


NOTES:

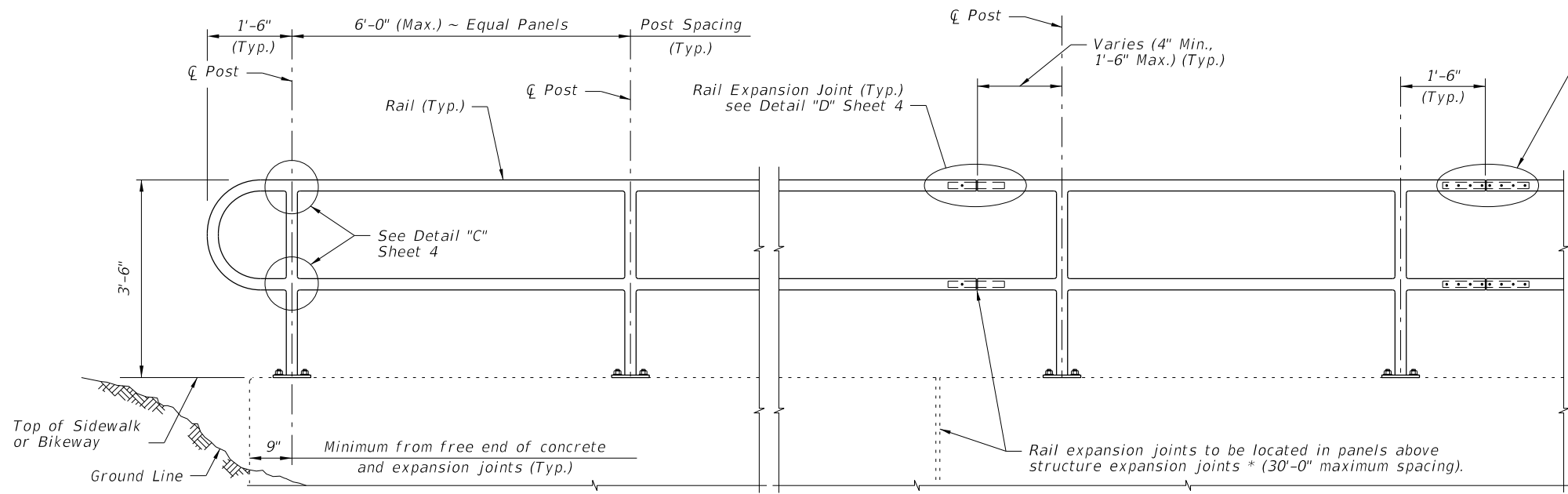
1. Shop Drawings are required.
2. Work with Specification 515.
3. Materials:
 - A. Pan Head Set Screws: Aluminum Alloy 2024-74 or 7075-T73 or Stainless Steel (SS) Type 316 or 18-8 Alloy.
 - B. Base Plates and Cap Plates: ASTM B209, Alloy 6061-T6
 - C. Structural Pipe Tube and Bars: ASTM B221 or ASTM B429, Alloy 6061-T6
 - D. End Rails 90° bends and corner bends with a maximum 4 foot spacing: Alloy 6063-T5 is permitted.

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) 1.50 ODx0.125 Wall	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

- E. Galvanized Steel Fasteners:
 - a. Hex Head Bolts: ASTM A 307 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
 - F. Aluminum Shims: ASTM B209, Alloy 6061
 - G. Bearing Pads: Plain, Fabric Reinforced, or Fabric Laminated meeting requirements of Specifications 515 & 932.
4. 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 top and bottom rails and handrails to match the alignment radius.
 - F. For changes in tangential longitudinal alignment greater than 45°, position posts a maximum of 2'-0" each side of the corner, not at the corner apex.
5. Handrails are required and must be continuous at landings for:
- A. Grades Steeper than 5%
 - B. Three or more steps
6. Cutting of reinforcing steel is permitted for post installed anchor bolts.

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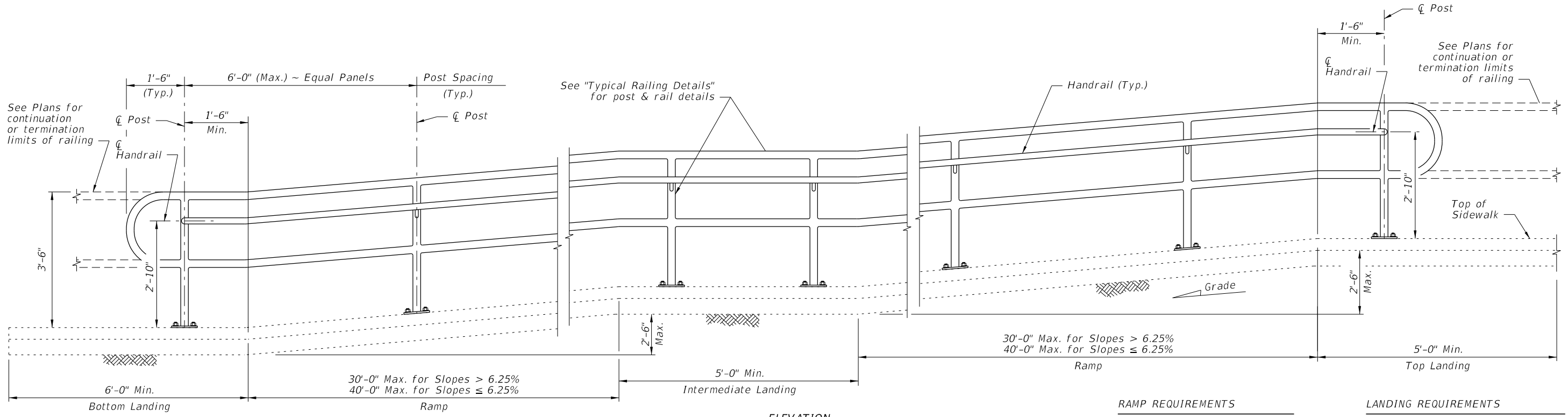
NOTES:
 NPS = Nominal Pipe Size

