This railing is not applicable for shielding drop-off hazards for vehicular traffic. This railing is not applicable for all cases where a pedestrian or bicyclist drop-off hazard exceeds 2'-0" or when a drop-off hazard is less than 2'-0" and is required by design. See Index No. 851 for special requirements and modifications for use on bridges. Adequate foundation support shall be provided for anchorage and stability against overturning. For unusual site conditions a site specific railing is to be designed by the responsible engineer. The railing shown on these drawings requires a handrail for ramps steeper than a 5% grade to conform with the requirements of the Americans with Disabilities Act (ADA). Refer to FDOT Plans Preparation Manual (Volume I) Chapters 4 & 8, for the definition of vehicular, pedestrian and bicyclist "drop-off hazards".

Manufacturers seeking approval of proprietary railing systems for inclusion on the Qualified Products List (QPL) as pre-approved alternate designs must submit application along with design documentation showing the proprietary railing system is designed to meet the design life, live loads, geometry and deflection requirements specified herein. All fixed joints are to be either welded or commercially designed fixed joint systems. Each fixed field section of railing must be identified with a permanently affixed label with the manufacturer's name and the FDOT QPL approval number. Labels must be a minimum of 1" by 3" and located at the base of a post within the field section. Project specific shop drawings are required for QPL approved railings, see Shop Drawings note. All welding shall be in accordance with the American Welding Society Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal shall be E60XX or E70XX. Nondestructive testing of welds shall be in accordance with ASTM E894 (Flexural Test). Anchorage systems must resist the minimum of 175% of the design load. Test proprietary or nonstandard anchorage systems in accordance with Section 992 of the Specifications. Each field section of railing must be identified with a permanently affixed label with the manufacturer's name and the FDOT QPL approval number. Labels must be a minimum of 1" by 3" and located at the base of a post within the field section. Project specific shop drawings are required for QPL approved railings, see Shop Drawings note.

PAYMENT:

Railing shall be paid for per linear foot (Item No. 515-2-abb). Payment will be plan quantity measured as foundation. Adequate foundation support shall be provided for anchorage and stability against overturning. For unusual site conditions a site specific railing joint/splice design shall be made consistent with a 2'-0" bend radius or terminate at adjoining sections with mitered end sections when handrails are not required. Railing must be fabricated and installed per the drawings below. Mitered ends shall have a maximum distance of 2'-0" each side of the corner and shall not be located at the corner apex. For curved longitudinal alignments the top and bottom rails and handrails shall be shop bent to match the alignment radius.

### 2010 Interim Design Standard

**RAILS, PICKETS & 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 standard weight pipe (Schedule 80). Structural Tube Posts shall be in accordance with ASTM A500 Grade B, C or D, or ASTM A501.
- Posts and End Rails shall be fabricated and installed plumb, ± 1° tolerance when measured at a 5'-0" above the foundation. Pickets shall be fabricated parallel to the foundation. Corners and changes in alignment in tangential longitudinal alignment shall be made consistent with a 2'-0" bend radius or terminate at adjoining sections with mitered end sections when handrails are not required. For changes in tangential longitudinal alignment, picket points shall have a maximum distance of 2'-0" each side of the corner and shall not be located at the corner apex. For curved longitudinal alignments the top and bottom rails and handrails shall be shop bent to match the alignment radius.

### RAILING MEMBER DIMENSIONS TABLE

<table>
<thead>
<tr>
<th>MEMBER DESCRIPTION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>2&quot; x 4&quot; Rectangular Tube</td>
<td>2.00&quot; x 4.00&quot;</td>
</tr>
<tr>
<td>Rail Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1½&quot; Round Bar</td>
<td>1.000&quot;</td>
</tr>
<tr>
<td>Pickets</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>0.840&quot;</td>
</tr>
<tr>
<td>1½&quot; Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### BASE PLATES & POST CAPS:
- Base Plates shall be in accordance with ASTM A36 or ASTM A709 Grade 36.
- Picket Cap Plates shall be in accordance with ASTM A53 or ASTM A500 Grade B, C or D.
- Structural Tube Posts shall be in accordance with ASTM A500 Grade B, C or D, or ASTM A501.
- Screws shall be in accordance with ASTM A307 or ASTM A325.

### ANCHOR BOLTS:
- Anchor Bolts shall be in accordance with ASTM F554 Grade 36. Heat treated anchor bolts for Adhesive Anchors shall be threaded full length. Cutting of reinforcing steel is permitted for drilled hole installation. Expansion Anchors are not permitted. All anchor bolts shall have single self-locking hex nuts. Field welding of the nut to the anchor bolt may be used in lieu of self-locking nuts. All anchors shall be in accordance with ASTM A563 or ASTM A194. Picket Washers shall be in accordance with ASTM F436 and Plate Washers (for long slotted holes only) shall be in accordance with ASTM A36 or ASTM A500 Grade 36. After the nuts have been snug tightened, the anchor bolt threads shall be distorted to prevent removal of the nuts. Distorted threads and tack welds shall be coated with a galvanizing compound in accordance with the Specifications.

