



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

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

August 16, 2005

In Reply Refer To: HSA-10/CC-93

Mr. Michael Kempen, Vice President
Safence, Inc.
46-04 245th Street
Douglaston, New York 11362

Dear Mr. Kempen:

In your letter to Mr. Richard Powers of my staff that he received on July 19, you requested the Federal Highway Administration's (FHWA) acceptance of a cable barrier terminal designed for use with the Safence Cable Barrier. With your letter, you submitted copies of crash test reports prepared by the VTI laboratory in Linkoping, Sweden under the direction of Messrs. Jan Wenall and Thomas Turbell and digital videos that documented the results of the crash tests that were conducted on this terminal.

The Safence cable barrier terminal consists of a concrete end anchor in which is embedded a fabricated steel plate. The four 19-mm diameter steel cables are connected to this plate. The first I-beam anchor post, approximately 300-mm high, is set 2 m beyond the anchor and each of the next 9 posts, set on 1-m centers, increase uniformly in height until the first full-height post is reached, 12 m from the anchor point. Succeeding line posts are all 800-mm above ground level with a 430-mm embedment depth and spaced on 2.5 m centers. All posts are set in precast concrete cylinders 0.6-m deep and 0.2 m in diameter. All posts have a 20-mm wide vertical slot to hold the four cables, which are separated from each other by 80-mm high plastic spacers. These and other details are shown in Enclosure 1.

The National Cooperative Highway Research Program (NCHRP) Report 350 tests 3-30, 3-34, 3-35, and 3-39 were successfully conducted and the summary results of each are shown in Enclosure 2. My staff had previously agreed that, upon successful results of tests 3-30 and 3-34, tests 3-31, 3-32 and 3-33 could be waived for your specific terminal design. Therefore, based on the test results, the Safence Cable Barrier Terminal, as described above, may be considered an NCHRP Report 350 terminal at test level 3. The C-posts, noted in the FHWA acceptance letter B-88C as an alternative to the original I-posts used with the Safence barrier proper, may also be substituted for the I-posts in your terminal design. In test 3-35, the pickup truck impacted the terminal approximately 0.6 m downstream from the first full-height post and was contained and redirected. Thus, the beginning length of need for the Safence terminal is just beyond the first standard post, 12.6 m from the terminal anchor.



We noted that in test 3-30, the impacting vehicle attained a roll angle of nearly 50 degrees before exiting the test installation and in test 3-34, the small car over-rode the terminal and proceeded well beyond the barrier proper. These results are similar to most non-energy absorbing terminals in general and to cable barrier terminals in particular. These test results 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. It is noteworthy, however, that your terminal is not a breakaway-type design and impacts at the terminal are not likely to release tension in any of the wire ropes. Thus, the barrier proper can be expected to remain functional in most cases following such hits.

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-93 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.
- Since this product is made from steel, the provisions of Title 23, Code of Federal Regulations, Section 635.410 (Buy America) are applicable.
- The Safence 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-National Highway System 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.

