

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"	HSS2½x1½x⅛	2.50" x 1.50"	0.125"
Post "B"	HSS2½x1½x⅜	2.50" x 1.50"	0.188"
Top Rail	2½" NPS (Sch. 10)	2.875"	0.120"
	HSS3.000x0.120	3.000"	0.120"
End Hoops	2½" NPS (Sch. 10)	2.875"	0.120"
	HSS3.000x0.120	3.000"	0.120"
Top Rail Joint/Splice Sleeves	HSS2.500x0.125	2.500"	0.125"
Intermediate & Bottom Rail	HSS2x2x⅜	2.00" x 2.00"	0.188" (1)
Int. & Bottom Rail Post Connection Sleeve	HSS1.500x0.125	1.500"	0.125" (1)
Handrail Joint/Splice Sleeves	1" NPS (Sch. 40)	1.315"	0.133"
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).

DESIGN LOADS, GEOMETRY AND APPLICABILITY:

See the Instructions for Design Standards for the design loads, geometry and applicability requirements.

GENERAL:

Adequate foundation support shall be provided for anchorage and stability against overturning (See Sheet 8). See Index No. 851 for special requirements and modifications for use on bridges. The railing shown on these drawings requires a handrail for ramps steeper than a 5% grade to conform with the requirements of the Americans with Disabilities Act (ADA).

RAILS, PANELS AND POSTS:

Pipe Rails and Pickets shall be in accordance with ASTM A500 Grade B, C or D, or ASTM A53 Grade B for standard weight pipe (Schedule 40) or ASTM A36 for bars. Structural Tube shall be in accordance with ASTM A500 Grade A, B, C or D, or ASTM A501. Perforated panels (Type 5), U-Channels and filler plates shall be ASTM A36 or A1011 (Grade 36). Posts and End Rails shall be fabricated and installed plumb, ± 1" tolerance when measured at 3'-6" above the foundation. Pickets and vertical panel elements shall be fabricated parallel to the posts, except that Type 2, 3 & 5 panel infills may be fabricated parallel to the longitudinal grade. Corners and changes in tangential longitudinal alignment shall be made continuous with a 9" bend radius or terminate at adjoining sections with mitered end sections 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.

BASE PLATES AND RAIL CAPS:

Base Plates and Rail Cap Plates shall be in accordance with ASTM A36 or ASTM A709 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 ¼" between 3 posts and localized irregularities greater than ⅛" beneath base plates. Field trim shim plates when necessary to match the contours of the foundation. Beveled 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 F1554 (Grade 36 for ⅞" Ø and Grade 55 for ⅞" Ø 4-Bolt Anchorage.) Headless anchor bolts for Adhesive. Anchors shall be threaded full length. Cutting of reinforcing steel is permitted for drilled hole installation. Expansion Anchors are not permitted. All anchor bolts shall have single self-locking hex 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 A563 or ASTM A194. Flat Washers shall be in accordance with ASTM F436 and Plate Washers (for long slotted holes only), shall be in accordance with ASTM A36 or ASTM A709 Grade 36. After the nuts have been snug tightened, distort the anchor bolt threads to prevent removal of the nuts. Distorted threads and tack welds shall be coated 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 of the finished pads shall not be required. Neoprene pads shall be durometer hardness 60 to 80.

JOINTS:

Grind welded joints as necessary to remove burs and weld splatter, additionally remove any sharp edges on rails to prevent injury. Grind all plug welds smooth. Expansion joints shall be spaced at a maximum 40'-0". Field splices similar to the expansion joint detail may be approved by the Engineer to facilitate handling, but top rail must be continuous across a minimum of two posts. For intermediate and bottom horizontal rails the screwed joints shown on Sheet 4 may be substituted with alternate joints shown on Sheet 3 Detail "K".

WELDING:

All welding shall be in accordance with the American Welding Society Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal shall be E60XX or E70XX. Nondestructive testing of welds is not required.

COATINGS:

The steel 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 Specification Section 962.


SHOP DRAWINGS:

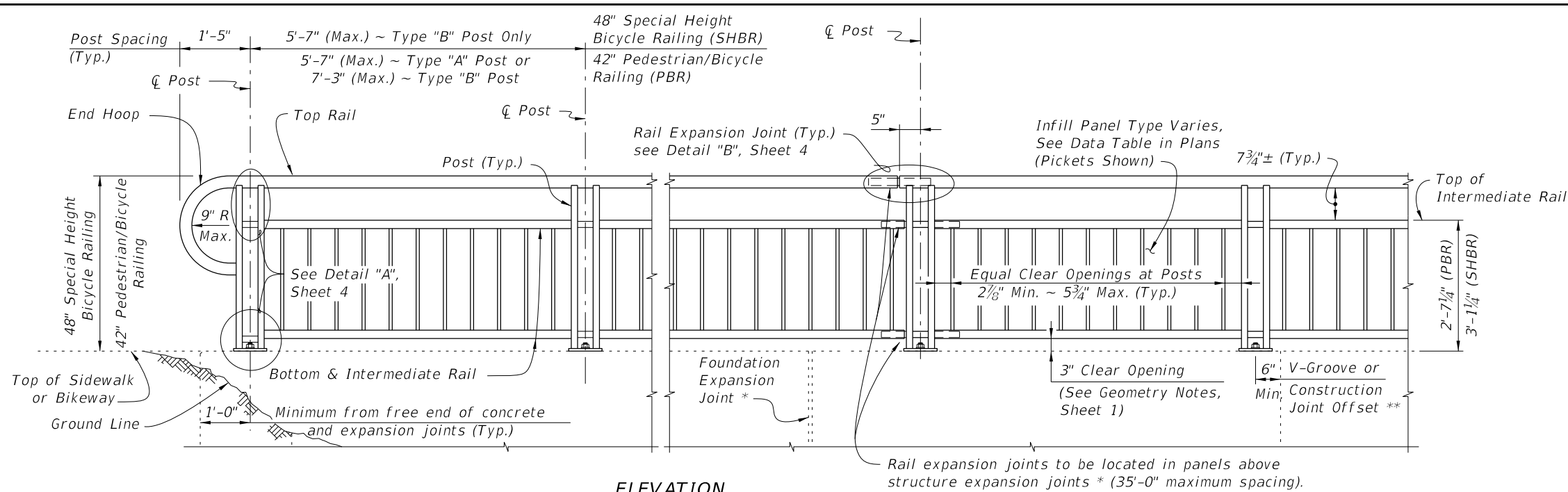
Details addressing project specific geometry (line & grade) showing post and expansion joint locations, post and panel type, anchor bolt installation "Case" or lengths, must be submitted by the Contractor for the Engineer's approval prior to fabrication of the railing. Shop drawings shall be in accordance with the Specifications.

PAYMENT:

Railing shall be paid for per linear foot (Item No. 515-2-abb). Payment will be plan quantity measured as the length along the center line of the top rail, and includes rails, posts, pickets, panels, 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 railing.

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LAST REVISION 07/01/15	REVISION	DESCRIPTION:	 2016 DESIGN STANDARDS	STEEL PEDESTRIAN/BICYCLE RAILING	INDEX NO. 852	SHEET NO. 1 of 8
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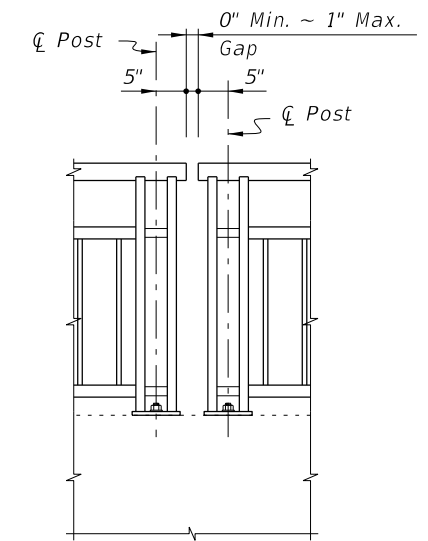


ELEVATION

(Showing Outside Face of Railing with Type "A" Posts)

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

(Type 1 - Picket Railing Shown, Other Types Similar)



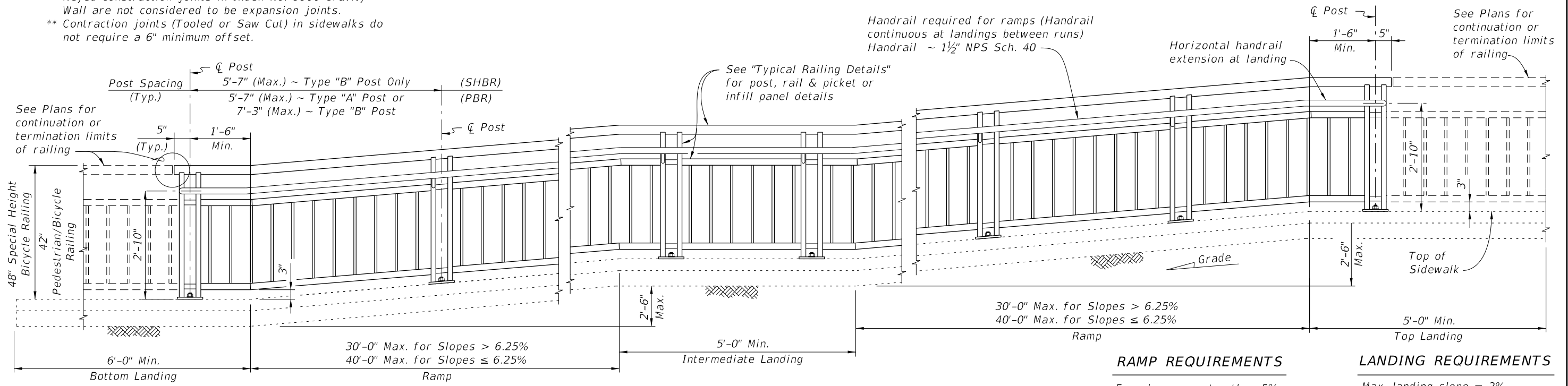
Note: Non-continuous corners are permitted when handrails are not required.

