U.S. Department of Transportation
Federal Highway Administration

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

February 9, 2011

In Reply Refer To:
HSST/CC-114

Mr. Geoff Maus
Chief Design Engineer
TrafFix Devices, Inc.
160 Avenida La Pata
San Clemente, California 92673

Dear Mr. Maus:

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

Name of system:	SLED – Sentry Longitudinal Energy Dissipater
Type of system:	Gating Crash Cushion/Impact Attenuator
Test Level:	NCHRP Report 350 Test Level 3 (TL-3)
Testing conducted by:	KARCO Engineering
Date of request:	August 31, 2010
Date initially acknowledged:	August 31, 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.

Requirements
Roadside safety devices should meet the guidelines contained in the Report 350. The FHWA memorandum "ACTION: Identifying Acceptable Highway Safety Features" of July 24, 1997, provides further guidance on crash testing requirements of longitudinal barriers.

Decision
The following device was found acceptable, with details provided below:

- TL-3 SLED – Sentry Longitudinal Energy Dissipater

Description
The SLED End Treatment is a high-density polyethylene (HDPE) water filled crash cushion designed to shield the end of permanent and portable barrier shapes including concrete, steel, and plastic. The SLED End Treatment modules are designed for uni- and bi-directional traffic applications where a gating device is acceptable to the road authority.

The SLED End Treatment modules are designated by their yellow color, each module has overall dimensions of approximately 6.3 ft (1.93 m) x 1.875 ft (.57 m) x 3.8 ft (1.16 m) and weighs approximately 160 lbs empty and 2000 lbs filled. Each module has eleven connecting lugs, five on one end and six on the opposite end. The four upper lugs on every module contain an independent corrosion resistant wire rope. A 1.125 inch (28.6 mm) diameter steel t-pin drops through the 1.5 inch (38 mm) diameter holes in the lugs linking the sections together.
At the front of the end treatment, pinned directly to module #1 is the Containment Impact Sled (CIS). The CIS is made of all steel construction with a flat bottom, a curved sheet metal nose, and support frames made of structural rectangular steel tubes. The CIS is designed to attach to either the five or six knuckle ends of module #1. The CIS has a curved impact face to fit over the curved knuckle contour of module #1. The vertical t-pin connects the CIS to module #1 through the series of vertical knuckles and the internal molded-in cables. Module #1 is designed to be an empty module. To prevent module #1 from being filled, six holes are designed into the lower edge of the side walls. Modules 2, 3, and 4 are filled entirely and weigh approximately 2000lbs (907 kg) each when filled.

When the Sentry SLED End Treatment is used to shield an end of an array of Sentry Water Cable Barriers, one CIS, and one module #1 is attached. For TL-3 applications, the SLED End Treatment is attached to a minimum of ten (unlimited maximum number) Sentry Water Cable Barriers.

For shielding all permanent and portable barriers, an adjustable steel transition has been designed. This transition securely attaches the rear of the Sentry SLED End Treatment to the shielded object. The transition is designed to accommodate assorted safety barrier shapes and sizes by using hinged outboard transition panels. The transition panels are made of 0.188 inch (4.8 mm) thick steel, which when attached to the barrier, conforms to the contour of the barrier. The combination of hinging, and contouring, allow the panels allows the SLED End Treatment to be attached to narrow and wide and profile shapes with either converging, or diverging angles, up to 10 degrees. For testing, the contoured hinged panels were anchored to the barriers using a minimum of eight 1 inch diameter anchor bolts with expansion sleeves, minimum four per side.

Crash Testing

A non-redirective gating crash cushion requires the following tests be conducted:
3-40, 3-41, 3-42, 3-43, and 3-44. The following full-scale tests were conducted on the SLED:

Tests for Shielding Sentry Water Cable Barrier

NCHRP-350 Test Number	Test Vehicle Weight (kg)	Impact Speed (kph)	Impact Condition	Occ. Imp Velocity (m/s)	Ridedown Acceleration (G)
3-40	820	99.6	¼ offset	10.6	15.7
3-41	2000	102	0°	11.1	11.0
3-43	2000	102.4	15°	8.0	4.8