### RESILIENT AND NEOPRENE PADS:
- Resilient and Neoprene pads shall be in accordance with Specification Section 932 except that testing of the finished pads shall not be required. Neoprene pads shall be PRESTRESSED standard 40 or 70.
- Field joints are to be welded all around and 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 hot-dip galvanizing and hand railing, but railing must be continuous across a minimum of two posts. Only use the continuity Field Joint Splice (Detail "C") to make the railing continuous. Otherwise separate field adjustments. Metallize rail ends with a galvanizing compound when field adjustments are required.

### WELDING:
- Beveled joint edges for welding shall be prepared by the Contractor for the Engineer's approval prior to fabrication of the railing. Shop drawings shall be in accordance with the Specifications.

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- Anchor Bolts shall be in accordance with ASTM F554 Grade 36. Heat treated anchor bolts for Adhesive Anchors shall be threaded full length. Cutting of reinforcing steel is permitted for drilled hole installation. Expansion Anchors are not permitted. All anchor bolts shall have single self-locking hex nuts. Field welding of the nut to the anchor bolt may be used in lieu of self-locking nuts. All anchors shall be in accordance with ASTM A563 or ASTM A194. Picket Washers shall be in accordance with ASTM F436 and Plate Washers (for long slotted holes only) shall be in accordance with ASTM A36 or ASTM A500 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.

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### WELDING:
- Beveled joint edges for welding shall be prepared by the Contractor for the Engineer's approval prior to fabrication of the railing. Shop drawings shall be in accordance with the Specifications.
STEEL PEDESTRIAN/BICYCLE PICKET RAILING

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

- **Typical Railing Details & Railings on Grades 0% to 5%**
- **Structures Expansion Joints Note:**
  - *Keyed construction joints in Index No. 520 Gravity Wall are not considered to be expansion joints.*

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

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

**Landing Requirements**

- **Elevation**
  - (Showing Inside Face of Railing)

**Expanded Elevation at Corners**

- **Detail for Non-Continuous Railing at Corners**
- **Cross Reference:**
  - For Details “C”, “D”, and “E”, see Sheet 4 of 5.

**Revisions**

- **850**
- **2010 Interim Design Standard**
- **Sheet 2 of 5**
- **2010 Interim Design Standard**
- **Sheet No. 2010 Interim Design Standard**
- **Date**
  - **07/01/10**
- **Optional Picket Spacing**
  - *Picket Spacing based on the optional picket members shown. If an alternate design is used maintain a maximum clear opening of 3".*

- **End Rail Bend Varies for Railings on Grades Steeper Than 2.4%**
- **NPS = Nominal Pipe Size**

- **See Plans for continuation or termination limits of railing**

- **Bottom Landing**
  - 6'-0" Min.
  - 5'-6" Max. for Slopes > 6.25%
  - 40'-0" Max. for Slopes ≤ 6.25%

- **Intermediate Landing**
  - 5'-0" Min.
  - 3'-6" Max. for Slopes > 6.25%
  - 30'-0" Max. for Slopes ≤ 6.25%

- **Top Landing**
  - 1'-10" Min.
  - 2'-0" Max. for Slopes > 6.25%
  - 40'-0" Max. for Slopes ≤ 6.25%

- **Top of Sidewalk or Bikeway**
  - **Ground Line**
  - **Wall**

- **For Details “C”, “D”, and “E”, see Sheet 4 of 5.**
- **See Plans for continuation or termination limits of railing.**

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

- **See Typical Railing Details**
  - for post, rail & picket details

- **Panel Clear Openings at Posts**
  - *Pickets ~ Ø 4" O.C.*

- **See “Typical Railing Details”**
  - for post, rail & picket details

- **Handrail**
  - **4'-6" Special Height Bicycle Railing**
  - **3'-6" Pedestrian/Bicycle Railing**

- **Top Rail ~ 2" NPS Sch 40 (Typ.)**
  - **Post ~ 2" x 4" x 1/2" wall Rectangular Tube (Typ.)**

- **Bottom Rail ~ 2" NPS Sch 40 (Typ.)**
  - **Minimum from free end of concrete and expansion joints (Typ.)**

- **Pickets ~ ¿ Ø Bar (Typ.)**
  - **Rectangular Tube (Typ.)**

- **3'-0" Max. for Slopes > 6.25%**
  - **40'-0" Max. for Slopes ≤ 6.25%**

- **See Detail “C” Sheet 4 of 5**

- **Rail Expansion Joint (Typ.)**
  - See Detail “E” Sheet 4 of 5

- **Continuity Field Splice (as required) see Detail “E” Sheet 4 of 5 (Typ.)**

- **Note:** Non-continuous corners are permitted when handrails are not required.
ALTERNATE END TREATMENT DETAILS

RAILINGS ON STEPS & STAIRS

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

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

Handrail termination (Typ.) See Detail "C"

Concrete sidewalk to extend 6" min. behind railing

HANDRAIL TERMINATION

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

RAILINGS ON STEPS & STAIRS

Revisions

DATE
07/2010
07/15/10
07/01/10

DESCRIPTION
Changed 2'-10" dimension to mid-height of Handrail.

