

3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL  
(42" Height shown, 48" Height Similar)

TABLE 1 - RAILING MEMBERS

MEMBER	DESIGNATION	OUTSIDE DIMENSION	WALL THICKNESS
Post "A"	HSS 2½ x 1½ x 1/8	2.50" x 1.50"	0.125"
Post "B"	HSS 2½ x 1½ x 3/16	2.50" x 1.50"	0.188"
Top Rail	2½" NPS (Sch. 10)	2.875"	0.120"
	HSS 3.000 x 0.120	3.000"	0.120"
End Hoops	2½" NPS (Sch. 10)	2.875"	0.120"
	HSS 3.000 x 0.120	3.000"	0.120"
Top Rail Joint/Splice Sleeves	HSS 2.500 x 0.125	2.500"	0.125"
Intermediate & Bottom Rail	HSS 2 x 2 x 3/16	2.00" x 2.00"	0.188" (1)
Int. & Bottom Rail Post Connection Sleeve	HSS 1.500 x 0.125	1.500"	0.125" (1)
Handrail Joint/Splice Sleeves	1" NPS (Sch. 40)	1.315"	0.133"
	HSS 1.500 x 0.125	1.500"	0.125"
Handrails	1½" NPS (Sch. 40)	1.900"	0.145"
Handrail Support Bar	¾" Ø Round Bar	0.750"	N/A
Pickets (Type 1 Infill Panel)	¾" Ø Round Bar	0.750"	N/A
Infill Panel Members (Types 2 - 5)	Varies (See Details)	Varies	Varies

TABLE 1 NOTES:

(1) 0.125" wall thickness permitted for rails with post spacings less than 5'-8", except that Post Connection Sleeve must be 1¼" NPS (Sch. 40).

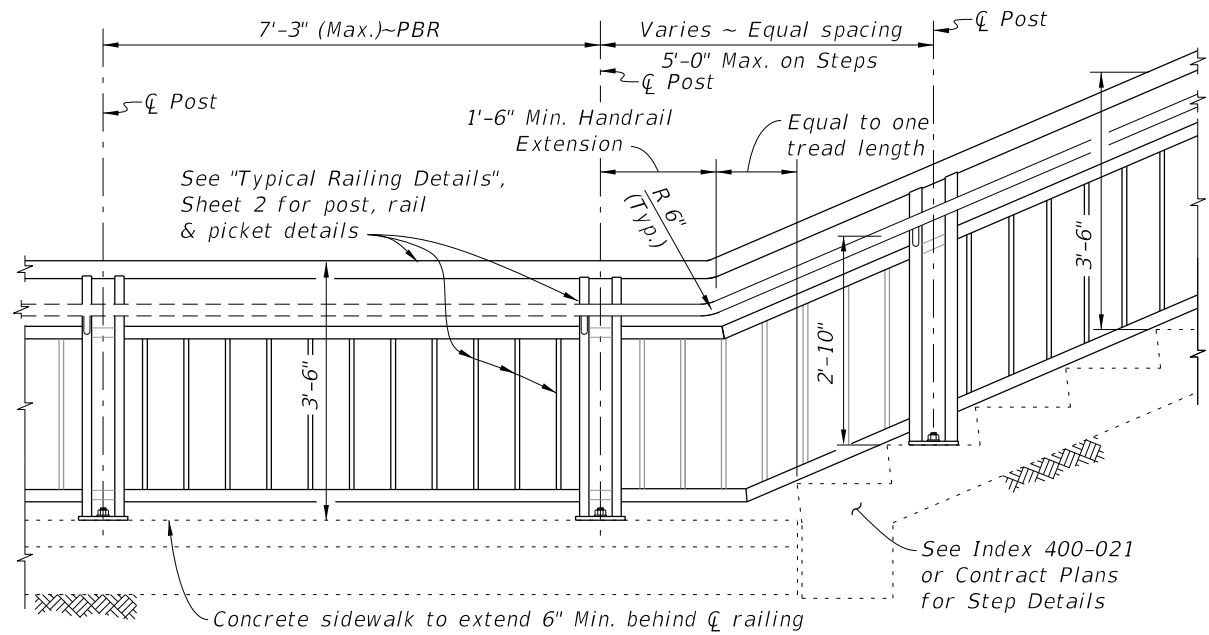
NOTES

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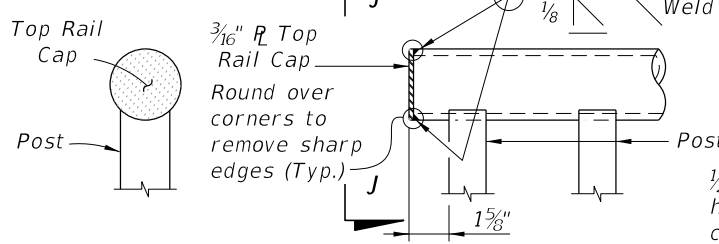
- Shop Drawings are required; see Specification Section 515
- For bridge mounted railings work this Index with Index 515-051 Bridge Bicycle/Pedestrian Railing
- Materials:
  - Pipe Rails and Pickets: ASTM A500 Grade B, C or D, or ASTM A53 Grade B for standard weight pipe (Schedule 40) and ASTM A36 for bars.
  - Structural Tube: ASTM A500 Grade A, B, C, or D or ASTM A501
  - Steel Plate: ASTM A36 or ASTM A709 Grade 36
  - U-Channels and filler plates: ASTM A36 or ASTM A1011 (Grade 36).
  - Stainless steel (SS) screws: Type 316 or 18-8 Alloy
  - Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
    - Hex Head Bolts: ASTM A 307
      - 7/8" diameter single bolt option, Grade 36
      - 7/16" four bolt option, Grade 55
    - Adhesive Anchors: ASTM F1554 fully threaded rods, Grade 55
    - Hex Nuts: ASTM A563
    - Flat Washers: ASTM F436
    - Plate Washers: ASTM A36 or ASTM A706 Grade 36.
  - Shims: ASTM B209 Alloy 6061
  - Bearing Pads: 1/8" Plain, Fabric Reinforced or Fabric Laminated pads that meet the requirements of Specification Section 932 for Ancillary Structures.
- Fabricate pickets and vertical panel elements parallel to the posts; except Type 2, 3 and 5 panel infills may be fabricated parallel to the longitudinal grade. Maintain a maximum clear opening of 5/8" for standard installations and 3/8" when a 4" sphere requirement is indicated in the Data Tables.
- Maximum spacing between expansion joints is 40'-0". Locate an Expansion Joint between the posts on either side of the Deck Expansion Joint.
- Field splices are similar to the Expansion Joint Detail and may be approved by the Engineer to facilitate handling; but the top rail must be continuous across a minimum of two posts.
- For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "K".
- Make corners and changes in tangential longitudinal alignment with a 9" bend radius or terminate adjoining sections with mitered end sections when handrails are not required.
- For changes in tangential longitudinal alignment greater than 45°, position posts a maximum of 2'-0" each side of the corner but not at the corner apex.
- For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
- Handrails are required and must be continuous at landings for:
  - Grades Steeper than 5%.
  - Three or more steps
- Installation: Cutting of reinforcing steel is permitted for post installed anchors.

