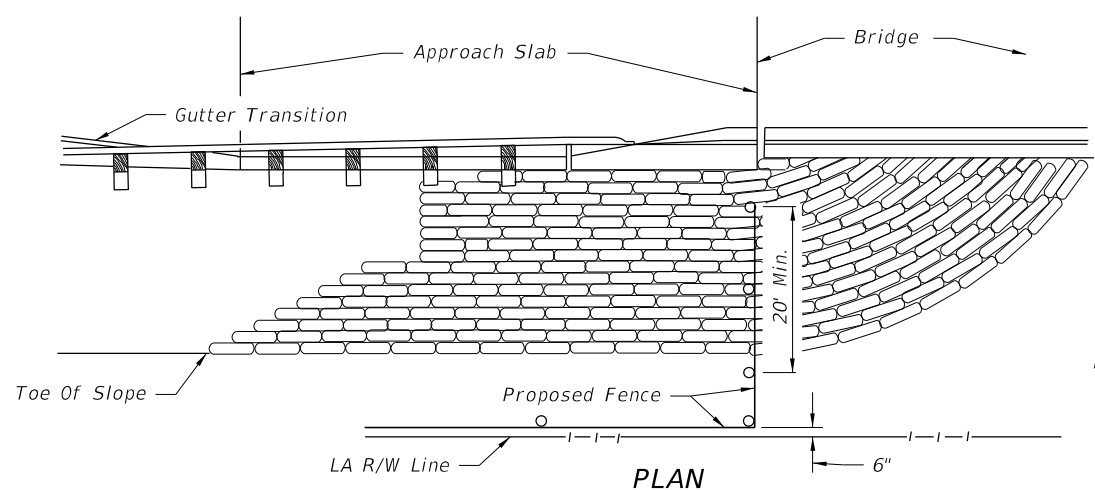
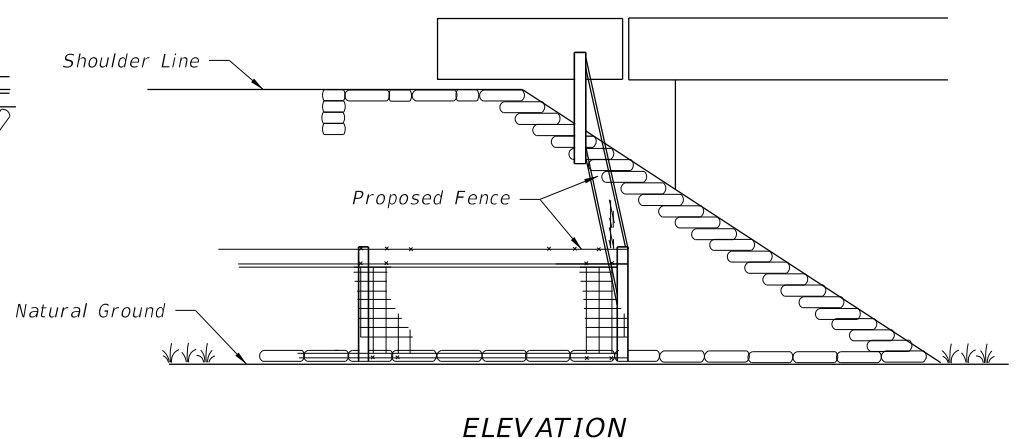


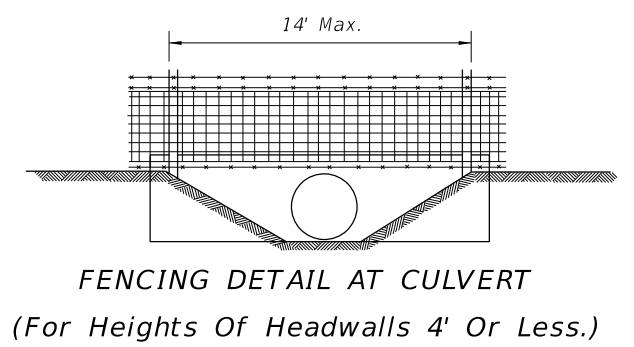
PLAN
(For Heights Of Headwall Greater Than 4')
FENCING TERMINALS AT BOX CULVERTS



FENCING TERMINALS AT BRIDGE ENDS
(STREAM CROSSING)



ELEVATION

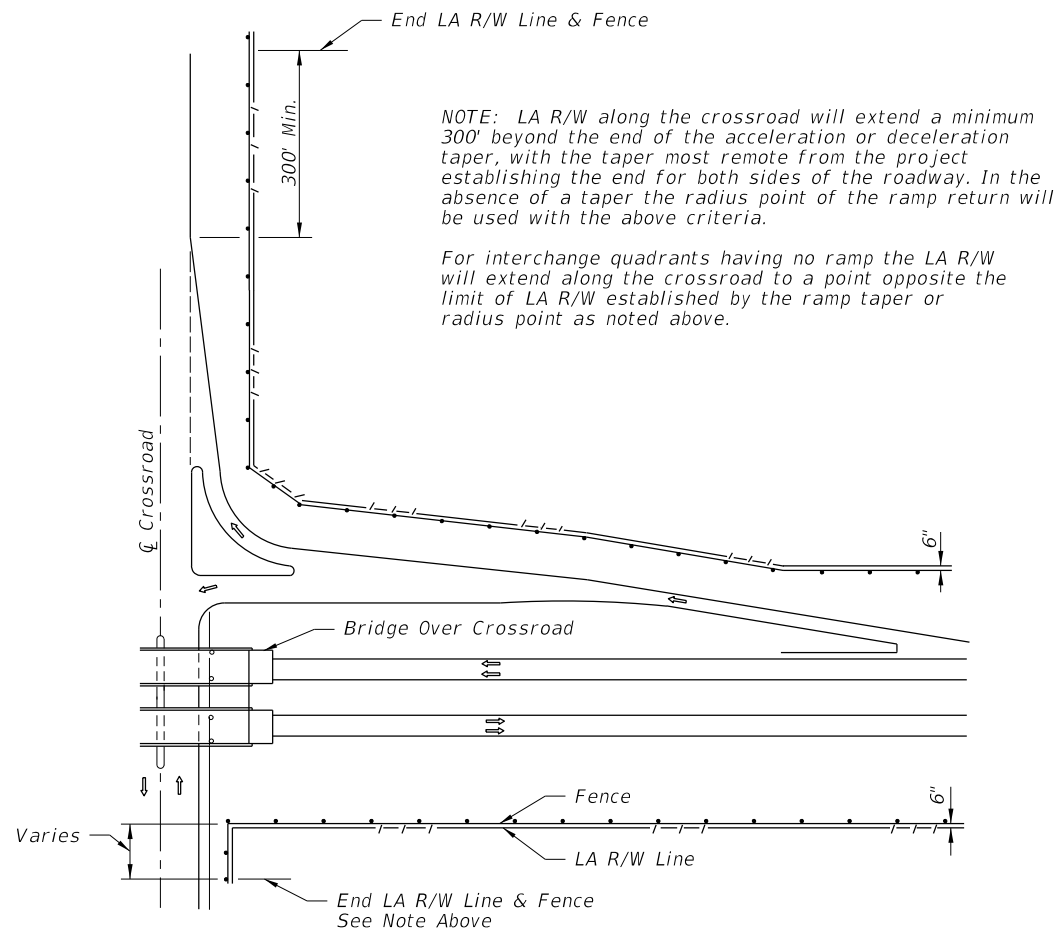


FENCING DETAIL AT CULVERT
(For Heights Of Headwalls 4' Or Less.)

Note: When height of headwall is 4' or less (drainage pipe 36" or less) the fence shall not be tied to the headwall, but shall span the lateral ditch.

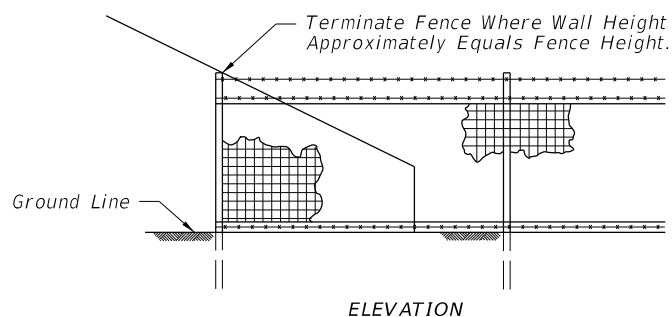
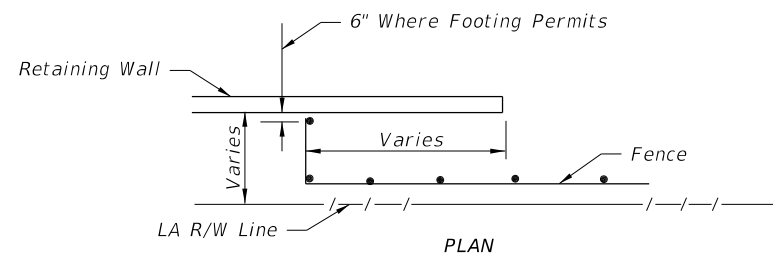
10/19/2016 9:54:33 AM

LAST REVISION 07/01/05	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	FENCE LOCATION	INDEX NO. 800	SHEET NO. 1 of 2
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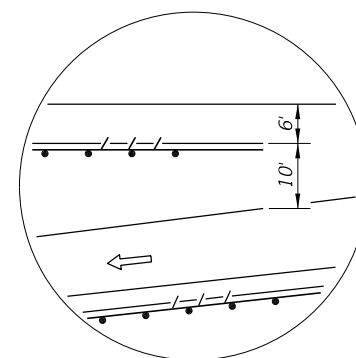


APPLIES TO BRIDGE OVER CROSSROAD AND CROSSROAD OVER FREEWAY (BRIDGE OVER CROSSROAD SHOWN)

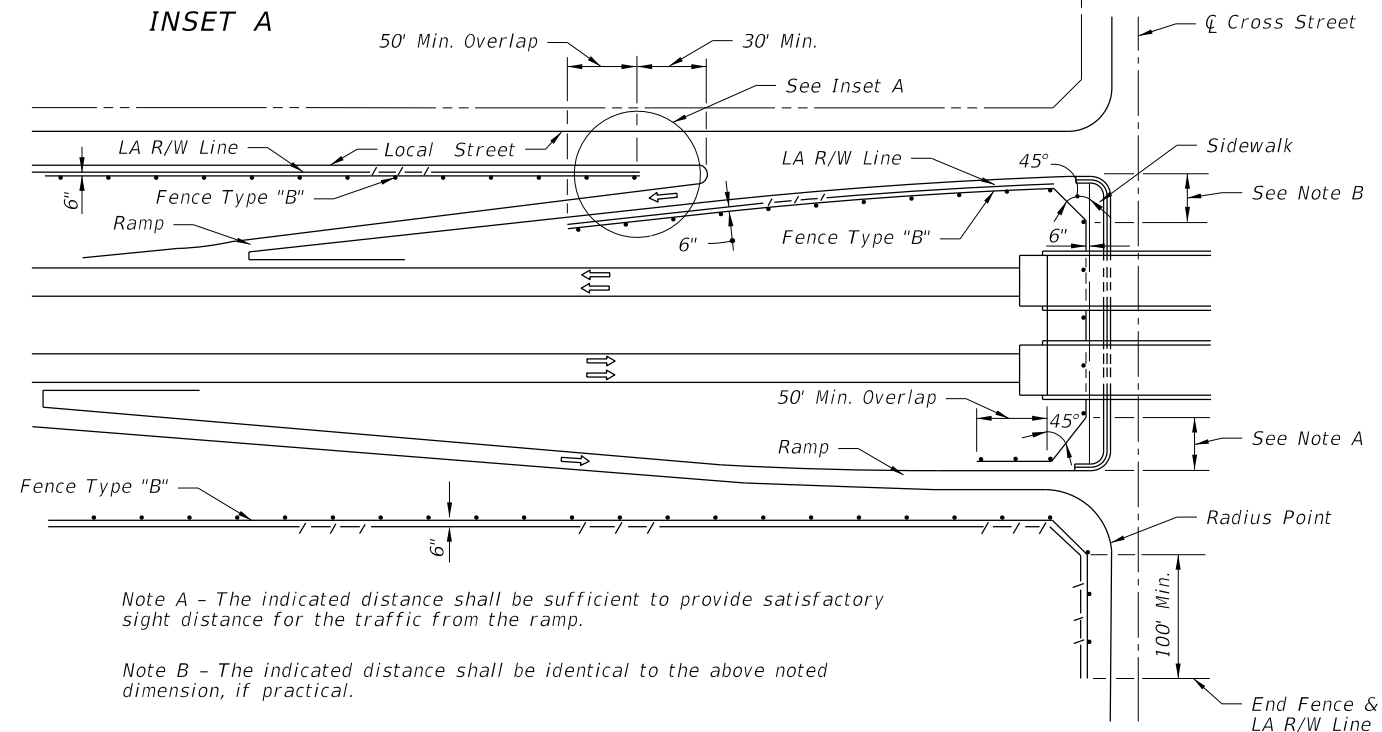
FENCING TERMINALS AT RURAL INTERCHANGES



FENCING TERMINALS AT RETAINING WALLS



INSET A




Note A - The indicated distance shall be sufficient to provide satisfactory sight distance for the traffic from the ramp.

Note B - The indicated distance shall be identical to the above noted dimension, if practical.

FENCING TERMINALS AT URBAN INTERCHANGES


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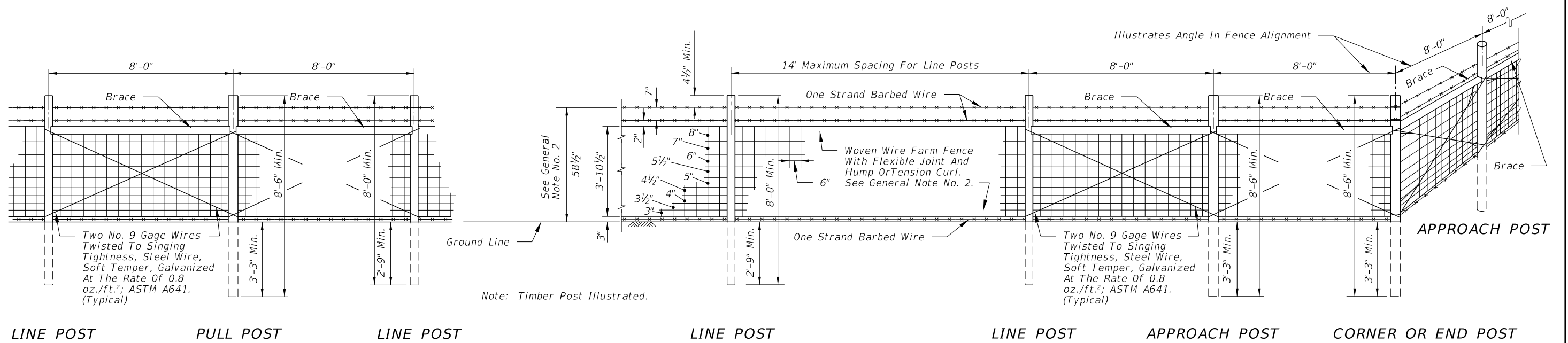
LAST REVISION 07/01/05	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	FENCE LOCATION	INDEX NO. 800	SHEET NO. 2 of 2
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GENERAL NOTES

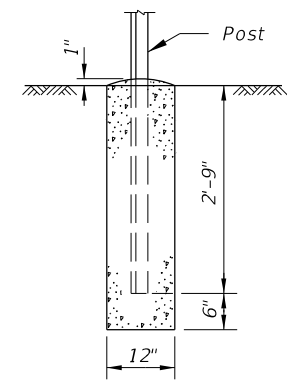
1. This fence to be provided generally in rural areas. For supplemental information see Section 550 of the FDOT Specifications.
2. Fabric shall be woven wire, either galvanized steel, meeting the requirements of ASTM A116, No. 9 Grade 60, Design Number 1047-6-9, with Class 3 zinc coating; No. 12 1/2 Grade 175, Design Number 1047-6-12 1/2, with a 10 1/2 gage top and bottom wire and with Class 3 zinc coating; or aluminum coated steel, meeting the requirements of ASTM A584, No. 9 Farm, Design Number 1047-6-9, with a minimum coating weight of 0.40 oz./ft.². For additional information see payment note below.
3. Fence shall be installed with wire side to private property except on horizontal curves greater than 3° the fence shall be installed so as to pull against all posts.
4. Posts may be either timber, steel, recycled plastic or concrete. Unless a specific post material is called for in the plans, the Contractor may elect to use either a single material or a combination of timber, steel, recycled plastic or concrete materials. Line posts of one material may be used with corner, pull and end post assemblies of a different material. Line posts of only one optional material and pull post assemblies of only one optional material will be permitted between corner and end post assemblies. Within individual corner and end post assemblies only one optional material will be permitted.
5. Timber posts shall meet the material requirements of Specification Section 954. Timber line posts are to be minimum 4" diameter. Timber corner, pull, approach and end posts are to be a minimum 5" diameter. Timber braces are to be minimum 4" diameter.
 - (A) Staples for line posts to be 1 1/4" minimum length; for approach, corner and pull posts 1 1/2" minimum length. At approach, corner and pull posts, staple every line wire in top half and alternate line wires in bottom half. Staples shall be driven diagonally across the line wire with the points in separate grains.
 - (B) Connections between timber posts and braces to be provided by dowels as shown in fastener details.
 - (C) Wire to be wrapped and tied, as shown in the splice details, at the following locations:
 - (a) All end posts, (b) Corner post, including the assemblies at vertical breaks of 15° or more and (c) Pull posts where the wire is not spliced and pulled through the assembly; see General Note 18.
6. Steel posts and braces shall be standard steel posts, galvanized at the rate of 2 oz./ft.², together with necessary hardware and wire clamps and meeting the following requirements:
 - (A) Line posts: 8' long; 1.33 lbs./ft.; roll formed studding; anchor plate attached, ASTM A702 (18 in.²).
 - (B) Approach posts: 2 1/2"x2 1/2"x1/4" angles, 8' long; fabricated for attaching brace; with necessary hardware, clamps, etc.
 - (C) Pull, end and corner posts: 2 1/2"x2 1/2"x1/4" angles, 8' long; fabricated for attaching brace; with necessary hardware, clamps, etc.
 - (D) Braces: 2"x2"x1/4" angles with necessary hardware and fabricated for attaching to post.
 - (E) The pull, corner, approach and end posts are to be set in concrete as per detail. (Also see General Note No. 15)
7. Recycled plastic posts shall meet the following material requirements: Line posts shall have a minimum section of 4" round or 4" square. Plastic posts shall not be used as corner, pull, end or approach posts unless such use is specifically detailed in the plans. The straightness of the post shall comply with 954-5 for timber post. The flexural strength shall meet the requirements of the latest edition of the Southern Pine Inspection Bureau's Standard Grading Rules for Southern Pine Lumber for No. 2SR Stress Rated Grade Timber. Plastic posts can be set by either digging and tamped backfill or by driving into full depth preformed holes 1/4" to 1/2" smaller than cross section of post. Staples for fabric and barbed wire connection to plastic line posts shall be the same size, count and location as that for timber posts.
8. The Contractor, at his option, may use any suitable precast or prestressed concrete posts; however, approval by the Engineer, of posts not shown on this index, will be required prior to construction of the fence. Precast posts shall be Class I concrete. Prestressed posts shall be Class III concrete. Lengths of concrete post to be as indicated for timber posts.
9. Aluminum post, braces and accessory framing hardware shall not be used unless the plans specifically detail their application or the Engineer specifically approves their incorporation in fence construction or repair. Aluminum framed gates are permitted as described in General Note 19.
10. The woven wire shall be attached to steel and concrete posts by a minimum of five tie wires. The single wire ties shall be applied to the top, bottom and three intermittent line wires. The ends of each tie wire shall have a minimum of two tight turns around the line wire. Tie wires shall be steel wire not less than 0.120" diameter, zinc coating Class 3, soft temper, in accordance with ASTM A641.
11. Steel Barbed Wire can be either of the following types:
 - Type I: This type shall conform to the requirements of ASTM A121, with two strands of 12 1/2 gage wire; four-point barbs, wire size 14 gage, twisted around both line wires; and, Class 3 coating, Design No. 12-4-5-14R.
 - Type IIA: This type same as Type I except the two strand wires are twisted in alternating directions between consecutive barbs.
 - Type IIB: This type shall conform to the requirements of ASTM A121 with two strands of 15 1/2 gage high tensile wire; four-point barbs, wire size 16 1/2 gage twisted around both line wires; and Class 3 coating, Design No. 15-4-5-16R.
 Aluminum Barbed Wire shall be fabricated of two strands of 0.110-inch wire with 0.08-inch diameter four-point barbs spaced at approximately 5 1/2", and at a maximum spacing of 6". The wire for the strands and for the barbs shall be of ASTM B211M Alloy 5052-H38 or equal.
12. The woven wire shall be stretched only until one-half the tension curl has been pulled out of the line wires.
13. Posts to be set by driving or digging. If by digging, the posts shall be set at the center of the hole and the soil tamped securely on all sides.
14. Longer posts than those indicated above may be required by the plans or for deeper installations.
15. Concrete bases for angular steel posts (pull, corner, end and approach) shall be Class NS as specified in Section 347. Materials for Class NS concrete may be proportioned by volume and/or by weight.
16. Pull post assemblies shall be installed at approximately 330' centers except that this maximum interval may be reduced by the Engineer on curves where the radius is less than 3°.
17. Corner post assemblies are to be installed at all horizontal and vertical breaks in fence of 15° or more.
18. A maximum length of 1320' of wire may be installed as a unit. For pulls through a pull post assembly the fabric shall be spliced by crimping sleeves only. Pulls through a corner post assembly will not be permitted.
19. Unless otherwise called for in the plans gates shall be commercially available metal swing gates assembled and installed in accordance with the manufacturer's specifications as approved by the Engineer. Chain link swing gates in accordance with Index No. 802 may be substituted for metal swing gates as approved by the Engineer. Gate size is full opening width whether single leaf or double leaves. Payment for gates shall include the gate, single or double, all necessary hardware for installation and any additional length and/or size for posts at the opening. Gates shall be paid for under the contract unit price for Fence Gates, EA.
20. For construction purposes, assemblies are defined as follows: End post assemblies shall consist of: one end post, one approach post, two braces, four diagonal tension wires and all necessary fittings and hardware. Pull post assemblies shall consist of: one pull post, two braces, four diagonal tension wires and necessary fittings and hardware. Corner post assemblies shall consist of: one corner post, two approach posts, four braces, eight diagonal tension wires and all necessary fittings and hardware.
21. All posts, braces, tension wires, fabric, tie wires, Class NS concrete, and all miscellaneous fittings and hardware to be included in the cost for Fencing, LF. Fencing shall be inclusive of the lengths of pull, end and corner post assemblies, but exclusive of gate widths.

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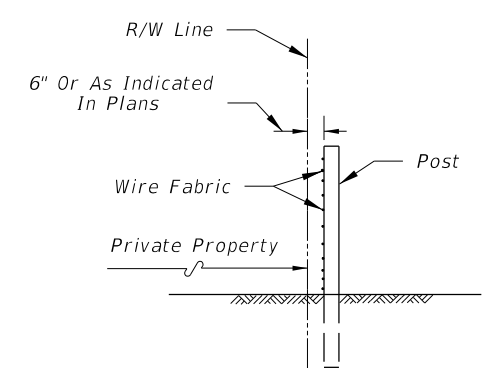
LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	FENCE TYPE A	INDEX NO. 801	SHEET NO. 1 of 3
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Note: Timber Post Illustrated.



(Pull, Corner, End And Approach Posts)
CONCRETE BASE FOR ANGULAR STEEL POST



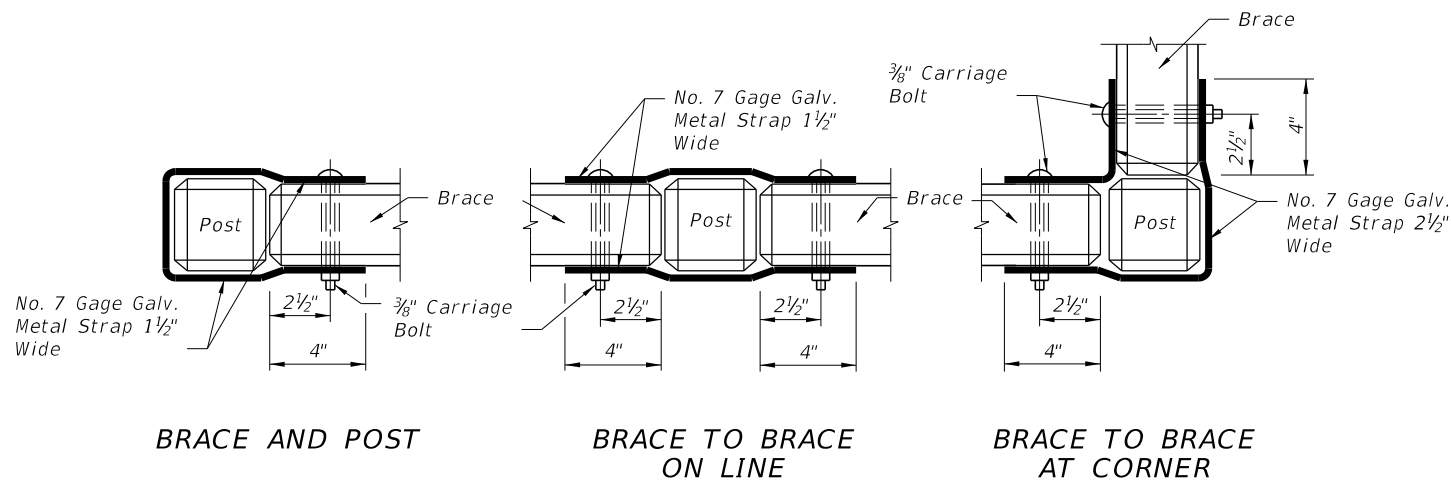
FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS
 (REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

DESIGN NOTE

This index details fencing that is constructed with farm fabric 46½" (47" nominal) in height and with specific ground clearance and specific barbed wire spacings. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.

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LAST REVISION 11/01/16	REVISION	DESCRIPTION:	FY 2017-18 DESIGN STANDARDS	FENCE TYPE A	INDEX NO. 801	SHEET NO. 2 of 3
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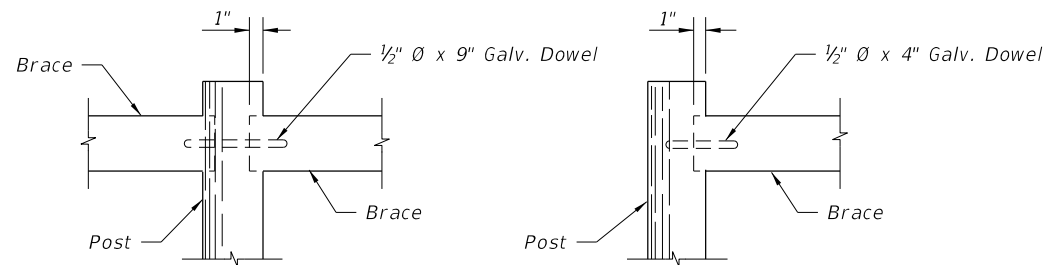


BRACE AND POST

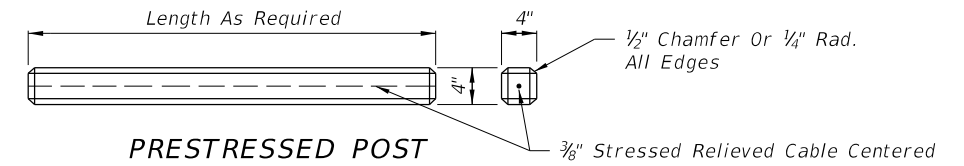
BRACE TO BRACE ON LINE

BRACE TO BRACE AT CORNER

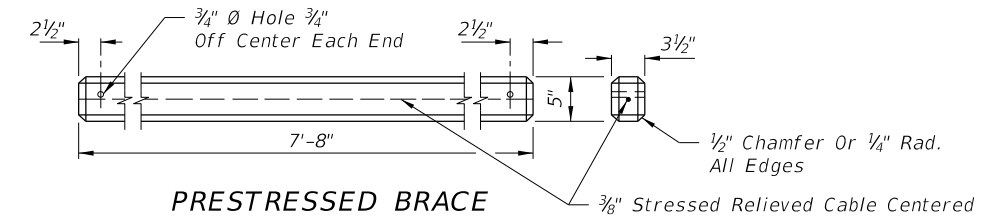
FASTENER FOR CONCRETE POST AND BRACES



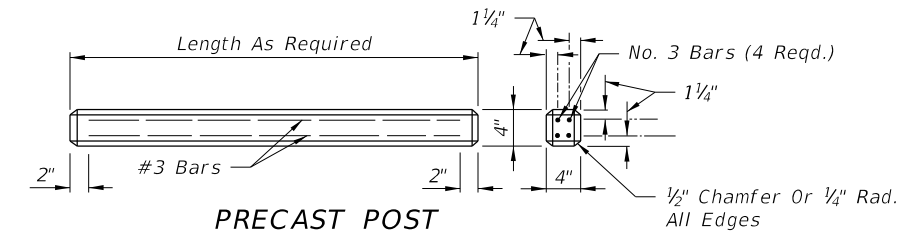
FASTENER FOR TIMBER POST AND BRACE



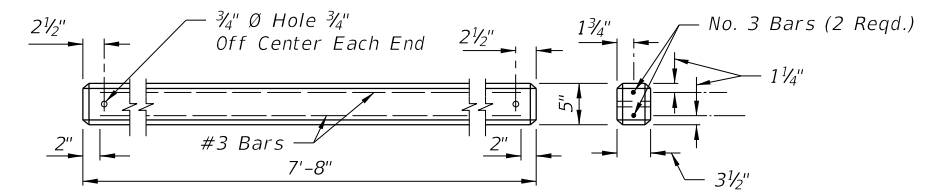
PRESTRESSED POST



PRESTRESSED BRACE

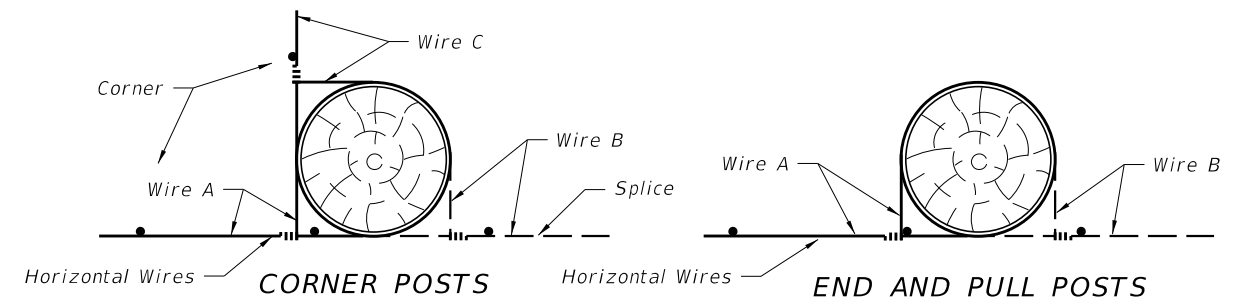


PRECAST POST



PRECAST BRACE

ALTERNATE CONCRETE POSTS AND BRACES




CORNER POSTS

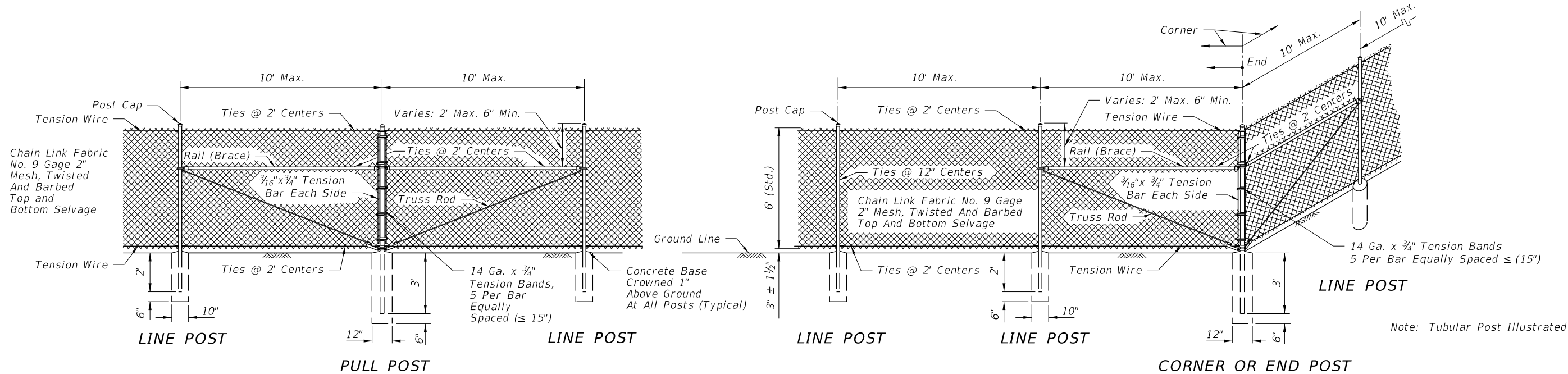
END AND PULL POSTS

Each horizontal wire to be wrapped around corner, end and pull posts and tied to same wire. See General Notes 5 and 17. Timber post illustrated. These methods also apply to steel and concrete post illustrations.

SPLICES

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LAST REVISION 07/01/05	REVISION DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	FENCE TYPE A	INDEX NO. 801	SHEET NO. 3 of 3
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GENERAL NOTES

1. This fence to be used generally in urban areas.
2. For supplemental information refer to Section 550 of FDOT Standard Specifications.
3. Chain link fabric, post, truss rods, tension wires, tie wires, stretcher bars, gates and all miscellaneous fittings and hardware shall meet the requirements of AASHTO and ASTM signify current reference.
4. Fence Component Options:
 - A. Line post options:
 - (1) Galvanized steel pipe, Schedule 40- 1 1/2" nominal dia. zinc galvanized at the rate of 1.8 oz./ft².: ASTM A53 Table 2 (Grade A or B), ASTM F1083, and AASHTO M111.
 - (2) Aluminum coated steel pipe: ASTM A53, Table 2 (Grade A or B): Schedule 40- 1 1/2" nominal dia., 1.90" OD; coated at the rate 0.40 oz./ft².: AASHTO M111.
 - (3) Aluminum alloy pipe- 2" nominal dia.: ASTM B241 or B221, Alloy 6063, T6.
 - (4) Steel H-Beam- 1 7/8" x 1 5/8": Zinc Galv. 1.8 oz./ft².: AASHTO M111 and Detail.
 - (5) Aluminum alloy H-Beam- 1 7/8" x 1 5/8" Detail.
 - (6) Steel C- 1 7/8" x 1 5/8": Galv.: 1.8 oz./ft² zinc: AASHTO M111; OR , 0.9 oz./ft² zinc-5% aluminum-mischmetal: ASTM F1043 and Detail.
 - (7) Resistance welded steel pipe; 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV (Alternative Design); fence industry 2" OD, 1 1/2" NPS, 1.900" dec. equiv., 0.120" min. wall thick. and min. wt. 2.28 lb./ft.; with ASTM F1043 metric equivalent internal coating Types A, B, C or D and external coating Types A, B, or C; the chromate conversion coating of external Type B shall have a thickness of 15µg/in². min. and the polymer film topcoat shall have a thickness of 0.0003" min.; internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.
 - B. Corner, end, and pull post options:
 - (1) Galvanized steel pipe, Schedule 40- 2" nominal dia. zinc galvanized at the rate of 1.8 oz./ft².: ASTM A53 Table X 2, ASTM F1083, and AASHTO M111.
 - (2) Aluminum coated steel pipe: ASTM A53 steel, X 2 Tables: Schedule 40; 2" nominal dia., 2.375" OD; coated at the rate 0.40 oz./ft².: AASHTO M111.
 - (3) Aluminum alloy pipe- 2 1/2" nominal dia.: ASTM B241 or B221, Alloy 6063, T6.
 - (4) Resistance welded steel pipe; 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV (Alternative Design); fence industry 2 1/2" OD, 2" NPS, 2.375" dec. equiv., 0.130" min. wall thick. and min. wt. 3.117 lb./ft.; with ASTM F1043 metric equivalent internal coating Types A, B, C or D and external coating Types A, B, or C; the chromate conversion coating of external Type B shall have a thickness of 15µg/in². min. and the polymer film topcoat shall have a thickness of 0.0003" min.; internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.

- C. Rail options:
 - (1) Galvanized steel pipe, Schedule 40- 1 1/4" nominal dia. zinc galvanized at the rate of 1.8 oz./ft².: ASTM A53 Table X 2, ASTM F1083, and AASHTO M111.
 - (2) Aluminum coated steel pipe; ASTM A53 steel, X 2 Tables Schedule 40; 1 1/4" nominal dia., 1.660" OD; coated at the rate 0.40 oz./ft².: AASHTO M111.
 - (3) Aluminum alloy pipe- 1 1/4" nominal dia.: ASTM B241 or B221, Alloy 6063, T6.
 - (4) Resistance welded steel pipe; 50,000 psi min. yeild strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV (Alternative Design); fence industry 1 3/8" OD, 1 1/4" NPS, 1.660" dec. equiv., 0.111" min. wall thick. and min. wt. 1.836 lb./ft.; with ASTM F1043 metric equivalent internal coating Types A, B, C or D and external coating Types A, B, or C; the chromate conversion coating of external Type B shall have a thickness of 15µg/in². min. and the polymer film topcoat shall have a thickness of 0.0003" min.; internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.
- D. Chain link fabric options (2" mesh with twisted and barbed selvage top and bottom for all options except as described in Note No. 10):
 - (1) AASHTO M181 Type I - Zinc Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 1.8 oz./ft². (M181 Class D 2.0 oz./ft². modified to 1.8 oz./ft²).
 - (2) AASHTO M181 Type II - Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft².
 - (3) AASHTO M181 Type IV- Polyvinyl Chloride (PVC) Coated Steel, No. 9 guage (coated core wire diameter), core wire-zinc coated steel. PVC coating: M181 Class A (either extruded or extruded and bonded) or Class B (bonded). See table right. Unless the plans call for M181 standard colors medium green, dark green or black the coating color shall be soft gray matching that of No. 36622 of Federal Standard 595a.
- E. Tension wire options:
 - (1) Steel wire No. 7 gage zinc galvanized at the rate of 1.2 oz./ft².: AASHTO M181.
 - (2) Aluminum alloy wire with a diameter of 0.1875" or larger conforming to the requirements of ASTM B211, Alloy 5056 Temper H38, or, Alclad Alloy 5056 Temper H192.
 - (3) Aluminum coated steel wire No.7 gage coated at the rate of 0.040 oz./ft².: AASHTO M181.
- F. Tie wire and hog ring options:
 - (1) Steel wire No.9 gage zinc galvanized at the rate of 1.2 oz./ft².
 - (2) Aluminum alloy wire with a diameter of 0.1443" or larger conforming to the requirements of ASTM B211, Alloy 5056 Temper H38, or, Alclad Alloy 5056 Temper H192.
 - (3) Aluminum coated steel wire No. 7 gage coated at the rate of 0.040 oz./ft².

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GENERAL NOTES CONTINUED

5. Unless a specific material is called for in the plans the Contractor may elect to use either a single type of material or a combination of material types from the component options listed in note 4. Combinations of optional materials are restricted as follows:
 - (a) Only one fabric optional material will be permitted between corner and/or end post assemblies.
 - (b) Only one line post optional material will be permitted between corner and/or end post assemblies.
 - (c) Pull post assemblies shall be optional materials identical to either the linepost optional material or the corner and end post assembly optional material; but, pull post assemblies shall be the same optional material between any set of corner and/or end post assemblies.
6. Concrete for bases shall be Class NS concrete as specified in Section 347 of the Standard Specifications or a packaged, dry material meeting the requirements of a concrete under ASTM C-387. Materials for Class NS concrete may be proportioned by volume and/or by weight.
7. Line post shall be 8'-6" long (Standard). Line post are to be set in concrete as described above or by the following methods:
 - (a) In accordance with special details and/or as specifically described in the contract plans and specifications.
 - (b) In accordance with ASTM F567 Subsections 5.4 through 5.10 as approved by the Engineer. Line post installed in accordance with Section 5.8 shall be 9'-6" long.
 - (c) Post mounted on concrete structure or solid rock shall be mounted in accordance with the base plate detail "Fence Mounting On Concrete Endwalls And Retaining Wall", Sheet 3; or, by embedment in accordance with ASTM F567 Subsection 5.5.

End, pull and corner post assemblies shall be in concrete as detailed above for all soil conditions other than solid rock. Post within assemblies that are located on concrete structures or solid rock shall be set by base plate or by embedment as prescribed under (b) above for line post.


Line and assembly posts for 6' fence which must be lengthened due to a variation in the normal ground clearance, shall be set an additional 3" in depth for each 1' of additional ground clearance.
8. Pull post shall be used at breaks in vertical grades of 15° or more, or at approximately 350' centers except that this maximum interval may be reduced by the Engineer on curves where the curve is greater than 3°.
9. Corner post are to be installed at all horizontal breaks in fence at 15° or more and as required at vertical breaks over 15° as determined by the Engineer.
10. When fence has an installed top of fabric height less than 6' knuckled top and bottom selvages shall be used unless the plans specifically identify locations for twisted selvage fabrics.
11. Unless sliding gates or special gates are called for in the plans, all gates shall be chain link swing gates meeting the material requirements described and as approved by the Engineer. Payment shall include the gates, single or double, all necessary hardware for installation and any additional length and/or size for posts at the opening. Gates shall be paid for under the contract unit price for Fence Gates, EA.
12. For construction purposes corner post assemblies shall consist of one corner post, two braces, two truss rods, and all necessary fittings and hardware as detailed. End post assemblies shall consist of one end post, one brace, one truss rod and all necessary fittings and hardware as detailed.
13. In areas where there are physical constraints outside the right-of-way which restricts the fence construction, the fabric may be installed on the inside of the posts..

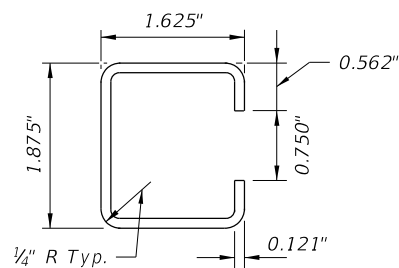
TYPE IV VINYL COATED FABRIC								
AASHTO M181 Table 4 Redefined As Follows								
Specified Diameter Of Metallic Coated Core Wire		Minimum Weight Of Zinc Coating		PVC Thickness Range				
				M181 Class A (Extruded Or Extruded And Bonded Coating)		M181 Class B (Bonded Coating)		
in.	mm	gage	oz./ft ² .	g/m ²	in.	mm	in.	mm
0.148	3.77	9	0.30	92	0.015 to 0.025	0.38 to 0.64	0.006 to 0.010	0.15 to 0.25

DESIGN NOTE

This index details fencing that is constructed with chain link fabric 6' (nominal) in height and with specific ground clearance. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.

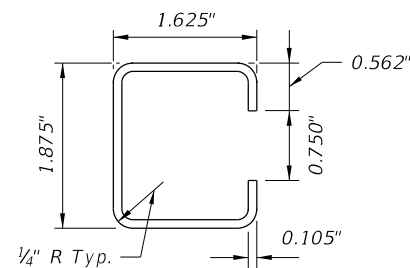
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LAST REVISION 07/01/09	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	FENCE TYPE B	INDEX NO. 802	SHEET NO. 2 of 3
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Galv. Wt. Per. Ft. = 2.34# ±5%
Yield PSI (Min.) 45,000

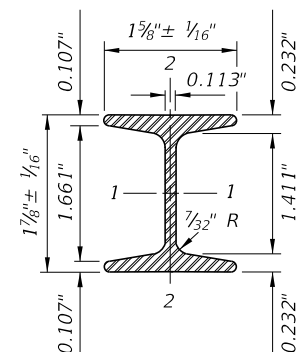
STANDARD WALL



Galv. Wt. Per. Ft. = 1.85# ±5%
Yield PSI (Min.) 45,000

THINWALL

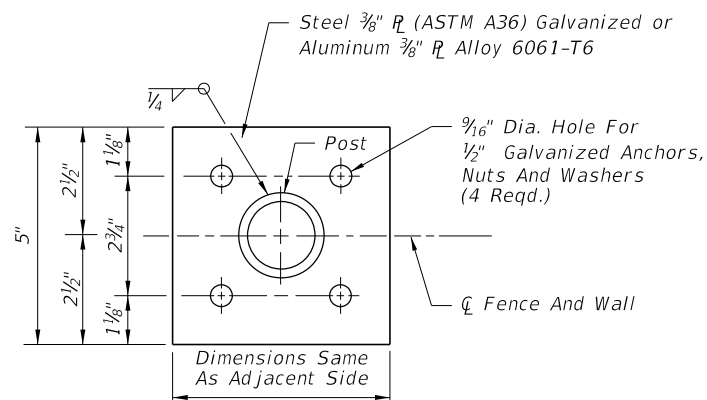
OPTIONAL "C" LINE POST



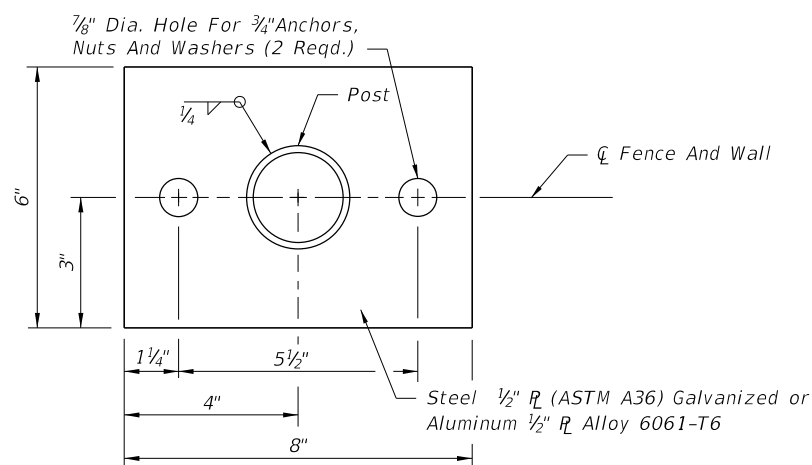
	STEEL	ALUMINUM
Area (Sq. In.)	724	724
Weight (Lb./Ft.)	2.72 ± 5% (Galv.)	0.91 ± 5%
Surface Area (SF/Ft.)	0.776	0.776
Tensile Strength (psi Min.)	80,000	30,000
Yielding Point (psi Min.)	48,000	25,000

	Axes		Axes	
	1-1	2-2	1-1	2-2
Moment Of Inertia	0.428	0.101	0.428	0.101
Section Modulus	0.456	0.124	0.456	0.124
Rad. Of Gyration	0.779	0.373	0.779	0.373

OPTIONAL 1 7/8" x 1 5/8" H-BEAM LINE POST

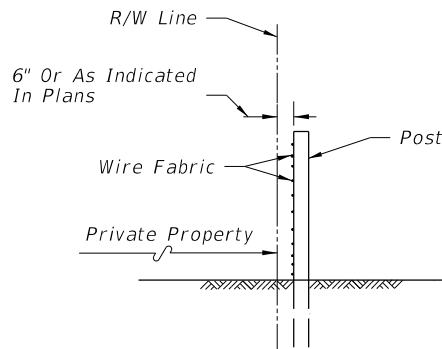


TOP VIEW
FOUR ANCHOR PLATE OPTION



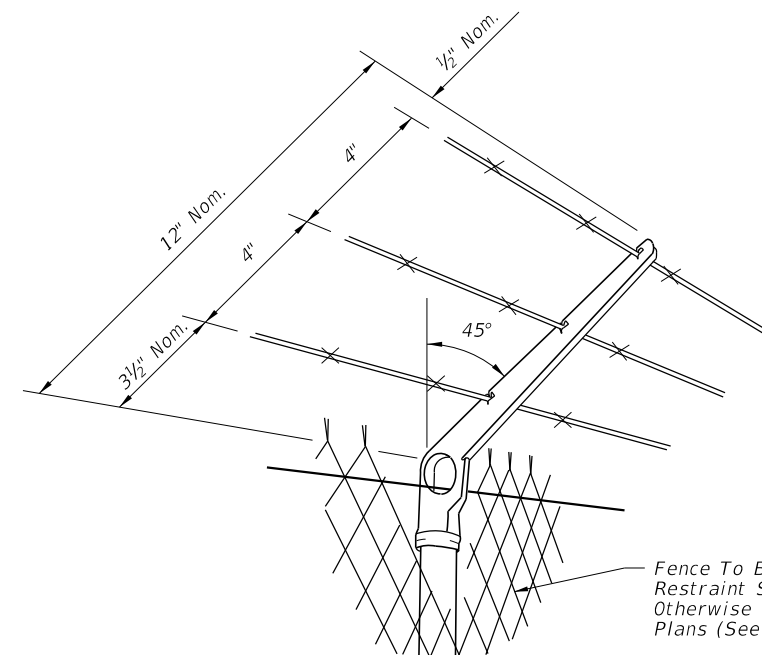
TOP VIEW
TWO ANCHOR PLATE OPTION

FENCE MOUNTING ON CONCRETE ENDWALL AND RETAINING WALLS



FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)



Fence To Be Mounted On Restraint Side Unless Otherwise Called For In Plans (See Notes)

NOTES

Attachments to be used only when called for in the plans. Attachments to extend in direction of restraint. Unless otherwise called for in plans, direction of restraint will be as follows:

- Outward on limited access right of way line.
- Outward on controlled access right of way line.
- Outward from utilities and hazardous facilities located within highway right of way.
- Outward from lateral ditches, outfalls, retention basins, canals, borrow areas and similar support facilities.
- Inward on pedestrian ways.

The cap-arm shall be designed to provide a drive fit over the top of posts and to exclude moisture in posts with tubular sections.

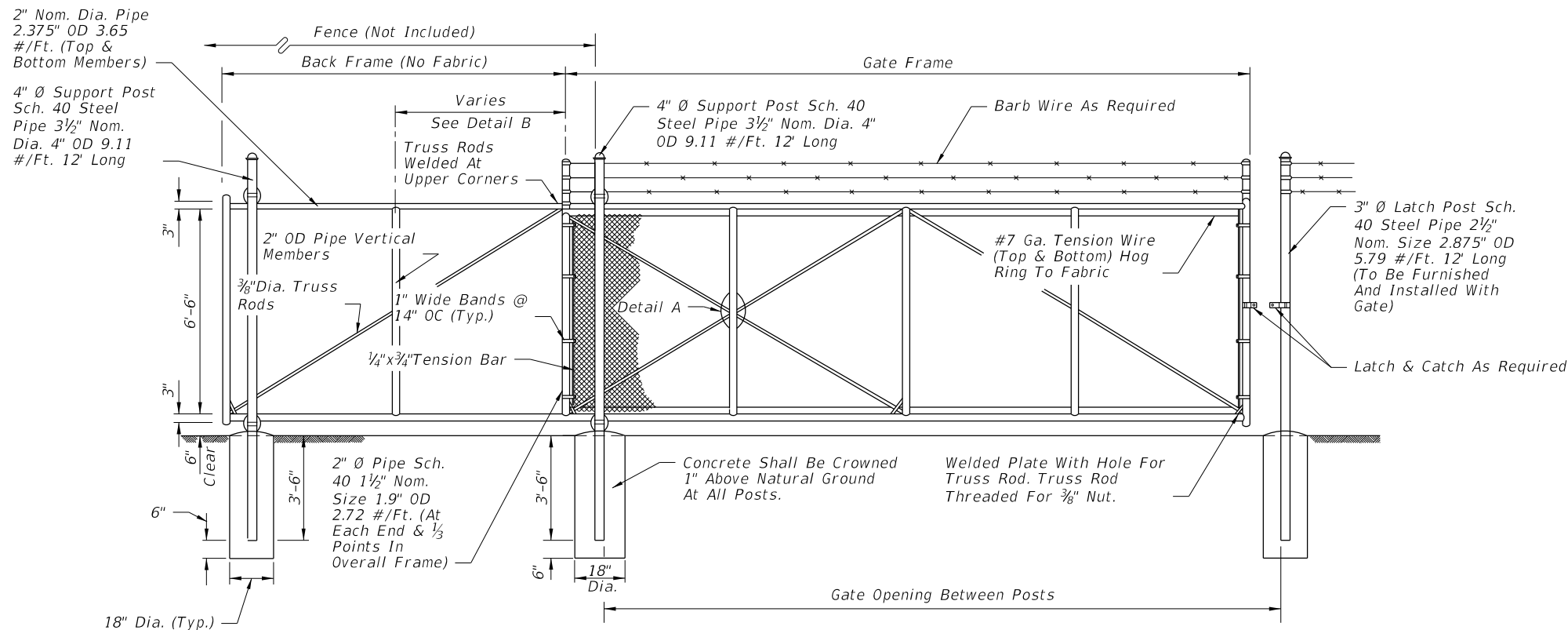
BARB WIRE ATTACHMENT

BASE PLATE AND ANCHOR NOTES:

- Base plate identical for line, pull, end and corner posts and shall be considered an integral part of the respective posts for basis of payment.
- Post to be plumbed by grout shim under base plate.
- Anchors (Galvanized Steel):
12" Cast In Place, 10 1/2" Embedment:
Headed Bolts, U-Bolts or Cluster Plates.
8" Adhesive Anchors, 6" Min. Embedment.*
*Adhesive anchors shall be headless anchor bolts set in drilled holes with an Adhesive Material System in accordance with Specification Sections 416 and 937; drilled holes shall be 1/8" larger in diameter than the anchor bolt.
Expansion Bolts Not Permitted.

10/19/2016 10:00:37 AM

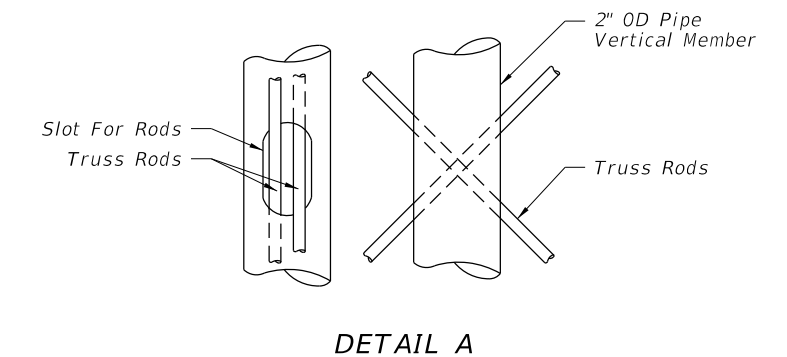
LAST REVISION 07/01/09	DESCRIPTION:	FDOT FY 2017-18 DESIGN STANDARDS	FENCE TYPE B	INDEX NO. 802	SHEET NO. 3 of 3
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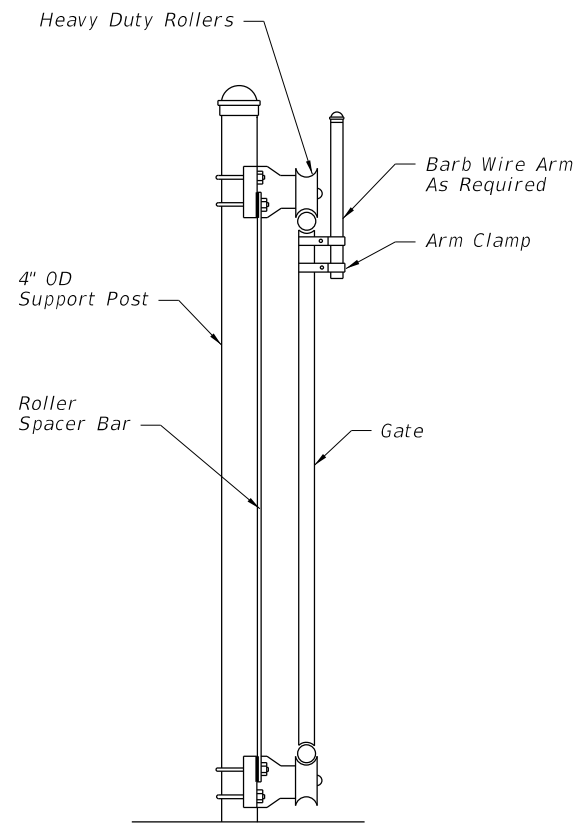
FRONT ELEVATION

GENERAL NOTES

- Extruded, rolled or formed components that provide equal strength and stability may be used in lieu of the pipe components shown; and, internal rollers may be used in lieu of the external roller units shown.
Gate components shall meet or exceed the protective coatings specified on Index No. 802.
- Steel gate frame shall be fabricated prior to galvanizing, except that truss rods may be fabricated following frame galvanizing provided surfaces damaged during welding are galvanized in accordance with Section 24 of AASHTO M36; or, fabricated from pipe components with protective coating meeting the requirements of Index No. 802 that are tolerant of welding (low burn back), and a protective coating applied to the weld and damaged pipe surfaces that is equivalent to the protective coating of the fabricated pipe stock.
- All fabric shall be knuckled top and bottom selvages.
- Concrete for bases shall be either Class NS concrete as specified in Section 347 of the Standard Specifications or a packaged, dry material meeting the requirements of a concrete under ASTM C-387. Materials for Class NS concrete may be proportioned by volume and/or by weight.
- Cost of all gate components shall be included in the contract unit price for Sliding Fence Gate (Cantilever), EA.

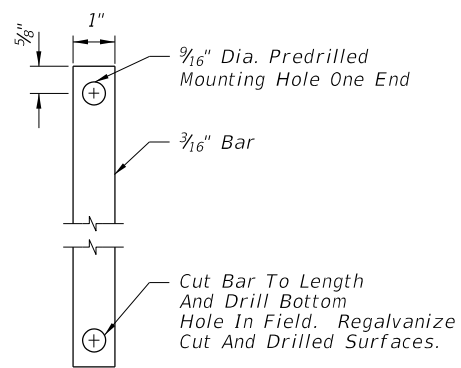


DETAIL A

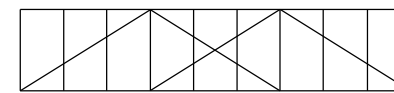


SUPPORT POST DETAIL

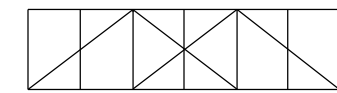
GATE OPENING	GATE FRAME	BACK FRAME
12'	12'-3"	6'
16'	16'-3"	8'
20'	20'-3"	10'
24'	24'-3"	12'



ROLLER SPACER BAR



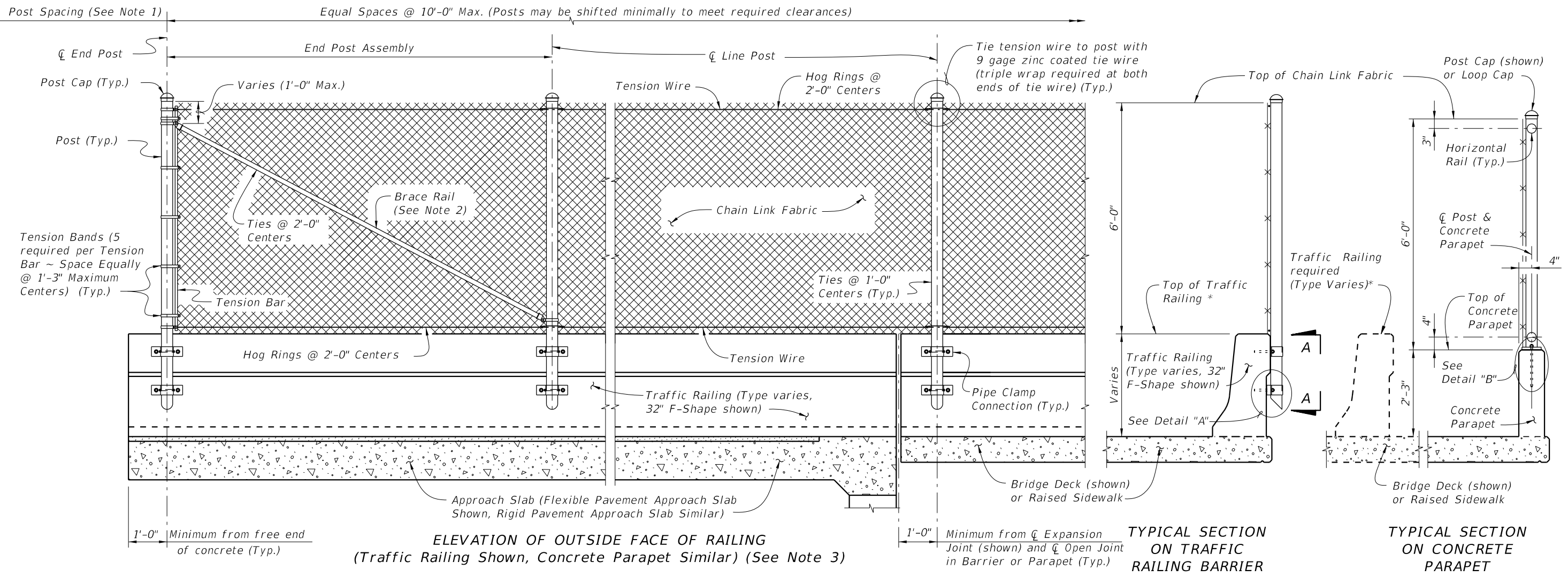
TYPICAL FRAME - 24' Opening



TYPICAL FRAME - 12', 16' & 20' Opening

DETAIL B

10/19/2016 10:00:57 AM



NOTES:

1. A Pull Post Assembly is required at maximum intervals of 500'-0". See Sheet 3.
2. Brace rails are only required for vertical fence installations on Traffic Railing.
3. Provide horizontal rails for vertical fence installations on Concrete Parapets in lieu of tension wire. Locate horizontal rails as shown in the Typical Section for Concrete Parapets at right.

