Use RFL when Pier is at Channel Edge and see CFR, Title 33, part 118 for Mounting Height restrictions. Use RCL otherwise.

Mounted only on the Pier that defines CM, otherwise does not apply.

RFL to be located at mid length of straight portion of fender.

NAVIGATION LIGHT NOTES:

1. Provide Navigation Light System in compliance with Specifications Section 510.

Size conduit and conductors per NEC requirements. Do not use conduit smaller than Ø.

NAVIGATION LIGHT SYSTEM SCHEMATIC

FOR SINGLE BRIDGE WITH FENDERS

FOR DUAL BRIDGES WITH FENDERS

FOR SINGLE BRIDGE WITHOUT FENDERS

FOR DUAL BRIDGES WITHOUT FENDERS

LEGEND

LC Lighting Contactor
PC Photocell Control
Xmer Transformer (If Required)

RFL Red Pier/Fender Light (180° visibility)
RCL Red Channel Margin Light (180° visibility)
GCL Green Center Channel Light (360° visibility)
CGL Clearance Gauge Light
CM Channel Margin or Pier inner surface whichever defines Channel Edge.

TYPICAL ELECTRICAL SCHEMATIC DIAGRAM

POWER CONDUCTORS

<table>
<thead>
<tr>
<th>DISTANCE (feet)</th>
<th>VOLTS</th>
<th>CONDUCTOR</th>
<th>TRANSFORMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 75</td>
<td>120</td>
<td>#12 AWG</td>
<td>N/A</td>
</tr>
<tr>
<td>75 - 500</td>
<td>120 or 240</td>
<td>#10 AWG</td>
<td>N/A</td>
</tr>
<tr>
<td>500 - 1000</td>
<td>240</td>
<td>#10 AWG</td>
<td>2 KVA</td>
</tr>
<tr>
<td>1000 - 2000</td>
<td>480</td>
<td>#6 AWG</td>
<td>2 KVA</td>
</tr>
<tr>
<td>2000 - 5000</td>
<td>480</td>
<td>#6 AWG</td>
<td>2 KVA</td>
</tr>
<tr>
<td>5000 - 10000</td>
<td>480</td>
<td>#4 AWG</td>
<td>2 KVA</td>
</tr>
<tr>
<td>Over 10000</td>
<td>480</td>
<td>#4 AWG</td>
<td>2 KVA</td>
</tr>
</tbody>
</table>
Approach Slab
Deck Joint
Front Face of Backwall & Begin or End Bridge
Bridge Deck

1'-9" (±12")
1'-0" Min.
8'-0" Maximum (Typ. all Posts)
8" Min.
Additional Rail required for SHBR with Post "B2"

ELEVATION OF INSIDE FACE OF TRAFFIC RAILING WITH PEDESTRIAN/BICYCLE BULLET RAILING

NOTES:
1. A Bullet Railing Tapered End Transition is required for all approach ends of Bullet Railings on Traffic Railings. When Guardrail Connection is required terminate the Bullet Railing Tapered-End Transition at beginning of the Traffic Railing End Transition.

2. Where Bullet Railing continues on retaining wall mounted Traffic Railings or Barriers, provide a Bullet Railing Tapered End Transition at the terminus of the Bullet Railing.

CROSS REFERENCES:
Work in conjunction with Index 515-022.
For Traffic Railing Details, Reinforcement and Notes see Index 521-427.
RAILING NOTES:

1. Work this Index with Index 521-423, 521-427, 521-428, 521-820 and 515-021 and Specification Section 515.

2. Shop Drawings: Submit shop drawings prior to fabrication.
   A. Include post and rail splice/expansion assembly location for curved alignments with radii < 40 feet and for all end terminations.

3. Materials:
   A. Supply Aluminum materials in accordance with Specification Section 965 and the following:
      Wrought Aluminum Post: ASTM B221, Alloy 6061-T6 or 6351-T5
      Rail End Cap: ASTM B26 sand cast aluminum alloy 356.0-F
      Plate and Bars: ASTM B209 Alloy 6061-T6
      Rails: ASTM B221 Alloy 6061-T6 or 6351-T5
      Stop Pins: Press-fit aluminum or stainless steel pins or tubes
   B. Stainless Steel Fasteners: ASTM F-593, Alloy Group 2 (316).
   C. Bearing Pads: Plain or Fiber Reinforced meeting Specification Section 932 for Ancillary Structures.

4. Layout:
   A. Posts shall be uniformly spaced with reasonable consistency.
   B. Tapered End Transitions are required at the terminus of the approach ends of Bullet Railings mounted on a Traffic Railing.
   Bullet Railings on concrete parapets shielded by a traffic railing do not require Tapered End Transitions unless noted otherwise in the Plans.
   C. Adjust post spacings to avoid parapet obstacles, such as armor expansion plates, by 9 inches minimum.
   D. Rails shall be continuous over a minimum of 3 posts, except that lengths less than 12 feet need only be continuous over 2 posts.
   E. Space splices at 40 feet maximum. Splice all rails in a given railing section at about the same center line.
   F. Provide rail expansion assemblies in panels between posts on either side of a bridge expansion joint. Rail expansion assemblies are similar to the rail splice assemblies with increased space at the expansion assembly to allow for movement equal to 1.5 times the bridge joint opening or 1" greater than the expected joint movement.

5. Installation:
   A. Set rails near bridge expansion joints to allow for expected movement.
   B. Cutting of reinforcing steel is permitted for post installed anchors.

6. Payment: Includes the full cost of installed bullet railing. Cost of the Concrete Parapet or Traffic Railing is separate.
1. Shop Drawings are required.
2. Work this index with Index 515-052 Bicycle/Pedestrian Railing Details (Steel) and Specification Section 515. Refer to the SPI for Design Criteria and limits of Use.
3. Materials:
   a. Steel: Galvanized after fabrication
      i. Fasteners: Hex Head Bolt ASTM A307, Hex Nuts ASTM A563, Washers ASTM F436
      ii. Support Bracket (Scheme 3) L-shape and Stiffener Plate: ASTM A36
      iii. Bottle-guard (Schemes 1 & 3) L-shape: ASTM A36
   b. Concrete: Same as bridge deck
   c. Pre-cured Silicone Sealant: Specification Section 932
   d. Bearing Pads: Provide 3/4" Plain, Fabric Reinforced or Fabric Laminated bearing pads that meet the requirements of Specification Section 932 for Ancillary Structures.
4. See Structures Plans, Superstructure Sheets for bridge information including concrete type, deck expansion joint locations and orientations, and thermal movement.
5. Railings:
   a. For thermal movement greater than 4" (up to a maximum of 5"), clear opening between adjacent pickets, or panels at Rail Expansion Joints above Deck Joints must be reduced to 3 1/2".
   b. For treatment of railings on skewed bridges see Index 521-427.
6. Curb:
   a. Match open curb joints at Deck Expansion Joint locations to the deck joint dimension.
   b. Construct Concrete Curb (Scheme 2) vertical with the top surface finished level transversely. See Concrete Curb Details Sheet 3.
   c. Provide 3/4" Intermediate open joints in curbs coinciding with the 3/4" joints in the traffic railing.
7. Payment: Support bracket (Scheme 3) is incidental to the cost of railing. Curb concrete and reinforcing steel (Scheme 2) are included in the bridge deck quantities.
**Detailed Instructions:**

- **Top Rail or Handrail Section:**
  - Variations in deck expansion joints:
    - 1/2" (± 1/4") - Field splice slip joint or curb intermediate open joint.
    - 1" max @ maximum movement.

- **Intermediate or Bottom Rail Section:**
  - 1" NPS (Sch. 40) for handrails.
  - 1.50 OD x 0.125 Wall for intermediate and bottom rails.

- **Set Screws:**
  - * Ø x 1/2" Pan Head Stainless Steel (Type 316 or 18-8 Alloy)
  - Set screws along outside face of railing. Set screws must be set flush against the rail surface.
  - A 1/2" Ø plug weld may be substituted for the two set screws at expansion joints.

- **Expansion Joint Opening:**
  - Embedded length may be 4" for plug welded connection.
  - Increase handrail sleeve embedment to 8" for expansion joint openings greater than 2".

- **Steel Sleeve:**
  - For top rail: 2.50 OD x 0.125 Wall.
  - For handrails (1" NPS (Sch. 40)).
  - For intermediate and bottom rails: 1.50 OD x 0.125 Wall.

- **Intermediate or Bottom Rail - Steel Sleeve Detail:**
  - Bottom side shown.

- **Detail "B" Expansion Joint (Field Splice Similar):**
  - Round over both ends of rails to remove sharp edges (Typ.).

- **FOR RAILS - TOP RAIL OR HANDRAIL:**
  - 1/2" Ø  x 3/4" Pan Head Stainless Steel (Type 316 or 18-8 Alloy).
  - Set screws along outside face of railing. Set screws must be set flush against the rail surface. A 3/4" plug weld may be substituted for the two set screws at expansion joints.

- **Intermediate or Bottom Rail Section:**
  - Set screws must be set flush against the rail surface. A 1/2" Ø plug weld may be substituted for the two set screws at expansion joints.

- **Handrail Section:**
  - Set screws must be set flush against the rail surface. A 1/2" Ø plug weld may be substituted for the two set screws at expansion joints.

- **Expansion Joint Opening:**
  - Embedded length may be 4" for plug welded connection.
  - Increase handrail sleeve embedment to 8" for expansion joint openings greater than 2".

- **Steel Sleeve:**
  - For top rail: 2.50 OD x 0.125 Wall.
  - For handrails (1" NPS (Sch. 40)).
  - For intermediate and bottom rails: 1.50 OD x 0.125 Wall.

- **Intermediate or Bottom Rail - Steel Sleeve Detail:**
  - Bottom side shown.

- **Detail "A" - Section at Intermediate Open Joint:**
  - At intermediate open joints, seal the lower 6" portion of the open joint with pre-cured silicone sealant. 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.
1. Shop Drawings are required.
2. Work this Index with Index 515-062 Aluminum Bicycle/Pedestrian Railing Details and Specification Section 515. Refer to the IDS for Design Criteria and Limits of Use.
3. Materials:
   A. Galvanized Steel Fasteners: Hex Head Bolt ASTM A307, Hex Nuts ASTM A563, Washers ASTM F436
   B. Aluminum:
      a. Support Bracket (Scheme 3) L-shape and Stiffener Plate: ASTM B209, Alloy 6061-T6
      b. Bottle-guard (Schemes 1 & 3) L-shape: ASTM B209, Alloy 6061-T6 or 6063-T5
   C. Concrete: Same as bridge deck
   D. Pre-cured Silicone Sealant: Specification Section 932
   E. Bearing Pads: Provide 3/8" thick Plain, Fabric Reinforced or Fabric Laminated pads meeting the requirements of Specification Section 932 for Ancillary Structures.
4. See Structures Plans, Superstructure Sheets for bridge information including concrete type, deck expansion joint locations and orientations, and thermal movement.
5. Railings:
   A. For thermal movement greater than 4" (up to a maximum of 5'), clear opening between adjacent pickets or panels at Rail Expansion Joints above Deck Joints must be reduced to 3½".
   B. For treatment of railings on skewed bridges see Index 521-427.
6. Curbs:
   A. Match open curb joints at Deck Expansion Joint locations to the deck joint dimension.
   B. Construct Concrete Curb (Scheme 2) vertical with the top surface finished level transversely. See Concrete Curb Details Sheet 3.
   C. Provide 3/8" Intermediate open joints in curbs coinciding with the 3/8" joints in the traffic railing.
7. Payment: Support Bracket (Scheme 3) is incidental to the cost of railing. Curb concrete and reinforcing steel (Scheme 2) are included in the bridge deck quantities.
**DETAIL "B" EXPANSION JOINT (FIELD SPLICE SIMILAR)**

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
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<tr>
<td>P</td>
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</tr>
<tr>
<td>S</td>
<td>4</td>
<td>As Reqd.</td>
</tr>
<tr>
<td>BAR 4P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAR 4S</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ALTERNATE REINFORCING (WWR) DETAILS**

**NOTE**: Place wire panels to minimize the end overhang. End overhangs greater than 4" are not permitted.

**CURB REINFORCING STEEL NOTES:**
1. All bar dimensions in the bending diagrams are out to out. The reinforcement for the curb on a retaining wall shall be the same as detailed for an 8" deck.
2. All reinforcing steel at the open joints shall have a 2" minimum cover.
3. Bar splices for Bars 4S shall be a minimum of 1'-0".
4. Deformed WWR meeting the requirements of Specifications Section 931 may be used in lieu of all Bars 4P and 4S.

**INTERMEDIATE JOINT SEAL NOTE:**
At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant. 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.