Tests for Shielding F-Shape CMB Unpinned and Permanently Anchored

NCHRP-350 Test Number	Test Vehicle Weight (kg)	Impact Speed (kph)	Impact Angle Degree	Occ. Imp Velocity (m/s)	Ridedown Acceleration (G)
3-41 Free Standing	2000	101.5	0°	9.2	9.6
3-41 Anchored	2000	99.1	0°	9.7	12.3
3-44 Anchored	2000	103.1	20°	9.8	10.6
3-44M Anchored	2000	96.2	15°	8.4	15.6

You requested waivers of the following tests:

Test 3-40 -Shielding permanent and portable concrete barriers.
Test 3-42 -Shielding Sentry Water Cable Barrier and permanent and portable concrete barriers.
Test 3-43- Shielding permanent and portable concrete barriers.
Test 3-44 -Shielding Sentry Water Cable Barrier.

You detailed your reasoning behind the waiver requests as follows:

Test 3-40 Shielding Permanent and Portable Concrete Barriers
The Sentry SLED End Treatment shielding Sentry Water Cable Barrier recorded an OIV of 10.6 m/s and a ridedown acceleration of 15.7 g's. These values are below accepted levels, and were recorded prior to movement of the fourth Sentry module. You expect little or no change in performance with the SLED End Treatment attached to a fixed object.

Tests 3-42 Shielding Sentry Water Cable Barrier and Permanent and Portable Concrete Barriers
You expect the impacting car to push the sled and first empty module aside, allowing the end treatment to act as a gating device, similar to the 3-43 test performed. Just as the 3-43 test had lower measured values than the 3-41 test, we would expect the 3-42 test would have lower values than the 3-40 test.

Test 3-43 Shielding Permanent and Portable Concrete Barriers
As tested, shielding the Sentry Water Cable Barrier, the trajectory of the impacting vehicle carried past the angled barrier and remained upright during and after the collision with only moderate, roll pitch, and yaw. It would be expected that the impacting vehicle would have similar test results regardless of the type of barrier that is being shielded.

Test 3-44 Shielding Sentry Water Cable Barriers
The SLED End Treatment was tested twice in the most severe condition, attached to rigid anchored F-shape safety concrete barrier, in test 3-44 and 3-44M parameters. In these tests, all specified evaluation criteria (C,D,F,K, and N) were met. In addition, evaluation criteria H and I (OIV and Ridedown) were well below the maximum accepted values. Based on the 3-11 performance of Sentry Water Cable Barriers, and the products ability to deflect, you expect equal or better performance for evaluation criteria C,D,F,K and N with the SLED End Treatment attached to Sentry Water Cable Barriers.

All physical crash test summaries are included as enclosures to this correspondence.

Findings
Because the SLED is a non-redirecting, gating cash cushion, it should be applied to hazards that are not likely to be impacted at an angle on the side at any significant velocity. We note also that proper antifreezing agents must be used as filler when the SLED and Sentry products are used in areas where low temperatures can be anticipated. All users of this device should be made aware of the factors that contribute to its proper performance.

Therefore, the system 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:

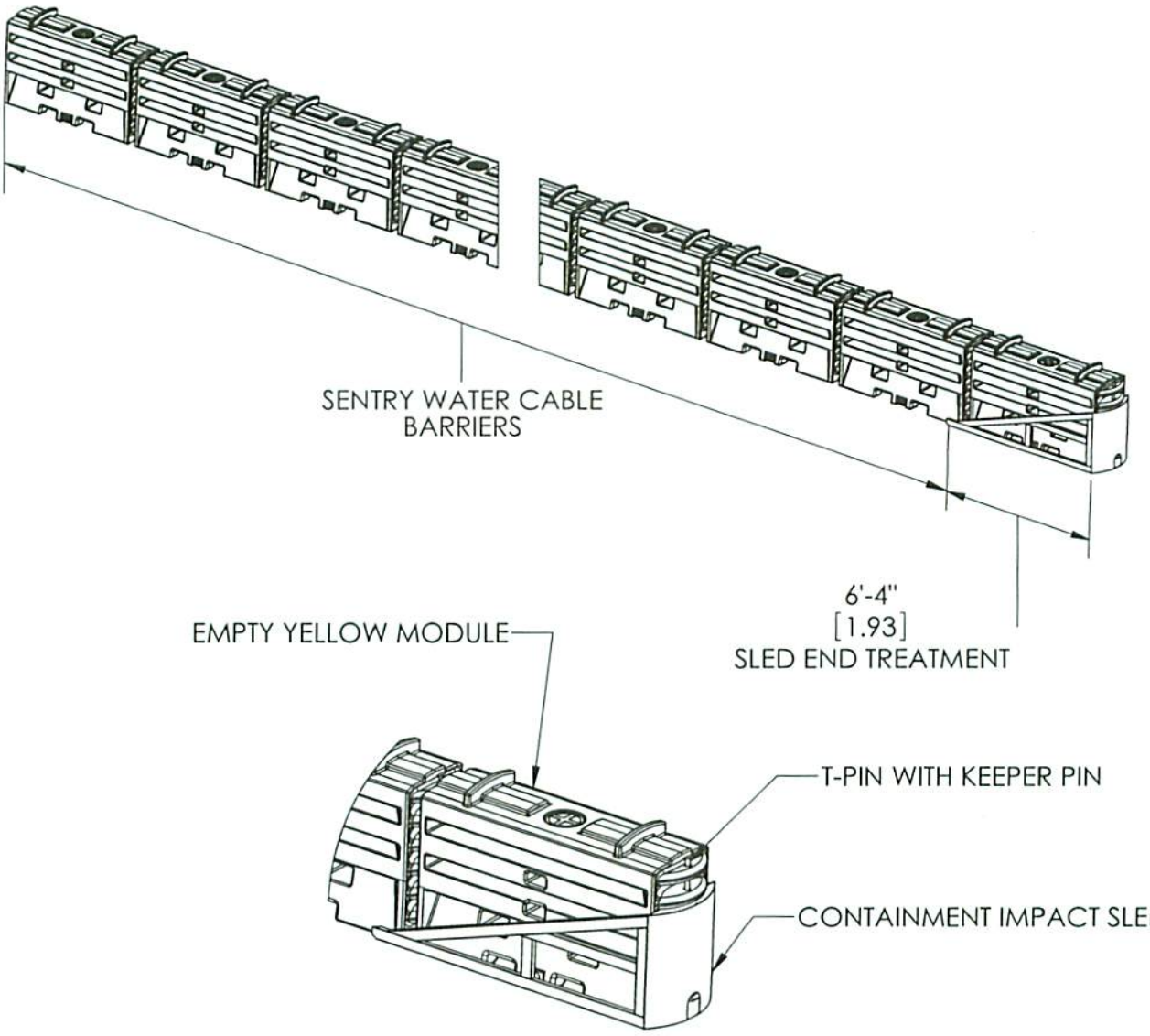
- This acceptance is limited to the crashworthiness characteristics of the systems and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may adversely influence the crashworthiness of the system will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the system 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 NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance is designated as number CC-114 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 Sentry and SLED 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 system for which the applicant is not the patent holder.

The acceptance letter is limited to the crashworthiness characteristics of the candidate system, 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



SLED END TREATMENT

TrafFix Devices Inc.

SER##

SHEET NO.	DATE:
1 OF 2	08/27/2010

INTENDED USE

The Sentry Longitudinal Energy Dissipater (**SLED**) End Treatment is a narrow water filled non-redirective, gating crash cushion designed to shield the Sentry Water Cable Barrier. Like the Sentry Water Cable Barrier the SLED End Treatment does not require foundation anchor bolts to be attached to road surface. The complete end treatment can be installed on firm soil, asphalt, and concrete.

The SLED End Treatment meets NCHRP-350 TL-3, TL-2, and TL-1 crashworthy test criteria as a non-redirective crash cushion. The complete end treatment consists of one yellow empty module and a Containment Impact Sled (CIS).

SLED End Treatment
Length: 75-3/4 in (1.93 m)
Height: 42-11/16 in (1.09 m)
Width: 22-1/2 in (0.57 m)

The SLED End Treatment has been fully tested to the recommended procedures of Report NCHRP-350.

