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 85 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 alternate 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".

11. "In accordance with Traffic Engineering Manual (Federal Number 750-000-005) Section 2.1. "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.
DESCRIPTION:

REVISED

11/01/17

MOVABLE SPAN BRIDGE SIGNALS

10/29/2019

8:17:37 AM

TRACT CONTROL DEVICES FOR

RR & Drawbridge

Arms 32' and over

6'-0" Center

2'-10" Center

5'-6" 8"

Roadway

Travelway

Louvered Backplates

Louvered Backplates

ROADWAY

5'-0" min.

12"

15" 30" 15" 12"

DRAWBRIDGE SIGNAL

5' x 2'-6"

2" Border-4" Radius

6" Series "D" Letters

BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND

TO BE USED WITH TYPE I OPERATION, AS SHOWN ON PREVIOUS SHEET

MONOTUBE SUPPORT MOUNTING

TYPICAL LAMP PLACEMENT

GATE & ARM DETAIL

NOTES:

1. 12 volt flashing red lights shall be mounted on gate arm and shall operate in the flashing mode only, when gate arm is in the lower position or in the process of being lowered. The number of lights shall vary accordingly to length of the gate arm.

2. Alternating 16" pattern of fully reflectorized red and white stripes.
GENERAL NOTES:

1. No guardrail is proposed for signals; however, some form of impact attenuation device may be specified for certain locations.

2. Advance flasher to be installed when and if called for in Plans or Specifications.

3. Top of foundation shall be no higher than 4" above finished shoulder grade.

4. Type of traffic control device
   - I. Flashing warning devices
   - II. Flashing warning devices with cantilever
   - III. Flashing warning devices with cantilever and gate
   - IV. Flashing warning devices with cantilever and gate and multiple tracks
   - V. Flashing warning devices with gate
   - VI. Flashing warning devices with gate and multiple tracks

5. Class of traffic control devices (Not Shown)
   - I. 2-Quadrant flashing warning devices and gates-multiple tracks
   - II. 2-Quadrant flashing warning devices and gates-one track
   - III. 2 Quadrant flashing warning devices-multiple tracks
   - IV. 2 Quadrant flashing warning devices-one track
   - V. 2 Quadrant flashing warning devices and gates-multiple tracks
   - VI. 2-4 Quadrant flashing warning devices and gates-multiple tracks

NOTE:

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

2. When 10' is deemed impractical the control device can be located as close as 2' from the edge of the near traffic lane.
TRAFFIC CONTROL DEVICES FOR CURBED ROADWAY

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.

NOTES:

- 10/29/2019 8:17:39 AM
- REVISION DESCRIPTION:
- STANDARD PLANS FY 2020-21
- RAILROAD GRADE CROSSING TRAFFIC CONTROL DEVICES
DO NOT STOP ON TRACKS

NOTES:
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 crossings for urban conditions and 300' in advance of crossing for rural conditions. See Index 700-102 for sign details.

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Distance &quot;A&quot; (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>400</td>
</tr>
<tr>
<td>55</td>
<td>325</td>
</tr>
<tr>
<td>50</td>
<td>250</td>
</tr>
<tr>
<td>45</td>
<td>175</td>
</tr>
<tr>
<td>40</td>
<td>125</td>
</tr>
<tr>
<td>35</td>
<td>75</td>
</tr>
</tbody>
</table>

RELATIVE LOCATION OF CROSSING TRAFFIC CONTROL DEVICES

RAILROAD CROSSING AT TWO-LANE ROADWAY

RAILROAD CROSSING AT MULTILANE ROADWAY

RAILROAD CROSSING PAVEMENT MESSAGE
**RAILROAD GRADE CROSSING**

**RAILROAD GATE ARM LIGHT SPACING**

<table>
<thead>
<tr>
<th>Specified Length Of Gate Arm</th>
<th>Dimension &quot;A&quot;</th>
<th>Dimension &quot;B&quot;</th>
<th>Dimension &quot;C&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Ft.</td>
<td>6&quot;</td>
<td>36&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>15 Ft.</td>
<td>18&quot;</td>
<td>36&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>16-32 Ft.</td>
<td>24&quot;</td>
<td>36&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>18-19 Ft.</td>
<td>28&quot;</td>
<td>45&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>20-23 Ft.</td>
<td>36&quot;</td>
<td>40&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>24-28 Ft.</td>
<td>36&quot;</td>
<td>41&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>29-33 Ft.</td>
<td>36&quot;</td>
<td>46&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>32-34 Ft.</td>
<td>36&quot;</td>
<td>36&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>35-37 Ft.</td>
<td>36&quot;</td>
<td>36&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>38 And Over</td>
<td>36&quot;</td>
<td>36&quot;</td>
<td>10&quot;</td>
</tr>
</tbody>
</table>

**NOTE:**

**MEDIAN SECTION AT SIGNAL GATES**

**MEDIAN SIGNAL GATES FOR**

**MULTILANE UNDIVIDED URBAN SECTIONS**

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

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.
- Pull Boxes 200' Nominal Spacing
- Advance Warning Sign Location May Be Adjusted To Fit Field Condition
- RR Control Cabinet To Contain Normally Closed Relay (Furnished By RR)
- Warning Flasher Cabinet (Type LB) (2" ID Min.)
- Pull Box (for specific situations)
- Another message may be preferred for specific situations
- "STOP AHEAD" is standard and preferred sign message.
- Another message may be approved when appropriate

TYPICAL PLAN

FRONT VIEW

SIDE VIEW

FRONT VIEW

ACTIVE STATE

(Train Circuit Actuated)

PASSIVE STATE

(Train Circuit Not Actuated)

ADVANCE WARNING FOR RR CROSSING

REVISION

REV 01/17

REV 01/17

REV 01/17

REV 01/17

FY 2020-21

STANDARD PLANS

INDEX

509-100

1 of 1

DESCRIPTION:

NOTE:
- Conduct and cable from the normally closed relay of RR controller cabinet to the junction box shall be furnish & installed by RR.
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>Post &quot;A&quot;</td>
<td>HSS 2 3/4 x 1 1/2</td>
<td>2.50&quot; x 1.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Post &quot;B&quot;</td>
<td>HSS 2 3/4 x 1 1/2</td>
<td>2.50&quot; x 1.50&quot;</td>
<td>0.188&quot;</td>
</tr>
<tr>
<td>Top Rail</td>
<td>2 1/2 NPS (Sch. 16)</td>
<td>2.875&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>HSS 3.000 x 0.120</td>
<td>3.000&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>HSS 2.500 x 0.123</td>
<td>2.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail Post Connection Sleeve</td>
<td>HSS 2 x 2 x 1/8</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>3/16 NPS (Sch. 40)</td>
<td>0.188&quot;</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>3/16 NPS (Sch. 40)</td>
<td>0.188&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>3/8 Ø Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>3/8 Ø Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>Varies (See Details)</td>
<td>Varies</td>
<td>Varies</td>
</tr>
</tbody>
</table>

### 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 A536 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 (S3) screws: Type 316 or 18-8 Alloy.
   F. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
   a. Hex Head Bolts: ASTM A307
      1. 3/8" diameter single bolt option, Grade 36
      2. 5/8" 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
   G. Shims: ASTM B209 Alloy 6061
   H. Bearing Pads: 3/8" 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 5 1/2" for standard installations and 3 1/2" when a 4" sphere requirement is indicated in the Data Tables.
5. Maximum spacing between expansion joints is 40'-0". Locate an Expansion Joint between the posts on either side of the Deck Expansion Joint.
6. Field splices are similar to the Expansion Joint Detail and may be approved by the Engineer to facilitate handling; but the top rail must be continuous across a minimum of two posts.
7. For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "K".
8. Make corners and changes in tangential longitudinal alignment with a 9" bend radius or terminate adjoining sections with mitered end sections when handrails are not required.
9. For changes in tangential longitudinal alignment greater than 45°, position posts a maximum of 2'-0" each side of the corner but not at the corner apex.
10. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
11. Handrails are required and must be continuous at landings for:
   A. Grades Steeper than 5%.
   B. Three or more steps.
12. Installation: Cutting of reinforcing steel is permitted for post installed anchors.
Handrail required for ramps (Handrail continuous at landings between runs)

Handrail ~ 1” NPS Sch. 40 Post

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

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

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

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

TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%
(Type 1 - Picket Railing Shown, Other Types Similar)

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

Minimum from free end of concrete
Ground Line

Top of Sidewalk
or Bikeway

Foundation
Expansion
Joint *

Top Rail
End Hoop

Rail Expansion Joint (Typ.)

Infill Panel Type Varies,
See Data Table in Plans
(Pickets Shown)

Equal Clear Openings at Posts

Intermediate Landing

Bottom Landing

6'-0" Min.

5'-0" Max.

4'-0" Min.

3'-0" Min.

Top of Intermediate Rail

Top of Sidewalk

Ramp

3'-0" Clear Opening

(V-Groove or
Construction Joint Offset **

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

Handrail required for ramps (Handrail continuous at landings between runs)
Handrail ~ 1½” WPS Sch. 40

Horizontal handrail
extension at landing

See Plans for
continuation or
termination limits
of railing

Top Landing

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%

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

RAILINGS ON GRADES STEEPER THAN 5%
(Type 1 - Picket Railing Shown, Other Types Similar)
**TYPE 1 - PICKET INFILL PANEL**

* Picket Spacing of 60" centers is based on a 3⁄8" Ø Bar for standard applications. When shown in the Contract Plans a 48" picket spacing may be required. See Note 4 (Sheet 1).

**PICKET NOTES:**

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

Ties @ 1'-0" center (Post and End Rail)

Ties @ 2'-0" center (Intermediate & Bottom Rail)

**NOTES:**

1. See Plans for Infill Panel option required.

**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.

**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>A 392</td>
<td>Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td></td>
<td>A 491</td>
<td>Aluminum-Coated Steel - No. 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td>Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter)</td>
<td>F 668</td>
<td>See Plans for specified color of PVC</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F 626</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>F 626</td>
<td>5/16&quot; (Min. thickness) x 1/2&quot; (Min. width) x 2'-3&quot; (Min. height) Steel Bars</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F 626</td>
<td>Zinc-Coated Steel</td>
</tr>
</tbody>
</table>
DETAIL "3A" INTERMEDIATE RAIL/RAY CONNECTION
DETAIL "3B" BOTTOM RAIL/RAY CONNECTION

SECTION A-A
SECTION A-A

SECTION C-C
SECTION C-C

SECTION B-B
SECTION B-B

DETAIL "3C" RAY/ARC CONNECTION
DETAIL "3D" ARC/POST CONNECTION (Continuous Top Rail)
DETAIL "3E" PANEL END CONNECTION AT POST WITH EXPANSION JOINT

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

DETAIL "4B" PANEL/SPLICE CONNECTION

NOTES:

1. See Plans for Infill Panel Option required.

PeDestrIaN/BicyCle rAIlinG (sTeel)
NOTES:

1. See Plans for Infill Panel Type required.
### TABLE 1 - RAILING MEMBERS

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>ALLOY</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts (Type &quot;A&quot; &amp; &quot;B&quot;)</td>
<td>6061-T6</td>
<td>Extrusion 1&quot;x2&quot;x0.125</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td>Posts (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion (See Details)</td>
<td>2.50&quot; x 2.50&quot;</td>
<td>Varies</td>
</tr>
<tr>
<td>Top Rail</td>
<td>6061-T6</td>
<td>Extradur</td>
<td>3.00 OD x 0.125 Wall</td>
<td>0.090&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>6061-T5</td>
<td>2.00 OD x 0.125 Wall</td>
<td>0.125&quot;</td>
<td></td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>6061-T6</td>
<td>2.50 OD x 0.125 Wall</td>
<td>0.750&quot;</td>
<td></td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>6061-T6</td>
<td>2.50 OD x 0.125 Wall</td>
<td>0.250&quot;</td>
<td></td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>6061-T6</td>
<td>2.50 OD x 0.125 Wall</td>
<td>0.250&quot;</td>
<td></td>
</tr>
<tr>
<td>Int. &amp; Bottom Rail Post Connection Sleeve</td>
<td>6061-T5</td>
<td>1.50 OD x 0.125 Wall</td>
<td>0.125&quot;</td>
<td></td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>6061-T5</td>
<td>1.50 OD x 0.125 Wall</td>
<td>0.125&quot;</td>
<td></td>
</tr>
<tr>
<td>Handrails</td>
<td>6061-T6</td>
<td>1.50 OD x 0.125 Wall</td>
<td>0.125&quot;</td>
<td></td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>6061-T6</td>
<td>1.50 OD x 0.125 Wall</td>
<td>0.750&quot;</td>
<td></td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>6061-T5</td>
<td>Varies (See Details)</td>
<td>Varies</td>
<td></td>
</tr>
</tbody>
</table>

### NOTES

1. Shop Drawings are required, see Specification Section 515.
2. For bridge mounted railings, work this Index with Index 515-061 Bridge Bicycle/Pedestrian Railing (Aluminum).
3. Materials:
   - A. Structural Extrusions, Tube, Pipe and Bars: Table 1 and ASTM B221 or ASTM B429
   - B. Base Plates and Rail Caps: ASTM B209 Alloy 6061-T6
   - C. Perforated panels (Type S) Alloy 3003-H14
   - D. Stainless steel (SS) screws: Types 316 or 18-8 Alloy
   - E. Aluminum screws: Alloy 2024-T4 or 7075-T6
   - F. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
   - a. Hex Head Bolts: ASTM A 307
   - b. Stainless Steel: ASTM A479, Grade 304
   - c. Plates: ASTM A36, Grade 36
   - d. Flat Washers: ASTM A566

### 3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL (42" Height Shown, 48" Height Similar)

### CROSS REFERENCES:

- **Detail "A"**, Sheet 4
- **Detail "B"**, Sheet 4
- **Detail "K"**, Sheet 3

### 3" ROUND TOP CAP RAIL

### TOP CAP RAIL INNER SPICE SLEEVE

### ALTERNATE TOP RAIL SECTION

### POST TYPE "C" SCREW SLOT SECTION

### SCREW SLOT DETAIL

### OPTIONAL TOP PLATE EXTRUSION SECTION (POST TYPE "C")

### DESIGNATION SHEET

### Varies

### 9"± x 9"±

### 3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL

### TOP CAP RAIL INNER SLEEVE

### ALTERNATE BOTTOM & INTERMEDIATE RAIL SECTION FOR TYPE 3, 4 & 5 RAILINGS

### SCREW SLOT DETAIL

### OPTIONAL TOP PLATE EXTRUSION SECTION (POST TYPE "C")

### STANDARD PLANS

### PEDESTRIAN/BICYCLE RAILING (ALUMINUM)

### INDEX

### SHEET

### FY 2020-21

### 1 of 9
Handrail required for ramps (Handrail continuous at landings between runs)

**DETAIL FOR NON-CONTINUOUS RAILING AT CORNERS**

**RAILINGS ON GRADES STEEPER THAN 5%**

(Type 1 - Picket Railing Shown, Other Types Similar)

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

**RAILINGS ON GRADES 0% TO 5%**

(Typ 1 - Picket Railing Shown, Other Types Similar)

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

**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.

**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%

**EXPANDED ELEVATION AT CORNERS**

See Plans for continuation or termination limits of railing.

**ELEVATION**

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

(Showing Outside Face of Railing with Type "A" Posts)
**RAILINGS ON STEPS & STAIRS**

**RAIL TERMINATION DETAILS**

**DETAIL "J" - ELEVATION VIEW**

**TOP RAIL TERMINATION**

- Handrail Continuous at Landing
- Length of Landing 5' Min.
- 9" Min. Wall Thickness
- Aluminum Handrail required for three or more steps

**DETAIL "K" - ELEVATION VIEW**

**BOTTOM RAIL CONNECTION**

- 7'-3" (Max.) ~ PBR
- Equal spacing
- 5' 0" Max. on Steps
- 5' 6" Max. on Steps
- See "Typical Railing Details", Sheet 2 for post, rail & picket details

**VIEW J-J**

**RAILING CONTINUATION BEYOND STEPS OR STAIRS**

(Bottom shown, Top similar)

**DETAIL "L" - PLAN VIEW**

**HANDRAIL TERMINATION**

- 1'-6" Min. Handrail Extension
- Equal to one tread length
- Varies - Equal spacing
- 5'-0" Max. on Steps

**ELEVATION**

(At-Grade Steps shown, Elevated Stairs similar)

- 9" (Min.) Wide cheekwall both sides
- See "Typical Railing Details", Sheet 2 for post, rail & picket details

**ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOPED WALLS**

- Not considered an expansion joint for railing fabrication (Typ.)
- See "Typical Railing Details", Sheet 2 for post, rail & picket details
- See Index 400-021 or Contract Plans for Step Details

**RAIL TERMINATION DETAILS**

- Cut rail sleeve to match inside face of post or weld rail directly to post (shown dotted)
- Varies ~ Equal spacing
- 5'-0" Max. on Steps
- See Index 400-021 or Contract Plans for Step Details

**LEVELING CHANNEL**

- See Detail "L" - Plan View

**ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOPED WALLS**

- Cut rail sleeve to match inside face of post or weld rail directly to post (shown dotted)
- Varies ~ Equal spacing
- 5'-0" Max. on Steps

**LEVELING CHANNEL**

- See Detail, Sheet 4
- See "Typical Railing Details", Sheet 2 for post, rail & picket details

**ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOPED WALLS**

- Not considered an expansion joint for railing fabrication (Typ.)
- See "Typical Railing Details", Sheet 2 for post, rail & picket details
- See Index 400-021 or Contract Plans for Step Details

**LEVELING CHANNEL**

- See Detail, Sheet 4
- See "Typical Railing Details", Sheet 2 for post, rail & picket details

**ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOPED WALLS**

- Not considered an expansion joint for railing fabrication (Typ.)
- See "Typical Railing Details", Sheet 2 for post, rail & picket details
- See Index 400-021 or Contract Plans for Step Details

---

**DESCRIPTION:**

**REVISION:**

**LAST REVISION:**

**STANDARD PLANS:**

**FY 2020-21**

**PEDESTRIAN/BICYCLE RAILING (ALUMINUM)**

**INDEX:**

**SHEET:**
BASE PLATE DETAILS FOR TYPE "C" POST

(Screws Not Shown For Clarity)

Countersunk Holes for \( \frac{3}{8}'' \times \frac{3}{4}'' \) Self-Tapping Screws (Typ.)

Countersunk Holes for \( \frac{3}{8}'' \times 1'' \) Min. Set Screws (Typ.)

Countersunk Holes for \( \frac{3}{8}'' \times 1\frac{1}{2}'' \) Self-Tapping Screws (Typ.)

$\frac{3}{8}''$ Corners (Typ.)

Countersunk Holes for \( \frac{3}{8}'' \times 1'' \) Min. Set Screws (Typ.)

Optional Intermittent weld in-lieu of Self-Tapping screws between posts.

Notes:
1. See Sheet 4 for Notes.
11. See Sheet 4 for Notes.
111. Length varies for beveled posts on grades. Holes must be drilled plumb to align with screw slot.
SECTION A-A

See Detail "1B"
See Detail "1A"

A

A

(Typ.)

Picket

Picket

6" O.C. (Max.)

Post

Intermediate Rail

45° Beveled End Permitted

Post - 3/8" Ø Bar (Typ.)

Picket Spacing *

(rough 2")

Post & Anchor Bolt

Optional Welded Connection at end picket

Post & Anchor Bolt

Optional Welded Connection at end picket

See Detail "1A"

DETAIL "1A"

(Top of Picket Connection)

DETAIL "1B"

(Bottom of Picket Connection)

3" Nominal Opening

Equal Clear Openings at Posts

2½" min. ~ 5½" max. (Typ.)

INTERMEDIATE RAIL

Picket ~ 1/2" Ø Bar (Typ.)

.writeHead(Typo.)

Writerheading

Writerheading

Anchor Bolt

PILE

Tie Wires

Tension Bars

Miscellaneous Fence Components

COMPONENT INFORMATION

Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating

ASTM A392

Zinc-Coated Wire - No. 9 gage with coating to match Chain-Link Fence Fabric.

F4626

Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter) - See Plans for specified color of PVC.

F668

Chain-Link Fence Fabric (2" mesh with twisted bottom and knuckled top selvage)

F626

Ties @ 1'-0" center (Post and End Rail)

Ties @ 1'-0" center (Intermediate & Bottom Rail)

Chain-Link Fence Fabric tied to inside face of railing

Ties @ 2'-0" center (Intermediate & Bottom Rail)

SECTION A-A

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.

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>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
<td>A491</td>
<td>Aluminum-Coated Steel - No. 9 gage (coated wire diameter)</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>F668</td>
<td></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>Tie Wires</td>
<td>F620</td>
<td>3/8&quot; (min. thickness) x 1/2&quot; (min. width) x 2'-3&quot; (min. height); Steel Bars</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F620</td>
<td>Zinc-Coated Steel</td>
</tr>
</tbody>
</table>

NOTES:

1. See Plans for Infill Panel option required.

PICTURE NOTES:

* Picket Spacing of 6½" centers is based on a 1/2" 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)
5'-0" Std. ~ 3'-0" Min. Clear
Between Handrails

Bolts & Post

Full size Shim Plates
when required for
height adjustment

Base Plate

Optional 4-Bolt
Anchorage
(shown dashed)

Reinforced
Concrete Structure

Top of Wall

Optional 4-Bolt
Anchorage (shown dashed)

Step Cheekwall

Min. #4 Bar (Typ.)
(Continuous)

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REVISION
01/01/19

PEDESTRIAN/BICYCLE RAILING (ALUMINUM)

INDEX
9 of 9

FY 2020-21
STANDARD PLANS
NOTES:
1. Shop Drawings are required.
2. Work with Specification 51S.
3. Materials:
   A. Pan Head Set Screws: Aluminum Alloy 2024-T4 or 7075-T6 or Stainless Steel (SS) Type 316 or 18-8 Alloy.
   B. Base Plates and Cap Plates: ASTM B209, Alloy 6061-T6
   C. Structural Pipe Tube and Bars: ASTM B221 or ASTM B429, Alloy 6061-T6
   D. End Rails: 90° bends and corner bends with a maximum 4 foot spacing; Alloy 6061-T6 is permitted.

