NOTES:

1. A bypass switch shall be installed to override each timing interval in case of a malfunction.
2. "STOP HERE ON RED" is omitted in Type I operation and "TRAFFIC SIGNALS" are omitted in Type II operation.
3. The time between beginning of flashing yellow on "Drawbridge Ahead" sign and the clearance of traffic signal to red, or beginning of flashing red should not be less than the travel time of a passenger car, from the sign location to the stop line, traveling at the 85th centile approach speed.
4. Beginning of operation of drawbridge gates shall not be less than 15 seconds after steady red or 20 seconds after flashing red (actual time may be determined by the bridge tender.)
5. Time of gate lowering and raising is dependent upon gate type.
6. Time of bridge opening is determined by the bridge tender.
7. Each gate shall be operated by a separate switch.
8. On each approach (Type II), all four red signals shall be on the same two circuit flashers, with the two top signals on one circuit, and the two bottom signals on the other circuit.
9. A Drawbridge Ahead sign is required for both types of signal operation. However, a flashing beacon shall be added to the sign when physical conditions prevent a driver traveling at the 85th centile approach speed from having continuous view of at least one signal indication for 10 seconds.
10. Requirements on gate installation are contained in Section 41 of the "Manual on Uniform Traffic Control Devices".
11. "In accordance with Traffic Engineering Manual (Topic Number 750-000-005, Section 2), SLIPPERY WHEN WET SIGNS shall be placed in advance of all MOVABLE and NONMOVABLE STEEL DECK BRIDGES."

* Field conditions may require adjustment of this standard distance.
FIGURE - A
MONOTUBE SUPPORT MOUNTING

FIGURE - B
SIGN PANEL MOUNTING ASSEMBLY

FIGURE - C
12" Signal Head With Visor

FIGURE - D
Pole Clamp With Wire Entrance

FIGURE - E
Lens With Visor

FIGURE - F
Bridge Mounting Details Not Shown

FIGURE - G
DRAW BRIDGE AHEAD

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TRAFFIC CONTROL DEVICES FOR
MOVABLE SPAN BRIDGE SIGNALS

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* Measured from the bottom of the sign to the near edge of the pavement. Horizontal distance between edge of the pavement and inside edge of sign will vary with condition at job site.
BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND
TO BE USED WITH TYPE 1 OPERATION, AS SHOWN ON PREVIOUS SHEET
MONOTUBE SUPPORT MOUNTING

NOTES:
1. 12 volt flashing red lights shall be mounted on gate arm and shall operate in the flashing mode only when gate arm is in the lower position or in the process of being lowered. The number of lights shall vary accordingly to length of the gate arm.
2. Alternating 16" pattern of fully reflectorized red and white stripes.
GENERAL NOTES:

1. No guardrail is proposed for signals; however, some form of impact attenuation device may be specified for certain locations.
2. Advance flasher to be installed when and if called for in plans or specifications.
3. Top of foundation shall be no higher than 4" above finished shoulder grade.
4. Type of traffic control device
   1. Flashing warning devices
   2. Flashing warning devices with cantilever
   3. Flashing warning devices with cantilever and gate
   4. Flashing warning devices with cantilever and gate
   5. Flashing warning devices with cantilever and gate
   6. Flashing warning devices with cantilever
5. Class of traffic control devices (Not Shown)
   1. 2 Quadrant flashing warning devices-one track
   2. 2 Quadrant flashing warning devices-multiple tracks
   3. 2 Quadrant flashing warning devices-multiple tracks
   4. 2 Quadrant flashing warning devices and gates-one track
   5. 2 Quadrant flashing warning devices and gates-one track
   6. 2 Quadrant flashing warning devices and gates-one track
6. Number of track signals is the option of the installing agency when automatic gates are used.
7. 30° alternate reflectorized red and white flashing warning devices.
8. Gates are used.
10. Edge of background or part nearest highway.

TRAFFIC CONTROL DEVICES FOR FLUSH SHOULDER ROADWAY

SIGNAL PLACEMENT AT RAILROAD CROSSING
(2 - LANE DESIGN)

**Note:** Arrows denote direction of travel not pavement markings. Lane length requirements see Note 5 Sheet 3.

**Note:** Two separate foundations may be required (one for signals, one for gate), depending on type of equipment used.

*When 10' is deemed impractical the control device can be located as close as 2' from the edge of a paved shoulder but not less than 6' from the edge of the near traffic lane.*

**Note:** Arrows denote direction of travel not pavement markings. Lane length requirements see Note 5 Sheet 3.

**Note:** Two separate foundations may be required (one for signals, one for gate), depending on type of equipment used.

*When 10' is deemed impractical the control device can be located as close as 2' from the edge of a paved shoulder but not less than 6' from the edge of the near traffic lane.*
NOTES:
1. The location of flashing warning devices and stop lines shall be established based on future (or present) installation of gate with appropriate track clearances.
2. Where plans call for railroad traffic control devices to be installed in curbed medians, the minimum median width shall be 12'-6".
3. Location of railroad traffic control device is based on the distance available between face of curb & sidewalk, 0 to 6' - locate device outside sidewalk. Over 6' - locate device between face of curb and sidewalk.
4. Stop line to be perpendicular to edge of roadway, approx. 19' from nearest rail; or 9' from and parallel to gate when present.
5. When a cantilevered-arm flashing warning device is used, the minimum vertical clearance shall be 12'-6" from above the Crown of Roadway to the lowest point of the Overhead Signal Unit.

TRAFFIC CONTROL DEVICES FOR CURBED ROADWAY

TYPE I

TYPE II

TYPE III

TYPE IV

TYPE V
NOTES:

1. When computing pavement message, quantities do not include traverse lines.

2. Placement of sign W10-1 in a residential or business district, where low speeds are prevalent, the W10-1 sign may be placed at a minimum distance of 100' from the crossing. Where street intersections occur between the RR pavement message and the tracks an additional W10-1 sign and additional pavement message should be used.

3. A portion of the pavement markings symbol should be directly opposite the W10-1 sign.

4. Recommended location for FTP-61-06 or FTP-62-06 signs, 100' urban and 300' rural. See Index 700-102 for sign details.

5. Gate Length Requirements:
   - For two-way undivided sections, the gate should extend to within 2' of the center line. On multiple approaches the maximum gate length may not reach to within 2' of the center line. For those cases, the distance from the gate to the center line shall be a maximum of 4'.
   - For one-way or divided sections, the gate shall be of sufficient length such that the distance from the gate tip to the inside edge of pavement is a maximum of 4'.

- The gate shall extend to within 2' of the center line.
**RAILROAD GATE ARM LIGHT SPACING**

<table>
<thead>
<tr>
<th>Specified Length Of Gate Arm</th>
<th>Dimension &quot;A&quot;</th>
<th>Dimension &quot;B&quot;</th>
<th>Dimension &quot;C&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Ft.</td>
<td>6&quot;</td>
<td>36&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>15 Ft.</td>
<td>18&quot;</td>
<td>36&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>16-17 Ft.</td>
<td>24&quot;</td>
<td>36&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>18-19 Ft.</td>
<td>28&quot;</td>
<td>45&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>20-23 Ft.</td>
<td>30&quot;</td>
<td>45&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>24-28 Ft.</td>
<td>30&quot;</td>
<td>45&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>29-31 Ft.</td>
<td>36&quot;</td>
<td>60&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>32-34 Ft.</td>
<td>36&quot;</td>
<td>72&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>35-37 Ft.</td>
<td>36&quot;</td>
<td>72&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>38 And Over</td>
<td>36&quot;</td>
<td>108&quot;</td>
<td>10&quot;</td>
</tr>
</tbody>
</table>

**MEDIAN SECTION AT SIGNAL GATES**

**MEDIAN SIGNAL GATES FOR**

**MULTILANE UNDIVIDED URBAN SECTIONS**

*(THREE OR MORE DRIVING LANES IN ONE DIRECTION, 45 MPH OR LESS)*

**NOTE:**


**RAILROAD GRADE CROSSING TRAFFIC CONTROL DEVICES**

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REPISIO

DESCRIPTION:

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ADVANCE WARNING FOR R/R CROSSING

LOCATION OF THE
ADVANCE WARNING SIGN

SPEED (mph)

DISTANCE (ft)

Min. 50

30 75

40 125

50 250

55 325

TYPICAL PLAN

TYPICAL PLAN

FUNCTIONAL BLOCK DIAGRAM

FRONT VIEW

SIDE VIEW

FRONT VIEW

ACTIVE STATE

(TRAIn CIRCUIT ACTUATED)

PASSIVE STATE

(TRAIn CIRCUIT NOT ACTUATED)
PEDESTRIAN/BICYCLE RAILING (STEEL)

**DESCRIPTION:**

10/25/2017

4:19:46 P.M.

**REVISION**

11/01/16

515-052

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PEDESTRIAN/BICYCLE RAILING (STEEL)

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**NOTES**

1. Shop Drawings are required; see Specification Section 515.
2. For bridge mounted railings work this Index with Index 515-051 Bridge Bicycle/Pedestrian Railing.
3. Materials:
   a. Pipe Rails and Pickets: ASTM A500 Grade B, C or D, or ASTM A36 Grade B for standard weight pipe (Schedule 40) and ASTM A53 for bars.
   b. Structural Tube: ASTM A500 Grade A, B, C, or D or ASTM A501.
   c. Steel Plate: ASTM A36 or ASTM A529 Grade 36.
   d. U-Channels and filler plates: ASTM A36 or ASTM A1011 (Grade 36).
   e. Stainless steel (SS) screws: Type 316 or 18-8 Alloy.
   f. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
      a. Hex Head Bolts: ASTM A307 or ASTM F1554
         1. 1⁄2" diameter single bolt option, Grade 36
         2. 3⁄4" four bolt option, Grade 55
      b. Adhesive Anchors: ASTM F1554 fully threaded rods, Grade 55
      c. Hex Nuts: ASTM A563
      d. Flat Washers: ASTM A36 or ASTM A1011 (Grade 36)
      e. Plate Washers: ASTM A529 or ASTM A529 Grade 36
   g. Shims: ASTM B209 Alloy 6061
   h. Bearing Pads: 1⁄2" Plain, Fabric Reinforced or Fabric Laminated pads that meet the requirements of Specification Section 962 for Ancillary Structures.
4. Fabricate pickets and vertical panel elements parallel to the posts; except Type 2, 3 and 5 panel infills may be fabricated parallel to the longitudinal grade. Maintain a maximum clear opening of 5⁄8" for standard installations and 3⁄8" when a 4" sphere requirement is indicated in the Data Tables.
5. Maximum spacing between expansion joints is 40'-0". Locate an Expansion Joint between the posts on either side of the Deck Expansion Joint.
6. Field splices are similar to the Expansion Joint Detail and may be approved by the Engineer to facilitate handling; but the top rail must be continuous across a minimum of two posts.
7. For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "K".
8. Make corners and changes in tangential longitudinal alignment with a 9" bend radius or terminate adjoining sections with mitered end sections when handrails are not required.
9. For changes in tangential longitudinal alignment greater than 45°, position posts a maximum of 2'-0" each side of the corner but not at the corner apex.
10. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
11. Handrails are required and must be continuous at landings for:
   a. Grades Steeper than 5%.
   b. Three or more steps.
12. Installation: Cutting of reinforcing steel is permitted for post installed anchors.

---

**TABLE 1 - RAILING MEMBERS**

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post &quot;A&quot;</td>
<td>HSS 2 1/2&quot; x 1 1/2&quot; x 3/8&quot;</td>
<td>2.50&quot; x 1.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Post &quot;B&quot;</td>
<td>HSS 2 1/2&quot; x 1 1/2&quot; x 3/8&quot;</td>
<td>2.50&quot; x 1.50&quot;</td>
<td>0.188&quot;</td>
</tr>
<tr>
<td>Top Rail</td>
<td>HSS 3.000 x 0.120</td>
<td>3.00&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>HSS 2 1/2&quot; NPS (Sch. 16)</td>
<td>2.875&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>HSS 3.000 x 0.120</td>
<td>3.00&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail Post Connection Sleeve</td>
<td>HSS 2 x 2 x 3/8&quot;</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.120/125</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>HSS 1.500 x 0.125</td>
<td>1.50&quot;</td>
<td>0.120/125</td>
</tr>
<tr>
<td>Handrails</td>
<td>HSS 1.500 x 0.125</td>
<td>1.50&quot;</td>
<td>0.125</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>HSS 1 1/2&quot; NPS (Sch. 40)</td>
<td>1.50&quot;</td>
<td>0.125</td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>1 1/2&quot; Ø Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>Varies (See Details)</td>
<td>Varies</td>
<td>Varies</td>
</tr>
</tbody>
</table>

---

**TABLE 1 NOTES:**

(1) 0.125" wall thickness permitted for rails with post spacings less than 5'-8", except that Post Connection Sleeve must be 1 1/2" NPS (Sch. 40).
Handrail required for ramps (Handrail continuous at landings between runs), railings on grades steeper than 5%.

For slopes greater than 5%:
Max. ramp slope = 8.33% (max. slope)
Max. ramp cross-slope = 2.0% (max. slope)

Landings:
Max. landing slope = 2% (max. slope)
Max. landing cross slope = 3% (max. slope)

Typical Railing Details & Railings on Grades 0% to 5%

(Showing Outside Face of Railing with Type "A" Posts)

Typical Railing Details & Railings on Grades 0% to 5%

(Showing Inside Face of Railing with Type "A" Posts)
SECTION A-A

**TYPE 1 - PICKET INFILL PANEL**

*Picket Spacing of 6" centers is based on a 3/8" Ø Bar for standard applications. When shown in the Contract Plans a 4" picket spacing may be required. See Note 4 (Sheet 1).*

**PICKET NOTES:**

- Ties @ 1'-0" center (Post and End Rail)
- Ties @ 2'-0" center (Intermediate & Bottom Rail)
- Chain-Link Fence Fabric tied to inside face of railing

**TYPE 2 - CHAIN-LINK (Continuous Infill Panel)**

**NOTES:**

1. See Plans for Infill Panel option required.

**TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS**

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
<th>COMPONENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc-Coated Steel - No. 9 gage (coated wire diameter)</td>
<td>A 392</td>
</tr>
<tr>
<td>Aluminum-Coated Steel - No. 9 gage (coated wire diameter)</td>
<td>A 491</td>
</tr>
<tr>
<td>Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter) - See Plans for specified color of PVC</td>
<td>F 668</td>
</tr>
<tr>
<td>Zinc-Coated Steel Wire</td>
<td>F 626</td>
</tr>
<tr>
<td>Zinc-Coated Steel Wire - 3/8&quot; Min. thickness x 3/8&quot; (Min. width) x 2'-3' (Min. length) Steel Bars</td>
<td>F 626</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F 626</td>
</tr>
</tbody>
</table>

**CHAIN-LINK PANEL NOTE:**

Chain-Link Fence Fabric shall be continuous along limits of railing. Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.
TYPE 3 - SUNSHINE INFILL PANEL

* Arc, Rays and Sun Segment may be formed in a single panel from 1/2" steel plate pattern cut with laser or plasma CNC, welded to a 1x1x1/8 Angle Border or the 3x3x1/8 Channel Border shown.

NOTE:
1. See Plans for Infill Panel Option required.
TYPE 5 - PERFORATED INFILL PANEL

DETAIL "5A" PANEL/RAIL CONNECTION
(Top Shown, Bottom Similar)

DETAIL "5B" PANEL, END CONNECTION
(Expansion Joint Shown, Sides Similar)

SECTION A-A
Seal welding mitered corners is permitted

SECTION C-C

NOTES:
1. See Plans for Infill Panel Type required.
**Typical Section on Concrete Sidewalk (Case I)**

- Edge Shim (8" long x 3/4" wide x thickness as reqd.)
- 1'-0" Min. required for stability of railing.
- 4" Sidewalk with Thickened Edge

**Typical Section on Retaining Wall (Case II)**

- 1 1/2 @ C-1-P Hex Head Anchor Bolt, or 1 1/2 Ø Adhesive Anchor with hex nut & washer.
- Place Anchor Bolts perpendicular to Base for Grades ≤ 8.33% (Ramps) with flat washer.
- Place anchor bolts plumb for Grades > 8.33% (Stairs) with flat washer & beveled washer or leveling channel.

**Detail "D" (Optional Shimming Detail for Cross Slope Correction)**

(Used in lieu of Beveled Shim Plates)

**Detail "C"**

(Cast-In-Place Anchor Bolts shown, Adhesive Anchors similar)

**Anchor Bolt Table**

<table>
<thead>
<tr>
<th>CASE</th>
<th>STRUCTURE TYPE</th>
<th>DIMENSIONS</th>
<th>ANCHOR LENGTH</th>
<th>ANCHOR SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Unreinforced Concrete</td>
<td>6&quot;</td>
<td>9&quot;</td>
<td>10 1/2&quot;</td>
</tr>
<tr>
<td>IIa</td>
<td>Reinforced Concrete</td>
<td>4&quot;</td>
<td>4&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>IIb</td>
<td>Gravity Wall Index 400-011</td>
<td>4 1/2&quot;</td>
<td>3 1/2&quot;</td>
<td>1 3/8&quot;</td>
</tr>
<tr>
<td>III</td>
<td>Step Cheekwall</td>
<td>4 1/2&quot;</td>
<td>4 1/2&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>IV</td>
<td>Varies</td>
<td>5&quot;</td>
<td>5&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

**Notes:**

- Embedment length "C" may be reduced to 9" for the 42" height railings for Case IIb, when the post spacing does not exceed 5'-0".
- **When required; measured from top of sidewalk.**

**PEDESTRIAN/BICYCLE RAILING (STEEL)**

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**INDEX 515-052**

**Sheet 8 of 8**

**REV 01/01/16**

**DESCRIPTION:**

**REVISION 11/01/16**

**LAST REVISION 01/01/16**

**PEDESTRIAN/BICYCLE RAILING (STEEL)**
TABLE 1 - RAILING MEMBERS

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>ALLOY</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts (Type &quot;A&quot; &amp; &quot;B&quot;)</td>
<td>6061-T6</td>
<td>RT 2x2x0.250</td>
<td>2.00 x 2.00</td>
<td>0.125</td>
</tr>
<tr>
<td>Posts (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion 1/2x2x0.125</td>
<td>1.50 x 2.00</td>
<td>0.125</td>
</tr>
<tr>
<td>Top Plate (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion (See Details)</td>
<td>25/8 x 7&quot;</td>
<td>Varies</td>
</tr>
<tr>
<td>Top Rail</td>
<td>6063-T5</td>
<td>2½ NPS (Sch. 10)</td>
<td>2.875&quot;</td>
<td>0.125</td>
</tr>
<tr>
<td></td>
<td>2½ Round Top Cap Rail</td>
<td>3.000&quot;</td>
<td>0.125</td>
<td></td>
</tr>
<tr>
<td>End Hoops</td>
<td>6063-T5</td>
<td>2½ NPS (Sch. 10)</td>
<td>2.875&quot;</td>
<td>0.125</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.00 OD x 0.125 Wall</td>
<td>3.000&quot;</td>
<td>0.125</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>2½ OD x 0.125 Wall</td>
<td>2.500&quot;</td>
<td>0.125</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Top Cap Rail Inner Sleeve</td>
<td>2.800&quot;</td>
<td>0.090</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>6061-T6</td>
<td>RT 2x2x0.250</td>
<td>2.00 x 2.00</td>
<td>0.250</td>
</tr>
<tr>
<td>Incl. &amp; Bottom Rail Post Connection Sleeves</td>
<td>6063-T5</td>
<td>1.50 OD x 0.125 Wall</td>
<td>1.500&quot;</td>
<td>0.125</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>1.315&quot;</td>
<td>0.133</td>
</tr>
<tr>
<td></td>
<td>1½ OD x 0.125 Wall</td>
<td>1.500&quot;</td>
<td>0.125</td>
<td></td>
</tr>
<tr>
<td>Handrails</td>
<td>6063-T6</td>
<td>1½ NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.185</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>6061-T6</td>
<td>3/8 Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>6061-T6</td>
<td>3/8 Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>6063-T5</td>
<td>Varies (See Details)</td>
<td>Varies</td>
<td>Varies</td>
</tr>
</tbody>
</table>

1. Shop Drawings are required, see Specification Section 515.
2. For bridge mounted railings, work this Index with Index 515-061 Bridge Bicycle/Pedestrian Railing (Aluminum).
3. Materials:
   a. Structural Extrusions, Tube, Pipe and Bars: Table 1 and ASTM B221 or ASTM B429
   b. Adhesive Anchors: ASTM F1554 fully threaded rods, Grade 55
   c. Hex Nuts: ASTM A3563
   d. Flat Washers: ASTM F436
   e. Plate Washers: ASTM A36 or ASTM A706 Grade 36
3. Shims: ASTM B209 Alloy 6061 or 6063
4. Bearing Pads: Provide ½" thick Plain, Fabric Reinforced or Fabric Laminated Bearing Pads meeting the requirements of Specification Section 962 for Ancillary Structures.
5. Fabricate pickets and vertical panel elements parallel to the top rail must be continuous across a minimum of two posts.
6. Field splices are similar to the Expansion Joint Detail and may be approved by the Engineer to facilitate handling; but the top rail must be continuous across a minimum of two posts.
7. For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "K", for Post Type "A" & "B".
8. For changes in tangential alignment greater than 9° when handrails are not required.
9. For changes in alignment greater than 45°, position posts a maximum of 2'-0" on each side of the corner but not at the corner apex.
10. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
11. Handrails are required and must be continuous at landings for:
   a. Grades Steeper than 5%
   b. Three or more steps
12. Installation: Cutting of reinforcing steel is permitted for post installed anchors.
Handrail required for ramps (Handrail continuous at landings between runs)

Handrail ~ 1” NPS Sch. 40 Post

30'-0” Max. for Slopes > 6.25%
40'-0” Max. for Slopes ≤ 6.25%

Ramp Requirements
For slopes greater than 5%:
Max. ramp slope = 8.33%
Max. ramp cross-slope = 2.0%

Landings Requirements
Max. landing slope = 2%
Max. landing cross slope = 3%

Railings on Grades Steeper Than 5%
(Type 1 - Picket Railing Shown, Other Types Similar)

Typical Railing Details & Railings on Grades 0% to 5%
(Type 1 - Picket Railing Shown, Other Types Similar)

Notes:
* Keyed construction joints in Index 400-011 Gravity Wall are not considered to be expansion joints.
** Contraction joints (Tooled or Saw Cut) in sidewalks do not require a 6” minimum offset.
**SECTION A-A**

**TYPE 1 - PICKET INFILL PANEL**

* Picket Spacing of 6" centers is based on a 3/8" Ø Bar for standard applications.

When shown in the Contract Plans a 4" picket spacing may be required. See Note 4 (Sheet 1).

**NOTES:**
1. See Plans for Infill Panel option required.

**SECTION A-A**

**TYPE 2 - CHAIN-LINK (Continuous Infill Panel)**

**COMPONENT**

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 2 - Chain-Link Panel Component Materials</td>
</tr>
<tr>
<td><strong>COMPONENT</strong></td>
</tr>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
</tr>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
</tr>
<tr>
<td>Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage</td>
</tr>
<tr>
<td>Tie Wires</td>
</tr>
<tr>
<td>Tension Bars</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
</tr>
</tbody>
</table>

**CHAIN-LINK PANEL NOTE:**

Chain-Link Fence Fabric shall be continuous along limits of railing. Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.
SECTION A-A

DETAIL "3A" INTERMEDIATE RAIL/RAY CONNECTION

DETAIL "3C" RAY/ARC CONNECTION

SECTION A-A

DETAIL "3D" ARC/POST CONNECTION
(Continuous Top Rail)

SECTION C-C

DETAIL "3E" PANEL END CONNECTION
AT POST WITH EXPANSION JOINT

SECTION B-B

DETAIL "4A" PANEL/RAIL CONNECTION
(Top Shown, Bottom Similar)

SECTION A-A

NOTES:
1. See Plans for Infill Panel Option required.

DESCRIPTION:

PEDESTRIAN/BICYCLE RAILING (ALUMINUM)

INDEX

FY 2018-19
STANDARD PLANS

PEDESTRIAN/BICYCLE RAILING (ALUMINUM)

INDEX

515-062

7 of 9
SECTION A-A

Panel Mullion

SECTION C-C

PANEL/SPLICE CONNECTION

Inside Face of Rail

Channel $3\times3\times\frac{3}{16}$

Perforated Panel (0.04" Min.)

$\frac{3}{8}\times\frac{3}{8}$ Filler Strip

Perforated Panel (0.04" Min.)

DETAIL "5A"

Panel/Rail Connection

(Top Shown, Bottom Similar)

DETAIL "5B"

Panel End Connection

(Expansion Joint Shown, Sides Similar)

Seal welding mitered corners is permitted

TYPE 5 - PERFORATED INFILL PANEL

REPEATING PATTERN DETAIL

FOR PERFORATED PANEL

Inside Face of Post

Channel $3\times3\times\frac{3}{16}$

Perforated Panel (0.04" Min.)

$\frac{3}{8}\times\frac{3}{8}$ Filler Strip

Perforated Panel (0.04" Min.)

#10 x $\frac{3}{16}$ Pan Head Screws @ 2'-0" sp.

#10 x $\frac{3}{16}$ Pan Head Screws @ 1'-0" sp.
NOTES:
1. Shop Drawings are required.
2. Work with Specification Section 515.
3. Materials:
   A. Pan Head Set Screws: Aluminum Alloy 2024-T4 or 7075-T73 or Stainless Steel (SS) Type 316 or 18-8 Alloy.
   B. Base Plates and Cap Plates: ASTM B209, Alloy 6061-T6
   C. Structural Pipe Tube and Bars: ASTM B221 or ASTM B429, Alloy 6061-T6
   D. End Rails 90° bends and corner bends with a maximum 4 foot spacing; Alloy 6063-T6 is permitted.

### RAILING MEMBER DIMENSIONS TABLE

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.154&quot;</td>
</tr>
<tr>
<td>Rails</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.154&quot;</td>
</tr>
<tr>
<td>Rail Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1&quot; Ø Round Bar</td>
<td>1.000&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

E. Galvanized Steel Fasteners:
   a. Hex Head Bolts: ASTM A325 Type 1 or ASTM F1554 Grade 36
   b. Adhesive Anchors: ASTM F1554 Grade 36 Fully Threaded Rods
   c. Hex Nuts: ASTM A563
   d. Flat Washers: ASTM F436
   F. Aluminum Shims: ASTM B209, Alloy 6061
   G. Bearing Pads: Plain, Fabric Reinforced, or Fabric Laminated meeting requirements of Specification Sections 515 & 962 for Ancillary Structures.

4. Fabrication
   A. Place expansion joints at a maximum of 30'-0" spacing.
   B. Field splices are similar to the expansion joint detail and may be approved by the Engineer to facilitate handling, but top rail must be continuous across a minimum of two posts.
   C. Continuity field splice (Detail "E") is only used to make the railing continuous for unforeseen field adjustments.
   D. Corners and changes in tangential alignment may be made continuous with a 9" bend radius or terminated at adjoining sections with a standard end hoop when handrails are not required.
   E. For curved longitudinal alignments, shop bend top and bottom rails and handrails to match the alignment radius.
   F. For changes in tangential longitudinal alignment greater than 45° position posts a maximum of 2'-0" each side of the corner, not at the corner apex.

5. Handrails are required and must be continuous at landings for:
   A. Grades Steeper than 5%
   B. Three or more steps

6. Cutting of reinforcing steel is permitted for post-installed anchor bolts.
PIPE GUARDRAIL (ALUMINUM)

**ELEVATION**

**TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%**

**RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%**
PIPE GUIDERAIL (ALUMINUM)

**SECTION B-B**
(Handrail Connection)

- **SECTION C-C**
  - **BASE PLATE DETAIL**
    - **2-Bolt Anchorage**
  - **BASE PLATE DETAIL**
    - **4-Bolt Anchorage**

**SHIM PLATE DETAIL**
(2-Bolt Anchorage)

**PLATE WASHER DETAIL**
(4-Bolt Anchorage)

**ALTERNATE BASE PLATE DETAIL**
(Recommended for Steep Slopes)

- **DETAIL "D" - EXPANSION JOINT**
  - **FIELD SPLICE SLIP JOINT SIMILAR**

- **DETAIL "E" - CONTINUITY**
  - **FIELD SPLICE**

**DETAIL "C" - RAIL CONNECTIONS**
(Handrail and 4-Bolt Anchorage Not Shown)

- **DETAIL "B" - RAIL AND HANDRAIL**
  - **FIELD SPLICE**

**CROSS REFERENCE:**
For locations of Details "C", "D" and "E", see Sheet 2.

**DETAILED DRAWINGS:**
- **SECTION B-B**
- **SECTION C-C**
- **SHIM PLATE DETAIL**
- **PLATE WASHER DETAIL**
- **ALTERNATE BASE PLATE DETAIL**
- **DETAIL "D" - EXPANSION JOINT**
- **DETAIL "E" - CONTINUITY**
- **DETAIL "C" - RAIL CONNECTIONS**
- **DETAIL "B" - RAIL AND HANDRAIL**

**REVISED 01/17**

**DESCRIPTION:**
**FY 2018-19 STANDARD PLANS**
**INDEX 515-070 SHEET 4 of 5**
NOTES:
1. Shop Drawings are required, refer to Specification Section 515.
2. Materials:
   A. Pan Head Set Screws: Stainless Steel (SS) Type 316 or 18-8 Alloy.
   B. Base Plates and Cap Plates: ASTM A36 or ASTM A709 Grade 36.
   C. Pipe Rails and Posts: ASTM A53 Grade B for standard weight pipe and ASTM A500 Grade B, C or D or ASTM A504 for Structural Tube.
   Handrail Support Bars: ASTM A36.

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<tr>
<th>MEMBER</th>
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<tr>
<td>Posts</td>
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<tr>
<td>Rails</td>
<td>2&quot; NPS (Sch. 40)</td>
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<tr>
<td>Rail Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Sch. 40)</td>
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<td>Handrails Joint/Splice Sleeves</td>
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<td>1½&quot; NPS (Sch. 40)</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1 ¼ Round Bar</td>
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<td>Handrails Joint/Splice Sleeves</td>
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<tr>
<td>Handrail Support Bar</td>
<td>1.000&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

3. Fabrication:
A. Place expansion joints at a maximum of 30'-0" spacing.
B. Field splices are similar to the expansion joint detail and may be approved by the Engineer to facilitate handling; but top rail must be continuous across a minimum of two posts.
C. Continuity field splice (Detail "F") only use to make the railing continuous for unforeseen field adjustments.
D. Corners and changes in tangential longitudinal alignment may be made continuous with a 9" bend radius at adjoining sections with a standard end hoop when handrails are not required.
E. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
F. For changes in tangential longitudinal alignment greater than 45°, position posts a maximum of 2'-0" each side of the corner, not at the corner apex.

4. Handrails are required and must be continuous at landings for:
A. Grades steeper than 5%.
B. Three or more steps.

5. Cutting of reinforcing steel is permitted for adhesive anchor bolt installations.
REVISED

DESCRIPTION:

REVISION

LAST

of

STANDARD PLANS

FY 2018-19

SHEET

INDEX

11/01/17

PIPE GUIDERAIL (STEEL)

NOTES:

NPS = Nominal Pipe Size

STRUCTURES EXPANSION JOINTS

NOTE:

* Keyed construction joints in Index 400-011 Gravity

Wall are not considered to be expansion joints.

CROSS REFERENCE:

For Details "C", "D" and "E", see Sheet 4.

ELEVATION

TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%

See Plans for continuation or termination limits of railing

See "Typical Railing Details" for post & rail details

RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

RAMP REQUIREMENTS

For slopes greater than 5%:

Max. ramp slope = 8.33%

Max. ramp cross-slope = 2.0%

LANDING REQUIREMENTS

Max. landing slope = 2%

Max. landing cross-slope = 2%

RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

1'-6" Min.

30'-0" Max. for Slopes > 6.25%

40'-0" Max. for Slopes ≤ 6.25%

5'-0" Min.

