FENCING TERMINALS AT BRIDGE ENDS (ROADWAY)

FENCING TERMINALS AT BRIDGE ENDS (STREAM CROSSING)

FENCING TERMINALS AT BOX CULVERTS

FENCING DETAIL AT CULVERT

Note: When height of headwall is 4' or less (drainage pipe 36" or less) the fence shall not be tied to the headwall, but shall span the lateral ditch.

L.A. R/W Line

Approach Slab

Natural Ground

Gutter Transition

Shoulder Line

Tee Of Slope

Natural Ground

Tee Of Slope

Proposed Fence

Plan

Pictorial View

Elevation

Fence Locations At Cross Drains With Excavated Outfall Ditches Or As Shown In Plans.
NOTE: LA R/W along the crossroad will extend a minimum 300' beyond the end of the acceleration or deceleration ramp, established by the ramp return or radius point as noted above. LA R/W will be established by the ramp return or radius point as noted above.

For interchange quadrants having no ramp the LA R/W will extend along the crossroad to a point opposite the limit of LA R/W established by the ramp return or radius point as noted above.

For interchange quadrants having no ramp the LA R/W will extend along the crossroad to a point opposite the limit of LA R/W established by the ramp return or radius point as noted above.

APPLIES TO BRIDGE OVER CROSSTRADE AND CROSSTRADE OVER FREEWAY (BRIDGE OVER CROSSTRADE SHOWN)

FENCING TERMINALS AT RURAL INTERCHANGES

RETAINING WALL

6" Where Footing Permits

6" Where Footing Permits

LA R/W Line

Fence

ELEVATION

FENCING TERMINALS AT RETAINING WALLS

6" Where Footing Permits

LA R/W Line

Fence

ELEVATION

FENCING TERMINALS AT RETAINING WALLS

LA R/W Line

Fence

ELEVATION

FENCING TERMINALS AT RETAINING WALLS

LA R/W Line

Fence

ELEVATION

FENCING TERMINALS AT RETAINING WALLS

LA R/W Line

Fence

ELEVATION

FENCING TERMINALS AT RETAINING WALLS

LA R/W Line

Fence

ELEVATION

FENCING TERMINALS AT RETAINING WALLS

LA R/W Line

Fence

ELEVATION

FENCING TERMINALS AT RETAINING WALLS

LA R/W Line

Fence

ELEVATION

FENCING TERMINALS AT RETAINING WALLS

LA R/W Line

Fence

ELEVATION

FENCING TERMINALS AT RETAINING WALLS

LA R/W Line

Fence

ELEVATION

FENCING TERMINALS AT RETAINING WALLS

LA R/W Line

Fence

ELEVATION

FENCING TERMINALS AT RETAINING WALLS

LA R/W Line

Fence

ELEVATION

FENCING TERMINALS AT RETAINING WALLS

LA R/W Line

Fence

ELEVATION

FENCING TERMINALS AT RETAINING WALLS

LA R/W Line

Fence

ELEVATION
GENERAL NOTES

1. This fence to be provided generally in rural areas. For supplemental information see Section 550 of the FDOT Specifications.

2. Fabric shall be woven wire, either galvanized steel, meeting the requirements of ASTM A120, No. 9 Grade 60, Design Number 1047-6-9, with Class 2 zinc coating; No. 12 ½ Grade 75, Design Number 1047-6-12 ½, with a 10 1/2 gauge top and bottom wire and with Class 3 zinc coating; or aluminum coated steel, meeting the requirements of ASTM A526, No. 9 Farm, Design Number 1047-6-9, with a minimum coating weight of 0.40 oz./ft². For additional information see payment note below.

3. Fence shall be installed with wire to private property except on horizontal curves greater than 3° the fence shall be installed as to pull against all posts.

4. Posts may be either timber, steel, recycled plastic or concrete. Unless a specific post material is called for in the plans, the Contractor shall use either a single material or a combination of timber, steel, recycled plastic or concrete materials. Line posts of one material may be used with corner, pull and end post assemblies of a different material. Line posts of only one optional material and pull posts of only one optional material will be permitted between corner and post assemblies. Within individual corner and end post assemblies only one optional material will be permitted.

5. Timber posts shall meet the material requirements of Specification Section 954. Timber line posts are to be minimum 4' diameter. Timber corner, pull, approach and end posts are to be a minimum 3' diameter. Timber corner, pull, approach and end posts are to be minimum 4' diameter.

(A) Staples for line posts to be 1¼ x 2¾ x 4' angles, 8 long; rolled formed studwall; anchor plate attached (23 in.²).

(B) Approaches to be provided for attaching brace; with necessary hardware, clamps, etc.

(C) Pulls and end posts: 3½ x 3½ x 4' angles, 8 long; fabricated for attaching brace; with necessary hardware, clamps, etc.

(D) Braces: 2½ x 2½ x 4' angles with necessary hardware and fabricated for attaching to post.

(E) The pull, corner, approach and end posts are to be set in concrete as per detail. (Also see General Note 11.)

6. Steel posts and braces shall be standard steel posts, galvanized at the rate of 2 oz./ft², together with necessary hardware and wire and meeting the following requirements:

(A) Line posts: 8 long; 1 1/2 lbs./ft.; rolled formed studwall; anchor plate attached (23 in.²).

(B) Approach posts: 2½ x 2½ x 4' angles, 8 long; fabricated for attaching brace; with necessary hardware, clamps, etc.

(C) Pull, end and corner posts: 3½ x 3½ x 4' angles, 8 long; fabricated for attaching brace; with necessary hardware, clamps, etc.

7. Recycled plastic posts shall meet the following material requirements: the line posts shall have a minimum section of 4" x 4". Plastic posts shall not be used as corner, pull, end or approach posts unless such use is specifically detailed in the plans. The straightness of the post shall comply with 954-5 for timber post. The overall length and material requirements of the latest edition of the Southern Pine Inspection Bureau's Standard Grading Rules for Southern Pine Lumber for No. 2SM Stress Rated Grade Timber. Plastic posts can be set by either digger and tamp harrow or by driving into full depth preformed holes ½ to ¾ smaller than cross section of post. Staples for fabric and barbed wire connection to plastic line posts shall be the same size, count and location as that for timber posts.

8. The Contractor, at his option, may use any suitable precast or prestressed concrete posts; however, approval by the Engineer, of posts not shown on this index, will be required prior to construction of the fence. Precast posts shall be Class III concrete. Lengths of concrete post to be as indicated for timber posts.

9. Aluminum posts, braces and accessory framing hardware shall not be used unless the plans specifically detail their application or the Engineer specifically approves their incorporation in fence construction or repair. Aluminum framed gates are permitted as described in General Note 19.

10. The woven wire shall be attached to steel and concrete posts by a minimum of four tie wires. The single wire ties shall be applied to the top, bottom and three intermittent line wires. The ends of each tie wire shall have a minimum of two tight turns around the line wire. Tie wires shall be steel wire not less than 0.120" diameter, zinc coating Class 3, soft temper, in accordance with ASTM A463.

11. Steel Barbed Wire shall be either of the following types:

(A) Type I: This type shall conform to the requirements of ASTM A121, with two strands of 12½ gauge wire; four-point barbs, wire size 14 gauge twisted around both line wires; and Class 3 coatings. Design No. 12-4-5-14R.

(B) Type II: Same as Type I except the two wire strands are twisted in alternating directions between consecutive barbs. Design No. 15-4-6-16R.

(C) Type III: Same as Type I except Class NS concrete shall be used as approved by the Engineer. Design No. 15-3-6-16R.

12. The woven wire shall be stretched only until it shall be pulled out of the line wires.

13. Posts to be set by driving or digging. If by digging, the posts shall be set at the center of the hole and the soil tamped securely on all sides.

14. Longer posts than those indicated above may be required by the plans or for deeper installations.

15. Concrete bases for angular steel posts (pull, corner, end and approach) shall be Class NS as specified in Section 342. Materials for Class NS concrete may be proportioned by volume or weight.

16. Pull post assemblies shall be installed at approximately 330' centers except that this maximum interval may be reduced by the Engineer on curves where the radius is less than 3°.

17. Corner post assemblies are to be installed at all horizontal and vertical breaks in fence of 12° or more.

18. A maximum length of 1320' of wire may be installed as a unit. For pulls through a pull post assembly the fabric shall be spliced by crimping sleeves only. Pulls through a corner post assembly will not be permitted.

19. Unless otherwise carried for in the plans gates shall be commercially available metal swing gates assembled and installed in accordance with the manufacturer's specifications as approved by the Engineer. Chain link swing gates in accordance with Index No. 803 may be substituted for metal swing gates as approved by the Engineer. Gate size is full opening width whether single leaf or double leaves. Payment for gates shall include the gate, single or double, all necessary hardware for installation and any additional length and/or size for posts at the opening. Gates shall be paid for under the contract unit price for fence gates, EA.

20. For construction purposes, assemblies are defined as follows: End post assemblies shall consist of: one end post, one approach post, two braces, four diagonal tension wires and all necessary fittings and hardware. Corner post assemblies shall consist of: one pull post, two braces, four diagonal tension wires and necessary fittings and hardware. Corner post assemblies shall consist of: one end post, two approach posts. Four braces, eight diagonal tension wires and all necessary fittings and hardware.

21. All posts, braces, tension wires, fabric wires, tie wires, Class NS concrete, and all miscellaneous fittings and hardware to be included in the cost for Fencing, LF. Fencing shall be inclusive of the lengths of pull, end and corner post assemblies, but exclusive of gate widths.
This index details fencing that is constructed with farm fabric (4") in height and with specific ground clearance and specific barbed wire spacings. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.

Fence Position at Locations Without Frontage Roads

(Refer to detail plans for fence position at locations with frontage roads.)

Design Note

Note: Timber Post Illustrated.

Typical:
- Two No. 9 Gage Wires
  - Twisted To Singing
  - Soft Temper, Galvanized
  - At The Rate Of 1.8
  - oz./ft.²; ASTM A641

(47" nominal) in height and with specific ground clearance and specific barbed wire spacings. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.
**REVISION NO. 801**

**FENCE TYPE A**

**DESCRIPTION:**

**ALTERNATE CONCRETE POSTS AND BRACES**

**FASTENER FOR CONCRETE POST AND BRACES**

**FASTENER FOR TIMBER POST AND BRACE**

**PRECAST POST**

**PRECAST BRACE**

**CORNER POSTS**

**END AND PULL POSTS**

Each horizontal wire to be wrapped around corner, end and pull posts and tied to same wire. See General Notes 5 and 17. Timber post illustrated. These methods also apply to steel and concrete post illustrations.

**SPLICES**
1. This fence is to be used generally in urban areas.

2. For supplemental information refer to Section 550 of FDOT Standard Specifications.

3. Chain link fabric, post, truss rods, tension wires, tie wires, stretcher bars, gates and all miscellaneous fittings and hardware shall meet the requirements of AASHO and FDOT and signify current reference.

4. Fence Component Options:
   A. Line post options:
      (1) Galvanized steel pipe, Schedule 40, 15'' nominal dia., zinc galvanized at the rate of 1.8 oz./ft²: ASTM A53 Table 3, Grade A or B, ASTM F1083, and AASHTO M111.
      (2) Aluminum coated steel pipe: ASTM A53, Table 2, Grade A or B, Schedule 40, 15'' nominal dia., 1900 psi, coated at the rate of 0.8 oz./ft²: AASHTO M111.
      (3) Aluminum alloy pipe, 2'' nominal dia., ASTM B241 or B221, Alloy 6063, T6.
      (4) Steel H-Beam - 16'' x 12'' x 1'', Zinc Galv. 1.8 oz./ft²: AASHTO M111 and Detail.
      (5) Aluminum alloy H-Beam - 16'' x 12'', 0.9 oz./ft², alloy 5456, H192.
      (6) Steel C - 1/8'' x 15/16'', 0.9 oz./ft², zinc, AASHTO M111, 0.9 oz./ft², zinc-5% aluminum-magnesium alloy, ASTM B331, and Detail.
      (7) Stainless steel pipe, 16 oz./ft², stainless steel, wall thickness of 0.0003'' min., internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.
   B. Corner, end and pull post options:
      (1) Galvanized steel pipe, Schedule 40, 2'' nominal dia., zinc galvanized at the rate of 1.8 oz./ft²: ASTM A53 Table 3, Grade A or B, ASTM F1083, and AASHTO M111.
      (2) Galvanized or aluminum coated steel pipe, ASTM A53 steel, 2'' Tables, Schedule 40, 2'' nominal dia., 1900 psi, coated at the rate of 1.2 oz./ft²: AASHTO M111.
      (3) Aluminum alloy pipe, 2'' nominal dia.: ASTM B241 or B221, Alloy 6063, T6.
      (4) Galvanized or aluminum alloy pipe, 2'' nominal dia.: ASTM A53, Schedule 40, 1.900'' OD, 1.120'' min. wall, and min. wt. 1.836 lb./ft.; with ASTM F1043 metric equivalent internal coating Types A, B, C or D and external coating Types A, B, C or D, the chrome conversion coating of external Type B shall have a thickness of 15µg/in², and the polymer film topcoats shall have a thickness of 0.0003'' min. internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.
      (5) Stainless steel pipe, 16 oz./ft², stainless steel, wall thickness of 0.0003'' min., internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.
      (6) Galvanized steel pipe, Schedule 40, 6'' nominal dia., 1.900'' OD; coated at the rate of 0.40 oz./ft²: AASHTO M111; or, 0.9 oz./ft², zinc-5% aluminum-magnesium alloy, ASTM F1043 and Detail.
      (7) Stainless steel pipe, 16 oz./ft², stainless steel, wall thickness of 0.0003'' min.; internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.

