NAVIGATION LIGHT SYSTEM SCHEMATIC FOR SINGLE BRIDGE WITH FENDERS

NAVIGATION LIGHT SYSTEM SCHEMATIC FOR DUAL BRIDGES WITH FENDERS

NAVIGATION LIGHT SYSTEM SCHEMATIC FOR SINGLE BRIDGE WITHOUT FENDERS

NAVIGATION LIGHT SYSTEM SCHEMATIC FOR DUAL BRIDGES WITHOUT FENDERS

NAVIGATION LIGHT NOTES:

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

NOTE:
- Size conductors per NEC requirements.
- Do not use conduit smaller than \( \Omega \).
CROSS REFERENCES:
1. For Navigation Light System notes and legend, see Sheet 1.
2. See Utility Conduit Detail sheets for Embedded Junction Box (EJB) dimensions & locations.
* Supplied by Light Fixture Manufacturer

Install Light Fixture so as to ensure visibility from an approaching vessel.

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

SECTION B-B
TYPICAL POSITION OF RCL OR GCL
RELATIVE TO SUPERSTRUCTURES
NOTES:

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

2. Where Bullet Railing continues on retaining wall mounted Traffic Railings or Barriers, provide a Bullet Railing Tapered End Transition at the 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 6351-T5
      Stop Pins: Press-fit aluminum or stainless steel pins or tubes
   B. Stainless Steel Fasteners: ASTM F-593, Alloy Group 2 (316).
   C. Bearing Pads: Plain or Fiber Reinforced meeting Specification Section 932 for Ancillary Structures.

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

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

6. Payment: Includes the full cost of installed bullet railing. Cost of the Concrete Parapet or Traffic Railing is separate.
V-Groove in both faces &
top of Concrete Curb (Equally
spaced between open
joints)

Intermediate
Open Joint (6C)

Bridge Deck/Sidewalk

Coping (Typ.)

Inside face of
Concrete Curb

Deck joint (5) *

Edge of Approach Slab (Coping)

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

30'-0" (Maximum)
Spacing 1/2" V-Groove

Intermediate
Open Joint

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

Type 1 - Picket Infill Panel shown
Infill Panel Type
Varies (See Plans)

Concrete Curb

Concrete Rail

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

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

Approach Slab
Begin or End Approach Slab

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

Approach Slab
Begin or End Bridge

NOTES:
1. Shop Drawings are required.
2. Work this Index with Index 515-052 Bicycle/Pedestrian Railing Details (Steel) and
Specification Section 515. Refer to the SPI for Design Criteria and limits of Use.
3. Materials:
   A. Steel: Galvanized after fabrication
      b. Support Bracket (Scheme 3) L-shape and Stiffener Plate: ASTM A36
      c. Bottle-guard (Schemes 1 & 3) L-shape: ASTM A36
   B. Concrete: Same as bridge deck
   C. Pre-cured Silicone Sealant: Specification Section 932
   D. Bearing Pads: Provide 1/2" 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
cement type, deck expansion joint locations and orientations, and thermal movement.
5. Railings:
   A. For thermal movement greater than 4" (up to a maximum of 5"), clear opening
      between adjacent pickets, or panels at Rail Expansion Joints above Deck Joints
      must be reduced to 3½".
   B. For treatment of railings on skewed bridges see Index 521-427.
6. Curbs:
   A. Match open curb joints at Deck Expansion Joint locations to the deck joint dimension.
   B. Construct Concrete Curb (Scheme 2) vertical with the top surface finished
      level transversely. See Concrete Curb Details Sheet 3.
   C. Provide 1/2" Intermediate open joints in curbs coinciding with the 1/2" 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.
**SCOPE 1 - TYPICAL SECTION THROUGH DECK MOUNTED RAILING**

- Traffic railing required for all schemes (Type varies, 36"
- Single-Slope shown, see Plans)

**SCHEME 1A - DETAILS**

(Adhesive Anchor Option shown)

- 7/8" Ø x 3" Hex Head Bolt with Nut, Flat Washer under Nut & Plate Washer under Head
- 1/8" Thick Bearing Pad (Typ.)
- Bridge Deck Sidewalk
- Slope 2% Max. (away from coping)

**SCHEME 1B - DETAILS**

(Thru-Bolt Option)

- 1" Ø Core Drilled Hole
- 7/8" Ø x 2 1/2" Long Slotted Hole
- 1 1/2" x 7/8" Angle Assembly
- Thru-Bolt Plate Washer

**THRU-BOLT PLATE WASHER DETAIL**

- 1 1/2" Ø Hole for Anchor Bolts
- 7/8" x 7/8" Angle Assembly
- Flat Washer
- 1/8" Thick Bearing Pad (Typ.)
- Bridge Deck Sidewalk

**SCHEME 2 - TYPICAL SECTION THROUGH CURB MOUNTED RAILING**

- 1/8" Ø Holes for Anchor Bolts
- 7/8" x 2 1/2" Long Slotted Hole
- 1/8" x 1/2" Angle Assembly

**PLATE WASHER DETAIL**

- 1 - 7/8" Ø x 2 1/2" Hex Head Bolt with Nut, Flat Washer under Nut & Plate Washer under Head
- 2 - 1/8" Ø x 1 1/2" Adhesive Anchor Hex Nut & Flat Washer

**SCHEME 3 - SIDE MOUNTED SUPPORT BRACKET DETAILS**

- 1/8" Ø x 3" Hex Head Bolt with double Hex Nuts, Flat Washer under Nut & Plate Washer under Head
- 1/8" Thick Bearing Pad (Typ.)
- Curb with 1/2" x 3/8" chambers

**Congratulations**

Index 515-052

Bottle-Guard (See Detail on Sheet 3)

See Typical Section

Bridge Casing

**Bridge Deck Sidewalk**

**Bridge Coping**

**Bottle-Guard**

(See Detail on Sheet 3)

**SCHEME 1 - TYPICAL SECTION THROUGH DECK MOUNTED RAILING**

(SCHEME 1B - DETAILS)

(Adhesive Anchor Option shown)

- 1/8" Ø x 3" Hex Head Bolt with Nut, Flat Washer under Nut & Plate Washer under Head

**SCHEME 1A - DETAILS**

(Adhesive Anchor Option shown)

- Traffic railing required for all schemes (Type varies, 36"
- Single-Slope shown, see Plans)

**SCHEME 1B - DETAILS**

(Thru-Bolt Option)

- 1" Ø Core Drilled Hole
- 7/8" Ø x 2 1/2" Long Slotted Hole
- 1 1/2" x 7/8" Angle Assembly
- Thru-Bolt Plate Washer

**THRU-BOLT PLATE WASHER DETAIL**

- 1 1/2" Ø Hole for Anchor Bolts
- 7/8" x 7/8" Angle Assembly
- Flat Washer
- 1/8" Thick Bearing Pad (Typ.)
- Bridge Deck Sidewalk

**SCHEME 2 - TYPICAL SECTION THROUGH CURB MOUNTED RAILING**

- 1/8" Ø Holes for Anchor Bolts
- 7/8" x 2 1/2" Long Slotted Hole
- 1/8" x 1/2" Angle Assembly

**PLATE WASHER DETAIL**

- 1 - 7/8" Ø x 2 1/2" Hex Head Bolt with Nut, Flat Washer under Nut & Plate Washer under Head
- 2 - 1/8" Ø x 1 1/2" Adhesive Anchor Hex Nut & Flat Washer

**SCHEME 3 - SIDE MOUNTED SUPPORT BRACKET DETAILS**

- 1/8" Ø x 3" Hex Head Bolt with double Hex Nuts, Flat Washer under Nut & Plate Washer under Head
- 1/8" Thick Bearing Pad (Typ.)
- Curb with 1/2" x 3/8" chambers

**Congratulations**

Index 515-052

Bottle-Guard (See Detail on Sheet 3)

See Typical Section

Bridge Casing

**Bridge Deck Sidewalk**

**Bridge Coping**

**Bottle-Guard**

(See Detail on Sheet 3)
ROUND RAILS - TOP RAIL OR HANDRAIL
* ½ x ½ Pan Head Stainless Steel (Type 316 or 18-8 Alloy)
Set Screws along outside face of railing. Set screws must be set flush against the rail surface. A ½" plug weld may be substituted for the two set screws at expansion joints.
** Embedded length may be 4" 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".