STRUCTURES EXPANSION JOINTS NOTE:
 * Keyed construction joints in Index 400-011 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%



ELEVATION
 (Showing Inside Face of Railing)

RAMP REQUIREMENTS

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

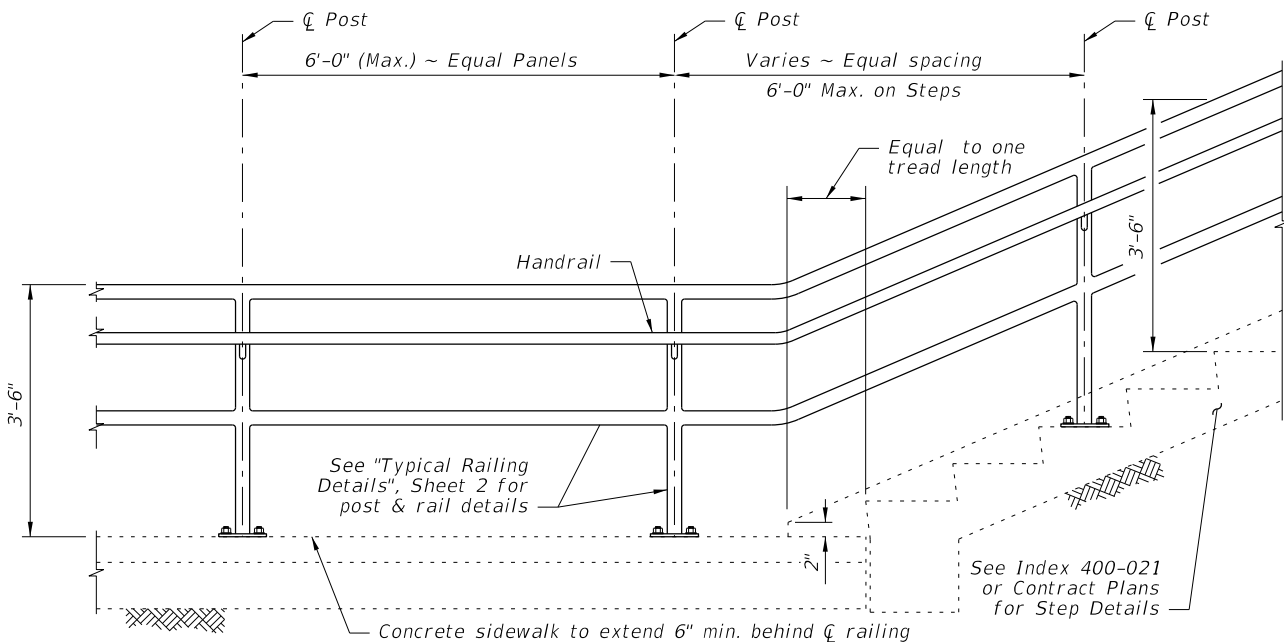
LANDING REQUIREMENTS

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

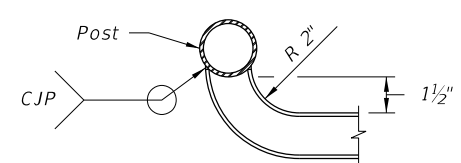
RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

