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 percentile 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 alternately flashing 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 85% approach speed from having continuous view of at least one signal indication for approximately 10 seconds.

10. Requirements on gate installation are contained in Section 4I of the "Manual on Uniform Traffic Control Devices".


"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
STOP HERE ON RED

FIGURE - D

FIGURE - E
SIGN SIGNAL MOUNTING ASSEMBLY

FIGURE - F

FIGURE - G
DRAW BRIDGE AHEAD

* 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.

Bridge Mounting Details Not Shown

Traffic Control Devices for Movable Span Bridge Signals

FY 2019-20
STANDARD PLANS

LAST REVISION 01/01/17
INDEX 2 of 3
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.

GATE & ARM DETAIL

TYPICAL LAMP PLACEMENT

INDEX 508-T01

SHEET 3 of 3
**TRAFFIC CONTROL DEVICES**

**DESCRIPTION:**

**TYPE III AND TYPE V**
- Two-Way

**TYPE IV AND TYPE VI**
- Four-Way

**MAXIMUM SIZE:**
- 51" Max.

**DESCRIPTION:**
- Flashing warning devices with cantilever and gate
- Flashing warning devices with cantilever
- Flashing warning devices

**GENERAL NOTES:**
1. No guardrail is proposed for signals; however, some form of impact attenuation device may be specified for certain locations.
2. Advanced flasher to be installed when called for in plans or specifications.
3. Top of foundation shall be no higher than 4" above finished shoulder grade.

**SIGNAL PLACEMENT AT RAILROAD CROSSING**

1. **(2 - LANE DESIGN)**
   - Shoulder
   - Paved Shoulder
   - Travelway
   - Roadway
   - Crown Of Highway
   - Crown Of Travelway
   - Median
   - Pavement Edge
   - Signal And Gate
   - Railroad Gate Or Signal And Gate

2. **(4 - LANE DESIGN)**
   - Shoulder
   - Paved Shoulder
   - Travelway
   - Roadway
   - Crown Of Highway
   - Crown Of Travelway
   - Median
   - Pavement Edge
   - Signal And Gate
   - Railroad Gate Or Signal And Gate

**Note:**
- Arrows denote direction of travel
- Pavement markings may be located as close as 2' from the edge of a paved shoulder
- No guardrail is proposed for signals; however, some form of impact attenuation device may be specified for certain locations
- Top of foundation shall be no higher than 4" above finished shoulder grade.

**FIGURE 1**

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

* When 20' is deemed impractical the control device can be located as close as 7' from the edge of a paved shoulder but not less than 6' from the edge of the near traffic lane.
TRAFFIC CONTROL DEVICES FOR CURBED ROADWAY

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. 15' from nearest rail; or 8' 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.

See FIGURE 1
1. Place an additional W10-1 sign where intersections occur between the R/R pavement message and the tracks.
2. Place FTP-61-06 or FTP-62-06 sign 100' in advance of crossing for urban conditions and 300' in advance of crossing for rural conditions. See Index 700-102 for sign details.

Design Speed
(mp/h) | Distance "A" (ft)
--- | ---
60 | 400
55 | 375
50 | 350
45 | 325
40 | 300
35 | 275

URBAN

Speed

Design

"A"

(ft)

55

50

45

40

35

Types of Locations

1. Place an additional W10-1 sign where intersections occur between the R/R pavement message and the tracks.
2. Place FTP-61-06 or FTP-62-06 sign 100' in advance of crossing for urban conditions and 300' in advance of crossing for rural conditions. See Index 700-102 for sign details.
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'</td>
<td>36'</td>
<td>5'</td>
</tr>
<tr>
<td>15 ft</td>
<td>18'</td>
<td>36'</td>
<td>5'</td>
</tr>
<tr>
<td>16-17 ft</td>
<td>24'</td>
<td>36'</td>
<td>5'</td>
</tr>
<tr>
<td>18-19 ft</td>
<td>28'</td>
<td>42'</td>
<td>7'</td>
</tr>
<tr>
<td>20-23 ft</td>
<td>30'</td>
<td>45'</td>
<td>7'</td>
</tr>
<tr>
<td>24-28 ft</td>
<td>36'</td>
<td>6'</td>
<td>8'</td>
</tr>
<tr>
<td>29-33 ft</td>
<td>36'</td>
<td>6'</td>
<td>8'</td>
</tr>
<tr>
<td>34-36 ft</td>
<td>36'</td>
<td>7'</td>
<td>9'</td>
</tr>
<tr>
<td>37-37 ft</td>
<td>36'</td>
<td>7'</td>
<td>9'</td>
</tr>
<tr>
<td>38 and Over</td>
<td>36'</td>
<td>10'</td>
<td>10'</td>
</tr>
</tbody>
</table>

NOTE:
**FUNCTIONAL BLOCK DIAGRAM**

**ADVANCE WARNING FOR RR CROSSING**

**LOCATION OF THE ADVANCE WARNING SIGN**

<table>
<thead>
<tr>
<th>SPEED (mph)</th>
<th>DISTANCE (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td>50</td>
</tr>
<tr>
<td>30</td>
<td>75</td>
</tr>
<tr>
<td>40</td>
<td>125</td>
</tr>
<tr>
<td>50</td>
<td>250</td>
</tr>
<tr>
<td>55</td>
<td>325</td>
</tr>
</tbody>
</table>

**NOTE:**
- The Distance is Measured Along Right Edge of Pavement from RR Stop Bar to Sign Advance Warning Sign.

**TYPICAL PLAN**

- Advance Warning Sign Location (Location May Be Adjusted To Fit Field Condition).
- Pull Box 200' Nominal Spacing.
- Power Service.

**ADVANCE WARNING SIGN**

- Flasher Cabinet To Contain Normally Closed Relay, (Furnished by RR).
- Pull Boxes 200' Nominal Spacing.
- Power Service.

**SYMBOLOGY**

- RR Control Cabinet (Normally Closed Relay) (Furnished by RR).
- Pull Boxes 200' Nominal Spacing.
- Power Service.

**PASSIVE STATE**

- (TRAIN CIRCUIT NOT ACTUATED)
- Signal Heads Not Active In Passive State
- Two 8" Signal Heads (Fellow Leds)
- Slip Fit Collar
- Stationary Background To Form A Portion Of Distance Message When "STOP AHEAD" Sign Is In Closed Mode.
- Power Service
- Grade At Edge Of Travel Way
- Shoulder

**ACTIVE STATE**

- (TRAIN CIRCUIT ACTUATED)
- Signal Heads Flashing Alternately In Active State
- Weatherproof Cap
- Stationary Background To Form A Portion Of Distance Message When "STOP AHEAD" Sign Is In Open Mode.
- Power Service
- Grade At Edge Of Travel Way
- Shoulder

**ADVANCE WARNING FOR RR CROSSING**

- Sign W10-1 (36"
- 8" Aluminum Pipe (0.188" Wall Thickness)" Signal Heads Flashing Alternately In Active State
- 8" Letter (Series "C")
- Folding Sign Control System (Closed)
- Pulling Elbow (Type LB) (2" ID Min.)
- Install Bushing To Protect Wires From Chafing
- Pull Box
- Crushed Rock
- 1" PVC Conduit
- Pull Box
- Crushed Rock
- 1" PVC Conduit

**NOTE:**
- 1. "STOP AHEAD" is standard and preferred sign message. Another message may be approved when appropriate for specific situations.
- NOTE:
  - Insulation Box Installed At RR Right Of Way.
  - From Railroad Controller Cabinet (Normally Closed Relay).
PEDESTRIAN/BICYCLE RAILING (STEEL)

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>Top Rail</td>
<td>2½&quot; NPS (Sch. 40)</td>
<td>2.875&quot; x 2.000&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>2½&quot; NPS (Sch. 16)</td>
<td>3.000&quot; x 2.000&quot;</td>
<td>0.120&quot;</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" NPS (Sch. 40).

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 A53 Grade B for standard weight pipe (Schedule 40) and ASTM A66 for bars.
   B. Structural Tube: ASTM A500 Grade A, B, C, or D or ASTM A501
   C. Steel Plate: ASTM A36 or ASTM A709 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 A 307
      1. ¾" diameter single bolt option, Grade 36
      2. ¾" four bolt option, Grade 55
   b. Adhesive Anchors: ASTM F1554 fully threaded rods, Grade 55
   c. Hex Nuts: ASTM A563
   d. Flat Washers: ASTM F436
   e. Plate Washers: ASTM A36 or ASTM A706 Grade 36
   f. Slings: ASTM B809 Alloy 6061
   g. Bearing Pads: ¾" Plain, Fabric Reinforced or Fabric Laminated pads that meet the requirements of Specification Section 932 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 3½" for standard installations and 2½" when a 4½" sphere requirement is indicated in the Data Tables.
5. Maximum spacing between expansion joints is 40'-0". Locate 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 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.
Handrail required for ramps (Handrail continuous at landings between runs)

Handrail ~ 1" NPS Sch. 40 PBR

30'-0" Max. for slopes > 6.25% 40'-0" Max. for slopes ≤ 6.25%

Ramps

Top Landing 5'-0" Min. 1'-6" Min. Intermediate Landing

LANDING REQUIREMENTS

Max. landing slope = 2% Max. landing cross-slope = 3%

EXPANDED ELEVATION AT CORNERS

DETAIL FOR NON-CONTINUOUS RAILING AT CORNERS

RAILINGS ON GRADES STEEPER THAN 5%

(Showing Inside Face of Railing with Type “A” Posts)

(Typ. - Picket Railing Shown, Other Types Similar)

ELEVATION

(Showing Outside Face of Railing with Type “A” Posts)

NOTES:

* Keyed construction joints in Index 400-01 Gravity Wall are not considered to be expansion joints.

** Contraction joints (Tooled or Saw Cut) in sidewalks do not require a 6" minimum offset.

VERTICAL HANDRAILS FROM RAILING TO SIDEWALK OR BIKEWAY

See “Typical Railing Details” for post, rail & picket or infill panel details

Handrail required for ramps (Handrail continuous at landings between runs)

Handrail ~ 1½" NPS Sch. 40

Rail expansion joints to be located in panels above structure expansion joints ~ (35'-0" maximum spacing).

See Plans for continuation or termination limits of railing.

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

RAIL REQUIREMENTS

30'-0" Max. for slopes > 6.25% 40'-0" Max. for slopes ≤ 6.25%

Ramp

NOTES:

10/30/20

REV 1/01/16

PEDESTRIAN/BICYCLE RAILING (STEEL)

515-052

2 of 8
SECTION A-A

**TYPE 1 - PICKET INFILL PANEL**

*Picket Spacing of 6" centers is based on a 5/8" Bar for standard applications. When shown in the Contract Plans a 4" picket spacing may be required. See Note 4 (Sheet 1).*

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

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

**DETAIL "1A"**

(Top of Picket Connection)

**DETAIL "1B"**

(Bottom of Picket Connection)

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

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
<th>ASTM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating</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 - No. 9 gage with coating to match Chain-Link Fence Fabric.</td>
<td></td>
</tr>
<tr>
<td>Ties @ 1'-0&quot; center (Post and End Rail)</td>
<td>F-626</td>
</tr>
<tr>
<td>Ties @ 2'-0&quot; center (Intermediate &amp; Bottom Rail)</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 1x1x5/8 Angle Border or the 3x3x5/8 Channel Border shown.

**TYPE 4 - BROADWAY 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 1x1x5/8 Angle Border or the 3x3x5/8 Channel Border shown.

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

<table>
<thead>
<tr>
<th>SHEET INDEX</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 of 8</td>
<td>PEDESTRIAN/BICYCLE RAILING (STEEL) FY 2019-20 STANDARD PLANS</td>
</tr>
</tbody>
</table>

**SECTION A-A**

- 1/2" Square Bar (Rays)
- Channel 3x3x5/8 (Border)
- Seal Weld mitered corners at Rail Expansion Joints

**SECTION C-C**

- Infill Panel
- Channel 3x3x5/8 (Border)
- 1/2" Square Bar (Rays)
- Channel 1x1x5/8 (Arc)

**SECTION B-B**

- Panel End Cap
- Channel 3x3x5/8 (Border)
- Channel 1/2" SS Pan Head Screws @ 2'-0" sp.

**DETAIL "3A"**

- Intermediate Rail/Ray Connection
- Front & Back Face Top of all Rays

**DETAIL "3B"**

- Bottom Rail/Ray Connection
- 1/2" Square Bar (Rays)
- Channel 1x1x5/8 (Arc)

**DETAIL "3C"**

- Ray/Arc Connection
- 3 - #10x5/8 SS Pan Head Screws @ 1'-0" sp.

**DETAIL "3D"**

- Arc/Post Connection (Continuous Top Rail)
- 1/2" Square Bar (Rays)
- Channel 3x3x5/8 (Border)

**DETAIL "3E"**

- Panel End Connection at Post with Expansion Joint
- #10x5/8 SS Pan Head Screws @ 2'-0" sp.

**SECTION A-A**

- Infill Panel
- Channel 3x3x5/8

**SECTION C-C**

- Infill Panel
- Channel 3x3x5/8

**SECTION B-B**

- Panel End Cap
- Channel 3x3x5/8

**PANEL/SPlice CONNECTION**

- Panel Mullion
- Filler Strip
- #10x5/8 SS Pan Head Screws @ 2'-0" sp.

**PANEL/RAIL CONNECTION**

- Opening
- Expansion Joint
- #10x5/8 SS Pan Head Screws @ 2'-0" sp.

**PANEL END CONNECTION**

- Top Shown, Bottom Similar
- Screw Size: #10x5/8 SS Pan Head Screws @ 2'-0" sp.

**PANEL ADJUSTMENT FOR RAILINGS ON GRADES**

- Lengthen border and trim top & bottom of panels to match grade.

**NOTES:**

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

1. See Plans for Infill Panel Type required.
3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL
(42" Height shown, 48" Height Similar)

**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>Posts (Type &quot;A&quot; &amp; &quot;F&quot;)</td>
<td>Extrusion</td>
<td>1.50&quot; x 2.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Posts (Type &quot;C&quot;)</td>
<td>Extrusion</td>
<td>1.50&quot; x 2.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Plate (Type &quot;C&quot;)</td>
<td>Extrusion</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Rail</td>
<td>Extrusion</td>
<td>1.50 OD x 0.125 Wall</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>1.50 OD x 0.125 Wall</td>
<td>0.125&quot;</td>
<td></td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>2.50 OD x 0.125 Wall</td>
<td>0.125&quot;</td>
<td></td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>2.00 OD x 0.125 Wall</td>
<td>0.125&quot;</td>
<td></td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>1.00 OD x 0.125 Wall</td>
<td>0.125&quot;</td>
<td></td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>0.75&quot; OD Round Bar</td>
<td>N/A</td>
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</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 1 NOTES:**
1. Alloy 6061-T6 or 6063-T5 may be substituted for Alloy 6063-T5.
2. 0.08" wall thickness is permitted for rails with post spacings less than 5'-8".
3. 1" NPS (Sch. 40) non-slit rail sleeves may be substituted when welded connection detail "K" is utilized.

**NOTES:**
1. Shop Drawings are required, see Specification Section 315.

**INDEX**
515-062
1 of 9
Handrail required for ramps (Handrail continuous at landings between runs)

Handrail ~ 1 ft 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%

LANDING 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)

EXPANDED ELEVATION AT CORNERS
DETAIL FOR NON-CONTINUOUS RAILING AT CORNERS

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.

SHBR
PBR

42" PBR
48" SHBR

2'-7" PBR
3'-1" SHBR

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.

SHBR
PBR

42" PBR
48" SHBR

2'-7" PBR
3'-1" SHBR

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.

SHBR
PBR

42" PBR
48" SHBR

2'-7" PBR
3'-1" SHBR

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.
BASE PLATE DETAILS FOR TYPE "C" POST
(Screws Not Shown for Clarity)

TOP PLATE DETAILS FOR TYPE "C" POST
(Screws Not Shown For Clarity)

Notes:
†     See Sheet 4 for Notes.
††    See Sheet 4 for Notes.
†††   Length varies for beveled posts on grades. Holes must be drilled plumb to align with screw slot.

††††   Optional intermittent weld in-lieu of Self-Tapping screws between posts.
**SECTION A-A**

**See Detail "1B"**

**See Detail "1A"**

---

**PICKET NOTES:**

* Picket Spacing of 6½" centers is based on a ¾" Ø Bar for standard applications. When shown in the Contract Plans a 4½" picket spacing may be required. See Note 4 (Sheet 1).

---

**TYPE 1 - PICKET INFILL PANEL**

---

**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</th>
<th>ASTM</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
<td>A392</td>
<td>Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td></td>
<td>A491</td>
<td>Aluminum-Coated Steel - No. 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td></td>
<td>F668</td>
<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>
</tr>
<tr>
<td>Tie Wires</td>
<td>F626</td>
<td>Zinc-Coated Steel Wire - No. 9 gage with coating to match Chain-Link Fence Fabric</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F626</td>
<td>¼&quot; (min. thickness) x ⅜&quot; (min. width) x 2'-3&quot; (min. height) Steel Bars</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F626</td>
<td>Zinc-Coated Steel</td>
</tr>
</tbody>
</table>

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**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.

---

**REV ISION**

**INDEX SHEET** 515-062 6 of 9
TYPE 3 - SUNSHINE INFILL PANEL

* Arc, Rays and Sun Segment may be formed in a single panel from 5/8" plate (ASTM B209 Alloy 6061-T6 or T651) pattern cut with laser or plasma CNC, welded to a 1x1½ Angle Border or the 3/8x3½ Channel Border shown.

TYPE 4 - BROADWAY INFILL PANEL

NOTES:
1. See Plans for Infill Panel Option required.
NOTES:
1. Shop Drawings are required.
2. Work with Specification SIS.
3. Materials:
   A. Pan Head Set Screws: Aluminum Alloy 2024-T4 or 7075-T73 or Stainless Steel (SS) Type 316 or 18-8 Alloy.
   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-T5 is permitted.

<table>
<thead>
<tr>
<th>RAILING MEMBER DIMENSIONS TABLE</th>
</tr>
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<tbody>
<tr>
<td>MEMBER</td>
</tr>
<tr>
<td>Posts</td>
</tr>
<tr>
<td>Rails</td>
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<tr>
<td>Handrail Joint/Splice Sleeves</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
</tr>
</tbody>
</table>

E. Galvanized Steel Fasteners:
   a. Hex Head Bolts: ASTM A 307 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 Shim: ASTM B209, Alloy 6061
   G. Bearing Pads: Phen, Fabric Reinforced, or Fabric Laminated meeting requirements of Specifications SIS & 932.

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; top cap rail must be continuous across a minimum of two posts.
   C. Continuity field splice (Detail "E") only one 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 or terminated at adjoining sections with a standard end hoop when handrails are not required.
   E. For curved longitudinal alignment, shop bend top and bottom rails and handrails to match the alignment radius.
   F. For changes in tangential longitudinal alignment greater than 45°, position post a minimum of 2'-0" each side of the corner, not at the corner apex.
   G. 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.
ELEVATION

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

RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

RAMP REQUIREMENTS
- Max. landing slope = 8.33%
- Max. ramp cross-slope = 2.0%

LANDING REQUIREMENTS
- Max. landing cross-slope = 2%
- Max. landing slope = 2%

RAMP REQUIREMENTS
- Max. landing cross-slope = 2%
- Max. landing slope = 2%

NOTES:
- NPS = Nominal Pipe Size
- Keyed construction joints in Index 400-011 Gravity Structures Expansion Joints
- Wall are not considered to be expansion joints.
PIPE GUIDERAIL (ALUMINUM)

**GUIDERAIL ON STEPS & STAIRS**

**DESCRIPTION:**

**REV 001**

**INDEX 515-070**

**SHEET 3 of 5**

**REVISION**

1/01/17

**STANDARD PLANS**

**FY 2019-20**

**LAST REVISION**

1/01/17

---

**RAILING CONTINUATION BEYOND STEPS**

(Bottom shown, Top similar)

- See "Typical Railing Details", Sheet 3 for post & rail details

- See Index 400-021 or Contract Plans for Step Details

**Handrail**

**Post**

**Concrete sidewalk to extend 6" min. behind Handrail**

**Handrail Termination**

See Detail "A" (Typ.)

**HANDRAIL TERMINATION**

**DETAIL "A" - PLAN VIEW**

**Pipe Guiderrail (Aluminum)**

**Handrail**

**Post**

**Concrete sidewalk to extend 6" min. behind Handrail**

**Handrail Termination**

See Detail "A" (Typ.)

**Handrail**

**Post**

**Concrete sidewalk to extend 6" min. behind Handrail**

**Handrail Termination**

See Detail "A" (Typ.)

**ELEVATION**

(At-Grade Steps)

**GUIDERAIL ON STEPS & STAIRS**

**DESCRIPTION:**

**REV 001**

**INDEX 515-070**

**SHEET 3 of 5**

**REVISION**

1/01/17

**STANDARD PLANS**

**FY 2019-20**

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**RAILING CONTINUATION BEYOND STEPS**

(Bottom shown, Top similar)

- See "Typical Railing Details", Sheet 3 for post & rail details

- See Index 400-021 or Contract Plans for Step Details

**Handrail**

**Post**

**Concrete sidewalk to extend 6" min. behind Handrail**

**Handrail Termination**

See Detail "A" (Typ.)

**HANDRAIL TERMINATION**

**DETAIL "A" - PLAN VIEW**

**Pipe Guiderrail (Aluminum)**

**Handrail**

**Post**

**Concrete sidewalk to extend 6" min. behind Handrail**

**Handrail Termination**

See Detail "A" (Typ.)

**Handrail**

**Post**

**Concrete sidewalk to extend 6" min. behind Handrail**

**Handrail Termination**

See Detail "A" (Typ.)

**ELEVATION**

(At-Grade Steps)
PIPE GUIDERAIL (ALUMINUM)

**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**

**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**

(Showing Sloped Condition for Ramps with 2-Bolt Anchorage)

**CROSS REFERENCE:**

For locations of Details "C", "D" and "E", see Sheet 2.

**REVISION SUMMARY:**

- Implementation:
  - Section C-C: Revised to include new details for base plate anchorage.
  - Section B-B: Updated with additional connection methods.
  - SHIM PLATE DETAIL: Adjusted to accommodate different anchorage configurations.
  - PLATE WASHER DETAIL: Enhanced with new recommended techniques for steep slopes.
  - DETAILS "D" & "E": Modified to reflect latest guidelines for expansion joints and continuity field splices.

**REVISION DETAILS:**

- Revised to incorporate new technical standards and recommendations for improved installation and durability.
- Updated with latest materials specifications and guidelines for quality assurance.
- Enhanced with additional illustrations and diagrams for better understanding.

