

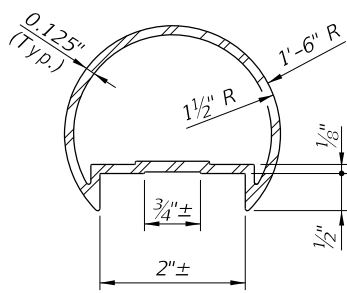
3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL
(42" Height shown, 48" Height Similar)

TABLE 1 - RAILING MEMBERS

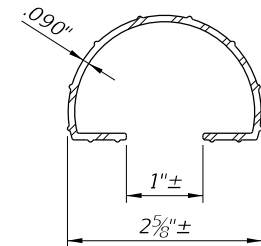
MEMBER	ALLOY ⁽¹⁾	DESIGNATION	OUTSIDE DIMENSION	WALL THICKNESS
Posts (Type "A" & "B")	6061-T6	RT 2x2x0.250	2.00" x 2.00"	0.250"
Posts (Type "C")	6061-T6	Extrusion 1½x2½x0.125	1.50" x 2.50"	0.125"
Top Plate (Type "C")	6061-T6	Extrusion (See Details)	2¾" x 7"	Varies
Top Rail	6061-T6	2½" NPS (Sch. 10) 3" Round Top Cap Rail	2.875" 3.000"	0.120" 0.125"
End Hoops	6063-T5	2½" NPS (Sch. 10) 3.00 OD x 0.125 Wall	2.875" 3.000"	0.120" 0.125"
Top Rail Joint/Splice Sleeves	6063-T5	2.50 OD x 0.125 Wall Top Cap Rail Inner Sleeve	2.500" 2.800"	0.125" 0.090"
Intermediate & Bottom Rail	6061-T6	RT 2x2x0.250	2.00" x 2.00"	0.250" ⁽²⁾
Int. & Bottom Rail Post Connection Sleeve	6063-T5	1.50 OD x 0.125 Wall ⁽³⁾	1.500"	0.125"
Handrail Joint/Splice Sleeves	6063-T5	1" NPS (Sch. 40) 1.50 OD x 0.125 Wall	1.315" 1.500"	0.133" 0.125"
Handrails	6061-T6	1½" NPS (Sch. 40)	1.900"	0.145"
Handrail Support Bar	6061-T6	¾" Ø Round Bar	0.750"	N/A
Pickets (Type 1 Infill Panel)	6061-T6	¾" Ø Round Bar	0.750"	N/A
Infill Panel Members (Types 2 - 5)	6063-T5	Varies (See Details)	Varies	Varies

TABLE 1 NOTES:

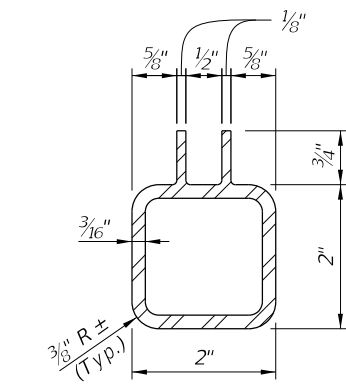
- (1) Alloy 6061-T6 or 6063-T52 & T6 may be substituted for Alloy 6063-T5.
- (2) 0.188" wall thickness permitted for rails with post spacings less than 5'-9".
- (3) 1" NPS (Sch. 40) non-slit rail sleeves may be substituted when welded connection Detail "K" is utilized.



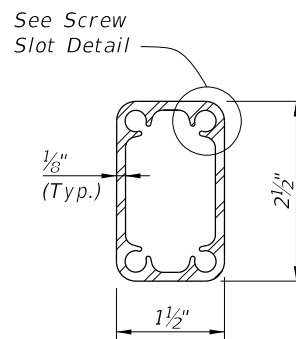
3" ROUND TOP CAP RAIL
ALTERNATE TOP RAIL SECTION



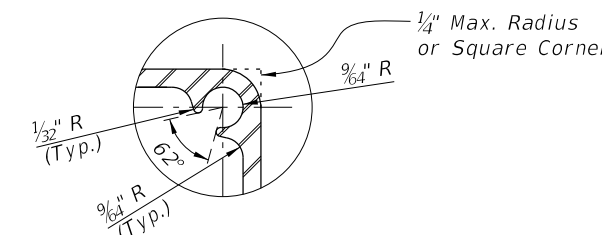
TOP CAP RAIL INNER
SPLICE SLEEVE



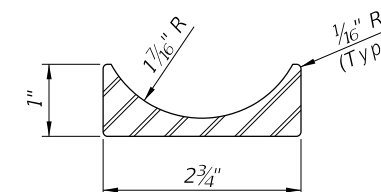
ALTERNATIVE BOTTOM &
INTERMEDIATE RAIL SECTION
FOR TYPE 3, 4 & 5 RAILINGS



POST TYPE "C"
SCREW SLOT SECTION



SCREW SLOT DETAIL



OPTIONAL TOP PLATE
EXTRUSION SECTION (POST TYPE "C")

CROSS REFERENCES:

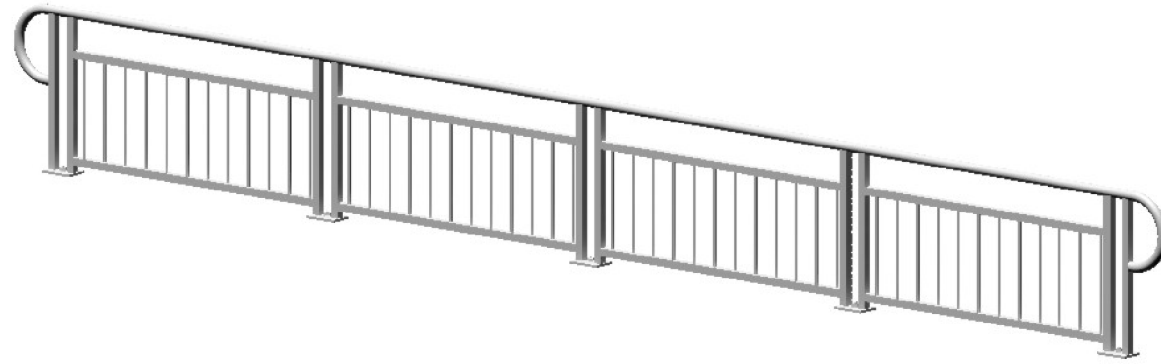
- Detail "A", Sheet 4
- Detail "B", Sheet 4
- Detail "K", Sheet 3

NOTES

1. Shop Drawings are required, see Specification Section 515.
2. For bridge mounted railings, work this Index with Index 515-061 Bridge Bicycle/Pedestrian Railing (Aluminum)
3. Materials:
 - A. Structural Extrusions, Tube, Pipe and Bars: Table 1 and ASTM B221 or ASTM B429
 - a. Top, bottom and intermediate rail corner bends with maximum 4'-0" post spacing may be Alloy 6063-T6
 - B. Base Plates and Rail Caps: ASTM B209 Alloy 6061-T6
 - C. Perforated panels (Type 5) Alloy 3003-H14
 - D. Stainless steel (SS) screws: Type 316 or 18-8 Alloy
 - E. Aluminum screws: Alloy 2024-T4 or 7075-T73
 - F. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
 - a. Hex Head Bolts: ASTM A 307
 1. 7/8" diameter single bolt option, Grade 36
 2. 7/16" diameter four bolt option, Grade 55
 - b. Adhesive Anchors: ASTM F1554 fully threaded rods, Grade 55
 - c. Hex Nuts: ASTM A563
 - d. Flat Washers: ASTM F436
 - e. Plate Washers: ASTM A36 or ASTM A706 Grade 36.
 - G. Shims: ASTM B209 Alloy 6061 or 6063
 - H. Bearing Pads: Provide 1/8" thick Plain, Fabric Reinforced or Fabric Laminated Bearing Pads meeting the requirements of Specification Section 932 for Ancillary Structures.
4. 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.
5. Locate railing expansion joints between the posts on either side of the deck expansion joint. Maximum spacing between expansion joints is 35'-0".
6. 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.
7. For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "K" for Post Type "A" & "B".
8. 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.
9. 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.
10. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
11. Handrails are required and must be continuous at landings for:
 - A. Grades Steeper than 5%
 - B. Three or more steps
12. Installation: Cutting of reinforcing steel is permitted for post installed anchors.

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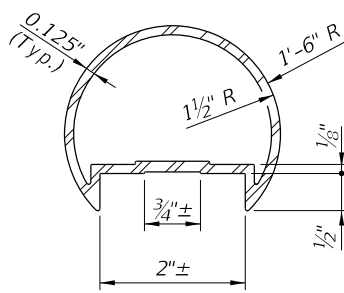
3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL
(42" Height shown, 48" Height Similar)

TABLE 1 - RAILING MEMBERS

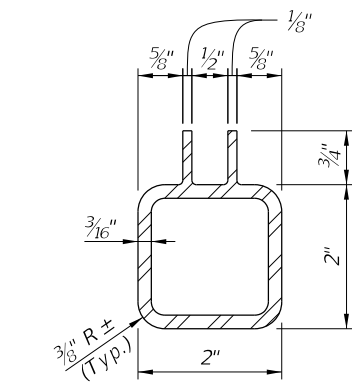
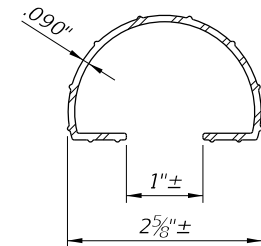
MEMBER	ALLOY ⁽¹⁾	DESIGNATION	OUTSIDE DIMENSION	WALL THICKNESS
Posts (Type "A" & "B")	6061-T6	RT 2x2x0.250	2.00" x 2.00"	0.250"
Posts (Type "C")	6061-T6	Extrusion 1½x2½x0.125	1.50" x 2.50"	0.125"
Top Plate (Type "C")	6061-T6	Extrusion (See Details)	2¾" x 7"	Varies
Top Rail	6061-T6	2½" NPS (Sch. 10) 3" Round Top Cap Rail	2.875" 3.000"	0.120" 0.125"
End Hoops	6063-T5	2½" NPS (Sch. 10) 3.00 OD x 0.125 Wall	2.875" 3.000"	0.120" 0.125"
Top Rail Joint/Splice Sleeves	6063-T5	2.50 OD x 0.125 Wall Top Cap Rail Inner Sleeve	2.500" 2.800"	0.125" 0.090"
Intermediate & Bottom Rail	6061-T6	RT 2x2x0.250	2.00" x 2.00"	0.250" ⁽²⁾
Int. & Bottom Rail Post Connection Sleeve	6063-T5	1.50 OD x 0.125 Wall ⁽³⁾	1.500"	0.125"
Handrail Joint/Splice Sleeves	6063-T5	1" NPS (Sch. 40) 1.50 OD x 0.125 Wall	1.315" 1.500"	0.133" 0.125"
Handrails	6061-T6	1½" NPS (Sch. 40)	1.900"	0.145"
Handrail Support Bar	6061-T6	¾" Ø Round Bar	0.750"	N/A
Pickets (Type 1 Infill Panel)	6061-T6	¾" Ø Round Bar	0.750"	N/A
Infill Panel Members (Types 2 - 5)	6063-T5	Varies (See Details)	Varies	Varies

TABLE 1 NOTES:

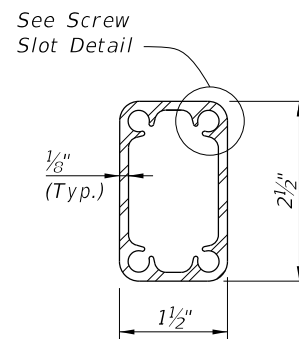
- (1) Alloy 6061-T6 or 6063-T52 & T6 may be substituted for Alloy 6063-T5.
- (2) 0.188" wall thickness permitted for rails with post spacings less than 5'-9".
- (3) 1" NPS (Sch. 40) non-slit rail sleeves may be substituted when welded connection Detail "K" is utilized.