**ESTIMATED CONCRETE CURB QUANTITIES (SCHEME 2)**

<table>
<thead>
<tr>
<th>ITEM</th>
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<td>Reinforcing Steel</td>
<td>LB/1'</td>
<td>4.01</td>
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**SCHEME 2 - CONCRETE CURB DETAILS**

---

**SCHEME 1 - BOTTLE GUARD DETAIL**

**SCHEME 3 - BOTTLE GUARD DETAIL**
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 (5'-0" embedment) and 18,500 lbs for Dowel Bars 6D along the outside face of the traffic railing (5'-0" 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 in accordance with Specification Section 705. Barrier Delineator color (white or yellow) shall match the color of the near edgeline.

GUARDRAIL: See Index 536-001 for guardrail component details, geometric layouts and associated notes not fully detailed herein.

BRIDGE NAME PLATE: If a portion of the existing Traffic Railing is to be removed that carries the bridge name, number and or date, or if the installation of the Traffic Railing (Thrie Beam Retrofit) will obscure the bridge name, number and or 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 sheathing and adhesive backing shall comply with Specification Section 994 and may comprise individual decals of letters and numbers.

PAYMENT: Guardrail Bridge Anchorage Assembly (each) includes all barrier delineators for the entire bridge length, transition blocks, and necessary hardware to complete the Guardrail transitions shown.
GUARDRAIL TRANSITION DETAILS - SHEET 1 OF 2

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

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

* See Limits of Removal of Existing Structure, Sheets 2 of 8 and 4 of 8.
GUARDRAIL TRANSITION DETAILS - SHEET 2 OF 2

PARTIAL PLAN - APPROACH TRANSITION

(a) (b) (c) (d) (e) (f) (g) (h)

PARTIAL ELEVATION - APPROACH TRANSITION

SCHEME 5
(Narrow Curb shown; Receded Curb similar)

PARTIAL ELEVATION - TRAILING END TRANSITION
(Narrow Curb Scheme 2 shown; All other Schemes similar)

SCHEME 6

GUARDRAIL TRANSITIONS-EXISTING POST & BEAM BRIDGE RAILINGS (NARROW & RECESSED CURBS)

INDEX
521-404

SHEET
7 of 8

REV: 07/01/14

DESCRIPTION:
FY 2018-19 STANDARD PLANS
PLAN VIEW OF TRANSITION BLOCK
(GUARDRAIL NOT SHOWN FOR CLARITY)

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

ESTIMATED QUANTITIES PER TRANSITION BLOCK

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
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<tbody>
<tr>
<td>Concrete Class II (Bridge Deck)</td>
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<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>0.0</td>
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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 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 23,800 lbs. for Dowel Bars 6D along the outside face of the traffic railing (5" min. embedment). Field Cut Bars 6D to provide 2" cover above blockout (Typ.).

BARRIERS ON CURVED ALIGNMENTS: The details presented in these Standards are shown for bridges on tangent alignments. Details for bridges with 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 bridge 2" from the face on the traffic side with accordance with Specification Section 310. 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. Guardrail Bridge Anchorage Assembly (each) includes all barrier delineators for the entire bridge length, transition blocks, and necessary hardware to complete the Guardrail 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. Guardrail Bridge Anchorage Assembly (each) includes all barrier delineators for the entire bridge length, transition blocks, and necessary hardware to complete the Guardrail transitions shown.

ESTIMATED TRAFFIC RAILING QUANTITIES

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<tr>
<th>ITEM</th>
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<tr>
<td>Reinforcing Steel</td>
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(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.)

PARTIAL ELEVATION OF RAILING SHOWING FINGER/SLIDING PLATE JOINT AT BEGIN OR END BRIDGE - SCHEMES 1 THRU 5

* 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.

PARTIAL ELEVATION OF RAILING SHOWING FINGER/SLIDING PLATE JOINT AT BEGIN OR END BRIDGE - SCHEME 2 THRU 5

(Guardrail Transition not shown for clarity)
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM

BILL OF REINFORCING STEEL

<table>
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<th>MARK</th>
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<td>AS REQD.</td>
<td>3</td>
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<tr>
<td>B</td>
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<tr>
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<td>4</td>
<td>2'-0&quot;</td>
<td>1, 2 &amp; 3</td>
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<tr>
<td>D</td>
<td>6</td>
<td>AS REQD.</td>
<td>2 &amp; 3</td>
</tr>
<tr>
<td>E</td>
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<td>1 &amp; 3</td>
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<td>F</td>
<td>4</td>
<td>4'-3&quot;</td>
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<td>G</td>
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<td>2'-5&quot;</td>
<td>1 &amp; 3</td>
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<td>I</td>
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<td>AS REQD.</td>
<td>2, 3 &amp; 4</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.

BARS 6D (12 required per open joint)

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.

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.
Existing Wing Wall Embedment - 1'-0" preferred with 2" Edge

Non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment at skewed deck joints see Skew Detail. Provide open Railing Joints at Deck Expansion Joint locations matching the dimension of the Deck Joint.

Curb heights vary from 5" Min. to 1'-2" Max.

Embed - 1'-0" preferred with 2" Edge Distance or Bottom Clearance. 6" Min. If Edge Distance or Bottom Clearance is less than 2'.

Existing Bridge Deck

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Expansion Dowel Assemblies & Bars 4C not shown for clarity)

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 4, 5 or 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.

For treatment of trailing end see Roadway Plans.

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.

NOTES:

- Field cut Bars 5S and Dowel Bars 6D to maintain clearance within Vertical Face Retrofit Railing.
- 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.
- Non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment at skewed deck joints see Skew Detail. Provide open Railing Joints at Deck Expansion Joint locations matching the dimension of the Deck Joint.
- Curb heights vary from 5" Min. to 1'-2" Max.
- Embed - 1'-0" preferred with 2" Edge Distance or Bottom Clearance. 6" Min. If Edge Distance or Bottom Clearance is less than 2'.

SECTION C-C
TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB
(SCHEMES 2 AND 3 ONLY)
Dowel Bars 4L (10" Embedment) (Place 3 Bars Min. Top and 1 Bar Min. Bottom) (See Note 2)

Existing Approach Slab

Match Existing Curb Height

Transition Block (See Note 1)

1'-0" Transition Block

(See Note 2)

2 " (2'-6" Min.)

Varies

Limiting Station of Transition Block (See Note 2)

Roadway Guardrail Transition (See Note 1 Below & Note 1, Sheet 3 of 6)

Vertical Face Retrofit Railing

Bars 4L (Typ.)

Max. (Black Face only)

Bars 60 @ 75" Spacing Max. (Front Face only)

Bars 55 (Typ.)

Transition Block (See Note 2)

Partial Elevation of Inside Face of Guardrail

(Partials shown, Existing Angled Wing Wall similar)

Dowel Bars 4L (10" Embedment) (See Note 2)

Existing Perpendicular Wing Wall shown, Existing Angled Wing Wall similar

Front Face of Backwall, Begin or End Bridge & Match Line (See Sheet 3 of 6)

SCHEME 2
RAILING END TREATMENT FOR PARALLEL CURBS

Asphalt Overlay when present (Varies) —

Final Riding Surface

Existing Curb

Dowel Bars 4L (10" Embedment) (Place 3 Bars Min. Top and 1 Bar Min. Bottom)

Existing Approach Slab

Match Existing Curb Height

Transition Block

(See Note 1)

1'-0"

Dowel Bars 4L (10" Embedment) (See Note 2)

Existing Approach Slab

Place first post 2" clear of Wing Wall

PARTIAL ELEVATION OF INSIDE FACE OF GUARDRAIL
(Existing Wing Post not shown for clarity)

SCHEME 1
RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLS

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 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 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.

---

**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 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.
GUARDRAIL TRANSITIONS - EXISTING POST & BEAM BRIDGE RAILINGS (WIDE CURBS)

**SCHEME 5**

**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 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 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. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend beyond end of existing End Bend 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 railing 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:**

- Parallel portion of Existing Flared Wing Wall may or may not exist (length varies).
- Vertical Face Retrofit Railings
- Bars 4C (Typ.) Expansion Dowel Sleeve Assembly
- Bars 6D cut to clear Backwall
- Bars 6D @ 7 3/8" Spacing
- Transition Block (SCHEMES 4 and 5 only)
- **Max. (Front Face only)**
- **Max. (Back Face only)**
- **Dowel Bars 6D @ 1'-3" Spacing**
- **Dowel Bars 4N @ 1'-3" (Typ.)**
- **Asphalt Overlay when present (Varies)**
- **Organic Felt Bond Breaker**

---

**PARTIAL PLAN OF RAILING**

- Existing Wing Post (Type Varies)
- Organic Felt Bond Breaker
- Vertical Face Retrofit Railings
- Bars 4C (Typ.) Expansion Dowel Sleeve Assembly
- Bars 6D cut to clear Backwall
- Dowel Bars 6D @ 1'-3" Spacing
- Max. (Back Face only)
- Bars 5S
- Transition Block (See Note 4)
- **Bars 6D (Typ.)**
- **Transition Block (See Note 3)**
- **Existing Approach Slab**
- **Dowel Bars 6D @ 1'/3" (Typ.)**
- **Max. (Front Face only)**
- **Dowel Bars 6D @ 1'/3" (Typ.)**
- **Max. (Back Face only)**
- **Dowel Bars 6D @ 7/8" Spacing**
- **Max. (Front Face only)**
- **Existing Approach Slab**

**PARTIAL ELEVATION OF INSIDE FACE OF RAILING**

*SCHEME 5*

**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 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 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. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend beyond end of existing End Bend 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 railing 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:**

- Parallel portion of Existing Flared Wing Wall may or may not exist (length varies).
- Vertical Face Retrofit Railings
- Bars 4C (Typ.) Expansion Dowel Sleeve Assembly
- Bars 6D cut to clear Backwall
- Dowel Bars 6D @ 7 3/8" Spacing
- Transition Block (SCHEMES 4 and 5 only)
- **Max. (Front Face only)**
- **Max. (Back Face only)**
- **Dowel Bars 6D @ 1'-3" Spacing**
- **Dowel Bars 4N @ 1'-3" (Typ.)**
- **Asphalt Overlay when present (Varies)**
- **Organic Felt Bond Breaker**
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 and MASH TL-4 Criteria.

CONCRETE AND REINFORCING STEEL: See Structures Plans, General Notes. GUARDRAIL: For Guardrail Connection details, see Index 536-001. RAILINGS ON RETAINING WALLS: If the Guardrail is to be provided on a retaining wall, the railing section will be the same as shown on Sheet 2 Section A-A. All other details such as the End Transition, Guardrail Connection, the maximum spacing of the 1/4 open joints, and 1/8 V-Groove shall apply. BARRIER DELINEATORS: Install Barrier Delineators on top of the Traffic Railing to the face on the traffic side in accordance with Specification Section 705. V-GROOVES: Construct 1/4 V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/4 Open Joints and Deck Joints and at V-Groove locations on Retaining Wall footings.

END TRANSITIONS: When guardrail approaches are shown in the Plans, provide the Railing End Transition as shown.

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 1/8" V-Grooves. V-Grooves shall be formed by preformed letters and figures. 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 521-427.

Provide 1/4 Intermediate Open joints at:
(1) - Superstructure supports where slab is continuous.
(2) - Ends of approach slabs where adjacent to retaining walls and at expansion joints on retaining wall junction slabs.


**SECTION A-A**

**TYPICAL SECTION THRU TRAFFIC RAILING**

**SECTION THRU BRIDGE DECK SHOWN**

**NOTES:**

1. Begin placing Railing Bars 5T and 5X on Approach Slab at the railing end and proceed toward Begin or End Bridge to avoid conflict with guardrail bolt holes. If required, adjustments to the bar spacing for Bars 5T and 5X shall be made immediately adjacent to Begin or End Bridge. Cut, shift and rotate Bars 5T and 5X as required to maintain cover in Railing End Transition.

2. Omit Railing End Transition and Guardrail if Concrete Traffic Railing is used beyond the Approach Slab or Retaining Wall. See Structures Plans, Plan and Elevation Sheet and Roadway 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.)

**VIEW B-B**

*(END VIEW OF TRAFFIC RAILING END TRANSITION)*

(Approach Slab shown, Retaining Wall Junction Slab similar)

**CROSS REFERENCE:**

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

**VIEW C-C**

**RAILING END TRANSITION**

(Guardrail Not Shown For Clarity)
**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

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<tr>
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**REINFORCING STEEL NOTES:**
1. All bar dimensions in the bending diagrams are out to out.
2. The 4'-6" vertical dimension shown for Bars ST and SX 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 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.

**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.

**ESTIMATED TRAFFIC RAILING QUANTITIES**

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<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<td>Reinforcing Steel</td>
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(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.)
**TRAFFIC RAILING - (32" VERTICAL SHAPE)**

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 End Transition, Guardrail Connection, the maximum spacing of the ½" open joints and ½" V-Grooves 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 figures 3" in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by V-Grooves. V-Grooves shall be formed by preformed letters and figures. OPEN JOINTS: See Structures Plans, General Notes, Approach Slab Sheets and Retaining Walls for actual dimensions and joint orientation. Provide open Traffic Railing Joints at Deck Expansion Assembly Locations matching the dimensions of the Deck Joint. For treatment of Railings on skewed bridges see Index 521-427. Provide ½ Intermediate Open Joints at:

1) Superstructure supports where slab is continuous.
2) Ends of approach slabs when adjacent to retaining wall junction slabs.