Sheet No.
850

2 of 5
BY
BY
Added (± 4") tolerance to End Hoop length in Detail "C".

Top Rail
SJN
SJN
Added Type B connection for pickets.

(Handrail Connection)
Bottom Rail ~ 2" NPS, Sch. 40
Handrail ~ 2" x 4" x 0.188" thick wall Rectangular Tube

VIEW F-F

SECTION B-B
(Handrail Connection)

SECTION G-G
BASE PLATE & BOTTOM RAIL CONNECTION

SECTION C-C
(Bottom of Picket Connection)

ALTERNATE
BASE PLATE DETAIL
(Recommended for Top of Step Cheekwalls)

SHIM PLATE DETAIL
PLATE WASHER DETAIL

DETAIL "C" - RAIL CONNECTIONS
(Showing Outside Face of Structure and Railing, Pickets and Handrail Not Shown for Clarity)

DETAIL "B" - RAIL AND HANDRAIL
(Showing Sloped Condition for Stairs or Ramp)

DETAILED MODIFICATION FOR TYPE B CONNECTION
(Top Rail Sleeve Shown, Bottom Rail Sleeve Similar)

CROSS REFERENCE:
For locations of Details "C", "D" and "E": see Sheet 2 of 5.

REVISIONS
2012 Interim Design Standard

Date: 07/01/10
Sheet No: 4 of 5

STEEL PEDESTRIAN/BICYCLE PICKET RAILING

850
**TYPICAL SECTION ON CONCRETE SIDEWALK**

*Case I*

- 2" Sidewalk with Thickened Edge
- Slope 2% Max. (away from drop-off)

**TYPICAL SECTION ON RETAINING WALL**

*Case II*

- 4" Sidewalk with Thickened Edge
- Slope 2% Max. (away from drop-off)

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

(Used in lieu of Beveled Shim Plates)

**DETAIL "A"**

(Cast-In-Place Anchor Bolts shown, Adhesive Anchors similar)

---

**ANCHOR BOLT TABLE**

<table>
<thead>
<tr>
<th>CASE</th>
<th>STRUCTURE TYPE</th>
<th>8&quot;</th>
<th>7-2&quot;</th>
<th>6&quot;</th>
<th>Min. Embedment</th>
<th>C.I.P. Hex Head Bolt</th>
<th>Adhesive Anchor</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Unreinforced Concrete</td>
<td>4&quot;</td>
<td>4&quot;</td>
<td>9&quot;</td>
<td>10(\frac{1}{2})&quot;</td>
<td>11&quot;</td>
<td>(\frac{1}{4}) ø</td>
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<tr>
<td>11a</td>
<td>Reinforced Concrete</td>
<td>4&quot;</td>
<td>4&quot;</td>
<td>9&quot;</td>
<td>10(\frac{1}{2})&quot;</td>
<td>11&quot;</td>
<td>(\frac{1}{4}) ø</td>
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<tr>
<td>11b</td>
<td>Gravity Wall</td>
<td>4(\frac{1}{2})&quot;</td>
<td>3(\frac{1}{4})&quot;</td>
<td>1&quot;-6&quot;</td>
<td>1&quot;-1(\frac{1}{4})&quot;</td>
<td>(\frac{1}{4}) ø</td>
<td></td>
</tr>
<tr>
<td>11c</td>
<td>Step Cheekwall</td>
<td>4(\frac{1}{2})&quot;</td>
<td>4(\frac{1}{2})&quot;</td>
<td>9&quot;</td>
<td>10(\frac{1}{2})&quot;</td>
<td>11&quot;</td>
<td>(\frac{1}{4}) ø</td>
</tr>
</tbody>
</table>

* Embed length "C" may be reduced to 9" for the 3'-0" height railings for Case 11b, when the post spacing does not exceed 5'-0".

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**REVISIONS**

<table>
<thead>
<tr>
<th>DATE/TIME</th>
<th>COMMENT</th>
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<tbody>
<tr>
<td>07/01/10</td>
<td>Changed 2'-10&quot; dimension to mid-height of handrail.</td>
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