U.S. Department of Transportation
Federal Highway Administration

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

April 3, 2006

In Reply Refer To: HSA-10/B-137B

Mr. Bill Neusch
President
Gibraltar
320 Southland Road
Burnet, Texas 78611

Dear Mr. Neusch:

In your March 2, 2006, letter to Mr. Richard Powers of my staff, you provided summary information on two additional tests you ran on your test level 4 (TL-4) Gibraltar cable barrier system and requested the Federal Highway Administration's (FHWA) acknowledgment and acceptance of the test results. On March 9, 2006, you sent him complete copies of the January 6, 2006, reports prepared by Karco Engineering, LLC (Test Report Nos. TR-P26021-01-A and TR-P26028-01-B) and digital videos that documented the results of these tests. Both tests were run on your TL-4 design in which the cables are 20, 30, and 39 inches above the ground. The support posts were C-posts 3.25 inches by 2.5 inches by 0.15 inches by 4.9-feet long. Each post was set in a 15-inch deep socket placed in a 42-inch deep by 12-inch diameter reinforced concrete footing. The shape and the dimensions of the steel "hairpin" and lock plate that hold the cables in place were slightly modified from your earlier design and are shown in Enclosure 1. For both tests, the total installation length was 305 feet and the cables were tensioned to 5700 pounds.

For the first test, the line posts were set on 10-foot centers and the reported dynamic deflection was 6.8 feet. For the second test, the posts were spaced on 30-foot centers, resulting in 9.3 feet of deflection. The summary sheets for both of these tests are shown as Enclosure 2. I concur with the test agency's assessment that both tests met the appropriate evaluation criteria for National Cooperative Highway Research Program Report 350 test 3-11, and either design may be used on the National Highway System when such use is acceptable to the contracting agency. In your March 29, 2006, follow-up letter, you requested confirmation that either 6.25-foot long posts (for TL-3) or 7-foot long C-posts (for TL-4), driven directly into the soil to a depth of 42-inches, could be used as an alternative to the tested socketed posts. Since the longer posts were successfully used in the June 20, 2005, TL-3 test referenced below and in your earlier TL-4 test, I agree that either the driven or the socketed post design may be used.

Based on a straight-line interpolation of the dynamic deflection distances noted above, you also requested FHWA concurrence in assumed deflections based on intermediate post spacings, i.e., post spacings *between* 10 feet and 30 feet. In reviewing our earlier acceptance letters for the

Gibraltar system, we noted that for your original TL-3 design with a 15-foot post spacing, the reported dynamic deflection was approximately 8.5 feet. A test conducted for you by Karco on June 20, 2005, on a slightly modified design resulted in a reduced dynamic deflection of 7.75 feet. Because both test installations were shorter in those tests (only 200 feet) and the tension in the cables was less (4800 lbs.), a direct comparison with your two recent tests cannot be made. However, the predicted deflections based on a straight-line interpolation between the 10- and 30-foot post spacing deflections appear reasonable. Thus, with your TL-4 design, the assumed deflections with a 12-foot post spacing would be approximately 7 feet, those with a 20-foot spacing would be approximately 8 feet, and those with a 30-foot spacing would be approximately 9 feet.

As noted in my original acceptance letter B-137, dated June 13, 2005, dynamic deflection distances based on a single standardized test are not precise and represent only an approximation of what is likely to be seen in the field. Many deflections will be less, but some will be significantly greater, depending on actual crash conditions. Assuming test deflections are accurate to the nearest inch and designing a barrier installation accordingly presumes a degree of precision that simply does not exist. To increase the factor of safety afforded the motoring public, the available deflection distance should exceed the design deflection distance for a flexible or semi-flexible barrier system whenever practicable.