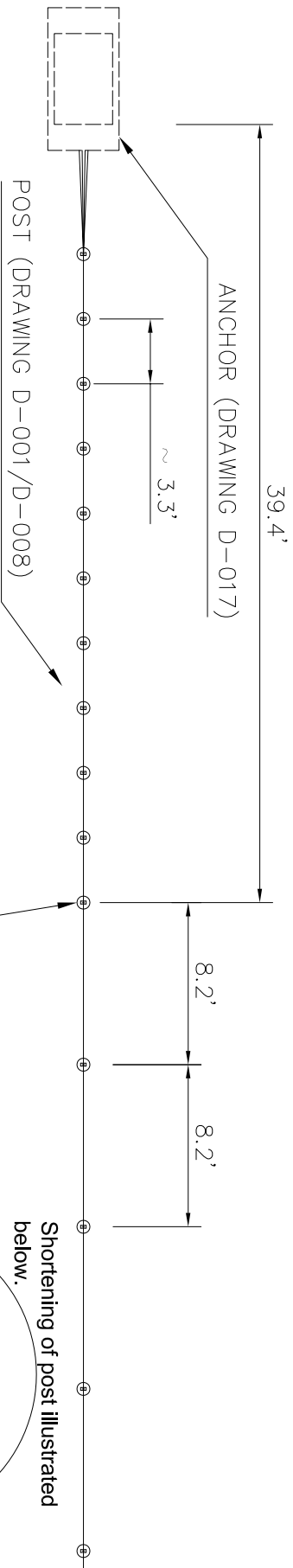
Sincerely yours,

/original signed by/

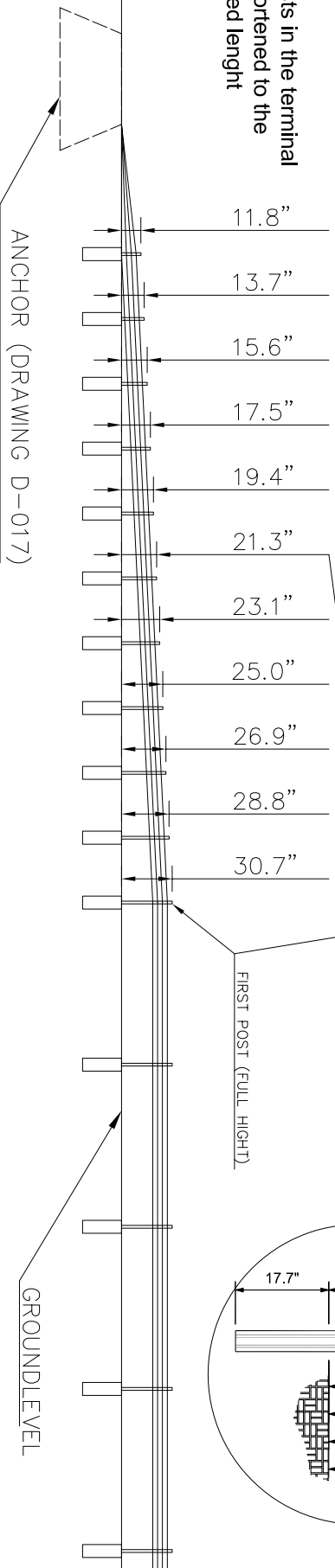
John R. Baxter, P.E.
Director, Office of Safety Design
Office of Safety

2 Enclosures

TOP VIEW



All posts in the terminal are shortened to the specified length



SIDE VIEW

Designed MH	Drawn NM	Approved - date 2005-08-02	Tolerance requirements	Units	Proj. 	Scale 1:100
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BLUE SYSTEMS AB

Hällfjundregatan 24
S-426 58 Västra Frölunda
SWEDEN



Tel: +4631 292716 Fax: +4631 293065
E-post: info@bluesystems.se

Name
SAFENCE 350 TL3 (Terminal)

