



# OHIO DEPARTMENT OF TRANSPORTATION

CENTRAL OFFICE, 1980 W. BROAD ST., COLUMBUS, OHIO 43216-0899

April 18, 2008

To: Users of the Standard Bridge Drawings  
From: Tim Keller, Administrator, Office of Structural Engineering  
By: Sean Meddles, Bridge Standards Engineer  
Re: Standard Bridge Drawing Updates

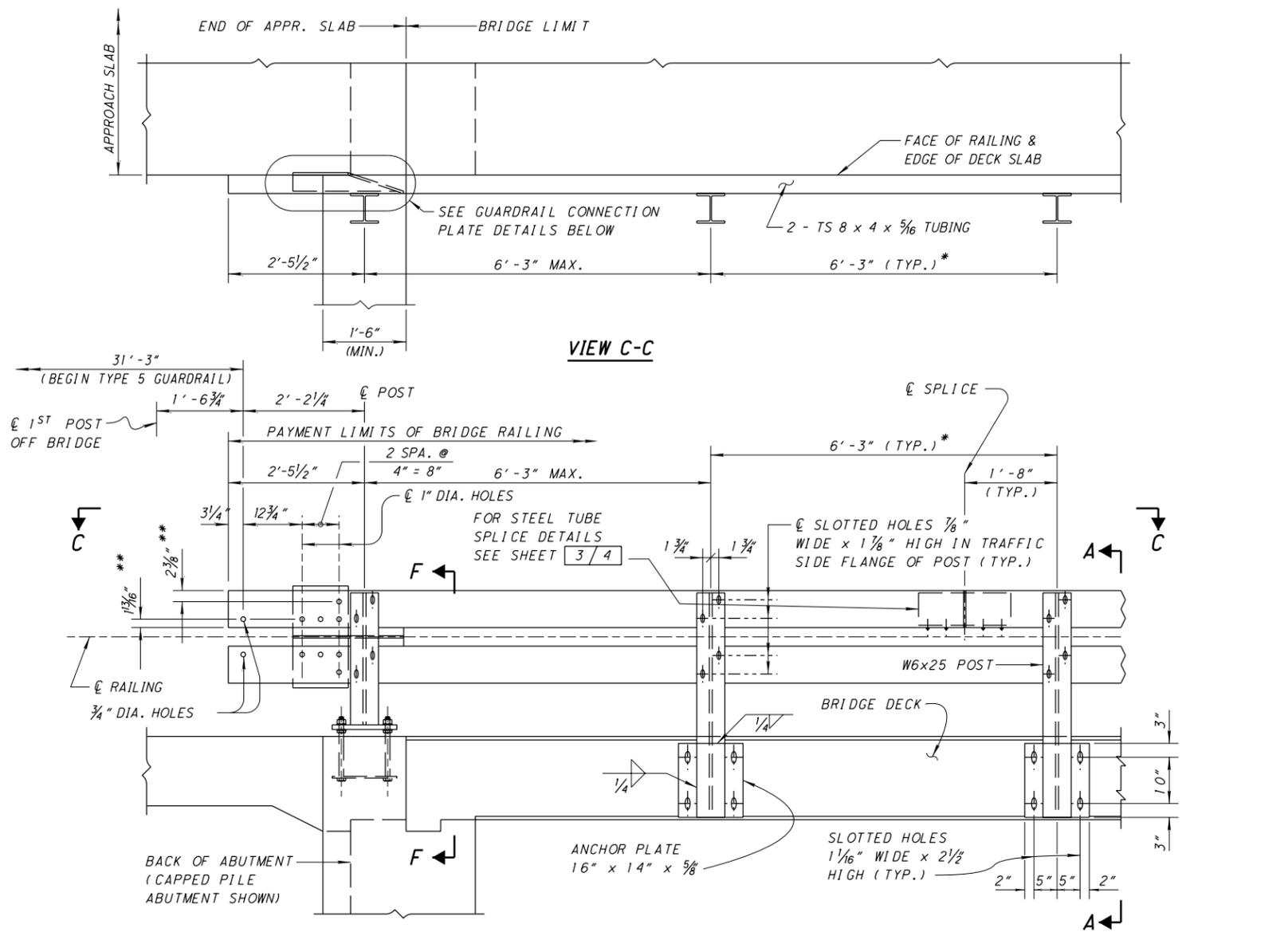
TST-1-99:

This drawing has been revised to address field fit-up issues resulting from the lack of tolerance available during installation and to address items that add little or no value to the final product. Because these revisions do not adversely affect the strength or crash-worthiness of the railing system, our office will maintain the railing as TL-4 compliant.

On sheet 1 of 4, Section F-F, a construction joint has been introduced in the abutment wingwall that will allow the bridge railing to be placed as necessary to allow fit-up. After the railing system, including flush mounted posts, is completely erected, the wingwall concrete can be placed above the construction joint to anchor the flush-mounted posts which are temporarily supported from above by the tube rails. In lieu of this construction joint, the drawing provides the Contractor the option to field drill the holes in the tube rails for the tube rail-to-post connections and repair the galvanized coating.