DETAILED "B" EXPANSION JOINT (FIELD SPlice SIMILAR)

ALTERNATE REINFORCING (WWR) DETAILS
NOTE: Place wire panels to minimize the end overhang. End Overhangs greater than 4½" are not permitted.

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

CROSS REFERENCE:
See Sheet 1 for Bridge Railing Notes.

DETAILED "A" - SECTION AT INTERMEDIATE OPEN JOINT

INTERMEDIATE JOINT SEAL NOTE:
At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant. Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

PRE-CURED SILICONE SEALANT

APPLICATION:
Apply the 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
Open Joint
Concrete Curb
Post
Post

6" Max.
7" Min.

6" Min.

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

Begin or End Approach Slab

Begin or End Approach Slab

Intermediate
Open Joint

ELEVATION OF INSIDE FACE OF RAILING
(Scheme 2 shown with Post “A”, other Schemes similar, Reinforcing Steel not shown for clarity)

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 Pad: 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 orientation, and thermal movement.
5. Railings:
   A. For thermal movement greater than 4" (up to a maximum of 5"), clear opening between adjacent pickets or panels at Rail Expansion Joints above Deck Joints must be reduced to 3½".
   B. For treatment of railings on skewed bridges see Index 521-427.
6. Curbs:
   A. Match open curb joints at Deck Expansion Joint locations to the deck joint dimension.
   B. Construct Concrete Curb (Scheme 2) vertical with the top surface finished level transversely. See Concrete Curb Details Sheet 3.
   C. Provide 3⁄8" Intermediate open joints in curbs coinciding with the 3⁄8" joints in the traffic railing.
7. Payment: Support Bracket (Scheme 3) is incidental to the cost of railing. Curb concrete and reinforcing steel (Scheme 2) are included in the bridge deck quantities.

PRESS REV

INDEX 515-061
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 (2'-0" embedment) and 18,500 lbs for Dowel Bars 6D along the outside face of the traffic railing (5" min. embedment).

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

BARRIER DELINEATORS: Barrier Delineators shall meet Specification Section 993. Install Barrier Delineators on top of the Traffic Railing along the entire length of the bridge 2' from the face on the traffic side in accordance with Specification Section 705. Barrier Delineator color (white or yellow) shall match the color of the near edgeline.

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

BRIDGE NAME PLATE: If a portion of the existing Traffic Railing is to be removed that carries the bridge name, number and or date, or if the installation of the Traffic Railing (Thrie Beam Retrofit) will obscure the bridge name, number and or date, then replace the information that has been removed or obscured, with 3" tall black lettering on white nonreflective sheeting applied to the top of the adjacent guardrail. The information must be clearly visible from the right side of the approaching travel lane. The sheeting and adhesive backing shall comply with Specification Section 994 and may comprise individual decals of letters and numbers.

PAYMENT: Guardrail Bridge Anchorage Assembly (each) includes all barrier delineators for the entire bridge length, transition blocks, and necessary hardware to complete the Guardrail transitions shown.
GUARDRAIL TRANSITIONS - EXISTING POST & BEAM BRIDGE RAILINGS (NARROW & RECEDED CURBS)

REV ISIO N

DESCRIPTION:

REVISION

LAST

STANDARD PLANS

FY 2019-20

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

1 RAILING PANEL ON WINGWALL ADJACENT TO END POST

2 CONTINUOUS RAILING PANELS ON WINGWALL ADJACENT TO END POST

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

2 CONTINUOUS RAILING PANELS ADJACENT TO BEGIN OR END BRIDGE

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

1 RAILING PANEL ADJACENT TO BEGIN OR END BRIDGE

SCHEME 1 - APPROACH ENDS OF BRIDGES WITH BEAM OR GIRDER SUPERSTRUCTURE

SCHEME 2 - APPROACH ENDS OF BRIDGES WITH FLAT SLAB SUPERSTRUCTURE & PARALLEL WINGWALLS (SHOWN) OR BEAM OR GIRDER SUPERSTRUCTURE & PARALLEL OR CURVED WINGWALLS (SIMILAR)

LEGEND

- Limits of Existing Structure to be removed

- Structures to remain

- Epoxy

- Saw cut

See Detail A

Remove exposed existing reinforcing steel by burning or grinding to 1" below finished end of saw cut. Repair resulting holes and then coat entire cut end of railing with Type F-1 epoxy in accordance with Section 926 (Typ.)

Saw cut railing and grind flat to align with edge of post.

DETAIL A

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

SECTION A-A

SECTION B-B

SECTION C-C

LAST

07/01/13

DESCRIPTION:

FY 2019-20

STANDARD PLANS

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521-404

2 of 8
**Revision Description:**

**Last Revision Date:** 07/01/13

**Bill of Reinforcing Steel Bending Diagram**

**Conventional Reinforcing Steel**

- **Mark:** D1, D2, S
- **Size:** 6, 6, 5
- **Length:** 3'-11", 3'-10", AS REQ.

**BARS 6D & 5S**

**Estimated Traffic Railings Quantities**

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<tbody>
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<td>Steel</td>
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**Scheme 1 - Approach Ends of Bridges with Beam or Girder Superstructure**

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

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

**© FDOT STANDARD PLANS**

**FY 2019-20**

**Guardrail Transitions - Existing Post & Beam Bridge Railings (Narrow & Recessed Curbs)**
SCHEME 3 - APPROACH ENDS OF BRIDGES WITH BEAM OR GIRDER SUPERSTRUCTURE

- Match height & face of Existing Railing at top of Railing
- 3'-0" Min., 3'-1 ½" Max.
- 1'-0" Min.*

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

- Match height & face of Existing Railing at top of Railing
- 3'-0" Min., 3'-1 ½" Max.
- 1'-0" Min.*

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

ESTIMATED TRAFFIC RAILING QUANTITIES

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CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM

BILL OF REINFORCING STEEL

- 3-4 Bar 6D
- 5 Bar 55
- AS REQ

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

PARTIAL PLAN - APPROACH TRANSITION

PARTIAL ELEVATION - APPROACH TRANSITION

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

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

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

SCHEME 5
(Narrow Curb shown; Recessed Curb similar)

SCHEME 6
(Narrow Curb Scheme 2 shown; All other Schemes similar)
**PLAN VIEW OF TRANSITION BLOCK**
(GUARDRAIL NOT SHOWN FOR CLARITY)

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

**ESTIMATED QUANTITIES PER TRANSITION BLOCK**

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**NOTES:**

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

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

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

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

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

**EXPANSION SLEEVE ASSEMBLY:** Pipe sleeve shall be ASTM D2241 PVC pipe, SDR13.5. End Cap shall be ASTM D2666 PVC socket fitting, Schedule 40. End of Sleeve assembly at railing open joint shall be sealed with silicone to prevent concrete intrusion during railing casting. A compressible expanded polyurethane 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 Bridge Anchorage Assembly (each) includes all barrier delineators for the entire bridge length, transition blocks, and necessary hardware to complete the Guardrail transitions shown.

---

**ESTIMATED TRAFFIC RAILING QUANTITIES**

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

---

**PARTIAL ELEVATION OF RAILING SHOWING FINGER/SLIDING PLATE JOINT AT BEGIN OR END BRIDGE - SCHEMES 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.*)

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

**INDEX:** 521-405

**SHEET:** 1 of 6

**REVISED:** 07/01/13

**DESCRIPTION:** FY 2019-20 STANDARD PLANS

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**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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<td>W</td>
<td>4</td>
<td>2'-0&quot;</td>
<td>1 &amp; 3</td>
</tr>
<tr>
<td>S</td>
<td>5</td>
<td>2'-0&quot;</td>
<td>2, 3 &amp; 4</td>
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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 55 may be continuous or spliced at the construction joints. Bar splices for Bars 5S shall be a minimum of 2'-0".
5. Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.

Bar 4C (12 required per open joint)

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

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

* 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 to not restrict in any way normal joint movement.