**INDEX:**

- Sheet 515-070
- Page 4 of 5
NOTES:
1. Shop Drawings are required, refer to Specification 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 A307 Grade B.
   C. Pipe Rails and Posts: ASTM A53 Grade B for standard weight pipe and ASTM A500 Grade B, C or D or ASTM A501 for Structural Tube.
   Handrail Support Bars: ASTM A36

<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>3.275&quot;</td>
<td>0.154&quot;</td>
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<td>Rail Joint/Splice Sleeves</td>
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<tr>
<td>Handrail Support Rail</td>
<td>1&quot; Ø Round Bar</td>
<td>1.000&quot;</td>
<td>N/A</td>
</tr>
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</table>

3. Fabrication:
   A. Place expansion joints at a maximum of 30'-0" spacing.
   B. Place splice plates at a minimum of two posts.
   C. Continuity joint splice (Detail "C") only use to make the railing continuous for unforeseen field adjustments.
   D. Corners and changes in tangential longitudinal alignment shall be made continuous with a radius or terminated at adjoining sections with a standard end hoop when handrails are not required.
   E. For changes in longitudinal longitudinal alignment greater than 45°, positioned posts a maximum of 2'-0" each side of the corner, not at the corner apex.
   F. For changes in longitudinal longitudinal alignment greater than 45°, positioned 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.
   C. Continuity field splice (Detail "E") 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 or terminated at adjoining sections with a standard end hoop when handrails are not required.
   E. For changes in longitudinal longitudinal alignment greater than 45°, positioned posts a maximum of 2'-0" each side of the corner, not at the corner apex.

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

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 A307 Grade B.
   C. Pipe Rails and Posts: ASTM A53 Grade B for standard weight pipe and ASTM A500 Grade B, C or D or ASTM A501 for Structural Tube.
   Handrail Support Bars: ASTM A36

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<td>Handrail Support Rail</td>
<td>1&quot; Ø Round Bar</td>
<td>1.000&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

D. Galvanized Steel Fasteners:
   a. Hex Head Bolts: ASTM A307 Type 1 or ASTM F1554 Grade 36
   b. Adhesive Anchors: ASTM F1554 Grade 36 for threaded rods
   c. Hex Nuts: ASTM A383
   d. Flat Washers: ASTM F436
   E. Aluminum Shims: ASTM B209, Alloy 6061
   F. Bearing Pads: Plain, Fabric Reinforced, or Fabric Laminated meeting requirements of Specifications 515 and 932.

3. Fabrication:
   A. Place expansion joints at a maximum of 30'-0" spacing.
   B. Place splice plates at a minimum of two posts.
   C. Continuity joint splice (Detail "C") 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 or terminated at adjoining sections with a standard end hoop when handrails are not required.
   E. For changes in longitudinal longitudinal alignment greater than 45°, positioned posts a maximum of 2'-0" each side of the corner, not at the corner apex.
   F. For changes in longitudinal longitudinal alignment greater than 45°, positioned 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.
   C. Continuity field splice (Detail "E") 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 or terminated at adjoining sections with a standard end hoop when handrails are not required.
   E. For changes in longitudinal longitudinal alignment greater than 45°, positioned posts a maximum of 2'-0" each side of the corner, not at the corner apex.

5. Cutting of reinforcing steel is permitted for adhesive anchor bolt installations.
**TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%**

- **Post Spacing:**
  - 6'-0" (Max.) – Equal Panels
  - Varies (4" Min., 1'-6" Max.)

- **Rail Expansion Joint (Typ.):** See Detail "D" Sheet 4

- **Continuity Field Splice:** (as required) see Detail "E" Sheet 4 (Typ.)

- **Rail (Typ.)**

- **Handrail (Typ.)**

**CROSS REFERENCE:**
For Details "C", "D" and "E", see Sheet 4.

**RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%**

- **Bottom Landing**
  - 6'-0" Min.
  - 30'-0" Max. for Slopes > 6.25%
  - 40'-0" Max. for Slopes ≤ 6.25%

- **Intermediate Landing**
  - 5'-0" Min.

- **Top Landing**
  - 5'-0" Min.

- **Ramp**
  - 30'-0" Max. for Slopes > 6.25%
  - 40'-0" Max. for Slopes ≤ 6.25%

- **ELEVATION**
  - Showing Inside Face of Railing

- **LANDING REQUIREMENTS**
  - Max. landing slope = 2%
  - Max. landing cross-slope = 2%

- **RAMP REQUIREMENTS**
  - For slopes greater than 5%:
    - Max. ramp slope = 8.33%
    - Max. ramp cross-slope = 2.0%

**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.

**STRENGTHS:**
- Wall are not considered to be expansion joints.
- See Plans for continuation or termination limits of railing.
PIPE GUIDERAIL (STEEL)

GUIDERAIL ON STEPS & STAIRS

RAILING CONTINUATION BEYOND STEPS
(Bottom shown, Top similar)

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

Handrail Termination
See Detail "A" (Typ.)

Handrail

Handrail Continuous

At Landing

6'-0" (Max.) Post

6'-0" (Max.) - Equal Panels

6'-0" Max. on Steps

6'-0" (Typ.)

6'-0" Max. on Steps

3'-6"

Concrete sidewalk to extend 6" min. behind Handrail

See Index 400-021 or Contract Plans for Step Details

Handrail

Equal to one tread length

2" Min. (Typ.)

2" Min. (Typ.)

9" Min. Wide cheekwall both sides

9" Min. Wide cheekwall both sides

9" Min. Wide cheekwall both sides

3'-6"

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3'-6"
TYPICAL SECTION ON CONCRETE SIDEWALK

TYPICAL SECTION ON GRAVITY WALL
(Other Retaining Walls Similar)

TYPICAL SECTION ON STEPS & STAIRS

OPTIONAL SIDEWALK ANCHORAGE DETAIL

SIDEWALK ANCHORAGE DETAIL
OPTION 2 & 3

NOTES:

**2 - 2" Ø x 8" or 4 - 3/4" 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.
Future Curb and Gutter Construction

PLAN

SECTION AA

SECTION BB

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.

** Rotate entire section so that gutter cross slope matches slope of adjacent circulating roadway pavement.

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.

Note: To be paid as parent curb.

Earth Berm

Standard Shoulder Line

1'-0" 6" Shoulder Pavement

DROP CURB

SHOULDER GUTTER

TRAFFIC BEARING SECTION FOR USE IN ROUNDABOUT CENTRAL ISLAND CONSTRUCTION TYPE RA

CONCRETE CURB

CONCRETE CURB AND GUTTER
Sawcuts should be avoided within valley gutter and within curb and gutter endings.

CONTRACTION JOINT IN CURB AND GUTTER

CURB AND GUTTER Endings

CURB AND GUTTER TYPES E & F

CURB AND GUTTER ENDINGS

CURB AND GUTTER AND TYPE A CURB ADJACENT TO FLEXIBLE PAVEMENT

GENERAL NOTES

1. For curb, gutter & curb & gutter provide 1/8" - 1/2" 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 Specification 520.

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

CONCRETE BUMPER GUARD

ASPHALTIC CONCRETE CURB

REV 11/01/17

DESCRIPTION:

REVISION

INDEX

520-001

2 of 2
DETAIL OF CONCRETE SPILLWAY AT END OF SHOULDER GUTTER
(TO BE USED WHERE INLETS, PIPES & ENDWALLS ARE IMPRACTICAL)

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.
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.

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.

Runoff

Runoff

Runoff

Runoff

Prop. Pavt.

Prop. Pavt.

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

Portion Of New 4-Lane Part.

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

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

Median Width As Indicated In Detail Plans

Median Width As Indicated In Detail Plans

Prop. Pavt.

Prop. Pavt.

Prop. Pavt.

Prop. Pavt.

Median

Median

Median

Median

Existing

New Part.

Existing

New Part.

Measurement of 0.02 Min., 0.05 Max.

Measurement of 0.02 Min., 0.05 Max.

Min. Slope 0.01'/ft.

Min. Slope 0.01'/ft.

Const. Ditch To Drain

Const. Ditch To Drain

Provide Smooth Section

Match Existing Grade

Match Existing Grade

Provide Smooth Section
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 90° V-grooves shall be placed perpendicular or radial to the edge 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:
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-0" @ 7 equal spaces (continuous)
   - At the Contractor's option, a one piece bar may be substituted for Bars 4B and 4E.

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

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 90° V-grooves shall be placed perpendicular or radial to the edge 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:
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-0" @ 7 equal spaces (continuous)
   - At the Contractor's option, a one piece bar may be substituted for Bars 4B and 4E.

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

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

OPTION I

TRANSVERSE SECTION

Notes:

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

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

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:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-6" @ 7 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.
**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

See Structures Plans, Superstructure Sheets for location(s) of drainage joints. Locations for drainage joints shall be limited to the constant width section of separator.

**DRAINAGE JOINT DETAIL**
*(For 5" Opening Or Less)*

---

**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 Reinforcing Wire)*

---

**CONCRETE:**

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

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

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

**DOWEL DETAIL**

---

**ESTIMATED TRAFFIC SEPARATOR QUANTITIES:**

**CONCRETE:**

**CONSTANT WIDTH OF SEPARATOR:**

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**TYPE "F"**

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</table>

**TYPE "E"**

---

**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 Specifications 416 and 937.

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

---

**BRIDGE INSTALLATIONS - TYPE "E" AND "F" CURB**

---

**REINFORCING STEEL:**

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

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

3. The dowel hole diameter is to meet adhesive bonding material system manufacturer's requirements.
GENERAL NOTES:

1. BARRIER 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 splices 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).

The default reinforcing details shown herein, including bar shapes and lap splice positions, are intended to show required steel locations and provide for a constructible design. However, with the approval of the Engineer, alternate steel configurations may be used in the same locations shown herein, given that the equivalent strength reinforcing is provided and the cover, maximum spacing, and continuity requirements are maintained.

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.

GENERAL NOTES (CONTINUED):

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 32" 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. Transverse Joints are permitted at 20-foot or greater intervals along the barrier. For Tall Grade-Separated Sections, see Sheet 3 for additional Transverse Joint requirements.

7. DOWELED JOINTS: As shown in the Dowel Details on Sheets 2 & 13, install Doweled 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 32" deep 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 12 inches of the subgrade to at least 98% of the maximum density determined by FM 1-T 180, Method D.

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.


14. SPALDGE VISUAL BARRIER: Where called for in the Plans, install Spaldge 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 DELINATORS: Install Barrier Delinators in accordance with Specification 705. For median barriers, mount the delinators on the top of the barrier, at the centerline of barrier, with reflective sheathing facing traffic on both approaches. For shoulder barriers and split sections, mount the delinators on the top of the barrier, with the roadway side of the delinators located 2" from the front face of the barrier and the reflective sheathing facing traffic of the nearest approach.

17. TOLL SITES: Where called for in the Plans, substitute the steel reinforcing bars shown herein with GFRP reinforcing bars of the same size. Construct GFRP reinforcing bars in accordance with Specification 932, and use a 40” inner diameter for bar bends. Where required to fit pull boxes while maintaining bar spacing and concrete cover, trim GFRP bars as defined in the Plans.

At toll site locations, the use of Median Barriers on outside shoulders is permitted where called for in the Plans. Shoulder Pavement shown herein may be substituted with material for an alternate usage where defined in the Plans.
DESCRIPTION:

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 face(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\(\frac{3}{4}\) x 13\(\frac{1}{2}\) drilled hole for cured concrete. For drilled holes larger than 1\(\frac{3}{4}\), 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\(\frac{3}{4}\) 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 Longitudinal Joint (See Note 3). Ensure that the joint face(s) in the barrier are raked to provide additional shear friction. Rake the fresh concrete surface so that about half of the surface area consists of approximately 45° depth longitudinal grooves, distributed evenly and approved by the Engineer.

5. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the 3\(\frac{1}{4}\) 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 CONNECTIONS: 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 details on Sheet 3.
PLAN VIEW - 38" HEIGHT MEDIAN BARRIER
FREE END REINFORCING (See Note 3)

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

NOTES:
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.

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

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

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 of 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 Tall Height Median Barrier sections of Sheet 2 using a 5' Dowelled Joint.

3. SHORT GRADE-SEPARATED SECTIONS: Bars 4U2 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 spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

Horizontal steel reinforcement is 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" O.C. for a total of 12 spaces on both sides of the joint.

Grade separation Heights of Y < 9" 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, our 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.

MEDIAN BARRIER - 56" HEIGHT SECTION
FOR BARRIER-MOUNTED SIGN
SUPPORT SHIELDING - SYMMETRICAL

NOTES:

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

   For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, our 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.

MEDIAN BARRIER - 56" HEIGHT SECTION
FOR BARRIER-MOUNTED SIGN
SUPPORT SHIELDING - SYMMETRICAL

NOTES:

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

   For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, our 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.

MEDIAN BARRIER - 56" HEIGHT SECTION
FOR BARRIER-MOUNTED SIGN
SUPPORT SHIELDING - SYMMETRICAL

NOTES:

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

   For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, our 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.

MEDIAN BARRIER - 56" HEIGHT SECTION
FOR BARRIER-MOUNTED SIGN
SUPPORT SHIELDING - SYMMETRICAL
**NOTES:**

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

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 40" maximum cover from the top of the barrier. The minimum pedestal width is 2'-0", where a complete removal of the gutter line taper is permitted.

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**
NOTES:

1. PROJECT SPECIFIC DESIGN: For the base plate, anchor bolts, foundation design, and additional reinforcing required for the barrier, 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" maximum cover from the top of the barrier.

3. 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 DUAL SIGN SUPPORT SHIELDING - MINIMUM WIDTH
NOTES:

1. OVERHEAD SIGN SUPPORT: The overhead sign support shown is an example only; see the Plans for the project-specific dimensions and requirements. The overall length and width of the barrier’s taper and parallel segments is governed by the 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. PLAN VIEW: Only outermost longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

4. STIRRUP BARS: For the vertical and transverse reinforcement requirements shown in Sections A-A, 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.

5. CONCRETE OR FLOWABLE FILL: Use Class NS Concrete in accordance with Specification 347 or Non-Excavatable Flowable Fill in accordance with Specification 121.

MEDIAN BARRIER - 38” HEIGHT SPLIT SECTION FOR STAND-ALONE SIGN SUPPORT SHIELDING
1. **SECTION VIEWS**: See Sheet II 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.

---

**ELEVATION**

**PLAN**

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

**NOTES:**

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**MEDIAN BARRIER - 44" HEIGHT**

**SPLIT SECTION FOR PIER SHIELDING**

---

**DESCRIPTION:**

**FY 2019-20**

**STANDARD PLANS**

**INDEX**

**CONCRETE BARRIER**

**SHEET**

10 of 26
NOTES:

1. GENERAL: Work with the Plan and Elevation views on Sheet 10.

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 10.

3. STIRRUP BARS: For the vertical and transverse reinforcement requirement 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.
NOTES:

1. GENERAL: Construct the Connection Segment as required per the Plans to connect existing SP плитка с баром с линией и постепенное увеличение размеров.

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. STIRRUP BARS: For the vertical and transverse reinforcement requirements shown, bar spacing 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.
SECTION A-A
38" HEIGHT SHOULDER BARRIER
(See Sheet 14 for Reinforcing Steel Details)

ELEVATION
PLAN
SECTION
PLACEMENT
DOWEL DETAILS
DOWEL BAR & PVC CONNECTION

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 14.
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 second casting, use a 1\%x24\% Schedule 80 PVC pipe with a sealed cap, cast-in-place as shown.
   For the dowel connection into the first casting, the dowel may be cast-in-place for new concrete or placed into a 1\%x13\% drilled hole for cured concrete. For drilled holes larger than 1\%, secure the dowel with adhesive in accordance with Specification 416. No load testing is required.
4. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the 1/2" Doweled Joint.
5. GUARDRAIL CONNECTIONS: Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001.
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 14.
SECTION A-A
38" HEIGHT SHOULDER BARRIER
Concrete Qty. = 0.32 CY/FT
Steel Qty. = 50.9 LB/FT

NOTES:
1. GENERAL: Work with the Plan and Elevation Views on Sheet 13. The Section Option Footings shown on Sheet 15 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 SV3 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 SV3, see the Bar Bending Diagrams on Sheet 26.

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 continuously between sections. Alternatively, a Dowelled Joint may be used as shown on Sheet 13.

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**: 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 continuously between sections. Alternatively, a Dowelled Joint may be used as shown on Sheet 13.

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.

**FRONT-FLUSH SECTION - PLAN VIEW**
(Not Applicable for Trench Footing Sections)

**RETAILING SECTION**
Concrete Qty. = 0.36 CY/FT
Steel Qty. = 55.3 LB/FT

**TRENCH FOOTING SECTION**
Concrete Qty. = 0.29 CY/FT
Steel Qty. = 46.6 LB/FT

**SHOULDER BARRIER - SECTION OPTIONS**

**FRONT-FLUSH SECTION (Where Required For Barrier Inlet Locations)**
Concrete Qty. = 0.26 CY/FT
Steel Qty. = 46.6 LB/FT

11/01/18
NOTE:
1. GENERAL: See the applicable notes on Sheet 15.
SHOULDER BARRIER - 38" HEIGHT REAR-FLUSH SECTION
FOR REDUCED SETBACK PIER SHIELDING
(DESIGN SPEED ≤ 45 MPH)

NOTE:
1. PIER-S: The piers shown herein are example shapes only; see the Plans for the project-specific dimensions. The details requiring protection, see Index 521-002.

PECULAR TO MAINTAIN COVER (Typ.)
44" HEIGHT REAR-FLUSH SECTION
ABOVE-GROUND HAZARD EMBEDDED IN FOOTING

SECTION C-C

44" HEIGHT REAR-FLUSH SECTION
WITH 3" WIDTH REDUCTION
ABOVE-GROUND HAZARD EMBEDDED IN FOOTING & BARRIER

NOTE:
1. PIERS: The piers shown herein are example shapes only; see the Plans for the project-specific details. 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.

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

FOR REDUCED SETBACK PIER SHIELDING

BAR 5C2 @ 8" Sp. (Min., 4" Max.) (Typ.)
3" Width Reduction

Joints Long. Optional

REVISION
10/30/19

DESCRIPTION:

FY 2019-20

STANDARD PLANS

CONCRETE BARRIER

INDEX
521-001

SHEET
18 of 26
SECTION A-A
BEGIN TRANSITION - OPTION 'A'
MATCH SINGLE-SLOPE
38" HEIGHT SHOULDER BARRIER

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

SECTION B-B
INTERMEDIATE SECTION
OF LINEAR SECTION

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 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 13.

3. TRAFFIC RAILING CONNECTION: For the Option 'B' connection, use a Dowelled Joint per Sheet 13 and the additional Free End Reinforcing with reduced bar spacing per Sheet 14.

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.

SHOULDER BARRIER - CONNECTION TO F-SHAPE

CONCRETE BARRIER

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**DRAINAGE SLOT NOTES:**

1. **GENERAL:** Place 2-ft 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 2-ft x 3/4" of concrete cover for reinforcing around the Drainage Slot. If cutting the vertical bars, maintain 10" bar spacing. If shifting the vertical bars, move the bars from the standard 10" spacing location to the closest end of the drainage slot (distributing 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 3/4" Doweled Joints as defined on Sheet 13.

4. **TRAFFIC RAILING CONNECTIONS:** Align the barrier and Traffic Railing faces and connect with the 3/4" Doweled Joint per Sheet 13.

5. **GUARDRAIL CONNECTIONS:** Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with 3/4" 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 21.

**CURB AND GUTTER BARRIER NOTES:**

1. **SECTION VIEWS:** For additional Views A-A and B-B, see Sheet 21.

2. **EXPANSION JOINTS:** Place 1" with 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 21.

3. **DOWELED JOINTS:** See the General Notes on Sheet 1 for usage of joint types. Where required, install 3/4" Doweled Joints as defined on Sheet 13.

4. **TRAFFIC RAILING CONNECTIONS:** Align the barrier and Traffic Railing faces and connect with the 3/4" Doweled Joint per Sheet 13.

5. **GUARDRAIL CONNECTIONS:** Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with 3/4" 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 21.
Notes:
1. General: Work with the Plan and Elevation Views on Sheet 20.
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 SV2 and SV4 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 SV4, see the Bar Bending Diagrams on Sheet 20.

Notes:
1. General: Work with the Plan and Elevation Views on Sheet 20.
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 SV2 and SV4 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 SV4, see the Bar Bending Diagrams on Sheet 20.
SECTION D-D
BEGIN TRANSITION

SECTION E-E
INTERMEDIATE TRANSITION
(Height Varies Linearly Per Elevation View)

SECTION F-F
END TRANSITION
(Align with Type-F Curb)

NOTES:
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 26.
Notes:

1. TAPER SEGMENTS AND OFFSET SEGMENT: The plan view shown is an example only, showing general geometry for the taper segments and offset segment. For the actual segment lengths and corresponding taper rates required, see the barrier placement information in the Plans.

2. OVERHEAD SIGN SUPPORT: The overhead sign support shown is an example only; see the Plans for the project-specific dimensions and requirements if applicable.

3. CONNECTION TO SHOULDER BARRIER SECTIONS: Connect to Shoulder Barrier 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.

4. FREE ENDS: Where shown in the Plans, terminate the Single-Faced Section with a transverse end face. Place a stirrup bar with a 3" cover from the end face. Place longitudinal bars with a 3" cover from the end face.

5. CONCRETE OR FLOWABLE FILL: Use Class NS Concrete in accordance with Specification 347 or Non-Excavatable Flowable Fill in accordance with Specification 121.
**NOTES:**

1. **TAPER SEGMENTS AND OFFSET SEGMENT:** The plan view shown is an example only, showing general geometry for the taper segments and offset segment. For the actual segment lengths and corresponding taper rates required, see the barrier placement information in the Plans.

2. **OVERHEAD SIGN SUPPORT:** The overhead sign support shown is an example only; see the Plans for the project-specific dimensions and requirements if applicable.

3. **CONNECTIONS TO DIFFERENT CONCRETE BARRIER SECTIONS:** Connect to aligning barrier 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.

4. **FREE ENDS:** Where shown in the Plans, terminate the Single-Faced Section with a transverse end face. Place a stirrup bar with a 3" cover from the end face. Place longitudinal bars with a 3" cover from the end face.

5. **GUARDRAIL CONNECTIONS:** Within the Shoulder Barrier Segment for Guardrail, install Shoulder Barrier as shown per Sheet 3, including the corresponding End Segment for Guardrail. Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001.

6. **CONCRETE OR FLOWABLE FILL:** Use Class NS Concrete in accordance with Specification 347 or Non-Excavatable Flowable Fill in accordance with Specification 123.

Use only concrete fill behind the Shoulder Barrier Segment; do not use flowable fill at this location.

---

**WALL SHIELDING BARRIER - 38" HEIGHT SECTION - GUARDRAIL CONNECTION**

**SECTION A-A**  
38" HEIGHT SINGLE-FACED SECTION (Reverse Side Similar by Opposite Hand)

**SECTION B-B**  
FLUSH SEGMENT

**SECTION C-C**  
OFFSET SEGMENT

**SECTION D-D**  
OVERHEAD SIGN SUPPORT

**SECTION E-E**  
SHOULDER BARRIER SEGMENT FOR GUARDRAIL

**SECTION F-F**  
CONCRETE FILL END FACE

---

**PLAN**  
(See Section A-A for Barrier Reinforcing)
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.
3. Use standard inner diameters for bar bending unless otherwise shown.
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. FOUNDATION: Compact the top 12 inches of the subgrade to at least 98% of the maximum density determined by FM 1-T 180, Method D.

