FENCE LOCATION

Description:

1. Locate fence along slope where top of fence approx. equals top of headwall.
2. Terminate fence where culvert tops of headwall.
3. Do not tie fence to headwall.
4. Fence shall not span lateral ditch.
5. Fence locations at cross drains with excavated gutal ditches as shown in plans.
6. Fence shall be constructed flush against footing.
7. 30° min. expansion or chemical concrete anchor eyebolts or studs and eyenuts.
8. 3 strands barbed wire.
9. 14' max. span lateral ditch.
10. Natural ground to toe of slope.
11. Shoulder line to approach slab.
12. Bridge to proposed fence.

Plan:

FENCING TERMINALS AT BRIDGE ENDS (ROADWAY)

FENCING TERMINALS AT BOX CULVERTS

FENCING DETAIL AT CULVERT

(For Heights Of Headwalls Greater Than 4')

(For Heights Of Headwalls 4' Or Less.)

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.

Elevation:

ELEVATION (STREAM CROSSING)
FENCING TERMINALS AT URBAN INTERCHANGES

- See Note A: The indicated distance shall be sufficient to provide satisfactory sight distance for the traffic from the ramp.
- See Note B: The indicated distance shall be identical to the above noted dimension, if practical.

FENCING TERMINALS AT RURAL INTERCHANGES

- Applies to bridge over crossroad and crossroad over freeway (bridge over crossroad shown).

FENCING TERMINALS AT RETAINING WALLS

- End LA/RW line & fence.
- See note above.

NOTE: LA/RW along the crossroad will extend a minimum 300' beyond the end of the acceleration or deceleration taper, with the taper most remote from the project establishing the end for both sides of the roadway. In the absence of a taper the radius point of the ramp return will be used with the above criteria.

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

INSET A

LA R/W Line

30' Min. Overlap

See Inset A

End LA R/W Line & Fence

LA R/W Line

50' Min. Overlap

End LA R/W Line & Fence

LA R/W Line

See Note A

LA R/W Line

End LA R/W Line & Fence

LA R/W Line

Note A - The indicated distance shall be sufficient to provide satisfactory sight distance for the traffic from the ramp.

Note B - The indicated distance shall be identical to the above noted dimension, if practical.

FENCE LOCATION

FDOT 2014 DESIGN STANDARDS

FENCE LOCATION

INDEX NO. 800

SHEET NO. 2 of 2
1. This fence shall be provided generally in rural areas. For supplemental information see Section 550 of the FDOT Specifications.

2. Fabric shall be woven wire, galvanized steel, meeting the requirements of ASTM A108, No. 9 Grade 60, Design Number 1024-6-9, with Class 3 zinc coating, No. 12½ Grade 75, Design Number 1024-7-12½, with a 1½ gage top and bottom wire and with Class 3 zinc coating, or aluminum coated steel, meeting the requirements of ASTM A584, No. 9 Farin, Design Number 1024-8-9, with a minimum coating weight of 0.4 oz./sq.ft. For additional information see payment note below.

3. Fence shall be installed with side to private property except on horizontal curves greater than 3°.

4. Posts may be either timber, steel, recycled plastic or concrete. Unless a specific post material is called for in the plans, the Contractor may elect to use either a single material or a combination of timber, steel, recycled plastic or concrete materials. Line posts of the same material may be used either as corner, pull or end posts, or in combination with different types. Line posts shall be installed in such a manner that the wires are not spliced at line posts.

5. Table 1 shall list the material requirements of Section 954. Timber line posts are to be a minimum 4" diameter. Timber corner, pull, approach and end posts are to be a minimum 5" diameter. Timber braces are to be minimum 4" diameter. Steel posts and braces shall be standard steel posts, galvanized at the rate of 2 oz./sq.ft., with necessary hardware and wire clamps and meeting the following requirements:

   (A) Line posts: 9 long, 1.13 lbs./ft.; roll formed studying, anchor plate attached (33 in.

   (B) Approach posts: 29½/2½/½" long, roll formed attaching, barewire, with necessary hardware, clamps, etc.

   (C) Pull, end and corner posts: 29½/2½/½" long, roll formed attaching, barewire, with necessary hardware, clamps, etc.

   (D) Braces: 2×2½/½" with necessary hardware and wire clamps for attaching to post.

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

   (A) Line posts: 9 long, 1.13 lbs./ft.; roll formed studying, anchor plate attached (33 in.

   (B) Approach posts: 29½/2½/½" long, roll formed attaching, barewire, with necessary hardware, clamps, etc.

   (C) Pull, end and corner posts: 29½/2½/½" long, roll formed attaching, barewire, with necessary hardware, clamps, etc.

   (D) Braces: 2×2½/½" with necessary hardware and wire clamps for attaching to post.

7. Recycled plastic posts shall meet the following material requirements. Line posts shall have a minimum section of 4 round or 4 square. Plastic posts shall not be used as corner, pull, end or approach posts unless such size is specified on the plan. Plastic wire may be used in place of line wire. Plastic wire shall be spliced by crimping sleeves only. Pulls through a corner post assembly will not be permitted.

8. The woven wire shall be attached to steel and concrete posts by a minimum of five ties wires. The single wire ties shall be spliced to the top, bottom and three intermediate 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 A641.

9. Steel Barbed Wire can be either of the following types:

   Type I: This type shall conform to the requirements of ASTM A221, with two strands of 17 gauge, four-point barbs, wire size 14 gauge, twisted around both line wires; and, Class 3 coating, Design No. 3-4-5-14-5-14. Steel Barbed Wire can be either of the following types:

   Type II/B: This type shall conform to the requirements of ASTM A221 with two strands of 17 gauge, four-point barbs, wire size 14 gauge, twisted around both line wires; and, Class 3 coating, Design No. 3-4-5-14-5-14. Steel Barbed Wire can be either of the following types:

   Type III: This type shall conform to the requirements of ASTM A221 with two strands of 17 gauge, four-point barbs, wire size 14 gauge, twisted around both line wires; and, Class 3 coating, Design No. 3-4-5-14-5-14. Steel Barbed Wire can be either of the following types:

   Type IV: This type shall conform to the requirements of ASTM A221 with two strands of 17 gauge, four-point barbs, wire size 14 gauge, twisted around both line wires; and, Class 3 coating, Design No. 3-4-5-14-5-14. Steel Barbed Wire can be either of the following types:

10. The woven wire shall be attached to steel and concrete posts by a minimum of five ties wires. The single wire ties shall be spliced to the top, bottom and three intermediate 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 A641.
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Ground Line

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FENCE TYPE A

REVISION

DESCRIPTION:

FASTENER FOR CONCRETE POST AND BRACES

FASTENER FOR TIMBER POST AND BRACE

ALTERNATE CONCRETE POSTS AND BRACES

SPLICES
This fence to be used generally in urban areas.

For supplemental information refer to Section 350 of FDOT Standard Specifications.

Chain link fabric, post, truss rods, tension wires, tie wires, stretcher bars, gates and all miscellaneous fittings and hardware shall meet the requirements of AASHTO and ASTM slightly current reference.

Fence Component Options:

A. Line post options:
   1. Galvanized pipe, Schedule 40, 1½" nominal dia. zinc galvanized at the rate of 1.8 oz./ft².: ASTM A53 Table 2 (Grade A or B), ASTM F1083, and AASHTO M111.
   2. Aluminum coated steel pipe; ASTM A53 steel, X 2 Tables Schedule 40; 1 inch nominal dia., 1.90" OD; coated at the rate 0.40 oz./ft².: AASHTO M111.
   4. Steel C-1
   5. Aluminum alloy H-Beam - 1
   6. Steel C-1
   7. Resistance welded steel pipe; 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials, ASTM F669 Group IV (Alternative Design); fence industry 1 or undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV.

B. Corner, end, and pull post options:
   1. Galvanized pipe, Schedule 40, 2" nominal dia. zinc galvanized at the rate of 1.8 oz./ft².: ASTM A53 Table 2 (Grade A or B), ASTM F1083, and AASHTO M111.
   2. Aluminum coated steel pipe; ASTM A53 steel, 2 Tables Schedule 40, 2" nominal dia.; 2.375" OD; coated at the rate 0.40 oz./ft².: AASHTO M111.
   4. Resistance welded steel pipe, 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials, ASTM F669 Group IV (Alternative Design); fence industry 1 or undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV.

C. Rail options:
   1. Galvanized steel pipe, Schedule 40, 1½" nominal dia. zinc galvanized at the rate of 1.8 oz./ft².: ASTM A53 Table 2, ASTM F1083, and AASHTO M111.
   2. Aluminum coated steel pipe; ASTM A53 steel, 1½ Tables Schedule 40, 1½" nominal dia., 1.80" OD; coated at the rate 0.40 oz./ft².: AASHTO M111.
   4. Resistance welded steel pipe, 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials, ASTM F669 Group IV.

