ORIGINATION FORM

Proposed Revisions to a Standard Plans Index

(Please provide all information – Incomplete forms will be returned)

Contact Information:

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Standard Plans:

Index Number: 536-001
Sheet Number (s): Sheets 1, 9, 10, 17, 18, & 22
Index Title: Guardrail

Summary of the changes:

Sheet 1: Make washers required under nut for all cases; Remove "Type II" from Table of Contents
Sheet 9: Update Trailing Anchorage design and remove "Type II" designation (Move to "Ground Strut" System)
Sheet 10: Lengthen Steel Tube Foundation (depth) by one foot; Add new detail for Ground Strut (C Channel Shape)
Sheet 17 & 18: Added "If Applicable" statement to transition segment for Crash Cushion for new policy
Sheet 18: Update Trailing Anchorage drawing and remove "Type II" designation
Sheet 22: In Washer detail title, remove "Type II" designation, replace with "Trailing Anchorage"

Commentary / Background:

The "Trailing Anchorage - Type II" end treatment is being replaced by a new design in order to align with more recent crash test studies. The updated end treatment will then be renamed to "Trailing Anchorage" (not Type II), and it will have a new Pay Item. Also, the trailing end Length of Need design will be updated in the SPI.

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

Yes	No	
☐	☐	Other Standard Plans –
☐	☐	FDOT Design Manual –
☑	☐	Basis of Estimates Manual – Melissa Hollis
☐	☐	Standard Specifications –
☐	☐	Approved Product List –
☐	☐	Construction –
☐	☐	Maintenance –

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

Yes	N/A	
☑	☐	Redline Mark-ups
☐	☐	Proposed Standard Plan Instructions (SPI)
☑	☐	Revised SPI
☐	☐	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

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2	General, TL-3 Guardrail - Installed Plan and Elevation
3	Low-Speed, TL-2 Guardrail - Installed Plan and Elevation
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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; ⅝" Button-Head Bolt System

Removed "Type II"

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 ℄ 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.

Removed Optional Case for Washers - Required All Cases

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 ± ½" 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 1½" 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'-4½" or 15'-7½" 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 ℄ of the panel's post bolt slots at the approach/trailing ends).

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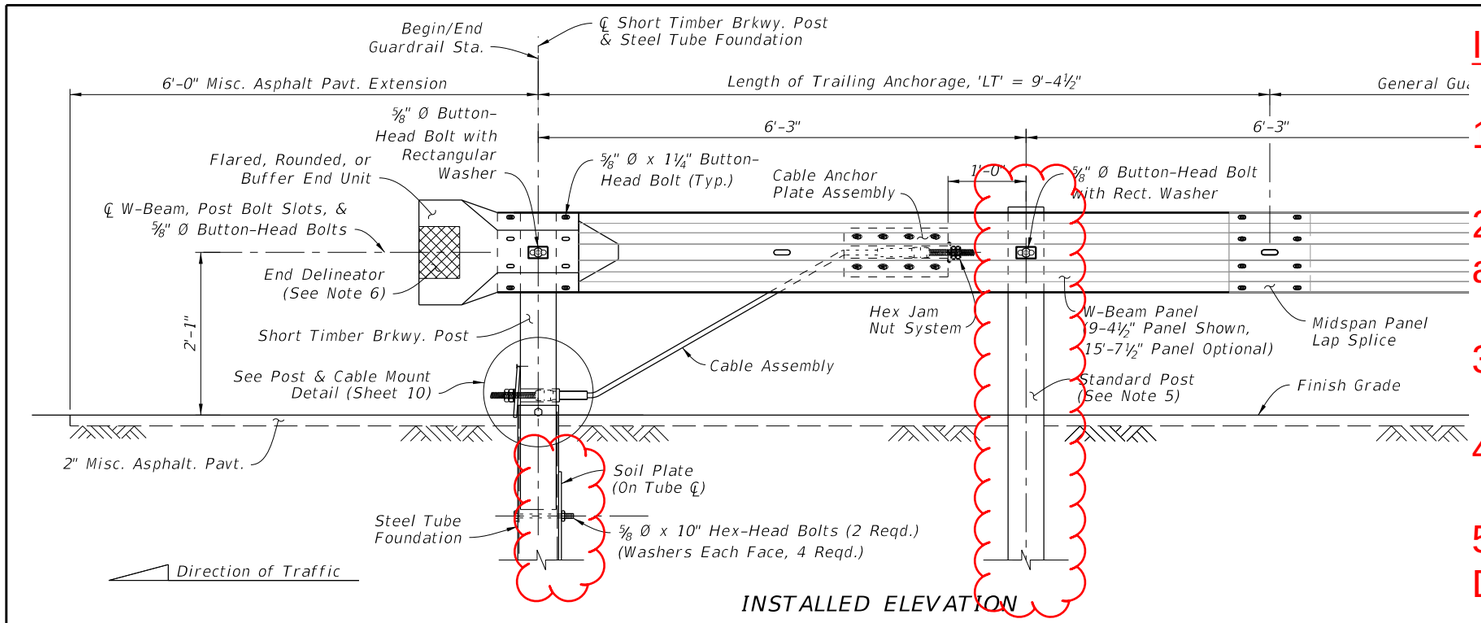
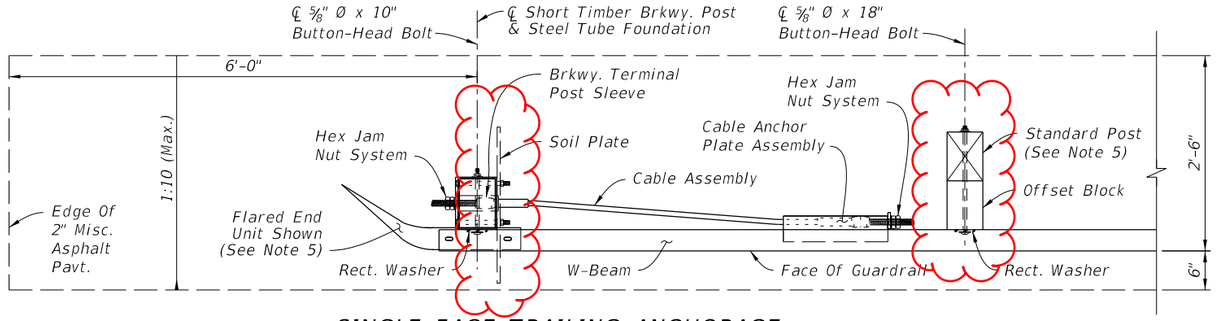
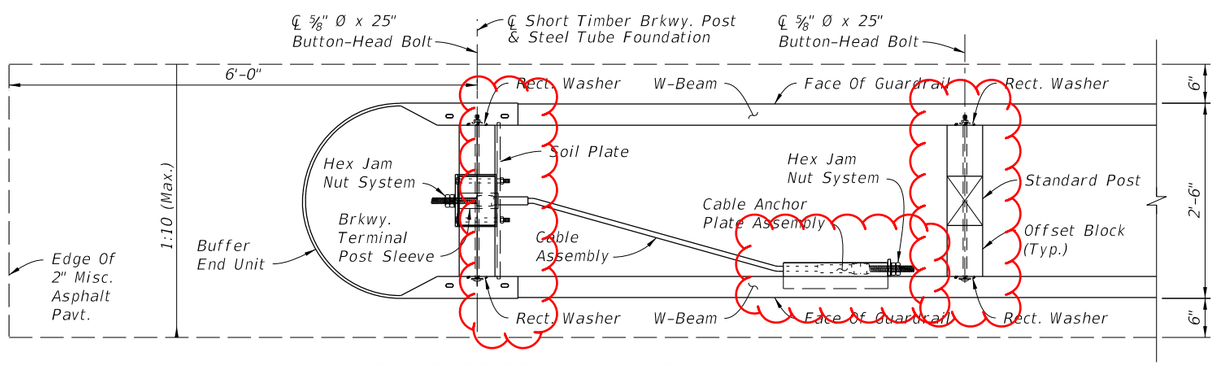


INSTALLED ELEVATION



SINGLE FACE TRAILING ANCHORAGE
INSTALLED PLAN



DOUBLE FACE TRAILING ANCHORAGE
INSTALLED PLAN

In Installed Plan & Elevation Views:

1. Removed Soil Plate
2. Added Breakaway Post and Steel Tube Foundation at Second Post Location
3. Removed Offset Block at Second Post Location
4. Added Ground Strut Supports
5. Moved Cable Anchor Plate to Opposite Side of Double Face Trailing Anchorage

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.

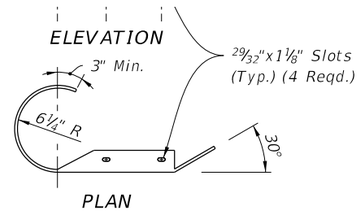
   Lap the Flared End Unit behind the W-Beam; lap the Rounded and Buffered End Units over the face of the W-Beam.
3. FOUNDATIONS: Install Steel Tubes with attached Soil Plates by either of the following methods:

   a. Excavate, backfill, and compact material to provide full passive soil resistance to all surfaces of the Tube and Soil Plate.

