



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

March 16, 2007

400 Seventh St., S.W.  
Washington, DC 20590

In Reply Refer To:  
HSSD/CC-65B

Mr. Felipe Almanza  
Mr. Jan Miller  
TrafFix Devices, Inc.  
220 Calle Pintoresco  
San Clemente, California 92672

Dear Mr. Almanza and Mr. Miller:

In your December 20, 2006 letter to Mr. Nicholas Artimovich of my staff you requested the Federal Highway Administration (FHWA) acceptance of a modified version of your existing Scorpion C 10,000 truck-mounted attenuator (TMA), specifically a new trailer version with wheels and a towing hitch. You refer to this unit as the Scorpion Trailer Attenuator and request it be accepted for use as a National Cooperative Highway Research Program (NCHRP) Report 350 device at Test Level 3 (TL 3) utilizing the rear axle configuration, for use with host vehicles weighing in the range between 10,000 pounds and 20,000 pounds. To support your request you submitted drawings and test reports prepared by KARCO Engineering Automotive Research Center in Adelanto, California, and crash test videos. Additional information in response to our request was provided on March 14, 2007.

You stated that the Scorpion Trailer Attenuator utilizes the same curved aluminum tube framework and engineered aluminum crush modules as the original Scorpion C 10,000 TMA previously submitted to our office for acceptance (reference FHWA letter HSA-10/CC65 & 65A). The total length of this Trailer Attenuator is 17.3 feet (5.3 m) including the steel tongue section which attaches the trailer. The total Scorpion Trailer Attenuator weight of approximately 1,900 pounds includes the 1,260 pound Trailer Attenuator and 640 pound steel tongue trailer attachment. Two modifications were made to the Scorpion C 10,000 TMA: (1) a rear mounted axle with tire assembly attached to a steel diaphragm at the rear cartridge, and (2) the steel tongue section that provides the trailer attachment point which incorporates an anti-rotation feature that is activated in the event of an impact. These modifications are displayed in the enclosed drawings. When impacted, the steel tongue is specifically designed to prevent the Attenuator Trailer from rotating about the pintle hook and the rear of the host vehicle by engaging the Telescoping Anti-Rotation System (TARS). The TARS must be aligned with the frame plate of the host vehicle to engage the anti-rotational arms and its bumper must be able to resist the anticipated TL 3 design impact loads to ensure optimal attenuator crash performance.



We initially agreed these modifications and attachment details were unlikely to affect the test results previously submitted for the Scorpion C 10,000 TMA for the two required TMA tests, i.e., tests 3-50 and 3-51. To verify the trailer's performance you conducted test 3-51M using a 10,000 pound host vehicle with trailer axle configurations in the middle and at the rear. A summary of these two 3-51M test results are enclosed. Test 3-51M is a modified version of the standard 3-51 test in which a 10,000 pound host vehicle was used instead of the standard 20,000 pound host vehicle. The center mounted axle configuration resulted in a more severe impact of 22.6 g's of ridedown acceleration that exceeded the maximum allowable 20 g's. Therefore, the trailer design was modified to replicate the original Scorpion C 10,000 TMA with a rear axle configuration and removal of a non-compressible center section. When impacted, the modified rear axle configuration design recorded a ridedown acceleration measuring the maximum allowable of 20 g's. The actual forward roll of the lighter host vehicle was determined to be between 60 and 70 feet when impacted by the 4,500 pound (2000P) test vehicle.

Additionally, you conducted optional tests 3-52 and 3-53 using the standard 20,000 pound host vehicle and the center mounted axle configuration to validate acceptable performance of an off-center impact. We had previously agreed that test 3-52 was a sufficient test when converting a TMA design to a trailer mounted attenuator, in line with the testing conducted by other manufacturers. Your tests were conducted with the center mounted axle and the non-compressible center section. Based on the results of the optional tests, we agree that the added steel tongue trailer attachment with the TARS prevented the trailer attenuator from rotating in an offset, angled rear impact. The center axle configuration of the attenuator trailer as tested for 3-52 and 3-53 with non-compressible center section presented an equivalent or more severe impact than could be expected with the rear axle configuration and passed the testing criteria. The summary results of both optional tests are enclosed.

