U.S. Department of Transportation
Federal Highway Administration

1200 New Jersey Ave., SE
Washington, D.C. 20590

April 21, 2011

In Reply Refer To:
HSST/CC-65G

Mr. Felipe Almanza
TrafFix Devices Inc.
160 Avenida La Pata
San Clemente, CA 92673

Dear Mr. Almanza:

This letter is in response to your request for the Federal Highway Administration (FHWA) acceptance of a roadside safety device for use on the National Highway System (NHS).

Name of device:	Scorpion Trailer Attenuator
Type of device:	Truck Mounted Trailer Attenuator
Test Level:	NCHRP Report 350 Test Level 2
Testing conducted by:	Karco Engineering
Date of request:	November 30, 2010
Completed package received:	December 2, 2010
Request acknowledged:	December 8, 2010

You requested that we find this system acceptable for use on the NHS under the provisions of the National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

Requirements
Roadside safety devices should meet the guidelines contained in the NCHRP Report 350 or the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH). The FHWA memorandum "Identifying Acceptable Highway Safety Features" of July 25, 1997, provides further guidance on crash testing requirements of longitudinal barriers.

Decision
The following device was found acceptable for use:

- Test Level 2 Scorpion Trailer Attenuator

Description
The TrafFix Devices, Inc. Scorpion Trailer Attenuator device consists of four major components: (1) Telescopic Anti-Rotation System (TARS) tongue; (2) aluminum curved cartridge tubes; (3) attenuator boxes; and (4) axle wheel assembly. Enclosures 1 and 2 show each component of the device.

The TARS tongue attaches the device directly to a host vehicle's pintle hook from a standard lunette eye. The TARS tongue provides a single point attachment with anti-rotation built-in. Upon impact the energy shears a steel pin allowing the tongue's inner and outer tubes to slide forward relative to each other. Anti-Rotation supports come into contact with the support truck's frame plate. This contact acts as a positive stop to the trailers rotation and induces a reactive force to counter the rotation, which prevents the attenuator from rotating around the back of the support vehicle.

The aluminum cartridge section is comprised of a structural energy absorbing curved aluminum tube framework. The aluminum curved cartridge tubes bolt directly to the TARS steel angles and rear axle diaphragm. Upon impact the aluminum curved cartridge tubes kink and bend, dissipating kinetic energy. Two sets (four curved tubes) of cartridge tube assemblies are used in each device.

Three crush modules are used on each device: Modules A, B, and C (Enclosure 3). Module A is the rearmost module and is typically the first module to be impacted. Modules B and C are located inside the circular curved aluminum cartridge tubes. These honeycomb shape modules are flattened from their expanded state once impacted. The modules are bolted to the TARS tongue and the rear axle diaphragm. Located at the rear of the cartridge is an axle diaphragm frame which provides a stable platform for the axle and wheel assembly.

The overall dimensions are 3.7 m (12.3 ft) long by 2.6 m (8.4 ft) wide by 0.9 m (3.0 ft) tall. It weighs approximately 677.5 kg (1490 lb) fully assembled.

Crash Testing
The Test Level 2 (TL-2) Scorpion Trailer Attenuator was conditionally accepted by FHWA in our letter CC-65D dated March 3, 2008. During the evaluation period no impacts were experienced by the TL-2 trailer, so you chose to have the unit crash tested by KARCO Engineering according to NCHRP 350 test designations 2-50 and 2-51 guidelines. All occupant impact velocities and occupant risk values were within allowable limits in both tests. The test vehicle was not penetrated during the tests. Enclosures 4 and 5 summarize the results of test 2-50 and 2-51, respectively. It should be noted that the support vehicle left side roll-ahead and right side roll-ahead distances in test 2-51 were measured at 1452 mm (57 inches) and 1489 mm (59 inches) respectively.

Findings
Tests 2-50 and 2-51 are to be conducted according to NCHRP 350 guidelines for Truck Mounted Attenuators for TL- 2 approval. The Scorpion Trailer Attenuator described above and shown in Enclosure 1 through 3 has successfully passed both tests.

Therefore, the device described in the requests above and detailed in the enclosed drawings is acceptable for use on the NHS under the range of conditions tested, when such use is acceptable to a highway agency.

