

NOTES:

1. Shop Drawings are required, refer to Specification Section 515.

2. Materials:

- A. Pan Head Set Screws: Stainless Steel (SS) Type 316 or 18-8 Alloy.
- B. Base Plates and Cap Plates: ASTM A36 or ASTM A709 Grade 36
- C. Pipe Rails and Posts: ASTM A53 Grade B for standard weight pipe and ASTM A500 Grade B, C or D or ASTM A501 for Structural Tube.

Handrail Support Bars: ASTM A36

RAILING MEMBER DIMENSIONS TABLE			
MEMBER	DESIGNATION	OUTSIDE DIMENSION	WALL THICKNESS
Posts	2" NPS (Sch. 40)	2.375"	0.154"
Rails	2" NPS (Sch. 40)	2.375"	0.154"
Rail Joint/Splice Sleeves	1½" NPS (Sch. 40)	1.900"	0.145"
Handrails Joint/Splice Sleeves	1" NPS (Sch. 40) HSS1.500x0.125	1.315" 1.500"	0.133" 0.125"
Handrails	1½" NPS (Sch. 40)	1.900"	0.145"
Handrail Support Bar	1" Ø Round Bar	1.000"	N/A

- D. Galvanized Steel Fasteners:
  - a. Hex Head Bolts: ASTM A307 Type 1 or ASTM F1554 Grade 36
  - b. Adhesive Anchors: ASTM F1554 Grade 36 fully threaded rods
  - c. Hex Nuts: ASTM A563
  - d. Flat Washers: ASTM F436
- E. Aluminum Shims: ASTM B209, Alloy 6061
- F. Bearing Pads: Plain, Fabric Reinforced, or Fabric Laminated meeting requirements of Specification Sections 515 and 962 for Ancillary Structures.

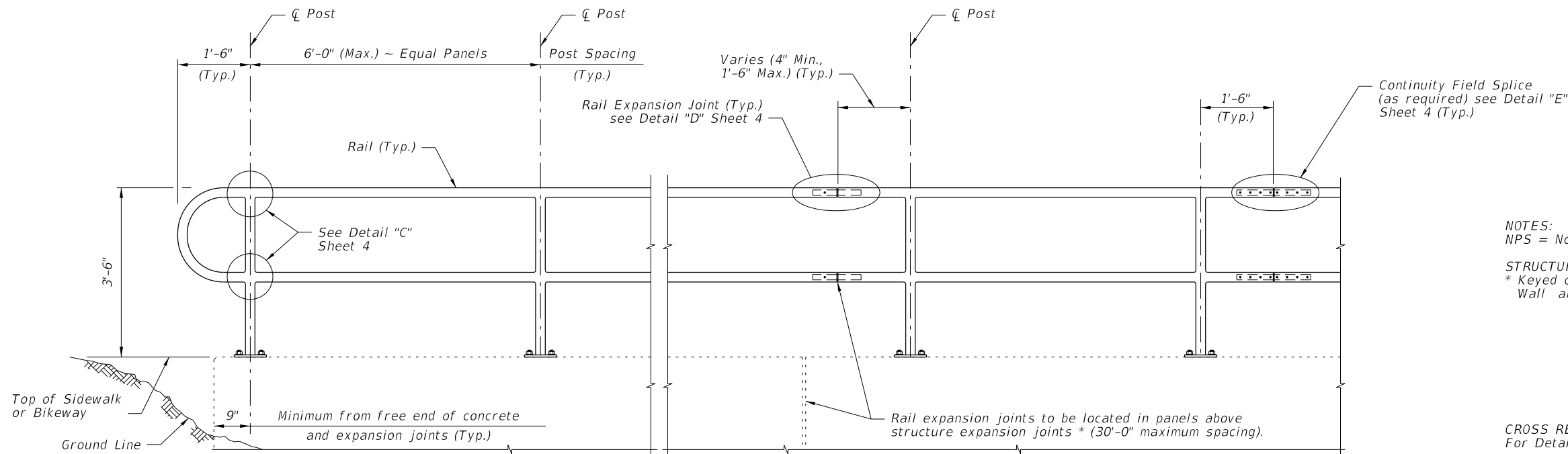
3. Fabrication:

- A. Place expansion joints at a maximum of 30'-0"spacing.
- B. Field splices are similar to the expansion joint detail and may be approved by the Engineer to facilitate handling; but top rail must be continuous across a minimum of two posts.
- C. Continuity field splice (Detail "E") only use to make the railing continuous for unforeseen field adjustments
- D. 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.
- E. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
- F. For changes in tangential longitudinal alignment greater than 45°, positioned posts a maximum of 2'-0" each side of the corner, not at the corner apex.

