



U.S. Department
of Transportation
**Federal Highway
Administration**

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

June 23, 2005

In Reply Refer To: HSA-10/CC-92

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

Dear Mr. Neusch:

In your June 7 letter to Mr. Richard Powers of my staff, you requested the Federal Highway Administration's acceptance of a cable barrier terminal designed for use with the Gibraltar Cable Barrier that was acknowledged to be a test level 3 (TL-3) barrier in my June 10 acceptance letter, B-137. With your letter, you submitted copies of crash test reports prepared by Karco Engineering and digital videos that documented the results of the crash tests that were conducted on the new terminal.

Your cable barrier terminal consists of a cable release anchor post and four terminal posts, the first of which is set 6'-3" beyond the anchor post, the second 6'-3" beyond the first, and the third and fourth on 7'-6" centers. These posts are then followed by standard line posts on 15-foot centers. The cable release anchor post is comprised of two HSS 2 x 4 x 3/8 steel posts welded to a 3/4-inch thick steel base plate. This anchor post rests on a 1/2-inch thick base plate that is welded to an HSS 8 x 8 x 3/8 tube, 30-inches long, set in a 6-foot deep x 24-inch diameter reinforced concrete foundation. This anchor post is designed to pry the cable ends out of slots in the base plate when it is struck, thus releasing all cable tension and allowing a vehicle to pass over the terminal with a relatively stable trajectory. All terminal posts are 3.25 x 2.5 C-posts, like the line posts, but the cables are held in place by 3/4-in x 5.5-in long J-bolts rather than the steel hairpins and lock plates used on the line posts. The first terminal post is angled towards the cable release post as show in Enclosure 1 and the first two terminal posts have 1.5-in diameter holes on all four sides at the ground line. All posts beyond the anchor post are set in 42-in deep reinforced concrete footings. We noted that the anchor post design was modified during the testing sequence. Specifically, the original HSS 8 x 8 x 3/8 steel anchor post was replaced with the anchor post described above for tests 3-30 and 3-34 because the larger post lodged under the impacting vehicle in earlier tests, causing the small car to overturn. The original post remained intact in the length-of-need test 3-35 and its release mechanism remained unchanged. Likewise, the larger post yielded satisfactorily in the reverse-direction test 3-39. Thus, I agreed that neither test needed to be conducted again with the smaller anchor post.



The National Cooperative Highway Research Program (NCHRP) Report 350 tests 3-30, 3-32, 3-35, and 3-39 were successfully conducted and the summary results of each are shown in Enclosure 2. We agreed that, upon successful results of tests 3-30 and 3-32, tests 3-31 and 3-33 could be waived for your specific terminal design. Therefore, based on the test results, the Gibraltar Cable Barrier Terminal, as described herein, may be considered an NCHRP Report 350 terminal at TL-3. In test 3-35, the pickup truck impacted the terminal at post 4 and was contained and redirected. Thus, the beginning length of need for the Gibraltar terminal is at the last terminal post, 27.5 feet downstream from the anchor post.

We noted that in test 3-30, the impacting vehicle rolled after exiting the test installation. After reviewing the film, we concluded that the vehicle had regained stability as it rode along the cable and that the rollover was the result of its wheels tripping in the loose soil at the test site rather than instability caused directly by impact into the terminal. However, this result and the post-impact trajectory seen in test 3-32 emphasize the fact that your terminal, like all cable terminals tested to date, has virtually no attenuating capability. Thus, vehicles impacting the end will normally continue a significant distance behind and beyond the barrier and are then likely to encounter non-traversable terrain or other roadside hazards or encroach into opposing traffic lanes when the barrier is used in a median. Designers must take this fact into account when selecting an optimum location for terminals in the field.

Please note also the following standard provisions that apply to the FHWA letters of acceptance:

- Our acceptance is limited to the crashworthiness characteristics of the tested device and does not cover its structural features, durability, or maintenance characteristics.
- Any design or material changes that may adversely affect the crashworthiness of the barrier will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the barrier being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that they will meet the crashworthiness requirements of the FHWA and the NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number CC-92 shall not be reproduced except in full. This letter, and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.
- The Gibraltar Cable Barrier Terminal includes patented components and is considered proprietary. When proprietary devices are *specified by a highway agency* for use on

Federal-aid projects, except exempt, non-NHS projects, they: (a) must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway

