CEN/TC 226 Secretariat

CEN/TC 226 N 1606

"Road equipment"
"Equipements de la route"
"Straßenausstattung"

2017-01-27

CEN/TC 226 – Draft Decision D 619c/2017

WG 10 – Adoption of a New Work Item (NWI) for the prEN 12767 "Passive safety of support structures for road equipment — Requirements and test methods"

Action : **Vote CIB – Deadline: 2017-03-20**

Source : CEN/TC 226/WG 10

Comments :

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NEW WORK ITEM PROPOSAL	
Closing date for voting **2017-03-20**	Reference number (to be given by the Secretariat) ……..
Date of circulation **2017-01-27**	**CEN/TC 226 N 1606**
Secretariat **AFNOR**	**CENELEC/TC / SC** (Sec)…

IMPORTANT NOTE: Incomplete proposals risk rejection or referral to originator.

☒ The proposer has considered the guidance given in Annexes 1 and 2 during the preparation of the NWIP

Proposal (to be completed by the proposer)

Title of the proposed deliverable
(in the case of an amendment, revision or a new part of an existing document, show the reference number and current title)

English title: **Passive safety of support structures for road equipment – Requirements and test methods**

French and German title (if available)

Scope of the proposed deliverable

This document specifies performance test procedures to determine the passive safety properties of support structures like lighting columns, sign posts, structural elements, foundations, detachable products and any other components used to support a particular item of equipment on the roadside.

This document provides a common basis for the vehicle impact testing of items of road equipment support structures.

This document does not apply to road restraint systems.

Purpose and justification of the proposal

This item corresponds to the revision of an EN, the EN 12767:2007.

Is the proposal actively or probably in support of European regulation / legislation or established public policy?

☒ **Yes** ☐ **No**

If Yes, indicate if the proposal is

- **in relation to EC mandate(s):……..(which one(s))**
- **in relation to EC Directive(s)/Regulation(s): EU 305/2011**
- **in relation to other legislation or established public policy: ……..(give details)**

Indication(s) of the preferred type or types of deliverable(s) to be produced under the proposal.

☒ European Standard ☐ Harmonization Document* ☐ Technical Specification ☐ Technical Report

* for CENELEC only

Envisaged track

☒ Enquiry and vote (see 11.2.3 of IR Part 2) ☐ UAP (see 11.2.5 of IR Part 2)

Preparatory work (at a minimum an outline should be included with the proposal)

☒ A draft is attached ☐ An outline is attached ☐ An existing document to serve as initial basis

The proposer or the proposer's organization is prepared to undertake the preparatory work required ☒ Yes ☐ No

If a draft is attached to this proposal,:

Please select from one of the following options (note that if no option is selected, the default will be the second option):

☐ Draft document will be registered as a preliminary project in the committee's work programme (stage 00.60)

☒ Draft document will be registered as a new project in the committee's work programme (stage 20.00)

☐ Draft document can be submitted to UAP (FprEN – stage 50.20)

Known patented items

☐ **Yes** ☒ **No** **If "Yes", see CEN-CENELEC Guide 8 and provide full information in an annex**

A statement from the proposer as to how the proposed work may relate to or impact on existing work, especially existing CEN, CENELEC, ISO and IEC deliverables. The proposer should explain how the work differs from any apparently similar work, or explain how duplication and conflict will be minimized.

The revision of the EN 12767:2007 has been already approved by the CEN/TC 226 **Decision 492/2013 taken on 2013-06-14.** This proposal relates to the re-establishment of a cancelled project (**WI 00226165** cancelled on **2015-11-16**) as an active project and to its submission to a new CEN Enquiry.

A listing of relevant existing documents at the international, regional and national levels.

A simple and concise statement identifying and describing relevant affected stakeholder categories (including small and medium sized enterprises) <u>in particular those who are immediately affected by the proposal</u> (see Annexes 1 and 2) **and how they will each benefit from or be impacted by the proposed deliverable(s)**

Liaisons:

A listing of relevant external European or international organizations or internal parties (other CEN, CENELEC, ISO and/or IEC committees) to which a liaison should be established (in case of ISO and IEC committees via Vienna and Frankfurt Agreements).

Joint/parallel work:

Possible joint/parallel work with:

☒ CEN (please specify committee ID)

CEN/TC 226/WG 3, Vertical signs

CEN/TC 50, Lighting columns and spigots

☐ CENELEC (please specify committee ID)

☐ ISO (please specify committee ID)

☐ IEC (please specify committee ID)

☐ Other (please specify)

Candidate for European – International cooperation?

Vienna Agreement (ISO-CEN Agreement):

☐ **Yes** ☒ **No** **('Yes' meaning joint ISO-CEN development)**

Frankfurt Agreement (IEC-CENELEC Agreement):

☐ **Yes** ☒ **No** **('Yes' meaning that the NWI, if approved, is to be offered to IEC for taking up)**

Name of the Proposer *(include contact details)*	**Proposed Project Leader** *(include contact details)*
On behalf of CEN/TC 226/WG 10 experts Mr Daniel MUTRICY (CEN/TC 226/WG 10 Convenor) AL BABTAIN France PETITJEAN 52 Av. du Maréchal Leclerc CS60010 10121 SAINT ANDRE LES VERGERS FRANCE Tel : +33 (0)3 25 71 32 69 Fax : +33 (0)3 25 71 47 52 Email: daniel.mutricy@petitjean.fr	CEN/TC 226/WG 10 experts

Supplementary information relating to the proposal

☐ This proposal relates to a new document;

☐ This proposal relates to the adoption as an active project of an item currently registered as a Preliminary Work Item;

☒ This proposal relates to the re-establishment of a cancelled project as an active project.

☐ This proposal relates to a research project outcome

Members already known to support the proposal and willing to participate to the activities:

According to Decision **CEN/TC 226 492/2013 taken on 2013-06-14:** AENOR, AFNOR, ASI, BSI, DIN, DS, NBN, NEN, NSAI, SFS, SIS, SN, SNV, UNI and UNMZ are the Members already known to support the proposal and willing to participate to the activities. … *[Note: The proposal cannot usually be approved without a minimum of 5 national Members]*

Annex(es) are included with this proposal (give details)

(1) Version of the draft CEN/TC 226/WG 10's experts would like to propose to the submission to a new CEN Enquiry.

☒

(2) Table compiling the comments received during the 1st CEN Enquiry completed.

Informative Annex 1 "Principal categories of market needs"

- Consumer protection and welfare
- Environment
- Innovation
- Support to:
    - -public policy
    - -European legislation/regulation
- Market access/barriers to trade, i.e. enhancing the free movement of:
    - services
    - goods
    - people
- Interoperability
- Health/Safety
- Terminology

Informative Annex 2 "Principal categories of stakeholders"

- Industry and commerce,
    where particularly appropriate, to be identified separately as
    - Large enterprises (those employing 250 staff or more)
    - Small and medium sized enterprises (SME), (those employing 250 staff or fewer)
- Government
- Consumers
    including those organizations representing interests of specific societal groups, e.g. people with disabilities or those needing other particular consideration)
- Labour
- Academic and research bodies
- Non-governmental organisations (NGO),
    including organizations representing broad or specific environmental interests
- Standards application business (e.g. testing laboratories, certification bodies)

Sometimes it is valuable also identify the immediate affected stakeholders from industry and commerce in terms of their position in a product value chain, as follows:
- Supplier
- Manufacturer
- Intermediary (e.g. warehousing, transport, sales)
- Service provider
- User of the product or service
- Maintenance / disposal

NOTE: ‘Immediately affected stakeholders’ are considered to be those who, within the context of the proposal, would be in a position to implement the provisions of the intended standard(s) into their products, services or management practices.

