

# ORIGINATION FORM

Proposed Revisions to a Standard Plans Index  
(Please provide all information – Incomplete forms will be returned)

## Contact Information:

Date: August 4, 2017  
Originator: **Richard Stepp**  
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## Standard Plans:

Index Number: **400**  
Sheet Number (s): 1,5,6,7,8,9,11,13,14,15,16,18,19,20,21  
Index Title: Guardrail

## Summary of the changes:

SEE SHEET 2 FOR SUMMARY



## Commentary / Background:

Miscellaneous clarifications, improvements, and additions added to newly redeveloped Guardrail Index released the prior year.

## Other Affected Offices / Documents: (Provide name of responsible personnel)

- | Yes                      | No                                  |                             |
|--------------------------|-------------------------------------|-----------------------------|
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Other Standard Plans –      |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | FDOT Design Manual –        |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Basis of Estimates Manual – |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Standard Specifications –   |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Approved Product List –     |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Construction –              |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Maintenance –               |

## Origination Package Includes: (Email or hand deliver package to Derwood Sheppard)

- | Yes                                 | N/A                                 |   |
|-------------------------------------|-------------------------------------|---|
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Redline Mark-ups                          |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Proposed Standard Plan Instructions (SPI) |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Revised SPI                               |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Other Support Documents                   |

## Implementation:

- Design Bulletin (Interim)    DCE Memo    Program Mgmt. Bulletin    FY-Standard Plans (Next Release)

Contact the Roadway Design Office for assistance in completing this form

## ORIGINATION FORM

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### Contact Information:

Date: **August 4, 2017**  
Originator: **Richard Stepp**  
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Email: richard.stepp@dot.state.fl.us

### Standard Plans:

Index Number: 400  
Sheet Number (s): 1,5,6,7,8,9,11,13,14,15,16,18,19,20,21  
Index Title: Guardrail

### Summary of the changes:

Sheet 1: specify that 31" height at top is "approximate" (real measurement at CL midheight panel) Add note to explain Nested W-Beam Concept

Sheet 5: Add note to allow for 13/16" bolt hole for steel posts (backwards compatibility) Correct visual of section and Elevation view to capture corrected 7" dimension to bolt hole

Sheet 6, 7, 8, 9, 11: clarify that shoulder slope is defined in the plans and that 1:10 is just a maximum for guardrail Function.

Sheet 7: Clarify that APL Approach Terminal drawings supersede Standards. Clarify post type exclusions. Clarify panel splice direction for Approach Terminal does not depend on direction of traffic.

Sheet 9: In the drawing labels, clarify what is Type II and what is just an End Unit

Sheet 11: Extend elevation view panel to make 15'-7.5" the default (to coordinate with Sheet 12) Add 6'-0" CRT post length option

Sheet 13, 14,15,16,18 other: Update Index references to include new Single-Slope Traffic Railing - Including new offset block designs

Sheets 13, 14, 15: update terminal connector splice bolts to 2" length (from 1.25")

Sheet 19: allow use of button head bolt for Bent-Plate Panel Rub rail splices Address double sided configuration in notes.

Sheet 20: add details for terminating pipe rail on steel posts

Sheet 21 and 7: clarify use of posts and special posts inside of approach terminal... post exclusions moved to Sheet 7.

SHEET NO.	CONTENTS
1	General Notes; Index Contents
2	General, TL-3 Guardrail - Installed Plan and Elevation
3	Low-Speed, TL-2 Guardrail - Installed Plan and Elevation
4	W-Beam and Thrie-Beam Panel Details
5	Post and Offset Block Details
6	Guardrail Sections - Heights and Adjacent Slopes
7	End Treatment - Approach Terminal Geometry, Parallel and Flared
8	End Treatment - Approach Terminal Geometry, Curbed and Double Faced
9	End Treatment - Trailing Anchorage Type II
10	End Treatment - Component Details
11	End Treatment - Controlled Release Terminal (CRT) System
12	Layout for CRT System - Side Roads and Driveways
13	Approach Transition Connection to Rigid Barrier - General, TL-3
14	Approach Transition Connection to Rigid Barrier - Low-Speed, TL-2
15	Approach Transition Connection to Rigid Barrier - Details
16	Approach Transition Connection to Rigid Barrier - Double Faced Guardrail
17	Layout to Rigid Barrier - Approach Ends
18	Layout to Rigid Barrier - Approach Ends with Double Faced Guardrail Layout to Rigid Barrier - Trailing Ends
19	Rub Rail Details
20	Pedestrian Safety Treatment - Pipe Rail
21	Modified Mount - Special Steel Post for Concrete Structure Mount; Modified Mount - Encased Post for Shallow Mount; Modified Mount - Frangible Leave-Out for Concrete Surface Mount
22	Barrier Delineators - Post Mounted; Clear Space - Reduced Post Spacing for Hazards; 5/8" Button-Head Bolt System

**GENERAL NOTES:**

1. **INSTALLATION:** Construct guardrail in accordance with Specification Section 536.

This Index, along with the plans and the manufacturers' drawings on the Approved Products List (APL), is sufficiently detailed for installation of General Guardrail, Low-Speed Guardrail, End Treatment assemblies, and their connecting options shown herein. This precludes requirements for shop drawing submittals unless otherwise specified in the plans.

2. **COMPATIBILITY:** The General Guardrail in this Index is based on the Midwest Guardrail System (MGS) design, with a 31" height at the top of the Panel (2'-1" mounting height at  $\bar{C}$  of Panel) and a midspan panel splice as shown on Sheet 2. Guardrail components included on the APL, which are compatible with this Index, may also be identified as 31" or MGS Guardrail.

3. **STANDARD COMPONENTS:** Standard guardrail components, including posts, panels, and bolt systems, are based upon English unit conversions of the AASHTO-AGC-ARTBA Joint Committee Task Force 13 Report: A Guide to Standardized Highway Barrier Hardware (<http://www.aashtotf13.org/Barrier-Hardware.php>).

4. **BUTTON-HEAD BOLTS:** Install Button-Head Bolts where indicated using bolts, nuts, and washers as defined on Sheet 22. Place washers under nuts; washers are optional against steel flanges. Do not place washers between bolt heads and panels, except where otherwise shown in this Index.

5. **HEX-HEAD BOLTS:** Install Hex-Head Bolts where indicated using bolts, nuts, and washers in accordance with material properties of Specification Section 967. Place washers under nuts; washers are optional against steel flanges.

6. **MISCELLANEOUS ASPHALT PAVEMENT:** Install Miscellaneous Asphalt Pavement where indicated with a tolerance of  $\pm 1/2$ " depth and in accordance with Specification Section 339.

7. **ADJACENT SIDEWALKS & SHARED USE PATHS:** When guardrail posts are placed within 4'-0" of a sidewalk or shared use path, use timber posts, or use steel posts only if treated with Pipe Rail as shown on Sheet 20.

When timber posts are used, one of the following safety treatments is required for the bolt(s) protruding from the back face of the posts:

- a. After tightening the nut, trim the protruding post bolt flush with the nut and galvanize per Specification Section 562.
- b. Use post bolts 15" in length and countersink the washer and nut between 1" and 1 1/2" deep into the back face of the post.
- c. Use 15" post bolts with sleeve nuts and washers.

When End Treatment posts are within 4'-0" of a sidewalk or shared use path, steel posts are not permitted within the End Treatment segment. Terminate the Pipe Rail outside of End Treatment segments, as noted per Sheet 20.

8. **CONNECTION TO RIGID BARRIER:** The connections to Rigid Barrier in this Index only apply to newly constructed bridge Traffic Railing and Concrete Barrier or where the complete Approach Transition Connection to Rigid Barrier shown herein can be installed without conflicting with existing Traffic Railings, structures, or approach slabs.

For connecting guardrail to existing bridge Traffic Railings, see the layouts and details of Index Nos. 402, 404, and 405.

9. **CONNECTION TO EXISTING GUARDRAIL:** Where a transition to existing guardrail at 27" height is required, linearly transition the guardrail height over a distance ranging from 25'-0" to 31"-3". Provide an immediate transition to the required midspan splice using the available panel options on Sheet 4 (9'-4 1/2" or 15'-7 1/2" panel).


10. **PLAN CALLOUTS:** Begin/End Station labels are shown throughout this Index as they correspond to the station and offset callouts specified in the plans.

In the plans, Begin/End Guardrail Station refers to the General TL-3 Guardrail Pay Item, and it may be abbreviated as Begin/End GR. Station. Where the Low-Speed TL-2 Guardrail Pay Item is specifically required, the callout in the plans will then specify Begin/End TL-2 GR. Station.

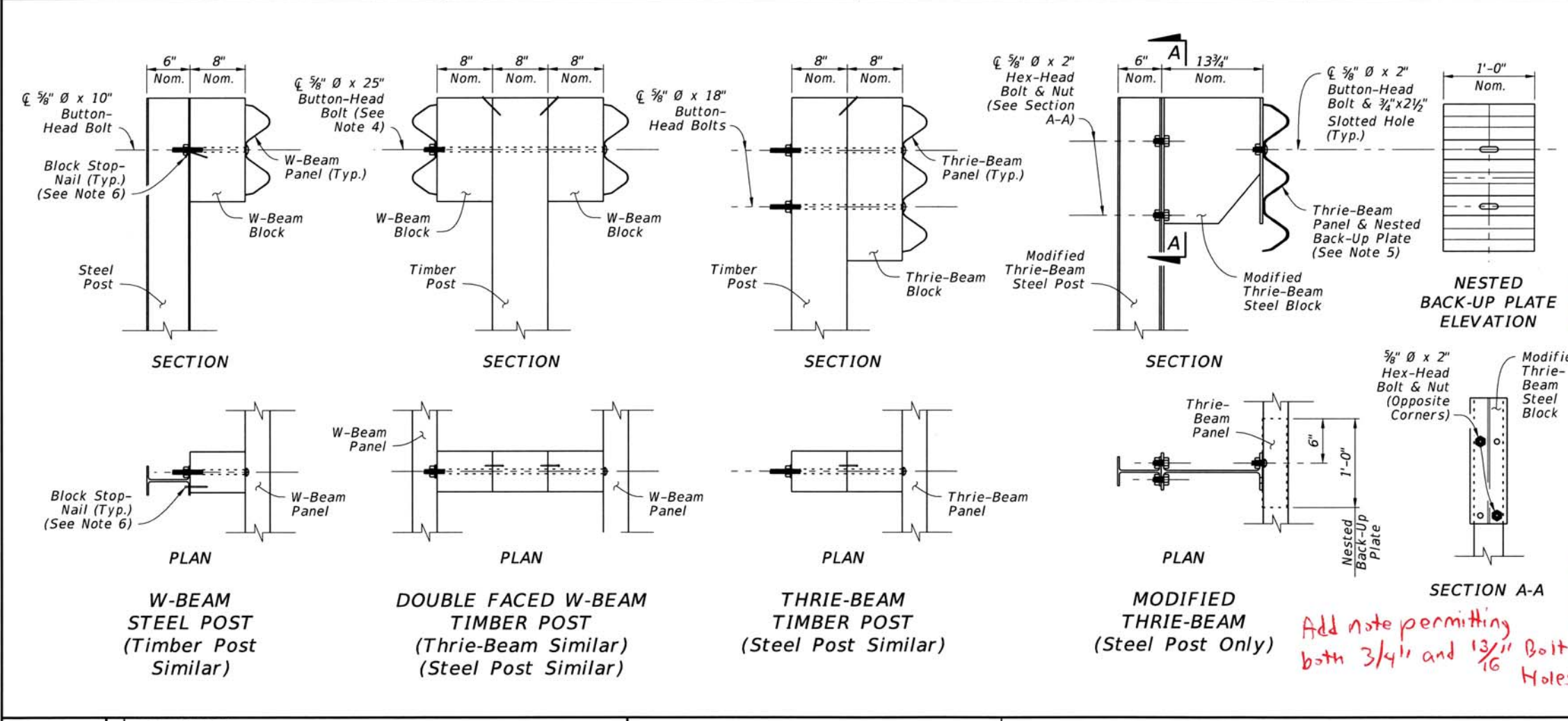
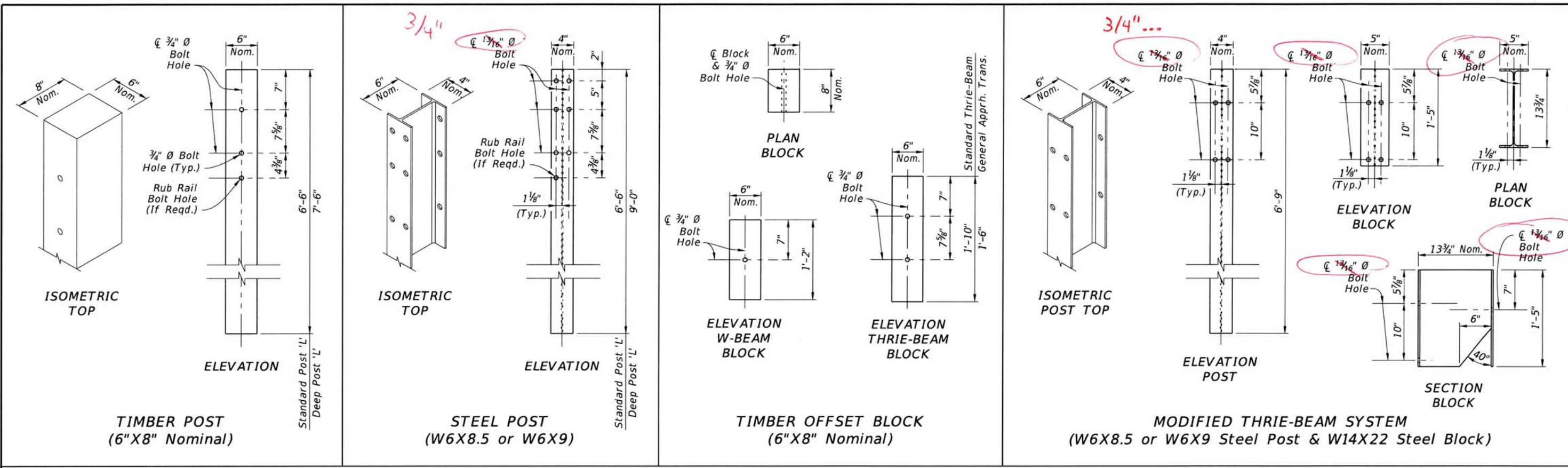
11. **QUANTITY MEASUREMENT:** Measure guardrail and corresponding components as defined in Specification Section 536. The Guardrail length is measured along the centerline of installed Panels, between the points labeled Begin/End Guardrail Station shown on the following Index Sheets and defined in the plans (typically measured from the  $\bar{C}$  of the panel's post bolt slots at the approach/trailing ends).

Add note for  
Nested W-Beam  
(explain usage)

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LAST REVISION 11/01/16	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	GUARDRAIL 536-001 → 400	INDEX NO. 400	SHEET NO. 1 of 22
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- NOTES:**
- GENERAL:** Install Posts and Offset Blocks where indicated throughout this Index.
  - OFFSET BLOCKS:** For each Panel type, install the corresponding Offset Block type. For General, TL-3 (Single Faced) Approach Transitions only, use the 1'-6" Thrie-Beam Block (See Sheet 13).
  - STANDARD POSTS:** Where Standard Posts are called for in this Index, use either a Timber Post or Steel Post at the Length, 'L', shown for Standard Posts. Use a single post material type consistently per each run of guardrail. Only where specified in the Plans, use the Deep Post 'L' for Slope Break Conditions as shown on Sheet 6.
  - DOUBLE FACED GUARDRAIL:** Orient Post Bolts with the Button-Head located on the side nearest the traffic lane. The bolt's threaded portion is not permitted to extend beyond 3/4" from the face of the tightened nut; trim the threaded portion as needed and galvanize in accordance with Specification Section 562.
  - MODIFIED THRIE-BEAM NESTED BACK-UP PLATE:** At each post connection, install a Nested Back-up Plate between the Thrie-Beam Panel and the post. The Nested Back-up Plate has a cross-section and material matching the Thrie-Beam Panel Section.
  - BLOCK STOP-NAIL:** Drive one nail per Standard Offset Block as shown to prevent Block rotation. Use steel 3 1/2" Type 16d nails with ASTM A153 hot-dip galvanization. For steel posts, drive the nail through the unused flange bolt hole and bend the nail so its head contacts the flange.
  - MATERIALS:** Use timber and steel posts and offset blocks in accordance with Specification Section 967. Composite offset blocks may be substituted as approved on the APL. Use a single offset block type consistently per each run of guardrail. Steel offset blocks are only permitted for Modified Thrie Beam.

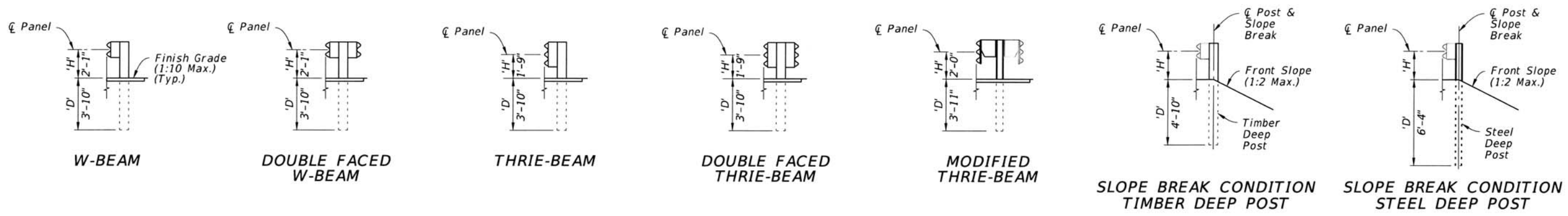
Add note permitting both 3/4" and 13/16" Bolt Holes

**POST AND OFFSET BLOCK DETAILS**

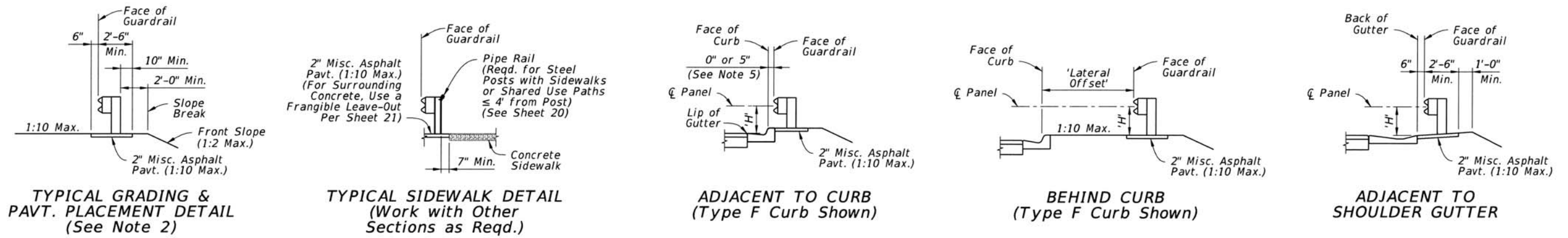
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LAST REVISION 02/01/16	DESCRIPTION:	FDOT FY 2017-18 DESIGN STANDARDS	GUARDRAIL	INDEX NO. 400	SHEET NO. 5 of 22
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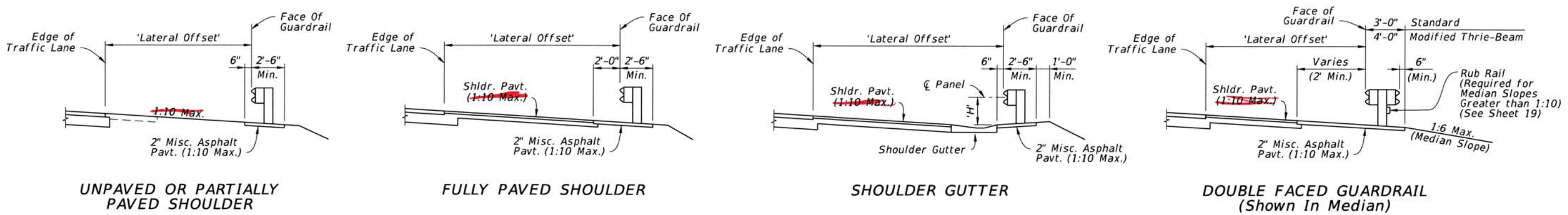


GUARDRAIL TYPES - MOUNTING HEIGHTS & POST DEPTHS



GUARDRAIL SECTIONS - TYPICAL

GUARDRAIL SECTIONS - CURB & GUTTER



GUARDRAIL SECTIONS - SHOULDERS

GUARDRAIL HEIGHT SUMMARY TABLE:			
Type:	Min. Depth 'D':	Mounting Height 'H':	Post Length 'L':
W-Beam (Single and Double Faced)	3'-10"	2'-1"	6'-6"
Thrie-Beam (Single and Double Faced)	3'-10"	1'-9"	6'-6"
Modified Thrie-Beam	3'-11"	2'-0"	6'-9"
Timber Deep Post	4'-10"	See Above	7'-6"
Steel Deep Post	6'-4"	See Above	9'-0"

NOTES:

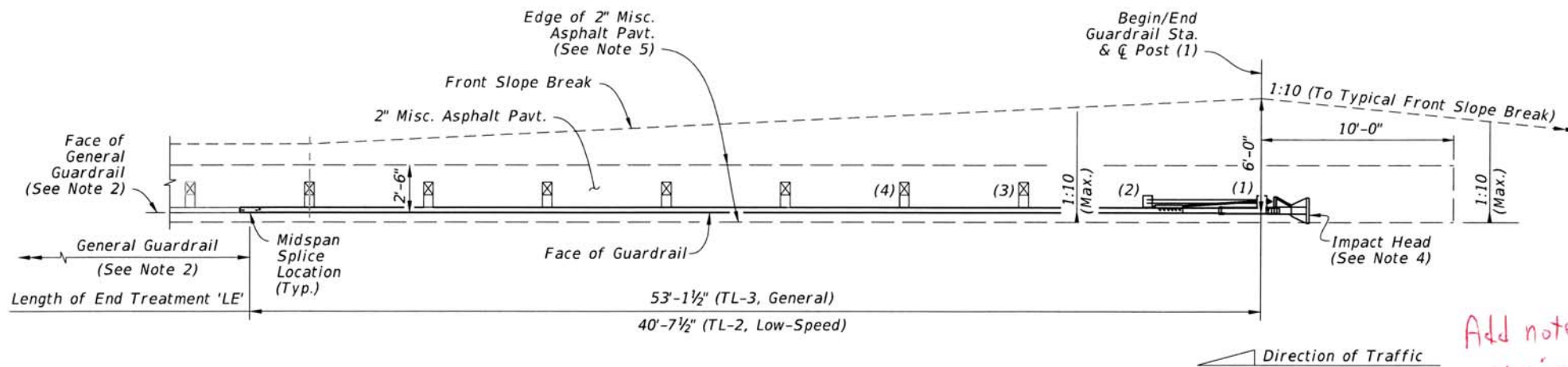
- GUARDRAIL SECTIONS: Construct Sections as indicated in the plans. The details shown herein depict W-Beam Guardrail, but are applicable to the other defined Guardrail Types placed at the corresponding height, 'H'. Use components per Sheets 4 & 5. Steel and timber post types are interchangeable unless otherwise defined.
- TYPICAL GRADING & PAVEMENT PLACEMENT DETAIL: Construct features as depicted except where superseded by specific Guardrail Sections or the plans. Place the Slope Break a Minimum of 2' behind the post. For Deep Posts, the slope break may be placed at the  $\phi$  Post with the 2" Miscellaneous Asphalt Pavement omitted.
- SLOPE BREAK CONDITION: Install Deep Posts only where called for in the plans. Deep Posts are only permitted where post spacing is 6'-3" or less.
- LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset call outs for Face of Guardrail, as shown in the plans.
- ADJACENT TO CURB: Place the Face of Guardrail consistently offset either flush with the Face of Curb or 5" behind the Face of Curb, as indicated by the plans station and offset callout. For offset changes, transition the Face of Guardrail as shown in the plans.

*Explain 1:10 is for guardrail function only, cross-slope defined per the plans*

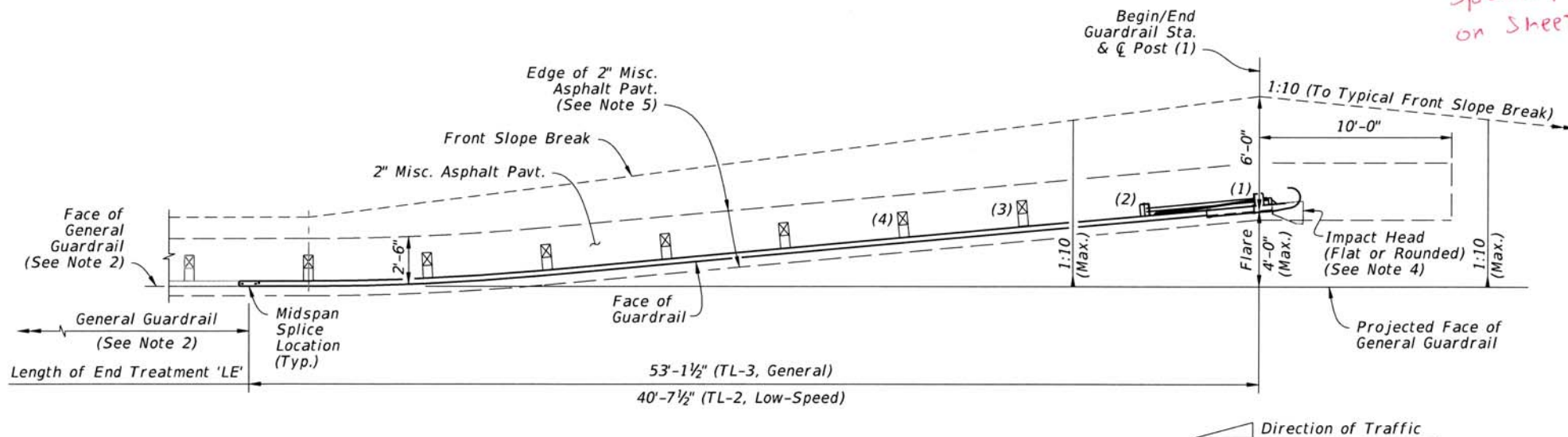
GUARDRAIL SECTIONS

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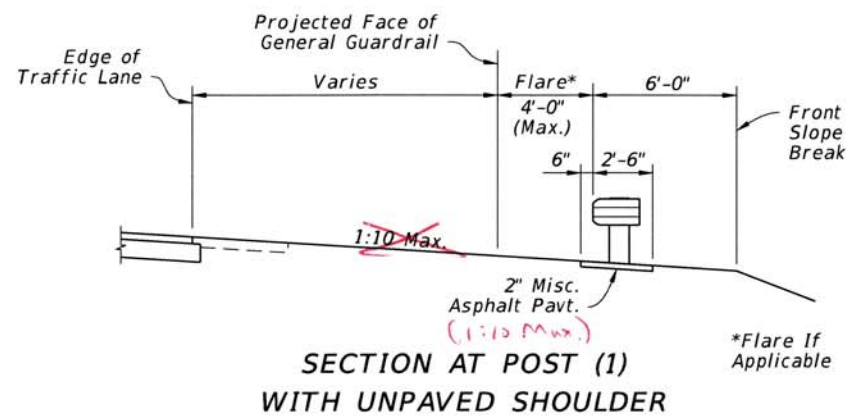




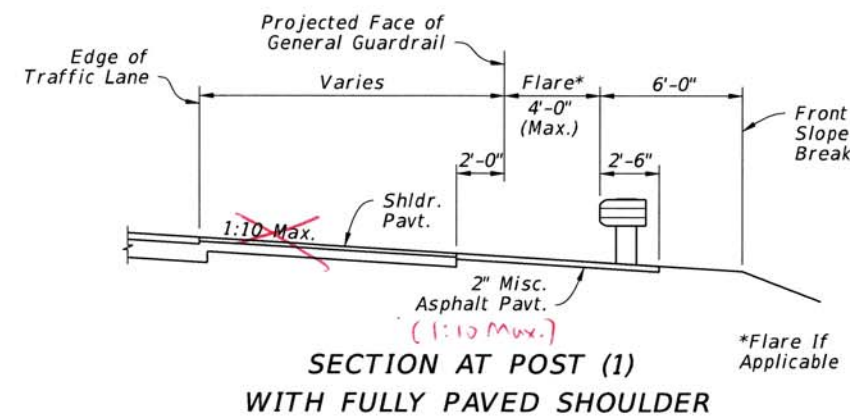
APPROACH TERMINAL ASSEMBLY  
'PARALLEL' SEGMENT - PLAN VIEW



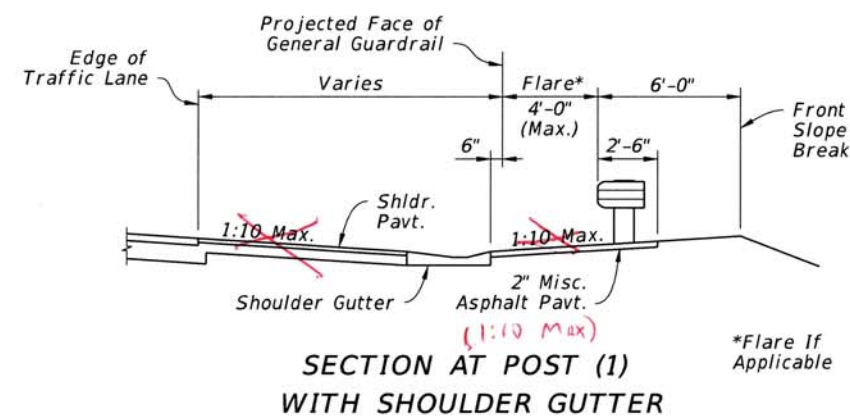
APPROACH TERMINAL ASSEMBLY  
'FLARED' SEGMENT - PLAN VIEW



SECTION AT POST (1)  
WITH UNPAVED SHOULDER



SECTION AT POST (1)  
WITH FULLY PAVED SHOULDER



SECTION AT POST (1)  
WITH SHOULDER GUTTER

NOTES:

1. **INSTALLATION:** Locate Approach Terminals where called for in the plans, with the Post (1)  $\phi$  placed at the Begin/End Guardrail Station indicated in the plans.

The Plan Views shown herein are schematic only, showing basic geometry for Approach Terminals listed on the APL. The predefined Length of End Treatment, 'LE', includes the proprietary portion of various Approach Terminals and provides for more consistent planning of assembly installations across the differing Approach Terminal types. Forward-anchoring style Approach Terminals may vary from the planned lengths shown by up to 3'-0\".

Construct Approach Terminals in accordance with the manufacturer's unique drawing details, procedures, and specifications. Install adjacent grading, gutters, and/or curbing as shown herein, unless otherwise specified in the plans.

The proprietary Approach Terminals listed in the APL are intended for use as End Treatments for General and Low-Speed Guardrail, as indicated in the plans.

2. **GENERAL GUARDRAIL:** General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments.

Approach Transitions, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

3. **APPROACH TERMINAL TEST LEVEL:** Install either a Test Level 3 (TL-3) or Test Level 2 (TL-2) Approach Terminal as specified in the plans. TL-3 Approach Terminals may substitute for TL-2 Approach Terminals unless the substitution is specifically prohibited in the plans. TL-2 Approach Terminals may not substitute for TL-3 installations.

4. **IMPACT HEAD END DELINEATOR:** Apply Yellow Retroreflective Sheeting to the nose of the End Terminal in accordance with Specification Section 536.

5. **2\" MISCELLANEOUS ASPHALT PAVEMENT:** The Plan Views shown herein depict the Unpaved Shoulder condition. For Fully Paved Shoulder and Shoulder Gutter conditions, extend the 2\" Misc. Asphalt Pavement as shown in the corresponding 'Section at Post (1)' details below.

6. 'CURBED' AND 'DOUBLE FACED' GUARDRAIL SEGMENTS: See Sheet 8.

Add notes for exclusion of special posts on sheet 21.

