GENERAL NOTES:

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

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 24. 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 ± 1/4" thickness over a distance ranging from 25'-0" to 31'-3". Height transitions must occur outside of End Treatment and Approach Transition segments.

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 22.

8. NEARBY W-BEAM: Where located 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 Railings 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 slopes.

10. CONNECTION TO EXISTING GUARDRAIL: Where a transition to existing guardrail 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.

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.

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).
GENERAL GUARDRAIL

INSTALLED ELEVATION

INSTALLED PLAN

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

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

3. CONNECTION DETAILS: Connections to End Treatments, Approach Transitions, or other segment types are defined in the Index Sheets, APL Drawings, or the plans.


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 sidewalks, or shallow depth conditions are encountered, see Sheet 23 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, TL-3 GUARDRAIL DETAILS

INDEX 536-001

SF DOT

STANDARD PLANS

FY 2020-21

sheet 2/24
LOW-SPEED GUARDRAIL DETAILS

1. GENERAL: Install the Low-Speed Guardrail configuration where indicated in the plans. Low-Speed Guardrail may include tapered segments if called for in the plans.

Use 12'-6" or 25'-0" W-Beam Panels for normal spans, and use 9'-4" Panels for end connections to adjoining segments as shown. A single 6'-3" Panel may be used at the end of the Low-Speed Guardrail run along with a single reduced 6'-3" post spacing to meet the nominal Begin/End Guardrail Sta. required.

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.


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 23 for additional post mounting options.

8. RESTRICTIONS: Low-Speed Guardrail segments are not permitted for use with items including, but not limited to, double faced W-Beam, Deep Posts at Slope Breaks, Raised Curb, Pipe Rail, and/or Rub Rail.
DESCRIPTION:

W-Beam Panel Section

Thrie-Beam Panel Section

Thrie-Beam Transition Panel Elevation (Reverse Direction Similar by Opposite Hand)

W-Beam Panel Elevation

Thrie-Beam Panel Elevation

PANEL SUMMARY TABLE:

<table>
<thead>
<tr>
<th>Panel Type</th>
<th>Number of Spaces</th>
<th>Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'-3&quot; W-Beam</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>9'-6&quot; W-Beam</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>12'-6&quot; W-Beam</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>15'-3&quot; W-Beam</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>18'-6&quot; W-Beam</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>21'-6&quot; Thrie-Beam</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>24'-6&quot; Thrie-Beam</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>27'-6&quot; Thrie-Beam</td>
<td>3</td>
<td>12</td>
</tr>
</tbody>
</table>

NOTES:

1. MATERIALS:
   The corrugated steel panels in accordance with Specification 567 and made from either Class A, 12 gauge steel or Class B, 10 gauge steel as specified in the Panel Summary Table above.

2. CABLE ANCHOR PLATE BOLT HOLES:
   Include \( \frac{3}{8}" \) Cable Anchor Plate Bolt Holes only where required for installation of the Cable Anchor Plate shown on Sheet 9, 10 & 11.
   \( \frac{3}{8}" \) x \( \frac{1}{2} " \) slots may substitute for the \( \frac{3}{8} " \) holes shown.
NOTES:
1. STANDARD POSTS: Where Standard Posts are called for in this Index, use either a Timber Post or Steel Post at the length “L”, shown for Standard Posts. Use a single post material type consistently per each run of guardrail. Only where specified in the Plans, use the Deep Post “L’ for Slope Break Conditions as shown on Sheet 6.
2. OFFSET BLOCKS: For each Panel type, install the corresponding Offset Block type as shown. For General, TL-3 (Single Faced) Approach Transitions only, use the 1'-6" Thrie-Beam Block (See Sheet 13).
3. BOLT HOLES: 3/8" Bolt Holes shown in posts within this Index may be substituted with 5/16" Bolt Holes.
4. DOUBLE FACED GUARDRAIL: Orient Post Bolts with the Button-Head located on the side nearest the traffic lane. The bolt's threaded portion is not permitted to extend beyond 1/8" from the face of the tightened nut; trim the threaded portion as needed and galvanize in accordance with Specification 562.
5. BLOCK STOP-NAIL: Drive one nail per Standard Offset Block as shown to prevent Block rotation. Use steel 3/16" Type 16d nails with ASTM A307 hot-dip galvanization. For steel posts, drive the nail through the unused Flange Bolt Hole and bend the nail so its head contacts the Flange.
6. MATERIALS: Use timber and steel posts and offset blocks in accordance with Specification 967. Composite offset blocks may be substituted as approved on the APL. Use a single offset block type consistently per each run of guardrail. Steel offset blocks are only permitted for Modified Thrie Beam.