**ELEVATION OF INSIDE FACE OF RAILING**

Rainfall notes have been structured to be equivalent or greater in strength to other safety shape railings which have been crash tested to NCHRP Report 350 TL-4 and MASH TL-4 Criteria.

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

**GUARDRAIL:** For Guardrail Connection details, see Index 539-001.

**PEDESTRIAN/BICYCLE RAILING AND SPECIAL HEIGHT BICYCLE RAILING DETAILS:** See Index 515-022. Details and Notes. V-GROOVES: Construct ½" V-Grooves plumb. Space V-Grooves equally between ½" Open Joints and/or Deck Joints and at V-Groove locations on Retaining Wall Footings.

**BARRIER DELINEATORS:** Install Barrier Delineators on top of Traffic Railing for Special Height Bicycle Railing. Pedestrian/Bicycle Railing requires Post “C” Rail Expansion Assembly for special height bicycle railing. 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 End Transition, Guardrail Connection, the maximum spacing of the ½" open joints and ½" V-Grooves shall apply.

**TRAFFIC RAILING NOTES**

For Detail "A" see Sheet 3. For Section A-A and View B-B, see Sheet 2.
NOTES:
1. Begin placing Railing Bars 5T and 5X on Approach Slab at the railing end and proceed toward Begin or End Bridge to avoid conflict with guardrail bolt holes. If required, adjustments to the bar spacing for Bars 5T and 5X shall be made immediately adjacent to Begin or End Bridge. Cut, shift and rotate Bars 5T and 5X as required to maintain cover in Railing End Transition.

2. Omit Railing End Transition and Guardrail if Concrete Traffic Railing is used beyond the Approach Slab or Retaining Wall. See Structures Plans, Plan and Elevation Sheet and Roadway 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 and View B-B see Sheet 1.

NOTE: For Bulletin Railing Details, see Index 515-022.
### CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

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<tr>
<td>7</td>
<td>5</td>
<td>9'-0&quot;</td>
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<td>X</td>
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<td>5'-10&quot;</td>
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<th>ROADWAY CROSS-SLOPE</th>
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<td>0% to 2%</td>
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<td>2% to 6%</td>
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<tr>
<td>6% to 10%</td>
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<td>96°</td>
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**Note:** All bar dimensions in the bending diagrams are cut to cut.

**Stirrup Bar 5T**
- 2'-8"
- 11"
- 5"

**Stirrup Bar 5X**
- 2'-8"
- 11"
- 7"

**Paint Recessed Surfaces Black**

### 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.

### ESTIMATED TRAFFIC RAILING QUANTITIES

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<th>ITEM</th>
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(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.)
This railing has been structurally evaluated to be equivalent or greater in strength to other single-slope railings which have been crash tested to MASH TL-4 criteria.

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

GUARDRAIL: For Guardrail Connection details see Index 536-001.

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 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.

BARRIER DELINERATORS: Install Barrier Delineators on top of the Traffic Railing along the centerline in accordance with Specification Section 106.

V-GROOVES: Construct ½ V-Grooves plumb. Space V-Grooves equally between 3/8" open joints and/or Deck Joints.

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 2. Provide ½ Intermediate Open Joints at:

(1) - Superstructure supports where slab is continuous.
(2) - Ends of Approach Slabs adjacent to a Roadway Median Barrier.

END TRANSITIONS: When guardrail approaches are shown in the Plans, provide the Railing End Transition as shown in Detail "B." When a Concrete Median Barrier is shown on the approaches, provide the Railing Height Transition as shown in Detail "B".

CROSS REFERENCE:

For Section A-A, View B-B, Detail "A" and Detail "B" see Sheet 2.
For Detail "C" see Sheet 4.
NOTES:

1. When guardrail approaches are shown in the plans, begin placing Railing Bars 5R and 5W on Approach Slab at the railing end and proceed toward Begin or End Bridge to avoid conflict with guardrail bolt holes. Cut, bend and lap bars as shown to maintain cover. If required, adjustments to the bar spacing for Bars 5R and 5W shall be made immediately adjacent to Begin or End Bridge.

2. When a Concrete Barrier is used beyond the Approach Slab form a 5'-0" long Height Transition and raise Bars 5R up to maintain 2" top clearance.

DETAIL "B"

38" Single-Slope Barrier

Raise Bars 5R to maintain 2" cover at top of Traffic Railing along taper

DETAIL "C"

ELEVATION - RAILING HEIGHT TRANSITION

(Showing Transition to 38" Single-Slope Barrier)
PARTIAL PLAN VIEW OF BRIDGE DECK AND APPROACH SLAB WITH MEDIAN TRAFFIC RAILING

NOTES:
1) Median Traffic Railing reinforcement vertical Bars 5W may be shifted up to 1" (Max.) and rotated up to 10 degrees as required to allow proper placement.

2) Transition Stirrup Bars 5W shall be used as required at railing ends adjacent to expansion joints to facilitate placement of bars in acute corners. Place Transition Bars 5W 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) ½" Intermediate Open Joints and V-Grooves in railing shall be placed perpendicular or radial to the face 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 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 with deformed bars having an equivalent area of steel.
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

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<th>ROADWAY CROSS-SLOPE</th>
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<tr>
<td>6% to 10%</td>
<td>96°</td>
<td>90°</td>
</tr>
</tbody>
</table>

BA and BB shall be 90° if Contractor elects to place railing perpendicular to the deck, and approach slabs.

WELDED WIRE REINFORCEMENT NOTES:
1. At the option of the Contractor deformed Welded Wire Reinforcement (WWR) may be utilized in lieu of all Bars 5R, 5S and 5W. WWR must meet the requirements of Specification Section 931.
2. WWR at Railing End Transition shall be field bent (as required) to maintain cover. The bottom 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.

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. 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'-2".
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.

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. Include the cost of the Pre-cured Silicone Sealant in the Contract Unit Price for the Traffic Railing.

ESTIMATED TRAFFIC RAILING QUANTITIES

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(The above quantities are based on a crowned roadway, with a 2% cross slope.)
This railing has been structurally evaluated to be equivalent or greater in strength to other single-slope railings which have been crash tested to MASH TL-4 Criteria.

CONCRETE AND REINFORCING STEEL: See Structures Plans General Notes.

GUARDRAIL: For Guardrail Connection details see Index 536-001.

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 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.

PEDESTRIAN AND BICYCLE RAILING: See Index 515-021 and 515-022 for Notes, Details and post spacings for Traffic Railings with Pedestrian/Bicycle Bullet Railings.

V-GROOVES: Construct 3/8" V-Grooves plumb. Space V-Grooves equally between 1/2" Open Joints and/or Deck Joints and at V-Groove locations on Retaining Wall footings.

END TRANSITIONS: When guardrail approaches are shown in the Plans, provide the Railing End Transition as shown in Detail "A". When a concrete traffic railing or barrier is shown on the approaches, provide the Railing Height Transition as shown in Detail "B".

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: Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side in accordance with Specification Section 705.

JOINTS: For treatment of Railings on skewed bridges see Sheet 3. Provide 1/2" Intermediate Open Joints at:

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

This railing has been structurally evaluated to be equivalent or greater in strength to other single-slope railings which have been crash tested to MASH TL-4 Criteria.

CONCRETE AND REINFORCING STEEL: See Structures Plans General Notes.

GUARDRAIL: For Guardrail Connection details see Index 536-001.

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 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.

PEDESTRIAN AND BICYCLE RAILING: See Index 515-021 and 515-022 for Notes, Details and post spacings for Traffic Railings with Pedestrian/Bicycle Bullet Railings.

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

END TRANSITIONS: When guardrail approaches are shown in the Plans, provide the Railing End Transition as shown in Detail "A". When a concrete traffic railing or barrier is shown on the approaches, provide the Railing Height Transition as shown in Detail "B".

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: Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side in accordance with Specification Section 705.

JOINTS: For treatment of Railings on skewed bridges see Sheet 3. Provide 1/2" Intermediate Open Joints at:

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

This railing has been structurally evaluated to be equivalent or greater in strength to other single-slope railings which have been crash tested to MASH TL-4 Criteria.

CONCRETE AND REINFORCING STEEL: See Structures Plans General Notes.

GUARDRAIL: For Guardrail Connection details see Index 536-001.

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 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.

PEDESTRIAN AND BICYCLE RAILING: See Index 515-021 and 515-022 for Notes, Details and post spacings for Traffic Railings with Pedestrian/Bicycle Bullet Railings.

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

END TRANSITIONS: When guardrail approaches are shown in the Plans, provide the Railing End Transition as shown in Detail "A". When a concrete traffic railing or barrier is shown on the approaches, provide the Railing Height Transition as shown in Detail "B".

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: Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side in accordance with Specification Section 705.

JOINTS: For treatment of Railings on skewed bridges see Sheet 3. Provide 1/2" Intermediate Open Joints at:

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

This railing has been structurally evaluated to be equivalent or greater in strength to other single-slope railings which have been crash tested to MASH TL-4 Criteria.

CONCRETE AND REINFORCING STEEL: See Structures Plans General Notes.

GUARDRAIL: For Guardrail Connection details see Index 536-001.

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 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.

PEDESTRIAN AND BICYCLE RAILING: See Index 515-021 and 515-022 for Notes, Details and post spacings for Traffic Railings with Pedestrian/Bicycle Bullet Railings.

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

END TRANSITIONS: When guardrail approaches are shown in the Plans, provide the Railing End Transition as shown in Detail "A". When a concrete traffic railing or barrier is shown on the approaches, provide the Railing Height Transition as shown in Detail "B".

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: Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side in accordance with Specification Section 705.

JOINTS: For treatment of Railings on skewed bridges see Sheet 3. Provide 1/2" Intermediate Open Joints at:

1. Superelevation Supports where slab is continuous.
2. Ends of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.
SECTION A-A
TYPICAL SECTION THRU TRAFFIC RAILING
(Section thru Bridge Deck shown, Section thru Approach Slab
and Retaining Walls similar)

PLAN - RAILING END TRANSITION
(Showing Bars 4V and 4S)

NOTE: Omit Detail "A" and provide Detail "B" if Index 521-001 Concrete Barrier or Retaining Wall with 38" Single-Slope Traffic Railing is used beyond the Approach Slab. See Structures Plans, Plan and Elevation Sheet and Roadway Plans. If Transitions are not required, extend Typical Section to end of the Approach Slab.

DETAIL "A"

PLAN - RAILING END TRANSITION
(Showing Bars 4P and 4S)

DETAIL "B"

ELEVATION - RAILING HEIGHT TRANSITION
(Showing Transition to 38" Single-Slope Traffic Railing or Barrier)
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 % 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 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.

NOTES:
1) Concrete Parapet reinforcement is not affected by skew angle, see Index 521-825 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 4V & 4P may be shifted up to 1½ (Max.) and rotated up to 10 degrees as required to allow proper placement. Bars 4V adjacent to expansion joints shall be field adjusted to maintain clearance and spacing; extra Bars 4V will be required. Cut bottom horizontal portion of 4V Bars to maintain maximum horizontal length to each vertical leg being placed. Discard the remainder of the bar. Rotate cut bars 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) % Intermediate Open Joints and 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 3' (gutter side or back face of railing as required) as shown to provide a base for casting of the railing. Field trim toe of Bars 4V by 1 inch as required to maintain concrete cover at edge of deck.
7) When Guardrail is shown on the approach, begin placing Railing Bars 4P and 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 4P and 4V shall be made immediately adjacent to Begin or End Bridge.
**ALTERNATE REINFORCING STEEL (WWR) DETAILS**

- **Welded Wire Reinforcement Notes:**
  1. At the option of the Contractor deformed Welded Wire Reinforcement (WWR) may be utilized in lieu of all Bars 4P, 4S and 4V. 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 (Piece 2) to maintain cover. The bottom of the vertical wires (D20) in Piece 1 shall be cut a maximum of 4 inches and the gutter side portion bent inward as required to allow placement.

- **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 933.
  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. Include the cost of the Pre-cured Silicone Sealant in the Contract Unit Price for the Traffic Railing.

- **Embodiment Notes:**
  1. Diameter = 2"
  2. Bend Inside Diameter = 2"
  3. Field Cut and Bent

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

- **Roadway Cross-Slope**
  - Low Gutter
  - High Gutter

- **Bill of Reinforcing Steel**

**ESTIMATED TRAFFIC RAILING QUANTITIES**

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(The above quantities are based on a 2% deck cross slope; railing on low side of deck.)
This railing has been structurally evaluated to be equivalent or greater in strength to other single slope railings which have been crash tested to MASH TL-5.

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 536-001.