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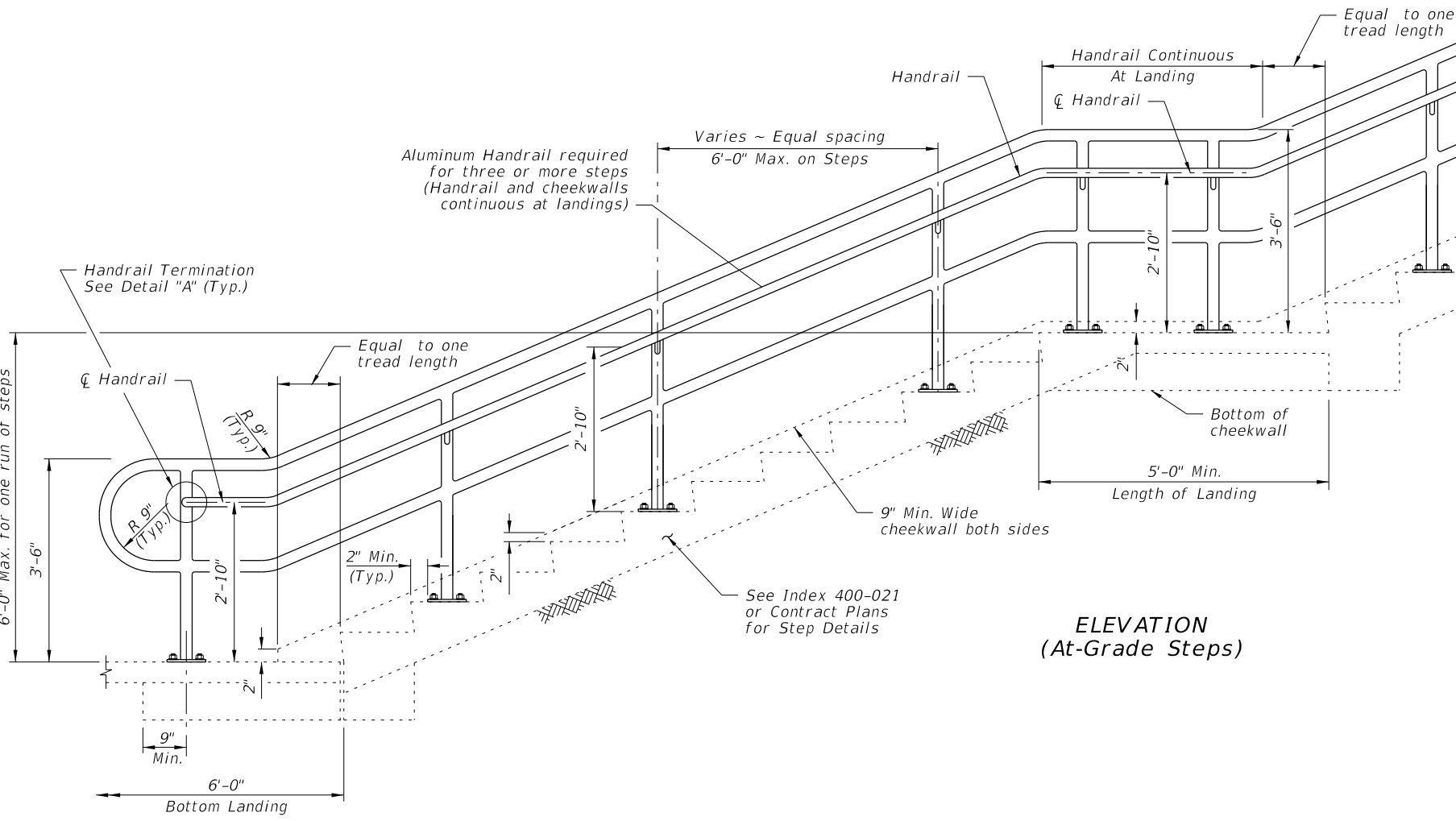
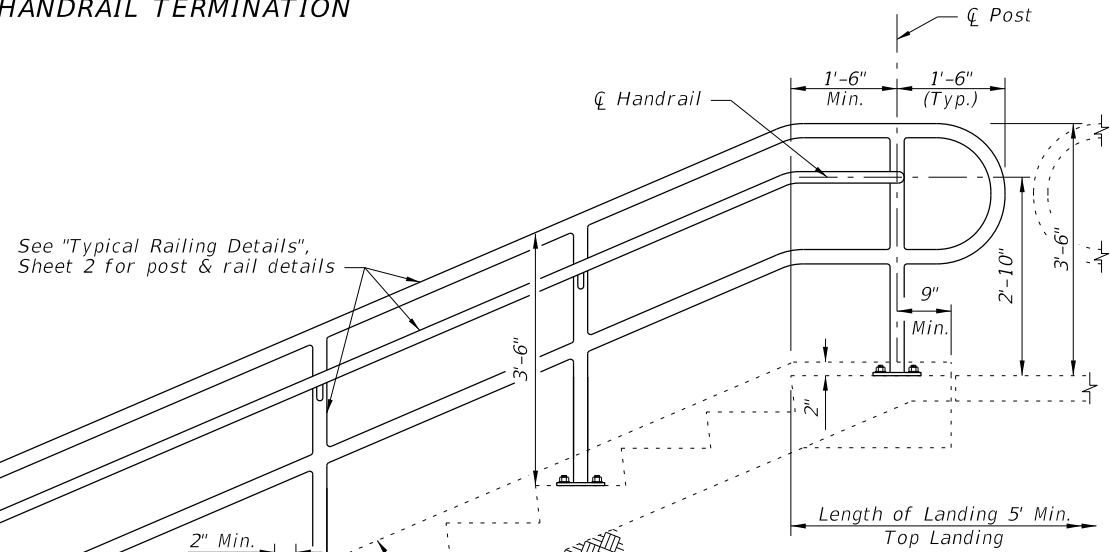
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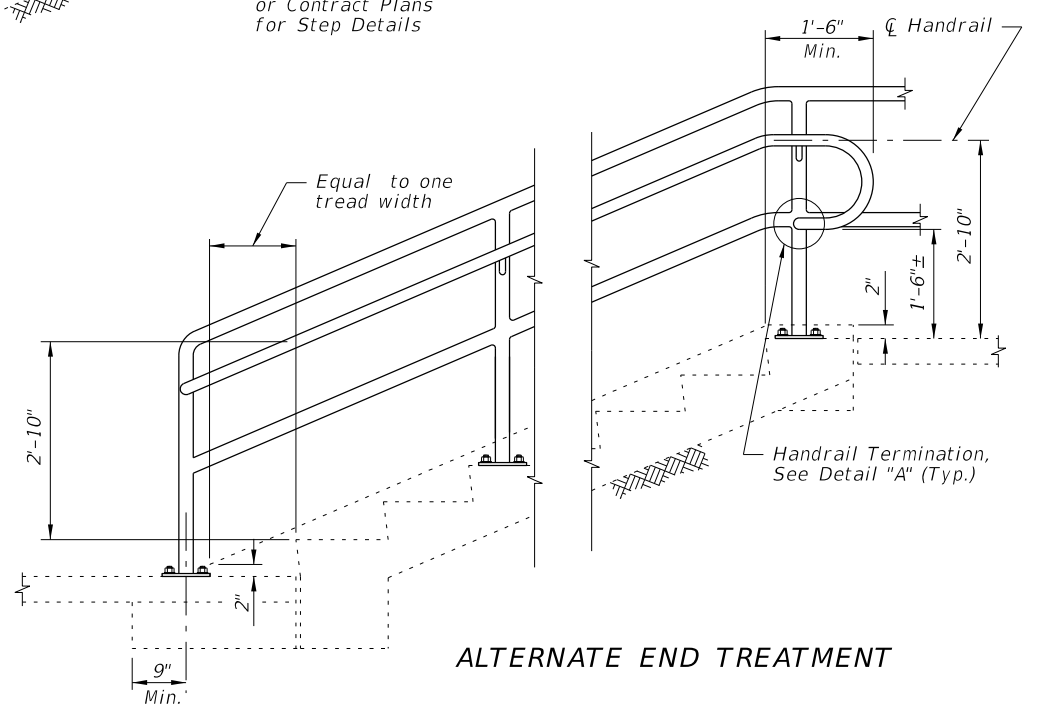
RAILING CONTINUATION BEYOND STEPS
(Bottom shown, Top similar)



