GENERAL NOTES

1. The illustrations for guardrail applications are standard configurations; adjustments are to be made as required by site specific conditions to attain optimum design for function, economy and serviceability.

2. The beginning of guardrail need shall be at the greatest of the upstream distances from the hazard, as determined from Figures 1 and 2. For more details see details of this Index.

3. One Panel (i.e., panel length) equals 12'-6". Guardrail shall be constructed with rail elements 12'-6" in length except where 25'-0" elements are called for by this and other standard indexes or where specifically called for in the plans.

4. The standard guardrail mounting height for W-beam guardrail is 2'-1" and for thrie-beam guardrail is 1'-9" to the center of beam. Modified three-beam shall be mounted at a height of 2'-0" to center of beam. The height is critical and shall be attained in all cases, a deviation of 1" below and 1" above the standard mounting heights is permissible over necessary surface irregularities (e.g., across shoulder gutters, inlets and roadway surface break lines). For guardrail placed on slopes beyond the shoulder point, there shall be no deviation more than 7" below or 3" above the desired height within any 25 foot section of guardrail. For standard guardrail with a mounting height of 2'-1" to the center of beam, a construction tolerance of 1/2" below and 1" above the standard mounting height is permissible. Use the applicable 2013 Design Standards, Index 400 Series for repair or replacement of existing W-beam guardrail systems with a mounting height of 1'-9" to the center of beam.

5. All guardrail panels, end sections and special end shoes shall be lapped in the direction of adjacent traffic.

6. Flared end anchorage assemblies providing a offset are the standard end anchorage for single face free standing guardrail approach ends. Parallel end anchorage assemblies for guardrail approach end anchorage will be constructed only where cost justifies prevent construction of flared end anchors.

Guardrail end anchorage assemblies shall be of the type called for in the plans. If the plans call for a "flared" end anchorage assembly and does not identify the specific system to be used, the contractor has the option to construct any FDOT approved "flared" end anchorage assembly identified on the Approved Products List (APL), subject to the conditions identified in these drawings, or the approved APL drawings.

If the plans call for a "parallel" end anchorage assembly and does not identify the specific system to be used, the contractor has the option to construct any FDOT approved "parallel" end anchorage assembly identified on the APL, subject to the conditions identified in these drawings, or the approved APL drawings.

If the plans call for a specific end anchorage assembly, substitutions with other end anchorage assemblies will not be permitted unless approved by the Engineer. Approved substitutions will not be eligible for CSIP consideration.

When an end anchorage assembly is attached to guardrail and PEDESTRIAN SAFETY TREATMENTS are required, only end anchorage assemblies approved with rubber posts are to be used. Currently approved proprietary end anchorage assemblies are identified on the Approved Products List (APL). Manufacturers seeking approval of proprietary end anchorage assemblies for inclusion on the APL must submit an application with appropriate documentation showing that the end anchorage assembly is deemed eligible by the Federal Highway Administration (FHWA) for federal funding on the National Highway System (NHS) and is compatible with FDOT guardrail systems. System approvals will be contingent upon FDOT’s evaluation of crash test performance results for consistency with FDOT system applications and use. If approved, product drawings signed and sealed by a professional engineer licensed in the State of Florida is required.

7. At above ground right hazards where the face of guardrail is offset from the hazard less than the 5’ minimum for standard W-beam, other guardrail configurations with reduced post spacing may be applicable. See General Note No. 11 and the minimum offset table on Sheet 19. For guardrail with post spacing less than 6’-3” the reduced spacing should extend a minimum of one panel in advance of the hazard. When minimum offset cannot be attained safety shape concrete barrier wall shall be used unless other shielding is approved by the Engineer of Record. See Index No. 410 for safety shape concrete barrier walls and typical applications, and the plans for special barrier shapes and applications.

8. In addition to use at roadside hazards or other areas where the Engineer has deemed guardrail necessary, guardrail should be considered on flush shoulder sections where fill slopes are steeper than 1:3 within the clear zone and fill heights are 8’ or greater. Curved sections are to be substituted for installation of guardrail where fill slopes are steeper than 1:3 and fill heights are 6’ or greater within 22’ of the traveled way. For more details on curved sections, see DETAIL L LOCATION AT CURB & GUTTER SECTIONS.

9. The guardrail to bridge connections contained in this Index is for bridges with Test level 4 traffic railing barriers. For guardrail to concrete barrier wall connections see Index No. 410. For existing bridges receiving retrofit traffic railing barriers see Index No. 402.
1. All FLARED OPTION and PARALLEL OPTION drawings are representative of the various proprietary guardrail end anchorage assemblies listed on the Department’s Approved Products List (APL). For specific details and requirements refer to the manufacturer’s detailed drawings, procedures and specifications located on the Approved Products List (APL) website at www.dot.state.fl.us/programmanagement/.

2. These drawings present general graphics which depict the limits of payment for guardrail and end anchorage assemblies, modifications to the shoulder, and placement of miscellaneous asphalt mow strips.

3. These drawings, along with the various manufacturer drawings on the APL, are intended to include sufficient detail for installation of the end anchorage assembly and their connection to Standard Guardrail. This excludes requirements for shop drawing submittals unless otherwise called for in the plans. The various end anchorage assemblies shall be assembled in accordance with the manufacturer’s detailed drawings, procedures and specifications.

4. The various proprietary end anchorage assemblies listed on the APL are intended for use as approach end guardrail end anchorage assemblies. The actual length of end anchorage assemblies vary refer to the manufacturer’s drawings on the APL for their length and use of special panels and details. Standard guardrail, guardrail transitions or other special treatments shall not be included within the limits of the end anchorage assembly. See the manufacturer drawings for the alignment of the end anchorage assemblies with respect to the normal guardrail alignment.

5. Flared or parallel end anchorage assemblies shall not be used in medians where horizontal clearance requires the use of a back rail.

6. Each of the various end anchorage assemblies have unique features. Careful attention shall be given to the types and orientation of the posts and other components. Refer to the manufacturer’s drawings on the APL for the specific requirements of each system.

7. For galvanizing requirements of the metallic components see Standard Specifications Section 967.

8. Test Level 3 End Anchorage Assemblies are suitable for all design speeds. However, use a 53'-11” long TL-3 End Anchorage Assembly shown on the APL for Design Speeds greater than or equal to 50 mph and a 47'-10” long TL-2 End Anchorage Assembly Shown on the APL for Design Speeds less than or equal to 45 mph.

9. Flared end anchorage assemblies shall be paid for under the contract unit price for Guardrail, End Anchorage Assembly - Flared, EA. Parallel end anchorage assemblies shall be paid for under the contract unit price for Guardrail, End Anchorage Assembly - Parallel, EA.

The unit price for end anchorage assemblies shall be full compensation for furnishing and installing all components in accordance with these drawings, the plans and the manufacturer’s detailed drawings, procedures and specifications.
Standard Guardrail, Special Transition or Other Special Treatment

End Anchorage Assembly - Flared (53'-1")

W-Beam WidSPAN Panel Splice (Typ.)

Misc. Asphalt Pavt.

End Measurement For Guardrail Payment

Location Station

Impact Head or Rounded End

TRAFFIC

FLARED OPTION
ELEVATION VIEW

Standard Guardrail, Special Transition or Other Special Treatment

End Anchorage Assembly - Parallel (53'-1")

W-Beam WidSPAN Panel Splice (Typ.)

Misc. Asphalt Pavt.

End Measurement For Guardrail Payment

Location Station

Impact Head

TRAFFIC

PARALLEL OPTION
ELEVATION VIEW

**APPROACH END ANCHORAGE DETAILS**
Design Speed (mph)  |  X (Length Of Advancement) Ft.  (See NOTES 1 & 2)
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 45</td>
<td>= 16 (D-d)</td>
</tr>
<tr>
<td>&gt; 50</td>
<td>= 13 (D-d)</td>
</tr>
</tbody>
</table>

**NOTES**

1. Length of advancement determined from the diagram and equations above establishes the location of the upstream beginning length of need for guardrail, however, the length of advancement can be no less than that required by other details of this index.

2. The flared end anchorage with 4' nose offset is shown in the diagram above, however, the diagram applies to other configurations that may occur at the beginning of length of need, such as, other flare designs; upstream returns; and, other upstream deflected, tangent and curvilinear conditions.

**Equation Variables:**

\[
D = \text{Distance in feet from near edge of the near approach traffic lane to either (a) the back of hazard, when the hazard is located inside the clear zone or horizontal clearance or (b) the clear zone or horizontal clearance outer limit, when the hazard extends to or goes beyond the clear zone or horizontal clearance limit. For left side hazards on two-way undivided facilities, } D \text{ is measured from the inside edge of the near approach traffic lane (see Figure 2).}
\]

\[
d = \text{Distance in feet from the near edge of the near approach traffic lane to the face of guardrail at its intersection with the departure line. For left side hazards on two-way undivided facilities, } d \text{ is measured from the inside edge of the near approach traffic lane (see Figure 2).}
\]

For flared and parallel end anchorage assemblies the beginning length of need is to be set at the center of post #3. That is, the departure line must intersect the face of the rail at post #3.

For flared end anchorage assemblies the offset distance 'd' will equal the normal guardrail offset measured from the face of the guardrail to the edge of the near approach travel lane plus 1'-2" for 45 mph or less and 1'-9" for greater than 45 mph.
BACK OF HAZARD (Standard For Trailing Applications)

Type II End Anchorage Assembly

Hazard Inside Clear Zone Or Hazard, Clear

Hazard Free, Traversable Slopes

Approach End Anchorage Assembly (Type Varies)

Length Of Guardrail System (Limit Of Pay For Guardrail)

ONE-WAY TRAFFIC

 LEFT SIDE OPPOSITE HAND

HORIZ. CLEAR.

Clear Zone Limit Or Horizontal Clearance Limit

Back Of Hazard

Hazard Inside Clear Zone Or Hazard, Clear

Face Of Guardrail

Edge Of Traffic Lane

Length Of Need

Type 3 Object Marker When Required

RIGHT APPROACH (RA)

LEFT APPROACH (LA)

TWO-LANE TWO-WAY TRAFFIC

For description of the dimensions D, d and X, see Length of Advancement - Figure 1.

For additional shoulder guardrail information, see Details B and C.

LOCATING TERMINALS ON SHOULDER GUARDRAILS - FIGURE 2
UNDIVIDED ROADWAY - DETAIL O

Notes For Details O & P:
See General Notes Nos. 1, 2, 3, 4, 5, 6, 8 and 9. See Detail J for approach connections to bridges. For end anchorage assemblies see sheets elsewhere in this Index and the plans.
Shoulder gutter in itself does not require the installation of guardrail.

DIVIDED ROADWAY - DETAIL P

GUARDRAIL APPLICATIONS FOR BRIDGES WITH FULL WIDTH SHOULDERS AND SAFETY SHAPE TRAFFIC RAILING BARRIER EXTENDING FULL LENGTH OF APPROACH SLAB
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

Notes for Details H & I:
See General Notes Nos. 1, 2, 3, 4, 5, 6, 8, and 9. See Index No. 402 for approach connections to bridges.
For end anchorage assemblies see sheets elsewhere in this Index and in the plans.
Shoulder gutter in itself does not require the installation of guardrail.

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

DIVIDED ROADWAY - DETAIL I

STANDARD PANELS SET TO RADIALS ADJOINING BRIDGES

Details S & T:
See General Notes Nos. 1, 2, 3, 4, 5, 6, 8, and 9. See Index No. 402 for approach connections to bridges.
For end anchorage assemblies see sheets elsewhere in this Index and in the plans.
### GUARDRAIL LENGTHS

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Projected ADT</th>
<th>CZ (Ft)</th>
<th>6’ &amp; 8’ Over. Shoulder</th>
<th>10’ &amp; 12’ Over. Shoulder</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>65-70</td>
<td>≤3000</td>
<td>30</td>
<td>32</td>
<td>214.0</td>
<td>Lengths are based on minimum median widths and on standard clear zone widths for travel lanes on tangent roadways, and the length of advancement needed for flared end anchorage assemblies. Lengths may need to be adjusted for auxiliary lanes, curved roadways, parallel end anchorage assemblies, skewed crossings and other hazards present.</td>
</tr>
<tr>
<td>65-70</td>
<td>&lt;1500</td>
<td>30</td>
<td>32</td>
<td>214.0</td>
<td></td>
</tr>
<tr>
<td>65-70</td>
<td>&lt;1500</td>
<td>24</td>
<td>32</td>
<td>214.0</td>
<td></td>
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<tr>
<td>65-70</td>
<td>&lt;1500</td>
<td>20</td>
<td>32</td>
<td>214.0</td>
<td></td>
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<tr>
<td>65-70</td>
<td>&lt;1500</td>
<td>14</td>
<td>32</td>
<td>214.0</td>
<td></td>
</tr>
<tr>
<td>30° Urban w/o Curb</td>
<td>30</td>
<td>32</td>
<td>214.0</td>
<td>214.0</td>
<td>When end terminal is outside of opposing roadway clear zone.</td>
</tr>
<tr>
<td>30° Urban w/o Curb</td>
<td>24</td>
<td>32</td>
<td>214.0</td>
<td>214.0</td>
<td></td>
</tr>
</tbody>
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#### GUARDRAIL LENGTHS

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<thead>
<tr>
<th>Median Width (Ft)</th>
<th>20’ R - 1:15 Taper Rate</th>
<th>15’ R - 1:10 Taper Rate</th>
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<tbody>
<tr>
<td>32</td>
<td>193.75</td>
<td>193.75</td>
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<tr>
<td>34</td>
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<td>36</td>
<td>231.25</td>
<td>231.25</td>
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<tr>
<td>38</td>
<td>245.00</td>
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<td>40</td>
<td>258.75</td>
<td>258.75</td>
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<tr>
<td>42</td>
<td>272.50</td>
<td>272.50</td>
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<tr>
<td>44</td>
<td>286.25</td>
<td>286.25</td>
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<tr>
<td>46</td>
<td>300.00</td>
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<tr>
<td>48</td>
<td>313.75</td>
<td>313.75</td>
</tr>
</tbody>
</table>

**Note:** For approach end anchorage assemblies see sheets elsewhere in this index and the plans.
**Description:**

**Revision No.:**

**Sheet No.:**

**MEDIAN DETAILS**

**MEDIAN WITH 10' BRIDGE SHOULDERS**

**MEDIAN WITH 6' BRIDGE SHOULDERS**

**GUARDRAIL LENGTHS**

**Approach Guardrail Treatments for Bridges with Safety Shape Traffic Railing**

**Extending Full Approach Slab Length in Narrow Medians with Flush Shoulders**

---

**Notes:**

- 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. When crash cushions are required on opposing roadway shoulders, their sizes may be determined by the residual speeds (S') along the runouts from the approach roadways; however, when calculated speeds (S') are less than 30 mph; crash cushions shall be no less in size than for 30 mph, see speed diagram left. The number of panels may be reduced when installing a crash cushion more than 2.5' in width, see * below.

---

**Table: Guardrail Lengths**

<table>
<thead>
<tr>
<th>Width (ft.)</th>
<th>6' Bridge Shoulders</th>
<th>10' Bridge Shoulders</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>14.5</td>
<td>181.25</td>
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<tr>
<td>28</td>
<td>12.5</td>
<td>156.25</td>
</tr>
<tr>
<td>26</td>
<td>11.5</td>
<td>143.75</td>
</tr>
<tr>
<td>24</td>
<td>9.5</td>
<td>118.75</td>
</tr>
</tbody>
</table>

**Note:**

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

---

**Approach Guardrail for Bridges with Safety Shape Traffic Railing**

**Extending Full Approach Slab Length in Narrow Medians with Flush Shoulders**

---

**Diagram:**

- Guardrail panels and length (see table below).
- Crash cushion located on opposing roadway shoulder.
- Medians with 10' bridge shoulders.
- Medians with 6' bridge shoulders.
- Approach guardrail treatments for bridges with safety shape traffic railing.
- Extending full approach slab length in narrow medians with flush shoulders.

---

**Table continued:**

<table>
<thead>
<tr>
<th>Panels (No.)</th>
<th>Length (ft.)</th>
<th>Panels (No.)</th>
<th>Length (ft.)</th>
<th>Panels (No.)</th>
<th>Length (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>93.75</td>
<td>19</td>
<td>55.75</td>
<td>33</td>
<td>28.75</td>
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<td>10</td>
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<td>19</td>
<td>55.75</td>
<td>33</td>
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<tr>
<td>10</td>
<td>93.75</td>
<td>19</td>
<td>55.75</td>
<td>33</td>
<td>28.75</td>
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<tr>
<td>10</td>
<td>93.75</td>
<td>19</td>
<td>55.75</td>
<td>33</td>
<td>28.75</td>
</tr>
</tbody>
</table>
GUARDRAIL LENGTH (FT.)

**Design Speed (mph)**
- 60-75
- 65-75
- 75-150
- 75-150
- 45-50
- 35-40

**Projected ADT (#)**
- 36
- 36
- 24
- 24
- 20
- 18

**Width of Roadway (FT.)**
- 36
- 36
- 24
- 24
- 20
- 18

**Min. Median Width (FT.)**
- 30
- 30
- 24
- 24
- 18
- 12

**Guardrail Length**
- 32
- 32
- 24
- 24
- 20
- 18

**Length Requirements:**
- Lengths are based on minimum median widths and on standard clear zone widths for travel lanes on tangent roadways, and the lengths of advancement needed for flared end anchorage assemblies to shield normal transverse underside and bridge end hazards.
- Lengths may need to be adjusted for connection location on wing post or bridge traffic railing barrier (see Index No. 402), auxiliary lanes, curved roadways, parallel end anchorage assemblies, skewed crossings and other hazards present. When the wing post is replaced by bridge traffic railing barrier, reference Detail J and see Index No. 402.

**Note:**
- For approach end anchorage assemblies see sheets elsewhere in this Index and the plans.

WHEN END TERMINAL IS OUTSIDE OF OPPOSING ROADWAY CLEAR ZONE

- **Approach Guardrail**: For Guardrail lengths see Table Below
- **Extended Shoulder**: (Extended Shoulder)
- **Mist. Asph. Pavt. To Suit Shoulder Treatment**: (See Detail W)
- **Approach Slab**: (See Detail W)

GUARDRAIL LENGTHS

**Index No.**
- 402

**Sheet No.**
- 10 of 26

**2016 Design Standards**

**Approach Guardrail Treatments for Bridges with Safety Shape Traffic Railing**

**Approach Slab**

**For Guardrail Lengths**

**Design Standards**

**LAST REVISION**
- 06/06/16

**INDEX NO.**
- 400
MEDIAN SIZING CRASH CUSHIONS LOCATED ON OPPOSING ROADWAY SHOULDERS

Speed (S) For Determining Crash Cushion Size:

\[ S = \frac{C}{(C + 2)} \cdot (Design\ Speed) \]

SIZING CRASH CUSHIONS LOCATED ON OPPOSING ROADWAY SHOULDERS

MEDIAN SIZING CRASH CUSHIONS LOCATED ON OPPOSING ROADWAY SHOULDERS

MEDIAN SIZING CRASH CUSHIONS LOCATED ON OPPOSING ROADWAY SHOULDERS

MEDIAN SIZING CRASH CUSHIONS LOCATED ON OPPOSING ROADWAY SHOULDERS

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MEDIAN SIZING CRASH CUSHIONS LOCATED ON OPPOSING ROADWAY SHOULDERS

MEDIAN SIZING CRASH CUSHIONS LOCATED ON OPPOSING ROADWAY SHOULDERS

MEDIAN SIZING CRASH CUSHIONS LOCATED ON OPPOSING ROADWAY SHOULDERS

MEDIAN SIZING CRASH CUSHIONS LOCATED ON OPPOSING ROADWAY SHOULDERS

GUARDRAIL LENGTHS

<table>
<thead>
<tr>
<th>MEDIAN WIDTH</th>
<th>6' BRIDGE SHOULDER</th>
<th>10' BRIDGE SHOULDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>158.75</td>
<td>240</td>
</tr>
<tr>
<td>26</td>
<td>158.75</td>
<td>240</td>
</tr>
<tr>
<td>24</td>
<td>158.75</td>
<td>240</td>
</tr>
</tbody>
</table>

The lengths shown in this table are based on standard widths for roadway and bridge median shoulders. Length requirements for both standard width and narrow bridge shoulders and end anchorage or end shielding requirements shall be determined on a site specific basis. When crash cushions are required on opposite roadway shoulders, their sizes may be determined by the residual speeds (S') along the runouts from the approach roadway; however, when calculated speeds (S') are less than 30 mph, crash cushions shall be no less in size than for 30 mph; see speed diagram left. The number of panels may be reduced when installing a crash cushion more than 2.5' in width; see * below.

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

APPROACH GUARDRAIL TREATMENTS FOR BRIDGES WITH SAFETY SHAPE TRAFFIC RAILING

EXTENDING LESS THAN FULL APPROACH SLAB LENGTH IN NARROW MEDIANs WITH FLUSH SHOULders
LEGEND

1. Edge of traffic lane for simple curve turnouts.
   Edge of travel lane for taper turnouts.
2. Taper.
3. Pavement return (radius R),
4. Flared end anchorage to be installed except when existing guardrail on intersecting drive or side road adjoins the project.
5. Post for locating flare, proximate to PC or PT:
   No. 2 post for Radii 25' or less.
   No. 3 post for Radii > 25' and < 50'.
   Between No. 4 and No. 5 posts for Radii 50' or greater.
6. Post for locating flare, proximate to PC or PT:
   No. 3 post for Radii 25' or less.
   Between No. 4 and No. 5 posts for Radii greater than 25'.
7. Expanded shoulder for guardrail.
8. Expanded shoulder for flared guardrail end anchorage.
10. Flared end anchorage assembly.
11. Radial guardrail to be installed when guardrail required on the intersecting drive or side road (Radius R).
12. End anchorage Type II (radial return only).
13. Guardrail installation limited to roadway right of way unless otherwise called for in the plans.

Note: The guardrail application shown on this sheet are for highways with flush shoulders and no restraints for constructing flared end anchorage and minimum lengths of guardrail. For highways with flush shoulders and restraints to constructing flared anchorage, see General Note No. 6.

Where openings in guardrail are required in close proximity to bridge traffic rails or ends of concrete barrier walls, and minimum length guardrail with flared end anchorages can not be applied, either controlled release returns or energy absorbing terminals are to be applied.
GUARDRAIL APPROACH TRANSITION AND CONNECTION FOR BRIDGES WITH SAFETY SHAPE TRAFFIC RAILING BARRIERS EXTENDING FULL LENGTH OF APPROACH SLAB

DETAIL J

APPLICATIONS

<table>
<thead>
<tr>
<th></th>
<th>SECTION CC</th>
<th>SECTION DD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Face Guardrail</td>
<td>U 4&quot; 4&quot; 13/16&quot; 3/16&quot; nom. 3/16&quot; nom. 8&quot; nom.</td>
<td></td>
</tr>
<tr>
<td>Double Face Guardrail With</td>
<td>V 4&quot; 4&quot; 13/16&quot; 3/16&quot; nom. 3/16&quot; nom. 8&quot; nom.</td>
<td></td>
</tr>
<tr>
<td>Steel Posts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Double Face Guardrail With</td>
<td>W 4&quot; 2&quot; 15/16&quot; 5&quot; 3/16&quot; 3/16&quot;</td>
<td></td>
</tr>
<tr>
<td>Timber Posts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For Double Face Guardrail Connections To Median Bridge Traffic Railing Barrier, See Index No. 410, GUARDRAIL CONNECTION TO BARRIER WALL APPROACH ENDS.
GUARDRAIL APPROACH TRANSITION AND CONNECTION FOR BRIDGES WITH SAFETY SHAPETRAFFIC RAILING BARRIERS EXTENDING FULL LENGTH OF APPROACH SLAB

DETAIL J

GUARDRAIL TRANSITION NOTE
When shoulder gutter is required, the 25' long dike transition, shown in the PLAN and PICTORIAL above, is required. Plate offset blocks are shown for guardrail installations adjacent to shoulder gutter/dike transitions; single offset blocks shall be installed in absence of shoulder gutter. Nested rails shall not be bolted to the blocks and posts at posts (a), (c), and (e). One 16d galvanized nail shall be driven between each post and block, and between double blocks. In order to prevent block rotation, see the NAV FOR PREVENTION OF OFFSET BLOCK ROTATION, this Index.

PLAN VIEW - GUARDRAIL, SHOULDER GUTTER AND SHOULDER TRANSITIONS

SECTION FF

SECTION GG
Note:
1. The W-beam Guardrail Mounting Height Transition from 1'-9" to 2'-1" shall be used to connect to existing 1'-9" guardrail at the project limits or in special cases as determined by the Engineer.
SHOULDER INTERFACE BETWEEN ROADWAYS AND BRIDGES

1. These sketches are for showing shoulder interface between roadways and bridges where crossings are normal to other roadways, railroads and streams. For site specific applications and details see the plans and the FDOT Structures Design Office "Detailing Manual" and "Design Guidelines".

2. Shoulder treatments shown in these sketches are for locations with shoulder gutter; shoulder hinge location will vary for facilities without shoulder gutter.
SHOULDER WITH OR WITHOUT 5' PAVEMENT

PAVED SHOULDERS

SHOULDER GUTTER

DOUBLE FACE RAIL

MISCELLANEOUS PAVING FOR STANDARD GUARDRAIL SECTIONS

SECTION AA (EXAMPLE FOR 30' CLEAR ZONE)

SECTION AA (EXAMPLE FOR 20' CLEAR ZONE)

SECTION BB (EXAMPLE FOR 30' CLEAR ZONE)

SECTION CC (EXAMPLE FOR 30' CLEAR ZONE)

SHOULDERS, SLOPES AND MISCELLANEOUS PAVING FOR FLARED END ANCHORAGE ASSEMBLIES
PERMISSIBLE POST AND OFFSET BLOCK COMBINATIONS

<table>
<thead>
<tr>
<th>POSTS</th>
<th>OFFSET BLOCKS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber</td>
<td>Timber 6&quot;x8&quot;x14&quot; (Nominal) For W-Beam And 6&quot;x8&quot;x22&quot; (Nominal) For Thrie-Beam</td>
<td>Post bolt hole in timber and composite blocks to be centered ± 1/8&quot;. All timber offset blocks shall be dressed on all four sides (S4S). One 16d galvanized nail per block is to be used to prevent rotation of block (see detail sets).</td>
</tr>
<tr>
<td>Steel</td>
<td>Steel Modified Thrie-Beam</td>
<td>Same as above for timber and composite blocks except that form fit composite block holes align with holes in steel posts and do not require nails.</td>
</tr>
</tbody>
</table>

Notes:
1. Timber and composite offset blocks of comparable size and shape can be intermixed within a run of rail.
2. Composite offset blocks shall be in conformance with Section 536 of the Specifications and be included on the Approved Products List. For additional information on composite offset block installations refer to Sheet 1, General Note 76.

LOCATION AT CURB & GUTTER SECTIONS

DETAIL L

NOTE:
For location of guardrail with offset behind curb and gutter refer to the Plans Preparation Manual, Volume 3, Section 4.3.5.

MOUNTING HEIGHTS ON SHOULDERS AND IN MEDIANS

STEEL POST    TIMBER POST

16d NAIL FOR PREVENTION OF OFFSET BLOCK ROTATION

STEEL MODIFIED THRIE-BEAM OFFSET BLOCK

POST FACE    SIDE VIEW   TRAFFIC FACE

All Holes Are 1/6" Ø

STEEL POST

TIMBER POST

W-BEAM

W-BEAM WITH RUB RAIL

MODIFIED THRIE-BEAM

FOR ADDITIONAL INFORMATION)

STEEL POST

TIMBER POST

W-BEAM

W-BEAM WITH RUB RAIL

MODIFIED THRIE-BEAM

FOR ADDITIONAL INFORMATION)

Composite (See Notes)

For Narrow Medians With No Median Swale. See Sheet 26 For Additional Information.

FOR ADDITIONAL INFORMATION)
**BARRIER Delineator Spacing**

- For curves greater than 2°, the spacing shall be reduced to 100' increments through the curve.

**BARRIER Delineator Notes**
1. BARRIER delineators shall conform to Section 993.
2. BARRIER delineator color (white or yellow) shall conform to the color of the near lane edgeline.
3. BARRIER delineators installed on median guardrail shall have retro-reflective sheeting on both sides of the BARRIER delineator.
4. The cost for BARRIER delineators shall be included in the contract unit price for guardrail.

**Notes**
1. Pipe rail is required on steel guardrail posts when the front of sidewalks or shared use paths are located 8' or less from behind the back of the post. Pipe rail shall terminate at the first post of the end anchorage assembly. Begin and end the pipe rail in accordance with the PIPE RAIL END FIXTURE detail.

   Refer to Sheet 1, GENERAL NOTE 6 for guardrail end anchorage assembly requirements and GENERAL NOTE 16 for offset block requirements.

2. When guardrail with timber posts are located with the back of post 8' or less from the near front of sidewalks or shared use paths, the bolt ends will require one of the following treatments:
   a. Trim back flush with the face of nut and metalize or galvanize after drilling and welding
   b. Use post bolts 15" in length with washers and nuts counter sunk into sinks 1" to 1 1/2" deep or
   c. Use post bolts 15" in length with sleeve nuts and washers.

3. Barrier delineator color (white or yellow) shall conform to the color of the near lane edgeline.

4. BARRIER delineators installed on median guardrail shall have retro-reflective sheeting on both sides of the BARRIER delineator.
Notes

1. END ANCHORAGE ASSEMBLY, TYPE MELT Details and Notes are Shown for Maintaining Existing Installations Only.

2. For Specific Details, Offset Requirements, and Special Treatments of Proprietary End Anchorage Assembly - Flared Systems, see the Approved Products List (APL).

3. Test Level 2 Crash Tested End Anchorage Assemblies Shown on the APL are Suitable For Design Speeds Less Than or Equal to 45 mph.
**Note:** For beam washer requirements on end terminals, see individual end anchorage assembly details. Washers are to be used where necessary to accomplish alignment or where the posts bolt head shows tendency to pull through the rail slot. Washers installed on guardrail, between end anchorages, prior to July 1, 1990 may remain in place until the guardrail is relocated or until repairs require removal and reinstallation of a post bolt.

### (RECTANGULAR PLATE WASHER)

**BEAM WASHER**

<table>
<thead>
<tr>
<th>L (In)</th>
<th>LENGTH (Min.) (In)</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot;</td>
<td>Full Length</td>
<td>Rail Splice Bolt</td>
</tr>
<tr>
<td>1/8&quot;</td>
<td>Post Bolt</td>
<td>Single Or Double Faced Guardrail Timber Or Composite Offset Bearing Or Steel Post</td>
</tr>
<tr>
<td>1/8&quot;</td>
<td>Post Bolt - Single Faced Guardrail Timber Posts As An Option, A Single 25° Long Bolt May Be Used</td>
<td></td>
</tr>
<tr>
<td>1/8&quot;</td>
<td>Post Bolt - Double Faced Guardrail Timber Posts Double Faced Guardrail Steel Posts</td>
<td></td>
</tr>
<tr>
<td>1/8&quot;</td>
<td>Post Bolt</td>
<td>Double Faced Guardrail Timber Posts</td>
</tr>
</tbody>
</table>

Special bolts having lengths of 10" or greater shall have a thread length of less than 4".

For applications where special bolts having lengths greater than 25" are required, the Contractor may use a 5/8" threaded rod (field cut to length). A hex nut and beam washer shall be used at the guardrail face with no more than 1/2" of the threaded rod projecting beyond the top of the nut. The projecting thread on both ends shall be distorted to secure the nuts, and both ends of the threaded rod metalized with organic zinc-rich coating.

**Note:** The round washer is not intended for use under the recess nut for the beam to rail splice. The washer is required under the recess nut for connecting the beam to the special end shoe. Under the post bolt nut for connecting the beam to the timber post and offset blocks, for connecting the beam to steel posts with timber offset blocks, under the hex bolt head for securing the beam anchor plates to the beam; and for general guardrail connections by 1/8" or hex bolts and nuts and under hex nut for connecting rub rail to wood and steel posts. For supplemental information see BEAM ANCHOR PLATE.

### W-BEAM BACK-UP PLATE

**OFFSETs (FL1)**

<table>
<thead>
<tr>
<th>POST</th>
<th>SINGLE BEAMS</th>
<th>MULTI-BEAMS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># Beam</td>
<td># Beam</td>
</tr>
<tr>
<td>1'-6</td>
<td>2-5</td>
<td>2-10</td>
</tr>
<tr>
<td>2'-8</td>
<td>2-5</td>
<td>2-10</td>
</tr>
</tbody>
</table>

**Note:** The values shown should be utilized unless changes are supported by empirical validation. Those desiring to develop offset values from the simulated deflection values shown in Table 3.1. Summary of Maximum Deflections in the AASHTO Roadside Design Guide are cautioned to proceed only if background in the table development is understood.

