NAVIGATION LIGHT SYSTEM SCHEMATIC
FOR SINGLE BRIDGE WITH FENDERS

NAVIGATION LIGHT SYSTEM SCHEMATIC
FOR DUAL BRIDGES WITH FENDERS

NAVIGATION LIGHT SYSTEM SCHEMATIC
FOR SINGLE BRIDGE WITHOUT FENDERS

NAVIGATION LIGHT SYSTEM SCHEMATIC
FOR DUAL BRIDGES WITHOUT FENDERS

**NAVIGATION LIGHT NOTES:**
1. Provide Navigation Light System in compliance with Specifications Section 510.

**NOTE:**
- Size conduit and conductors per NEC requirements.
- Do not use conduit smaller than \( \Omega \) 6.0.

**NAVIGATION LIGHT SYSTEM DETAILS**

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFL</td>
<td>Red Pier/Fender Light (180° visibility)</td>
</tr>
<tr>
<td>RCL</td>
<td>Red Channel Margin Light (180° visibility)</td>
</tr>
<tr>
<td>GCL</td>
<td>Green Center Channel Light (360° visibility)</td>
</tr>
<tr>
<td>CGL</td>
<td>Clearance Gauge Light</td>
</tr>
<tr>
<td>CM</td>
<td>Channel Margin or Pier inner surface whichever defines Channel Edge.</td>
</tr>
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</table>

**TYPICAL ELECTRICAL SCHEMATIC DIAGRAM**

**POWERS CONDUCTORS**

<table>
<thead>
<tr>
<th>DISTANCE (feet)</th>
<th>VOLTS</th>
<th>CONDUCTOR</th>
<th>TRANSFORMER</th>
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</thead>
<tbody>
<tr>
<td>0 - 75</td>
<td>120</td>
<td>#12 AWG</td>
<td>N/A</td>
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<tr>
<td>75 - 500</td>
<td>120 or 240</td>
<td>#10 AWG</td>
<td>N/A</td>
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<td>500 - 1000</td>
<td>240</td>
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<td>N/A</td>
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<tr>
<td>1000 - 2000</td>
<td>480</td>
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<td>2 KVA</td>
</tr>
<tr>
<td>2000 - 5000</td>
<td>480</td>
<td>#6 AWG</td>
<td>2 KVA</td>
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<tr>
<td>5000 - 10000</td>
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</tr>
<tr>
<td>Over 10000</td>
<td>480</td>
<td>#4 AWG</td>
<td>2 KVA</td>
</tr>
</tbody>
</table>

**LEGEND**

- LC: Lighting Contactor
- PC: Photocell Control
- Xmer: Transformer (If Required)
- RFL or RCL: Red Pier Lite/Fender Lite if Piers are 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.
GCL OR RCL MOUNTING DETAILS (SCHEMATIC)
VIEW A-A

CROSS REFERENCES:
1. For Navigation Light System notes and legend, see Sheet 1.
2. See Utility Conduit Detail sheets for Embedded Junction Box (EJB) dimensions & locations.

* Supplied by Light Fixture Manufacturer

GCL OR RCL MOUNTING DETAILS (SCHEMATIC)
ELEVATION VIEW
(Traffic Railing (36° Single-Slope) shown, other railings similar)

SECTION B-B
TYPICAL POSITION OF RCL OR GCL RELATIVE TO SUPERSTRUCTURES
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 terminals of the Bullet Railing.

CROSS REFERENCES:

Work in conjunction with Index 515-022.

For Traffic Railing Details, Reinforcement and Notes see Index 521-427.
Drill & tap hole to accept 3/8" Ø Stainless Steel Fasteners.

Insert Bar (Type 1) *
Tack Weld two places each end (Typ.)

Insert Bar (Type 2) 25/32" X 1/8" X 1'-0" Flat Bar. *

" Use of either Type 1 or Type 2 Insert Bars is at the option of the Contractor.

* Note: Provide for drive fit.

CROSS REFERENCE:
For Notes and Tapered End Transition Details, See Sheet 3.

PEDESTRIAN/BICYCLE BULLET RAILING DETAILS

INDEX
515-022 SHEET 2 of 3

REVISON 07/01/14 LAST REVISON
07/01/14
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 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 Railing 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.
V-Groove in both faces & top of Concrete Curb (Equally spaced between open joints)

Intermediate Open Joint

Concrete Curb

Post

Post

Max.

6" Min.

5'-7" (Max.) ~ Type "B" Post Only

5'-7" (Max.) ~ Type "A" Post or 7'-3" (Max.) ~ Type "B" Post

Rail Field Splice Joint (Typ.) See Detail "B", Sheet 3

Begin or End Bridge

Approach Slab

Rail Expansion Joint (Typ.) See Detail "B", Sheet 3

Index 515-052 Railing shown, see Contract Plans for actual railing continuation or termination

Deck Joint (5) *

4½" Max. Gap

5½" Max. Gap

Begin or End Approach Slab

Approach Slab

Date:

11/01/17

Sheet:

3

Index:

515-051

FY 2020-21

STANDARD PLANS

BRIDGE PEDESTRIAN/BICYCLE RAILING

(Steel)

NOTES:

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


      b. Support Bracket (Scheme 3) L-shape and Stiffener Plate: ASTM A36

      c. 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 ƃ" 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 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 ƃ" Intermediate open joints in curbs coinciding with the ƃ" 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.

REVISED:

11/01/17

DESCRIPTION:

REV MSN

STANDARD PLANS

BRIDGE PEDESTRIAN/BICYCLE RAILING

(Steel)

515-051

1 of 3
**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

BIL OF REINFORCING STEEL

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<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>4</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>S</td>
<td>4</td>
<td>As Read.</td>
</tr>
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</table>

**BILL OF REINFORCING STEEL**

- **MARK**
  - P
  - S
- **SIZE**
  - 4
- **LENGTH**
  - 2'-0"

**CONCRETE CURB QUANTITIES (SCHEME 2)**

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<thead>
<tr>
<th>ITEM</th>
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</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/FT</td>
<td>4.01</td>
</tr>
</tbody>
</table>

**ALTERNATE REINFORCING (WWR) DETAILS**

**NOTE:**

- Place wire panels to minimize the end overhang. End Overhangs greater than 4 3/4" are not permitted.

**SPICE DETAIL**

- D157 or #4 Bar (Tap Splice Each Longitudinal Wire)

**WWR SECTION DETAIL**

- D157 (Horizontal)
- D157 (Vertical)

**CURB REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the curb on a retaining wall shall be the same as detailed for an 8" deck.
3. All reinforcing steel at the open joints shall have a 2" minimum cover.
4. Bars 4S may be continuous or spliced at the construction joints. Bar splices for Bars 4S shall be a minimum of 1'-8".
5. Deformed Welded Wire Reinforcement (WWR) meeting the requirements of Specification Section 931 may be used in lieu of all Bars 4P and 4S.

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

**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)**

**SCHEME 2 - CONCRETE CURB DETAILS**

**SCHEME 1 - BOTTLE GUARD DETAIL**

**SCHEME 3 - BOTTLE GUARD DETAIL**

---

**CROSS REFERENCE:**

See Sheet 1 for Bridge Railing Notes.

**REVISION:**

11/01/16

**DESCRIPTION:**

Bridge Pedestrian/Bicycle Railing (Steel)

**INDEX:**

515-051

**SHEET:**

3 of 3
**BRIDGE PEDESTRIAN/BICYCLE RAILING (ALUMINUM)**

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:**
   - 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. **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)

**Alternate Reinforcing (WWR) Details**
- **NOTE:** Place wire panels to minimize the end overhangs. End overhangs greater than 4 3/4" are not permitted.

**Splice Detail** (Between WWR Sections)
- D19.7 or #4 Bar (Lap Splice Each Longitudinal Wire)
- D19.7 (Horizontal)
- D19.7 (Vertical) (Typ.)

**WWR Section Detail**

### SQUARE RAILS - INTERMEDIATE OR BOTTOM RAIL

**INTERMEDIATE OR BOTTOM RAIL - ALUMINUM SLEEVE DETAIL** (Bottom Side Shown)

- **Aluminum Sleeve:**
  - 2.50 OD x 0.125 Wall for top rail
  - 1" NPS (Sch. 40) for handrails

- **#10 x 5/8" Pan Head Screws (18-8 SS) @ 2'-0" sp.