Intermediate Landing

(Showing Inside Face of Railing)

ELEVATION

RAMP REQUIREMENTS

For slopes greater than 5%:

Max. ramp slope = 8.33%

Max. ramp cross-slope = 2.0%

LANDING REQUIREMENTS

Max. landing slope = 2%

Max. landing cross-slope = 2%
PIPE GUARD RAIL (STEEL)

RAILING CONTINUATION BEYOND STEPS
(Bottom shown, Top similar)

Handrail

Steel Handrail required for three or more steps (handrail and cheekwalls continuous at landings)

Handrail Termination
See Detail "A" (Typ.)

Handrail Continuation
See Detail "A" (Typ.)

At Landing

Handrail Terminations
See Detail "A" (Typ.)

Length of Landing 5' Min.

ELEVATION
(At-Grade Steps)

Guidesrail on Steps & Stairs

ALTERNATE END TREATMENT
PIPE GUIDERAIL (STEEL)

**SECTION B-B**
(Handrail Connection)

**SECTION C-C**
BASE PLATE DETAIL
(2-Bolt Anchorage)

**SECTION C-C**
BASE PLATE DETAIL
(4-Bolt Anchorage)

**SHIM PLATE DETAIL**
(2-Bolt Anchorage)

**SHIM PLATE DETAIL**
(4-Bolt Anchorage)

**PLATE WASHER DETAIL**
(Recommended for Steep Slopes)

**DETAIL "D" - EXPANSION JOINT**
(FIELD SPlice SLIP JOINT SIMILAR)

**DETAIL "E" - CONTINUITY FIELD SPlice**

**DETAIL "C" - RAIL CONNECTIONS**
(Handrail and 4-Bolt Anchorage Not Shown)

**DETAIL "B" - RAIL AND HANDRAIL**
(Showing Sloped Condition For Ramps with 2-Bolt Anchorage)

**Cross Reference:**
For locations of Details "C", "D" and "E", see Sheet 2.
TYPICAL SECTION ON CONCRETE SIDEWALK

TYPICAL SECTION ON GRAVITY WALL
(Other Retaining Walls Similar)

TYPICAL SECTION ON STEPS & STAIRS

DETAIL "F" (OPTIONAL SHIMMING DETAIL FOR CROSS SLOPE CORRECTION)
(Used in lieu of Beveled Shim Plates)

OPTIONAL SIDEWALK ANCHORAGE DETAIL

SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3

NOTES:

2 - 3/8" Ø x 8" or 4 - 1/2" Ø x 6" Steel Anchors:
Galvanized Steel Bolts (As Shown) (C-I-P); Galvanized U-Bolts Permitted (C-I-P); Galvanized Adhesive Anchors Permitted (**) Expansion Anchors Not Permitted.

*** The minimum embedment for adhesive anchors is 6" for 2-Bolt Anchorage or 4" for 4-Bolt Anchorage.
CURB AND GUTTER

3 /2 0 /2 0 1 8
2 :1 5 :0 4 P M

REVISION
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CURB AND GUTTER
REV IS IO N
ST OF INDEX
Gutter Construction
Future Curb And Gutter Construction
- 20' R Or As Shown On Plans

PLAN

SECTION AA

6" 1'-0" 1'-10" 1'-2"

SECTION BB

6" 1'-0" 1'-10" 1'-2"

SECTION CC

VALLEY GUTTER

* When used on high side of roadways, the cross slope of the gutter shall match the cross slope of the adjacent pavement. The thickness of the lip shall be 6", unless otherwise shown on plans.

Note: To be paid for as parent curb.

For use adjacent to concrete or flexible pavement. For details depicting usage adjacent to flexible pavement, see Sheet 2. Expansion joint, preformed joint filler and joint seal are required between curb & gutter and concrete pavement only, see Sheet 2.
CURB AND GUTTER ENDINGS

CURB TYPE A

CURB AND GUTTER TYPES E & F

SHOULDER GUTTER

SURFACE ON LOW SIDE OF PAVEMENT TO BE 1/2" ABOVE LIP OF GUTTER. SURFACE ON HIGH SIDE TO BE FLUSH WITH LIP OF CURB OR CURB & GUTTER.

Sawcuts should be avoided within valley gutter and within curb and gutter endings.

CONTRACTION JOINT IN CURB AND GUTTER

CONTRACTION JOINT IN CURB

CONCRETE BUMPER GUARD

APPLIES TO BOTH HIGH AND LOW SIDES OF PAVEMENT, LOW SIDE SHOWN.

APPLIES TO SHOULDER GUTTER ONLY WHERE ADJOINING TRAFFIC LANES.

EXPANSION JOINT BETWEEN GUTTER AND CONCRETE PAVEMENT

CURB AND GUTTER AND TYPE A CURB ADJACENT TO FLEXIBLE PAVEMENT

GENERAL NOTES

1. For curb, gutter and curb & gutter provide 1/2" to 1/4" contraction joints at 10' centers (max.) contraction joints adjacent to concrete pavement on tangents and flat curves are to match the pavement joints, with intermediate joints not to exceed 10' centers. Curb, gutter and curb & gutter expansion joints shall be located in accordance with Section 520 of the Standard Specifications.

2. Ends of Curbs Types B and D shall transition from full to zero heights in 3'.

CONCRETE BUMPER GUARD

APPLIES TO BOTH HIGH AND LOW SIDES OF PAVEMENT, LOW SIDE SHOWN.

APPLIES TO SHOULDER GUTTER ONLY WHERE ADJOINING TRAFFIC LANES.

A. For curb, gutter and curb & gutter provide 1/2" to 1/4" contraction joints at 10' centers (max.) contraction joints adjacent to concrete pavement on tangents and flat curves are to match the pavement joints, with intermediate joints not to exceed 10' centers. Curb, gutter and curb & gutter expansion joints shall be located in accordance with Section 520 of the Standard Specifications.

2. Ends of Curbs Types B and D shall transition from full to zero heights in 3'.

CONCRETE BUMPER GUARD

APPLIES TO BOTH HIGH AND LOW SIDES OF PAVEMENT, LOW SIDE SHOWN.

APPLIES TO SHOULDER GUTTER ONLY WHERE ADJOINING TRAFFIC LANES.

A. For curb, gutter and curb & gutter provide 1/2" to 1/4" contraction joints at 10' centers (max.) contraction joints adjacent to concrete pavement on tangents and flat curves are to match the pavement joints, with intermediate joints not to exceed 10' centers. Curb, gutter and curb & gutter expansion joints shall be located in accordance with Section 520 of the Standard Specifications.

2. Ends of Curbs Types B and D shall transition from full to zero heights in 3'.
1. Spillway to be paid for as Shoulder Gutter, L.F.
2. If spillway empties into an unpaved ditch, the detail should be modified as necessary.

DETAIL OF CONCRETE SPILLWAY AT END OF SHOULDER GUTTER
(TO BE USED WHERE INLETS, PIPES & ENDWALLS ARE IMPRACTICAL)
GENERAL NOTES

1. These details are to apply to projects which provide for the conversion of 2-lane sections to 4-lane divided highway sections and for superelevated sections of new 4-lane divided highways. Layout above is illustration only. Cost of flumes to be included in the contract price for Curb or Curb and Gutter. Sed to be paid for under the contract unit price for Performance Turf, SF.

2. Flumes to be located in low point of noses and at other points as designated in the plans. The locations may be adjusted by the Engineer during construction.

Provide Approximately A Minimum Of 0.20% Grade On Gutter, Slightly Warping The Surface Of The Median Pavement If Necessary. Within Limits Of The Median Curb Or Curb And Gutter. Construct A Drainage Flume Or Flumes At The Point Or Points Of Low Grade. See Details.

Grade To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction.

Turf, SY.

Limits Of The Median Curb Or Curb And Gutter. Construct A Drainage Warp The Surface Of The Median Pavement If Necessary, Within To Prop. Flumes.

The Engineer During Construction.

Two drains in low point of noses and at other points as designated in the plans. The locations may be adjusted by the Engineer during construction.

Runoff To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction.

Prop. Median Pavt., Warp Surface If Necessary, To Drain To Prop. Flumes.

Prop. Past. Or Superleveled Part. (Exist. Part. Of New 4-Lane Pavt.)

Portion Of New 4-Lane Pavt.

Prop. Pavt., Warp To Approx. Match That Of Adjoining Pavt. (Breakover 0.02 Min., 0.05 Max.)

Slope To Approx. Match That Of Adjoining Pavt. (Breakover 0.02 Min., 0.05 Max.)

Crown Line (Exist. Pavt.) Or Lane Line Of Superelevated Pavt. (Exist. Pavt. Or New 4-Lane Pavt.)

The Plans Or As Adjusted By The Engineer During Construction.

Provide Approximately A Minimum Of 0.20% Grade On Gutter, Slightly Warping The Surface Of The Median Pavement If Necessary. Within Limits Of The Median Curb Or Curb And Gutter. Construct A Drainage Flume Or Flumes At The Point Or Points Of Low Grade. See Details.

Grade To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction.

Turf, SY.

Limits Of The Median Curb Or Curb And Gutter. Construct A Drainage Warp The Surface Of The Median Pavement If Necessary, Within To Prop. Flumes.

The Engineer During Construction.

Two drains in low point of noses and at other points as designated in the plans. The locations may be adjusted by the Engineer during construction.

Runoff To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction.

Prop. Median Pavt., Warp Surface If Necessary, To Drain To Prop. Flumes.

Prop. Past. Or Superleveled Part. (Exist. Part. Of New 4-Lane Pavt.)

Portion Of New 4-Lane Pavt.

Prop. Pavt., Warp To Approx. Match That Of Adjoining Pavt. (Breakover 0.02 Min., 0.05 Max.)

Slope To Approx. Match That Of Adjoining Pavt. (Breakover 0.02 Min., 0.05 Max.)

Crown Line (Exist. Pavt.) Or Lane Line Of Superelevated Pavt. (Exist. Pavt. Or New 4-Lane Pavt.)

The Plans Or As Adjusted By The Engineer During Construction.

Provide Approximately A Minimum Of 0.20% Grade On Gutter, Slightly Warping The Surface Of The Median Pavement If Necessary. Within Limits Of The Median Curb Or Curb And Gutter. Construct A Drainage Flume Or Flumes At The Point Or Points Of Low Grade. See Details.

Grade To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction.

Turf, SY.

Limits Of The Median Curb Or Curb And Gutter. Construct A Drainage Warp The Surface Of The Median Pavement If Necessary, Within To Prop. Flumes.

The Engineer During Construction.

Two drains in low point of noses and at other points as designated in the plans. The locations may be adjusted by the Engineer during construction.

Runoff To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction.

Prop. Median Pavt., Warp Surface If Necessary, To Drain To Prop. Flumes.

Prop. Past. Or Superleveled Part. (Exist. Part. Of New 4-Lane Pavt.)

Portion Of New 4-Lane Pavt.

Prop. Pavt., Warp To Approx. Match That Of Adjoining Pavt. (Breakover 0.02 Min., 0.05 Max.)

Slope To Approx. Match That Of Adjoining Pavt. (Breakover 0.02 Min., 0.05 Max.)

Crown Line (Exist. Pavt.) Or Lane Line Of Superelevated Pavt. (Exist. Pavt. Or New 4-Lane Pavt.)

The Plans Or As Adjusted By The Engineer During Construction.

Provide Approximately A Minimum Of 0.20% Grade On Gutter, Slightly Warping The Surface Of The Median Pavement If Necessary. Within Limits Of The Median Curb Or Curb And Gutter. Construct A Drainage Flume Or Flumes At The Point Or Points Of Low Grade. See Details.

Grade To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction.

Turf, SY.

Limits Of The Median Curb Or Curb And Gutter. Construct A Drainage Warp The Surface Of The Median Pavement If Necessary, Within To Prop. Flumes.

The Engineer During Construction.

Two drains in low point of noses and at other points as designated in the plans. The locations may be adjusted by the Engineer during construction.

Runoff To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction.

Prop. Median Pavt., Warp Surface If Necessary, To Drain To Prop. Flumes.

Prop. Past. Or Superleveled Part. (Exist. Part. Of New 4-Lane Pavt.)

Portion Of New 4-Lane Pavt.

Prop. Pavt., Warp To Approx. Match That Of Adjoining Pavt. (Breakover 0.02 Min., 0.05 Max.)

Slope To Approx. Match That Of Adjoining Pavt. (Breakover 0.02 Min., 0.05 Max.)

Crown Line (Exist. Pavt.) Or Lane Line Of Superelevated Pavt. (Exist. Pavt. Or New 4-Lane Pavt.)

The Plans Or As Adjusted By The Engineer During Construction.
Traffic Separator transverse reinforcement adjacent to deck expansion joints shall be field adjusted to maintain clearance and spacing. Bars shall be field cut as shown, bars may be rotated to maintain clearance.

1. Traffic Separator ends at deck expansion joints shall follow the deck joint limits. Drainage joints and V-grooves shall be placed perpendicular or radial to the E of the Traffic Separator. See Structures Plans, Superstructure and Approach Slab Sheets for details.

2. Option II is not permitted on bridge decks with prestressing steel.


4. Option II is not permitted on bridge decks with prestressing steel.

5. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-0" @ 7 equal spaces (continuous)

6. At the Contractor's option, a one piece bar may be substituted for bars 4B and 4E.

7. Field bend and cut rebar as required to maintain cover.

Notes:

The Traffic Separator transverse reinforcement adjacent to deck expansion joints shall be field adjusted to maintain clearance and spacing. Bars shall be field cut as shown, bars may be rotated to maintain clearance.

Traffic Separator ends at deck expansion joints shall follow the deck joint limits. Drainage joints and V-grooves shall be placed perpendicular or radial to the E of the Traffic Separator. See Structures Plans, Superstructure and Approach Slab Sheets for details.

See Structures Plans, Superstructure Sheets for actual dimensions and joint orientation.

5. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-0" @ 7 equal spaces (continuous)

6. At the Contractor's option, a one piece bar may be substituted for bars 4B and 4E.

7. Field bend and cut rebar as required to maintain cover.

Notes:

1. Traffic Separator transverse reinforcement adjacent to deck expansion joints shall be field adjusted to maintain clearance and spacing. Bars shall be field cut as shown, bars may be rotated to maintain clearance.

2. Traffic Separator ends at deck expansion joints shall follow the deck joint limits. Drainage joints and V-grooves shall be placed perpendicular or radial to the E of the Traffic Separator. See Structures Plans, Superstructure and Approach Slab Sheets for details.


4. Option II is not permitted on bridge decks with prestressing steel.

5. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-0" @ 7 equal spaces (continuous)

6. At the Contractor's option, a one piece bar may be substituted for bars 4B and 4E.

7. Field bend and cut rebar as required to maintain cover.

Notes:

1. Traffic Separator transverse reinforcement adjacent to deck expansion joints shall be field adjusted to maintain clearance and spacing. Bars shall be field cut as shown, bars may be rotated to maintain clearance.

2. Traffic Separator ends at deck expansion joints shall follow the deck joint limits. Drainage joints and V-grooves shall be placed perpendicular or radial to the E of the Traffic Separator. See Structures Plans, Superstructure and Approach Slab Sheets for details.


4. Option II is not permitted on bridge decks with prestressing steel.

5. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-0" @ 7 equal spaces (continuous)

6. At the Contractor's option, a one piece bar may be substituted for bars 4B and 4E.

7. Field bend and cut rebar as required to maintain cover.
LONGITUDINAL SECTION (NOSE)

OPTION I

TRANSVERSE SECTION

OPTION II

REINFORCING STEEL

(Bridge Deck Shown, Approach Slab Similar)

EXPANSION JOINTS

(Details on Sheet 5)

PITCH:

1/8" for 4' Separator
1/8" for 6' Separator
1/8" for 8'-6" Separator

1. Treatment of separators on straight bridges shown. For additional notes and treatment of separators on skewed bridges, see Sheet 2.

2. Option II is not permitted on bridge decks with prestressing steel.

3. Bar Spacing:

   - 8'-6" @ 7 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 4'-0" @ 3 equal spaces (continuous)

4. At the Contractor's option, a one piece bar may be substituted for Bars 4B and 4E.

5. Field bend and cut rebar as required to maintain cover.

Notes:
### REINFORCING STEEL NOTES:

1. All dimensions are out to out.

2. The 8" vertical dimension shown for Bars 4B and 4D are based on a slab 8½" thick or greater without a wearing surface. If slab thickness is less than 8½", decrease this dimension by an amount equal to the difference in thickness. If a wearing surface is to be provided, increase this dimension by an amount equal to the wearing surface thickness.

### ALTERNATE REINFORCING STEEL DETAILS

(Welded Wire Reinforcement)

**Options:**
- **OPTION I:** Use Welded Wire Reinforcement 3 x 4 - W5.0 x W6.7 as required by plans in place of Bars 4A and 4C shown in the Bending Diagram for Reinforcing Steel Option I.
- **OPTION II:** Use Welded Wire Reinforcement 3 x 4 - W5.0 x W6.7 as required by plans in place of Bars 4A, 4B, and 4E shown in Reinforcing Steel Option II.

**NOTE:** Welded Wire Reinforcement to consist of smooth wire meeting the requirements of Specification Section 931.

### ESTIMATED TRAFFIC SEPARATOR QUANTITIES:

**CONCRETE:**

- **Constant Width of Separator:**
  - **Type II:**
    - 4'-0" Width = 0.047 CY per Ft. - 0.062 CY per Ft.  
    - 6'-0" Width = 0.093 CY per Ft. - 0.112 CY per Ft.  
    - 8'-0" Width = 0.130 CY per Ft. - 0.156 CY per Ft.  

- **Nose:**
  - **Type II:**
    - 4'-0" Width = 0.034 CY per Ft. - 0.043 CY per Ft.  
    - 6'-0" Width = 0.067 CY per Ft. - 0.083 CY per Ft.  
    - 8'-0" Width = 0.094 CY per Ft. - 0.112 CY per Ft.  

**Reinforcing Steel:**

- **Type II:**
  - **All quantities are based on an 8½" slab:**
    - 4'-0" Width = 0.056 CY per Ft. - 0.072 CY per Ft.  
    - 6'-0" Width = 0.102 CY per Ft. - 0.125 CY per Ft.  
    - 8'-0" Width = 0.148 CY per Ft. - 0.175 CY per Ft.  

### DRAINAGE JOINT DETAIL

(For 5" Opening Or Less)

### DOWEL NOTES:

1. Shift Dowel Holes to clear if existing reinforcement is encountered.

2. Provide and install an adhesive bonding material system in accordance with Sections 416 and 937 of the Specifications.

3. The dowel hole diameter is to meet adhesive bonding material system manufacturer’s requirements.

**OPTION I:**

- 4'-0" Width = 3.67 Lbs. per Ft.  
- 6'-0" Width = 6.80 Lbs. per Ft.  
- 8'-0" Width = 11.95 Lbs. per Ft.

**OPTION II:**

- 4'-0" Width = 4.77 Lbs. per Ft.  
- 6'-0" Width = 7.00 Lbs. per Ft.  
- 8'-0" Width = 9.45 Lbs. per Ft.
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### GENERAL NOTES:

1. **CONCRETE:** Use Class II concrete for all barriers constructed in slightly aggressive environments, and use Class IV Concrete for all barriers constructed in moderately or extremely aggressive environments. On all exposed surfaces, apply a Class 3 surface finish in accordance with Specification 400.

2. **STEEL BAR REINFORCEMENT:** Where required to maintain continuity, provide lap splice lengths of at least 18 inches for No. 4 bars and 20 inches for No. 5 bars, unless otherwise shown herein (including shorter splices as provided by the default bar bending diagrams).

3. **OPTIONAL WELDED WIRE REINFORCEMENT:** With the approval of the Engineer, steel welded wire reinforcement in accordance with Specification 415 may be substituted for the steel bars shown herein. Place the welded wire in the same locations specified for the steel bars, and maintain the equivalent strength, cover, maximum spacing, and continuity requirements.

4. **TOP FACE LONGITUDINAL REINFORCEMENT:** Unless otherwise specified, the longitudinal reinforcement shown closest to the top face of the barrier has a maximum cover of 4/" measured from the top face of the barrier.

5. **MINIMUM BARRIER LENGTH:** Unless otherwise shown in the Plans, the minimum concrete barrier length is 40 feet.

6. **CONSTRUCTION JOINTS:** Install Construction Joints only as needed for discontinuous concrete casting or cold joints. Maintain continuity of steel reinforcement across Construction Joints. Construction Joints are classified herein as Transverse Joints or Longitudinal Joints.

7. **DOWELED JOINTS:** As shown in the Dowel Details on Sheets 2 & 12, install 1/" doveled Joints for concrete Barrier connections to Pier Protection Barrier and Traffic Railings. Doweled Joints are also required for expansion mitigation in Median Barrier as defined per Sheets 2 & 5. Doweled Joints are not permitted within Grade-Separated Median Barrier.

8. **CRACK CONTROL V-GROOVES:** At 20-foot intervals, place 3/" depth V-grooves that run vertically and/or transversely in the front, top, and back faces of barriers. The V-grooves can be either molded or scored while the concrete is still plastic.

9. **SUBGRADE:** Compact the top layer of subgrade with Type B Stabilization, LBR 40 (12 in.).

10. **FOOTING BOTTOM CONCRETE COVER:** At the bottom of barrier footings shown throughout this Index, up to 2 inches of additional concrete cover is permitted beyond what is shown herein to accommodate soil grade irregularities.

11. **FINISH GRADE ELEVATION:** At the barrier face location, the finish grade pavement has a vertical position tolerance of ± 1/" from the locations shown herein, relative to the barrier elevation. Maintain visually smooth and even pavement at the barrier face, per the approval of the Engineer.

12. **DRAINAGE INLETS:** Where called for in the Plans, install corresponding inlets per Indexes 425-030 thru 425-032.

13. **LIGHT POLE MOUNTING:** Where called for in the Plans, install aluminum light poles per Index 715-002.

14. **OPAQUE VISUAL BARRIER:** Where called for in the Plans, install Opaque Visual Barrier per Index 521-010.

15. **BARRIER END MARKERS:** For all free ends of concrete barriers that are not shielded with an end treatment or connection to another barrier or traffic railing type, install a Type 3 Object Marker on the end face per Specification 705.

16. **BARRIER DELINERATORS:** Install Barrier Delineralators in accordance with Specification 705. For median barriers, mount the delineator on the top of the barrier, at the centerline of barrier, with reflective sheeting facing traffic on both approaches. For shoulder barriers and split sections, mount the delineator on the top of the barrier, with the roadway side of the delineator located 2" from the front face of the barrier and the reflective sheeting facing traffic of the nearest approach.
**NOTES:**

1. **BARRIER RUN SEGMENT:** Within the Barrier Run Segment, either the 38” Height Median Barrier or the differing Median Barrier sections shown throughout the Index may be placed as required per the Plans.

2. **SECTION VIEWS:** For additional Views A-A and B-B, see Sheet 3.

3. **DOWELED JOINTS:** See the General Notes on Sheet 1 for usage of joint types. Space Doweled Joints at 100-foot maximum intervals. Place steel reinforcing with a longitudinal 3” cover adjacent to the joint faces(s) in the barrier. Use ASTM A36 smooth round bars with hot-dip galvanization.

   For the dowel connection into the first casting, the dowel may be cast-in-place for new concrete or placed into a 1”Ø x 13”Ø drilled hole for cured concrete. For drilled holes larger than 1 3/4”, secure the dowel with adhesive in accordance with Specification 416. No load testing is required.

   For the dowel connection into the second casting, use a 1 1/2” NPS Schedule 80 PVC pipe with a sealed cap, cast-in-place as shown.

4. **OPTIONAL LONGITUDINAL JOINT:** When a longitudinal joint is placed above the footing, use the Optional 5/8” x 5/8” (Min.) Shear Key shown. As a substitute for the Shear Key, the concrete footing’s top surface may be raked to provide additional shear friction. Rake the fresh concrete surface so that about half of the surface area consists of approximately 1” deep longitudinal grooves, distributed evenly and approved by the Engineer.

5. **TRAFFIC RAILING CONNECTIONS:** Align the barrier and Traffic Railing faces and connect with the 5/8” Dowelled Joint.

6. **GUARDRAIL CONNECTIONS:** Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with the 16’-0” End Segment for Guardrail shown herein.

7. **CRASH CUSHION CONNECTORS:** Connect Crash Cushions per Index 544-001 in conjunction with the 3’-0” End Transition for Guardrail as shown herein.

8. **FREE ENDS:** When the barrier end does not terminate with a Traffic Railing Connection, Guardrail Connection, Crash Cushion Connection, or Sloped End Treatment as called for in the Plans, terminate in accordance with the Free End Reinforcing detail on Sheet 3.

---

**SHEET 3**

**CONCRETE BARRIER**

**MEDIAN BARRIER**
1. GENERAL: Work with the Plan and Elevation Views on Sheet 2.
2. BAR BENDING DIAGRAMS: For additional information on Bars 4V1 and 4U1, see the details on Sheet 2.
3. PLAN VIEWS: Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal steel locations, see the section views.

NOTES:

PLAN VIEW - 38" HEIGHT MEDIAN BARRIER
FREE END REINFORCING (See Note 3)

PLAN VIEW - END SEGMENT FOR
GUARDRAIL CONNECTION (See Note 3)

SECTION A-A
38" HEIGHT
MEDIAN BARRIER
Concrete Bcy. = 0.20 ft³
Steel Qty. = 11.8 LB/FT

VIEW B-B
REDUCED SECTION
OF END TRANSITION
FOR GUARDRAIL
(End of Barrier)

MEDIAN BARRIER - REINFORCING DETAILS
ELEVATION - SLOPED END TREATMENT

PLAN - SLOPED END TREATMENT
(Only Top & Bottom Longitudinal Bars Shown for Clarity, See Section Views for All Longitudinal Steel Locations)

NOTES:
1. GENERAL: Install Sloped End Treatment only where called for in the plans.
2. JOINTS: Construction or Doweled Joints are not permitted within the Sloped End Treatment segment.

SECTION C-C
BEGIN TRANSITION REINFORCING
(Height Varies Linearly per Elevation View)

SECTION D-D
INTERMEDIATE TRANSITION REINFORCING
(Height Varies Linearly per Elevation View)

VIEW E-E
END TRANSITION

MEDIAN BARRIER - SLOPED END TREATMENT

CONCRETE BARRIER
1. GENERAL: Install the Grade-Separated sections where shown in the Plans and as required to accommodate vertical offsets in pavement of Height Y. Dowelled joints are not permitted within Grade-Separated sections.

2. CONNECTIONS BETWEEN DIFFERENT SECTIONS: Connect Short Grade-Separated sections and Tall Grade-Separated sections using a continuous pour or Transverse Joint, where longitudinal steel that aligns within the adjacent section is maintained continuously between sections or has a full lap splice with the adjacent section's longitudinal steel. Connect Short Grade-Separated sections and 39" Height Median Barrier sections of Sheet 2 using a 5V Dowelled Joint.

3. SHORT GRADE-SEPARATED SECTIONS: Bars 4C1 and the two uppermost longitudinal bars may be omitted for segments where Y ≤ 2'.

4. TALL GRADE-SEPARATED SECTIONS: For the vertical and transverse steel reinforcement shown in the Tall Grade-Separated Sections, bar bending diagrams are not provided due to varying section dimensions and Longitudinal Joint locations. Use any combination of supplied reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

Longitudinal joints are permitted between the vertical limits shown, and must remain level and at a consistent height per each continuous casting of concrete. Longitudinal joints may change elevations at Transverse Joint locations. Field bending of bars is permitted at Longitudinal Joint locations.

Transverse joints between Tall Grade-Separated Sections do not require continuous steel across the joint if the following conditions are met:

i. The barrier length on both sides is at least 40 feet, where each segment has continuous steel reinforcement.

ii. The barrier's vertical steel spacing is reduced to 4" on both sides of the joint.

Grade separation Heights of Y < 2' are permitted on a limited basis using the Tall Grade-Separated section; this is to accommodate cases where maintaining the spread footing through lower height segments is more practical than changing to the Short Grade-Separated section.

Transverse Joints between Tall Grade-Separated Sections do not require continuous steel across the joint if the following conditions are met:

Transverse Joints do not require continuous steel across the joint if the following conditions are met:

1. Install the Grade-Separated sections where shown in the Plans and as required to accommodate vertical offsets in pavement of Height Y. Dowelled joints are not permitted within Grade-Separated sections.

2. Connect Short Grade-Separated sections and Tall Grade-Separated sections using a continuous pour or Transverse Joint, where longitudinal steel that aligns within the adjacent section is maintained continuously between sections or has a full lap splice with the adjacent section's longitudinal steel. Connect Short Grade-Separated sections and 39" Height Median Barrier sections of Sheet 2 using a 5V Dowelled Joint.

3. Bars 4C1 and the two uppermost longitudinal bars may be omitted for segments where Y ≤ 2'.

4. Tall Grade-Separated Sections: For the vertical and transverse steel reinforcement shown in the Tall Grade-Separated Sections, bar bending diagrams are not provided due to varying section dimensions and Longitudinal Joint locations. Use any combination of supplied reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

Longitudinal joints are permitted between the vertical limits shown, and must remain level and at a consistent height per each continuous casting of concrete. Longitudinal joints may change elevations at Transverse Joint locations. Field bending of bars is permitted at Longitudinal Joint locations.

Transverse joints between Tall Grade-Separated Sections do not require continuous steel across the joint if the following conditions are met:

i. The barrier length on both sides is at least 40 feet, where each segment has continuous steel reinforcement.

ii. The barrier's vertical steel spacing is reduced to 4" on both sides of the joint.

Grade separation Heights of Y < 2' are permitted on a limited basis using the Tall Grade-Separated section; this is to accommodate cases where maintaining the spread footing through lower height segments is more practical than changing to the Short Grade-Separated section.
1. PROJECT-SPECIFIC REINFORCING: For footing and barrier reinforcing required for the overhead sign support, see the project-specific design in the Plans.

2. BARRIER REINFORCING: Maintain the 38' Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 46" maximum cover from the top of the barrier.

For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, bar bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

3. PROJECT-SPECIFIC PEDESTAL WIDTH & SETBACK: The pedestal width is governed by the size requirements of the overhead sign support, as detailed in the Plans. Likewise, the setback distance from the sign support base to the barrier face is governed by the anchor bolt cover requirements, as defined per the Plans. The minimum pedestal width is 2'-0", where a complete removal of the gutter line taper is permitted.

4. PLAN VIEW: Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

NOTES:

1. PROJECT-SPECIFIC REINFORCING: For footing and barrier reinforcing required for the overhead sign support, see the project-specific design in the Plans.

2. BARRIER REINFORCING: Maintain the 38' Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 46" maximum cover from the top of the barrier.

For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, bar bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

3. PROJECT-SPECIFIC PEDESTAL WIDTH & SETBACK: The pedestal width is governed by the size requirements of the overhead sign support, as detailed in the Plans. Likewise, the setback distance from the sign support base to the barrier face is governed by the anchor bolt cover requirements, as defined per the Plans. The minimum pedestal width is 2'-0", where a complete removal of the gutter line taper is permitted.

4. PLAN VIEW: Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.
**NOTES:**

1. **PROJECT-SPECIFIC REINFORCING:** For footing and barrier reinforcing required for the overhead sign support, see the project-specific design in the Plans.

2. **BARRIER REINFORCING:** Maintain the 38' Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 4'-0" maximum cover from the top of the barrier.

3. **PROJECT-SPECIFIC PEDESTAL WIDTH & SETBACK:** The pedestal width is governed by the size requirements of the overhead sign support, as detailed in the Plans. Likewise, the setback distance from the sign support base to the barrier face is governed by the anchor bolt cover requirements, as defined per the Plans. The minimum pedestal width is 2'-0", where a complete removal of the gutter line taper is permitted.

4. **PLAN VIEW:** Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

**MEDIAN BARRIER - 56" HEIGHT SECTION**

**FOR BARRIER-MOUNTED SIGN SUPPORT SHIELDING - ASYMMETRICAL**

---

**SECTION A-A BEGIN TRANSITION**

No. 4 Bars @ 12" Sp. Max. (Typ.)