POST AND OFFSET BLOCK DETAILS
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 approximate 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-entering 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 drawings, details, procedures, and specifications.

Install posts in accordance with the manufacturer's drawings. The Special Posts on Sheet 23, including Special Steel Posts, Encased Posts, and Frangible Space-Savers, 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 Splice Location, Midspan Space Leave-Outs. General Guardrail is shown in the plans.

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 dune vegetation and trees.

7. CURBED AND DOUBLE FACED GUARDRAIL SEGMENTS: See Sheet 8.

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 approximate 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-entering 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 drawings, details, procedures, and specifications.

Install posts in accordance with the manufacturer's drawings. The Special Posts on Sheet 23, including Special Steel Posts, Encased Posts, and Frangible Space-Savers, 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 Splice Location, Midspan Space Leave-Outs. General Guardrail is shown in the plans.

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 dune vegetation and trees.

7. CURBED AND DOUBLE FACED GUARDRAIL SEGMENTS: See Sheet 8.
SHEET 2: APPROACH TERMINAL ASSEMBLY

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 9'-0" to 10'-0".
3. TAPER LENGTH: For Curbed Segments, taper the guardrail away from the roadway where shown to place the inside edge of the Impact Head at 0' 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). General Guardrail (See Section A-A). Linearly taper the difference in Height over a minimum length of 12'-0", starting where indicated herein.
5. DOUBLE FACED SEGMENT: Connect to Double Faced General Guardrail use consistent Posts and Offset Blocks as specified in the APL drawings over the entire Length of End Treatment. 'LE'. Posts and Offset Blocks in the adjoining General Guardrail segment may be different from those inside of the 'LE'. A change in post type between timber and steel is permitted, immediately outside of the 'LE' segment.
6. IMPACT HEAD END DELINERATOR: Apply Yellow Retroreflective Sheeting to the nose of 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'-0", starting where indicated herein.
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 installations, 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.

APPROACH TERMINAL GEOMETRY
CURBED AND DOUBLE FACED
NOTES:
1. COMPONENT DETAILS: For additional component details, see Sheet 10.
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.
   a. Drive the Tube using a dummy timber post to prevent damage to the Breakaway Post.
   b. Lap the Flared End Unit behind the W-Beam; Lap the Flared End Unit behind the Buffer End Unit; Lap the Flared End Unit behind the Flared End Unit.
3. FOUNDATIONS: Install Steel Tubes by either of the following methods:
   a. Driving into compact material to provide sufficient soil resistance to the surface of the Tube.
   b. Driving into compact material to provide sufficient soil resistance to the surface of the Tube.
4. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Anchoring as shown on Sheet 2, Including parallel and lapped 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 Round End Unit (Flared End Unit not permitted for this case).
6. END DELINERATOR: Mount retroreflective sheeting to the approach face of the End Unit in accordance with Specification Sections 536 and 967.
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 2 in.-diameter Type 8d nails with ASTM A53 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.

