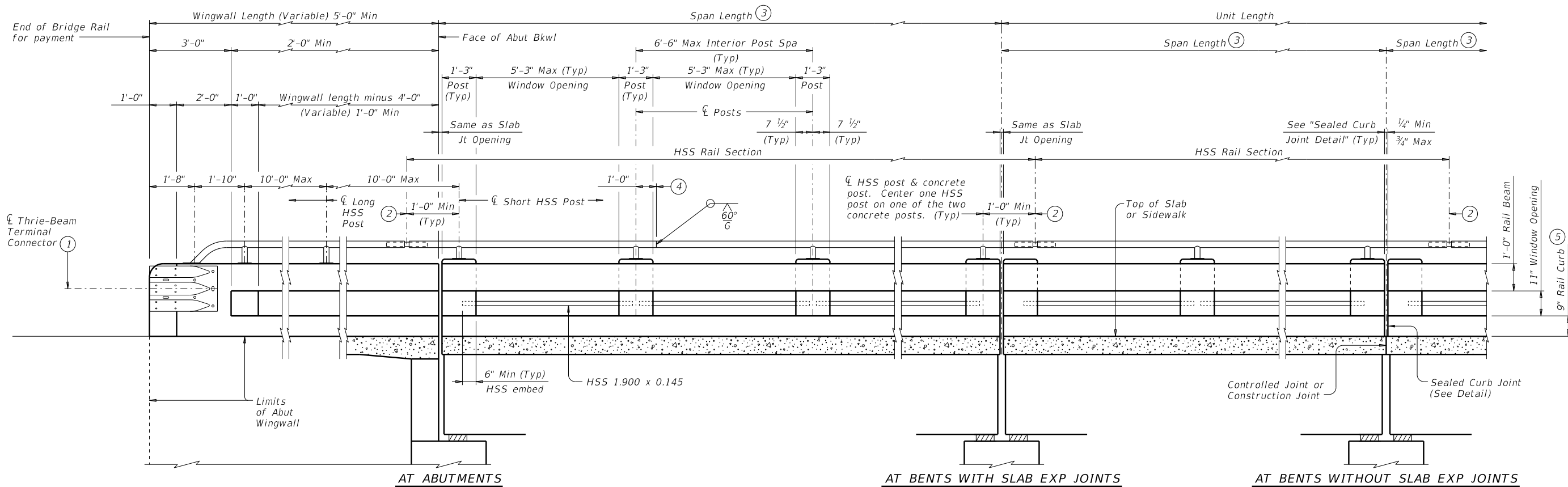


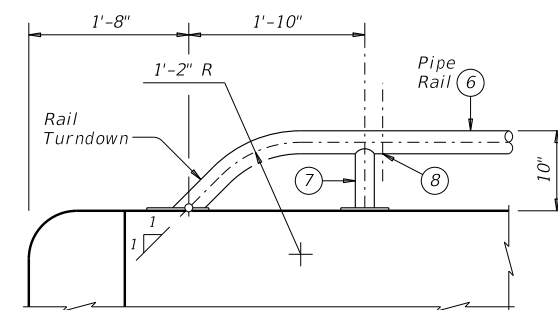
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**ROADWAY ELEVATION OF RAIL**