**SECTION B-B**

*Dimension Varies Linearly Between Section A-A and C-C*

No. 4 Bars @ 12" Sp. Max. (Typ.)

**SECTION C-C END TRANSITION (56" Height Section)**

No. 4 Bars @ 12" Sp. Max. (Typ.)

**SECTION D-D**

(Reinforcing Steel Not Shown for Clarity)
NOTES:

1. OVERHEAD SIGN SUPPORT: The overhead sign support shown is an example only; see the Plans for the actual shape dimensions and requirements. The overall length and width of the split barrier system is governed by the project-specific overhead sign support dimensions, as defined in the Plans.

2. MULTIPLE SIGN SUPPORTS: The parallel segment may be lengthened to accommodate multiple sign supports, with the approach and trailing tapers located 1 foot, measured longitudinally, upstream and downstream from the first and last sign support bases, respectively.

3. STIRRUP BARS: For the vertical and transverse reinforcement requirements shown in Sections A-A and B-B, bar bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

4. PLAN VIEW: Only outermost longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.
**DESCRIPTION:**

**REVISION**

**LAST OF STANDARD PLANS FY 2018-19 SHEET INDEX**

**ELEVATION**

**PLAN**

(See Section Views on Sheet 10 for All Longitudinal Steel Locations)

**NOTES:**

1. **SECTION VIEWS:** See Sheet 10 for Section Views A-A through D-D and corresponding reinforcing steel details.

2. **PIER:** The round pier shown is an example only, and project-specific pier shapes may vary. For actual dimensions and requirements, see the Plans. The overall length and width of the split barrier system is governed by the project-specific pier dimensions, as defined in the Plans.

3. **MULTIPLE PIERS:** The parallel segment may be lengthened to accommodate multiple consecutive piers, with the approach and trailing tapers located 1 foot, measured longitudinally, upstream and downstream from the first and last piers, respectively.

**MEDIAN BARRIER - 44 INCH HEIGHT SPLIT SECTION FOR PIER SHIELDING**

**CONCRETE BARRIER**

**INDEX**

**SHEET** 9 of 22
1. GENERAL: Work with the Plan and Elevation views on Sheet 9.

2. LONGITUDINAL REINFORCING CONTINUITY: Maintain all longitudinal steel reinforcing shown in Section C-C continuously into Section D-D (spliced where required). The additional longitudinal reinforcing shown in Section D-D does not require continuity into Section C-C, and it starts 3" from the construction joint or edge of concrete per the details on Sheet 9.

3. STIRRUP BARS: For the vertical and transverse reinforcement requirement shown, bar bending diagrams are not provided on Sheet 9. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

NOTES:
SECTION A-A
BEGIN TRANSITION - OPTION 'A'
MATCH SINGLE-SLOPE 36" HEIGHT TRAFFIC RAILING
(Bridge Applications)

SECTION A-A
BEGIN TRANSITION - OPTION 'B'
MATCH SINGLE-SLOPE 36" HEIGHT TRAFFIC RAILING
(Bridge Applications)

SECTION B-B
INTERMEDIATE SECTION
OF LINEAR TRANSITION

SECTION C-C
END TRANSITION
MATCH 32" HEIGHT
F-SHAPE SECTION

NOTES:
1. GENERAL: Construct the Connection Segment as required per the Plans to connect existing F-Shape sections to Single-Slope Median Barrier or Traffic Railing sections. Construct Option 'A' or 'B' as required to match the heights of the connecting sections.

2. DOWELED JOINT: Install Dowel Bars per the Dowel Details on Sheet 2.

3. TRAFFIC RAILING CONNECTION: For the Option 'B' connection, use a Doweled Joint per Sheet 2 and the additional Free End Reinforcing with reduced bar spacing per Sheet 3.

4. STIRRP BARS: For the vertical and transverse reinforcement requirements shown, bar bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

MEDIAN BARRIER - CONNECTION TO F-SHAPE

CONCRETE BARRIER

INDEX 521-001

FACILITY $0001

STANDARD PLANS
FY 2018-19

DEPARTMENT OF TRANSPORTATION
PUBLIC WORKS

LAST REVISION
01/01/17

DESCRIPTION:

ELEVATION
(Reverse Direction Similar by Opposite Hand)
 SECTION A-A
38" HEIGHT SHOULDER BARRIER
(See Sheet 13 for Reinforcing Steel Details)

NOTES:
1. BARRIER RUN SEGMENT: Either the 38" Height Shoulder Barrier or the differing Shoulder Barrier sections shown throughout the Index may be placed within this segment as required per the Plans.
2. SECTION VIEWS: For additional Views A-A and B-B, see Sheet 13.
3. DOWELED JOINTS: See the General Notes on Sheet 1 for usage of joint types. Place steel reinforcing with a longitudinal 3" cover adjacent to the joint face in the barrier. Use ASTM A36 smooth round bars with hot-dip galvanization.

For the dowel connection into the first casting, the dowel may be cast-in-place for new concrete or placed into a 1½" x 19¾" drilled hole for cured concrete. For drilled holes larger than 1½", secure the dowel with adhesive in accordance with Specification Section 416. No load testing is required.

For the dowel connection into the second casting, use a 1½" NPS Schedule 80 PVC pipe with a sealed cap, cast-in-place as shown.

4. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the ½" Dowed Joint.
5. GUARDRAIL CONNECTIONS: Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with the 16'-0" End Segment for Guardrail shown herein.
6. CRASH CUSHION CONNECTIONS: Connect Crash Cushions per Index 544-001 in conjunction with the 3'-0" End Transition for Guardrail as shown herein.
7. FREE ENDS: When the barrier end does not terminate with a Traffic Railing Connection, Guardrail Connection, or Crash Cushion Connection as called for in the Plans, terminate in accordance with the Free End Reinforcing Note on Sheet 13.
NOTES:

1. GENERAL: Work with the Plan and Elevation Views on Sheet 12. The Section Option footings shown on Sheet 14 may be substituted where called for in the Plans.

2. FREE END REINFORCING: Where shown in the Plans, terminate the 38" Height Barrier section with a transverse vertical end face. Reduce the spacing of Bars SV2 and SU3 to 6" for 5 Spaces, placed with 3" cover from the barrier's end face.

3. BAR BENDING DIAGRAMS: For additional details for bars SV2 and SU3, see the Bar Bending Diagrams on Sheet 22.

SHOULDER BARRIER - REINFORCING DETAILS

PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION

_LONGITUDINAL STEEL NOT SHOWN FOR CLARITY_
1. GENERAL: Install the differing Section Options as required per the Plans.

2. CONNECTIONS BETWEEN DIFFERENT SECTIONS: Connect differing Shoulder Barrier sections using a continuous pour or Transverse Joint, where longitudinal steel that aligns within the adjacent section is maintained continuity between sections. Alternatively, a Doweled Joint may be used as shown on Sheet 12.

3. FLUSH RETAINING SECTION COMBINATION: Where Barrier Joints are required in retaining segments, install the Flush Section, except replace the 1'-0" General Heel with the 2'-0" Extended Heel as shown in the Retaining Section. Use longer lateral reinforcing bars of 2-1/2' length to maintain the cover shown.

NOTES:
1. GENERAL: See the applicable Notes on Sheet 14.
Plan - Round Pier Example

Rear-flush section

Plan - Round Pier Example

Rear-flush section

Plan - Square Pier Example

Rear-flush section

Plan - Square Pier Example

Rear-flush section

SECTION A-A

38" Height Rear-flush section

Above-ground hazard embedded in footing

SECTION B-B

38" Height Rear-flush section

With 3" width reduction

NOTE:

1. Piers shown herein are example shapes only; see the plans for the project-specific dimensions. The details of concrete barrier protection per the AASHTO LRFD requirements. For piers requiring protection, see Index 521-002.

SHOULDER BARRIER - 38" HEIGHT REAR-FRUSH SECTION

For reduced setback pier shielding

(Design speed ≤ 45 MPH)
**SHOULDER BARRIER - 44" HEIGHT REAR-FLUSH SECTION FOR REDUCED SETBACK PIER SHIELDING**

**SECTION C-C**
- **ABOVE-GROUND HAZARD EMBEDDED IN FOOTING**
- **44" HEIGHT REAR-FLUSH SECTION**
- **PLAN - ROUND PIERS EXAMPLE (SQUARE PIERS SIMILAR)**
- **ELEVATION - ROUND PIERS EXAMPLE (SQUARE PIERS SIMILAR)**

**NOTE:**
1. **PIERS:** The piers shown herein are example shapes only; see the Plans for the project-specific dimensions. The details shown herein are only for use when piers do not require protection per the AASHTO LRFD requirements. For piers requiring protection, see Index 521-002.

**DESCRIPTION:**
- Pier (See Note 1)
- ¾" Preformed Joint Filler (Full Height of Barrier Sections)
- ¾" Preformed Joint Filler (Full Height of Barrier Sections)
- ¾" Preformed Joint Filler (Full Height of Barrier Sections)

**FOR REDUCED SETBACK PIER SHIELDING**

**Transition**
- **Line Gutter**
  - 2'-6" (Stem & Barrier Top & Sides)
  - 4'-1" (Foot of Top & Bottom)

---

**SHOULDER BARRIER - 44" HEIGHT REAR-FLUSH SECTION FOR REDUCED SETBACK PIER SHIELDING**

**SECTION C-C**
- **ABOVE-GROUND HAZARD EMBEDDED IN FOOTING**
- **44" HEIGHT REAR-FLUSH SECTION**
- **PLAN - ROUND PIERS EXAMPLE (SQUARE PIERS SIMILAR)**
- **ELEVATION - ROUND PIERS EXAMPLE (SQUARE PIERS SIMILAR)**

**NOTE:**
1. **PIERS:** The piers shown herein are example shapes only; see the Plans for the project-specific dimensions. The details shown herein are only for use when piers do not require protection per the AASHTO LRFD requirements. For piers requiring protection, see Index 521-002.
NOTES:

1. GENERAL: Construct the Connection Segment as required per the Plans to connect existing F-Shape sections to Single-Slope Shoulder Barrier or Traffic Railing sections. Construct Option 'A' or 'B' as required to match the heights of the connecting sections.

2. DOWELED JOINT: Install Dowel Bars per the Dowel Details on Sheet 12.

3. TRAFFIC RAILING CONNECTION: For the Option 'B' connection, use a Doweled Joint per Sheet 2. Option 'A or 'B' as required to match the heights of the connecting sections. Construct Option 'A' or 'B' as required to match the heights of the connecting sections.

4. STIRRUP BARS: For the vertical and transverse reinforcement requirements shown, bar bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.
DRAINAGE SLOT DETAILS:

DRAINAGE SLOT NOTES:
1. GENERAL: Place 20" x 18" Drainage Slots at locations and/or spacing called for in the Plans.
2. STEEL REINFORCEMENT CONFLICT: When the Drainage Slot encounters a conflict with reinforcing steel, shift or cut the reinforcing steel to provide 20" x 18" of concrete cover for the reinforcing around the Drainage Slot. If cutting the vertical bars, maintain 6" bar spacing. If shifting the vertical bars, move the bars from the standard spacing location to the closest end of the drainage slot. Distribute additional vertical reinforcement evenly on each side of the Drainage Slot.
3. DOWELED JOINTS: See the General Notes on Sheet 1 for usage of joint types. Where required, install 5/8" Doweled Joints as defined on Sheet 12.
4. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the 1/2" Doweled Joint per Sheet 12.
5. GUARDRAIL CONNECTIONS: Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with 5/8" End Transition for Guardrail as shown herein.
6. FREE ENDS: When the barrier end does not terminate with a Traffic Railing connection or Guardrail connection as called for in the Plans, terminate the barrier in accordance with the Free End Reinforcing Note on Sheet 20.

Curb and Gutter Barrier Notes:
1. SECTION VIEWS: For additional Views A-A and B-B, see Sheet 20.
2. EXPANSION JOINTS: Place 18" wide transverse expansion joints through the barrier and footing spaced at 100-foot maximum intervals. On both sides of each joint, use the Free End Reinforcing bar spacing per Sheet 20.
3. DOWELED JOINTS: See the General Notes on Sheet 1 for usage of joint types. Where required, install 5/8" Doweled Joints as defined on Sheet 12.
4. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the 1/2" Doweled Joint per Sheet 12.
5. GUARDRAIL CONNECTIONS: Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with 5/8" End Transition for Guardrail as shown herein.
6. FREE ENDS: When the barrier end does not terminate with a Traffic Railing connection or Guardrail connection as called for in the Plans, terminate the barrier in accordance with the Free End Reinforcing Note on Sheet 20.

Curb and Gutter Barrier Notes:
1. SECTION VIEWS: For additional Views A-A and B-B, see Sheet 20.
2. EXPANSION JOINTS: Place 18" wide transverse expansion joints through the barrier and footing spaced at 100-foot maximum intervals. On both sides of each joint, use the Free End Reinforcing bar spacing per Sheet 20.
3. DOWELED JOINTS: See the General Notes on Sheet 1 for usage of joint types. Where required, install 5/8" Doweled Joints as defined on Sheet 12.
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5. GUARDRAIL CONNECTIONS: Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with 5/8" End Transition for Guardrail as shown herein.
6. FREE ENDS: When the barrier end does not terminate with a Traffic Railing connection or Guardrail connection as called for in the Plans, terminate the barrier in accordance with the Free End Reinforcing Note on Sheet 20.
NOTES:

1. GENERAL: Work with the Plan and Elevation Views on Sheet 19.

2. FREE END REINFORCING: Where shown in the Plans, terminate the 38" Curb & Gutter Barrier section with a transverse vertical end face. Reduce the spacing of Bars 5V2 and 5U4 to 6" for 5 Spaces, placed with 2" cover from the barrier's end face.

3. BAR BENDING DIAGRAMS: For additional details for bars 5V2 and 5U4, see the Bar Bending Diagrams on Sheet 22.

PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION
(Longitudinal Steel Not Shown for Clarity)
1. GENERAL: Install a Sloped End Treatment only where called for in the Plans, using either a 10'-0" length or 25'-0" length treatment as specified in the Plans. The 10'-0" length option is shown herein, while the 25'-0" length option requires additional trimmed Bars 5V2 & 5U4 at the same 9" longitudinal spacing.

2. BAR BENDING DIAGRAMS: For additional details on Bars 5V2 & 5U4, see the Bar Bending Diagrams on Sheet 22.

NOTES:

CURB AND GUTTER BARRIER - SLOPED END TREATMENT

ELEVATION - CURB AND GUTTER BARRIER
SHOWING SLOPED END TREATMENT
(Approach and Trailing End Similar by Opposite Hand)

PLAN - CURB AND GUTTER BARRIER
SHOWING SLOPED END TREATMENT
(Approach and Trailing End Similar by Opposite Hand;
See Sections for All Longitudinal Steel Locations)
**BILL OF REINFORCING STEEL**

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</tr>
<tr>
<td>V2</td>
<td>5</td>
<td>6'-3&quot;</td>
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</table>

**NOTES:**

1. Work with the Standard Bar Bending Details per Index 415-001.
2. All bar dimensions in the bending diagrams are out to out.

**REINFORCING BAR BENDING DIAGRAMS**
### Index Contents: General Notes

1. **Page 1:** Index Contents: General Notes
2. **Page 2:** Example Layouts – Footing Placement and Connections
3. **Page 3:** Barrier Plan and Elevation – Connection to Concrete Barrier – Connection to Guardrail
4. **Page 4:** Barrier Details – Connection to Concrete Barrier
5. **Page 5:** Barrier Details – Connection to Guardrail
6. **Page 6:** Barrier Footing Options
7. **Page 7:** Crash Wall Details
8. **Page 8:** Reinforcing Bar Bending Diagrams

### General Notes:

1. **Concrete:** Use Class III or IV concrete unless otherwise called for in the Plans.

2. **Construction Joints:** Maintain continuity of reinforcement steel across Construction joints, reinforcement lap splices are permitted immediately adjacent to joints. Construct all Pier Protection Barrier continuously, with no expansion or contraction joints. Construction Joints are classified herein as Transverse Joints or Longitudinal Joints.

   Transverse Joints are permitted at 40 foot or greater intervals along the barrier.

   Longitudinal Joints may only be installed where indicated in the following details and notes, with a location tolerance of ± 1” from the locations shown.

3. **Subgrade:** Compact the top layer of subgrade with Type B Stabilization, LBR 40 (12 in.).

4. **Drainage Inlets:** See Index 425-001 for Shoulder Barrier Inlets, and isolate these structures from Pier Protection Barriers and Footings with 1” Preformed Joint Filler.

5. **Barrier End Markers:** For all free ends of barriers that are not connected to guardrail or concrete barrier, install a Type 3 Object Marker on the end face per Specification 705.

6. **Barrier Delineators:** Install Barrier Delineators in accordance with Specification Section 705. Mount the delineators on the top face of the barrier, with the roadway side of the delineator located 2” from the front face of the barrier and the reflective sheeting facing traffic of the nearest approach.

7. **Crack Control:** Provide 1/4 depth crack control V-Grooves at 15 to 30’ spacing. Locate V-Grooves above any joint or discontinuity in the barrier facing. Align V-Grooves perpendicular to the longitudinal axis of the Pier Protection Barrier and make continuous across the top surface and both side faces. For slip formed barriers, score 1/2” V-Grooves while the concrete is still plastic, otherwise pre-form the joints when stationary forms are utilized.
1. **GENERAL**: The views shown herein are schematic only, showing example layouts for Pier Protection Barrier (PPB) footings and other shapes similar. The actual PPB footing placement depends on the project-specific configuration of adjacent structures and obstacles. For project-specific locations of PPB and adjacent features, see the Plans.

2. **MINIMUM FOOTING LENGTH**: The minimum length of a single footing option (i.e. Symmetrical Footing, Rear-Flush Footing, Front-Flush Footing), 6'-0", measured longitudinally. See Sheet 6 for the footing option details.

3. **FOOTING OVERLAP**: When a Front-Flush Footing section connects to a Rear-Flush Footing section, a 4'-0" footing overlap is required as shown. In footing overlap segments, place all lateral steel reinforcement continuously for the entire width of the combined footing while maintaining the cover requirements per Sheet 6.

4. **CONNECTING GUARDRAIL OR CONCRETE BARRIER**: Connect the PPB to either Guardrail or Concrete Barrier as specified in the Plans. For additional Guardrail Details, see Sheet 3 and Index 536-001. For additional Concrete Barrier Details, see Sheet 3 and Index 521-001.
ELEVATION

(56" PPB Shown, 44" PPB Similar with T-0" Riser and Related Reinforcing Removed)

PLAN

(Details Not Shown Below Gutter Line, See Sheet 6 for Footing and Stem Details)

(Only Top & Bottom Longitudinal Steel Shown, See Section Views for All Steel Locations)

NOTES:

1. GENERAL: Construct either the 56" PPB or the 44" PPB height as called for in the Plans.
   See Sheets 2 & 3 for additional plan and elevation details.

2. FOOTING OPTIONS: See Sheet 6 for the supporting stem and footing details.

BARRIER DETAILS - CONNECTION TO CONCRETE BARRIER
NOTES:
1. GENERAL: Construct either the 56" PPB or the 44" PPB height as called for in the Plans. See Sections Views for All Steel Locations.
2. FOOTING OPTIONS: See Sheet 6 for the supporting stem and footing details.
3. FOOTING PORTION: Bar 5U (Typ.), Bar 5V (Typ.), and Bar 5R (Typ.) are shown (Details Not Shown Below Gutter Line, Reinforcing Removed).

Steel Qty. = 47.7 LB/FT (Excluding Bars 5U & 8T)
Concrete Qty. = 0.19 CY/FT (Above Gutter Line)

Steel Qty. = 35.7 LB/FT (Excluding Bars 5U & 8T)
Concrete Qty. = 0.16 CY/FT (Above Gutter Line)

END VIEW C-C
(End Tapered Toe for Guardrail)

END VIEW D-D
(End Tapered Toe for Guardrail)
**SECTION E-E**

**FRONT-FLUSH FOOTING OPTION**

Concrete Qty. = 0.94 CY/FT (Below Gutter Line)
Steel Qty. = 63.5 LB/FT (Including Bars SU)

**SECTION F-F**

**SYMMETRICAL FOOTING OPTION**

Concrete Qty. = 0.34 CY/FT (Below Gutter Line)
Steel Qty. = 62.6 LB/FT (Including Bars SU)

**SECTION G-G**

**REAR-FLUSH FOOTING OPTION**

Concrete Qty. = 0.94 CY/FT (Below Gutter Line)
Steel Qty. = 63.5 LB/FT (Including Bars SU)

**NOTES:**

1. **GENERAL:** Install the footing options per project-specific requirements, as defined on Sheet 2 and specified per the Plans.

   Work with the supported 44" PPB and 56" PPB as shown on Sheets 3, 4, & 5.

2. **OPTIONAL SLIP FORMING SUPPORT:** The 1'-0" depth spread footing may be extended by 2 Sp. @ 1'-0" laterally beyond the face of the stem to provide support for a subsequent slip forming operation above. Do not adjust the steel reinforcement location for the additional concrete.

3. **GUARDRAIL CONNECTION TAPERED Toe:** For tapering the barrier as shown on Sheet 5, View D-D, bend Bars U away from the stem face as required. For this case, the cover requirement is variable for one side of the stem (only at the tapered toe locations).
1. GENERAL: Only where called for in the Plans, install the Crash Wall as a supplement for PPB. If applicable, see the Plans for the corresponding Station and Offset required.

For additional layout details, see Sheets 2 & 3.

2. CRASH WALL HEIGHT: Install the Crash Wall at a height which matches the adjacent PPB (either 44" or 56").

3. SCHEMATIC VIEWS: Only partial reinforcing is shown in the Schematic Views to establish a trend while keeping clarity. For all reinforcing steel locations and spacing requirements, see Section H-H.

4. GUARDRAIL CONNECTIONS: To facilitate guardrail connections, shift the Crash Wall 3 feet from the end of the PPB as shown on Sheets 2 & 3.

5. OPTIONAL SLIP FORMING SUPPORT: The 1'-0" depth spread footing may be extended by 3' laterally beyond the face of the wall to provide support for a subsequent slip forming operation above. Do not adjust the steel reinforcement location for the additional concrete.

NOTES:

CRASH WALL DETAILS

Concrete Qty. = \(0.82 \text{ CY/FT (44" Crash Wall)}\) or \(0.83 \text{ CY/FT (56" Crash Wall)}\)

Steel Qty. = \(71.8 \text{ LB/FT (44" Crash Wall)}\) or \(76.0 \text{ LB/FT (56" Crash Wall)}\)
BILL OF REINFORCING STEEL

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<tr>
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NOTES:

1. Work with the Standard Bar Bending Details per Index 415-001.
2. All bar dimensions in the bending diagrams are out to out.

BAR BENDING DIAGRAMS
**Description:**

3" 2" Clear Visual Barrier Payment, LF End Measurement For Opaque Visual Barrier Payment, LF

**Estimated Quantities, LF**

Concrete 0.042 CY
Reinforcing Steel 3.27 Lbs.

"*3.08 Lbs. With 2'-2" Dowels"

**General Notes**

1. The opaque visual barrier is intended to function as a visual screen, and is not intended to resist vehicle impact loads nor to restrain, contain or restrict vehicles or cargo. The barrier is designed to withstand zone wind loading and strikes by light debris, and designed to yield to exceptional strikes by vehicles or cargo, and to contain ruptured segments of the screen when yielding to such strikes.

2. When the opaque visual barrier is constructed on an existing barrier wall, dowels shall be 7'-8" in length, embedded 6" into the barrier wall and set with an approved non-shrink grout. Embedment holes shall be 1#8" diameter, drilled to a depth 1#4" below the tip of the dowel unless greater depth is required to accept manufactured grout capsules.

When the opaque visual barrier is constructed in conjunction with project concrete barrier walls, dowels may be set as described above, in either the drilled or preformed holes; or, placed when the barrier wall is cast. For dowels that are placed when the wall is cast, the dowel shall be 2'-2" in length and embedded to a depth of 12".

When longitudinal reinforcing bars are encountered in the stem of existing barrier, shift the dowels to clear, maintaining the 11#2" Cover Minimum to the face of the Opaque Visual Barrier.

3. For both double and single faced concrete barrier walls the opaque visual barrier is to be located in the center of the top of the wall.

For single faced barrier walls that are constructed around other vertical structures, the opaque visual barrier shall follow the alignments of only one of the walls and be centered along that wall.

For dual median barrier walls that follow differential profiles, the opaque visual barrier shall be constructed atop the wall with the higher elevation, unless conditions dictate otherwise. Lateral transitions or end overlaps for opaque visual barriers that alternate between dual walls shall be detailed in the plans.

For median barrier walls that are divided when connecting to separated bridges, the opaque visual barrier shall be constructed atop the approach side barrier wall, unless differential profiles dictate locating the opaque visual barrier on the departure side barrier wall.

Opaque visual barriers to be located on capped fills between dual barrier walls shall be detailed in the plans.

4. In lieu of the reinforcement shown, the Contractor may substitute welded wire fabric equal to or better than that shown, when approved by the Engineer. Details shall be submitted with requests for substitution.

5. The Contractor may construct contiguous precast concrete panels in lieu of the cast-in-place opaque screen when approved by the Engineer. Panel design and method for anchorage to the barrier wall shall be detailed by shop drawings when requesting the Engineer's approval.

The Contractor may construct the opaque screen monolithically with the barrier wall; however, the screen design shall not be modified so as to cause the wall to be dynamically active from strikes on the screen; see design considerations in Note No. 1 above.

6. Exposed concrete surfaces shall have a Class 3 surface finish in accordance with Section 521 of the Standard Specification, unless another finish is called for in the plans.

7. Payment for opaque visual barrier shall be full compensation for concrete, reinforcement, dowels, casting, placement, drilling, grooving, tooling, finishing, and work incidental thereto, and shall be paid for under the contract unit price for Opaque Visual Barrier (Concrete) (2'-3" Height), LF.
PLAN
(Reinforcing Steel not shown for clarity)

ELEVATION OF INSIDE FACE OF RAILING/NOISE WALL (T-SHAPED FOOTING SHOWN, OTHER FOUNDATIONS SIMILAR) (Reinforcing Steel not shown for clarity)

*R Construct 1/4" Open Joints plumb at Construction Joints in Junction Slabs or Footings.
**NOTES:**
Work this Index with Indexes 521-512 through 521-515.

**CONSTRUCTION REQUIREMENTS:** The Concrete Barrier/Noise Wall and joints shall be constructed plumb, they shall not be constructed perpendicular to the roadway surface.

CONCRETE: Class II for slightly aggressive environments and Class IV for moderately or extremely aggressive environments.

**BARRIER DELINNATORS:** Install Barrier Delinators 2'-4" above the riding surface in accordance with Specification Section 705. Match the Barrier Delinators color (White or Yellow) to the near edgeline.

**OPEN JOINTS:** Provide 1/2 Open Joints spaced between 30 feet minimum or 90 feet maximum.
Align Open Joints with construction joints in the Junction Slab or footing. Provide additional reinforcing (see Sheet 3) at each open joint.

### ESTIMATED TRAFFIC RAILING/NOISE WALL QUANTITIES

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<td>Additional Rein. @ Open Joint</td>
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(The above quantities are based on the Concrete Barrier/Noise wall typical section (excluding junction slab or footing))

### BILL OF REINFORCING STEEL

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### REINFORCING STEEL BENDING DIAGRAMS

**REINFORCING STEEL NOTES:**
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints shall have a 2" minimum cover.
3. Bars S1 may be continuous or spliced at the construction joints. Lap splices for Bars S1 shall be a minimum of 2'-2".
4. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of deformed wire meeting the requirements of Specification Section 931.
5. See Index 521-514 and 521-515 for further footing vertical reinforcing.

### CROSS REFERENCE:
See Index 521-512 for Junction Slab Details and Indexes 521-513 thru 521-515 for additional footing details.

---

**LAST REVISION:** 01/01/17

**DESCRIPTION:** FY 2018-19 STANDARD PLANS

**CONCRETE BARRIER/NOISE WALL (8'-0")**

**INDEX:** 521-510

**SHEET:** 2 of 5
### Elevation of Railing/Noise Wall Reinforcing Steel at Open Joint

(Bars 5S1 in Railing not shown for clarity)

(Footing or Junction Slab Details not shown)

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4" (Space may be increased to 6" to lap Bars 5R on opposite side of remaining Bars 5V, as required)

### Elevation of Railings/Noise Wall End Taper (Adjacent to Concrete Barrier/BARRIER SHOWN, GUARDRAIL ATTACHMENT SIMILAR SEE DETAIL "A", SHEET 5)

(Bars 5S1 in Railing not shown for clarity)

(Footing or Junction Slab Details not shown)

**NOTES:**

* Field Cut Bars 5R & 5S1 to maintain clearance.
** Terminate 3/4" V-groove at construction joint & cast top of railing with End Taper.
*** Bar spacing shown for Bars 5V only applies when Single-Slope Concrete Barrier continues. For transition to guardrail see Sheet 5.

**Work Traffic/ Railing Noise Wall reinforcing with Index 521-512 (Junction Slab) or Index 521-513 through 521-515 (T, L or Trench Footings)
**CROSS REFERENCE:***

1. For location of Detail "A" see Sheet 1.
2. For location of Section C-C see Sheet 1.
3. For View B-B see Sheet 4.

---

**PLAN - RAILING END TRANSITION (Showing Bars 5R, and Bars 5S1)***

(Bars 5V not shown for Clarity)

---

**PLAN - RAILING END TRANSITION (Showing Bars 5R and Bars 5S1)***

(Bars 5V not shown for Clarity)

---

**DETAIL "A" NOTES:**

1. Begin placing Railing Bars 5V at the railing end and proceed toward the guardrail (thrie beam) terminal connector to ensure placement of guardrail bolt holes. Pair Bars 5R with Bars 5V as shown. Clearance of Bars 5R & 5V to guardrail bolt holes shall be checked to prevent cutting of bars if bolt holes are to be drilled. Shift bars locally where conflicts occur.
2. For Guardrail connection details see Index 536-001.
3. Omit Railing End Transition if a Single-Slope Concrete Barrier/Barrier continues beyond the End Taper. See the Plan Sheets.
4. Field cut Bars 5R1 to maintain cover. Field cut Bars 5V and lap as necessary to maintain cover; field cut & bend Bars 5R2 front leg (more plumb) to maintain cover and tie to S1 Bars. (See Sheet 4 Notes 1 and 2)
**Concrete Barrier/Noise Wall Notes**

1. This railing has been structurally evaluated to be equivalent or greater in strength to a safety shape/Noise Wall combination railing which has been crash tested to NCHRP Report 350 TL-4 Criteria.

2. **Construction Requirements:** Construct the Concrete Barrier/Noise Wall and joints plumb; do not construct the Concrete Barrier/Noise Wall perpendicular to the roadway surface.

3. **Concrete:** Use Class II concrete for slightly aggressive environments. Use Class IV concrete for moderately or extremely aggressive environments. Concrete will be in accordance with Specification Section 346.

4. **Construct Open Joints** plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown. Open Joint locations are to coincide with Open Joints in footings.

5. **Construct V-Grooves** plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between Open Joint locations and/or Begin or End Concrete Barrier/Noise Wall. V-Groove locations are to coincide with V-groove locations in footings.

6. **14'-0" Noise Wall End Taper** is required when adjacent to an 8'-0" Concrete Barrier/Noise Wall and may be used when an 8'-0" Concrete Barrier/Noise Wall End Taper is provided (see Index 521-510 for details). See Roadway Plans for Concrete Barrier/Noise Wall End Treatment.

7. Work this Index with Index 521-510 - Concrete Barrier/Noise Wall (8'-0") and one or more of the following:
   a. Index 521-513 - Concrete Barrier/Noise Wall T-Shaped Spread Footing,
   b. Index 521-514 - Concrete Barrier/Noise Wall L-Shaped Spread Footing,
   c. Index 521-515 - Concrete Barrier/Noise Wall Trench Footing.