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

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

GUARDRAIL TRANSITIONS - EXISTING
POST & BEAM BRIDGE RAILINGS (WIDE CURBS)
TYPICAL TREATMENT OF RAILING ALONG BRIDGE

1. On approach end provide a Roadway Guardrail Transition, Index No. 402 (as shown) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is along the Wing Wall, see Schemes 2, 3, 4 or 5, Sheets 4, 5 or 6. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing. For treatment of trailing end see Roadway Plans.

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

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

NOTES:

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

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

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

- Existing Curb

- Top of Existing Railing

- Bottom of Existing Railing

- Existing Bridge Deck

- Existing Curb

- Existing Post & Beam Railing

- Existing Bridge Coping

- Direction of Traffic

- 3rd or 4th Existing Post - Contractor to establish and construct

- Minimum possible length using criteria shown above in Partial Plan of Railing

- Top of Existing Curb

- Embedment 1'-0" preferred with 2" Edge Distance or Bottom Clearance

- Rotation Correction 0
**SCHEME 1 NOTES:**

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

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

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

**SCHEME 2 NOTES:**

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

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

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

---

**SCHEME 1**

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

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

**PARTIAL PLAN OF RAILING**

---

**SCHEME 2**

**RAILING END TREATMENT FOR PARALLEL CURBS**

**PARTIAL ELEVATION OF INSIDE FACE OF GUARDRAIL**

**PARTIAL PLAN 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 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 Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wall, attach 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 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 3'-0" minimum embedment.

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

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

SCHEME 5 NOTES:

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wall, attach 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 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 3'-0" minimum embedment.
This railing has been structurally evaluated to be equivalent or greater in strength to other safety shape railings which have been crash tested to NCHRP Report 350 TL-4 and MASH TL-4 Criteria.

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

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

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

BARRIER DELINEATORS: Install Barrier Delineators on top of the Traffic Railing 2" from the face of 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 ½" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between ½" 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 ½" V-Grooves. V-Grooves shall be formed by preformed letters and figures.

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

Provide 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.

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.
Raised Sidewalk

3'-0" Taper

Approach Slab

Bars 5S (Typ.)

3'-6"

Field Bend

Bars 5S as Required

10 12 2" 11 2 8" 2 1 2" 10"

VIEW C-C

RAILING END TRANSITION

(Guardrail Not Shown For Clarity)

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

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

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

**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.)
V-Groove in Sheet 2:5 5 :3 9 P M

DESCRIPTION:

1'-9" (Max.)

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

color (white or yellow) of the near edgeline.

on the traffic side in accordance with Specification Section 705. Match the Barrier Delineator to the

BARRIER DELINEATORS: Install Barrier Delineators on top of the Traffic Railing 2" from the face

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

V-GROOVES : Construct ƀ" V-Grooves plumb. Space V-Grooves equally between Ƃ" Open Joints

for Post, Rail and Rail Splice/Expansion Assembly fabrication and installation Details and Notes.

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

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

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

This railing has been structurally evaluated to be equivalent or greater in strength to other safety shape

railings which have been crash tested to NCHRP Report 350 TL-4 and MASH TL-4 Criteria.

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

Ђ" V-Groove should 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

Ђ" V-Grooves. V-Grooves shall be formed by predetermined letters and figures.

OPEN JOINTS : See Structures Plans, Superstructure, Approach Slab Sheets and Retaining Walls for actual dimensions and joint


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

Provide Ђ" Intermediate Open Joints at :

(1) - Superstructure supports where slab is continuous.

(2) - Ends of approach slabs when adjacent to retaining wall.

junction slabs.

CROSS REFERENCE:

For Section A-A and View B-B, see Sheet 2.

For Detail "A" see Sheet 3.

TRAFFIC RAILING NOTES

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

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

TRAFFIC RAILING - (32" VERTICAL SHAPE)
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.)

RAILING END DETAIL
(Guardrail Not Shown For Clarity)

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

NOTE: For Bullet Railing Details, see Index 515-022.
## Bill of Reinforcing Steel

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## Conventional Reinforcing Steel Bending Diagrams

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<td>6% to 10%</td>
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## Estimation 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.)

### Detail "A" - 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.

---

### Reinforcing Steel Notes:

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

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 ½ V-Grooves plumb. Space V-Grooves equally between ½ open joints and/or Deck Joints.

JOINTS: See Plans, Superstructure, Approach Slab and Retaining Walls Sheets for actual dimensions and joint orientation. Provide open Railing Joints at Deck Expansion Joint locations matching the dimensions of the Deck Joint. For treatment of Railings on skewed bridges see Sheet 3. Provide ½ Intermediate Open Joints at:

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

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

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

TRAFFIC RAILING NOTES

(Reinforcing Steel not shown for clarity)
**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.

**DETAILS:**

- **PLAN** - Railing End Transition (Showing Bars 5W and 5S)
- **PLAN** - Railing End Transition (Showing Bars 5R and 5S)
- **VIEW B-B** - END TRANSITION
- **VIEW C-C** - HEIGHT TRANSITION
- **DETAIL "A"**
- **DETAIL "B"** - ELEVATION - RAILING HEIGHT TRANSITION (Showing Transition to 38" Single-Slope Barrier)
PARTIAL PLAN VIEW OF BRIDGE DECK AND APPROACH SLAB WITH MEDIAN TRAFFIC RAILING

NOTES:
1) Median Traffic Railing reinforcement vertical Bars 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) 1/2" Intermediate Open Joints and V-Grooves in railing shall be placed perpendicular or radial to the axis of the median railing. See Structures Plans, Superstructure and Approach Slab Sheets for locations.

5) At begin or end approach slab extend slab at the median railing ends 3' (open side) as shown to provide a base for casting of the railing.

6) Work this Sheet with Approach Slab Indexes as applicable.

7) Deck Expansion Joint at begin or end bridge shown. Deck Expansion Joints at Pier or Intermediate Bents are similar.

8) Partial Plan Views shown are intended as guides only. See Structures Plans, Superstructure and Approach Slab Sheets for skew angles, joint orientation, dimensions and details.

9) If Welded Wire Reinforcement is used in lieu of conventional reinforcement, placement of the WWR vertical elements shall be similar to those shown above. Clipping of horizontal elements to facilitate placement shall be minimized where possible. Where clipping is required, supplement horizontal elements by lap splicing with deformed bars having an equivalent area of steel.
**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. At Railing End Transition, WWR shall be field bent inward as required to maintain cover. The bottom of Piece 1 shall be cut to allow overlap.
3. Place WWR panels as to minimize the end overhang 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.

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

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

**ESTIMATED TRAFFIC RAILING QUANTITIES**

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

CONCRETE AND REINFORCING STEEL: See Structures Plans General Notes.

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

SUPERELEVATED BRIDGES: At the option of the Contractor the Traffic Railing on 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 Bell Railings.

V-GROOVES: Construct ½" V-Grooves plumb. Space V-Grooves equally between ⅝" Open Joints and/or Deck joints and at V-Groove locations on Retaining Railings.

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

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

JOINTS: See Plans, Superstructure, Approach Slab and Retaining Walls Sheets for actual dimensions and joint orientation. Provide open Railing Joints at Deck Expansion Joint locations matching the dimensions of the Deck Joint. For treatment of Railings on skewed bridges see Sheet 3.

Provide ⅝" 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**

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

- **Coping**
- **Bars 4S**
- **Bars 4V**
- **Bars 4P**
- **Approach Slab**
- **Concrete Barriers**
- **Edge of Approach Slab (Coping)**

*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.*

**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.
See Note 3.

Begin or End Approach Slab

Front Face of Backwall and Begin or End Bridge

Deck Expansion Joint

Coping

Concrete Parapet

Intermediate Open Joint in Railing or Parapet

Inside Face of Parapet

Bridge Deck

Bars 4V (See Note 3)

Gutter

Traffic Railing

Pier or Bent

Intermediate

Approach Slab

Railing End Transition where required

GENERAL NOTES:

1) Work this Sheet with Traffic Railing, Pedestrian/Bicycle Railing, and Approach Slab Indexes as applicable.

2) Deck Expansion Joint at begin or end bridge shown. Deck Expansion Joints at ¶ Pier or Intermediate Bents are similar.