EXPANDED ELEVATION AT CORNERS

DETAIL FOR NON-CONTINUOUS RAILING AT CORNERS

NOTES:

- * Keyed construction joints in Index No. 6011 Gravity Wall are not considered to be expansion joints.
- ** Contraction joints (Tooled or Saw Cut) in sidewalks do not require a 6" minimum offset.



ELEVATION

(Showing Inside Face of Railing with Type "A" Posts)

RAILINGS ON GRADES STEEPER THAN 5%

(Type 1 - Picket Railing Shown, Other Types Similar)

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%

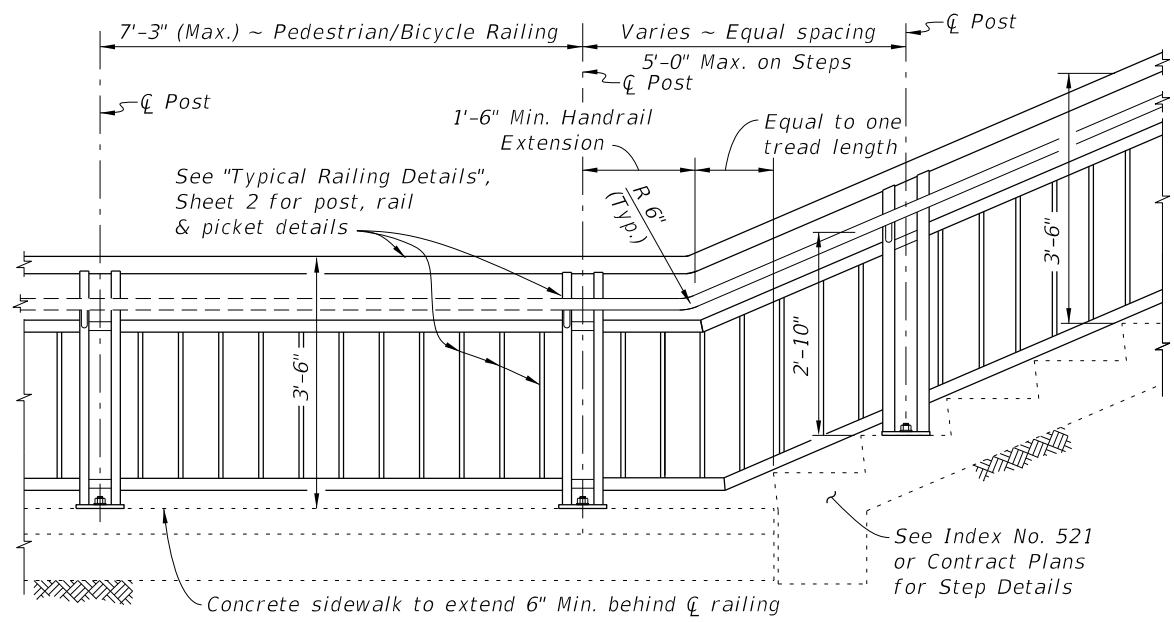
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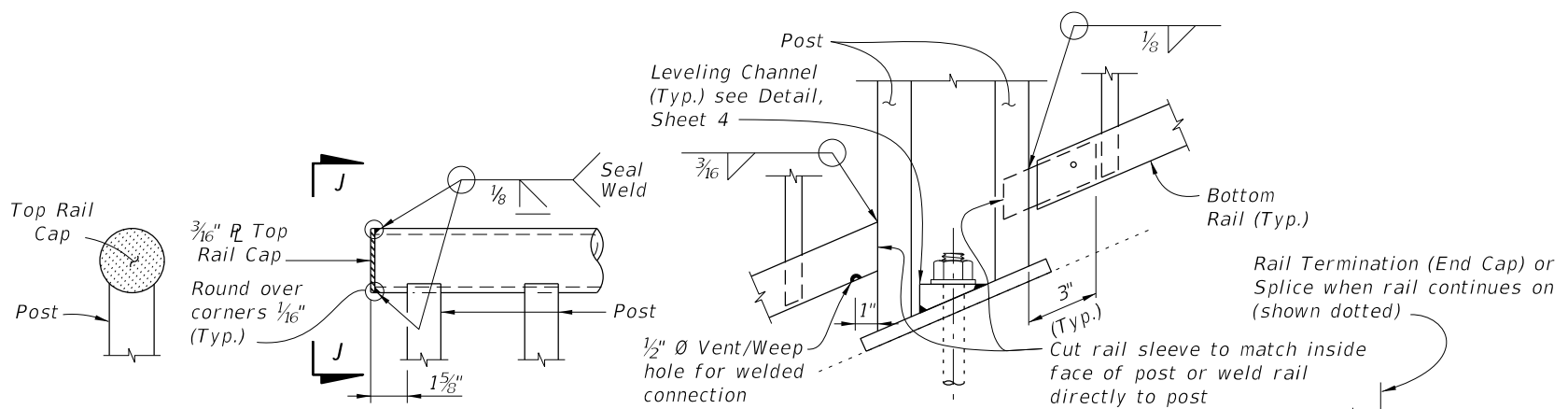


STEEL PEDESTRIAN/BICYCLE RAILING

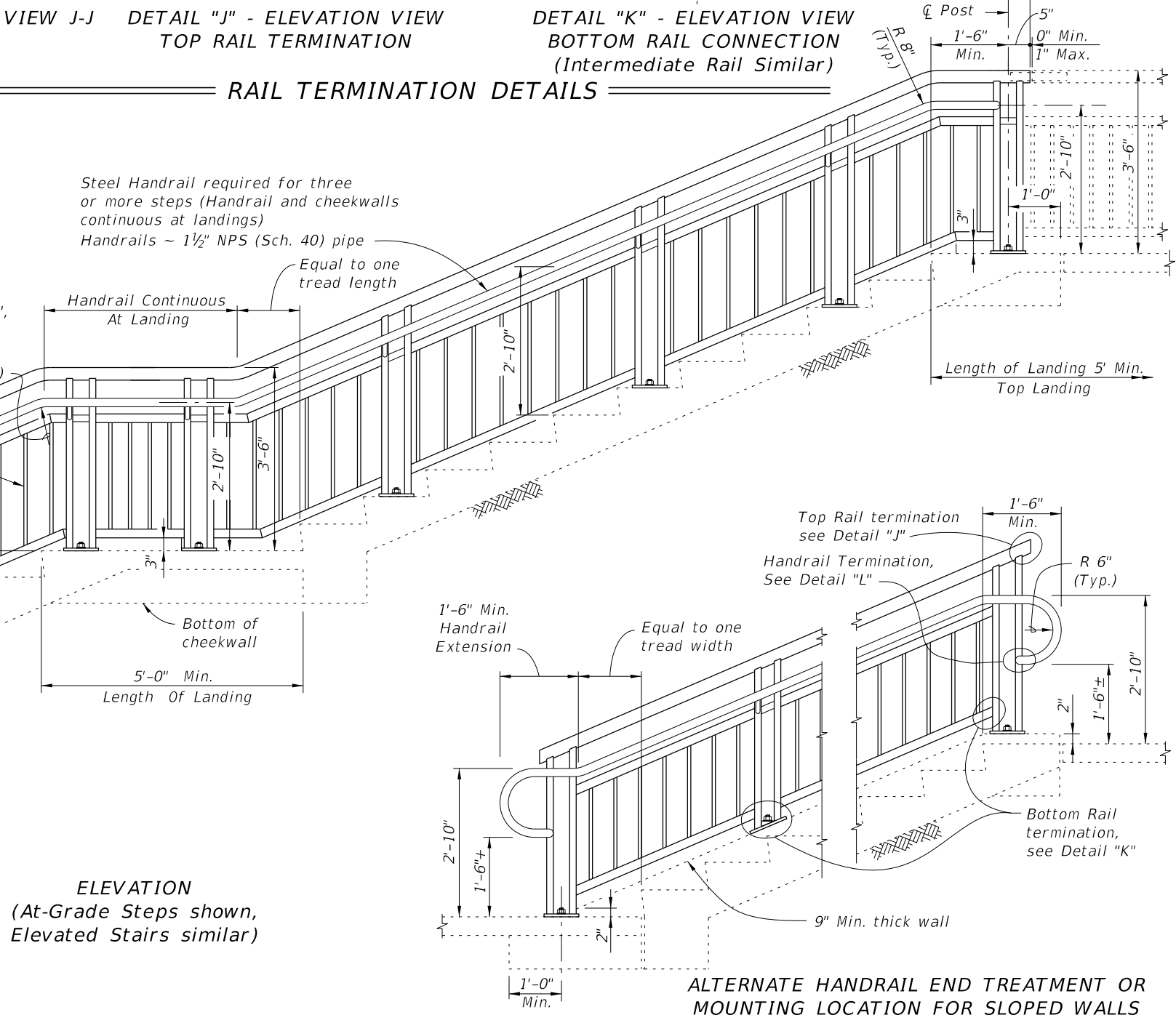
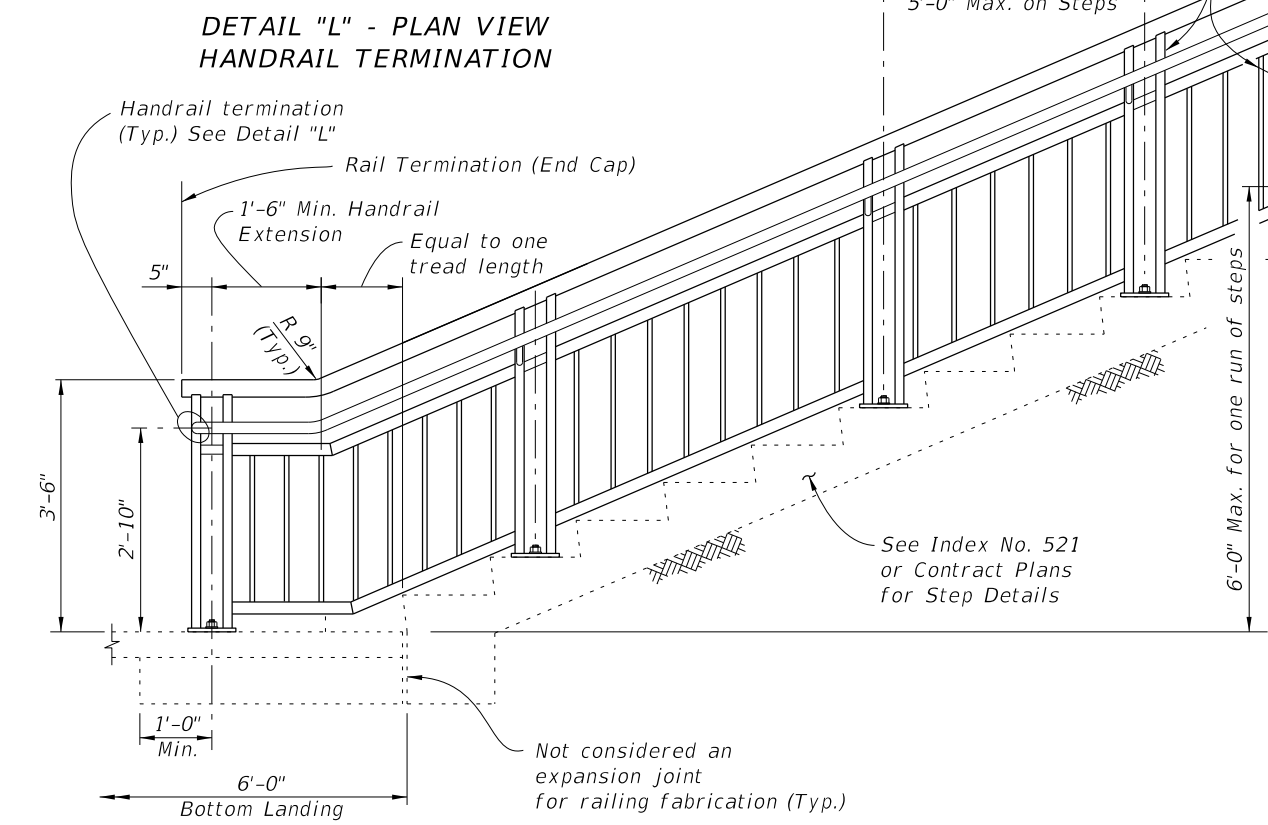
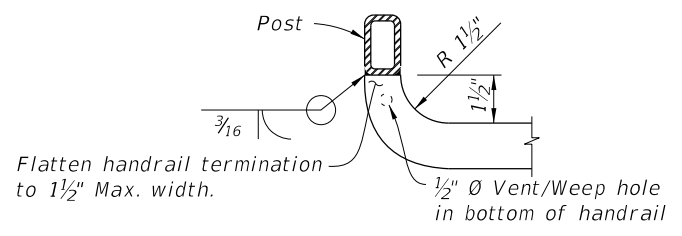
INDEX NO. 852	SHEET NO. 2 of 8
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RAILING CONTINUATION BEYOND STEPS OR STAIRS
(Bottom shown, Top similar)