8. **Begin or End 14'-0" Concrete Barrier/Noise Wall continuing or End Taper on Approach Slab or Roadway** (shown)
### Elevation of Concrete Barrier/Noise Wall Reinforcing Steel

<table>
<thead>
<tr>
<th>Steel Type</th>
<th>Spacing</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bars 5S1</td>
<td>6&quot;</td>
<td>1. Field Cut Bars 5R &amp; 5S1 in Noise Wall End Taper as required to maintain minimum cover.</td>
</tr>
<tr>
<td>Bars 5S2</td>
<td>6&quot;</td>
<td>2. See Index 521-513, 521-514 and 521-515 for footing reinforcement.</td>
</tr>
<tr>
<td>Bars 5V @ 6&quot; sp. (Typ.)</td>
<td>6&quot; sp.</td>
<td>3. V-Groove</td>
</tr>
<tr>
<td>Shoulder or Roadway Pavement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top of Footing</td>
<td></td>
<td>4. Bar spacing shown is along the Gutter Line.</td>
</tr>
</tbody>
</table>

### Notes:
1. Field Cut Bars 5R & 5S1 in Noise Wall End Taper as required to maintain minimum cover.
2. See Index 521-513, 521-514 and 521-515 for footing reinforcement.
3. V-Groove
4. Bar spacing shown is along the Gutter Line.
**REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
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<th>LENGTH</th>
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</thead>
<tbody>
<tr>
<td>R1</td>
<td>5</td>
<td>11'-10&quot;</td>
</tr>
<tr>
<td>R2</td>
<td>5</td>
<td>13'-10&quot;</td>
</tr>
<tr>
<td>S1</td>
<td>5</td>
<td>AS REG.</td>
</tr>
<tr>
<td>S2</td>
<td>5</td>
<td>7'-3&quot;</td>
</tr>
<tr>
<td>R2</td>
<td>5</td>
<td>2'-10&quot;</td>
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**BARS S51 & S52**

**ESTIMATED CONCRETE BARRIER/NOISE WALL QUANTITIES**

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<tr>
<td>Concrete (Noise Wall, excluding any thickening)</td>
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<tr>
<td>Reinforcing Steel (Railing/Noise Wall)</td>
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<td>105.95</td>
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<tr>
<td>(Bars R1, R2, S1 &amp; V)</td>
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<td></td>
</tr>
<tr>
<td>Additional Reinf @ Open Joint (Railing/Noise Wall)</td>
<td>LB/FT</td>
<td>0.8</td>
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<tr>
<td></td>
<td></td>
<td>488.12</td>
</tr>
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</table>

**NOTES:**

1. See Index 521-513, 521-514 or 521-515 for footing reinforcement.
2. At 12" Open Joints, plug the lower 3" portion of the open joint by filling it with mortar in accordance with Specification Section 400.
SECTION A-A
SECTION THRU JUNCTION SLAB, BARRIER WALL INLET AND RETAINING WALL
(TYPE 1 Junction Slab Shown, TYPE 2 Similar)

NOTES

1. CONSTRUCTION REQUIREMENTS: Construct the expansion joints and face of coping plumb.

2. CONCRETE: Use Class I concrete for slightly aggressive environments. Use Class IV concrete for moderately or extremely aggressive environments. Concrete will be in accordance with Specification Section 346.

3. DOWELS: Dowel Load Transfer Devices will be hot-dip galvanized ASTM A36 smooth round bars or GRP smooth round bars with a minimum shear strength of 22 ksi in accordance with ASTM D6963. Install Dowel Load Transfer Devices in accordance with Specification Section 350.

4. EXPANSION JOINTS: Construct 1" Expansion Joints plumb, and either perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.

5. Shear Keys in Junction Slab are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key must be constant and between 5° to 45° from horizontal.

6. Provide Organic Felt bond breaker on top and Expanded Polystyrene as permitted to form joints.

7. V-GROOVES: Construct 1/2" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/2" Expansion Joints and/or Begin or End Expansion Joint. V-Groove locations are to coincide with V-Groove locations in the Railing/Noise Wall. See Section 6-B for details.

8. FILL REQUIREMENTS: Shoulder or Roadway Pavement or Fill is required on top of the junction slab for its entire length on the traffic side of the Railing/Noise Wall. See Section B-B for details.

9. Actual location & width vary depending on type of Retaining Wall used.

10. Field cut Bars 5A and 5B2 as required to maintain minimum cover for skewed Approach Slab.

11. Spacing shown is along the Gutter Line. See Index 425-031 for details.

12. Field cut Bars 5A and 5B2 as required to maintain minimum cover for skewed Approach Slab.

13. Work this Index with Index 521-512 - Concrete Barrier/Noise Wall 8'-0".

CROSS REFERENCE:
For Section B-B and Detail "A", see Sheet 2.

CONCRETE BARRIER/NOISE WALL (8'-0"
JUNCTION SLAB

INDEX 521-512

1 of 2
**SECTION B-B**

**TYPICAL SECTION THRU JUNCTION SLAB AND RETAINING WALL**

**REINFORCING STEEL BENDING DIAGRAMS**

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Lap splices for Bars 5B will be a minimum of 2'-2".
4. The Contractor may use Deformed WWR when approved by the Engineer. Deformed WWR must meet the requirements of Specification Section 931.

**BILL OF REINFORCING STEEL**

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<thead>
<tr>
<th>MARK</th>
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<td>9'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>5</td>
<td>10'-0&quot;</td>
<td>10'-0&quot;</td>
<td>N/A</td>
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<tr>
<td>B2</td>
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<td>AS REQ.</td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>5</td>
<td>AS REQ.</td>
<td>AS REQ.</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>5</td>
<td>4'-0&quot;</td>
<td>4'-0&quot;</td>
<td>4'-0&quot;</td>
</tr>
<tr>
<td>L</td>
<td>5</td>
<td>4'-0&quot;</td>
<td>5'-0&quot;</td>
<td>4'-0&quot;</td>
</tr>
<tr>
<td>S3</td>
<td>4</td>
<td>3'-1&quot;</td>
<td>5'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>D1</td>
<td>5</td>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
<td>4'-0&quot;</td>
</tr>
<tr>
<td>U2</td>
<td>5</td>
<td>17'-10&quot;</td>
<td>17'-10&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**BILLION 1 Ø SMOOTH BAR**

2'-0" 2'-0"

**PARTIAL END VIEW OF RAILING END TRANSITION FOR GUARDRAIL ATTACHMENT**

(Showing Bars 5V and Bars 5B1)

**NOTE:** See Index 521-510, Detail "A" for details.

**ESTIMATED JUNCTION SLAB QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
</table>
| Concrete (Junction Slab) | CF/FT | 0.268
| Rebar (Typical) | LB/FT | 21.36 34.85
| Additional Reinf @ Expansion Joint | LB | 21.36 21.36

**NOTES:**

1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary Junction Slab slope based on roadway cross slope to maintain a minimum 6" asphalt depth at the edge of the slab as shown.
3. Actual width varies depending on type of Retaining Wall used.
4. See Index 521-510 for Bars 5V and Bars 5S1.
5. For Rigid Pavement (Concrete), Junction Slab may be thickened to match finished grade.
6. If slip forming is used, submit shop drawings for approval showing Expansion Joint support details and 2" side cover with adjusted Typical Section dimensions.

**CROSS REFERENCE:** For location of Section B-B, see Sheet 1.
PLAN - OPTION B
SPREAD FOOTING ADJACENT TO SKEWED APPROACH SLAB AND WITH BARRIER WALL INLET
(Option A Similar) (Bars S1 Not Shown)

NOTES:

1. CONSTRUCTION REQUIREMENTS: Construct the Spread Footing level transversely and expansion joints plumb; do not construct the spread footing perpendicular to the roadway surface.
2. CONCRETE: Use Class II concrete for slightly aggressive environments. Use Class IV concrete for moderately or extremely aggressive environments. Concrete will be in accordance with Specification Section 346.
3. DOWELS: Dowel Load Transfer Devices will be ASTM A 36 smooth round bar and hot-dip galvanized in accordance with Specification Section 962. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
4. Construct 1/2" Expansion Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.
5. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.
6. Construct 1/2" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/2" Expansion Joints and/or Begin or End Spread Footing. V-Groove locations are to coincide with V-Groove locations in the Concrete Barrier/Noise Wall.
7. FILL REQUIREMENTS: Shoulder or Roadway Pavement and Fill is required on the traffic side of the spread footing for Option A. Fill is required for a distance of 4'-0" on the backside of the spread footing and the full length of the spread footing (3'-0" minimum depth) on the traffic side of the spread footing for Option B. See Typical Sections on Sheets 2 and 3 for details.
8. Spacing shown is along the Gutter Line.
9. Work this Index with one or both of the following:
   a. Index 521-510 - Concrete Barrier/Noise Wall (8'-0")
   b. Index 521-511 - Concrete Barrier/Noise Wall (14'-0").

CROSS REFERENCE:
For Detail "A", see Sheet 3.
For Section A-A and Estimated Quantities, see Sheet 4.
**NOTES:**
1. Match Cross Slope of Travel Lane or Shoulder.
2. Place 10 - Bars (8 - Bars SB and 2 - Bars SS1) inside Bars SU1 as shown; (2 - SS1 Bars are included in 521-510 or 521-511 quantities)
3. For Reinforcing Steel spacing, see Typical Section Thru Spread Footing - Option A this Sheet.
4. Provide 3" lip when optional construction joint is used.
**EXPANSION JOINT DETAIL**

(Spread Footing expansion joints are required at 1⁄8" open joints in Concrete Barrier/Noise Wall)

**NOTES:**

1. Match Cross Slope of Travel Lane or Shoulder.
2. Place 10 ~ Bars (8 ~ Bars 5B and 2 ~ Bars 5S1) inside Bars SU1 as shown.
3. Provide 3" lip when optional construction joint is used.
SECTION A-A
TYPICAL SECTION THRU SPREAD FOOTING AND BARRIER WALL INLET - OPTION B
(Bars 5P, 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

NOTES:
1. Place 8 ~ Bars 5B and 2 Bars 5S1 inside Bars 5U1 as shown.
2. For Reinforcing Steel spacing, see Typical Section Thru Spread Footing - Option B on Sheet 3.
3. Provide 3" lip when optional construction joint is used.

REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>5</td>
<td>AS REQD.</td>
</tr>
<tr>
<td>F</td>
<td>5</td>
<td>5'-6&quot;</td>
</tr>
<tr>
<td>S3</td>
<td>5</td>
<td>2'-7&quot;</td>
</tr>
<tr>
<td>S4</td>
<td>5</td>
<td>2'-10&quot;</td>
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<tr>
<td>U1</td>
<td>5</td>
<td>8'-2&quot;</td>
</tr>
<tr>
<td>U2</td>
<td>5</td>
<td>13'-10&quot;</td>
</tr>
<tr>
<td>U3</td>
<td>5</td>
<td>12'-10&quot;</td>
</tr>
</tbody>
</table>

DOWEL 1" Ø Smooth Bar 2'-0"

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Lap splices for Bars 5B will be a minimum of 2'-2".
4. Lap splices Bars 5T and 5V with 5U1 will be a minimum of 2'-2".
5. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

ESTIMATED L-SHAPED SPREAD FOOTING QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
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<th>QUANTITY</th>
</tr>
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<tbody>
<tr>
<td>Concrete (Foot)</td>
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<td>0.398</td>
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<tr>
<td>Reinforcing Steel (Typical)*</td>
<td>LB/FT</td>
<td>68.84</td>
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<tr>
<td>Additional Rein. @ Expansion Joint</td>
<td>LB</td>
<td>48.06</td>
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</tbody>
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* Bars 5V and 5S1 are included in Index 521-510 or 521-511 quantities.

CROSS REFERENCE: For location of Section A-A, see Sheet 1.
1. **CONSTRUCTION REQUIREMENTS:** Construct the Trench Footing and expansion joints plumb; do not construct the Trench Footing perpendicular to the roadway surface.

2. **CONCRETE:** Use Class II concrete for slightly aggressive environments. Use Class VI concrete for moderately or extremely aggressive environments. Concrete will be in accordance with Specification Section 346.

3. **DOVELS:** Dowel Load Transfer Devices will be hot-dip galvanized ASTM A36 smooth round bar or GFRP smooth round bars with a minimum shear strength of 22 ksi in accordance with ASTM C7617.

4. Construct 6" Expansion Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.

5. Shear Keys in footing are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Torque Slope on Shear Key must be constant and between 5° to 45° from the transverse vertical plane.

6. Construct 1/2" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/2" Expansion Joints and/or Begin or End Trench Footing, V-Groove locations are to coincide with V-Groove locations in the Railing/Noise Wall.

7. **FILL REQUIREMENTS:** Fill is required a distance of 4'-0" on both sides for the entire depth of the Trench Footing. See Typical Section for details.

8. Match Cross Slope of Travel Lane or Shoulder.

9. Spacing shown is along the Gutter Line.

10. Work this Index with one or both of the following:
    a. Index 521-510 - Concrete Barrier/Noise Wall (8'-0").
    b. Index 521-511 - Concrete Barrier/Noise Wall (14'-0").

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.

2. All reinforcing steel at the open joints will have a 2" minimum cover.

3. Lap splices for Bars 5B will be a minimum of 2'-2".

4. Spacing shown is along the Gutter Line.

5. Shear Keys in footing are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Torque Slope on Shear Key must be constant and between 5° to 45° from the transverse vertical plane.

6. Construct 1/2" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/2" Expansion Joints and/or Begin or End Trench Footing, V-Groove locations are to coincide with V-Groove locations in the Railing/Noise Wall.

7. **FILL REQUIREMENTS:** Fill is required a distance of 4'-0" on both sides for the entire depth of the Trench Footing. See Typical Section for details.

8. Match Cross Slope of Travel Lane or Shoulder.

9. Spacing shown is along the Gutter Line.

10. Work this Index with one or both of the following:
    a. Index 521-510 - Concrete Barrier/Noise Wall (8'-0").
    b. Index 521-511 - Concrete Barrier/Noise Wall (14'-0").

**REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

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<thead>
<tr>
<th>MARK</th>
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<td>B</td>
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<td>AS REQ.</td>
</tr>
<tr>
<td>T</td>
<td>5</td>
<td>12'-7&quot;</td>
</tr>
<tr>
<td>DOWEL</td>
<td>1&quot; Ø Smooth Bar</td>
<td>2'-0&quot;</td>
</tr>
</tbody>
</table>

**EXPANSION JOINT DETAIL**

(Trench Footing expansion joints are required at 1/2" open joints in Concrete Barrier/Noise Wall)

**STANDARD PLANS**

**CONCRETE BARRIER/NOISE WALL**

**TRENCH FOOTING**

**INDEX**

**SHEET**
PRECAST COPING - PARTIAL ELEVATION VIEW

PRECAST AND C-I-P COPING NOTES:
1. Provide Class II concrete for slightly aggressive environments or Class IV for moderately or extremely aggressive environments.
2. Dowel Bars 4D extend 11" above the top of retaining wall panel. Field cut as necessary to maintain 2" minimum cover. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
3. Payment for Dowel Bars 4D, Buildup Concrete and Coping will be made under Retaining Wall System (Permanent).

SECTION A-A
C-I-P COPING

SECTION B-B
PRECAST COPING
### REINFORCING STEEL BENDING DIAGRAMS - PRECAST AND C-I-P COPINGS

#### BILL OF REINFORCING STEEL

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<td>AS REQ'd.</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>AS REQ'd.</td>
<td>AS REQ'd.</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>2'-0&quot;</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>U1</td>
<td>4</td>
<td>Panel width + 4&quot;</td>
<td>Panel width + 4&quot;</td>
</tr>
<tr>
<td>U2</td>
<td>4</td>
<td>Dim. B - 4&quot;</td>
<td>Dim. B - 4&quot;</td>
</tr>
<tr>
<td>U3</td>
<td>4</td>
<td>Dim. C - 4&quot;</td>
<td>Dim. C - 6&quot;</td>
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</table>

#### REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Bars 4A may be continuous or spliced at the construction joints. Lap splices for Bars 4A will be a minimum of 1'-8".
4. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

#### C-I-P COPING USED WITH PRECAST COPING

Note: When precast coping units do not fill the entire length of the retaining wall, use this similar C-I-P coping for short portions between precast coping units. This C-I-P coping may also be used for vertical copings.

#### C-I-P COPING ENCLOSURE DETAIL

- **Bars 4A (Horizontal)** (Field cut as required to maintain minimum cover)
- **Bars 4B (Horizontal)** (Field cut as required to maintain minimum cover for Extremely Aggressive Environments)
- **Bars 4U3 (1'-6" Max. Sp. (Typ.)**

**Top of C-I-P COPING ENCLOSURE**

- **Beginning or End Retaining Wall**
- **Bars 4A (follows Slope of C-I-P Coping Enclosure)**
- **Bars 4B (Horizontal)** (Field cut as required to maintain minimum cover)

**Top of Retaining Wall End Panel**

- **Bars 4A (Typ.)**
- **Bars 4B (Horizontal)**
- **Bars 4U3 (1'-6"

**Drainage Ditch**

- **Wedge (Match Precast Dimensions)**
- **Leveling Pad for MSE Wall Shown**

**LEVELING PAD**

- **3" Min. Overlap**
- **4" Cover (Bottom)**

**SECTION C-C**

- **For Slightly and Moderately Aggressive environments**
- **For Extremely Aggressive environments**
- **W" Chamfer (Typ.)**
- **V" Chamfer (Typ.)**

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Bars 4A may be continuous or spliced at the construction joints. Lap splices for Bars 4A will be a minimum of 1'-8".
4. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

**DIM. B**

- **Panel width + 4"**
- **Panel width + 4"**

**DIM. C**

- **Panel width + 4"**
- **Panel width + 6"**

**LEM. C"**

- **3" Min. Overlap**
- **4" Cover (Bottom)**

**LEVELING PAD**

- **3" Min. Overlap**
- **4" Cover (Bottom)**

**SECTION C-C**

- **For Slightly and Moderately Aggressive environments**
- **For Extremely Aggressive environments**
- **W" Chamfer (Typ.)**
- **V" Chamfer (Typ.)**
JUNCTION SLAB NOTES:
1. Construct the expansion joints, V-Grooves and face of coping plumb.
2. Provide Class II concrete for slightly aggressive environments or Class IV for moderate or extremely aggressive environments.
3. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A36 smooth round bar, or GFRP smooth round bars with a minimum shear strength of 22 ksi in accordance with ASTM D7617. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
4. Construct 1/2" V-Grooves in junction slabs and C-I-P copings plumb and perpendicular or radial to the Gutter Line. Provide 30'-0" Min. as shown. Provide 3"x3" Mortar plugs in open joints at the base of traffic railings to contain run-off.
5. Shear Keys in junction slabs are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key should be constant and between 5º to 15º from horizontal.
6. Provide and Install Preformed Expansion Joint Filler in accordance with Specification Section 932.
7. Shear Keys in junction slabs are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key should be constant and between 5º to 15º from horizontal.
8. Spacing shown is along the Gutter Line. Provide 30'-0" Max. as shown. Provide 3"x3" Mortar plugs in open joints at the base of traffic railings to contain run-off.
9. Spacing shown is along the Gutter Line. Provide 30'-0" Max. as shown. Provide 3"x3" Mortar plugs in open joints at the base of traffic railings to contain run-off.
10. For Precast Coping only, provide Dowel Bars 4D embedded 1'-0" and extended 9" above the top of MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the buildup concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
11. For Precast Coping only, provide Dowel Bars 4D embedded 1'-0" and extended 9" above the top of MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the buildup concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.

PARTIAL ELEVATION VIEW
(Precast Coping and Junction Slab Reinforcing not Shown for Clarity)
(Precast Coping Shown, C-I-P Coping Similar)
NOTES:
1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary Junction Slab slope based on roadway cross slope to maintain a minimum 6" asphalt depth at the edge of the slab as shown.
3. For Rigid Pavement (Concrete), Junction Slab may be thickened to match finished grade. Vary the Junction Slab slope to maintain a minimum 1'-6" thickness at the edge of the slab.
4. Minimum length of Junction Slab between expansion joints is 30'-0".
5. At the Contractor's option, mechanical couplers may be used to splice reinforcing. Complete details, including reinforcement lengths are required in the Shop Drawings. Provide mechanical couplers in accordance with Specification Section 415. Mechanical couplers shall develop 125% of the bar yield strength.
6. Contractor to maintain stability of precast coping/traffic railing prior to junction slab completion. In the Shop Drawings, show reinforcement for optional extension required for stability, shipping and handling. Maintain 2" minimum concrete cover.
7. When the air gap between the precast coping extension and retaining wall exceeds 2½", fill gap with full depth Expanded Polystyrene to provide a maximum 2" air gap.
8. Angle varies = 0° min., 25° max.
1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary the Joint Slab slope based on the roadway cross slope to maintain a minimum
   6" asphalt depth at the edge of the slab.
3. For Rigid Pavement (Concrete), Joint Slab may be thickened to match finish grade.
4. Minimum length of Joint Slab between expansion joints is 36" for 36" Single-Slope
   or 60" for 42" Single-Slope.
5. Contractor to maintain stability of precast coping prior to joint slab completion. In the
   Shop Drawings, show reinforcement for optional extension required for stability, shipping
   and handling. Maintain 2" minimum concrete cover.
6. If slip forming is used, submit shop drawings for approval showing 2½" side cover with
   the typical section dimensions adjusted.
7. Match Cross Slope of Travel Lane or Shoulder.
8. Vary the Joint Slab slope based on the roadway cross slope to maintain a minimum
   6" asphalt depth at the edge of the slab.
9. Contractor to maintain stability of precast coping prior to joint slab completion. In the
   Shop Drawings, show reinforcement for optional extension required for stability, shipping
   and handling. Maintain 2" minimum concrete cover.
10. Match Cross Slope of Travel Lane or Shoulder.
11. Vary the Joint Slab slope based on the roadway cross slope to maintain a minimum
    6" asphalt depth at the edge of the slab.
12. For Rigid Pavement (Concrete), Joint Slab may be thickened to match finish grade.
13. Minimum length of Joint Slab between expansion joints is 36" for 36" Single-Slope
    or 60" for 42" Single-Slope.
14. Contractor to maintain stability of precast coping prior to joint slab completion. In the
    Shop Drawings, show reinforcement for optional extension required for stability, shipping
    and handling. Maintain 2" minimum concrete cover.
15. If slip forming is used, submit shop drawings for approval showing 2½" side cover with
    the typical section dimensions adjusted.

### ESTIMATED QUANTITIES FOR C-I-P

<table>
<thead>
<tr>
<th>ITEM</th>
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<th>QUANTITY (36&quot;)</th>
<th>QUANTITY (42&quot;)</th>
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<tr>
<td>Concrete</td>
<td>CY/103</td>
<td>0.376</td>
<td>0.420</td>
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<tr>
<td>Reinforcing Steel (Typical) (includes Bars SC &amp; SF)</td>
<td>LB/103</td>
<td>62.45</td>
<td>82.17</td>
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<tr>
<td>Additional Rein. @ Expansion Joint (Steel Dowels)</td>
<td>LB</td>
<td>21.36</td>
<td>21.36</td>
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</tbody>
</table>

(The above concrete quantities are based on a max. superelevation of 6.25%).
RAISED SIDEWALK NOTES:
1.  When a 42" Vertical Shape Traffic Railing is used with a precast coping, increase Bars 4C to Bars 5C or provide Bars 4C @ 4" spacing within 6'-0" of Expansion Joints.
2.  Construct the expansion joints, V-Grooves and face of coping plumb.
3.  Provide Class II concrete for slightly aggressive environments or Class IV for moderately or extremely aggressive environments.
4.  Dowel Load Transfer Devices will be hot-dip galvanized ASTM A36 smooth round bar, or GFRP smooth round bar with a minimum shear strength of 22 ksi in accordance with ASTM D7617. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
5.  Construct 2" Expansion Joints in raised sidewalk and C-I-P copings perpendicular or radial to the Gutter Line. Provide at 30'-0" maximum intervals as shown.
6.  Shear Keys in Junction Slab are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key must be constant or variable as required to maintain 2" minimum cover to the top of the MSE wall panels. Field cut reinforcing as required to maintain minimum cover (Typ.) in Precast Coping.
7.  Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 350. Field cut reinforcing as required to maintain minimum cover to the top of the MSE wall panels. Dowels 4D (Typ.) are permitted to form joints.

EXPANSION JOINT DETAIL
(Raised Sidewalk expansion joints are to coincide with 2" open joints in Traffic Railing)

RAISED SIDEWALK:

1.  When a 42" Vertical Shape Traffic Railing is used with a precast coping, increase Bars 4C to Bars 5C or provide Bars 4C @ 4" spacing within 6'-0" of Expansion Joints.
2.  Construct the expansion joints, V-Grooves and face of coping plumb.
3.  Provide Class II concrete for slightly aggressive environments or Class IV for moderately or extremely aggressive environments.
4.  Dowel Load Transfer Devices will be hot-dip galvanized ASTM A36 smooth round bar, or GFRP smooth round bar with a minimum shear strength of 22 ksi in accordance with ASTM D7617. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
5.  Construct 2" Expansion Joints in raised sidewalk and C-I-P copings perpendicular or radial to the Gutter Line. Provide at 30'-0" maximum intervals as shown.
6.  Shear Keys in Junction Slab are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key must be constant or variable as required to maintain 2" minimum cover to the top of the MSE wall panels. Field cut reinforcing as required to maintain minimum cover (Typ.) in Precast Coping.
7.  Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 350.
8.  Construct 2" V-Grooves in raised sidewalk and C-I-P copings at 30'-0" maximum intervals as shown. Space V-Grooves equally between 2" Expansion Joints and/or Begin or End Raised Sidewalk. V-Groove locations are to coincide with V-Groove locations in the Traffic Railing.
9.  Spacing shown is along the Gutter Line.
10.  For Precast Coping only, provide Dowel Bars 4D embedded 1'-0" and extend 9" above the top of MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the build up concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
11.  Finish Sidewalks in accordance with Specification Section 522.
12.  When 32" Vertical Shape is required, see Indexes 51-620 and 51-630 for Bullet Railings.
13.  The following Indexes contain details of the intersection of the retaining wall at approach slabs:

   Index 400-090 - Approach Slabs (Flexible Pavement Approaches)
   Index 400-091 - Approach Slabs (Rigid Pavement Approaches)

CROSS REFERENCE: Detail "N", see Sheet 2.

PARTIAL PLAN VIEW FOR VERTICAL SHAPE TRAFFIC RAILING
(Precast Coping Shown, C-I-P Coping Similar) (Traffic Railing not Shown for Clarity)

PARTIAL ELEVATION VIEW
(Precast Coping & Raised Sidewalk Reinforcing not Shown for Clarity)
(Precast Coping Shown, C-I-P Coping Similar)

VERTICAL SHAPE TRAFFIC RAILINGS
Concrete (Precast Coping) | CY/LF | 0.095
Concrete (C-I-P Raised Sidewalk) | CY/LF | 0.232
Reinforcing Steel (Precast Coping) excluding Bars S5, S8 and S5 (Typ.) | LB/LF | 23.90
Reinforcing Steel (C-I-P Raised Sidewalk) (Typ.) | LB/LF | 13.50
Additional Rein. @ Expansion Joints (Steel Dowels) | LB | 32.04

The above concrete quantities are based on a Type D Concrete Curb (See Note 2).

The above concrete quantities are based on a Type D Concrete Curb (See Note 2).

NOTES:
1. Actual width varies depending on type of Retaining Wall used.
2. Match roadway curb shape (Type) and height; See Roadway Plans and Index 520-001. 5'-11" dimension is based on a 32" Vertical Shape Traffic Railing with a Type D curb adjacent to a 6'-0" wide sidewalk. Adjust this dimension as required for other curb types or transitions at Begin or End Retaining Wall.
3. Trim end of Bars S5 and S5 to clear construction joint for 42" Vertical Shape Traffic Railing.
4. Trim end of Bars S5 and S5 to clear construction joint for 42" Vertical Shape Traffic Railing.
5. Contractor to maintain stability of precast coping prior to junction slab completion.
6. When the air gap between the precast coping extension and retaining wall exceeds 2½", fill gap with full depth Expanded Polystyrene to provide a maximum 2½" air gap.

END VIEW OF 32" TRAFFIC RAILING END TRANSITION FOR GUARDRAIL ATTACHMENT (Showing Bars S5, Bars S5 and Bars S5X) (Precast Coping Shown, C-I-P Coping Similar)

NOTE: See Sheet 4 for Elevation View of End Transition.

TYPICAL SECTION THRU PRECAST COPING WITH C-I-P RAISED SIDEWALK AND RETAINING WALL AT EXPANSION JOINTS

(32" Vertical Shape Shown, 42" Vertical Shape Similar)

NOTES:
1. Actual width varies depending on type of Retaining Wall used.
2. Match roadway curb shape (Type) and height; See Roadway Plans and Index 520-001. 5'-11" dimension is based on a 32" Vertical Shape Traffic Railing with a Type D curb adjacent to a 6'-0" wide sidewalk. Adjust this dimension as required for other curb types or transitions at Begin or End Retaining Wall.
3. Trim end of Bars S5 and S5 to clear construction joint for 42" Vertical Shape Traffic Railing.
4. Trim end of Bars S5 and S5 to clear construction joint for 42" Vertical Shape Traffic Railing.
5. Contractor to maintain stability of precast coping prior to junction slab completion.
6. When the air gap between the precast coping extension and retaining wall exceeds 2½", fill gap with full depth Expanded Polystyrene to provide a maximum 2½" air gap.
The above concrete quantities are based on a Type D Concrete Curb on a level Retaining Wall (See Note 1).

NOTES:
1. Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 6'-8" dimension is based on a 32" Vertical Shape Traffic Railing with a Type D curb adjacent to a 6'-0" wide sidewalk. Adjust this dimension as required for other curb types or transitions at Begin or End Retaining Wall.
2. If slip forming is used, submit shop drawings for approval showing 3" side cover with the Typical Section dimensions adjusted.
3. Begin placing Railing Bars 5T and 5X at the railing end and proceed toward Retaining Wall to avoid conflict with guardrail bolt holes. If required, adjustments to the bar spacing for Bars 5T and 5X shall be made immediately adjacent to Begin or End Bridge. Cut, shift and rotate Bars 5T and 5X as required to maintain cover in Railing End Transition.

BUILDUP FOR STEPPED MSE WALL PANELS AND C-I-P COPING

- Expanded Polystyrene (12" Side)
- Optional Keyway
- Construction Joint Permitted
- Buildup for Stepped MSE Wall Panels
- 42" Vertical Shape Traffic Railings

42" Vertical Shape Traffic Railings

ELEVATION

RAILING END TRANSITION

(Guardrail Not Shown For Clarity)

NOTE:
1. Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 6'-8" dimension is based on a 32" Vertical Shape Traffic Railing with a Type D curb adjacent to a 6'-0" wide sidewalk. Adjust this dimension as required for other curb types or transitions at Begin or End Retaining Wall.

TYPICAL SECTION THRU C-I-P COPING AND RAISED SIDEWALK AND RETAINING WALL AT EXPANSION JOINTS

(42" Vertical Face Shown, 32" Vertical Face Similar)

- Expanded Polystyrene (12" Side)
- Optional Keyway
- Construction Joint Permitted
- Buildup for Stepped MSE Wall Panels
- 42" Vertical Shape Traffic Railings

NOTE:
1. Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 6'-8" dimension is based on a 32" Vertical Shape Traffic Railing with a Type D curb adjacent to a 6'-0" wide sidewalk. Adjust this dimension as required for other curb types or transitions at Begin or End Retaining Wall.
**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

<table>
<thead>
<tr>
<th>PRECAST COPING</th>
<th>C-I-P COPING</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH</td>
<td>LENGTH</td>
</tr>
</tbody>
</table>

**BILL OF REINFORCEMENT STEEL**

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<td>5'-11&quot;</td>
</tr>
<tr>
<td>B1</td>
<td>5</td>
<td>9'-4/11'-6&quot;</td>
</tr>
<tr>
<td>B2</td>
<td>5</td>
<td>AS REG'D</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>5'-5&quot;</td>
</tr>
<tr>
<td>L</td>
<td>5</td>
<td>4'-5&quot;</td>
</tr>
</tbody>
</table>

**Vertical Shape Traffic Railings**

- **V-Groove (Typ.)**
- **Preformed Expansion Joint Filler**

**Details**

- **Approach Slab**
- **Railing End Transition Bars**
- **Spacing Bars**

**Reinforcing Steel Notes:**

1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at expansion joints will have a 2" minimum cover.
3. Lap splices for Bars 5B and 5S will be a minimum of 2'-2".
4. Lap splice Bars 5A with Bars 4C. Lap splices will be a minimum of 2'-2".
5. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 1'-8".
6. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 5'-8", and reinforcing size must be increased to #5 bars (Bars 5C).
7. The Contractor may use deformed WWR when approved by the Engineer. WWR must meet the requirements of Specification Section 931.