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 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 1/2" depth crack control V-Grooves at 15' to 30' spacing. Locate V-Grooves above any joint or discontinuity in the barrier footing. 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.
NOTES:

1. GENERAL: The views shown herein are schematic only, showing example layouts for Pier Protection Barrier (PPB) footings and Crash Wall placement in relation to adjacent miscellaneous structures (including bridge piers, footings, drainage structures, etc.). 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), is 8'-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.
PIER PROTECTION BARRIER

REVISED: 11/01/17

DESCRIPTION:

CONCRETE BARRIER
CONNECTION TO
GUARDRAIL

PLAN
(Footing Not Shown,
See Sheet 6 for Options)

ELEVATION - 44" PPB
(See Sheet 4)

ELEVATION - 56" PPB
(See Sheet 4)

ELEVATION - 44" PPB
(See Sheet 5)

ELEVATION - 56" PPB
(See Sheet 5)

ELEVATION - 44" PPB
(Per the Plans)

ELEVATION - 56" PPB
(Per the Plans)

521-001

521-002
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

SECTION A-A
56" PPB
Concrete Qty. = 0.19 CY/FT (Above Gutter Line)
Steel Qty. = 47.7 LB/FT (Excluding Bars 5U & 8T)

SECTION B-B
44" PPB
Concrete Qty. = 0.16 CY/FT (Above Gutter Line)
Steel Qty. = 35.7 LB/FT (Excluding Bars 5U & 8T)
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.

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

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

5. (Per the Plans) Begin/End PPB Sta. & Offset

6. (As Req'd) Bars 8T

END VIEW C-C

(End Tapered Toe for Guardrail)

END VIEW D-D

(End Tapered Toe for Guardrail)
**REVISION DESCRIPTION:**

**BARRIER FOOTING OPTIONS**

**SECTION E-E REAR-FLUSH FOOTING OPTION**

Concrete Qty. = 0.34 CY/FT (Below Gutter Line)  
Steel Qty. = 63.5 LB/FT (Including Bars 5U)

**SECTION F-F SYMMETRICAL FOOTING OPTION**

Concrete Qty. = 0.34 CY/FT (Below Gutter Line)  
Steel Qty. = 62.6 LB/FT (Including Bars 5U)

**NOTES:**

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

2. **OPTIONAL SLIP FORMING SUPPORT:** The 1'-0" depth spread footing may be extended by 2" 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 CY/FT (44" Crash Wall) or 0.93 CY/FT (56" Crash Wall)

Steel Qty. = 71.8 LB/FT (44" Crash Wall) or 76.0 LB/FT (56" Crash Wall)

PIER PROTECTION BARRIER

REVISIO

DESCRIPTION:

REVISIONS

LAST

REVISION

521-002

11/01/17

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STANDARD PLANS

FY 2019-20
### BILL OF REINFORCING STEEL

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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.

### BARS 5V

### BARS 5U

### BARS 5R

### BARS 5F1

### BARS 5E

### BARS 5L

### BAR BENDING DIAGRAMS
GENERAL NOTES:

1. GENERAL: Construct Opaque Visual Barrier (OVB) in accordance with Specification 521, and use either cast in place or precast panels of cast OVB concrete monolithically with the Concrete Barrier or Traffic Railing, using an ASTM D6860, Class 5, Type III Organic Fiber bend breaker as needed.

2. DOWEL BAR CONNECTION: For the embedment in Concrete Barrier or Traffic Railing concrete, dowel bars must be either cast in place for new concrete or grouted in place for existing concrete. Embed the dowel bars to the corresponding depths shown, and use the bar lengths provided in the Dowel Bar Length Table.

3. TRANSVERSE JOINTS: Place Transverse Joints with a maximum spacing of 50'-0" and a minimum spacing of 20'-0". Use a consistent spacing where practical. Without violating the above spacing requirements, place Transverse Joints matching the location and width of open joints in the supporting Concrete Barrier or Traffic Railing.

4. SLOPED END TREATMENTS: Regardless of the traffic direction, place Sloped End Treatments on all exposed ends of OVB, excluding leave-outs for barrier-mounted signs and light poles. See Note 7 below.

5. BARRIER-MOUNTED SIGNS AND LIGHT POLES: Where signs and barrier-mounted light poles conflict with placement of OVB, end and restart the OVB with a transverse vertical face located a longitudinal distance of 3" (± 3") from the base of the structure. Follow the same reinforcing scheme and concrete cover requirements for the Transverse Joint shown herein. See Note 7 below.

6. LARGE BARRIER-MOUNTED SIGN SUPPORTS: See Sheet 2 for details. See Note 7 below.

7. LEAVE-OUTS: OVB leave-outs are longitudinal gaps in OVB segments required to accommodate barrier-mounted signs and light pole placement. Leave-outs up to 15 feet in length are included in OVB length measurement.

8. ASYMMETRICAL CONCRETE BARRIER SECTIONS: When mounting on top of an asymmetrical Concrete Barrier section (not shown), align the centerline of the OVB with the centerline of the top face of the Concrete Barrier section.

9. SPLIT CONCRETE BARRIER SECTIONS: For split Concrete Barrier sections that run separately for vertical structures, bridge, etc., OVB is only required on top of one of the Concrete Barrier sections. Place OVB on top of the Concrete Barrier section with the highest elevation. Longitudinally overlapping OVB runs are permitted where called for in the Plans, which are designated with overlapping Begin and End Station OVB callouts.

10. VERTICAL REINFORCING: Place vertical No. 3 bars with the spacing shown, except that No. 3 bars at the dowel bar locations may be shifted longitudinally or they may be omitted at the option of the contractor.

11. OPTIONAL WELDED WIRE REINFORCEMENT: With the approval of the Engineer, the No. 3 bars shown herein may be replaced with welded wire reinforcement in accordance with Specification 431. Use welded wire reinforcement of equal or greater strength than the bars being replaced, maintain the same cover requirements with equivalent or smaller spacing.

12. VARIABLE HEIGHT CONCRETE BARRIERS: See Sheet 2 for details.

13. CONCRETE BARRIER AND TRAFFIC RAILING TRANSITIONS BETWEEN DIFFERING SECTIONS: Transition the OVB section using a method similar to the OVB Linear Transition shown in Elevation View 'B' on Sheet 2, except adjust the longitudinal length of the transition as required.
ELEVATION VIEW 'A' - OVB END SEGMENT AT CONCRETE BARRIER
HEIGHT TRANSITION FROM 38" HEIGHT TO 56" HEIGHT SECTION
(REVERSE DIRECTION SIMILAR BY OPPOSITE HAND)

NOTES:
1. LATERAL DIMENSIONS: Maintain the OVB section width and lateral placement
   as defined on Sheet 1.

2. DOWEL BAR LENGTHS & CONNECTIONS: For the differing OVB section heights,
   trim or adjust the dowel bar lengths as required to meet the clearances
   shown while maintaining the dowel bar connection requirements of Sheet 1.

   Elevation View 'A' - For the two dowel bars closest to the OVB end location,
   use full dowel bar lengths and bend as shown to maintain clearances.
   Overlapping dowel bars may deviate from the lateral centerline as required.

3. DOWEL BAR SPACING:

   Elevation View 'B' - The dowel locations shown in this detail are examples
   only, and may shift to maintain the spacing pattern that is governed by
   adjacent OVB. Maintain the dowel bar spacing scheme as defined on Sheet 1;
   place dowel bars within the OVB Linear Bottom Transition as required.

4. SEGMENT LENGTHS:

   Elevation View 'B' - The length of the reduced-section OVB segment is
   governed by the length of the linear width and height transition of the Concrete Barrier.
   Overlapping dowel bars may deviate from the lateral centerline as required.

5. VERTICAL REINFORCING: For the differing OVB section heights, trim or adjust
   the vertical No. 3 Bar lengths as required to meet the clearances shown.

   Elevation View 'B' - The length of the reduced-section OVB segment is
   governed by the length of Concrete Barrier with 44" Height Section.

6. TRANSVERSE JOINTS:

   Follow the requirements of Sheet 1.

   Elevation View 'B' - Do not place Transverse Joints within the End Segment.
   Elevation View 'B' - Maintain the Transverse Joint spacing scheme as defined
   on Sheet 1; place dowel bars within the OVB Linear Bottom Transition as required.
**NOTES:**

1. Work this Index with Indexes 521-512 through 521-515.
2. The Concrete Barrier/Noise Wall and Joints shall be constructed plumb.
3. Concrete:
   - A. Class II for slightly aggressive environments.
   - B. Class IV for moderately or extremely aggressive environments.
4. Provide \( \frac{1}{2} \) Open Joints spaced between 30 feet minimum to 80 feet maximum. Align Open Joints with construction joints in the Junction Slab or Footing. Provide additional reinforcing (see Sheet 2) at each open joint.
5. Install Barrier Delineators 2’-4” above the riding surface in accordance with Specification Section 705. Match the Barrier Delineators color (White or Yellow) to the near edgeline.
6. Slip forming of the barrier portion is permitted:
   - A. Stem walls may be widened, at no additional cost, to accommodate slip forming.

---

**PLAN**

(Reinforcing Steel not shown for clarity)

**ELEVATION**

(INSIDE FACE OF CONCRETE BARRIER/NOISE WALL WITH T-SHAPED FOOTING SHOWN, (Other footings similar, Reinforcing steel not shown for clarity)}
ELEVATION OF BARRIER/NOISE WALL REINFORCING STEEL AT OPEN JOINT
(Bars 5S1 in Barrier not shown for clarity)
(Footing or Junction Slab Details not shown)

ELEVATION OF BARRIER/NOISE WALL END TAPER (ADJACENT TO CONCRETE 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 2"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 521-523 through 521-515 (T, L or Trench Footings).
SECTION A-A
TYPICAL SECTION THRU CONCRETE BARRIER/NOISE WALL AT OPEN JOINT
(Section Thru T-Footing Shown, Section Thru Junction Slab, L or Trench Footings similar)

NOTES:
1. Bars 5V shown are for T-Shape footings.
   5V for Junction Slab, L-Shape and Trench footings are similar.
2. Foundation Details:
   Index 521-510 (Junction Slab)
   Index 521-513 (T-Shape)
   Index 521-514 (L-Shape)
   Index 521-515 (Trench)
   Thickened section required for Textured Form Liner, when called for in the Plans
   (See Plans for details)
3. Foundation Details:
   Index 521-510 (Junction Slab)
   Index 521-513 (T-Shape)
   Index 521-514 (L-Shape)
   Index 521-515 (Trench)

VIEW B-B
END VIEW OF RAILING END TRANSITION FOR GUARDRAIL ATTACHMENT
(T-Footing shown, Junction Slab, L or Trench Footings similar)
**REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

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**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 5R shall be one continuous or lap spliced bar. No mechanical couplers are permitted.
4. Bars 5S1 may be continuous or spliced at the construction joints. Lap splices for Bars 5R, 5S1 and 5W shall 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 TRAFFIC RAILING/NOISE WALL QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
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</thead>
<tbody>
<tr>
<td>Concrete (Railings)</td>
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<td>0.107</td>
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<tr>
<td>Concrete (Noise Wall)</td>
<td>CY/LF</td>
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<tr>
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</tr>
<tr>
<td>Additional Rein. @ Open Joint</td>
<td>LB</td>
<td>226.95</td>
</tr>
</tbody>
</table>

(The above quantities are based on the Concrete Barrier/ Noise wall typical section (excluding junction slab or footing).

**REINFORCEMENT STEEL NOTES:**
To Be Field Cut (Railing End Transition)

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

**INDEX**

521-510
CROSS REFERENCE:
For location of Detail "A" see Sheet 1.
For location of Section C-C see Sheet 1.
For View B-B see Sheet 3.

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 5R2 to maintain cover. Field cut Bars 5V and lap as necessary to maintain cover; field cut & bend Bars 5R1 front leg (more plumb) to maintain cover and tie to S1 Bars. (See Sheet 1 Notes 1 and 2)
CROSS REFERENCE: For Section A-A, Detail “A” and Estimated Quantities, see Sheet 3. For Expansion Joint Detail in footing, see Index 521-513, 521-514 or 521-515.

PLAN (Reinforcing Steel not shown for clarity) (T-Shaped Spread Footing Shown, L-Shaped Spread Footing and Trench Footing Similar)

Concrete Barrier/Noise Wall NOTES

1. Construct the Concrete Barrier/Noise Wall and joints plumb; do not construct the Concrete Barrier/Noise Wall perpendicular to the roadway surface.
2. CONCRETE: Concrete will be in accordance with Specification Section 346.
   A. Class II concrete for slightly aggressive environments.
   B. Class IV concrete for moderately or extremely aggressive environments.
3. Construct ½” Open Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown. ½” Open Joint locations are to coincide with ½” Expansion Joints in footings.
4. Construct ½” V-Grooves plumb and provide at 30'-0” maximum intervals as shown. Space V-Grooves equally between ½” Open Joints and/or Begin or End Concrete Barrier/Noise Wall.
5. 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.
6. 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 or
   C. Index 521-515 – Concrete Barrier/Noise Wall Trench Footing.

ELEVATION OF INSIDE FACE OF CONCRETE BARRIER/NOISE WALL (Reinforcing Steel not shown for clarity) (T-Shaped Spread Footing Shown, L-Shaped Spread Footing and Trench Footing Similar)
NOTES:
1. Field Cut Bars S1 & SS1 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. 1/2" Open Joint may be omitted when 8'-0" Railing/Noise Wall End Taper is adjacent to a
   14'-0" Concrete Barrier/Noise Wall End Taper as shown on Sheet 1. See Index 521-510 for
   reinforcement details and spacing. Bars SS2 are not required when 1/2" Open Joint is omitted.
4. Bar spacing shown is along the Gutter Line.

ELEVATION OF CONCRETE BARRIER/NOISE WALL REINFORCING STEEL
(Bars SS1 in Railing not shown for clarity)

ELEVATION OF CONCRETE BARRIER/NOISE WALL END TAPER
(Bars SS1 in Railing not shown for clarity)
For locations of Section A-A and Detail "A", see Sheet 1.

**SECTION A-A**

**TYPICAL SECTION THRU CONCRETE BARRIER/NOISE WALL**

**DETAIL "A" - SECTION AT OPEN JOINT**

**NOTES:**
1. See Index 521-513, 521-514 or 521-515 for footing reinforcement.
2. At 1'-2" Open Joints, plug the lower 2" portion of the open joint by filling it with mortar in accordance with Specification Section 400.

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
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<td>S</td>
<td>6'-2&quot;</td>
</tr>
<tr>
<td>R2</td>
<td>S</td>
<td>6'-2&quot;</td>
</tr>
<tr>
<td>R3</td>
<td>S</td>
<td>10'-10&quot;</td>
</tr>
<tr>
<td>S1</td>
<td>S</td>
<td>AS REQ.</td>
</tr>
<tr>
<td>S2</td>
<td>S</td>
<td>7'-3&quot;</td>
</tr>
</tbody>
</table>

**REINFORCING STEEL BENDING DIAGRAMS**

**ESTIMATED CONCRETE BARRIER/NOISE WALL QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<tbody>
<tr>
<td>Concrete (Concrete Barrier)</td>
<td>CF/FT</td>
<td>0.107</td>
</tr>
<tr>
<td>Concrete (Noise Wall, excluding any thickening)</td>
<td>CF/FT</td>
<td>0.293</td>
</tr>
<tr>
<td>Reinforcing Steel (Railing/Noise Wall)</td>
<td>LB/FT</td>
<td>100.31</td>
</tr>
<tr>
<td>(Bars R1, R2, R3, S1 &amp; S2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional Rein. @ Open Joint (Railing/Noise Wall)</td>
<td>LB/FT</td>
<td>397.38</td>
</tr>
</tbody>
</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 S1 may be continuous or spliced at construction joints. Lap splices for Bars S1 and S2 will 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.

**CONCRETE BARRIER/NOISE WALL (14'-0")**

**INDEX**

521-511
JUNCTION SLAB ADJACENT TO SKEWED APPROACH SLAB AND WITH BARRIER WALL INLET

NOTES

1. Work this Index with Index 521-510 - Concrete Barrier/Noise Wall (8'-0').
2. Concrete will be in accordance with Specification Section 346.
3. Class IV concrete for moderately or extremely aggressive environments.
4. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A36 smooth round bars 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.
5. Expansion Joints 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° and 10° from horizontal.
6. Construct a 3" V-grooves and provide at 30'-0" maximum intervals as shown. Space V-grooves equally between Expansion Joints and/or Begin or End Junction Slab. V-groove locations are to coincide with V-Groove locations in the Barrier/Noise Wall.
7. Provide Organic Felt Bond Breaker on top and Expanded Polystyrene (1" thick) on sides of retaining wall.
8. 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° and 10° from horizontal.
9. Actual location & width vary depending on type of Retaining Wall used.
10. Field cut Bars SA and SB2 as required to maintain minimum cover for skewed Approach Slab.
11. Spacing shown is along the Gutter Line.
12. See Index 521-570 for Bars 5V and 2 - Bars 5U1. See Plans for Junction Slab with (TYPE 1).

PLAN

JUNCTION SLAB (TYPE 1) OR 7'-0" (TYPE 2)

1. Work this Index with Index 521-510 - Concrete Barrier/Noise Wall (8'-0').
2. Concrete will be in accordance with Specification Section 346.
3. Class IV concrete for moderately or extremely aggressive environments.
4. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A36 smooth round bars 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.
5. Expansion Joints 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° and 10° from horizontal.
6. Construct a 3" V-grooves and provide at 30'-0" maximum intervals as shown. Space V-grooves equally between Expansion Joints and/or Begin or End Junction Slab. V-groove locations are to coincide with V-Groove locations in the Barrier/Noise Wall.
7. Provide Organic Felt Bond Breaker on top and Expanded Polystyrene (1" thick) on sides of retaining wall.
8. 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° and 10° from horizontal.
9. Actual location & width vary depending on type of Retaining Wall used.
10. Field cut Bars SA and SB2 as required to maintain minimum cover for skewed Approach Slab.
11. Spacing shown is along the Gutter Line.
12. See Index 521-570 for Bars 5V and 2 - Bars 5U1. See Plans for Junction Slab with (TYPE 1).

NOTES

1. Work this Index with Index 521-510 - Concrete Barrier/Noise Wall (8'-0').
2. Concrete will be in accordance with Specification Section 346.
3. Class IV concrete for moderately or extremely aggressive environments.
4. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A36 smooth round bars 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.
5. Expansion Joints 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° and 10° from horizontal.
6. Construct a 3" V-grooves and provide at 30'-0" maximum intervals as shown. Space V-grooves equally between Expansion Joints and/or Begin or End Junction Slab. V-groove locations are to coincide with V-Groove locations in the Barrier/Noise Wall.
7. Provide Organic Felt Bond Breaker on top and Expanded Polystyrene (1" thick) on sides of retaining wall.
8. 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° and 10° from horizontal.
9. Actual location & width vary depending on type of Retaining Wall used.
10. Field cut Bars SA and SB2 as required to maintain minimum cover for skewed Approach Slab.
11. Spacing shown is along the Gutter Line.
12. See Index 521-570 for Bars 5V and 2 - Bars 5U1. See Plans for Junction Slab with (TYPE 1).

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

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>TYPE 1</th>
<th>TYPE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5</td>
<td>8'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>B1</td>
<td>5</td>
<td>AS REGO</td>
<td>AS REGO</td>
</tr>
<tr>
<td>B2</td>
<td>5</td>
<td>AS REGO</td>
<td>AS REGO</td>
</tr>
<tr>
<td>F</td>
<td>5</td>
<td>4'-8&quot;</td>
<td>5'-8&quot;</td>
</tr>
<tr>
<td>L</td>
<td>5</td>
<td>4'-8&quot;</td>
<td>5'-8&quot;</td>
</tr>
<tr>
<td>S3</td>
<td>4</td>
<td>3'-1&quot;</td>
<td>4'-0&quot;</td>
</tr>
<tr>
<td>D1</td>
<td>5</td>
<td>4'-8&quot;</td>
<td>5'-8&quot;</td>
</tr>
<tr>
<td>U2</td>
<td>5</td>
<td>17'-10&quot;</td>
<td>17'-10&quot;</td>
</tr>
<tr>
<td>DOWEL</td>
<td>1&quot; Ø Smooth Bar</td>
<td>2'-0&quot;</td>
<td>2'-0&quot;</td>
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**SECTION B-B**

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

**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**

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<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>TYPE 1</th>
<th>TYPE 2</th>
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<tr>
<td>Concrete (Junction Slab)</td>
<td>CF/FT</td>
<td>0.268</td>
<td>0.305</td>
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<tr>
<td>Reinforcing Steel (Typical)</td>
<td>LB/FT</td>
<td>31.72</td>
<td>21.36</td>
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**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. For Asphalt: Shoulder or Roadway Pavement will be SuperPave Structural asphalt. Variable thickness asphalt will be structural overbuild.
7. If slip forming is used, submit shop drawings for approval showing Expansion Joint support details and 2½" side cover with adjusted Typical Section dimensions.

**CROSS REFERENCE:**
For location of Section B-B, see Sheet 1.
NOTE 1: Construct the Spread Footing level transversely and plumb vertically; do not construct the spread footing perpendicular to the roadway surface.

NOTE 2: Concrete will be in accordance with Specification Section 346.

A. Class II concrete for slightly aggressive environments.

B. Class IV concrete for moderately or extremely aggressive environments.

NOTE 3: 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.

NOTE 4: Construct 1” Expansion Joints plumb and perpendicular or radial to Gutter Line. Provide at 90’-0” maximum intervals as shown.

NOTE 5: Construct 3” V-Grooves plumb and provide at 30’-0” maximum intervals as shown. Space V-Grooves equally between 1” Expansion Joints and/or Begin or End Spread Footing. V-Groove locations are to coincide with V-Groove locations in the Barrier/Noise Wall.

NOTE 6: Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.

NOTE 7: FILL REQUIREMENTS: Shoulder or Roadway Pavement or Fill is required on top (1’-0” minimum depth) for the entire length of the spread footing on both sides of the Barrier/Noise Wall. See Section B-B for details.

NOTE 8: See Index 521-510 for Bars 5V2.

NOTE 9: Place 8 ~ Bars (6 ~ 5B1 & 2 ~ 5S1) inside Stirrup Bars 5V2 as shown. (2 ~ 5S1 Bars included in 521-510 or 521-511 quantities)

NOTE 10: Spacing shown is along the Gutter Line.

NOTE 11: 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

BARS 5A & 5B

1" Ø DOWEL

BAR 5U

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 Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

PARTIAL END VIEW OF RAILING END TRANSITION FOR GUARDRAIL ATTACHMENT (Showing Bars 5V2, and Bars 5B inside of Stirrup Bars 5V2)

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

SECTION B-B
TYPICAL SECTION THRU SPREAD FOOTING
(Bars 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

NOTES:
1. Match Cross Slope of Travel Lane or Shoulder.
2. See Sheet 1, Notes 8 & 9.

