TABLE 1 - RAILING MEMBERS

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>ALLOY(2)</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>RT 2 x 2 x 0.250</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td>Posts (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion</td>
<td>1.50&quot; x 2.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Plate (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion (See Details)</td>
<td>2(\frac{3}{4}) x 7&quot;</td>
<td>Varies</td>
</tr>
<tr>
<td>Top Rail</td>
<td>6063-T5</td>
<td>2.50 OD x 0.125 Wall</td>
<td>2.50&quot; x 0.125</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>6063-T5</td>
<td>2.50 OD x 0.125 Wall</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 OD x 0.125 Wall</td>
<td>3.00 OD x 0.125 Wall</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>6061-T6</td>
<td>Extrusion</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td>(incl. Bottom Rail Post Connection Sleeve)</td>
<td>6063-T5</td>
<td>1.50 OD x 0.125 Wall</td>
<td>3.500&quot;</td>
<td>0.125&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>Handrail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>1.50 OD x 0.125 Wall</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>6061-T6</td>
<td>1/8&quot; 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>1/8&quot; 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>

TABLE 1 NOTES:
(1) Alloy 6061-T6 or 6063-T52 & 6 may be substituted for Alloy 6063-T5.
(2) 0.080" wall thickness permitted for rails with post spacings less than 5'-0".
(3) 1" NPS (Sch. 40) non-slit rail may be substituted when welded connection (Detail "K") is utilized.

NOTES
1. Shop Drawings are required, see Specification Section 515.
2. For bridge mounted railings, work this Index with Index 515-061 Bridge Bicycle/Pedestrian Railing (Aluminum).
3. Materials:
   a. Structural Extrusions, Tube, Pipe and Bars: Table 1 and ASTM B221 or ASTM B36.
   c. Perforated panels (Type 5) Alloy 3003-H14.
   d. Stainless steel (SS) screws: Type 316 or 18-8 Alloy.
   e. Aluminum screws: Alloy 2024-T8 or J075-T14.
   f. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.

   a. Hex Head Bolts: ASTM A 307
   b. 1/2" diameter single bolt option, Grade 36
   c. 2" diameter four bolt option, Grade 55
   d. Adhesive Anchors: ASTM F 1554 fully threaded rods, Grade 55
   e. Hex Nuts: ASTM A 3563
   f. Flat Washers: ASTM F 1436
   g. Plate Washers: ASTM A 36 or ASTM A 500 Grade 36
   h. Bearing Pads: Provide 1/8" thick Plain, Fabric Reinforced or Fabric Laminated Bearing Pads meeting the requirements of Specification Section 932 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 5/8" for standard installations and 3/8" 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 screw joint 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,asions not at the corner apex.

   11. Handrail expansion joints are required and must be continuous at landings for: A. Grades Steeper than 5%.

   12. Installation: Cutting of reinforcing steel is permitted for post installed anchors.

3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL

(42" Height Shown, 48" Height Similar)
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(Typ.)</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 (1/2)x2.50</td>
<td>2.50 x 2.50</td>
<td>0.125</td>
</tr>
<tr>
<td>Posts (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion (See Details)</td>
<td>2 3/8 x 7”</td>
<td>Varies</td>
</tr>
<tr>
<td>Top Plate (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion (See Details)</td>
<td>2 3/8 x 7”</td>
<td>Varies</td>
</tr>
<tr>
<td>Top Rail</td>
<td>6063-T5</td>
<td>3/16&quot; NPS (Sch. 10)</td>
<td>3.000&quot;</td>
<td>0.125</td>
</tr>
<tr>
<td>End Hoops</td>
<td>6063-T5</td>
<td>3/16&quot; NPS (Sch. 10)</td>
<td>3.000&quot;</td>
<td>0.125</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Splters</td>
<td>6063-T5</td>
<td>2.50 OD x 0.125 Wall</td>
<td>2.500&quot;</td>
<td>0.125</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>6061-T6</td>
<td>Extrusion (See Details)</td>
<td>2 3/8 x 7”</td>
<td>0.250(1)</td>
</tr>
<tr>
<td>Handrail Joint/Splice Splters</td>
<td>6063-T5</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>1.315&quot;</td>
<td>0.133</td>
</tr>
<tr>
<td>Handrail</td>
<td>6063-T5</td>
<td>1 3/16&quot; OD x 0.125 Wall</td>
<td>1.500&quot;</td>
<td>0.125</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>6061-T6</td>
<td>1/4&quot; 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>1/4&quot; 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>