4.Handrails are required and must be continuous at landings for:

- A. Grades Steeper than 5%,
- B. Three or more steps

5. Cutting of reinforcing steel is permitted for adhesive anchor bolt installations.

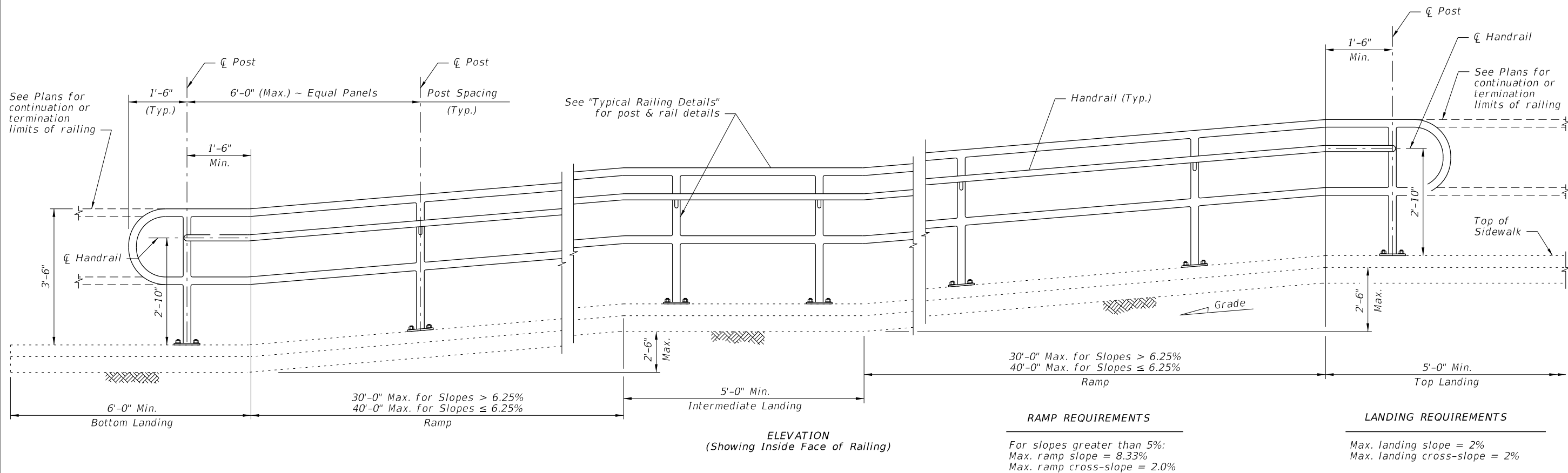


NOTES:  
 NPS = Nominal Pipe Size  
 STRUCTURES EXPANSION JOINTS NOTE:  
 \* Keyed construction joints in Index 6011 Gravity Wall are not considered to be expansion joints.

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

ELEVATION

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



RAMP REQUIREMENTS

For slopes greater than 5%:  
 Max. ramp slope = 8.33%  
 Max. ramp cross-slope = 2.0%


LANDING REQUIREMENTS

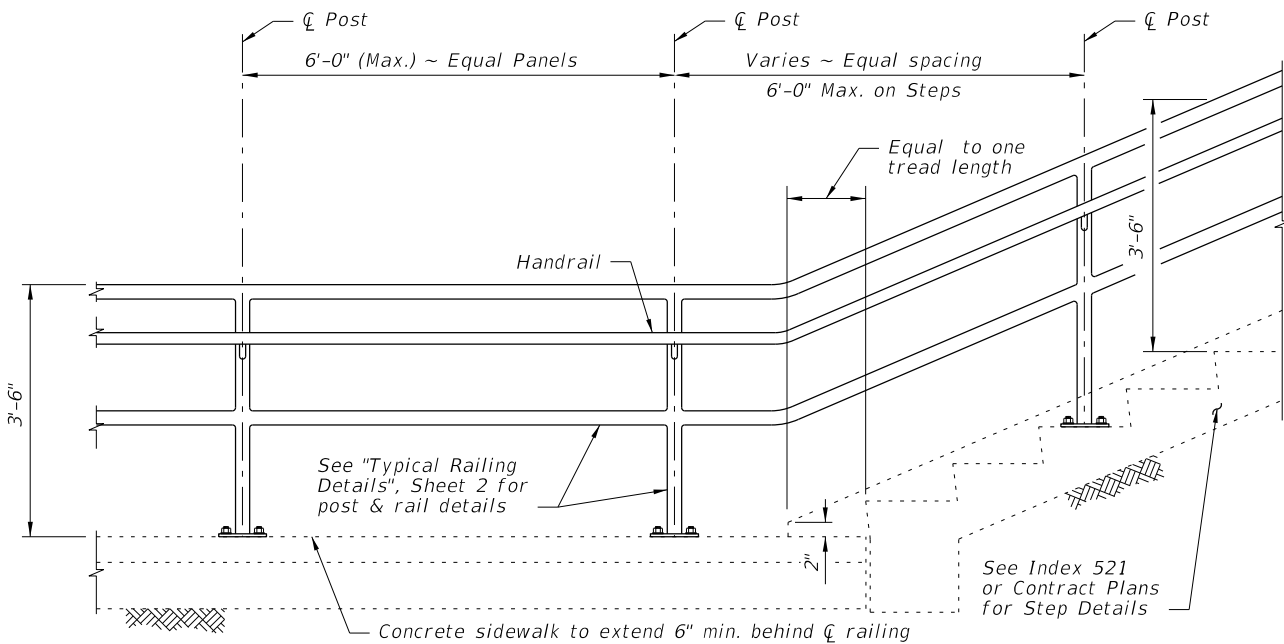
Max. landing slope = 2%  
 Max. landing cross-slope = 2%

ELEVATION  
 (Showing Inside Face of Railing)