5. SOIL PLATE BOLT HOLE(S): For Trailing Anchorage installations as shown on Sheet 9, the two bolt holes shown may be substituted with a single bolt hole located at the tube centerline.
DESCRIPTION: CRT System

2. COMPONENT DETAILS: For additional component details, See Sheet 10 & 12. For the Rectangular Post Mount Cap & Steel Tube Foundation

3. MATERIALS: Use steel end shoes, plates, tubes, and bolts in accordance with Specification 967.

4. PARTIAL CABLE ASSEMBLY: The Partial Cable Assembly is similar to the Cable Assembly defined on Sheet 10, except with a 9'-0" total length and the Swage Fitting and Cable Stud omitted from one end.

Feed the Cable Stud through the Cable Stud Hole of the Transverse Cable Stud Mount as shown, and secure it with the Hex Jam Nut System as defined on Sheet 10.

5. SPECIAL END SHOE MOUNT: Punch a \( \frac{1}{2} \)" hole in the W-Beam Panel as needed to secure the Special End Shoe with the \( \frac{1}{2} \)" Hex-Head Bolt. Galvanize hole per Specification 562.

6. 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 steel tube and soil plate as a single unit using a dummy timber post to prevent damage to the roadway post.

7. END DELINERATOR: Mount retroreflective sheeting to the approach face of the Buffer End Unit in accordance with Specifications 536 and 967.

NOTES:
1. INSTALLATION: Use with CRT Systems as required on Sheet 12.

2. COMPONENT DETAILS: For additional component details, See Sheet 10 & 12. For the Rectangular Post Mount Cap & Steel Tube Foundation

3. MATERIALS: Use steel end shoes, plates, tubes, and bolts in accordance with Specification 967.

4. PARTIAL CABLE ASSEMBLY: The Partial Cable Assembly is similar to the Cable Assembly defined on Sheet 10, except with a 9'-0" total length and the Swage Fitting and Cable Stud omitted from one end.

Feed the Cable Stud through the Cable Stud Hole of the Transverse Cable Stud Mount as shown, and secure it with the Hex Jam Nut System as defined on Sheet 10.

5. SPECIAL END SHOE MOUNT: Punch a \( \frac{1}{2} \)" hole in the W-Beam Panel as needed to secure the Special End Shoe with the \( \frac{1}{2} \)" Hex-Head Bolt. Galvanize hole per Specification 562.

6. 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 steel tube and soil plate as a single unit using a dummy timber post to prevent damage to the roadway post.

7. END DELINERATOR: Mount retroreflective sheeting to the approach face of the Buffer End Unit in accordance with Specifications 536 and 967.
2. MIN. CLEAR AREA: Keep the area behind the CRT free of fixed objects and aboveground hazards within the Min. Clear Area limits shown. Maintain a slope not steeper than 1:10 for a minimum 2' behind the posts, and maintain a slope not steeper than 1:2 beyond 2' from the posts.

3. APPROACH GRADING: Maintain grading on the roadway side of the guardrail face at a maximum slope of 1:10.

4. MATERIALS: For CRT Posts, use Timber Post material in accordance with Specification 967. Use steel panels and hardware in accordance with Specification 967.

5. BOLT OMISSION: For the 8 Foot Radius CRT System only, do not place a panel-to-post mount bolt at the center CRT Post (omit the ½" Button-Head Bolt only at the location shown).

6. SHOP-BENT PANELS: Install Shop-Bent panel(s) where indicated using 12'-0" or 25'-0" W-Beam Panels. Splice at post locations within the CRT radius using the General configuration of ½" Ø Button-Head Bolts (8 reqd. per splice).

7. 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.
NOTES:

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

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 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 Sheet 14 for additional curb options and Sheet 17 for curb shape 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.

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 calculations 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 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.

APPENDIX: Approach Transition Connection to Rigid Barrier - General, TL-3

For existing bridge connection options, see Index 536-002, 521-404, and 521-405.

For existing guardrail offsets, see Sheet 19.

For concrete barriers, see Sheet 17.

For traffic railings, see Sheet 23 and 17 for curb shape details.