D. Chain link fabric options (2" mesh with twisted and barbed selvage top and bottom for all options described in Note No. 10):
   1. Aluminum coated steel pipe; ASTM A53 steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft².: AASHTO M181 Type II - Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft². (M181 Class D 2.0 oz./ft². modified to 1.8 oz./ft².).
   2. AASHTO M181 Type IV - Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft².

E. Tension wire options:
   1. Steel wire No. 9 gage (coated wire diameter), coated at the rate of 0.32 oz./ft².: AASHTO M181.
   2. AASHTO M181 Type III - Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft². (M181 Class B (depleted or extruded and bonded) or Class B (tongued). See Table 3.12.7 unless the plans call for standard colors medium green, dark green or black the coating shall be gray matching that of No. 3662 of Federal Standard 595A.

F. Tie wire and hog ring options:
   1. Steel wire No. 9 gage (coated wire diameter), coated at the rate of 0.32 oz./ft².: AASHTO M181.
   2. AASHTO M181 Type III - Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft². (M181 Class B (depleted or extruded and bonded) or Class B (tongued). See Table 3.12.7 unless the plans call for standard colors medium green, dark green or black the coating shall be gray matching that of No. 3662 of Federal Standard 595A.

GENERAL NOTES

1. This fence to be used generally in urban areas.

2. For supplemental information refer to Section 350 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 AASHTO and ASTM slightly current reference.

4. Fence Component Options:

A. Line post options:
   1. Galvanized pipe, Schedule 40, 1½" nominal dia. zinc galvanized at the rate of 1.8 oz./ft².: ASTM A53 Table 2 (Grade A or B), ASTM F1083, and AASHTO M111.
   2. Aluminum coated steel pipe; ASTM A53 steel, X 2 Tables Schedule 40; 1 inch nominal dia., 1.90" OD; coated at the rate 0.40 oz./ft².: AASHTO M111.
   4. Steel C-1
   5. Aluminum alloy H-Beam - 1
   6. Steel C-1
   7. Resistance welded steel pipe; 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials, ASTM F669 Group IV (Alternative Design); fence industry 1 or undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV.

B. Corner, end, and pull post options:
   1. Galvanized pipe, Schedule 40, 2" nominal dia. zinc galvanized at the rate of 1.8 oz./ft².: ASTM A53 Table 2, ASTM F1083, and AASHTO M111.
   2. Aluminum coated steel pipe; ASTM A53 steel, 2 Tables Schedule 40, 2" nominal dia.; 2.375" OD; coated at the rate 0.40 oz./ft².: AASHTO M111.
   4. Resistance welded steel pipe, 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials, ASTM F669 Group IV (Alternative Design); fence industry 2 or undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV.

C. Rail options:
   1. Galvanized steel pipe, Schedule 40, 1½" nominal dia. zinc galvanized at the rate of 1.8 oz./ft².: ASTM A53 Table 2, ASTM F1083, and AASHTO M111.
   2. Aluminum coated steel pipe; ASTM A53 steel, 1½ Tables Schedule 40, 1½" nominal dia., 1.80" OD; coated at the rate 0.40 oz./ft².: AASHTO M111.
   4. Resistance welded steel pipe, 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials, ASTM F669 Group IV.

D. Chain link fabric options (2" mesh with twisted and barbed selvage top and bottom for all options described in Note No. 10):
   1. Aluminum coated steel pipe; ASTM A53 steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft².: AASHTO M181 Type II - Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft². (M181 Class D 2.0 oz./ft². modified to 1.8 oz./ft².).
   2. AASHTO M181 Type IV - Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft².

E. Tension wire options:
   1. Steel wire No. 9 gage (coated wire diameter), coated at the rate of 0.32 oz./ft².: AASHTO M181.
   2. AASHTO M181 Type III - Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft². (M181 Class B (depleted or extruded and bonded) or Class B (tongued). See Table 3.12.7 unless the plans call for standard colors medium green, dark green or black the coating shall be gray matching that of No. 3662 of Federal Standard 595A.

F. Tie wire and hog ring options:
   1. Steel wire No. 9 gage (coated wire diameter), coated at the rate of 0.32 oz./ft².: AASHTO M181.
   2. AASHTO M181 Type III - Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft². (M181 Class B (depleted or extruded and bonded) or Class B (tongued). See Table 3.12.7 unless the plans call for standard colors medium green, dark green or black the coating shall be gray matching that of No. 3662 of Federal Standard 595A.
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 top post optional material
or the corner and/or 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 8' 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) In accordance with Section 9.3, in accordance with the base stamp detail "Fence Mounting On Concrete Endwalls And Retaining Wall", Sheet 3; or, by embedment in
connection with ASTM F567 Subsection 5.5.

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

9. Corner post are to be installed at all horizontal breaks in fence at 15° or more and as required at vertical
breaks over 15° 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. All post, tension wires, chain link fabric, tie wires, Class NS concrete, and all miscellaneous fittings and
hardware to be included in the cost for Fencing, LF.

TYPE IV VINYL COATED FABRIC

<table>
<thead>
<tr>
<th>Specified Diameter</th>
<th>Minimum Weight</th>
<th>PVC Thickness Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
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</tr>
</tbody>
</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.

Specify the type of material or a combination of material types from the component options listed.
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 top post optional material
or the corner and/or 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.

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.

Line post shall be 8' 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) In accordance with Section 9.3, in accordance with the base stamp detail "Fence Mounting On Concrete Endwalls And Retaining Wall", Sheet 3; or, by embedment in
connection with ASTM F567 Subsection 5.5.

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

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

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.

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.

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.

All post, tension wires, chain link fabric, tie wires, Class NS concrete, and all miscellaneous fittings and
hardware to be included in the cost for Fencing, LF.
**Barb Wire Attachment**

**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.
   - Adhesive Anchors, 6" Embedment. *Adhesive anchors shall be headless anchor bolts set in drilled and filled holes with an Adhesive Material System in accordance with Specification Sections 416 and 937; drilled holes shall be larger in diameter than the anchor bolt.

**Expansion Bolts Not Permitted.**

---

**Fence Mounting on Concrete Endwall and Retaining Walls**

**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 utilities and hazardous facilities located within highway right of way.
- (d) Outward from ditches, outfalls, 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.

---

**Barb Wire Attachment**

**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.
   - Adhesive Anchors, 6" Embedment. *Adhesive anchors shall be headless anchor bolts set in drilled and filled holes with an Adhesive Material System in accordance with Specification Sections 416 and 937; drilled holes shall be larger in diameter than the anchor bolt.

**Expansion Bolts Not Permitted.**

---

**Fence Mounting on Concrete Endwall and Retaining Walls**

**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 utilities and hazardous facilities located within highway right of way.
- (d) Outward from ditches, outfalls, 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.

---

**Barb Wire Attachment**

**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.
   - Adhesive Anchors, 6" Embedment. *Adhesive anchors shall be headless anchor bolts set in drilled and filled holes with an Adhesive Material System in accordance with Specification Sections 416 and 937; drilled holes shall be larger in diameter than the anchor bolt.

**Expansion Bolts Not Permitted.**

---

**Fence Mounting on Concrete Endwall and Retaining Walls**

**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 utilities and hazardous facilities located within highway right of way.
- (d) Outward from ditches, outfalls, 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.

---

**Barb Wire Attachment**

**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.
   - Adhesive Anchors, 6" Embedment. *Adhesive anchors shall be headless anchor bolts set in drilled and filled holes with an Adhesive Material System in accordance with Specification Sections 416 and 937; drilled holes shall be larger in diameter than the anchor bolt.

**Expansion Bolts Not Permitted.**

---

**Fence Mounting on Concrete Endwall and Retaining Walls**

**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 utilities and hazardous facilities located within highway right of way.
- (d) Outward from ditches, outfalls, 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.

---

**Barb Wire Attachment**

**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.
   - Adhesive Anchors, 6" Embedment. *Adhesive anchors shall be headless anchor bolts set in drilled and filled holes with an Adhesive Material System in accordance with Specification Sections 416 and 937; drilled holes shall be larger in diameter than the anchor bolt.

**Expansion Bolts Not Permitted.**

---

**Fence Mounting on Concrete Endwall and Retaining Walls**

**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 utilities and hazardous facilities located within highway right of way.
- (d) Outward from ditches, outfalls, 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.
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.

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 galvanized in accordance with Section 24 of AASHTO M36; or, fabricated from pipe stock.

