

**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.

FURNISH NON SHRINK, NON METALLIC GROUT ACCORDING TO CMS 705.20.

**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 CMS 711.09 (ASTM A325). THE THREAD LENGTH REQUIREMENT OF A325 MAY BE WAIVED.

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, STEEL SHIM PLATES, GUARDRAIL CONNECTION PLATES, ANCHOR BOLTS, GROUT, 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
		TST-1-99	
REVISIONS	CHECKED	DESIGNED	REVIEWED
10-20-00 07-19-02 04-18-03	JS	AJM/SAM DRAWN SAM	WTL
STANDARD TWIN STEEL TUBE BRIDGE RAILING			
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