Origination Form

Proposed Revisions to a Standard Plans Index

Originator:	Stepp, Richard	Index Number:	536-001
Date:	6/01/2025	Sheet Number(s):	1,2,3,7,8,9,13,15,16
E-mail:	richard.stepp@dot.state.fl.us	Index Title:	Guardrail

Summary of the changes:

Sheet 1: Contents - Changed Sheet 3 title to "Connection to Existing 27" Height Guardrail"; General Note 9 - Added "See Sheet 13 thru 21"; General Note 10 - Updated title to "Connection to Existing 27" Height Guardrail", Deleted instructions for connection to existing guardrail and instead referenced Sheet 3

Sheet 2: Sheet title - Deleted "TL-3"

Sheet 3: Deleted previous sheet for Low-Speed TL-2 Guardrail. Replaced with new sheet for "Connection to Existing 27" Height Guardrail" details.

Sheet 7 & 8: Approach Terminal Assembly details - Added text explaining design speeds for the TL-2 and TL-3 options

Sheet 9: Installed Elevation detail - Added reference to Note 7 on guardrail height dimension; Notes - Added new Note 7 for "End Height" to explain curbed conditions

Sheet 13: Note 1 - Specified "TL-3" Approach Transition

Sheet 15: Installed Elevation detail - Replaced "Low Speed" with "General" guardrail label; Note 1 - Specified "TL-

2" Approach Transition; Sheet title - Added applicable design speed

Sheet 16: Sheet title - Added applicable design speed

Commentary/Background:

Sheet 9: Based on a contractor request, guidance is being added for how to handle end height measurement with a raised curb condition.

All Other Sheets: The Department is removing the general TL-2 guardrail post spacing option. This is based on new information gained from historic usage costs along with the idea that vehicle fleets are expected to continue increasing in size. Note that TL-2 options for Approach Terminals and Approach Transitions will remain for appropriate low-speed conditions and may still be used where identified in project-specific Plans.

Other Affected Documents/Offices	Person Contacted	Affected (Yes/No)
Other Standard Plans		No
FDOT Design Manual	Richard Stepp	Yes
Standard Specifications		No
Basis of Estimates Manual		Yes
Approved Product List		No
Construction Office		No
Maintenance Office		No

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25	Clear Space - Reduced Post Spacing for Hazards;
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CONTENTS

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.

Height Guardrail

- 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 on the Task Force 13 Publication: Guide to Roadside Hardware Components (http://tf13.org/Guides/componentGuide/).
- 4. BUTTON-HEAD BOLTS: Install Button-Head Bolts where indicated using bolts, nuts, and washers as defined on Sheet 25. Place washers under nuts against timber posts. Washers are not required at steel post flanges and panel lap splices. 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 $\pm \frac{1}{2}$ " depth and in accordance with Specification 339.
- 7. ADJACENT SIDEWALKS & SHARED USE PATHS: When quardrail 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 23.

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

- 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 $1\frac{1}{2}$ " 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 23.

- 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. See Sheets 13 thru 21.

For connecting guardrail to existing bridge Traffic Railings, see Indexes 536-002, 521-404, and 521-405.

27" HEIGHT -

10. CONNECTION TO EXISTING GUARDRAIL: Where a transition to existing guardrail at 27" height is required, linearly transition the new guardrail height over a distance ranging from 25'-0" to 31'-3". Height transitions must occur outside of End Treatment and Approach Transition segments. See the connection options on Sheet 3.

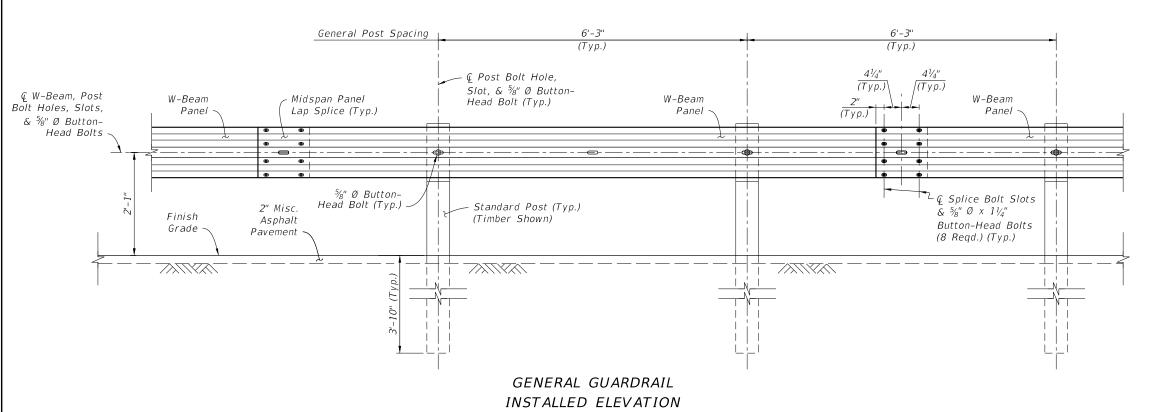
Provide an immediate transition to the required midspan panel splice using the available panel options on Sheet 4 (9'-4 $\frac{1}{2}$ '' or 15'- $7\frac{1}{2}$ " panel). Alternatively, this transition to midspan panel splice may be achieved by installing a single reduced post spacing of 3'- $1\frac{1}{2}$ " within the new quardrail, immediately adjacent to the connection location.

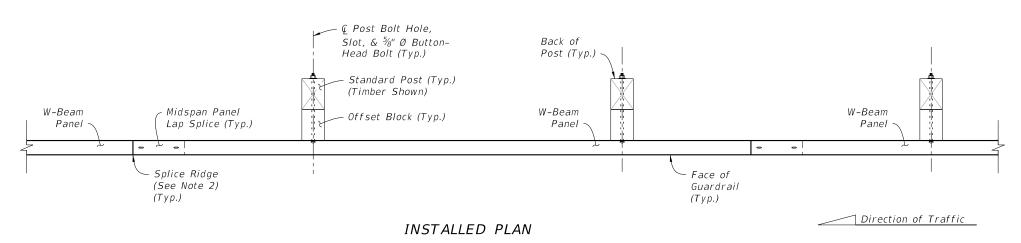
11. PLANS CALLOUTS: Begin/End Station labels are shown throughout this Index as they correspond to the station and offset callouts specified in the plans.

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.

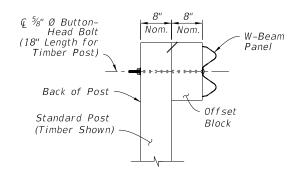
12. QUANTITY MEASUREMENT: Measure quardrail and corresponding components as defined in Specification 536. The Guardrail length is measured along the centerline of installed Panels, between the points labeled Begin/End Guardrail Station shown on the following Index Sheets and defined in the plans (typically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

DESCRIPTION:





DELETED: TL-3 specific langauge



INSTALLED SECTION

NOTES:

1. GENERAL: Install the General Guardrail configuration where indicated in the plans. This may include tapered segments if called for in the plans.

Use 12'-6" or longer W-Beam Panels. A single 6'-3" Panel may be used at the end of the run to meet the nominal Begin/End Guardrail Sta. requirements.

Where a differing guardrail configuration is required for constructability beyond the options shown in this Index or the plans, obtain approval from the Engineer prior to installation.

2. MIDSPAN PANEL LAP SPLICE: For proper structural function, place all Lap Splices at midspan unless otherwise indicated.

Lap the Panels with the Splice Ridge oriented downstream of the final Direction of Traffic in the nearest traffic lane. For reverse lane conditions, orient the Splice Ridge downstream of the lane direction with the highest traffic volume. Orienting Lap Splices for Temporary Traffic Control phasing is not required.