Sincerely yours,

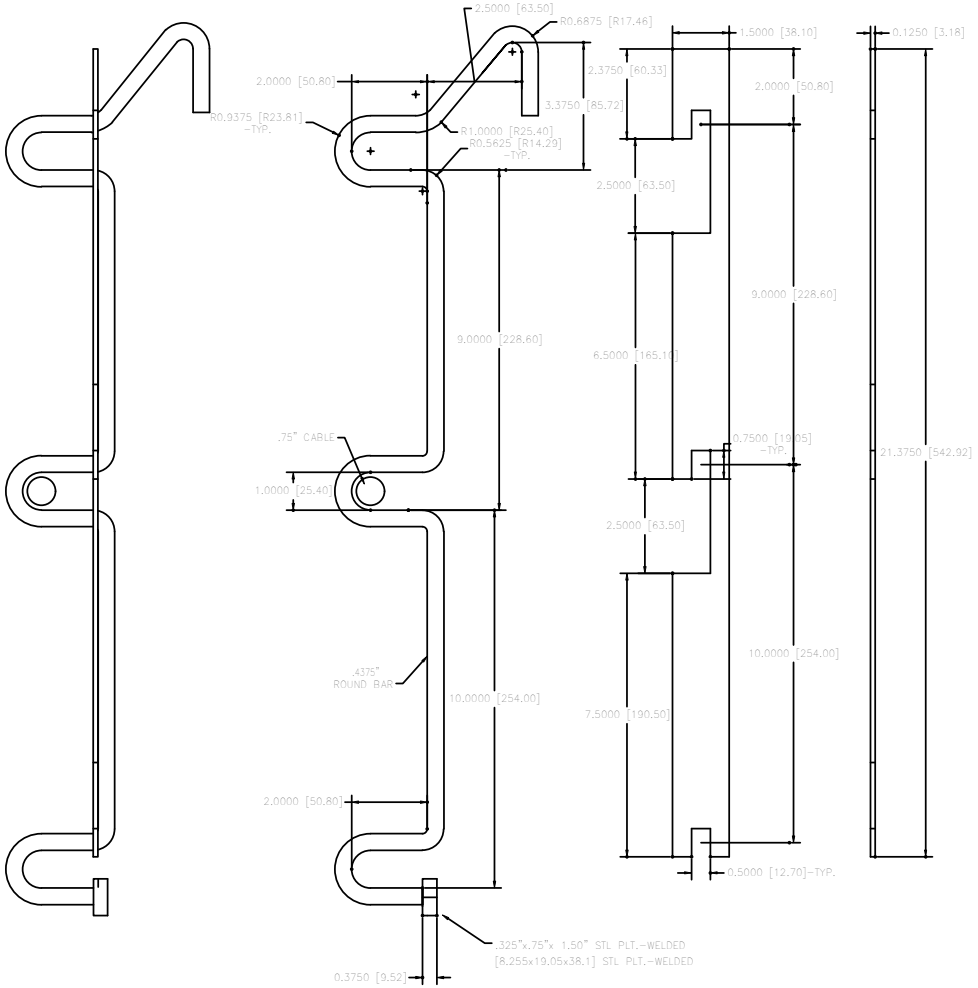
/original signed by/

John R. Baxter, P.E.
Director, Office of Safety Design
Office of Safety

2 Enclosures

PART # 4-L29

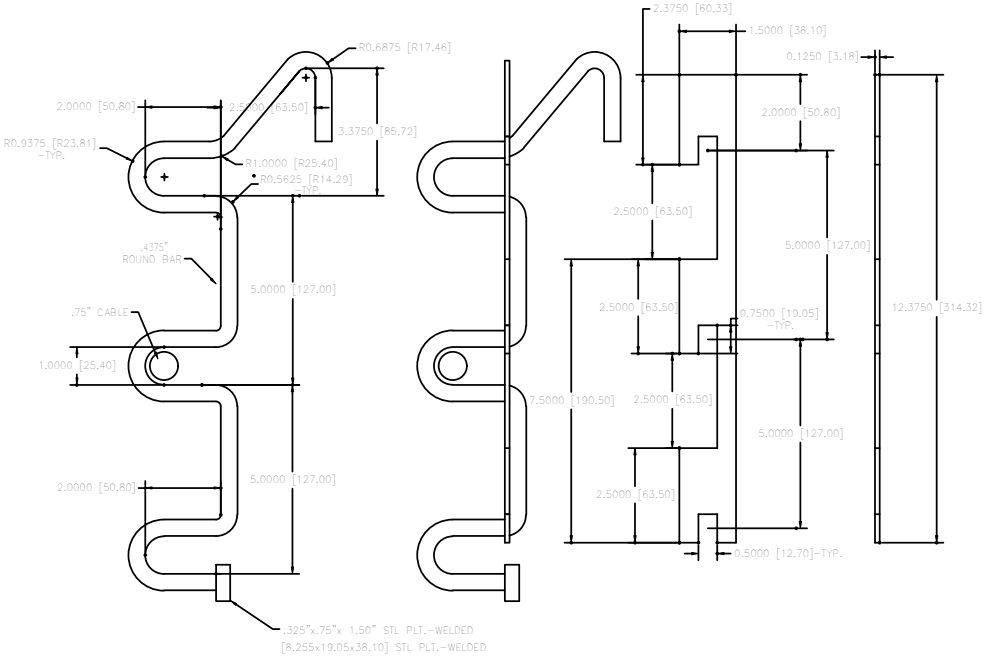
PART # 4-L30



TL-4 HAIRPIN AND LOCKPLATE

PART # 3-L03

PART # 3-L04



TL-3HAIRPIN AND LOCKPLATE

DATA SHEET NO. 4

SUMMARY OF RESULTS FOR TEST NO. 3-11

GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO ENGINEERING	IMPACT VELOCITY (m/sec)	
TEST NO.	3-11	X-DIRECTION	4.0
DATE	01/06/06	Y-DIRECTION	6.8
TEST ARTICLE		THIV (optional)	N/A
TYPE	Gibraltar TL-4 Cable Barrier System	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH (m)	93 m(305 ft)	X-DIRECTION	-2.3
SIZE AND/OR DIMENSION OF KEY ELEMENTS	¾ in 3 X 7 cable on 10 ft post spacings	Y-DIRECTION	-5.3
SOIL TYPE AND CONDITION	CONCRETE	PHD (optional)	N/A
TEST VEHICLE	2000P	ASI (optional)	0.44
TYPE	PRODUCTION	TEST ARTICLE DEFLECTIONS (m)	N/A
DESIGNATION	3-11	DYNAMIC	2 m (6.8 ft)
MODEL	Chevrolet 2500 Pick-Up Truck	PERMANENT	N/A
MASS (CURB)	2138 kg (4712 lbs)	VEHICLE DAMAGE	
MASS (TEST INERTIAL)	2020 kg (4452 lbs)	EXTERIOR	
DUMMY(s) MASS	N/A	VDS	1FR1
GROSS STATIC WEIGHT	2020 kg (4452 lbs)	CDC	01RDEN2
IMPACT CONDITIONS		INTERIOR	
SPEED (km/h)	99.85 km/h (62.06 mph)	OCDI	FS0000000
ANGLE (Deg.)	25		
IMPACT SEVERITY (kJ)	140	POST-IMPACT VEHICULAR BEHAVIOR	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (Deg.)	-33.0