### MINIMUM OFFSETS FOR SINGLE FACED GUARDRAIL (FL1)

<table>
<thead>
<tr>
<th>SHEET</th>
<th>1/8&quot;</th>
<th>1/4&quot;</th>
<th>1/2&quot;</th>
<th>3/4&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFFSET</td>
<td>1&quot;</td>
<td>1.5&quot;</td>
<td>3&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

### HEX BOLTS AND NUTS

Hex bolts for THREE-BEAM TERMINAL CONNECTORS shall conform to the requirements of ASTM A449 (Type 1) with heavy hex nuts and washers. All other hex bolts shall conform to the requirements of ASTM A425. Bolts, nuts and washers shall be hot dip galvanized. Heavy hex nut may be used in lieu of hex nuts and hex nuts used for jam nuts.
**Note:** Cable assemblies shall be in accordance with the specifications of AASHTO-AGC-ARTBA A Guide to Standardized Highway Barrier Hardware Cable Anchor Assembly FCA01. An additional cable assembly B in length with a swaged fitting on one (1) end is required for each end anchorage assembly Type CRT.

**Hardware’ Cable Anchor Assembly FCA01.** An additional cable assembly shall be in accordance with the specifications.

1. **Symmetrical**
2. **Tolerance (-0,+1")**
3. **Beam Anchor Plate**
4. **Beam Transition Section**
5. **Approach Beam, W-Thrie**
6. **Neutral Axis**
7. **W-Beam**

**Adjustment:**

- **GALVANIZED STEEL BACK-UP PLATES FOR CONNECTING SPECIAL END SHOES AND TERMINAL CONNECTORS TO CONCRETE BRIDGE TRAFFIC RAILING BARRIERS AND CONCRETE BARRIER WALLS**

- **REVISION**
- **LAST REVISION 01/01/14**
- **DESCRIPTION:**
- **INDEX NO. 400**
- **SHEET NO. 20 of 26**

**DESIGN STANDARDS 2016**

**GUARDRAIL**

**SPECIAL END SHOE**

**FILLER PLATE**

**BEARING PLATE**

**BREAKAWAY TERMINAL POST SLEEVE**

**BEAM ANCHOR PLATE**

**THRIE-BEAM TERMINAL CONNECTOR**

**THRIE-BEAM BACK-UP PLATE**

**THRIE-BEAM RAIL SPLICE**

**THRIE-BEAM TERMINAL CONNECTOR**

**BACK VIEW**

**SECTION**

**SOIL PLATES**

**CABLE ASSEMBLY**

**INDEX**

**SHEET**
TRANSITION PANEL RIGHT

TRANSITION PANEL LEFT

W-THRIE BEAM TRANSITION PANEL

ASYMMETRICAL W-THRIE BEAM TRANSITION PANEL
RW102 (AASHTO-AGC-ARTBA Report) 10 Gauge
12'-6" W-BEAM PANEL

4-SPACE W-BEAM GUARDRAIL PANEL
RWM04a (AASHTO-AGC-ARTBA Report)

PANEL DETAIL

PLAN VIEW

ELEVATION VIEW
1. The 5-Space 15'-7½" W-beam Guardrail Panel shall be used at the downstream end of an End Anchor System that does not offset the W-beam Panel Splice to Midspan.

Note:

- 5'-SPACE 15'-7½" W-BEAM GUARDRAIL PANEL

15'-7½" W-BEAM PANEL
The 5-Space 15'-7\(\frac{1}{2}\)" W-beam Guardrail Panel with Beam Anchor Plate Attachment shall be used to anchor the Type II or Type CRT End Anchorage Assemblies.
STANDARD TIMBER AND STEEL GUARDRAIL POSTS

FOR REPLACEMENT OF EXISTING W8x18 GUARDRAIL POSTS ON APPROACH SLABS AND BRIDGES

- Additional slotted hole required when mounting three-beam guardrail.

NOTES: (SPECIAL STEEL POST):

1. See Index No. 402 for special steel posts required for construction and repair of guardrail transitions to bridge traffic railing barrier retrofits on existing bridges. See Structures Index Nos. 470 through 476 for steel posts required to construct traffic railing barrier retrofits on existing bridges.

2. Either anchor bolts, concrete wedge anchors or approved Adhesive-Bonded anchors for Structural Applications may be used. Anchor bolts, wedge anchors and adhesive anchors shall have a minimum tensile strength of 60,000 psi and galvanized in accordance with ASTM A153 (stainless steel components may be substituted but components plated in accordance with ASTM B-633 are not acceptable). Adhesive anchor nuts shall be equal in diameter to that detailed for anchor bolts. Wedge anchors are to be installed in accordance with the manufacturer's recommendations, assuming 3,000 psi compressive strength for concrete. Wedge anchors shall meet the following requirements:
   a. tensile load each anchor: approach slabs 14,000 lbs.; other structures 8,000 lbs.
   b. shear load each anchor: approach slabs 15,000 lbs.; other structures 7,800 lbs.

3. Posts are to be plumbed by adjusting nuts or mortar seating. Posts installed using anchor bolts and adhesive anchors are to be set with adjusting nuts as detailed, unless the Engineer approves the use of mortar seating in lieu of adjusting nuts. Posts installed using wedge anchors are to be set with mortar seating. Base plates shall be grouted with neat finish.

4. Adhesive-Bonded Anchors for Structural Applications shall comply with Section 937 and be installed in accordance with Section 146. Drilled hole diameter shall be in accordance with the manufacturer's instructions.

5. Anchor holes and recesses shall be drilled; wedge anchor holes are to be drilled in accordance with the manufacturer's specifications. Encountered reinforcing steel shall be drilled through. Holes shall be thoroughly cleaned when setting bolts and anchors and dry when setting wedge anchors.

6. Steel post and base units shall be galvanized in accordance with ASTM A123. Any damaged galvanized areas are to be metalized in accordance with Section 562 of the Standard Specifications.

7. Special steel guardrail posts are not to be incorporated into a guardrail approach end anchor system.
**Notes:**

1. The locations shown for special posts mounted on inlets are to be used as guidelines for positioning the posts and for estimating the number of required posts.

2. Special posts and their anchorages mounted on curb inlets shall be in accordance with special steel guardrail posts Sheet 21, and paid for under the contract unit price for Special Guardrail Post, EA.

3. Variations shown for the locations of special posts mounted on inlets are established from standard post spacing (6'-3"), clearance of standard posts from inlets (4" min.), use of single and double offset blocks on standard posts adjacent to the inlets; optional flange mountings; and, concrete anchor edge distances (2" for grouted and 3" for expansion anchors). The number of posts and their locations may vary by reducing post spacing and adjusting the length of rail panel(s).

4. Encased guardrail posts shall conform in section to standard timber and steel posts, and be paid for under the contract unit price for Special Guardrail Post, EA. Payment shall include cost of foam wrap and concrete encasement.

**Legend:**

Variation In Location Of Special Post:

- Single Offset Block(s) On Adjacent Standard Posts
- Expanded Location By Using Double Offset Blocks On Adjacent Standard Posts

**ENCASED GUARDRAIL POST**

**SPECIAL POST LOCATIONS ON CURB INLETS**

**CURB INLET TYPE 1**

**CURB INLET TYPE 2**

**CURB INLET TYPE 3**

**CURB INLET TYPE 4**

**CURB INLET TYPE 5**

**CURB INLET TYPE 6**
CABLE ANCHOR OPTION
END ANCHORAGE ASSEMBLY TYPE II

The payment for the items of End Anchorage Assembly Type II shall be full compensation for furnishing and installing either the Round or the Buff End Section, the Beam Anchor Plate, Cable Assembly, Pipe Sleeve, Soil Plate, Steel Tube, Bearing Plate, Short Timber Breakaway Post, Offset Blocks and the necessary hardware.

CONCRETE ANCHOR BLOCK OPTION

TYPE II NOTES
1. Unless specified in the plans, the contractor can supply either the cable anchor option or the concrete anchor block option.

2. Type II end anchorage assemblies are approved for all speeds and are intended for use as:
   a. trailing end anchors for single face free standing guardrail systems;
   b. approach end anchors for single face free standing guardrail systems when the end anchor is located outside of the clear zone; and,
   c. both approach and trailing ends of double face guardrail systems.

3. Crash cushions shall be constructed at or in lieu of approach Type II end anchorages located inside the clear zone.

End anchorage for thrie beam guardrail shall be constructed the same as detailed for W-beam, except use thrie beam rail and end section, and the Anchor Plate is to be attached to the bottom corrugation of the thrie beam.

These end anchors are to be paid for under the contract unit price for Guardrail, End Anchorage Assembly (Type II), EA as called for in the plans or by permit.
Timber or steel posts with timber offset blocks may be used. Timber posts and offset blocks are shown. These posts must be timber in a steel post run of guardrail adjacent to sidewalks or shared use paths (see pedestrian safety treatments).

Note:
1. For Beam Anchor Plate Details see Sheet 20 of 26.
2. For Beam Anchor Plate Attachment Details see Sheet 20D of 26.
**MODIFIED ECCENTRIC LOADER TERMINAL NOTES**

1. The MELT is applicable for design speeds up to 45 mph. The MELT is intended for use as an approach end guardrail anchorage for shoulder guardrail. Its alignment is a flare from the normal guardrail alignment with a flare length of 37.55 including three standard W-beam panel outside of any standard guardrail, guardrail transitions or other special treatments.

2. This standard drawing is produced by the Florida Department Of Transportation solely for use by the Department and its agencies. This standard drawing provides the general graphics and information necessary to field identity component parts of the MELT and their incorporation into a whole system.

3. This standard drawing is sufficient for plan details for the MELT when installed in connection with shoulder guardrail and precludes the requirement for shop drawing submittals unless the plans otherwise call for such submittals. The MELT shall be assembled in accordance with the distributor’s detailed drawings, procedures and specifications.

4. The first two post must be short timber breakaway posts with steel foundation tubes and soil plates, post Nos. 3 thru 6 must be CRT timber posts and post No. 7 must be a standard timber post.

5. The MELT cannot be used in medians where horizontal clearance requires the use of a backrail.

6. See the General Notes for galvanizing requirements of metallic components.

7. If the plans call for the MELT at a specific location, substitutions with other end anchorage assemblies will not be permitted unless approved by the Engineer. If the plans call for end anchorage assembly ‘flared’ at a specific location, the contractor has the option to construct any FDOT approved flared assembly that meet the applications for that location. Where a flared end anchorage is called for in the plans, any approved substitution with a parallel end anchorage will not be eligible for CSIP consideration.

8. The MELT shall be paid for under the contract unit price for Guardrail, End Anchorage Assembly (flared). EA and shall be full compensation for furnishing and installing all components in accordance with the plans; the distributor’s detailed drawings, procedures and specifications and this index.

**END ANCHORAGE ASSEMBLY TYPE MELT**

1. END ANCHORAGE ASSEMBLY, TYPE MELT details and notes are shown for maintaining existing installations only.

2. For specific details, offset requirements, and special treatments of proprietary end anchorage assembly - flared systems, see the approved products list (APL).

3. Test level 2 crash tested end anchorage assemblies shown on the APL are suitable for design speeds less than or equal to 45 mph.

- **END ANCHORAGE ASSEMBLY, MELT (46179)**

**PLAN**

- Shelf Angle
- Soil Plate
- Nut & Washer
- Strut and Yoke Assembly
- Cable Assembly
- Anchor Plate
- Shelf Angle
- 3/4” Long Button Head Bolt and Nut
- With Beam Washer Under Head and Nut
- 15’-7” Long Button Head Bolts and Access Nuts (6 Req’d.)
- Nut, Hex Nut, Hex (Jam) Nut, Washer Each

**TOP VIEW**

- Breakaway Terminal Post Sleeve
- Strut and Yoke Assembly
- Splice Bolts and Nuts
- Bearing Plate
- Strut Angle
- Shelf Angle
- Soil Plate
- Nut & Washer
- Steel Tube
- 2-3/4”x16” Long Bolts and Nuts With 7/8” Washer Under Head and Nut
- 3/4” Round Washer Under Heads and Nuts (2 Req’d. Per Steel Tube)
- Steel Tube
- *Note: 3/4” Round Bolt and Tube BOQ is in tube.
- Strut and Yoke Assembly
- Splice Bolts and Nuts
- Bearing Plate

**ELEVATION**

- Amber Reflective Sheeting to Nose
- Two 8d Nails to Prevent Rotation
- Location Station
- Short Timber Breakaway Post
- Splice Bolts and Nuts

**BUFFERED END SECTION**

- 1/2” Steel Plate
- Soil Plate
- Nut & Washer
- Steel Tube
- 3/4” Long Button Head Bolt and Nut
- With Beam Washer Under Head and Nut

**FLAT PLATE LAYOUT**

- Amber Reflective Sheeting (See Above)
- Location Station
- Short Timber Breakaway Post
- Splice Bolts and Nuts

**DIAPHRAGM PLATE (2 Req’d.)**

- Note: Assembly installed with channel turned down for right side guardrail and turned up for left side guardrail.

**STEEL STRUT AND YOKE ASSEMBLY**

- Steel tube and soil plate as a unit with a dummy timber post to prevent damage to breakaway post.
CONTROLLED RELEASE RETURN NOTES
1. Controlled release returns are intended for use in openings in continuous guardrail for driveway and side road access when flares and transitions or standard radial returns cannot be applied (Sheet 12) and (b) for shielding the ends of bridge traffic rails and barrier walls where the driveway and side road access is in close proximity to the structure and space does not permit the proper use of approved flared and parallel types of Guardrail End Anchorages Assemblies.

2. Controlled release returns are not intended as a substitute or replacement for the appropriate use of approved vehicle impact attenuators.

3. Controlled release returns with either 8, 16 or 24 radii are designed for highway speeds of 60 mph or less.

4. The controlled release returns shown are designed as full returns based on an intersection angle of 90°. The return can be terminated with the Guardrail End Anchorages Assembly Type CRT connected to standard guardrail as shown or as otherwise detailed in the plans.

5. The Guardrail End Anchorages Assembly Type CRT is to be used only for the controlled release returns with 8, 16, 24 and 32 radii as shown: the assembly is not to be used in any tangent rail or flared rail applications. Other types of end anchorages assemblies are not to be used in close proximity to the controlled return releases.

6. The area immediately behind the controlled release return shall have slopes not steeper than 1:2 and maintained free of fixed objects in accordance with the area limits tabulated in the plan below.

7. The surface approaching the controlled release return shall have a transverse slope not exceeding 1:10. The effective width of the transverse surface is to be based on standard vehicle departures, return radii and preceding shielding. The width (beyond the shoulder) shall be not greater than the corresponding 15 and 30, W values tabulated below.

8. The curved guardrail portion of the controlled release return shall be full section shop bent panels (12.5’ or 25’ panels).

9. Washers are not to be used between the guardrail beam and the head of the button head post bolts at any controlled release returns with either 8’, 16’, 24’ or 32’ radii as shown: the assembly is not to be used in any tangent rail or flared rail applications.

10. The guardrail beam of the # radius return is not bolted to the center control release post.

11. See the General Notes for bolting requirements of metallic components.

12. Controlled release return systems shall be paid for under the contract unit prices for Guardrail (Roadway), TL Guardrail End Anchorages Assembly Type CRT, EA as called for in the plans or by permit and shall be full compensation for furnishing and installing all components in accordance with the plans and with this index. CRT posts are included in the vest for guardrail.

GUARDRAIL END ANCHORAGE ASSEMBLY TYPE CRT

Do NOT Bolt Rail To Post at The Center Of The Nose. (See CONTROLLED RELEASE RETURN NOTES No. 10)

Principle Highway

Standard Wood Or Steel Posts Guardrail Section (As Shown)
Or Guardrail Transition To Bridge Rail (See Detail J and Index No. 402) Or To Barriers Wall (Index No. 410)

Cable Clamps

4"/8" Cable W/1"-3/4" Button Head Bolt With Head Washers. No Connection To Post Is Required.

Bearing Plate


3/4" Diameter x 9'-0" Cable With One Swaged End (See Sheet 74)

Washer Each End

Special Guardrail Pipe Attachment (See Left)

Soil Plate (24 x 18 x 4"")

Special End Shoe

Location Station

Guardrail End Anchorage Assembly Type CRT (In Absence Of Connecting Guardrail)

End Measurement For Guardrail Payment

15'-2" W-Beam End Anchor Panel

Guardrail End Anchorages Assembly Type CRT (In Absence Of Connecting Guardrail)

Note: To be constructed when flares and transitions or standard radial returns cannot be applied. See Sheet 12

CABLE TIMBER POST

Return Nom. | Length Of Shop Bent Panels | No. Of CRT Posts | Required Area Free Of Hazards | L x W
---|---|---|---|---
16 | 13.5 | 6 | 25 x 18 | 20 x 19
20 | 25 | 6 | 30 x 15 | 20 x 19
24 | 37.5 | 8 | 40 x 20 | 20 x 20
32 | 50 | 12 | 50 x 20 | 20 x 20

Options

Transition From 1'-9" To 2'-3" W-Beam Guardrail as needed

CONTROLED RELEASE RETURN FOR SIDE ROAD AND DRIVEWAY ACCESS

2016 DESIGN STANDARDS

INDEX NO. 400

SHEET NO. 25 of 26
GUARDRAIL

LATERAL PLACEMENT ON SLOPES
(FROM EDGE OF NEAR TRAFFIC LANE)²

<table>
<thead>
<tr>
<th>Slope</th>
<th>Standard Guardrail</th>
<th>Guardrail Not Recommended</th>
<th>Guardrail With Rub Rail³</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:6</td>
<td>17' to 22'</td>
<td>23' to 45'</td>
<td></td>
</tr>
<tr>
<td>1:7</td>
<td>21' to 24'</td>
<td>25' to 45'</td>
<td></td>
</tr>
<tr>
<td>1:8</td>
<td>26' to 45'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:9</td>
<td>27' to 45'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:10</td>
<td>28' to 45'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. For shoulders less than 12' in width the tabulated values will be reduced by the difference between 12' and the shoulder width. Placement of guardrail on front slopes steeper than 1:6 not recommended.
2. Standard guardrail, 2'-1" to 6 post bolt. Rub Rail is required on the median side when double face guardrail is used.
3. Guardrail with Rub Rail, 2'-4" to 6 post bolt.

GUARDRAIL ON MEDIAN SHOULders (FREEWAYS)

Notes:
1. Typical placement shown. May be constructed at other locations as called for in the plans.
2. Rub Rail is required on the median side or ditch side of the barrier.

MOUNTING HEIGHT FOR DOUBLE FACED GUARDRAIL ON MEDIAN SHOULDERS:

GUARDRAIL ON OUTSIDE SLOPES

GUARDRAIL ON SLOPES

[Diagram showing lateral placement and termination options]

RUB RAIL TERMINATION

[Diagram showing rub rail termination]

* C6x8.2, Plates And Fasteners Or Bent Plate And Fasteners In Accordance With Standards RLR01 And RER01 Of AASHTO-AGC-ARTBA "A Guide To Standardized Highway Barrier Hardware"
CURB TYPE F FLARE WHEN END OF EXISTING APPROACH SLAB CURB EXPOSED

TOP VIEW

SPECIAL STEEL POST FOR ROADWAY THRIE-BEAM TRANSITIONS TO BRIDGE TRAFFIC RAILING RETROFITS

SIDE VIEW

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

GENERAL NOTES

1. This index provides thrie-beam transition and connection details for approach end guardrail on existing bridges, and anchorage details for trailing end traffic railing retrofits and safety shapes on existing bridges. Sheets 1 through 23 apply to bridges with retrofitted traffic railings. Sheet 23 shows the trailing end guardrail connections. Sheet 24 applies to bridges with safety shaped traffic railing.

2. The schemes identified by Arabic numerals in this index are complementary to the bridge traffic railing barrier retrofit schemes with like numeral identification in Index Nos. 470, 471 through 476, 480 through 483. The schemes in this index identified by Roman numerals are complementary to bridge safety shaped traffic railing barrier where determined to be in accordance with applications of criteria specified in the instructions for Design Standards (IDS-410 & IDS-480).

3. For guardrail applications and details of related hardware and accessories that are not provided on this index, refer to Index No. 400.

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 blunt ends are not in place.

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

4. Anchor studs and nuts shall be hot-dip zinc coated in accordance with Section 536 of the Specifications.

5. Anchor stud 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.

6. For installing thrie-beam terminal connector to traffic railing vertical face retrofits, see notations on Sheets 12 through 15 and the flag notation on Sheet 23.

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

1. For selection of an appropriate transition scheme, see the Instructions for Design Standards (IDS-410 & IDS-480) for instructions to the Structures and Roadway engineers.
SEE INDEX NO. 471 - SCHEME 1

SEE INDEX NO. 471 - SCHEME 2

SEE INDEX NO. 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)
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
SEE INDEX NO. 474 - SCHEME 1

SEE INDEX NO. 474 - SCHEME 2

SEE INDEX NO. 474 - SCHEME 3

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 INDEX NOS. 472, 473, 475 & 476 - SCHEME 1

SEE INDEX NOS. 472, 473, 475 & 476 - SCHEME 2

PICTORIAL VIEWS

TRAFFIC RAILING

THRIE-BEAM RETROFIT

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

PICTORIAL VIEWS

SEE INDEX NO. 472, 473, 475 & 476 - SCHEMES 5 & 6

SEE INDEX NO. 472, 473, 475 & 476 - SCHEMES 3 & 4

PICTORIAL VIEWS OF GUARDRAIL APPROACH

TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
**PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)**

- **SEE INDEX NO. 481 - SCHEME 1**
- **SEE INDEX NO. 481 - SCHEME 2**
- **SEE INDEX NO. 481 - SCHEME 3**

**Note:**

*21" x 12" x 3/8" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And 1/2" x 12" Long HS Hex Bolts And Nuts (5 Req'd.) With 2 1/2" OD Plain Round Washers Under Heads And Nuts*
Traffic Railing (Vertical Face Retrofit)

Existing Flared Wing Post

Existing Curb (See Indexes For Face Of Railing Offset)

Traffic Railing (Vertical Face Retrofit)

Traffic Railing (Vertical Face Retrofit)

SEE INDEX NOS. 405 OR 482 - SCHEME 2

SEE INDEX NOS. 405 OR 482 - SCHEME 2

SEE INDEX NOS. 405 OR 482 - SCHEME 3

SEE INDEX NOS. 405 OR 482 - SCHEME 3

Note:

* 2½" x 12" x 18" Thrie-Beam Terminal Connector Plate (Back-Up Plate); And ½" x 12" Long

NS 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 482 SHOWN, INDEX 405 SIMILAR)
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 482 SHOWN, INDEX 405 SIMILAR)
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)

Note:

"21" x 12" x 1/8" 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 3/16 Req.) With 27/8 OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 482 SHOWN, INDEX 405 SIMILAR)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

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

SEE INDEX NO. 483 - SCHEME 3

SEE INDEX NO. 483 - SCHEME 3

SEE INDEX NO. 483 - SCHEME 3

PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)
NOTES FOR TRAILING END TRAFFIC RAILING VERTICAL FACE RETROFITS

1. Where Guardrail Extensions Are Required Beyond The Trailing End Of Bridges With Traffic Railing Vertical Face Retrofits, Guardrail Connections To The Bridge Railing Will Be By SPECIAL END SHOE For W-Beam Guardrail Extensions And BY THREE-BEAM TERMINAL CONNECTOR For Thrie-Beam Guardrail Extensions.

2. Install W-Beam Special End Shoes and Thrie-Beam Terminal Connectors With Back-up Plates, And 3/8 HS Hex Bolts And Nuts (12" Long) With 2" OD Plain Round Washers Under Heads And Nuts (4 Required For Special End Shoes And 5 Required For Three-Beam Terminal Connectors). Back-up Plates For Special End Shoes are 12"x12"x5/8" And For Terminal Connector 21"x12"x5/8".

3. Payment For Connecting Trailing End Special End Shoes And Thrie-Beam Terminal Connectors To Traffic Railing Vertical Face Retrofits Will Be Made Under The Contract Unit Price For Guardrail Bridge Anchorage Assembly, EA.

THRIE-BEAM RETROFIT NOTES

1. See indexes for bridge three-beam traffic railing retrofits.

2. Trailing end guardrail to be paid for under the contract unit price for the parent roadway guardrail; end measure includes length of end anchorage assembly; additional payment made for end anchorage assembly. No additional payment for connecting roadway three-beam to bridge three-beam retrofit.

TRAILING END GUARDRAIL AND ANCHORAGE FOR BRIDGE TRAFFIC RAILING (THRIE BEAM RETROFITS)
GUARDRAIL TRANSITIONS TO EXISTING FLAT SLAB BRIDGES

**SCHEME I**

Use Of Scheme I Shall Be Determined In Accordance With The Instructions For Design Standards (IDS-402).

GUARDRAIL TRANSITION TO EXISTING FLAT SLAB BRIDGES

**SCHEME II**

Use Of Schemes II And III Shall Be Determined In Accordance With The Instruction For Design Standards (IDS-402)

GUARDRAIL TRANSITIONS TO EXISTING PRESTRESSED BEAM OR GIRDER BRIDGES

**APPROACH POSTS AND SPECIAL OFFSET BLOCKS**

Block assemblies for special offsets can be made up of one special block plus one standard size block or of three standard size blocks field dressed to approximately equal size, with the pieces secured for relative position by 1/4d galvanized nails, see 1/4d NAIL, FOR PREVENTION OR OFFSET BLOCK.

**NOTATION** - Index 400. The nested rails shall not be bolted to the blocks and at posts (a), (c) and (e). The details shown are for approach slabs with internal edge dikes extending beyond parapet type traffic railing termini.

**PLAN**

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

1. When the existing wing post is to be replaced with a bridge traffic railing in accordance with the Instructions For Design Standards (IDS-402), the three-beam guardrail connection shall be in accordance with Detail J of Index No. 400.

2. 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 3/8" x 1" long concrete screws or expansion anchors at each corner, as approved by the Engineer. The sign panel shall be a minimum 3/8" thick and meet the requirements of Specification Section 790 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.

3. 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, 6A, and shall be full compensation for bolt hole construction, terminal connector, terminal connector plate(s) and bolts, nuts and washers.
Traffic Design Standards Index 401 Scheme 16 Retrofit

Existing Installation of 1987 thru 2000 Roadway and Traffic Design Standards Index 401 Scheme 16 Retrofit

Type II End Anchorage, other approved anchorage or continuation of guardrail. See Plans for required treatment.

First Panel must be a 15'-7" Panel

APPROACH END

TRAILING END *

PARTIAL ELEVATION

W-BEAM BRIDGE TRAFFIC RAILING RETROFITS

W-Beam Guardrail

(2 Panels Min.)

6'-3" Post Spacing (Typ.)

12'-6" Nested W-Beam Guardrail

Partially Plan

Partially Elev

PARTIAL PLAN

Current INSTALLATION of 1987 thru 2000 Roadway and Traffic Design Standards Index 401 Scheme 16 Retrofit

Remove existing and install New Guardrail Posts & Offset Blocks as required to clear Transition Block

Existing Guardrail Posts

Direction of Traffic

Install New Guardrail Posts and Offset Blocks

APPROACH END

TRAILING END *

PARTIAL ELEVATION

VERTICAL FACE BRIDGE TRAFFIC RAILING RETROFITS

Existing Installation of 1987 thru 2000 Roadway and Traffic Design Standards Index 401 Scheme 1 or 19 Retrofit

Type II End Anchorage, other approved anchorage or continuation of guardrail. See Plans for required treatment.

First Panel must be a 15'-7" Panel

APPROACH END

TRAILING END *

PARTIAL ELEVATION

VERTICAL FACE BRIDGE TRAFFIC RAILING RETROFITS

Existing Installation of 1987 thru 2000 Roadway and Traffic Design Standards Index 401 Scheme 1 or 19 Retrofit

Approach Rail Transition

APPROACH END

TRAILING END *

PARTIAL ELEVATION

VERTICAL FACE BRIDGE TRAFFIC RAILING RETROFITS

Existing Installation of 1987 thru 2000 Roadway and Traffic Design Standards Index 401 Scheme 1 or 19 Retrofit

Type II End Anchorage, other approved anchorage or continuation of guardrail. See Plans for required treatment.

First Panel must be a 15'-7" Panel

APPROACH END

TRAILING END *

PARTIAL ELEVATION

VERTICAL FACE BRIDGE TRAFFIC RAILING RETROFITS

Existing Installation of 1987 thru 2000 Roadway and Traffic Design Standards Index 401 Scheme 1 or 19 Retrofit

Approach Rail Transition

APPROACH END

TRAILING END *

PARTIAL ELEVATION

VERTICAL FACE BRIDGE TRAFFIC RAILING RETROFITS
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH PERPENDICULAR OR ANGLED WING WALLS

PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH FLARED WING WALLS
AND PARALLEL INTEGRALLY REINFORCED APPROACH SLAB CURBS
(APPROACH SLAB WITH DETACHED CURBS OR SIDEWALK SIMILAR)

PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH PARALLEL WING WALLS
AND INTEGRALLY REINFORCED APPROACH SLAB CURBS
(APPROACH SLAB WITH DETACHED CURBS OR SIDEWALK SIMILAR)

CROSS REFERENCE:
For Transition Block Details, Quantities and reinforcement
see Sheet 3.
GUARDRAIL TRANSITIONS FOR EXISTING BRIDGE TRAFFIC RAILING RETROFFTS

DESCRIPTION:

Revised as required to clear Transition Block (Typ.)

New Guardrail Posts, positioned as required to clear Transition Block (Typ.)

Adhesive-Bonded Dowels are shown installed in an existing curb or sidewalk integrally reinforced with Approach Slab, Wingwall or Bridge Deck. For installations in existing detached curbs or sidewalks, install dowels in available sound concrete.

Payment for Transition Block will be made under Pay Item Concrete Curb (Special), LF.

Payment for Guardrail work will be made under Pay Item Guardrail (Reset) LF.


column 1

Concrete Class NS
Reinforcing Steel
Guardrail (Reset)

0.4
61
12.5

Payment for Guardrail work will be made under Pay Item Guardrail (Reset) LF.

Payment for Transition Block will be made under Pay Item Concrete Curb (Special), LF.

NOTES:

Concrete for Transition Blocks shall be Class NS.

Reinforcing steel shall be ASTM A615, Grade 60.

Steel Anchor Rods shall be ASTM A36, ASTM A709 Grade 36 or ASTM A615 Grade 60 hot-dip galvanized in accordance with Specification Section 962.

Guardrail components and installation shall be in accordance with Design Standards Index 400.

Adhesive Bonding Material Systems for Dowels shall comply with Specification Section 937 (Type HV) and be installed in accordance with Specification Section 416.

Adhesive Bonded Dowels are shown installed in an existing curb or sidewalk integrally reinforced with Approach Slab, Wingwall or Bridge Deck. For installations in existing detached curbs or sidewalks, install dowels in available sound concrete.

Payment for Guardrail work will be made under Pay Item Guardrail (Reset) LF.

Payment for Transition Block will be made under Pay Item Concrete Curb (Special), LF.

Item | Unit | Quantity
--- | --- | ---
Concrete Class NS | CY | 0.4
Reinforcing Steel | LB | 61
Guardrail (Reset) | LF | 12.5

PLAN VIEW OF TRANSITION BLOCK
(GUARDRAIL NOT SHOWN FOR CLARITY)

ELEVATION OF TRANSITION BLOCK
(GUARDRAIL AND POSTS NOT SHOWN FOR CLARITY)
GENERAL NOTES

CONCRETE: Concrete for the Traffic Railing (Vertical Face Retrofit) shall be Class IV. Concrete for Curb Transition Blocks shall be Class II (Bridge Deck).

ADHESIVE-BONDED DOWELS: Adhesive Bonding Material Systems for Dowels shall comply with Specification Section 937 and be installed in accordance with Specification Section 416. The field testing proof loads required by Specification Section 416 shall be 23,800 lbs for Dowel Bars 6D on the inside face (traffic side) of the railing (1'-0" embedment) and 18,500 lbs for Dowel Bars 6D along the outside face of the traffic railing (5" min. embedment).

BRIDGES ON CURVED ALIGNMENTS: The details presented in this Standard are shown for bridges on tangent alignments. Details for bridges on horizontally curved alignments are similar.

BARRIER DELINEATORS: Barrier Delineators shall meet Specification Section 993. Install Barrier Delineators on top of the Traffic Railing along the entire length of the bridge 2' from the face on the traffic side at the spacing shown in the table below. Barrier Delineator color (white or yellow) shall match the color of the near edgeline.

GUARDRAIL: See Index 400 for guardrail component details, geometric layouts and associated notes not fully detailed herein.

BARRIER Delineators (white or yellow) shall match the color of the near edgeline. The sheeting and adhesive backing shall comply with Specification Section 994 and may comprise individual decals of letters to the top of the adjacent guardrail. The information must be clearly visible from the right side of the approaching travel lane. Replace the information that has been removed or obscured, with 3" tall black lettering on white nonreflective sheeting applied to the top of the adjacent guardrail if the installation of the Traffic Railing (Thrie Beam Retrofit) will obscure the bridge name, number and or date.

