### 3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL
(42" Height Shown, 48" Height Similar)

#### TABLE 1 - RAILING MEMBERS

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>ALLOY(1)</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</td>
<td>Extrusion 1&quot;x2&quot;x0.125</td>
<td>1.00&quot; x 2.00&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Posts (Type &quot;C&quot;)</td>
<td>6063-T5</td>
<td>Extrusion (See Details)</td>
<td>2&quot;Ø x 7&quot;</td>
<td>Varies</td>
</tr>
<tr>
<td>Top Rail</td>
<td>6061-T6</td>
<td>2½&quot; NPS (Sch. 10)</td>
<td>2.875&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>6063-T5</td>
<td>2½&quot; NPS (Sch. 10)</td>
<td>2.875&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>2.50&quot; 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>2½&quot; x 7&quot;</td>
<td>2.500&quot;</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>1.315&quot;</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>6061-T6</td>
<td>1½&quot; OD x 0.125 Wall</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>6063-T5</td>
<td>1½&quot; OD Round Bar</td>
<td>1.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>6061-T6</td>
<td>1½&quot; OD Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>6063-T5</td>
<td>Varies (See Details)</td>
<td>Varies</td>
<td>Varies</td>
</tr>
</tbody>
</table>

#### NOTES

1. Shop Drawings are required, see Specification Section 315.
2. For bridge mounted railings, work this Index with Index 515-061 Bridge Bicycle/Pedestrian Railing (Aluminum).
3. Materials:
   - Structural Extrusions, Tube, Pipe and Bars: Table 1 and ASTM B221 or ASTM B249
   - Extrusions: 6063-T5 for use in this Index.
   - Plates and Rail Caps: ASTM B209 Alloy 6063-T6
   - Perforated panels (Type S) Alloy 3003-H14
   - Stainless steel (SS) screws: Type 316 or 18-8 Alloy
   - Aluminum screws: Alloy 2024-T4 or 7075-T6
   - Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
   - Hex Head Bolts: ASTM A 307
   - 1" diameter single bolt option, Grade 36
   - 3" diameter four bolt option, Grade 55
   - Adhesive Anchors: ASTM F1554 fully threaded rods, Grade 55
   - Hex Nuts: ASTM A563
   - Flat Washers: ASTM F436
   - Plate Washers: ASTM A36 or ASTM A106 Grade 36
   - Shims: ASTM B209 Alloy 6061 or 6063
   - Bearing Pads: Provide ½" thick Plain, Fabric Reinforced or Fabric Laminated Bearing Pads meeting the requirements of Specification Section 932 for Ancillary Structures.
   - Fabricated 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 5½" for standard installations and 3½" when a 4" sphere requirement is indicated in the Data Tables.
   - Locate railing expansion joints between the posts on either side of the deck expansion joint. Maximum spacing between expansion joints is 35'-0".
   - 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.
   - 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".
   - 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.
   - 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 apes.
   - For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
   - Handrails are required and must be continuous at landings for: Grades Steeper than 5%, 1½" Ø Round Bar
   - Installation: Cutting of reinforcing steel is permitted for post installed anchors.

#### TABLE 1 NOTES:

1. Alloy 6061-T6 or 6063-T52 & T6 may be substituted for Alloy 6063-T5.
2. 0.120" wall thickness permitted for rails with post spacings less than 3'-0".
3. 1" NPS (Sch. 40) non-slit rail sleeves may be substituted when welded connection Detail "K" is utilized.