* Do not anchor fencing to the top of Traffic Railings.

FENCING NOTES

FENCE INSTALLATION:

Install posts plumb (within a tolerance of $\pm 1\frac{1}{2}$ "). Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.

TRAFFIC RAILING DETAILS:

See Superstructure Sheets for Traffic Railing Barrier details.

CONCRETE PARAPET DETAILS:

See Index 820 - Pedestrian/Bicycle Railing for Concrete Parapet details. Provide fencing in lieu of aluminum bullet railing as shown on Index 820.

LIMITS OF FENCING:

Limits of fencing are from begin of approach slab at Begin Bridge to end of approach slab at End Bridge, unless otherwise shown in the plans.

PAYMENT:

Payment will be made under Fencing, Type R. Payment includes posts, horizontal and expansion rails, brace rails and bands, rail ends, combination rail ends, boulevard clamps, chain link fabric, tension wire, ties, hog rings, tension bars and bands, post and loop caps, pipe clamps, base plates, anchor rods, bolts, nuts, washers, shim plates, spacers, neoprene pads, miscellaneous fence fittings and hardware and all incidental materials and labor required to complete installation of the fence.

CROSS REFERENCE:

- For Table of Fence Components, Table of Post Attachment Components, View A-A and Detail "A" see Sheet 2.
- For Pull Post Assembly Detail for Traffic Railing Barriers see Sheet 3.
- For Pull Post Assembly Detail for Concrete Parapets and Detail "B" see Sheet 4.

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LAST REVISION 01/01/12	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	BRIDGE FENCING (VERTICAL)	INDEX NO. 810	SHEET NO. 1 of 4
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TABLE OF CHAIN LINK FENCE COMPONENTS

COMPONENT		ASTM DESIGNATION	COMPONENT INFORMATION
Traffic Railing Barriers and Concrete Parapets	Posts	F1083	Galvanized Steel Pipe - 3" NPS, Schedule 40 Regular Grade
	Chain Link Fabric (2" mesh with twisted top and knuckled bottom selvage)	A392	Zinc Coated Steel - 9 gage (coated wire diameter), Class 2 Coating
		A491	Aluminum Coated Steel - 9 gage (coated wire diameter)
		F668	Polyvinyl Chloride (PVC) Coated Steel - 9 gage Class 2b
	Tie Wires	F626	Zinc Coated Steel Wire - 9 gage
	Brace Bands	F626	12 Gage (Min. thickness) x 3/4" (Min. width) Steel Bands (Beveled or Heavy)
	Tension Bars	F626	3/16" (Min. thickness) x 3/4" (Min. width) x 5'-10" (Min. height) Steel Bars
	Tension Bands	F626	14 Gage (Min. thickness) x 3/4" (Min. width) Steel Bands
Miscellaneous Fence Components	F626	Zinc Coated Steel ~ (includes post or loop caps, horizontal and brace rail ends, combination rail ends, boulevard clamps and all other miscellaneous fittings & hardware)	
Concrete Parapets	Horizontal Rails	F1083	Galvanized Steel Pipe - 2 1/2" NPS, Schedule 40 Regular Grade
	Expansion Rails	F1083	Galvanized Steel Pipe - 2" NPS, Schedule 40 Regular Grade
	Bolts	A307	1/4" Ø x 4 1/4" Hex Head Bolts for Expansion Rail Connections
	Nuts	A563	Hex Nuts for Expansion Rail Connections
	Washers	F436	Flat Washers for Expansion Rail Connections
Traffic Railing Barriers	Tension Wire	A824 & A817	Type II (Zinc Coated Steel Wire) - 7 gage, Class 4 Coating Type I (Aluminum Coated Steel Wire) - 7 gage
	Hog Rings	F626	Zinc Coated Steel Wire - 12 gage
	Brace Rails	F1083	Galvanized Steel Pipe - 1 1/4" NPS, Schedule 40 Regular Grade

TABLE OF POST ATTACHMENT COMPONENTS

COMPONENT		ASTM DESIGNATION	COMPONENT INFORMATION
Pipe Clamps		A36 or A709 Grade 36	1/4" Steel R
Base Plates		A36 or A709 Grade 36	3/4" Steel R
Shim Plates		A36 or A709 Grade 36 or B209 Alloy 6061-T6 or B221 Alloy 6063-T5	Plate thicknesses as required; Holes in shim plates will be 3/4" Ø
Spacers		-	1 1/4" R for all materials
Pipe Clamp Connection	Adhesive Anchor Rods	F1554 Grade 36	Fully threaded Headless Anchor Rods ~ 5/8" Ø x 6" (no spacer) or 5/8" Ø x 7 1/4" (with spacer)
	C-I-P Anchor Rods	F1554 Grade 36	Hex Head Anchor Rods ~ 5/8" Ø x 6" (no spacer) or 5/8" Ø x 7 1/4" (with spacer)
Base Plate Connection	Adhesive Anchor Rods	F1554 Grade 36	Fully threaded Headless Anchor Rods ~ 7/8" Ø x 14 1/2"
	C-I-P Anchor Rods	F1554 Grade 36	Hex Head Anchor Rods ~ 7/8" Ø x 14 1/2"
Bolts		A307	3/8" Ø x 4 3/4" Hex Head Bolts for Pipe Clamp Connections to Posts
Nuts		A563	Hex Nuts for Pipe Clamp and Base Plate Connections
Washers		F436	Flat Washers for Pipe Clamp and Base Plate Connections
Neoprene Pads		-	In accordance with Specification Section 932 for Ancillary Structures

POST ATTACHMENT NOTES

ANCHOR RODS, NUTS AND WASHERS:

After the nuts have been tightened, distort the Anchor Rod threads to prevent removal of the nuts. Coat distorted threads and exposed trimmed ends of anchors with a galvanizing compound in accordance with Specification Section 562.

COATINGS:

Hot-dip galvanize all Nuts, Washers, Bolts, C-I-P Anchor Rods, Adhesive Anchors and Fence Framework (Posts, Internal Sleeves, Shim Plates, Base Plates, Pipe Clamps and Spacers) in accordance with Specification Section 962. Hot-dip galvanize Fence Framework after fabrication.

ADHESIVE-BONDED ANCHORS AND DOWELS:

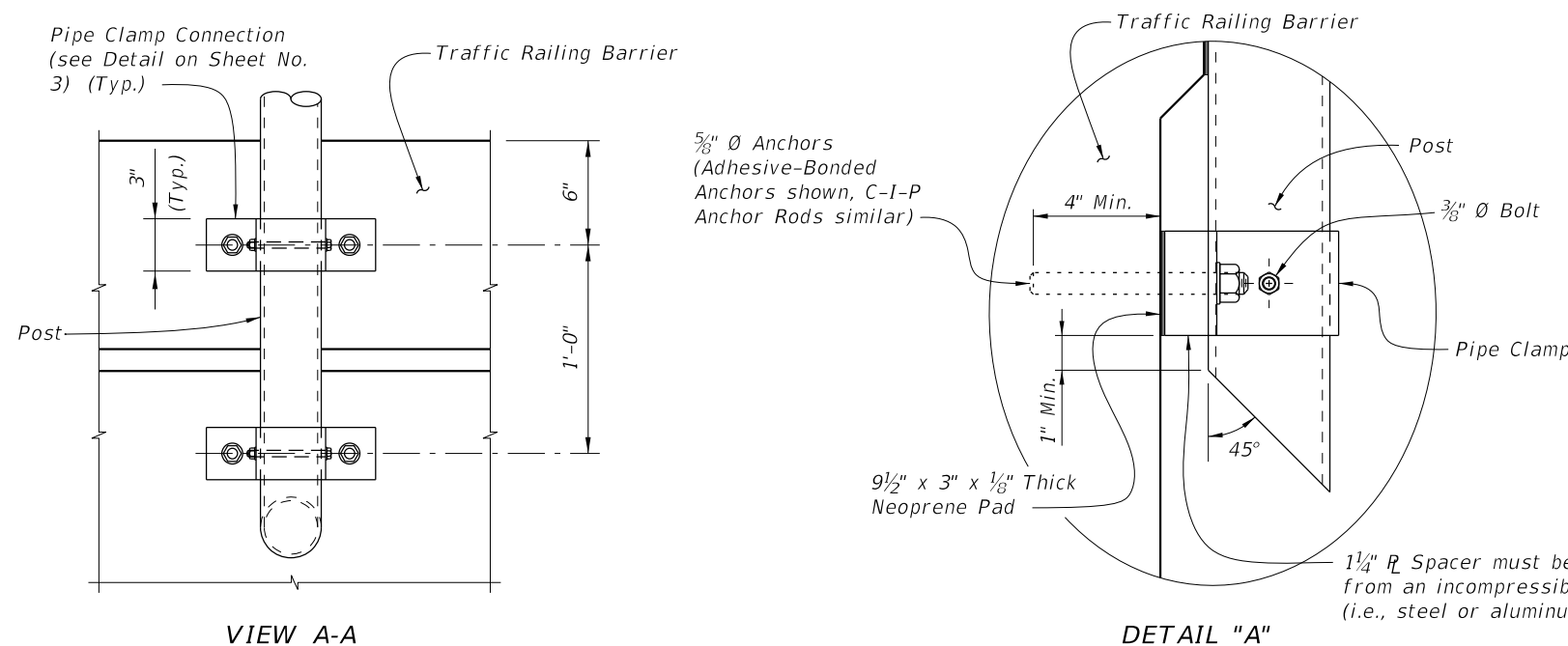
Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 416. Cutting of reinforcing steel is permitted for drilled hole installation.

WELDING:

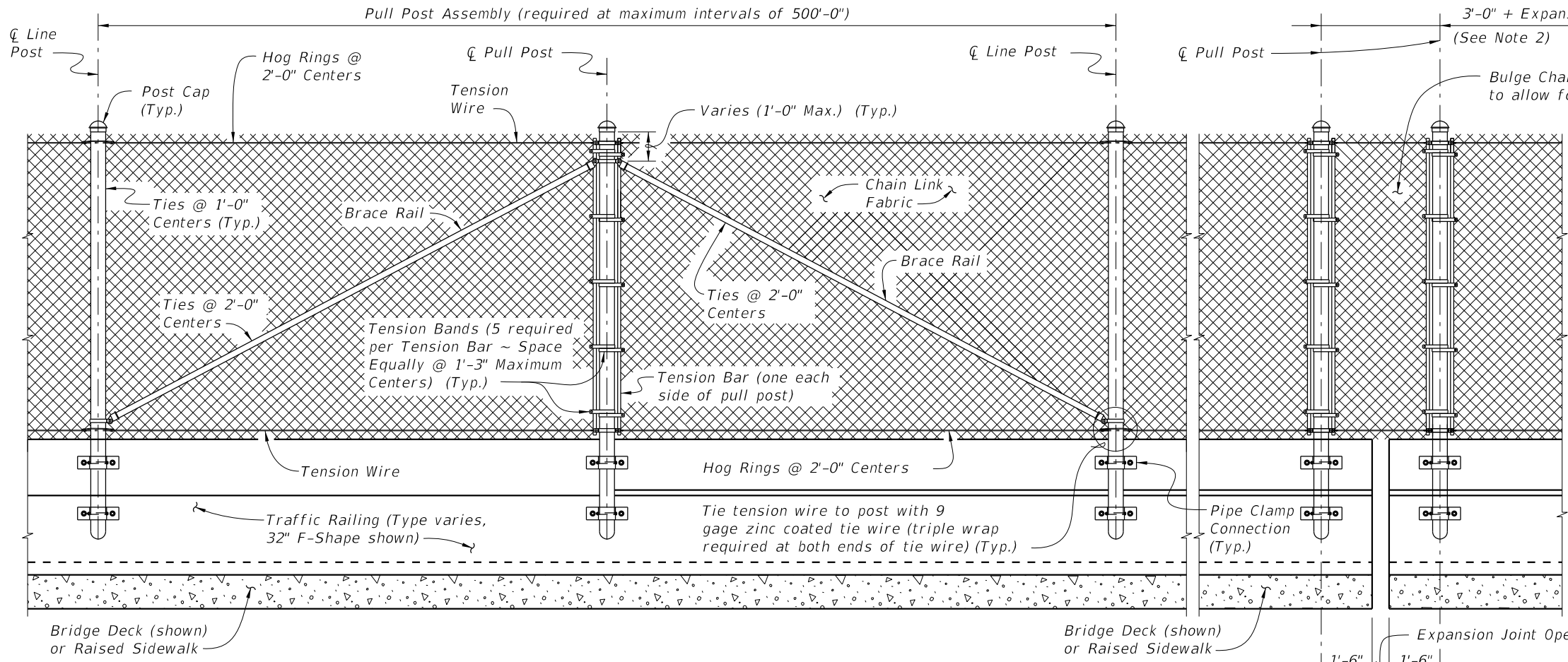
All welding will be in accordance with the American Welding Society Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.

CROSS REFERENCE:

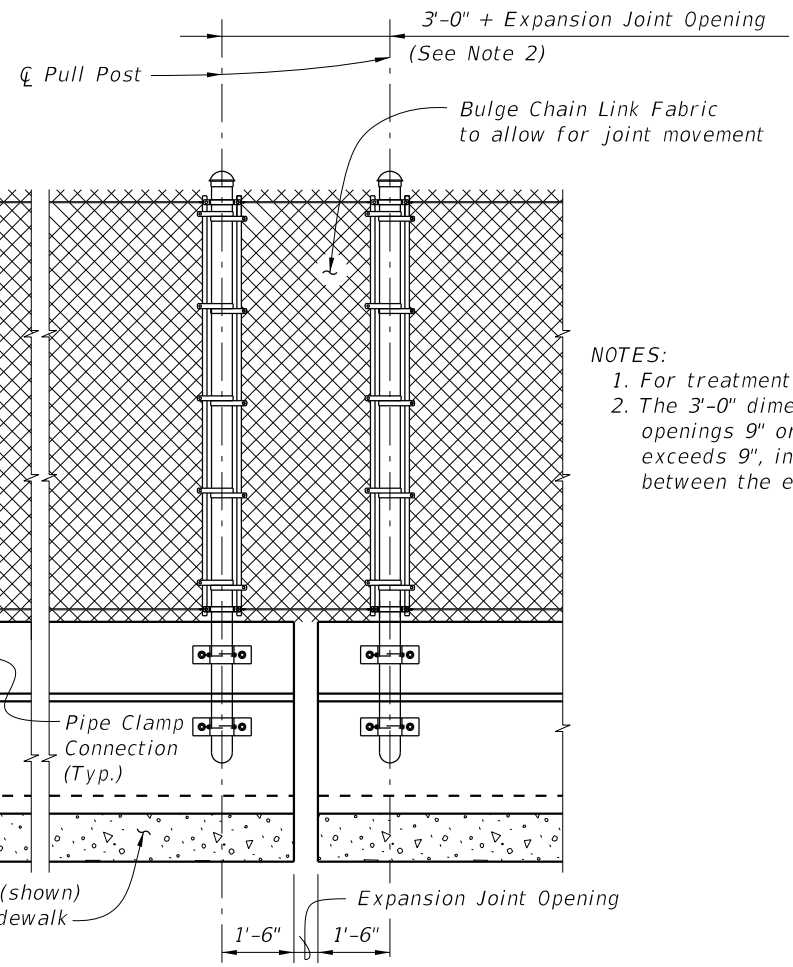
For location of View A-A and Detail "A" see Sheet 1.



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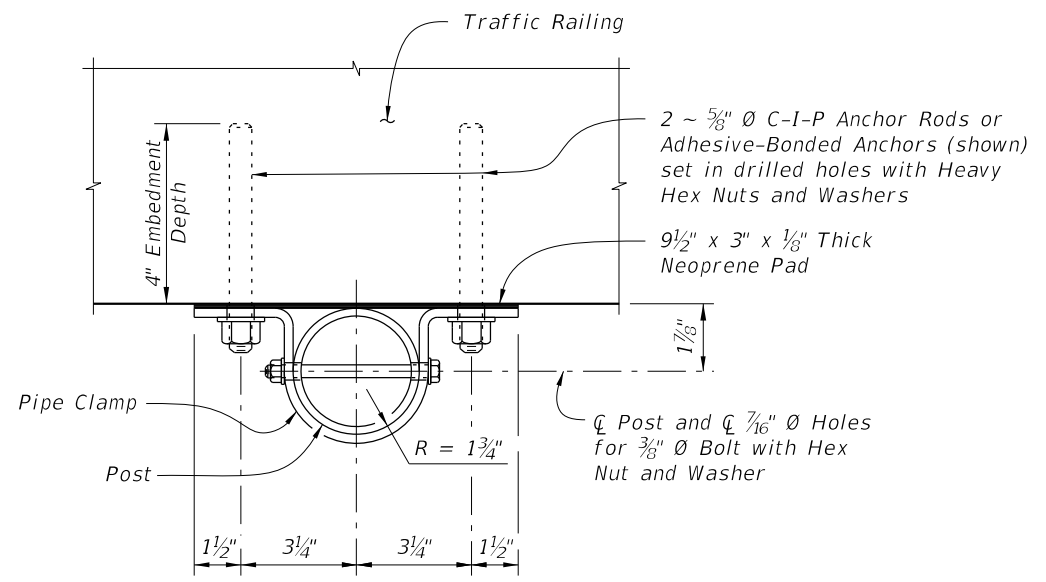
PULL POST ASSEMBLY DETAIL FOR TRAFFIC RAILING



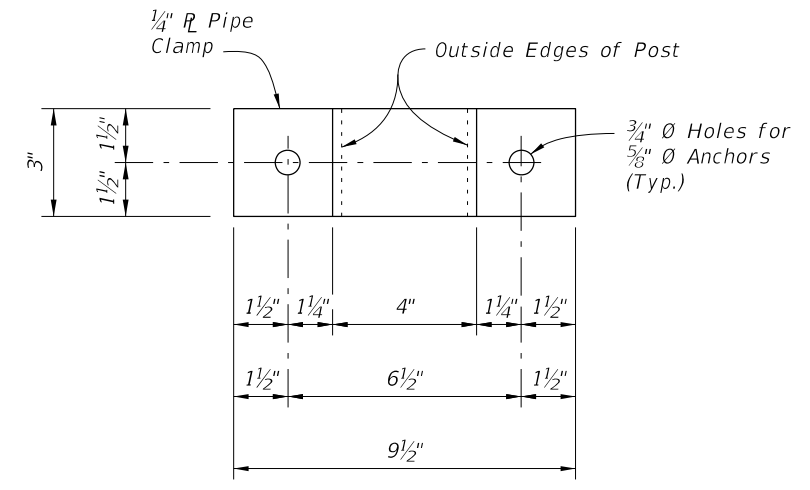
EXPANSION ASSEMBLY DETAIL

(Required only at expansion joint locations where total movement exceeds 6")

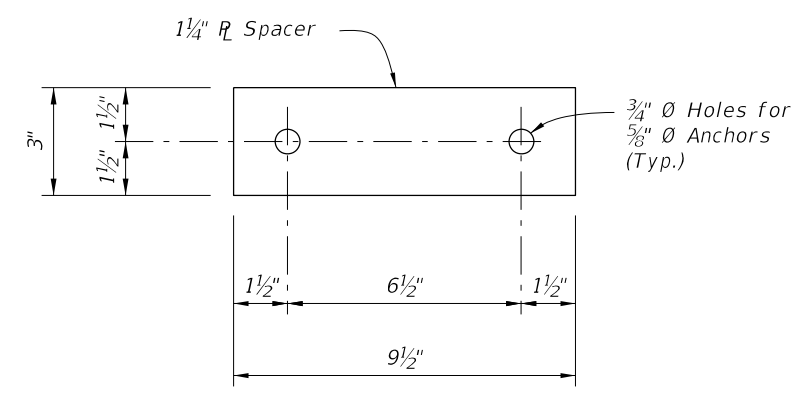
- NOTES:
1. For treatment at bridge ends, see Sheet 1.
 2. The 3'-0" dimension shown is for expansion joint openings 9" or less. If the expansion joint opening exceeds 9", increase this dimension by the difference between the expansion joint opening and 9".



PIPE CLAMP CONNECTION DETAIL
(Connection without spacer shown, Connection with spacer similar)



PIPE CLAMP DETAIL

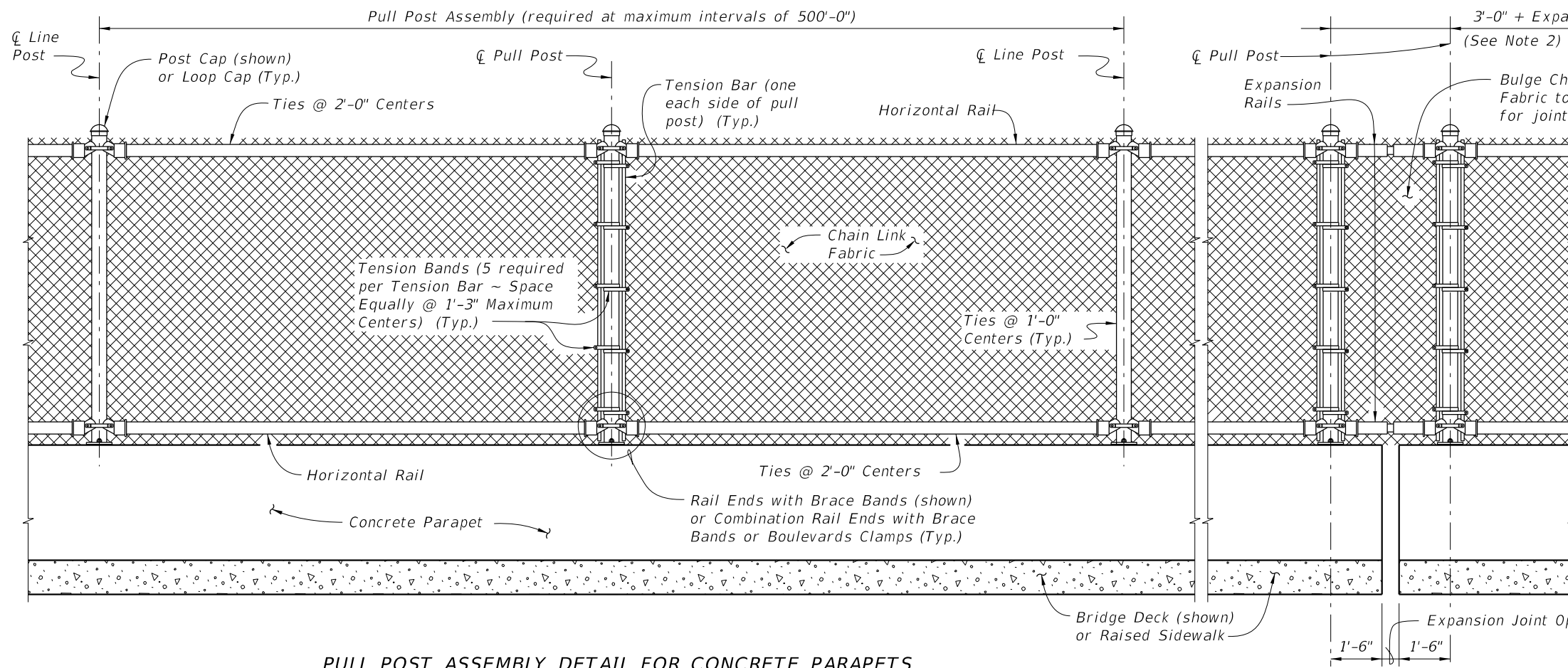


SPACER DETAIL

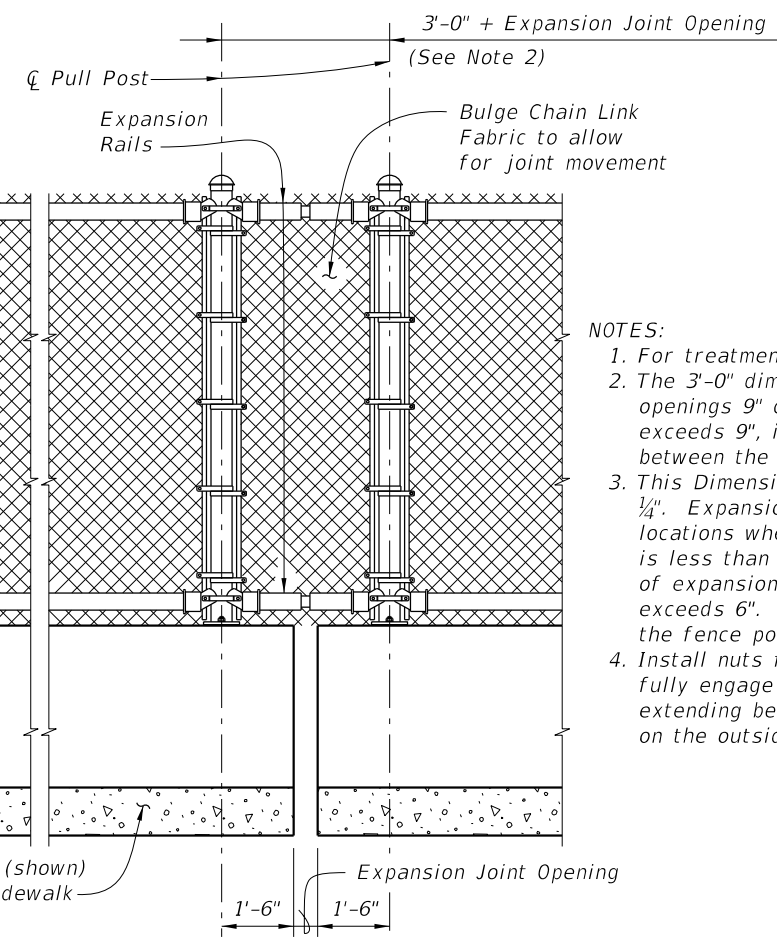
(Must be manufactured from an incompressible material (i.e., steel or aluminum))

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PULL POST ASSEMBLY DETAIL FOR CONCRETE PARAPETS



EXPANSION ASSEMBLY DETAIL

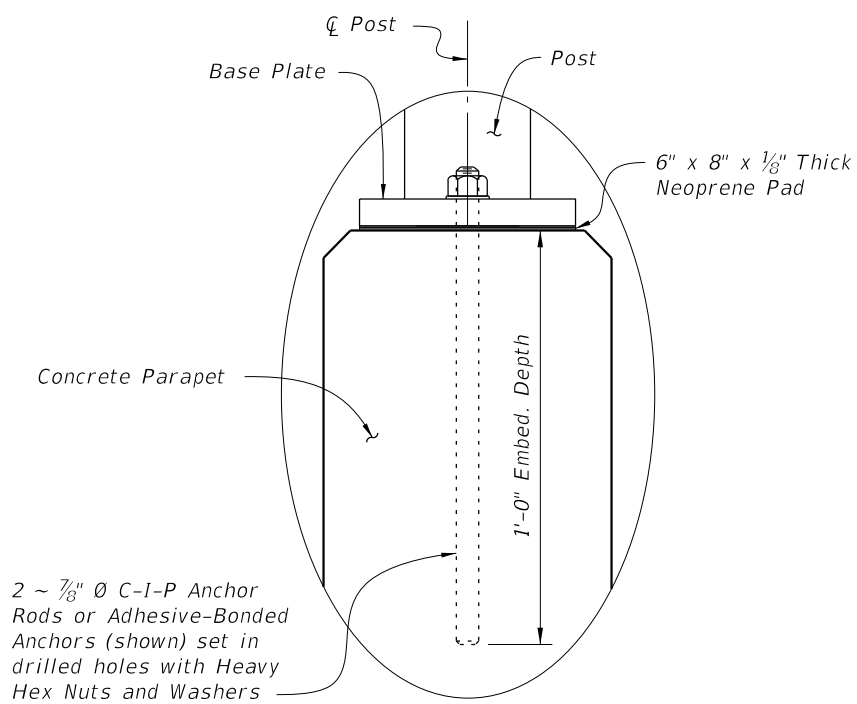
(Required only at expansion joint locations where total movement exceeds 6")

NOTES:

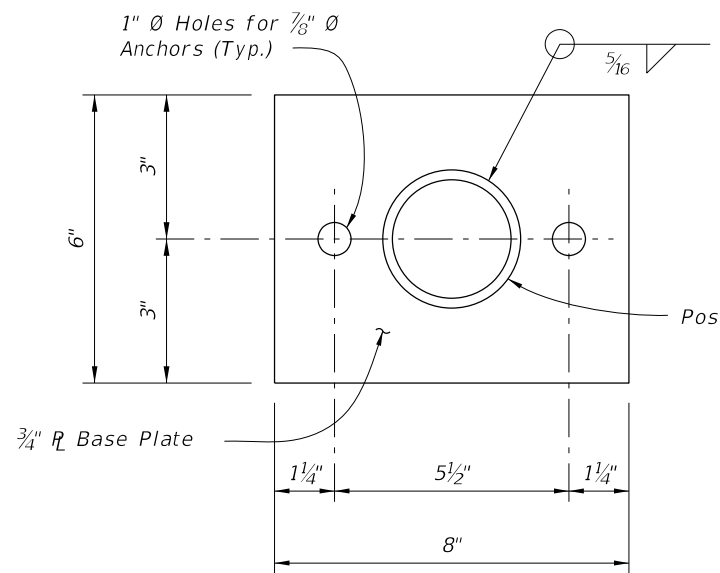
1. For treatment at bridge ends, see Sheet 1.
2. The 3'-0" dimension shown is for expansion joint openings 9" or less. If the expansion joint opening exceeds 9", increase this dimension by the difference between the expansion joint opening and 9".
3. This Dimension is the expansion joint opening plus 1/4". Expansion rails are required at expansion joint locations where the total movement exceeds 1", but is less than or equal to 6". Expansion rails are part of expansion assemblies when the total movement exceeds 6". Install expansion rails midway between the fence posts spanning the expansion joint.
4. Install nuts for expansion rails finger-tight. Nuts will fully engage bolts with a minimum of one bolt thread extending beyond the nuts. Distort the first thread on the outside of the nut to prevent loosening.

CROSS REFERENCE:

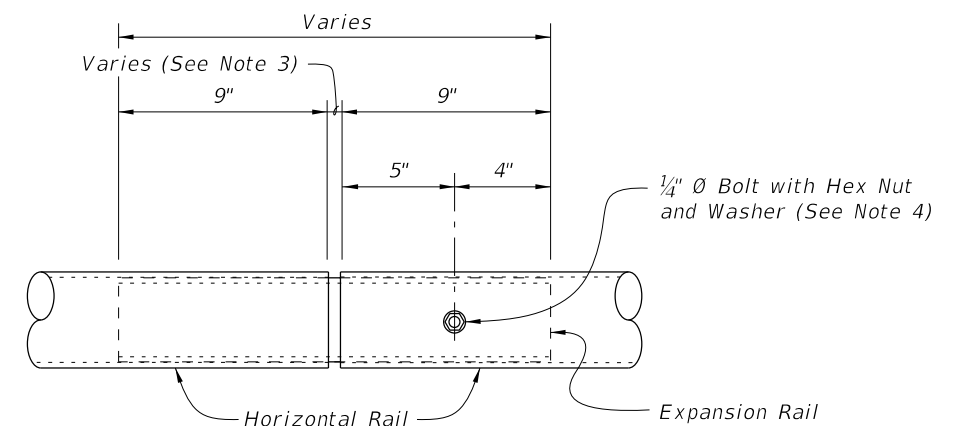
For location of Detail "B" see Sheet 1.



DETAIL "B"



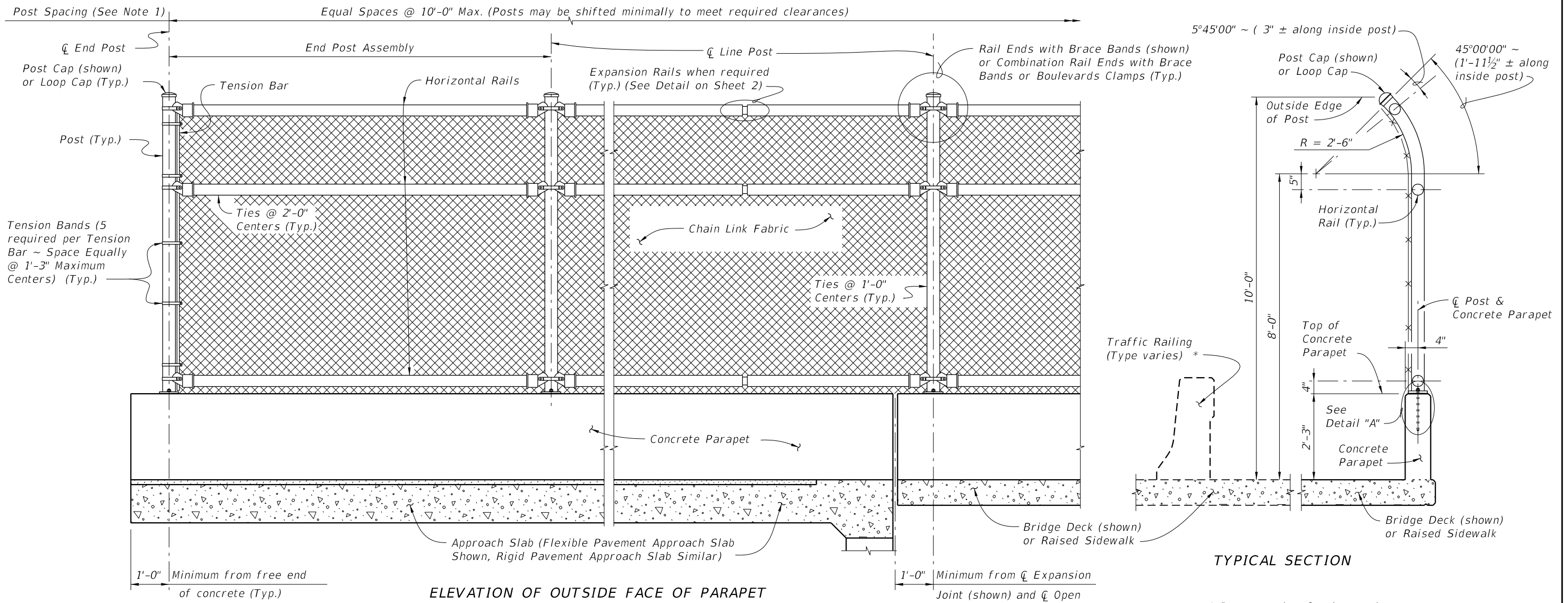
BASE PLATE DETAIL



EXPANSION RAIL DETAIL

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LAST REVISION	DESCRIPTION:
07/01/05	



NOTES:
 1. A Pull Post Assembly is required at maximum intervals of 500'-0". See Sheet 2.

FENCING NOTES

FENCE APPLICATION:
 This bridge fence can only be used on sidewalk installations separated from traffic by a traffic railing.

FENCE INSTALLATION:
 Install posts plumb (within a tolerance of $\pm 1\frac{1}{2}$ "). Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.


CONCRETE PARAPET DETAILS:
 See Index 820 - Pedestrian/Bicycle Bullet Railing for Concrete Parapet details. Provide fencing in lieu of aluminum bullet railing as shown on Index 820.

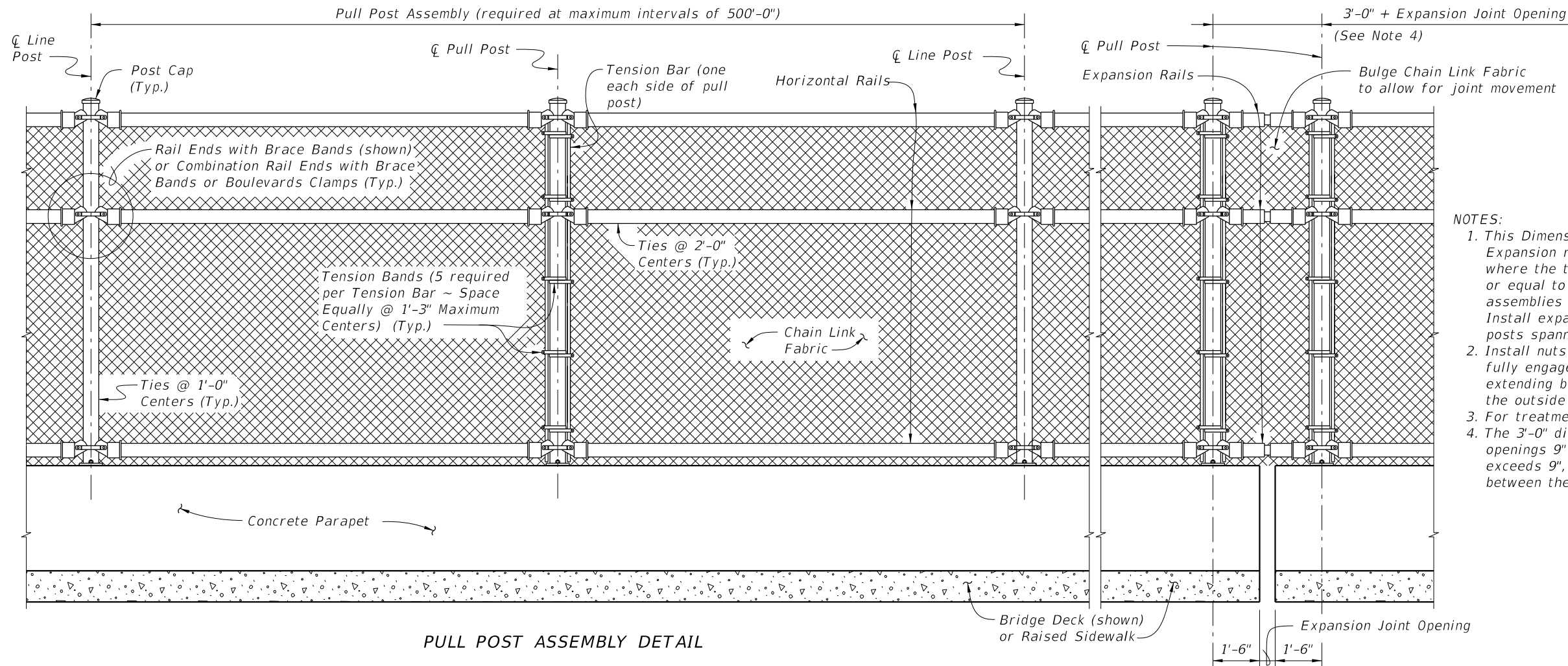
LIMITS OF FENCING:
 Limits of fencing are from begin of approach slab at Begin Bridge to end of approach slab at End Bridge, unless otherwise shown in the plans.

PAYMENT:
 Payment will be made under Fencing, Type R. Payment includes posts, horizontal and expansion rails, brace bands, rail ends, combination rail ends, boulevard clamps, chain link fabric, ties, tension bars and bands, post and loop caps, base plates, anchor rods, bolts, nuts, washers, shim plates, neoprene pads, miscellaneous fence fittings and hardware and all incidental materials and labor required to complete installation of the fence.

CROSS REFERENCE:
 For Table of Fence Components and Pull Post Assembly Detail see Sheet 2.
 For Table of Post Attachment Components and Detail "A" see Sheet 3.

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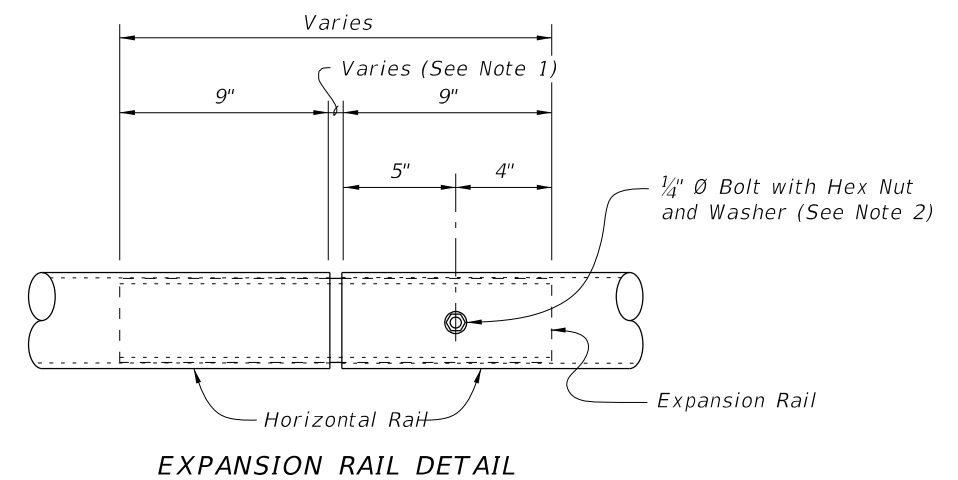
LAST REVISION 01/01/12	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	BRIDGE FENCING (CURVED TOP)	INDEX NO. 811	SHEET NO. 1 of 3
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PULL POST ASSEMBLY DETAIL

EXPANSION ASSEMBLY DETAIL

(Required only at expansion joint locations where total movement exceeds 6")



EXPANSION RAIL DETAIL

NOTES:

1. This Dimension is the expansion joint opening plus 1/4". Expansion rails are required at expansion joint locations where the total movement exceeds 1", but is less than or equal to 6". Expansion rails are part of expansion assemblies when the total movement exceeds 6". Install expansion rails midway between the fence posts spanning the expansion joint.
2. Install nuts for expansion rails finger-tight. Nuts will fully engage bolts with a minimum of one bolt thread extending beyond the nuts. Distort the first thread on the outside of the nut to prevent loosening.
3. For treatment at bridge ends, see Sheet 1.
4. The 3'-0" dimension shown is for expansion joint openings 9" or less. If the expansion joint opening exceeds 9", increase this dimension by the difference between the expansion joint opening and 9".

TABLE OF CHAIN LINK FENCE COMPONENTS		
COMPONENT	ASTM DESIGNATION	COMPONENT INFORMATION
Posts	F1083	Galvanized Steel Pipe - 3 1/2" NPS, Schedule 40 Regular Grade
Horizontal Rails	F1083	Galvanized Steel Pipe - 3" NPS, Schedule 40 Regular Grade
Expansion Rails	F1083	Galvanized Steel Pipe - 2 1/2" NPS, Schedule 40 Regular Grade
Bolts	A307	1/4" Ø x 4 1/4" Hex Head Bolts for Expansion Rail Connections
Nuts	A563	Hex Nuts for Expansion Rail Connections
Washers	F436	Flat Washers for Expansion Rail Connections
Chain Link Fabric (2" mesh with twisted top and knuckled bottom selvage)	A392	Zinc Coated Steel - 9 gage (coated wire diameter), Class 2 Coating
	A491	Aluminum Coated Steel - 9 gage (coated wire diameter)
	F668	Polyvinyl Chloride (PVC) Coated Steel - 9 gage Zinc Coated Wire, Class 2b
Tie Wires	F626	Zinc Coated Steel Wire - 9 gage
Brace Bands	F626	12 Gage (Min. thickness) x 3/4" (Min. width) Steel Bands (Beveled or Heavy)
Tension Bars	F626	3/16" (Min. thickness) x 3/4" (Min. width) x Variable Height Steel Bars ~ Height = Post Length along inside Post - 2" Max.
Tension Bands	F626	14 Gage (Min. thickness) x 3/4" (width) Steel Bands
Miscellaneous Fence Components	F626	Zinc Coated Steel ~ (includes post or loop caps, horizontal and brace rail ends, combination rail ends, boulevard clamps and all other miscellaneous fittings and hardware)

LEGEND: NPS = Nominal Pipe Size

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TABLE OF POST ATTACHMENT COMPONENTS		
COMPONENT	ASTM DESIGNATION	COMPONENT INFORMATION
Base Plates	A36 or A709 Grade 36	$\frac{3}{4}$ " Steel ϕ
Shim Plates	A36 or A709 Grade 36 or B209 Alloy 6061-T6 or B221 Alloy 6063-T5	Plate thicknesses as required, Holes in shim plates will be $\frac{3}{4}$ " ϕ
Adhesive Anchor Rods	F1554 Grade 36	Fully threaded Headless Anchor Rods $\sim \frac{7}{8}$ " ϕ x $14\frac{1}{2}$ "
C-I-P Anchor Rods	F1554 Grade 36	Hex Head Anchor Rods $\sim \frac{7}{8}$ " ϕ x $14\frac{1}{2}$ "
Nuts	A563	Hex Nuts for Base Plate Connections
Washers	F436	Flat Washers for Base Plate Connections
Neoprene Pads	-	In accordance with Specification Section 932

POST ATTACHMENT NOTES

ANCHOR RODS, NUTS AND WASHERS:

After the nuts have been tightened, distort the Anchor Rod threads to prevent removal of the nuts. Coat distorted threads and exposed trimmed ends of anchors with a galvanizing compound in accordance with Specification Section 562.

COATINGS:

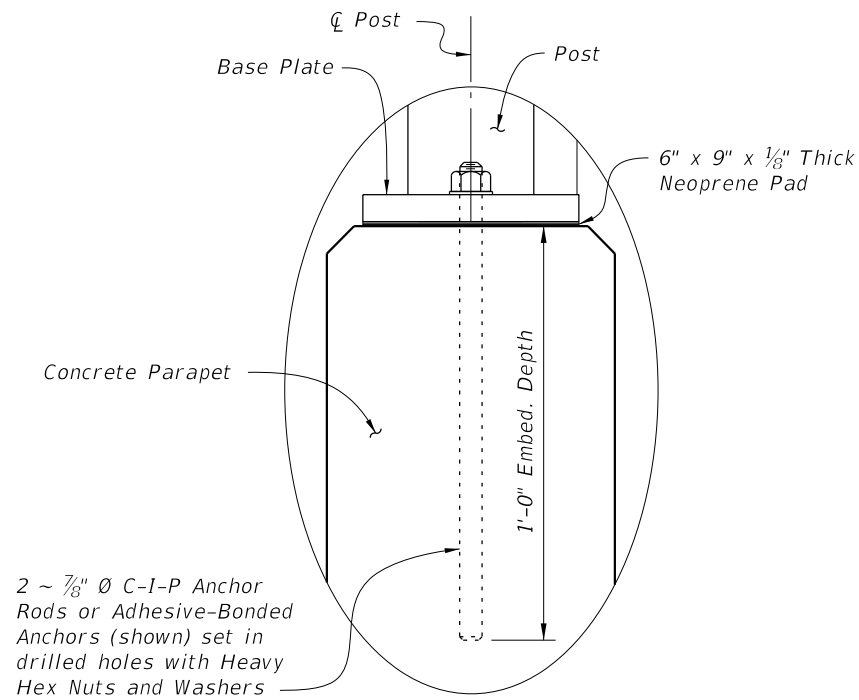
Hot-dip galvanize all Nuts, Washers, Bolts, C-I-P Anchor Rods, Adhesive Anchors and Fence Framework (Posts, Internal Sleeves, Shim Plates and Base Plates) in accordance with Specification Section 962. Hot-dip galvanize Fence Framework after fabrication.

ADHESIVE-BONDED ANCHORS AND DOWELS:

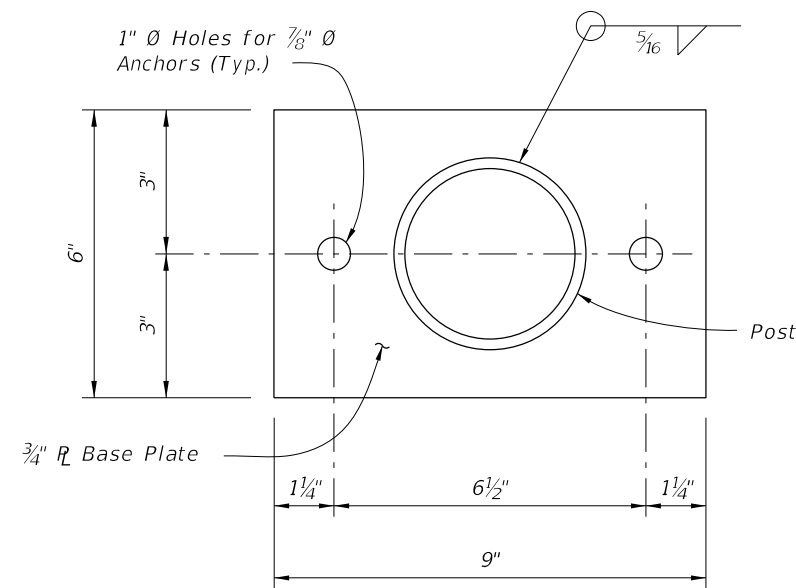
Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 416. Cutting of reinforcing steel is permitted for drilled hole installation.

WELDING:

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



DETAIL "A"




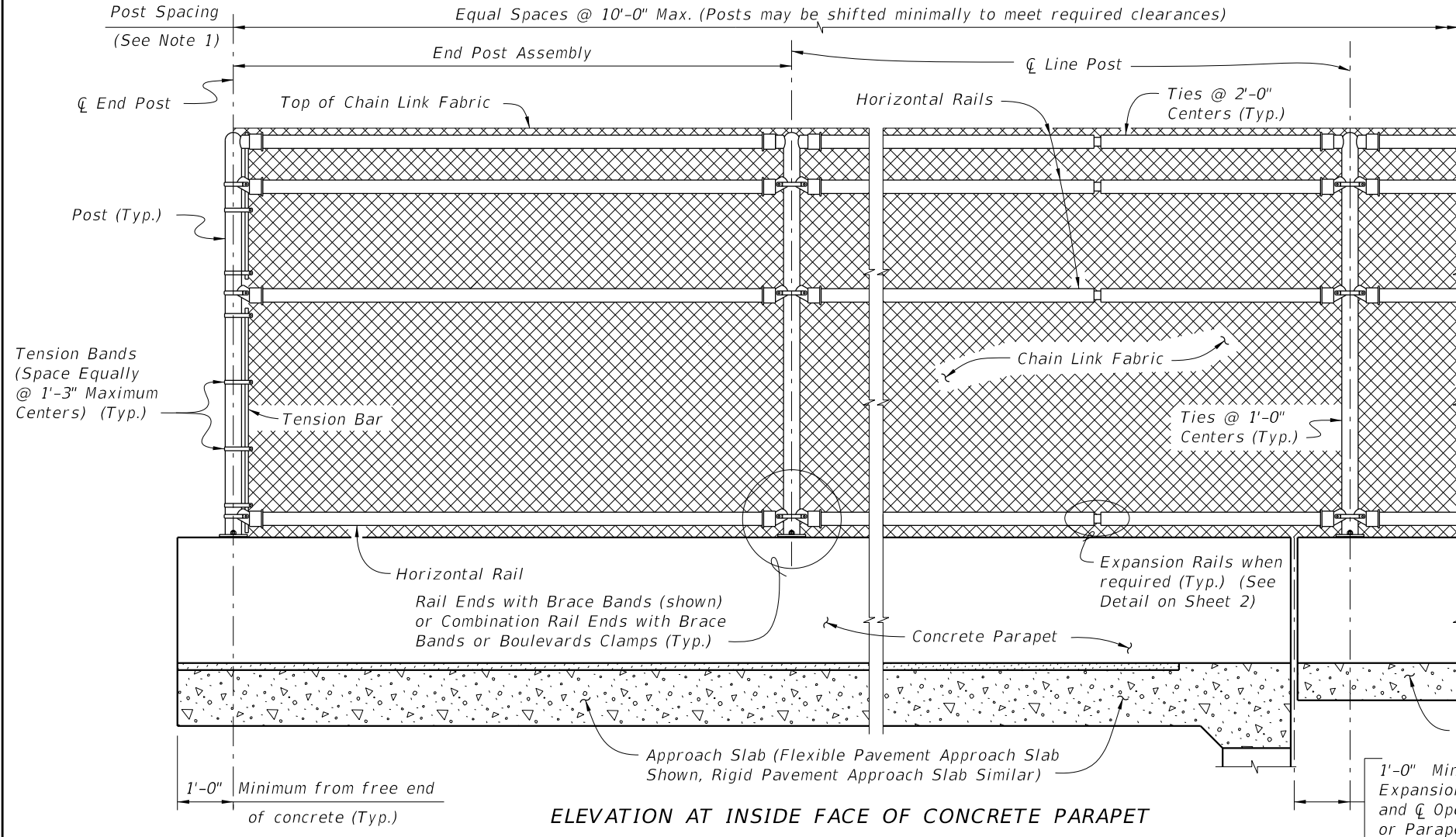
BASE PLATE DETAIL

CROSS REFERENCE:

For location of Detail "A" see Sheet 1.

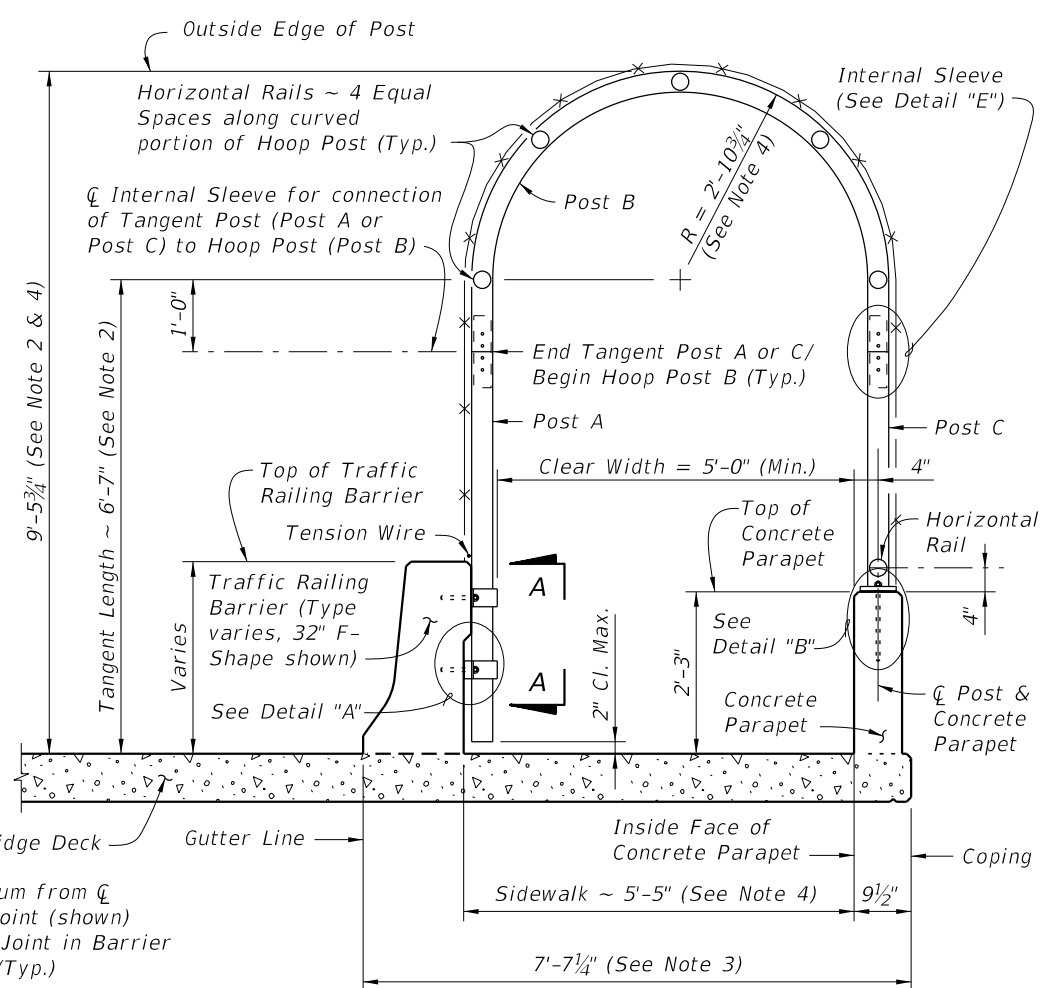
10/26/2016 8:24:56 AM

LAST REVISION 07/01/15	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	BRIDGE FENCING (CURVED TOP)	INDEX NO. 811	SHEET NO. 3 of 3
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ELEVATION AT INSIDE FACE OF CONCRETE PARAPET

- NOTES:
1. A Pull Post Assembly is required at maximum intervals of 500'-0". See Sheet 3.
 2. Dimension is measured along Inside Face of Concrete Parapet.
 3. Dimension shown is for 32" F-Shape Traffic Railing Barriers as shown in Index 420. Adjust as required for other Traffic Railing Barriers and sidewalk widths.
 4. For sidewalk clear widths greater than 5'-0", increase the radius and height of the curved portion of the Hoop Post at the rate of 6" for every one foot increase in sidewalk width.



TYPICAL SECTION

FENCING NOTES

FENCE INSTALLATION:
Install posts plumb (within a tolerance of $\pm 1/2"$). Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.

TRAFFIC RAILING BARRIER DETAILS:
See Superstructure Sheets for Traffic Railing Barrier details.

CONCRETE PARAPET DETAILS:
See Index 820 - Pedestrian/Bicycle Railing for Concrete Parapet details. Provide fencing in lieu of aluminum bullet railing as shown on Index 820.

LIMITS OF FENCING:
Limits of fencing are from begin of approach slab at Begin Bridge to end of approach slab at End Bridge, unless otherwise shown in the plans.

PAYMENT:
Payment will be made under Fencing, Type R. Payment includes posts, horizontal and expansion rails, brace bands, rail ends, combination rail ends, boulevard clamps, chain link fabric, tension wire, ties, hog rings, tension bars and bands, pipe clamps, base plates, anchor rods, bolts, nuts, washers, shim plates, spacers, neoprene pads, miscellaneous fence fittings and hardware and all incidental materials and labor required to complete installation of the fence.

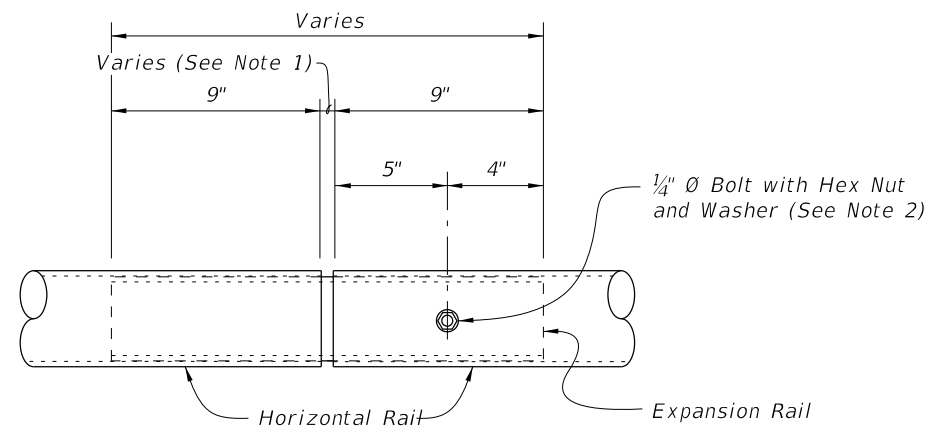
CROSS REFERENCE:
For Table of Fence Components and Table of Post Attachment Components see Sheet 2.
For Pull Post Assembly Detail, View A-A and Detail "A" see Sheet 3.
For Detail "B" and "E" see Sheet 4.

