Navigating the Light System Details (Fixed Bridges)

**NAVIGATION LIGHT SYSTEM Schematic**

- **For Single Bridge With Fenders**
- **For Dual Bridges With Fenders**
- **For Single Bridge Without Fenders**
- **For Dual Bridges Without Fenders**

**Legend**
- **LC**: Lighting Contact
- **PC**: Photocell Control
- **Xmer**: Transformer (If Required)
- **RFL**: Red Pier/Fender Light (180° visibility)
- **RCL**: Red Channel Margin Light (180° visibility)
- **GCL**: Green Center Channel Light (360° visibility)
- **CGL**: Clearance Gauge Light
- **CM**: Channel Margin or Pier inner surface whichever defines Channel Edge.

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

**Typical Electrical Schematic Diagram**

**Power Conductors**

<table>
<thead>
<tr>
<th>Distance (feet)</th>
<th>Volts</th>
<th>Conductor</th>
<th>Transformer</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 75</td>
<td>120</td>
<td>#12 AWG</td>
<td>N/A</td>
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<tr>
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<td>120 or 240</td>
<td>#10 AWG</td>
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<tr>
<td>500 - 1000</td>
<td>240</td>
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<td>1000 - 2000</td>
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<td>2000 - 5000</td>
<td>480</td>
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<td>2 KVA</td>
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</tr>
<tr>
<td>Over 10000</td>
<td>480</td>
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<td></td>
</tr>
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</table>

**NOTE**: Size conduit and conductors per NEC requirements. Do not use conduit smaller than Ø 2."
Install Light Fixture so as to ensure visibility from an approaching vessel.

* Supplied by Light Fixture Manufacturer

36° Single-Slope Traffic Railing (shown) other railings or Parapet similar

2" Ø Conduits

Access Fitting 3/4" Ø Min.

Bend if required

Type LB or LR Access Fitting, 3/4" Ø Min., whichever applicable.

* Light Fixture Swivel Box

* Mounting Box

Coping

Back of Traffic Railing or Parapet

Service Chain

Bottom of Bridge Deck

RCL or GCL

EJB

2" Ø Conduits

Bottom of Girder

GCL OR RCL MOUNTING DETAILS (SCHEMATIC)
VIEW A-A

(1) For Navigation Light System notes and legend, see Sheet 1.

(2) See Utility Conduit Detail sheets for Embedded Junction Box (EJB) dimensions & locations.

CROSS REFERENCES:

* Light Fixture

Swivel Box

Mounting Box

Service Chain

RCL or GCL

GCL OR RCL MOUNTING DETAILS (SCHEMATIC)
ELEVATION VIEW

(Traffic Railing (36° Single-Slope) shown, other railings similar)
ELEVATION OF INSIDE FACE OF TRAFFIC RAILING WITH PEDESTRIAN/BICYCLE BULLET RAILING

NOTES:

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

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

CROSS REFERENCES:

Work in conjunction with Index 515-022.

For Traffic Railing Details, Reinforcement and Notes see Index 521-427.
RAILING NOTES:

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

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

3. Materials:
   A. Supply Aluminum materials in accordance with Specification Section 965 and the following:
      Wrought Aluminum Post: ASTM B221, Alloy 6061-T6 or 6351-T5
      Rail End Cap: ASTM B26 sand cast aluminum alloy 356.0-F
      Plate and Bars: ASTM B209 Alloy 6061-T6 or 655-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 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. Splice splices at 40 feet maximum. Splice all rails in a given railing section at about the same center line.
   F. Provide rail expansion assemblies in panels between posts on either side of a bridge expansion joint. Rail expansion assemblies are similar to the rail splice assemblies with increased space at the expansion assembly to allow for movement equal to 1.5 times the bridge joint opening or 1" greater than the expected joint movement.

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

6. Payment: Includes the full cost of installed bullet railing. Cost of the Concrete Parapet or Traffic Railing is separate.
1. Shop Drawings are required.
2. Work this Index with Index 515-052 Bicycle/Pedestrian Railing Details (Steel) and Specification Section 515. Refer to the SPI for Design Criteria and limits of Use.
3. Materials:
   a. Steel: Galvanized after fabrication
   c. Support Bracket (Scheme 3) L-shape and Stiffener Plate: ASTM A36
   d. Bottle-guard (Schemes 1 & 3) L-shape: ASTM A36
   e. Pre-cured Silicone Sealant: Specification Section 932
   f. Bearing Pads: Provide ½" 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 4½" (up to a maximum of 5½"), clear opening between adjacent pickets, or panels at Rail Expansion Joints above Deck Joint 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 ½" Intermediate open joints in curbs coinciding with the ½" joints in the traffic railing.
7. Payment: Support bracket (Scheme 3) is incidental to the cost of railing. Curb concrete and reinforcing steel (Scheme 2) are included in the bridge deck quantities.
### Detail "B" Expansion Joint (Field Splice Similar)

**Round Rails - Top Rail or Handrail**
- *1/2" Ø x 3/4" Pan Head Stainless Steel (Type 316 or 18-8 Alloy)*
- Set Screws along outside face of railing. Set screws must be set flush against the rail surface.
- **Embedded length may be 3" for plug welded connection.**
- **Increase handrail sleeve embedment to 8" for Expansion Joint openings greater than 2".**
- **Expansion joint opening shall match the clear opening in the deck joint but not greater than 3".**

**Square Rails - Intermediate or Bottom Rail**
- Steel Sleeve: 1.50 OD x 0.125 Wall for intermediate and bottom rails

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

**Pre-Cured Silicone Sealant (4" wide)**
- 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.

### Conventional Reinforcing Steel Bending Diagrams

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<td>4</td>
<td>2'-0&quot;</td>
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<tr>
<td>S</td>
<td>4</td>
<td>As Read.</td>
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</table>

**Sleeve Detail**
- Interimmediate or Bottom Rail - Steel Sleeve Detail (Bottom Side Shown)

### Estimated Concrete Curb Quantities (Scheme 2)

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<tr>
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### Scheme 1 - Bottle Guard Detail

**Scheme 2 - Concrete Curb Details**

**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.
V-Groove in both faces & top of Concrete Curb (Equally spaced between open joints)

Intermediate

Concrete
Curb

Post

Post

Plan

(Scheme 2 shown, other Schemes similar, Reinforcing Steel not shown for clarity)

**Deck Joint at Begin Bridge or End Bridge shown; Deck Joint at Pier or Intermediate Pier similar.

Index 515-062 Railing shown, see Contract Plans for actual railing continuation or termination.

NOTES:

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

**ALTERNATE REINFORCING (WWR) DETAILS**

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

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 WWR meeting the requirements of Specifications Section 931 may be used in lieu of all Bars 4P and 4S.