DETAIL "A" - PLAN VIEW
HANDRAIL TERMINATION



ELEVATION
(At-Grade Steps)

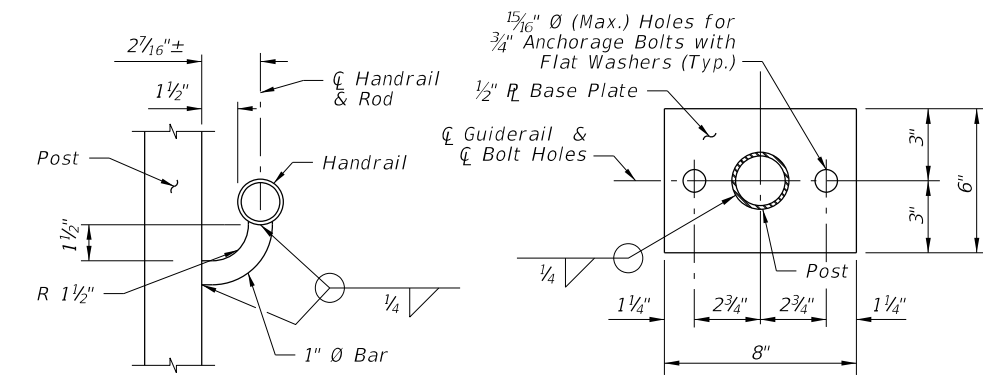


ALTERNATE END TREATMENT

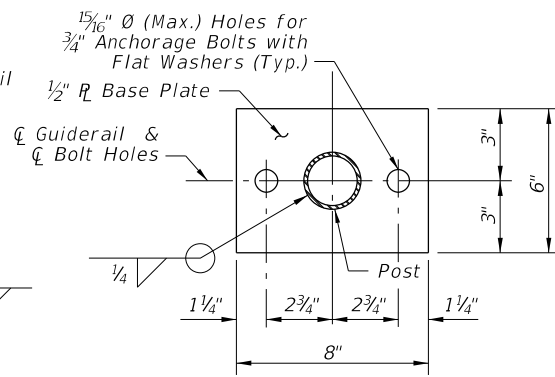
GUIDERAIL ON STEPS & STAIRS

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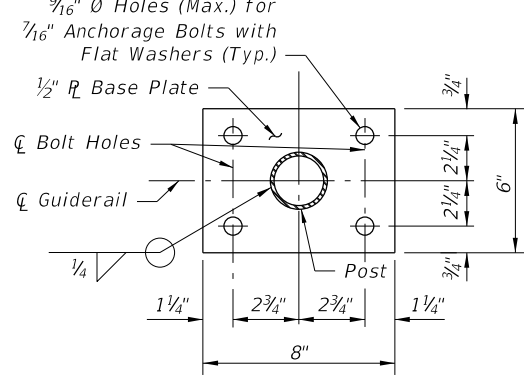
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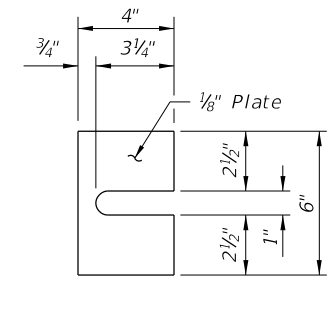
SECTION B-B
(Handrail Connection)



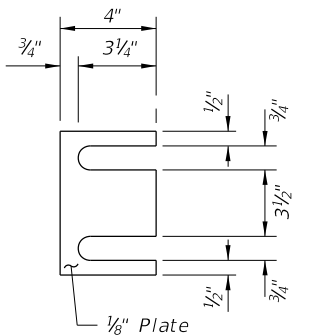
SECTION C-C
BASE PLATE DETAIL
(2~Bolt Anchorage)



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



SHIM PLATE DETAIL
(2~Bolt Anchorage)



SHIM PLATE DETAIL
(4~Bolt Anchorage)