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

4. Concrete for bases shall be either 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-367. Material for Class NS concrete may be proportioned by volume and/or by weight.

5. 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") 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 DETAILS:**
See Superstructure Sheets for Traffic Railing Barrier details.

**CONCRETE PARAPET DETAILS:**
See Index No. 820 Pedestrian/Bicycle Railing for Concrete Parapets 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 rails and bands, rail ends, combination rail ends, boulevard clamps, chain link fabric, tension wire, lines, 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.
**TABLE OF CHAIN LINK FENCE COMPONENTS**

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>Galvanized Steel Pipe - 2&quot; NPS, Schedule 40 (3.500&quot; Outside Diameter, 0.216&quot; Wall Thickness)</td>
<td></td>
</tr>
<tr>
<td>Chain Link Fabric (2&quot; mesh with twisted top and knuckled bottom seigage)</td>
<td>Zinc Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating</td>
<td></td>
</tr>
<tr>
<td>Tie Wires</td>
<td>Zinc Coated Steel Wire - No. 9 gage</td>
<td></td>
</tr>
<tr>
<td>Brace Bands</td>
<td>No. 12 Gage (Min. thickness) x 3/8&quot; (Min. width) Steel Bands (Beveled or Heavily)</td>
<td></td>
</tr>
<tr>
<td>Tension Bars</td>
<td>1/2&quot; (Min. thickness) x 3/8&quot; (Min. width) x 5'-10&quot; (Min. height) Steel Bars</td>
<td></td>
</tr>
<tr>
<td>Tension Bands</td>
<td>No. 14 Gage (Min. thickness) x 3/8&quot; (Min. width) Steel Bands</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>Zinc Coated Steel — (includes post or loop caps, horizontal and brace rail ends, combination rail ends, boulevard clamps and all other miscellaneous fittings &amp; hardware)</td>
<td></td>
</tr>
<tr>
<td>Horizontal Rails</td>
<td>Galvanized Steel Pipe - 2½&quot; NPS, Schedule 40 (2.875&quot; Outside Diameter, 0.203&quot; Wall Thickness)</td>
<td></td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>Galvanized Steel Pipe - 2½&quot; NPS, Schedule 40 (2.375&quot; Outside Diameter, 0.154&quot; Wall Thickness)</td>
<td></td>
</tr>
<tr>
<td>Bolts</td>
<td>⅜&quot; x 14&quot; Hex Head Bolts for Expansion Rail Connections</td>
<td></td>
</tr>
<tr>
<td>Nuts</td>
<td>Hex Nuts for Expansion Rail Connections</td>
<td></td>
</tr>
<tr>
<td>Washers</td>
<td>Flat Washers for Expansion Rail Connections</td>
<td></td>
</tr>
<tr>
<td>Tension Wire</td>
<td>Type II (Zinc Coated Steel Wire) - No. 7 gage, Class 4 Coating</td>
<td></td>
</tr>
<tr>
<td>Hog Rings</td>
<td>Type I (Aluminum Coated Steel Wire) - No. 7 gage</td>
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</tr>
<tr>
<td>Brace Rails</td>
<td>Galvanized Steel Pipe - 1½&quot; NPS, Schedule 40 (1.660&quot; Outside Diameter, 0.140&quot; Wall Thickness)</td>
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</tbody>
</table>

**TABLE OF POST ATTACHMENT COMPONENTS**

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Clamps</td>
<td>A 36 or A 209 Grade 36</td>
<td></td>
</tr>
<tr>
<td>Base Plates</td>
<td>A 36 or A 709 Grade 36</td>
<td></td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A 709 Grade 36 or B 209 alloy 6061-T6 or B 221 alloy 6063-T5</td>
<td></td>
</tr>
<tr>
<td>Spacers</td>
<td>⅞&quot; Ø for all materials</td>
<td></td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F 1554 Grade 36</td>
<td></td>
</tr>
<tr>
<td>C-I-P Anchor Rods</td>
<td>F 1554 Grade 36</td>
<td></td>
</tr>
<tr>
<td>Nuts</td>
<td>A 563</td>
<td></td>
</tr>
<tr>
<td>Washers</td>
<td>F 436</td>
<td></td>
</tr>
<tr>
<td>Neoprene Pads</td>
<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 975.

COATINGS:

ADHESIVE-BOUND ANCHORS AND DOVETAIL:
Adhesive Bonding Material Systems for Anchors and Dovetails will comply with Specification Section 935 and be installed in accordance with Specification Section 416. Cutting of reinforcing steel is permitted for drilled hole installation.

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

CROSS REFERENCE:
For location of View A-A and Detail "A" see Sheet No. 1.
Pull Post Assembly (required at maximum intervals of 500'-0")

Bridge Deck (shown) or Raised Sidewalk

PULL POST ASSEMBLY DETAIL FOR TRAFFIC RAILING

Pipe Clamp Connection Detail
(Required only at expansion joint locations where total movement exceeds 6")

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".

EXPANSION ASSEMBLY DETAIL

(-Pull Post Assembly Detail-)

PIPE CLAMP DETAIL
(Must be manufactured from an incompressible material (i.e., steel or aluminum))
DESCRIPTION:

PULL POST ASSEMBLY DETAIL FOR CONCRETE PARAPETS

EXPANSION ASSEMBLY DETAIL

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

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 3". Expansion rails are required at expansion joint locations where the total movement exceeds 1", but is less than or equal to 9". 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. Discard the first thread on the outside of the nut to prevent loosening.

CROSS REFERENCE:

For location of Detail "B" see Sheet No. 1.
FENCING NOTES

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

FENCE INSTALLATION:
Install posts plumb (within a tolerance of ± 1°). 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 - Pedestrian/Bicycle Railings 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 the 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.
**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>§' Steel §</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A 36 or A 709 Grade 36 or B 209 Alloy 6061-T6 or B 221 Alloy 6063-T5</td>
<td>Plate thicknesses as required. Holes in shim plates will be §' Ø</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F 1554 Grade 36</td>
<td>Fully Threaded Headless Anchor Rods = §' Ø x 14½&quot;</td>
</tr>
<tr>
<td>C-I-P Anchor Rods</td>
<td>F 1334 Grade 36</td>
<td>Hex Mold Anchor Rods = §' Ø x 14½&quot;</td>
</tr>
<tr>
<td>Nuts</td>
<td>A 563</td>
<td>Hex Nuts for Base Plate Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F 436</td>
<td>Flat Washers for 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 975.
- CONTINUOUS:
  - 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 916. 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/AWS D1.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.

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 975.
- CONTINUOUS:
  - 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 916. 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/AWS D1.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.

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

FENCE INSTALLATION:
Install posts plumb (within a tolerance of ±1/2'). Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM 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-A and Detail "A" see Sheet No. 3.
For Detail "B" and "E" see Sheet No. 4.

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-A and Detail "A" see Sheet No. 3.
For Detail "B" and "E" see Sheet No. 4.
**COMPONENT INFORMATION**

**COMPONENT** | **ASTM DESIGNATION** | **COMPONENT INFORMATION**
--- | --- | ---
Posts | F 1083 | Galvanized Steel Pipe - 3" NPS, Schedule 40 (3.500" outside diameter, 0.216" wall thickness) or E70XX. Nondestructive testing of welds is not required. All welding will be in accordance with the American Welding Society Structural Welding Code (Steel) AWS/AWS D.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.
Horizontal Rails and Internal Sleeves | F 1083 | Galvanized Steel Pipe - 2½" NPS, Schedule 40 (2.875" outside diameter, 0.154" wall thickness) or B 209 Alloy 6061-T6 or A 36 or B 221 Alloy 6063-T5 or A 812.
Expansion Rails | F 1083 | Galvanized Steel Pipe - 3" NPS, Schedule 40 (3.500" outside diameter, 0.216" wall thickness) or E70XX. Nondestructive testing of welds is not required. All welding will be in accordance with the American Welding Society Structural Welding Code (Steel) AWS/AWS D.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.
Chain Link Fabric (2" mesh with knurled bottom sealings) | A 392 | Zinc Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating
 | A 491 | Aluminum Coated Steel - No. 9 gage (coated wire diameter)
 | F 668 | 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
Tension Wire | A 824 & A 817 | Type I (Zinc Coated Steel Wire) - No. 7 gage, Class 4 Coating
 | Type I (Aluminum Coated Steel Wire) - No. 7 gage
Tie Wires | F 626 | Zinc Coated Steel Wire - No. 9 gage
Hog Rings | F 626 | Zinc Coated Steel Wire - No. 12 gage
Brace Bands | F 626 | No. 12 gage (Min. thickness) x ⅜ (Min. width) Steel Bands (Beveled or Heavy)
Tension Bars | F 626 | ⅞ (Min. thickness) x ⅜ (Min. width) x Variable Height Steel Bars - Height = Tangent of Hoop Length - Barrier or Parapet Height - 2” max
Tension Bands | F 626 | No. 14 gage (Min. thickness) x ⅜ (Min. width) Steel Bands
Miscellaneous Fence Components | F 626 | Zinc Coated Steel - Includes horizontal rail ends, combination rail ends, bollard clamps and all other miscellaneous fittings and hardware.
Bolts | A 307 | ⅜ Ø x 4½" Hex Head Bolts for Internal Sleeve connections
 | ⅜ Ø x 4½" Hex Head Bolts for Expansion Rail connections
Washers | A 563 | Hex Nuts for Internal Sleeve and Expansion Rail connections
Washers | F 436 | Flat Washers for Internal Sleeve and Expansion Rail connections