**CURB REINFORCING STEEL NOTES:**

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

**BILL OF REINFORCING STEEL**

**STEEL BENDING DIAGRAMS**

**PRE-CAST CONCRETE CURB QUANTITIES (SCHEME 2)**

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

**CONCRETE QUANTITIES**

- Concrete: 0.0124 cubic feet
- Reinforcing Steel: 4.01 pounds

**SCHEME 1 - BOTTLE GUARD DETAIL**

**SCHEME 2 - CONCRETE CURB DETAILS**

**SCHEME 3 - BOTTLE GUARD DETAIL**
GENERAL NOTES

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

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

Manufacturer's Requirements

Hole Diameter to meet the Manufacturer's Requirements

Dowel Bar 6D

Embden Lengh

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

REVISION LAST OF STANDARD PLANS FY 2020-21 SHEET INDEX

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

VERTICAL FACE RETROFIT RAILING DETAILS - POST & BEAM RAILING WITH NARROW CURB

REV 07/01/13 STANDRAD PLANS INDEX 521-404 3 of 8

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.

BILL OF REINFORCING STEEL

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<td>S</td>
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CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM

ESTIMATED TRAFFIC RAILING QUANTITIES

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**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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**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM**

**BILL OF REINFORCING STEEL**

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<tr>
<td>D</td>
<td>6</td>
<td>3'-4&quot;</td>
<td>7 sp. @ 3' 7&quot;</td>
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<tr>
<td>S</td>
<td>5</td>
<td>AS REQD.</td>
<td>2'-2 1/4&quot;</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.

**PARTIAL ELEVATION OF INSIDE FACE OF RAILING**

**PARTIAL PLAN OF RAILING**
GUARDRAIL TRANSITION DETAILS - SHEET 2 OF 2

PARTIAL PLAN - APPROACH TRANSITION

SCHEME 5

(Partial Plan - Approach Transition)

(Narrow Curb shown; Recessed Curb similar)

PARTIAL ELEVATION - APPROACH TRANSITION

SCHEME 6

(Partial Elevation - Approach Transition)

(Narrow Curb shown; Recessed Curb similar)
**ITEM**  
Concrete Class III (Bridge Deck)  
Reinforcing Steel  

**UNIT**  
CT  
L  

**QUANTITY**  
0.4  
61  

**ESTIMATED QUANTITIES PER TRANSITION BLOCK**

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. 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 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 1'-0" embedment length of Bars 6D. If the curb height or embedment length differs from that shown, increase or decrease quantity by the given per inch increment.)

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

* Place 1" thick polystyrene blockout over limits of bridge deck expansion joint full width to the end of the Traffic Railing to allow for thermal movement. Seal Forms to prevent mortar leakage into the expansion joint.

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

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

BILL OF REINFORCING STEEL

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<tr>
<td>D</td>
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<td>2 &amp; 3</td>
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<tr>
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<td>4'-3&quot;</td>
<td>1 &amp; 3</td>
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<td>2'-5&quot;</td>
<td>1 &amp; 3</td>
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<tr>
<td>G</td>
<td>5</td>
<td>AS REGD.</td>
<td>2, 3 &amp; 4</td>
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REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a retaining wall shall be the same as detailed for a bridge deck.
3. All reinforcing steel in the Vertical Face Retrofit Railing shall have a 2" minimum cover.
4. Bars 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.

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

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

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

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

* 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.

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

REVISED: 07/01/13

10/14/2019 3:27:07 PM

521-405

FY 2020-21
STANDARD PLANS

INDEX

2 of 6
NOTES:

1. On approach end provide a Wayoad 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 and 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 55 and Dowel Bars 60 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 slab by grooving or grinding as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1" below existing concrete and grouted over.

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

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

---

**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 and 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.

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2. Field cut Bars 55 and Dowel Bars 60 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 slab by grooving 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 and 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 55 and Dowel Bars 60 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 slab by grooving 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**

**RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLS**

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

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

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

**SCHEME 2**

**RAILING END TREATMENT FOR PARALLEL CURBS**

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

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

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

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

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

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

SCHEME 4 NOTES:

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

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

3. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or they may be installed in drilled holes in the new section of curb using an Adhesive Bonding Material System with a 1'-0" minimum embedment.
**SCHEME 5 NOTES:**

1. See Roadway Plan for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the 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. 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 4N within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

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

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**PARTIAL ELEVATION OF INSIDE FACE OF RAILING**

(Existing Wing Post, Railing Reinforcing and Expansion Dowel Assemblies not shown for clarity)

**SCHEME 5**

**RAILING END TREATMENT FOR PARALLEL CURBS**

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**TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB**

(SCHEME 4 SHOWN, SCHEME 5 SIMILAR)
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 538-002.

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 \( \frac{1}{2} \) open joints and \( \frac{3}{8} \) V-Groove 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 \( \frac{3}{8} \) V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between \( \frac{1}{2} \) 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.

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 \( \frac{3}{8} \) V-Grooves. V-Grooves shall be formed by preformed letters and figures.

JOINTS: See Plans, Superstructure, Approach Slab and Retaining Walls Sheets for actual dimensions and joint orientation. Provide open Railing Joints at Deck Joint locations matching the dimensions of the Deck Joint. For treatment of Railings on skewed bridges see Index 521-427.

Provide \( \frac{3}{8} \) 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.
SECTION A-A
TYPICAL SECTION THRU TRAFFIC RAILING
SECTION THRU BRIDGE DECK SHOWN

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

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

VIEW B-B
(END VIEW OF TRAFFIC RAILING END TRANSITION)
(Approach Slab shown, Retaining Wall Junction Slab similar)

CROSS REFERENCE:
For location of Section A-A, View B-B and View C-C, see Sheet 1.
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

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Paint Recessed Surfaces Black

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

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. The 4'-6" vertical dimension shown for Bars 5T and 5X is based on a bridge deck with a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and a counter 2% raised sidewalk cross slope. If the raised sidewalk thickness, width or cross slope vary from the above amounts, adjust this dimension accordingly to achieve a 6" minimum embedment into the bridge deck. See Structures Plans, Superstructure and Approach Slab Sheets.
3. The reinforcement for the railing on a retaining wall shall be the same as detailed above with ØA = 90°.
4. All reinforcing steel at the open joints shall have a 2" minimum cover.
5. Bars 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.

REINFORCING STEEL NOTES:

1. All bar dimensions in the bending diagrams are out to out.
2. The 4'-6" vertical dimension shown for Bars 5T and 5X is based on a bridge deck with a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and a counter 2% raised sidewalk cross slope. If the raised sidewalk thickness, width or cross slope vary from the above amounts, adjust this dimension accordingly to achieve a 6" minimum embedment into the bridge deck. See Structures Plans, Superstructure and Approach Slab Sheets.
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REINFORCING STEEL NOTES:

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3. The reinforcement for the railing on a retaining wall shall be the same as detailed above with ØA = 90°.
4. All reinforcing steel at the open joints shall have a 2" minimum cover.
5. Bars SS may be continuous or spliced at the construction joints. Bar splices for Bars SS shall be a minimum of 2'-2".
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REINFORCING STEEL NOTES:

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2. The 4'-6" vertical dimension shown for Bars 5T and 5X is based on a bridge deck with a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and a counter 2% raised sidewalk cross slope. If the raised sidewalk thickness, width or cross slope vary from the above amounts, adjust this dimension accordingly to achieve a 6" minimum embedment into the bridge deck. See Structures Plans, Superstructure and Approach Slab Sheets.
3. The reinforcement for the railing on a retaining wall shall be the same as detailed above with ØA = 90°.
4. All reinforcing steel at the open joints shall have a 2" minimum cover.
5. Bars 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.
V-Grooves: Construct V-Grooves plumb. Space V-Grooves equally between open joints and V-Groove shall apply.

