



U.S. Department  
of Transportation

**Federal Highway  
Administration**

# Memorandum

6300 Georgetown Pike  
McLean, Virginia 22101-2296

Subject: **ACTION:** New York State Department of Transportation's  
(NYSDOT) Proposed Bridge Railing Modifications

Date: November 8, 2000

From: Frederick G. Wright, Jr.  
Program Manager, Safety

Reply to  
Attn. of: HSA-1\B72

To: Mr. Harold J. Brown  
Division Administrator (HDA-NY)  
Albany, NY

Earlier this year, Mr. Earl Dubin of your staff forwarded a request from the New York State Department of Transportation (NYSDOT) to review specific design changes made to crash tested bridge railings and to accept these revised designs as meeting NCHRP Report 350 evaluation criteria without requiring additional full-scale testing. I apologize for the delayed response.

The bridge rail designs that were physically tested and the test results are identified and contained in the Texas Transportation Institute (TTI) September 1999 report, "Testing and Evaluation of the New York Two-Rail Curbless and Four-Rail Curbless Bridge Railing and the Box-Beam Transition." The NYSDOT has requested formal acceptance of a curb-mounted two-rail design, the four-rail design with and without a sidewalk, and a five-rail design for bicycles. No tests were conducted on the curb-mounted two-rail, the four-rail on a sidewalk, or the five-rail designs. Members of my staff have completed their reviews of the crash test reports and the modified designs for which NYSDOT has requested formal acceptance. They concluded that each of the railings may be considered to meet NCHRP Report 350 evaluation criteria at test level 4 (TL-4) without additional testing. This decision was based on the following analysis:

The two-rail design was tested without a curb. Tests with the 820-kg car and the 8000-kg single-unit truck met appropriate evaluation criteria. However, the test with the 2000-kg pickup truck resulted in vehicular snagging and passenger compartment intrusion considered likely by the researchers to result in serious injuries to vehicle occupants. When mounted directly on the deck, the clear opening from the deck to the bottom of the lower rail was 336 mm (approximately 13 inches), which allowed the wheel of the pickup to fold under the lower rail and impact a support post. This snagging resulted in the observed passenger compartment deformation and caused excessive damage to the bridge deck. The NYSDOT modification mounts this rail on a 150-mm (6-inch) curb, reducing the clear opening to 226 mm (approximately 9 inches), and increasing the overall height of the rail from 790 mm (31 inches) to 830 mm (32.6 inches). The resultant design is very similar to the New England Transportation Consortium's (NETC) two-rail curb-mounted design that has been successfully tested under NCHRP Report 350 guidelines. To minimize the bolt snagging noted in the NYSDOT test, the lower rail was mounted to the support posts with a steel shelf angle, thus eliminating the horizontal bolts through the rail which probably contributed to some of the snagging noted in the test. Thus, I agree that the modified curb-mounted design shown in Attachment 1 may be considered an NCHRP Report 350 TL-4 bridge rail.