* See Sheet 3 Note 3.
**PRECAST COPING/PARAPET AND SIDEWALK NOTES:**

1. Provide Class II concrete for slightly aggressive environments or Class IV for moderately or extremely aggressive environments.
2. Construct 2" Expansion Joints in sidewalk and C-I-P coping plumb and either perpendicular or radial to the Gutter Line. Provide Expansion Joints at 90'-0" maximum intervals as shown.
3. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.
4. Construct 2" V-Grooves in sidewalk and C-I-P coping. Space V-Grooves at 30'-0" Maximum intervals equally spaced between 2" Expansion Joints and/or Begin or End Sidewalk. For C-I-P Coping only, V-Groove locations are to coincide with V-Groove locations in the Concrete Parapet.
5. Spacing shown is along the Gutter Line.
6. For Precast Coping only, provide Dowel Bars 4D embedded 1'-0" and extend 11" above the top of MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the build up concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
7. Work this Index with Index 521-001 - Concrete Barrier Wall.
8. For C-I-P Coping only, work this Index with Index 521-820 - Pedestrian/Bicycle Railing, or Index 521-825 - 42" Concrete Pedestrian/Bicycle Railing.
9. Finish Sidewalks in accordance with Specifications Section 522.
10. The following Indexes contain details of the intersection of the retaining wall at approach slabs:
   - Index 400-090 - Approach Slabs (Flexible Pavement Approaches)
   - Index 400-091 - Approach Slabs (Rigid Pavement Approaches)

**PARTIAL PLAN VIEW**

(Skewed Approach Slab Shown, Perpendicular Approach Slab Similar)
(Precast Coping Shown, C-I-P Coping Similar) (Concrete Parapet not Shown for Clarity)

**PARTIAL ELEVATION VIEW**

(Precast Coping and Sidewalk Reinforcing not Shown for Clarity)
(Precast Coping Shown, C-I-P Coping Similar)
TYPICAL SECTION THRU PRECAST COPING/PARAPET WITH C-I-P SIDEWALK AND RETAINING WALL (MSE Wall Shown, other Wall Types Similar)

1. Actual width varies depending on type of Retaining Wall used.
2. Place or cast Concrete Parapet vertical.
3. Gradually deflect/displace Soil Reinforcement downward as required. Soil Reinforcement is shown deflected downward for illustrative purposes only and is not to scale. See Wall Control Drawings for details.
4. Complete details and dimensions of Concrete Precast/Bicycle Railing are required in the Shop Drawings.
5. Match cross slope of connecting sidewalk or as shown in the Wall Control Drawings.
6. If shop forming is used, submit shop drawings for approval showing 2" side cover with adjusted Typical Section dimensions.
**PLAN VIEW**

(Junction Slab Shown, Raised Sidewalk Similar)

- **Bars 5B1 (See Note 4)**
- **Bars 4V1 or 5V1 (Typ.)**
- **Bars 5S3**
- **Bars 5L (Bottom) (Typ.)**
- **Gutter Line**
- **Bars 5A (Top) (Typ.)**
- **Bars 5U3**
- **Bars 5U2**
- **Bars 5B2 (Field Cut as required to clear Barrier Wall Inlet) (Typ.)**
- **Bars 5U3**
- **Bars 5B1**
- **Bars 5C (Top) (Typ.)**
- **Bars 5S3**
- **Bars 5L (Bottom) (Typ.)**
- **Gutter Line**
- **Bars 5A (Top) (Typ.)**

**SECTION A-A**

SECTION THRU JUNCTION SLAB, BARRIER WALL INLET AND RETAINING WALL

(Junction Slab Shown, Raised Sidewalk Similar)

- **Spacing shown along the Gutter Line. Spacing shown is for C-I-P Junction Slab. For C-I-P Raised Sidewalks or Sidewalks, match bar spacing and size shown in Typical Sections (i.e., 11 ~ Bars 5U2 and 15 ~ Bars 452 @ 6" spacing for Raised Sidewalks).**
- **Dimensions shown are for junction slab increase width as required for C-I-P Raised Sidewalk and Sidewalks.**
- **Actual location & width vary depending on type of Retaining Wall used.**
- **See Index 521-610 for Bars 4V1 or 5V1 and 5B1.**
- **Organic Felt bond breaker (Top) & Expanded Polystyrene shown hatched (ƀ" Side).**
- **Locate % Barrier Wall Inlet a minimum of 10'-0" away from % Expansion Joints in Junction Slab, Raised Sidewalk or Sidewalk, C-I-P Coping and Traffic Railing or Concrete Parapet.**
- **Work this Index with the following as appropriate:**
  - Index 521-610
  - Index 521-620
  - Index 521-630

**REINFORCING STEEL BENDING DIAGRAMS - DRAINAGE**

**BILL OF REINFORCING STEEL**

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<tr>
<td>U3</td>
<td>4</td>
<td>5</td>
<td>12-10&quot;</td>
</tr>
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</table>

**STIRRUP BAR 452**

- **BAR 5S3**
- **BAR 5U3**
- **BAR SU2**

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at open joints will have a 2" minimum cover.
3. See Index 521-610, 521-620 & 521-630 for Bars 5A, 5B, 5C and 5L.
4. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.
**LIGHT POLE PEDESTAL NOTES:**

1. **ANCHOR BOLTS:**
   - Anchor Bolt design is based on the standard Roadway Aluminum Light Pole configurations shown on Index 715-040 with top of pedestal 75' or less above ground or MLW.
   - Anchor Bolt Diameter: See Table 1

2. **MATERIALS:**
   - Anchor Bolts: ASTM F1554 Grade 55.
   - Nuts: ASTM A563 Grade A, Heavy-Hex.
   - Washers: ASTM F236 Type 1.
   - Anchor Plate: ASTM A325 (Grade 36) or ASTM A325.
   - Coating: Galvanize all Nuts, Bolts Washers, and plates in accordance with ASTM F2399.

3. The Contractor is responsible for ensuring the anchor bolt design is compatible with the light pole base plate. Modifications to the anchor bolt design shown must be signed and sealed by the Contractor's Specialty Engineer and submitted to the Engineer for approval prior to construction.

4. Install Anchor Bolts plumb.

5. For conduit, EJB and expansion/deflection fitting details, see Utility Conduit Detail Drawings.

6. The cost of anchor bolts, nuts, washers and anchor plates will be included in the Bid Price for Light Poles. Include the cost of all labor, concrete and reinforcing steel required for construction of the pedestals, and miscellaneous hardware required for the completion of the electrical system in the Bid Price for either the Traffic Railing or Concrete Parapet that the pedestal is behind.

7. Field Cut Bars 4M2 as required to maintain clearance.

8. Slip Forming Method of construction requires the Engineer's approval within the limits shown.

9. Reinforcing shown for light pole pedestals is in addition to typical reinforcing for Junction Slabs and Raised Sidewalks.

10. Work this Index with the following as appropriate:
    - Index 521-512
    - Index 521-610
    - Index 521-620
    - Index 521-630

11. Pedestal may be precast in one section with Coping. Minimum Precast Coping section length is 10 ft. or 12 ft. for combination Precast Traffic Railing and Coping section.

12. For Estimated Quantities, see Sheet 6.

13. Unless otherwise noted, Traffic Railing (36’ Single-Slope) is shown in all Views and Sections. The Pedestal details for other traffic railings or pedestrian/bicycle railings are similar.

---

**TABLE 1 DESIGN LIMITATION FOR ANCHOR BOLTS (1" Dia.)**

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<tr>
<td>140</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>160</td>
<td>8 &amp; 10</td>
<td>75</td>
</tr>
<tr>
<td>160</td>
<td>12 &amp; 15</td>
<td>75</td>
</tr>
</tbody>
</table>

* Above Natural Ground
**Use 1½” Ø Anchor bolts for wall heights greater than the height shown and less than 75’.

---

**PLAN VIEW**

(Junction Slab reinforcing not shown for clarity)

(Junction Slab Shown, Raised Sidewalk or Sidewalk Similar)
NOTES:
1. Provide Concrete Class to match adjacent coping.
2. For junction slabs, increase the 1'-0" depth dimension to 1'-9".
3. For Parapet with sidewalk see Index 521-630, but increase 6" sidewalk depth to 1'-6".
   For raised sidewalk see Index 521-620.
4. The minimum length of the Junction Slabs, raised sidewalks and sidewalks is 30'-0”, measured along the Gutter Line.
5. Bars 4i are only required when pedestals are behind a Traffic Railing or Traffic Railing/Noise Wall.
6. Top of junction slab may be thickened to match finished grade of concrete pavement or shoulder, or top of sidewalk or raised sidewalk (See Notes 3 & 4).
7. Actual width varies depending on type of retaining wall used.
8. See Index 521-610 for Bars 4v1, 5v1 and 5b, or Index 521-512 for Bars 5v and 5b1.
9. Work with Index 521-512 (Traffic Railing/Noise Wall), Index 521-610 (Single-Slope), Index 521-620 (Vertical Shape), and Index 521-630 (Concrete Parapet).
**REINFORCING STEEL BENDING DIAGRAMS - LIGHT POLE PEDESTAL**

**BILL OF REINFORCING STEEL**

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<td>7</td>
<td>2</td>
<td>6'-0&quot;</td>
</tr>
</tbody>
</table>

**REINFORCING STEEL NOTES:**
1. All bar dimensions in the bending diagrams are out to out.
2. Lap splices for Bars 4G1, 4G2, 4G3, 4G4 & 4G5 will be a minimum of 1'-4".
3. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of deformed wire meeting the requirements of Specification Section 931.

**DETAIL "A"**

- Optional Notch for Index 521-610 (Typ.)
- Minimum Limits of C-I-P Coping
- Slope Pedestal
- Surface Longitudinally with Profile Grade
- Typical Notch for Index 521-610

**ESTIMATED QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Pedestal)</td>
<td>CY</td>
<td>0.926</td>
</tr>
<tr>
<td>Concrete (Thickened Junction Slab)</td>
<td>CY</td>
<td>1.222</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>344.09</td>
</tr>
</tbody>
</table>

The quantities above are for one C-I-P Light Pole Pedestal. The concrete quantity for the thickened junction slab is based on a 5'-0" length, 9" increase in thickness and a 5" wide retaining wall panel. Adjust thickened concrete quantity as required.

**NOTES:**
1. Field Cut Bars 4M2 as required to maintain minimum cover.
2. Maximum clearance between leveling nut and top of pedestal will not exceed anchor bolt diameter.

**ITEMS:**
- 1'-9" Thickened Junction Slab
- 1'-'-9" Thickened Junction Slab
- 2'-6" (Length of 1'-9" Thick Junction Slab)
- 2'-3" (Length of 1'-9" Thick Junction Slab)
- 2'-0" (Length of 1'-9" Thick Junction Slab)

**DESCRIPTION:**
- Reinforcing Steel
- Concrete (Thickened Junction Slab)
- Concrete (Pedestal)

**REVISION**
- 10/25/2017
- REV: 1

**INDEX**
- 521-650

**LAST REVISION**
- 11/01/17

**REVISED**
- FY 2018-19

**STANDARD PLANS**
- LIGHT POLE PEDESTAL - WALL COPING
GENERAL NOTES:
1. Construct sidewalks in accordance with Specification 522. Use 6" concrete for Sidewalks and Curb Ramps located within Curb Returns (See Plan View). Install all other concrete with thickness as shown, unless otherwise detailed in the Plans.
2. Include detectable warnings on sidewalk curb ramps in accordance with Index 522-002.
3. For TURNOUTS see Index 000-515.
4. Bond breaker material can be any impermeable coated or sheet membrane or preformed material having a thickness of not less than 6 mils or more than 15 mils.
5. Construct sidewalks with Edge Beam through the limits of any surface mounted Pedestrian/Bicycle Railing or Pipe Guardrail shown in the plans. (See RAILING DETAIL)
6. When roadways or driveways are newly constructed, reconstructed or altered, construct the cross slopes for crosswalks and discontinuous sidewalks as follows:
   A. Max. 0.02 cross slope for roadways or driveways controlled by "STOP" Sign or "YIELD" sign.
   B. Max. 0.05 cross slope for roadways or driveways controlled by traffic signal.

PLAN

SIDEWALK WITH UTILITY STRIP

LEGEND:
- 4" Thick Sidewalk
- 6" Thick Sidewalk
- Utility Strip

SAWED JOINTS

LONGITUDINAL SECTION

LEGEND:
A- 1/4" Expansion Joints (Preformed Joint Filler)
B- 1/8" Dummy Joints, Tooled
C- 1/4" Formed Open Joints
D- 9/16" Saw Cut Joints, 1/2" Deep (within 96 hours) Max. 5' Centers
E- 9/16" Saw Cut Joints, 1/2" Deep (within 12 hours) Max. 30' Centers
   Joint(s) Required When Length Exceeds 30'
F- 1/4" Expansion Joint When Run Of Sidewalk Exceeds 120'. Intermediate
t   locations when called for in the plans or at locations as directed by
   the Engineer.
G- Cold Joint With Bond Breaker, Tooled

SIDEWALK JOINTS

GENERAL NOTES AND CONCRETE SIDEWALK ON CURBED ROADWAYS

FAO:

FY 2018-19

INDEX 522-001

1 of 2
LEGEND:
A- 1/4" Expansion Joints (Preformed Joint Filler)
B- 1/4" Dummy Joints, Tooled
C- 1/4" Formed Open Joints
D- 1/2" Saw Cut Joints, 1/2" Deep (within 96 hours) Max. 5' Centers
E- 1/2" Saw Cut Joints, 1 1/2" Deep (within 12 hours) Max. 30' Centers
Joint(s) Required When Length Exceeds 30'
F- 1/4" Expansion Joint When Run Of Sidewalk Exceeds 120'. Intermediate locations when called for in the plans or at locations as directed by the Engineer.

CONCRETE SIDEWALK ON FLUSH SHOULDER ROADWAYS

SIDEWALK JOINTS

LONGITUDINAL SECTION

PLAN

DISCONTINUOUS SIDEWALK

OPEN JOINTS

SAWED JOINTS
GENERAL NOTES
1. Cross Slopes and Grades:
   A. Sidewalk, ramp, and landing slopes (i.e. 0.02, 0.05, and 1:12) shown in this Index are maximums. With approval of the Engineer, provide the minimum feasible slope where the requirements cannot be met.
   B. Landings must have cross-slopes less than or equal to 0.02 in any direction.
   C. Install ramp slopes along a single linear plane (i.e. no warps or varying slope). Ramp slopes are not required to exceed 15 feet in length.
   D. Joints permitted at the location of Slope Breaks. Otherwise locate joints in accordance with Index 522-001. No joints are permitted within the ramp portion of the Curb Ramp.

2. Grade Breaks:
   Grade breaks at the top and bottom of ramps must be parallel to each other and perpendicular to the direction of the ramp slope.

3. Curb, Curb and Gutter and/or Sidewalk:
   A. Refer to Index 522-001 for concrete thickness and sidewalk details.
   B. Remove any existing curb or curb and gutter to the nearest joint beyond the curb transition or to the extent that no remaining section of curb or curb and gutter is less than 5 feet long. Remove any existing sidewalk to the nearest joint beyond the transition slope or to the extent that no remaining section of sidewalk is less than 5 feet long.

4. Curb Ramp Alpha-Identification:
   A. Sidewalk curb ramp alpha-identifications (e.g. CR-A) are provided for reference purposes in the Plans.
   B. Alpha-identifications CR-I and CR-J are intentionally omitted.

5. Detectable Warnings:
   A. Install detectable warnings in accordance with Specification 527.
   B. Place detectable warnings across the full width of the ramp or landing, to a minimum depth of 2 feet measured perpendicular to the curb line and no greater than 5 feet from the back of the curb or edge of pavement.
   C. If detectable warnings are shown in the Plans on slopes greater than 5%, align the truncated domes with the centerline of the ramp; otherwise, the truncated domes are not required to be aligned.

6. Detectable Warnings – Acceptance Criteria:
   A. Color and texture shall be complete and uniform.
   B. 90% of individual truncated domes shall be in accordance with the Americans with Disabilities Act Standards for Transportation Facilities, Section 705.
   C. There shall be no more than 4 non-compliant domes in any one square foot.
   D. Non-compliant domes shall not be adjacent to other non-compliant domes.
   E. Surfaces shall not deviate more than 0.10" from a true plane.

Curb Ramp Nomenclature:
- Sidewalk (S)
- Ramp (R)
- Utility Strip (U)
- Curb (C)
- Transition (T)
- Landing (L)
SECTION B-B

Sidewalk Curb (Where Necessary)

See SIDEWALK CURB OPTIONS details.

* Note: For Additional Information On Sidewalk Curb Construction, See SIDEWALK CURB OPTIONS details.

SECTION C-C

SIDEWALK CURB OPTIONS

CONSTRUCTION OF SIDEWALK CURB IN CUT SECTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS
LANDINGS FOR CURB RAMPS WITHOUT SIDEWALKS

(See CR-F, CR-G & CR-K respectively for Detectable Warning Details/Options)

OPTION A

OPTION B

DETECTABLE WARNING ON FLUSH SHOULDER SIDEWALKS
NOTES:

1. Cross Slope of the median crossing not to exceed 0.02.

2. Running Slopes:
   A. Slopes ≤ 0.05: For roadway cross sections the Edge of Pavement elevation is the same for both directions of traffic, the median crossing running slopes (0.02 Typ.) should meet at the centerline of the median. For roadway cross sections with variable Edge of Pavement elevations, or to accommodate other construction in the median, the slopes may intersect off the centerline of the median.
   B. Slopes > 0.05: Provide a median refuge area (landing, 0.02 slope) for crossings with running slopes > 0.05. The refuge area must extend the full width of the crossing and have a minimum length of 5 feet.

3. On existing facilities, remove and reconstruct curb transition for raised sidewalk with ramp.
NOTES:

1. Where crosswalk markings are used, ramps must fall within the crosswalk limits. A clear space of 48" minimum is required at the bottom of the ramp within a marked crosswalk. If crosswalk markings are not present, a clear space of 48" minimum is required at the bottom of the ramp outside of active travel lanes.

2. Crosswalk widths and configurations vary; must conform to Index 711-001.

3. Flangeway Gap may be up to 3" for Freight-only Railways.

---

RAILROAD CROSSING

PLACEMENT OF SIDEWALK CURB RAMPS AT CURBED RETURNS (TYP.)

---

RAILROAD CROSSING AND CURB RAMPS AT CURBED RETURNS

DESCRIPTION:

FY 2018-19

STANDARD PLANS

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

INDEX 522-002

SHEET 8 of 8
(EXCEPT INDEX 430-030) STRAIGHT ENDBAND INDEX 430-030 U-TYPE ENDBAND INDEX 430-011 INDEX 430-011 STRAIGHT ENDWALL INDEX 430-040 INDEX 430-020 FLARED ENDSECTION INDEX 430-020 U-TYPE WINGS 45° WINGS WINGED ENDBANDS INDEX 430-040

SOD PLACEMENT AT PIPE/CULVERT END TREATMENTS

FILTER FABRIC PLACEMENT AT CONCRETE STRUCTURE

TABLE 2: SOD QUANTITIES (SY)

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
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</thead>
<tbody>
<tr>
<td>INDEX 430-030</td>
</tr>
<tr>
<td>SLOPE 1</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>13</td>
</tr>
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<td>16</td>
</tr>
<tr>
<td>17</td>
</tr>
<tr>
<td>18</td>
</tr>
</tbody>
</table>

Note: Either option may be used unless otherwise called for in the plans.
1. Provide Plain or Fiber Reinforced Bearing Pads meeting the requirements of Specification Section 932 for Ancillary Structures.
   A. For Collar Bearing Points provide:
      1. 4”x 4”x ½” Fiber Reinforced Pads;
      2. Plain Pads may be substituted for Fiber Reinforced Pads when sufficient bearing area is available on the concrete collar for the following:
         a. 10’ Post Spacing: 4”x 4”x ½”
         b. 20’ Post Spacing and Wall Height < 17 feet: 4”x 4”x ½”
         c. 20’ Post Spacing and Wall Height ≥ 17 feet: 4”x 5”x ½”
   B. At panel bearing points between stacked panels, use Plain or Fiber Reinforced Bearing Pads.

2. Construct Noise Walls in accordance with the requirements of Specification Section 334,
   and Augers Cast Piles in accordance with Specification Section 455.

3. Field verify the location of all overhead and underground services shown in the Wall Control Drawings.

4. Wall Height is the nominal height of the walls above finished grade. The Wall Embedment Depth for design is 1’-0”. The actual embedment depth may vary plus or minus 6” along the length of the wall.

5. Post Spacing in this Index are nominal, and are measured from centerline to centerline of the auger cast piles. Actual post spacing may vary as shown in the Wall Control Drawings.

6. Panels:
   A. The sum of the individual stacked panel heights is the Wall Height plus 1’-0” (embedment depth).
   B. Where special graphics are required, locate the horizontal panel joints outside of the graphics. Where possible, hold horizontal panel joints at a constant elevation.
   C. Side Installed Panels are only permitted when reduced overhead clearance between posts prohibits installing panels from the top.
      1. For Flush Face panels, install panel into posts from the roadway (front face) of the wall. Recessed panels may be installed from the back face of the wall.
      2. After panels are installed and centered between posts, grout between both panel ends and the adjoining posts (see Sheets 4 and 5 for details).
   D. Individual panel heights should be between 6’-0” and 12’-0” tall. The minimum panel height is 4’-0” and may be used where overhead clearance is limited, or where graphic panels are required on shorter walls.

7. Concrete And Grout:
   A. Concrete Class and Compressive Strength for:
      1. Precast Panels, Posts, and Post Caps: Class IV
      2. Cast-In-Place Collars: Class IV
   B. Minimum Compressive Strength for form removal and handling of posts and panels:
      1. 2,500 psi for horizontally cast post and panels
      2. 2,000 psi for vertically cast panels or when tilt-up tables are used for horizontally cast panels.
   C. Grout for Auger Cast Piles:
      1. Maximum Working Compressive Strength = 2,000 psi
      2. Minimum 28 day strength = 5,000 psi

8. Reinforcing Steel:
   A. In addition to the requirements of Specification Section 415, tie post and pile stirrups at the following locations as a minimum:
      1. Post Stirrups Tie at all four corner bars and at every third interior bar intersection.
      2. Pile Stirrups Tie to the main vertical reinforcing at alternate intersections for circular configurations and at the four corners and at every third interior bar intersection for rectangular configurations.
   B. Provide 2” concrete cover unless noted otherwise.

9. Casting Tolerances for precast panels and posts:
   A. Overall Height and Width: ±1/8”
   B. Thickness: ±1/16”
   C. Plane of side mold: ±1/16”
   D. Openings: ±1/8”
   E. Out of Square: 1/8” per 6 ft., but not more than 3/8” total along any side
   F. Warping: 1/16” per foot distance to nearest corner
   G. Bowing: 1/240 panel dimension
   H. Surface Smoothness for Type “A” Smooth Surface Texture Option: ±1/16”

GENERAL NOTES
RUNNING BOND BLOCK:
12" x (12", 14", 16" & 12")  (1st course)
6" x (21", 10" & 23")        (2nd course)
12" x (9", 10", 21" & 14")    (3rd course)
6" x (16", 14" & 24")        (4th course)

Type "A"  
SMOOTH

Type "B"  
ASHLAR STONE
3/4" Back Face
1/4" Front Face
Varies
3/4" to 11/2"

Type "C"  
RUNNING BOND BLOCK
8" x 16"  Running Bond Brick

Type "D"  
FRACTURED GRANITE
3/4" Depth

Type "E"  
WIRE-CUT BRICK
3/4" Depth

Type "F"  
PEA GRAVEL

Type "G"  
VERTICAL FRACTURED FIN

Type "H"  
TRAPEZOID VERTICAL FINS W/ FRACTURED FACE (COLORADO DRAG AGGREGATE)

Type "I"  
CUT CORAL BLOCK (RUNNING BOND)
12" x (12", 14", 16" & 12")  (1st course)
6" x (21", 10" & 23")        (2nd course)
12" x (9", 10", 21" & 14")    (3rd course)
6" x (16", 14" & 24")        (4th course)

NOTES:
1. Surfaces shall be formed, rolled, or pressed using form liners in accordance with the Plans and Specifications for Class 3 Surface Finish.
2. See Noise Wall Data Tables for project aesthetic requirements.
DESCRIPTION:

REVISION

LAST

REVISED

STANDARD PLANS

NOISE WALLS - (PRECAST)

INDEX

3 of 16

10/-0 Max

Symmetric about Panel

Top of Wall

Example Graphic

Type SE-2

Horizontal joint between stacked panels

Back Face Panel Texture

(Formed, Rolled or Pressed into Plastic Concrete)

Precast wall panel

Front Face Panel

Texture (Formed)

(Top of Wall)

Example Graphic

Type SE-2

Second layer surface for recessed graphic design (optional)

Single layer flat surface attached to form liner for casting smooth areas of wall design. See plans for project specific graphic drawings. Joints between flat surface and form liner to be sealed watertight.

FORMER DETAIL

(Front Face Panel Texture Type "H" shown)

(Back Face Panel Texture Type "D" shown)

(Post Forming Details Similar)

NOTES:

1. Submit specific form liner samples for approval by the Engineer.

2. Textures and graphics shown are for demonstration purposes only. See Noise Wall Data Tables in the plans for project specific texture and graphic requirements.

HALF ELEVATION

(Front Face Post and Panel Texture Type "H" shown)

(Graphic Type SE-2 shown)

(Two stacked panels shown, three stacked panels similar)
NOTE: At the Contractors Option, Smooth or Deformed Welded Wire Reinforcement may be used (equal area).

* Vertical Steel ~ #4 Bars @ 10" (As=0.24 in²/ft) (Typ.)

Horizontal Steel ~ #4 Bars @ 8" (As=0.30 in²/ft) (Typ.)

TYPICAL PANEL ELEVATION

* In lieu of utilizing the standard pick up points below, panels may be cast vertically or cast horizontally then tilted upright using tilt-tables prior to lifting from form. In this case, pick points must be placed in the top of panels only and transported maintaining the vertical orientation. If these criteria are met, the vertical steel may be reduced to #4 Bars @ 1'-3" (As=0.16 in²/ft).

STANDARD PICK UP POINTS FOR PANELS
(panels shall be rotated about long axis only)

**SECTION D-D**

(Typically both ends)

**SECTION D-D**

(Showing Recessed Type Panel)

<table>
<thead>
<tr>
<th>Panel Length (L)</th>
<th>0.207 L</th>
<th>0.586 L</th>
<th>0.207 L</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Panel Height (H)</th>
<th>0.207 H</th>
<th>0.586 H</th>
<th>0.207 H</th>
</tr>
</thead>
</table>

Notes:
1. See Sheet 3 for allowable methods of applying textures.
2. See plans for panel type and aesthetic requirements.
3. For equal post spacing, side-installed panel length will be shorter than top-installed Panel length.
NOTE: The shop drawings shall include specific pivoting details of panel ends at locations where the deflection angle (2Δ°) between panels exceeds 7°.

NOTE: The shop drawings shall include specific pivoting details of panel ends at locations where the deflection angle (2Δ°) between panels exceeds 20°.

See Detail "C" for panel dimensions

See Detail "D" for panel dimensions

See Detail "E" for panel dimensions

See Detail "E" for panel dimensions

See Detail "E" for panel dimensions

TYPICAL PANEL DETAILS

PIVOTING DETAILS
(Flush Type Panel)

PIVOTING DETAILS
(Recessed Type Panel)
DRAINAGE HOLES TYPES A, B, C & D
(Front Face of Wall Shown)
(Two Holes Shown,
One Hole Similar)

BAR BENDING DETAILS (#3 Bars)

GRATING NOTES:
1. Grating shall be ASTM A36 steel welded in accordance with the current edition of ANSI/AWS D1.1
Steel Welding Code. Hot-dip galvanize grate after fabrication in accordance with Specification
Section 962.
2. Expansion Anchors: Use ½" Ø x 2" min. corrosion resistant (zinc/aluminum alloy or stainless steel)
exansion anchors to connect grates to panels.
3. Blockout textured concrete surface for a strip 2" wide around drainage hole to enable secure
attachment of the drainage grate.

DRAINAGE HOLES DETAILS

SECTION F-F

GRATING DETAIL

SECTION G-G

SECTION H-H

DATES:
11/01/17

REVISION:
10/25/17

INDEX:
534-200

SHEET:
7 of 16
**DESCRIPTION:**

**REVISION**

**STANDARD PLANS**

**NOISE WALLS - (PRECAST)**

**INDEX**

**REVIEW DATES:**

**REV 11/01/16**

**L O W C L E A R A N C E O P T I O N**

*Extend Post 2 above top of high side wall panel when post caps are shown in plans. See Sheet 4, "ELEVATION STEP AT TOP OF WALL".*

**NOTES:**

1. For Post Reinforcing see Sheets 15 and 16.
2. For Pile Lengths Tables see Sheets 15 and 16.
POST PLACEMENT & PILE REINFORCING STEEL DETAILS

TYPICAL POST

STANDARD POST PLACEMENT IN AUGER CAST PILE
(H-Post Shown, 45° Corner Posts Similar)

LOW CLEARANCE OPTION

NOTE:
1. For Pile Length Tables, see Sheets 15 and 16.

* Extend Post 2" above top of high side wall panel when post caps are shown in plans. See Sheet 4, "ELEVATION STEP AT TOP OF WALL".

NOTE:
1. For Pile Length Tables, see Sheets 15 and 16.

(H-Post Shown, 45° Corner Posts Similar)
1. Reference Sheets 8 & 9 for location of Sections.
   Space Bars P7 as shown for Bars P1.
   Space Bars P8 as shown for Bars P2.
2. Match texture thickness with appropriate Panel face.
3. For Post Reinforcing, see sheets 15 & 16.
4. For Pile Length Tables, see sheets 15 & 16.

45° POST NOTES:

1. Bars A (Typ.)
2. Bars B (Typ.)
3. Bars C (Typ.)
4. Bars D (Typ.)
5. Bars E (Typ.)
6. Bars P7 (Pairs)

TEXTURE:

1. Chamfer (Typ.)
2. Radius (Typ.)
3. Cover (Typ.)
**DESCRIPTION:** REVIEW

**STANDARD PLANS**

**NOISE WALLS - (PRECAST)**

**REVIEW**

**90° CORNER POST NOTES:**
1. For Post Reinforcing, see Sheets 15 and 16.
2. For Pile Length Tables, see Sheets 15 and 16.
3. Reduce typical panel length or adjust pile spacing at each 90° Corner Post.
4. Match texture thickness with appropriate Panel Face.

---

**TYPICAL POST**

**LOW CLEARANCE OPTION**

* Extend Post 2" above top of high side wall panel when post caps are shown in plans. See Sheet 4, "ELEVATION STEP AT TOP OF WALL".