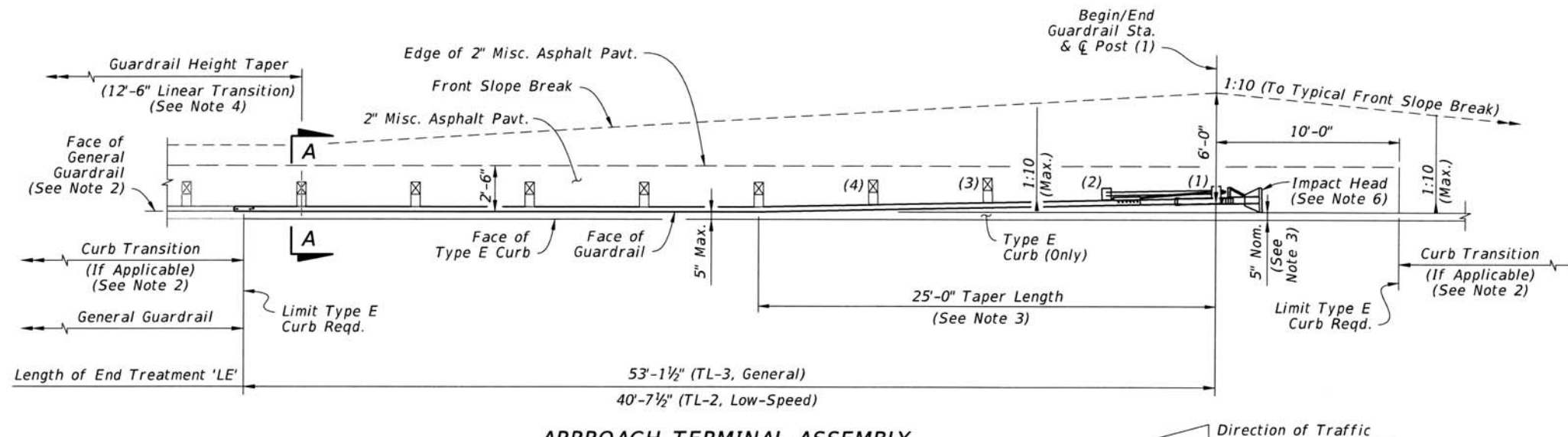
Explain Panel Lap splice orientation per manufacturer's drawings

END TREATMENT -  
APPROACH TERMINAL GEOMETRY  
PARALLEL AND FLARED

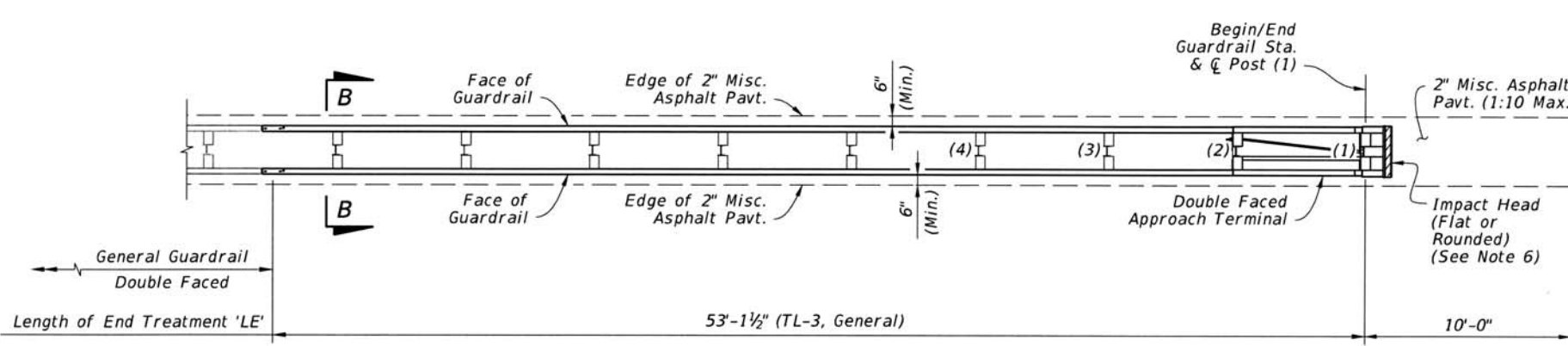
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LAST REVISION 02/01/16	DESCRIPTION:	FDOT FY 2017-18 DESIGN STANDARDS	GUARDRAIL	INDEX NO. 536-001 - 400	SHEET NO. 7 of 22
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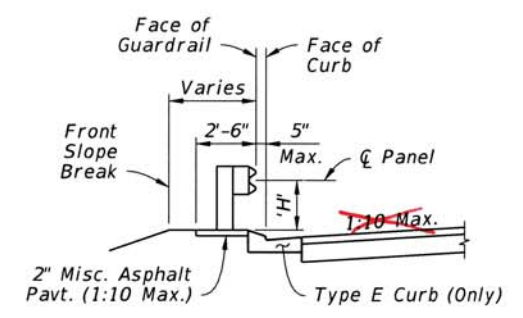




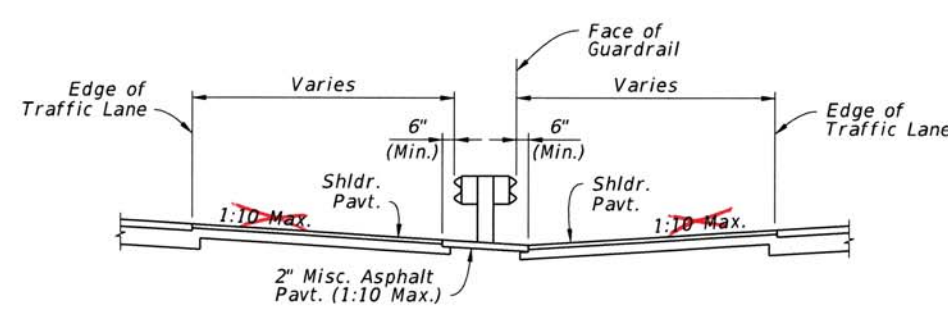
**APPROACH TERMINAL ASSEMBLY  
'CURBED' SEGMENT - PLAN VIEW**



**APPROACH TERMINAL ASSEMBLY  
'DOUBLE FACED' SEGMENT - PLAN VIEW**



**'CURBED' SECTION A-A  
(Height, 'H', Measured from  
Misc. Asphalt Pavt.)**



**'DOUBLE FACED' SECTION B-B  
(1:10 Slope or Flatter Req'd.)**

**NOTES:**

1. GENERAL: See Notes 1 through 3 on Sheet 7.
2. CURBED SEGMENTS: Type E curb is required within the limits shown. When a different curb type is called for outside of the Type E curb limits, transition the curb shape linearly, over a nominal distance ranging 5'-0" to 10'-0"
3. TAPER LENGTH: For Curbed Segments, taper the guardrail away from the roadway where shown to place the inside edge of the Impact Head at 5" behind the face of the curb. Where additional lateral offset is required to fit the Approach Terminal Assembly hardware, such as a soil plate, place the Impact Head as close to the curb as the hardware allows, not to exceed 2'-0" from the face of curb.
4. GUARDRAIL HEIGHT TAPER: For Curbed Segments, the connecting General Guardrail Mounting Height, 'H', is typically measured from the Lip of Gutter (See Sheet 6 Guardrail Sections, 'Adjacent to Curb'), while the End Terminal Assembly 'H' is measured from the Misc. Asphalt Pavt. (See Section A-A). Linearly taper the difference in Mounting Height over a minimum length of 12'-6", starting where indicated herein.
5. DOUBLE FACED SEGMENT: Connect to Double Faced General Guardrail. Use consistent Posts and Offset Block types as specified in the APL drawings over the entire Length of End Treatment, 'LE'. Posts and Offset Blocks in the adjoining General Guardrail segment may be different from those inside of the 'LE'. A change in post type between timber and steel is permitted, immediately outside of the 'LE' segment.  
  
Maintain the 1:10 maximum grading as shown in Section B-B throughout segment 'LE'. Where required, transition to differing adjacent slopes linearly, over a minimum longitudinal length of 25'-0".
6. IMPACT HEAD END DELINEATOR: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal in accordance with Specification Section 536.
7. SINGLE FACED 'PARALLEL' AND 'FLARED' SEGMENTS: See Sheet 7.

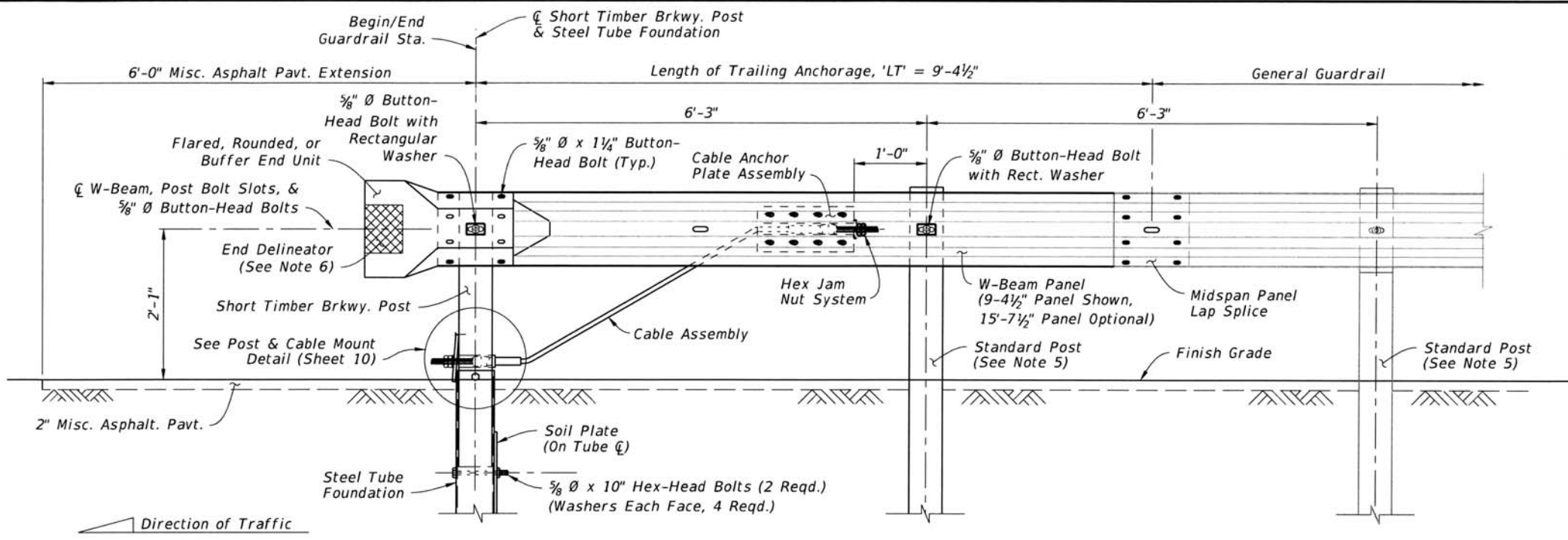
**END TREATMENT -  
APPROACH TERMINAL GEOMETRY  
CURBED AND DOUBLE FACED**

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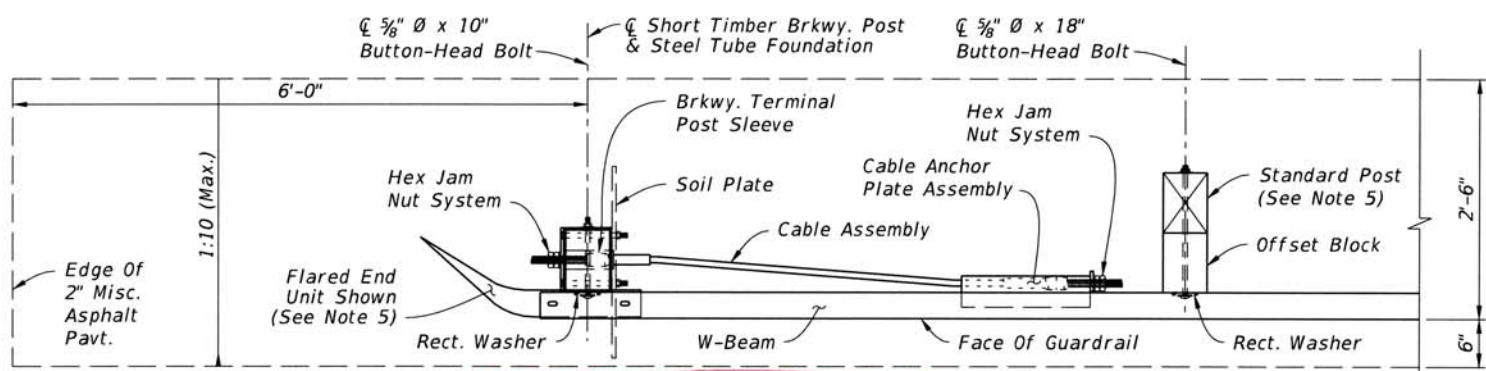
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536-001

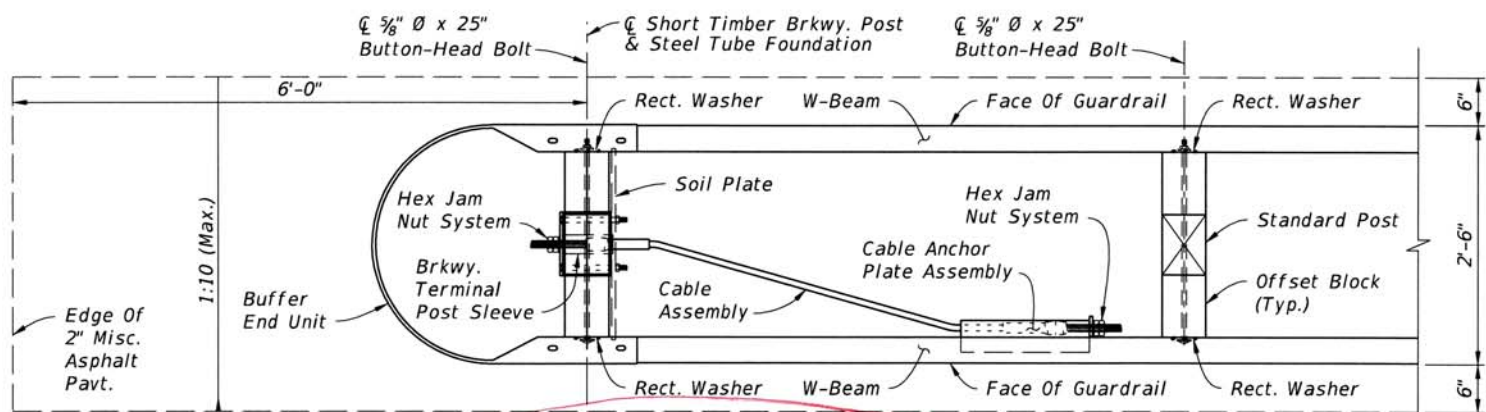




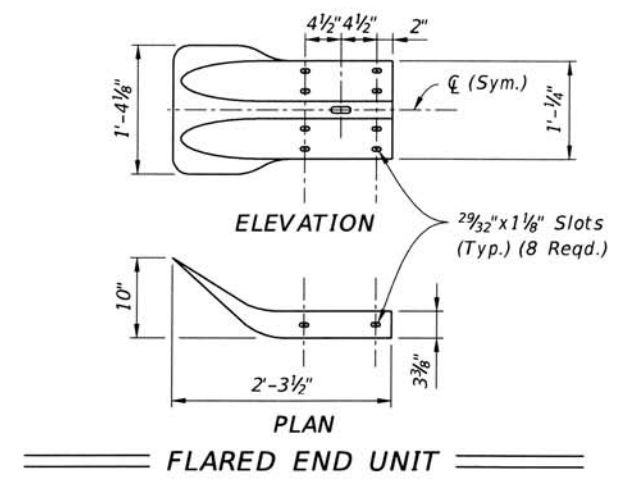
INSTALLED ELEVATION



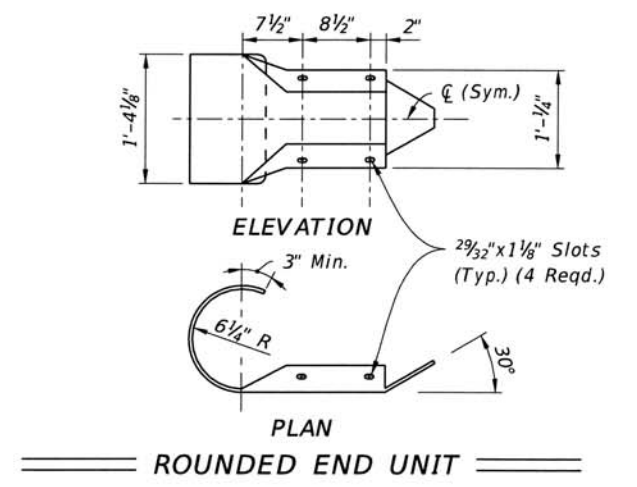
SINGLE FACE - INSTALLED PLAN  
FLARED END UNIT  
(Round End Unit Similar)



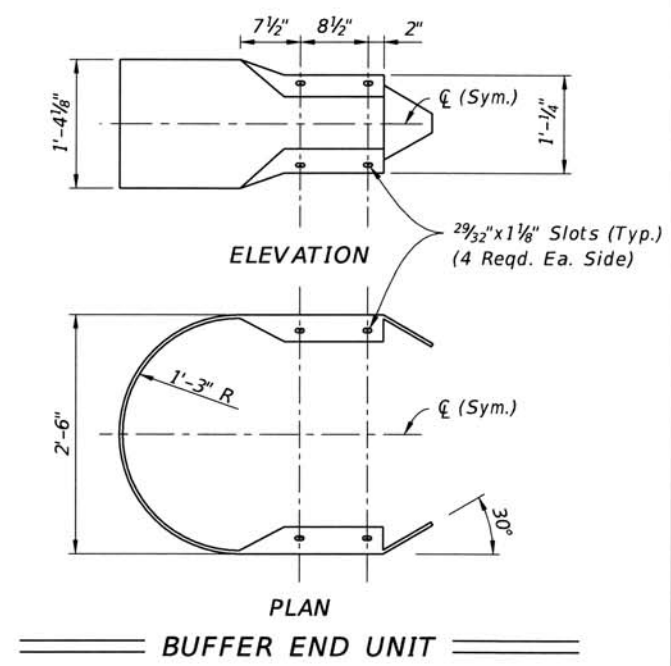
DOUBLE FACE - INSTALLED PLAN  
BUFFER END UNIT



FLARED END UNIT



ROUNDED END UNIT



BUFFER END UNIT

NOTES:

1. COMPONENT DETAILS: For additional Type II component details, See Sheet 10. For Rectangular Washer details, See Sheet 22.
2. END UNITS: Use materials for end units as defined in Specifications Section 967. End Units are referred to as "End or Buffer Sections" in AASHTO M180.  
Lap the Flared End Unit behind the W-Beam; lap the Rounded and Buffered End Units over the face of the W-Beam.
3. FOUNDATIONS: Install Steel Tubes with attached Soil Plates by either of the following methods:
  - a. Excavate, backfill, and compact material to provide full passive soil resistance to all surfaces of the Tube and Soil Plate.
  - b. Drive the Tube and Soil Plate as a single unit using a dummy timber post to prevent damage to the Breakaway Post.
4. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Transitions, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.
5. SIDEWALK REQUIREMENTS: When sidewalks are located adjacent to the End Treatment, install a Rounded End Unit (Flared End Unit not permitted).  
When sidewalks or shared use paths are within 4'-0" from the backs of posts, use the Timber Post option shown (including the first post in the General Guardrail segment). Install the Pipe Rail for adjacent Steel Posts if used, as shown on Sheet 20.
6. END DELINEATOR: Mount retroreflective sheeting to the approach face of the End Unit in accordance with Specification Sections 536 and 967.

END TREATMENT - TRAILING ANCHORAGE TYPE II

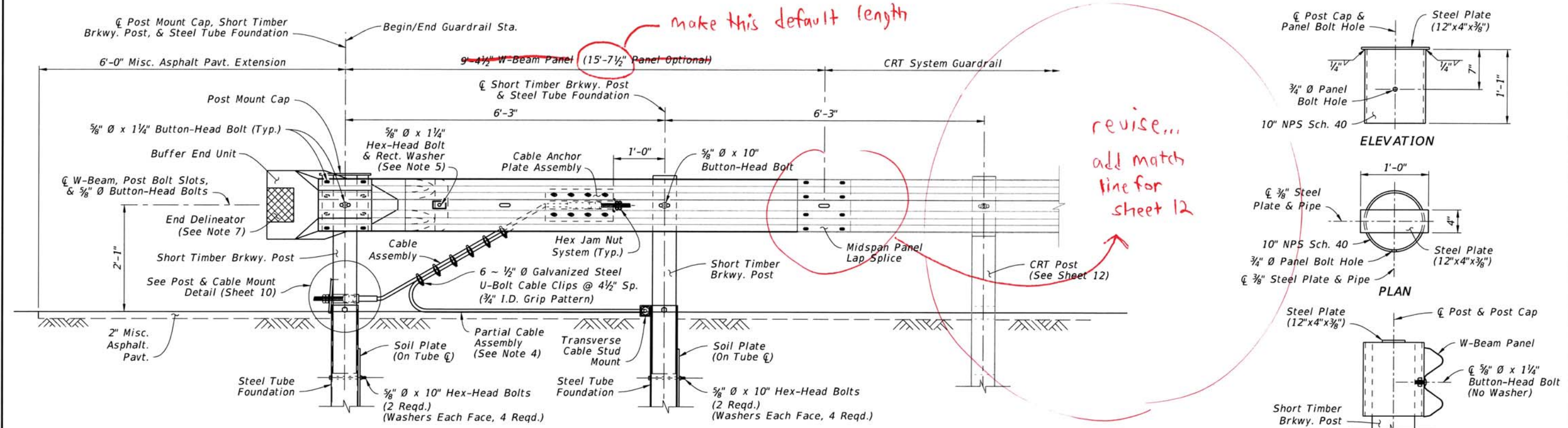
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LAST REVISION 02/01/16	DESCRIPTION:	FDOT FY 2017-18 DESIGN STANDARDS	GUARDRAIL	INDEX NO. 536-001-400	SHEET NO. 9 of 22
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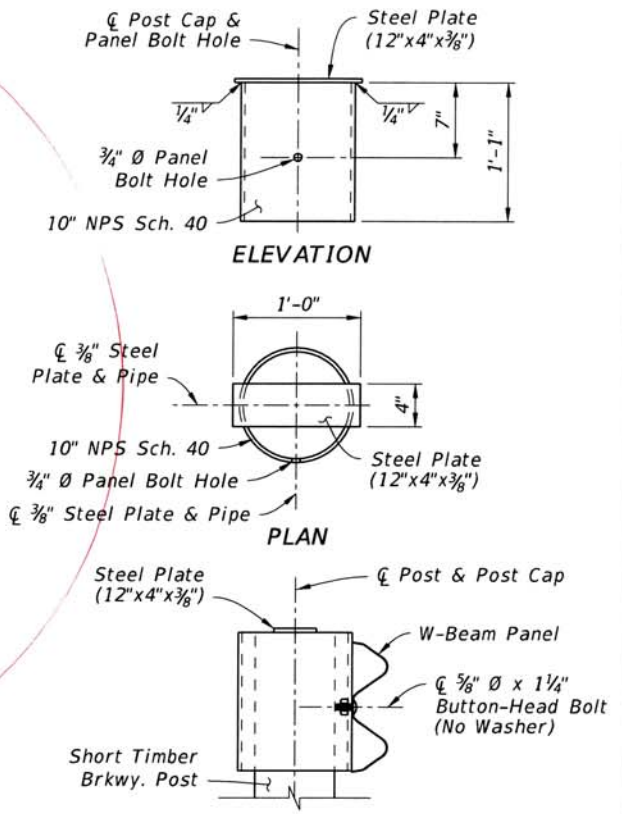


make this default length

revise...  
add match  
line for  
sheet 12

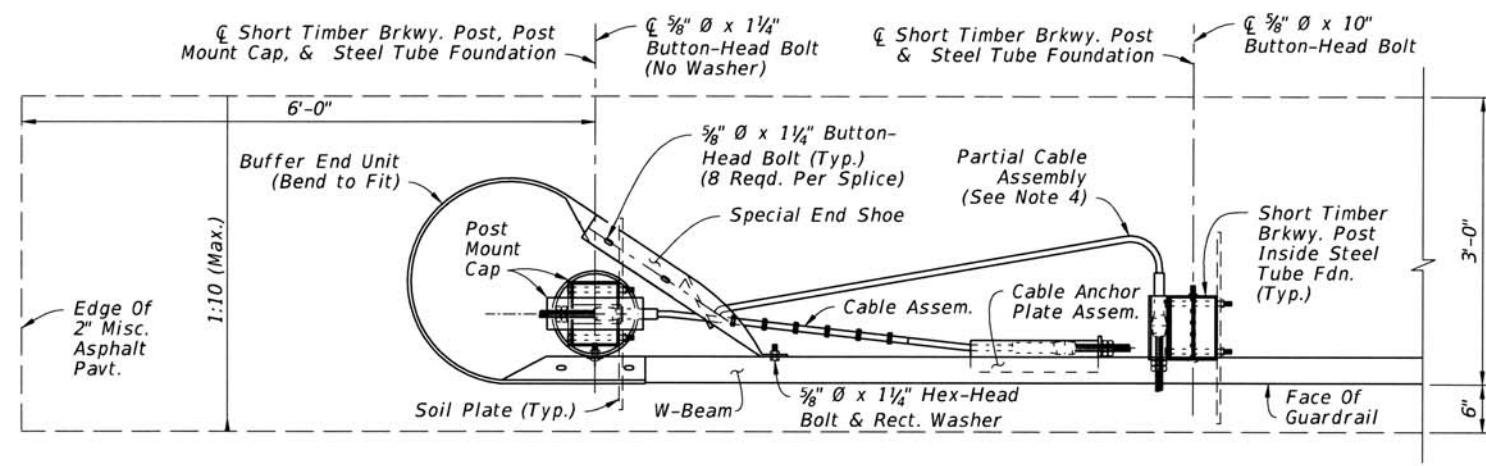


INSTALLED ELEVATION



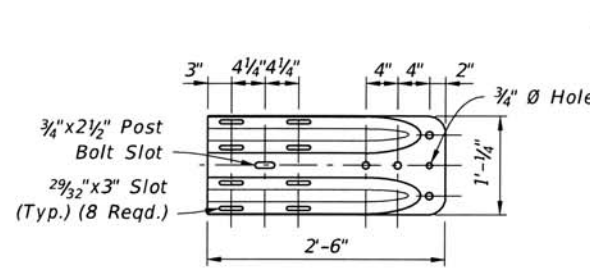
INSTALLED SECTION

POST MOUNT CAP

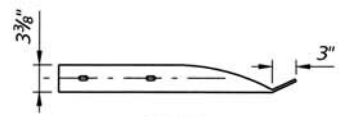


INSTALLED PLAN

CRT END TREATMENT ASSEMBLY

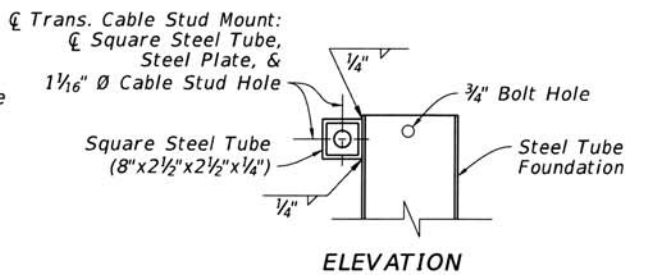


ELEVATION

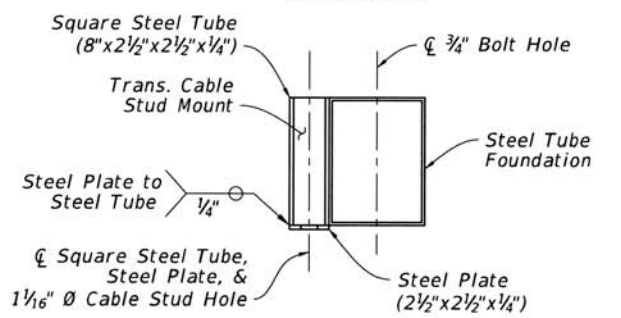


PLAN

SPECIAL END SHOE



ELEVATION



PLAN

TRANSVERSE CABLE STUD MOUNT

NOTES:

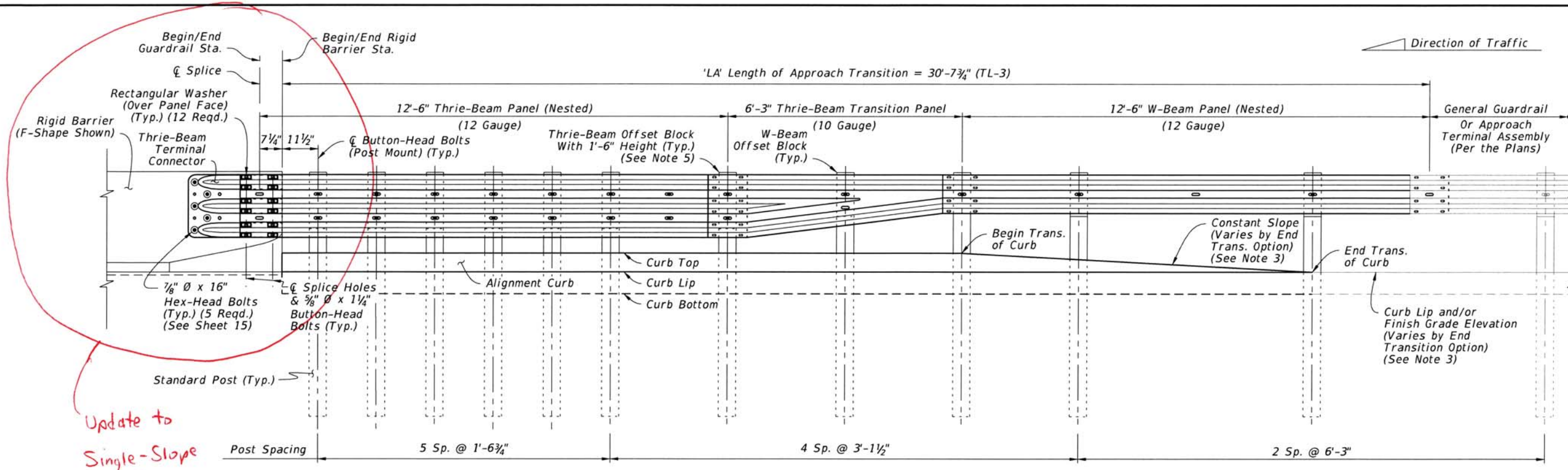
- INSTALLATION: Use with CRT Systems as required on Sheet 12.
- COMPONENT DETAILS: For additional component details, See Sheet 10 & 12. For the Rectangular Washer detail, see Sheet 22.
- MATERIALS: Use steel End Shoes, Plates, Tubes, and pipes in accordance with Specifications Section 967.
- PARTIAL CABLE ASSEMBLY: The Partial Cable Assembly is similar to the Cable Assembly defined on Sheet 10, except with a 9'-0" total length and the Swage Fitting and Cable Stud omitted from one end.  
Feed the Cable Stud through the Cable Stud Hole of the Transverse Cable Stud Mount as shown, and secure it with the Hex Jam Nut System as defined on Sheet 10.
- SPECIAL END SHOE MOUNT: Punch a 3/4" diameter hole in the W-Beam Panel as needed to secure the Special End Shoe with the 5/8" diameter Hex-Head Bolt. Galvanize hole per Specification Section 562.
- FOUNDATIONS: Install Steel Tubes with attached Soil Plates by either of the following methods:
  - Excavate, backfill, and compact material to provide full passive soil resistance to all surfaces of the tube and soil plate.
  - Drive the steel tube and soil plate as a single unit using a dummy timber post to prevent damage to the breakaway post.
- END DELINEATOR: Mount retroreflective sheeting to the approach face of the Buffer End Unit in accordance with Specification Sections 536 and 967.