Open Joint (see Notes) for Pre-cured Silicone Sealant

Additional Rail required for Special Height Bicycle Railing

Intermediate Open Joint (see Notes)

Raised Sidewalk

For Detail "A" see Sheet 3.

TRAFFIC RAILING NOTES

RAILINGS ON RETAINING WALLS: If the Traffic Railing is to be provided on a retaining wall, the railing section will be the same as shown on Sheet 2. All other details such as the End Transition, Guardrail Connection, the maximum spacing of the ½ V-Groove in both faces and top of Traffic Railing shall apply.

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

OPEN JOINTS: See Structures Plans, Superstructure, Approach Rail Assembly Details and Notes. For Treatment of Railings on Skewed Bridges see Index 521-427.

Provide ½ Intermediate Open Joints at:
(1) - Superstructure supports where slab is continuous.
(2) - Ends of approach Slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.

CROSS REFERENCE:
For Section A-A and View B-B, see Sheet 2.
For Detail "A" see Sheet 3.
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

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Reinforcing Steel
Concrete
Reinforcing Steel
Paint Recessed Surfaces Black
45°
96°
93°
90°
87°
6% to 10%
5'-10"
3'-8"
11"
11"
11"
11"
11"
7"
5"
9'-0"
2% to 6%
0% to 2%

Pre-cured Silicone Sealant (4" wide)

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.

STIRRUP BAR 5T
STIRRUP BAR 5X

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. The 3'-8" vertical dimensions shown for Bars 5T and 5X 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 5S may be continuous or spliced at the construction joints. Bar splices for Bars 5S shall be a minimum of 2'-2".
6. The reinforcement for the railing on a Retaining Wall shall be the same as detailed with ØA = 90°.

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

ESTIMATED TRAFFIC RAILING QUANTITIES

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(The above quantities are based on a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and counter 2% sidewalk cross slope.)
This railing has been structurally evaluated to be equivalent or greater in strength to other single-slope railings which have been crash tested to MASH TL-4 criteria.

CONCRETE AND REINFORCING STEEL: See Structures Plans, General Notes. GUARDRAIL: For Guardrail Connection details see Index 536-002.

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 V-Grooves plumb. Space V-Grooves equally between open joints and/or Deck Joints.


Provide 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".

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 536-002.

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 V-Grooves plumb. Space V-Grooves equally between open joints and/or Deck Joints.


Provide 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".

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 536-002.

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 V-Grooves plumb. Space V-Grooves equally between open joints and/or Deck Joints.


Provide 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".

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 536-002.

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 V-Grooves plumb. Space V-Grooves equally between open joints and/or Deck Joints.


Provide 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.

DETAIL "B"

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) Bridge Deck

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.
ALTERNATE REINFORCING STEEL (WWR) DETAILS

WELDED WIRE REINFORCEMENT NOTES:
1. At the option of the Contractor, deformed Welded Wire Reinforcement (WWR) may be utilized in lieu of all Bars 5R, 5S, and 5W. 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 overlap of longitudinal wires at Railing Ends and Open Joints. Overhangs greater than 6" are not permitted.

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.

WELDED WIRE REINFORCEMENT NOTES:
1. At the option of the Contractor, deformed Welded Wire Reinforcement (WWR) may be utilized in lieu of all Bars 5R, 5S, and 5W. WWR must meet the requirements of Specification Section 931.
2. WWR at Railing End Transition shall be field bent 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 overlap of longitudinal wires at Railing Ends and Open Joints. Overhangs greater than 6" are not permitted.

DETAIL "C" - SECTION AT INTERMEDIATE OPEN JOINT

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints shall have a 2" minimum cover.
3. Bars 5S may be continuous or spliced at the construction joints. Bar splices for Bars 5S shall be a minimum of 2'-2".
4. At the Contractor's option, Bars 5W may be fabricated as a two piece bar with a 1'-2" lap splice of the bottom legs.

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

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SPAN DEPTHS:

- 1'-0" @ 1'-6"
- 1'-0" @ 1'-6"
- 1'-0" @ 1'-6"
- 1'-0" @ 1'-6"

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

CONCRETE AND REINFORCING STEEL: See Structures Plans General Notes.

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

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

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

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

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

NAME, DATE AND BRIDGE NUMBER: The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be placed on the driver's left side when approaching the bridge. The Name shall be as shown in the General Notes in the Structures Plans. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and figures 3" in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by 3/8" 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 Deleinator 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 junctions.
Coping

SECTION A-A
TYPICAL SECTION THRU TRAFFIC RAILING
(Section thru Bridge Deck shown, Section thru Approach Slab and Retaining Walls similar)

* 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)

DETAIL "A"

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.

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

VIEW C-C
HEIGHT TRANSITION

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

DETAIL "B"

INDEX

521-427

FY 2020-21
STANDARD PLANS

TRAFFIC RAILING - (36" SINGLE-SLOPE)

11/01/17

REV 11/01/17

DESCRIPTION:

REV

3:27:37 PM

REVIEW

10/14/2019

45/STANDARD PLANS

INDEX

521-427

2 of 5
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 Joint 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.
**ALTERNATE REINFORCING STEEL (WWR) DETAILS**

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

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**CONSTRUCTION**

**ROADWAY CROSS-SLOPE**

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<td>2% to 6%</td>
<td>87°</td>
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<tr>
<td>6% to 10%</td>
<td>84°</td>
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**Aisle:** 3'-8"  **Typ.**

**SURFACES BLACK**

**ALTERNATE REINFORCING STEEL (WWR) DETAILS**

**WELDED WIRE REINFORCEMENT NOTES:**

1. At the option of the Contractor deformed Welded Wire Reinforcement (WWR) may be utilized in lieu of all Bars 4P, 4S and 4V. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

2. WWR at Railing End Transition shall be field bent inward as required (Piece 2) to maintain cover. The bottom of the vertical wires (D20) in Piece 2 shall be cut a maximum of 4 inches and the gutter side portion bent inward as required to allow placement.

**CONSTRUCTION**

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.

2. The 8光伏垂直 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 923.

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.

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

**ESTIMATED TRAFFIC RAILING QUANTITIES**

**ITEM**

**UNIT**

**QUANTITY**

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(The above quantities are based on a 2% deck cross slope; railing on low side of deck.)

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

**PRE-CURED SILICONE SEALANT (4" wide) -**

**CONSTRUCTION**

**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 923.

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.
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 5 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.

SECTION A-A
36" Single-Slope Shown
Other traffic railings similar

DESCRIPTION:

FY 2020-21
STANDARD PLANS

TRAFFIC RAILING - (36" SINGLE-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-5.

