



U.S. Department
of Transportation

**Federal Highway
Administration**

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

APR 2 1997

Refer to: HNG-14

Mr. Kaddo Kothmann
President
Road Systems, Inc.
P.O. Box 2163
Big Spring, Texas 79721

Dear Mr. Kothmann:

Your March 4 letter to Mr. Gerald L. Eller provided the Federal Highway Administration (FHWA) information on the design and the crash-test performance of a new w-beam guardrail terminal named the Sequential Kinking Terminal (SKT-350). The design and performance details were contained in a March 1997 report from Southwest Research Institute entitled "Full-Scale Crash Evaluation of a Sequential Kinking Terminal (SKT-350)."

The SKT-350 is 15.2 m long and can be installed parallel to the roadway or with a 50:1 flare. Its major components include a 3.81-m w-beam rail section (modified by punching three 102-mm x 12.6-mm long slots in the "valley" of the rail and centered at 267 mm, 546 mm, and 825 mm from the upstream end of the rail), an impact head assembly, a guide tube and guide rail assembly, and a breakaway cable anchorage assembly. Details for each of these components are included in Enclosure 1, drawings SKT-1 through SKT-5.

When the SKT-350 is struck head-on the impact head is forced rearward, bending the w-beam rail against the deflector plate, which, in conjunction with a "kinker" beam in the head, causes short segments of rail to kink sequentially, and bend away from the impacting vehicle. For hits at and downstream from post 3 (the beginning of the length of need), the cable attachment transmits the tensile forces in the rail to the anchorage system to contain and redirect the impacting vehicle.

The National Cooperative Highway Research Program (NCHRP) Report 350 recommends up to seven crash tests to determine the adequacy of a traffic barrier terminal/crash cushion at test level 3 (TL-3).

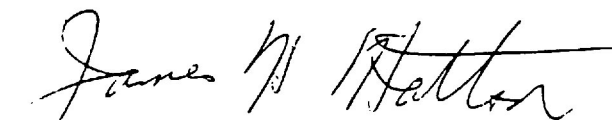
Enclosure 2 is a summary of the results of the tests actually run on the SKT-350. We have noted that tests 3-34 and 3-39 were not run. Test 3-34 is a 100-km/h, 15-degree impact with an 820-kg car at the "critical impact point," which is approximately mid-way between the end of the terminal and the beginning of the length of need, i.e., at post number 2 for the SKT-350.

Test 3-39 is a 100-km/h, 20-degree impact with a 2000-kg pickup truck at the mid-point of the terminal in a reverse direction. You stated that both tests were run previously on the ET-2000 and/or BEST terminals and that, because of the similarity of the three designs at the impact points specified for tests 3-34 and 3-39, these tests would be redundant, and hence, unnecessary for certification of the SKT-350. After reviewing the earlier tests and the details of the SKT-350 design, we agree that tests 3-34 and 3-39 are not needed. However, we note that in the reverse direction tests (test 3-39), with both the ET-2000 and the BEST, the impact heads were dislodged from the w-beam rail and were propelled approximately 60 m downstream on a line that was approximately the same as that of the barrier installation. Under some site and roadway alignment conditions this head could become a hazard to other motorists. We assume that the SKT-350 head will act the same and that users will be advised accordingly.

Based on our analysis of the information you provided, we conclude that the SKT-350 terminal meets the appropriate evaluation criteria contained in the NCHRP Report 350 and may be considered acceptable for use on projects on the National Highway System (NHS) when selected by a State highway agency. In addition to the design tested, we also agree that the post/foundation tube combinations shown in Enclosure 3 are acceptable for use with the SKT-350 without additional testing.

Since your product is proprietary, 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. If you have any questions, please call Mr. James Hatton at (202) 366-1329 or Mr. Richard Powers at (202) 399-1320.

Sincerely yours,



For Dwight A. Horne, Chief
Federal-Aid and Design Division

3 Enclosures