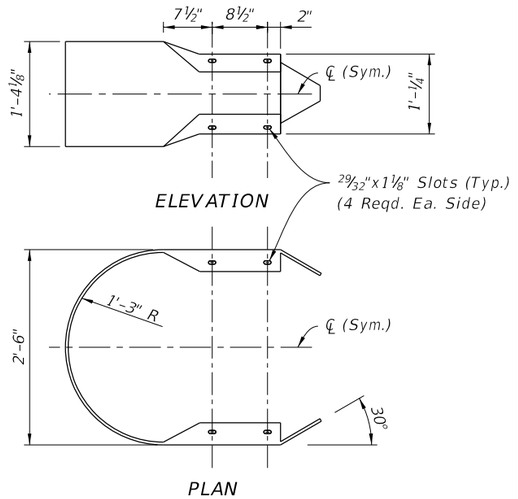
   b. Drive the Tube and Soil Plate as a single unit using a dummy timber post to prevent damage to the Breakaway Post.
4. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Transitions, Low-Speed Guardrail, or Reduced 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 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 Removed Post Verbiage ent Steel Pos
6. END DELINEATOR: Mount retroreflective sheeting to the approach face of the End Unit in accordance with Specification Sections 536 and 967.

Removed "Type II"



ROUNDED END UNIT



BUFFER END UNIT

Removed "Type II"

END TREATMENT - TRAILING ANCHORAGE, TYPE II

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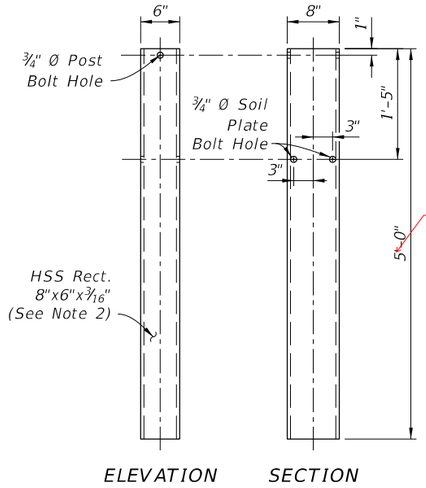
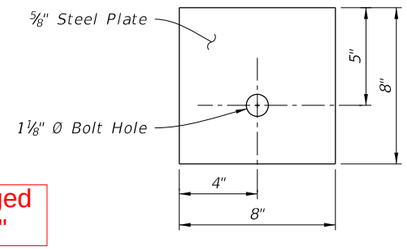


ELEVATION SECTION

STEEL TUBE FOUNDATION

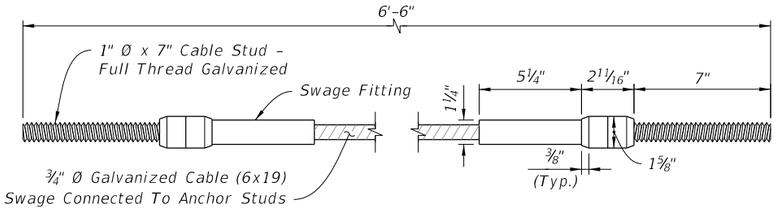
Changed to 6'-0"



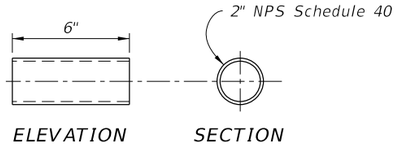
SECTION

BEARING PLATE

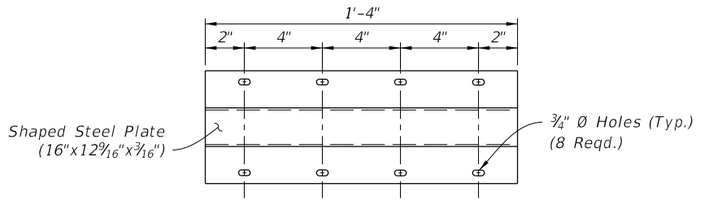
Added New Ground Strut Detail



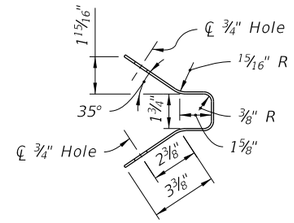
CABLE ASSEMBLY



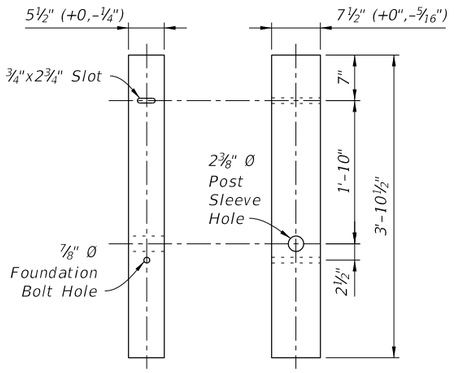
ELEVATION SECTION



ELEVATION



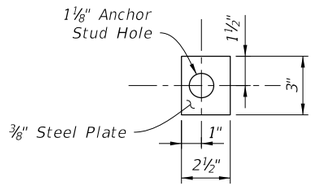
SECTION



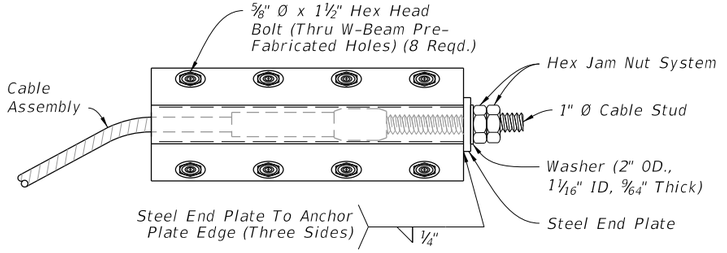
ELEVATION SECTION

SHORT TIMBER BREAKAWAY POST (6"x8" Nom.)

BREAKAWAY TERMINAL POST SLEEVE

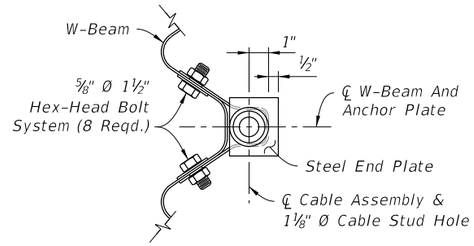


STEEL END PLATE



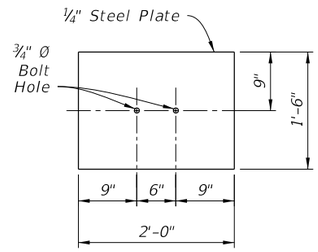
ELEVATION

CABLE ANCHOR PLATE



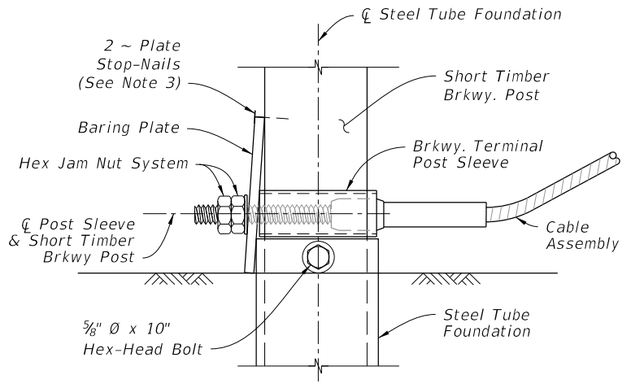
SECTION

CABLE ANCHOR PLATE ASSEMBLY



SECTION

SOIL PLATE



ELEVATION

POST & CABLE MOUNT ASSEMBLY

NOTES:

1. INSTALLATION: Use components as shown on Sheets 9 & 11.
2. MATERIALS: Use steel Plates and Cable Assemblies in accordance with Specification Section 967.

   Use Short Timber Breakaway Posts and Steel Tube Foundations in accordance with Specification Section 536.

   Use Hex Nuts, Hex Jam Nuts, and Washers in accordance with the AASHTO-AGC-ARTBA Guide to Standardized Barrier Hardware with English unit equivalents of components FNX24a and FWC24a, respectively. Two Hex Nuts may be used for the Hex Jam Nut System.
3. PLATE STOP-NAILS: To prevent rotation of the Bearing Plate, drive steel 2½" Type 8d nails with ASTM A153 hot-dip galvanization.
4. CABLE ANCHOR PLATE ASSEMBLY INSTALLATION: Mount to the pre-fabricated Cable Anchor Plate Bolt Holes in the W-Beam Panel, as shown on Sheet 4. These panel holes are only permitted for this Cable Anchor Plate Assembly application.