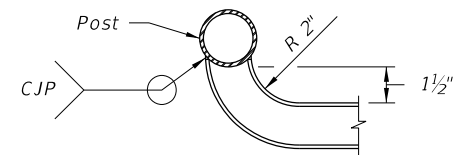
RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

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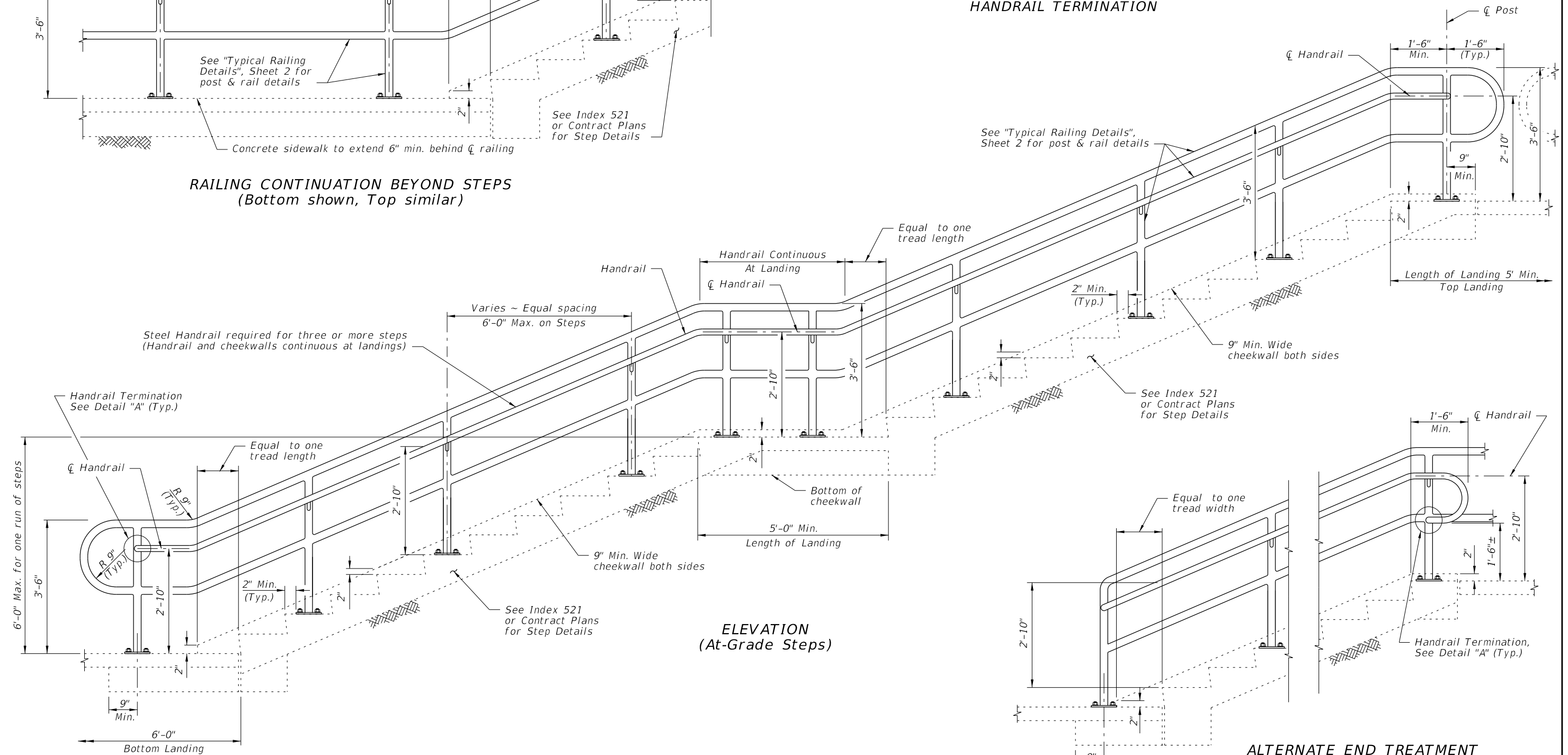
LAST REVISION 11/01/16	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	STEEL PIPE GUIDERAIL	INDEX NO. 880	SHEET NO. 2 of 5
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**RAILING CONTINUATION BEYOND STEPS**  
(Bottom shown, Top similar)



**DETAIL "A" - PLAN VIEW**  
**HANDRAIL TERMINATION**



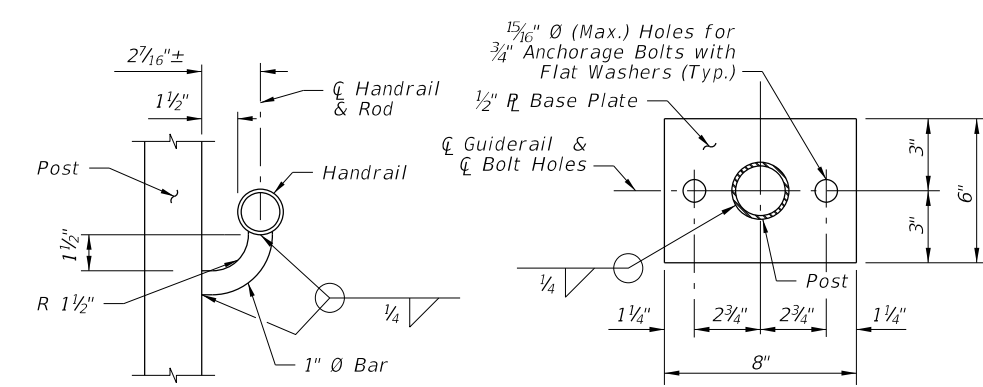
**ELEVATION**  
(At-Grade Steps)