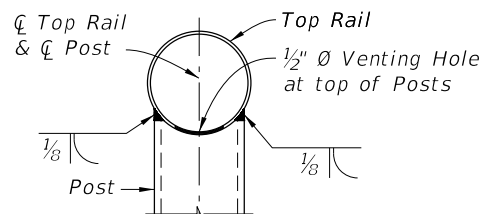
RAIL TERMINATION DETAILS



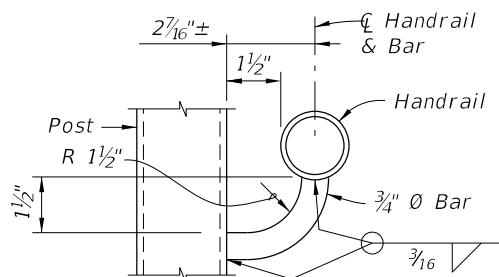
RAILINGS ON STEPS & STAIRS

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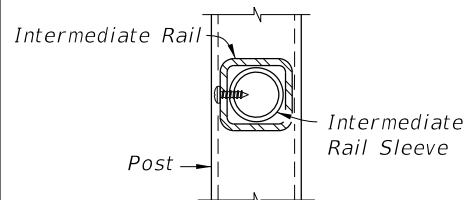
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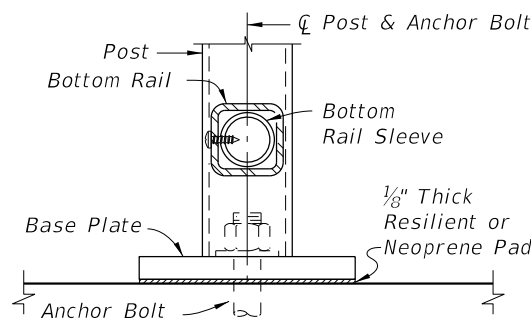
SECTION A-A
(Top Rail Connection)



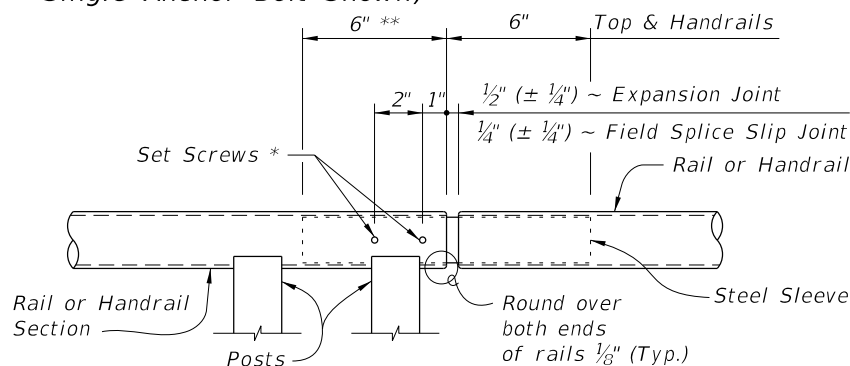
SECTION B-B
(Handrail Connection)



SECTION C-C
(Intermediate Rail Connection)

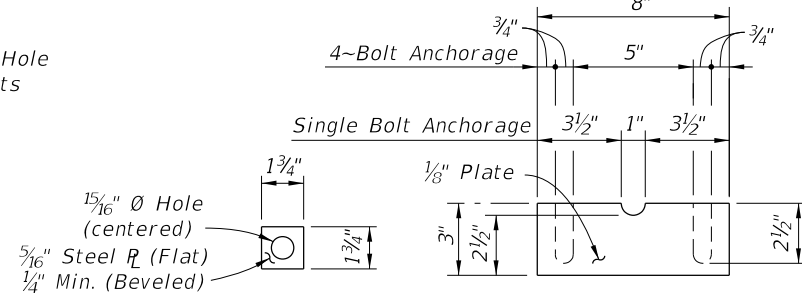


SECTION D-D
(Bottom Rail Connection -
Single Anchor Bolt Shown)



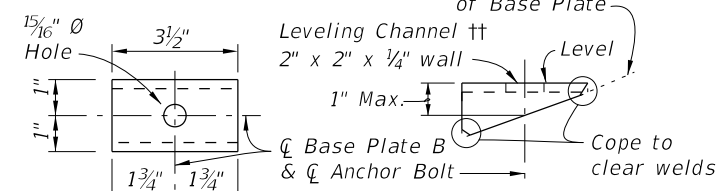
ROUND RAILS - TOP RAIL OR HANDRAIL
(Top Rail at Expansion Joint Shown)