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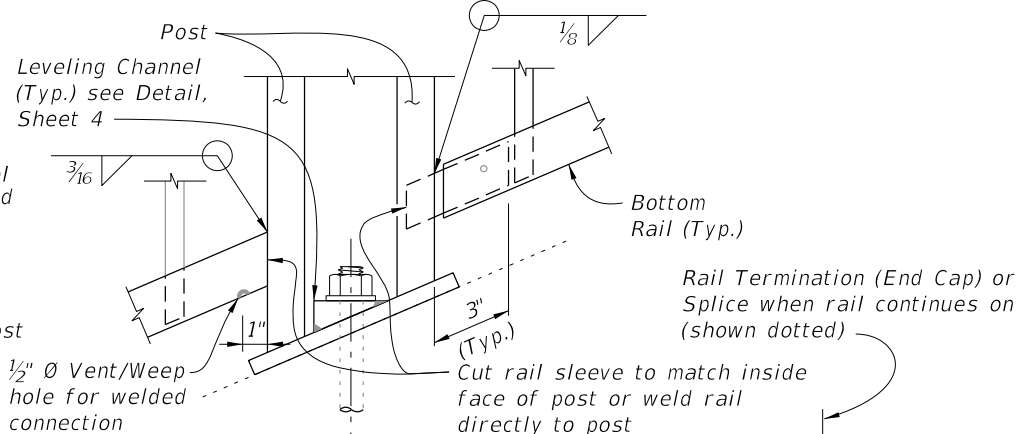