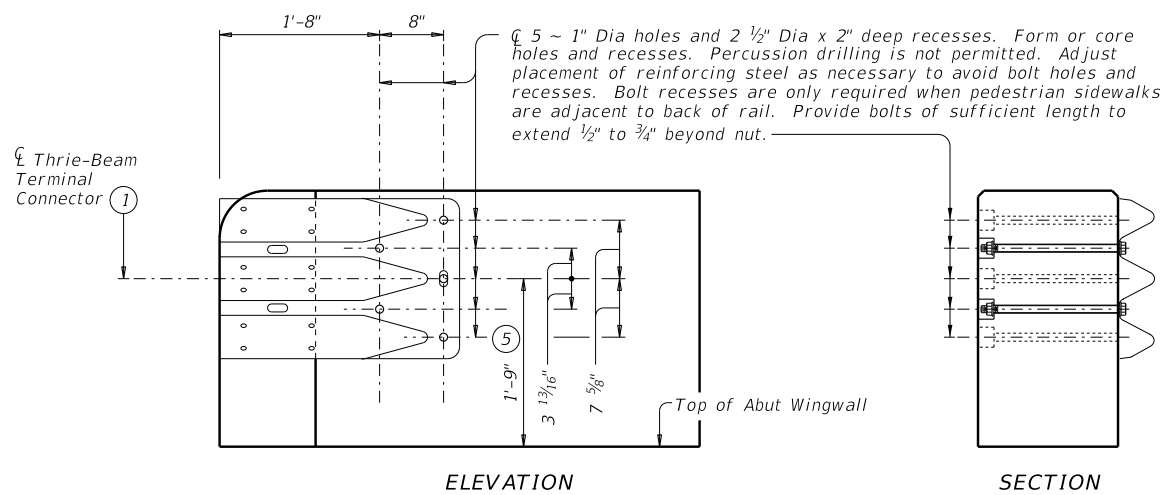
(Showing without raised sidewalk)

- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence." Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ②  $\bar{C}$  Splice Jt or Exp Jt
- ③ Span length of rail must always have a minimum of three concrete posts. Spans always have a concrete post located at each end of span. Space concrete posts equally within a span unless directed otherwise by the Engineer.
- ④ One shop splice per HSS rail section is permitted with minimum 85 percent penetration. The weld may be square groove or single V groove. Grind smooth.
- ⑤ Increase 2" for structures with 2" Max overlay.
- ⑥ HSS 2.875 x 0.203
- ⑦ HSS 2.375 x 0.154
- ⑧  $\frac{3}{8}$ " Dia Hole in bottom of HSS rail (Minimum 1 hole between posts ~ Typ)



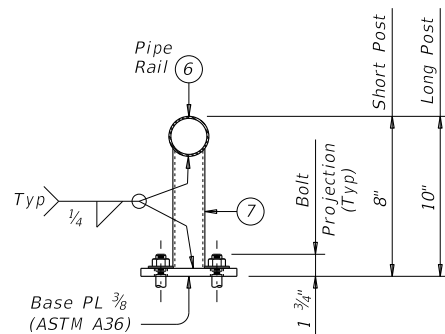
Note that at least two anchor points (as shown) are required for the Bridge Rail on the Abutment Wingwall. Longer Wingwalls may require more than two Rail anchorages.

**HSS RAIL TERMINAL DETAIL**

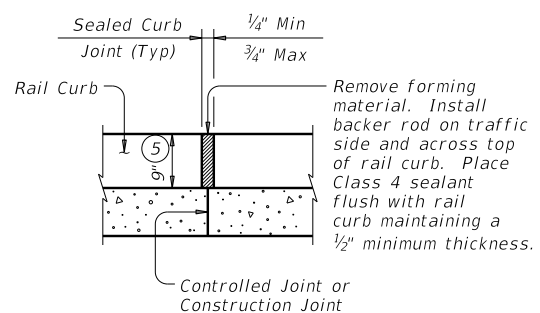


**TERMINAL CONNECTION DETAILS**

(Special forming details on parapet not shown for clarity. See "Elevation Showing Typical Reinforcing Placement.")

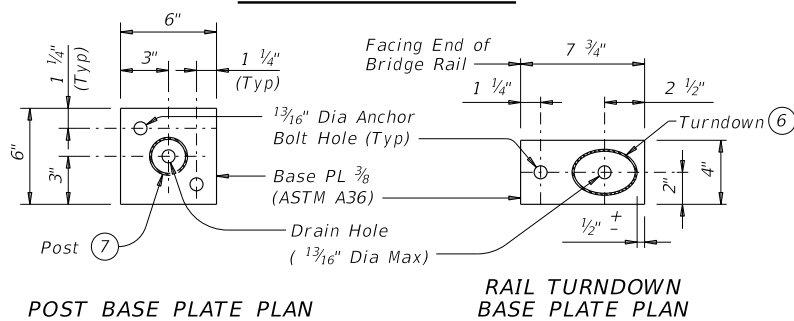


**TRANSVERSE SECTION**



**SEALED CURB JOINT DETAIL**

Provide at all interior bents without slab expansion joints.