END TREATMENT - CONTROLLED RELEASE TERMINAL (CRT) SYSTEM

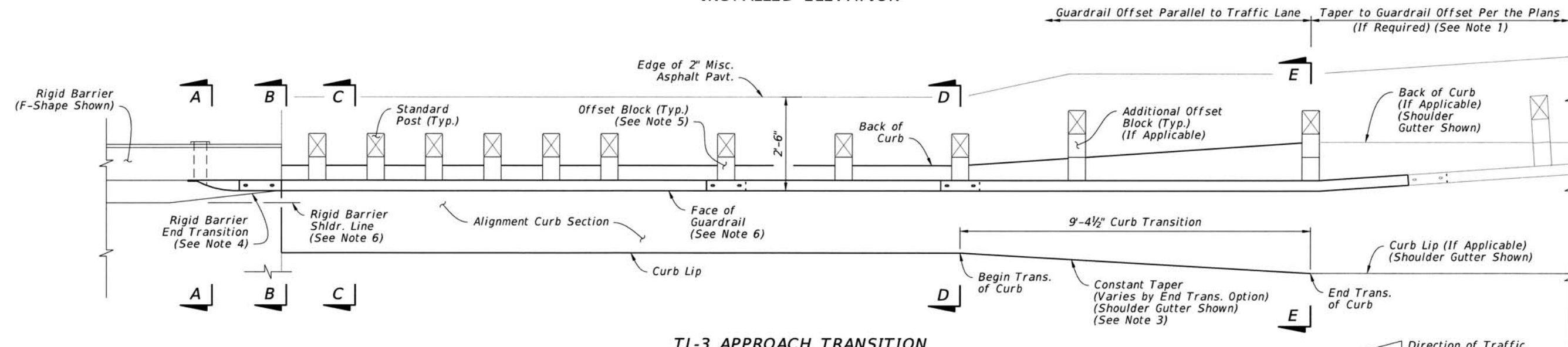
10/26/2016 6:34:52 AM

LAST REVISION 02/01/16	DESCRIPTION:	FDOT FY 2017-18 DESIGN STANDARDS	GUARDRAIL	INDEX NO. 536-001-400	SHEET NO. 11 of 22
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TL-3 APPROACH TRANSITION  
INSTALLED ELEVATION



TL-3 APPROACH TRANSITION  
INSTALLED PLAN

NOTES:

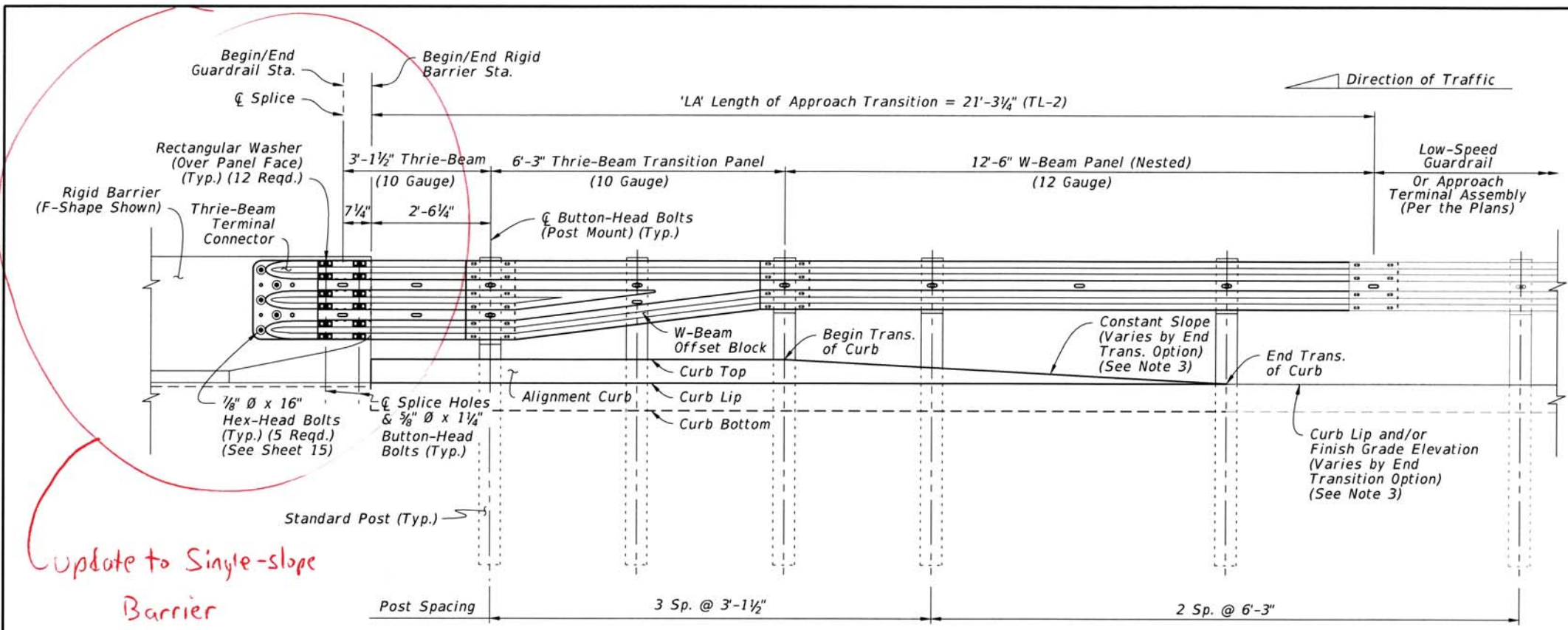
- INSTALLATION:** Construct the Approach Transition segment where indicated in the plans. The required offset of the connecting adjacent guardrail is shown in the plans.  
The Layouts given on Sheet 17 provide basic schemes for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.  
For existing bridge connection options, see Index Nos. 402, 404, and 405.
- SECTION VIEWS & DETAILS:** For cross sections and details including the barrier mounting hardware, curb transition, adjacent grading, and installation dimensions, see Sheet 15.
- END TRANSITION OF CURB OPTION:** The Plan and Elevation views depict an example Curb Transition to Shoulder Gutter from Section D-D to E-E, but this transition may require a different shape depending on the End Transition option indicated in the plans (Either a 'Shoulder Gutter Option', 'Raised Curb Option', or 'Flat No Curb Option'). See Sheet 15 for curb shape details.
- RIGID BARRIER END TRANSITION:** Taper the Rigid Barrier to a Single Slope end section. See Concrete Barrier Wall, Index 410, and Traffic Railing, Indexes 420 thru 425, for details.
- OFFSET BLOCKS:** For Thrie-Beam post locations within the Length of Approach Transition segment, use the Timber Offset Blocks with 1'-6" height shown on Sheet 5.  
For the midspan of the Thrie-Beam Transition Panel and for all other W-Beam locations shown herein, use the W-Beam Offset Blocks with 1'-2" height.
- OFFSET:** The required offset difference between the Face of Guardrail and Rigid Barrier Shoulder Line is considered negligible and may not be shown in the guardrail offset callouts in the plans. A consistent guardrail offset deviation of up to 4 inches outside of the Rigid Barrier Shoulder Line is permitted over the length 'LA'.
- GENERAL GUARDRAIL:** General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Approach Terminals, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

APPROACH TRANSITION CONNECTION  
TO RIGID BARRIER - GENERAL, TL-3

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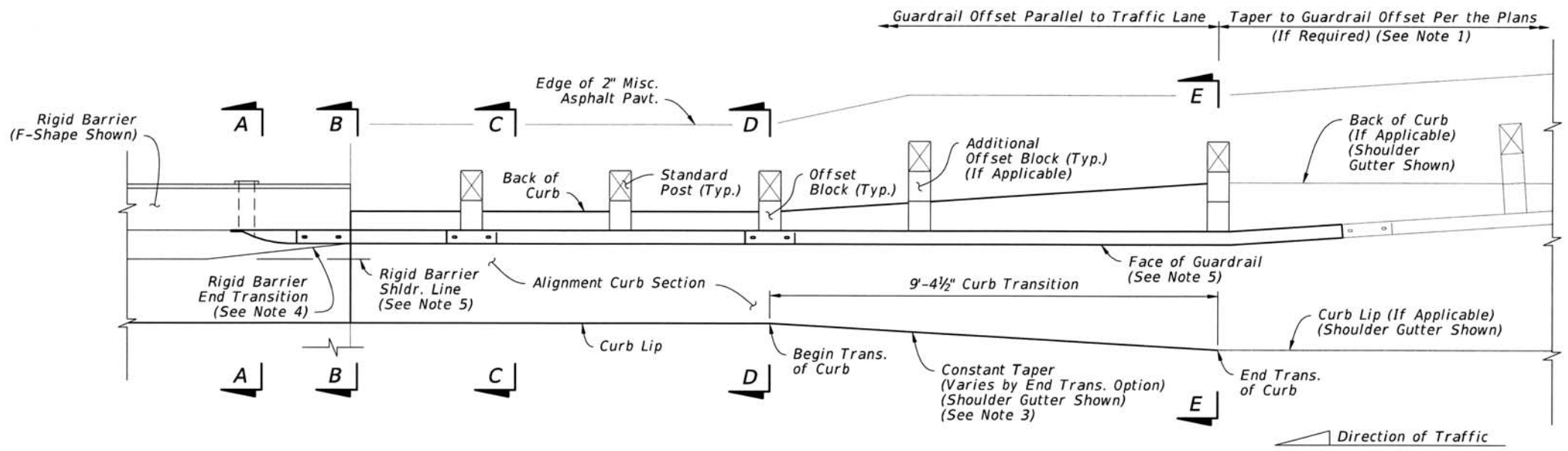
LAST REVISION 11/01/16	DESCRIPTION:		FY 2017-18 DESIGN STANDARDS	GUARDRAIL	INDEX NO.	SHEET NO.
					S36-001-400	13 of 22





Update to Single-slope Barrier

TL-2 APPROACH TRANSITION INSTALLED ELEVATION




TL-2 APPROACH TRANSITION INSTALLED PLAN

NOTES:

- INSTALLATION:** Construct the Approach Transition segment where indicated in the plans. The required offset of the connecting adjacent guardrail is shown in the plans.  
  
The Layouts given on Sheet 17 provide basic schemes for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.  
  
For existing bridge connection options, see Index Nos. 402, 404, and 405.
- SECTION VIEWS & DETAILS:** For cross sections and details including the barrier mounting hardware, curb transition, adjacent grading, and installation dimensions, see Sheet 15.
- END TRANSITION OF CURB OPTION:** The Plan and Elevation views depict an example Curb Transition to Shoulder Gutter from Section D-D to E-E, but this transition may require a different shape depending on the End Transition option indicated in the plans (Either a 'Shoulder Gutter Option', 'Raised Curb Option', or 'Flat No Curb Option'). See Sheet 15 for curb shape details.
- RIGID BARRIER END TRANSITION:** Taper the Rigid Barrier to a Single Slope end section. See Concrete Barrier Wall, Index 410, and Traffic Railing, Indexes 420 thru 425, for details.
- OFFSET:** The required offset difference between the Face of Guardrail and Rigid Barrier Shoulder Line is considered negligible and may not be shown in the guardrail offset callouts in the plans. A consistent guardrail offset deviation of up to 4 inches outside of the Rigid Barrier Shoulder Line is permitted over the length 'LA'.
- LOW-SPEED GUARDRAIL:** Low-Speed Guardrail typically includes Panels and Post Spacing as shown on Sheet 3, including parallel and tapered segments. Approach Terminals, General Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the Low-Speed Guardrail shown herein if indicated in the plans.

APPROACH TRANSITION CONNECTION TO RIGID BARRIER - LOW-SPEED, TL-2

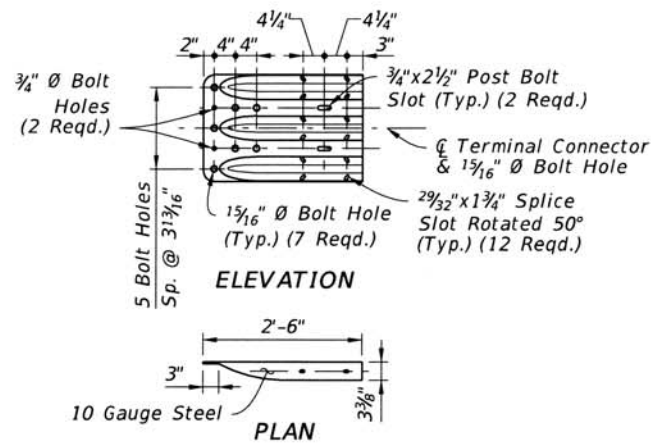
10/26/2016 6:35:02 AM

LAST REVISION 11/01/16	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	<b>GUARDRAIL</b>	INDEX NO. <del>400</del>	SHEET NO. 14 of 22
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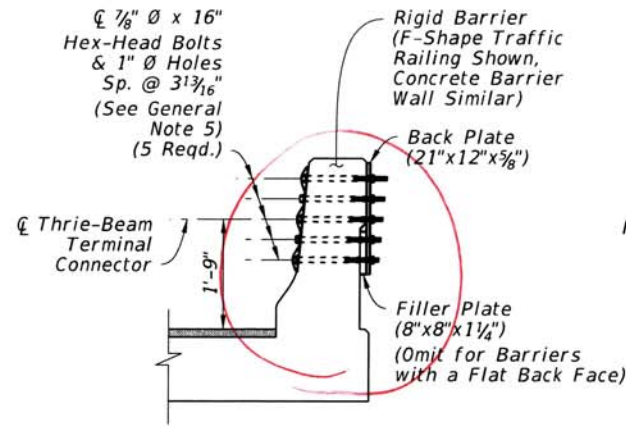
536-001-400



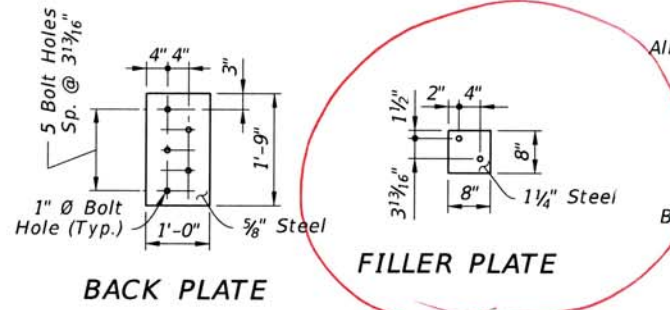
Update for Single-Slope Barrier...



THRIE-BEAM TERMINAL CONNECTOR DETAIL

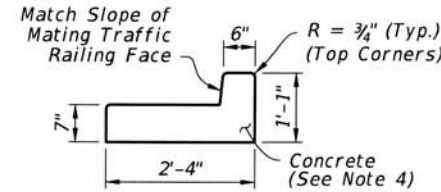


SECTION A-A RIGID BARRIER TERMINAL CONNECTOR MOUNT

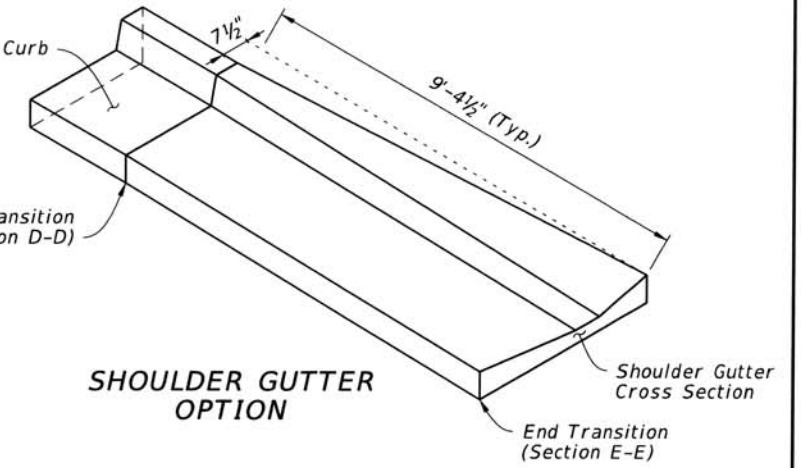


BACK PLATE

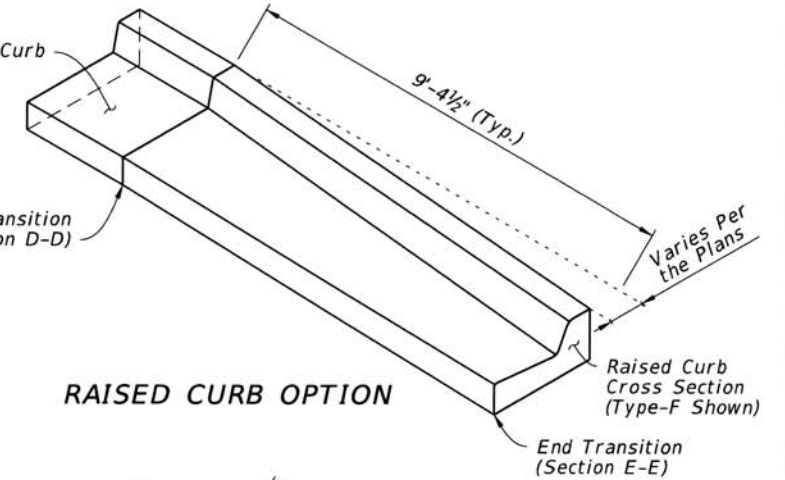
FILLER PLATE



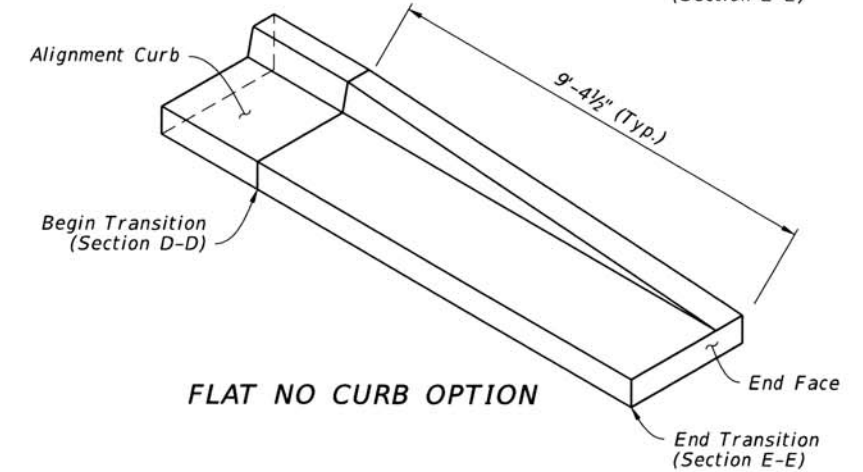
ALIGNMENT CURB SECTION



SHOULDER GUTTER OPTION

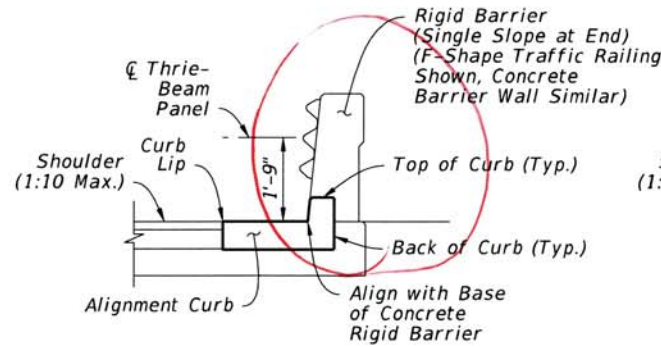


RAISED CURB OPTION

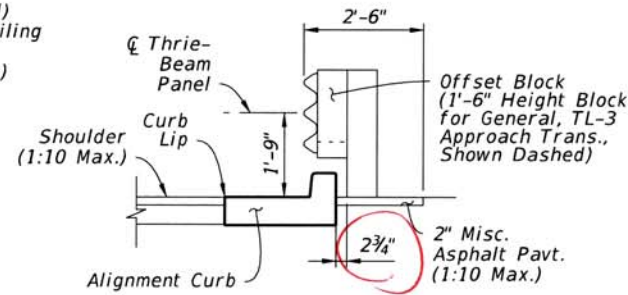


FLAT NO CURB OPTION

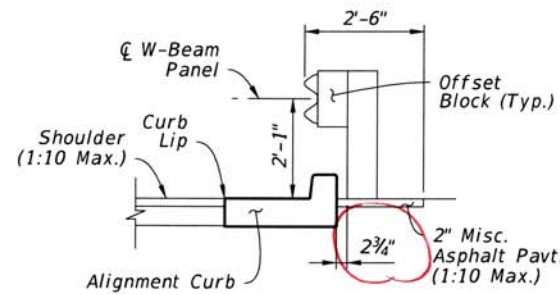
CURB TRANSITION ISOMETRIC VIEWS



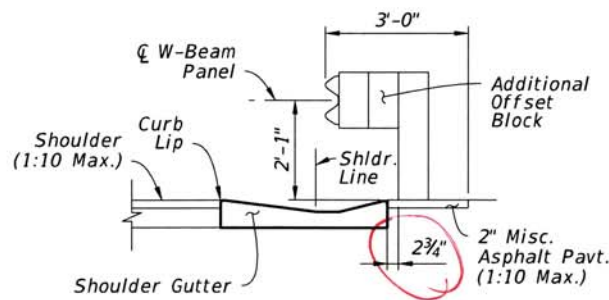
SECTION B-B BEGIN ALIGNMENT CURB (Mate to Rigid Barrier)



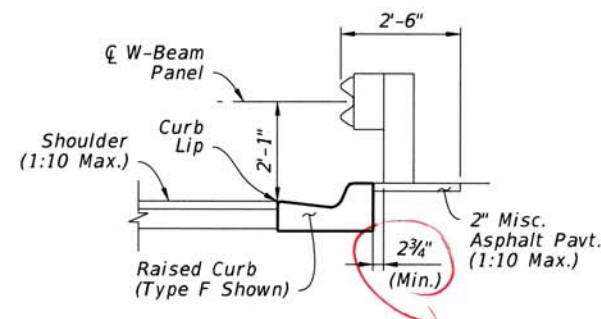
SECTION C-C ALIGNMENT CURB (Intermediate)



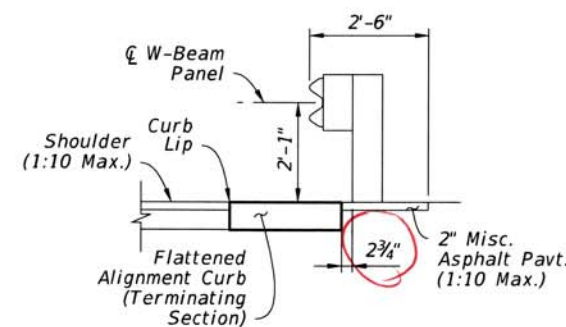
SECTION D-D BEGIN TRANSITION (End Alignment Curb)



SECTION E-E END TRANSITION SHOULDER GUTTER OPTION



SECTION E-E END TRANSITION RAISED CURB OPTION



SECTION E-E END TRANSITION FLAT NO CURB OPTION

CURB TYPICAL SECTIONS

NOTES:

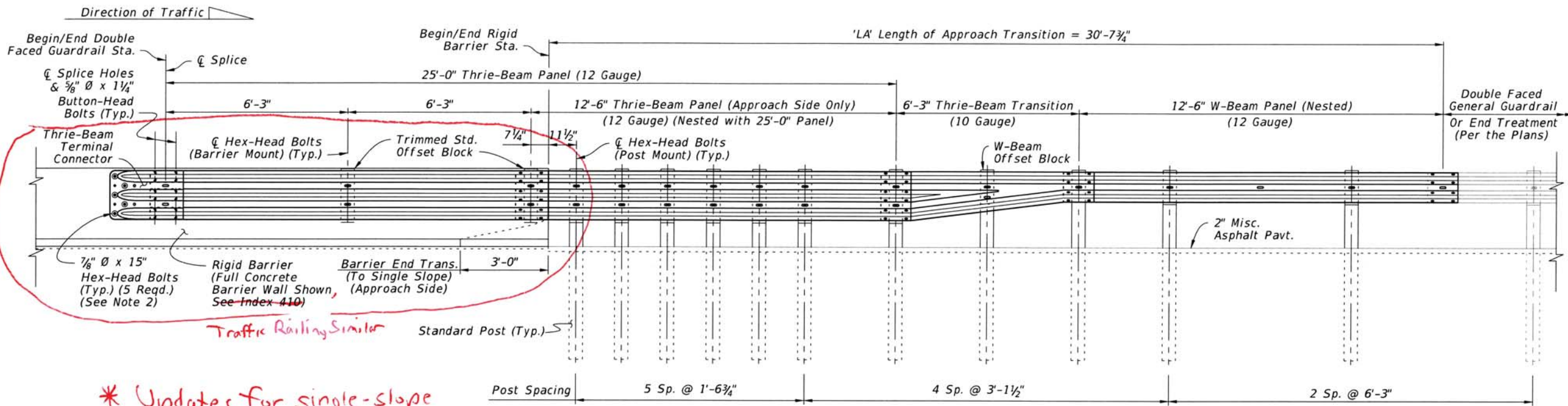
1. PLAN AND ELEVATION VIEWS: Work with Sheets 13 & 14.
2. END TRANSITION OF CURB OPTION: Install one of the three End Transition types shown per Section E-E as indicated by the plans.
3. GRADING BEHIND POSTS: Place Slope Break a Min. 2'-0" behind the post, per Sheet 6.
4. MATERIALS & CONSTRUCTION: Construct the concrete Aligning Curb and Curb transition in accordance with Specification Section 520. Use steel Plates and Thrie-Beam Terminal Connectors in accordance with Specifications Section 967.

APPROACH TRANSITION CONNECTION - DETAILS

10/26/2016 6:35:05 AM

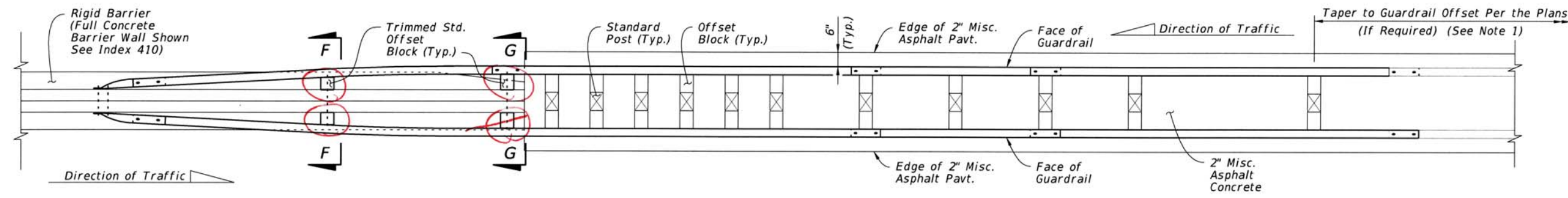
LAST REVISION 11/01/16	DESCRIPTION:	FDOT FY 2017-18 DESIGN STANDARDS	GUARDRAIL	INDEX NO. 535-001-400	SHEET NO. 15 of 22
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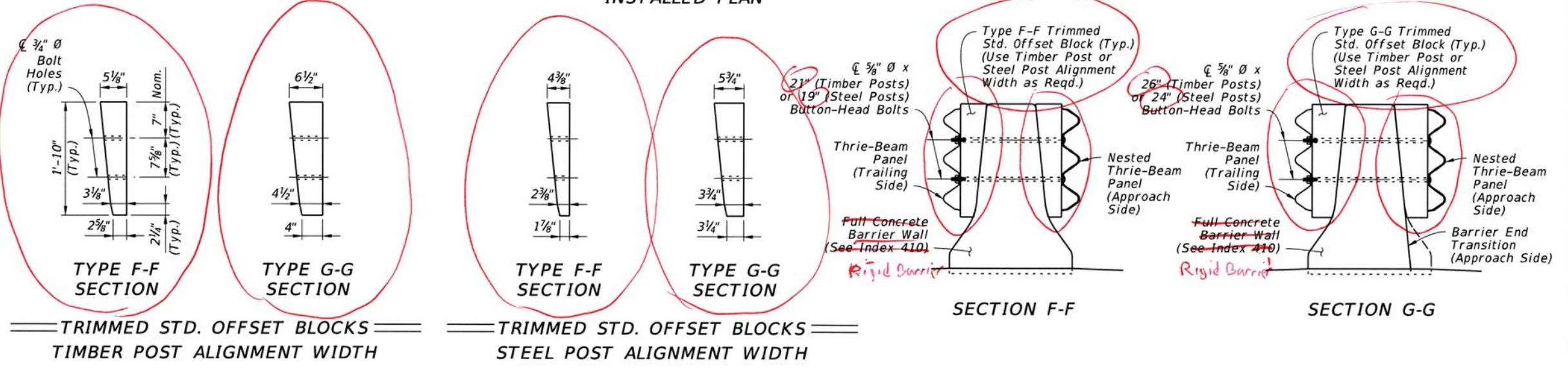
\* Updates for single-slope barriers and traffic railing...

TL-3 DOUBLE FACED APPROACH TRANSITION INSTALLED ELEVATION



TL-3 DOUBLE FACED APPROACH TRANSITION INSTALLED PLAN

- NOTES:**
- INSTALLATION:** Construct the Approach Transition segment where indicated in the plans. The required offset of the connecting adjacent guardrail is shown in the plans.  
The Layouts given on Sheet 18 provide basic schemes for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail has the same offset as the Approach Transition segment, then no taper is required.
  - THRIE-BEAM TERMINAL CONNECTOR:** See Sheet 15 for Details. The installed bolt's threaded portion is not permitted to extend beyond 3/4" from the face of the nut; trim the threaded portion as needed and galvanize in accordance with Specification Section 562.
  - GENERAL GUARDRAIL:** General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. End Treatments or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

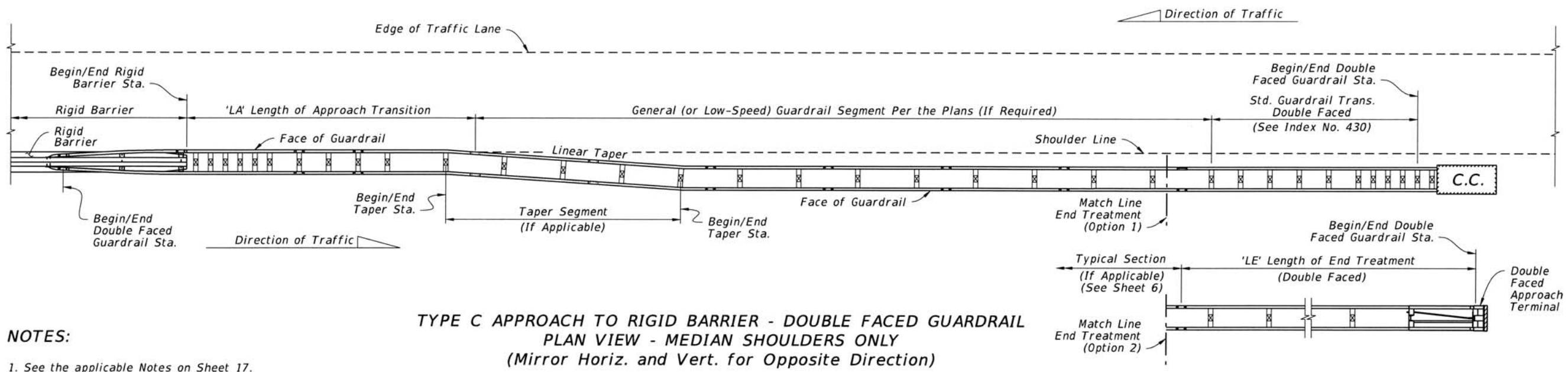


APPROACH TRANSITION CONNECTION TO RIGID BARRIER WITH DOUBLE FACED GUARDRAIL

10/26/2016 6:35:08 AM

LAST REVISION 11/01/16	DESCRIPTION:	FDOT FY 2017-18 DESIGN STANDARDS	GUARDRAIL	INDEX NO. 536-001 <del>400</del>	SHEET NO. 16 of 22
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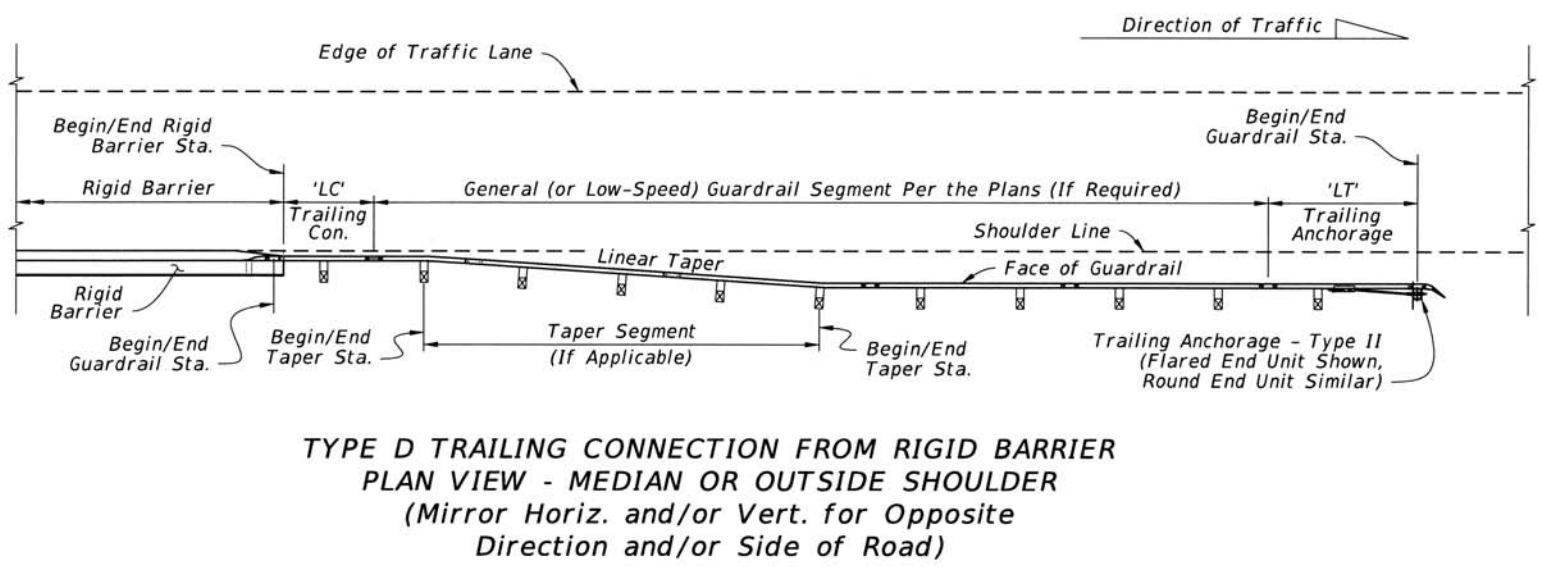


**NOTES:**

1. See the applicable Notes on Sheet 17.

**TYPE C APPROACH TO RIGID BARRIER - DOUBLE FACED GUARDRAIL  
PLAN VIEW - MEDIAN SHOULDERS ONLY  
(Mirror Horiz. and Vert. for Opposite Direction)**

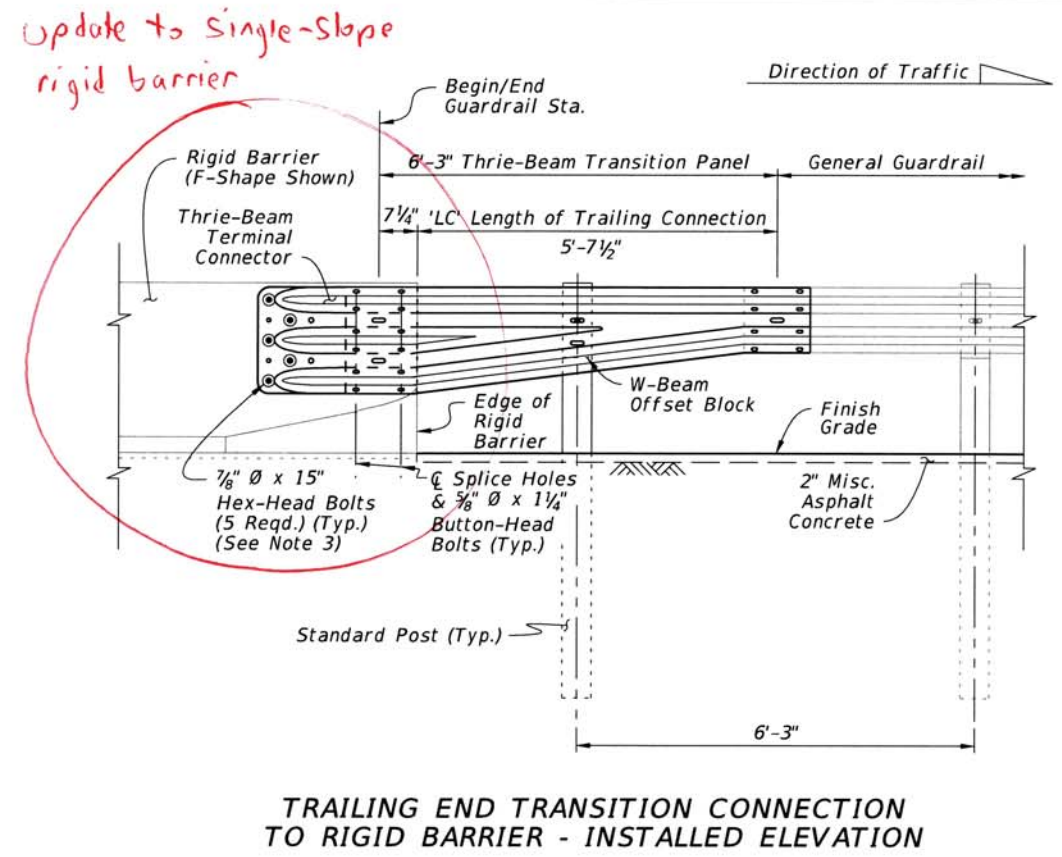
**LAYOUT TO RIGID BARRIER -  
APPROACH ENDS WITH  
DOUBLE FACED GUARDRAIL**



**TYPE D TRAILING CONNECTION FROM RIGID BARRIER  
PLAN VIEW - MEDIAN OR OUTSIDE SHOULDER  
(Mirror Horiz. and/or Vert. for Opposite  
Direction and/or Side of Road)**

**NOTES:**

1. See the applicable Notes on Sheet 17.
2. LENGTH OF TRAILING ANCHORAGE, 'LT': Install the Trailing Anchorage - Type II as shown on Sheet 9, where called for in the plans.
3. THRIE-BEAM TERMINAL CONNECTOR: Install connector and bolts as shown on Sheet 15.
4. RIGID BARRIER SINGLE SLOPE END FACE: See Concrete Barrier Wall, Index 410, and Traffic Railing, Indexes 420 thru 425, for details.