---

**SECTION S-S**

**SECTION R-R**

---

**90° CORNER POST DETAILS**

---

**INDEX**

**SHEET**

---

**LAST REVISED**

**11/01/16**

---

**REV 534-200**
NOTES:
1. For Pile Length Tables, see Sheets 15 and 16.
2. Trowel finish top of Collar to allow placement of Bearing Pads.
   * Extend Post 2" above top of high side wall panel when post caps are shown in plans. See Sheet 4, "ELEVATION STEP AT TOP OF WALL".
NOTES:
1. For Pile Length Tables, see Sheets 15 and 16.
2. Trowel Finish top of auger cast pile to allow placement of Bearing Pads.
   * Extend Post 2" above top of high side wall panel when post caps are shown in plans. See Sheet 4, "ELEVATION STEP AT TOP OF WALL".

10 - #9 Bars (Typ.), See Section W-W

Exposed Precast Post Reinforcement (Typ.)

36" Ø Auger Cast Pile

V

Top of Auger Cast Pile, Elev. A (See Note 2)

ELEVATION

SECTION V-V

SECTION W-W

EXPOSED PRECAST POST REINFORCEMENT STEEL DETAILS
**PLAN VIEW**

*(Type "A" Cap Shown, Type "B" & "C" Caps Similar)*

**VIEW A-A SHOWN, VIEW B-B SIMILAR**

*(Type "A" Cap Shown, Type "B" & "C" Caps Similar)*

**SECTION C-C**

**TYPE "A" CAP DETAILS**

**SECTION C-C**

**TYPE "B" CAP DETAILS**

**SECTION C-C**

**TYPE "C" CAP DETAILS**

**CAP PLACEMENT DETAIL**

*(Type "B" Cap Shown, Type "A" & "C" Caps Similar)*

PRECAST POST CAPITAL
**TABLE 1A - TABLE OF POST REINFORCING STEEL**

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST SPACING</th>
<th>BARS A</th>
<th>BARS B</th>
<th>BARS C</th>
<th>BARS D</th>
<th>BARS E</th>
<th>BARS F</th>
</tr>
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<tbody>
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<td>&quot;A&quot;</td>
<td>&quot;A&quot;</td>
<td>&quot;A&quot;</td>
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<tr>
<td>12</td>
<td>13-0'&quot;</td>
<td>#4</td>
<td>#4</td>
<td>#4</td>
<td>#4</td>
<td>9'-11&quot;</td>
<td>9'-11&quot;</td>
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<td>14-0'&quot;</td>
<td>#4</td>
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<td>#4</td>
<td>#4</td>
<td>9'-11&quot;</td>
<td>9'-11&quot;</td>
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<td>15-0'&quot;</td>
<td>#4</td>
<td>#4</td>
<td>#4</td>
<td>#5</td>
<td>#6</td>
<td>9'-11&quot;</td>
</tr>
<tr>
<td>15</td>
<td>16-0'&quot;</td>
<td>#5</td>
<td>#5</td>
<td>12'-0&quot;</td>
<td>#6</td>
<td>11'-4&quot;</td>
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<td>20-0'&quot;</td>
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<td>14'-0&quot;</td>
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</table>

**TABLE 1B - PILE LENGTHS (Feet) - WIND SPEED = 130 MPH**

| SOIL 1 | SOIL 2 | SOIL 1 | SOIL 2 | SOIL 1 | SOIL 2 | SOIL 1 | SOIL 2 | SOIL 1 | SOIL 2 | SOIL 1 | SOIL 2 | SOIL 1 | SOIL 2 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 10'-0" | 10'-0" | 10'-0" | 10'-0" | 10'-0" | 10'-0" | 10'-0" | 10'-0" | 10'-0" | 10'-0" | 10'-0" | 10'-0" | 10'-0" | 10'-0" |
| 12      | 12      | 12      | 12      | 12      | 12      | 12      | 12      | 12      | 12      | 12      | 12      | 12      | 12      |

**PILE DEPTH & REINFORCING SUMMARY**

- **Soil 1**: Loose Granular Soil, N = 4 to 9.
- **Soil 2**: Medium Dense Granular Soil, N = 10 to 40.
<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 150 MPH</th>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
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<table>
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<tr>
<th>TABLE 2A - TABLE OF POST REINFORCING STEEL</th>
<th>TABLE 2B - TABLE OF PILE LENGTHS (Feet) - WIND SPEED = 150 MPH</th>
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<th>TABLE 3A - TABLE OF POST REINFORCING STEEL</th>
<th>TABLE 3B - TABLE OF PILE LENGTHS (Feet) - WIND SPEED = 170 MPH</th>
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<td>---------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td></td>
<td>WITH CAP</td>
</tr>
</tbody>
</table>

**TABLE NOTE:**
1. Bars D and Bars E are for 40° Corner Posts only.
2. See Contract Plans for project wind speed.
   Soil 2 = Medium Dense Granular Soil, N = 10 to 40.

**PILE DEPTH & REINFORCING SUMMARY**
GENERAL NOTES:

1. Construct Perimeter Walls in accordance with Specification Section 534.
2. Choice of either Precast Option or Masonry Option is at the discretion of the Contractor.
3. Post spacing is measured from centerline to centerline of foundation element. For this index, posts and foundation elements have been designed for 20 ft. spacings. Use post spacings less than 20 ft only at changes in horizontal alignment, wall terminations or to accommodate steep grades.
4. See "Perimeter Wall Data Tables" in the specs for project requirements.
5. Field verify the locations of all overhead and underground utilities shown in the Wall Control Drawings.

MASONRY OPTION NOTES (CONT.):

D. Fully Grout all cells with horizontal or vertical reinforcing bars.
E. Use reinforcing bar positioners to maintain vertical and horizontal bar placement.
F. Fully grout first three courses of the wall.
G. Joint Reinforcement: Use W-3.3 (9mm) galvanized ladder reinforcing spaced at 15° vertically. Provide special accessories for corners, intersections, etc. Joint reinforcing shall be continuous except it shall not pass through vertical masonry control joints. Lap joint reinforcing a minimum of 6".
H. Construct expansion joints in the foundation at 90 foot maximum intervals, and directly below a wall control joint.
I. Dowel Load Transfer Devices will be ASTM A36 smooth round bars hot-dip galvanized in accordance with Specification Section 362. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
J. For spread footings, use a walk-behind compactor of at least 600 lbs. in weight. Obtain a minimum density of 95% of the maximum dry density as determined by FM I-7-180. Perform soil density tests at 100 foot intervals.
K. Protect walls during construction from soil, grout or mortar stains. Clean wall as work progresses by dry brushing to remove mortar fins and smears before grouting.
L. Use soap and potable water to clean walls. If stain removal is necessary, use a cleaning method indicated in NCMA TEK TA applicable to the type of stain on the exposed surface.
M. During construction, cover tops of walls with waterproof sheeting at the end of each day's work, or when construction is not in progress. Extend sheeting a minimum of 2 ft. down each side and secure in place.
N. Comply with Hot Weather Requirements in ACI 530.1.

13. MATERIALS:

A. Concrete Masonry Units (CMU): Provide normal weight blocks.
B. Cast-In-Place Concrete: Class II for slightly to moderate aggressive environments or Class IV for extremely aggressive environments.
C. Mortar: Type S meeting requirements of ASTM C1329 or Specification Section 901 size 8 or 89.

14. STORAGE OF MATERIALS:

A. Store CMUs on elevated platforms in a dry location or under cover. If units become wet, do not install until they are dry.
B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp or exceeded the manufacturers shelf life.
C. Store masonry accessories and reinforcing to prevent corrosion and accumulation of dirt and oil.

### GENERAL WALL ELEVATION

(Precast Option with Single Height Panel Shown, Others Similar)
DRAINAGE HOLES TYPES A, B, C & D

* Hole Types A, B, C & D refer to distance from bottom of panel/wall to center of the pipe.

NOTES:
1. Drainage holes may be formed with 4" NPS PVC pipe that may remain in place.
2. See Wall Control drawings for number, Type and location/spacing of drainage holes.
ELEVATION STEP AT TOP OF WALL
(Precast Panel Cap not Shown)

3" (Typ.)

Bottom Panel

Auger Cast Pile (Typ.)

Top Panel

Typical Post

Typical Post

Non-roadway face of wall/Back Face of Panel

Roadway face of wall/Front Face of Panel

3" (Typ.)

3" (Typ.)

L (Top-Installed)

L (Side-Installed)

Fill with Non-Shrink Grout

SELECTION D-D

SECTION E-E

PIVOTING JOINT DETAILS

NOTE: Shop Drawings shall include specific pivoting point details of panel ends at locations where the deflection angle (2°) between panels exceeds 20°.

TYPICAL ELEVATION
(Front Face Shown, Textured Finish not Shown for Clarity)

ELEVATION STEP AT BOTTOM OF WALL
(Auger Cast Pile (Typ.)

PRECAST OPTION - TYPICAL DETAILS

TYPICAL PLAN

* Nominal embedment (not including tolerances)

NOTE: Shop Drawings shall include specific pivoting point details of panel ends at locations where the deflection angle (2°) between panels exceeds 20°.

Chamfer as Required

DETAIL "A"
(Back Face Chamfer Shown Front Face Chamfer Similar)
TYPICAL PANEL ELEVATION

* In lieu of utilizing the standard pick up points below, panels may be cast vertically or cast horizontally then tilted upright using lift-cables prior to lifting from form. In this case, pick points must be placed in the top of panels only and transported maintaining the vertical orientation. If these criteria are met, the vertical steel may be reduced to #4 Bars @ 1'-3" (As=0.16 in.²/ft.).

**NOTE:** At the Contractor's option, Smooth or Deformed Welded Wire Reinforcement may be used (equal area).

**NOTE:** Smooth or Deformed Welded Wire Reinforcement may be used (equal area).

Panel Length (L)

Panel Height (H)

Texture

Front Face

Panel Length (L)

Panel Height (H)

Pick up points

Standard pick up points for panels (panels shall be rotated about long axis only)

Horizontal Steel ~ #4 Bars @ 7/8" (As=0.32 in.²/ft.) (Typ.)

Vertical Steel ~ #4 Bars @ 10" (As=0.24 in.²/ft.) (Typ.)

PRECAST OPTION - TYPICAL PANEL DETAILS

**SECTION F-F**

**SECTION G-G**

**DETAIL "B" - TOP-INSTALLED**
(Typ. Both Ends)

**DETAIL "B" - SIDE-INSTALLED**
(Typ. Both Ends)
LOW CLEARANCE OPTION

NOTES:
1. See Shop Drawing for Post Lengths.
Finished Grade

Top of Precast Collar, Elev. A

Top of Auger Cast Pile

Top of Wall per Plan

Precast Post

Precast Post

Top of Precast Collar, Elev. A

Top of Auger Cast Pile

Exposed Precast Post Reinforcement (Typ.)

6 ~ #8 Bars (Typ.)

30" Ø Auger Cast Pile

30" Ø Auger Cast Pile

30" Ø Auger Cast Pile

Projected location of 4" x 2" x ½" Neoprene Bearing Pad (Typ.)

Post

30" Ø Auger Cast Pile

Wall & Bearing Pad (Typ.)

Bearing Pad

SECTION H-H

(Reinforcing not Shown for Clarity)

SECTION I-I

(Typical Post Option)

SECTION J-J

(Typical Post Option)

SECTION J-J

(Low Clearance Option)

SECTION I-I

(Low Clearance Option)

Notes:
1. For Reinforcing Steel Sizes and Pile Lengths, see Table 1, Sheet 6.
2. For Corner Posts, see Sheet 8.
3. For Typical Post Section Dimensions, see Sheet 6.

Precast Post

2 " Post, Collar and Auger Cast Pile

Exposed Precast Post

30" Ø Auger Cast Pile

30" Ø Auger Cast Pile

30" Ø Auger Cast Pile

Bars S1 (Typ.)

6 - #8 Bars Spaced Equally Around Bar S1 (Typ.)

Bar Length = 6'-9"

All bar dimensions in bending diagrams are out-to-out.
All bars not shown in the bending diagrams are straight.

STANDARD POST PLACEMENT IN AUGER CAST PILE

(Standard Post Shown, 45° and 90° Corner Posts Similar)
**NOTES:**
1. For Reinforcing Steel Sizes, and Foundation Dimensions, see Table 1 Sheet 6.
2. For location of Section H-H and I-I, see Sheet 6.
3. The Bearing area beneath Neoprene Pads is formed by top of Auger Cast Pile Grout.

**SECTION H-H**
- Texture (3/8" thick Max. when required)
- Bars P4 (Bars @ 7 1/2" max. spacing)
- Bars A (Typ.)
  - R = 1/2" (Typ.)

**SECTION I-I (Precast Collar)**
- Texture (3/8" thick Max. when required)
- Bars P5
  - 4 1/2"
  - 5 1/2"
  - 6 1/2"

**SPECIAL POST FOR 90° CORNERS**
- 3 1/2" Chamfer (Typ.)
- 12° Post

**SPECIAL POSTS FOR 45° CORNERS**
- 4° Post
- 4° Post

**BAR BENDING DETAILS**
- Bar P3 (90° Corner)
  - Bar Length = 3'-3/4" (Typ.)
- Bar P6 (90° Corner)
  - Bar Length = 4'-2" (Typ.)
- Bar P4 (45° Corner)
  - Bar Length = 2'-3/4" (Typ.)
- Bar P5 (45° Corner)
  - Bar Length = 4'-6 1/2" (Typ.)

All bar dimensions in bending diagrams are out-to-out. All bars not shown in the bending diagrams are straight.

**PRECAST Option - Special Corner Posts**
- 30° & Auger Cast Pile
- Projected Location of Bearing Pad (See Note 3)
- Bars S1
  - @ 12" Max.
- Bars P6
  - 10 1/2" (Typ.)

**ELEVATION VIEW**
- Low Clearance Shown
- Bars P6
  - 10 1/2" (Typ.)
- Bars S1
  - @ 12" Max.
- Bars P6
  - 1 1/2"

**ELEVATION VIEW (See Note 3)**
- Bars P6
  - 1 1/2"
- Bars S1 @ 12" Max.
- Bars P6
  - 1 1/2"

**SECTION H-H**
- Texture (3/8" thick Max. when required)
- Bars P4 (Bars @ 7 1/2" max. spacing)
- Bars A (Typ.)
  - R = 1/2" (Typ.)

**SECTION I-I (See Note 3)**
- Projected Location of Bearing Pad
- Bars S1 @ 12" Max.
- Bars P6
  - 10 1/2" (Typ.)
- Bars S1
  - @ 12" Max.
- Bars P6
  - 1 1/2"

**ELEVATION VIEW**
- Low Clearance Shown
- Bars P6
  - 10 1/2" (Typ.)
- Bars S1 @ 12" Max.
- Bars P6
  - 1 1/2"

**SECTION H-H**
- Texture (3/8" thick Max. when required)
- Bars P4 (Bars @ 7 1/2" max. spacing)
- Bars A (Typ.)
  - R = 1/2" (Typ.)

**SECTION I-I (See Note 3)**
- Projected Location of Bearing Pad
- Bars S1 @ 12" Max.
- Bars P6
  - 10 1/2" (Typ.)
- Bars S1
  - @ 12" Max.
- Bars P6
  - 1 1/2"
## Table 2

<table>
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<td>Bars V1</td>
<td>Bars E1, E2</td>
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<tr>
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<td>#5 2'-0&quot;</td>
<td>#5 2'-0&quot;</td>
</tr>
<tr>
<td>150</td>
<td>#5 1'-8&quot;</td>
<td>#5 6'-0&quot;</td>
</tr>
</tbody>
</table>

### Notes:

1. End vertical reinforcing bars 1½" from top of bond beam blocks and horizontal bars 1½" from edge of control joints.
2. Do not continue horizontal #4 bond beam reinforcing through control joint.
3. Use stainless steel joint stabilizing anchors spaced at 16" vertically at all control joints. Install per manufacturer's instructions.
4. Seal Control Joints with backer rod and Type "A" silicone sealant (top and both sides).
5. See Sheet 10 for Bar placement details.
6. For Pilaster Cap Details, see Sheet 2.

---

### Section M-M

**Pilaster Reinforcing and Wall Control Joint Detail**

**Trench Footing Shown, Trench Footing Similar**

### Section K-K

**Control Joint (Typ.)**

**Mortar Cap**

**Top of Bond Beam**

**Wall Height**

**Notes:**

1. End vertical reinforcing bars 1½" from top of bond beam blocks and horizontal bars 1½" from edge of control joints.
2. Do not continue horizontal #4 bond beam reinforcing through control joint.
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**Masonry Option**

**Table 2**

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### Section M-M

**Pilaster Reinforcing and Wall Control Joint Detail**

**Trench Footing Shown, Trench Footing Similar**

### Section K-K

**Control Joint (Typ.)**

**Mortar Cap**

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**Masonry Option**

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2. Do not continue horizontal #4 bond beam reinforcing through control joint.
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4. Seal Control Joints with backer rod and Type "A" silicone sealant (top and both sides).
5. See Sheet 10 for Bar placement details.
6. For Pilaster Cap Details, see Sheet 2.
Notes:
1. For location of Sections K-K and L-L see Sheet 9.
2. Provide and install 1/2" Preformed Expansion Joints with 2 - 1" Ø Dowel Load Transfer Devices at 90' Max. as shown. See Sections L-L for placement details.
3. For Reinforcing sizes and spacings, see Table 2, Sheet 9.
4. Pairs F1, V1 are required in the wall cells on both sides of pilasters, plus a pair in each pilaster cell. Space wall reinforcing per Table 2, Sheet 9.
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 (G) of Panel) and a midspan panel splice as shown on Sheet 2. General Guardrail components included on the APL, which are compatible with this Index, may also be identified as 31" or MGS Guardrail.


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

5. HEX-HEAD BOLTS: Install Hex-Head Bolts where indicated using bolts, nuts, and washers in accordance with material properties of Specification Section 961. Place washers under nuts; washers are optional against steel flanges.

6. MISCELLANEOUS ASPHALT PAVEMENT: Install Miscellaneous Asphalt Pavement where indicated with a tolerance of ±3/4" depth and in accordance with Specification Section 339.

7. ADJACENT SIDEWALKS & SHARED USE PATHS: When guardrail posts are placed within 6'-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 bolts(s) protruding from the back face of the posts:
   a. After tightening the nut, trim the protruding post bolt flush with the nut and galvanize per Specification Section 562.
   b. Use post bolts 15" in length and countersink the washer and nut between 1" and 1 ½" 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 Panel's mounted flush per location, securing all panels with Button-Head Bolts threaded through aligned slots and holes. 2" Button-Head Bolts are permitted for panel splice locations.

9. CONNECTION TO RIGID BARRIER: The connections to Rigid Barrier in this Index only apply to newly constructed bridge Traffic Railing and Concrete Barrier or where the complete Approach Transition Connection to Rigid Barrier shown herein can be installed without conflicting with existing Traffic Railings, structures, or approach slabs. For connecting guardrail to existing bridge Traffic Railings, see the layouts and details of Indexes 536-002, 521-404, and 421-405.

10. CONNECTION TO EXISTING GUARDRAIL: Where a transition to existing guardrail at 27" height is required, linearly transition the guardrail height over a distance ranging from 25'-0" to 31"-3". Provide an immediate transition to the required midspan splice using the available panel options on Sheet 4 (9'-4" or 15'-7" 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 G of the panel’s post bolt slots at the approach/trailing ends).
GENERAL GUARDRAIL DETAILS

NOTES:

1. GENERAL: Install the General Guardrail configuration where indicated. 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. 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 sidewalks, or shallow depth conditions are encountered, see Sheet 7 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, Modified Thrie-Beam, Deep Posts at Slope Breaks, Pipe Rail, Rob Rail, or Reduced Post Spacing for Hazards).
LOW-SPEED GUARDRAIL

INDEXED SECTION

NOTES:

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" posts spacing to meet the nominal Begin/End Guardrail mix 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 21 for additional post mounting options.

8. RESTRICTIONS: Low-Speed Guardrail segments are not permitted for use with items including, but not limited to, Double Face W-Beam, Modified Thrie-Beam, Deep Posts at Slope Breaks, Pipe Rail, and/or Rub Rail.

LOW-SPEED, TL-2 GUARDRAIL DETAILS
W-BEAM PANEL ELEVATION

THRIE-BEAM PANEL ELEVATION

THRIE-BEAM PANEL SECTION

W-BEAM PANEL SECTION

PANEL SUMMARY TABLE:

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<thead>
<tr>
<th>Panel Type</th>
<th>Number of Spans</th>
<th>Gauge</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2</td>
<td>12</td>
</tr>
<tr>
<td>9'-4&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'-7&quot; W-Beam</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>18'-9&quot; W-Beam</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>21'-11&quot; W-Beam</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>25'-0&quot; W-Beam</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>6'-3&quot; Thrie-Beam</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>9'-4&quot; Thrie-Beam</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>12'-6&quot; Thrie-Beam</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>18'-9&quot; Thrie-Beam</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>21'-11&quot; Thrie-Beam</td>
<td>6</td>
<td>12</td>
</tr>
</tbody>
</table>

NOTES:

1. MATERIALS:
   Use corrugated steel panels in accordance with Specification Section 967 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 1/2" Ø Cable Anchor Plate Bolt Holes only where required for installation of the Cable Anchor Plate shown on Sheet 9, 10, & 11.

Thrie-Beams may substitute for the 1/2" Ø holes shown.
**MATERIALS:** Use timber and steel posts and offset blocks.

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 one 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. Use a single offset block type consistently per each run of guardrail. Only one 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 Steel Offset Block (See Sheet 6). For General, use the Steel Offset Block. Only where specified in the Plans, use the Steel Offset Block. Only where specified in the Plans, use the Steel Offset Block. For General, only use Steel Offset Blocks.

3. **BOLT HOLES:** Where Bolt Holes are shown in posts within this Index, use either a Timber Post or Steel Post at the Length, ‘L’, shown for Standard Posts. Drive the nail through the unused flange Bolt Hole and bend the nail so its head contacts the flange. 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.

4. **DOUBLE FACED GUARDRAIL:** Orient Post Bolts with the Button-Head located on the side nearest the traffic lane. Use a single offset block type consistently per each run of guardrail. Only one 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.

5. **MODIFIED THRIE-BEAM NESTED BACK-UP PLATE:** At each post connection, install a Nested Back-up Plate between the Thrie-Beam Panel and the post. The Nested Back-up Plate has a cross-section and material matching the Thrie-Beam Panel Section. Only use Steel Offset Blocks.

6. **BLOCK STOP-NAIL:** Drive one nail per Standard Offset Block as shown to prevent block rotation. Use a single offset block type consistently per each run of guardrail. Steel offset blocks are only permitted for Modified Thrie Beam.

7. **MATERIALS:** Use timber and steel posts and offset blocks in accordance with Specification Section 967. Composite offset blocks may be substituted as approved on the APL. Use a single offset block type consistently per each run of guardrail. Steel offset blocks are only permitted for Modified Thrie Beam.
GUARDRAIL TYPES - MOUNTING HEIGHTS & POST DEPTHS

GUARDRAIL SECTIONS - TYPICAL

GUARDRAIL SECTIONS - CURB & GUTTER

GUARDRAIL SECTIONS - SHOULders

GUARDRAIL HEIGHT SUMMARY TABLE:

<table>
<thead>
<tr>
<th>Type</th>
<th>Min. Depth 'D'</th>
<th>Mounting Height 'H'</th>
<th>Post Length 'L'</th>
</tr>
</thead>
<tbody>
<tr>
<td>W-Beam</td>
<td>3'-0&quot;</td>
<td>2'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>(Single and Double Faced)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thrie-Beam</td>
<td>3'-11&quot;</td>
<td>2'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>(Single and Double Faced)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modified Thrie-Beam</td>
<td>3'-11&quot;</td>
<td>2'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>Timber Deep Post</td>
<td>4'-10&quot;</td>
<td>See Above</td>
<td>7'-0&quot;</td>
</tr>
<tr>
<td>Steel Deep Post</td>
<td>6'-4&quot;</td>
<td>See Above</td>
<td>9'-0&quot;</td>
</tr>
</tbody>
</table>

NOTES:

1. GUARDRAIL SECTIONS: Construct Sections as indicated in the plans. The details shown herein depict W-Beam guardrail, but are applicable to the other defined Guardrail Types placed at the corresponding height, 'H'. Use components per sheets 4 & 5. Steel and timber post types are interchangeable unless otherwise defined. The 1:10 Max. cross slope shown is the maximum slope permitted for proper guardrail function, but project-specific cross slope requirements are governed per the plans.

2. TYPICAL GRADING & PAVEMENT PLACEMENT DETAIL: Construct features as indicated in the plans. Deep Posts are only permitted where post spacing is 6'-3" or less.

3. LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset callouts for Face of Guardrail, as shown in the plans. The 1:10 Max. cross slope shown is the maximum slope permitted for proper guardrail function, but project-specific cross slope requirements are governed per the plans.

4. ADJACENT TO CURB: Place the Face of Guardrail consistently offset either flush with the Face of Curb or 5" behind the Face of Curb, as indicated by the plans station and offset call outs. For offset changes, transition the Face of Guardrail from the corresponding height, 'H'. Use components per sheets 4 & 5. Steel and timber post types are interchangeable unless otherwise defined. The 1:10 Max. cross slope shown is the maximum slope permitted for proper guardrail function, but project-specific cross slope requirements are governed per the plans.

5. ADJACENT TO SUBURBAN GUTTER: Place the Face of Guardrail consistently offset either flush with the Face of Curb or 5" behind the Face of Curb, as indicated by the plans station and offset call outs. For offset changes, transition the Face of Guardrail from the corresponding height, 'H'. Use components per sheets 4 & 5. Steel and timber post types are interchangeable unless otherwise defined. The 1:10 Max. cross slope shown is the maximum slope permitted for proper guardrail function, but project-specific cross slope requirements are governed per the plans.

6. SLOPE BREAK CONDITION: Install Deep Posts only where called for in the plans. Deep Posts are only permitted where post spacing is 6'-3" or less.
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 in the APL. The planned Length of End Treatment, ‘LE’, includes the proprietary portion of various Approach Terminals and provides for more consistent planning of assembly installations across the differing Approach Terminal types. Forward-anchoring style Approach Terminals may vary from the planned lengths shown by up to 3'-0”.

Construct Approach Terminals as shown in the APL and in accordance with the manufacturer’s unique drawing details, procedures, and specifications.

Install posts in accordance with the manufacturer’s drawings. The Special Posts on Sheet 21, including Special Steel Posts, Encased Posts, and Transverse Leave-Outs, are not permitted within the Approach Terminal segment unless otherwise called for in the plans.

Align panel lip splices in accordance with the manufacturer’s drawings, regardless of the direction of traffic.

Install adjacent grading, gutters, and/or curbing as shown herein, unless otherwise specified in the plans.

2. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown in 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 DELINERATOR: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal in accordance with Specification Section 536.

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

NOTES:
1. COMPONENT DETAILS: For additional Type II component details, See Sheet 10. For Rectangular Button-Head Bolt 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 ASHTO M180.
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 included 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 final post in the General Guardrail segments). Install the Pipe Rail for adjacent Steel Posts if used, as shown on Sheet 20.
6. END DELINERATOR: Mount retroreflective sheeting to the approach face of the End Unit in accordance with Specification Sections 936 and 967.

**INSTALLED ELEVATION**

**SINGLE FACE TRAILING ANCHORAGE**

**DOUBLE FACE TRAILING ANCHORAGE**

**END TREATMENT - TRAILING ANCHORAGE, TYPE II**

**FLARED END UNIT**

**ROUNDED END UNIT**

**BUFFER END UNIT**
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.

3. PLATE STOP-NAILS: To prevent rotation of the Bearing Plate, drive steel 2½" Type B8 nails with ASTM A153 hot-dip galvanization.

4. CABLE ANCHOR PLATE ASSEMBLY INSTALLATION: Mount the pre-fabricated Cable Anchor Plate Bolt Holes in the W-Beam Panel, as shown on Sheet 6. These panel holes are only permitted for this Cable Anchor Plate Assembly application.
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, see Section 967. Place End Washers between the steel tube and soil plate as a single unit using a dummy timber post to prevent damage to the breakaway post.

3. MATERIALS: Use steel End Shoes, Plates, Tubes, and pipes in accordance with Specifications 536 and 967.

4. PARTIAL CABLE ASSEMBLY: The Partial Cable Assembly is similar to the Cable Assembly defined on Sheet 10. Place End Washers between the steel tube and soil plate as a single unit using a dummy timber post to prevent damage to the breakaway post.

5. SPECIAL END SHOE MOUNT: Punch a \( \frac{3}{16} \) 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 Section 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 breakaway post.

7. END DELIMITER: Mount retroreflective sheeting to the approach face of the Buffer End Unit in accordance with Specification Sections 536 and 967.
8 FOOT RADIUS CRT SYSTEM PLAN VIEW

16 FOOT RADIUS CRT SYSTEM PLAN VIEW

24 FOOT RADIUS CRT SYSTEM PLAN VIEW

32 FOOT RADIUS CRT SYSTEM PLAN VIEW

CRT SYSTEM SUMMARY TABLE:

<table>
<thead>
<tr>
<th>RETURN RADIUS (FT.)</th>
<th>LENGTH OF SHOP-BENT PANELS (FT.)</th>
<th>QUANTITY OF CRT POSTS</th>
<th>AREA CLEAR OF HAZARDS L' x W' (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>12.5</td>
<td>5</td>
<td>25 x 15</td>
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<tr>
<td>16</td>
<td>25.0</td>
<td>5</td>
<td>30 x 15</td>
</tr>
<tr>
<td>24</td>
<td>37.5</td>
<td>8</td>
<td>40 x 20</td>
</tr>
<tr>
<td>32</td>
<td>50.0</td>
<td>10</td>
<td>50 x 20</td>
</tr>
</tbody>
</table>

NOTES:

1. INSTALLATION: Construct the specified radius layout and Connecting Detail option as shown in the plans.

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' beyond the posts, and maintain a slope not steeper than 1:2 beyond 2'.

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 Posts material in accordance with Specification Section 967. Use steel panels and hardware in accordance with Specification Section 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 1/2" Button-Head Bolt only at the location shown).

6. SHOP-BENT PANELS: Install Shop-Bent panels where indicated using 12'-0" or 25'-0" Steel Panels. Splice at post locations within the CRT radius using the General configuration of 4 x 8 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. The required offset of the connecting adjacent guardrail is shown in the plans. The Layouts given on Sheet 17 provide basic schemes for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required. For existing bridge connection options, see Indexes 536-002, 521-404, and 521-405.

2. SECTION VIEWS & DETAILS: For cross sections and details including the barrier mount, rectangular washer, and installation dimensions, see Sheet 15.

3. END TRANSITION OF CURB OPTION: The Plan and Elevation views depict an example Curb Transition to Shoulder Gutter from Section D-D to E-E, but this transition may require a different shape depending on the End Transition option indicated in the plans (either a Shoulder Gutter Option, Raised Curb Option, or Flat No Curb Option). See Sheet 15 for curb shape details.

4. RIGID BARRIER END TRANSITION: Taper the Rigid Barrier toe as shown. See Concrete Barrier, Index 521-001, and Traffic Railing, Indexes 521-422 and 521-428, for details.

5. OFFSET BLOCKS: For Thrie-Beam post locations within the Length of Approach Transition segment, use the Timber Offset Blocks with 1'-6" height shown on Sheet 5. For the midspan of the Thrie-Beam Transition Panel and for all other W-Beam locations shown herein, use the W-Beam Offset Blocks with 1'-0" height.

6. OFFSET: The required offset difference between the Face of Guardrail and Rigid Barrier Shoulder Line is considered negligible and may not be shown in the guardrail offset calculations on 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.

8. APPROACH TRANSITION CONNECTION TO RIGID BARRIER - GENERAL, TL-3: For existing bridge connection options, see Indexes 536-002, 521-404, and 521-405.

9. SECTION VIEWS & DETAILS: For cross sections and details including the barrier mount, rectangular washer, and installation dimensions, see Sheet 15.
NOTES:

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

The Layouts given on Sheet 17 provide basic schemes for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.

For existing bridge connection options, see Indexes 536-000, 521-401, and 521-402.

2. SECTION VIEWS & DETAILS: For cross sections and details including the barrier mounting hardware, curb transition, adjacent grading, and installation dimensions, see Sheet 15.