- 3. CONNECTION DETAILS: Connections to End Treatments, Approach Transitions, or other segment types are defined in the following Index Sheets, APL Drawings, or the plans.
- 4. W-BEAM PANEL DETAILS: See Sheet 4.
- 5. POST & OFFSET BLOCK DETAILS: See Sheet 5.
- 6. GUARDRAIL SECTIONS: For Sections showing typical mounting heights, grading, and lateral offsets in relation to adjacent roadway features, see Sheet 6.
- 7. MODIFIED MOUNTS: Where concrete structures, concrete sidewalk, or shallow depth conditions are encountered, see Sheet 24 for additional post mounting options.
- 8. DEFINED SEGMENTS: The General Guardrail shown provides the base configuration, including Post Spacing and splice locations, for Defined Segment modifications where indicated in the plans and using the Guardrail Types, Sections, and/or hardware as shown in this Index (e.g. Double Faced W-Beam, Deep Posts at Slope Breaks, Pipe Rail, Rub Rail, or Reduced Post Spacing for Hazards).

GENERAL DETAILS

DESCRIPTION: REVISION 11/01/23 11/01/25

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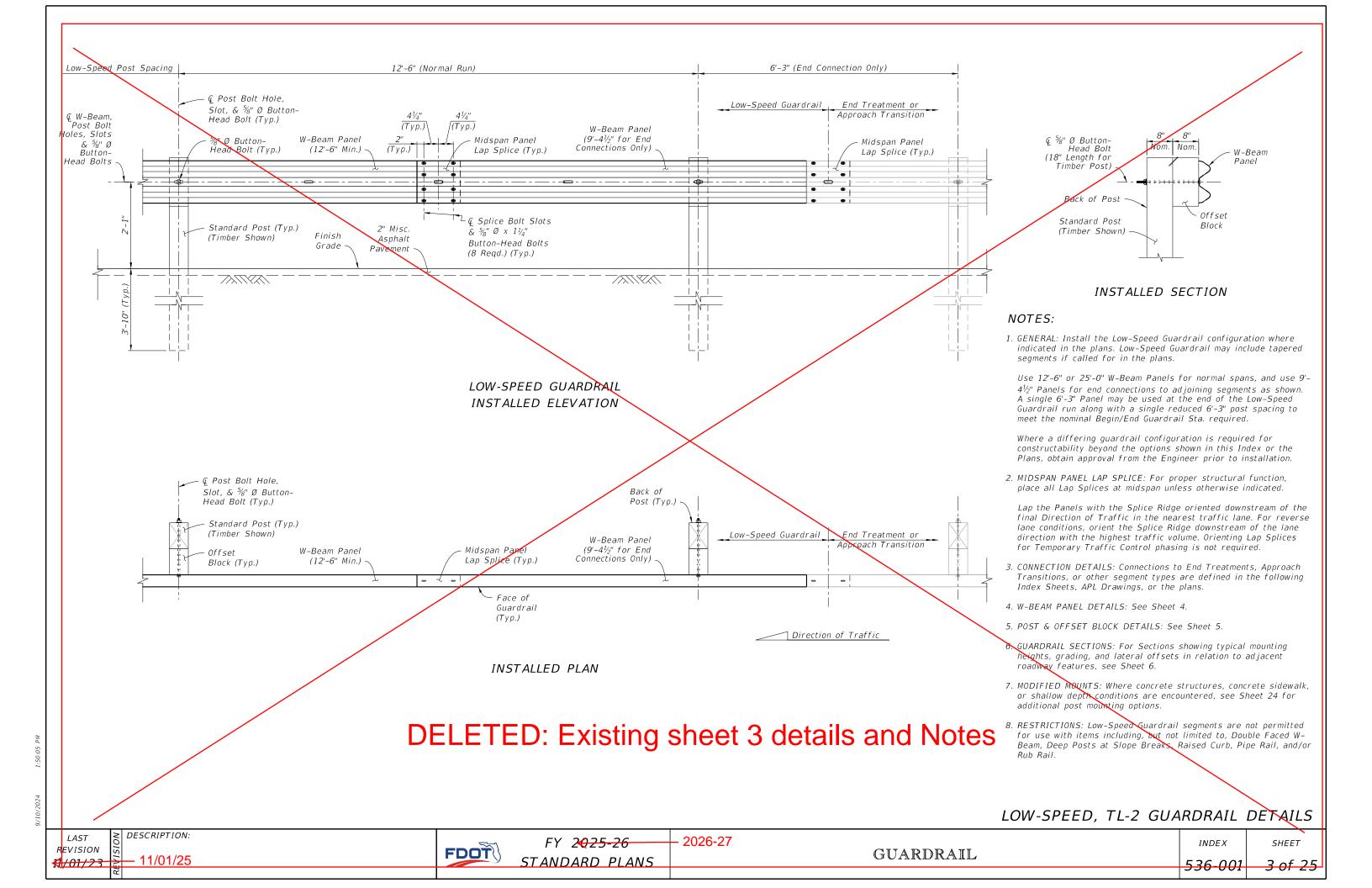
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GUARDRAIL

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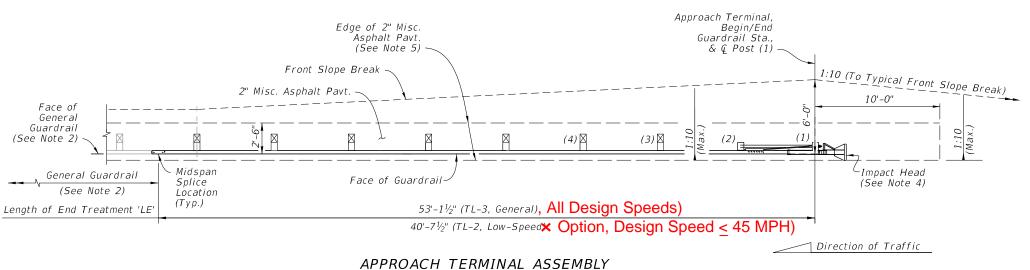
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NEW SHEET 3: CONNECTION TO EXISTING 27" HEIGHT GUARDRAIL

ADDED: Option 1 and Option 2 details for transition to existing guardrail

ADDED: Notes



'PARALLEL' TYPE - PLAN VIEW

NOTES:

1. INSTALLATION: Locate Approach Terminals where called for in the plans, with the Post (1) & 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 24, including Special Steel Posts, Encased Posts, and Frangible 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.

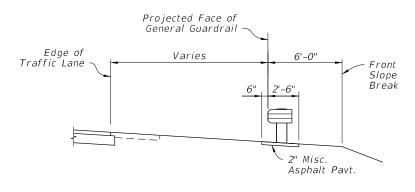
2. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments.

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.

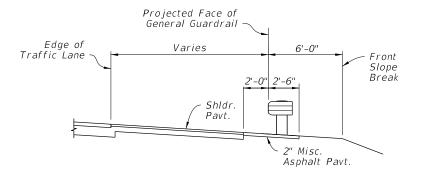
- 3. APPROACH TERMINAL TEST LEVEL: Install either a Test Level 3 (TL-3) or Test Level 2 (TL-2) Approach Terminal as specified in the plans. TL-3 Approach Terminals may substitute for TL-2 Approach Terminals unless the substitution is specifically prohibited in the plans. TL-2 Approach Terminals may not 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 536.
- 5. 2" MISCELLANEOUS ASPHALT PAVEMENT: The Plan View depicts 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.

The 2" Misc. Asphalt Pavement shown upstream of Post (1) may be substituted with a different pavement type where called for in the Plans.