CEN/TC 226

Date: 2017-01

prEN 12767:2017.13

CEN/TC 226

Secretariat: AFNOR

Passive safety of support structures for road equipment — Requirements and test methods

ICS:

Descriptors:

Document type: European Standard
Document subtype:
Document stage: Working Document
Document language: E

Contents

European Foreword

This document (prEN 12767:2017.13) has been prepared by Technical Committee CEN/TC 226 “Road Equipment”, the secretariat of which is held by AFNOR.

This document is a working document.

This document will supersede EN 12767:2007.

Annexes A, B, D, E, G, H, I, K, L of this European standard are normative, Annexes C, F, J, M, N, O are informative.

The significant technical changes incorporated in this revision are:

— Incorporation of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC terminology.

— Introduction of a push-pull test to enable a comparison to be made between the backfills used in the test and those on-site.

— Harmonization of the boundary values for occupant safety (ASI and THIV) independent of the energy absorption class.

— Replacement of the occupant safety class by an alphanumeric character instead of a number to make a clear distinction with the old (EN 12767:2007) approach. Now, NE-C, LE-C and HE-C have the same occupant safety. The best occupant safety is achieved for A.

— Introduction of collapse modes to classify if test-items become flying objects or remain (connected) in place.

— Introduction of direction classes to take into account any sensitiveness to impact angle.

— Improved test description, include installation manual and translation of roof deformation into a measurable value, to reduce the effects of the vehicle structure.

— Introduction of an extra test at 50 km/h for cases where the test-item is not activated at low speed. An explanation of the definition of "activated" is also given.

— Better rules for the determination of families (product families) based on the tested limit(s).

— Introduction of a risk assessment approach, in line with the EN 1317-1, for assessing changes of a version, and the use of (for example) virtual testing in this.

— Possibility to declare, under certain conditions, intermediate speed classes.

Most of the comments collected from all CEN members to the previous version of this standard are implemented or solved. The definition and use of newer technologies has to be developed before introduction into the standard.

Some added changes mentioned above are expressed in a new performance classification for the product. This results in a longer description of the overall passive safety performance, but at the end, it gives a clearer indication of product performance. For example, an old performance classification like “100, HE,

3" could be translated to "100-HE-C-S-SE-MD". In this example, the last 3 sub-indications stands for backfill type (S), collapse mode (SE), and direction class (MD).

Translation of older tests to this new standard is possible when sufficient information is available in the reports, photographs and videos of the tests.

The previous version of EN 12767 included test acceptance criteria – this is now, for convenience, repeated in Annex A.

When this standard is used as a supporting standard for a product standard under CPR (e.g. sign supports) relevant clauses of Annexes A, G and H are supposed to be copied inside the product standard, and the product standard refers to the rest of this standard.

When this standard is used for testing constructions with no product standard the specifying authority is supposed to refer to whole EN 12767, including Annexes A, G and H.

Introduction

The severity of accidents for the occupant(s) of a vehicle is affected (in part) by the performance of the support structures for items of road equipment under impact. Based on safety considerations, support structures can be manufactured to behave in controlled ways to reduce the overall risk.

Passive safety is intended to reduce the severity of injury to vehicle occupants of a car in an impact with support structures of road equipment.

All erected support structures will, for a certain amount of kinetic energy during impact, collapse and fall down, posing an injury risk for road users.

This European standard has been developed in order to provide:

— test methods for determining impact safety performance and,

— methods to handle the data resulting from the impact tests,

— technical background about passive safety that can be used in the product standard.

The test procedure includes guidelines:

— for test item selection, test parameters, detailed test methods with different test conditions, the data to record, and requirements for reporting.

— to assess the performance within families of product (called “product families”) and for modified products (called “changed versions”).

This European standard considers:

— two kinds of test inputs:

  — three speed classes (50, 70 and 100);

  — three Backfill types (standard aggregates (S), special (X) and Rigid (R)).

— four kinds of test outcomes:

  — three energy absorption classes: high energy absorbing (HE), low energy absorbing (LE) and non-energy absorbing (NE);

  — five occupant safety classes (A to E);

  — two mechanisms of collapse for support structures (Separation mode (SE) and No separation collapse mode (NS));

  — three direction classes (single-directional (SD), bi-directional (BD) and multi-directional (MD)).

In order to help to evaluate the risk in case of a product modification, this European Standard introduces Virtual Testing through the definition of procedures for verification, validation, and development of numerical models.

Based on the evaluation of the performance of each tested support structure, National and Local road authorities will be able to specify the performance class of an item of road equipment support structure in terms of the likely effect on the occupants of a vehicle in impact with the structure.

1 Scope

This document specifies performance test procedures to determine the passive safety properties of support structures like lighting columns, sign posts, structural elements, foundations, detachable products and any other components used to support a particular item of equipment on the roadside.

This document provides a common basis for the vehicle impact testing of items of road equipment support structures.

This document does not apply to road restraint systems.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *Road restraint systems — Part 1: Terminology and general criteria for test methods*

prEN 13285:_[1)] *Unbound mixtures - Specifications*

ISO 6487, *Road vehicles — Measurement techniques in impact tests — Instrumentation*

ISO 10392, *Road vehicles with two axles — Determination of centre of gravity*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
impact test
test in which a test vehicle impacts a test item of road equipment support structure

3.2
impact angle
angle between the intended direction of traffic and the approach path of the test vehicle into the test item

3.3
vehicle impact point
initial point of impact on the test vehicle

3.4
test item impact point
initial point of impact on the test item

3.5
impact speed, v_i
measured impact speed of the impacting vehicle, measured along the test vehicle approach path at a distance no further than 6 meters before the impact point

1) To be published

3.6
exit speed, v_e
speed of the test vehicle after the impact with the test item, measured perpendicular to the extended approach path at a point 12 m beyond the impact point

Note # to entry: For exit speed of non-harmful products as defined in 3.16, non-harmful support structure see 7.5, simplified test method for non-harmful support structures.

3.7
test vehicle
production models representative of current traffic in Europe used in an impact test to evaluate the performance of a test item

3.8
test item
complete system of a support structure including the road equipment to be supported and foundation (if needed)

3.9
support structure
system used to support items of road equipment

Note # to entry: Items of road equipment may include luminaires, traffic signs, traffic signals, telephones and utility cables or any other requirement. The system includes posts, poles, structural elements, foundations, detachable mechanisms, if used, and any other components used to support the particular item of equipment.

3.10
sign support
support structure intended to hold one or more signs, consisting of one or more parts: a post, possibly an extension piece and, if necessary, a bracket

3.11
lighting column
support structure intended to hold one or more lanterns, consisting of one or more parts: a post, possibly an extension piece and, if necessary, a bracket

3.12
utility pole
support structure intended to hold power transmission, telecommunication cables or similar

3.13
cantilever support
support structure with a single post and a cantilever arm supporting signs, signals or other equipment

3.14
gantry support
support structure spanning a carriageway with one or more legs on each side of carriageway supporting signs, signals or other equipment

3.15
multi-legged support
support structures with several legs, either identical or different

Note # to entry: The term includes structures with legs aligned transverse to the road or along the road

3.16
non-harmful support structure
non-harmful support structures are small support structures (for example some types of bollards, self-righting signs, delineators) that cause only minor damage and a small change of speed during impact

3.17
ASI
dimensionless impact severity index calculated from the tri-axial vehicle accelerations according to the procedure given by EN 1317-1

3.18
THIV
velocity, expressed in km/h, at which a hypothetical "point mass" occupant impacts the surface of a hypothetical occupant compartment and calculated in accordance with the procedure given by EN 1317-1

3.19
ballast
mass added to a test vehicle, excluding instrumentation, to simulate cargo and/or to achieve desired test mass

3.20
total mass
mass that includes all items in the test vehicle at the beginning of the test

3.21
collapse mode
mode by which the support structure deforms under vehicle impact

3.22
anthropomorphic test device (ATD)
anthropomorphic device representative of a 50th percentile adult, specifically designed to represent in form, size and mass, a vehicle occupant, and to reproduce the dynamic behaviour of an occupant in crash testing

3.23
performance class
a class for one speed class, one energy absorption level, one occupant safety class, one backfill type, one collapse mode and one direction class, putted in a format as formulated in A.1, performances classes

3.24
product family
product series of the same type in various sizes, made from the same materials using the same design and general construction method, and having the same performance class

3.25
object length
height of the support structure (h) above ground level plus half of the horizontal bracket projection (w) in case of a bracket in top of the support structure

NOTE h and w are defined by EN 40-2.