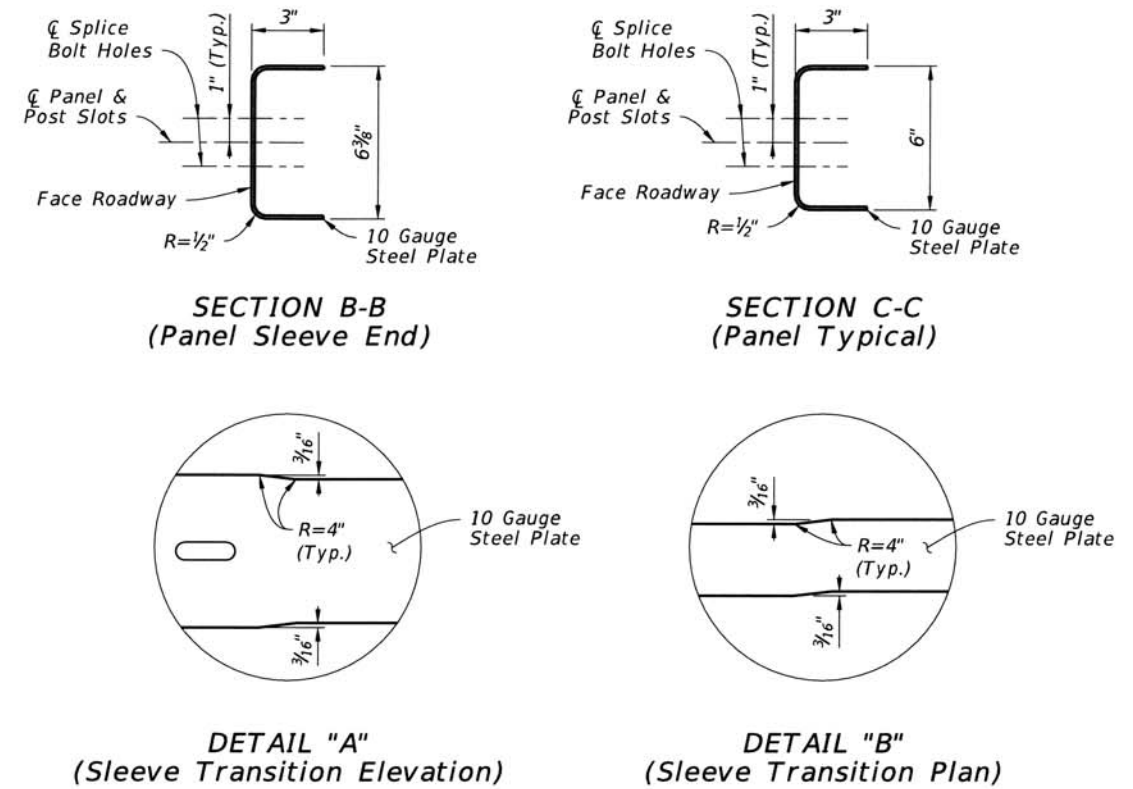
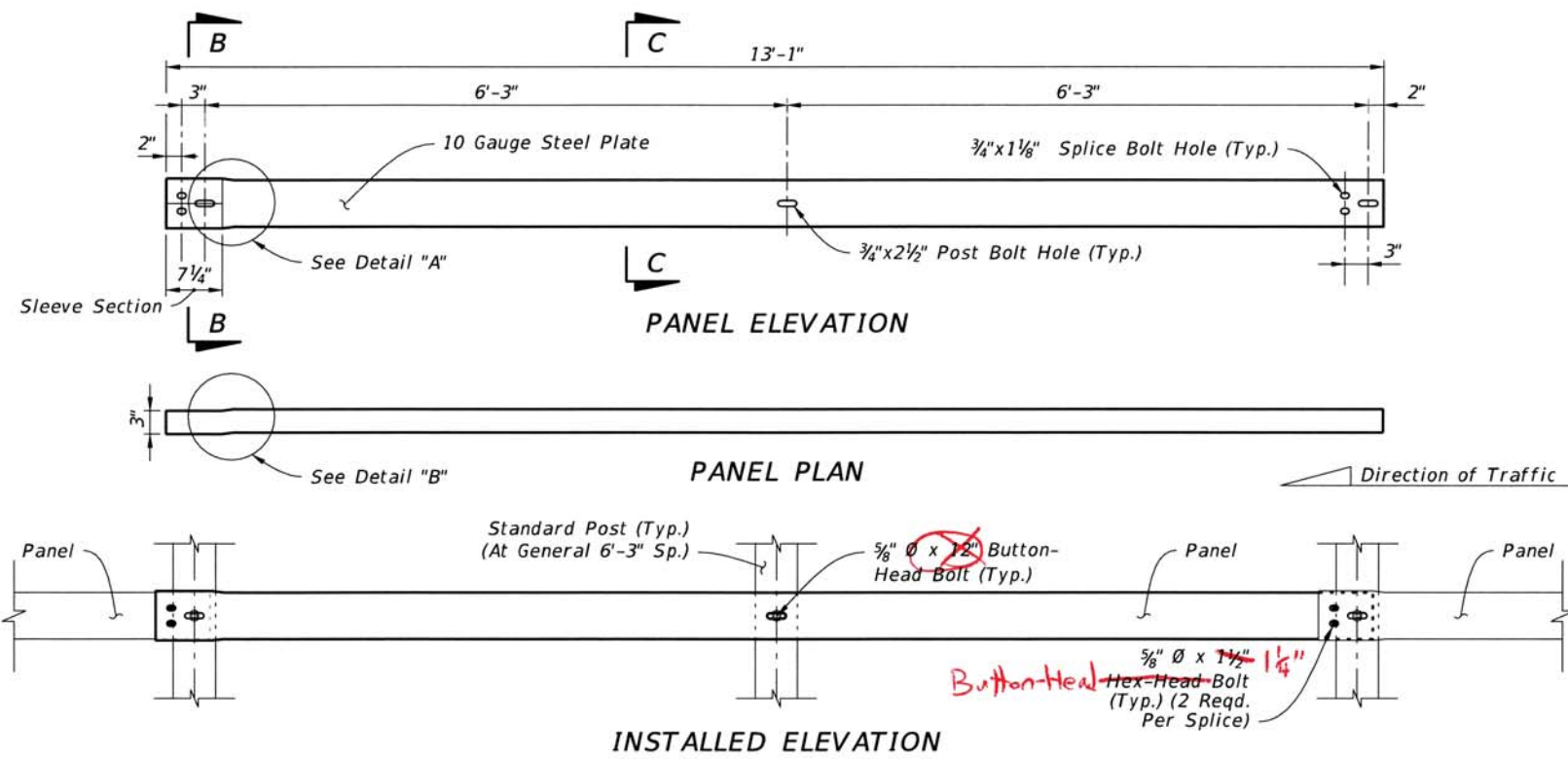
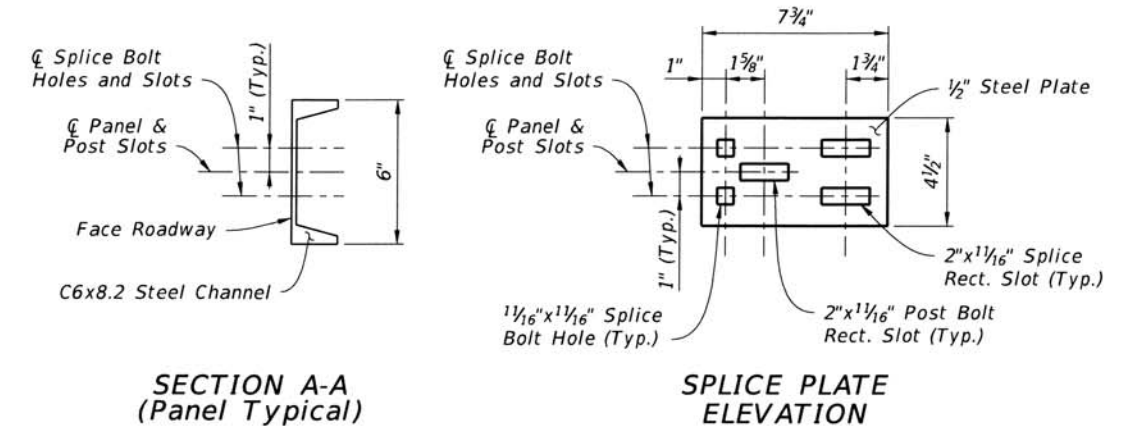
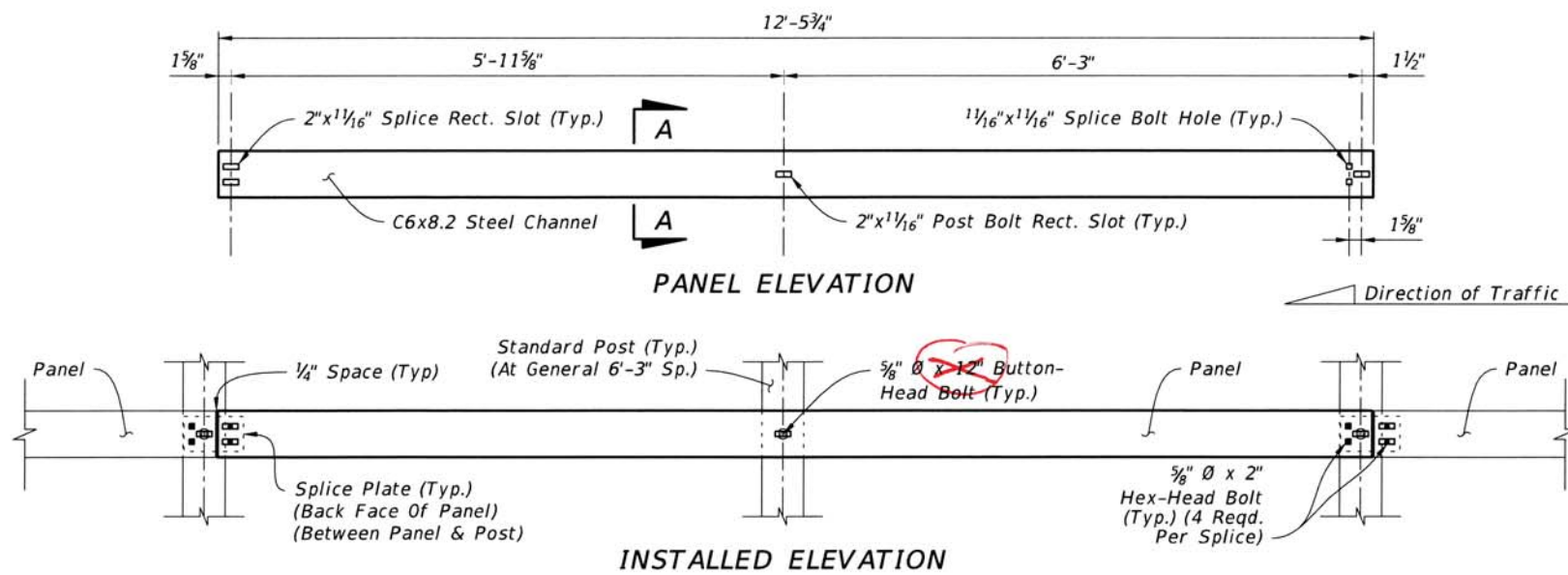
**TRAILING END TRANSITION CONNECTION  
TO RIGID BARRIER - INSTALLED ELEVATION**

**LAYOUT TO RIGID BARRIER -  
TRAILING ENDS**

10/26/2016 6:35:13 AM

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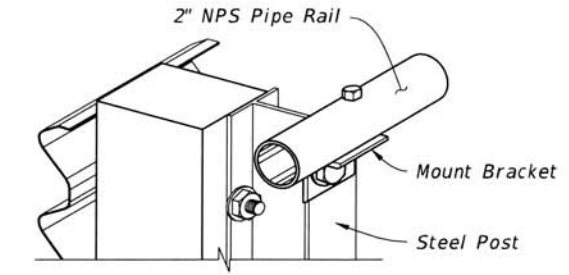
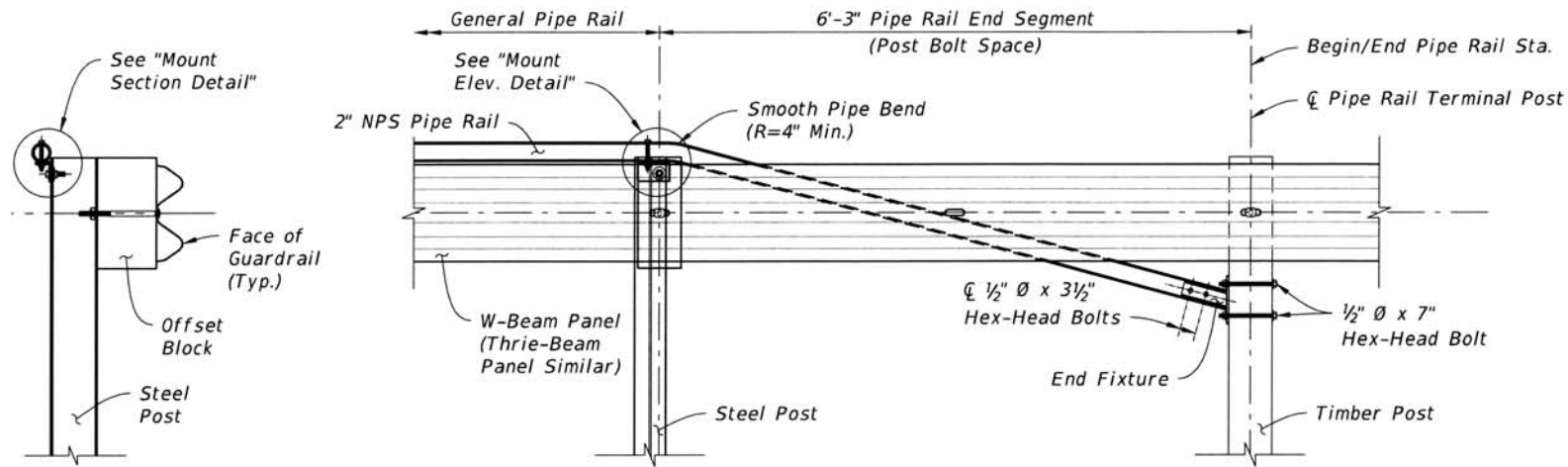
- NOTES:**
1. **INSTALLATION:** Install where indicated in the plans. Tighten the backs of Rub Rail panels snug against Standard Posts. Follow the Double Faced Guardrail Typical Section requirements of Sheet 6 unless otherwise specified by the plans. Either of the Channel Section or Bent-Plate Panel Rub Rail options may be used unless otherwise indicated in the Plans.
  2. **MOUNTING HEIGHT:** Mount to the Standard Post's Rub Rail Bolt Hole as defined on Sheet 5.
  3. **MATERIALS:** Use steel components in accordance with Specification Section 967.
  4. **END RUB RAIL:** For Single Faced Guardrail, terminate the run of Rub Rail by bending the panel behind the post and securing in place. For Double Faced Guardrail, terminate the run of guardrail on the front face of the post and secure it with the typical Button-Head bolt.

*Explain Double-Sided Rub Rail Usage ->*

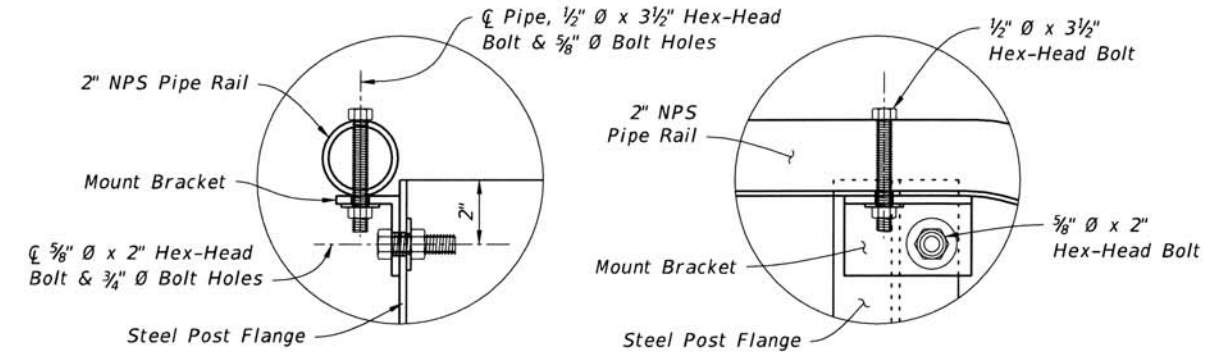
10/26/2016 6:35:15 AM

LAST REVISION 02/01/16	DESCRIPTION:	FDOT FY 2017-18 DESIGN STANDARDS	GUARDRAIL	INDEX NO. 536-001 - 400	SHEET NO. 19 of 22
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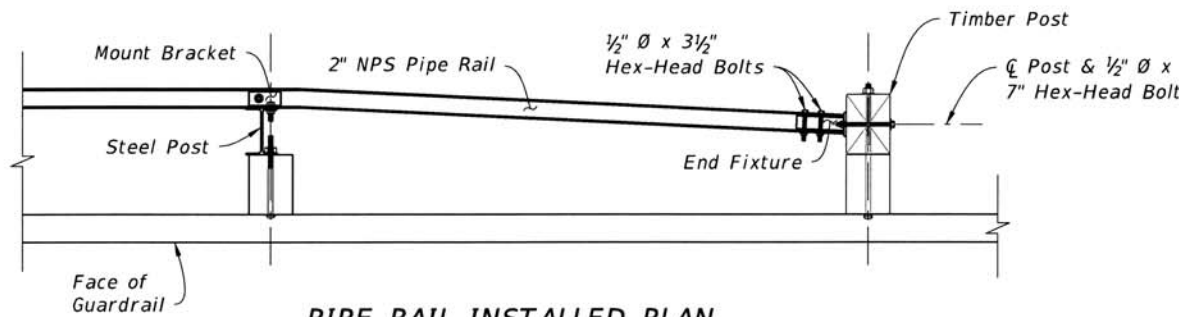


**MOUNT ISOMETRIC CUT-AWAY**



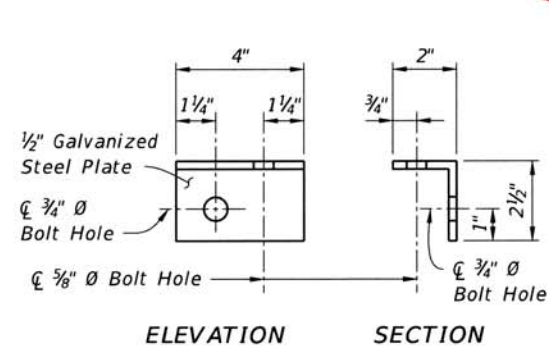
**MOUNT SECTION DETAIL**

**MOUNT ELEVATION DETAIL (Back View - Mirrored)**

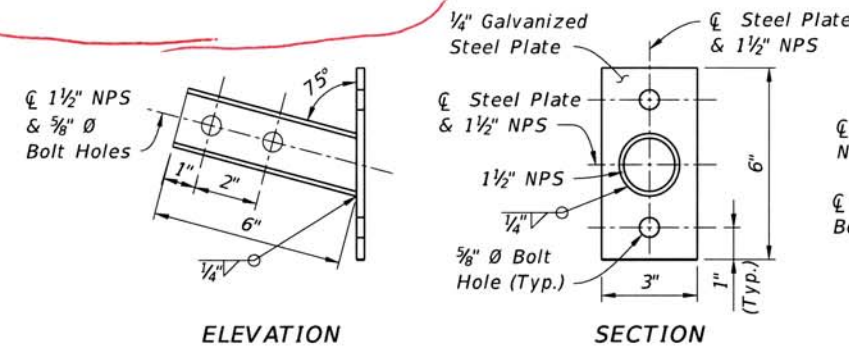


**PIPE RAIL INSTALLED PLAN (End Segment Shown)**

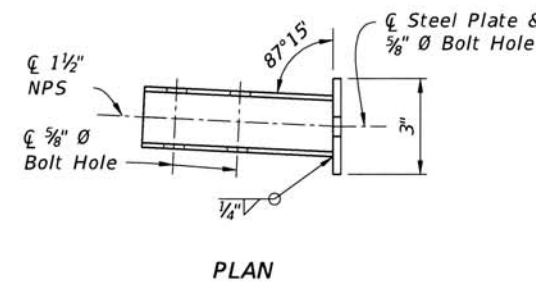
\* Add Steel Terminal Post Option...



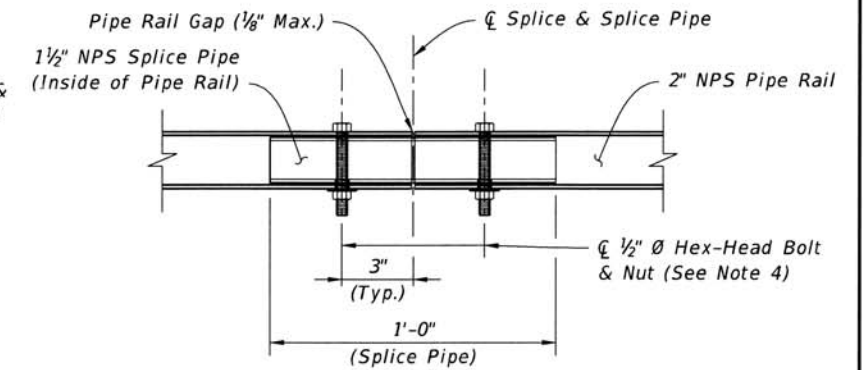
**MOUNT BRACKET DETAIL**



**END FIXTURE DETAIL**



**PLAN**



**RAIL SPLICE DETAIL**

**NOTES:**

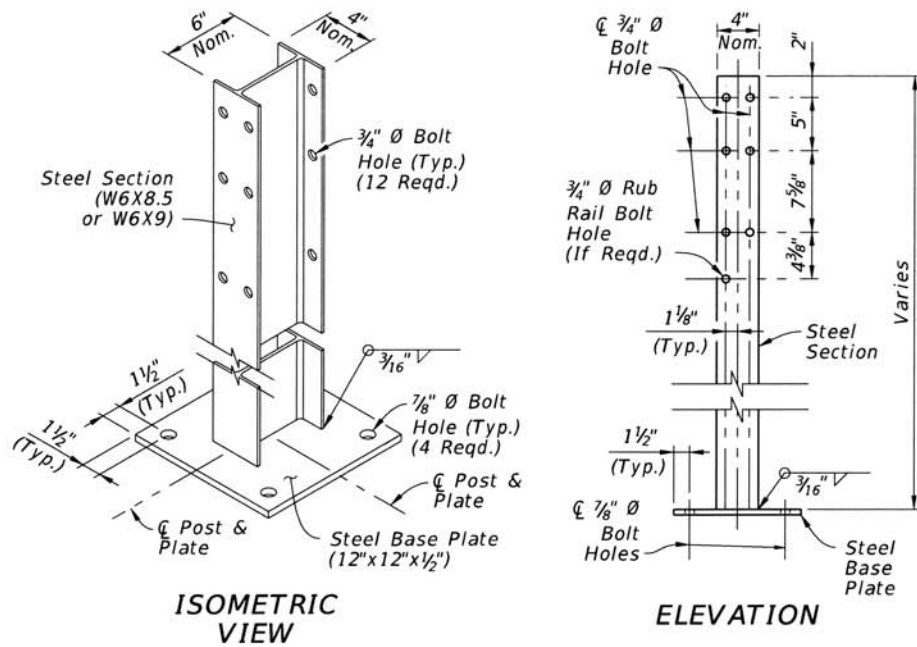
- GENERAL:** Install General Pipe Rail where indicated in the plans or when existing sidewalks or shared use paths are located less than 4'-0" from the back of Steel Posts as shown on Sheet 6.
- PIPE RAIL END SEGMENTS:** Place End Segments on both ends of General Pipe Rail runs, with End Fixtures mounted to Timber Posts located outside of Approach Terminal Assembly ('LE'), Trailing Anchorage Assembly ('LT'), and Approach Transition ('LA') segments.
- MATERIALS:** Use steel brackets, fixtures, and pipes in accordance with Specification Section 967.
- RAIL SPLICES:** Install Rail Splices to join pieces of 2" NPS Pipe Rail into a continuous system. Place splices as needed, at a spacing of 18'-0" or greater. Orient the head of bolt on the top of the pipe.

**PEDESTRIAN SAFETY TREATMENT - PIPE RAIL**

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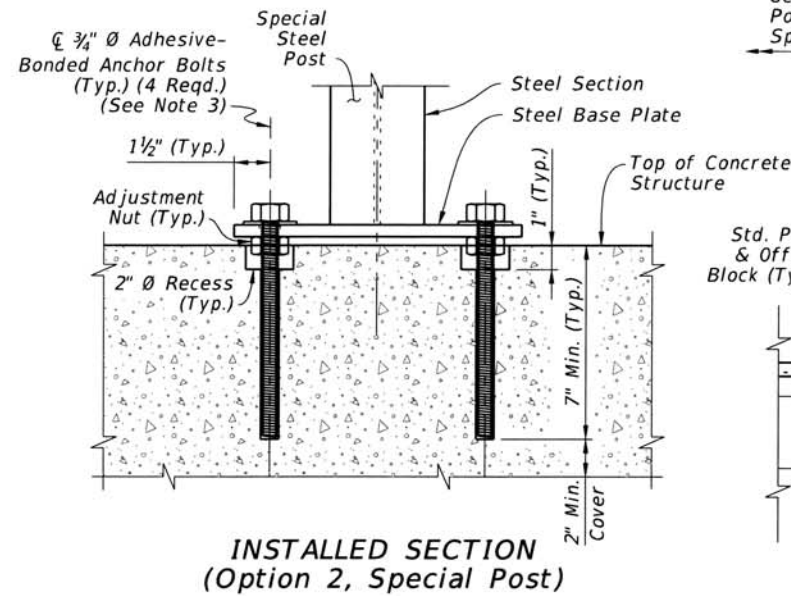
LAST REVISION 11/01/16	DESCRIPTION:		FY 2017-18 DESIGN STANDARDS	GUARDRAIL	INDEX NO. 400	SHEET NO. 20 of 22
					536-001	



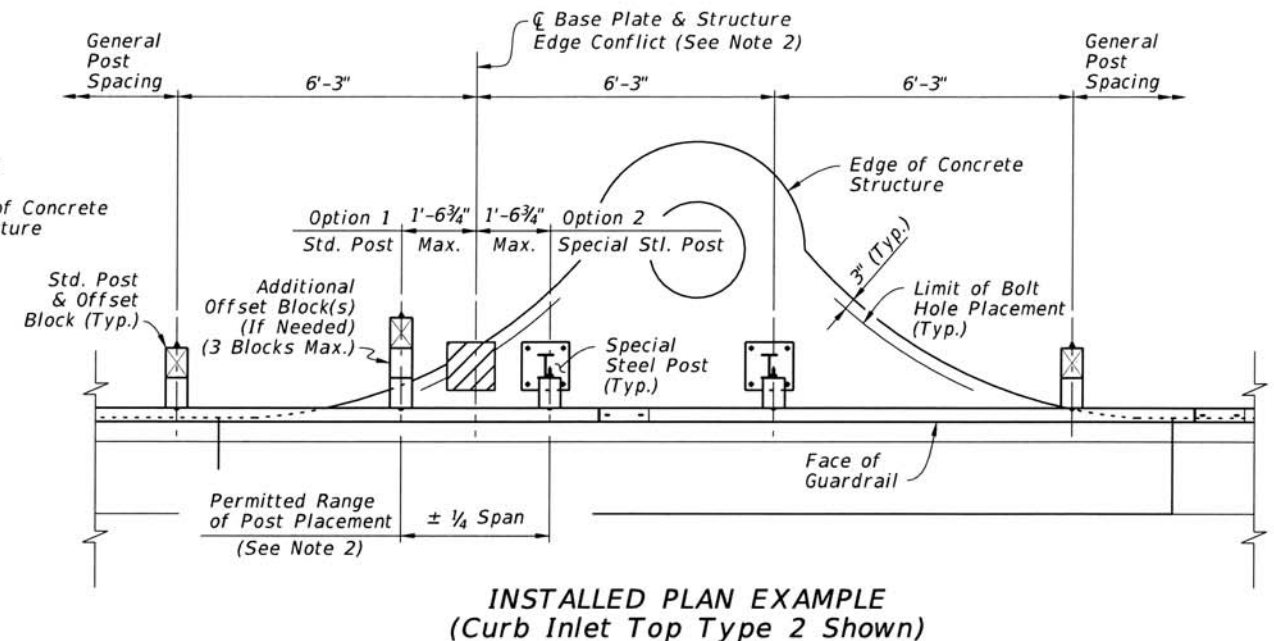


ISOMETRIC VIEW

ELEVATION



INSTALLED SECTION (Option 2, Special Post)



INSTALLED PLAN EXAMPLE (Curb Inlet Top Type 2 Shown)

**SPECIAL STEEL POST**

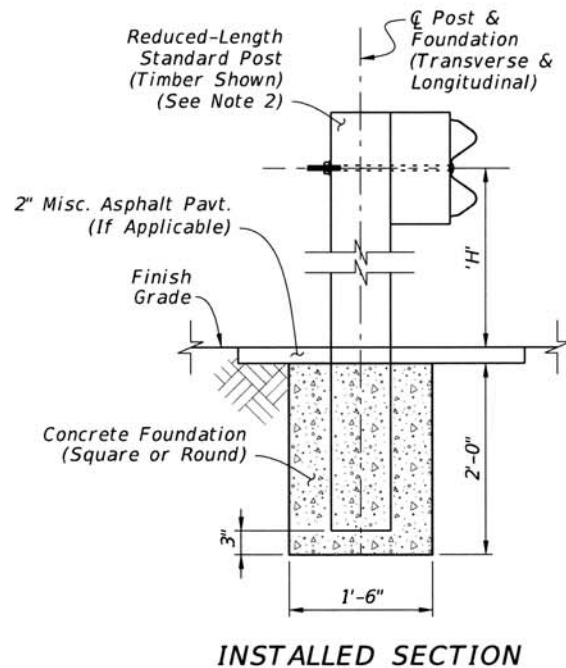
**STRUCTURE MOUNTING**

**NOTES:**

- INSTALLATION:** When the construction of Guardrail at the required post spacing results in post(s) located atop culverts, inlets, pier footings, or similar concrete structures, a Special Steel Post may be substituted for a Standard Post. ~~Special Steel Posts are not permitted within an Approach Terminal's Design Length as specified on the APL drawing.~~ Install where shown in the plans and/or as-needed in accordance with Specification Section 536.
- EDGE CONFLICT:** When a required post location causes an Edge Conflict with the structure, where the Steel Base Plate is not located entirely on the structure at least 3" from the Edge of Concrete, the longitudinal post location may be altered by up to 1'-6 3/4" (Quarter Span) from the original required spacing location to prevent the Edge Conflict. With the post location adjusted, use a Std. Post mounted in soil (Option 1) or a Special Steel Post with its Base Plate mounted entirely on the structure (Option 2). Maintain the original required spacing locations upstream and downstream of the structure.

- BASE PLATE MOUNT:** Install Special Steel Posts as shown using steel Adhesive-Bonded Anchor Bolts in accordance with Specifications Section 536. Use 3/4" Hex-Head Bolts for structures less than 9" deep as defined in the Specification.
- PANEL MOUNT TO ADJUSTED POST:** Punch additional 3/4"x2 1/2" Post Bolt Slot(s) in the W-Beam or Thrie-Beam Panel only where needed to mount the panel to a post in an adjusted location. Meet the Panel Post Bolt Slots requirements of Specification Section 536.
- MATERIALS:** Use steel base plates in accordance with Specification Section 536.