3" ROUND TOP CAP RAIL TOP CAP RAIL INNER SPlice SLEEVE
ALTERNATE TOP RAIL SECTION



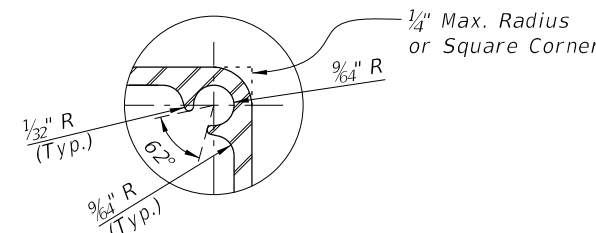
ALTERNATIVE BOTTOM & INTERMEDIATE RAIL SECTION FOR TYPE 3, 4 & 5 RAILINGS



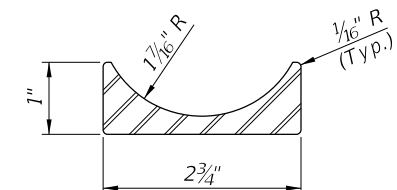
POST TYPE "C" SCREW SLOT SECTION

CROSS REFERENCES:

- Detail "A", Sheet 4
- Detail "B", Sheet 4
- Detail "K", Sheet 3



SCREW SLOT DETAIL



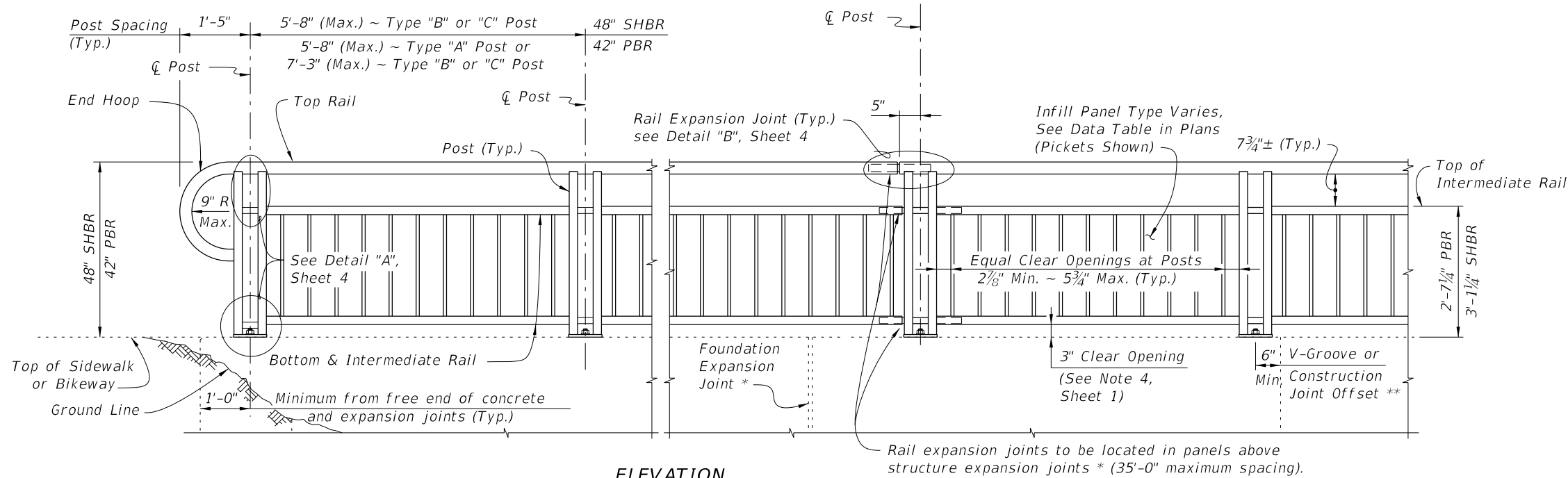
OPTIONAL TOP PLATE EXTRUSION SECTION (POST TYPE "C")

NOTES

1. Shop Drawings are required, see Specification Section 515.
2. For bridge mounted railings, work this Index with Index 515-061 Bridge Bicycle/Pedestrian Railing (Aluminum)
3. Materials:
 - A. Structural Extrusions, Tube, Pipe and Bars: Table 1 and ASTM B221 or ASTM B429
 - a. Top, bottom and intermediate rail corner bends with maximum 4'-0" post spacing may be Alloy 6063-T6
 - B. Base Plates and Rail Caps: ASTM B209 Alloy 6061-T6
 - C. Perforated panels (Type 5) Alloy 3003-H14
 - D. Stainless steel (SS) screws: Type 316 or 18-8 Alloy
 - E. Aluminum screws: Alloy 2024-T4 or 7075-T73
 - F. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
 - a. Hex Head Bolts: ASTM A 307
 1. 7/8" diameter single bolt option, Grade 36
 2. 7/16" diameter four bolt option, Grade 55
 - b. Adhesive Anchors: ASTM F1554 fully threaded rods, Grade 55
 - c. Hex Nuts: ASTM A563
 - d. Flat Washers: ASTM F436
 - e. Plate Washers: ASTM A36 or ASTM A706 Grade 36.
 - G. Shims: ASTM B209 Alloy 6061 or 6063
 - H. Bearing Pads: Provide 1/8" thick Plain, Fabric Reinforced or Fabric Laminated Bearing Pads meeting the requirements of Specification Section 932 for Ancillary Structures.
4. 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.
5. Locate railing expansion joints between the posts on either side of the deck expansion joint. Maximum spacing between expansion joints is 35'-0".
6. 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.
7. For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "K" for Post Type "A" & "B".
8. 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.
9. 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.
10. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
11. Handrails are required and must be continuous at landings for:
 - A. Grades Steeper than 5%
 - B. Three or more steps
12. Installation: Cutting of reinforcing steel is permitted for post installed anchors.

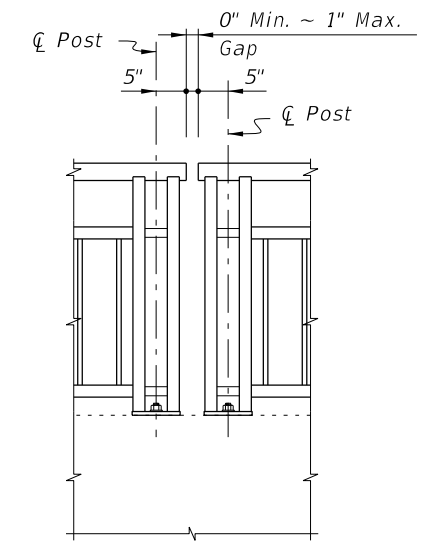
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LAST REVISION 11/01/18	REVISION	DESCRIPTION:	 FY 2019-20 STANDARD PLANS	PEDESTRIAN/BICYCLE RAILING (ALUMINUM)	INDEX 515-062	SHEET 1 of 9
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ELEVATION
(Showing Outside Face of Railing with Type "A" Posts)

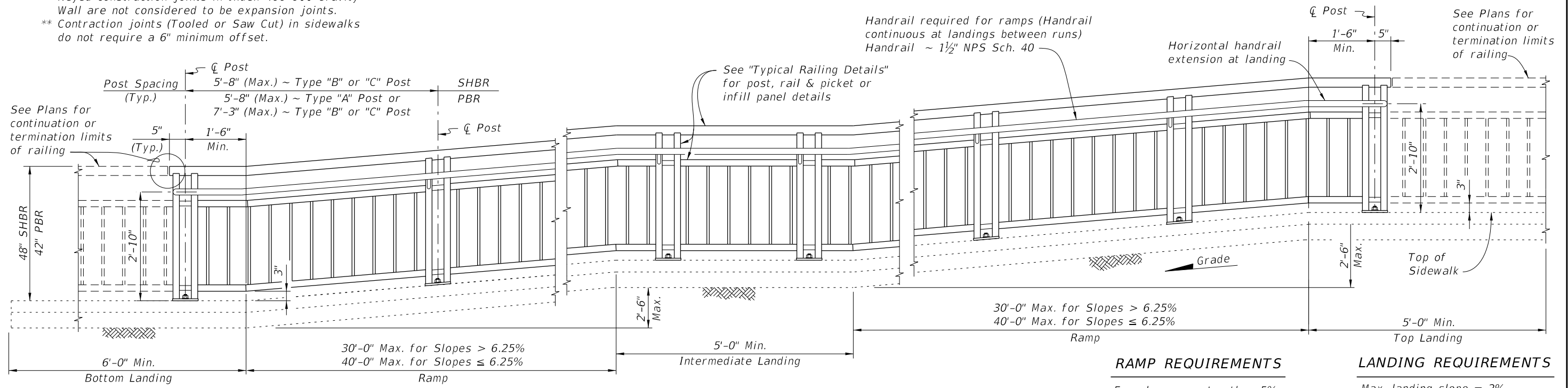
TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%
(Type 1 - Picket Railing Shown, Other Types Similar)