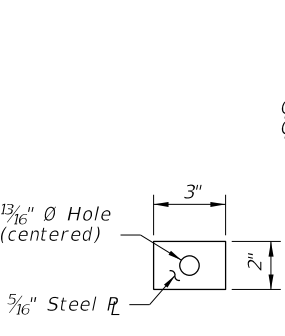
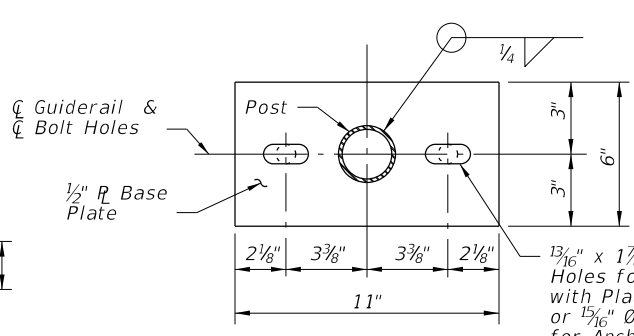
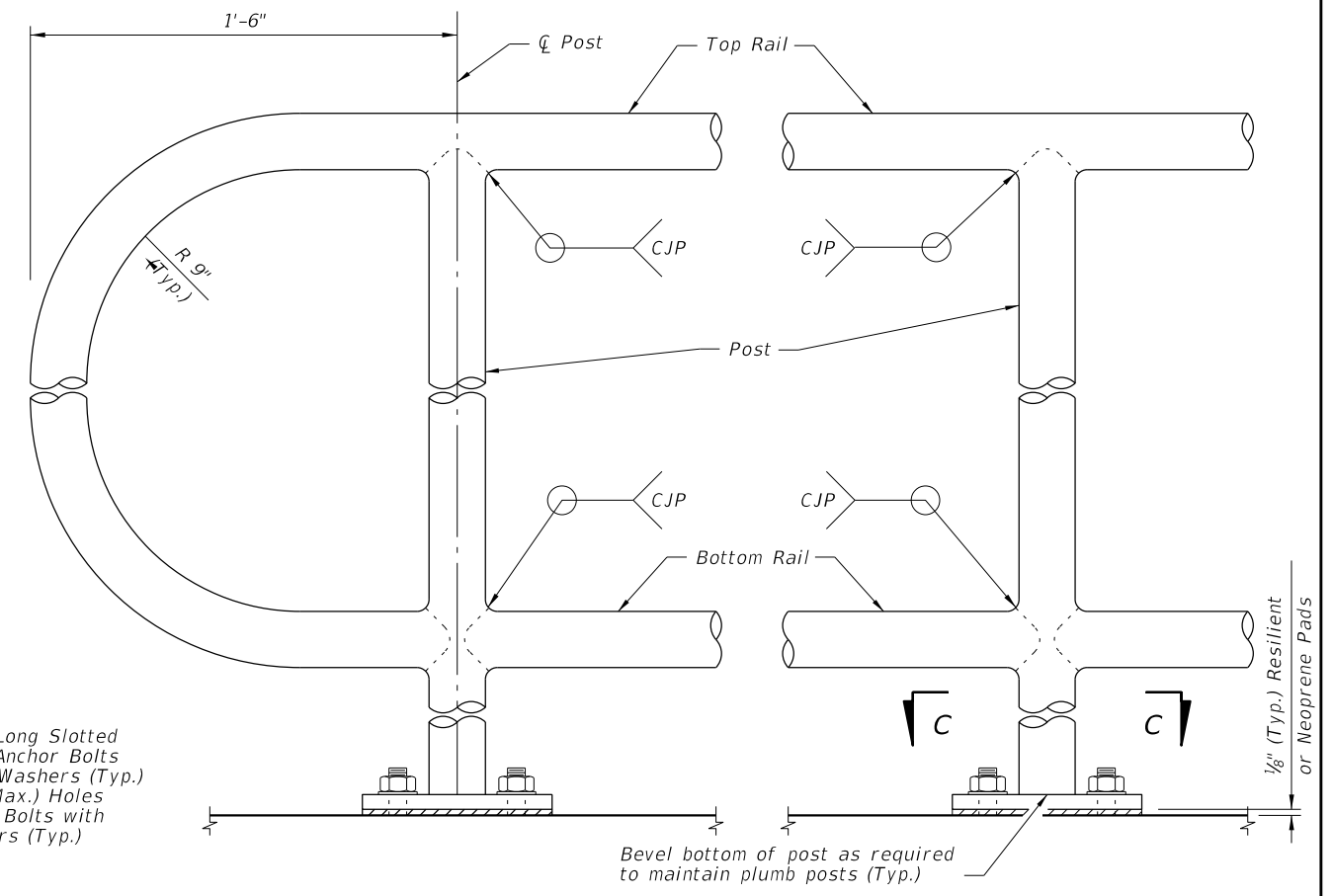


PLATE WASHER
DETAIL

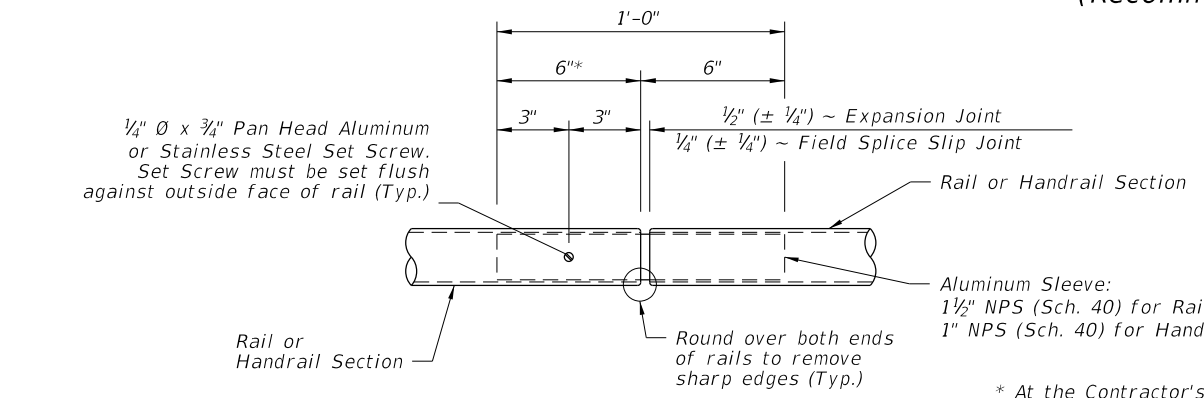


ALTERNATE BASE
PLATE DETAIL
(Recommended for Steep Slopes)

13/16" x 1 7/8" Long Slotted Holes for Anchor Bolts with Plate Washers (Typ.) or 15/16" Ø (Max.) Holes for Anchor Bolts with Flat Washers (Typ.)