**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)

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<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CF/CF</td>
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<tr>
<td>Reinforcing Steel</td>
<td>LR/LF</td>
<td>4.01</td>
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### INDEX SHEET

- **BIM Plan Set**
- **TSD Set**
- **Final Set**
- **ADD Plans**

**SCHEME 2 - CONCRETE CURB DETAILS**

**SCHEME 1 - BOTTLE GUARD DETAIL** (Post Not Shown for Clarity)

**SCHEME 3 - BOTTLE GUARD DETAIL** (Post Not Shown for Clarity)
GENERAL NOTES

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

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

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

BARRIER DELINEATORS: Barrier Delineators shall meet Specification Section 993. Install Barrier Delineators on top of the Traffic Railing along the entire length of the bridge 2" from the face on the traffic side 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 sheeting and adhesive backing shall comply with Specification Section 994 and may comprise individual decals of letters and numbers.

PAYMENT: Concrete Traffic Railing-Bridge Retrofit – Post & Beam Railing (EA) includes all material and labor required to demolish a portion of the existing structure where required to construct the concrete portion of the retrofit railing. Guardrail Approach Transition to rigid Barriers (EA) includes transition block, and necessary hardware to complete the Guardrail transitions shown.

Note:
Shift dowel holes to clear if the existing reinforcement is encountered.
**Revision Description:**

**Revision Last of Standard Plans:**

**Guardsrail Transitions-Existing Post & Beam Bridge Railings (Narrow & Receded Curbs)**

**Guardsrail Transitions-Existing Post & Beam Bridge Railings (Narrow & Receded Curbs)**

**Bill of Reinforcing Steel**

**Concrete:**
- CY/FT 0.076

**Reinforcing Steel:**
- LB/FT 14.71

**Estimated Traffic Railing Quantities**

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
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<tr>
<td>Reinforcing Steel</td>
<td>LB/FT</td>
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**Conventional Reinforcing Steel Bending Diagram**

**Scheme 1 - Approach Ends of Bridges with Beam or Girder Superstructure**

**Scheme 2 - Approach Ends of Bridges with Flat Slab Superstructure & Parallel Wingwalls (Shown) or Beam or Girder Superstructure & Parallel or Curved Wingwalls (Similar)**

**Partial Elevation of Inside Face of Railing**

**Vertical Face Retrofit Railing Details - Post & Beam Railing with Narrow Curb**

**Section A-A**

**Section B-B**
3 OR MORE CONTINUOUS RAILING PANELS ON WINGWALL ADJACENT TO END POST

2 CONTINUOUS RAILING PANELS ON WINGWALL ADJACENT TO END POST

1 RAILING PANEL ON WINGWALL ADJACENT TO END POST

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

LEGEND

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

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

DETAIL A

SECTION A-A

SECTION B-B

REMOVE EXPOSED EXISTING REINFORCING STEEL BY BURNING OR GRINDING TO 3" BELOW FINISHED END OF SAW CUT. REPAIR RESULTING HOLES AND THEN COAT ENTIRE END OF RAILING OR CURB WITH TYPE F-1 EPOXY IN ACCORDANCE WITH SECTION 926 (TYP.).

SAW CUT RAILING AND RECESSED CURB AND GRIND FLAT TO ALIGN WITH EDGE OF POST.

EXISTING RECESSED CURB
**SCHEME 3 - APPROACH ENDS OF BRIDGES WITH BEAM OR GIRDER SUPERSTRUCTURE**

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

**ESTIMATED TRAFFIC RAILING QUANTITIES**

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<th>ITEM</th>
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**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM**

<table>
<thead>
<tr>
<th>BARS 6D &amp; 5S</th>
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</thead>
<tbody>
<tr>
<td><strong>MARK</strong></td>
</tr>
<tr>
<td>D</td>
</tr>
<tr>
<td>S</td>
</tr>
</tbody>
</table>

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

**VERTICAL FACE RETROFIT RAILING DETAILS - POST & BEAM RAILING WITH RECESSED CURB**

**SECTION A-A**

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

PARTIAL PLAN - APPROACH TRANSITION

PARTIAL ELEVATION - APPROACH TRANSITION

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.
**STANDARD PLANS**

**FY 2020-21**

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

**DESCRIPTION:**

**REV ISIO N**

**LAST UPDATED:** 07/01/13

**INDEX**

**PAGE 8 of 8**

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### 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>
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<tr>
<td>Reinforcing Steel</td>
<td>CY</td>
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**NOTES:**

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

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

Shift bars (as needed) to install six dowels into existing bridge or approach slab mounted curb.
GENERAL NOTES

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

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

EXPANSION SLEEVE ASSEMBLY: Pipe sleeve shall be ASTM D2241 PVC pipe, SDR13.5. End Cap shall be ASTM 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 load required by Specification Section 416 shall be 23,800 lbs. for Dowel Bars 6D on the inside face (traffic side) of the railing (1'-0" embedment) and 18,500 lbs for Dowel Bars 6D along the outside face of the traffic railing (5" min. embedment).

BRIDGES ON CURVED ALIGNMENTS: The details presented in these Standards 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 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.

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 Approach Transition to Rigid Barriers (EA) includes all transition blocks, and necessary hardware to complete the Guardrail transitions shown.

ESTIMATED TRAFFIC RAILING QUANTITIES

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(Quantities are based on a 9" curb, no curb cross slope and 2'-0" embedment length of Bars 6D. If the curb height or embedment length differs from that shown, increase or decrease quantity by the given per inch increment.)
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM

BILL OF REINFORCING STEEL

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<thead>
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<th>MARK</th>
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<th>LENGTH</th>
<th>NOTE NOS.</th>
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<tbody>
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<td>B</td>
<td>3</td>
<td>2'-0&quot;</td>
<td>1, 2 &amp; 3</td>
</tr>
<tr>
<td>D</td>
<td>6</td>
<td>2'-0&quot;</td>
<td>2 &amp; 3</td>
</tr>
<tr>
<td>L</td>
<td>4</td>
<td>4'-3&quot;</td>
<td>1 &amp; 3</td>
</tr>
<tr>
<td>W</td>
<td>4</td>
<td>2'-0&quot;</td>
<td>1 &amp; 3</td>
</tr>
<tr>
<td>S</td>
<td>5</td>
<td>2'-0&quot;</td>
<td>2, 3 &amp; 4</td>
</tr>
</tbody>
</table>

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a retaining wall shall be the same as detailed for a bridge deck.
3. All reinforcing steel in the Vertical Face Retrofit Railing shall have a 2" minimum cover.
4. Bars S5 may be continuous or spliced at the construction joints. Bar splices for Bars S5 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.

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.

* ½" Preformed Joint Filler at top of Existing Curb shall extend beyond the joint material (Silicone, poured rubber, armored neoprene seal or sliding plates) as shown to prevent concrete intrusion during railing casting and shall be placed so as not to restrict in any way normal joint movement.

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

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

GUARDRAIL TRANSITIONS - EXISTING POST & BEAM BRIDGE RAILINGS (WIDE CURBS)
DESCRIPTION:

Non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment at skewed deck joints see Stew 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".

**Concrete cover**

1. On approach end provide a Roadway Guardrail Transition, Index No. 402 (as shown)
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:

1. On approach end provide a Roadway Guardrail Transition, Index No. 402 (as shown) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Three-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is 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.

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 Three-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.

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 Three-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.

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 Three-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.
**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 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.
PARTIAL PLAN OF RAILING

PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

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 3 of 6.

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

3. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or 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 Wings Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 3 of 6.

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

3. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or 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.
PARTIAL PLAN OF RAILING

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

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

SCHEME 5 NOTES:

1. See roadway plans for limiting station of roadway guardrail transition or other site specific treatment. If limiting station of roadway guardrail transition is along the 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 Bar 4N may be installed on a maximum angle of 45° to the cut edge of the approach slab as shown to facilitate drilling of holes and installation of bars.

3. Provide transition block (as shown) or curb if existing approach slab curb does not extend beyond end of existing end bent wing wall. See roadway plans. Shape and height of transition block or curb shall match existing bridge curb. Railing end transition and transition block may be omitted on trailing ends with no opposing traffic.

4. Field bend dowel bar 4N within transition block as required to maintain 2'-0" top and side clearance and 3'-0" bottom clearance.

5. At the contractor's option, along the length of the approach slab curb that is to be replaced, dowel bar 6D may be cast in with the new section of curb as shown or may be installed in drilled holes in the new section of curb using an adhesive bonding material system with a 3'-0" minimum embedment.

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

TYPICAL SECTION THRU EXISTING APPROACH SLAB AND END BENT WING WALL SHOWING LIMITS OF REMOVAL (SCHEMES 4 AND 5 ONLY)
Approach Slab (Flexible Pavement Approach Slab Shown, Rigid Pavement Approach Slab Similar)

Front Face of Backwall & Begin or End Bridge

Raised Sidewalk

Bridge Deck

Coping (Typ.)

Joint (see Notes)

Superstructure Supports

3'-0" Maximum

Deck Joint (see Notes) 6" Min.