**ALTERNATE END TREATMENT**

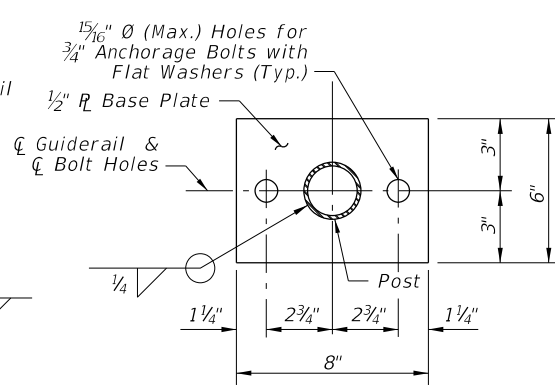
**GUIDERAIL ON STEPS & STAIRS**

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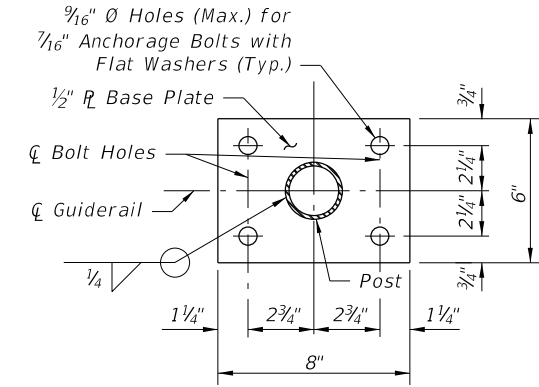
LAST REVISION	DESCRIPTION:	FY 2017-18 DESIGN STANDARDS	STEEL PIPE GUIDERAIL	INDEX NO. 880	SHEET NO. 3 of 5
11/01/16					



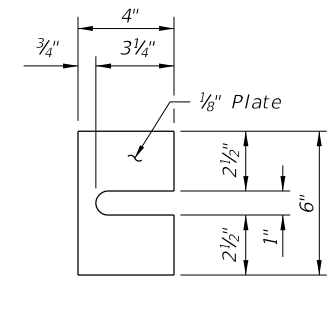
**SECTION B-B**  
(Handrail Connection)



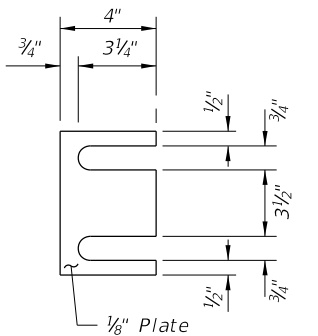
**SECTION C-C**  
**BASE PLATE DETAIL**  
(2~Bolt Anchorage)



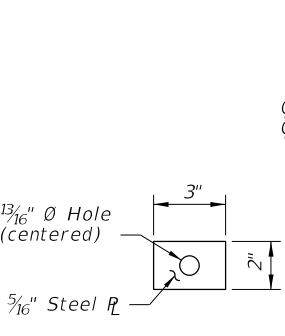
**SECTION C-C**  
**BASE PLATE DETAIL**  
(4~Bolt Anchorage)



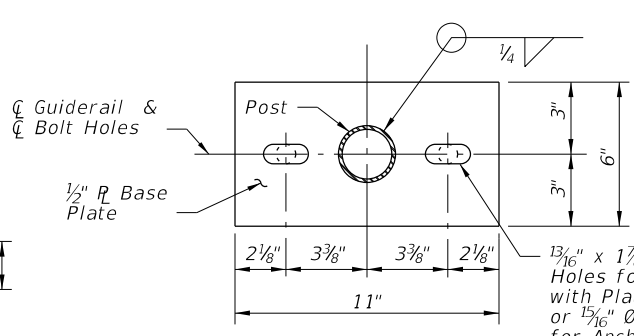
**SHIM PLATE DETAIL**  
(2~Bolt Anchorage)