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

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

GUARDRAIL: For guardrail connection details, see Index 536-001.

V-GROOVE: Construct ½" V-Grooves plumb. Space V-Grooves equally between 2½" 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 Railings End Transition as shown in Detail "B". When a concrete traffic railing or barrier is shown on the approaches, provide the Railings Height Transition as shown in Detail "A".

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

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

PLAN
(Reinforcing Steel not shown for clarity)

For Railing End Transition, see View C-C and Detail "A" (Typical when Guardrail Connection required)

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

NAME, DATE, AND BRIDGE NUMBER: The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be placed on the driver's left side when approaching the bridge. The 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.


SPACING ½" - V-Groove (see Notes)

For treatment of Railings on skewed bridges see Index 521-427.

CROSS REFERENCE:
For Section A-A, End View B-B and Detail "A" see Sheet 2.
For Detail "B" see Sheet 3.
For Detail "C" see Sheet 4.

GUARDRAIL: For Guardrail connection details, see Index 536-001.

V-GROOVS: Construct ½" V-Grooves plumb. Space V-Grooves equally between 2½" 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 Railings End Transition as shown in Detail "A". When a concrete traffic railing or barrier is shown on the approaches, provide the Railings Height Transition as shown in Detail "B".

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

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.
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 521-410 as necessary.
5. Field cut 5P Bars as shown to maintain 2" min. (4" max.) cover at top of traffic railing.

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 521-410 as necessary.
5. Field cut 5P Bars as shown to maintain 2" min. (4" max.) cover at top of traffic railing.

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 521-410 as necessary.
5. Field cut 5P Bars as shown to maintain 2" min. (4" max.) cover at top of traffic railing.
The estimated railing quantities are based on a 2% deck cross slope; railing on low side of deck.

**Bill of Reinforcing Steel**

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**Reinforcing Steel Notes:**
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints shall have a 2" minimum cover.
3. Bars S1 may be continuous or spliced at the construction joints. Lap splices for Bars S1 and S2 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.

**Detail "C" - Section at Intermediate Open Joint**

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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Note: The estimated railing quantities are based on a 2% deck cross slope; railing on low side of deck.
This Traffic Railing Retrofit has been structurally evaluated to be equivalent or greater in strength to a design which has been successfully crash tested previously and approved for a NCHRP Report 350 Test Level 4 rating, except for the Tapered End Transition on Index 521-484.

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

REINFORCING STEEL: Reinforcing steel shall be ASTM A615, Grade 60, except Expansion Dowel Bar B which shall be ASTM A36 smooth round bar 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 polyethylene 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 Ƅ” V-Grooves. V-Grooves shall be formed by preformed letters and figures.

ELEVATION MARKERS: Elevation Markers need not be replaced when portions of the existing traffic railing carrying existing 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 416. 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.

Concrete (C/FT): 0.064
Reinforcing Steel (LB/FT): 13.27

**ESTIMATED TRAFFIC RAILING QUANTITIES**

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**PRACTICAL ELEVATION OF RAILING SHOWING FINGER/SLIDING PLATE JOINT - SCHEMES 2 THRU 5**

* Place 1” thick polystyrene blockout over limits of bridge deck expansion joint full width to the end of the Traffic Railing to allow for thermal movement. Seal forms to prevent mortar leakage into the expansion joint.

**LIMITING STATION OF TRANSITION (See Roadway Plans)**

**NAME, DATE AND BRIDGE NUMBER**

**LETTERING DETAIL**

**EQUIPMENT, TOOLS AND MATERIALS**

**PARTIAL ELEVATION OF RAILING SHOWING FINGER/SLIDING PLATE JOINT AT BEGIN OR END BRIDGE - SCHEME 1**

*Guardrail Transition not shown for clarity.*
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM

BILL OF REINFORCING STEEL

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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.

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM

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

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

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

INDEX 521-480

FY 2020-21
STANDARD PLANS

MARK DRAWN
01/01/16

DESCRIPTION:

LAST REVISION
01/01/16

<table>
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<th>SHEET</th>
</tr>
</thead>
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<td>2 of 2</td>
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Dowel Installation Notes:
1. Shift dowel holes to clear if the existing reinforcement is encountered.
2. See Index 521-482 thru 521-484 for required embedment length of Bars 6D, 4L or 4N.
**Traffic Railing - (Vertical Face Retrofit) Narrow Curb**

### 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 treatments. 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, use 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 at trailing end see Roadway Plans. For 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 ground over.

---

**TYPICAL TREATMENT OF RAILING ALONG BRIDGE**

- **Partial Plan of Railing**
- **Partial Elevation of Inside Face of Railing**
- **Typical Section Thru Existing Traffic Railing Showing Limits of Removal (Bridge Deck Shown, Wing Wall Similar)**
- **Section A-A**

---

**Cross Reference:**
For General Notes, Estimated Quantities, Dowel Notes & Bending Diagrams see Index 521-480.
SCHEME 1 NOTES:

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

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

SCHEME 2 NOTES:

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is 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.
**TYPICAL TREATMENT OF RAILING ALONG BRIDGE**

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, 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 3'-0" minimum dimension shall apply to both the front and back face of the railing. For treatment of railing end see Roadway Plans. If vertical face retrofit extends beyond bridge and approach slab ends, see Index 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.

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

**NOTES:**

- Non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment at skewed deck joints see Skew Detail, Index 527-480. Provide open Railing Joints at Deck Expansion Joint locations matching the dimension of the Deck Joint.

- Provide 3'-0" Intermediate Open Joints at:
  - (1) - Superstructure supports where slab is continuous.
  - (2) - Railing Joints (Typ.)
  - (3) - Roadway Guardrail Transition (See Note 1)

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

---

**TYPICAL SECTION THRU EXISTING APPROACH SLAB AND END BENT WING WALL SHOWING LIMITS OF REMOVAL**

**SECTION A-A**

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

**SECTION B-B**

- Varies (3' max. and Preferred, 1' Min. constant for full length of Retrofit)
SCHEME 1
RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLS

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

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

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

SCHEME 2
RAILING END TREATMENT FOR PARALLEL CURBS

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the 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.
PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

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 Three-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 Three-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 5
RAILING END TREATMENT FOR PARALLEL CURBS

PARTIAL PLAN OF RAILING

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

*** CURB HEIGHTS VARY FROM 5" MIN. TO 10" MAX. MATCH HEIGHT AND SHAPE OF EXISTING CURB ON BRIDGE.

SCHEME 5 NOTES:
1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1.
2. Dowel Bars 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 6D within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
5. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or they may be installed in drilled holes in the new section of curb using an Adhesive Bonding Material System with a 1'-0" minimum embedment.
**TYPICAL TREATMENT OF RAILING ALONG BRIDGE**

**NOTES:**

1. On approach end provide a Roadway Guardrail Transition, Index 536-062 (as shown) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is along the Wing Wall, see Schemes 2 or 3, Sheets 2 & 3. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing. For treatment of trailing end see Roadway Plans. If vertical face retrofit extends beyond bridge and approach slab ends, see Index 521-484 for treatment and Details.