3) Partial Plan Views shown are intended as guides only. See Structures Plans, Superstructure and Approach Slab Sheets for details.

4) Railings on Raised Sidewalks shall be treated similar to the Partial Plan View of Bridge Deck with Traffic Railing.

5) If Welded Wire Reinforcement is used in lieu of conventional reinforcement, placement of the WWR vertical elements shall be similar to those shown above. Clipping of horizontal elements to facilitate placement shall be minimized where possible. When clipping is required, supplement horizontal elements by lap splicing with deformed bars having an equivalent area of steel.
**ALTERNATE REINFORCING STEEL (WWR) DETAILS**

- Longitudinal D20 wires or #4 bars may be tied.

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

- ROADWAY CROSS-SLOPE (LH)
  - LOW GUTTER
    - 0% to 2%: 90°
    - 2% to 6%: 87°
    - 6% to 10%: 84°
  - HIGH GUTTER
    - 0% to 2%: 90°
    - 2% to 6%: 93°

- BB shall be 90° if contractor elects to place railing perpendicular to the deck and approach slabs.

**BILL OF REINFORCING STEEL**

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<td>S</td>
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<td>As Reqd</td>
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<tr>
<td>V</td>
<td>4</td>
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**Pre-cured Silicone Sealant (4" wide)**

- Sealant (4" wide)
- Pre-cured Silicone Sealant in accordance with Specification Section 931.
- All bar dimensions in the bending diagrams are out-to-out.
- The 8VB vertical dimensions shown for Bar 4V is based on a 6" embedment into the bridge deck without a raised sidewalk. If a raised sidewalk is to be provided, increase this dimension to achieve a 6" minimum embedment into the bridge deck. See Structures Plans, Superstructure and Approach Slab Sheets.
- Bars 4S may be continuous or spliced at the construction joints. Bar splices for Bars 4S shall be a minimum of 2'-0".
- All reinforcing steel at the open joints shall have a 2" minimum cover.

**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 931.
2. Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.
3. Include the cost of the Pre-cured Silicone Sealant in the Contract Unit Price for the Traffic Railing.

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

- Sealant (4" wide)
- Pre-cured Silicone Sealant (4" wide)
- Field Bend Bar to maintain cover
- Field Cut and Lapped

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

- Field Bend Bar to maintain cover
- Field Cut and Lapped

**STIRRUP BAR 4P**

- End Stirrup Bar 4P to Be Field Cut and Bent

**END STIRRUP BAR 4P**

- End Transition Bar 4V Field Cut and Lapped

**REINFORCING STEEL NOTES**

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

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

- Paint Recessed Surfaces Black

**ESTIMATED TRAFFIC RAILING QUANTITIES**

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

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

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

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

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

TRAFFIC RAILING NOTES - (Reinforcing Steel not shown for clarity)

For Railing Height Transition, See Detail "B" (Typical when Concrete Barrier or Traffic Railing is required beyond Approach Slab at approach and/or trailing end)

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

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

SUPERELEVATION SUPPORTS: See Detail "C" for Pre-cured Silicone Sealant

Provide 3/8" Intermediate Open Joints shall be provided at:

(1) - Superstructure supports where slab is continuous.

(2) - Ends of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.

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

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.
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:

Discard 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:

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:

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:

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:

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:

Omit Detail "A" and provideDetail "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:
Provide Detail "B" Height Transition where 42" Single-Slope Traffic Railings or Barriers are shown on approaches.
**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

### BILL OF REINFORCING STEEL

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### ROADWAY CROSS-SLOPE

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<tr>
<td>0% to 2%</td>
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<tr>
<td>2% to 6%</td>
<td>98°</td>
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<tr>
<td>6% to 10%</td>
<td>95°</td>
</tr>
<tr>
<td>ØA</td>
<td>ØB</td>
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**Note:** ØA and ØB shall be 90° if Contractor elects to place Railing perpendicular to the Deck.

### Reinforcing Steel Notes:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints shall have a 2' minimum cover.
3. Bars 6S1 may be continuous or spliced at the construction joints. Lap splices for Bars 6S1 and 5S2 shall be a minimum of 3'-0" and 2'-2", respectively.
4. The Contractor may utilize deformed WWR when approved by the Engineer. WWR must meet the requirements of Specification Section 931.

### Concrete

- **Concrete:** CY/LF
- **Reinforcing Steel:** LB/LF

**Note:** The estimated railing quantities are based on a 2% deck cross slope; railing on low side of deck.

---

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

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

**ESTIMATED TRAFFIC RAILING QUANTITIES**

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**Note:** The estimated railing quantities are based on a 2% deck cross slope; railing on low side of deck.
This Traffic Railing Retrofit has been structurally evaluated to be equivalent or greater in strength to a design which has been successfully crash tested previously and approved for a NCHRP Report 350 Test Level 4 rating, except for the Tapered End Transition on Index 521-480.

CONCRETE: Concrete for the Traffic Railing (Vertical Face Retrofit). Spread Footing Approaches and replacement curb sections shall be Class IV. Concrete for Curb Transition Blocks shall be Class II (Bridge Deck). REINFORCEMENT STEEL: Reinforcement 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, SDR11. End Cap shall be ASTM D2466 PVC socket fitting, Schedule 40. End of Sleeve assembly at railing open joint shall be sealed with silicone to prevent concrete intrusion during railing casting. A compressible expanded polystyrene plug is required in the opposite end of the assembly for correct dowel positioning during railing casting. Correct dowel positioning is required in order to provide for thermal movement of the deck.

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

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

NAME, DATE AND BRIDGE NUMBER: The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be the year the bridge was constructed. Letters and figures may be 3" tall black plastic as approved by the Engineer or V-Grooves. V-Grooves shall be formed by preformed letters and figures.

ELEVATION MARKERS: Elevation Markers need not be replaced when portions of the existing traffic railing carrying existing legend 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 at the spacing shown in the table below. Barrier Delineator color (white or yellow) shall match the color of the near edgeline.

PAYMENT: Payment under Traffic Railing (Vertical Face Retrofit) includes all materials and labor required to construct the traffic railing. Crash tested previously and approved for a NCHRP Report 350 Test Level 4 rating, except for the Tapered End Transition on Index 521-480, Sheet 4 for Spread Footing Approach Quantities.

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

LIMITING STATION OF TRANSITION (See Roadway Plans) 7'-0" (Min.) Varies (2'-6" Min.)

### NAME OR DATE OR BRIDGE NUMBER

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(Directions are based on a 9" curb, no curb cross slope and 2'-0" embedment length of Bars 6D. If the curb height or embedment length differs from that shown, increase or decrease quantity by the given per inch increment.) See Index 521-48A, Sheet 4 for Spread Footing Approach Quantities.

PARTIAL ELEVATION OF RAILING SHOWING FINGER/SLIDING PLATE JOINT - SCHEMES 2 THRU 5 (Begin or End Bridge Shown, Intermediate Joints Similar)

* 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.

**Notes:**
- Field Cut Bars 6D to maintain cover (Typ.)
- Dowel Bars 6D Spacing (Inside Face) 3" (Max)
- Field Bend Bars 55 to maintain cover (Typ.)
- Dowel Bars 6D Spacing (Outside Face) 3" (Max)
- Dowel Bars 6D (Typ.)

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(Directions are based on a 9" curb, no curb cross slope and 2'-0" embedment length of Bars 6D. If the curb height or embedment length differs from that shown, increase or decrease quantity by the given per inch increment.) See Index 521-48A, Sheet 4 for Spread Footing Approach Quantities.
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM

BILL OF REINFORCING STEEL

- A 4 $\times$ AS REQ. 521-482 ONLY
- C 4 $\times$ AS REQ. 521-481 THRU 521-484
- E 5 $\times$ AS REQ. 521-484 ONLY
- F 4 $\times$ AS REQ. 521-484 ONLY
- H 4 $\times$ AS REQ. 521-482 ONLY
- K 10 $\times$ AS REQ. 521-481 THRU 521-484

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. Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.

REINFORCING STEEL "sp. (Typ.)"