PAYMENT: Guardrail Bridge Anchorages Assembly (each) includes all barrier delineators for the entire bridge length, transition blocks, and necessary hardware to complete the Guardrail transitions shown.

---

<table>
<thead>
<tr>
<th>SPACING</th>
<th>BARRIER DELINEATOR SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>Edge of Travel Lane to Face of Railing</td>
</tr>
<tr>
<td>Spacing (ft)</td>
<td></td>
</tr>
<tr>
<td>&lt; 4</td>
<td>40'</td>
</tr>
<tr>
<td>4' to 8</td>
<td>80'</td>
</tr>
<tr>
<td>&gt; than 8</td>
<td>None Required</td>
</tr>
</tbody>
</table>

Dowel Bars 6D along the outside face of the traffic railing (5" min. embedment). Dowel Bar 6D shall be 23,800 lbs for Dowel Bars 6D on the inside face (traffic side) of the railing (1'-0" embedment) and 18,500 lbs for Dowel Bars 6D along the outside face of the traffic railing (5" min. embedment).

Bridges on Curved Alignments: The details presented in this Standard are shown for bridges on tangent alignments. Details for bridges on horizontally curved alignments are similar.

Barrier Delineators shall meet Specification Section 993. Install Barrier Delineators on top of the Traffic Railing along the entire length of the bridge 2' from the face on the traffic side at the spacing shown in the table below. Barrier Delineator color (white or yellow) shall match the color of the near edgeline.

General Notes: Concrete for the Traffic Railing (Vertical Face Retrofit) shall be Class IV. Concrete for Curb Transition Blocks shall be Class II (Bridge Deck).

Adhesive Bonding Material Systems for Dowels shall comply with Specification Section 937 and be installed in accordance with Specification Section 416. The field testing proof loads required by Specification Section 416 shall be 23,800 lbs for Dowel Bars 6D on the inside face (traffic side) of the railing (1'-0" embedment) and 18,500 lbs for Dowel Bars 6D along the outside face of the traffic railing (5" min. embedment).

Bridges on Curved Alignments: The details presented in this Standard are shown for bridges on tangent alignments. Details for bridges on horizontally curved alignments are similar.

Barrier Delineators shall meet Specification Section 993. Install Barrier Delineators on top of the Traffic Railing along the entire length of the bridge 2' from the face on the traffic side at the spacing shown in the table below. Barrier Delineator color (white or yellow) shall match the color of the near edgeline.
**Scheme 1 - Approach Ends of Bridges with Beam or Girder Superstructure**

- **Beam Railing**: Existing Post & Beam Railing
- **Vertical Face Retrofit Railing**: Bars 5S (Typ.)
- **Gutter Line**: Bars 6D (Typ.)
- **Existing Approach Slab (if present)**: 2 equal sp. @ 1'-3" Max.
- **Direction of Traffic**: Bars 6D1
- **Beam Railing**: Existing Post & Beam Railing
- **Coping**: Bars 5S (Typ.)
- **Existing Approach Slab (if present)**: 2 equal sp. @ 1'-3" Max.
- **Direction of Traffic**: Bars 6D2

**Scheme 2 - Approach Ends of Bridges with Flat Slab Superstructure & Parallel Wingwalls (Shown)**

- **Beam Railing**: Existing Post & Beam Railing
- **Vertical Face Retrofit Railing**: Bars 5S (Typ.)
- **Gutter Line**: Bars 6D (Typ.)
- **Existing Approach Slab (if present)**: 2 equal sp. @ 1'-3" Max.
- **Direction of Traffic**: Bars 6D1

**Bill of Reinforcing Steel**

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<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/FT</td>
<td>0.076</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/FT</td>
<td>14.71</td>
</tr>
</tbody>
</table>

**Conventional Reinforcing Steel Bending Diagram**

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<tr>
<th>Mark</th>
<th>Size</th>
<th>Length</th>
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<tbody>
<tr>
<td>D1</td>
<td>6</td>
<td>3'-7&quot;</td>
</tr>
<tr>
<td>D2</td>
<td>6</td>
<td>3'-10&quot;</td>
</tr>
<tr>
<td>S</td>
<td>S</td>
<td>AS REQD</td>
</tr>
</tbody>
</table>

**Estimated Traffic Railing Quantities**

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>Concrete</td>
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</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/FT</td>
<td>14.71</td>
</tr>
</tbody>
</table>

**Reinforcing Steel Notes**:
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a retaining wall shall be the same as detailed for a bridge deck.
3. All reinforcing steel in the Vertical Face Retrofit Railing shall have a 2" minimum cover.

**Notes**

- **Match width of existing Deck Joint at Begin or End Bridge (if present)**
- **See Limits of Removal of Existing Structure Sheet 2 of B**
GUARDRAIL TRANSITIONS-EXISTING POST & BEAM BRIDGE RAILINGS (NARROW & RECESSED CURBS)

LEGEND

SCHEME 3 - APPROACH ENDS OF BRIDGES WITH BEAM OR GIRDER SUPERSTRUCTURE

1 RAILING PANEL ON WINGWALL ADJACENT TO END POST

2 CONTINUOUS RAILING PANELS ON WINGWALL ADJACENT TO END POST

3 OR MORE CONTINUOUS RAILING PANELS ON WINGWALL ADJACENT TO END POST

SCHEME 4 - APPROACH ENDS OF BRIDGES WITH FLAT SLAB SUPERSTRUCTURE & PARALLEL WINGWALLS (SHOWN) OR BEAM OR GIRDER SUPERSTRUCTURE & PARALLEL OR CURVED WINGWALLS (SIMILAR)

1 RAILING PANEL ADJACENT TO BEGIN OR END BRIDGE

2 CONTINUOUS RAILING PANELS ADJACENT TO BEGIN OR END BRIDGE

3 OR MORE CONTINUOUS RAILING PANELS ADJACENT TO BEGIN OR END BRIDGE

LIMITS OF REMOVAL OF EXISTING STRUCTURE - POST & BEAM RAILING WITH RECESSED CURB

3 OR MORE CONTINUOUS RAILING PANELS ON WINGWALL ADJACENT TO BEGIN OR END BRIDGE
PARTIAL PLAN - APPROACH TRANSITION

Limiting Station of Transition
Varies (7'-6" Min, 7'-0" Max)

Begin or End Bridge
Thrie-Beam Panel

Transition Block (if shown in Plans)

Existing Bridge Deck

Gutter Line

PARTIAL ELEVATION - APPROACH TRANSITION

SCHEMES 1 & 3
(Narrow Curb Shown, Recessed Curb Similar)

Guardrail Transition

Standard Guardrail

PARTIAL PLAN - APPROACH TRANSITION

Limiting Station of Transition
Varies (7'-6" Min, 7'-0" Max)

Begin or End Bridge
Thrie-Beam Panel

Transition Block (if shown in Plans)

Existing Bridge Deck

Gutter Line

PARTIAL ELEVATION - APPROACH TRANSITION

SCHEMES 2 & 4
(Narrow Curb Shown, Recessed Curb Similar, Flat Slab Superstructure Shown, Beam or Girder Superstructure Similar)

Guardrail Transition

Standard Guardrail

* See Limits of Removal of Existing Structure, Sheets 2 of 8 and 4 of 8.
PARTIAL ELEVATION - APPROACH TRANSITION

SCHEME 5

(Narrow Curb shown; Recessed Curb similar)

PARTIAL ELEVATION - TRAILING END TRANSITION

SCHEME 6

(Narrow Curb Scheme 2 shown; All other Schemes similar)
GUARDRAIL TRANSITIONS-EXISTING POST & BEAM BRIDGE RAILINGS (NARROW & RECESSED CURBS)

**Summary**

- Plan View of Transition Block
- Elevation of Transition Block

**Description:**

- New Guardrail Posts, positioned as required to clear Transition Block (Typ.)
- Existing Bridge or Approach Slab Mounted Curb
- Gutter Line
- Transition Block
- Existing Approach Slab or Bridge Deck

**Estimates Quantities Per Transition Block**

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Concrete Class II (Bridge Deck)</td>
<td>CT</td>
<td>0.4</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>Lb</td>
<td>61</td>
</tr>
</tbody>
</table>

**Notes:**

- Anchor Rods: Steel Anchor Rods shall be ASTM A36, ASTM A709 Grade 36 or ASTM A615 Grade 60 hot-dip galvanized in accordance with Specification Section 962.
- Adhesive-Bonded Dowels: Adhesive Bonded Dowels are shown installed in an existing curb or sidewalk integrally reinforced with Approach Slab, Wingwall or Bridge Deck. For installations in existing detached curbs or sidewalks, install dowels in available sound concrete. Shift bars (as needed) to install six dowels into existing bridge or approach slab mounted curb.
GENERAL NOTES

CONCRETE: Concrete for the Traffic Railing (Vertical Face Retrofit) and replacement curb sections shall be Class IV. Concrete for Curb Transition Blocks shall be Class II (Bridge Deck).

REINFORCING STEEL: Reinforcing steel shall be ASTM A615, Grade 60, except Expansion Dowel Bar B which shall be ASTM A36 smooth round bar hot-dip galvanized in accordance with the Specifications.

EXPANSION SLEEVE ASSEMBLY: Pipe sleeve shall be ASTM D2241 PVC pipe, SDR13.5. End Cap shall be ASTM D2666 PVC socket fitting, Schedule 40. End of Sleeve assembly at railing open joint shall be sealed with silicone to prevent concrete intrusion during railing casting. A compressible polystyrene plug is required in the opposite end of the assembly for correct dowel positioning during railing casting. Correct dowel positioning is required in order to provide for thermal movement of the deck.

ADHESIVE BONDED ANCHORS AND DOWELS: Adhesive Bonding Material Systems for Anchors and Dowels shall comply with Specification Section 937d and be installed in accordance with Specification Section 416. The field testing proof loads required by Specification Section 416 shall be 23,800 lbs for Dowel Bars 6D on the inside face (traffic side) of the railing (1'-0" embedment) and 18,500 lbs for Dowel Bars 6D along the outside face of the traffic railing (5" min. embedment).

MAXIMUM ENDS}: The details presented in these Standards are shown for bridges on tangent alignments. Details for bridges on curved alignments are similar.

BARRIERS: Barriers shall meet Specification Section 993. Install barrier delineators on top of the Traffic Railing along the entire length of bridge 2" from the face on the traffic side at the spacing shown in the table below. Barrier Delineator color (white or yellow) shall match the color of the near edgeline.

PAYMENT: Concrete Traffic Railing- Bridge Retrofit- Post & Beam Railing (each) includes all materials and labor required to demolish a portion of the existing structure where required and to construct the concrete portion of the retrofit railings. Guardian Bridge Anchorage Assembly (each) includes all barrier delineators for the entire bridge length, transition blocks, and necessary hardware to complete the Guardian transitions shown.

PAYMENT:

Concrete Traffic Railing- Bridge Retrofit- Post & Beam Railing (each) includes all materials and labor required to demolish a portion of the existing structure where required and to construct the concrete portion of the retrofit railings. Guardian Bridge Anchorage Assembly (each) includes all barrier delineators for the entire bridge length, transition blocks, and necessary hardware to complete the Guardian transitions shown.

DISTANCE TO FACE OF RAILING:

<table>
<thead>
<tr>
<th>Distance to Face of Railing</th>
<th>Spacing (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 8</td>
<td>40</td>
</tr>
<tr>
<td>8 to 16</td>
<td>80</td>
</tr>
<tr>
<td>&gt; than 16</td>
<td>None Required</td>
</tr>
</tbody>
</table>

ESTIMATED TRAFFIC RAILING QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CI/FT</td>
<td>0.064</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/FT</td>
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</tr>
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</table>

(Quantities are based on a 9" curb, no curb cross slope and 1'-0" embedment length of Bars 6D. If the curb height or embedment length differs from that shown, increase or decrease quantity by the given per inch increment.)
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
<th>NOTE NOS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>D = 4D Pin</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>1&quot; Ø</td>
<td>2'-0&quot;</td>
<td>2 &amp; 5</td>
</tr>
<tr>
<td>C</td>
<td>2&quot;</td>
<td>1'-3&quot;</td>
<td>1, 2 &amp; 3</td>
</tr>
<tr>
<td>D</td>
<td>6</td>
<td>2'-0&quot;</td>
<td>2 &amp; 3</td>
</tr>
<tr>
<td>E</td>
<td>4&quot;</td>
<td>1'-3&quot;</td>
<td>1, 2 &amp; 3</td>
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<tr>
<td>F</td>
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<td>1 &amp; 3</td>
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<tr>
<td>G</td>
<td>2</td>
<td>1'-3&quot;</td>
<td>1, 2 &amp; 3</td>
</tr>
<tr>
<td>H</td>
<td>2</td>
<td>1'-0&quot;</td>
<td>1 &amp; 3</td>
</tr>
</tbody>
</table>

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a retaining wall shall be the same as detailed for a bridge deck.
3. All reinforcing steel in the Vertical Face Retrofit Railing shall have a 2" minimum cover.
4. Bars 5S may be continuous or spliced at the construction joints. Bar splices for Bars 5S shall be a minimum of 2'-0".
5. Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.

BILL OF REINFORCING STEEL

PARTIAL PLAN OF RAILING (SKEW ANGLE Ø LESS THAN 70°)

PARTIAL PLAN OF RAILING (SKEW ANGLE Ø = 70° OR GREATER)

OPEN JOINT EXPANSION DOWEL DETAIL
(Railing Reinforcing Not Shown For Clarity)

Dowel Installation Note:
Shift dowel holes to clear if the existing reinforcement is encountered.

NOTE:
- All reinforcing steel in the Vertical Face Retrofit Railing shall have a 2" minimum cover.
- Bars 5S may be continuous or spliced at the construction joints. Bar splices for Bars 5S shall be a minimum of 2'-0".
- Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.
- ½" Preformed Joint Filler at top of Existing Curb shall extend beyond the joint material (Silicone, poured rubber, armored neoprene seal or sliding plates) as shown to prevent concrete intrusion during railing casting and shall be placed so as not to restrict in any way normal joint movement.

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM

BILL OF REINFORCING STEEL

<table>
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<td>B</td>
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<td>2 &amp; 5</td>
</tr>
<tr>
<td>C</td>
<td>2&quot;</td>
<td>1'-3&quot;</td>
<td>1, 2 &amp; 3</td>
</tr>
<tr>
<td>D</td>
<td>6</td>
<td>2'-0&quot;</td>
<td>2 &amp; 3</td>
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<td>E</td>
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<td>6</td>
<td>1'-0&quot;</td>
<td>1 &amp; 3</td>
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<tr>
<td>G</td>
<td>2</td>
<td>1'-3&quot;</td>
<td>1, 2 &amp; 3</td>
</tr>
<tr>
<td>H</td>
<td>2</td>
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REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a retaining wall shall be the same as detailed for a bridge deck.
3. All reinforcing steel in the Vertical Face Retrofit Railing shall have a 2" minimum cover.
4. Bars 5S may be continuous or spliced at the construction joints. Bar splices for Bars 5S shall be a minimum of 2'-0".
5. Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.
SCHEME 1
RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLS

1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

3. If a Special Steel Guardrail Post is required for attachment to the top of a sloping Wing Wall, saw cut and remove a wedge shaped portion of the sloping Wing Wall as required to provide a level surface for post installation.

SCHEME 2
RAILING END TREATMENT FOR PARALLEL CURBS

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 3 of 6. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing.

2. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend beyond end of existing End Bent Wing Wall, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.

3. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
**SCHEME 3 NOTES:**

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 3 of 6.

2. Dowel Bars 4N may be installed on a maximum angle of 45° to the cut edge of the Approach Slab as shown to facilitate drilling of holes and installation of bars.

3. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or may be installed in drilled holes in the new section of curb using an Adhesive Bonding Material System with a 1'-0" minimum embedment.

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**SCHEME 4 NOTES:**

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 3 of 6.

2. Dowel Bars 4N may be installed on a maximum angle of 45° to the cut edge of the Approach Slab as shown to facilitate drilling of holes and installation of bars.

3. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or may be installed in drilled holes in the new section of curb using an Adhesive Bonding Material System with a 1'-0" minimum embedment.
**GENERAL NOTES**

1. Concrete shall be used for the construction of Concrete Barrier Walls, except, in moderately and extremely aggressive environments, Class IV concrete shall be used. All non-designated size reinforcing steel shall be No. 5 bars. Exposed concrete surfaces shall have a Class 3 surface finish in accordance with Specification Section 521 or as shown in the plans.

2. Longitudinal reinforcement to be continuous or spliced No. 5 Bars. Lap splices a minimum of 2'-0".

3. Terminal protection by the use of a crash cushion system.

4. Expansion joints are required at bridge ends and/or at locations where the wall is an integral part of an existing or proposed concrete slab. Construct required joints to match existing or proposed expansion joints.

5. Minimum length of cast-in-place or precast segments is 20 feet. For wall segments constructed with the slip form method, score 3/8" deep crack control V-Grooves while the concrete is still plastic and mold them when walls are constructed with the stationary form method. V-Grooves shall be spaced at 20 intervals, the end of the side face grooves shall be in line with the ends of the top face grooves and the long dimension of all grooves shall align at 90 degrees to the longitudinal axis of the wall. When wall segments are less than 40' in length, space the V-Groove equally between open joints. Dowel transverse construction joints for abutting segments less than 40' (See DETAIL B).

6. For wall segments constructed with the slip form method, score 3/8" deep crack control V-Grooves while the concrete is still plastic and mold them when walls are constructed with the stationary form method. V-Grooves shall be spaced at 20 intervals, the end of the side face grooves shall be in line with the ends of the top face grooves and the long dimension of all grooves shall align at 90 degrees to the longitudinal axis of the wall. When wall segments are less than 40' in length, space the V-Groove equally between open joints. Dowel transverse construction joints for abutting segments less than 40' (See DETAIL B).

7. Shoulder concrete barrier wall has been structurally evaluated to be equivalent to safety shapes which have been crash tested to NCHRP Report 350, TL-4 requirements.

8. Minimum length of cast-in-place or precast segments is 20 feet.

9. Precast construction is allowed as an alternate to cast-in-place construction. a. Wall segments < 40' in length shall be joined by a transverse joint in accordance with DETAIL C. The minimum segment length is 20'.

10. Bedding of the precast sections shall be facilitated by the use of sand-cement grout or equal method to assure uniform bearing. c. Reinforcement may be required for handling stresses.

11. On roadways designated for reverse laning, all downstream ends that are not shielded or outside the clear zone shall be marked by Type 3 Object Markers.

12. For BARRIER WALL INLET details see Index 218 and Index 219. For MEDIAN BARRIER INLETS see Index 217.

13. Concrete barrier wall with NJ Safety Shape may not be substituted for the Standard F Shape Barrier.
SHOULD shoulder TREATMENT WHEN CRASH CUSHIONS SHIELD CONCRETE BARRIER WALL ENDS LOCATED INSIDE APPROACH CLEAR ZONE OR LATERAL OFFSET

DETAIL A

DOWELED TRANSVERSE CONSTRUCTION JOINT WHERE ABUTTING SEGMENT(S) LESS THAN 40" IN LENGTH
(Required on abutting ends of Segments < 40' long)

DETAIL B

TOP VIEW TONGUE DETAIL GROOVE DETAIL
PRECAST TONGUE AND GROOVE TRANSVERSE JOINT
(Required on abutting ends of Precast Segments ≥ 40' long)

DETAIL C

CONCRETE BARRIER WALL SPECIAL DETAILS

FREE END REINFORCEMENT
NOTES:
1. Reduce the vertical steel spacing to 4 inches O.C. a distance of 4 feet for each side of all cold or expansion joints.
2. Unless otherwise noted, Minimum Segment Wall Length is 20 LF.
3. All walls may be made up of segments 20 or more in length provided the segments are joined by a transverse joint in accordance with the CONCRETE BARRIER WALL SPECIAL DETAILS, DETAIL B.
4. Quantities shown are for information only. Barrier wall inlets (Index 218) shall be isolated from the barrier wall stem and footing by 1" expansion material.
5. All longitudinal reinforcement to be continuous or spliced No. 5 bars. Lap splices a minimum of 2'-0".
6. For additional information on Bars 5A, 5B, 5C and 5D, see BAR BENDING DIAGRAMS.

QUANTITIES: Concrete 0.30 CY/LF
Reinforcing Steel 30 LBS/LF

SHOULDER WALL (TYPICAL)

PLAN VIEW
SHOULDER WALL FOOTING
TRANSITION AT INLETS

REINFORCED CONCRETE SHOULDER WALL

INDEX NO. 410
3 of 25
**SUPERELEVATED SECTION**

**CANTILEVER WALL**

**MEDIAN BARRIER WALL FOR SUPERELEVATED SECTIONS WITH VARIABLE ROADWAY PROFILE GRADE LINES**

### NOTES:

1. Unless the plans stipulate a specific wall type, either the Cantilever Wall or the L-Wall may be constructed at the Contractor's option.

2. Reduce the vertical steel spacing to 4 inches O.C. a distance of 4 feet for each side of all cold or expansion joints.

3. All longitudinal reinforcement to be continuous or spliced No. 5 bars. Lap splices a minimum of 2'-0".

4. For additional information on Bars 5E, 5F, 5G, 5H and 5J, see BAR BENDING DIAGRAMS.

5. No. 4 dowel may be extended to provide steel stake. Omit dowel bars when construction joint is not used.
LARGE SIGN MEDIAN BARRIER MOUNTED SIGN SUPPORT TRANSITION (OPTION 1)

* See Plans For Additional Project Specific Reinforcement For Sign Support Foundation.

** V-Groove Joint

Field Bend #5 Bar To Maintain Cover (Typ.)

#5 Stirrup Bars @ 1'-0" Spacing
Max. Shift To Clear Project Specific Sign Support Foundation

Spacing of #5 Stirrup Bars

Design Standards Index 410

15'-0"

Varies

15'-0"

32" F-Shape Median Barrier Transition from 32" to 54" Barrier Height

* 54" High Vertical Face Barrier Transition from 32" to 54" Barrier Height

ELEVATION

SECTION A-A

2" Cover (Min.)

#5 Stirrup Bars

SECTION B-B

2" Cover (Min.)

SECTION C-C

2'-0"

0" Setback Distance (Min.)

Overhead Sign Support (Project Specific Design)

SECTION D-D

Design Standards Index 410

SECTION A-A

2" Cover (Min.)

#5 Stirrup Bars

SECTION B-B

2" Cover (Min.)

SECTION C-C

2'-0"

0" Setback Distance (Min.)

Overhead Sign Support (Project Specific Design)
**Design Standards Index 410**

- **32" F-Shape Median Barrier**
  - 2016
  - 07/01/15
  - Last Revision

**Description:**

- See Plans for additional Project Specific Reinforcement for Sign Support Foundation.
- Transition from 32" to 54" Barrier Height
- 54" High Vertical
- Transition from 32" to 54" Barrier Height
- Shoulder

**Elevation:**

- 2' Cover (Min.)
  - 6 #5 Bars

**Sections:**

- **Section A-A**
  - 2" Cover (Min.)
  - 6 #5 Bars

- **Section B-B**
  - 2" Cover (Min.)
  - 6 #5 Bars

- **Section C-C**
  - 2" Cover (Min.)
  - 6 #5 Bars

- **Section D-D**
  - 0" Setback

**Additional Information:**

- V-Groove Joint
- Symmetric about ¥
- Field Bend #5 Bar to maintain cover
- Equal Spacing @ 3'-0" Max.
- Spacing of #5 Stirrup Bars
- Reduced Shoulder

**Notes:**

- Spread Footing shown, Drilled Shaft similar
- See Plans for additional project specific reinforcement
- Transition from 32" to 54" Barrier Height
- Shoulder
- Reduced Shoulder

**Sign Support Foundation:**

- Overhead Sign Support (Project Specific Design)
CONCRETE MEDIAN BARRIER WALL TRANSITIONS AT OVERHEAD SIGN SUPPORTS

**NOTE:**
1. Footing extended as called for on other indexes or as called for in the plans.
SPREAD FOOTING AND CYLINDRICAL NOTES
The Reinforcement Details And Dimensions For Both The Spread Footing And Cylindrical Foundations Can Be Found In Index 17515.
NOTES:
1. Transition Segments Shall Be Doweled Into The End Of The Barrier Wall In The Following Manner: Four 1" diameter holes 6" deep on 6" centers shall be drilled in the end of the barrier and No. 6 bars 15" long set in an Adhesive Bonded Material System per Standard Specification Section 416. The ends of the dowels extending into the transition segment shall be wrapped with one layer of 15 lb. Type I Asphalt-saturated roofing felt with the ends crimped.

2. When Construction Joints Are Utilized For Transition Segment Construction The Stem Shall Be Doweled To The Footing In The Following Manner: Five No. 5 bars 18" long shall be embedded 9" into the footing. The dowels shall be spaced 15" on centers with the first dowel located 12" from the barrier wall. Dowels may be placed within or adjacent to the keyway.

3. The detail BRIDGE WITH BIKE LANE can be superimposed over the details: WITH UTILITY STRIPS AND WITH BIKE LANE and WITHOUT UTILITY STRIPS AND WITH BIKE LANE. The detail BRIDGE WITHOUT BIKE LANE can be superimposed over the details: WITH UTILITY STRIPS AND WITHOUT BIKE LANE and WITHOUT UTILITY STRIPS AND WITHOUT BIKE LANE.

4. For SECTION DD, see CURB AND GUTTER WITHOUT ADJACENT BICYCLE LANE. For SECTION TT, see CURB AND GUTTER WITH ADJACENT BICYCLE LANE.
NOTES:
1. For X=Length of advancement in feet for near and opposing lanes and for sectional details see CURB AND GUTTER WITHOUT ADJACENT BICYCLE LANE.
2. The 1'-6" and 2'-6" offsets to toe of barrier wall cannot be reduced to accommodate hazards; however, hazards located in the stem of the wall may be accommodated by the details on HAZARD PENETRATION INTO STEM OF RIGID CONCRETE BARRIER WALLS; AND SHOULDER BARRIER WALL WHEN OFFSET FROM ABOVE GROUND HAZARD < 1'-6" AND THE DESIGN SPEED ≤ 45 MPH.
3. The detail BRIDGE WITH BIKE LANE can be superimposed over the details: WITH UTILITY STRIPS AND WITH BIKE LANE and WITHOUT UTILITY STRIPS AND WITHOUT BIKE LANE. The detail BRIDGE WITHOUT BIKE LANE can be superimposed over the details: WITH UTILITY STRIPS AND WITHOUT BIKE LANE and WITHOUT UTILITY STRIPS AND WITHOUT BIKE LANE.
4. For SECTION EE, see ONE-WAY CURB AND GUTTER DEPARTURES.
5. For SECTION QLD, see CURB AND GUTTER WITHOUT ADJACENT BICYCLE LANE.
   For Section FD, see CURB AND GUTTER WITH ADJACENT BICYCLE LANE.

WITH AND WITHOUT UTILITY STRIP
PICTORIAL VIEW

SECTION FF

WITH AND WITHOUT UTILITY STRIP
PICTORIAL VIEW

TWO-WAY CURB AND GUTTER TRAFFIC DEPARTURE

CONCRETE BARRIER WALL

DESIGN STANDARDS

2016

INDEX NO.
410

SHEET NO.
12 of 25
HAZARD 4' OR LESS FROM FACE OF CURB
ONE-WAY AND TWO-WAY CURB AND GUTTER NEAR LANE APPROACHES TRAFFIC (UNDIVIDED)

BRIDGE WITHOUT BIKE LANE

WITH UTILITY STRIP AND WITHOUT BIKE LANE

WITHOUT UTILITY STRIP AND WITHOUT BIKE LANE

NOTES:
1. For SECTION EE, see ONE-WAY CURB AND GUTTER DEPARTURES.
2. For SECTION QQ, see CURB AND GUTTER WITHOUT ADJACENT BICYCLE LANE.
3. The detail BRIDGE WITH BIKE LANE can be superimposed over the details: WITH UTILITY STRIPS AND WITH BIKE LANE and WITHOUT UTILITY STRIPS AND WITH BIKE LANE. The detail BRIDGE WITHOUT BIKE LANE can be superimposed over the details: WITH UTILITY STRIPS AND WITHOUT BIKE LANE and WITHOUT UTILITY STRIPS AND WITHOUT BIKE LANE.
END OF BRIDGE RAIL OR OTHER HAZARD THAT REQUIRES SHIELDING

BEGIN CONCRETE BARRIER WALL

That Requires Shielding Or Other Hazard

END OF BRIDGE RAIL OR OTHER HAZARD

RIGHT SIDE APPROACH SHOWN - LEFT SIDE OPPOSITE HAND

NEAR LANE APPROACH

OPPOSING LANE APPROACH

WITH OR WITHOUT UTILITY STRIP - UTILITY STRIP SHOWN

For Applications, see CURB AND GUTTER (WITH AND WITHOUT) UTILITY STRIP AND WITHOUT ADJACENT BIKE LANE

LENGTH OF ADVANCEMENT

CURB AND GUTTER WITHOUT ADJACENT BIKE LANE

EQUATION VARIABLES:

\[ D = \text{Distance in feet from near edge of the near approach traffic lane to back of hazard or clear zone width whichever is lesser. For left side hazards and clear zones on two-way undivided facilities D is measured from the inside edge of the near approach traffic lane.} \]

\[ d = \text{Distance in feet from near edge of the near approach traffic lane to the face of barrier (at offset control point). For left side hazards on two-way undivided facilities d is measured from the inside edge of the nearest opposing traffic lane.} \]

LENGTH OF ADVANCEMENT

CURB AND GUTTER WITHOUT ADJACENT BIKE LANE

SECTION QQ

FOR HIGH SIDE

SECTION QQ

FOR LOW SIDE

NOTES:

1. Reduce the vertical steel spacing to 4 inches O.C. a distance of 4 feet for each side of all cold or expansion joints.

2. All longitudinal reinforcement to be continuous or spliced No. 5 bars. Lap splices a minimum of 2'-0".

3. Transverse expansion joints are to be constructed at the juncture of wall transitions and curb and gutter, and at intervals so that spacing will not exceed 100'.

4. For Concrete Barrier Wall Inlet details with Rigid Curb and Gutter applications, see Index No. 219.

5. Minimum Segment Wall Length = 20 LF.

6. For additional information on Bar 5K, see BAR BENDING DIAGRAM.

QUANTITIES:

Concrete: 0.24 CY/LF; Reinforcing Steel: 26 LBS/LF

INDEX

410

420

425
**NOTES:**

1. Reduce the vertical steel spacing to 4 inches O.C. a distance of 4 feet for each side of all cold or expansion joints.

2. All longitudinal reinforcement to be continuous or spliced No. 5 bars. Lap splices a minimum of 2'-0".

3. Transverse expansion joints are to be constructed at the juncture of wall transitions and curb and gutter, and at intervals so that spacing will not exceed 100'.

4. For Concrete Barrier Wall Inlet details with Rigid Curb and Gutter applications, see Index No. 219.

5. Minimum Segment Wall Length = 20 LF.

6. For additional information on Bar 5K, see BAR BENDING DIAGRAM.

7. Drainage slots shall be located at all low points along the sidewalk and unless otherwise shown in the plans, slots shall be spaced at intervals not exceeding 50' in fill sections and 20' cut sections. Slots shall be located such that only two bars are cut away or deleted in front and back lines of vertical reinforcement. On each side of drainage slots, vertical and horizontal bars shall be placed to provide 2" concrete cover.

---

**SECTION TT (FOR HIGH SIDE)**

**SECTION TT (FOR LOW SIDE)**

---

**PICTORIAL VIEW**

**SECTION HH**

**SIDEWALK DRAINAGE SLOT FOR BARRIER WALL (RIGID) (CURB & GUTTER)**
STANDARD GUARDRAIL APPROACH TO SHOULDER BARRIER

TRANSITION SECTION NOTES:
1. The longitudinal dimensions and payment limits shown for median concrete barrier wall also apply to shoulder concrete barrier walls.
2. W-beam elements do not apply to these transition schemes. For barrier wall trailing end guardrail connections for one-way lanes, see FREE END REINFORCEMENT.
3. Where reaming is necessary to fit nested beams, the reamed surfaces shall be metalized in accordance with Section 562 of the Standard Specifications.
4. Either steel or timber guardrail post may be used, timber posts shown.

5. The nested beams shall not be bolted to blocks and posts at posts numbers (1), (3), and (5).
6. On the trailing side of MEDIAN BARRIER WALL, offset blocks may be omitted at posts numbers (2), (4), and (6).
7. For additional guardrail information refer to Index No. 400.
8. Single Thrie-Beam on trailing ends of barrier wall; Nested Thrie-Beams on approach ends of barrier wall.

