May 21, 1999 Refer to: HMHS-CC46B

Mr. Kaddo Kothmann
President, Road Systems, Inc.
1507 E. 4th
P.O. Box 2163
Big Spring, Texas 79721

Dear Mr. Kothmann:

In your April 8 letter to Mr. Henry Rentz, which was forwarded to me for action, you requested the Federal Highway Administration to accept a modified version of your FLEAT guardrail terminal as meeting the test level 2 (TL-2) evaluation criteria contained in the National Cooperative Highway Research Program (NCHRP) Report 350. To support your request, you included a copy of a January 30, 1999 report prepared by the Midwest Roadside Safety Facility, entitled "FULL-SCALE CRASH EVALUATION OF A TL-2 FLARED ENERGY ABSORBING TERMINAL (FLEAT-TL2)" and a video tape of the additional test that was run to verify acceptable performance of the modified design.

As noted in your letter and in the test report, the FHWA has previously accepted the 11.4-m long TL-3 FLEAT with permissible end offsets from 762 mm to 1219 mm. The modified or TL-2 FLEAT is only 7.62-m long, but with the same flare rates as the TL-3 design. Thus, the end off sets for the TL-2 FLEAT will range from 508 mm to 813 mm. The TL-2 FLEAT uses two fewer CRT posts (three vs. five) than the TL-3 design. Line posts may be either steel posts with timber or recycled blocks, or wood posts and blocks, since the system was tested with the more critical steel line posts. Design details for the TL-2 FLEAT are shown in Enclosure 1. After analyzing the results of tests conducted at 100 k/hr on the TL-3 designs with either the full 1219 mm offset or with the reduced 762 mm offset, you concluded that NCHRP Report 350 tests 2-30, 2-31, 2-34, and 2-39 need not be conducted at the reduced impact speed of 70 k/hr. We concur. Test 2-35 was run and is described in the above-referenced report. Appropriate evaluation criteria were met. A summary of that test is shown in Enclosure 2.

Based on our review of the information you provided, we find the TL-2 FLEAT acceptable for use on the National Highway System (NHS) when such use is requested by a transportation agency. This acceptance assumes that the modified FLEAT will be installed as tested and at locations where anticipated impact speeds will not exceed 70 k/hr. Because it remains a proprietary device, its use on Federal-aid projects, except exempt, non-NHS projects, is subject to the conditions listed in Title 23, Code of Federal Regulations, Section 635.411.

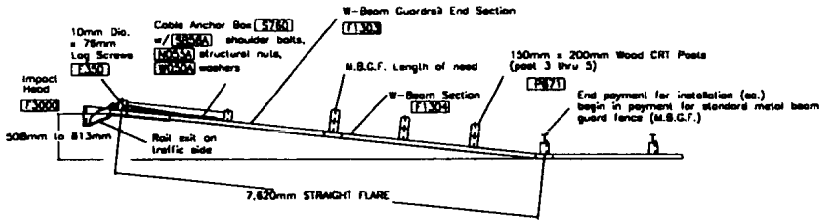
Sincerely yours,

(original signed by Dwight A. Horne)

