NOTES

PIPE RAILING & POSTS:
Structural Tube, Pipe and Bar shall be in accordance with ASTM B221 or ASTM B42. Alloy 6061-T6. End Rail 90° bends and corner bends with maximum 4'-0" post spacing, may be Alloy 6061-T6. Posts and End Rails shall be fabricated and installed in a 1° tolerance when measured at 7'-0" above the foundation. Corners and changes in tangential longitudinal alignment, may be made continuous with a 9" bend radius or terminated at adjoining sections with a standard end hoop 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.

RAILING MEMBER DIMENSIONS TABLE

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.124&quot;</td>
</tr>
<tr>
<td>Rails</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.124&quot;</td>
</tr>
<tr>
<td>Rail Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrails Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.130&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1½&quot; Round Bar</td>
<td>1.000&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

BASE PLATES:
Base Plates shall be in accordance with ASTM B209, Alloy 6061-T6.

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 base plates. Field trim shim plates when necessary to match the contours of the foundation. Beveled 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 ½", unless longer anchor bolts are provided for the exposed thread length.

COATINGS:
The aluminum railing shall be mill finish unless otherwise noted in the Contract Documents. All nuts, bolts and washers shall be hot-dip galvanized in accordance with Section 962 of the Specifications.

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 connecting access is permitted for drilled hole installation. All anchor bolts shall have single self-locking hex nuts. Flat washers and the nuts shall be in accordance with ASTM A563 or ASTM A194. Flat Anchors shall be threaded full length. All anchor bolts shall have single self-locking hex nuts. Tack welding of the nut to the anchor bolt may be used if in accordance with ASTM A424. All washer bolts shall be in accordance with ASTM F436 and Plate Washers (for long slotted holes only), shall be in accordance with ASTM A53 or ASTM A529 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 lock 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 932, except that testing of the finished pads shall not be required. Neoprene pads shall be durometer hardness 60 or 70.

JOINTS:
All fixed joints are to be welded all around and ground smooth. Expansion Joints shall be spaced at a maximum of 30'-0". Field splices similar to the expansion joint detail may be approved by the Engineer to facilitate shipping and handling, but rails must be continuous across a minimum of two posts. Only use the Continuity Field Splice Oeral "E" to make the railing continuous for unforeseen field adjustments.

WELDING:
All welding shall be in accordance with the American Welding Society Structural Welding Code (Aluminum) AWS/USMRS D1.2 (current edition). Filler metal shall be either ER5183, ER556 or ER5556. Nondestructive testing of welds is not required.

SHOP DRAWINGS:
Details addressing project specific geometry (line & grade) showing post and expansion joint locations 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:
Guiderail shall be paid for under the contract unit price for Pipe Guiderail (Aluminum), LF (Item No. 313-1-21). Payment for the Guiderail will be plan quantity measured as the length along the center line of the top rail, and includes rails, posts, 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 Guiderail.
ELEVATION

TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%

See Plans for continuity or termination limits of railing

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 = 2%

RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

Wall are not considered to be expansion joints.

* Keyed construction joints in Index No. 6011 Gravity Structures Expansion Joints

NOTES:
NPS = Nominal Pipe Size

STRUCTURES EXPANSION JOINTS NOTE:

For Details "C", "D" and "E", see Sheet 4.
RAILING CONTINUATION BEYOND STEPS
(Bottom shown, Top similar)

Concrete sidewalk to extend 6" min. behind railing

Handrail required for three or more steps (Handrail and cheekwalls continuous at landings) Handrail = 1½" NPS (Sch. 40)

Handrail Continuous
Variations = Equal spacing
6'-0" Max. on Steps

Handrail Terminal
See Detail "A" (Typ.)

Handrail Terminal
See Detail "A" (Typ.)

ELEVATION
(At-Grade Steps)

Length of Landing 5' Min.
Top Landing

Length of Landing 5' Min.
Bottom Landing

6'-0" Max. for one run of steps

6'-0" Max. for one run of steps

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

870

GUIDERAIL ON STEPS & STAIRS

ALUMINUM PIPE GUARDERAIL

INDEX NO.
870

SHEET NO.
3 of 5