Note # to entry: The object length of other support structure is the overall height of the structure including signs, signal heads and other attachments.

3.26
object mass
mass of the part of the support structure above ground level included attachments such as signs and luminaires

4 Symbols and abbreviations

ASI	Acceleration Severity Index
THIV	Theoretical Head Impact Velocity
SE	Separation mode
NS	No separation collapse mode
S	Backfill type S, standard aggregates
X	Backfill type X, special aggregates
R	Backfill type R, rigid
SD	Single-directional
BD	Bi-directional
MD	Multi-directional
C	Circumscribed circle for supports theoretical alignment point
O	Centre of the circumscribed circle for supports theoretical alignment point
L	Clear opening for multi-legged supports
v	Velocity
t	Time
VT	Virtual testing
NPD	No performance determined
ATD	Anthropomorphic Test Device

5 General test parameters

5.1 Test site

The test site shall be generally flat with a gradient not exceeding 2,5 %, and shall be clear of standing water, ice or snow at the time of the test. The test site shall be of sufficient size to enable the test vehicle to be accelerated up to the required speed and controlled so that its approach to the test object is stable.

The test vehicle shall run on a level hardened or paved surface until the vehicle reaches the installation backfill volume.

NOTE "paved" can be interpreted both as a surface that has asphalt, paving elements or concrete on top, or as well compacted or gravel surface made hard enough to drive on. For the purposes of this standard, the term "paved" is used only for an installation with asphalt, brick slabs/pavers or a concrete surface.

Appropriate measures shall be taken in order to minimize dust generation from the test area and the test vehicle during the impact test so that photographic records will not be obscured.

The tests in this standard shall be carried out with the test item installed in the ground or placed on a levelled surface at the same level as the adjoining carriageway.

5.2 Backfill

5.2.1 General

The manufacturer shall select the type(s) of backfill to be used in the Type Tests from those given in Table 1, backfill type.

Table 1 — Backfill type

Backfill type	Name
S	Standard aggregates
X	Special
R	Rigid

NOTE Standard aggregates are recommended when testing new support structures.

The backfill at the test site shall be well known, repeatable and described thoroughly, either in the test report or as a reference to well-known and widely accepted geotechnical references or pavement properties.

The same backfill type shall be used for low speed(s) and high speed(s) test on the same product families.

The different backfill types are described in 5.2.2 and 5.2.3.

The backfill according to which the performance of the test item is determined is part of the performance declaration (see Annex A).

5.2.2 Backfill type S and X

Backfill type S and X identify the use of backfill material in the backfill volume.

— Backfill type S grading shall be in accordance with Annex B backfill requirements, B.3 standard aggregates, type S.

— Backfill type X shall be described by a sieving curve supplied by the manufacturer and included in the test report (grading shall be in accordance with prEN 13285:_.

The results of the push/pull test should be reported according to Annex C, push/pull test.

The minimum dimensions of the backfill volume, the positioning of the item in the volume and the compaction of the backfill material shall comply with Annex B backfill requirements, B.1 backfill dimension and support structure positioning for S and X backfill types and B.2 compaction of the backfill. The backfill volume shall not be frozen at the time of test and shall be protected from rain before the impact test.

Backfill type S and X shall not be paved, but any pavement where the wheels of the car travel is allowed.

5.2.3 Backfill type R

Backfill type R identifies the use of a flat continuous rigid surface (such as asphalt and/or concrete) of a sufficient thickness to provide anchoring of the tested item without being displaced according to B.4, rigid, type R. This can be locally damaged in the impact area as a result of the impact test.

5.3 Test vehicle

5.3.1 General

The test vehicle shall be a standard passenger car and shall also meet the following specifications:

— the total mass: 900 kg ± 40 kg. Of this, the maximum allowed combined mass of ballast and instrumentation is 120 kg;

NOTE 1 An ATD (or a driver for simplified test method) may be used; in this case the total mass includes the ATD.

— the dimensions of the test vehicle are determined according to Annex D, vehicle data;

— front and rear wheel track: 1,35 m ± 0,20 m;

— longitudinal centre of gravity location in distance from front axle (CGx) 0,90 m ± 0,09 m. No dummy shall be in the car when the centre of gravity is determined;

NOTE 2 Procedures according to ISO 10392 might be used for determining the centre of gravity location. ISO 10392 does allow the use of methods proved to be more accurate than the described method in ISO 10392.

— lateral centre of gravity location (CGy) distance from vehicle centreline ± 0,07 m;

— centre of gravity height from ground (CGz) 0,49 m ± 0,05 m;

— the vehicles to be used in the tests shall be production models representative of current traffic in Europe; the vehicle shall not have a sunroof;

— additional equipment on the car, which might be important for the test, shall be of a type normally delivered by the manufacturer or otherwise approved for use on the specific car type;

— a heavy car shall not be stripped of heavy standard equipment to fit into the mass restrictions of this standard;

— The tyres shall be inflated to the vehicle manufacturer's recommended pressures. The condition of the vehicle shall satisfy the requirements for the issue of a vehicle certificate of road worthiness with respect to tyres, suspension, wheel alignment and bodywork, including windows and features that are expected to affect the test result. No repairs or modifications including reinforcement shall be made that would alter the general characteristics of the vehicle or invalidate such a certification. Any repairs shall conform to the original vehicle specification as defined by the vehicle manufacturer. The vehicle shall be clean and mud deposits which may cause dust on impact shall be removed prior to testing. Marker points shall be placed on external surfaces of the test vehicle to aid analysis;

— The vehicle shall not be restrained by control of the steering or any other means during impact and within a distance of 12 m after the impact point (e.g. engine power, braking, anti-lock brakes, blocking or fixing).

— All fluids shall be included in the test inertial mass;

— All ballast weights shall be securely fixed to the vehicle in such a way as not to exceed the manufacturer's specifications for distribution of weight in the horizontal and vertical planes;

— Ballast weights shall not be fixed in locations, which would modify the deformation of, or intrusions into, the vehicle.

The test vehicle shall satisfy the vehicle calibration test requirements of Annex E, vehicle calibration.

5.3.2 Test vehicle instrumentation

The minimum test vehicle instrumentation and the accuracy of the measurements taken during the test shall be in accordance with EN 1317-1.

Accelerometers shall be positioned as described in EN 1317-1.

5.3.3 Bogie vehicle

The use of a bogie vehicle is not accepted for determining the performance class. Nevertheless, Annex F, *bogie vehicle* is included in this document for technical background and stakeholders are invited to study the feasibility of replacing a real car with a bogie vehicle in the future.