C. Rail options:
   (1) Galvanized steel pipe, Schedule 40, 15/8'' nominal dia, zinc galvanized at the rate of 1.8 oz./ft²: ASTM A53 Table 3, Grade A or B, ASTM F1083, and AASHTO M111.
   (2) Aluminum coated steel pipe, ASTM A53 steel, 2'' Tables, Schedule 40, 2'' nominal dia., 1900 psi, coated at the rate of 0.8 oz./ft²: AASHTO M111.
   (3) Aluminum alloy pipe: 15/8'' nominal dia.: ASTM B241 or B221, Alloy 6063, T6.
   (4) Resistance welded steel pipe, 30,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undeployed stock of discontinued A446/A446M base materials; ASTM F1043 Group 19. (Alternative Design): Fence industry 15/8'' OD, 1.120'' min. wall, and min. wt. 1.836 lb./ft.; with ASTM F1043 metric equivalent internal coating Types A, B, C or D and external coating Types A, B, C or D, the chrome conversion coating of external Type B shall have a thickness of 15µg/in², and the polymer film topcoats shall have a thickness of 0.0003'' min. internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.
   (5) Stainless steel pipe, 16 oz./ft², stainless steel, wall thickness of 0.0003'' min.; internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.

D. Chain link fabric options (2' mesh with twisted and barbed selvage top and bottom for all options except as described in Note 10):
   (1) Galvanized M11 (Type I) - Zinc Coated Steel, No. 7 gage (coated wire diameter), coated at the rate of 1.8 oz./ft²: M181 Class D 2.0 oz./ft², Modified to 1.8 oz./ft².
   (2) AASHTO M111 (Type II) - Aluminum alloy wire with a diameter of 0.1443'' or larger conforming to the requirements of ASTM B211, Alloy 5056 Temper H38, or, Alclad Alloy 5056 Temper H192.
   (3) AASHTO M111 (Type III) - Aluminum alloy wire with a diameter of 0.1443'' or larger conforming to the requirements of ASTM B211, Alloy 5056 Temper H38, or, Alclad Alloy 5056 Temper H192.
   (4) Galvanized M181 (Type IV) - Polystyrene (Chloride PVF) Coated Steel, No. 9 gage (coated wire diameter, core wire-zinc coated steel, PVC coating M181 Class A (either extruded or bonded) or M181 Class B (bonded)). See table right. Unless the plans call for M181 standard colors medium green, dark green or black the coating color shall be soft gray matching that of No. 30632 of Federal Standard 595a.

E. Tension wire options:
   (1) Steel wire No. 7 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M181.
   (2) Steel alloy wire with a diameter of 0.1875'' or larger conforming to the requirements of ASTM F1043, ASTM F669 Group IV, or, Actual Alloy ASTM F669 Group IV.
   (3) Galvanized steel wire No. 7 gage coated at the rate of 0.8 oz./ft²: AASHTO M181.

F. Tie wire and hog ring options:
   (1) Steel wire No. 7 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M181.
   (2) Steel alloy wire with a diameter of 0.1875'' or larger conforming to the requirements of ASTM F1043, ASTM F669 Group IV, or, Actual Alloy ASTM F669 Group IV.
   (3) Galvanized steel wire No. 7 gage coated at the rate of 0.8 oz./ft²: AASHTO M181.
GENERAL NOTES CONTINUED

5. Unless a specific material is called for in the plans the Contractor may elect to use either a single
type of material or a combination of material types from the component options listed in note 4.
Combinations of optional materials are restricted as follows:
(a) Only one fabric optional material will be permitted between corner and/or end post assemblies.
(b) Only one line post optional material will be permitted between corner and/or end post assemblies.
(c) Pull post assemblies shall be optional materials identical to either the line post optional material
or the corner and end post assembly optional material; but, pull post assemblies shall be the same
optional material between any set of corner and/or end post assemblies.

6. Concrete for bases shall be Class NS concrete as specified in Section 347 of the Standard Specifications
or a packaged, dry material meeting the requirements of a concrete under ASTM C-387. Materials for
Class NS concrete may be proportioned by volume and/or by weight.

7. Line post shall be 6'-6" long (Standard). Line post are to be set in concrete as described above or
by the following methods:
(a) In accordance with special details and/or as specifically described in the contract plans
and specifications.
(b) In accordance with ASTM F567 Subsections 5.4 through 5.10 as approved by the Engineer.
(c) Line post installed in accordance with Section 5.8 shall be 9'-6" long.
End, pull and corner post assemblies shall be in concrete as detailed above for all soil conditions other than
soil rock. Post within assemblies that are located on concrete structures or solid rock shall be set by
base plate or by embedment as prescribed under (b) above for line post.
Line and assembly posts for 6' fence which must be lengthened due to a variation in the normal ground
clearance, shall be set an additional 3' in depth for each 3' of additional ground clearance.

8. Pull post shall be used at breaks in vertical grades of 15º or more, or at approximately 350' centers
except that this maximum interval may be reduced by the Engineer on curves where the curve is
greater than 3º.

9. Corner post are to be installed at all horizontal breaks in fence at 15º or more and as required at vertical
breaks over 15º as determined by the Engineer.

10. When fence has an installed top of fabric height less than 6' knuckled top and bottom selvages shall
be used unless the plans specifically identify locations for twisted selvage fabrics.

11. Unless sliding gates or special gates are called for in the plans, all gates shall be chain link swing gates
meeting the material requirements described and as approved by the Engineer. Payment shall include the
gates, single or double, all necessary hardware for installation and any additional length and/or size for
posts at the opening. Gates shall be paid for under the contract unit price for Fence Gates, EA.

12. For construction purposes corner post assemblies shall consist of one corner post, two braces, two truss
rods, and all necessary fittings and hardware as detailed. End post assemblies shall consist of one end post,
one brace, one truss rod and all necessary fittings and hardware as detailed.

13. In areas where there are physical constraints outside the right-of-way which restricts the fence construction,
the fabric may be installed on the inside of the posts.

TYPE IV VINYL COATED FABRIC

AASHTO M181 Table 4 Redefined As Follows

<table>
<thead>
<tr>
<th>Specified Diameter Of Metallic Coated Core Wire</th>
<th>Minimum Weight Of Zinc Coating</th>
<th>M41 Class A (Extruded Or Extruded And Bonded Coating)</th>
<th>M41 Class B (Extruded Coating)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in.</td>
<td>mm</td>
<td>oz./ft²</td>
<td>g/m²</td>
</tr>
<tr>
<td>0.015</td>
<td>0.38</td>
<td>0.025</td>
<td>0.64</td>
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</table>

DESIGN NOTE

This Index details fencing that is constructed with chain link fabric 6' (nominal) in
height and with specific ground clearance.
For fencing of different height or installation details, the fence shall be fully detailed
in the Contract plans.
Fence Mounting on Concrete Endwall and Retaining Walls

**Fence Type B**

**Fence Position at Locations Without Frontage Roads**

Refer to Detail Plans for Fence Position at Locations With Frontage Roads

**Notes**

Attachments to be used only when called for in the plans.

Attachments to extend in direction of restraint, unless otherwise called for in plans, direction of restraint will be as follows:

(a) Outward on limited access right of way line.
(b) Outward on controlled access right of way line.
(c) Outward from lateral ditches, outfalls, retention basins, canals, borrow areas and similar support facilities located within highway right of way.
(d) Outward from lateral ditches, canals, retention basins, canals, borrow areas and similar support facilities.
(e) Outward on pedestrian ways.

The cap-arm shall be designed to provide a drive fit over the top of posts and to exclude moisture in posts with tubular sections.

**Base Plate and Anchor Notes:**

1. Base plate identical for line, pull, end and corner posts and shall be considered an integral part of the respective posts for basis of payment.
2. Post to be plumbed by grout shim under base plate.
3. Anchors (Galvanized Steel):
   - 12" Cast In Place, 100% Embedment
   - Headed Bolts, U-Bolts or Cluster Plates
   - Anchors shall be spliced for bolts set in drilled holes with an Adhesive Material System in accordance with Specification Sections 416 and 937. Drilled holes shall be 1/2" larger in diameter than the anchor bolt.
   - Expansion Bolts Not Permitted.

**Barb Wire Attachment**

**Fence To Be Mounted On**

- Anchor Side unless otherwise called for in plans (See Notes)

**Table:**

<table>
<thead>
<tr>
<th>Material</th>
<th>Area (in.²)</th>
<th>Weight (lb/ft)</th>
<th>Tensile Strength (psi Min.)</th>
<th>Yielding Point (psi Min.)</th>
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</thead>
<tbody>
<tr>
<td>Steel</td>
<td>724</td>
<td>5.7 ± 5%</td>
<td>60,000</td>
<td>22,000</td>
</tr>
<tr>
<td>Aluminum</td>
<td>724</td>
<td>0.91 ± 5%</td>
<td>30,000</td>
<td>25,000</td>
</tr>
</tbody>
</table>

**Dimensions:**

- Bottom: 1/8" x 1 1/8" H-Beam Line Post
- Optional: 1/8" x 1 1/8" H-Beam Line Post
- Fence To Be Mounted On Anchor Side

**Design Standards:**

- 2016
- Last Revision: 07/01/09
- Description: FODT
- Index: 802
- Sheet: 3 of 3
CANTILEVER SLIDE GATE TYPE B FENCE

DESIGN STANDARDS

INDEX NO. 803

DESCRIPTION:

REVISION NO.

SHEET NO.

1

1 of 1

GENERAL NOTES

1. Extruded, rolled or formed components that provide equal strength and stability may be used in lieu of the pipe components shown; and, internal rollers may be used in lieu of the external roller units shown.

Gate components shall meet or exceed the protective coatings specified on Index No. 802.

2. Steel gate frame shall be fabricated prior to galvanizing, except that truss rods may be fabricated following frame galvanizing provided surfaces damaged during welding are galvanized in accordance with Section 24 of AASHTO M36; or, fabricated from pipe components with protective coating meeting the requirements of Index No. 802 that are tolerant of welding (low burn back), and a protective coating applied to the weld and damaged pipe surfaces that is equivalent to the protective coating of the fabricated pipe stock.

3. All fabric shall be knuckled top and bottom selvages.

Concrete for bases shall be either Class RS concrete as specified in Section 347 of the Standard Specifications or a packaged, dry material meeting the requirements of a concrete under ASTM C-389. Materials for Class RS concrete may be proportioned by volume and/or by weight.

4. Cost of all gate components shall be included in the contract unit price for Sliding Fence Gate (Cantilever), EA.

5. Cost of all gate components shall be included in the contract unit price for Sliding Fence Gate (Cantilever), EA.

DETAIL A

DETAIL B

TYPICAL FRAME - 24' Opening

TYPICAL FRAME - 12', 16' & 20' Opening

FRONT ELEVATION

GATE OPENING

GATE FRAME

BACK FRAME

12
12.3'
6
16
16.3'
8
20
20.3'
10
24
24.3'
12

SUPPORT POST

DETAIL

ROLLER SPACER BAR

1" Dia. Predrilled Hounuting Hole One End

1/4" Bar

Cut Bar To Length And Drill Bottom Hole In Field - Regalvanize Cut And Drilled Surfaces

2" Nom. Dia. Pipe 2.375" OD 365#/FL. (Top & Bottom Members)

4" Ø Support Post Sch. 40 Steel Pipe 39⁄16" Nom. Dia. 4" OD 9.11#/FL. 12' Long

DETAIL A

P-4 OD Pipe Vertical Member

Gate (Cantilever), EA.

Cost of all gate components shall be included in the contract unit price for Sliding Fence Gate (Cantilever), EA.
**FENCING NOTES**

**FENCE INSTALLATION:**
Install posts plumb (within a tolerance of ± 1/8") and use shim plates 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 F 567 as applicable.

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

**CONCRETE PARAPET DETAILS:**
See Index No. 820 – Pedestrian/Bicycle Railing for Concrete Parapet details. Provide fencing in lieu of aluminum bullet railing as shown on Index No. 820.

**LIMITS OF FENCING:**
Limits of fencing are from the 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, 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, Table of Post Attachment Components, View A-A and Detail "A" see Sheet No. 2.
For Pull Post Assembly Detail for Traffic Railing Barriers see Sheet No. 3.
For Pull Post Assembly Detail for Concrete Parapets and Detail "B" see Sheet No. 4.