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



SHIM PLATE DETAIL

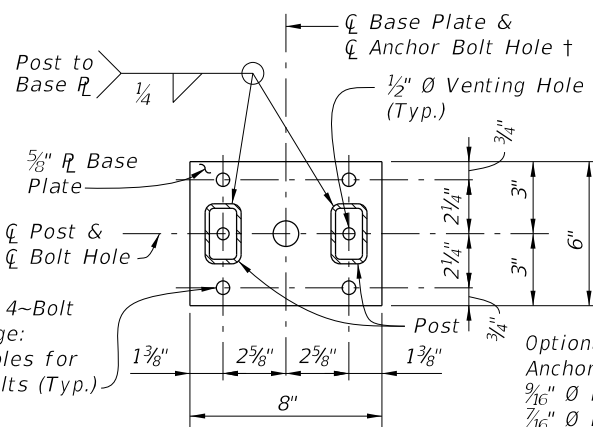
PLATE WASHER DETAIL



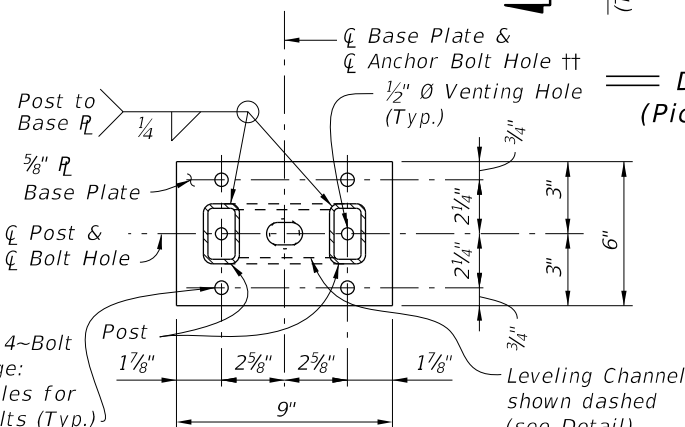
TOP VIEW

SIDE VIEW

LEVELING CHANNEL DETAIL

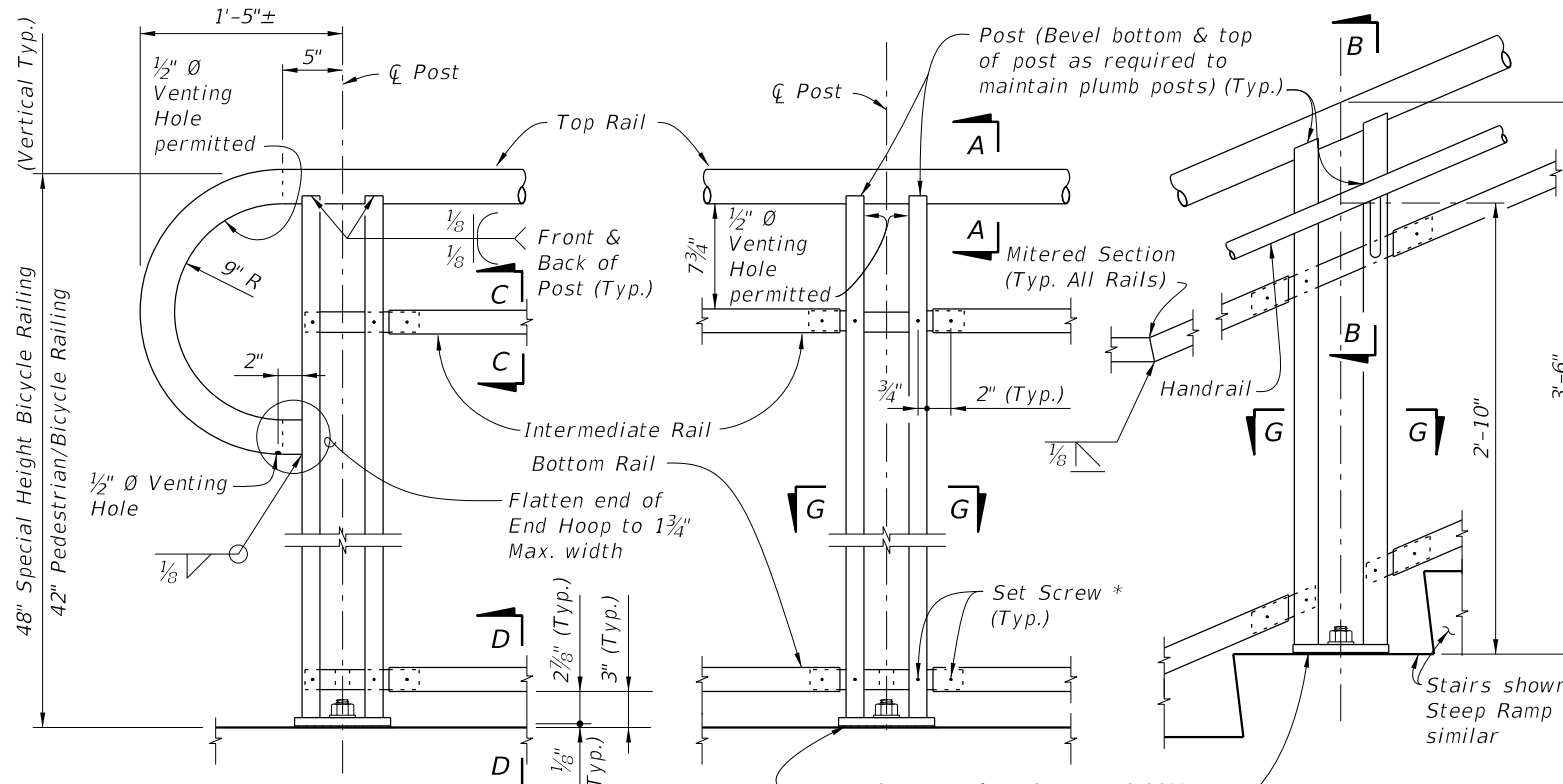


BASE PLATE A



BASE PLATE B

SECTION G-G - BASE PLATE DETAILS



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

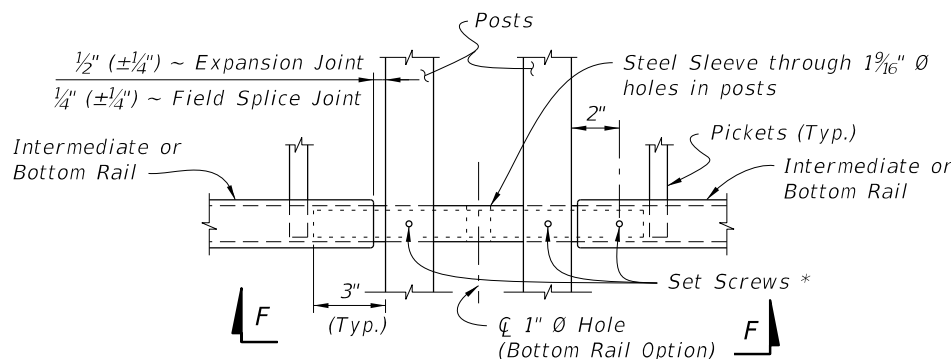
NOTES:

† Base Plate A (Ramps - Bolts normal) use 1 1/16 inch diameter holes for single anchor bolts with flat washers for slopes less than or equal to 8.33%.

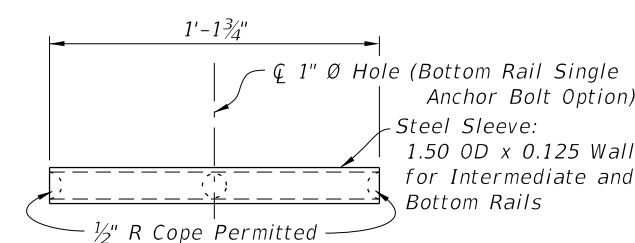
‡ Base Plate B (Stairs - Bolts plumb) use 1 1/4 inch diameter holes for single anchor bolts with beveled plate and washers for slopes greater than 8.33% to less than or equal to 15%; use 1 5/16 inch x 1 1/2 inch slotted holes with leveling channel for slopes greater than 15%.

* 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.



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



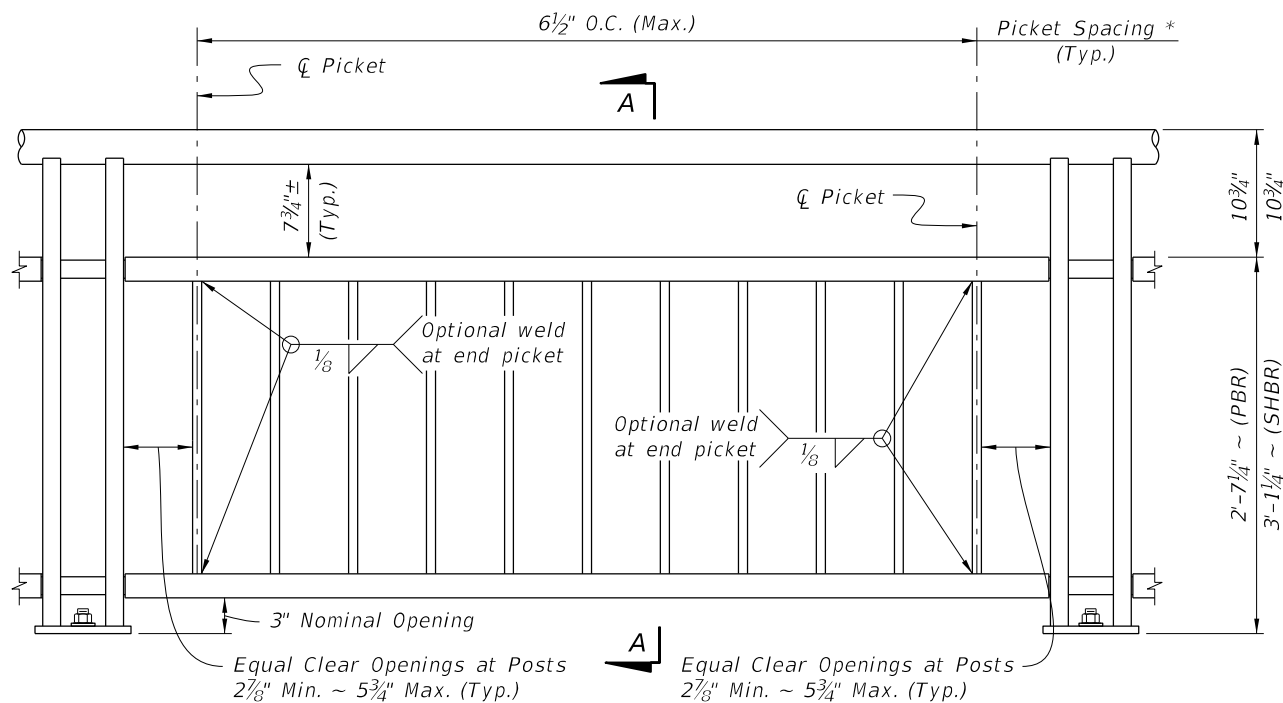
VIEW F-F
INTERMEDIATE OR BOTTOM RAIL -
STEEL SLEEVE DETAIL (Bottom Side Shown)

CROSS REFERENCE:

For location of Details "B", See Sheet 2.

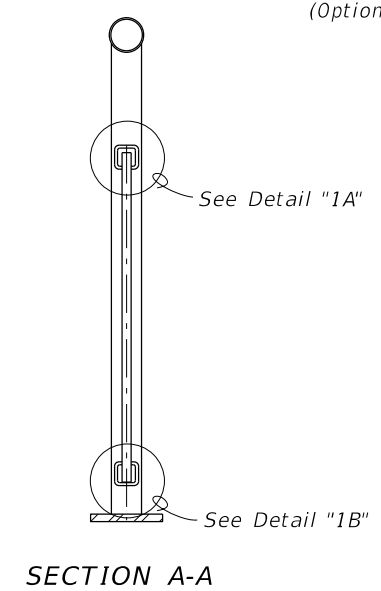
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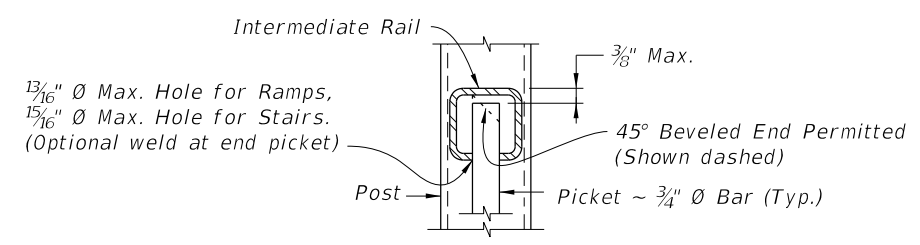


TYPE 1 - PICKET INFILL PANEL

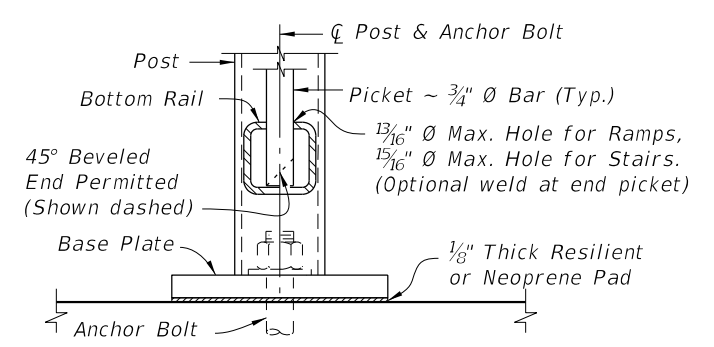
PICKET NOTES:
 * Picket Spacing of 6 1/2" centers is based on a 3/4" Ø Bar for standard applications. When shown in the Contract Plans a 4 1/2" picket spacing may be required. If an alternate design is used, maintain a maximum clear opening of 5 7/8" for standard installations and 3 7/8" for special conditions.