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LAST REVISION 07/01/07	REVISION	DESCRIPTION:	<p>FY 2017-18 DESIGN STANDARDS</p>	<p>BRIDGE FENCING (ENCLOSED)</p>	<p>INDEX NO. 812</p>	<p>SHEET NO. 1 of 4</p>
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TABLE OF CHAIN LINK FENCE COMPONENTS		
COMPONENT	ASTM DESIGNATION	COMPONENT INFORMATION
Posts	F1083	Galvanized Steel Pipe - 3" NPS, Schedule 40 Regular Grade
Horizontal Rails and Internal Sleeves	F1083	Galvanized Steel Pipe - 2½" NPS, Schedule 40 Regular Grade
Expansion Rails	F1083	Galvanized Steel Pipe - 2" NPS, Schedule 40 Regular Grade
Chain Link Fabric (2" mesh with knuckled bottom selvages)	A392	Zinc Coated Steel - 9 gage (coated wire diameter), Class 2 Coating
	A491	Aluminum Coated Steel - 9 gage (coated wire diameter)
	F668	Polyvinyl Chloride (PVC) Coated Steel - 9 gage Class 2b Zinc Coated Wire
Tension Wire	A824 & A817	Type II (Zinc Coated Steel Wire) - 7 gage, Class 4 Coating
		Type I (Aluminum Coated Steel Wire) - 7 gage
Tie Wires	F626	Zinc Coated Steel Wire - 9 gage
Hog Rings	F626	Zinc Coated Steel Wire - 12 gage
Brace Bands	F626	12 gage (Min. thickness) x ¾" (Min. width) Steel Bands (Beveled or Heavy)
Tension Bars	F626	¾" (Min. thickness) x ¾" (Min. width) x Variable Height Steel Bars ~ Height = Tangent or Hoop Length - Barrier or Parapet Height - 2" max.
Tension Bands	F626	14 gage (Min. thickness) x ¾" (Min. width) Steel Bands
Miscellaneous Fence Components	F626	Zinc Coated Steel ~ (includes horizontal rail ends, combination rail ends, boulevard clamps and all other miscellaneous fittings and hardware)
Bolts	A307	¾" Ø x 4¼" Hex Head Bolts for Internal Sleeve connections ¼" Ø x 4¼" Hex Head Bolts for Expansion Rail connections
Nuts	A563	Hex Nuts for Internal Sleeve and Expansion Rail connections
Washers	F436	Flat Washers for Internal Sleeve and Expansion Rail connections

TABLE OF POST ATTACHMENT COMPONENTS		
COMPONENT	ASTM DESIGNATION	COMPONENT INFORMATION
Pipe Clamps	A36 or A709 Grade 36	¼" Steel R
Base Plates	A36 or A709 Grade 36	¾" Steel R
Shim Plates	A36 or A709 Grade 36 or B209 Alloy 6061-T6 or B221 Alloy 6063-T5	Plate thicknesses as required; Holes in shim plates will be ¾" Ø
Spacers	-	1¼" R for all materials
Pipe Clamp Connection	Adhesive Anchor Rods	F1554 Grade 36 Fully threaded Headless Anchor Rods ~ ⅝" Ø x 6" (no spacer) or ⅝" Ø x 7¼" (with spacer)
	C-I-P Anchor Rods	F1554 Grade 36 Hex Head Anchor Rods ~ ⅝" Ø x 6" (no spacer) or ⅝" Ø x 7¼" (with spacer)
Base Plate Connection	Adhesive Anchor Rods	F1554 Grade 36 Fully threaded Headless Anchor Rods ~ ⅞" Ø x 14½"
	C-I-P Anchor Rods	F1554 Grade 36 Hex Head Anchor Rods ~ ⅞" Ø x 14½"
Bolts	A307	¾" Ø x 4¾" Hex Head Bolts for Pipe Clamp Connections to Posts
Nuts	A563	Hex Nuts for Pipe Clamp and Base Plate Connections
Washers	F436	Flat Washers for Pipe Clamp and Base Plate Connections
Neoprene Pads	-	In accordance with Specification Section 932 for Ancillary Structures



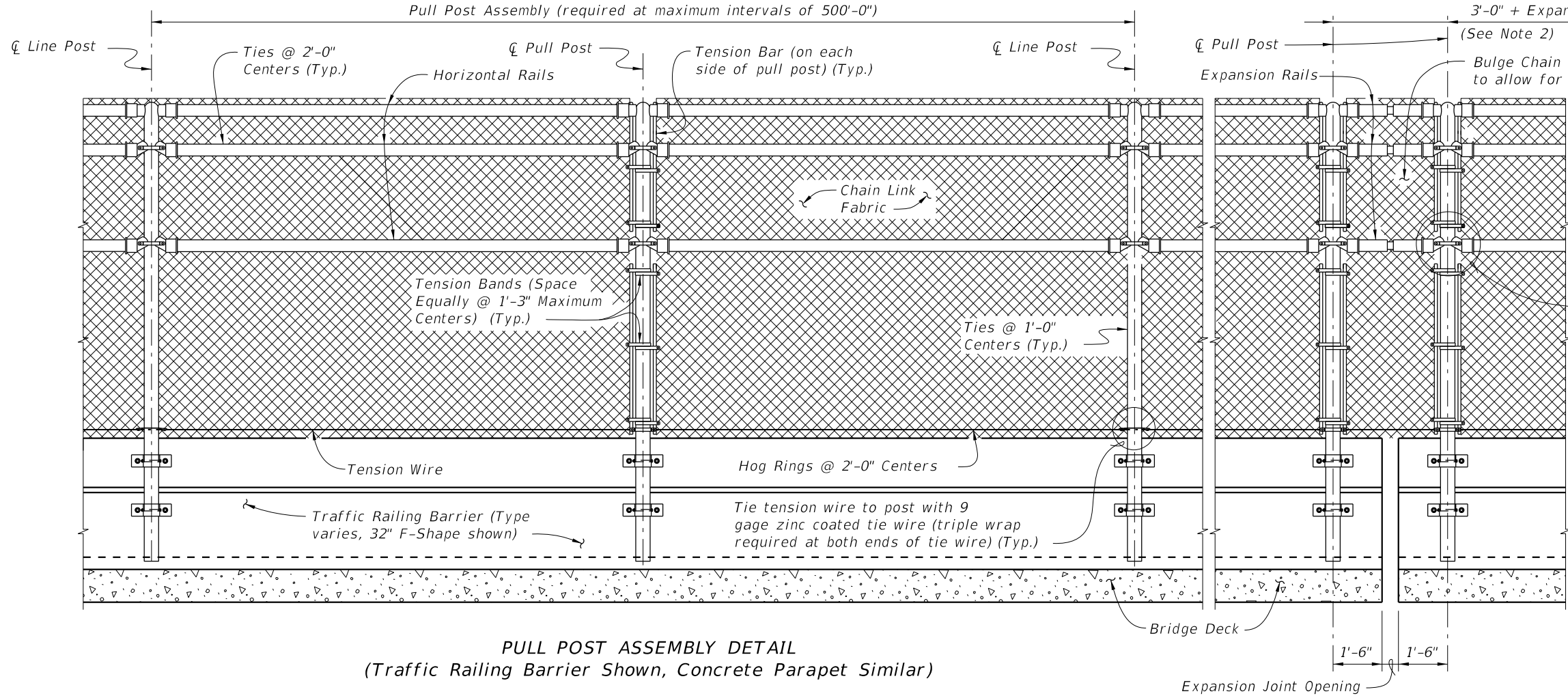
- NOTES:
1. This Dimension is the expansion joint opening plus ¼". Expansion rails are required at expansion joint locations where the total movement exceeds 1", but is less than or equal to 6". Expansion rails are part of expansion assemblies when the total movement exceeds 6". Install expansion rails midway between the fence posts spanning the expansion joint.
 2. Install nuts for expansion rails finger-tight. Nuts will fully engage bolts with a minimum of one bolt thread extending beyond the nuts. Distort the first thread on the outside of the nut to prevent loosening.

POST ATTACHMENT NOTES

- ANCHOR RODS, NUTS AND WASHERS:**
After the nuts have been tightened, distort the Anchor Rod threads to prevent removal of the nuts. Coat distorted threads and exposed trimmed ends of anchors with a galvanizing compound in accordance with Specification Section 562.
- COATINGS:**
Hot-dip galvanize all Nuts, Washers, Bolts, C-I-P Anchor Rods, Adhesive Anchors and Fence Framework (Posts, Internal Sleeves, Shim Plates, Base Plates, Pipe Clamps and Spacers) in accordance with Specification Section 962. Hot-dip galvanize Fence Framework after fabrication.
- ADHESIVE-BONDED ANCHORS AND DOWELS:**
Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 416. Cutting of reinforcing steel is permitted for drilled hole installation.
- WELDING:**
All welding will be in accordance with the American Welding Society Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.

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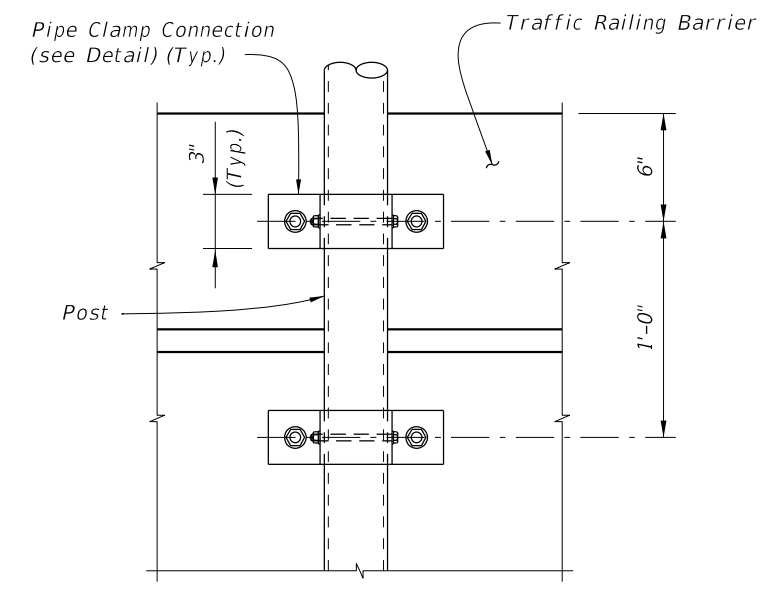
LAST REVISION 11/01/16	DESCRIPTION:	FY 2017-18 DESIGN STANDARDS	BRIDGE FENCING (ENCLOSED)	INDEX NO. 812	SHEET NO. 2 of 4
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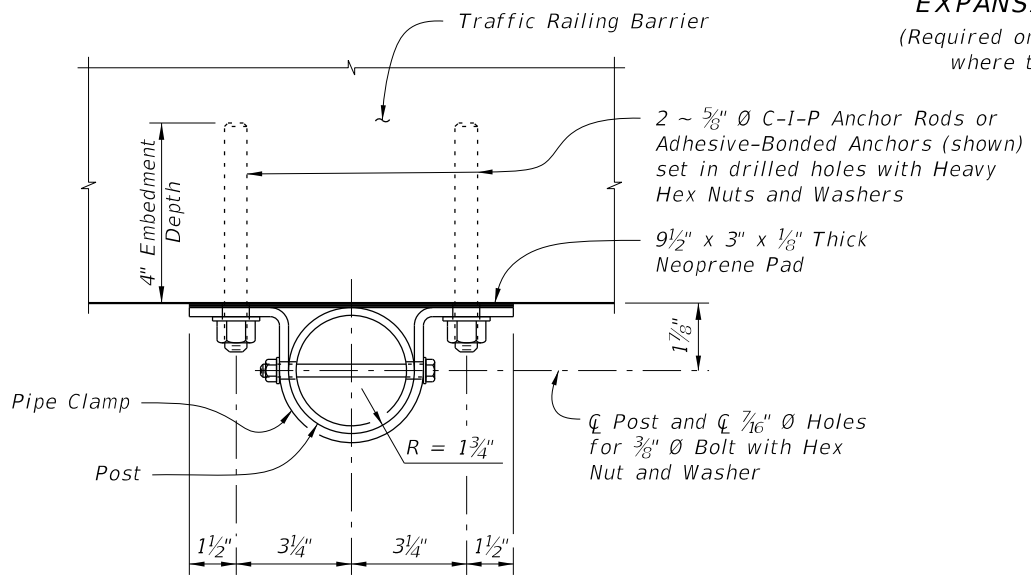
NOTES:
 1. For treatment at bridge ends, see Sheet 1.
 2. The 3'-0" dimension shown is for expansion joint openings 9" or less. If the expansion joint opening exceeds 9", increase this dimension by the difference between the expansion joint opening and 9".

PULL POST ASSEMBLY DETAIL
 (Traffic Railing Barrier Shown, Concrete Parapet Similar)

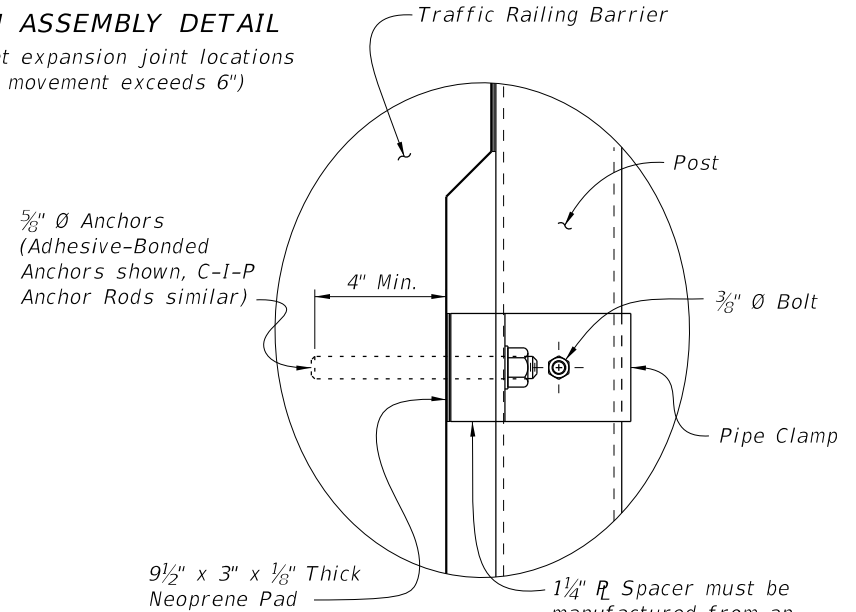
EXPANSION ASSEMBLY DETAIL
 (Required only at expansion joint locations where total movement exceeds 6")



VIEW A-A



PIPE CLAMP CONNECTION DETAIL
 (Connection without spacer shown, Connection with spacer similar)

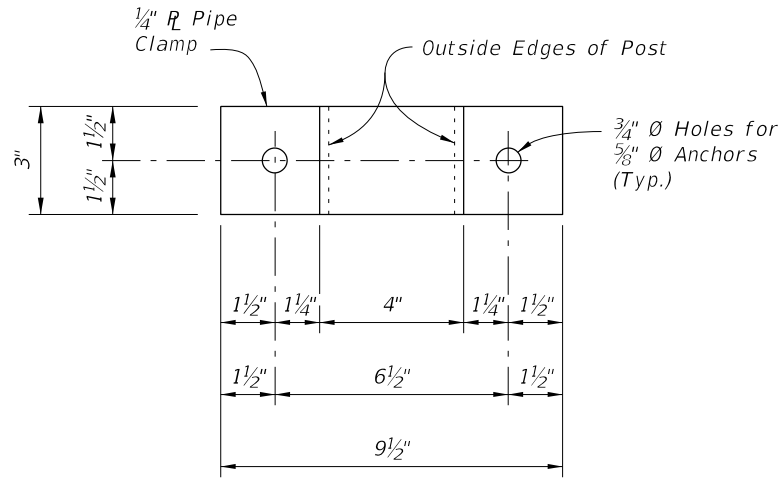


DETAIL "A"

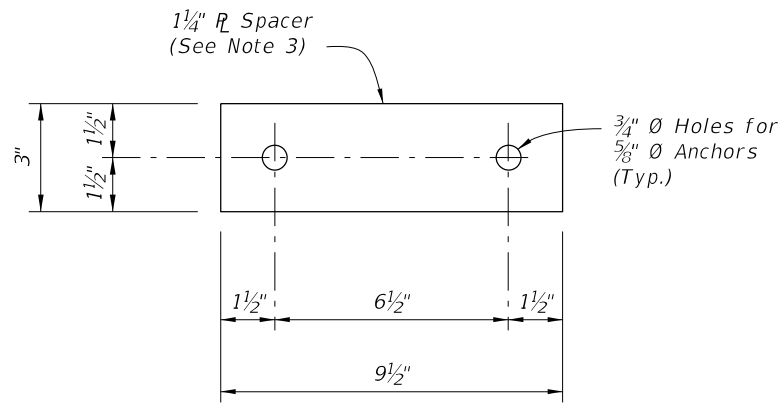
CROSS REFERENCE:
 For location of View A-A and Detail "A" see Sheet 1.

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LAST REVISION 01/01/12	REVISION	DESCRIPTION:	FY 2017-18 DESIGN STANDARDS	BRIDGE FENCING (ENCLOSED)	INDEX NO. 812	SHEET NO. 3 of 4
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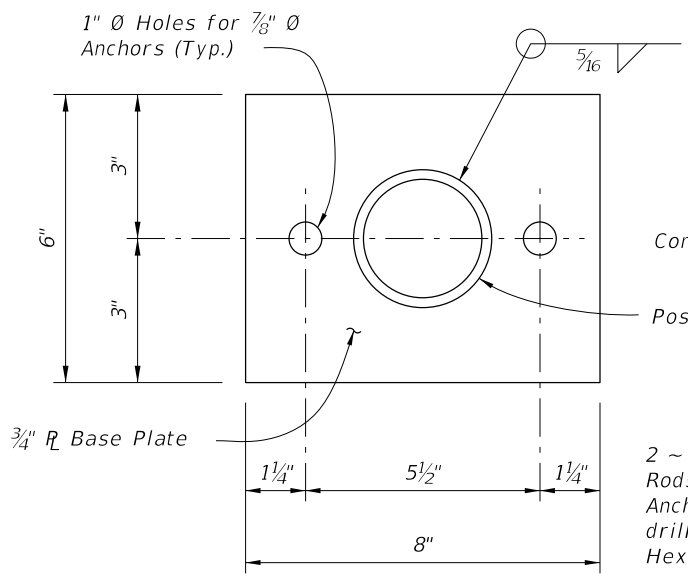


PIPE CLAMP DETAIL

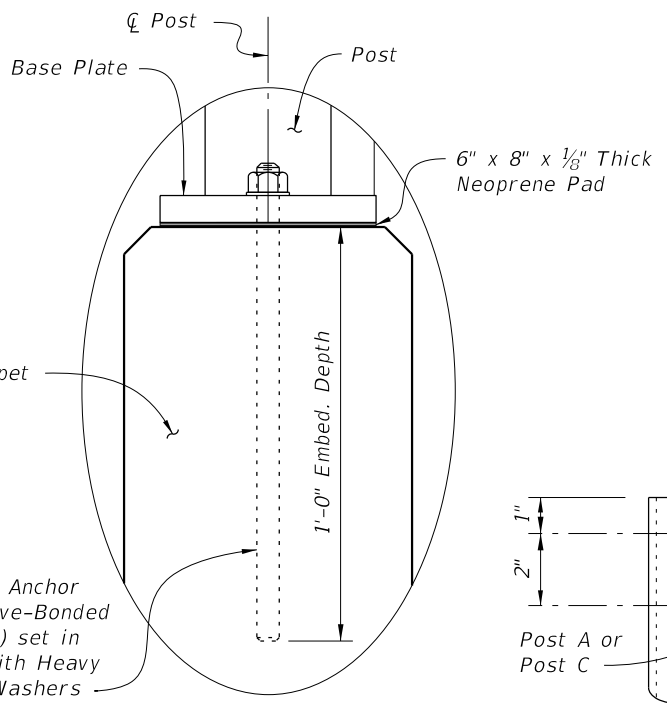


SPACER DETAIL

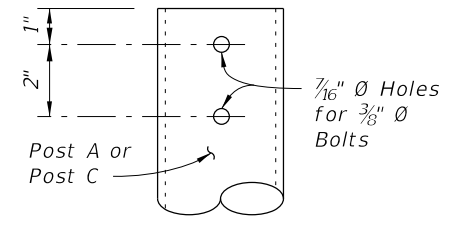
(Must be manufactured from an incompressible material (i.e., steel or aluminum))



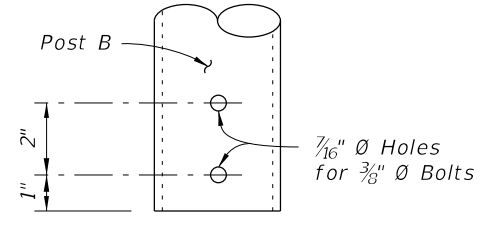
BASE PLATE DETAIL



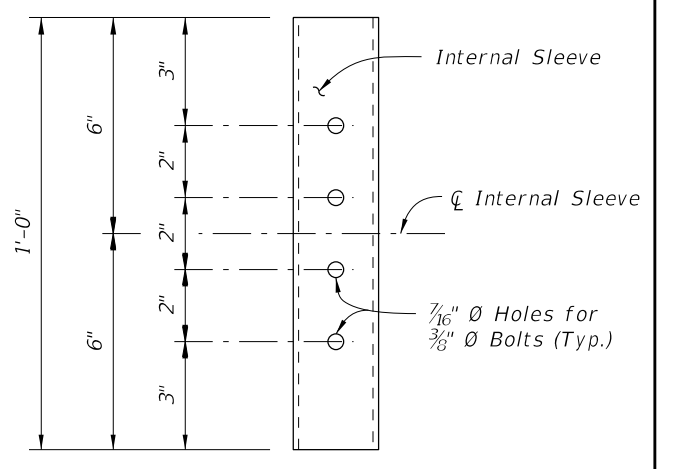
DETAIL "B"



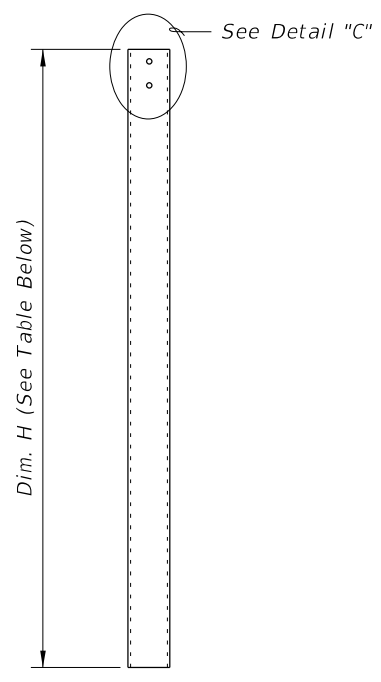
DETAIL "C"



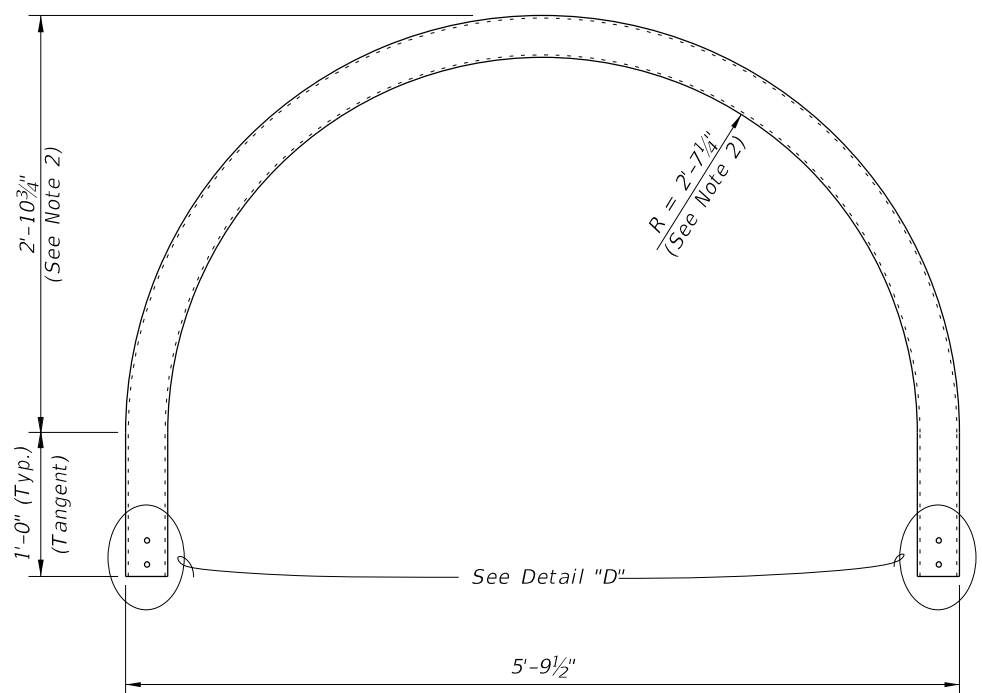
DETAIL "D"



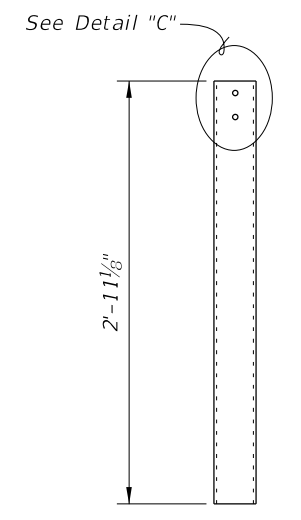
**DETAIL "E"
(INTERNAL SLEEVE DETAIL)**



POST A DETAIL



POST B DETAIL



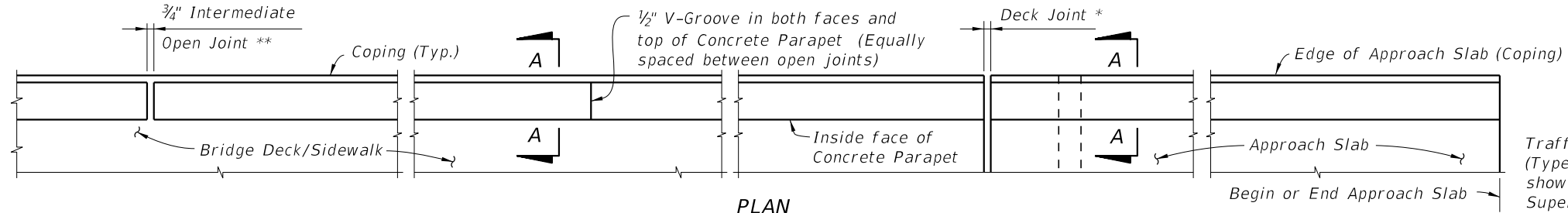
POST C DETAIL

SIDEWALK CROSS-SLOPE	DIM. H (See Note 1)
2% Left	5'-6 1/4"
2% Right	5'-3 3/4"

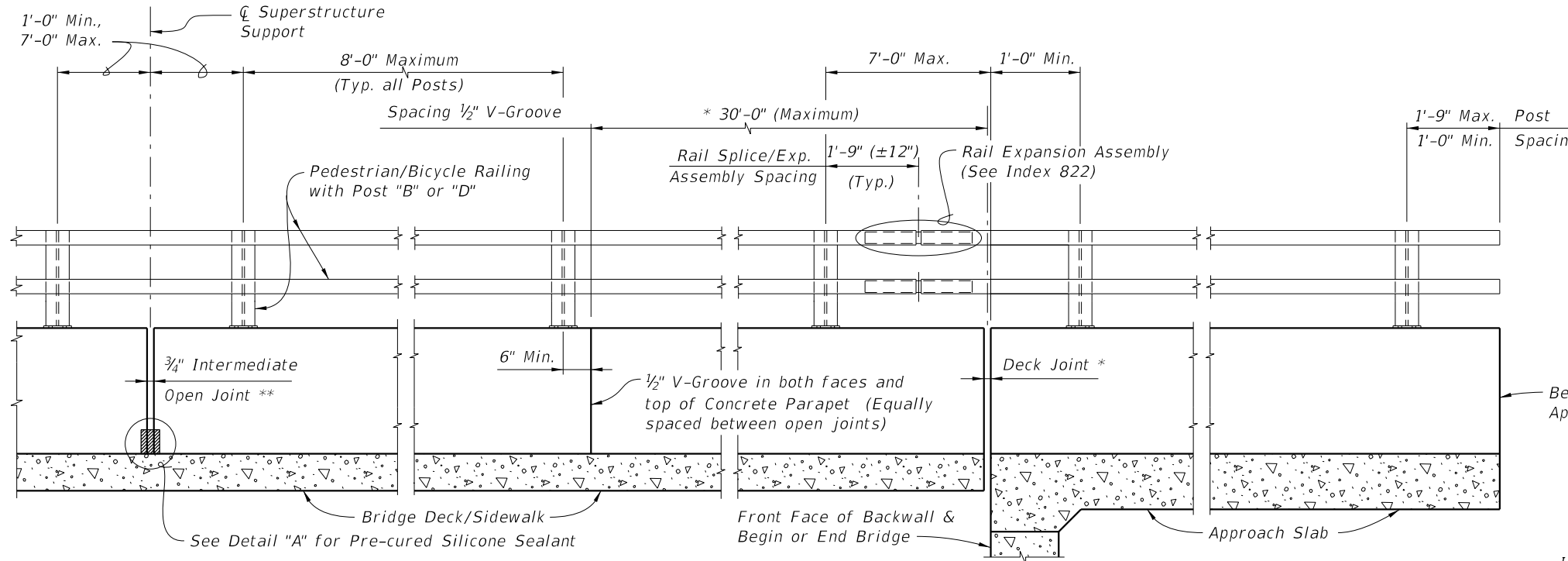
- NOTES:**
1. Values shown for Dim. H are for a 5'-0" clear sidewalk width. Adjust as required for clear sidewalk widths greater than 5'-0".
 2. For clear sidewalk widths greater than 5'-0" increase radius and height by 6" for every one foot increase in sidewalk width.
 3. Spacer plate thickness shown is for the 32" F-Shape Traffic Railing shown in Index 420. Adjust thickness as required for other Traffic Railings.

CROSS REFERENCE:
For location of Details "B" and "E" see Sheet 1.

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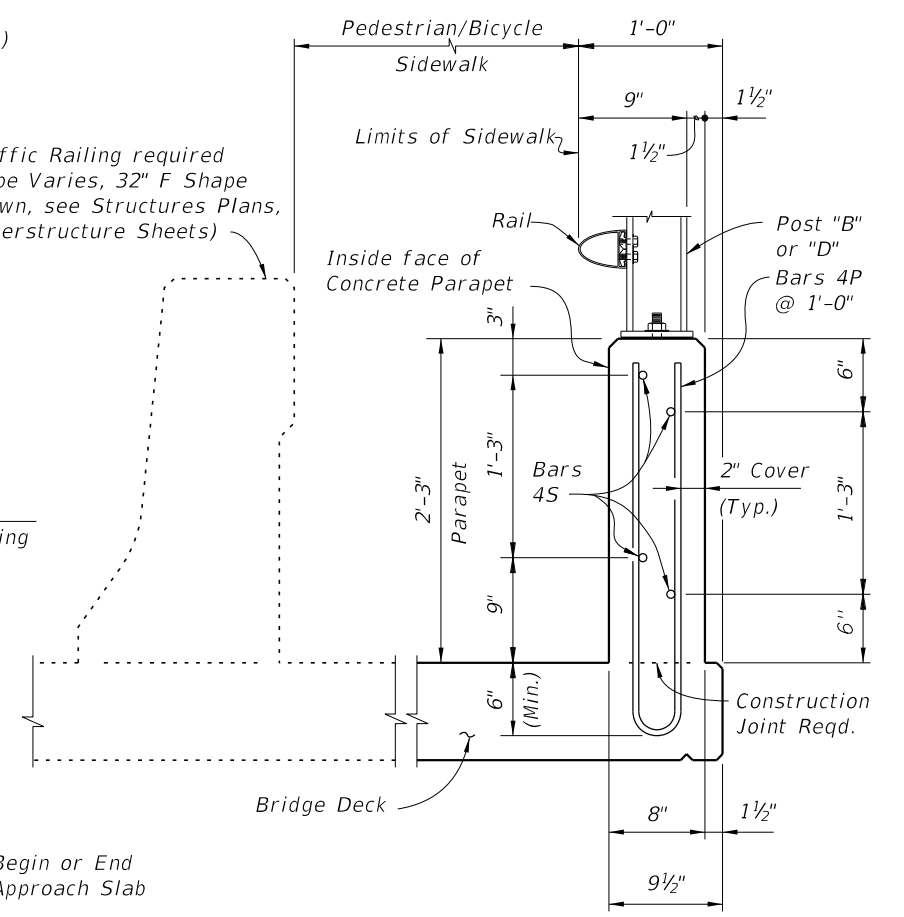


** 3/4" Intermediate Open Joints shall be provided at locations coinciding with 3/4" Joints for the Traffic Railing.



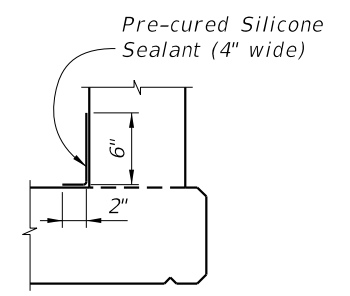
* See Structures Plans, Superstructure Sheets for actual dimensions and joint orientation. Open Parapet Joints at Deck Expansion Joint locations shall match the dimension of the Deck Joint. For treatment of Railings on skewed bridges see Index 420. Deck Joint at Begin Bridge or End Bridge shown. Deck Joint at Pier or Intermediate Bent similar.

Traffic Railing required (Type Varies, 32" F Shape shown, see Structures Plans, Superstructure Sheets)



INTERMEDIATE JOINT SEAL NOTE:

- At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Section 932 of the Specifications.
- Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.
- The cost of the Pre-cured Silicone Sealant shall be included in the Contract Unit Price for the Concrete Parapet.



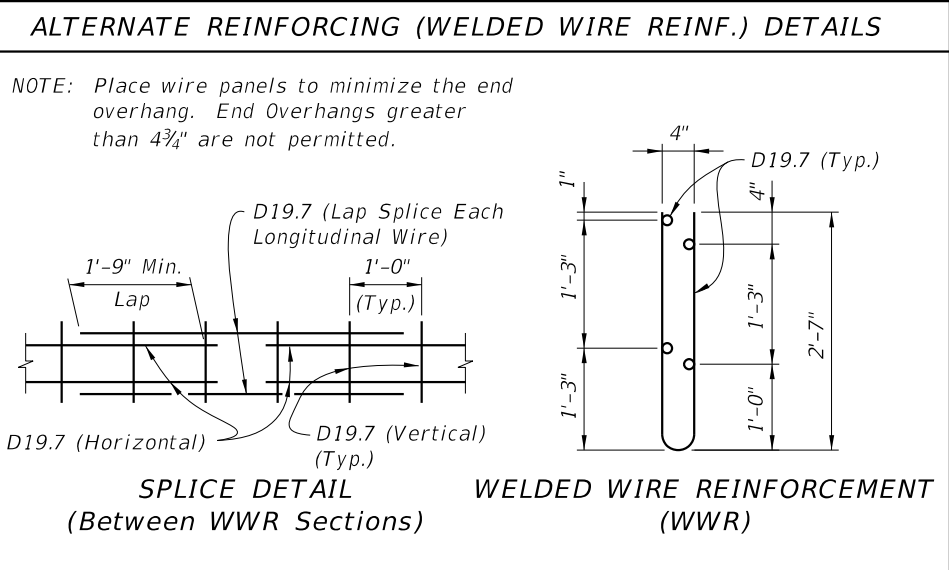
PEDESTRIAN/BICYCLE RAILING NOTES:

CONCRETE PARAPET: Concrete parapet shall be placed vertical and top surface shall be level transversely.

RAIL AND POST DETAILS: For Rail, Post, Rail Splice/Expansion Assembly fabrication and installation details see Index 822.

BRIDGE FENCING: For Bridge Fencing see Index 810, 811 or 812 in lieu of Posts and Rails on Index 822.

PAYMENT: Concrete parapet shall be paid for under the contract unit price for 27" Concrete Parapet (Pedestrian/Bicycle), LF, and Rails shall be paid for under Aluminum Bullet Railings, LF.



CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

MARK	SIZE	LENGTH
P	4	5'-5"
S	4	As Reqd.

BAR 4P **BAR 4S**

ESTIMATED CONCRETE PARAPET QUANTITIES

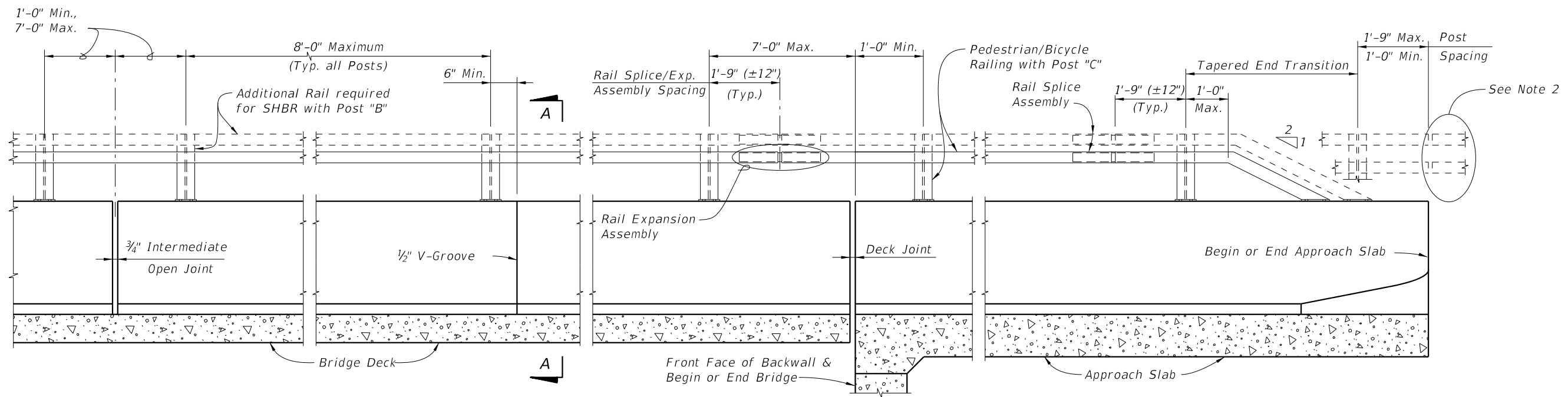
ITEM	UNIT	QUANTITY
Concrete	CY/LF	0.056
Reinforcing Steel	LB/FT	6.29

(The above quantities are based on a deck with a 2% cross slope)

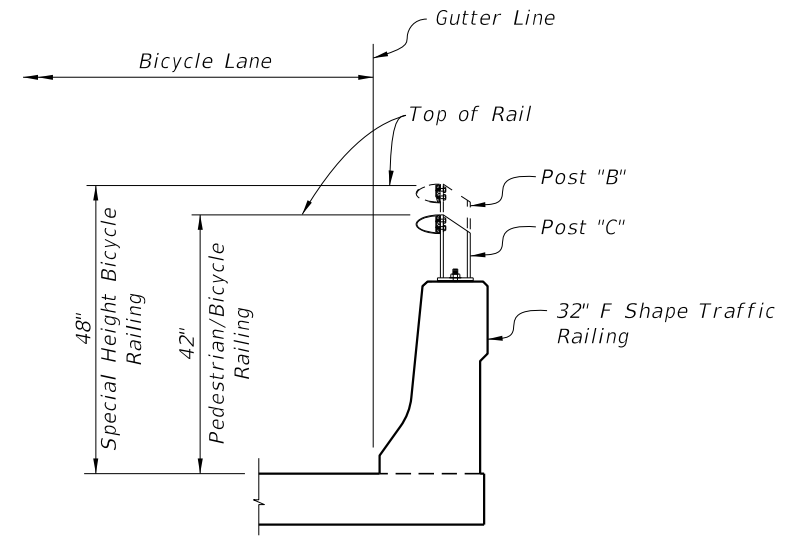
REINFORCING STEEL NOTES:

- All bar dimensions in the bending diagrams are out to out.
- The reinforcement for the parapet on a retaining wall shall be the same as detailed above for a 8" deck.
- All reinforcing steel at the open joints shall have a 2" minimum cover.
- Bars 4S may be continuous or spliced at the construction joints. Bar splices for Bars 4S shall be a minimum of 1'-8".
- At the option of the Contractor deformed WWR may be used in lieu of all Bars 4P and 4S.

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ELEVATION OF INSIDE FACE OF TRAFFIC RAILING WITH PEDESTRIAN/BICYCLE BULLET RAILING



SECTION A-A
TYPICAL SECTION THRU BRIDGE DECK
(APPROACH SLAB SIMILAR)


NOTES:

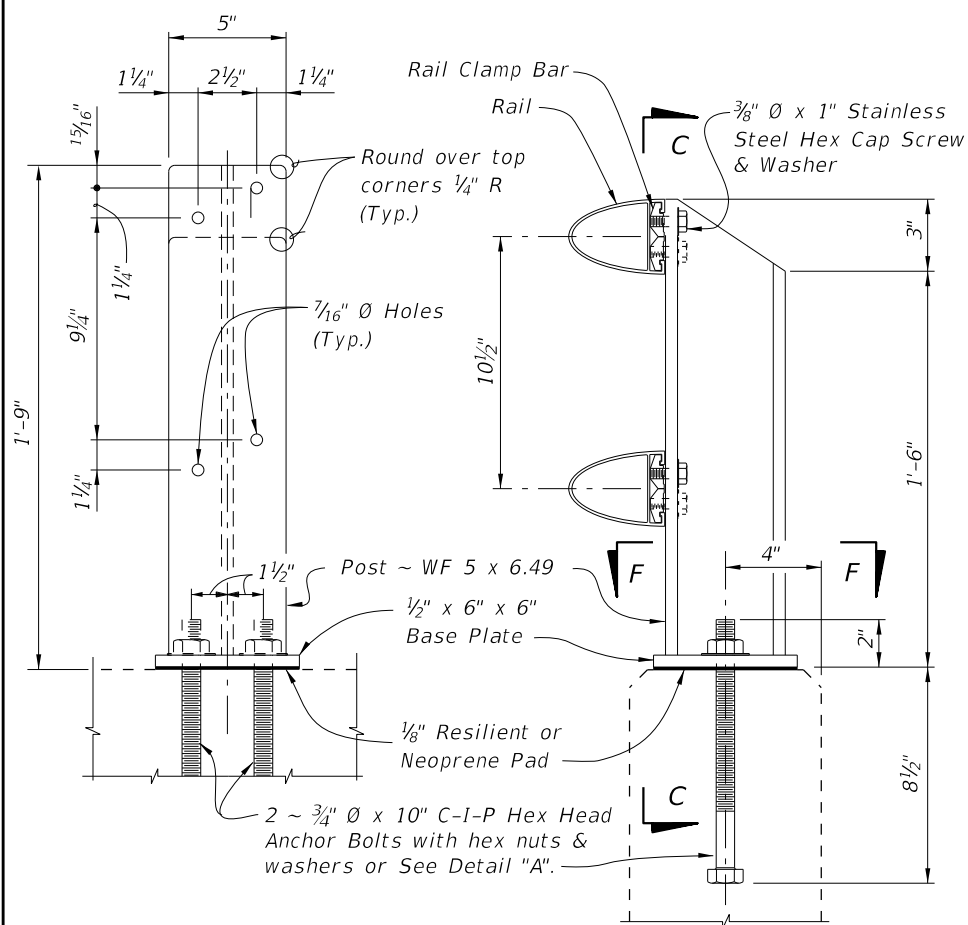
1. A Tapered-End Transition is required for all approach ends of Bullet Railings on Traffic Railings.
2. Where Bullet Railing continues on retaining wall mounted Traffic Railings or other Traffic Railings, the Tapered End Transition shall be located at the terminus of the Bullet Railing.

CROSS REFERENCES:

Work in conjunction with Index 822.
For Traffic Railing Details, Reinforcement and Notes see Index 420.

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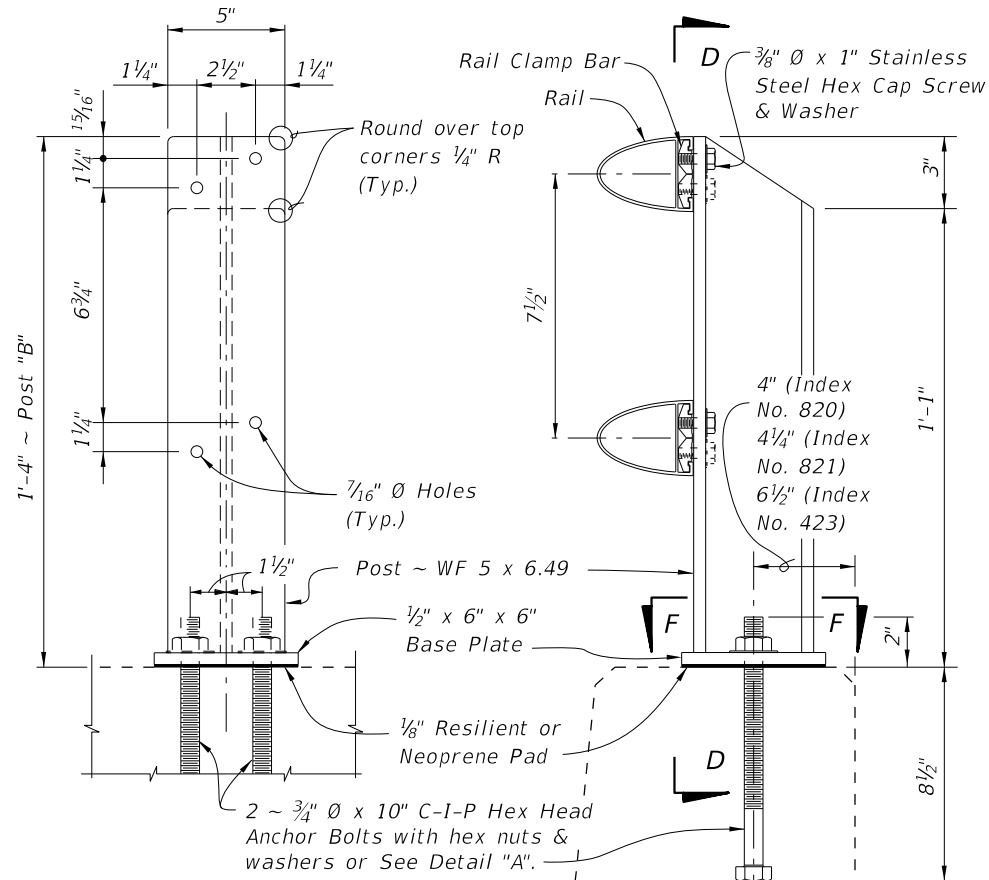
LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	BRIDGE ALUMINUM PEDESTRIAN/BICYCLE BULLET RAILING FOR TRAFFIC RAILING (32" F SHAPE)	INDEX NO. 821	SHEET NO. 1 of 1
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SECTION C-C
(RAILS NOT SHOWN)

ELEVATION
OF POST "D"

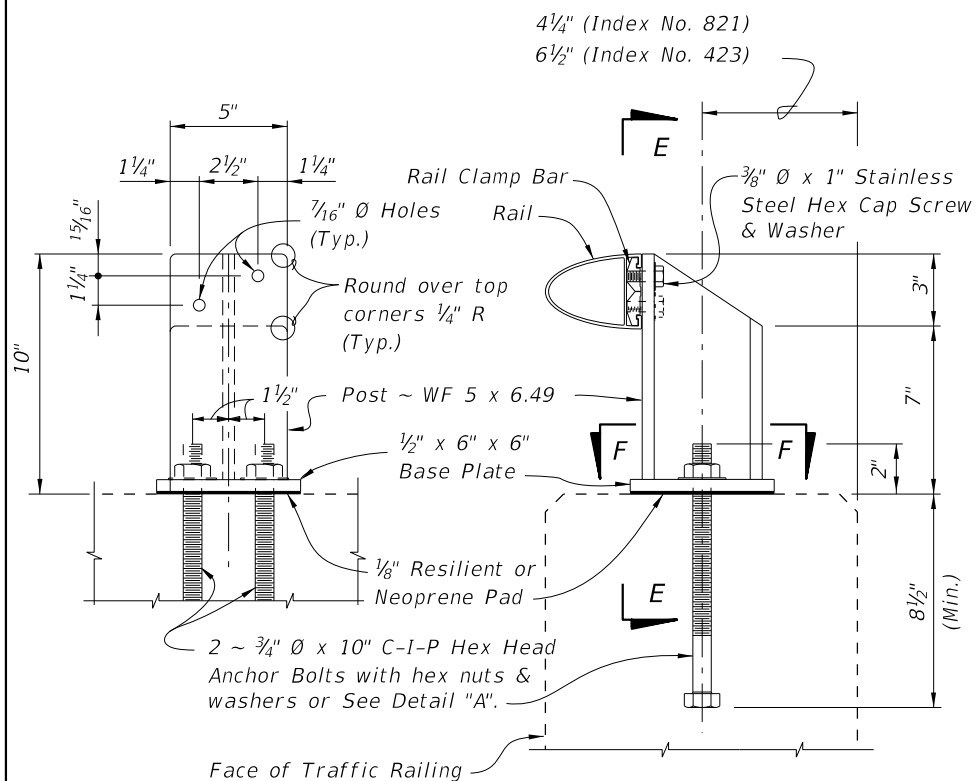
POST "D" DETAILS FOR SPECIAL HEIGHT BICYCLE RAILING
ON CONCRETE PARAPET (INDEX 820)



SECTION D-D
(RAILS NOT SHOWN)

ELEVATION OF POST "B"

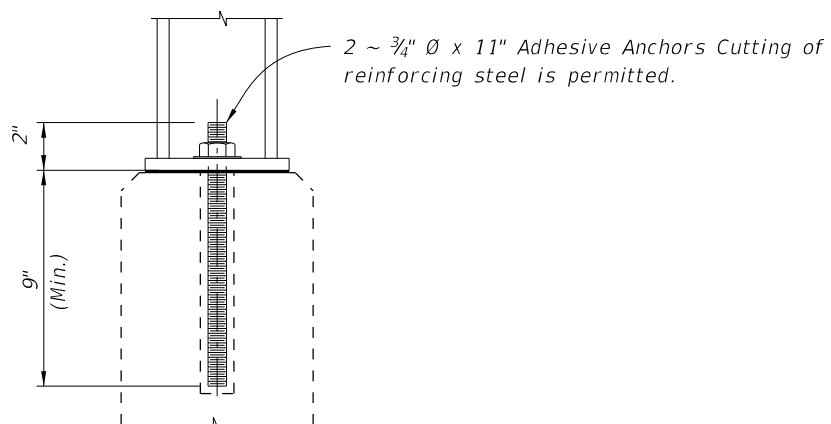
POST "B" DETAILS FOR SPECIAL HEIGHT BICYCLE RAILING ON
TRAFFIC RAILINGS (INDEX 423 AND 821)
AND FOR PEDESTRIAN/BICYCLE
RAILING ON CONCRETE PARAPETS (INDEX 820)



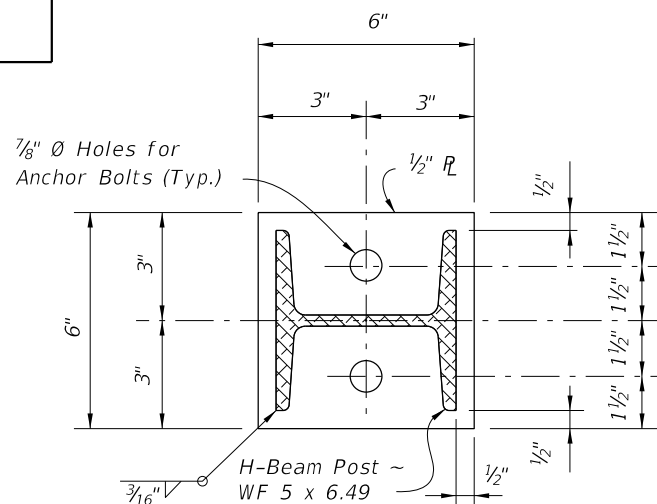
SECTION E-E
(RAIL NOT SHOWN)

ELEVATION
OF POST "C"

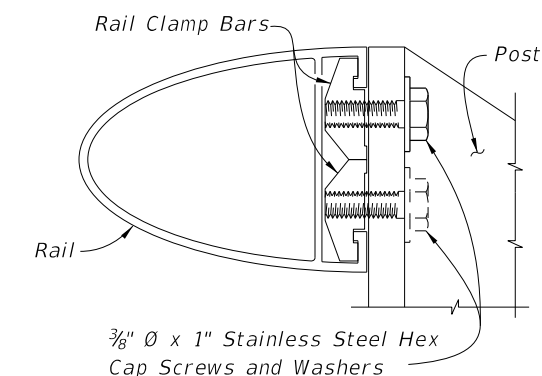
POST "C" DETAILS FOR PEDESTRIAN/BICYCLE RAILING
ON TRAFFIC RAILINGS (INDEX 423 AND 821)



DETAIL "A"
ALTERNATE ANCHOR BOLT
(Concrete Parapet Shown,
Traffic Railings Similar)



SECTION F-F
BASE PLATE DETAIL



RAIL TO POST CONNECTION DETAIL

CROSS REFERENCES:

For Post "B" and Post "D" spacing see
Index 820.

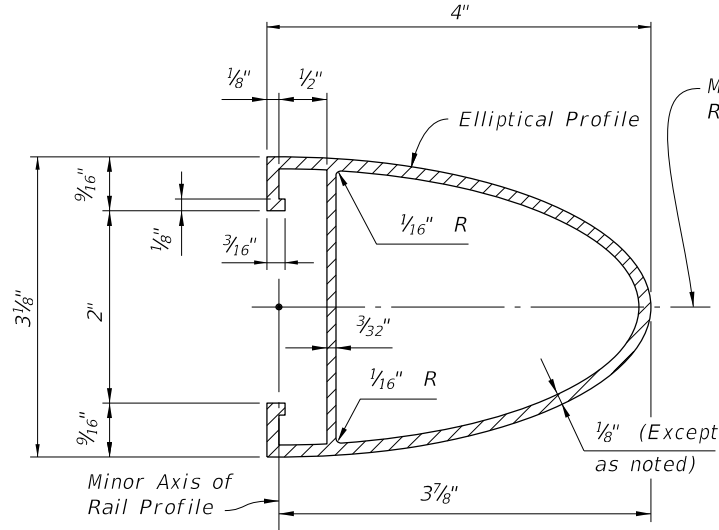
For Post "B" & Post "C" spacing see
Index 423 or 821.

For Rail Details see Sheet 2.

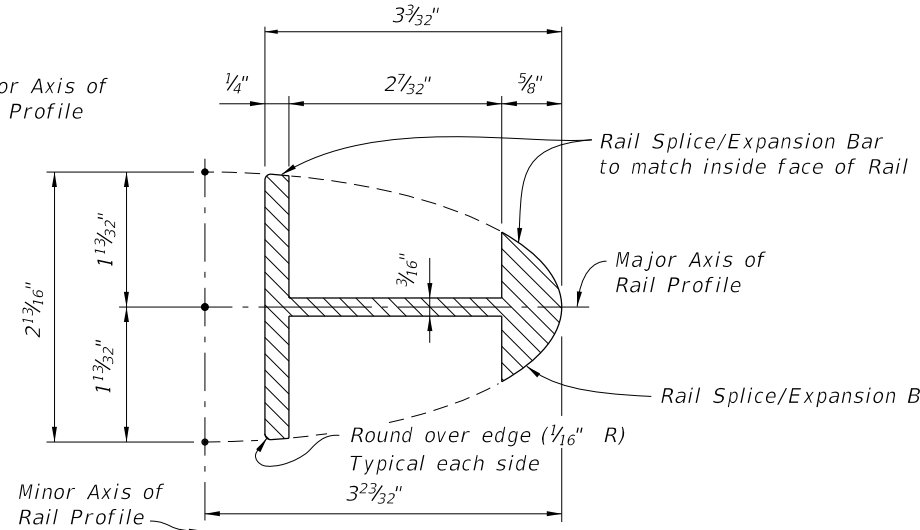
For Railing Notes and Tapered End
Transition Details see Sheet 3.

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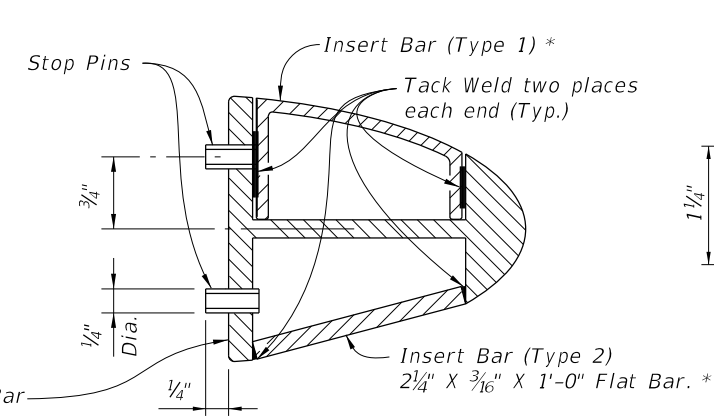
LAST REVISION	DESCRIPTION:
11/01/16	



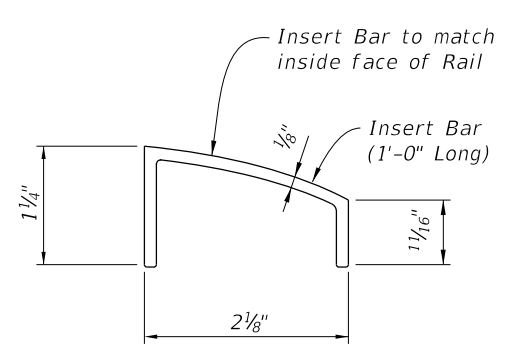
**SECTION A-A
TYPICAL SECTION THRU RAIL**



**SECTION B-B - RAIL SPLICE/EXPANSION BAR
(Rail not shown for clarity)**

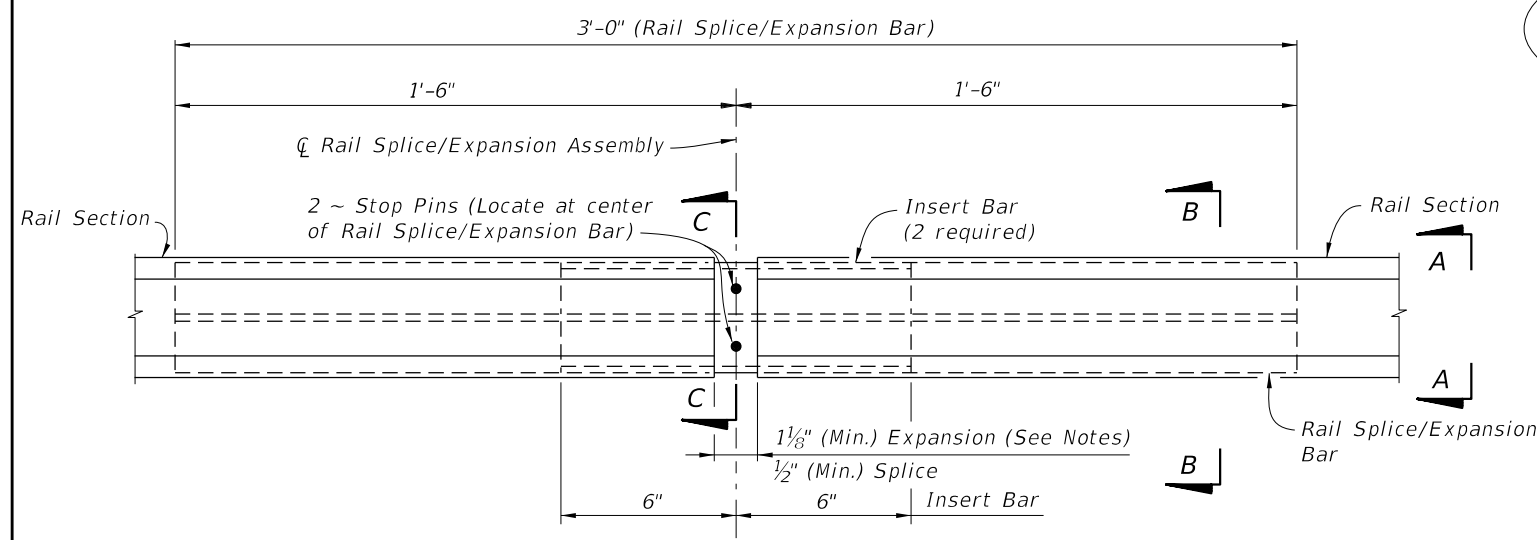


**SECTION C-C
RAIL SPLICE/EXPANSION
BAR ASSEMBLY**

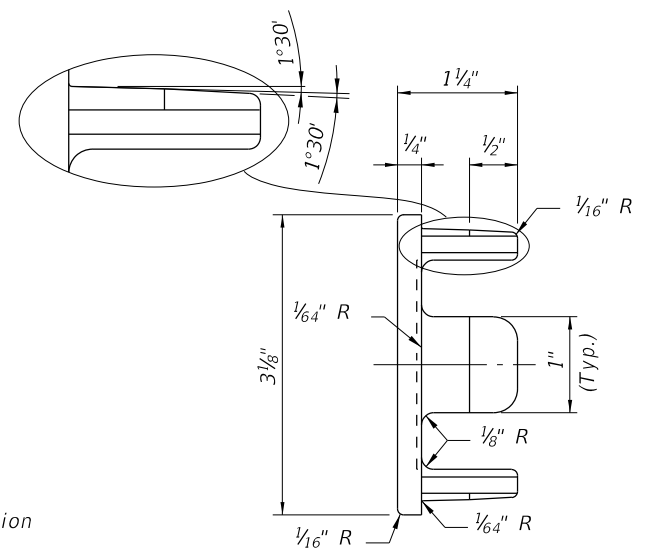


INSERT BAR DETAIL (TYPE 1)

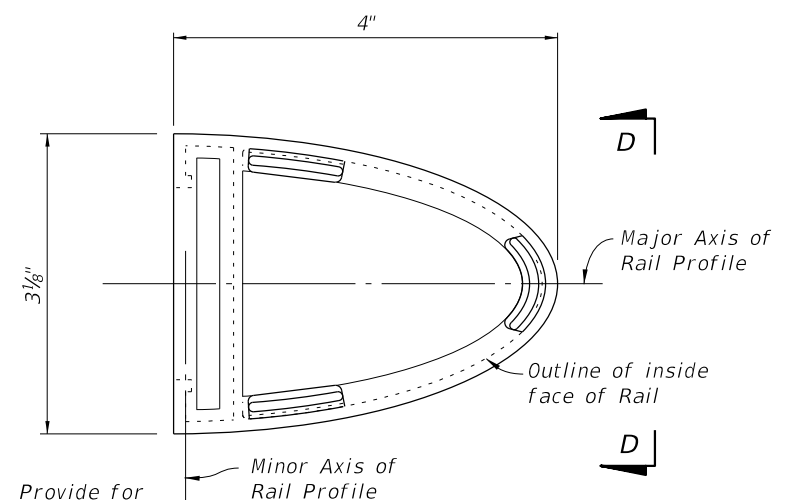
* Use of either Type 1 or Type 2 Insert Bars is at the option of the Contractor.



