Table 1: Railing Members

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts (Type &quot;A&quot; &amp; &quot;B&quot;)</td>
<td>6061-T6 Extrusion 1½x2x0.125</td>
<td>1.50 x 2.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Rail</td>
<td>6061-T6 Extrusion (See Details)</td>
<td>2½&quot; x 7&quot;</td>
<td>Varies</td>
</tr>
<tr>
<td>Top &amp; Bottom Rail</td>
<td>6061-T6 Extrusion</td>
<td>3.00 OD x 0.125&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>6061-T6</td>
<td>2.50 OD x 0.125&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>6061-T6</td>
<td>2.50 OD x 0.125&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Int. &amp; Bottom Rail Post Connection Sleeve</td>
<td>6061-T6</td>
<td>1.50 OD x 0.125&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>6061-T6</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>6061-T6</td>
<td>1½ NPS (Sch. 40)</td>
<td>0.150&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>6061-T6 1½ Ø Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>6061-T6</td>
<td>1½ Ø Round Bar</td>
<td>0.750&quot;</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>6061-T6</td>
<td>Varies (See Details)</td>
<td>Varies</td>
</tr>
</tbody>
</table>

NOTES:

1. Shop Drawings are required, see Specification Section 515.
2. For bridge mounted railings, work this Index with Index 861 Bridge Bicycle/Pedestrian Railing (Aluminum).
3. Materials:
   - A. Structural Extrusions, Tube, Pipe and Bars: Table 1 and ASTM B221 or ASTM D429
   - a. Top, bottom and intermediate rail corner bends with maximum 4° post spacing may be Alloy 6063-T6
   - b. Base Plates and Rail Caps: ASTM B209 Alloy 6061-T6
   - c. Perforated panels (Type 5) Alloy 3003-M14
   - d. Stainless steel (SS) screws: Type 316 or 18-8 Alloy
   - e. Aluminum screws: Alloy 2024-T8 or 7075-T6
   - f. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
   - g. Hex Head Bolts: ASTM A 307
   - h. 2½" diameter single bolt option, Grade 36
   - i. 3½" diameter four bolt option, Grade 55
   - j. Adhesive Anchors: ASTM F1554 fully threaded rods, Grade 55
   - k. Hex Nuts: ASTM A3563
   - l. Flat Washers: ASTM F436
   - m. Pipe Washers: ASTM A363 or ASTM A106 Grade 36
   - n. Shims: ASTM B209 Alloy 6061, or 6063
   - o. Bearing Pads: Provide 1½" thick Plain, Fabric Reinforced or Fabric Laminated Bearing Pads meeting the requirements of Specification Section 962 for Ancillary Structures.
4. Fabricate pickets and vertical panel elements parallel to the posts; except Type 2, 3 and 5 panel infills may be fabricated parallel to the longitudinal grade. Maintain a maximum clear opening of 5¼" for standard installations and 3¼" when a 4" sphere requirement is indicated in the Data Tables.
5. Locate railing expansion joints between the posts on either side of the deck expansion joint. Maximum spacing between expansion joints is 35'-0".
6. Field splices are similar to the Expansion Joint Detail and may be approved by the Engineer to facilitate handling; but the top rail must be continuous across a minimum of two posts.
7. For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "K" for Post Type "A" & "B".
8. Make corners and changes in tangential longitudinal alignment with a 9" bend radius or terminate adjoining sections with mitered end sections when handrails are not required.
9. For changes in tangential longitudinal alignment greater than 45°, position posts a maximum of 2'-0" each side of the corner but not at the corner apex.
10. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
11. Handrails are required and must be continuous at landings for: a. Grades Steeper than 5%, b. Three or more steps.
12. Installation: Cutting of reinforcing steel is permitted for post installed anchors.

Cross References:
- Detail "A", Sheet 4
- Detail "B", Sheet 4
- Detail "K", Sheet 3
ALUMINUM PEDESTRIAN/BICYCLE RAILING

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

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%

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

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

** NOTES: **
* Keyed construction joints in Index 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.

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

TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%
(Type 1 - Picket Railing Shown, Other Types Similar)

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

HANDRAIL REQUIRED FOR RAMPSES (Handrail continuous at landings between runs)
Handrail = 1½' WPS Sch. 40

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

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BASE PLATE DETAILS FOR TYPE "C" POST

(Screws Not Shown For Clarity)

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

SECTION "I-1"  SECTION "I-2"  VIEW "I"

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

Notes:
†     See Sheet 4 for Notes.
††    See Sheet 4 for Notes.
†††   Length varies for beveled posts on grades. Holes must be drilled plumb to align with screw slot.
### TYPE 1 - PICKET INFILL PANEL

* Picket Spacing at 6½" centers is based on a ⅝ Ø Bar for standard applications.

