### NOTES

Three-dimensional view of railing with Type 1 - Picket Infill Panel (42" Height shown, 48" Height Similar)

<table>
<thead>
<tr>
<th>TABLE 1 - RAILING MEMBERS</th>
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<tbody>
<tr>
<td>MEMBER</td>
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<tr>
<td>Post &quot;A&quot;</td>
</tr>
<tr>
<td>Post &quot;B&quot;</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>Int. &amp; Bottom Rail Post Connection Sleeve</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
</tr>
<tr>
<td>Handrads</td>
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<tr>
<td>Handrail Support Bar</td>
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<tr>
<td>Pickets (Type 1 Infill Panel)</td>
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<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
</tr>
</tbody>
</table>

### TABLE 1 NOTES:

(1) 0.125" wall thickness permitted for rails with post spacings less than 5'-8", except that Post Connection Sleeve must be 1½" NPS (Sch. 40).

### 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 Sheet 8).

### RAILS, PANELS AND POSTS:

Pipe Rails and Pickets shall be in accordance with ASTM A550 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 A601. Perforated panels (Type 5), U-Channels and filler plates shall be ASTM A36 or A1011 (Grade 36). Posts and End Rails shall be fabricated and installed plumb, 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 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 aluminum in accordance with ASTM B209, Alloy 6061 or 6063. Shim plates shall be used for foundation height adjustments greater than ½" between 3 posts and localized irregularities greater than ½" beneath the rail cap. Where trim shim plates when necessary to match the contours of the foundation. Shim plates may be used in lieu of crimped flat shim plates shown. Stacked shim plates must be bonded together with adhesive bonding material and limited to a maximum total thickness of ½", unless longer anchor bolts are provided for the exposed thread length.

### ANCHOR BOLTS:

Anchor bolts shall be in accordance with ASTM F1554 (Grade 36 for ½" and Grade 55 for ½", ⅜" 4-Bolt Anchorage). 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 self-locking hex nuts. Tack welding of the nut to the anchor bolt may be used in lieu of self-locking nuts. All nuts shall be in accordance with ASTM A563 or ASTM A194. Flat Washers shall be in accordance with ASTM F436 and Plate Washers (for long slotted holes only), shall be in accordance with ASTM A36 or ASTM A709 Grade 36. After the nuts have been snug tightened, distort the anchor bolt threads to prevent removal of the nuts. Distorted threads and tack welds shall be coated with a galvanizing compound in accordance with the Specifications.

### RESILIENT AND NEOPRENE PADS:

Resilient and Neoprene pads shall be in accordance with Specification Section 932 except that testing of the finished pads shall not be required. Neoprene pads shall be diameter hardness 60 to 80.

### JOINTS:

Grind welded joints as necessary to remove burrs and weld splatter, additionally remove any sharp edges on rails to prevent injury. Grind all plug welds smooth. Expansion Joints shall be spaced at a maximum 40'-0". Field splices similar to the expansion joint detailing may be approved by the Engineer to facilitate handling, but top rail must be continuous across a minimum of two posts. For intermediate and bottom horizontal rails the screwed joints shown on Sheet 4 may be substituted with alternate joints shown on Sheet 3 Detail "K".

### WELDING:

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

### FINISHING:

The steel railing shall be hot-dip galvanized after fabrication in accordance with Specification Section 962 of the Specifications. 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 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-abb). 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.
RAILINGS ON GRADES STEEPER THAN 5%  
(Type 1 - Picket Railing Shown, Other Types Similar)

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

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

LANDING REQUIREMENTS
Max. landing slope = 2%  
Max. landing cross slope = 3%

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

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

Handrail required for ramps (Handrail continuous at landings between runs)  
Handrail = 1 1/2” WPS Sch. 40

Horizontal handrail extension at landing

NOTES:
* Keyed construction joints in Index No. 6011 Gravity Wall are not considered to be expansion joints.  
** Contraction joints (Tooled or Saw Cut) in sidewalks do not require a 6” minimum offset.
PICKET NOTES:
* Picket Spacing of 6̂/₂" centers is based on a ½" Ø Bar for standard applications. When shown in the Contract Plans a 4̂/₂" 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 1 - PICKET INFILL PANEL