**POST BASE PLATE PLAN**

**RAIL TURNDOWN BASE PLATE PLAN**

**HSS RAIL DETAILS**

SHEET 1 OF 4



**COMBINATION RAIL**

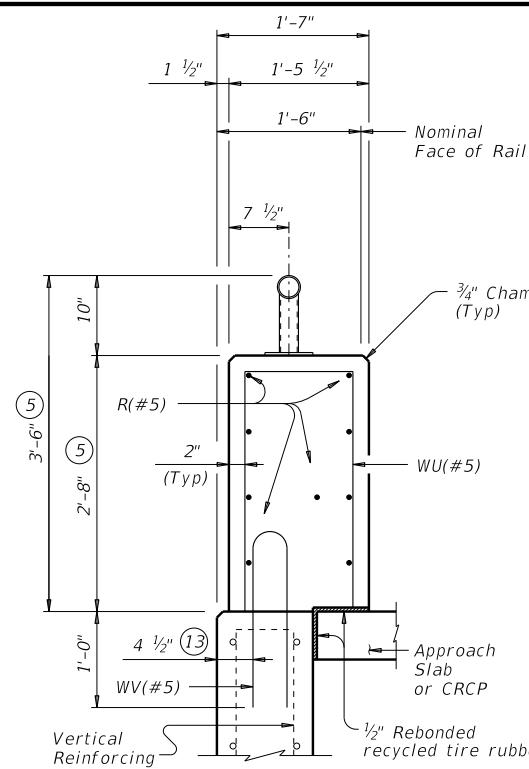
**TYPE C66**

FILE: RL-C66-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY	SHEET NO.	

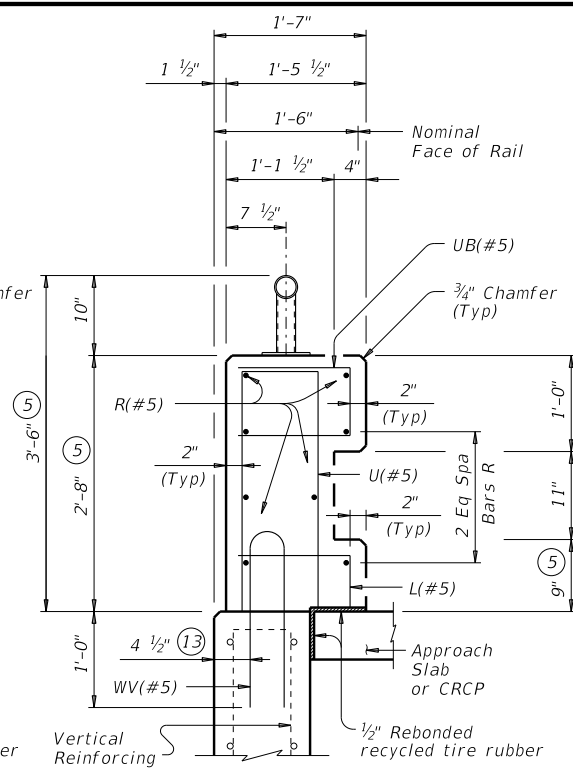
