December 9, 2003

Refer to: HSA-10/CC-84

Keith R. Lane, P.E.
Director of Research and Materials
Connecticut Department of Transportation
280 West Street
Rocky Hill, Connecticut 06067

Dear Mr. Lane:

In your September 25 letter, you requested Federal Highway Administration acceptance of the non-proprietary Modified Eccentric Loader Terminal (MELT) for use on the National Highway System (NHS) as a 70-km/h test level 2 (TL-2) design. As you know, the original MELT, when tested at 100 km/h to National Cooperative Highway Research Program (NCHRP) Report 350 test level 3 (TL-3), was considered unsatisfactory because the pickup truck, after breaking through the terminal and traveling behind the rail, eventually struck the support posts from behind, spun sideways and overturned.

The New England Transportation Consortium (NETC) subsequently contracted directly with the Texas Transportation Institute (TTI) to run two full-scale crash tests on a slightly modified version of the original MELT at the reduced TL-2 speed of 70 km/h. The results of the two tests conducted were reported in TTI's July 2002 report entitled, "Guardrail Testing – MELT at NCHRP 350 TL-2." Electronic copies of this report are accessible through the NETC website at www.netc.uconn.edu by first clicking on "Reports", then on "Bridges, Signs, and Guardrails". The report can also be found directly from the Transportation Research Board website at http://docs.trb.org/00935456.pdf.

Key design features of the TL-2 MELT include the use of two breakaway posts set in steel tubes (posts #1and 2), six breakaway CRT posts on 1270-mm centers (posts #3-8) and one standard wood line post (post #9) set 1270 mm beyond the last CRT post. The remaining downstream posts are standard line posts (wood or steel) on 1905-mm centers. The first two breakaway posts and the connecting ground strut are identical to the original MELT design shown on drawing SEW05 in the AASHTO "Guide to Standardized Highway Barrier Hardware", except that the shelf angle used to support the rail is at post #2 rather than at post #3. The tested installation used two 3810-mm long sections of w-beam. The first section was shop-curved to a radius of 11.5 meters over the first half of its length and to a radius of 27 meters over the downstream half. The second section was curved to a radius of 27 meters over its entire length. The rail was bolted to post #1 and to post #9 only. The w-beam back-up plates were used at posts #4,5,7, and 8. These and other details are shown on Figure 3 in the TTI report.

Both the small car and the pickup truck end-on tests (tests 2-30 and 2-31, respectively) were successfully run at the TL-2 impact speed of 70 km/h. I have noted that a test at post #3 (beginning of barrier length-of-need) with a pickup truck was successfully conducted on a similar MELT design at the Southwest Research Institute on January 23, 1997, and described in that agency's February 1997 report, entitled "Full-Scale Crash Evaluation of a MELT NCHRP Report 350 Test Designation 2-35/ SwRI Test No. MLT-2." Furthermore, since the anchor detail and post spacing are essentially identical to the design used for the Report 350 TL-3 tests on the Eccentric Loader Terminal, no additional side impact tests were considered necessary to qualify the MELT at TL-2. Tests 2-32 and 2-33 we also waived because angle hits on the nose of gating terminals similar to the MELT have been consistently shown to be less severe than the head-on tests that were successfully conducted.

Based on test results, the modified MELT terminal as described in the TTI test report may be used on the NHS as a TL-2 W-beam guardrail anchor when anticipated impact speeds are not expected to exceed 70km/h and when such use is acceptable to the contracting agency.

As with all gating, non-energy absorbing w-beam terminals, the MELT does not absorb significant crash energy when struck end-on. In test 2-31, the pickup truck traveled 34.3 m (112 feet) behind the guardrail before coming to a stop on top of the w-beam rail. Therefore, a non-energy absorbing terminal should be used only in locations where, for shallow-angle (i.e., essentially end-on) impacts, a reasonable recovery area exists behind and essentially parallel to the barrier. If no such area is available, then a buried-in-backslope terminal or an energy-absorbing terminal would be a more appropriate design choice. In spite of this limitation, the TL-2 MELT should find widespread applications along lower-speeds roads and streets throughout the country. I very much appreciate the initiative taken by the NETC to fund the testing needed to certify the MELT as an NCHRP Report 350 TL-2 design.

Sincerely yours,

/***Original signed by***/

John R. Baxter, P.E.
Director, Office of Safety Design
Office of Safety