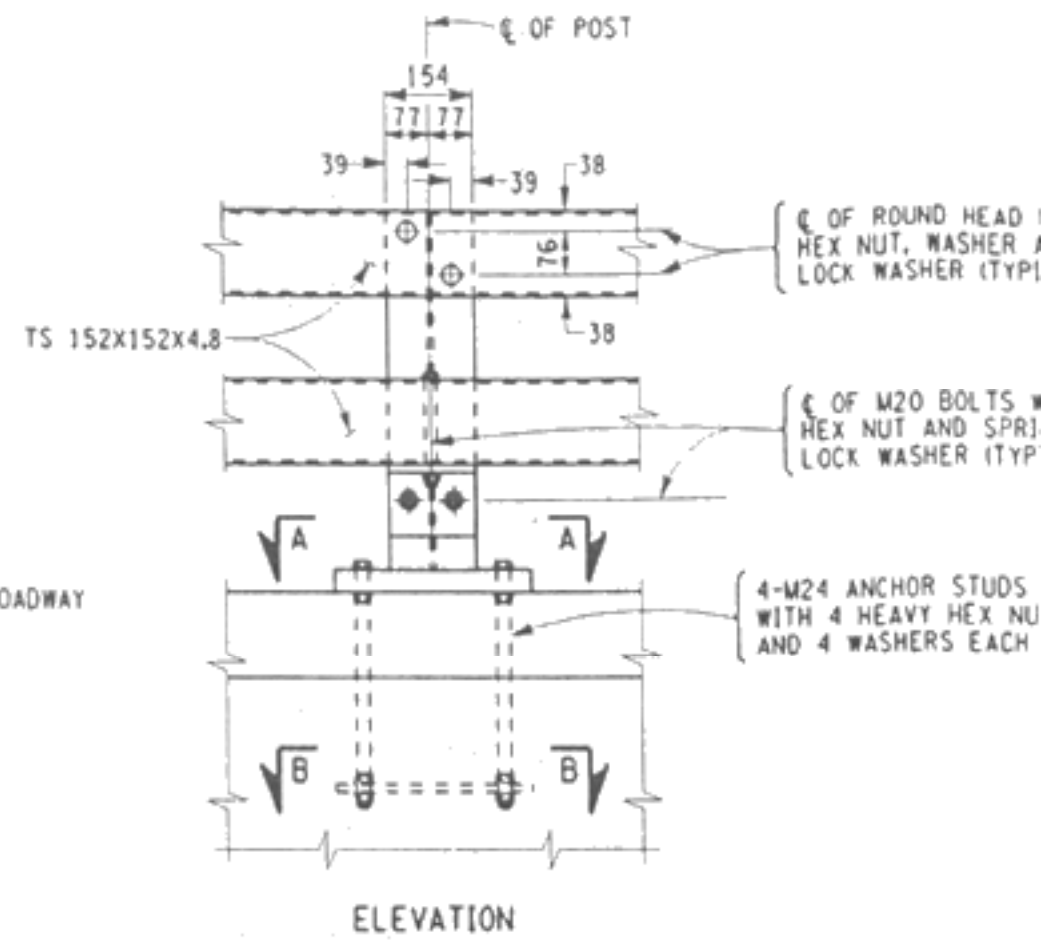
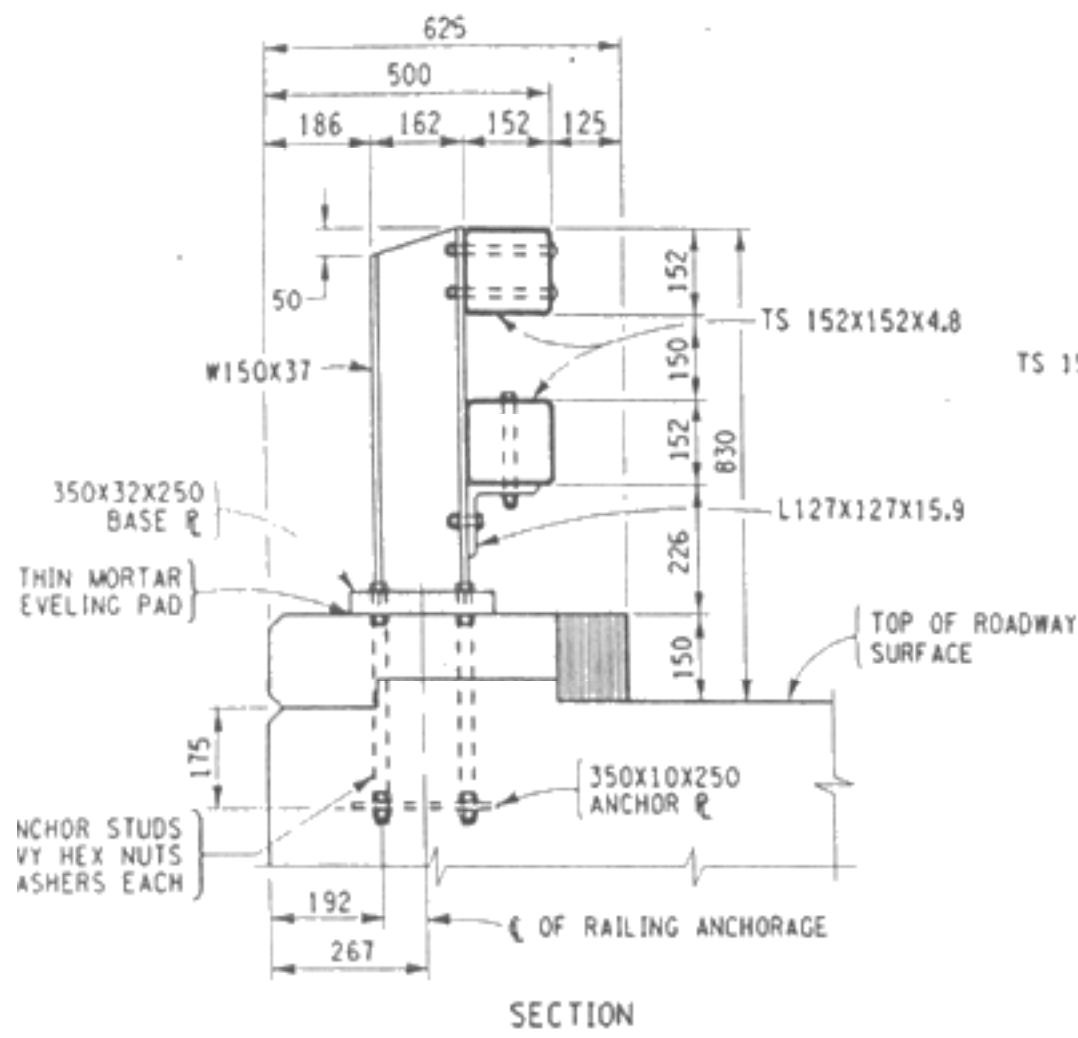
The deck-mounted four-rail design shown as Attachment 2 successfully met all evaluation criteria for a TL-4 design when tested at TTI. The lower 152 mm x 152 mm x 4.8 mm rail-to-post attachment was modified by using a shelf angle as noted above for the two-rail