Material

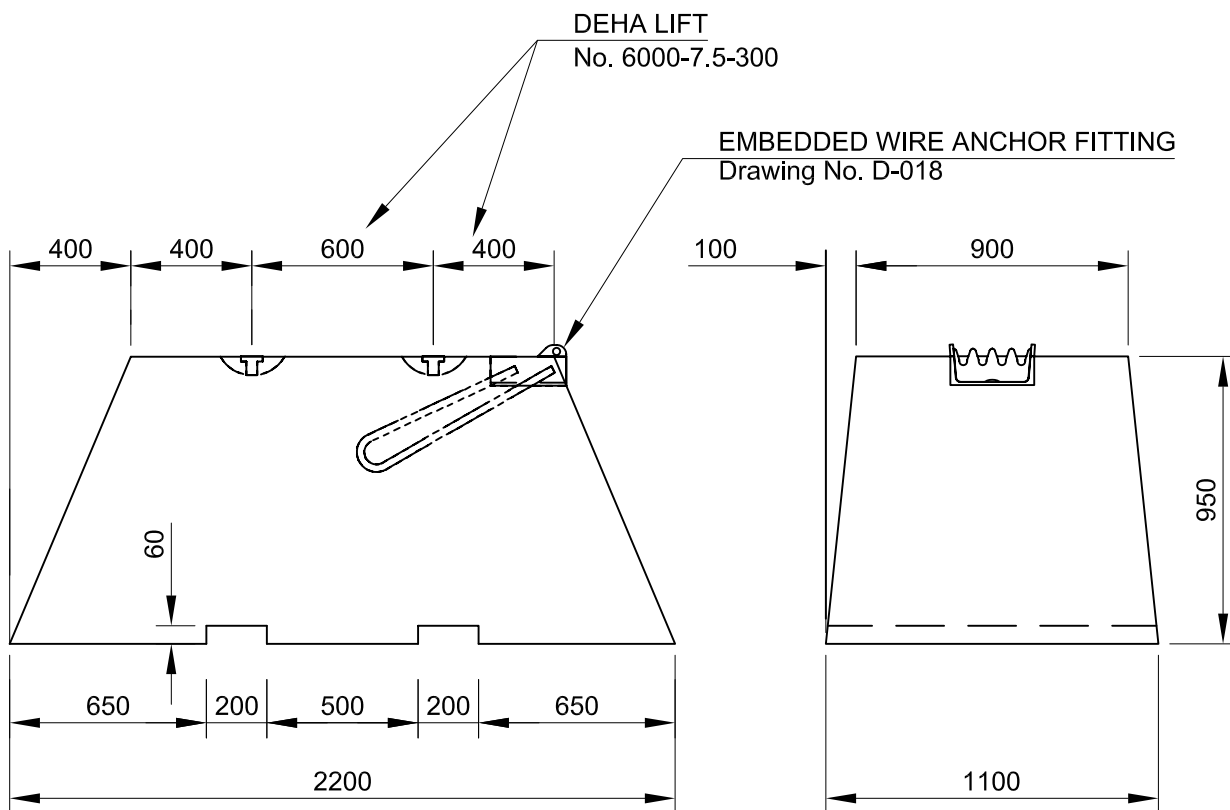
Issue

Sheet

File

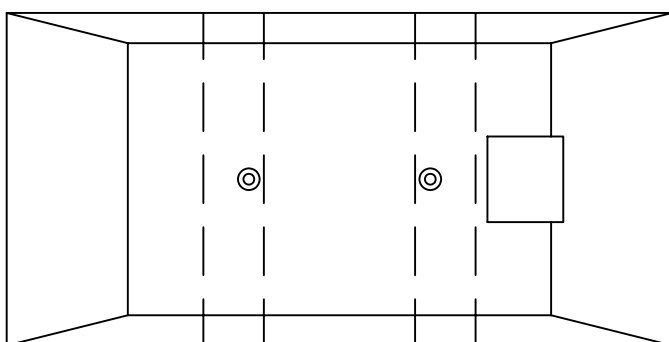
Drawing No.