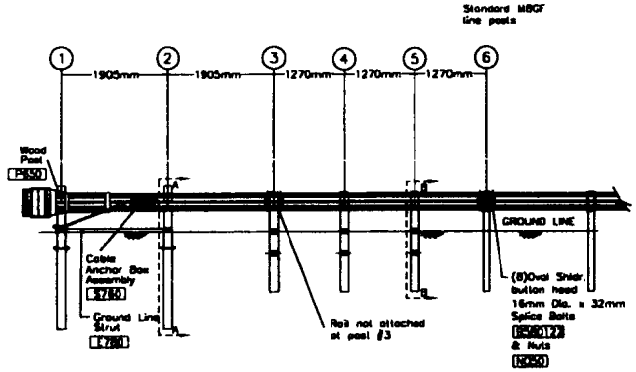
Dwight A. Horne

Director, Office of Highway Safety Infrastructure

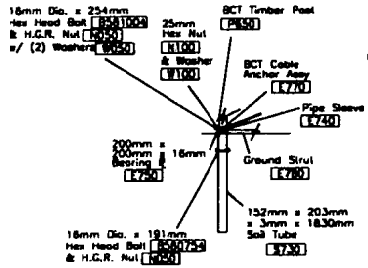
2 Enclosures



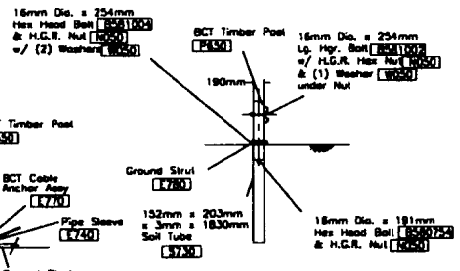
PLAN



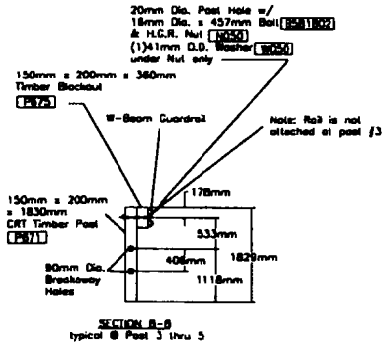
ELEVATION



PARTIAL VIEW OF POST 1

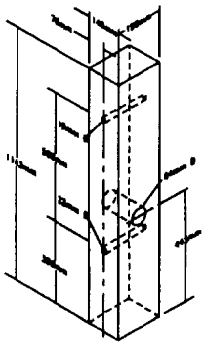


SECTION A-A at Post #2

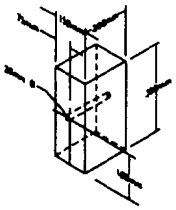


SECTION B-B typical @ Post 3 thru 5

All measurements should be taken from bottom of post



POSTS 1 & 2

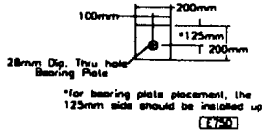


TIMBER BLOCKOUT

GENERAL NOTES
1. Wood posts are required with the FLEAT.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The soil tubes shall not protrude more than 100mm above ground (measured along a 1500mm cord). Site grading may be necessary to meet this requirement.
4. The soil tubes may be driven with an approved driving head. Soil tubes should not be driven with the wood post in the tube. If the tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent settlement.
5. When rock is encountered during excavation, a 300mm Dia. post hole, 500mm deep may be used if approved by the engineer. Granular material will be placed in the bottom of the hole approx. 85mm deep to provide drainage. The soil tubes will be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
6. The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.
7. The wood blockouts should be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.

ITEM #	QTY	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA.
F1304	1	W-BEAM GUARDRAIL CENTER SECTION, 12 GA.
S730	2	*FOUNDATION SOIL TUBE, 152mm x 203mm x 1830mm
E740	1	PIPE SLEEVE
E750	1	BEARING PLATE, 200mm x 200mm x 16mm
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
E780	1	GROUND STRUT
P650	2	140mm x 190mm x 1143mm WOOD POSTS
P671	3	150mm x 200mm x 1830mm WOOD CRT POST
P675	3	150mm x 200mm x 360mm TIMBER BLOCKOUT
		HARDWARE
B580122	16	16mm Dia. x 32mm SPLICE BOLT
B580754	2	16mm Dia. x 191mm HEX BOLT
B581004	2	16mm Dia. x 254mm HEX BOLT
B581002	1	16mm Dia. x 254mm H.G.R. BOLT (POST 2 ONLY)
B581802	3	16mm Dia. x 457mm H.G.R. BOLT (POST 3 THRU 7)
N050	24	16mm Dia. H.G.R. NUT (SPLICE 24, SOIL TUBES 2, STRUT 2, POST 2, 1; POST 3 THRU 7, 5.)
W050	8	H.G.R. WASHER
N100	2	25mm ANCHOR CABLE HEX NUT
W100	2	25mm ANCHOR CABLE WASHER
E350	2	10mm x 76mm LAG SCREW
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLTS
N055A	8	13mm A325 STRUCTURAL NUT
W050A	16	27mm OD X 14mm ID A325 STR. WASHER

Foundation Tube Options For Posts 1 & 2
- *1829mm Split Foundation Tubes S730
- *1829mm Solid Foundation Tubes E731
- *1524mm Foundation Tubes S735 W/Soil Plates SP600
- *1372mm Foundation Tubes E735 W/Soil Plates SP600