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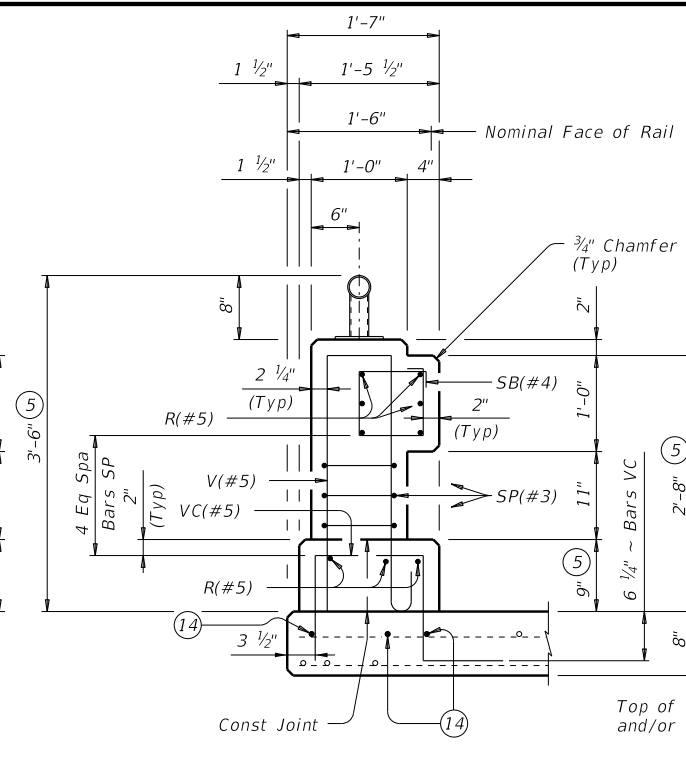
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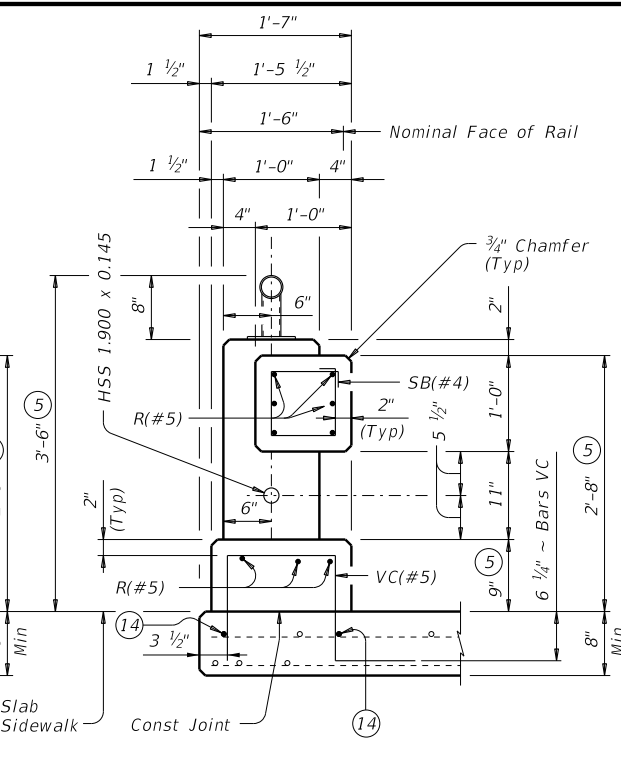
SECTION D-D ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