**RAILING CONTINUATION BEYOND STEPS OR STAIRS**  
(Bottom shown, Top similar)

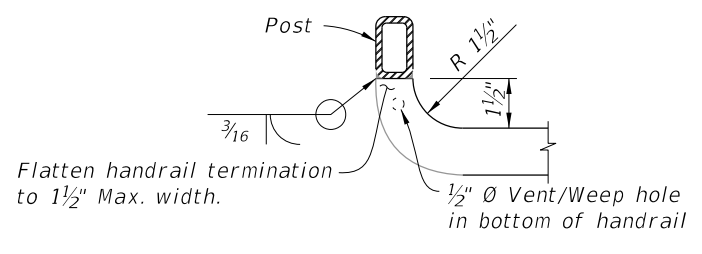


**VIEW J-J DETAIL "J" - ELEVATION VIEW TOP RAIL TERMINATION**

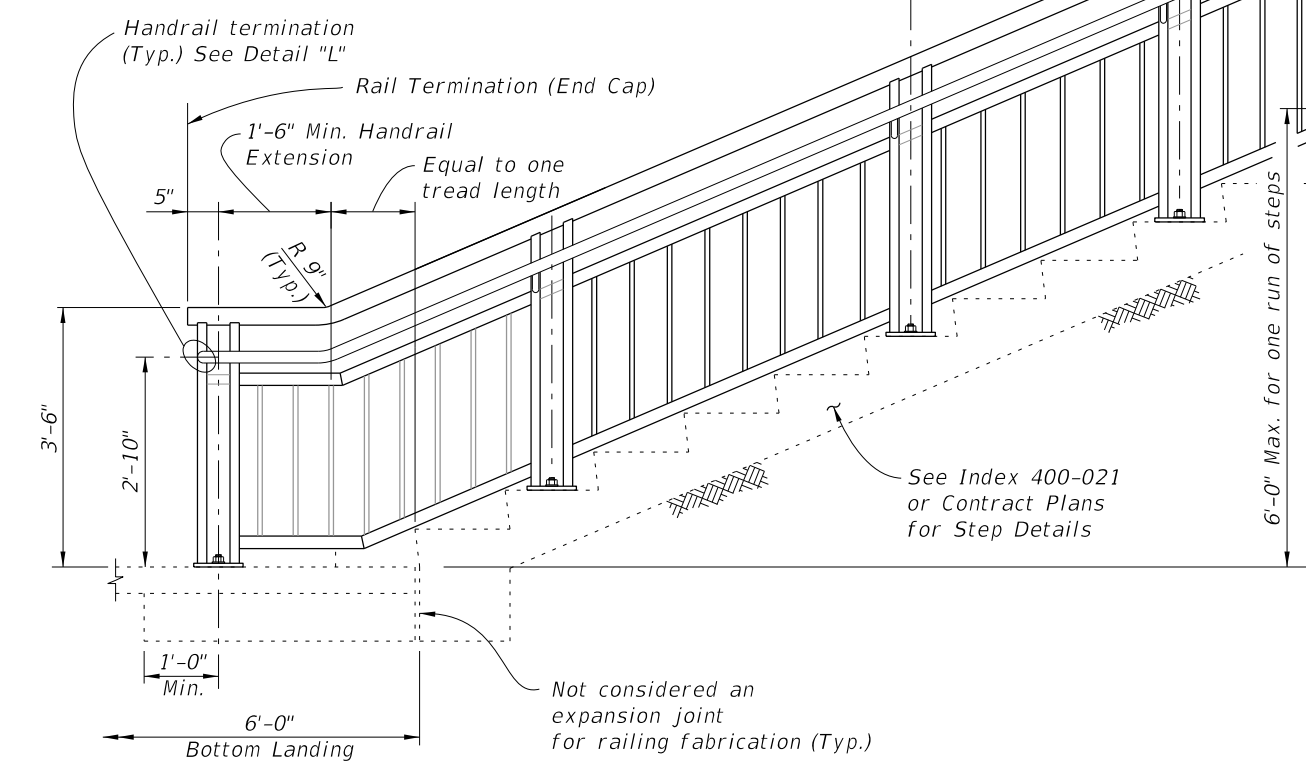


**DETAIL "K" - ELEVATION VIEW BOTTOM RAIL CONNECTION (Intermediate Rail Similar)**

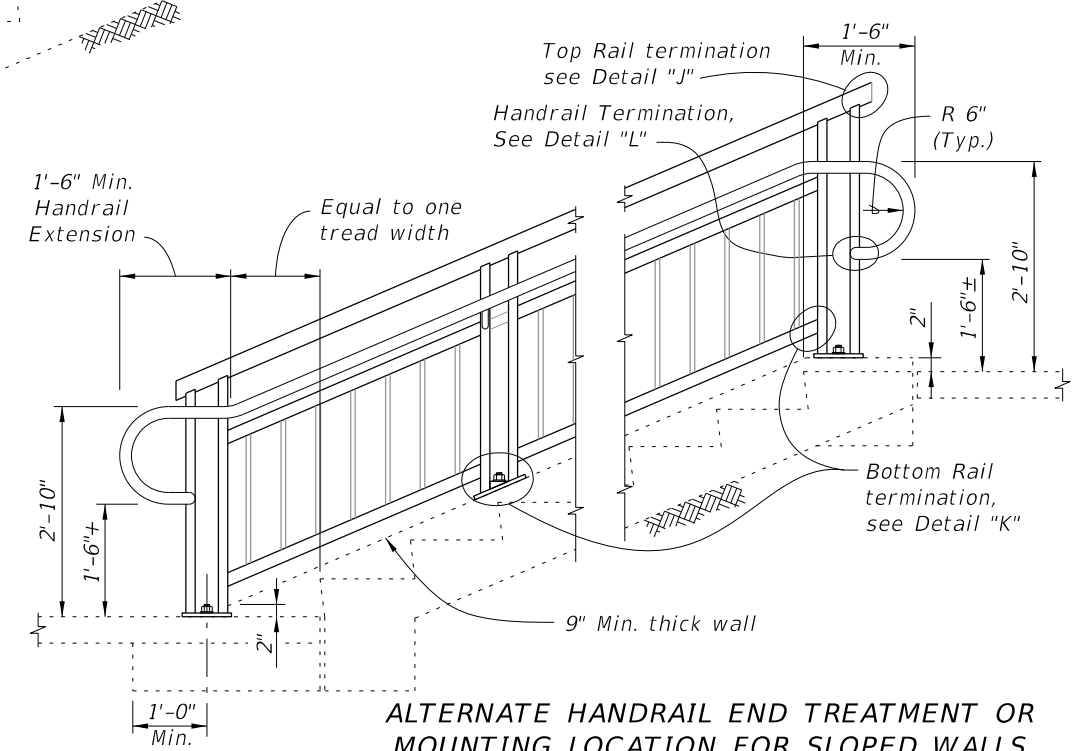
**RAIL TERMINATION DETAILS**



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




**ELEVATION (At-Grade Steps shown, Elevated Stairs similar)**

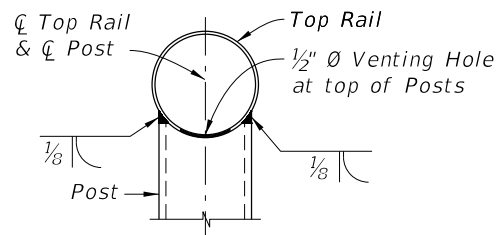


**ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOPED WALLS**

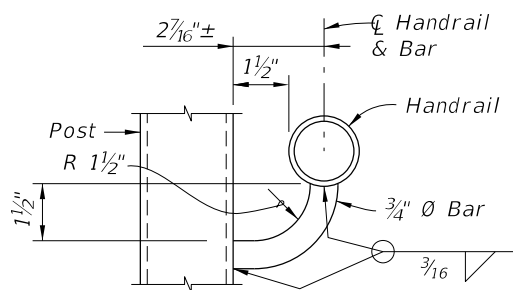
**RAILINGS ON STEPS & STAIRS**

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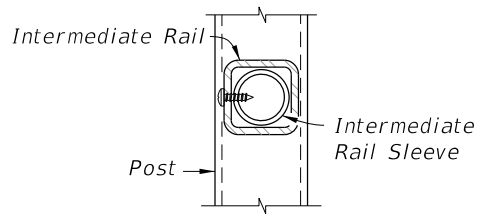
LAST REVISION 11/01/16	DESCRIPTION:	 FY 2024-25 STANDARD PLANS	PEDESTRIAN/BICYCLE RAILING (STEEL)	INDEX 515-052	SHEET 3 of 8
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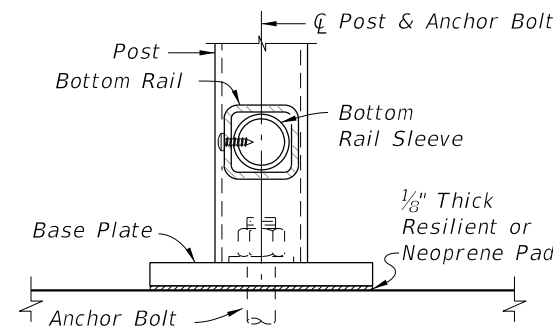
**SECTION A-A**  
(Top Rail Connection)



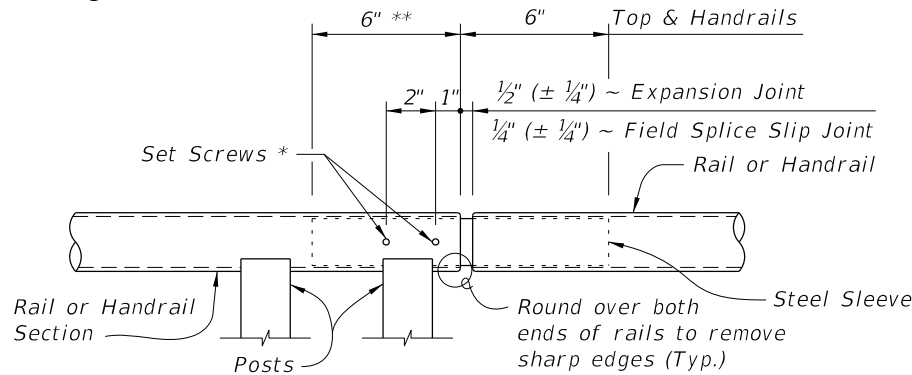
**SECTION B-B**  
(Handrail Connection)