SRB-011 imp



SIDE VIEW 1:25

FRONT VIEW 1:25



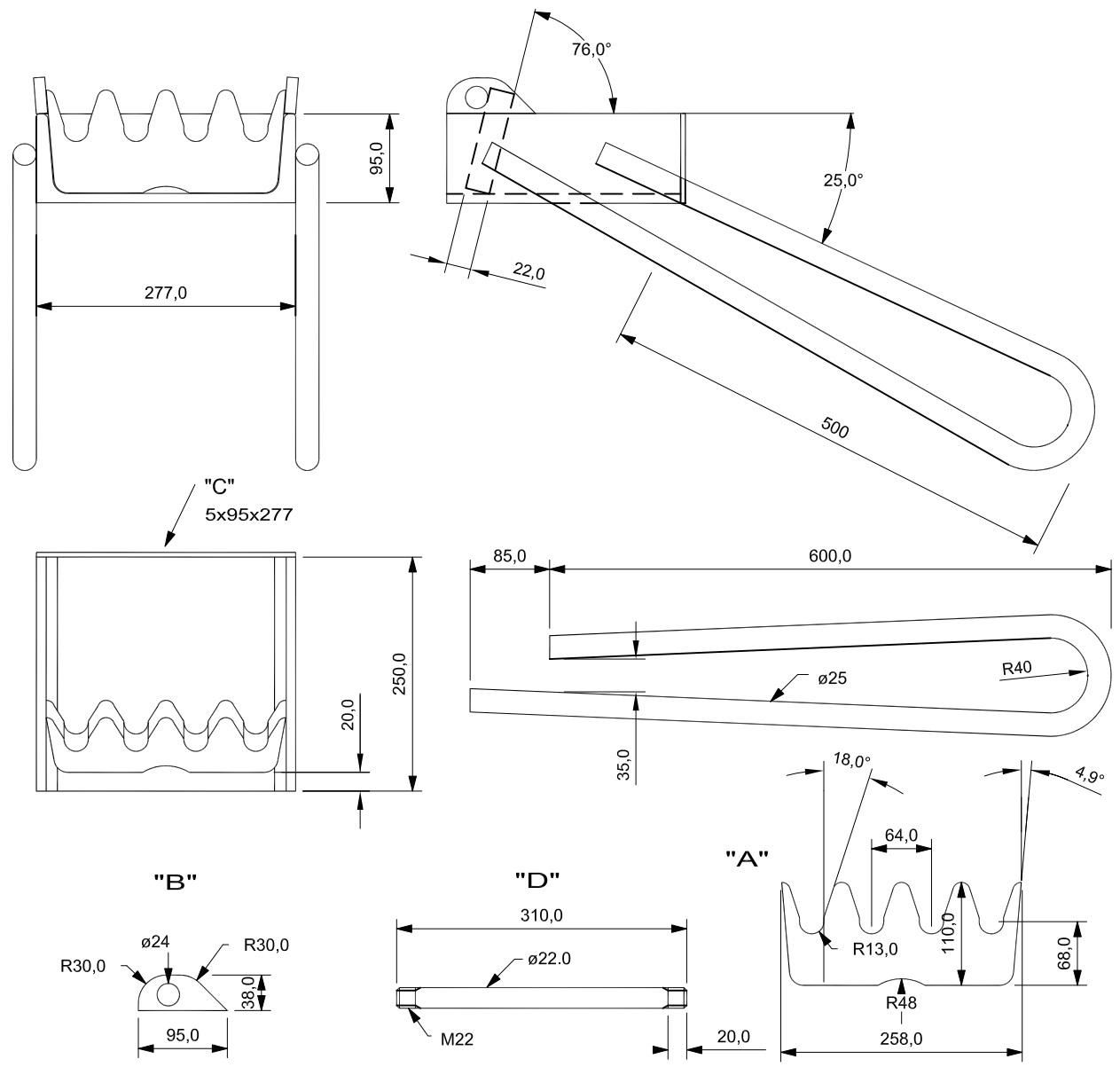
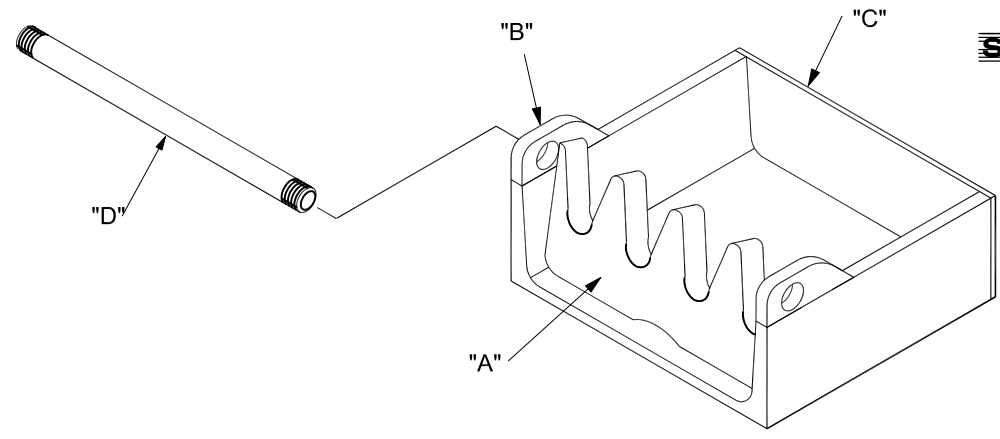
TOP VIEW 1:25