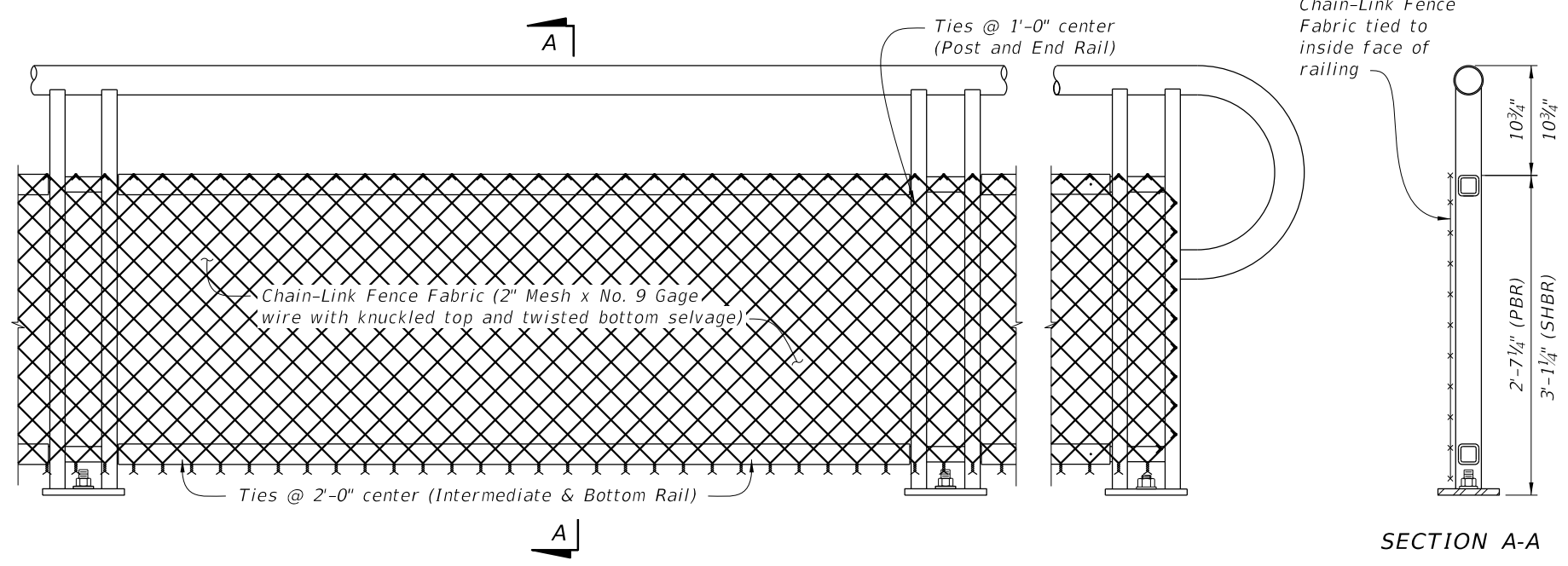
SECTION A-A



DETAIL "1A"
(Top of Picket Connection)

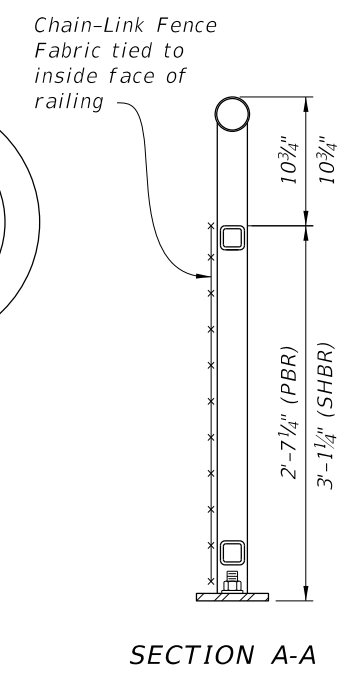


DETAIL "1B"
(Bottom of Picket Connection)



TYPE 2 - CHAIN-LINK (Continuous Infill Panel)

NOTES:
 1. See Plans for Infill Panel option required.

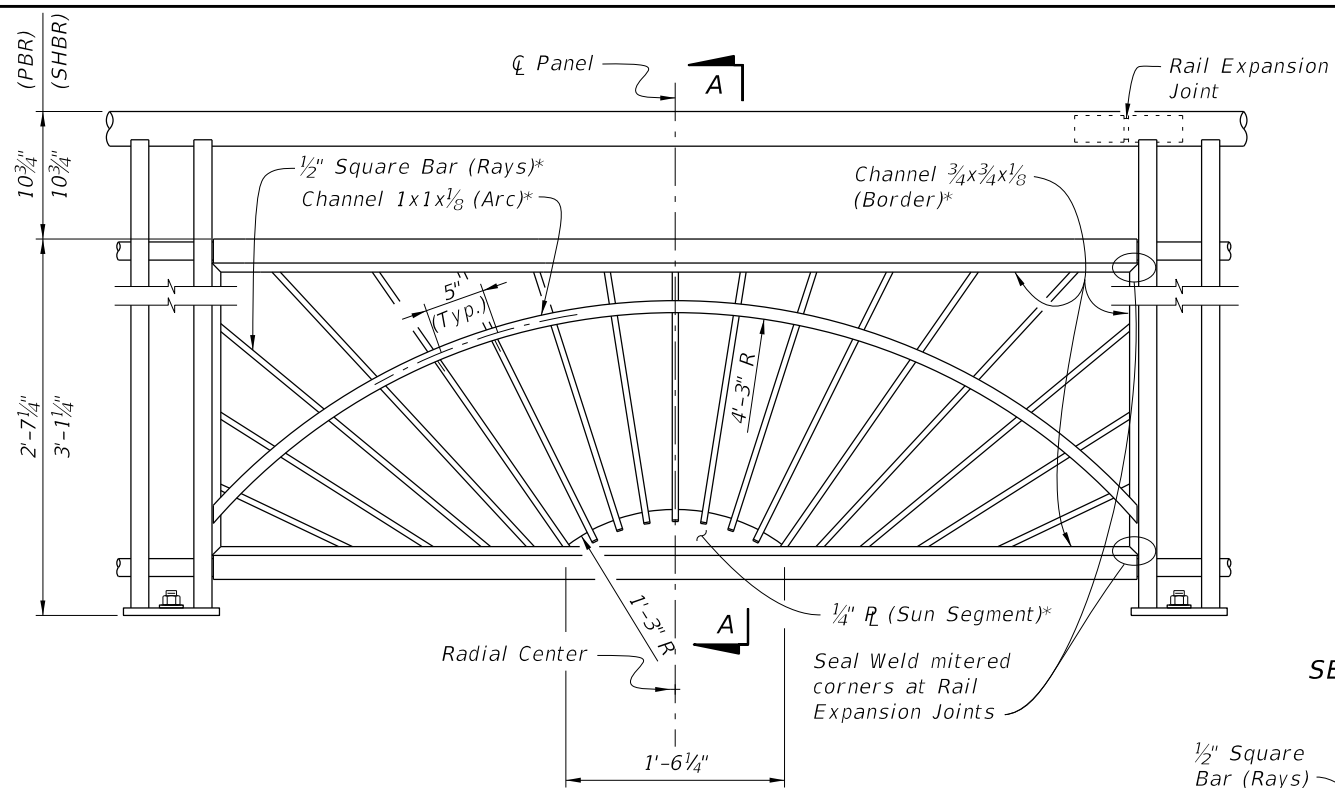


SECTION A-A

TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS		
COMPONENT	ASTM	COMPONENT INFORMATION
Chain-Link Fence Fabric (2" mesh with twisted bottom and knuckled top selvage)	A 392	Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating
	A 491	Aluminum-Coated Steel - No. 9 gage (coated wire diameter)
	F 668	Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter) ~ See Plans for specified color of PVC.
Tie Wires	F 626	Zinc-Coated Steel Wire - No. 9 gage with coating to match Chain-Link Fence Fabric.
Tension Bars	F 626	3/16" (Min. thickness) x 3/4" (Min. width) x 2'-3' (Min. height) Steel Bars
Miscellaneous Fence Components	F 626	Zinc-Coated Steel

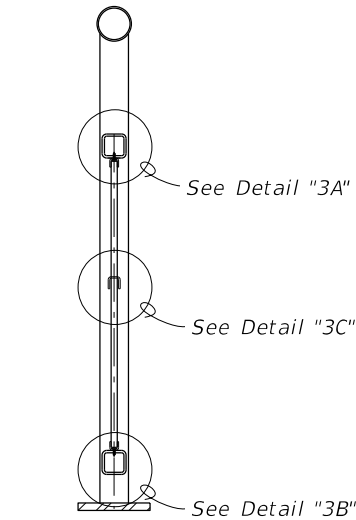
CHAIN-LINK PANEL NOTE:
 Chain-Link Fence Fabric shall be continuous along limits of railing. Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.

