U.S. Department
of Transportation
**Federal Highway
Administration**

AUG 27 1996

400 Seventh St., S.W.
Washington, D.C. 20590

Refer to: HNG-14

John F. Carney, III, Ph.D., P.E.
Professor of Civil Engineering
Provost and Vice President for
Academic Affairs
Worcester Polytechnic Institute
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Worcester, Massachusetts 01609-2280

Dear Dr. Carney:

Your July 22 letter requested the Federal Highway Administration's (FHWA) acceptance of the Vanderbilt Truck Mounted Attenuator (VTMA) as a National Cooperative Highway Research Program (NCHRP) Report 350 test level 3 (TL-3) crash cushion. In support of this request, you sent copies of crash-test videotapes and the Texas Transportation Institute's June 1996 report "Crash Testing and Evaluation of the Vanderbilt Truck Mounted Attenuator" by Mr. Dean Alberson and Ms. Wanda Menges. Supplemental information was provided in your August 13 letter to FHWA's Office of Engineering.

As indicated in the enclosed drawings, the VTMA consists of four 910-mm high polyethylene cylinders of varying diameters and wall thickness bolted to each other and to a backup structure connected to a support vehicle (dump truck). The cantilevered end of the TMA is supported by a cable connected to a steel boom mounted in the bed of the dump truck and extending out over the VTMA at a 45 degree angle. An 890-mm square "Vehicle Grabber Assembly" is bolted to the impact face of the VTMA. The VTMA is 3780 mm long and weighs 1158 kg.

Two NCHRP Report 350 test level 3 (TL-3) tests were reported: Test 3-50 and test 3-51, the results of which are summarized in Enclosure 2. The support vehicle for both tests was an 8880-kg dump truck. For test 3-50, with the 820-kg car, this truck was blocked to prevent forward movement. For test 3-51, it was in second gear with its parking brake engaged. The dump truck rolled ahead 5.4 meters after impact into the VTMA by the 2000-kg pickup truck.

As noted in your letter, all the NCHRP Report 350 TL-3 evaluation criteria were met in both tests, except the longitudinal occupant ride down acceleration in test 3-51 which exceeded the maximum allowable value of 20 g's by 1.48 g's. You presented an analysis which indicated that if the impact speed had been at the low end of the tolerances allowed, or if the support vehicle had been significantly lighter than the 9000-kg dump truck recommended by the NCHRP Report 350, the 10-ms ride down acceleration would have been below the maximum 20 g's. Although both of these statements are valid, Report 350 suggests only a 450-kg tolerance in the weight of the support vehicle and states that the impact severity (IS) for a truck-mounted attenuator test should preferably meet or exceed the nominal value. While we can agree that a difference of only 1.48 g's may be insignificant in most cases, we are not willing to set a precedent by accepting test values above the NCHRP Report 350 maximums. Appendix A of the NCHRP Report 350 states that "test results should fall below [the "maximum" limiting values of Table 5.1] and desirably should not exceed the "preferred" values . . ." Section A5.3 goes on the say ". . . values in excess of the "maximum" limits are considered to be unacceptable." Consequently, we will accept the VTMA as an NCHRP Report 350 TL-2 attenuator based on the tests done to date, recognizing that, with the one exception, its performance equalled or exceeded that of TMA units that were tested at only 70 km/h. It may be used in work zones on the National Highway System (NHS) when such use is requested by a highway agency. As a proprietary device, its use on Federal-aid highway projects, except exempt, non-NHS projects, is subject to the conditions stated in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely yours,