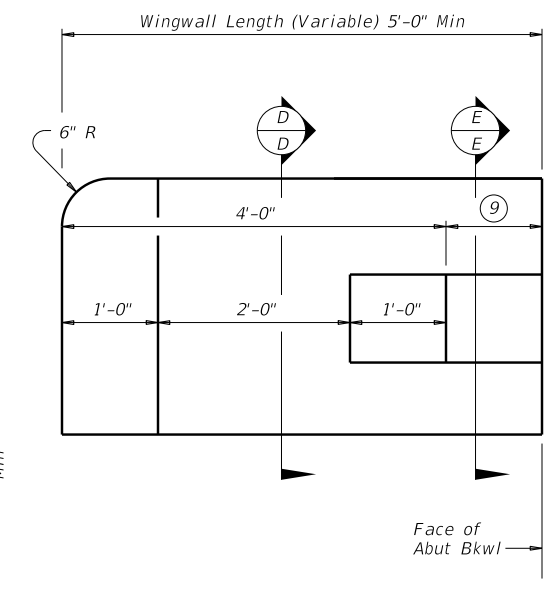
SECTION E-E ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB AT POST

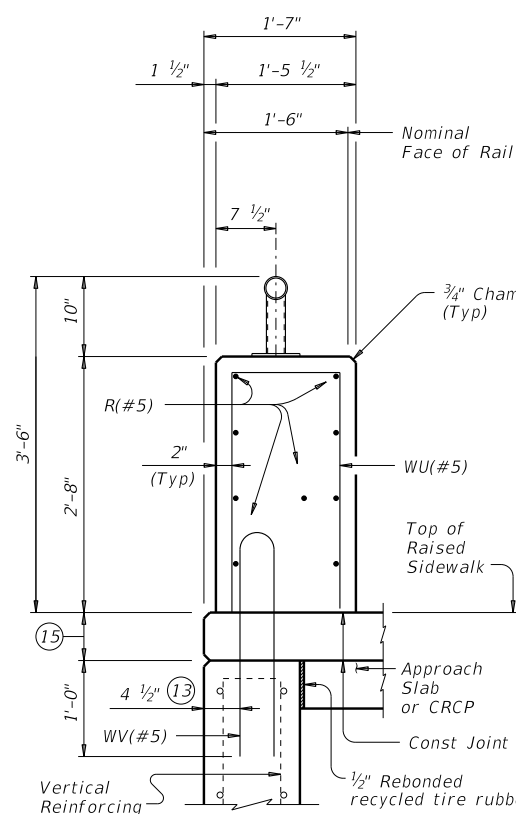


ON BRIDGE SLAB AT WINDOW

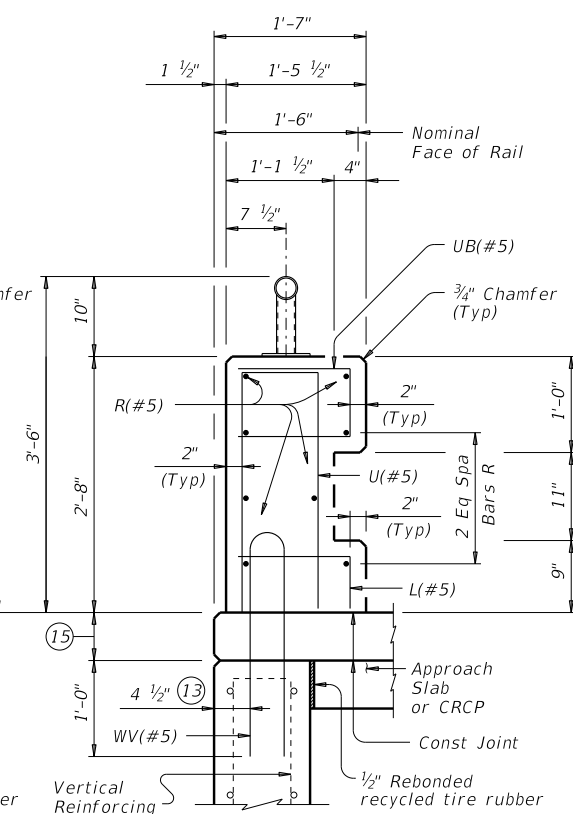


ELEVATION AT ABUTMENT WINGWALL  
(HSS rail not shown for clarity)

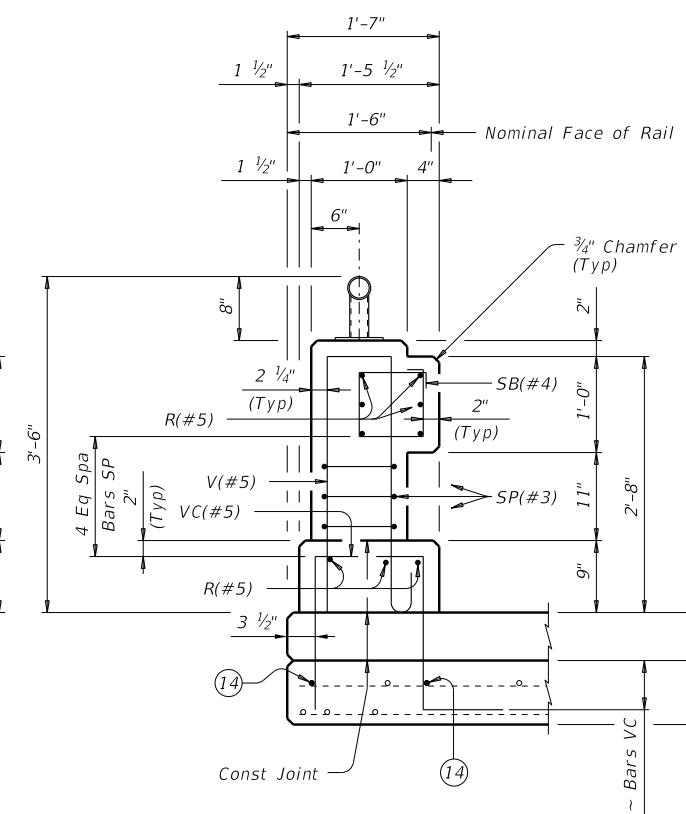
SECTIONS THRU RAIL WITHOUT RAISED SIDEWALK