**TABLE OF CHAIN LINK FENCE COMPONENTS**

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>Hex Head Anchor Rods ~ Fully threaded Headless Anchor Rods ~ ⅜ Ø x 6&quot; (no spacer) or ⅜ Ø x 7½&quot; (with spacer)</td>
</tr>
<tr>
<td>Horizontal Rails and Internal Sleeves</td>
<td>Fully threaded Headless Anchor Rods ~ ⅜ Ø x 14½&quot;</td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>Fully threaded Headless Anchor Rods ~ ⅜ Ø x 14½&quot;</td>
</tr>
<tr>
<td>Chain Link Fabric (2&quot; mesh with knurled bottom sealings)</td>
<td>Flat Washers for Pipe Clamp and Base Plate Connections</td>
</tr>
<tr>
<td>Tension Wire</td>
<td>Hex Nuts for Pipe Clamp and Base Plate Connections</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>Base Plates</td>
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<tr>
<td>Hog Rings</td>
<td>Base Plates</td>
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<tr>
<td>Brace Bands</td>
<td>Base Plates</td>
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<tr>
<td>Tension Bars</td>
<td>Base Plates</td>
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<tr>
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<td>Base Plates</td>
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<tr>
<td>Bolts</td>
<td>Base Plates</td>
</tr>
<tr>
<td>Washers</td>
<td>Base Plates</td>
</tr>
<tr>
<td>Neoprene Pads</td>
<td>Base Plates</td>
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**TABLE OF POST ATTACHMENT COMPONENTS**

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>Pipe Clamps</td>
<td>A 36 or A 709 Grade 36</td>
</tr>
<tr>
<td>Base Plates</td>
<td>A 36 or A 709 Grade 36</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A 709 Grade 36 or B 209 Alloy 6061-T6 or B 221 Alloy 6063-T5</td>
</tr>
<tr>
<td>Spacers</td>
<td>-</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F 1554 Grade 36</td>
</tr>
<tr>
<td>C-I-P Anchor Rods</td>
<td>F 1554 Grade 36</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F 1554 Grade 36</td>
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<tr>
<td>C-I-P Anchor Rods</td>
<td>F 1554 Grade 36</td>
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<tr>
<td>Bolts</td>
<td>A 307</td>
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<tr>
<td>Nuts</td>
<td>A 563</td>
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<tr>
<td>Washers</td>
<td>F 436</td>
</tr>
<tr>
<td>Neoprene Pads</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 975.

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 932.

**EXPANSION RAIL DETAIL**

**NOTES:**
1. This Dimension is the expansion joint opening plus ⅜. 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.
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".

CROSS REFERENCE:
For location of View A-A and Detail "A" see Sheet No. 1 of 4.
**PIPE CLAMP DETAIL**

- 1 1/2" Pipe Clamp
- Outside Edges of Post

**BASE PLATE DETAIL**

- 1 1/2" Pipe Clamp
- 1 1/2" Holes for 1 1/2" Anchors (Typ.)

**SPACER DETAIL**

- Must be manufactured from an incompressible material (i.e., steel or aluminum)
- 1" Holes for 1 1/2" Anchors (Typ.)

**BASE PLATE DETAIL**

- 1 1/2" Pipe Clamp
- 1 1/2" Holes for 1 1/2" Anchors (Typ.)

**POST A DETAIL**

- Base Plate
- Concrete Parapet
- Post

**POST B DETAIL**

- Base Plate
- Post A or Post C
- 1/2" Holes for 1 1/2" Bolts

**POST C DETAIL**

- Base Plate
- Post B
- 1/2" Holes for 1 1/2" Bolts

**DETAIL "B"**

- 1 1/2" Hole for Post
- 1 1/2" Hole for Post A or Post C

**DETAIL "C"**

- 1 1/2" Hole for Post

**DETAIL "D"**

- 1 1/2" Hole for Post

**DETAIL "E"**

- Internal Sleeve
- 1/2" Hole for 1 1/2" Bolts

**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.

**CROSS REFERENCE:**

For location of Details "B" and "E" see Sheet No. 1.
**ALTERNATE REINFORCING (WELDED WIRE REINF.) DETAILS**

**NOTE:** Place wire panels to minimize the end overhang. End overhangs greater than 1/2" are not permitted.

**SPICE DETAIL**

(Between WWR Sections)

**WELDED WIRE REINFORCEMENT (WWR)**

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

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are cut to out.
2. The reinforcement for the parapet on a retaining wall shall be the same as detailed above for a 8" deck.
3. All reinforcing steel at the open joints shall have a 2" minimum cover.
4. Bars 45 may be continuous or spliced at the construction joints. Bar splices for Bars 45 shall be a minimum of 1-1/2".
5. In the option of the Contractor Welded Wire Reinforcement (WWR) may be used in lieu of all Bars 4P and 45. WWR must consist of deformed wire meeting the requirements of Specification Section 721.

**ESTIMATED CONCRETE PARAPET QUANTITIES**

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<tr>
<th>ITEM</th>
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<td>Reinforcing Steel</td>
<td>LB/FT</td>
<td>6.29</td>
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(The above quantities are based on a deck with a 2% cross slope)

**SPICE DETAIL**

**DETAIL "A" - SECTION AT INTERMEDIATE OPEN J OINT**

**PEDESTRIAN/BICYCLE RAILING NOTES:**

**CONCRETE PARAPET:** Concrete parapet shall be placed vertical and top surface shall be level transversely, end, and post details. For rail, post, rail expansion joint fabrication and installation details and notes, see Index No. 822.

**BRIDGE FENCING:** For Bridge Fencing see Index Nos. 810, 811, or 812 in lieu of Posts and Rails on Index No. 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.
DESCRIPTION:

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. For Post, Rail and Rail Expansion Joint fabrication and installation Details and Notes see Index No. 822.
2. For Traffic Railing Details, Reinforcement and Notes see Index No. 420.
POST "A" DETAILS FOR SPECIAL HEIGHT BICYCLE RAILING ON CONCRETE PARAPETS (INDEX NO. 820)

CROSS REFERENCES:
For Post "A" and Post "B2" spacing see Index No. 820
For Rail Details see Index Sheet 2.
For Railing Notes see Sheet 9.
For Transition Details see Sheet 3.

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

ALTERNATE Anchor Bolt detail "A" (Concrete Parapet Shown, Traffic Railings Similar)
**SECTION A-A**

TYPICAL SECTION THRU RAIL

- Rail Splice or Expansion Joint
- 2 - Stop Pins (Locate on center of Rail Splice or Expansion Joint)
- Rail Section
- Splice Insert Bar (Type 1)
- Rail Splice/Expansion Bar
- Rail Splice/Expansion Bar

**SECTION B-B - RAIL SPLICE/EXPANSION BAR**

(Rail not shown for clarity)

- Rail Section
- Splice Insert Bar (Type 1)
- Rail Splice/Expansion Bar

**SECTION C-C**

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

**RAIL SPLICE ASSEMBLY DETAIL (TYPICAL AT BRIDGE EXPANSION JOINTS AND RAIL SPLICE LOCATIONS)**

**VIEW D-D**

- NOTE:Provide for drive fit.

**RAIL END CAP DETAIL**

**VIEW E-E**

**RAIL CLAMP BAR DETAIL**

- Drill & tap hole to accept 3/8 x 3/4" Stainless Steel Fasteners
**Railing Notes:**

PAYMENT: Payment for the railing includes Rails, Posts, Rail Splice 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.

POST ASSEMBLY: Fabricated wrought aluminum; Post – ASTM B221, alloy 6061-T6, or alloy 6351-T5; Base Plate – ASTM B209, alloy 6061-T6.

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

RAIL AND RAIL SPlice 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 6351-13.