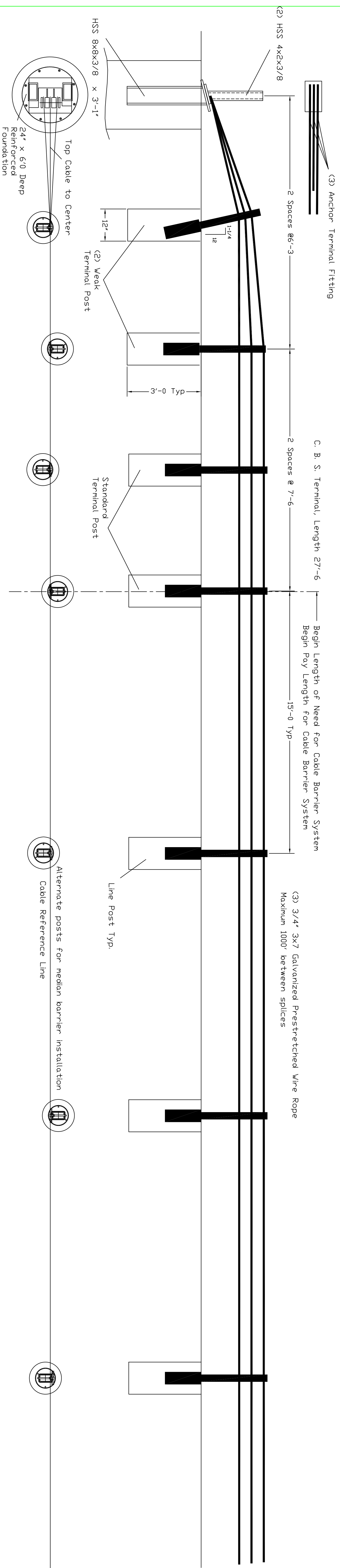
agency must certify that they are essential for synchronization with existing highway facilities or that no equally suitable alternative exists or; (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely yours,