NOTE:
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:
   - A. Structural Extrusions, Tube, Pipe and Bars: Table 1 and ASTM B221 or ASTM B429
   - B. Base Plates and Rail Caps: ASTM B209 Alloy 6061-T6
   - C. Perforated panels (Type "A") Alloy 3003-H14
   - D. Stainless steel (SS) screws: Type 316 or 18-8 Alloy
   - E. Aluminum screws: Alloy 2024-T4 or 7075-T13
   - F. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
   - a. Hex Head Bolts: ASTM A 307
   - b. Screw Slot Detail: ASTM A307
   - c. Hex Nuts: ASTM A352
   - d. Flat Washers: ASTM F436
   - e. Plate Washers: ASTM A36 or ASTM A563 Grade 36
   - f. Shim: ASTM B209 Alloy 6061 or 6063
   - H. Bearing Pads: Provide 1/2" thick Plain, Fabric Reinforced or Fabric Laminated Bearing Pads meeting the requirements of Specification Section 932 for Ancillary Structures.
   - I. 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 3" when a 4" sphere requirement is indicated in the Data Tables.
   - J. Locate railing expansion joints between the posts on either side of the deck expansion joint. Maximum spacing between expansion joints is 25'-0".
   - K. 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.
   - L. For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "K" for Post Type "K" & "L".
   - M. Make corners and changes in tangential alignment with a 9" bend radius or terminate adjoining sections with mitered end sections when handrails are not required.
   - N. For changes in tangential alignment greater than 45°, position posts a maximum of 2'-0" each side of the corner but not at the corner apexes.
   - O. Handrails are required and must be continuous at landings for: Grades Steeper than 5%, 12. Installation: Cutting of reinforcing steel is permitted for post installed anchors.

CROSS REFERENCES:
- Detail "A", Sheet 4
- Detail "B", Sheet 4
- Details "C", Sheet 3
Handrail required for ramps (Handrail continuous at landings between runs)

Handrail ~ 1" NPS Sch. 40 Post

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

For slopes greater than 5%:
Max. ramp slope = 8.33%
Max. ramp cross-slope = 2.0%
RAILINGS ON STEPS & STAIRS

RAIL TERMINATION DETAILS

VIEW J-J DETAIL "J" - ELEVATION VIEW
TOP RAIL TERMINATION

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

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

DETAIL "L" - PLAN VIEW
HANDRAIL TERMINATION

1'-0" Min. Handrail Extension
Equal to one tread length

5'-0" Max. on Steps
1'-0" Post

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

DETAIL "L" - PLAN VIEW
HANDRAIL TERMINATION

HANDRAIL CONTINUOUS AT LANDING

5'-0" Min. Handrail Extension
Equal to one tread length

5'-0" Max. on Steps
1'-0" Post

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

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

LEVELING CHANNEL
Post

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

BY-PASS DETAIL

Top Rail Cap

1/8" R Top Rail Cap

Round over corners to remove sharp
edges (Typ.)

1'-0" Post

Handrail Continuous

Length Of Landing

8" (Typ.)

Cut rail sleeve to match inside
face of post or weld rail
directly to post

Varies ~ Equal spacing
5'-0" Max. on Steps

1'-0" Min. Handrail Extension
Equal to one tread length

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

Post

Top Rail termination
See Detail "J"

Handrail Termination,
See Detail "L"

Bottom Rail (Typ.)

Top Rail termination
See Detail "J"

Handrail Termination,
See Detail "L"

Bottom Rail termination
see Detail "K"

ALTERNATE HANDRAIL END TREATMENT OR
MOUNTING LOCATION FOR SLOPED WALLS

Concrete sidewalk to extend 6" min. behind railing

9" Min. Wall Thickness

7'-3" (Max.) ~ PBR

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

Not considered an
expansion joint
for railing fabrication (Typ.)

5'-0" Min. Handrail Extension
Equal to one tread length

Top Rail Cap

3'-6"

R 6" (Typ.)

Concrete sidewalk to extend 6" min. behind railing

9" Min. Wall Thickness

7'-3" (Max.) ~ PBR

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

Not considered an
expansion joint
for railing fabrication (Typ.)
PEDESTRIAN/BICYCLE RAILING (ALUMINUM)

DETAIL "B" - EXPANSION JOINT (FIELD SPlice SLIP JOINT SIMILAR)

NOTE:
- Cross Reference: View "F" (see sheet 3)
- Post: Bevel bottom & top of post as required to maintain plumb posts.
- Expansion Joint:
  - Type "B" Post: for slopes > 8.33%
  - Type "A" Post: for slopes ≤ 8.33%

ALUMINUM SLEEVE DETAIL (Bottom Side Shown)

INTERMEDIATE OR BOTTOM RAIL - ALUMINUM SLEEVE DETAIL (Bottom Side Shown)

CROSS REFERENCE:
For location of Details "B", see Sheet 2.

SQUARE RAILS - INTERMEDIATE OR BOTTOM RAIL

Intermediate or Bottom Rail

Intermediate Rail

SECTION C-C
(Intermediate Rail Connection)

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

LEVELING CHANNEL DETAIL

DETAIL "A" - RAIL CONNECTIONS

(Showing Inside Face of Railing)

(Pickets/Panel and 4-Bolt Anchorage Not Shown for Clarity)

NOTES:
- 1 ¹/₂" Ø Holes for Single Anchor Bolts with Flat Washers for slopes ≤ 8.33%
- 1 ¹/₂" Ø Holes for Single Anchor Bolts with Beveled Plate and Washers for slopes > 8.33% to ≤ 15%; use ¹/₂" x ¹/₂" Slotted Holes with Leveling Channel for slopes > 15%
- ¹/₂" x ¹/₂" 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 (¹/₂" 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.