BARS 4A, B, 6D, 5F, 4G & 5S
Bar 4N 2'-0" 1'-0"
Bar 4M 3'-10"
Bar 4L 3'-6"

BARS 4L, 4M & 4N

BARS 4C
(12 required per open joint)

BARS 5E
(Typical Section) (Tapered End Transition)

MATCH WIDTH OF DECK JOINT 2" COVER (Typ.)

VERTICAL FACE RETROFIT RAILING

TOP OF EXISTING CURB 3'-6" or 7'-4" SPACING EXPANSION SLEEVE ASSEMBLY

PAIRS OF BARS 4C @ 3" SPACING EXPANSION SLEEVE ASSEMBLY

BAR 4M 2'-0" 3'-0"
BAR 4L 3'-6" 2'-6"
BAR 4N 2'-0" 2'-0"
BAR 4K 2'-0" 2'-0"
BAR 4L 2'-0" 2'-0"
BAR 4M 2'-0" 2'-0"
BAR 4N 2'-0" 2'-0"
BAR 4K 2'-0" 2'-0"
BAR 4L 2'-0" 2'-0"
BAR 4M 2'-0" 2'-0"
BAR 4N 2'-0" 2'-0"
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BAR 4L 2'-0" 2'-0"
BAR 4M 2'-0" 2'-0"
BAR 4N 2'-0" 2'-0"
BAR 4K 2'-0" 2'-0"
BAR 4L 2'-0" 2'-0"
BAR 4M 2'-0" 2'-0"
BAR 4N 2'-0" 2'-0"
BAR 4K 2'-0" 2'-0"
BAR 4L 2'-0" 2'-0"
BAR 4M 2'-0" 2'-0"
BAR 4N 2'-0" 2'-0"
**DESCRIPTION:**

1. On approach end provide a Roadway Guardrail Transition, Index 536-002 (as shown) or other site specific treatment. See Roadway Plans for limited station of Roadway Guardrail Transition or other site specific treatment. If limited station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limited station of Roadway Guardrail Transition 1/4 along the Wing Wall, see Schemes 2 or 3, Index 521-484, Sheet 2 and 3. On skewed bridges, if the skew along the joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing. For treatment of railing and see Roadway Plans. If vertical face retrofit extends beyond bridge and approach slab ends, see Index 521-484 for treatment and Details.

2. Field cut Bars 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 grouding or grinding as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1' below existing concrete and ground over.

**NOTES:**

- **Superstructure Supports:**
  - **Superstructure supports where slab is continuous.**
  - **Provide 3/8" Intermediate Open Joints at:**
    1) Superstructure supports where slab is continuous.
    2) Provide 3/8" Intermediate Open Joints at:
    3) As noted for skewed deck joints.

- **Bars 60 spacing at Railing joints (Typ. on bridge except as noted for skewed deck joints):**
  - **Bars 60 spacing at Railing joints (Typ. on bridge except as noted for skewed deck joints):**

- **Bars 5S spacing at Railing joints (Typ. on bridge except as noted for skewed deck joints):**
  - **Bars 5S spacing at Railing joints (Typ. on bridge except as noted for skewed deck joints):**

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

- **Provide 3/8" Intermediate Open Joints at:**
  - **Provide 3/8" Intermediate Open Joints at:**
  - **Provide 3/8" Intermediate Open Joints at:**

- **Curb heights vary from 5" Min. to 1'-3" Max.**
  - **Curb heights vary from 5" Min. to 1'-3" Max.**
  - **Curb heights vary from 5" Min. to 1'-3" Max.**

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

- **Provide 3/8" Intermediate Open Joints at:**
  - **Provide 3/8" Intermediate Open Joints at:**

- **Supports:**
  - **Supports:**
  - **Supports:**

- **Last Revised 07/01/13**
  - **Last Revised 07/01/13**
  - **Last Revised 07/01/13**
Dowel Bars 4L (10" Embedment) (See Note 3)

Existing End Bent Wing Wall

Bent Wing Wall

Existing Approach Slab

Match Existing Curb Height

1'-0"

Transition Block (See Note 1)

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

Partial Elevation of Inside Face of Guardrail

Partial Plan of Guardrail

Partial Plan of Railing

Partial Plan of Inside Face of Railing

SCHEME 1 NOTES:

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

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

SCHEME 2 NOTES:

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

Traffic Railing - (Vertical Face Retrofit) Narrow Curb
PARTIAL PLAN OF RAILING

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

Parallel Portion of Vertical Face Retrofit Railing (if present) (See Note 1)

Limiting Station of Transition Varies (1'-0' Min.)

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

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

SCHEME 3
RAILING END TREATMENT FOR FLARED WING WALLS

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.
**DESCRIPTION:**

**Thrie-Beam Railing (Type Varies)**

**PARTIAL PLAN OF RAILING**

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

EXISTING TRAFFIC RAILING, EXPANSION DOWEL ASSEMBLIES & BARS 4C NOT SHOWN FOR CLARITY

**NOTES:**

1. On approach end provide a Roadway Guardrail Transition, Index 538-002 (as shown) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is along the wing wall, see Schemes 2, 3, 4 or 5. Sheets 3 and 4. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing. For treatment of trailing end see Roadway Plans. If vertical face retrofit extends beyond bridge and approach slab ends, see Index 521-484 for treatment and Details.

2. Field cut Bars 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.

**TYPICAL TREATMENT OF RAILING ALONG BRIDGE**

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

**TYPICAL SECTION THRU RAILING ON BRIDGE DECK**

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

**SHOWING LIMITS OF REMOVAL**

(SHEMES 4 AND 5 ONLY)

**SECTION A-A**

**SECTION B-B**

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

INDEX 521-482

1 of 4
**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.

**PARTIAL ELEVATION OF INSIDE FACE OF GUARDRAIL**

(Existing Wing Post not shown for clarity)

**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 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.

**PARTIAL ELEVATION OF INSIDE FACE OF GUARDRAIL**

(Existing Wing Post, Railing Reinforcing and Expansion Dowel Assemblies not shown for clarity)
**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 not on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1.

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

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

**SCHEME 4:**

**RAILING END TREATMENT FOR FLARED CURBS**

**SCHEME 4 NOTES:**

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

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

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

SCHEME 5 NOTES:
1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1.
2. Dowel Bars 4M may be installed on a maximum angle of 45° to the cut edge of the Approach Slab as shown to facilitate drilling of holes and installation of bars.
3. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend beyond end of existing End Bent Wing Wall, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.
4. Field bend Dowel Bars 4M within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
5. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or they may be installed in drilled holes in the new section of curb using an Adhesive Bonding Material System with a 1'-0" minimum embedment.
**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 Three-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is along the Wing Wall, see Schemes 2 or 3, 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 enclosed in new concrete shall be burned off 1" below existing concrete and grouted over.

**NOTES:**

- Non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment at skewed deck joints see Slew Detail, Index 521-480. Provide open Railing Joints at Deck Expansion Joint locations matching the dimension of the Deck Joint.
- Provide 1/2 Intermediate Open Joints at: (1) Superstructure supports where slab is continuous.
- Curb heights vary from 5" Min. to 3'-2" Max.
- Expansion Dowel & Bars 4C not required at end of railing for Scheme 1, except where traffic railing retrofit extends beyond ends of bridge, see Index 521-484
- Provide open Railing Joints at Deck Expansion Joint locations.
- 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.

**TYPICAL SECTION THRU RAILING ON BRIDGE DECK**

**SECTION A-A**

**SECTION B-B**

**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

Partial Portion of Vertical Face Retrofit Railing if present (See Note 1)

Limiting Station of Transition

Asphalt Overlay when present (Varies)

Final Riding Surface

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

SCHEMATIC PLAN VIEW - OPPOSING LANE APPROACH

SCHEMATIC PLAN VIEW - NEAR LANE APPROACH

* Guardrail or Crash Cushion may also be shown in the Contract Plans, in lieu of the Tapered End Transition.

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.