#### CROSS REFERENCES:

- Detail "A", Sheet 4
- Detail "B", Sheet 4
- Detail "K", Sheet 3

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**PEDESTRIAN/BICYCLE RAILING (ALUMINUM)**

**INDEX**

**515-062**

**1 of 9**

**STANDARD PLANS**

**FY 2020-21**
**Railings on Grades Steeper Than 5%**

For slopes greater than 5%:
- Max. ramp slope = 8.33%
- Max. landing slope = 2%
- Max. landing cross-slope = 2%

**Ramp Requirements**

(Elevations showing inside face of railing with Type "A" Posts)

(Typ. - Picket Railing Shown, Other Types Similar)

**Landings Requirements**

**Expanded Elevation at Corners**

Detail for Non-Continuous Railing at Corners

**Typical Railing Details & Railings on Grades 0% to 5%**

(Typ. - Picket Railing Shown, Other Types Similar)

**Notes:**
- *Keyed construction joints in Index 400-011 Gravity Wall are not considered to be expansion joints.
- **Contraction joints (Tooled or Saw Cut) in sidewalks do not require a 6" minimum offset.

**Rail Expansion Joints**

(Spacing between posts)

- 5'-0" Max. for Sides > 6.25%
- 40'-0" Max. for Sides ≤ 6.25%

**Foundation Expansion Joint**

(See Note 4, Sheet 1)

**Handrail Requirements**

(Handrail continuous at landings between runs)

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

**Handrail for Ramps**

(For post, rail & picket or infill panel details)

**Infill Panel Type Varies, See Data Table in Plans**

(Pickets Shown)
RAILINGS ON STEPS & STAIRS

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

VIEW J-J
DETAIL “F” - ELEVATION VIEW
TOP RAIL TERMINATION

DETAIL “K” - ELEVATION VIEW
BOTTOM RAIL CONNECTION
(Intermediate Rail Similar)

RAIL TERMINATION DETAILS

HANDRAIL TERMINATION
Equal to one tread length

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

ALTERNATE HANDRAIL END TREATMENT OR
MOUNTING LOCATION FOR SLOPED WALLS

R E V I S I O N
11/01/16

F Y  2 0 2 0 - 2 1
S T A N D A R D  P L A N S
P E D E S T R I A N / B I C Y C L E  R A I L I N G ( A L U M I N U M )
I N D E X
S H E E T
5 1 5 - 0 6 2
3  of  9
**SECTION A-A**
(Top Rail Connection)

**SECTION B-B**
(Handrail Connection)

**SECTION C-C**
(Intermediate Rail Connection)

**SECTION D-D**
(Bottom Rail Connection - Single Anchor Bolt Shown)

**SECTION G-G**
(BASE PLATE DETAILS)

**SECTION H-H**
(Intermediate Rail Connection)

**SECTION I-I**
(Bottom Rail Connection - Single Anchor Bolt Shown)

**SECTION J-J**
(Base Plate Details)

**DETAIL "B" - EXPANSION JOINT (FIELD SPICE SLIP JOINT SIMILAR)
(Cross Reference: For Location of Details "B", See Sheet 2)

**DETAIL "A" - RAIL CONNECTIONS**
(Showing Inside Face of Railing)
(Pickets/Panels and 4-Bolt Anchorage Not Shown for Clarity)

**NOTES:**
1. Base Plate A (Ramps - Bolts normal) use 1½ Ø Holes for Single Anchor Bolts with Flat Washers for slopes ≤ 8.33%.
2. Base Plate B (Stairs - Bolts plumb) use 1½ Ø holes for Single Anchor Bolts with Beveled Washers and Washers for slopes > 8.33% to ≤ 15%; use 1½ x 1½ Slotted Holes with Leveling Channel for slopes > 15%.
3. ½ Ø x ⅜ Pan Head Aluminum or Stainless Steel Set Screws. Screws must be set flush against the outside face of rails & posts and underside of handrails. A single tack weld (½ max. length) at top of the sleeve for each post may be substituted for the Set Screws. Do not provide Set Screws for Rails at free end of Expansion Joints.

**CROSS REFERENCE:**
For Location of Details "B", See Sheet 2.
BASE PLATE DETAILS FOR TYPE "C" POST

(Screws Not Shown For Clarity)

SECTION H-H

BASE PLATE A

BASE PLATE B

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.
SECTION A-A

TYPE 1 - PICKET INFILL PANEL

* Picket Spacing of 6½ centers is based on a ½ Ø Bar for standard applications. When shown in the Contract Plans a 4½ picket spacing may be required. See Note 4 (Sheet 1).