ESTIMATED T-SHAPED SPREAD FOOTING QUANTITIES

ITEM | UNIT | QUANTITY
--- | --- | ---
Concrete (Footings) | CY/FT | 0.312
Reinforcing Steel (Typical) | LB/FT | 25.90
Additional Rein. @ Expansion Joint | LB | 31.38

Note: The reinforcing steel quantity includes the difference between Index 521-510 or 521-511 and Bars 5V shown. Bars 5S1 are included in Index 521-510 or 521-511 quantities.

CROSS REFERENCE:
For location of Section B-B, see Sheet 1.
PLAN - OPTION B

SPREAD FOOTING ADJACENT TO SKEWED APPRCH SLAB AND WITH BARRIER WALL INLET
(Option A Similar) (Bars S1 Not Shown)

NOTES:
1. Construct the Spread Footing level transversely; do not construct the spread footing perpendicular to the roadway surface.
2. Concrete will be in accordance with Specification Section 346.
   a. Class II concrete for slightly aggressive environments.
   b. Class IV concrete for moderately or extremely aggressive environments.
3. 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. Construct 1/4" 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.
6. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.
7. 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.

Revision Date: 11/01/18

Description:
FY 2019-20
Standard Plans

Concrete Barrier/Noise Wall
L-shaped Spread Footing

Index:
521-514

Sheet:
1 of 4
TYPICAL SECTION THRU SPREAD FOOTING - OPTION A
(Bars 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

TYPICAL SECTION THRU SPREAD FOOTING AND BARRIER WALL INLET - OPTION A
(Reinforcing Steel not shown for clarity (See Note 3))

NOTES:
1. Match Cross Slope of Travel Lane or Shoulder.
2. Place 10 ~ Bars (8 ~ Bars 5B and 2 ~ Bars 5S1) inside Bars 5U1 as shown; (2 ~ 5S1 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.

14'-0" or 8'-0" Concrete Barrier/Noise Wall

Roadway or Shoulder Pavement and Fill (4'-0" Min.)

Fill

Bars 5V (lap with Bars 5U1 as shown)

Top of Spread Footing (Const. Joint Required)

Bars 5S1

Bottom of Spread Footing (Level Transversely)

1" Ø Dowel Load Transfer Devices at expansion joints (Typ.)

4" Cover (Bottom)

2" Cover (Top & Sides)

Slope Varies

Barrier Wall Inlet and Grate (See Index 425-031 for details)

Stem Wall

Const. Joint Permitted
TYPICAL SECTION THRU SPREAD FOOTING - OPTION B
(Bars 5P, 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

NOTES:
1. Match Cross Slope of Travel Lane or Shoulder.
2. Place 10 ~ Bars (8 ~ Bars 5B and 2 ~ Bars 5S1) inside Bars 5U1 as shown.
3. Provide 3" lip when optional construction joint is used.
### Estimation of L-Shaped Spread Footing Quantities

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<td>Reinforcing Steel (Typical)</td>
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<tr>
<td>Additional Rein. @ Expansion Joint</td>
<td>LB</td>
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* Bars 5V and 5S1 are included in Index 521-510 or 521-511 quantities.

### Bill of Reinforcing Steel

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<thead>
<tr>
<th>BARS</th>
<th>SIZE</th>
<th>LENGTH</th>
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<tbody>
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<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>3'-7&quot;</td>
</tr>
<tr>
<td>S4</td>
<td>5</td>
<td>3'-10&quot;</td>
</tr>
<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>

### 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.
1. Construct the Trench Footing plumb, do not construct the Trench Footing perpendicular to the roadway surface.
2. Concrete will be in accordance with Specification Section 346.
   A. Class IT concrete for strictly aggressive environments.
   B. Class VI concrete for moderately or extremely aggressive environments.
3. 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.
4. Shear Keys in footing 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 the transverse vertical plane.
5. Construct 1/2" Expansion joints plum and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.
6. Construct 1/2" V-Grooves plum 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 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 shown.
7. 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 521-515 - Concrete Barrier/Noise Wall (8'-0').
    b. Index 521-511 - Concrete Barrier/Noise Wall (14'-0').

**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 SB will be a minimum of 2'-2".
4. The Contractor may use Deformed Welded Wire Reinforcement (WWR) meeting the requirements of Specification Section 931 when approved by the Engineer.

**Bar SB**

5B

**Locations**

3/4" V-Grooves and Optional Shear Key (See Note 4)

3" Min. Cover (Bottom & Sides)

2" Min. Cover @ Expansion Joints

---

**Bar ST**

521-511 quantities.

**Details**

**V-Grooves and 1/2" V-Groove Expansion Joint Filler**

**Plan**

(Bars SSI Not Shown)

**Legends**

NW = Concrete Barrier/Noise Wall

---

**Concrete Footing Bill of Materials**

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<tr>
<th>Item</th>
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<tr>
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<tr>
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**Estimated Trench Footing Quantities**

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<td>Reinforcing Steel (Typical)</td>
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<td>Additional Rein. @ Expansion Joint</td>
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**Typical Section Through Trench Footing**

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<tr>
<td>Additional Rein. @ Expansion Joint</td>
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<td>21.36</td>
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**Detail "A"**

(Showing locations of 1/2" V-Grooves and 1/2" Preformed Expansion Joint Filler)

1/2" Dowel Load Transfer Devices (See Typical Section and Note 3)

---

**EXPANSION JOINT DETAILS**

(Trench Footing expansion joints are required at 1/2" open joints in Concrete Barrier/Noise Wall)
PRECAST COPING - PARTIAL ELEVATION VIEW

SECTION A-A

C-I-P COPING

PRECAST COPING - PARTIAL ELEVATION VIEW

SECTION B-B

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).

STANDARD PLANS
MSE WALL COPING (PRECAST OR C-I-P)

REV
07/01/14

DESCRIPTION:
FY 2019-20

INDEX
521-600

REV
1 of 2
**BILL OF REINFORCING STEEL**

**REINFORCING STEEL BENDING DIAGRAMS - PRECAST AND C-I-P COPINGS**

**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.

**Bars 4U3 @ 1'-6"**
Max. sp. (Typ.)

**Bars 4U3 @ 1'-6"**
Max. sp. (Typ.)

**Bars 4B (Horizontal)** (Field cut as required to maintain minimum cover)

**Bars 4A (Horizontal)** (Field cut as required to maintain minimum cover for Extremely Aggressive Environments)

**Field bond Bars 4A to maintain minimum cover for Extremely Aggressive Environments**

**Bars 4B (Horizontal)** (Field cut as required to maintain minimum cover)

**Bars 4A (Horizontal)** (Field cut as required to maintain minimum cover)

**REINFORCING STEEL NOTES:**

* For Slightly and Moderately Aggressive environments.
** For Extremely Aggressive environments.

**C-I-P COPING ENCLOSURE DETAIL**

**LEVELING PAD FOR MSE WALL SHOWN...**

**Dowel Bars 4D (See Note 2, Sheet 1)**

**Dowel Bars 4D (See Note 2, Sheet 1)**

**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.

**Note:** When precast coping units do not fit 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.
**Coping**

**Preformed Expansion Joint**

**DESCRIPTION:**

- Open Joint
  - 1:4
  - 8:4
  - P M
- Open Joint

**SHEET 1**

Open joints in Concrete Barrier (See Note 5)

Shear Key

11/01/17

for details)

(flex typical sections
1" Ø Dowel Load Transfer Devices (See Typical Sections
Index 400-091 - Approach Slabs (Rigid Pavement Approaches)
Index 400-090 - Approach Slabs (Flexible Pavement Approaches)

11. The following Indexes contain details of the intersection of the retaining wall at approach slabs:

- Field cut reinforcing as required to maintain minimum cover (Typ.)
- Spacing Bars 5V1 or 5V1 (Typ.)
- Expansion Joint (See "Expansion Joint Detail" on this sheet and Detail "A")

PARTIAL PLAN VIEW FOR 36" SINGLE-SLOPE CONCRETE BARRIER

(Precast Coping Shown, C-I-P Coping Similar) (Concrete Barrier not Shown for Clarity)

**JUNCTION SLAB NOTES:**

1. Construct the expansion joints, V-Grooves and face of coping plumb.
2. Provide Class III 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 Transfer Devices in accordance with Specification Section 350.
4. Construct 1/2" Expansion Joints in junction slabs and C-I-P copings plumb and perpendicular or radial to the Gutter Line. Provide at 90'-0" minimum intervals as shown. Provide 3" flat mortar plugs in open joints at the base of Concrete Barriers to contain runoff.
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 and install preformed expansion joint filler in accordance with Specification Section 932.
7. Construct 1/2" V-Grooves in junction slabs and C-I-P copings at 30'-0" minimum intervals as shown. Space V-Grooves equally between 1/2" Expansion Joints and/or Begin or End Expansion Joint Slab. V-Groove locations are to coincide with V-Groove locations in the Concrete Barrier.
8. Shoulder or roadway pavement is required on top of the junction slab for its entire length on the traffic side of the Concrete Barrier. See typical sections on sheets 2 and 3 for details.
9. Spacing shown is along the Gutter Line.
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. 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 ELEVATION VIEW**

(Precast Coping and Junction Slab Reinforcing not shown for Clarity)

(Precast Coping Shown, C-I-P Coping Similar)
**Description:****

**CONCRETE BARRIER/JUNCTION SLAB - WALL COPING**

**FY 2019-20**

**INDEX**

**SINGLE-SLOPE CONCRETE BARRIERS**

**DETAIL "A"**

(Showing Locations of 1/2" V-Grooves and 3" Preformed Expansion Joint Filler)

**TYPICAL SECTION THRU PRECAST 36" SINGLE-SLOPE CONCRETE BARRIER AND COPING WITH C-I-P JUNCTION SLAB**

**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.
4. For Asphalt: Shoulder or Roadway Pavement will be SuperPave Structural asphalt. Vary the Junction Slab slope based on roadway cross slope to maintain a minimum 6" asphalt depth at the edge of the slab as shown.
5. Minimum length of Junction Slab between expansion joints is 30'-0".
6. 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.
7. Contractor to maintain stability of precast coping/Concrete Barrier 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.
8. 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.
9. Angle varies 0° min., 25° max.
REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
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<tr>
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<th>C-I-P COPING</th>
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<td></td>
<td></td>
<td>FOR SINGLE SLOPE</td>
<td>FOR SINGLE SLOPE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(36&quot;)</td>
<td>(42&quot;)</td>
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<td>A</td>
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<td>V1</td>
<td>5</td>
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<td>2'-0&quot;</td>
<td>2'-0&quot;</td>
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</table>

BARS SBI, SB2, SC, SF, 4S, & 6S

3'-9"

STIRRUP BAR 4P (36") 5P (42")

STIRRUP BAR 4V1 (36") 5V1 (42")

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at expansion and open joints will have a 2" minimum cover.
3. Lap splices for Bars SB & SE will be a minimum of 2'-2".
4. For Precast Copings only, lap splice Bars SA with Bars SC. Lap splices will be a minimum of 2'-2".
5. The Contractor may use either full length Bars SA or lap splice with Bars SC at Bars SA for C-I-P Copings.
6. Dimension is for lap splice option. For mechanical coupler option, this dimension is 7'-25" (36" Single-Slope) or 1'-42" (42" Single-Slope).
7. Dimension is for lap splice option. For mechanical coupler option, this dimension is 4'-8".
8. When approved by the Engineer, the Contractor may use deformed Welded Wire Reinforcement (WWR) meeting the requirements of Specification Section 93).
9. Contractor may use a single #5 stirrup in lieu of two bars for 4P and 4V1.

ESTIMATED QUANTITIES FOR C-I-P

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(The above concrete quantities are based on a max. super-elevation of 6.25%)

CONCRETE BARRIER/JUNCTION SLAB - WALL COPING

TYPICAL SECTION THRU C-I-P CONCRETE BARRIER WITH C-I-P JUNCTION SLAB AND C-I-P COPING
(PRECAST COPING SIMILAR WITH C-I-P BUILDUP)
EXPANSION JOINT DETAIL

(Raised Sidewalk, expansion joints are to coincide with 3/8" open joints in Concrete Barrier)

** Stay-In-Place Plastic Preformed Bond Breakers are permitted to form joints.

RAISED SIDEWALK NOTES:

1. When a 42" Vertical Shape is used with a precast coping, increase Bar 4C to Bars 5C or provide Bar 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 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.

5. Provide 3/8" 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 extremely aggressive environments.

7. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.

8. Construct 3/8" V-Grooves in raised sidewalk and C-I-P copings at 30'-0" maximum intervals as shown. Space V-Grooves equally between 3/8" Expansion Joints and/or Begin or End Raised Sidewalk V-Groove locations are to coincide with V-Groove locations in the Concrete Barrier. Space shown is along the Gutter Line.

9. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.

10. Finish Sidewalks in accordance with Specification Section 932.

11. 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: For Detail "B", see Sheet 4.

PARTIAL ELEVATION VIEW

(Precast Coping & Raised Sidewalk Reinforcing not shown for Clarity)

(Precast Coping Shown, C-I-P Coping Similar)
**END VIEW OF 32" VERTICAL SHAPE END TRANSITION FOR GUARDRAIL ATTACHMENT** (Showing Bars SS, Bars ST and Bars SX) (Precast Coping Shown, C-I-P Coping Similar)

**NOTE:** See Sheet 4 for End Transition Elevation.

---

**ESTIMATED QUANTITIES FOR PRECAST COPING**

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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. 9'-11" dimension is based on a 32" Vertical Shape 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 ST and SX to clear construction joint for 42" Vertical Shape.
4. At the Contractor's option, mechanical couplers may be used to splice reinforcing. Complete details, including reinforcement lengths are required in the Shop Drawings. Mechanical couplers shall develop 125% of the bar yield strength.
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 Polyethylene to provide a maximum 2½" air gap.
7. For Bullet Railings, see Index 515-821 and 515-822.

8. Begin placing Railing Bars ST and SX 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 ST and SX shall be made immediately adjacent to Begin or End Bridge. Cut, shift and rotate Bars ST and SX as required to maintain cover in 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)

**FY 2019-20 STANDARD PLANS**

**CONCRETE BARRIER/RAISED SIDEWALK • WALL COPING**

**INDEX**

**SHEET** 2 of 4
The above concrete quantities are based on a Type D Concrete Curb on a level Retaining Wall (See Note 1).

1. Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 6'-6" dimension is based on a 42" Vertical Shape 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 ST and SX 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 ST and SX shall be made immediately adjacent to Begin or End Retaining Wall. Cut, shift and rotate Bars ST and SX as required to maintain cover in End Transition.

NOTES:
1. Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 6'-6" dimension is based on a 42" Vertical Shape 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 ST and SX 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 ST and SX shall be made immediately adjacent to Begin or End Retaining Wall. Cut, shift and rotate Bars ST and SX as required to maintain cover in End Transition.

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

42° VERTICAL SHAPE

NOTES:
1. Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 6'-6" dimension is based on a 42" Vertical Shape 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 ST and SX 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 ST and SX shall be made immediately adjacent to Begin or End Retaining Wall. Cut, shift and rotate Bars ST and SX as required to maintain cover in End Transition.

THE ABOVE CONCRETE QUANTITIES ARE BASED ON A TYPE D CONCRETE CURB ON A LEVEL RETAINING WALL (SEE NOTE 1).
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

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<td>5'-1&quot;</td>
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</table>

STIRRUP BAR 5T

To Be Field Cut & Discard

BAR 5A

END TRANSITION STIRRUP BARS 5T FOR 42"
To Be Field Cut (7 of each required per Railing End Transition)

BAR 5X

END TRANSITION STIRRUP BARS 5X FOR 42"
To Be Field Cut (7 of each required per Railing End Transition)

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 will be a minimum of 2'-2".
5. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 7'-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.

VARIABLES (Field cut to Field Cut & Discard)

1" Ø Dowel Smooth Bar 2'-0" 2'-0"
32" 42"
T 5 7'-4" 9'-2"
X 5 5'-1" 6'-0"

STIRRUP BAR 5T

For 42" & Bars 5X*

END TRANSITION ELEVATION FOR 32" VERTICAL SHAPE
(Guardrail Not Shown For Clarity)

ESTIMATED CONCRETE BARRIER QUANTITIES

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<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<tr>
<td>Reinforcing Steel</td>
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VERTICAL SHAPE
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 ⅛ 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 ⅛" V-Grooves in sidewalk and C-I-P coping. Space V-Grooves at 30'-0" Maximum intervals equally spaced between ⅛" 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 building concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
7. Work this Index with Index 521-501 - Concrete Barrier Wall Drawings for number and spacing of Dowel Bars 4D.
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)

PARAPET WITH C-I-P SIDEWALK - WALL COPING

10/30/18

LAST REVISION: 07/06/20

DESCRIPTION:

REVISED: 08/06/20

MY 2019-20

STANDARD PLANS

INDEX 521-630

PARAPET WITH C-I-P SIDEWALK - WALL COPING

1 of 2 SHEET
PLAN VIEW
(Junction Slab Shown, Raised Sidewalk Similar)

6'-10" (See Note 2)

SECTION A-A
SECTION THRU JUNCTION SLAB, BARRIER WALL INLET and RETAINING WALL
(Junction Slab Shown, Raised Sidewalk Similar)

REINFORCING STEEL BENDING DIAGRAMS - DRAINAGE

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>REQD</th>
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<tr>
<td>U2</td>
<td>11</td>
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<td>VARIES</td>
</tr>
<tr>
<td>U3</td>
<td>4</td>
<td>5</td>
<td>12'-10&quot;</td>
</tr>
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</table>

STIRRUP BAR 4S2

BAR 5S3

BAR 5U2

BAR 5U3

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.

NOTES:
1. Spacing shown is 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 4S2 @ 6" spacing for Raised Sidewalks).
2. Dimensions shown are for junction slab. Increase width as required for C-I-P Raised Sidewalk and Sidewalks.
3. Actual location & width vary depending on type of Retaining Wall used.
4. See Index 521-610 for Bars 4V1 or 5V1 and 5B1.
5. Organic Felt bond breaker (Top) & Expanded Polystyrene shown hatched (ƀ" Side).
6. Locate % Barrier Wall Inlet a minimum of 10'-0" away from % Expansion Joints in Junctions Slab, Raised Sidewalk or Sidewalk, C-I-P Coping and Traffic Railing or Concrete Parapet.
7. Work this Index with the following as appropriate:
   - Index 521-610
   - Index 521-620
   - Index 521-630

DESCRIPTION:

REVISION

LAST

REVISED

INDEX

SHEET

FY 2019-20
STANDARD PLANS

DRAINAGE INLET OPENINGS IN JUNCTION SLAB - WALL COPING
**LIGHT POLE PEDESTAL NOTES:**

1. **ANCHOR BOLTS:**
   - Anchor Bolt design is based on the standard Roadway Aluminum Light Pole configurations shown on Index F1554-040 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 1, Heavy-Hex.
   - Washers: ASTM F436 Type 1.
   - Anchor Plate: ASTM A709 (Grade 36) or ASTM A36.
   - Coating: Galvanize all Nuts, Bolts, Washers, and plates in accordance with ASTM F2329.
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 Concrete Barrier 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 Concrete Barrier and Coping section.
12. For Estimated Quantities, see Sheet 6.
13. Unless otherwise noted, Concrete Barrier (36” Single-Slope) is shown in all Views and Sections. The Pedestal details for other Concrete Barriers or pedestrian/bicycle railings are similar.

---

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

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<td>140</td>
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<td>75, 75</td>
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<tr>
<td>160</td>
<td>8 &amp; 10</td>
<td>75, 75, 45**</td>
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<td>160</td>
<td>12 &amp; 15</td>
<td>75, 75, 25**</td>
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* Above Natural Ground
** Use 1½” Ø Anchor bolts for wall heights greater than the height shown and less than 75’.
TYPICAL SECTION AT LIGHT POLE PEDESTAL

(Junction Slab Shown, Raised Sidewalk or Sidewalk Similar) (36° Single-Slope Concrete Barrier shown, other railings similar)

NOTES:
1. Provide Concrete Class to match adjacent coping.
2. For junction slabs, increase the 1'-0" depth dimension to 1'-2".
3. For Parapet with sidewalk see Index 521-630, but increase 6" sidewalk depth to 1'-6".
4. The minimum length of the Junction Slabs, raised sidewalks and sidewalks is 30'-0", measured along the Gutter Line.
5. Bars 4J are only required when pedestals are behind a Concrete Barrier or Concrete Barrier/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 (Concrete Barrier/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**

**ELEVATION VIEW**
(Junction Slab Reinforcing & Bars 4j not Shown for Clarity) (Junction Slab Shown, Raised Sidewalk or Sidewalk Similar)

**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.

**REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

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<tr>
<td>M2</td>
<td>4</td>
<td>10</td>
<td>7'-0&quot;</td>
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</table>

**ITEM** | **UNIT** | **QUANTITY**
--- | --- | ---
Concrete (Pedestal) | CY | 0.926
Concrete (Thickened Junction Slab) | CY | 1.222
Reinforcing Steel | LB | 334.09

(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.)

**DETAIL "A"**
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 Driveways see Index 522-003.

4. Bond breaker material can be any impermeable coated or sheet membrane or preformed material having a thickness of not less than 6 mils and not more than 0.30”.

5. Construct sidewalks with Edge Beam through the limits of any surface mounted Pedestrian/Bicycle Railing or Pipe Guiderail shown in the Plans. (See RAILING DETAIL)

LEGEND:

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

OPEN JOINTS

120' Max.

SAWED JOINTS

LONGITUDINAL SECTION

LEGEND:

A- ½" Expansion Joints (Preformed Joint Filler) between the sidewalk and: driveways, sidewalk-intersections, and all other fixed objects (e.g. drainage inlets and utility poles).

B- ½” Dummy Joints, Tooled

C- ½” Formed Open Joints

D- ½” Saw Cut Joints, ½” Deep (within 96 hours) Max. ½” Centers

E- ½” Saw Cut Joints, 1½” Deep (within 12 hours) Max. 30” Centers (Joints Required When Length Exceeds 30’)

F- ½” Expansion Joint When Run of Sidewalk Exceeds 120’. Intermediate 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
**Flexible Pavt.**

**Rigid Pavt.**

---

**LONGITUDINAL SECTION**

**Sawed Joints**

**Legend:**

A - 1/6" Expansion Joints (Preformed Joint Filler) between the sidewalk and driveways, sidewalk-intersections, and all other fixed objects (e.g. drainage inlets and utility poles).

B - 1/6" Dummy Joints, Tooled

C - 1/6" Formed Open Joints

D - 1/2" Saw Cut Joints, 1/2" Deep (within 96 hours) Max. 5' Centers

E - 1/2" Saw Cut Joints, 1/16" Deep (within 12 hours) Max. 30' Centers

F - 1/6" Expansion Joint When Run Of Sidewalk Exceeds 120'. Intermediate locations when called for in the plans or at locations as directed by the engineer.