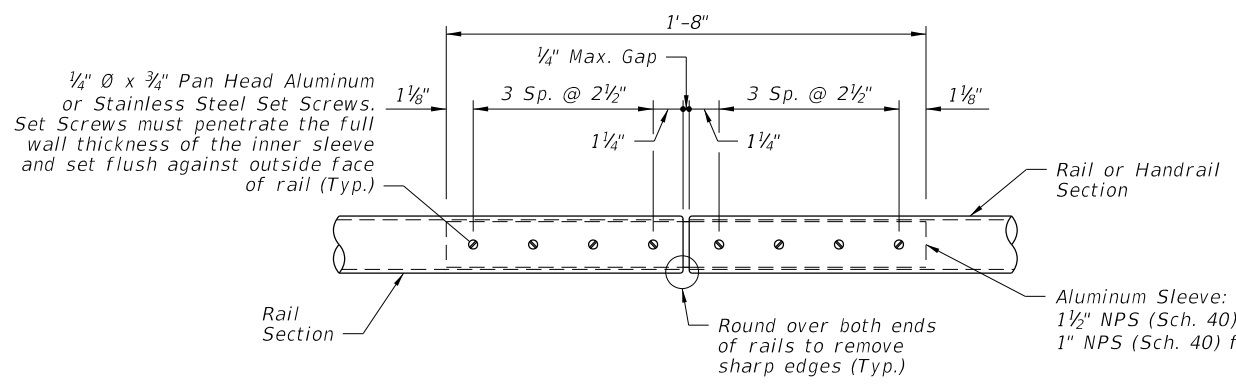


DETAIL "C" - RAIL CONNECTIONS
(Handrail and 4~Bolt Anchorage Not Shown)

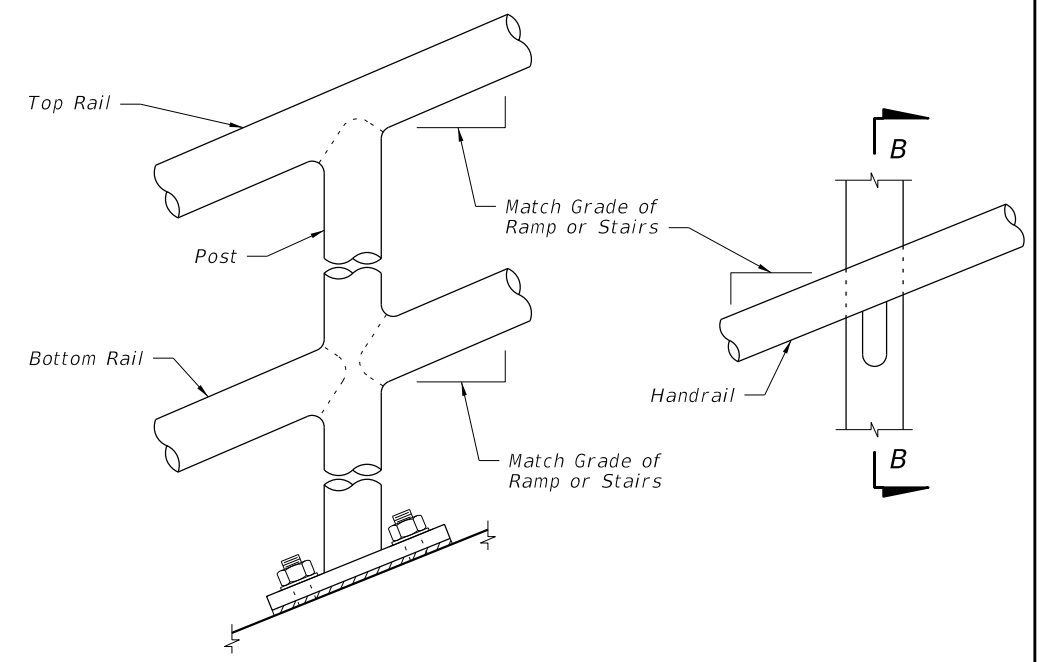


DETAIL "D" - EXPANSION JOINT
(FIELD SPLICE SLIP JOINT SIMILAR)