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

END TRANSITIONS: When guardrail approaches are shown in the Plans, provide the Railing End Transition as shown in Detail "A". When a concrete traffic railing or barrier is shown on the approaches, provide the Railing Height Transition as shown in Detail "B".

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.


Provide 1/2" Intermediate Open Joints shall be provided 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 DELINEATORS: Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side in accordance with Specification Section J05.
NOTE:

Begin placing Railing Bars 5P and 5V 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 5P and 5V shall be made immediately adjacent to Begin or End Bridge. Shift Bars 5P and 5V (see Detail "A") as required to maintain cover in Railing End Transition.

* Where railings of adjacent bridges are to be built back to back, the outside vertical plane of the railing and deck may coincide along a plane centered 1'-6" from each gutter line. A bond breaker will be required. See Structures Plans, Superstructure Sheets for Details.

** See joint orientation note on Sheet 1.

*** Field Cut & Lap Bars 5V in Toe Transition to maintain clearance.

NOTE:

Omit Detail "A" and provide Detail "B" if 44" Concrete Barrier or Single-Slope Traffic Railing is used beyond the Approach Slab. See Structures Plan and Elevation Sheet and Roadway Plans. If Transitions are not required, extend Typical Section to end of Approach Slab.

** Transition Bars 5P, Field Cut & Bend in Toe Transition

*** Transition Bars 5P, Field Cut & Splice

View C-C

Elevation - Railing End Transition

(Guardrail not shown for clarity)

View B-B

End Transition

(Typical Section thru Approach Slab shown, Rigid Pavement Approach Slab similar)
ELEVATION
RAILING HEIGHT TRANSITION

NOTE:
Provide Detail "B" Height Transition where 42" Single-Slope Traffic Railings or Barriers are shown on approaches.

VIEW C-C
RAILING HEIGHT TRANSITION
(Section Thru Approach Slab shown)
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

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<tr>
<td>S2</td>
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<td>T1 &amp; T2</td>
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ROADWAY CROSS-SLOPE

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<tr>
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<td>0% to 2%</td>
<td>0% to 2%</td>
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</tbody>
</table>

BA and BB shall be 90° if Contractor elects to place Railing perpendicular to the Deck.

STIRRUP BAR 5P

TRANSITION STIRRUP BAR 5P

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

STIRRUP BAR 5V

END STIRRUP BAR 5V

To Be Field Cut and Lapped

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 6S1 may be continuous or spliced at the construction joints. Lap splices for Bars 6S1 and 5S2 shall be a minimum of 3'-0" and 2'-2", respectively.
4. The Contractor may utilize deformed WWR when approved by the Engineer. WWR must meet 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>ITEM</th>
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Note:
The estimated railing quantities are based on a 2% deck cross slope, railing on low side of deck.
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 521-480.

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 hot dip galvanized in accordance with the Specifications.

EXPANSION SLEEVE ASSEMBLY: Pipe sleeve shall be ASTM D2241 PVC pipe, Schedule 40. 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 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'-0" embedment).

BRIDGES ON CURVED ALIGNMENTS: The details presented in these Islands 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 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 DELINIEATORS: 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 below. Barrier Delineator 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 Delineators.

Concrete: 0.064 CY/FT
Reinforcing Steel: 13.27 LB/FT

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(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.)

TRAFFIC RAILING NOTES

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 521-480.

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 hot dip galvanized in accordance with the Specifications.

EXPANSION SLEEVE ASSEMBLY: Pipe sleeve shall be ASTM D2241 PVC pipe, Schedule 40. 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 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'-0" embedment).

BRIDGES ON CURVED ALIGNMENTS: The details presented in these Islands 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 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 DELINIEATORS: 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 below. Barrier Delineator 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 Delineators.

Concrete: 0.064 CY/FT
Reinforcing Steel: 13.27 LB/FT

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(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

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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 S5 may be continuous or spliced at the construction joints. Bar splices for Bars S5 shall be a minimum of 2'-2".
5. Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.

REINFORCING STEEL BENDING DIAGRAM

TRAFFIC RAILING - (VERTICAL FACE RETROFIT)
TYPICAL DETAILS & NOTES

INDEX 521-480

PARTIAL PLAN OF RAILING (SKEW ANGLE θ GREATER THAN 20°)
(Skewed Deck Joint at Begin or End Bridge Shown, Skewed Deck Joint at Intermediate Pier or Bent Similar)

PARTIAL PLAN OF RAILING (SKEW ANGLE θ = 20° OR LESS)
(Skewed Deck Joint at Begin or End Bridge Shown, Skewed Deck Joint at Intermediate Pier or Bent Similar)

SKEW DETAIL

MATCH WIDTH OF DECK JOINT

2" COVER (Typ.)

1'-0"

2" PREFORMED JOINT FILLER

BAR 6D (Typ.)

PAIRS OF BARS 4C @ 3'-3" (Typ.)

SHIFT TO CLEAR BAR 6D AS REQUIRED

3'-10"

VERTICAL FACE RETROFIT RAILING

FIELD CUT - BAR 6D

2" ABOVE EXISTING CURB FOR CORNER OVERHANGS

EXISTING BRIDGE DECK

GUTTER LINE

EXISTING APPROACH SLAB

BACK FACE, APPROACH SLAB SIDE ONLY

BAR 6D @ 1'-3" SPACING

BAR 6D @ 3'-2" SPACING

2\( \frac{3}{2} \) (Shift Bars 4C to clear Bars 6D for skewed joints)

5\( \frac{2}{3} \) (Shift Bars 4C to clear Bars 6D for skewed joints)

2\( \frac{3}{4} \) (Shift Bars 4C to clear Bars 6D for skewed joints)

PLUG TO MATCH WIDTH OF OPEN JOINT

EXISTING CONCRETE

HOE DIAMETER TO MEET MANUFACTURER'S REQUIREMENTS

ADHESIVE BONDING MATERIAL SYSTEM

DOE CAL DETAIL

Dowel Installation Notes:
1. Shift dowel holes to clear if the existing reinforcement is encountered.
2. See Index 521-481 thru 521-484 for required embedment length of Bars 6D, 4L or 4N.

* 1\( \frac{1}{2} \) Preformed Joint Filler at top of Existing Curb shall extend beyond the joint material (Silicone, poured rubber, armored neoprene seal or sliding planes) 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 Index 521-481 thru 521-484 for spacing of Bars 6D.
**TYPICAL TREATMENT OF RAILING ALONG BRIDGE**

**NOTES:**
1. On approach end provide a Roadway Guardrail Transition, Index 536-002 (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 along the Wing Wall, see Schemes 2 or 3, Index 521-481, 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 to both the front and back face of the railing. For treatment of railing and see Roadway Plans. If vertical face retrofit extends beyond bridge and approach slab ends, see Index 521-484 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 gouging or grinding as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1" below existing concrete and grouted over.

**TYPICAL SECTION THRU EXISTING TRAFFIC RAILING SHOWING LIMITS OF REMOVAL (BRIDGE DECK SHOWN, WING WALL SIMILAR)**

**SECTION A-A**

**TYPICAL SECTION THRU RAILING ON FULL DEPTH CURB (BRIDGE SHOWN, WING WALL SIMILAR)**

**CROSS REFERENCE:**
For General Notes, Estimated Quantities, Dowel Detail, Expansion Dowel Detail, Reinforcing Steel Notes & Bending Diagrams see Index 521-480.
Dowel Bars 4L (10" Embedment) (See Note 2)

Existing End Bent Wing Wall

Existing Approach Slab

Match Existing Curb Height

1'-0"

Transition Block (See Note 1)

Front Face of Backwall, Begin or End Bridge & Match Line (See Sheet 1)

Dowel Bars 4L (10" Embedment) (See Note 2)

Existing Approach Slab

Transition Block (See Note 1)

Partially Elevation of Inside Face of Guardrail

PARTIAL PLAN OF GUARDRAIL

SCHEME 1

RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLS

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.

PARTIAL ELEVATION OF INSIDE FACE OF GUARDRAIL

SCHEME 2

RAILING END TREATMENT FOR PARALLEL WING WALLS

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 521-481, 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.
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 Three-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see 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
**Sheet 4**

**DESCRIPTION:**

3. Where existing structure has been removed and not encased in new concrete; match adjoining areas and approach slab ends, see Index 521-484 for treatment and Details.

2. Field cut Bars 5S and Dowel Bars 6D to maintain clearance within Vertical Face Retrofit Railing.

1. On approach end provide a Roadway Guardrail Transition, Index 536-002 (as shown) or other specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other 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 521-484 for treatment and Details.

NOTES:

- Non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment at skewed deck joints see Skew Detail, Index 521-480. 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.
  - (2) Superstructure supports where slab is continuous.

- Curb heights vary from 5" Min. to 1'-2" Max.

**CROSS REFERENCE:**

For General Notes, Estimated Quantities, Dowel Detail, Expansion Dowel Detail, Reinforcing Steel Notes & Bending Diagrams see Index 521-480.

**PARTIAL ELEVATION OF INSIDE FACE OF RAILING**

(Existing Traffic Railing, Expansion Dowel Assemblies & Bars 4C not shown for clarity)

**TYPICAL TREATMENT OF RAILING ALONG BRIDGE**

1. On approach end provide a Roadway Guardrail Transition, Index 536-002 (as shown) or other specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other 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 521-484 for treatment and Details.

**NOTES:**

- Non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment at skewed deck joints see Skew Detail, Index 521-480. 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.
  - (2) Superstructure supports where slab is continuous.

- Curb heights vary from 5" Min. to 1'-2" Max.

**CROSS REFERENCE:**

For General Notes, Estimated Quantities, Dowel Detail, Expansion Dowel Detail, Reinforcing Steel Notes & Bending Diagrams see Index 521-480.
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 trail end 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 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 trail end 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.
Existing Approach Slab

Match Existing Curb Height on Bridge
Roadway Guardrail Transition (See Note 1 Below & Note 1, Sheet 1)

Begin Flared Portion of Vertical Face Retrofit Railing

Asphalt Overlay when present (Varies)
Final Riding Surface

Limiting Station of Transition

Asphalt Overlay when present (Varies)
Final Riding Surface

PARTIAL PLAN OF RAILING

Roadway Guardrail Transition (See Note 1 Below & Note 1, Sheet 1)

Front Face of Backwall, Begin or End Bridge & Match Line (See Sheet 1)

Varies (Match Length of Existing Flared Curb)

Existing Approach Slab

Direction of Traffic

SCHEME 3

Railin g End Treatment for Flared Curb s

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 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.

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 1.

2. Dowel Bars 4N may be installed at 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.
10" Min. Embedment

Dowel Bars 4N @ 1'-3" (Typ.)

Bars 4A @ 9" Max., Min. 3 full length bars required Top & Bottom (Field Bend to clear) (Typ.)


Existing Approach Slab

Asphalt Overlay when present

Roadway Guardrail Transition (See Note 1 Below & Note 1,Sheet 1)

12'-0" (Min.)

Final Riding Surface

Asphalt Overlay when present (Varies)

Curb heights vary from 3" Min. to 10" Max. Match height and shape of existing curb on bridge.

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 4M 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.

SCHEME 5 TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB (SCHEME 4 SHOWN, SCHEME 5 SIMILAR)

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Wing Post, Railing Reinforcing and Expansion Dowel Assemblies not shown for clarity)

SCHEME 5 RAILING END TREATMENT FOR PARALLEL CURBS
NOTES:
1. On approach end provide a Roadway Guardrail Transition, Index 536-002 (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 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 521-484 for treatment and details.

2. Field cut Bars SS 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.

** Non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment at skewed deck joints see Slew Detail, Index 521-480. Provide open Railing Joints at Deck Expansion Joint locations matching the dimension of the Deck Joint.

** Provide 1/2 Intermediate Open Joints as at (1) - Superstructure supports where slab is continuous.

*** Curb heights vary from 5" Min. to 1'-2" Max.

** Expansion Dowel & Bars 4C not required at end of railing for Scheme 1, except where traffic railing retrofit extends beyond ends of bridge, see Index 521-484

Front Face of Backwall, Begin or End Bridge & Match Line (See Sheet 2 and 3 and Index 521-484, Sheets 5, 9 & 10.)

Existing Bridge Deck

PARTIAL PLAN OF RAILING

Existing Bridge Deck

PARTIAL ELEVATION OF INSIDE FACE OF RAILING (Expansion Dowel Assemblies and Bars 4C not shown for clarity)

TYPICAL TREATMENT OF RAILING ALONG BRIDGE

** Traffic Railing - (Vertical Face Retrofit): Intermediate Curb

CROSS REFERENCE:

For General Notes, Estimated Quantities, Dowel Notes & Bending Diagram see Index 521-480.

TRAFFIC RAILING - (VERTICAL FACE RETROFIT): INTERMEDIATE CURB
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.
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 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 ELEVATION OF INSIDE FACE OF RAILING
(Railing Reinforcing and Expansion Dowel Assemblies not shown for clarity)
CROSS REFERENCES:
For Section A-A, B-B and X-X see Sheet 4.