---

**SIDEWALK JOINTS**

---

**PLAN**

**CONCRETE SIDEWALK ON FLUSH SHOULDER ROADWAYS**
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. Maintain a single longitudinal slope along each side of the curb ramp. 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 522-002. 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, curb and gutter, or sidewalk to the nearest joint beyond the curb transition or to the extent that no remaining section 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.
SIDEWALK CURB RAMPS CR-A AND CR-B

NOTE: For Example of CR-A used in Radial Curb Returns, See Sheet 8.

CR-A

ISOMETRIC VIEW

PLAN VIEW

SECTION A-A

FOR EXAMPLE OF CR-A USED IN RADIAL CURB RETURNS, SEE SHEET 8.
NOTE: For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

MONOLITHIC CAST CURB

SEPARATELY CAST CURB

CONSTRUCTION OF SIDEWALK CURB IN CUT SECTIONS

NOTE: For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.
NOTES:
1. Crosswalk Width and Configuration Vary; Must Conform to Index 711-001.
2. 15' Radius Curve Shown for CR-L.
3. For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details, on Sheet 3.
LANDINGS FOR CURB RAMPS WITHOUT SIDEWALKS

(See CR-F, CR-G & CR-K Respectively For Detectable Warning Details/Options)

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

NOTE: Remove Elevated Pavement by Spading And Rolling, Smooth Milling, or Grinding.

SECTION C-C

PAVEMENT RELIEF DETAILS

CURB RAMPS WITHOUT SIDEWALKS AND 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 were 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.

Rail Car Width

Rail Car Width

NOTES:
3. Flangeway Gap may be up to 3" for Freight-only Railways.
2. Crosswalk widths and configurations vary; must conform to Index 711-001.
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.
GENERAL NOTES:
1. Work this Index with Specification 522.
2. Refer to Index 520-001 for drop curb details and Index 522-001 for joints between driveway, sidewalks, and curb.
3. Existing Curb and Gutter:
   Remove existing curb and gutter to either the nearest joint beyond the flared point or to where no remaining section is less than 3 feet long.
4. Grades and cross slopes shown are maximums.
5. Longitudinal Joints:
   Construct 1⁄8" open joints placed at equal (20 max.) intervals for driveways over 20 wide. Match joints in curb and gutter to match joints in driveways.
6. Transverse Joints:
   Construct 1⁄8" open joints @ 10' Centers and 1⁄8" expansion joints with prefurred joint filler every 5th joint.
7. Construct driveways (6" thick concrete) to a uniform width (W) to the R/W line or to the extent shown in the Plans.
8. Width of Sidewalk Thru Driveway is 4'-0" minimum. Match sidewalk width when shown in Plans or when utility strip width is equal to or greater than the depth of the Driveway Apron.
9. Alpha-Numeric Identification:
   Concrete flared driveway Alpha-Numeric Identifications (e.g. G4) are provided for reference purposes in the Plans.

LEGEND:
- Sidewalk
- Flared Driveway (6" Thick Concrete)
- Sidewalk Thru Driveway (6" Thick Concrete)
- Utility Strip
- G4 Grade of Apron
- G5 Grade of Driveway (Per Plans)

CONCRETE FLARED DRIVEWAY NOMENCLATURE

CONCRETE FLARED DRIVEWAYS
INDEX 522-003
SHEET 1 of 4
**Concrete Flared Driveways**

**Legend:**
- Sidewalk
- Flared Driveway (6" Thick Concrete)
- Sidewalk Thru Driveway (6" Thick Concrete)
- Utility Strip

**Revision Details:**
- Last Revision: 11/01/18
- Description: FY 2019-20 Standard Plans

**Index:**
- 522-003

**Sheet:**
- 2 of 4
DESCRIPTION:

SIDEWALK WITHOUT UTILITY STRIP

NOTE:
5' sidewalks shown.

SIDEWALK WITH UTILITY STRIP ON 0.02 SLOPE

SIDEWALK WITH UTILITY STRIP ON 0.04 SLOPE

DRIVEWAY SECTIONS ON CURBED FACILITIES WITH SIDEWALKS

FY 2019-20
STANDARD PLANS

CONCRETE FLARED DRIVEWAYS

INDEX 522-003

SHEET 3 of 4

LAST REVISION 11/01/18
**Standard Paved Ditch**

**TYPICAL SECTION**

**SHEET 3**

**Grade**

**REVISION**

**5'** Ditch Bottom Width

**7'** Median Swale

**6'** Front Slopes; **1:4** Back Slope

**W**- **Normal Ditch Elevation**

**Point B**

**W**- **Normal Ditch Elevation**

**Point A**

**Varies (25' Min.)**

**Paved Ditch End Treatment**

**General Notes**

1. Type of ditch pavement shall be as shown on plans.

2. In concrete ditch pavement, contraction joints are to be spaced at 25' minimum intervals, or as directed by the Engineer. Contraction joints may be either formed (construction joint) or tooled. No open joints will be permitted in concrete ditch pavement.

3. Lip at end of ditch pavement shall normally be located downstream of DPA, or on flatter grades where there is a decrease in ditch velocity.

4. Trenches are to be used with all ditch paving. A trench is not required adjacent to drainage structures.

5. When directed by the Engineer, weep hole spacing may be reduced to 5' minimum.

6. For junction of R/W ditch spillway and lateral ditch, sides of paving to be 1' high minimum.

7. For ditch pavements requiring filter fabric (See Table 1) place the filter fabric directly beneath the pavement for the entire length and width of the pavement. See Specification 985 for fabric requirements and application.

8. When weep holes with aggregate are used, place filter fabric below the aggregate to form a mat continuous with the pavement filter fabric or underlapping the pavement filter fabric, if present.

9. Ditch pavement requiring reinforcement shall be detailed in the plans.

10. Cost of plastic filter fabric to be included in the contract unit price for ditch pavement.

11. Sodding to be paid for under contract unit price for Performance Turf, SY.

**TABLE 1: DITCH PAVEMENT**

<table>
<thead>
<tr>
<th>Pavement Type</th>
<th>Dimensions</th>
<th>Payment Unit</th>
<th>Basis of Estimate</th>
<th>Type of Filter Fabric</th>
<th>Range</th>
<th>References &amp; Remarks</th>
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<td>Miscellaneous Asphalt</td>
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**Filter Fabric Required**

**Flow Line**

**Up (1' Rise)**

**SECTION EE**

**PLAN**

**PAVED DITCH END TREATMENT**

**GENERAL NOTES**

1. Type of ditch pavement shall be as shown on plans.

2. In concrete ditch pavement, contraction joints are to be spaced at 25' minimum intervals, or as directed by the Engineer. Contraction joints may be either formed (construction joint) or tooled. No open joints will be permitted in concrete ditch pavement.

3. Lip at end of ditch pavement shall normally be located downstream of DPA, or on flatter grades where there is a decrease in ditch velocity.

4. Trenches are to be used with all ditch paving. A trench is not required adjacent to drainage structures.

5. When directed by the Engineer, weep hole spacing may be reduced to 5' minimum.

6. For junction of R/W ditch spillway and lateral ditch, sides of paving to be 1' high minimum.

7. For ditch pavements requiring filter fabric (See Table 1) place the filter fabric directly beneath the pavement for the entire length and width of the pavement. See Specification 985 for fabric requirements and application.

8. When weep holes with aggregate are used, place filter fabric below the aggregate to form a mat continuous with the pavement filter fabric or underlapping the pavement filter fabric, if present.

9. Ditch pavement requiring reinforcement shall be detailed in the plans.

10. Cost of plastic filter fabric to be included in the contract unit price for ditch pavement.

11. Sodding to be paid for under contract unit price for Performance Turf, SY.

**DESCRIPTION:** FY 2019-20 STANDARD PLANS

**INDEX:** 524-001 SHEET 1 of 2
**TABLE 2: SOD QUANTITIES (SY)**

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<td>68</td>
</tr>
</tbody>
</table>

Note: Sodding quantities for each endwall to be determined by the designer from this detail.

*(EXCEPT INDEX 430-030)*

**STRAIGHT ENDEWALL**

**INDEX 430-030**

**U-TYPE ENDEWALL**

**INDEX 430-011**

**FLARED ENDEWALL**

**INDEX 430-040**

**WINGED ENDEWALLS**

**INDEX 430-020**

---

**FILTER FABRIC PLACEMENT AT CONCRETE STRUCTURE**

- **Sand-Cement Or Rubble Riprap**
- **12" Bituminous Coating On Face Of Concrete**
- **Treated Timber**
- **1"x2" Pressure Treated Timber Nailed To Surface**

**SOD PLACEMENT AT PIPE/CULVERT END TREATMENTS**

- **Endwall With Baffles**

---

**AS CONSTRUCTED**

**REV 01/17**

**INDEX**

**524-001**

**DESCRIPTION:**

**DITCH PAVEMENT AND SODDING**

**FY 2019-20 STANDARD 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.
   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: +/- ½'
   B. Thickness: +/- ½'
   C. Plane of side mold: +/- 1/16'
   D. Openings: +/- ½'
   E. Out of Square: 1/8" per 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"
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)

1:15 Min. Bevel

MORTAR JOINT

[child texture]

Amplitude

4" o.c.

1" o.c.

Typ. Random 3/8" - 3/4" Gravel Texture

TEXTURE OPTIONS

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.
REVISION DESCRIPTION:

NOISE WALLS - (PRECAST)

FORMATION DETAILS

HALF ELEVATION
(Front Face Post and Panel Texture Type "H" shown)
(Graphic Type SE-2 shown)
(Two stacked panels shown, three stacked panels 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.
**NOTE:**
At the Contractor's 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. If these criteria are met, the vertical steel may be reduced to #4 Bars @ 1'-3" (As=0.16 in²/ft.).

- See Detail "A" - SIDE-INSTALLED
- See Detail "B" - TOP-INSTALLED

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

- Pick up points

### SECTION D-D
(Showing Flushed Type Panel)

- Texture: Non-Roadway Face (Back Face)
- Texture: Front Face

### SECTION D-D
(Showing Recessed Type Panel)

- Continuous V-Groove (Not required for Bottom Panel)

### SECTION C-C

**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

CASE 1
(Interior Angle)

CASE 2
(Exterior Angle)

CASE 2
(Exterior Angle)

CASE 1
(Interior Angle)

DETAIL "C"

DETAIL "D"

DETAIL "E"
(Back Face Chamfer Shown Front Face Chamfer Similar)

PIVOTING DETAILS
(Flush Type Panel)

PIVOTING DETAILS
(Recessed Type Panel)

TYPICAL PANEL DETAILS
DRAINAGE HOLES TYPES A, B, C & D
(Front Face of Wall Shown)
(Two Holes Shown, One Hole Similar)

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 $\frac{1}{2}''$ Ø x 2'' min. corrosion resistant (zinc/aluminum alloy or stainless steel) expansion 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 HOLE DETAILS

BAR BENDING DETAILS (#3 Bars)

NOTE:
* Hole Types A, B, C and D refer to distance from bottom of panel to center of opening. See Wall Control Drawings in the plans.
**STANDARD POST REINFORCEMENT**

(Standard Post Shown, 45° Corner Posts Similar)

**TYPICAL POST**

- **Pile Length (H Section):**
  - Standard Post (See Sheet 2)
  - Top of Collar (Elev. A)

- **Top of Wall**
  - Bars B
  - Bars A
  - Bars P2 (Typ.)

- **Post Length (H Section):**
  - Bars B
  - Bars A
  - Bars P1 (Typ.)

- **TYPICAL POST SECTION**
  - (H Section)
  - 1'-4" 3" 4'-6"
  - 1'-4" 3" 4'-6"
  - 1'-4" 3" 4'-6"

- **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 J-J**
  - 1'-4" 2 Equal sp.
  - Bars B
  - Bars A
  - Bars P1 (Staggered)
  - Bars P2 (Staggered)

- **SECTION L-L**
  - 1'-4" 2 Equal sp.
  - Bars B
  - Bars A
  - Bars P1 (Staggered)
  - Bars P2 (Staggered)

- **SECTION K-K** (Collar Section)
  - 2" Cover
  - Bars B
  - Bars A
  - Bars P2

- **SECTION H-H**
  - 1'-4" 2 Equal sp.
  - Bars B
  - Bars A
  - Bars P1 (Staggered)

**STANDARD POST DETAILS**

1. For Post Reinforcing see Sheets 15 and 16.
2. For Pile Lengths Tables see Sheets 15 and 16.
REVISION DESCRIPTION:

NOISE WALLS - (PRECAST) FY 2019-20
STANDARD PLANS

POST PLACEMENT & PILE REINFORCING STEEL DETAILS

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

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

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

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

1. 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".

1. 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".

30° Ø or 36° Ø Auger Cast Pile

30° Ø or 36° Ø Auger Cast Pile

Projected Location of Bearing Pad (Typ.)
(See Sheet 1, Note H)

Projected Location of Bearing Pad (Typ.)
(See Sheet 1, Note H)

EXPOSED PRECAST POST REINFORCEMENT (Typ.)

EXPOSED PRECAST POST REINFORCEMENT (Typ.)

10 – #9 Bars (Typ.), See Section P-P

10 – #9 Bars (Typ.), See Section P-P

SECTION N-N

SECTION M-M

SECTION P-P

Low Clearance Option

Low Clearance Option

1ramento & Pile Reinforcing Steel Details

1ramento & Pile Reinforcing Steel Details
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.
**DESCRIPTION:**

**REVISION**

**LAST STANDARDS PLAN:** FY 2019-20

**SHEET INDEX:** 11

---

**SECTION R-R**

- Bars P5 (Pairs) @ 7-1/2" Max.
- Bars P5 @ 6'-0" (See Note 1)
- #4 Bars and Bars B
- Bars P5 (Pairs)

**SECTION S-S**

- Bars P4 @ 7-1/2" Max.
- Bars P4 @ 5 equal 5s

---

**LOW CLEARANCE OPTION**

- Bars P4 @ 1'-0" Max.

---

**TYPICAL POST**

- Bars A and Bars B
- Bars P5 (Pairs)
- Bars P4 (Typ.)

---

**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.

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**POST SURFACE FEATURES NOT SHOWN FOR CLARITY**

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**REV 01/01/16**

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**NOISE WALLS - (PRECAST)**

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**INDEX 534-200**

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**SHEET 11 of 16**
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".

SECTION T-T
C-I-P COLLAR

SECTION U-U

90° CORNER TYPICAL POST PLACEMENT DETAILS

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".
**BAR BENDING DETAILS**

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

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

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (FEET)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 130 MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10'-0&quot; POST SPACING</td>
<td>20'-0&quot; POST SPACING</td>
</tr>
<tr>
<td></td>
<td>SIZE</td>
<td>BARS</td>
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<td>12</td>
<td>13'-0&quot;</td>
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<td>21'-2&quot;</td>
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<tr>
<td>22</td>
<td>23'-0&quot;</td>
<td>23'-2&quot;</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (FEET)</th>
<th>H-POSTS 10'-0&quot; POST SPACING</th>
<th>CORNER POSTS 20'-0&quot; POST SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SOIL 1</td>
<td>SOIL 2</td>
</tr>
<tr>
<td>30'-0&quot;</td>
<td>30'-0&quot;</td>
<td>30'-0&quot;</td>
</tr>
<tr>
<td>36'-0&quot;</td>
<td>36'-0&quot;</td>
<td>36'-0&quot;</td>
</tr>
</tbody>
</table>

**TABLE NOTE:**
1. Bars D and Bars E are for 45° Corner Posts only.
2. See Contract Plans for project wind speed.
4. Soil 2 = Medium Dense Granular Soil, N = 10 to 40.

**PILE DEPTH & REINFORCING SUMMARY**

- Bar Length = 5'-5"  
- Bar Length = 2'-10"  
- Bar Length = 1'-4"
### TABLE 2A - TABLE OF POST REINFORCING STEEL

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 150 MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10'-0&quot; POST SPACING</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BARS A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SIZE</td>
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<tr>
<td>12</td>
<td>13'-0&quot;</td>
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<td>22'-0&quot;</td>
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</tbody>
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### TABLE 2B - TABLE OF POST LENGTHS (Feet) - WIND SPEED = 150 MPH

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 150 MPH</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10'-0&quot; POST SPACING</td>
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<td></td>
<td></td>
<td>H-POSTS</td>
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### TABLE 3A - TABLE OF POST REINFORCING STEEL

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 170 MPH</th>
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<tbody>
<tr>
<td></td>
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<td>10'-0&quot; POST SPACING</td>
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<tr>
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<td>BARS A</td>
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<tr>
<td></td>
<td></td>
<td>D</td>
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<td>SIZE</td>
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### TABLE 3B - TABLE OF POST LENGTHS (Feet) - WIND SPEED = 170 MPH

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 170 MPH</th>
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<td>10'-0&quot; POST SPACING</td>
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<td>H-POSTS</td>
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<td>30'</td>
</tr>
</tbody>
</table>

### TABLE NOTE:
1. Bars D and Bars E are for 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

**FY 2019-20 STANDARD PLANS**

**NOISE WALLS - PRECAST**

**INDEX**

534-200

**SHEET**

16 of 16
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. Contractor must also select the desired foundation type. Modifications to this Index is restricted to those required for geometric needs only.
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 feet only at changes in horizontal alignment, wall terminations or to accommodate steep grades.
4. See "Perimeter Wall Details" in the plans for project requirements.
5. Field verify the locations of all overhead and underground utilities shown in the Wall Control Drawings.

PRECAST OPTION NOTES:
6. WALL NOTES:
   A. Walls may consist of either a single height panel or two stacked panels. Minimum panel height is 4'-0".
   B. Only when reduced overhead clearance between posts prohibits installation of panels from the top, side-installed panels are allowed. After panel is centered between posts, grout between panel ends and posts.
7. CONCRETE AND GROUT:
   A. Cast-In-Place and Precast Concrete: Class IV
   B. Grout for Auger Cast Piling: Minimum 28 Day Strength = 5000 psi
   C. Minimum Compressive Strength for Form Removal and Handling of Posts, Panels and Precast Spread Footings:
      i. 2,500 psi for horizontally cast post, panels and precast spread footings.
      ii. 2,000 psi for vertically cast panels or when tilt-up form tables are used for horizontally cast panels.
8. REINFORCING STEEL:
   A. Concrete Cover: 1/2" unless otherwise noted
   B. In addition to the requirements of Specification Section 415, tie post and pile stirrups at the following locations as a minimum:
      i. Post stirrups - Tie at all four corner bar and at every third interior bar intersection.
      ii. Pile Stirrups - Tie to the main vertical reinforcing at alternate intersections.
9. BEARING PADS:
   A. Bearing Pads for Collar or Pedestal Bearing Points and between stacked panels may be either Plain or Fiber Reinforced Neoprene Pads, in accordance with Specification Section 932 for ancillary structures.
10. CASTING TOLERANCES:
    A. Overall Height & Width: +/- 1/2"
    B. Thickness: +/- 1/2"
    C. Plane of side mold: +/- 1/16"
    D. Openings: +/- 1/2"
    E. Out of Square: 1/8" per 6 ft., but not more than 1/2" total along any side
    F. Warping: 1/8" per foot distance to nearest corner
    G. Bowing: 1/240 panel dimension
11. PILING:
    A. Construct Auger Cast Piling in accordance with the Plans and Specification Section 455.

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 1.2 (9mm) galvanized ladder reinforcing spaced at 16" 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 A 36 smooth round bars hot-dip galvanized in accordance with Specification Section 462. Install Dowel Load Transfer Devices in accordance with Specification Section 230.
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 T-180. Perform soil density tests at 100 feet 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 tooing joints.
L. Use soap and potable water to clean walls. If stain removal is necessary, use a cleaning method indicated in NCMA TECH 8-2A 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 of a minimum of 2 feet 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
   D. Grout: Type S; coarse grout.
   E. Dowel: Type M1, minimum 1.25" in diameter.
   F. anchors - Use plain round bars hot-dip galvanized in accordance with Specification Section 932.
   G. Bearing Pads for Collar or Pedestal Bearing Points and between stacked panels may be either Plain or Fiber Reinforced Neoprene Pads, in accordance with Specification Section 932 for ancillary structures.
   H. Dowel Load Transfer Devices will be ASTM A 36 smooth round bars hot-dip galvanized in accordance with Specification Section 462. Install Dowel Load Transfer Devices in accordance with Specification Section 230.
   I. 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 T-180. Perform soil density tests at 100 feet intervals.
   J. 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 tooing joints.
   K. Use soap and potable water to clean walls. If stain removal is necessary, use a cleaning method indicated in NCMA TECH 8-2A applicable to the type of stain on the exposed surface.
   L. 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 of a minimum of 2 feet down each side and secure in place.
   M. Comply with Hot Weather Requirements in ACI 530.1.

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 cimentitious 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.
DRAINAGE HOLE TYPES A, B, C & D

Type A: 8" (Min.)
Type B: 1'-0" (Min.)
Type C: 1'-4" (Min.)
Type D: 1'-8"

* 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"

4" Ɓ 4

Ɓ 4

4

Ɓ 4

(Elevating Step of Wall)

**Typical Plan**

*Nominal embedment (not including tolerances)*

**Typical Elevation**

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

**Precast Option - Typical Details**

**Pivoting Joint Details**

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

**SECTION D-D**

**SECTION E-E**

**Elevation Step At Top Of Wall**

(Precast Panel Cap not Shown)

3" x 4" x Ɓ"

Bearing Pad

Front Face

**Elevation Step At Bottom Of Wall**

(Bottom Panel)

**Precast Post Cap (Typ.)**

(See Sheet 2)

**Non-roadway face of wall/**

Back Face of Panel

**Roadway face of wall/**

Front Face of Panel

**Typical Plan**

**TYPICAL PLAN**

**TYPICAL ELEVATION**

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

**PIVOTING JOINT DETAILS**

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

**Auger Cast Pile (Typ.)**

**Post Spacing (S)**

(10'-0" Max.)

**Post & Pile**

**Bearing Pads**

6/4

5/4

**Post (Typ.)**

**Top of wall elevation**

**Finished Grade**

**Bottom of wall elevation**

**Top Panel**

**Auger Cast Pile (Typ.)**

**Post (Typ.)**
**PRECAST OPTION - TYPICAL PANEL DETAILS**

**SECTION F-F**

- **Panel Height (H) 0.586 L**
- **Panel Length (L) 0.207 L**
- **Panel Height (H) 0.207 L**

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

**TYPICAL PANEL ELEVATION**

- **Panel Length (L) 0.207 L**
- **Panel Height (H) 0.586 L**

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

**Horizontal Steel** - #4 Bars @ 7/2 (As=0.32 in.²/ft.) (Typ.)

**STANDARD PICK UP POINTS FOR PANELS**

(Panels shall be rotated about long axis only)

**SECTION G-G**

- **Panel Height (H) 0.586 L**
- **Panel Length (L) 0.207 L**

**Patented Texture**

- **Front Face**

**NOTE:**
- In lieu of utilizing the standard pick up points below, panels may be cast vertically or cast horizontally then lifted 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.).