When shown in the Contract Plans a 4½" picket spacing may be required. See Note 4 (Sheet 1).

### 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 INFORMATION</th>
<th>ASTM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
<td>A392  Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
<td>A491  Aluminum-Coated Steel - No. 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td>Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter) - See Plans for specified color of PVC</td>
<td>F668</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F626  Zinc-Coated Steel Wire - No. 9 gage with coating to match Chain-Link Fence Fabric.</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F628  ⅝&quot; (min. thickness) x ⅛&quot; (min. width) x 2'-3&quot; (min. height) Steel Bars</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F628  Zinc-Coated Steel</td>
</tr>
</tbody>
</table>

### ALUMINUM PEDESTRIAN/BICYCLE RAILING

**Notations:**
- PICKET NOTES:
  - Equal Clear Openings at Posts
    - 2½" min. ~ 5½" max. (Typ.)
- Chain-Link Panel Note:
  - Chain-Link Fence Fabric shall be continuous along limits of railing.
  - Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.
TYPE 3 - SUNSHINE INFILL PANEL

* Arc, Rays and Sun Segment may be formed in a single panel from 5/8" plate (ASTM B209 Alloy 6061-T6 or T651) pattern cut with laser or plasma CNC, welded to a 1x1½ Angle Border or the 3½x3½ Channel Border shown.

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

SECTION A-A

DETAIL "3A" INTERMEDIATE RAIL/RAY CONNECTION

DETAIL "3B" BOTTOM RAIL/RAY CONNECTION

DETAIL "3C" RAY/ARC CONNECTION

(Continuous Top Rail)

DETAIL "3D" ARC/POST CONNECTION

DETAIL "3E" PANEL END CONNECTION AT POST WITH EXPANSION JOINT

SECTION C-C

PANEL/SPLICE CONNECTION

SECTION A-A

PANEL ADJUSTMENT FOR RAILINGS ON GRADES

SECTION B-B

PANEL END CAP

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

DESCRIPTION:

ALUMINUM PEDESTRIAN/BICYCLE RAILING

INDEX NO.
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SHEET NO.
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TYPE 5 - PERFORATED INFILL PANEL

DETAIL "5A"
PANEL/RAIL CONNECTION
(Top Shown, Bottom Similar)

DETAIL "5B"
PANEL END CONNECTION
(Expansion Joint Shown, Sides Similar)

SEAL WELDING MITERED CORNERS IS PERMITTED

REPEATING PATTERN DETAIL
FOR PERFORATED PANEL

SECTION C-C
PANEL/SPlice CONNECTION

SECTION A-A
1'-0" * 5'-0" Std. ~ 3'-0" Min. Clear Between Handrails

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

DETAIL "D" (Optional Shimming Detail For Cross Slope Correction) (Used in lieu of Beveled Shim Plates)

ANCHOR BOLT TABLE

<table>
<thead>
<tr>
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<th></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>10 3/4&quot;</td>
<td>11&quot;</td>
</tr>
<tr>
<td>IIa</td>
<td>Reinforced Concrete</td>
<td>4&quot;</td>
<td>4&quot;</td>
<td>9&quot;</td>
<td>10 3/4&quot;</td>
<td>11&quot;</td>
</tr>
<tr>
<td>IIb</td>
<td>Gravity Wall Index No. 6011</td>
<td>4 3/4&quot;</td>
<td>3&quot;</td>
<td>3'-0&quot; *</td>
<td>1'-1 1/2&quot;</td>
<td>1'-2&quot;</td>
</tr>
<tr>
<td>III</td>
<td>Step Cheekwall</td>
<td>4 3/4&quot;</td>
<td>4 3/4&quot;</td>
<td>9&quot;</td>
<td>10 3/4&quot;</td>
<td>11&quot;</td>
</tr>
<tr>
<td>IV</td>
<td>Varies</td>
<td>5&quot;</td>
<td>5&quot;</td>
<td>5&quot;</td>
<td>6 5/8&quot;</td>
<td>7&quot;</td>
</tr>
</tbody>
</table>

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

TYPICAL SECTION ON STEPS & STAIRS (Case III)

TYPICAL SECTION ON CONCRETE SIDEWALK (Case I)

TYPICAL SECTION ON RETAINING WALL (Case II)

ALUMINUM PEDESTRIAN/BICYCLE RAILING

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DESIGN STANDARDS

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TYPICAL SECTION FOR 4-BOLT ANCHORAGE (Case IV)