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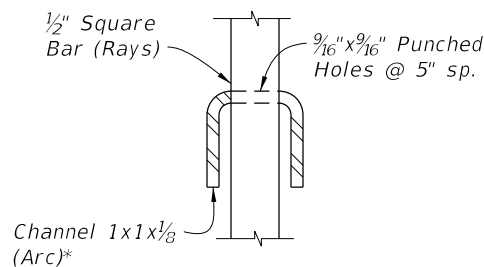


TYPE 3 - SUNSHINE INFILL PANEL

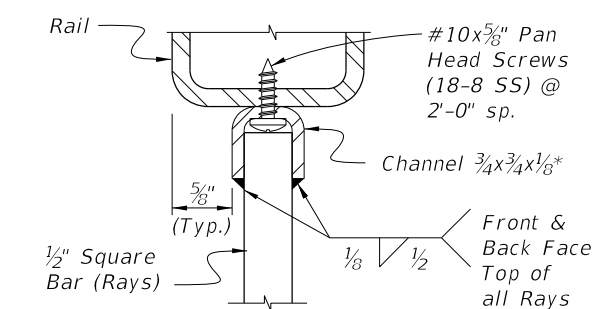
* Arc, Rays and Sun Segment may be formed in a single panel from 1/2" plate (ASTM 36 or A709 - Grade 36) pattern cut with laser or plasma CNC, welded to a 1x1 1/8 Angle Border or the 3/4x3/4x1/8 Channel Border shown.



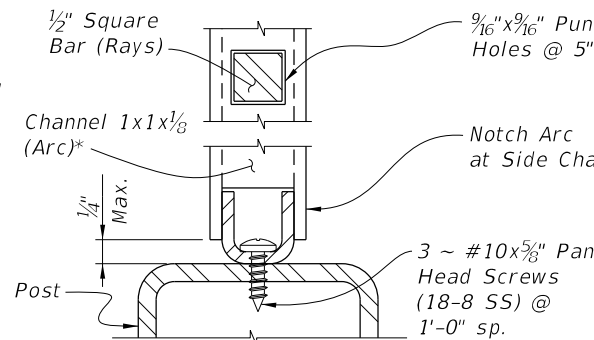
SECTION A-A



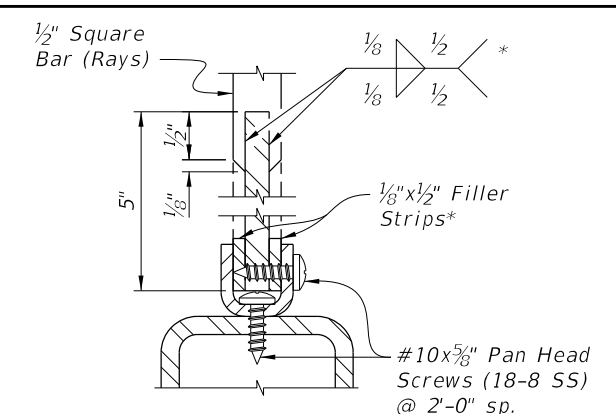
DETAIL "3C" RAY/ARC CONNECTION



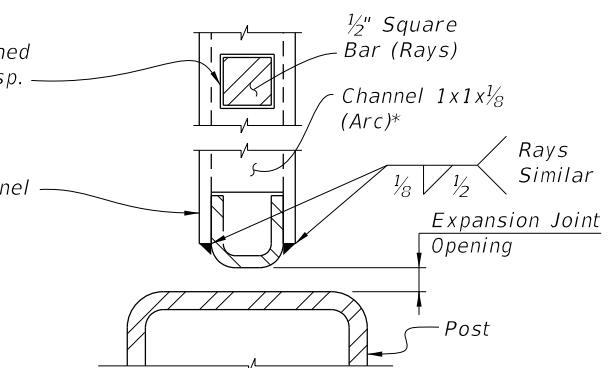
DETAIL "3A" INTERMEDIATE RAIL/RAY CONNECTION



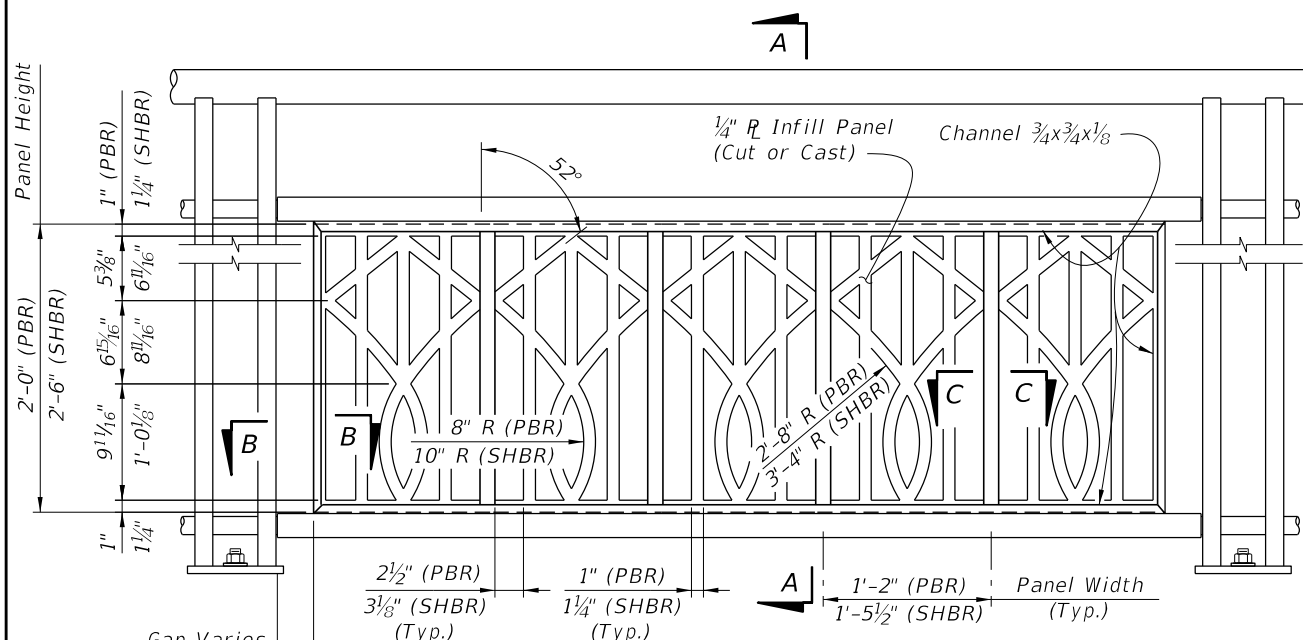
DETAIL "3D" ARC/POST CONNECTION (Continuous Top Rail)



DETAIL "3B" BOTTOM RAIL/RAY CONNECTION



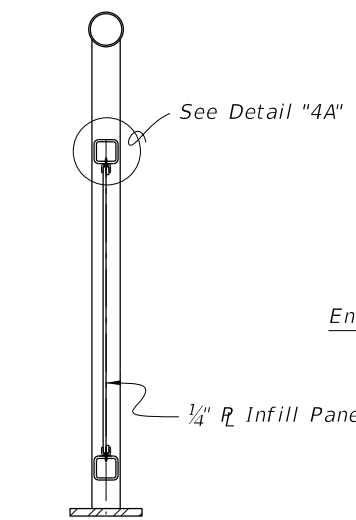
DETAIL "3E" PANEL END CONNECTION AT POST WITH EXPANSION JOINT



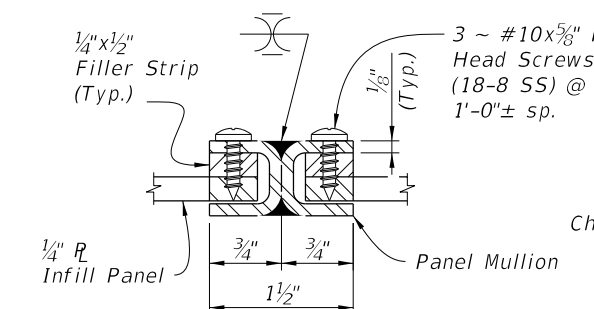
TYPE 4 - BROADWAY INFILL PANEL

NOTES:

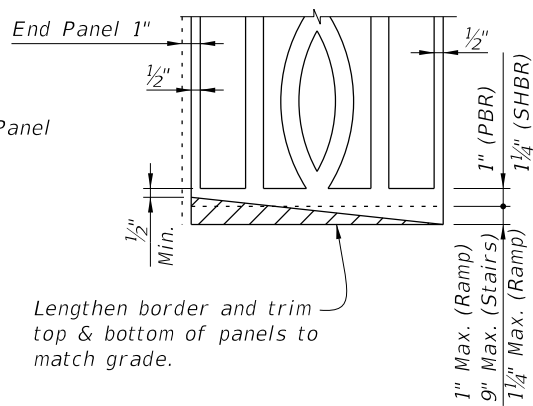
1. See Plans for Infill Panel Option required.