LIFT (DEHA No. 6000-7.5-300)

VOLUME = 1.68m³

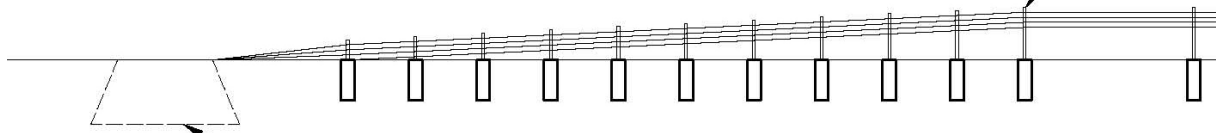
WEIGHT = 3.86 ton

Designed	Drawn NM	Approved - date 2005-03-28	Tolerance requirements	Units mm	Proj. 	Scale 1:25
BLUE SYSTEMS AB Hällefjordregatan 24 S-426 58 Västra Frölunda SWEDEN Tel: +4631 297216 Fax: +4631 293065 E-post: info@bluesystems.se	Material CONCRETE K40 EN206-1, C30/37	Name ANCHOR	Issue	Sheet	File	Drawing No. D-017, REV A



Designed	Drawn NM	Approved - date 2005-03-28	Tolerance requirements	Units mm	Proj. 	Scale
<p>BLUE SYSTEMS AB Hällefjordregatan 24 S-426 58 Västra Frölunda SWEDEN Tel: +4631 297216 Fax: +4631 293065 E-post: info@bluesystems.se</p>	Material S235JRG2	Name EMBEDDED WIRE ANCHOR FITTING		Issue	Sheet	File
				Drawing No.		
				D-018		