Toe of Curb
Top of Curb
2 " Bars 5F (Typ.)
Bars 4G (Typ.)
Bars 5S (field bend & cut to maintain cover)
20'-0" (Traffic Railing and Curb Transition)
Extend Bars 5S in back face of Traffic Railing 1'-6" into Tapered End Transition
Bars 5E (Typ.) (Cut to maintain cover in Taper)

Bridge and/or Approach Slab Transition
Bars 5S

2'-9" Vertical Curb Transition
Roadway Shoulder

Optional Construction Joint
Top of Curb
2 "
Bars 4G (Typ.)

DETAIL "B"
TRANSITION TO NON-CURB APPROACH
(Reinforcing Not Shown For Clarity)

20'-0" (Traffic Railing
& Curb Transition)
Bars 5S

PARTIAL PLAN VIEW

PARTIAL ELEVATION VIEW

TAPERED END TRANSITION

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 536-002 (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 520-001 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)

SECTION A-A TYPICAL SECTION
(9" Curb shown, 6" Curb similar)

CROSS REFERENCES:
For location of Sections A-A, B-B and X-X see Sheet 2.
For location of Section C-C see Sheet 3.

NOTE: Quantities are based on a 9" curb, no curb cross slope.
PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Expansion Dowel Assemblies and Bars 4C not shown for clarity)

SCHEME 1 – MODIFICATION FOR INDEX 521-481, 521-482 AND 521-483 - SCHEME 1
RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLS WITH NARROW CURBS (SHOWN), WIDE CURBS AND INTERMEDIATE CURBS (SIMILAR)

CROSS REFERENCE:
For Section A-A see Sheet 4.
For Expansion Dowel Assemblies and placement of Dowel Bars 6D Details see Index 521-480.

DESCRIPTION:
For Expansion Dowel Assemblies and placement of Dowel Bars 6D Details see Index 521-480.

PARTIAL PLAN

SECTION D-D

SECTION E-E (NARROW CURB SHOWN, WIDE AND INTERMEDIATE CURBS SIMILAR)

Reusable Text
NOTES:
1. 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.

PARTIAL PLAN

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 521-480.
Existing Flared Wing Post to be removed to top of curb

Curb & portion of Approach Slab (when present, shown shaded) to be removed

Approach Slab Transition

Bars 4G (Typ.)

Max. (Typ.) Clip bars as reqd. to maintain Cover

Bars 5F @ 8" spacing

Typical Section

Bars 5S

Bars 5S @ 8" spacing Max. (Typ.) tied to Bars 5F (tilt bars minimally as required)

Edge of Existing Approach Slab (Location Varies)

Final Riding Surface

3'-10" (Min. match bridge offset constant for Retrofit to begin transition)

Bars 4G @ 1'-4" ±

Bars 6D

Bars 5S

Edge of Existing Approach Slab (Location Varies)

Partial Elevation of Inside Face of Railing

(Expansion Dowel Assemblies and Bars 4C not shown for clarity)

Partial Plan of Railing

Section G-G

Note: **Match curb height at adjoining existing end bent wing.

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 521-480.
Existing End Bent Wing Wall

Bars 4G (Typ.)

Bars 5F @ 8" spacing
Max. (Typ.) Clip bars as
reqd. to maintain Cover

Max. (Typ.) Clip bars as
reqd. to maintain Cover

Expansion Dowel
Sleeve Assembly

Gutter Line

Bars SS (Typ.)

Edge of Existing Approach
Slab (Location Varies)

Top of Curb

Bars SF @ 8" spacing
Max. (Typ.) Clip bars as
reqd. to maintain Cover

Top of Curb

Final Riding Surface

Edge of Existing Approach
Slab (Location Varies)

PARTIAL PLAN OF RAILING

Asphalt Overlay when
present (Varies)

Final Riding Surface

Bars 4G (extend 2'-0"
beyond wing wall as shown)

Existing End Bent Wing Wall

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Wing Post, Expansion Dowel Assemblies and Bars 4C not shown for clarity)

SCHEME 4 ~ MODIFICATION FOR INDEX 521-482 SCHEME 2
RAILING END TREATMENT FOR PARALLEL CURBS AND
WING WALLS WITH WIDE CURBS

FRONT FACE OF BACKWALL,
Begin or End Bridge &
Match Line (See Index
521-482, Sheet 3)

PARTIAL PLAN OF RAILING

Top of Curb

Bars SF @ 8" spacing
Max. (Typ.) Clip bars as
reqd. to maintain Cover

Top of Curb

Existing Approach Slab

Gutter Line

Bars SS (Typ.)

Edge of Existing Approach
Slab (Location Varies)

G

D

A

G

D

A

D

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 521-482 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 521-480.
SCHEME 6 ~ MODIFICATION FOR INDEX 521-483 SCHEME 2
RAILING END TREATMENT FOR PARALLEL CURBS AND WING WALLS WITH INTERMEDIATE CURBS

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Expansion Dowel Assemblies and Bars 4C not shown for clarity)
**Match curb height at adjoining existing end bent wing.**

- **Bars 5F @ 8" spacing Max. (Typ.)** Clip bars as reqd. to maintain Cover
- **Bars 5S @ 8" spacing Max. (Typ.)** tied to Bars 5F (tie bars minimally as required)

**Asphalt Overlay when present (Varies)**

**Top of Curb**

**Bars 5S (Typ.)**

**3" Cover (Typ. ends)**

**Existing End Bent Wing**

**Organic Felt bond breaker along joint**

- **Bars 5E @ 8" sp.** Max. (Typ.) tied to Bars 5F
- **Dowel Bars 6D**

**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 521-480.

**Note:**
- **Match curb height at adjoining existing end bent wing.**
PLAN (BRIDGE MOUNTED RAILING/NOISE WALL SHOWN, WALL OR FOOTING MOUNTED RAILING/NOISE WALL SIMILAR)  
(Reinforcing Steel not shown for clarity)

ELEVATION OF INSIDE FACE OF RAILING/NOISE WALL (BRIDGE MOUNTED RAILING/NOISE WALL SHOWN, WALL OR FOOTING MOUNTED RAILING/NOISE WALL SIMILAR)  
(Reinforcing Steel not shown for clarity)

* On Bridges see Superstructure and Approach Slab Sheets for actual dimensions and joint orientation. Open Railing/Noise Wall Joints at Deck Expansion Joint locations shall match the dimensions of the Deck Joint.  
For treatment of Railing/Noise Walls on skewed bridges see Index 521-427.  
Deck Joint at Begin Bridge or End Bridge shown.  
Deck Joint at 9" Pier or Intermediate Bent, Junction Slab or Footing similar.

** Construct 9" Intermediate Open Joints plumb and provide at:
(1) - Superstructure supports where slab is continuous.  
(2) - Construction Joints for Junction Slabs and Footings.

CROSS REFERENCE:  
For Detail "B" and V-Groove Lettering Detail see Sheet 2.  
For Section C-C and Detail "A" see Sheet 5.

See Detail "A" for Railing End Transition when Guardrail called for in Roadway Plans.

See Detail "B" for Pre-cured Silicone Seallant.

REVISION DESCRIPTION:
01/01/17  
11/01/17
FY 2018-19
STANDARD PLANS
TRAFFIC RAILING/NOISE WALL (8'-0") - BRIDGE
INDEX
521-509
SHEET
1 of 5
CONSTRUCTION REQUIREMENTS: The Traffic Railing/Noise Wall and joints shall be constructed plumb; they shall not be constructed perpendicular to the roadway surface.

CONCRETE: For Railing/Noise Wall on bridges see General Notes. For Wall and Footing mounted Railing/Noise Wall, concrete shall be Class II for slightly aggressive environments and Class IV for moderately or extremely aggressive environments.

NAME, DATE AND BRIDGE NUMBER: For Railing/Noise Wall on bridges, the name and bridge number shall be placed on the Traffic Railing so as to be seen 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 formed by Ƅ" V-Grooves. V-Grooves shall be formed as preformed letters and figures.

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

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

INTERMEDIATE JOINT SEAL NOTES:
1. All 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.

DETAIL "B" - SECTION AT INTERMEDIATE OPEN JOINT

ESTIMATED TRAFFIC RAILING/NOISE WALL QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Railing)</td>
<td>CY/LF</td>
<td>0.105</td>
</tr>
<tr>
<td>Concrete (Noise Wall)</td>
<td>CY/LF</td>
<td>0.136</td>
</tr>
<tr>
<td>Reinforcing Steel (Typical)</td>
<td>LB/LF</td>
<td>69.36</td>
</tr>
<tr>
<td>Additional Rein. @ Open Joint</td>
<td>LB</td>
<td>254.73</td>
</tr>
</tbody>
</table>

(The above quantities are based on the bridge mounted typical section, 2% deck cross slope and railing on low side of deck.)
ELEVATION OF RAILING/NOISE WALL REINFORCING STEEL
(INTERMEDIATE OPEN JOINT SHOWN, DECK JOINT SIMILAR)
(Bars SS1 in Railing not shown for clarity)

ELEVATION OF RAILING/NOISE WALL END TAPER (ADJACENT TO TRAFFIC RAILING SHOWN, GUARDRAIL ATTACHMENT SIMILAR SEE DETAIL "A", SHEET 5)
(Bars SS1 in Railing not shown for clarity)

NOTES:
* Field Cut Bars SR & SS1 to maintain clearance.
** Terminate 3/8" V-groove at construction joint & cast top of railing with End Taper.
*** Bar spacing shown for Bars SV only applies when Single-Slope Traffic Railing continues. For transition to guardrail see Sheet 5.
CROSS REFERENCE:
For locations of Section A-A see Sheet 1.
For location of View B-B, see Sheet 5.

NOTES:
1. Bottom Bars 5S1 shown are part of the Traffic Railing/Noise Wall reinforcing.
   See Superstructure Sheets in the Plans for additional Bridge Deck reinforcing.

SECTION A-A
TYPICAL SECTION THRU TRAFFIC RAILING/NOISE WALL
(Section Thru Bridge Deck Shown, Section Thru Approach Slab Similar)

VIEW B-B
END VIEW OF RAILING END TRANSITION FOR
GUARDRAIL ATTACHMENT AT END OF APPROACH SLAB
(Flexible Pavement Approach Slab Shown, Rigid Pavement Approach Slab Similar)
For location of Detail "A" see Sheet 1.

For location of Section C-C see Sheet 1.

For View B-B see Sheet 4.

### DETAIL "A" NOTES:

1. Begin placing Railing Bars 5V at the railing end and proceed toward the guardrail (thrie beam) terminal connector to ensure placement of guardrail bolt holes. Pair Bars 5R with Bars 5V as shown. Clearance of Bars 5R & 5V to guardrail bolt holes shall be checked to prevent cutting of bars if holes are to be drilled. Shift bars locally where conflicts occur.

2. For Guardrail connection details see Index 536-001.

3. Omit Railing End Transition if a 36" Single-Slope Traffic Railing is used beyond the End Taper. See the Plan Sheets.

4. Field cut Bars 5R1 to maintain cover. Field cut Bars 5V and lap as necessary to maintain cover; field cut & bend Bars 5R2 front leg (more plumb) to maintain cover and tie to S1 Bars.
**PLAN VIEW**

- Bridge Deck or Approach Slab (Reinforcing not shown for clarity)
- Concrete Pedestal Surface, Sloped Longitudinally with Profile Grade and Transversely with Cross Slope.

**ELEVATION VIEW**

- Top of Traffic or Pedestrian/Bicycle Railing
- Concrete Pedestal Surface, Sloped Longitudinally with Profile Grade and Transversely with Cross Slope.

**TYPICAL SECTION AT LIGHT POLE PEDESTAL FOR APPROACH SLAB OR BRIDGE DECK THICKNESS LESS THAN 1'-5" AT COPING**

- 4" Ø Conduits
- Construction Joint

**TYPICAL SECTION AT LIGHT POLE PEDESTAL FOR APPROACH SLAB OR BRIDGE DECK THICKNESS LESS THAN 1'-1" AT COPING**

- 4" Ø Conduits
- Construction Joint

**CROSS REFERENCE:** For Detail "A", Anchor Plate and Light Pole Pedestal Notes, see Sheet 3.

**FOR INDEX 521-660 - Pedestrian/Bicycle Railing and concrete curb, this dimension is 3½". For raised sidewalks, this dimension is 1'-0" Max.**

**NOTE:** Anchor Bolt, Nuts, Washers and Anchor Plate are dashed for clarity.
LIGHT POLE PEDESTAL NOTES

1. Concrete and Reinforcing Steel required for the construction of the Pedestal shall meet the same requirements as the Traffic Railing or Pedestrian/Bicycle Railing the Pedestal is attached to.