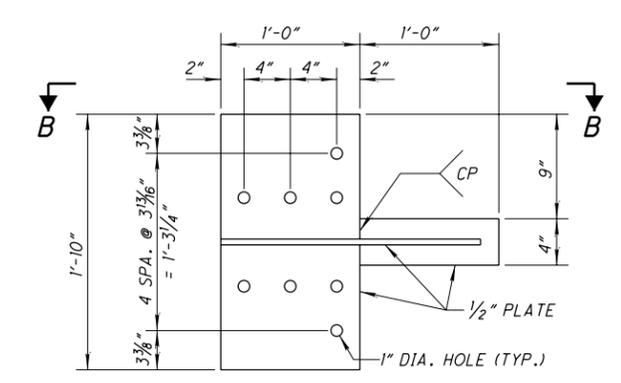
Also on sheet 1 of 4, Section F-F, the non-shrink grout beneath the flush mounted post base plate has been eliminated. The grout adds very little value and prevents visual inspection of the anchors beneath the base plate.

On sheet 2 of 4, Section A-A, Detail A and Section J-J, the 6x3x0.25 steel tubing and 3/8" shim plate have been removed. Our office found numerous existing installations where the shim plates were not drawn tight against the superstructure fascia. When installed in this position, the tubing and shim do not provide the compressive support intended thus requiring the lower anchor bolts carry the entire compressive load to the superstructure. The 1" diameter anchor bolts have sufficient capacity without the additional compression support provided by the tubing and shim plate.

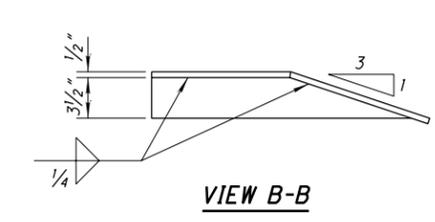


**RAILING ELEVATION ON CONCRETE SLAB** FOR SECTION A-A SEE SHEET 2/4.  
 BRIDGE TERMINAL ASSEMBLY NOT SHOWN. REFER TO STANDARD CONSTRUCTION DRAWING GR-3.6 FOR DETAILS.

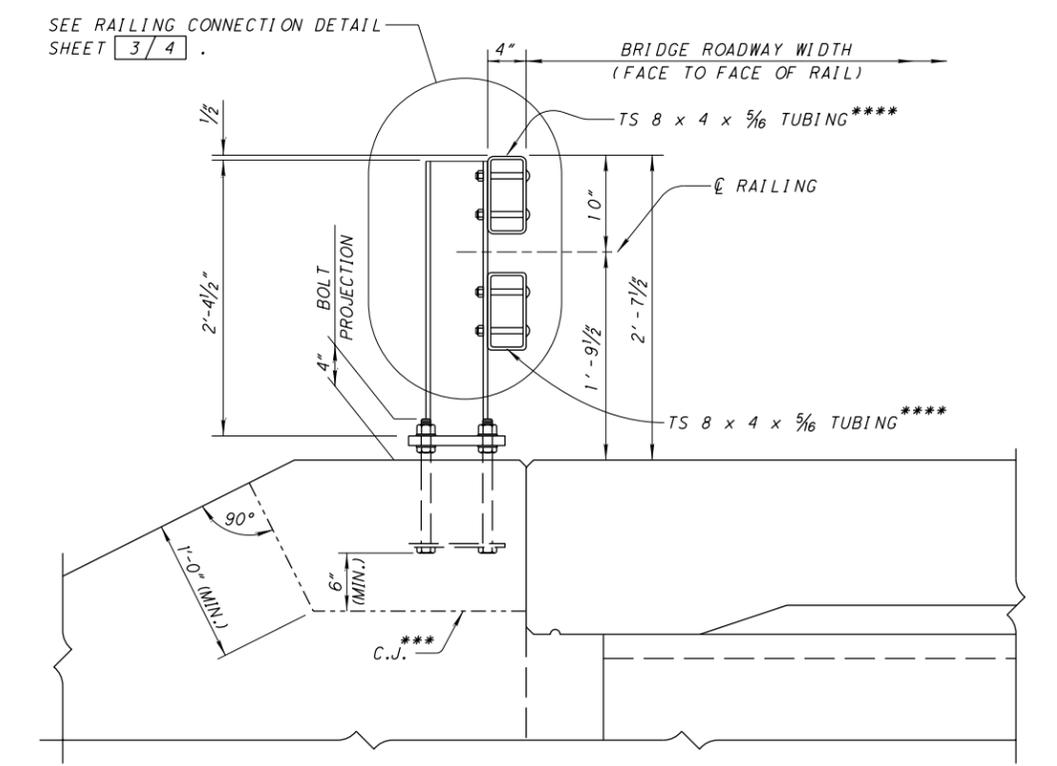
- \* - ON EACH SIDE OF THE BRIDGE, ONE POST SPACING PER SPAN MAY BE DECREASED TO ACCOUNT FOR ANY REQUIRED CONSTRUCTION CLEARANCES. NO POST SPACING SHALL EXCEED 6'-3".
- \*\* - SYMMETRICAL ABOUT  $\bar{C}$  RAILING