* Fencing shall not anchor to the top of Traffic Railings.
TABLE OF CHAIN LINK FENCE COMPONENTS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>F 1083</td>
<td>Galvanized Steel Pipe - 3&quot; NPS, Schedule 40 (3.305&quot; Outside Diameter, 0.210&quot; Wall Thickness)</td>
</tr>
<tr>
<td>Chain Link Fabric (3&quot; mesh with twisted top and knurled bottom seizure)</td>
<td>A 392</td>
<td>Zinc Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F 626</td>
<td>3/8&quot; (Min. thickness) x 3/8&quot; (Min. width) x 5'-10&quot; (Min. height) Steel Bars</td>
</tr>
<tr>
<td>Horizontal Rails</td>
<td>F 1083</td>
<td>Galvanized Steel Pipe - 3/8&quot; NPS, Schedule 40 (0.207&quot; Wall Thickness)</td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>F 1083</td>
<td>Galvanized Steel Pipe - 2&quot; NPS, Schedule 40 (2.737&quot; Outside Diameter, 0.154&quot; Wall Thickness)</td>
</tr>
<tr>
<td>Bolts</td>
<td>A 307</td>
<td>3/4&quot; Ø x 4½&quot; Hex Head Bolts for Expansion Rail Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F 436</td>
<td>Flat Washers for Expansion Rail Connections</td>
</tr>
<tr>
<td>Tension Wire</td>
<td>A 824 &amp; A 817</td>
<td>Type II (Zinc Coated Steel Wire) - No. 7 gage, Class 4 Coating</td>
</tr>
<tr>
<td>Hog Rings</td>
<td>F 626</td>
<td>Zinc Coated Steel Wire - No. 12 gage</td>
</tr>
<tr>
<td>Brace Rails</td>
<td>F 1083</td>
<td>Galvanized Steel Pipe - 1½&quot; NPS, Schedule 40 (1.660&quot; Outside Diameter, 0.140&quot; Wall Thickness)</td>
</tr>
</tbody>
</table>

TABLE OF POST ATTACHMENT COMPONENTS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Clamps</td>
<td>A 36 or A 709 Grade 36</td>
<td>Steel Ø</td>
</tr>
<tr>
<td>Base Plates</td>
<td>A 36 or A 709 Grade 36</td>
<td>Steel Ø</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A 36 or A 709 Grade 36</td>
<td>Steel Ø</td>
</tr>
<tr>
<td>Spacers</td>
<td>-</td>
<td>1/16&quot; Ø for all materials</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F 1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods - 3/8&quot; Ø x 6&quot; (no spacer) or 3/8&quot; Ø x 1½&quot; (with spacer)</td>
</tr>
<tr>
<td>C-1-P Anchor Rods</td>
<td>F 1554 Grade 36</td>
<td>Hex Head Anchor Rods - 3/8&quot; Ø x 6&quot; (no spacer) or 3/8&quot; Ø x 1½&quot; (with spacer)</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F 1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods - 3/8&quot; Ø x 1½&quot;</td>
</tr>
<tr>
<td>Bolts</td>
<td>A 307</td>
<td>5/8&quot; Ø x 4½&quot; Hex Head Bolts for Pipe Clamp Connections to Posts</td>
</tr>
<tr>
<td>Nuts</td>
<td>A 563</td>
<td>Hex Nuts for Pipe Clamp and Base Plate Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F 436</td>
<td>Flat Washers for Pipe Clamp and Base Plate Connections</td>
</tr>
<tr>
<td>Neoprene Pads</td>
<td>-</td>
<td>In accordance with Specification Section 932</td>
</tr>
</tbody>
</table>

POST ATTACHMENT NOTES

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

COATINGS:

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

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

CROSS REFERENCE:
For location of View A-A and Detail "A" see Sheet No. 1.
Bridge Deck (shown) or Raised Sidewalk

Tension Wire

Pipe Clamp (Type)

Post Cap (Typ.)

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

NOTES:
1. For treatment at bridge ends, see Sheet No. 1.
2. The 3'-0" Dimension shown is for expansion joint openings 9" or less. If the expansion joint opening exceeds 9", increase this dimension by the difference between the expansion joint opening and 9".

Pipe Clamp Connection (Typ.)

Pipe Clamp Detail

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

Pipe Clamp Connection Detail (Connection without spacer shown, Connection with spacer similar)
Bulge Chain Link Fabric to allow for joint movement (See Note 2)

3'-0" + Expansion Joint Opening

Expansion Rails

- Pull Post
- Line Post
- Horizontal Rail

- Ties @ 2'-0" Centers
- Tension Bar (one each side of pull post) (Typ.)
- Chain Link Fabric
- Ties @ 1'-0" Centers (Typ.)

Concrete Parapet

Rail Ends with Brace Bands (shown) or Combination Rail Ends with Brace Bands or Boulevards Clamps (Typ.)

Ties @ 2'-0" Centers

Bridge Deck (shown) or Raised Sidewalk

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

CROSS REFERENCE:
For location of Detail "B" see Sheet No. 1.

NOTES:
1. For treatment at bridge ends, see Sheet No. 1.
2. The 3'-0" dimension shown is for expansion joint openings 9" or less. If the expansion joint opening exceeds 9", increase this dimension by the difference between the expansion joint opening and 9".
3. This Dimension is the expansion joint opening plus ½". Expansion rails are required at expansion joint locations where the total movement exceeds 1", but it is less than or equal to 6". Expansion rails are part of expansion assemblies when the total movement exceeds 6". Install expansion rails midway between the fence posts spanning the expansion joint.
4. Install nuts for expansion rails finger-tight. Nuts 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.

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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 ± 1½"). 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 F 567 as applicable.

CONCRETE PARAPET DETAILS:
See Index No. 820 – Pedestrians/Bicycle Bullet Railing for Concrete Parapet details. Provide fencing in lieu of aluminum bullet railing as shown on Index No. 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 No. 2 of 3.
For Table of Post Attachment Components and Detail “A” see Sheet No. 3 of 3.
Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc Coated Wire (metallic-coated core wire diameter) ~ Specify the color of the polymer coating in the General Notes.

Aluminum Coated Steel - No. 9 gage (coated wire diameter)

Zinc Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating

Flat Washers for Expansion Rail Connections

Hex Nuts for Expansion Rail Connections

Galvanized Steel Pipe - 3" NPS, Schedule 40 (3.500" Outside Diameter, 0.216" Wall Thickness)

F 1083

F 1083

F 1083

A 307

A 563

F 436

A 392

A 491

F 668

F 626

F 626

F 626

F 626

Miscellaneous Fence Components

Tension Bands (5 required per Tension Bar ~ Space Equally @ 1'-3" Maximum Centres) (Typ.)

Ties @ 2'-0" Centers (Typ.)

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

Chain Link Fabric

Concrete Parapet

NOTES:
1. This Dimension is the expansion joint opening plus \( \frac{1}{4} " \).
   Expansion rails are required at expansion joint locations where the total movement exceeds 1", but is less than or equal to 6". Expansion rails are part of expansion assemblies when the total movement exceeds 6". Install expansion rails midway between the fence posts spanning the expansion joint.

2. Install nuts for expansion rails finger-tight. Nuts 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.

3. For treatment at bridge ends, see Sheet No. 1 of 3.

4. The 3'-0" dimension shown is for expansion joint openings 9" or less. If the expansion joint opening exceeds 9", increase this dimension by the difference between the expansion joint opening and 9".

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

EXPANSION ASSEMBLY DETAIL

TABLE OF CHAIN LINK FENCE COMPONENTS

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
<th>ASTM DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>F 1083</td>
</tr>
<tr>
<td>Horizontal Rails</td>
<td>F 1083</td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>F 1083</td>
</tr>
<tr>
<td>Bolts</td>
<td>A 307</td>
</tr>
<tr>
<td>Nuts</td>
<td>A 563</td>
</tr>
<tr>
<td>Washers</td>
<td>F 436</td>
</tr>
<tr>
<td>Chain Link Fabric</td>
<td>A 392</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F 668</td>
</tr>
<tr>
<td>Brace Bands</td>
<td>F 626</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F 626</td>
</tr>
<tr>
<td>Tension Bands</td>
<td>F 626</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F 626</td>
</tr>
</tbody>
</table>

LEGEND:  NPS = Nominal Pipe Size
**POST ATTACHMENT NOTES**

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

COATINGS:

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

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

### 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>A 36 or A 709 Grade 36</td>
<td>$\frac{3}{8}$ Steel Ø</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A 36 or A 709 Grade 36 or Ö 209 alloy 6061-T6 or Ö 221 alloy 6063-T6</td>
<td>Plate thicknesses as required. Holes in shim plates will be $\frac{3}{8}$ Ø</td>
</tr>
</tbody>
</table>
| Adhesive Anchor Rods | F 1554 Grade 36 | Fully threaded Headless Anchor Rods – $\frac{3}{8}$ Ø x 14"
| C-I-P Anchor Rods  | F 1554 Grade 36 | Hex Head Anchor Rods – $\frac{3}{8}$ Ø x 14"
| Nuts               | A 563            | Hex Nuts for Base Plate Connections        |
| Washers            | F 436            | Flat Washers for Base Plate Connections    |
| Neoprene Pads      | -                | In accordance with Specification Section 932 |

**CROSS REFERENCE:**
For location of Detail "A" see Sheet No. 1 of 3.
FENCING NOTES:

1. A Pull Post Assembly is required at maximum intervals of 500'-0". See Sheet No. 3 of 4.
2. Dimension is measured along Inside Face of Concrete Parapet.
3. Dimension shown is for 32" F-Shape Traffic Railing Barriers as shown in Index No. 420.
   Adjust as required for other Traffic Railing Barriers and sidewalk widths.
4. For sidewalk clear widths greater than 5'-0", increase the radius and height of the curved portion of the Hoop Post at the rate of 6" for every one foot increase in sidewalk width.

ELEVATION AT INSIDE FACE OF CONCRETE PARAPET

NOTES:

1. A Pull Post Assembly is required at maximum intervals of 500'-0". See Sheet No. 3 of 4.
2. Dimension is measured along Inside Face of Concrete Parapet.
3. Dimension shown is for 32" F-Shape Traffic Railing Barriers as shown in Index No. 420.
   Adjust as required for other Traffic Railing Barriers and sidewalk widths.
4. For sidewalk clear widths greater than 5'-0", increase the radius and height of the curved portion of the Hoop Post at the rate of 6" for every one foot increase in sidewalk width.

FENCE INSTALLATION:

Install posts plumb (within a tolerance of ± 1/2'). Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F 567 as applicable.

TRAFFIC RAILING BARRIER DETAILS:

See Superstructure Sheets for Traffic Railing Barrier details.

CONCRETE PARAPET DETAILS:

See Index No. 820 - Pedestrian/Bicycle Railing for Concrete Parapet details. Provide fencing in lieu of aluminum bullet railing as shown on Index No. 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 No. 2.
For Pull Post Assembly Detail, View A and Detail "A" see Sheet No. 3.
For Detail "B" and "E" see Sheet No. 4.
TABLE OF CHAIN LINK FENCE COMPONENTS