RAIL SPLICE/EXPANSION ASSEMBLY DETAIL



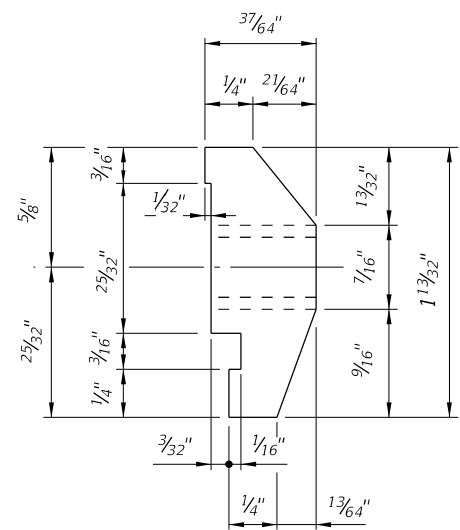
VIEW D-D



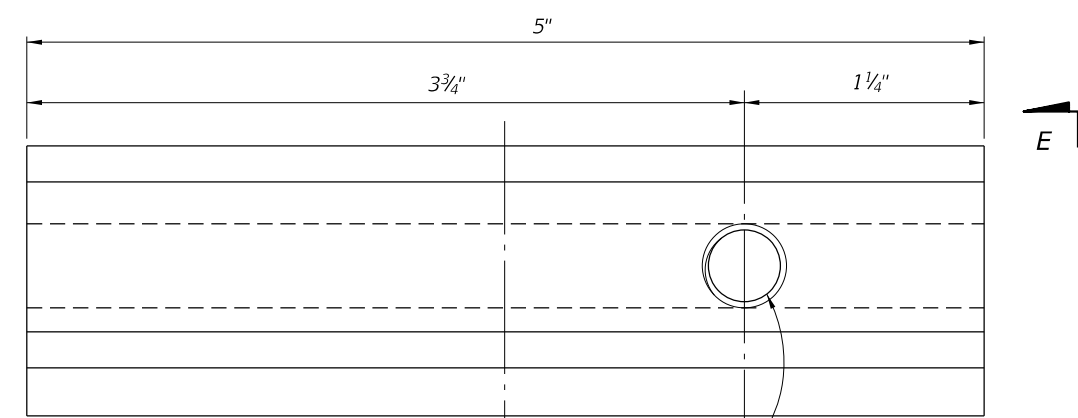
RAIL END CAP DETAIL

NOTE: Provide for drive fit.

CROSS REFERENCE:
For Notes and Tapered End Transition Details,
See Sheet 3.



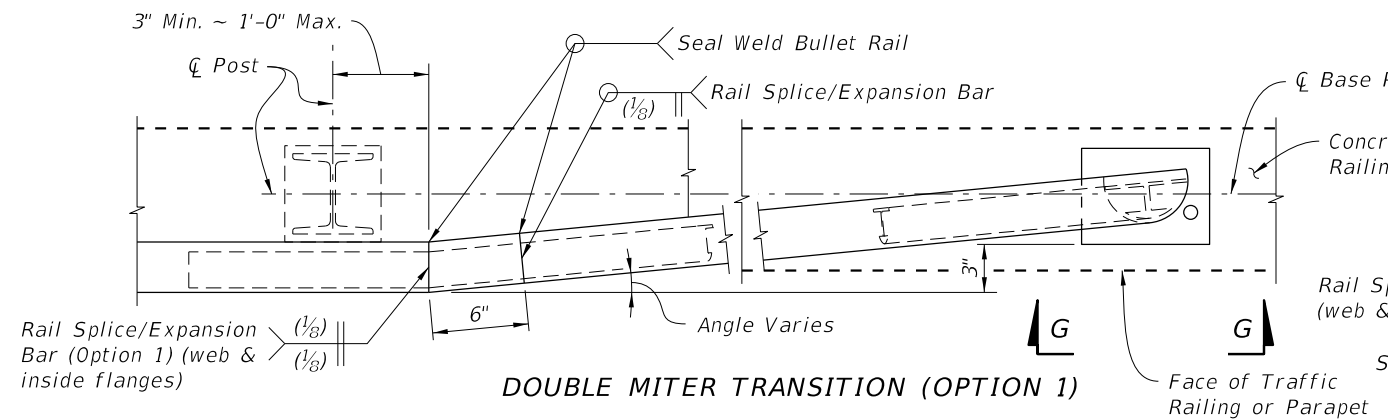
VIEW E-E



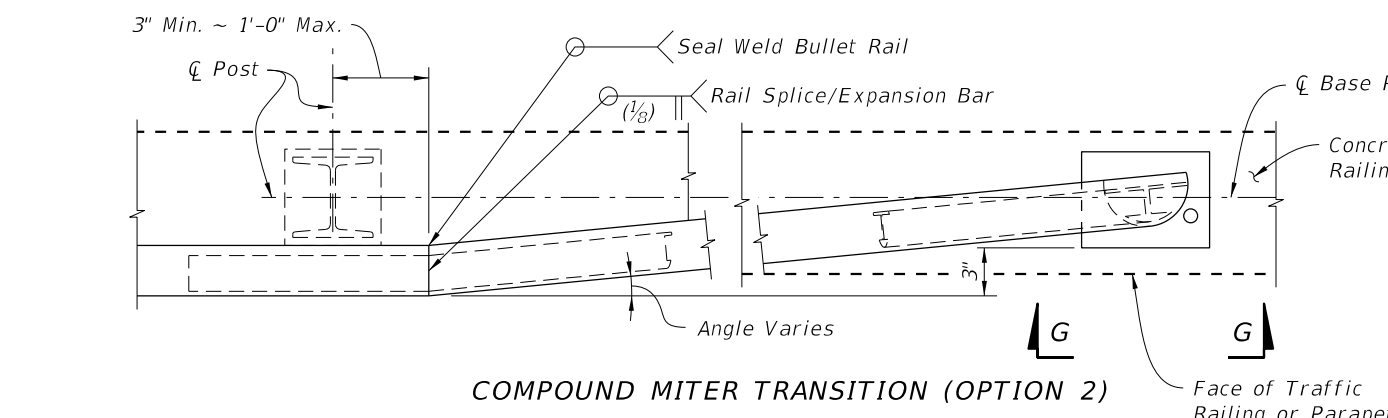
RAIL CLAMP BAR DETAIL

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LAST REVISION 07/01/14	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	BRIDGE ALUMINUM PEDESTRIAN/BICYCLE BULLET RAILING DETAILS	INDEX NO. 822	SHEET NO. 2 of 3
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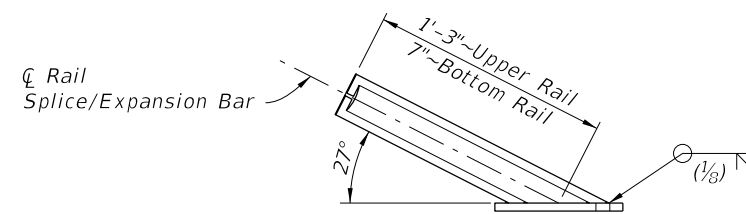


DOUBLE MITER TRANSITION (OPTION 1)

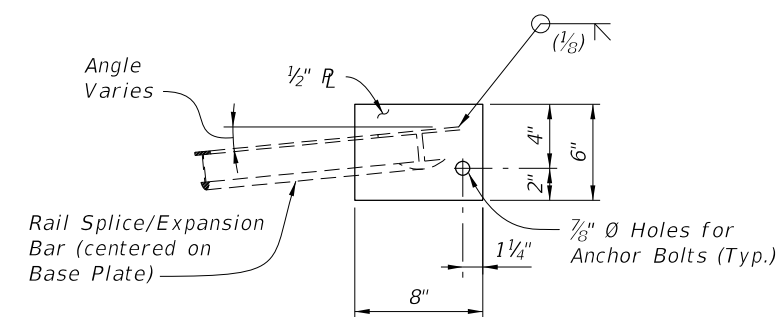


COMPOUND MITER TRANSITION (OPTION 2)

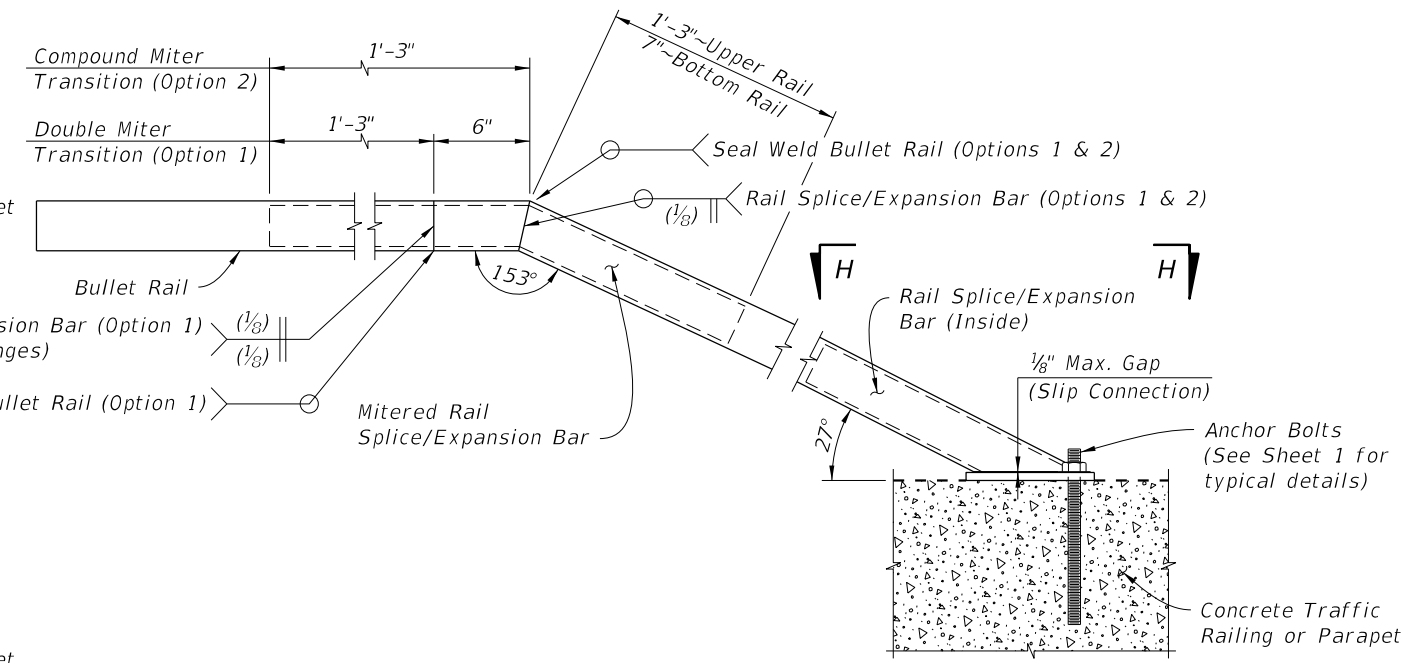
PARTIAL PLAN OF TAPERED END TRANSITIONS
(Single Rail Shown, Double or Triple Rail Similar)



VIEW G-G TRANSITION BASE PLATE
(Bullet Rail not shown for Clarity)



VIEW H-H TRANSITION BASE PLATE
(Bullet Rail not shown for Clarity)



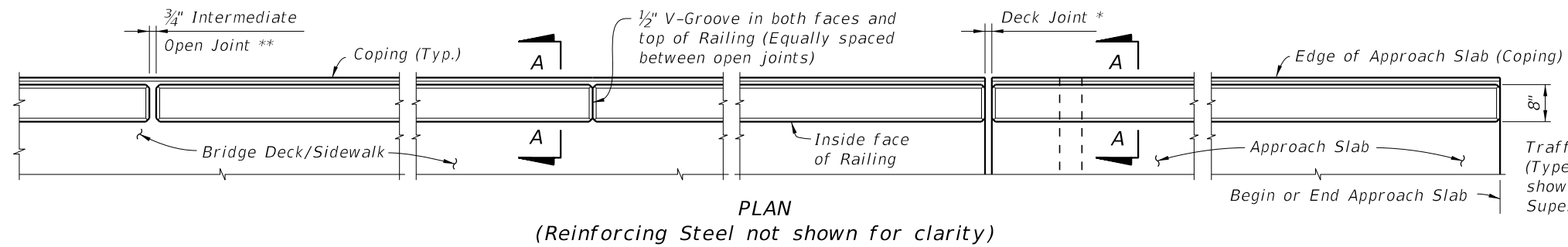
ELEVATION OF TAPERED END TRANSITION
(Single Rail Shown, Double or Triple Rail Similar)

RAILING NOTES:

1. Work this Index with Index 423, 820 and 822 and Specification Section 515.
2. Shop Drawings: Submit shop drawings prior to fabrication.
 - a. Include post and rail splice/expansion assembly location for curved alignments with radii < 40 feet and for all end terminations.
3. Materials:
 - a. Supply Aluminum materials in accordance with Specification Section 965 and the following:
Wrought Aluminum Post: ASTM B221, Alloy 6061-T6 or 6351-T5
Rail End Cap: ASTM B26 sand cast aluminum alloy 356.0-F
Plate and Bars: ASTM B209 Alloy 6061-T6
Rails: ASTM B221 Alloy 6061-T6 or 6351-T5.
Stop Pins: Press-fit aluminum or stainless steel pins or tubes
 - b. Stainless Steel Fasteners: ASTM F-593, Alloy Group 2 (316).
4. Layout:
 - a. Posts shall be uniformly spaced with reasonable consistency.
 - b. Tapered End Transitions are required at the terminus of the approach ends of Bullet Railing mounted on a Traffic Railing. Bullet Railings on concrete parapets shielded by a traffic railing do not require Tapered End Transitions unless noted otherwise in the Plans.
 - c. Adjust post spacing's to avoid parapet obstacles, such as armor expansion plates, by 9 inches minimum.
 - d. Rails shall be continuous over a minimum of 3 posts, except that lengths less than 12 feet need only be continuous over 2 posts.
 - e. Space splices at 40 feet maximum. Splice all rails in a given railing section at about the same center line.
 - f. Provide rail expansion assemblies in panels between posts on either side of a bridge expansion joint. Rail expansion assemblies are similar to the rail splice assemblies with increased space at the expansion assembly to allow for movement equal to 1.5 times the bridge joint opening or 1" greater than the expected joint movement.
5. Installation:
 - a. Set rails near bridge expansion joints to allow for expected movement.
 - b. Cutting of reinforcing steel is permitted for post installed anchors.
6. Payment: Includes the full cost of installed bullet railing. Cost of the Concrete Parapet or Traffic Railing is separate.

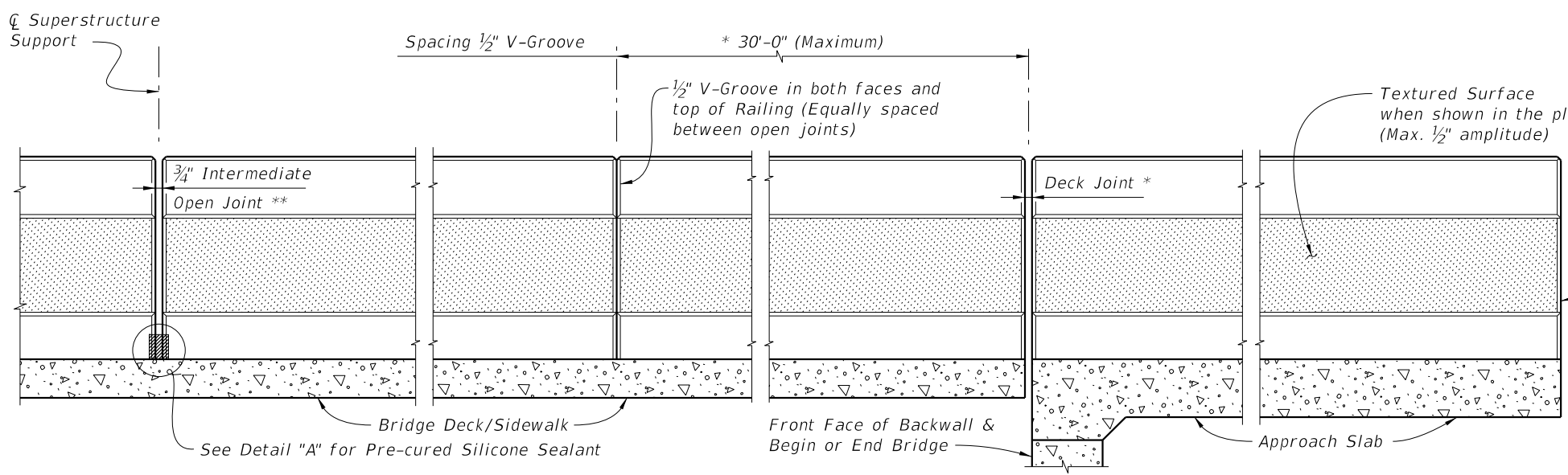
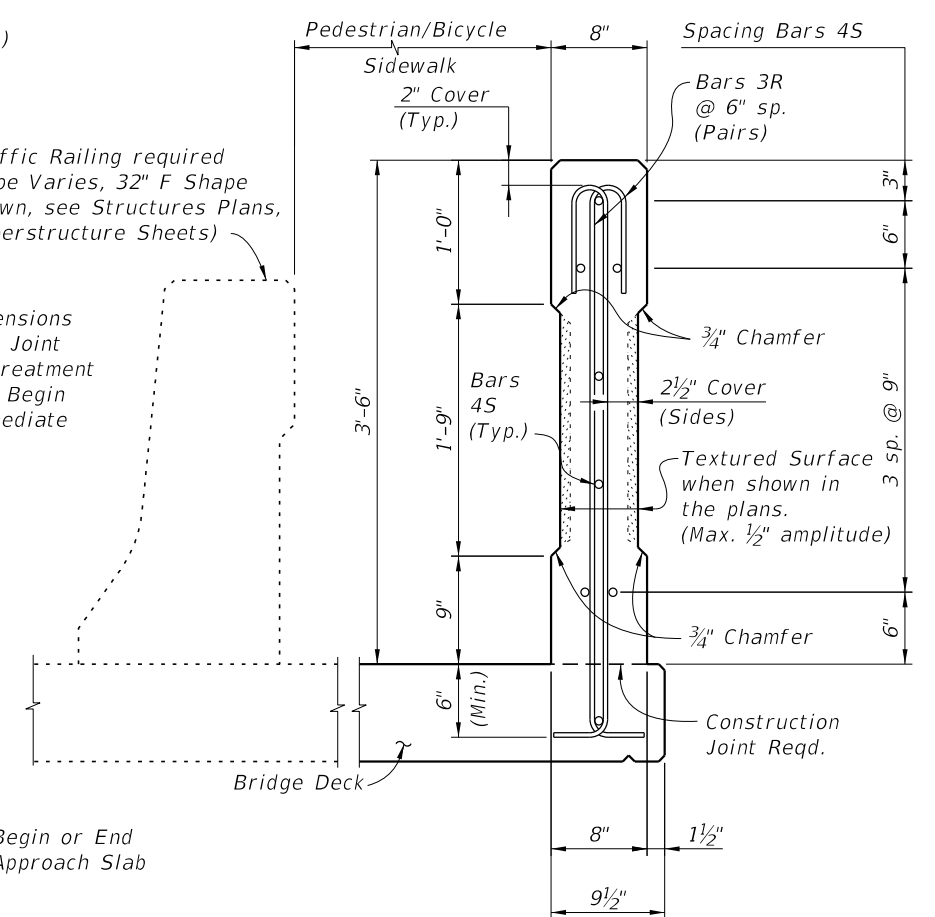
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LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	BRIDGE ALUMINUM PEDESTRIAN/BICYCLE BULLET RAILING DETAILS	INDEX NO. 822	SHEET NO. 3 of 3
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* See Structures Plans, Superstructure Sheets for actual dimensions and joint orientation. Open Railing Joints at Deck Expansion Joint locations shall match the dimension of the Deck Joint. For treatment of Railings on skewed bridges see Index 420. Deck Joint at Begin Bridge or End Bridge shown. Deck Joint at ϕ Pier or Intermediate Bent similar.

Traffic Railing required (Type Varies, 32" F Shape shown, see Structures Plans, Superstructure Sheets)



** 3/4" Intermediate Open Joints shall be provided at locations coinciding with 3/4" Joints for the Traffic Railing.

ELEVATION OF INSIDE FACE OF RAILING
(Reinforcing Steel not shown for clarity)

RAILING NOTES:

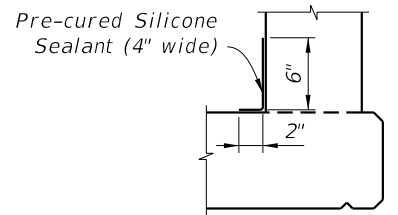
1. Railing shall be placed vertical and top surface shall be level transversely.

INTERMEDIATE JOINT SEAL NOTES:

- At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Specification Section 932.
- Apply sealant prior to any Class 5 Finish Coating and remove all curing compound and loose material from the surface prior to application of bonding agent.
- The cost of the Pre-cured Silicone Sealant shall be included in the Contract Unit Price for the Railing.

REINFORCING STEEL NOTES:

- All bar dimensions in the bending diagrams are out to out.
- The reinforcement for the railing on a retaining wall shall be the same as detailed above for an 8" deck.
- All reinforcing steel at the open joints shall have a 2" minimum cover.
- Bar splices for Bars 4S shall be a minimum of 1'-8".
- At the option of the Contractor deformed WWR may be used in lieu of all Bars 3R and 4S.



ESTIMATED CONCRETE RAILING QUANTITIES

ITEM	UNIT	QUANTITY
Concrete	CY/LF	0.079
Reinforcing Steel	LB/LF	13.12

(The above quantities are based on a deck with a 2% cross slope)

ALTERNATE REINFORCING (WELDED WIRE REINF.) DETAILS

NOTE: Place wire panels to ensure vertical wire is within 4" of open joints.

SPLICE DETAIL (Between WWR Sections)

WELDED WIRE REINFORCEMENT (WWR) (2 Pieces Req'd)

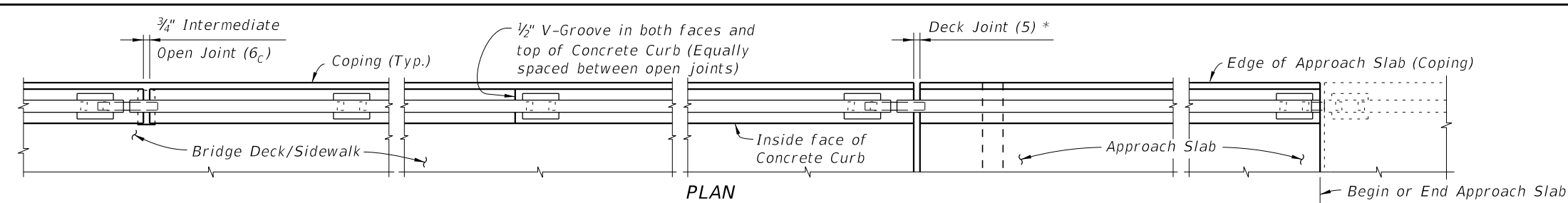
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

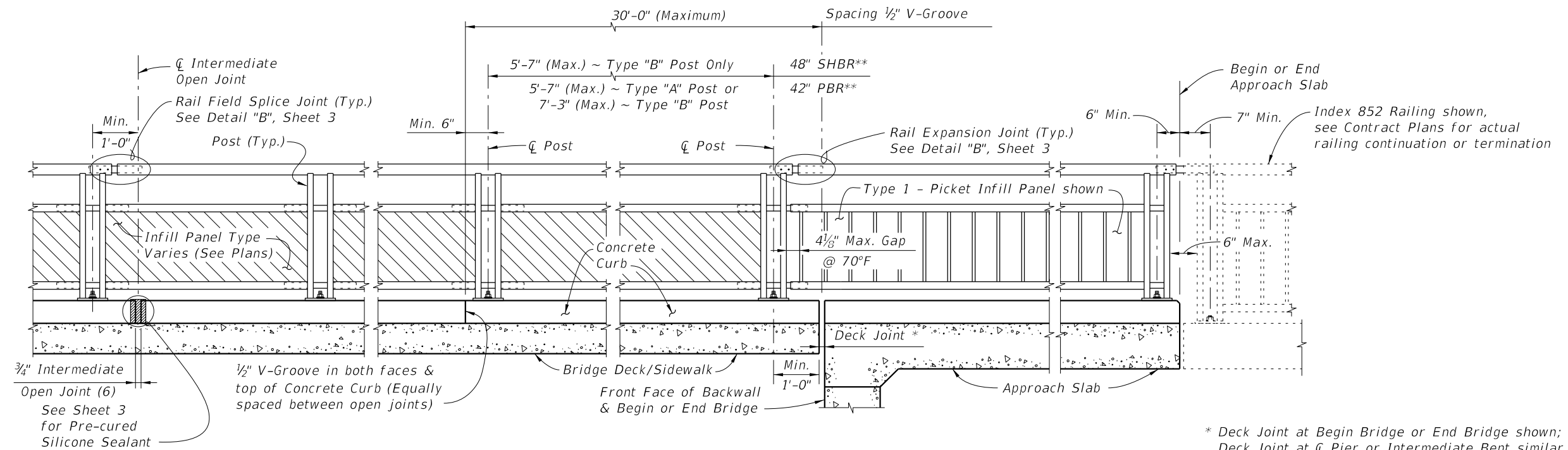
MARK	SIZE	LENGTH
R	3	5'-2"
S	4	As Req'd.

BAR 3R **BAR 4S**

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PLAN
 (Scheme 2 shown, other Schemes similar, Reinforcing Steel not shown for clarity)



ELEVATION OF INSIDE FACE OF RAILING
 (Scheme 2 shown with Post "A", other Schemes similar, Reinforcing Steel not shown for clarity)

* Deck Joint at Begin Bridge or End Bridge shown;
 Deck Joint at ϕ Pier or Intermediate Bent similar.

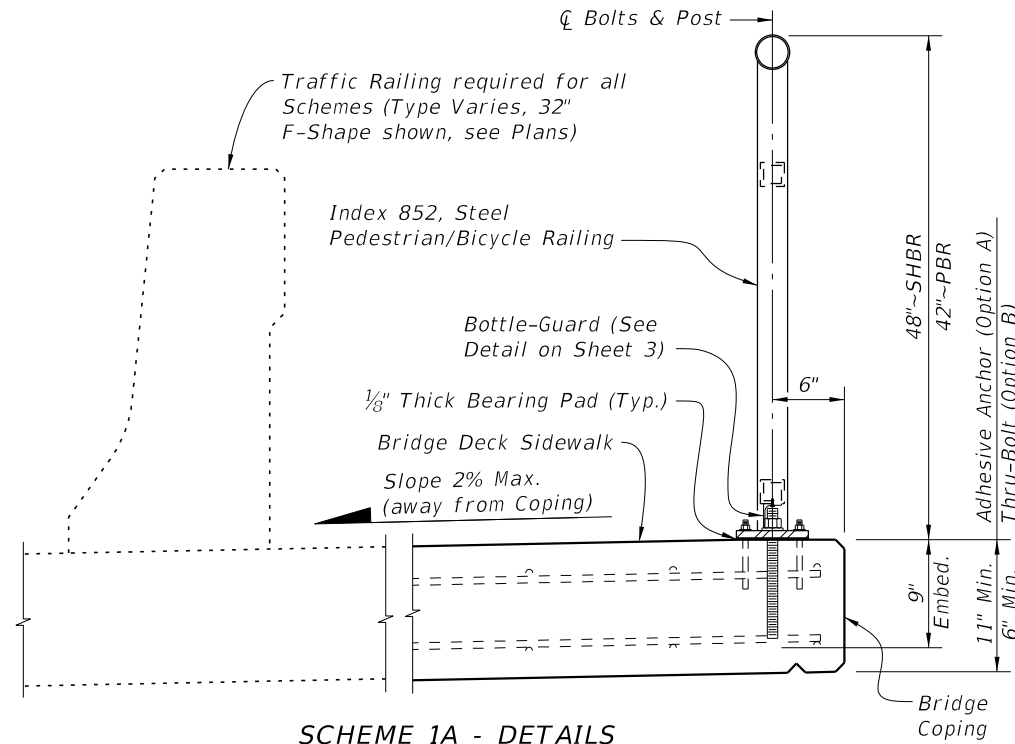
** SHBR~Special Height Bicycle Rail
 PBR~Pedestrian/Bicycle Rail

NOTES:

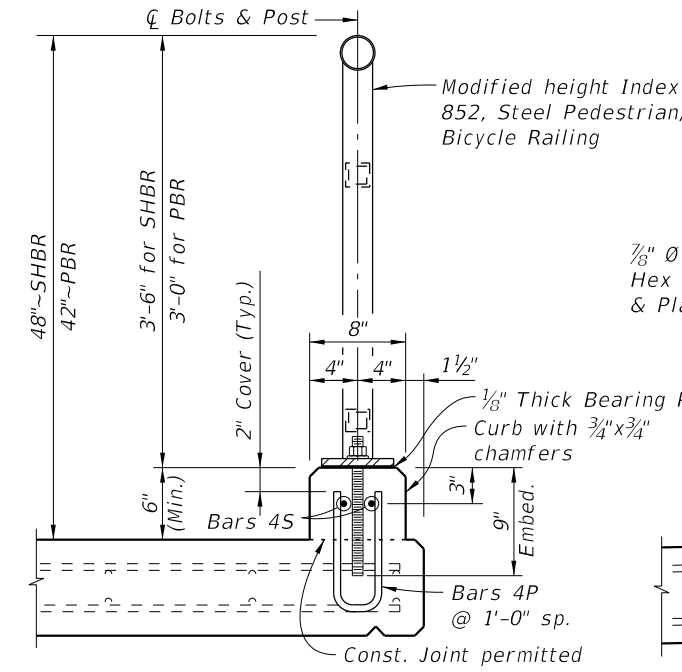
1. Shop Drawings are required.
2. Work this Index with Index 852 Steel Bicycle/Pedestrian Railing Details and Specification Section 515. Refer to the IDS for Design Criteria and Limits of Use.
3. Materials:
 - A. Steel: Galvanized after fabrication
 - a. Fasteners: Hex Head Bolt ASTM A307, Hex Nuts ASTM A563, Washers ASTM F436
 - b. Support Bracket (Scheme 3) L-shape and Stiffener Plate: ASTM A36
 - c. Bottle-guard (Schemes 1 & 3) L-shape: ASTM A36
 - B. Concrete: Same as bridge deck
 - C. Pre-cured Silicone Sealant: Specification Section 932
 - D. Bearing Pads: Provide $\frac{1}{8}$ " Plain, Fabric Reinforced or Fabric Laminated bearing pads that meet the requirements of Specification Section 962 for Ancillary Structures.
4. See Structures Plans, Superstructure Sheets for bridge information including concrete type, deck expansion joint locations and orientations, and thermal movement.
5. Railings:
 - A. For thermal movement greater than 4" (up to a maximum of 5"), clear opening between adjacent pickets, or panels at Rail Expansion Joints above Deck Joints must be reduced to $3\frac{1}{2}$ ".
 - B. For treatment of railings on skewed bridges see Index 420.
6. Curbs:
 - A. Match open curb joints at Deck Expansion Joint locations to the deck joint dimension.
 - B. Construct Concrete Curb (Scheme 2) vertical with the top surface finished level transversely. See Concrete Curb Details Sheet 3.
 - C. Provide $\frac{3}{4}$ " Intermediate open joints in curbs coinciding with the $\frac{3}{4}$ " joints in the traffic railing.
7. Payment: Support bracket (Scheme 3) is incidental to the cost of railing. Curb concrete and reinforcing steel (Scheme 2) are included in the bridge deck quantities.

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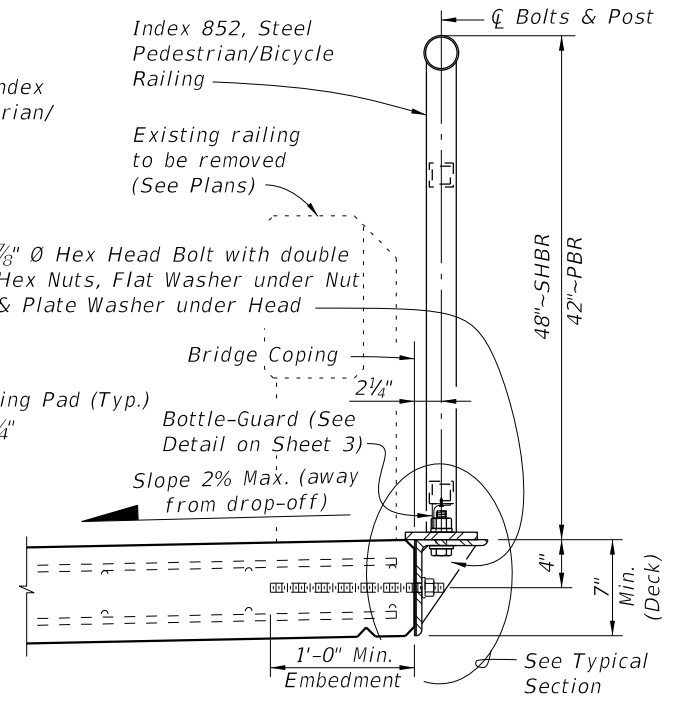
LAST REVISION 11/01/16	DESCRIPTION:	FY 2017-18 DESIGN STANDARDS	BRIDGE PEDESTRIAN/BICYCLE RAILING (STEEL)	INDEX NO. 851	SHEET NO. 1 of 3
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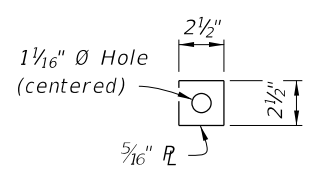
SCHEME 1A - DETAILS
(Adhesive Anchor Option shown)



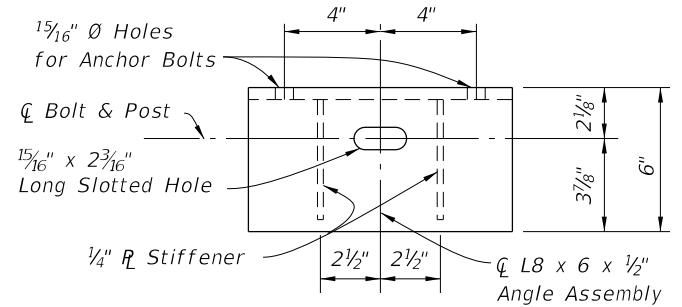
SCHEME 2 - TYPICAL SECTION THROUGH CURB MOUNTED RAILING



SCHEME 3 - TYPICAL SECTION THROUGH SIDE MOUNTED RAILING (RETROFIT)



THRU-BOLT PLATE WASHER DETAIL



PLAN VIEW

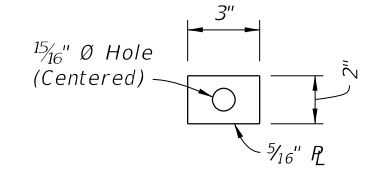
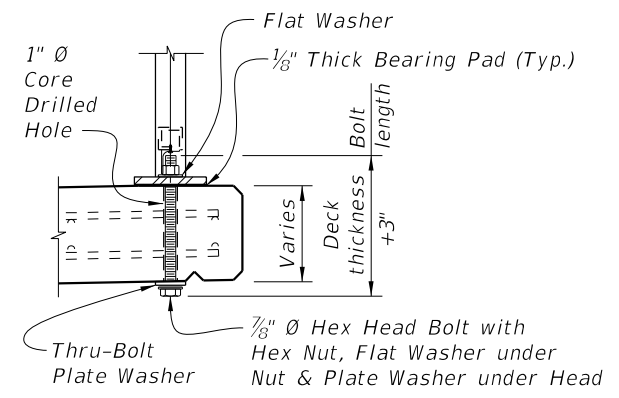
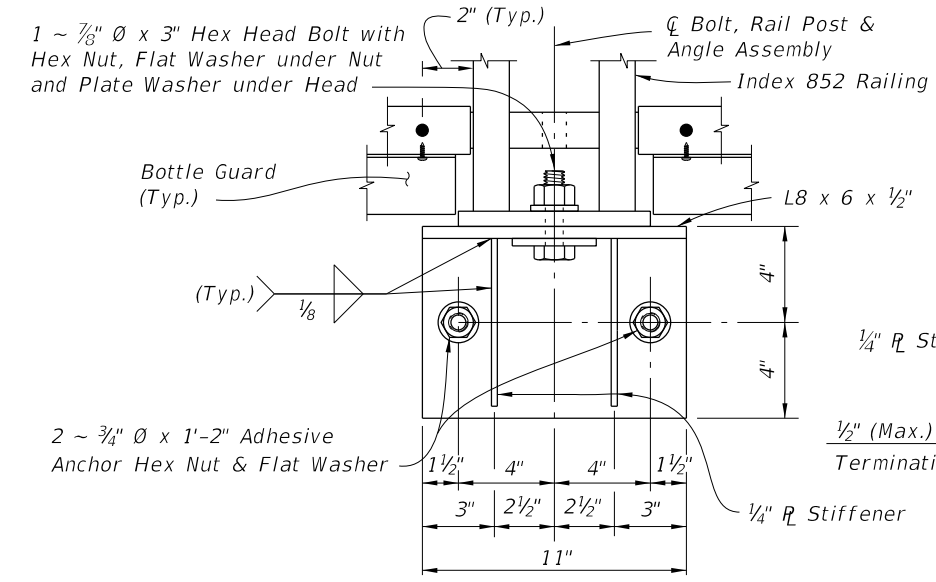


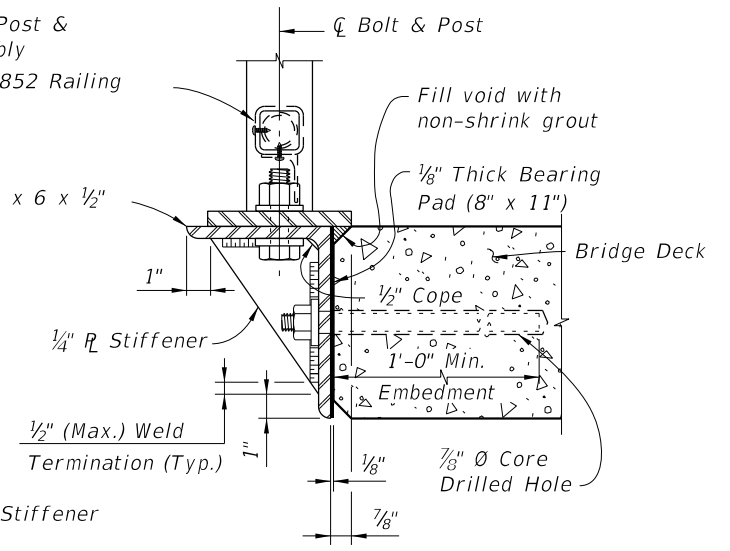
PLATE WASHER DETAIL



SCHEME 1B - DETAILS
(Thru-Bolt Option)



ELEVATION VIEW




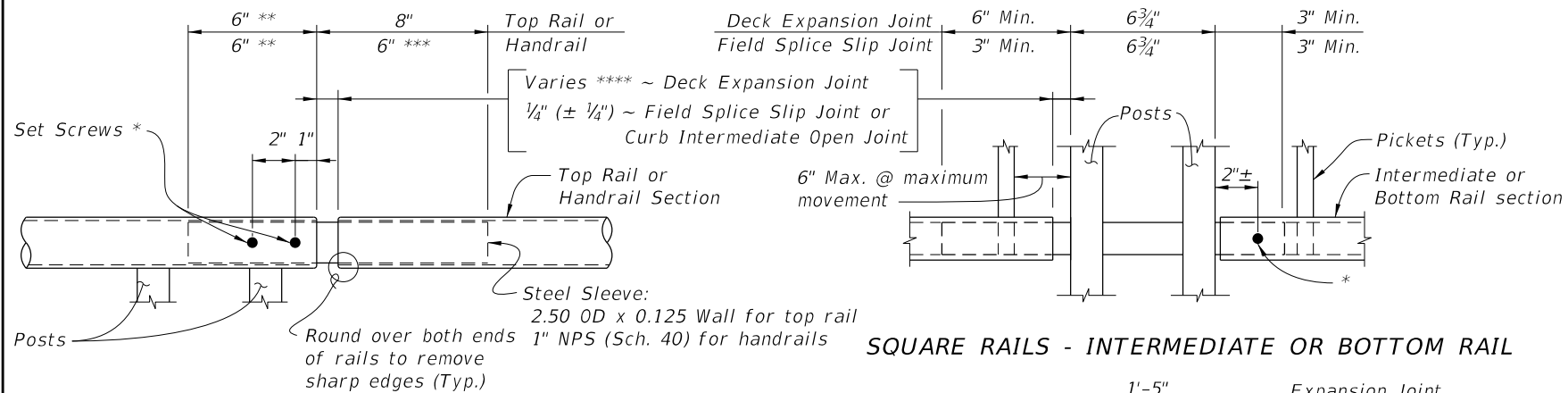
TYPICAL SECTION

SCHEME 1 - TYPICAL SECTION THROUGH DECK MOUNTED RAILING

SCHEME 3 - SIDE-MOUNTED SUPPORT BRACKET DETAILS

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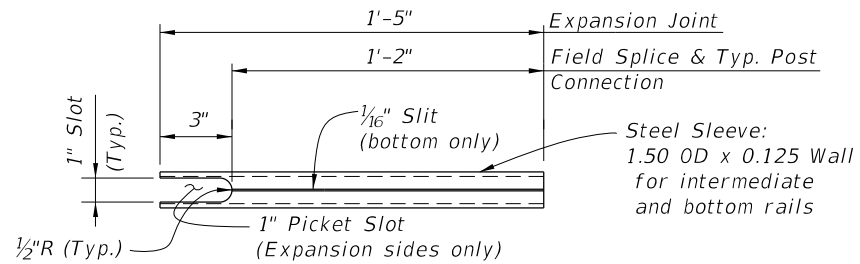
LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	BRIDGE PEDESTRIAN/BICYCLE RAILING (STEEL)	INDEX NO. 851	SHEET NO. 2 of 3
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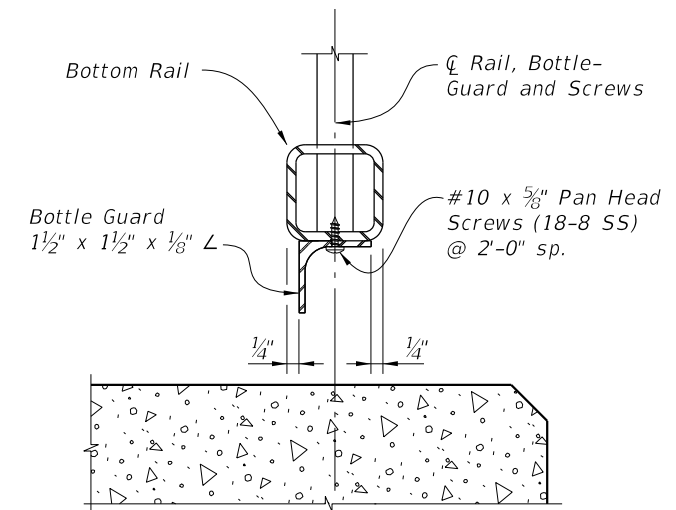
ROUND RAILS - TOP RAIL OR HANDRAIL

- * 1/4" Ø x 3/4" Pan Head Stainless Steel (Type 316 or 18-8 Alloy) Set Screws along outside face of railing. Set screws must be set flush against the rail surface. A 3/4" Ø plug weld may be substituted for the two set screws at expansion joints.
- ** Embedded length may be 4" for plug welded connection.
- *** Increase handrail sleeve embedment to 8" for Expansion Joint openings greater than 2".
- **** Expansion Joint opening shall match the clear opening in the deck joint but not greater than 3".

SQUARE RAILS - INTERMEDIATE OR BOTTOM RAIL



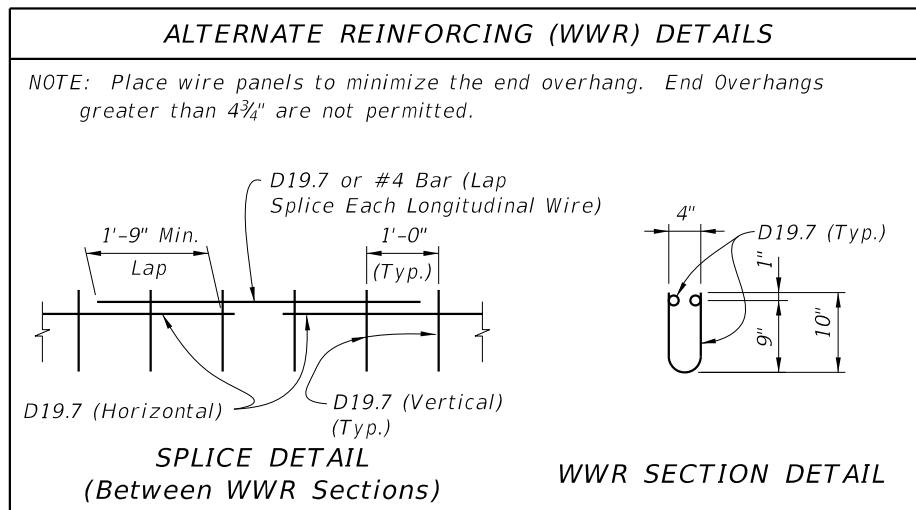
INTERMEDIATE OR BOTTOM RAIL - STEEL SLEEVE DETAIL (Bottom Side Shown)



TYPICAL SECTION THROUGH BOTTOM RAIL (Post Not Shown for Clarity)

DETAIL "B" EXPANSION JOINT (FIELD SPLICE SIMILAR)

SCHEME 1 - BOTTLE GUARD DETAIL



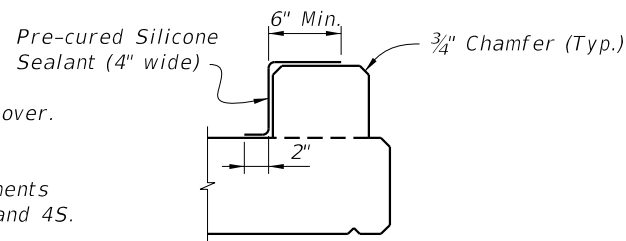
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

MARK	SIZE	LENGTH
P	4	2'-0"
S	4	As Req'd.

CROSS REFERENCE:
See Sheet 1 for Bridge Railing Notes.

- CURB REINFORCING STEEL NOTES:**
- All bar dimensions in the bending diagrams are out to out.
 - The reinforcement for the curb on a retaining wall shall be the same as detailed for an 8" deck.
 - All reinforcing steel at the open joints shall have a 2" minimum cover.
 - Bars 4S may be continuous or spliced at the construction joints. Bar splices for Bars 4S shall be a minimum of 1'-8".
 - Deformed Welded Wire Reinforcement (WWR) meeting the requirements of Specification Section 931 may be used in lieu of all Bars 4P and 4S.



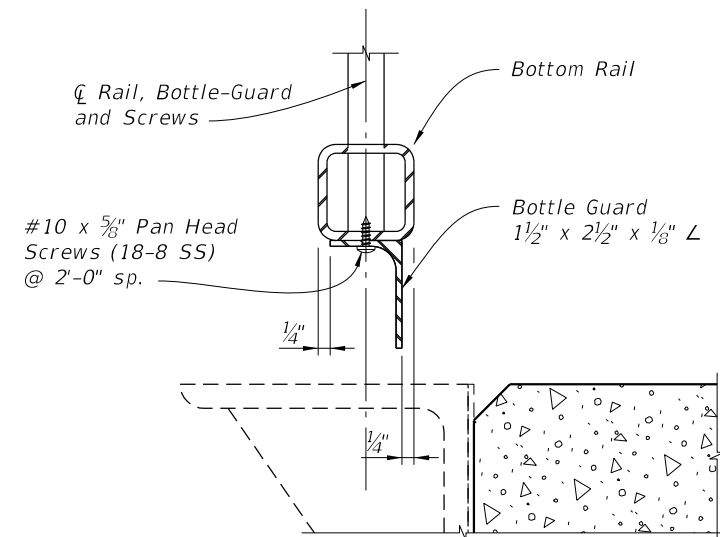
DETAIL "A" - SECTION AT INTERMEDIATE OPEN JOINT

INTERMEDIATE JOINT SEAL NOTE:
At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant. Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.

ESTIMATED CONCRETE CURB QUANTITIES (SCHEME 2)

ITEM	UNIT	QUANTITY
Concrete	CY/LF	0.0124
Reinforcing Steel	LB/LF	4.01

SCHEME 2 - CONCRETE CURB DETAILS

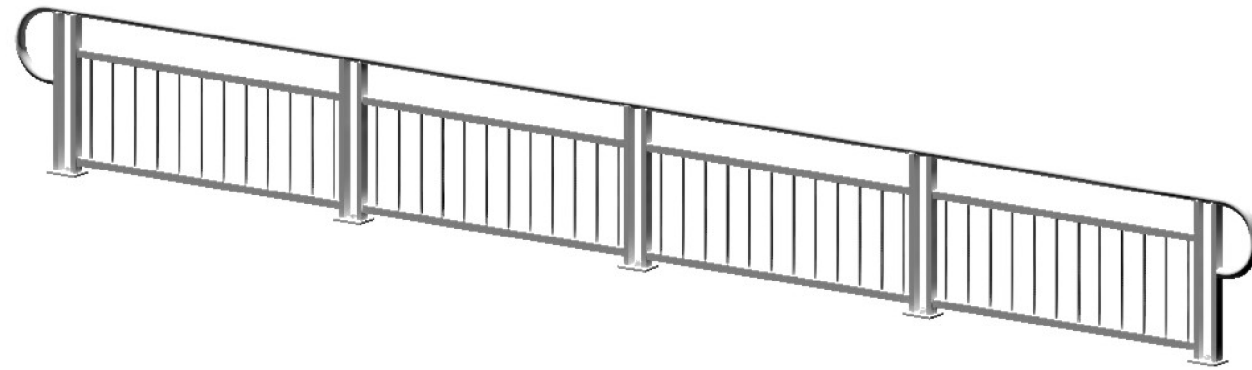


TYPICAL SECTION THROUGH BOTTOM RAIL (Post Not Shown for Clarity)

SCHEME 3 - BOTTLE GUARD DETAIL

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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	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).

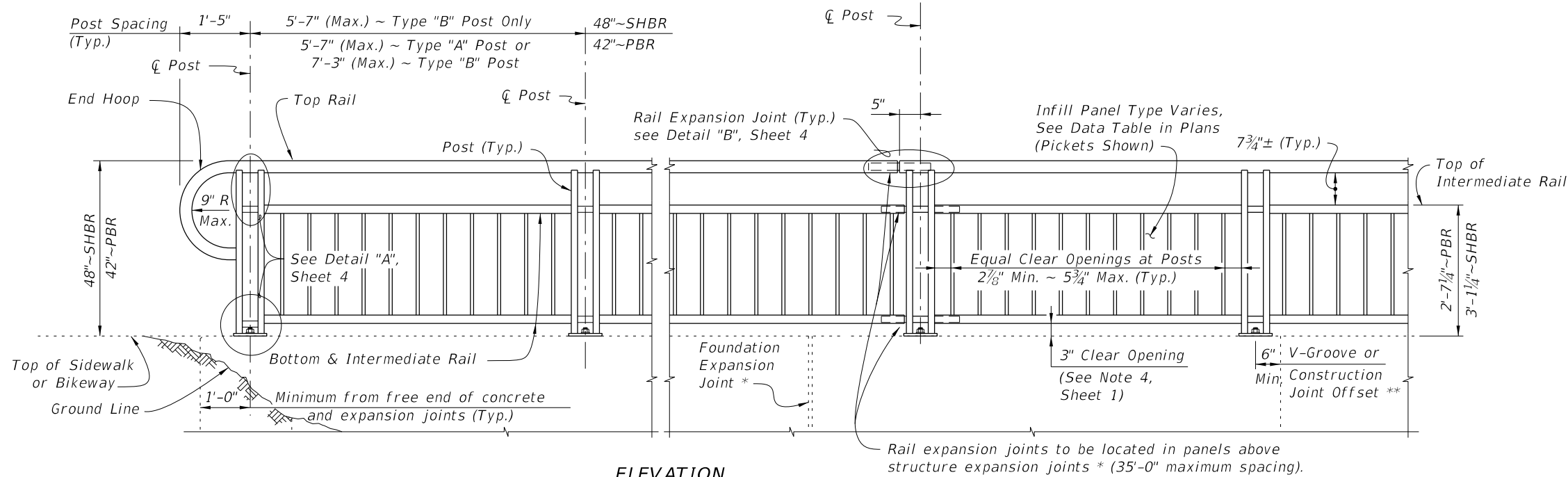
NOTES

Notes:

- Shop Drawings are required; see Specification Section 515
- For bridge mounted railings work this Index with Index 851 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 or ASTM F1554
 - 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 962 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.