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

E. Galvanized Steel Fasteners:
   a. Hex Head Bolts: ASTM 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
   e. Bearing Pads: Plain, Fabric Reinforced, or Fabric Laminated meeting requirements of Specifications 51S & 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; but top 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 alignment may be made continuous with a 90° bend radius or
      terminated at adjoining sections with a standard end hoop when handrails are not required.
   E. For curved longitudinal alignments, shop bends top and bottom rails and handrails to match the alignment radius.
   F. For changes in tangential longitudinal alignment greater than 45°, position posts a maximum of 2'-0" each side
      of the corner, not at the corner apex.

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

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

11/01/17
515-070
2
2

DESCRIPTION:

REVIsIOn

of

STANDARD PLANS
FY 2020-21

Sheet 4
See Detail "C" Sheet 4

Minimum from free end of concrete
See Detail "C" Sheet 4

Rail expansion joints to be located in panels above
See Detail "C" Sheet 4

structure expansion joints * (30'-0" maximum spacing).

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

NOTES:
NPS = Nominal Pipe Size
STRUCTURES EXPANSION JOINTS NOTE:
* Keyed construction joints in Index 400-011 Gravity
   Rail are not considered to be expansion joints.

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

ELEVATION

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

RAMP REQUIREMENTS

LANDING REQUIREMENTS

Max. landing cross-slope = 2.0%
Max. landing slope = 2%

Max. landing cross-slope = 8.33%
Max. landing slope = 2%

RAMP REQUIREMENTS

LANDING REQUIREMENTS

Max. landing cross-slope = 2.0%
Max. landing slope = 2%

Max. landing cross-slope = 8.33%
Max. landing slope = 2%

RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%
RAILING CONTINUATION BEYOND STEPS
(Bottom shown, Top similar)

Concrete sidewalk to extend 6' min. behind railing

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

HANDRAIL TERMINATION

DETAIL "A" - PLAN VIEW

Handrail Continuous

Handrail Termination
See Detail "A" (Typ.)

See 'Typical Railing Details', Sheet 2 for post & rail details

ELEVATION
(At-Grade Steps)

GUIDERAIL ON STEPS & STAIRS

PIPE GUARDERAIL (ALUMINUM)

REV 30/01/17

DESCRIPTION:

FY 2020-21

STANDARD PLANS

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515-070

SHEET

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

**DETAL "B" - RAIL AND HANDRAIL**
(Showing Sloped Condition for Ramps with 2~Bolt Anchorage)

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

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**DESCRIPTION:**

**REV IS IO N**

**LAST REVISION**

**INDEX**

**FY 2020-21 STANDARD PLANS**

**PIPE GUIDERAIL (ALUMINUM)**

**INDEX**

**SHEET**

**515-070**

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 A709 Grade 36.
   - C. Pipe Rails and Posts: ASTM A53 Grade B for standard weight pipe and ASTM A500 Grade B, C or D or ASTM A501 for Structural Tube.
   - Handrail Support Bars: ASTM A36

<table>
<thead>
<tr>
<th>RAILING MEMBER DIMENSIONS TABLE</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Posts</td>
</tr>
<tr>
<td>Rails</td>
</tr>
<tr>
<td>Rail Joint/Splice Sleeves</td>
</tr>
<tr>
<td>Handrails Joint/Splice Sleeves</td>
</tr>
<tr>
<td>Handrails</td>
</tr>
<tr>
<td>Handrail Support Bar</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 fully threaded rods
   - c. Hex Nuts: ASTM A563
   - 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. Field splices are similar to the expansion joint detail and may be approved by the Engineer to facilitate handling.
   - C. Field splices are similar to the expansion joint detail and may be approved by the Engineer to facilitate handling.
   - D. Corners and changes in tangential longitudinal alignment may be made continuous with a 90° bend radius or terminated at adjoining sections with a standard end hoop when handrails are not required.
   - E. For changes in longitudinal alignment, shop bend the top and bottom rails and handrails to match the alignment radius.
   - F. For changes in longitudinal alignment, shop bend the top and bottom rails and handrails to match the alignment radius.

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. For changes in tangential longitudinal alignment greater than 45°, positioned posts a maximum of 72° each side of the corner, not at the corner apex.

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

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

See Plans for continuation or termination limits of railing

See “Typical Railing Details” for post & rail details

Rail expansion joints to be located in panels above structure expansion joints *(30'-0" maximum spacing).

RAILINGS ON GRADIENTS 0% TO 5%

RAILINGS ON GRADIENTS STEEPER THAN 5% TO 8.33%

NOTES:
NPS = Nominal Pipe Size

STRUCTURES EXPANSION JOINTS NOTE:
* Keyed construction joints in Index 400-011 Gravity Wall are not considered to be expansion joints.

Cross Reference:
For Details “C”, “D” and “E”, see Sheet 4.

RAMP REQUIREMENTS

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

LANDING REQUIREMENTS

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

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

Ramp

Intermediate Landing

Intermediate Landing

Bottom Landing

Bottom Landing

Ramp

Ramp

6'-0" Min.

5'-0" Min.

5'-0" Min.

5'-0" Min.

6'-0" Min.

5'-0" Min.

6'-0" Min.

5'-0" Min.

6'-0" Min.

5'-0" Min.

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5'-0" Min.

6'-0" Min.

5'-0" Min.

6'-0" Min.

5'-0" Min.

6'-0" Min.

5'-0" Min.

6'-0" Min.

5'-0" Min.
Concrete sidewalk to extend 6" min. behind handrail.

See 'Typical Railing Details', Sheet 2 for post & rail details.

Steel Handrail required for three or more steps.

Handrail and cheekwalls continuous at landings.

Handrail Termination:
- See Detail "A" (Typ.)
- See Index 400-021

Length of Landing 3' Min.
- Top landing
- Bottom landing

6'-0" Max. for one run of steps

6'-0" (Max.) = Equal Panels
6'-0" Max. on Steps

6'-6" (Typ.)

6'-0" (Max.)

6'-0" (Typ.)

ELEVATION
(A-Grade Steps)

Handrail Continuation:
- See Detail "A" (Typ.)
- See Index 400-021

ELEVATION
(At-Grade Steps)

Handrail Termination:
- See Detail "A" (Typ.)
- See Index 400-021

GUIDERAIL ON STEPS & STAIRS

ALTERNATE END TREATMENT

PIPE GUARDRAIL (STEEL)
REVISION DESCRIPTION:

STANDARD PLANS FY 2020-21

CONCRETE CURB AND 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.

CONCRETE CURB

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

CURB AND GUTTER TYPES E & F

CURB TYPE A

PHASE 2 PLAN

CURB AND GUTTER ENDINGS
CURB AND GUTTER TYPES E & F

CONTRACTION JOINT IN CURB AND GUTTER

CONTRACTION JOINT IN CURB

CONCRETE BUMPER GUARD

CONCRETE BUMPER GUARD

ASPHALTIC CONCRETE CURB

GENERAL NOTES

1. For curb, gutter and curb & gutter provide 1/2" - 1" 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'.

SHOULDER GUTTER

CURB AND GUTTER ENDINGS
CURB AND GUTTER TYPES E & F

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

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

CURB AND GUTTER AND TYPE A CURB ADJACENT TO FLEXIBLE PAVEMENT

APPLICATION OF JOINTS

Applies to both high and low sides of pavement, low side shown.

Applies to shoulder gutter only where adjoining traffic lanes.
1. Spillway to be paid for as Shoulder Gutter, L.F.

2. If spillway empties into an unpaved ditch, the detail should be modified as necessary.

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

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

The Plans Or As Adjusted By The Engineer During Construction.

The Engineer During Construction.

Prop. Pavt.

Prop. Pavt.

Const. Ditch To Drain

Const. Ditch To Drain

Min. Slope 0.02'/ft.

Min. Slope 0.02'/ft.

9' For Types A & E Curb

6' For Type F Curb

7' For Type A Curb

18' For Types B & F Curb

1'-6" For Type A Curb

7" For Type A Curb

9" For Types A & E Curbs

6" For Type F Curb

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.

The Plans Or As Adjusted By The Engineer During Construction.

Prop. Pavt.

Prop. Pavt.

Median Width As Indicated In Detail Plans

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

Crown Line (Exist. Pavt.) Or Lane Line Of Pavt. (Breakover 0.02 Min., 0.05 Max.)

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

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

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

Crown Line (Exist. Pavt.) Or Lane Line Of Prop. Pavt.

Provided As Indicated In Detail Plans

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

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Existing Or New Pavt.

Prop. Pavt.

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Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

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Existing Or New Pavt.

Prop. Pavt.

Median

Existing Or New Pavt.

Prop. Pavt.
Notes:
1. Traffic Separator transverse reinforcement adjacent to deck expansion joints shall be field adjusted to maintain clearance and spacing. Bars shall be field cut as shown, bars may be rotated to maintain clearance.
2. Traffic Separator ends at deck expansion joints shall follow the deck joint limits. Drainage joints and V-Grooves shall be placed perpendicular or radial to the E of the Traffic Separator. See Structures Plans, Superstructure and Approach Slab Sheets for details.
4. Option II is not permitted on bridge decks with prestressing steel.
5. Bar Spacing:
   - 4'-0" @ 7 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-0" @ 3 equal spaces (continuous)
6. At the Contractor’s option, a one piece bar may be substituted for Bars 4B and 4E.
7. Field bend and cut rebar as required to maintain cover.
Traffic Separator (Typ.)

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 rebars as required to maintain cover.
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.

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

DRAINAGE JOINT DETAIL
(For 5" Opening Or Less)

ESTIMATED TRAFFIC SEPARATOR QUANTITIES:

CONCRETE:

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<thead>
<tr>
<th>Width</th>
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<th>Weight/CY</th>
<th>Type</th>
<th>Weight/CY</th>
</tr>
</thead>
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<td>0.072 CY</td>
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</tr>
<tr>
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<td>0.112 CY</td>
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<td></td>
</tr>
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<td>8'-0&quot;</td>
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</thead>
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<tr>
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<td>0.304 CY</td>
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REINFORCING STEEL:

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<th>Weight/CY</th>
<th>Type</th>
<th>Weight/CY</th>
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<tbody>
<tr>
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<td>0.132 CY</td>
<td>0.164 CY</td>
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<td>0.112 CY</td>
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</tbody>
</table>

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.

DOWEL DETAIL

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.

BRIDGE INSTALLATIONS - TYPE "E" AND "F" CURB
### GENERAL NOTES:

1. **BARRIER CONCRETE:** Use Class II concrete for all barriers constructed in moderately or extremely aggressive environments, and use Class IV Concrete for all barriers constructed in slightly aggressive or less aggressive environments. Specifications for Class II and Class IV concrete are outlined in FM 1-T 170, General Notes 3, 4, and 5 on Sheet 3.

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).

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 4 inches; measured from the top face of the barrier.

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

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

7. **DOWELED JOINTS:** As shown in the Dowel Details on Sheets 2 & 13, install 7/8" Dowelled Joints for Concrete Barrier connections to Pier Protection Barrier and Traffic Railings. Dowelled Joints are also required for expansion mitigation in Median Barrier as shown herein. Dowelled Joints are permitted within Grade-Separated Median Barrier.

8. **CRACK CONTROL V-GROOVES:** At 20-foot intervals, place 1/8" 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. The V-grooves may be used as part of a crack control system. When used for crack control, spacing between the V-grooves shall be no greater than 20 feet as shown herein.

9. **SUBGRADE:** Compact the top 12 inches of the subgrade to at least 98% of the maximum density determined by FM 1-T 897 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 density irregularities.

11. **FINISH GRADE ELEVATION:** At the barrier face location, the finish grade pavement has a vertical position tolerance of ± 1 inch from the locations shown.

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

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

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

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

16. **BARRIER 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 sheeting 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 from the front face of the barrier and the reflective sheeting 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 4½" 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:**

REVISION 10/29/19

**REV 521-001**

**INDEX**

**STANDARD PLANS**

**CONCRETE BARRIER**

**FY 2020-21**

**LAST REVISION 01/01/18**

**NOTE:**

1. **BARRIER RUN SEGMENT:** Within the Barrier Run Segment, either the 3' 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 Dowel 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 1½" x 13 (±1/8) drilled hole for cured concrete. Drill holes larger than 1½". Ensure the dowel is secure with adhesive in accordance with Specification 416. No load testing is required.

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

4. **OPTIONAL LONGITUDINAL JOINT:** When a longitudinal joint is placed above the footing, use the Optional 1½" x 3½" (Min.) Shear Key shown. As a substitute for the Shear Key, the concrete footing surface may be raked to provide additional shear friction. Rake the fresh concrete surface so that about half of the surface area consists of approximately 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 1½" 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 detail on Sheet 3.

**DOWEL DETAILS**

**SECTION A-A**

**38' HEIGHT MEDIAN BARRIER**

(See Sheet 3 for Steel Reinforcing Details)
**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 26.

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 Cyl. = 0.20 cu ft

Steel Qty. = 11.8 LB/FT

**VIEW B-B**

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

**PLAN VIEW - 38" HEIGHT MEDIAN BARRIER**

FREE END REINFORCING (See Note 3)

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

Sloped End Treatment (Linear Transition)

38' Height Median Barrier
(See Sheet 2)

Sloped End Treatment (Linear Transition)

3'-0" Min.

Top of Barrier (Constant Slope -
Linear Transition)

3'-0" (+7)

ELEVATION - SLOPED END TREATMENT

PLAN - SLOPED END TREATMENT

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

NOTES:

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

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

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

VIEW E-E
END TRANSITION

MEDIAN BARRIER -
SLOPED END TREATMENT

CONCRETE BARRIER
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 in Grade-Separated sections.

2. CONNECTIONS BETWEEN DIFFERENT SECTIONS: Connect Short Grade-Separated sections and Tall Grade-Separated sections using a continuous pour or Transverse Joint, where longitudinal steel that aligns within the adjacent section is maintained continuously between sections or has a full lap splice with the adjacent section's longitudinal steel. Connect Short Grade-Separated sections and Tall Height Median Barrier sections of Sheet 2 using a 4" Dowelled Joint.

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

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

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

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

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

ii. The barrier's vertical steel spacing is reduced to 4" 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.

TALL GRADE-SEPARATED HEEL FOOTING SECTION
FOR Y ≤ 4'-0"
**SECTION A-A**

- **BEGIN TRANSITION**
- **Variable Section**
- **Width Sta.**
- **38" Height Median Barrier**
  - (See Sheet 2)

**ELEVATION**

- **4'-8" (Typ.)** Shoulder Pavement (Typ.)
- **2'-0" (Typ.)** Gutter Line
- **20 Min.**

**PLAN**

- **(See Note 4)**
- **Pedestal Width**
- **Pedestal Setback**
- **Pedestal Height & Width Transition**

**SECTION B-B**

- **BEGIN TRANSITION**
- **End Transition (56" Height Section)**
- **+2'-0" Cover (Typ.)**
- **4'-8" (Typ.)** Shoulder Pavement (Typ.)
- **2'-0" (Typ.)** Gutter Line
- **20 Min.**

**SECTION C-C**

- **3" (Typ.)**
- **3" (Typ.)**
- **(Not Shown) (See Note 1)**
- **(See Note 4)**

**SECTION D-D**

- **Begin Transition**
- **Variable Section**
- **Width Sta.**
- **38" Height Median Barrier**
  - (See Sheet 2)

---

**NOTES:**

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

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

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

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

---

**MEDIAN BARRIER - 56" HEIGHT SECTION**

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

**FY 2020-21 STANDARD PLANS**

**CONCRETE BARRIER**

**INDEX 521-001**

**SHEET 6 of 26**
NOTES:

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

2. BARRIER REINFORCING: Maintain the 38" Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 40" maximum cover from the top of the barrier.

3. PROJECT-SPECIFIC PEDESTAL WIDTH & SETBACK: The pedestal width is governed by the size requirements of the overhead sign support, as detailed in the Plans. Likewise, the setback distance from the sign support base to the barrier face is governed by the anchor bolt cover requirements, as defined per the Plans. The minimum required 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.
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.

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

NOTES:

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, B-B, and 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.

5. CONCRETE OR FLOWABLE FILL: Use Class NS Concrete in accordance with Specification 347 or Non-Excavatable Flowable Fill in accordance with Specification 521.

MEDIAN BARRIER - 38" HEIGHT SPLIT SECTION
FOR STAND-ALONE SIGN SUPPORT SHIELDING

SECTION A-A
TRANSITION SECTION (AT BEGIN SPLIT SECTIONS)

SECTION B-B
38" HEIGHT SPLIT SECTION
(OPPOSITE SIDE SIMILAR BY OPPOSITE HAND)

SECTION C-C
OVERHEAD SIGN SUPPORT几种
**DESCRIPTION:**

REVISION of STANDARD PLANS FY 2020-21

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**NOTE:**

1. **SECTION VIEWS:** See Sheet 11 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.

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**MEDIAN BARRIER - 44" HEIGHT**

**SPLIT SECTION FOR PIER SHIELDING**

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**PLAN**

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

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**ELEVATION**
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.

MEDIAN BARRIER - 44" HEIGHT
SPLIT SECTION FOR PIER SHIELDING - DETAILS

Concrete Qty. = 0.20 CY/FT
Steel Qty. = 52.6 LB/FT
SECTION A-A
38" HEIGHT SHOULDER BARRIER
(See Sheet 14 for Reinforcing Steel Details)

NOTES:

1. BARRIER RUN SEGMENT: Either the 38" Height Shoulder Barrier or the differing Shoulder Barrier sections shown throughout the Index may be placed within this segment as required per the Plans.

2. SECTION VIEWS: For additional Views A-A and B-B, see Sheet 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 first casting, the dowel may be cast-in-place for new concrete or placed into a 1 7/8 x 13" ± 8") drilled hole for cured concrete. For drilled holes larger than 1 7/8", 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 7/8 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.
**DESCRIPTION:** REVISION of STANDARD PLANS FY 2020-21

**DESCRIPTION:**

**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 5V2 and 5U3 to 6" for 5 Spaces, placed with 3" cover from the barrier's end face.

3. **BAR BENDING DIAGRAMS:** For additional details for bars 5V2 and 5U3, see the Bar Bending Diagrams on Sheet 26.

**VIEW B-B**

**REDUCED SECTION OF END TRANSITION FOR GUARDRAIL**

(End of Barrier)

**SHOULDER BARRIER - REINFORCING DETAILS**

**PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION**

(Longitudinal Steel Not Shown for Clarity)
1. GENERAL: Install the differing Section Options as required per the Plans.

2. CONNECTIONS BETWEEN DIFFERENT SECTIONS: Connect differing Shoulder Barrier sections using a continuous pour or Transverse Joint, where longitudinal steel that aligns within the adjacent section is maintained 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 2-1IP length to maintain the cover shown.

NOTES:

- Maintain the cover shown.
- Use longer lateral reinforcing bars of 2'-10" length to the 2'-0" Extended Heel as shown in the Retaining Section.
- Inlets are required in retaining segments, install the Inlet Structure per the Plans.

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

SHOULDER BARRIER - SECTION OPTIONS
1. GENERAL: See the applicable Notes on Sheet 18.

**NOTE:**

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

**SHOULDER BARRIER - SECTION OPTIONS (CONTINUED)**

**CONCRETE BARRIER**
As Reqd. to Maintain Cover
Trim Reinforcing as
Req'd to Maintain Cover
(10'/ Min., 8' Max.) (Typ.)
3' Height Rear-
Flush Section

Plan - Round Pier Example
Rear-Flush Section
(See Section View for All
Longitudinal Steel Locations)

Plan - Round Pier Example
Rear-Flush Section
With 3' Width Reduction
(See Section View for All
Longitudinal Steel Locations)

Plan - Round Pier Example
Rear-Flush Section
With 3' Width Reduction
(See Section View for All
Longitudinal Steel Locations)

Plan - Square Pier Example
Rear-Flush Section
(See Section View for All
Longitudinal Steel Locations)

Plan - Square Pier Example
Rear-Flush Section
With 3' Width Reduction
(See Section View for All
Longitudinal Steel Locations)

NOTE:
1. Pier(s): The piers shown herein are example shapes only; see the Plans for the project-specific dimensions. The details shown herein are example details for protection per the AASHTO LRFD requirements. For piers requiring protection, see Index 521-002.

SHOULDER BARRIER - 38' HEIGHT REAR-FLUSH SECTION
FOR REDUCED SETBACK PIER SHIELDING
(DESIGN SPEED ≤ 45 MPH)
44" HEIGHT
REAR-FLUSH SECTION
EMBEDDED IN FOOTING

SECTION C-C
ABOVE-GROUND HAZARD
FOR REDUCED SETBACK PIER SHIELDING

44" HEIGHT
REAR-FLUSH SECTION
WITH 3" WIDTH REDUCTION
EMBEDDED IN FOOTING

SECTION D-D
ABOVE-GROUND HAZARD
& BARRIER

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

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

DESCRIPTION:

FY 2020-21
STANDARD PLANS

INDEX 521-001

SECTIONS VIEWED
(See Note 1)

Pier (See Note 1)

1/2" Preformed Joint Filler (Full Height of Barrier Sections)

44" Height Rear-Flush Section

Trunk Reinforcing as Req'd to Maintain Cover (1/2" Min., 4" Max.) (Typ.)

Back of Pier (Typ.) (Round Pier Shown, Other Shapes Similar) (See Note 1)

Back of Barrier

Plan - Round Piers Example (Square Piers Similar)

(Elevations and Section Views)

For All Longitudinal Steel Locations,
See the Section Views

Field Cut

Sp. Max.

Bars 5/8 @ 8" Sp. Max. (Field Cut as Req'd)

No 4 Bars @ 8" Sp. Max. (Typ.)