SECTION A-A

TYPE 2 - CHAIN-LINK (Continuous Infill Panel)

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

TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
<td>A 392 Zinc-Coated Steel – No. 9 gage (coated wire diameter), Class 2 Coating</td>
<td></td>
</tr>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
<td>A 491 Aluminum-Coated Steel – No. 9 gage (coated wire diameter)</td>
<td></td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F 626 Zinc-Coated Steel Wire – No. 9 gage with coating to match Chain-Link Fence Fabric.</td>
<td></td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F 626 3/8&quot; (Min. thickness) x 5/16&quot; (Min. width) x 2'-3&quot; (Min. height) Steel Bars</td>
<td></td>
</tr>
</tbody>
</table>

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

- Arc, Rays, and Sun Segment may be formed in a single panel from ½" plate (ASTM 36 or A709 - Grade 36) pattern cut with laser or plasma CNC, welded to a 1x1½" Angle Border or the 3½x3½" Channel Border shown.

**TYPE 4 - BROADWAY INFILL PANEL**

1. See Plans for Infill Panel Option required.

**NOTES:**

- Panel Height
- Panel Width
- Gap Varies
- 6" Max.
- 2½" (PBR) ½" (SHBR) (Typ.)
- 2½" (PBR) ½" (SHBR) (Typ.)
- 2½" (PBR) ½" (SHBR) (Typ.)
- 2½" (PBR) ½" (SHBR) (Typ.)

**SECTION A-A**

- See Detail "3A"
- See Detail "3C"
- See Detail "3B"
- See Detail "4A"

**SECTION C-C**

- Panel/Splice Connection
- Panel/Rail Connection
- Panel End Connection

**SECTION B-B**

- Panel End Cap

**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

**SECTION A-A**

- Ray/Arc Connection

**SECTION C-C**

- Panel/Spline Connection

**SECTION B-B**

- Panel End Cap

**NOTES:**

- See Plans for Infill Panel Option required.

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**DESCRIPTION:**

- STEEL PEDESTRIAN/BICYCLE RAILING

**INDEX NO:**

- 852

**SHEET NO:**

- 6 of 8
SECTION A-A

Seal welding mitered corners is permitted.

DETAIL "5A"

PANEL/RAIL CONNECTION
(Top Shown, Bottom Similar)

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

Inside Face of Rail

Perforated Panel
(0.04" Min.)

DETAIL "5B"

PANEL END CONNECTION
(Expansion Joint Shown, Sides Similar)

#10 x #2 Pan Head Screws (18-8 SS) @ 1'-0" sp.

Inside Face of Post

Perforated Panel
(0.04" Min.)

NOTES:

1. See Plans for Infill Panel Type required.

TYPE 5 - PERFORATED INFILL PANEL

PERFORATED PANEL

Channel 3x1-1/2x1/2

Panel Mullion

3'-0" Max. (Panel Width)

3'-0" Max. (Panel Height)

DETAIL "5A"

PANEL/RAIL CONNECTION
(Top Shown, Bottom Similar)

#10 x #2 Pan Head Screws (18-8 SS) @ 1'-0"± sp.

Inside Face of Rail

Channel 3x1-1/2x1/2

Perforated Panel
(0.04" Min.)

DETAIL "5B"

PANEL END CONNECTION
(Expansion Joint Shown, Sides Similar)

#10 x #2 Pan Head Screws (18-8 SS) @ 1'-0"± sp.

Inside Face of Post

Perforated Panel
(0.04" Min.)

3- #10 x #2 Pan Head Screws (18-8 SS) @ 1'-0"± sp.

PERFORATED PANEL

3/4" Filter Strip (Typ.)

SECTION C-C

PANEL/SPICE CONNECTION

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

Inside Face of Rail

Channel 3x1-1/2x1/2

Perforated Panel
(0.04" Min.)

PERFORATED PANEL

3/4" Filter Strip (Typ.)

Panel Mullion

3" Opening

Expansion Joint

DETAIL "5A"

PANEL/RAIL CONNECTION
(Top Shown, Bottom Similar)

#10 x #2 Pan Head Screws (18-8 SS) @ 1'-0" sp.

Inside Face of Rail

Rail Expansion Joint

Notes:

1. See Plans for Infill Panel Type required.