Deck Joint

ELEVATION OF INSIDE FACE OF RAILING
(Reinforcing Steel not shown for clarity)

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

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

Guardrail Connection (When called for in Plans)

Railing End Transition

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

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 Traffic Railing 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 6" open joints and 3/4" V-Grooves shall apply.

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. Match the Barrier Delineator to the color (white or yellow) of the near edgeline.

V-GROOVES: Construct 3/4" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 6" 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.

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 3/4" 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 Joint locations matching the dimensions of the Deck Joint. For treatment of Railings on skewed bridges see Index 521-427.

Provide 3/4" Intermediate Open Joints at:
(1) - Superstructure supports where slab is continuous.
(2) - Ends of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.

3'-0" Taper

3" Interim Open Joint

Joint (see Notes)

Approach Slab

Deck Joint

Approach Slab

Coping (Typ.)

Joint (see Notes)

Superstructure Supports

3'-0" Maximum

Deck Joint (see Notes) 6" Min.

Deck Joint

ELEVATION OF INSIDE FACE OF RAILING
(Reinforcing Steel not shown for clarity)

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

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

Guardrail Connection (When called for in Plans)

Railing End Transition

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

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 Traffic Railing 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 6" open joints and 3/4" V-Grooves shall apply.

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. Match the Barrier Delineator to the color (white or yellow) of the near edgeline.

V-GROOVES: Construct 3/4" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 6" 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.

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 3/4" 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 Joint locations matching the dimensions of the Deck Joint. For treatment of Railings on skewed bridges see Index 521-427.

Provide 3/4" Intermediate Open Joints at:
(1) - Superstructure supports where slab is continuous.
(2) - Ends of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.
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.)
### Conventional Reinforcing Steel Bending Diagrams

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Length</th>
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</thead>
<tbody>
<tr>
<td>S</td>
<td>5</td>
<td>As Req'd.</td>
</tr>
<tr>
<td>T</td>
<td>5</td>
<td>10'-6&quot;</td>
</tr>
<tr>
<td>X</td>
<td>5</td>
<td>6'-9&quot;</td>
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<th>Roadway Cross-Slope</th>
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<td>0% to 2%</td>
<td>90°</td>
<td>90°</td>
</tr>
<tr>
<td>2% to 6%</td>
<td>87°</td>
<td>83°</td>
</tr>
<tr>
<td>6% to 10%</td>
<td>84°</td>
<td>96°</td>
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**Concrete**

**Reinforcing Steel**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<tr>
<td>Concrete</td>
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<td>0.145</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/LF</td>
<td>20.68</td>
</tr>
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</table>

(These 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.)

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.
2. The 4'-6" vertical dimension shown for Bars T and S 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 $\theta_{A} = 90^\circ$.
4. All reinforcing steel at the open joints shall have a 2" minimum cover.
5. Bars S5 may be continuous or spliced at the construction joints. Bar splices for Bars S5 shall be a minimum of 2'-2".
6. The Contractor may utilize Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

---

**Estimated Traffic Railing Quantities**

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<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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</thead>
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<tr>
<td>Concrete</td>
<td>CY/LF</td>
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</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/LF</td>
<td>20.68</td>
</tr>
</tbody>
</table>

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

**Intermediate Joint Seal Notes:**

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

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

---

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

**Paint Recessed Surfaces Black**

**Reinforcing Bar S5**

**End Transition Stirrup Bars ST**

**End Transition Stirrup Bars SX**

**STIRRUP BAR ST**

**STIRRUP BAR SX**

To Be Field Cut (7 of each required per Railing End Transition)

**Landscape Finish Cut & Discard**

**Main Cover. 10" Max.**

**STIRRUP BAR 5T**

**STIRRUP BAR 5X**

**Main Cover (10‘-6")**

**Field Cut & Discard**

**Varena (Field Cut & Discard)**

**To Be Field Cut & Discard**

**Paint Recessed Surfaces Black**

**Length as Required**

**Details:**

- Pre-cured Silicone Sealant (4" wide)
- Paint Recessed Surfaces Black
- Reinforcing Bar S5
- End Transition Stirrup Bars ST
- End Transition Stirrup Bars SX
- STIRRUP BAR ST
- STIRRUP BAR SX
- Landscape Finish Cut & Discard
- Main Cover. 10" Max.
- Varena (Field Cut & Discard)
- To Be Field Cut & Discard
- Paint Recessed Surfaces Black
- Length as Required
**DESCRIPTION:**

**V-Groove in Sheet 3:**

The V-Groove shall be formed by preformed letters and figures. Plastic letters and figures 3" in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by completed. For a widening where 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.

**TRAFFIC RAILING NOTES:**

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

**GUARDRAIL:** For Guardrail Connection details, see Index 535-001.

**PEDESTRIAN/BICYCLE RAILING AND SPECIAL HEIGHT BICYCLE RAILING DETAILS:** See Index 515-022.

**V-GROOVES:** Construct ½ V-Grooves plum. Space V-Grooves equally between ⅜" Open Joints and/or Deck Joints and at V-Groove locations on Retaining Wall Footings.

**BARRIER DELINEATORS:** Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side in accordance with Specification Section 705. Match the Barrier Delineator to the color (white or yellow) of the near edgeline.

**END TRANSITION:** When guardrail approaches are shown in the plans, provide Railing End Transition.

**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 ⅜ open joints and ½ V-Groove shall apply.

**NAME, DATE, AND BRIDGE NUMBER:** The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be placed on the driver's left side when approaching the bridge. The Name shall be as shown in the General Notes of the Structures Plans. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening.

**TRAFFIC RAILING - (32" VERTICAL SHAPE):**
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, shear 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 Railings are 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 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 Bullet Railing Details, see Index 515-022.
**Reinforcing Steel Notes:**

1. All bar dimensions in the bending diagrams are cut to out.
2. The 3'-8" vertical dimensions shown for Bars ST and SX are based on a bridge deck with a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and a counter 2% raised sidewalk cross slope. If the raised sidewalk thickness, width or cross slopes vary from the above amounts, adjust these vertical dimensions accordingly to achieve a 6" minimum embedment into the bridge deck.
3. The reinforcement for the railing on a Retaining Wall shall be the same as detailed with ØA = 90°.
4. All reinforcing steel at the open joints shall have a 2" minimum cover.
5. Bars SS may be continuous or spliced at the construction joints. Bar splices for Bars SS shall be a minimum of 2'-2".
6. The Contractor may utilize Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

**Conventional Reinforcing Steel Bending Diagrams**

<table>
<thead>
<tr>
<th>Bill of Reinforcing Steel</th>
<th>Roadway</th>
<th>ØA</th>
<th>Low Gutter</th>
<th>High Gutter</th>
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<tbody>
<tr>
<td>Mark</td>
<td>Size</td>
<td>Length</td>
<td>Cross-Slope</td>
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<td>S</td>
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<tr>
<td>X</td>
<td>5</td>
<td>5'-10&quot;</td>
<td>84°</td>
<td>96°</td>
</tr>
</tbody>
</table>

**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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<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Concrete</td>
<td>CY/CBF</td>
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<tr>
<td>Reinforcing Steel</td>
<td>LB/CBF</td>
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</table>

(The above quantities are based on a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and counter 2% sidewalk cross slope.)
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 DELINEATORS: Install Barrier Delineators on top of the Traffic Railing along the centerline in accordance with Specification Section 705. Match the Barrier Delineator to the color (white or yellow) of the near edgeline.

V-GROOVES: Construct 1/2 V-Grooves plumb. Space V-Grooves equally between 3/4 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 3.

Provide 3/4 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 "A". When a Concrete Median Barrier is shown on the approaches, provide the Railing Height Transition as shown in Detail "B".
SECTION A-A
TYPICAL SECTION THRU TRAFFIC RAILING
(SECTION THRU BRIDGE DECK SHOWN - SECTION THRU APPROACH SLAB SIMILAR)

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.

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 "A"
PLAN - Railing End Transition
(Showing Bars 5W and 5S)

DETAIL "B"
PLAN - Railing End Transition
(Showing Bars 5R and 5S)

ELEVATION - RAILING HEIGHT TRANSITION
(Showing Transition to 38" Single-Slope Barrier)
NOTES:
1) Median Traffic Railing reinforcement vertical Bars SW may be shifted up to 1" (Max.) and rotated up to 10 degrees as required to allow proper placement.
2) Transition Stirrup Bars SW shall be used as required at railing ends adjacent to expansion joints to facilitate placement of bars in acute corners. Place Transition Bars SW in a fan pattern to maintain spacing. Rotate bars in 10° (Max.) increments as required.
3) Median Traffic Railing ends at deck expansion joints shall follow the deck joint with allowance for joint movement. See Structures Plans, Superstructure and Approach Slab Sheets for details.
4) ½" Intermediate Open Joints and V-Grooves in railing shall be placed perpendicular or radial to the axis 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.
The above quantities are based on a crowned roadway, with a 2% cross slope.

