3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL
(42” Height shown, 54” Height Similar)

<table>
<thead>
<tr>
<th>TABLE 1 - RAILING MEMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMBER</td>
</tr>
<tr>
<td>Post “A”</td>
</tr>
<tr>
<td>Post “B”</td>
</tr>
<tr>
<td>Top Rail</td>
</tr>
<tr>
<td>End Hoops</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTES</th>
</tr>
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<tbody>
<tr>
<td>DATE DESCRIPTION</td>
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<tr>
<td>01/01/11 New Design Standard</td>
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<table>
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<tr>
<th>REVISIONS</th>
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<tr>
<td>2010 Interim Design Standard</td>
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<table>
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<tr>
<th>STEEL PEDESTRIAN/BICYCLE RAILING</th>
</tr>
</thead>
</table>

DESIGN LOADS, GEOMETRY AND APPLICABILITY:

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

Adequate foundation support shall be provided for anchorage and stability against overturning. See Index No. 851 for special requirements and modifications for use on bridges. The railing shown in these drawings requires a handrail for ramps steeper than a 5% grade to conform with the requirements of the Americans with Disabilities Act (ADA).

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 Tubes shall be in accordance with ASTM A500 Grade A, B, C or D, or ASTM A501. Perforated panels and tilt plates shall be ASTM A36 or ASTM A1011 (Grade 36). Posts and End Rails shall be fabricated and installed plumb, ± 1" tolerance when measured at 3'-0" 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 90° bend radius or terminate at adjoining sections with mitered end sections when handrails are not required. For changes in tangential longitudinal alignment greater than 45°, posts shall be positioned at a maximum distance of 2'-0" each side of the corner and shall not be located at the corner apex. For curved longitudinal alignments the top and bottom rails and handrails shall be shop bent to match the alignment radius.

BASE PLATES AND RAIL CAPS:

Base Plates and Rail Cap Plates shall be in accordance with ASTM A36 or ASTM A709 Grade 36.

SHIM PLATES:

Shim Plates shall be steel in accordance with ASTM B209. Any 6063 or 6060. Shim plates shall be used for foundation height adjustments greater than ½" and localized irregularities greater than ¼". Field trim shim plates when necessary to match the contours of the foundation. Revealed shim plates may be used in lieu of trimmed flat shim plates shown. Stacked shim plates must be bonded together with adhesive bonding material and limited to a maximum total thickness of ⅝", unless longer anchor bolts are provided for the exposed thread length.

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. Expansion Anchors are not permitted. All anchor bolts shall have single self-locking hex nuts. Tack welding of the nut to the anchor bolt may be used in lieu of self-locking nuts. All nuts shall be in accordance with ASTM A563 or ASTM A194. Field 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 A709 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 washers 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 833 except that testing of the finished pads shall not be required. Neoprene pads shall be durometer hardness 60 to 80. JOINTS:

All welded joints are to 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. Only use the Continuity Field Splice (Detail “E”) to make the top rail continuous for unforeseen field adjustments.

WELDING:

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 is not required.

CORRUGATIONS:

The steel railing shall be hot-dip galvanized after fabrication in accordance with Section 962 of the Specifications and finish unless noted in the contract documents. All nuts, bolts and washers shall be hot-dip galvanized in accordance with Section 962 of the Specifications.

SHOP DRAWINGS:

Complete details addressing project specific geometry line & grade showing post and expansion joint locations, post and panel type, anchor bolt installation “Case” or lengths, must be submitted by the Contractor for the Engineer’s approval prior to fabrication of the railing. Shop drawings shall be in accordance with the Specifications.

PAYMENT:

Railing shall be paid for per linear foot (Item No. 515-2-00b). Payment will be plan quantity measured as 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 neoprene 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 Foundation
Wall are not considered to be expansion joints.

NPS = Nominal Pipe Size

CROSS REFERENCE:
For Details "C", "D" and "E", see Sheet 4 of 8.

EXPANDED ELEVATION AT CORNERS
DETAIL FOR NON-CONTINUOUS RAILING AT CORNERS

Note: Non-continuous corners are permitted when handrails are not required.

RAIL REQUIREMENTS
LANDING REQUIREMENTS

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

RAILINGS ON GRADES STEEPER THAN 5%
(Type 1 - Picket Railing Shown, Other Types Similar)

2010 Interim Design Standard
Sheet No. 852
RAILINGS ON STEPS & STAIRS

RAIL TERMINATION DETAILS

TOP RAIL TERMINATION

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

BOTTOM RAIL CONNECTION

- Length Of Landing 5' Min.
- Variations ~ Equal spacing

DETAIL "L" - PLAN VIEW

- Handrail termination (Typ.) See Detail "L"
- Rail Termination (End Cap) See Detail "L"
- FE Panel (Typ.) see Detail "L"

DETAIL "F" - ELEVATION VIEW

- Top Rail Cap Round over corners ½" (Typ.)
- See Index No. 521 or Contract Plans for Step Details

DETAIL "K" - ELEVATION VIEW

- Top Landing
- Length Of Landing 5' Min.
- Variations ~ Equal spacing

ALTERNATE END TREATMENT

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

INDEX NO. 521

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

Concrete sidewalk to extend 6" min. behind rail

RAILING CONTINUATION BEYOND STEPS OR STAIRS

(Bottom shown, Top similar)
TYPE 1 - PICKET INFILL PANEL

* Picket Spacing of 6½ centers is based on a ¾ NPS for standard applications. When shown in the Contract Plans a 6½ 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.

PICKET NOTES:

SECTION A-A

DETAIL "1A"

(Top of Picket Connection)

DETAIL "1B"

(Bottom of Picket Connection)

<p>| TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS |</p>
<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
<td>A 392</td>
<td>Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td></td>
<td>A 491</td>
<td>Aluminum-Coated Steel - No. 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td></td>
<td>F 668</td>
<td>Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter) - See Plans for specified color of PVC</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F 626</td>
<td>Zinc-Coated Steel Wire - No. 9 gage with coating to match Chain-Link Fence Fabric</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F 626</td>
<td>¾&quot; (min. thickness) x ¾&quot; (min. width) x 2'-3&quot; (min. height) Steel Bars</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F 626</td>
<td>Zinc-Coated Steel</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.
REVISIONS
DATE
BY
DESCRIPTION
DATE
BY
DESCRIPTION
A
A
SECTION A-A
See Detail "5A"
2'-0" Sp.
(18-8 SS) @
Head Screws
#10x_DURATION"
Typ.)
PANEL/SPLICE CONNECTION
SECTION C-C
of Rail
Inside Face
Perforated Panel
Channel (0.04" Min.)
Strip (Typ.)
F x b"
(0.04" Min.)
Perforated Panel
(0.04" Min.)
Panel Mullion
REPEATING PATTERN DETAIL
FOR PERFORATED PANEL
SECTION C-C
PANEL/SPlice CONNECTION
DETAIL "5A"
PANEL/RAIL CONNECTION
DETAIL "5A"
(Top Shown, Bottom & Sides Similar)

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

TYPE 5 - PERFORATED INFILL PANEL