design. Based on tests of similar bridge railing designs mounted behind a sidewalk with a curb height of 200 mm (8 inches) or less, I agree that the NYSDOT four-rail design remains acceptable as a TL-4 bridge rail when used behind a 1.525-m (5-foot) wide or wider sidewalk having a curb height of 200 mm (8 inches) or less.

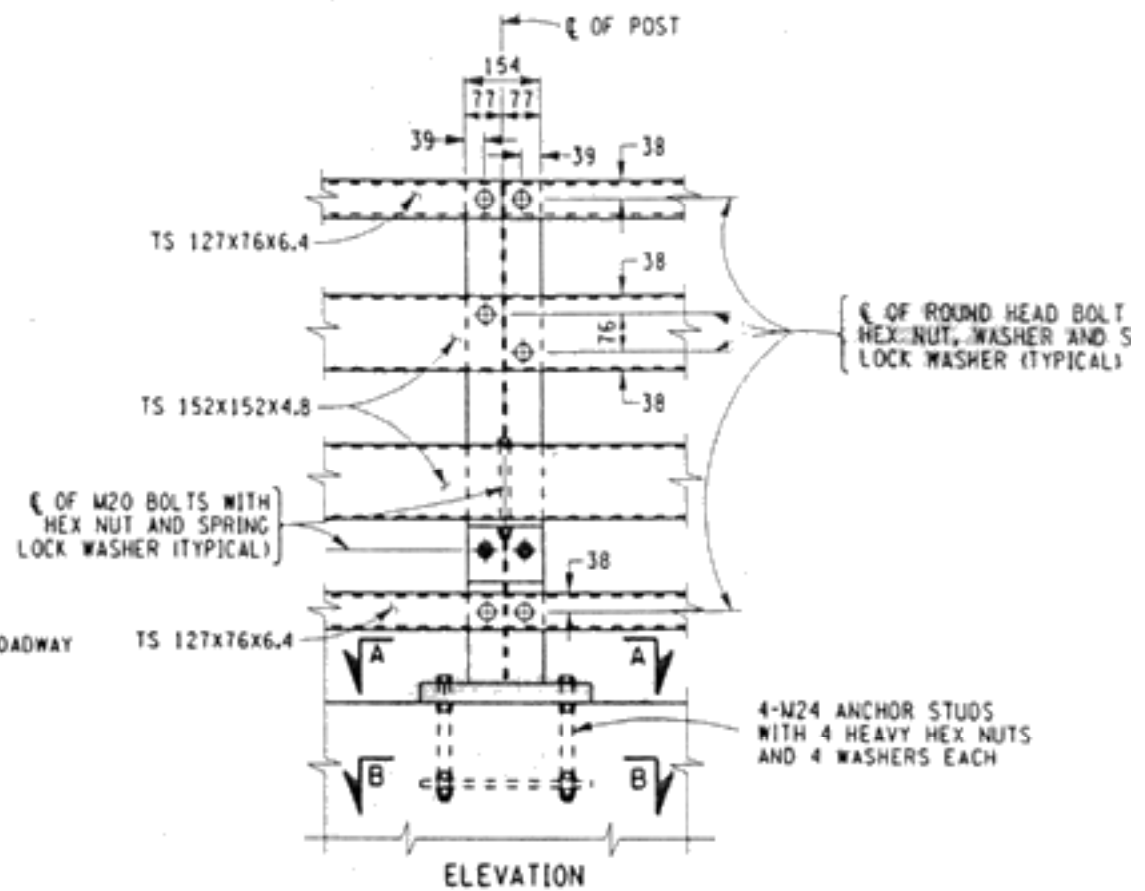
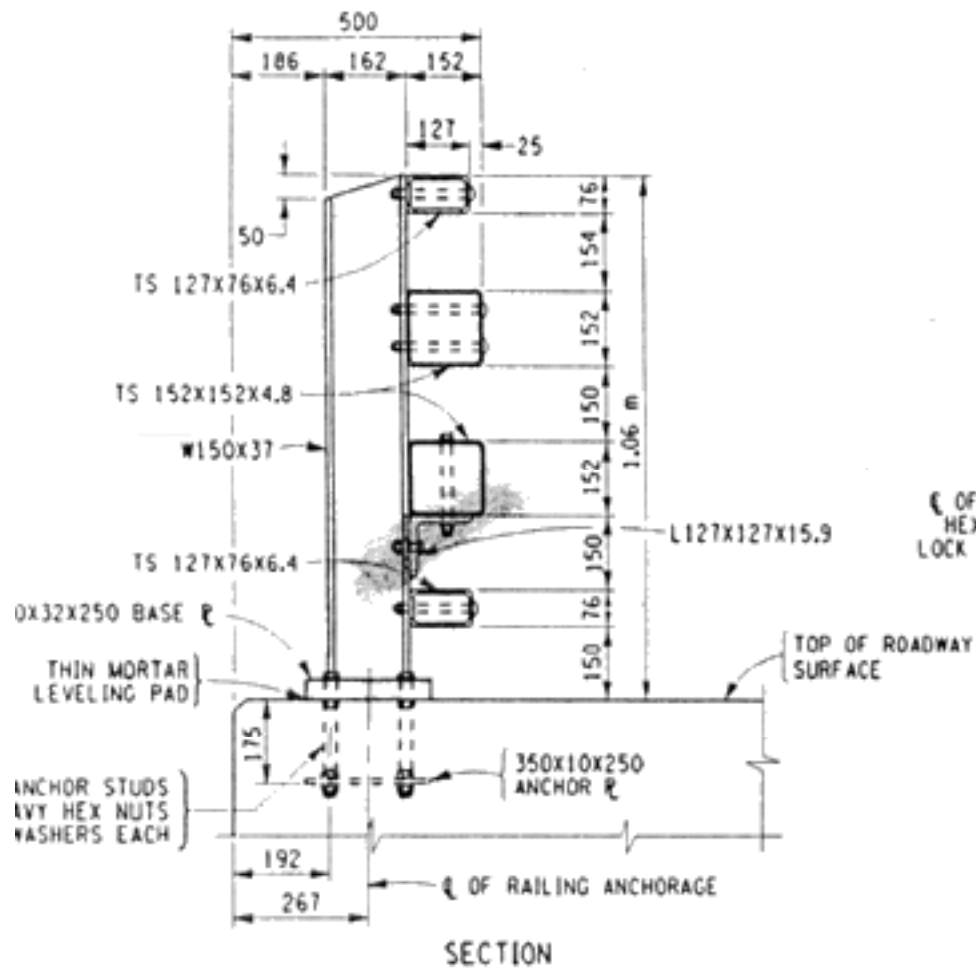
The five-rail design shown as Attachment 3 is identical to the four rail design except for the extra height and additional rail. A review of the crash tests for the four rail design showed that there was no significant vehicle overhang of the top rail. Thus, the additional height does not appear to create a snagging problem with the pickup truck and would likely reduce the roll angle observed with the single-unit truck. Consequently, this design may also be considered a TL-4 railing.