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

3. Where existing structure has been removed and not encased in new concrete; match adjoining areas and finish flat by grouting or grinding as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1" below existing concrete and grouted over.

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**TYPICAL SECTION THRU RAILING ON BRIDGE DECK**

- **Existing Bridge Deck**
- **2'-10" Distance**
- **1'-0" Min.**
- **2" Cover**
- **2" Cover**
- **10"**
- **2" Cover**
- **2" Cover**

**TYPICAL SECTION THRU RAILING ON WING WALL**

- **Existing Bridge Deck**
- **2'-10" Distance**
- **1'-0" Min.**
- **2" Cover**
- **2" Cover**
- **10"**
- **2" Cover**
- **2" Cover**

**CROSS REFERENCE:**

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

- **Bars 4C (Typ.)**
- **Bars 5S (Field Bend)**
- **Bars 6D @ 1'-3" Spacing Max. (Middle row of bars only)**
- **Provision bond breaker on top of curb (shown hatched)**

**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**
Opposing Traffic Lane Line
 Toe of Vertical Face Traffic Railing
 Face of Vertical Face Traffic Railing
 Edge of Traffic Lane
 Toe of Curb
 Point of Departure
 Back of Curb
 Begin Vertical Face Traffic Railing Tapered End Transition
 Clear Zone Limits or Horizontal Clearance Limit
 Departure Line
 Tapered End Transition *
 Begin Vertical Face Traffic Railing Tapered End Transition
 Lateral Hazard or Top of Non-Traversable slope
 End of bridge end bent wing (flared wing shown, parallel wing similar) or other Hazard that requires shielding

SCHEMATIC PLAN VIEW - NEAR LANE APPROACH

SCHEMATIC PLAN VIEW - OPPOSING LANE APPROACH

CROSS REFERENCES:
For General Notes, Dowel Details, Expansion Dowel Details, Reinforcing Steel Notes and Reinforcing Steel Bending Diagram see Index 521-480.
CROSS REFERENCES:
For Section A-A, B-B and X-X see Sheet 4.

Details:

- **Bars 5S** (field bend & cut to maintain cover)
- **Bars 5F** (Typ.)
- **Bars 4G** (Typ.)
- **Bars 5E** (Typ.) (Cut to maintain cover in Taper)
- **Bars 5F @ 8" spacing**

**Partial Plan View**

- **20'-0" (Traffic Railing and Curb Transition)**
- **Bars 5S** (Typ.) (Cut to maintain cover in Transition Area)
- **Bars 5G** @ 8" spacing (tied to Bars 4I)
- **Bars 5E @ 8" spacing**

**Partial Elevation View**

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

**Notes:**

- Detail "B" when no approach curb is present
- See Detail "B" when no approach curb is present

**Reinforcement Details:**

- **Bars 5S** (field bend & cut to maintain cover)
- **Bars 5E** (Typ.) (Cut to maintain cover in Transition Area)
- **Bars 5F** (Typ.)

**REV ISIO NDESCRIPTION:**

FY 2020-21
STANDARD PLANS
TRAFFIC RAILING - (VERTICAL FACE RETROFIT)
SPREAD FOOTING APPROACH

**Last Revision:** 07/01/09
**Index:** 521-484
**Sheet:** 2 of 10
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 slabs.
** Curb height of adjacent bridge and approach slabs. Adjust height in Transition area to match adjoining Roadway curb.

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

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

**SECTION C-C**
**GUARDRAIL END TRANSITION**

**SECTION B-B**
**TAPERED END TRANSITION**
(Bars 5S not shown for clarity)
SCHEME 1 – MODIFICATION FOR INDEX 521-481, 521-482 AND 521-483 - SCHEME 1

RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLS WITH NARROW CURBS (SHOWN), WIDE CURBS AND INTERMEDIATE CURBS (SIMILAR)

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

DESCRIPTION:
For FY 2020-21

TRAFFIC RAILING - (VERTICAL FACE RETROFIT)
SPREAD FOOTING APPROACH

INDEX
521-484

SHEET
5 of 10
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.

PARTIAL PLAN

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

SECTION F-F

SECTION THRU EXISTING CURB AND APPROACH SLAB TO BE REMOVED
(Free Standing Curb Similar)
SCHEME 3 - MODIFICATION FOR INDEX 521-481 SCHEME 3
RAILING END TREATMENT FOR FLARED WING WALLS WITH NARROW CURBS

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

PARTIAL PLAN OF RAILING

SECTION G-G

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.

DESCRIPTION:

REVISED
01/01/16
FY 2020-21
STANDARD PLANS

TRAFFIC RAILING - (VERTICAL FACE RETROFIT) SPREAD FOOTING APPROACH

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

PARTIAL PLAN OF RAILING

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

SCHEME 5 ~ MODIFICATION FOR INDEX 521-482 SCHEME 3 AND 4
RAILING END TREATMENT FOR PARALLEL CURBS AND FLARED WING WALLS WITH WIDE CURBS

CROSS REFERENCES:
For Section A-A see Sheet 4.
For Section D-D see Sheet 5.
For Section G-G see Sheet 7.
For Expansion Dowel Assemblies Details see Index 521-480.

TRAFFIC RAILING - (VERTICAL FACE RETROFIT)
SPREAD FOOTING APPROACH

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521-484

SHEET
8 of 10
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)

SECTION H-H

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

CROSS REFERENCES:
For Section A-A see Sheet 4.
For Section D-D see Sheet 5.
For Expansion Dowel Assembly and placement of Dowel Bars 6D Details see Index 521-480.
Note: **Match curb height at adjoining existing end bent wing.

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

Bars 5S @ 8" @ 8" sp.

3" Cover (Typ. ends)

Existing End Bent Wing

Organic Felt bond breaker along joint

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.

Scheme 7 – Modification for Index 521-483 Scheme 3
Railing End Treatment for Parallel Curbs and Flared Wing Walls with Intermediate Curbs

Partial Plan of Railing

Partial Elevation of Inside Face of Railing
(Expansion Dowel Assemblies and Bars 4C not shown for clarity)

Asphalt Overlay when present (Varies)

Existing Curb

Existing Approach Slab

Front Face of Backwall, Begin or End Bridge & Match Line (See Index 521-483, Sheet 3)
PLAN (BRIDGE MOUNTED RAILING/NOISE WALL SHOWN, WALL OR FOOTING MOUNTED RAILING/NOISE WALL SIMILAR) (Reinforcing Steel not shown for clarity)

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 ⅝” V-Grooves. V-Grooves shall be formed by preformed letters and figures.

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 Railing/Noise Wall and joints plumb, not perpendicular to the roadway surface.
3. Concrete:
   A. Class II for slightly aggressive environments.
   B. Class IV for moderately or extremely aggressive environments.
4. Provide ⅝” 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.
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)

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

CROSS REFERENCE:
For locations of Section A-A see Sheet 1.
For location of View B-B, see Sheet 5.
Paint Recessed Surfaces Black

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

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.