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
<th>ASTM DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain Link Fabric (2' mesh with knuckled bottom selvages)</td>
<td>A 392</td>
</tr>
<tr>
<td>Zinc Coated Steel – No. 9 gage (coated wire diameter), Class 2 Coating</td>
<td>F 668</td>
</tr>
<tr>
<td>Polymethyl Chloride (PVC) Coated Steel – No. 9 gage Zinc Coated Wire (metallic-coated core wire diameter) – Specify the color of the polymer coating in the General Notes</td>
<td>Type II (2In Zinc Coated Steel Wire) – No. 7 gage, Class 4 Coating</td>
</tr>
<tr>
<td>Type I (Aluminum Coated Steel Wire) – No. 7 gage</td>
<td>A 624 &amp; A 817</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F 626</td>
</tr>
<tr>
<td>Zinc Coated Steel Wire – No. 9 gage</td>
<td></td>
</tr>
<tr>
<td>Hog Rings</td>
<td>F 626</td>
</tr>
<tr>
<td>Zinc Coated Steel Wire – No. 12 gage</td>
<td></td>
</tr>
<tr>
<td>Brace Bars</td>
<td>F 626</td>
</tr>
<tr>
<td>3/8&quot; (Min. thickness) x 1/2&quot; (Min. width) Steel Bands (Beveled or Heavy)</td>
<td></td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F 626</td>
</tr>
<tr>
<td>3/4&quot; (Min. thickness) x 1 1/4&quot; (Min. width) Variable Height Steel Bars – Height = Tangent or Hoop Length – Barrier or Parapet Height – 2&quot; max</td>
<td></td>
</tr>
<tr>
<td>Stainless Steel Bands</td>
<td>F 626</td>
</tr>
<tr>
<td>No. 14 gage (Min. thickness) x 1/2&quot; (Min. width) Steel Bands</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F 626</td>
</tr>
<tr>
<td>Zinc Coated Steel – (includes horizontal rail ends, combination rail ends, boulevard clamps and all other miscellaneous fittings and hardware)</td>
<td></td>
</tr>
<tr>
<td>Bolts</td>
<td>A 307</td>
</tr>
<tr>
<td>3/8&quot; X 2 1/2&quot; Hex Head Bolts for Internal Sleeve connections</td>
<td></td>
</tr>
<tr>
<td>5/8&quot; X 4 1/2&quot; Hex Head Bolts for Expansion Rail connections</td>
<td></td>
</tr>
<tr>
<td>Washers</td>
<td>A 491</td>
</tr>
<tr>
<td>Aluminum Coated Steel – No. 9 gage (coated wire diameter)</td>
<td></td>
</tr>
<tr>
<td>Spacers</td>
<td>F 1554 Grade 36</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>Fully threaded Headless Anchor Rods – 5/8&quot; Ø x 6&quot; (no spacer) or 5/8&quot; Ø x 7 1/2&quot; (with spacer)</td>
</tr>
<tr>
<td>C-I-P Anchor Rods</td>
<td>F 1554 Grade 36</td>
</tr>
<tr>
<td>C-I-P Anchor Rods</td>
<td>Fully threaded Headless Anchor Rods – 5/8&quot; Ø x 14 1/2&quot;</td>
</tr>
<tr>
<td>Bolts</td>
<td>A 307</td>
</tr>
<tr>
<td>5/8&quot; X 6&quot; Hex Head Bolts for Pipe Clamp Connections to Posts</td>
<td></td>
</tr>
<tr>
<td>Nuts</td>
<td>A 563</td>
</tr>
<tr>
<td>Hex Nuts for Pipe Clamp and Base Plate Connections</td>
<td></td>
</tr>
<tr>
<td>Washers</td>
<td>F 436</td>
</tr>
<tr>
<td>Flat Washers for Pipe Clamp and Base Plate Connections</td>
<td></td>
</tr>
<tr>
<td>Neoprene Pads</td>
<td>–</td>
</tr>
<tr>
<td>In accordance with Specification Section 932</td>
<td></td>
</tr>
</tbody>
</table>

TABLE OF POST ATTACHMENT COMPONENTS

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
<th>ASTM DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Clamps</td>
<td>Pipe Clamp Connection</td>
</tr>
<tr>
<td>Base Plates</td>
<td>A 36 or A 709 Grade 36</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>B 209 Alloy 6061-T6 or B 221 Alloy 6063-75</td>
</tr>
<tr>
<td>Spacers</td>
<td>–</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F 1554 Grade 36</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>Fully threaded Headless Anchor Rods – 5/8&quot; Ø x 6&quot; (no spacer) or 5/8&quot; Ø x 7 1/2&quot; (with spacer)</td>
</tr>
<tr>
<td>C-I-P Anchor Rods</td>
<td>F 1554 Grade 36</td>
</tr>
<tr>
<td>C-I-P Anchor Rods</td>
<td>Fully threaded Headless Anchor Rods – 5/8&quot; Ø x 14 1/2&quot;</td>
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<tr>
<td>Bolts</td>
<td>A 307</td>
</tr>
<tr>
<td>5/8&quot; X 6&quot; Hex Head Bolts for Pipe Clamp Connections to Posts</td>
<td></td>
</tr>
<tr>
<td>Nuts</td>
<td>A 563</td>
</tr>
<tr>
<td>Hex Nuts for Pipe Clamp and Base Plate Connections</td>
<td></td>
</tr>
<tr>
<td>Washers</td>
<td>F 436</td>
</tr>
<tr>
<td>Flat Washers for Pipe Clamp and Base Plate Connections</td>
<td></td>
</tr>
<tr>
<td>Neoprene Pads</td>
<td>–</td>
</tr>
<tr>
<td>In accordance with Specification Section 932</td>
<td></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.

CORRUGINES:
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 937 and be installed 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 927 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.

NOTES:
1. This dimension is the expansion joint opening plus 1/2". Expansion rails are required at expansion joint locations where the total movement exceeds 7", but is less than or equal to 6'. Expansion rails are part of expansion assemblies when the total movement exceeds 6'. Install expansion rails midway between the fence posts, spanning the expansion joint.
2. Install nuts for expansion rails finger-tight. Nuts 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.

EXPANSION RAIL DETAIL

Varies (See Note 1)

5/8" Bolt with Hex Nut and Washer (See Note 2)

Horizontal Rail

Expansion Rail

5/8" Ø x 4" Hex Head Anchor Rods for all materials

8" (Min. thickness) x 1 1/2" (Min. width) Steel Bars ~

Neoprene Pads

Washers

Pipe Clamp Connections

Base Plates

Shim Plates

Spacers

Adhesive Anchor Rods

C-I-P Anchor Rods

Bolts

Nuts

Washers

Neoprene Pads

In accordance with Specification Section 932

Pipe Clamp Connections to Posts

Flat Washers for Pipe Clamp and Base Plate Connections

In accordance with Specification Section 932

Hex Head Anchor Rods ~

Fully threaded Headless Anchor Rods – 5/8" Ø x 6" (no spacer) or 5/8" Ø x 7 1/2" (with spacer)

Fully threaded Headless Anchor Rods – 5/8" Ø x 14 1/2"

5/8" X 6" Hex Head Bolts for Pipe Clamp Connections to Posts

Hex Nuts for Pipe Clamp and Base Plate Connections

Flat Washers for Pipe Clamp and Base Plate Connections

In accordance with Specification Section 932

5/8" X 6" Hex Head Bolts for Expansion Rail connections

Hex Head Anchor Rods ~

Fully threaded Headless Anchor Rods – 5/8" Ø x 14 1/2"
Pipe Clamp Connection (see Detail) (Typ.)

Traffic Railing Barrier (Type varies, 32" F-Shape shown)

Tension Wire

Traffic Railing Barrier

Hog Rings @ 2'-0" Centers (Typ.)

TIE tension wire to post with No. 9 gage zinc coated tie wire (triple wrap required at both ends of tie wire) (Typ.)

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

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

Pipe Clamp

Post

Traffic Railing Barrier

Post and § 3/8" Ø Holes for § 3/8" Ø Bolt with Hex Nut and Washer

$\frac{3}{8}$" x 3" x $\frac{1}{2}$" Thick Neoprene Pad

$\frac{3}{8}$" Ø Anchors
(Adhesive-Bonded Anchors shown, C-I-P Anchor Rods similar)

$\frac{3}{8}$" § Anchors
(Adhesive-Bonded Anchors shown, C-I-P Anchor Rods similar)

2 - $\frac{3}{8}$Ø C-I-P Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Nuts and Washers

NOTES:
1. For treatment at bridge ends, see Sheet 1.
2. The 3'-0" dimension shown is for expansion joint openings 9" or less. If the expansion joint opening exceeds 9", increase this dimension by the difference between the expansion joint opening and 9".

Rail Ends with Brace Bands (shown) or Combination Rail Ends with Brace Bands or Boulevards Clamps (Typ.)

Chain Link Fabric

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

Ties @ 2'-0" Centers (Typ.)

1'-0" 1'-0"

Bridge Deck

Expansion Joint Opening

Pull Post Assembly Detail
(Traffic Railing Barrier Shown, Concrete Parapet Similar)

Bridge Fence (Enclosed)

Design Standards

2016

Index No. 812

Sheet No. 3 of 4
PIPE CLAMP DETAIL

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

BASE PLATE DETAIL

DETAIL "B"

DETAIL "C"

DETAIL "D"

DETAIL "E" (INTERNAL SLEEVE DETAIL)

NOTES:
1. Values shown for Dim. H are for a 5'-0" clear sidewalk width. Adjust as required for clear sidewalk widths greater than 5'-0".
2. For clear sidewalk widths greater than 5'-0" increase radius and height by 6" for every one foot increase in sidewalk width.
3. Spacer plate thickness shown is for the 32" F-Shape Traffic Railing shown in Index No. 420. Adjust thickness as required for other Traffic Railings.
**ALTERNATE REINFORCING (WELDED WIRE REINF.) DETAILS**

**NOTE:** Place wire panels to minimize the end overhang. End Overhangs greater than 4½" are not permitted.

**WELDED WIRE REINFORCEMENT (WWR)**

- **D19.7 (Lap Splice Each Longitudinal Wire)**
- **D19.7 (Horizontal)**
- **D19.7 (Vertical)**

**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>P</td>
<td>4</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>S</td>
<td>4</td>
<td>As Req</td>
</tr>
</tbody>
</table>

*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 420, Deck Joint at Begin Bridge or End Bridge shown. Deck Joint at C Pier or Intermediate Pier similar.*

**PLAN**

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

- **1'-0" Min., 7'-0" Max.**
- **6'-0" Maximum (Typ. all Posts)**
- **(Horizontal)**
- **1'-3" Max.**
- **1'-0" Min.**
- **30'-0" (Maximum)**
- **V-Groove in both faces and top of Concrete Parapet (Equally spaced between open joints)**
- **Inside face of Concrete Parapet**
- **Approach Slab**
- **Begin or End Approach Slab**
- **Pedestrian/Bicycle Railing**
- **Bridge Deck/Sidewalk**

**CONVENTIONAL REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out. The reinforcement for the parapet on a retaining wall shall be the same as detailed above for a 8' deck.
2. All reinforcing steel at the open joints shall have a 2" minimum cover.
3. Bars 4S may be continuous or spliced at the construction joints. Bar splices for Bars 4S shall be a minimum of 1'-0".
4. At the option of the Contractor Welded Wire Reinforcement (WWR) may be used in lieu of all Bars 4P and 4W. WWR must consist of deformed wire meeting the requirements of Specification Section 931.

**PRECAST CONCRETE PARAPET WITH PEDESTRIAN/BICYCLE BULLET RAILING**

**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 822.

**SECTION A-A**

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

**SECTION A-A**

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

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

**RiFFOCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out. The reinforcement for the parapet on a retaining wall shall be the same as detailed above for a 8' deck.
2. All reinforcing steel at the open joints shall have a 2" minimum cover.
3. Bars 4S may be continuous or spliced at the construction joints. Bar splices for Bars 4S shall be a minimum of 1'-0".
4. At the option of the Contractor Welded Wire Reinforcement (WWR) may be used in lieu of all Bars 4P and 4W. WWR must consist of deformed wire meeting the requirements of Specification Section 931.

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

**INTERMEDIATE JOINT SEAL NOTE:**

1. At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Section 932 of the Specifications.
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.

**PEDESTRIAN/BICYCLE RAILING NOTES:**

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

**RAIL AND POST DETAILS:** For Rail, Post, Rail Splice/Expansion Assembly Fabrication and installation details see Index 822.

**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 Aluminum Bullet Railings, LF.
SECTION A-A
TYPICAL SECTION THRU BRIDGE DECK
(APPROACH SLAB SIMILAR)

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

NOTES:

1. Where Bullet Railing continues on retaining wall mounted Traffic Railings or other Traffic Railings, the Tapered End Transition shall be located at the terminus of the Bullet Railing.

CROSS REFERENCES:

1. Work in conjunction with Index 822.
2. For Traffic Railing Details, Reinforcement and Notes see Index 420.
**DESCRIPTION:** REVIEW NO. SHEET NO. INDEX NO. DESCRIPTION:

**REV 1 07/01/15**

**2016 DESIGN STANDARDS**

**INDEX NO. 822 SHEET NO. 1 of 3**

**POST "D" DETAILS FOR SPECIAL HEIGHT BICYCLE RAILING ON CONCRETE PARAPET (INDEX 820)**

**SECTION C-C (RAILS NOT SHOWN)**

POST "D" DETAILS FOR SPECIAL HEIGHT BICYCLE RAILING ON CONCRETE PARAPET (INDEX 820)

**SECTION D-D (RAILS NOT SHOWN)**

POST "D" DETAILS FOR SPECIAL HEIGHT BICYCLE RAILING ON CONCRETE PARAPET (INDEX 820)

**SECTION F-F BASE PLATE DETAIL**

**RAIL TO POST CONNECTION DETAIL**

**NOTE:** After nuts have been tightened, the bolt threads shall be deformed to prevent removal of nuts. Tack welding of nuts to anchor bolts, to prevent theft, is permitted. Coat deformed or tack welded threads with a galvanizing compound in accordance with Specification Section 562.

**CROSS REFERENCES:**

- For Post "B" and Post "D" spacing see Index 820.
- For Post "B" & Post "C" spacing see Index 423 or 821.
- For Rail Details see Sheet 2.
- For Railing Notes and Tapered End Transition Details see Sheet 3.
PARTIAL PLAN OF TAPERED END TRANSITIONS
(Single Rail Shown, Double or Triple Rail Similar)

RAILING NOTES:

PAYMENT: Payment for the railing includes Rails, Posts, Rail Splice/Expansion Assemblies, Rail Clamp Bars, Rail End Caps, Anchor Bolts, Nuts, Resilient Pads, Screws and Washers and all incidental materials and labor required to complete the installation.