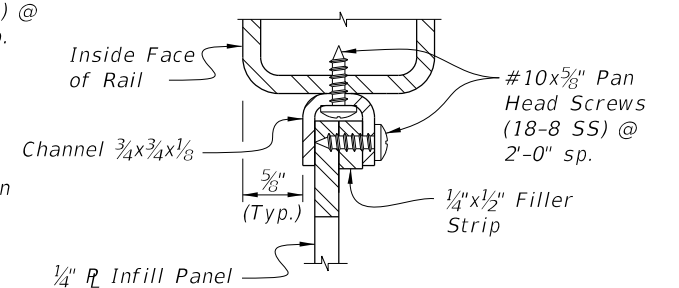
SECTION A-A



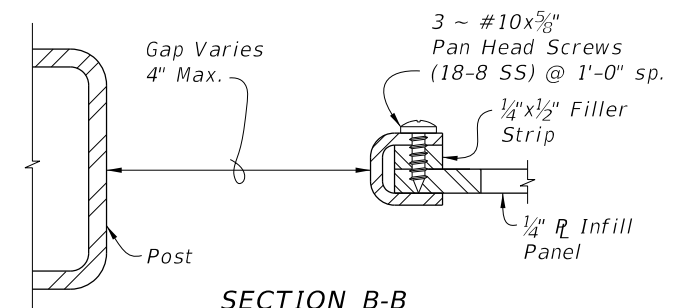
SECTION C-C PANEL/SPLICE CONNECTION



PANEL ADJUSTMENT FOR RAILINGS ON GRADES



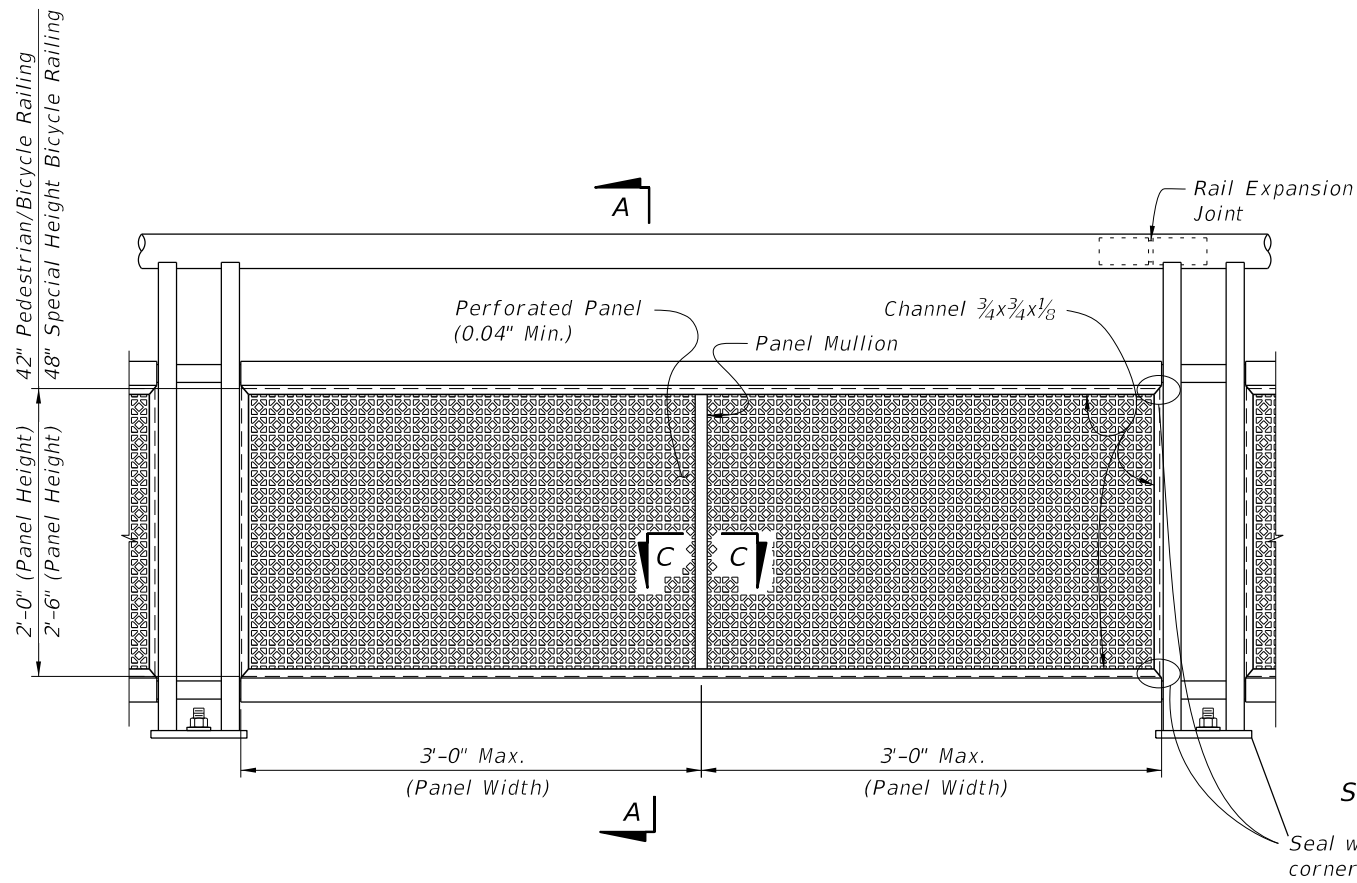
DETAIL "4A" PANEL/RAIL CONNECTION (Top Shown, Bottom Similar)



SECTION B-B PANEL END CAP

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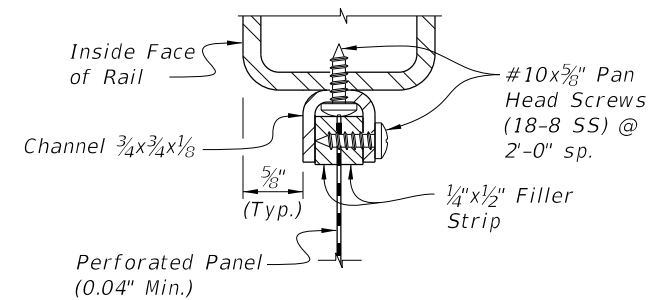
LAST REVISION 07/01/15	DESCRIPTION:	2016 FDOT DESIGN STANDARDS	STEEL PEDESTRIAN/BICYCLE RAILING	INDEX NO. 852	SHEET NO. 6 of 8
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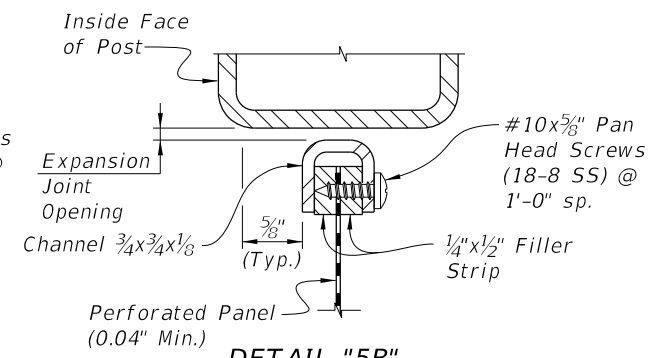
TYPE 5 - PERFORATED INFILL PANEL

SECTION A-A

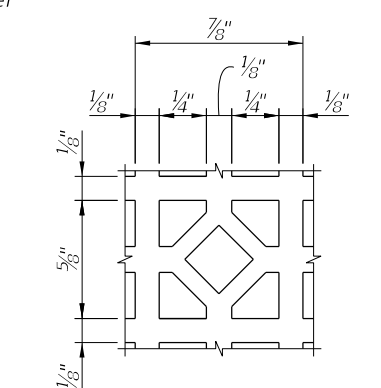
Seal welding mitered corners is permitted



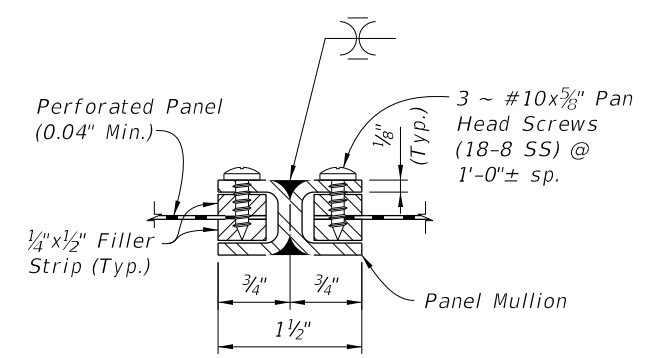
DETAIL "5A"
PANEL/RAIL CONNECTION
(Top Shown, Bottom Similar)