Optional Long Joints

Gutter Line

2" Cover

Pier (See Note 1)

1/2" Preformed Joint Filler (Full Height of Barrier Sections)

44" Height Rear-Flush Section with 3" Width Reduction

Gutter Line

Toe of Floating

Back of Barrier

44" Height Shoulder Barrier

(See Sheet 13)

Height Transition

3'-0"

2'-0" (Min.)

10 /29 /2019
R E V I S I O N
8 :18 :38  A M

LAST REVISION
11/01/18

INDEX
CONCRETE BARRIER

521-001

SHEET
18 of 26
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 Doweled 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.
**SECTION A-A**

Curb & Gutter Barrier

**SECTION C-C**

Curb & Gutter Barrier with Drainage Slot

**ISOMETRIC VIEW**

Curb Gutter Barrier

**ELEVATION**

**PLAN**

Curb and Gutter Barrier Notes:

1. **GENERAL:** Place 20" x 18" Drainage Slots at locations and/or spacing called for in the Plans.

2. **steel reinforcement conflict:** When the Drainage Slot encounters a conflict with reinforcing steel, shift or cut the reinforcing steel to provide 20" x 18" of concrete cover for the reinforcing around the Drainage Slot. If cutting the vertical bars, maintain 8" bar spacing. If shifting the vertical bars, move the bars from the standard 8" 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 4" Doweled Joints as defined on Sheet 13.

4. **Traffic Railing Connections:** Align the barrier and Traffic Railing faces and connect with the 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'-0" 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.

**DRAINAGE SLOT NOTES:**

1. **GENERAL:** For additional views A-A and B-B, see Sheet 21.

2. **Expansion Joints:** Place 20" 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 4" Doweled Joints as defined on Sheet 13.

4. **Traffic Railing Connections:** Align the barrier and Traffic Railing faces and connect with the 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'-0" 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 26.
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 SIV4 to 6" for 5 Sp. placed with 3" cover from the barrier's end face.
3. BAR BENDING DIAGRAMS: For additional details for bars SV2 and SIV4, see the Bar Bending Diagrams on Sheet 26.

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

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

WALL SHIELDING BARRIER - 38" HEIGHT SECTION - APPROACH & TRAILING TRANSITION
NOTE:

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 Joint. 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 6. CONCRETE OR FLOWABLE FILL: Use Class NS Concrete in accordance with Specification 347 or Non-Excavatable Flowable Fill in accordance with Specification 6. CONCRETE OR FLOWABLE FILL: Use Class NS Concrete in accordance with Specification 347 or Non-Excavatable Flowable Fill in accordance with Specification 6.
WALL SHIELDING BARRIER - 56" HEIGHT SECTION FOR BARRIER-MOUNTED SIGN SUPPORT SHIELDING

NOTES:

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

2. BARRIER REINFORCING: Maintain the 38" Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 4 3/4" maximum cover from the top of the barrier.

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

3. PROJECT-SPECIFIC PEDESTAL WIDTH & SETBACK: The pedestal width is governed by the size requirements of the overhead sign support, as detailed in the Plans. Likewise, the setback distance from the sign support base to the barrier face is governed by the anchor bolt cover requirements, as defined in the Plans.

4. TRANSITION SEGMENTS: The Transition Segments shown are examples only. For the actual approach and trailing transition taper rate, length, and width, see the details in the Plans.

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

END TRANSITION

SECTION D-D (Reinforcing Steel Not Shown for Clarity)

SECTION C-C (56" Height Section)

SECTION B-B

SECTION A-A

BEGIN TRANSITION

5/28/2020

38" Height Single-Faced Section
(Variably Sectional Height, See Note 4)

38" Height Single-Faced Section
(See Sheet 23)

38" Height Single-Faced Section
(See Sheet 23)
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 425-031 for Adjacent 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 ½ 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 ½" 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 596-001. For additional Concrete Barrier Details, see Sheet 3 and Index 521-001.
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 footing and stem details.

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 footing and stem details.

BARRIER DETAILS - CONNECTION TO CONCRETE BARRIER

ELEVATION
(56" PPB Shown, 44" PPB Similar with 1'-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)

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)
1. GENERAL: Construct either the 56" PPB or the 44" PPB height as called for in the Plans. See Section Views for All Steel Locations.

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

See Sheets 2 & 3 for additional plan and elevation details.

NOTES:
1. GENERAL: Construct either the 56" PPB or the 44" PPB height as called for in the Plans. See Section Views for All Steel Locations.

2. FOOTING OPTIONS: See Sheet 6 for the supporting stem and footing details.
**REV 0**

**DESCRIPTION:**

**REVISION OF STANDARD PLANS FY 2020-21**

**INDEX SHEET**

**BARRIER FOOTING OPTIONS**

**SECTION E-E**

**REAR-FLUSH FOOTING OPTION**

Concrete Qty. = 0.34 CF/FT (Below Gutter Line)

Steel Qty. = 63.5 LB/FT (Including Bars 5U)

**SECTION F-F**

**SYMMETRICAL FOOTING OPTION**

Concrete Qty. = 0.34 CF/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.

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

2. OPTIONAL SLIP FORMING SUPPORT: The 1'-0" depth spread footing may be extended by 3" 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, expand 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).
**REVISION DESCRIPTION:**

**LAST REVIEW DATE:** 01/01/17

**DESCRIPTION:**

**FY 2020-21**

**STANDARD PLANS**

**PIER PROTECTION BARRIER**

**INDEX:** 521-002

**SHEET:** 7 of 8

---

**NOTES:**

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.

---

**SECTION H-H**

**CRASH WALL**

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)

---

**VIEW J-J CRASH WALL ELEVATION**

(Schematic View - See Note 3)
BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
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<th>LENGTH</th>
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</thead>
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<tr>
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<td>5</td>
<td>7'-5&quot;</td>
</tr>
<tr>
<td>U</td>
<td>5</td>
<td>8'-31&quot;</td>
</tr>
<tr>
<td>R</td>
<td>5</td>
<td>6'-0&quot;</td>
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<tr>
<td>F1</td>
<td>5</td>
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<tr>
<td>F2</td>
<td>5</td>
<td>Varies (Straight)</td>
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<td>L</td>
<td>5</td>
<td>6'-0&quot; / 7'-9&quot;</td>
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<tr>
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<td>5</td>
<td>4'-6&quot;</td>
</tr>
<tr>
<td>S1</td>
<td>8</td>
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</tr>
<tr>
<td>S2, S3</td>
<td>5</td>
<td>Varies (Straight)</td>
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</tbody>
</table>

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

BAR BENDING DIAGRAMS

BARS 5V

BARS 5U

BARS 5F1

BARS 5L

BARS 5R

BARS 5E
GENERAL NOTES:
1. GENERAL: Construct Opaque Visual Barrier (OVB) in accordance with Specification 521, and use either cast in place or precast panels as cast OVB concrete monolithically with the Concrete Barrier or Traffic Railing; use an ASTM D6860, Class 3, Type III Organic Felt 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 3" 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 pole structures conflict with placement of OVB, end and restart the OVB with a transverse vertical face located a longitudinal distance of 2" (± 1/2") from the base of the structure. Follow the same reinforcing scheme and concrete cover requirement 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, 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, bridges, etc.), OVB is only required on top of one of the Concrete Barrier sections. OVB on top of the Concrete Barrier section with the highest elevation. Longitudinally overlapping OVB runs are perpendicular 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 which may be shifted longitudinally 1/2 of the required bar spacing.
11. OPTIONAL BLEDGED 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 413. 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 Junction 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 shown on Sheet 1; place dowel bars within the OVB Linear Bottom Transition as required.

4. SEGMENT LENGTHS:
   Elevation View 'C' - The length of the reduced-section OVB segment is governed by the length of linear width and height transition of the Concrete Barrier.
   Elevation View 'D' - The length of the reduced-section OVB segment is governed by the length of Concrete Barrier with 44" Height Section.

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.

6. TRANSVERSE JOINTS:
   Follow the requirements of Sheet 1.
   Elevation View 'A' - 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.

ELEVATION VIEW 'B' - OVB SEGMENT FOR CONCRETE BARRIER WITH 44" HEIGHT SECTION
(OVB LINEAR BOTTOM TRANSITION SHOWN, REVERSE DIRECTION SIMILAR BY OPPOSITE HAND)
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. Support the open joints spaced between 30 feet minimum to 90 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 Delimiters 2'-4" above the riding surface in accordance with Specification Section 705. Match the Barrier Delimiter color (white or yellow) to the near edge. Line.
6. Slip forming of the barrier portion is permitted.
   A. Stem walls may be widened, at no additional cost, to accommodate slip forming.

* Construct 1/2" Open Joints plumb at construction joints in Junction Slabs or footings.

PLAN
(Restraining Steel not shown for clarity)

CROSS REFERENCE:
For Section A-A see Sheet 3.
For Section C-C and Detail "A" see Sheet 5.
For Wall mounted Barrier/Noise Wall Details see Index 521-512.
For Footing mounted Barrier/Noise Wall Details see Index 521-513 (T-shaped), 521-514 (L-shaped) or 521-515 (Trench).

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. Support the open joints spaced between 30 feet minimum to 90 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 Delimiters 2'-4" above the riding surface in accordance with Specification Section 705. Match the Barrier Delimiter color (white or yellow) to the near edge.
6. Slip forming of the barrier portion is permitted.
   A. Stem walls may be widened, at no additional cost, to accommodate slip forming.
Riding Surface

Const. Joint Required

2" Cover (Top)

Spacing Bars SS1 & SS2

Bars SR3

Bars SS1 (Typ.)

V-Groove

Bars SS2

Bars SV

2½" Cover

2½" Cover

2½" Cover (Top)

2½" Cover (Top)

2½" Cover (Top)

2½" Cover (Top)

2½" Cover (Top)

2½" Cover (Top)

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**Bill of Reinforcing Steel**

<table>
<thead>
<tr>
<th>Mark</th>
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<tbody>
<tr>
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<tr>
<td>R2</td>
<td>5</td>
<td>5'-2½&quot;</td>
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<td>R3</td>
<td>5</td>
<td>4'-10&quot;</td>
</tr>
<tr>
<td>S1</td>
<td>5</td>
<td>As Req'd</td>
</tr>
<tr>
<td>S2</td>
<td>5</td>
<td>7'-3&quot;</td>
</tr>
<tr>
<td>V (Wall)</td>
<td>5</td>
<td>6'-6½&quot;</td>
</tr>
<tr>
<td>V (T-Footings)</td>
<td>5</td>
<td>7'-6½&quot;</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 shall have a 2" minimum cover.
3. Bars S1 shall be one continuous or lap spliced bar. No mechanical couplers are permitted.
4. Bars S5S1 may be continuous or spliced at the construction joints. Lap splices for Bars S5S, S5S1 and SW 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>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Railing)</td>
<td>CY/LF</td>
<td>0.107</td>
</tr>
<tr>
<td>Concrete (Noise Wall)</td>
<td>CY/LF</td>
<td>0.136</td>
</tr>
<tr>
<td>Reinforcing Steel (Typical)</td>
<td>LB/ LF</td>
<td>69.36</td>
</tr>
<tr>
<td>Additional Rein. @ Open Joint</td>
<td>LB</td>
<td>226.85</td>
</tr>
</tbody>
</table>

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

**SECTION C-C THRU NOISE WALL END TAPER**

**PLANS - RAILING END TRANSITION**

(Showing Bars 5R and Bars 5S1)

(Bars 5V not shown for clarity)

**PLANS - RAILING END TRANSITION**

(Showing Bars 5V and Bars 5S1)

(Bars 5R not shown for clarity)
T-Shaped Spread Footing

Expansion Joint in footing (Typ.)

Shoulder or Roadway Pavement

See Detail "A" for Mortar Plug

1/2 V-Groove in both faces and top of Concrete Barrier/Noise Wall

1/2 V-Groove in both faces and top of Concrete Barrier/Noise Wall

1/2 Open Joint

1/2 Open Joint

T-Shaped Spread Footing

T-Shaped Spread Footing

Stem Wall

Gutter Line

T-Shaped Spread Footing

Concrete Barrier/Noise Wall

Open Joint

V-Groove

Spacing 1/2 Open Joint

Spacing 1/2 V-Groove

30'-0" Maximum (See Note 3)

ELEVATION OF INSIDE FACE OF CONCRETE BARRIER/NOISE WALL

(Reinforcing Steel not shown for clarity)

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 1/2" Open Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown. 1/2" Open Joint locations are to coincide with 1/2" Expansion Joints in footings.
4. Construct 1/2" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/2" 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.

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)

1/2 Open Joint

1/2 Open Joint

T-Shaped Spread Footing

T-Shaped Spread Footing

Begin or End 8'-0" Concrete Barrier/Noise Wall or End Taper (See Note 6)

Begin or End 8'-0" Concrete Barrier/Noise Wall or End Taper (See Note 6)

Begin or End 14'-0" Concrete Barrier/Noise Wall

Begin or End 14'-0" Concrete Barrier/Noise Wall

1/2 Open Joint

1/2 Open Joint

T-Shaped Spread Footing

T-Shaped Spread Footing

Outside Edge of Concrete Barrier

Begin or End 8'-0" Traffic Railing/Noise Wall or End Taper (See Note 6 & 7)
ELEVATION OF CONCRETE BARRIER/NOISE WALL REINFORCING STEEL
(Bars 5S1 in Railing not shown for clarity)

NOTES:
1. Field Cut Bars 5R & 5S1 in Noise Wall End Taper as required to maintain minimum cover.
2. See Index 521-513, 521-514 and 521-515 for footing reinforcement.
3. 3/8" 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 5S2 are not required when 3/8" Open Joint is omitted.
4. Bar spacing shown is along the Gutter Line.

ELEVATION OF CONCRETE BARRIER/NOISE WALL END TAPER
(Bars 5S1 in Railing not shown for clarity)
SECTION A-A
TYPICAL SECTION THRU CONCRETE BARRIER/NOISE WALL

NOTES:
1. See Index 521-513, 521-514 or 521-515 for footing reinforcement.
2. At 3" Open Joints, plug the lower 1/2 portion of the open joint by filling it with mortar in accordance with Specification Section 400.

REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
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</thead>
<tbody>
<tr>
<td>R1</td>
<td>5</td>
<td>5'-2&quot;</td>
</tr>
<tr>
<td>R2</td>
<td>5</td>
<td>5'-25&quot;</td>
</tr>
<tr>
<td>R3</td>
<td>5</td>
<td>10'-10&quot;</td>
</tr>
<tr>
<td>S1</td>
<td>5</td>
<td>AS REQD.</td>
</tr>
<tr>
<td>S2</td>
<td>5</td>
<td>7'-3&quot;</td>
</tr>
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</table>

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Bars SR may be continuous or spliced at construction joints. Lap splices for Bars SR, and SS1 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.

ESTIMATED CONCRETE BARRIER/NOISE WALL QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<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>0.283</td>
</tr>
<tr>
<td>Reinforcing Steel (Railing/Noise Wall) (Bars R1, R2, R3, S1 &amp; V)</td>
<td>LB/Ft</td>
<td>100.31</td>
</tr>
<tr>
<td>Additional Rein. @ Open Joint (Railing/Noise Wall)</td>
<td>lb</td>
<td>397.38</td>
</tr>
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REVISION:
11/01/18

LAST REVISION:
11/01/18

DESCRIPTION:

FY 2020-21 STANDARD PLANS

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

INDEX 521-511

SHEET 3 of 3
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 SB 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>
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<tr>
<th>MARK</th>
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<th>TYPE 2</th>
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<tbody>
<tr>
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<td>5</td>
<td>8'-0&quot;</td>
<td>9-0&quot;</td>
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<tr>
<td>B1</td>
<td>5</td>
<td>AS REGO</td>
<td>AS REGO</td>
</tr>
<tr>
<td>B2</td>
<td>5</td>
<td>10'-0&quot;</td>
<td>N/A</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'-5&quot;</td>
<td>4'-5&quot;</td>
</tr>
<tr>
<td>S3</td>
<td>4</td>
<td>3'-1&quot;</td>
<td>8-0&quot;</td>
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<tr>
<td>D1</td>
<td>5</td>
<td>4'-8&quot;</td>
<td>4'-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>
</tr>
</tbody>
</table>

BAR SB3 (TYPE 1 only)
BAR 4S3
BAR 5U1
BAR 5U2

6'-2" (TYPE 1)
7'-2" (TYPE 2)

MATCH TOP SLOPE OF JUNCTION SLAB
BAR 5A
BAR SA
BAR 5F
BAR 5L

8" (TYPE 1)
3-1/2" (TYPE 2)

1'-0 DOWEL

BARS SB & SF

JUNCTION SLAB
MATCH TOP SLOPE OF TRAVEL LANE OR SHOULDER.

PARTIAL END VIEW OF RAILING END TRANSITION FOR GUARDRAIL ATTACHMENT (SHOWING BARS 5V AND BARS 5B1)

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

ESTIMATED JUNCTION SLAB QUANTITIES

<table>
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<tr>
<th>ITEM</th>
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<th>QUANTITY</th>
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</thead>
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<tr>
<td>Concrete (Junction Slab)</td>
<td>CF/FT</td>
<td>0.268</td>
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<tr>
<td>Reinforcing Steel (Typical)</td>
<td>LB/FT</td>
<td>31.72</td>
</tr>
<tr>
<td>Additional Rein. @ Expansion Joint</td>
<td>LB</td>
<td>21.36</td>
</tr>
</tbody>
</table>

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.
7. If slip forming is used, submit shop drawings for approval showing Expansion Joint support details and 2" side cover with adjusted Typical Section dimensions.

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

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

INDEX 521-512

Sheet 2 of 2
1. Construct the Spread Footing level transversely and plumb vertically. 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" expansion joints plumb and perpendicular or radial to Gutter line. Provide at 90'-0" maximum intervals as shown.

5. Construct 3/4" 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.

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

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.

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

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)

10. Spacing shown is along the Gutter line.

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").

**SUMMARY:**
- **SPREAD FOOTING ADJACENT TO SKEWED APPROACH SLAB AND WITH BARRIER WALL INLET**
- **PLATE:**
  - 9'-0" x 1'-0" expansion joints
  - 3'-0" x 1'-0" expansion joints
- **NOTES:**
  - Construct the Spread Footing level transversely and plumb vertically; do not construct the spread footing perpendicular to the roadway surface.
  - Concrete will be in accordance with Specification Section 346.
  - 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.
  - Construct 1" expansion joints plumb and perpendicular or radial to Gutter line. Provide at 90'-0" maximum intervals as shown.
  - Construct 3/4" 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.
  - Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.
  - 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.
  - See Index 521-510 for Bars 5V2.
  - Place 8 ~ Bars (6 ~ 5B1 & 2 ~ 5S1) inside Stirrup Bars 5V2 as shown. (2 ~ 5S1 Bars included in 521-510 or 521-511 quantities)
  - Spacing shown is along the Gutter line.
  - 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 Section B-B and Detail 'A', see Sheet 2.
**BILL OF REINFORCING STEEL**

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<tr>
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<td>A</td>
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<td>6'-8&quot;</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>5' AS REGD.</td>
</tr>
<tr>
<td>U</td>
<td>5</td>
<td>1'-0&quot;</td>
</tr>
</tbody>
</table>

**DOWEL**

1" Ø Smooth Bar

2'-0"

**BARS 5A & 5B**

**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.

**REINFORCING STEEL BENDING DIAGRAMS**

**SECTION B-B**

**TYPICAL SECTION THRU SPREAD FOOTING**

(Bars 5V and 5S 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**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<td>LB</td>
<td>31.38</td>
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Note: The reinforcing steel quantity includes the difference between Index 521-510 or 521-511 and Bars 5V shown. Bars 5S 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 APPROACH 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 3/8" Expansion Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.
5. Construct 1/2" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 3/8" 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.

For Detail "A", see Sheet 3.
For Section A-A and Estimated Quantities, see Sheet 4.
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.

Top of Spread Footing

Bars 5V
(Lap with Bars 5U1 as shown)
Spacing 1" Ø Dowels

Bottom of Spread Footing (Level Transversely)

2" Cover (Top & Sides)

Optional Const. Joint (See Note 3)

EXPANSION JOINT DETAIL

(Spread Footing expansion joints are required at 3" open joints in Concrete Barrier/Noise Wall)

DETAIL "A"
(Option A Shown, Option B Similar)
(Showing Locations of 1/2" V-Grooves and 3/4" Preformed Expansion Joint Filler)
SECTION A-A
Typical Section Thru Spread Footing and Barrier Wall Inlet - Option B
(Bars 5P, 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

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

REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

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<th>LENGTH</th>
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</tr>
<tr>
<td>S3</td>
<td>5</td>
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<td>S4</td>
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<td>U1</td>
<td>5</td>
<td>9'-2&quot;</td>
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<td>U2</td>
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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 will have a 2" minimum cover.
3. Lap splices for Bars 5B will be a minimum of 2'-2".
4. Lap splices Bars 5T and 5V with 5U1 will be a minimum of 2'-2".
5. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

ESTIMATED L-SHAPED SPREAD FOOTING QUANTITIES

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* Bars 5V and 5S1 are included in Index 521-510 or 521-511 quantities.