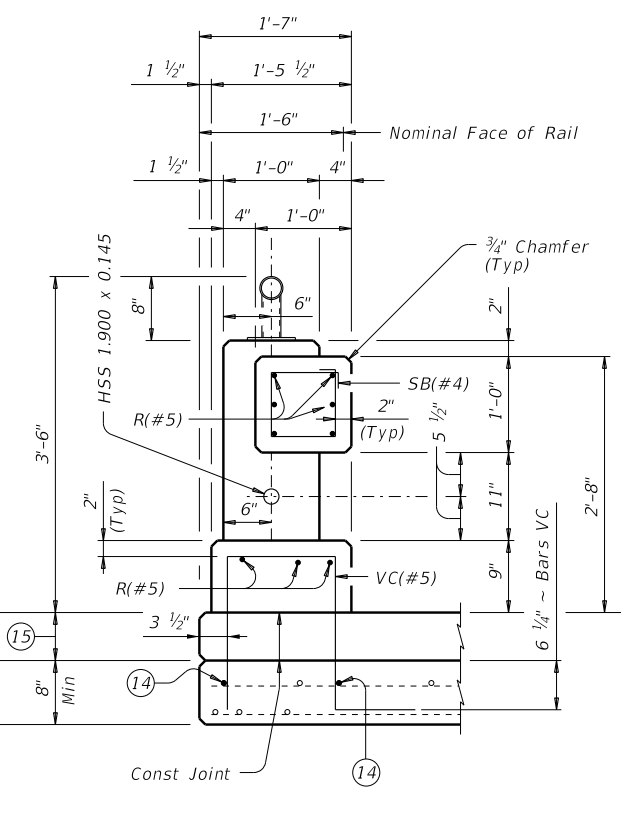
SECTION D-D ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



SECTION E-E ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB AT POST



ON BRIDGE SLAB AT WINDOW

SECTIONS THRU RAIL WITH RAISED SIDEWALK

- ⑤ Increase 2" for structures with 2" Max overlay.
- ⑨ Wingwall length minus 4'-0" (Variable) 1'-0" Min.
- ⑬ 5 1/2" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑭ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑮ Raised Sidewalk.

SHEET 3 OF 4

Texas Department of Transportation Bridge Division Standard

COMBINATION RAIL

TYPE C66

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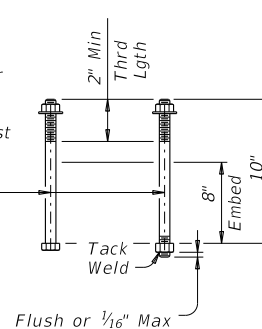
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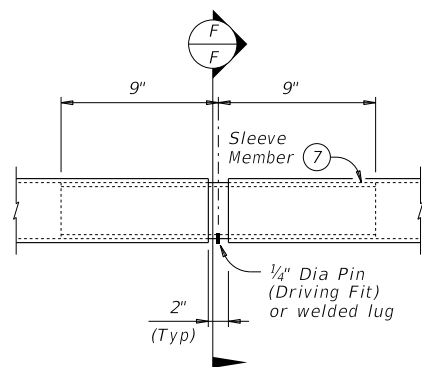
DATE: FILE:

- ⑤ Increase 2" for structures with 2" Max overlay.
- ⑥ HSS 2.875 x 0.203
- ⑦ HSS 2.375 x 0.154
- ⑬ For raised sidewalks, add sidewalk height to total bar height. Use sidewalk height at rail's location.
- ⑰ See "Material Notes" for anchor bolt information.