END TREATMENT - COMPONENT DETAILS

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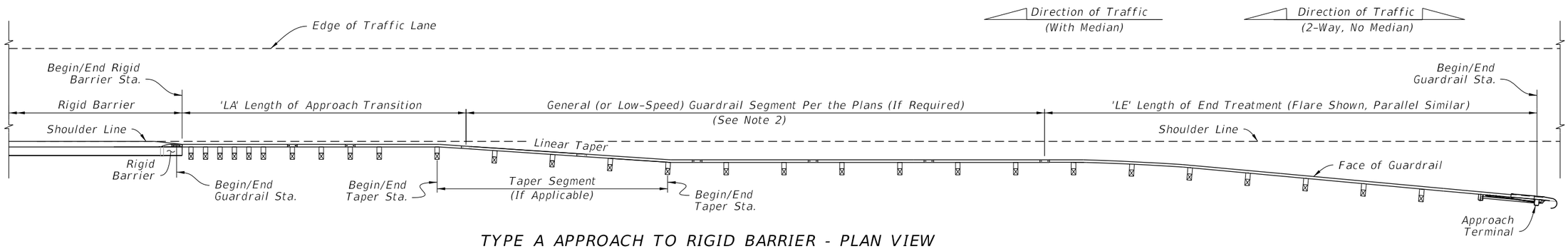
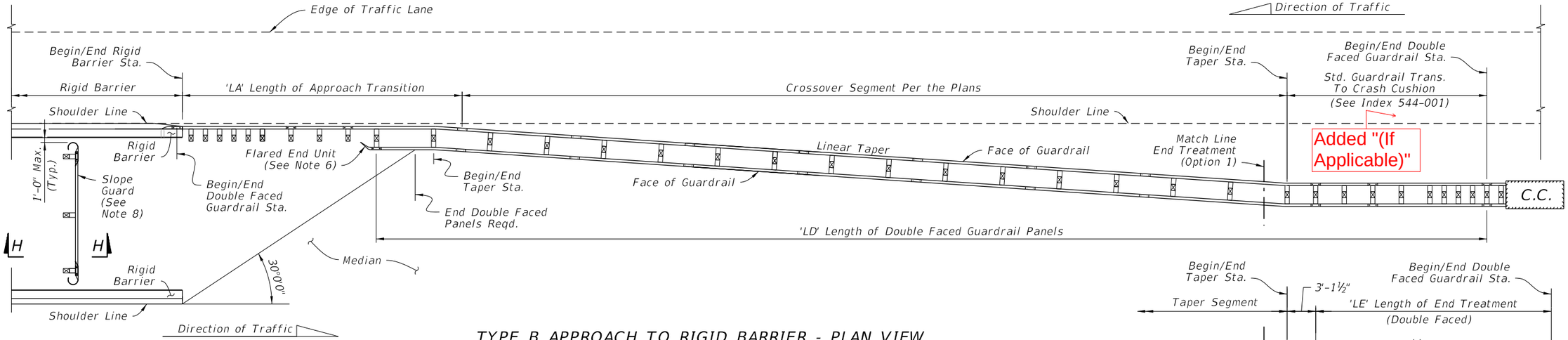
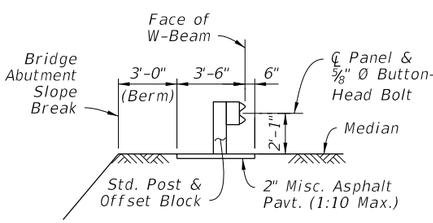


TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW
MEDIAN OR OUTSIDE SHOULDERS
(Mirror Horiz. and/or Vert. for Opposite Direction and/or Side of Road)



TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW
CROSSOVER GUARDRAIL FOR MEDIAN SHOULDERS ONLY
DUAL BRIDGE APPROACH CONFIGURATION
(Mirror Horiz. and Vert. for Opposite Direction)



SECTION H-H
BRIDGE ABUTMENT
SLOPE GUARD
(Between Bridges)

NOTES:

1. *INSTALLATION: The Plan Views shown are schematic only, showing example geometry for connecting guardrail segments including taper locations and Double Faced Guardrail requirements as applicable. Work this Sheet with the plans, where stationing and offsets for Begin/End Guardrail, Begin/End Rigid Barrier, and Begin/End Taper are specified. For existing bridge layouts, see Index 536-002, 521-404, and 521-405.*

2. *GENERAL (OR LOW-SPEED) GUARDRAIL SEGMENT: Construct this segment if shown in the plans. For the case where this segment's offset differs from the Approach Transition offset, linearly taper the guardrail between the Begin/End Taper Stations and offsets as specified in the plans.*

   For the shortest length case of a direct connection between the End Treatment and the Approach Transition, this segment may be omitted as shown in the plans.

3. *LENGTH OF APPROACH TRANSITION 'LA': Install the Approach Transition as shown per Sheet 13 or 14 as called for in the plans.*

4. *LENGTH OF END TREATMENT 'LE': Install the Approach Terminal End Treatment as shown per Sheet 7 or 8, where called for in the plans. Use the corresponding APL drawings for construction details.*

5. *CROSSOVER GUARDRAIL (FOR TYPE B APPROACH): Install the Crossover Segment tapering linearly from the Begin Taper Sta. and offset to the End Taper Sta. and offset as specified in the plans.*

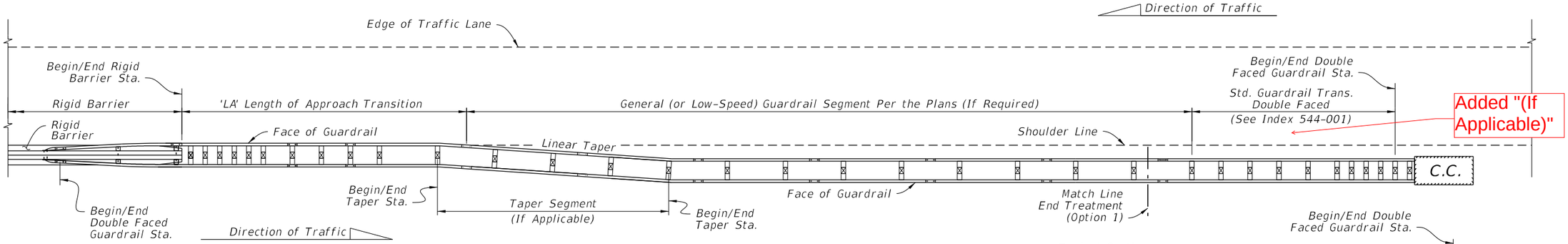
6. *LENGTH OF DOUBLE FACED GUARDRAIL PANELS, 'LD' (FOR TYPE B APPROACH): Terminate the Double Faced Guardrail panels as shown (based upon the 30° line measured from the hazard on the opposite side of the median). Extend the panel segment longer than the dimension 'LD' as needed for the Panel's end Bolt Slot to align with a post Bolt hole.*

   Install a Flared End Unit where shown, as defined on Sheet 9.

7. *END TREATMENT OPTIONS (FOR TYPE B & C APPROACH): For Double Faced applications, use either a Double Faced Approach Terminal Assembly per Sheet 8 or a Crash Cushion per Index 544-001. For either Option, meet the 1:10 adjacent grading requirements for Approach Terminals as shown on Sheet 8.*

8. *SLOPE GUARD: Where indicated in the plans, install a Guardrail segment between bridge approaches and offset from the bridge abutment's Slope Break as shown. Install posts at the end bolt slots of the panel system. Use post spacing of either 3'-1½" or 6'-3", as needed to correctly fit system between barriers. The system may also be lengthened to fit by installing two Rounded End Units as defined on Sheet 9.*

LAYOUT TO RIGID BARRIER - APPROACH ENDS

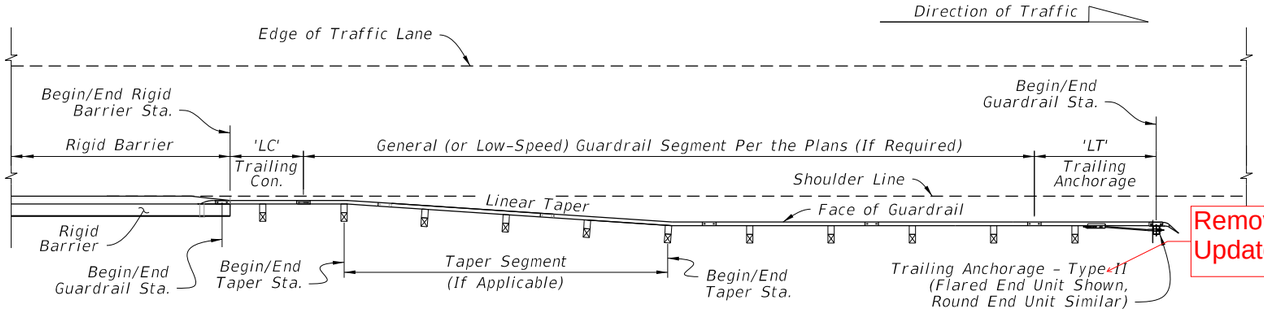


NOTES:

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)