For detail views, see Sheet 17.

For additional curb options and Sheet 17 for curb shape details.

For midspan of the Thrie-Beam Transition Panel and for all other W-Beam locations shown herein, use the W-Beam Offset Blocks with 1'-6" height.
NOTES:

1. GENERAL: See the applicable notes and details on Sheet 13.
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 13. The curb details will differ depending on curb option required.
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.

APPOTHRH TRAVERSE ONNECTION TO RIGID BARRIER - LOW-SPEED, TL-2 CURB CONNECTIONS
NOTES:
1. PLAN AND ELEVATION VIEWS: Work with Sheets 13 thru 16.
2. END TRANSITION OF CURB OPTION: Install one of the three End Transition types shown per Section E-E as indicated by the plans.
3. GRADE BEHIND POSTS: Place Slope Break a Min. 2'-0" behind the post, per Sheet 6.
4. MATERIALS & CONSTRUCTION: Construct the concrete Aligning Curb and Curb transition Connectors in accordance with Specification 963. Use steel Plates and Thrie-Beam Terminal Connectors in accordance with Specification 967.

Curb Transition Isometric Views

Flush Shoulder Option

Shoulder Gutter Option

Raised Curb Option

Curb Transition Sections

Approach Transition Connection - Details

Index 536-001
Sheet 17 of 24
**NOTES:**

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

The layout given on Sheet 20 provides a basic scheme for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail has the same offset as the Approach Transition segment, then no taper is required.

2. **THRIE-BEAM TERMINAL CONNECTOR:** See Sheet 17 for Details. The installed bolt's threaded portion is not permitted to extend beyond 3/4" from the face of the nut. Trim the threaded portion as needed and galvanize in accordance with Specification 992.

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

---

**APPROACH TRANSITION CONNECTION TO RIGID BARRIER WITH DOUBLE FACED GUARDRAIL**

**TL-3 DOUBLE FACED APPROACH TRANSITION INSTALLED ELEVATION**

Guardrail Offset Parallel to Traffic Lane = 27'-6"

Taper to Guardrail Offset Per the Plans (If Required) 1:15 Max. (See Note 1)

**TL-3 DOUBLE FACED APPROACH TRANSITION INSTALLED PLAN**

NOTES:

3. **GENERAL GUARDRAIL:**

   - **SECTION F-F**
     - **TYPE F-F SECTION**
     - **TRIMMED STD. OFFSET BLOCKS**
     - **TIMBER POST ALIGNMENT WIDTH**

   - **SECTION G-G**
     - **TYPE G-G SECTION**
     - **TRIMMED STD. OFFSET BLOCKS**
     - **STEEL POST ALIGNMENT WIDTH**

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

---

**DESCRIPTION:**

**FY 2020-21 STANDARD PLANS**

**INDEX**

**536-001**

**SHEET 18 of 24**
TYPE C APPROACH TO RIGID BARRIER - DOUBLE FACED GUARDRAIL

Plan View - Median Shoulders Only
(Mirror Horiz. and Vert. for Opposite Direction and/or Side of Road)

NOTES:
1. See the applicable Notes on Sheet 19.
2. LENGTH OF TRAILING ANCHORAGE, 'LT': Install the Trailing Anchorage as shown on Sheet 9, where called for in the plans.
3. THREE-BEAM TERMINAL CONNECTOR: Install connector and bolts as shown on Sheet 17.
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.
1. GENERAL: Install Rub Rail where called for in the plans. Position as shown on Sheet 6 unless otherwise shown in the plans. Install the backs of Rub Rail panels flush against Standard Posts. Either of the Channel Section or Bent-Plate Panel Rub Rail options may be used (consistent type per project). Where Double Sided Rub Rail is called for, thread the Button-Head Bolt through the Post Bolt Hole(s) and the panels on either side, and tighten the nut against the face of the panel farthest from adjacent traffic lanes. Trim the bolt's threaded portion in accordance with Note 4 on Sheet 5.