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

- This acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may adversely influence the crashworthiness of the device 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 device being marketed is significantly different from the version that was crash tested, we reserve the right to modify or revoke our 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 it will meet the crashworthiness requirements of the FHWA and the NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance is designated as number CC-65G and shall not be reproduced except in full. This letter and the test documentation upon which it is based are public information. All such letters and documentation may be reviewed at our office upon request.
- The Scorpion Trailer Attenuators are patented products and considered proprietary. If proprietary devices are specified by a highway agency for use on Federal-aid projects, except exempt, non-NHS projects, (a) they 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.
- This acceptance letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented device for which the applicant is not the patent holder. The acceptance letter is limited to the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

Sincerely,

Michael S. Griffith
Director, Office of Safety Technologies
Office of Safety

Enclosures

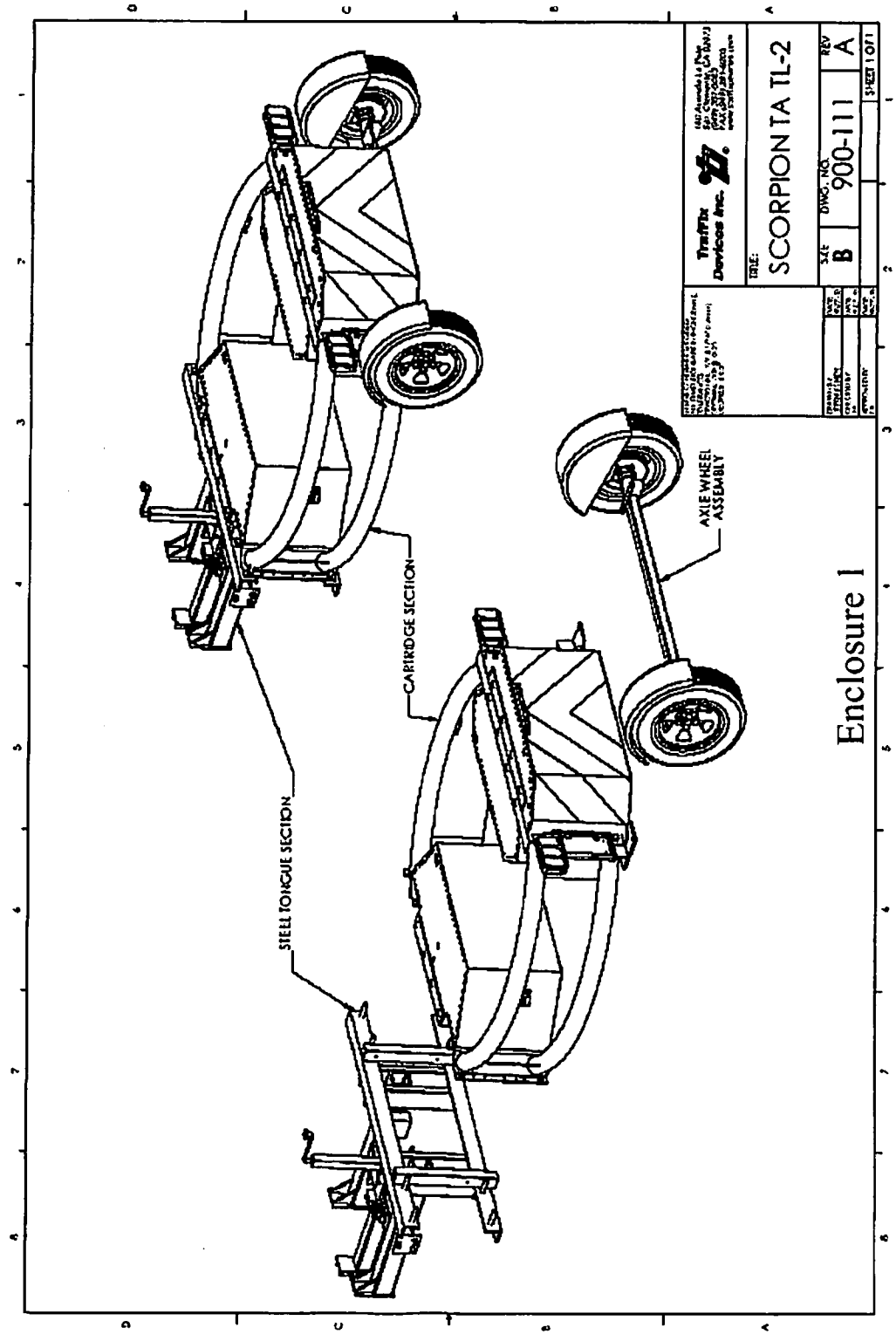


Figure 57: Manufacturer's Drawing

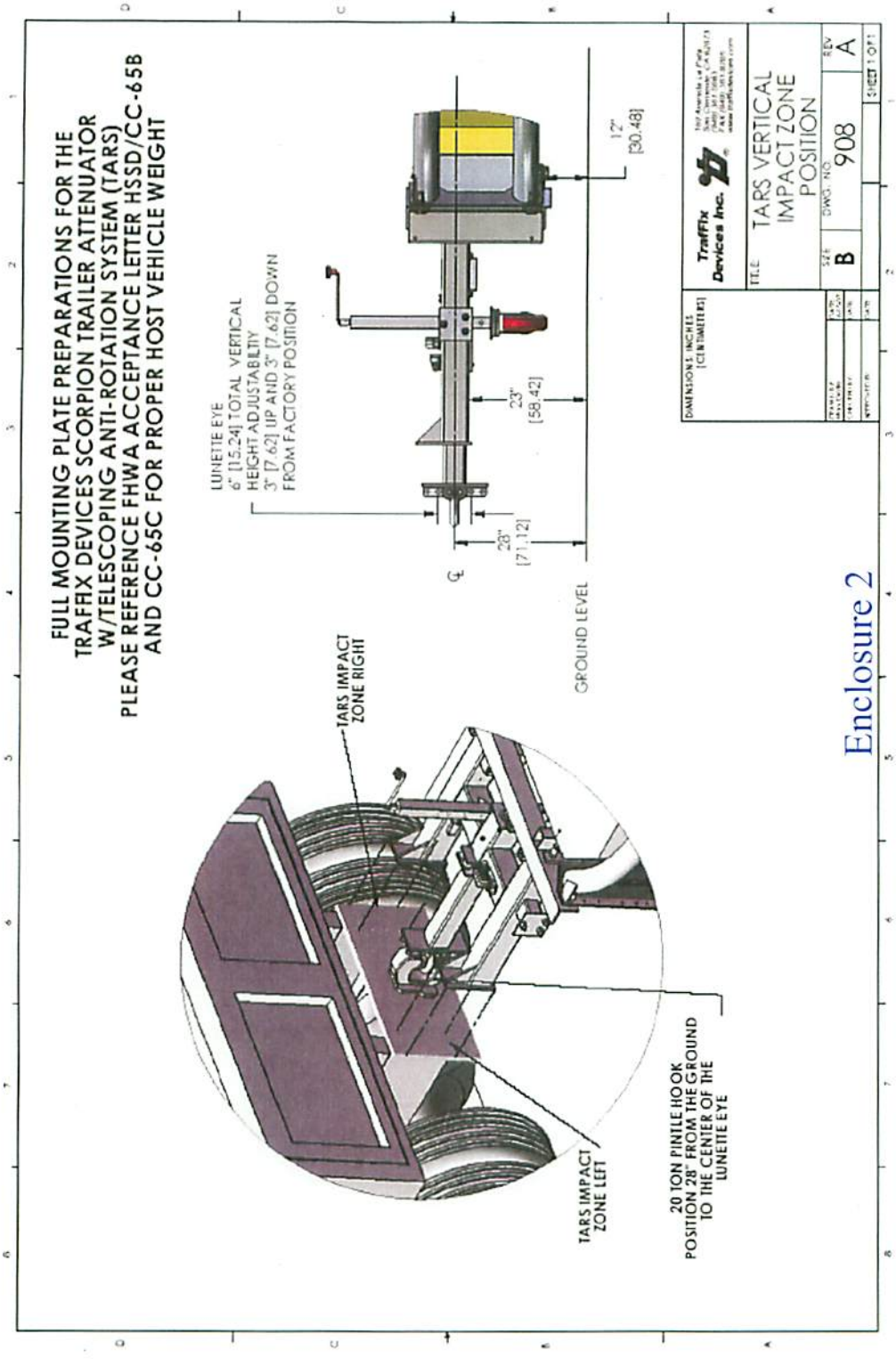
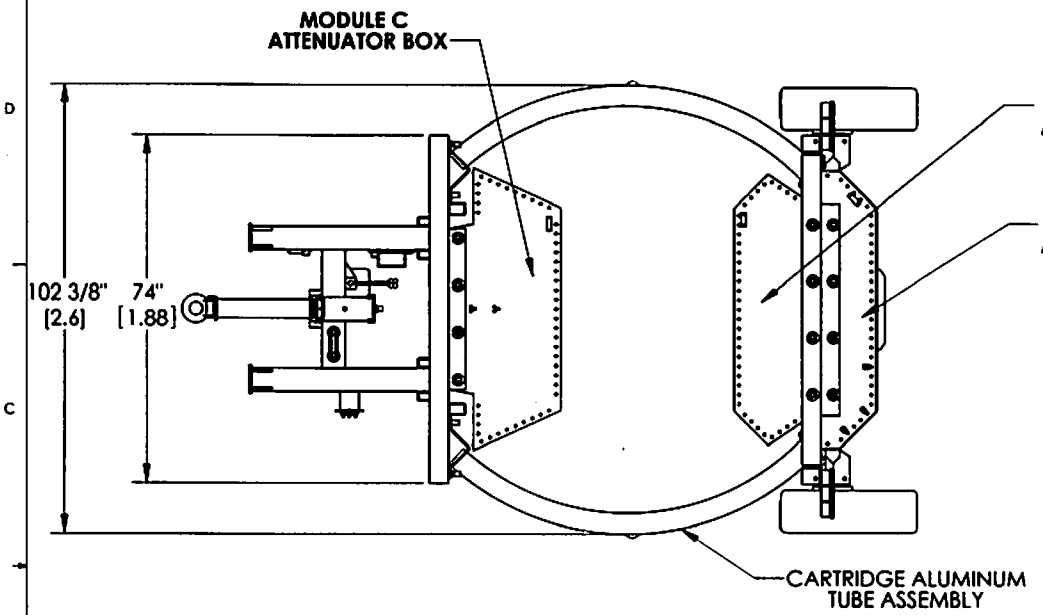
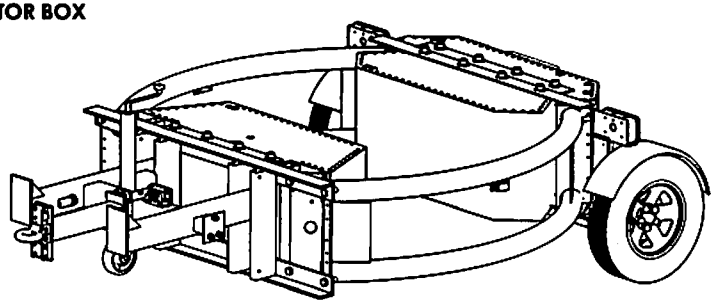
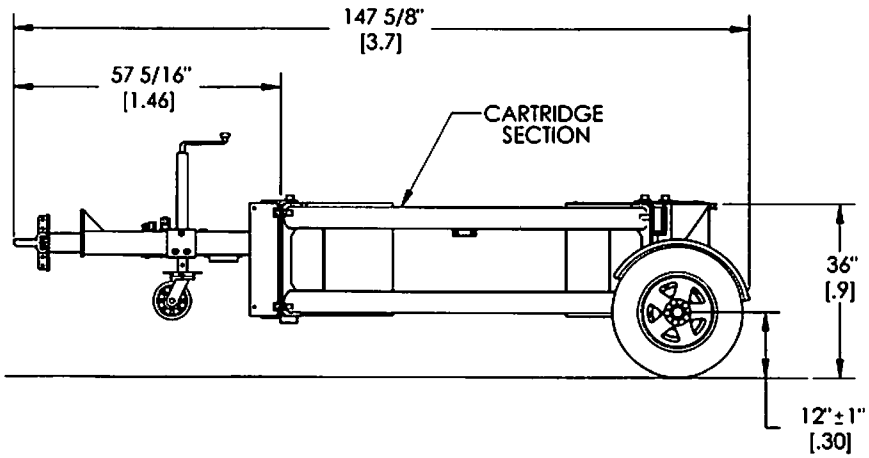