**SECTION C-C**  
(Intermediate Rail Connection)

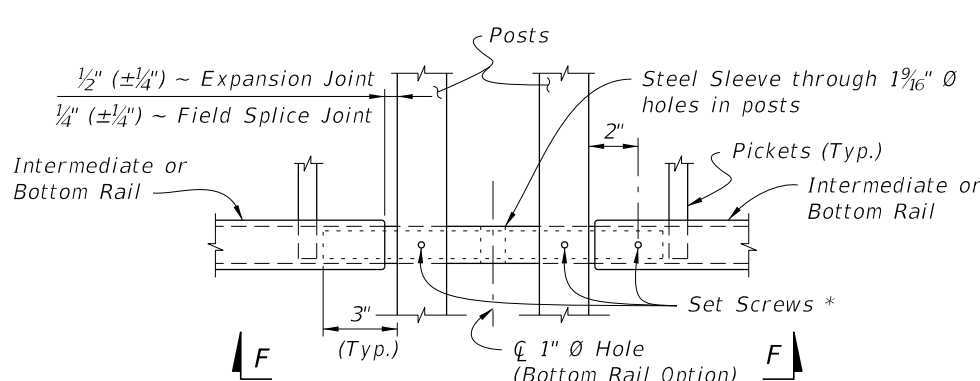


**SECTION D-D**  
(Bottom Rail Connection -  
Single Anchor Bolt Shown)

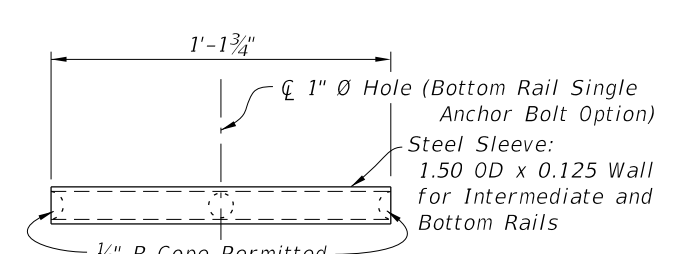


**ROUND RAILS - TOP RAIL OR HANDRAIL**  
(Top Rail at Expansion Joint Shown)

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

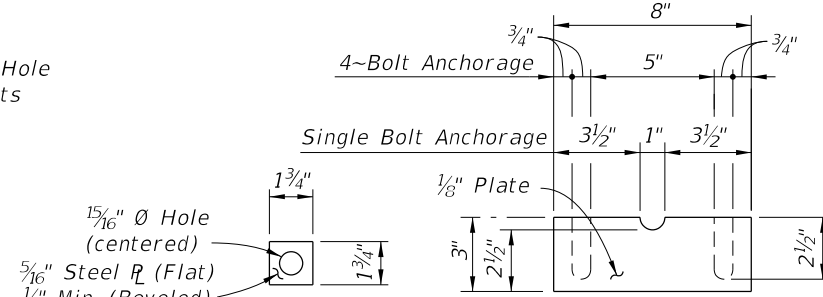


**SQUARE RAILS - INTERMEDIATE OR BOTTOM RAIL**  
(Bottom Rail at Expansion Joint Shown)

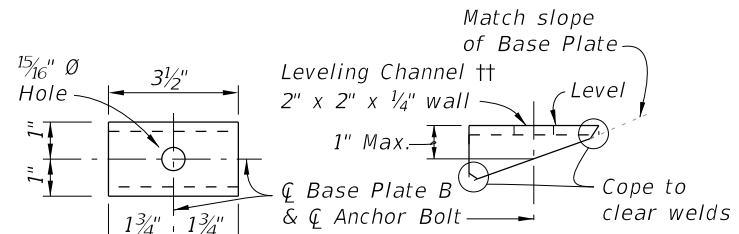


**VIEW F-F**  
**INTERMEDIATE OR BOTTOM RAIL -**  
**STEEL SLEEVE DETAIL (Bottom Side Shown)**

**CROSS REFERENCE:**  
For location of Details "B", See Sheet 2.



**PLATE WASHER DETAIL**

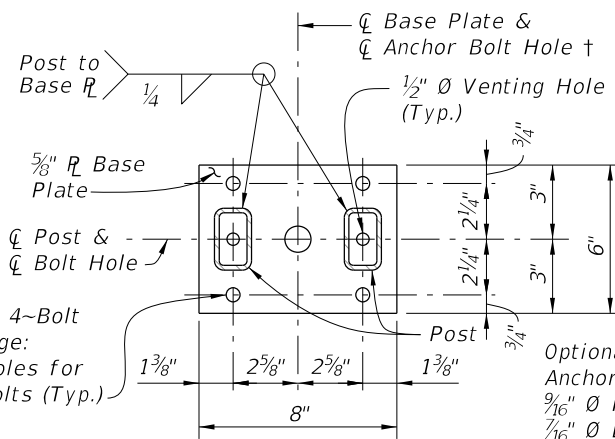


**SHIM PLATE DETAIL**

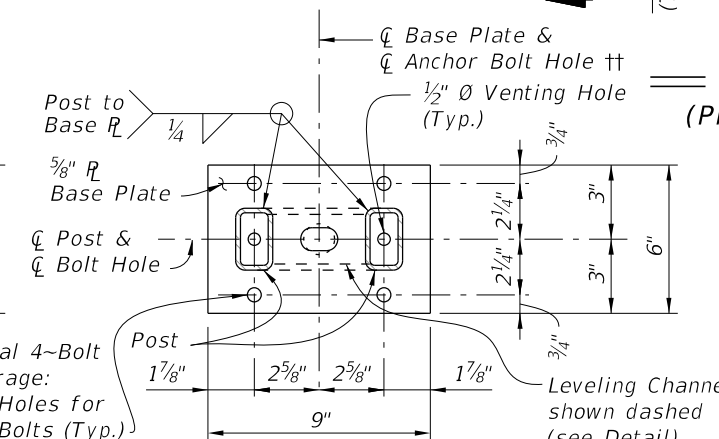


**TOP VIEW**      **SIDE VIEW**

**LEVELING CHANNEL DETAIL**

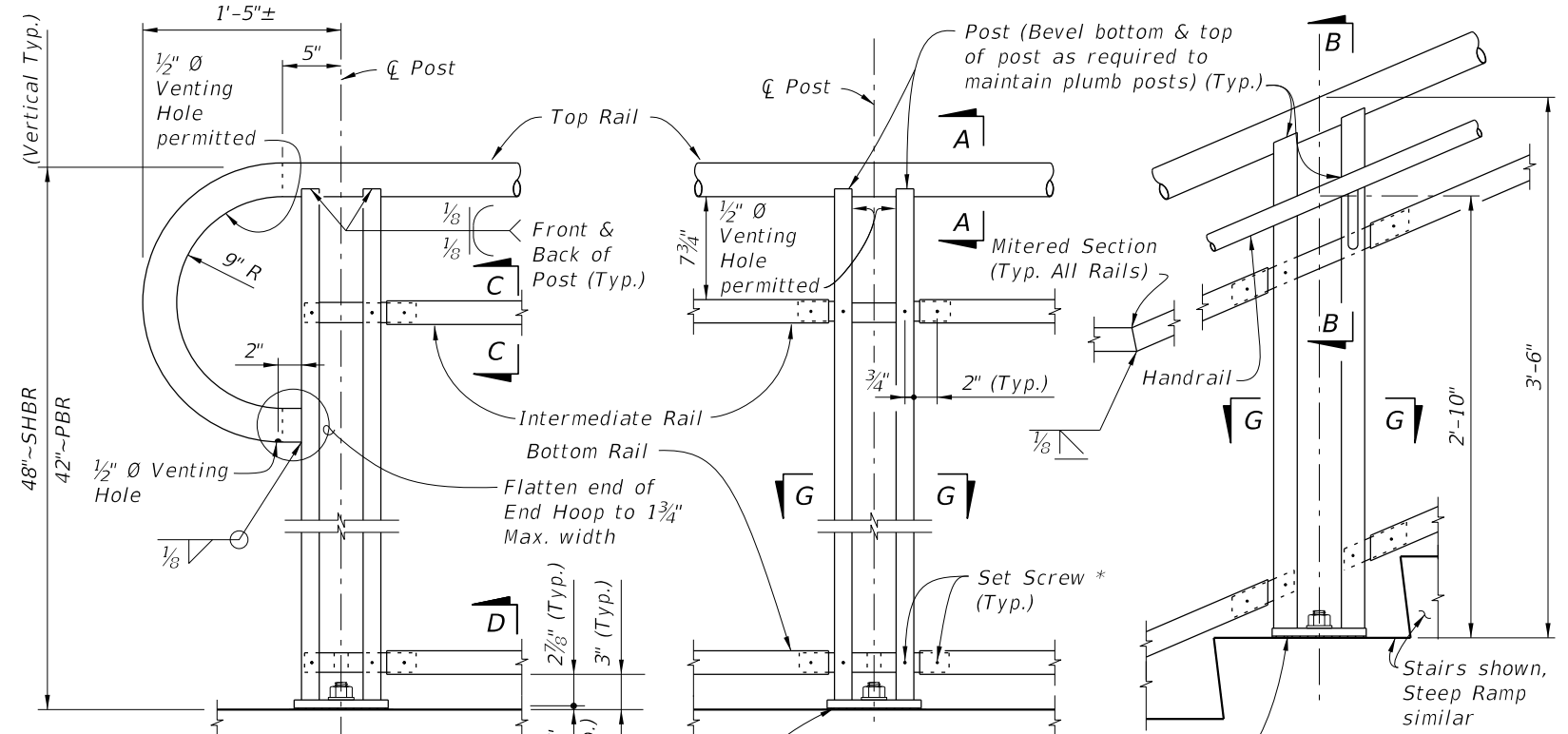


**BASE PLATE A**



**BASE PLATE B**

**SECTION G-G - BASE PLATE DETAILS**

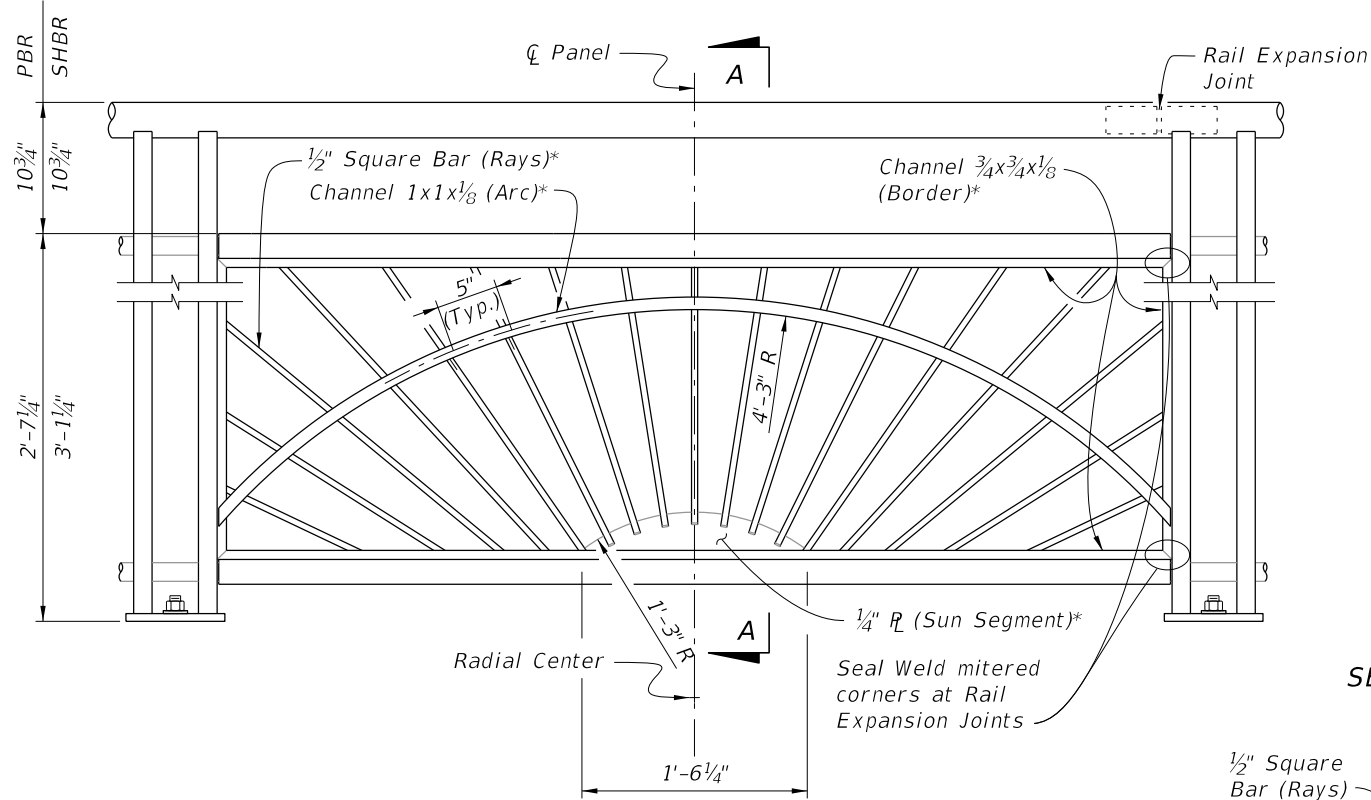


**DETAIL "A" - RAIL CONNECTIONS**  
(Pickets/Panels and 4-Bolt Anchorage  
Not Shown for Clarity)

**NOTES:**  
† Base Plate A (Ramps - Bolts normal) use 1 1/16 inch diameter holes for single anchor bolts with flat washers for slopes ≤ 8.33%.  
