NOTES

PIPE RAILING & POSTS:
Pipe Rails and Posts shall be in accordance with ASTM A53 Grade B for standard weight pipe and ASTM A500 Grade B, C or D or ASTM A501 for structural tube. Bars for handrail supports shall be ASTM A36. Posts and End Rails shall be fabricated and installed plumb, ± 1° tolerance when measured at 3'-0" above the foundation. Corners and changes in tangential longitudinal alignment, may be made continuous with a 9° bent 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>0.154&quot;</td>
</tr>
<tr>
<td>Rails</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.154&quot;</td>
</tr>
<tr>
<td>Rail Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td></td>
<td>0.245&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>1&quot; NPS (Sch. 40)</td>
<td></td>
<td>0.135&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; Ø 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 A36 or ASTM A501 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" and localized irregularities greater than ½". Field trim shim plates when necessary to match the contours of the foundation. Bevelled 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 railing shall be hot-dip galvanized after fabrication in accordance with Section 962 of the Specifications. 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 reinforcing steel is permitted for drilled hole installation. Anchor bolts shall be 2 times the thread length above the finished pads shall not be required. Neoprene pads shall be durometer hardness 60 or 70. Resilient and Neoprene pads shall be in accordance with Specification Section 932, except that testing shall be coating 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 shall be coating with a galvanizing compound in accordance with the Specifications.

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 welds must be continuous across a minimum of two pipe rails and posts. Continuous Field Splice (Detail “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 (Steel) AWS/D1.1 (current edition). Weld metal shall be E60XX or E70XX. Nondestructive testing of welds is not required.

PAYMENT:
Payment shall be paid for under the contract unit price for Pipe Guiderail (Steel, LF (Item No. 512-11)). Payment for the Guiderail will be plan quantity measured as the length along the center line of the top rail, and includes rails, posts, handrail assembly, base plates, anchor bolts, nuts, washers, resiliens or neoprene pads and all incidental materials and labor required to complete installation of the Guiderail.
NOTES:
NPS = Nominal Pipe Size

STRUCTURES EXPANSION JOINTS NOTE:
* Keyed construction joints in Index No. 520 Gravity Wall are not considered to be expansion joints.

CROSS REFERENCE:
For Details "C", "D" and "E", see Sheet 4.

ELEVATION

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

RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%
**GUIDERAIL ON STEPS & STAIRS**

**STEEL PIPE GUIDERAIL**

- **Handrail**
  - See "Typical Railing Details", Sheet 2 for post & rail details
  - See Index No. 521 or Contract Plans for step details

- **Cheekwall**
  - 9" Min. Wide cheekwall both sides
  - See Index No. 521 or Contract Plans for Step Details

- **Steel Handrail required for three or more steps** (Handrail and cheekwalls continuous at landings) Handrail = 1/8" MFS (Sch. 40)

- **Handrail Termination**
  - See Detail "A" (Typ.)

- **ELEVATION** (At-Grade Steps)
  - 6'-0" Max. on Steps
  - 6'-0" (Max.) = Equal Panels
  - Varies = Equal spacing
  - Railing Continuation Beyond Steps

- **Railing Continuation Beyond Steps**
  - (Bottom shown, Top similar)

- **Alternate End Treatment**
  - 2'-10" Min.
  - 9" Min.
  - ALTERNATE END TREATMENT

**DETAIL "A" - PLAN VIEW**

- **Handrail Termination**
  - See "Typical Railing Details", Sheet 2 for post & rail details

- **Concrete sidewalk to extend 6" min. behind Cedar**

- **Post**
  - 11" High

- **Steel Handrail required for three or more steps**
  - Handrail and cheekwalls continuous at landings
  - Handrail = 1/8" MFS (Sch. 40)

- **Handrail Termination**
  - See Detail "A" (Typ.)

- **Cheekwall Both Sides**
  - 9" Min. Wide
  - See Index No. 521 or Contract Plans for Step Details

- **Step Details**
  - 6'-0" Min. on Steps
  - See "Typical Railing Details", Sheet 2 for post & rail details

- **Handrail**
  - See "Typical Railing Details", Sheet 2 for post & rail details
  - See Index No. 521 or Contract Plans for Step Details

- **Handrail Continuation Beyond Steps**
  - (At-Grade Steps)

- **Length of Landing**
  - 5'-0" Min.
  - At Landing
  - Handrail continuous

- **Handrail Terminations**
  - See "Typical Railing Details", Sheet 2 for post & rail details

- **Checkwall Both Sides**
  - 9" Min. Wide checked both sides
  - See Index No. 521 or Contract Plans for Step Details

- **Railing Continuation Beyond Steps**
  - (At-Grade Steps)
TYPICAL SECTION ON CONCRETE SIDEWALK

TYPICAL SECTION ON GRAVITY WALL
(Other Retaining Walls Similar)

EDGE SHIM
18" long
\( \frac{1}{2} \)" x 1/2" x thickness as reqd.

Base Plate

2 - \( \frac{3}{8} \)" Anchor Bolts (**) with Self-Locking Hex Nuts & Washers.

FULL SIZE SHIM PLATES when required for height adjustment

1/2" Thick Resilient or Neoprene Pad

Varies (2 Min. Required For Stability of Railing)

TYPICAL SECTION ON STEPS & STAIRS

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

OPTIONAL SIDEWALK ANCHORAGE DETAIL

NOTES:

** 2 - \( \frac{3}{8} \)" x 8" Steel Anchors:
Galvanized Steel Bolts (As Shown) (C-I-P); Galvanized U-Bolts Permitted (C-I-P); Galvanized Adhesive Anchors Permitted
Expansion Anchors Not Permitted.

*** Adhesive anchors shall be fully threaded headless anchor bolts (manufacturer recommended diameter) with an Adhesive Bonding Material System in accordance with Specification Section 937 and installed in accordance with Specification Section 416. The minimum embedment is 6".