During our review we requested additional information which you provided. We ultimately concluded that Test 3-51 should not be waived due to the design modifications made when converting your TMA to a trailer TMA. Therefore on March 5, 2007, we requested that you conduct a Test 3-51 of your final Scorpion Trailer TMA using a standard weight host vehicle. On March 9, 2007, this test was conducted by Karco with acceptable results, including a ridedown acceleration measuring 14.6 g's. A summary of the Test 3-51 results are also enclosed for reference.

After reviewing the matrix of tests conducted and additional information you sent us, the FHWA acknowledges with the conditions that the Scorpion Trailer Attenuator with the rear mounted axle configuration and steel tongue TARS attached to host vehicles weighing 10,000 to 20,000 pounds meets the appropriate evaluation criteria under NCHRP Report 350 Tests 3-50, 3-51, 3-52, and 3-53. The Scorpion Trailer Attenuator may be used as a TL-3 TMA on the National Highway System when such use is acceptable to the contracting authority.

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

- This acceptance is limited to the crashworthiness characteristics of the device and does not cover its structural features, durability, or its conformity with the Manual on Uniform Traffic Control Devices pertaining to reflectorization of its impact face.
- Any design changes that may adversely influence the crashworthiness of the device may require additional tests and a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance evaluations reveal unacceptable safety problems, or that the device being marketed is significantly different from the version that was submitted for review and acceptance, we reserve the right to modify or revoke this acceptance.
- You will be expected to supply potential users with sufficient information on installation and operational requirements to ensure proper performance. Specifically, the trailer hitch connections to the support vehicle must be designed to withstand the anticipated day-to-day and impact loads expected during use.
- 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.
- To prevent misunderstanding by others, this letter of acceptance, designated as number CC-65B, shall not be reproduced except in full. This letter, and 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 Scorpion Trailer Attenuator is a patented product and considered proprietary. If proprietary devices are specified by a highway agency for use on a 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 the 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,

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

Enclosures

FHWA:HSSD:MLupes:tb:x66994:3/16/07

File: s://directory folder/mlupes/CC65B.doc

cc: HSSD (Reader, HSA-1; Chron File, HSSD; M.Lupes, HSSD;  
M.McDonough, HSSD)