GUARDRAIL CONNECTION TO CONCRETE BARRIER WALL APPROACH ENDS
SHOULDER BARRIER WALL AT ABOVE GROUND RIGID HAZARDS WHEN OFFSET FROM HAZARD < 3'

1. The affected segments between bent supports or pier columns shall be constructed in accordance with the detail for REINFORCED CONCRETE SHOULDER WALL, Section QQ, or Section TT. In cases where the barrier wall and slope pavement or other structure would occupy the same location, the wall and structure are to be modified as detailed in the plans.

2. The barrier wall radial segments are intended for use on approach and trailing ends of both one-way and two-way facilities. The guardrail connections shown on this sheet apply to one-way approaches and to the approaching and trailing ends of two-lane two-way facilities. For details on trailing ends of two-way multilane and one-way facilities, the end connection on W-Beam guardrail connection to concrete barrier wall trailing ends may be used.

3. Refer to Index No. 400 for additional guardrail information.

4. Attach three-beam terminal connector to shoulder barrier wall with a 21"x12"x1/2" thrie beam terminal connector plate and 5-5/8"x12" long HS hex bolts and nuts with 5/8" plain round washers under heads and nuts.

5. 12"x12"x1/2" galvanized steel back-up plate with 5/8" post bolts (either 14" or 18" long) and nuts with 5/8" plain round washers under nuts.

6. For details at Rigid Hazard, see HAZARD PENETRATION INTO STEM OF RIGID CONCRETE BARRIER WALLS.

7. For additional information on PLAN FOR DESIGN SPEED ≤ 45 MPH, see SHOULDER BARRIER WHEN OFFSET FROM ABOVE GROUND HAZARD < 1'-6" AND THE DESIGN SPEED ≤ 45 MPH.

8. For additional information on PLAN FOR DESIGN SPEED ≥ 50 MPH, see SHOULDER BARRIER WHEN OFFSET FROM ABOVE GROUND HAZARD < 1'-6" AND THE DESIGN SPEED ≥ 50 MPH.

9. See GUARDRAIL CONNECTION TO CONCRETE BARRIER WALL APPROACH ENDS FOR POST SPACING AND BOLT CONNECTIONS, Steel Or Timber Posts Are Applicable.
PIER AT BACK OF CONCRETE BARRIER WALL

NOTES:
1. These treatments are not applicable to hazards that cannot provide lateral support to resist the LRFD lateral equivalent static force. See the plans for limits of wall sections and other associated wall treatments.
2. For Low Speed SECTIONS MM, NN and OO, see SHOULDER BARRIER WALL WHEN OFFSET FROM ABOVE GROUND HAZARD < 1'-6" AND THE DESIGN SPEED ≤ 45 MPH.
3. For High Speed SECTIONS MM and NN, see SHOULDER BARRIER WALL WHEN OFFSET FROM ABOVE GROUND HAZARD < 1'-6" AND THE DESIGN SPEED ≥ 50 MPH.
4. The details on this sheet are treatments to the F-shape concrete barrier walls, where site conditions impose reduced clearances between above ground hazards and the walls. Bridge bent supports and piers are shown.
5. When thru drainage is required, a 3" x 12" Drain Slot shall be provided at one of the following locations:
   a. 4' upstream of pier edge for a declining approach.
   b. 4' downstream of pier edge for an inclining approach.

PIER PENETRATION INTO TOP OF CONCRETE BARRIER WALL

PIER AT FACE OF CONCRETE BARRIER WALL

RIGID HAZARD PENETRATION INTO STEM OF CONCRETE BARRIER WALL
**SHOULDER BARRIER WALL WHEN OFFSET FROM ABOVE GROUND HAZARD < 1'-6" AND THE DESIGN SPEED ≤ 45 MPH**

**NOTES:**

1. Reduce the vertical steel spacing to 4 inches O.C. a distance of 4 feet for each side of all cold or expansion joints.

2. All longitudinal reinforcement to be continuous or spliced No. 5 bars. Lap splices a minimum of 2'-0".

3. For additional information on Bars 5A and 5L, see BAR BENDING DIAGRAMS.

4. ½" Min. Expansion Joint or at the contractor's option: Back face of barrier wall may be cast against Pier with 1/2" Expansion Material.

---

**SHOULDER BARRIER WALL**

**SECTION MM**

WHEN PIER OFFSET ≥ 15½"

**SECTION NN**

WHEN 12½" ≤ PIER OFFSET < 15½"

**SECTION OO**

WHEN 8½" ≤ PIER OFFSET < 12½"
42" SHOULDER WALL
SECTION NN
WHEN 12¾" ≤ PIER OFFSET < 16¾"

NOTES:
1. Reduce the vertical steel spacing to 4 inches O.C. a distance of 4 feet each side of all cold joints.
2. All longitudinal reinforcement to be continuous or spliced No. 5 bars. Lap splices a minimum of 2'-0".
3. For additional information on Bars 5A, 5B, 5M, 5N and 5P, see BAR BENDING DIAGRAMS.
4. For Section OO, see SHOULDER BARRIER WALL WHEN OFFSET FROM ABOVE GROUND HAZARD < 1'-6" AND THE DESIGN SPEED ≤ 45 MPH.
5. Where the 42" SHOULDER WALL does not abut the pier, use the TYPICAL or MODIFIED sections.
6. 1½" Min. Expansion Joint or at the contractor's option: Back face of barrier wall may be cast against Pier with 1½" Expansion Material.

SHOULDER BARRIER WALL WHEN OFFSET FROM ABOVE GROUND HAZARD < 1'-6" AND DESIGN SPEED ≥ 50 MPH
ONE-WAY TRAFFIC
(LEFT SIDE OPPOSITE HAND)

TWO-LANE TWO-WAY TRAFFIC

SHOULDER BARRIER WALL WHEN OFFSET FROM ABOVE GROUND HAZARD < 1'-6" AND DESIGN SPEED ≥ 50 MPH
END TRANSITION DETAILS - 42" SHOULDER WALL WITH GUARDRAIL OR SHOULDER WALL CONTINUATION FOR DESIGN SPEED ≥ 50 MPH

ELEVATION VIEW
42" SHOULDER WALL END TRANSITION

Notes:
For additional information on Bars 5A, 5M and 5N see BAR BENDING DIAGRAMS.
CONCRETE MEDIAN BARRIER WALL TRANSITIONS AT BRIDGE PIERS FOR DESIGN SPEEDS ≥ 50 MPH

NOTES:
1. Reduce the vertical steel spacing to 4 inches O.C. a distance of 4 feet for each side of all cold or expansion joints.
2. All longitudinal reinforcement to be continuous or spliced No. 5 bars. Lap splices a minimum of 2'-0".
4. For additional information on Bars 5A, 5M, 5N and 5R, see BAR BENDING DIAGRAMS.

End Measurement for Median Barrier Transition

M = ((P+1)/12 - 1) * 10; where M is in feet and P is in inches.

Varies = L - 30 - M; when Varies, L and M are in feet.

For additional information on Bars 5A, 5M, 5N and 5R, see BAR BENDING DIAGRAMS.

2016 DESIGN STANDARDS

CONCRETE BARRIER WALL

INDEX NO. 410

SHEET NO. 24 of 25
NOTES:
1. For Additional Information on "STANDARD BAR BENDING DETAILS," See Index 21300.
2. For Bar 5G, Bar 5J, and Dimensions (W, W1 and Y), see CANTILEVER WALL DIMENSIONS TABLE.
This Pier Protection Barrier has been structurally evaluated to be equivalent or greater in strength to other safety shape traffic barriers which have been crash tested to NCHRP Report 350 TL-5 criteria. This barrier meets the requirements of the AASHTO LRFD Bridge Design Specifications for a barrier used for bridge pier protection.

GENERAL NOTES

1. Concrete shall be Class III or IV unless otherwise called for in the plans.

2. Construct Pier Protection Barrier continuous without transverse contraction or expansion joints. Transverse contraction joints may be used at a spacing greater than or equal to 40'. Provide longitudinal reinforcing steel continuous across construction joints.

3. When the Pier Protection Barrier is installed adjacent to Roadway or Shoulder pavement, compact the top 12” of the subgrade to at least 98% of the maximum density determined by FM 1-T 180, Method D.

4. Construct Pier Protection Barrier continuous without transverse contraction or expansion joints. Transverse construction joints may be used at a spacing greater than or equal to 40'. Provide longitudinal reinforcing steel continuous across construction joints.

5. Piezometric tubes, Field and in place testing, Barriers and Footings with 1” expansion material.

Concrete shall be Class III or IV unless otherwise called for in the plans.

6. Payment: Pier Protection Barrier to be paid for under the contract unit price for Shoulder Concrete Barrier Wall (Rigid-Shoulder 42”), LF, or Shoulder Concrete Barrier Wall (Rigid-Shoulder 54”), LF.

7. Provide 3½” deep 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 3/8” V-Grooves while the concrete is still plastic, otherwise pre-form the joints when stationary forms are utilized.
### ONE-WAY TRAFFIC

**LEFT SIDE OPPOSITE HAND**

**ONE-WAY TRAFFIC**

**DETAIL 'A'**

(Guardrail not shown for clarity)

**TWO-LANE TWO-WAY TRAFFIC**

**LENGTH OF ADVANCEMENT DIAGRAMS - PIER PROTECTION BARRIER WITH GUARDRAIL CONTINUATION**

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>X (Length of Advancement) (ft.)</th>
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<tbody>
<tr>
<td>≤45</td>
<td>16 (d-d)</td>
</tr>
<tr>
<td>&gt;50</td>
<td>13 (d-d)</td>
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</tbody>
</table>

**NOTE:**

Length of Advancement determined from the diagrams and equations shown establishes the location of the upstream beginning of need for a Pier Protection Barrier, however, the Length of Advancement for the combination of Pier Protection Barrier and required guardrail can be no less than that required by other details of Index 400.

**Equation Variables:**

- **D** = Distance in feet from the near edge of the near approach traffic lane to the Pier Protection Barrier gutter line at its intersection with the departure line or the face of guardrail at its intersection with the departure line. For left side hazards on two-way undivided facilities, **D** is measured from the inside edge of the near approach traffic lane.

**d** = Distance in feet from the near edge of the near approach traffic lane to either (a) the back of pier, when the pier is located inside the Setback Distance or (b) the Setback Distance, when the pier extends to or goes beyond the Setback Distance. For left side piers on two-way undivided facilities, **D** is measured from the inside edge of the near approach traffic lane.

**D** = Distance in feet from the near edge of the near approach traffic lane to either (a) the back of pier, when the pier is located inside the Setback Distance or (b) the Setback Distance, when the pier extends to or goes beyond the Setback Distance. For left side piers on two-way undivided facilities, **D** is measured from the inside edge of the near approach traffic lane.

**NOTE:**

See Index 400 for Clear Zone and Horizontal Clearance, Length of Advancement Diagrams.

**PPB** = Pier Protection Barrier
SETBACK LIMIT

Back of Pier or Bent

Type 3 Object Marker when required (see Index 400, General Note No. 21)

Hazard Free, Traversable Slopes

Distance

Concrete Barrier Wall, see Index 410

Point of Departure

PPB = Pier Protection Barrier

Length of Advancement Diagrams.
**DESCRIPTION:**

**REVISION NO.:**

**SHEET NO.:**

**INDEX NO.:**

**REVISED NO.:**

**REVISED 07/01/09**

**2016 DESIGN STANDARDS**

**PIER PROTECTION BARRIER**

**INDEX NO.:** 411

**SHEET NO.:** 4 of 10

**LENGTH OF ADVANCEMENT DIAGRAMS - PIER PROTECTION BARRIER WITH CRASH WALL AND GUARDRAIL CONTINUATION**

**Setback Limit**

**Back of Pier or Bent**

**Distance**

**X (Length of Advancements)**

**Beginning of length of need**

**Pier Protection Barrier**

**Barrier Gutter Line**

**Crash Wall**

**Pier or Bent**

**Inside Setback Distance**

**Point of Departure**

**Setback Limit**

**Type 3 Object Marker**

**Crash Wall**

**Barrier Gutter Line**

**Guardrail Transition, see Index 410, Sheet 24**

**Point of Departure (LA)**

**Point of Departure (RA)**

**Crash Wall**

**42" or 54" Pier Protection Barrier with Crash Walls - 50 Min.**

**ONE-WAY TRAFFIC**

**TWO-LANE TWO-WAY TRAFFIC**

**NOTES:**

See Index 400 for Clear Zone and Horizontal Clearance Length of Advancement Diagrams.

PPB = Pier Protection Barrier

See Notes on Sheet 2.

**DETAIL 'B'**

(Guardrail not shown for clarity)

**2.49' - Design Speed ≥ 50 mph**

**1.76' - Design Speed ≤ 45 mph**

See Notes on Sheet 2.
(LEFT SIDE OPPOSITE HAND)
ONE-WAY TRAFFIC

TWO-LANE TWO-WAY TRAFFIC

LENGTH OF ADVANCEMENT DIAGRAMS - PIER PROTECTION BARRIER WITH CRASH WALL AND CONCRETE BARRIER WALL CONTINUATION

NOTES:
See Index 400 for Clear Zone and Horizontal Clearance Length of Advancement Diagrams.
PPB = Pier Protection Barrier

See Notes on Sheet 2.
**PLAN FOR DESIGN SPEED ≤ 45 MPH**

- **Barrier Gutter Line**
- **Crash Wall (when called for in Plans)**
- **42" or 54" PPB**
- **Beam Washers stacked back of rail**
- **End measurement for PPB payment**
- **Standard Thrie-Beam Offset Block, field trimmed, see Detail**

**PLAN FOR DESIGN SPEED ≥ 50 MPH**

- **FLARED END TREATMENT - PIER PROTECTION BARRIER WITH GUARDRAIL CONTINUATION**
- **42" or 54" PPB**
- **Crash Wall (when called for in Plans)**
- **32" Concrete Barrier Wall, See Index 410**
- **Elevation**

* 12"x12"x½" galvanized steel back-up plate with ½" post bolts (either 21" or 21½" long) and nuts with ½" plain round washers under nuts.
* **Attach** thrie-beam terminal connector to Pier Protection Barrier with a 2½"x12½"x3½" beam terminal connector plate and 5½"x15" long HS hex bolts and nuts with ½" plain round washers under heads and nuts.

---

**NOTES**

1. The Pier Protection Barrier radial segments are intended for use on approach and trailing ends of both one-way and two-way facilities. The guardrail connections shown on this sheet apply to one-way approaches and to the approaching and trailing ends of two-lane two-way facilities. On trailing ends of two-way multimile and one-way facilities the end connection on Index 410, Sheet 2 may be used.

For guardrail connections, see Index 410, Sheet 20.

2. Refer to Index No. 400 Detail J for additional guardrail information.

---

**GUARDRAIL TRANSITIONS**

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<th>DISTANCE</th>
<th>OFFSETS &quot;y&quot;</th>
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</thead>
<tbody>
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<tr>
<td>25</td>
<td>24.83</td>
<td>2.49</td>
</tr>
</tbody>
</table>

Notes:
- Barrier may be constructed in chords having lengths ≤4 feet.
- Chords having lengths >4 feet.
- Barriers may be constructed in chords having lengths >4 feet.
- The guardrail information.

---

**END TREATMENT - PIER PROTECTION BARRIER WITH CONCRETE BARRIER WALL CONTINUATION**

**ELEVATION**

**PIER PROTECTION BARRIER**

**DESIGN STANDARDS**

**INDEX NO.**

**SHEET NO.**
END TRANSITION AND TAPERED TOE DETAILS - PIER PROTECTION BARRIER WITH GUARDRAIL CONTINUATION

(Showing Bars 5V, 8S, 5B & 8T2)

NOTE:
- Lap Bars 6T1 and 6T2 with Bars 8S (4'-0" min. Lap Splice)
- Field Bend Bars as required
- Begin or End PPB

END TRANSITION DETAILS - PIER PROTECTION BARRIER WITH GUARDRAIL OR CONCRETE BARRIER WALL CONTINUATION

ELEVATION - BARRIER END TRANSITION - 42" PPB (shown); 54" PPB (similar)

(Transitional bars 5P and Bars 8S & 8T1)

NOTE:
- Field Cut & Lap Splice (Typ. unless otherwise noted)
- Transition Bars 5P Field Cut & Lap Splice (Typ. unless otherwise noted)

ESTIMATED 42" PPB QUANTITIES

<table>
<thead>
<tr>
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ESTIMATED 54" PPB QUANTITIES

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NOTE:
- PPB = Pier Protection Barrier
**Bill of Reinforcing Steel**

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<th>LENGTH</th>
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<tbody>
<tr>
<td>P</td>
<td>5</td>
<td>7'-6&quot;</td>
</tr>
<tr>
<td>R</td>
<td>5</td>
<td>8'-3&quot;</td>
</tr>
<tr>
<td>S</td>
<td>8</td>
<td>As Head</td>
</tr>
<tr>
<td>42&quot; PPB T1 &amp; T2</td>
<td>8</td>
<td>18'-0&quot;</td>
</tr>
<tr>
<td>54&quot; PPB T1 &amp; T2</td>
<td>8</td>
<td>21'-0&quot;</td>
</tr>
</tbody>
</table>

**Conventional Reinforcing Steel Bending Diagrams**

- **Bars 8S**
- **Bars 8S** (within Flared End Treatments)
- **Bars 8T1**
- **Bars 8T2**

**Transition Bars 8T1 & 8T2**

- To Be Field Cut (10 of each required per Railing End Transition)

**Stirrup Bar 5P**

- Field Cut

**Stirrup Bar 5R**

- Field Cut & Discard

**End Stirrup Bar 5V**

- To Be Field Cut

- (Two required per Barrier End Transition)

- w/ Tapered Toe

**Detailed Notes**

1. All bar dimensions in the bending diagrams are cut to 12'-0" min. lap.
2. Bars 8S may be continuous or spliced at the construction joints. Lap splices for Bars 8S shall be a minimum of 4'-0".
3. The Contractor may utilize Welded Wire Reinforcement when approved by the Engineer. Welded Wire Reinforcement must consist of Deformed wire meeting the requirements of Specification Section 931.
4. #2 bars may be continuous or spliced at the construction joints. Lap splices for Bars 8S shall be a minimum of 4'-0".
5. Bars 8S may be continuous or spliced at the construction joints. Lap splices for Bars 8S shall be a minimum of 4'-0".
6. Field Cut End Bars 8T2 to maintain cover Bar 8T1

**Revision Notes**

1. See Sheet 9 for Footing Details.
2. See Sheet 7 for bar spacings and details within End Transitions.
Barrier Gutter Line

Bars 5V @ 8" sp.

Spacing Bars 5B

2" (Typ.)
42" or 54" Pier Protection Barrier
Const. Joint Required

Barrier Gutter Line

Bars 5V @ 8" sp.

Spacing Bars 5B

2" (Typ.)
42" or 54" Pier Protection Barrier
Const. Joint Required

Barrier Gutter Line

Bars 5V @ 8" sp.

Spacing Bars 5B

2" (Typ.)
42" or 54" Pier Protection Barrier
Const. Joint Required

Slope Varies

Bottom of Spread Footing (Level Transversely)

Bars 5B (Typ.)

Spacing Bars 5B

1'-9"

3" Lip (See Note 1)

SECTION A-A TYPICAL SECTION THRU BACK CANTILEVER FOOTING

SECTION B-B TYPICAL SECTION THRU T FOOTING

Slope Varies

Bottom of Spread Footing (Level Transversely)

Bars 5B (Typ.)

Spacing Bars 5B

2" (Typ.)
42" or 54" Pier Protection Barrier
Const. Joint Required

SECTION C-C TYPICAL SECTION THRU FRONT CANTILEVER FOOTING

Bottom of Spread Footing (Level Transversely)

Bars 5B (Typ.)

Spacing Bars 5B

2" (Typ.)
42" or 54" Pier Protection Barrier
Const. Joint Required

Slope Varies

Bars 5B (Typ.)

Spacing Bars 5B

1'-9"

3" Lip (See Note 1)

BARRIER FOOTING DETAILS

BILL OF REINFORCING STEEL

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are cut to out.
2. Lap splices for Bars 5B shall be a minimum of 2'-2".
3. The Contractor may use Welded Wire Reinforcement when approved by the Engineer. Welded Wire Reinforcement must consist of Deformed wire meeting the requirements of Specification Section 931.

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

bars 5A & 5B

bars U

Length as Required

Est. BARS U

(Within Flared End Treatments)

bars 5B

Concrete

Reinforcing Steel (w/ Bars 5V) Cantilever Footing

Reinforcing Steel (w/ Bars 5'B) T Footing

E-17

0.335

64.32

6.01

Est. BARS 5A & 5B

(Estimated Barrier Footing Quantities)

ITEM
Concrete
Reinforcing Steel (w/ Bars 5V) Cantilever Footing
Reinforcing Steel (w/ Bars 5'B) T Footing

UNIT
CY/FT
LB/FT
LB/FT

QUANTITY
0.335
64.32
6.01

NOTES:
1. Provide 3" lip when optional construction joint is used. Omits 3" lip adjacent to Barrier Wall Inlets and as required to provide 2" min. clear between Cantilever Footing and adjacent Pier Footing or Column.
2. See Sheets 7 & 8 for Barrier Details.
Field bend and shift Bars 5B in Crash Wall Footing to lap 2'-0" min. with Bar 5B in Barrier Footing (Typ.).

Field cut, rotate and shift Bars 5A & 5B in Footings as shown (Typ.).

Field bend Bars 5B in Crash Wall to extend 2'-0" min. into PPB (Typ.).

Barrier Gutter Line

 Barrier Footing (Typ.)

Min. 2'-0" with Bars 5B in Crash Wall Footing to lap 2'-0" min. with Bar 5B in Barrier Footing (Typ.).

Barrier Footing (Typ.)

3" Lip (See Note 1)

Match Cross Slope of Shoulder

3" Cover (Top)

1" Cover (Top)

3" Cover (Bottom)

7'-0"

CRASH WALL & FOOTING DETAILS

VIEW G-G

PLAN VIEW

(Concrete Barrier Wall Continuation shown, Guardrail Continuation similar)
GENERAL NOTES

1. Pursuant to 35 United States Code, Chapter 18, also known as the Bayh Dole Act of 1980, the non-mountable curb was developed through federal funding. The 'Portable Temporary Low Profile Barrier For Roadside Safety' is a licensed design by the University Of Florida. Any infringement on the rights of the designer shall be the sole responsibility of the user.

2. This standard drawing (Index No. 412) is provided by the Florida Department of Transportation solely for use by the Department and its assignees. The purpose for this standard drawing is to indicate the approval of use of the barrier on the State Highway System; to provide sufficient pictorials for identifying the barrier unit; and, to provide general installation geometry for the barrier.

3. This legally mandated relationship is unique to federally funded university patents that Department contractors use on Contracts. Pursuant to federal law, the University may pursue royalties for a valid patent. Only those barrier units cast by producers licensed by the University Of Florida will be allowed for installation on the State highway System in Florida. Barrier wall units shall conform to Section 521 of the Standard Specification and shall be produced in Department-approved plants with quality control plans for precasting concrete barrier walls. Each barrier wall unit shall be permanently marked with an identification that is traceable to the manufacturer, the producing precast concrete plant and the date of production. This permanent identification mark will serve as certification that the unit has been manufactured in accordance with University of Florida drawings and specifications, and the approved quality control program.

4. The low profile barrier is to be installed only with hardware and accessories furnished by the licensed barrier producer. Units shall be used for no purpose other than as interconnected segments in a run of barrier. Low profile barrier wall units shall maintain firm contact with adjoining units. Nuts on tensioning rods shall be installed snug tight.

5. The low profile barrier is applicable for work zone speeds of 45 mph or less.

6. If the plans specify Low Profile Barrier then substitution with other barrier types is not permitted.

7. Tubular markers shall be orange in color and installed along the run of barrier at the ends and at 50 centers on tangents and 25 centers on radii. The markers shall be fixed to the top of the barrier by an adhesive or other method approved by the engineer. Approach end units shall be marked with a Type I object marker. The cost of the tubular markers and Type I object marker shall be included in the cost of the low profile barrier.

8. Information regarding licensing, shop drawings, specifications, quality control and certification of compliance can be obtained from the University Of Florida: Office of Technology Licensing, P.O. Box 115500, Gainesville, Florida, 32611-5500. Telephone: 352-392-8929, Fax: 352-392-6600. Reference UF#11052.

9. The Portable Temporary Low Profile Barrier For Roadside Safety shall be paid for under the contract unit price for Barrier Wall (Temporary) Low Profile Concrete, LF, and will be full compensation for furnishing, installing, maintaining, and removing barrier wall.

10. Deflection space shall be kept clear of any grass, construction debris, stockpiled materials, equipment, and objects.

BACKSIDE AND END PICTORIAL VIEWS

PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY
PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY

PLAN VIEWS OF CONNECTIONS

CONCAVE CONNECTION

PARALLEL CONNECTION

CONVEX CONNECTION

PLAN VIEW OF APPROACH END OFFSET

END VIEWS

DEFLECTION SPACE AT DROPOFFS

Notes:

LIMITATION OF USE: This installation technique can only be used on flexible or rigid pavement.

ASPHALT PAD: Where existing pavement is not present, construct 2" Asphalt Pad using miscellaneous asphalt pavement in accordance with Specification Section 339 with the exception that the use of a pre-emergent herbicide is not required. Payment for asphalt pad will be included in the cost of the barrier.

PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY
PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY

MAXIMUM CURVATURE ● MINIMUM RADIUS

CONVEX CURVATURE

CONCAVE CURVATURE

Inset A

Inset B

See Inset A

See Inset B
BARRIER OPENINGS AT DRIVEWAYS

PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY

* Trailing End Flares Are Not Required When Barrier Located Outside The Clear Zone Of Opposing Traffic
Type I Object Marker To Be Installed When Trailing End Flare Falls Within The Clear Zone Of Opposing Traffic

LEGEND
Type I Object Marker
Flare Falls Within The Clear Zone Of Opposing Traffic
Type I Object Marker To Be Installed When Trailing End Located Outside The Clear Zone Of Opposing Traffic

* Trailing End Flares Are Not Required When Barrier Located Outside The Clear Zone Of Opposing Traffic
Type I Object Marker To Be Installed When Trailing End Flare Falls Within The Clear Zone Of Opposing Traffic

LEGEND
Type I Object Marker

BARRIER OPENINGS AT DRIVEWAYS
PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY
The Type K Temporary Concrete Barrier System has been crash tested to NCHRP Report 350 TL-3 criteria or structurally evaluated to meet the requirements of NCHRP Report 350 TL-3 criteria for the installation configurations as shown utilizing the types, sizes, lengths, shapes, strengths and grades of the fabrication and installation materials as shown.

In order to maintain crashworthiness of the system, do not substitute different grades, sizes, shapes or types of reinforcing steel for those shown for constructing Type K Barrier Units. Also, do not substitute different type, size, length or material grade anchor bolts, nuts, washers, adhesives, connector pins, stakes, keeper pins, or guardrail components for installing Type K Barrier Units.

FABRICATION NOTES:

FABRICATOR PREQUALIFICATION: The Barrier Units shall be made in a prestressed concrete plant that meets the requirements of Specification Section 450 or in a precast plant meeting the requirements of Specification Section 325.

CONCRETE: Concrete shall be Class IV in accordance with Specification Section 346. Specification Sections 346-10.2 through 346-10.4 are not applicable. Barrier Units represented by concrete acceptance strength tests which fall below 5000 psi will be rejected.

REINFORCING STEEL: All reinforcing steel shall be ASTM A 615, Grade 60 except for Bars 6D1, 6D2 and 6D3. Bars 6D3 shall be ASTM A 706 except that a 2½ diameter pin must be used for the 180 degree bend test. After fabrication, all or part of Bars 6D shall be hot-dip galvanized in accordance with Specification Section 962 or coated with a cold galvanizing compound in accordance with Specification Section 975. The minimum limit of galvanizing or coating is shown in the Bending Diagrams. At the Fabricator's option, the entire length of Bars 6D may be galvanized or coated. Install Bars 6D within ⅜ of the plan dimensions. Correct placement of Bars 6D is critical for proper fit up and performance of individual Barrier Units.

As an option of the Fabricator, Deformed Welded Wire Fabric in accordance with Specification Section 931 and the details shown on Sheet 2 may be utilized in lieu of Bars 4A and 5B.

All dimensions in the Bending Diagrams are out to out. All reinforcing steel shall have a 2” minimum cover except as noted.

LIFTING SLEEVE ASSEMBLY: Inclusion of the Lifting Sleeve Assembly is optional. Steel for Pipe Sleeve shall be in accordance with ASTM A 52. Hot-dip galvanize the Lifting Sleeve Assemblies after their fabrication in accordance with the Specifications.

SURFACE FINISH: Construct Barrier Units in accordance with Specification Section 400 and 521. Finish the top and sides of the Barrier Units with a General Surface Finish. Finish the bottom of the Barrier Units to a dense uniform surface by floating in view of the General Surface Finish. Use stationary metal forms or stationary timber forms with a form liner.

MARKING: Permanently mark the top left end of each Barrier Unit by the use of an embedded and anchored metallic plate with letters and figures a minimum of 0.5” tall. Ink stamps are not allowed. Permanently mark with the following information:
- Type K1
- Fabricator's name or symbol
- Date of manufacture (day, month and year)

HANDLING: At no time shall the Barrier Units be lifted or moved by use of Bars 6D that extend from the ends of the units. Approximate weight of one unit equals 2.7 tons.

Alternate Designs: Manufacture/vendors seeking approval of proprietary Temporary Barrier Systems for inclusion on the Approved Products List (APL) as alternative designs shall submit a Product Application package. The application package shall include manufacturer's product drawings, specifications, installation manual, National Cooperative Highway Research Program (NCHRP) Report 350 or Manual for Assessing Safety Hardware (MASH) Test Level 3 (TL-3) crash test documentation and the FHWA "Letter of Acceptance."

The posted APL drawings will need to include the following:
1. Anchorage, bolting, and staking details for connections to asphalt and concrete pavement.
2. Sections and tables showing required deflection space and minimum offsets to above ground hazards or drop-offs.
3. Alignment and length of need details.
4. Transition and overlap details.
5. End treatment details.
**Type K Temporary Concrete Barrier System**

**Concrete Barrier Quantities**

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<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>218</td>
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**Note:** The above quantities are for one Barrier Unit.

**Cross References:**

For Section A-A, Section B-B and Section C-C see Sheet 3.

**Estimated Temporary Concrete Barrier Quantities**

**Revision:** 07/01/07

**Last Revised:** 07/01/07

**Design Standards:**

**2016**

**Section D-D**

(Reinforcement not shown for clarity)

*Measured from end of Barrier Unit to outside edge of Bars 60.

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**Anchor Blockout Detail**

**Plan View**

**Elevation View**

**Lifting Sleeve Assembly Detail (Optional)**

**ANZindrical View**

**Section Thru Lift/Drain Slot**
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NUMBER</th>
<th>LENGTH</th>
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<tr>
<td>A1</td>
<td>4</td>
<td>10</td>
<td>6'-3&quot;</td>
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<tr>
<td>A2</td>
<td>4</td>
<td>2</td>
<td>5'-5&quot;</td>
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<tr>
<td>B</td>
<td>5</td>
<td>3</td>
<td>12'-3&quot; (Straight)</td>
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<tr>
<td>C</td>
<td>6</td>
<td>6</td>
<td>3'-1&quot;</td>
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<tr>
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<td>2</td>
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<td>2'-0&quot;</td>
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</tbody>
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NOTE:
Provide 1/4" Chamfer at top and bottom corners of Barrier.

NOTE:
Provide 1/4" Chamfer at top and bottom corners of Barrier.

No. 4 Drain Bar over drain slots (Conventional Steel), placed with D 19.7 except over drain slots.

No. 4 Drain Bar over drain slots (Conventional Steel), placed with D 19.7 to clear drain slots by 2".

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NOTES FOR ALL INSTALLATIONS:

1. LIMITATION OF USE: This Temporary Concrete Barrier System is intended for work zone traffic control and other temporary applications. It shall not be used for permanent traffic railing construction unless specifically permitted by the Plans. Exception: For the Back Filled Roadway Installations, the Barrier Units must be installed on top of rigid pavement (concrete) surface as shown from a cross slope of 1:10 or flatter. Exception as shown for transition installations, Type K Barrier Units are not intended to be bolted down or staked down in locations where they can be impacted from the back side.

2. HANDLING: At no time shall the Barrier Units be lifted or moved by use of Bars 6D that extend from the ends of the units. Approximate weight of one unit equals 27 tons.

3. SURFACE PREPARATION: Except as shown for the Back Filled Roadway Installations, remove all grass, debris, loose dirt and sand from the pavement, bridge deck or asphalt pad surface within the Barrier footprint just prior to placement of the Barrier Units.