2. MOUNTING HEIGHT: Mount to the Standard Post’s Rub Rail Bolt Hole as defined on Sheet 5.

3. MATERIALS: Use steel components in accordance with Specification 967.

4. END RUB RAIL: For Single Sided Rub Rail, terminate the run of Rub Rail by bending the panel behind the post and securing in place (as shown). For Double Sided Rub Rail, terminate the runs of Rub Rail on their respective front face of the post and secure with the typical Button-Head bolt.
1. GENERAL: Install General Pipe Rail where indicated in the plans or when existing sidewalks or shared use paths are located less than 4'-0" from the back of Steel Posts as shown on Sheet 6.

2. PIPE RAIL END SEGMENTS. Place End Segments on both ends of General Pipe Rail runs, with End Fixtures mounted to Terminal Posts located outside of Approach Terminal Assembly ('LE'), Approach Anchorage Assembly ('LT'), and Approach Transition ('LA') segments.

3. MATERIALS: Use steel brackets, fixtures, and pipes in accordance with Specification 967.

4. RAIL SPLICES: Install Rail Splices to join pieces of 2" NPS Pipe Rail into a continuous system. Place splices as needed, at a spacing of 18'-0" or greater. Orient the head of bolt on the top of the pipe.

PEDESTRIAN SAFETY TREATMENT - PIPE RAIL
NOTES:
1. INSTALLATION: When the construction of Guardrail at the required post spacing results in posts located atop culverts, slabs, pier footings, or similar concrete structures, a Special Steel Post may be substituted for a Standard Post. Install where shown in the plans and/or as-needed, in accordance with Specification 536.

2. EDGE CONFLICT: When a required post location causes an Edge Conflict with the structure, where the Steel Base Plate is not located entirely on the structure at least 3” from the Edge of Concrete, the longitudinal post location may be altered by up to 1'-6" (Quarter Span) from the original required spacing location to prevent the Edge Conflict. With the post location adjusted, use a Std. Post mounted in soil (Option 1) or a Special Steel Post with its Base Plate mounted entirely on the structure (Option 2). Maintain the original required spacing locations upstream and downstream of the structure.

3. BASE PLATE MOUNT: Install Special Steel Posts as shown using steel Adhesive-Bonded Anchor Bolts in accordance with Specification 536. Use 3/8 HEX-Head Bolts for structures less than 9' deep as defined in the Specification.

4. PANEL MOUNT TO ADJUSTED POST: Punch additional 7/8" Post Bolt Slots in the W-Beam or Thrie-Beam Panel only where needed to mount the panel to a post in an adjusted location. Meet the Panel Post Bolt Slots requirements of Specification 536.

5. MATERIALS: Use steel base plates in accordance with Specification 536.

SPECIAL STEEL POST FOR CONCRETE STRUCTURE MOUNT

NOTES:
1. INSTALLATION: When the construction of Guardrail at the required post spacing results in posts located atop underground utilities or other underground obstructions, an Encased Post may be used where a 2'-0" depth will avoid the conflict. Install where shown in the plans and/or as-needed, in accordance with Specification 536.

2. REDUCED-LENGTH STANDARD POST: Use a Standard Post with reduced length such that the Panel Height ‘H’ is maintained while the post bottom terminates 3’ from the bottom of the concrete foundation. Typically, the post length ‘L’ is 4’-6" for W-Beam Guardrail.

3. FOUNDATION: Use non-reinforced Class NS Concrete material in accordance with Specification 347. After casting the concrete, ensure the surrounding soil material is completely backfilled and tamped to provide full passive resistance.

4. LIMIT: Encased Posts are not permitted for more than 3 consecutive posts.

ENCASED POST FOR SHALLOW MOUNT

FRANGIBLE LEAVE-OUT FOR CONCRETE SURFACE MOUNT

NOTES:
1. INSTALLATION: When the construction of Guardrail at the required post spacing results in posts placed within a concrete surface (typically a sidewalk), use a Frangible Leave-Out around the post base as shown in the plans and/or as-needed, in accordance with Specification 536.