ACCEPTANCE

FHWA Acceptance Letters:

CONTACT INFORMATION

TrafFix Devices, Inc.
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San Clemente, CA 92673
www.traffixdevices.com

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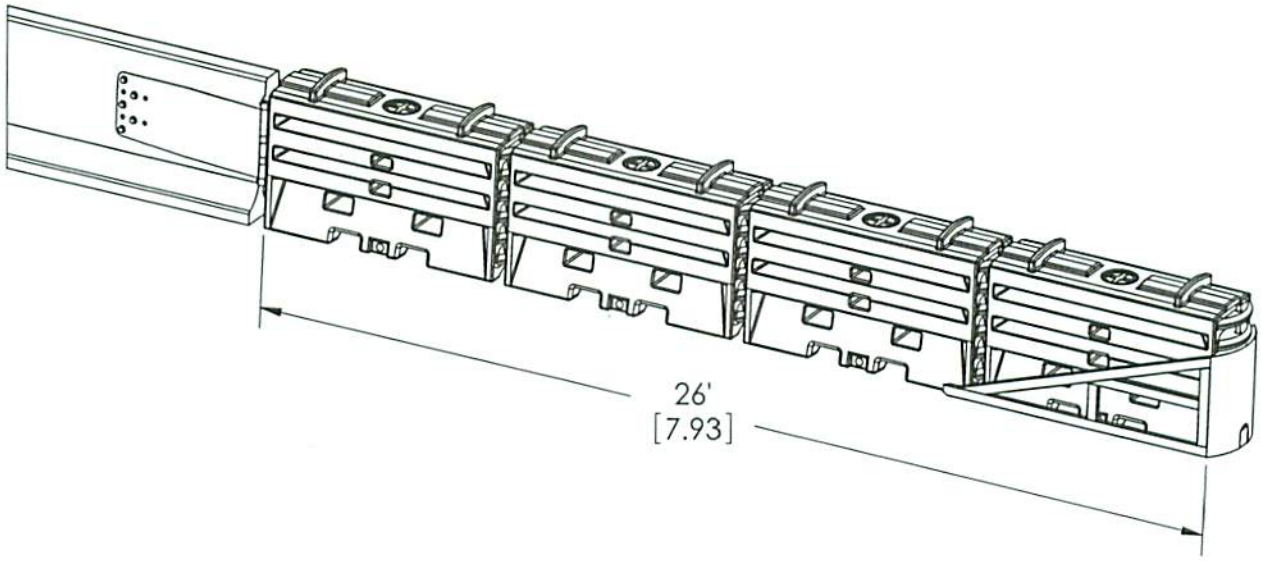
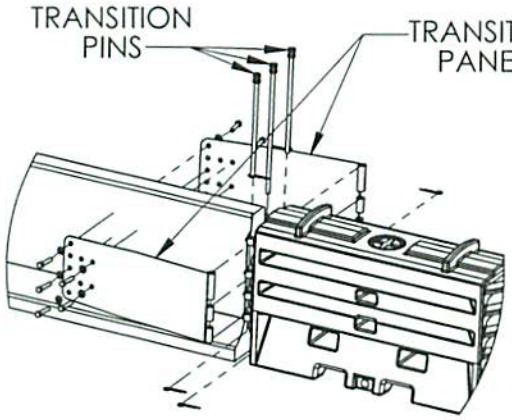
SLED END TREATMENT

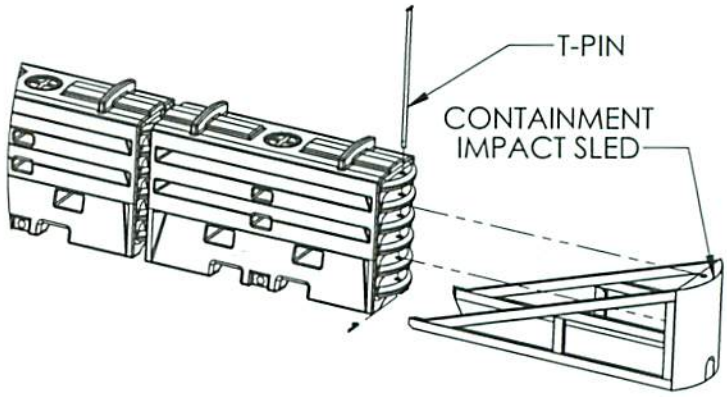
SER##

SHEET NO.	DATE:
2 OF 2	08/27/2010

TrafFix Devices Inc.