‡ Base Plate B (Stairs - Bolts plumb) use 1 1/4 inch diameter holes for single anchor bolts with beveled plate and washers for slopes > 8.33% to ≤ 15%; use 1 5/16 inch x 1 1/2 inch slotted holes with leveling channel for slopes > 15%.  
\* 1/4 inch x 3/4 inch Pan Head Stainless Steel (Type 316 or 18-8 Alloy) Set Screws. Screws must be set flush against the outside face of rails & posts and underside of handrails. 1/2 inch diameter plug welds may be substituted for the set screws. Do not provide set screws for rails at free end of expansion joints.  
\*\* Embedded length may be 4 inches for plug welded connection.

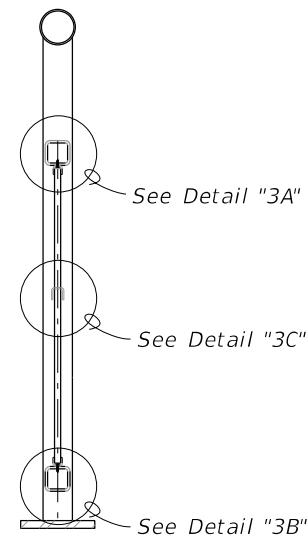
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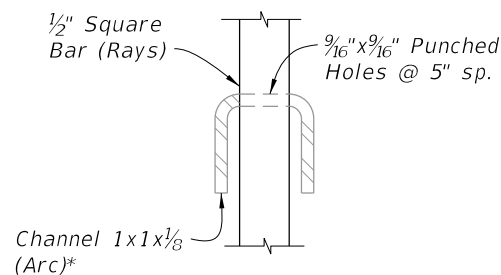


**TYPE 3 - SUNSHINE INFILL PANEL**

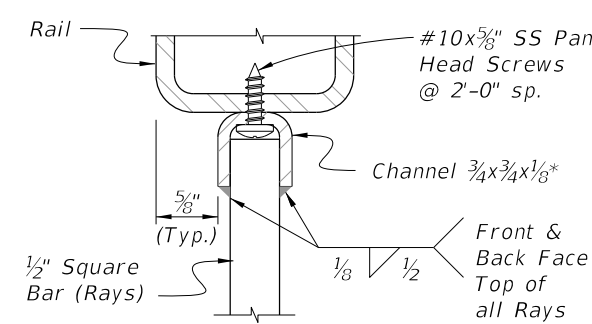
\* Arc, Rays and Sun Segment may be formed in a single panel from  $\frac{1}{2}$ " steel plate pattern cut with laser or plasma CNC, welded to a  $1 \times 1 \times \frac{1}{8}$ " Angle Border or the  $\frac{3}{4} \times \frac{3}{4} \times \frac{1}{8}$ " Channel Border shown.



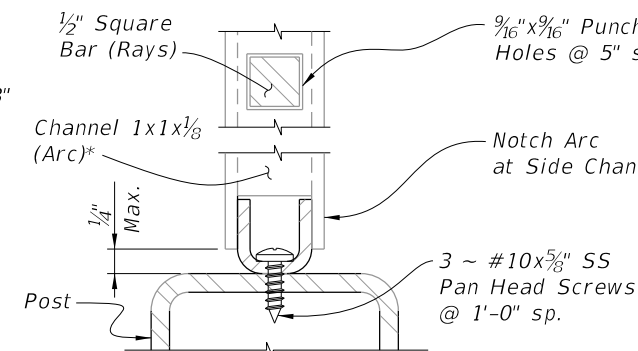
**SECTION A-A**



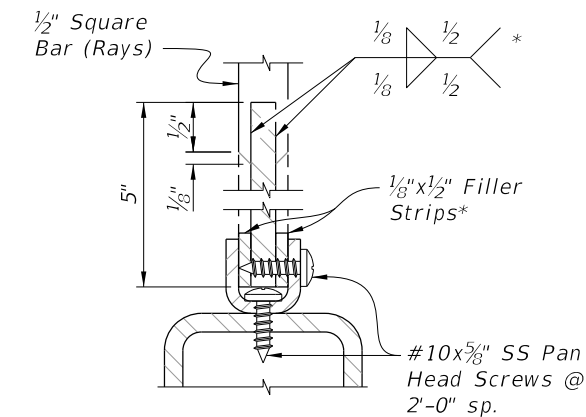
**DETAIL "3C" RAY/ARC CONNECTION**



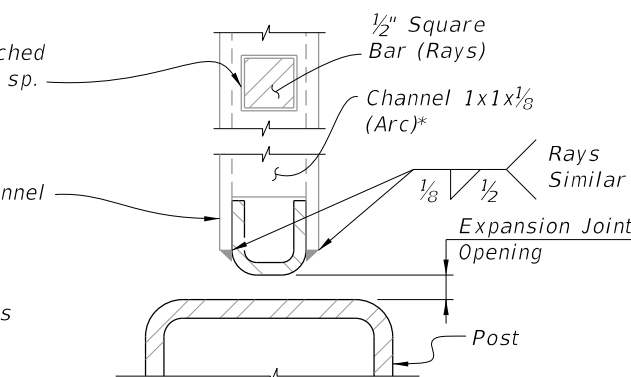
**DETAIL "3A" INTERMEDIATE RAIL/RAY CONNECTION**



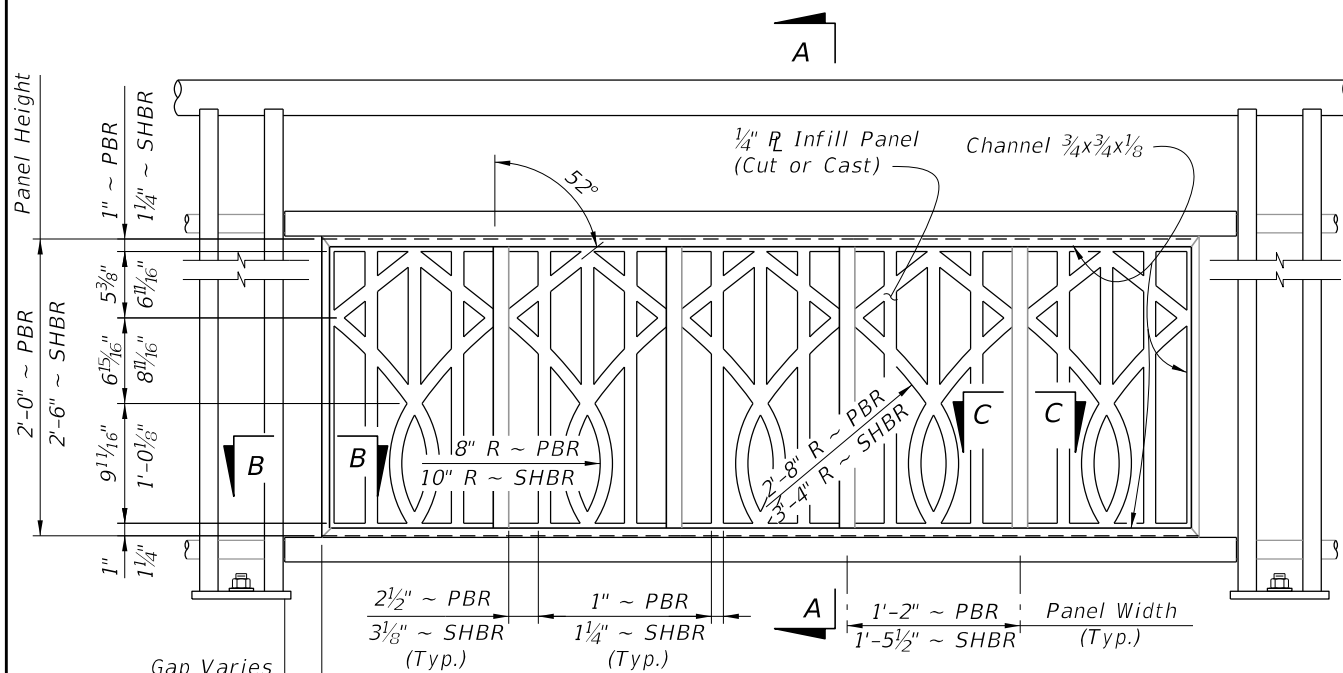
**DETAIL "3D" ARC/POST CONNECTION (Continuous Top Rail)**