CROSS REFERENCE: For location of Section A-A, see Sheet 1.
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).
**BILL OF REINFORCING STEEL**

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<thead>
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<tr>
<td>B</td>
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<td>AS REQD.</td>
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<tr>
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<td>4</td>
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<td>Dim. C - 6&quot;</td>
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**C-I-P COPING USED WITH PRECAST COPING**

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

**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 4B 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.

**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 4B 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.

**BILL OF REINFORCING STEEL**

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<td>AS REQD.</td>
</tr>
<tr>
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<td>AS REQD.</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>2'-0&quot;</td>
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<tr>
<td>U1</td>
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<td>Panel width + 4&quot;</td>
<td>Panel width + 4&quot;</td>
</tr>
<tr>
<td>U2</td>
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<td>Dim. B - 4&quot;</td>
<td>Dim. B - 4&quot;</td>
</tr>
<tr>
<td>U3</td>
<td>4</td>
<td>Dim. C - 4&quot;</td>
<td>Dim. C - 6&quot;</td>
</tr>
</tbody>
</table>
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 bar with a minimum shear strength of 22 ksi in accordance with ASTM D7617. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
4. Construct 3/4" Expansion Joints in junction slabs and C-I-P copings plumb and perpendicular or radial to the Gutter Line. Provide at 90'-0" maximum intervals as shown. Provide 3x3" Mortar plugs in open joints at the base of Concrete Barriers to contain runoff.
5. Shear Keys in junction slabs are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key 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. For Prestressed Concrete, 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.
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 521-610 - Approach Slabs (Flexible Pavement Approaches)
   - Index 521-609 - Approach Slabs (Rigid Pavement Approaches)

CROSS REFERENCE: For Detail "A", see Sheet 2.
CONCRETE BARRIER/JUNCTION SLAB
- WALL COPING

NOTES:

1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary Junction Slab slope based on roadway cross slope to maintain a minimum 6" asphalt depth at the edge of the slab as shown.
3. For Rigid Pavement (Concrete), Junction Slab may be thickened to match finished grade. Vary the Junction Slab slope to maintain a minimum 1'-6" thickness at the edge of the slab.
4. See Roadway Plans for asphalt shoulder, roadway pavement and overbuild.
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 reinforcing 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 2" or with full depth Expanded Polystyrene to provide a maximum 2" air gap.
9. Angle varies - 0° min., 25° max.

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

PROJECT: FOUR LAKES EXPANSION

1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary Junction Slab slope based on roadway cross slope to maintain a minimum 6" asphalt depth at the edge of the slab as shown.
3. For Rigid Pavement (Concrete), Junction Slab may be thickened to match finished grade. Vary the Junction Slab slope to maintain a minimum 1'-6" thickness at the edge of the slab.
4. See Roadway Plans for asphalt shoulder, roadway pavement and overbuild.
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 reinforcing 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 2" or with full depth Expanded Polystyrene to provide a maximum 2" air gap.
9. Angle varies - 0° min., 25° max.

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. Vary the Junction Slab slope to maintain a minimum 1'-6" thickness at the edge of the slab.
4. See Roadway Plans for asphalt shoulder, roadway pavement and overbuild.
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 reinforcing 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 2" or with full depth Expanded Polystyrene to provide a maximum 2" air gap.
9. Angle varies - 0° min., 25° max.

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. Vary the Junction Slab slope to maintain a minimum 1'-6" thickness at the edge of the slab.
4. See Roadway Plans for asphalt shoulder, roadway pavement and overbuild.
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 reinforcing 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 2" or with full depth Expanded Polystyrene to provide a maximum 2" air gap.
9. Angle varies - 0° min., 25° max.
REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

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<th>C-I-P COPING FOR SINGLE-SLOPE</th>
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<td>5'-3&quot; 7'-10&quot; 8'-6&quot;</td>
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<td>11'-6&quot; 9'-6&quot; AS REQD AS REQD</td>
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<td>AS REQD AS REQD AS REQD AS REQD</td>
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</table>

1" Ø Dowel

STIRRUP BAR

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

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

TYPICAL SECTION THRU C-I-P CONCRETE BARRIER WITH C-I-P JUNCTION SLAB AND C-I-P COPING

(RECAST COPING SIMILAR WITH C-I-P BUILDUP)

NOTES:
1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary the Junction Slope based on the roadway cross slope to maintain a minimum 6" asphalt depth at the edge of the slab.
3. For Rapid Pavement (Concrete), Junction Slab may be thinned to match finish grade. Vary the Junction Slope to maintain a minimum 1'-6" thickness at the inside edge of the slab.
4. Minimum length of Junction Slab between expansion joints is 30'-6" for 36" Single-Slope or 60'-0" for 42" Single-Slope.
5. Contractor to maintain stability of Precast coping 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.
6. If slip forming is used, submit shop drawings for approval showing 2" side cover with 2" minimum concrete cover.

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 5B & 5S will be a minimum of 2'-2".
4. For Precast Copings only, lap splice Bars 5A with Bars 5C. Lap splices will be a minimum of 2'-2".
5. The Contractor may use either full length Bars 5A or lap splice with Bars 5C at Bars 5A for C-I-P Copings.
6. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 7'-25" (36" Single-Slope) or 7'-40" (42" Single-Slope).
7. Dimension shown 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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<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY (36&quot;)</th>
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<td>21.36</td>
<td>21.36</td>
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(The above concrete quantities are based on a max. super-elevation of 6.25%)
**RAISED SIDEWALK NOTES:**
1. When a 42° Vertical Shape is used with a precast coping, increase Bars 4C to Bars 5C or provide Bars 4C @ 4" spacing within 6'-0" of Expansion Joints.
2. Construct the expansion joints, V-Grooves and face of coping plumb.
3. Provide Class II concrete for slightly aggressive environments or Class IV for moderately or extremely aggressive environments.
4. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A 36 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. Construct 1/2" Expansion Joints in raised sidewalk and C-I-P copings perpendicular or radial to the Gutter Line. Provide at 48'-0" maximum intervals as shown.
6. Shear Keys in Junction Slab are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key must be constant or variable to coincide with V-Groove locations in the Concrete Barrier.
7. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 352.
8. Construct 1/2" V-Grooves in raised sidewalk and C-I-P copings at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/2" Expansion Joints and/or Begin or End Raised Sidewalk. V-Groove locations are to coincide with V-Groove locations in the Concrete Barrier.
9. Spacing shown is along the Gutter Line.
10. For Precast Coping only, provide Dowel Bars 4D embedded 1'-0" and extend 9" above the top of MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the build-up concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
11. Finish Sidewalks in accordance with Specification Section 922.
12. The following Indexes contain details of the intersection of the retaining wall at approach slabs:
   - Index 400-090 - Approach Slabs (Flexible Pavement Approaches)
   - Index 400-091 - Approach Slabs (Rigid Pavement Approaches)

**PARTIAL PLAN VIEW**
(Precast Coping Shown, C-I-P Coping Similar) (Concrete Barrier not shown for Clarity)

**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 5S, Bars 5T and Bars 5X) (Precast Coping Shown, C-I-P Coping Similar)

NOTE: See Sheet 4 for End Transition Elevation.

ESTIMATED QUANTITIES FOR PRECAST COPING

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Precast Coping)</td>
<td>CY/LF</td>
<td>0.095</td>
</tr>
<tr>
<td>Concrete (C-I-P Raised Sidewalk)</td>
<td>CY/LF</td>
<td>0.232</td>
</tr>
<tr>
<td>Reinforcing Steel (Precast Coping) excluding Bars 5T, 5S and 5X (Typ.)</td>
<td>LB/LF</td>
<td>23.90</td>
</tr>
<tr>
<td>Reinforcing Steel (C-I-P Raised Sidewalk) (Typ.)</td>
<td>LB/LF</td>
<td>13.50</td>
</tr>
<tr>
<td>Additional Rein. @ Expansion Joints (Steel Dowels)</td>
<td>LB</td>
<td>32.04</td>
</tr>
</tbody>
</table>

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

NOTES:

1. Actual width varies depending on type of Retaining Wall used.
2. Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 5'-11" dimension is based on a 32" Vertical Shape 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 5T and 5X to clear construction joint for 42" Vertical Shape.
4. Trim end of Bars 5T and 5X to clear construction joint for 42" Vertical Shape.
5. Contractor to maintain stability of precast coping prior to junction slab completion.
6. If required, adjustments to the bar spacing for Bars 5T and 5X shall be made immediately adjacent to Begin or End Bridge Cut, shift, and rotate Bars 5T and 5X as required to maintain cover in End Transition.
7. For Bullet Railings, see Index 515-021 and 515-022.
8. Bars 502 @ 6" sp. (lap with Bars 5A) (Note 3)
9. Bars 5A @ 1'-0" sp. (lap with Bars 5B1) (Note 3)
**ESTIMATED QUANTITIES FOR C-I-P COPING**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/LF</td>
<td>0.326</td>
</tr>
<tr>
<td>Reinforcing Steel (Typical) excluding Bars ST, SX and SS (Typ.)</td>
<td>LB/LF</td>
<td>35.38</td>
</tr>
<tr>
<td>Additional Rein. @ Expansion Joints (Steel Shown)</td>
<td>LB</td>
<td>32.04</td>
</tr>
</tbody>
</table>

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

**NOTES:**

1. Match roadway curb shape (Type) and height. See Roadway Plans and Index 530-001. 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.
Concrete Reinforcing Steel

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
<th>PRECAST COPING/ RAILING</th>
<th>C-I-P COPING</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5</td>
<td>5'-11&quot;</td>
<td>9'-3&quot;</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>6'-11/6&quot;</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>5'-0&quot;</td>
<td>5'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>5</td>
<td>4'-5&quot;</td>
<td>4'-5&quot;</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>5</td>
<td>7'-0&quot;</td>
<td>7'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>5</td>
<td>5'-1&quot;</td>
<td>6'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>5</td>
<td>7'-4&quot;</td>
<td>5'-2&quot;</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>5</td>
<td>5'-4&quot;</td>
<td>6'-0&quot;</td>
<td></td>
</tr>
</tbody>
</table>

1" Ø Dowel Smooth Bar 2'-0" 2'-0"

32" 42"

7 5 7'-4" 9'-2"

X 5 5'-1" 6'-0"

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are cut 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 2'-0".
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.

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/LF</td>
<td>0.095</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/LF</td>
<td>23.38</td>
</tr>
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</table>

**DETAIL "B"**

**PRECAST COPING**

(Showing locations of 1/2" V-Grooves and 3/4" Preformed Expansion Joint Filler)

**END TRANSITION ELEVATION FOR 32" VERTICAL SHAPE**

(Guardrail Not Shown For Clarity)

**ESTIMATED CONCRETE BARRIER QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
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<td>0.145</td>
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<tr>
<td>Reinforcing Steel</td>
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<td>28.33</td>
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</tbody>
</table>

**VERTICAL SHAPE**

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

**STANDARD PLANS**

**FY 2020-21**

**INDEX SHEET**

521-620 4 of 4
**PRECAST COPING PARAPET AND SIDEWALK NOTES:**

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

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

**PARTIAL ELEVATION VIEW**
(Precast Coping and Sidewalk Reinforcing not Shown for Clarity)
(Precast Coping Shown, C-I-P Coping Similar)
PLAN VIEW
(Junction Slab Shown, Raised Sidewalk Similar)

REINFORCING STEEL BENDING DIAGRAMS - DRAINAGE

BIL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>REQD.</th>
<th>SIZE</th>
<th>LENGTH</th>
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<tbody>
<tr>
<td>S2</td>
<td>16</td>
<td>3</td>
<td>3'-7&quot;</td>
</tr>
<tr>
<td>U2</td>
<td>11</td>
<td>5</td>
<td>VARIES</td>
</tr>
<tr>
<td>U3</td>
<td>4</td>
<td>5</td>
<td>12-10&quot;</td>
</tr>
</tbody>
</table>

STIRRUP BAR 452

BAR 553

BAR 5U3

BAR 5U2

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.

5. Organic Felt bond breaker (Top) & Expanded Polystyrene shown hatched (1" Side).

6. Locate Barrier Wall Inlet a minimum of 10'-0" away from Expansion Joint in Junction Slab, Raised Sidewalk or Sidewalk, C-I-P Coping and Traffic Railing or Concrete Parapet.

7. Locate open joints in Barrier Wall and Coping a minimum of 5'-0" from the centerline of the Barrier Wall Inlet.

8. Work this Index with the following as appropriate: Index 521-610, Index 521-620, Index 521-630.
1. ANCHOR BOLTS:
   Anchor Bolt design is based on the standard Roadway Aluminum Light Pole configurations shown on Index 715-002 with top of pedestal 75' or less above ground or MLW.
   Anchor Bolt Diameter: See Table 1
2. MATERIALS.
   Anchor Bolt: ASTM F1554 Grade 55.
   Nuts: ASTM A563 Grade A, Heavy-Hex.
   Washers: ASTM F36 Type 1.
   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 3.
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.)

<table>
<thead>
<tr>
<th>Wind Speed (MPH)</th>
<th>Arm Length (FT)</th>
<th>BASE OF POLE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>ALL</td>
<td>75</td>
</tr>
<tr>
<td>140</td>
<td>40 ft</td>
<td>75</td>
</tr>
<tr>
<td>160</td>
<td>45 ft</td>
<td>75</td>
</tr>
<tr>
<td>160</td>
<td>50 ft</td>
<td>75</td>
</tr>
</tbody>
</table>

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

PLAN VIEW
(Junction Slab reinforcing not shown for clarity)
(Junction Slab Shown, Raised Sidewalk or Sidewalk Similar)
NOTES:

1. Provide Concrete Class to match adjacent coping.
2. For junction slabs, increase the 1'-0" depth dimension to 1'-9".
3. For Parapet with sidewalk see Index 521-630, but increase 6" sidewalk depth to 1'-6". For raised sidewalk see Index 521-620.
4. The minimum length of the Junction Slabs, raised sidewalks and sidewalks is 30'-0", measured along the Gutter Line.
5. Bars 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**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD.</th>
<th>LENGTH</th>
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</thead>
<tbody>
<tr>
<td>G1</td>
<td>4</td>
<td>4</td>
<td>4-8</td>
</tr>
<tr>
<td>G2</td>
<td>4</td>
<td>4</td>
<td>4-8</td>
</tr>
<tr>
<td>G3</td>
<td>4</td>
<td>6</td>
<td>8-10</td>
</tr>
<tr>
<td>G4</td>
<td>4</td>
<td>4</td>
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<td>9-12</td>
</tr>
<tr>
<td>M1</td>
<td>5</td>
<td>8</td>
<td>6-10</td>
</tr>
<tr>
<td>M2</td>
<td>4</td>
<td>10</td>
<td>7-9</td>
</tr>
</tbody>
</table>

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

**ESTIMATED QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Pedestal)</td>
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</tr>
<tr>
<td>Concrete (Thickened Junction Slab)</td>
<td>CY</td>
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</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>334.09</td>
</tr>
</tbody>
</table>

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

**DETAIL "A"**

**NOTES:**
1. Find 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.

**ELEVATION VIEW**

(Junction Slab Reinforcing & Bars 4J not Shown for Clarity) (Junction Slab Shown, Raised Sidewalk or Sidewalk Similar)
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 10'.
5. Construct sidewalks with Edge Beam through the limits of any surface mounted Pedestrian/Bicycle Railing or Pipe Guardrail shown in the plans. (See RAILING DETAIL)

PLAN

SIDEWALK WITH UTILITY STRIP

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

SIDEWALK WITHOUT UTILITY STRIP

LEGEND:

SAWED JOINTS

LONGITUDINAL SECTION

LEGEND:
A- 1/2" 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- 1/8" Dummy Joints, Toolied
C- 1/8" Formed Open Joints
D- 1/2" Saw Cut Joints, 1/2" Deep (within 96 hours) Max. 10' Centers
E- 1/2" Saw Cut Joints, 1/2" Deep (within 12 hours) Max. 30' Centers
F- 1/2" 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, Toolied

GENERAL NOTES AND CONCRETE SIDEWALK ON CURBED ROADWAYS

SIDEWALK JOINTS

OPEN JOINTS

120' Max.
30' Max.

Rigid Structure

Return Curb

FOT

CONCRETE SIDEWALK

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STANDARD PLANS

DESCRIPTION:

REVISION
11/01/18

REV ISIO N
8:19:45 AM

0.02 Max.

0.02 Max.

0.02 Max.

0.02 Max.
CONCRETE SIDEWALK ON FLUSH SHOULDER ROADWAYS

**LONGITUDINAL SECTION**

**LEGEND:**
A - 1/2" 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 - 3/8" Dummy Joints, Tooled
C - 1/2" Formed Open Joints
D - 3/8" Saw Cut Joints, 1/2" Deep (within 96 hours) Max. 9' Centers
E - 1/4" Saw Cut Joints, 1/8" Deep (within 12 hours) Max. 30' Centers
F - 1/8" 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**

**CONCRETE SIDEWALK**

**PLAN**

**LEGEND:**
- 4" Thick Sidewalk
- 2' Detectable Warning Surface
- Edge of Travel Way
- Shoulder Line

**SECTION C-C**
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 522-001. No joints are permitted within the ramp portion of the Curb Ramp.

2. 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.

3. 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.

4. 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.

5. 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.
NOTE: For Example of CR-A used in Radial Curb Returns, See Sheet B.
CONSTRUCTION OF SIDEWALK CURB IN CUT SECTIONS

NOTE: For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

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

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

DETECTABLE WARNING ON FLUSH SHOULDER SIDEWALKS

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. 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 44" 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.

1/11/17

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

RAILROAD CROSSING AND CURB RAMPS AT CURBED RETURNS (TYP.)

RAILROAD CROSSING

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

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STANDARD PLANS
DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS
INDEX
522-002
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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 1/2 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 1/2 open joints @ 10 Centers and 1/2 expansion joints with preformed joint filler every 5th joint.
7. Construct driveways (6" thick concrete) to a uniform width (W) to the R/W line or 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
**DESCRIPTION:**

REVISION LAST of STANDARD PLANS FY 2020-21

**LEGEND:**
- Sidewalk
- Flared Driveway (6" Thick Concrete)
- Sidewalk Thru Driveway (6" Thick Concrete)
- Utility Strip
SIDEWALK WITHOUT UTILITY STRIP

SIDEWALK WITH UTILITY STRIP ON 0.02 SLOPE

SIDEWALK WITH UTILITY STRIP ON 0.04 SLOPE

NOTE:
5’ sidewalks shown.
**DITCH PAVEMENT AND SODDING**

**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>Variability</th>
<th>References &amp; Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>2' x 1'</td>
<td>FY</td>
<td>% of Estimate</td>
<td>D-6</td>
<td>Low-Moderate</td>
<td>Specification 524</td>
</tr>
<tr>
<td>Miscellaneous Asphalt</td>
<td>2' x 1'</td>
<td>Area</td>
<td>0.2 T/T</td>
<td>T</td>
<td>Low-Moderate</td>
<td>Specification 339</td>
</tr>
<tr>
<td>Matting (Sand-Cement)</td>
<td>2' x 1'</td>
<td>FY</td>
<td>0.13 FY/SF</td>
<td>C</td>
<td>Low-Moderate</td>
<td>Specification 530, Grouting of joints required</td>
</tr>
<tr>
<td>Riprap (Ditch Lining)</td>
<td>2' x 1'</td>
<td>TN</td>
<td>0.15 TN</td>
<td>D-4</td>
<td>Moderate</td>
<td>Specification 530</td>
</tr>
</tbody>
</table>

**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 225' maximum intervals, or as directed by the Engineer. Contraction joints may be eliminated (construction joint) or tooled. No open joints will be permitted in concrete ditch pavement.
3. Expansion joints with 1/8" preformed joint filler shall be constructed at all inlets, endwalls, and at intervals of not more than 200'.
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, deep 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. Filter fabric is required under all ditch pavement, except for miscellaneous asphalt, regardless of the pavement thickness. 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 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.
Note: Either option may be used unless otherwise called for in the plans.

FILTER FABRIC PLACEMENT AT CONCRETE STRUCTURE
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. Field verify the location of all overhead and underground services shown in the Wall Control Drawings.

3. Construct Noise Walls in accordance with the requirements of Specification Section 534, and Augers Cast Piles in accordance with Specification Section 455.

4. Section C-1.- 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

5. 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.

6. Casting Tolerances for precast panels and posts:
   A. Overall Height and Width: +/- 1/8
   B. Thickness: +/- 1/8
   C. Plane of side mold: +/- 1/16
   D. Openings: +/- 1/32
   E. Out of Square: 1/8" per 6 ft., but not more than 2/8"/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
**Type “A”**: SMOOTH

**Type “B”**: ASHLAR STONE

**Type “C”**: SPLIT FACE RUNNING BOND BLOCK

**Type “D”**: FRACTURED GRANITE

**Type “E”**: WIRE-CUT BRICK

**Type “F”**: CUT CORAL BLOCK (RUNNING BOND)

**Type “G”**: VERTICAL FRACTURED FIN

**Type “H”**: TRAPEZOID VERTICAL FINS W/ FRACTURED FACE (COLORADO DRAG AGGREGATE)

**Type “I”**: PEA GRAVEL

---

**NOTES:**

1. Surfaces shall be formed, rolled, or pressed using form liners in accordance with the Plans and Specifications for Class 2 Surface Finish.

2. See Noise Wall Data Tables for project aesthetic requirements.
**DESCRIPTION:**

**REVISION:**

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**NOISE WALLS - (PRECAST)**

**GRAPHICS & TEXTURE 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.

---

Form Roller

Example Graphic Type SE-2

PreCast wall panel

Front Face Panel Texture (Formed, Rolled or Pressed into Plastic Concrete)

Back Face Panel Texture

Sealed cavity

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

Second layer surface for recessed graphic design (optional)

---

10'-0" Max

10'-0" Max

Top of Wall

Horizontal joint between stacked panels

Symmetric about Panel

Form liner

Precast wall panel

TYPICAL FORMING DETAIL

(Front Face Panel Texture Type "H" shown)

(Back Face Panel Texture Type "D" shown)

(Post Forming Details Similar)

10'-0" Max

Sealed cavity

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

---

Bottom Panel

Varies (12'-0" Max., 4'-0" Min.)

Top Panel

Varies (12'-0" Max., 4'-0" Min.)

---

NOISE WALLS - (PRECAST)

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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. In this case, pick points must be placed in the top of panels only and transported maintaining the vertical orientation. If these criteria are met, the vertical steel may be reduced to #4 Bars @ 1'-3" (As=0.16 in²/ft.).

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 (2\(\Delta\)^\circ) between panels exceeds 7\(^\circ\).

**PIVOTING DETAILS**
(Flush Type Panel)

**PIVOTING DETAILS**
(Recessed Type Panel)
**REVISION DESCRIPTION:**

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**DESCRIPTION:**

**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 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 HOLES DETAILS**

**SECTION G-G**

**GRATING DETAIL**

---

**BAR BENDING DETAILS (#3 Bars)**

---

**SECTION F-F**

---

**DIMENSIONS:**

1. 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.