In its request, NYSDOT acknowledged that the original transition design for these bridge railings was not tested successfully and that the design is being modified for retesting in the future. I would appreciate your keeping Mr. Richard Powers of my staff advised of the status of this effort.

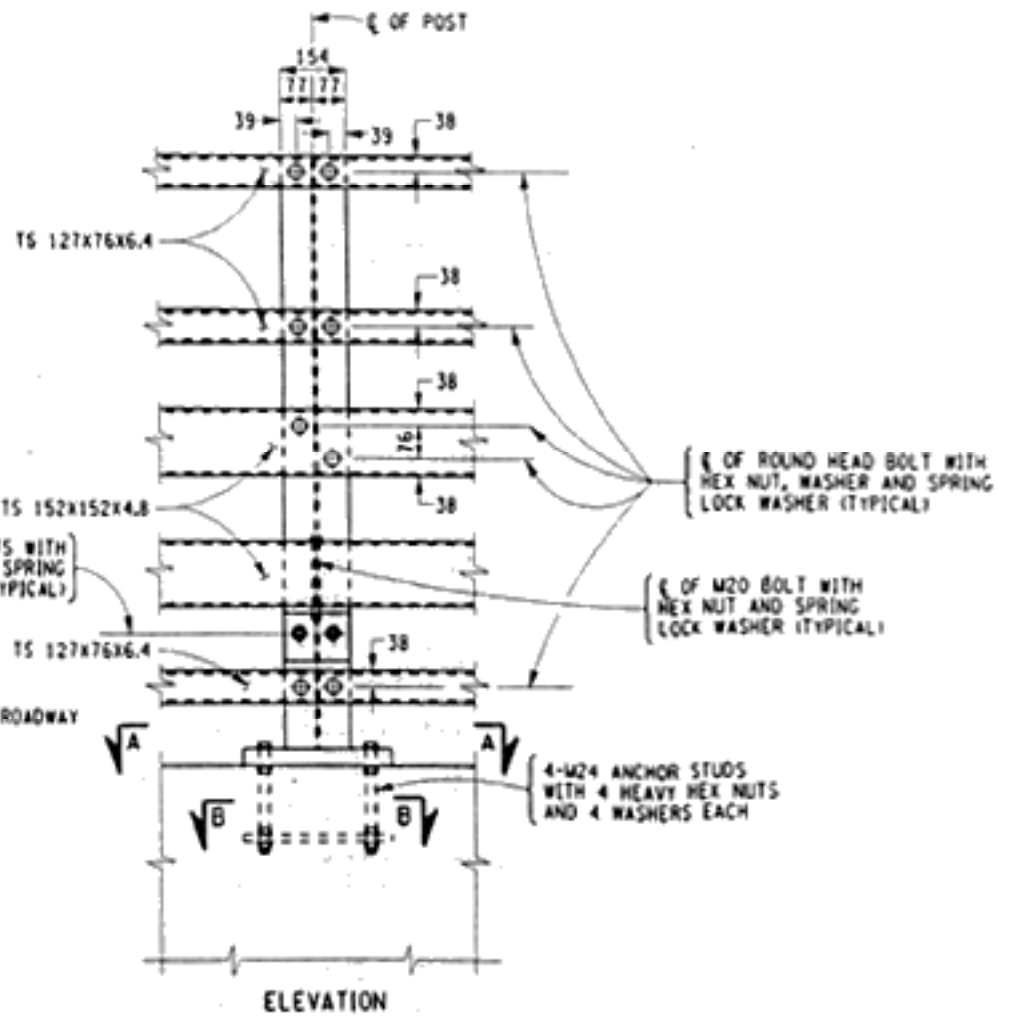
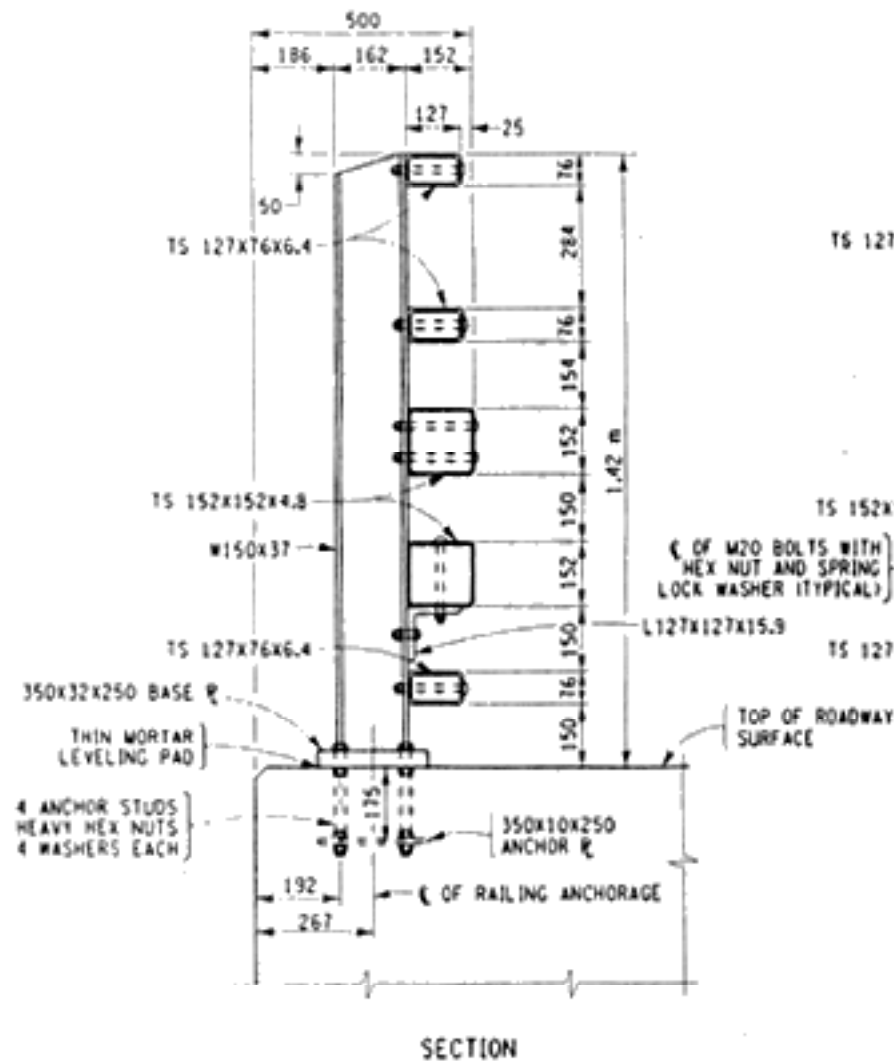
3 Attachments



STEEL BRIDGE RAILING  
(TWO-RAIL - BRUSH CURB)



STEEL BRIDGE RAILING  
(FOUR-RAIL - CURBLESS)



STEEL BRIDGE RAILING  
(FIVE-RAIL - CURBLESS)