Stainless Steel Fasteners: 3/8 Hex Cap Screws and Washers shall be ASTM F.593, alloy group 2 (316).

Anchor Bolts: Anchor bolts shall be in accordance with ASTM A36 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 12" without exceeding maximum post spacing. Post shall be uniformly spaced with reasonable consistency. Set Posts on 1'-3" Max. gap resilient or neoprene pads in accordance with Specification Section 932. The pad dimension shall be the same as the post base plate. Provide expansion joints in panels between posts on either side of Bridge Expansion Joints. Rail expansion joints shall be similar to rail splice with provision 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 not overthe proper openings. Remove any burrs or sharp edges on rails and posts to prevent injury. Rail Splices: 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 centers. Splice all rails in any railing section about equal to 1.5 times the bridge joint opening or 1" greater than the expected joint movement. Take care to ensure rails are not over the proper openings. Remove any burrs or sharp edges on rails and posts to prevent injury. Rail Splices: 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 centers. Splice all rails in any railing section about equal to 1.5 times the bridge joint opening or 1" greater than the expected joint movement. Take care to ensure rails are not over the proper openings. Remove any burrs or sharp edges on rails and posts to prevent injury.

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 butorimeter hardness 60 or 70.

Shop Drawings: Submit typical details for straight alignments and complete details for end terminations or curved alignments with radii < 40', including post and expansion joint 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.
**PLAN**

(Reinforcing Steel not shown for clarity)

**ELEVATION OF INSIDE FACE OF RAILING**

(Reinforcing Steel not shown for clarity)

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

NOTE: Place wire panels to ensure vertical wire is within 6" of open joints.

**WELDED WIRE REINFORCEMENT (WWR)**

(2 Pieces Req'd.)

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

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

**PRE-CURED SILICONE SEALANT**

(4" wide - 2 pieces Reqd.)

**SECTION A-A**

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

**RAILING NOTES:**

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

**INTERMEDIATE JOINT SEAL NOTES:**

1. At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Specification Section 932.
2. Apply sealant prior to any Class 5 Finish Coating and remove all curing compound 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 3R 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 933.

---

**BILL OF REINFORCING STEEL**

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<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
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<td>Reinforcing Steel</td>
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</table>

(The above quantities are based on a deck with a 2% cross slope)
**ALTERNATE REINFORCING (WELDED WIRE REINF.) DETAILS**

**NOTE:** Place wire panels to minimize the end overhang. End Overhangs greater than 48' are not permitted.

**WELDED WIRE REINFORCEMENT (WWR)**

**Curb Reinforcing Steel Notes:**
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the curb on a retaining wall shall be the same as detailed for an 8" deck.
3. All reinforcing steel at the open joints shall have a 2" minimum cover.
4. Bars 4S may be continuous or spliced at the construction joints. Bar splices for Bars 4S shall be a minimum of 1'-9".
5. At the option of the Contractor Welded Wire Reinforcement (WWR) may be used in lieu of all Bars 4P and 4S. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

**BILL OF REINFORCING STEEL**

**STEEL BENDING DIAGRAMS**

**MARK**  | **SIZE**  | **LENGTH**
---|---|---
P | 4 | 2'-0"
S | 4 | As Req.

**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 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.

**CONVENTIONAL REINFORCING**

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

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**QUANTITIES (SCHEME 2)**

**BILL OF REINFORCING STEEL**

**BILL OF REINFORCING STEEL**

**SCHEME 2 - CONCRETE CURB DETAILS**

**SCHEME 1 - BOTTLE GUARD DETAIL**

**TYPICAL SECTION THROUGH BOTTOM RAIL**

**SCHEME 3 - BOTTLE GUARD DETAIL**

**PLAN VIEW**

**ELEVATION VIEW**

**TYPICAL SECTION**

**CROSS REFERENCE:**
See Sheet 3 for Bridge Railing Notes.
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, 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) AWS/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: 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, 54" Height Similar)*

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
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<td>3.000</td>
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<td>Rail Joint Splice Sleeves</td>
<td>HSS2x0.125</td>
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<tr>
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<tr>
<td>Post Connection Sleeve</td>
<td>HSS2x0.125</td>
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</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1/2&quot; Round Bar</td>
<td>0.750</td>
<td>N/A</td>
</tr>
<tr>
<td>Pickets (Type 1 - Infill Panel)</td>
<td>1/2&quot; Round Bar</td>
<td>0.750</td>
<td>N/A</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>Varies</td>
<td>Varies</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 1 NOTES:**

- (1) 0.125" wall thickness permitted for rails with post spacings less than 5'-0".
- (2) Post Connection Sleeve must be 1½" NPS (Sch. 40).

**DESIGN LOADS, GEOMETRY AND APPLICABILITY:**

See the instructions for Design Standards for the design loads, geometry, and applicability requirements.

**GENERAL:**

Adhere to all foundation support provided by the bridge for anchorage and stability against overturning. See Index No. 451 for special requirements and modifications for use on bridges.

**RAILS, PANELS AND POSTS:**

Pipe Rails and Pickets shall be in accordance with ASTM A500 Grade B, C or D, or ASTM A53 Grade B for standard weight pipe (Schedule 40) or ASTM A36 for bars. Structural Tube shall be in accordance with ASTM A500 Grade A, B, C or D, or ASTM A50, Perforated panels (Type 3), U-Channel plates shall be ASTM A53 or A1011 (Grade 36). Posts and End Rails shall be fabricated and installed, the 2" radius at 2'-0" above the foundation. Pickets and vertical panel elements shall be fabricated parallel to the posts, except that Type 2, 3, 5 & 6 panel infills may be fabricated parallel to the longitudinal grade. Corners and changes in tangential longitudinal alignment shall be made continuous with a 9" 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 notched at the corner apex. Curved longitudinal alignments the outside and bottom rails and handrails shall be shop bent to match the alignment radius.

**BASE PLATES AND RAIL CAPS:**

Base Plates and Rail Cap Plates shall be in accordance with ASTM A536 or ASTM A1079 Grade 36.

**SHRIM PLATES:**

Shrim Plates shall be in accordance with ASTM B609, Alloy 6061 or 6063. Shrim plates shall be used to establish foundation height adjustments greater than 1/4", and shall be in accordance with ASTM F380 and Plate Washers (for long slotted holes only), shall be in accordance with ASTM A506 or ASTM A1079 Grade 36. After the nuts have been snugly tightened, the anchor bolts threads shall be distorted to prevent removal of the nuts. Distorted threads and lack washers shall be coated with a galvanizing compound in accordance with the Specifications.

**RESIDENTIAL AND NON-RESIDENTIAL:**

Resident and Nonresident pads in accordance with Specifications Section 932 except that testing of the finished pads shall not be required. Nonresident pads shall be conform to hardness 40 to 80.

**JOINTS:**

All welded joints shall be ground smooth. Expansion joints shall be spaced at a maximum 40'-0". Field splices similar to the expansion joint detail may be approved by the Engineer to facilitate handling, but top rail must be continuous across a minimum of two posts.

**WELDING:**

All welding shall be in accordance with the American Welding Society Structural Welding Code (Steel).

**ANNEALING:**

Current (standard). Weld metal shall be E6013 or E7018. Nondestructive testing of welds is not required.

**COATINGS:**

The steel railing shall be hot-dip galvanized after fabrication in accordance with Section 962 of the Specifications. All hot-dip galvanized steel in accordance with Specification Section 962.

**SHOP DRAWINGS:**

Details addressing project specific dimensions and tolerances shall 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.

**PAYMENTS:**

Railing shall be paid for per linear foot (Item No. 515-2-01). Payment will be prorated based on the length along the center line of the top rail, and includes rails, posts, pickets, panels, rail splice assembly, base plates, anchor bolts, nuts, washers, resilient or nonresilient pads and all incidental materials and labor required to complete installation of the railing.
**ELEVATION (Showing Outside Face of Railing with Type "A" Posts)**

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

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

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

---

**EXTENDED ELEVATION AT CORNERS**

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

**HANDRAIL REQUIREMENTS**

- Handrail required for ramps (Handrail continuous at landings between runs)
- Handrail = 2 1/8" NPS Sch. 40

**RAMP REQUIREMENTS**

- 30'-0" Max for slopes > 6.25% (Type 1 - Picket Railing Shown, Other Types Similar)
- 40'-0" Max for slopes ≤ 6.25% (Type 1 - Picket Railing Shown, Other Types Similar)

**LANDING REQUIREMENTS**

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

---

**RAILINGS ON GRADES STEEPER THAN 5%**

*Type 1 - Picket Railing Shown, Other Types Similar*
TYPE 1 - PICKET INFILL PANEL

Picket Spacing of 6½" centers is based on a 3½" NPS for standard applications. When shown in the Contract Plans a 4½" picket spacing may be required. If an alternate design is used, maintain a maximum clear opening of 5½" for standard installations and 3½" for special conditions.