**DETAIL "B" - TOP-INSTALLED**

(Typ. Both Ends)

**DETAIL "B" - SIDE-INSTALLED**

(Typ. Both Ends)
**SECTION H-H**

(Reinforcing not Shown for Clarity)

**SECTION I-I**

(Typical Post Option)

**SECTION J-J**

(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.

**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.

SPECIAL POST FOR 90° CORNERS

BAR BENDING DETAILS

SPECIAL POSTS FOR 45° CORNERS

PRECAST OPTION - SPECIAL CORNER POSTS
Notes:
1. End vertical reinforcing bars 1 1/2" from top of bond beam blocks and horizontal bars 1 1/2" 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.

Table 2

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<td>#5 8'-6&quot;</td>
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<td>#5 6'-6&quot;</td>
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</table>

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

1/1/17 10/30/18
10/30/18 10/30/18
9 of 10
534-250

Finished Grade

Control Joint (Typ.)

3'-4" (Typ.)

Control Joint (Typ.)

Top of Bond Beam

Mortar Cap

Masonry Cap

Pilaster Spacing (S) (20'-0" Max.)

1'-4"

2'-0" Min.

6" Min.

6'-4" W/2

1'-0" Max.

SECTION M-M

PILASTER REINFORCING AND WALL CONTROL JOINT DETAIL

SECTION K-K

(Shown at Cell Without Vertical Reinforcing)

(Shown at Cell Without Vertical Reinforcing)

TYPICAL ELEVATION

(T-Footing Shown, Trench Footing Similar)

Joint Stabilizing Anchor

Bar FF1

Length = 5'-2"

All bar dimensions in bending diagram are out to out.
All bars not shown in the bending diagrams are straight.
1. For location of Sections K-K and L-L see Sheet 9.
2. Provide and install 3/4" Preformed Expansion Joint & 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.
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<td>End Treatment -- Approach Terminal Geometry, Curbed and Double Faced</td>
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<td>Approach Transition Connection to Rigid Barrier -- Details</td>
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<td>Approach Transition Connection to Rigid Barrier -- Double Faced Guardrail</td>
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<td></td>
<td>3/8&quot; Button-Head Bolt System</td>
</tr>
</tbody>
</table>

GENERAL NOTES:

1. INSTALLATION: Construct guardrail in accordance with Specification 536. This Index, along with the plans and the manufacturer's 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 includes 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 edge of Panel) and a minimum panel splice as shown on Sheet 2. Guardrail components included on the APL, which are compatible with this Index, may also be identified as 31" or MGS Guardrail.


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

5. HEX-HEAD BOLTS: Install Hex-Head Bolts where indicated using bolts, nuts, and washers in accordance with material properties of Specification 967. Place washers under nuts.

6. MISCELLANEOUS ASPHALT PAVEMENT: Install Miscellaneous Asphalt Pavement where indicated with a tolerance of ± 1/16" depth.

7. ADJACENT SIDEWALKS & SHARED USE PATHS: When guardrail posts are placed within 4'-0" of a sidewalk or shared use path, use timber posts or use steel posts only if treated with Pipe Rail as shown on Sheet 20. When timber posts are used, one of the following safety treatments is required for the bolt(s) protruding from the back face of the posts:
   a. After tightening the nut, trim the protruding post bolt flush with the nut and galvanize per Specification 562.
   b. Use post bolts 15" in length and countersink the washer and nut between 1" and 1 1/2" deep into the back face of the post.
   c. Use 15" post bolts with sleeve nuts and washers.

8. 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.

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

10. 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, 531-404, and 423-405.

11. 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).

12. 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.

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

GENERAL GUARDRAIL
INSTALLED PLAN

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

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

3. CONNECTION DETAILS: Connections to End Treatments, Approach Transitions, or other segment types are defined in the 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 41 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, Rub Rail, or Reduced Post Spacing for Hazards).
LOW-SPEED GUARDRAIL
INSTALLED PLAN

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 8'-4" Panels for end connections to adjoining segments as shown. A single 6'-3" Panel may be used at the end of the Low-Speed Guardrail run along with a single reduced 6'-3" post spacing to meet the nominal Begin/End Guardrail Sta. required.

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

2. MIDSPAN PANEL LAP SPLICE: For proper structural function, place all Lap Splices at midspan unless otherwise indicated. Lap the Panels with the Splice Ridge oriented downstream of the 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.

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LOW-SPEED, TL-2 GUARDRAIL DETAILS

NOTES:

1. Use 12'-6" or 25'-0" W-Beam Panels for normal spans, and use 8'-4" Panels for end connections to adjoining segments as shown. A single 6'-3" Panel may be used at the end of the Low-Speed Guardrail run along with a single reduced 6'-3" post spacing to meet the nominal Begin/End Guardrail Sta. required.

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

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

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

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


5. POST & OFFSET BLOCK DETAILS: See Sheet 5.

6. GUARDRAIL SECTIONS: For Sections showing typical mounting heights, grading, and lateral offsets in relation to adjacent roadway features, see Sheet 6.

7. MODIFIED MOUNTS: Where concrete structures, concrete sidewalk, or shallow depth conditions are encountered, see Sheet 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.
DESCRIPTION:

SHEET 4

1:10/3:0/2:0 1:8

11/01/17

REVISION

1. MATERIALS:
The corrugated steel panels to be used are in accordance with Specification 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 3/8" Ø Cable Anchor Plate Bolt Holes only where required for installation of the Cable Anchor Plate shown on Sheet 9, 10, & 11, 1/4" Ø slots may substitute for the 3/8" Ø holes shown.

NOTES:

Panel Type
Number of Spaces W
Gauge
6'-3" W-Beam 2 12
6'-4½" W-Beam 3 12
12'-6" W-Beam 4 12
15'-7½" W-Beam 5 12
25'-0" Thrie-Beam 6 12
3'-1½" Thrie-Beam 7 12
6'-3" Thrie-Beam 8 12
12'-6" Thrie-Beam 9 12
25'-0" Thrie-Beam 10 10

PANEL SUMMARY TABLE:

Panel Type
Number of Spaces W
Gauge
6'-3" W-Beam 2 12
6'-4½" W-Beam 3 12
12'-6" W-Beam 4 12
15'-7½" W-Beam 5 12
25'-0" Thrie-Beam 6 12
3'-1½" Thrie-Beam 7 12
6'-3" Thrie-Beam 8 12
12'-6" Thrie-Beam 9 12
25'-0" Thrie-Beam 10 10

THRIE-BEAM PANEL SECTION

THRIE-BEAM TRANSITION PANEL ELEVATION
(Reverse Direction Similar by Opposite Hand)

W-BEAM PANEL SECTION

W-BEAM PANEL ELEVATION

W-SPACES @ 3'-1½"
(See Table 1)

W-SPACES @ 3'-1½"
(See Table 1)

W-SPACES @ 3'-1½"
(See Table 1)

PANEL DETAILS

W-BEAM AND THRIE-BEAM
PANEL DETAILS

GUARDRAIL

FY 2019-20
STANDARD PLANS

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LAST REVISION
3/1/17

DESCRIPTION:

5/36-001
NOTES:

1. STANDARD POSTS: Where Standard Posts are called for in this Index, use either a Timber or Steel Post at the Length, "L" shown for Standard Posts. Use a single post material type consistently per each run of guardrail. Only where specified in the Plan, use the "W" or "L" for Slope Break Conditions as shown on Steel 6.

2. DOUBLE FACED GUARDRAIL: Orient Post Bolts with the corresponding Offset Block type as shown. For General, 1'-3" (Single Sided) Approach Transitions only, use the 1'-6" Thrie-Beam Block (See Steel 12). Use a Steel 3" Button & Nut (Typ.) extended beyond the face of the tightened nut. Trim the threaded portion as needed and galvanize in accordance with Specification 962.

3. BOLT HOLES: \( \frac{3}{8} '' \) x 2'' Bolt Holes shown in posts within this Index may be substituted with \( \frac{1}{2} '' \) x 2'' Bolt Holes.

4. DOUBLE FACED GUARDRAIL: Orient Post Bolts with the Button-Head located on the side near the traffic lane. The bolt's threaded portion is not permitted to extend beyond \( \frac{1}{4} '' \) from the face of the tightened nut. Trim the threaded portion as needed and galvanize in accordance with Specification 962.

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

6. BLOCK STOP-NAIL: Drive one nail per Standard Offset Block as shown to prevent Block rotation. Use steel 3/4'' Type 164 nails with ASTM A153 hot-dip galvanization. For steel posts, drive the nail through the unused flange Bolt Hole and bend the nail so its head contacts the flange.

7. MATERIALS: Use timber and steel posts and offset blocks in accordance with Specification 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:

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. "N" 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 shown in the plans. Deep Posts are only permitted where post spacing is 6'-3" or less.
3. SLOPE BREAK CONDITION: Install Deep Posts only where called for in the plans. Deep Posts are only permitted where post spacing is 6'-3" or less.
4. LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset call outs for Face of Guardrail, as shown in the plans.
5. ADJACENT TO CURB: Place the Face of Guardrail consistently offset either flush with the Face of Curb or 5" behind the Face of Curb, as indicated by project-specific cross slope requirements and offset call outs for the plans.
6. MODIFIED THRIE-BEAM: Place the Face of Guardrail behind the corresponding Post. Place the Slope Break a Minimum of 2' behind the Post. For Deep Posts, the slope break may be placed at the Post with the 2" Miscellaneous Asphalt Pavement omitted.

GUARDRAIL SECTIONS - STANDARD PLANS

INDEX

FY 2019-20 STANDARD PLANS

GUARDRAIL

536-001

6 of 22
NOTES:
1. INSTALLATION: Locate Approach Terminals where called for in the plans, with the Post (1) placed at the Right/End Guardrail Station indicated in the plans.

2. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Posts, and Frangible Leave-Outs, are not permitted within the Approach Terminal segment unless otherwise called for 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 536.

5. PARALLEL AND FLARED Approach Terminals may vary from the Forward-anchoring style Approach Terminals shown herein if indicated in the plans.

6. "CURVED AND DOUBLE FACED GUARDRAIL SEGMENTS: See Sheet B"
1. COMPONENT DETAILS: For additional component details, see Sheet 10.

2. END UNITS: Use materials for end units as defined in Specifications Section 967. End Units are referred to as "End or Buffer Sections" in AASHTO M180.

3. FOUNDATIONS: Install Steel Tubes by either of the following methods:
   a. Drive the Tube using a dummy timber post to prevent damage to the Breakaway Post.
   b. Drive the Tube using a dummy timber post to provide full passive soil resistance to the surface of the Tube.

4. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2. Including parallel and tapered segments. Transitions, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

5. SIDEWALK REQUIREMENTS: When sidewalks are located adjacent to the End Treatment, install a Rounded End Unit (Flared End Unit not permitted for this case).

6. END DELINER: Mount reflector to the approach face of the End Unit in accordance with Specifications Sections 136 and 967.
1. INSTALLATION: Use components as shown on Sheets 9 & 11.

2. MATERIALS: Use steel plates, channels, and Cable Assemblies in accordance with Specification 967.

   Use Hex Nuts, Hex Jam Nuts, and Washers in accordance with the AASHTO-AGC-ARTBA Guide to Standardized Barrier Hardware with English unit equivalents of components FNX24 and FWC24, respectively. Two Hex Nuts may be used for the Hex Jam Nut System.

3. PLATE STOP-NAILS: To prevent rotation of the Bearing Plate, drive steel 2\(\times\)12\(\) type 8d nails with ASTM A53 hot-dip galvanization.

4. CABLE ANCHOR PLATE ASSEMBLY INSTALLATION: Mount to the pre-fabricated Cable Anchor Plate Bolt Holes in the W-Beam Panel, as shown on Sheet 6. These panel holes are only permitted for this Cable Anchor Plate Assembly application.

5. SOIL PLATE BOLT HOLES: For Trailing Anchorage installations as shown on Sheet 9, the two bolt holes may be substituted with a single bolt hole located at the tube centerline.

NOTES:
GUARDRAIL

NOTES:

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

2. COMPONENT DETAILS: For additional component details, see Sheet 10 & 12. For the Rectangular Post & Cable Mount details, see Sheet 10.

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

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

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

5. SPECIAL END SHOE MOUNT: Punch a ⅜" hole in the W-Beam Panel as needed to secure the Special End Shoe with the ⅜" Hex-Head Bolt. Galvanize hole per Specification 562.

6. FOUNDATIONS: Install Steel Tubes with attached Soil Plates by either of the following methods:
   a. Excavate, backfill, and compact material to provide full passive soil resistance to all surfaces of the tube and soil plate.
   b. Drive the steel tube and soil plate as a single unit using a dummy timber post to prevent damage to the breakaway post.

7. END DELINERATE: Mount retroreflective sheeting to the approach face of the Buffer End Unit in accordance with Specifications 535 and 967.

FY 2019-20 STANDARD PLANS

GUARDRAIL
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' behind 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 Post material in accordance with Specification 967. Use steel panels and hardware in accordance with Specification 967.

5. BOLT OMISSION: For the 8 Foot Radius CRT System only, do not place a panel-to-post mount bolt at the center CRT Post (omit the 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" W-Beam Panels. Splice at post locations within the CRT radius using the General configuration of 1/2" Button-Head Bolts (8 reqd. per splice).

7. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 7, 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 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 Sheet 15 for curb shape details.

5. OFFSET BLOCKS: For Thrie-Beam post locations within the Length of Approach Transition segment, use the Timber Offset Blocks with 7'-6" height shown on Sheet 5. For the midspan of the Three-Beam Transition Panel and for all other W-Beam locations shown herein, use the W-Beam Offset Blocks with 7'-6" height.

6. OFFSET: The required offset difference between the Face of Guardrail and Rigid Barrier Shoulder Line is considered negligible and may not be shown in the guardrail offset callouts in the plans. A consistent guardrail offset elevation 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 Terminal, Low Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

APPROACH TRANSITION CONNECTION TO RIGID BARRIER - GENERAL, TL-3
APPROACH TRANSITION CONNECTION TO RIGID BARRIER - LOW-SPEED, TL-2

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 536-001, 521-404, and 521-405.

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

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

4. RIGID BARRIER END TRANSITION: Taper the Rigid Barrier Toe as shown. See Concrete Barrier, Index 521-001, and Traffic Railing, Indexes 521-420 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 Terminals, General Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the Low-Speed Guardrail shown herein if indicated in the plans.
DESCRIPTION:

- **Alignment Curb**: A curb designed to align traffic and prevent vehicles from crossing between lanes. It is typically constructed from concrete or steel and may include features like shoulder gutters, raised curbs, or flat options.

- **Shoulder Gutter**: A barrier that separates the road from the shoulder, often used to protect the shoulder from erosion or vehicle encroachment.

- **Raised Curb Option**: A curb option that provides additional height and can be used to control traffic or prevent vehicles from crossing the road.

- **Flat No Curb Option**: A flat surface without a curb, typically used in areas where a curb is not necessary, such as at the end of a road or in pedestrian areas.

- **Sections A-A, B-B, C-C, D-D, E-E**: These sections provide detailed views of the alignment curb and its components, including the transition sections and connector details.

**Approach Transition Connection - Details**

1. **Planning and Elevation Views**: Work with Sheets 13 & 14.
2. **End Transition of Curb Option**: Install one of the three End Transition Types shown per Section E-E as indicated by the plans.
3. **Grading Behind Posts**: Place slope break a min. 2'-0" behind the post, per Sheet 6.
4. **Materials & Construction**: Construct the concrete Aligning Curb and Curb transition in accordance with Specification 520. Use steel Plates and Thrie-Beam Terminal Connectors in accordance with Specification 967.
TL-3 DOUBLE FACED APPROACH TRANSITION
INSTALLED ELEVATION

TL-3 DOUBLE FACED APPROACH TRANSITION
INSTALLED PLAN

NOTES:

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

The layouts given on Sheet 18 provide basic schemes for connections to adjacent guardrails, where a taper to a differencing 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 1/2" from the face of the nut; trim the threaded portion as needed and galvanize in accordance with Specification 562.

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

APPROACH TRANSITION CONNECTION TO RIGID BARRIER WITH DOUBLE FACED GUARDRAIL

FAVADA: Section "Double Faced General Guardrail..."
1. GENERAL: Install Rub Rail where called for in the plans. Position as shown on Sheet 6 unless otherwise shown in the plans. Install the backs of Rub Rail panels flush against Standard Posts. Either of the Channel Section or Bent-Plate Panel Rub Rail options may be used (consistent type per project). Where Double Sided Rub Rail is called for, thread the Button-Head Bolt through the Post Bolt Hole(s) and the panels on either side, and tighten the nut against the face of the panel farthest from adjacent traffic lanes. Trim the bolt's threaded portion in accordance with Note 4 on Sheet 5.

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

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

4. END RUB RAIL: For Single Sided Rub Rail, terminate the run of Rub Rail by bending the panel behind the post and securing in place as shown. For Double Sided Rub Rail, terminate the runs of Rub Rail on their respective front face of the post and secure with the typical Button-Head bolt.

NOTES:

SECTION A-A (Panel Typical)

SECTION B-B (Panel Sleeve End)

SECTION C-C (Panel Typical)

DETAIL ‘A’ (Sleeve Transition Elevation)

DETAIL ‘B’ (Sleeve Transition Plan)

RUB RAIL TERMINATION - SCHEMATIC PLAN VIEW
GENERAL PIPE RAIL SECTION

PIPE RAIL INSTALLED ELEVATION (End Segment Shown)

PIPE RAIL INSTALLED PLAN END AT TIMBER POST OPTION

PIPE RAIL INSTALLED PLAN END AT STEEL POST OPTION

MOUNT ISOMETRIC CUT-AWAY

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

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

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

3. **BASE PLATE MOUNT:** Install Special Steel Posts as shown using steel Adhesive-Bonded Anchor Bolts in accordance with Specification 536. Use ½” Hex-Head Bolts for structures less than 9’ deep as defined in the Specification.

4. **PANEL MOUNT TO ADJUSTED POST:** Punch additional ½” x 5/8” Post Bolt Slots in the W-Beam or Thrie-Beam Panel only where needed to mount the panel to a post in an adjusted location. Meet the Panel Post Bolt Slot(s) requirements of Specifications 536.

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

**SPECIAL STEEL POST FOR CONCRETE STRUCTURE MOUNT**

**NOTES:**
1. **INSTALLATION:** When the construction of Guardrail at the required post spacing results in post(s) conflicting with the edge of the structure, use a Standard Post mounted in soil (Option 1) or a Special Steel Post with its Base Plate altered by up to 1'-6" to mount the panel to a post in an adjusted location. Meet the Panel Post Bolt Slot(s) requirements of Specification 536.

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

3. **BASE PLATE MOUNT:** Install Special Steel Posts as shown using steel Adhesive-Bonded Anchor Bolts in accordance with Specification 536. Use ½” Hex-Head Bolts for structures less than 9’ deep as defined in the Specification.

4. **PANEL MOUNT TO ADJUSTED POST:** Punch additional ½” x 5/8” Post Bolt Slots in the W-Beam or Thrie-Beam Panel only where needed to mount the panel to a post in an adjusted location. Meet the Panel Post Bolt Slot(s) requirements of Specifications 536.

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

**ENCASED POST FOR SHALLOW MOUNT**

**NOTES:**
1. **INSTALLATION:** When the construction of Guardrail at the required post spacing results in post(s) conflicting with the edge of the structure, use a Standard Post mounted in soil (Option 1) or a Special Steel Post with its Base Plate altered by up to 1'-6" to mount the panel to a post in an adjusted location. Meet the Panel Post Bolt Slot(s) requirements of Specification 536.

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

3. **BASE PLATE MOUNT:** Install Special Steel Posts as shown using steel Adhesive-Bonded Anchor Bolts in accordance with Specification 536. Use ½” Hex-Head Bolts for structures less than 9’ deep as defined in the Specification.

4. **PANEL MOUNT TO ADJUSTED POST:** Punch additional ½” x 5/8” Post Bolt Slots in the W-Beam or Thrie-Beam Panel only where needed to mount the panel to a post in an adjusted location. Meet the Panel Post Bolt Slot(s) requirements of Specifications 536.

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

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

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

2. **MATERIALS:** Use Non-Excavatable Flowable Fill in accordance with Specification 151, not to exceed 150 psi.
NOTES:

1. INSTALLATION: Install Barrier Delineators as shown in accordance with the plans, with Specifications 536 and 705, and with the manufacturer's design as approved on the APL.

2. MATERIALS: Use materials of the size and type defined for Barrier Delineators in Specifications 993.

3. COLOR: Use either white or yellow retroreflective sheeting to match the color of the nearest lane's edge line.

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 = 20' x 1 Space
   - S3 = 15' x 1 Space
   - S4 = 10' x 1 Space for the Remaining Run
   Additionally, place a Barrier Delineator on Post (2) of the Trailing Anchorage or on the post nearest the Rigid Barrier.

5. MEDIAN GUARDRAIL: Install retroreflective sheeting on both sides of the barrier delineator for Guardrail on medians.

BARRIER DELINEATORS

STEEL POSTS

TIMBER POSTS

MOUNT LOCATION - ISOMETRIC VIEWS

MOUNT LOCATION - PLAN VIEW

STEEL POSTS

 timber post

BARREL POSTS

MOUNT LOCATION - ISOMETRIC VIEWS

MOUNT LOCATION - PLAN VIEW

BUTTON-HEAD BOLT SYSTEM

NOTES:

1. INSTALLATION: Work these details with the plans, where shown for Barrier Delineators in Specifications 993.

2. PANEL SPICES: Midspan Panel Splices are not required in Transition and Reduced Post Spacing. If shown, they are for General Purposes. To show Midspan Splice in General Sections, use one 4" x General Panel length (9-40" or 10-70") 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" spaces.

4. PANEL POST BOLT SLOTS: For Quarter Spacing configurations, punch additional 3 1/8" Post Bolt Slots in the panels only where required for mounting in accordance with Specification 596.

5. MEDIAN GUARDRAIL: Install retroreflective sheeting on both sides of the barrier delineator for Guardrail on medians.
1. This index provides guardrail transition and connection details for approach end guardrail on existing bridges, and anchorage 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 end 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 (a) the standard post spacings within the typical thrie-beam approach transitions connecting to existing bridges with retrofit 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 slabs 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.

4. 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.

5. 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.

6. Anchor studs and nuts shall be hot-dip zinc coated 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. Nested beam extensions and points for terminal connector attachments will vary for traffic railing barrier vertical face retrofits. The plans view for the vertical face retrofit barriers show the primary configurations for each particular scheme. The associated pictorial views show the variations.

7. 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.

8. 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.