WELDING: Welding of aluminum components shall be in accordance with ANSI and AWS D1.2 “Structures Welding Code - Aluminum”.

RAIL AND RAIL SPlice/EXPANSION ASSEMBLIES: Aluminum: ASTM B221, alloy 6061-T6, or alloy 6351-T5. Stop Pins shall be press-fit Aluminum or Stainless Steel pins or tubes, unless otherwise approved by the Engineer.

RAIL CLAMP BAR: Aluminum; ASTM B221, alloy 6061-T6, or alloy 6351-T5.

STAINLESS STEEL FASTENERS: #8 Hex Cap Screws and Washers shall be ASTM F-593, alloy group 2 (316). Anchor Bolts: Anchor bolts shall be in accordance with ASTM A307 or ASTM F1554, Grade 36. Anchor Bolts, Nuts, and Washers shall be hot dip galvanized in accordance with Specification Section 962.

RAIL END CAP: ASTM B26 sand cast aluminum alloy 356.0-F.

RAIL INSTALLATION: Set Rail Posts normal to Profile Grade longitudinally and vertical transversely. Post spacings that land on barrier or parapet obstacles such as armor expansion plates etc. shall be adjusted to clear obstacles by 8 without exceeding maximum post spacing. Post shall be uniformly spaced with reasonable consistency. Set Posts on ½ thick resilient or neoprene pads in accordance with Specification Section 932. The pad dimension shall be the same as the post base plate. Provide rail expansion assembly in panels between posts on either side of Bridge Expansion Joints. Rail expansion assembly is similar to the rail splice assembly with increased space at assembly to allow for movement equal to 1.5 times the bridge joint opening or 1" greater than the expected joint movement. Take care to ensure rails are set with the proper openings. Remove any burrs or sharp edges on rails and posts to prevent injury.

RAIL SPLICE ASSEMBLIES: Rails shall be continuous over a minimum of 3 posts, except that lengths less than 12' need only be continuous over 2 posts. Space splices at 40'-0" maximum on centers. Splice all rails in any railing section about the same center line. RESILIENT AND NEOPRENE PADS: Resilient and Neoprene Pads shall be in accordance with the Specifications except that testing of the finished pads is not required. Neoprene pads shall be dimeter hardness 60 or 70.

Sheet DIMENSIONS: Submit typical details for straight alignments and complete details for end terminations or curved alignments with radii < 40', including post and rail splice/expansion assembly locations of the proposed railing for the Engineer’s approval prior to fabrication.

CROSS REFERENCE: For Post Details see Sheet 1.
For Rail Details see Sheet 2.

DESIGN STANDARDS
BRIDGE ALUMINUM PEDESTRIAN/BICYCLE RAILING DETAILS

INDEX NO.
822
SHEET NO.
3 of 3

2016

07/01/15

07/01/15

49
105
115
118
**CONCEPT DESIGN DRAWING**

**DESCRIPTION:**

Traffic Railing required (Type Varies, 32" F Shape shown, see Structures Plans, Superstructure Sheets)

**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'-4".
5. At the option of the Contractor Welded Wire Reinforcement (WWR) may be used in lieu of all Bars 3R and 4S. Welded Wire Reinforcement shall conform to Specification Section 931.

**ELEVATION OF INSIDE FACE OF RAILING**

(Reinforcing Steel not shown for clarity)

**SECTION A.A**

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

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

**REINFORCING STEEL**

*See Structures Plans, Superstructure Sheets for actual dimensions and joint orientation. Open Railing Joints at Deck Expansion Joint locations shall match the dimension of the Deck Joint. For treatment of Railing on skewed bridges see Index No. A20. Deck Joint at Begin Bridge or End Bridge shown. Deck Joint at Pier or Intermediate Bent similar.*

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

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

**BILL OF REINFORCING STEEL**

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

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

Intermediate Min. 6" V-Groove in both faces & top of Concrete Curb (Equally spaced between open joints)
CROSS REFERENCE:
At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Specification Section 932. 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.

### Scheme 2 - Concrete Curb Details

#### Estimation of Concrete Curb Quantities (Scheme 2)

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/15'</td>
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</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/15'</td>
<td>4.01</td>
</tr>
</tbody>
</table>

### Scheme 1 - Bottle Guard Detail

**Typical Section Through Bottom Rail**

(Post Not Shown for Clarity)

### Scheme 3 - Bottle Guard Detail

**Typical Section Through Bottom Rail**

(Post Not Shown for Clarity)
BRIDGE PEDESTRIAN/BICYCLE RAILING (STEEL)

**DESCRIPTION:**

- **DETAIL "B" EXPANSION JOINT (FIELD SPICE SIMILAR)**
- **ROUND RAILS - TOP RAIL OR HANDRAIL**
  - Set Screws *
  - Round over both ends of rails 1/8" (Typ.)
- **SQUARE RAILS - INTERMEDIATE OR BOTTOM RAIL**
  - 1 1/2" Silt (Typ.)
  - 1" Picket Slot (Expansion sides only)
  - Steel Sleeve: 1 1/2" OD x 0.125 Wall for intermediate and bottom rails
- **INTERMEDIATE OR BOTTOM RAIL - Steel SLEEVE DETAIL (Bottom Side Shown)**
  - * 1/2" Ø x 1/2" Pan Head Stainless Steel (Type 316 or 18-8 Alloy)
  - Set Screws along outside face of railing. Set screws must be set flush against the rail surface. A 3/8" 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 embedded 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".**

**BRIDGE RAILING NOTES:**

- **APPLICABILITY NOTE:** Railing is limited to use on bridges with an expansion joint thermal movements not exceeding 3". Scheme 3 is limited to bridge retrofit applications where additional sidewalk width is required.
- **RAILING DETAILS:** For Railing fabrication and installation details and notes see Index No. 852, except that railing shall be fabricated and installed normal to the Profile Grade Longitudinally and vertically transversely, unless otherwise shown in the Contract Plans.
- **BOTTLE-GUARD (Schemes 1 & 3):** L-Shape shall be in accordance with ASTM A36.
- **CONCRETE CURB (Scheme 2):** Construct concrete curb vertical with the top surface finished level transversely. Concrete class shall be the same as the bridge deck.
- **SIDE MOUNTED SUPPORT BRACKET (Scheme 3):** L-Shape and Stiffener Plate shall be in accordance with ASTM A36. Welding shall be in accordance with the American Society of Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal shall be E60XX or E70XX. Nondestructive testing of welds is not required. The bracket shall be hot-dip galvanized after fabrication in accordance with Specification Section 962.
- **PAYMENT:** Railing shall be paid per linear foot (Item No. 515-2-abb) for the steel railing and include the cost of support brackets (Scheme 3). Concrete and reinforcing steel quantities for the concrete curb (Scheme 2), will be included in the bridge deck plan quantity pay items. Payment will be plan quantity measured as the length along the center line of the top rail, and includes rails, posts, pickets, rail splice assembly, base plates, bottle-guards, anchor bolts, nuts, washers, resilient or neoprene pads and all incidental materials and labor required to complete installation of the railing.

**APPLICABILITY NOTE:** Railing is limited to use on bridges with an expansion joint thermal movements not exceeding 3". Scheme 3 is limited to bridge retrofit applications where additional sidewalk width is required.

**RAILING DETAILS:** For Railing fabrication and installation details and notes see Index No. 852, except that railing shall be fabricated and installed normal to the Profile Grade Longitudinally and vertically transversely, unless otherwise shown in the Contract Plans.

**BOTTLE-GUARD (Schemes 1 & 3):** L-Shape shall be in accordance with ASTM A36.

**CONCRETE CURB (Scheme 2):** Construct concrete curb vertical with the top surface finished level transversely. Concrete class shall be the same as the bridge deck.

**SIDE MOUNTED SUPPORT BRACKET (Scheme 3):** L-Shape and Stiffener Plate shall be in accordance with ASTM A36. Welding shall be in accordance with the American Society of Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal shall be E60XX or E70XX. Nondestructive testing of welds is not required. The bracket shall be hot-dip galvanized after fabrication in accordance with Specification Section 962.

**PAYMENT:** Railing shall be paid per linear foot (Item No. 515-2-abb) for the steel railing and include the cost of support brackets (Scheme 3). Concrete and reinforcing steel quantities for the concrete curb (Scheme 2), will be included in the bridge deck plan quantity pay items. Payment will be plan quantity measured as the length along the center line of the top rail, and includes rails, posts, pickets, rail splice assembly, base plates, bottle-guards, anchor bolts, nuts, washers, resilient or neoprene pads and all incidental materials and labor required to complete installation of the railing.
3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL
(42" Height shown, 48" Height Similar)

TABLE 1 - RAILING MEMBERS

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
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</thead>
<tbody>
<tr>
<td>Post &quot;A&quot;</td>
<td>HSS2x2(1)x1/2&quot;</td>
<td>2.50&quot; x 1.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Post &quot;B&quot;</td>
<td>HSS2x2(1)x3/8&quot;</td>
<td>2.50&quot; x 1.30&quot;</td>
<td>0.188&quot;</td>
</tr>
<tr>
<td>Top Rail</td>
<td>HSS3.000x1/120</td>
<td>3.000&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>End Hooks</td>
<td>HSS3.000x1/120</td>
<td>3.000&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>HSS2.500x1/125</td>
<td>2.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail Joint/Splice Sleeves</td>
<td>HSS2x2(1)x3/8&quot;</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.188&quot;</td>
</tr>
<tr>
<td>Int. &amp; Bottom Rail Post Connection Sleeve</td>
<td>HSS1.500x1/125</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>1.315&quot;</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>1/2&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
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<tr>
<td>Handrail Support Bar</td>
<td>1/2&quot; Round Bar</td>
<td>0.750&quot;</td>
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<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>1/2&quot; Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>Varies (See Details)</td>
<td>Varies</td>
<td>Varies</td>
</tr>
</tbody>
</table>

TABLE 1 NOTES:
1. 0.125" wall thickness permitted for rails with post spacings less than 5'-8", except that Post Connection Sleeve must be 1/8" NPS (Sch. 40).
**TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%**

(Showing Outside Face of Railing with Type "A" Posts)

- **NOTES:**
  - * Keyed construction joints in Index No. 6011 Gravity Wall are not considered to be expansion joints.
  - ** Contraction joints (Tooled or Saw Cut) in sidewalks do not require a 6" minimum offset.

---

**RAILINGS ON GRADES STEEPER THAN 5%**

(Showing Inside Face of Railing with Type "A" Posts)

- **NOTES:**
  - ** See Detail "A", Sheet 4

---

**ELEVATION**

(Showing Outside Face of Railing with Type "A" Posts)

**EXPANDED ELEVATION AT CORNERS**

**DETAIL FOR NON-CONTINUOUS RAILING AT CORNERS**

**RAMP REQUIREMENTS**

For slopes greater than 5%:
- Max. ramp slope = 8.33%
- Max. ramp cross-slope = 2.0%

**LANDING REQUIREMENTS**

Max. landing slope = 2%
Max. landing cross slope = 3%
RAILINGS ON STEPS & STAIRS

RAIL TERMINATION DETAILS

RAILING CONTINUATION BEYOND STEPS OR STAIRS
(Bottom shown, Top similar)

DETAIL "L" - PLAN VIEW
HANDRAIL TERMINATION

DETAIL "J" - ELEVATION VIEW
TOP RAIL TERMINATION

DETAIL "K" - ELEVATION VIEW
BOTTOM RAIL CONNECTION
(Intermediate Rail Similar)

Steel Handrail required for three or more steps (Handrail and cheekwalls continuous at landings)
Handrails = 1½" NPS (Sch. 40) pipe

Handrail Continuous
At Landing

Length of Landing 5' Min.
Top Landing

ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOPED WALLS

RAIL TERMINATION DETAILS

STEEL PEDESTRIAN/BICYCLE RAILING

2016 DESIGN STANDARDS

INDEX NO. 852

SHEET NO. 3 of 8
TYPE 1 - PICKET INFILL PANEL

PICKET NOTES:
* Picket Spacing of 60" centers is based on a 3" Ø Bar for standard applications. When shown in the Contract Plans a 40" picket spacing may be required. If an alternate design is used, maintain a maximum clear opening of 50" for standard installations and 30" for special conditions.

SECTION A-A

PICKET NOTES:
* Picket Spacing of 60" centers is based on a 3" Ø Bar for standard applications. When shown in the Contract Plans a 40" picket spacing may be required. If an alternate design is used, maintain a maximum clear opening of 50" for standard installations and 30" for special conditions.

SECTION A-A

TYPE 2 - PICKET INFILL PANEL

NOTES:
1. See Plans for Infill Panel option required.

TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
</tr>
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<tbody>
<tr>
<td>ASTM</td>
</tr>
<tr>
<td>COMPONENT</td>
</tr>
<tr>
<td>Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td>A 392</td>
</tr>
<tr>
<td>Aluminum-Coated Steel - No. 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td>A 491</td>
</tr>
<tr>
<td>Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter) - See Plans for specified color of PVC</td>
</tr>
<tr>
<td>F 668</td>
</tr>
<tr>
<td>Zinc-Coated Steel</td>
</tr>
<tr>
<td>F 626</td>
</tr>
</tbody>
</table>

CHAIN-LINK PANEL NOTE:
Chain-Link Fence Fabric shall be continuous along limits of railing. Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.
**TYPE 3 - SUNSHINE INFILL PANEL**

* Arc, Rays and Sun Segment may be formed in a single panel from ½ plate (ASTM 36 or A709 - Grade 36) pattern cut with laser or plasma CNC, welded to a 1x1xƃ Angle Border or the ƂxƂxƃ Channel Border shown.

**TYPE 4 - BROADWAY INFILL PANEL**

* Arc, Rays and Sun Segment may be formed in a single panel from ½ plate (ASTM 36 or A709 - Grade 36) pattern cut with laser or plasma CNC, welded to a 1x1xƃ Angle Border or the ƂxƂxƃ Channel Border shown.

NOTES:

1. See Plans for Infill Panel Option required.
NOTES:

1. See Plans for Infill Panel Type required.
ALTERNATE REINFORCING (WELDED WIRE REINF.) DETAILS

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

SPIKE DETAIL (Between WWR Sections)

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
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<tbody>
<tr>
<td>p</td>
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<td>2'-0&quot;</td>
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<tr>
<td>5</td>
<td>4</td>
<td>As Req'd</td>
</tr>
</tbody>
</table>

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

WELED WIRE REINFORCEMENT (WWR)

| D19.7 or #4 Bar (Lap Splice Each Longitudinal Wire) |
| D19.7 (Horizontal) |

CUREFILI FLIGHT 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 45 shall be continuous or spliced at the construction joints. Bar splices for Bars 45 shall be a minimum of 1'-9".
5. At the option of the Contractor Welded Wire Reinforcement (WWR) may be used in lieu of all Bars 4P and 4S. WWR shall consist of welded wire meeting the requirements of Specifications Section 931.

DETAIl "A" - SECTION AT INTERMEDIATE OPEN JOINT

INTERMEDIATE JOINT SEAL NOTE:

At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Section 932. 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.

ILI, ESTIMATED CONCRETE CURB QUANTITIES (SCHEME 2)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/lf</td>
<td>60124</td>
</tr>
<tr>
<td>Steel</td>
<td>Lb/lf</td>
<td>401</td>
</tr>
</tbody>
</table>

SCHEME 2 - CONCRETE CURB DETAILS

SCHEME 3 - SIDE-MOUNTED SUPPORT BRACKET DETAILS

TYPICAL SECTION THROUGH BOTTOM RAIL (Post Not Shown for Clarity)

SCHEME 1 - BOTTLE GUARD DETAIL

SCHEME 3 - BOTTLE GUARD DETAIL

INDEX NO. 861 4/23/15

PLATE WASHER DETAIL

BRIDGE PEDESTRIAN/BICYCLE RAILING

2016 DESIGN STANDARDS

BRIDGE PEDESTRIAN/BICYCLE RAILING (ALUMINUM)

INDEX NO. 861 4/23/15

PLATE WASHER DETAIL

BRIDGE PEDESTRIAN/BICYCLE RAILING

2016 DESIGN STANDARDS

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

1. **DETAIL "B" EXPANSION JOINT (FIELD SPlice SIMILAR)**

2. **ROUND RAILS - TOP RAIL OR HANDRAIL**
   - 3/8" x 3/8" Pan Head Aluminum (Alloy T6063-T5) or Stainless Steel (Type 316 or 18-8 Alloy) Set Screws along outside face of railing. Set screws must be set flush against the rail surface. A 3/8" plug weld may be substituted for the two set screws at expansion joints.
   - Embedded length may be 1" for plug welded connection.
   - Increase handrail sleeve embedment to 3" for Expansion Joint openings greater than 1/2".
   - Expansion joint opening shall match the clear opening in the deck joint but not greater than 3/4".

3. **SQUARE RAILS - INTERMEDIATE OR BOTTOM RAIL**
   - Aluminum Sleeve: 1.50 OD x 0.125 Wall for intermediate and bottom rails
   - 1/8" Slit (bottom only)

4. **INDEX NO. 861**

**PAYMENT:**
- Railing shall be paid per linear foot (Item No. 515-2-abb) for the aluminum railing and include the cost of support brackets (Scheme 3). Concrete and reinforcing steel quantities for the concrete curb (Scheme 2), will be included in the bridge deck plan quantity pay items. Payment will be plan quantity measured as the length along the center line of the top rail, and includes rails, posts, pickets, rail splice assembly, base plates, bottle-guards, anchor bolts, nuts, washers, resilient or neoprene pads and all incidental materials and labor required to complete installation of the railing.
ALUMINUM PEDESTRIAN/BICYCLE RAILING

3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL
(42" Height shown, 48" Height Similar)

**TABLE 1 - RAILING MEMBERS**

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>ALLOY</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts (Type &quot;A&quot; &amp; &quot;B&quot;)</td>
<td>6061-T6</td>
<td>RT 2x2 x 250</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td>Posts (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion 150/250 x 125</td>
<td>1.50&quot; x 0.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Plate (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion (See Details)</td>
<td>2.95&quot; x 4.25&quot;</td>
<td>Varies</td>
</tr>
<tr>
<td>Top Rail</td>
<td>6061-T6</td>
<td>2.95&quot; NPS (Sch. 10)</td>
<td>2.875&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Round Top Cap Rail</td>
<td>6063-T5</td>
<td>2.00 OD x 0.125 Wall</td>
<td>2.875&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>6063-T5</td>
<td>3.00 OD x 0.125 Wall</td>
<td>3.00&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>2.50 OD x 0.125 Wall</td>
<td>2.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>6063-T5</td>
<td>RT 2x2 x 250</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>1.35 OD x 0.125 Wall (3)</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>6063-T5</td>
<td>1.35 OD x 0.125 Wall (4)</td>
<td>1.315&quot;</td>
<td>0.136&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>6063-T5</td>
<td>1.56 OD Round Bar</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Pickets (Type 1 infill Panel)</td>
<td>6061-T6</td>
<td>1.35 OD Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>6061-T6</td>
<td>Varies (See Details)</td>
<td>Varies</td>
<td>Varies</td>
</tr>
</tbody>
</table>

**NOTES**

(1) Alloy 6061-T5 or 6063-T5 & T6 may be substituted for Alloy 6063-T5.
(2) 0.188" wall thickness permitted for rails with post spacings less than 5'-9".
(3) 0.125" wall thickness for rails with post spacings of 10'-0" and greater.
(4) 0.125" wall thickness for rails with post spacings of 15'-0" and greater.

**Design Standards:**

- See the Design Standards for the design loads, geometry and applicability requirements.
- General:
- Adequate foundation support shall be provided for anchorage and stability against overturning.
- See Index No. 861 for special requirements and modifications for use on bridges.
- The railing shown on these drawings requires a handrail for ramps steeper than a 5% grade to conform with the requirements of the Americans with Disabilities Act (ADA).
- It is recommended that the railing be fabricated in sections of a maximum length of 20'-0" and not less than 2'-0" in length, to allow for ease of installation and transportation.
- Structural Extrusions, Tube, Pipe and Bar shall be in accordance with ASTM B221 or ASTM B429.
- Top, bottom and intermediate rail corner bends with maximum 4'-0" post spacing, may be Alloy 6063-T6. Perforated panels (Type S) shall be Alloy 6060-T44. Posts shall be fabricated and installed plumb, ± 1/16" tolerance when measured at 4'-0" above the foundation.
- Pickets and vertical panel elements shall be fabricated parallel to the posts, except that Type 2, 3, 5 & 5 panel infills may be fabricated parallel to the longitudinal grade. Corners and changes in tangential longitudinal alignment shall be made continuous with a 15° bend radius or terminate at adjoining sections with mitered end sections when handrails are not required. For changes in tangential longitudinal alignment greater than 45°, posts shall be positioned at a maximum distance of 2'-0" each side of the corner and shall not be located at the corner apex. For curved longitudinal alignments the top and bottom rails and handrails shall be shop bent to match the alignment radius.
- **BASE PLATES & RAIL CAPS:**
- Base Plates and Post Cap plates shall be in accordance with ASTM B209, Alloy 6061-T6.
- **SHIM PLATES:**
- Shim Plates shall be in accordance with aluminum in accordance with ASTM B209, Alloy 6061 or 6063. Shim plates shall be used for foundation height adjustments greater than ±2" between posts and localized irregularities greater than ±1" beneath base plates. Field trim shim plates when necessary to match the contours of the foundation. Beveled shim plates may be used in lieu of trimmed flat shim plates shown. Stacked shim plates must be bonded together with adhesive bonding material and limited to a maximum total thickness of ±0.5", unless longer anchor bolts are provided for the exposed thread length.
- **ANCHOR BOLTS:**
- Anchor bolts shall be in accordance with ASTM F1554 (Grade 36 for ±0" Ø and Grade 55 for ±0.5" Ø Bolt Anchorages). Headless anchor bolts for Adhesive Anchors shall be threaded full length. Cutting of reinforcing steel is permitted for drilled hole installation. Expansion Anchors are not permitted. All anchor bolts shall have single self-locking hex nuts. Tack welding of the nut to the anchor bolt may be used in lieu of self-locking nuts. All nuts shall be in accordance with ASTM A563 or ASTM A194. Flat Washers shall be in accordance with ASTM F436 and Plate Washers (for long slotted holes only) shall be in accordance with ASTM A36 or ASTM A799 Grade 36. After the nuts have been snug tightened, distort the anchor bolt threads to prevent removal of the nuts. Distorted threads and tack welds shall be coated with a galvanizing compound in accordance with the Specifications.
- **RESILIENT AND NEOPRENE PADS:**
- Resilient and Neoprene pads shall be in accordance with Specification Section 932 except that testing of the finished pads shall not be required. Neoprene pads shall be diameter hardness 60 to 80.
- **JOINTS:**
- Grind welded joints as necessary to remove burns and weld splatter, additionally remove any sharp edges on rails to prevent removal of the nuts. Distorted threads and tack welds may be substituted with alternate joints shown on Sheet 3 Detail "K" for Post Type "A" & "B".
- **WELDING:**
- All welding shall be in accordance with the American Welding Society Structural Welding Code (Aluminum) AWS/AMSE D1.1 (current edition). Filler metal shall be either ER4043, ER5556 or ER5559. All welds shall be finished toinstep with the requirements of the American Welding Society Structural Welding Code (Aluminum) AWS/AMSE D1.1 (current edition). Filler metal shall be either ER4043, ER5556 or ER5559. Nondestructive testing of welds is not required.
- **COATINGS:**
- The aluminum railing shall be mill finish unless otherwise noted in the Contract Documents. All nuts, bolts and washers shall be galvanized in accordance with Specification Section 906.
- **SHOP DRAWINGS:**
- Details addressing project specific geometry (line & grade) showing post and expansion joint locations, post and panel type, anchor bolt installation "Case" or lengths, must be submitted by the Contractor for the Engineer's approval prior to fabrication of the railing. Shop drawings shall be in accordance with the Specifications.
- **PAYMENT:**
- Payment includes rails, posts, pickets, panels, rail splice assembly, base plates, anchor bolts, nuts, washers, resilient or neoprene pads and all incidental materials and labor required to complete installation of the railing.
**RAILINGS ON GRADES STEEPER THAN 5%**

*(Type 1 - Picket Railing Shown, Other Types Similar)*

**ELEVATION**

*(Showing Inside Face of Railing with Type "A" Posts)*

- **Handrail required for ramps (Handrail continuous at landings between runs)**
- **Handrail ~ 1½ NPS Sch. 40**

**RAMP REQUIREMENTS**

- For slopes greater than 5%:
  - Max. ramp slope = 8.33%
  - Max. ramp cross-slope = 2.0%

**LANDING REQUIREMENTS**

- Max. landing slope = 2%
- Max. landing cross slope = 2%

**EXPANDED ELEVATION AT CORNERS**

**DETAIL FOR NON-CONTINUOUS RAILING AT CORNERS**

- Rail expansion joints to be located in panels above structure expansion joints * (35'-0" maximum spacing).

**NOTES:**

* Keyed construction joints in Index No. 6011 Gravity Wall are not considered to be expansion joints.

**Construction Joint Offset **

- Contraction joints (Tooled or Saw Cut) in sidewalks do not require a 6" minimum offset.

- Equal Clear Openings at Posts (Typ.)

- See "Typical Railing Details" for post, rail & picket or infill panel details

- Infill Panel Type Varies, See Data Table in Plans (Pickets Shown) ~ 1" NPS Sch. 40

- Post Spacing (Typ.)

- See Plans for continuation or termination limits of railing

**RAILINGS ON GRADES 0% TO 5%**

*(Type 1 - Picket Railing Shown, Other Types Similar)*

**TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%**

**ELEVATION**

*(Showing Outside Face of Railing with Type "A" Posts)*

**EXPANDED ELEVATION AT CORNERS**

**DETAIL FOR NON-CONTINUOUS RAILING AT CORNERS**

- Rail expansion joints to be located in panels above structure expansion joints * (35'-0" maximum spacing).