Seppo I. Sillan, Acting Chief
Federal-Aid and Design Division

2 Enclosures

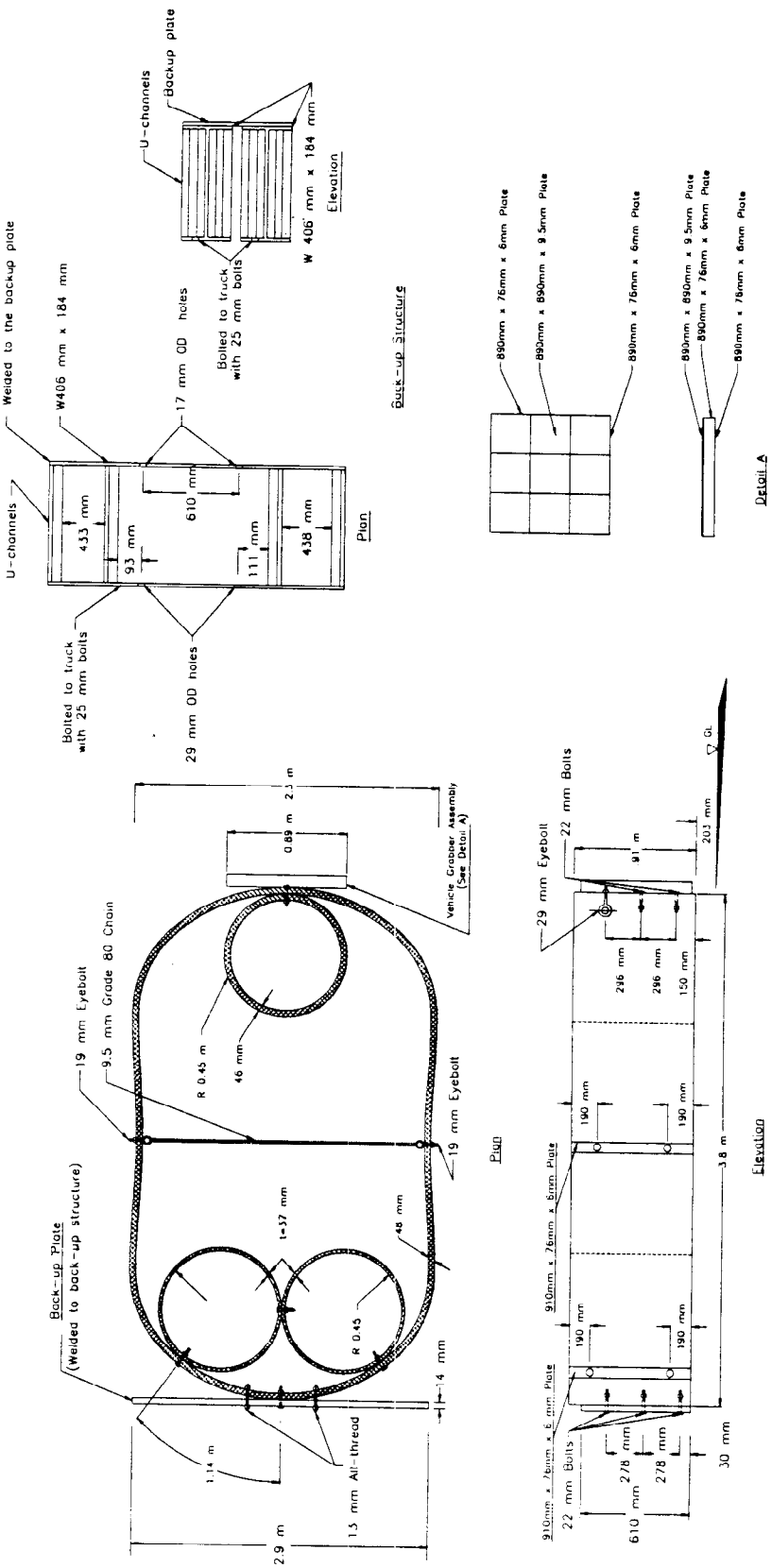
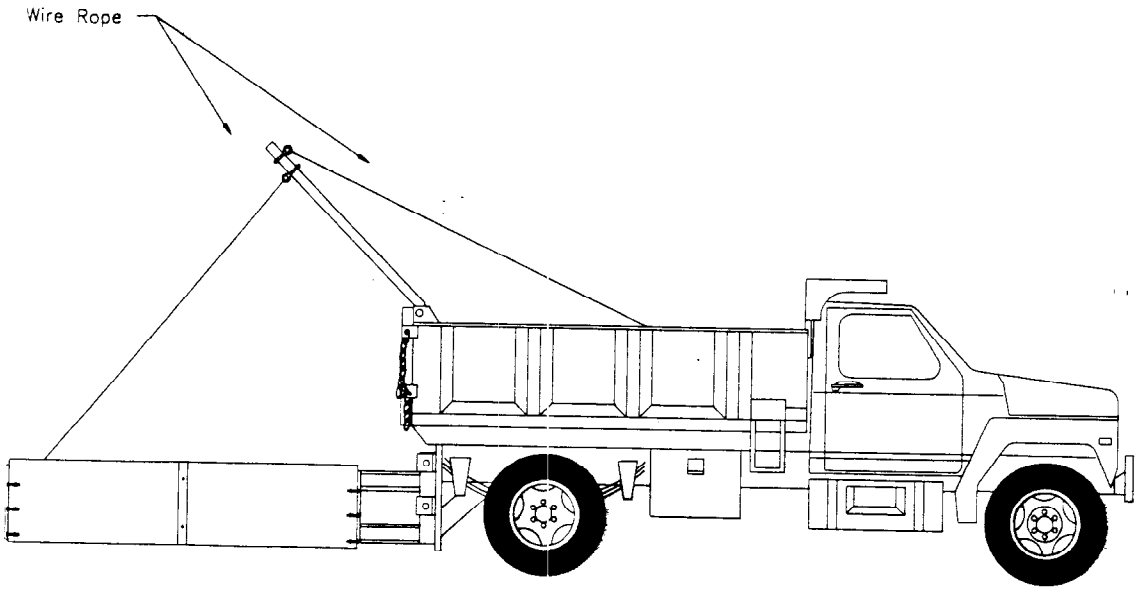
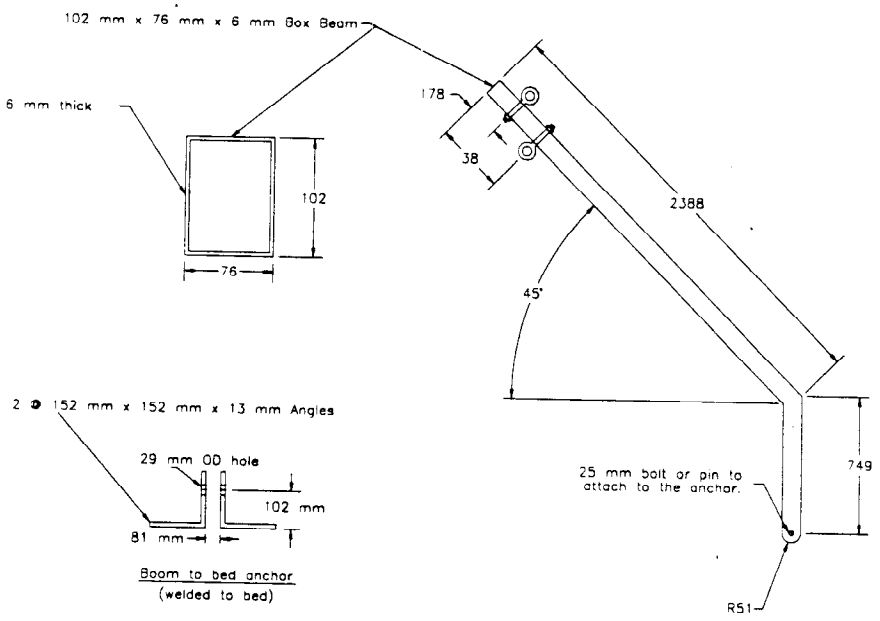


Figure 1. Details of the Vanderbilt TMA (VTMA).



VTMA attachment to Support Vehicle



Boom Detail

Figure 1. Details of the Vanderbilt TMA (VTMA) (continued).

Table 1. Summary of VTMA Crash Test Results.

NCHRP Report 350 Test Designation	**3-50**	**3-51**
Vehicle mass (kg)	820	2000
Impact speed (km/h)	100.95	101.91
Impact Angle (degrees)	0	0
Vehicle impact location	Nose	Nose
Occupant impact velocity (m/s)		
Longitudinal (12 max. allowable)	10.70	9.34
Lateral (12 max. allowable)	1.73	0.41
Occupant ridedown acceleration (peak 10 ms avg g's)		
Longitudinal (20 max. allowable)	16.53	21.48
Lateral (20 max. allowable)	5.04	7.32