2. 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.

---

**NOISE WALLS - (PRECAST)**

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NOISE WALLS - (PRECAST)

Texture (Formed)

Front Face Post

Roadway Face of wall

Post (Typ.)

" Post

1'-6" (Typ.)

2 Equal sp.

1'-1"

3" (Elev. A)

Collar

Top of

(Elev. A)

* Post Length (H Section)

* Post Length (H Section)

Top of Collar (Elev. A)

Top of Collar (Elev. A)

Pile Length minus 6" (See Sheet 2)

Pile Length minus 6" (See Sheet 2)

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".

STANDARD POST REINFORCEMENT

(Standard Post Shown, 45° Corner Posts Similar)

STANDARD POST DETAILS

NOTES:

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

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**INDEX NOTES:**

- **NOISE WALLS - (PRECAST)**
- **SECTION M-M**
- **SECTION N-N**
- **SECTION P-P**
- **LOW CLEARANCE OPTION**
- **TYPICAL POST**
- **STANDARD POST PLACEMENT IN AUGER CAST PILE**

**NOTE:**

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

**POST PLACEMENT & PILE REINFORCING STEEL DETAILS**
10 / 29 / 2019

SECTION H-H
(45° Corner Post)

SECTION K-K
(Collar Section, 45° Corner Post)

SECTION L-L
(45° Corner Post)

SECTION N-N
(45° Corner Post)

45° POST 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.
Match texture thickness with appropriate Panel face.
3. For Post Reinforcing, see sheets 15 & 16.
4. For Pile Length Tables, see sheets 15 & 16.

45° POST PLACEMENT IN AUGER CAST PILE

45° CORNER POST DETAILS

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DESCRIPTION:

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".

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.

90° CORNER POST DETAILS

(Typ. Both Sides)
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".

FINISHED GRADE

SECTION T-T
C-I-P COLLAR

SECTION U-U

90° CORNER TYPICAL POST PLACEMENT DETAILS

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3-6'

3-6'

3-6'

90° Corner Typical Post

Top of Wall

Bottom of Auger Cast Pile

Exposed Precast Post Reinforcement

Top of Collar, Elev. A (see Note 2)

Projected Location of Bearing Pad (Typ.)
(See Sheet 1, Note 10)

Bars P6 (Pairs)

30" Ø Auger Cast Pile

Exposed Precast Post Reinforcement

Top of Auger Cast Pile

9 broadcaster

8 broadcaster

3'-6"

1'-6"

1'-8"

T-8"

8 broadcaster

ELEVATION

10/29/19

10:20:12 AM

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DESCRIPTION:
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".
**DESCRIPTION:**

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**NOISE WALLS - (PRECAST)**

**PRECAST POST CAPITAL**

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### 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>
<th>20'-0&quot; POST SPACING</th>
<th>20'-0&quot; POST SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NOMINAL WALL HEIGHT (Feet)</td>
<td>WITHOUT CAP</td>
<td>WITH CAP</td>
<td>BARS A</td>
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<tr>
<td></td>
<td>12</td>
<td>13'-0&quot;</td>
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### TABLE 2B - PILE LENGTHS (Feet) - WIND SPEED = 150 MPH

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<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 150 MPH</th>
<th>20'-0&quot; POST SPACING</th>
<th>20'-0&quot; POST SPACING</th>
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<tbody>
<tr>
<td></td>
<td>NOMINAL WALL HEIGHT (Feet)</td>
<td>WITHOUT CAP</td>
<td>WITH CAP</td>
<td>BARS A</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>
<th>20'-0&quot; POST SPACING</th>
<th>20'-0&quot; POST SPACING</th>
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<tbody>
<tr>
<td></td>
<td>NOMINAL WALL HEIGHT (Feet)</td>
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<td>WITH CAP</td>
<td>BARS A</td>
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### TABLE 3B - PILE LENGTHS (Feet) - WIND SPEED = 170 MPH

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<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 170 MPH</th>
<th>20'-0&quot; POST SPACING</th>
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<td>NOMINAL WALL HEIGHT (Feet)</td>
<td>WITHOUT CAP</td>
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<td>22</td>
<td>22'-0&quot;</td>
<td>21'-0&quot;</td>
<td>#8</td>
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</tbody>
</table>

### TABLE NOTE:
1. Bars D and Bars E are for 47 Corner Posts only.
2. See Contract Plans for project wind speed.
   Soil 2 = Medium Dense Granular Soil, N = 10 to 40.
GENERAL NOTES:
1. Construct Perimeter Walls in accordance with Specification Section 534.
2. Choice of either Precast Option or Masonry Option is at the discretion of the Contractor.
3. Post spacers are measured from centerline to centerline of foundation element. For this index, posts and foundation elements have been designed for 20 ft. spacings. Use post spacers less than 20 feet only at changes in horizontal alignment, wall terminations or to accommodate steep grades.
4. See "Perimeter Wall Data Tables" 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'-8".
   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 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" 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 bars 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: +/- 1/16" 
    E. Out of Square: 1/2" per 6 ft., but not more than 3/16" total along any side 
    F. Warping: 3/8" 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-1.7 (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 not less than 60' 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 962. Install Dowel Load Transfer Devices in accordance with Specification Section 200.
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 1 T-180. Perform soil density tests at 100 foot intervals.
K. Protect walls during construction from soil, grout or mortar stains. Clean wall as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
L. Use soap and potable water to clean walls. If stain removal is necessary, use a cleaning method indicated in NCMA TEK 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 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

14. STORAGE OF MATERIALS:
A. Store CMU's on elevated platforms in a dry location or under cover.
B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp or exceeded the manufacturers shelf life.
C. Store masonry accessories and reinforcing to prevent corrosion and accumulation of dirt and oil.
D. Use soap and potable water to clean walls. If stain removal is necessary, use a cleaning method indicated in NCMA TEK 8-2A applicable to the type of stain on the exposed surface.

GENERAL WALL ELEVATION:
(Precast Option with Single Height Panel Shown, Others Similar)
**TYPE "C" CAP DETAILS**

**SECTION B-B**

**PICTORIAL VIEW**

**TYPE "A" CAP DETAILS**

**SECTION B-B**

**PICTORIAL VIEW**

**TYPE "B" CAP DETAILS**

**SECTION B-B**

**PICTORIAL VIEW**

**CAP PLACEMENT DETAIL**

(Type "B" Post Cap with Precast Option Shown)
**DRAINAGE Holes Types A, B, C & D**

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

**NOTES:**

1. Drainage holes may be formed with 4" NPS PVC pipe that may remain in place.
2. See Wall Control drawings for number, Type and location/spacing of drainage holes.
PIVOTING JOINT DETAILS

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

ELEVATION STEP AT TOP OF WALL
(Precast Panel Cap not Shown)

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

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

SECTION D-D

SECTION E-E

TYPICAL PLAN

* Nominal embedment (not including tolerances)

ELEVATION STEP AT BOTTOM OF WALL
(Precast Post Cap (Typ.))

PRECAST OPTION - TYPICAL DETAILS
NOTE:

* Vertical Steel – #4 Bars @ 10" (As=0.24 in²/ft²) (Typ.)

Horizontal Steel – #4 Bars @ 1/2 (As=0.32 in²/ft²) (Typ.)

NOTE:

At the Contractors Option, Smooth or Deformed Welded Wire Reinforcement may be used (equal area).

**TYPICAL PANEL ELEVATION**

* In lieu of utilizing the standard pick up points below, panels may be cast vertically or cast horizontally then tilted upright using lift-cables prior to lifting from form. In this case, pick points must be placed in the top of panels only and transported maintaining the vertical orientation. If these criteria are met, the vertical steel may be reduced to #4 Bars @ 1'-3" (As=0.16 in²/ft²).

**STANDARD PICK UP POINTS FOR PANELS**

(Panels shall be rotated about long axis only)
LOW CLEARANCE OPTION

NOTES:
1. See Shop Drawing for Post Lengths.

TYPICAL POST

STANDARD POST REINFORCEMENT

BAR BENDING DETAILS

BAR P1
Bar Length = 2'-3Ɓ" All bar dimensions in bending diagrams are out-to-out.

BAR P2
Bar Length = 9'-0"

All bars not shown in the bending diagrams are straight.

PRECAST OPTION - STANDARD POST DETAILS

TABLE 1

<table>
<thead>
<tr>
<th>Wind Speed (MPH)</th>
<th>Pile Length</th>
<th>Bars A</th>
<th>Bars P1 thru P6</th>
<th>Bars S1</th>
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<tr>
<td>130</td>
<td>12'-0&quot;</td>
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<td>170</td>
<td>15'-0&quot;</td>
<td>#6</td>
<td>#3</td>
<td>#4</td>
</tr>
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</table>
Preceding text: 

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.
### Table 2

<table>
<thead>
<tr>
<th>Wind Speed Category</th>
<th>Masonry Walls (8x8x16)</th>
<th>Foundations</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Bars V1</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>170</td>
<td>#5</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>110</td>
<td>#5</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>90</td>
<td>#5</td>
<td>2'-0&quot;</td>
</tr>
</tbody>
</table>

**Notes:**
1. End vertical reinforcing bars 1½" from top of bond beam blocks and horizontal bars 1½" from edge of control joint.
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.

---

**MASONRY OPTION**

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

---

**BAR F1**

- **Length = 5'-2"**
- All bar dimensions in bending diagram are out to out.
- All bars not shown in the bending diagrams are straight.

---

**SECTION M-M**

**PILASTER REINFORCING AND WALL CONTROL JOINT DETAIL**

- **Notes:**
  - End vertical reinforcing bars 1½" from top of bond beam blocks and horizontal bars 1½" from edge of control joint.
  - Do not continue horizontal #4 bond beam reinforcing through control joint.
  - Use stainless steel joint stabilizing anchors spaced at 16" vertically at all control joints. Install per manufacturer’s instructions.
  - Seal Control Joints with backer rod and Type "A" silicone sealant (top and both sides).
  - See Sheet 10 for Bar placement details.
  - For Pilaster Cap Details, see Sheet 2.
REINFORCING AT PILASTER WITH EXPANSION JOINT
(Step Shown, without Step Similar)
(T-Footing Shown, Trench Footing Similar)

SECTION K-K
TYPICAL WALL SECTION
WITH T-FOOTING

SECTION L-L
PILASTER SECTION
WITH T-FOOTING

SECTION K-K
TYPICAL WALL SECTION
WITH TRENCH FOOTING

SECTION L-L
TYPICAL PILASTER SECTION
WITH TRENCH FOOTING

EXPANSION JOINT DETAILS

Notes:
1. For location of Sections K-K and L-L see Sheet 9.
2. Provide and install 1/2" Preformed Expansion Joints with 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.
**GENERAL NOTES:**

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

   This Index, along with the plans and the manufacturers’ drawings on the Approved Products List (APL), is sufficiently detailed for installation of General Guardrail, Low-Speed Guardrail, End Treatment assemblies, and their connecting options shown herein. This Index provides 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 6” of Panel) and a midspan panel splice as shown on Sheet 2. Guardrail components included on the APL, which are compatible with this Index, may also be identified as 31” or MGS Guardrail.

3. **STANDARD COMPONENTS:** Standard guardrail components, including posts, panels, and bolt systems, are based on the Task Force 13 Publication, Guide to Roadside Hardware Components (http://tf13.org/Guides/componentGuide/).

4. **BUTTON-HEAD BOLTS:** Install Button-Head Bolts where indicated using bolts, nuts, and washers as defined on Sheet 24. Place washers under nuts. Do not place washers between bolt heads and panels, except where otherwise shown in this Index.

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

6. **MISCELLANEOUS ASPHALT PAVEMENT:** Install Miscellaneous Asphalt Pavement where indicated with a tolerance of ± 1” in accordance with Specification 339.

7. **ADJACENT SIDEWALKS & SHARED USE PATHS:** When guardrail posts are placed within 4'-0” of a sidewalk or shared use path, use timber posts, or use steel posts only if treated with Pipe Rail as shown on Sheet 22.

8. **When timber posts are used, one of the following safety treatments is required for the bolts(s) protruding from the back face of the post:**
   - 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.

9. **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 22.

10. **When timber posts are used, one of the following safety treatments is required for the bolts(s) protruding from the back face of the post:**
    - 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.

11. **FOR CONNECTING GUARDRAIL to existing bridge Traffic Railings, see Indexes 536-002, 521-404, and 521-405.**

12. **When transitioning from an existing 31” or MGS Guardrail, a panel splice at a height of 0” may be required.**

13. **The connections to Rigid Barrier in this Index only apply to newly constructed bridge Traffic Railings and Concrete Barrier or where the complete Approach Transition Connection to Rigid Barrier shown herein can be installed without conflicting with existing Traffic Railings, structures, or approach slabs.**

14. **When connecting guardrail to existing bridge Traffic Railings, see indexes 536-002, 521-404, and 521-405.**

15. **FOR CONNECTING GUARDRAIL to existing bridge Traffic Railings, see indexes 536-002, 521-404, and 521-405.**

16. **The connections to Rigid Barrier in this Index only apply to newly constructed bridge Traffic Railings and Concrete Barrier or where the complete Approach Transition Connection to Rigid Barrier shown herein can be installed without conflicting with existing Traffic Railings, structures, or approach slabs.**

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

18. **When transitioning from an existing 31” or MGS Guardrail, a panel splice at a height of 0” may be required.**

19. **The connections to Rigid Barrier in this Index only apply to newly constructed bridge Traffic Railings and Concrete Barrier or where the complete Approach Transition Connection to Rigid Barrier shown herein can be installed without conflicting with existing Traffic Railings, structures, or approach slabs.**

20. **When connecting guardrail to existing bridge Traffic Railings, see indexes 536-002, 521-404, and 521-405.**

21. **FOR CONNECTING GUARDRAIL to existing bridge Traffic Railings, see indexes 536-002, 521-404, and 521-405.**

22. **When transitioning from an existing 31” or MGS Guardrail, a panel splice at a height of 0” may be required.**

23. **The connections to Rigid Barrier in this Index only apply to newly constructed bridge Traffic Railings and Concrete Barrier or where the complete Approach Transition Connection to Rigid Barrier shown herein can be installed without conflicting with existing Traffic Railings, structures, or approach slabs.**

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

25. **When transitioning from an existing 31” or MGS Guardrail, a panel splice at a height of 0” may be required.**

26. **The connections to Rigid Barrier in this Index only apply to newly constructed bridge Traffic Railings and Concrete Barrier or where the complete Approach Transition Connection to Rigid Barrier shown herein can be installed without conflicting with existing Traffic Railings, structures, or approach slabs.**
NOTES:

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

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

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

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

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

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


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

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

7. MODIFIED MOUNTS: Where concrete structures, concrete sidewalks, or shallow depth conditions are encountered, see Sheet 23 for additional post mounting options.

8. DEFINED SEGMENTS: The General Guardrail shown provides the base configuration, including Post Spacing and splice locations, for defined segment modifications where indicated in the plans and using the Guardrail Types, Sections, and/or hardware as shown in this Index (e.g., Double Faced W-Beam, Deep Posts at Slope Breaks, Pipe Rail, Rub Rail, or Reduced Post Spacing for Hazards).

GENERAL, TL-3 GUARDRAIL DETAILS

GENERAL GUARDRAIL

INSTALLED ELEVATION

INSTALLED PLAN
**LOW-SPEED GUARDRAIL**

**INSTALLED ELEVATION**

**INSTALLED PLAN**

**NOTES:**

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

   Use 12'-6" or 25'-0" W-Beam Panels for normal spans, and use 9'-4" Panels for end connections to adjoining segments as shown. A single 6'-3" Panel may be used at the end of the Low-Speed Guardrail run along with a single reduced 6'-3" 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 SPICE: For proper structural function, place all Lap Splices at midspan unless otherwise indicated.

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

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


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

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

7. MODIFIED MOUNTS: Where concrete structures, concrete sidewalk, or shallow depth conditions are encountered, see Sheet 23 for additional post mounting options.

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

**LOW-SPEED, TL-2 GUARDRAIL DETAILS**
**STANDARD POSTS:** Where Standard Posts are called for in this Index, use either a Timber Post or Steel Post at the length, L, shown for Standard Posts. Use a single post material type consistently per each run of guardrail. Only where specified in the Plans, use the Steel Post “L” for Slope Break Conditions as shown on Sheet 6.

**OFFSET BLOCKS:** For each Panel type, install the corresponding Offset Block type as shown. For General, TL-3 (Single Faced) Approach Transitions only, use the 1'-6" Thrie-Beam Block (See Sheet 13).

**BOLT HOLES:** In guardrail with Button-Head located on the side nearest the traffic lane. The bolt's threaded portion is not permitted to extend beyond 7/8" from the face of the tightened nut; trim the threaded portion as needed and galvanize in accordance with Specification 562.

**BLOCK STOP-NAIL:** Drive one nail per Standard Offset Block as shown to prevent Block rotation. Use steel 3/8" Type 16d 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.

**NOTES:**

1. **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.

2. **FLARE END UNIT:** Use the 1'-6" Thrie-Beam Block (See Sheet 9) at the Length, 'L', shown on Sheet 6.

3. **DOUBLE FACED GUARDRAIL:** Orient Post Bolts with the Button-Head located on the side nearest the traffic lane. The bolt's threaded portion is not permitted to extend beyond 7/8" from the face of the tightened nut; trim the threaded portion as needed and galvanize in accordance with Specification 562.

4. **THRIE-BEAM GUARDRAIL:** Orient Post Bolts with the Button-Head located on the side nearest the traffic lane. The bolt's threaded portion is not permitted to extend beyond 7/8" from the face of the tightened nut; trim the threaded portion as needed and galvanize in accordance with Specification 562.

5. **BLOCK STOP-NAIL:** Drive one nail per Standard Offset Block as shown to prevent Block rotation. Use steel 3/8" Type 16d 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.

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

<table>
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<tr>
<th>Type</th>
<th>Min. Depth (DF)</th>
<th>Mounting Height @</th>
<th>Post Length 'L'</th>
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</thead>
<tbody>
<tr>
<td>W-Beam</td>
<td>1'-10&quot;</td>
<td>7'-1&quot;</td>
<td>6'-6&quot;</td>
</tr>
<tr>
<td>Double Faced W-Beam</td>
<td>1'-10&quot;</td>
<td>7'-1&quot;</td>
<td>6'-6&quot;</td>
</tr>
<tr>
<td>Thrie-Beam</td>
<td>1'-10&quot;</td>
<td>1'-9&quot;</td>
<td>6'-6&quot;</td>
</tr>
<tr>
<td>Timber Deep Post</td>
<td>4'-10&quot;</td>
<td>See Above</td>
<td>7'-6&quot;</td>
</tr>
<tr>
<td>Steel Deep Post</td>
<td>6'-4&quot;</td>
<td>See Above</td>
<td>9'-0&quot;</td>
</tr>
</tbody>
</table>

### GUARDRAIL SECTIONS - TYPICAL

#### GUARDRAIL SECTIONS - CURB & GUTTER

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. GUARDRAIL TYPES - MOUNTING HEIGHTS & POST DEPTHS: Place the Face of Guardrail consistently offset either flush with the Face of Curb or 5" behind the Face of Curb, as indicated by the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.

3. SLOPE BREAK CONDITION: Install Deep Posts only where called for in the plans. Deep Posts are only permitted when post spacing is 6'-3" or less.

4. LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset callouts 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 the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.

### GUARDRAIL SECTIONS - SHOULDSERS

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.

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### GUARDRAIL SECTIONS - SHOULDSERS

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3. SLOPE BREAK CONDITION: Install Deep Posts only where called for in the plans. Deep Posts are only permitted when post spacing is 6'-3" or less.

4. LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset callouts 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 the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.

### GUARDRAIL SECTIONS - SHOULDSERS

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. GUARDRAIL TYPES - MOUNTING HEIGHTS & POST DEPTHS: Place the Face of Guardrail consistently offset either flush with the Face of Curb or 5" behind the Face of Curb, as indicated by the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.

3. SLOPE BREAK CONDITION: Install Deep Posts only where called for in the plans. Deep Posts are only permitted when post spacing is 6'-3" or less.

4. LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset callouts 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 the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.

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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. GUARDRAIL TYPES - MOUNTING HEIGHTS & POST DEPTHS: Place the Face of Guardrail consistently offset either flush with the Face of Curb or 5" behind the Face of Curb, as indicated by the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.

3. SLOPE BREAK CONDITION: Install Deep Posts only where called for in the plans. Deep Posts are only permitted when post spacing is 6'-3" or less.

4. LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset callouts 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 the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.

### GUARDRAIL SECTIONS - SHOULDSERS

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. GUARDRAIL TYPES - MOUNTING HEIGHTS & POST DEPTHS: Place the Face of Guardrail consistently offset either flush with the Face of Curb or 5" behind the Face of Curb, as indicated by the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.

3. SLOPE BREAK CONDITION: Install Deep Posts only where called for in the plans. Deep Posts are only permitted when post spacing is 6'-3" or less.

4. LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset callouts 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 the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.

### GUARDRAIL SECTIONS - SHOULDSERS

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. GUARDRAIL TYPES - MOUNTING HEIGHTS & POST DEPTHS: Place the Face of Guardrail consistently offset either flush with the Face of Curb or 5" behind the Face of Curb, as indicated by the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.

3. SLOPE BREAK CONDITION: Install Deep Posts only where called for in the plans. Deep Posts are only permitted when post spacing is 6'-3" or less.

4. LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset callouts 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 the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.
APPROACH TERMINAL ASSEMBLY
'PARALLEL' TYPE - PLAN VIEW

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

The Plan Views shown herein are schematic only, showing basic geometry for Approach Terminals listed on the APL. The proprietary Length of End Treatment 'LE' includes the proprietary portion of various Approach Terminals and provides for on site consistent planning of assembly installations across the different Approach Terminal types. Forward-anchoring style Approach Terminals may vary from the planned lengths shown by up to 3'-0".