6 General test item parameters

6.1 General test item documentation

Before the test, the manufacturer shall supply drawings and full technical specifications for the test item. The overall tested item mass and the various component masses shall be given by the manufacturer.

Full technical specification is the material specifications and drawings necessary to uniquely identify the test item and the properties of all relevant parts. It also includes installation and maintenance drawings and instructions necessary to ensure the initial and continuing functioning of the device to the determined safety class. Additional requirements such as foundation requirements, torque settings of brackets, sign clamps, fixing systems, anchor bolts must be defined in the installation instructions and checked before the test.

The installation drawings shall illustrate the traffic direction. If the structure is designed to perform when hit in a particular direction, the features participating to that behaviour shall be identified.

NOTE The impact safety performance of some support structures might be affected by the orientation of the impact (vehicle direction in horizontal plane). This may be related to a particular design (structures designed to behave in a controlled manner when hit in a preferred direction, having an expected collapse mode) or to a special requirement such as inspection or maintenance openings, see Annex A.

Each drawing shall have a unique number, version number and a date, in order to uniquely identify the tested item. The drawings shall only include the tested configuration, not any untested options, sizes or variations. Text on drawings shall be preferably in English or in the language of the country where the test is carried out.

The test laboratory shall verify if the test item corresponds with the information in the drawings and specifications.

6.2 Test item selection

6.2.1 General

The manufacturer shall select the configuration of tested items to be used in the tests.

The item selected for testing shall be representative of actual or future production including, where present, inspection or maintenance openings or any other device which will be in use when placed on the market.

The installation of the test item at the test site shall be made in accordance with the manufacturer's specifications as described in 6.1, *General test item documentation*. Any deviation of the installation with respect to the manufacturer's specifications shall be recorded in the test report.

In those cases where several versions of a product are based on the same construction principle, the manufacturer selects an item to be a parent member. Annex G, *product families* gives explanations on how to choose the other family members.

If a modification is applied to an already tested product, Annex H, *changed versions* gives an explanation on how to assess the risks associated with the modification, and how to evaluate the changed version.

Due to the risk of penetration of the windscreen of an impacting car, the untested reduced minimum height of the lower edge of any attachment above 2 kg shall not be lower than 2,0 m. For lower installations and heavier attachments, the risk of windscreen penetration shall be evaluated.

Specific requirements for the selection of the test item are given in 6.2.2, *lighting column* to 6.2.7, *multi-legged supports*.

6.2.2 Lighting column

A lighting column shall be tested with the longest and heaviest single arm bracket, and luminaire of the greatest mass related to the bracket length, for which the column is designed.

Luminaires, and cables to luminaires, shall be installed when a lighting column is tested, including typical underground cables and connection boxes and/or fuse units, if the lighting column is intended for use with such items.

Overhead cables need not be installed for the impact tests. However, if they are used at test, the overhead cables shall be installed so as to simulate the fixing on adjacent columns/posts in service.

Underground cables shall be securely fixed outside the backfill volume in such a way that the fixing does not allow movement of the cable at the fixing point during the test.

Dedicated electrical disconnections might be installed during test, and their performance can be part of additional voluntary information in a test report, however not forming basis for any pass/fail considerations of the actual support structure.

6.2.3 Sign support

A sign support shall be tested with the largest area of symmetrically mounted sign plate for which that height of support is designed. Any necessary electrical equipment, cables including underground cables and connection boxes and/or fuse units (for example for transilluminated signs) shall be installed.

6.2.4 Signal support

A signal support shall be tested with the heaviest signal head(s), together with cables including underground cables, connection boxes and/or fuse units.

Underground cables shall be securely fixed outside the backfill volume in such a way that the fixing does not allow movement of the cable at the fixing point during the test.

6.2.5 Utility pole

A utility pole shall be tested with the heaviest intended load.

Overhead cables shall be installed unless the effect of overhead cables and its fixings on the performance is known from other tests with similar utility poles.

When testing with overhead cables, at least three utility poles shall be installed and the central utility pole shall be the one impacted

6.2.6 Other support structures

Other support structures shall be tested with the heaviest intended load. This includes non-harmful support structures.

NOTE Support structures, such as mailboxes, gantries, cantilever supports, emergency telephones, camera supports, weather and traffic monitoring device supports, advertisement installations, solar panels, wind turbines or other items not specified above might also be tested in accordance with this European Standard. In this case the test configuration should be based (as closely as possible) on the principles described in 6, *General test item parameters* and 7, *Test method* and the related subclauses. The installation is as complete and realistic as possible.

6.2.7 Multi-legged supports

Multi-legged support structures are of two types: multi-legged support structures with identical legs and multi-legged support structures with non-identical legs. Identical means that these legs refer to the same drawing number.

For multi-legged lighting columns, the supported luminaire shall be selected in accordance with, 6.2.2, *Lighting columns*.

For multi-legged sign supports, the supported sign shall be selected in accordance with 6.2.3, *Sign support*.

For multi-legged signal supports, the supported signal shall be selected in accordance with 6.2.4, *Signal support*.

For multi-legged utility poles, the supported load shall be selected in accordance with 6.2.5, *Utility pole*.

Other multi-legged support structures shall be selected in accordance with 6.2.6, *Other support structures*.

7 Test method

7.1 General

The test shall be performed by a competent test laboratory.

NOTE For ensuring better reliability of test results the test may be performed by an accredited test laboratory according to the EN ISO/IEC 17025

The test method is described in terms of:

— Impact angle

— Impact point

— Impact speed

7.2 Impact angle

The test vehicle shall follow an approach path oriented according to the manufacturer's installation specification and with respect to the impact angle. The installation of the test item shall reproduce the installation on the road as documented by the manufacturer (refer to 6.1, *General test item documentation*); for example the opening shall be oriented in the direction most likely to reproduce the installation on the road.

The item shall be tested with an impact angle of 20° ± 2°. The accuracy of the measurement shall be ± 0,5°.

When required (by Annex A, A.6*, evaluation of the direction class* for bi-directional classification or other standard), an additional test shall be performed with an impact angle of 160° ± 2° (all the way around 180° minus 20°) as indicated in Figure 1, *Theoretical alignment point and impact angle of a single legged support structure*. This is equivalent to a vehicle leaving the road from the carriageway of the opposite side, hitting the rear of the item. The tests shall be made under identical test conditions with the exception of the test angle.