Toe of Curb
Top of Curb
2”

Bars 5F (Typ.)
Bars 4G (Typ.)
See Detail “B” when no approach curb is present

Bars 5S (field bend & cut to maintain cover)
20’-0” (Traffic Railing and Curb Transition)
Extend Bars 5S in back face of Traffic Railing 1’-6” into Tapered End Transition

Bars 5E (Typ.)
(Cut to maintain cover in Taper)

Bars 5F @ 8” spacing
Bars 5E @ 8” spacing (tied to Bars 4F)

Partial Plan View

Partial Elevation View

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

Tapered End Transition

Traffic Railing - (Vertical Face Retrofit) Spread Footing Approach

FY 2019-20
STANDARD PLANS

LAST REVISION 07/01/09
DESCRIPTION:

REV 071400
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 slab.
** Match curb height of adjacent bridge and approach slab. Adjust height in Transition area to match adjoining Roadway curb.

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)

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

**PARTIAL ELEVATION OF INSIDE FACE OF RAILING**

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

**PARTIAL PLAN**

**SECTION D-D**

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

**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:**

**TRAFFIC RAILING - (VERTICAL FACE RETROFIT) SPREAD FOOTING APPROACH**

**INDEX:**

**521-484**

**SHEET:**
5 of 10

**LAST REVISION:**
07/01/09

**DESCRIPTION:**

**REV ISIO N**

**07/01/09**

**STANDARD PLANS**

**FY 2019-20**
SCHEME 2 ~ MODIFICATION FOR INDEX 521-481 - SCHEME 2
RAILING END TREATMENT FOR PARALLEL WING WALLS WITH NARROW CURBS

NOTES:
1. Remove existing concrete along saw cut joints. Existing reinforcing steel may be cut at joint or extended into new concrete. Exposed existing reinforcing not encased in new concrete shall be removed 1" below existing concrete surface and grouted over.
2. Match curb height at adjoining existing end bent wing.
3. Varies (3" Max., 1" Min., match bridge offset constant for Retrofit to begin transition)
4. Edge of Existing Approach Slab (Location Varies)
5. Note:** Match curb height at adjoining existing end bent wing.

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

PARTIAL PLAN

Typical Section

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)

CROSS REFERENCES:
For Section A-A see Sheet 4.
For Section D-D see Sheet 5.
For Expansion Dowel Assembly and placement of Dowel Bars 6D Details see Index 521-480.
Existing Flared Wing Post to be removed to top of curb

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

Approach Slab Transition

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

Bars 5S

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

Bars 5E @ 8" spacing

Max. (Typ.) tied to Bars 5F (till bars minimally as required)

Typical Section

Bars 4G (Typ.)

Bars 4G (Min.)

3" Cover

10" ±

2" Cover

Expansion Dowel Sleeve Assembly

Sutter Line 1'-3" Max. Spacing

Chamfer

2 @ 3.5"

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

Asphalt Overlay when present (Varies)

Existing Flared Wing Post to be removed to top of curb

Organic Felt bond breaker along end bent wing wall only

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

Existing Flared Wing Post to be removed to top of curb

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

Asphalt Overlay when present (Varies)

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

Asphalt Overlay when present (Varies)

Note:

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

CROSS REFERENCES:

For Section A-A see Sheet 4.
For Section D-D see Sheet 5.
For Section F-F see Sheet 6.
For Expansion Dowel Assemblies Details and placement of Dowel Bars 6D see Index 521-480.
PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Wing Post, Expansion Dowel Assemblies and Bars 4C not shown for clarity)

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

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.
Note:
** Match curb height at adjoining existing end bent wing.
3" (Min.)
Varies
1'-4" ±

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

Bars 5S @ 8" @ 3" Cover (Typ. ends)

Existing End Bent Wing

Partial Plan of Railing

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

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

Cross References:
For Section A-A see Sheet 4.
For Section D-D see Sheet 5.
For Section H-H see Sheet 9.
For Expansion Dowel Assemblies and placement of Dowel Bars 6D Details see Index 521-480.
**PLAN (BRIDGE MOUNTED RAILING/NOISE WALL SHOWN, WALL OR FOOTING MOUNTED RAILING/NOISE WALL SIMILAR)**

**ELEVATION OF INSIDE FACE OF RAILING/NOISE WALL (BRIDGE MOUNTED RAILING/NOISE WALL SHOWN, WALL OR FOOTING MOUNTED RAILING/NOISE WALL SIMILAR)**

**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 ½" open joints every 30 to 90 feet. Align open joints with construction joints in the approach slab or footing.
5. Install Barrier Delineators 2'-4" above the riding surface in accordance with Specification Section 705. Match the Delineator color (White or Yellow) to the near edgeline.
6. Slip forming of the traffic railing portion is permitted.

**CROSS REFERENCE:**
- For Detail "B" and V-Groove Lettering see Sheet 6.
- 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 left side when approaching the bridge. Place the Date on the driver's right 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 ½" V-Grooves, V-Grooves shall be formed by preformed letters and figures.

**REV 11/01/18**
### Elevation of Railing/Noise Wall Reinforcing Steel

<table>
<thead>
<tr>
<th>Bars 5S1</th>
<th>Bars 5V</th>
<th>Bars 5S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Typical at open joints)</td>
<td>(Typical at open joints)</td>
<td>(Typical at open joints)</td>
</tr>
</tbody>
</table>

**4" (Space may be increased to 6" to lap Bars 5R on opposite side of remaining Bars 5V, as required)**

**Bars 5S1**

**Bars 5V**

**Bars 5S2**

**Bridge Deck or Approach Slab**

**Elevation of Railing/Noise Wall End Taper (Adjacent to Traffic Railing Shown, Guardrail Attachment Similar See Detail "A", Sheet 5)**

(Bars 5S1 in Railing not shown for clarity)

**NOTES:**

* Field Cut Bars 5R & 5S1 to maintain clearance.
** Terminate 3/8" V-groove at construction joint & cast top of railing with End Taper.
*** Bar spacing shown for Bars 5V only applies when Single-Slope Traffic Railing continues. For transition to guardrail see Sheet 5.

**Rev:** 11/01/18

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**Description:**

Traffic Railing/Noise Wall (8'-0") - Bridge

**Index:** 521-509

**Sheet:** 2 of 5
CROSS REFERENCE:
For locations of Section A-A see Sheet 1.
For location of View B-B, see Sheet 5.

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

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

(Additional Rent, @ Open Joint LB 229.85)

(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>
</tr>
</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>
</tbody>
</table>
| S1   | 5    | As Req.
| S2   | 5    | 7'-3"  |
| V    | 5    | 6'-6½" |

BRIDGE CROSS-SLOPE

LOW GUTTER HIGH GUTTER

0% to 2% 90° 90° 90° 90°
2% to 6% 87° 87° 93° 93°
6% to 10% 84° 84° 96° 96°

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

CROSS REFERENCE:
For locations of Detail "B", see Sheet 1.

TRAFFIC RAILING/NOISE WALL (8'-0") - BRIDGE

INDEX 521-509
SHEET 4 of 5

REV 5/28/19 FY 2019-20
STANDARD PLANS

LAST REVISION 01/01/18
DESCRIPTION:

TRAFFIC RAILING/NOISE WALL (8'-0") - BRIDGE

521-509 4 of 5

REV ISIO N

DESCRIPTION:

TRAFFIC RAILING/NOISE WALL (8'-0") - BRIDGE

521-509 4 of 5

REV ISIO N

DESCRIPTION:

TRAFFIC RAILING/NOISE WALL (8'-0") - BRIDGE

521-509 4 of 5

REV ISIO N

DESCRIPTION:

TRAFFIC RAILING/NOISE WALL (8'-0") - BRIDGE

521-509 4 of 5

REV ISIO N

DESCRIPTION:

TRAFFIC RAILING/NOISE WALL (8'-0") - BRIDGE

521-509 4 of 5

REV ISIO N

DESCRIPTION:

TRAFFIC RAILING/NOISE WALL (8'-0") - BRIDGE

521-509 4 of 5

REV ISIO N

DESCRIPTION:

TRAFFIC RAILING/NOISE WALL (8'-0") - BRIDGE

521-509 4 of 5

REV ISIO N

DESCRIPTION:

TRAFFIC RAILING/NOISE WALL (8'-0") - BRIDGE

521-509 4 of 5

REV ISIO N

DESCRIPTION:
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 Railings is used beyond the End Taper. See the Plan Sheet.
4. Field cut Bars 5R2 to maintain cover. Field cut Bars 5V and lap as necessary to maintain cover; field cut & bend Bars 5R1 front leg (more plumb) to maintain cover and tie to S1 Bars.
**PLAN VIEW**

**Bars 4G (Top) ~ 7 sp. @ 1'-0" +**

**Spacing Bars 4F1, 4F2 & 4F3 (pairs)**

**Construction Joint Permitted**

**1 - 1½" Ø Conduit**

**2" Ø Conduits**

**See Anchor Plate Detail**

**Bars 4F5 (pairs)**

**Bars 4F4 (pairs)**

**Bars 4F3 (pairs)**

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

**Top of Traffic or Pedestrian/Bicycle Railing**

**Coping**

**2'-6"**

**OPTION 2 - TYPICAL SECTION AT LIGHT POLE PEDESTAL**

(Approach Slab Similar)

**Riding Surface**

**Bars 4F4 (pairs)**

**Bars 4F3 (pairs)**

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

**Top of Traffic or Pedestrian/Bicycle Railing**

**Coping**

**2'-6"**

**OPTION 2 - ELEVATION VIEW**

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

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

**CROSS REFERENCE:** For Detail "A", Anchor Plate Detail and Light Pole Pedestal Notes, see Sheet 4.
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

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'-1/2", Bars 4F4 shall have leg length and bar length shown in parentheses.

b. The number of bars shown in parentheses is 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'-1/2".

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

STANDARD PLANS

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

2. Light Pole Pedestal may be used with the following:
   - Index 521-423 - Traffic Railing (32" Vertical Shape),
   - Index 521-422 - Traffic Railing (42" Vertical Shape),
   - Index 521-428 - Traffic Railing (42" Single-Slope),
   - Index 521-660 - Traffic Railing (42" Vertical Shape),
   - Index 521-820 - Pedestrian/Bicycle Railing
   - Index 515-021 - Pedestrian/Bicycle Bullet Railing
   - Index 521-820 - Bridge

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

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

5. Install Anchor Bolts plum.

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

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

---

ELEVATION BOTTOM BARS 4H2
(For Option 2)

BAR 4H1 & 4H2 (Plan View)

BAR 4G

BAR 4F1, 4F2, 4F3, 4F4 & 4F5

LIGHT POLE PEDESTAL NOTES

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

2. Lap Splices for Bars 4F1, 4F2 & 4F3 shall be a minimum of 1'-4".

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

ANCHOR PLATE DETAIL

LIGHT POLE PEDESTAL - BRIDGE

BILL OF REINFORCING STEEL

<table>
<thead>
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<th>SIZE</th>
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<th>TYPE</th>
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<tr>
<td>F1</td>
<td>4</td>
<td>16</td>
<td>5'-8&quot;</td>
<td>c</td>
</tr>
<tr>
<td>F2</td>
<td>4</td>
<td>4</td>
<td>4'-8&quot;</td>
<td>c</td>
</tr>
<tr>
<td>F3</td>
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<td>4'-2&quot;</td>
<td>a, c</td>
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<tr>
<td>F4</td>
<td>4</td>
<td>8</td>
<td>8'-3&quot;</td>
<td>b, c</td>
</tr>
<tr>
<td>F5</td>
<td>4</td>
<td>4</td>
<td>6'-7&quot;</td>
<td>c</td>
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<tr>
<td>G</td>
<td>4</td>
<td>8</td>
<td>6'-0&quot;</td>
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<td>H</td>
<td>4</td>
<td>2</td>
<td>15'-8&quot;</td>
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<td>J1</td>
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<td>8</td>
<td>4'-8&quot;</td>
<td>d</td>
</tr>
<tr>
<td>J2</td>
<td>4</td>
<td>12</td>
<td>4'-0&quot;</td>
<td>-</td>
</tr>
</tbody>
</table>

ANCHOR PLATES

Note a & b

---

ESTIMATED LIGHT POLE PEDESTAL QUANTITIES PER LIGHT POLE PEDESTAL

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<tbody>
<tr>
<td>Concrete Per Pedestal Thickness</td>
<td>CY/In.</td>
<td>0.040</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>195 (182)</td>
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</tbody>
</table>

(The Reinforcing Steel quantity shown in parenthesis is for a Pedestal attached to Pedestrian/Bicycle Railing - Index 521-820 with Bridge Deck or Approach Slab thinner than 1'-1/2". Add 59 lbs. for Bars 4J1 & 4J2 when Pedestal Thickness is 1'-5/8" or greater.)
**PEDESTRIAN/BICYCLE RAILING NOTIONS:**

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

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

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

**PAYMENT:** Concrete parapet shall be paid for under the contract unit price for 27" Concrete Parapet (Pedestrian/Bicycle), LF, and Rails shall be paid for under Bullet Railings, LF.

---

**ELEVATION OF INSIDE FACE OF RAILING**

(Reinforcing Steel not shown for clarity)

* See Structures Plans, Superstructure Sheets for actual dimensions and joint orientation. Open Parapet Joints at Deck Expansion Joint locations shall match the dimension of the Deck Joint. For Treatment of Railings on skewed bridges see Index 521-427. Deck Joint at Pier or Intermediate Bent similar.

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

---

**PLAN**

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

---

**SECTION A-A**

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

Bars P1 shown, Bars P2 similar
**ALTERNATE REINFORCING (WELDED WIRE REINF.) DETAILS**

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

**WELDED WIRE REINFORCEMENT (WWR)**

**SPICE DETAIL**  
(Between WWR Sections)

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>4</td>
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</tr>
<tr>
<td>P2</td>
<td>4</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>S</td>
<td>4</td>
<td>As Req'd</td>
</tr>
</tbody>
</table>

**ESTIMATED CONCRETE PARAPET QUANTITIES**

<table>
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<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<tr>
<td>Reinforcing Steel (P1 &amp; S)</td>
<td>LB/FT</td>
<td>6.35</td>
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<tr>
<td>Reinforcing Steel (P2 &amp; S)</td>
<td>LB/FT</td>
<td>6.68</td>
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</tbody>
</table>

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

**INTERMEDIATE JOINT SEAL NOTE:**

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

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the parapet on a retaining wall shall be the same as detailed above for a 8" deck.
3. All reinforcing steel at the open joints shall have a 2" minimum cover.
4. Bars 4S may be continuous or spliced at the construction joints. Bar splice 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.
**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>3</td>
<td>5'-2&quot;</td>
</tr>
<tr>
<td>S</td>
<td>4</td>
<td>As Reqd.</td>
</tr>
</tbody>
</table>

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

**ESTIMATED CONCRETE RAILING QUANTITIES**

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

**PLAN**

(Reinforcing Steel not shown for clarity)

**ELEVATION OF INSIDE FACE OF RAILING**

(Reinforcing Steel not shown for clarity)

**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.

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

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

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

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

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

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

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

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Clamps</td>
<td>A36 or A309 Grade 36</td>
<td>Ɓ Ø Steel 8</td>
</tr>
<tr>
<td>Base Plates</td>
<td>A36 or A239 Grade 36</td>
<td>Ɓ Steel G</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A36 or A209 Grade 36, 8209 Alloy 6061-T6 or 8221 Alloy 6063-T7</td>
<td>Plate thicknesses as required. Holes in shim plates will be 1½ Ø</td>
</tr>
<tr>
<td>Spacers</td>
<td>-</td>
<td>Plate thickness varies based on traffic railing type (See Detail &quot;A&quot;)</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods – 1½ Ø x 6&quot; (no spacer) or 1½ Ø x (6&quot; + spacer thickness)</td>
</tr>
<tr>
<td>C-1-P Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Hex Head Anchor Rods – 1½ Ø x 6&quot; (no spacer) or 1½ Ø x (6&quot; + spacer thickness)</td>
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<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods – 1½ Ø x 14½&quot;</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307</td>
<td>1½ Ø x 4½&quot; Hex Head Bolts for Pipe Clamp Connections to Posts</td>
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<tr>
<td>Nuts</td>
<td>A563</td>
<td>Hex Nuts for Pipe Clamp and Base Plate Connections</td>
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<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Pipe Clamp and Base Plate Connections</td>
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<tr>
<td>Bearing Pads</td>
<td>-</td>
<td>In accordance with Specification Section 932 for Ancillary Structures</td>
</tr>
</tbody>
</table>

### POST ATTACHMENT NOTES

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

**COATINGS:**

**ADHESIVE-BONDED ANCHORS AND DowELS:**
Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 946. Cutting of reinforcing steel is permitted for drilled hole installation.