Construction Approach Terminals as shown in the APL and in accordance with the manufacturer's unique drawing details, procedures, and specifications. Install posts in accordance with the manufacturer's drawings. The Special Posts on Sheet 23, including Special Steel Posts, Encased Posts, and Frangible Leave-Outs, are not permitted within the Approach Terminal segment unless otherwise called for in the plans.

Align panel lap splices in accordance with the manufacturer's drawings, regardless of the direction of traffic. Install adjacent grading, gutters, and/or curbing as shown herein.

2. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Splice Location. 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.

Approach Terminals, Low Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

3. APPROACH TERMINAL TEST LEVEL: Install either a Test Level 3 (TL-3) or Test Level 2 (TL-2) Approach Terminal as specified in the plans. TL-3 Approach Terminals may substitute for TL-2 Approach Terminals unless the substitution is specifically prohibited in the plans. TL-2 Approach Terminals may not substitute for TL-3 installations.

4. IMPACT HEAD END DELINEATOR: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal in accordance with Specification 536.

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

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. Approach Terminals, Low Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

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

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

1. GENERAL: See Notes 1 through 3 on Sheet 7.

2. CURBED SEGMENTS: Type E curb is required within the limits shown. When a different curb type is called for outside of the Type E curb limits, transition the curb shape linearly, over a nominal distance ranging 9'-0" to 10'-0".

3. TAPER LENGTH: For Curbed Segments, taper the front and guardrail away from the roadway where shown to place the inside edge of the Impact Head at 5' behind the face of the curb. Where additional lateral offset is required to fit the Approach Terminal Assembly hardware, such as a soil plate, place the Impact Head as close to the curb as the hardware allows, not to exceed 2'-0" from the face of curb.

4. GUARDRAIL HEIGHT TAPER: For Curbed Segments, the connecting general guardrail mounting height, "H", is typically measured from the top of gutter (See Sheet 6). For Double Faced Segments, the Approach Terminal Assembly "H" is measured from the Misc. Asphalt Pavement (See Sheet 6). Linearly taper the difference in mounting height over a minimum length of 12'-0", starting where indicated herein.

5. DOUBLE FACED SEGMENTS: Connect to Double Faced General Guardrail use consistent Posts and Offset Blocks types as specified in the APL drawings over the entire Length of End Treatment, "LE". Posts and Offset Blocks in the adjoining general guardrail segment may be different from those inside of the "LE". A change in post type between timber and steel is permitted, immediately outside of the "LE" segment. Maintain the 1:10 maximum grading as shown in Section B-B throughout segment "LE". Where required, transition to differing adjacent slopes linearly, over a minimum longitudinal length of 25'-0".

6. IMPACT HEAD END DELINEATOR: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal, typically measured from the Lip of Gutter (See Sheet 6). For the finished condition, keep this area free of all aboveground obstructions, including dense vegetation and trees.

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

8. 2" MISCELLANEOUS ASPHALT PAVEMENT: The 2" Misc. Asphalt Pavement shown upstream of Post (1) may be substituted with a different pavement type where called for in the Plans.

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.

Lag the Flared End Unit behind the W-Beam; lap the Flared and Buffered End Units over the face of the W-Beam.

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 DELINERATOR: Mount retroreflective sheeting to the approach face of the End Unit in accordance with Specification Sections 536 and 967.
NOTES:

1. INSTALLATION: Use components as shown on Sheets 9 & 11.

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

3. PLATE STOP-NAILS: To prevent rotation of the Bearing Plate, drive steel 2 1/2" x 1" Stop-Nails (See Note 2) into the plate edge (three sides).

4. CABLE ANCHOR PLATE ASSEMBLY INSTALLATION: Mount to the pre-fabricated Cable Anchor Plate Bolt Holes in the W-Beam Panel, as shown on Sheet 4. These 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.

END TREATMENT - COMPONENT DETAILS

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-sheet-
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 Washer detail, see Sheet 24.

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

4. PARTIAL CABLE ASSEMBLY: The Partial Cable Assembly is similar to the Cable Assembly defined on Sheet 10, except with a 9'-0" total length and the Swage Fitting and Cable Stud omitted from one end. Feed the Cable Stud through the Cable Stud Hole of the Transverse Cable Stud Mount as shown, and secure it with the Hex Jam Nut System as defined on Sheet 10.

5. SPECIAL END SHOE MOUNT: Punch a ½" hole in the W-Beam Panel as needed to secure the Special End Shoe with the ½" 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 DELINIER: Mount retroreflective sheeting to the approach face of the Buffer End Unit in accordance with Specifications 33a and 86f.


**NOTES:**

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

2. **MIN. CLEAR AREA:** Keep the area behind the CRT free of fixed objects and aboveground hazards within the Min. Clear Area limits shown. Maintain a slope not steeper than 1:10 for a minimum 2' 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 panel(s) where indicated using 12'-0" or 25'-0" W-Beam Panels. Splice at post locations within the CRT radius using the General configuration of 1/2" Button-Head Bolts (8 reqd. per splice).

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

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

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

3. GUARDRAIL TAPER: The connecting guardrail may require a different lateral offset if shown in the plans. At the location shown herein, taper the guardrail to the connecting guardrail offset if the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.

4. END TRANSITION OF CURB OPTIONS: The Plan and Elevation views depict an example Curb Transition to Flush Shoulder from Section D-D to E-E, but this transition may require a different shape depending on the End Transition option shown in the plans (Either a Shoulder Gutter Option, Raised Curb Option, or Flush Shoulder Option). See Sheet 14 for additional curb options and Sheet 15 for curb shape details.

5. RIGID BARRIER END TRANSITION: Taper the Rigid Barrier toe as shown. See Sheet 14 for additional curb options and Sheet 15 for curb shape details.

6. OFFSET BLOCKS: For Thrie-Beam post locations within the Length of Approach Transition segment, use the Timber Offset Blocks with 1'-6" height shown on Sheet 5.

7. OFFSET: The required offset difference between the face of Guardrail and Rigid Barrier Shoulder Line is considered negligible and may not be shown in the guardrail offset callouts in the plans. A consistent guardrail offset deviation of up to 4 inches outside of the Rigid Barrier Shoulder Line is permitted over the length 'LA'.

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

TP-3 APPROACH TRANSITION
INSTALLER ELEVATION

TP-3 APPROACH TRANSITION
INSTALLER PLAN

APPROACH TRANSITION CONNECTION
TO RIGID BARRIER - GENERAL, TL-3
NOTES:

1. GENERAL: See the applicable notes and details on Sheet 13.

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

3. ELEVATION VIEW: For post and panel installation details within 'LA', see the elevation view on Sheet 13. The curb details will differ depending on curb option required.
NOTES:

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

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

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

3. GUARDRAIL TAPER: The connecting guardrail may require a different lateral offset if shown in the Plans. At the location indicated herein, taper the guardrail to the connecting guardrail offset. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.

4. END TRANSITION OF CURB OPTIONS: The Plan and Elevation views depict an example Curb Transition to Flush Shoulder from Section D-D to E-E. But, this transition may require a different shape depending on the End Transition option shown in the Plans (either a Shoulder Gutter Option, Raised Curb Option, or Flush Shoulder Option). See Sheet 16 for additional curb options and Sheet 17 for curb shape details.

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

6. OFFSET: The required offset difference between the Face of Guardrail and Rigid Barrier Shoulder Line is considered negligible and may not be shown in the guardrail offset callouts in the plans. A consistent guardrail offset deviation of up to 4 inches outside of the Rigid Barrier Shoulder Line is permitted over the length ‘LA’.

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

APPROACH TRANSITION CONNECTION TO RIGID BARRIER - LOW-SPEED, TL-2
TL-2 APPROACH TRANSITION
WITH ‘SHOULDER GUTTER’
CONNECTION - PLAN VIEW

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

NOTES:
1. GENERAL: See the applicable notes and details on Sheet 15.
2. SECTION VIEWS & DETAILS: For cross sections and details, including the barrier mounting hardware, curb transition, adjacent grading, and installation dimensions, see Sheet 17.
3. ELEVATION VIEW: For post and panel installation details within ‘LA’, see the elevation view on Sheet 15. The curb details will differ depending on curb option required.
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 layout given on sheet 20 provides a basic scheme for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail has the same offset as the Approach Transition segment, then no taper is required.

2. THRIE-BEAM TERMINAL CONNECTOR: See Sheet 17 for details. The installed bolt's threaded portion is not permitted to extend beyond ¾" from the face of the nut. Trim the threaded portion as needed and galvanize in accordance with Specification 582.

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

APPRAOCH TRANSITION CONNECTION TO RIGID BARRIER WITH DOUBLE FACED GUARDRAIL

TL-3 DOUBLE FACED APPROACH TRANSITION
INSTALLED ELEVATION

TL-3 DOUBLE FACED APPROACH TRANSITION
INSTALLED PLAN

DESCRIPTION:

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GUARDRAIL

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TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW
(Dual Bridge Approach Configuration)

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

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

3. LENGTH OF APPROACH TRANSITION 'LA': Install the applicable Approach Transition as shown per Sheets 13 thru 16, where called for in the plans.

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

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

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

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

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

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

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

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

3. LENGTH OF APPROACH TRANSITION 'LA': Install the applicable Approach Transition as shown per Sheets 13 thru 16, where called for in the plans.

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

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

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

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

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

1. See the applicable Notes on Sheet 19.

2. LENGTH OF TRAILING ANCHORAGE, 'LT': Install the Trailing Anchorage as shown on Sheet 19, where called for in the Plans.

3. THREE-BEAM TERMINAL CONNECTOR: Install connector and bolts as shown on Sheet 17.

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

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TYPE C APPROACH TO RIGID BARRIER - DOUBLE FACED GUARDRAIL

PLAN VIEW - MEDIAN SHOULDERS ONLY
(Mirror Horiz. and Vert. for Opposite Direction and/or Side of Road)

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TYPE D TRAILING CONNECTION FROM RIGID BARRIER

PLAN VIEW - MEDIAN OR OUTSIDE SHOULDER
(Mirror Horiz. and/or Vert. for Opposite Direction and/or Side of Road)

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TRAILING END TRANSITION CONNECTION TO RIGID BARRIER - INSTALLED ELEVATION

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LAYOUT TO RIGID BARRIER - TRAILING ENDS

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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:

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:

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.

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

MATERIALS: Use steel components in accordance with Specification 967.

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

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

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

4. RAIL SPLICES: Install Rail Splices to join pieces of 2" NPS Pipe Rail into a continuous system. Place splices as needed, at a spacing of 18'-0" or greater. Orient the head of bolt on the top of the pipe.
1. INSTALLATION: When the construction of Guardrail at the required post spacing results in post(s) located atop culverts, instills, pipe tees, or similar concrete structures, a Standard Steel Post may be substituted for a Standard Post. Instill where shown in the plans and/or as-needed, in accordance with Specification 536. Use 9/16 Hex-Head Bolts for structures less than 9" deep as defined in the Specification.

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

3. BASE PLATE MOUNT: Install Special Steel Posts as shown using steel Adhesive-Bonded Anchor Bolts in accordance with Specification 536. Use 1/2" Hex-Head Bolts for structures less than 9" deep as defined in the Specification.

4. PANEL MOUNT TO ADJUSTED POST: Punch additional 1/2" Post Bolt Slots in the W-Beam or Thrie-Beam Panel only where needed to mount the panel to a post in an adjusted location. Meet the Panel Post Bolt Slots requirements of Specification 536.

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

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

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

4. MOUNT LOCATIONS: Mount Barrier Delineators atop posts as shown. Starting with Post (3) of Approach Terminals and incrementally increasing spacing towards the downstream direction. Install the Barrier Delineators at the following spacing:
   - S1 = 25' x 1 Space
   - S2 = 50' x 1 Space
   - S3 = 75' x 1 Space
   - S4 = 100' x 1 Space for the remainder. Additionally, place a Barrier Delineator on Post (2) of the Trailing Anchorage or on the post nearest the Rigid Barrier.

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

BARRIER DELINEATORS

NOTES:

1. INSTALLATION: Work these details with the plans, where shown. Install Midspan Panel Splicers Where Shown in accordance with Specifications 536, 537, 538, 539, 708, and with the manufacturer's design as approved on the A/A.

2. PANEL SPLICES: Midspan Panel Splicers are not required in Transition and Reduced Post Spacing segments. When they are required for General Segments, use one Midspan Panel Splicer (9-49" or 10-75") 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 5/8" Panel Post Bolt Slots in the panels only where required for mounting and in accordance with Specification 596.

REDUCED POST SPACING FOR HAZARDS

STEEL POSTS

MOUNT LOCATION - ISOMETRIC VIEWS

DETAIL 'S' - HALF SPACING ELEVATION

BUTTON-HEAD BOLT SYSTEM

Application(s):
Panel Splice
1/2" Full Length
Steel Post Mount - Single Faced Guardrail
10" #
Timber Post Mount - Single Faced Guardrail
18" #
Steel or Timber Post Mount - Double Faced Guardrail
22" #
**GUARDRAIL TRANSITION ALIGNMENTS FOR BRIDGE THRIE-BEAM AND VERTICAL FACE TRAFFIC RAILING RETROFIT**

**APPRAISAL SLAB WITHOUT CURB**

- 6 Posts Spaced @ 1'-6"
- 3'-1½"
- 3'-1½"
- 3'-1½"
- 6'-3"

125' R: 1:10 Taper Rate
187' R: 1:15 Taper Rate

**APPRAISAL SLAB WITH CURB**

- 10 Gage Thrie-Beam Or Thrie-Beam Terminal Connector
- Traffic Railing (Thrie-Beam Or Vertical Face Retrofit)

Roadway Guardrail Transition

- 125' R: 1:10 Taper Rate
- 187' R: 1:15 Taper Rate

**GENERAL NOTES**

1. This index provides guardrail transition details for approach and trailing end guardrail connections to existing bridges, including details for connecting to traffic railing retrofits and safety shape barriers on existing bridges. Sheets 1 through 26 apply to bridges with retrofitted traffic railings. (Sheet 26 shows the trailing and guardrail connections). Sheets 27 and 28 apply to bridges with safety shape traffic railing, and they provide approach and trailing end transition connection details for guardrail. Construct these guardrail transitions and connections where called for in the plans.

2. For miscellaneous guardrail components and 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 slab curbs extend to the beginning of the slab, and where other treatment to curb bunt 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.

4. Anchor studs and nuts shall be hot-dip galvanized in accordance with the Specifications. After the nuts have been snug tightened, the anchor stud threads shall be single punch distorted immediately above the top nuts to prevent loosening of the nuts. Distorted threads shall be coated with a galvanizing compound in accordance with the Specifications.

5. For installing thrie-beam terminal connector to traffic railing vertical face retrofits, see notations on Sheets 15 through 18 and the flag notation on Sheet 26.

6. Payment for connections to traffic railing vertical face retrofits are to be made under the contract unit price for Bridge Anchorage Assembly, E.A., and shall be full compensation for bolt hole construction, terminal connector, terminal connector plate and bolts, nuts and washers.
GUARDRAIL APPLICATIONS FOR BRIDGES WITH FULL WIDTH SHOULDERS AND SAFETY SHAPE TRAFFIC RAILING BARRIER EXTENDING LESS THAN FULL APPROACH SLAB LENGTH

UNDIVIDED ROADWAY - DETAIL H

DIVIDED ROADWAY - DETAIL I

GUARDRAIL APPLICATIONS FOR BRIDGES WITH LESS THAN FULL WIDTH SHOULDERS AND CONCRETE TRAFFIC RAILING EXTENDING LESS THAN FULL APPROACH SLAB LENGTH

UNDIVIDED ROADWAY - DETAIL S

DIVIDED ROADWAY - DETAIL T

GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES

STANDARD PLANS

FY 2020-21

INDEX 536-002

SHEET 2 of 28
### GUARDRAIL LENGTHS

**Design Speed**

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Projected ADT</th>
<th>CZ (ft)</th>
<th>Min. Median Width</th>
<th>Guardrail Length</th>
<th>Min. Median Width</th>
<th>Guardrail Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-50</td>
<td>1500</td>
<td>36</td>
<td>50</td>
<td>36.25</td>
<td>54</td>
<td>31.25</td>
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<tr>
<td>60-65</td>
<td>1500</td>
<td>36</td>
<td>64</td>
<td>28.75</td>
<td>48</td>
<td>23.25</td>
</tr>
<tr>
<td>60-65</td>
<td>2500</td>
<td>24</td>
<td>38</td>
<td>21.25</td>
<td>42</td>
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<tr>
<td>80-90</td>
<td>2500</td>
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<td>18.25</td>
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<tr>
<td>40-50</td>
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<td>18.25</td>
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<td>11.75</td>
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<tr>
<td>40-50</td>
<td>Urban w/o Curb</td>
<td>18</td>
<td>22</td>
<td>12.25</td>
<td>42</td>
<td>10.25</td>
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</table>

**Approach Slab**

<table>
<thead>
<tr>
<th>6' Or 10 Shoulder (Std.)</th>
<th>1:10 For Design Speeds ≤ 45 mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-65</td>
<td>1500</td>
</tr>
<tr>
<td>60-65</td>
<td>&lt; 1500</td>
</tr>
<tr>
<td>60-65</td>
<td>≥ Clear Zone Width</td>
</tr>
<tr>
<td>60-65</td>
<td>≥ Clear Zone Width</td>
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**Approach Slab**

<table>
<thead>
<tr>
<th>6' Or 10 Shoulder (Std.)</th>
<th>1:15 For Design Speeds ≥ 50 mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-65</td>
<td>1500</td>
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<tr>
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<td>&lt; 1500</td>
</tr>
<tr>
<td>60-65</td>
<td>≥ Clear Zone Width</td>
</tr>
<tr>
<td>60-65</td>
<td>≥ Clear Zone Width</td>
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</tbody>
</table>

**Approach Terminal (See Index 536-001)**

### GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES

**Approach Slab**

<table>
<thead>
<tr>
<th>6' Or 10 Shoulder (Std.)</th>
<th>1:25 When Shoulder Gutter Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-65</td>
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<td>&lt; 1500</td>
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<tr>
<td>60-65</td>
<td>≥ Clear Zone Width</td>
</tr>
<tr>
<td>60-65</td>
<td>≥ Clear Zone Width</td>
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</tbody>
</table>

**Approach Slab**

<table>
<thead>
<tr>
<th>6' Or 10 Shoulder (Std.)</th>
<th>1:10 For Design Speeds ≤ 45 mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-65</td>
<td>1500</td>
</tr>
<tr>
<td>60-65</td>
<td>&lt; 1500</td>
</tr>
<tr>
<td>60-65</td>
<td>≥ Clear Zone Width</td>
</tr>
<tr>
<td>60-65</td>
<td>≥ Clear Zone Width</td>
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</table>

**Approach Terminal (See Index 536-001)**

### GUARDRAIL LENGTHS

**100 TAPER RATE**

<table>
<thead>
<tr>
<th>Panels (No.)</th>
<th>6' Bridge Shoulder Length (Ft.)</th>
<th>10' Bridge Shoulder Length (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>7.5</td>
<td>11.5</td>
</tr>
<tr>
<td>34</td>
<td>8.5</td>
<td>14.5</td>
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<tr>
<td>36</td>
<td>9.5</td>
<td>17.5</td>
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<tr>
<td>38</td>
<td>10.5</td>
<td>20.5</td>
</tr>
<tr>
<td>40</td>
<td>11.5</td>
<td>23.5</td>
</tr>
<tr>
<td>42</td>
<td>12.5</td>
<td>26.5</td>
</tr>
<tr>
<td>44</td>
<td>13.5</td>
<td>29.5</td>
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<tr>
<td>46</td>
<td>14.5</td>
<td>32.5</td>
</tr>
<tr>
<td>48</td>
<td>15.5</td>
<td>35.5</td>
</tr>
</tbody>
</table>

**225 TAPER RATE**

<table>
<thead>
<tr>
<th>Panels (No.)</th>
<th>6' Bridge Shoulder Length (Ft.)</th>
<th>10' Bridge Shoulder Length (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>7.5</td>
<td>11.5</td>
</tr>
<tr>
<td>34</td>
<td>8.5</td>
<td>14.5</td>
</tr>
<tr>
<td>36</td>
<td>9.5</td>
<td>17.5</td>
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<tr>
<td>38</td>
<td>10.5</td>
<td>20.5</td>
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<tr>
<td>40</td>
<td>11.5</td>
<td>23.5</td>
</tr>
<tr>
<td>42</td>
<td>12.5</td>
<td>26.5</td>
</tr>
<tr>
<td>44</td>
<td>13.5</td>
<td>29.5</td>
</tr>
<tr>
<td>46</td>
<td>14.5</td>
<td>32.5</td>
</tr>
<tr>
<td>48</td>
<td>15.5</td>
<td>35.5</td>
</tr>
</tbody>
</table>

**Notes:**

1. Lengths shown on this table are typical for roadways with standard width shoulders and a relocated connection to the existing wing post. Length requirements shall be determined on a site specific basis for both standard width and narrow bridge shoulders and for end anchorage or end shielding use.

2. Flared end anchorage assemblies to shield normal transverse underslope and bridge end hazards.

3. Flared end anchorage assemblies for connection location on wing post or bridge traffic railing barrier.

4. Flared end anchorage assemblies, skewed crossings and other hazards present.

5. Flared end anchorage assemblies for connection location on wing post or bridge traffic railing barrier.

6. Flared end anchorage assemblies to shield normal transverse underslope and bridge end hazards.

7. Flared end anchorage assemblies for connection location on wing post or bridge traffic railing barrier.

8. Flared end anchorage assemblies, skewed crossings and other hazards present.

9. Flared end anchorage assemblies for connection location on wing post or bridge traffic railing barrier.

10. Flared end anchorage assemblies to shield normal transverse underslope and bridge end hazards.

11. Flared end anchorage assemblies for connection location on wing post or bridge traffic railing barrier.

12. Flared end anchorage assemblies, skewed crossings and other hazards present.

13. Flared end anchorage assemblies for connection location on wing post or bridge traffic railing barrier.
MEDIANS WITH 10' BRIDGE SHOULDERS

MEDIANS WITH 6' BRIDGE SHOULDERS

Approach Slab

Guardrail Transition (Approach Section) As Required For Crash Cushion

Special Blocks As Required

Misc. Asphalt Pavt.