**SPECIAL STEEL POST FOR CONCRETE STRUCTURE MOUNT**

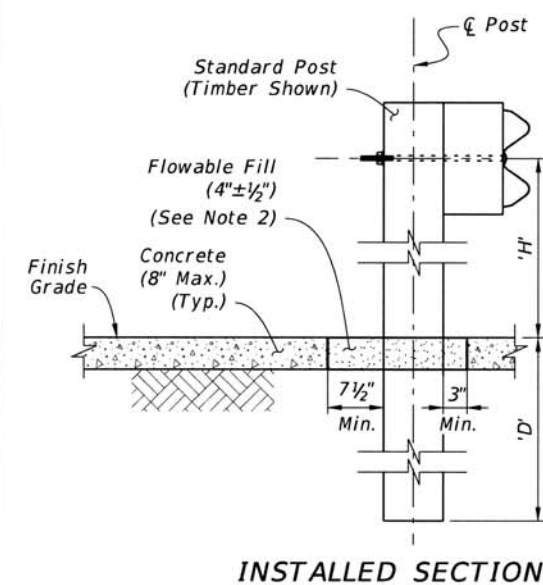


INSTALLED SECTION

**ENCASED POST FOR SHALLOW MOUNT**

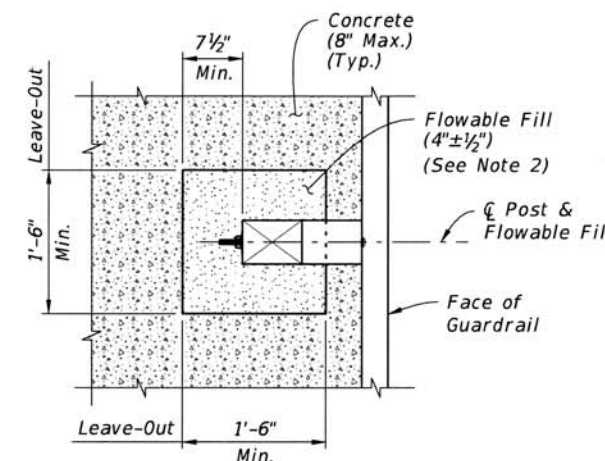
**NOTES:**

- INSTALLATION:** When the construction of Guardrail at the required post spacing results in post(s) conflicting with underground utilities or other underground obstructions, an Encased Post may be used where a 2'-0" depth will avoid the conflict. Install where shown in the plans and/or as-needed in accordance with Specification Section 536.
- REDUCED-LENGTH STANDARD POST:** Use a Standard Post with reduced Length such that the Panel Height 'H' is maintained while the post bottom terminates 3" from the bottom of the Concrete Foundation. Typically, the Post Length 'L' is 4'-7" for W-Beam Guardrail.
- FOUNDATION:** Use non-reinforced Class NS Concrete material in accordance with Specification Section 347. After casting the concrete, ensure the surrounding soil material is completely backfilled and tamped to provide full passive resistance.
- LIMIT:** Encased Posts are not permitted for consecutive posts unless otherwise shown in the plans.



INSTALLED SECTION

**FRANGIBLE LEAVE-OUT FOR CONCRETE SURFACE MOUNT**



INSTALLED PLAN

**NOTES:**

- INSTALLATION:** When the construction of Guardrail at the required post spacing results in post(s) placed within a concrete surface (typically a sidewalk), use a Frangible Leave-Out around the post base as shown. Install where shown in the plans and/or as-needed in accordance with Specification Section 536.  
For the required 1'-6" x 1'-6" Leave-Out, smoothly cut the existing concrete surface or form-up the square shape when an application has new surrounding concrete.  
Ensure Flowable Fill surface is smooth and even with the adjacent concrete surface.
- MATERIALS:** Use Non-Excavatable Flowable Fill in accordance with Specification Section 121, not to exceed 150 psi.

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1	General Notes; Index Contents
2	General, TL-3 Guardrail - Installed Plan and Elevation
3	Low-Speed, TL-2 Guardrail - Installed Plan and Elevation
4	W-Beam and Thrie-Beam Panel Details
5	Post and Offset Block Details
6	Guardrail Sections - Heights and Adjacent Slopes
7	End Treatment - Approach Terminal Geometry, Parallel and Flared
8	End Treatment - Approach Terminal Geometry, Curbed and Double Faced
9	End Treatment - Trailing Anchorage Type II
10	End Treatment - Component Details
11	End Treatment - Controlled Release Terminal (CRT) System
12	Layout for CRT System - Side Roads and Driveways
13	Approach Transition Connection to Rigid Barrier - General, TL-3
14	Approach Transition Connection to Rigid Barrier - Low-Speed, TL-2
15	Approach Transition Connection to Rigid Barrier - Details
16	Approach Transition Connection to Rigid Barrier - Double Faced Guardrail
17	Layout to Rigid Barrier - Approach Ends
18	Layout to Rigid Barrier - Approach Ends with Double Faced Guardrail Layout to Rigid Barrier - Trailing Ends
19	Rub Rail Details
20	Pedestrian Safety Treatment - Pipe Rail
21	Modified Mount - Special Steel Post for Concrete Structure Mount; Modified Mount - Encased Post for Shallow Mount; Modified Mount - Frangible Leave-Out for Concrete Surface Mount
22	Barrier Delineators - Post Mounted; Clear Space - Reduced Post Spacing for Hazards; 5/8" Button-Head Bolt System

**GENERAL NOTES:**

1. **INSTALLATION:** Construct guardrail in accordance with Specification Section 536.

This Index, along with the plans and the manufacturers' drawings on the Approved Products List (APL), is sufficiently detailed for installation of General Guardrail, Low-Speed Guardrail, End Treatment assemblies, and their connecting options shown herein. This precludes requirements for shop drawing submittals unless otherwise specified in the plans.

2. **COMPATIBILITY:** The General Guardrail in this Index is based on the Midwest Guardrail System (MGS) design, with an approximate height of 31" at the top of the Panel (2'-1" mounting height at vertical  $\bar{C}$  of Panel) and a midspan panel splice as shown on Sheet 2. Guardrail components included on the APL, which are compatible with this Index, may also be identified as 31" or MGS Guardrail.

3. **STANDARD COMPONENTS:** Standard guardrail components, including posts, panels, and bolt systems, are based upon English unit conversions of the AASHTO-AGC-ARTBA Joint Committee Task Force 13 Report: A Guide to Standardized Highway Barrier Hardware (<http://www.aashtotf13.org/Barrier-Hardware.php>).

4. **BUTTON-HEAD BOLTS:** Install Button-Head Bolts where indicated using bolts, nuts, and washers as defined on Sheet 22. Place washers under nuts; washers are optional against steel flanges. Do not place washers between bolt heads and panels, except where otherwise shown in this Index.

5. **HEX-HEAD BOLTS:** Install Hex-Head Bolts where indicated using bolts, nuts, and washers in accordance with material properties of Specification Section 967. Place washers under nuts; washers are optional against steel flanges.

6. **MISCELLANEOUS ASPHALT PAVEMENT:** Install Miscellaneous Asphalt Pavement where indicated with a tolerance of  $\pm 1/2$ " depth and in accordance with Specification Section 339.

7. **ADJACENT SIDEWALKS & SHARED USE PATHS:** When guardrail posts are placed within 4'-0" of a sidewalk or shared use path, use timber posts, or use steel posts only if treated with Pipe Rail as shown on Sheet 20.

When timber posts are used, one of the following safety treatments is required for the bolt(s) protruding from the back face of the posts:

- a. After tightening the nut, trim the protruding post bolt flush with the nut and galvanize per Specification Section 562.
- b. Use post bolts 15" in length and countersink the washer and nut between 1" and 1 1/2" deep into the back face of the post.
- c. Use 15" post bolts with sleeve nuts and washers.

When End Treatment posts are within 4'-0" of a sidewalk or shared use path, steel posts are not permitted within the End Treatment segment. Terminate the Pipe Rail outside of End Treatment segments, as noted per Sheet 20.

8. **NESTED W-BEAM:** Where called for in the plans, install two W-Beam Panels mounted flush per location, securing all panels with Button-Head Bolts threaded through aligned slots and holes. 2" Button-Head Bolts are permitted for panel splice locations.

9. **CONNECTION TO RIGID BARRIER:** The connections to Rigid Barrier in this Index only apply to newly constructed bridge Traffic Railing and Concrete Barrier or where the complete Approach Transition Connection to Rigid Barrier shown herein can be installed without conflicting with existing Traffic Railings, structures, or approach slabs.

For connecting guardrail to existing bridge Traffic Railings, see the layouts and details of Indexes 536-002, 521-404, and 421-405.


10. **CONNECTION TO EXISTING GUARDRAIL:** Where a transition to existing guardrail at 27" height is required, linearly transition the guardrail height over a distance ranging from 25'-0" to 31"-3". Provide an immediate transition to the required midspan splice using the available panel options on Sheet 4 (9'-4 1/2" or 15'-7 1/2" panel).

11. **PLANS CALLOUTS:** Begin/End Station labels are shown throughout this Index as they correspond to the station and offset callouts specified in the plans.

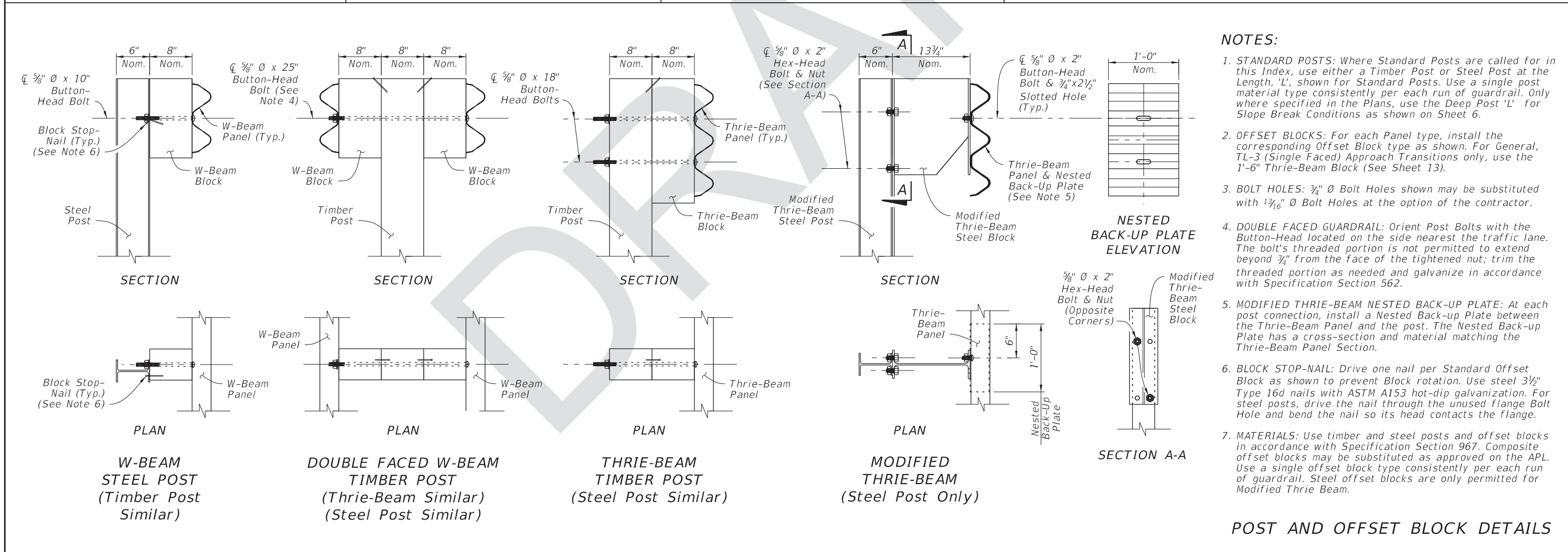
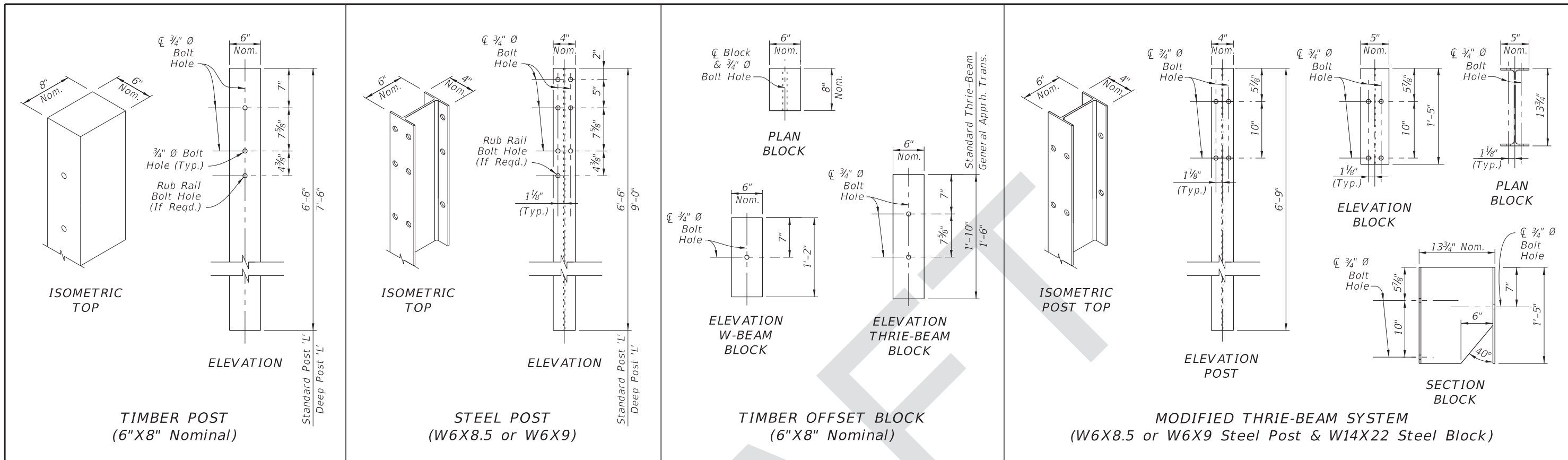
In the plans, Begin/End Guardrail Station refers to the General TL-3 Guardrail Pay Item, and it may be abbreviated as Begin/End GR. Station. Where the Low-Speed TL-2 Guardrail Pay Item is specifically required, the callout in the plans will then specify Begin/End TL-2 GR. Station.

12. **QUANTITY MEASUREMENT:** Measure guardrail and corresponding components as defined in Specification Section 536. The Guardrail length is measured along the centerline of installed Panels, between the points labeled Begin/End Guardrail Station shown on the following Index Sheets and defined in the plans (typically measured from the  $\bar{C}$  of the panel's post bolt slots at the approach/trailing ends).

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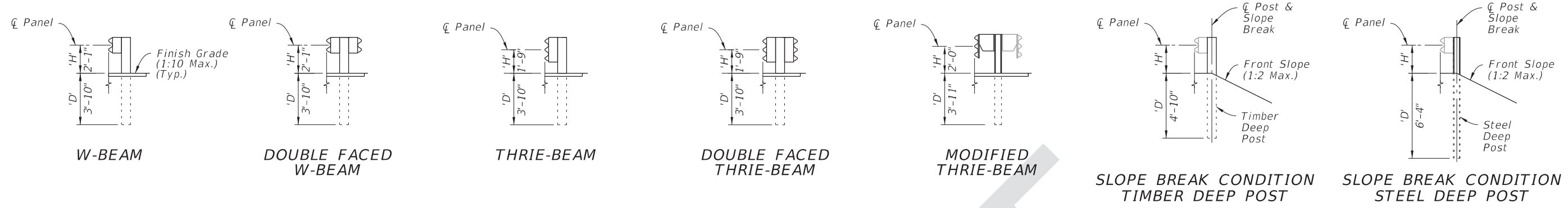




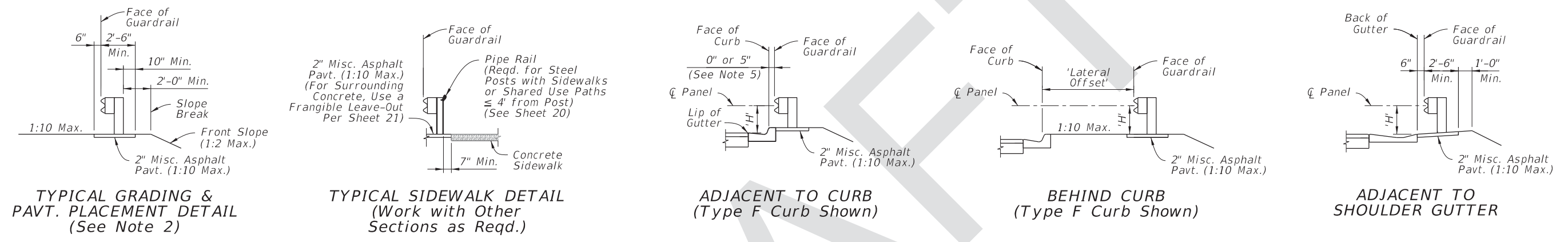
- NOTES:**
1. **STANDARD POSTS:** Where Standard Posts are called for in this Index, use either a Timber Post or Steel Post at the Length, 'L', shown for Standard Posts. Use a single post material type consistently per each run of guardrail. Only where specified in the Plans, use the Deep Post 'L' for Slope Break Conditions as shown on Sheet 6.
  2. **OFFSET BLOCKS:** For each Panel type, install the corresponding Offset Block type as shown. For General, TL-3 (Single Faced) Approach Transitions only, use the 1'-6" Thrie-Beam Block (See Sheet 13).
  3. **BOLT HOLES:** 3/4" Ø Bolt Holes shown may be substituted with 1 3/16" Ø Bolt Holes at the option of the contractor.
  4. **DOUBLE FACED GUARDRAIL:** Orient Post Bolts with the Button-Head located on the side nearest the traffic lane. The bolt's threaded portion is not permitted to extend beyond 3/4" from the face of the tightened nut; trim the threaded portion as needed and galvanize in accordance with Specification Section 562.
  5. **MODIFIED THRIE-BEAM NESTED BACK-UP PLATE:** At each post connection, install a Nested Back-up Plate between the Thrie-Beam Panel and the post. The Nested Back-up Plate has a cross-section and material matching the Thrie-Beam Panel Section.
  6. **BLOCK STOP-NAIL:** Drive one nail per Standard Offset Block as shown to prevent Block rotation. Use steel 3 1/2" Type 16d nails with ASTM A153 hot-dip galvanization. For steel posts, drive the nail through the unused flange Bolt Hole and bend the nail so its head contacts the flange.
  7. **MATERIALS:** Use timber and steel posts and offset blocks in accordance with Specification Section 967. Composite offset blocks may be substituted as approved on the APL. Use a single offset block type consistently per each run of guardrail. Steel offset blocks are only permitted for Modified Thrie Beam.

**POST AND OFFSET BLOCK DETAILS**



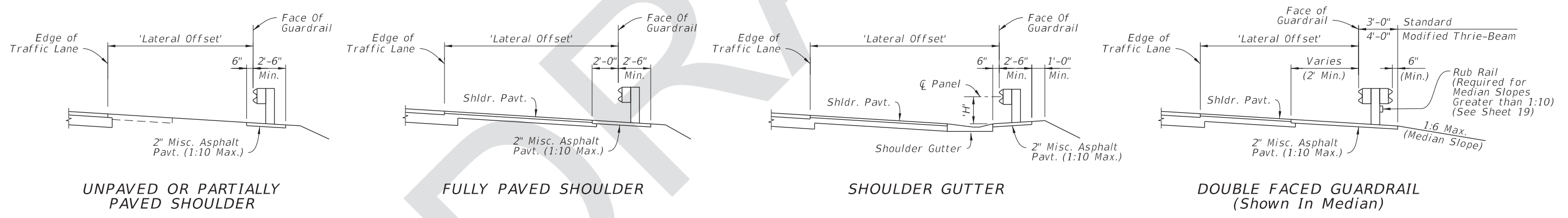


GUARDRAIL TYPES - MOUNTING HEIGHTS & POST DEPTHS



GUARDRAIL SECTIONS - TYPICAL

GUARDRAIL SECTIONS - CURB & GUTTER



GUARDRAIL SECTIONS - SHOULDERS

GUARDRAIL HEIGHT SUMMARY TABLE:			
Type:	Min. Depth 'D':	Mounting Height 'H':	Post Length 'L':
W-Beam (Single and Double Faced)	3'-10"	2'-1"	6'-6"
Thrie-Beam (Single and Double Faced)	3'-10"	1'-9"	6'-6"
Modified Thrie-Beam	3'-11"	2'-0"	6'-9"
Timber Deep Post	4'-10"	See Above	7'-6"
Steel Deep Post	6'-4"	See Above	9'-0"

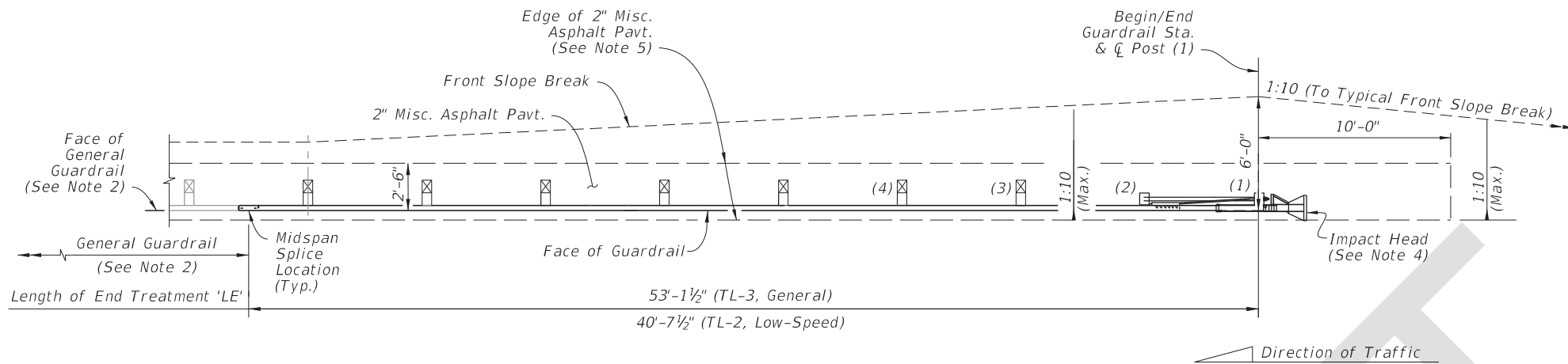
NOTES:

1. GUARDRAIL SECTIONS: Construct Sections as indicated in the plans. The details shown herein depict W-Beam Guardrail, but are applicable to the other defined Guardrail Types placed at the corresponding height, 'H'. Use components per Sheets 4 & 5. Steel and timber post types are interchangeable unless otherwise defined. The 1:10 Max. cross slope shown is the maximum slope permitted for proper guardrail function, but project-specific cross slope requirements are governed per the plans.
2. TYPICAL GRADING & PAVEMENT PLACEMENT DETAIL: Construct features as depicted except where superseded by specific Guardrail Sections or the plans. Place the Slope Break a Minimum of 2' behind the post. For Deep Posts, the slope break may be placed at the  $\bar{C}$  Post with the 2" Miscellaneous Asphalt Pavement omitted.
3. SLOPE BREAK CONDITION: Install Deep Posts only where called for in the plans. Deep Posts are only permitted where post spacing is 6'-3" or less.
4. LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset call outs for Face of Guardrail, as shown in the plans.
5. ADJACENT TO CURB: Place the Face of Guardrail consistently offset either flush with the Face of Curb or 5" behind the Face of Curb, as indicated by the plans station and offset callout. For offset changes, transition the Face of Guardrail as shown in the plans.

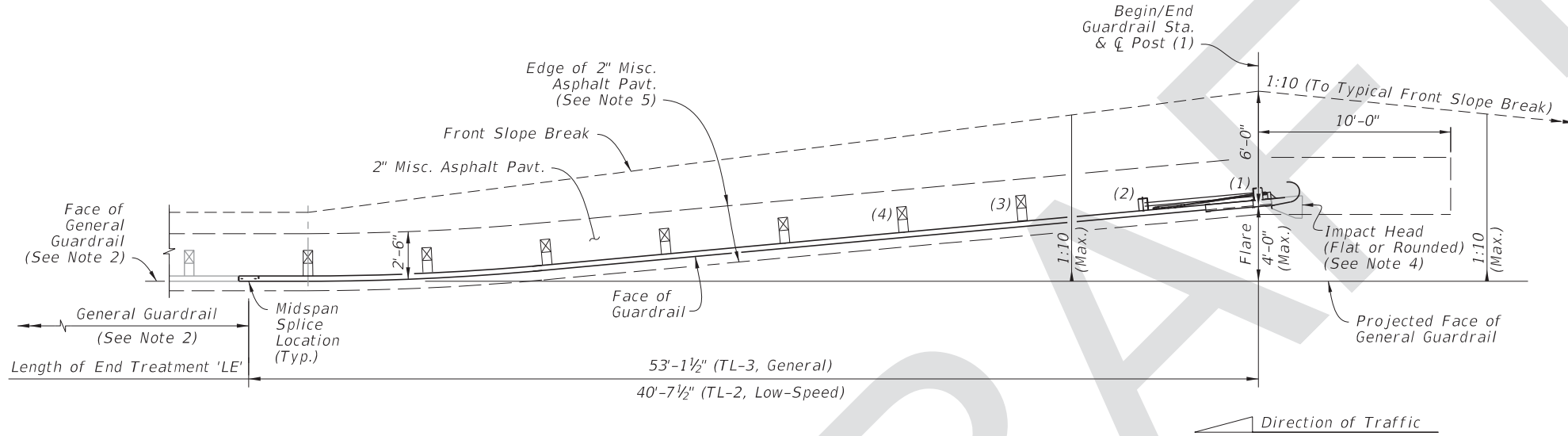
GUARDRAIL SECTIONS

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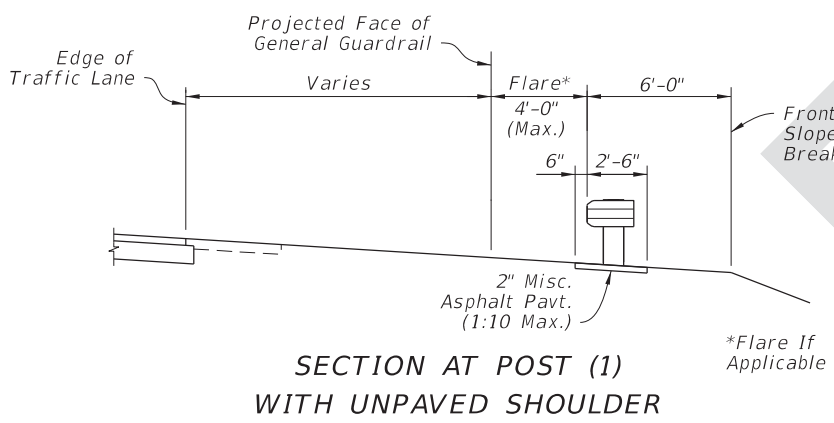
**APPROACH TERMINAL ASSEMBLY  
'PARALLEL' SEGMENT - PLAN VIEW**



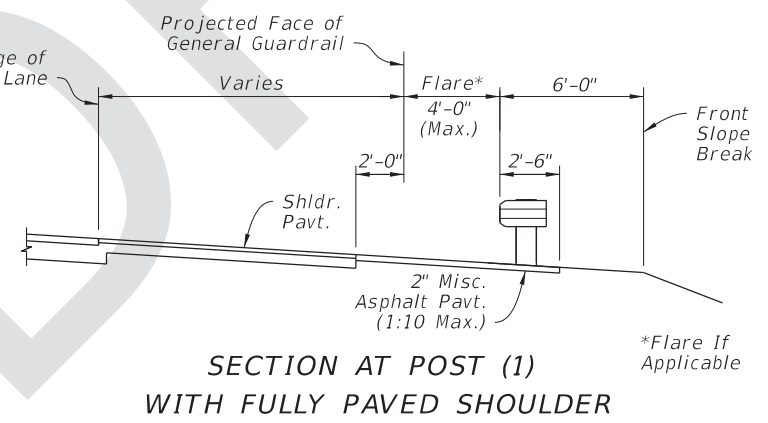
**APPROACH TERMINAL ASSEMBLY  
'FLARED' SEGMENT - PLAN VIEW**

**NOTES:**

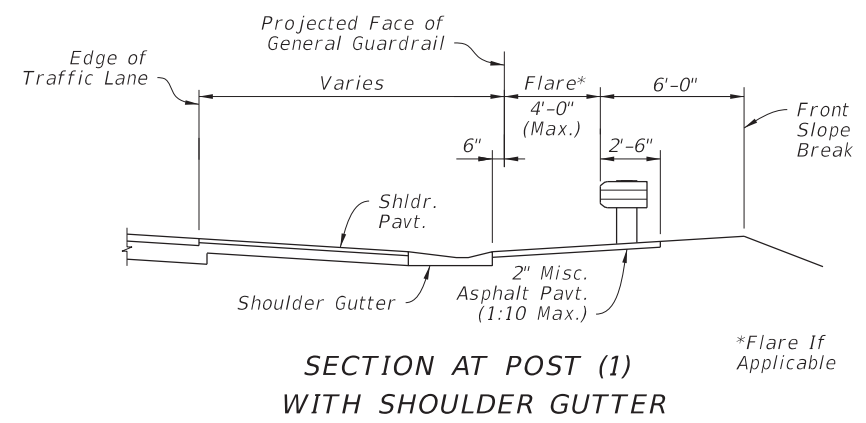
- INSTALLATION:** Locate Approach Terminals where called for in the plans, with the Post (1)  $\bar{C}$  placed at the Begin/End Guardrail Station indicated in the plans.  
  
The Plan Views shown herein are schematic only, showing basic geometry for Approach Terminals listed on the APL. The predefined Length of End Treatment, 'LE', includes the proprietary portion of various Approach Terminals and provides for more consistent planning of assembly installations across the differing Approach Terminal types. Forward-anchoring style Approach Terminals may vary from the planned lengths shown by up to 3'-0\".
- Construct Approach Terminals as shown in the APL and in accordance with the manufacturer's unique drawing details, procedures, and specifications.
- Install posts in accordance with the manufacturer's drawings. The Special Posts on Sheet 21, including Special Steel Posts, Encased Posts, and Fragible Leave-Outs, are not permitted within the Approach Terminal segment unless otherwise called for in the plans.
- Align panel lap splices in accordance with the manufacturer's drawings, regardless of the direction of traffic.
- Install adjacent grading, gutters, and/or curbing as shown herein, unless otherwise specified in the plans.
- GENERAL GUARDRAIL:** General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments.  
  
Approach Transitions, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.
- APPROACH TERMINAL TEST LEVEL:** Install either a Test Level 3 (TL-3) or Test Level 2 (TL-2) Approach Terminal as specified in the plans. TL-3 Approach Terminals may substitute for TL-2 Approach Terminals unless the substitution is specifically prohibited in the plans. TL-2 Approach Terminals may not substitute for TL-3 installations.
- IMPACT HEAD END DELINEATOR:** Apply Yellow Retroreflective Sheeting to the nose of the End Terminal in accordance with Specification Section 536.
- 2\" MISCELLANEOUS ASPHALT PAVEMENT:** The Plan Views shown herein depict the Unpaved Shoulder condition. For Fully Paved Shoulder and Shoulder Gutter conditions, extend the 2\" Misc. Asphalt Pavement as shown in the corresponding 'Section at Post (1)' details below.
- 'CURBED' AND 'DOUBLE FACED' GUARDRAIL SEGMENTS:** See Sheet 8.