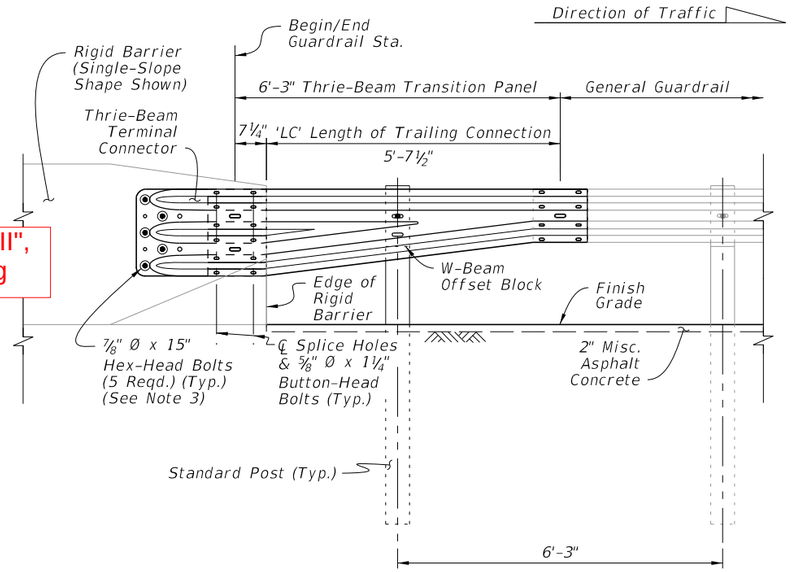
LAYOUT TO RIGID BARRIER - APPROACH ENDS WITH DOUBLE FACED GUARDRAIL



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. Removed "Type II"
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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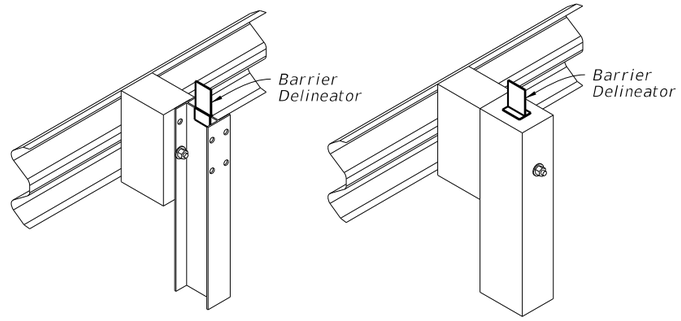
NOTES:

1. INSTALLATION: Install Barrier Delineators as shown in accordance with the plans, with Specifications Section 536 and 705, and with the manufacture's design as approved on the APL.
2. MATERIALS: Use materials of the size and type defined for Barrier Delineators in Specifications Section 993.
3. COLOR: Use either white or yellow retroreflective sheeting to match the color of the nearest lane's edgeline.
4. MOUNT LOCATIONS: Mount Barrier Delineators atop posts as shown, starting with Post (3) of Approach Terminals and incrementally increasing spacing towards the downstream direction. Install the Barrier Delineators at the following spacing:

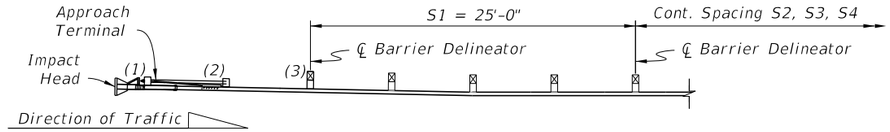
   S1 = 25' x 1 Space
   S2 = 50' x 1 Space
   S3 = 75' x 1 Space
   S4 = 100' x for the Remaining Run

   Additionally, place a Barrier Delineator on Post (2) of the Trailing Anchorage or on the post nearest the Rigid Barrier.
5. MEDIAN GUARDRAIL: Install retroreflective sheeting on both sides of the barrier delineator for Guardrail on medians.



STEEL POSTS TIMBER POSTS

MOUNT LOCATION - ISOMETRIC VIEWS



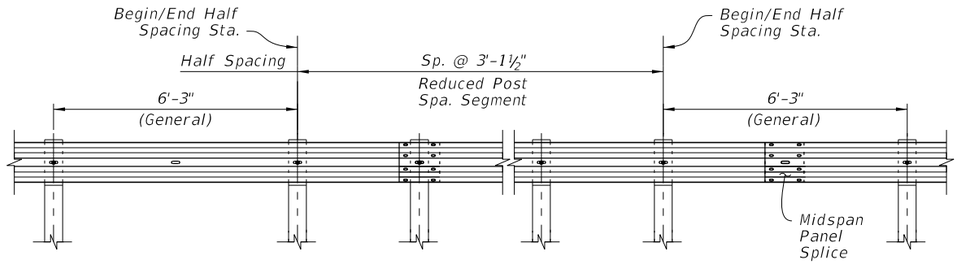
MOUNT LOCATION - PLAN VIEW

BARRIER DELINEATORS

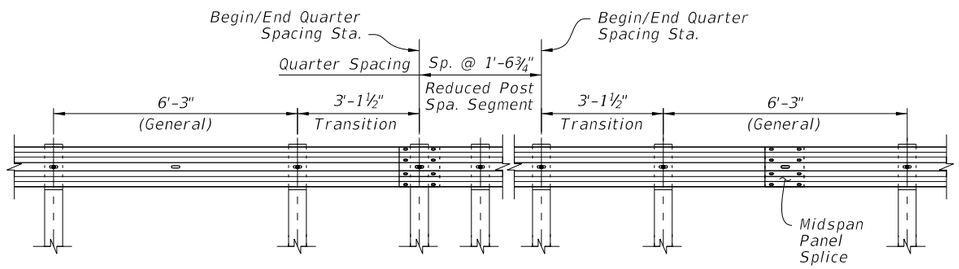
NOTES:

1. INSTALLATION: Work these details with the plans, where Stationing for Begin/End Half Spacing and Begin/End Quarter Spacing are indicated if required.

   Where the Begin/End Stations indicated in the plans do not correspond exactly to post locations in construction, extend the Reduced Post Spacing segment to the nearest post(s) before the Begin Station and/or after the End Station called for.
2. PANEL SPLICES: Midspan Panel Splices are not required in Transition and Reduced Post Spacing segments, however they are required for General segments. To place midspan splices in General segments, use one Non-General panel length (9'-4½" or 15'-7½") or add an additional Transition spaced post where required.
3. LOW-SPEED GUARDRAIL: For Reduced Post Spacing with Low-Speed Guardrail (12'-6" post spacing), the Reduced Spacing pattern requires a 6'-3" space between the 12'-6" and 3'-1½" spaces.
4. PANEL POST BOLT SLOTS: For Quarter Spacing configurations, punch additional ¾"x2½" Post Bolt Slots in the panels only where required for mounting and in accrodance with Specification Section 536.

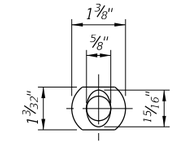


DETAIL 'S' - HALF SPACING ELEVATION
(AS REQ'D. PER THE PLANS)

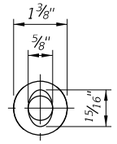


DETAIL 'S' - QUARTER SPACING ELEVATION
(AS REQ'D. PER THE PLANS)

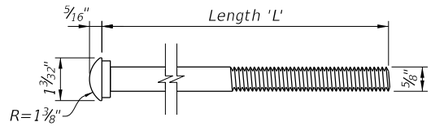
REDUCED POST SPACING FOR HAZARDS



ELEVATION OPTION 1

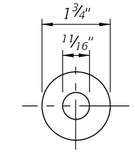


ELEVATION OPTION 2

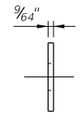


PROFILE (Option 1 Shown)

BUTTON-HEAD BOLT

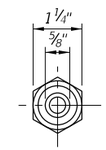


ELEVATION

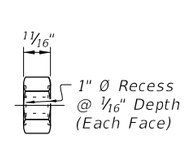


PROFILE

WASHER

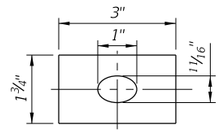


ELEVATION

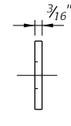


PROFILE

HEX-NUT



ELEVATION



PROFILE

RECTANGULAR WASHER
(For Type II, CRT, & Terminal Connectors Where Shown - Install Over Panel Face)

Removed "Type II", Added "Trailing Anchorage"

BUTTON-HEAD BOLT LENGTHS:

Application(s):	Length 'L':	Min. Thread Length:
Panel Splice	1¼"	Full Length
Steel Post Mount – Single Faced Guardrail	10"	4"
Timber Post Mount – Single Faced Guardrail	18"	4"
Steel or Timber Post Mount – Double Faced Guardrail	25"	4"
Modified Thrie-Beam Panel / Terminal Connector Splice	2"	Full Length

NOTES:

1. Use nuts, bolts, and washers in accordance with Specification Section 967.
2. For Steel Posts with Double Faced Guardrail, the single 25" Length bolt (one bolt thru both post flanges) may be replaced with two 10" Length bolts (one bolt per post flange).
3. Use bolts listed in Table 2 in corresponding locations shown in this Index.