Reinforcing Steel
Concrete
CY/LF
LB/LF

Optional Splice (see Note 4)
Length as Required

As Reqd.
5
5
5
W
S
R

0% to 2%
79'
79'
79'
79'

>2% to 6%
81'
77'
79'
79'

>6% to 10%
84'
74'
79'
79'

BAR 5S

TRANSITION STIRRUP BAR 5R
(5 required per Railing End Transition)

STIRRUP BAR 5W
TRANSITION STIRRUP BAR 5W
To Be Field Cut
(10 required per Railing End Transition)

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints shall have a 2” minimum cover.
3. Bars S5 may be continuous or spliced at the construction joints. Bar splices for Bars S5 shall be a minimum of 2’-2”.
4. At the Contractor’s option, Bars S5 may be fabricated as a two piece bar with a 1’-2” lap splice of the bottom legs.

PRE-CURED SILICON SEALANT 4” wide (Typ.):

1. At the option of the Contractor deformed Welded Wire Reinforcement (WWR) may be utilized in lieu of all Bars S5, S5 and S5 WWR must meet the requirements of Specification Section 931.
2. WWR at Railing End Transition shall be field bent inward, and as required (Pieces 1 & 2) 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.

PRE-CURED SILICON SEALANT 4” wide (Typ.):

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.

FIELD BEND as required to maintain cover.

FIELD CUT & DISCARD

Welded Wire Reinforcement Notes:
1. At the option of the Contractor deformed Welded Wire Reinforcement (WWR) may be utilized in lieu of all Bars SR, S5 and S5 WWR must meet the requirements of Specification Section 931.
2. WWR at Railing End Transition shall be field bent inward as required (Pieces 1 & 2) to maintain cover. The 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.

DETAIL "C" - SECTION AT INTERMEDIATE OPEN JOINT

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

PRE-CURED SILICON SEALANT 4” wide (Typ.):

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.

PRE-CURED SILICON SEALANT 4” wide (Typ.):

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.
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 superelivated 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 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".

TRAFFIC RAILING NOTES

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

BARRIER DELINEATORS: Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side in accordance with Specification Section 705. Match the Barrier Delineator to the color (white or yellow) of the near edgeline.

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 3.

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

**SECTION A-A**

TYPICAL SECTION THRU TRAFFIC RAILING

(Section thru Bridge Deck shown, Section thru Approach Slab and Retaining Walls similar)

- Bars 4S @ 6" sp. (Typ.)
- Bars 4P @ 6" sp. (Max.)
- Bars 4V @ 6" sp. (Max.)
- Bars 4S (Top)
- Edge of Approach Slab (Coping) *
- Construction Joint Required

**DETAIL "A"**

- 2" Cover (Top)
- 2" Cover (Bottom)
- 2" Cover (Sides)
- Thrie-Beam Terminal Connector Bolts

**VIEW B-B**

END TRANSITION

(Section thru Approach Slab shown, Section thru Retaining Walls similar)

- Bars 4P @ 6" sp. (Typ.)
- Bars 4V @ 6" sp. (Typ.)
- Bars 4S (Top)
- 2" Cover (Top)
- 2" Cover (Bottom)
- Edge of Approach Slab (Coping) *
- Construction Joint Required

**VIEW C-C**

HEIGHT TRANSITION

- 38" Single-Slope Traffic Railing
- 5'-0" Taper
- Raise Bars 4P to maintain 2" cover at top of Traffic Railing along taper

**PLAN - RAILING END TRANSITION**

(Showing Bars 4V and 4S)

- Top of Coping
- 3'-0" Toe
- 2" Vertical
- 2'-0" Connector Bolts

**DETAIL "B"**

- ELEVATION - RAILING HEIGHT TRANSITION

(Showing Transition to 38" Single-Slope Traffic Railing or Barrier)

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.

**DETAILED SPECIFICATIONS:**

- Bars 4P @ 6" sp. (Max.)
- Bars 4S @ 6" sp. (Typ.)
- Bars 4V @ 6" sp. (Max.)
- Bars 4S (Top)
- Edge of Approach Slab (Coping) *
- Construction Joint Required

**NOTE:** Where railings of adjacent bridges are to be built back to back, the outside vertical plane of the railing and deck/approach slab may coincide along a plane centered 1'-4" from each gutter line. A bond breaker will be required. See Structures Plans, Superstructure Sheets for Details.

**PLAN - RAILING END TRANSITION**

(Showing Bars 4V and 4S)

- 2" Cover (Top)
- 2" Cover (Bottom)
- Edge of Approach Slab (Coping) *
- Construction Joint Required

**DETAIL "A"**

- Bars 4S @ 6" sp. (Typ.)
- Bars 4P @ 6" sp. (Max.)
- Bars 4V @ 6" sp. (Max.)
- Bars 4S (Top)
- Edge of Approach Slab (Coping) *
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 effected by skew angle, see Index 521-820 for details.
2) Parapet expansion joint shall match the deck expansion joint which shall be turned perpendicularly 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 1” (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 allowance for joint movement. Expansion joint at the inside face of parapet shall be turned perpendicularly or radial to this line. See Structures Plans, Superstructure and Approach Slab Sheets for details.
5) ½ Intermediate Open Joints and V-Grooves in railing and parapet shall be placed perpendicularly 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**

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 2 shall be cut a maximum of 4 inches and the gutter side portion bent inward as required to allow placement.

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

- **ROADWAY CROSS-SLOPE**
  - **LOW GUTTER**
    - 0% to 2%: 90°
    - 2% to 6%: 87°
    - 6% to 10%: 84°
  - **HIGH GUTTER**
    - 0% to 2%: 90°
    - 2% to 6%: 93°
    - 6% to 10%: 98°

**BILL OF REINFORCING STEEL**

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<tr>
<td>S</td>
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<td>As Reqd</td>
</tr>
<tr>
<td>v</td>
<td>4</td>
<td>4'-10&quot;</td>
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</tbody>
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**STIRRUP BAR 4P END STIRRUP BAR 4P**

To Be Field Cut and Bent

**BAR 4S END TRANSITION BAR 4V**

Field Cut and Lapped

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.
2. The 8" vertical dimensions shown for Bar 4V is based on a 6" embedment into the bridge deck without a raised sidewalk. If a raised sidewalk is to be provided, increase this dimension to achieve a 6" minimum embedment into the bridge deck. See Structures Plans, Superstructure and Approach Slab Sheets.
3. All reinforcing steel at the open joints shall have a 2" minimum cover.
4. Bars 4S may be continuous or spliced at the construction joints. Bar splices for Bars 4S shall be a minimum of 2'-0".

**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.

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

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

**ESTIMATED TRAFFIC RAILING QUANTITIES**

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<th>ITEM</th>
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(The above quantities are based on a 2% deck cross slope; railing on low side of deck.)
SECTION A-A
36" Single-Slope Show
Other traffic railings similar

ELEVATION

DRAINAGE SLOT NOTES:
1. Use only when required for safety. See Plans for locations and size of drainage slots.
2. Maintain 2" minimum cover to all reinforcing. Trim P Bars over drainage slots and raise bottom S Bars as necessary to maintain cover.
3. For slots greater than 6" in length, add additional vertical bars (V & P) on each side of the opening.
4. Drainage slot heights are 2" or 3". See the plans for size and location details.
This railing has been structurally evaluated to be equivalent or greater in strength to other single slope railings which have been crash tested to NCHRP TL-5.

CONCRETE AND REINFORCING STEEL: See Structures Plans, General Notes. SUPERELEVATED BRIDGES: When the approach to 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 the Contractor's expense.

GUARDRAIL: For Guardrail connection details, see Index 536-001. V-GROOVES: Construct ½ V-Grooves plumb. Space V-Grooves equally between 2/3 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".

ELEVATION OF INSIDE FACE OF RAILING (Railing on Bridge Deck and Approach Slab Shown, Railing on Retaining Wall similar)

This railing has been structurally evaluated to be equivalent or greater in strength to other single slope railings which have been crash tested to NCHRP TL-5.

CONCRETE AND REINFORCING STEEL: See Structures Plans, General Notes. SUPERELEVATED BRIDGES: When the approach to 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 the Contractor's expense.

GUARDRAIL: For Guardrail connection details, see Index 536-001. V-GROOVES: Construct ½ V-Grooves plumb. Space V-Grooves equally between 2/3 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".

DRAINAGE SLOTS: When shown in the plans, see Index 521-427 Sheet 3 for details.

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 ½ V-Grooves. V-Grooves shall be formed by preformed letters and figures.


For railing end transition see View C-C and Detail "A", (Typical when guardrail connection required)
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.