**GUARDRAIL CONNECTION PLATE DETAILS**

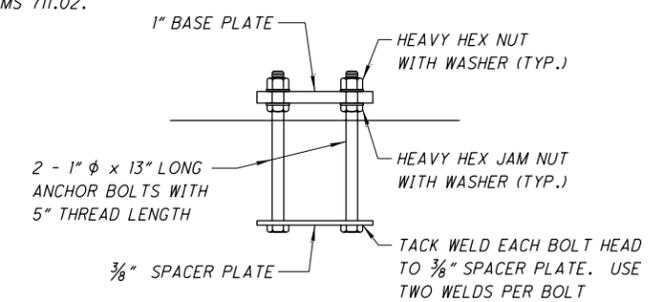


**VIEW B-B**

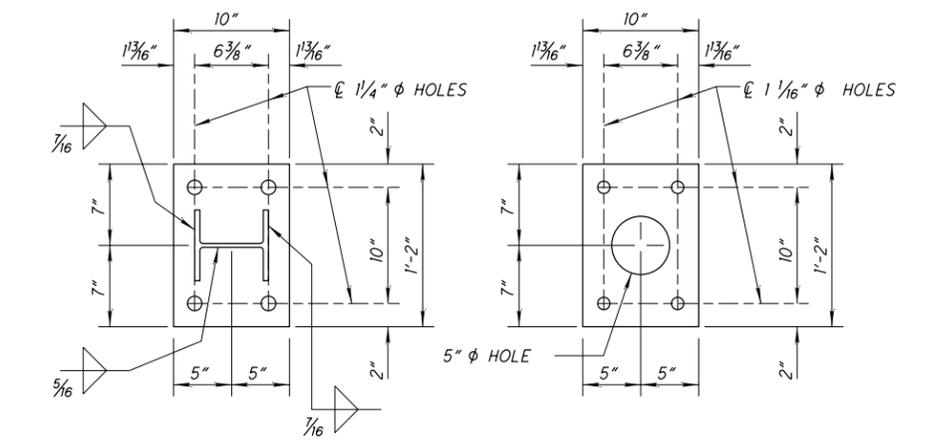


**SECTION F-F**

- \*\*\* - PLACE THE CONCRETE ABOVE THE CONSTRUCTION JOINT AFTER INSTALLATION OF THE RAILING IS COMPLETE.
- \*\*\*\* - IN LIEU OF PROVIDING THE WINGWALL CONSTRUCTION JOINT, THE CONTRACTOR MAY FIELD DRILL HOLES IN THE TUBING FOR POST-TO-TUBE RAIL CONNECTIONS AT ALL FLUSH MOUNTED POST LOCATIONS. REPAIR GALVANIZING ACCORDING TO C&MS 711.02.



**FLUSH MOUNTED POST ANCHOR DETAIL**  
 (POST NOT SHOWN)

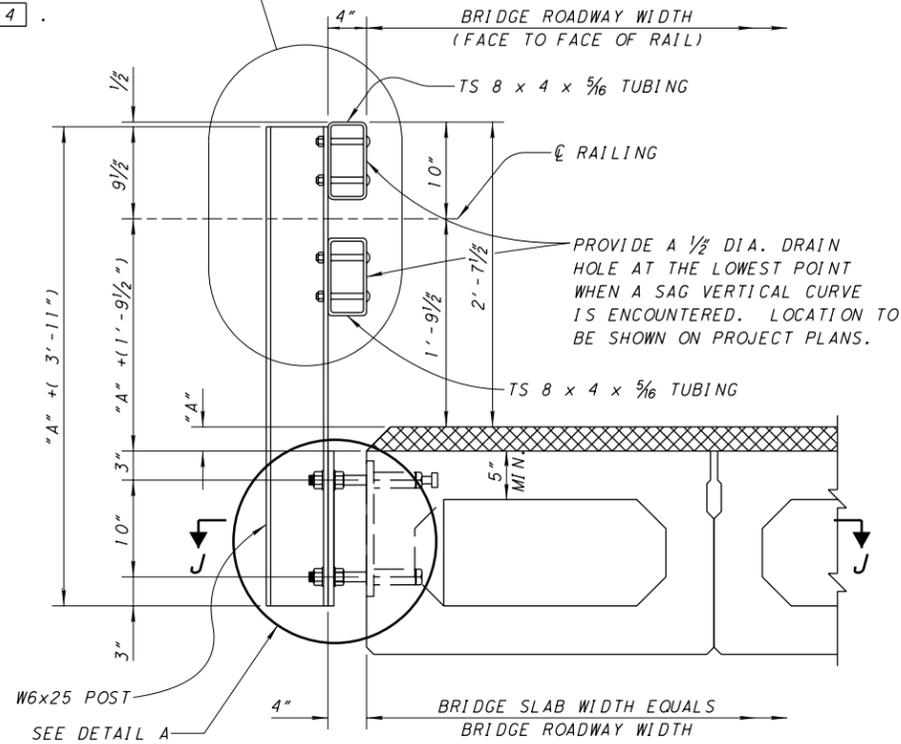


**BASE PLATE**  
 (1" PLATE)

**SPACER PLATE**  
 (3/8" PLATE)

DESIGN AGENCY	OFFICE OF	STRUCTURAL ENGINEERING
STATE OF OHIO DEPARTMENT OF TRANSPORTATION	7-06-99	DATE
ADMINISTRATOR	Brad Fogwell	
REVIEWED	WTL	
CHECKED	JS	TST-1-99
DESIGNED	AJM/SAM	DRAWN
REVISIONS	10-20-00	04-18-08
	07-19-02	04-18-03
	10-17-03	
STANDARD	TWIN STEEL TUBE	BRIDGE RAILING
	1	4

