NOTES

PIPE RAILING & POSTS:
Pipe Rails and Posts shall be in accordance with ASTM A53 Grade B for standard weight pipe and ASTM A106 Grade B, C, or D or ASTM A500 for structural pipe. Bars for handrail supports shall be ASTM A36. Posts and End Rails shall be fabricated and installed plumb, ± 1° tolerance when measured at 2'-0" above the foundation. Corners and changes in tangential alignment, may be made continuous with a 3° bend radius or terminated at a minimum bend radius at an outside corner. 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. The convex longitudinal alignments and handrail 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>0.134&quot;</td>
</tr>
<tr>
<td>Rails</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.134&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>Handrail Joint/Splice Sleeves</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>1.375&quot;</td>
<td>0.131&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>1&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 A 36 or ASTM A709 Grade 36.

SHIM PLATES:
Shim Plates shall be aluminum in accordance with ASTM B 209, 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 (See Sheet 5 for additional details). Revealed 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.

ANCHOR BOLTS:
Anchor bolts shall be in accordance with ASTM F 1554 Grade 36. Heavier anchor bolts for Adhesive Anchors shall be threaded full length. Cutting of reinforcing steel is permitted for drilled hole installation. All anchor bolts shall have single self-locking nuts. Tack welding of the nut to the anchor bolt may be used in lieu of self-locking nuts. All nuts shall be in accordance with ASTM A 563 or ASTM A 194. Flat Washers shall be in accordance with ASTM F 436 and Plate Washers (for long slotted holes only) shall be in accordance with ASTM A 563 or ASTM A 709 Grade 36. After the nuts have been snug tightened, distort the anchor bolt thread to displace the top of stud to prevent removal of the nuts. Distorted threads and tack welds shall be coated with a galing-compounding 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 joint assemblies are to be welded all around and plug welded ground smooth. Remove burns and weld splatter, additionally remove any sharp edges on rails to prevent injury. Expansion joints shall be spaced at a maximum of 36'-0". Field splices similar to the expansion joint detail may be approved by the engineer to facilitate shipping and handling, but rails must be contoured across a minimum of two posts. Only use the Continuity 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/CSA/AISC D.1.1 (current edition). Weld metal shall be E60XX or E70XX. 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 (Steel), LF (Item No. 515-11). Payment for the Guiderail will be plan quantity measured as the length along the center line of the top rail, and includes rails, posts, 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.
TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%

**ELEVATION**

**RAMP REQUIREMENTS**
- For slopes greater than 5%:
  - Max. ramp slope = 6.25%
  - 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%**

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

- 3'-6" Min. 5'-0" Max. for Slopes > 6.25%
- 40'-0" Max. for Slopes ≤ 6.25%
- 30'-0" Max. for Slopes > 6.25%
- 40'-0" Max. for Slopes ≤ 6.25%
- 2'-10" Min. 5'-0" Max.
RAILING CONTINUATION BEYOND STEPS
(Bottom shown, Top similar)

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

Handrail Termination
See Detail "A" (Typ.)

6'-0" Max. on Steps

Equal to one tread length

Concrete sidewalk to extend 6" min. behind Handrail

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

See Index No. 521 or Contract Plans for Step Details

GUIDERAIL ON STEPS & STAIRS

ELEVATION
(At-Grade Steps)

Handrail Continuation
See Detail "A" (Typ.)

6'-0" Max. on Steps

Equal to one tread length

Handrail

B600

Length of Landing

5'-0" Min.

Top Landing

Min.

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

6'-0" Min.

Varies ~ Equal spacing

Length of Landing

2'-10" ±

2'-10" (Typ.)

1'-6"

Min.

1'-6" (Typ.)

3'-6"

2" Min.

2" Min.

9" Min.

Min.

9"

Min.

2"

Min.

2"

Min.

ELEVATION

(At-Grade Steps)

GUIDERAIL ON STEPS & STAIRS

ELEVATION

(At-Grade Steps)

GUIDERAIL ON STEPS & STAIRS

ELEVATION

(At-Grade Steps)
### Description:

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

- **SHIM PLATE DETAIL**
  - (2-Bolt Anchorage)
  - 3/4" x 3/4" Pan Head Stainless Steel (Type 316 or 18-8 Alloys) Set Screw
  - Steel Sleeve: 1/4" NPS (Sch. 40) for Rails
  - Rail or Handrail Section

- **PLATE WASHER DETAIL**
  - (Recommended for Steep Slopes)

**SECTION C-C**

- **BASE PLATE DETAIL**
  - (2-Bolt Anchorage)
  - 3/4" Hole (Centered) for Flat Washers (Typ.)
  - Round over both ends of rails 1/8" (Typ.)

- **BASE PLATE DETAIL**
  - (4-Bolt Anchorage)
  - 1/4" Base Plate
  - 1/4" Steel Sleeve

- **ALTERNATE BASE PLATE DETAIL**
  - (Recommended for Steep Slopes)

**DETAIL "D" - EXPANSION JOINT**

- (FIELD SPLICE SLIP JOINT SIMILAR)

- **DETAIL "E" - CONTINUITY FIELD SPlice**

- **DETAIL "B" - RAIL AND HANDRAIL**
  - (Showing Sloped Condition for Ramps with 2-Bolt Anchorage)
  - Match Grade of Ramp or Stairs
  - Match Grade of Ramp or Stairs

**CROSS REFERENCE:**
For locations of Details "C", "D" and "E", see Sheet 2.

**Design Standards for FY 2016-17**

- Steel Pipe GUiderail
- Top Rail ~ 2" NPS, Sch. 40
- Post ~ 2" NPS, Sch. 40
- Bottom Rail ~ 2" NPS, Sch. 40

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**Last Revision:** 07/01/15

**Description:**

**Steel Pipe GUiderail**

- Top Rail
- Match Grade of Ramp or Stairs
- Rail or Handrail Section
- Steel Sleeve: 1/4" NPS (Sch. 40) for Rails
- 1" NPS (Sch. 40) for Handrails

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**Index No.**

- 880

**Sheet No.**

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