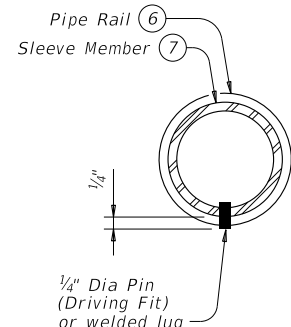
⑰ 5/8" Dia hex head anchor bolt or threaded rod (ASTM A307 Gr A) with one hardened steel washer (ASTM F436) placed under each hex nut (ASTM A563). One additional hex nut must be furnished and tack welded for each threaded rod.



**CAST-IN-PLACE ANCHOR BOLT OPTIONS ⑰**

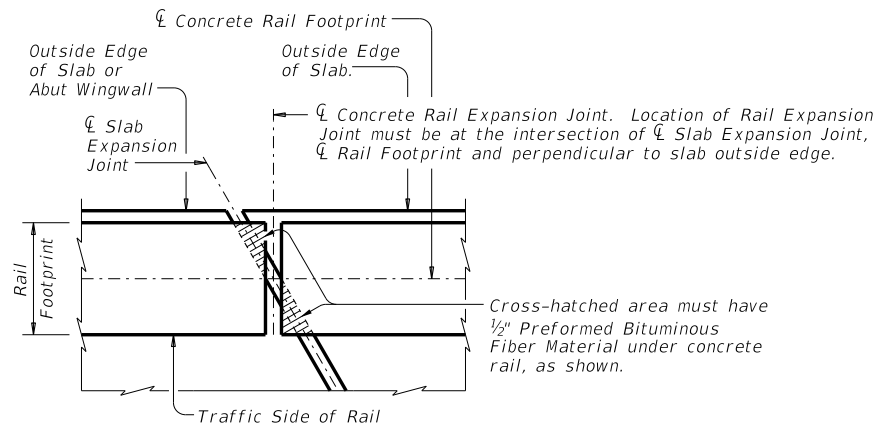


AT SPLICE JT OR EXP JT



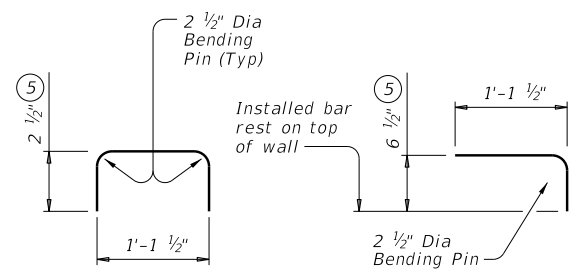
SECTION F-F

**PIPE SPLICE DETAILS**



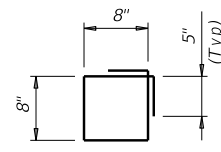
**PLAN OF RAIL AT EXPANSION JOINTS**

Example showing Slab Expansion Joints without breakbacks.

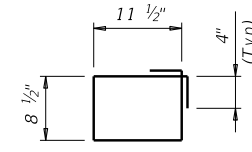


BARS C (#5)

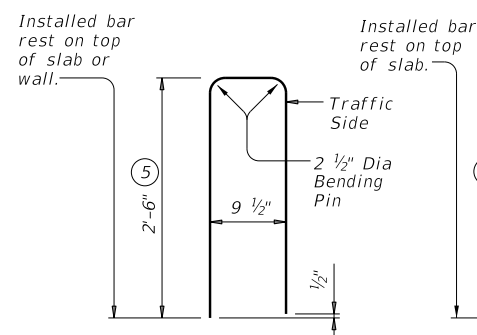
BARS L (#5)



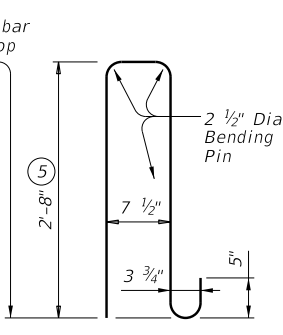
BARS SB (#4)



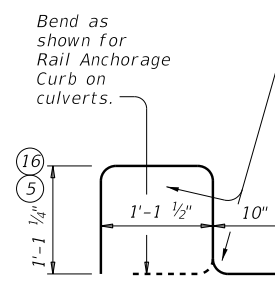
BARS SP (#3)