7.3 Impact point

7.3.1 General

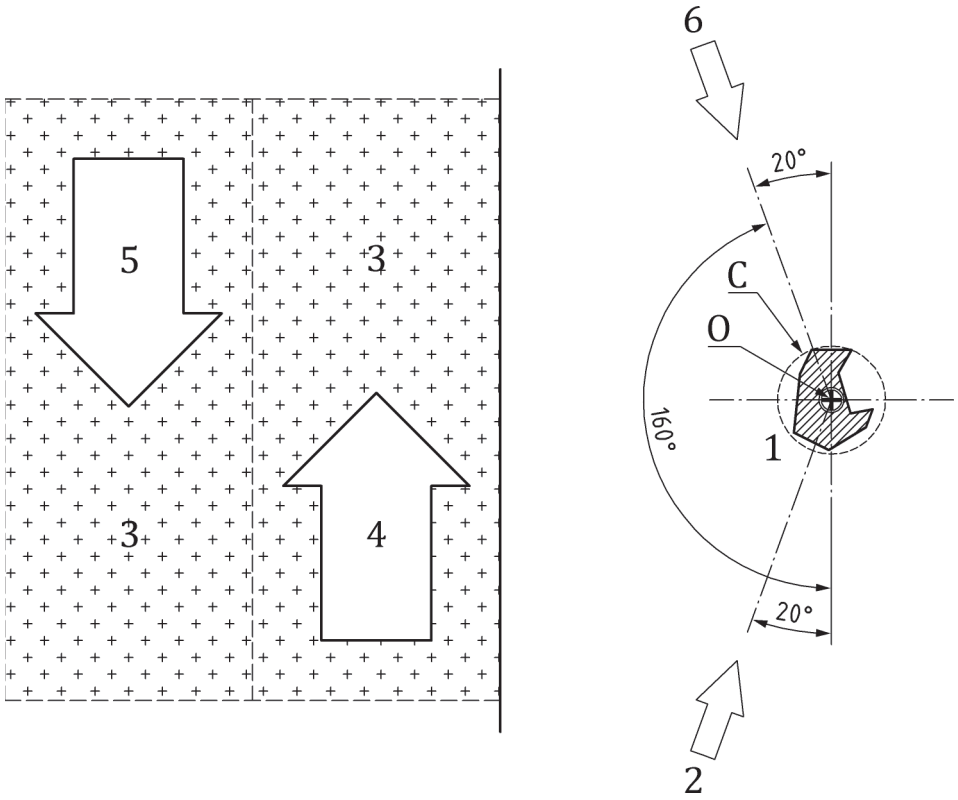
The impact point of the vehicle is the foremost point of the vehicle along the vehicle's centreline. The vehicle centreline line and the impact point of the vehicle shall be directed towards the support structure's theoretical alignment point (O), with an allowed impact alignment tolerance of ± 0,1 m.

The support structure's theoretical alignment point shall be determined in accordance with 7.3.2, *Theoretical alignment point for single legged support structures* for single legged support structures, and 7.3.3, *Theoretical alignment point for multilegged support structures* for multi-legged support structures.

The accuracy of the measurement of the impact alignment and the lateral movement at the exit side of the test item at the ground level shall be ± 0,02 m. For rigid backfill (Type R) the accuracy of the measurement of the lateral movement at the exit side of the test item at ground level shall be ± 0,005 m.

7.3.2 Theoretical alignment point for single legged support structures

For single legged support structures, the support structure theoretical alignment point (O) is the centre of the circle circumscribed around the cross section of the leg at a height of 0,3 m above ground level, in the horizontal plane, see Figure 1, *Theoretical alignment point and impact angle of a single legged support structure.*



Key

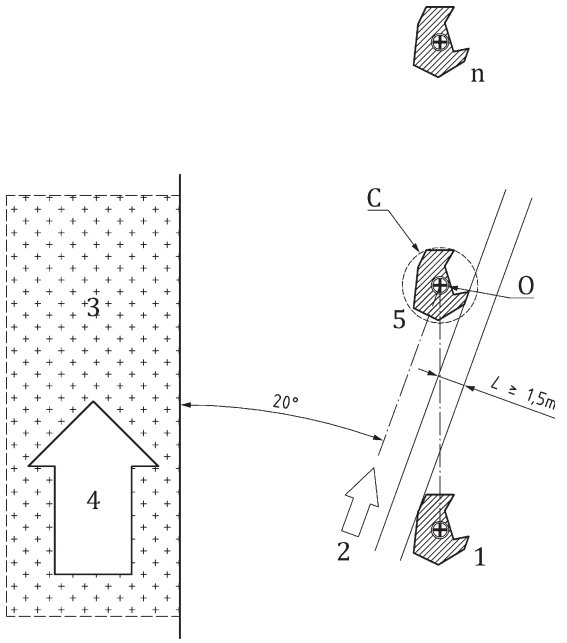
C Circumscribed circle of the single support structure
O The support structure theoretical alignment point (centre of circle C)
1 Leg of the single support structure
2 Mandatory impact direction
3 Carriageway
4 Traffic flow
5 Opposite traffic flow
6 Impact direction opposite traffic flow (optional, see annex A)

Figure 1 — Theoretical alignment point and impact angle of a single legged support structure

7.3.3 Theoretical alignment point for multilegged support structures

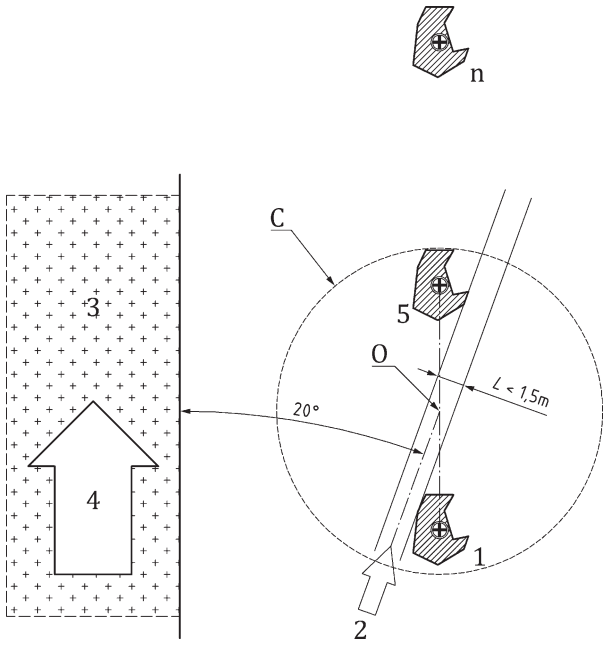
For multi-legged support structures, the projected distance at the 20° impact direction between two adjacent support structure legs shall be determined and reported at a height of 0,3 m above ground level in the horizontal plane. The clear opening (L) is the smallest distance as measured between the legs as indicated in Figure 2, *Theoretical alignment point and impact angle of multi-legged support structures*.

NOTE The clear opening is generally shorter than the distance between two adjacent legs. Normally all the legs have a constant distance between each other.



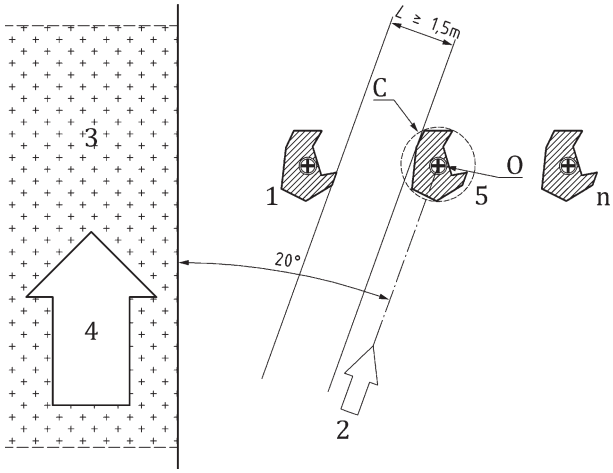
Situation with identical legs and clear opening L ≥ 1,5 m. In this case the theoretical alignment point (O) shall be defined as for a single leg (see Figure 1), against the second leg.

a) Legs parallel to the carriageway with L ≥ 1,5 m



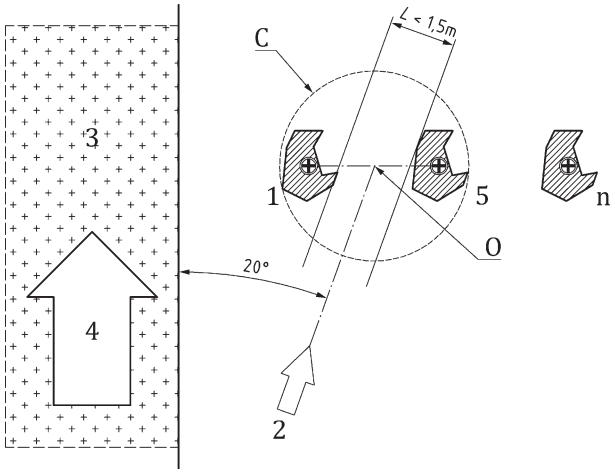
Situation with identical legs and clear opening L < 1,5 m. In this case the theoretical alignment point (O) shall be defined between the legs.

b) Legs parallel to the carriageway with L < 1, 5 m



Situation with identical legs and clear opening L ≥ 1,5 m. In this case the theoretical alignment point (O) shall be defined as for a single leg (see Figure 1), against the second leg.