**NOTES:**
- Picket Spacing of 6½" centers is based on a 3½" NPS for standard applications. When shown in the Contract Plans a 4½" picket spacing may be required. If an alternate design is used, maintain a maximum clear opening of 5½" for standard installations and 3½" for special conditions.

**TYPE 2 - CHAIN-LINK (Continuous Infill Panel)**

NOTES:
- See Plans for Infill Panel option required.
NOTES:
1. See Plans for Infill Panel Option required.
NOTES:
1. See Plans for Infill Panel Type required.
**TYPICAL SECTION ON CONCRETE SIDEWALK**

**TYPICAL SECTION ON RETAINING WALL**

**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>A Edge Dist.</td>
<td>B Edge Dist.</td>
<td>C-I-P Hex Head Bolt</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 Index No. 6011</td>
<td>4 1/2&quot;</td>
<td>3 1/2&quot; (top)</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>III</td>
<td>Step Cheekwall</td>
<td>4 1/2&quot;</td>
<td>4 1/2&quot;</td>
<td>9&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".
**ALTERNATE REINFORCING (WELDED WIRE REINF.) DETAILS**

**NOTE:** Place wire panels to minimize the end overhang. End Overhangs greater than 48" are not permitted.

**CURB REINFORCING STEEL NOTES:**
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the curb on a retaining wall shall be the same as detailed for an 8" deck.
3. All reinforcing steel at the open joints shall have a 2" minimum cover.
4. Bars 4S may be continuous or spliced at the construction joints. Bar splices for Bars 4S shall be a minimum of 1'-9".
5. At the option of the Contractor Welded Wire Reinforcement (WWR) may be used in lieu of all Bars 4P and 4S. WWR must consist of Deformed wire meeting the requirements of Specifications Section 931.

**CONVENTIONAL REINFORCING STEEL 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>2'-0&quot;</td>
</tr>
<tr>
<td>S</td>
<td>4</td>
<td>As Req.</td>
</tr>
</tbody>
</table>

**WELDED WIRE REINFORCEMENT (WWR)**

**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 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.

**BILL OF REINFORCING STEEL**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>QUANTITIES (SCHEME 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITEM</td>
</tr>
<tr>
<td>Concrete</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
</tr>
</tbody>
</table>

**EXHIBIT INFORMATION**

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

**SCHEME 1 - BOTTLE GUARD DETAIL**

**SCHEME 2 - CONCRETE CURB DETAILS**

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

**INDEX NO. 861**

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

**FDOT 2014 DESIGN STANDARDS**

**LAST REV. 07/01/13**

**DESCRIPTION:**

**PLATE WASHER DETAIL**

**TYPICAL SECTION**

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

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

**CROSS REFERENCE:** See Sheet 3 for Bridge Railing Notes.
DETAIL "B" EXPANSION JOINT (FIELD SPLICE SIMILAR)

**BRIDGE RAILING NOTES:**

**APPLICABILITY NOTE:** Railing is limited to use on bridges with an expansion joint thermal movements not exceeding 5°. 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. 862, 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 B299, Alloy 6063-T5 or 6061-T6.

**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 B209, Alloy 6063-T5 (bottom only) and ASTM B209, Alloy 6061-T5 (Expansion sides only).

**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.
### 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</td>
<td>6061-T6</td>
<td>RT 2x2x230</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td>Top Rail</td>
<td>6061-T6</td>
<td>25° NPS (Sch. 10)</td>
<td>2.875&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>6063-T5</td>
<td>25° NPS (Sch. 10)</td>
<td>2.875&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>3.00 OD x 0.125 Wall</td>
<td>3.000&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Cap Rail Inner Sleeve</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>6061-T6</td>
<td>RT 2x2x230</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td>Int. &amp; Bottom Rail Post Connection Sleeve</td>
<td>6063-T5</td>
<td>1.50 OD x 0.125 Wall</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>1.000&quot;</td>
<td>0.137&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>6061-T6</td>
<td>1.25 NPS (Sch. 40)</td>
<td>1.000&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>6061-T6</td>
<td>1/2&quot; Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Pickets (Type 1 Top/1 Panel)</td>
<td>6061-T6</td>
<td>1/4&quot; Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>(Infill Panel Members (Types 2 &amp; 5)</td>
<td>6063-T5</td>
<td>Varies (See Details)</td>
<td>Varies</td>
<td>Varies</td>
</tr>
</tbody>
</table>

### TABLE 1 NOTES:

1. Alloy 6061-T6 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. 1” NPS (Sch. 40) non-stall rail sleeves may be substituted when welded connection detail “K” is utilized.

### DESIGN LOADS, GEOMETRY AND APPLICABILITY:

- See the Instructions for Design Standards for the design loads, geometry and applicability requirements.

### GENERAL:

1. 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 5% grade to conform with the requirements of the Americans with Disabilities Act (ADA).

### RAILS, PANELS AND POSTS:

- Structural Extrusions, Tube, Pipe and Bar shall be in accordance with Table 1 and ASTM B221 or ASTM B429. Top, bottom and intermediate rail corner bends with maximum 8’-0” post spacing, may be Alloy 6063-T6. Perforated panels (Type 5) shall be Alloy 3003-H14. Posts shall be fabricated and installed plum, ± 1° tolerance when measured at 3’-6” above the foundation. Pickets and vertical panel elements shall be fabricated parallel to the posts, except that Type 2, 3 & 5 panel infills may be fabricated parallel to the longitudinal grade. Corners and changes in tangential longitudinal alignment shall be made continuous with a 9° 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 apexes. For curved longitudinal alignments the top and bottom rails and handrails shall be shop bent to match the alignment radius.

### BASE PLATE AND RAIL CAPS:

- Base Plates and Post Cap plates shall be in accordance with ASTM B229. Alloy 6061-T6 or 6063-T6. Shims shall be used for foundation height adjustments greater than 1/2" and localized irregularities greater than 1/2".

### ANCHOR BOLTS:

- Anchor bolts shall be in accordance with ASTM F1534 Grade 36. Headless anchor bolts for adhesive anchors. Anchors shall be threadless 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 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 Flat Lock Washers (Forlong slotted holes only), shall be in accordance with ASTM A564 or ASTM A490 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.

### RESILOENT AND NITROPRENE 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:

- All welded joints are to be ground smooth. Expansion joints shall be spaced at a maximum 35’-0”. Field splices similar to the expansion joint detail may be approved by the Engineer to facilitate handling, but top rail must be continuous a minimum of two posts.

### WELDING:

- All welding shall be in accordance with the American Welding Society Structural Welding Code (Aluminum ANSI/AWS D1.1 (current edition)). Filter metal shall be either ER5183, ER5556 or ER5556. Nondestructive testing of welds is not required. Filter metal for plug welds and bond welds shall be ER4404.

### 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 Specification Section 962.

### SHOP DRAWINGS:

- Details addressing project specific geometry (line & grade) showing post and expansion joint locations, post and panel angle, 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:

- Railing shall be paid for per linear foot (Item No. 515-2-2bt) Payment will be plan quantity measured as the length along the center line of the top rail, and includes posts, rails, 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.
**Railing on Grades Steeper Than 5%**

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

**ELEVATION**

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

**Notes:**

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

- Handrail required for ramps (Handrail continued at landings between runs)
  - Handrail ~ 1/2" NPS Sch. 40
  - See "Typical Railing Details" for post, rail & picket or infill panel details
  - Rail expansion joints to be located in panels above structure expansion joints *(35'-0" maximum spacing).*

- Rail expansion joints at为基础

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

DETAIL "J" - ELEVATION VIEW
TOP RAIL TERMINATION

RAIL TERMINATION DETAILS

ALTERNATE END TREATMENT
(Elevated Stairs similar)

RAILINGS ON STEPS & STAIRS

(At-Grade Steps shown, Elevated Stairs similar)

ELEVATION

VIEW J-J DETAIL "J" - ELEVATION VIEW
TOP RAIL TERMINATION

DETAIL "K" - ELEVATION VIEW
BOTTOM RAIL CONNECTION

See "Typical Railing Details", Sheet 2 for post, rail & picket details.

Handrail Continuous
At Landing

Handrail required for three or more steps (Handrail and cheekwalls continuous at landings)
Handrails ~ 1 1/2" NPS (Sch. 40) pipe

Aluminum Handrail required for three or more steps (Handrail and cheekwalls continuous at landings)
Handrails ~ 1 1/2" NPS (Sch. 40) pipe

Concrete sidewalk to extend 6" min. behind railing

ELEVATION
(Related to post, rail, & picket details)

For railing fabrication (Typ.)