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 400-011 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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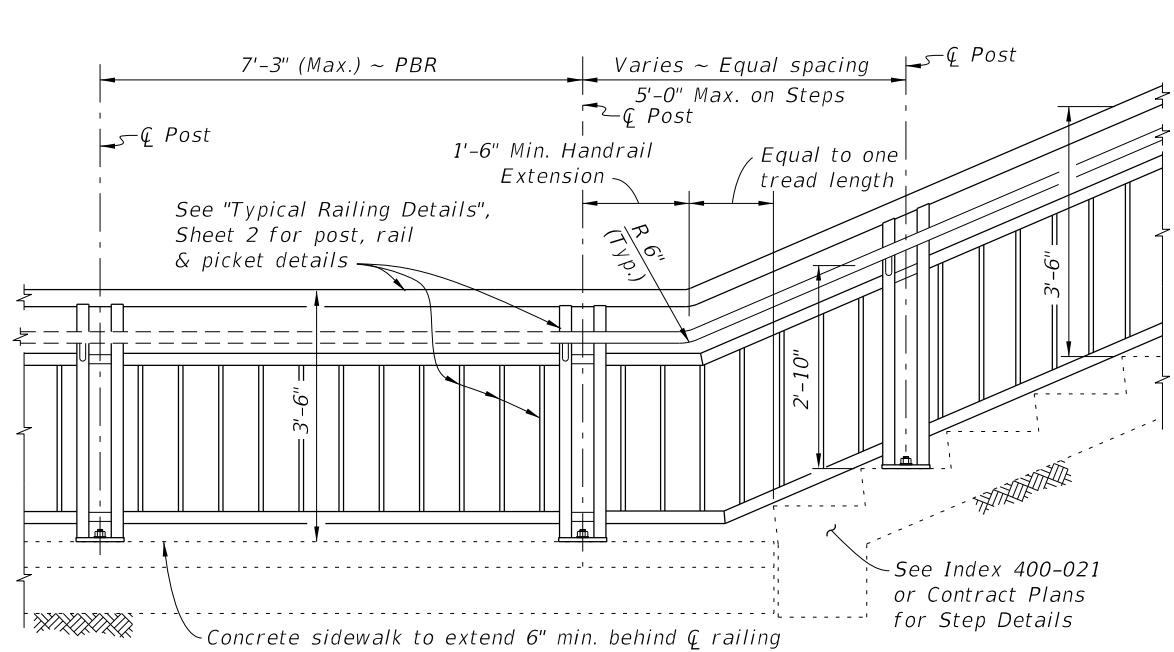


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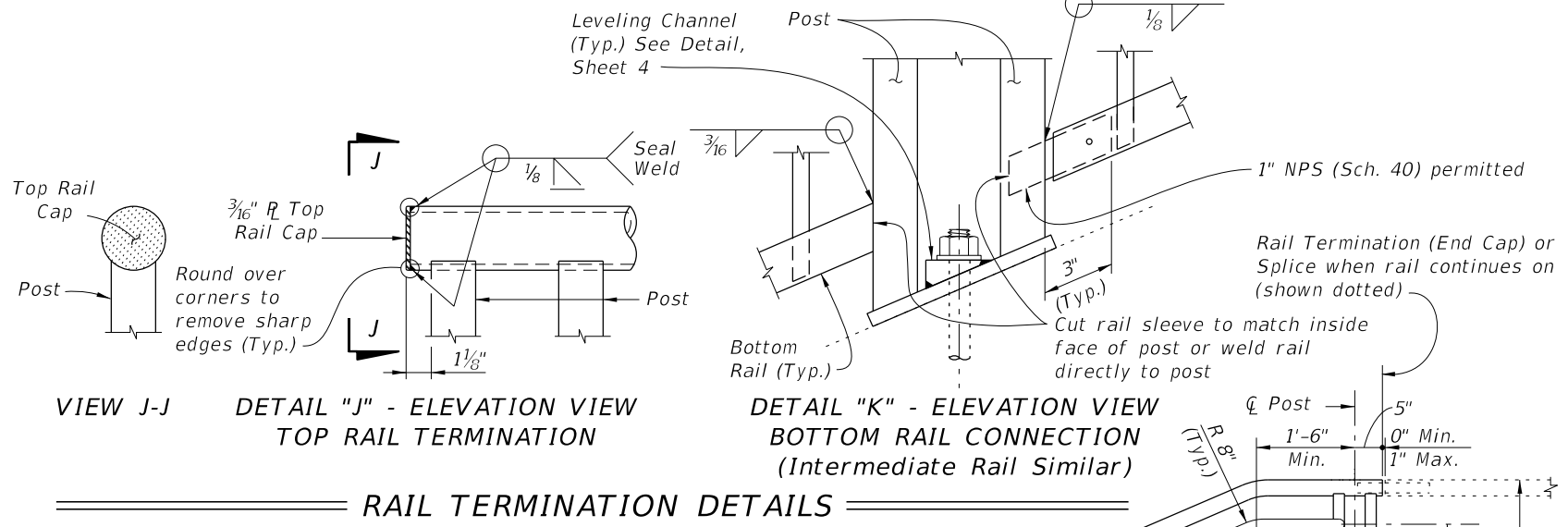
PEDESTRIAN/BICYCLE RAILING (ALUMINUM)

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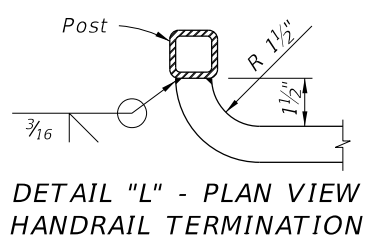
SHEET
2 of 9



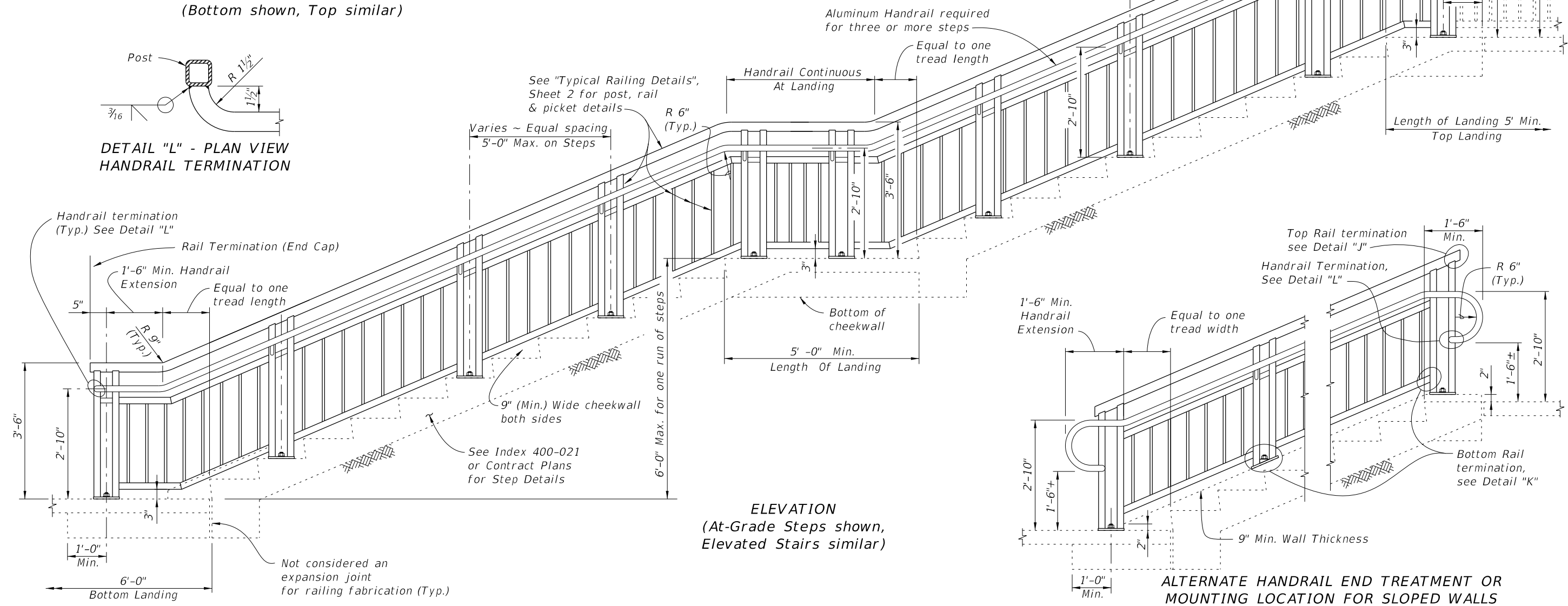
RAILING CONTINUATION BEYOND STEPS OR STAIRS
(Bottom shown, Top similar)



RAIL TERMINATION DETAILS



DETAIL "L" - PLAN VIEW HANDRAIL TERMINATION



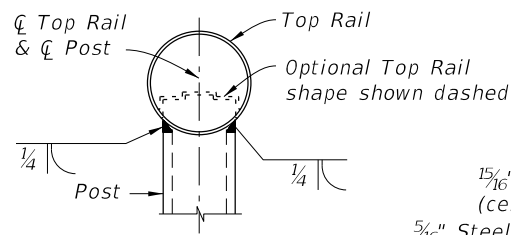
ELEVATION
(At-Grade Steps shown, Elevated Stairs similar)

ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOPED WALLS

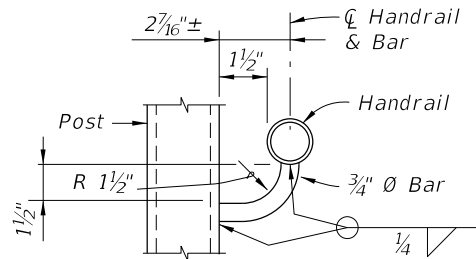
RAILINGS ON STEPS & STAIRS

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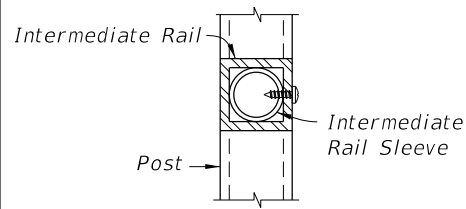
LAST REVISION 11/01/16	DESCRIPTION:	 FY 2019-20 STANDARD PLANS	PEDESTRIAN/BICYCLE RAILING (ALUMINUM)	INDEX 515-062	SHEET 3 of 9
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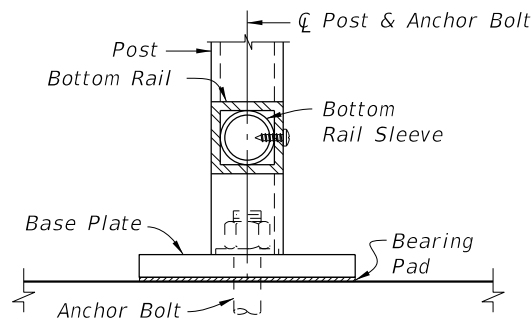
SECTION A-A
(Top Rail Connection)



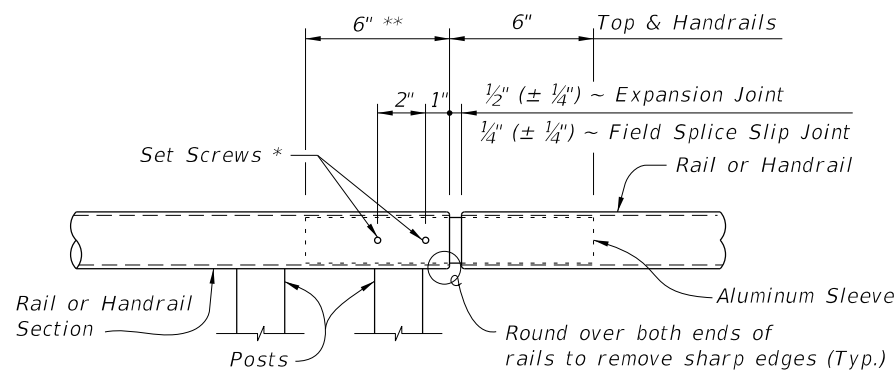
SECTION B-B
(Handrail Connection)



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)