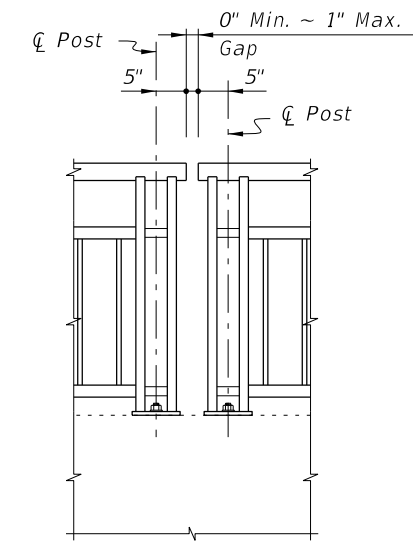
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ELEVATION
(Showing Outside Face of Railing with Type "A" Posts)

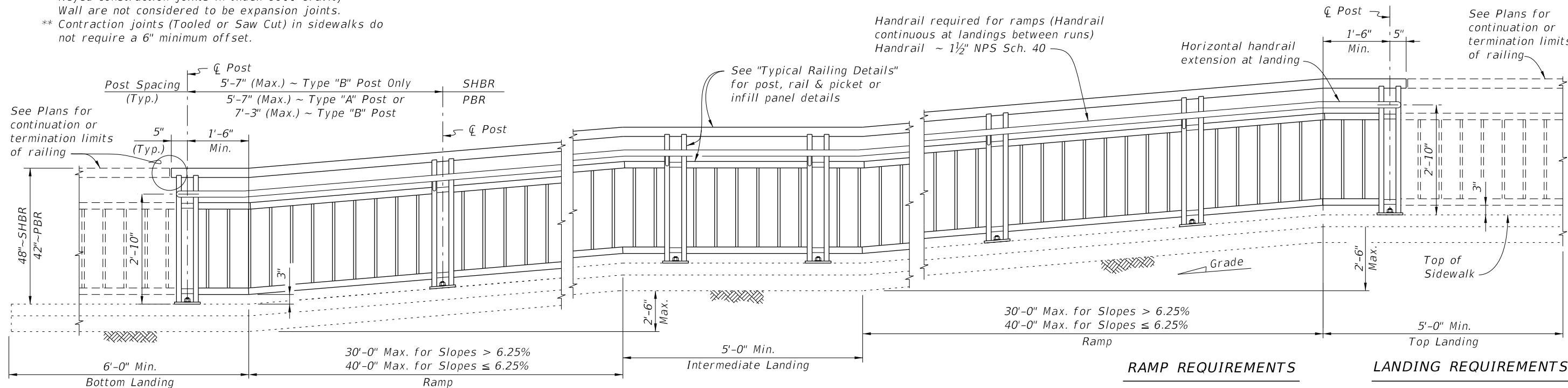
TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%
(Type 1 - Picket Railing Shown, Other Types Similar)



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 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)

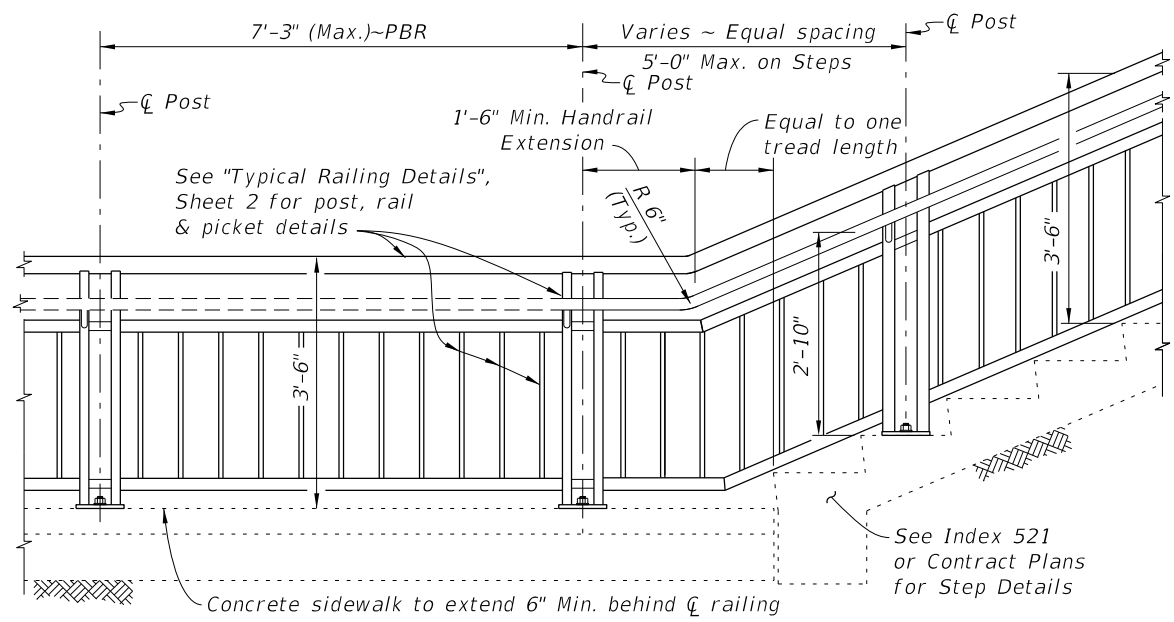
RAILINGS ON GRADES STEEPER THAN 5%
(Type 1 - Picket Railing Shown, Other Types Similar)

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

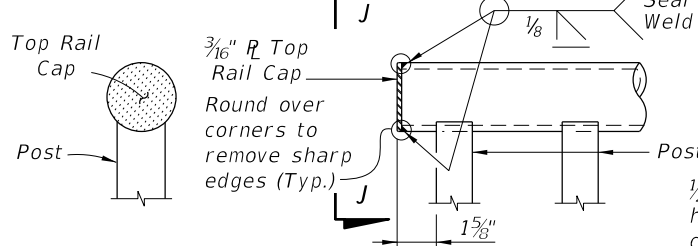
LANDING REQUIREMENTS
 Max. landing slope = 2%
 Max. landing cross-slope = 2%

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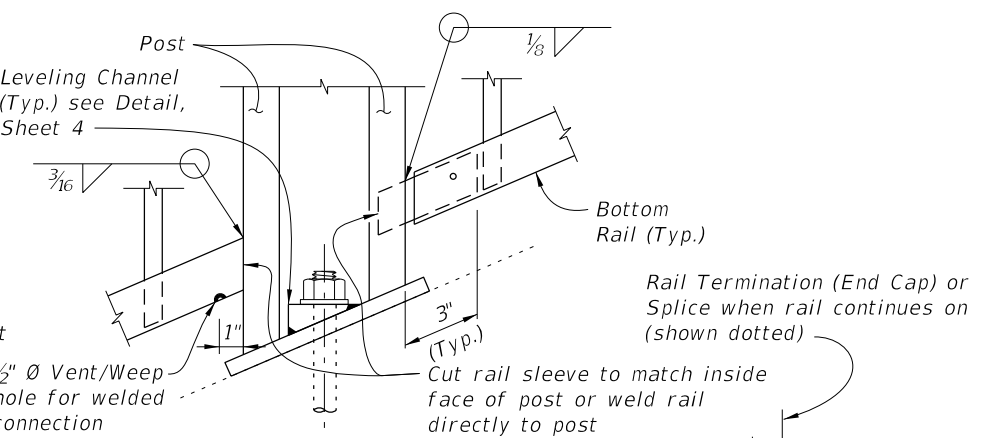
LAST REVISION 11/01/16	DESCRIPTION:	FY 2017-18 DESIGN STANDARDS	STEEL PEDESTRIAN/BICYCLE RAILING	INDEX NO. 852	SHEET NO. 2 of 8
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RAILING CONTINUATION BEYOND STEPS OR STAIRS
(Bottom shown, Top similar)

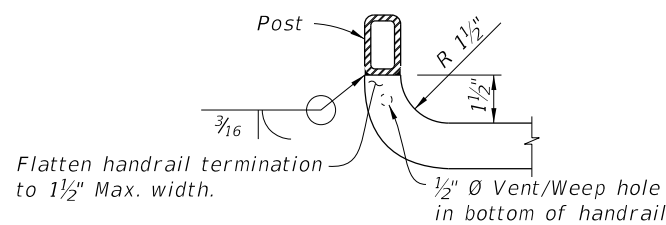


VIEW J-J DETAIL "J" - ELEVATION VIEW TOP RAIL TERMINATION

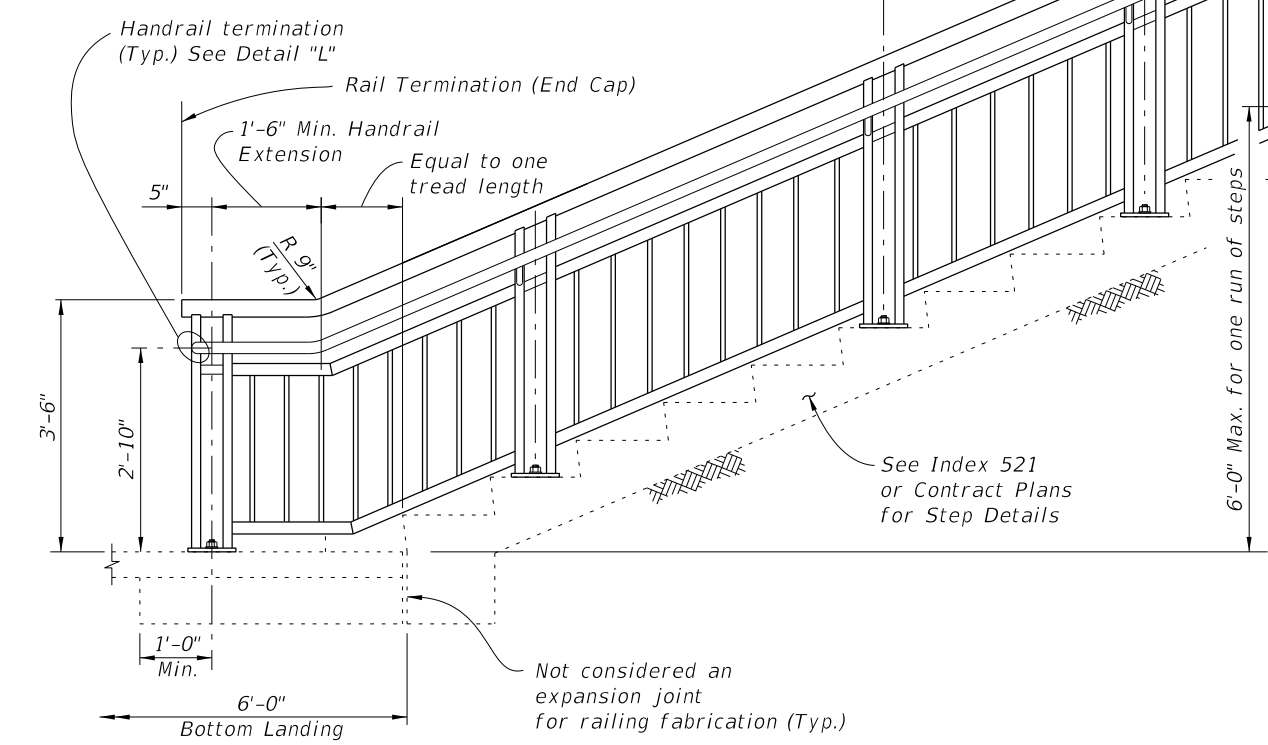


DETAIL "K" - ELEVATION VIEW BOTTOM RAIL CONNECTION (Intermediate Rail Similar)

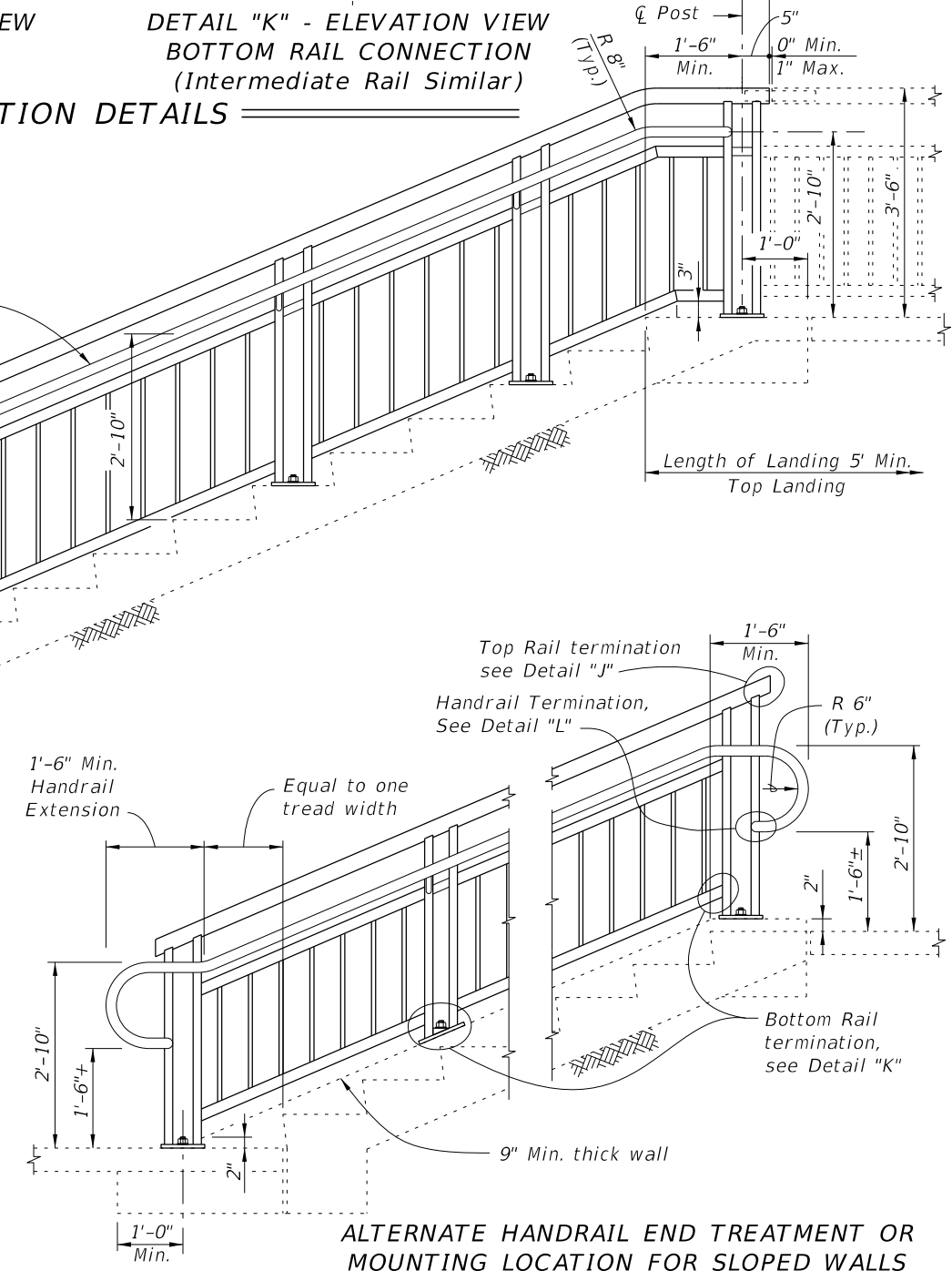
RAIL TERMINATION DETAILS



DETAIL "L" - PLAN VIEW HANDRAIL TERMINATION



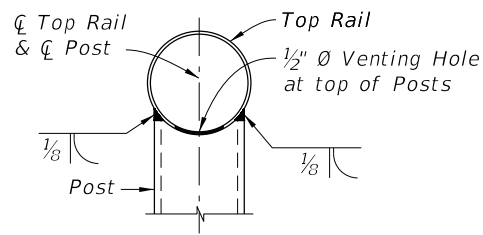
ELEVATION (At-Grade Steps shown, Elevated Stairs similar)



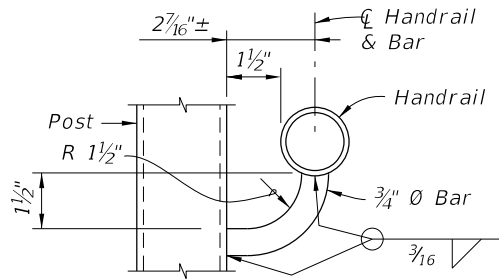
ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOPED WALLS

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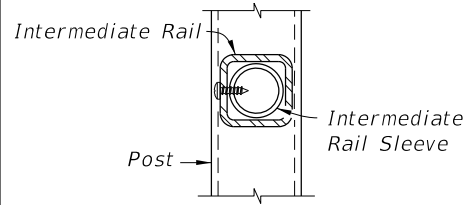
LAST REVISION 11/01/16	REVISION	DESCRIPTION:		FY 2017-18 DESIGN STANDARDS	STEEL PEDESTRIAN/BICYCLE RAILING	INDEX NO.	SHEET NO.
						852	3 of 8



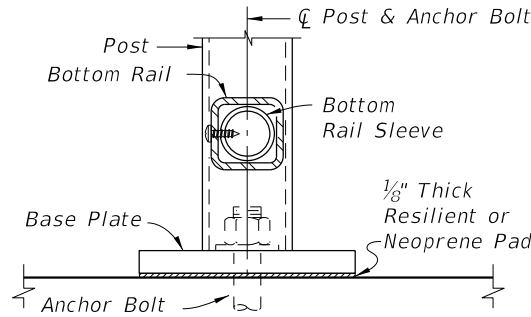
SECTION A-A
(Top Rail Connection)



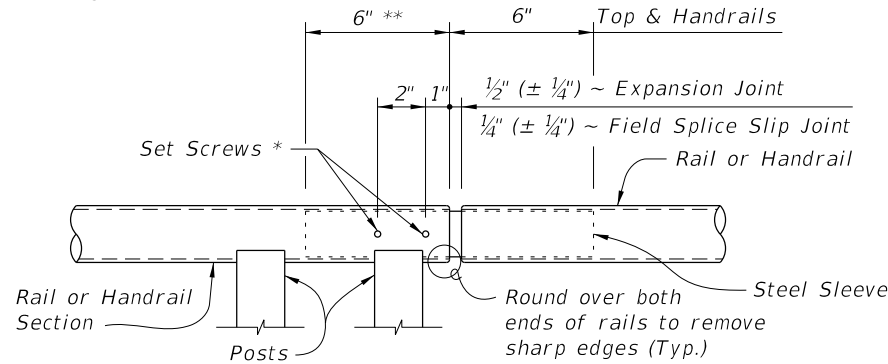
SECTION B-B
(Handrail Connection)



SECTION C-C
(Intermediate Rail Connection)

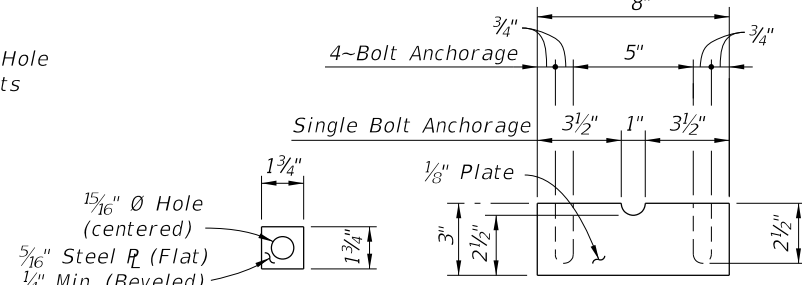


SECTION D-D
(Bottom Rail Connection -
Single Anchor Bolt Shown)



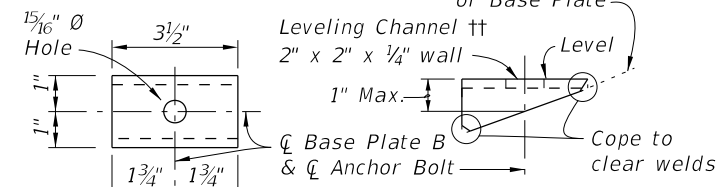
ROUND RAILS - TOP RAIL OR HANDRAIL
(Top Rail at Expansion Joint Shown)

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



SHIM PLATE DETAIL

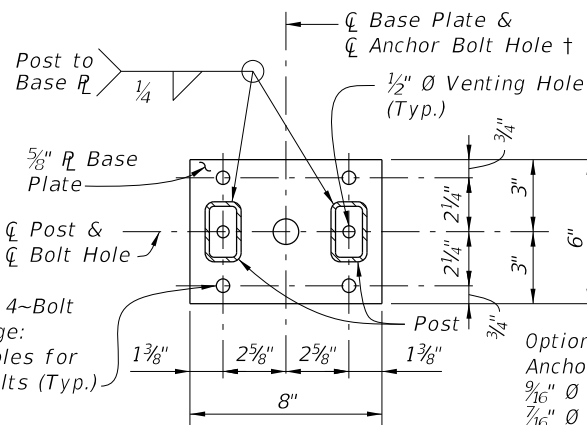
PLATE WASHER DETAIL



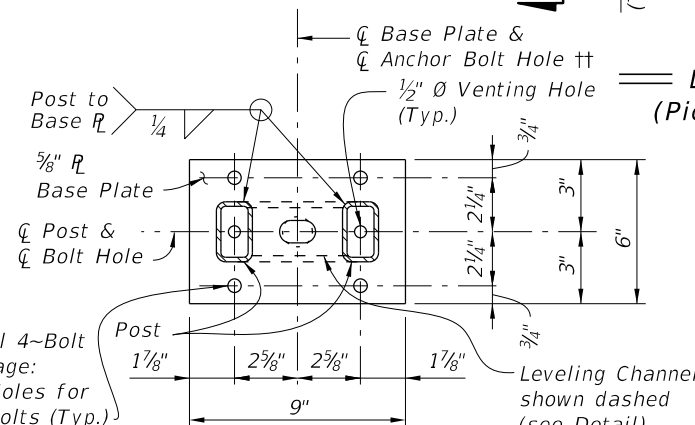
TOP VIEW

SIDE VIEW

LEVELING CHANNEL DETAIL

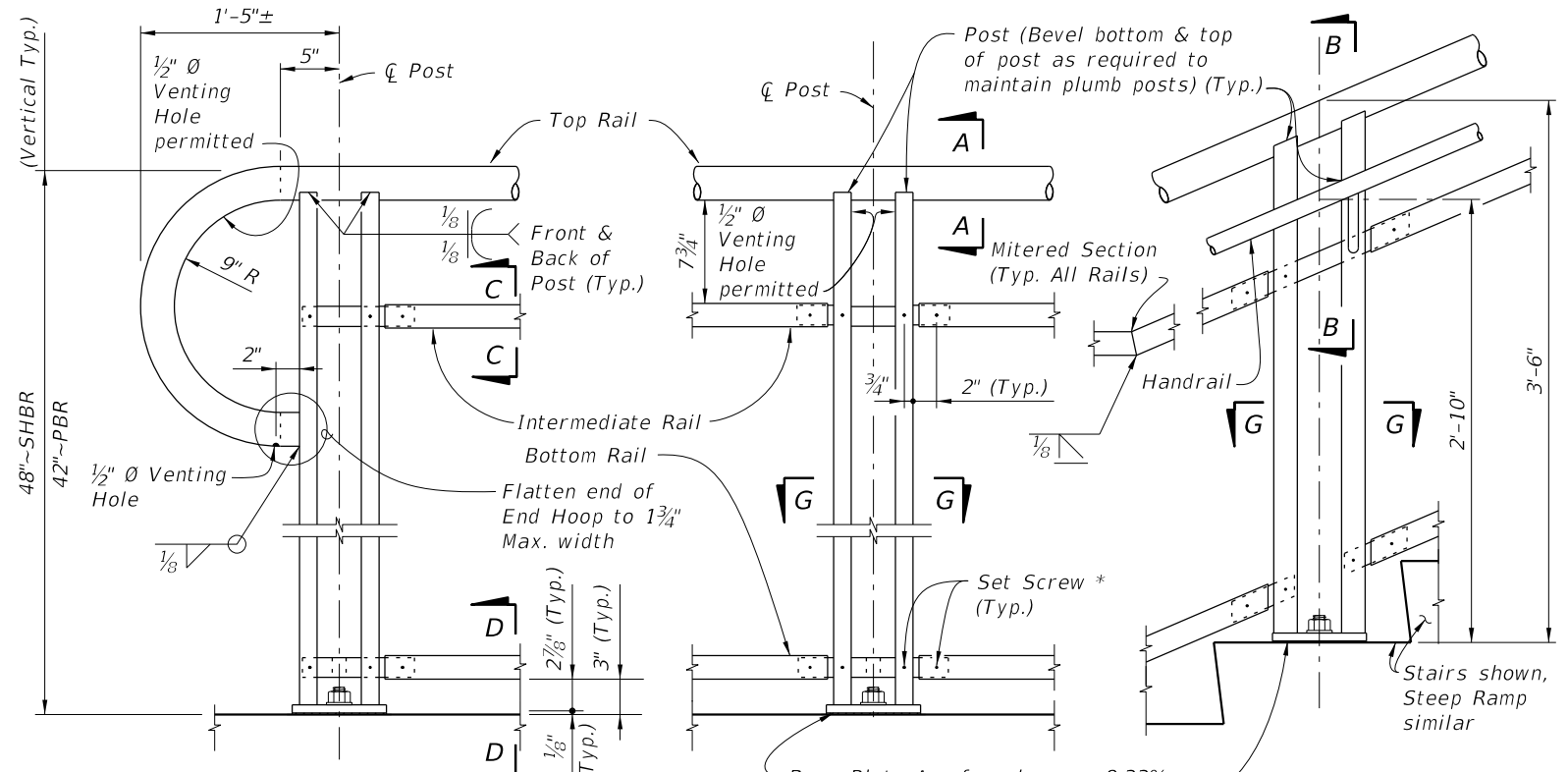


BASE PLATE A



BASE PLATE B

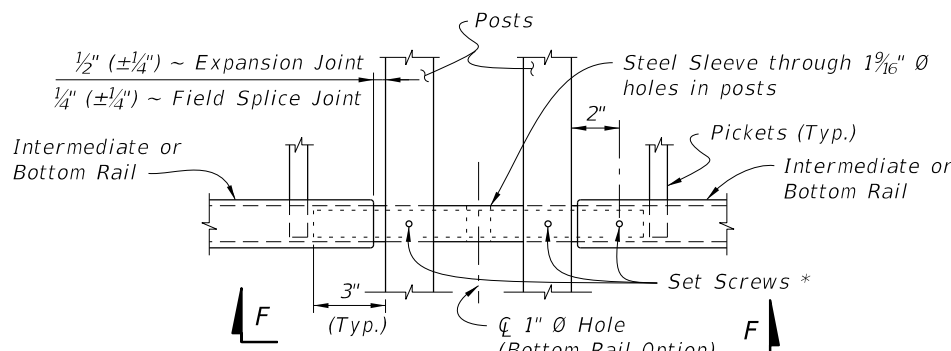
SECTION G-G - BASE PLATE DETAILS



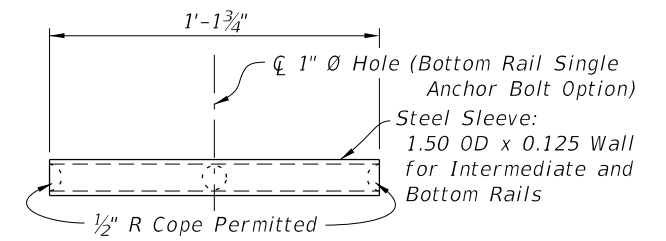
DETAIL "A" - RAIL CONNECTIONS
(Pickets/Panels and 4-Bolt Anchorage
Not Shown for Clarity)

NOTES:

- † Base Plate A (Ramps - Bolts normal) use 1 1/16" Ø Holes for Single Anchor Bolts with Flat Washers for slopes ≤ 8.33%.
- ‡ Base Plate B (Stairs - Bolts plumb) use 1 1/4" Ø Holes for Single Anchor Bolts with Beveled Plate and Washers for slopes > 8.33% to ≤ 15%; use 1 5/16" x 1 1/2" Slotted Holes with Leveling Channel for slopes > 15%.
- * 1/4" Ø x 3/4" 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" Ø 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" for plug welded connection.



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



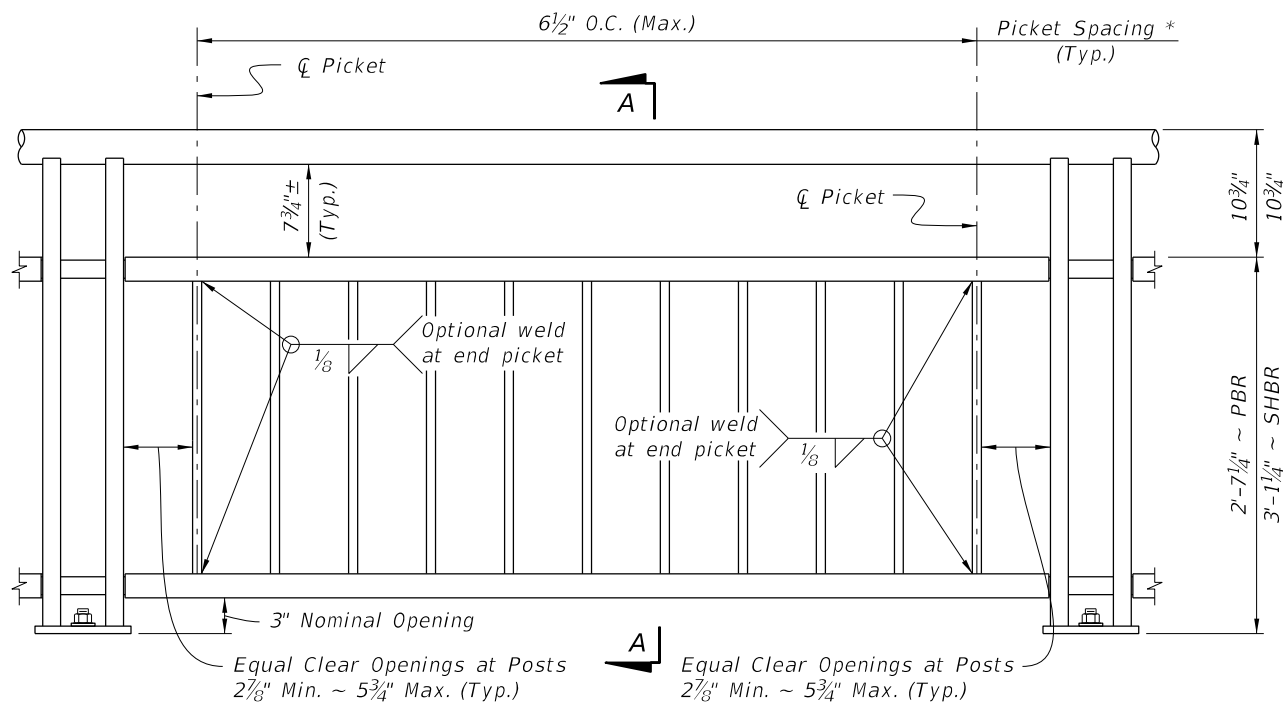
VIEW F-F
INTERMEDIATE OR BOTTOM RAIL -
STEEL SLEEVE DETAIL (Bottom Side Shown)

CROSS REFERENCE:

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

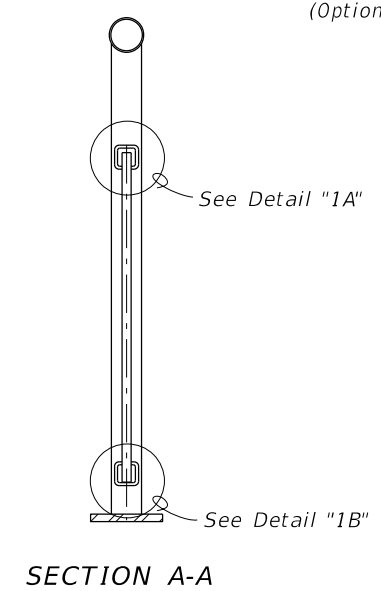
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LAST REVISION	DESCRIPTION:
11/01/16	

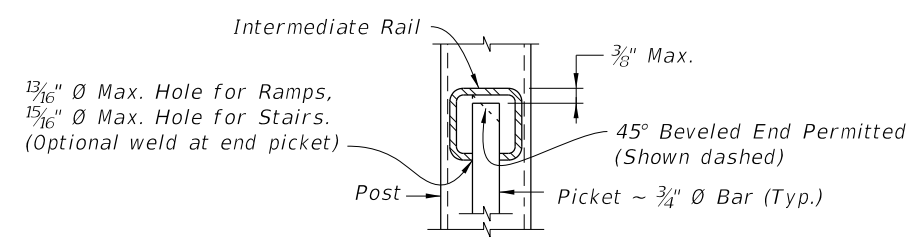


TYPE 1 - PICKET INFILL PANEL

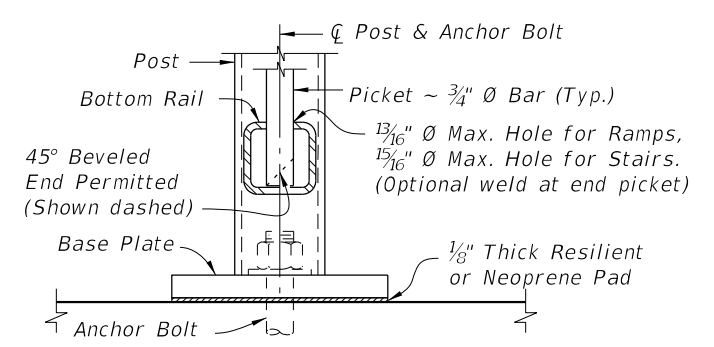
PICKET NOTES:
 * Picket Spacing of 6 1/2" centers is based on a 3/4" Ø Bar for standard applications.
 When shown in the Contract Plans a 4 1/2" picket spacing may be required. See Note 4 (Sheet 1).



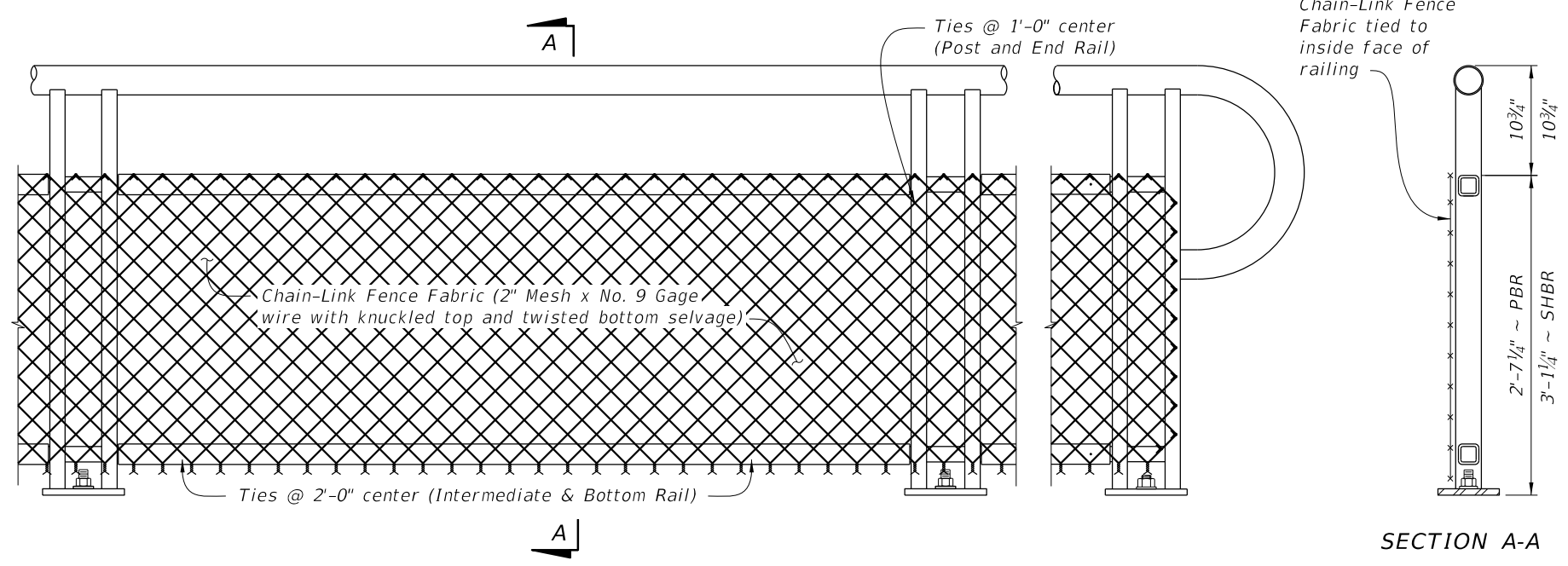
SECTION A-A



DETAIL "1A"
(Top of Picket Connection)

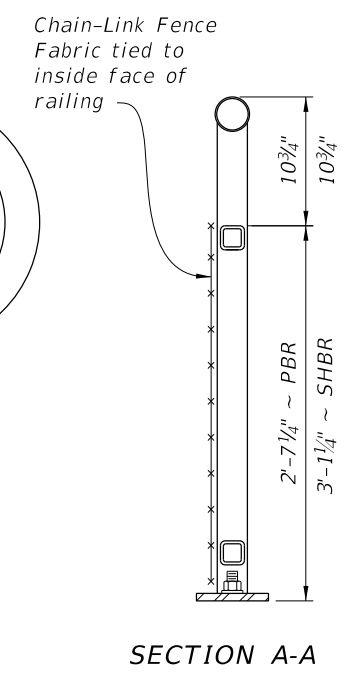


DETAIL "1B"
(Bottom of Picket Connection)



TYPE 2 - CHAIN-LINK (Continuous Infill Panel)

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

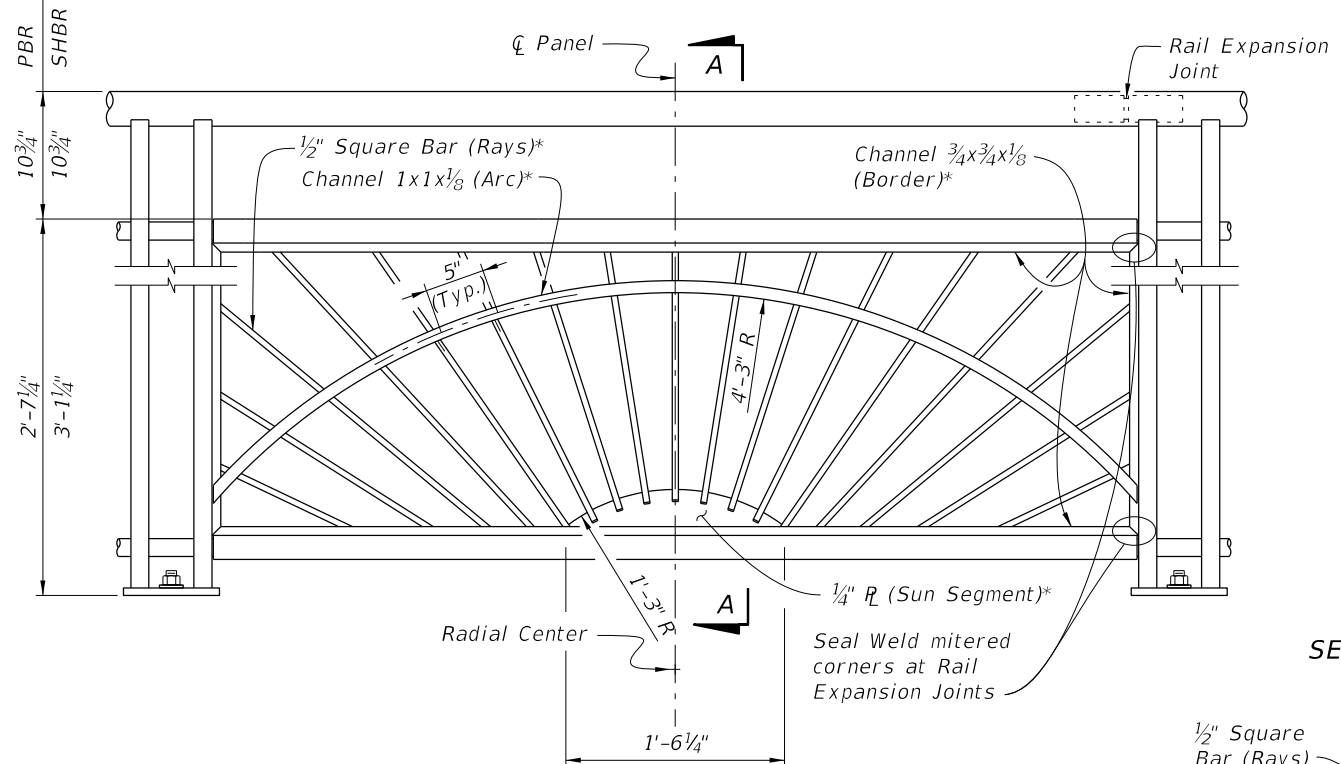


SECTION A-A

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

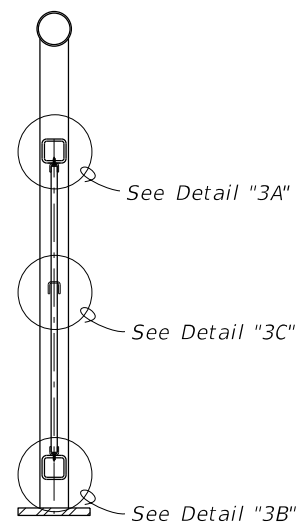
CHAIN-LINK PANEL NOTE:
 Chain-Link Fence Fabric shall be continuous along limits of railing. Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.

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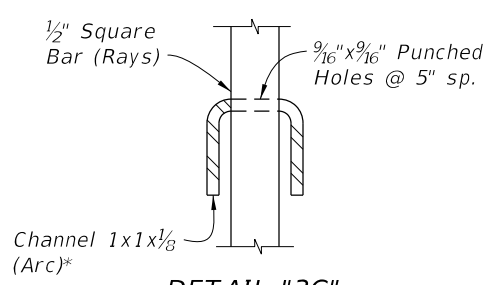


TYPE 3 - SUNSHINE INFILL PANEL

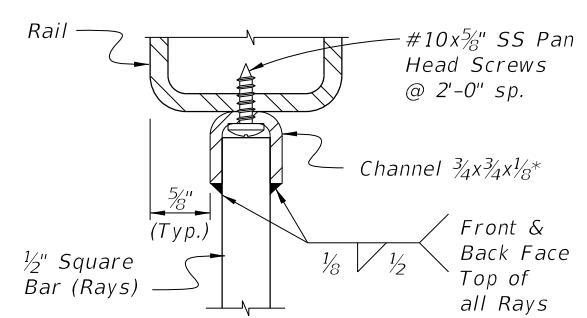
* Arc, Rays and Sun Segment may be formed in a single panel from 1/2" steel plate pattern cut with laser or plasma CNC, welded to a 1x1 1/8 Angle Border or the 3/4x3/4x1/8 Channel Border shown.



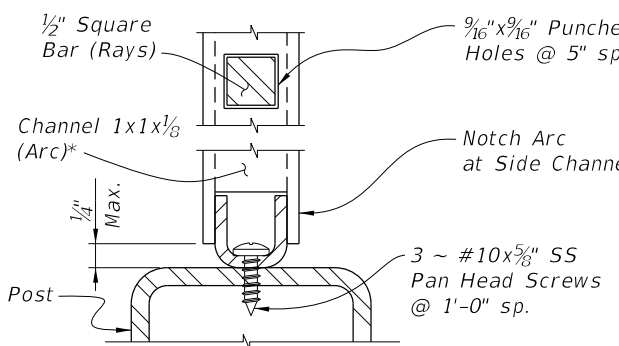
SECTION A-A



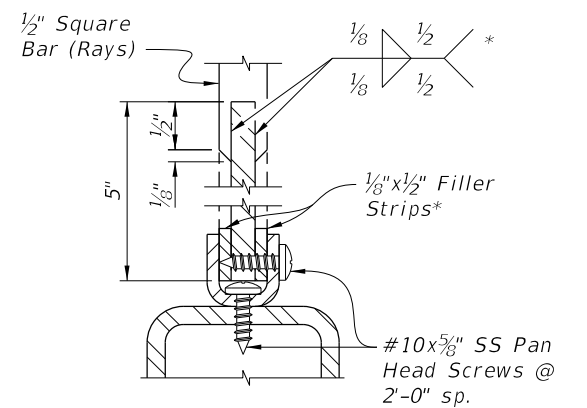
DETAIL "3C" RAY/ARC CONNECTION



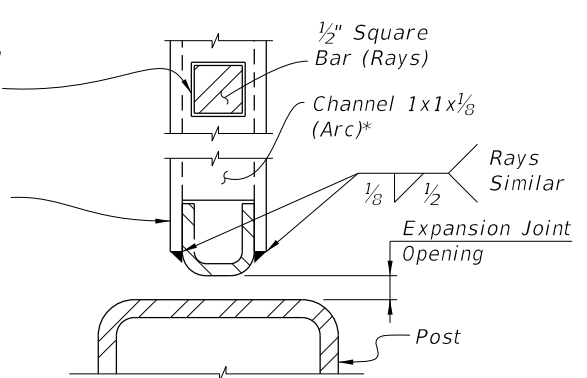
DETAIL "3A" INTERMEDIATE RAIL/RAY CONNECTION



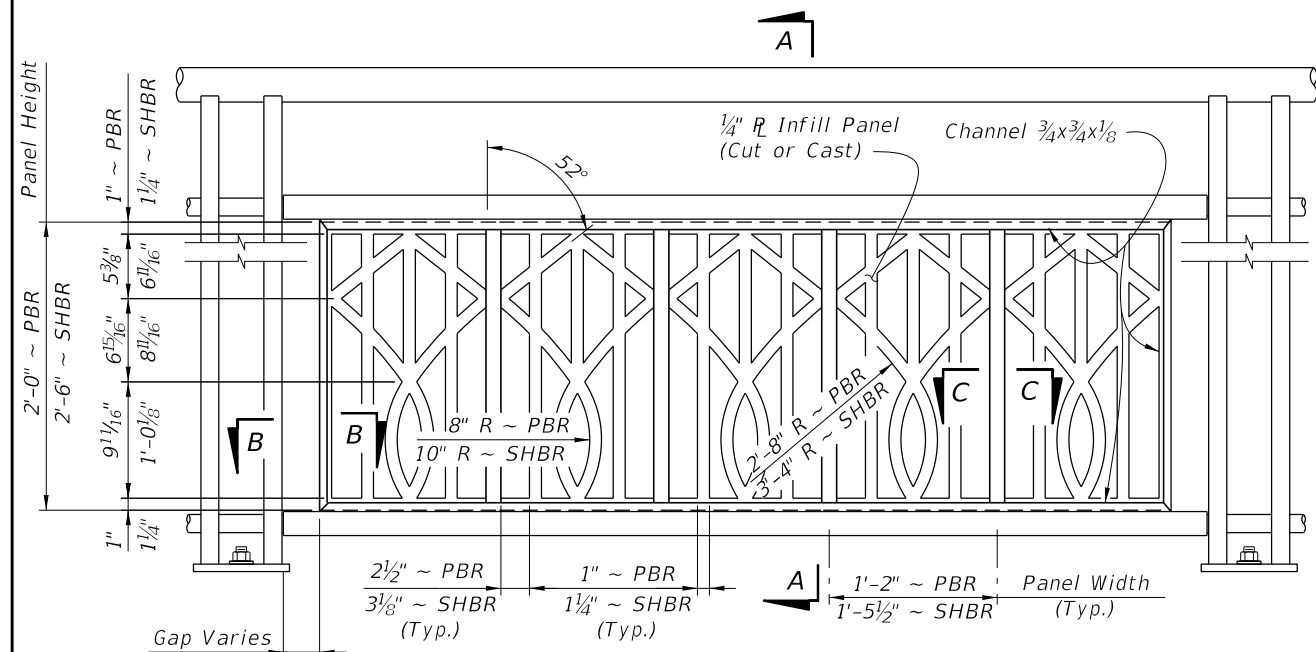
DETAIL "3D" ARC/POST CONNECTION (Continuous Top Rail)



DETAIL "3B" BOTTOM RAIL/RAY CONNECTION

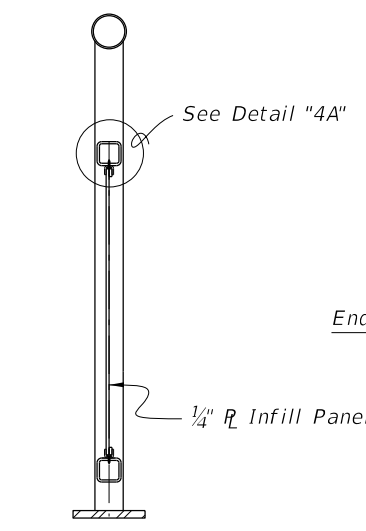


DETAIL "3E" PANEL END CONNECTION AT POST WITH EXPANSION JOINT

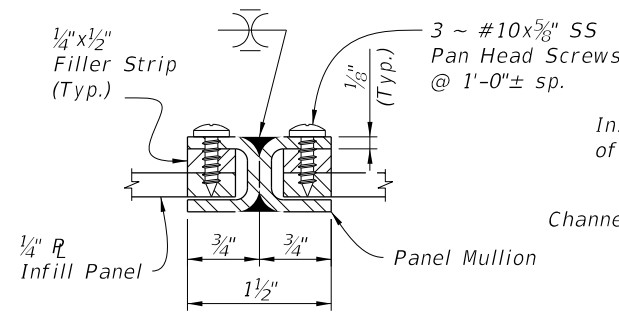


TYPE 4 - BROADWAY INFILL PANEL

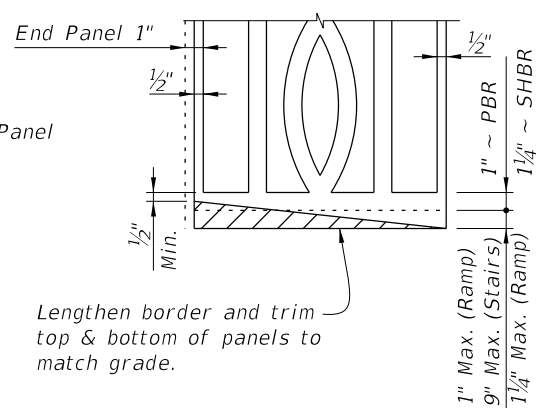
NOTES:
1. See Plans for Infill Panel Option required.



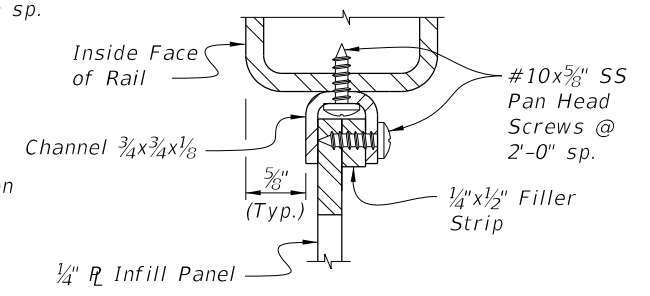
SECTION A-A



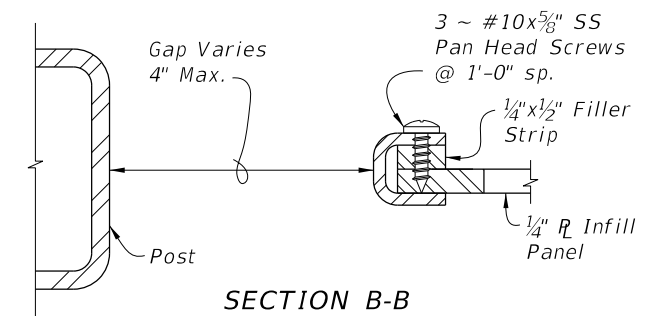
SECTION C-C PANEL/SPLICE CONNECTION



PANEL ADJUSTMENT FOR RAILINGS ON GRADES



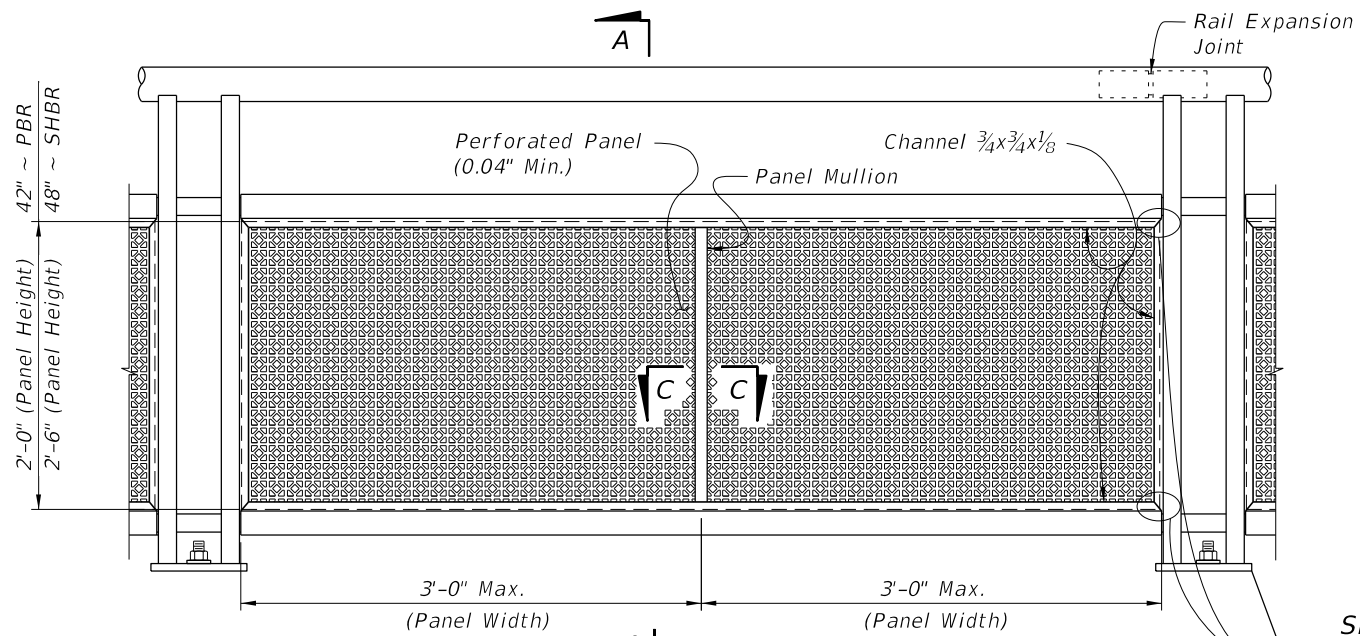
DETAIL "4A" PANEL/RAIL CONNECTION (Top Shown, Bottom Similar)



SECTION B-B PANEL END CAP

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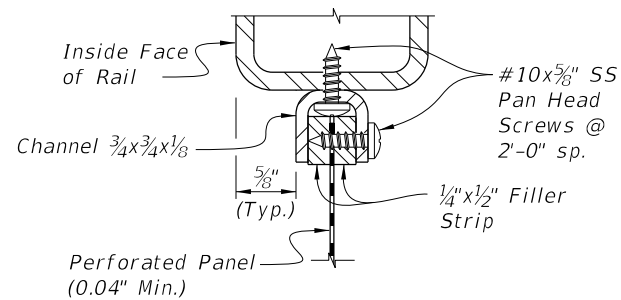
LAST REVISION 11/01/16	DESCRIPTION:	FY 2017-18 DESIGN STANDARDS	STEEL PEDESTRIAN/BICYCLE RAILING	INDEX NO.	SHEET NO.
				852	6 of 8



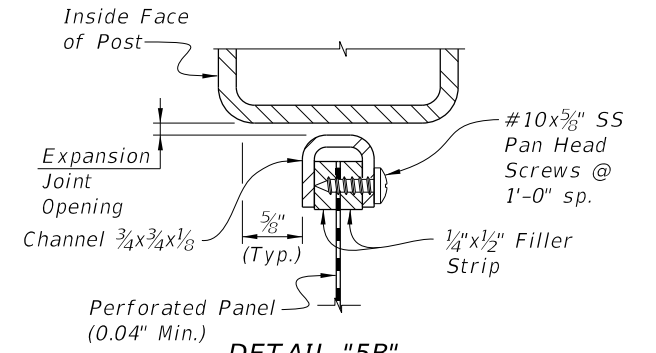
TYPE 5 - PERFORATED INFILL PANEL

SECTION A-A

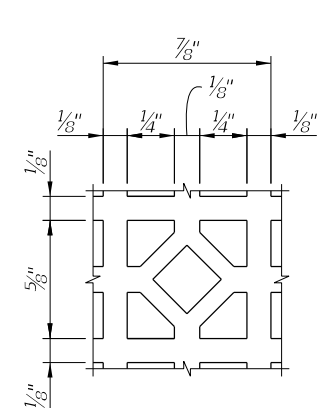
Seal welding mitered corners is permitted



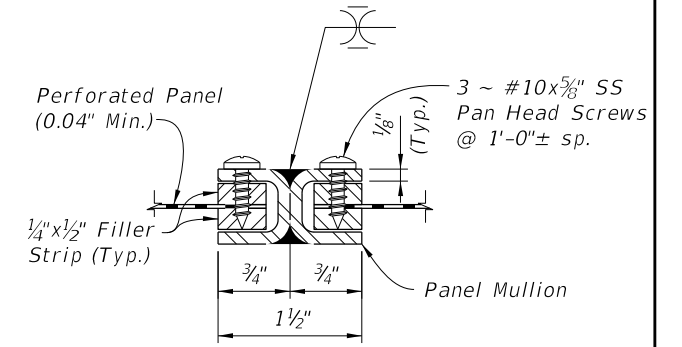
DETAIL "5A"
PANEL/RAIL CONNECTION
(Top Shown, Bottom Similar)



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



REPEATING PATTERN DETAIL
FOR PERFORATED PANEL




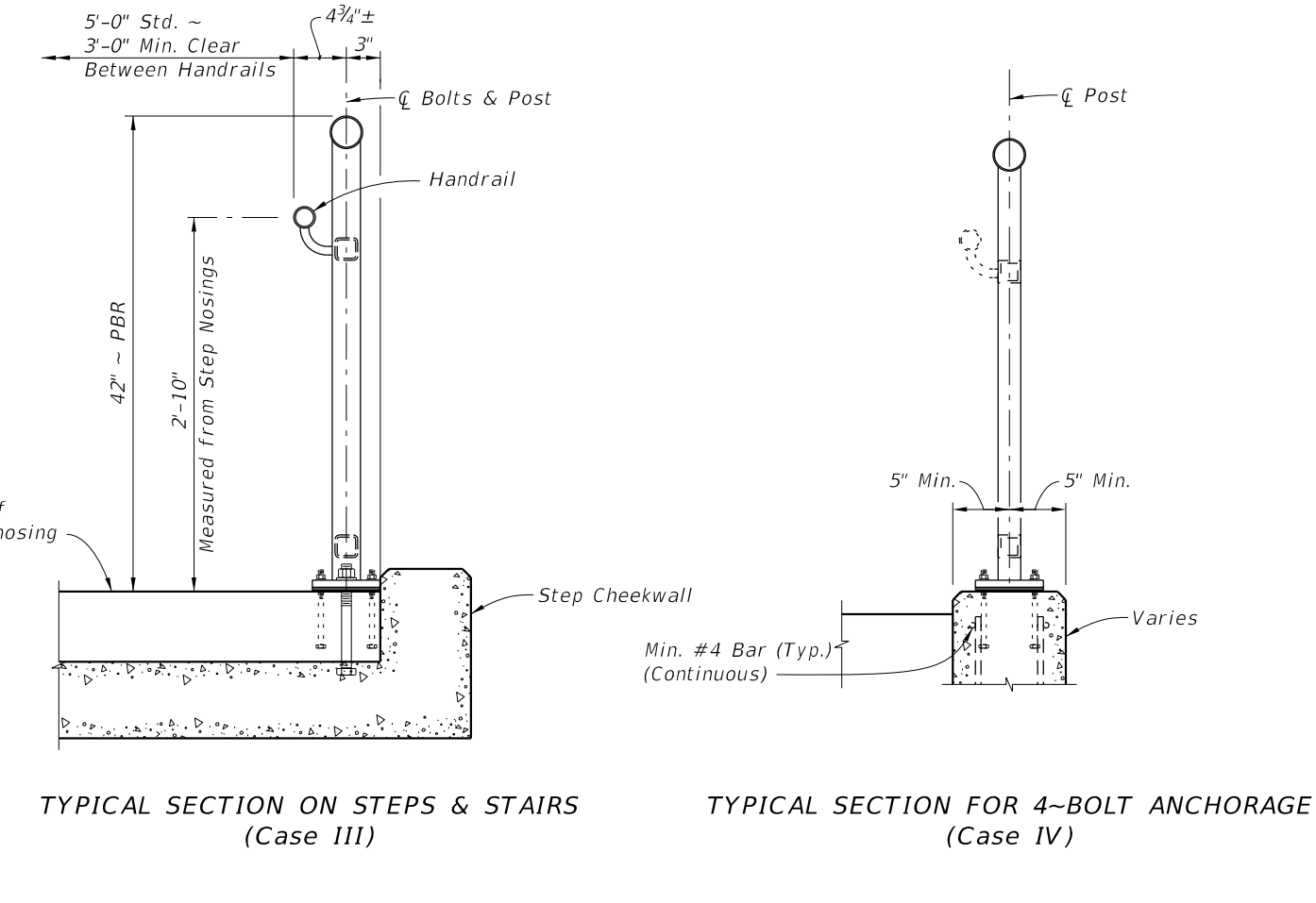
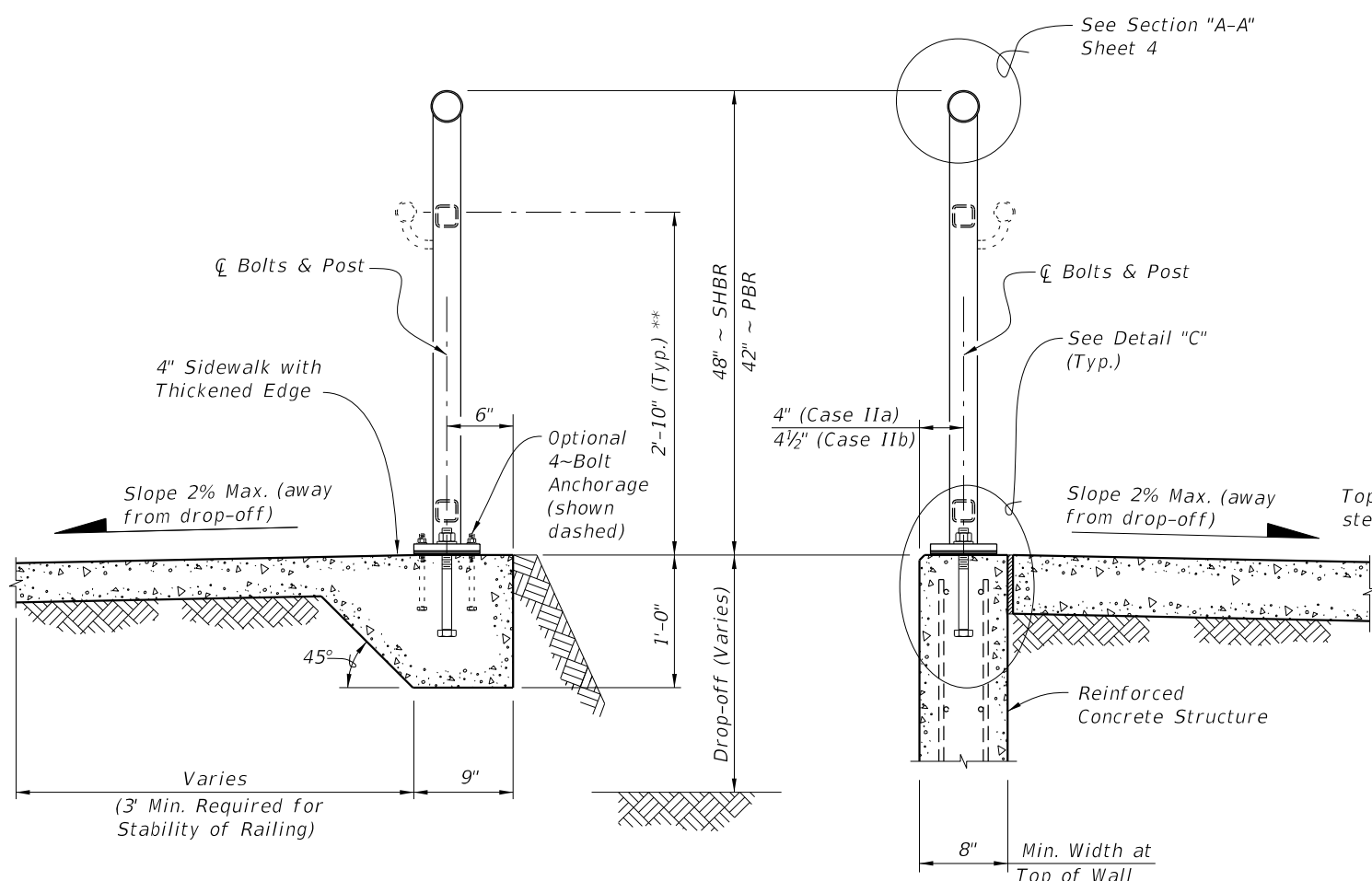
SECTION C-C
PANEL/SPLICE CONNECTION

NOTES:

1. See Plans for Infill Panel Type required.

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LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	STEEL PEDESTRIAN/BICYCLE RAILING	INDEX NO. 852	SHEET NO. 7 of 8
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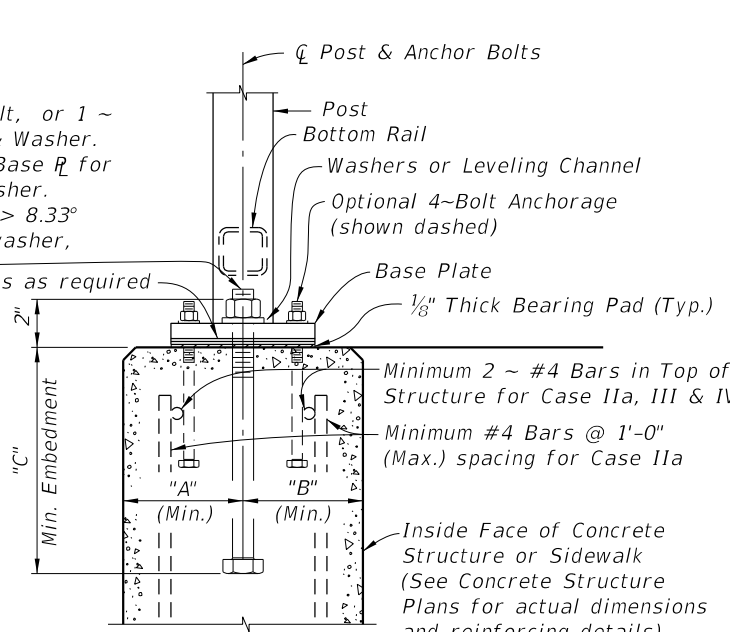
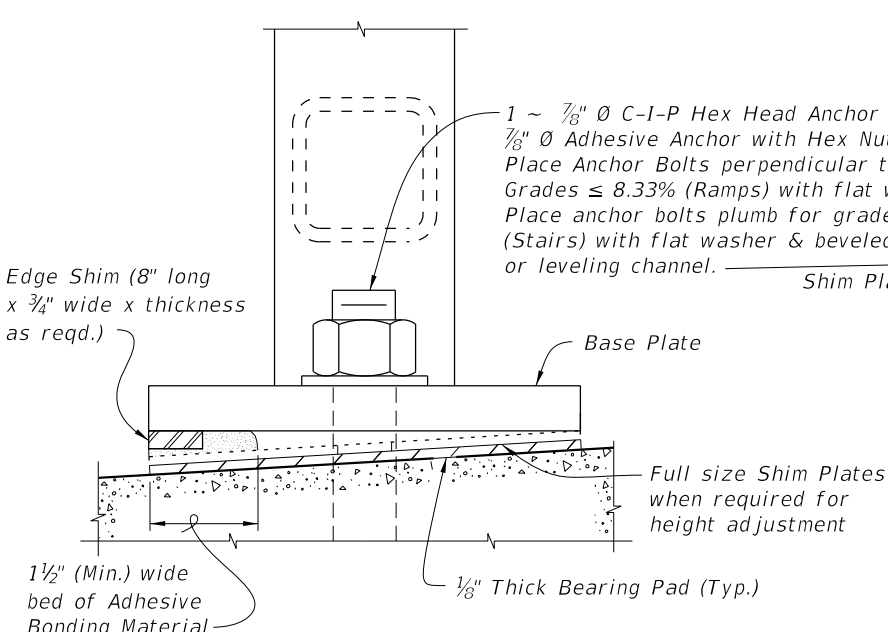


TYPICAL SECTION ON CONCRETE SIDEWALK (Case I)

TYPICAL SECTION ON RETAINING WALL (Case II)

TYPICAL SECTION ON STEPS & STAIRS (Case III)

TYPICAL SECTION FOR 4-BOLT ANCHORAGE (Case IV)

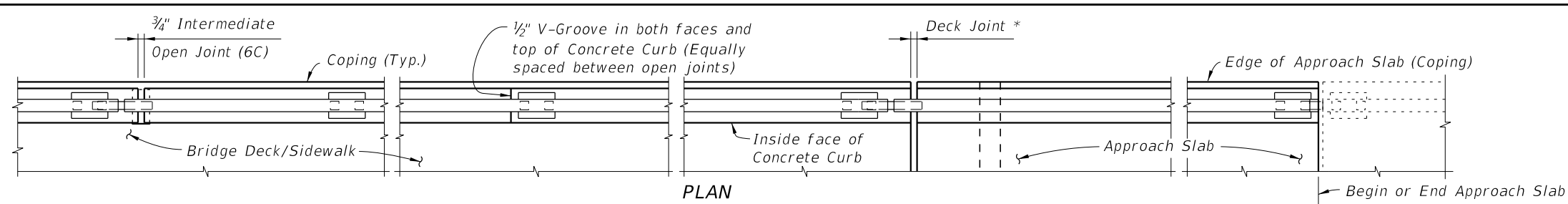


ANCHOR BOLT TABLE							
CASE	STRUCTURE TYPE	DIMENSIONS			ANCHOR LENGTH		ANCHOR SIZE
		A Edge Dist.	B Edge Dist.	C Embedment	C-I-P Hex Head Bolt	Adhesive Anchor	
I	Unreinforced Concrete	6"	1'-2"	9"	10 1/2"	11"	7/8" Ø
IIa	Reinforced Concrete	4"	4"	9"	10 1/2"	11"	7/8" Ø
IIb	Gravity Wall Index 6011	4 1/2"	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

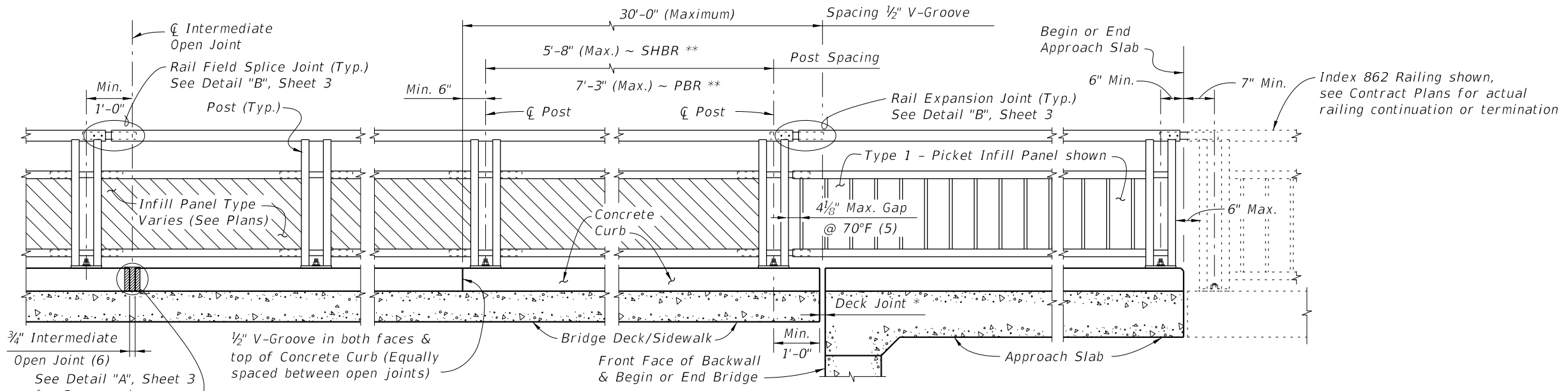
* Embedment length "C" may be reduced to 9" for the 42" height railings for Case IIb, when the post spacing does not exceed 5'-0".