* 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

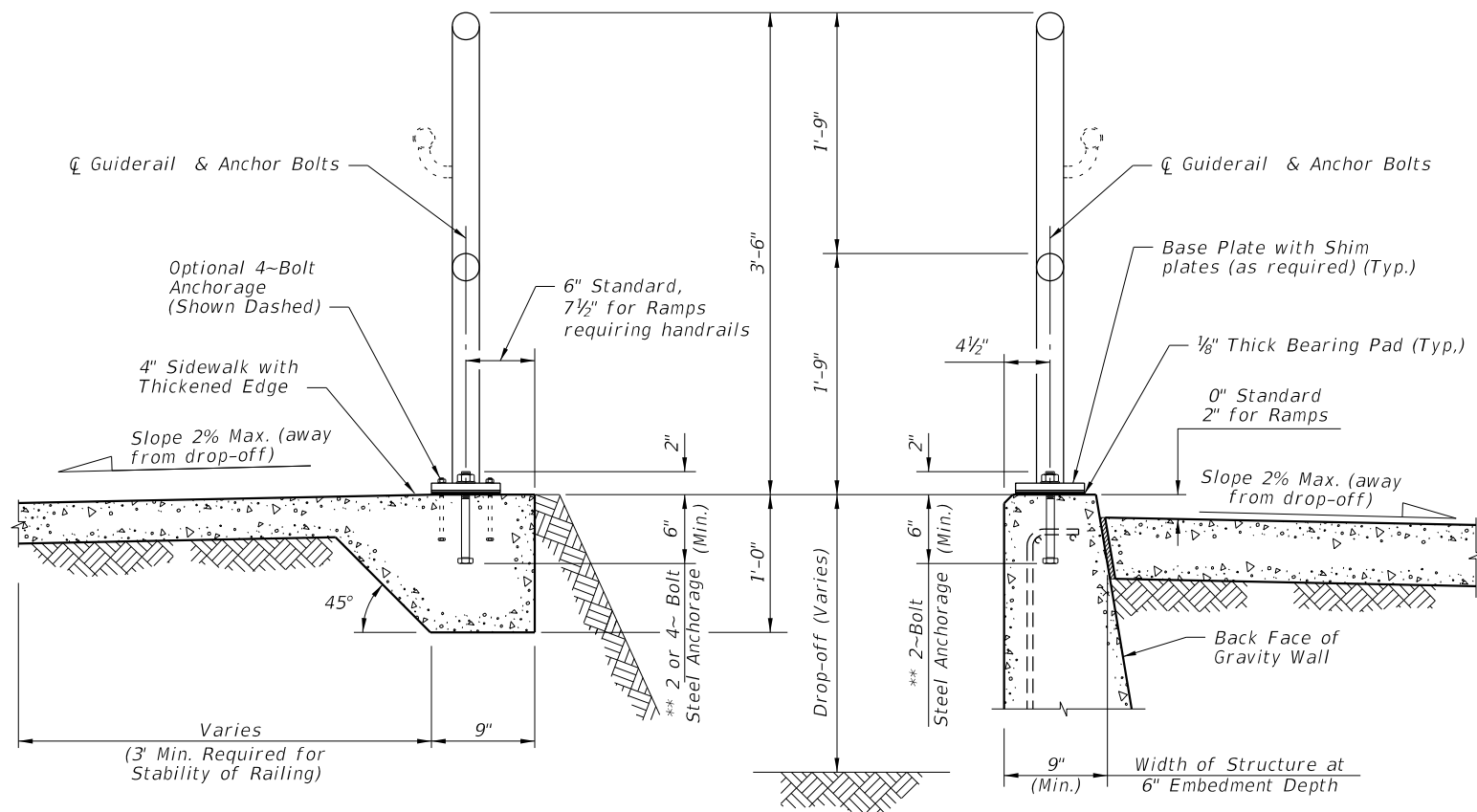


DETAIL "B" - RAIL AND HANDRAIL
(Showing Sloped Condition for Ramps with 2~Bolt Anchorage)

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

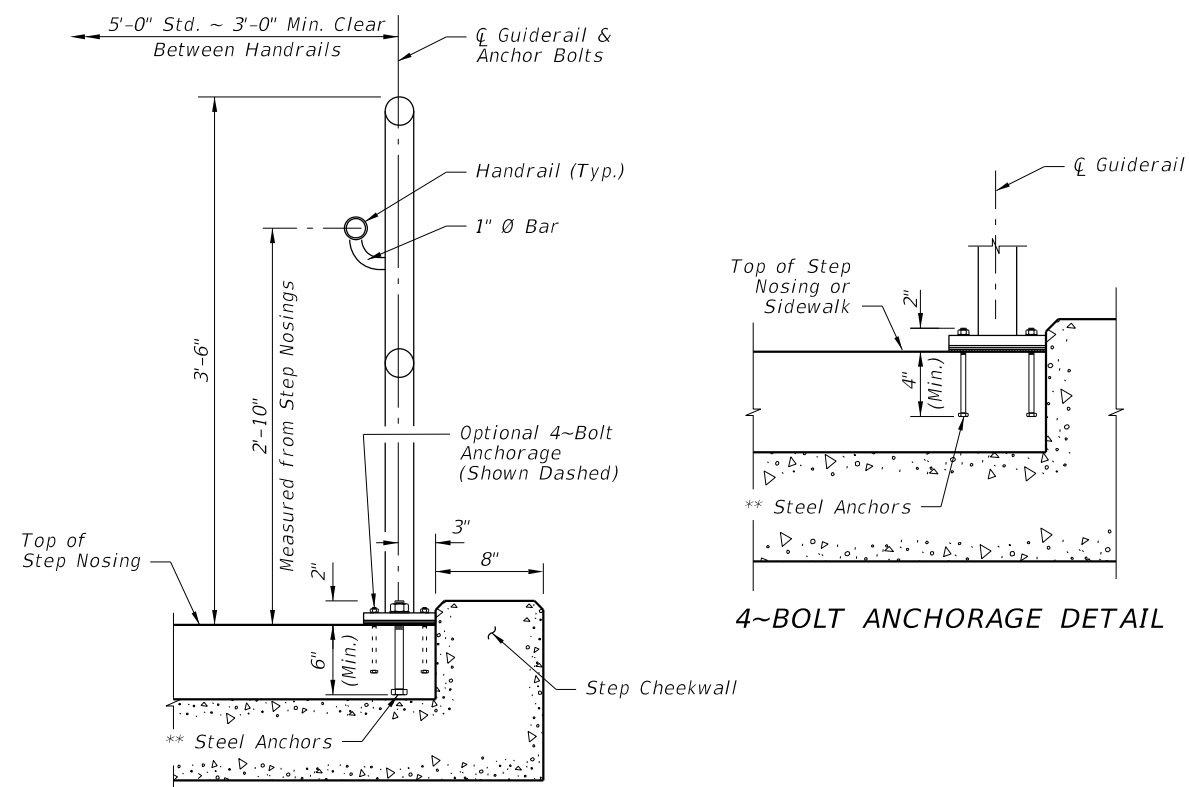
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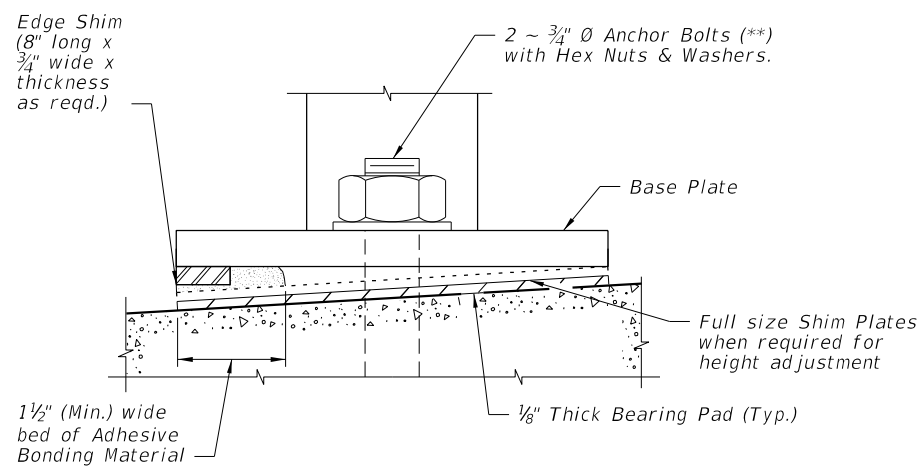
TYPICAL SECTION ON CONCRETE SIDEWALK