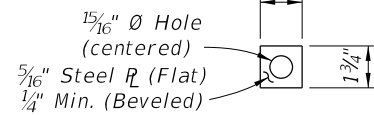
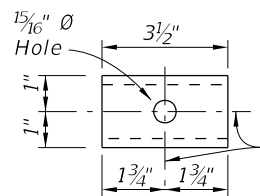
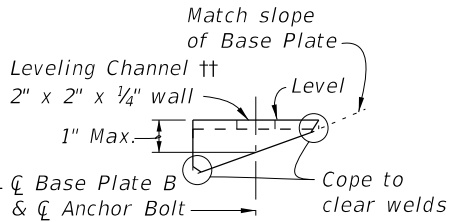


PLATE WASHER
DETAIL

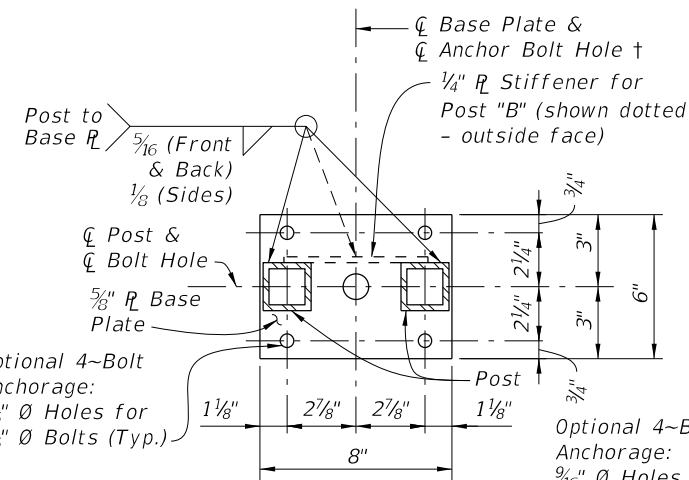


TOP VIEW

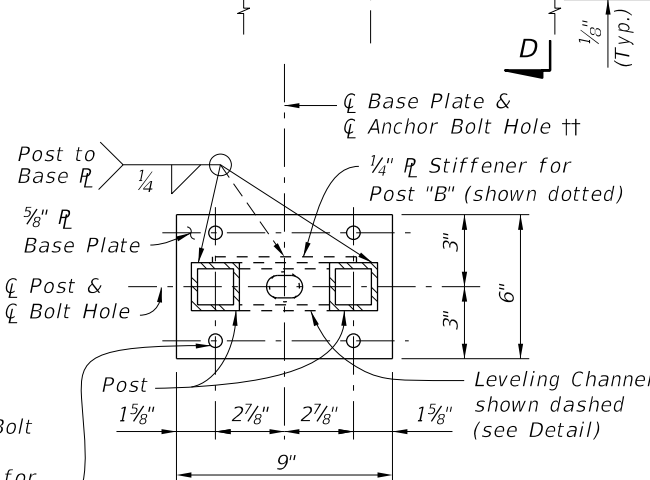


SIDE VIEW

LEVELING CHANNEL DETAIL



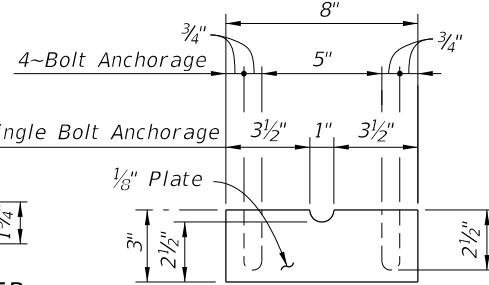
BASE PLATE A



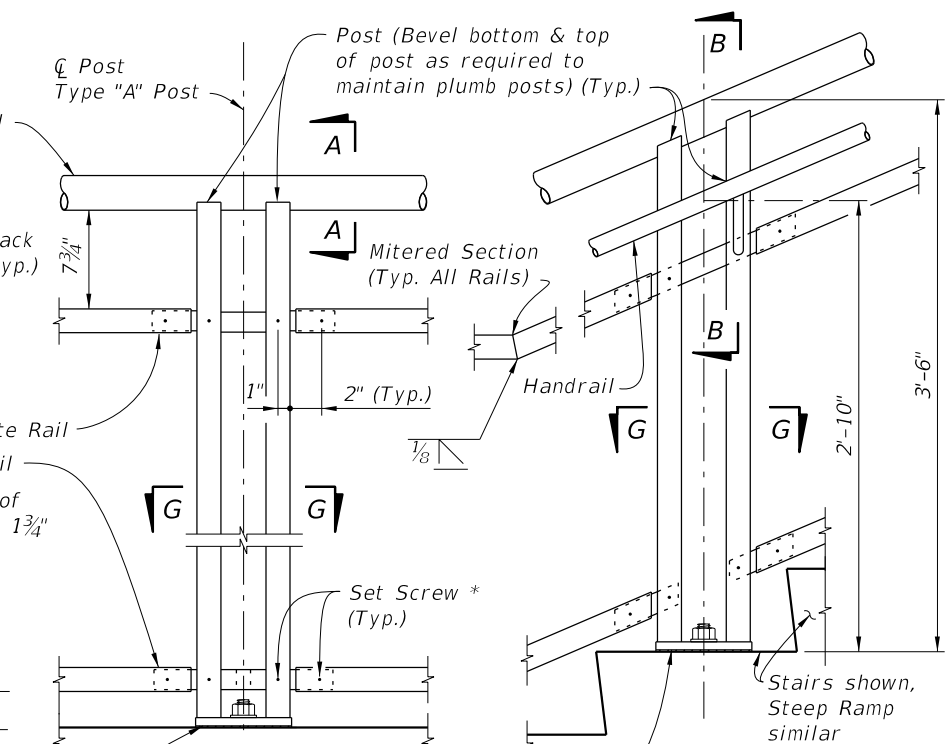
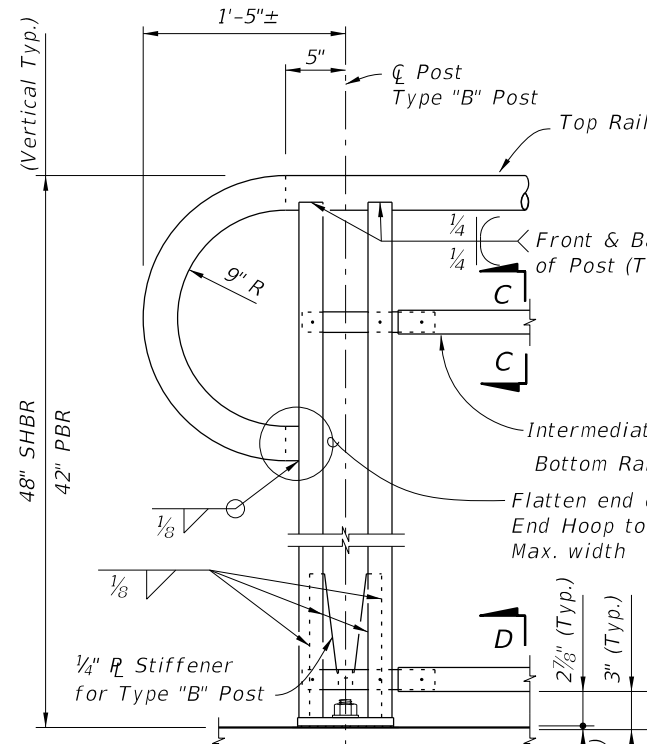
BASE PLATE B

SECTION G-G - BASE PLATE DETAILS

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



SHIM PLATE DETAIL

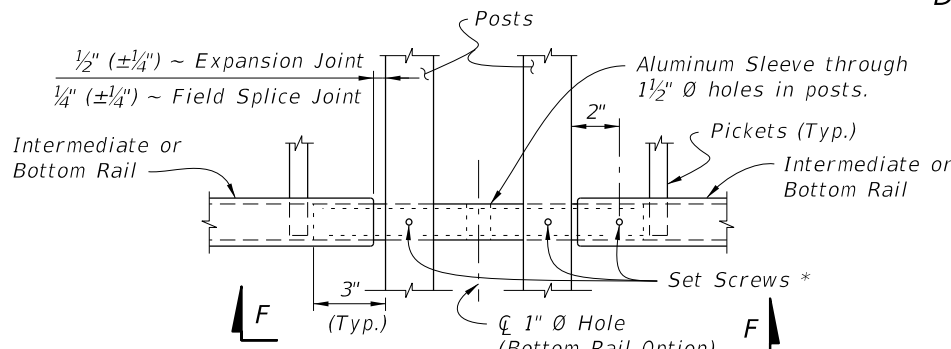


DETAIL "A" - RAIL CONNECTIONS
(Showing Inside Face of Railing)
(Pickets/Panels and 4-Bolt Anchorage Not Shown for Clarity)

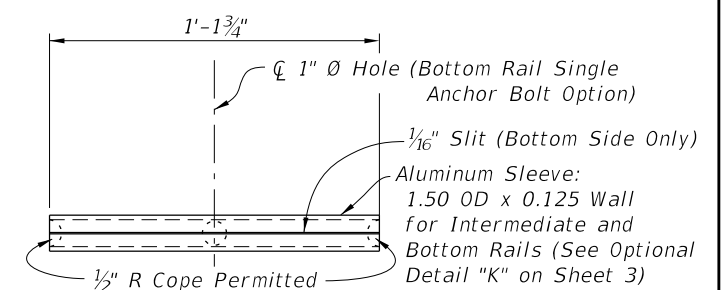
- NOTES:
- † Base Plate A (Ramps - Bolts normal) use 1 1/16 inch diameter holes for single anchor bolts with flat washers for slopes ≤ 8.33%.
 - ‡ Base Plate B (Stairs - Bolts plumb) use 1/4 inch diameter holes for single anchor bolts with beveled plate and washers for slopes > 8.33% to ≤ 15%; use 1 5/16 inch x 1 1/2 inch slotted holes with leveling channel for slopes > 15%.
 - * 1/4 inch diameter x 3/4 inch pan head aluminum or stainless steel set screws. Screws must be set flush against the outside face of rails & posts and underside of handrails. A single tack weld (1/2 inch max. length) at top of the sleeve for each post may be substituted for the set screws. Do not provide set screws for rails at free end of expansion joints.