2. Light Pole Pedestal may be used with the following:
   - Index 521-422 - Traffic Railing (42" Vertical Shape)
   - Index 521-423 - Traffic Railing (10" Vertical Shape)
   - Index 521-427 - Traffic Railing (36" Single-Slope)
   - Index 521-428 - Traffic Railing (42" Single-Slope)
   - Index 521-620 - Pedestrian/Bicycle Railing
   - Index 515-021 - Pedestrian/Bicycle Bullet Railing
   - Index 521-820 - Pedestrian/Bicycle Railing
   - Index 521-427 - Traffic Railing (36" Single-Slope)
   - Index 521-422 - Traffic Railing (42" Vertical Shape)
   - Index 521-428 - Traffic Railing (42" Single-Slope)
   - Index 515-509 - Traffic Railing /Noise Wall - Bridge.

3. Unless otherwise noted, Traffic Railing (36" Single-Slope) is shown in all Views and Sections. The Pedestal details for other Traffic Railings or Pedestrian/Bicycle Railings are similar.

4. ANCHOR BOLTS:
   - Anchor Bolt design is based on the standard roadway Aluminum Light Pole configurations shown on Index 715-002 with top of pedestal 75' or less above ground or MLW.
   - Anchor Bolt Diameter: See Table 1
   - Anchor Bolts: ASTM F1554 Grade 55.
   - Nuts: ASTM A563 Grade A, Heavy-Hex.
   - Washers: ASTM F436 Type 1.
   - Anchor Plate: ASTM A709 (Grade 36) or ASTM A36.
   - Coating: Galvanize all Nuts, Bolts, Washers, and plates in accordance with ASTM F233.
   - The Contractor is responsible for ensuring the anchor bolt configuration is compatible with the light pole base plate. Submit modifications of the anchor bolt design to the Engineer for approval.

5. Install Anchor Bolts plumb.

6. For Conduit, Embedded Junction Boxes (F28), Expansion/Deflection Fitting and adjacent Reinforcing Steel Details, see Utility Conduit Detail Sheets.

7. PAYMENT: The cost of Wire Screen, Anchor Bolts, Nuts, Washers and Anchor Plates shall be included in the Bid Price for Light Poles. The cost of all Labor, Concrete and Reinforcing Steel required for the Construction of the Pedestals, and Miscellaneous Hardware required for the completion of the Electrical System, shall be included in the Bid Price for the Traffic Railing or Pedestrian/Bicycle Railing the Pedestal is attached to.

---

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

<table>
<thead>
<tr>
<th>BOLT DIAMETER (IN.)</th>
<th>LENGTH (IN.)</th>
<th>DESIGN MOUNTING HEIGHT (IN.)</th>
<th>END PLATE DECK HEIGHT (IN.)</th>
<th>SPEED (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.25</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>120</td>
</tr>
<tr>
<td>1.50</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>140</td>
</tr>
<tr>
<td>1.75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>160</td>
</tr>
<tr>
<td>2.00</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>180</td>
</tr>
</tbody>
</table>

* Above natural ground or MLW

**Use 1½" Diameter Anchor Bolt for Bridge Deck Height greater than shown, in Table 1, up to 75'**

---

**ESTIMATED LIGHT POLE PEDESTAL QUANTITIES PER LIGHT POLE PEDESTAL**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Per Pedestal</td>
<td>CF/In.</td>
<td>0.040</td>
</tr>
<tr>
<td>Rebar</td>
<td>LB</td>
<td>195 (182)</td>
</tr>
</tbody>
</table>

(The Reinforcing Steel quantity shown in parenthesis is for a Pedestal attached to Pedestrian/Bicycle Railing - Index 521-820 with Bridge Deck or Approach Slab thinner than 1½") Add 59 lbs. for Bars 4J1 & 4J2 when Pedestal Thickness is greater than 1½'
**PLAN**

(Rails, Posts & Reinforcing Steel not shown for clarity)

**1/2 Intermediate Open Joints** shall be provided at locations coinciding with 1/2 Joints for the Traffic Railing. 

**Superstructure Support**

**6' Min.**

**7'-0" Max.**

**Spacing 1/2 V-Groove** (Typ. all Posts)

**30'-0" (Maximum)**

**Rail Splice/Expansion Assembly Spacing** (See Index 515-022)

**ELEVATION OF INSIDE FACE OF RAILING**

(Reinforcing Steel not shown for clarity)

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

**CONCRETE PARAPET QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/LF</td>
<td>0.055</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/FT</td>
<td>6.29</td>
</tr>
</tbody>
</table>

(The above quantities are based on a deck with a 2% cross slope)

**REINFORCING STEEL NOTES:**

1. **Intermediate Joint Seal Note:**
   - At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Section 032 of the Specifications.
   - 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.
   - The cost of the Pre-cured Silicone Sealant shall be included in the Contract Unit Price for the Concrete Parapet.

**ALTERNATE REINFORCING (WELDED WIRE REINF.) DETAILS**

*See Structures Plans, Superstructure Sheets for actual dimensions and joint orientation. Open Parapet Joints at Deck Expansion Joint locations shall match the dimension of the Deck Joint. For treatment of Railings on skewed bridges see Index 521-027, Deck Joint at Begin Bridge or End Bridge shown. Deck Joint at Pier or Intermediate Joint similar.*

**NOTE:** Place wire panels to minimize the end overhang. End Overhangs greater than 4" are not permitted.

**PLACE DETAIL "A" for Pre-cured Silicone Sealant**

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

**PEDESTRIAN/BICYCLE RAILING NOTES:**

**CONCRETE PARAPET:** Concrete parapet shall be placed vertical and top surface shall be level transversely.

**RAIL AND POST DETAILS:** For Rail, Post, Rail Splice/Expansion Assembly fabrication and installation details see Index 515-022.

**BRIDGE FENCING:** For Bridge Fencing see Index 550-010 thru 550-013 in lieu of Posts and Rails on Index 515-022.

**PAYMENT:** Concrete parapet shall be paid for under the contract unit price for 27" Concrete Parapet (Pedestrian/Bicycle), LF, and Rails shall be paid for under Bullet Railings, LF.
ELEVATION OF INSIDE FACE OF RAILING
(Reinforcing Steel not shown for clarity)

ALTERNATE REINFORCING (WELDED WIRE REINF.) DETAILS

NOTE: Place wire panels to ensure vertical wire is within 4" of open joints.

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/LF</td>
<td>0.079</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/LF</td>
<td>13.12</td>
</tr>
</tbody>
</table>

SECTION A.A
(Typical C-I-P Section Thru Bridge Deck Shown, Section Thru Approach Slab Similar)

RAILING NOTES:
1. Railing shall be placed vertical and top surface shall be level transversely.

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 5 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 Railing.

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 an 8" deck.
3. All reinforcing steel at the open joints shall have a 2" minimum cover.
4. Bar splices for Bars 4S shall be a minimum of 1'-8".
5. At the option of the Contractor deformed WWR may be used in lieu of all Bars 3R and 4S.
FENCING NOTES:

FENCE INSTALLATION:
Install posts plumb (within a tolerance of ± 1/8”). Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.

TRAFFIC RAILING DETAILS:
See Superstructure Sheets for Traffic Railing details.

CONCRETE PARAPET DETAILS:
See Index 521-820 - Pedestrian/Bicycle Railing for Concrete Parapet details. Provide fencing in lieu of aluminum bullet railing as shown on Index 521-820.

LIMITS OF FENCING:
Limits of fencing are from begin of approach slab at Begin Bridge to end of approach slab at End Bridge, unless otherwise shown in the plans.

PAYMENT:
Payment will be made under Fencing, Type R. Payment includes posts, horizontal and expansion rails, brace rails and bands, rail ends, combination rail ends, boulevard clamps, chain link fabric, tension wire, ties, hog rings, tension bars and bands, post and loop caps, pipe clamps, base plates, anchor rods, bolts, nuts, washers, shim plates, spacers, bearing pads, miscellaneous fence fittings and hardware and all incidental materials and labor required to complete installation of the fence.

CROSS REFERENCE:
For Table of Fence Components, Table of Post Attachment Components, View A A and Detail “A” see Sheet 2.
For Pull Post Assembly Detail for Traffic Railings see Sheet 3.
For Pull Post Assembly Detail for Concrete Parapets and Detail “B” see Sheet 4.
**TABLE OF CHAIN LINK FENCE COMPONENTS**

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 3&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Chain Link Fabric</td>
<td>A392</td>
<td>Zinc Coated Steel - 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td>Brace Bands</td>
<td>F626</td>
<td>Hex Head Bolts for Expansion Rail Connections</td>
</tr>
<tr>
<td>Brace Bands</td>
<td>F626</td>
<td>12 Gage (Min. thickness) x 3/8&quot; (Min. width) Steel Bands (Blevied or Heavy)</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F626</td>
<td>1 1/4&quot; (Min. thickness) x 3/8&quot; (Min. width) x 3/16&quot; (Min. height) Steel Bars</td>
</tr>
<tr>
<td>Tension Bands</td>
<td>F626</td>
<td>14 Gage (Min. thickness) x 3/8&quot; (Min. width) Steel Bands</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F626</td>
<td>Zinc Coated Steel – includes post or loop caps, horizontal and brace rail ends, combination rail ends, boulevard clamps and all other miscellaneous fittings &amp; hardware</td>
</tr>
<tr>
<td>Horizontal Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 2 1/2&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 2&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307</td>
<td>3/8&quot; Ø x 4 1/2&quot; Hex Head Bolts for Expansion Rail Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>A436</td>
<td>Flat Washers for Expansion Rail Connections</td>
</tr>
<tr>
<td>Tension Wire</td>
<td>AR24 &amp; AR17</td>
<td>Type II (Zinc Coated Steel Wire) - 7 gage, Class 4 Coating</td>
</tr>
<tr>
<td>Hog Rings</td>
<td>F626</td>
<td>Zinc Coated Steel Wire - 12 gage</td>
</tr>
<tr>
<td>Brace Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 1 1/2&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
</tbody>
</table>

**POST ATTACHMENT NOTES**

ANCHOR RODS, NUTS AND WASHERS:
After the nuts have been tightened, distort the Anchor Rod threads to prevent removal of the nuts. Coat distorted threads and exposed trimmed ends of anchors with a galvanizing compound in accordance with Specification Section 562.

COATINGS:

ADHESIVE-BONDED ANCHORS AND Dowels:
Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 941. Cutting of reinforcing steel is permitted for drilled hole installation.

WELDING:
All welding will be in accordance with the American Welding Society Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal will be L60XX or E70XX. Nondestructive testing of welds is not required.

CROSS REFERENCE:
For location of View A-A and Detail "A" see Sheet 1.
**NOTES:**

1. For treatment at bridge ends, see Sheet 1.
2. Expansion Joint Opening is the width at the time of fence installation.

**DESCRIPTION:**

- **Pipe Clamp Connection Detail** (Connection without spacer shown, Connection with spacer similar)
  - 2 - 3/8" C-I-P Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Bolts and Washers
  - 9/16" x 3" x 1/2" Thick Bearing Pad
  - Pipe Clamp
  - Post
  - R = 1 1/2

- **Pipe Clamp Detail**
  - 3/8" Pipe Clamp
  - Outside Edges of Post
  - 3/8" Ø Holes for 3/8" Ø Anchors (Typ.)

- **Spacer Detail**
  - Must be manufactured from an incompressible material (i.e., steel or aluminum)
  - 3/8" Ø Holes for 3/8" Ø Anchors (Typ.)
  - 3/8" Ø Spacer (See Note 3)

**Bridge Deck (shown) or Raised Sidewalk**

**Pull Post Assembly Detail for Traffic Railing**

**Expansion Assembly Detail**

(Required only at expansion joint locations where total movement exceeds 6")

- **Pipe Clamp Connection Detail** (Connection without spacer shown, Connection with spacer similar)
  - 2 - 3/8" C-I-P Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Bolts and Washers
  - 9/16" x 3" x 1/2" Thick Bearing Pad
  - Pipe Clamp
  - Post
  - R = 1 1/2

- **Pipe Clamp Detail**
  - 3/8" Pipe Clamp
  - Outside Edges of Post
  - 3/8" Ø Holes for 3/8" Ø Anchors (Typ.)

- **Spacer Detail**
  - Must be manufactured from an incompressible material (i.e., steel or aluminum)
  - 3/8" Ø Holes for 3/8" Ø Anchors (Typ.)
  - 3/8" Ø Spacer (See Note 3)
**Bulge Chain Link Fabric** to allow for joint movement.

**Expansion Rails**
- Pull Post Assembly
  - Tension Bar (one each side of pull post) (Typ.)
  - Chain Link Fabric
  - Ties @ 3'-0" Centers (Typ.)
- Horizontal Rail
  - Ties @ 2'-0" Centers
- Concrete Parapet
  - Rail Ends with Brace Bands (shown)
  - Expansion Joint Opening
    - 1'-6" (Required only at expansion joint locations where total movement exceeds 6")
  - Bearing Pad
    - 6" x 8" x 3/4" Thick
  - 2 - 3/8" C-1-4 Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Nuts and Washers.