TYPICAL SECTION ON GRAVITY WALL
(Other Retaining Walls Similar)

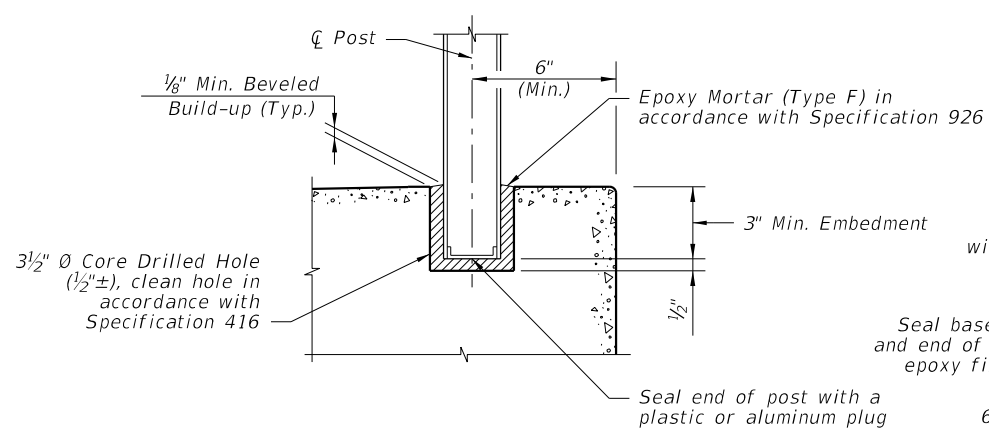


TYPICAL SECTION ON
STEPS & STAIRS

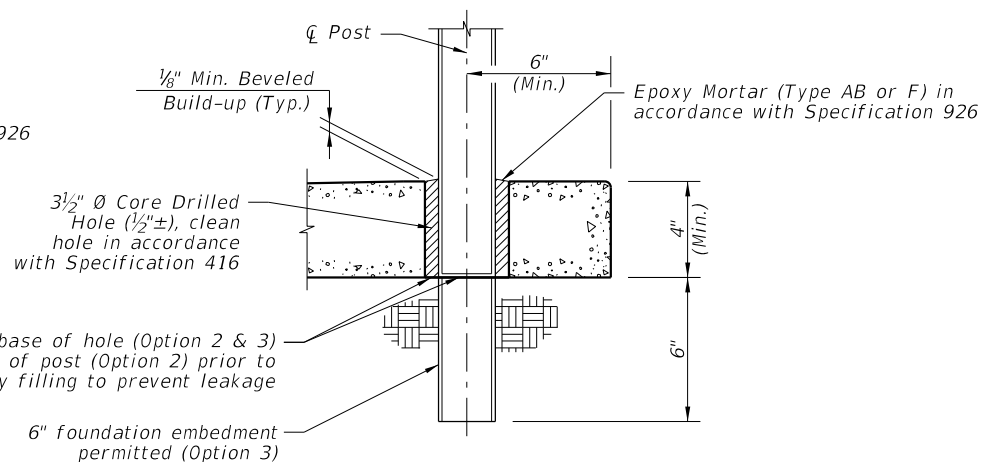
4-BOLT ANCHORAGE DETAIL



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



SIDEWALK ANCHORAGE DETAIL
OPTION 1



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
 *** The minimum embedment for Adhesive Anchors is 6" for
 2-Bolt Anchorage or 4" for 4-Bolt Anchorage.

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