⅝" BUTTON-HEAD BOLT SYSTEM

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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
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; ⅝" Button-Head Bolt System

GENERAL NOTES:

1. INSTALLATION: Construct guardrail in accordance with Specification 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 ℄ 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. 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 967. Place washers under nuts.

6. MISCELLANEOUS ASPHALT PAVEMENT: Install Miscellaneous Asphalt Pavement where indicated with a tolerance of ± ½" depth and in accordance with Specification 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 562.
   b. Use post bolts 15" in length and countersink the washer and nut between 1" and 1½" 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'-4½" or 15'-7½" 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 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 ℄ of the panel's post bolt slots at the approach/trailing ends).

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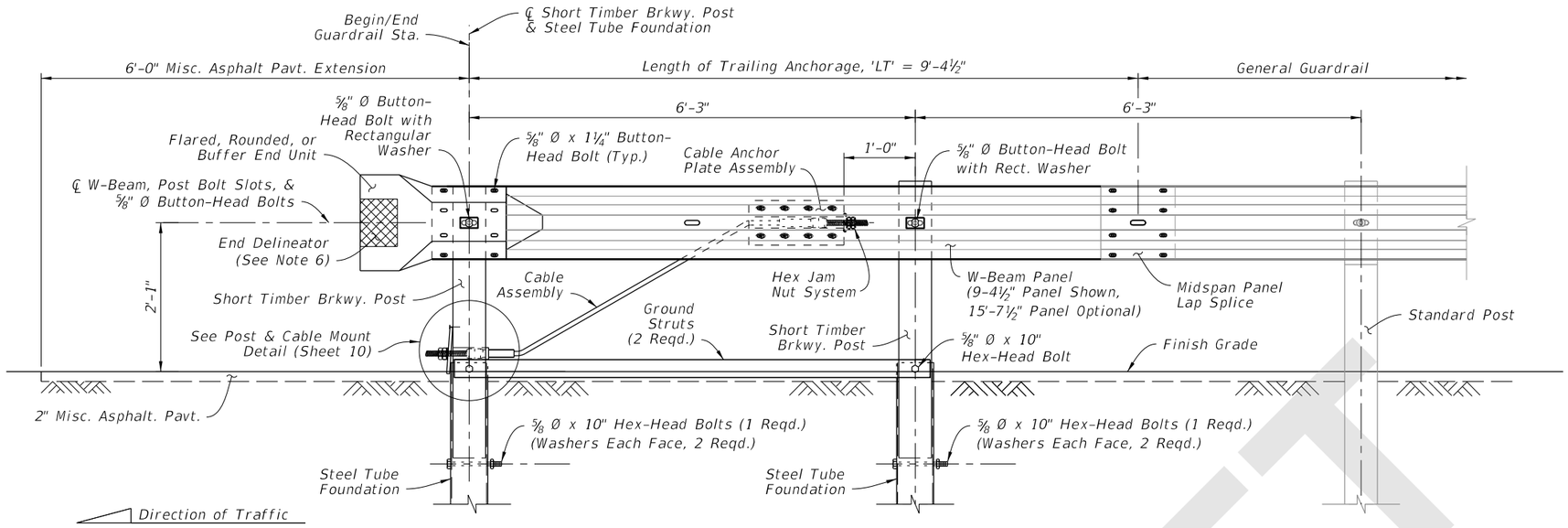
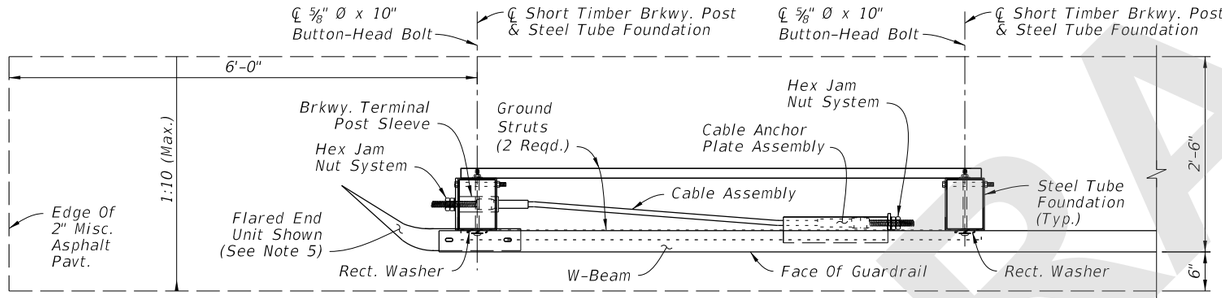
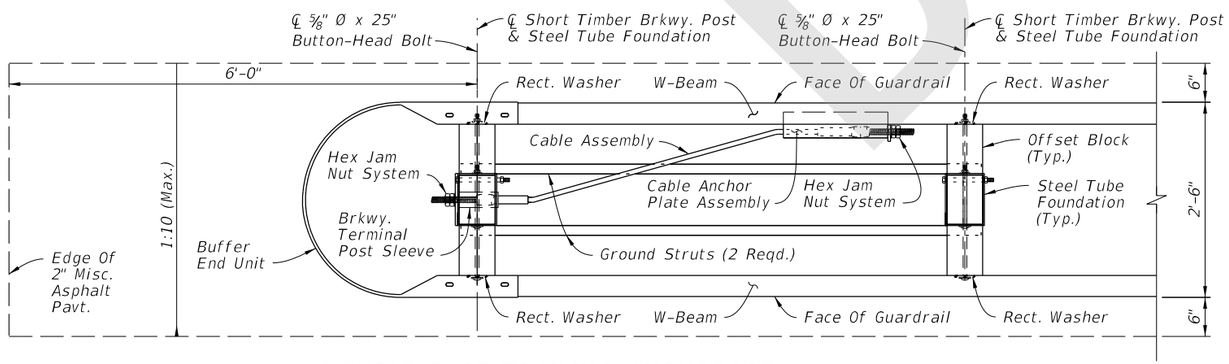


INSTALLED ELEVATION



SINGLE FACE TRAILING ANCHORAGE
INSTALLED PLAN



DOUBLE FACE TRAILING ANCHORAGE
INSTALLED PLAN

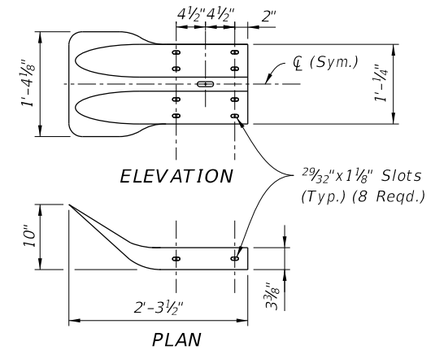
NOTES:

1. *COMPONENT DETAILS:* For additional 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.

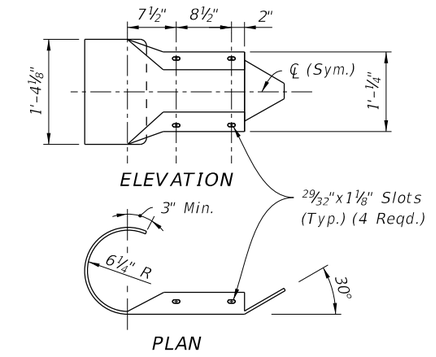
   Lap the Flared End Unit behind the W-Beam; lap the Rounded and Buffered End Units over the face of the W-Beam.
3. *FOUNDATIONS:* Install Steel Tubes with attached Soil Plates by either of the following methods:

   a. Excavate, backfill, and compact material to provide full passive soil resistance to all surfaces of the Tube and Soil Plate.