4. OFFSET TO TRAVELWAY: Offset shall meet requirements as shown on sheet 1 of Index 415.

5. CONNECTION PIN ASSEMBLY: Steel for Connection Pin and Top Plate assemblies shall be in accordance with ASTM A36 or ASTM A309 Grade 36. Nondestructive testing of welds shall not be required. At the Contractor’s option, a 3/8" diameter hole may be provided at the bottom of the Connection Pin, as shown, for the installation of a vandal resistance bolt.

6. CONNECTION PIN INSTALLATION: Initially set Barrier Units by using a 3/8" wooden block between ends of adjacent units. Install Connection Pin between adjacent Barrier Units as shown, then pull newly placed Barrier Unit away from adjacent Barrier Unit to remove slack between Connection Pin and Bars 6D (except as shown on Sheet 3). Barrier Units shall not be used unconnected.

7. DETAILING: Mount Barrier Delineators on top of Barrier Units that are used as traffic barriers along travel ways in work zones. Space the Barrier Delineators at 50 centers in alignment transitions, 100 centers on horizontal curves and 200 centers on tangent alignments.

8. MAINTENANCE: Deflection space shall be kept clear of any grass, construction debris, stockpiled materials, equipment, and objects.

9. REUSE OF CONNECTION PINS: Connection pins may be reused if they have the structural integrity of new pins.

10. INSTALLATIONS ON CURVED ALIGNMENTS: The details presented in these Standards are shown for installations on tangent alignments. Details for horizontally curved alignments are similar.

11. TRANSITIONS: Transitions are required between freestanding, bolted down, staked down and back filled Type K Barrier installations, see Sheet 8 for transition requirements and details. Transitions are also required between installations of Type K Barrier and other types of temporary barrier, see Index No. 415 for transition requirements and details. Splices and transitions are required between installations of Type K Barrier and permanent Bridge or Roadway Traffic Railings, see Sheets 9 through 13 for transition requirements and details. Transitions are required between installations of Type K Barrier and Proprietary (APL) Barrier Systems, see Sheets 14 and 15 for transition requirements and details.

12. PAYMENT: Barrier Units for work zone traffic control and other temporary applications shall be paid for under the contract unit price for Barrier Wall (Temporary) (F&I) (Type K), LF. Any relocation of the Barrier Units required for the project shall be paid for under the contract unit price for Barrier Wall (Temporary) (F&I) (Type K), LF. The Contractor shall furnish Barrier Units except when the Plans stipulate the availability of Department owned units. Regardless of unit source the Contractor shall furnish all hardware and shall be responsible for all handling including loading, transporting, unloading, stockpiling, installation, removal and return. Unless otherwise noted on the Plans, the Barrier Units shall become the property of the Contractor and shall be removed from the site prior to acceptance of the completed project.

NOTES FOR THREE BEAM GUARDRAIL SPlice INSTALLATIONS:

1. THREE-BEAM GUARDRAIL: Provide Three-Beam Guardrail for splices in accordance with AASHTO M 180, Type II (Zinc coated) and as follows:

   a. Two panels per splice (one panel per side) of Class B (10 Gauge), or
   b. Four panels per splice (two nested panels per side) of Class A (12 Gauge)

   Guardrail panel length shall be 12’-6”. Provide and install all other associated metallic guardrail components (Terminal Connectors, Shoulder Bolts, Hex Bolts and Nuts, Filter Plates, etc.) in accordance with Index No. 410. Install Guardrail Anchor Bolts at each end of each splice in any of the standard seven anchor bolt holes in the Three-Beam Terminal Connector. If reinforcing steel is encountered when drilling holes for Guardrail Anchor Bolts in Type K Barrier Units, shift Three-Beam Terminal Connector so as to clear reinforcing steel within the given tolerances or select a different bolt hole to use. Do not drill or cut through reinforcing steel within Type K Barrier Units. Drilling or cutting through reinforcing steel within permanent concrete traffic railings is permitted. Do not drill or cut through utilities or conduits within permanent concrete traffic railings.

2. GUARDRAIL OFFSET BLOCKS: Provide and install timber Offset Blocks meeting the material requirements of Index No. 400. Field trim Offset Blocks as required for proper fit. Utilize Offset Blocks as shown and required in order to prevent bending or kinking of Three-Beam Guardrail panels.

3. FILLING TAPERED TRAFFIC RAILING TOES: Provide concrete for filling tapered toes of Traffic Railings as shown meeting the material requirements of Specification Section 346, any Class, or a commercially available prebagged concrete mix (3000 psi minimum compressive strength). Sampling, testing, evaluation and certification of the concrete in accordance with Specification Section 346 is not required. Saturate with water the surfaces upon and against which the concrete fill will be placed prior to placing concrete. Place aggregate around the perimeter to the general configurations shown as to provide a smooth shape transition between the Type K Barrier and the adjacent traffic railing. A low slump is desirable if placing and finishing concrete by hand methods. Cure the concrete fill by application of a curing compound, or by covering with a wet tarp or burlap for a minimum of 24 hours. Completely remove the concrete fill upon relocation or removal of the Type K Temporary Concrete Barrier.
BOLTED DOWN BRIDGE, APPROACH SLAB, ROADWAY AND TRANSITION INSTALLATIONS

NOTES FOR BOLTED DOWN BRIDGE, APPROACH SLAB, ROADWAY AND TRANSITION INSTALLATIONS:

LIMITATION OF USE: This installation technique can only be used on rigid pavement and concrete bridge decks as shown. Barrier Units shall not be bolted down on bridge superstructures that contain post-tensioned tendons within the concrete deck (top flange of concrete box girders) or on bridge superstructures consisting of longitudinally prestressed, transversely post-tensioned, solid or voided concrete slab units. Anchor Bolts must not be installed on both sides of the Barrier Units. Do not bolt down Barrier Units across bridge finger joints or modular expansion joints.

ANCHOR BOLTS, NUTS AND WASHERS: Adhesive-Bonded Anchor Bolts shall be fully threaded rods in accordance with ASTM F 1554 Grade 36. Anchor Bolts for through bolting shall be in accordance with ASTM A 36 or ASTM A 709 Grade 36. Nuts shall be in accordance with ASTM A 563 or ASTM A 194. Flat Washers shall be in accordance with ASTM F 436 and Plate Washers shall be in accordance with ASTM A 563 or ASTM A 194.

Install three (3) Anchor Bolts per Barrier Unit on the traffic side of the Barrier Units as shown, except for Transition Installations. For the number and positions of Anchor Bolts required in Transition Installations see Sheets 8 and 9 and Index No. 419. Drilling through deck reinforcing steel to install Anchor Bolts is permitted. Unless otherwise shown in the Plans, at the Contractor’s option Barrier Units may be installed by through bolting (where geometrically possible) or by the use of Adhesive-Bonded Anchor Bolts. Do not drill into or otherwise damage the tops of supporting beams or girders, bridge deck expansion joints or drains. Install Anchor Bolts and Nuts so that the maximum extension beyond the face of the Barrier Units is 1/16”. Slight tighten the nuts on the Anchor Bolts. For through bolted installations, snug tighten the double Nuts on the underside of the deck against each other to minimize the possibility for loosening.

Attach one (1) Anchor Bolt within a single Barrier Unit if a conflict exists between the Anchor Bolt location and a bridge deck expansion joint or drain. The adjacent Barrier Units must each be installed with the standard three (3) Anchor Bolts.

Attach one (1) Anchor Bolt within a single Barrier Unit as shown in the Treatment at Bridge Deck Expansion Joint Schematic if the Barrier Unit straddles a bridge deck expansion joint. The adjacent Barrier Units must each be installed with the standard three (3) Anchor Bolts.

ADHESIVE-BONDING MATERIAL SYSTEMS: Adhesive Bonding Material Systems for Anchor Bolts shall be Type IIA in accordance with Specification Section 937 and shall be installed in accordance with Specification Section 416. Prior to installation of the Barrier Units in the Plan location(s), install a demonstration Barrier Unit using the proposed production installation method, at a location approved by the Engineer. In lieu of the production test requirements of Specification Section 416-6, install six (6) Adhesive-Bonded Anchor Bolts in the demonstration Barrier Unit and test each Anchor Bolt with a 25,000 pound tensile proof load. Install and test additional demonstration Barrier Units when requested by the Engineer. Remove the demonstration Barrier Unit prior to testing the Anchor Bolts. Remove the test Anchor Bolts after testing as directed by the Engineer.

REMOVAL OF ANCHOR BOLTS: Upon removal or relocation of Barrier Units, remove all Anchor Bolts and completely fill the remaining holes in bridge decks, approach slabs and roadway rigid pavements that are to remain with Magnesium Ammonium Phosphate Concrete in accordance with Specification Section 930 or with an Epoxy Resin Compound, Type F or G, in accordance with Specification Section 906. If a flexible pavement overlay is present and is to remain, completely fill the remaining holes in the flexible pavement with hot or cold patch asphalt material.

TREATMENT AT BRIDGE DECK EXPANSION JOINT SCHEMATIC

* To accommodate movement at Expansion Joint, set Barrier Units with 1/16” gap at locations shown.
NOTES FOR STAKED DOWN ROADWAY AND TRANSITION INSTALLATIONS:

LIMITATION OF USE: This installation technique can only be used on flexible pavement or an Asphalt Pad as shown. Stakes must not be installed on both sides of the Barrier Units.

ASPHALT PAD: Where existing flexible pavement is not present, construct the Asphalt Pad using Flexible Pavement in accordance with Specification Section 339 with the exception that the use of a pre-emergent herbicide is not required. Payment for the asphalt pad will be included in the cost of the barrier.

STAKES: Provide steel for Stake assemblies in accordance with ASTM A 36 or ASTM A 709 Grade 36. All welding shall be in accordance with the American Welding Society Structural Welding Code (Steel) AWS D1.1 (current edition). Weld metal shall be E6010 or E7010. Nondestructive testing of welds is not required.

Install three (3) Stakes on the traffic side of the Barrier Units as shown, except for Transition Installations. For the number and positions of stakes required in Transition Installations see Sheets 4, 5 and 6 and Index No. 415. Install Stakes so that the Stop Plate is snug against the bottom of the Anchor Blockout.

BURIED UTILITIES: Prior to installation of Stakes verify locations of all adjacent buried utilities, drainage structures, pipes, etc. If conflicts between Stake locations and buried elements exist, a maximum of two (2) Stakes within a single Barrier Unit may be omitted if the adjacent Barrier Units are installed with the standard three (3) Stakes.

REMOVAL OF STAKES: Upon removal or relocation of Barrier Units, completely remove all Stakes and completely fill the remaining holes in flexible pavement that is to remain with hot or cold patch asphalt material.

REUSE OF STAKES: Stakes may be reused if they have the structural integrity of new stakes.

NOTES FOR FREE STANDING BRIDGE OR APPROACH SLAB INSTALLATIONS:

KEEPER PINS: Keeper Pins shall be 1\(\frac{1}{8}\) inch diameter, smooth steel bar in accordance with ASTM A 36 or ASTM A 709 Grade 36. As directed by the Engineer in order to limit vibration induced translation of the Barrier Units, install one (1) Keeper Pin per Barrier Unit on the traffic side of the Barrier Units as shown. Do not drill into or otherwise damage bridge deck expansion joints or drains.

REMOVAL OF KEEPER PINS: Upon removal or relocation of Barrier Units, remove all Keeper Pins and completely fill the remaining holes in bridge decks and approach slabs that are to remain with Magnesium Ammonium Phosphate Concrete in accordance with Specification Section 930 or with an Epoxy Resin Compound, Type F or Q, in accordance with Specification Section 926. If a flexible pavement overlay is present and is to remain, completely fill the remaining holes in the flexible pavement with hot or cold patch asphalt material.

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FREESTANDING BRIDGE OR APPROACH SLAB INSTALLATIONS

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FREESTANDING ROADWAY INSTALLATION

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TYPE K TEMPORARY CONCRETE BARRIER SYSTEM

INDEX NO. 414

SHEET NO. 6 of 15
NOTES FOR FREESTANDING MEDIAN INSTALLATION:

KEEPER PINS: Required for Bridge Decks only. Keeper Pins shall be 3/8" diameter, smooth steel bar in accordance with ASTM A 36 or ASTM A 709 Grade 36. As directed by the Engineer in order to limit vibration induced translation of the Barrier Units, install one (1) Keeper Pin per Barrier Unit as shown. Alternate Keeper Pin locations from side to side of Barrier Units along the length of the installation. Do not drill into or otherwise damage bridge deck expansion joints or drains. Upon removal or relocation of Barrier Units, remove all Keeper Pins and completely fill the remaining holes in bridge decks and approach slabs that are to remain with Magnesium Ammonium Phosphate Concrete in accordance with Specification Section 930 or with an Epoxy Resin Compound, Type F or Q, in accordance with Specification Section 926. If a flexible pavement overlay is present and is to remain, completely fill the remaining holes in the flexible pavement with hot or cold patch asphalt material.

ASPHALT PAD: Where existing pavement is not present, construct the Asphalt Pad using Miscellaneous Asphalt Pavement in accordance with Specification Section 339 with the exception that the use of a pre-emergent herbicide is not required. No separate payment will be made for the Asphalt Pad.

FLOWABLE FILL BACK FILL ROADWAY INSTALLATIONS:

SOIL BACK FILLED ROADWAY INSTALLATIONS:

SOIL BACK FILL MATERIAL: Provide Back Fill Material consisting of any available clean soil. Compact Back Fill Material until the soil mass is firm and unyielding. Provide erosion control as specified in the Plans. If none is specified in the Plans, provide erosion control as required to maintain the integrity of the Back Fill embankment.

GEOTEXTILE FABRIC: Provide Type D-5 Geotextile Fabric in accordance with Specification Section 985 to contain Back Fill Material behind Barrier Units. Geotextile Fabric may be continuous over the length and height of the installation or may be individual pieces as required to cover the Lift / Drain Slots and open vertical joints between Barrier Units.

GENERAL:

Under Traffic on Both Sides

Traffic on One Side
**APPRAOCH TRANSITION FROM FREESTANDING TO BOLTED OR STAKED DOWN TYPE K TEMPORARY CONCRETE BARRIERS**

**APPRAOCH TRANSITION FROM FREESTANDING TO BACK FILLED TYPE K TEMPORARY CONCRETE BARRIERS**

**TRAILING END TRANSITION FROM BOLTED OR STAKED DOWN TO FREESTANDING TYPE K TEMPORARY CONCRETE BARRIERS**

**TRAILING END TRANSITION FROM BACK FILLED TO FREESTANDING TYPE K TEMPORARY CONCRETE BARRIERS**

*NOTE:*
Where Barrier is located within Clear Zone of opposing traffic, Approach Transition is required.
TRANSITION FROM FREESTANDING TYPE K TEMPORARY CONCRETE BARRIERS TO BRIDGE MEDIAN TRAFFIC RAILING OR ROADWAY MEDIAN CONCRETE BARRIER WALL

TRANSITION FROM FREESTANDING TYPE K TEMPORARY CONCRETE BARRIERS TO BRIDGE TRAFFIC RAILING OR ROADWAY CONCRETE BARRIER WALL

TRANSITION FROM BOLTED OR STAKED DOWN TYPE K TEMPORARY CONCRETE BARRIERS TO BRIDGE TRAFFIC RAILING OR ROADWAY CONCRETE BARRIER WALL

LEGEND:
* NOTE:
Where barrier is located within clear zone of opposing traffic, approach transition is required.

Details Sheets 10, 12 & 13
Details Sheets 10, 12 & 13
Details Sheets 11 thru 13
Details Sheets 11 thru 13
Details Sheets 10, 12 & 13
Details Sheets 10, 12 & 13
Details Sheets 10 & 13
Details Sheets 10 & 13

See Sheet 6 for dimensions
See Sheet 7 for dimensions
See Sheet 6 for dimensions

Drop-off or Hazard
Drop-off or Hazard

Edge of Travel Way
Edge of Travel Way
Edge of Travel Way

Bolted - 3/4" Nominal
Staked - 1'-0" Min

Bolted or Staked Units
Bolted or Staked Units

See Approach Transition Splice
Details Sheets 10, 12 & 13

See Approach Transition Splice
Details Sheets 10, 12 & 13

See Approach Transition Splice
Details Sheets 10, 12 & 13

See Approach Transition Splice
Details Sheets 10, 12 & 13

See Approach Transition Splice
Details Sheets 10, 12 & 13

Type K Barrier Units (Typ.)
Type K Barrier Units (Typ.)
Type K Barrier Units (Typ.)

Bridge Trafiic Railing or Roadway Concrete Barrier Wall
Bridge Trafiic Railing or Roadway Concrete Barrier Wall
Bridge Trafiic Railing or Roadway Concrete Barrier Wall

Third-Beam Guardrail Splice (Typ.)
Third-Beam Guardrail Splice (Typ.)
Third-Beam Guardrail Splice (Typ.)

Freestanding Units (13 Units Min.)
Freestanding Units (13 Units Min.)
Freestanding Units (13 Units Min.)

See Sheet 6 for dimensions
See Sheet 7 for dimensions

07/01/13
07/01/13
07/01/13

NOTE: Freestanding Units (13 Units Min.)

TRANSITION FROM BOLTED OR STAKED DOWN TYPE K TEMPORARY CONCRETE BARRIERS TO BRIDGE TRAFFIC RAILING OR ROADWAY CONCRETE BARRIER WALL

LEGEND:

Dot indicates number and position of Bolts or Stakes

07/01/13

2016 DESIGN STANDARDS

TYPE K TEMPORARY CONCRETE BARRIER SYSTEM

INDEX NO.
414

SHEET NO.
9 of 15
32" Florida Corral Traffic Railing (shown),
Bolted or Staked Down
Type K Barrier Units

32 & 42 Vertical Shape Traffic Railings (similar)

* See Thrie-Beam Guardrail Positioning Detail,
Sheet 13 and Notes for Thrie-Beam Guardrail
Splice Installations, Sheet 4.

PARTIAL PLAN VIEW - FLORIDA CORRAL TRAFFIC RAILING

PARTIAL ELEVATION VIEW - FLORIDA CORRAL TRAFFIC RAILING

FOR F AND NEW JERSEY SHAPE TRAFFIC RAILINGS AND 8’ & 14’
TRAFFIC RAILING / NOISE WALLS (CONCRETE BARRIER WALL SIMILAR)

PARTIAL ELEVATION VIEW

APPROACH TRANSITION SPLICE DETAIL

FOR F AND NEW JERSEY SHAPE TRAFFIC RAILINGS AND 8’ & 14’
TRAFFIC RAILING / NOISE WALLS (CONCRETE BARRIER WALL SIMILAR)

PARTIAL ELEVATION VIEW - VERTICAL SHAPE TRAFFIC RAILINGS

APPROACH TRANSITION SPLICE DETAIL

FOR FLORIDA CORRAL AND VERTICAL SHAPE TRAFFIC RAILINGS

* See Thrie-Beam Guardrail Positioning Detail,
Sheet 13 and Notes for Thrie-Beam Guardrail
Splice Installations, Sheet 4.

PARTIAL ELEVATION VIEW

32’ F Shape Traffic Railing (shown);
32’ New Jersey Shape and 42’ F Shape
Traffic Railings and 8’ & 14’ Traffic
Railing / Noise Walls (similar)

Bolted or Staked Down
Type K Barrier Units

PARTIAL PLAN VIEW AT MEDIAN TRAFFIC RAILING

Cross References:
See Sheet 13 for Section A-A,
Section B-B and Section C-C.

32’ F Shape Traffic Railing (shown);
32’ New Jersey Shape and 42’ F Shape
Traffic Railings and 8’ & 14’ Traffic
Railing / Noise Walls (similar)

Bolted or Staked Down
Type K Barrier Units

PARTIAL PLAN VIEW AT SHOULDER TRAFFIC RAILING

32’ F Shape Traffic Railing (shown);
32’ New Jersey Shape and 42’ F Shape
Traffic Railings and 8’ & 14’ Traffic
Railing / Noise Walls (similar)

Bolted or Staked Down
Type K Barrier Units

Fill tapered toe if present (shown hatched)
with concrete, see Note on Sheet 4

PARTIAL PLAN VIEW AT MEDIAN TRAFFIC RAILING

Fill tapered toe if present (shown hatched)
with concrete, see Note on Sheet 4

PARTIAL PLAN VIEW AT SHOULDER TRAFFIC RAILING

Bolted or Staked Down
Type K Barrier Units

Anchor Bolts or Stakes

Align Top of Type K Barrier Unit with Traffic Railing at its end

PARTIAL PLAN VIEW AT MEDIAN TRAFFIC RAILING

32’ F Shape Traffic Railing (shown);
32’ New Jersey Shape and 42’ F Shape
Traffic Railings and 8’ & 14’ Traffic
Railing / Noise Walls (similar)

Bolted or Staked Down
Type K Barrier Units

* See Thrie-Beam Guardrail Positioning Detail,
Sheet 13 and Notes for Thrie-Beam Guardrail
Splice Installations, Sheet 4.

PARTIAL PLAN VIEW - VERTICAL SHAPE TRAFFIC RAILINGS

APPROACH TRANSITION SPLICE DETAIL

FOR FLORIDA CORRAL AND VERTICAL SHAPE TRAFFIC RAILINGS

* See Thrie-Beam Guardrail Positioning Detail,
Sheet 13 and Notes for Thrie-Beam Guardrail
Splice Installations, Sheet 4.

PARTIAL PLAN VIEW

32’ Florida Corral Traffic Railing
Bolted or Staked Down
Type K Barrier Units

32’ & 42’ Vertical Shape Traffic Railings (similar)

* See Thrie-Beam Guardrail Positioning Detail,
Sheet 13 and Notes for Thrie-Beam Guardrail
Splice Installations, Sheet 4.

PARTIAL PLAN VIEW

PARTIAL ELEVATION VIEW

32’ Florida Corral Traffic Railing
Bolted or Staked Down
Type K Barrier Units

32’ & 42’ Vertical Shape Traffic Railings (similar)

* See Thrie-Beam Guardrail Positioning Detail,
Sheet 13 and Notes for Thrie-Beam Guardrail
Splice Installations, Sheet 4.

PARTIAL ELEVATION VIEW

PARTIAL ELEVATION VIEW

PARTIAL ELEVATION VIEW - VERTICAL SHAPE TRAFFIC RAILINGS

APPROACH TRANSITION SPLICE DETAIL

FOR FLORIDA CORRAL AND VERTICAL SHAPE TRAFFIC RAILINGS
**TYPE K TEMPORARY CONCRETE BARRIER SYSTEM**

**DESCRIPTION:**

Freestanding Type K Barrier Units shown; Bolted or Staked Units similar. See Plans for specific requirements.

**PARTIAL PLAN VIEW**

* See Thrie-Beam Guardrail Splice Installations, Sheet 4.

Freestanding Type K Barrier Units shown; Bolted or Staked Units similar. See Plans for specific requirements.

**PARTIAL ELEVATION VIEW**

Cross References: See Sheet 13 for Section A-A, Section B-B and Section C-C.

**TRAILING END SPLICE DETAIL**

FOR F AND NEW JERSEY SHAPE TRAFFIC RAILINGS

AND 8' & 14' TRAFFIC RAILING / NOISE WALLS

**PARTIAL PLAN VIEW**

Limits of concrete fill

**PARTIAL ELEVATION VIEW**

Cross References: See Sheet 13 for Section A-A, Section B-B and Section C-C.

**TRAILING END SPLICE DETAIL**

FOR FLORIDA CORRAL AND VERTICAL SHAPE TRAFFIC RAILINGS
Type K Temporary Concrete Barrier System

Design Standards

Revision 07/01/07

Description: For 32" F and New Jersey Shape Traffic Railings with Railing Transition and End Post

Cross References: See Sheet 13 for Section B-B, Section C-C and Section D-D.
Median Concrete Barrier Wall (similar)

32" F Shape Median Traffic Railing (shown), 32" New Jersey Shape Traffic Railing (shown), 32" Florida Corral Traffic Railing (shown), 32" & 42" Vertical Shape Traffic Railing (shown), or Filler Plate

Offset Block or Filler Plate

Thrie-Beam Guardrail Splice

Type K Barrier Unit

Anchor Bolt or Stake required for Approach Transition

Open Joint

Traffic Railing

Offset Block

Terminating Connector (Typ.)

Traffic Railing

Offset Block or Filler Plate

Thrie-Beam Guardrail Splice

Type K Barrier Unit

Riding Surface

Bridge Traffic Railing or Roadway Concrete Barrier Wall

THRIE-BEAM GUARDRAIL POSITIONING DETAIL

* Shift Thrie-Beam Guardrail Splice beyond Open Joint 3'-0" Min. (as shown), when 3' Min. dimension can not be obtained

* 1'-0" ± 1'

Varies 3/-2" Min., 1'-0" Max.

Varies 9/-5" Min., 9'-7" Max.

Varies 7'-8" Min., 4'-10" Max.

Varies 2'-11" Min., 4'-10" Max.

* 3" Min.

Open Joint

Tapered toe (shown hatched) with concrete on trailing Ends only

Fill tapered toe (shown) when 3" Min. dimension can not be obtained

See Notes, Sheet 4
**APPROACH TRANSITION FROM FREESTANDING PROPRIETARY TEMPORARY BARRIERS TO BOLTED OR STAKED DOWN TYPE K TEMPORARY CONCRETE BARRIERS**

---

**LEGEND:**

- Edge of Travel Way
- Freestanding Proprietary Barrier Units
- Fully Bolted or Staked Type K Barrier Units
- Type K-Proprietary Barrier Transition Unit A or B (See APL)
- Transition Section from Freestanding to Bolted or Staked Barrier Units

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**TRAILING END TRANSITION FROM BOLTED OR STAKED DOWN TYPE K TEMPORARY CONCRETE BARRIERS TO FREESTANDING PROPRIETARY TEMPORARY BARRIERS**

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**APPROACH AND TRAILING END TRANSITIONS FROM FREESTANDING TYPE K TEMPORARY CONCRETE BARRIERS TO FREESTANDING PROPRIETARY TEMPORARY BARRIERS**

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**TYPE K-PROPRIETARY TEMPORARY CONCRETE BARRIER TRANSITIONS**
**Approach Transition** from Freestanding Proprietary Temporary Barriers to Back Filled Type K Temporary Concrete Barriers

**Trailing End Transition** from Back Filled Type K Temporary Concrete Barriers to Freestanding Proprietary Barriers

**Median Approach and Trailing End Transitions** from Freestanding Type K Temporary Concrete Barriers to Freestanding Proprietary Temporary Barriers

**Type K-Proprietary Temporary Concrete Barrier Transitions**
GENERAL NOTES

1. Temporary concrete barrier systems on roadways may be any of the following:
   a. The FDOT Type K Temporary Concrete Barrier system (Design Standard Index 414): F-Shape Units. For temporary concrete barrier systems on bridges see Design Standard Index No. 414.
   b. Proprietary temporary concrete barrier systems meeting NCHRP Report 350 Test Level 3 criteria which are included on the Approved Products Unit.

2. Barrier units of dissimilar types may be interconnected within a single line barriers using transition units.

3. Alignment, length of need, anchorage and end treatment shall be in accordance with this Index.

4. Temporary concrete barrier units shown herein shall not be used for permanent barrier wall construction regardless of unit length.

5. If the plans specify Barrier (Temporary) (Type K), substitution with other barrier types is not permitted.

6. If the plans specify temporary concrete barrier system, substitution with water filled barriers is not permitted.

7. Where existing pavement is not present, construct an Asphalt Pad using Miscellaneous Asphalt Pavement. Cost of the Asphalt Pad to be included in the cost of the Barrier system.

8. Barrier Delineators meeting the requirements of Specifications Section 993 are to be mounted on top of temporary concrete barriers that are used as barriers along traveled ways in work zones. The barrier delineators are to be spaced at 50' centers in transitions, 100' centers on curves and 200' centers on tangent roadways. Color must match adjacent longitudinal pavement marking.

9. Barrier units used for work zone traffic control and other temporary applications shall be paid for under the contract unit price for Barrier (Temporary).

10. Deflection space shall be clear of any grass, construction debris, stockpiled materials, equipment, and objects.

11. Placing alternate temporary barrier systems with heights greater than 32 inches within the work zone may obstruct the clear sight distance at intersections and driveways. Prior to placing these barrier systems, the contractor shall submit a Certification Statement that the clear sight distance meets the requirements of Index 546, signed and sealed by a Florida Professional Engineer.

12. Minimum temporary concrete barriers installed per run shall be 16 units.

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<table>
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<tr>
<th>Offset and Deflection Space Requirements</th>
<th>Installation</th>
<th>Shielding</th>
<th>Work Zone Speed</th>
<th>Offset to</th>
<th>Deflection Space</th>
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<tbody>
<tr>
<td>Left or Right Shoulder</td>
<td>Above Ground Hazards</td>
<td>45 mph or Less</td>
<td>1' min., 2' preferred</td>
<td>2' min.</td>
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<tr>
<td></td>
<td></td>
<td>50 mph and Greater</td>
<td>2' min., 4' preferred</td>
<td>4' min.</td>
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<tr>
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<td>Drop-Off Hazards</td>
<td>45 mph or Less</td>
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<td>50 mph and Greater</td>
<td>4' min., 2' preferred</td>
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<tr>
<td>Separating Traffic</td>
<td>Adjacent Opposing Traffic</td>
<td>45 mph or Less</td>
<td>1' min., 2' preferred</td>
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<tr>
<td></td>
<td></td>
<td>50 mph and Greater</td>
<td>4' min., 2' preferred</td>
<td>4' min., 2' preferred</td>
<td></td>
</tr>
</tbody>
</table>

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OFFSET AND DEFLECTION SPACE REQUIREMENTS
The approach departure line location is determined by the line intersect with the back of the hazard or the area to be shielded, however the intersect offset distance is not to be beyond the clear zone limit. The trailing departure line is determined by the line intersect with the front of the downstream end of the hazard or the area to be shielded.

The length of barrier wall need is the distance from the approach departure line intersect with the upstream toe of the temporary concrete barrier wall to the trailing departure line intersect with the downstream toe of the temporary concrete barrier wall.

Where temporary concrete barrier wall Temporary concrete barrier wall end units shall be located at or outside the clear zone or shielded by other structure, earth embedment or a crash cushion.

Proprietary redirective crash cushions designed for use with temporary concrete barriers have the beginning length of need and departure line intersect point indicated on the respective APL drawing for each proprietary crash cushion. Where redirective crash cushions are located on the departure line by their length of need reference point, the wall upstream end unit must be aligned with the crash cushion, and the wall's end unit secured with bolts or stakes. See Sheets 3 through 6 for configurations requiring end unit anchorage.

The wall offset from the near traffic lane, wall flare rate and wall flare length are to be in conformance with the alignment called for in the plans and the alignments called for by Department Design Standards specified in the plans; in absence of either plan requirements, the offset shall be as determined by the Engineer; and, unless other flare rates are approved by the Engineer the flare rates to be applied are 1:10 or flatter for speeds ≤ 45 mph and 1:15 or flatter for speeds ≥ 50 mph; see Index No. 642 for other flare rates on freeway facilities.

The surface cross slope approaching the barrier wall and continuing across the required deflection space shall not exceed a rate of 1 vertical: 10 horizontal.
### CLEAR ZONE WIDTHS FOR WORK ZONES

The term 'clear zone' describes the unobstructed relatively flat area, impacted by construction, extending outward from the edge of the traffic lane. The table below gives clear zone widths in work zones for medians and roadside conditions other than for roadside canals; where roadside canals are present, clear zone widths are to conform with the distances to canals as described in Volume I, Chapter 4, Section 4.2 and Exhibit 4-A and 4-B of the Plans Preparation Manual.

<table>
<thead>
<tr>
<th>WORK ZONE SPEED</th>
<th>TRAVEL LANES &amp; MULTILANE RAMPS (feet)</th>
<th>AUXILIARY LANES &amp; SINGLE LANE RAMPS (feet)</th>
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<tbody>
<tr>
<td>60-70</td>
<td>30</td>
<td>18</td>
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<tr>
<td>55</td>
<td>24</td>
<td>14</td>
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<td>45-50</td>
<td>18</td>
<td>10</td>
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<td>30-40</td>
<td>16</td>
<td>10</td>
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<tr>
<td>ALL SPEEDS</td>
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<td>10</td>
</tr>
<tr>
<td>CURB &amp; GUTTER</td>
<td>4 BEHIND FACE OF CURB</td>
<td></td>
</tr>
<tr>
<td>4 BEHIND FACE OF CURB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Equation Variables:**

- \( L \) (Length of Need) = The distance a longitudinal barrier must be extended in advance of an area of concern in order to adequately shield the hazard.
- \( X \) (Length of Advancement) = The distance a longitudinal barrier must be extended in advance of an area of concern in order to adequately shield the hazard.
- \( D(RA), D(LA) \) = Distance in feet from the near edge of the travel way to the back of the hazard or the clear zone limit, whichever is less.
- \( X=(Length \ of \ advancement) = \) Distance a longitudinal barrier must be extended in advance of an area of concern in order to adequately shield the hazard.