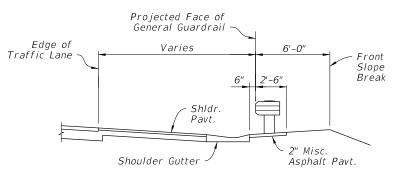
- 6. CLEAR AREA REQUIREMENT: Do not place any permanent aboveground installations within the areas shown with 1:10 maximum grading. For the finished condition, keep this area free of all aboveground obstructions, including dense vegetation and trees.
- 7. 'CURBED' AND 'DOUBLE FACED' GUARDRAIL SEGMENTS: 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

LAST REVISION IS 11/01/25

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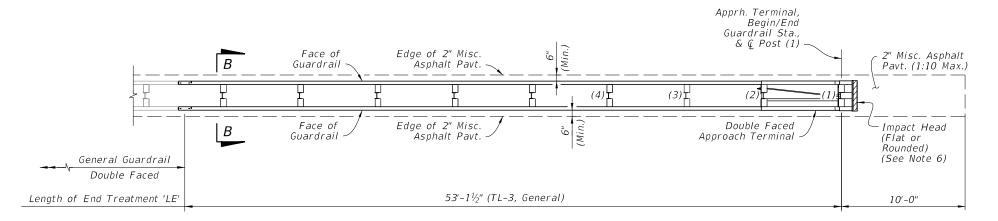
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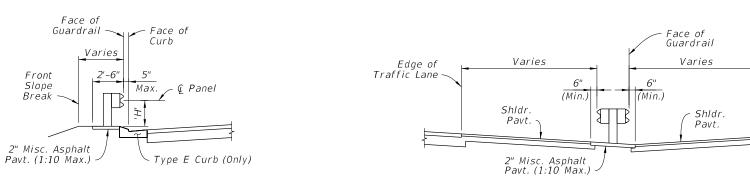
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APPROACH TERMINAL ASSEMBLY 'DOUBLE FACED' SEGMENT - PLAN VIEW



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

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

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
- 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 536.
- 7. CLEAR AREA REQUIREMENT: Do not place any permanent aboveground installations within the areas shown with 1:10 maximum grading. For the finished condition, keep this area free of all aboveground obstructions, including dense vegetation and trees.
- 8. 2" MISCELLANEOUS ASPHALT PAVEMENT: The 2" Misc. Asphalt Pavement shown upstream of Post (1) may be substituted with a different pavement type where called for in the Plans.
- 9. SINGLE FACED 'PARALLEL' SEGMENTS: See Sheet 7.

END TREATMENT - APPROACH TERMINAL GEOMETRY CURBED AND DOUBLE FACED

DESCRIPTION: REVISION 11/01/23 11/01/25

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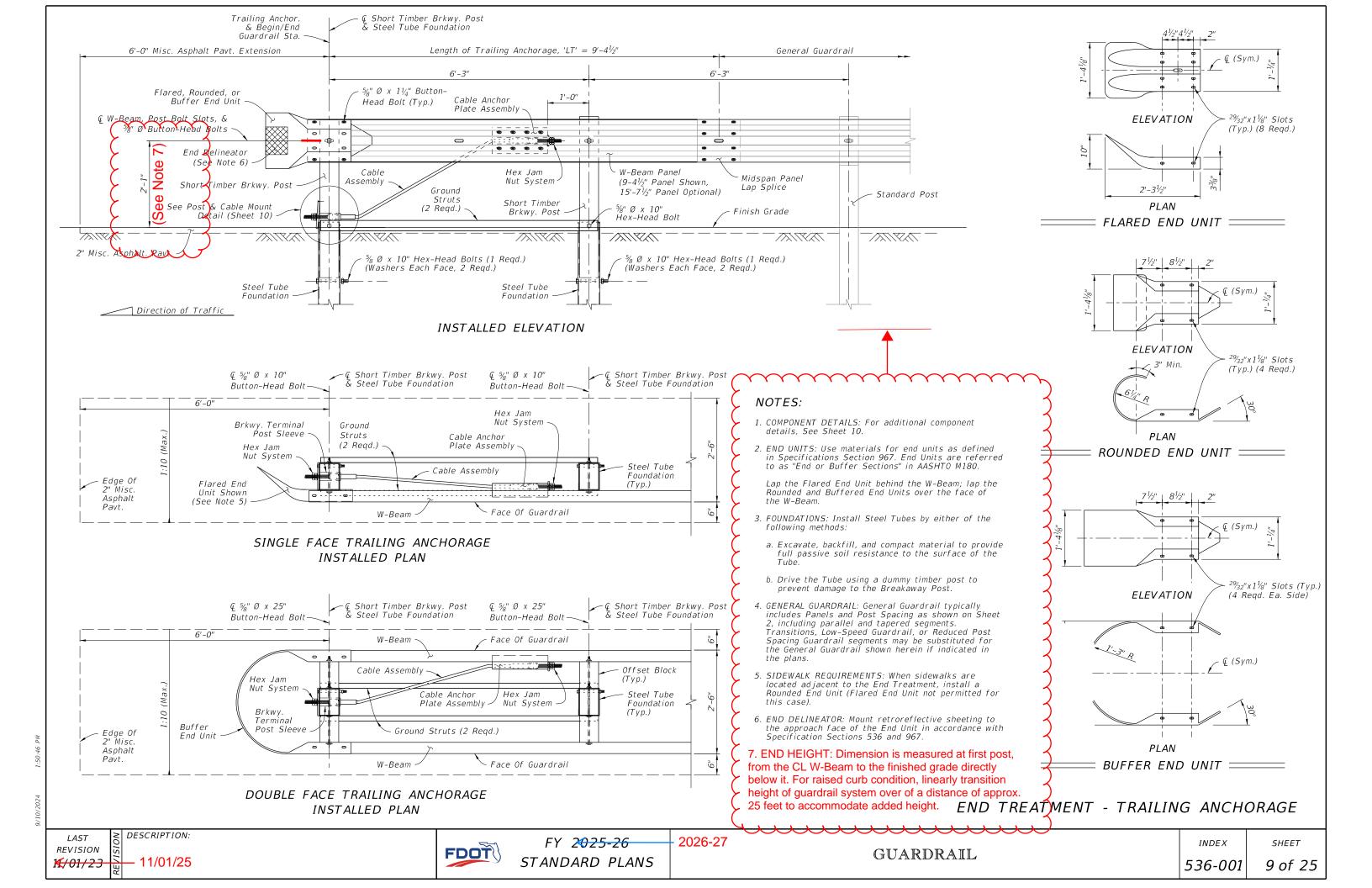
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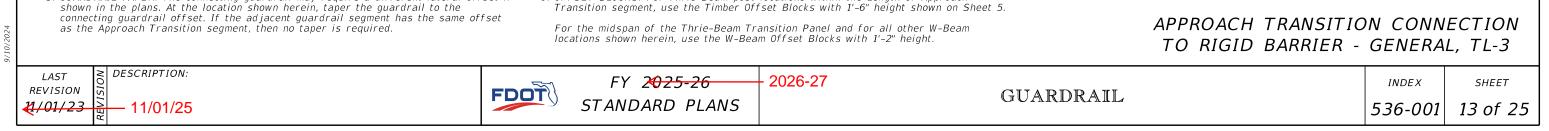
GUARDRAIL