POST "B" STIFFENER
DETAIL

** Embedded length may be 4" for plug welded connection.



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



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

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

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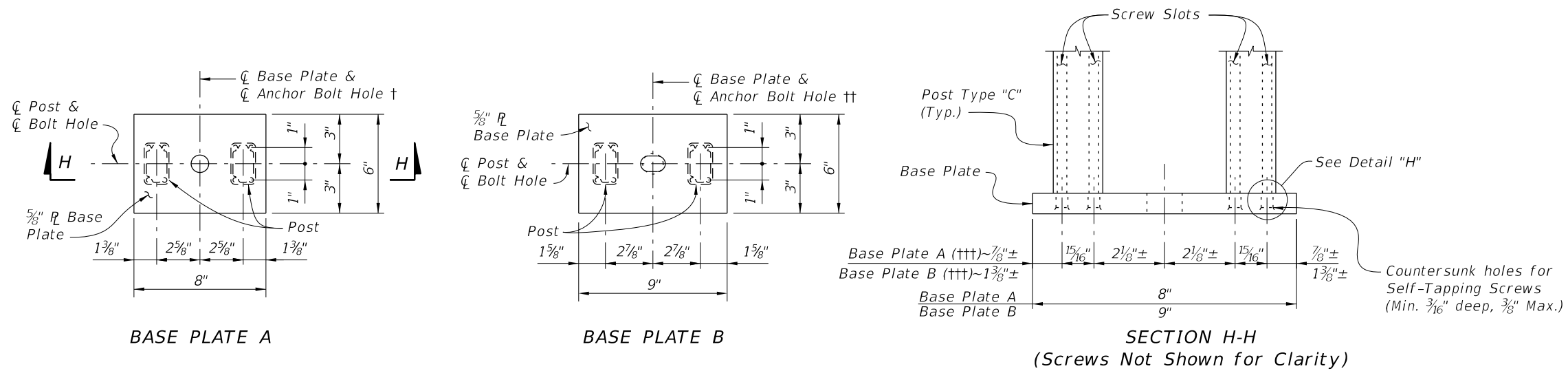
LAST REVISION 11/01/16	DESCRIPTION:
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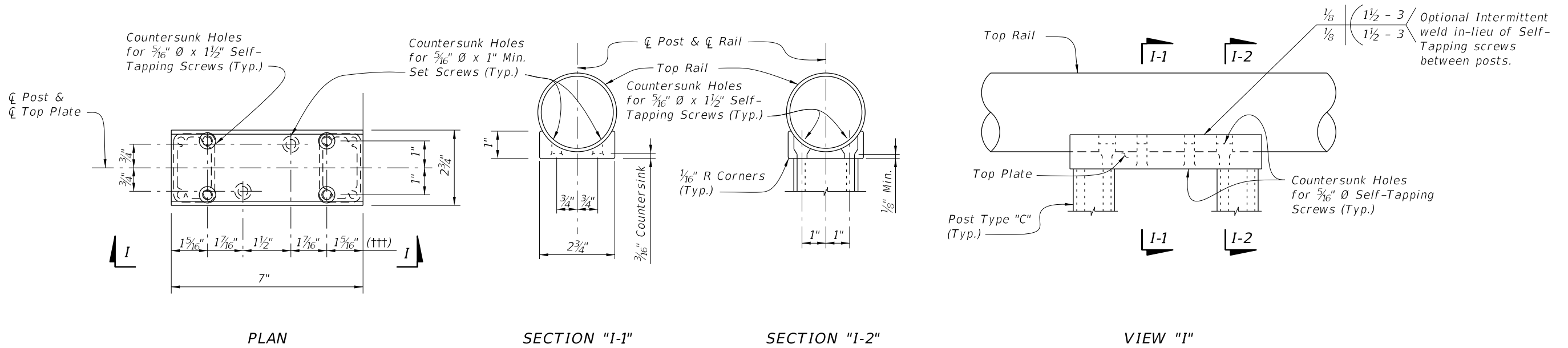
FY 2019-20
STANDARD PLANS

PEDESTRIAN/BICYCLE RAILING (ALUMINUM)

INDEX SHEET
515-062 4 of 9



BASE PLATE DETAILS FOR TYPE "C" POST

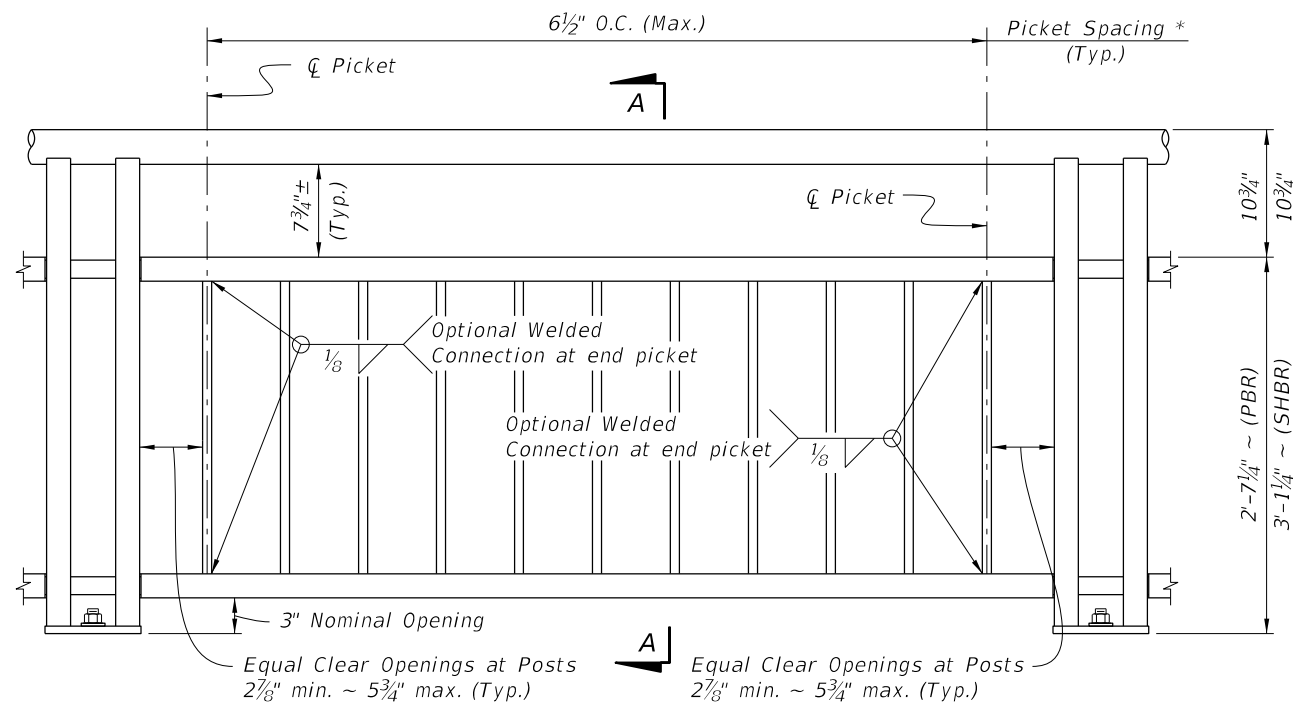


TOP PLATE DETAILS FOR TYPE "C" POST
(Screws Not Shown For Clarity)

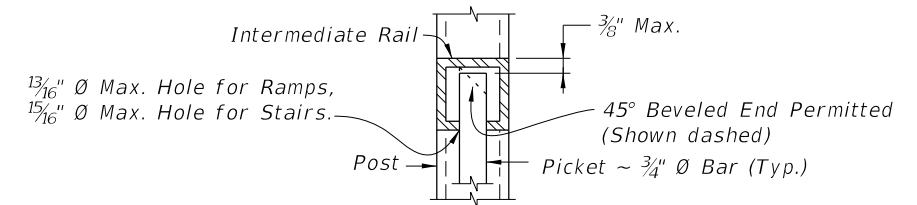
Notes:
 † See Sheet 4 for Notes.
 †† See Sheet 4 for Notes.
 ††† Length varies for beveled posts on grades. Holes must be drilled plumb to align with screw slot.

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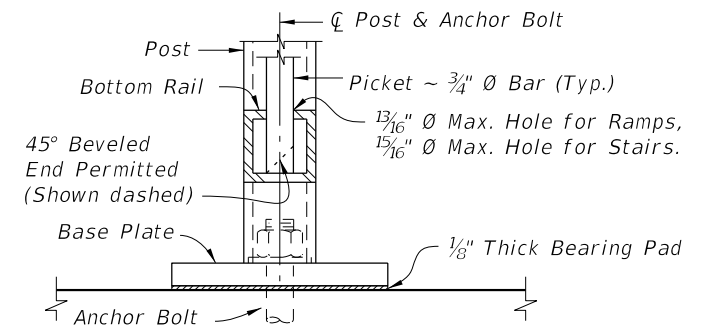
LAST REVISION 11/01/16	DESCRIPTION:		FY 2019-20 STANDARD PLANS	PEDESTRIAN/BICYCLE RAILING (ALUMINUM)	INDEX	SHEET
						515-062



SECTION A-A



DETAIL "1A"
(Top of Picket Connection)

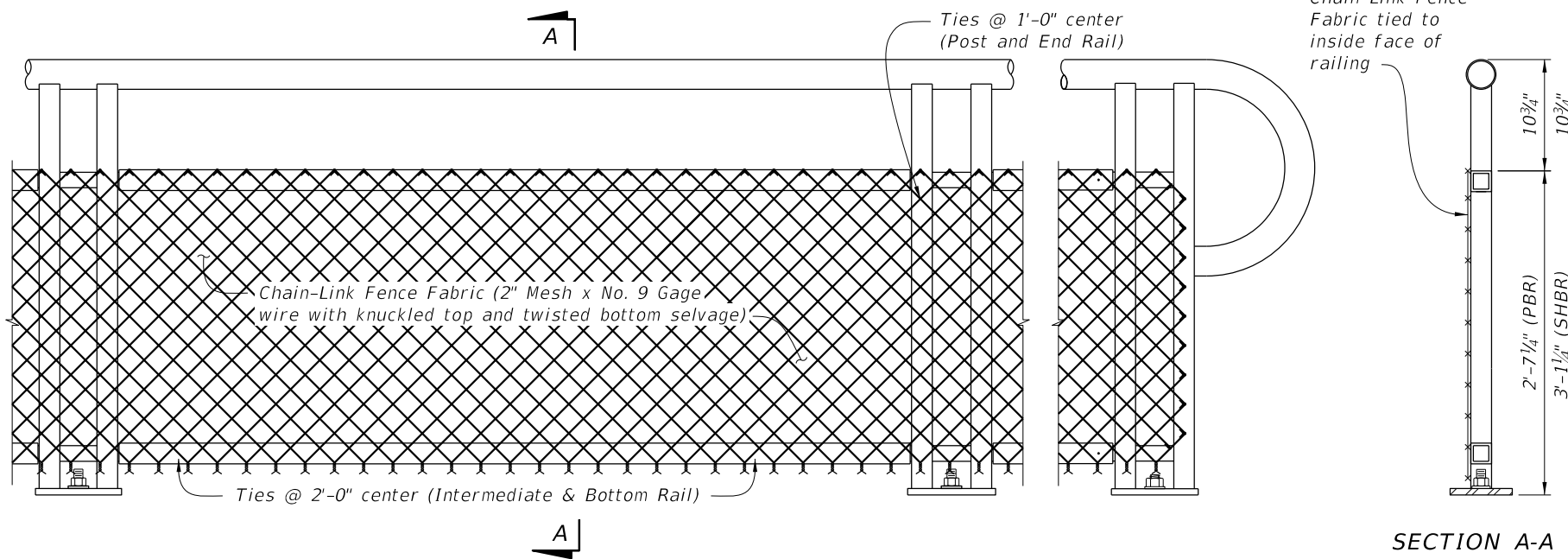


DETAIL "1B"
(Bottom of Picket Connection)

TYPE 1 - PICKET INFILL PANEL

PICKET NOTES:

* Picket Spacing of $6\frac{1}{2}$ " centers is based on a $\frac{3}{4}$ " \varnothing Bar for standard applications. When shown in the Contract Plans a $4\frac{1}{2}$ " picket spacing may be required. See Note 4 (Sheet 1).