ANCHOR BOLT OPTIONS:
- Type "A" Post (Ramps - Bolts normal) use 1½" Ø Holes for Single Anchor Bolts with Flat Washers for slopes > 8.33%
- Type "B" Post (Stairs - Bolts plumb) use 1½" Ø Holes for Single Anchor Bolts with Beveled Plate and Washers for slopes > 8.33% to ≤ 15%; use ¹/₂" x ¹/₂" Slotted Holes with Leveling Channel for slopes > 15%

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STANDARD PLANS

PEDESTRIAN/BICYCLE RAILING (ALUMINUM)

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BASE PLATE DETAILS FOR TYPE "C" POST
(Screws Not Shown for Clarity)

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.

Optional intermittent weld in-lieu of Self-Tapping screws between posts.
**SECTION A-A**

**PICKET NOTES:**
* Picket Spacing of 6" centers is based on a 1/2" Ø Bar for standard applications.
When shown in the Contract Plans a 4" picket spacing may be required. See Note 4 (Sheet 1).

**TYPE 1 - PICKET INFILL PANEL**

**DETAIL "1A"**
(Top of Picket Connection)
- Post
- Post & Anchor Bolt
- 45° Beveled End Permitted (Shown dashed)
- 1/2" Ø Max. Hole for Ramps,
- 1/2" Ø Max. Hole for Stairs.

**DETAIL "1B"**
(Bottom of Picket Connection)
- Post
- Post & Anchor Bolt
- 45° Beveled End Permitted (Shown dashed)
- 1/2" Ø Max. Hole for Ramps,
- 1/2" Ø Max. Hole for Stairs.

**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</td>
<td>A92</td>
<td>Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td>Fabric (2&quot; mesh with</td>
<td>A491</td>
<td>Aluminum-Coated Steel - No. 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td>twisted bottom and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>knuckled top selvage)</td>
<td>F668</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>F626</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>F626</td>
<td>1/4&quot; (min. thickness) x 1/4&quot; (min. width) x 2'-3&quot; (min. height) Steel Bars</td>
</tr>
<tr>
<td>Miscellaneous Fence</td>
<td>F624</td>
<td>Zinc-Coated Steel</td>
</tr>
<tr>
<td>Components</td>
<td></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'-0" minimum increments is permitted.

**NOTES:**
1. See Plans for Infill Panel option required.
TYPE 3 - SUNSHINE INFILL PANEL

* Arc, Rays and Sun Segment may be formed in a single panel from 5/16" plate (ASTM B209 Alloy 6061-T6 or T651) pattern cut with laser or plasma CNC, welded to a 1x1x3/8 Angle Border or the 3x1x3/8 Channel Border shown.

SECTION A-A

DETAIL "3A" INTERMEDIATE RAIL/RAY CONNECTION

DETAIL "3B" BOTTOM RAIL/RAY CONNECTION

DETAIL "3C" RAY/ARC CONNECTION (Continuous Top Rail)

SECTION C-C

DETAIL "3D" ARC/POST CONNECTION (Continuous Top Rail)

SECTION A-A

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

NOTES:

1. See Plans for Infill Panel Option required.

TYPE 4 - BROADWAY INFILL PANEL

Panel Height

Panel Width

NOTES:

1. See Plans for Infill Panel Option required.

PEDESTRIAN/BICYCLE RAILING (ALUMINUM)
SECTION A-A
Panel Mullion

SECTION C-C
PANEL/SPLICE CONNECTION

DETAIL "5A"
Panel/Rail Connection
(Top Shown, Bottom Similar)

DETAIL "5B"
Panel End Connection
(Expansion Joint Shown, Sides Similar)

REPEATING PATTERN DETAIL
FOR PERFORATED PANEL

TYPE 5 - PERFORATED INFILL PANEL

Seal welding mitered corners is permitted

Panel Mullion

Perforated Panel
(0.04" Min.)

Perforated Panel
(0.04" Min.)

Perforated Panel
(0.04" Min.)

Perforated Panel
(0.04" Min.)

Channel 2"x2"x1/8" (Typ.)

Channel 2"x2"x1/8" (Typ.)

Perforated Panel
(0.04" Min.)

#10x3/4" Pan Head Screws
@ 2'-0" sp.

#10x3/4" Pan Head Screws
@ 1'-0" sp.

Perforated Panel
(0.04" Min.)

Perforated Panel
(0.04" Min.)

Perforated Panel
(0.04" Min.)

Perforated Panel
(0.04" Min.)

Inside Face of Rail

Inside Face of Post

Opening Joint

Expansion Joint

Seal welding mitered corners is permitted

REVISION

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SHEET