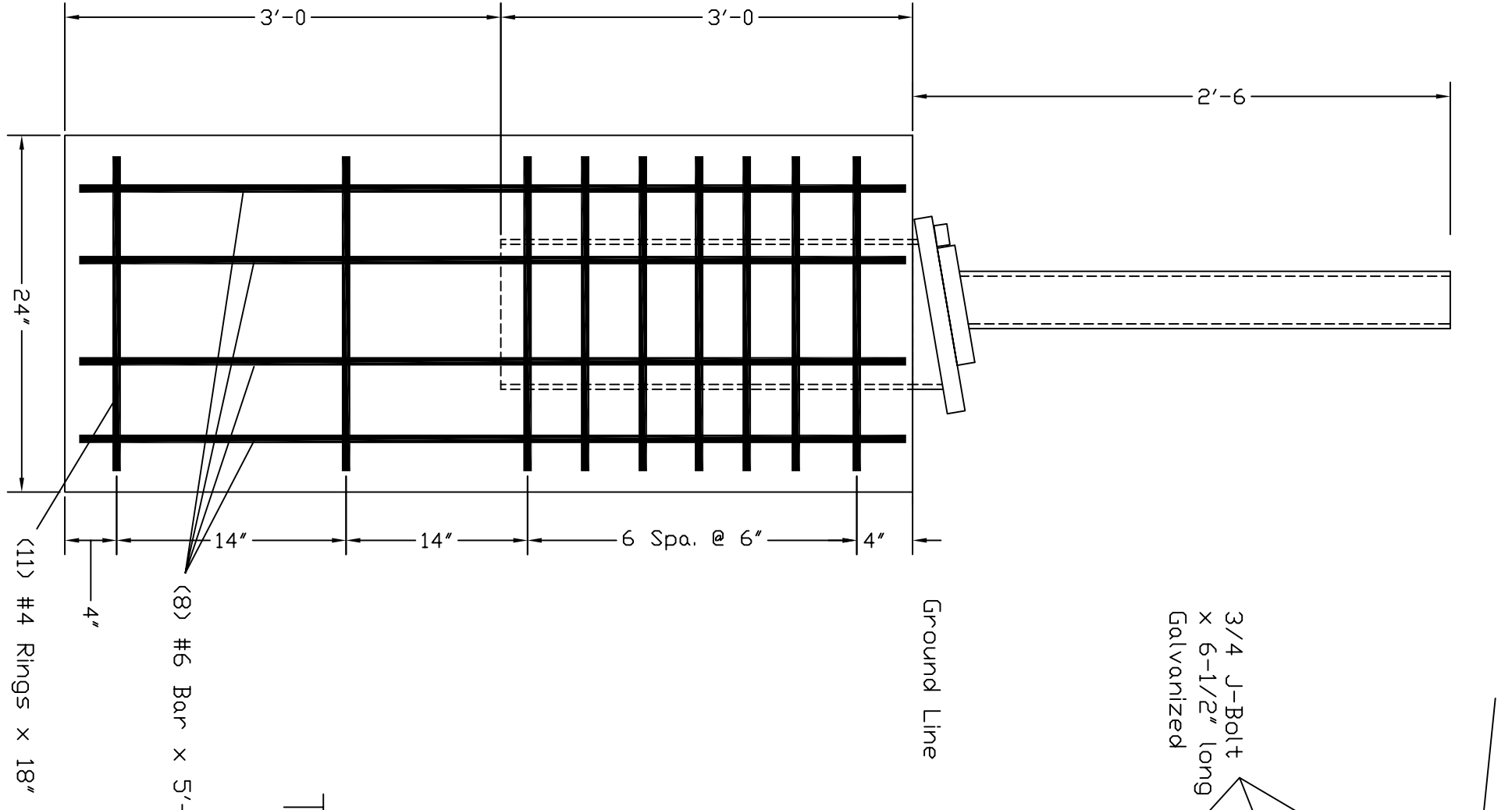
/original signed by/

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