**Departure Rates:**

- 1.16 For Speeds < 45 mph
- 1.13 For Speeds ≥ 45 mph

**Legends:**

- **Legend:**
  - **IA:** Left Approach
  - **RA:** Right Approach
  - **Departure Rates:**
    - 1.16 For Speeds < 45 mph
    - 1.13 For Speeds ≥ 45 mph
  - **Area Shielded When Work Zone Hazards Or The Work Area Extend To Or Beyond Clear Zone Limit**
  - **Dot Indicates Number And Position Of Bolts Or Stakes**

**Straight Alignment and Length of Need**

- Point at which a barrier intersects the departure line establishes the beginning of both the Length of Need and the Length of Advancement.
* Flare rates to be applied are 1:10 or flatter for speeds ≤ 45 mph and 1:15 or flatter for speeds ≥ 50 mph

MEDIAN HAZARDS WITHIN CLEAR ZONES BOTH ROADWAYS

MEDIAN HAZARDS EXTENDS TO OR BEYOND CLEAR ZONES BOTH ROADWAYS

LEGEND

- Dot indicates number and position of bolts or stakes

BARRIER END UNIT ANCHORAGE
**TEMPORARY CONCRETE BARRIER**

**DESCRIPTION:**

**45 MPH OR LESS**

- **Approach Shoulder Barrier on Undivided Facilities**
  - Free Standing Units (Type K or Approved Proprietary Unit)
  - Transition Units
  - Fixed Units

**50 MPH OR GREATER**

- **Approach Shoulder Barrier on Divided Facilities**
  - Free Standing Units (Type K or Approved Proprietary Unit)
  - Transition Units
  - Fixed Units

**Interior Median Barrier**

- Continuation of barrier • from other type barriers to barrier Type K

**LEGEND**

- Dot indicates number and position of bolts or stakes

**Crash Cushion**

- Transition Unit

**Position of Bolts Or Stakes**

- Dot indicates number and position of bolts or stakes

**Design Standards**

- 2016

**Revision**

- 07/01/12

**Index No.**

- 415
DEPARTURE (TRAILING) SHOULDER BARRIER ON UNDIVIDED FACILITIES

CONTINUATION OF BARRIER • FROM BARRIER TYPE K TO OTHER TYPE BARRIERS

BARRIER TYPE K ON BRIDGES AND APPROACH SLABS

LEGEND

Dot Indicates Number And
Position Of Bolts Or Stakes

DEPARTURE (TRAILING) SHOULDER BARRIER ON DIVIDED FACILITIES

45 MPH OR LESS

50 MPH OR GREATER

Overlap Reference Line
NOTES FOR WALL END SHIELDING

1. Redirective crash cushions are the principal (standard) device to be used for shielding approach ends of temporary concrete barrier walls. The contractor has the option to construct any of the redirective crash cushions listed on the Approved Products List at “102 Temporary Crash Cushion”, subject to the uses and limitations described on their respective drawings. The barrier wall four end unit abutting crash cushions must be anchored to a paved surface using anchors/stakes in accordance with Standard Index 414.

2. Temporary redirective crash cushions shall be installed in accordance with the manufacturer’s specifications and recommendations. Temporary crash cushions can be either new or functionally sound used devices. Performance of intended function is the only condition for acceptance, whether the crash cushion is new, used, refurbished, purchased, leased, rented, on loan, shared between projects, or made up of mixed new and used components.

3. Temporary Crash Cushions shall not be bolted down on bridge superstructures that contain post-tensioned tendons within the concrete deck (top flange of concrete box girders) or on bridge superstructures consisting of longitudinally prestressed, transversely post-tensioned, solid or voided concrete slab units. Gating crash cushions shall be used where bolting is not allowed.

4. Assemble and install Crash Cushions according to the limitations noted on the Approved Products List (APL) webpage, the manufacturer’s specifications, and the applicable crash cushion drawings posted on the APL.

5. Optional temporary redirective crash cushions are to be paid for per locations under the contract unit price for Crash Cushion (Redirective Option) (Temporary), LO.

6. A yellow Type I Object Marker shall be centered 3’ in front of the crash cushion nose. Mounting hardware shall be in conformance with Section 993 of the Standard Specifications for Road and Bridge Construction.

As an option, the contractor may install reflective sheeting on the nose of the crash cushion. The sheeting to be used must be solid yellow, Type III or better and must be a product listed on the Department’s Approved Products List (APL). The sheeting to be applied to the nose of the crash cushion shall be a minimum of 360 square inches with a minimum height of 15 inches.

7. Equipment, stockpile material, etc., shall not be placed behind the crash cushion.

8. When subjected to reverse direction hits, construct Transition Panels from Concrete Barrier Walls to Crash Cushions; for additional details refer to the applicable crash cushion drawings on the APL.

9. Galvanize metallic components to meet the requirements for Steel Guardrail, Section 967 of the Standard Specifications for Road and Bridge Construction.
TRAFFIC RAILING - (32" F SHAPE)

This railing has been structurally evaluated to be equivalent or greater in strength to other safety shape railings which have been crash tested to NCHRP Report 350 TL-4 Criteria.

CONCRETE AND REINFORCING STEEL: See Structures Plans General Notes.

GUARDRAIL: For Guardrail connection details see Index Nos. 400 and 410.

SUPERELEVATED BRIDGES: At the option of the Contractor the Traffic Railing on super-elevated bridges may be constructed perpendicular to the roadway surface. If an adjoining railing is constructed plum, transition the end of the Traffic Railing from perpendicular to plum over a minimum distance of 20'-0". The cost of all modifications will be at the Contractor's expense.

PEDESTRIAN AND BICYCLE RAILING: See Index Nos. 821 and 822 for Notes, Details and post spacings for Traffic Railings with Aluminum Pedestrian/Bicycle Bullet Railings.

V-GROOVES: Construct 1/2" V-Grooves plum. Space V-Grooves equally between 1/2" Open Joints and/or Deck joints and at V-Groove locations on Retaining Wall footings.

TRAFFIC RAILING NOTES

NAME, DATE AND BRIDGE NUMBER: The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be placed on the driver's left side when approaching the bridge. The Name shall be as shown in the General Notes in the Structures Plans. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and figures 3" in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by 1/2" V-Grooves. V-Grooves shall be formed by preformed letters and figures.

BARRIER DELINEATORS: Barrier Delineators shall meet Specification Section 993. Installing Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side at the spacing shown in the table above. Barrier Delineator color (white or yellow) shall match the color of the near edgeline. The cost of the Barrier Delineators shall be included in the Contract Unit Price for the Traffic Railing.

JOINTS: See Plans, Superstructure, Approach Slab and Retaining Walls Sheets for actual dimensions and joint orientation. Provide open Railing joints at Deck Expansion Joint locations matching the dimensions of the Deck Joint. For treatment of Railings on skewed bridges see Sheet No. 3. Provide 1/2 Intermediate Open Joints at:

1. Superstructure supports where slab is continuous.
2. Ends of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.

For Railing End Transition see Detail "A" (Typical except as noted below)

Edge of Approach Slab (Coping)

32'-0" Maximum

Spacing 1/2 V-Grooves (see Notes)

Deck Joint (see Notes)

Approach Three-Beam Guardrail Transition (When called for in Plans)

Joint (see Notes)

1/2 Intermediate Open Joint (see Notes)

1/2" V-Groove in both faces and top of Traffic Railing

The Cost of all modifications will be at the Contractor's expense.

For Superstructure supports where slab is continuous.

For treatment of Railings on skewed bridges see Sheet No. 3.

Provide 1/2 Intermediate Open Joints at:

1. End of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.

TRAFFIC RAILING - (32" F SHAPE)

INDEX NO.

420

SHEET NO.

1 of 4
This page contains details for traffic railing design, including sections and plans. It specifies the placement of bars, coping, and guardrail bolts, and provides notes for construction and placement. The diagram illustrates the railing end transition and typical section through traffic railing, showing the railing on approach slab and retaining walls. The text also includes a note to omit railing end transition and guardrail if Index 410 concrete barrier wall is used beyond the approach slab or retaining wall. The details include bar spacings, cover requirements, and construction joints.
NOTES:
1) Concrete Parapet reinforcement is not affected by skew angle, see Index No. 820 for details.
2) Parapet expansion joint shall match the deck expansion joint which shall be turned perpendicular or radial to the gutter line. See Structures Plans, Superstructure Sheets for details.
3) Traffic Railing reinforcement vertical Bars SV & SP may be shifted up to 1" (Max) and rotated up to 10 degrees as required to allow proper placement. Bars SV adjacent to expansion joints shall be field adjusted to maintain clearance and spacing, extra Bars SV will be required. Bars SV bottom horizontal portion shall be cut so as to maintain maximum bottom horizontal length of bar to each vertical leg being placed, the remainder of bar shall be discarded. Cut Bars SV may be rotated to maintain clearance.
4) Railing ends at deck expansion joints shall follow the deck joint with allowance for joint movement. Expansion joint at the inside face of parapet shall be turned perpendicular or radial to this line. See Structures Plans, Superstructure and Approach Slab Sheets for details.
5) $^\frac{3}{8}$ Intermediate Open Joints and $^\frac{1}{2}$ V-Grooves in railing and parapet shall be placed perpendicular or radial to the gutter line or inside face of parapet line. See Structures Plans, Superstructure Sheets for locations.
6) At begin or end approach slab extend slab at the railing ends $^\frac{3}{8}$ (gutter side or back face of railing as required) as shown to provide a base for casting of the railing.
7) Begin placing Railing Bars SP and SV on Approach Slab at the railing end and proceed toward Begin or End Bridge to ensure placement of guardrail bolt holes. If required, adjustments to the bar spacing for Bars SP and SV shall be made immediately adjacent to Begin or End Bridge.

PARTIAL PLAN VIEW OF SKEWED BRIDGE DECK AND APPROACH SLAB WITH SIDEWALK, F SHAPE TRAFFIC RAILING AND PEDESTRIAN/BICYCLE RAILING INDEX NO. 820, 825 or 826, OTHER TRAFFIC RAILINGS SIMILAR

GENERAL NOTES:
1) Work this Sheet with Traffic Railing, Pedestrian/Bicycle Railing, and Approach Slab Indexes as applicable.
2) Deck Expansion Joint at begin or end bridge shown. Deck Expansion Joints at $^\frac{1}{4}$ Pier or Intermediate Bents are similar.
3) Partial Plan Views shown are intended as guides only. See Structures Plans, Superstructure and Approach Slab Sheets for skew angles, joint orientation, dimensions and details.
4) Railings on Raised Sidewalks shall be treated similar to the Partial Plan View of Bridge Deck with Traffic Railing.
5) If Welded Wire Reinforcement is used in lieu of conventional reinforcement, placement of the WWR vertical elements shall be similar to those shown above. Clipping of horizontal elements to facilitate placement shall be minimized where possible. When clipping is required, supplement horizontal elements by lap splicing with deformed bars having an equivalent area of steel.
**WELDED WIRE REINFORCEMENT NOTES:**

1. At the option of the Contractor Welded Wire Reinforcement (WWR) may be utilized in lieu of all Bars 5P, 5S and 5V. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

2. WWR at Railing End Transition shall be field bent inward as required (Pieces 1 & 2) to maintain cover. The vertical wires (D30.7) in Piece 1 shall be cut as shown and the gutter side portion bent inward as required to allow placement.

3. The reinforcement for the railing on a retaining wall shall be the same as detailed above for a 8" deck with ØA = ØB = 90°.

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

5. Bars 5S may be continuous or spliced at the construction joints. Bar splices for Bars 5S for a 8" deck with ØA = ØB = 90° shall be a minimum of 2'-6".

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.
2. The ØA and the 2'-4" vertical dimensions shown for Bar 5V are based on a bridge deck without a raised sidewalk. If a raised sidewalk is to be provided, increase these dimensions to achieve a 6" minimum embedment into the bridge deck. See Structures Plans, Superstructure and Approach Slab Sheets.
3. The reinforcement for the railing on a retaining wall shall be the same as detailed above for a 8" deck with ØA = ØB = 90°.
4. All reinforcing steel at the open joints shall have a 2" minimum cover.
5. Bars 5S may be continuous or spliced at the construction joints. Bar splices for Bars 5S shall be a minimum of 2'-6".

**SECTION THRU RECESSED "V" GROOVE TO FORM INSCRIBED LETTERS AND FIGURES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/LF</td>
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<tr>
<td>Reinforcing Steel</td>
<td>LR/LF</td>
<td>27.12</td>
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(The above quantities are based on a 2% deck cross slope; railing on low side of deck.)

**ALTERNATE REINFORCING STEEL (WELDED WIRE REINFORCEMENT) DETAILS**

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

<table>
<thead>
<tr>
<th>ROADWAY CROSS-SLOPE</th>
<th>LOW GUTTER</th>
<th>HIGH GUTTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>0% to 2%</td>
<td>90°</td>
<td>90°</td>
</tr>
<tr>
<td>2% to 6%</td>
<td>87°</td>
<td>87°</td>
</tr>
<tr>
<td>6% to 10%</td>
<td>84°</td>
<td>84°</td>
</tr>
</tbody>
</table>

ØA and ØB shall be 90° if Contractor elects to place railing perpendicular to the deck and approach sides.

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
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</thead>
<tbody>
<tr>
<td>P</td>
<td>5</td>
<td>5'-7&quot;</td>
</tr>
<tr>
<td>S</td>
<td>5</td>
<td>As Req'd</td>
</tr>
<tr>
<td>V</td>
<td>5</td>
<td>5'-3&quot;</td>
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**ESTIMATED TRAFFIC RAILING QUANTITIES**

**TRAFFIC RAILING - (32' F SHAPE)**

**DETAILED "B" - SECTION AT INTERMEDIATE OPEN JOINT**

**INTERMEDIATE JOINT SEAL NOTES:**

1. At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Specification Section 932.
2. Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.
3. The cost of the Pre-cured Silicone Sealant shall be included in the Contract Unit Price for the Traffic Railing.

**PRE-CURED SILICONE SEALANT**

- Black Paint Recessed Surfaces

**DESIGN STANDARDS**

**DESIGN STANDARDS**

**TRAFFIC RAILING - (32' F SHAPE)**

**INDEX**

**SHEET NO.**

**DESCRIPTION:**

**LAST REVISION:** 07/01/13

**FOOT CORPORATION**
This railing has been structurally evaluated to be equivalent or greater in strength to other safety shape railings which have been crash tested to NCHRP Report 350 TL-4 criteria.

**CONCRETE AND REINFORCING STEEL**: See Structures Plans, General Notes.

**GUARDRAIL**: For Guardrail connection details see Index No. 400.

**SUPERELEVATED BRIDGES**: At the option of the Contractor the Traffic Railing on super-elevated bridges may be constructed perpendicular to the roadway surface. The cost of all modifications will be at the Contractor's expense.

**BARRIER DELINEATORS**: Barrier Delineators shall meet Specification Section 993. Install Barrier Delineators on top of the Traffic Railing along the centerline at the spacing shown in the table above. Barrier Delineator color (white or yellow) shall match the color of the near edgeline. The cost of the Barrier Delineators shall be included in the Contract Unit Price for the Traffic Railing.

For treatment of Railings on skewed bridges see Sheet No. 3.

**CROSS REFERENCE**: For Section A-A, View B-B and Detail "A" see Sheet 2. For Detail "B" see Sheet 4.
NOTE:
Begin placing Railing Bars 5R and 5W on Approach Slab at the railing end and proceed toward Begin or End Bridge to ensure placement of guardrail bolt holes. If required, adjustments to the bar spacing for Bars 5R and 5W shall be made immediately adjacent to Begin or End Bridge. Shift and rotate Bars 5R and 5W as required to maintain cover in Railing End Transition.

Omit Railing End Transition and Guardrail if Index 410 Concrete Barrier Wall is used beyond the Approach Slab. See Structures Plans, Plan and Elevation Sheet and Roadway Plans. If Railing End Transition is omitted, extend Typical Section to the end of Approach Slab and space Bars 5R and 5W at 1'-0" (Typ.)
PARTIAL PLAN VIEW OF BRIDGE DECK AND APPROACH SLAB WITH MEDIAN TRAFFIC RAILING

NOTES:
1) Median Traffic Railing reinforcement vertical bars SW may be shifted up to 1" (Max.) and rotated up to 10 degrees as required to allow proper placement.
2) Transition Stirrup Bars SW shall be used as required at railing ends adjacent to expansion joints to facilitate placement of bars in acute corners. Place Transition Bars SW in a fan pattern to maintain spacing. Rotate bars in 10° (Max.) increments as required.
3) Median Traffic Railing ends at deck expansion joints shall follow the deck joint with allowance for joint movement. See Structures Plans, Superstructure and Approach Slab Sheets for Details.
4) 3/8" Intermediate Open Joints and V-Grooves in railing shall be placed perpendicular or radial to the θ of the median railing. See Structures Plans, Superstructure and Approach Slab Sheets for locations.
5) At begin or end approach slab extend slab at the median railing ends 3" (open side) as shown to provide a base for casting of the railing.
6) Work this Sheet with Approach Slab Indexes as applicable.
7) Deck Expansion Joint at begin or end bridge shown. Deck Expansion Joints at θ Pier or Intermediate Bents are similar.
8) Partial Plan Views shown are intended as guides only. See Structures Plans, Superstructure and Approach Slab Sheets for skew angles, joint orientation, dimensions and details.
9) If Welded Wire Reinforcement is used in lieu of conventional reinforcement, placement of the WWR vertical elements shall be similar to those shown above. Clipping of horizontal elements to facilitate placement shall be minimized where possible. Where clipping is required, supplement horizontal elements by lap splicing deformed bars with an equivalent area of steel.
## Welded Wire Reinforcement (WWR)

**Piece No. 1**
- **D30.7** @ 1'-0" Ctrs.
- **Welded Wire Reinforcement Piece No. 1**
- 2" Cover (Top)
- 2" Min. Embedment

**Piece No. 2**
- **D30.7** (Lap Splice each longitudinal wire)
- **2" Min. Lap**

**Splice Detail** (Between WWR Sections)

1. At the option of the Contractor Welded Wire Reinforcement (WWR) may be utilized in lieu of all Bars 5R, 5S and 5W. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.
2. WWR at Railing End Transition shall be field bent inward as required (Pieces 1 & 2) to maintain cover. The top of Piece 1 shall be cut to allow overlap.
3. Place WWR panels so as to minimize the end overhang of longitudinal wires at Railing Ends and Open Joints. Overhangs greater than 6" are not permitted.

**Pre-cured Silicone Sealant** 4" wide (Typ.)

**Detail "B" - Section At Intermediate Open Joint**

### 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 5S may be continuous or spliced at the construction joints. Bar splices for Bars 5S shall be a minimum of 2'-0".
4. At the Contractor's option, Bars 5W may be fabricated as a two piece bar with a 1'-2" lap splice of the bottom legs.

### Welded Wire Reinforcement (WWR) Notes:
1. At the option of the Contractor Welded Wire Reinforcement (WWR) may be utilized in lieu of all Bars 5R, 5S and 5W. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.
2. WWR at Railing End Transition shall be field bent inward as required (Pieces 1 & 2) to maintain cover. The top of Piece 1 shall be cut to allow overlap.
3. Place WWR panels so as to minimize the end overhang of longitudinal wires at Railing Ends and Open Joints. Overhangs greater than 6" are not permitted.

### Estimation of Traffic Railing Quantities

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/LF</td>
<td>0.120</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LF/LF</td>
<td>33.25</td>
</tr>
</tbody>
</table>

(The above quantities are based on a crowned roadway, with a 2% cross slope)
### Approach Slab (Flexible Pavement Approach Slab Shown, Rigid Pavement Approach Slab Similar)

- **Front Face of Backwall & Begin or End Bridge**
- **Raised Sidewalk**
- **Deck Joint (see Notes)**
- **V-Groove in both Faces and top of Traffic Railing (Equally spaced between open joints)**

#### Raised Sidewalk

- **Joint (see Notes)**
- **See Detail "A" for Pre-cured Silicone Sealant**

#### Traffic Railing Notes

<table>
<thead>
<tr>
<th>Joint Type</th>
<th>Joint Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot; Open Joint</td>
<td>See Notes</td>
</tr>
<tr>
<td>1/2&quot; V-Groove in both Faces and top of Traffic Railing (Equally spaced between open joints)</td>
<td></td>
</tr>
</tbody>
</table>

#### V-Grooves

- **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 Deck Joints and at V-Groove locations on Retaining Wall footings.**

#### Barrier Delineators

- **Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side at the spacing shown in the table above. Barrier Delineator color (white or yellow) shall match the color of the near edgeline. The cost of the Barrier Delineators shall be included in the Contract Unit Price for the Traffic Railings.**

#### Elevation of Inside Face of Railing

(Reinforcing Steel not shown for clarity)

<table>
<thead>
<tr>
<th>Name or Date</th>
<th>Bridge Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME OR DATE</td>
<td>BRIDGE NUMBER</td>
</tr>
</tbody>
</table>

**Traffic Railing Notes**

- **This railing has been structurally evaluated to be equivalent or greater in strength to other safety shape railings which have been crash tested to NCHRP Report 350 TL-4 Criteria.**

**Concrete and Reinforcing Steel**

- See Structures Plans, General Notes.

**Guardrail**

- For Guardrail connection details, see Index No. 400.

**Railings on Retaining Walls**

- If the Traffic Railing is to be provided on a retaining wall, the railing section will be the same as shown on Index No. 422, Sheet 2. All other details such as the guardrail transition attachment, the maximum spacing of the 1/2" open joints and 1/2" V-Grooves shall apply.

**Barrier Delineators**

- Barrier Delineators shall meet Specification Section 993. Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side at the spacing shown in the table above. Barrier Delineator color (white or yellow) shall match the color of the near edgeline. The cost of the Barrier Delineators shall be included in the Contract Unit Price for the Traffic Railings.

**V-Grooves**

- 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 Deck Joints and at V-Groove locations on Retaining Wall footings.

**Joints**

- See Plans, Superstructure, Approach Slab and Retaining Walls Sheets for actual dimensions and joint orientation. Provide open Railing Joints at Deck Expansion Joint locations matching the dimensions of the Deck Joint. For treatment of Railings on skewed bridges see Index No. 420.

**Provide 1/2" Intermediate Open Joints at**

1. Superstructure supports where slab is continuous.
2. Ends of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.

**Barrier Delineator Spacing**

<table>
<thead>
<tr>
<th>Distance</th>
<th>Spacing (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge of Travel Lane to Face of Railing</td>
<td></td>
</tr>
<tr>
<td>&lt; 4</td>
<td>40&quot;</td>
</tr>
<tr>
<td>4 to 8'</td>
<td>80&quot;</td>
</tr>
<tr>
<td>&gt; than 8</td>
<td>None Required</td>
</tr>
</tbody>
</table>

**Approach Slab (Flexible Pavement Approach Slab Shown, Rigid Pavement Approach Slab Similar)**

**Approach Thrie-Beam Guardrail Transition on Approach Slab shown, Retaining Wall similar (When called for in Plans)**

**Coping (Typ.)**

- **Joint (see Notes)**
- **Gutter**

**Guardrail (When called for in Plans)**

- **Begin or End Approach Slab or Begin or End Railing on Retaining Wall**

**Joint**

- **3'-0" Taper (Typ.)**

**Spacing**

- **3"**
- **2"**
- **1'-3"**
- **2'-0"**

**Raising Sidewalk**

- **6" Min.**

**Deck Joint (see Notes)**

**Coping (Typ.)**

- **Joint (see Notes)**
- **See Details A, View B-B and View C-C, see Sheet 2.**

**Name, Date, and Bridge Number**

- The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be placed on the driver's left side when approaching the bridge. The Name shall be as shown in the General Notes in the Structures Plans. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and figures 3" in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by 1/2" V-Grooves. V-Grooves shall be formed by preformed letters and figures.

**Joint**

- See Plans, Superstructure, Approach Slab and Retaining Walls Sheets for actual dimensions and joint orientation. Provide open Railing Joints at Deck Expansion Joint locations matching the dimensions of the Deck Joint. For treatment of Railings on skewed bridges see Index No. 420.

**Provide 1/2" Intermediate Open Joints at**

1. Superstructure supports where slab is continuous.
2. Ends of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.

**Barrier Delineator Spacing**

<table>
<thead>
<tr>
<th>Distance</th>
<th>Spacing (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge of Travel Lane to Face of Railing</td>
<td></td>
</tr>
<tr>
<td>&lt; 4</td>
<td>40&quot;</td>
</tr>
<tr>
<td>4 to 8'</td>
<td>80&quot;</td>
</tr>
<tr>
<td>&gt; than 8</td>
<td>None Required</td>
</tr>
</tbody>
</table>

**Approach Thrie-Beam Guardrail Transition on Approach Slab shown, Retaining Wall similar (When called for in Plans)**

**Coping (Typ.)**

- **Joint (see Notes)**
- **Gutter**

**Guardrail (When called for in Plans)**

- **Begin or End Approach Slab or Begin or End Railing on Retaining Wall**

**Joint**

- **3'-0" Taper (Typ.)**

**Spacing**

- **3"**
- **2"**
- **1'-3"**
- **2'-0"**

**Raising Sidewalk**

- **6" Min.**

**Deck Joint (see Notes)**

**Coping (Typ.)**

- **Joint (see Notes)**
- **See Details A, View B-B and View C-C, see Sheet 2.**

**Name, Date, and Bridge Number**

- The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be placed on the driver's left side when approaching the bridge. The Name shall be as shown in the General Notes in the Structures Plans. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and figures 3" in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by 1/2" V-Grooves. V-Grooves shall be formed by preformed letters and figures.

**Joint**

- See Plans, Superstructure, Approach Slab and Retaining Walls Sheets for actual dimensions and joint orientation. Provide open Railing Joints at Deck Expansion Joint locations matching the dimensions of the Deck Joint. For treatment of Railings on skewed bridges see Index No. 420.

**Provide 1/2" Intermediate Open Joints at**

1. Superstructure supports where slab is continuous.
2. Ends of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.

**Barrier Delineator Spacing**

<table>
<thead>
<tr>
<th>Distance</th>
<th>Spacing (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge of Travel Lane to Face of Railing</td>
<td></td>
</tr>
<tr>
<td>&lt; 4</td>
<td>40&quot;</td>
</tr>
<tr>
<td>4 to 8'</td>
<td>80&quot;</td>
</tr>
<tr>
<td>&gt; than 8</td>
<td>None Required</td>
</tr>
</tbody>
</table>

**Approach Thrie-Beam Guardrail Transition on Approach Slab shown, Retaining Wall similar (When called for in Plans)**
Begin placing Railing Bars 5T and 5X on Approach Slab at the railing end and proceed toward Begin or End Bridge to ensure placement of guardrail bolt holes. If required, adjustments to the bar spacing for Bars 5T and 5X shall be made immediately adjacent to Begin or End Bridge. Shift and rotate Bars 5T and 5X as required to maintain cover in Railing End Transition.

Omit Railing Taper, End Transition and Guardrail if Concrete Barrier Wall is used beyond the Approach Slab or Retaining Wall. See Structures Plans, Plan and Elevation Sheet and Highway Plans. If Taper and Railing End Transition is omitted, extend Typical Section to end of the Approach Slab or limiting station on Retaining Wall, and space Bars 5T and 5X at 1'-0" (Typ.).

CROSS REFERENCE:
For location of Section A-A, View B-B and View C-C, see Sheet 1.
### Bill of Reinforcing Steel

<table>
<thead>
<tr>
<th>Mark</th>
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<tbody>
<tr>
<td>5</td>
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<td>As Req'd.</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>10'-8&quot;</td>
</tr>
<tr>
<td>x</td>
<td>5</td>
<td>6'-7&quot;</td>
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### roadway cross-slope

<table>
<thead>
<tr>
<th>Low Gutter</th>
<th>High Gutter</th>
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<tbody>
<tr>
<td>0% to 2%</td>
<td>90°</td>
</tr>
<tr>
<td>2% to 6%</td>
<td>87°</td>
</tr>
<tr>
<td>6% to 10%</td>
<td>84°</td>
</tr>
</tbody>
</table>

### Reinforcing Steel Notes:
1. All bar dimensions in the bending diagrams are out to out.
2. The 4'-6" vertical dimension shown for Bars 5T and 5X is based on a bridge deck with a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and a counter 2% raised sidewalk cross slope. If the raised sidewalk thickness, width or cross slope vary from the above amounts, adjust this dimension accordingly to achieve a 6" minimum embedment into the bridge deck. See Structures Plans, Superstructure and Approach Slab Sheets.
3. The reinforcement for the railing on a retaining wall shall be the same as detailed above with ØA = 90°.
4. All reinforcing steel at the open joints shall have a 2" minimum cover.
5. Bars 5S may be continuous or spliced at the construction joints. Bar splices for Bars 5S shall be a minimum of 2'-2".
6. The Contractor may utilize 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 Quantities

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
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</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/LF</td>
<td>0.68</td>
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</tbody>
</table>

(The above quantities are based on a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and counter 2% sidewalk cross slope.)
RAILINGS ON RETAINING WALLS: If the Traffic Railing is to be provided on a retaining wall, the railing section will be the same as shown on Sheet 2. All other details such as the guardrail transition attachment, the maximum spacing of the 1/2 open joints and 1/2 V-Groove shall apply.

NAME, DATE, AND BRIDGE NUMBER: The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be placed on the driver's left side when approaching the bridge. The Name shall be as shown in the General Notes of the Structures Plans. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and numbers in height may be used, as approved by the Engineer, in lieu of the letters and numbers formed by 1/2 V-Grooves. V-Grooves shall be formed by preformed letters and numbers.

CROSS REFERENCE: For Section A-A and View B-B, see Sheet 2. For Detail "A" see Sheet 3.

TRAFFIC RAILING - (32" VERTICAL SHAPE)
**DESCRIPTION:**

**TRAFFIC RAILING - (32' VERTICAL SHAPE)**

**INDEX NO.**

**SHEET NO.**

**NOTES:**

- Omit Railing End Taper and Guardrail if Concrete Barrier Wall is used beyond the Approach Slab. See Structures Plans, Plan and Elevation Sheet and Roadway Plans. If Railing End Taper is omitted, extend Typical Section to the end of the Approach Slab. Begin placing Railing Bars ST and SX at the Approach Slab at the end of the Approach Slab and proceed toward Begin or End Bridge to ensure placement of guardrail bolt holes. If required, adjustments to the bar spacing for Bars ST and SX shall be made immediately adjacent to Begin or End Bridge. Shift and rotate Bars ST and SX on Approach Slab in end taper section as required to maintain cover.

**CROSS REFERENCE:**

For location of Section A-A and View B-B see Sheet 1.

**NOTE:** For Post "B", Post "C" and Rail Details, see Index No. 822.
### CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
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<tbody>
<tr>
<td>S</td>
<td>5</td>
<td>As Req</td>
</tr>
<tr>
<td>T</td>
<td>5</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>X</td>
<td>5</td>
<td>5'-10&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ROADWAY CROSS-SLOPE</th>
<th>LOW GUTTER</th>
<th>HIGH GUTTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>0% to 2%</td>
<td>90°</td>
<td>90°</td>
</tr>
<tr>
<td>2% to 6%</td>
<td>87°</td>
<td>93°</td>
</tr>
<tr>
<td>6% to 10%</td>
<td>84°</td>
<td>96°</td>
</tr>
</tbody>
</table>

**REINFORCING STEEL NOTES:**
1. All bar dimensions in the bending diagrams are cut to cut.
2. The 3'-8" vertical dimensions shown for Bars ST and SX are based on a bridge deck with a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and a counter 2% raised sidewalk cross slope. If the raised sidewalk thickness, width or cross slopes vary from the above amounts, adjust these vertical dimensions accordingly to achieve a 6" minimum embedment into the bridge deck.
3. The reinforcement for the railing on a Retaining Wall shall be the same as detailed with ØA = 90°.
4. All reinforcing steel at the open joints shall have a 2" minimum cover.
5. Bars SS may be continuous or spliced at the construction joints. Bar splices for Bars SS shall be a minimum of 2'-2".
6. The Contractor may utilize 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 QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/CF</td>
<td>0.095</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/CF</td>
<td>25.90</td>
</tr>
</tbody>
</table>

(The above quantities are based on a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and counter 2% sidewalk cross slope.)
PLAN OF RAILING ON BRIDGE DECK (WITHOUT SIDEWALK SHOWN, WITH SIDEWALK SIMILAR) (Reinforcing Steel Not Shown For Clarity)

CONCRETE AND REINFORCING STEEL: See Structures Plans General Notes. AGGREGATE LIMITATION: The aggregate used in the concrete mix shall be a #67 aggregate.

GUARDRAIL: For Guardrail connection details see Index No. 400.

SUPERFLOATED BRIDGES: At the option of the Contractor the Traffic Railing on superfloated bridges may be constructed perpendicular to the roadway surface. The cost of all modifications will be at the Contractor's expense.