**DETAIL "3B" BOTTOM RAIL/RAY CONNECTION**

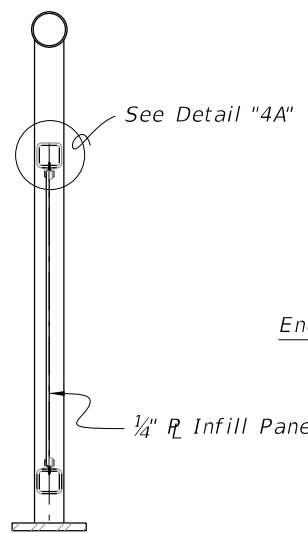


**DETAIL "3E" PANEL END CONNECTION AT POST WITH EXPANSION JOINT**

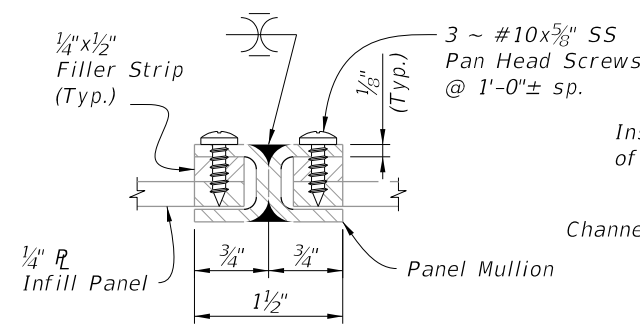


**TYPE 4 - BROADWAY INFILL PANEL**

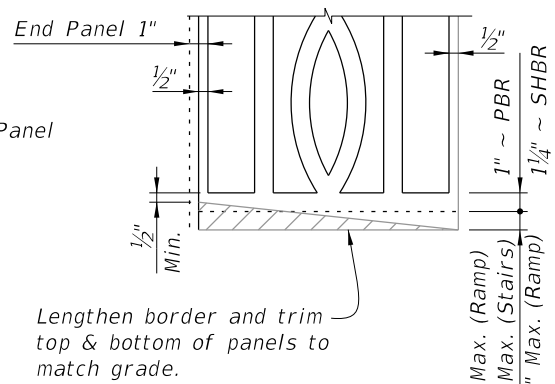
NOTE:  
See Plans for Infill Panel Option required.



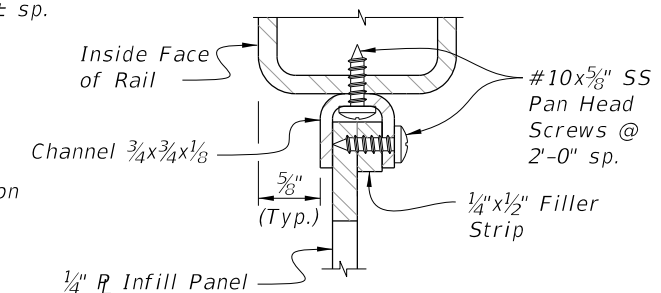
**SECTION A-A**



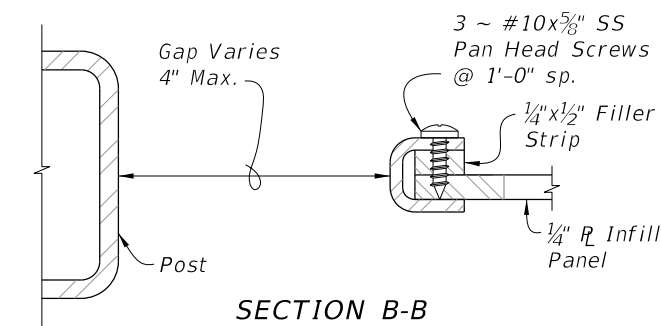
**SECTION C-C PANEL/SPLICE CONNECTION**



**PANEL ADJUSTMENT FOR RAILINGS ON GRADES**



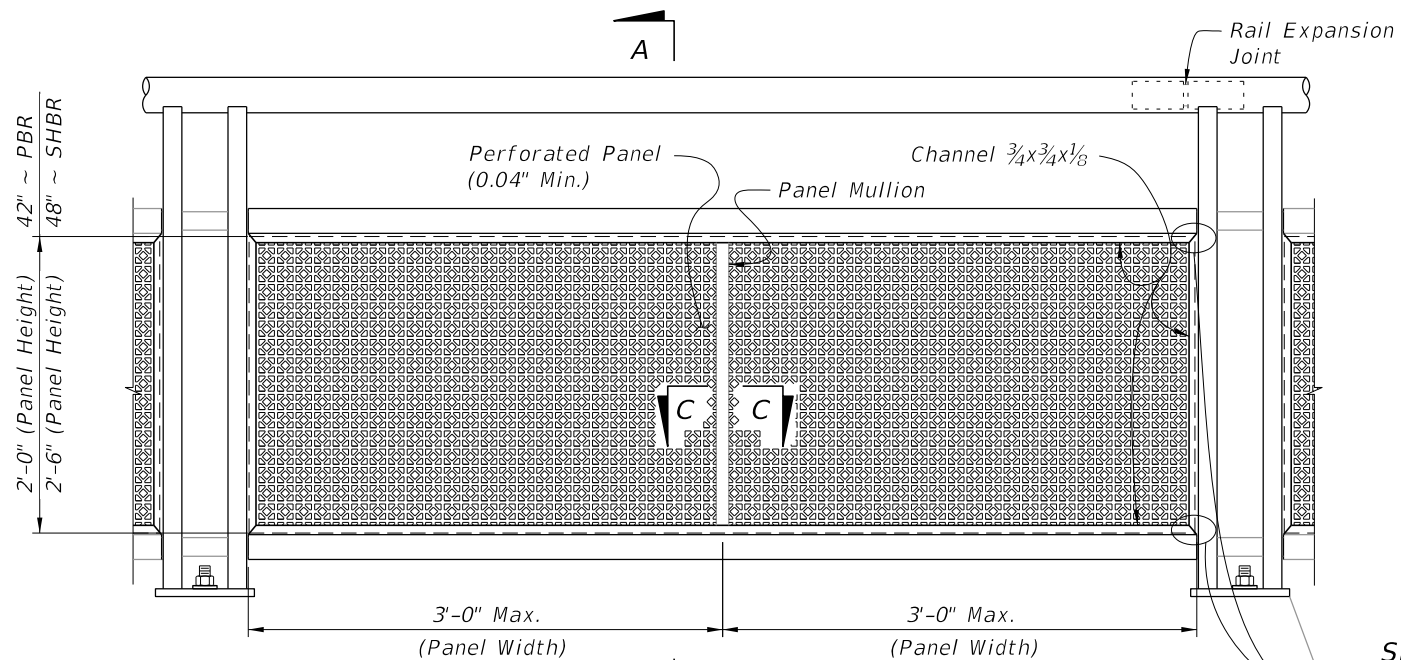
**DETAIL "4A" PANEL/RAIL CONNECTION (Top Shown, Bottom Similar)**