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)	A392	Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating
	A491	Aluminum-Coated Steel - No. 9 gage (coated wire diameter)
	F668	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	F626	Zinc-Coated Steel Wire - No. 9 gage with coating to match Chain-Link Fence Fabric.
Tension Bars	F626	$\frac{3}{16}$ " (min. thickness) x $\frac{3}{4}$ " (min. width) x 2'-3' (min. height) Steel Bars
Miscellaneous Fence Components	F626	Zinc-Coated Steel

CHAIN-LINK PANEL NOTE:

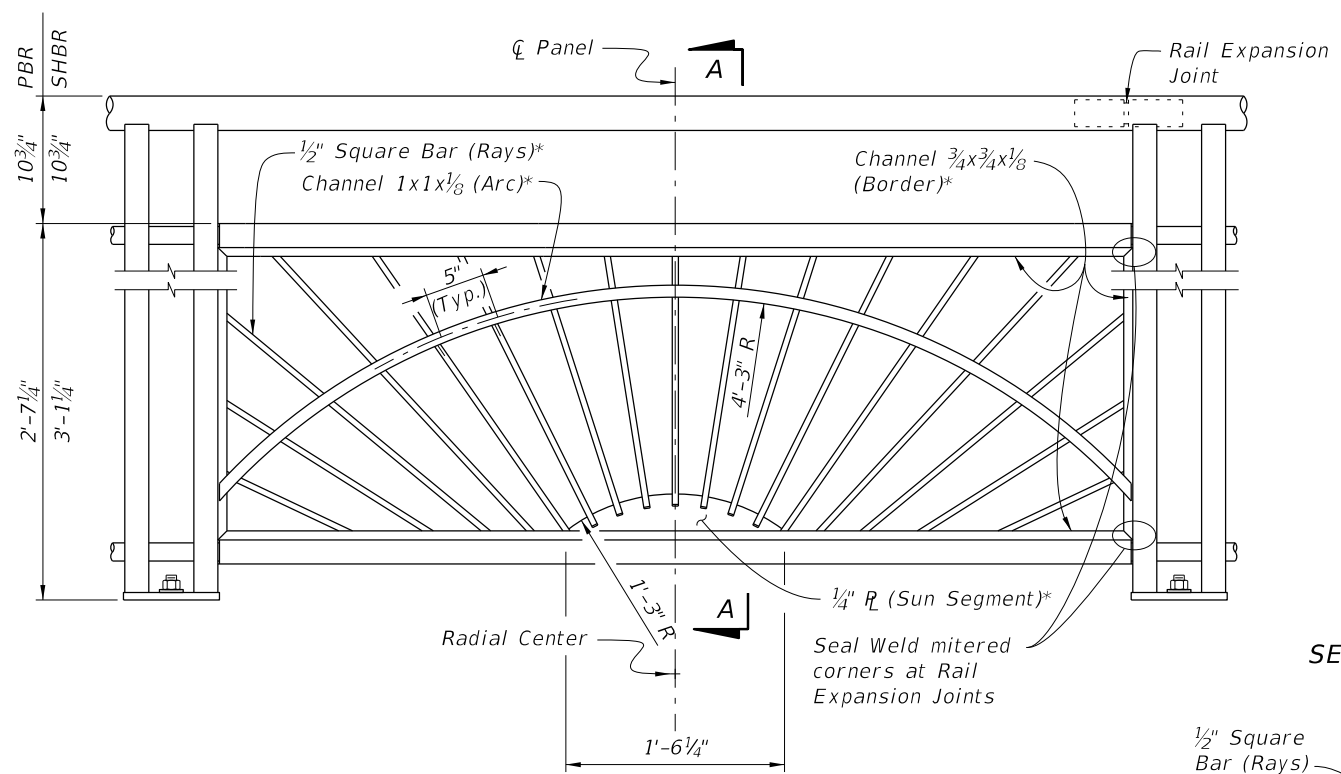
Chain-Link Fence Fabric shall be continuous along limits of railing. Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.

TYPE 2 - CHAIN-LINK (Continuous Infill Panel)

NOTES:

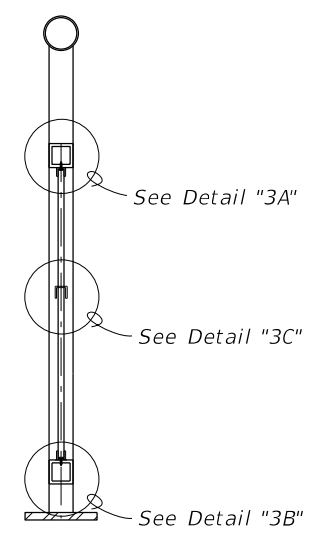
1. See Plans for Infill Panel option required.

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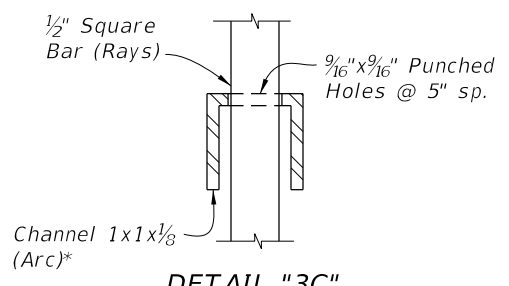


TYPE 3 - SUNSHINE INFILL PANEL

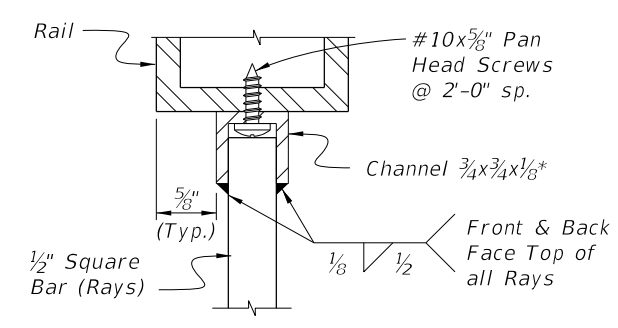
* Arc, Rays and Sun Segment may be formed in a single panel from 1/2" plate (ASTM B209 Alloy 6061-T6 or T651) pattern cut with laser or plasma CNC, welded to a 1x1x1/8 Angle Border or the 3/4x3/4x1/8 Channel Border shown.



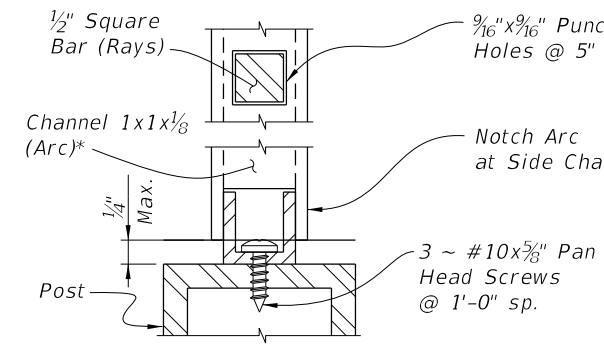
SECTION A-A



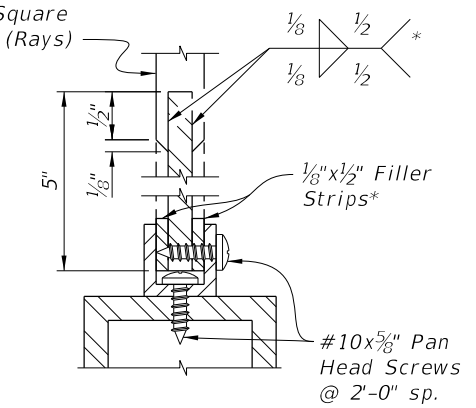
DETAIL "3C" RAY/ARC CONNECTION



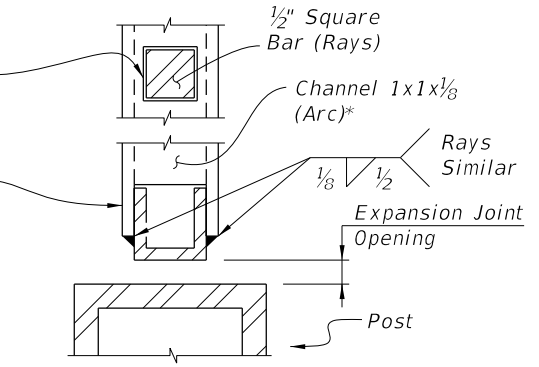
DETAIL "3A" INTERMEDIATE RAIL/RAY CONNECTION



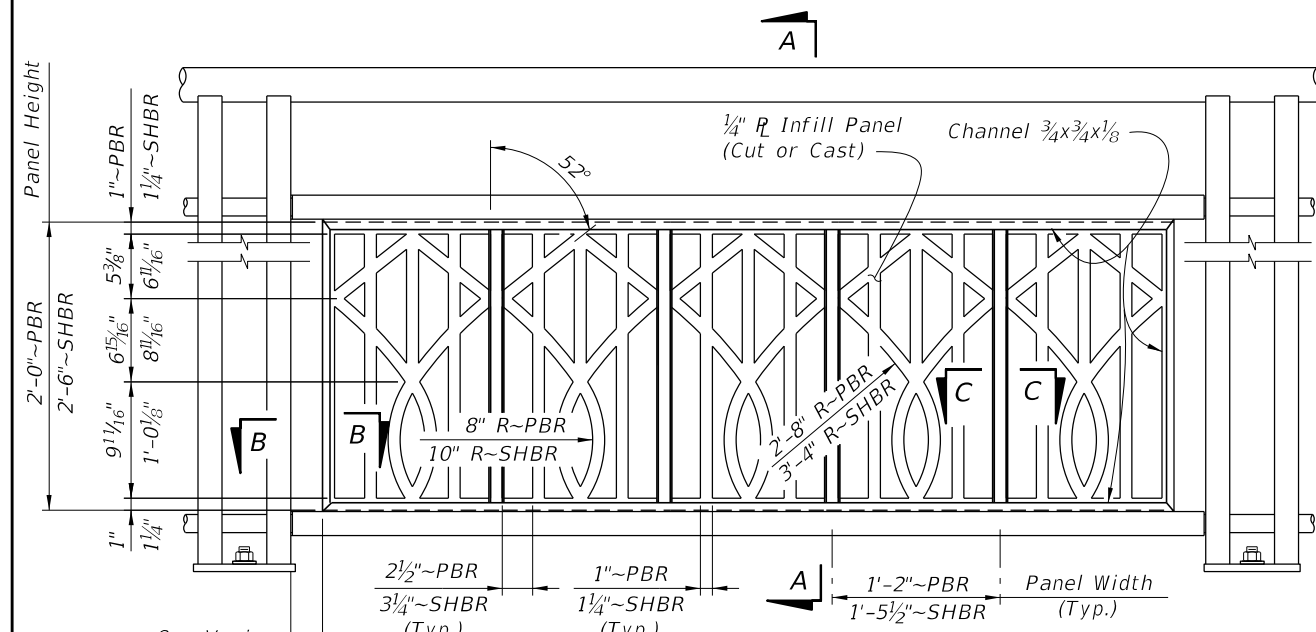
DETAIL "3D" ARC/POST CONNECTION (Continuous Top Rail)



