



SLOVENSKI STANDARD

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Oprema cest - 3. del: Razredi uporabnosti, merila za preskušanje ob naletu in preskusne metode za blažilnike trkov

Road restraint systems - Part 3: Performance classes, impact test acceptance criteria and test methods for crash cushions

Rückhaltesysteme an Straßen - Teil 3: Leistungsklassen, Abnahmekriterien für Anprallprüfungen und Prüfverfahren für Anpralldämpfer

Dispositifs de retenue routiers - Partie 3: Classes de performance, critères d'acceptation des essais de choc et méthodes d'essai pour les atténuateurs de choc

Ta slovenski standard je istoveten z: EN 1317-3:2010

ICS:

13.200	Preprečevanje nesreč in katastrof	Accident and disaster control
93.080.30	Cestna oprema in pomožne naprave	Road equipment and installations

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English Version

Road restraint systems - Part 3: Performance classes, impact test acceptance criteria and test methods for crash cushions

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This European Standard was approved by CEN on 29 April 2010.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN 1317-3:2010) has been prepared by Technical Committee CEN/TC 226 "Road equipment", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2011, and conflicting national standards shall be withdrawn at the latest by January 2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1317-3:2000.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

EN 1317 consists of the following parts:

- EN 1317-1, *Road restraint systems — Part 1: Terminology and general criteria for test methods*;
- EN 1317-2, *Road restraint systems — Part 2: Performance classes, impact test acceptance criteria and test methods for safety barriers including vehicle parapets*;
- EN 1317-3, *Road restraint systems — Part 3: Performance classes, impact test acceptance criteria and test methods for crash cushions*;
- ENV 1317-4, *Road restraint systems — Part 4: Performance classes, impact test acceptance criteria and test methods for terminals and transitions of safety barriers*;
- prEN 1317-4, *Road restraint systems — Part 4: Performance classes, impact test acceptance criteria and test methods for transitions of safety barriers* (under preparation: this document will supersede ENV 1317-4:2001 for the clauses concerning transitions);
- EN 1317-5, *Road restraint systems — Part 5: Product requirements and evaluation of conformity for vehicle restraint systems*;
- prEN 1317-6, *Road restraint systems — Pedestrian restraint systems — Part 6: Pedestrian Parapet* (under preparation);
- prEN 1317-7, *Road restraint systems — Part 7: Performance classes, impact test acceptance criteria and test methods for terminals of safety barriers* (under preparation: this document will supersede ENV 1317-4:2001 for the clauses concerning terminals);
- prEN 1317-8, *Road restraint systems — Part 8: Motorcycle road restraint systems which reduce the impact severity of motorcyclist collisions with safety barriers* (under preparation)..

Annex A is normative.

The significant technical changes incorporated in this revision are:

- a) Deletion of PHD;

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- b) Introduction of the measure of VCDI;
- c) Reduction of impact angle tolerance to $\pm 1^\circ$;
- d) Introduction of combined limit deviation of speed and angle for side tests;
- e) New Annex A (normative) – Detailed test report template.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

Based on safety considerations, the design of roads may require the installation of crash cushions at certain locations. These are designed to reduce the severity of vehicle impact with a more resistive object.

The standard specifies the levels of performance, required of crash cushions, for the restraint and/or redirection of impacting vehicles.

The impact severity of vehicles in collision with crash cushions is rated by the indices Theoretical Head Impact Velocity (THIV), and Acceleration Severity Index (ASI) (see EN 1317-1).

The different performance levels will enable national and local authorities to specify the performance class of crash cushions.

Attention is drawn to the fact that the acceptance of a crash cushion will require the successful completion of a series of vehicle impact tests (see Tables 1, 2, 3, etc.) as well as compliance with the full standard.

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EN 1317-3:2010 (E)**1 Scope**

This European Standard specifies requirements for the performance of crash cushions during vehicle impacts. It specifies performance classes and acceptance criteria for impact tests, which should be read in conjunction with EN 1317-1 and EN 1317-5.

The modifications included in this European Standard are not a change of test criteria, in the sense of EN 1317-5:2007+A1:2008, ZA.3.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1317-1:2010, *Road restraint systems — Part 1: Terminology and general criteria for test methods*

3 Abbreviations

ASI: Acceleration Severity Index

THIV: Theoretical Head Impact Velocity

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4 Terms and definitions

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For the purposes of this document, the terms and definitions given in EN 1317-1:2010 and the following apply.

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4.1**obstacle**

item or hazard being protected from vehicular impact by the presence of a crash cushion

4.2**front face of the obstacle**

surface closest to a plane drawn perpendicular to the centre line of the crash cushion

4.3**family of crash cushions**

multiple performance product that can be assembled to form different models from the same set of components, to obtain different shapes and performances, with the same working mechanism for the system and its components

4.4**crash cushion head**

structural beginning of a crash cushion, i.e. first point at which the system offers significant resistance to an impact in the direction defined in 5.2

NOTE 1 In some designs, a non-structural beginning (head) may be included which offers no significant resistance to an impact. The crash cushion head is defined by the manufacturer and accepted by the test house performing the test.