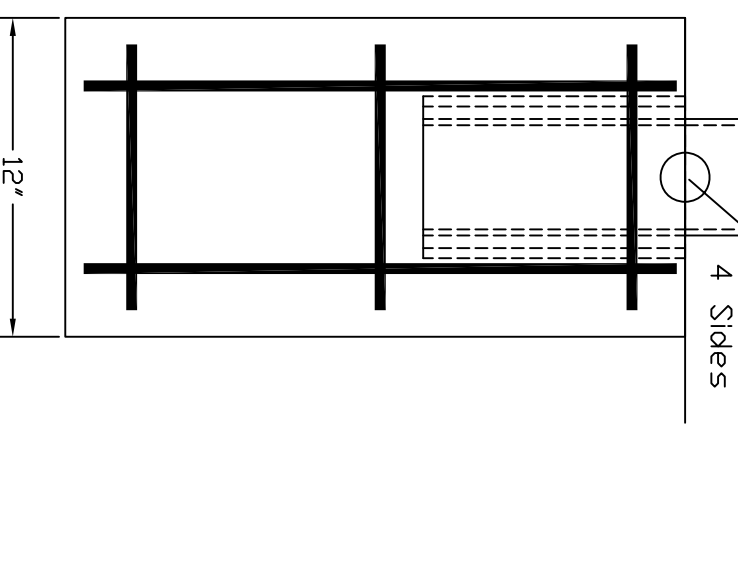
2 Enclosures



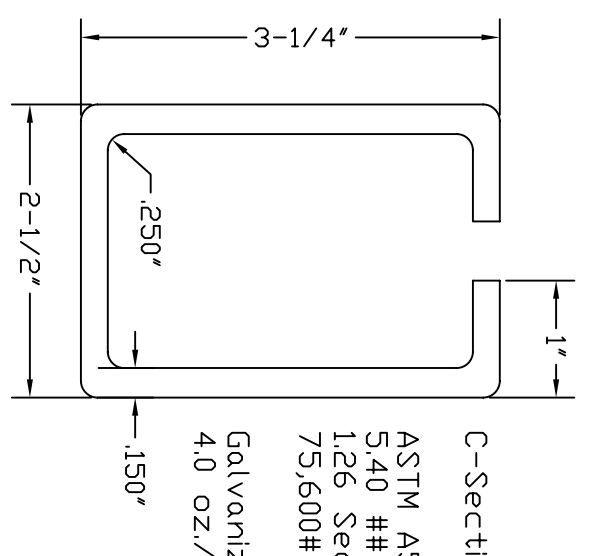
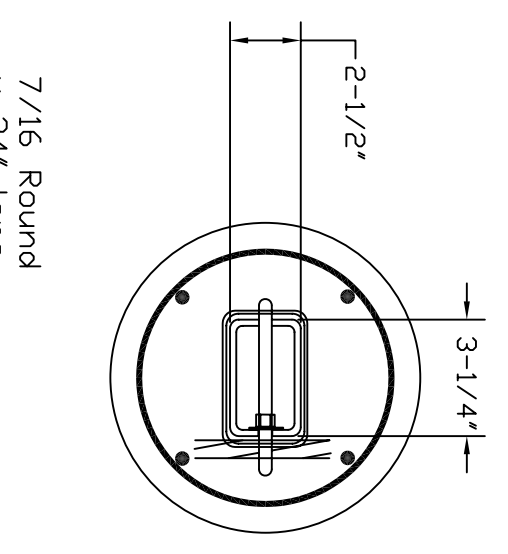