Leveling Channel
(Typ.) see Detail, Sheet 4

Length of Landing 5' Min.

See Index No. 521 or Contract Plans for Step Details

Handrail Termination
(Typ.) or Splice when rail continues on

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

NPS (Sch. 40) permitted for first panel at top of stairs

Length of Landing 5' Min.

Top Landing

Varies ~ Equal spacing
5' -0" Max. on Steps

Equal to one tread length

Top Rail Cap
Round over corners 1 1/2" (Typ.)

Post
Rail Cap

See "Typical Railing Details", Sheet 2 for post, rail & picket details.

Post Cap

Top Rail

NPS (Sch. 40) pipe

Handrail ~ 1 1/2" continuous at landings)

or more steps (Handrail and cheekwalls

Aluminum Handrail required for three

3 1/2" Max. permitted

1 b"

R 1 b"

16"

37" (Max.) ~ Pedestrian/Bicycle Railing

1'-0"

2 '-1 0"

1'-6" ±

862
**TYPE 1 - PICKET INFILL PANEL**

* Picket Spacing of 6\(\frac{1}{2}\) centers is based on a 3\(\frac{3}{8}\) NPS for standard applications. When shown in the Contract Plans a 4\(\frac{1}{2}\) picket spacing may be required. If an alternate design is used, maintain a maximum clear opening of 53\(\frac{3}{8}\) for standard installations and 35\(\frac{3}{8}\) for special conditions.

**PICKET NOTES:**
- Ties @ 1'-0" center (Post and End Rail)
- Ties @ 2'-0" center (Intermediate & Bottom Rail)
- Chain-Link Fence Fabric tied to inside face of railing

**TYPE 2 - CHAIN-LINK (Continuous Infill Panel)**

**ocus:**
- Ties @ 1'-0" center (Post and End Rail)
- Ties @ 2'-0" center (Intermediate & Bottom Rail)
- Chain-Link Fence Fabric tied to inside face of railing

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

**TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS**

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPONENT</td>
</tr>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh x No. 9 Gauge - knuckled top and twisted bottom selvages)</td>
</tr>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvages)</td>
</tr>
<tr>
<td>Tied Wires</td>
</tr>
<tr>
<td>Tension Bars</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</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

TYPE 3 - SUNSHINE INFILL PANEL
Seal Weld mitered corners at Rail Expansion Joints

SECTION A-A

TYPE 4 - BROADWAY INFILL PANEL

SECTION C-C

PANEL/SPLICE CONNECTION

DETAIL "3A" INTERMEDIATE RAIL/RAY CONNECTION

DETAIL "3B" BOTTOM RAIL/RAY CONNECTION

DETAIL "3C" RAY/ARC CONNECTION

DETAIL "3D" ARC/POST CONNECTION

DETAIL "3E" PANEL END CONNECTION

DETAIL "4A" PANEL/RAIL CONNECTION

SECTION A-A

PANEL ADJUSTMENT FOR RAILINGS ON GRADES

INDEX NO. 862
TYPE 5 - PERFORATED INFILL PANEL

Seal welding mitered corners is permitted

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

SECTION C-C
Panel/Splice Connection

SECTION A-A
**Typical Section on Concrete Sidewalk**  
(Case I)

- 4" Sidewalk with Thickened Edge
- Edge Shim (Minimum 4" long x \( \frac{1}{2} \)" wide x thickness as required)
- 1" ~ 2"Ø C-I-P Hex Head Anchor Bolts, or 1" ~ 2"Ø Headless Anchor Bolts set with an Adhesive Bonding Material System in accordance with Specification Sections 416 and 937. Self-Locking Hex Nut & Washer. Place Anchor Bolts perpendicular to Base for Grades = 8.33% (Ramps) with flat washer. Place anchor bolts plum for grades \( > 8.33\% \) (Stairs) with flat washer & beveled washer, or leveling channel.
- Washing or leveling channel is required for height adjustment.
- Edges to be Leveled
- 5/8" Min. Width at Top of Wall

**Typical Section on Retaining Wall**  
(Case II)

- Reinforced Concrete Structure
- Edge Shim (Minimum 4" long x \( \frac{1}{2} \)" wide x thickness as required)
- Full size Shim Plates as required
- 1/2" Thick Resilient Pad or Neoprene Pad

**Detail "C"**  
(Cast-In-Place Anchor Bolts shown, Adhesive Anchors similar)

- See Section A-A Sheet 4
- For Horizontal Cross Bar Railing
- See detail "C" (Typ)
- 4" (Case IIa)
- 41/2" (Case IIb)
- 2 1/2" Handrail
- 1 1/2" Min. Clear

**Anchor Bolt Table**

<table>
<thead>
<tr>
<th>CASE</th>
<th>STRUCTURE TYPE</th>
<th>&quot;A&quot;</th>
<th>&quot;B&quot;</th>
<th>&quot;C&quot;</th>
<th>C.I.P Hex Head Bolt</th>
<th>Adhesive Anchor</th>
<th>ANCHOR LENGTH</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>
<td>101/2&quot;</td>
<td>11&quot;</td>
<td>3/8&quot; Ø</td>
</tr>
<tr>
<td>IIa</td>
<td>Reinforced Concrete</td>
<td>4&quot;</td>
<td>4&quot;</td>
<td>1&quot;</td>
<td>101/2&quot;</td>
<td>11&quot;</td>
<td>3/8&quot; Ø</td>
</tr>
<tr>
<td>IIIb</td>
<td>Gravity Wall</td>
<td>41/2&quot;</td>
<td>31/2&quot;</td>
<td>1'-0&quot;</td>
<td>1'-11/2&quot;</td>
<td>1'-2&quot;</td>
<td>5/8&quot; Ø</td>
</tr>
<tr>
<td>III</td>
<td>Step Cheekwall</td>
<td>41/2&quot;</td>
<td>41/2&quot;</td>
<td>9&quot;</td>
<td>101/2&quot;</td>
<td>11&quot;</td>
<td>3/8&quot; Ø</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".*

**Description:**

- Stability of railing
- (3' Min. Required for Stability of Railing)
- See Section A-A Sheet 4
- 4" Special Height Banne Railing
- Reinforced Concrete Structure
- Top of wall

**Aluminum Pedestrian/Bicycle Railing**

- FDOT 2014
- Design Standards
- Index No. 862
- Sheet No. 8 of 8
NOTES

PIPE RAILS & POSTS:
Structural Tube, Pipe and Bar shall be in accordance with ASTM B221 or ASTM B429. Alloy 6061-T6. End Rail W2 bends and corner bends with maximum 4'-0" post spacing, may be Alloy 6061-T6. Posts and End Rails shall be fabricated and installed plumb. A 1° tolerance when measured at 3'-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 and 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 stop bent to match the alignment radius.

RAILING MEMBER DIMENSIONS TABLE

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION (IN.)</th>
<th>WALL THICKNESS (IN.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375</td>
<td>0.154</td>
</tr>
<tr>
<td>Rails</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375</td>
<td>0.154</td>
</tr>
<tr>
<td>Rail Joint/Splice Sleeves</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>1.900</td>
<td>0.145</td>
</tr>
<tr>
<td>Handrails Joint/Splice Sleeves</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>1.315</td>
<td>0.135</td>
</tr>
<tr>
<td>Handrails</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>1.900</td>
<td>0.145</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1&quot; B Round Bar</td>
<td>1.000</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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

SHIM PLATES:
Shim Plates shall be in aluminum in accordance with ASTM B209, Alloy 6061 or 6063. Shim plates shall be used for foundation height adjustments greater than 1" and localized irregularities greater than 1/4". Field trim shim plates when necessary to match the contours of the foundation. Bevelled shim plates may be used in lieu of trimmed flat shim plates shown. Stacked shim plates shall be bonded together with adhesive bonding material and limited to a maximum total thickness of 1/4", unless larger anchor bolts are provided for the exposed thread length.

ANCHOR BOLTS:
All anchor bolts shall be in accordance with ASTM F1554 Grade 36. Headless anchor bolts for adhesive anchors shall be threaded full-length. Cutting 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 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 A956 or ASTM A936. 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 welds is not required. Neoprene pads shall be durometer hardness 60 or 70.

SHIM PLATES:
Shim Plates shall be aluminum in accordance with ASTM B209, Alloy 6061-T6. Shim plates shall be coated with a galvanizing compound in accordance with Section 962 of the Specifications. 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 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 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 A956 or ASTM A936. 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 welds is not required. Neoprene pads shall be durometer hardness 60 or 70.