Annex 13
Summary sheet

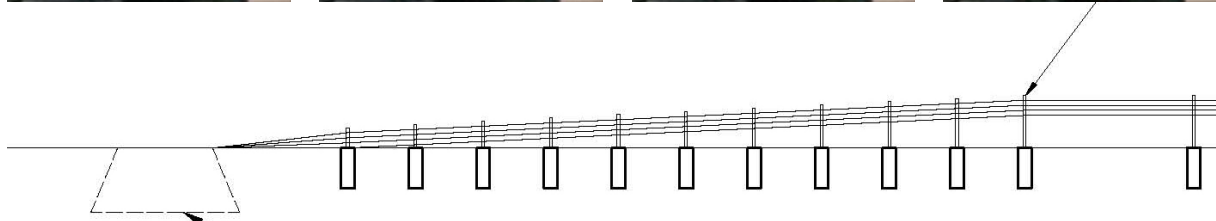


NCHRPR 350 3-30

General information		Occupant Risk Values	
Test agency	VTI	Impact Velocity [m/s]	
Test No.	2005-06-14-1	x-direction	2,3 m/s
Date	14 th of June 2005	y-direction	1,1 m/s
Test article		THIV	
Type	Safence 350 TL3 terminal	Ridedown Acceleration [g's]	9,0 km/h (2,5 m/s)
Installation length [m]	12 m + 60 m	x-direction	2,2 g
Size and/or dimension and material of key elements	19 mm wire, height 0,72 m	y-direction	2,9 g
Soil Type and Condition		PHD	
Standard soil		ASI	
Test Vehicle		Test Article Deflections [m]	
Type	Nissan Micra	Dynamic	none
Designation	A03	Permanent	none
Model	1,0 3D	Vehicle Damage	
Mass [kg] Curb	920 kg ¹	Exterior	
Test Inertial Dummy(s)	825 kg	VDS	12-FCQ-1
Gross Static	900 kg	CDC	12-UFYN-1
Impact Conditions		Interior	
Speed [km/h]	102,0 km/h	OCDI	RS0000000
Angle [deg]	0°	Post Impact Vehicular Behaviour	
Exit Conditions		Maximum Roll Angle [deg]	47,6°
Speed [km/h]	97 km/h	Maximum Pitch Angle [deg]	15,8°
Angle [deg]	0°	Maximum Yaw Angle [deg]	9,0°

¹ Driver 75 kg included.

Annex 13
Summary sheet

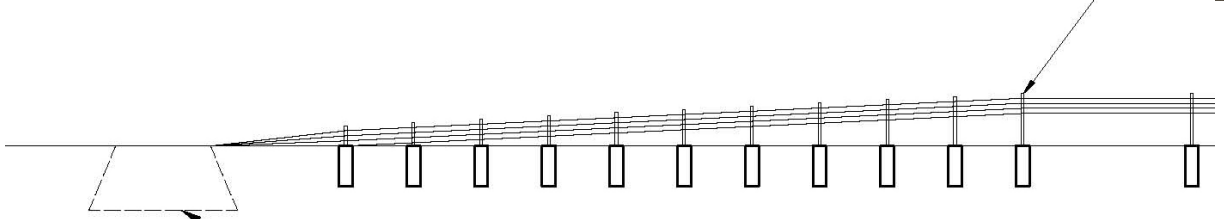


NCHRPR 350 3-34

General information		Occupant Risk Values	
Test agency	VTI	Impact Velocity [m/s]	
Test No.	2005-06-08-1	x-direction	2,2 m/s
Date	8 th of June 2005	y-direction	2,1 m/s
Test article		THIV	
Type	Safence 350 TL3 terminal	Ridedown Acceleration [g's]	9,6 km/h (2,7 m/s)
Installation length [m]	12 m + 60 m	x-direction	2,3 g
Size and/or dimension and material of key elements	19 mm wire, height 0,72 m	y-direction	3,9 g
Soil Type and Condition		PHD	
Standard soil		ASI	
Test Vehicle		Test Article Deflections [m]	
Type	Nissan Micra	Dynamic	none
Designation	A03	Permanent	none
Model	1,0 3D	Vehicle Damage (prior to second impact)	
Mass [kg] Curb	920 kg ¹	Exterior	
Test Inertial Dummy(s)	823 kg	VDS	12-FCQ-1
Gross Static	75 kg	CDC	12-UFYN-1
	898 kg	Interior	
		OCDI	RS0000000
Impact Conditions		Post Impact Vehicular Behaviour	
Speed [km/h]	101,6 km/h	Maximum Roll Angle [deg]	31,3°
Angle [deg]	15°	Maximum Pitch Angle [deg]	6,9°
Exit Conditions		Maximum Yaw Angle [deg]	
Speed [km/h]	94 km/h		21,2°
Angle [deg]	4,7°		

¹ Driver 75 kg included.