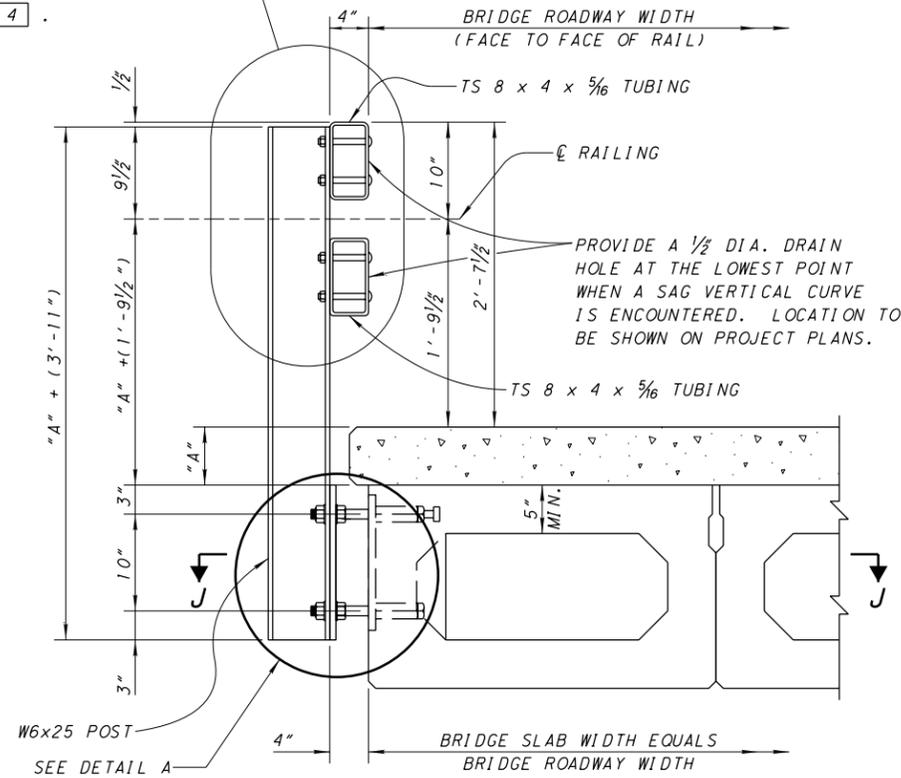
SEE RAILING CONNECTION DETAIL SHEET 3/4 .



**SECTION A-A**

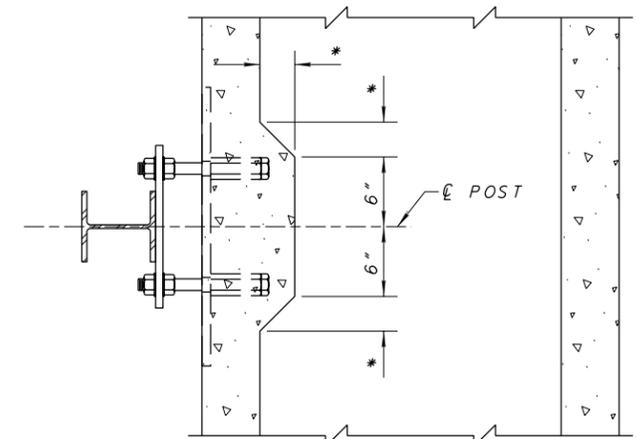
(FOR 17" AND DEEPER NONCOMPOSITE PRESTRESSED BOX BEAM BRIDGES)

SEE RAILING CONNECTION DETAIL SHEET 3/4 .



**SECTION A-A**

(FOR 17" AND DEEPER COMPOSITE PRESTRESSED BOX BEAM BRIDGES)