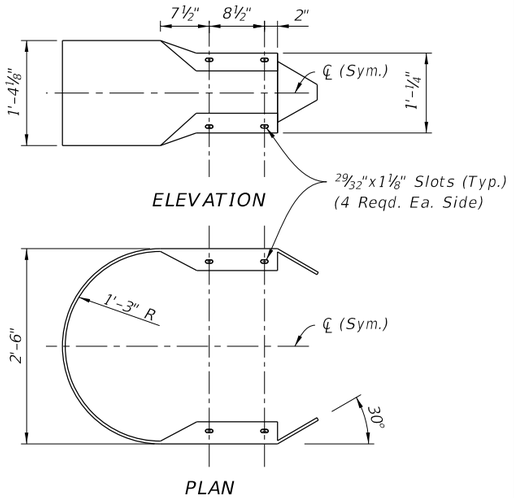
   b. Drive the Tube and Soil Plate as a single unit using a dummy timber post to prevent damage to the Breakaway Post.
4. *GENERAL GUARDRAIL:* General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Transitions, Low-Speed Guardrail, or 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 for this case).
6. *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

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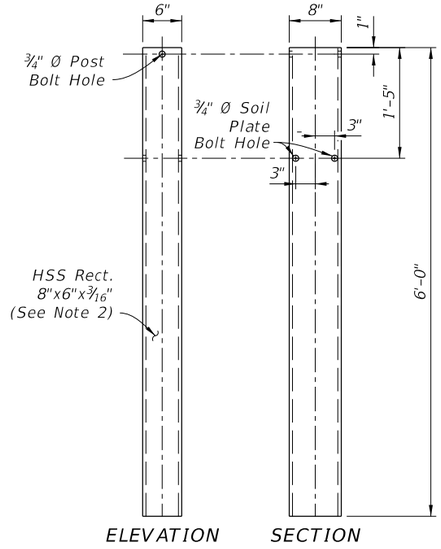
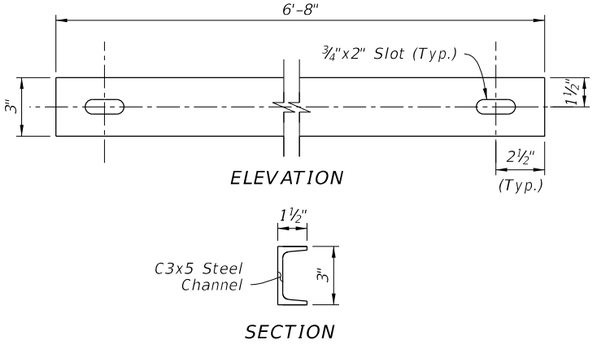
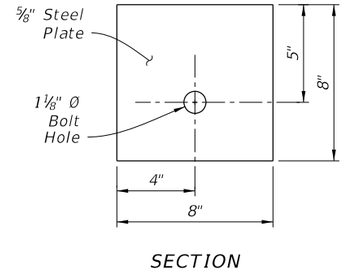


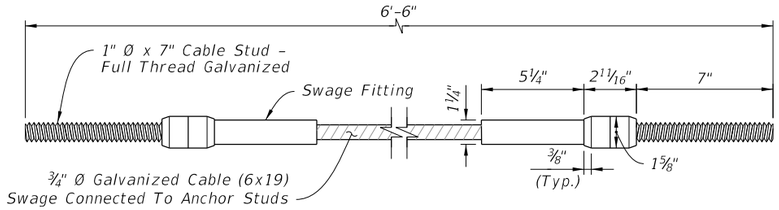
STEEL TUBE FOUNDATION



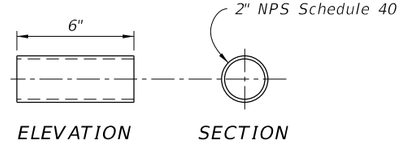
GROUND STRUT



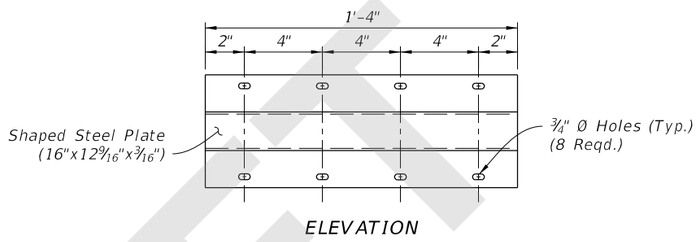
BEARING PLATE

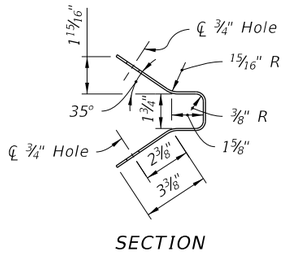


CABLE ASSEMBLY

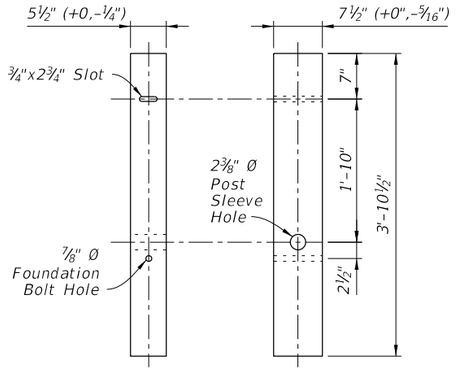


BREAKAWAY TERMINAL POST SLEEVE

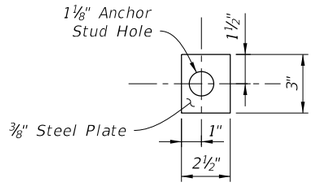




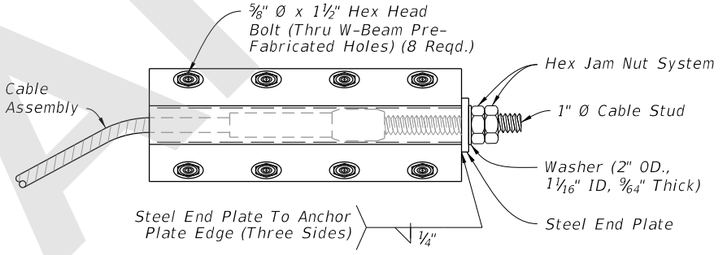
CABLE ANCHOR PLATE

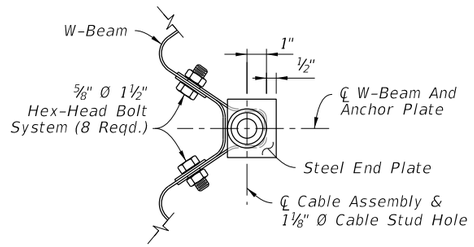


SHORT TIMBER BREAKAWAY POST (6"x8" Nom.)

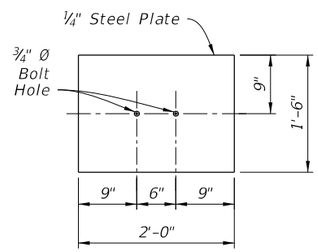


STEEL END PLATE

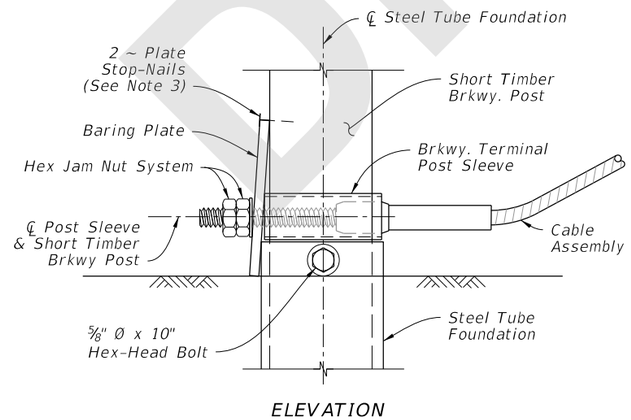




CABLE ANCHOR PLATE ASSEMBLY



SOIL PLATE



POST & CABLE MOUNT ASSEMBLY

NOTES:

1. INSTALLATION: Use components as shown on Sheets 9 & 11.
2. MATERIALS: Use steel plates, channels, and Cable Assemblies in accordance with Specification 967.

   Use Short Timber Breakaway Posts and Steel Tube Foundations in accordance with Specification 536.

   Use Hex Nuts, Hex Jam Nuts, and Washers in accordance with the AASHTO-AGC-ARTBA Guide to Standardized Barrier Hardware with English unit equivalents of components FNX24a and FWC24a, respectively. Two Hex Nuts may be used for the Hex Jam Nut System.
3. PLATE STOP-NAILS: To prevent rotation of the Bearing Plate, drive steel 2½" Type 8d nails with ASTM A153 hot-dip galvanization.
4. CABLE ANCHOR PLATE ASSEMBLY INSTALLATION: Mount to the pre-fabricated Cable Anchor Plate Bolt Holes in the W-Beam Panel, as shown on Sheet 4. These panel holes are only permitted for this Cable Anchor Plate Assembly application.