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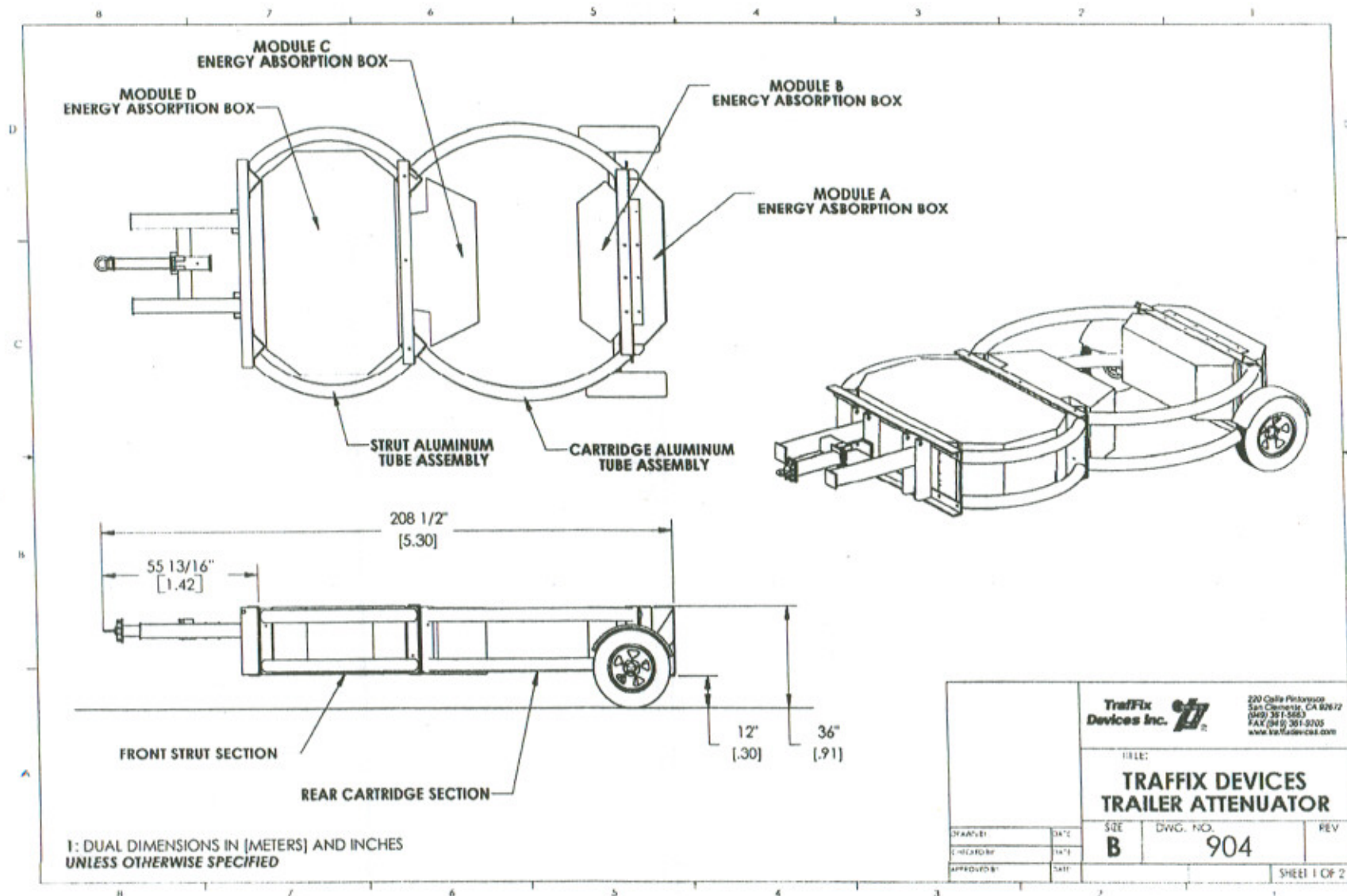
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Sincerely yours,