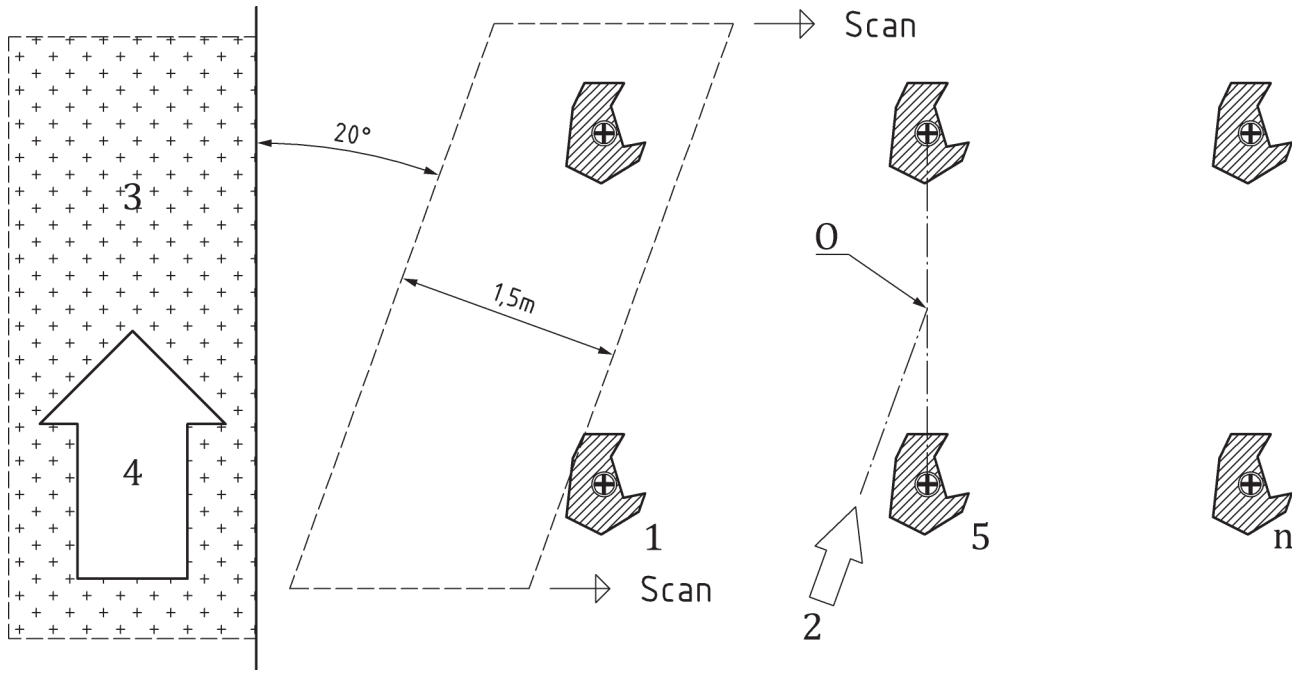
c) Legs perpendicular to the carriageway with L ≥ 1,5 m



Situation with identical legs and clear opening L < 1,5 m. In this case the theoretical alignment point (O) shall be defined between the legs.

d) Legs perpendicular to the carriageway with L < 1, 5 m

Figure 2 — Theoretical alignment point and impact angle of multi-legged support structures (1 of 2)



A more complex situation with a matrix of legs. In this case the theoretical alignment point (O) shall be determined by the maximum sum of section area's caught within the 1,5 m- scanning window over all sections, as indicated. If the matrix contains more than one maximum sum of section areas, the impact shall be determined through the centre of sections within the second window. This is in line with the idea behind Figure 2c) where the second leg shall be tested.

e) Complex construction with use of scanning window

Key

C Circumscribed circle of the single support structure
L Clear opening
O The support structure theoretical alignment point (centre of circle C)
1 Leg of the support structure closest to the carriageway
2 Mandatory impact direction
3 Carriageway
4 Traffic flow
5 Adjacent leg in the multilegged support structure
n All other legs in the multilegged structure

Figure 2 — Theoretical alignment point and impact angle of multi-legged support structures (2 of 2)

For multi-legged support structures consisting of different support legs, at least one of the high speed tests shall be on the strongest leg. If that is not the same leg as the one identified in Figure 2, Theoretical alignment point and impact angle of multi-legged support structures two additional tests shall be performed on the strongest leg (one high speed test and one low speed test).

7.4 Impact speed

The manufacturer shall select the speed class to which the support structure will be tested from Table 2, Support structure speed class. The speed class identifies the impact speed in the high speed test.

Table 2 — Support structure speed class

Speed class	Impact speed km/h	Impact speed tolerance km/h
50	50	± 3
70	70	± 5
100	100	± 5

For any speed class, a low speed test shall also be carried out at 35 km/h ± 3 km/h. Furthermore an additional 50 km/h test can be necessary following the provision given in Annex A, A.2.

The overall accuracy of the impact speed measurement shall be within ± 2 % of the target impact speed.

The test vehicle impact speed shall be measured along the test vehicle approach path, no further than 6 m before the impact point. The average impact speed shall be measured over a length of at least 1 m ahead of the impact.

7.5 Simplified test method for non-harmful support structures

The simplified test method shall be used to test support structures expected to be non-harmful according to Table A.4

The simplified test method shall be carried out as described in this standard with the following exemptions:

Subclause	
5.3	A driver can be used during the test and no vehicle instrumentation is required
5.3.2	Shall not apply
7.4	Only the high speed test shall be carried out.
	The impact speed shall be measured immediately before the impact.
8.4	The exit speeds shall be measured immediately after the impact.
	Measurements of pitch and roll angle are not required.
	All the other requirements shall not apply.
8.2	The high speed film cameras and /or high speed video cameras are not required
8.5	Shall not apply
8.6	The high speed film cameras and /or high speed video cameras are not required
9	A simplified test report is acceptable, with just the relevant parts included.

8 Impact data measurement

8.1 General

The requested data recorded before, during and after the impact test shall be evaluated and reported accordingly. To aid the reporting of the evaluation, classes of convenience are given in Annex A, data evaluation.

8.2 Impact data to be recorded

The following data shall be recorded.

Pre test data :

— mass and location of the centre of gravity of the test vehicle in the test condition including added ballast (see ISO 10392) (see 5.3);

— vehicle dimensions (see 5.3);

— interior and exterior photographs of the test vehicle;

— photographs of the test item, including photographs of the foundation and other below ground items, before installation;

— test item orientation with respect to the traffic direction (any deviations from the installation manual shall be documented) (see 6 and above);

— calculated or measured object mass of the above ground part of the tested item (see 6 and above);

— marking of the point 6 m above ground level (for test-items > 6m)

— profile of vehicle roof (see 8.4);

— drawings of the test item (see 6 and above);

— detailed description or drawings of the properties below if present in the test-item (if not already included in the test and foundation drawings or instruction):

  — material / alloy type

  — bending capacity at ground level

  — activating system (for example: slip-base, cables, breakbolts, holes etc.)