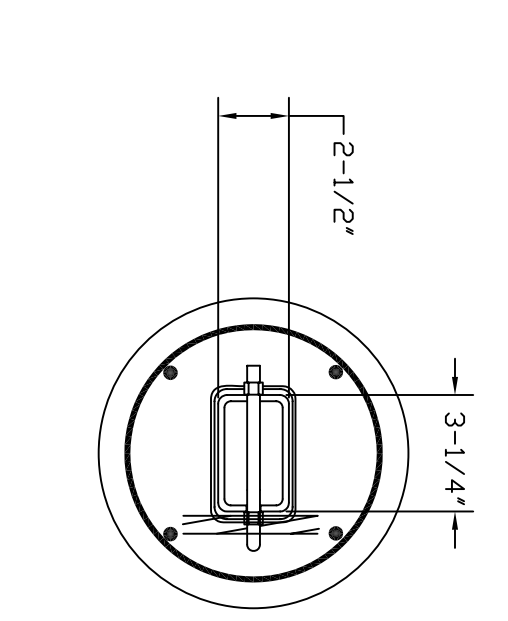
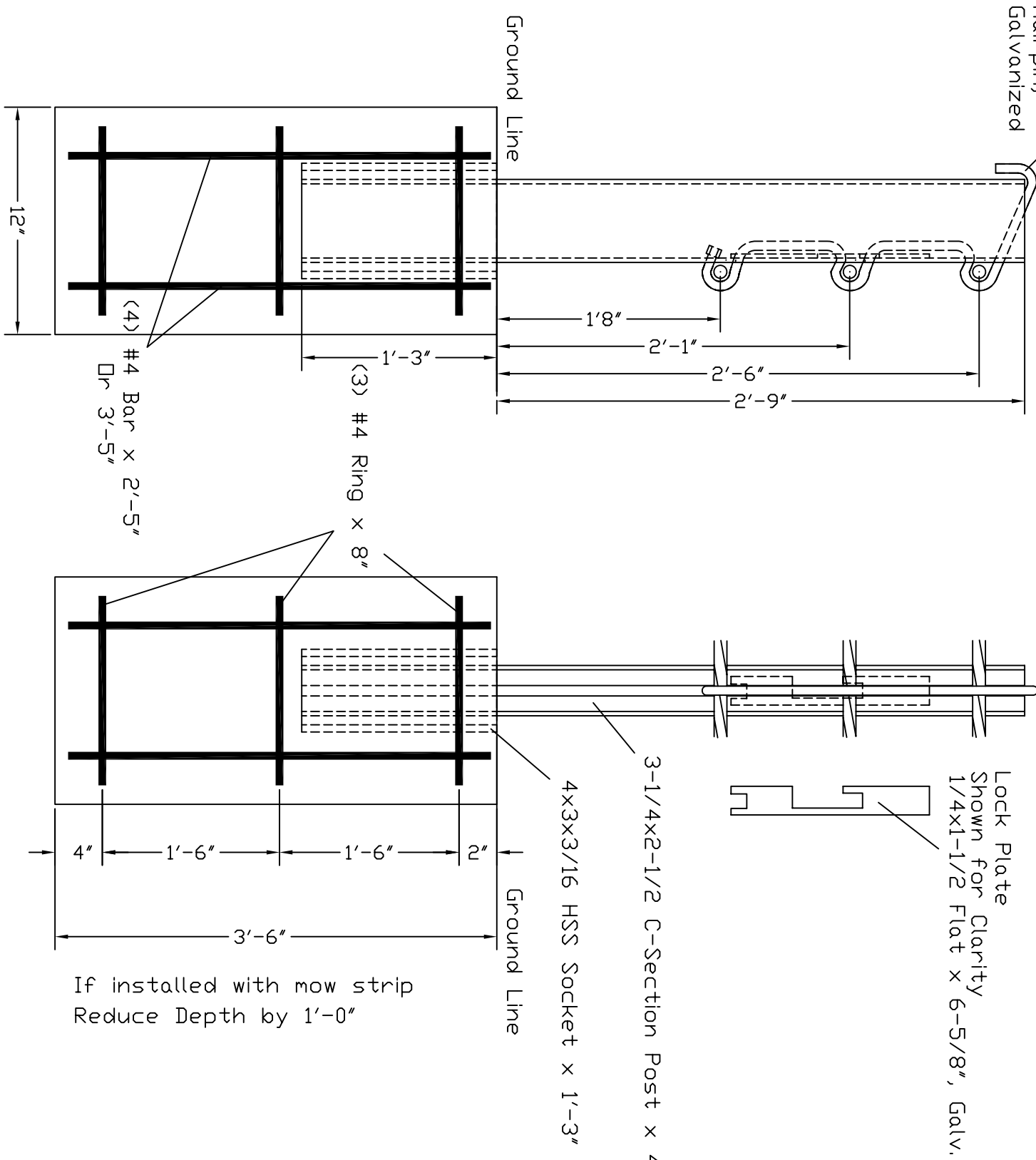
Cable Release Anchor Post