GENERAL NOTES

LONGITUDINAL LOCATION OF TRANSITION BLOCKS AND CURB END FLARES WILL VARY WITH SCHEME TYPE

PARTIAL PLAN VIEWS

GUARDRAIL TRANSITION ALIGNMENTS FOR BRIDGE THRIE-BEAM AND VERTICAL FACE TRAFFIC RAILING RETROFIT
CONNECTIONS FOR EXISTING BRIDGES

SHEET 13.5

1:15 TAPER RATE

15° or Flatter

Uniform Slope

GUARDRAIL LENGTHS

MEDIAN WIDTH

(FT.)

6' Bridge Shoulder Length (FT)

Panels (No.)

6' Bridge Shoulder Panels (No.)

Length (FT)

10' Bridge Shoulder Length (FT)

Panels (No.)

10' Bridge Shoulder Panels (No.)

Length (FT)

32

7.5

6

13.5

168.75

45

3

7.5

93.75

11.5

9

20.5

256.25

7.5

6

12.5

168.75

34

8.5

6

14.5

181.25

55

4

9.5

118.75

12.5

10

22.5

281.25

7.5

6

12.5

168.75

38

10.5

8

18.5

231.75

7.5

6

13.5

168.75

14.5

12

36.5

306.25

9.5

7

19.5

243.75

40

10.5

8

18.5

231.25

7.5

6

13.5

168.75

16.5

13

29.5

368.75

11.5

9

20.5

456.25

34

13

10.5

243.75

8.5

6

14.5

181.25

17.5

14

31.5

471.25

12.5

10

22.5

521.25

44

12.5

10

22.5

289.75

9.5

7

19.5

243.75

19.5

15

33.5

418.75

12.5

11

25.5

306.25

46

12.5

9

21.5

269.75

10.5

8

18.5

231.25

19.5

16

35.5

443.75

14.5

17

36.5

331.25

48

14.5

7

22.5

318.75

11.5

8

20.5

256.25

20.5

16

46.5

456.25

16.5

13

29.5

368.75

19° or Flatter

approach end anchorage assemblies to shield normal transverse underside and bridge end hazards.

不应需要特制用于连接位置在行车道或行车道交通分隔区之间的翼端止端，除非端部结构有辅助车道、交叉口和其他潜在危险。

Note: For approach end anchorages see sheets elsewhere in this Index and the plans.

WHEN END TERMINAL IS OUTSIDE OF OPPOSING ROADWAY CLEAR ZONE

EXTENDING LESS THAN FULL APPROACH SLAB LENGTH IN WIDE MEDIANS WITH FLUSH SHOULDERS
MEDIAN CONFIGURATIONS

MEDIAN WITH 10' BRIDGE SHOULDERS

MEDIAN WITH 6' BRIDGE SHOULDERS

Note: The guardrail configurations shown apply only to parallel or near parallel bridges with open medians.

GUARDRAIL LENGTHS

APPROACH GUARDRAIL TREATMENTS FOR BRIDGES WITH CONCRETE TRAFFIC RAILING

EXTENDING LESS THAN FULL APPROACH SLAB LENGTH IN NARROW MEDIANS WITH FLUSH SHOULDERS
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
Part 1:

- **Existing Curb**: See Indexes For Face Of Rail Offset
- **Existing Parallel Wing Post**: Key Post (Q Post Bolts)
- **Sidewalk**: Sidewalk Removed
- **Any Detached Or Integral Sidewalk**: Sidewalk Removed
- **Transition Block In Absence Of Curb**: Sidewalk Removed
- **Front Face Of Existing Backwall**: Sidewalk Removed
- **Traffic Railing (Thrie-Beam Retrofit)**: Traffic Railing (Thrie-Beam Retrofit)
- **Special Steel Post For Roadway**: Special Steel Post For Roadway
- **Thrie-Beam Transitions**: Thrie-Beam Transitions
- **Existing Approach Slab**: Existing Approach Slab
- ** transitions**
- **Existing Flared Wing Post**: Exist廷g Flared Wing Post
- **Existing Approach Slab Wide Curb**: Existing Integral Approach Slab
- **Smooth And Even With Adjoining Area**: Smooth And Even With Adjoining Area
- **Remove Portion Of Curb As Required For Post Placement**: Remove Portion Of Curb As Required For Post Placement
- **Area Of Curb Removal To Be Finish**: Area Of Curb Removal To Be Finish

**SEE INDEXES 460-472 & 460-475 - SCHEME 1**

**SEE INDEXES 460-472 & 460-475 - SCHEME 2**

**SEE INDEXES 460-472 & 460-475 - SCHEME 2**

---

**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 460-472 & 460-475 - SCHEMES 3 & 4

SEE INDEXES 460-472 & 460-475 - 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)

SEE INDEXES 460-473 & 460-476 - SCHEMES 5 & 6

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)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR
BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

PICTORIAL VIEW
SEE INDEX 460-471 - SCHEME 3

PICTORIAL VIEW
SEE INDEX 460-471 - SCHEME 2

PICTORIAL VIEW
SEE INDEX 460-471 - SCHEME 1

DESCRIPTION:
REV IS IO N
LAST
REVISION
11/01/17

1 0 /3 0 /2 0 1 8

PM

1 1

1

R E V IS IO N

1 :5 4 :3 7

6

STANDARD PLANS

FY 2019-20

GUIDE RAIL TRANSITIONS AND
CONNECTIONS FOR EXISTING BRIDGES

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PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEE INDEXES 460-472, 460-473, 460-475 & 460-476 - SCHEME 1

SEE INDEXES 460-472, 460-473, 460-475 & 460-476 - SCHEME 2

Any Detached or Integral Sidewalk Removed
Transition Block In Absence of Curb

Any Detached or Integral Sidewalk Removed
Transition Block In Absence of Curb

Key Post Reference Line

Key Post Reference Line

Traffic Railing

Traffic Railing

Roofway Guardrail Transition

Roofway Guardrail Transition

X Post Bolts

X Post Bolts

Nested Three-Beam

Nested Three-Beam

Nested W-Beam

Nested W-Beam

Twist Bolt for W-Beam

Twist Bolt for W-Beam

SEE INDEXES 460-472, 460-473, 460-475 & 460-476 - SCHEME 2
PICTORIAL 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)
**PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)**

- **Front Face Of Existing Backwall & Begin Or End Existing Bridge**
- **Existing Railing Removed**
- **Traffic Railing (Vertical Face Retrofit)**
- **Parallel Wing Post Removed, Traffic Railing (Vertical Face Retrofit) S Or More In Length Constructed**
- **Existing Curb - See Indexes For Face Of Railing Offset**
- **Existing Approach Slab**
- **Traffic Railing (Vertical Face Retrofit)**
- **Transition Block In Absence Of Curb**
- **Existing Flared Wing Post Removed, Traffic Railing (Vertical Face Retrofit) Constructed**
- **Special Steel Post For Roadway Three-Beam Transitions**
- **Existing Approach Slab**
- **Traffic Railing (Vertical Face Retrofit)**
- **Roadway Guardrail Transition**
- **Existing Approach Slab**

**Note:**
- "2 1/2" x 12" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And 1/8" x 1/2" Long HS Hex Bolts And Nuts (5 Req'd.) With 5/16 OD Plain Round Washers Under Heads And Nuts

**SEE INDEX 460-481 - SCHEME 1**

**SEE INDEX 521-481 - SCHEME 2**

**SEE INDEX 521-481 - SCHEME 3**
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

Note:
* 21" x 12" x 14' Three-Beam Terminal Connector Plate (Back-Up Plate) And 3/4" x 12" Long
  1/2" Hex Bolts And Nuts (5 Req'd.) With 21/2" OD Plain Round Washers Under Heads And Nuts
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)

**Note:**

*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) 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)

* Post Bolts At First Standard (3'-1"") Post Hole Location On Bridge
(7" Min. From End Of Bridge). Use 3/8" NS Hex Bolts And Nuts
With 2 x 1" OD Plain Round Washers Under Heads And Nuts.
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 2 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)

* Post Bolts At First Standard (3'-0"), Post Hole Location On Bridge
(2" Min. From End Of Bridge). Use 1/8" HS Hex Bolts And Nuts
With 3/4" 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
(1'T Min. From End Of Bridge). Use 7/8" H5 Hex Bolts And Nuts
With 2 1/2" OD Plain Round Washers Under Heads And Nuts.

SEE INDEX 521-405 OR 521-482 - SCHEMES 3 & 4

SEE INDEX 521-405 OR 521-482 - SCHEMES 3 & 4

SEE INDEX 521-405 OR 521-482 - SCHEMES 3 & 4

SEE INDEX 521-405 OR 521-482 - SCHEMES 3 & 4

SEE INDEX 521-405 OR 521-482 - SCHEMES 3 & 4
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)

* Post Bolts At First Standard (7'-15") Post Hole Location On Bridge (7' Min. From End Of Bridge). Use 1/2" HS Hex Bolts And Nuts With 2½" OD Plain Round Washers Under Heads And Nuts.

**PICTORIAL VIEW**

SEE INDEX 521-483 - SCHEME 1

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

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SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 2
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)
**Description:**

GUARDRAIL TRAILING END ANCHORAGE IN ABSENCE OF OTHER HAZARDS

GUARDRAIL TRAILING END ANCHORAGE WHEN OTHER HAZARDS PRESENT

TRAILING END GUARDRAIL AND ANCHORAGE FOR BRIDGE TRAFFIC RAILING (THRIE BEAM RETROFITS)

**Revision:**

FY 2019-20

STANDARD PLANS

GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES

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**Figure:**

The figure illustrates the layout and details of a bridge traffic railing system, focusing on the trailing end guardrail and anchorage, both in the absence and presence of other hazards. The system includes various components such as end anchors, posts, and rails, with specific considerations for retrofitting and assembly types. The diagrams show detailed views of the guardrail and anchorage, highlighting the placement and orientation of elements to ensure safety and structural integrity.
GENERAL NOTES:

1. GENERAL: Work this Index in accordance with Specification 564 and the "Summary of Permanent Crash Cushions" table in the Plans.

2. TRANSITION PANEL: Where crash cushions are placed between two-way traffic or adjacent to two-way two-lane traffic, place a Transition Panel from the Concrete Barrier to the Crash Cushion on the downstream side of the barrier end (as shown). Follow the requirements of the APL drawing.

3. MANUFACTURER'S TRANSITION: Construct the proprietary guardrail transition only if shown in the applicable APL drawing. See Note 4 below.

4. STANDARD GUARDRAIL TRANSITION: If the APL drawing does not provide a guardrail transition to w-beam guardrail, construct the Standard Guardrail Transition segment from three-beam to w-beam as shown per Sheet 2. This 21'-10" segment must remain parallel to the roadway.

If the APL drawing does provide a guardrail transition to w-beam guardrail, replace the Standard Guardrail Transition segment with a w-beam guardrail segment at 6'-3" post spacing, except that Post (10) will remain where shown herein if it is located at a guardrail begin or end taper station callout per the Plans. This 21'-10" segment must also remain parallel to the roadway.

5. LENGTH OF END TREATMENT: For Crash Cushions, the Length of End Treatment includes all proprietary elements of the design as shown in the APL drawing, including the manufacturer's transition of guardrail if applicable.

The actual Length of End Treatment varies per Crash Cushion type, but an estimated Length of End Treatment is generally shown in the Plans to provide sufficient space for the Contractor's option of differing Crash Cushion types.

6. LENGTH RESTRICTION: In the "Summary of Permanent Crash Cushions" table, if a value is provided in the Length Restriction column, then select a Crash Cushion from the APL which has a Length of End Treatment less than or equal to the value shown. If the table instead shows N/A, then Crash Cushion selection is unrestricted regarding length.

7. CRASH CUSHION STATION: The Crash Cushion Station point shown herein corresponds to the station provided in the "Summary of Permanent Crash Cushions" table in the Plans.

PERMANENT CRASH CUSHION APPLICATIONS

CONCRETE BARRIER APPLICATION

GUARDRAIL APPLICATION

CRASH CUSHION DETAILS

INDEX

544-001

1 of 2
Standard Guardrail Transition

Crash Cushion Details

Plan View

Elevation View

NOTE:
Work this Sheet with the details and General Notes on Sheet 1.
Braking Zone

75' 125' 200' 400'

Alert/Reaction Zone

See DETAIL "A"

TABLE 1 - BRAKING ZONE

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>'L' (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>40</td>
<td>200</td>
</tr>
<tr>
<td>50</td>
<td>250</td>
</tr>
<tr>
<td>60</td>
<td>300</td>
</tr>
<tr>
<td>70</td>
<td>350</td>
</tr>
<tr>
<td>80</td>
<td>400</td>
</tr>
<tr>
<td>90</td>
<td>450</td>
</tr>
<tr>
<td>100</td>
<td>500</td>
</tr>
</tbody>
</table>

(See Optional Materials Details)

Raised Rumble Strip Set (Typ.) (See Optional Materials Details)

OPTION P1 - ASPHALT SET

OPTION P2 - PREFORMED THERMOPLASTIC SET

NOTES:
1. Construct permanent raised rumble strips where shown in the Plans and in accordance with Specification 546.

PERMANENT RAISED RUMBLE STRIPS

OPTIONAL MATERIALS DETAILS

STANDARD PLANS

 RAISED RUMBLE STRIPS

INDEX 546-001

SHEET 1 of 2
OPTION ST1 - ASPHALT SET

Asphalt Rumble Strip (Typ.)

OPTION ST2 - PREFORMED THERMOPLASTIC SET

Preformed Thermoplastic Rumble Strip (Typ.) (See Note 3)

OPTION ST3 - REMOVABLE POLYMER STRIPING TAPE SET

Removable Polymer Stripping Tape Strip (Typ.) (See Note 3)

NOTES:

1. Construct short-term raised rumble strips where noted in the Plans and in accordance with Specification 546.

2. See Sheet 1 for placement and additional details.

3. Use color white for Preformed Thermoplastic and Removable Polymer Stripping Tape Sets.

OPTIONAL MATERIALS DETAILS

SHORT-TERM RAISED RUMBLE STRIPS
NOTES:

1. 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 1,000 feet in advance of bridge ends 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 strip slabs at the approach slab joint.
   F. On either side of median crossover openings, terminate rumble strips within 400 feet of the centerline of the overhead gantry.

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 strip slabs at the approach slab joint.
   F. On either side of median crossover openings, terminate rumble strips within 400 feet of the centerline of the overhead gantry.

4. Use the continuous array on both inside and outside shoulders 1,000 feet in advance of bridge ends or back to the gore recovery area for mainline interchange bridges. Use the skip array for all other locations.

5. 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 strip slabs at the approach slab joint.
   F. On either side of median crossover openings, terminate rumble strips within 400 feet of the centerline of the overhead gantry.

**RUMBLE STRIP DEPTH TABLE**

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DEPTH FROM SURFACE (IN.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>1/8 (±1/8)</td>
</tr>
</tbody>
</table>

**RUMBLE STRIP ARRAY DETAILS**

- **CONTINUOUS ARRAY**
  - Center to Center
  - Rumble Strip (Typ.)
  - Continuous Grinding

- **SKIP ARRAY**
  - Center to Center
  - Rumble Strip (Typ.)
  - 5'-0" (±6") Gap
  - 9'-0" (±6") Gap
  - 7'-0" (±6") Grinding

**RUMBLE STRIP PLACEMENT**

- **PLAN VIEW**
  - Edge of Traveled Way
  - Edge of Friction Course
  - 6" Pavement Marking
  - Rumble Strip (Typ.)
  - Center to Center

**RUMBLE STRIP DETAILS**

- **PLAN VIEW**
  - Edge of Traveled Way
  - Edge of Friction Course
  - 6" Pavement Marking
  - Rumble Strip (Typ.)
  - Center to Center
**Description:**

**Revision:**

**Last Revision:** 04/04/18

**FY 2019-20 Standard Plans**

**Index:** 546-010

**Sheet:** 2 of 3

**Note:**

See the Plans for the Placement Type to be used.

**Rumble Strip Details**

**Plan View**

**Rumble Strip Array Details**

**Edge Line Rumble Strip Placement Types**

**Centerline Rumble Strip Placement Types**

**Rumble Strip Depth Table**

<table>
<thead>
<tr>
<th>Location</th>
<th>Depth from Surface (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>12&quot; (± 1&quot;)</td>
</tr>
<tr>
<td>D</td>
<td>6&quot; Yellow</td>
</tr>
</tbody>
</table>

**Rumble Strip Array Details**

**Continuous Array**

(Outside Shoulder Edge Lines)

**Skip Array**

(Outside Shoulder Edge Lines)

**Cylindrical for Arterials and Collectors**
NOTE:
See the Plans for the Placement Type to be used.
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 panels 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 Wall Control 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/length, factored bearing resistance’s, 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 strip/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 layer(s) 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 super-elevation 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 545.
11. A structural extension of the connection of the retaining wall 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 shall be 2'-0" minimum below final ground line.
14. The height of panels in the bottom course of MSE Walls must not be less than half the height of a standard panel.
15. Work this Index with Index 521-600 thru 521-650.

SHOP DRAWINGS:
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 (Carbon-Steel Reinforcing)</th>
<th>Durability Requirements (FRP Reinforcing)</th>
<th>Potential Other Allowable FDOT Wall Types</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Concrete Cover (in.)</td>
<td>Concrete Class for Panels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pozzolan Additions**</td>
<td>Concrete Cover (in.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pozzolan Additions**</td>
<td>Concrete Class for Panels</td>
<td></td>
</tr>
<tr>
<td>Type 2A</td>
<td>2</td>
<td>II</td>
<td>Metal</td>
</tr>
<tr>
<td>Type 2B</td>
<td>2</td>
<td>IV</td>
<td>Metal</td>
</tr>
<tr>
<td>Type 2C</td>
<td>3</td>
<td>IV</td>
<td>Metal</td>
</tr>
<tr>
<td>Type 2D</td>
<td>3</td>
<td>IV</td>
<td>Metal</td>
</tr>
<tr>
<td>Type 2E</td>
<td>3</td>
<td>IV</td>
<td>Plastic</td>
</tr>
</tbody>
</table>

Junction Slab
Shoulder or Roadway pavement

Concrete Casing
Top of Casing Elevation
Concrete Casing
Soil Reinforcement (Type)
Surface treatment when required (See Construction Note 9)

Proposed Final Ground Line
Limits of Soil Volume

Concrete Barrier
Top of Leveling Pad Elevation

Provide Supplemental 4-BAR with 3" concrete cover
ELEVATION VIEW OF COPING HEIGHT TRANSITION

LAST REVISION 01/01/18

MSE RETAINING WALL SYSTEMS - PERMANENT
INDEX 548-020

GENERAL NOTES AND DETAILS

FY 2019-20
STANDARD PLANS
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 that 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 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.

GENERAL NOTES AND DETAILS
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 A121, No. 12 1/2 Grade 50, Design Number 12047-6-6-8-12 ½, with a 10 1/2 gauge top and bottom wire and with Class 3 zinc coating; or aluminum coated steel, meeting the requirements of ASTM A589, No. 9 Farm, Design Number 12047-6-8-9, with a minimum coating weight of 0.40 oz./ft.². For additional information see payment note below.

3. Fencing shall be wired with line to private property except on horizontal curves 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 250-830 of the National Electrical Code. Lines of one material may be used with corner, pull and approach post assemblies only. Any one material will be permitted between corner and end post assemblies. Within individual corner and end post assemblies only one material will be permitted.

5. Wire to be wrapped and tied, as shown in the splice details, at the following locations:
   - (A) Staples for line posts to be 1 1/2" minimum length, for approach, corner and pull posts 1 3/4" 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 in bottom half. Staples shall be driven diagonally across the line wire with the points on separate grains.
   - (B) Connections between timber posts and braces to be provided by dowels as shown in fastener details.
   - (C) Wire to be wrapped and tied, as shown in the splice details, at the following locations:
     - (i) All end posts.
     - (ii) Corner post, including the assemblies at vertical breaks of 15° or more and
     - (iii) Pull posts where the wire is not spliced and pulled through the assembly. See General Note 19.

6. Steel posts and braces shall be standard steel posts, galvanized at the rate of 2 oz./ft.², together with necessary hardware and wire clamps and meeting the following requirements:
   - (A) Line posts: 8 long; 1.13 lbs./ft.; full formed studweld, anchor plate attached, ASTM A702 (1 1/16 x 3 1/2) x 1/4 angle, " Type I:
   - (B) Approach posts: 2 1/2" x 2 1/2" x 1/4 angle. 8 long; fabricated for attaching brace; with necessary hardware, clamps, etc.
   - (C) Pull, end and corner posts: 2 1/2" x 2 1/2" x 1/4 angle. 8 long; fabricated for attaching brace; with necessary hardware, clamps, etc.
   - (D) Braces: 2 1/2" x 2 1/2" x 1/4 angle. 8 long; fabricated for attaching brace; with necessary hardware, fabricated and for attaching to post.
   - (E) Cuts, corner, approach and post ends to be cut in concrete as per detail. (Also see General Note 15).

7. Recycled plastic posts shall meet the following material requirements: line posts shall have a minimum section of 4" round or 4" square. Plastic posts shall not be used as corner, pull, end or approach posts unless such use is specifically detailed in the plans. The strength of the post shall comply with Specification 94A for timber post. For bolts, the requirements of the latest edition of the Southern Pine Inspection Bureau’s Standard Grading Rules for Southern Pine lumber. No. 25R Stress Rated Grain Timber. Plastic posts can be set by either digging and tamp backfill or by driving into full depth preformed holes 1/2 to 1/3 smaller than cross section of post. Staples for fabric and barbed wire connection to plastic line posts shall be the same size, count and location as that for timber posts.

8. The Contractor, at his option, may use any suitable precast or prestressed concrete posts; however, approval by the Engineer of posts not shown on this index, will be required prior to construction of the fence. Concrete post shall be Class I concrete. Prestressed posts shall be Class I 1 1/16 concrete. Lengths of concrete post to be as indicated for timber posts.

9. Aluminum post, braces and accessory framing hardware shall not be used unless the plans specifically detail their application or the Engineer specifically approves their incorporation in Fencible construction or repair. Aluminum framed gates are permitted as described in General Note 19.

10. The woven wire shall be attached to steel and concrete posts by a minimum of four tie wires. The single 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 tight turns around the line wire. Tie wires shall be steel wire not less than 0.120" diameter, zinc coating Class 3, soft temper, in accordance with ASTM A482.

11. Steel Barbed Wire may be either of the following types:
   - Type I: This type shall conform to the requirements of ASTM A121, with two strands of 1 1/4 gage wire; four-point barbs, wire size 14 gage, twisted around both line wires; and, Class 3 coating. Design No. 12-4-5-6.
   - 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 1/4 gage high tensile wire; four-point barbs, wire size 18 1/2 gage twisted around both line wires; and, Class 3 coating. Design No. 12-4-5-6.

12. The woven wire shall be stretched only until one-half the tension curl has been pulled out of the line wires.

13. Posts to be set by driving or digging. If by digging, the posts shall be set at the center of the hole and the soil tamped securely on all sides.

14. Longer posts than those indicated above may be required by the plans or for deeper installations.

15. Concrete bases for angular steel posts (pilp, corner, end and approach) shall be Class R5 in accordance with Specification 407. Materials for Class R5 concrete may be proportioned by volume and/or weight.