VIEW C-C

ELEVATION - RAILING END TRANSITION
(Guardrail not shown for clarity)

SECTION A-A

TYPICAL SECTION THRU TRAFFIC RAILING
(Section Thru Bridge Deck shown - Section Thru Approach Slab similar)

VIEW B-B

END TRANSITION
(Section thru Approach Slab shown, Section thru Retaining Walls similar)
NOTE:
1. Provide Detail "B" height transition where 42" Single-Slope Traffic Railings increase to 44" Barriers beyond flexible pavement approaches.
2. Work Detail "B" with Index 400-090.
3. Provide Detail "C" height transition where 42" Traffic Railings are required on bridge, and 36" or 38" Barriers are shown on approaches.
4. Work Detail "C" with Indexes 400-090 or 400-091, 521-427, and 521-610 as necessary.
5. Field cut 5P Bars as shown to maintain 2" min. (4" max.) cover at top of traffic railing.

1. Provide Detail "B" height transition where 42" Single-Slope Traffic Railings increase to 44" Barriers beyond flexible pavement approaches.
2. Work Detail "B" with Index 400-090.
3. Provide Detail "C" height transition where 42" Traffic Railings are required on bridge, and 36" or 38" Barriers are shown on approaches.
4. Work Detail "C" with Indexes 400-090 or 400-091, 521-427, and 521-610 as necessary.
5. Field cut 5P Bars as shown to maintain 2" min. (4" max.) cover at top of traffic railing.
**Note:**
The estimated railing quantities are based on a 2% deck cross slope, railing on low side of deck.

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

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<td>V</td>
<td>5</td>
<td>9'-0&quot;</td>
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Reinforcing Steel:

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.

**Roadway Cross-Slope**

- **Low Gutter**
  - 0% to 2%: 10'
  - 2% to 6%: 10'
  - 6% to 10%: 10'

**Paint Recessed Surfaces Black**

45°

**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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**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 3271.

**CONCRETE:** Concrete for the Traffic Railing (Vertical Face Retrofit), Spread Footing Approaches and replacement curb sections shall be

**Dowel Bars 6D Spacing (Inside Face)**

**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, SDR15. 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" min. embedment).

**Bridges on Curved Alignments:** The details presented in these Indexes 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 placed when portions of the existing traffic railing carrying existing elevation markers are removed.

**BARRIER DELINEATORS:** Barrier Delineators shall meet Specification Section 993. Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side in accordance with Specification Section 705. Match the Barrier Delineator color (white or yellow) to 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.

**International Bridge Design:** Dowel Bar Movement

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### ESTIMATED TRAFFIC RAILING QUANTITIES

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<th>ITEM</th>
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<tr>
<td>Reinforcing Steel</td>
<td>LB/FT</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 quantities by the given per inch increment.) See Index 521-48A, Sheet 4 for Spread Footing Approach Quantities.*
**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM**

**BILL OF REINFORCING STEEL**

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<th>LENGTH</th>
<th>INDEX NO.</th>
<th>NOTE NOS.</th>
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<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'-2".
5. Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.

**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)

**SKEW DETAIL**

**TRAFFIC RAILING - (VERTICAL FACE RETROFIT)**

**TYPICAL DETAILS & NOTES**

**OPEN JOINT EXPANSION DOWEL DETAIL**

(Railing Reinforcing Not Shown For Clarity)

**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.

**REFERENCES:**

- See Index 521-481 thru 521-484 for spacing of Bars 6D.
**NOTES:**

1. On approach end provide a Roadway Guardrail Transition, Index 536-002 (as shown) or other site specific treatment. See Roadway Plans for limited station of Roadway Guardrail Transition or other site specific treatment. If limited 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, 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 grubbing or grading as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1" below existing concrete and grouted over.

**DESCRIPTION:**

3:2 7:4 9 PM

**REVISE**

**LAST REVISED** 07/01/13

**INDEX** 521-481

**FY 2020-21 STANDARD PLANS**

**TRAFFIC RAILING - (VERTICAL FACE RETROFIT) NARROW CURB**

**VARI AN EX-view** 1/4" & 1/16" Scale

**SECTIONS:**

**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.

**TYPICAL ELEVATION OF INSIDE FACE OF RAILING**

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

**PARTIAL TREATMENT OF RAILING ALONG BRIDGE**

**PARTIAL PLAN OF RAILING**

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

**EXISTING BRIDGE DECK**

**DECK J OINT**

**V-Groove**

**R E V I S I O N**

**NOTES:**

1. 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.

2. Provide 3/8 Intermediate Open Joints at:
   - (1) Superstructure supports where slab is continuous.
   - (2) - Superstructure supports where slab is continuous.

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

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 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)

SCHEME 3
RAILING END TREATMENT FOR FLARED WING WALLS
**NOTES:**

1. On approach end provide a Roadway Guardrail Transition, Index 538-002 (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, 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.

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 grading as required. Exposed existing reinforcing steel not encased in new concrete shall be trimmed off 1" below existing concrete and ground over.

**TYPICAL TREATMENT OF RAILING ALONG BRIDGE**

1. On approach end provide a Roadway Guardrail Transition, Index 538-002 (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, 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.

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 grading as required. Exposed existing reinforcing steel not encased in new concrete shall be trimmed off 1" below existing concrete and ground over.

**CROSS REFERENCE:**

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

**TYPICAL SECTION THRU RAILING ON BRIDGE DECK**

Varies (3" max. and Preferred, 1" Min. constant for full length of Retrofit)

**TYPICAL SECTION THRU EXISTING APPROACH SLAB AND END BENT Wing WALL**

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

**PARTIAL ELEVATION OF INSIDE FACE OF RAILING**

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

1'-0"

Transition Block

(See Note 1)

3'-0" Transition Bars 5S (Typ.)

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

Railing End Transition (See Note 2)

3'-0" Transition

Bars 6D @ 1'-3" Spacing Max. (Back Face only)

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 NOTES:

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

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

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

SCHEME 2 NOTES:

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

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

SCHEME 3
RAILING END TREATMENT FOR FLARED CURBS

SCHEME 4
RAILING END TREATMENT FOR FLARED CURBS

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 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 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.

LAST REVISION 11/01/16
DESCRIPTION: REVISED
FY 2020-21
STANDARD PLANS
TRAFFIC RAILING - (VERTICAL FACE RETROFIT) WIDE CURB
INDEX
SHEET
521-482 3 of 4
Partial Plan of Railing

Partial Elevation of Inside Face of Railing

Scheme 5

Railing End Treatment for Parallel Curb

Scheme 5 Notes:

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

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

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

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

5. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb 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.

Organic Felt bond breaker along joint
**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 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'-0" 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 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.

**PARTIAL PLAN OF RAILING**

- **Existing Bridge Deck**
- **Bars 6D spacing at Railing Joints (Typ. on bridge except as noted for skewed deck joints)**
- **E Superstructure Supports**
- **1'-0" V-Groove in both faces and top of Traffic Railing**
- **1/2 V-Groove Spacing = 30'-0" (Max.)**
- **2 equal sp. @ 11'/2" Max.**
- **2 equal sp. @ 3'-0" Max.**
- **Deck Joint**

**PARTIAL ELEVATION OF INSIDE FACE OF RAILING**

- **Expansion Dowel Assemblies and Bars 4C not shown for clarity**

**TYPICAL SECTION THRU RAILING ON BRIDGE DECK**

- **Existing Curb & Wing Wall**
- **Roadway Guardrail Transition (See Note 1)**
- **Asphalt Overlay when present (Varies)**
- **Final Riding Surface**
- **Limiting Station of Traffic Railing**
- **Bars 5S (Typ.) Dowel Bars 6D (Typ.)**
- **2" Cover (Typ.)**
- **Embedment - 1'-0" preferred with 2" edge distance, 6" Min. if edge distance is less than 2"**

**CROSS REFERENCE:**
For General Notes, Estimated Quantities, Dowel Details, Expansion Dowel Detail, Reinforcing Steel Notes & Bending Diagram see Index 521-480.

**TYPICAL SECTION THRU RAILING ON WING WALL**

- **Asphalt Overlay when present**
- **Existing Approach Slab**
- **Existing Curb & Wing Wall**
- **Roadway Guardrail Transition**
- **Asphalt Overlay when present (Varies)**
- **Final Riding Surface**
- **Limiting Station of Traffic Railing**
- **Bars 5S (Typ.) Dowel Bars 6D (Field cut as required to maintain clearance)**
- **2" Cover (Typ.)**
- **Embedment - 1'-0" preferred with 2" edge distance, 6" Min. if edge distance is less than 2"**

**REET RAILING - (VERTICAL FACE RETROFIT) INTERMEDIATE CURB**

**INDEX**

**521-483**
Dowel Bars 4L (10" Embedment) (See Note 2)

Existing End Bent Wing Wall

Existing Approach Slab

Match Existing Curb Height

Transition Block (See Note 1)

Final Riding Surface

Existing Curb

Asphalt Overlay when present (Varies)

Limiting Station of Transition (2'-6" Min.)