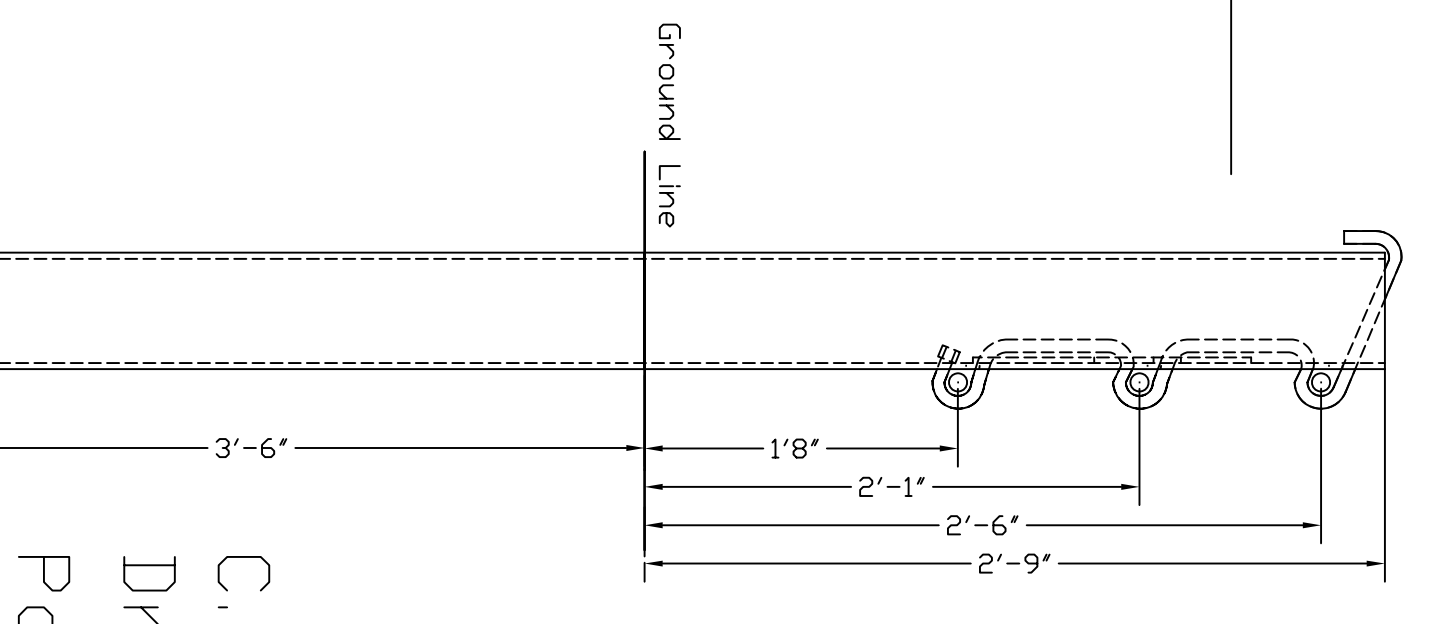
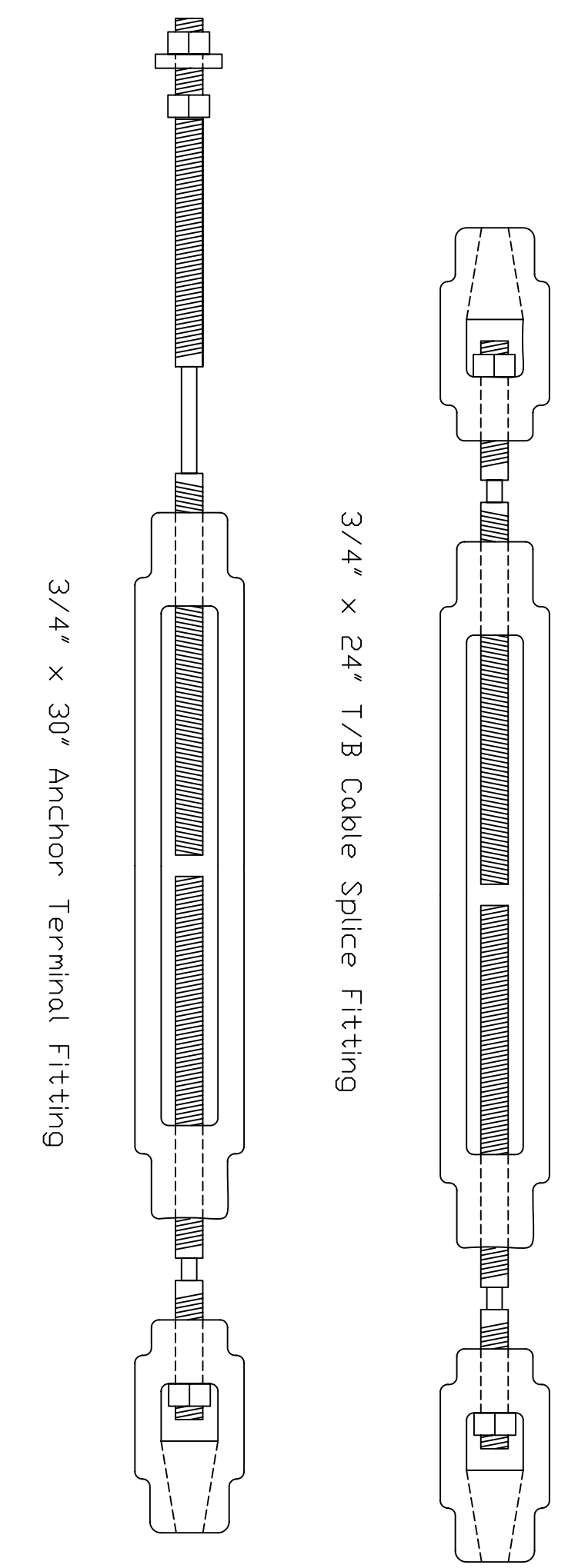
Terminal Post