**SECTION B-B PANEL END CAP**

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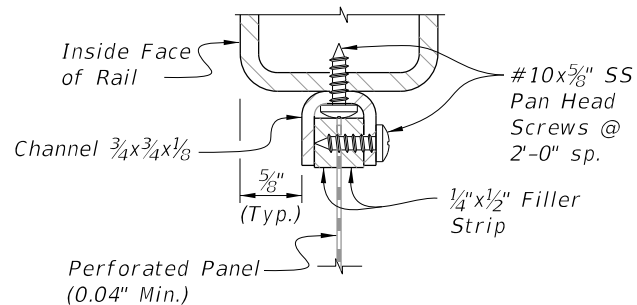
LAST REVISION 11/01/16	DESCRIPTION:		FY 2024-25 STANDARD PLANS	PEDESTRIAN/BICYCLE RAILING (STEEL)	INDEX	SHEET
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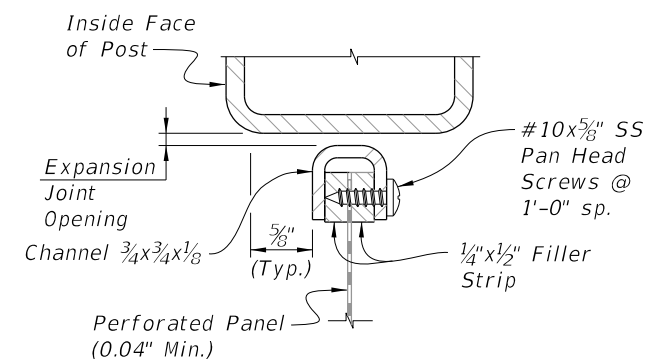
TYPE 5 - PERFORATED INFILL PANEL

SECTION A-A

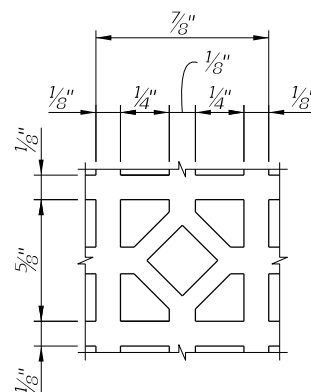
Seal welding mitered corners is permitted



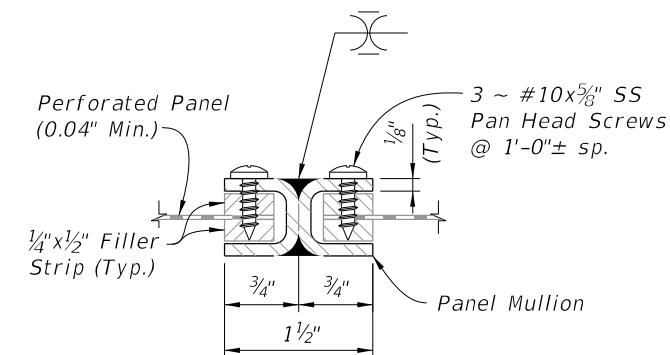
DETAIL "5A"  
PANEL/RAIL CONNECTION  
(Top Shown, Bottom Similar)



DETAIL "5B"  
PANEL END CONNECTION  
(Expansion Joint Shown, Sides Similar)



REPEATING PATTERN DETAIL  
FOR PERFORATED PANEL




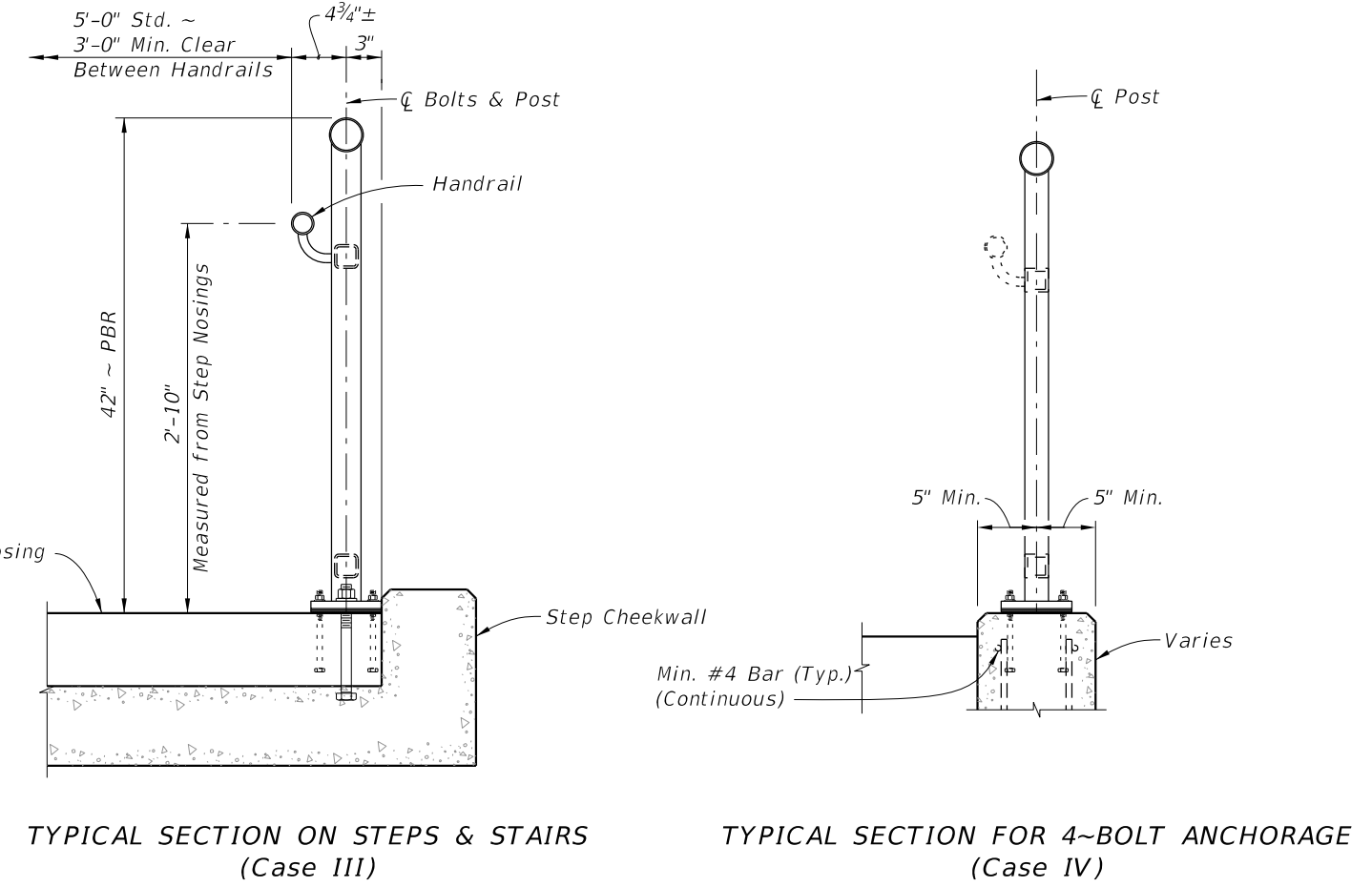
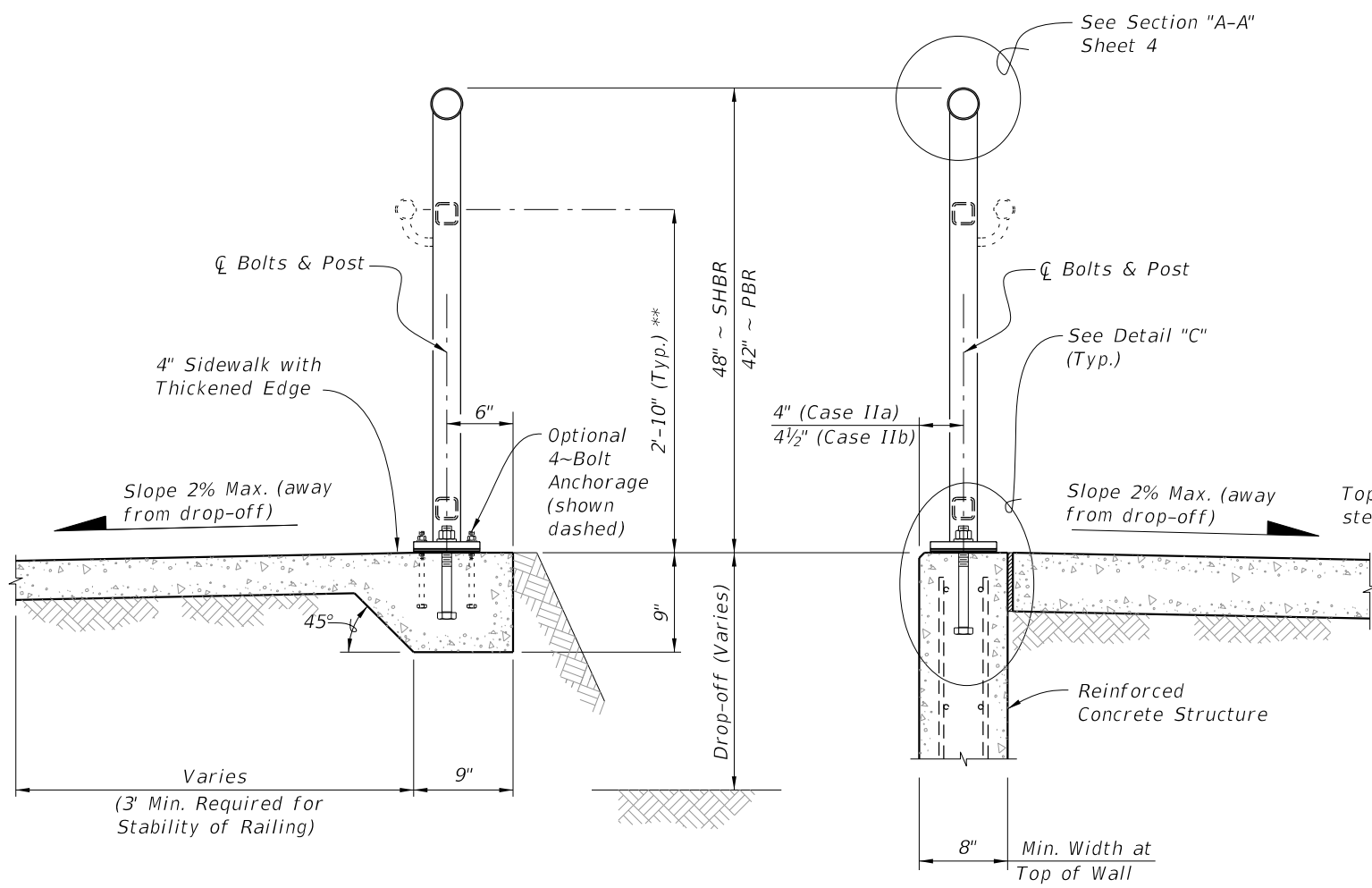
SECTION C-C  
PANEL/SPLICE CONNECTION