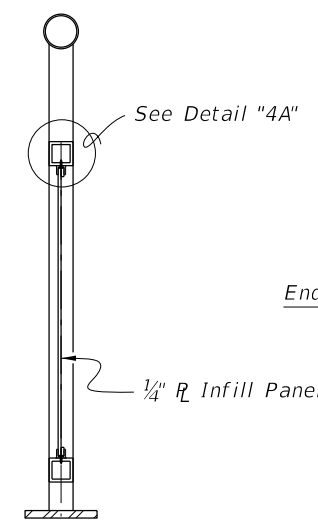
DETAIL "3B" BOTTOM RAIL/RAY CONNECTION



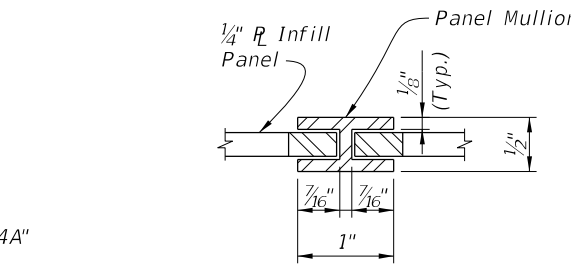
DETAIL "3E" PANEL END CONNECTION AT POST WITH EXPANSION JOINT



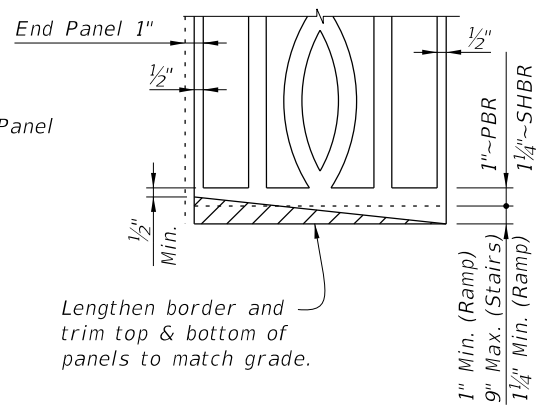
TYPE 4 - BROADWAY INFILL PANEL



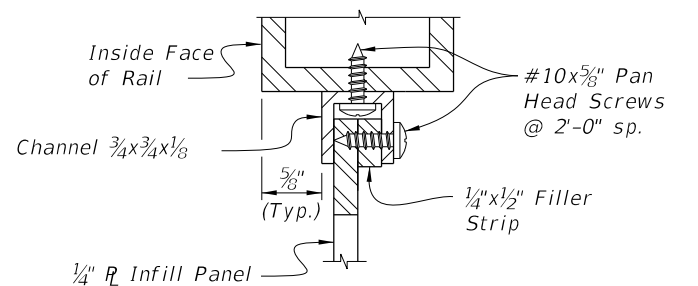
SECTION A-A



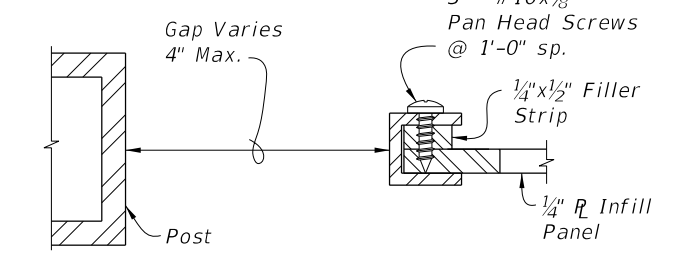
SECTION C-C PANEL/SPLICE CONNECTION



PANEL ADJUSTMENT FOR RAILINGS ON GRADES



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

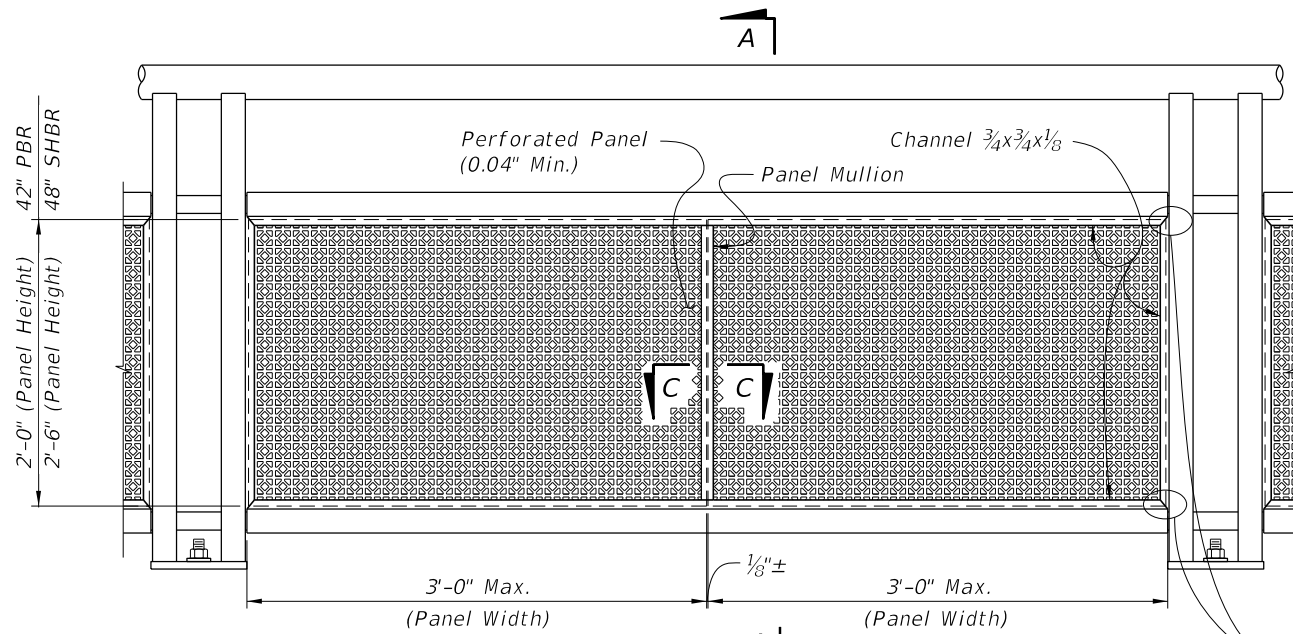


SECTION B-B PANEL END CAP

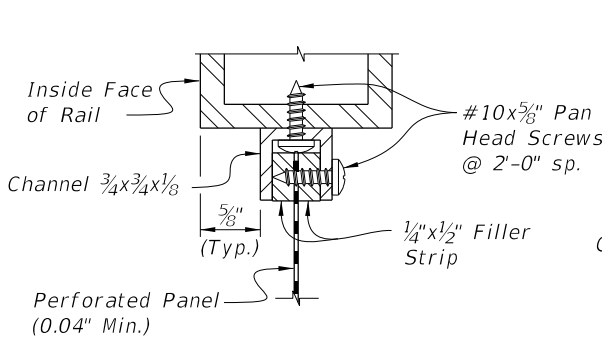
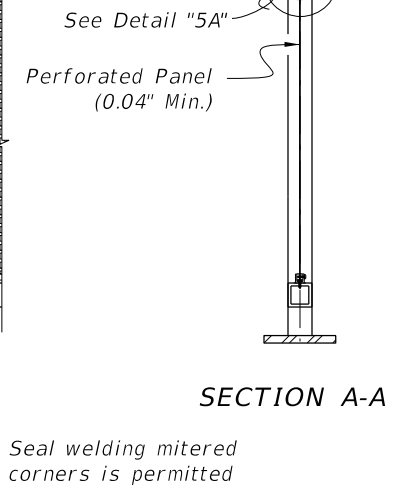
NOTES:
1. See Plans for Infill Panel Option required.

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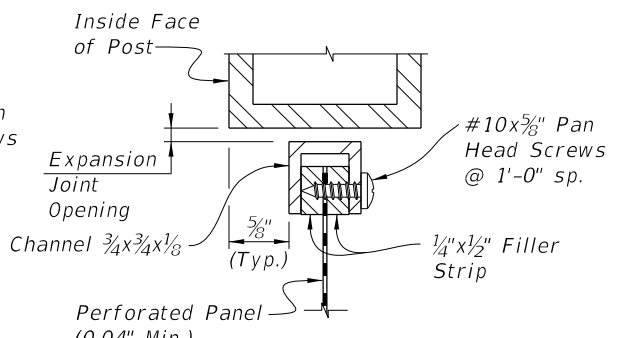
LAST REVISION 11/01/16	DESCRIPTION:	 FY 2019-20 STANDARD PLANS	PEDESTRIAN/BICYCLE RAILING (ALUMINUM)	INDEX 515-062	SHEET 7 of 9
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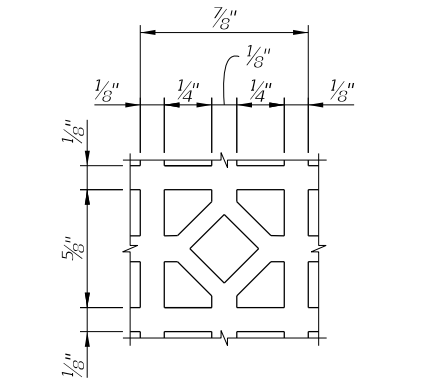
TYPE 5 - PERFORATED INFILL PANEL



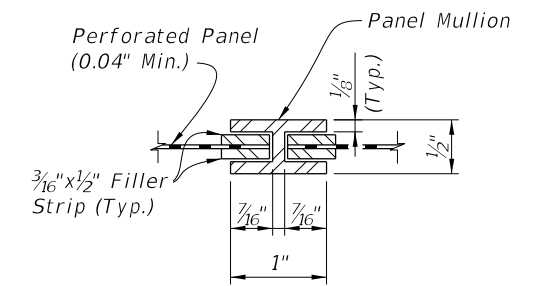
**DETAIL "5A"
PANEL/RAIL CONNECTION
(Top Shown, Bottom Similar)**