END TREATMENT - COMPONENT DETAILS

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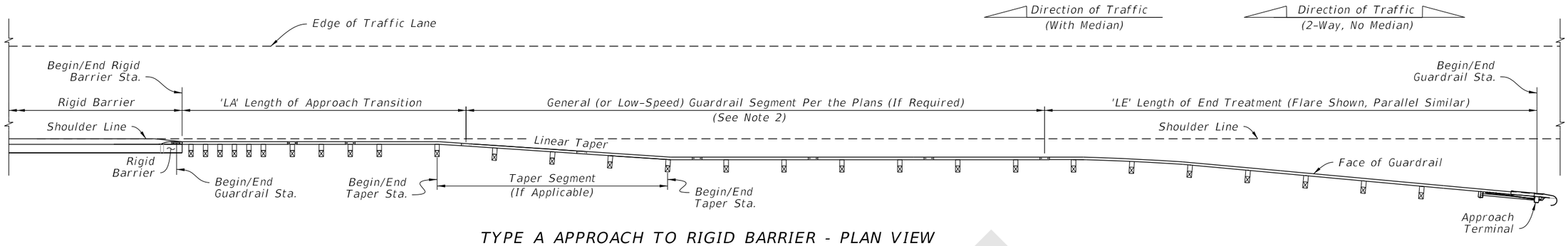
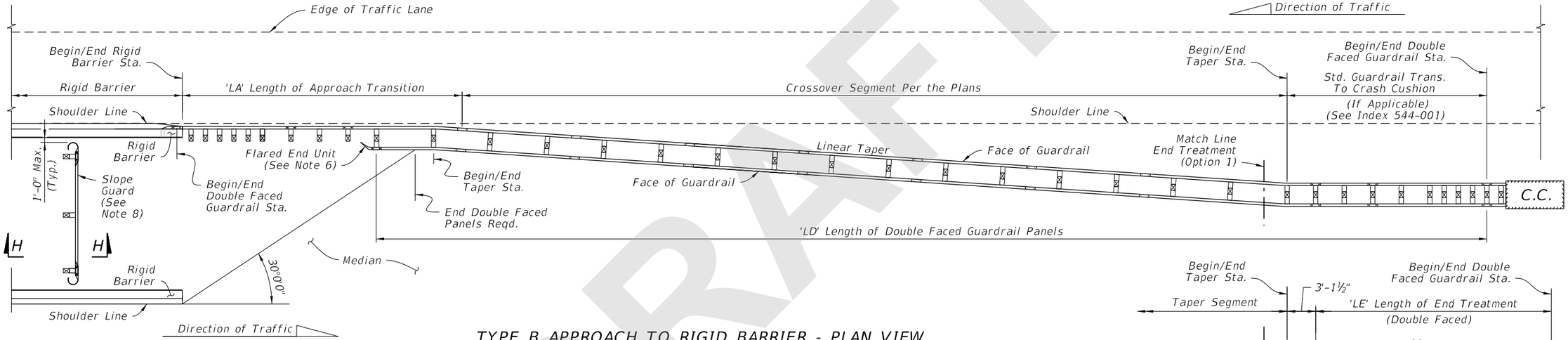
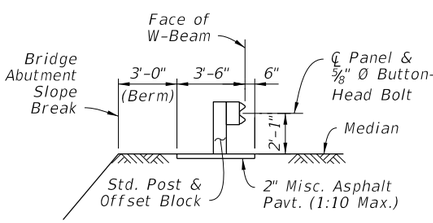


TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW
MEDIAN OR OUTSIDE SHOULDERS
(Mirror Horiz. and/or Vert. for Opposite Direction and/or Side of Road)



TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW
CROSSOVER GUARDRAIL FOR MEDIAN SHOULDERS ONLY
DUAL BRIDGE APPROACH CONFIGURATION
(Mirror Horiz. and Vert. for Opposite Direction)



SECTION H-H
BRIDGE ABUTMENT
SLOPE GUARD
(Between Bridges)

NOTES:

1. *INSTALLATION: The Plan Views shown are schematic only, showing example geometry for connecting guardrail segments including taper locations and Double Faced Guardrail requirements as applicable. Work this Sheet with the plans, where stationing and offsets for Begin/End Guardrail, Begin/End Rigid Barrier, and Begin/End Taper are specified. For existing bridge layouts, see Index 536-002, 521-404, and 521-405.*

2. *GENERAL (OR LOW-SPEED) GUARDRAIL SEGMENT: Construct this segment if shown in the plans. For the case where this segment's offset differs from the Approach Transition offset, linearly taper the guardrail between the Begin/End Taper Stations and offsets as specified in the plans.*

   For the shortest length case of a direct connection between the End Treatment and the Approach Transition, this segment may be omitted as shown in the plans.

3. *LENGTH OF APPROACH TRANSITION 'LA': Install the Approach Transition as shown per Sheet 13 or 14 as called for in the plans.*

4. *LENGTH OF END TREATMENT 'LE': Install the Approach Terminal End Treatment as shown per Sheet 7 or 8, where called for in the plans. Use the corresponding APL drawings for construction details.*

5. *CROSSOVER GUARDRAIL (FOR TYPE B APPROACH): Install the Crossover Segment tapering linearly from the Begin Taper Sta. and offset to the End Taper Sta. and offset as specified in the plans.*

6. *LENGTH OF DOUBLE FACED GUARDRAIL PANELS, 'LD' (FOR TYPE B APPROACH): Terminate the Double Faced Guardrail panels as shown (based upon the 30° line measured from the hazard on the opposite side of the median). Extend the panel segment longer than the dimension 'LD' as needed for the Panel's end Bolt Slot to align with a post Bolt hole.*

   Install a Flared End Unit where shown, as defined on Sheet 9.

7. *END TREATMENT OPTIONS (FOR TYPE B & C APPROACH): For Double Faced applications, use either a Double Faced Approach Terminal Assembly per Sheet 8 or a Crash Cushion per Index 544-001. For either Option, meet the 1:10 adjacent grading requirements for Approach Terminals as shown on Sheet 8.*

8. *SLOPE GUARD: Where indicated in the plans, install a Guardrail segment between bridge approaches and offset from the bridge abutment's Slope Break as shown. Install posts at the end bolt slots of the panel system. Use post spacing of either 3'-1½" or 6'-3", as needed to correctly fit system between barriers. The system may also be lengthened to fit by installing two Rounded End Units as defined on Sheet 9.*

LAYOUT TO RIGID BARRIER - APPROACH ENDS

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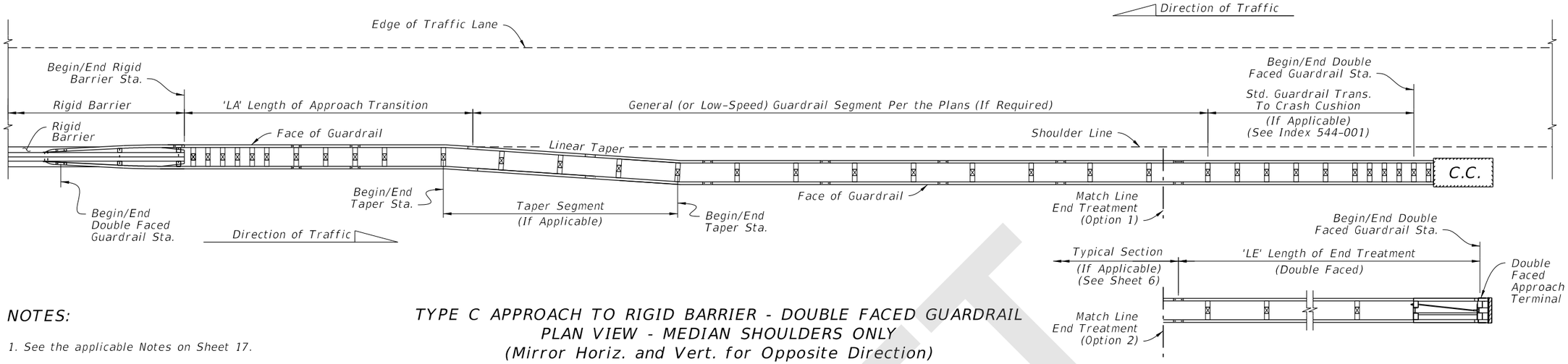
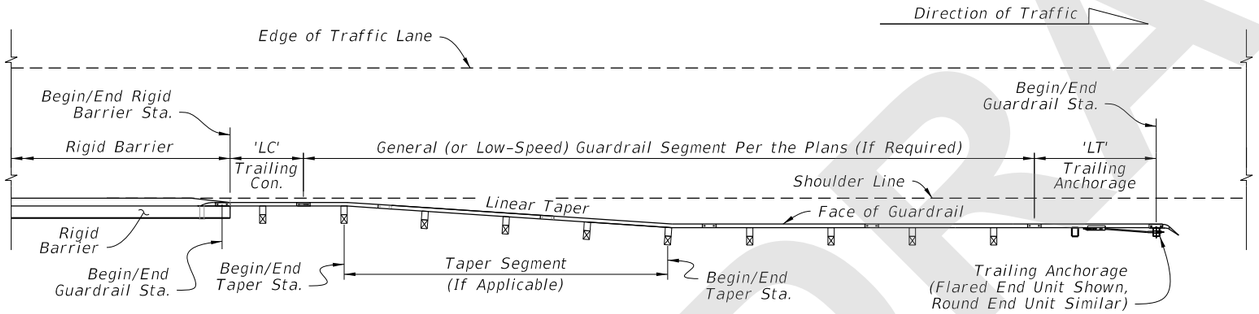


NOTES:

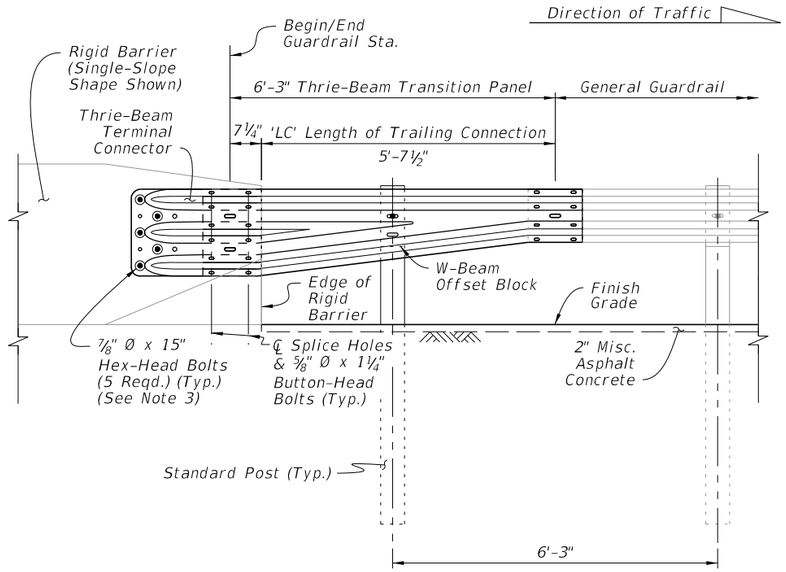
1. See the applicable Notes on Sheet 17.