16. Pull post assemblies shall be installed at approximately 330' centers except that this maximum interval may be reduced by the Engineer on curves where the radius is less than 3°.

17. Corner post assemblies are to be installed at all horizontal and vertical breaks in fence of 13° or more.

18. A maximum length of 1320' of wire may be installed as a unit. For pulls through a pull post assembly the fabric shall be spliced by crimping sleeves only. Pulls through a corner post assembly will not be permitted.

19. Unless otherwise called for in the plans gates shall be commercially available metal swing gates assembled and installed in accordance with the manufacturer’s specifications as approved by the Engineer. Chain link swing gates in accordance with Index 550-002 may be substituted for metal swing gates as approved by the Engineer. Gate size is full opening width whether single leaf or double leaves. Payment for gates shall include the gate, single or double, all necessary hardware for installation and any additional length and/or size for posts at the corners. Gates shall be paid for under the contract unit price for Fence Gates, EA.

20. For construction purposes, assemblies are defined as follows: End post assemblies shall consist of:
   - one end post, one approach post, two braces, four diagonal tension wires and all necessary fittings and hardware.
   - Pull post assemblies shall consist of: one pull post, two braces, four diagonal tension wires and necessary fittings and hardware.
   - Corner post assemblies shall consist of: one corner post, two approach posts. Four braces, eight diagonal tension wires and all necessary fittings and hardware.

21. All posts, braces, tension wires, fabric, tie wires, Class R5 concrete, and all miscellaneous fittings and hardware to be included in the cost for Fencing, IT. Fencing shall be inclusive of the lengths of pull, end and corner post assemblies, but exclusive of gate widths.

GENERAL NOTES
This index details fencing that is constructed with farm fabric 46½" (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.
ALTERNATE CONCRETE POSTS AND BRACES

FASTENER FOR CONCRETE POST AND BRACES

FASTENER FOR TIMBER POST AND BRACE

PRECAST POST

PRECAST BRACE

CORNER POSTS

END AND PULL POSTS

Each horizontal wire to be wrapped around corner, end and pull posts and tied to same wire. See General Notes 3 and 17. Timber post illustrated. These methods also apply to steel and concrete post illustrations.
GENERAL NOTES

1. This fence to be used generally in urban areas.
2. For supplemental information refer to Specification 550.
3. Chain link fabric, post, truss rods, tension wires, tie wires, 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- 1½" nominal dia., zinc galvanized at the rate of 1.8 oz./ft²: ASTM A53 Table E 2, ASTM F1083, and AASHTO M111.
      (2) Aluminum coated steel pipe, Schedule 40- 1½" nominal dia., 1.860" OD; coated at the rate 0.40 oz./ft²: AASHTO M111.
      (3) Aluminum alloy pipe: 1½" nominal dia.; ASTM B241 or B221, Alloy 6063, T6.
   B. Corner, end, and pull post options:
      (1) Galvanized steel pipe; 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undereoted stock of discontinued A446/A446M base materials; ASTM F1883 Group IV.
      (2) AASHTO M181 Type I - Zinc Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 1.2 oz./ft²: AASHTO M181.
      (3) AASHTO M181 Type II - Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.040 oz./ft²: AASHTO M181.
      (4) AASHTO M181 Type IV - Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated core wire diameter), core wire-zinc coated steel, PVC coating: M181 Class A (either extruded or extruded and stranded or Class B (bonded). See table right; unless the blank cell for M181 standard colors medium green, dark green or black the coating color shall be soft gray matching that of ASTM F1883.
   C. Rail options:
      (1) Galvanized steel pipe, Schedule 40- ½" nominal dia., zinc galvanized at the rate of 1.8 oz./ft²: ASTM A53 Table E 2, ASTM F1083, and AASHTO M111.
      (2) Aluminum coated steel pipe, ASTM A53 steel, ⅔ Tables 40- 1¾" nominal dia., ASTM F1083, and AASHTO M111.
      (3) Aluminum alloy pipe- 1¾" OD, 2" NPS, 1.900" dec. equiv., 0.120" min. wall: ASTM B241, Alloy 6063, T6.
      (4) Steel H-Beam- 1½" x 1½": Zinc Galv. 1.8 oz./ft²: AASHTO M111 and Detail.
   D. Chain link fabric options (2" mesh with twisted and barbed selvage top and bottom for all options except as described in Note 10):
      (1) Steel wire No. 9 gage zinc galvanized at the rate of 1.2 oz./ft²: ASTM F1043.
      (2) Aluminum alloy wire with a diameter of 0.1875" or larger conforming to the requirements of ASTM F1043.
      (3) AASHTO M181 Type I - Zinc Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 1.2 oz./ft²: AASHTO M181.
      (4) AASHTO M181 Type II - Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.040 oz./ft²: AASHTO M181.
      (5) AASHTO M181 Type IV - Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated core wire diameter), core wire-zinc coated steel, PVC coating: M181 Class B (either extruded or extruded and stranded or Class C (bonded). See table right; unless the blank cell for M181 standard colors medium green, dark green or black the coating color shall be soft gray matching that of ASTM F1883.
   E. Tension wire options:
      (1) Steel wire No. 7 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M181.
      (2) Aluminum alloy wire with a diameter of 0.1442" or larger conforming to the requirements of ASTM F669 Group 6.
      (3) Aluminum coated steel wire No. 7 gage coated at the rate of 0.824 oz./ft²: AASHTO M181.
   F. Tie wire and hog ring options:
      (1) Steel wire No. 6 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M181.
      (2) Aluminum alloy wire with a diameter of 0.1050" or larger conforming to the requirements of ASTM F813.

GENERAL NOTES

1. This fence to be used generally in urban areas.
2. For supplemental information refer to Specification 550.
3. Chain link fabric, post, truss rods, tension wires, tie wires, 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- 1½" nominal dia., zinc galvanized at the rate of 1.8 oz./ft²: ASTM A53 Table E 2, ASTM F1083, and AASHTO M111.
      (2) Aluminum coated steel pipe, Schedule 40- 1½" nominal dia., 1.860" OD; coated at the rate 0.40 oz./ft²: AASHTO M111.
      (3) Aluminum alloy pipe: 1½" nominal dia.; ASTM B241 or B221, Alloy 6063, T6.
   B. Corner, end, and pull post options:
      (1) Galvanized steel pipe; 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undereoted stock of discontinued A446/A446M base materials; ASTM F1883 Group IV.
      (2) AASHTO M181 Type I - Zinc Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 1.2 oz./ft²: AASHTO M181.
      (3) AASHTO M181 Type II - Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.040 oz./ft²: AASHTO M181.
      (4) AASHTO M181 Type IV - Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated core wire diameter), core wire-zinc coated steel, PVC coating: M181 Class A (either extruded or extruded and stranded or Class B (bonded). See table right; unless the blank cell for M181 standard colors medium green, dark green or black the coating color shall be soft gray matching that of ASTM F1883.
   C. Rail options:
      (1) Galvanized steel pipe, Schedule 40- ½" nominal dia., zinc galvanized at the rate of 1.8 oz./ft²: ASTM A53 Table E 2, ASTM F1083, and AASHTO M111.
      (2) Aluminum coated steel pipe, ASTM A53 steel, ⅔ Tables 40- 1¾" nominal dia., ASTM F1083, and AASHTO M111.
      (3) Aluminum alloy pipe- 1¾" OD, 2" NPS, 1.900" dec. equiv., 0.120" min. wall: ASTM B241, Alloy 6063, T6.
      (4) Steel H-Beam- 1½" x 1½": Zinc Galv. 1.8 oz./ft²: AASHTO M111 and Detail.
   D. Chain link fabric options (2" mesh with twisted and barbed selvage top and bottom for all options except as described in Note 10):
      (1) Steel wire No. 9 gage zinc galvanized at the rate of 1.2 oz./ft²: ASTM F1043.
      (2) Aluminum alloy wire with a diameter of 0.1875" or larger conforming to the requirements of ASTM F1043.
      (3) AASHTO M181 Type I - Zinc Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 1.2 oz./ft²: AASHTO M181.
      (4) AASHTO M181 Type II - Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.040 oz./ft²: AASHTO M181.
      (5) AASHTO M181 Type IV - Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated core wire diameter), core wire-zinc coated steel, PVC coating: M181 Class B (either extruded or extruded and stranded or Class C (bonded). See table right; unless the blank cell for M181 standard colors medium green, dark green or black the coating color shall be soft gray matching that of ASTM F1883.
   E. Tension wire options:
      (1) Steel wire No. 7 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M181.
      (2) Aluminum alloy wire with a diameter of 0.1442" or larger conforming to the requirements of ASTM F669 Group 6.
      (3) Aluminum coated steel wire No. 7 gage coated at the rate of 0.824 oz./ft²: AASHTO M181.
   F. Tie wire and hog ring options:
      (1) Steel wire No. 6 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M181.
      (2) Aluminum alloy wire with a diameter of 0.1050" or larger conforming to the requirements of ASTM F813.
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 post optional material or the corner and end post assembly optional 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 6'-6" long (Standard). Line post are to be set in concrete as described above or by the following methods:
   (a) In accordance with special details and/or as specifically described in the contract plans and specifications.
   (b) In accordance with ASTM F567 Subsections 5.4 through 5.10 as approved by the Engineer.

Line post installed in accordance with Section 3.8 shall be 9'-6" long.

(c) Post mounted on concrete structure or solid rock shall be mounted in accordance with the base plate detail "Fence Mounting On Concrete Endwalls and Retaining Walls", Sheet 3; or, by embedment in accordance with ASTM F567 Subsection 5.5.

End, pull and corner post assemblies shall be in concrete as detailed above for all soil conditions other than solid rock. Post within assemblies that are located on concrete structures or solid rock shall be set by base plate or by embedment as prescribed under (b) above for line post.

Line and assembly posts for 6' fence which must be lengthened due to a variation in the normal ground clearance, shall be set an additional 3' in depth for each 3' of additional ground clearance.

8. Pull post shall be used at breaks in vertical grades of 15° or more, or at approximately 350' centers except that this 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 locations for twisted selvage fabrics.

11. Unless sliding gates or special gates are called for in the plans, all gates shall be chain link swing gates meeting the material requirements described and as approved by the Engineer. Payment shall include the gates, single or double, all necessary hardware for installation and any additional length and/or wire for posts at the opening. Gates shall be paid for under the contract unit price for Fence Gates, EA.

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, one truss rod 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.

<table>
<thead>
<tr>
<th>TYPE IV VINYL COATED FABRIC</th>
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<tbody>
<tr>
<td>ASSHTO M181 Table 4 Redefined As Follows</td>
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<td>Specified Diameter Of Metallic Coated Core Wire</td>
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<tr>
<td>in.</td>
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DESIGN NOTE

This index details fencing that is constructed with chain link fabric 6' (nominal) in height and with specific ground clearance. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.
**FENCE MOUNTING ON CONCRETE ENDWALL AND RETAINING WALLS**

**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 from utilities and hazardous facilities located within highway right of way.
(d) Outward from lateral ditches, culverts, 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.

<table>
<thead>
<tr>
<th>Material</th>
<th>Area (Sq. In.)</th>
<th>Weight (Lb./Ft.)</th>
<th>Tensile Strength (psi Min.)</th>
<th>Yielding Point (psi Min.)</th>
<th>Surface Area (Sqr. Ft.)</th>
<th>Yield Point (psi Min.)</th>
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<tbody>
<tr>
<td>Steel</td>
<td>724</td>
<td>2.75 ± 5% (Galv.)</td>
<td>80,000</td>
<td>48,000</td>
<td>0.779</td>
<td>0.428</td>
</tr>
<tr>
<td>Aluminum</td>
<td>724</td>
<td>0.41 ± 5%</td>
<td>30,000</td>
<td>25,000</td>
<td>0.976</td>
<td>0.428</td>
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</tbody>
</table>

**BARB WIRE ATTACHMENT**

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 (Galvanized Steel): Galvanized anchors set in drilled holes with an Adhesive Material System in accordance with Specifications 416 and 937; drilled holes shall be 1/4" larger in diameter than the anchor bolt.

**TOP VIEW FOUR ANCHOR PLATE OPTION**

**TOP VIEW TWO ANCHOR PLATE OPTION**

**STEEL**

Ø 1/8" Dia. Hole for Ø 5/16" Anchors, Nuts and Washers (2 Req'd)

**ALUMINUM**

Ø 1/8" Dia. Hole for Ø 5/16" Anchors, Nuts and Washers (2 Req'd)

**Post**

Fence To Be Mounted On Retained Side Unless Otherwise Called For In Plans (See Notes)
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 galvanized 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.

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 galvanized 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 NS concrete in accordance with Specification 347 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 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**

**DETAIL B**

**TYPICAL FRAME - 24' Opening**

**TYPICAL FRAME - 12', 16' & 20' Opening**
**FENCING TERMINALS AT BRIDGE ENDS**

**ROADWAY**

- Locate fence along slope where top of fence approx. equals tops of headwall.
- Terminate fence where culvert drop height approx. equals fence height.
- Fence locations at cross drain with excavated outfall ditches or as shown in plans.
- Construct flush against footing.
- Embedment: 2 max. (3 reqd.)
- Expansion or chemical concrete.
- Anchor eyebolt or studs and eye-nuts.
- 3 strands barbed wire.

**STREAM CROSSING**

- **FENCING TERMINALS AT BOX CULVERTS**
  (For Heights of Headwalls Greater Than 4')

- **FENCING DETAIL AT CULVERT**
  (For Heights of Headwalls 4' or Less.)

Note: When height of headwall is 4' or less (drainage pipe 36" or less) the fence shall not be tied to the headwall, but shall span the lateral ditch.

- Propose fence wing height approx. equals top of headwall.
- Terminate fence where culvert tops of headwall.
- Fence locations at cross drain with excavated outfall ditches or as shown in plans.
- Construct flush against footing.
- Embedment: 2 max. (3 reqd.)
- Expansion or chemical concrete.
- Anchor eyebolt or studs and eye-nuts.
- 3 strands barbed wire.

**PICTORIAL VIEW**

- Approach slab
- Shoulder line
- Gutter transition
- Slope pavement
- Shoulder line
- Approach slab
- Bridge
- Gutter transition
- Slope pavement
- Shoulder line
- Approach slab
- Bridge
- Gutter transition
- Slope pavement
**FENCING TERMINALS AT RURAL INTERCHANGES**

- **LA R/W Line & Fence**
- **Bridge Over Crossroad**
- **Retaining Wall**
  - Varieties
  - Fence
  - 6" Where Footing Permits

**FENCING TERMINALS AT URBAN INTERCHANGES**

- **LA R/W Line**
- **Fence**
- **Radius Point**
- **End LA R/W Line & Fence**

**FENCING TERMINALS AT RETAINING WALLS**

- **LA R/W Line**
- **Ground Line**
- **Fence**
- **Terminate Fence Where Wall Height**
  - Approximately Equals Fence Height

**INSET A**

- **LA R/W Line**
- **Local Street**
- **Fence Type "B"**
- **See Note A**
- **Ramp**
- **Fence Type "B"**
- **LA R/W Line**

**Note A** - The indicated distance shall be sufficient to provide satisfactory sight distance for the traffic from the ramp.

**Note B** - The indicated distance shall be identical to the above noted dimension, if practical.

**NOTE:** LA R/W along the crossroad will extend a minimum 600' beyond the end of the acceleration or deceleration lane, if necessary, for interchange protection. For ramps, the LA R/W 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.

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.

FENCING TERMINALS AT URBAN INTERCHANGES

- LA R/W Line
- Local Street
- LA R/W Line
- Fence Type "B"
- LA R/W Line

**PLAN**

- LA R/W Line
- Fence
- Ground Line

**ELEVATION**

- LA R/W Line
- Fence
- Terminate Fence Where Wall Height
  - Approximately Equals Fence Height

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**REVISION**

- 11/01/17
WILDFLOWER SEEDING RATES

Common Name (Botanical Name)  lbs/ac

#1 Group

Common Name (Botanical Name)  lbs/ac

Black-Eyed Susan (Rudbeckia hirta)  2
Lance Leaf Tickseed (Coreopsis lanceolata)  10
Goldenseal Tickseed (Coreopsis balearis)  10
Leavenworth's Tickseed (Coreopsis leavenworthii)  10
Fire Wheel (Gaillardia pulchella)  10
Soft Hair Coneflower (Rudbeckia mollis)  2
Crimson Clover (Trifolium incarnatum)  15

#2 Group

Common Name (Botanical Name)  lbs/ac

Annual Phlox (Phlox drummondii)  10
Moss Verbena (Verbena cneorum)  6
Leavenworth's Tickseed (Coreopsis leavenworthii)  10
Fire Wheel (Gaillardia pulchella)  10
Crimson Clover (Trifolium incarnatum)  15

Note: Wildflower seeding rates are for restoring impacted wildflower areas.

GENERAL NOTES

1. All turf establishment shall be performed meeting the requirements of Specification 570.

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.

SEEDING ZONES

1. Confirm compatibility of wildflower with Seeding Zones.

Note:

- Wildflower Group #1
- Wildflower Group #2
- Turf (To Limit of Construction)
- Selective Cleaning And Grubbing
- Limits Of Construction
- Turf

LEGEND

Zone I
Zone II

WILDFLOWER SEEDING RATES

- Black-Eyed Susan (Rudbeckia hirta): 2 lbs/ac
- Lance Leaf Tickseed (Coreopsis lanceolata): 10 lbs/ac
- Goldenseal Tickseed (Coreopsis balearis): 10 lbs/ac
- Leavenworth's Tickseed (Coreopsis leavenworthii): 10 lbs/ac
- Fire Wheel (Gaillardia pulchella): 10 lbs/ac
- Soft Hair Coneflower (Rudbeckia mollis): 2 lbs/ac
- Crimson Clover (Trifolium incarnatum): 15 lbs/ac

Note: Wildflower seeding rates are for restoring impacted wildflower areas.
Shoulder Point

5' Shoulder Pavement Or 32" Sod Strip (See Notation Above)
Sod Strip (Overlapped) See
Shoulder Pavement,
Sod To Toe Of Front Slope When Algebraic Difference In Roadway Grades Exceeds 4%
(Both Sides)
Sod To Toe Of Front Slope When Algebraic Difference In Roadway Grades Exceeds 4%
(Both Sides)
Low Point Of Sag
Low Point Of Sag

In Absence Of Shoulder Pavement On Existing Divided Roadways, Construct Shoulder Pavement
Same As Above

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.

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.
C O M P L E T E D  S H O U L D E R

2 '-8 "

resurfacing build-up is less than 3"

is rural or is urban without curb and gutter

of shoulder pavement

is resurfacing, widening and resurfacing or construction

Project___

C R I T E R I A  F O R  U S I N G  T R E A T M E N T  I

PLAN VIEW

Width Called For In The Plans (Shoulder Width Plus 2' Min.)

Varies, 2' Min.

Varies, 2' Min.

resurfacing build-up is 3" or more

is rural or is urban without curb and gutter

is resurfacing or construction of shoulder pavement

Project___

C R I T E R I A  F O R  U S I N G  T R E A T M E N T  I I


TREATMENT I

TREATMENT II

SHOULDER OPTION 1

SHOULDER OPTION 2

GENERAL NOTES

1. Treatment I:

If trenching under sod is necessary to achieve the required Drop-Off, excavated topsoil is to be used for filling voids and low areas at the edge of pavement or for flushing along the edge of sod. Excess material to be uniformly distributed over the shoulder.

2. Treatment II:

A. Borrow must meet the requirements for a "Select" material in accordance with Index 120-001 and Specification 120.

B. Borrow may be used in lieu of excavated turf and topsoil when economically feasible. There will be no additional payment for substituting borrow for excavated turf and topsoil.

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. Establish turf in accordance with Specification 570.

B. Establish turf in accordance with Specification 570.

A SIMILAR TREATMENT MAY BE USED FOR PROJECTS THAT REQUIRE SHOULDER WIDENING. DETAILS ARE TO BE SHOWN IN THE PLANS.
GENERAL NOTES:

1. All dimensions 6" and less are exaggerated for illustrative purposes only. All dimensions provided for wood materials are nominal.

2. Remove plant containers prior to planting. If plants are not container grown, remove a minimum of the top 1/3 of burlap, fabric, or wire mesh.

3. Allow no more than 1" of soil to cover the uppermost root on all trees. Set the top of root ball 1"-2" above finish grade after settling and set plumb to the horizon.

4. Backfill with loosened existing soil or as shown in the plans. Remove rocks, 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. Except when a permanent, subsurface or drip irrigation system is provided, construct soil rings 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. Construct a 3" deep layer of mulch placed 2" off the edge of the trunk flare, around the base of shrub, or solidly around the trunk with a height of 3" and gently sloping sides. Do not pile mulch against the tree trunk.

7. Install guying with minimum 1" wide nylon or polypropylene straps. Check straps monthly and adjust as required to eliminate girdling of tree. Locate all wood stakes or anchors beyond the edge of soil ring in undisturbed soil and located below finished grade, unless otherwise specified. 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.

8. Relocated Trees and Palms: Brace relocated trees and palms in accordance with the Contract Documents. Remove bracing at the conclusion of the contract or as directed by the Engineer. Bracing or straps must not damage or become embedded in the tree bark.
**Palm Planting on Slope**

- **ELEVATION**
  - Minimum of three wood braces spaced at 120° apart with optional fourth wood brace. See cut ends at proper angle to allow for flush connection to wood batten. Nail braces securely to wood batten.
  - For palms over 24 clear trunk, increase wood braces to 6" x 6" minimum. Use four braces with minimum length of 16 spaced at 90° apart. Mulch, remove existing vegetation prior to planting.
  - Note: May be used on large caliper canopy trees, adjust banding every 6 months or as needed (for fast growing species) to prevent girdling. Slope provided as rise:run.

- **Palm Planting**
  - Planting pit 2 times width of rootball.
  - With berms or straps.
  - 2" x 4" Wood Brace.
  - Use four braces with minimum length of 16 spaced at 90° apart. Nail braces securely to wood batten below finished grade.
  - Use four braces with minimum length of 16 spaced at 90° apart. Nail braces securely to wood batten below finished grade.

- **Detail A**
  - Use four braces with minimum length of 16 spaced at 90° apart. Nail braces securely to wood batten below finished grade.
  - Use four braces with minimum length of 16 spaced at 90° apart. Nail braces securely to wood batten below finished grade.

- **Detail B**
  - Use four braces with minimum length of 16 spaced at 90° apart. Nail braces securely to wood batten below finished grade.
  - Use four braces with minimum length of 16 spaced at 90° apart. Nail braces securely to wood batten below finished grade.

- **Landscape Soil Work**
  - (Typical Section)
  - Prop limits of soil work.
  - Total soil work depth.
  - Existing disturbed soil.
  - Amend/replace depth.
  - Scarification depth.

- **Index**
  - 580-001

- **Revision**
  - 01/10/18

- **Description**
  - FY 2019-20

- **Standard Plans**
  - Landscape Installation

- **Sheet**
  - 2 of 2