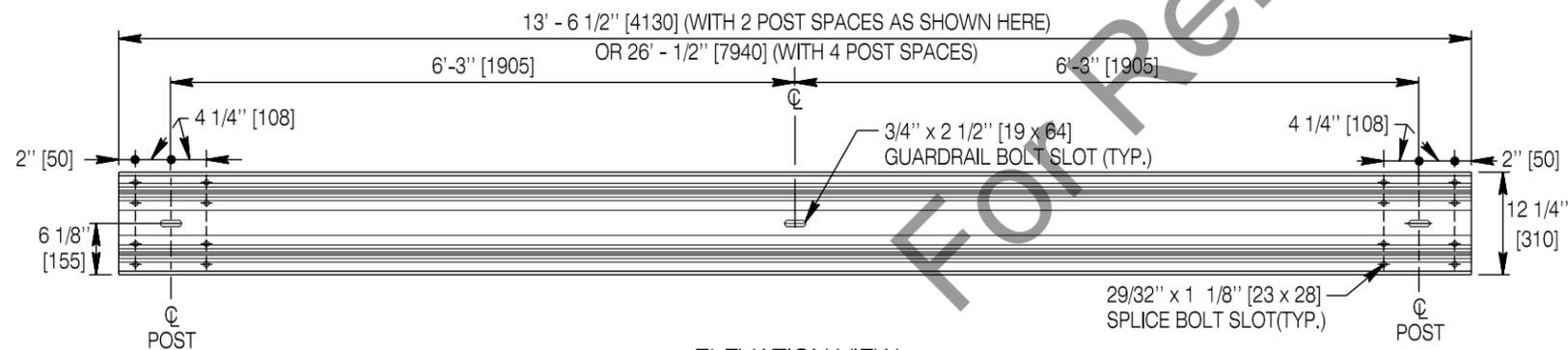
**BUFFER END SECTION**



**ROUNDED END SECTION**



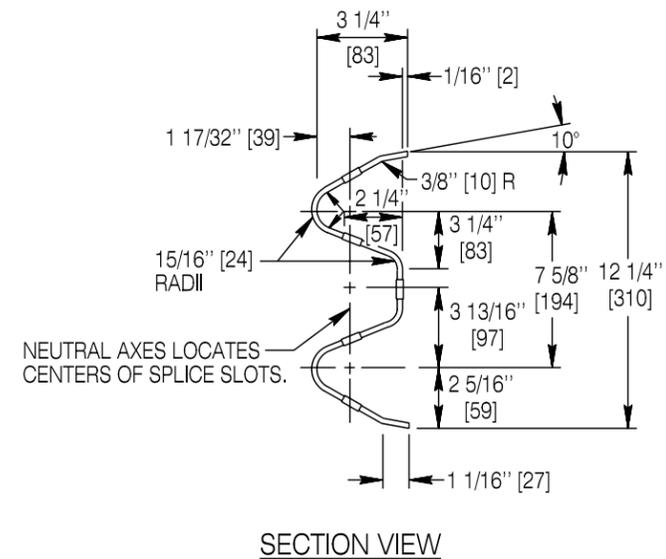
**W - BEAM TERMINAL CONNECTOR**



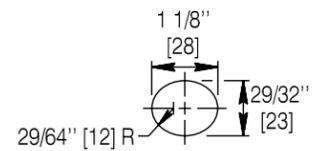
**ELEVATION VIEW**

**STANDARD W-BEAM RAIL ELEMENT**

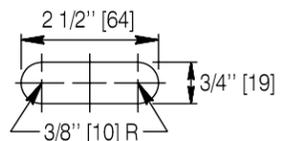
12 GAGE [2.7 THICK]



**SECTION VIEW**



**TYPICAL SPLICE BOLT SLOT**



**TYPICAL POST BOLT SLOT**

Designed by: WBW  
 Drawn by: GLD  
 Checked by: WBW  
 Previous Dwg. No. 606-01C

**FABRICATION DETAIL - STANDARD RAIL AND END SECTIONS**

Note: Units shown in brackets [ ] are metric and are in millimeters (mm) unless other units are shown.



**CORRUGATED BEAM GUARDRAIL**

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