SPEED (km/h)	83.3 km/h @1000 ms	MAXIMUM YAW ANGLE (Deg.)	-12.7
ANGLE (Deg.)	<10	MAXIMUM PITCH ANGLE (Deg.)	2.8

DATA SHEET NO. 4

SUMMARY OF RESULTS FOR TEST NO. 3-11

GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO ENGINEERING	IMPACT VELOCITY (m/sec)	
TEST NO.	3-11	X-DIRECTION	4.0
DATE	01/06/06	Y-DIRECTION	6.8
TEST ARTICLE		THIV (optional)	
TYPE	Gibraltar TL-4 Cable Barrier System	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH (m)	93 m(305 ft)	X-DIRECTION	-2.3
SIZE AND/OR DIMENSION OF KEY ELEMENTS	¾ in 3 X 7 cable on 30 ft post spacings	Y-DIRECTION	-5.3
SOIL TYPE AND CONDITION	CONCRETE	PHD (optional)	
TEST VEHICLE	2000P	ASI (optional)	0.44
TYPE	PRODUCTION	TEST ARTICLE DEFLECTIONS (m)	N/A
DESIGNATION	3-11	DYNAMIC	2.8 m (9.3 ft)
MODEL	Chevrolet 2500 Pick-Up Truck	PERMANENT	N/A
MASS (CURB)	2138 kg (4712 lbs)	VEHICLE DAMAGE	
MASS (TEST INERTIAL)	2020 kg (4452 lbs)	EXTERIOR	
DUMMY(s) MASS		VDS	1FR1
GROSS STATIC WEIGHT	2020 kg (4452 lbs)	CDC	01RDEN2
IMPACT CONDITIONS		INTERIOR	
SPEED (km/h)	101.5 km/h (62.80 mph)	OCDI	FS0000000
ANGLE (Deg.)	25		
IMPACT SEVERITY (kJ)	140	POST IMPACT VEHICULAR BEHAVIOR	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (Deg.)	-33.0
SPEED (km/h)	54.9 km/h @ 1500ms	MAXIMUM YAW ANGLE (Deg.)	-12.7
ANGLE (Deg.)	<10	MAXIMUM PITCH ANGLE (Deg.)	2.8