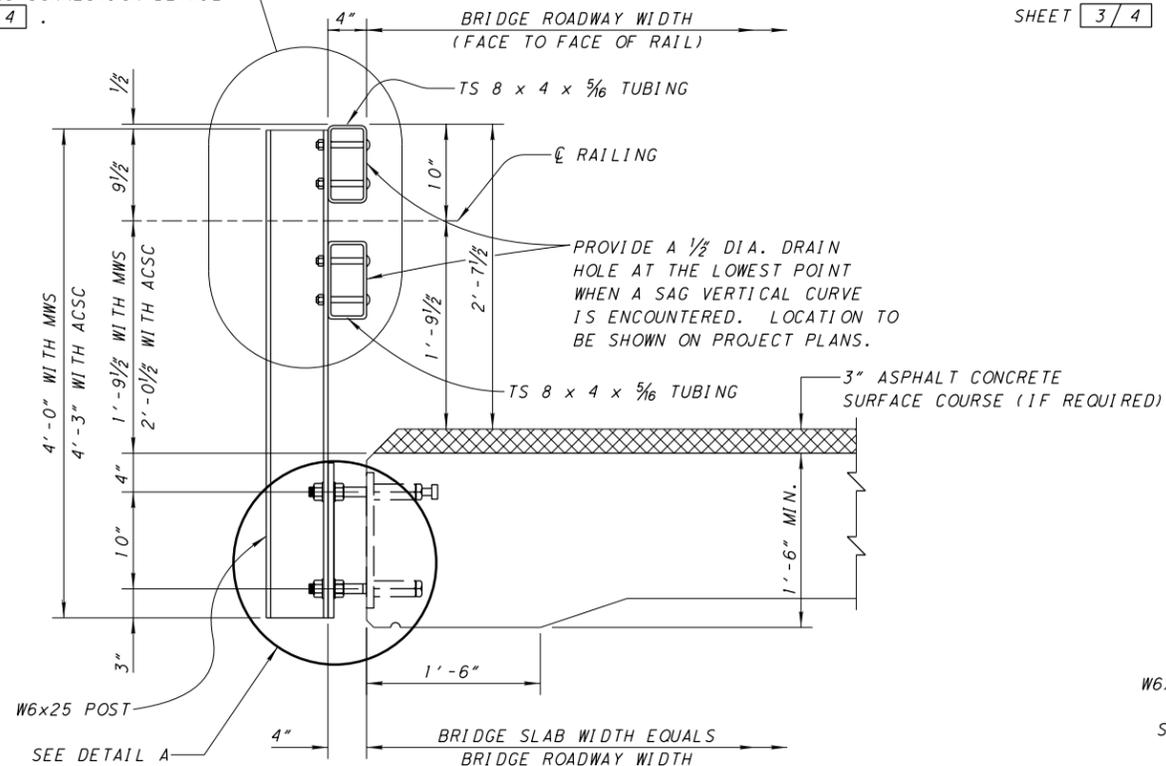


**SECTION J-J**

**LEGEND**

- MWS - MONOLITHIC WEARING SURFACE
- ACSC - ASPHALT CONCRETE SURFACE COURSE
- "A" - DECK OR OVERLAY THICKNESS, THIS DIMENSION VARIES ACROSS THE LENGTH OF THE BRIDGE.
- \* - THIS DIMENSION IS THE SAME AS THE WIDTH OF FILLET IN THE BOX BEAMS'S VOID.

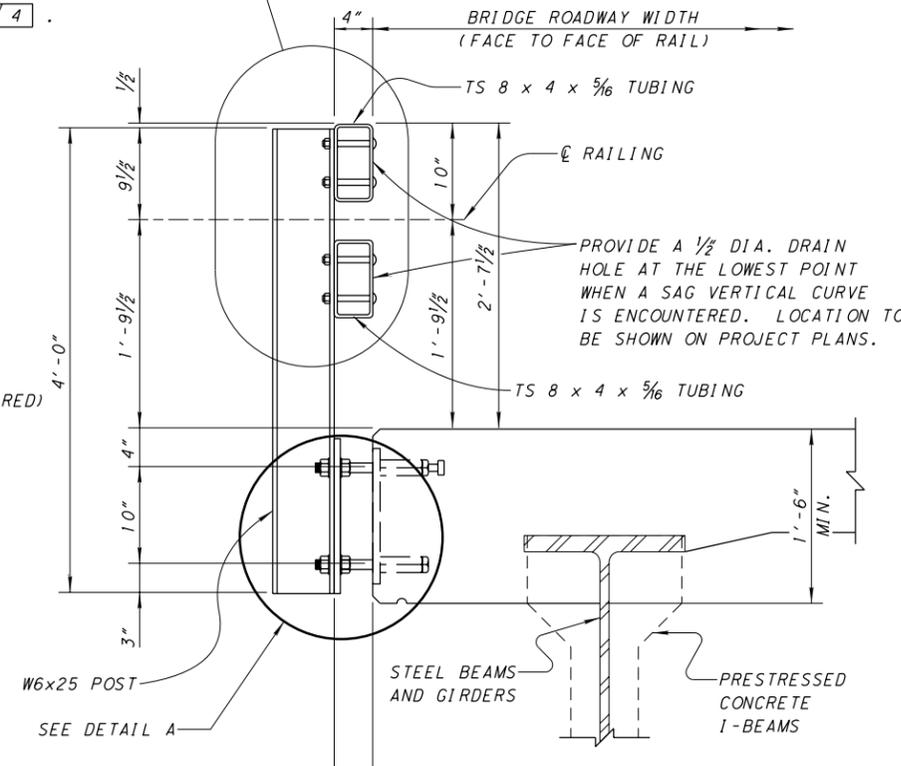
SEE RAILING CONNECTION DETAIL SHEET 3/4 .



**SECTION A-A**

(FOR SLAB BRIDGES)

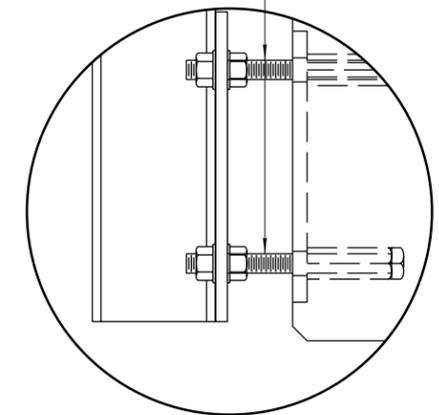
SEE RAILING CONNECTION DETAIL SHEET 3/4 .



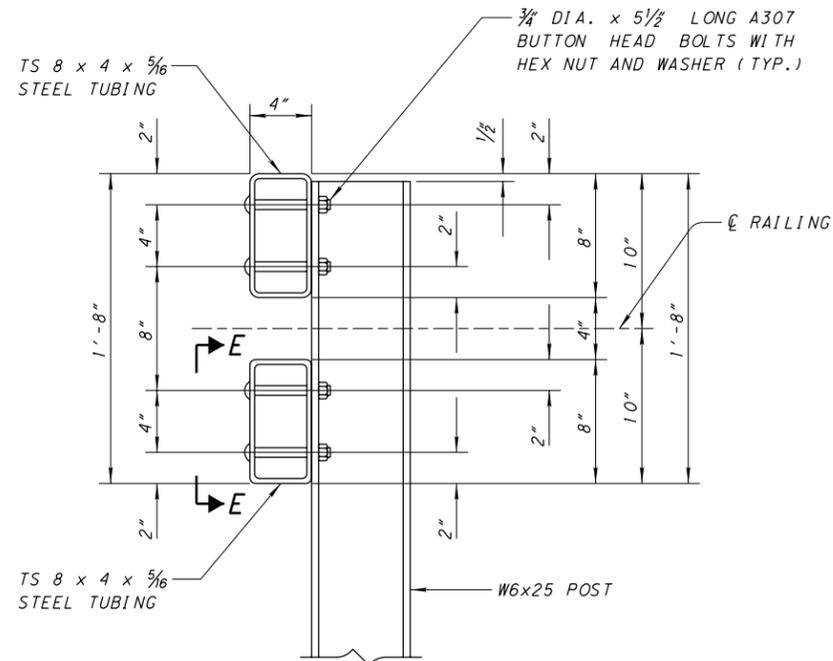
**SECTION A-A**

(FOR CONCRETE OR STEEL I-BEAM BRIDGES)