**NOTES:**
1. For treatment at the bridge ends, see Index 811 Sheet 1.
2. Expansion Rails are required at expansion joint locations where the total movement exceeds 1'. Install expansion rails midway between the fence posts spanning the expansion joint.
3. An Expansion Assembly is required where the total joint movement exceeds 6'. Expansion Assembly includes Expansion Rails and two pull posts (as shown). When the Expansion Joint Opening is greater than 9" add an additional length to the free end of the Expansion Rail equal to the difference between the Expansion Joint Opening and 9".
4. Install the post on the fixed (bolted) side of the Expansion Rail 1'-6" from the edge of the expansion joint. Install the post on the slip (unbolted) side of the Expansion Rail 1'-6" from the edge of the expansion joint unless the Expansion Joint Opening is greater than 9". When the Expansion Joint Opening exceeds 9" increase the 1'-6" dimension by the difference between the Expansion Joint Opening and 9".
5. Install nut for the expansion rail finger-tight. The nut will 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.

**CROSS REFERENCE:**
For location of Detail "B" see Sheet 1.

**DETAIL "B"**
- 1" Ø Holes for 3/8" Ø Anchors (Typ.)
- 3/8" Ø Base Plate
- 5/8" Ø Bolt with Hex Nut and Washer (See Note 5)
- EXPANSION RAIL DETAIL
  - Expansion Joint Opening
    - Varies (Expansion Rail Length)
    - 5' x 5/8" Ø Bolt with Hex Nut and Washer (See Note 5)
  - EXPANSION ASSEMBLY DETAIL
    - Varies (9" Min.)
    - Expansion Joint Opening
      - Varies
      - Post on the fixed (bolted) side of the Expansion Rail 1'-6" from the edge of the expansion joint. Install the post on the slip (unbolted) side of the Expansion Rail 1'-6" from the edge of the expansion joint unless the Expansion Joint Opening is greater than 9". When the Expansion Joint Opening exceeds 9" increase the 1'-6" dimension by the difference between the Expansion Joint Opening and 9".
  - 6" x 8" x 3/4" Thick Bearing Pad
  - 2 - 3/8" C-1-4 Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Nuts and Washers.

**BASE PLATE DETAIL**
- 6" x 8" x 3/4" Thick Bearing Pad
- 2 - 3/8" C-1-4 Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Nuts and Washers.

**EXPANSION ASSEMBLY DETAIL**
- Expansion only at expansion joint locations where total movement exceeds 6'
- 1'-0" E embed depth
- 2 ~ 5/8" Ø C-I-P Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Nuts and Washers.

**PULL POST ASSEMBLY DETAIL FOR CONCRETE PARAPETS**
- Base Plate
- Post Cap (shown) or Loop Cap (Typ.)
- Post Cap (shown) or Loop Cap (Typ.)
- Ties @ 2'-0" Centers
- Tension Bar (one each side of pull post) (Typ.)
- Horizontal Rail
- Concrete Parapet
- Pull Post Assembly
  - Tension Bar (one each side of pull post) (Typ.)
  - Chain Link Fabric
  - Ties @ 3'-0" Centers (Typ.)
- Horizontal Rail
  - Ties @ 2'-0" Centers
- Concrete Parapet
  - Rail Ends with Brace Bands (shown)
  - Expansion Joint Opening
    - 1'-6" (Required only at expansion joint locations where total movement exceeds 6")
  - Bearing Pad
    - 6" x 8" x 3/4" Thick
  - 2 - 3/8" C-1-4 Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Nuts and Washers.

**EXPANSION RAIL DETAIL**
- Expansion Joint Opening
  - Varies (Expansion Rail Length)
  - 5' x 5/8" Ø Bolt with Hex Nut and Washer (See Note 5)
  - EXPANSION ASSEMBLY DETAIL
    - Varies (9" Min.)
    - Expansion Joint Opening
      - Varies
      - Post on the fixed (bolted) side of the Expansion Rail 1'-6" from the edge of the expansion joint. Install the post on the slip (unbolted) side of the Expansion Rail 1'-6" from the edge of the expansion joint unless the Expansion Joint Opening is greater than 9". When the Expansion Joint Opening exceeds 9" increase the 1'-6" dimension by the difference between the Expansion Joint Opening and 9".
  - 6" x 8" x 3/4" Thick Bearing Pad
  - 2 - 3/8" C-1-4 Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Nuts and Washers.

**BASE PLATE DETAIL**
- 6" x 8" x 3/4" Thick Bearing Pad
- 2 - 3/8" C-1-4 Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Nuts and Washers.
**FENCING NOTES**

**FENCE APPLICATION:**
This bridge fence can only be used on sidewalk installations separated from traffic by a traffic railing.

**FENCE INSTALLATION:**
Install posts plumb (within a tolerance of ± 1") by shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.

**CONCRETE PARAPET DETAILS:**
See Index 521-820 - Pedestrian/Bicycle Bullet Railing for Concrete Parapet details. Provide fencing in lieu of aluminum bullet railing as shown on Index 521-820.

**LIMITS OF FENCING:**
Limits of fencing are from begin of approach slab at Begin Bridge to end of approach slab at End Bridge, unless otherwise shown in the plans.

**PAYMENT:**
Payment will be made under Fencing, Type R. Payment includes posts, horizontal and expansion rails, brace bands, rail ends, combination rail ends, boulevard clamps, chain link fabric, ties, tension bars and bands, post and loop caps, base plates, anchor rods, bolts, nuts, washers, shim plates, neoprene pads, miscellaneous fence fittings and hardware and all incidental materials and labor required to complete installation of the fence.

**TYPICAL SECTION**

* Do not anchor fencing to the top of Traffic Railings.

**Notes:**
1. A Pull Post Assembly is required at maximum intervals of 500'-0". See Sheet 2.

**CROSS REFERENCE:**
For Table of Fence Components and Pull Post Assembly Detail see Sheet 2.
For Table of Post Attachment Components and Detail "A" see Sheet 3.
**Table of Chain Link Fence Components**

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>A668</td>
<td>Zinc Coated Steel Wire - 9 gauge (coated wire diameter), Class 7b</td>
</tr>
<tr>
<td>Horizontal Rails</td>
<td>A307</td>
<td>Steel Bands (Beveled or Heavy) 12 gage (Min. thickness) x 3/8&quot; (Min. width) x Variable Height Steel Bands – Height = Post Length along Inside Post – 2&quot; Max</td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>A668</td>
<td>Zinc Coated Steel Wire - 9 gauge</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307</td>
<td>3/8&quot; Ø x 4 1/4&quot; Hex head Bolts for Expansion Rail Connections</td>
</tr>
<tr>
<td>Nuts</td>
<td>A563</td>
<td>Hex Nuts for Expansion Rail Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Expansion Rail Connections</td>
</tr>
<tr>
<td>Chain Link Fabric</td>
<td>A392</td>
<td>Zinc Coated Steel – 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td></td>
<td>A491</td>
<td>Aluminum Coated Steel – 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td></td>
<td>F668</td>
<td>Polyvinyl Chloride (PVC) Coated Steel – 9 gage Zinc Coated Wire, Class 2b</td>
</tr>
</tbody>
</table>

**Legend:** NPS = Nominal Pipe Size

**Notes:**
1. For treatment at the bridge ends, see Sheet 1.
2. Expansion Rails are required at expansion joint locations where the total movement exceeds 1". Install expansion rails midway between the fence posts spanning the expansion joint.
3. An Expansion Assembly is required where the total joint movement exceeds 6". Expansion Assembly includes Expansion Rails and two pull posts (as shown). When the Expansion Joint Opening is greater than 9" add an additional length to the free end of the Expansion Rail equal to the difference between the Expansion Joint Opening and 9".
4. Install the post on the fixed (bolted) side of the Expansion Rail 1'-6" from the edge of the expansion joint. Install the post on the slip (unbolted) side of the Expansion Rail 1'-6" from the edge of the expansion joint unless the Expansion Joint Opening is greater than 9". When the Expansion Joint Opening exceeds 9" increase the 1'-6" dimension by the difference between the Expansion Joint Opening and 9".
5. Install nut for the expansion rail finger-tight. The nut will 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.
### TABLE OF POST ATTACHMENT COMPONENTS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Plates</td>
<td>A36 or A572 Grade 36</td>
<td>% Steel Ø</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A36 or A709 Grade 36 or A508 Grade 6061-T6 or A508 Grade 6063-T5</td>
<td>Plate thicknesses as required. Holes in shim plates will be % Ø</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods - % Ø x 14(\frac{1}{2})q</td>
</tr>
<tr>
<td>C-1-P Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Hex Head Anchor Rods - % Ø x 14(\frac{1}{2})q</td>
</tr>
<tr>
<td>Nuts</td>
<td>A563</td>
<td>Hex Nuts for Base Plate Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Base Plate Connections</td>
</tr>
<tr>
<td>Bearing Pads (Plain)</td>
<td>-</td>
<td>In accordance with Specification Section 932 for ancillary structures</td>
</tr>
</tbody>
</table>

### POST ATTACHMENT NOTES

**ANCHOR RODS, NUTS AND WASHERS:**

After the nuts have been tightened, distort the Anchor Rod threads to prevent removal of the nuts. Coat distorted threads and exposed trimmed ends of anchors with a galvanizing compound in accordance with Specification Section 562.

**COATINGS:**


**ADHESIVE-BONDED ANCHORS AND DOWELS:**

Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 416. Cutting of reinforcing steel is permitted for drilled hole installation.

**WELDING:**

All welding will be in accordance with the American Welding Society Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.

**CROSS REFERENCE:**

For location of Detail "A" see Sheet 1.
FENCING NOTES:

FENCE INSTALLATION:
Install posts plumb (within a tolerance of ± 1/2”). Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.

TRAFFIC RAILING DETAILS:
See Superstructure Sheets for Traffic Railing details.

CONCRETE PARAPET DETAILS:
See Index 521-820 - Pedestrian/Bicycle Railing for Concrete Parapet details. Provide fencing in lieu of aluminum bullet railing as shown on Index 521-B20.

LIMITS OF FENCING:
Limits of fencing are from begin of approach slab at Begin Bridge to end of approach slab at End Bridge, unless otherwise shown in the plans.

PAYMENT:
Payment will be made under Fencing, Type R. Payment includes posts, horizontal and expansion rails, brace bands, rail ends, combination rail ends, boulevard clamps, chain link fabric, tension wire, ties, hog rings, tension bars and bands, pipe clamps, base plates, anchor rods, bolts, nuts, washers, shim plates, spacers, neoprene pads, miscellaneous fence fittings and hardware and all incidental materials and labor required to complete installation of the fence.

CROSS REFERENCE:
For Table of Fence Components and Table of Post Attachment Components see Sheet 2.
For Pull Post Assembly Detail, View A-A and Detail "A" see Sheet 3.
For “B’ and “E” see Sheet 4.
TABLE OF CHAIN LINK FENCE COMPONENTS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 3&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>HRIS &amp; IS</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 2½&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 2&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Chain Link Fabric</td>
<td>1/2&quot; mesh w/ knuckled bottom selvages</td>
<td></td>
</tr>
<tr>
<td>Tension Wire</td>
<td>A284 &amp; A187</td>
<td>Type II (Zinc Coated Steel Wire) - 7 gauge, Class 4 Coating</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F626</td>
<td>5&quot; gauge (Min. thickness) x ½&quot; (Min. width) Variable Height Steel Bars - Height = Tangent or Hoop Length - Barrier or Parapet Height - 2&quot; max</td>
</tr>
<tr>
<td>Tension Bands</td>
<td>F626</td>
<td>14 gauge (Min. thickness) x 3/8&quot; (Min. width) Steel Bands</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F626</td>
<td>Zinc Coated Steel - (includes horizontal rail ends, combination rail ends, boulevard clamps and all other miscellaneous fittings and hardware)</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307</td>
<td>½&quot; B x 4½&quot; Hex Head Bolts for Internal Sleeve connections</td>
</tr>
<tr>
<td>Nuts</td>
<td>A563</td>
<td>Hex Nuts for Internal Sleeve and Expansion Rail connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Internal Sleeve and Expansion Rail connections</td>
</tr>
<tr>
<td>Notes: 1. Expansion Rails are required at expansion joint locations where the total movement exceeds 1&quot;. Install expansion rails midway between the fence posts spanning the expansion joint. 2. An Expansion Assembly is required where the total joint movement exceeds 6&quot;. Expansion Assembly includes Expansion Rails and two pull posts (see Sheet 3). When the Expansion Joint Opening is greater than 9&quot; add an additional length to the free end of the Expansion Rail equal to the difference between the Expansion Joint Opening and 9&quot;. 3. Install nut for the expansion rail finger-tight. The nut will fully engage bolts with a minimum of one bolt thread extending beyond the nut. Distort the first thread on the outside of the nut to prevent loosening. 4. Hot-dip galvanize all Nuts, Washers, Bolts, C-I-P Anchor Rods, Adhesive Anchors and Fence Framework (Posts, Internal Sleeves, Shim Plates, Base Plates, Pipe Clamps and Spacers) in accordance with Specification Section 962. Hot-dip galvanize Fence Framework after fabrication.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TABLE OF POST ATTACHMENT COMPONENTS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Clamps</td>
<td>A36 or A209 Grade 36</td>
<td>½&quot; Steel θ</td>
</tr>
<tr>
<td>Base Plates</td>
<td>A36 or A209 Grade 36</td>
<td>½&quot; Steel θ</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A36 or A209 Grade 36 or B209 Alloy 6061-T6 or B221 Alloy 6063-T5</td>
<td>Plate thicknesses as required. Holes in shim plates will be 3/16&quot;</td>
</tr>
<tr>
<td>Spacers</td>
<td>–</td>
<td>Plate thickness varies based on Traffic Railing type (See Detail 'A')</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods - ½&quot; θ x 6&quot; (no spacer) or ½&quot; θ x (6&quot; + spacer thickness)</td>
</tr>
<tr>
<td>C-1-P Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Hex Head Anchor Rods - ½&quot; θ x 6&quot; (no spacer) or ½&quot; θ x (6&quot; + spacer thickness)</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods - ½&quot; θ x 14½&quot;</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307</td>
<td>½&quot; B x 4½&quot; Hex Head Bolts for Pipe Clamp Connections to Posts</td>
</tr>
<tr>
<td>Washers</td>
<td>A563</td>
<td>Hex Nuts for Pipe Clamp and Base Plate Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Pipe Clamp and Base Plate Connections</td>
</tr>
<tr>
<td>Bearing Pads (Plain)</td>
<td>–</td>
<td>In accordance with Specification Section 932 for Ancillary Structures</td>
</tr>
</tbody>
</table>