SLED END TREATMENT

TrafFix Devices Inc.

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1 OF 2	08/27/2010

INTENDED USE

The Sentry Longitudinal Energy Dissipater (SLED) End Treatment is a narrow water-filled non-redirective, gating crash cushion designed to shield the end of all permanent and portable barrier shapes including concrete, steel, and plastic. The SLED End Treatment does not require foundation anchor bolts to be attached to the road surface. The complete crash cushion can be installed on firm soil, asphalt, and concrete.

The SLED End Treatment meets NCHRP-350 TL-3, TL-2, and TL-1 crashworthy test requirements as a non-redirective crash cushion. Four yellow modules make up the complete crash cushion assembly. Front module 1 is left empty and weighs 160 lbs. [75.6 kg]. Modules 2, 3, and 4 are filled and weigh approximately 2000 lbs [907.2 kg]. The Containment Impact Sled is attached to the front of Module 1 and the Transition is attached to the rear of Module 4.

SLED End Treatment
Length: 26 ft (7.93 m) Four (4) Modules
Height: 42-11/16 in (1.09 m)
Width: 22-1/2 in (0.57 m)

The SLED End Treatment has been fully tested to the recommended procedures of NCHRP-350.

ACCEPTANCE

FHWA Acceptance Letters:

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TrafFix Devices, Inc.
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SLED END TREATMENT

SER##

SHEET NO.	DATE:
2 OF 2	08/27/2010

TrafFix Devices Inc.

DATA SHEET 4

SUMMARY OF RESULTS

Test Article:	TrafFix Devices Sentry End Treatment	Project No.:	P30061-01
Test Program:	NCHRP 350 3-40	Test Date:	05/14/10
Test Vehicle:	1995 Geo Metro		

GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO Engineering, LLC	FLAIL SPACE VELOCITY (m/sec)	
TEST NO.	3-40	X DIRECTION	10.6
DATE	5/14/2010	Y DIRECTION	0.4
TEST ARTICLE		THIV (Optional)	
TYPE	Crash Cushion	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH	25.0 m (82.1 ft.)	X DIRECTION	-15.7
SIZE AND/OR DIMENSION OF KEY ELEMENTS	Nominal Mass 79.4 kg (175 lbs)	Y DIRECTION	2.2
SOIL TYPE AND CONDITION	Concrete	PHD (Optional)	
TEST VEHICLE		ASI (Optional)	
TYPE	Production Model	**TEST ARTICLE DEFLECTIONS (m)**	
DESIGNATION	820C	DYNAMIC	
MODEL	1995 Geo Metro	PERMANENT	
MASS (CURB)	807.0 kg (1779 lbs)	**VEHICLE DAMAGE**	
MASS (TEST INERTIAL)	806.5 kg (1778 lbs)	EXTERIOR	
DUMMY MASS	75.0 kg (165 lbs)	VDS	12-FR-5
MASS (GROSS STATIC)	885.5 kg (1952 lbs)	CDC	12FREW2
IMPACT CONDITIONS		INTERIOR	
VELOCITY (km/h)	99.6 km/h (61.9 mi/h)	OCDI	FS0000000
ANGLE (°)	0.1		
IMPACT SEVERITY (kJ)	337.9	**POST-IMPACT VEHICULAR BEHAVIOR**	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (°)	-7.0
VELOCITY (km/h)		MAXIMUM PITCH ANGLE (°)	-7.4
ANGLE (°)		MAXIMUM YAW ANGLE (°)	-165.3

DATA SHEET 4

SUMMARY OF RESULTS

Test Article:	TrafFix Devices Sentry End Treatment	Project No.:	P30040-01
Test Program:	NCHRP 350 3-41	Test Date:	04/15/10
Test Vehicle:	1998 Chevrolet 2500 Cheyenne		

GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO Engineering, LLC	FLAIL SPACE VELOCITY (m/sec)	
TEST NO.	3-41	X DIRECTION	11.1
DATE	4/15/2010	Y DIRECTION	0.1
TEST ARTICLE		THIV (Optional)	
TYPE	Crash Cushion	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH	25.0 m (82.1 ft.)	X DIRECTION	-11.0
SIZE AND/OR DIMENSION OF KEY ELEMENTS	Nominal Mass 79.4 kg (175 lbs)	Y DIRECTION	-2.7
SOIL TYPE AND CONDITION	Concrete	PHD (Optional)	
TEST VEHICLE		ASI (Optional)	
TYPE	Production Model	**TEST ARTICLE DEFLECTIONS (m)**	
DESIGNATION	2000P	DYNAMIC	
MODEL	1998 Chevrolet 2500 Cheyenne	PERMANENT	
MASS (CURB)	2155 kg (4752 lbs)	**VEHICLE DAMAGE**	
MASS (TEST INERTIAL)	2034 kg (4484 lbs)	EXTERIOR	
DUMMY MASS	N/A	VDS	12-FC-5
MASS (GROSS STATIC)	2034 kg (4484 lbs)	CDC	12FCEN2
IMPACT CONDITIONS		INTERIOR	
VELOCITY (km/h)	102.0 km/h (63.3 mi/h)	OCDI	FS0000000
ANGLE (°)	0.1		
IMPACT SEVERITY (kJ)	815.9	**POST-IMPACT VEHICULAR BEHAVIOR**	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (°)	-6.0
VELOCITY (km/h)		MAXIMUM PITCH ANGLE (°)	3.4
ANGLE (°)		MAXIMUM YAW ANGLE (°)	-6.6

DATA SHEET 4

SUMMARY OF RESULTS

Test Article: TrafFix Devices Sentry End Treatment

Project No.: P30075-01

Test Program: NCHRP 350 3-43

Test Date: 06/17/10

Test Vehicle: 1998 Chevrolet Silverado 2500

GENERAL INFORMATION	
TEST AGENCY	KARCO Engineering, LLC
TEST NO.	3-43
DATE	6/17/2010
TEST ARTICLE	
TYPE	Crash Cushion
INSTALLATION LENGTH	25.1 m (82.4 ft.)
SIZE AND/OR DIMENSION OF KEY ELEMENTS	Nominal Mass 79.4 kg (175 lbs)
SOIL TYPE AND CONDITION	Concrete
TEST VEHICLE	
TYPE	Production Model
DESIGNATION	2000P
MODEL	1998 Chevrolet Silverado 2500
MASS (CURB)	2122.5 kg (4679 lbs)
MASS (TEST INERTIAL)	2044.0 kg (4506 lbs)
DUMMY MASS	N/A
MASS (GROSS STATIC)	2044.0 kg (4506 lbs)
IMPACT CONDITIONS	
VELOCITY (km/h)	102.4 km/h (63.6 mi/h)
ANGLE (°)	15.5
IMPACT SEVERITY (kJ)	826.8
EXIT CONDITIONS	
VELOCITY (km/h)	
ANGLE (°)	23.0

OCCUPANT RISK VALUES	
FLAIL SPACE VELOCITY (m/sec)	
X DIRECTION	8.0
Y DIRECTION	1.9
THIV (Optional)	
RIDEDOWN ACCELERATION (g's)	
X DIRECTION	-4.8
Y DIRECTION	3.7
PHD (Optional)	
ASI (Optional)	
TEST ARTICLE DEFLECTIONS (m)	
DYNAMIC	
PERMANENT	
VEHICLE DAMAGE	
EXTERIOR	
VDS	11-FL-4
CDC	11FLEN2
INTERIOR	
OCDI	FS0000000
POST-IMPACT VEHICULAR BEHAVIOR	
MAXIMUM ROLL ANGLE (°)	6.3
MAXIMUM PITCH ANGLE (°)	-2.7
MAXIMUM YAW ANGLE (°)	-14.3