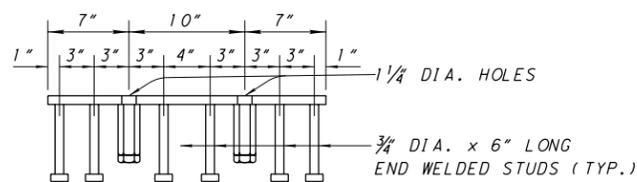
2 - 1" DIA. x 12" LONG ANCHOR BOLTS WITH MACHINE THREADS FULL LENGTH AND TWO HEX NUTS AND TWO 3" x 3" x 5/16" PLATE WASHERS PER BOLT.



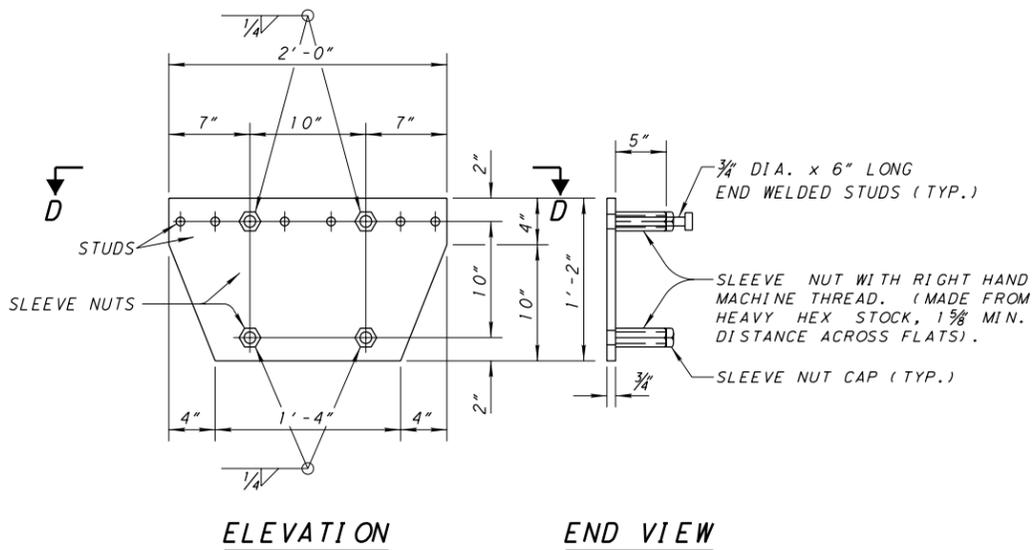
**DETAIL A**



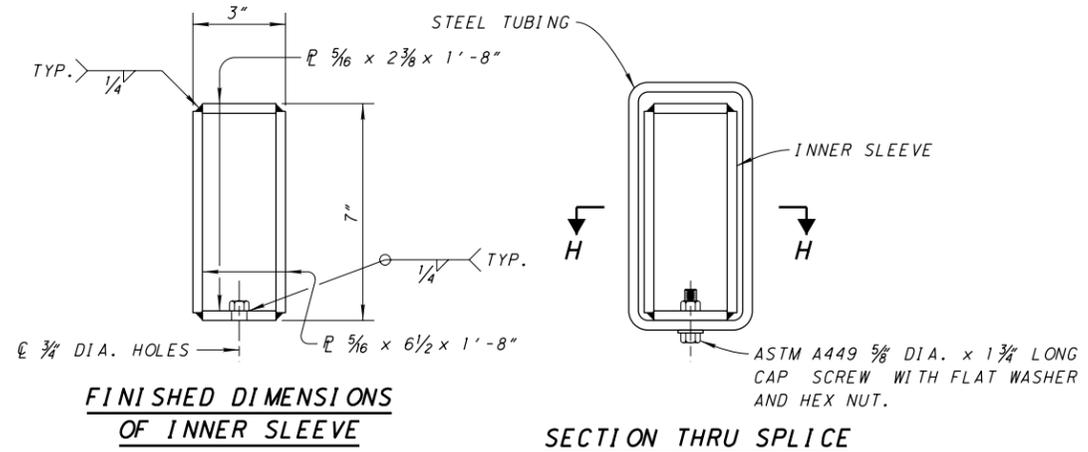
**RAILING CONNECTION DETAIL**



**VIEW D-D**

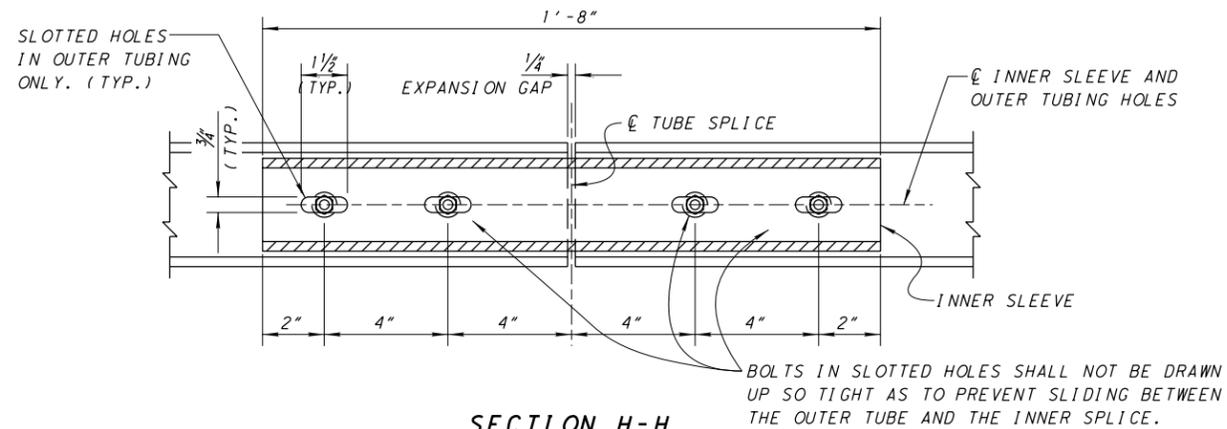


**POST ANCHOR DEVICE**

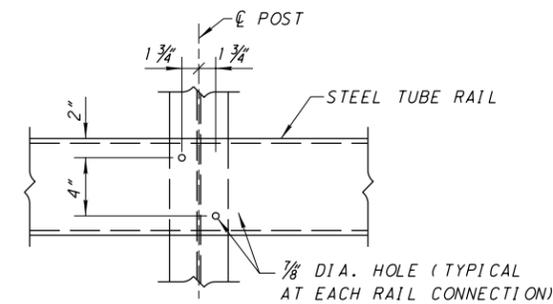


**FINISHED DIMENSIONS OF INNER SLEEVE**

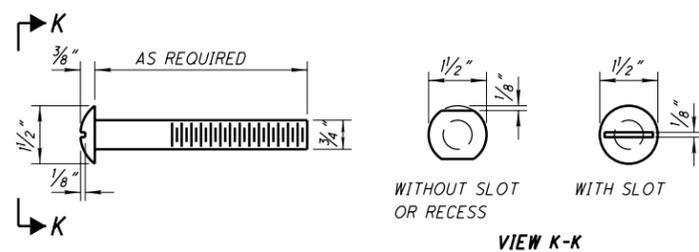
**SECTION THRU SPLICE**



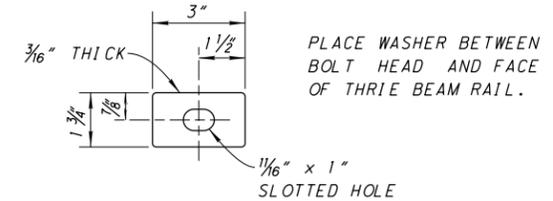
**SECTION H-H STEEL TUBE SPLICE DETAILS**



**VIEW E-E**



**DETAIL OF 3/4" DIA. ROUND HEAD BOLT**



**SPECIAL WASHER**

DESIGN AGENCY	OFFICE OF	STRUCTURAL ENGINEERING
STATE OF OHIO DEPARTMENT OF TRANSPORTATION	BRUCE FAYGELL	ADMINISTRATOR
REVISIONS	DESIGNED	CHECKED
10-20-00	AJM/SAM	JS
07-19-02		
04-18-03		
10-17-03		
REVIEWED	WTL	TST-1-99
DATE	7-06-99	
STANDARD	TWIN STEEL TUBE	BRIDGE RAILING
3	4	