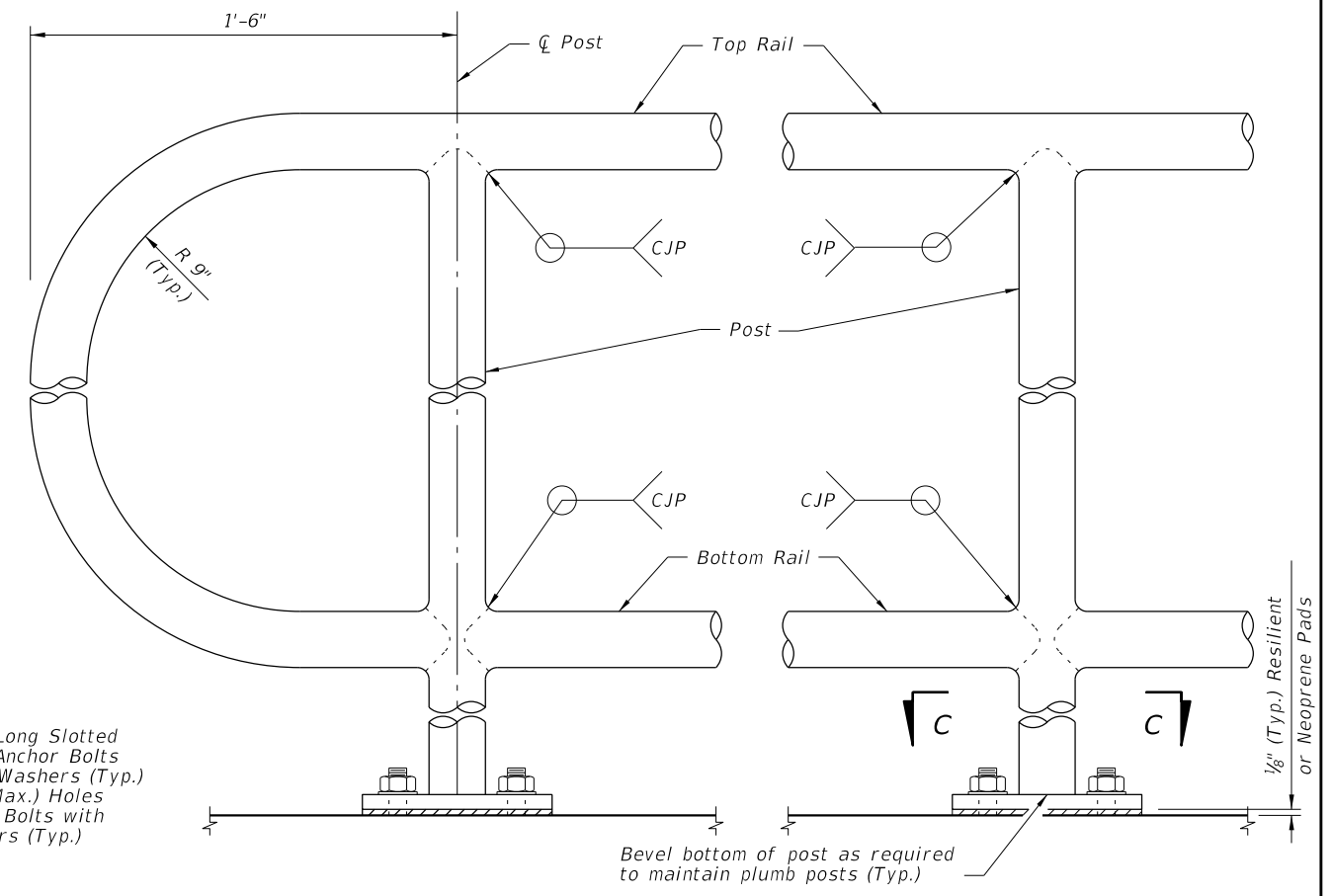
**SHIM PLATE DETAIL**  
(4~Bolt Anchorage)