Line Post



C-Section Post
ASTM A570 Gr 60
3/40 #/ft.
240 #/ft.
140 #/ft.
75,800# Bend Moments
Galvanized In and Out
4.0 oz./sqft ASTM F1043 A



C. B. S.
Driven
Post

GENERAL NOTES

1. For additional information contact Gibraltar at 1-800-495-8957.
2. All concrete shall be Class C. All posts shall be socketed design unless otherwise specified.
3. The Cable Barrier System is designed for bi-directional traffic flow. If installed for traffic in one direction install cables on traffic side of posts.
4. The Cable Barrier System shall be installed on median shoulders or on depressed medians with slopes of 6:1 or flatter without obstructions, depressions, etc. that may influence trajectory of an errant vehicle.
5. See the Texas MUTCD for proper delineation.

Cable Tension	9122
-10F	9122
0	8688
10	8274
20	7954
30	7419
40	7001
50	6586
60	6151
70	5728
80	5303
90	4878
100	4455
110	4030

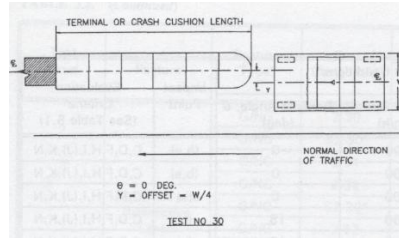
Date	6/10/05
Drawn by	DM
Issued For Construction	
Approver	

Gibraltar 320 Southland Road
Burnet, Texas 78611

Cable Barrier System

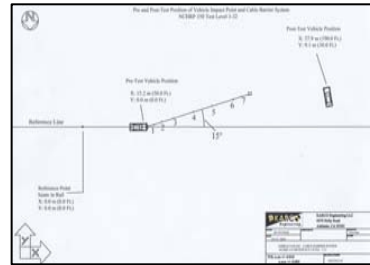
1 May 2005

DATA SHEET NO. 3
SUMMARY OF RESULTS FOR TEST NO. 3-30



GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO ENGINEERING, LLC	IMPACT VELOCITY (m/sec)	
TEST NO.	3-30	X-DIRECTION	4.4
DATE	06/01/05	Y-DIRECTION	0.1
TEST ARTICLE		THIV (optional)	
TYPE	CABLE BARRIER SYSTEM	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH (m)		X-DIRECTION	-1.9
SIZE AND/OR DIMENSION OF KEY ELEMENTS		Y-DIRECTION	1.5
SOIL TYPE AND CONDITION	CONCRETE	PHD (optional)	
TEST VEHICLE	820C	ASI (optional)	0.35
TYPE	PRODUCTION	TEST ARTICLE DEFLECTIONS (m)	
DESIGNATION	3-30	DYNAMIC LATERAL	
MODEL	1998 Chevrolet Metro	LONGITUDINAL	
MASS (CURB)	807 kg (1780 lbs)	PERMANENT	
MASS (TEST INERTIAL)	804 kg (1772 lbs)	VEHICLE DAMAGE	
DUMMY(S) MASS	75 Kg.	EXTERIOR	
GROSS STATIC WEIGHT	878 kg (1936 lb)	VDS	1FR1
IMPACT CONDITIONS		CDC	12RDEN2
SPEED (km/h)	100.2 (62.3 mph)	INTERIOR	
ANGLE (Deg.)	0.0	OCDI	FS0000000
IMPACT SEVERITY (kJ)	311.8	POST IMPACT VEHICULAR BEHAVIOR	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (Deg.)	21.9
SPEED (km/h)	79.2 (49.2 mph)	MAXIMUM PITCH ANGLE (Deg.)	-12.8
ANGLE (Deg.)		MAXIMUM YAW ANGLE (Deg.)	8.9

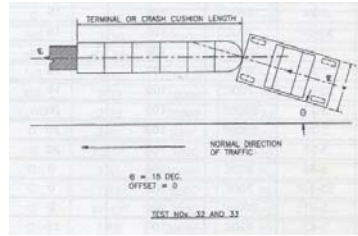
DATA SHEET NO. 3
SUMMARY OF RESULTS FOR TEST NO. 3-32



GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO ENGINEERING, LLC	IMPACT VELOCITY (m/sec)	
TEST NO.	3-32	X-DIRECTION	3.5
DATE	5/31/05	Y-DIRECTION	0.2
TEST ARTICLE		THIV (optional)	
TYPE	LONGITUDINAL FENCE BARRIER UNIT	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH (m)		X-DIRECTION	-1.2
SIZE AND/OR DIMENSION OF KEY ELEMENTS		Y-DIRECTION	-1.6
SOIL TYPE AND CONDITION	CONCRETE	PHD (optional)	
TEST VEHICLE	820C	ASI (optional)	0.5
TYPE	PRODUCTION	TEST ARTICLE DEFLECTIONS (m)	
DESIGNATION	3-32	DYNAMIC LATERAL	
MODEL	2000 Chevrolet Metro	LONGITUDINAL	
MASS (CURB)	848 kg (1870 lb)	PERMANENT	
MASS (TEST INERTIAL)	844 kg (1860 lb.)	VEHICLE DAMAGE	
DUMMY(S) MASS	75 Kg.	EXTERIOR	
GROSS STATIC WEIGHT	919 kg (2026 lb.)	VDS	1FR1
IMPACT CONDITIONS		CDC	01RDEN2
SPEED (km/h)	103.2 (64.1 mph)	INTERIOR	
ANGLE (Deg.)	15.0	OCDI	FS0000000
IMPACT SEVERITY (kJ)	375.8	POST IMPACT VEHICULAR BEHAVIOR	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (Deg.)	-27.1
SPEED (km/h)	88.9 (55.2 mph)	MAXIMUM PITCH ANGLE (Deg.)	-7.4
ANGLE (Deg.)		MAXIMUM YAW ANGLE (Deg.)	-19.2