DETAIL "B" - SECTION AT INTERMEDIATE OPEN Joint

ESTIMATED TRAFFIC RAILING/NOISE WALL QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Railing)</td>
<td>CY/LF</td>
<td>0.107</td>
</tr>
<tr>
<td>Concrete (Noise Wall)</td>
<td>CY/LF</td>
<td>0.136</td>
</tr>
<tr>
<td>Reinforcing Steel (Typical)</td>
<td>LB/LF</td>
<td>69.96</td>
</tr>
<tr>
<td>Additional Rein. @ Open Joint</td>
<td>LB</td>
<td>226.85</td>
</tr>
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</table>

(The above quantities are based on the bridge mounted typical section, 2% deck cross slope and railing on low side of deck.)

REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
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</thead>
<tbody>
<tr>
<td>R1</td>
<td>5</td>
<td>5'-2&quot;</td>
</tr>
<tr>
<td>R2</td>
<td>5</td>
<td>5'-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>

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

(For locations of Detail "B", see Sheet 1.)

Cross Reference: For additional information on the design standards and specifications, refer to the latest edition of the Standard Plans. The traffic railing/ noise wall design is based on the requirements outlined in the Specifications, which include details on material selection, installation methods, and quality control measures. The design is intended to provide a safe and functional barrier while also enhancing the aesthetic appeal of the bridge structure.

(Handwritten notes: 10/14/2019 3:28:13 PM, REV 521-509 11/01/18 4 of 5)
DETAIL "A" NOTES:
1. Begin placing Railing Bars 5V at the railing end and proceed toward the guardrail (thrie beam) terminal connector to ensure placement of guardrail bolt holes. Pair Bars 5R with Bars 5V as shown. Clearance of Bars 5R & 5V to guardrail bolt holes shall be checked to prevent cutting of bars if holes are to be drilled. Shift bars locally where conflicts occur.
2. For Guardrail connection details see Index 536-001.
3. Omit Railing End Transition if a 36° Single-Slope Traffic Railing is used beyond the End Taper. See the Plan Sheets.
4. Field cut Bars 5R2 to maintain cover. Field cut Bars 5V and lap as necessary to maintain cover; field cut & bend Bars 5R1 front leg (more plumb) to maintain cover and tie to 51 Bars.

PLAN - RAILING END TRANSITION
(Showing Bars 5R, and Bars 5S1) (Bars 5V & Noise Wall Reinforcement not shown for Clarity)

PLAN - RAILING END TRANSITION
(Showing Bars 5V and Bars 5S1) (Bars 5R not shown for Clarity)

SECTION C-C
THRU NOISE WALL END TAPER

CROSS REFERENCE:
For Location of Detail "A" see Sheet 1.
For Location of Section C-C see Sheet 1.
For View B-B see Sheet 3.
OPTION 2 - TYPICAL SECTION AT LIGHT POLE PEDESTAL (Approach Slab Similar)

**PLAN VIEW**

- Bars 4G (Typ.)
- Bars 4F (pairs)
- Bars 4F3 (pairs) (Typ.)
- Bars 4F4 (pairs)
- Bars 4G (Top & Bott. of Slab)
- Bars 4F5 (pairs)
- Bars 4F2 (pairs)
- Bars 4F1 (pairs)
- Anchor Plate (dashed lines)

**ELEVATION VIEW**

- 1'-1½" Ø Conduit
- 2'-6" Ø Conduits
- 1½" Ø Conduit
- Bars 4F5 (pairs)
- Bars 4F2 (pairs)
- Bars 4F1 (pairs)
- Bars 4F (pairs)
- Bars 4F4 (pairs) (Typ.)

**NOTES:**
- Anchor Bolt, Nuts, Washers and Anchor Plate are dashed for clarity.
- For Index 521-820 - Pedestrian/Bicycle Railing and concrete curb, this dimension is 3½". For raised sidewalks, this dimension is 1'-0" Max.
- Anchor Bolt pattern orientation shall be as shown.
- Anchor Bolt Circle 1'-1½" Ø Construction Joint Permitted

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

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

**OPTION 2 - ELEVATION VIEW**

LIGHT POLE PEDESTAL FOR APPROACH SLAB OR BRIDGE DECK LESS THAN 1'-5½" AT COPING OPTION 2
REINFORCING STEEL NOTES:

a. When Pedestal is attached to Pedestrian/Bicycle Railing - Index 521-820 or an 8" wide concrete curb and the Bridge Deck or Approach Slab thickness is less than 1'-15/16", Bars 4F3 shall have leg length and bar lengths shown in parentheses.

b. The number of bars shown in parentheses for Bars 4F4 when Pedestal is attached to Pedestrian/Bicycle Railing - Index 521-820 or an 8" wide concrete curb and the Bridge Deck or Approach Slab thickness is less than 1'-15/16".

c. Lap Splices for Bars 4F1, 4F2 & 4F3 shall be a minimum of 1'-4". Lap Splices for Bars 4F4 & 4F5 shall be a minimum thickness of 1'-8".

d. Bars 4J1 and 4J2 are not required when Pedestal thickness is less than 1'-5/16". Field trim height of bars to maintain cover when Pedestal is attached to Pedestrian/Bicycle Railing - Index 521-820 with Bridge Deck or Approach Slab thickness is less than 1'-15/16".

e. All bar dimensions in the bending diagrams are out to out.

LIGHT POLE PEDESTAL NOTES

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

2. Light Pole Pedestal may be used with the following:
   - Index 521-428 - Traffic Railing (32" Vertical Shape),
   - Index 521-423 - Traffic Railing (36" Single-Slope),
   - Index 521-820 - Pedestrian/Bicycle Railing

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

4. ANCHOR BOLTS:
   - Anchor Bolt design is based on the standard Roadway Aluminum Light Pole configurations shown on Index 715-002.
   - Anchor Bolt Diameter: See Table 1
   - Anchor Bolts: ASTM F1554 Grade 55
   - Nuts: ASTM A563 Grade A, Heavy-Hex
   - Washers: ASTM F436 Type 1
   - Coating: Galvanize all Nuts, Bolts Washers, in accordance with ASTM F2329
   - Galvanize plates in accordance with ASTM A123
   - Anchor Bolt design is based on the standard Roadway Aluminum Light Pole configurations shown on Index 715-002.

5. Install Anchor Bolts plumb.

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

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

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

<table>
<thead>
<tr>
<th>BOLT SPEED</th>
<th>LENGTH (IN.)</th>
<th>DESIGN MOUNTING HEIGHT (IN.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 ≤ 15</td>
<td>15 ± 5</td>
<td>75 75 75 75 75 75 75 75</td>
</tr>
<tr>
<td>140 ≤ 15</td>
<td>15 ± 5</td>
<td>75 75 75 75 75 75 75 75</td>
</tr>
<tr>
<td>160 ≤ 15</td>
<td>15 ± 5</td>
<td>75 75 75 75 75 75 75 75</td>
</tr>
<tr>
<td>180 ≤ 15</td>
<td>15 ± 5</td>
<td>75 75 75 75 75 75 75 75</td>
</tr>
</tbody>
</table>

* Above natural ground or NMR
** Use 12" Diameter Anchor Bolt for Bridge Deck height greater than shown, in Table 1, up to 75".
PLAN
(Rails, Posts & Reinforcing Steel not shown for clarity)

A
A
A
A

Section A-A
(Typical Section Thru Bridge Deck Shown, Section Thru Approach Slab Similar)
Bars P1 shown, Bars P2 similar

Approach Slab
Inside Face of Concrete Parapet

Front Face of Backwall &
Begin or End Bridge

Approach Slab

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.