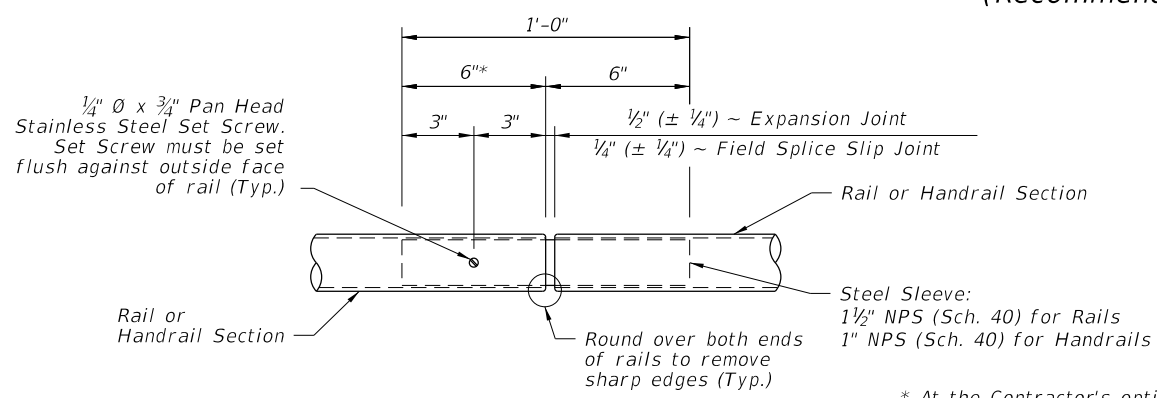
**PLATE WASHER**  
**DETAIL**



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

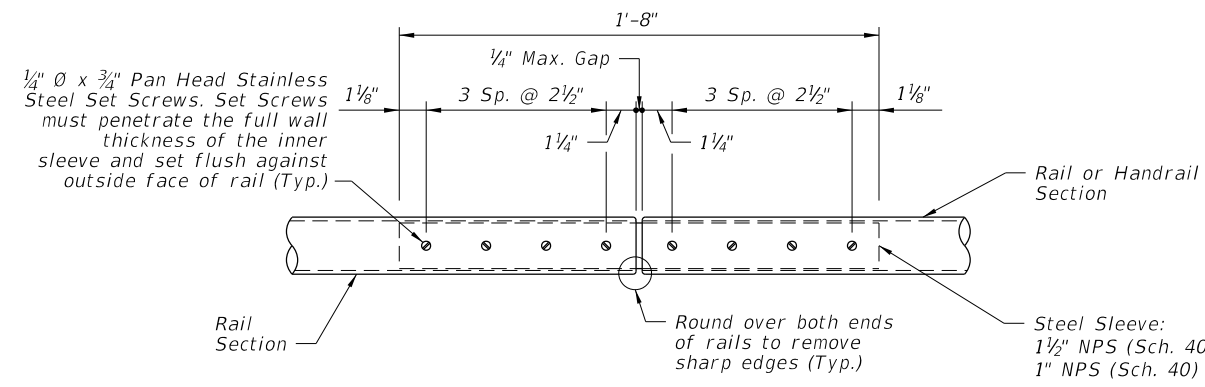


**DETAIL "C" - RAIL CONNECTIONS**  
(Handrail and 4~Bolt Anchorage Not Shown)

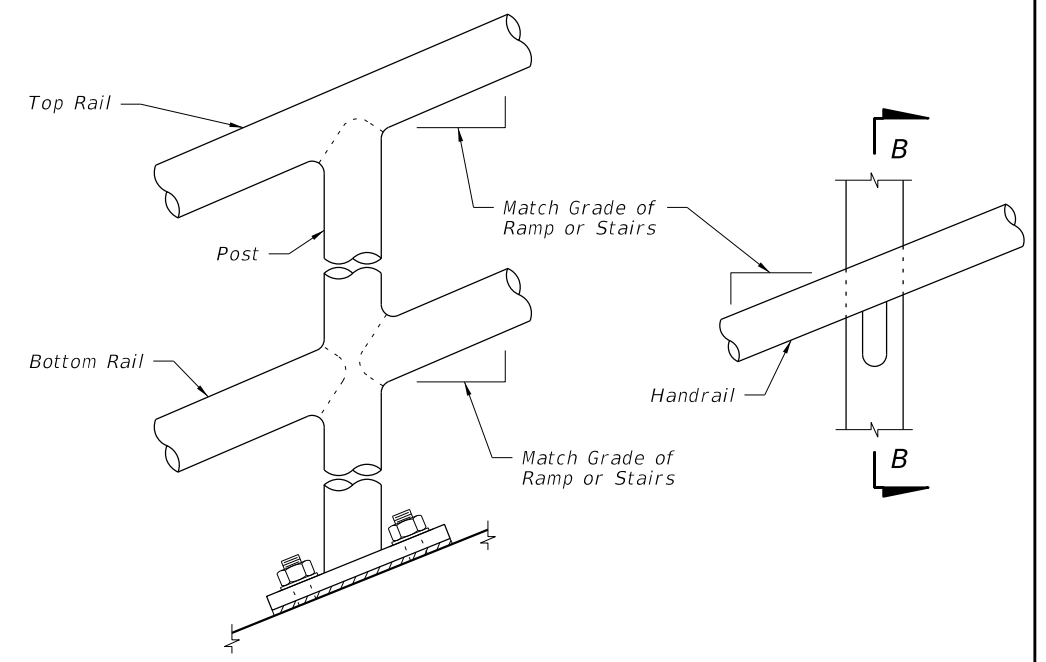


**DETAIL "D" - EXPANSION JOINT**  
(FIELD SPLICE SLIP JOINT SIMILAR)

\* At the Contractor's option, embedded length may be 4" when a 3/4" Ø plug weld is substituted for the 1/4" Ø set screw.