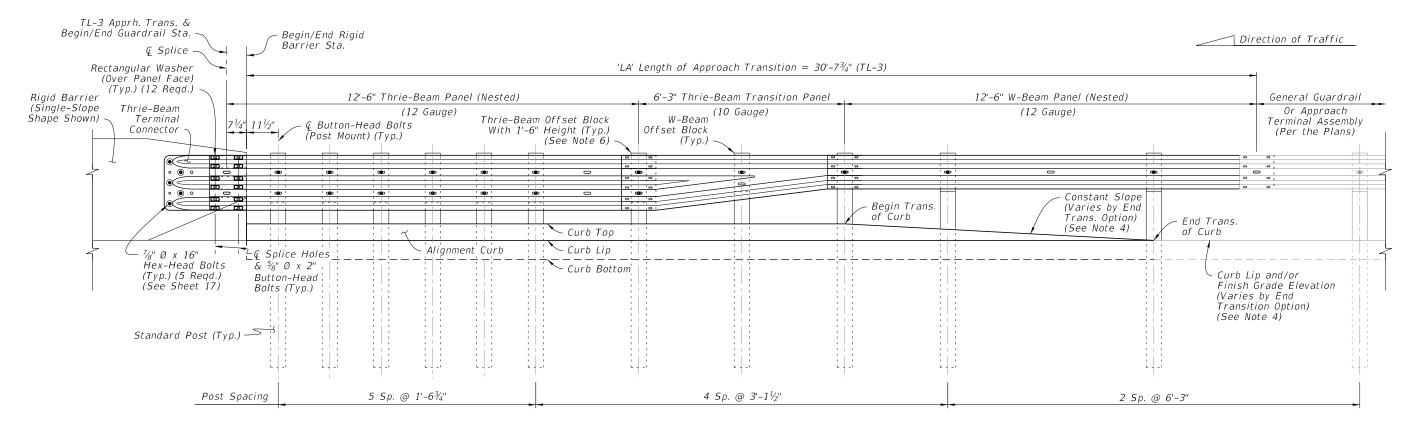
Edge of Traffic Lane

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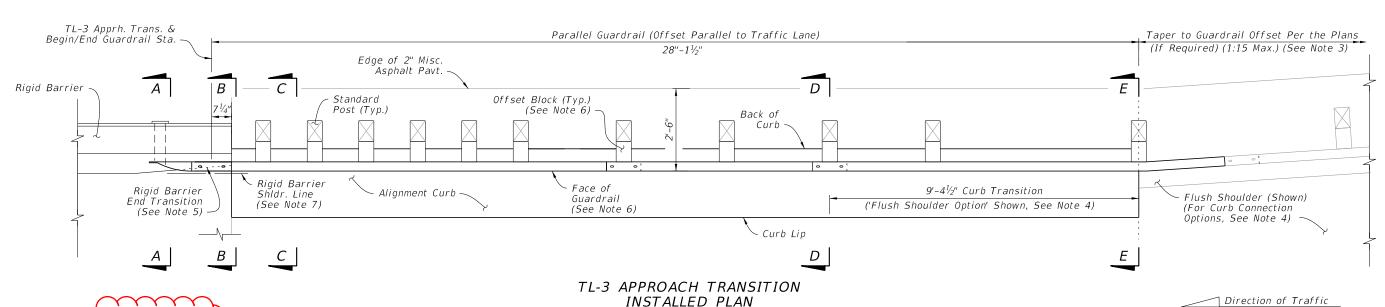








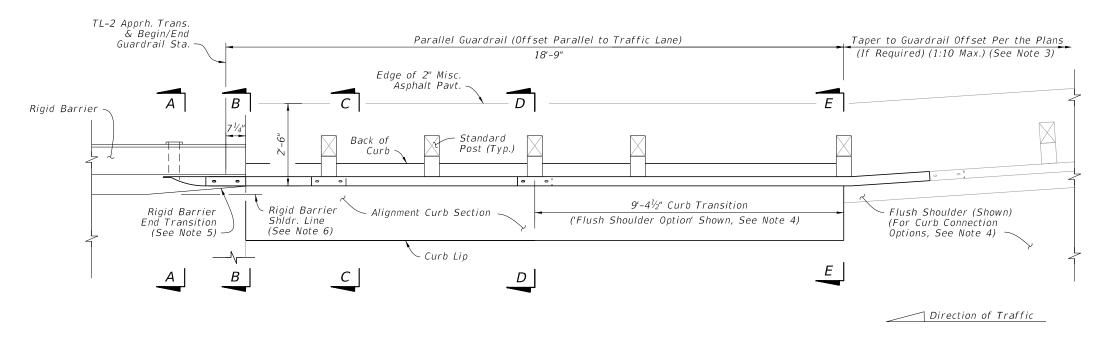
TL-3 APPROACH TRANSITION INSTALLED ELEVATION



NOTES:

- 1. INSTALLATION: Construct the Approach Transition segment where indicated in the plans. For example Layouts showing the Approach Transition's fit among other guardrail segments, see Shket 19.1
- 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 17.
- 3. GUARDRAIL TAPER: The connecting guardrail may require a different lateral offset if shown in the plans. At the location shown herein, taper the guardrail to the connecting guardrail offset. If the adjacent guardrail segment has the same offset
- 4. END TRANSITION OF CURB OPTIONS: The Plan and Elevation views depict an example Curb Transition to Flush Shoulder from Section D-D to E-E, but this transition may require a different shape depending on the End Transition option shown in the plans (Either a 'Shoulder Gutter Option', 'Řaised Curb Option', or 'Flush Shoulder Option'). See Sheet 14 for additional curb options and Sheet 17 for curb shape details.
- 5. 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.
- 6. OFFSET BLOCKS: For Thrie-Beam post locations within the Length of Approach
- 7. 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.
- 8. 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.

TL-2 APPROACH TRANSITION INSTALLED ELEVATION



1. INSTALLATION: Construct the Approach Transition segment only where indicated in the plans. For example Layouts showing the Approach Transition's fit among other guardrail segments, see Sheet 19.

NOTES:

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 17.
- 3. GUARDRAIL TAPER: The connecting guardrail may require a different lateral offset if shown in the plans. At the location indicated herein, taper the guardrail to the connecting guardrail offset. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.
- 4. END TRANSITION OF CURB OPTIONS: The Plan and Elevation views depict an example Curb Transition to Flush Shoulder from Section D-D to E-E, but this transition may require a different shape depending on the End Transition option shown in the plans (Either a 'Shoulder Gutter Option', 'Raised Curb Option', or 'Flush Shoulder Option'). See Sheet 16 for additional curb options and Sheet 17 for curb shape details.
- 5. 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.
- 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.

TL-2 APPROACH TRANSITION INSTALLED PLAN

> APPROACH TRANSITION CONNECTION TO RIGID BARRIER LOW SPEED, TL-2 OPTION (DESIGN SPEED ≤ 45 MPH)

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

DESCRIPTION: REVISION 1/01/23 11/01/25

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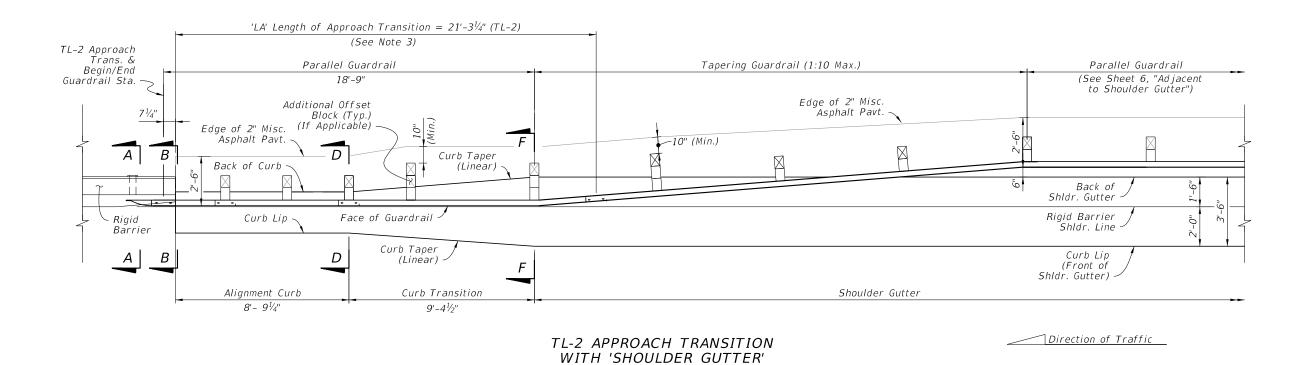
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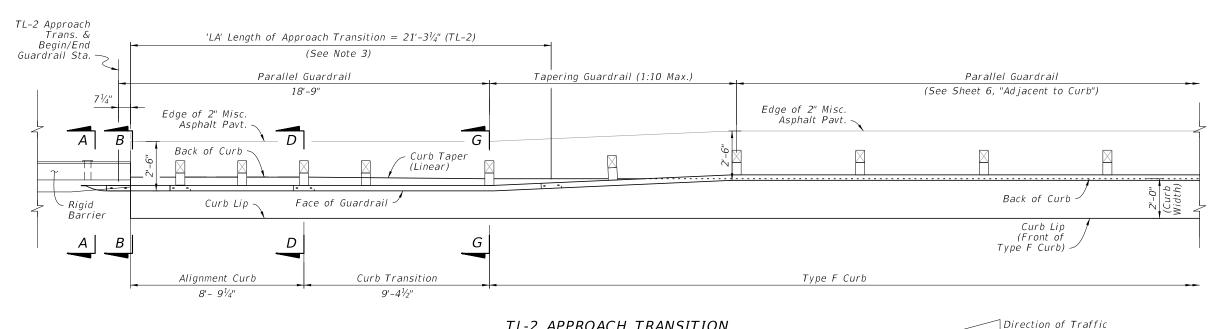
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CONNECTION - PLAN VIEW



NOTES:

- 1. GENERAL: See the applicable notes and details on Sheet 15.
- 2. SECTION VIEWS & DETAILS: For cross sections and details, including the barrier mounting hardware, curb transition, adjacent grading, and installation dimensions, see Sheet 17.
- 3. ELEVATION VIEW: For post and panel installation details within 'LA', see the elevation view on Sheet 15. The curb details will differ depending on curb option required.