Transition Block (See Note 1)

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

Existing Approach Slab

Dowel Bars 6D @ 1'-3" Spacing Max. (Front and Back row of bars only)

Breaker on top of existing curb (shown hatched)

Bars 4C (Typ.)

Dowel Bar (Typ.)

Expansion Dowel Sleeve Assembly

Dowel Bars 6D @ 1'-3" Spacing Max. (Middle row of bars only)

Transition Block (See Note 2)

Varies (Match Length of Existing End Bent Wing Wall)

Transition Block (See Note 2)

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

SCHEME 1 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
3. If a Special Steel Guardrail Post is required for attachment to the top of a sloping Wing Wall, saw cut and remove a wedge shaped portion of the sloping Wing Wall as required to provide a level surface for post installation.

SCHEME 2 NOTES:
1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing.
2. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend beyond end of existing End Bent Wing Wall, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.
3. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
SCHEME 3 NOTE:
1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1.

PARTIAL PLAN OF RAILING

SCHEME 3
RAILING END TREATMENT FOR
FLARED WING WALLS
CROSS REFERENCES:
For General Notes, Dowel Details, Expansion Dowel Details, Reinforcing Steel Notes and Reinforcing Steel Bending Diagram see Index 521-480.

**SCHEMATIC PLAN VIEW - NEAR LANE APPROACH**

- End of bridge end bent wing (flared wing shown, parallel wing similar) or other Hazard that requires shielding
- Lateral Hazard or Top of Non-Traversable slope
- Clear Zone Limits or Horizontal Clearance Limit
- Departure Line
- Back of Curb
- Toe of Curb

**Tapered End Transition *

X (Length of Advancement, Ft.)

Beginning of Length of Need and Offset Control Point

**SCHEMATIC PLAN VIEW - OPPOSING LANE APPROACH**

- Opposing Traffic Lane Line
- Point of Departure

**CROSS REFERENCES:**
For General Notes, Dowel Details, Expansion Dowel Details, Reinforcing Steel Notes and Reinforcing Steel Bending Diagram see Index 521-480.
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.

NOTE: Quantities are based on a 9" curb, no curb cross slope.

SECTION C-C
(GUARDRAIL END TRANSITION)

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

SECTION B-B
TAPERED END TRANSITION
(Bars 5S not shown for clarity)

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.
PARTIAL PLAN

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.
FRONT FACE OF BACKWALL, BEGIN OR END BRIDGE & MATCH LINE (SEE INDEX 521-481, SHEET 2)

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.

2. 1'-0" Min. Embed.

3. Expansion Dowel Sleeve Assembly 1'-3" Max. Spacing

4. Asphalt Overlay when present (Varies)

5. Top of Curb

6. Existing Curb

7. Front Face of Backwall, Begin or End Bridge & Match Line (See Index 521-481, Sheet 2)

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

SCHEME 2 ~ MODIFICATION FOR INDEX 521-481 - SCHEME 2
RAILING END TREATMENT FOR PARALLEL WING WALLS WITH NARROW CURBS

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.

2. 1'-0" Min. Embed.

3. Expansion Dowel Sleeve Assembly 1'-3" Max. Spacing

4. Asphalt Overlay when present (Varies)

5. Top of Curb

6. Existing Curb

7. Front Face of Backwall, Begin or End Bridge & Match Line (See Index 521-481, Sheet 2)

PARTIAL PLAN

SECTION F-F

SECTION THRU EXISTING CURB AND APPROACH SLAB TO BE REMOVED
(_FREE STANDING CURB SIMILAR)
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 5F @ 8" spacing Max. (Typ.) Clip bars as reqd. to maintain Cover

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

Bars 5S

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

Bars 5F @ 8"

Bars 5G (Typ.)

Bars 5S

Bars 5E

Bars 6D

Expansion Dowel Sleeve Assembly

Organic Felt bond breaker along end bent wing wall only

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

Existing Flared Wing Post to be removed to top of curb

Bars 4C (Typ.)

Bars 5S

Edge of Existing Approach Slab

(Existing Flared Wing Post to be removed to top of curb)

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

** 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.

ORGANIC FELT BOND BREAKER (SHEET 6)

Organic Felt bond breaker along joint

Organic Felt bond breaker along end bent wing wall only

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

SCHEME 3 - MODIFICATION FOR INDEX 521-481 SCHEME 3
RAILING END TREATMENT FOR FLARED WING WALLS WITH NARROW CURBS

PARTIAL PLAN OF RAILING

Front Face of Backwall, Begin or End Bridge & Match Line (See Index 521-481, Sheet 3)

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

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

SCHEME 3 - MODIFICATION FOR INDEX 521-481 SCHEME 3
RAILING END TREATMENT FOR FLARED WING WALLS WITH NARROW CURBS

Front Face of Backwall, Begin or End Bridge & Match Line (See Index 521-481, Sheet 3)
Existing End Bent Wing Wall

Bars 4G (Typ.)

Expansion Dowel Sleeve Assembly

Front Face of Backwall, Begin or End Bridge & Match Line (See Index 521-482, Sheet 2)

**PARTIAL PLAN OF RAILING**

 Bars 5E @ 8" spacing Max. (Typ.) tied to Bars 5F

Curb & portion of Approach Slab should be removed

Edge of Existing Approach Slab (Location Varies)

**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

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)

---

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

3" (Min.)

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

3" Cover (Typ. ends)

**Existing Approach Slab Transition**

**Partial Plan of Railing**

**Partial Elevation of Inside Face of Railing**

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

**Scheme 7 - Modification for Index 521-483 Scheme 3**

Railing End Treatment for Parallel Curbs and Flared Wing Walls with Intermediate Curbs

CROSS REFERENCES:
For Section A-A see Sheet 4.
For Section D-D see Sheet 5.
For Section H-H see Sheet 9.
For Expansion Dowel Assemblies and placement of Dowel Bars 6D Details see Index 521-480.
### 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)

**Notes:**
1. Work this with Indexes 521-512 through 521-515.
2. Construct Traffic Railings/Noise Wall and joints plumb, not perpendicular to the roadway surface.
3. Concrete:
   - Class II for slightly aggressive environments.
   - Class IV for moderately or extremely aggressive environments.
4. Provide 1/2" open joints every 30 to 90 feet. Align open joints with construction joints in the Junction Slab or footing.
5. Install Barrier Delineators 2'-4" above the riding surface in accordance with Specification Section 705. Match the Delineator color (White or Yellow) to the near edgeline.
6. Slip forming of the traffic railing portion is permitted.

**CROSS REFERENCE:**
- For Detail "B" and V-Groove Lettering Detail see Sheet 4.
- For Section A-A see Sheet 3.
- For Section C-C and Detail "A" see Sheet 5.

**NAME, DATE AND BRIDGE NUMBER:**
- For Railing/Noise Wall on bridges, place the name as shown in the General Notes in the Structures Plans and Bridge Number on the Traffic Railing so as to be seen on the driver’s right side when approaching the bridge. Place the Date on the driver’s left side when approaching the bridge. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and figures 3" in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by 1/2" V-Grooves. V-Grooves shall be formed by preformed letters and figures.
4" (Space may be increased to 6" to lap Bars 5R on opposite side of remaining Bars 5V, as required)

Bars 5S1

Bars 5S2

Bars 5V

Bars 5S1 & 5S2

Bars 5V & 6" Spacing (Typ.)

ELEVATION OF RAILING/NOISE WALL REINFORCING STEEL
(INTERMEDIATE OPEN JOINT SHOWN, DECK JOINT SIMILAR)
(Bars 5S1 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 5S1 in Railing not shown for clarity)

NOTES:
* Field Cut Bars 5R & 5S1 to maintain clearance.
** Terminate ⅜" V-groove at construction joint & cast top of railing with End Taper.
*** Bar spacing shown for Bars 5V 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 S51 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)
**Paint Recessed Surfaces Black**

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.

**Estimates of Traffic Railing/Noise Wall Quantities**

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<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Railing)</td>
<td>CY/LF</td>
<td>0.107</td>
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<tr>
<td>Concrete (Noise Wall)</td>
<td>CY/LF</td>
<td>0.136</td>
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<tr>
<td>Reinforcing Steel (Typical)</td>
<td>LB/LF</td>
<td>69.98</td>
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**Additional Rein., @ Open Joint**

Pre-cured Silicone Sealant (4" wide) is shown.