Figure 59: Manufacturer's Drawing







1. Units: Inches [M]
NOTES: UNLESS OTHERWISE SPECIFIED

Enclosure 3

TrafFix Devices Inc.
160 Avenida La Pata
San Clemente, CA 92673
(949) 361-5663
FAX (949) 361-9205
www.traffixdevices.com

TITLE:
TRAFFIX DEVICES SCORPION
TRAILER ATTENUATOR TL-2

DRAWN BY: Marty Drake	DATE 08.15.08
CHECKED BY:	DATE
APPROVED BY:	DATE

SIZE	DWG. NO.	REV
B	10002-TL2-TA	A

SHEET 1 OF 1

Enclosure 5

DATA SHEET 5

SUMMARY OF RESULTS

Test Article: TrafFix Devices Scorpion Trailer Attenuator TL-2 Project No.: P30110-01

Test Program: NCHRP 350 2-51 Test Date: 10/01/10

Test Vehicle: 1993 Chevrolet Cheyenne

GENERAL INFORMATION	
TEST AGENCY	KARCO Engineering, LLC
TEST NO.	2-51
DATE	10/1/2010
TEST ARTICLE	
TYPE	TMA
INSTALLATION LENGTH	N/A
SIZE AND/OR DIMENSION OF KEY ELEMENTS	Approximately 3.7 meters long and 2.6meters wide
SOIL TYPE AND CONDITION	Concrete
TEST VEHICLE	
TYPE	Production Model
DESIGNATION	2000P
MODEL	Chevrolet Cheyenne
MASS (CURB)	2040.0 kg (4497 lbs)
MASS (TEST INERTIAL)	1993.5 kg (4395 lbs)
DUMMY MASS	0 kg (0 lbs)
MASS (GROSS STATIC)	1993.5 kg (4395 lbs)
IMPACT CONDITIONS	
VELOCITY (km/h)	67.8 km/h (42.1 mph)
ANGLE (°)	0.3
IMPACT SEVERITY (kJ)	353.4
EXIT CONDITIONS	
VELOCITY (km/h)	
ANGLE (°)	

OCCUPANT RISK VALUES	
FLAIL SPACE VELOCITY (m/sec)	
X DIRECTION	8.9
Y DIRECTION	0.4
THIV (Optional)	
RIDEDOWN ACCELERATION (g's)	
X DIRECTION	-9.7
Y DIRECTION	-3.7
PHD (Optional)	
ASI (Optional)	
TEST ARTICLE DEFLECTIONS (m)	
DYNAMIC	
PERMANENT	
VEHICLE DAMAGE	
EXTERIOR	
VDS	12-FD-4
CDC	12FDEW2
INTERIOR	
OCDI	FS0000000
POST-IMPACT VEHICULAR BEHAVIOR	
MAXIMUM ROLL ANGLE (°)	4.2
MAXIMUM PITCH ANGLE (°)	4.9
MAXIMUM YAW ANGLE (°)	2.1

Enclosure 4

DATA SHEET 5

SUMMARY OF RESULTS

Test Article: TrafFix Devices Scorpion Trailer Attenuator TL-2 Project No.: P28092-01

Test Program: NCHRP 350 2-50 Test Date: 05/23/08

Test Vehicle: 1996 Geo Metro

GENERAL INFORMATION	
TEST AGENCY	KARCO Engineering, LLC
TEST NO.	2-50
DATE	5/23/2008
TEST ARTICLE	
TYPE	TMA
INSTALLATION LENGTH	N/A
SIZE AND/OR DIMENSION OF KEY ELEMENTS	Approximately 3.7 meters long and 2.6 meters wide
SOIL TYPE AND CONDITION	Concrete
TEST VEHICLE	
TYPE	Production Model
DESIGNATION	820C
MODEL	Geo Metro
MASS (CURB)	805.5 kg (1775 lbs)
MASS (TEST INERTIAL)	823.0 kg (1815 lbs)
DUMMY MASS	75.0 kg (165 lbs)
MASS (GROSS STATIC)	901.0 kg (1987 lbs)
IMPACT CONDITIONS	
VELOCITY (km/h)	70.5 km/h (43.8 mph)
ANGLE (°)	0.0
IMPACT SEVERITY (kJ)	157.8
EXIT CONDITIONS	
VELOCITY (km/h)	
ANGLE (°)	

OCCUPANT RISK VALUES	
FLAIL SPACE VELOCITY (m/sec)	
X DIRECTION	10.5
Y DIRECTION	0.2
THIV (Optional)	
RIDEDOWN ACCELERATION (g's)	
X DIRECTION	-17.9
Y DIRECTION	-3.1
PHD (Optional)	
ASI (Optional)	
TEST ARTICLE DEFLECTIONS (m)	
DYNAMIC	
PERMANENT	
VEHICLE DAMAGE	
EXTERIOR	
VDS	12-FD-6
CDC	12FDEW2
INTERIOR	
OCDI	FS0000000
POST-IMPACT VEHICULAR BEHAVIOR	
MAXIMUM ROLL ANGLE (°)	1.8
MAXIMUM PITCH ANGLE (°)	-6.8
MAXIMUM YAW ANGLE (°)	-1.3