**DETAIL "E" - CONTINUITY**  
**FIELD SPLICE**

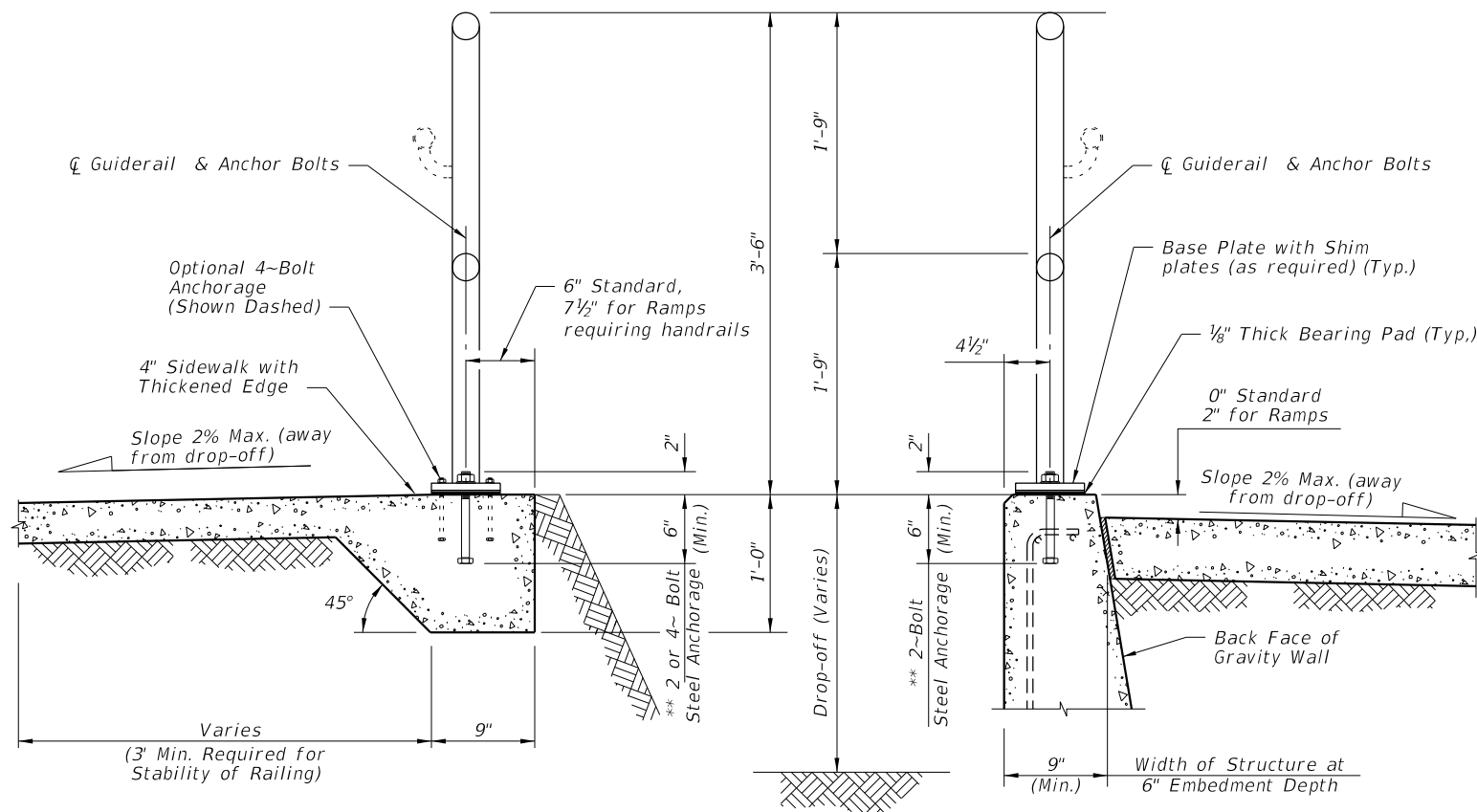


**DETAIL "B" - RAIL AND HANDRAIL**  
(Showing Sloped Condition for Ramps with 2~Bolt Anchorage)

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

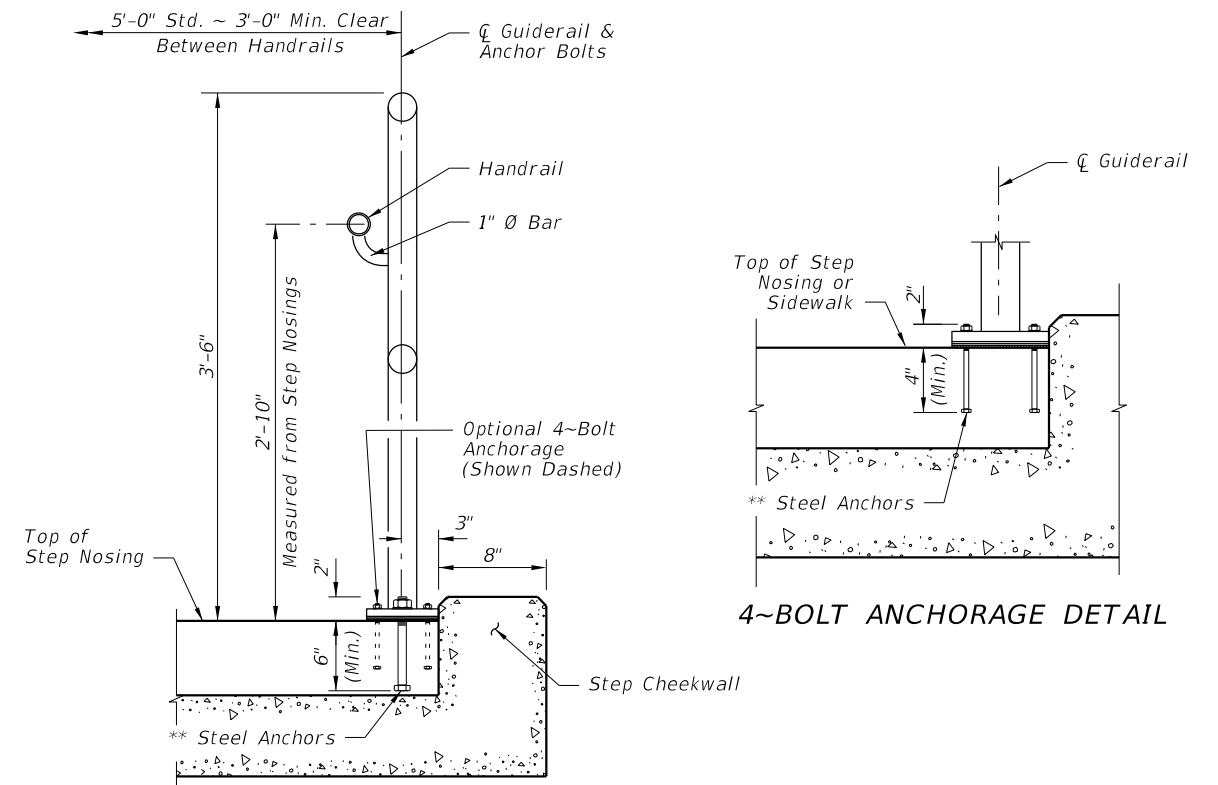
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LAST REVISION 11/01/16	DESCRIPTION:  	 <b>FY 2017-18</b> <b>DESIGN STANDARDS</b>	<b>STEEL PIPE GUIDERAIL</b>	INDEX NO. <b>880</b>	SHEET NO. <b>4 of 5</b>
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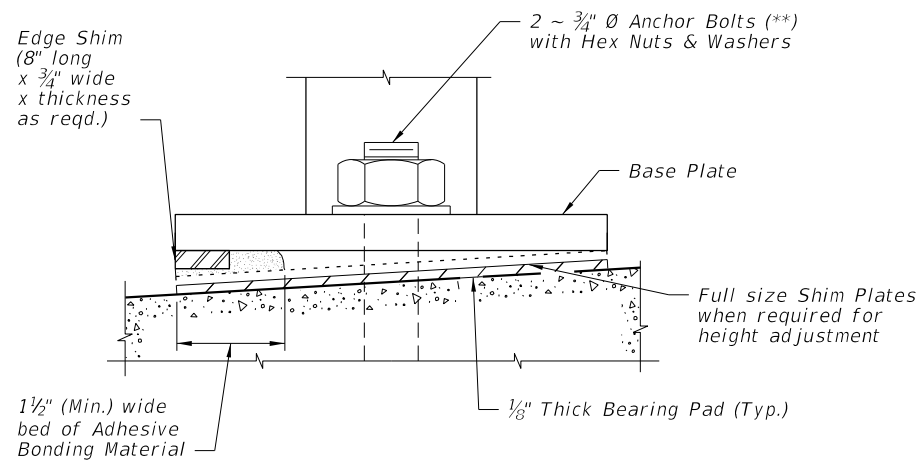