  — stiffness changes in test-item including Root-section (like for example cable entry holes, doorsections, door-reinforcements, holes, steps, changes in diameter or wallthickness, connections)

  — attachments (like ground wings, bottomplates, stabilizing concrete etc.)

— backfill type according to Table 1;

— possible push/pull test (see 5.2, *backfill* and Annex C, *push pull test*);

Test data:

— test vehicle impact speed and exit speed (see 7.4, *impact speed* and 8.4, *vehicle behaviour*);

— test vehicle approach angle and impact point (see 7.2, *impact angle* 7.3, *impact point*);

— test item impact point (see 7.3, impact point and 8.6, photographic coverage);

— test vehicle linear accelerations and angular rates (see 5.3.2, *test vehicle instrumentation*);

— photographic records from high speed cine film cameras and/or high speed video cameras deployed in such a way as to give a complete record of the test vehicle response and test object behaviour, including deformation and deflections (see 8.6).

Post-test data:

— damage to the test item and test vehicle (see 8.3, *test item behaviour*, 8.4, *vehicle behaviour* and 8.6, *photographic coverage*);

— still photographs of the tested support structure, to aid reporting (see 8.3, *test item behaviour*);

— location and mass of significant debris (with a mass greater than 2 kg) according to 8.3, *test item behaviour*;

— interior and exterior photographs of the test vehicle (see 8.4, *vehicle behaviour*);

— collapse mode (see 8.3, *test item behaviour*);

— movement of the test item at ground level (see 8.3, *test item behaviour*);

— maximum displacement in the lower 2 m of the structure;

— roof or windshield penetration (see 8.3.3, *detached elements*);

— vehicle behaviour (see 8.4, *vehicle behaviour*);

— roof deformation (see 8.4, *vehicle behaviour*).

8.3 Test item behaviour

8.3.1 General

The test item's general behaviour shall be described in the test report, with additional photographs to aid understanding. The information included shall be sufficient to enable the determination of the test item's energy absorbing category and mode of collapse.

8.3.2 Collapse mode

The test item's collapse mode shall be determined as follows:

a) Separation mode (SE): In this mode the structure detaches from the ground or its foundation, or breaks off.

b) No separation collapse mode (NS): in this mode the support structure does not break and / or does not get separated from its base or foundation and the whole test item is not completely pulled out from the ground.

8.3.3 Detached elements

The final position of and mass of any detached elements, with a mass greater than 2 kg, of the item under test shall be recorded in the test report with their weight and position. The position shall be given as a distance from the support structure's theoretical alignment point (O) and the direction.

8.3.4 Other aspects of test item behaviour

Other aspects of test item behaviour should be reported such as speed and mass. An example for determining the speed and mass of the falling support is given in Annex I, *determining the speed and mass of the falling support.*

8.4 Vehicle behaviour

The behaviour and trajectory of the vehicle shall be reported.

The exit speed of the test vehicle shall be measured perpendicular to the extended approach path at a point 12 m beyond the impact point. For a vehicle yawing, pitching or rolling, the exit speed is the speed determined by the movement of the centre of gravity of the vehicle.

The measurement accuracy of the test vehicle's exit speed shall be within ± 5 % of the target impact speed.

The profile of the shape of the original roof line of the test vehicle shall be made along the centre line of the vehicle prior to the impact test, using a straightedge with the lower edge shaped to the roof profile. The position of the top of the straightedge shall be recorded as a vertical distance above a fixed datum point on the lower edge of the side windows. After the impact, the roof profile shall be applied again in the same position relative to the datum, and the vertical deformation measured. The maximum vertical roof deformation shall be measured with an accuracy of ± 10 mm.

Deformation shall be measured at three positions:

a) Behind the windscreen

b) In line with the rear edge of the front doors

c) In front of the rear window

Results shall be presented in the test report, 6 c) "Additional observations".

8.5 Impact severity indexes

Impact severity indexes shall be defined as in EN 1317-1. The evaluation of vehicle occupant impact severity assessment indices ASI and THIV shall be carried for each test.

As a function of the value of the ASI and THIV indices, different occupant safety classes are defined in Table A.4, *impact severity indexes*.

The maximum acceptable values for the pass and fail criteria of the tests for different energy absorption categories are specified in Table A.3, *energy absorption categories*.

8.6 Photographic coverage

Photographic coverage shall include both the still frame photographs and the moving image videos taken before, during and after the impact test. These shall be sufficient to clearly describe the behaviour of the support structure and its installation during and after the impact, and the test vehicle's motion and trajectory before, during and after impact.

Still photographs shall be taken before and after the impact of the test vehicle with the support structure. Items not visible during the actual test, like foundations, shall be photographed before and after test.

The test shall be photographically covered by at least two high speed video cameras with a minimum speed of 200 frames per second. These cameras shall be perpendicular to the approach path of the impacting vehicle and shall together continuously cover the vehicle trajectory 6 m before, and 12 m after, the impact point. One perpendicular camera shall cover the complete support structure before and during the initial impact process.

NOTE 1 Reference marks corresponding to the specific locations for determining the impact and exit speeds are recommended. Additional high speed cameras are recommended, particularly where the test item has a specific detachment mechanism. Overhead camera is not mandatory.

A time reference shall be incorporated for cameras which are used for determining speed. Marker points and a known scale shall be used, and the distance to the camera shall be recorded to aid video analysis.

NOTE 2 A zero time impact marker, such as a photograph flash, is recommended for the synchronisation of images.

Normal speed cameras shall be operated at a minimum of 24 frames per second.

It is encouraged to use additional videos and still photographs to view and demonstrate any anomalies of the test that is reported or commented in other parts of this European standard.

NOTE 3 A panned camera, often used in other impact test procedures, is not mandatory. The panned camera will never stay perpendicular in respect of impacting vehicle, and can thus not be used for determining any objective values. It is just a optional camera for the convenience of showing the impact sequence, if used.

9 Test report

9.1 General

For each test performed, one test report shall be provided. For example for a defined speed class, one test report shall be produced for the low speed test, and one test report shall be produced for the high speed test.

NOTE The test report for each impact speed may be in accordance with the template given in Annex J, *test report*.

All collected data mentioned in clause 8, *impact data measurement* shall be reported.

The test item's general behaviour shall be described in the test report, with additional photographs used to aid the understanding. The information included shall be sufficient to enable the determination of the test item's energy absorbing category and mode of collapse.

9.2 Test data decimal rounding

Data related to specific requirements within this standard shall be reported in accordance with the requirements of the corresponding values in the standard. The following decimals shall be rounded off; decimals less than 5 shall be rounded downwards, and decimals 5 or greater shall be rounded upwards.

ASI shall be reported with one decimal.

EXAMPLE 1 A calculated ASI value of 1,049 is rounded downwards to 1,0 and reported in that format. A calculated ASI value of 1,05 is reported as 1,1.

THIV shall be reported without decimals.

EXAMPLE 2 A calculated THIV value of 27,49 km/h is to be reported as 27 km/h, and a determined THIV value 27,50 km/h is to be reported as 28 km/h.

Angles shall be reported in degrees with one decimal and rounded off in a similar way. Mass shall be reported in kilograms with one decimal, and rounded off in a similar way.

Speed shall be reported in km/h, with the accuracy of one decimal. The second decimal shall be rounded off as described above. This procedure shall be applied for both impact speed and exit speed, despite the difference in accuracy requirements.

Distances and measurements shall be reported in metres, with one decimal, except for distances within or on the test vehicle, where the position of the accelerometers and the centre of gravity shall be reported in metres with two decimals.

On manufacturer's drawings, the above decimal and precision requirements for distances or support structure dimensions shall not apply.