DATA SHEET 4

SUMMARY OF RESULTS

Test Article: TrafFix Devices Sentry End Treatment

Project No.: P30043-01

Test Program: NCHRP 350 3-41

Test Date: 05/27/10

Test Vehicle: 1994 GMC Sierra 2500

GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO Engineering, LLC	FLAIL SPACE VELOCITY (m/sec)	
TEST NO.	3-41	X DIRECTION	9.2
DATE	5/27/2010	Y DIRECTION	0.1
TEST ARTICLE		THIV (Optional)	
TYPE	Crash Cushion	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH	20.1 m (65.9 ft.)	X DIRECTION	-9.6
END TREATMENT LENGTH	7.9 m (25.9 ft.)	Y DIRECTION	-3.4
SIZE AND/OR DIMENSION OF KEY ELEMENTS	Nominal Mass 79.4 kg (175 lbs)	PHD (Optional)	
SOIL TYPE AND CONDITION	Concrete	ASI (Optional)	
TEST VEHICLE		**TEST ARTICLE DEFLECTIONS (m)**	
TYPE	Production Model	DYNAMIC	
DESIGNATION	2000P	PERMANENT	
MODEL	1994 GMC Sierra 2500		
MASS (CURB)	2092.5 kg (4614 lbs)	**VEHICLE DAMAGE**	
MASS (TEST INERTIAL)	2016 kg (4445 lbs)	EXTERIOR	
DUMMY MASS	N/A	VDS	12-FC-5
MASS (GROSS STATIC)	2016 kg (4445 lbs)	CDC	12FCEN2
IMPACT CONDITIONS		INTERIOR	
VELOCITY (km/h)	101.5 km/h (63.1 mi/h)	OCDI	FS0000000
ANGLE (°)	0.2		
IMPACT SEVERITY (kJ)	801.9	**POST-IMPACT VEHICULAR BEHAVIOR**	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (°)	-2.8
VELOCITY (km/h)		MAXIMUM PITCH ANGLE (°)	3.6
ANGLE (°)		MAXIMUM YAW ANGLE (°)	3.6

DATA SHEET 4

SUMMARY OF RESULTS

Test Article: TrafFix Devices Sentry End Treatment Project No.: P30072-01

Test Program: NCHRP 350 3-41 Test Date: 06/15/10

Test Vehicle: 1992 Chevrolet Silverado 2500

GENERAL INFORMATION		OCCUPANT RISK VALUES	
TEST AGENCY	KARCO Engineering, LLC	FLAIL SPACE VELOCITY (m/sec)	
TEST NO.	3-41	X DIRECTION	9.7
DATE	6/15/2010	Y DIRECTION	0.3
TEST ARTICLE		THIV (Optional)	
TYPE	Crash Cushion	RIDEDOWN ACCELERATION (g's)	
INSTALLATION LENGTH	20.3 m (66.6 ft.)	X DIRECTION	-12.3
END TREATMENT LENGTH	8.0 m (26.2 ft.)	Y DIRECTION	3.5
SIZE AND/OR DIMENSION OF KEY ELEMENTS	Nominal Mass 79.4 kg (175 lbs)	PHD (Optional)	
SOIL TYPE AND CONDITION	Concrete	ASI (Optional)	
TEST VEHICLE		**TEST ARTICLE DEFLECTIONS (m)**	
TYPE	Production Model	DYNAMIC	
DESIGNATION	2000P	PERMANENT	
MODEL	1992 Chevrolet Silverado 2500		
MASS (CURB)	2130 kg (4696 lbs)	**VEHICLE DAMAGE**	
MASS (TEST INERTIAL)	2013.5 kg (4439 lbs)	EXTERIOR	
DUMMY MASS	N/A	VDS	12-FC-5
MASS (GROSS STATIC)	2013.5 kg (4439 lbs)	CDC	12FCEN2
IMPACT CONDITIONS		INTERIOR	
VELOCITY (km/h)	99.1 km/h (61.5 mi/h)	OCDI	FS0000000
ANGLE (°)	0.1		
IMPACT SEVERITY (kJ)	762.6	**POST-IMPACT VEHICULAR BEHAVIOR**	
EXIT CONDITIONS		MAXIMUM ROLL ANGLE (°)	-5.6
VELOCITY (km/h)		MAXIMUM PITCH ANGLE (°)	-2.6
ANGLE (°)		MAXIMUM YAW ANGLE (°)	-4.1