2. MATERIALS: Use Non-Excavatable Flowable Fill in accordance with Specification 121, not to exceed 150 psi.
NOTES:
1. INSTALLATION: Install Barrier Delineators as shown in accordance with the plans, with Specifications 536 and 705, and with the manufacturer's design as approved on the APL.
2. MATERIALS: Use materials of the size and type defined for Barrier Delineators in Specification 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.

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. For Steel Posts with Double Faced Guardrail they are required for General Panel Splices. To show midspan splices in general sections, use one慑General panel length (9'-10½" or 10'-10½") 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 0'-3" space between the 12'-6" and 3'-1½" spaces.
4. PANEL POST BOLT SLOTS: For Quarter Spacing configurations, punch additional 3/8" x 6" Post Bolt Slots in the panels only where required for mounting and in accordance with Specification 593.

Steel Posts

Timber Posts

Mount Location - Isometric Views

Mount Location - Plan View

Detail 'S' - Half Spacing Elevation (As Read. Per the Plans)

Detail 'S' - Quarter Spacing Elevation (As Read. Per the Plans)

Reduced Post Spacing for Hazards

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 panel flange)
3. Use bolts listed in Table 2 in corresponding locations shown in this Index.

5/8" Button-Head Bolt System

Button-Head Bolt System Lengths:

<table>
<thead>
<tr>
<th>Application(s):</th>
<th>Length 'L':</th>
<th>Min. Thread Length:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel Splice</td>
<td>10&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Steel Post Mount - Single Faced Guardrail</td>
<td>10&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Timber Post Mount - Single Faced Guardrail</td>
<td>18&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Steel or Timber Post Mount - Double Faced Guardrail</td>
<td>22&quot;</td>
<td>#</td>
</tr>
</tbody>
</table>

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 panel flange)
3. Use bolts listed in Table 2 in corresponding locations shown in this Index.

5/8" Button-Head Bolt System

Button-Head Bolt System Lengths:

<table>
<thead>
<tr>
<th>Application(s):</th>
<th>Length 'L':</th>
<th>Min. Thread Length:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel Splice</td>
<td>10&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Steel Post Mount - Single Faced Guardrail</td>
<td>10&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Timber Post Mount - Single Faced Guardrail</td>
<td>18&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Steel or Timber Post Mount - Double Faced Guardrail</td>
<td>22&quot;</td>
<td>#</td>
</tr>
</tbody>
</table>

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 panel flange)
3. Use bolts listed in Table 2 in corresponding locations shown in this Index.

5/8" Button-Head Bolt System

Button-Head Bolt System Lengths:

<table>
<thead>
<tr>
<th>Application(s):</th>
<th>Length 'L':</th>
<th>Min. Thread Length:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel Splice</td>
<td>10&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Steel Post Mount - Single Faced Guardrail</td>
<td>10&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Timber Post Mount - Single Faced Guardrail</td>
<td>18&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Steel or Timber Post Mount - Double Faced Guardrail</td>
<td>22&quot;</td>
<td>#</td>
</tr>
</tbody>
</table>

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 panel flange)
3. Use bolts listed in Table 2 in corresponding locations shown in this Index.

5/8" Button-Head Bolt System

Button-Head Bolt System Lengths:

<table>
<thead>
<tr>
<th>Application(s):</th>
<th>Length 'L':</th>
<th>Min. Thread Length:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel Splice</td>
<td>10&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Steel Post Mount - Single Faced Guardrail</td>
<td>10&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Timber Post Mount - Single Faced Guardrail</td>
<td>18&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Steel or Timber Post Mount - Double Faced Guardrail</td>
<td>22&quot;</td>
<td>#</td>
</tr>
</tbody>
</table>