** 6" 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.
**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**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<tr>
<td>Concrete</td>
<td>CY/FT</td>
<td>0.056</td>
</tr>
<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>
</tr>
</tbody>
</table>

(The above quantities are based on a deck with a 2% cross slope)
PLAN
(Reinforcing Steel not shown for clarity)

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

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

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

INTERMEDIATE JOINT SEAL NOTES:
1. At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Specification Section 932.
2. Apply sealant prior to any Class 5 Finish Coating and remove all curing compound and loose material from the surface prior to application of bonding agent.
3. The cost of the Pre-cured Silicone Sealant shall be included in the Contract Unit Price for the Railing.

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

** See Structures Plans, Superstructure Sheets for actual dimensions and joint orientation. Open Railing 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 Begin Bridge or End Bridge shown. Deck Joint at Pier or Intermediate Bent similar.

** See Structures Plans, Superstructure Sheets for actual dimensions and joint orientation. Open Railing 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 Begin Bridge or End Bridge shown. Deck Joint at Pier or Intermediate Bent similar.

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

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

DETAIL "A" - SECTION AT INTERMEDIATE OPEN JOINT

ESTIMATED CONCRETE RAILING QUANTITIES

ITEM

| Concrete CY/LF | 0.079 |
| Reinforcing Steel LB/LF | 13.12 |

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

FENCE INSTALLATION:
Install posts plumb (within a tolerance of ± 1/16”). Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.

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

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

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

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

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

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
<th>ASTM DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>F1083 Galvanized Steel Pipe - 3½ NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Chain Link Fabric</td>
<td>A902 Zinc Coated Steel - 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td></td>
<td>A491 Aluminum Coated Steel - 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F626 Zinc Coated Steel Wire - 9 gage</td>
</tr>
<tr>
<td>Brace Bands</td>
<td>F626 12 Gauge (Min. thickness) x ½ (Min. width) Steel Bands (Bleveled or Heavy)</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F626 ½ (Min. thickness) x ½ (Min. width) x 5'-10&quot; (Min. height) Steel Bars</td>
</tr>
<tr>
<td>Tension Bands</td>
<td>F626 14 Gauge (Min. thickness) x ½ (Min. width) Steel Bands</td>
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<tr>
<td>Miscellaneous Fence</td>
<td>F626 Zinc Coated Steel - (includes post or loop caps, horizontal and brace rail ends, combination rail ends, boulevard clamps and all other miscellaneous fittings &amp; hardware)</td>
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<tr>
<td>Horizontal Rails</td>
<td>F1083 Galvanized Steel Pipe - 2½ NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>F1083 Galvanized Steel Pipe - 2&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307 ½ Ø x 4½&quot; Hex Head Bolts for Expansion Rail Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436 Flat Washers for Expansion Rail Connections</td>
</tr>
<tr>
<td>Tension Wire</td>
<td>A824, A817 Type II (Zinc Coated Steel Wire) - 7 gage, Class 4 Coating</td>
</tr>
<tr>
<td>Hog Rings</td>
<td>F626 Zinc Coated Steel Wire - 12 gage</td>
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<tr>
<td>Brace Rails</td>
<td>F1083 Galvanized Steel Pipe - 1½ NPS, Schedule 40 Regular Grade</td>
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TABLE OF POST ATTACHMENT COMPONENTS

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<th>COMPONENT INFORMATION</th>
<th>ASTM DESIGNATION</th>
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</thead>
<tbody>
<tr>
<td>Pipe Clamps</td>
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<tr>
<td>Base Plates</td>
<td>A36 or A709 Grade 36</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A36 or A709 Grade 36</td>
</tr>
<tr>
<td>Spacers</td>
<td>-</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
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<tr>
<td>Bolts</td>
<td>A307 ½ Ø x 4½&quot; Hex Head Bolts for Pipe Clamp Connections to Posts</td>
</tr>
<tr>
<td>Washers</td>
<td>A563 Hex Nuts for Pipe Clamp and Base Plate Connections</td>
</tr>
<tr>
<td>Bearing Pads</td>
<td>- Flat Washers for Pipe Clamp and Base Plate Connections</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) AWS A5.1 (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.
Pull Post Assembly (required at maximum intervals of 500'-0")

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

Bridge Deck (shown) or Raised Sidewalk

Pipe Clamp Connection Detail
(Connection without spacer shown, Connection with spacer similar)

Pipe Clamp Detail

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

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

Pipe Clamp Connection Detail (Connection without spacer shown, Connection with spacer similar)
Bulge Chain Link Fabric to allow for joint movement

Expansion Rails

Pull Post Assembly (required at maximum intervals of 500'-0")

Tension Bar (one each side of pull post) (Typ.)

Horizontal Rail

Pull Post

Line Post

Post Cap (shown) or Loop Cap (Typ.)

Ties @ 2'-0" Centers

Chain Link Fabric

Expansion Joint Opening

Bridge Chain Link Fabric to allow for joint movement

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

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

**Washers**
**Nuts**
**Bolts**
**Expansion Rails**
**Horizontal Rails**
**Posts**

**LEGEND: NPS = Nominal Pipe Size**

**EXPANSION RAIL DETAIL**
**EXPANSION ASSEMBLY DETAIL**

**COMPONENT INFORMATION**

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>F1083 Galvanized Steel Pipe - 3½&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Horizontal Rails</td>
<td>F1083 Galvanized Steel Pipe - 3&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>F1083 Galvanized Steel Pipe - 2½&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307 5/8&quot; x 4½&quot; Hex Head Bolts for Expansion Rail Connections</td>
</tr>
<tr>
<td>Nuts</td>
<td>A563 Hex Nuts for Expansion Rail Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436 Flat Washers for Expansion Rail Connections</td>
</tr>
<tr>
<td>Chain Link Fabric</td>
<td>A392 Zinc Coated Steel - 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td></td>
<td>A491 Aluminum Coated Steel - 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F626 Zinc Coated Steel Wire - 9 gage</td>
</tr>
<tr>
<td>Brace Bands</td>
<td>F626 12 Gage (Min. thickness) x 3/8&quot; (Min. width) Steel Bands (Beveled or Heavy)</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F626 5/16&quot; (Min. thickness) x 3/8&quot; (Min. width) x Variable Height Steel Bars - Height = Post Length inside Post - 2&quot; Max</td>
</tr>
<tr>
<td>Tension Bands</td>
<td>F626 14 Gage (Min. thickness) x 5/8&quot; (width) Steel Bands</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F626 Zinc Coated Steel - Includes post or loop caps, horizontal and brace rail ends, combination rail ends, boulevard clamps and other miscellaneous fittings and hardware</td>
</tr>
</tbody>
</table>