- Rail expansion joints to be located in panels above structure expansion joints * (35'-0" maximum spacing).
Railing Continuation Beyond Steps or Stairs (Bottom shown, Top similar)

Handrail termination (Typ.) See Detail "L"

- 1'-6" Min. Handrail Extension
- Equal to one tread length

Rail Termination (End Cap) or Splice when rail continues (shown dotted)

Cut rail sleeve to match inside face of post or weld rail directly to post

RAIL TERMINATION DETAILS

- Aluminum Handrail required for three or more steps (Handrail and cheekwalls continuous at landings)
- Handrails – 1½" NPS (Sch. 40) pipe
- Equal to one tread length

ELEVATION (At-Grade Steps shown, Elevated Stairs similar)

ALUMINUM PEDESTRIAN/BICYCLE RAILING

ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOPED WALLS
BASE PLATE DETAILS FOR TYPE "C" POST
(Screws Not Shown For Clarity)

TOP PLATE DETAILS FOR TYPE "C" POST
(Screws Not Shown For Clarity)

† See Sheet 4 for Notes.
†† See Sheet 4 for Notes.
††† Length varies for beveled posts on grades. Holes must be drilled plumb to align with screw slot.
SECTION A-A

Ties @ 1'-0" center (Post and End Rail)

Ties @ 2'-0" center (Intermediate & Bottom Rail)

PICKET NOTES:
* Picket Spacing of 6" centers is based on a 3/8" Ø Bar for standard applications.
When shown in the Contract Plans a 4" picket spacing may be required. If an alternate design is used, maintain a maximum clear opening of 5" for standard installations and 3½" for special conditions.

TYPE 1 - PICKET INFILL PANEL

SECTION A-A

TIES @ 1'-0" CENTER (POST AND END RAIL)

TIES @ 2'-0" CENTER (INTERMEDIATE & BOTTOM RAIL)

DETAIL "1A"
(Top of Picket Connection)

POST & ANCHOR BOLT

ANCHOR BOLT

SECTION A-A

DETAIL "1B"
(Bottom of Picket Connection)

TIE WIRE @ 1'-0" CENTER (POST AND END RAIL)

TIE BAR @ 2'-0" CENTER (INTERMEDIATE & BOTTOM RAIL)

DESCRIPTION:
REVISION
SHEET
INDEX
NO.
DESIGN STANDARDS
ALUMINUM PEDESTRIAN/BICYCLE RAILING

TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
<td>A 392 Zinc-Coated Steel - No. 9 gage (coated wire diameter) Class 2 Coating</td>
<td></td>
</tr>
<tr>
<td>Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter) - See Plans for specified color of PVC</td>
<td>F 668 Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter)</td>
<td></td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F 626 Zinc-Coated Steel Wire - No. 9 gage with coating to match Chain-Link Fence Fabric.</td>
<td></td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F 626 3/8&quot; (min. thickness) x 3/8&quot; (min. width) x 2'-3&quot; (min. height) Steel Bars</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F 626 Zinc-Coated Steel</td>
<td></td>
</tr>
</tbody>
</table>

CHAIN-LINK PANEL NOTE:
Chain-Link Fence Fabric shall be continuous along limits of railing. Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.

NOTES:
1. See Plans for Infill Panel option required.
SECTION A-A

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

SECTION C-C

PANEL/SPLICE CONNECTION

Inside Face of Rail

Channel 3/8 x 3/16

Perforated Panel (0.04" Min.)

basePath x 3/8 Filler Strip

Perforated Panel (0.04" Min.)

Inside Face of Post

Opening Joint

Perforated Panel

panel mullion

DETAIL"5A"

PANEL/RAIL CONNECTION

(Top Shown, Bottom Similar)

DETAIL "5B"

PANEL END CONNECTION

(Expansion Joint Shown, Sides Similar)

REPEATING PATTERN DETAIL

FOR PERFORATED PANEL

TYPE 5 - PERFORATED INFILL PANEL

Panel Mullion

Perforated Panel (0.04" Min.)

Inside Face of Post

Channel 3/8 x 3/16

Inside Face of Rail

Seal welding mitered corners is permitted
ALUMINUM PEDESTRIAN/BICYCLE RAILING

TYPICAL SECTION ON STEPS & STAIRS
(Case III)

TYPICAL SECTION FOR 4-BOLT ANCHORAGE
(Case IV)

ANCHOR BOLT TABLE

<table>
<thead>
<tr>
<th>CASE</th>
<th>STRUCTURE TYPE</th>
<th>DIMENSIONS</th>
<th>ANCHOR LENGTH</th>
<th>ANCHOR SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Unreinforced Concrete</td>
<td>6&quot;</td>
<td>1'-2&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>IIa</td>
<td>Reinforced Concrete</td>
<td>4&quot;</td>
<td>4&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>IIb</td>
<td>Gravity Wall</td>
<td>4½&quot;</td>
<td>3½&quot;</td>
<td>3'-0&quot;</td>
</tr>
<tr>
<td>III</td>
<td>Step Cheekwall</td>
<td>4½&quot;</td>
<td>4½&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>IV</td>
<td>Varies</td>
<td>5&quot;</td>
<td>5&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

* Embedment length "C" may be reduced to 9" for the 42" height railings for Case IIb, when the post spacing does not exceed 5'-0".
** When required; measured from top of sidewalk (Typ.)

DETAIL "D" (OPTIONAL SHIMMING DETAIL FOR CROSS SLOPE CORRECTION) (Used in lieu of Beveled Shim Plates)

DETAIL "C" (Cast-in-Place Anchor Bolts shown, Adhesive Anchors similar)
NOTES

PIPE RAILING & POSTS:
Structural Tubing, Pipe and Bar shall be in accordance with ASTM B223 or ASTM B429. Alloy 6061-T6. End Rail 90° bends and corner bends with maximum 4'-0" post spacing, may be Alloy 6063-T6. Posts and End Rails shall be fabricated and installed per a 1" tolerance when measured at 7'-0" above the foundation. Corners and changes in tangential longitudinal alignment may be made continuous with a 9" bend radius or terminated at adjoining sections with a standard end hoop when handrails are not required. For changes in tangential longitudinal alignment greater than 45°, posts shall be positioned at a maximum distance of 2'-0" each side of the corner and shall not be located at the corner apex. For curved longitudinal alignments the top and bottom rails and handrails shall be shop bent to match the alignment radius.

RAILING MEMBER DIMENSIONS TABLE

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Rails</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Rail Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrails Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>1.315&quot;</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1&quot; Ø Round Bar</td>
<td>1.000&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

BASE PLATES:
Base Plates shall be in accordance with ASTM B209, Alloy 6061-T6.

SHIM PLATES:
Shim Plates shall be aluminum in accordance with ASTM B209; Alloy 6061 or 6063. Shim plates shall be used for foundation height adjustments greater than ½" between 3 posts and localized irregularities greater than ½" beneath base plates. Field trim shim plates when necessary to match the contours of the foundation. Reveled shim plates may be used in lieu of trimmed flat shim plates shown. Stacked shim plates must be bonded together with adhesive bonding material and limited to a maximum total thickness of ½", unless longer anchor bolts are provided for the exposed thread length.

COATINGS:
The aluminum railing shall be mill finish unless otherwise noted in the Contract Documents. All nuts, bolts and washers shall be hot-dip galvanized in accordance with Section 962 of the Specifications.

ANCHOR BOLTS:
Anchor bolts shall be in accordance with ASTM F1554 Grade 36. Headless anchor bolts for Adhesive Anchors shall be threaded full length. Cutting of confining steel is permitted for drilled hole installation. Anchor bolts shall have single self-locking hex nuts. Tack welding of the nut to the anchor bolt may be specified in lieu of anti-rotation washers. All nuts shall be in accordance with ASTM A563 or ASTM A194. Plate Washers shall be in accordance with ASTM F436 and Plate Washers (for long slotted holes only), shall be in accordance with ASTM A563 or ASTM A520 Grade 36. After the nuts have been snug tightened, the anchor bolt threads shall be distorted to prevent removal of the nuts. Distorted threads and tack welds shall be coated with a galvanizing compound in accordance with the Specifications.

RESILIENT AND NEOPRENE PADS:
Resilient and Neoprene pads shall be in accordance with Specification Section 932, except that testing of the finished pads shall not be required. Neoprene pads shall be durometer hardness 60 or 70.

JOINTS:
All fixed joints are to be welded all over and ground smooth. Expansion Joints shall be spaced at a maximum of 36'-0". Field splices similar to the expansion joint detail may be approved by the Engineer to facilitate shipping and handling, but rails must be continuous across a minimum of two posts. Only use the Continuity Field Splice Detail "E" to make the welding continuous for unforeseen field adjustments.

WELDING:
All welding shall be in accordance with the American Welding Society Structural Welding Code (Aluminum) MEXICAN 81.2. Current edition. Filler metal shall be either ER5183, ER5556 or ER5356. Nondestructive testing of welds is not required.

SHOP DRAWINGS:
Details addressing project specific geometry (line & grade) showing post and expansion joint locations must be submitted by the Contractor for the Engineer's approval prior to fabrication of the railing. Shop drawings shall be in accordance with the Specifications.

PAYMENT:
Guiderail shall be paid for under the contract unit price for Pipe Guiderail (Aluminum) 1F (Item No. 513-1-21). Payment for the Guiderail shall be plan quantity measured as the length along the center line of the top rail, and includes rails, posts, rail splice assembly, base plates, anchor bolts, nuts, washers, resilient or Neoprene pads and all incidental materials and labor required to complete installation of the Guiderail.
### TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%

- **Rail - 2" NPS Sch. 40 (Typ.)**
- **Post Spacing (Typ.)**
- **Rail Expansion Joint (Typ.)** see Detail "D" Sheet 4
- **Varies (8" Min., 1'-6" Max.) (Typ.)**
- **Continuity Field Splice (as required) see Detail "E" Sheet 4 (Typ.)**

**NOTES:**
- NPS = Nominal Pipe Size
- STRUCTURES EXPANSION JOINTS NOTE:
  - * Keyed construction joints in Index No. 6011 Gravity
  - Rail are not considered to be expansion joints.

**CROSS REFERENCE:**
- For Details "C", "D" and "E", see Sheet 4.

### ELEVATION

#### RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

- **Top of Sidewalk or Bikeway**
- **Ground Line**
- **See Plans for continuity or termination limits of railing**
- **See Plans for continuation or termination limits of railing**

#### RAMP REQUIREMENTS
- Max. landing cross-slope = 2.0%
- Max. landing slope = 2.0%
- Max. ramp cross-slope = 6.25%
- Max. ramp slope = 8.33%

#### LANDING REQUIREMENTS
- Max. landing cross-slope = 2.0%
- Max. landing slope = 2.0%
- Max. ramp cross-slope = 6.25%
- Max. ramp slope = 8.33%
GUIDERAIL ON STEPS & STAIRS

RAILING CONTINUATION BEYOND STEPS
(Bottom shown, Top similar)

Concrete sidewalk to extend 6" min. behind ¶ railing

See 'Typical Railing Details', Sheet 2 for post & rail details
See Index No. 521 or Contract Plans for Step Details

HANDRAIL TERMINATION

DETAIL "A" - PLAN VIEW
HANDRAIL TERMINATION

ELEVATION
(At-Grade Steps)

ALTERNATE END TREATMENT

GUIDERAIL ON STEPS & STAIRS

DESCRIPTION:

2016 DESIGN STANDARDS

ALUMINUM PIPE GUIDERAIL

INDEX NO. 870 SHEET NO. 3 of 5
DESCRIPTION:

**SECTION B-B** (Handrail Connection)

**BASE PLATE DETAIL** (2-Bolt Anchorage)

**SECTION C-C**

**BASE PLATE DETAIL** (4-Bolt Anchorage)

**SHIM PLATE DETAIL** (2-Bolt Anchorage)

**SHIM PLATE DETAIL** (4-Bolt Anchorage)

**PLATE WASHER DETAIL**

(Recommended for Steep Slopes)

**ALTERNATE BASE PLATE DETAIL**

**DETAIL "D" - EXPANSION JOINT**

(FIELD SPlice SLIP JOINT SIMILAR)

**DETAIL "E" - CONTINUITY FIELD SPlice**

**DETAIL "C" - RAIL CONNECTIONS**

(Handrail and 4-Bolt Anchorage Not Shown)

**DETAIL "B" - RAIL AND HANDRAIL**

(Showing Sloped Condition for Ramps with 2-Bolt Anchorage)

**CROSS REFERENCE:**

For locations of Details "C", "D" and "E", see Sheet 2.
REVISION NO. 2016
ALUMINUM PIPE GUIDERAIL

**GUIDERAIL & ANCHOR BOLTS**

Optional 4-Bolt Anchorage (Shown Dashed)

4" Sidewalk with Thickened Edge

6" Standard, 3½" for Ramps requiring handrails

Slope 2% Max. (away from drop-off)

Base Plate with Shim plates (as required) (Typ.)