**Section Thru Recessed 'V' Groove To Form Inscribed Letters And Figures**

DETAIL "B" - SECTION AT INTERMEDIATE OPEN JOINT

---

**Bill Of Reinforcing Steel**

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<thead>
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<th>LENGTH</th>
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<tr>
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<td>5</td>
<td>5'-2&quot;</td>
</tr>
<tr>
<td>R2</td>
<td>5</td>
<td>5'-2½&quot;</td>
</tr>
<tr>
<td>R3</td>
<td>5</td>
<td>4'-10&quot;</td>
</tr>
<tr>
<td>S1</td>
<td>5</td>
<td>As Req.</td>
</tr>
<tr>
<td>S2</td>
<td>5</td>
<td>7'-3&quot;</td>
</tr>
<tr>
<td>V</td>
<td>5</td>
<td>6'-6½&quot;</td>
</tr>
</tbody>
</table>

**Reinforcing Steel Bending Diagrams**

- **Bridge Cross-Slope**: 0% to 2%, 2% to 6%, 6% to 10%
- **Low Gutter**: 5" to 9", 9" to 11", 11" to 13"
- **High Gutter**: 5" to 9", 9" to 11", 11" to 13"

**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.

**Reinforcing Steel Notes:**
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints shall have a 2" minimum cover.
3. Bars 5R shall be one continuous or lap spliced bar. No mechanical couplers are permitted.
4. Bars 5S1 may be continuous or spliced at the construction joints. Lap splices for Bars 5R2 and 5S1 shall be a minimum of 2'-2".
5. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of deformed wire meeting the requirements of Specification Section 931.

**Cross Reference:**
For locations of Detail "B", see Sheet 1.
**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 SR with Bars 5V as shown. Clearance of Bars SR & 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 Railings is used beyond the End Taper. See the Plan Sheets.

4. Field cut Bars SR2 to maintain cover. Field cut Bars 5V and lap as necessary to maintain cover; field cut & bend Bars SR1 front leg (more plumb) to maintain cover and tie to S1 Bars.

---

**PLAN - RAILING END TRANSITION**

(Showing Bars SR and Bars S5I) (Bars 5V & Noise Wall Reinforcement not shown for Clarity)

**PLAN - RAILING END TRANSITION**

(Showing Bars 5V and Bars S5I) (Bars SR not shown for Clarity)
PLAN VIEW

OPTION 2 - TYPICAL SECTION AT LIGHT POLE PEDESTAL
(Approach Slab Similar)

PHASE View

Bridge Deck or Approach Slab (Reinforcing not shown for clarity)

1'0" Conduit

Bars 4F5 (pairs)
Bars 4F5 (pairs)

Bars 4F1 (pairs)

Bars 4F3 (pairs)

Bars 4F4 (pairs)

Bars 4G (Top & 4H2 Bott. of Slab)

Top of Traffic or Pedestrian/Bicycle Railing

Coping

Traffic or Pedestrian/Bicycle Railing or Curb

Construction Joint Permitted

Bars 4H1 & 4G

Bars 4H2 Tie to bottom slab reinforcement

Maintain pedestal depth to edge of Girder Flange

CROSS REFERENCE:
For Detail "A", Anchor Plate Detail and Light Pole Pedestal Notes, see Sheet 4.

NOTE: Anchor Bolt, Nuts, Washers and Anchor Plate are dashed for clarity.

OPTION 2 - ELEVATION VIEW

LIGHT POLE PEDESTAL FOR APPROACH SLAB OR BRIDGE DECK LESS THAN 1'-5" AT COPING OPTION 2

* Slip Forming Method of Construction requires the Engineer's approval within the limits shown.
** For Index 521-820 - Pedestrian/Bicycle Railing and concrete curb, this dimension is 3' max. For raised sidewalks, this dimension is 1'-0" max.
*** Anchor Bolt pattern orientation shall be as shown.
**PLAN**

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

*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 521-427. Deck Joint at Pier or Intermediate Bent similar.**

**SECTION A-A**

(Typical Section Thru Bridge Deck Shown, Section Thru Approach Slab Similar)

Bars P1 shown, Bars P2 similar

**ELEVATION OF INSIDE FACE OF RAILING**

(Reinforcing Steel not shown for clarity)

* 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 521-427. Deck Joint at Pier or Intermediate Bent similar.

**Intermediate Open Joints** shall be provided at locations coinciding with 6" Joints for the Traffic Railing.

---

**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.
ALTAR E DE REINFORCING (WELDED WIRE REINF.) DETAILS

NOTE: Place wire panels to minimize the end overhang. End overhangs greater than 4\(\frac{3}{4}\)" are not permitted.

WELDED WIRE REINFORCEMENT (WWR)

D19.7 (Typ.)

D19.7 (Vertical) (Typ.)

D19.7 (Horizontal) (Typ.)

SPLICE DETAIL
(Between WWR Sections)

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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<tbody>
<tr>
<td>P1</td>
<td>4</td>
<td>5' 6&quot;</td>
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<tr>
<td>P2</td>
<td>4</td>
<td>6' 3&quot;</td>
</tr>
<tr>
<td>S</td>
<td>4</td>
<td>As Req'd</td>
</tr>
</tbody>
</table>

PRE-CURED SILICONE SEALANT (4" wide)

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

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the parapet on a retaining wall shall be the same as detailed above for a 8" deck.
3. All reinforcing steel at the open joints shall have a 2" minimum cover.
4. Bars 4S may be continuous or spliced at the construction joints. Bar splices for Bars 4S shall be a minimum of 1'-8".
5. Bars 4P2 may be used in lieu of Bars 4P1.
6. At the option of the Contractor deformed WWR may be used in lieu of all Bars 4P or 4P2 and 4S.

ESTIMATED CONCRETE PARAPET QUANTITIES

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<tr>
<th>ITEM</th>
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<th>QUANTITY</th>
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<tr>
<td>Concrete</td>
<td>CY/LF</td>
<td>0.056</td>
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<tr>
<td>Reinforcing Steel (P1 &amp; S)</td>
<td>LB/FT</td>
<td>6.35</td>
</tr>
<tr>
<td>Reinforcing Steel (P2 &amp; S)</td>
<td>LB/FT</td>
<td>6.68</td>
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</table>

(The above quantities are based on a deck with a 2% cross slope)
Traffic Railing required
(Type Varies, 3R: Single-Slope shown, see Structures Plans, Superstructure Sheets)

PLAN
(Reinforcing Steel not shown for clarity)

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.

WELDED WIRE REINFORCEMENT (WWR)
(2 Pieces Req'd.)

D9.9 or #4 Bar
(Lap Splice Each Longitudinal Wire)

D9.9 (Horizontal)

D9.9 (Vertical) (Typ.)

BAR 3R
BAR 4S

PRE-CURED SILICONE SEALANT

Textured Surface when shown in the plans.
(Max. ½" amplitude)

REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

MARK | SIZE | LENGTH
--- | --- | ---
R | 3 | 5'-2"
S | 4 | As Req'd

DETAIL "A" - SECTION AT INTERMEDIATE OPEN JOINT

ESTIMATED CONCRETE RAILING QUANTITIES

ITEM | UNIT | QUANTITY
--- | --- | ---
Concrete | CY/LF | 0.079
Reinforcing Steel | LB/LF | 13.12

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

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are cut to cut.
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 ± 1/2”). 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 521-820.

**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

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<th>COMPONENT</th>
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<th>COMPONENT INFORMATION</th>
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<tbody>
<tr>
<td>Posts</td>
<td>F1082</td>
<td>Galvanized Steel Pipe - 3” NPS, Schedule 40 Regular Grade</td>
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<tr>
<td>Chain Link Fabric</td>
<td>A392</td>
<td>Zinc Coated Steel - 9 gage (coated wire diameter), Class 2 Coating</td>
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<tr>
<td>Aluminum Coated Steel</td>
<td>A491</td>
<td>- 9 gage (coated wire diameter)</td>
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<tr>
<td>Polyvinyl Chloride (PVC)</td>
<td>F668</td>
<td>Coated Steel - 9 gage Class 2b</td>
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<tr>
<td>Tie Wires</td>
<td>F626</td>
<td>Zinc Coated Steel Wire - 9 gage</td>
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<td>Brace Bands</td>
<td>F626</td>
<td>12 Gauge (Min. thickness) x 3⁄16” (Min. width) Steel Bands</td>
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<tr>
<td>Tension Bars</td>
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<td>9⁄16” (Min. thickness) x 3⁄16” (Min. width) x 5-10” (Min. height) Steel Bars</td>
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<tr>
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<td>14 Gauge (Min. thickness) x 3⁄16” (Min. width) Steel Bands</td>
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<td>Miscellaneous Fence</td>
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<td>Components (includes post or loop cages, horizontal and brace rail ends, combination rail ends, boulevard clamps and all other miscellaneous fittings &amp; hardware)</td>
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<td>Horizontal Rails</td>
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<td>Galvanized Steel Pipe - 2½” NPS, Schedule 40 Regular Grade</td>
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<tr>
<td>Expansion Rails</td>
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<td>Galvanized Steel Pipe - 2” NPS, Schedule 40 Regular Grade</td>
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<tr>
<td>Bolts</td>
<td>A307</td>
<td>½” Ø x 4½” Hex Head Bolts for Expansion Rail Connections</td>
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<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Expansion Rail Connections</td>
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<tr>
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<td>A824 &amp; A817</td>
<td>Type II (Zinc Coated Steel Wire) - 7 gage, Class 4 Coating</td>
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<td>Hog Rings</td>
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<td>Zinc Coated Steel Wire - 12 gage</td>
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<td>Galvanized Steel Pipe - 1½&quot; NPS, Schedule 40 Regular Grade</td>
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### TABLE OF POST ATTACHMENT COMPONENTS