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

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**PULL POST ASSEMBLY DETAIL**

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

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**TABLE OF CHAIN LINK FENCE COMPONENTS**

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**REVISED**

**DESCRIPTION:**

**REVISION**

**INDEX**

**FY 2020-21 STANDARD PLANS**

**BRIDGE FENCING (CURVED TOP)**

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**LAST REVISION**

**SHEET**
**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 A709 Grade 36</td>
<td>3/8&quot; Steel Ø</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A36 or A709 Grade 36 or B220 Alloy 6061-T6 or B2221 Alloy 6063-T5</td>
<td>Plate thicknesses as required, Holes in shim plates will be 3/8&quot; Ø</td>
</tr>
</tbody>
</table>
| Adhesive Anchor Rods  | F1554 Grade 36   | Fully threaded Headless Anchor Rods – 3/8" Ø x 14½"
| C-I-P Anchor Rods     | F1554 Grade 36   | Hex Head Anchor Rods – 3/8" Ø x 14½"
| Nuts                  | A563             | Hex Nuts for Base Plate Connections       |
| Washers               | F436             | Flat Washers for Base Plate Connections    |
| Bearing Pads (Plain)  | -                | In accordance with Specification Section 932 for ancillary structures |

**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**

**FENCE INSTALLATION:**
Install posts plumb (within a tolerance of ± 1/2") and 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.

**ELEVATION AT INSIDE FACE OF CONCRETE PARAPET**

**NOTES:**
1. A Pull Post Assembly is required at maximum intervals of 500'-0". See Sheet 3.
2. Dimensions are 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.
Adhesive Anchor Rods

"Hex Head Bolts for Pipe Clamp

Ø Steel ℅ Ø x 14

SHEET

10/14/2019

COMPONENT INFORMATION

COMPONENT

ASTM DESIGNATION

Posts

F1083

Galvanized Steel Pipe - 3" NPS, Schedule 40 Regular Grade

Horizontal Rails and Internal Sleeves

F1083

Galvanized Steel Pipe - 2½" NPS, Schedule 40 Regular Grade

Expansion Rails

F1083

Galvanized Steel Pipe - 2" NPS, Schedule 40 Regular Grade

Chain Link Fabric

(2" mesh with knuckled bottom selvages)

A392

Zinc Coated Steel - 9 gage (coated wire diameter), Class 2 Coating

A491

Aluminum Coated Steel - 9 gage (coated wire diameter)

F668

Polyvinyl Chloride (PVC) Coated Steel - 9 gage Class 2b Zinc Coated Wire

Tension Wire

A824 & A817

Type II (Zinc Coated Steel Wire) - 7 gage, Class 4 Coating

Type I (Aluminum Coated Steel Wire) - 7 gage

Tie Wires

F626

Zinc Coated Steel Wire - 9 gage

Hex Nuts for Internal Sleeve and Expansion Rail connections

" Hex Head Bolts for Internal Sleeve connections

" Hex Head Bolts for Expansion Rail connections

Galvanized Steel Pipe - 2" NPS, Schedule 40 Regular Grade

Galvanized Steel Pipe - 3" NPS, Schedule 40 Regular Grade

Pipe Clamps

A36 or A209 Grade 36

Base Plates

A36 or A209 Grade 36

Shim Plates

A36 or A209 Grade 36 or B209 Alloy 6061-T6 or B221 Alloy 6063-T6

Spacers

- Plate thickness varies based on Traffic Railing type (See Detail "F")

Adhesive Anchor Rods

F1554 Grade 36

Fully threaded Headless Anchor Rods - \( \frac{5}{8} \) Ø x 6" (no spacer) or \( \frac{5}{8} \) Ø x (6" + spacer thickness)

C-1-P Anchor Rods

F1554 Grade 36

Hex Head Anchor Rods - \( \frac{5}{8} \) Ø x 6" (no spacer) or \( \frac{5}{8} \) Ø x (6" + spacer thickness)

Adhesive Anchor Rods

F1554 Grade 36

Fully threaded Headless Anchor Rods - \( \frac{5}{8} \) Ø x 14½"

Bolts

A307

\( \frac{5}{8} \) Ø x 6½" Hex Head Bolts for Pipe Clamp Connections to Posts

Nuts

A563

Hex Nuts for Pipe Clamp and Base Plate Connections

Washers

F436

Flat Washers for Pipe Clamp and Base Plate Connections

Bearing Pads (Plain)

- In accordance with Specification Section 932 for Ancillary Structures

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.

CONNECTING UNITS:

- Galvanize Fence Framework after fabrication.

ADHESIVE-BONDED ANCHORS AND DOWELS:

Adhesive Bonding Material Systems for Anchors and Dowels will comply with Adhesive-Bonded Anchor Rods Section 937 and be installed in accordance with Specification Section 962. Hot-dip galvanize Fence Framework after fabrication.

COATINGS:


ANCHOR RODS, NUTS AND WASHERS:

1. Expansion Rails are required at expansion joint locations where the total movement exceeds 1' (See Note 2). Install expansion rails midway between the fence posts spanning the expansion joint.

2. An Expansion Assembly is required where the total joint movement exceeds 6'. Expansion Assembly includes Expansion Rails and two pull posts (See Sheet 3). 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'.

3. Install nut for the expansion rail finger-tight. The nut will fully engage bolts with a minimum of one bolt thread extending beyond the nuts. Distort the first thread on the outside of the nut to prevent loosening.
Pipe Clamp Connection

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

Bridge Deck

Traffic Railing

Pipe Clamp Connection Detail

(Traffic Railing Barrier Shown, Concrete Parapet Similar)

Pipe Clamp Connection Detail

(Connection without spacer shown, Connection with spacer similar)

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

EXPANSION ASSEMBLY DETAIL

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

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”.

Tension Wire

Hog Rings @ 2'-0” Centers

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

Cross Reference:
For location of View A-A and Detail “A” see Sheet 1.
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 ± 1/8"). Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.

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

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

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

CROSS REFERENCE:
- For Table of Fence Components, Table of Post Attachment Components, View A-A and Detail ‘A’ see Sheet 2.
- For Pull Post Assembly Detail for Traffic Railing see Sheet 3.
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) AWS/D1.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.

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

Tension Wire

Hog Rings @ 2'-0" Centers

Ties @ 1'-0" Centers (Typ.)

Tension Bar (one each side of pull post) (Typ.)

Ties @ 2'-0" Centers

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

Hog Rings @ 2'-0" Centers

Brace Rail

Chain Link Fabric

Bridge Chain Link Fabric to allow for joint movement

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

PULL POST ASSEMBLY DETAIL FOR TRAFFIC RAILING

PIPE CLAMP CONNECTION DETAIL
(Required only at expansion joint locations where total movement exceeds 6"

PIPE CLAMP DETAIL

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

FY 2020-21
BRIDGE FENCING (OVER RAILROAD)