TL-2 APPROACH TRANSITION WITH 'TYPE F CURB' CONNECTION - PLAN VIEW

> APPROACH TRANSITION CONNECTION TO RIGID BARRIER LOW SPEED, TL-2 OPTION (DESIGN SPEED ≤ 45 MPH), CURB

CONNECTIONS

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

DESCRIPTION: LAST REVISION 11/01/23 11/01/25

FDOT

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8	End Treatment - Approach Terminal Geometry, Curbed and Double Faced
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10	End Treatment - Component Details
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12	Layout for CRT System - Side Roads and Driveways
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24	Modified Mount - Encased Post for Shallow Mount;
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25	Barrier Delineators - Post Mounted;
	Clear Space - Reduced Post Spacing for Hazards;
	5%" 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 quardrail components, including posts, panels, and bolt systems, are based on the Task Force 13 Publication: Guide to Roadside Hardware Components (http://tf13.org/Guides/componentGuide/).
- 4. BUTTON-HEAD BOLTS: Install Button-Head Bolts where indicated using bolts, nuts, and washers as defined on Sheet 25. Place washers under nuts against timber posts. Washers are not required at steel post flanges and panel lap splices. 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 $\pm \frac{1}{2}$ " depth and in accordance with Specification 339.
- 7. ADJACENT SIDEWALKS & SHARED USE PATHS: When quardrail 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 23.

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

- 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 $1\frac{1}{2}$ " 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 23.

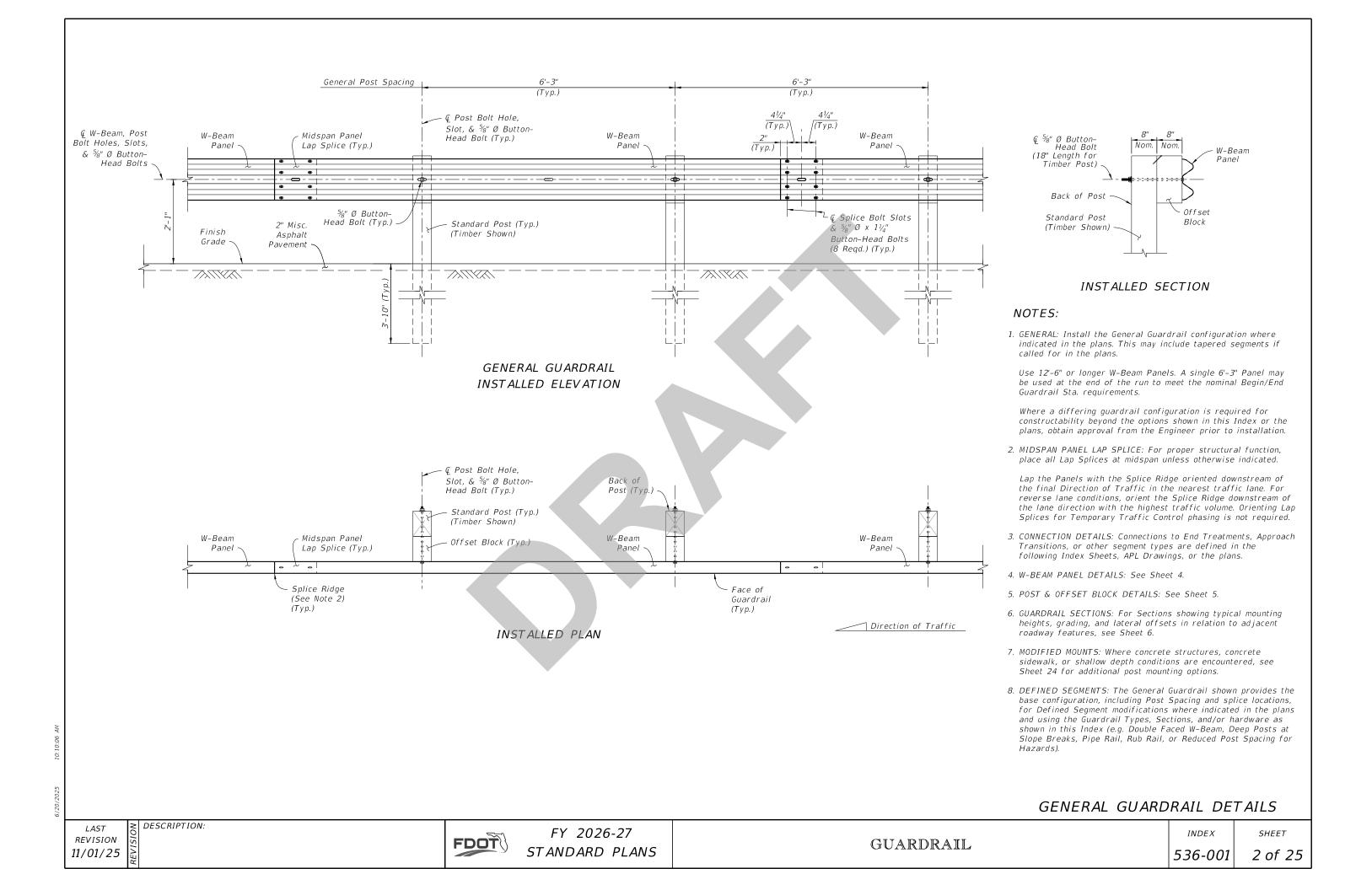
- 8. NESTED W-BEAM: Where called for in the plans, install two W-Beam Panels mounted flush per location, securing all panels with Button-Head Bolts threaded through aligned slots and holes. 2" Button-Head Bolts are permitted for panel splice locations.
- 9. CONNECTION TO RIGID BARRIER: The connections 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. See Sheets 13 thru 21.

For connecting guardrail to existing bridge Traffic Railings, see Indexes 536-002, 521-404, and 521-405.

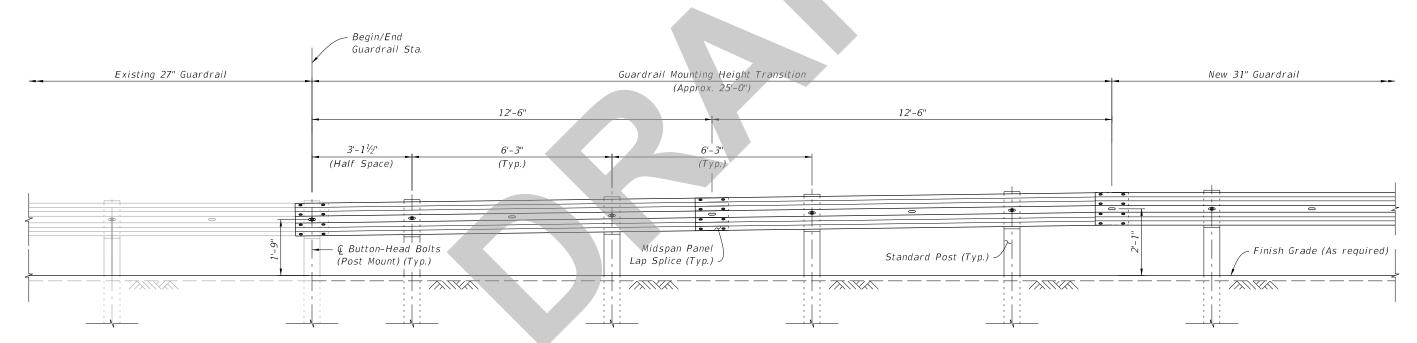
- 10. CONNECTION TO EXISTING 27" HEIGHT GUARDRAIL: See the connection options on Sheet 3.
- 11. PLANS CALLOUTS: Begin/End Station labels are shown throughout this Index as they correspond to the station and offset callouts specified in the plans.

