April 2, 1999

Refer to: HMHS-CC56A

Mr. Darryl E. Durgin
Deputy Commissioner
Minnesota Department of Transportation
Transportation Building
395 John Ireland Boulevard
Saint Paul, Minnesota 55155-1899

Dear Mr. Durgin:

In my December 24, 1998, letter, you were advised that the Federal Highway Administration accepted Minnesota's Eccentric Loader Terminal (ELT) as a National Cooperative Highway Research Program (NCHRP) Report 350 guardrail terminal at Test Level 3, with some restrictions based on our review of the full-scale tests that were conducted at the Texas Transportation Institute. On February 5, 1999, in a letter addressed to Mr. Henry H. Rentz, you requested clarification on two of our stated concerns.

Your first question was in response to FHWA's recommendation that a minimum length of 45 m is needed from the end of the ELT to any fixed object or other hazardous feature located immediately behind the barrier proper. You asked where this distance is to be measured from and whether or not it would include the transition section to a rigid bridge railing. Our intent was to measure from the nose of the terminal as you have interpreted. If the transition design you use has the same height as the approach guardrail, the transition length may be included. However, an approach guardrail only 45 m long is unlikely to meet the American Association of State Highway and Transportation Officials Roadside Design Guide criteria for length of need on a high-speed roadway with even moderate traffic volume. Furthermore, in the crash test you ran, the vehicle stopped in 45 m only because it was dissipating energy as it rode on top of the guardrail. Tests with other acceptable nonenergy absorbing designs typically result in the vehicle traveling almost twice this distance behind and immediately adjacent to the barrier. We believe, therefore, that the likely post-crash vehicle trajectory following a high speed end-on hit is a factor that should be taken into consideration when selecting a terminal for use at a specific site.

Your second concern was our recommendation that the ELT be installed in strong soil only. This recommendation was again based on our review of the testing that was done by TTI. While we can agree that the soil type may make little difference in the end-on test, we remain concerned that installation in a very weak soil may result in tearing of the rail when it is struck

on the side near the terminal. You will recall that the w-beam almost failed in tension in test 3-35. Historically, terminals and guardrails have been tested in strong soil, but actually used in a wide range of soil types and conditions. It can be expected that the ELT will be (and has been) used in soils that do not fully match a strong soil as defined in the NCHRP Report 350. We emphasized using this terminal in a strong soil to preclude its use in very weak soils. Consequently, we can agree that it will be acceptable to install the ELT in most of the soil types found in Minnesota, with the exception of a weak soil as defined in Appendix B, Part 2 of the NCHRP Report 350.

Should you have any additional questions, please do not hesitate to call Mr. Richard Powers of my staff at (202) 366-1320.

Sincerely yours,

(original signed by Dwight A. Horne)

Dwight A. Horne
Director, Office of Highway Safety Infrastructure