3. END TRANSITION OF CURB OPTION: The Plan and Elevation views depict an example Curb Transition to Shoulder Gutter from Section D-D to E-E, but this transition may require a different shape depending on the End Transition option indicated in the plans (Either a Shoulder Gutter Option, Raised Curb Option, or Flat No Curb Option). See Sheet 15 for curb shape details.

4. RIGID BARRIER END TRANSITION: Taper the Rigid Barrier toe as shown. See Concrete Barrier, Index 521-403, and Traffic Railing, Indexes 521-420 thru 521-429, for details.

5. 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 "L".

6. LOW-SPEED GUARDRAIL: Low-Speed Guardrail typically includes Panels and Post Spacing as shown on Sheet 3, including parallel and tapered segments. Approach Rigid Barrier, General Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the Low-Speed Guardrail shown herein if indicated in the plans.

APPRAOCH TRANSITION CONNECTION TO RIGID BARRIER - LOW-SPEED, TL-2
**SHOULDER GUTTER OPTION**

**APPRAOCH TRANSITION CONNECTION - DETAILS**

**CURB TRANSITION ISOMETRIC VIEWS**

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

**NOTES:**

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

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

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

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

- **SECTION E-E**
  - END TRANSITION
    - **SHOULDER GUTTER OPTION**
    - **RAISED CURB OPTION**
    - **FLAT NO CURB OPTION**

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

2. **THRIE-BEAM TERMINAL CONNECTOR:** See Sheet 15 for Details. The installed bolt's threaded portion is not permitted to extend beyond ¾" from the face of the put; trim the threaded portion as needed and galvanize in accordance with Specification Section 562.

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

**TRIMMED STD. OFFSET BLOCKS**

- **TIMBERPOST ALIGNMENT WIDTH**
- **STEEL POST ALIGNMENT WIDTH**

**APPORACH TRANSITION CONNECTION TO RIGID BARRIER WITH DOUBLE FACED GUARDRAIL**
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)

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 Taper stations are specified. For existing bridge layouts, see Index 536-902. 524-404, and 524-405.

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.

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

4. LENGTH OF END TREATMENT 'LE': Install the Approach Terminal End Treatment as shown on Sheet 13 or 14 as called for in the plans.

5. CROSSED 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 PANELS, 'LDP' (FOR TYPE B APPROACH): Terminate the Double Faced Guardrail segment 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 'LDP' as needed for the Panel's End Bolt Slot to align with a post Bolt hole.

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 Slope Break as shown. Install posts at the end bolt slots of the panel system. Use post spacing of either 3'-1" 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.

SECTION H-H
BRIDGE ABUTMENT
(Slope Guard (Between Bridges))

EDGE OF TRAFFIC LANE

Rigid Barrier

Shoulder Line

Rigid Barrier

LAYOUT TO RIGID BARRIER - APPROACH ENDS

APPROACH ENDS

Face of Traffic Lane

Rigid Barrier

Face of Traffic Lane

Berm

Shoulder Line

Type B Approach (Option 1)

Type B Approach (Option 2)

Match Line

End Treatment (Option 1)

End Treatment (Option 2)

MEDIAN OR OUTSIDE SHOULDERS
(Mirror Horiz. and/or Vert. for Opposite Direction and/or Side of Road)
NOTES:

1. See the applicable Notes on Sheet 17.

2. LENGTH OF TRAILING ANCHORAGE, 'LT': Install the Trailing Anchorage - Type II as shown on Sheet 9, where called for in the plans.

3. THRIE-BEAM TERMINAL CONNECTOR: Install connector and bolts as shown on Sheet 15.

4. RIGID BARRIER SINGLE SLOPE END FACE: See Concrete Barrier Wall, Index 521-001, and Traffic Railing, Indexes 521-422 and 521-423, for details.

NOTES:

1. See the applicable Notes on Sheet 17.

2. LENGTH OF TRAILING ANCHORAGE, 'LT': Install the Trailing Anchorage - Type II as shown on Sheet 9, where called for in the plans.

3. THRIE-BEAM TERMINAL CONNECTOR: Install connector and bolts as shown on Sheet 15.

4. RIGID BARRIER SINGLE SLOPE END FACE: See Concrete Barrier Wall, Index 521-001, and Traffic Railing, Indexes 521-422 and 521-423, for details.
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 Section 967.

4. END RUB RAIL: For Single Sided Rub Rail, terminate the run of Rub Rail by bending the panel behind the post and securing in place (as shown). For Double Sided Rub Rail, terminate the runs of Rub Rail on their respective front face of the post and secure with the typical Button-Head bolt.
1. GENERAL: Install General Pipe Rail where indicated in the plans or where 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 (LT), Approach Transition (LA), and Approach Transition (LT) segments.

3. MATERIALS: Use steel brackets, fixtures, and pipes in accordance with Specification #57.

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 back of Steel Posts as shown on Sheet 6.

NOTES:
1. INSTALLATION: When the construction of Guardrail at the required post spacing results in post(s) located atop curbs, streets, pipe feetings, or similar concrete structures, a Special Steel Post may be substituted for a Standard Post. Install where shown in the plans and/or as needed, in accordance with Specification Section 536.

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 altered by up to 1'-6" (Quarter Span) to mount 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 Specifications Section 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 Panel Post Bolt Slot(s) in the W-Beam or Thrie-Beam Panel only where needed to mount the panel to a post in an adjusted location. Meet the Panel Post Bolt Slot requirements of Specification Section 536.

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

1. INSTALLATION: Install Barrier Delineators as shown in accordance with the plans, with Specifications Section 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 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 stop 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
   - S4 = 100' x 1 Space
   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.

6. MOUNT LOCATION - ISOMETRIC VIEWS
   - Steel Posts
   - Timber Posts

7. BUTTON-HEAD BOLT LENGTHS:
   - Application(s):
     - Panel Splice
     - Steel Post Mount - Single Faced Guardrail
     - Timber Post Mount - Double Faced Guardrail
     - Steel or Timber Post Mount - Double Faced Guardrail
     - Modified Three-Beam Panel / Terminal Connector Splice
   - Length 'L'
   - Min. Thread Length

NOTES:

1. INSTALLATION: Work these details with the plans, where Spacing for Begin/End Quarter Spacing and Begin/End Half 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 SPLICE: Midspan Panel Splices are not required in Transition and Reduced Post Spaced panels when the panels are required for General Spacing. To show Midspan Splices in General segments, use one Non-General panel length (9'-4") or 10'-7") 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'-1"

4. PANEL POST BOLT SLOTS: For Quarter Spacing configurations, punch additional 3/8" x 10" Post Bolt Slots in the panels only where required for mounting and in accordance with Specifications Section 936.

REDUCED POST SPACING FOR HAZARDS

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

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

BARRIER DELINEATORS

PROFILE

RECTANGULAR WASHER

FOR TYPE II, CRT, & TERMINAL CONNECTORS WHERE SHOWN - INSTALL OVER PANEL FACE

BUTTON-HEAD BOLT SYSTEM

1/8" BUTTON-HEAD BOLT
GENERAL NOTES

1. This index provides guardrail transition and connection details for approach end guardrail on existing bridges, and anchor details for trailing end traffic railing retrofits and safety shapes on existing bridges. Sheets 1 through 26 apply to bridges with retrofitted traffic railings. (Sheet 26 shows the trailing and guardrail connections). Sheet 27 applies to bridges with safety shaped traffic railing. Construct the guardrail transitions and connections where shown in the plans.

2. For trailing end guardrail connections for existing bridges with either Vertical Face Retrofits or Safety Shape Traffic Railing, see the Trailing End Transition Connection to Rigid Barrier detail shown in Index 536-001. Likewise, for miscellaneous guardrail construction details that are not provided in this Index, refer to Index 536-001.

NOTES FOR GUARDRAIL TRANSITIONS CONNECTING TO TRAFFIC RAILING RETROFITS ON EXISTING BRIDGES

1. The transition detail shown on this sheet shows all the standard post spacings within the typical thrie-beam approach transitions connecting to existing bridges with retrofitted traffic railings, and (b) depict the typical alignments of the approach transitions.

2. The curb and gutter flare shown on this sheet is typical of flares that are to be constructed when approach slab curbs extend to the beginning of the slab, and where other treatment to curb blunt ends are not in place.

3. The special steel post for roadway thrie-beam transitions detailed on this sheet is specific to all transition applications on this Index that require one or more steel posts.

The special steel post and base plate assembly shall be fabricated in accordance with Specification 967.

Anchor studs shall be fully threaded rods in accordance with ASTM F1554 Grade 36 or ASTM A193 Grade B7. All nuts shall be heavy hex in accordance with ASTM A563 or ASTM A19

4. Anchor studs and nuts shall be hot-dip zinc coated in accordance with the Specifications.

After the nuts have been snug tightened, the anchor stud threads shall be single punch distorted immediately above the top nuts to prevent loosening of the nuts. Distorted threads shall be coated with a galvanizing compound in accordance with the Specifications.

Adhesive bonding material systems for anchors shall comply with Specification 937 and be installed in accordance with Specification 416.4. Welded beam extensions and posts for terminal connector attachments will vary for traffic railing barrier vertical face retrofits. The plan views for the vertical face retrofits barriers show the primary configurations for each particular scheme. The associated pictorial views show the variations.

5. For installing thrie-beam terminal connector to traffic railing vertical face retrofits, see notations on Sheets 15 through 18 and the flag notation on Sheet 26.

6. Payment for connections to traffic railing vertical face retrofits are to be made under the contract unit price for Bridge Anchorage Assembly, EA., and shall be full compensation for bolt hole construction, terminal connector, terminal connector plate and bolts, nuts and washers.
Approach Guardrail Treatments for Bridges with Concrete Traffic Railing

Extending Less than Full Approach Slab Length in Narrow Medians with Flush Shoulders

Guardrail lengths

<table>
<thead>
<tr>
<th>Median Width (ft.)</th>
<th>6' Bridge Shoulders</th>
<th>10' Bridge Shoulders</th>
</tr>
</thead>
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<tr>
<td></td>
<td>110 Taper Rate</td>
<td>115 Taper Rate</td>
</tr>
<tr>
<td>PANELS (No.)</td>
<td>LENGTH (ft.)</td>
<td>PANELS (No.)</td>
</tr>
<tr>
<td>10</td>
<td>115.75</td>
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<td>20</td>
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<td>316.75</td>
</tr>
<tr>
<td>30</td>
<td>237.75</td>
<td>437.75</td>
</tr>
</tbody>
</table>

The lengths shown in this table are based on standard widths for roadway and bridge median shoulders. Length requirements for both standard width and narrow bridge shoulders and end anchorage or end shielding requirements shall be determined on a site specific basis.

When crash cushions are required on approach roadway shoulders, their sizes may be determined by the residual speeds (S') along the runouts from the approach roadways; however, when calculated speeds (S') are less than 30 mph, crash cushions shall be no less in size than for 30 mph; see speed diagram left. The number of panels may be reduced when installing a crash cushion more than 2.5' in width; see * below.

*Number shown is the minimum number of panels plus a W-Thrie beam transition panel; single faced guardrail must have a length of five (5) or more panels.

Note: The guardrail configurations shown apply only to parallel or near parallel bridges with open medians.

Guardrail transition lengths

The lengths shown in this table are based on standard widths for roadway and bridge median shoulders. Length requirements for both standard width and narrow bridge shoulders and end anchorage or end shielding requirements shall be determined on a site specific basis.

When crash cushions are required on approach roadway shoulders, their sizes may be determined by the residual speeds (S') along the runouts from the approach roadways; however, when calculated speeds (S') are less than 30 mph, crash cushions shall be no less in size than for 30 mph; see speed diagram left. The number of panels may be reduced when installing a crash cushion more than 2.5' in width; see * below.

*Number shown is the minimum number of panels plus a W-Thrie beam transition panel; single faced guardrail must have a length of five (5) or more panels.

Approach Guardrail Treatments for Bridges with Concrete Traffic Railing

Extending less than full approach slab length in narrow medians with flush shoulders.

Guardrail configurations shown apply only to parallel or near parallel bridges with open medians.
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEE INDEXES 460-473 & 460-476 - SCHEME 1

SEE INDEXES 460-473 & 460-476 - SCHEME 2

SEE INDEXES 460-473 & 460-476 - SCHEMES 3 & 4
SEE INDEXES 460-473 & 460-476 - SCHEMES 5 & 6

PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEE INDEX 640-471 - SCHEME 1

SEE INDEX 640-471 - SCHEME 2

SEE INDEX 640-471 - SCHEME 3

GUIDE TO TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES

11/01/17

FY 2018-19

STANDARD PLANS

536-002

11 of 27
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR
BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)

(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

Note:
* 21" x 12" x 14" Thrie-Beam Terminal Connector Plate (Back-Up Plate); And 3/8" x 12" Long
  Hex Bolts And Nuts (5 Req'd.) With 2" Go Plain Round Washers Under Heads And Nuts

SEE INDEX 521-405 OR 521-482 - SCHEME 2

SEE INDEX 521-405 OR 521-482 - SCHEME 3

SEE INDEX 521-405 OR 521-482 - SCHEME 2

SEE INDEX 521-405 OR 521-482 - SCHEME 3
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

Note:
* 2 1/2" x 12" x 1/2" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And 1/4" x 12" Long
  MS Hex Bolts And Nuts (5 Req'd.) With 2½" OD Plain Round Washers Under Heads And Nuts
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)

* Note:
1. 21" x 12" x ½" Thrie-Beam Terminal Connector Plate (Back-Up Plate), and ½" MS Hex Bolts And Nuts (12" Long For Scheme 1 And Length To Fit For Schemes 2 And 3/5 Req'd) With 2½" OD Plain Round Washers Under Heads And Nuts

SEE INDEX 521-483 - SCHEME 1

SEE INDEX 521-483 - SCHEME 2

SEE INDEX 521-483 - SCHEME 3
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS
AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING
(VERTICAL FACE RETROFIT)

* Post Bolts At First Standard (3'-1") Post Hole Location On Bridge
(7" Min. From End Of Bridge). Use 7/8" HS Hex Bolts And Nuts
With 21/2" UD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

PICTORIAL VIEW

SEE INDEX 521-481: SCHEME 3

PICTORIAL VIEW

SEE INDEX 521-481: SCHEME 3

PICTORIAL VIEW

SEE INDEX 521-481: SCHEME 3

* Post Bolts At First Standard (3'-1") Post Hole Location On Bridge (7" Min. From End Of Bridge). Use ¾" HS Hex Bolts And Nuts With 2½" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

*Post Bolts At First Standard (3'-1") Post Hole Location on Bridge
(7" Min. From End Of Bridge). Use 1/2" HS Hex Bolts And Nuts
With 2-1/2" DD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

* Post Bolts At First Standard (7'-11") Post Hole Location On Bridge (7" Min. From End Of Bridge). Use 9/16 HS Hex Bolts And Nuts With 1/2" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

EXISTING RAILING AND PARALLEL WING POST REMOVED; TRAFFIC RAILING (VERTICAL FACE RETROFIT) CONSTRUCTED

SEE INDEX 521-482 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 1

* Post Bolts At First Standard (7'-15") Post Hole Location On Bridge (7" Min. From End Of Bridge). Use #3 HS Hex Bolts And Nuts With 2½" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS

AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING

(VERTICAL FACE RETROFIT)

See INDEX 521-483 - SCHEME 3

PICTORIAL VIEW

See INDEX 521-483 - SCHEM 3

PICTORIAL VIEW

See INDEX 521-483 - SCHEM 3

* Post Bolts At First Standard (3'-1") Post Hole Location On Bridge
(7" Min. From End Of Bridge). Use 3/8" HS Hex Bolts And Nuts
With 2x10 Plain Round Washers Under Heads And Nuts.
TRAILING END GUARDRAIL AND ANCHORAGE FOR BRIDGE TRAFFIC RAILING (THRIE BEAM RETROFITS)
**GUARDRAIL TRANSITIONS TO EXISTING FLAT SLAB BRIDGES**

Use Of Scheme I Shall Be Determined In Accordance With The Instructions For Standard Plans (IDS-402)

**SCHEME I**

- Existing Approach Slab
- Existing Shoulder Gutter

**SCHEME II**

- Approach Slab
- Slab (Shoulder Gutter Shown)

**SCHEME III**

- Approach Slab
- Existing Flat Slab Bridge Wing Post

**APPROACH POSTS AND SPECIAL OFFSET BLOCKS**

Block assemblies for special offsets can be made up of one special block plus one standard size block or of three standard size blocks field dressed to approximately equal size, with the pieces secured for relative position by 16d galvanized nails, see "16d NAIL FOR PREVENTION OF OFFSET BLOCK NOTATION - Index 596-01". The nested rails shall not be bolted to the blocks and posts at posts (a), (c) and (e). The details shown are for approach slabs with internal edge dike extending beyond parapet type traffic railing termini.

**NOTES FOR GUARDRAIL TRANSITIONS TO SAFETY SHAPE TRAFFIC RAILINGS ON EXISTING BRIDGES**

1. When the guardrail attachment overlays the Bridge Number, Bridge Name or Date on the traffic railing, provide an aluminum sign panel with the obscured information. Attach the sign panel to the face of the traffic railing adjacent to the Three-Beam Terminal Connector with 1/8" x 1" long concrete screws or expansion anchors at each corner, as approved by the Engineer. The sign panel shall be a minimum 1/8" thick and meet the requirements of Specification Section 700 with a white background and 3" tall black letters and sized appropriately to contain the information required. The cost of the sign panel shall be included in the cost of the Guardrail Bridge Anchorage Assembly.

2. When retrofitting three-beam guardrail to existing wing posts or existing bridge safety shape traffic railing, attachment construction to be paid for under the contract unit price for Guardrail Bridge Anchorage Assembly, EA, and shall be full compensation for bolt hole construction, terminal connector, terminal connector plate(s) and bolts, nuts and washers.
GENERAL NOTES

1. This Index is applicable for permanent crash cushion installations that shield the ends of Concrete Barrier or Guardrail, only.

2. Design Length is based on a given design speed and the shortest Crash Cushion available on the Approved Products List (APL). When a Length Restriction is not applicable (N/A), then the Contractor has the option to select valid Crash Cushions from the APL which have design lengths greater than or equal to the Design Length identified in the plans. When a Length Restriction is applicable, then the Contractor has the option to select valid Crash Cushions from the APL which have design lengths less than or equal to the Design Length identified in the plans and that are less than or equal to the Length Restriction identified in the plans.

3. For High Speed Facilities with a Design Speed greater than 60 mph, use a TL-3 Crash Cushion.

4. Assemble and install Crash Cushions according to the limitations noted on the Approved Products List (APL) webpage, the manufacturer’s specifications, and the applicable crash cushion drawings posted on the APL.

5. When subjected to reverse direction hits, construct Transition Panels from Concrete Barrier to Crash Cushions; for additional details refer to the applicable crash cushion drawings on the APL.

6. Galvanized metallic components are to meet the requirements in the Specification, Section 967.

7. For Guardrail Applications, construct the Manufacturer’s Transition between the Permanent Crash Cushion and the Standard Guardrail Transition; refer to all Standard Guardrail Transition details of this Index.

8. For additional information on the End Measurement for Guardrail Payment, refer to the Standard Specifications for Road and Bridge Construction, Section 536.

9. Provide delineation in accordance with Specification, Section 544.

10. The EOR shall provide the station of the Length of Need (LON) location in the plans. Provide delineation in accordance with Specification, Secton 544.

Concrete Barrier Applications

<table>
<thead>
<tr>
<th>Design Length (ft)</th>
<th>Design Speed (mph)</th>
<th>Crash Test Level</th>
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<td>40</td>
<td>TL-2</td>
</tr>
<tr>
<td>7.25</td>
<td>45</td>
<td>TL-2</td>
</tr>
<tr>
<td>10.25</td>
<td>50</td>
<td>TL-3</td>
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<td>TL-3</td>
</tr>
<tr>
<td>16.00</td>
<td>≥ 60</td>
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Guardrail Applications

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</thead>
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<td>20.00</td>
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<tr>
<td>22.75</td>
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</tbody>
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PERMANENT CRASH CUSHION APPLICATIONS
CRASH CUSHION DETAILS

**PLAN VIEW**
- **PERMANENT CRASH CUSHION**
- **CRASH CUSHION DETAILS**
- **ELEVATION VIEW**
- **STANDARD GUARDRAIL TRANSITION**

**DESIGN LENGTH**
- **12'-6" Thrie-Beam Panel (Nested For Bi-Directional Traffic)**
- **6'-3" W-Thrie Beam Transition Panel**
- **18'-9" Standard Guardrail Transition**
- **W-Beam Guardrail**

**Location Station**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)
- **End Measurement For Guardrail Payment**

**Notes:**
- Post Numbers 8, 9, and 10 will have Standard 6"x8"x18" Wooden W-beam Blockouts.
- For Additional Information on Standard Guardrail Transitions see Index 536-001.

**Standard W-Beam Blockout**
- **Standard W-Beam Blockout**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)

**W-Beam Guardrail**
- **W-Beam Guardrail**
- **Standard W-Beam Blockout**

**Location Station**
- **Location Station**

**Design Length**
- **Design Length**

**Manufacturer’s Transition – Distance Varies**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)

**Standard W-Beam Blockout**
- **Standard W-Beam Blockout**
- **Standard W-Beam Blockout**

**W-Beam Guardrail**
- **W-Beam Guardrail**
- **W-Beam Guardrail**

**Location Station**
- **Location Station**

**Design Length**
- **Design Length**

**Manufacturer’s Transition – Distance Varies**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)

**Standard W-Beam Blockout**
- **Standard W-Beam Blockout**
- **Standard W-Beam Blockout**

**W-Beam Guardrail**
- **W-Beam Guardrail**
- **W-Beam Guardrail**

**Location Station**
- **Location Station**

**Design Length**
- **Design Length**

**Manufacturer’s Transition – Distance Varies**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)

**Standard W-Beam Blockout**
- **Standard W-Beam Blockout**
- **Standard W-Beam Blockout**

**W-Beam Guardrail**
- **W-Beam Guardrail**
- **W-Beam Guardrail**

**Location Station**
- **Location Station**

**Design Length**
- **Design Length**

**Manufacturer’s Transition – Distance Varies**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)

**Standard W-Beam Blockout**
- **Standard W-Beam Blockout**
- **Standard W-Beam Blockout**

**W-Beam Guardrail**
- **W-Beam Guardrail**
- **W-Beam Guardrail**

**Location Station**
- **Location Station**

**Design Length**
- **Design Length**

**Manufacturer’s Transition – Distance Varies**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)

**Standard W-Beam Blockout**
- **Standard W-Beam Blockout**
- **Standard W-Beam Blockout**

**W-Beam Guardrail**
- **W-Beam Guardrail**
- **W-Beam Guardrail**

**Location Station**
- **Location Station**

**Design Length**
- **Design Length**

**Manufacturer’s Transition – Distance Varies**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)

**Standard W-Beam Blockout**
- **Standard W-Beam Blockout**
- **Standard W-Beam Blockout**

**W-Beam Guardrail**
- **W-Beam Guardrail**
- **W-Beam Guardrail**

**Location Station**
- **Location Station**

**Design Length**
- **Design Length**

**Manufacturer’s Transition – Distance Varies**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)

**Standard W-Beam Blockout**
- **Standard W-Beam Blockout**
- **Standard W-Beam Blockout**

**W-Beam Guardrail**
- **W-Beam Guardrail**
- **W-Beam Guardrail**

**Location Station**
- **Location Station**

**Design Length**
- **Design Length**

**Manufacturer’s Transition – Distance Varies**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)

**Standard W-Beam Blockout**
- **Standard W-Beam Blockout**
- **Standard W-Beam Blockout**

**W-Beam Guardrail**
- **W-Beam Guardrail**
- **W-Beam Guardrail**

**Location Station**
- **Location Station**

**Design Length**
- **Design Length**

**Manufacturer’s Transition – Distance Varies**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)

**Standard W-Beam Blockout**
- **Standard W-Beam Blockout**
- **Standard W-Beam Blockout**

**W-Beam Guardrail**
- **W-Beam Guardrail**
- **W-Beam Guardrail**

**Location Station**
- **Location Station**

**Design Length**
- **Design Length**

**Manufacturer’s Transition – Distance Varies**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)

**Standard W-Beam Blockout**
- **Standard W-Beam Blockout**
- **Standard W-Beam Blockout**

**W-Beam Guardrail**
- **W-Beam Guardrail**
- **W-Beam Guardrail**

**Location Station**
- **Location Station**

**Design Length**
- **Design Length**

**Manufacturer’s Transition – Distance Varies**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)

**Standard W-Beam Blockout**
- **Standard W-Beam Blockout**
- **Standard W-Beam Blockout**

**W-Beam Guardrail**
- **W-Beam Guardrail**
- **W-Beam Guardrail**

**Location Station**
- **Location Station**

**Design Length**
- **Design Length**

**Manufacturer’s Transition – Distance Varies**
- **Manufacturer’s Transition – Distance Varies**
  (See Crash Cushion Drawings On The APL)

**Standard W-Beam Blockout**
- **Standard W-Beam Blockout**
- **Standard W-Beam Blockout**

**W-Beam Guardrail**
- **W-Beam Guardrail**
- **W-Beam Guardrail**

**Location Station**
- **Location Station**

**Design Length**
- **Design Length**
**RAISED RUMBLE STRIPS AT INTERSECTIONS**

**INSET A**

- Rumble strips may be required for one or more legs of the intersection (one leg shown for spacing information).
- Rumble strips shall be constructed only on the legs identified in the plans.

**PLAN**

- Raised rumble strip sets are to be constructed in accordance with Section 546 of the Specifications.

**Thermoplastic Set**

- Thermoplastic rumble strip (typical)

**Asphalt Set**

- Asphalt rumble strip (typical)

**NOTE:**

- Thermoplastic rumble strip sets shall be white.

**SECTION AA FOR THERMOPLASTIC AND ASPHALT RUMBLE STRIP SETS**

- Braking zone: 15' (4 strips) 15' (6 strips)

- Alert/reaction zone: 12'' min.

- Thickness: 2'' min.

- Frequency: 5' (4 strips)

- Identification: Identified in the plans.
GENERAL NOTES

1. For Limited Access roadways, when friction course extends more than 8" beyond the edge of the traveled way, blade off the extended friction course to the 8" line prior to rumble strip grinding.

2. Use the continuous array on both inside and outside shoulders in advance of bridge ends for a distance of 1,000 feet or back to the gore recovery area for mainline interchange bridges. Use the skip array for all other locations.

3. Exclude rumble strips at the following locations:
   A. At mainline tolling areas, terminate rumble strips at the end of the mainline normal section.
   B. At All Electronic Tolling (AET) facilities, terminate rumble strips within 50 feet of the centerline of the overhead gantry.
   C. On outside shoulders of entrance ramp terminals, terminate rumble strips at the point of the physical gore and resume at the end of the acceleration lane taper.
   D. On outside shoulders of exit ramp terminals, terminate rumble strips at the start of the deceleration lane taper and resume at the point of the physical gore.
   E. On approaches to bridges, terminate rumble strips at the approach slab joint.
   F. On either side of median crossover openings, terminate rumble strips within 400 feet.

GROUND-IN RUMBLE STRIPS FOR LIMITED ACCESS ROADWAYS

LOCATION

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DEPTH FROM SURFACE (IN.)</th>
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<tbody>
<tr>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>8 (±6&quot;)</td>
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</tbody>
</table>

PROFILE VIEW (SECTION A-A)

RUMBLE STRIP DETAILS

DETAIL "A"
### Notes

**Design Criteria:**
1. Design is based on the assumption that the material contained within the reinforced soil volume, methods of construction and quality of prefabricated materials are in accordance with Specification Section 548 and Chapter 3 of the FDOT Structures Design Guidelines.

**Soil Parameters:**
1. See Wall Control Drawings for soil characteristics of foundation material to be used in the design of the wall system.
2. The Contractor will provide soil design parameters for backfill material based on the actual soil characteristics utilized at the site.

**Materials:**
1. See Specification Section 548 for material requirements.

**Construction:**
1. Walls will be constructed in accordance with Specification Section 548 and the Wall Company's instructions.
2. For location and alignment of retaining walls, see Wall Control Drawings.
3. If required, locate manholes and drop inlets as shown on wall elevations.
4. Refer to Wall Control Drawings of individual walls for minimum reinforcement strip mesh length, factored bearing resistance, minimum wall embedment and anticipated long term and differential settlements.
5. The Contractor is responsible for controlling water during storm events as needed during construction.
6. It is the Contractor's responsibility to determine the location of any guardrail posts behind retaining wall panels. Prior to placement of the top layer of soil reinforcement, individual reinforcing strips/mesh may be skewed (15° maximum) to avoid the post locations if authorized by the Engineer. No cutting of soil reinforcement is allowed unless shown on Shop Drawings and approved by the Engineer. Any damage done to the soil reinforcement due to installation of the guardrail will be repaired by the Contractor at the Contractor's expense. Repair method will be approved by the Engineer.
7. If existing or future structures, pipes, foundations or guardrail posts within the reinforced soil volume interfere with the normal placement of soil reinforcement and specific directions have not been provided on the plans, the Contractor will notify the Engineer to determine what course of action shall be taken.
8. The Contractor is responsible for gradually displacing upper layers of soil reinforcement downward (15° maximum from horizontal) to avoid cutting soil reinforcement and conflicts with paving and subgrade preparation. The Contractor's attention is directed especially to situations where roadway superelevation and/or soil mixing are anticipated.
9. For concrete facing panel surface treatment, see Wall Control Drawings. Extend surface treatment a minimum of 6" below final ground line.
10. Drive piles located within the soil volume prior to construction of the retaining wall, unless a method to protect the structure, acceptable to both the Engineer and Wall Company, is proposed and approved in writing. The portion of piles or drilled shafts extensions within the soil volume will be wrapped with polyethylene sheeting in accordance with Specification Section 549.
11. An structural extension of the connection of the retaining wall panel to soil reinforcement will be used whenever necessary to avoid cutting or excessive skewing (greater than 15°) of the soil reinforcement around obstructions (i.e., piles, pipes, manholes, drop inlets, etc.).
12. Steps in leveling pads will occur at MSE Wall panel interfaces. Panels will not cantilever more than 2" past the end of the upper tier leveling pad.
13. The top of the leveling pad or footing will be 2'-0" minimum below final ground line.
14. Top of leveling pad elevations shown in the Wall Control Drawings are maximum elevations. The constructed leveling pad elevations may be deeper based on the panel layout shown in the shop drawings.
15. The height of panels in the bottom course of MSE Walls must not be less than half the height of a standard panel.
16. Work this Index with Index 521-600 thru 521-650.

**Shop Drawing Requirements:**
See Specification Section 548 for shop drawing requirements.

### FDOT MSE Retaining Wall Classification Table

<table>
<thead>
<tr>
<th>Applicable FDOT Wall Type</th>
<th>Durability Requirements</th>
<th>Other Allowable FDOT Wall Types</th>
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<tr>
<td>Concrete Cover (in.)</td>
<td>Concrete Class for Panels</td>
<td>Pozzolan Additions?</td>
</tr>
<tr>
<td>Type 2A</td>
<td>2</td>
<td>II</td>
</tr>
<tr>
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<td>2</td>
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<td>IV</td>
</tr>
<tr>
<td>Type 2F</td>
<td>3</td>
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</table>

* See Data Table in Contract Plans.
** Silica fume, metakaolin or ultrafine fly ash.
NOTES

DESIGN CRITERIA:
1. Design is based on the assumption that the material contained within the reinforced soil volume, methods of construction and quality of prefabricated materials are in accordance with Specification Section 548 and FDOT Structures Design Guidelines Section 3.13.2.
2. It is the responsibility of the Engineer to determine the factored bearing pressure shown for the wall does not exceed the factored bearing resistance of the foundation for that specific wall location.
3. The Wall Company is responsible for internal stability of the wall. External stability design, including foundation and slope stability, is the responsibility of the Engineer.
4. If present, consider in design and analysis and locate manholes and drop inlets as shown on wall elevations.