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 quardrail 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 Q of the panel's post bolt slots at the approach/trailing ends).



OPTION 1: 9'-41/2" PANEL CONNECTION



OPTION 2: HALF POST SPACE PANEL CONNECTION

NOTES:

≥ DESCRIPTION:

- 1. Height transitions must occur outside of End Treatment and Approach Transition segments.
- Consider post location alignment needs when selecting option.
 Either option may be used unless a specific option number is called for in the plans.

CONNECTION TO EXISTING 27" HEIGHT GUARDRAIL

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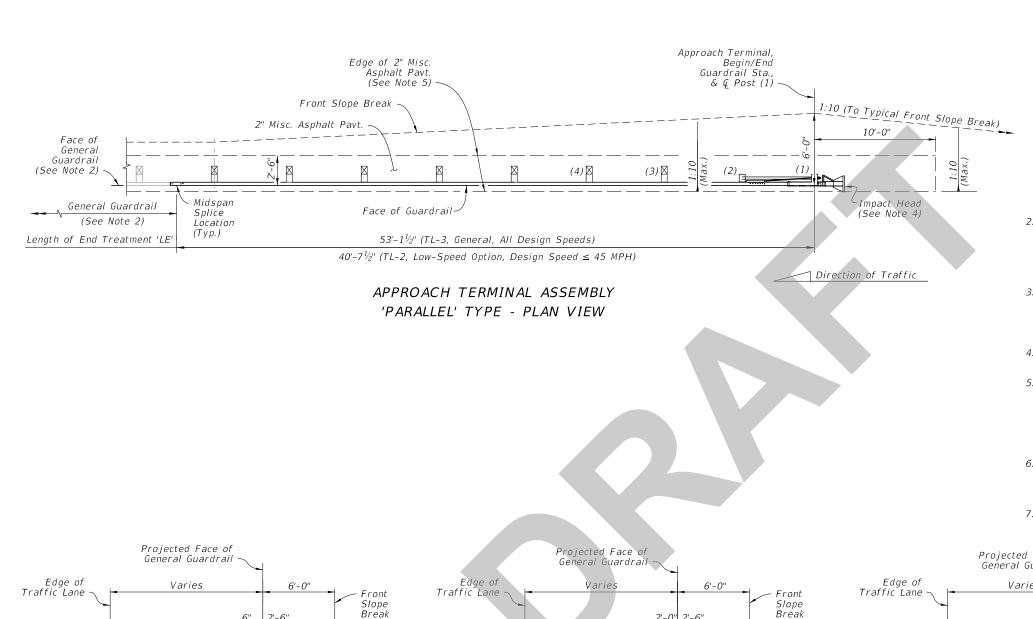
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NOTES:

1. INSTALLATION: Locate Approach Terminals where called for in the plans, with the Post (1) @ 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. Forwardanchoring 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 24, including Special Steel Posts, Encased Posts, and Frangible 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.

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.

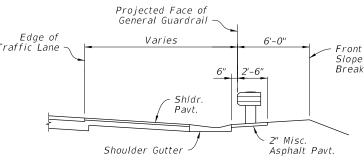
- 3. APPROACH TERMINAL TEST LEVEL: Install either a Test Level 3 (TL-3) or Test Level 2 (TL-2) Approach Terminal as specified in the plans. TL-3 Approach Terminals may substitute for TL-2 Approach Terminals unless the substitution is specifically prohibited in the plans. TL-2 Approach Terminals may not 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 536.
- 5. 2" MISCELLANEOUS ASPHALT PAVEMENT: The Plan View depicts 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

The 2" Misc. Asphalt Pavement shown upstream of Post (1) may be substituted with a different pavement type where called for in the Plans.

- 6. CLEAR AREA REQUIREMENT: Do not place any permanent aboveground installations within the areas shown with 1:10 maximum grading. For the finished condition, keep this area free of all aboveground obstructions, including dense vegetation and trees.
- 7. 'CURBED' AND 'DOUBLE FACED' GUARDRAIL SEGMENTS: See Sheet 8.

Front

Slope



SECTION AT POST (1) WITH SHOULDER GUTTER

SECTION AT POST (1) WITH UNPAVED SHOULDER

2" Misc.

Asphalt Pavt.

SECTION AT POST (1) WITH FULLY PAVED SHOULDER

Pavt

2" Misc.

Asphalt Pavt.

END TREATMENT - APPROACH TERMINAL GEOMETRY - PARALLEL

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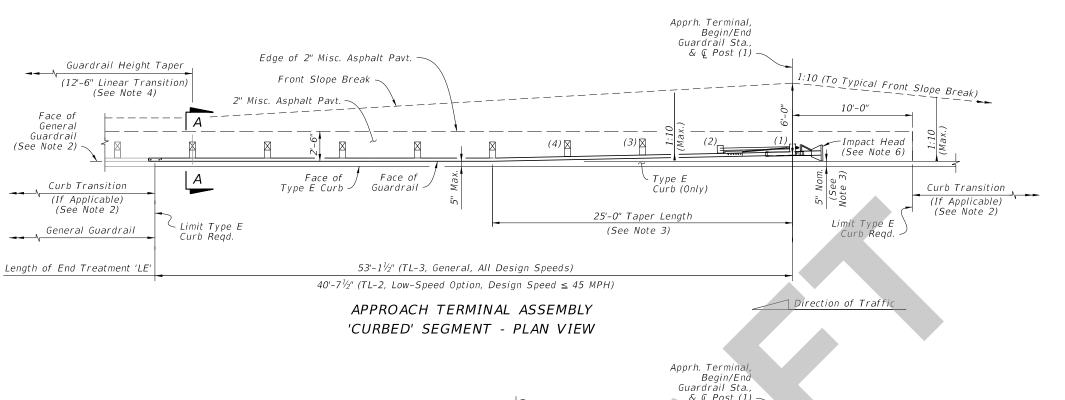
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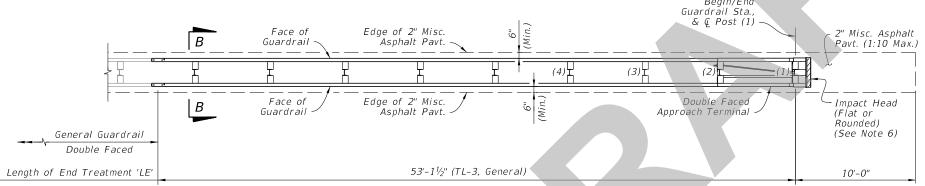
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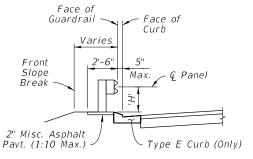
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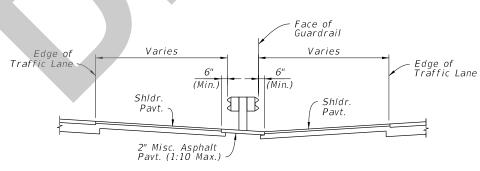




APPROACH TERMINAL ASSEMBLY 'DOUBLE FACED' SEGMENT - PLAN VIEW



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



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

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
- 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 536.
- 7. CLEAR AREA REQUIREMENT: Do not place any permanent aboveground installations within the areas shown with 1:10 maximum grading. For the finished condition, keep this area free of all aboveground obstructions, including dense vegetation and trees.
- 8. 2" MISCELLANEOUS ASPHALT PAVEMENT: The 2" Misc. Asphalt Pavement shown upstream of Post (1) may be substituted with a different pavement type where called for in the Plans.
- 9. SINGLE FACED 'PARALLEL' SEGMENTS: See Sheet 7.