TRAFFIC RAILING NOTES:

RETAINING WALL: If the Traffic Railing Barrier is to be provided on a retaining wall, the railing sections will be the same as on Sheets 3 and 4. See Retaining Wall Plans for payment.

NAME, DATE AND BRIDGE NUMBER: The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver’s right side when approaching the bridge. The Name shall be as shown in the General Notes in the Structures Plans. The Date shall be placed on the driver’s left side when approaching the bridge. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and figures 3” in height may be used as approved by the Engineer, in lieu of the letters and figures formed by 3” V-Grooves. V-Grooves shall be formed by preformed letters and figures.

BARRIER DELINEATORS: Barrier Delineators shall meet Specification Section 993. Install Barrier Delineators on top of the Traffic Railing 2” from the face on the traffic side at the spacing shown in the table above. Barrier Delineator color (white or yellow) shall match the color of the near edgeline. The date of the Barrier Delineators shall be included in the Contract Unit Price for the Traffic Railing.

CROSS REFERENCES:

For Sections see Sheets 3 and 4. For Detail “D” see Sheet 3. For Quantities and Quantity Breakdown see Sheet 5.

ELEVATION OF INSIDE FACE OF RAILING (BRIDGE DECK SHOWN, APPROACH SLAB WITHOUT GUARDRAIL OR ADJACENT TO ROADWAY BARRIER SIMILAR)
PLAN OF RAILING WITH GUARDRAIL ON APPROACH SLAB WITHOUT SIDEWALK (APPROACH SLAB WITH ADJACENT SIDEWALK SIMILAR)  
(Reinforcing Steel Not Shown For Clarity)

**Begin placing Railing Bars 7P1 or 7P2 and 4V on Approach Slab at the barrier end and proceed toward Begin or End Bridge to ensure placement of guardrail bolt holes.** If required, adjustments to the bar spacing for Bars 7P1 or 7P2 and 4V shall be made immediately adjacent to Begin or End Bridge.

Bar Spacing

- Bars 4S1 @ 1'-4"; Bars 4V, 7P1 & 7P2 sp. @ 8"
- 2'-0" Gap (Field Cut)
- Field Cut Bar 6R1 8'-0" Long (Centered about Guardrail Bolt Connection)  
- Bars 6R1

**NOTE:** For curb details and reinforcement of Typical End Section, Typical Interior Section and Posts with or without curbs see "Elevation of Inside Face of Railing" Sheet 1.
Railing Adjacent to Sidewalk Notes:
1) End Post Detailed above, Interior Post and Approach Slab End Section similar.
2) For decks to 8'-6" place Bars 7P1 and 7P2 and 4V with the bottom mat of reinforcement as shown in Section A-A. For decks and slabs thicker than 8'-6" place Bars 7P1 and 7P2 and 4V with 6" embedment.
3) Alternate Bars 7P1 and 7P2 at each post. At End Posts 3 each (Min.) required, at Intermediate Post 6 each required.
4) Reverse direction of every other Bar 4V1 to match direction of Bars 7P1 or 7P2.
5) Shift deck and approach slab transverse reinforcement minimally to allow placement of Bars 7P & 4V.

Cross References:
For Locations of Sections see Sheets 1 and 2, For Quantities and Rebar Details see Sheet 5.
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
<th>LB/BAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>7</td>
<td>7'-4&quot;</td>
<td>15.00</td>
</tr>
<tr>
<td>P2</td>
<td>7</td>
<td>7'-3&quot;</td>
<td>14.82</td>
</tr>
<tr>
<td>P3</td>
<td>7</td>
<td>7'-2&quot;</td>
<td>14.65</td>
</tr>
<tr>
<td>*** P4</td>
<td>7</td>
<td>7'-3&quot;</td>
<td>14.82</td>
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<tr>
<td>* P5</td>
<td>4</td>
<td>2'-31&quot;</td>
<td>1.94</td>
</tr>
<tr>
<td>R1</td>
<td>6</td>
<td>As Reqd.</td>
<td>1.5(LB/LF)</td>
</tr>
<tr>
<td>R2</td>
<td>5</td>
<td>As Reqd.</td>
<td>1.04(LB/LF)</td>
</tr>
<tr>
<td>* R3</td>
<td>4</td>
<td>As Reqd.</td>
<td>0.67(LB/FL)</td>
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<tr>
<td>** S1</td>
<td>4</td>
<td>5'-0&quot;</td>
<td>3.34</td>
</tr>
<tr>
<td>** S2</td>
<td>4</td>
<td>Varies 6'-2&quot; Min. 10'-3&quot; Max.</td>
<td>Varies 4.18 Min. 10.09 Max.</td>
</tr>
<tr>
<td>** S3</td>
<td>4</td>
<td>13'-3&quot;</td>
<td>7.52</td>
</tr>
<tr>
<td>T</td>
<td>6</td>
<td>13'-4&quot;</td>
<td>17.02</td>
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<tr>
<td>U</td>
<td>5</td>
<td>6'-8&quot;</td>
<td>4.87</td>
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<tr>
<td>V1</td>
<td>4</td>
<td>3'-2&quot;</td>
<td>2.12</td>
</tr>
<tr>
<td>*** V2</td>
<td>4</td>
<td>3'-6&quot;</td>
<td>2.34</td>
</tr>
</tbody>
</table>

* Bars 4P5 and 4R3 are to be used with a curb only.
** Bend Bars 4S1, 4S2 & 4S3 around a #3 Stirrup Pin.
*** Bars 7P4 & 4V2 are to be used on C-I-P Concrete Retaining Walls.

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a C-I-P Concrete Retaining Wall shall be the same as detailed above for a 8" deck with $\theta_A = 90^\circ$, where applicable. If horizontal legs of Bars 7P1, 7P3 and 4V1 prohibit placement, Bars 7P4 and 4V2 may be substituted for Bars 7P1, 7P3 and 4V1 as shown.
3. All reinforcing steel at the open joints shall have a 2" minimum cover unless otherwise noted.
4. At Construction Joints, Bars 6R1, 5R2 and 4R3 may be continuous or spliced. Where bars are spliced, provide a 2'-6" Min. lap length for Bar 6R1, a 2'-0" Min. lap length for Bars 5R2 and a 1'-3" Min. lap length for Bars 4R3.
5. The skew angle for Bars 7P3 may vary from joint to joint and side to side, see Structures Plans, Superstructure Sheets for details.

ROADWAY OR SIDEWALK CROSS-SLOPE | HIGH SIDE | LOW SIDE
--- | --- | ---
0% to 2% | 90° | 90°
2% to 6% | 93° | 87°
6% to 10% | 96° | 84°

$\theta_A$ shall be 90° if Contractor elects to place Railing Perpendicular to the Deck.

ESTIMATED TRAFFIC RAILING QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CONCRETE QUANTITY (CY)</th>
<th>REBAR QUANTITY (LB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical 10'-0&quot; Section w/Curb</td>
<td>1.13</td>
<td>451</td>
</tr>
<tr>
<td>Typical 10'-0&quot; Section w/o Curb</td>
<td>1.03</td>
<td>428</td>
</tr>
<tr>
<td>Approach Slab with Guardrail End Section</td>
<td>0.14</td>
<td>(per LF)</td>
</tr>
</tbody>
</table>
NOTES:

1) Railing expansion joint shall match the deck expansion joint which shall be turned perpendicular or radial to the gutter line. See Structures Plans, Superstructure and Approach Slab Sheets for details.

2) Bars 4S1 (not shown) shall be placed perpendicular or radial to the gutter.

3) End Post & Approach Slab End Section - Place Bars 7P1 & 4V1 in acute corners of intersection of deck joint and gutter line. Place Bars 7P3 & 4V1 in acute corners of intersection of deck joint and gutter line as required. Interior Post - use Bars 7P1 and 4V1 placed with bottom mat of reinforcement. Shift deck or slab reinforcement minimally to allow proper placement of Bars 7P and 4V and to facilitate placement of concrete.

4) Approach Slab with Guardrail Attached (not shown):
   - Bars 7P1 & 4V1 in acute corners of intersection of deck joint and gutter line as required. Shift deck or slab reinforcement minimally to allow proper placement of Bars 7P & 4V and to facilitate placement of concrete.
   - Bars 7P3 & 4V1 in acute corners of intersection of deck joint and gutter line as required. Shift deck or slab reinforcement minimally to allow proper placement of Bars 7P & 4V and to facilitate placement of concrete.

5) Begin placing Railing Bars 7P & 4V on Approach Slab at the railing end and proceed toward Begin or End Bridge to ensure placement of guardrail bolt holes. If required, adjustments to the bar spacing for Bars 7P & 4V shall be made immediately adjacent to Begin or End Bridge.

GENERAL NOTES:

1) Deck Expansion Joint at begin or end bridge shown. See Structures Plans, Superstructure and Approach Slab Sheets for details.

2) Partial Plan Views shown are intended as guides only. See Structures Plans, Superstructure and Approach Slab Sheets for skew angles, joint orientation, dimensions and details.
PARTIAL PLAN VIEW OF BRIDGE DECK AND APPROACH SLAB WITH SIDEWALK
- SKEW ANGLE GREATER THAN 15 DEGREES

NOTES:
1) Railing ends at deck expansion joints shall follow the deck joint with allowance for joint movement. Expansion joint at the inside face of parapet shall be turned perpendicular or radial to this line. See Structures Plans, Superstructure and Approach Slab Sheets for details.
2) Bars 4S1 (not shown) shall be placed perpendicular or radial to the gutter.
3) Edge of Approach Slab adjacent to the roadway shall follow end of railing. Bars 7P at end of the railing shall be field cut and shifted to maintain clearance, see detail bottom left this sheet for similar details.
4) Alternate Bars 7P1 with Bars 7P2 and reverse direction of every other Bar 4V1 to facilitate placement of concrete.
5) Bars 7P & 4V shall be rotated to match bridge deck reinforcement. Shift deck transverse reinforcement minimally to allow placement of Bars 7P & 4V.
6) Railing End Post reinforcement detailed above. Railing Interior Post reinforcement similar.

PARTIAL PLAN VIEW AT BEGIN OR END APPROACH SLAB WITH SIDEWALK AND RAILING WITH GUARDRAIL ATTACHED
- SKEW ANGLE GREATER THAN 15 DEGREES SHOWN, 15 DEGREES OR LESS

NOTES:
1) Railing ends at deck expansion joints shall follow the deck joint with allowance for joint movement. Expansion joint at the inside face of parapet shall be turned perpendicular or radial to this line. See Structures Plans, Superstructure and Approach Slab Sheets for details.
2) Bars 4S1 (not shown) shall be placed perpendicular or radial to the gutter.
3) Deck transverse reinforcement may be shifted minimally as required to allow proper placement of Bars 7P & 4V and to facilitate placement of concrete. Bars 7P1 & 4V1 or 7P2 & 4V1 shall be used on opposing sides of the joint depending on the direction of the skew, See Detail above. Approach Slab reinforcement may be shifted if conflicts occur.
4) End Post - alternate Bars 7P1 with Bars 7P2 and reverse direction of every other Bar 4V1 to facilitate placement of concrete.
5) Interior Post - alternate Bars 7P1 with Bars 7P2 and reverse direction of every other Bar 4V1 to facilitate placement of concrete. See Structures Plans, Superstructure and Approach Slab Sheets for details.
6) Use Bars 7P2 and reverse direction of Bars 4V1 where skew restricts use of Bars 7P1 & 4P1.
7) Begin placing Railing Bars 7P & 4V on Approach Slab at the railing end and proceed toward Begin or End Bridge to ensure placement of guardrail bolt holes. If required, adjustments to the bar spacing for Bars 7P & 4V shall be made immediately adjacent to Begin or End Bridge.
CONCRETE AND REINFORCING STEEL: See Structures Plans, General Notes.

SUPERELEVATED BRIDGES: At the option of the Contractor the Traffic Railing on superelevated bridges may be constructed perpendicular to the roadway surface. If an adjoining railing is constructed plumb, transition the end of the Traffic Railing from perpendicular to plumb over a minimum distance of 20'-0". The cost of all modifications will be at the Contractor's expense.

GUARDRAIL: For Guardrail connection details, see Index No. 400.

BARRIER DELINEATORS: Barrier Delineators shall meet Specification Section 993. Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side at the spacing shown in the table above. Barrier Delineator color (white or yellow) shall match the color of the near edgeline. The cost of the Barrier Delineators shall be included in the Contract Unit Price for the Traffic Railing.

NAME, DATE, AND BRIDGE NUMBER: The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be placed on the driver's left side when approaching the bridge. The Name shall be as shown in the General Notes in the Structures Plans. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and figures 3" in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by 1/2" V-grooves. V-grooves shall be formed by preformed letters and figures.


PROVISIONAL DATE: Date No. 1: 01/01/14

TRAFFIC RAILING NOTES

Traffic Railing - (42" F Shape)
**TRAFFIC RAILING** - *(42" F SHAPE)*

**DETAIL "A"**

**TYPICAL SECTION THRU TRAFFIC RAILING**
*(SECTION THRU BRIDGE DECK SHOWN - SECTION THRU APPROACH SLAB SIMILAR)*

**VIEW C-C**
**ELEVATION - RAILING END TRANSITION**
*(Guardrail and back leg of Stirrups not shown for clarity)*

**VIEW B-B**
**(Section thru Approach Slab shown, Section thru Retaining Walls similar)**

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**DESIGN STANDARDS**

**2016**

**INDEX NO.** 425

**SHEET NO.** 2 of 3
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

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<tr>
<td>51</td>
<td>8</td>
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ROADWAY CROSS-SLOPE

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<tr>
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<th>HIGH GUTTER</th>
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<tbody>
<tr>
<td>BA</td>
<td>BB</td>
</tr>
<tr>
<td>0% to 2%</td>
<td>90°</td>
</tr>
<tr>
<td>2% to 6%</td>
<td>97°</td>
</tr>
<tr>
<td>6% to 10%</td>
<td>96°</td>
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BA and BB shall be 90° if Contractor elects to place Railing perpendicular to the Deck.

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a retaining wall shall be the same as detailed above for a 10" deck with BA = BB = 90°.
3. All reinforcing steel at the open joints shall have a 2" minimum cover.
4. Bars 851 may be continuous or spliced at the construction joints. Lap splices for Bars 851 and 552 shall be a minimum of 4'-0" and 2'-0", respectively.
5. The Contractor may utilize Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of deformed wire meeting the requirements of Specification Section 931.

INTERMEDIATE JOINT SEAL NOTES:
1. At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Specification Section 932.
2. Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.
3. The cost of the Pre-cured Silicone Sealant shall be included in the Contract Unit Price for the Traffic Railing.

SECTION THRU RECESSED "V" GROOVE TO FORM INSCRIBED LETTERS AND FIGURES

ESTIMATED TRAFFIC RAILING QUANTITIES

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<th>QUANTITY</th>
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<tr>
<td>Reinforcing Steel</td>
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Note:
The estimated railing quantities are based on a 2% deck cross slope; railing on low side of deck.
GENERAL NOTES

1. Index 430 is applicable for permanent crash cushion installations that shield the ends of Concrete Barrier Wall or Guardrail, only.

2. Design Length is based on a given design speed and the shortest Crash Cushion available on the Approved Products List (APL). When a Length Restriction is not applicable (N/A), then the Contractor has the option to select valid Crash Cushions from the APL, which have design lengths greater than or equal to the Design Length identified in the Plans. When a Length Restriction is applicable, then the Contractor has the option to select valid Crash Cushions from the APL, which have design lengths less than or equal to the Design Length identified in the Plans.

3. For High-Speed Facilities with a Design Speed greater than 60 mph, use a TL-3 Crash Cushion.

4. Assemble and install Crash Cushions according to the limitations noted on the Approved Products List (APL) webpage, the manufacturer's specifications, and the applicable crash cushion drawings posted on the APL.

5. When subjected to reverse direction hits, construct Transition Panels from Concrete Barrier Walls to Crush Cushions; for additional details refer to the applicable crash cushion drawings on the APL.

6. Galvanize metallic components to meet the requirements for Steel Guardrail, Section 967 of the Standard Specifications for Road and Bridge Construction.

7. For Guardrail Applications, construct the Manufacturer’s Transition between the Permanent Crash Cushion and the Standard Guardrail Transition; refer to all Standard Guardrail Transition details of this index.

8. For additional information on the End Measurement for Guardrail Payment, refer to the Standard Specifications for Road and Bridge Construction, Section 536.

9. A yellow Type I Object Marker shall be centered 3’ in front of the crash cushion nose. As an option, the contractor may install Retroreflective Sheeting on the nose of the crash cushion. The sheeting to be used must be solid yellow, Type IV or better and must be a product listed on the Department’s Approved Products List (APL). The sheeting to be applied to the nose of the crash cushion shall be a minimum of 360 square inches with a minimum height of 15 inches. Mounting hardware, Object Markers or Retroreflective Sheeting shall be in conformance with Section 993 of the Standard Specifications for Road and Bridge Construction.

10. The EDI shall provide the station of the Length of Need (LON) location in the Plans.
PEATanic CRASH CUSHION

PLAN VIEW

PERMANENT CRASH CUSHION

Location Station

Lap In Direction Of Adjacent Traffic

Nested For Bi-Directional Traffic

Lap In Direction Of Adjacent Traffic

ELEVATION VIEW

Manufacturer's Transition - Distance Varies (See Crash Cushion Drawings On The APL)

Location Station

4 Spaces @ 1'-6¾" CC

5 Spaces @ 3'-1½" CC

6'-3" to Next Post

Standard W-Beam Blockout

Design Length

12'-6" Thrie-Beam Panel (Nested For Bi-Directional Traffic)

6'-3" W-Thrie Beam Transition Panel

18'-9" Standard Guardrail Transition

W-Beam Guardrail

Downstream End Of Crash Cushion (Manufacturer's Transition)

End Measurement For Guardrail Payment

Note:
- Post Numbers 8, 9, and 10 will have Standard 6"x8"x14" Wooden W-beam Blockouts.
- For Additional Information on Standard Guardrail Transitions see Design Standard, Index 400.

CRASH CUSHION DETAILS
ESTIMATED QUANTITIES, LF

Concrete 0.042 CY
Reinforcing Steel 3.27 Lbs.*
*3.38 Lbs. With 2'-2" Dowels

GENERAL NOTES

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

2. When the opaque visual barrier is constructed on an existing barrier wall, dowels shall be 3'-0" in length, embedded 6" into the barrier wall and set with an approved non-shrink grout. Embedment holes shall be 3/4" in diameter, drilled to a depth 1-1/2" below the top of the dowel unless greater depth is required to accept manufactured grout capsules.

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

When longitudinal reinforcing bars are encountered in the stem of existing barrier, shift the dowels to clear, maintaining the 1" x 2" Cover Minimum to the face of the Opaque Visual Barrier.

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

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

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

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

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

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

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

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

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

7. Payment for opaque visual barrier shall be full compensation for concrete, reinforcement, dowels, casting, placement, drilling, grouting, tooling, finishing and work incidental thereto, and shall be paid for under the contract unit price for Opaque Visual Barrier (Concrete) (2'-3" Height), LF.
TRAFFIC RAILING NOTES

THREE-BEAM GUARDRAIL: Steel Three-Beam Elements shall meet the requirements for Class B (10 Gauge) Guardrail of AASHTO M 180, Type II (Zinc coated). The minimum panel length for Three-Beam Elements shall be 12'-6". Field drilled holes for Post connections shall be 3⁄8" by 2½" slotted holes.

GUARDRAIL BOLTS: Guardrail bolts, nuts and washers shall be in accordance with AASHTO M 180.

GUARDRAIL POSTS AND BASE PLATES: Posts and Base Plates shall be in accordance with ASTM A 36 or ASTM A 709 Grade 36.

ANCHOR BOLTS, NUTS AND WASHERS: Adhesive-Bonded Anchors and Anchor Bolts shall be fully threaded rods in accordance with ASTM F1554 Grade 105 or ASTM A 193 Grade B7. At the Contractor's option, Anchor Bolts for through bolting may be in accordance with ASTM A 449. All Nuts shall be single self-locking hex nuts and in accordance with ASTM A563 or ASTM A194. Flat Washers shall be in accordance with ASTM F 436 and Plate Washers (for long slotted holes only) shall be in accordance with ASTM A 36 or ASTM A 709 Grade 36. After the nuts have been snug tightened, the anchor bolt threads shall be distorted to prevent removal of the nuts. Distorted threads and the exposed trimmed ends of anchors shall be coated with a galvanizing compound in accordance with the Specifications.

COATTINGS: All Nuts, Bolts, Anchors, Washers, Guardrail Posts, Anchor Bolts and Base Plates shall be hot-dip galvanized in accordance with the Specifications. Guardrail Post Assemblies shall be hot-dip galvanized after fabrication.

ADHESIVE-BONDED ANCHORS AND DOWELS: Adhesive Bonded Material Systems for Anchors and Dowels shall comply with Specification Section 937 and be installed in accordance with Specification Section 416. The field testing proof loads required by Specification Section 416 shall be 15,000 lbs. for 2½" Ø anchor bolts; 5,000 lbs. for the 2½" anchor bolts with 1½" embedment; and 10,000 lbs. for the 3½" Ø anchor bolts with 2½" embedment.

BRIDGES ON CURVED ALIGNMENTS: The details presented in these Standards are shown for bridges on tangent alignments. Details for bridges on horizontally curved alignments are similar.

POST SPACING: Posts shall be located along the length of the bridge at typical 6'-3" or 3'-1½" spaces. Utilize the Modified Post Spacing at Intermediate Deck Joints Details as required to clear deck joints. Establish post spacing along the bridge and Roadway Guardrail Transition beginning with the Key Post. The variable post spacings located near the end of the bridge may be utilized to optimize the typical post spacing. Variable lengths of guardrail overlap are also permitted to optimize the typical post spacing Symmetry at post spacing is not necessary.

THREE-BEAM EXPANSION SECTION: Three-Beam Expansion Sections shall be installed at locations shown in the Plans. Install nuts for splice bolts finger-tight at 2½" slots in three-beam expansion sections. Screws shall fully engage bolts with a minimum of one bolt thread extending beyond the nuts. Distort the first thread on the outside of the nut to prevent loosening. Tighten guardrail bolts in 2½" slots at guardrail posts that lie between the slotted expansion splice and bridge deck joint so that the bolt heads are in full contact with three-beam elements, but not so tight as to impede movement due to expansion.

NEOPRENE PADS: Neoprene pads must be plain pads with a durometer hardness of 60 or 70 and meet the requirements of Specification Section 932, except that testing of the finished pad will not be required.

ELEVATION MARKERS: Elevation Markers need not be replaced when portions of the existing traffic railing carrying existing elevation markers are removed.

BARRIER DELINEATORS: Barrier Delineators shall conform to Spec. Section 993. Install Barrier Delineators at the top of the guardrail offset blocks at the spacings shown in the table below. Barrier Delineator color (white or yellow) shall conform to the color of the near edgeline.

PEDESTRIAN SAFETY TREATMENTS: Pedestrian Safety Treatment is required when called for in the Plans. See Index No. 400 for details.

BRIDGE NAME PLATE: If a portion of the existing Traffic Railing is to be removed that carries the bridge name, number and date, or if the installation of the Traffic Railing (Three-Beam Retrofit) will obscure the bridge name, number and date, then replace the information that has been removed or obscured, with 3" tall black lettering on white nonreflective sheeting applied to the top of the adjacent guardrail. The information must be clearly visible from the right side of the approaching travel lane. The sheeting and adhesive backing shall comply with Specification Section 994 and may comprise of individual decals of letters and numbers.

PAYMENT: Payment will be made under Metal Traffic Railing (Thrie-Beam Retrofit) which shall include all materials and labor required to fabricate and install the barrier and (lapped) guardrail where necessary to maintain post spacing. Transition Blocks and Curves, Bridge Name Plate and Barrier Delineators and installation of Elevation Markers, where required, will not be paid for directly but shall be considered as incidental work.

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<th>DISTANCE EDGE OF TRAVEL LANE TO FACE OF RAILING</th>
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<tr>
<td>&gt; than 8&quot;</td>
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TRAFFIC RAILING - (THREE-BEAM RETROFIT) GENERAL NOTES & DETAILS
PARTIAL ELEVATION OF INSIDE FACE OF RAILING
MODIFIED POST SPACING AT INTERMEDIATE DECK JOINTS DETAIL FOR INDEX NOS. 471, 475 & 476

PARTIAL PLAN
INTERMEDIATE JOINT SKEW DETAIL

TRAFFIC RAILING - (THRIE-BEAM RETROFIT)
GENERAL NOTES & DETAILS

INDEX NO. 470
2 of 3
TYPICAL TREATMENT OF RAILING ALONG BRIDGE

NOTES:
1. On approach end provide Index No. 402 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.
2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index No. 470, Sheet 2, as required.
3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing concrete and grouted over.

CROSS REFERENCES:
For Section A-A see Sheet 2.
For Traffic Railing Notes and Details see Index No. 470.
**NOTES:**
1. All bar dimensions are out to out.
2. The 1'-2" vertical dimension shown for Bar 4D is based on a curb height of 9".
   If curb height is less or more than 9", decrease or increase this dimension by an amount equal to the difference in curb height.

**BAR BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

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<tr>
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</tr>
<tr>
<td>L</td>
<td>4</td>
<td>4'-1&quot;</td>
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Length as Required

**BAR 4A**

- (Standard 180° Hook)

**Dowel Bar 4D**

(See Note 2)

- 3'-8" to 6'-1"

- 1'-11" to 4'-1"

**Dowel Bar 4L**


\* Shim with washers around Anchors as required to maintain tolerance.

\** Offset may vary ± 1" for Adhesive-Bonded Anchors to clear existing curb reinforcing and provide minimum edge clearance. Offset shall be consistent along length of bridge.**

**CROSS REFERENCES:**

For location of Section A-A see Sheets 1, 3 & 4.
For location of Section B-B see Sheets 3 & 4.
For application of Dim. A see Post Dimension Table on Index 470, Sheet 3.
**SCHEME 1 NOTES:**

1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

**SCHEME 2 NOTES:**

1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
SCHEME 3 NOTES:

1. Provide Cast-In-Place Curb as shown. Shape and height of Transition Block and Curb shall match existing bridge curb. Transition Block may be omitted on terminal ends with no opposing traffic.

2. Field cut and bend Bars 4A and rotate Dowel Bars 4D within Curb and Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

3. A single 7/8" Ø x 8" Adhesive-Bonded Anchor may be omitted as shown when 2" clear cover cannot be provided.
NOTES:

1. On approach end provide Index No. 402 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.

2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index No. 470, Sheet 2, as required.

3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing concrete and grouted over.

CROSS REFERENCES:
For Section A-A see Sheet 2.
For Traffic Railing Notes and Details see Index No. 470.
**NOTE:** All bar dimensions are out to out.
PARTIAL PLAN OF RAILING

Varies (6'-3" Max., 3'-1/2" Min.)

Thrie-Beam Guardrail

Front Face of Backwall & Begin or End Bridge

Existing Curb

Asphalt Overlay when present (Varies)

Guardrail Post Assembly with Offset Block (Typ.)

Existing Approach Slab

Post Bolts

Direction of Traffic

POST ELEVATION OF INSIDE FACE OF RAILING

(SCHEMES 3 AND 4)

RAILING END TREATMENT FOR FLARED INTEGRAL CURBS

SCHEMES 5 AND 6

RAILING END TREATMENT FOR PARALLEL INTEGRAL CURBS

SCHEMES 5 AND 6 NOTES:

1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab.

Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
NOTES:
1. On approach end provide Index No. 402 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.
2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index No. 470, Sheet 2, as required.
3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1” below existing concrete and grouted over.

CROSS REFERENCES:
For Section A-A see Sheet 2.
For Traffic Railing Notes and Details see Index No. 470.

TYPICAL TREATMENT OF RAILING ALONG BRIDGE
**SECTION A-A**

**TYPICAL SECTION THRU RAILING ON BRIDGE DECK**

- 2'-8" x 10" x 1/8" Thick Neoprene Pad
- Existing Bridge Deck
- 2'-0" Cover Min. **
- 2 - 1/4" Ø x 7'-4" Adhesive-Bonded Anchors with Heavy Hex Nuts and Washers set in drilled holes (1'-11/2" Max. Depth)

**SECTION B-B**

**TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB**

(SCHEMES 5 AND 6 SHOWN, SCHEMES 3 AND 4 SIMILAR)

- 2 - 1/4" Ø x 8" Adhesive-Bonded Anchors with Heavy Hex Nuts and Washers set in drilled holes (51/2" Max. Depth)

**BILL OF REINFORCING STEEL**

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<tr>
<td>M</td>
<td>4</td>
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**BAR BENDING DIAGRAMS**

- **Dowel Bar 4D**
  - 1'-71/2" x 5"
  - 2'-0" x 1/8"

- **Dowel Bar 4L**
  - 2'-8"

- **Bar 4M**
  - 3'-8" x 4/8"

**CROSS REFERENCES:**

For location of Section A-A see Sheet 1, 3 and 4.
For location of Section B-B see Sheet 4.
For location of View C-C see Sheet 4.
For Traffic Railing Notes and Details see Index No. 470.
For application of Dim. A see Post Dimension Table on Index 470, Sheet 3.

**NOTE:** All bar dimensions are out to out.
SCHEME 1 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEME 2 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic and on bridges with flared Approach Slab Curbs.

2. Field bend or tilt Dowel Bars 4D and Bars 4M within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Wing Post and Traffic Railing not shown for clarity)

SCHEMES 3 AND 4
RAILING END TREATMENT FOR FLARED INTEGRAL CURBS

SCHEMES 5 AND 6
RAILING END TREATMENT FOR PARALLEL INTEGRAL CURBS

DESIGN STANDARDS
TRAFFIC RAILING - (THRIE-BEAM RETROFIT)
WIDE STRONG CURB TYPE 2

INDEX NO.
473

SHEET NO.
4 of 4

2016

DESCRIPTION:

1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab.
   Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEMES 5 AND 6 NOTES:

1. Place 3 Bars Min. Top and 1 Bar Min. Bottom (see Note 2) to clear Post Anchor Bolts (see Note 2) and match Existing Curb height.

2. Place 3 Bars Min. Top and 1 Bar Min. Bottom (see Note 2) to clear Post Anchor Bolts (see Note 2) and match Existing Curb height.

3. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
Guardrail Post Assembly with Offset Block (Typ.)

Existing Curb

Intermediate Deck Joint

Existing Bridge Coping

(Guardrail Post Assembly)

Existing Bridge Deck

Gutter Line

Front Face of Thrie-Beam Guardrail

Direction of Traffic

PARTIAL PLAN OF RAILING

Existing Bridge Deck

Top of Existing Curb

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

TYPICAL TREATMENT OF RAILING ALONG BRIDGE

NOTES:
1. On approach end provide Index No. 402 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.
2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index No. 470, Sheet 2, as required.
3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing concrete and grouted over.

CROSS REFERENCES:
For Match Line see Sheets 3 & 4.
For Section A-A see Sheet 2.
For Traffic Railing Notes and Details see Index No. 470.
SECTION A-A
TYPICAL SECTION THRU RAILING ON BRIDGE DECK

BILL OF REINFORCING STEEL

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BAR BENDING DIAGRAM

DOWEL BAR 4L

NOTE: All bar dimensions are out to out.

SECTION B-B (SCHEME 2)
TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB

* Shin with washers around Anchor Bolts and Anchors as required to maintain tolerance.

** Offset may vary ± 1" for Adhesive-Bonded Anchors to clear existing curb reinforcing and provide minimum edge clearance. Offset shall be consistent along length of bridge.

CROSS REFERENCES:
For location of Section A-A see Sheet 1 and 3.
For location of Section B-B see Sheet 3.
For application of Dim. A see Post Dimension Table on Index 470, Sheet 3.

TRAFFIC RAILING - (THRIE-BEAM RETROFIT) INTERMEDIATE CURB

INDEX NO. 474

DESCRIPTION: 2016 DESIGN STANDARDS

LAST REVISION 07/01/08 SHEET NO. 2 of 4
SCHEME 1 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEME 2 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
CROSS REFERENCE:
For application of Dim. A see Post Dimension Table on Index 470, Sheet 3.

SCHEME 3 NOTE:
1. A single 7/8" x 8" Adhesive-Bonded Anchor may be omitted as shown when 2" clear cover cannot be provided (see Section C-C).
NOTES:
1. On approach end provide Index No. 402 (as shown) or other site specific treatment, see Roadway Plans.
   For treatment of trailing end see Roadway Plans.
2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index No. 470, Sheet 2, as required.
3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burnished off 1" below existing concrete and grouted over.

CROSS REFERENCES:
For Section A-A see Sheet 2.
For Traffic Railing Notes and Details see Index No. 470.