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



REPEATING PATTERN DETAIL
FOR PERFORATED PANEL



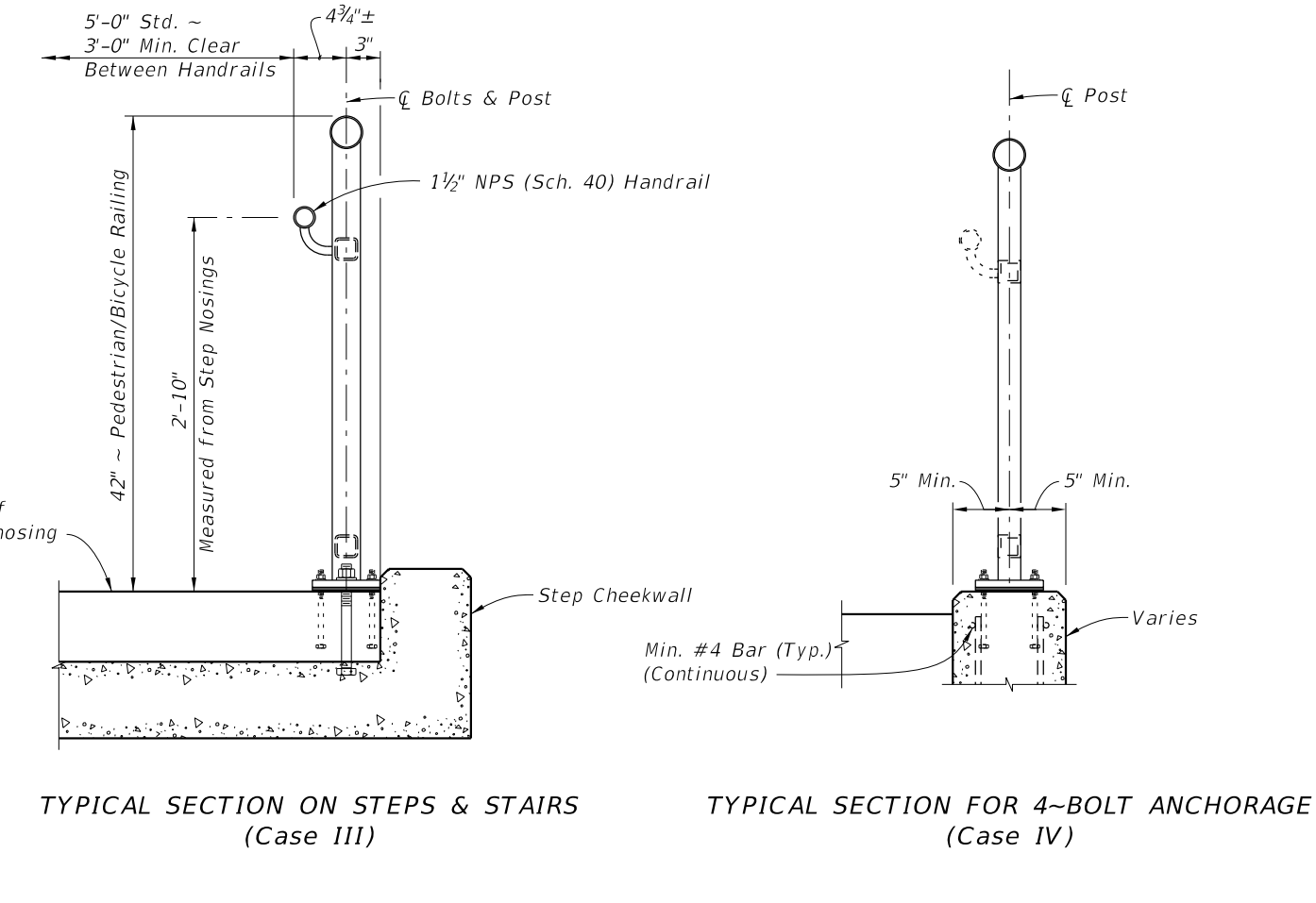
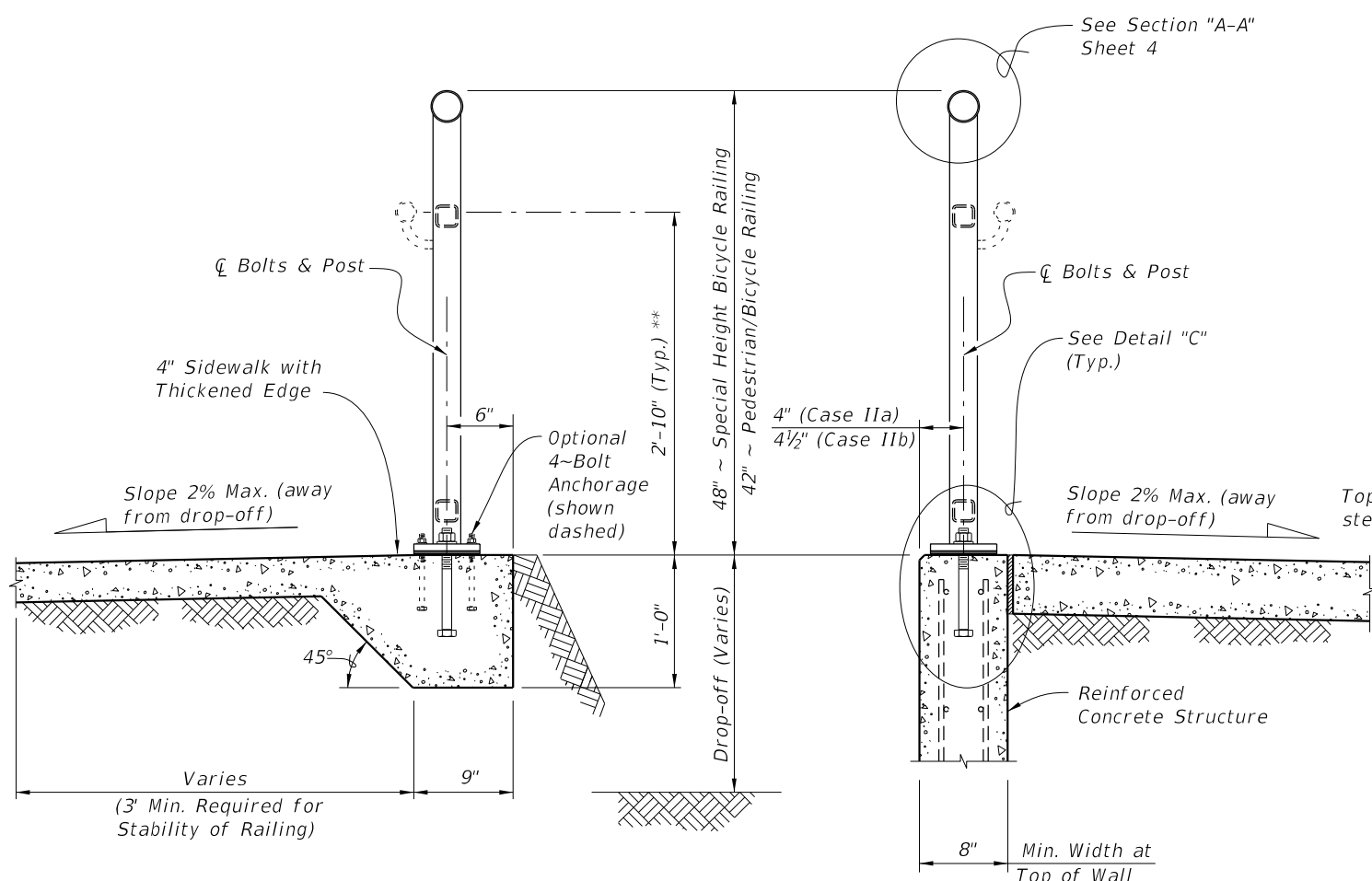
SECTION C-C
PANEL/SPLICE CONNECTION

NOTES:

- 1. See Plans for Infill Panel Type required.

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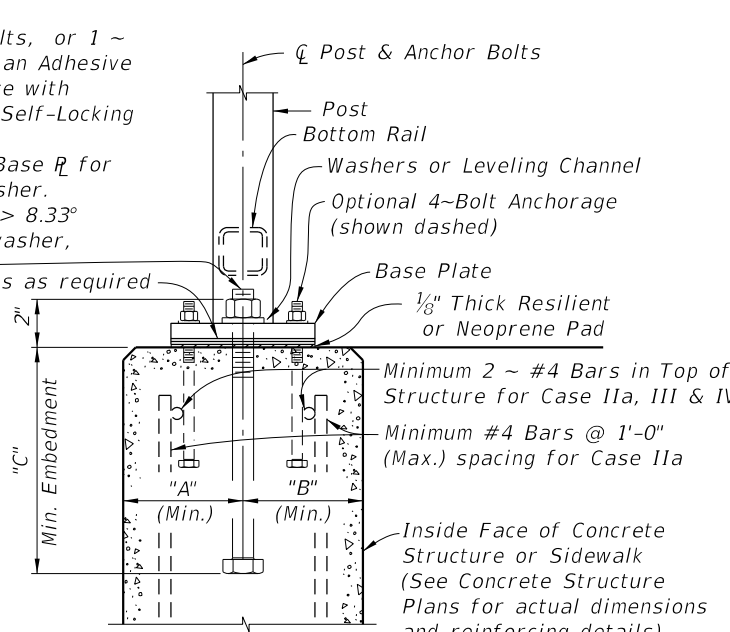
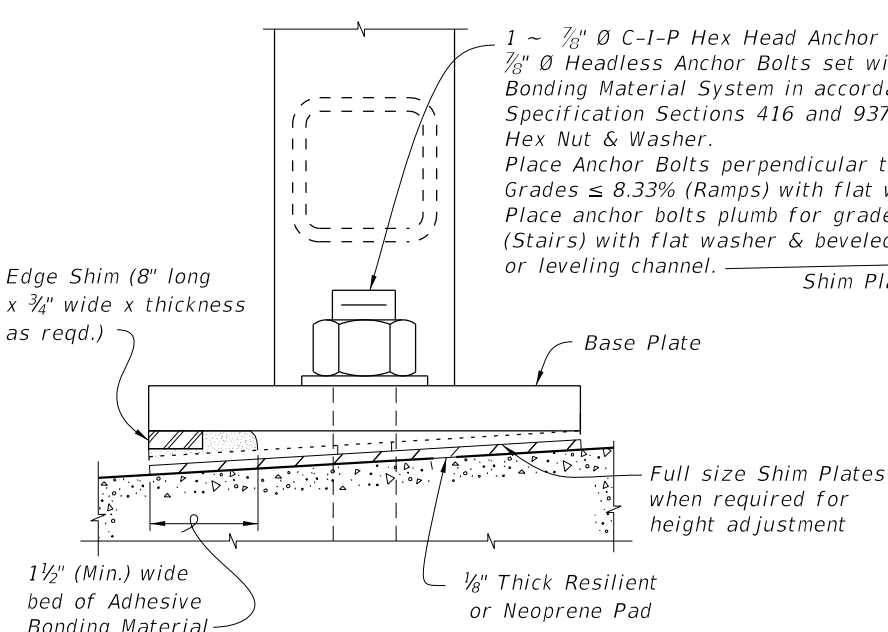


TYPICAL SECTION ON CONCRETE SIDEWALK (Case I)

TYPICAL SECTION ON RETAINING WALL (Case II)

TYPICAL SECTION ON STEPS & STAIRS (Case III)

TYPICAL SECTION FOR 4-BOLT ANCHORAGE (Case IV)



ANCHOR BOLT TABLE							
CASE	STRUCTURE TYPE	DIMENSIONS			ANCHOR LENGTH		ANCHOR SIZE
		A Edge Dist.	B Edge Dist.	C Embedment	C-I-P Hex Head Bolt	Adhesive Anchor	
I	Unreinforced Concrete	6"	1'-2"	9"	10½"	11"	⅞" Ø
IIa	Reinforced Concrete	4"	4"	9"	10½"	11"	⅞" Ø
IIb	Gravity Wall Index No. 6011	4½"	3½" @ top	1'-0" *	1'-1½"	1'-2"	⅞" Ø
III	Step Cheekwall	4½"	4½"	9"	10½"	11"	⅞" Ø
IV	Varies	5"	5"	5"	6½"	7"	⅞" Ø

* Embedment length "C" may be reduced to 9" for the 42" height railings for Case IIb, when the post spacing does not exceed 5'-0".

** When required; measured from top of sidewalk.

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