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



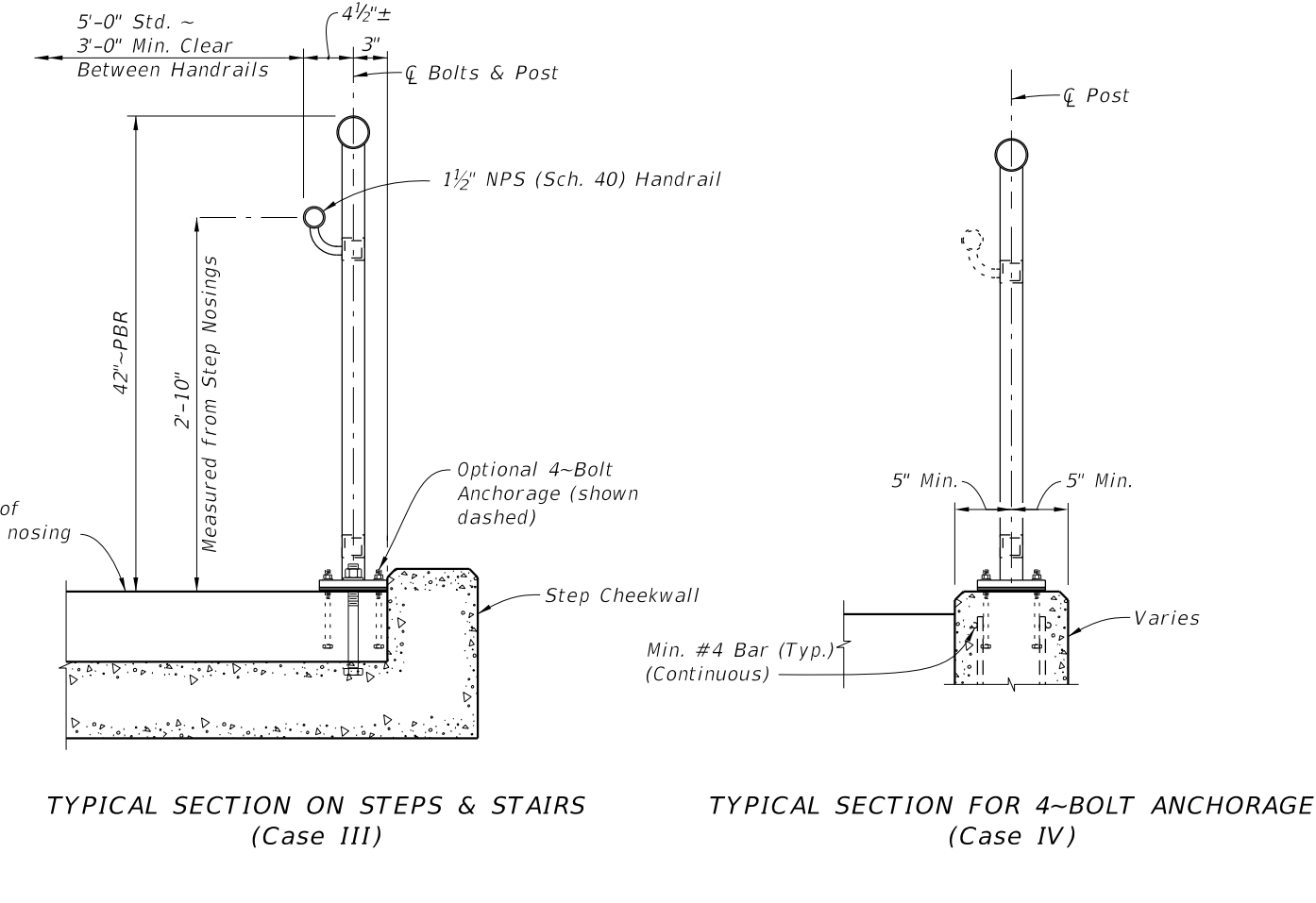
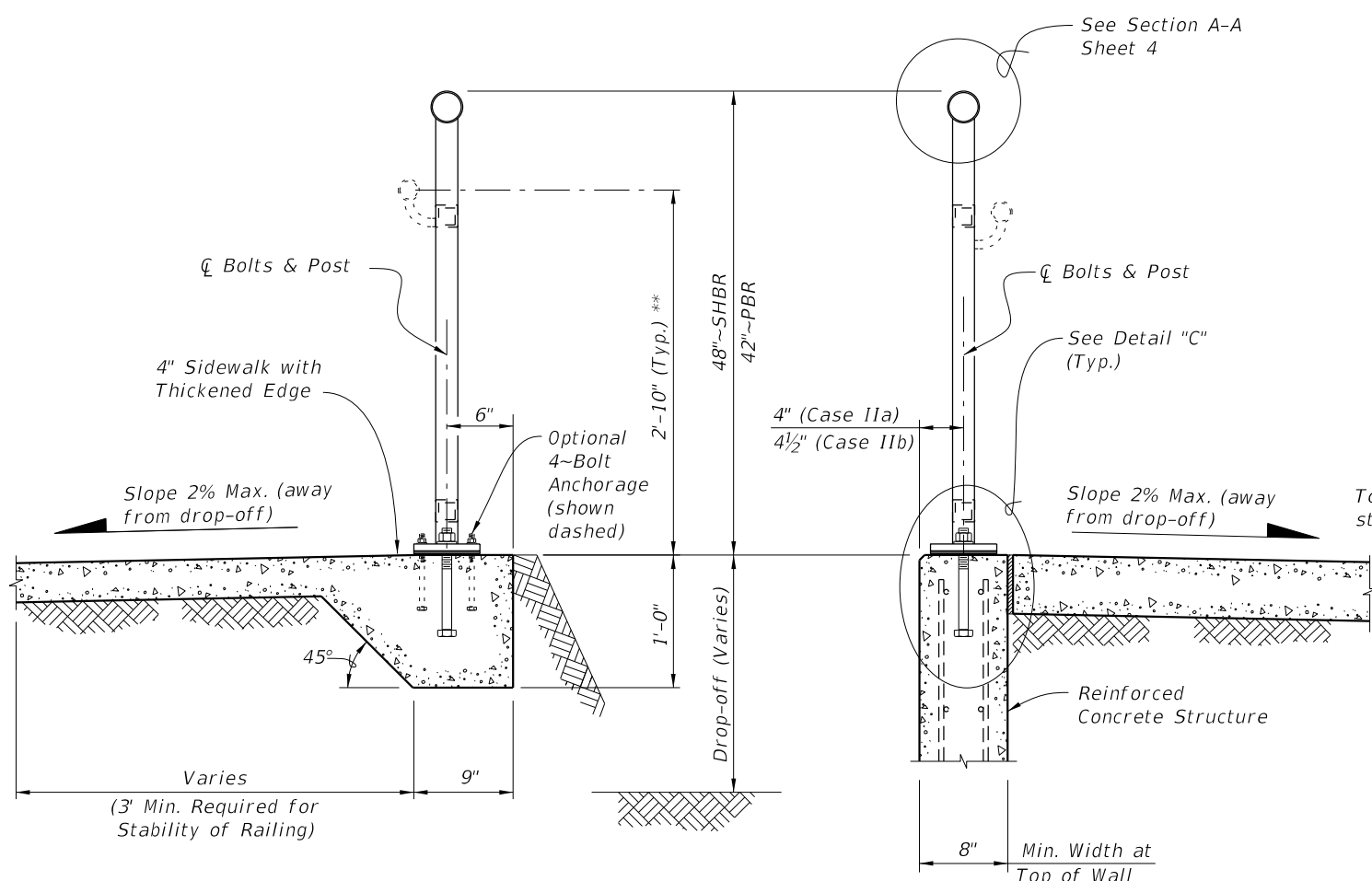
**REPEATING PATTERN DETAIL
FOR PERFORATED PANEL**



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

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LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2019-20 STANDARD PLANS	PEDESTRIAN/BICYCLE RAILING (ALUMINUM)	INDEX 515-062	SHEET 8 of 9
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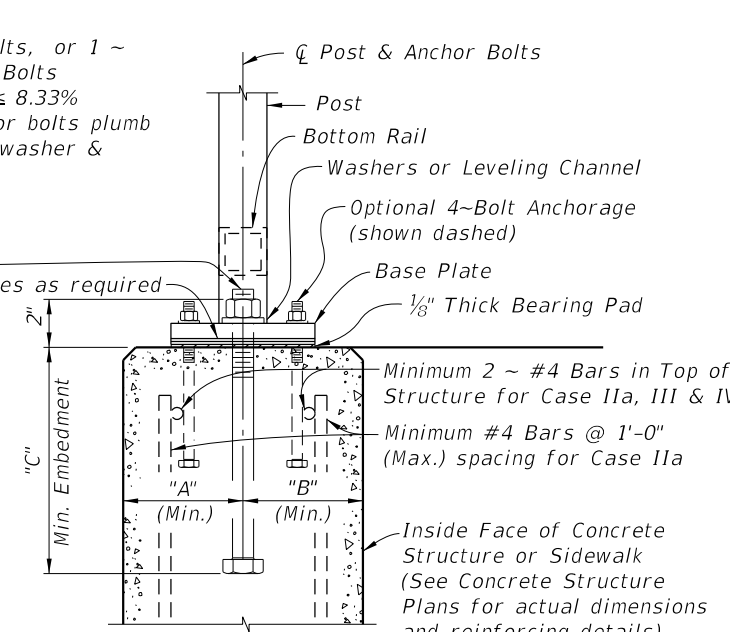
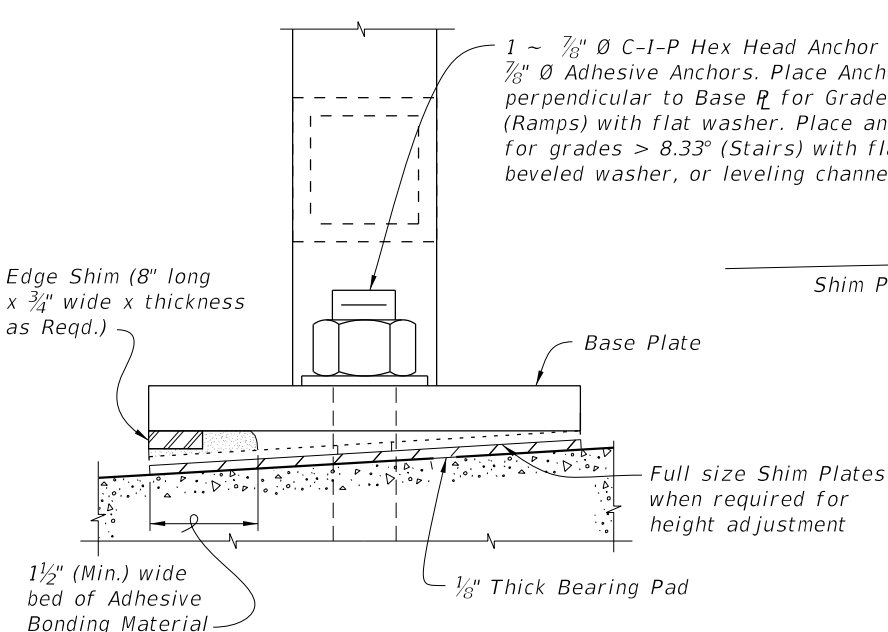


TYPICAL SECTION ON CONCRETE SIDEWALK (Case I)

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"	10 1/2"	11"	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	1'-0" *	1'-1 1/2"	1'-2"	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

* 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 (Typ.)

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