SOIL PARAMETERS:
1. See wall control drawings for soil characteristics of foundation material to be used in the design of the wall system. The Contractor must provide soil design parameters for backfill material based on the actual soil characteristics utilized at the site. Provide the values of unit weight, cohesion and internal friction angle in the Shop Drawings.

MATERIALS:
1. Provide soil reinforcement in accordance with Specification Section 548.
2. For additional material notes, see Wall Company General Notes.

CONSTRUCTION:
1. Walls must be constructed in accordance with Specification Section 548 and the Wall Company’s instructions.
2. For location and alignment of retaining walls, see Wall Control Drawings.
3. Refer to Plan and Elevation sheets of individual walls for minimum reinforcement strip/mesh length. Factored bearing resistances, minimum wall embedment and anticipated long term and differential settlements.
4. If existing or future structures, pipes, foundations or guardrail posts within the reinforced soil volume interfere with the normal placement of soil reinforcement and specific directions have not been provided on the plans, the Contractor must notify the Engineer to determine what course of action should be taken.
5. The Contractor is responsible for gradually deflecting upper layer(s) of soil reinforcement downward (15° maximum from horizontal) to avoid colling soil reinforcement and conflicts with paving and subgrade preparation. The Contractor’s attention is directed especially to situations where roadway superelevation and/or soil mixing are anticipated.

GENERAL NOTES AND DETAILS

TYPICAL RETAINING WALL SECTION
(Showing Limits of the Reinforced Soil Volume)

SOIL PARAMETERS:
1. Refer to Plan and Elevation sheets of individual walls for minimum reinforcement strip/mesh length. Factored bearing resistances, minimum wall embedment and anticipated long term and differential settlements.

MATERIALS:
1. Provide soil reinforcement in accordance with Specification Section 548.
2. For additional material notes, see Wall Company General Notes.

CONSTRUCTION:
1. Walls must be constructed in accordance with Specification Section 548 and the Wall Company's instructions.
2. For location and alignment of retaining walls, see Wall Control Drawings.
3. Refer to Plan and Elevation sheets of individual walls for minimum reinforcement strip/mesh length. Factored bearing resistances, minimum wall embedment and anticipated long term and differential settlements.
4. If existing or future structures, pipes, foundations or guardrail posts within the reinforced soil volume interfere with the normal placement of soil reinforcement and specific directions have not been provided on the plans, the Contractor must notify the Engineer to determine what course of action should be taken.
5. The Contractor is responsible for gradually deflecting upper layer(s) of soil reinforcement downward (15° maximum from horizontal) to avoid colling soil reinforcement and conflicts with paving and subgrade preparation. The Contractor’s attention is directed especially to situations where roadway superelevation and/or soil mixing are anticipated.
GENERAL NOTES

1. This fence to be provided generally in rural areas. For supplemental information see Specifications 550.
2. Fabric shall be woven wire, either galvanized steel meeting the requirements of ASTM A316, No. 9 Grade 60, Design Number 1047-6-9, with Class 3 zinc coating; No. 17 Grade 173, Design Number 1047-8-12, with a 0.108 gage top and bottom wire and with Class 3 zinc coating; or aluminum coated steel meeting the requirements of ASTM A584, No. 9 Farm, Design Number 1047-5-9, with a minimum coating weight of 0.04 oz./ft.². For additional information see payment note below.
3. Fence shall be wired with line wire to private property except on horizontal curvatures greater than 3° the fence shall be installed so as to pull against all posts.
4. Posts may be either timber, steel, recycled plastic or concrete. Unless a specific post material is called for in the plans, the Contractor may elect to use either a single material or a combination of timber, steel, recycled plastic or concrete materials, but must comply with the electrical grounding requirements in Section 550. Line posts of one material may be used with corner, pull and end post assemblies or a different material. Line posts of only one optional material and pull post only one optional material will be permitted between corner and end post assemblies, within individual corner and end post assemblies only one optional material will be permitted.
5. Your position shall meet the material requirements of Specification 994. Timber line posts are to be minimum 4" diameter. Timber corner, pull, approach and end posts to be a minimum 5" diameter. Timber braces are to be minimum 4" diameter.
6. Connections between timber posts and braces to be provided by dowels as shown in fastener details.
7. Braces: 2"x2"x 1 1/4" angles, 8' long; fabricated for attaching brace; with necessary hardware and wire clamps and meeting the following requirements:
   (A) Line posts: 8 long; 1.33 lbs./ft.; roll formed studing, anchor plate attached, ASTM A709 (L8 in). 
   (B) Approach posts: 25'/29'/34'x 1 1/4" angles, 8' long; fabricated for attaching brace; with necessary hardware, clamps, etc.
   (C) Pull, end and corner posts: 25'/29'/34'x 1 1/4" angles, 8' long; fabricated for attaching brace; with necessary hardware, clamps, etc.
   (D) Braces: 2"x2"x 1 1/4" angles with necessary hardware and fabricated for attaching to post.
   (E) The pull, corner, approach and end posts to be set in concrete as per detail. (See General Note 15.)
8. Recycled plastic posts shall meet the following material requirements: Lines shall have a minimum section of 6" round or 6" square. Plastic posts shall not be used as corner, pull, end or approach posts unless such use is specifically detailed in the plans. The straightness of the post shall comply with Specification 994 for timber post. 
9. Staples for line posts to be 1 1/4" minimum length; for approach, corner and pull posts 1 1/4" minimum length. At approach, corner and pull posts, staple every line wire. At line posts, staple every line wire in top half and alternate line wires at bottom half. Staples shall be driven diagonally along the line wire with the points in separate slants.
10. The woven wire shall be attached to steel and concrete posts by means of a minimum of four ties wires. The single tie wire ties shall be applied to the top, bottom and three intermittent line wires. The ends of each tie wire shall have a minimum of two turns tied around the line wire. Tie wires shall be steel wire not less than 0.108 diameter, zinc coated Class 3, soft temper, in accordance with ASTM A464.
11. Steel Barbed Wire shall be either of the following types:
   Type I: This type shall conform to the requirements of ASTM A121, with two strands of 1/2 gage wire; four-point barbs, wire size 12 1/2 gage twisted around both line wires; and Class 3 coating. Design No. 12-4-5-28
   Type IIA: This type same as Type I except the two strand wires are twisted in alternating directions between consecutive barbs.
   Type IIB: This type shall conform to the requirements of ASTM A121 with two strands of 1/2 gage high tensile wire, four-point barbs, wire size 16 1/2 gage twisted around both line wires; and Class 3 coating. Design No. 12-4-5-28
   Type IIB: This type shall conform to the requirements of ASTM A121 with two strands of 1/2 gage high tensile wire, four-point barbs, wire size 16 1/2 gage twisted around both line wires; and Class 3 coating. Design No. 12-4-5-28
   Type IIB: This type shall conform to the requirements of ASTM A121 with two strands of 1/2 gage high tensile wire, four-point barbs, wire size 16 1/2 gage twisted around both line wires; and Class 3 coating. Design No. 12-4-5-28
   Type IIB: This type shall conform to the requirements of ASTM A121 with two strands of 1/2 gage high tensile wire, four-point barbs, wire size 16 1/2 gage twisted around both line wires; and Class 3 coating. Design No. 12-4-5-28
   Type IIB: This type shall conform to the requirements of ASTM A121 with two strands of 1/2 gage high tensile wire, four-point barbs, wire size 16 1/2 gage twisted around both line wires; and Class 3 coating. Design No. 12-4-5-28
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   Type IIB: This type shall conform to the requirements of ASTM A121 with two strands of 1/2 gage high tensile wire, four-point barbs, wire size 16 1/2 gage twisted around both line wires; and Class 3 coating. Design No. 12-4-5-28
This index details fencing that is constructed with farm fabric 460 (47 nominal) in height and with specific ground clearance and specific barbed wire spacings. For fencing of different height or installation details, the fence shall be fully detailed in the contract plans.
GENERAL NOTES

1. This fence to be used generally in urban areas.

2. For supplemental information refer to Section 550 of FDOT Standard Specifications.

3. Chain link fabric, post, truss rods, tension wires, tie wire, stretcher bars, gates and all miscellaneous fittings and hardware shall meet the requirements of AASHTO and ASTM signify current reference.

4. Fence Component Options:

   A. Line post options:
   (1) Galvanized steel pipe, Schedule 40-1/2" nominal dia.; zinc galvanized at the rate of 1.8 oz./ft².
   (2) Aluminum coated steel pipe, ASTM A53 steel, X 45 Tables Schedule 40; 1/2" nominal dia.; coated at the rate of 0.40 oz./ft².
   (3) Steel H-Beam-1 5/8" x 1 3/4"; zinc Galv. 1.8 oz./ft². AASHTO M111 and Detail.
   (4) Steel C-1/8" x 1 15/16"; zinc Galv. 1.8 oz./ft². AASHTO M111 and Detail.
   (6) Steel C-1/8" x 1 15/16"; zinc. AASHTO M111; OR, 0.9 oz./ft²; zinc-3% aluminum-magnesium, ASTM F1936 and Detail.
   (7) Resistance welded pipe, 50,000 psi yield strength ASTM A586/A586M. A583/A583M or uncoated steel ASTM A500/A500M basic materials, ASTM F669 Group 19

   (Alternative Design): Fence industry 20° CO, 150NPS, 1.900” OD, 0.130” min. wall thick. and min. wt. 2.28 lb./ft.; with ASTM F1043 metric equivalent internal coating Types A, B, C, or D and external coating Types A, B, C, or D; the chromate conversion coating of external Type B shall have a thickness of 0.09µg/in². and the polymer film topcoated shall have a thickness of 0.0003" min. Internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.

   B. Corner, end, and pull post options:
   (1) Galvanized steel pipe, Schedule 40-1/2" nominal dia.; zinc galvanized at the rate of 1.8 oz./ft².
   (2) Aluminum coated steel pipe, ASTM A53 steel, X 45 Tables Schedule 40; 1/2" nominal dia.
   (3) Steel H-Beam-1 5/8" x 1 3/4"; zinc. AASHTO M111 and Detail.
   (4) Steel C-1/8" x 1 15/16"; zinc. AASHTO M111 and Detail.
   (6) Steel C-1/8" x 1 15/16"; zinc. AASHTO M111; OR, 0.9 oz./ft²; zinc-3% aluminum-magnesium, ASTM F1936 and Detail.
   (7) Resistance welded pipe, 50,000 psi yield strength ASTM A586/A586M. A583/A583M or uncoated steel ASTM A500/A500M basic materials, ASTM F669 Group 19

   (Alternative Design): Fence industry 20° CO, 150NPS, 1.900” OD, 0.130” min. wall thick. and min. wt. 2.28 lb./ft.; with ASTM F1043 metric equivalent internal coating Types A, B, C, or D and external coating Types A, B, C, or D; the chromate conversion coating of external Type B shall have a thickness of 0.09µg/in². and the polymer film topcoated shall have a thickness of 0.0003" min. Internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.

   C. Rail options:
   (1) Galvanized steel pipe, Schedule 40-1/2" nominal dia.; zinc galvanized at the rate of 1.8 oz./ft².
   (2) Aluminum coated steel pipe, ASTM A53 steel, X 45 Tables Schedule 40; 1/2" nominal dia. 1.660” OD; coated at the rate of 0.40 oz./ft².
   (3) Aluminum alloy pipe: 7/8" nominal dia. ASTM B241 or B221 Alloy 6063, T6
   (4) Resistance welded steel pipe; 50,000 psi min. yield strength ASTM A586/A586M, A583/A583M or uncoated steel of discontinuous A466/A466M base materials; ASTM F669 Group 19
   (Alternative Design): Fence industry 20° CO, 150NPS, 1.900” OD, 0.130” min. wall thick. and min. wt. 2.28 lb./ft.; with ASTM F1043 metric equivalent internal coating Types A, B, C or D and external coating Types A, B, C, or D; the chromate conversion coating of external Type B shall have a thickness of 0.09µg/in². min. and the polymer film topcoated shall have a thickness of 0.0003’ min. Internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.

   D. Chain link fabric options 2” mesh with twisted and barbed selvage top and bottom for all options except as described in Note No. 10.
   (1) AASHTO M181 Type I - Zinc Coated Steel, No. 7 gage (coated wire diameter) coated at the rate of 1.0 oz./ft². M181 Class D 2.6 oz./ft². Modified to 1.0 oz./ft².
   (2) AASHTO M181 Type II - Aluminum Coated Steel, No. 7 gage (coated wire diameter) coated at the rate of 0.40 oz./ft².
   (3) AASHTO M181 Type IV - Polyvinyl (Chloride) Coated Steel, No. 9 gauge (coated wire diameter), core wire - zinc coated steel. PVC coating: M181 Class A (either extruded or bonded) or Class B (bonded). See table right. Unless the plans call for M181 standard colors medium green, dark green or black the coating color shall be soft gray matching that of No. 30832 of Federal Standard 595A.

   E. Tension wire options:
   (1) Steel wire No. 7 gage zinc galvanized at the rate of 1.2 oz./ft².
   (2) Steel alloy wire with a diameter of 0.1402” or larger conforming to the requirements of ASTM A672, Alloy 5056 Temper T6. or. Alloy A106 Temper T6.
   (3) Aluminum coated steel wire No. 7 gage coated at the rate of 0.40 oz./ft².

   F. Tie wire and hog ring options:
   (1) Wire steel No. 8 gage zinc galvanized at the rate of 1.2 oz./ft².
   (2) Steel alloy wire with a diameter of 0.1402” or larger conforming to the requirements of ASTM A672, Alloy 5056 Temper T6. or. Alloy A106 Temper T6.
   (3) Aluminum coated steel wire No. 7 gage coated at the rate of 0.40 oz./ft².
GENERAL NOTES CONTINUED

5. Unless a specific material is called for in the plans the Contractor may elect to use either a single type of material or a combination of material types from the component options listed in note 4.
   (a) Only one fabric optional material will be permitted between corner and/or end post assemblies.
   (b) Only one line post optional material will be permitted between corner and/or end post assemblies.
   (c) Pull post assemblies shall be optional materials identical to either the line or end post material or the corner and end post assembly material; but, pull post assemblies shall be the same optional material between any set of corner and/or end post assemblies.

6. Concrete for bases shall be Class NS concrete as specified in Section 347 of the Standard Specifications or a packaged, dry material meeting the requirements of a concrete under ASTM C-387. Materials for Class NS concrete may be proportioned by volume and/or by weight.

7. Line post shall be 8'-6" long (Standard). Line posts are to be set in concrete as described above or by the following method:
   (a) In accordance with special details and/or as specifically described in the contract plans and specifications.
   (b) In accordance with ASTM F567 Subsections 5.8 through 5.10 as approved by the Engineer.
   (c) Line post installed in accordance with Section 3.8 shall be 9'-6" long.

8. Pull post shall be used at breaks in vertical grades of 15° or more, or at approximately 350' centers except that the maximum interval may be reduced by the Engineer on curves where the curve is greater than 3°.

9. Corner post are to be installed at all horizontal breaks in fence at 15° or more and as required at vertical breaks over 15° as determined by the Engineer.

10. When fence has an installed top of fabric height less than 6' knuckled top and bottom selvages shall be used unless the plans specifically identify Location for twisted selvage fabrics.

11. Use a single material or a combination of material types from the component options listed in note 4.

12. For construction purposes corner post assemblies shall consist of one corner post, two braces, two truss rods, and all necessary fittings and hardware as detailed. End post assemblies shall consist of one end post, one brace, two truss rods, and all necessary fittings and hardware as detailed.

13. In areas where there are physical constraints outside the right-of-way which restricts the fence construction, the fabric may be installed on the inside of the posts.

### TYPE IV VINYL COATED FABRIC

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<tr>
<th>SPECIFIED DIAMETER OF METAL WIRE</th>
<th>MINIMUM WEIGHT OF ZINC COATING</th>
<th>PVC THICKNESS RANGE</th>
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**DESIGN NOTE**

This index details fencing that is constructed with chain link fabric 6' (nominal) in height with specific ground clearance. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.

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**INDEX SHEET**

- FY 2018-19
- STANDARD PLANS
- FENCE TYPE B
- 550-002
- 2 of 3
FENCE TYPE B

FENCE MOUNTING ON CONCRETE ENDWALL AND RETAINING WALLS

BASE PLATE AND ANCHOR NOTES:

1. Base plate identical for line, pull, end and corner posts and shall be considered an integral part of the respective posts for basis of payment.

2. Post to be plumbed by grout shim under base plate.

3. Anchors (Galvanized Steel):
   - 12" Cast: In Place, 100% Embedment
   - Headed Bolts, U-Bolts or Cluster Plates
   - Anchors shall be headless anchor bolts set in drilled holes with an adhesive material system in accordance with Specification Sections 416 and 937. Drilled holes shall be 1.625" larger in diameter than the anchor bolt.
   - Expansion Bolts Not Permitted.

NOTES

Attachments to be used only when called for in the plans.
Attachments to extend in direction of restraint, unless otherwise called for in plans, direction of restraint will be as follows:
(a) Outward on limited access right of way line.
(b) Outward on controlled access right of way line.
(c) Outward on controlled access right of way line.
(d) Outward from lateral ditches, outfalls, retention basins, canals, borrow areas and similar support facilities.
(e) Outward on pedestrian ways.
The cap-arm shall be designed to provide a drive fit over the top of posts and to exclude moisture in posts with tubular sections.

FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)
CANTILEVER SLIDE GATE TYPE B FENCE

**GENERAL NOTES**

1. Extruded, rolled or formed components that provide equal strength and stability may be used in lieu of the pipe components shown; and, internal rollers may be used in lieu of the external roller units shown.

   Gate components shall meet or exceed the protective coatings specified on Index 550-002.

2. Steel gate frame shall be fabricated prior to galvanizing, except that truss rods may be fabricated following frame galvanizing provided surfaces damaged during welding are repaired in accordance with Section 24 of AASHTO M36, or, fabricated from pipe components with protective coating meeting the requirements of Index 550-002, that are tolerant of welding (low burn back), and a protective coating applied to the weld and damaged pipe surfaces that is equivalent to the protective coating of the fabricated pipe stock.

3. All fabric shall be knuckled top and bottom selvages.

4. Concrete for bases shall be either Class RS concrete as specified in Section 347 of the Standard Specifications or a packaged, dry material meeting the requirements of a concrete under ASTM C-389. Materials for Class RS concrete may be proportioned by volume and/or by weight.

5. Cost of all gate components shall be included in the contract unit price for Sliding Fence Gate (Cantilever), EA.

**DETAIL A**

- Fence (Not Included) - Back Frame (No Fabric)
- Barb Wire As Required
- 2" OD Pipe Vertical Members
- Truss Rods welded at Upper Corners
- 3/16" Dia. Tension Bar (Top & Bottom) Hog Ring To Fabric
- Vertical Member
- 2" OD Pipe Sch. 40 Steel Pipe 35' Nom Dia. 4" OD 9.11 #/Fl. 12 Long
- Slot for Rods
- Truss Rods
- Latch & Catch As Required

**DETAIL B**

- Gate Opening Between Posts
- Support Post
- 24'-3" Gate Opening Between Posts
- Gate Frame
- Back Frame
- Gate Frame
- Gate Opening
- Gate Frame
- Back Frame
- Barb Wire Arm As Required
- Arm Clamp
- 4" OD Support Post
- Roller Spacer Bar
- Gate (Cantilever), EA.

**SPECIFICATIONS**

1. Extruded, rolled or formed components that provide equal strength and stability may be used in lieu of the pipe components shown; and, internal rollers may be used in lieu of the external roller units shown.

2. Steel gate frame shall be fabricated prior to galvanizing, except that truss rods may be fabricated following frame galvanizing provided surfaces damaged during welding are repaired in accordance with Section 24 of AASHTO M36, or, fabricated from pipe components with protective coating meeting the requirements of Index 550-002, that are tolerant of welding (low burn back), and a protective coating applied to the weld and damaged pipe surfaces that is equivalent to the protective coating of the fabricated pipe stock.

3. All fabric shall be knuckled top and bottom selvages.

4. Concrete for bases shall be either Class RS concrete as specified in Section 347 of the Standard Specifications or a packaged, dry material meeting the requirements of a concrete under ASTM C-389. Materials for Class RS concrete may be proportioned by volume and/or by weight.

5. Cost of all gate components shall be included in the contract unit price for Sliding Fence Gate (Cantilever), EA.
**FENCING TERMINALS AT BRIDGE ENDS**

**FENCING TERMINALS AT BOX CULVERTS**

- Propose the following:
  - Fence Height
  - Wing Height
  - Terminate fence where culvert tops of headwall.
- Fence locations at cross draining with excavated outfall ditches or as shown in plans.
- Where applicable, develop natural ground at toe of slope.
- Construct flush against footing.
- Embedment 2" (minimum) anchor eye bolt or studs and eye bolts.
- Expansion or chemical concrete:
  - 3 strands barbed wire
  - 1' min. (3 req'd.)
  - 2" min. embedment

**Note:** When height of headwall is 4' or less, the fence shall not be tied to the headwall, but shall span the lateral ditch.
FENCING TERMINALS AT RURAL INTERCHANGES

FENCING TERMINALS AT URBAN INTERCHANGES

APPLIES TO BRIDGE OVER CROSSROAD AND CROSSROAD OVER FREEWAY (BRIDGE OVER CROSSROAD SHOWN)

FENCING TERMINALS AT RETAINING WALLS

NOTE: LA R/W along the crossroad will extend a minimum of 300' beyond the end of the acceleration or deceleration lane. The LA R/W line at the crossroad will extend to a point opposite the limit of LA R/W established by the ramp taper or radius point as noted above.

For interchange quadrants having no ramp the LA R/W will extend along the crossroad to a point opposite the limit of LA R/W established by the ramp taper or radius point as noted above.

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FENCING TERMINALS AT RETAINING WALLS

APPLIES TO BRIDGE OVER CROSSROAD AND CROSSROAD OVER FREEWAY (BRIDGE OVER CROSSROAD SHOWN)

FENCING TERMINALS AT URBAN INTERCHANGES

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For interchange quadrants having no ramp the LA R/W will extend along the crossroad to a point opposite the limit of LA R/W established by the ramp taper or radius point as noted above.
**GENERAL NOTES**

1. All turf establishment shall be performed meeting the requirements of Section 570 of the Standard Specifications.

2. Activities such as clearing, grading, and excavating that will disturb one or more acres of land require coverage under the Generic Permit for Stormwater Discharge from Large and Small Construction Activities from the Florida Department of Environmental Protection, and implementation of appropriate pollution prevention measures to minimize erosion and sedimentation and properly manage stormwater.

3. Confirm compatibility of wildflower with Seeding Zones.

---

**WILDFLOWER SEEDING RATES**

<table>
<thead>
<tr>
<th>Common Name (Botanical Name)</th>
<th>#1 Group</th>
<th>#2 Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black-Eyed Susan (Rudbeckia hirta)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Lance Leaf Tickseed (Coreopsis lanceolata)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Goldfinch Tickseed (Coreopsis basalis)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Leavenworth's Tickseed (Coreopsis leavenworthii)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Soft Hair Coneflower (Rudbeckia mollis)</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Crimson Clover (Trifolium incarnatum)</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Annual Phlox (Phlox drummondii)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Moss Verbena (Verbena tenella)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Leavenworth's Tickseed (Coreopsis leavenworthii)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Firewheel (Gaillardia pulchella)</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

**LEGEND**

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wildflower Group #1</td>
</tr>
<tr>
<td>2</td>
<td>Wildflower Group #2</td>
</tr>
<tr>
<td>3</td>
<td>Turf (To Limit of Construction)</td>
</tr>
<tr>
<td>5</td>
<td>Selective Clearing And Grubbing</td>
</tr>
<tr>
<td>10</td>
<td>Limits Of Construction</td>
</tr>
<tr>
<td>15</td>
<td>Turf</td>
</tr>
</tbody>
</table>

**NOTE:** Wildflower seeding rates are for restoring impacted wildflower areas.
SHOULDER AND SLOPE TREATMENT FOR SUPERERELEVATED ROADWAYS

CRITERIA FOR PAVING SHOULDER ON DIVIDED AND UNDIVIDED FACILITIES

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Degree Of Curve</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>7° Or Greater</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>7° Or Greater</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>5° Or Greater</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>4° Or Greater</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>3° Or Greater</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>2° Or Greater</td>
<td></td>
</tr>
</tbody>
</table>

Note: Shoulder Pavement is required on all curves meeting the criteria tabulated. For curves not meeting the criteria, shoulders are to be paved where erosion of the shoulder is evident or anticipated.

NOTES

1. These treatments are applicable to new construction, reconstruction and RRR projects. Project requirements for shoulder pavement and sodding that exceed the limits of this standard take precedence.

2. For sodding adjacent to ditches and at headwalls, see Index 524-001.

3. All front slopes steeper than 1:3 are to be sodded.

TREATMENTS FOR PROTECTION FROM CONCENTRATED ROADWAY RUNOFF EROSION AND SHOULDER RAVELING
TREATMENT I

COMPLETED SHOULDER

CRITERIA FOR USING TREATMENT I

Project:
- A. Resurfacing, widening and resurfacing or construction of shoulder pavement.
- B. Resurfacing build-up is less than 3".
- C. Is rural or is urban without curb and gutter.

D. Drop-Off (1' Min., 3' Max.)

Introduction:
- A. All turf establishment shall be performed meeting the requirements of Section 570 of the Standard Specifications.
- B. Wildflowers destroyed by shoulder sodding and turf operations are to be reestablished under the seeding rates prescribed for permanent wildflower #2 Group shown by table on Index 570-001.

2. Treatment I:
A. All borrow shall meet requirements for a "Select" material in accordance with Index 120-001 and Section 120 of the Standard Specifications.
B. Borrow may be used in lieu of excavated turf and topsoil when economically feasible, however the upper 6" shall meet the requirements of Section 162 "Prepared Soil Layer". There will be no additional payment for substituting borrow for excavated turf and topsoil.
C. When existing turf and topsoil do not meet the requirements of Section 162 "Prepared Soil Layer", provide additive materials as necessary in the upper 6" to meet the requirements of Section 162. There will be no additional payment for additives.
D. Payment for Treatment I will be under Prepared Soil Layer. Sod and other materials for turf establishment shall be paid for as Performance Turf, SY.

3. Special attention is to be directed at achieving the required Drop-Off at the edge of pavement, within the dimension range shown.

4. Activities such as clearing, grading, and excavating that will disturb one or more acres of land require coverage under the Generic Permit for Stormwater Discharge from Large and Small Construction Activities from the Florida Department of Environmental Protection, and implementation of appropriate pollution prevention measures to minimize erosion and sedimentation and properly manage stormwater.

5. Turf Establishment:
A. Wildflowers destroyed by shoulder sodding and turf operations are to be reestablished under the seeding rates prescribed for permanent wildflower #2 Group shown by table on Index 570-001.
B. All turf establishment shall be performed meeting the requirements of Section 570 of the Standard Specifications.

SHOULDER OPTION 1

SHOULDER OPTION 2

TREATMENT II

CRITERIA FOR USING TREATMENT II

Project:
- A. Resurfacing or construction of shoulder pavement.
- B. Is rural or is urban without curb and gutter.
- C. Resurfacing build-up is 3" or more.
- D. Drop-Off (1' Min., 3' Max.)

A similar treatment may be used for projects that require shoulder widening. Details are to be shown in the plans.
GENERAL NOTES:

6. Mulch shall be a 3" deep layer placed 2" off the edge of the trunk flare, around the base of shrubs, or solidly around groundcover. Never pile mulch against the trunk.

7. Straps shall be minimum 1" wide nylon or polypropylene. Check straps monthly and adjust as required to eliminate girdling of tree. All wood stakes or anchors shall be located beyond the edge of root ball in undisturbed soil and located below finished grade, unless otherwise specified.

8. Sabal Palms may be hurricane cut. All other palms must have fronds tied with biodegradable twine. Palm trunks shall have no burn marks, scars, or sanding.

9. All dimensions provided for wood materials are nominal.

10. When a permanent, subsurface, or drip irrigation system is provided, a soil ring is not required. Mulch to edge of planting pit.

11. Alternate tree bracing and guying systems specified or approved by the Engineer may be used in lieu of the tree bracing and guying methods detailed on the Index.

12. Remove above ground guying systems at the end of the establishment period.

1. All dimensions 6" and less are exaggerated for illustrative purposes only.

2. Plant containers shall be removed prior to planting, if plants are not container grown, remove a minimum of the top 1/3 of burlap, fabric, or wire mesh. Never lift or handle the tree by the trunk.

3. The uppermost root on all trees shall be covered by less than 1" of soil. Use hand tools to carefully remove all excess soil. The top of root ball shall be set 1"-2" above finish grade after settling and set plumb to the horizon. If planting pit is too deep, remove the tree and firmly pack additional soil in the bottom of the planting pit to raise the rootball. After positioning the tree in the planting pit, slice through rootballs with 3 or 4 vertical slices (top to bottom) equally distributed around the tree.

4. Backfill shall be loosened existing soil. Remove roots, sticks, or other deleterious material greater than 1" in any direction prior to backfilling. Water and tamp to remove air pockets. If existing soils contain excessive sand, clay, or other material not conducive to proper plant growth, contact Engineer prior to planting.

5. Soil rings shall be constructed of existing soil at the outer edge of the planting pit, with a height of 3" and gently sloping sides. Do not pile soil on top of rootball.

6. Mulch shall be a 3" deep layer placed 2" off the edge of the trunk flare, around the base of shrubs, or solidly around groundcover. Never pile mulch against the trunk.

7. Straps shall be minimum 1" wide nylon or polypropylene. Check straps monthly and adjust as required to eliminate girdling of tree. All wood stakes or anchors shall be located beyond the edge of root ball in undisturbed soil and located below finished grade, unless otherwise specified.

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12. Remove above ground guying systems at the end of the establishment period.
**REVISED DESCRIPTION:**

**LAST REVIEWED:** 01/01/19

**STANDARD PLANS**

**FY 2018-19**

**LANDSCAPE INSTALLATION**

**INDEX:** 580-001

**SHEET:** 2 of 2

---

**REVISED OF:** 11/01/17

**STANDARD PLANS FY 2018-19 SHEET INDEX**

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**Palm Planting for Up to 24' Clear Trunk**

**Wood Staking Detail**

**Wood Batten Detail**

**Multi-Trunk Tree Planting**

---

**4" and Larger Caliper Tree Planting on Slope**

**Up to 4" Caliper Tree Planting on Slope**

---

**NOTES:**

- Slope provided as rise:run.
- For palms over 24' clean trunk, use detail provided in contract plans.
- For up to 24' clear trunk, use detail provided in contract plans.

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**Wood Staking Detail**

- 2 x 4 Wood Braces (Minimum of three wood braces spaced at 120° apart. Saw cut ends at proper angle to allow for flush connection to wood batten. Nail wood braces securely to wood batten.

---

**Wood Batten Detail**

- See wood batten detail.

---

**MULTI-TRUNK TREE PLANTING**

- 30° minimum depth of wood stake.

---

**Palm Planting for Up to 24' Clear Trunk**

- Burlap layers (five).

---

**Wood Batten Detail**

- See wood batten detail.

---

**Wood Staking Detail**

- See wood staking detail.

---

**MULTI-TRUNK TREE PLANTING**

- Optional fourth wood brace. If optional fourth wood brace is used, spaced at 90° apart.

---

**Palm Planting for Up to 24' Clear Trunk**

- Strap securely fastened to tree.

---

**Wood Batten Detail**

- Optional fourth wood brace. If optional fourth wood brace is used, spaced at 90° apart.

---

**Palm Planting for Up to 24' Clear Trunk**

- Strap securely fastened to tree.

---

**Wood Staking Detail**

- Strap securely fastened to tree.

---

**MULTI-TRUNK TREE PLANTING**

- Strap securely fastened to tree.

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**Palm Planting for Up to 24' Clear Trunk**

- Strap securely fastened to tree.

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**Wood Batten Detail**

- Strap securely fastened to tree.

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**Wood Staking Detail**

- Strap securely fastened to tree.

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**MULTI-TRUNK TREE PLANTING**

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**Palm Planting for Up to 24' Clear Trunk**

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