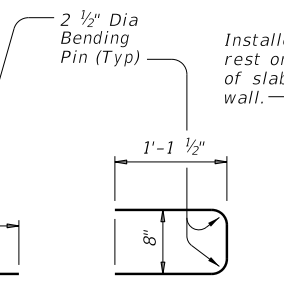
BARS U (#5)



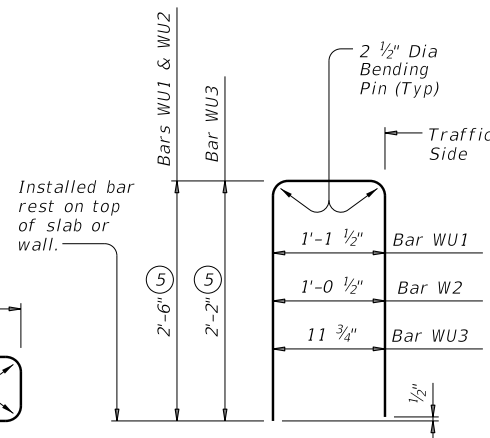
BARS V (#5)



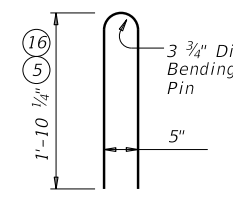
BARS VC (#5)



BARS UB (#5)



BARS WU (#5)



BARS WV (#5)

Cover dimensions are clear dimensions, unless noted otherwise.  
Reinforcing bar dimensions shown are out-to-out of bar.

**RAIL DATA FOR HORIZONTAL CURVES**

	RADIUS TO FACE OF RAIL	MAX CHORD LENGTH	CONSTRUCT OR FABRICATE
HSS Rail	Over 2800'	29'-0"	Straight rail sections
	Over 1400' thru 2800'	14'-6"	To required radius or to chords shown
	Over 700' thru 1400'	7'-3"	
	Thru 700'	Zero	To required radius

**CONSTRUCTION NOTES:**

Face of rail, posts and parapet must be vertical transversely unless otherwise approved by the Engineer. HSS rail posts and opening end faces must be perpendicular to top of adjacent concrete parapet grade. Use Type VIII epoxy mortar under HSS rail post base plates if gaps larger than 1/16" exist.

HSS rail sections must include not less than two posts, and no more than five (except at Abutments).

Round or chamfer exposed edges of HSS rail and HSS rail posts to approximately 1/16" by grinding.

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

At the Contractor's option anchor bolts may be cast with the parapet (See Cast-in-Place Anchor Bolt Options).

Clear cover is 2" minimum, unless shown otherwise.  
Chamfer all exposed concrete corners.

**MATERIAL NOTES:**

Provide Class "S" concrete. Provide Class "S" (HPC) if required elsewhere.

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.

Provide ASTM A1085, A500 Gr B or A53 Gr B for all HSS.

Galvanize all metal components of steel rail system. Apply additional coatings when shown elsewhere on the plans. When plans require paint over galvanizing, follow the requirements for painting galvanized steel in Item 445, "Galvanizing" and when field painting, Item 446, "Field Cleaning and Painting Steel."

Sleeve members and anchor bolts must receive galvanization prior to installation and only field paint after installation unless directed otherwise by Engineer.

Anchor bolts must be 5/8" Dia ASTM A307 Gr A fully threaded rods with one hex nut and one hardened steel washer (ASTM F436) each. Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into parapet wall with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive embedment depth is 3". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 5 kips (edge distance must be accounted for).

Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

Optional cast-in-place anchor bolts must be 5/8" Dia ASTM A307 Gr A bolts (or threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer (ASTM F436) at each bolt. Nuts must conform to ASTM A563 requirements.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #5 = 2'-0"  
Epoxy coated ~ #5 = 3'-0"

**GENERAL NOTES:**

This railing has been successfully evaluated by full-scale crash test to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

This railing cannot be used on bridges with expansion joints providing more than 5" movement.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Submit erection drawings showing panel lengths, HSS rail post spacing, and anchor bolt setting to the Engineer for approval.

Average weight of railing with no overlay: 366 plf total  
355 plf (Conc)  
11 plf (Steel)



**COMBINATION RAIL**

**TYPE C66**

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