

February 1, 2002

HSA-10/CC-69A

**Mr. Kaddo Kothmann
President, Road Systems, Inc.
3616 Howard County Airport Road
Big Spring, TX 79720**

Dear Mr. Kothmann:

Mr. Frederick G. Wright's November 9, 2000 letter to you formally accepted your Burster Energy Absorbing Terminal (BEAT) as an NCHRP Report 350 terminal for a standard roadside box-beam guardrail, but suggested additional tests be run to verify crashworthy performance when used as a terminal for a box-beam median barrier. In a December 20, 2001 letter to Mr. Wright, you provided information on the results of these additional tests and requested FHWA acceptance of your BEAT Median Barrier Terminal (BEAT-MT).

The BEAT-MT is identical to the roadside design with the following exceptions:

- A Stage 2 energy absorbing tube was added**
- A transition from the Stage 2 tube to the standard box-beam tubular rail element for a median barrier was added**
- Three additional posts were added to support the Stage 2 tube**
- A modified post-to-rail connection design was used for all support posts, including the standard line posts**

In the BEAT roadside terminal, the standard TS 152 mm x 152 mm x 4.8 mm box-beam rail section serves as the Stage 2 energy absorbing tube. However, the mandrel in the BEAT-MT will not work with the larger TS 203 mm x 152 mm x 6.4 mm rail element used in the median box-beam. Thus, a 5.5-m long TS 152 mm x 152 mm x 4.8 mm rail section and a transition section was added to the BEAT-MT as the Stage 2 energy absorbing tube, making its total length 9.8 m. Lastly, in lieu of the standard beam to post support paddles, the rail was attached to all support posts with 10-mm thick bent steel plates fastened to each post with two 19-mm diameter A307 bolts. The rail was then attached to the support angles with 11.1-mm diameter A307 through bolts, 190-mm long. This final design modification was critical in preventing the rail element from dropping too rapidly in the redirection impact and allowing vehicular penetration behind the barrier.

The two additional tests that you conducted were NCHRP Report 350 tests 3-32 and 3-35. Test 3-32 was an 820-kg car impacting the nose of the BEAT-MB at a nominal speed and angle of 100 km/h and 15 degrees, respectively. In this test, the car burst approximately 2 m of the terminal before yawing counterclockwise and coming to rest upright 19.4 m downstream from the point of initial contact and 4.4 m behind the barrier installation. The longitudinal occupant impact velocity was 10.3 m/s and the 10-millisecond ridedown acceleration was 10.1 g's. Test 3-35 was a 2000-kg

pickup truck impacting at the beginning of the barrier length of need. This point was selected to be at post no. 3 which is located 4.4 m downstream from the first post of the BEAT-MT. The vehicle was contained and redirected with an extremely low occupant impact velocity of 3 m/s and a maximum 10-millesecond ridedown acceleration of 7.4 g's.

Based on the results of these new tests and earlier testing done on the roadside BEAT, the BEAT-MB, as described above, may be considered an NCHRP Report 350 box-beam median barrier terminal at test level 3. Consequently, it may be used on the National Highway System (NHS) when such use is acceptable to the contracting authority. Since it is a proprietary product, its use on Federal-aid projects, except exempt non-NHS projects, is subject to the provisions in Title 23, Code of Federal Regulations, Section 635.411, a copy of which is enclosed for your ready reference.

Sincerely yours,

(original signed by Michael L. Halladay)

**Michael L. Halladay
Acting Program Manager, Safety**

Enclosure

Sec. 635.411 Material or product selection.

(a) Federal funds shall not participate, directly or indirectly, in payment for any premium or royalty on any patented or proprietary material, specification, or process specifically set forth in the plans and specifications for a project, unless:

(1) Such patented or proprietary item is purchased or obtained through competitive bidding with equally suitable unpatented items; or

(2) The State highway agency certifies either that such patented or proprietary item is essential for synchronization with existing highway facilities, or that no equally suitable alternate exists; or

(3) Such patented or proprietary item is used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes.

(b) When there is available for purchase more than one nonpatented, nonproprietary material, semifinished or finished article or product that will fulfill the requirements for an item of work of a project and these available materials or products are judged to be of satisfactory quality and equally acceptable on the basis of engineering analysis and the anticipated prices for the related item(s) of work are estimated to be approximately the same, the PS&E for the project shall either contain or include by reference the specifications for each such material or product that is considered acceptable for incorporation in the work. If the State highway agency wishes to substitute some other acceptable material or product for the material or product designated by the successful bidder or bid as the lowest alternate, and such substitution results in an increase in costs, there will not be Federal-aid participation in any increase in costs.

(c) A State highway agency may require a specific material or product when there are other acceptable materials and products, when such specific choice is approved by the Division Administrator as being in the public interest. When the Division Administrator's approval is not obtained, the item will be nonparticipating unless bidding procedures are used that establish the unit price of each acceptable alternative. In this case Federal-aid participation will be based on the lowest price so established.

(d) Appendix A sets forth the FHWA requirements regarding (1) the specification of alternative types of culvert pipes, and (2) the number and types of such alternatives which must be set forth in the specifications for various types of drainage installations.

(e) Reference in specifications and on plans to single trade name materials will not be approved on Federal-aid contracts.