END TREATMENT - APPROACH TERMINAL GEOMETRY CURBED AND DOUBLE FACED

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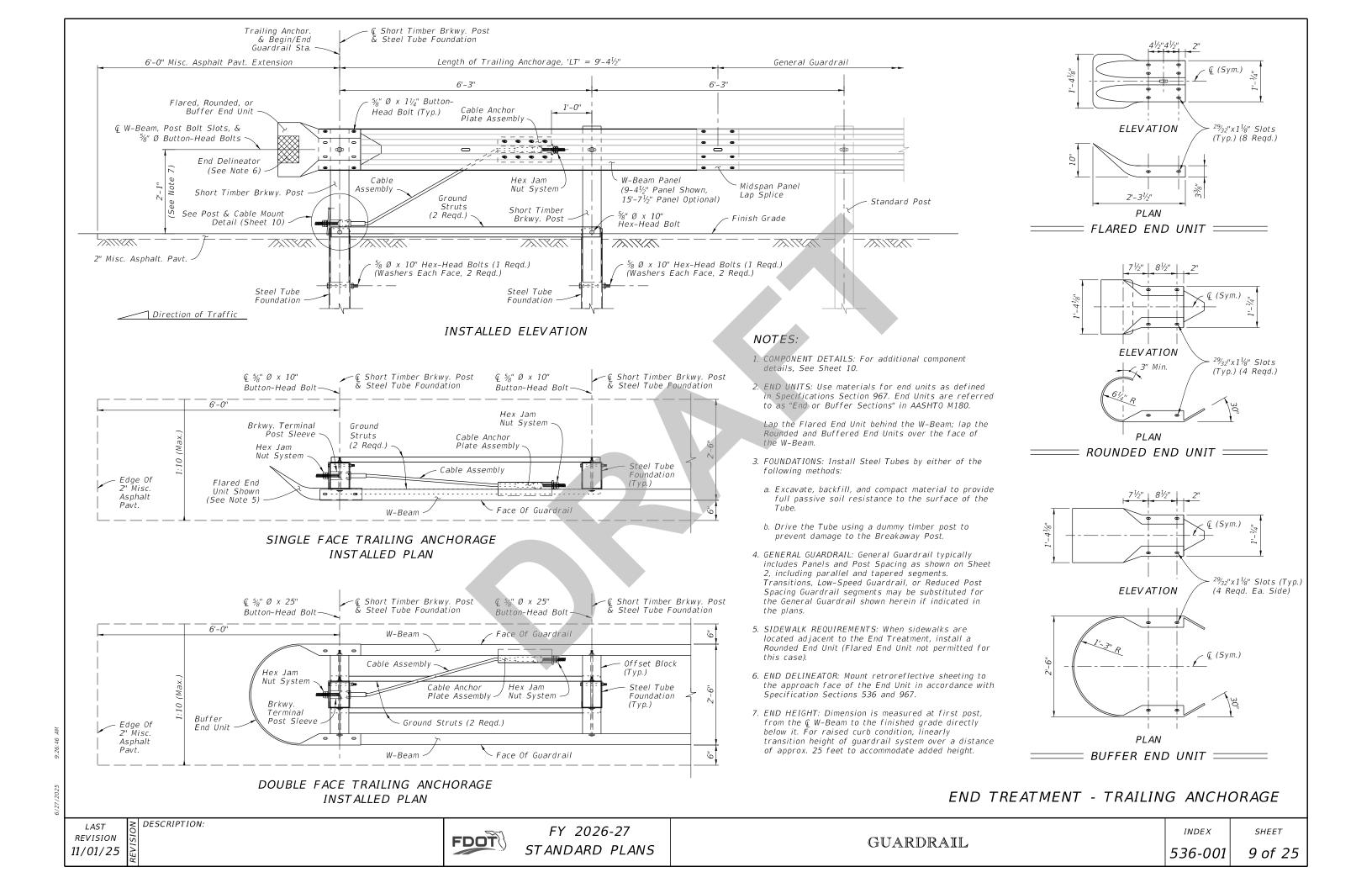
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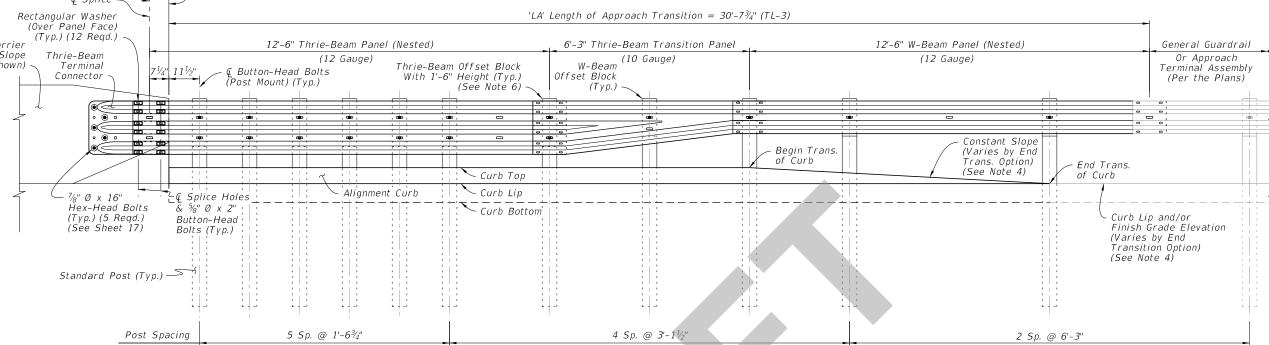
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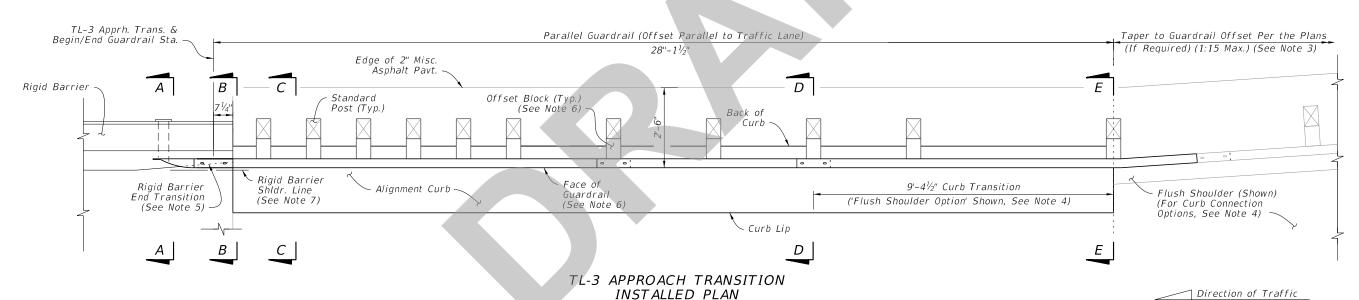
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TL-3 APPROACH TRANSITION INSTALLED ELEVATION



NOTES:

1. INSTALLATION: Construct the TL-3 Approach Transition_segment where indicated in the plans. For example Layouts showing the Approach Transition's fit among other guardrail segments, see Sheet 19.

TL-3 Apprh. Trans. & Begin/End Guardrail Sta.