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

### CROSS REFERENCE:
For location of View A-A and Detail "A" see Sheet 1.
Pull Post Assembly (required at maximum intervals of 500'-0")

- Post Cap (Typ.)
- Hog Rings @ 2'-0" Centers
- Ties @ 1'-0" Centers (Typ.)
- Tension Wire
- Brace Rail
- Chain Link Fabric
- Chain Link Fabric

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

- Tie tension wire to post with 9-gage zinc coated tie wire (triple wrap required at both ends of tie wire) (Typ.)
- Hog Rings @ 2'-0" Centers
- Traffic Railing (Type varies, 36" Single-Slope shown)
- Pipe Clamp
- Connection (Typ.)

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

2 1/8" C.I.P. Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Nuts and Washers

Pipe Clamp Detail

1/2" Holes for 3/8" Anchors (Typ.)

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

2 1/8" C.I.P. Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Nuts and Washers

Pipe Clamp Detail

1/2" Holes for 3/8" Anchors (Typ.)

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

For location of Detail "B" see Sheet 1.
**FENCING NOTES**

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

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

**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.

---

**NOTES:**
1. A Pull Post Assembly is required at maximum intervals of 500'-0". See Sheet 2.
**CHAIN LINK FENCE COMPONENTS**

### Pull Post Assembly Detail

**TABLE OF CHAIN LINK FENCE COMPONENTS**

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>F1083</td>
</tr>
<tr>
<td>Horizontal Rails</td>
<td>F1083</td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>F1083</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307</td>
</tr>
<tr>
<td>Nuts</td>
<td>A563</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</td>
</tr>
<tr>
<td>Chain Link Fabric</td>
<td>A392</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F626</td>
</tr>
<tr>
<td>Brace Bands</td>
<td>F626</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F626</td>
</tr>
</tbody>
</table>

### Expansion Assembly Detail

**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'.
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.

**LEGEND:**

- NPS = Nominal Pipe Size
- Chain Link Fabric
- Horizontal Rail
- Expansion Rail
- Expansion Joint Opening
- Bridge Deck (shown) or Raised Sidewalk
- Pull Post Assembly (required at maximum intervals of 500'-0"
- Horizontal Bars with Brace Bands (shown) or Combination Rail Ends with Brace Bands or Boulevards Clamps (Typ.)
- Tension Bars (5 required per Tension Bar - Space Equally @ 1'-3" Maximum Centers) (Typ.)
- Tension Band (one each side of pull post)
- Chain Link Fabric to allow for joint movement

FY 2019-20
STANDARD PLANS

BRIDGE FENCING (CURVED TOP)

INDEX

550-011

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### 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 A369 Grade 36</td>
<td>3/8 Steel ℄</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A36 or A369 Grade 36 or B209 Alloy 6061-T6 or B221 Alloy 6063-T5</td>
<td>Plate thicknesses as required. Holes in shim plates will be 3/8 ℄</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 (Plates) |                | 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 galvanising 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.

### DESCRIPTION:

For location of Detail "A" see Sheet 1.

### CROSS REFERENCE:

Bearing Pads (Plain) In accordance with Specification Section 932 for ancillary structures.
FENCING NOTES:

FENCING INSTALLATION:
Install posts plumb (within a tolerance of ± 1/4") 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.
COMPONENT INFORMATION

**COMPONENT** | **ASTM DESIGNATION** | **COMPONENT INFORMATION**
--- | --- | ---
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) | | 
Chain Link Fabric (2½' mesh with knuckled bottom selvages) | | 

**TABLE OF CHAIN LINK FENCE COMPONENTS**

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<tr>
<th>COMPONENT</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 3&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Horizontal Rails and Internal Sleeves</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 2½&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 2&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Chain Link Fabric (2' mesh with knuckled bottom selvages)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chain Link Fabric (2½' mesh with knuckled bottom selvages)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolts</td>
<td>A307</td>
<td>5/8&quot; 8 x 4½&quot; Hex Head Bolts for Internal Sleeve connections 5/8&quot; 8 x 4½&quot; Hex Head Bolts for Expansion Rail connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Internal Sleeve and Expansion Rail connections</td>
</tr>
<tr>
<td>Nuts</td>
<td>A563</td>
<td>Hex Nuts for Internal Sleeve and Expansion Rail connections</td>
</tr>
<tr>
<td>Brace Bands</td>
<td>F626</td>
<td>12 gage (Min. thickness) x 5&quot; (Min. width) Steel Bands (Beveled or Heavy)</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F626</td>
<td>5/8&quot; (Min. thickness) x 5&quot; (Min. width) Variable Height Steel Bars - Height = Tangent or Hoop Length - Barrier or Parapet Height - 2&quot; max</td>
</tr>
<tr>
<td>Tension Bands</td>
<td>F626</td>
<td>14 gage (Min. thickness) x 5&quot; (Min. width) Steel Bands</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F626</td>
<td>Zinc Coated Steel - (includes horizontal rail ends, combination rail ends, boulevard clamps and all other miscellaneous fittings and hardware)</td>
</tr>
</tbody>
</table>

**COMPONENT INFORMATION**

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<td>A307</td>
<td>5/8&quot; 8 x 4½&quot; Hex Head Bolts for Internal Sleeve connections 5/8&quot; 8 x 4½&quot; Hex Head Bolts for Expansion Rail connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Internal Sleeve and Expansion Rail connections</td>
</tr>
<tr>
<td>Nuts</td>
<td>A563</td>
<td>Hex Nuts for Internal Sleeve and Expansion Rail connections</td>
</tr>
</tbody>
</table>

**TABLE OF POST ATTACHMENT COMPONENTS**

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<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Clamps</td>
<td>A36 or A709 Grade 36</td>
<td>5/8&quot; Steel Bolt</td>
</tr>
<tr>
<td>Base Plates</td>
<td>A36 or A709 Grade 36</td>
<td>5/8&quot; Steel Bolt</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A36 or A709 Grade 36 or B209 Alloy 6061-T6</td>
<td>Plate thicknesses as required. Holes in shim plates will be 5/8&quot; Bolt</td>
</tr>
<tr>
<td>Spacers</td>
<td></td>
<td>Plate thickness varies based on Traffic Railing type (See Detail &quot;A&quot;)</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods - 5/8&quot; Ø x 6&quot; (no spacer) or 5/8&quot; Ø x (6&quot; + spacer thickness)</td>
</tr>
<tr>
<td>C-I-P Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Hex Head Anchor Rods - 5/8&quot; Ø x 6&quot; (no spacer) or 5/8&quot; Ø x (6&quot; + spacer thickness)</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods - 5/8&quot; Ø x 14½&quot;</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307</td>
<td>5/8&quot; 8 x 4½&quot; Hex Head Bolts for Pipe Clamp Connections to Posts</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</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. Corrosion:
- Hot-dip galvanize all Nuts, Washers, Bolts, C-I-P Anchor Rods, Adhesive Anchors and Fence Framework (Posts, Internal Sleeves, Shim Plates, Base Plates, Pipe Clamps and Spacers) in accordance with Specification Section 962. Hot-dip galvanize Fence Framework after fabrication. ADHESIVE-BONDED ANCHORS AND DOWELS:
- Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 946. 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.
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".

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 ± 1/4"). 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.
- Install traffic railing in accordance with Superstructure Sheets.

TRAFFIC RAILING DETAILS:
- 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.
- 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.

LIMITS OF FENCING:

PAYMENT:
- Payment will be made under Fencing, Type R. Payment includes all materials and labor required to complete installation of the fence.
- Do not anchor Fencing to the top of Traffic Railings.

FENCING NOTES

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