**SECTION AT POST (1)  
WITH UNPAVED SHOULDER**




**SECTION AT POST (1)  
WITH FULLY PAVED SHOULDER**



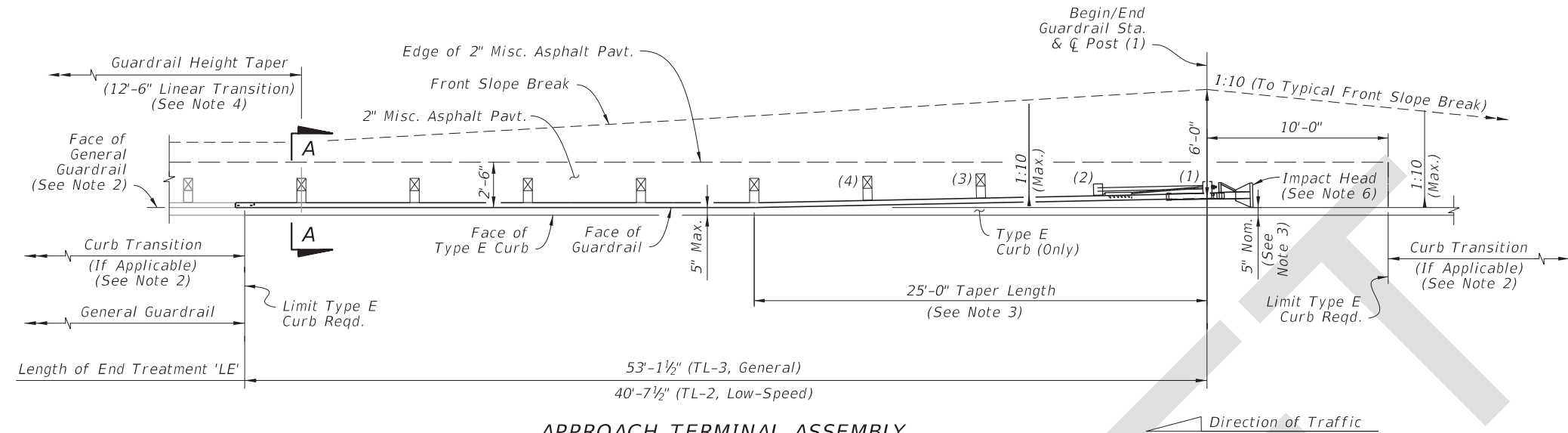
**SECTION AT POST (1)  
WITH SHOULDER GUTTER**

**END TREATMENT -  
APPROACH TERMINAL GEOMETRY  
PARALLEL AND FLARED**

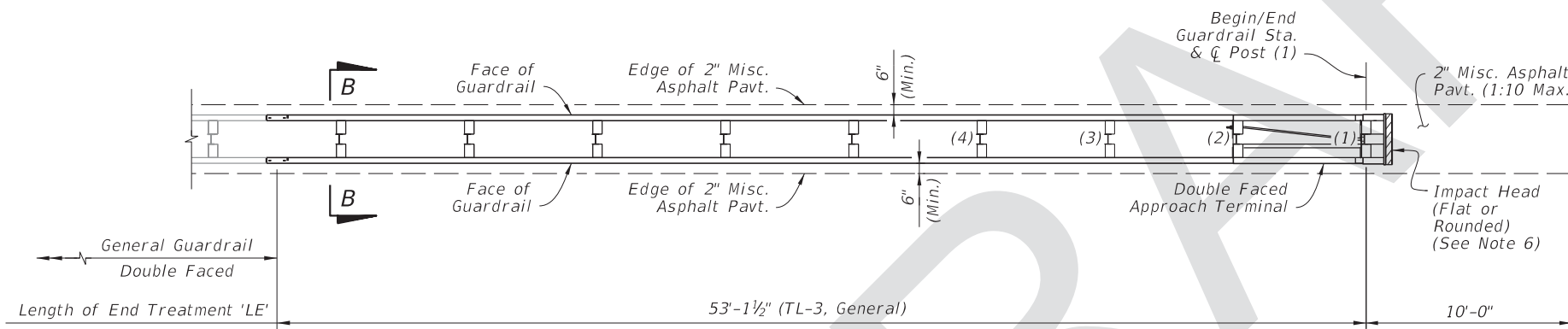
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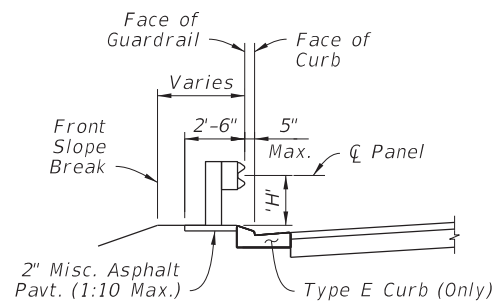




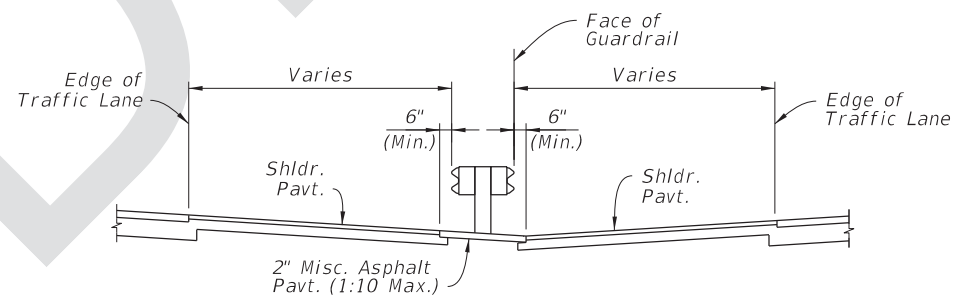
**APPROACH TERMINAL ASSEMBLY  
'CURBED' SEGMENT - PLAN VIEW**



**APPROACH TERMINAL ASSEMBLY  
'DOUBLE FACED' SEGMENT - PLAN VIEW**



**'CURBED' SECTION A-A**  
(Height, 'H', Measured from  
Misc. Asphalt Pavt.)



**'DOUBLE FACED' SECTION B-B**  
(1:10 Slope or Flatter Reqd.)

**NOTES:**

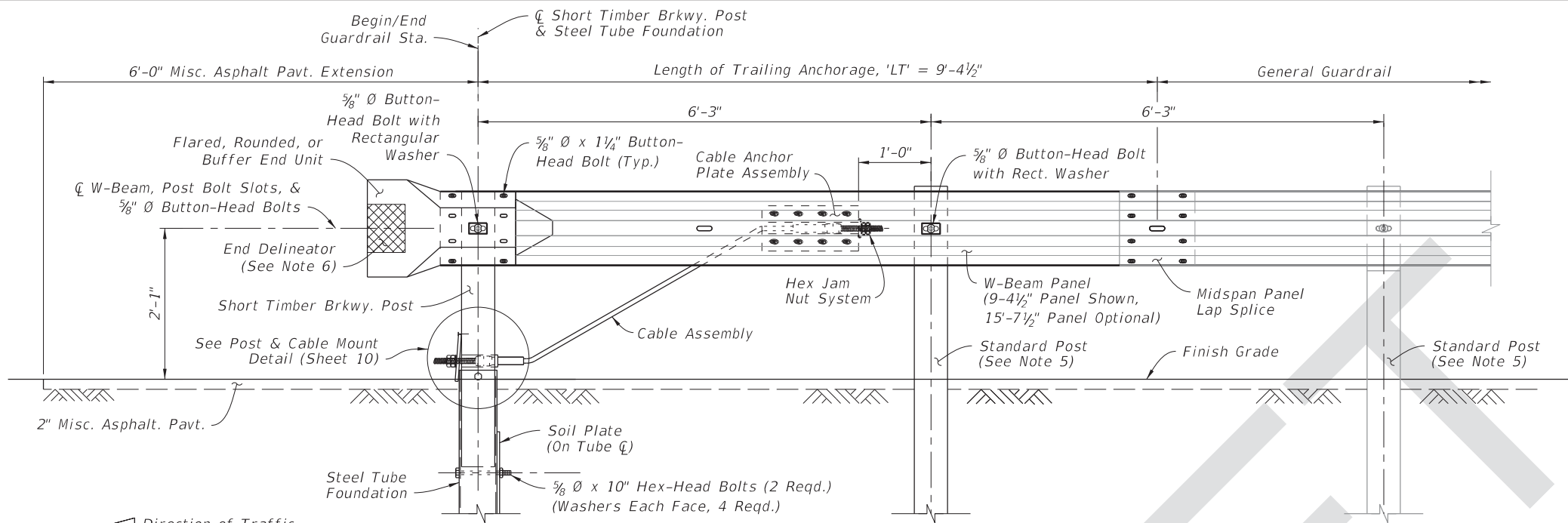
1. GENERAL: See Notes 1 through 3 on Sheet 7.
2. CURBED SEGMENTS: Type E curb is required within the limits shown. When a different curb type is called for outside of the Type E curb limits, transition the curb shape linearly, over a nominal distance ranging 5'-0" to 10'-0"
3. TAPER LENGTH: For Curbed Segments, taper the guardrail away from the roadway where shown to place the inside edge of the Impact Head at 5" behind the face of the curb. Where additional lateral offset is required to fit the Approach Terminal Assembly hardware, such as a soil plate, place the Impact Head as close to the curb as the hardware allows, not to exceed 2'-0" from the face of curb.
4. GUARDRAIL HEIGHT TAPER: For Curbed Segments, the connecting General Guardrail Mounting Height, 'H', is typically measured from the Lip of Gutter (See Sheet 6 Guardrail Sections, 'Adjacent to Curb'), while the End Terminal Assembly 'H' is measured from the Misc. Asphalt Pavt. (See Section A-A). Linearly taper the difference in Mounting Height over a minimum length of 12'-6", starting where indicated herein.
5. DOUBLE FACED SEGMENT: Connect to Double Faced General Guardrail. Use consistent Posts and Offset Block types as specified in the APL drawings over the entire Length of End Treatment, 'LE'. Posts and Offset Blocks in the adjoining General Guardrail segment may be different from those inside of the 'LE'. A change in post type between timber and steel is permitted, immediately outside of the 'LE' segment.
6. IMPACT HEAD END DELINEATOR: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal in accordance with Specification Section 536.
7. SINGLE FACED 'PARALLEL' AND 'FLARED' SEGMENTS: See Sheet 7.

**END TREATMENT -  
APPROACH TERMINAL GEOMETRY  
CURBED AND DOUBLE FACED**

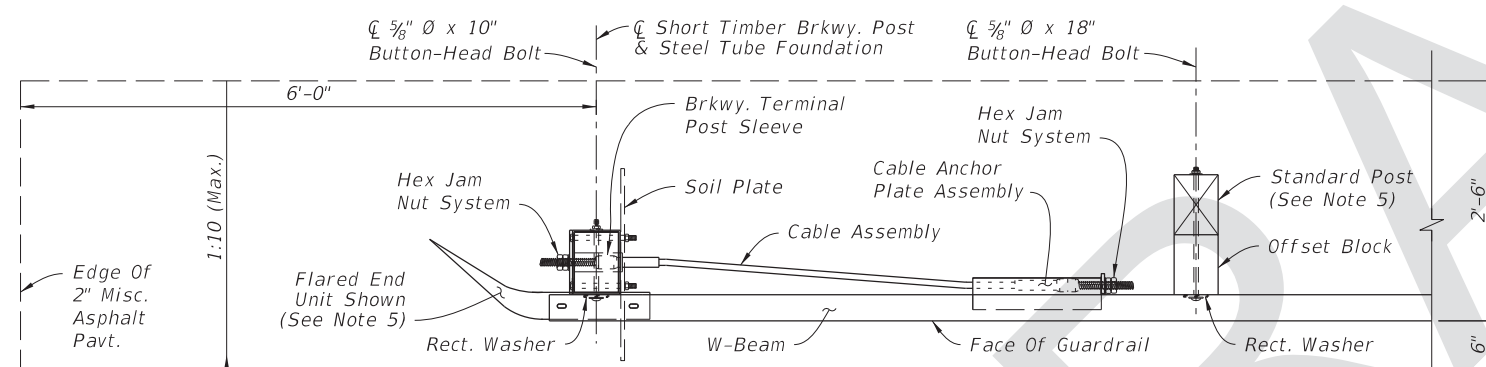
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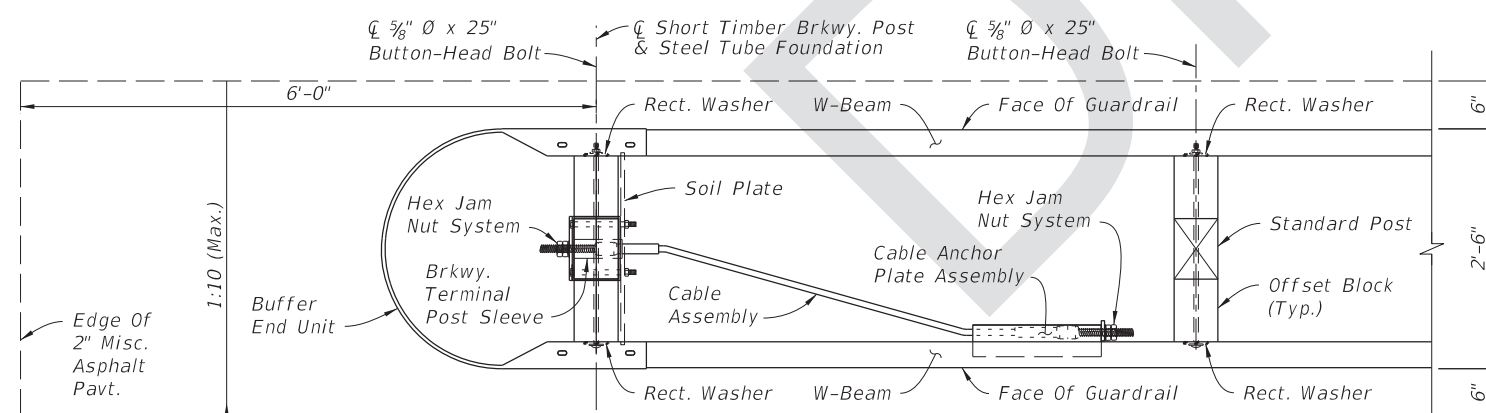




INSTALLED ELEVATION



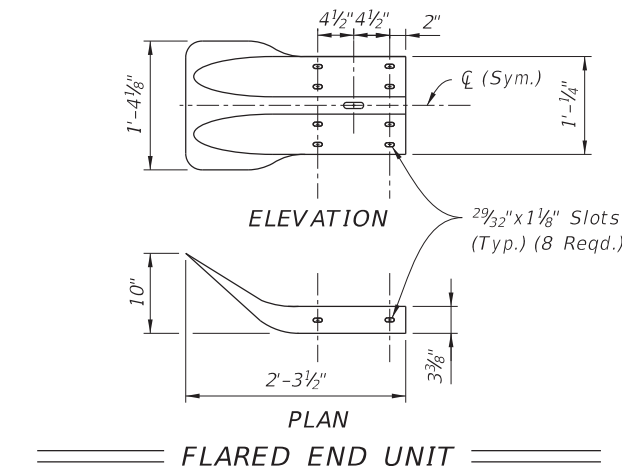
SINGLE FACE TRAILING ANCHORAGE INSTALLED PLAN



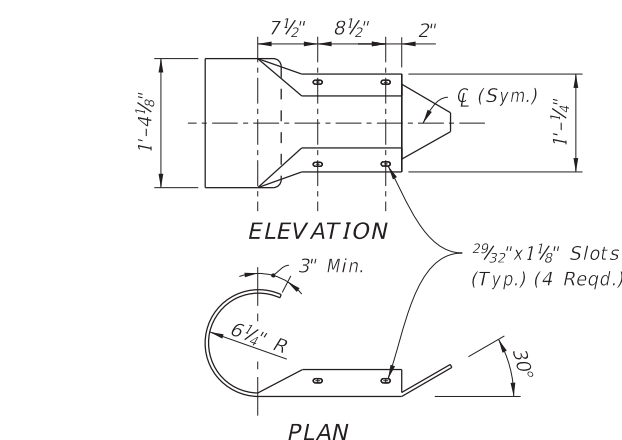
DOUBLE FACE TRAILING ANCHORAGE INSTALLED PLAN

NOTES:

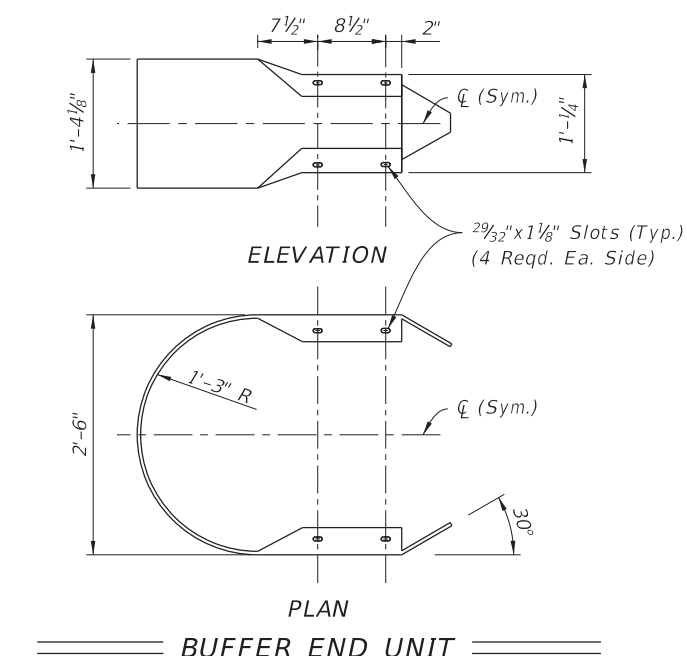
- COMPONENT DETAILS:** For additional Type II component details, See Sheet 10. For Rectangular Washer details, See Sheet 22.
- END UNITS:** Use materials for end units as defined in Specifications Section 967. End Units are referred to as "End or Buffer Sections" in AASHTO M180.  
Lap the Flared End Unit behind the W-Beam; lap the Rounded and Buffered End Units over the face of the W-Beam.
- FOUNDATIONS:** Install Steel Tubes with attached Soil Plates by either of the following methods:
  - Excavate, backfill, and compact material to provide full passive soil resistance to all surfaces of the Tube and Soil Plate.
  - Drive the Tube and Soil Plate as a single unit using a dummy timber post to prevent damage to the Breakaway Post.
- GENERAL GUARDRAIL:** General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Transitions, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.
- SIDEWALK REQUIREMENTS:** When sidewalks are located adjacent to the End Treatment, install a Rounded End Unit (Flared End Unit not permitted for this case).  
When sidewalks or shared use paths are within 4'-0" from the backs of posts, use the Timber Post option shown (including the first post in the General Guardrail segment). Install the Pipe Rail for adjacent Steel Posts if used, as shown on Sheet 20.
- END DELINEATOR:** Mount retroreflective sheeting to the approach face of the End Unit in accordance with Specification Sections 536 and 967.



FLARED END UNIT



ROUNDED END UNIT



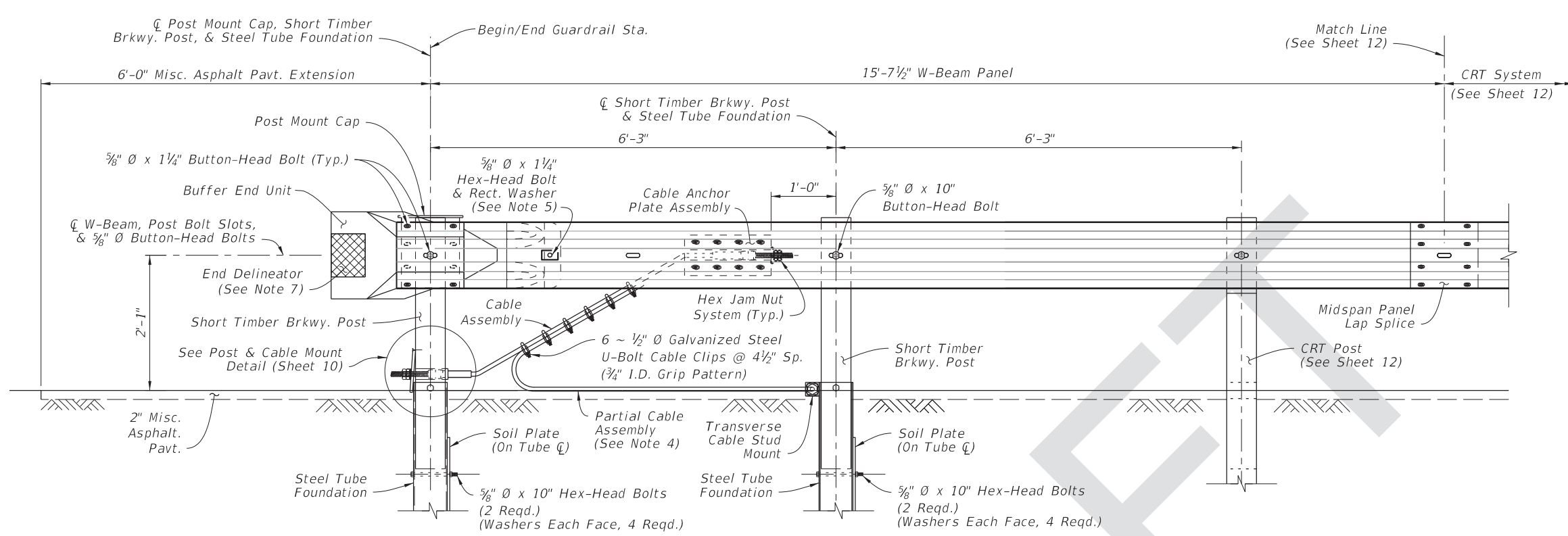
BUFFER END UNIT

END TREATMENT - TRAILING ANCHORAGE, TYPE II

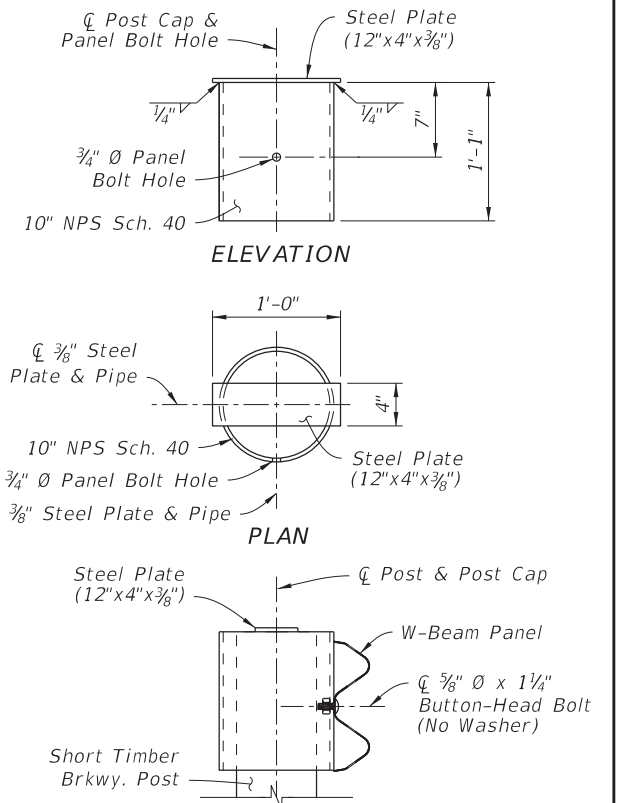
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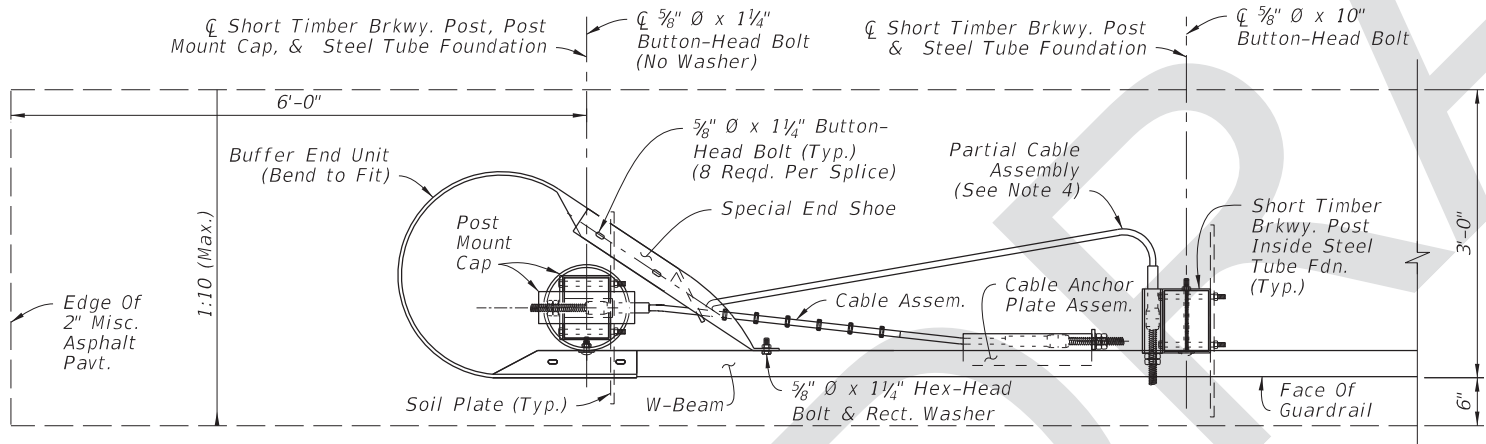




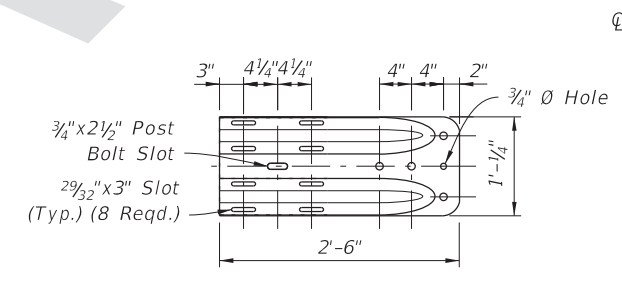
**INSTALLED ELEVATION**



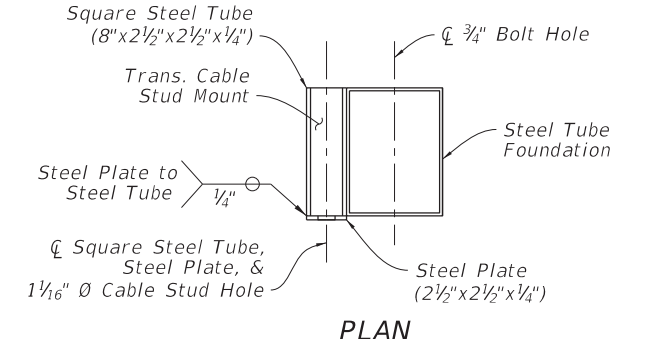
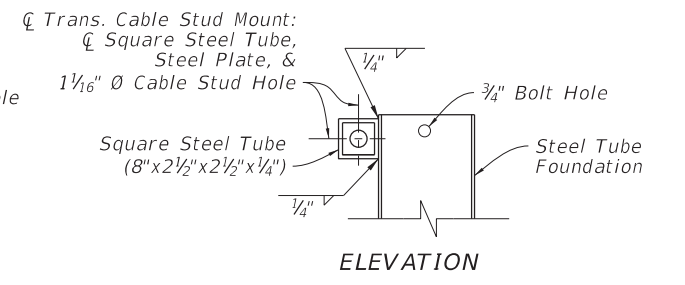
**POST MOUNT CAP**



**CRT END TREATMENT ASSEMBLY**



**SPECIAL END SHOE**



**TRANSVERSE CABLE STUD MOUNT**

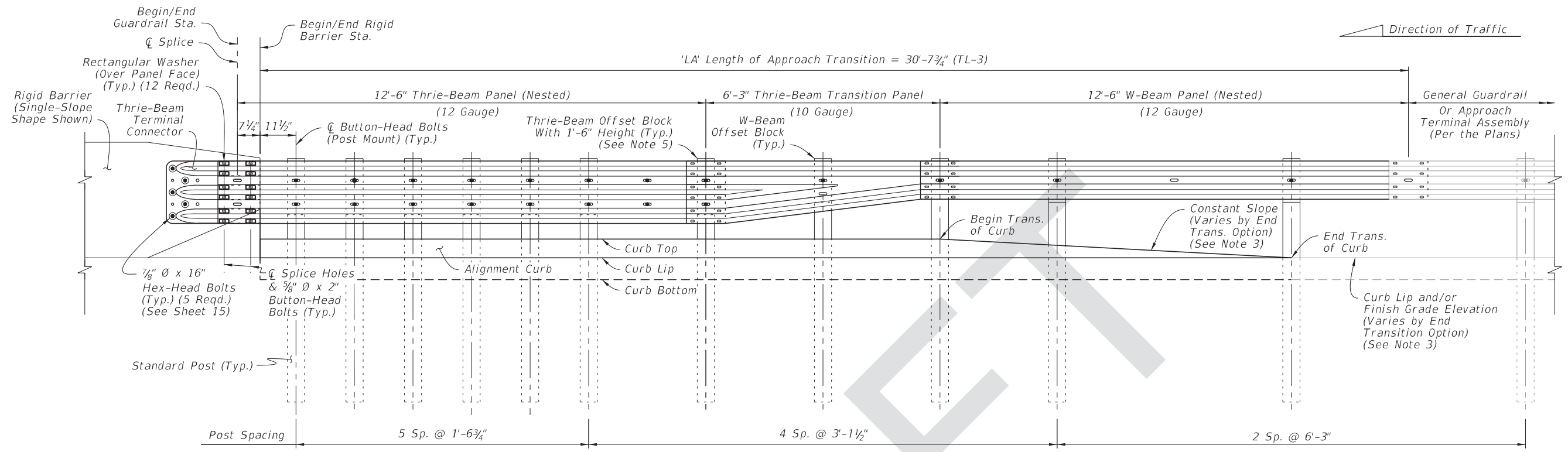
**NOTES:**

- INSTALLATION:** Use with CRT Systems as required on Sheet 22.
- COMPONENT DETAILS:** For additional component details, See Sheet 10 & 12. For the Rectangular Washer detail, see Sheet 22.
- MATERIALS:** Use steel End Shoes, Plates, Tubes, and pipes in accordance with Specifications Section 967.
- PARTIAL CABLE ASSEMBLY:** The Partial Cable Assembly is similar to the Cable Assembly defined on Sheet 10, except with a 9'-0" total length and the Swage Fitting and Cable Stud omitted from one end.  
Feed the Cable Stud through the Cable Stud Hole of the Transverse Cable Stud Mount as shown, and secure it with the Hex Jam Nut System as defined on Sheet 10.
- SPECIAL END SHOE MOUNT:** Punch a 3/4" Ø hole in the W-Beam Panel as needed to secure the Special End Shoe with the 5/8" Ø Hex-Head Bolt. Galvanize hole per Specification Section 562.
- FOUNDATIONS:** Install Steel Tubes with attached Soil Plates by either of the following methods:
  - Excavate, backfill, and compact material to provide full passive soil resistance to all surfaces of the tube and soil plate.
  - Drive the steel tube and soil plate as a single unit using a dummy timber post to prevent damage to the breakaway post.
- END DELINEATOR:** Mount retroreflective sheeting to the approach face of the Buffer End Unit in accordance with Specification Sections 536 and 967.