** When required; measured from top of sidewalk.

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PLAN
(Scheme 2 shown, other Schemes similar, Reinforcing Steel not shown for clarity)



ELEVATION OF INSIDE FACE OF RAILING
(Scheme 2 shown with Post "A", other Schemes similar, Reinforcing Steel not shown for clarity)

* Deck Joint at Begin Bridge or End Bridge shown; Deck Joint at ϕ Pier or Intermediate Bent similar.

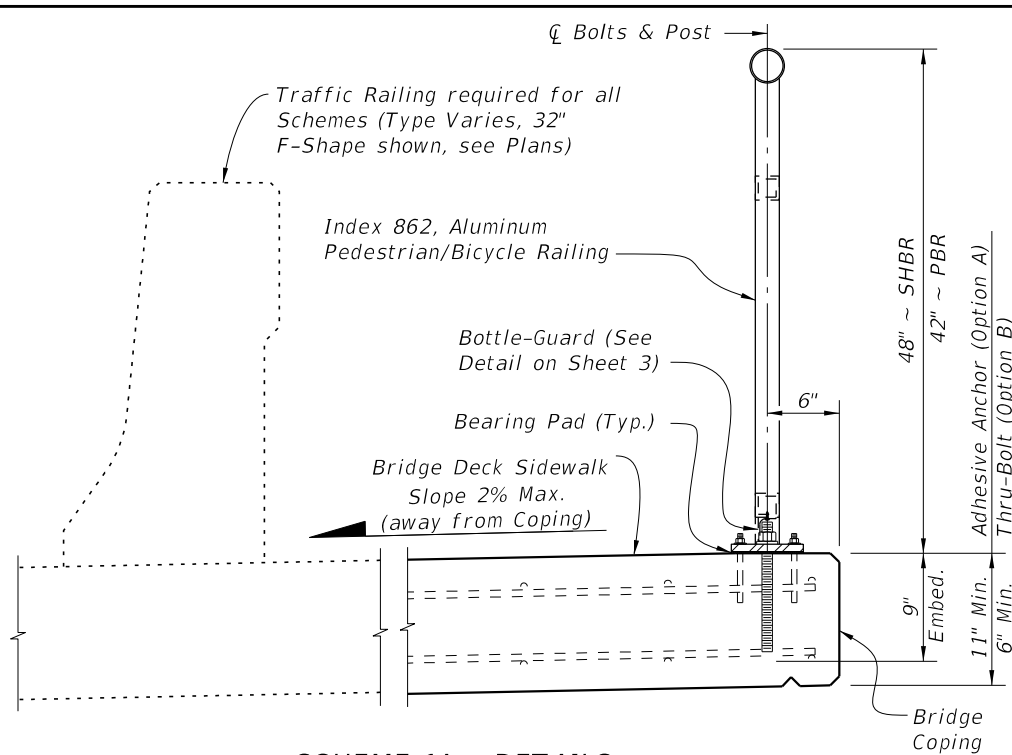
** SHBR ~ Special Height Bicycle Railing
PBR ~ Pedestrian/Bicycle Railing

NOTES:

1. Shop Drawings are required.
2. Work this Index with Index 862 Aluminum Bicycle/Pedestrian Railing Details and Specification Section 515. Refer to the IDS for Design Criteria and Limits of Use.
3. Materials:
 - A. Galvanized Steel Fasteners: Hex Head Bolt ASTM A307, Hex Nuts ASTM A563, Washers ASTM F436
 - B. Aluminum:
 - a. Support Bracket (Scheme 3) L-shape and Stiffener Plate: ASTM B209, Alloy 6061-T6
 - b. Bottle-guard (Schemes 1 & 3) L-shape: ASTM B209, Alloy 6061-T6 or 6063-T5
 - C. Concrete: Same as bridge deck
 - D. Pre-cured Silicone Sealant: Specification Section 932
 - E. Bearing Pads: Provide 1/8" thick Plain, Fabric Reinforced or Fabric Laminated pads meeting the requirements of Specification Section 962 for Ancillary Structures.
4. See Structures Plans, Superstructure Sheets for bridge information including concrete type, deck expansion joint locations and orientations, and thermal movement.
5. Railings:
 - A. For thermal movement greater than 4" (up to a maximum of 5"), clear opening between adjacent pickets, or panels at Rail Expansion Joints above Deck Joints must be reduced to 3 1/2".
 - B. For treatment of railings on skewed bridges see Index 420.
6. Curbs:
 - A. Match open curb joints at Deck Expansion Joint locations to the deck joint dimension.
 - B. Construct Concrete Curb (Scheme 2) vertical with the top surface finished level transversely. See Concrete Curb Details Sheet 3.
 - C. Provide 3/4" intermediate open joints in curbs coinciding with the 3/4" joints in the traffic railing.
7. Payment: Support bracket (Scheme 3) is incidental to the cost of railing. Curb concrete and reinforcing steel (Scheme 2) are included in the bridge deck quantities.

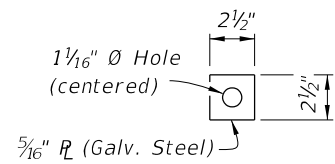
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LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	BRIDGE PEDESTRIAN/BICYCLE RAILING (ALUMINUM)	INDEX NO. 861	SHEET NO. 1 of 3
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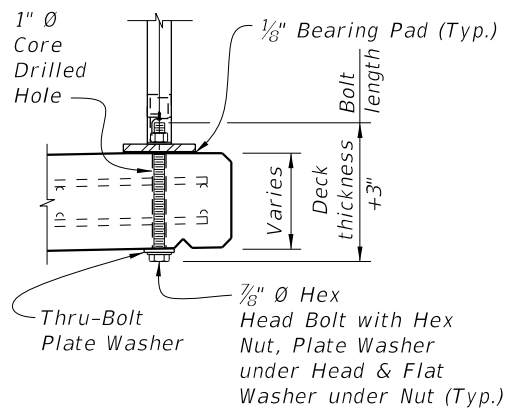


SCHEME 1A - DETAILS
(Adhesive Anchor Option)

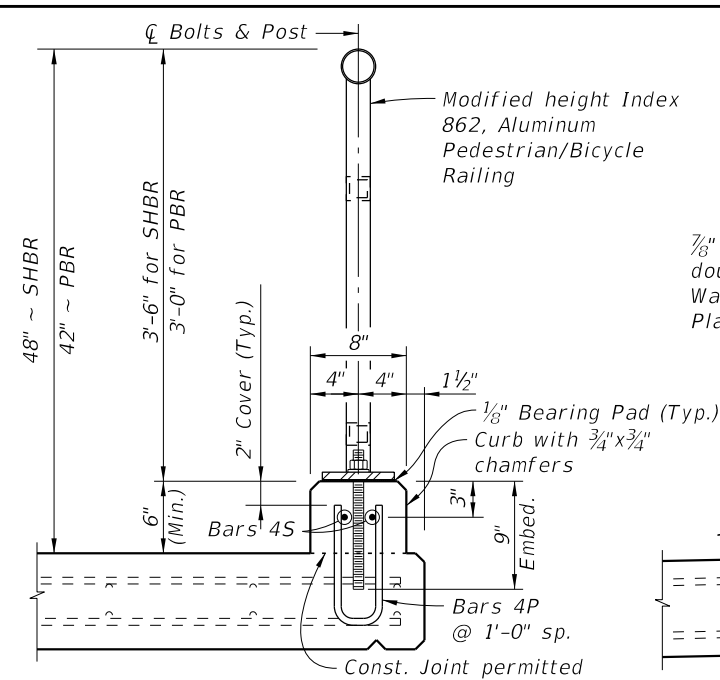
CROSS REFERENCE:
See Sheet 1 for Bridge Railing Notes.



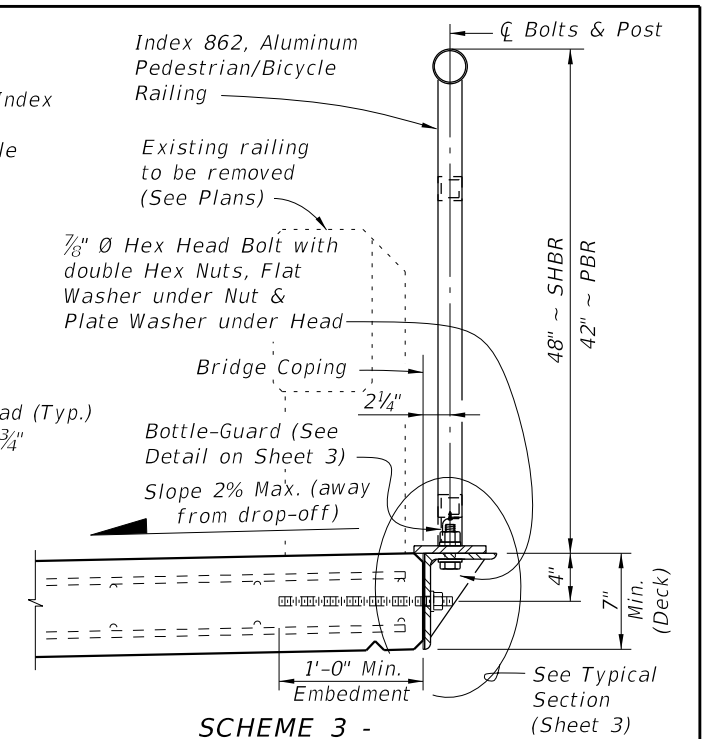
THRU-BOLT PLATE WASHER DETAIL



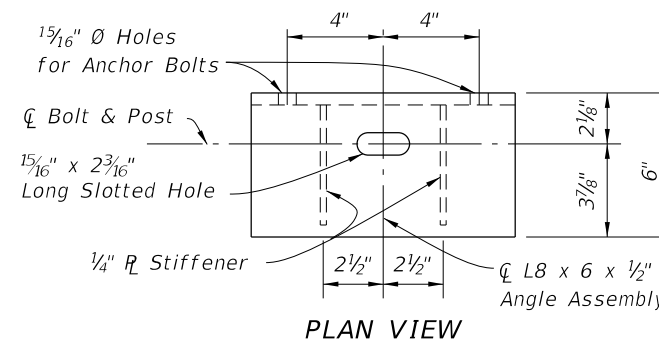
SCHEME 1B - DETAILS
(Thru-Bolt Option)



SCHEME 2 -
TYPICAL SECTION THROUGH
CURB MOUNTED RAILING



SCHEME 3 -
TYPICAL SECTION THROUGH
SIDE MOUNTED RAILING (RETROFIT)



PLAN VIEW

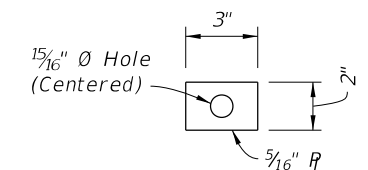
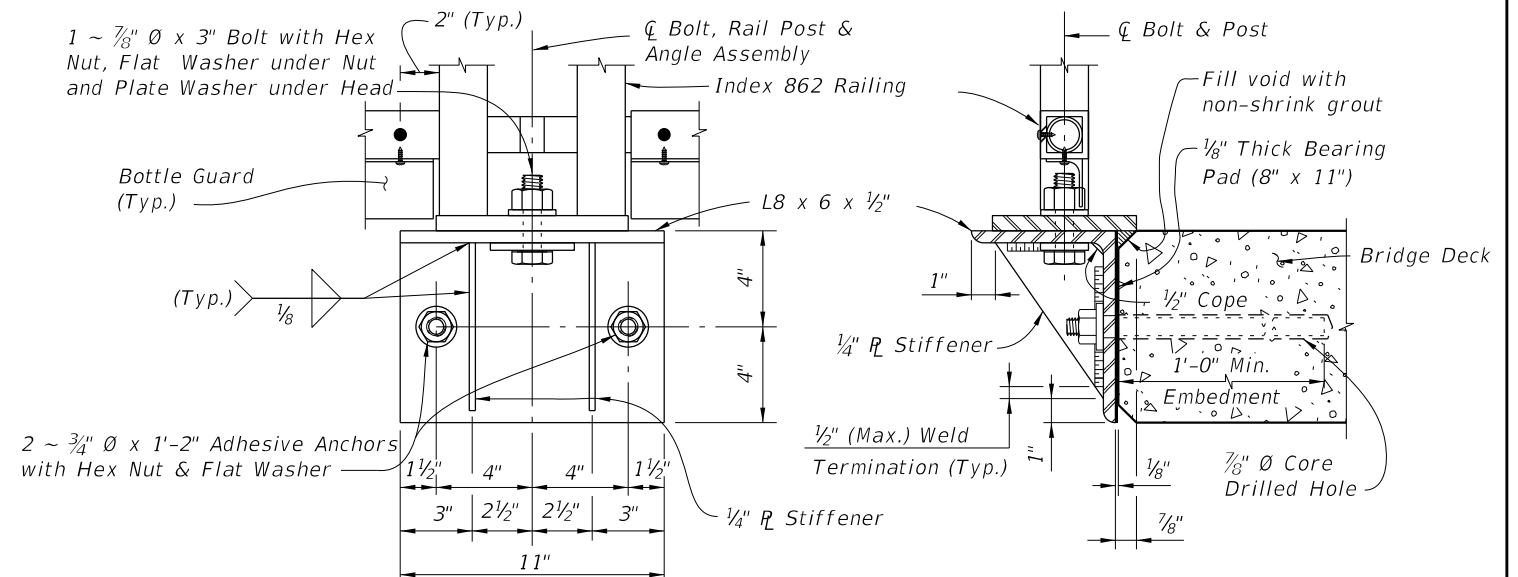


PLATE WASHER DETAIL



ELEVATION VIEW

TYPICAL SECTION

SCHEME 1 - TYPICAL SECTION THROUGH DECK MOUNTED RAILING

SCHEME 3 - SIDE-MOUNTED SUPPORT BRACKET DETAILS

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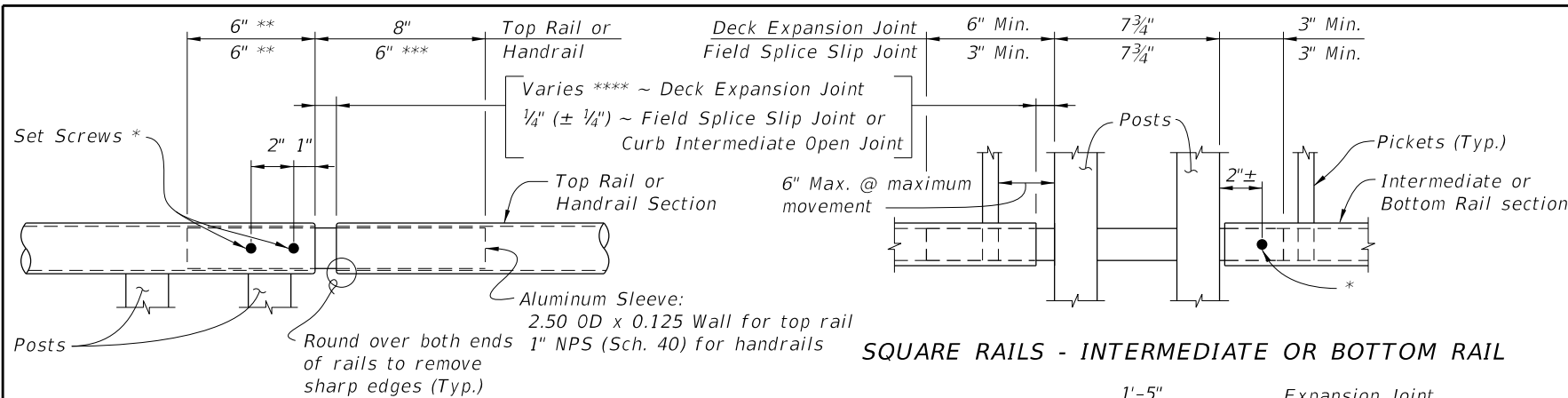
LAST REVISION	DESCRIPTION:
11/01/16	



FY 2017-18
DESIGN STANDARDS

BRIDGE PEDESTRIAN/BICYCLE RAILING
(ALUMINUM)

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ROUND RAILS - TOP RAIL OR HANDRAIL

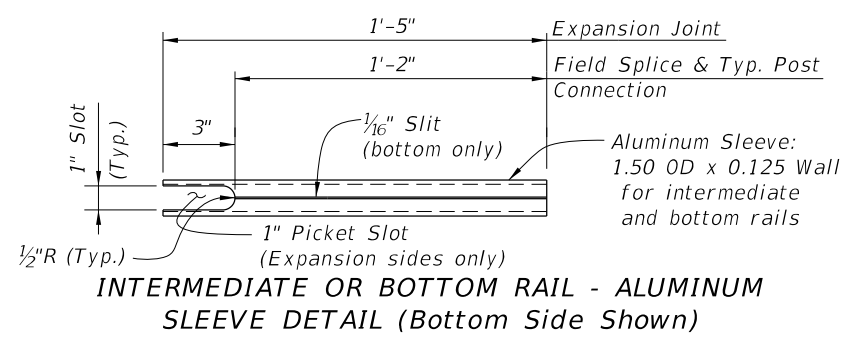
* $\frac{1}{4}$ " \varnothing x $\frac{3}{4}$ " Pan Head Aluminum (Alloy 7075-T73) or Stainless Steel (Type 316 or 18-8 Alloy) Set Screws along outside face of railing. Set screws must be set flush against the rail surface. A $\frac{3}{4}$ " \varnothing plug weld may be substituted for the two set screws at expansion joints.

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

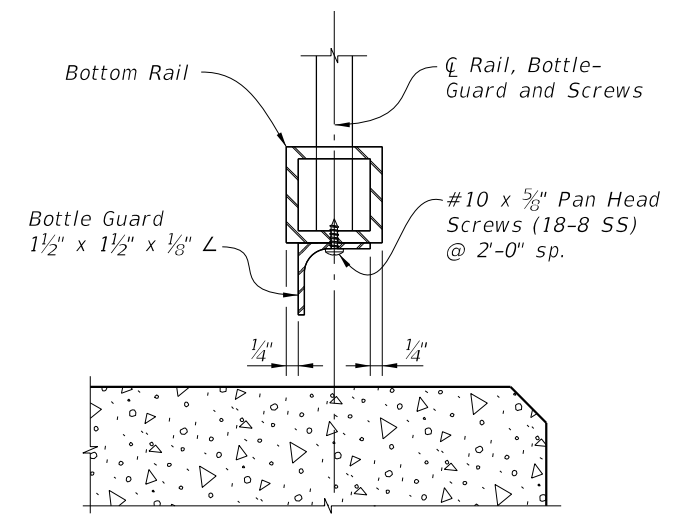
*** Increase handrail sleeve embedment to 8" for Expansion Joint openings greater than 2".

**** Expansion Joint opening shall match the clear opening in the deck joint but not greater than 3".

SQUARE RAILS - INTERMEDIATE OR BOTTOM RAIL



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



TYPICAL SECTION THROUGH BOTTOM RAIL (Post Not Shown for Clarity)

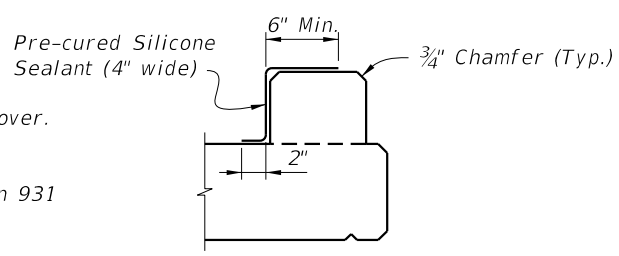
SCHEME 1 - BOTTLE GUARD DETAIL

DETAIL "B" EXPANSION JOINT (FIELD SPLICE SIMILAR)

ALTERNATE REINFORCING (WWR) DETAILS		CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS	
NOTE: Place wire panels to minimize the end overhang. End Overhangs greater than 4 3/4" are not permitted.		BILL OF REINFORCING STEEL	
<p>SPLICE DETAIL (Between WWR Sections)</p>		MARK	SIZE
<p>WWR SECTION DETAIL</p>		P	4
		S	4
		BAR 4P	As Req'd.
		BAR 4S	As Req'd.

CURB REINFORCING STEEL NOTES:

- All bar dimensions in the bending diagrams are out to out.
- The reinforcement for the curb on a retaining wall shall be the same as detailed for an 8" deck.
- All reinforcing steel at the open joints shall have a 2" minimum cover.
- Bars 4S may be continuous or spliced at the construction joints. Bar splices for Bars 4S shall be a minimum of 1'-8".
- Deformed WWR meeting the requirements of Specifications Section 931 may be used in lieu of all Bars 4P and 4S.



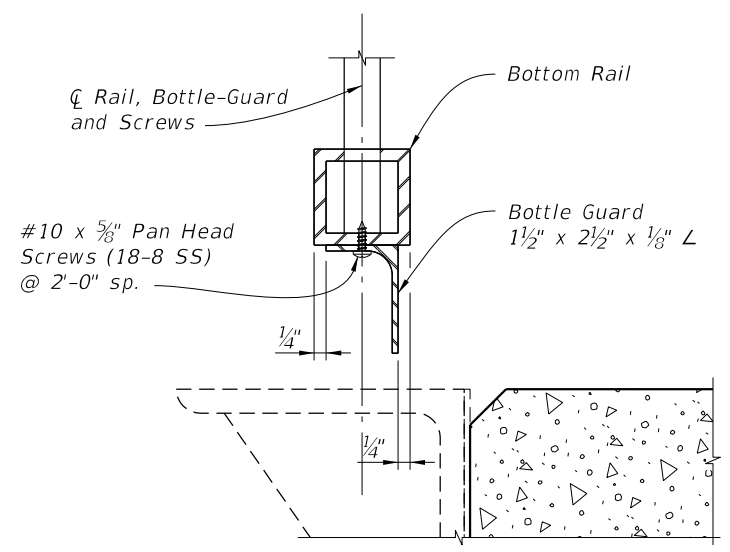
DETAIL "A" - SECTION AT INTERMEDIATE OPEN JOINT

INTERMEDIATE JOINT SEAL NOTE:

At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant. Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.

ESTIMATED CONCRETE CURB QUANTITIES (SCHEME 2)		
ITEM	UNIT	QUANTITY
Concrete	CY/LF	0.0124
Reinforcing Steel	LB/LF	4.01

SCHEME 2 - CONCRETE CURB DETAILS



TYPICAL SECTION THROUGH BOTTOM RAIL (Post Not Shown for Clarity)

SCHEME 3 - BOTTLE GUARD DETAIL

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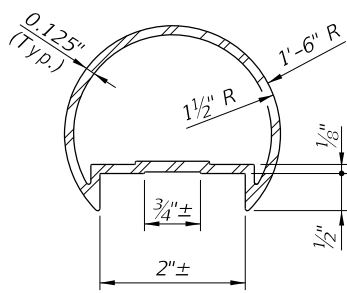
3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL
(42" Height shown, 48" Height Similar)

TABLE 1 - RAILING MEMBERS

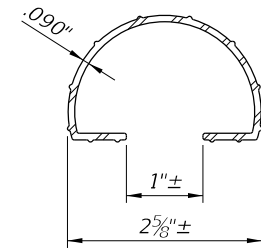
MEMBER	ALLOY ⁽¹⁾	DESIGNATION	OUTSIDE DIMENSION	WALL THICKNESS
Posts (Type "A" & "B")	6061-T6	RT 2x2x0.250	2.00" x 2.00"	0.250"
Posts (Type "C")	6061-T6	Extrusion 1½x2½x0.125	1.50" x 2.50"	0.125"
Top Plate (Type "C")	6061-T6	Extrusion (See Details)	2¾" x 7"	Varies
Top Rail	6061-T6	2½" NPS (Sch. 10) 3" 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:

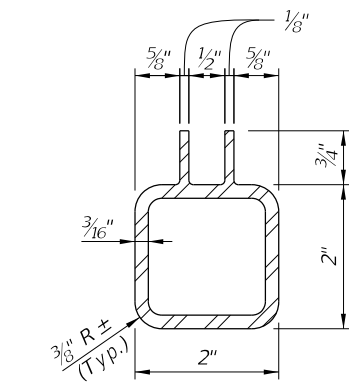
- (1) Alloy 6061-T6 or 6063-T52 & T6 may be substituted for Alloy 6063-T5.
- (2) 0.188" wall thickness permitted for rails with post spacings less than 5'-9".
- (3) 1" NPS (Sch. 40) non-slit rail sleeves may be substituted when welded connection Detail "K" is utilized.



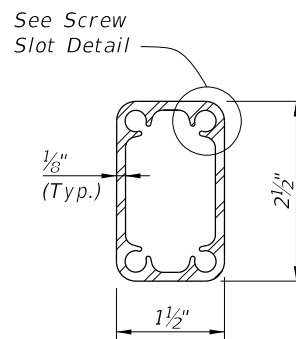
3" ROUND TOP CAP RAIL
ALTERNATE TOP RAIL SECTION



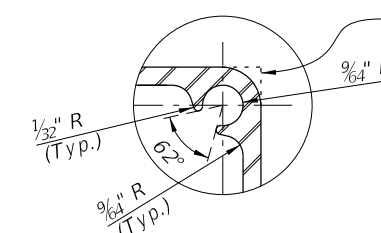
TOP CAP RAIL INNER SPlice SLEEVE



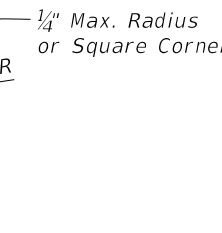
ALTERNATIVE BOTTOM & INTERMEDIATE RAIL SECTION FOR TYPE 3, 4 & 5 RAILINGS



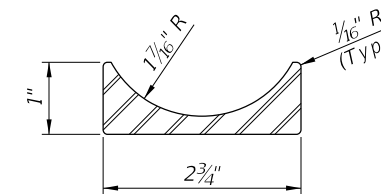
POST TYPE "C" SCREW SLOT SECTION



SCREW SLOT DETAIL



SCREW SLOT DETAIL



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

NOTES

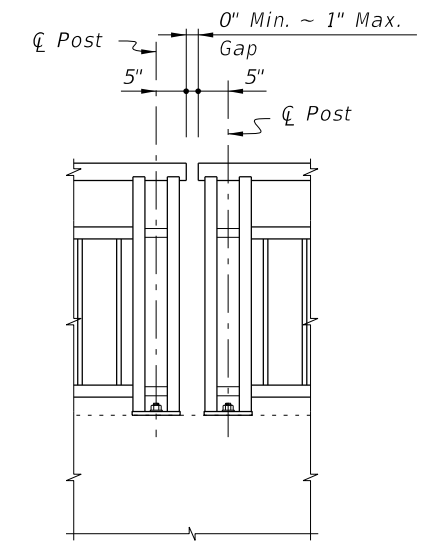
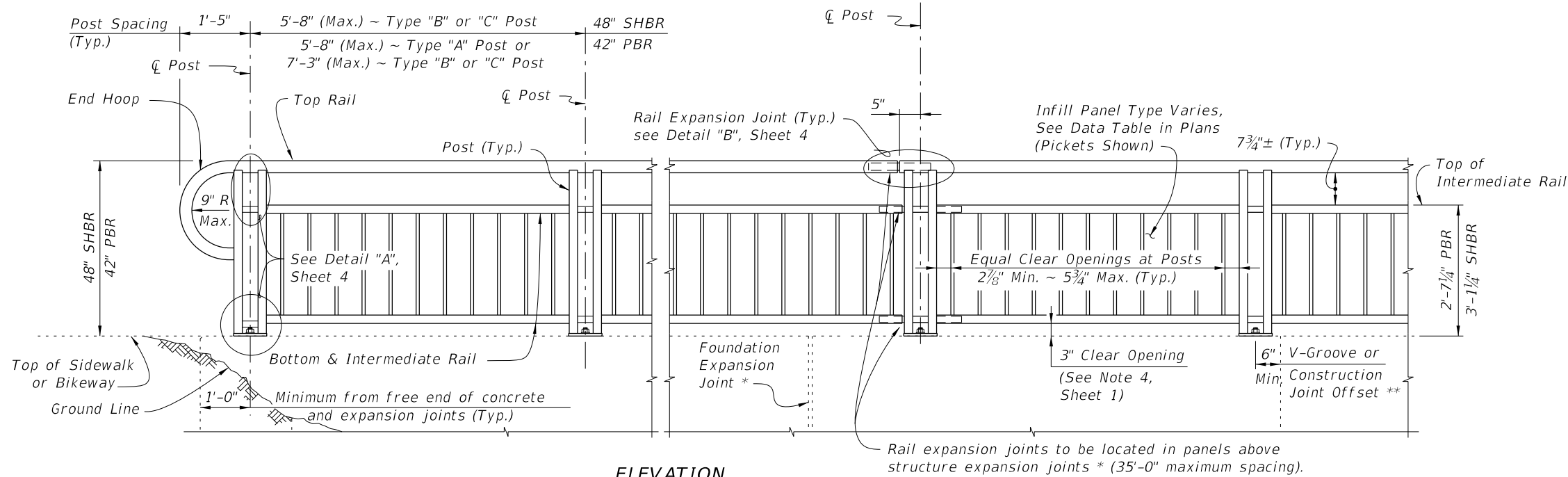
1. Shop Drawings are required, see Specification Section 515.
2. For bridge mounted railings, work this Index with Index 861 Bridge Bicycle/Pedestrian Railing (Aluminum)
3. Materials:
 - A. Structural Extrusions, Tube, Pipe and Bars: Table 1 and ASTM B221 or ASTM B429
 - a. Top, bottom and intermediate 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 962 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.

CROSS REFERENCES:

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

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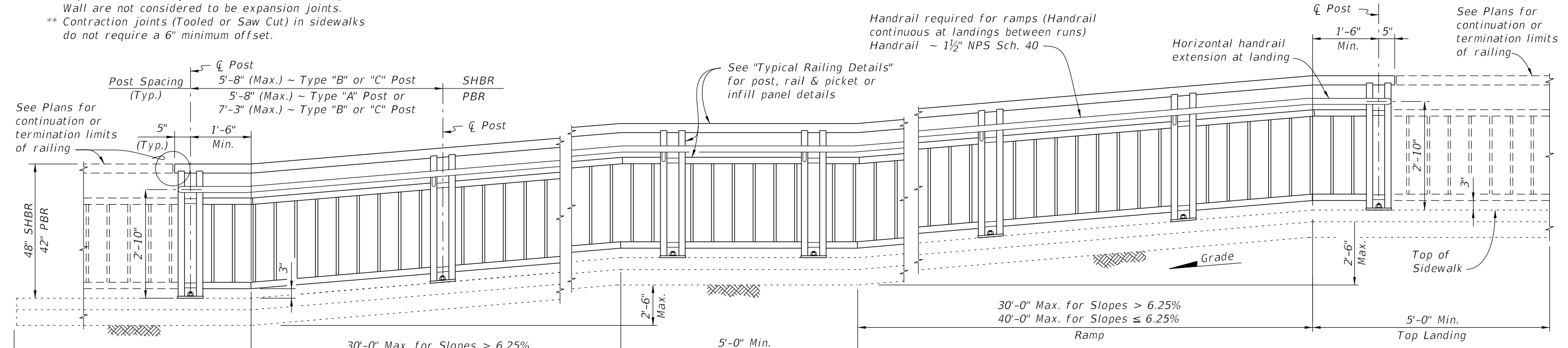
Note: Non-continuous corners are permitted when handrails are not required.

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

EXPANDED ELEVATION AT CORNERS
DETAIL FOR NON-CONTINUOUS RAILING AT CORNERS

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

- NOTES:**
 * Keyed construction joints in Index 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.



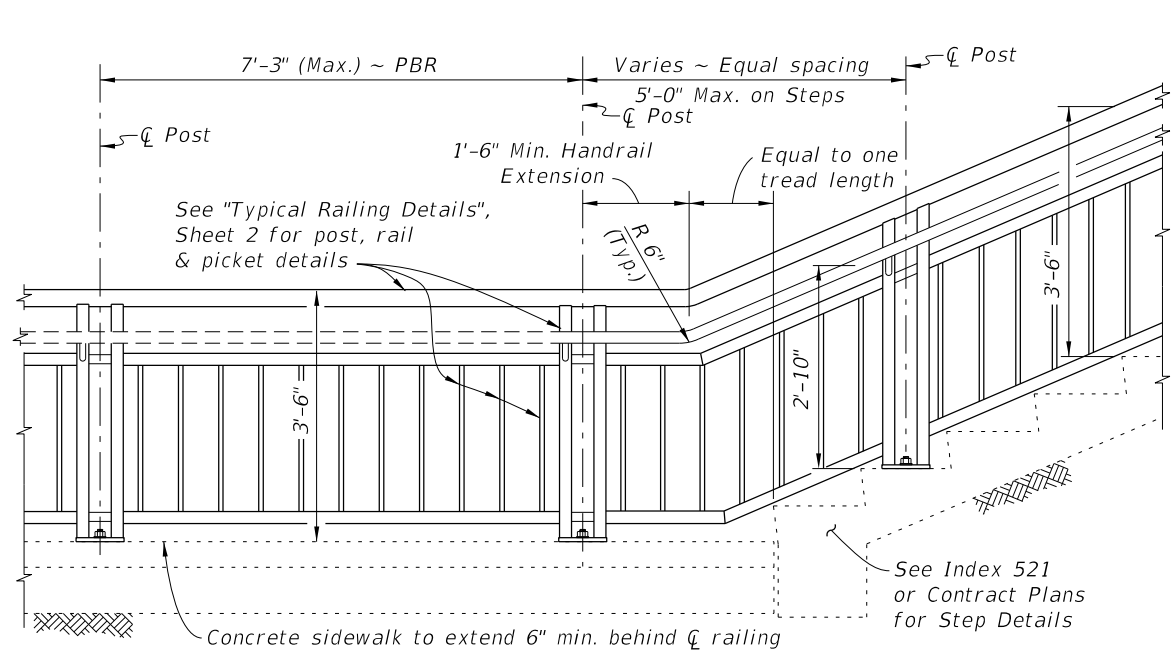
- RAMP REQUIREMENTS**
 For slopes greater than 5%:
 Max. ramp slope = 8.33%
 Max. ramp cross-slope = 2.0%
- LANDING REQUIREMENTS**
 Max. landing slope = 2%
 Max. landing cross-slope = 2%

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

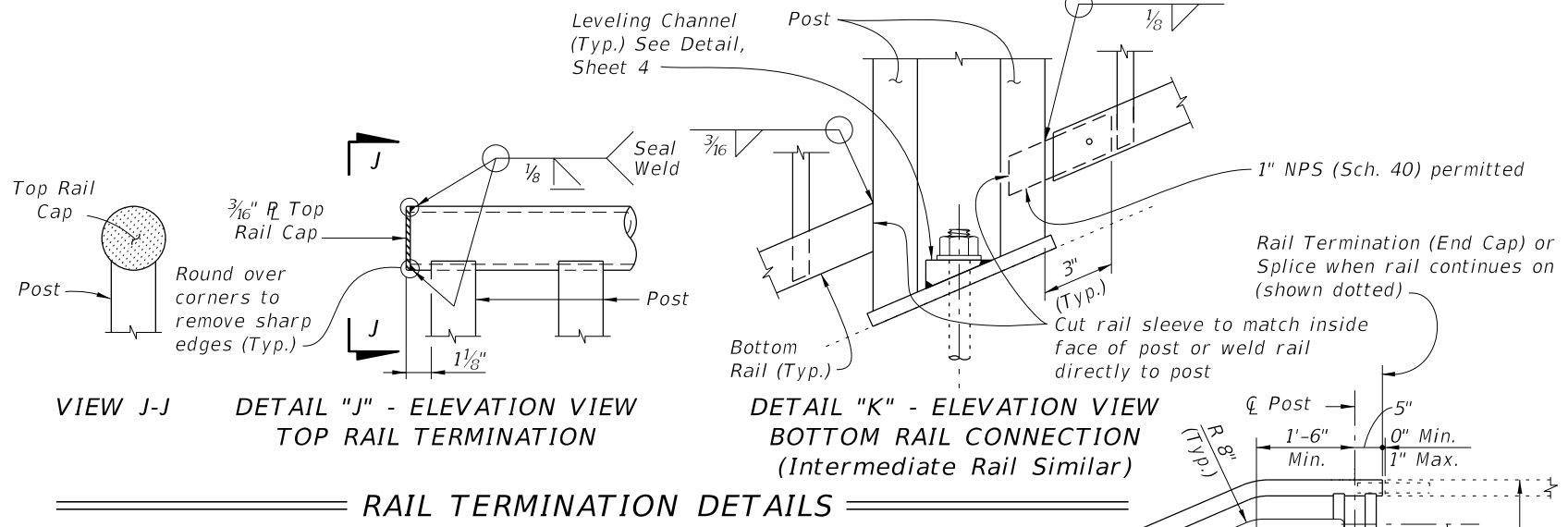
RAILINGS ON GRADES STEEPER THAN 5%
(Type 1 - Picket Railing Shown, Other Types Similar)

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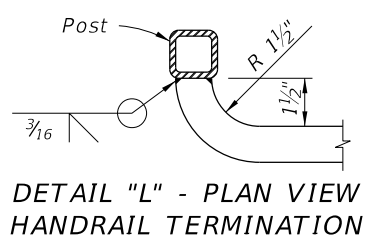
LAST REVISION 07/01/15	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	ALUMINUM PEDESTRIAN/BICYCLE RAILING	INDEX NO. 862	SHEET NO. 2 of 9
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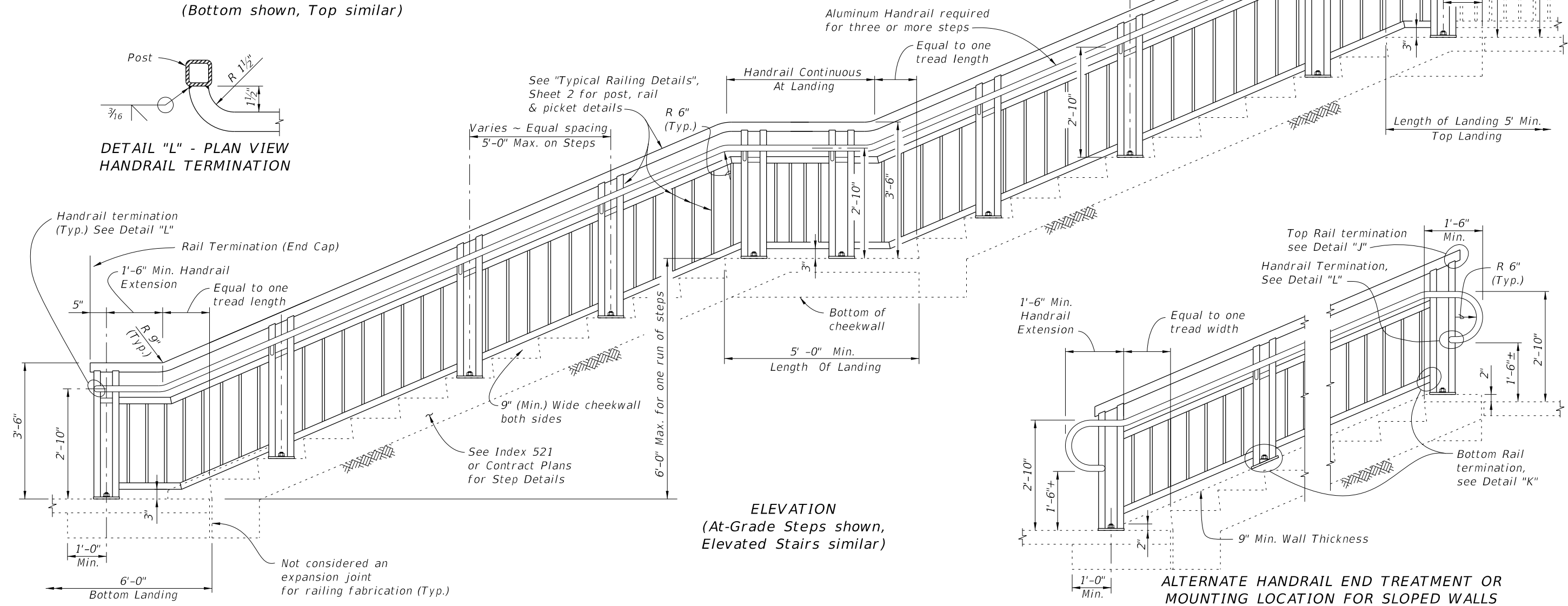
RAILING CONTINUATION BEYOND STEPS OR STAIRS
(Bottom shown, Top similar)



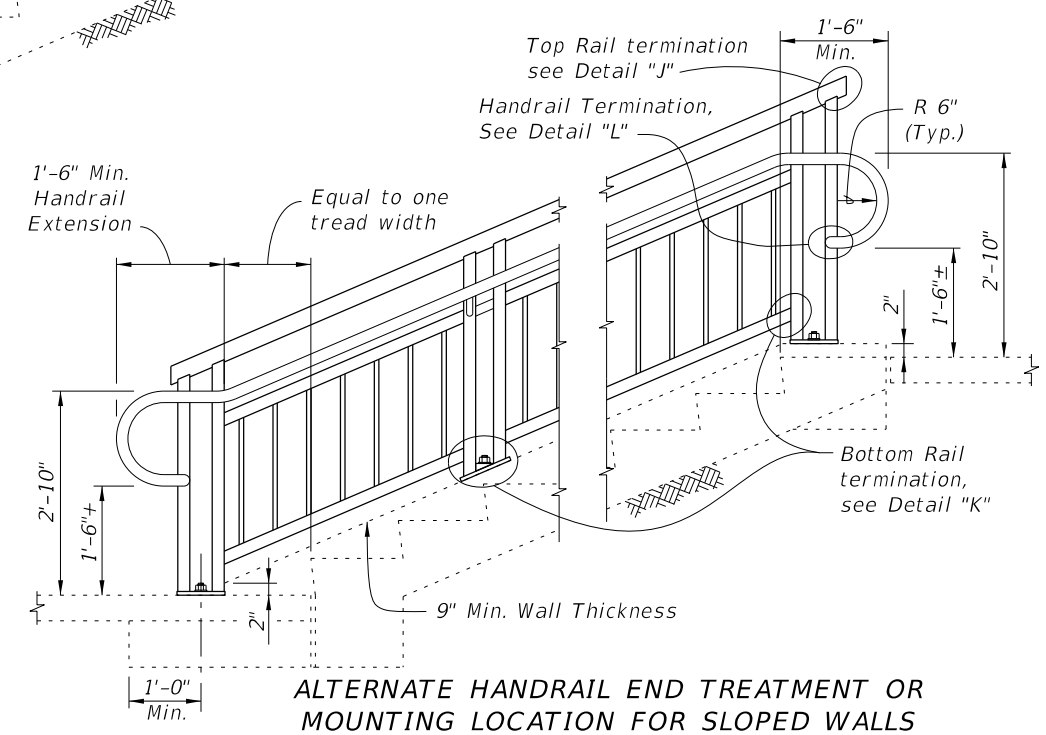
RAIL TERMINATION DETAILS



DETAIL "L" - PLAN VIEW HANDRAIL TERMINATION



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

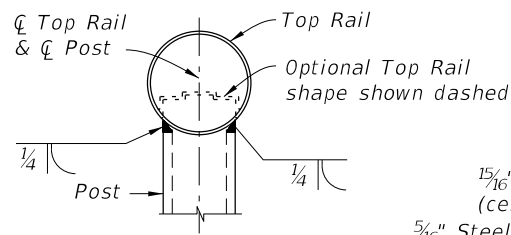


ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOPED WALLS

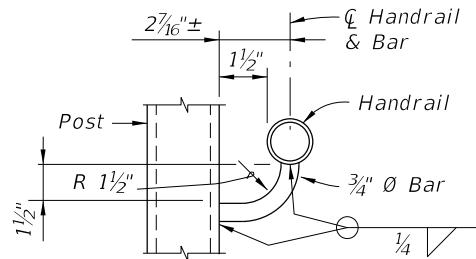
RAILINGS ON STEPS & STAIRS

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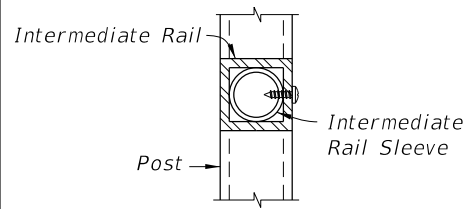
LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	ALUMINUM PEDESTRIAN/BICYCLE RAILING	INDEX NO. 862	SHEET NO. 3 of 9
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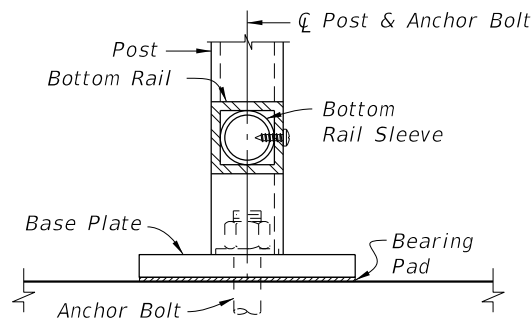
SECTION A-A
(Top Rail Connection)



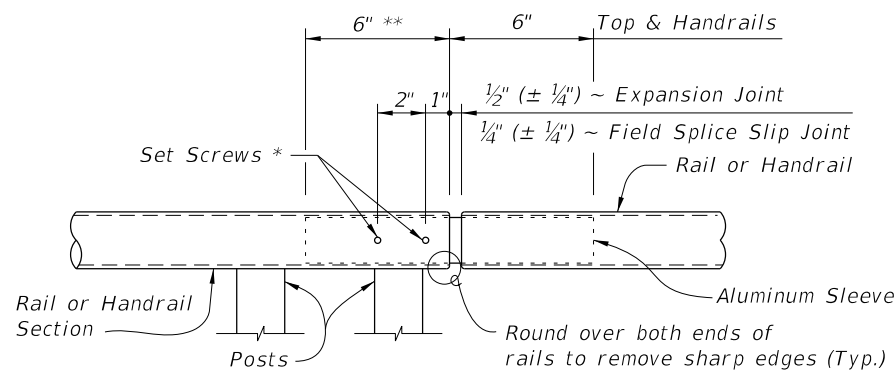
SECTION B-B
(Handrail Connection)



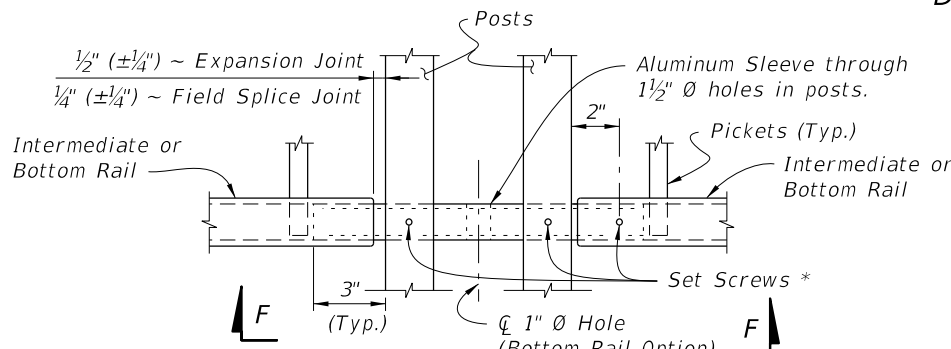
SECTION C-C
(Intermediate Rail Connection)



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



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



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

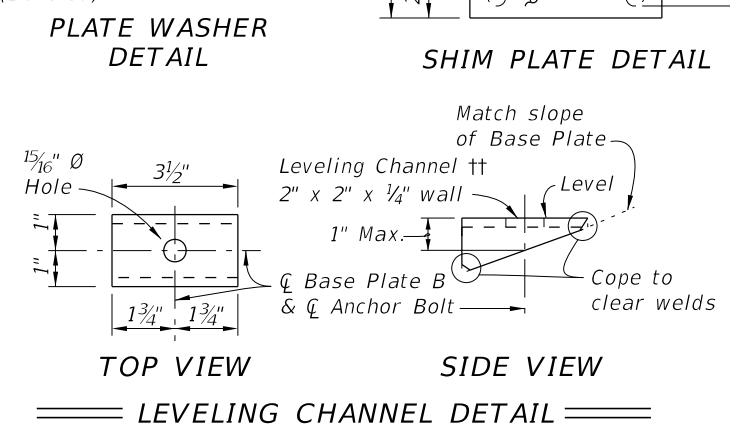
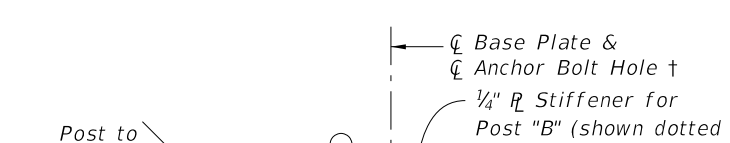
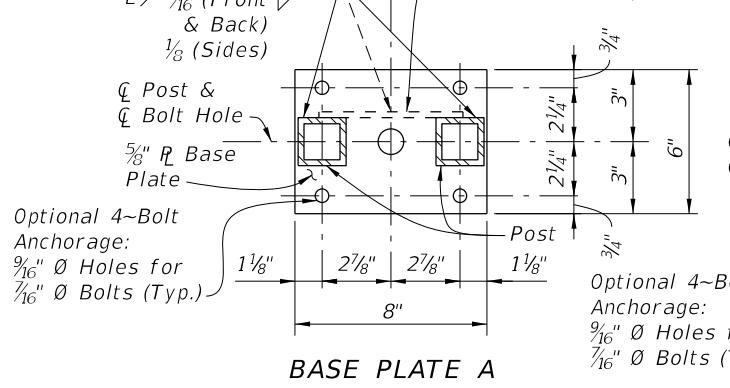


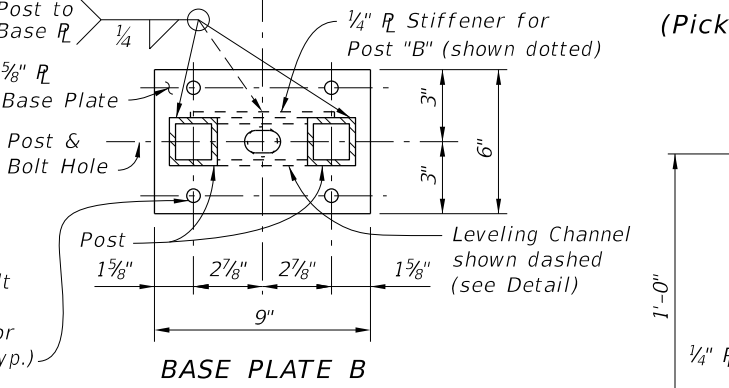
PLATE WASHER
DETAIL



LEVELING CHANNEL
DETAIL

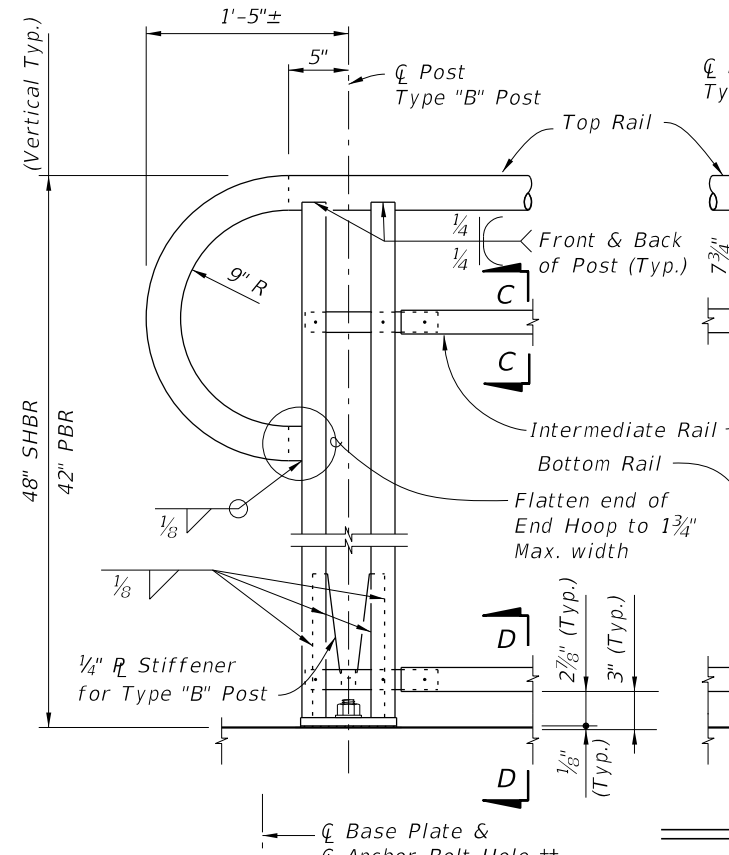


BASE PLATE A



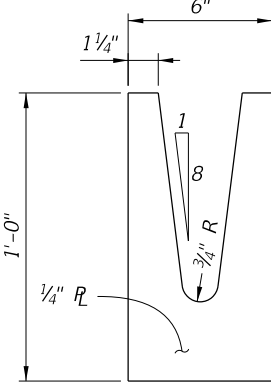
BASE PLATE B

SECTION G-G - BASE PLATE DETAILS

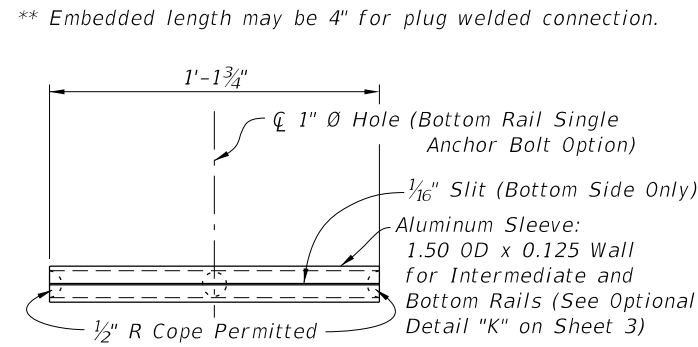


DETAIL "A" - RAIL CONNECTIONS
(Showing Inside Face of Railing)
(Pickets/Panels and 4-Bolt Anchorage Not Shown for Clarity)

NOTES:
 † Base Plate A (Ramps - Bolts normal) use 1 5/16" Ø Holes for Single Anchor Bolts with Flat Washers for slopes ≤ 8.33%.
 ‡ Base Plate B (Stairs - Bolts plumb) use 1 1/4" Ø Holes for Single Anchor Bolts with Beveled Plate and Washers for slopes > 8.33% to ≤ 15%; use 1 5/16" x 1 1/2" Slotted Holes with Leveling Channel for slopes > 15%.
 * 1/4" Ø x 3/4" 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" 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.
 ** Embedded length may be 4" for plug welded connection.