NOTES:

1. See Plans for Infill Panel Type required.

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LAST REVISION 11/01/16	REVISION	DESCRIPTION:		FY 2024-25 STANDARD PLANS	PEDESTRIAN/BICYCLE RAILING (STEEL)	INDEX 515-052	SHEET 7 of 8
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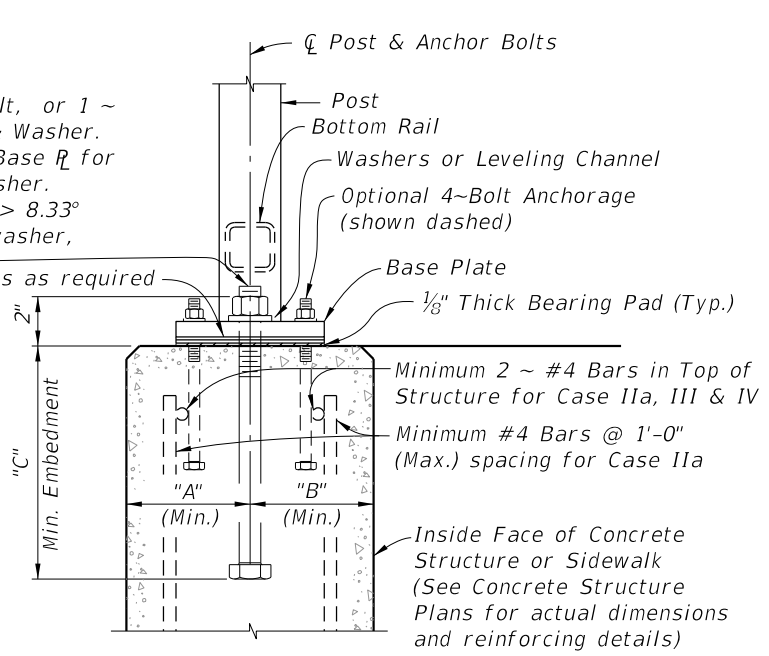
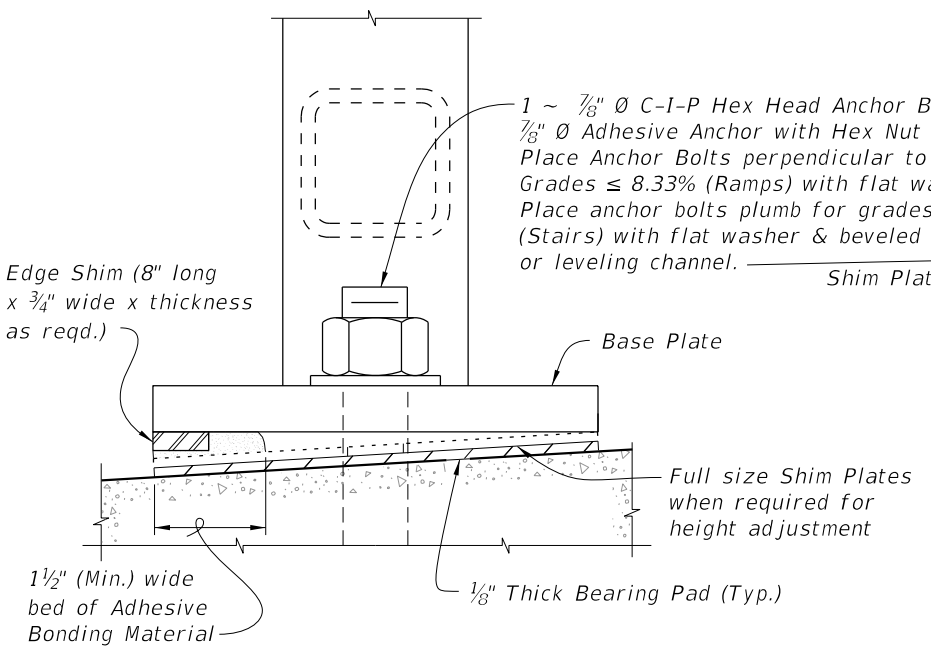


TYPICAL SECTION ON CONCRETE SIDEWALK (Case I)

TYPICAL SECTION ON RETAINING WALL (Case II)

TYPICAL SECTION ON STEPS & STAIRS (Case III)

TYPICAL SECTION FOR 4-BOLT ANCHORAGE (Case IV)



CASE	STRUCTURE TYPE	DIMENSIONS			ANCHOR LENGTH		ANCHOR SIZE
		A	B	C	C-I-P Hex Head Bolt	Adhesive Anchor	
		Edge Dist.	Edge Dist.	Embedment			
I	Unreinforced Concrete	6"	1'-2"	6"	7 1/2"	8"	7/8" Ø
IIa	Reinforced Concrete	4"	4"	9"	10 1/2"	11"	7/8" Ø
IIb	Gravity Wall Index 400-011	4 1/2"	3 1/2" @ top	9"	10 1/2"	11"	7/8" Ø
III	Step Cheekwall	4 1/2"	4 1/2"	9"	10 1/2"	11"	7/8" Ø
IV	Varies	5"	5"	5"	6 1/2"	7"	7/16" Ø

\*\* When required; measured from top of sidewalk.

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