Begin/End Rigid

- 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,
- 3. GUARDRAIL TAPER: The connecting quardrail may require a different lateral offset if shown in the plans. At the location shown herein, taper the guardrail to the connecting guardrail offset. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.
- 4. END TRANSITION OF CURB OPTIONS: The Plan and Elevation views depict an example Curb Transition to Flush Shoulder from Section D-D to E-E, but this transition may require a different shape depending on the End Transition option shown in the plans (Either a 'Shoulder Gutter Option', 'Raised Curb Option', or 'Flush Shoulder Option'). See Sheet 14 for additional curb options and Sheet 17 for curb shape details.
- 5. 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.
- 6. 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.

- 7. 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.
- 8. 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

→ Direction of Traffic

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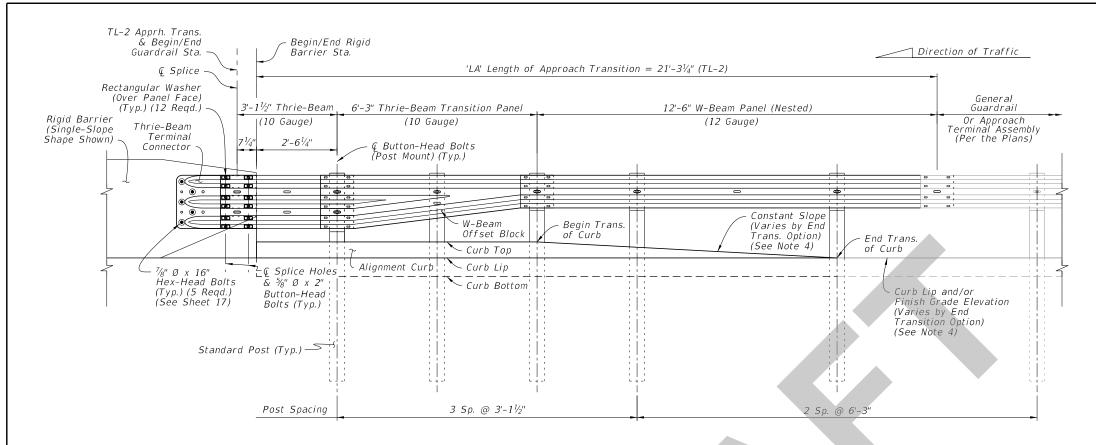
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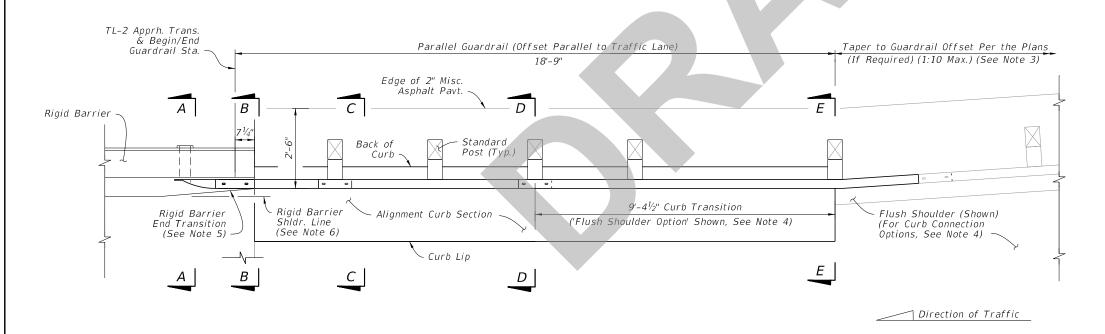
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TL-2 APPROACH TRANSITION INSTALLED ELEVATION



NOTES:

1. INSTALLATION: Construct the TL-2 Approach Transition segment only where indicated in the plans. For example Layouts showing the Approach Transition's fit among other guardrail segments, see Sheet 19.

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 17.
- 3. GUARDRAIL TAPER: The connecting guardrail may require a different lateral offset if shown in the plans. At the location indicated herein, taper the guardrail to the connecting guardrail offset. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.
- 4. END TRANSITION OF CURB OPTIONS: The Plan and Elevation views depict an example Curb Transition to Flush Shoulder from Section D-D to E-E, but this transition may require a different shape depending on the End Transition option shown in the plans (Either a 'Shoulder Gutter Option', 'Raised Curb Option', or 'Flush Shoulder Option'). See Sheet 16 for additional curb options and Sheet 17 for curb shape details.
- 5. 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.
- 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 lenath '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.

TL-2 APPROACH TRANSITION INSTALLED PLAN

> APPROACH TRANSITION CONNECTION TO RIGID BARRIER LOW-SPEED, TL-2 OPTION (DESIGN SPEED ≤ 45 MPH)

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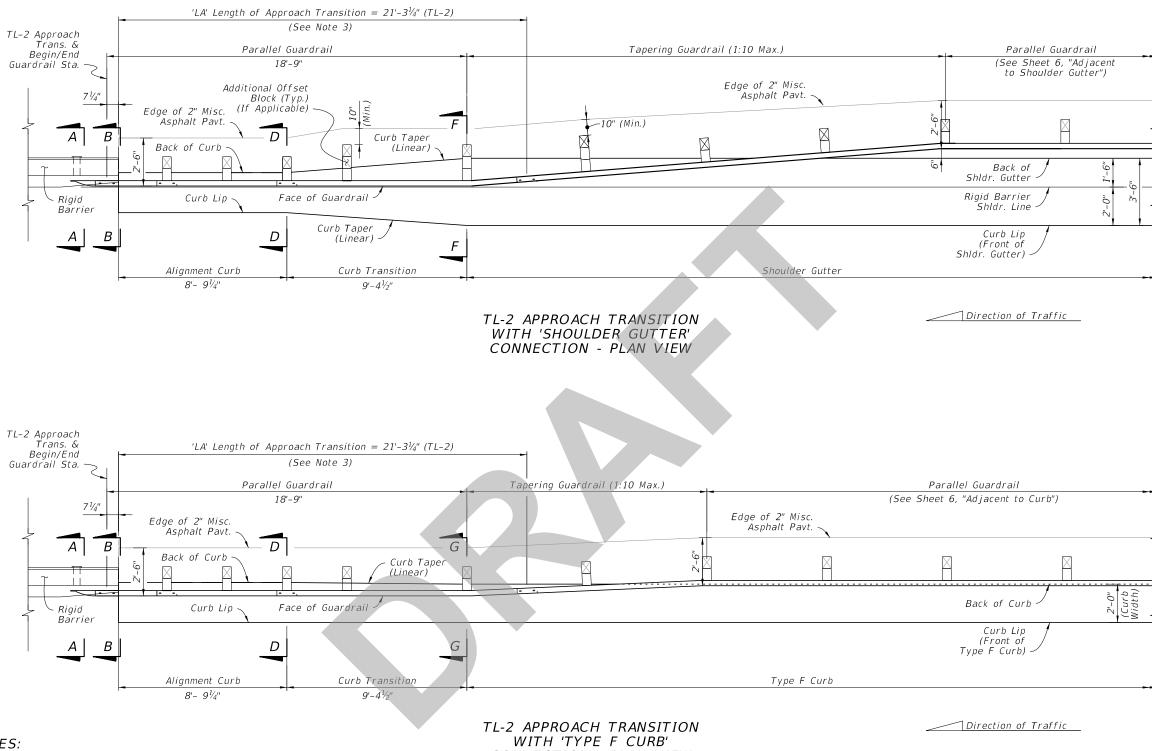
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NOTES:

DESCRIPTION:

1. GENERAL: See the applicable notes and details on Sheet 15.

2. SECTION VIEWS & DETAILS: For cross sections and details, including the barrier mounting hardware, curb transition, adjacent grading, and installation dimensions, see Sheet 17.

3. ELEVATION VIEW: For post and panel installation details within 'LA', see the elevation view on Sheet 15. The curb details will differ depending on curb option required.

CONNECTION - PLAN VIEW

APPROACH TRANSITION CONNECTION TO RIGID BARRIER LOW-SPEED, TL-2 OPTION (DESIGN SPEED ≤ 45 MPH), CURB CONNECTIONS

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