*for bearing plate placement, the 125mm side should be installed up

E750

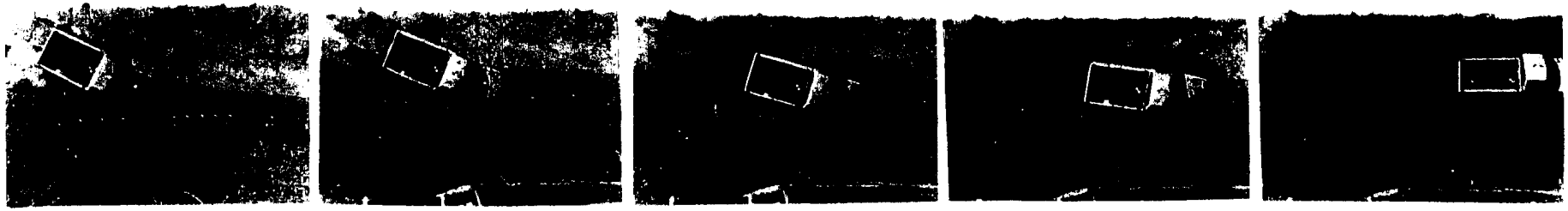
Bearing Plate

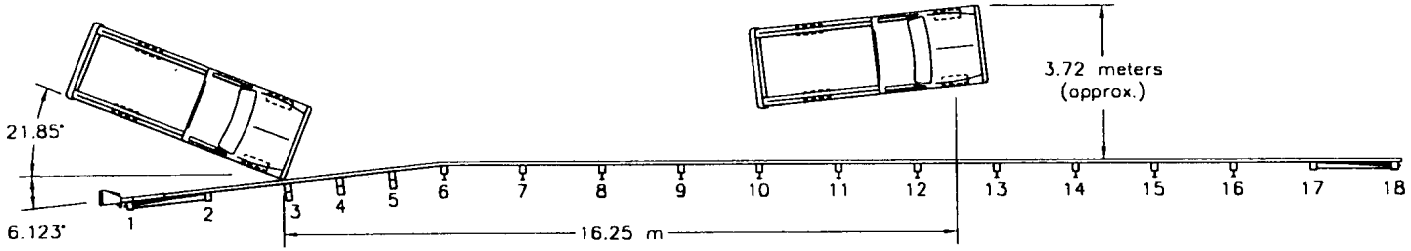
FLared Energy Absorbing Terminal
FLEAT TL-2
508 to 813mm Offset

DRAWN/REVISED BY	DATE REVISED	DWG NO.	PG	OF
JRR/JRR	05/03/99	FLT-M	1	1

ROAD SYSTEMS INC.
BIG SPRING, TX
(915)-263-2435 or (815)-464-5917

ENCLOSURE (1)





Test Number	FLEAT-4
NCHRP 350 Test Designation	2-35
Date	12/15/98
Installation	**FL**ared **E**nergy **A**bsorbing **T**erminal
System length	30.5 m
Head Dimensions (LxWxH)	1557 mm x 356 mm x 490 mm
Face Angle	6.0 degrees
Flare Details	
Length	7.62 m
Offset	0.81 m
Angle	6.123 degrees
Guardrail	12-gauge W-beam
End Terminal Posts	
Numbers 1-2	BCT timber posts 140x190x1080 long in foundation tubes with groundline strut
Numbers 3-5	CRT timber posts 150x200x1830 long
Number 6	W150x13.5 steel posts, 1830 long
Vehicle Model	1992 Chevy 2500 ¾-Ton Pickup
Vehicle Weight	
Curb	2061 kg
Test Inertia	2034 kg
Gross Static	2034 kg

Speed	
Impact	71.7 km/h
Exit	N.A.
Angle	
Impact	21.9 deg (to tangent)
Exit	N.A.
Occupant Impact Velocity	
Longitudinal	3.93 m/s
Lateral	3.10 m/s
Occupant Ridedown Deceleration	
Longitudinal	6.9 g's
Lateral	5.3 g's
Vehicle Damage	
TAD	1-FR-1
VDI	01FREE1
Vehicle Rebound Distance	3.72 meters (approx.)

Conversion Factors: 1 in.= 2.54 cm; 1 lb= 0.454 kg

Figure 10. Summary of Test FLEAT-4.

ENCLOSURE (2)