SHIM PLATES:
Shim Plates shall be in accordance with ASTM B209, Alloy 6061-T6. Shim plates shall be coated with a galvanizing compound in accordance with Section 962 of the Specifications. 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 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 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 A956 or ASTM A936. 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 welds is not required. Neoprene pads shall be durometer hardness 60 or 70.

SHIM PLATES:
Shim Plates shall be in accordance with ASTM B209, Alloy 6061-T6. Shim plates shall be coated with a galvanizing compound in accordance with Section 962 of the Specifications. 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.
description:

**DETAILED "C" - RAIL CONNECTIONS**

(Handrail Not Shown)

**DETAILED "B" - RAIL AND HANDRAIL**

(Showing Sloped Condition for Stairs or Ramp)

**DETAILED "D" - EXPANSION JOINT**

(FIELD SPLICE SLIP JOINT SIMILAR)

**DETAILED "E" - CONTINUITY**

FIELD SPLICE

---

For locations of Details "C", "D" and "E", see Sheet 2.
**DESCRIPTION:**

- Anchor Bolts
- GUiderail & Anchor Plates (as required) (Typ.)
- Base Plate with Shim or Neoprene Pad (Typ.)
- 8" Thick Resilient Edge Shim (as reqd.)
- Bonding Material (Min.) wide bed of Adhesive

**NOTES:**

- 2 - ¾" x 8" Anchor Bolts (***) with Self-Locking Hex Nuts & Washers.
- Adhesive anchors shall be fully threaded headless anchor bolts set in drilled holes (manufacturer recommended diameter) with Adhesive Bonding Material System in accordance with Specification Section 416. The minimum embedment is 6".
- Adhesive Anchors Not Permitted (C-I-P); Galvanized Steel Anchors Permitted (C-I-P); Galvanized U-Bolts (***); Expansion Anchors Not Permitted

**RELATED SPECIFICATIONS:**

- Section 416
- Section 926
- Section 416

**TYPICAL SECTION ON STEPS & STAIRS**

**TYPICAL SECTION ON CONCRETE SIDEWALK**

**TYPICAL SECTION ON GRAVITY WALL**

(Other Retaining Walls Similar)

**OPTIONAL SIDEWALK ANCHORAGE DETAIL**

(Used in lieu of Beveled Shim Plates)
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 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 3'-0" above the foundation. Corners and changes in tangential longitudinal alignment, may be made
continuous with a 90° bent radius or terminated at adjoining sections with a standard end boss when
handrails are not required. For changes in tangential longitudinal alignment greater than 45°, posts
shall be spaced at a maximum 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

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<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>0.240&quot;</td>
</tr>
<tr>
<td>Handrails 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>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.147&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 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" and localized irregularities greater than ½". Field
trim shim plates when necessary to match the contours of the foundation. Reelled shim
plates may be used in lieu of trimmed flat shim plates shown. Stacked shim plates must be bonded
一起 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 railing shall be hot-dip galvanized after fabrication in accordance with Section 962 of the Specifications.

ANCHOR BOLTS:
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
anchorages shall be threaded full length. Cutting 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-threading 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
used in lieu of trimmed flat shim plates shown. Stacked shim plates must be bonded
一起 with adhesive bonding material and limited to a maximum total thickness of ½", unless
longer anchor bolts are provided for the exposed thread length.

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 around and ground smooth. 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 CRL must be continuous across a minimum of two
(m)-beams. A Radius Continuous Field Splice (Detail "F") 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/D1.1 (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:
Payment for the 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 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.
**RAMP REQUIREMENTS**

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

**LANDING REQUIREMENTS**

Max. landing slope = 2.0%
Max. landing cross-slope = 2.0%

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

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

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

Wall are not considered to be expansion joints.

*Keyed construction joints in Index No. 520 Gravity Wall are not considered to be expansion joints.*

**CROSS REFERENCE:**

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

NPS = Nominal Pipe Size

**NOTES:**

- For construction joints in Index No. 520 Gravity Wall, expansion joints are not considered to be expansion joints.

**STRUCTURES EXPANSION JOINTS NOTE:**

- The following details are for post & rail details:
  - See "Typical Railing Details" for post & rail details
  - See Plans for continuation or termination limits of railing

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

Max. landing cross-slope = 2.0%
Max. landing slope = 2.0%

**RAMP REQUIREMENTS**

For slopes greater than 5%:
- Max. ramp slope = 8.33%
- Max. ramp cross-slope = 2.0%
RAILING CONTINUATION BEYOND STEPS
(Bottom shown, Top similar)

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

Handrail Termination
See Detail "A" (Typ.)

Concrete sidewalk to extend 6' min. behind \( \& \) railings

See "Typical Railing Details", Sheet 2 for
post & rail details

See Index No. 521
or Contract Plans
for step details

ELEVATION
(At-Grade Steps)

Handrail continuous

Handrail Termination
See Detail "A" (Typ.)

Length of Landing
(Bottom Landing)

Length of Landing
(Top Landing)

9" Min. Wide
Cheekwall both sides

5'-0" Min.
Length of Landing
(Top Landing)

9" Min. Wide
Cheekwall both sides

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

GUIDERAIL ON STEPS & STAIRS

STEEL PIPE GUIDERAIL

FDOT 2014 DESIGN STANDARDS

INDEX NO. 880 SHEET NO. 3 of 5

LAST REVISION 01/01/12

ADMINISTRATION COMMITTEE REVIEW
02/14/14
**TYPICAL SECTION ON CONCRETE SIDEWALK**

- 4" Sidewalk with Thickened Edge
- 6" Standard, 7\(\frac{1}{2}\)" for Ramps requiring handrails
- 8" Sidewalk, 6" for Ramps requiring handrails

**TYPICAL SECTION ON GRAVITY WALL**

- Base Plate with Shim plates (as required) (Typ.)
- 3\(\frac{1}{2}\) Thick Resilient or Neoprene Pad (Typ.)
- 8° Standard
- 0° for Ramps

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

**TYPICAL SECTION ON STEPS & STAIRS**

- Step Cheekwall
- Step Nosing

**DETAIL "F" (OPTIONAL SHIMMING DETAIL FOR CROSS SLOPE CORRECTION)**

- Used in lieu of Beveled Shim Plates

**OPTIONAL SIDEWALK ANCHORAGE DETAIL**

- 2 - 3\(\frac{1}{2}\) Ø Anchor Bolts (***) with Self-Locking Hex Nuts & Washers.
- 3\(\frac{1}{2}\) Thick Resilient or Neoprene Pad
- Edge Shim 8" long x \(\frac{3}{8}\)" wide x thickness as req'd.

**NOTES:**

- **Adhesive anchors shall be fully threaded headless anchor bolts (***); Expansion Anchors Not Permitted.**
- Galvanized Steel Bolts (As Shown) (C-I-P); Galvanized Adhesive Anchors Permitted
- Galvanized U-Bolts
- Permitted (C-I-P); Galvanized U-Bolts
- Plastic or galvanized steel plug
- Seal end of post with an Adhesive Bonding Material System in accordance with Specification Section 937 and installed in accordance with Specification Section 416. The minimum embedment is 6".

**SPECIFICATION SECTION 416**

- The minimum embedment is 6".
- Specification Section 937 and installed in accordance with Specification Section 926.

**DETAIL "E"**

- Epoxy Mortar (Type F) in accordance with Specification Section 926
- 3\(\frac{1}{2}\) Min. Embedment

**NOTE:**

- 2 - 3\(\frac{1}{2}\) Ø Steel Anchor Bolts
- Full size Shim Plates when required for height adjustment
- 1\(\frac{3}{4}\)" (Min.) wide x thickness of Adhesive Bonding Material

**DETAIL "F"**

- 3'-0" Min. Clear
- 5'-0" Std. ~ Between Handrails
- 3'-6" Maximum (away from drop-off)
- 6" Standard
- 9" Embedment Depth
- Width of Structure at
- 6" Embedment Depth
- Measure from Step Nosing
- Full size Shim Plates when required for height adjustment
- 2" Min. Beveled 8\(\frac{1}{16}\)" Build-up (Typ.)
- 45° Beveled

**DETAIL "G"**

- Top of Step Nosing
- Steel Pipe Guiding Rail
- Steel Pipe Anchor Bolts
- 1" Ø Bar
- 3\(\frac{1}{2}\)" Min. Embedment
- 2\(\frac{1}{2}\)" Ø Core Drilled hole in accordance with Specification Section 416
- 45° Beveled
- 3\(\frac{1}{2}\)" Min. Embedment
- epoxy Mortar (Type F) in accordance with Specification Section 926
- Seal end of post with a plastic or galvanized steel plug