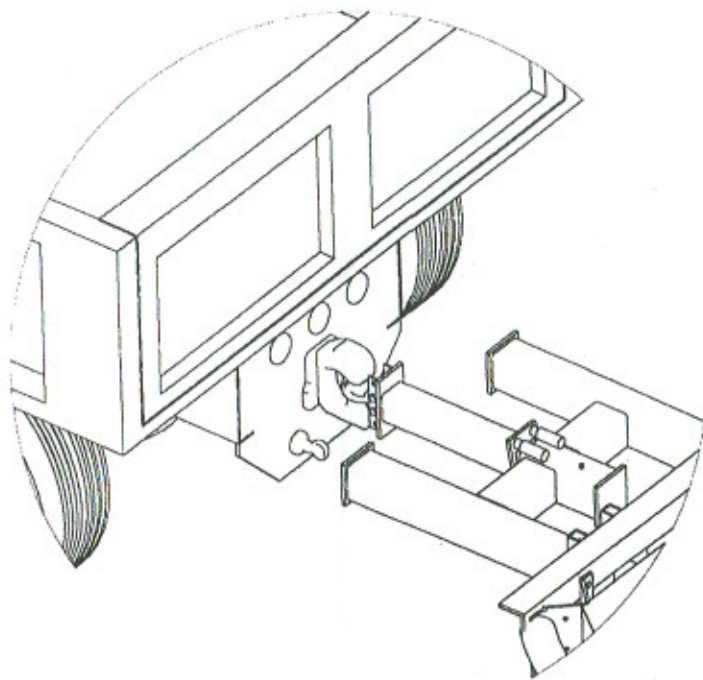


John R. Baxter, P.E.  
Director, Office of Safety Design  
Office of Safety

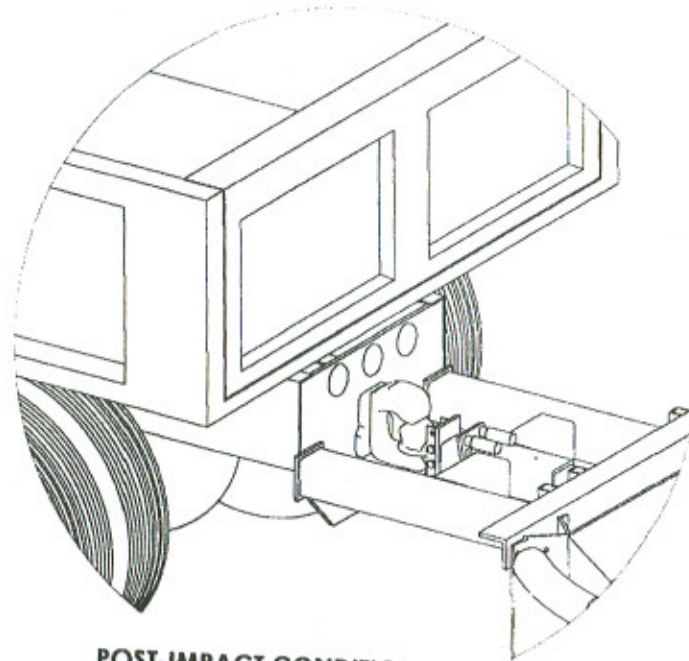
Enclosures



DRAWING C-5: MANUFACTURER'S DRAWING OF TEST ARTICLE FOR TEST NO. 3-51M (P26214-03)



**PRE-IMPACT CONDITION  
POSITION DURING NORMAL  
OPERATIONAL USE**



**POST-IMPACT CONDITION  
POSITION AFTER IMPACT EVENT  
HAS OCCURED**

**Traffix  
Devices Inc.** 

220 Calle Portonuevo  
San Clemente, CA 92672  
(949) 381-5663  
FAX (949) 381-8205  
www.traffixdevices.com

FILE: PRE AND POST  
IMPACT TONGUE  
POSITIONS

SIZE  
**B**

DWG. NO.  
**902**

REV

SHEET 3 OF 4

DRAWING C-7: MANUFACTURER'S DRAWING OF TEST ARTICLE FOR TEST NO. 3-51M (P26214-03)