¾" Thick Resilient or Neoprene Pad (Typ.)

0" Standard, 2" for Ramps

Slope 2% Max. (away from drop-off)

TYPICAL SECTION ON CONCRETE SIDEWALK

TYPICAL SECTION ON GRAVITY WALL

(Other Retaining Walls Similar)

TYPICAL SECTION ON STEPS & STAIRS

SIDEWALK ANCHORAGE DETAIL

OPTION 1

SIDEWALK ANCHORAGE DETAIL

OPTION 2 & 3

NOTES:

** 2 ~ 2” Ø x 8” or 4 ~ 3” Ø x 6” Steel Anchors:
Galvanized Steel Bolts (As Shown) (C-I-P); Galvanized U-Bolts Permitted (C-I-P); Galvanized Adhesive Anchors Permitted

*** Expansion Anchors Not Permitted.

*** Adhesive anchors shall be fully threaded headless anchor bolts set in drilled holes (manufacturer recommended diameter) with corresponding hole sizes, washers and fasteners in accordance with Specification Section 416. The minimum embedment is 6” for 2-Bolt Anchorage or 4” for 4-Bolt Anchorage.

DETAIL "F" (OPTIONAL SHIMMING DETAIL FOR CROSS SLOPE CORRECTION) (Used in lieu of Beveled Shim Plates)

SIDEWALK ANCHORAGE DETAIL OPTION 1

SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3

5" Ø Core Drilled Hole (1½”), clean hole in accordance with Specification Section 416

3½” Ø Core Drilled Hole (2½”), clean hole in accordance with Specification Section 926

3¾” Min. Embedment

6" Min. Beveled Build-up (Typ.)

2¾” Min. Beveled Build-up (Typ.)

6” Foundation embedment permitted (Option 3)

Seal end of post (Option 2 & 3) and end of post (Option 2) prior to epoxy filling to prevent leakage

Seal base of hole (Option 2 & 3)

Edge Shim (8” long x ½” wide x thickness as req.)

Full size Shim Plates when required for height adjustment

1½” (Min.) wide bed of Adhesive Bonding Material

½” Thick Resilient or Neoprene Pad

Base Plate

Stability of Railing

(3’ Min. Required for Stability of Railings)

6" Embedment Depth

9" (Min.)

9"

Width of Structure at 6” Embedment Depth

6" Embedment Depth

9"

9" (Min.)

9"

Varies

Varies

SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3

5'-0" Std. ~ 3'-0" Min. Clear

6" Embedment Depth

9"

9" (Min.)

9"

Varies

Varies

SIDEWALK ANCHORAGE DETAIL OPTION 1

5’-0” Std. ~ 3’-0” Min. Clear

6" Embedment Depth

9"

9" (Min.)

9"

Varies

Varies

SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3

5’-0” Std. ~ 3’-0” Min. Clear

6" Embedment Depth

9"

9" (Min.)

9"

Varies

Varies

SIDEWALK ANCHORAGE DETAIL OPTION 1

5’-0” Std. ~ 3’-0” Min. Clear

6" Embedment Depth

9"

9" (Min.)

9"

Varies

Varies

SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3

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9"

9" (Min.)

9"

Varies

Varies

SIDEWALK ANCHORAGE DETAIL OPTION 1

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9"

9" (Min.)

9"

Varies

Varies

SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3

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9"

9" (Min.)

9"

Varies

Varies

SIDEWALK ANCHORAGE DETAIL OPTION 1

5’-0” Std. ~ 3’-0” Min. Clear

6" Embedment Depth

9"

9" (Min.)

9"

Varies

Varies

SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3

5’-0” Std. ~ 3’-0” Min. Clear

6" Embedment Depth

9"

9" (Min.)

9"

Varies

Varies

SIDEWALK ANCHORAGE DETAIL OPTION 1

5’-0” Std. ~ 3’-0” Min. Clear

6" Embedment Depth

9"

9" (Min.)

9"

Varies

Varies

SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3

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9" (Min.)

9"

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Varies

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9" (Min.)

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Varies

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SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3

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9" (Min.)

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9" (Min.)

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Varies

SIDEWALK ANCHORAGE DETAIL OPTION 1

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9" (Min.)

9"

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Varies

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9" (Min.)

9"

Varies

Varies

SIDEWALK ANCHORAGE DETAIL OPTION 1

5’-0” Std. ~ 3’-0” Min. Clear

6" Embedment Depth

9"

9" (Min.)

9"

Varies

Varies

SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3

5’-0” Std. ~ 3’-0” Min. Clear

6" Embedment Depth

9"

9" (Min.)

9"

Varies

Varies
**NOTES**

**PIPE RAILING & POSTS:**
Pipe Rails and Posts shall be in accordance with ASTM A53 Grade B for standard weight pipe and ASTM A500 Grade B, C or D or ASTM A403 for structural pipe. Bars for handrail supports shall be ASTM A36. Posts and End Rails shall be fabricated and installed plumb, ± 1° tolerance when measured at 2'-0" above the foundation. Corners and changes in tangential longitudinal alignment, may be made continuous with a 9° bend radius or terminated at adjoining sections with a standard end hoop when handrails are not required. For changes in tangential longitudinal alignment greater than 9°, posts shall be positioned at a maximum distance of 2'-0" each side of the corner and shall not be located at the corner apex. For curved longitudinal alignments the top and bottom rails and handrails shall be shop bent to match the alignment radius.

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**RAILING MEMBER DIMENSIONS TABLE**

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.154&quot;</td>
</tr>
<tr>
<td>Rails</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.154&quot;</td>
</tr>
<tr>
<td>Rail Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Mandrel Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrail</td>
<td>1½&quot; Ø Round Bar</td>
<td>1.000&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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**BASE PLATES**
Base Plates shall be in accordance with ASTM A36 or ASTM A709 Grade 36.

**SHIM PLATES:**
Shim Plates shall be aluminum in accordance with ASTM B209, Alloy 6061 or 6063. Shim plates shall be used for foundation height adjustments greater than ½" between 3 posts and localized irregularities greater than ½" beneath base plates. Field trim shim plates when necessary to match the contours of the foundation (See Sheet 5 for additional details). Beveled shim plates may be used in lieu of trimmed flat shim plates shown. Stacked shim plates must be bonded together with adhesive bonding material and limited to a maximum total thickness of 3", unless longer anchor bolts are provided for the exposed thread length.

**COATINGS:**
The railing shall be hot-dip galvanized after fabrication in accordance with Section 962 of the Specifications. All nuts, bolts and washers shall be hot-dip galvanized in accordance with Section 962 of the Specifications.

**ANCHOR BOLTS:**
Anchor bolts shall be in accordance with ASTM F1554 Grade 36. Heavily anchor bolts for Adhesive Anchor shall be threaded full length. Coating of reinforcing steel is permitted for drilled hole installation. All anchor bolts shall have single self-locking hex nuts. Tack welding of the nut to the anchor bolt may be used in lieu of self-locking nuts. All nuts shall be in accordance with ASTM A563 or ASTM A194. Flat Washers shall be in accordance with ASTM F436 and Plate Washers (for long slotted holes only) shall be in accordance with ASTM A563 or ASTM A500 Grade 36. After the nuts have been snug tightened, distort the anchor bolt threads or disfigure the top of stud to prevent removal of the nuts. Distorted threads and tack welds shall be coated with a galvanizing compound in accordance with the Specifications.

**RESILIENT AND NEOPRENE PADS:**
Resilient and Neoprene pads shall be in accordance with Specification Section 932, except that testing of the finished pads shall be required. Neoprene pads shall be durometer hardness 60 or 70.

**JOINTS:**
All fixed joints are to be welded all around and plug welds ground smooth. Remove burs and weld spatter, additionally remove any sharp edges on rails to prevent injury. Expansion joints shall be spaced at a maximum of 30'-0". Field splices similar to the expansion joint detail may be approved by the Engineer to facilitate shipping and handling, but rails must be continuous across a minimum of two posts. Only use the Continuity Field Splice (Detail "E") to make the railing continuous for unforeseen field adjustments.

**WELDING:**
All welding shall be in accordance with the American Welding Society Structural Welding Code (Steel) AWS A5.1 and AWS A5.1 (current edition). Weld metal shall be E60XX or E70XX. Nondestructive testing of welds is not required.

**SHOP DRAWINGS:**
Details addressing project specific geometry (line & grade) showing post and expansion joint locations must be submitted by the Contractor for the Engineer’s approval prior to fabrication of the railing. Shop drawings shall be in accordance with the Specifications.

**PAYMENT:**
Guiderail shall be paid for under the contract unit price for Pipe Guiderail (Steel), LF (Item No. 515-1-1). Payment for the Guiderail will be per plan quantity measured as the length along the center line of the top rail, and includes rails, posts, rail splice assembly, base plates, anchor bolts, nuts, washers, resilient or neoprene pads and all incidental materials and labor required to complete installation of the Guiderail.
TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%

See Plans for continuation or termination limits of railing.

For Details "C", "D" and "E", see Sheet 4.

CROSS REFERENCE:
For Details "C", "D" and "E", see Sheet 4.

RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

Top of Sidewalk or Bikeway

Ground Line

Minimum from free end of concrete
and expansion joints (Typ.)

Rail expansion joints to be located in panels above structure expansion joints • (30'-0" maximum spacing).

SHEET 4 (Typ.) see Detail "E" Sheet 4 (Typ.)

Varies (4" Min., 1'-6" Max.) (Typ.)

See Detail "D" Sheet 4

See "Typical Railing Details" for post & rail details

Rail ~ 2" NPS

Sch. 40 (Typ.)

Handrail ~ 1½" NPS

Sch. 40 (Typ.)

Handrail

Top of Sidewalk

Bottom Landing

Ramp

Intermediate Landing

Max.

Min.

30'-0" Max. for Slopes > 6.25%
40'-0" Max. for Slopes ≤ 6.25%

Max. landing slope = 2% Max. ramp slope = 8.33%

Max. landing cross-slope = 2%
Railing Continuation Beyond Steps
(Bottom shown, Top similar)

Concrete sidewalk to extend 6" min. behind handrail

Steel Handrail required for three or more steps (handrail and cheekwalls continuous at landings) Handrail - 1 1/2" NPS (Sch. 40)

Handrail Continuation
See Detail "A" (Typ.)

Length of Landing 5' Min.
Top Landing

8'-0" Max. for one run of steps

Handrail Termination, See Detail "A" (Typ.)

GUIDERAIL ON STEPS & STAIRS

Steel Pipe Guardrail

ELEVATION
(At-Grade Steps)

Handrail Continuation
See Detail "A" (Typ.)

Length of Landing

Handrail Termination, See Detail "A" (Typ.)

ALTERNATE END TREATMENT
**OPTIONAL SIDEWALK ANCHORAGE DETAIL**

- **DETAIL "F" (OPTIONAL SHIMMING DETAIL FOR CROSS SLOPE CORRECTION) (Used in lieu of Beveled Shim Plates)**
  - 1½" Ø x 8" Anchor Bolt (Typ.)
  - Full size Shim Plates when required for height adjustment

- **TYPICAL SECTION ON CONCRETE SIDEWALK**
  - Edge Shim (1½" x 8" or 1½" Ø x 8" thickness as reqd.)

- **TYPICAL SECTION ON GRAVITY WALL (Other Retaining Walls Similar)**
  - 3½" Ø Core Drilled hole (Typ.), clean hole in accordance with Specification Section 416

- **SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3**
  - 3½" Ø Core Drilled hole (Typ.), clean hole in accordance with Specification Section 416
  - Seal end of post with plastic or galvanized steel plug
  - 6" foundation embedment permitted (Option 3)

**NOTES:**

- **2~2 Bolt Anchorage or 4" for 4~Bolt Anchorage.**

- **Adhesive anchors shall be fully threaded headless anchor bolts set in drilled holes (manufacturer recommended diameter) with an Adhesive Bonding Material System in accordance with Specification Section 416 and installed in accordance with Section 937 and installed in accordance with Installation Section 416.**

- **Stick Anchors Permitted (C-I-P); Galvanized Adhesive Anchors Permitted (***); Expansion Anchors Not Permitted.**

- **Steel Anchors:**
  - **2~2" Ø x 8" or 4~2" Ø x 6" Steel Anchors:**
    - Galvanized Steel Bolts (As Shown) (C-I-P); Galvanized U-Bolts Permitted (C-I-P), Galvanized Adhesive Anchors Permitted (***).

- **Steel Anchors:**
  - **2~2" Ø x 8" or 4~2" Ø x 6" Steel Anchors:**
    - Galvanized Steel Bolts (As Shown) (C-I-P); Galvanized U-Bolts Permitted (C-I-P), Galvanized Adhesive Anchors Permitted (***).

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- **Steel Anchors:**
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- **Steel Anchors:**
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- **Steel Anchors:**
  - **2~2" Ø x 8" or 4~2" Ø x 6" Steel Anchors:**
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- **Steel Anchors:**
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