DATA SHEET 4

SUMMARY OF RESULTS

Test Article: TrafFix Devices Sentry End Treatment CMB

Project No.: P30077-01

Test Program: NCHRP 350 3-44

Test Date: 06/28/10

Test Vehicle: 1996 Chevrolet Cheyenne 2500

GENERAL INFORMATION	
TEST AGENCY	KARCO Engineering, LLC
TEST NO.	3-44
DATE	6/28/2010
TEST ARTICLE	
TYPE	Crash Cushion
INSTALLATION LENGTH	20.3 m (66.6 ft)
END TREATMENT LENGTH	8.0 m (26.2 ft)
SIZE AND/OR DIMENSION OF KEY ELEMENTS	Nominal Mass 66.5 kg (146 lbs)
SOIL TYPE AND CONDITION	Concrete
TEST VEHICLE	
TYPE	Production Model
DESIGNATION	2000P
MODEL	1996 Chevrolet Cheyenne 2500
MASS (CURB)	2087.0 kg (4601 lbs)
MASS (TEST INERTIAL)	2044.5 kg (4507 lbs)
DUMMY MASS	N/A
MASS (GROSS STATIC)	2044.5 kg (4507 lbs)
IMPACT CONDITIONS	
VELOCITY (km/h)	103.1 km/h (64.1 mi/h)
ANGLE (°)	20.1
IMPACT SEVERITY (kJ)	99.0
EXIT CONDITIONS	
VELOCITY (km/h)	
ANGLE (°)	

OCCUPANT RISK VALUES	
FLAIL SPACE VELOCITY (m/sec)	
X DIRECTION	9.8
Y DIRECTION	2.2
THIV (Optional)	
RIDEDOWN ACCELERATION (g's)	
X DIRECTION	-10.6
Y DIRECTION	4.3
PHD (Optional)	
ASI (Optional)	
TEST ARTICLE DEFLECTIONS (m)	
DYNAMIC	
PERMANENT	
VEHICLE DAMAGE	
EXTERIOR	
VDS	1-FR-5
CDC	01FREW2
INTERIOR	
OCDI	FS0000000
POST-IMPACT VEHICULAR BEHAVIOR	
MAXIMUM ROLL ANGLE (°)	-35.7
MAXIMUM PITCH ANGLE (°)	-5.2
MAXIMUM YAW ANGLE (°)	-15.2

DATA SHEET 4

SUMMARY OF RESULTS

Test Article:	TrafFix Devices Sentry End Treatment CMB	Project No.:	P30074-01
Test Program:	NCHRP 350 3-44 (Modified)	Test Date:	06/16/10
Test Vehicle:	1990 Chevrolet Silverado		

GENERAL INFORMATION	
TEST AGENCY	KARCO Engineering, LLC
TEST NO.	NCHRP 350 3-44 (Modified)
DATE	6/16/2010
TEST ARTICLE	
TYPE	Crash Cushion
INSTALLATION LENGTH	20.3 m (66.5 ft)
END TREATMENT LENGTH	8.0 m (26.2 ft)
SIZE AND/OR DIMENSION OF KEY ELEMENTS	Nominal Mass 71.7 kg (158 lbs)
SOIL TYPE AND CONDITION	Concrete
TEST VEHICLE	
TYPE	Production Model
DESIGNATION	2000P
MODEL	1990 Chevrolet Silverado
MASS (CURB)	2020.5 kg (4454 lbs)
MASS (TEST INERTIAL)	1983.0 kg (4372 lbs)
DUMMY MASS	N/A
MASS (GROSS STATIC)	1983.0 kg (4372 lbs)
IMPACT CONDITIONS	
VELOCITY (km/h)	96.2 km/h (59.8 mi/h)
ANGLE (°)	15.0
IMPACT SEVERITY (kJ)	47.4
EXIT CONDITIONS	
VELOCITY (km/h)	
ANGLE (°)	

OCCUPANT RISK VALUES	
FLAIL SPACE VELOCITY (m/sec)	
X DIRECTION	8.4
Y DIRECTION	2.0
THIV (Optional)	
RIDEDOWN ACCELERATION (g's)	
X DIRECTION	-15.6
Y DIRECTION	7.4
PHD (Optional)	
ASI (Optional)	
TEST ARTICLE DEFLECTIONS (m)	
DYNAMIC	
PERMANENT	
VEHICLE DAMAGE	
EXTERIOR	
VDS	1-FR-5
CDC	01FREW2
INTERIOR	
OCDI	FS0000000
POST-IMPACT VEHICULAR BEHAVIOR	
MAXIMUM ROLL ANGLE (°)	-19.3
MAXIMUM PITCH ANGLE (°)	10.7
MAXIMUM YAW ANGLE (°)	4.0