NOTE 2 If no agreement is reached between the manufacturer and the test house regarding the definition of the crash cushion head, the test can be performed according to the manufacturer's definition and a note should be added to the test report outlining the diverging points of view.

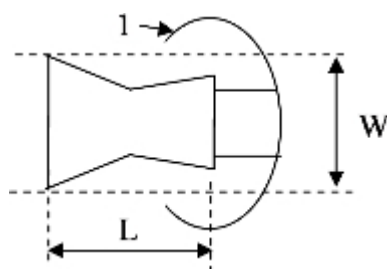
4.5 structural length of a crash cushion

L
length of a crash cushion to be used to define the impact points, i.e. the longitudinal distance from the head of the crash cushion to the rearmost point of the system required to achieve the declared performance

4.6 crash cushion width

W
maximum horizontal distance between the approach side and the departure side of the crash cushion, measured orthogonally to its centre line

NOTE See Figure 1.



Key

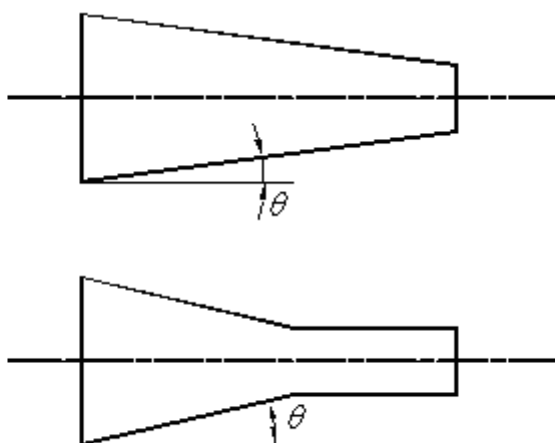
- 1 Non structural head
- L Structural length of the crash cushion
- W Crash cushion width

Figure 1 — Example of crash cushion width

4.7 taper angle

maximum angle in plan view from a parallel of the center line and the angled side of the crash cushion

NOTE See Figure 2.



Key

- θ Taper angle

Figure 2 — Example of taper angle

EN 1317-3:2010 (E)**4.8****trapezoidal envelope**

trapezium surrounding the plan profile of the crash cushion, having a minimum plan area as shown in Figures 4 and 5

NOTE Any essential supporting structure should be included within this envelope.

5 Performance classes**5.1 General**

Crash cushions shall comply with requirements given in 5.2 to 5.6 when tested in accordance with impact test criteria defined in Table 1.

Vehicle specifications and deviations shall conform to EN 1317-1.

5.2 Types of crash cushion

Types of crash cushion shall be:

- a) redirective (R): crash cushions which contain and redirect vehicles;
- b) non-redirective (NR): crash cushions which contain but do not redirect vehicles.

5.3 Vehicle impact tests

Vehicle impact test descriptions shall be as given in Table 1.

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Table 1 — Vehicle impact test descriptions for crash cushions

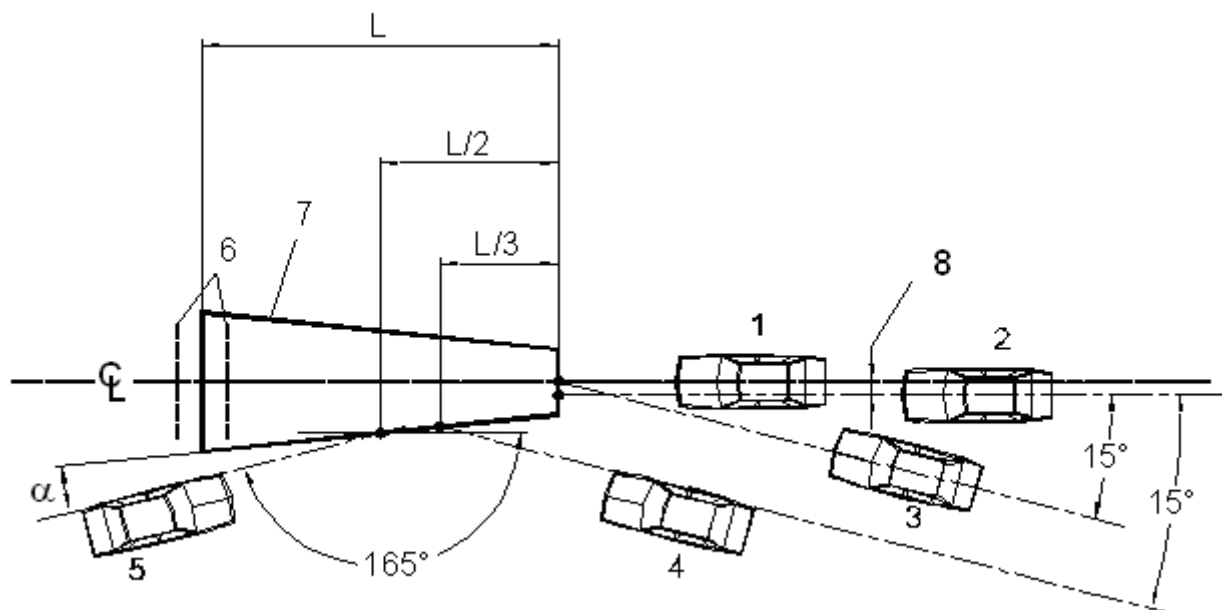
Test ^a	Approach	Total vehicle mass kg	Velocity km/h	Figure 3 Test no.	
TC 1.1.50	Frontal centre	900	50	1	
TC 1.1.80		900	80		
TC 1.1.100		900	100		
TC 1.2.80		Frontal, ¼ vehicle offset	1 300	80	1
TC 1.2.100			1 300	100	
TC 1.3.110			1 500	110	
TC 2.1.80	Frontal, ¼ vehicle offset	900 ^b	80	2	
TC 2.1.100		900 ^b	100		
TC 3.2.80	Head (centre), at 15°	1 300	80	3	
TC 3.2.100		1 300	100		
TC 3.3.110		1 500	110		
TC 4.2.50	Side impact at 15°	1 300	50	4	
TC 4.2.80		1 300	80		
TC 4.2.100		1 300	100		
TC 4.3.110		1 500	110		
TC 5.2.80	Side impact at 165°	1 300	80	5	
TC 5.2.100		1 300	100		
TC 5.3.110		1 500	110		