**TST-1-99 GENERAL NOTES:**

**GENERAL:** THIS DRAWING PROVIDES DESIGN AND CONSTRUCTION DETAILS. THE PROJECT PLANS FOR EACH STRUCTURE SHALL PROVIDE NECESSARY ADDITIONAL RAILING DIMENSIONS INCLUDING RAILING LENGTHS, POST SPACINGS, POST LENGTHS AND ANY OTHER PERTINENT INFORMATION INCLUDING SPECIAL NOTES AND DETAILS. FOR ADDITIONAL GUARDRAIL DETAILS, SEE STD. CONSTR. DWGS. GR-1.1, GR-1.2 AND OTHER DRAWINGS PERTAINING TO DESIGN OF SPECIFIC GUARDRAIL TYPES.

**APPLICATION:** THE TWIN STEEL TUBE RAILING SHALL BE USED ON STRUCTURES DESIGNED TO DRAIN SURFACE WATER OVER THE SIDES OF THE STRUCTURE. THIS RAILING IS NOT APPLICABLE TO COMPOSITE BOX BEAM BRIDGES WITH DESIGN OVERHANGS GREATER THAN 2" OR TOP FLANGE THICKNESSES LESS THAN 5".

CONNECT THE APPROACH AND TRAILING ENDS OF THE TWIN STEEL TUBE RAILING TO THE BRIDGE TERMINAL ASSEMBLY DETAILED IN STANDARD CONSTRUCTION DRAWING GR-3.6. THE FIRST POST AT THE APPROACH END AND THE LAST POST AT THE TRAILING END OF THE BRIDGE RAILING SHALL BE FLUSH MOUNTED AS SHOWN ON SHEET 1 OF 4.

**DESIGN SPECIFICATIONS:** THIS DESIGN CONFORMS TO THE "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 1996, INCLUDING THE 1997 INTERIM SPECIFICATIONS, AND THE ODOT BRIDGE DESIGN MANUAL.