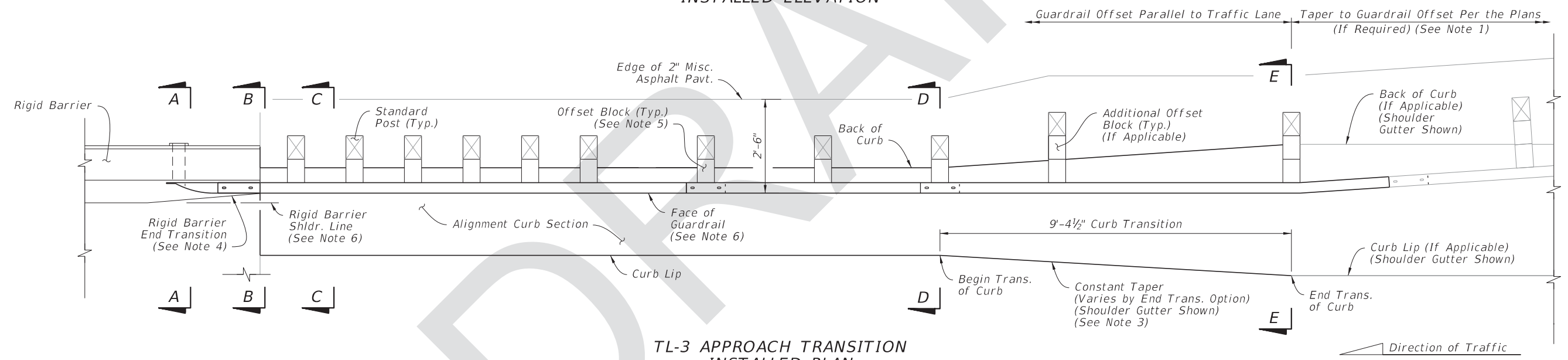
**END TREATMENT - CONTROLLED RELEASE TERMINAL (CRT) SYSTEM**

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TL-3 APPROACH TRANSITION  
INSTALLED ELEVATION



TL-3 APPROACH TRANSITION  
INSTALLED PLAN

**NOTES:**

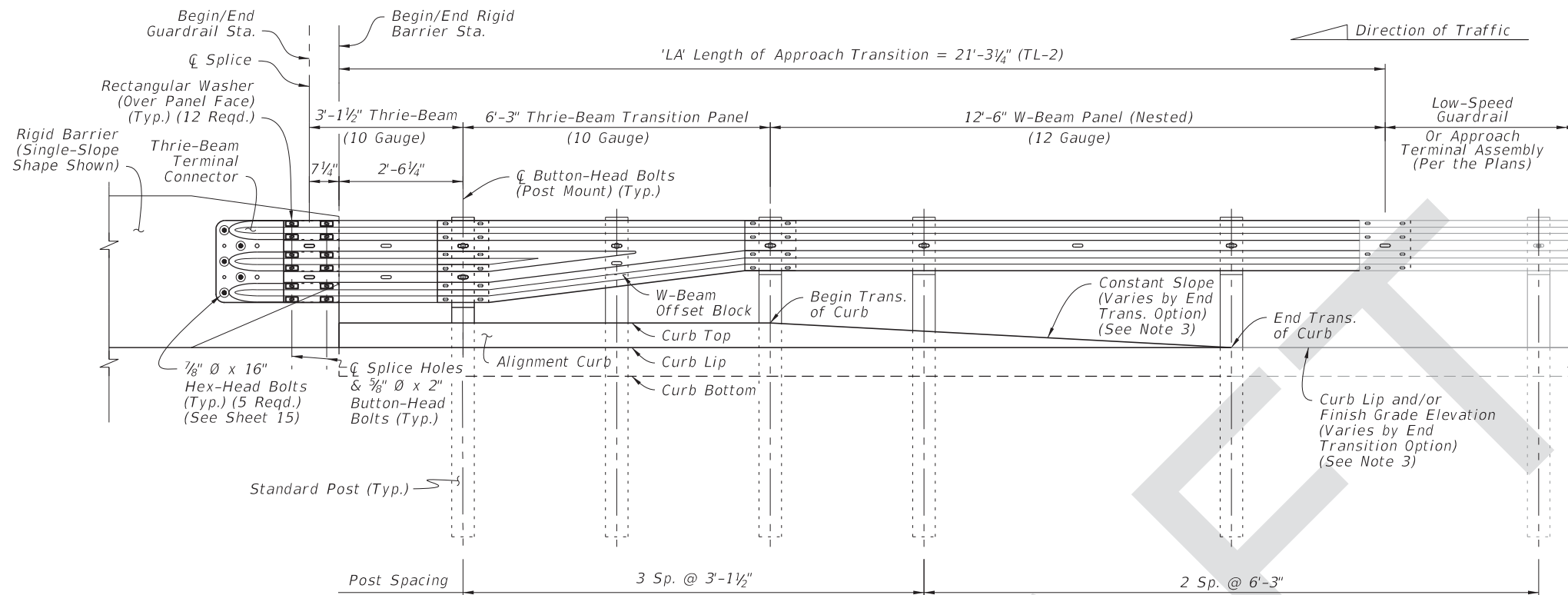
1. **INSTALLATION:** Construct the Approach Transition segment where indicated in the plans. The required offset of the connecting adjacent guardrail is shown in the plans.  
The Layouts given on Sheet 17 provide basic schemes for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.  
For existing bridge connection options, see Indexes 536-002, 521-404, and 521-405.
2. **SECTION VIEWS & DETAILS:** For cross sections and details including the barrier mounting hardware, curb transition, adjacent grading, and installation dimensions, see Sheet 15.
3. **END TRANSITION OF CURB OPTION:** The Plan and Elevation views depict an example Curb Transition to Shoulder Gutter from Section D-D to E-E, but this transition may require a different shape depending on the End Transition option indicated in the plans (Either a 'Shoulder Gutter Option', 'Raised Curb Option', or 'Flat No Curb Option'). See Sheet 15 for curb shape details.
4. **RIGID BARRIER END TRANSITION:** Taper the Rigid Barrier toe as shown. See Concrete Barrier, Index 521-001, and Traffic Railing, Indexes 521-422 and 521-428, for details.
5. **OFFSET BLOCKS:** For Thrie-Beam post locations within the Length of Approach Transition segment, use the Timber Offset Blocks with 1'-6" height shown on Sheet 5.  
For the midspan of the Thrie-Beam Transition Panel and for all other W-Beam locations shown herein, use the W-Beam Offset Blocks with 1'-2" height.
6. **OFFSET:** The required offset difference between the Face of Guardrail and Rigid Barrier Shoulder Line is considered negligible and may not be shown in the guardrail offset callouts in the plans. A consistent guardrail offset deviation of up to 4 inches outside of the Rigid Barrier Shoulder Line is permitted over the length 'LA'.
7. **GENERAL GUARDRAIL:** General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Approach Terminals, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

**APPROACH TRANSITION CONNECTION  
TO RIGID BARRIER - GENERAL, TL-3**

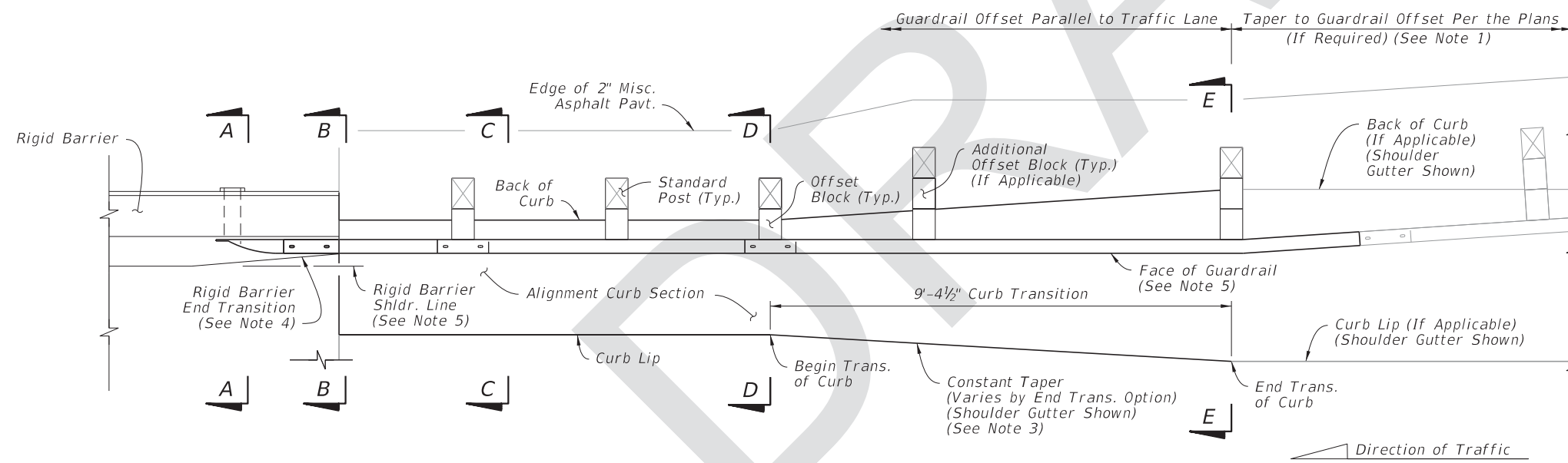
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TL-2 APPROACH TRANSITION  
INSTALLED ELEVATION




TL-2 APPROACH TRANSITION  
INSTALLED PLAN

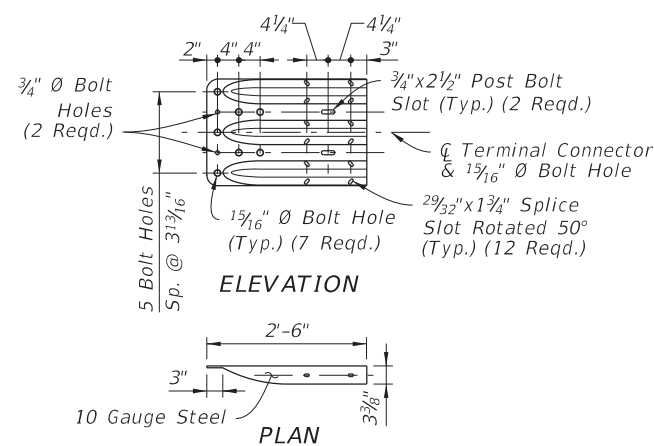
**NOTES:**

- INSTALLATION:** Construct the Approach Transition segment where indicated in the plans. The required offset of the connecting adjacent guardrail is shown in the plans.  
  
The Layouts given on Sheet 17 provide basic schemes for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.  
  
For existing bridge connection options, see Indexes 536-002, 521-404, and 521-405.
- SECTION VIEWS & DETAILS:** For cross sections and details including the barrier mounting hardware, curb transition, adjacent grading, and installation dimensions, see Sheet 15.
- END TRANSITION OF CURB OPTION:** The Plan and Elevation views depict an example Curb Transition to Shoulder Gutter from Section D-D to E-E, but this transition may require a different shape depending on the End Transition option indicated in the plans (Either a 'Shoulder Gutter Option', 'Raised Curb Option', or 'Flat No Curb Option'). See Sheet 15 for curb shape details.
- RIGID BARRIER END TRANSITION:** Taper the Rigid Barrier toe as shown. See Concrete Barrier, Index 521-001, and Traffic Railing, Indexes 521-422 thru 521-428, for details.
- OFFSET:** The required offset difference between the Face of Guardrail and Rigid Barrier Shoulder Line is considered negligible and may not be shown in the guardrail offset callouts in the plans. A consistent guardrail offset deviation of up to 4 inches outside of the Rigid Barrier Shoulder Line is permitted over the length 'LA'.
- LOW-SPEED GUARDRAIL:** Low-Speed Guardrail typically includes Panels and Post Spacing as shown on Sheet 3, including parallel and tapered segments. Approach Terminals, General Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the Low-Speed Guardrail shown herein if indicated in the plans.

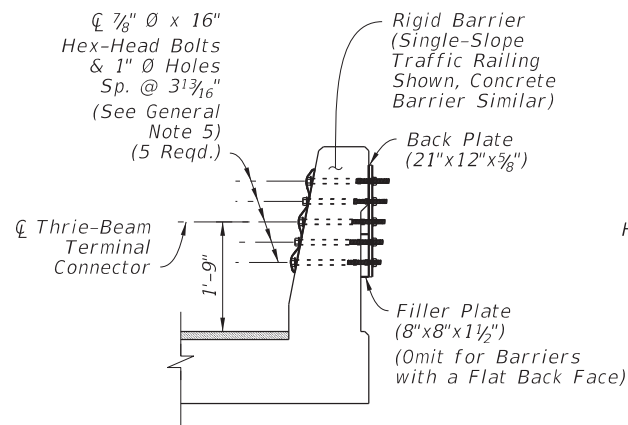
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LAST REVISION 11/01/17	DESCRIPTION:	 FY 2018-19 STANDARD PLANS	GUARDRAIL	INDEX 536-001	SHEET 14 of 22
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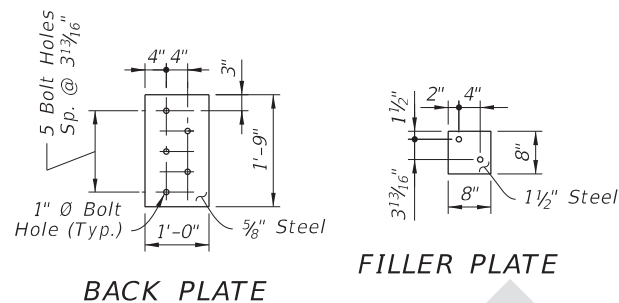
APPROACH TRANSITION CONNECTION  
TO RIGID BARRIER - LOW-SPEED, TL-2



**THRIE-BEAM TERMINAL CONNECTOR DETAIL**

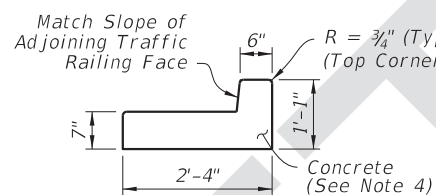


**SECTION A-A RIGID BARRIER TERMINAL CONNECTOR MOUNT**

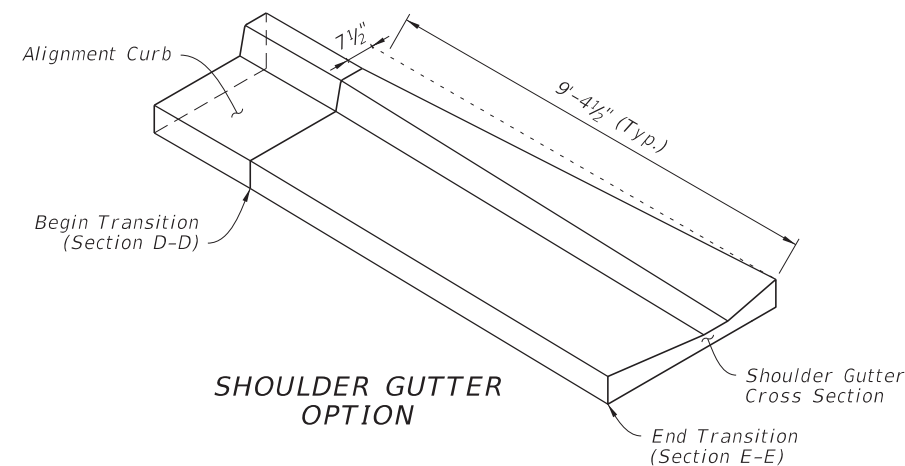


**BACK PLATE**

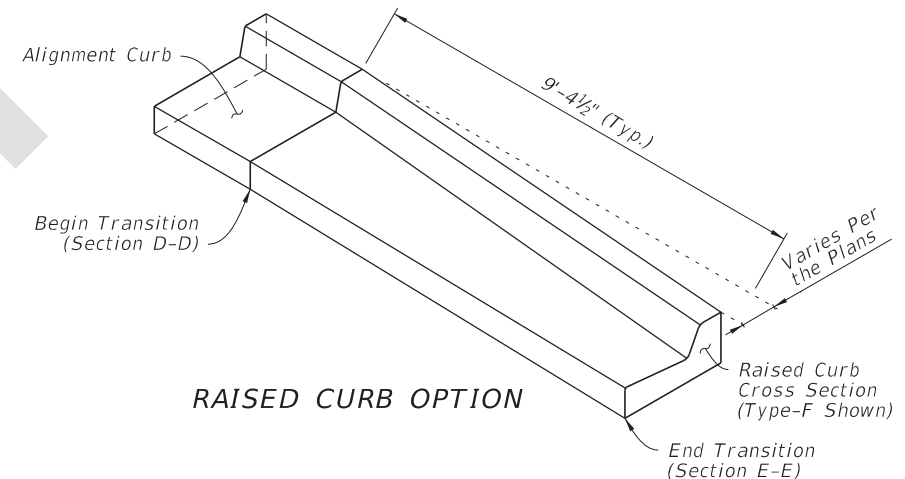
**FILLER PLATE**



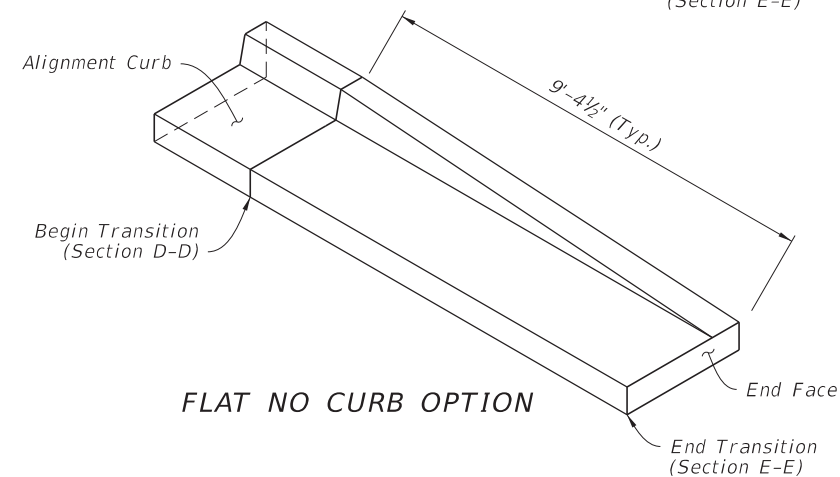
**ALIGNMENT CURB SECTION**



**SHOULDER GUTTER OPTION**



**RAISED CURB OPTION**

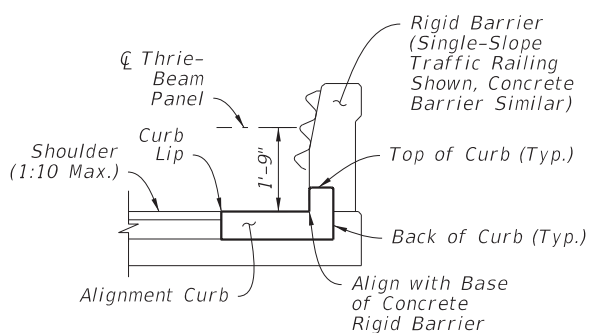


**FLAT NO CURB OPTION**

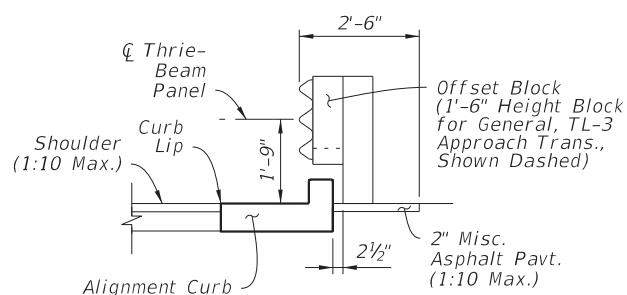
**CURB TRANSITION ISOMETRIC VIEWS**

**NOTES:**

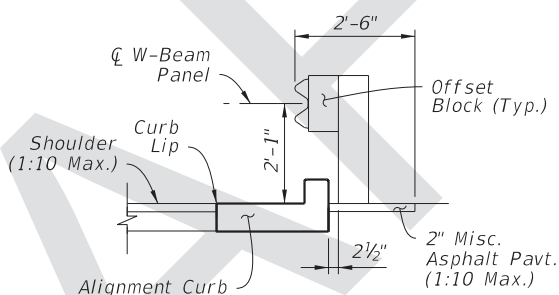
1. PLAN AND ELEVATION VIEWS: Work with Sheets 13 & 14.
2. END TRANSITION OF CURB OPTION: Install one of the three End Transition types shown per Section E-E as indicated by the plans.
3. GRADING BEHIND POSTS: Place Slope Break a Min. 2'-0" behind the post, per Sheet 6.
4. MATERIALS & CONSTRUCTION: Construct the concrete Aligning Curb and Curb transition in accordance with Specification Section 520. Use steel Plates and Thrie-Beam Terminal Connectors in accordance with Specifications Section 967.



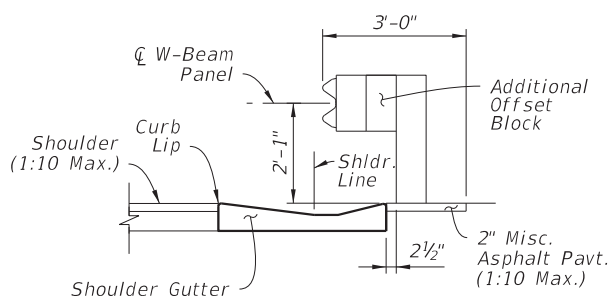
**SECTION B-B BEGIN ALIGNMENT CURB (Mate to Rigid Barrier)**



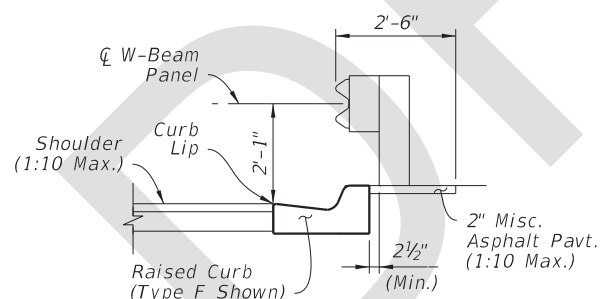
**SECTION C-C ALIGNMENT CURB (Intermediate)**



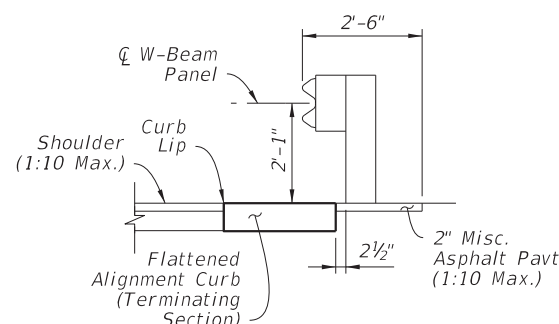
**SECTION D-D BEGIN TRANSITION (End Alignment Curb)**



**SECTION E-E END TRANSITION SHOULDER GUTTER OPTION**



**SECTION E-E END TRANSITION RAISED CURB OPTION**



**SECTION E-E END TRANSITION FLAT NO CURB OPTION**

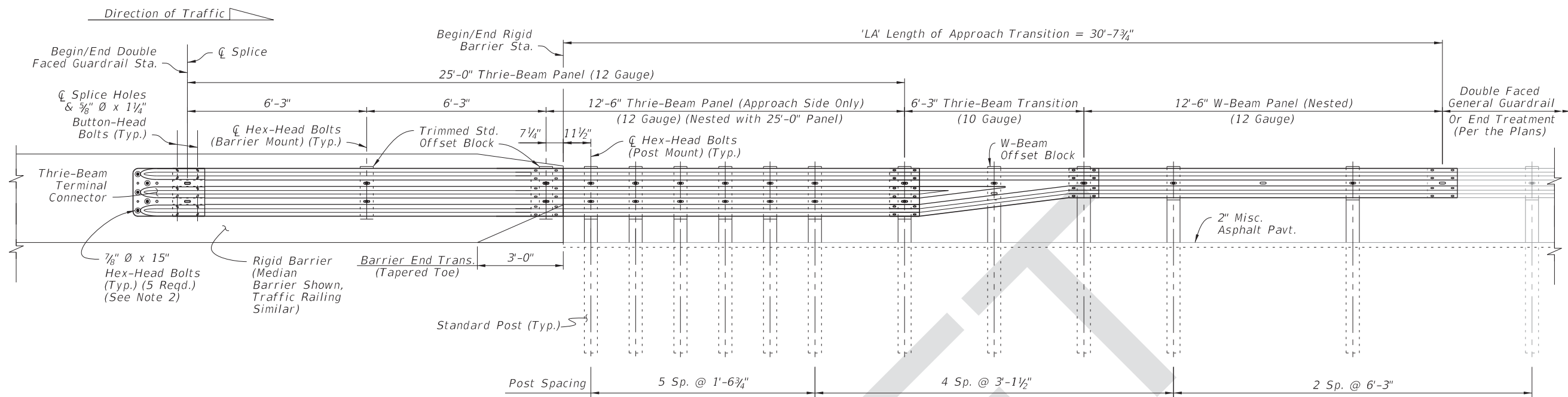
**CURB TYPICAL SECTIONS**

**APPROACH TRANSITION CONNECTION - DETAILS**

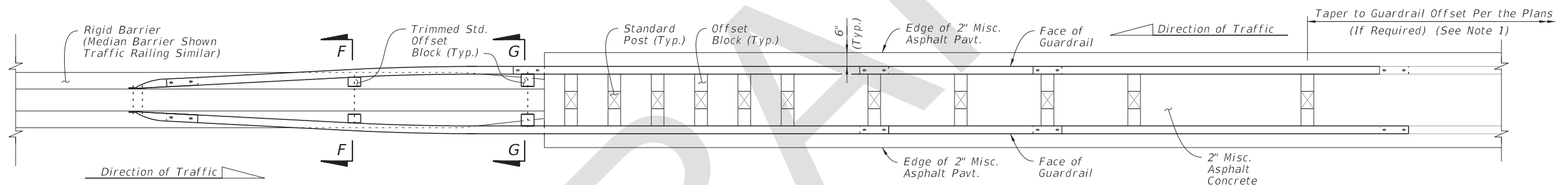
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TL-3 DOUBLE FACED APPROACH TRANSITION  
INSTALLED ELEVATION



TL-3 DOUBLE FACED APPROACH TRANSITION  
INSTALLED PLAN

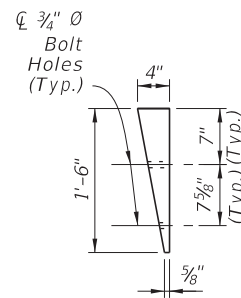
**NOTES:**

1. **INSTALLATION:** Construct the Approach Transition segment where indicated in the plans. The required offset of the connecting adjacent guardrail is shown in the plans.

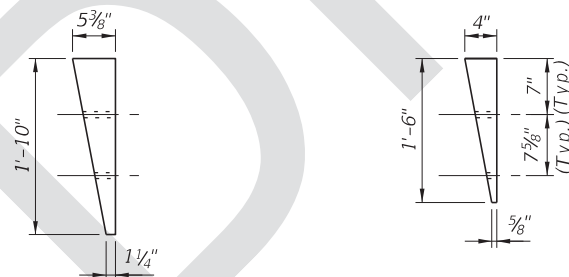
The Layouts given on Sheet 18 provide basic schemes for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail has the same offset as the Approach Transition segment, then no taper is required.

2. **THRIE-BEAM TERMINAL CONNECTOR:** See Sheet 15 for Details. The installed bolt's threaded portion is not permitted to extend beyond 3/4" from the face of the nut; trim the threaded portion as needed and galvanize in accordance with Specification Section 562.

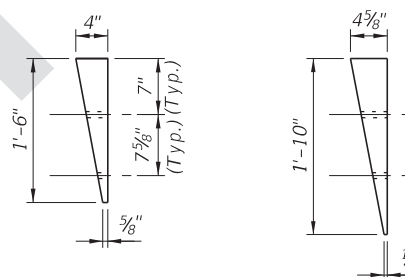
3. **GENERAL GUARDRAIL:** General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. End Treatments or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.



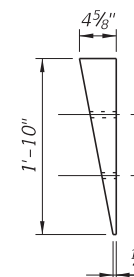
TYPE F-F SECTION



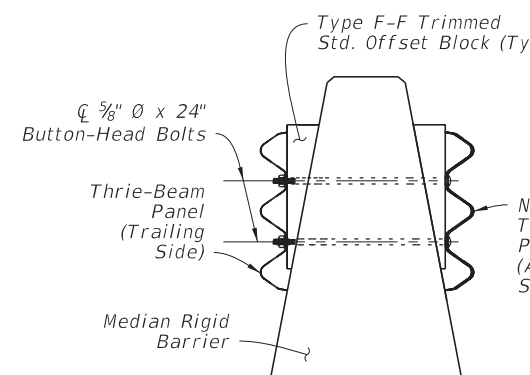
TYPE G-G SECTION



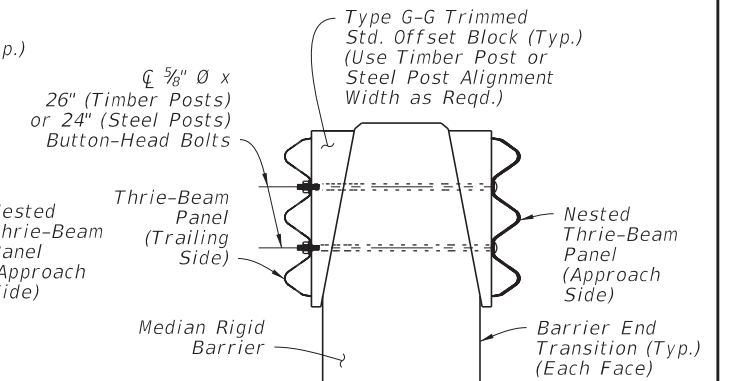
TYPE F-F SECTION



TYPE G-G SECTION



SECTION F-F



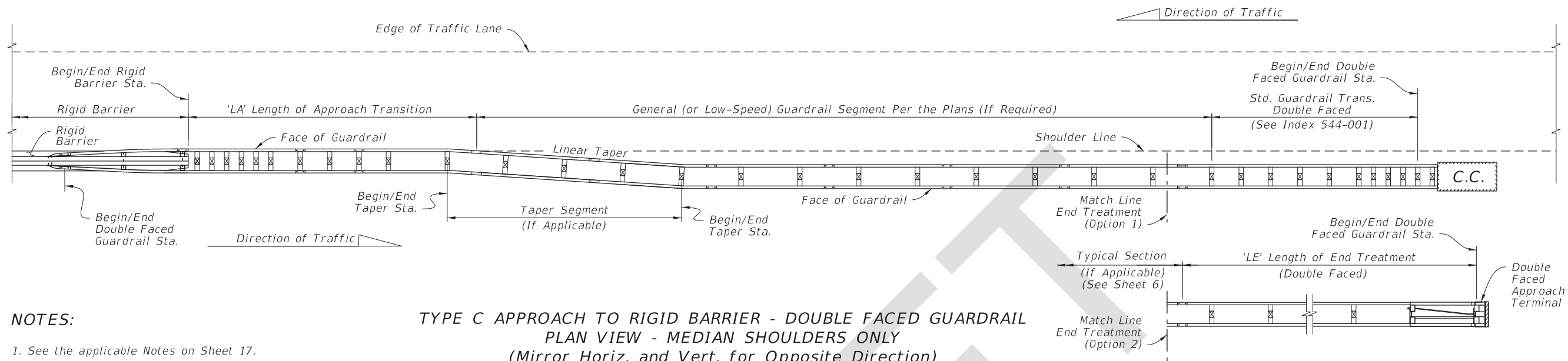
SECTION G-G

==== TRIMMED STD. OFFSET BLOCKS ==== TRIMMED STD. OFFSET BLOCKS ====  
TIMBER POST ALIGNMENT WIDTH STEEL POST ALIGNMENT WIDTH

APPROACH TRANSITION CONNECTION TO  
RIGID BARRIER WITH DOUBLE FACED GUARDRAIL

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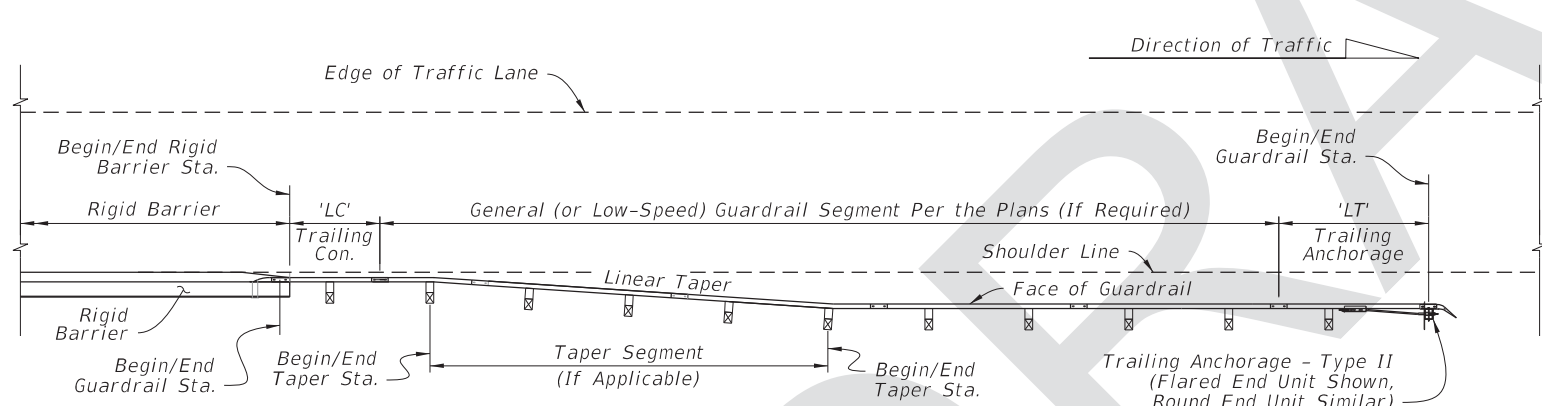


**NOTES:**

1. See the applicable Notes on Sheet 17.

**TYPE C APPROACH TO RIGID BARRIER - DOUBLE FACED GUARDRAIL  
PLAN VIEW - MEDIAN SHOULDERS ONLY  
(Mirror Horiz. and Vert. for Opposite Direction)**

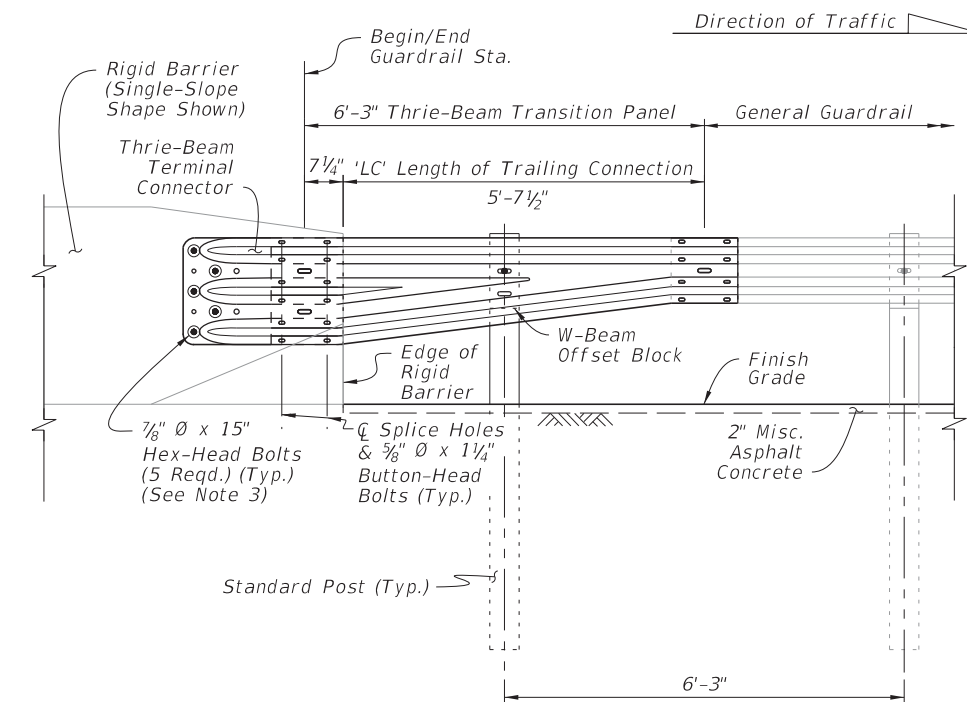
**LAYOUT TO RIGID BARRIER -  
APPROACH ENDS WITH  
DOUBLE FACED GUARDRAIL**



**TYPE D TRAILING CONNECTION FROM RIGID BARRIER  
PLAN VIEW - MEDIAN OR OUTSIDE SHOULDER  
(Mirror Horiz. and/or Vert. for Opposite  
Direction and/or Side of Road)**

**NOTES:**


1. See the applicable Notes on Sheet 17.
2. LENGTH OF TRAILING ANCHORAGE, 'LT': Install the Trailing Anchorage - Type II as shown on Sheet 9, where called for in the plans.
3. THRIE-BEAM TERMINAL CONNECTOR: Install connector and bolts as shown on Sheet 15.
4. RIGID BARRIER SINGLE SLOPE END FACE: See Concrete Barrier Wall, Index 521-001, and Traffic Railing, Indexes 521-422 and 521-423, for details.