TYPICAL SECTION ON CONCRETE SIDEWALK

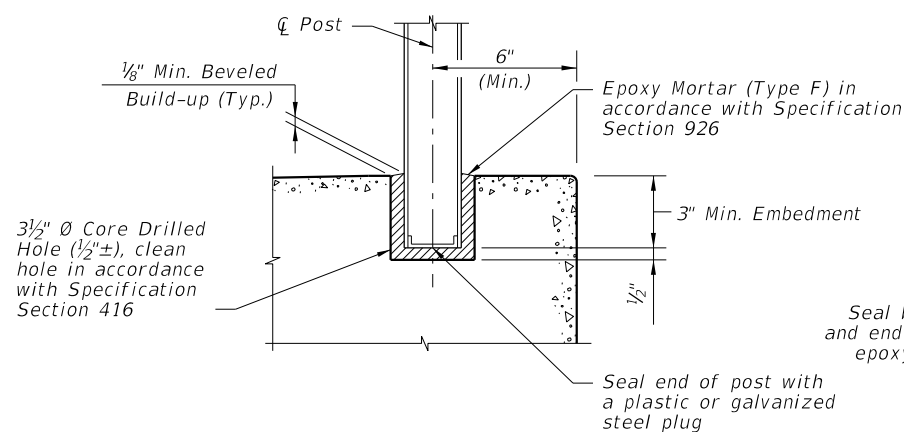
TYPICAL SECTION ON GRAVITY WALL  
(Other Retaining Walls Similar)



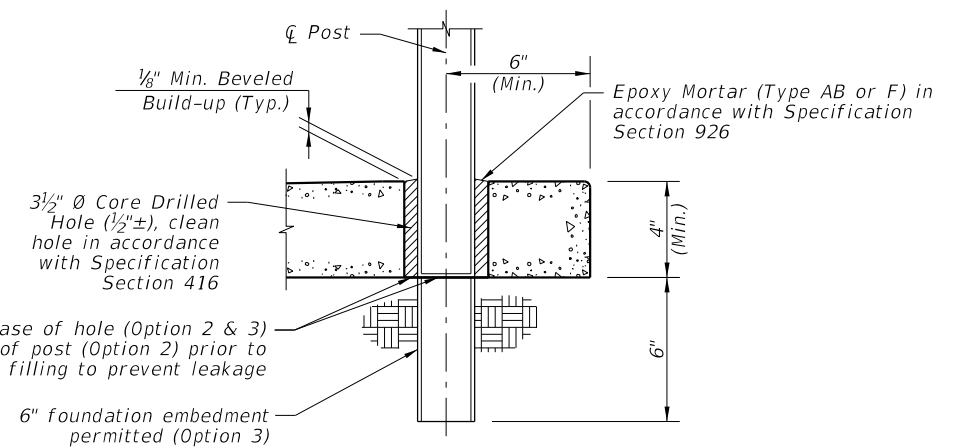
TYPICAL SECTION ON STEPS & STAIRS



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



OPTIONAL SIDEWALK ANCHORAGE DETAIL



SIDEWALK ANCHORAGE DETAIL  
OPTION 2 & 3

NOTES:  
 \*\*2 ~ 3/4" Ø x 8" or 4 ~ 7/16" Ø x 6" 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.

\*\*\* The minimum embedment for adhesive anchors is 6" for  
 2-Bolt Anchorage or 4" for 4-Bolt Anchorage.

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LAST REVISION 11/01/16	DESCRIPTION:	FY 2017-18 DESIGN STANDARDS	STEEL PIPE GUIDERAIL	INDEX NO. 880	SHEET NO. 5 of 5
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