**DESIGN DATA:**  
 REINFORCING STEEL - MINIMUM YIELD STRENGTH = 60,000 PSI  
 STEEL TUBING - MINIMUM YIELD STRENGTH = 46,000 PSI  
 ALL OTHER STEEL - MINIMUM YIELD STRENGTH = 50,000 PSI

**MATERIALS:** FURNISH SHAPED STRUCTURAL TUBING ACCORDING TO 707.10 (ASTM A500, GRADE B). IN LIEU OF THE "DROP WEIGHT TEAR TEST" (ASTM E436), THE MANUFACTURER MAY CHOOSE TO SUPPLY TUBING THAT MEETS IMPACT TOUGHNESS ACCORDING TO AASHTO T266, "NOTCHED BAR IMPACT TESTING OF METALLIC MATERIALS (CVN)". THE CVN IMPACT REQUIREMENTS SHALL BE 15 FT-LBS AT 0° F. FOR EACH HEAT SUPPLIED, THE MANUFACTURER SHALL FURNISH ONE 2" x 18" SPECIMEN, MARKED WITH ITS HEAT NUMBER, FOR IMPACT TESTING.

FURNISH STRUCTURAL STEEL SHAPES, PLATES AND PLATE WASHERS ACCORDING TO 711.01.

**GALVANIZING:** GALVANIZE ALL SHAPED STRUCTURAL TUBES, POSTS, PLATES, HARDWARE AND ACCESSORIES IN ACCORDANCE WITH 711.02. PRIOR TO GALVANIZING, ROUND ALL STRUCTURAL TUBING ENDS AND REMOVE BURRS FROM ALL STEEL TUBING, SHAPES AND PLATES.

**HORIZONTAL CURVATURE:** THIS STANDARD IS APPLICABLE TO STRUCTURES HAVING A RAILING CURVATURE RADIUS OF 20 FEET OR MORE. FOR A RADIUS OF LESS THAN 20 FEET, THE DESIGN SHALL BE SPECIAL. FOR ALL CURVED STRUCTURES, HEAT CURVE THE HORIZONTAL RAIL ELEMENTS ACCORDING TO THE AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES.

**TUBE SPLICES:** LOCATE SPLICES SO THAT EACH TUBE SEGMENT IS CONNECTED TO NOT LESS THAN TWO POSTS. STAGGER SPLICES IN THE TOP AND BOTTOM TUBES TO AVOID OCCURRENCES IN THE SAME PANEL.

**FASTENERS:** FURNISH MATERIAL CONFORMING TO THE FOLLOWING:

ALL ANCHOR BOLTS, SLEEVE NUTS, NUTS AND WASHERS SHALL CONFORM TO ASTM A 449.

END WELDED STUDS SHALL CONFORM TO ASTM A108.

THE TUBE RAIL TO POST CONNECTION BOLTS AND HEX NUTS SHALL CONFORM TO 711.10 (ASTM A307). REFER TO STANDARD CONSTRUCTION DRAWING GR-3.6 FOR THE BRIDGE TERMINAL ASSEMBLY CONNECTION HARDWARE.

THE HEX CAP SCREWS (BOLTS), HEX NUTS AND WASHERS SHALL CONFORM TO ASTM A 449.

**BOX BEAMS:** THE DISTANCE FROM THE CENTERLINE OF A GUARDRAIL POST TO THE ABUTMENT END OF THE BEAM OR TO THE CENTERLINE OF A TIE ROD SHALL NOT BE LESS THAN 1'-8". THE DISTANCE FROM THE CENTERLINE OF A GUARDRAIL POST TO THE PIER END OF THE BEAM SHALL NOT BE LESS THAN 2'-10". THE LOCATION OF THE HORIZONTAL TIE RODS MAY NEED TO BE ADJUSTED IN ORDER TO ACCOMMODATE EACH POST ANCHOR DEVICE.

**METHOD OF MEASUREMENT:** THE DEPARTMENT WILL MEASURE TWIN STEEL TUBE BRIDGE RAILING BY THE NUMBER OF FEET. THE DEPARTMENT WILL MEASURE THE LENGTH OF RAILING AS THE DISTANCE BETWEEN THE CENTERS OF THE FLUSH MOUNTED POSTS AT THE APPROACH AND TRAILING ENDS PLUS 4'-11".

**BASIS OF PAYMENT:** THE DEPARTMENT WILL CONSIDER THE COSTS ASSOCIATED WITH FURNISHING AND INSTALLING STEEL TUBING, STEEL POSTS, POST ANCHOR DEVICES, ANCHOR PLATES, TUBE SPLICE PLATES, GUARDRAIL CONNECTION PLATES, ANCHOR BOLTS, 3/4" ROUND HEAD BOLTS, SLEEVE NUTS, NUTS, CAP SCREWS, WASHERS AND OTHER HARDWARE TO BE INCLUDED WITH THE TWIN STEEL TUBE RAILING. THE DEPARTMENT WILL PAY FOR ACCEPTED QUANTITIES AT THE CONTRACT PRICE FOR ITEM 517, RAILING (TWIN STEEL TUBE).

THE DEPARTMENT WILL PAY FOR BRIDGE TERMINAL ASSEMBLY HARDWARE SEPARATELY.

DESIGN AGENCY OFFICE OF STRUCTURAL ENGINEERING	STATE OF OHIO DEPARTMENT OF TRANSPORTATION <i>Brad Fogwell</i> ADMINISTRATOR	7-06-99	DATE
		7-06-99	DATE
REVIEWED WTL	CHECKED JS	DESIGNED AJM/SAM	DRAWN SAM
TST-1-99			
REVISIONS	10-20-00	04-18-08	-----
	07-19-02	-----	-----
	04-18-03	-----	-----
	10-17-03	-----	-----
STANDARD	TWIN STEEL TUBE BRIDGE RAILING		
4	4		