TYPICAL TREATMENT OF RAILING ALONG BRIDGE

PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING  
(Existing Traffic Railing not shown for clarity)
**SECTION A-A**

**TYPICAL SECTION THRU RAILING ON BRIDGE DECK**

**BILL OF REINFORCING STEEL**

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<td>M</td>
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**BAR BENDING DIAGRAMS**

- **Dowel Bar 4D**
- **Bar 4M**

**NOTE:** All bar dimensions are out to out.

**SECTION B-B**

**TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB**

(Schemes 5 and 6 shown, Schemes 3 and 4 similar)

**CROSS REFERENCES:**
- For location of Section A-A see Sheet 1, 3 & 4.
- For location of Section B-B see Sheet 4.
- For location of View C-C see Sheet 3.
- For application of Dim. A see Post Dimension Table on Index 470, Sheet 3.

**VIEW C-C**

**DETAIL "A"**

**TRAFFIC RAILING - (THRIE-BEAM RETROFIT)**

**WIDE CURB TYPE 1**

**INDEX NO.** 475

**SHEET NO.** 2 of 4
NOTES:
1. On approach end provide Index No. 402 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.
2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index No. 470, Sheet 2, as required.
3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing concrete and grouted over.

CROSS REFERENCES:
For Section A-A see Sheet 2. For Traffic Railing Notes and Details see Index No. 470.

TYPICAL TREATMENT OF RAILING ALONG BRIDGE
NOTE: All bar dimensions are out to out.

Dowel Bars 4D (10” Embedment) (See Note 2, Sheet 3)

2-½” x 8” Adhesive-Bonded Anchors with Heavy Hex Nuts and Washers set in drilled holes (5½” Max. Depth)

Shim with washers around Anchors as required to maintain tolerance.

Offset may vary ± 1” for Adhesive-Bonded Anchors to clear existing curb reinforcing and provide minimum edge clearance. Offset shall be consistent along length of bridge.

CROSS REFERENCES:
For location of Section A-A see Sheet 1, 3 & 4.
For location of Section B-B see Sheet 4.
For location of Section C-C see Sheet 3.
For application of Dim. A see Post Dimension Table on Index No. 470, Sheet 3.
SCHEME 1 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted at leading ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEME 2 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted at trailing ends with no opposing traffic on bridges with flared Approach Slab Curbs.

2. Field bend or tilt Dowel Bars 4D and Bars 4M within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
DESIGN STANDARDS

TRAFFIC RAILING - (THRIE-BEAM RETROFIT)
WIDE CURB TYPE 2

INDEX NO. 476

DESCRIPTION:

1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing curb bridge. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEMES 5 AND 6 NOTES:

-SCHEMES 5 AND 6 NOTES:

1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing curb bridge. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEMES 5 AND 6:

RAILING END TREATMENT FOR PARALLEL INTEGRAL CURBS

SCHEMES 3 AND 4:

RAILING END TREATMENT FOR FLARED INTEGRAL CURBS

PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

(Existing Wing Post and Traffic Railing not shown for clarity)

SCHEMES 3 AND 4

RAILING END TREATMENT FOR FLARED INTEGRAL CURBS

SCHEMES 5 AND 6:

RAILING END TREATMENT FOR PARALLEL INTEGRAL CURBS

TRAFFIC RAILING - (THRIE-BEAM RETROFIT)
WIDE CURB TYPE 2

INDEX NO. 476

DESCRIPTION:

1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing curb bridge. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
TRAFFIC RAILING RETROFIT NOTES

See Index 400 for component details, geometric layouts and associated notes not fully detailed herein.

CONCRETE: Concrete For Transition Blocks shall be Class II (Bridge Deck).

THRIE-BEAM PANEL: Steel Thrie-Beam Elements shall meet the requirements for Class B (10 Gauge) Guardrail of AASHTO M 180, Type II (Zinc coated). The minimum panel length for Thrie-Beam Elements shall be 12'-0". Field drilled holes for Post connections shall be 7/8" by 21/2" slotted holes.

BOLTS, NUTS AND WASHERS: Bolts, nuts and round washers shall be in accordance with AASHTO M180. Plate Washers shall be in accordance with ASTM A36 or ASTM A709 Grade 36.

COATINGS: All Nuts, Bolts, Anchors, and Washers shall be hot-dip galvanized in accordance with the Specifications.

BRIDGES ON CURVED ALIGNMENTS: The details presented herein are shown for bridges on tangent alignments. Details for bridges on horizontally curved alignments are similar.

THRIE-BEAM EXPANSION SECTION: Thrie-Beam Expansion Sections shall be installed at locations shown in the Plans. Install nuts for splice bolts finger-tight at 21/2" slots in thrie-beam expansion sections. Nuts shall fully engage bolts with a minimum of one bolt thread extending beyond the nuts. Distort the first thread on the outside of the nut to prevent loosening. Tighten bolts in 3" by 1" increments until all nuts are fully engaged.

WOOD BLOCKS: All wood blocks, including required wedge shaped blocks shall be Pressure Treated lumber in accordance with Specifications Section 953. Bolt holes in blocks to be centered (+/-5%).

BRIDGE NAME PLATE: If a portion of the existing Traffic Railing is to be removed that carries the bridge name, number or date, then replace the information that has been removed or obscured, with 3" tall black lettering on white non-reflective background. Enter the date of replacement in black or white non-reflective lettering on the bridge name plate.

PAYMENT: Payment will be made under Thrie-Beam Panel Retrofit which shall include all materials and labor required to fabricate and install the retrofit railing, Transition Blocks and Curbs, Bridge Name Plate and Barrier Delineators, where required, will not be paid for directly but shall be considered incidental work.

NOTE: All Thrie Beam Panels shall be lapped in the direction of adjacent traffic. At the Contractor's option, laps may be extended. Field drill holes in Trailing Thrie-Beam Panel as required.

TRAILING THRIE-BEAM PANEL SPLICE

NOTE: Thrie-Beam Panel Splices shall be fabricated as shown in typical section thru class B (10 Gauge) Thrie-Beam Panel (Expansion Section Similar).
NOTES:

1. Dimensions and elevations for existing guardrails to be verified by the Contractor before beginning construction.

2. Provide Transition Block as shown or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of the traffic face of Transition Block or Curb shall match existing bridge curb. See Sheet 4 for Transition Block details. Block may be omitted on trailing ends with no opposing traffic.

3. Do not bolt nested rails to the blocks and posts at posts (a), (c) & (e).

4. Provide Transition Block as shown or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of the traffic face of Transition Block or Curb shall match existing bridge curb. See Sheet 4 for Transition Block details. Block may be omitted on trailing ends with no opposing traffic.

5. Do not bolt nested rails to the blocks and posts at posts (a), (c) & (e).

6. Provide Transition Block as shown or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of the traffic face of Transition Block or Curb shall match existing bridge curb. See Sheet 4 for Transition Block details. Block may be omitted on trailing ends with no opposing traffic.

7. Do not bolt nested rails to the blocks and posts at posts (a), (c) & (e).
**DESCRIPTION:**

**REVISION**

**INDEX NO.**

**SHEET NO.**

**DESIGN STANDARDS**

**THRIE-BEAM PANEL RETROFIT**

**CONCRETE HANDRAIL**

---

**ELEVATION VIEW A-A**

*At Double Posts*

(View at Intermediate Double Posts shown; View at Expansion Joints similar)

**ELEVATION VIEW A-A**

*At Single Post*

*Measured from edge of existing Post. Bolts may be installed at either side of any Post.*

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**NOTES:**

1. Post Bolts shall be 5/8" x 14" long set in 7/8" core drilled holes, see Sheet No. 1.

2. Shift Post Bolt holes minimally inward toward center of posts if existing reinforcement is encountered during drilling of holes. If reinforcement is still encountered, notify the Engineer before proceeding with drilling.

3. Post Bolt spacing not to exceed 8'-0" (± 1%).

---

For End Posts with an existing wedge shaped wood block, remove existing wood block and replace with new Wedge Shaped Wood Block (See Sheet 1 for notes and details).
Existing Bridge or Approach Slab Mounted Curb

New Guardrail Posts, positioned as required to clear Transition Block (Typ.)

#3 Stirrups (Field Bend) (Typ.)

Edge of Existing Approach Slab (location varies)

PLAN VIEW OF TRANSITION BLOCK
(GUARDRAIL NOT SHOWN FOR CLARITY)

Existing Approach Slab or Bridge Deck

#4 Adhesive-Bonded Dowels (6 Required)

Top of Existing Curb

Top of Existing Approach Slab or Bridge Deck

ELEVATION OF TRANSITION BLOCK
(GUARDRAIL AND POSTS NOT SHOWN FOR CLARITY)

#4 Adhesive-Bonded Dowels (6 Required)

£" Anchor Rods 3'-0" long driven into ground prior to casting concrete

1'-3" 2'-3" 2'-3" 1'-3"

ESTIMATED QUANTITIES PER TRANSITION BLOCK

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NOTES:

ANCHOR RODS: Steel Anchor Rods shall be ASTM A36, ASTM A709 Grade 36 or ASTM A615 Grade 60 hot-dip galvanized in accordance with Specification Section 962.

ADHESIVE-BONDED DOWELS: Adhesive Bonding Material Systems for Dowels shall comply with Specification Section 937 (Type HV) and be installed in accordance with Specification Section 416.

Adhesive Bonded Dowels are shown installed in an existing curb or sidewalk integrally reinforced with Approach Slab, Wingwall or Bridge Deck. For installations in existing detached curbs or sidewalks, install dowels in available sound concrete.

Shift bars (as needed) to install six dowels into existing bridge or approach slab mounted curb.
This Traffic Railing Retrofit has been structurally evaluated to be equivalent or greater in strength to a design which has been successfully crash tested previously and approved for a NCHRP Report 350 Test Level 4 rating, except for the Tapered End Transition on Index No. 484.

CONCRETE: Concrete for the Traffic Railing (Vertical Face Retrofit), Spread Footing Approaches and replacement curb sections shall be Class IV. Concrete for Curb Transition Blocks shall be Class II (Bridge Deck).

REINFORCING STEEL: Reinforcing steel shall be ASTM A615, Grade 60, except Expansion Dowel Bar B which shall be ASTM A36 smooth round bar not dip galvanized in accordance with the Specifications.

EXPANSION SLEEVE ASSEMBLY: Pipe sleeve shall be ASTM D2241 PVC pipe, SD13.5. End Cap shall be ASTM D2466 PVC socket fitting, Schedule 40. End of Sleeve assembly at railing open joint shall be sealed with silicone to prevent concrete intrusion during railing casting. A compressible expanded polystyrene plug is required in the opposite end of the assembly for correct dowel positioning during railing casting. Correct dowel positioning is required in order to provide for thermal movement of the deck.

ADHESIVE-BONDED ANCHORS AND DOWELS: Adhesive Bonding Material Systems for Anchors and Dowels shall comply with Specification Section 937 and be installed in accordance with Specification Section 416. The field testing proof loads required by Specification Section 416 shall be 35,800 lbs. for Dowel Bars 6D on the inside face (traffic side) of the railing (1'-0" embedment) and 18,500 lbs for Dowel Bars 6D along the outside face of the traffic railing (5' min. embedment).

BRIDGES ON CURVED ALIGMENTS: The details presented in these Standards are shown for bridges on tangent alignments. Details for bridges on horizontally curved alignments are similar.

NAME, DATE AND BRIDGE NUMBER: The name and bridge number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be placed on the driver's left side when approaching the bridge. The Date shall be the year the bridge was constructed. Letters and figures may be 3" tall black plastic as approved by the Engineer or V-Grooves. V-Grooves shall be formed by preformed letters and figures.

ELEVATION MARKERS: Elevation Markers need not be replaced when portions of the existing traffic railing carrying existing elevation markers are removed.

BARRIER DELINERATORS: Barrier Delinereators shall meet Specification Section 993. Install Barrier Delinereators on top of the Traffic Railing 2" from the face on the traffic side at the spacing shown in the table below. Barrier Delinereator color (white or yellow) shall match the color of the near edgeline.

PAYMENT: Payment under Traffic Railing (Vertical Face Retrofit) includes all materials and labor required to construct the railing and incidental work as required for transition blocks, curbs, spread footing approaches, and Barrier Delinereators.

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(Quantities are based on a 9" curb, no curb cross slope and 2'-0" embedment length of Bars 6D. If the curb height or embedment length differs from that shown, increase or decrease quantity by the given per inch increment.) See Index No. 484, Sheet 4 for Spread Footing Approach Quantities.

**PARTIAL ELEVATION OF RAILING SHOWING FINGER/SLIDING PLATE JOINT - SCHEMES 2 THRU 5**

1. Place 1" thick polystyrene blockout over limits of bridge deck expansion joint full width to the end of the Traffic Railing to allow for thermal movement. Seal Forms to prevent mortar leakage into the expansion joint.

2. Field Cut Bars 6D to provide 2" cover above blockout (Typ.)

3. Dowel Bars 6D Spacing (Inside Face) 1'-3" (Max)

4. Dowel Bars 6D Spacing (Outside Face) 1'-3" (Max)

**PARTIAL ELEVATION OF RAILING SHOWING FINGER/SLIDING PLATE JOINT AT BEGIN OR END BRIDGE - SCHEME 1**

(Guardrail Transition not shown for clarity)
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM

BILL OF REINFORCING STEEL

REINFORCING STEEL NOTES:

1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a retaining wall shall have a 2" minimum cover.
3. The reinforcement for the railing on a retaining wall shall be the same as detailed for a bridge deck.
4. Expansion Dowel Bar B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.
5. Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.

REVISION

INDEX NO.

SIZE

MARK

LENGTH

NOTE NOS.

LEVEL

DESCRIPTION:

1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a retaining wall shall have a 2" minimum cover.
3. The reinforcement for the railing on a retaining wall shall be the same as detailed for a bridge deck.
4. Expansion Dowel Bar B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.
5. Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.

TRAFFIC RAILING - (VERTICAL FACE RETROFIT)

GENERAL NOTES & DETAILS

PARTIAL PLAN OF RAILING (SKEW ANGLE $\theta$ GREATER THAN 20°)

Partially Skewed Approach Slab, 1'-3" Max. on Bridge)

PARTIAL PLAN OF RAILING (SKEW ANGLE $\theta$ = 20° OR LESS)

Skewed Deck Joint at Intermediate Pier or Bent Similar

SKEW DETAIL

DOWEL DETAIL

Dowel Installation Notes:

1. Shift dowel holes to clear if the existing reinforcement is encountered.
2. See individual Standards Index Nos. 481 thru 484 for required embedment length of Bars 5D, 4L or 4N.

* ½" Preformed Joint Filler at top of Existing Curb shall extend beyond the joint material (Silicone, poured rubber, armored neoprene seal or sliding plates) as shown to prevent concrete intrusion during railing casting and shall be placed so as not to restrict in any way normal joint movement.

** See individual Standard Index Nos. 481 thru 484 for spacing of Bars 6D.

PARTIAL PLAN OF RAILING (SKEW ANGLE $\theta$ GREA 20° OR LESS)

Skewed Deck Joint at Begin or End Bridge Shown, Skewed Deck Joint at Intermediate Pier or Bent Similar

SKEW DETAIL

TRAFFIC RAILING - (VERTICAL FACE RETROFIT)

INDEX

No.

2

2016

DESIGN STANDARDS

480
**NOTES:**
1. On approach end provide a Roadway Guardrail Transition, Index No. 402 (as shown) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Three Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is at the wing wall, see Schemes 2 or 3, Index No. 484, Sheet 2 and 3. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply both to the front and back face of the railing. For treatment of railing end see Roadway Plans. If vertical face retrofit extends beyond bridge and approach slab ends, see Index No. 484 for treatment and Details.
2. Field cut Bars 5S and Dowel Bars 6D to maintain clearance within Vertical Face Retrofit Railing.
3. Where existing structure has been removed and not encased in new concrete; match adjoining areas and finish flat by grinding or grouting as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1" below existing concrete and grouted over.

**DESIGN STANDARDS**

**TRAFFIC RAILING - (VERTICAL FACE RETROFIT)**

**NARROW CURB**

**SECTION A-A**

**TYPICAL SECTION THRU RAILING ON FULL DEPTH CURB (BRIDGE SHOWN, WING WALL SIMILAR)**

**PARTIAL PLAN OF RAILING**

**PARTIAL ELEVATION OF INSIDE FACE OF RAILING**

(Expansion Dowel Assemblies & Bars 4C not shown for clarity)

**TYPICAL TREATMENT OF RAILING ALONG BRIDGE**

- **Superstructure Supports**
- **Bars 6D spacing at Railing joints (Typ. on bridge except as noted for skewed deck joints)**
- **Bars 5S**

**V-Groove Spacing ~ 30'-0" (Max.)**

*Non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment at skewed deck joints see Skew Detail, Index No. 480. Provide open Railing Joints at Deck Expansion Joint locations matching the dimension of the Deck Joint.*

**Provide 3/4 Intermediate Open Joints at:**

1. Superstructure supports where slab is continuous.
2. **Curb heights vary from 3'-0" Min. to 1'-2" Max.**

**CROSS REFERENCE:**

For General Notes, Estimated Quantities, Dowel Details, Expansion Dowel Details, Reinforcing Steel Notes & Bending Diagrams see Index No. 480.**
Dowel Bars 4L (10" Embedment)  (See Note 2)

Transition Block (See Note 1)

3'-0"  Direction of Traffic

Front Face of Backwall, Begin or End Bridge & Match Line (See Sheet 1)

PARTIAL PLAN OF GUARDRAIL

SCHEME 1 NOTES:

1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb. See Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEME 2 NOTES:

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Three-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Index No. 481, Sheet 1. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing.

2. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb. See Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.

3. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

TRAFFIC RAILING - (VERTICAL FACE RETROFIT)
NARROW CURB

2016 DESIGN STANDARDS

TRAFFIC RAILING - (VERTICAL FACE RETROFIT)
NARROW CURB

INDEX
NO.
481

PAGE 2 OF 3
SCHEME 3 NOTE:

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1.
TYPICAL TREATMENT OF RAILING ALONG BRIDGE

1. On approach end provide a Roadway Guardrail Transition, Index No. 402 (as shown) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is along the Wing Wall, see Schemes 2, 3, 4 or 5, Sheets 3 and 4. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing. For treatment of trailing end see Roadway Plans. If vertical face retrofit extends beyond bridge and approach slab ends, see Index No. 484 for treatment and Details.

2. Field cut Bars 5S and Dowel Bars 6D to maintain clearance within Vertical Face Retrofit Railing.

3. Where existing structure has been removed and not encased in new concrete; match adjoining areas and finish flat by grouting or grinding as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1" below existing concrete and ground over.

NOTES:

* Non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment at skewed deck joints see Skew Detail, Index No. 480. Provide open Railing Joints at Deck Expansion Joint locations matching the dimension of the Deck Joint.

** Provide 3/8" Intermediate Open Joints at: (1) - Superstructure supports where slab is continuous.

*** Curb heights vary from 5" Min. to 1'-2" Max.

** Asphalt Overlay when present (Varies).

CROSS REFERENCE:
For General Notes, Estimated Quantities, Dowel Detail, Expansion Dowel Detail, Reinforcing Steel Notes & Bending Diagrams see Index No. 480.

DESIGN STANDARDS
SCHEME 1 NOTES:

1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

3. If a Special Steel Guardrail Post is required for attachment to the top of a sloping Wing Wall, saw cut and remove a wedge shaped portion of the sloping Wing Wall as required to provide a level surface for post installation.

SCHEME 2 NOTES:

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing.

2. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend beyond end of existing End Bent Wing Wall, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.

3. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
**Revised Design Standards 2016**

**DESCRIPTION:**

**TRAFFIC RAILING - (VERTICAL FACE RETROFIT) WIDE CURB**

**INDEX NO.**

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**SCHEME 3 NOTES:**

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1.

2. Dowel Bars 4N may be installed on a maximum angle of 45° to the cut edge of the Approach Slab as shown to facilitate drilling of holes and installation of bars.

3. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or they may be installed in drilled holes in the new section of curb using an Adhesive Bonding Material System with a 1'-0" minimum embedment.

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**SCHEME 4 NOTES:**

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1.

2. Dowel Bars 4N may be installed on a maximum angle of 45° to the cut edge of the Approach Slab as shown to facilitate drilling of holes and installation of bars.

3. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or they may be installed in drilled holes in the new section of curb using an Adhesive Bonding Material System with a 1'-0" minimum embedment.
*** Curb heights vary from 3" Min. to 10" Max. Match height and shape of existing curb on bridge.

Existing Filared Wing Wall shown. Existing Parallel Wing Wall similar
Bars 4A @ 9" Max. (Field bend as required to maintain clearance) (Typ.)

Transition Block (See Note 3)

Edge of Existing Approach Slab (Location Varies)

10" Min. Embedment

Bars 4A @ 9" Max. (Typ.)


Bars 4A @ 9" Max., Min. 3 full length bars required Top & Bottom (Field Bend to clear) (Typ.)

2'-0" (Min.)

Bars 4A @ 9" Max. (Typ.)

Asphalt Overlay when present (Variates)

Dowel Bars 4N @ 1'-3" Spacing Max. (Front Face only)

12" Min. Embedment

Curb heights vary from 5" Min. to 10" Max.  Match height and shape of existing curb on bridge.

C-I-P Curb

Match Existing Curb Height on Bridge

Bars 4M (1'-0" Min. Embedment, See Note 4)

Partially shown for clarity)

SCHEME 5 NOTES:

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1.

2. Dowel Bars 4N may be installed on a maximum angle of 45° to the cut edge of the Approach Slab as shown to facilitate drilling of holes and installation of bars.

3. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend beyond end of existing End Bent Wing Wall, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.

4. Field bend Dowel Bars 4M within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

5. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or they may be installed in drilled holes in the new section of curb using an Adhesive Bonding Material System with a 1'-0" minimum embedment.
**NOTES:**

1. On approach end provide a Roadway Guardrail Transition, Index No. 403 (as shown) or other specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is along the Wing Wall, see Schemes 2 or 3, Sheets 2 & 3. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing. For treatment of trailing end see Roadway Plans. If vertical face retrofit extends beyond bridge and approach slab ends, see Index No. 484 for treatment and Details.

2. Field cut Bars 5S and Dowel Bars 6D to maintain clearance within Vertical Face Retrofit Railing.

3. Where existing structure has been removed and not encased in new concrete: match adjoining areas and finish flat by grouting or grinding as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1" below existing concrete and grouted over.
Dowel Bars 4L (10" Embedment)

Dowel Bars 6D @ 1'-3" Spacing Max. (Front and Back row of bars only)

Bar 5S (Typ.)

Dowel Bar 6D (6 7/8" Spacing Max. (Middle row of bars only)

Transition Block (See Note 2)

SCHEME 1 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb. See Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
3. If a Special Steel Guardrail Post is required for attachment to the top of a sloping Wing Wall, saw cut and remove a wedge shaped portion of the sloping Wing Wall as required to provide a level surface for post installation.

SCHEME 2 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend beyond end of existing End Bent Wing Wall, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

TRAFFIC RAILING - (VERTICAL FACE RETROFIT) INTERMEDIATE CURB
**SCHEME 3 NOTE:**

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1.

**PARTIAL PLAN OF RAILING**

- Parallel Portion of Vertical Face Retrofit Railing if present (See Note 1)
- Limiting Station of Transition
- Roadway Guardrail Transition (See Note 1, This Sheet & Note 1, Sheet 1)

**PARTIAL ELEVATION OF INSIDE FACE OF RAILING**

(Railing Reinforcing and Expansion Dowel Assemblies not shown for clarity)

**SCHEME 3**

RAILING END TREATMENT FOR FLARED WING WALLS
DESIGN NOTES:

1. The minimum length of advancement for both near lane and opposing lane approaches is 20'.

2. For Design Speeds greater than 40 mph the Tapered End Transition is not permitted. See Index No. 400 for length of Advancement of guardrail or other project specific end treatments.

The Tapered End Transition should only be used when space is limited which precludes the use of a guardrail end treatment or crash cushion.

D = Distance in feet from near edge of near approach traffic lane to either:
(a) the back of hazard, when the hazard is located inside the clear zone or horizontal clearance;
(b) the clear zone or horizontal clearance outer limits, when hazard extends to, or goes beyond the clear zone or horizontal clearance limits.

For left side hazards on two way undivided facilities, "D" is measured from the inside edge of the near approach traffic lane as shown above.

d = Distance in feet from near edge of near approach traffic lane to face of traffic railing (at offset control point). For left side hazards on two-way undivided facilities "d" is measured from the inside edge of the nearest opposing traffic lane as shown above.

CROSS REFERENCES:
For General Notes, Dowel Details, Expansion Dowel Details, Reinforcing Steel Notes and Reinforcing Steel Bending Diagram see Index No. 480.
Approach Slab Transition (See Schemes 1 thru 7 for Details and Reinforcement)

Begin or End Approach Slab Transition (see Schemes for Details)

Bridge and/or Approach Slab Transition

Bars 4G (Typ.)

Bars 5S (field bend & cut to maintain cover)

Bars 5F (Typ.)

Bars 5E (Typ.) (Cut to maintain cover in Transition Area)

Bars 5S @ 8" spacing (tied to Bars 4F)

Offset Control Point (Front Face of Railing) Begin Tapered End Transition

Bars 5F @ 8" spacing

20'-0" (Traffic Railing to Curb Transition)

Extend Bars 5S in back face of Traffic Railing 1'-6" into Tapered End Transition

Bars 5F (Typ.)

Bars 4G (Typ.)

Bars 5S (field bend & cut to maintain cover)

Bars 5S @ 8" spacing (tied to Bars 4F)

20'-0" (Traffic Railing and Curb Transition)

Bars 5F (Typ.)

Bars 4G (Typ.)

Bars 5S (field bend & cut to maintain cover)

Bars 5S @ 8" spacing (tied to Bars 4F)

20'-0" (Traffic Railing and Curb Transition)

Bars 4G (Typ.)

Bars 5S (field bend & cut to maintain cover)

Bars 5S @ 8" spacing (tied to Bars 4F)

TAPERED END TRANSITION

PARTIAL PLAN VIEW

PARTIAL ELEVATION VIEW

CROSS REFERENCES:
For Section A-A, B-B and X-X see Sheet 4.
NOTES:
1. On approach end provide a Roadway Guardrail Transition, Index No. 402 (Sheet 16 - Scheme 1) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment.
2. Provide Railing & Curb Base Transitions (as shown) if curb does not extend beyond end of Spread Footing Approach, see Roadway Plans. Railing End Transition & Railing & Curb Base Transitions may be omitted on trailing ends with no opposing traffic.

CROSS REFERENCES:
For Section A-A, C-C and X-X see Sheet 4.
SECTION X-X (TYPICAL CURB. TYPE VARIES, TYPE F SHOWN)  
(See Index No. 300 and Plans for Details)

* Match Cross Slope of high side and low side at begin or end bridge or approach slab.

** Match curb height of adjacent bridge and approach slab. Adjust height in Transition area to match adjoining Roadway curb.

SECTION C-C  
(GUARDRAIL END TRANSITION)
**SCHEME 1 ~ MODIFICATION FOR INDEX NO. 481, 482 AND 483 - SCHEME 1**

**RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WALLS WITH NARROW CURBS (SHOWN), WIDE CURBS AND INTERMEDIATE CURBS (SIMILAR)**

**CROSS REFERENCE:**
For Section A-A see Sheet 4.
For Expansion Dowel Assembly and placement of Dowel Bars 6D Details see Index 480.

**PARTIAL ELEVATION OF INSIDE FACE OF RAILING**
(Expansion Dowel Assemblies and Bars 4C not shown for clarity)

**PARTIAL PLAN**

**SECTION D-D**

**SECTION E-E (NARROW CURB SHOWN, WIDE AND INTERMEDIATE CURBS SIMILAR)**
PARTIAL PLAN

Existing Approach Slab

Asphalt Overlay when present (Varies)

Top of Curb

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Expansion Dowel Assemblies and Bars 4C not shown for clarity)

SCHEME 2 ~ MODIFICATION FOR INDEX NO. 481 - SCHEME 2
RAILING END TREATMENT FOR PARALLEL WING WALLS WITH NARROW CURBS

NOTES:
3. Remove existing concrete along saw cut joints. Existing reinforcing steel may be cut at joint or extended into new concrete. Exposed existing reinforcing not encased in new concrete shall be removed 1" below existing concrete surface and grouted over.

SECTION F-F

CROSS REFERENCES:
For Section A-A see Sheet 4.
For Section D-D see Sheet 5.
For Expansion Dowel Assembly and placement of Dowel Bars 6D Details see Index 480.
Existing Flared Wing Post to be removed to top of curb
Curb & portion of Approach Slab (when present, shown shaded) to be removed
Existing Flared Wing Post to be removed to top of curb
Bond Breaker along end bent wing wall only
Bars SF @ 8" spacing Max. (Typ.) Clip bars as reqd. to maintain Cover
Curb & portion of Approach Slab

PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Expansion Dowel Assemblies and Bars 4C not shown for clarity)

SCHEME 3 - MODIFICATION FOR INDEX NO. 481 SCHEME 3
RAILING END TREATMENT FOR FLARED WING WALLS WITH NARROW CURBS

CROSS REFERENCES:
For Section A-A see Sheet 4.
For Section D-D see Sheet 5.
For Section F-F see Sheet 6.
For Expansion Dowel Assemblies Details and placement of Dowel Bars 6D see Index 480.
SCHEME 4 ~ MODIFICATION FOR INDEX NO. 482 SCHEME 2
RAILING END TREATMENT FOR PARALLEL CURBS AND WING WALLS WITH WIDE CURBS

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Wing Post, Expansion Dowel Assemblies and Bars 4C not shown for clarity)

PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Wing Post, Expansion Dowel Assemblies and Bars 4C not shown for clarity)

SCHEME 5 ~ MODIFICATION FOR INDEX NO. 482 SCHEME 3 AND 4
RAILING END TREATMENT FOR PARALLEL CURBS AND FLARED WING WALLS WITH WIDE CURBS

CROSS REFERENCES:
For Section A-A see Sheet 4.
For Section D-D see Sheet 5.
For Section G-G see Sheet 7.
For Expansion Dowel Assemblies Details see Index 480.

TRAFFIC RAILING - (VERTICAL FACE RETROFIT) SPREAD FOOTING APPROACH

DESIGN STANDARDS 2016

INDEX 484

SHEET 8 of 10

LAST REVISION 07/01/09
DESCRIPTION: 07/01/09

07/01/09

TRAFFIC RAILING - (VERTICAL FACE RETROFIT)
SPREAD FOOTING APPROACH
Provide 1½ Preformed Joint Filler on top of existing curb (shown hatched).

Bars 4C (Typ.)

Expansion Dowel Sleeve Assembly

Bars 5F @ 8" spacing Max. (Typ.) Clip bars as req’d to maintain Cover

Bars 5E @ 8" spacing Max. (Typ.) tied to Bars 5F

Dowel Bars 6D 1'-3" Max. Spacing

Provide 1½ Preformed Joint Filler on top of existing curb (shown hatched).

Bars 4C (Typ.)

Expansion Dowel Sleeve Assembly

Bars 5F @ 8" spacing Max. (Typ.) Clip bars as req’d to maintain Cover

Bars 5E @ 8" spacing Max. (Typ.) tied to Bars 5F

Dowel Bars 6D 1'-3" Max. Spacing

Note:
- Match curb height at adjoining existing end bent wing.

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Expansion Dowel Assemblies and Bars 4C not shown for clarity)

SCHEME 6 - MODIFICATION FOR INDEX NO. 483 SCHEME 2
RAILING END TREATMENT FOR PARALLEL CURBS AND WING WALLS WITH INTERMEDIATE CURBS

TRAFFIC RAILING - (VERTICAL FACE RETROFIT) SPREAD FOOTING APPROACH
PARTIAL PLAN OF RAILING

Front Face of Backwall, Begin or End Bridge & Match Line (See Index No. 483, Sheet 3)

Asphalt Overlay when present (Varies)

Existing Curb

Existing Approach Slab

Existing End Bent Wing Wall

Dowel Bars 6D

Dowel Bars 5E @ 8" spacing Max. (Typ.) tied to Bars 5F

Top of Curb Bonds

Bars 5S (Typ.)

Bars 5F @ 8" spacing Max. (Typ.) Clip bars as reqd. to maintain Cover

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

(Expansion Dowel Assemblies and Bars 4C not shown for clarity)

SCHEME 7 ~ MODIFICATION FOR INDEX NO. 483 SCHEME 3

RAILING END TREATMENT FOR PARALLEL CURBS AND FLARED WING WALLS WITH INTERMEDIATE CURBS

CROSS REFERENCES:
For Section A-A see Sheet 4.
For Section D-D see Sheet 5.
For Section H-H see Sheet 9.
For Expansion Dowel Assemblies and placement of Dowel Bars 6D Details see Index 480.

Note:
** Match curb height at adjoining existing end bent wing

TRAFFIC RAILING - (VERTICAL FACE RETROFIT) SPREAD FOOTING APPROACH

INDEX NO. 484

DESIGN STANDARDS 2016