Annex 13
Summary sheet

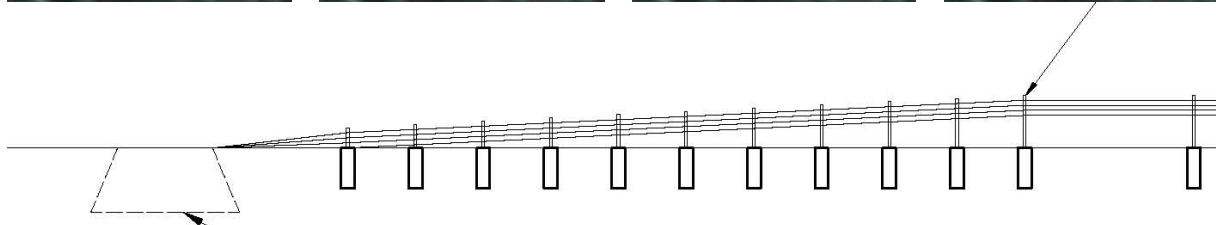


NCHRP 350 3-35

General information		Occupant Risk Values	
Test agency	VTI	Impact Velocity [m/s]	
Test No.	2005-06-16-1	x-direction	2,7 m/s
Date	16 th of June 2005	y-direction	4,0 m/s
Test article		THIV	
Type	Safence 350 TL3 terminal	Ridedown Acceleration [g's]	16,4 km/h (4,6 m/s)
Installation length [m]	12 m + 60 m	x-direction	2,3 g
Size and/or dimension and material of key elements	19 mm wire, height 0,72 m	y-direction	5,4 g
Soil Type and Condition		PHD	
Standard soil		5,8 g	
Test Vehicle		ASI	
Type	Chevrolet 2500	0,48	
Designation		Test Article Deflections [m]	
Model		Dynamic	1,67 m
Mass [kg] Curb	2160 kg ¹	Permanent	NA
Test Inertial Dummy(s)	2024 kg	Vehicle Damage	
Gross Static	2024 kg	Exterior	
		VDS	11-LFQ-3
		CDC	11-LFES-3
		Interior	
		OCDI	RS0000000
Impact Conditions		Post Impact Vehicular Behaviour	
Speed [km/h]	101,9 km/h	Maximum Roll Angle [deg]	15,2°
Angle [deg]	20°	Maximum Pitch Angle [deg]	3,9°
Exit Conditions		Maximum Yaw Angle [deg]	
Speed [km/h]	87 km/h	27,1°	
Angle [deg]	4,5°		

¹ Driver 75 kg included.

Annex 13
Summary sheet



NCHRPR 350 3-39

General information		Occupant Risk Values	
Test agency	VTI	Impact Velocity [m/s]	
Test No.	2005-06-03-1	x-direction	4,3 m/s
Date	3 rd of June 2005	y-direction	5,2 m/s
Test article		THIV	23,7 km/h (6,6 m/s)
Type	Safence 350 TL3 terminal	Ridedown Acceleration [g's]	
Installation length [m]	12 m + 60 m	x-direction	6,3 g
Size and/or dimension and material of key elements	19 mm wire, height 0,72 m	y-direction	6,4 g
Soil Type and Condition		PHD	7,9 g
Standard soil		ASI	0,74
Test Vehicle		Test Article Deflections [m]	
Type	Nissan Micra	Dynamic	0,85 m
Designation	A03	Permanent	NA
Model	1,0 3D	Vehicle Damage	
Mass [kg] Curb	920 kg ¹	Exterior	
Test Inertial Dummy(s)	837 kg	VDS	1-RFQ-4
Gross Static	75 kg	CDC	01-RFES-4
	912 kg	Interior	
		OCDI	RS0000000
Impact Conditions		Post Impact Vehicular Behaviour	
Speed [km/h]	98,9 km/h	Maximum Roll Angle [deg]	14,4°
Angle [deg]	20°	Maximum Pitch Angle [deg]	11,6°
Exit Conditions		Maximum Yaw Angle [deg]	81,1°
Speed [km/h]	63 km/h		
Angle [deg]	9°		

¹ Driver 75 kg included.