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<tr>
<td>Pipe Clamps</td>
<td>A36 or A709 Grade 36</td>
<td>3⁄8” Steel Ø</td>
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<tr>
<td>Base Plates</td>
<td>A36 or A709 Grade 36</td>
<td>3⁄8” Steel Ø</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A36 or A409 Grade 36 or B209 Alloy 6061-T6 or B221 Alloy 6063-T3</td>
<td>Plate thicknesses as required. Holes in shim plates will be 3⁄8” Ø</td>
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<tr>
<td>Spacers</td>
<td>-</td>
<td>Plate thickness varies based on traffic railing type (See Detail &quot;A&quot;)</td>
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<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods - 3⁄8” Ø x 6” (no spacer) or 3⁄8” Ø x (6” + spacer thickness)</td>
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<tr>
<td>C-1-P Anchor Rods</td>
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<td>Hex Head Anchor Rods - 3⁄8” Ø x 6” (no spacer) or 3⁄8” Ø x (6” + spacer thickness)</td>
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<td>Fully threaded Headless Anchor Rods - 3⁄8” Ø x 14½”</td>
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<td>A307</td>
<td>3⁄8” Ø x 4½” Hex Head Bolts for Pipe Clamp Connections to Posts</td>
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<tr>
<td>Nuts</td>
<td>A563</td>
<td>Hex Nuts for Pipe Clamp and Base Plate Connections</td>
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<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Pipe Clamp and Base Plate Connections</td>
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<tr>
<td>Bearing Pads (Plain Neoprene)</td>
<td>-</td>
<td>In accordance with Specification Section 932 for Ancillary Structures</td>
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### 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.
- Adhesive bonding material systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 962. Hot-dip galvanize Fence Framework after fabrication.

COATINGS:
- 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 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 nut. Distort the first thread on the outside of the nut to prevent loosening.
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 ± 1/2") 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.

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.

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.
**Flats Washers for Expansion Rail Connections**

**Hex Nuts for Expansion Rail Connections**

**Miscellaneous Fence Components**

- Tension Bands
- Tension Bars
- Brace Bands
- Tie Wires
- Chain Link Fabric
  - (2" mesh with twisted top and knuckled bottom selvage)

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**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. Distance the first thread on the outside of the nut to prevent loosening.

---

**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 - 3/8'' NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Horizontal Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 3'' NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 2 1/2'' NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307</td>
<td>1/2 Ø x 4 1/4'' 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>Tie Wires</td>
<td>F626</td>
<td>Polyvinyl Chloride (PVC) Coated Steel - 9 gage zinc coated wire, class 2b</td>
</tr>
<tr>
<td>Brace Bands</td>
<td>F626</td>
<td>12 gauge (min. thickness) x 3/16'' (min. width) steel bands (beveled or heavy)</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F626</td>
<td>1/16'' (min. thickness) x 3/16'' (min. width) x variable height steel bars - height = post length along inside post - 1' max</td>
</tr>
<tr>
<td>Tension Bands</td>
<td>F626</td>
<td>14 gauge (min. thickness) x 3/16'' (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 and hardware</td>
</tr>
</tbody>
</table>

*LEGEND: NPS = Nominal Pipe Size*
**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 A205 Grade 36</td>
<td>3/16 Steel 8</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A36 or A709 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 Ø</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods – 3/16 Ø x 14 3/8”</td>
</tr>
<tr>
<td>C-I-P Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Hex Head Anchor Rods – 3/16 Ø x 14 3/8”</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.

**DETAIL "A"**

**BASE PLATE DETAIL**

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

1. A Pull Post Assembly is required at maximum intervals of 500'-0". See Sheet 3.
2. Dimension is measured along Inside Face of Concrete Parapet.
3. Dimension shown is for 36" Single-Slope Traffic Railings as shown in Index 521-427. Adjust as required for other Traffic Railing Barriers and sidewalk widths.
4. For sidewalk clear widths greater than 5'-0", increase the radius and height of the curved portion of the Hoop Post at the rate of 6" for every one foot increase in sidewalk width.

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 521-820.

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, 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 Detail "B" and "E" see Sheet 4.
**DESCRIPTION:**

Ø x 14 SHEET Ø

**Hex Head Bolts for Pipe Clamp**

4 Ø x 14 3:2 8:4 2:8 PM Ø x 4

**COMPONENTS**

- Nuts
- Washers
- Components
- Miscellaneous Fence
- Tension Bands
- Tension Bars
- Expansion Rails
- Chain Link Fabric

**COATINGS:**

- Galvanized Steel - 3" NPS, Schedule 40 Regular Grade
- Aluminum Coated Steel - 9" gage (Min. thickness) x 2" (Min. width) Steel Bands
- Zinc Coated Steel Wire - 12 gage (Min. thickness) x 2" (Min. width) Steel Bands (Beveled or Heavy)
- Zinc Coated Steel Wire - 9 gage
- Aluminum Coated Steel - 9 gage (coated wire diameter)
- Zinc Coated Steel Wire - 12 gage (Min. thickness) x 2" (Min. width) Steel Bands

**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.
- 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.

ADHESIVE-BONDED ANCHORS AND DOWELS:

- Adhesive Bonding Material Systems for Anchors and Dowels will comply with Adhesive Bonding Material Systems for Anchors and Dowels in accordance with Specification Section 932 for Ancillary Structures.

WEAVING:

- 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.

**Standard Plans**

- FY 2020-21
- Bridge Fencing (Enclosed)

**Index**

- 550-012
- 2 of 4
Pipe Clamp Connection (see Detail) (Typ.)

Pipe Clamp

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

Tension Wire

Traffic Railing

VIEW A-A

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

Pipe Clamp Post

Cross Reference:
For location of View A-A and Detail "A" see Sheet 1.

PULL POST ASSEMBLY DETAIL
(Traffic Railing Barrier Shown, Concrete Parapet Similar)

Expansion Joint Opening

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

Bridge Deck

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 exceeds 9" increase the 1'-6" dimension by the difference between the Expansion Joint Opening and 9".
PIPE CLAMP DETAIL

1½" Ø Spacer
(See Note 3)

½ Ø Holes for ½ Ø Anchors
(Typ.)

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

1½" Ø Holes for ½ Ø Anchors
(Typ.)

BASE PLATE DETAIL

½ Ø Base Plate

Concrete Parapet

2 – ½ Ø C-I-P Anchor
Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy
Hex Nuts and Washers

DETAIL "B"

DETAIL "C"

DETAIL "D"

This detail is typically used for the following:

- **POST A DETAIL**
- **POST B DETAIL**
- **POST C DETAIL**

**SIDEWALK CROSS-SLOPE**

<table>
<thead>
<tr>
<th>DIM. H</th>
<th>NOTES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-6&quot;</td>
<td>1. Values shown for Dim. H are for a 5'-0&quot; clear sidewalk width. Adjust as required for clear sidewalk widths greater than 5'-0&quot;.</td>
</tr>
<tr>
<td>5'-3½&quot;</td>
<td>2. For clear sidewalk widths greater than 5'-0&quot; increase radius and height by 6&quot; for every one foot increase in sidewalk width.</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>3. Spacer plate thickness shown is for Single-Slope Traffic Railings. Adjust thickness as required for other Traffic Railings.</td>
</tr>
</tbody>
</table>

**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.
**FENCING NOTES**

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

---

**FENCE INSTALLATION:**
Install posts plumb (within a tolerance of ± 1/4") using 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.

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**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.

---

**ELEVATION OF OUTSIDE FACE OF RAILING**

- Tension Wire
- Hog Rings @ 2'-0" Centers
- Line Post
- Ties @ 2'-0" Centers
- Tension Bar
- Brace Rail
- Chain Link Fabric
- Traffic Railing (Type varies, 36" Single-Slope shown)
- Pipe Clamp Connection (Typ.)
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.