U.S. Department
of Transportation
Federal Highway
Administration

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

November 9, 2000

Refer to: HSA-1\HSA-CC69

Mr. Kaddo Kothmann
President, Road Systems, Inc.
1507 East Fourth Street
Big Spring, TX 79720

Dear Mr. Kothmann:

In your September 20 letter, you provided information on a proprietary box-beam guardrail terminal called the Bursting Energy Absorbing Terminal (BEAT) and requested that this terminal be formally accepted as a National Cooperative Highway Research Program (NCHRP) Report 350 terminal at test level 3 (TL-3). To support your request, you also sent a copy of the September 22, 2000, test report prepared by the Midwest Roadside Safety Facility (MwRSF) entitled "Crash Testing of Box-Beam Bursting Energy Absorbing Terminal (BEAT)" and a video tape of the tests that were run. After reviewing these materials, Mr. Richard Powers of my staff requested additional information from Dr. Dean Sicking which he received in a letter dated October 16.

The roadside BEAT is approximately 4.3 m (14-feet) long from its nose to the beginning of the standard box-beam guardrail. Its primary components include an impact head, a 3.7-m (12-foot) long section of 152mm x 152mm x 3.2mm (6 inch x 6 inch x 1/8 inch) box-beam rail, and a steel breakaway end post and cable anchor system. The impact head includes a steel mandrel which causes the box beam rail section to split at the corners and peel back as the head is pushed backwards in an end-on impact. These and other details are shown in Enclosure 1. The BEAT may be installed parallel to the roadway or offset from traffic on a 50:1 flare rate.

Three successful tests were run on the BEAT and these are summarized in Enclosure 2. Based on the results of the strength test (test 3-35), the length of need of this gating, redirective terminal is approximately 380-mm (15 inches) upstream from post number 3, or approximately 4800 mm (15.75 feet) from the nose of the BEAT. The supplemental information provided by Dr. Sicking enabled us to agree that the minor changes made to the impact head following an unsuccessful test with the pickup truck would not significantly change the results of test 3-30 which was run earlier with the 820-kg car. Based on the similarities between the BEAT and the previously-accepted WYBET box-beam terminal, you concluded that Report 350 tests 3-32, 3-33, 3-34, and 3-39 did not need to be run on the BEAT. We concur that these tests may be waived for the roadside BEAT. However, it is likely that test 3-32 and test 3-35 will need to be run on the median barrier BEAT design.

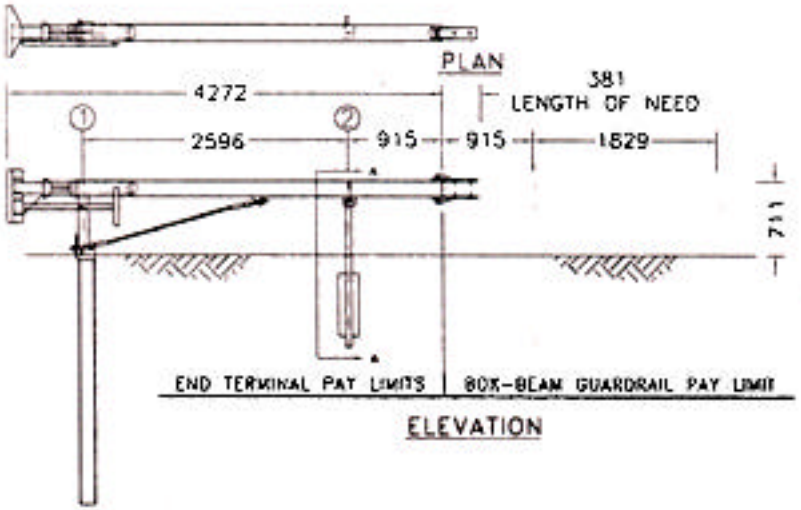
The roadside BEAT may be considered a TL-3 terminal for box-beam guardrail and used on the National Highway System (NHS) when such use is requested by the contracting agency. Since it is a proprietary product, its use on the federal-aid projects, except exempt non-NHS projects is

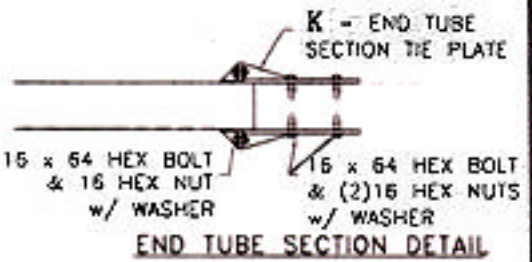
subject to the conditions in Title 23, Code of Federal Regulations, Section 635.411. As requested by Dr. Sicking in his October 16 correspondence, this acceptance is for the roadside BEAT only. The acceptability of the median barrier BEAT design remains under review and will be addressed in a separate letter.