DATA SHEET NO. 3

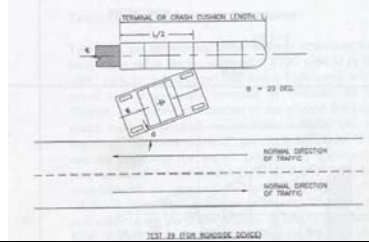
SUMMARY OF RESULTS FOR TEST NO. 3-35



GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO ENGINEERING, LLC	IMPACT VELOCITY (m/sec)	
TEST NO.	3-35	X-DIRECTION	2.5
DATE	5/27/05	Y-DIRECTION	3.0
TEST ARTICLE		THIV (optional)	N/A
TYPE	CABLE BARRIER SYSTEM	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH (m)	N/A	X-DIRECTION	-5.5
SIZE AND/OR DIMENSION OF KEY ELEMENTS		Y-DIRECTION	-5.3
SOIL TYPE AND CONDITION	CONCRETE	PHD (optional)	N/A
TEST VEHICLE	2000P	ASI (optional)	N/A
TYPE	PRODUCTION	TEST ARTICLE DEFLECTIONS (m)	
DESIGNATION	3-35	DYNAMIC	2 (6.5 ft)
MODEL	CHEVROLET 2-DOOR PICKUP	PERMANENT	N/A
MASS (CURB)	2033 Kg (4482 lbs)	VEHICLE DAMAGE	
MASS (TEST INERTIAL)	1987 Kg (4380 lbs)	EXTERIOR	
DUMMY(S) MASS	N/A	VDS	1FR1
GROSS STATIC WEIGHT	1987 Kg (4380 lbs)	CDC	01RDEN2
IMPACT CONDITIONS		INTERIOR	
SPEED (km/h)	99.95 (62.12 mph)	OCDI	FS0000000
ANGLE (Deg.)	20		
IMPACT SEVERITY (kJ)	89.6	POST IMPACT VEHICULAR BEHAVIOR	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (Deg.)	44.2
SPEED (km/h)	38 (23.7 mph)	MAXIMUM PITCH ANGLE (Deg.)	7.7
ANGLE (Deg.)	N/A	MAXIMUM YAW ANGLE (Deg.)	51.0

DATA SHEET NO. 3

SUMMARY OF RESULTS FOR TEST NO. 3-39 (Modified)



GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO ENGINEERING	IMPACT VELOCITY (m/sec)	
TEST NO.	3-39 (Modified)	X-DIRECTION	11.0
DATE	5/27/05	Y-DIRECTION	4.4
TEST ARTICLE		THIV (optional)	N/A
TYPE	CABLE BARRIER SYSTEM	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH (m)	N/A	X-DIRECTION	-17.5
SIZE AND/OR DIMENSION OF KEY ELEMENTS		Y-DIRECTION	N/A
SOIL TYPE AND CONDITION	CONCRETE	PHD (optional)	N/A
TEST VEHICLE	820C	ASI (optional)	N/A
TYPE	PRODUCTION	TEST ARTICLE DEFLECTIONS (m)	N/A
DESIGNATION	3-39 (Modified)	DYNAMIC	N/A
MODEL	CHEVROLET METRO 2-DOOR	PERMANENT	N/A
MASS (CURB)	808 Kg (1780 lbs)	VEHICLE DAMAGE	
MASS (TEST INERTIAL)	803 Kg (1769 lbs)	EXTERIOR	
DUMMY(s) MASS	75 kg (165 lbs.)	VDS	1FR1
GROSS STATIC WEIGHT	873 Kg (1924 lbs)	CDC	01RDEN2
IMPACT CONDITIONS		INTERIOR	
SPEED (km/h)	98.9 (61.47 mph)	OCDI	FS0000000
ANGLE (Deg.)	20		
IMPACT SEVERITY (Kj)	38.6	POST IMPACT VEHICULAR BEHAVIOR	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (Deg.)	-53.9
SPEED (km/h)	0	MAXIMUM PITCH ANGLE (Deg.)	-60.5
ANGLE (Deg.)	0	MAXIMUM YAW ANGLE (Deg.)	-15.5