1:15 For Design Speeds ≥ 50 mph

1:10 For Design Speeds ≤ 45 mph

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

The lengths shown in this table are based on standard widths for roadway and bridge median shoulders. Length requirements for both standard width and narrow bridge shoulders and end anchorage or end shielding requirements shall be determined on a site specific basis.

The number of panels may be reduced when installing a crash cushion more than 2.5' in width; see * below.

*Number shown is the minimum number of panels plus a W-Thrie beam transition panel; single faced guardrail must have a length of five (5) or more panels.

Approach Guardrail Treatments for Bridges With Concrete Traffic Railing

Extending Less Than Full Approach Slab Length in Narrow Medians With Flush Shoulders

Guardrail Lengths

<table>
<thead>
<tr>
<th>Median Width (ft.)</th>
<th>6' Bridge Shoulders</th>
<th>10' Bridge Shoulders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1:10 Taper Rate</td>
<td>1:15 Taper Rate</td>
</tr>
<tr>
<td>Panels (No.)</td>
<td>Length (ft.)</td>
<td>Panels (No.)</td>
</tr>
<tr>
<td>28</td>
<td>23.75</td>
<td>14.375</td>
</tr>
<tr>
<td>28</td>
<td>23.75</td>
<td>14.375</td>
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<tr>
<td>28</td>
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<tr>
<td>28</td>
<td>23.75</td>
<td>14.375</td>
</tr>
<tr>
<td>28</td>
<td>23.75</td>
<td>14.375</td>
</tr>
<tr>
<td>28</td>
<td>23.75</td>
<td>14.375</td>
</tr>
</tbody>
</table>

The number of panels may be reduced when installing a crash cushion more than 2.5' in width; see * below.

*Number shown is the minimum number of panels plus a W-Thrie beam transition panel; single faced guardrail must have a length of five (5) or more panels.

Guardrail Transitions and Connections for Existing Bridges

FY 2020-21

Standard Plans
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEE INDEX 460-471 - SCHEME 1

SEE INDEX 460-471 - SCHEME 2

SEE INDEX 460-471 - SCHEME 3
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

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)

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 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

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

Any Detached or Integral Sidewalk Removed

Any Detached or Integral Sidewalk Removed

Integral Approach Side with Curb

Remove Portion of curb as required for test placement.

Transition Block in Absence of Curb

Transition Block in Absence of Curb

Traffic Railing (Thrie-Beam Retrofit)

Key Post Reference Line

Nested Thrie-Beam

Nested W-Beam

Nested W-Beam

Nested W-Beam

Nested W-Beam

Nested W-Beam

Nested W-Beam

Nested W-Beam

Nested W-Beam

Nested W-Beam

Nested W-Beam

Nested W-Beam

Nested W-Beam

Nested W-Beam

Nested W-Beam

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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 - SCHEMES 5 & 6

SEE INDEXES 460-472, 460-473, 460-475 & 460-476 - SCHEMES 3 & 4

On Bridge Structure Blocks Control And
Posts Located Behind Back Of Rail
For All Schemes
Traffic Railing

Traffic Railing

On Bridge Structure Blocks Control And
Posts Located Behind Back Of Rail
For All Schemes

Traffic Railing

On Bridge Structure Blocks Control And
Posts Located Behind Back Of Rail
For All Schemes

Traffic Railing

On Bridge Structure Blocks Control And
Posts Located Behind Back Of Rail
For All Schemes

Traffic Railing

On Bridge Structure Blocks Control And
Posts Located Behind Back Of Rail
For All Schemes

Traffic Railing

See Indexes 460-472, 460-473, 460-475 & 460-476 - SCHEMES 5 & 6

See Indexes 460-472, 460-473, 460-475 & 460-476 - SCHEMES 3 & 4
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)

Note:
*21" x 12" x 9/16" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And (9/16" x 12" Long HS Hex Bolts And Nuts (5 Req'd.) With 1/2" 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 1/4" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And 3/8" x 12" Long
- 1/2" Hex Bolts And Nuts (5 Req'd.) With 2½" OD Plain Round Washers Under Heads And Nuts
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)
**PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)**

**NOTE:**

*21" x 12" x 5/16" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And 5/8" HS Hex Bolts And Nuts (12" Long For Scheme 1 And Length To Fit For Schemes 2 And 3/5 Req.) With 21/2" OD Plain Round Washers Under Heads And Nuts*

---

**SEE INDEX 521-483 - SCHEME 1**

**SEE INDEX 521-483 - SCHEME 2**

**SEE INDEX 521-483 - SCHEME 3**

---

**DESCRIPTION:**

**REVISED**

**LAST REVISION 01/01/19**

**STANDARD PLANS**

**GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES**

**INDEX 536-002**

**SHEET 18 of 28**
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

SEE INDEX 536-002 - SCHEME 1

SEE INDEX 536-002 - SCHEME 2

PICTORIAL VIEW

EXISTING RAILING AND PARALLEL HORIZONTAL RAIL POST REMOVED
EXISTING RAILING AND PARALLEL HORIZONTAL RAIL POST REMOVED
EXISTING RAILING AND PARALLEL HORIZONTAL RAIL POST REMOVED

Traffic Railing (Veritical Face Retrofit) Conneted
Traffic Railing (Veritical Face Retrofit) Conneted
Traffic Railing (Veritical Face Retrofit) Conneted

End of Terminal Connector Identified
In The Plans By Station Location
End of Terminal Connector Identified
In The Plans By Station Location
End of Terminal Connector Identified
In The Plans By Station Location

SEE INDEX 536-002 - SCHEME 2

SEE INDEX 536-002 - SCHEME 2

PICTORIAL VIEW

Traffic Railing (Vertical Face Retrofit)
Traffic Railing (Vertical Face Retrofit)
Traffic Railing (Vertical Face Retrofit)

4) Post Bolt Location On Bridge
7) Min. From End Of Bridge). Use 1/2" NS Hex Bolts And Nuts
With 21/2" OD Plain Round Washers Under Heads And Nuts.

* Post Bolts At First Standard (3'-1"") Post Hole Location On Bridge

OD Plain Round Washers Under Heads And Nuts.

4) Post Bolt Location On Bridge
7) Min. From End Of Bridge). Use 1/2" NS Hex Bolts And Nuts
With 21/2" OD Plain Round Washers Under Heads And Nuts.

OD Plain Round Washers Under Heads And Nuts.

4) Post Bolt Location On Bridge
7) Min. From End Of Bridge). Use 1/2" NS Hex Bolts And Nuts
With 21/2" OD Plain Round Washers Under Heads And Nuts.

OD Plain Round Washers Under Heads And Nuts.

4) Post Bolt Location On Bridge
7) Min. From End Of Bridge). Use 1/2" NS Hex Bolts And Nuts
With 21/2" OD Plain Round Washers Under Heads And Nuts.

OD Plain Round Washers Under Heads And Nuts.

4) Post Bolt Location On Bridge
7) Min. From End Of Bridge). Use 1/2" NS Hex Bolts And Nuts
With 21/2" OD Plain Round Washers Under Heads And Nuts.

OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

* Post Bolts At First Standard (3'-1") Post Hole Location On Bridge
(7" Min. From End Of Bridge) Use 7/8" HS Hex Bolts And Nuts
With 2½" OD Plain Round Washers Under Heads And Nuts
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

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

* Post Bolts At First Standard (3'-1"") Post Hole Location On Bridge
(1" Min. From End Of Bridge). Use 7/8" HS Hex Bolts And Nuts
With 3/4" OD Plain Round Washers Under Heads And Nuts.

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) (INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING
(VERSICAL FACE RETROFIT)

Traffic Railing (Vertical Face Retrofit)

Roadway Guardrail Transition

End of Terminal Connector Identified In The Plans By Station Location

* Bolt As First Standard (7'-15") Post Hole Location On Bridge (10" Min. From End Of Bridge). Use 3/8 H5 Hex Bolts And Nuts.

With 2½" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS
AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING
(VERTICAL FACE RETROFIT)

SEE INDEX 521-483 - SCHEME 3

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 3

PICTORIAL VIEW

SEE INDEX 521-483 - SCHEME 3

PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS
AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING
(VERTICAL FACE RETROFIT)
GUIDE RAIL TRAILING END ANCHORAGE IN ABSENCE OF OTHER HAZARDS

GUIDE RAIL TRAILING END ANCHORAGE WHEN OTHER HAZARDS PRESENT

TRAILED END GUARDRAIL AND ANCHORAGE FOR BRIDGE TRAFFIC RAILING (THREE BEAM RETROFITS)
GUARDRAIL TRANSITION TO EXISTING FLAT SLAB BRIDGES

SCHEME I

Use Of Scheme I Shall Be Determined In Accordance With The Standard Plans Instructions (SPI 536-002).

GUARDRAIL TRANSITIONS TO EXISTING PRESTRESSED BEAM OR GIRDER BRIDGES

SCHEME II

Use Of Schemes II and III Shall Be Determined In Accordance With The Standard Plans Instructions (SPI 536-002).

SCHEME III

TRAILING END POSTS AND SPECIAL OFFSET BLOCKS

Block assemblies for special offsets can be made up of one special block plus one standard size block or of three standard size blocks field dressed to approximately equal size, with the pieces secured for relative position by 16d galvanized nails, see ’16d NAIL FOR PREVENTION OF OFFSET BLOCK NOTATION – Index 536-001’. The nested rails shall not be bolted to the blocks and posts at posts (a), (b) and (c). The details shown are for approach slabs with internal edge dikes extending beyond parapet type traffic railing termini.

NOTES FOR GUARDRAIL TRANSITIONS TO SAFETY SHAPE TRAFFIC RAILINGS ON EXISTING BRIDGES

1. When the guardrail attachment overlays the Bridge Number, Bridge Name or Date on the traffic railing, provide an aluminum sign panel with the obscured information. Attach the sign panel to the face of the traffic railing adjacent to the Three-Beam Terminal Connector with 1/8" x 1" long concrete screws or expansion anchors at each corner, as approved by the Engineer. The sign panel shall be a minimum 1/8" thick and meet the requirements of Specification 700 with a white background and 3" tall black letters and sized appropriately to contain the information required. The cost of the sign panel shall be included in the cost of the Guardrail Bridge Anchorage Assembly.

2. When retrofitting three-beam guardrail to existing wing posts or existing bridge safety shape traffic railing, attachment construction to be paid for under the contract unit price for Guardrail Bridge Anchorage Assembly, EA., and shall be full compensation for bolt hole construction, terminal connector, terminal connector plate(s) and bolts, nuts and washers.
GENERAL NOTES:

1. GENERAL: Work this Index in accordance with Specification 564 and the "Summary of Permanent Crash Cushions" table in the Plans. Where applicable, use Guardrail components and panel lap splices in accordance with Index 536-001.

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 8'-6" 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 not applicable (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.

   The 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.

   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.

   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 8'-6" 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.

   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.

   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.

   Construct the proprietary guardrail transition only if shown in the applicable APL drawing. See Note 4 below.

   Work this Index in accordance with Specification 564 and the "Summary of Permanent Crash Cushions” table in the Plans. Where applicable, use Guardrail components and panel lap splices in accordance with Index 536-001.

---

PERMANENT CRASH CUSHION APPLICATIONS

---

CONCRETE BARRIER APPLICATION

---

GUARDRAIL APPLICATION

---

PERMANENT CRASH CUSHION APPLICATIONS

---

CRASH CUSHION DETAILS

---

INDEX 544-001 SHEET 1 of 3
**STANDARD GUARDRAIL TRANSITION**

**CRASH CUSHION DETAILS**

- **Facing Traffic:**
  - Crash Cushion Sta. (See General Note 7)
  - Begin/End Guardrail Sta. (Q Post)
  - Length of End Treatment
  - Manufacturer's Transition
  - 4 Spaces @ 1'-6¾" CC
  - Thrie-Beam Offset Block (Typ.)
  - 5 Spaces @ 3'-1½" CC
  - W-Beam Offset Block (Typ.)
  - 21'-10¾" Standard Guardrail Transition (Parallel to Roadway)

- **Offset Block (Typ.)**
  - Panel Lap Splice (Typ.)
  - (Lap in Direction of Adjacent Traffic)

- **Width of Roadway:**
  - 12'-6" Thrie-Beam Panel (Nested)
  - 6'-3" Thrie-Beam Transition Panel
  - W-Beam Panels

- **Finished Grade:**
  - Adjacent Traffic
  - (Lap in Direction of Traffic)

- **Guardrail Post (Typ.)**
  - 2'-1"

- **Begin/End Taper:**
  - (If Applicable, See General Note 3)
  - (If Applicable, See General Note 4)

- **Standard Guardrail Transition (Parallel to Roadway):**
  - Per the Plans

**NOTE:**

Work this Sheet with the details and General Notes on Sheet 1.
1. GENERAL: Work this Sheet with the details and General Notes on Sheet 1.

   Install short guardrail extension only where called for in the plans, using the project-specific length specified. Short guardrail extensions are typically used where adding length to a barrier system is warranted, but a full Approach Transition Connection to Rigid Barrier will not fit.

2. CONNECTION TO CONCRETE TRAFFIC RAILING: See Index 536-001 for connection details to rigid barrier including the Thrie-Beam Terminal Connector and Alignment Curb details. Install the Alignment Curb section with no curb transition, and extend the curb to the crash cushion as shown. The crash cushion must laterally extend beyond the above-ground portion of the alignment curb to shield its end face from approaching traffic.

3. CONNECTION TO THRIE-BEAM RETROFIT: Provide Thrie-beam Retrofit guardrail connection splice, curb, and Transition Block per Index 536-002 and the applicable Index 460-470 series.

NOTES:
SPACING OF RAISED RUMBLE STRIP SETS AT INTERSECTIONS
(Preformed Thermoplastic Set Shown, Others Similar)

TABLE 1 - BRAKING ZONE

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>L' (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 20</td>
<td>150</td>
</tr>
<tr>
<td>25</td>
<td>200</td>
</tr>
<tr>
<td>30</td>
<td>250</td>
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<td>35</td>
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<td>350</td>
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<td>45</td>
<td>410</td>
</tr>
<tr>
<td>50</td>
<td>470</td>
</tr>
<tr>
<td>55</td>
<td>550</td>
</tr>
</tbody>
</table>

NOTES:
1. Construct permanent raised rumble strips where shown in the Plans and in accordance with Specification 546.
2. Preformed Thermoplastic Set:
   a. Use multiple applications to achieve desired 1/8" thickness.
   b. Use color white.

OPTION P1 - ASPHALT SET

OPTION P2 - PREFORMED THERMOPLASTIC SET

OPTIONAL MATERIALS DETAILS

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

Preformed Thermoplastic Rumble Strip (Typ.) (See Note 2)
SHORT-TERM RAISED RUMBLE STRIPS

OPTION ST1 - ASPHALT SET

OPTION ST2 - PREFORMED THERMOPLASTIC SET

OPTION ST3 - REMOVABLE POLYMER STRIPING TAPE SET

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 Striping Tape Sets.

OPTIONAL MATERIALS DETAILS
### 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 within 50 feet of the centerline of the overhead gantry.
   - D. On outside shoulders of exit ramp terminals, terminate rumble strips at the point of the physical gore and resume at the end of the acceleration lane taper.
   - E. On approaches to bridges, terminate rumble strips at the approach slab joint.
   - F. On either side of median crossover openings, terminate rumble strips within 400 feet.

### 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>3&quot; (±1&quot;)</td>
</tr>
</tbody>
</table>

### RUMBLE STRIP ARRAY DETAILS

#### CONTINUOUS ARRAY

- Center to Center
- Rumble Strip (Typ.)

#### SKIP ARRAY

- 12" (±6") Gap
- 7'-0" (±6") Grinding

### RUMBLE STRIP DETAILS

- PLAN VIEW
- SECTION A-A

### RUMBLE STRIP PLACEMENT

(Plan View)
Rumble Strip (Typ.) 6" Pavement Marking

Edge of Traveled Way

Rumble Strip (Typ.) 6" Pavement Marking

Edge of Traveled Way

EDGE LINE RUMBLE STRIP PLACEMENT TYPES

CENTERLINE RUMBLE STRIP PLACEMENT TYPES

RUMBLE STRIP DETAILS

RUMBLE STRIP ARRAY DETAILS

RUMBLE STRIP DEPTH TABLE

LOCATION | SURFACE (IN.) | DEPTH FROM GROUND (IN.)
---------|---------------|----------------------
C        | 0             | ±1"                  
D        | 30' Skip      | ±1'-0"               
10' Pavement Marking | 12'-6" Gap  |
48'-0" Grinding  | 12'-6" Gap  |
Continuous Grinding  |

PLAN VIEW

CONTINUOUS ARRAY

(Centerlines and Inside Shoulder Edge Lines)

TYPE "A1" (Plan View)

TYPE "B1" (Plan View)

TYPE "C1" (Plan View)

TYPE "D1" - NO PASSING (Plan View)

TYPE "D1" - PASSING (Plan View)

Note:
See the Plans for the Placement Type to be used.

EDGE LINE RUMBLE STRIP PLACEMENT TYPES

CENTERLINE RUMBLE STRIP PLACEMENT TYPES

RUMBLE STRIP ARRAY DETAILS

RUMBLE STRIP DEPTH TABLE

LOCATION | SURFACE (IN.) | DEPTH FROM GROUND (IN.)
---------|---------------|----------------------
C        | 0             | ±1"                  
D        | 30' Skip      | ±1'-0"               
10' Pavement Marking | 12'-6" Gap  |
48'-0" Grinding  | 12'-6" Gap  |
Continuous Grinding  |

PLAN VIEW

CONTINUOUS ARRAY

(Centerlines and Inside Shoulder Edge Lines)

Note:
See the Plans for the Placement Type to be used.

RUMBLE STRIP DETAILS

RUMBLE STRIP ARRAY DETAILS

RUMBLE STRIP DEPTH TABLE

LOCATION | SURFACE (IN.) | DEPTH FROM GROUND (IN.)
---------|---------------|----------------------
C        | 0             | ±1"                  
D        | 30' Skip      | ±1'-0"               
10' Pavement Marking | 12'-6" Gap  |
48'-0" Grinding  | 12'-6" Gap  |
Continuous Grinding  |

PLAN VIEW

CONTINUOUS ARRAY

(Centerlines and Inside Shoulder Edge Lines)

Note:
See the Plans for the Placement Type to be used.
Rumble Strip (Typ.)

6" Pavement Marking

Rumble Strip (Typ.)

6" White

Traffic Lane

Buffered Bike Lane

Rumble Strip (Typ.)

6" Yellow

Surface

SECTION C-C

PLAN VIEW

CONTINUOUS ARRAY

Rumble Strip (Typ.)

6" Double Yellow

Rumble Strip (Typ.)

SKIP ARRAY

(Outside Shoulder Edge Lines)

CONTINUOUS ARRAY

(Centerlines and Inside Shoulder Edge Lines)

NOTE:

See the Plans for the Placement Type to be used.

RUMBLE STRIP DEPTH TABLE

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DEPTH FROM SURFACE (IN.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>1/8</td>
</tr>
<tr>
<td>G</td>
<td>3/8</td>
</tr>
<tr>
<td>H</td>
<td>1/2</td>
</tr>
<tr>
<td>I</td>
<td>1/4</td>
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</tbody>
</table>

RUMBLE STRIP ARRAY DETAILS

EDGE LINE RUMBLE STRIP PLACEMENT TYPES

CENTERLINE RUMBLE STRIP PLACEMENT TYPES

RUMBLE STRIP DETAILS

GROUND-IN RUMBLE STRIPS

SINUSOIDAL FOR ARTERIALS AND COLLECTORS

FAA

FY 2020-21

STANDARD PLANS

INDEX

546-010

3 of 3
**NOTES**

**DESIGN CRITERIA:**
1. Design is based on the assumption that the material contained within the reinforced soil volume, methods of construction and quality of prefabricated materials are in accordance with Specification Section 548 and Chapter 3 of the FDOT Structures Design Guidelines.

**SOIL PARAMETERS:**
1. See Wall Control Drawings for soil characteristics of foundation material to be used in the design of the wall system.
2. The Contractor will provide soil design parameters for backfill material based on the actual soil characteristics utilized at the site.

**MATERIALS:**
1. See Specification Section 548 for material requirements.

**CONSTRUCTION:**
1. Walls will be constructed in accordance with Specification Section 548 and the Wall Company's instructions.
2. For location and alignment of retaining walls, see Wall Control Drawings.
3. If required, locate manholes and drop inlets as shown on wall elevations.
4. Refer to Wall Control Drawings of individual walls for minimum reinforcement strip/mesh length, factored bearing resistance, minimum wall embedment and anticipated long-term and differential settlements.
5. The Contractor is responsible for controlling water during storm events as needed during construction.
6. It is the Contractor's responsibility to determine the location of any guardrail posts behind retaining wall panels. Prior to placement of the top layer of soil reinforcement, individual reinforcing strips/mesh may be skewed (15° maximum) to avoid the post locations if authorized by the Engineer. No cutting of soil reinforcement is allowed unless shown on Shop Drawings and approved by the Engineer. Any damage done to the soil reinforcement due to installation of the guardrail will be repaired by the Contractor at his own expense. Repair method will be approved by the Engineer.
7. If existing or future structures, pipes, foundations or guardrail posts within the reinforced soil volume interfere with the normal placement of soil reinforcement and specific directions have not been provided on the plans, the Contractor will notify the Engineer to determine what course of action shall be taken.
8. The Contractor is responsible for gradually displacing upper layers of soil reinforcement downward (15° maximum from horizontal) to avoid cutting soil reinforcement and conflicts with paving and subgrade preparation. The Contractor's attention is directed especially to situations where roadway super-elevation and/or soil mixing are anticipated.
9. For concrete facing panel surface treatment, see Wall Control Drawings.
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 459.
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 will be 2'-0" minimum below final ground line.
14. The top of the leveling pad or footing will be 2'-0" minimum below final ground line.
15. The height of panels in the bottom course of MSE Walls must not be less than half the height of a standard panel.
16. Work this Index with Index 521-600 thru 521-650.