POST "B" STIFFENER
DETAIL

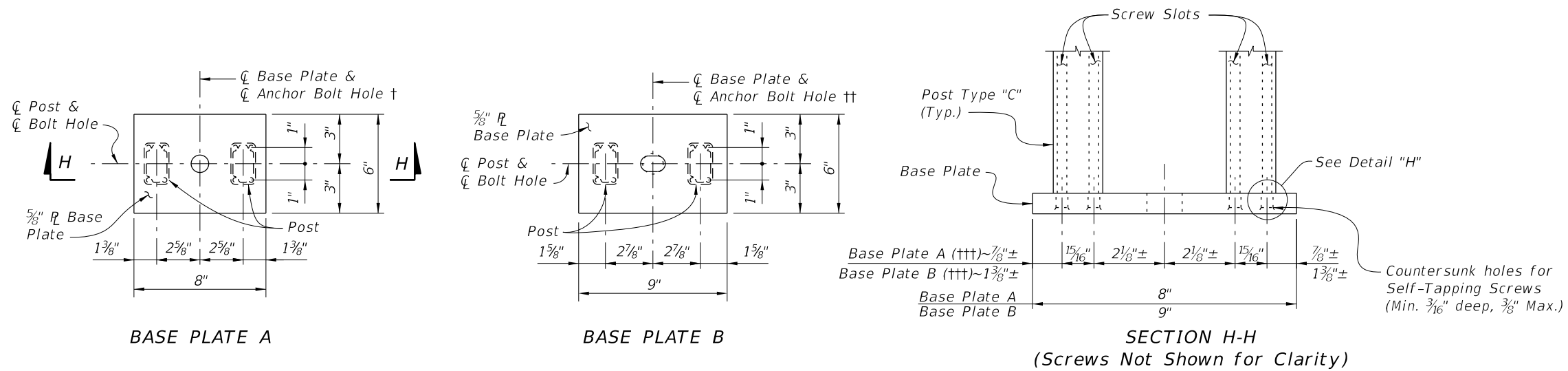


VIEW F-F
INTERMEDIATE OR BOTTOM RAIL -
ALUMINUM SLEEVE DETAIL (Bottom Side Shown)

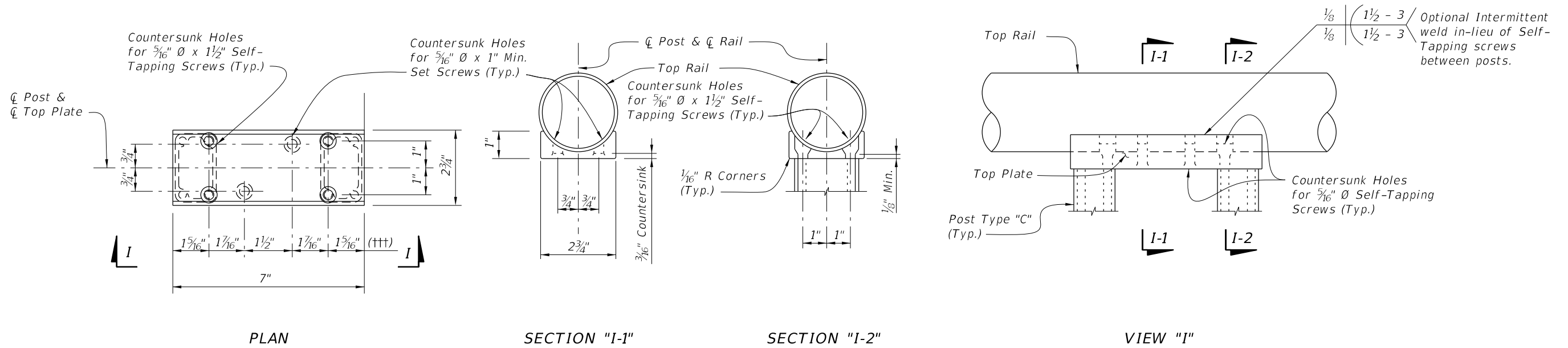
CROSS REFERENCE:
For location of Details "B", See Sheet 2.

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BASE PLATE DETAILS FOR TYPE "C" POST

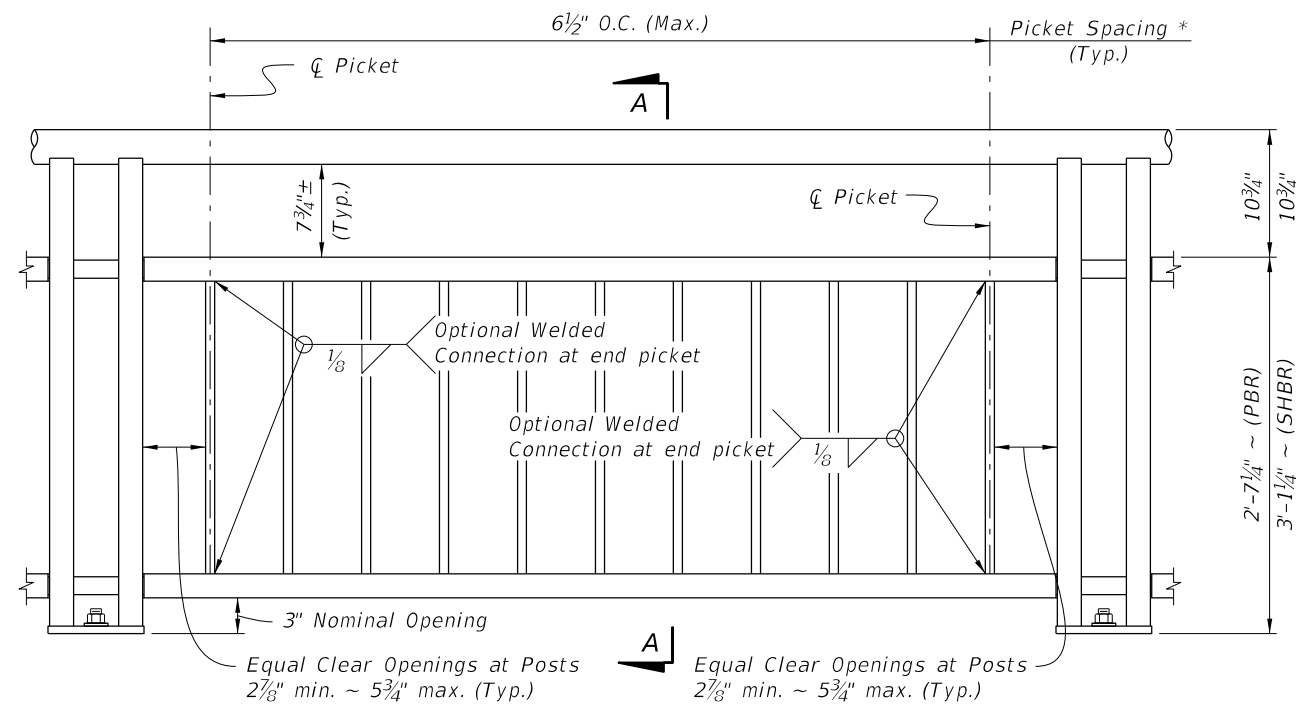


TOP PLATE DETAILS FOR TYPE "C" POST
(Screws Not Shown For Clarity)

- 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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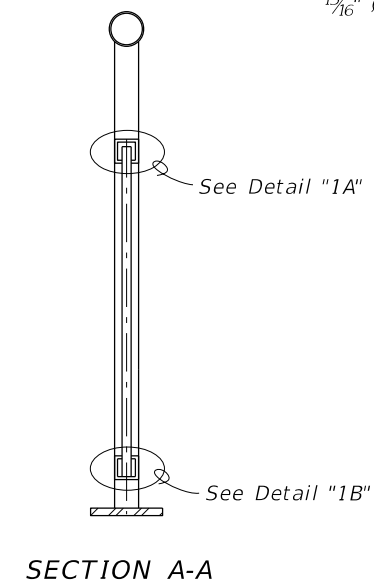
LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	ALUMINUM PEDESTRIAN/BICYCLE RAILING	INDEX NO. 862	SHEET NO. 5 of 9
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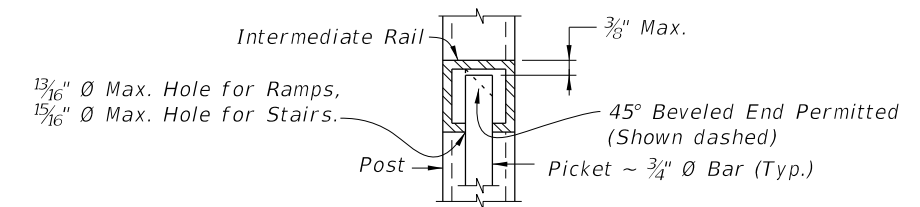
TYPE 1 - PICKET INFILL PANEL

PICKET NOTES:

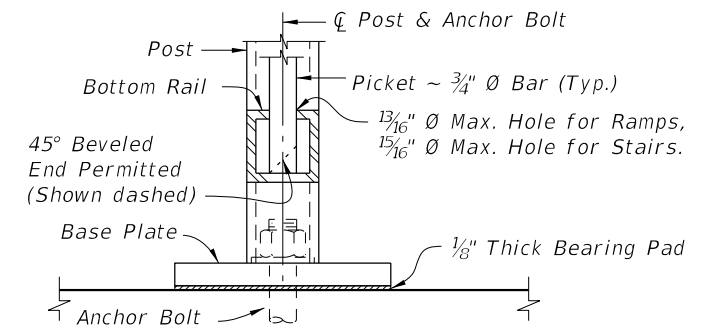
* Picket Spacing of 6 1/2" centers is based on a 3/4" Ø Bar for standard applications. When shown in the Contract Plans a 4 1/2" picket spacing may be required. See Note 4 (Sheet 1).



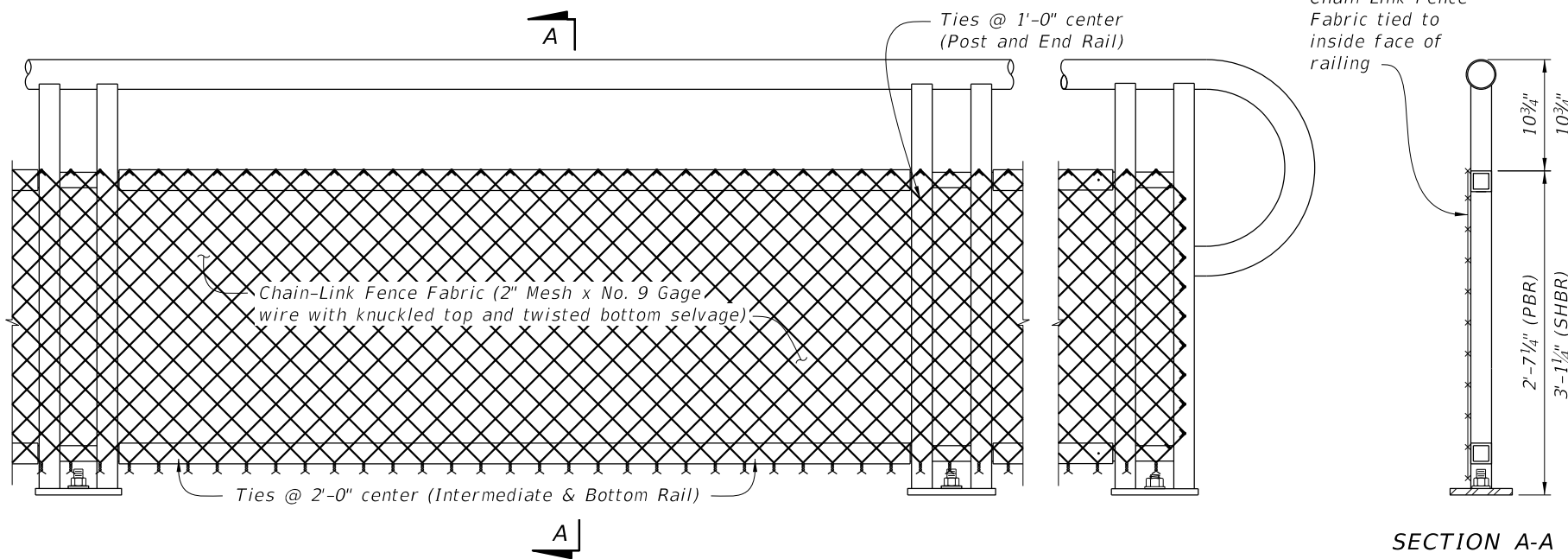
SECTION A-A



**DETAIL "1A"
(Top of Picket Connection)**



**DETAIL "1B"
(Bottom of Picket Connection)**



SECTION A-A

TYPE 2 - CHAIN-LINK (Continuous Infill Panel)

NOTES:

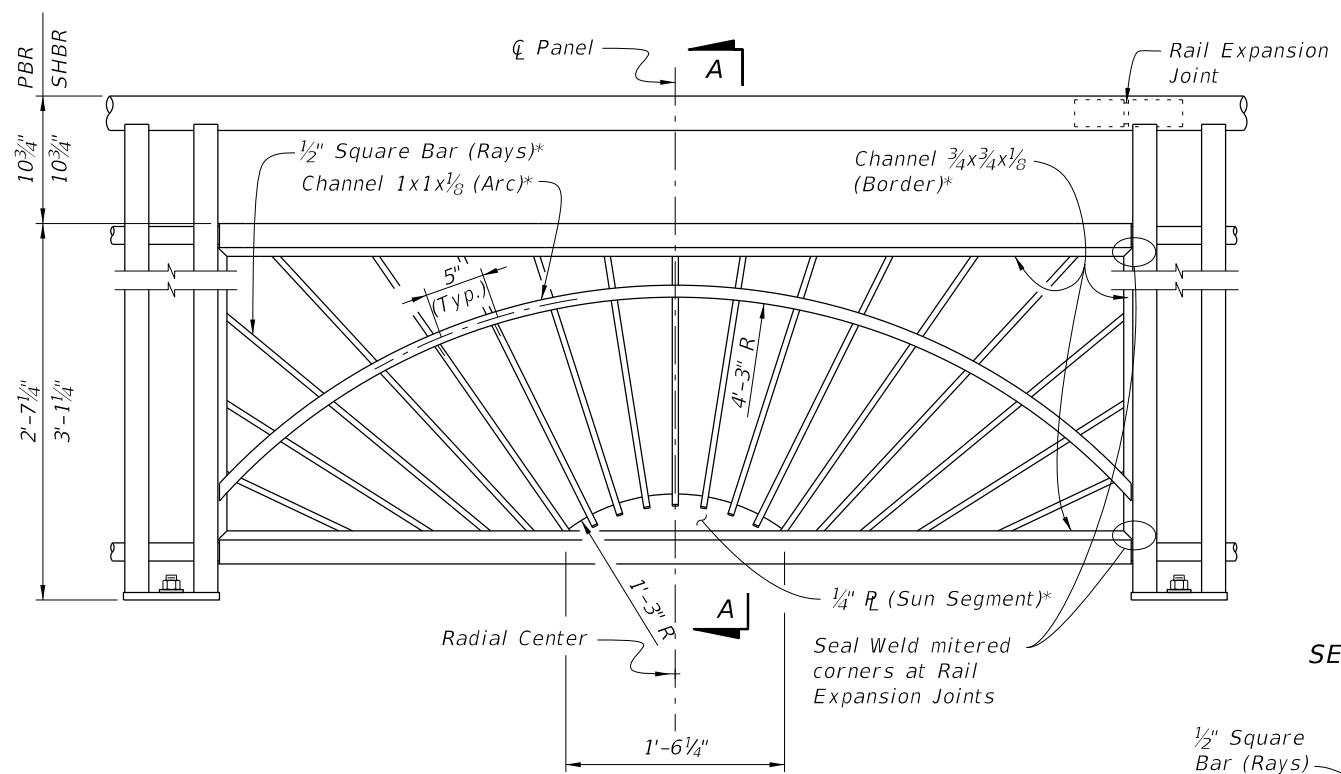
1. See Plans for Infill Panel option required.

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	3/16" (min. thickness) x 3/4" (min. width) x 2'-3' (min. height) Steel Bars
Miscellaneous Fence Components	F626	Zinc-Coated Steel

CHAIN-LINK PANEL NOTE:

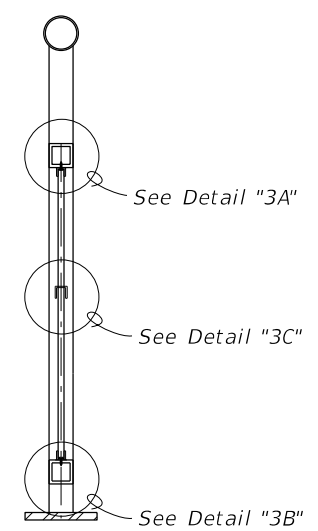
Chain-Link Fence Fabric shall be continuous along limits of railing. Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.

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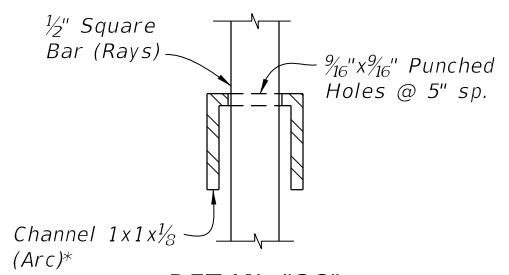


TYPE 3 - SUNSHINE INFILL PANEL

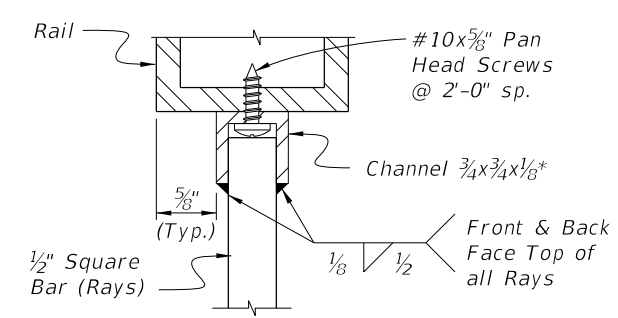
* Arc, Rays and Sun Segment may be formed in a single panel from 1/2" plate (ASTM B209 Alloy 6061-T6 or T651) pattern cut with laser or plasma CNC, welded to a 1x1x1/8 Angle Border or the 3/4x3/4x1/8 Channel Border shown.



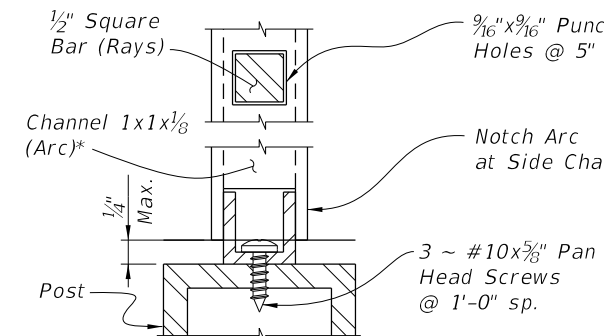
SECTION A-A



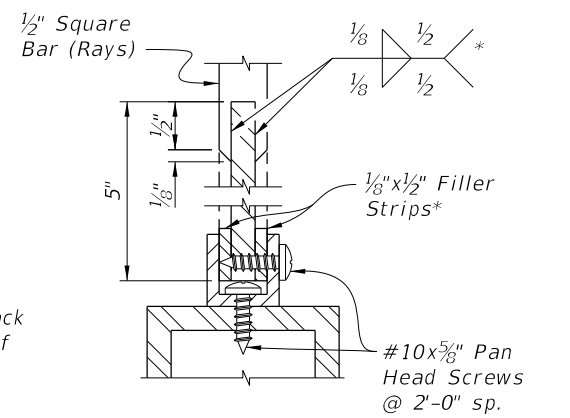
DETAIL "3C" RAY/ARC CONNECTION



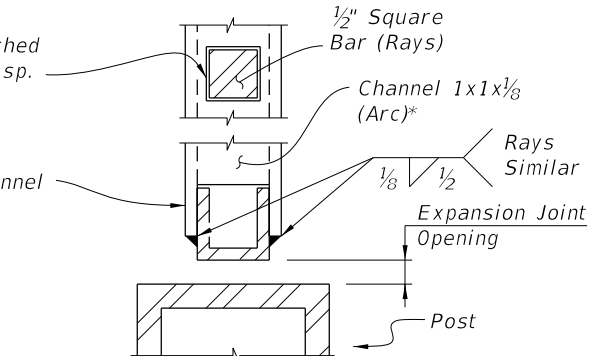
DETAIL "3A" INTERMEDIATE RAIL/RAY CONNECTION



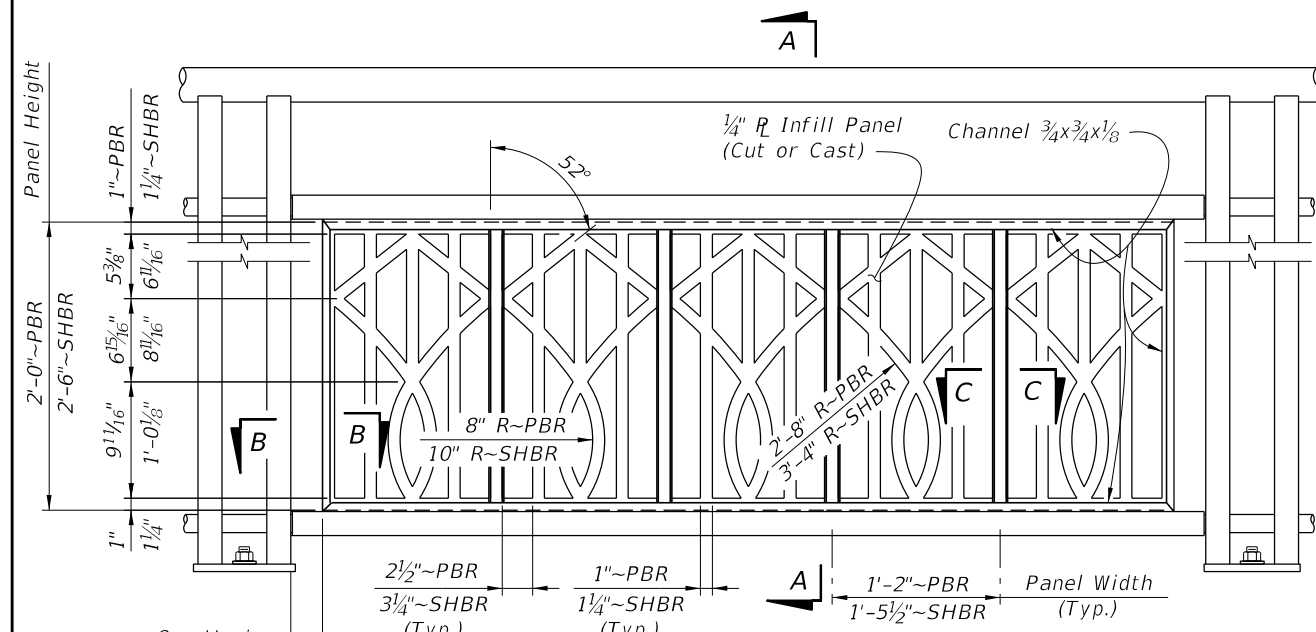
DETAIL "3D" ARC/POST CONNECTION (Continuous Top Rail)



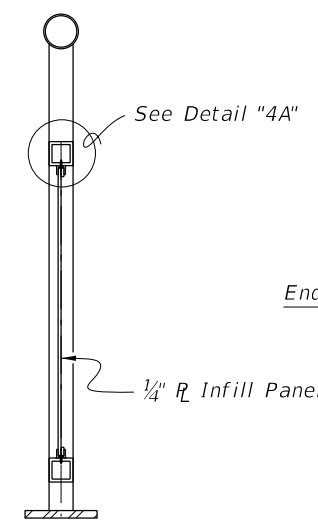
DETAIL "3B" BOTTOM RAIL/RAY CONNECTION



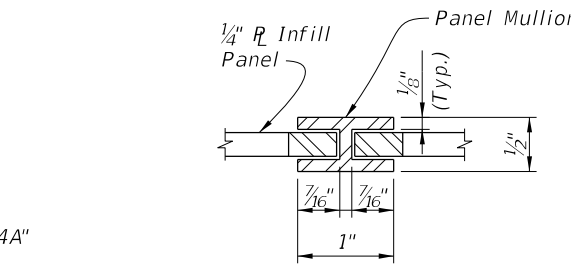
DETAIL "3E" PANEL END CONNECTION AT POST WITH EXPANSION JOINT



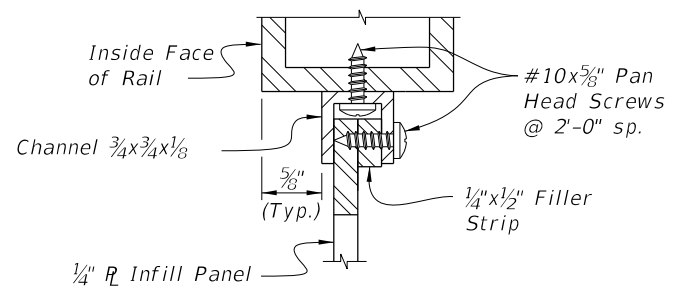
TYPE 4 - BROADWAY INFILL PANEL



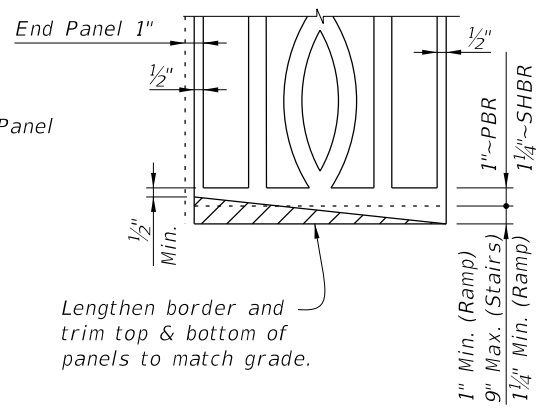
SECTION A-A



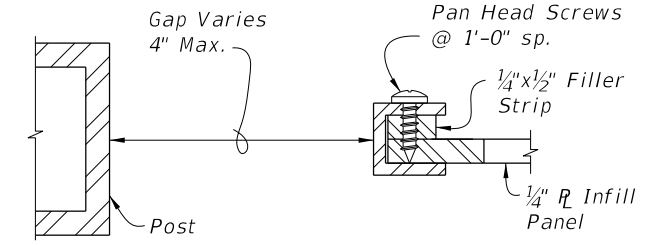
SECTION C-C PANEL/SPLICE CONNECTION



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



PANEL ADJUSTMENT FOR RAILINGS ON GRADES

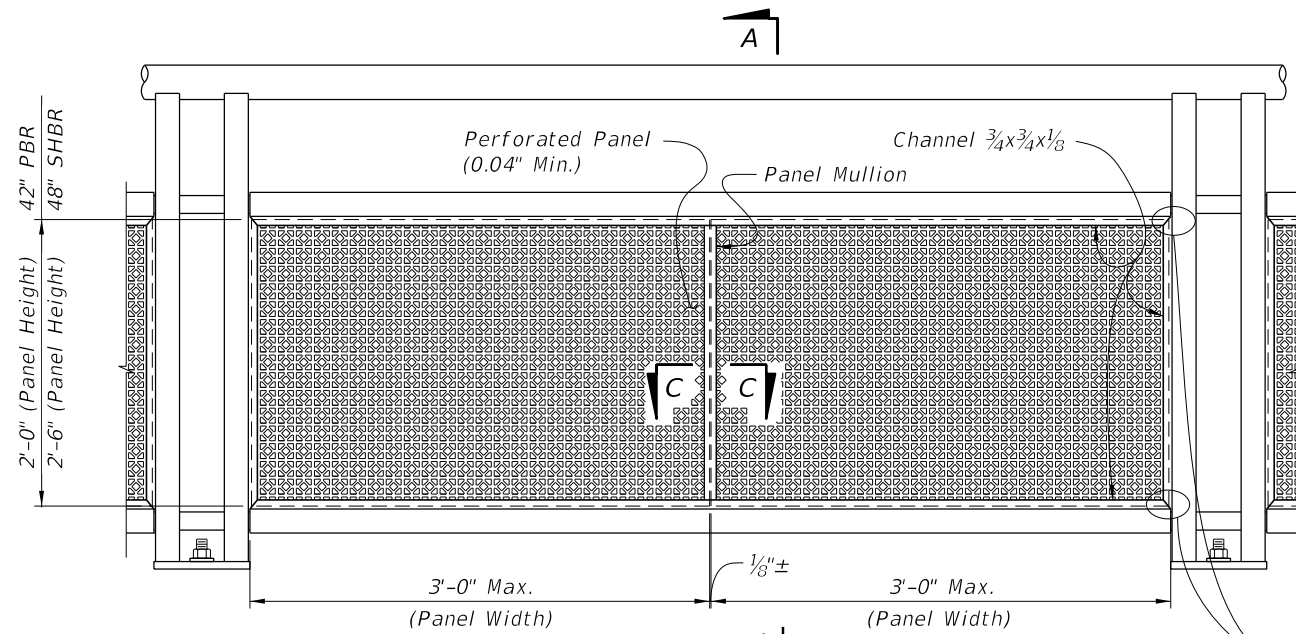


SECTION B-B PANEL END CAP

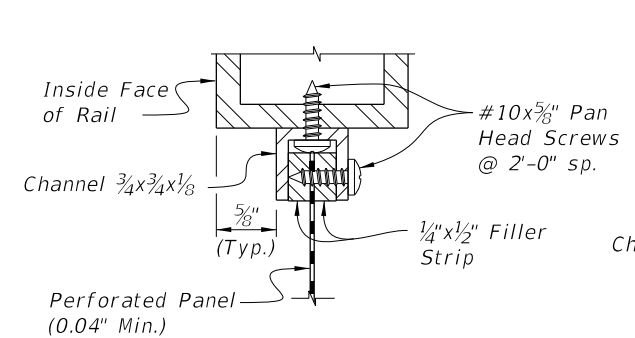
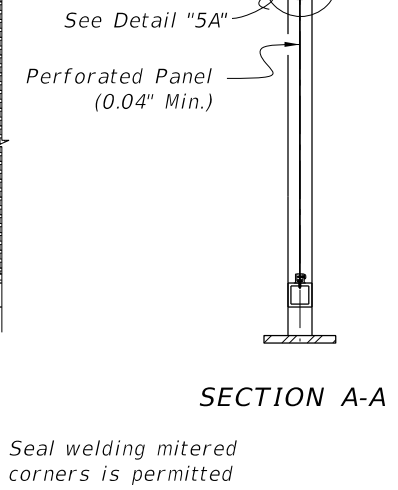
NOTES:
1. See Plans for Infill Panel Option required.

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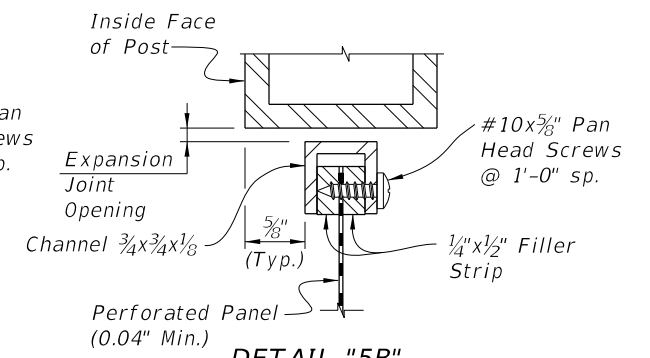
LAST REVISION 11/01/16	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	ALUMINUM PEDESTRIAN/BICYCLE RAILING	INDEX NO. 862	SHEET NO. 7 of 9
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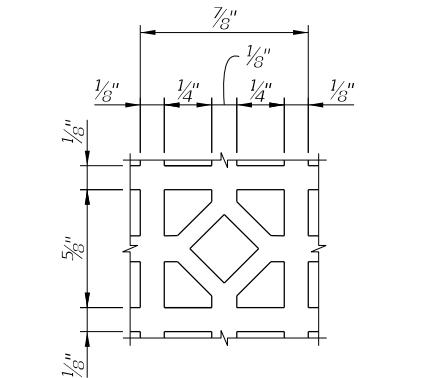
TYPE 5 - PERFORATED INFILL PANEL



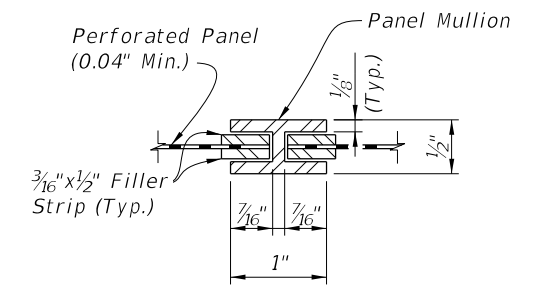
**DETAIL "5A"
PANEL/RAIL CONNECTION
(Top Shown, Bottom Similar)**



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



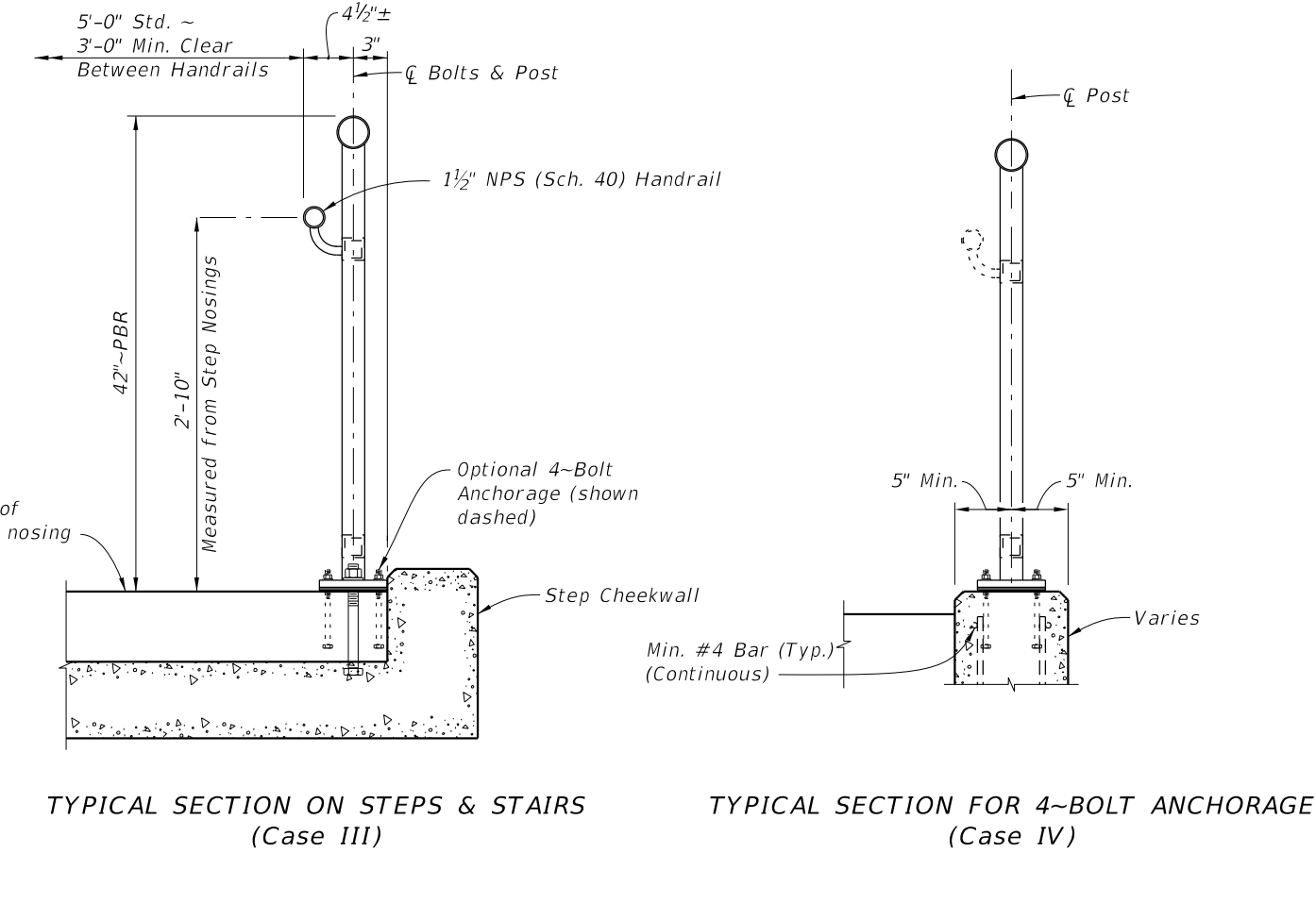
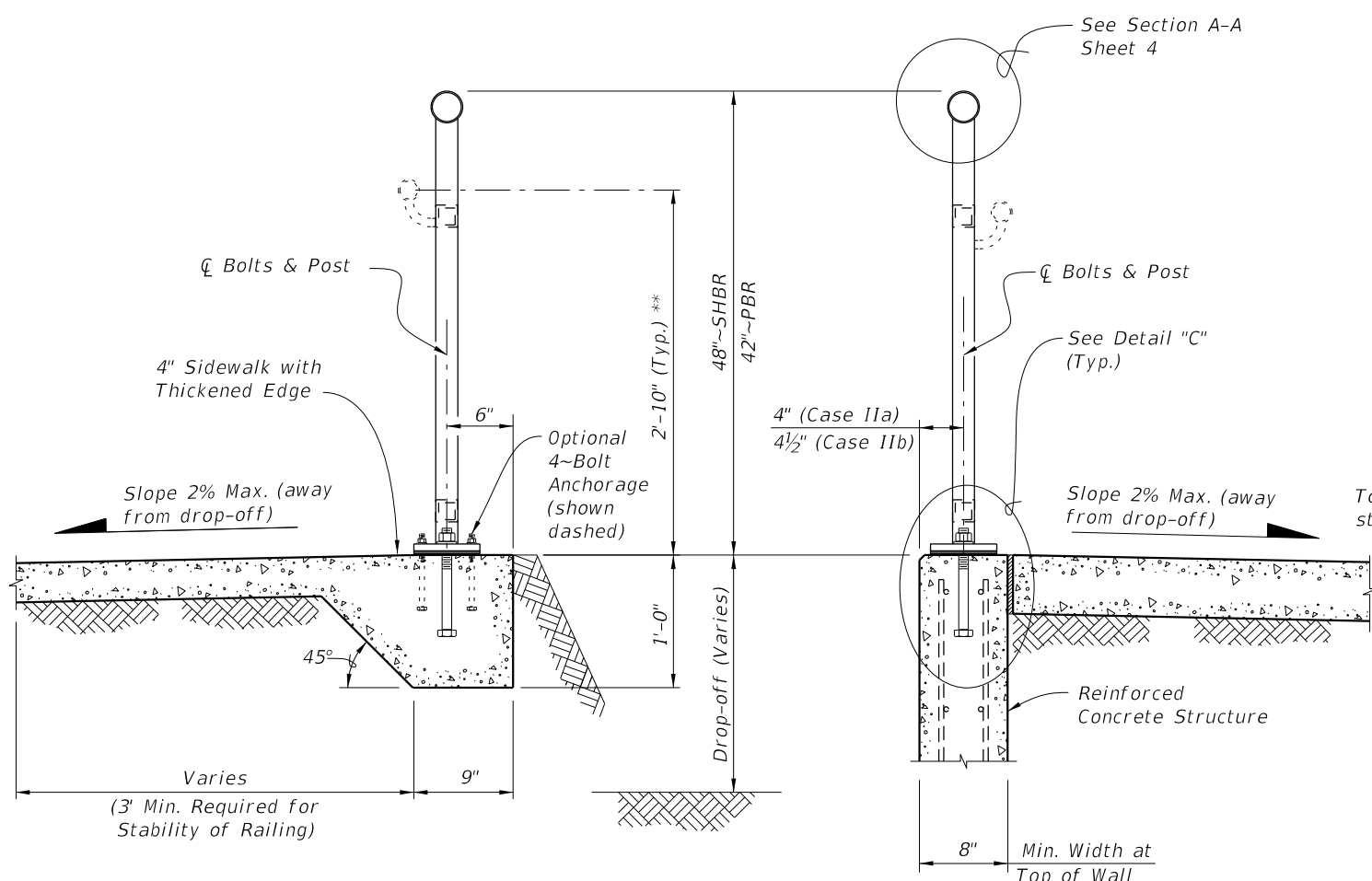
**REPEATING PATTERN DETAIL
FOR PERFORATED PANEL**



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

10/26/2016 8:33:04 AM

LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	ALUMINUM PEDESTRIAN/BICYCLE RAILING	INDEX NO. 862	SHEET NO. 8 of 9
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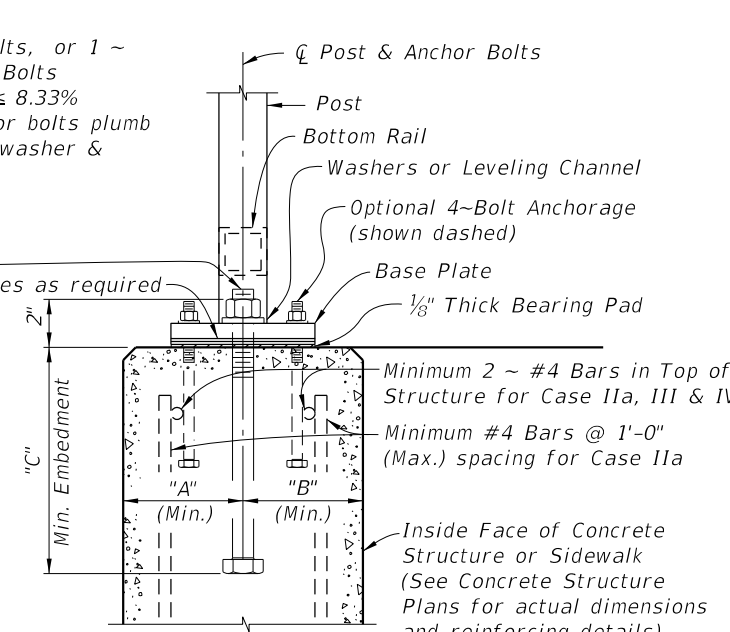
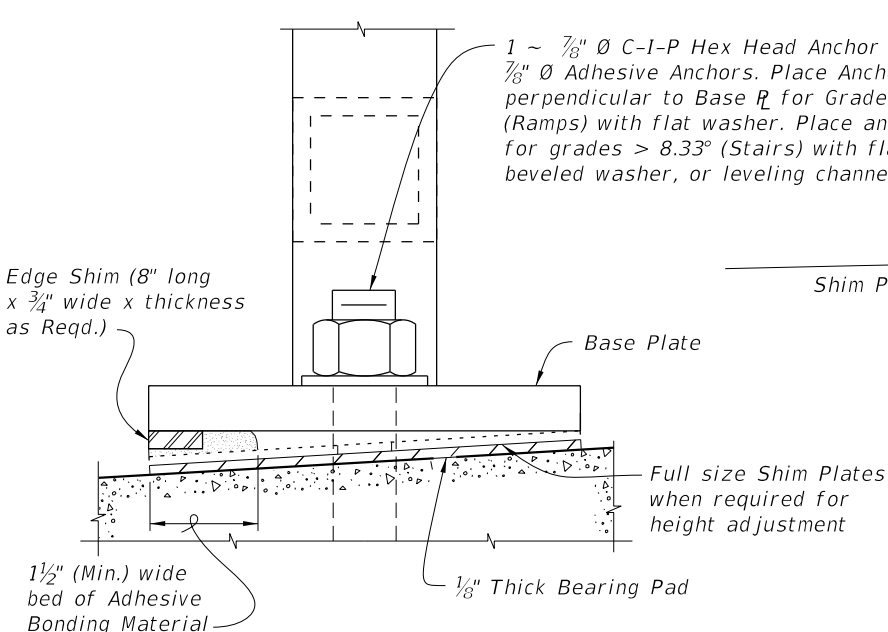


TYPICAL SECTION ON CONCRETE SIDEWALK (Case I)

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 No. 6011	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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NOTES:

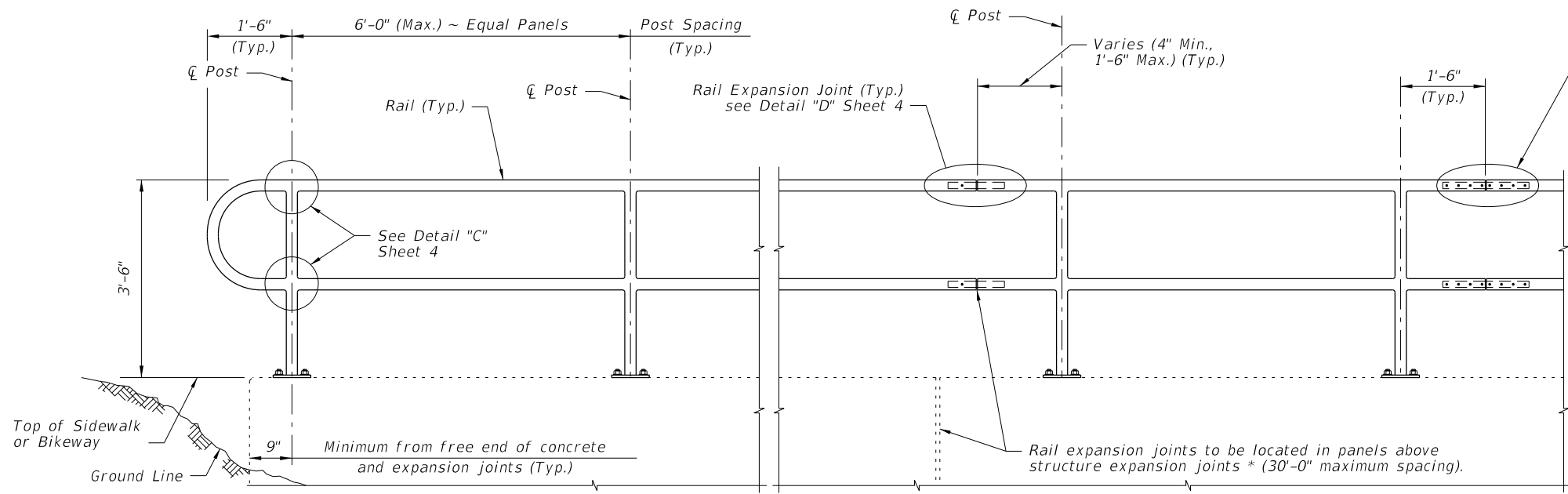
1. Shop Drawings are required.
2. Work with Specification Section 515.
3. Materials:
 - A. Pan Head Set Screws: Aluminum Alloy 2024-74 or 7075-T73 or Stainless Steel (SS) Type 316 or 18-8 Alloy.
 - B. Base Plates and Cap Plates: ASTM B209, Alloy 6061-T6
 - C. Structural Pipe Tube and Bars: ASTM B221 or ASTM B429, Alloy 6061-T6
 - D. End Rails 90° bends and corner bends with a maximum 4 foot spacing: Alloy 6063-T6 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 Specification Sections 515 & 962 for Ancillary Structures.
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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LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	ALUMINUM PIPE GUIDERAIL	INDEX NO. 870	SHEET NO. 1 of 5
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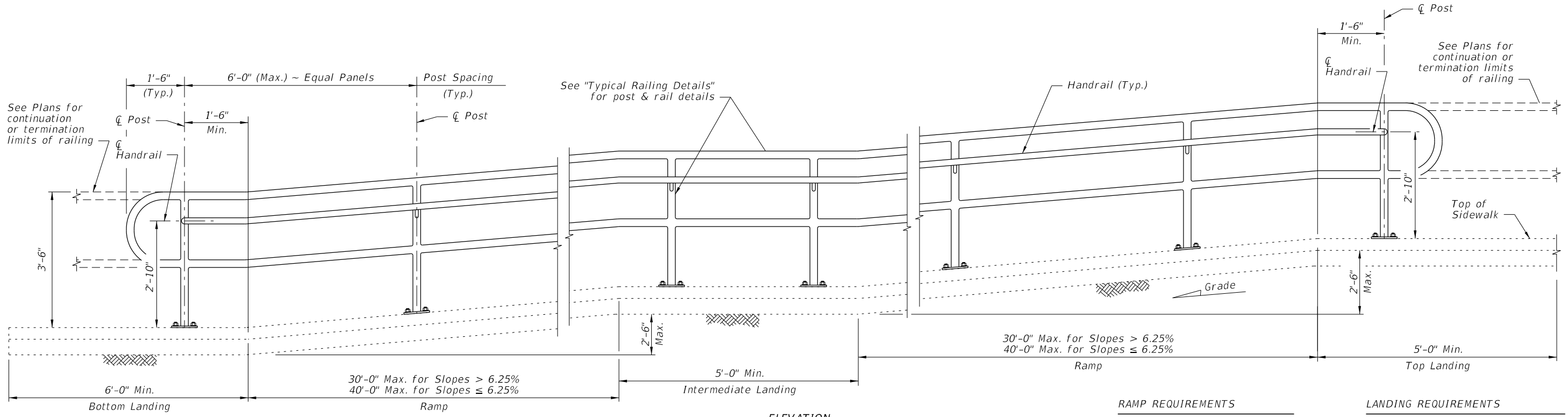
NOTES:
 NPS = Nominal Pipe Size

STRUCTURES EXPANSION JOINTS NOTE:
 * Keyed construction joints in Index No. 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%



ELEVATION
 (Showing Inside Face of Railing)

RAMP REQUIREMENTS

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

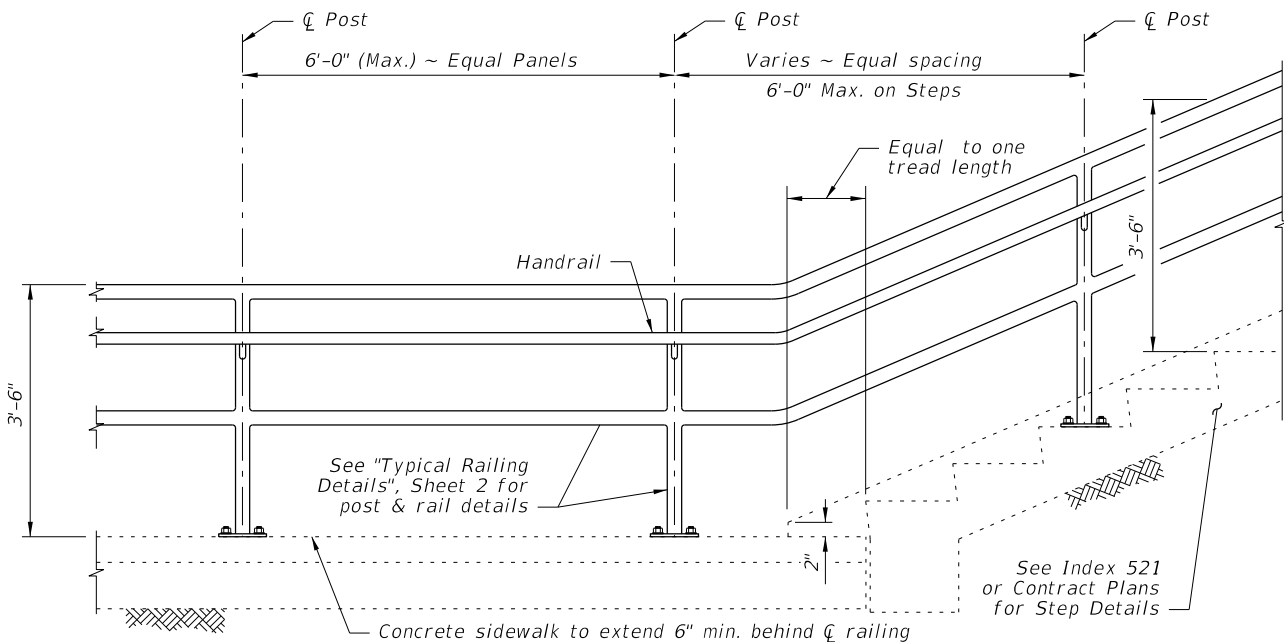
LANDING REQUIREMENTS

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

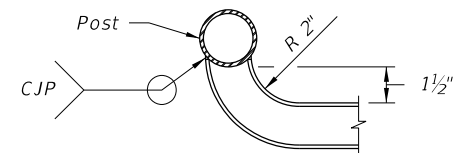
RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

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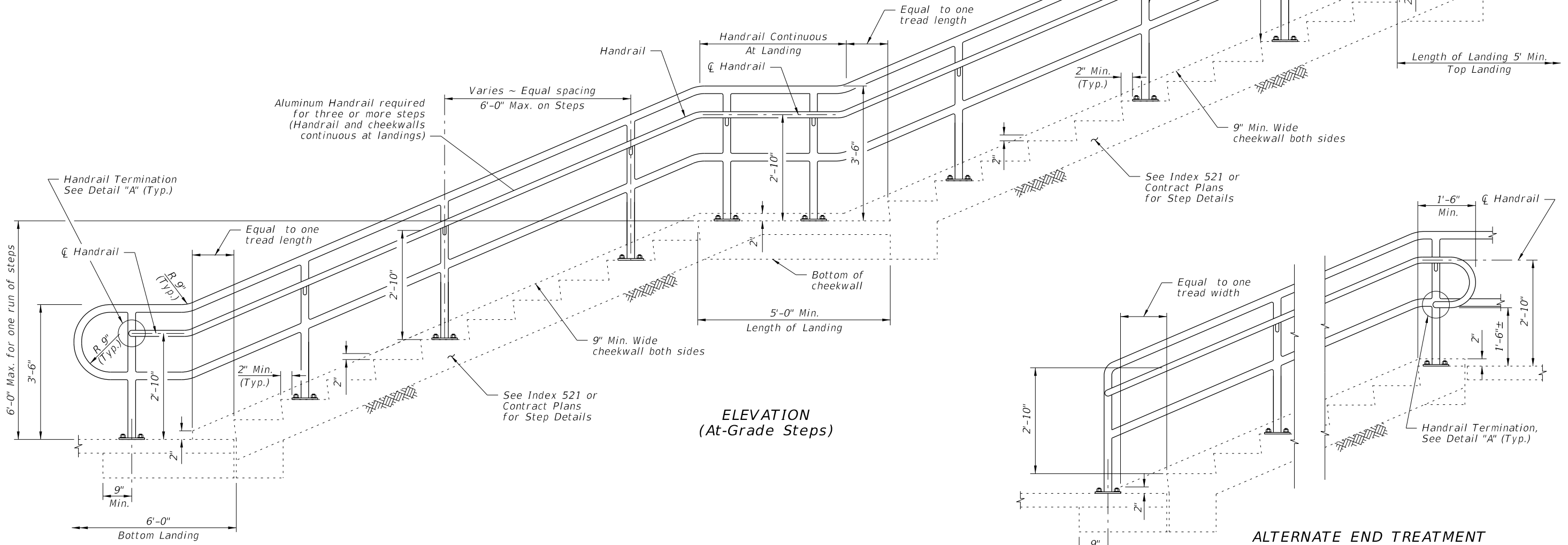
LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	ALUMINUM PIPE GUIDERAIL	INDEX NO. 870	SHEET NO. 2 of 5
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RAILING CONTINUATION BEYOND STEPS
(Bottom shown, Top similar)



DETAIL "A" - PLAN VIEW
HANDRAIL TERMINATION




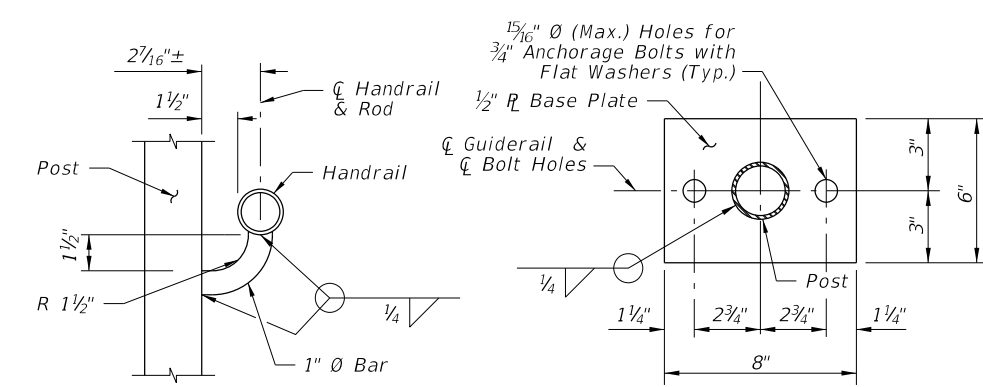
ELEVATION
(At-Grade Steps)

ALTERNATE END TREATMENT

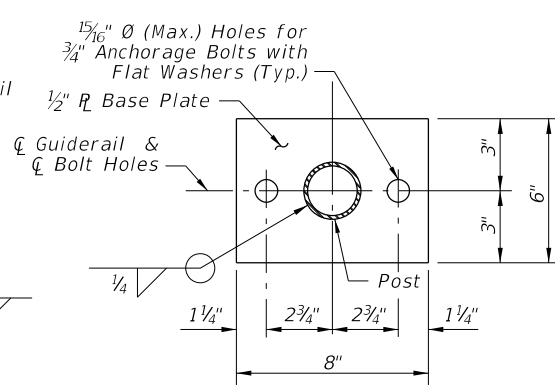
GUIDERAIL ON STEPS & STAIRS

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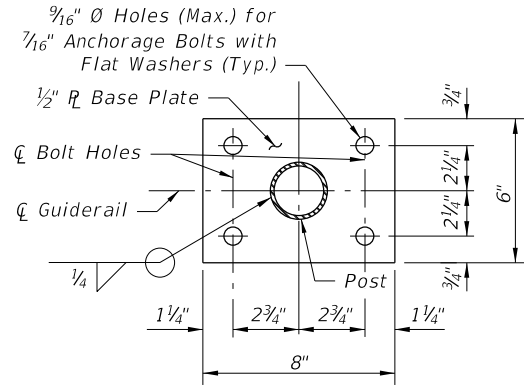
LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	ALUMINUM PIPE GUIDERAIL	INDEX NO. 870	SHEET NO. 3 of 5
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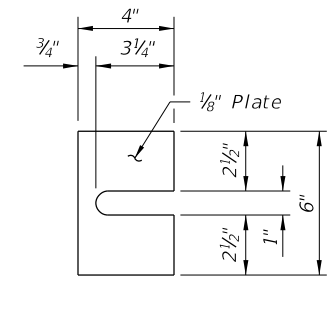
SECTION B-B
(Handrail Connection)



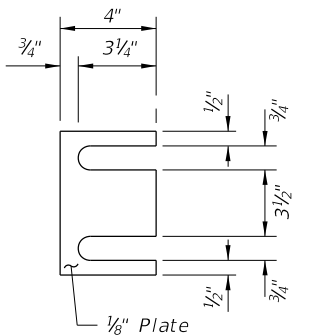
SECTION C-C
BASE PLATE DETAIL
(2~Bolt Anchorage)



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



SHIM PLATE DETAIL
(2~Bolt Anchorage)



SHIM PLATE DETAIL
(4~Bolt Anchorage)

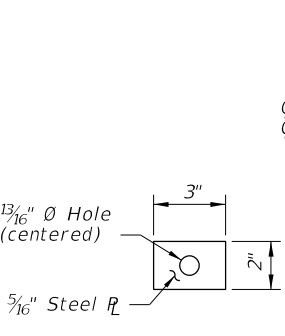
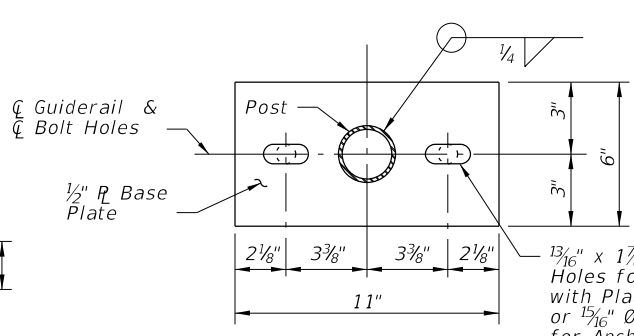
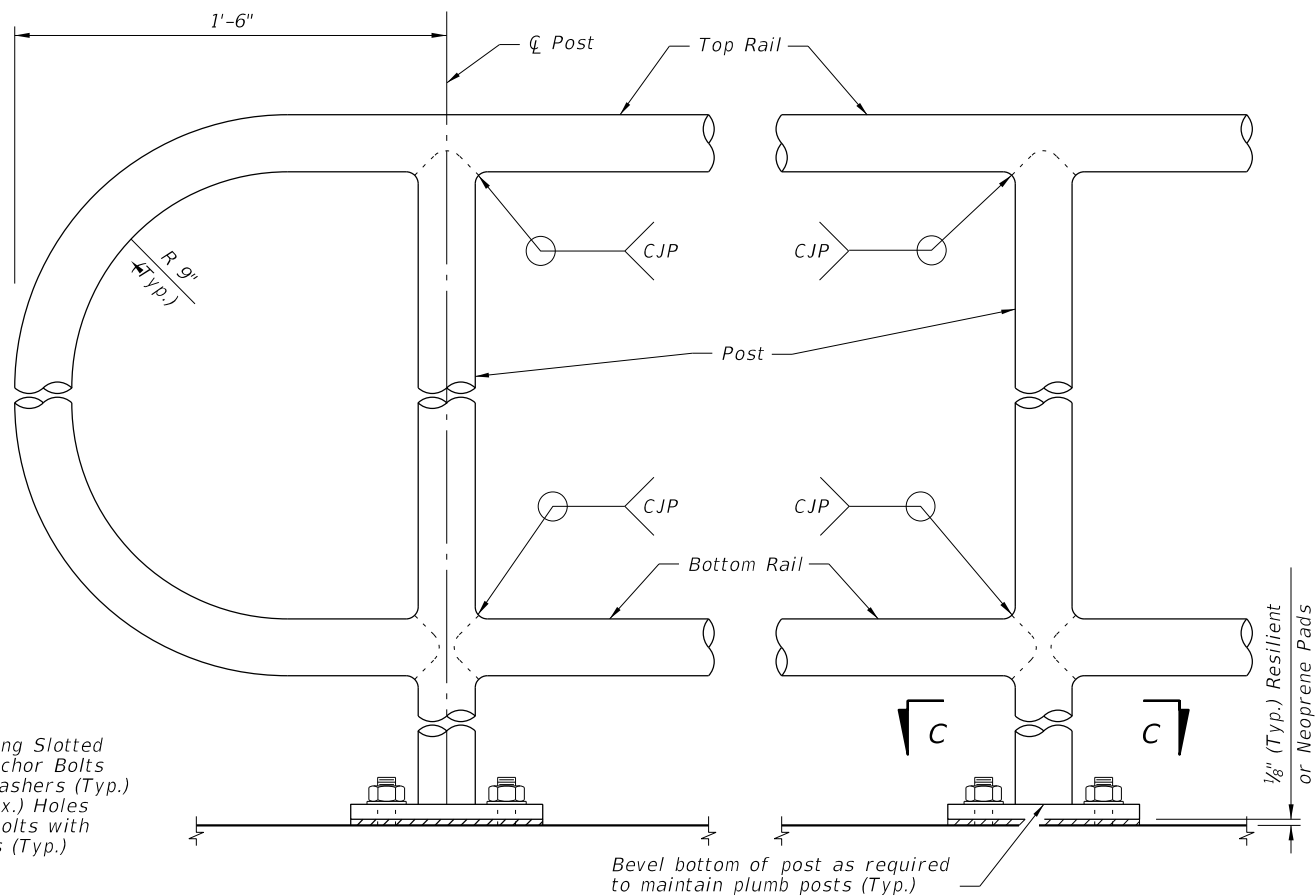