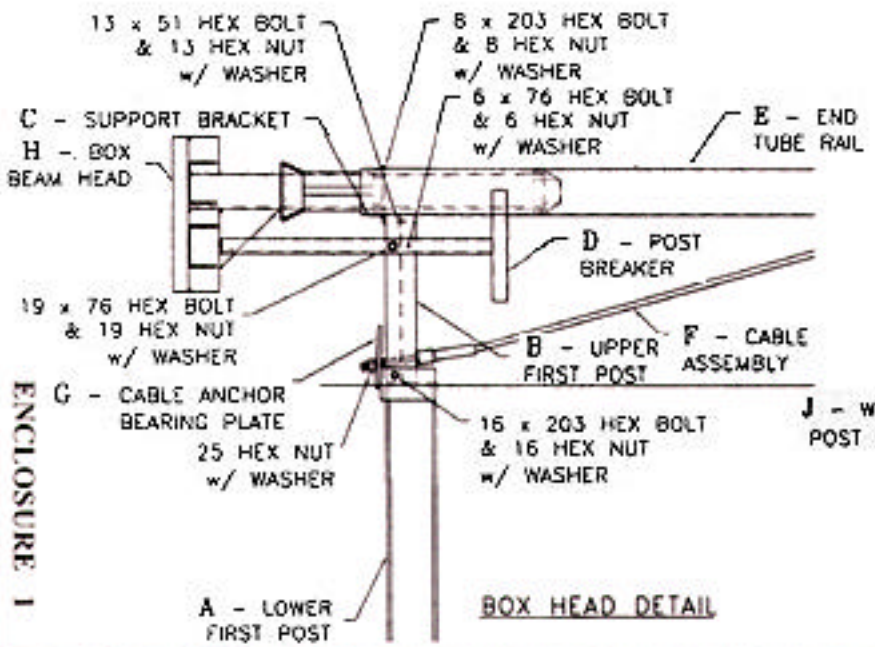
Sincerely yours,

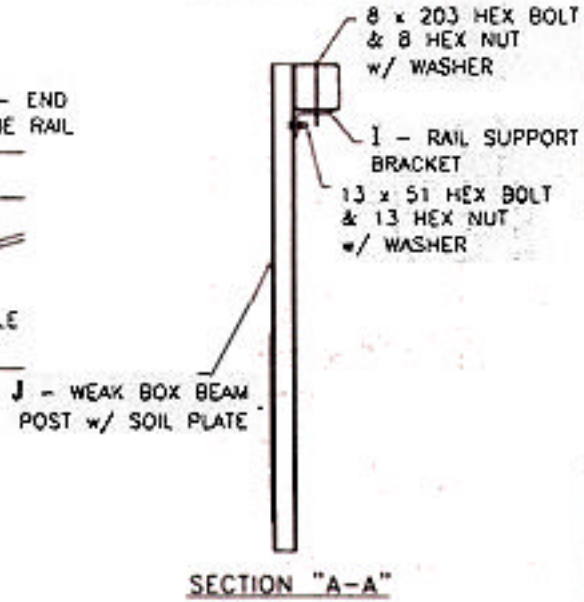
Frederick G. Wright, Jr.
Program Manager, Safety

2 Enclosures









ITEM	QTY	DESCRIPTION
A	1	LOWER FIRST POST W152x37.2 x 2,438 LG
B	1	UPPER FIRST POST W152X13.4 X 552 LG
C	1	SUPPORT BRACKET 10 GAGE BENT PLATE
D	1	POST BREAKER
E	1	END TUBE RAIL TS152x152x3 x 3,658 LG
F	1	CABLE ASSEMBLY
G	1	BEARING PLATE
H	1	BOX BEAM HEAD
I	1	RAIL SUPPORT BRACKET L127x89x3 x 114 LG
J	1	WEAK BOX BEAM POST w/ SOIL PLATE
K	2	END TUBE SECTION TIE PLATE
		HARDWARE
	2	8 x 203 LG. GRADE 5 BOLT
	1	6 x 76 LG. GRADE 2 BOLT
	2	13 x 51 LG. GRADE 5 BOLT
	8	16 x 64 LG. GRADE 5 BOLT
	1	16 x 203 LG. GRADE 5 BOLT
	1	19 x 76 LG. GRADE 5 BOLT
	2	8 HEX NUT
	1	6 HEX NUT
	2	13 HEX NUT
	13	16 HEX NUT
	1	19 HEX NUT
	2	25 ANCHOR CABLE HEX NUT
	2	8 WASHER
	1	6 WASHER
	2	13 WASHER
	9	16 WASHER
	1	19 WASHER
	2	25 ANCHOR CABLE WASHER

ENCLOSURE 1

RSI
Road Systems, Inc.

BEAT Box-Beam Terminal Layout

Scale	Date	Sheet
NONE	09-11-00	BEAT-1
Drawn by: SML	Drawing Number: F00002P4	

TABLE 1. SUMMARY OF CRASH TEST RESULTS

Test No.	Test Designation and Description	Actual Impact Conditions		Occupant Risk				Comments	Assessment
		Speed (km/h)	Angle (Deg.)	OIV (m/s)		RA (g's)			
				Long.	Lat.	Long.	Lat.		
BB-1	Test 3-35 - Pickup truck redirection.	100.6 (62.7 mph)	27.5	4.7	4.2	-6.1	8.8	Maximum deflection = 1.97 m (6.45 ft). Length of contact = 13.1m (43 ft). Wet soil condition. Evidence of soil failure at end post.	**PASS**
BB-2	Test 3-30 - Small car end-on.	99.2 (61.8 mph)	1.65	10.8	0.74	-13.8	6.4	Impact angle 1.65 degrees and offset of vehicle increased by 100 mm (4 in.) from 387 mm (15-1/4 in.) to 487 mm (19-1/4 in.) Vehicle yawed a total of 300 degrees. Stage 1 tube bursted for a length of 1.85 m (73 in.)	**PASS**
BB-3	Test 3-31 - Pickup truck end-on.	102.6 (63.7 mph)	3.5	8.3	0.7	-20.5	11.9	Stage 1 tube was completely bursted, but bursting process did not continue with stage 2 tube, resulting in excessively high ridedown acceleration of 20.5 g's.	**FAIL**
BB-4	Test 3-31 - Pickup truck end-on.	98.3 (61.2 mph)	2.7	7.4	0.15	-9.2	3.2	Repeat of test BB-3 after design modifications to the impact head. Stage 1 tube was completely bursted and stage 2 tube bursted for a length of 1.45 m (57 in.)	**PASS**