**SHOP DRAWINGS:**
See Specification Section 548 for shop drawing requirements.

---

**FDOT MSE RETAINING WALL CLASSIFICATION TABLE**

<table>
<thead>
<tr>
<th>Applicable Wall Type</th>
<th>Durability Requirements (Carbon-Steel Reinforcing)</th>
<th>Durability Requirements (FRP Reinforcing)</th>
<th>Soil Reinforcement</th>
<th>Other Allowable FDOT Wall Types</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Concrete Cover (in.)</td>
<td>Concrete Cover (in.)</td>
<td>Pozzanol Additions</td>
<td>Concrete Cover (in.)</td>
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<td>3</td>
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<td>2</td>
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</tr>
<tr>
<td>Type 2F</td>
<td>3</td>
<td>1</td>
<td>Yes</td>
<td>2</td>
</tr>
</tbody>
</table>

* See Data Table in Contract Plans.
** Silica fume, metakaolin or ultrafine fly ash.

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**GENERAL NOTES AND DETAILS**
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 super-elevation and/or soil mixing are anticipated.

GENERAL NOTES AND DETAILS
GENERAL NOTES

1. This fence to be provided generally in rural areas. For supplemental information see Specifications 550.

2. Fabric shall be woven wire, either galvanized steel, meeting the requirements of ASTM A131. Design Number 1047-6-9, with Class 3 zinc coating; No. 12½ Grade 175, Design Number 1047-6-12½, with a 16½ gauge top and bottom wire and with Class 3 zinc coating; or aluminum coated steel, meeting the requirements of ASTM A584, No. 9 Farm, Design Number 1047-6-9, with a minimum coating weight of 0.40 oz./ft.². For additional information see payment note below.

3. Fence shall be installed with wire to private property except on horizontal curvatures greater than 3°. The fence shall be installed so as not to pull against all posts.

4. Posts may be either timber, steel, recycled plastic or concrete. Unless a specific post material is called for in the plans, the Contractor may elect to use either a single material or a combination of timber, steel, recycled plastic or concrete materials, but must comply with the electrical grounding requirements in Section 550. Line posts of one material may be used with corner, pull and end post assemblies of a different material. One post of only one optional material will be permitted between corner and pull post assemblies. Within individual corner and end post assemblies only one optional material will be permitted.

5. Posts and bracing shall meet the material requirements of Specification 964. Timber line posts are to be minimum 4” diameter. Timber corner, pull, approach and end posts are to be a minimum 5” diameter. Timber bracing to be 1½”x1¼” angles, 8’ long; fabricated for attaching brace; with necessary hardware and wire clamps and meeting the following requirements:

   (A) Line posts: 8’ long, 1.33 lbs./ft.; rolled sheathing, anchor plate attached, ASTM A702 (18 in²).

   (B) Approach posts: 2½”x2½”x1¼”x1¼”, 8’ long; fabricated for attaching brace; with necessary hardware, clamps, etc.

   (C) Pull, end and corner posts: 2½”x2½”x1¼”x1½”, 8’ long; fabricated for attaching brace; with necessary hardware, clamps, etc.

   (D) Braces: 2½”x2½”x1¼”x1¼” angles with necessary hardware and fabricated for attaching to post.

   (E) Pull, corner, approach and end posts are to be set in concrete as per detail. (Also 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, 111 lbs./ft.; rolled sheathing, anchor plate attached, ASTM A702 (18 in²).

   (B) Approach posts: 2½”x2½”x1¼”x1¼”, 8’ long; fabricated for attaching brace; with necessary hardware, clamps, etc.

   (C) Pull, end and corner posts: 2½”x2½”x1¼”x1½”, 8’ long; fabricated for attaching brace; with necessary hardware, clamps, etc.

   (D) Braces: 2½”x2½”x1¼”x1¼” angles with necessary hardware and fabricated for attaching to post.

   (E) Pull, corner, approach and end posts are to be set in concrete as per detail. (Also see General Note 19).

7. Recycled plastic posts shall meet the following material requirements: line posts shall have a minimum section of 4”x4” minimum square. Plastic posts shall not be used as corner, pull, end or approach posts unless such use is specifically detailed in the plans. The straightness of the post shall comply with Specification 954 for timber post. All posts, brace, and approach post shall meet the requirements of the latest edition of the Southern Pine Inspection Bureau’s Standard Grading Rules for Southern Pine lumber for No. 2SR Stress Graded R 16 timber. Plastic posts can be set by either digging and tamp backfill or by driving into full depth, preformed holes 1½” to 2½” 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. Pre-stressed concrete posts shall be Class 1 concrete. Prestressed posts shall be Class 11 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 fence 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 tie wires 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 A467.

11. Steel Barbed Wire can be either of the following types:

   Type I: This type shall conform to the requirements of ASTM A121, with a maximum of two strands of 1½ gauge wire; four-point barbs, wire size 14 gauge, twisted around both line wires; and, Class 3 coating, Design No. 12-4-5-12R.

   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 1½ gauge high tensile wire, four-point barbs, wire size 16½ gauge twisted around both line wires; and, Class 3 coating, Design No. 12-4-5-16R.

   Aluminum Barbed Wire shall be fabricated of two strands of 0.110-inch wire with 0.085-inch diameter four-point barbs spaced at approximately 5°, and at a maximum spacing of 6’. The wire for the strands and for the bars shall be of ASTM A611 Alloy 3003-H18 or equal.

   Type II: This type shall conform to the requirements of ASTM A121 with a maximum of two strands of 1½ gauge high tensile wire; four-point barbs, wire size 16½ gauge twisted around both line wires; and, Class 3 coating, Design No. 12-4-5-16R.

   Type II: This type shall conform to the requirements of ASTM A121 with two strands of 1½ gauge high tensile wire; four-point barbs, wire size 16½ gauge twisted around both line wires; and, Class 3 coating, Design No. 12-4-5-16R.

Aluminum Barbed Wire shall be fabricated of two strands of 0.110-inch wire with 0.085-inch diameter four-point barbs spaced at approximately 5°, and at a maximum spacing of 6’. The wire for the strands and for the bars shall be of ASTM A611 Alloy 3003-H18 or equal.

   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 (pull, corner, end and approach) shall be Class NS in accordance with Specification 347. Materials for Class NS concrete may be proportioned by volume and/or by weight.

   16. Pull post assemblies shall be installed at approximately 30° 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 to be installed at all horizontal and vertical breaks in fence of 1½° 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. 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 all the same. Gates shall be paid for under the contract unit price for Fence Gates, EA.

   20. Chain link swing gates in accordance with Index 550-002 may be substituted for metal swing gates as approved by the Engineer. Length of a single gate shall be 54’0” or less. Payment for each gate shall include the gate, single or double, and all necessary fittings and hardware.

   21. All posts, braces, tension wires, fabric, tie wires, Class NS concrete, and all miscellaneous fittings and hardware to be included in the cost for Fencing, LF. Fencing shall be inclusive of the lengths of pull, end and corner post assemblies, but exclusive of gate widths.
At The Rate Of 0.8 oz./ft.²; ASTM A641.
Soft Temper, Galvanized Tightness, Steel Wire,
Twisted To Singing Two No. 9 Gage Wires

Note: Timber Post Illustrated.

CONCRETE BASE FOR ANGULAR STEEL POST

PRIVATE PROPERTY

FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

DESIGN NOTE
This index details fencing that is constructed with farm fabric 46½ (47½ 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.

LINE POST  PULL POST  LINE POST  LINE POST  LINE POST  APPROACH POST  CORNER OR END POST
FENCE TYPE A

DESCRIPTION:

REVISED

LAST

REVISION

INDEX

SHEET

550-001

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FY 2020-21

STANDARD PLANS

Wire C

Wire A

Wire B

Splice

Corner

Horizontal Wires

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.

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Sheet Index

BRACE TO BRACE ON LINE

BRACE TO BRACE AT CORNER

FASTENER FOR CONCRETE POST AND BRACES

FASTENER FOR TIMBER POST AND BRACE

ALTERNATE CONCRETE POSTS AND BRACES

PRECAST POST

PRECAST BRACE

PRESSESSED POST

PRESSESSED BRACE

Wire A

Wire B

Splice

Corner

Horizontal Wires

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.

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ALTERNATE CONCRETE POSTS AND BRACES

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Corner

Horizontal Wires

End and Pull Posts

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Splice

Corner

Horizontal Wires

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Splice

Corner

Horizontal Wires

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FASTENER FOR TIMBER POST AND BRACE

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Wire B

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Corner

Horizontal Wires

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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.

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BRACE TO BRACE AT CORNER

FASTENER FOR CONCRETE POST AND BRACES

FASTENER FOR TIMBER POST AND BRACE

ALTERNATE CONCRETE POSTS AND BRACES

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PRECAST BRACE

PRESSESSED POST

PRESSESSED BRACE

Wire A

Wire B

Splice

Corner

Horizontal Wires

End and Pull Posts

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FASTENER FOR CONCRETE POST AND BRACES

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ALTERNATE CONCRETE POSTS AND BRACES

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PRESSESSED BRACE

Wire A

Wire B

Splice

Corner

Horizontal Wires

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.
1. Ties @ 2' Centers
2. Varies: 2' Max. 6" Min.
3. Ties @ 2 Centers

GENERAL NOTES

1. This fence to be used generally in urban areas.
2. For supplemental information refer to Specification 550.
3. Chain link fabric, posts, 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 A36 Table 1 (Grade A or B), 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, 2" nominal dia. ASTM B241 or B221, Alloy 6063, T6.
   B. Corner, end, and pull post options:
      (1) Galvanized steel pipe - 2" nominal dia.: ASTM B241 or B221, Alloy 6063, T6.
      (2) Aluminum coated steel pipe: ASTM A53, Table 2 (Grade A or B): Schedule 40 - 1½" nominal dia., 1.860" OD; coated at the rate 0.40 oz./ft²: AASHTO M111.
      (3) Aluminum alloy pipe: 2" nominal dia. ASTM B241 or B221, Alloy 6063, T6.
   C. Rail options:
      (1) Galvanized steel pipe. Schedule 40 - 1½" nominal dia. zinc galvanized at the rate of 1.8 oz./ft²: ASTM A36 Table 1 (Grade A or B), ASTM F1083, and AASHTO M111.
      (2) Aluminum coated steel pipe, ASTM A53 steel, 2 Tables Schedule 40, 2½" nominal dia., 1.850" OD; coated at the rate 0.40 oz./ft²: AASHTO M111.
      (3) Aluminum alloy pipe, 3" nominal dia.: ASTM B241 or B221, Alloy 6063, T6.
   D. Tension options:
      (1) Tension wire and hog ring options:
         (a) AASHTO M181 Type IV- Polyvinyl Chloride (PVC) Coated Steel; No. 9 gage (coated wire diameter), coated at the rate 0.40 oz./ft².
         (b) AASHTO M181 Type III- Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated at the rate 0.40 oz./ft².
      (2) Galvanized steel wire No. 9 gage zinc galvanized at the rate of 1.2 oz./ft².
      (3) Aluminum coated steel wire No. 9 gage coated at the rate of 0.40 oz./ft².
      (4) Aluminum alloy wire with a diameter of 0.1875" or larger conforming to the requirements of ASTM B211, Alloy 5056 Temper H38, or, Alclad Alloy 5056 Temper H192.
   E. Tie wire options:
      (1) Steel wire No. 7 gage zinc galvanized at the rate of 1.2 oz./ft².
      (2) Aluminum alloy wire with a diameter of 0.1875" or larger conforming to the requirements of ASTM B211, Alloy 5056 Temper H192, or, Alclad Alloy 5056 Temper H192.
      (3) Aluminum coated steel wire No. 7 gage coated at the rate of 0.40 oz./ft².
   F. Truss and hog ring options:
      (1) Steel wire No. 7 gage zinc galvanized at the rate of 1.2 oz./ft².
      (2) Aluminum alloy wire with a diameter of 0.1875" or larger conforming to the requirements of ASTM B211, Alloy 5056 Temper H192, or, Alclad Alloy 5056 Temper H192.
      (3) Aluminum coated steel wire No. 7 gage coated at the rate of 0.40 oz./ft².

Note: Tubular Post Illustrated

Index 550-002
1 of 3
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. Combinations of optional materials are restricted as follows:
   (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 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 and/or by weight.

7. Line post shall be 8'-4" 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.
   (c) Line post installed in accordance with Section 5.8 shall be 9'-6" long.
   (d) Post mounted on concrete structure or solid rock shall be mounted in accordance with the base plate detail “Fence Mounting on Concrete Enotalls 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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<td>ASSHTO M181 Table 4 Refined As Follows</td>
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<th>Specified Diameter</th>
<th>Minimum Weight Of Zinc Coating</th>
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<tr>
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<td>MIRI Class A</td>
<td>MIRI Class B (Bonded Coating)</td>
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<td>(Extruded Or Extruded And Bonded Coating)</td>
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<td>in. / mm</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.
**REVISION DESCRIPTION:**

**REVISION LAST OF STANDARD PLANS FY 2020-21 SHEET INDEX**

11/01/17

**FENCE TYPE B**

**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 lateral ditches, outfalls, retention basins, canals, borrow areas and similar support facilities.
(d) Outward from lateral ditches, outfalls, retention basins, canals, borrow areas and similar support facilities.
(e) Permit in 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.

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.

**BARB WIRE ATTACHMENT**

**BASE PLATE AND ANCHOR NOTES:**

1. Base plate identical for line, pull, end and corner posts and shall be considered an integral part of the respective posts for basis of payment.

2. Post to be plumbed by grout shim under base plate.

3. Anchors (Galvanized Steel): 12" Cast In Place, "Embedment:

   *Adhesive Anchors, 8" Min. Embedment:

   Expansion Bolts Not Permitted.

   *Headed Anchors, U-Bolts or Cluster Plates.

   *Adhesive Anchors, 8" Min. Embedment:

   Expansion Bolts Not Permitted.

   *Headed Anchors, U-Bolts or Cluster Plates.

   *Adhesive Anchors, 8" Min. Embedment:

   Expansion Bolts Not Permitted.

   *Headed Anchors, U-Bolts or Cluster Plates.

   *Adhesive Anchors, 8" Min. Embedment:

   Expansion Bolts Not Permitted.

   *Headed Anchors, U-Bolts or Cluster Plates.

   *Adhesive Anchors, 8" Min. Embedment:

   Expansion Bolts Not Permitted.

   *Headed Anchors, U-Bolts or Cluster Plates.

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   Expansion Bolts Not Permitted.

   *Headed Anchors, U-Bolts or Cluster Plates.

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   *Headed Anchors, U-Bolts or Cluster Plates.

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   *Headed Anchors, U-Bolts or Cluster Plates.

   *Adhesive Anchors, 8" Min. Embedment:

   Expansion Bolts Not Permitted.

   *Headed Anchors, U-Bolts or Cluster Plates.

   *Adhesive Anchors, 8" Min. Embedment:

   Expansion Bolts Not Permitted.
REVISION OF STANDARD PLANS

DESCRIPTION:

Rev. of Standard Plans

FY 2020-21

CANTILEVER SLIDE GATE TYPE B FENCE

REV 11/01/17

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.

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 and/or by weight.

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 and/or by weight.

5. Cost of all gate components shall be included in the contract unit price for Sliding Fence Gate (Cantilever), EA.

TYPICAL FRAME - 24" Opening

TYPICAL FRAME - 12", 16" & 20" Opening

DETAIL A

DETAIL B
REVISION:

DESCRIPTION:

REVISION

LAST

of

STANDARD PLANS

FY 2020-21

INDEX

SHEET

11/01/17

FENCE LOCATION

Or As Shown In Plans.

With Excavated Outfall Ditches

Fence Locations At Cross Drains

Construct Flush Against Footing

Locate Fence Along Slope Where

Top Of Fence Approx. Equals

Tops Of Headwall.

Terminate Fence Where Culvert

Drop Height Approx. Equals

Fence Height

Tops Of Headwall.

Terminates At Culvert

Where Excavated Outfall Ditches

Or As Shown In Plans.

Note: When height of headwall is 4' or less

(For Heights Of Headwall 4’ Or Less.)

(For Heights Of Headwall Greater Than 4’)

(For Heights Of Headwalls 4’ Or Less.)

Span the lateral ditch.
NOTE: LA R/W along the crossroad will extend a minimum
300' beyond the end of the acceleration or deceleration
lane. LA R/W line 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.

APPLIES TO BRIDGE OVER CROSSROAD AND CROSSROAD OVER FREEWAY (BRIDGE OVER CROSSROAD SHOWN)

FENCING TERMINALS AT RURAL INTERCHANGES

FENCING TERMINALS AT URBAN INTERCHANGES

FENCING TERMINALS AT RETAINING WALLS
REV 1

DESCRIPTION:

REVISION LAST of STANDARD PLANS

FY 2020-21

STANDARD PLANS

PERMANENT EROSION CONTROL

INDEX

570-001

1 of 3
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.

SHOULDER AND SLOPE TREATMENT FOR SUPERELEVATED ROADWAYS

TREATMENTS FOR PROTECTION FROM CONCENTRATED ROADWAY RUNOFF EROSION AND SHOULDER RAVELING

PERMANENT EROSION CONTROL

INDEX
570-001

SHOULDER AND SLOPE TREATMENT IN SAG VERTICAL CURVES

CRITERIA FOR PAVING SHOULDER ON DIVIDED AND UNDIVIDED FACILITIES

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Degree Of Curve</th>
<th>Note</th>
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<tr>
<td>30</td>
<td>7° or Greater</td>
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<td>60</td>
<td>3° or Greater</td>
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<td>70</td>
<td>2° or Greater</td>
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SHOULDER AND SLOPE TREATMENT IN SAG VERTICAL CURVES

TRANSVERSE SECTION

LONGITUDINAL SECTION

OVERLAPPED SOD FLUME

NOTES

1. These treatments are applicable to new construction, reconstruction and RRR projects. Project requirements for shoulder pavement and sodding that exceed the limits of this standard take precedence.

2. For sodding adjacent to ditches and at headwalls, see Index 524-001.

3. All front slopes steeper than 1:3 are to be sodded.
TABLE 2: SOD QUANTITIES (SY)

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>SLOPE</th>
<th>INDEX 430-010</th>
<th>INDEX 430-011</th>
<th>INDEX 430-030</th>
<th>INDEX 430-031</th>
<th>INDEX 430-032</th>
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Note: See Plans for sodding quantities for each endwall to be determined by the designer from this detail.
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.
GENERAL NOTES:
1. Staking guidelines are based on standard horticultural requirements and are provided for plant establishment purposes only. Details are not intended to apply when bracing is intended to address safety considerations. When bracing for safety, refer to Designer generated signed and sealed details. These guidelines are not intended to apply when the tree or palm is within falling distance of a roadway, pedestrian or bicycle route, under extreme wind loads, non-standard soil properties, subsurface or drip irrigation system is provided. Do not pile soil on top of rootball.

2. All dimensions 6" and less are exaggerated for illustrative purposes only. Dimensions shown for wood materials are nominal. Slopes shown are Vertical/Horizontal.

3. Remove plant containers prior to planting. Remove a minimum of the top 1/3 of burlap, fabric, or wire mesh for plants not grown in containers.

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

5. 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. Contact the Engineer prior to planting if existing soils contain excessive sand, clay, or other material not conducive to proper plant growth.

6. Construct soil rings at the outer edge of the planting pit with a height of 3" and gently sloping sides unless a permanent, sub-surface or drip irrigation system is provided. Do not pile soil on top of rootball.

7. Construct a 3" deep layer of mulch placed 2" off the edge of the trunk flare, around the base of shrub, or solidly around ground cover. Never pile mulch against the tree trunk.

8. Install guying with minimum 1" wide nylon or polypropylene straps with a minimum 600 lb. break strength. Check straps monthly and adjust as required to eliminate girdling of tree. Locate all wood stakes beyond the edge of soil ring in existing soil and embed a minimum of 18" 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 plans.

9. 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.

10. Use 2" x 2" minimum wood stakes unless otherwise shown in the Plans or directed by the Engineer. Use wood meeting #2 Common or better in accordance with the Standard Grading Rules for Southern Pine.

11. Drive stakes into existing, undisturbed soil. Localized compaction may be provided to prevent displacement of the stakes for previously disturbed existing soils that do not provide sufficient stability.

12. Embedment depth of tree height 2'-0" Min. 1'-6" to 2'-0" for Trees Over 4" Cal.

13. Mulch, Remove Existing Vegetation Prior to Planting.

14. Construct soil rings at the outer edge of the planting pit with a height of 3" and gently sloping sides unless a permanent, sub-surface or drip irrigation system is provided. Do not pile soil on top of rootball.

15. Install guying with minimum 1" wide nylon or polypropylene straps with a minimum 600 lb. break strength. Check straps monthly and adjust as required to eliminate girdling of tree. Locate all wood stakes beyond the edge of soil ring in existing soil and embed a minimum of 18" 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 plans.

16. 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.

17. Drive stakes into existing, undisturbed soil. Localized compaction may be provided to prevent displacement of the stakes for previously disturbed existing soils that do not provide sufficient stability.

18. Use 2" x 2" minimum wood stakes unless otherwise shown in the Plans or directed by the Engineer. Use wood meeting #2 Common or better in accordance with the Standard Grading Rules for Southern Pine.

19. 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.

20. Drive stakes into existing, undisturbed soil. Localized compaction may be provided to prevent displacement of the stakes for previously disturbed existing soils that do not provide sufficient stability.
NOTES:

1. Work this Index with Specification 591.

2. Install Sleeve with the minimum depth measured from the top of the Irrigation Sleeve as shown in the Plans or specified in Index 630-001.

3. When installing Irrigation Sleeves in a median crossover, place sleeves along the centerline.

4. Irrigation Sleeves for Electrical Control Wire and Irrigation Pipe must be no further than 12" apart.

5. Install Utility Strip Breaks only when shown in the Plans.