^a Test notation is as follows:

TC	1	2	80
Test of crash cushion	Approach	Test vehicle mass	Impact speed

^b For this test condition, the ATD shall be located at the more distant location from the centre line of crash cushion.

Test 5 (see Figure 3) shall not be run for a crash cushion of non-parallel form when, at the relevant impact point, the angle (α) of the vehicle path to the traffic face of the crash cushion is less than 5° .



Key

- 1 Test 1
- 2 Test 2
- 3 Test 3
- 4 Test 4
- 5 Test 5

6 Alternative locations for front face of obstacle

7 Crash cushion

8 1/4 vehicle width

For further details see Figure 5a).

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Figure 3 — Vehicle approach paths for tests 1 to 5

5.4 Performance levels

The crash cushion performance classes shall be as given in 5.6 and Table 2. These are classified according to an increasing energy absorption capacity. A successfully tested crash cushion at a given performance level, shall be considered as having met the test conditions of lower levels.

Table 2 — Performance levels for crash cushions

Level	Acceptance test					
50	TC 1.1.50	-	-	-	TC 4.2.50 ^a	-
80/1	-	TC 1.2.80	TC 2.1.80	-	TC 4.2.80 ^a	-
80	TC 1.1.80	TC 1.2.80	TC 2.1.80	TC 3.2.80	TC 4.2.80 ^a	TC 5.2.80 ^a
100	TC 1.1.100	TC 1.2.100	TC 2.1.100	TC 3.2.100	TC 4.2.100 ^a	TC 5.2.100 ^a
110	TC 1.1.100	TC 1.3.110	TC 2.1.100	TC 3.3.110	TC 4.3.110 ^a	TC 5.3.110 ^a

^a Relevant for the redirective crash cushions only.

EN 1317-3:2010 (E)**5.5 Impact severity**

Vehicle occupant impact severity shall be assessed by the indices ASI and THIV as given in EN 1317-1:2010.

The severity levels shall be determined as shown in Table 3 as a function of the values of the ASI and THIV indices.

Impact severity level A affords a greater level of safety for the occupants of an errant vehicle than level B and is preferred.

The highest impact severity level from a series of tests shall denote the severity level of the crash cushion family.

Table 3 — Vehicle impact severity values

Impact severity levels	Index values		
A	$ASI \leq 1,0$	and	THIV ≤ 44 km/h in tests 1,2 and 3 THIV ≤ 33 km/h in tests 4 and 5
B	$1,0 < ASI \leq 1,4$		THIV ≤ 44 km/h in tests 1,2 and 3 THIV ≤ 33 km/h in tests 4 and 5
NOTE The limit value for THIV is higher in tests 1, 2 and 3 because experience has shown that higher values can be tolerated in frontal impacts (also because of better passive safety in this direction). Such a difference in tolerance between frontal and lateral impacts is already considered in the ASI parameter, which therefore does not need to be changed.			

5.6 Families of crash cushions

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A family of crash cushion models shall be derived from a single parent crash cushion once the latter has been successfully tested to this standard.

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A reduced matrix of tests shall be completed for the other family members in accordance with Tables 4 to 9. The models in the family cover a range of performance classes, width and taper angles.

Provided that the models in the family:

- a) are assembled from the same set of components;
- b) have the same product name;
- c) have the same working mechanism for the system and for the components,

the family, specified by the drawings of all the models, can be tested as a single product with multiple performance levels. If the tests specified by the family test matrix are passed, the crash cushion is accepted as a multiple performance product, i.e. each model is accepted in the relevant performance class. All the cushions in the family shall be of the same type, i.e. all redirective or all non-redirective.

If the parent crash cushion has the minimum taper angle/width and belongs to the highest performance class, the test matrix is the one shown in Table 4, 5, 6 or 7, depending on the highest velocity of the family.