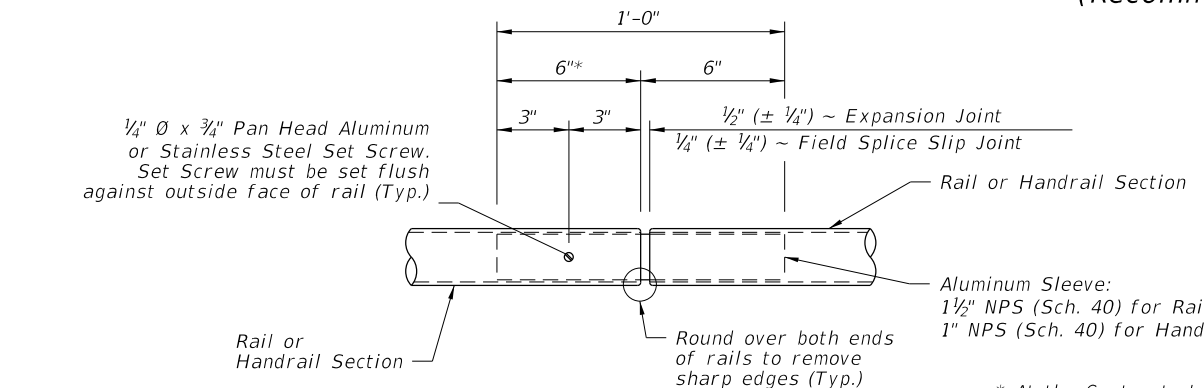
PLATE WASHER
DETAIL



ALTERNATE BASE
PLATE DETAIL
(Recommended for Steep Slopes)

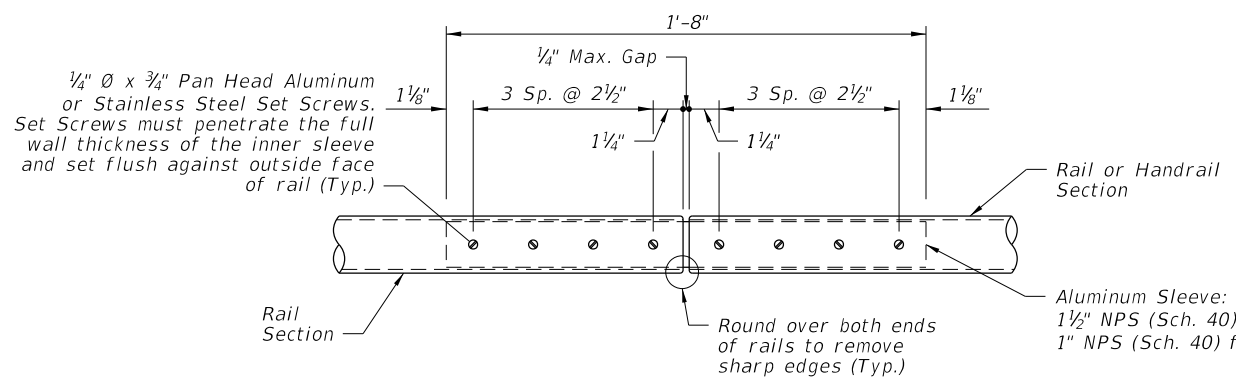


DETAIL "C" - RAIL CONNECTIONS
(Handrail and 4~Bolt Anchorage Not Shown)

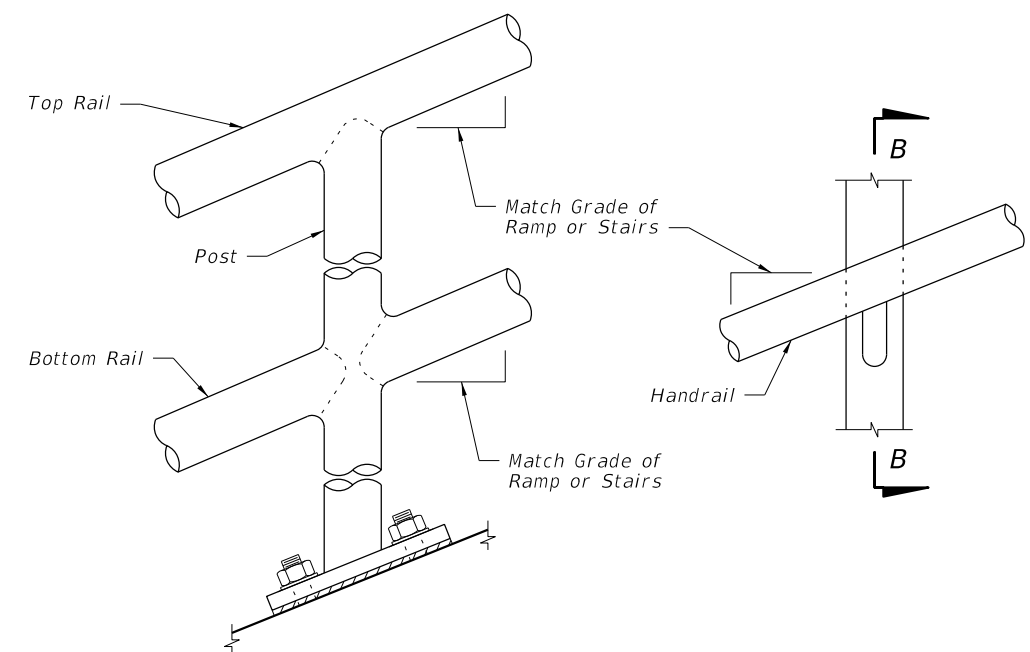


DETAIL "D" - EXPANSION JOINT
(FIELD SPLICE SLIP JOINT SIMILAR)

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



DETAIL "E" - CONTINUITY
FIELD SPLICE

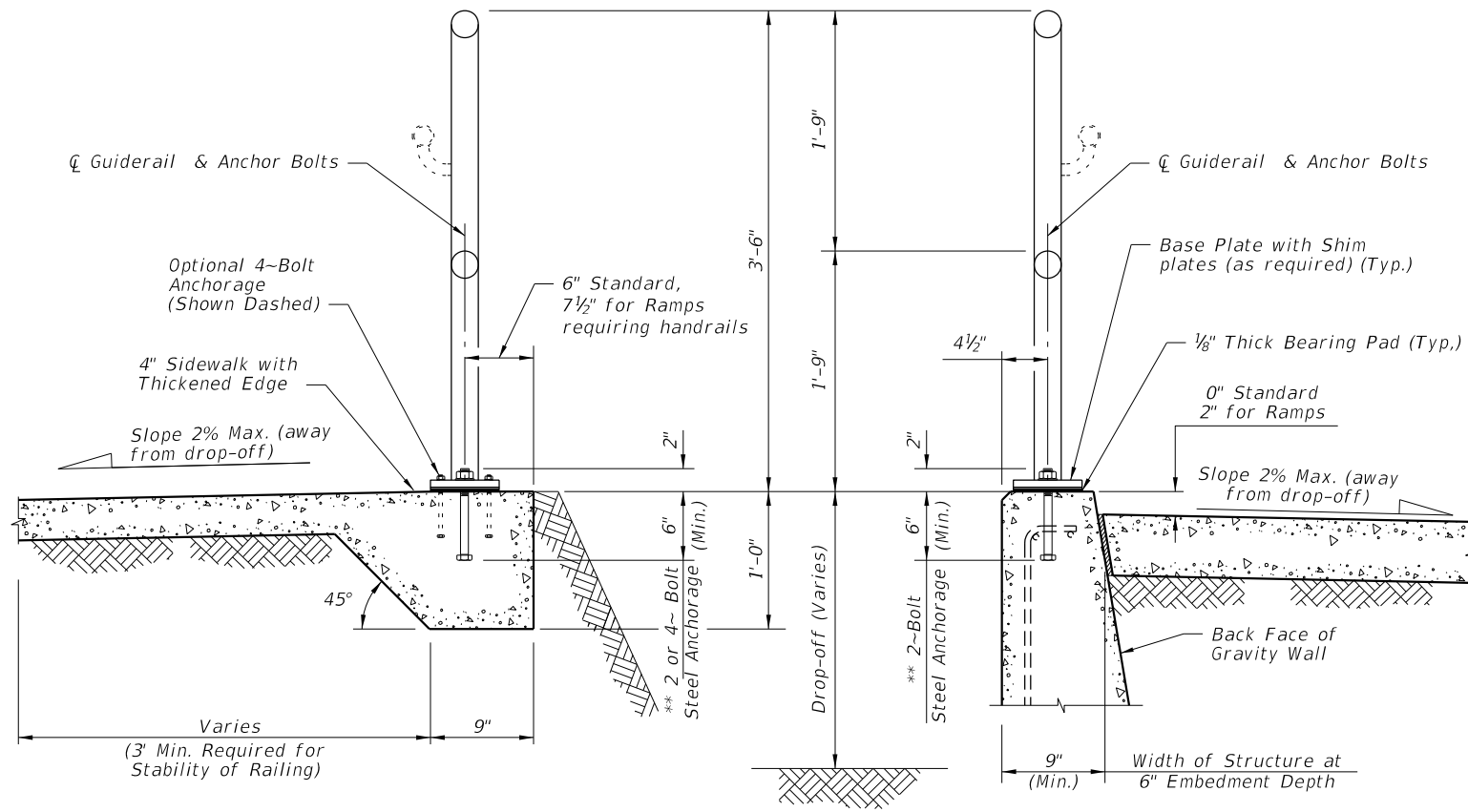


DETAIL "B" - RAIL AND HANDRAIL
(Showing Sloped Condition for Ramps with 2~Bolt Anchorage)

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

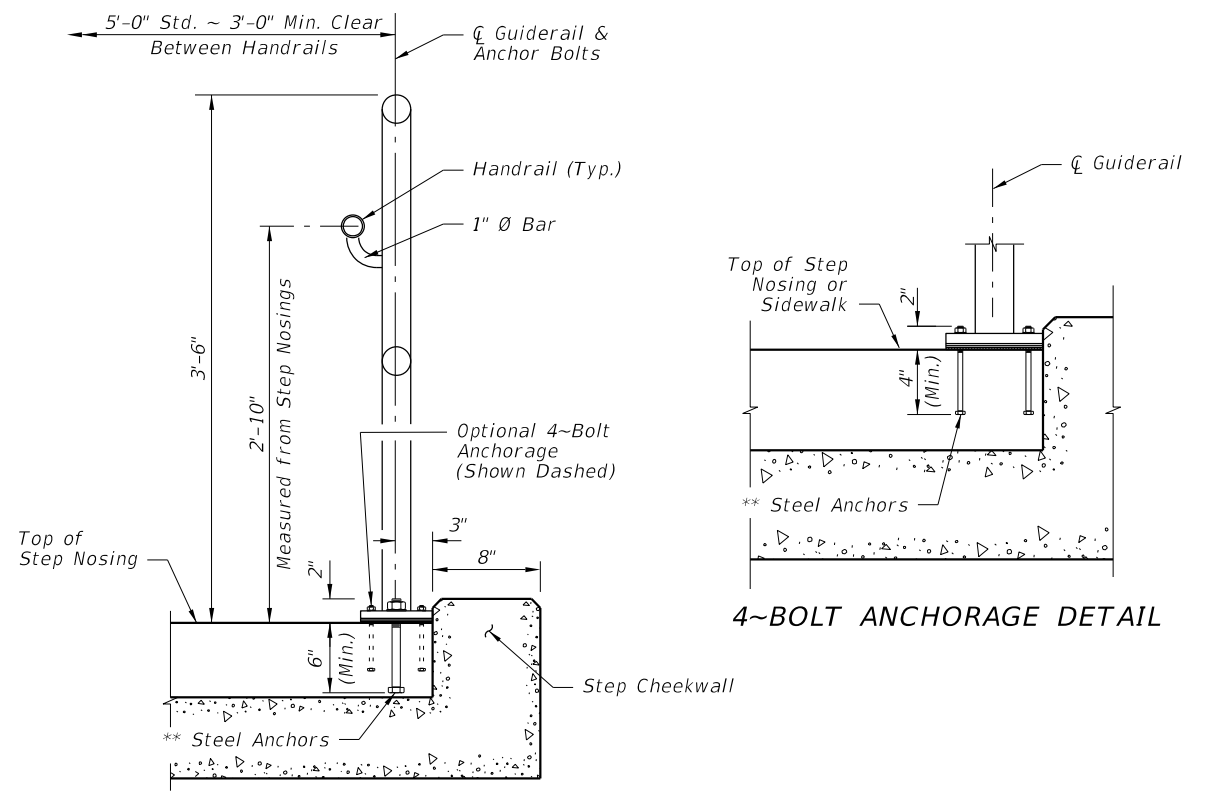
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LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	ALUMINUM PIPE GUIDERAIL	INDEX NO. 870	SHEET NO. 4 of 5
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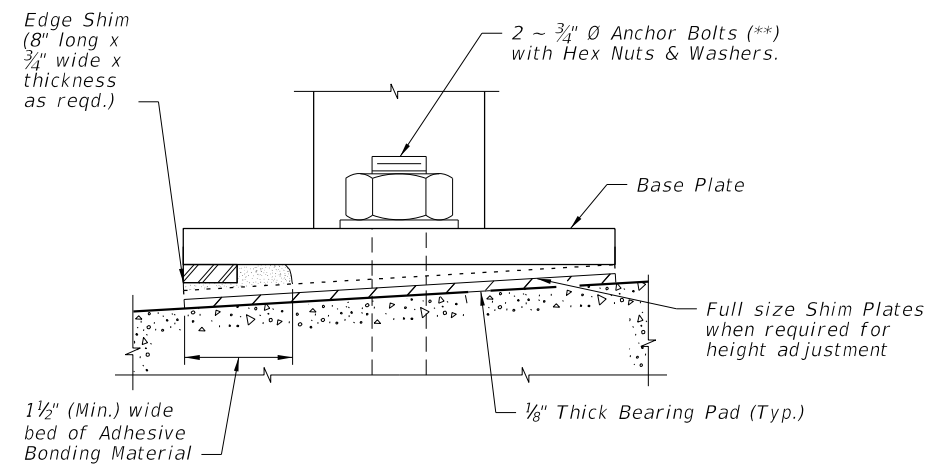
TYPICAL SECTION ON CONCRETE SIDEWALK

TYPICAL SECTION ON GRAVITY WALL
(Other Retaining Walls Similar)

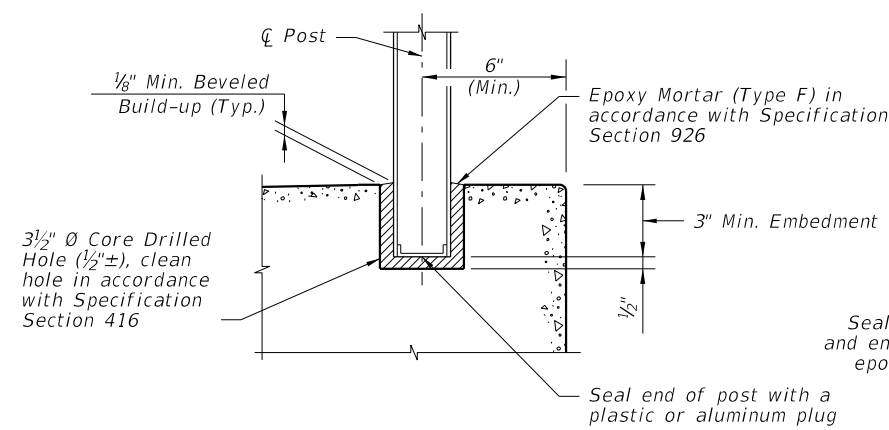


TYPICAL SECTION ON STEPS & STAIRS

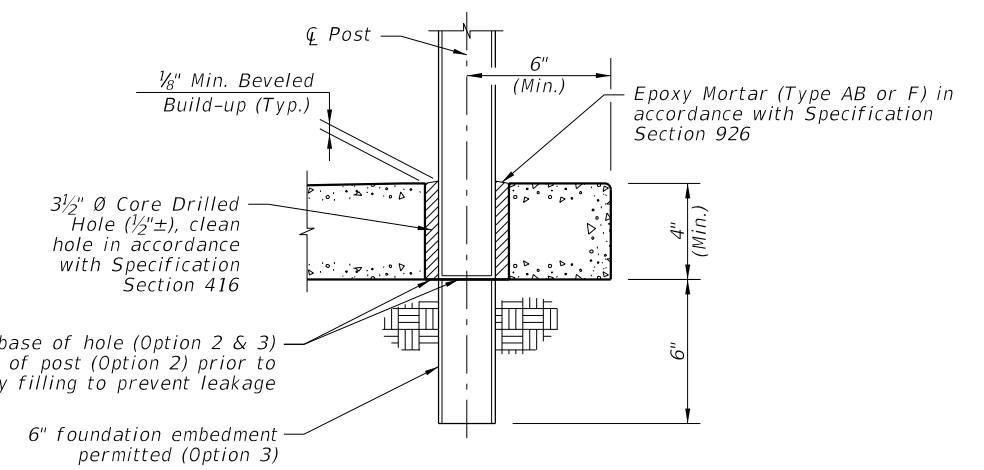
4-BOLT ANCHORAGE DETAIL



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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LAST REVISION 11/01/16	DESCRIPTION:		FY 2017-18 DESIGN STANDARDS	ALUMINUM PIPE GUIDERAIL	INDEX NO. 870	SHEET NO. 5 of 5
REVISION						

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°, position posts a maximum of 2'-0" each side of the corner, not at the corner apex.

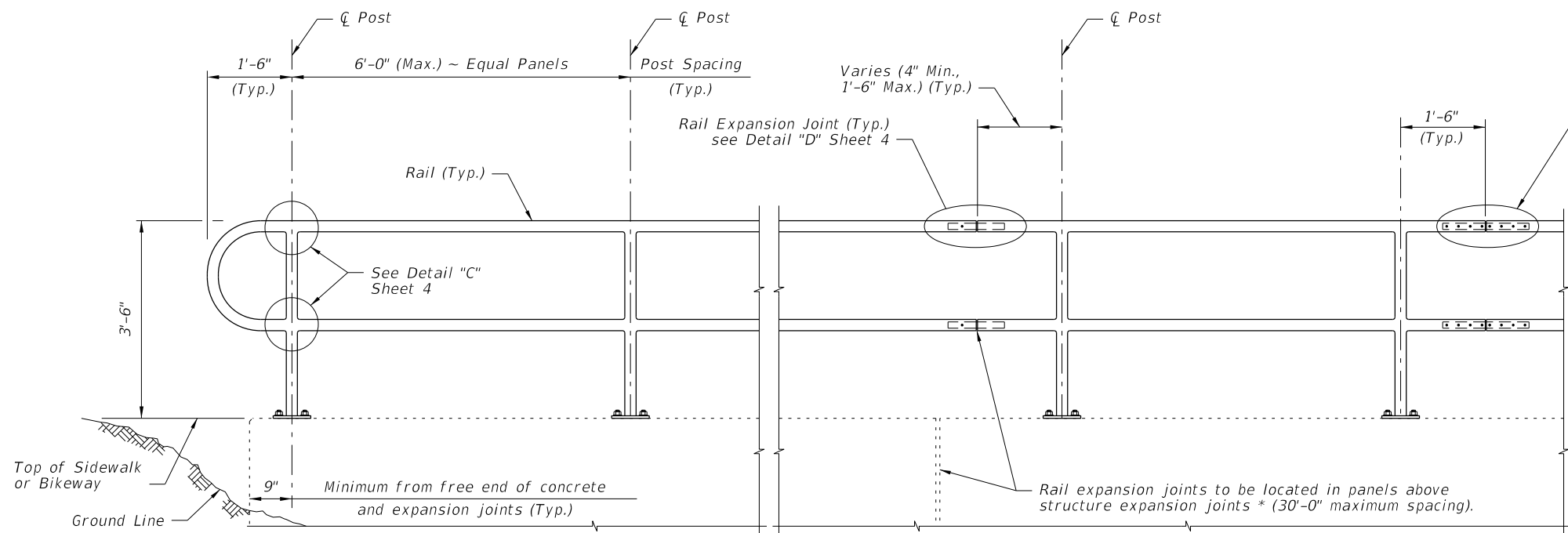
4. Handrails are required and must be continuous at landings for:

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

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

10/19/2016 10:03:37 AM

LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	STEEL PIPE GUIDERAIL	INDEX NO. 880	SHEET NO. 1 of 5
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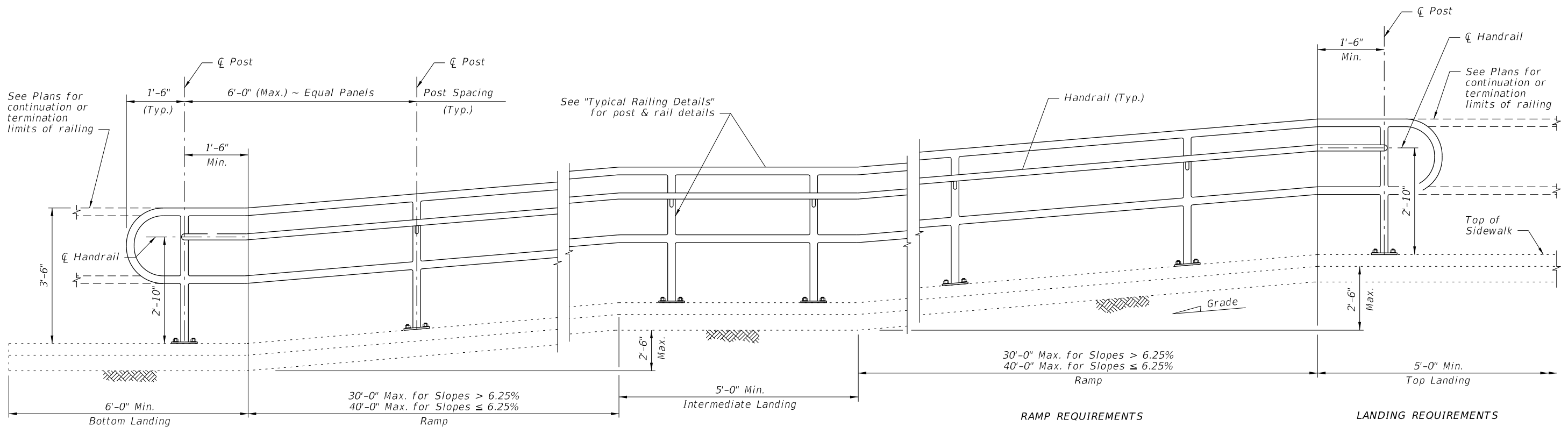


NOTES:
 NPS = Nominal Pipe Size
 STRUCTURES EXPANSION JOINTS NOTE:
 * Keyed construction joints in Index 6011 Gravity Wall are not considered to be expansion joints.

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

ELEVATION

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



ELEVATION
 (Showing Inside Face of Railing)

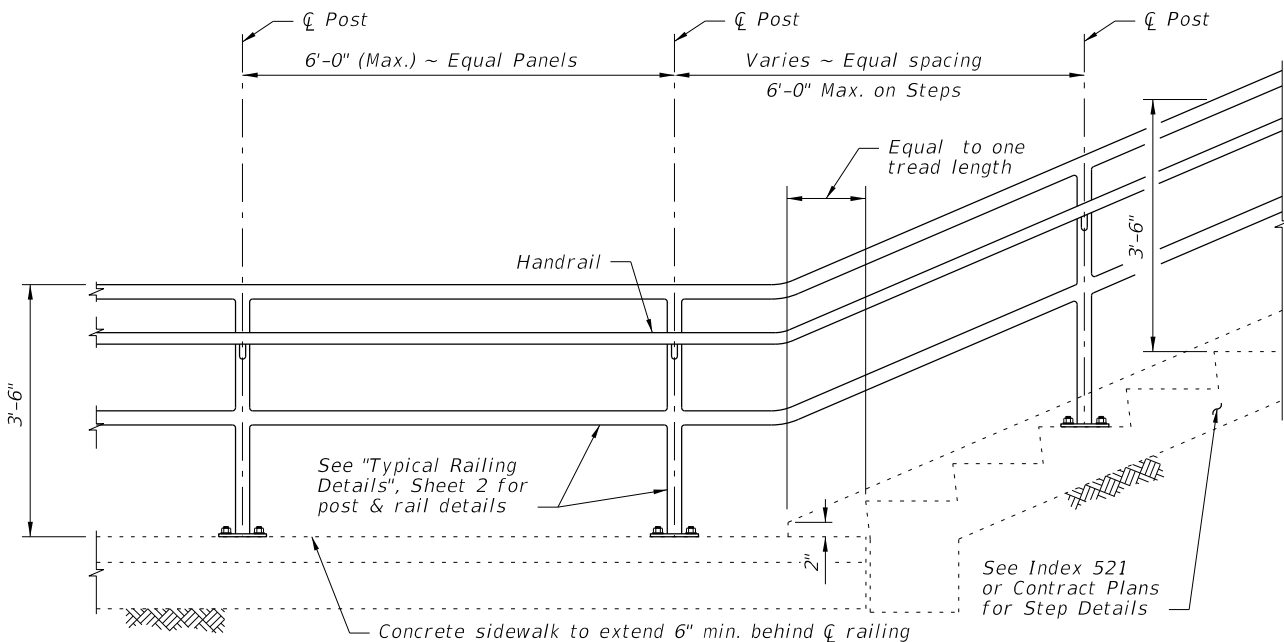
RAMP REQUIREMENTS
 30'-0" Max. for Slopes > 6.25%
 40'-0" Max. for Slopes ≤ 6.25%

LANDING REQUIREMENTS
 5'-0" Min.
 Max. landing slope = 2%
 Max. landing cross-slope = 2%

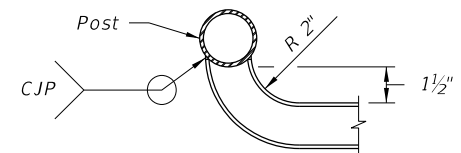
RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

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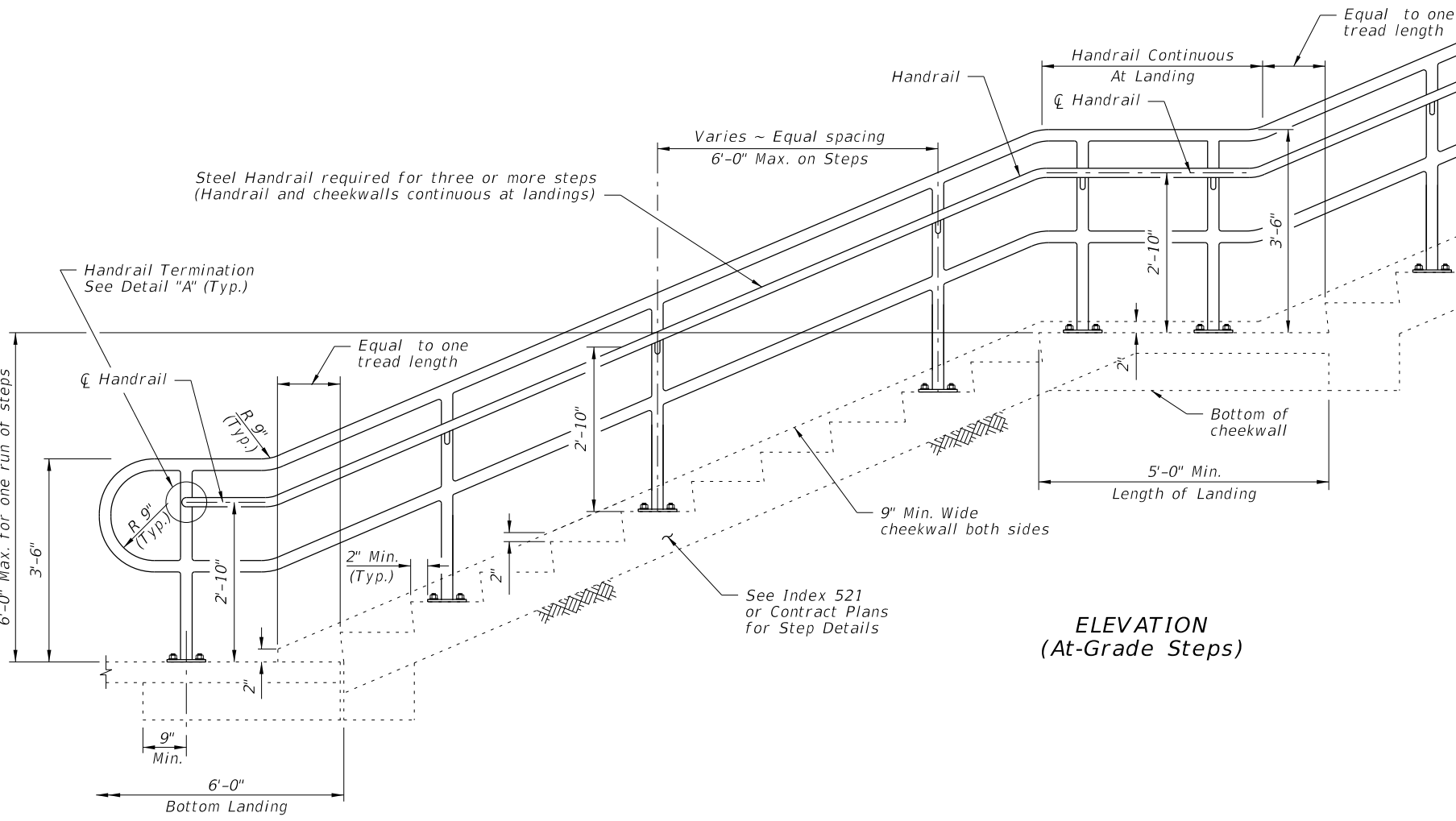
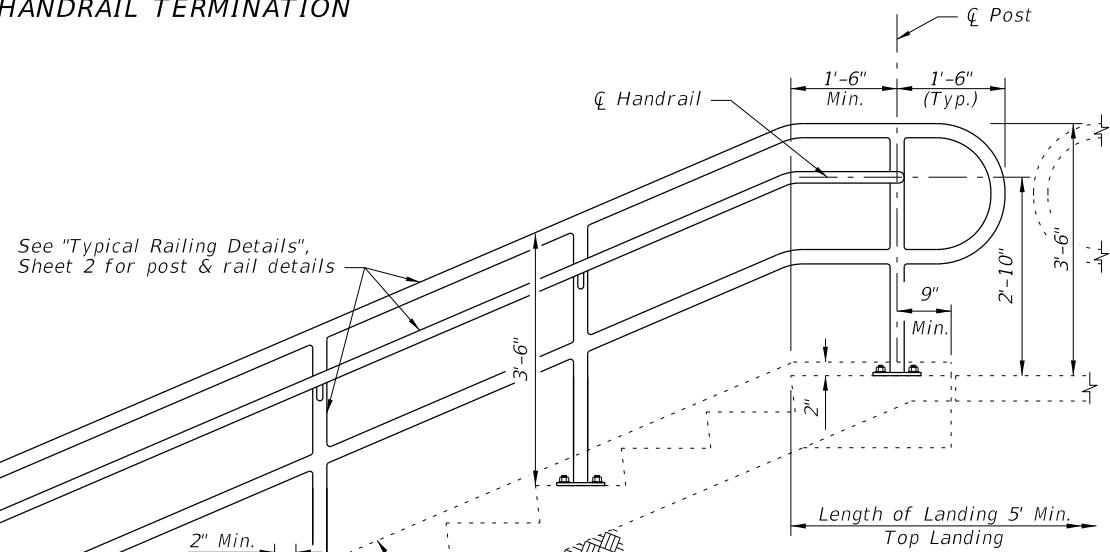
LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	STEEL PIPE GUIDERAIL	INDEX NO. 880	SHEET NO. 2 of 5
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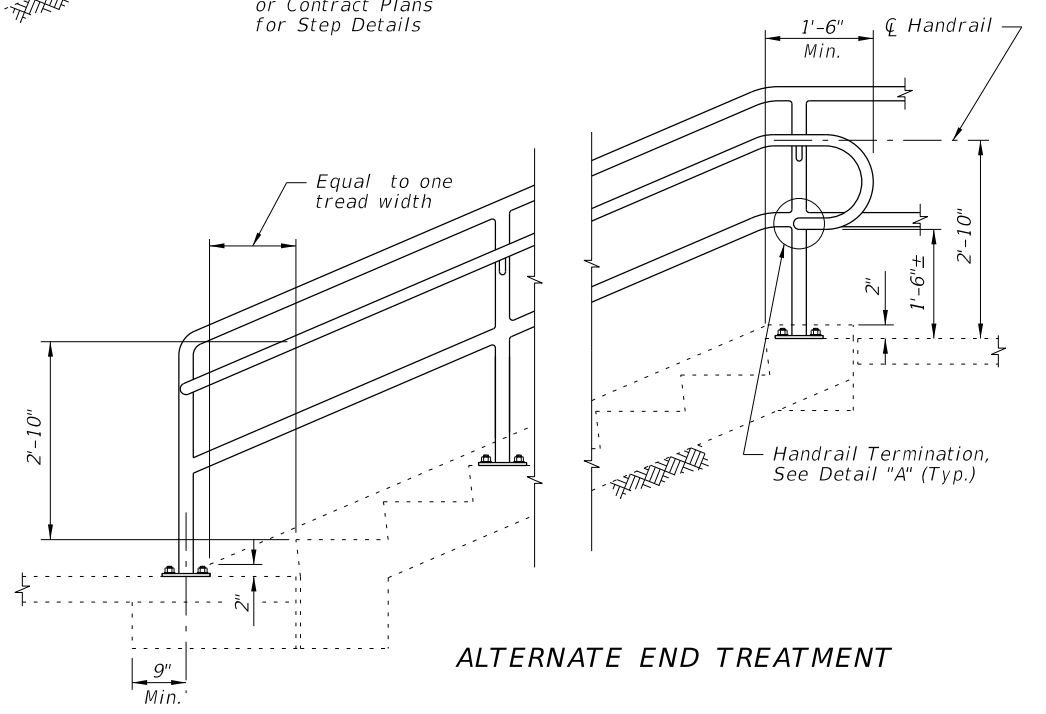
RAILING CONTINUATION BEYOND STEPS
(Bottom shown, Top similar)



DETAIL "A" - PLAN VIEW
HANDRAIL TERMINATION




ELEVATION
(At-Grade Steps)

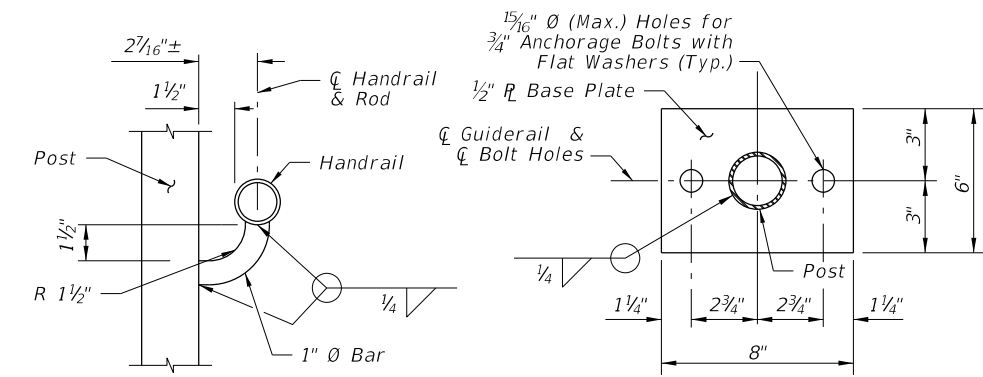


ALTERNATE END TREATMENT

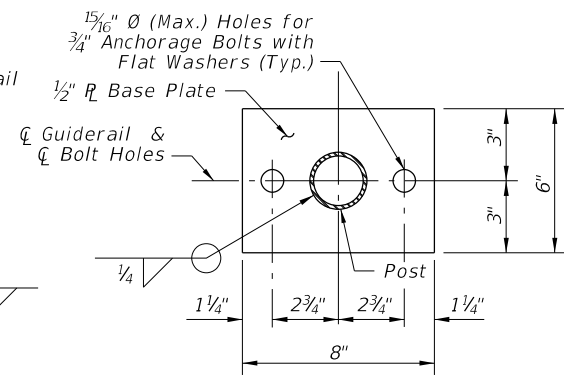
GUIDERAIL ON STEPS & STAIRS

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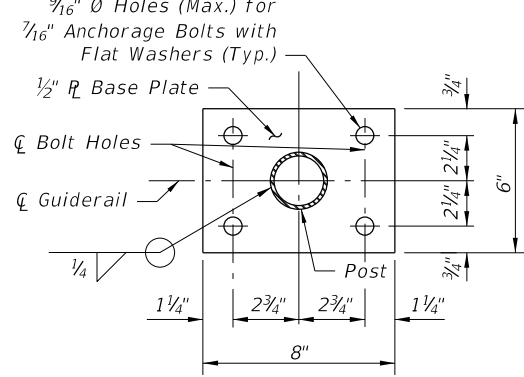
LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	STEEL PIPE GUIDERAIL	INDEX NO. 880	SHEET NO. 3 of 5
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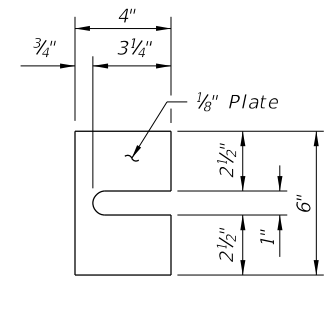
SECTION B-B
(Handrail Connection)



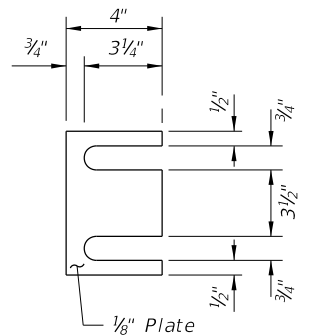
SECTION C-C
BASE PLATE DETAIL
(2~Bolt Anchorage)



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



SHIM PLATE DETAIL
(2~Bolt Anchorage)



SHIM PLATE DETAIL
(4~Bolt Anchorage)

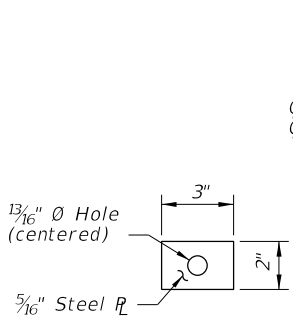
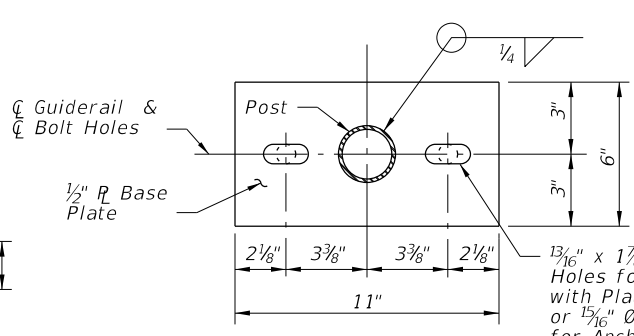
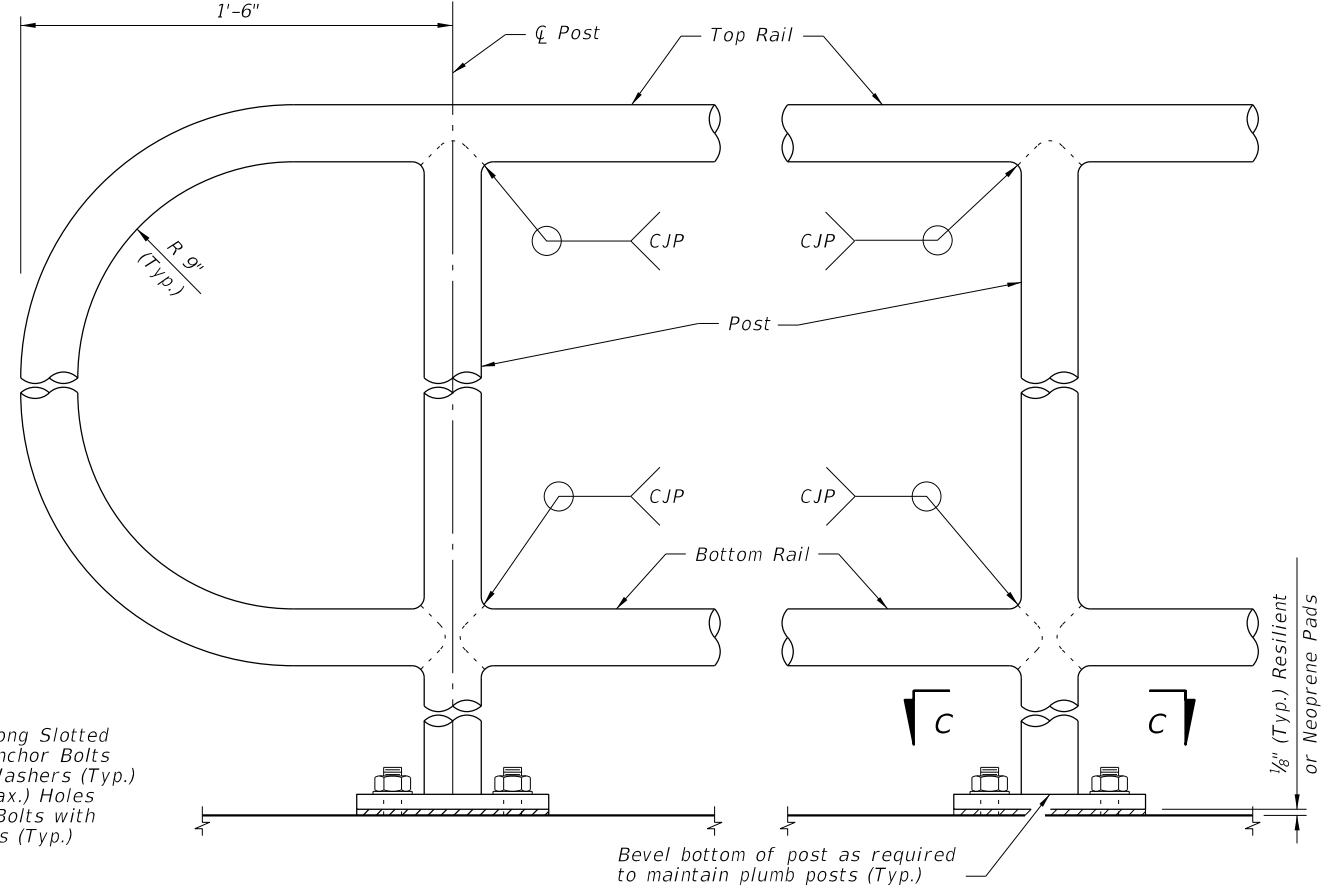


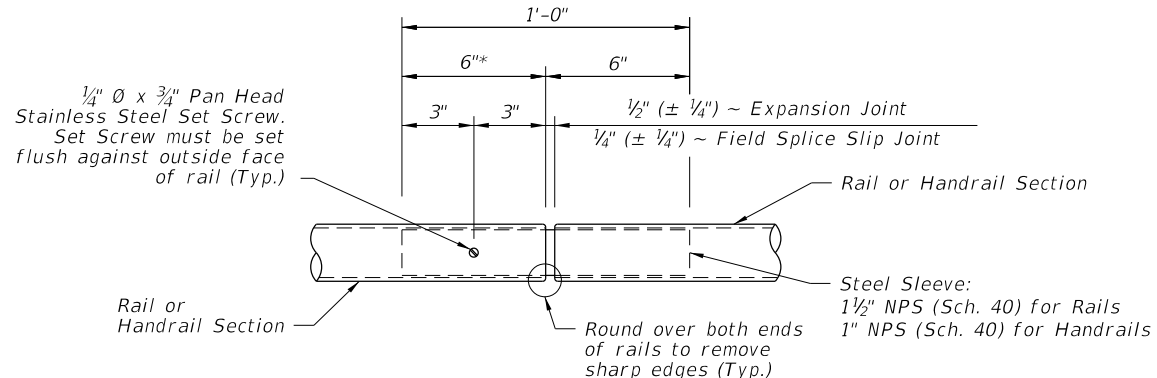
PLATE WASHER
DETAIL



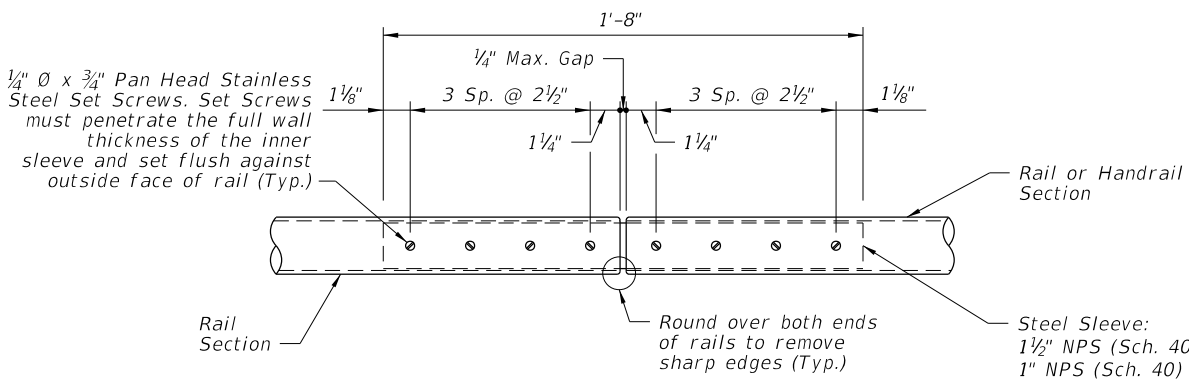
ALTERNATE BASE
PLATE DETAIL
(Recommended for Steep Slopes)



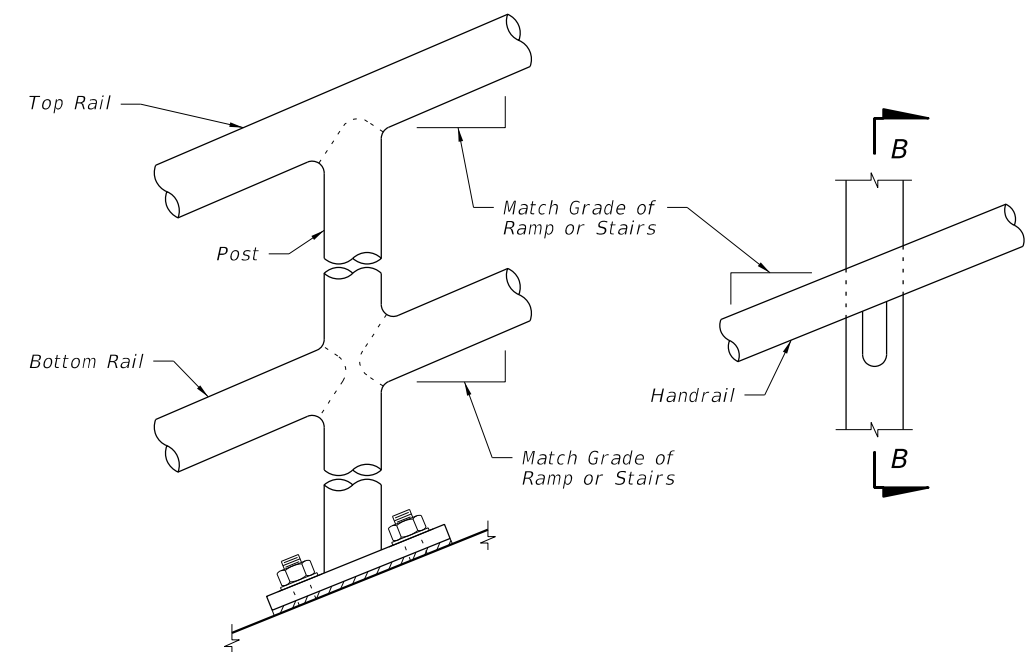
DETAIL "C" - RAIL CONNECTIONS
(Handrail and 4~Bolt Anchorage Not Shown)



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



DETAIL "E" - CONTINUITY
FIELD SPLICE

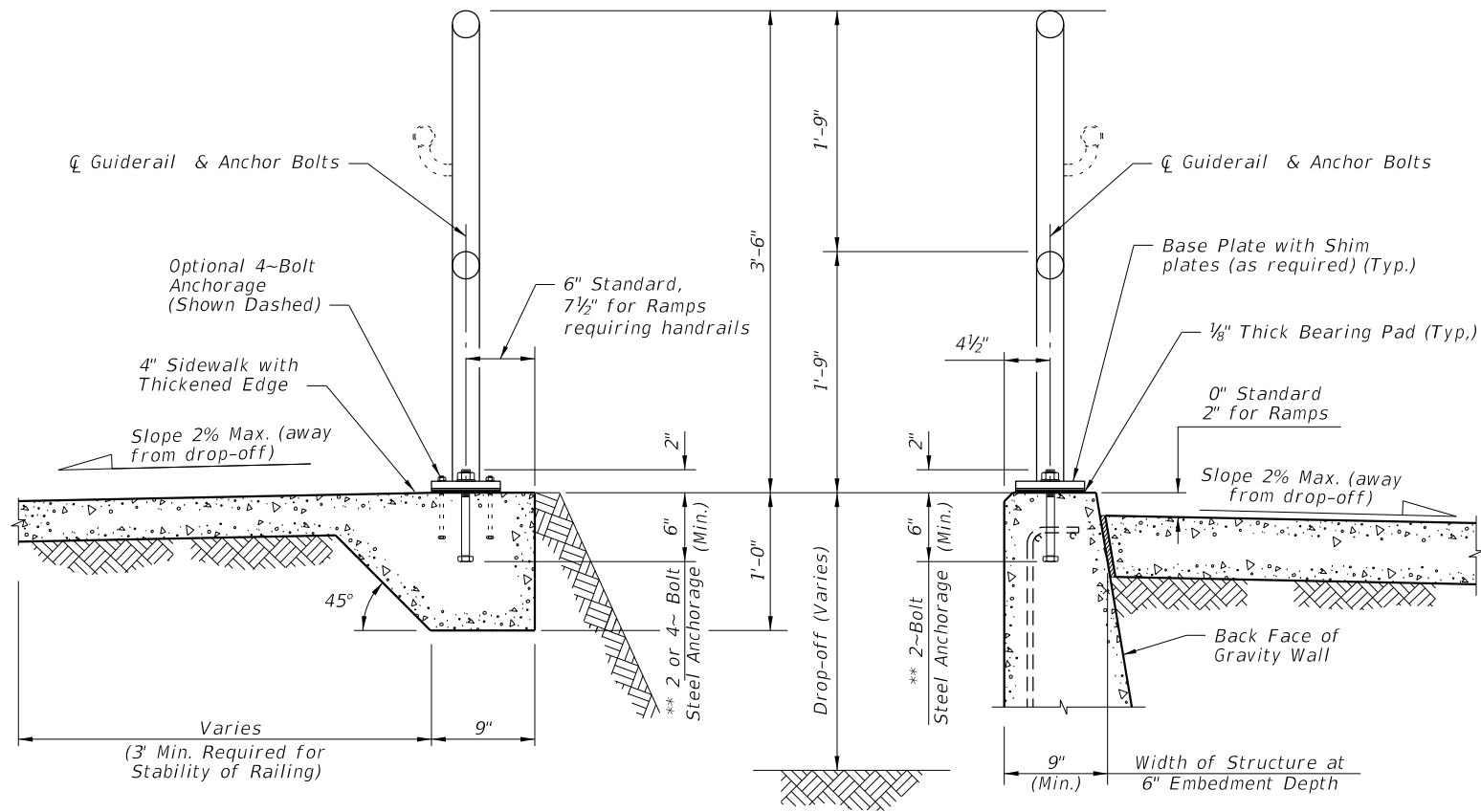


DETAIL "B" - RAIL AND HANDRAIL
(Showing Sloped Condition for Ramps with 2~Bolt Anchorage)

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

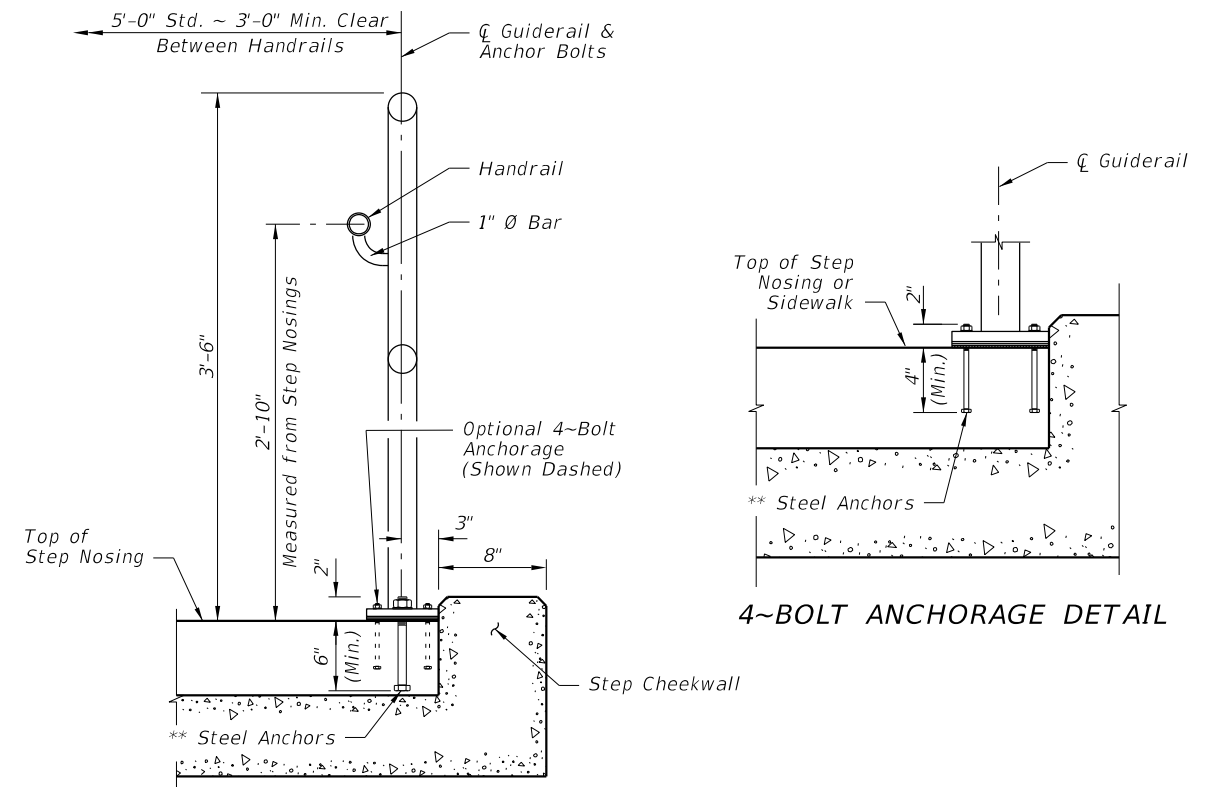
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LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2017-18 DESIGN STANDARDS	STEEL PIPE GUIDERAIL	INDEX NO. 880	SHEET NO. 4 of 5
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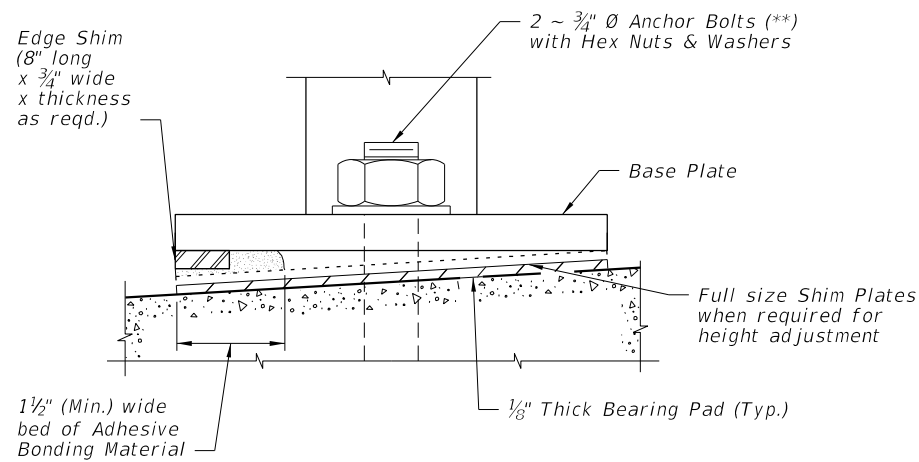
TYPICAL SECTION ON CONCRETE SIDEWALK

TYPICAL SECTION ON GRAVITY WALL
(Other Retaining Walls Similar)

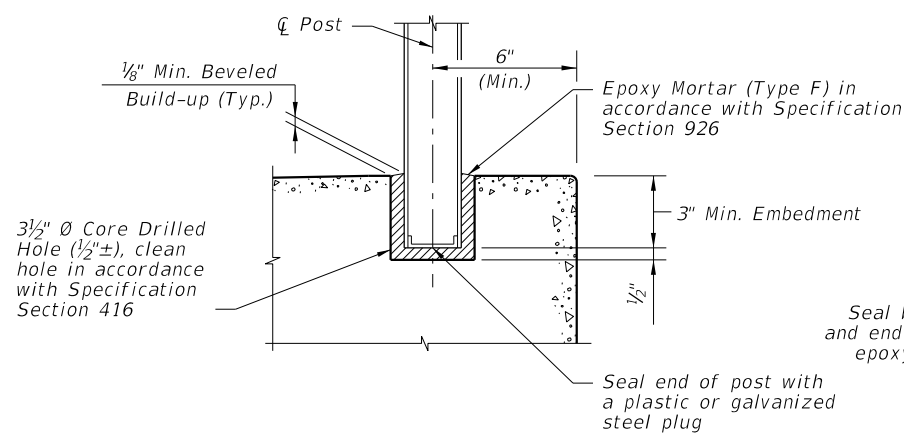


TYPICAL SECTION ON STEPS & STAIRS

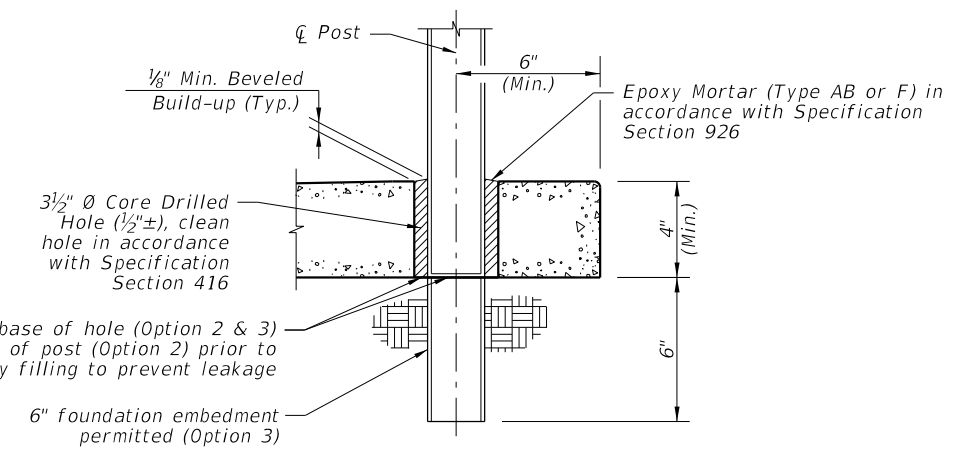
4~BOLT ANCHORAGE DETAIL



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



OPTIONAL SIDEWALK ANCHORAGE DETAIL



SIDEWALK ANCHORAGE DETAIL
OPTION 2 & 3

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

10/19/2016 10:03:51 AM

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