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

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 INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMPONENT</strong></td>
</tr>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
</tr>
<tr>
<td>Aluminum-Coated Steel - No. 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td>PVC Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter)</td>
</tr>
<tr>
<td>Tie 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.
TYPE 3 - SUNSHINE INFILL PANEL

* Arc, Rays and Sun Segment may be formed in a single panel from 3/8" plate (ASTM B209 Alloy 6061-T6 or T651) pattern cut with laser or plasma CNC, welded to a 1x1½ Angle Border or the 3x3½ Channel Border shown.

NOTES:
1. See Plans for Infill Panel Option required.
SECTION A-A

Panel Mullion

SECTION C-C

PANEL/SPLICE CONNECTION

Inside Face of Rail

Channel 2"x2"x5/8" (Typ.)

Perforated Panel (0.04" Min.)

1-3/4" x 1-3/4" Filler Strip (Typ.)

Panel Mullion

DETAIL "5A"

PANEL/RAIL CONNECTION

(Top Shown, Bottom Similar)

Inside Face of Post

#10 1/2" Pan Head Screws @ 2'-0" sp.

Perforated Panel (0.04" Min.)

DETAIL "5B"

PANEL END CONNECTION

(Expansion Joint Shown, Sides Similar)

Opening Joint

Expansion Joint

Seal welding mitered corners is permitted

SEE DETAIL "5A"

Perforated Panel (0.04" Min.)

REPEATING PATTERN DETAIL

FOR PERFORATED PANEL

SECTION C-C

PANEL/SPLICE CONNECTION

Panel Mullion

#10 1/2" Pan Head Screws @ 1'-0" sp.

Perforated Panel (0.04" Min.)

3'-0" Max. (Panel Width)

3'-0" Max. (Panel Width)

TYPE 5 - PERFORATED INFILL PANEL

Seal welding mitered corners is permitted

Panel/Mullion

Perforated Panel (0.04" Min.)

Panel/Splice Connection

Panel Width
TYPICAL SECTION ON CONCRETE SIDEWALK (Case I)

1 – ⁷/₈ C-I-P Hex Head Anchor Bolts, or 1 – ⁵/₈ Adhesive Anchors. Place Anchor Bolts perpendicular to Base \( \beta \) for Grades \( \leq 8.33\% \) (Ramps) with flat washer, Place anchor bolts plumb for Grades > 8.33\% (Stairs) with flat washer & beveled washer, or leveling channel.

2 – ⁷/₈ Thick Bearing Pad

Optional 4-Bolt Anchorage (shown dashed)

Washers or Leveling Channel

TYPICAL SECTION ON RETAINING WALL (Case II)

TYPICAL SECTION ON STEPS & STAIRS (Case III)

TYPICAL SECTION FOR 4-BOLT ANCHORAGE (Case IV)

ANCHOR BOLT TABLE

<table>
<thead>
<tr>
<th>CASE</th>
<th>STRUCTURE TYPE</th>
<th>DIMENSIONS</th>
<th>ANCHOR LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>Unreinforced Concrete</td>
<td>6&quot;</td>
<td>1&quot;-2&quot;</td>
</tr>
<tr>
<td>ii</td>
<td>Reinforced Concrete</td>
<td>4&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>iib</td>
<td>Gravity Wall</td>
<td>⁴/₈&quot;</td>
<td>⁷/₈&quot;</td>
</tr>
<tr>
<td>iii</td>
<td>Step Cheekwall</td>
<td>⁴/₈&quot;</td>
<td>⁴/₈&quot;</td>
</tr>
<tr>
<td>iv</td>
<td>Varies</td>
<td>5&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

** When required; measured from top of sidewalk (Typ.)

DETAIL "D" (OPTIONAL SHIMMING DETAIL FOR CROSS SLOPE CORRECTION)
(Used in lieu of Beveled Shim Plates)

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