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)



TRAILING END TRANSITION CONNECTION
TO RIGID BARRIER - INSTALLED ELEVATION

NOTES:

1. See the applicable Notes on Sheet 17.
2. LENGTH OF TRAILING ANCHORAGE, 'LT': Install the Trailing Anchorage 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.

LAYOUT TO RIGID BARRIER - TRAILING ENDS

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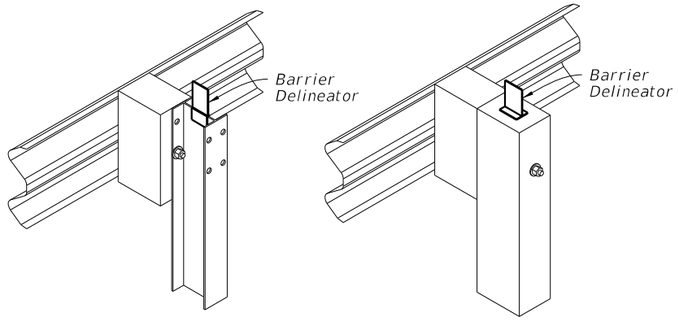
NOTES:

1. INSTALLATION: Install Barrier Delineators as shown in accordance with the plans, with Specifications 536 and 705, and with the manufacture's design as approved on the APL.
2. MATERIALS: Use materials of the size and type defined for Barrier Delineators in Specifications 993.
3. COLOR: Use either white or yellow retroreflective sheeting to match the color of the nearest lane's edgeline.
4. MOUNT LOCATIONS: Mount Barrier Delineators atop posts as shown, starting with Post (3) of Approach Terminals and incrementally increasing spacing towards the downstream direction. Install the Barrier Delineators at the following spacing:

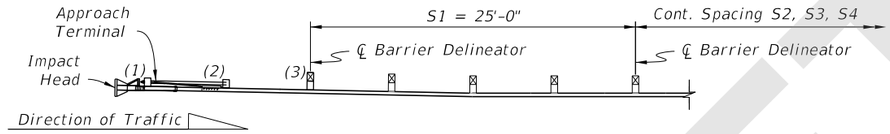
   S1 = 25' x 1 Space
   S2 = 50' x 1 Space
   S3 = 75' x 1 Space
   S4 = 100' x for the Remaining Run

   Additionally, place a Barrier Delineator on Post (2) of the Trailing Anchorage or on the post nearest the Rigid Barrier.
5. MEDIAN GUARDRAIL: Install retroreflective sheeting on both sides of the barrier delineator for Guardrail on medians.



STEEL POSTS TIMBER POSTS

MOUNT LOCATION - ISOMETRIC VIEWS



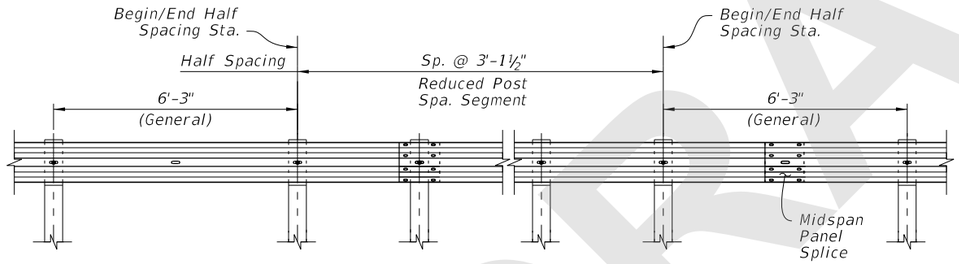
MOUNT LOCATION - PLAN VIEW

BARRIER DELINEATORS

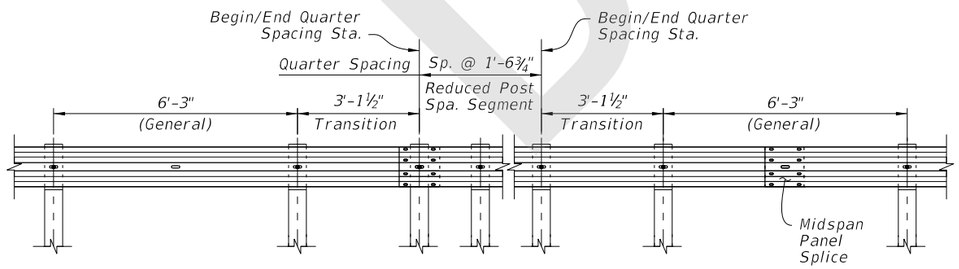
NOTES:

1. INSTALLATION: Work these details with the plans, where Stationing for Begin/End Half Spacing and Begin/End Quarter Spacing are indicated if required.

   Where the Begin/End Stations indicated in the plans do not correspond exactly to post locations in construction, extend the Reduced Post Spacing segment to the nearest post(s) before the Begin Station and/or after the End Station called for.
2. PANEL SPLICES: Midspan Panel Splices are not required in Transition and Reduced Post Spacing segments, however they are required for General segments. To place midspan splices in General segments, use one Non-General panel length (9'-4½" or 15'-7½") or add an additional Transition spaced post where required.
3. LOW-SPEED GUARDRAIL: For Reduced Post Spacing with Low-Speed Guardrail (12'-6" post spacing), the Reduced Spacing pattern requires a 6'-3" space between the 12'-6" and 3'-1½" spaces.
4. PANEL POST BOLT SLOTS: For Quarter Spacing configurations, punch additional ¾"x2½" Post Bolt Slots in the panels only where required for mounting and in accrodance with Specification 536.

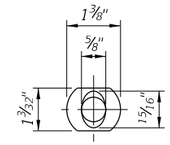


DETAIL 'S' - HALF SPACING ELEVATION
(AS REQ'D. PER THE PLANS)

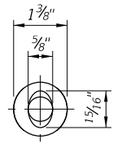


DETAIL 'S' - QUARTER SPACING ELEVATION
(AS REQ'D. PER THE PLANS)

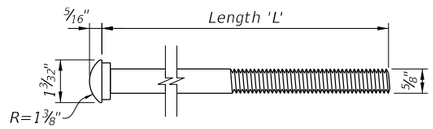
REDUCED POST SPACING FOR HAZARDS



ELEVATION OPTION 1

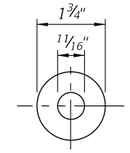


ELEVATION OPTION 2

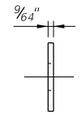


PROFILE (Option 1 Shown)

BUTTON-HEAD BOLT

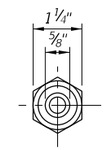


ELEVATION

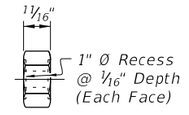


PROFILE

WASHER

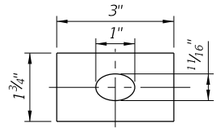


ELEVATION

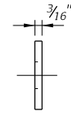


PROFILE

HEX-NUT



ELEVATION



PROFILE

RECTANGULAR WASHER
(For Trailing Anchorage, CRT, & Terminal Connectors Where Shown - Install Over Panel Face)

BUTTON-HEAD BOLT LENGTHS:

Application(s):	Length 'L':	Min. Thread Length:
Panel Splice	1¼"	Full Length
Steel Post Mount – Single Faced Guardrail	10"	4"
Timber Post Mount – Single Faced Guardrail	18"	4"
Steel or Timber Post Mount – Double Faced Guardrail	25"	4"
Modified Thrie-Beam Panel / Terminal Connector Splice	2"	Full Length

NOTES:

1. Use nuts, bolts, and washers in accordance with Specification 967.
2. For Steel Posts with Double Faced Guardrail, the single 25" Length bolt (one bolt thru both post flanges) may be replaced with two 10" Length bolts (one bolt per post flange).
3. Use bolts listed in Table 2 in corresponding locations shown in this Index.

⅝" BUTTON-HEAD BOLT SYSTEM

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