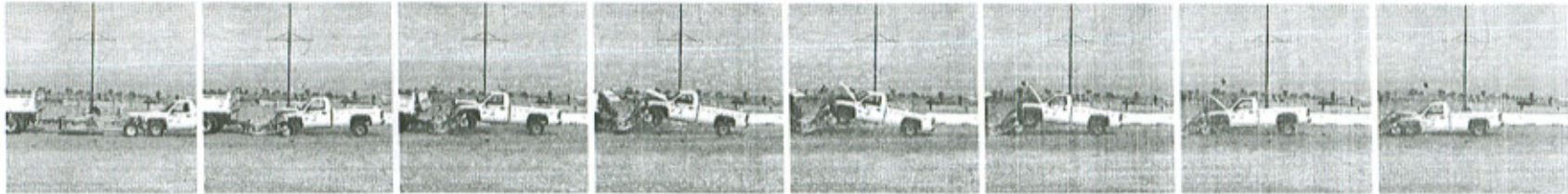
C-7

TR-P26214-A



DATA SHEET NO. 2

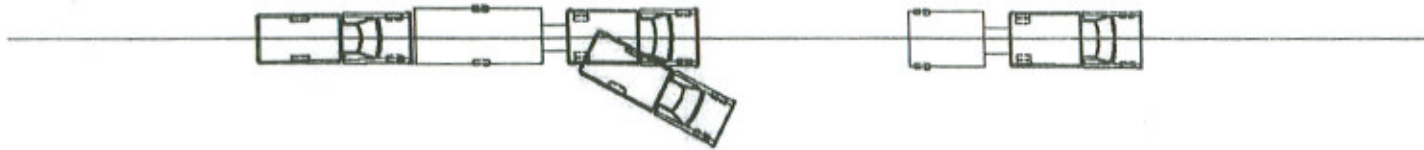
SUMMARY OF RESULTS FOR TEST NO. 3-51



GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO ENGINEERING, LLC	FLAIL SPACE VELOCITY (m/sec)	
TEST NO.	3-51	X-DIRECTION	9.4
DATE	03/09/07	Y-DIRECTION	0.0
TEST ARTICLE	TRAFFIX DEVICES	THIV (optional)	
TYPE	TRAILER ATTENUATOR	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH (meters)	0.91 (36 in.) X 2.44 (96 in.) X 5.3 (208 in.)	X-DIRECTION	-14.6
SIZE AND/OR DIMENSION OF KEY ELEMENTS		Y-DIRECTION	1.8
SOIL TYPE AND CONDITION	CONCRETE	PHD (optional)	
TEST VEHICLE	2000P	ASI (optional)	1.10
TYPE	PRODUCTION	TEST ARTICLE DEFLECTIONS	
DESIGNATION	PICKUP TRUCK	DYNAMIC	
MODEL	CHEROLET 2500	PERMANENT	
MASS (CURB)	4898 lbs (2222 kg)	VEHICLE DAMAGE	
MASS (TEST INERTIAL)	4486 lbs (2034 kg)	EXTERIOR	
GROSS STATIC WEIGHT	4486 lbs (2034 kg)	VDS	12-FD-2
IMPACT CONDITIONS		CDC	01FCHW7
SPEED (km/h)	97.12 (60.35 mph)	INTERIOR	
ANGLE (Deg.)	0	OCDI	FS0000000
IMPACT SEVERITY (kJ)	741.0	POST-IMPACT VEHICULAR BEHAVIOR	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (Deg.)	-4.3
SPEED (km/h)		MAXIMUM PITCH ANGLE (Deg.)	-6.8
ANGLE (Deg.)		MAXIMUM YAW ANGLE (Deg.)	8.9

DATA SHEET NO. 2

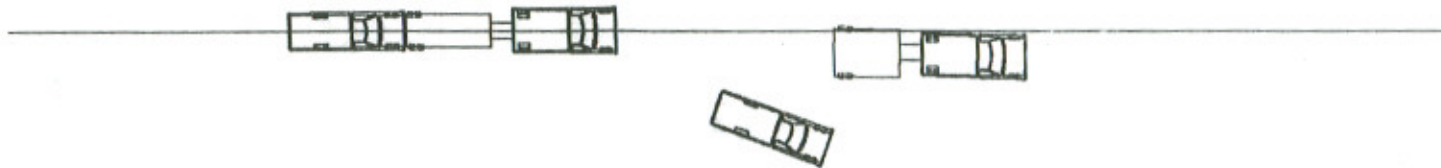
SUMMARY OF RESULTS FOR TEST NO. 3-51M (P26214-02)



GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO ENGINEERING, LLC	FLAIL SPACE VELOCITY (m/sec)	
TEST NO.	3-51M	X-DIRECTION	9.8
DATE	11/21/06	Y-DIRECTION	0.2
TEST ARTICLE	TRAFFIX DEVICES	THIV (optional)	
TYPE	TRAILER ATTENUATOR	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH (meters)	0.91 (36 in.) X 2.44 (96 in.) X 5.64 (222 in.)	X-DIRECTION	-22.6
SIZE AND/OR DIMENSION OF KEY ELEMENTS		Y-DIRECTION	7.4
SOIL TYPE AND CONDITION	CONCRETE	PHD (optional)	
TEST VEHICLE	2000P	ASI (optional)	1.42
TYPE	PRODUCTION	TEST ARTICLE DEFLECTIONS	
DESIGNATION	PICKUP TRUCK	DYNAMIC	
MODEL	CHEVROLET 2500	PERMANENT	
MASS (CURB)	5766 lbs (2615 kg)	VEHICLE DAMAGE	
MASS (TEST INERTIAL)	4330 lbs (1964 kg)	EXTERIOR	
GROSS STATIC WEIGHT	4330 lbs (1964 kg)	VDS	12-FD-2
IMPACT CONDITIONS		CDC	01FCHW7
SPEED (km/h)	101.58 (63.12 mph)	INTERIOR	
ANGLE (Deg.)	0	OCDI	FS0000000
IMPACT SEVERITY (kJ)	782.2	POST-IMPACT VEHICULAR BEHAVIOR	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (Deg.)	0.0
SPEED (km/h)		MAXIMUM PITCH ANGLE (Deg.)	2.7
ANGLE (Deg.)		MAXIMUM YAW ANGLE (Deg.)	-2.4

DATA SHEET NO. 6

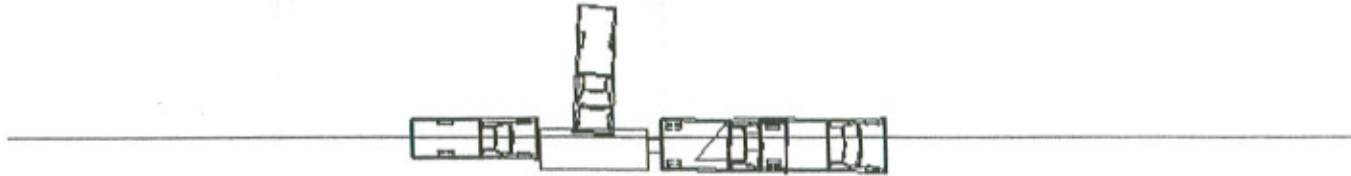
SUMMARY OF RESULTS FOR TEST NO. 3-51M (P26214-03)



GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO ENGINEERING, LLC	FLAIL SPACE VELOCITY (m/sec)	
TEST NO.	3-51M	X-DIRECTION	9.6
DATE	12/7/06	Y-DIRECTION	0.1
TEST ARTICLE	TRAFFIX DEVICES	THIV (optional)	
TYPE	TRAILER ATTENUATOR	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH (meters)	0.91 (36 in.) X 2.44 (96 in.) X 5.3 (208 in.)	X-DIRECTION	-20.0
SIZE AND/OR DIMENSION OF KEY ELEMENTS		Y-DIRECTION	3.7
SOIL TYPE AND CONDITION	CONCRETE	PHD (optional)	
TEST VEHICLE	2000P	ASI (optional)	1.41
TYPE	PRODUCTION	TEST ARTICLE DEFLECTIONS	
DESIGNATION	PICKUP TRUCK	DYNAMIC	
MODEL	GMC Sierra	PERMANENT	
MASS (CURB)	4948 lbs (2244 kg)	VEHICLE DAMAGE	
MASS (TEST INERTIAL)	4506 lbs (2044 kg)	EXTERIOR	
GROSS STATIC WEIGHT	4506 lbs (2044 kg)	VDS	12-FD-2
IMPACT CONDITIONS		CDC	01FCHW7
SPEED (km/h)	103.76 (64.48 mph)	INTERIOR	
ANGLE (Deg.)	0	OCDI	FS0000000
IMPACT SEVERITY (kJ)	849.33	POST-IMPACT VEHICULAR BEHAVIOR	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (Deg.)	0.0
SPEED (km/h)		MAXIMUM PITCH ANGLE (Deg.)	-3.2
ANGLE (Deg.)		MAXIMUM YAW ANGLE (Deg.)	-3.7

DATA SHEET NO. 6

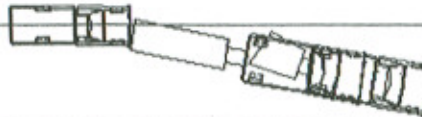
SUMMARY OF RESULTS FOR TEST NO. 3-52 (P26188-02)



GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO ENGINEERING, LLC	FLAIL SPACE VELOCITY (m/sec)	
TEST NO.	3-52	X-DIRECTION	11.3
DATE	10/27/06	Y-DIRECTION	0.7
TEST ARTICLE	TRAFFIX DEVICES SCORPION	THIV (optional)	
TYPE	TRAILER ATTENUATOR	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH (meters)	0.91 (36 in.) X 2.44 (96 in.) X 5.64 (222 in.)	X-DIRECTION	-14.0
SIZE AND/OR DIMENSION OF KEY ELEMENTS		Y-DIRECTION	4.0
SOIL TYPE AND CONDITION	CONCRETE	PHD (optional)	
TEST VEHICLE	2000P	ASI (optional)	1.2
TYPE	PRODUCTION	TEST ARTICLE DEFLECTIONS	
DESIGNATION	PICKUP TRUCK	DYNAMIC	
MODEL	GMC Sierra	PERMANENT	
MASS (CURB)	4784 lbs (2170 kg)	VEHICLE DAMAGE	
MASS (TEST INERTIAL)	4470 lbs (2028 kg)	EXTERIOR	
GROSS STATIC WEIGHT	4470 lbs (2028 kg)	VDS	12-FD-3
IMPACT CONDITIONS		CDC	01FZHW6
SPEED (km/h)	101.35 (62.99 mph)	INTERIOR	
ANGLE (Deg.)	0	OCDI	FS0000000
IMPACT SEVERITY (kJ)	804.03		
Y = OFFSET = W/3	610 mm (24.0 in)	POST-IMPACT VEHICULAR BEHAVIOR	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (Deg.)	-6.5
SPEED (km/h)		MAXIMUM PITCH ANGLE (Deg.)	-7.3
ANGLE (Deg.)		MAXIMUM YAW ANGLE (Deg.)	65.7

DATA SHEET NO. 2

SUMMARY OF RESULTS FOR TEST NO. 3-53 (P26188-01)



GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO ENGINEERING, LLC	FLAIL SPACE VELOCITY (m/sec)	
TEST NO.	3-53	X-DIRECTION	9.8
DATE	09/27/06	Y-DIRECTION	1.3
TEST ARTICLE	TRAFFIX DEVICES SCORPION	THIV (optional)	
TYPE	TRAILER ATTENUATOR	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH (meters)	0.91 (36 in.) X 2.44 (96 in.) X 5.64 (222 in.)	X-DIRECTION	-14.4
SIZE AND/OR DIMENSION OF KEY ELEMENTS		Y-DIRECTION	4.7
SOIL TYPE AND CONDITION	CONCRETE	PHD (optional)	
TEST VEHICLE	2000P	ASI (optional)	1.03
TYPE	PRODUCTION	TEST ARTICLE DEFLECTIONS	
DESIGNATION	PICKUP TRUCK	DYNAMIC	
MODEL	CHEVROLET 2500	PERMANENT	
MASS (CURB)	4632 lbs (2101 kg)	VEHICLE DAMAGE	
MASS (TEST INERTIAL)	4464 lbs (2025 kg)	EXTERIOR	
GROSS STATIC WEIGHT	4464 lbs (2025 kg)	VDS	12-FD-2
IMPACT CONDITIONS		CDC	01FZHW6
SPEED (km/h)	101.71 (63.21 mph)	INTERIOR	
ANGLE (Deg.)	10	OCDI	FS0000000
Y = OFFSET = W/4	482.5 mm (19.0 in)		
IMPACT SEVERITY (kJ)	808.64	POST-IMPACT VEHICULAR BEHAVIOR	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (Deg.)	13.7
SPEED (km/h)		MAXIMUM PITCH ANGLE (Deg.)	-30.2
ANGLE (Deg.)		MAXIMUM YAW ANGLE (Deg.)	103.2