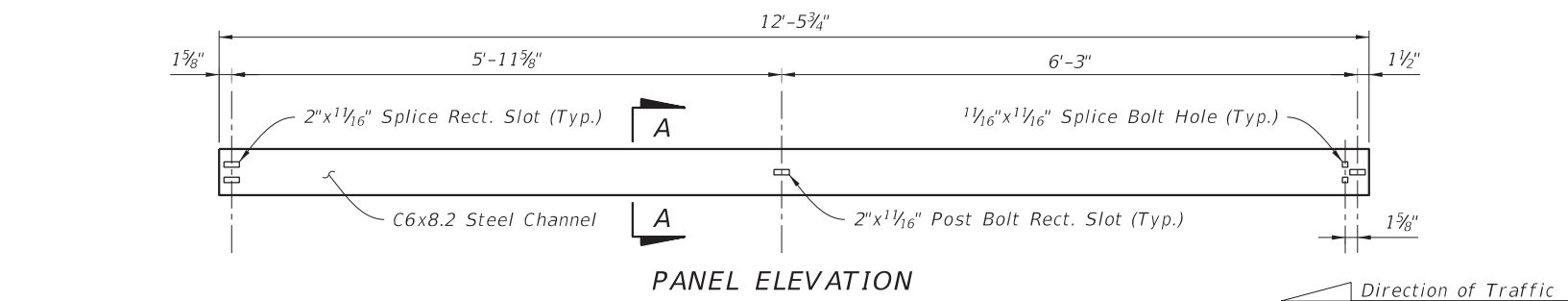
**TRAILING END TRANSITION CONNECTION  
TO RIGID BARRIER - INSTALLED ELEVATION**

**LAYOUT TO RIGID BARRIER -  
TRAILING ENDS**

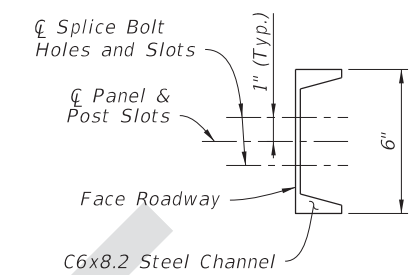
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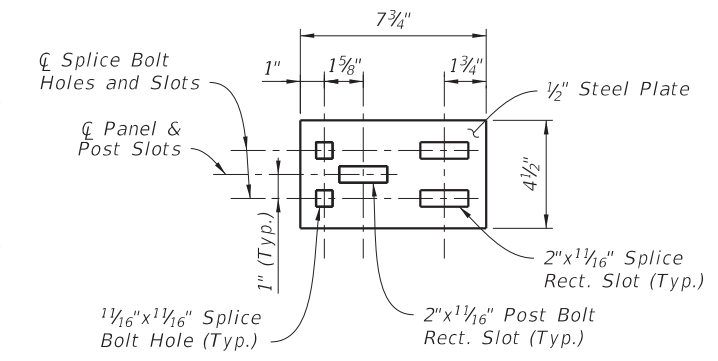




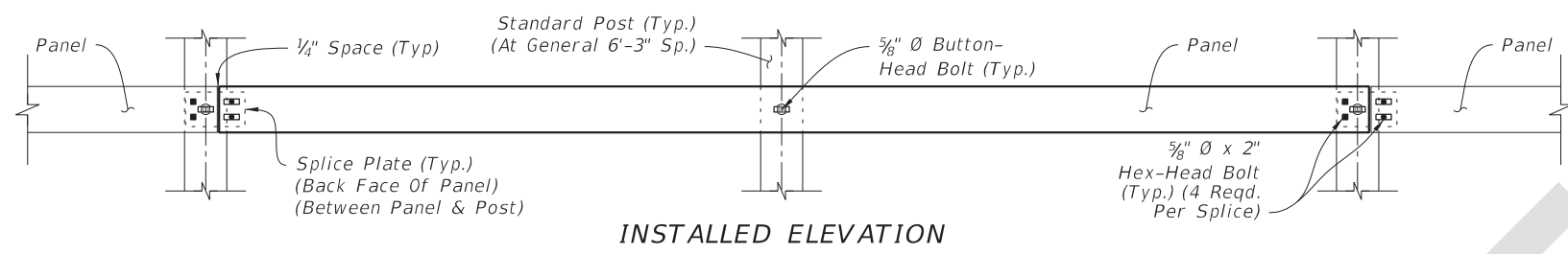
PANEL ELEVATION



SECTION A-A  
(Panel Typical)

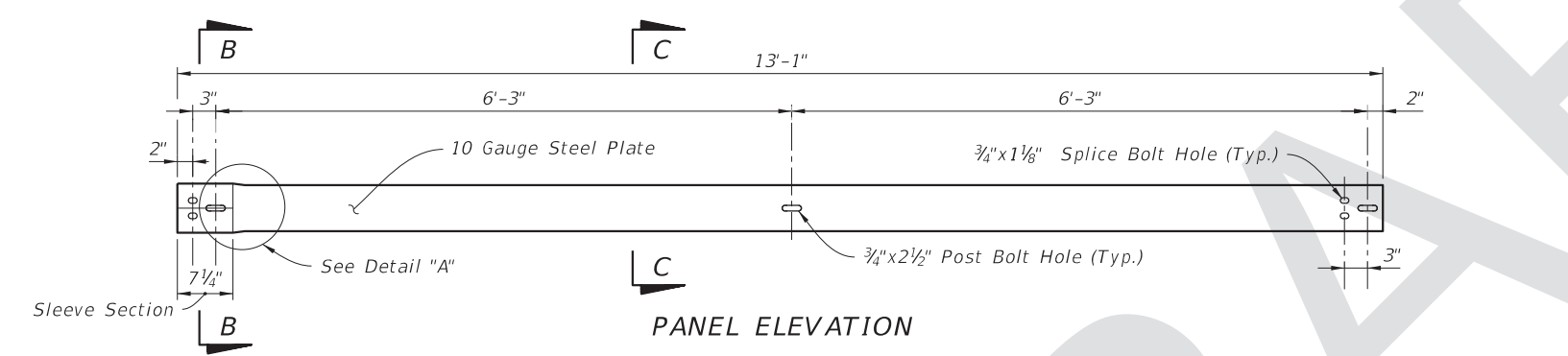


SPLICE PLATE  
ELEVATION

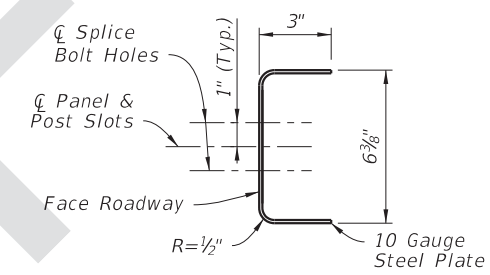


INSTALLED ELEVATION

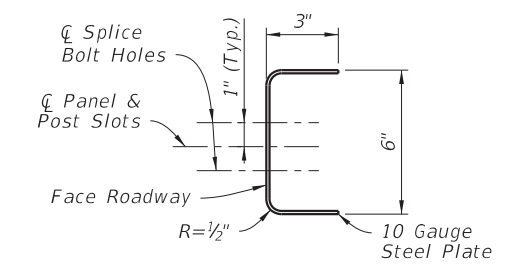
CHANNEL SECTION RUB RAIL



PANEL ELEVATION



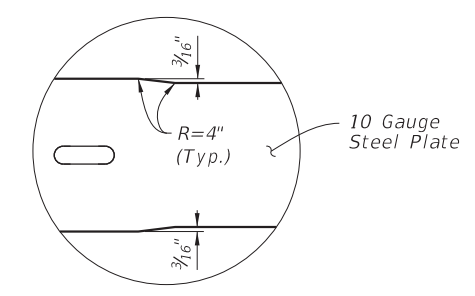
SECTION B-B  
(Panel Sleeve End)



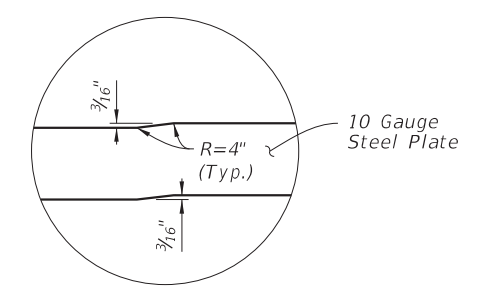
SECTION C-C  
(Panel Typical)



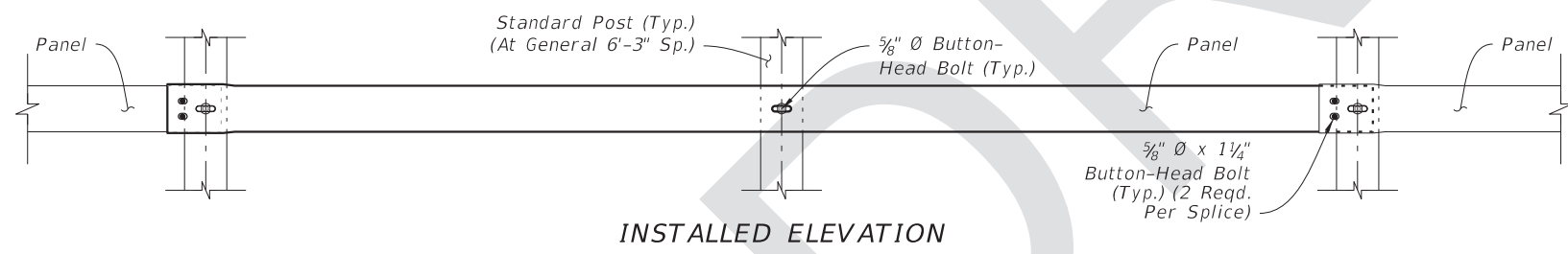
PANEL PLAN



DETAIL "A"  
(Sleeve Transition Elevation)

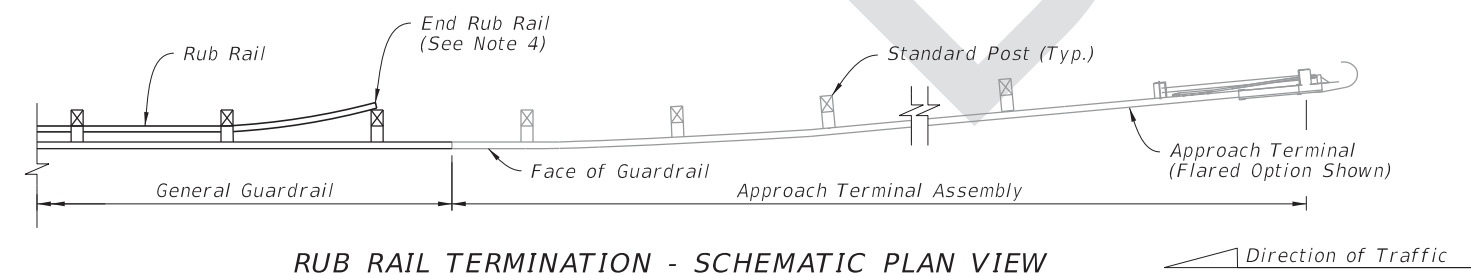


DETAIL "B"  
(Sleeve Transition Plan)



INSTALLED ELEVATION

BENT-PLATE PANEL RUB RAIL



RUB RAIL TERMINATION - SCHEMATIC PLAN VIEW

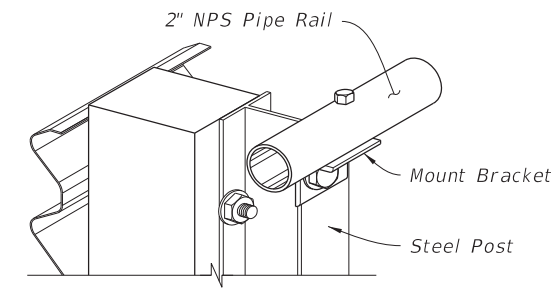
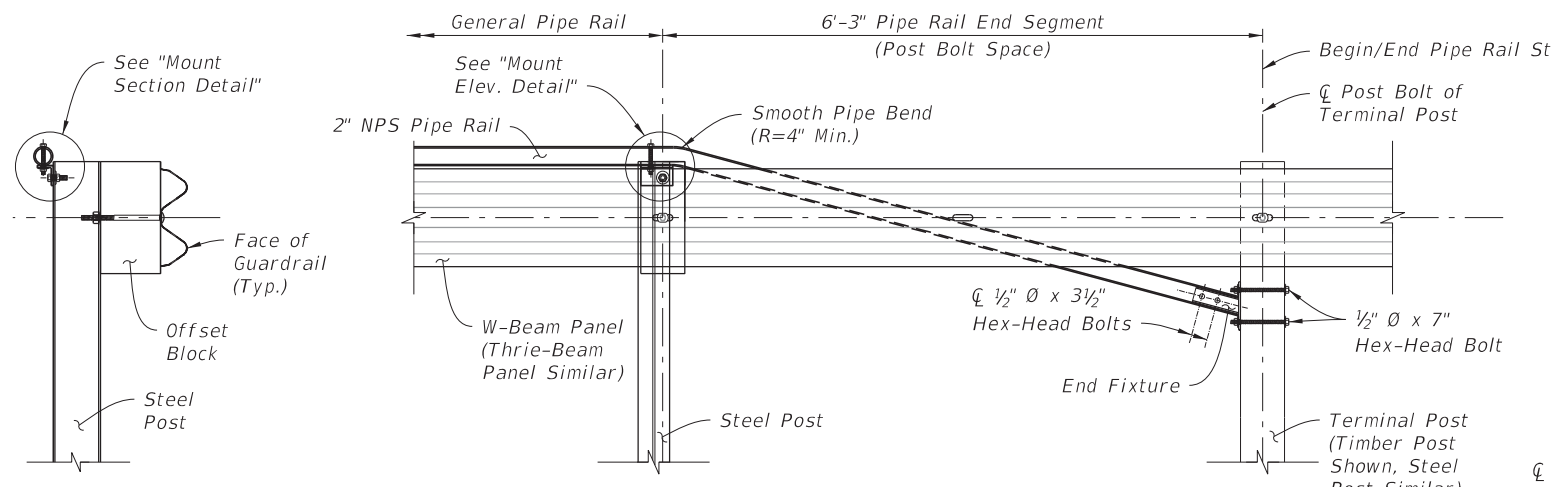
NOTES:

1. GENERAL: Install Rub Rail where called for in the plans. Position as shown on Sheet 6 unless otherwise shown in the plans. Install the backs of Rub Rail panels flush against Standard Posts. Either of the Channel Section or Bent-Plate Panel Rub Rail options may be used (consistent type per project). Where Double Sided Rub Rail is called for, thread the Bottom-Head Bolt through the Post Bolt Hole(s) and the panels on either side, and tighten the nut against the face of the panel farthest from adjacent traffic lanes. Trim the bolt's threaded portion in accordance with Note 4 on Sheet 5.
2. MOUNTING HEIGHT: Mount to the Standard Post's Rub Rail Bolt Hole as defined on Sheet 5.
3. MATERIALS: Use steel components in accordance with Specification Section 967.
4. END RUB RAIL: For Single Sided Rub Rail, terminate the run of Rub Rail by bending the panel behind the post and securing in place (as shown). For Double Sided Rub Rail, terminate the runs of Rub Rail on their respective front face of the post and secure with the typical Button-Head bolt.

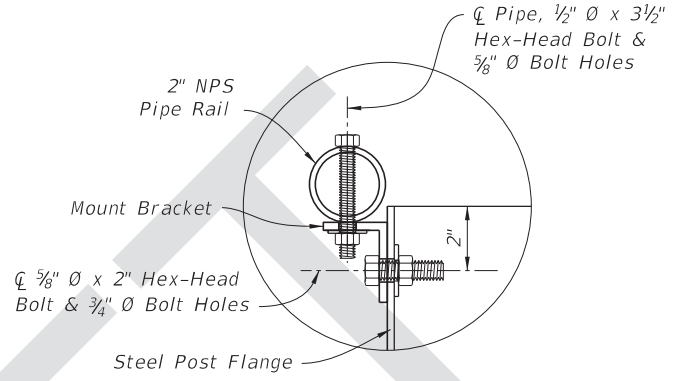
RUB RAIL DETAILS

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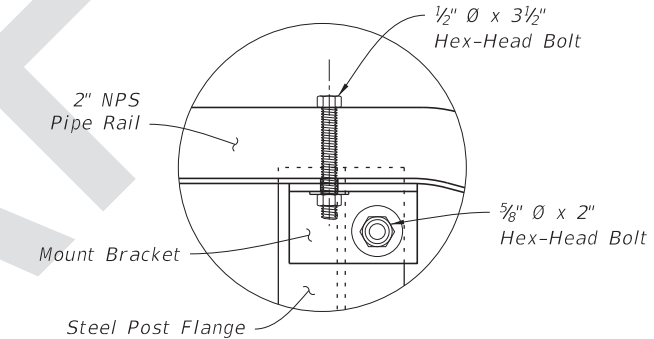
LAST REVISION 11/01/17	DESCRIPTION:		FY 2018-19 STANDARD PLANS	GUARDRAIL	INDEX	SHEET
					536-001	19 of 22



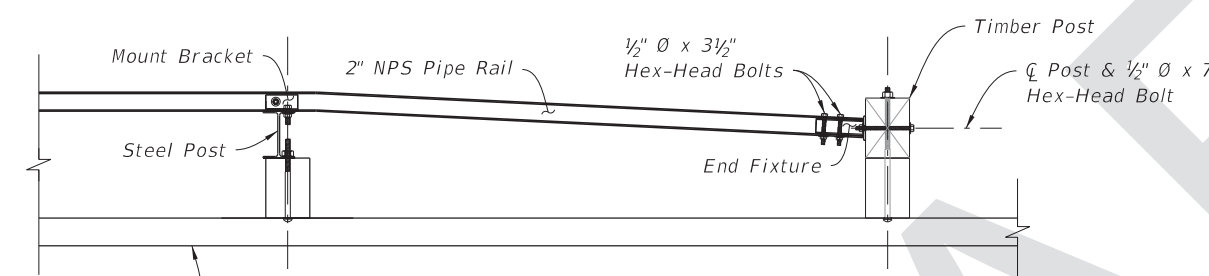
**MOUNT ISOMETRIC CUT-AWAY**



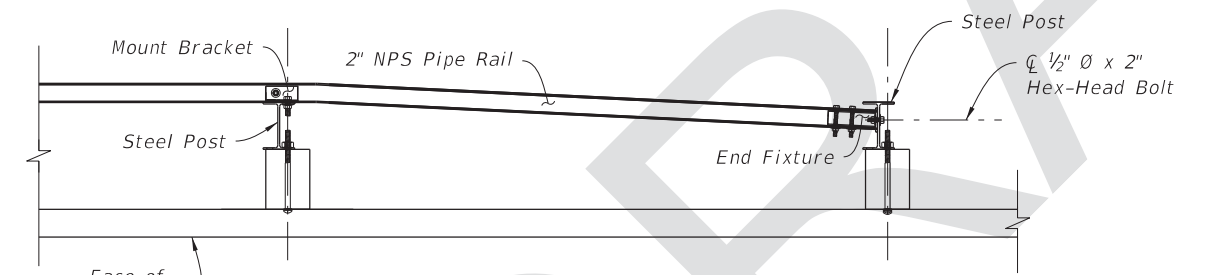
**MOUNT SECTION DETAIL**



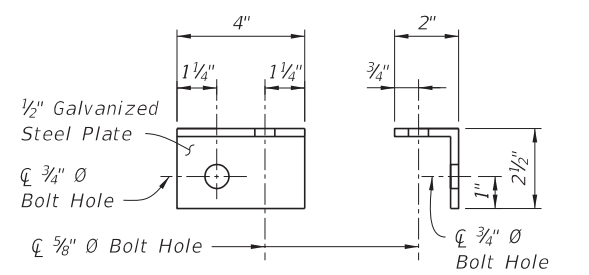
**MOUNT ELEVATION DETAIL (Back View - Mirrored)**



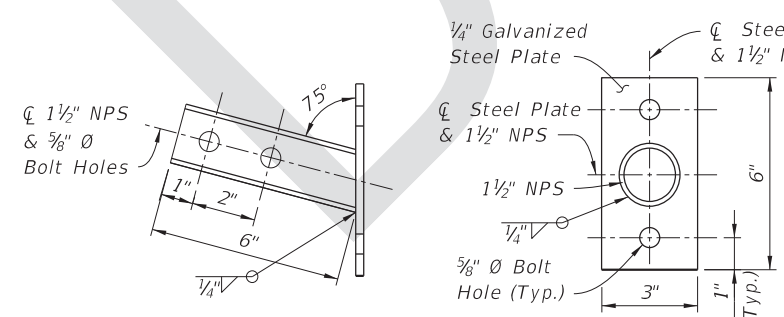
**PIPE RAIL INSTALLED PLAN END AT TIMBER POST OPTION**



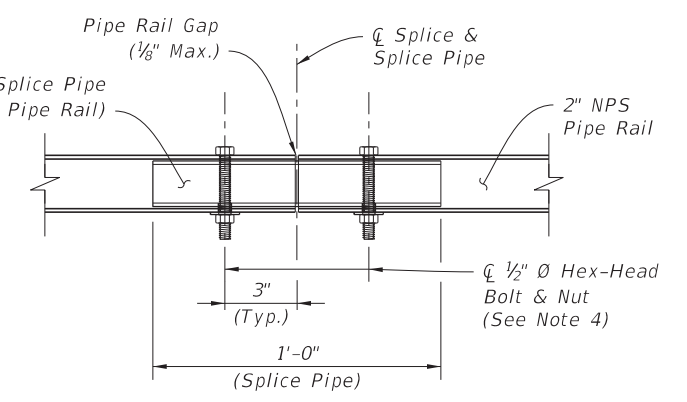
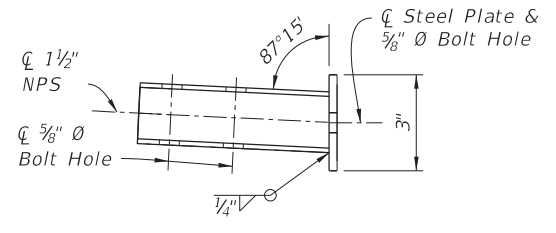
**PIPE RAIL INSTALLED PLAN END AT STEEL POST OPTION**



**MOUNT BRACKET DETAIL**



**END FIXTURE DETAIL**



**RAIL SPLICE DETAIL**

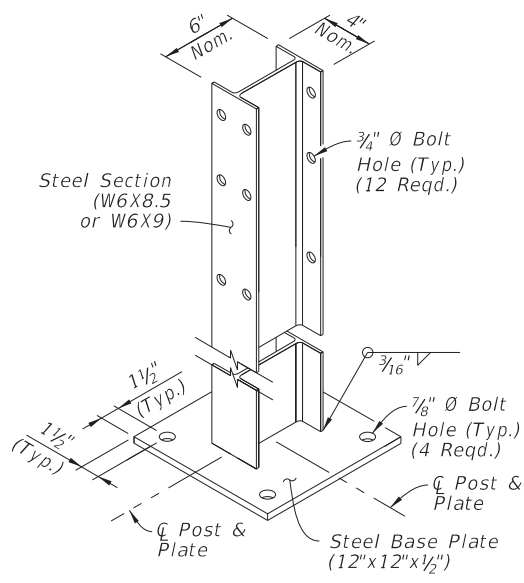
- NOTES:**
1. GENERAL: Install General Pipe Rail where indicated in the plans or when existing sidewalks or shared use paths are located less than 4'-0" from the back of Steel Posts as shown on Sheet 6.
  2. PIPE RAIL END SEGMENTS: Place End Segments on both ends of General Pipe Rail runs, with End Fixtures mounted to Timber Posts located outside of Approach Terminal Assembly ('LE'), Trailing Anchorage Assembly ('LT'), and Approach Transition ('LA') segments.
  3. MATERIALS: Use steel brackets, fixtures, and pipes in accordance with Specification Section 967.
  4. RAIL SPLICES: Install Rail Splices to join pieces of 2" NPS Pipe Rail into a continuous system. Place splices as needed, at a spacing of 18'-0" or greater. Orient the head of bolt on the top of the pipe.

**PEDESTRIAN SAFETY TREATMENT - PIPE RAIL**

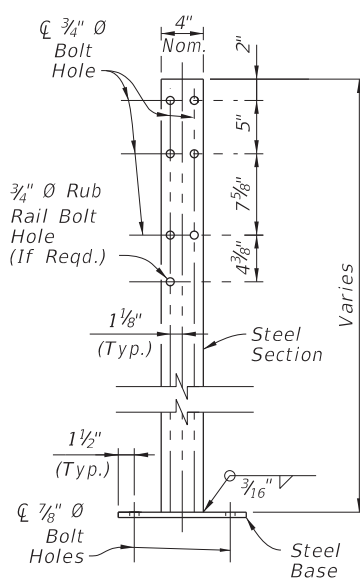
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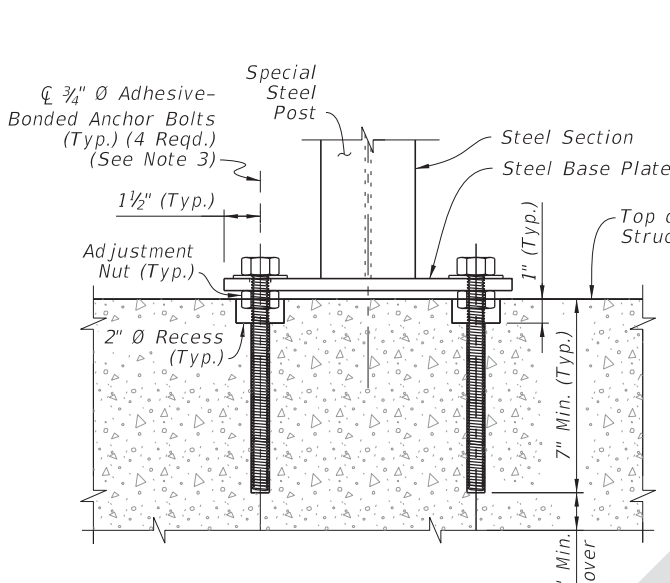




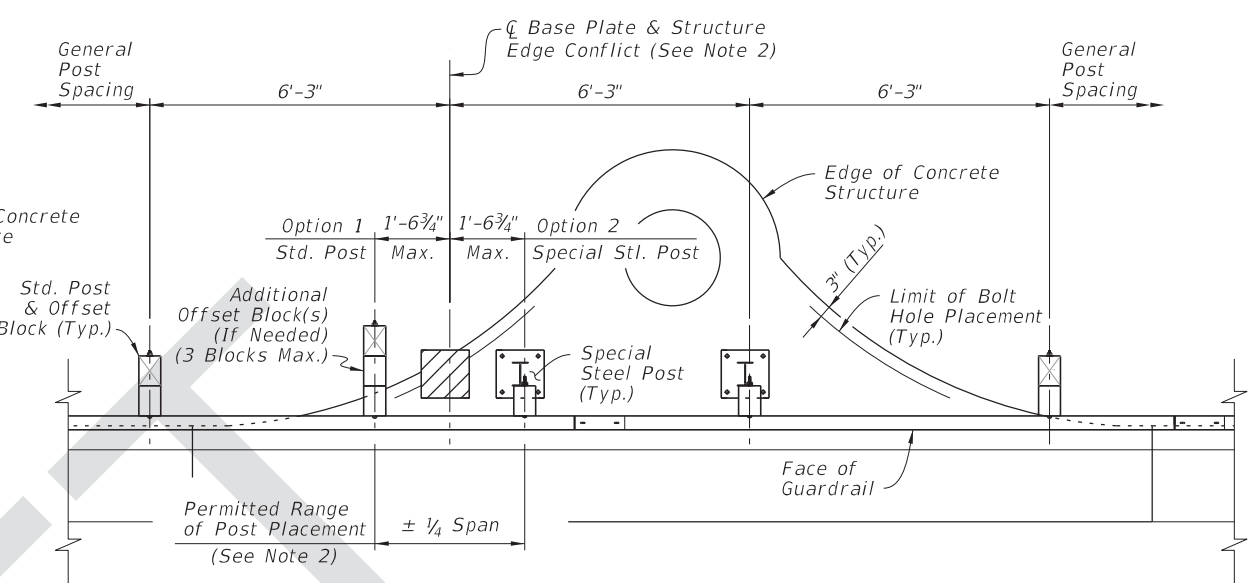
ISOMETRIC VIEW



ELEVATION



INSTALLED SECTION (Option 2, Special Post)



INSTALLED PLAN EXAMPLE (Curb Inlet Top Type 2 Shown)

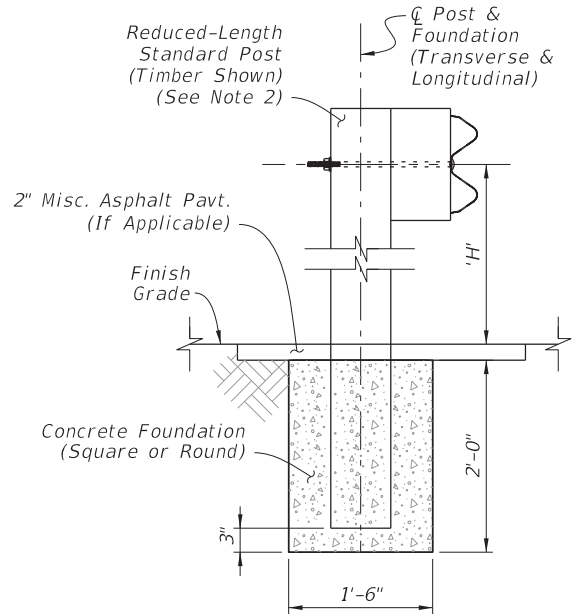
SPECIAL STEEL POST

STRUCTURE MOUNTING

NOTES:

- INSTALLATION:** When the construction of Guardrail at the required post spacing results in post(s) located atop culverts, inlets, pier footings, or similar concrete structures, a Special Steel Post may be substituted for a Standard Post. Install where shown in the plans and/or as-needed, in accordance with Specification Section 536.
- EDGE CONFLICT:** When a required post location causes an Edge Conflict with the structure, where the Steel Base Plate is not located entirely on the structure at least 3" from the Edge of Concrete, the longitudinal post location may be altered by up to 1'-6 3/4" (Quarter Span) from the original required spacing location to prevent the Edge Conflict. With the post location adjusted, use a Std. Post mounted in soil (Option 1) or a Special Steel Post with its Base Plate mounted entirely on the structure (Option 2). Maintain the original required spacing locations upstream and downstream of the structure.
- BASE PLATE MOUNT:** Install Special Steel Posts as shown using steel Adhesive-Bonded Anchor Bolts in accordance with Specifications Section 536. Use 3/4" Hex-Head Bolts for structures less than 9" deep as defined in the Specification.
- PANEL MOUNT TO ADJUSTED POST:** Punch additional 3/4"x2 1/2" Post Bolt Slot(s) in the W-Beam or Thrie-Beam Panel only where needed to mount the panel to a post in an adjusted location. Meet the Panel Post Bolt Slots requirements of Specification Section 536.
- MATERIALS:** Use steel base plates in accordance with Specification Section 536.

SPECIAL STEEL POST FOR CONCRETE STRUCTURE MOUNT

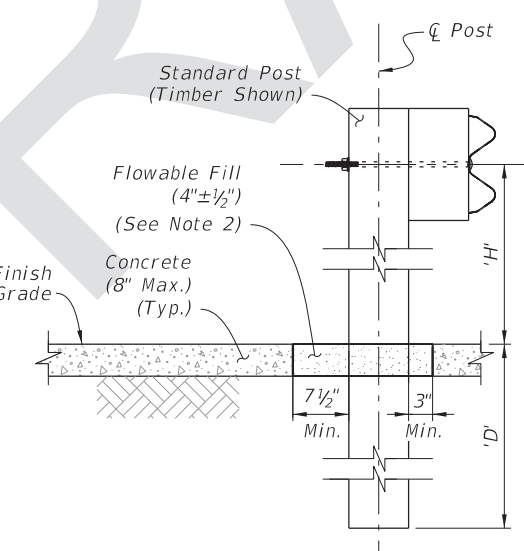


INSTALLED SECTION

ENCASED POST FOR SHALLOW MOUNT

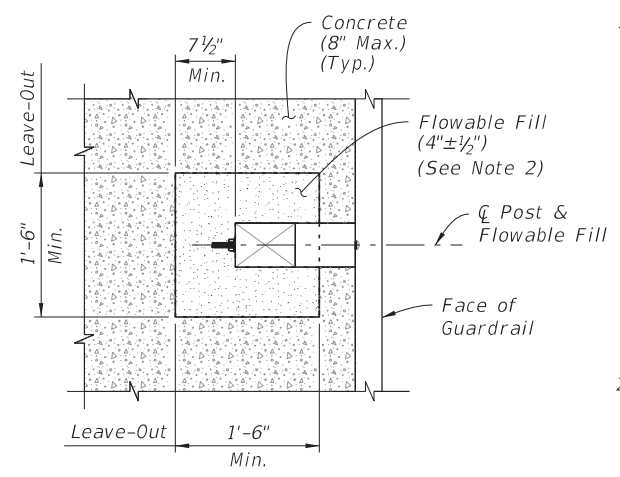
NOTES:

- INSTALLATION:** When the construction of Guardrail at the required post spacing results in post(s) conflicting with underground utilities or other underground obstructions, an Encased Post may be used where a 2'-0" depth will avoid the conflict. Install where shown in the plans and/or as-needed, in accordance with Specification Section 536.
- REDUCED-LENGTH STANDARD POST:** Use a Standard Post with reduced length such that the Panel Height 'H' is maintained while the post bottom terminates 3" from the bottom of the Concrete Foundation. Typically, the Post Length 'L' is 4'-7" for W-Beam Guardrail.
- FOUNDATION:** Use non-reinforced Class NS Concrete material in accordance with Specification Section 347. After casting the concrete, ensure the surrounding soil material is completely backfilled and tamped to provide full passive resistance.
- LIMIT:** Encased Posts are not permitted for consecutive posts unless otherwise shown in the plans.



INSTALLED SECTION

FRANGIBLE LEAVE-OUT FOR CONCRETE SURFACE MOUNT



INSTALLED PLAN

NOTES:

- INSTALLATION:** When the construction of Guardrail at the required post spacing results in post(s) placed within a concrete surface (typically a sidewalk), use a Frangible Leave-Out around the post base as shown. Install where shown in the plans and/or as-needed, in accordance with Specification Section 536. For the required 1'-6" x 1'-6" Leave-Out, smoothly cut the existing concrete surface or form-up the square shape when an application has new surrounding concrete. Ensure Flowable Fill surface is smooth and even with the adjacent concrete surface.
- MATERIALS:** Use Non-Excavatable Flowable Fill in accordance with Specification Section 121, not to exceed 150 psi.

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LAST REVISION 11/01/17	DESCRIPTION:	FDOT	FY 2018-19 STANDARD PLANS	GUARDRAIL	INDEX 536-001	SHEET 21 of 22
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