POST ATTACHMENT NOTES

ANCHOR RODS, NUTS AND WASHERS:
After the nuts have been tightened, distort the Anchor Rod threads to prevent removal of the nuts. Coat distorted threads and exposed trimmed ends of anchors with a galvanizing compound in accordance with Specification Section 562. Corrosion:
Hot-dip galvanize all Nuts, Washers, Bolts, C-I-P Anchor Rods, Adhesive Anchors and Fence Framework (Posts, Internal Sleeves, Shim Plates, Base Plates, Pipe Clamps and Spacers) in accordance with Specification Section 962. Hot-dip galvanize Fence Framework after fabrication. Adhesive-Bonded Anchors and Dowels:
Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 962. Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 962. Welding:
All welding will be in accordance with the American Welding Society Structural Welding Code (Steel) AWS D1.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.
NOTES:
1. For treatment at the bridge ends, see Sheet 1.
2. Expansion Rails are required at expansion joint locations where the total movement exceeds 1". See Sheet 2 for Expansion Rail Detail and notes.
3. An Expansion Assembly is required where the total joint movement exceeds 6". Expansion Assembly includes Expansion Rails and two pull posts (as shown). When the Expansion Joint Opening is greater than 9", add an additional length to the free end of the Expansion Rail equal to the difference between the Expansion Joint Opening and 9".
4. Install the post on the fixed (bolted) side of the Expansion Rail 1'-6" from the edge of the expansion joint. Install the post on the slip (unbolted) side of the Expansion Rail 1'-6" from the edge of the expansion joint unless the Expansion Joint Opening is greater than 9". When the Expansion Joint Opening is greater than 9" increase the 1'-6" dimension by the difference between the Expansion Joint Opening and 9".

PIPE CLAMP CONNECTION DETAIL
(Connection without spacer shown, Connection with spacer similar)

EXPANSION ASSEMBLY DETAIL
(Required only at expansion joint locations where total movement exceeds 6")

CROSS REFERENCE:
For location of View A-A and Detail "A" see Sheet 1.
PIPE CLAMP DETAIL

1½" Ø Holes for ½" Anchors (Typ.)

1½" Spacer (See Note 3)

1½" Ø Holes for ½" Anchors (Typ.)

BASE PLATE DETAIL

2 - 1½" C-L-P Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Nuts and Washers

SPACER DETAIL

(Must be manufactured from an incompressible material i.e. steel or aluminum)

1" Ø Base Plate

SPACER DETAIL

(INTERNAL SLEEVE DETAIL)

POST A DETAIL

POST B DETAIL

POST C DETAIL

SIDEWALK CROSS-SLOPE | DIM. H
--- | ---
2% Left | 5'-0" (See Note 1)
2% Right | 5'-3½" (See Note 1)

NOTES:
1. Values shown for Dim. H are for a 5'-0" clear sidewalk width. Adjust as required for clear sidewalk widths greater than 5'-0".
2. For clear sidewalk widths greater than 5'-0" increase radius and height by 6" for every one foot increase in sidewalk width.

CROSS REFERENCE:
For location of Details "B" and "E" see Sheet 1.
FENCE INSTALLATION:
Install posts plumb (within a tolerance of ± 1/2"). Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.

TRAFFIC RAILING DETAILS:
See Superstructure Sheets for Traffic Railing details.

LIMITS OF FENCING:
Limits of fencing are from begin of approach slab at Begin Bridge to end of approach slab at End Bridge, unless otherwise shown in the plans.

PAYMENT:
Payment will be made under Fencing, Type R. Payment includes all materials and labor required to complete installation of the fence.

CROSS REFERENCE:
For Table of Fence Components, Table of Post Attachment Components, View A-A and Detail "A", see Sheet 2.
For Pull Post Assembly Detail for Traffic Railing, see Sheet 3.

NOTES:
1. A Pull Post Assembly is required at maximum intervals of 500'-0". See Sheet 3.

* Do not anchor Fencing to the top of Traffic Railings.
ANCHOR RODS, NUTS AND WASHERS:
After the nuts have been tightened, distort the Anchor Rod threads to prevent removal of the nuts. Coat distorted threads and exposed trimmed ends of anchors with a galvanizing compound in accordance with Specification Section 562.

COATINGS:

ADHESIVE-BONDED ANCHORS AND DOWELS:
Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 416. Cutting of reinforcing steel is permitted for drilled hole installation.

WELDING:
All welding will be in accordance with the American Welding Society Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.

CROSS REFERENCE:
For location of View A-A and Detail “A” see Sheet 1.

TABLE OF CHAIN LINK FENCE COMPONENTS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 3” NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Chain Link Fabric</td>
<td>A392</td>
<td>Zinc Coated Steel - 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td></td>
<td>A401</td>
<td>Aluminum Coated Steel - 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td></td>
<td>F668</td>
<td>Polyvinyl Chloride (PVC) Coated Steel - 9 gage Class 2b</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F626</td>
<td>Zinc Coated Steel Wire - 9 gage</td>
</tr>
<tr>
<td>Brace Bands</td>
<td>F626</td>
<td>12 Gage (Min. thickness) x 3/4 (Min. width) Steel Bands (Bevered or Heavy)</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F626</td>
<td>3/8” (Min. thickness) x 3/4” (Min. width) x 6’-10” (Min. height) Steel Bars</td>
</tr>
<tr>
<td>Tension Bands</td>
<td>F626</td>
<td>14 Gage (Min. thickness) x 3/4” (Min. width) Steel Bands</td>
</tr>
<tr>
<td>Miscellaneous Fence</td>
<td>F626</td>
<td>Zinc Coated Steel - (includes post or loop caps, horizontal and brace rail ends, combination rail ends, bellevard clamps and all other miscellaneous fittings &amp; hardware)</td>
</tr>
<tr>
<td>Components</td>
<td>A824 &amp; A817</td>
<td>Type III (Zinc Coated Steel Wire) - 7 gage, Class 4 Coating Connections Type III (Aluminum Coated Steel Wire) - 7 gage</td>
</tr>
<tr>
<td>Hog Rings</td>
<td>F626</td>
<td>Zinc Coated Steel Wire - 12 gage</td>
</tr>
<tr>
<td>Brace Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 1½” NPS, Schedule 40 Regular Grade</td>
</tr>
</tbody>
</table>

TABLE OF POST ATTACHMENT COMPONENTS

<table>
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<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Clamps</td>
<td>A36 or A709 Grade 36</td>
<td>½” Steel Ø</td>
</tr>
<tr>
<td>Base Plates</td>
<td>A36 or A709 Grade 36</td>
<td>½” Steel Ø</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A36 or A709 Grade 36 or B209 Alloy 6061-T6 or B221 Alloy 6063-T</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plate thicknesses as required; Holes in shim plates will be ½” Ø</td>
</tr>
<tr>
<td>Spacers</td>
<td></td>
<td>Plate thickness varies based on traffic railing type (See Detail “A”)</td>
</tr>
<tr>
<td>Anchor Rod Connections</td>
<td></td>
<td>Hex Head Anchor Rods - ½” Ø x 6” (no spacer) or ½” Ø x (6” + spacer thickness)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-I-P Anchor Rods similar</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307</td>
<td>½” Ø x 1 ½” Hex Head Bolts for Pipe Clamp Connections to Posts</td>
</tr>
<tr>
<td></td>
<td>A563</td>
<td>Hex Nuts for Pipe Clamp Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Pipe Clamp</td>
</tr>
<tr>
<td>Bearing Pads (Plain Neoprene)</td>
<td></td>
<td>In accordance with Specification Section 932 for Ancillary Structures</td>
</tr>
</tbody>
</table>

ANCHOR RODS, NUTS AND WASHERS:
After the nuts have been tightened, distort the Anchor Rod threads to prevent removal of the nuts. Coat distorted threads and exposed trimmed ends of anchors with a galvanizing compound in accordance with Specification Section 562.

COATINGS:

ADHESIVE-BONDED ANCHORS AND DOWELS:
Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 416. Cutting of reinforcing steel is permitted for drilled hole installation.

WELDING:
All welding will be in accordance with the American Welding Society Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.

CROSS REFERENCE:
For location of View A-A and Detail “A” see Sheet 1.
**Bridge Deck (shown) or Raised Sidewalk**

- **Tension Wire** @ 2'-0" Centers (Typ.)
- **Ties** @ 1'-0" Centers (Typ.)
- **Tension Bands** (6 required per Tension Bar – Space Equally @ 1'-3" Maximum Centers) (Typ.)
- **Hog Rings** @ 2'-0" Centers
- **Tension Bar** (one each side of pull post)
- **Brace Rail**
- **Chain Link Fabric**
- **Pipe Clamp** Connection (Typ.)

**Expansion Joint Opening** (See Note 2)

NOTES:
1. For treatment at bridge ends, see Sheet 1.
2. Expansion Joint Opening is the width at the time of fence installation.

**Pipe Clamp Connection Detail**

- **Pipe Clamp**
- **Post**
- **Bearing Pad**
- **Hole for C-I-P Anchor Rod or Adhesive-Bonded Anchors (shown)**

**Pipe Clamp Detail**

- **Holes for **
- **Post Cap**
- **Washer**

**Spacer Detail**

- **Spacer**
- **Bearing Pad**
- **C-I-P Anchor Rod or Adhesive-Bonded Anchors (shown)**

**Traffic Railing** (Type varies, 36" Single-Slope shown)

- **Tie tension wire to post with 9 gage zinc coated tie wire (triple wrap required at both ends of tie wire) (Typ.)**

**Pull Post Assembly Detail for Traffic Railing**

- **Pull Post Assembly** (required at maximum intervals of 500'-0")
- **Post Cap** (Typ.)
- **Hog Rings** @ 2'-0" Centers
- **Tension Wire**
- **Pipe Clamp**
- **Bearing Pad**
- **Post Cap** (Typ.)
- **Brace Rail**
- **Chain Link Fabric**

**Pipe Clamp Connection Detail**

- **Pipe Clamp**
- **Post**
- **Hole for C-I-P Anchor Rod or Adhesive-Bonded Anchors (shown)**
- **Washer**

**Pipe Clamp Detail**

- **Holes for **

**Spacer Detail**

- **Spacer**
- **Bearing Pad**
- **C-I-P Anchor Rod or Adhesive-Bonded Anchors (shown)**

**Notes:**
1. For treatment at bridge ends, see Sheet 1.
2. Expansion Joint Opening is the width at the time of fence installation.

**Bridge Fencing (Over Railroad)**

**Description:**

- **Post and **
- **Bearing Pad**
- **Hex Nut and Washer**

**Notes:**
1. For treatment at bridge ends, see Sheet 1.
2. Expansion Joint Opening is the width at the time of fence installation.

**Bridge Fencing (Over Railroad)**

**Description:**

- **Post and **
- **Bearing Pad**
- **Hex Nut and Washer**

**Notes:**
1. For treatment at bridge ends, see Sheet 1.
2. Expansion Joint Opening is the width at the time of fence installation.

**Bridge Fencing (Over Railroad)**

**Description:**

- **Post and **
- **Bearing Pad**
- **Hex Nut and Washer**

**Notes:**
1. For treatment at bridge ends, see Sheet 1.
2. Expansion Joint Opening is the width at the time of fence installation.