Annex A
(normative)

Data evaluation

A.1 Performance classes

The performance class of each tested support structure shall be expressed as a combination of speed class, energy absorption category, occupant safety class, backfill type, collapse mode and direction class given by the parameters shown in Table A.1, *passive safety performance types*. The performance class shall be expressed in the following format; speed class-energy absorption category-occupant safety class-backfill type-collapse mode-direction class, e.g. 100-HE-A-S-SE-MD, 70-LE-B-R-SE-SD and 100-HE-C-X-NS-MD.

Table A.1 — Passive safety performance types

	Alternatives	Clause
Speed class	50, 70, 100	A.2
Energy absorption category	HE, LE or NE	A.3
Occupant safety class	A, B, C, D, E	A.4
Backfill type	S, X, R	5.2.1, Table 1
Collapse mode	SE, NS	A.5
Direction class	SD, BD, MD	A.6

The support structure shall successfully pass the test(s) described in this standard, and shall meet the general requirements of Annex A, A.2 to A.6.

The test vehicle shall not roll over (including rolling onto its side) within a 12 m radius of the impact point.

Additional information to be given shall be in accordance with A.7, evaluation of risk of roof indentation.

Some standard metal tubes are deemed to comply with the requirements of this standard, and their performances classes are given in Annex K, *deemed to comply*.

For products tested in accordance with previous versions of this standard, Annex L, *use of test results performed in accordance with previous versions of the EN 12767* provides guidelines.

As in the previous versions, a class “0” is mentioned for products not tested.

A.2 Evaluation of speed class

Support structures shall be classified according to speed class. Three speed classes are defined according to the selected impact speed: 100 km/h, 70 km/h and 50 km/h.

In order to receive a speed class the test item shall be tested at high speed (the class speed) and low speed (35 km/h test). If the support structure is not activated in the low speed test, an additional test at 50 km/h shall be performed in speed classes 100 km/h and 70 km/h.

Activation means that one point of the support, situated in the lower 2 m of the support structure, has a permanent displacement of more than 0,5 m. Rotation of the bracket or sign is not included in this movement.

If the test item is shorter than 2 m, displacement at the top of the support structure shall be considered.

If the test item is entirely detached from the ground, activation has been achieved.

It is possible to declare intermediate speed classes, depending on the observed early stage of one or more of the collapse modes detailed in 8.3.2, collapse mode.

All tests mentioned in Table A.2, *declaration of speed classes* are to be within the ASI and THIV values for occupant safety.

Table A.2 — Declaration of speed classes

	Impact speed used for a successful test (km/h)				Speed class to declare
	35	50	70	100	
Observed collapse mode	NS	NS SE			Declare speed class 50
	NS		NS		Declare speed classes 50 and 70
	NS		SE		Declare speed class 70
	NS			NS	Declare speed classes 50, 70 and 100
	NS			SE	Declare speed class 100
	SE	SE			Declare speed class 50
	SE		SE		Declare speed classes 50 and 70
	SE			SE	Declare speed classes 50, 70 and 100
	SE	NS			Declare speed class 50
	SE		NS		Declare speed classes 50 and 70
	SE			NS	Declare speed classes 50, 70 and 100
	NS	NS		SE	Declare speed classes 50 and 100
	NS	SE		SE	Declare speed classes 50, 70 and 100

A.3 Evaluation of energy absorbing categories

Support structures shall be classified according to the energy absorbing category for the selected speed class related to the exit speed in Table A.3 energy absorption categories. The energy absorbing categories are High Energy absorbing (HE), Low Energy absorbing (LE) and Non-Energy absorbing (NE) support structures.

Table A.3 — Table A.3 — Energy absorption categories

Speed class	50	70	100
Energy absorption category	Vehicle exit speed, v_e km/h		
HE	$v_e = 0$	$0 \le v_e \le 5$	$0 \le v_e \le 50$
LE	$0 < v_e \le 5$	$5 < v_e \le 30$	$50 < v_e \le 70$
NE	$5 < v_e \le 50$	$30 < v_e \le 70$	$70 < v_e \le 100$

If the actual impact speed is not the nominal speed, but is still within permitted tolerances given in 7.4, *impact speed*, the measured exit speed used for the energy absorption categorisation according to Table A.3 energy absorption categories shall be adjusted to the value of adjusted exit speed by using the formula (A.1).

$$V_{Adjusted\ Exit\ Speed} = \sqrt{V^2_{Nominal\ Impact\ Speed} - V^2_{Measured\ Impact\ Speed} + V^2_{Measured\ Exit\ Speed}} \qquad (A.1)$$

For a combination of a high impact speed and low exit speed, the formula returns mathematically invalid results. When the sum under the square root is a negative number, the measured exit speed is of such low value that the adjusted exit speed goes below zero. For such cases, theoretical adjustments are not appropriate and the exit speed shall be taken as 0 km/h.

A.4 Evaluation of occupant safety class

The test item, detached elements, fragments or other debris from the test item shall not penetrate the occupant compartment. The windscreen may be fractured and the roof or other parts may be dented, but shall not be penetrated. If this requirement is not fulfilled, no occupant safety class can be declared and the test fails.

Support structures shall be classified according to the Impact severity indexes as defined in 8.5, impact severity indexes. The results shall comply with Table A.4 Impact severity indexes.

Each test used for the evaluation of the speed class (refer to A.2, evaluation of speed class) shall be classified in accordance with Table A.4 *Impact severity indexes*.

The ASI and THIV values of the mandatory high speed and low speed (35 km/h) tests and (where conducted) of the additional 50 km/h test, shall be taken into consideration.

Table A.4 — Impact severity indexes

Energy absorption categories	Occupant safety class	Speeds			
		Low speed test (35 km/h)		High speed test (50 km/h , 70 km/h , 100 km/h)	
		Maximum values		Maximum values	
		ASI	THIV (in km/h)	ASI	THIV (in km/h)
HE / LE / NE	E	1	27	1,4	44
HE / LE / NE	D	1	27	1,2	33
HE / LE / NE	C	1	27	1	27
HE / LE / NE	B	0,6	11	0,6	11
NE	A	No test required	No test required	No ASI and THIV measurements[a]	

[a] Occupant safety classes are not evaluated for class A (non-harmful) products. They are tested in accordance with the simplified test method, see 7.5,*simplified test method for non-harmful support structures.* For non harmful products, the requirement for vehicle behaviour (8.4) is to remain upright, as pitch and roll angles are not required. For Occupant safety class A (non harmful) products, the difference between the measured impact speed and the measured exit speed shall be less than or equal to 3 km/h.

A.5 Evaluation of collapse mode behaviour

Support structures shall be classified according to their collapse mode. The declared collapse mode shall be determined by the support structure behaviour in the high speed test (see 8.3.2, collapse mode). The following letters identify the collapse modes from which the performance of the support structure shall be declared:

— SE, Separation mode

— NS, No Separation collapse mode

A.6 Evaluation of the direction class

Support structures shall also be classified according to their direction class. Three direction classes are defined in Table A.5.

Table A.5 — Direction classes requirements

Direction class	Requirements
SD	mandatory 20° impact angle test according to 7.1, *(test method) general*) as indicated by arrow 2 in Figure 1
BD	mandatory 20° impact angle test according to 7.1, *(test method) general*) as indicated by arrow 2 in Figure 1, and one symmetry plane is perpendicular to the carriageway[a] or mandatory 20° impact angle test according to 7.1, *(test method) general*) as indicated by arrow 2 in Figure 1 and an additional 160° impact angle as indicated by arrow 6 in Figure 1 is needed[b]
MD	mandatory 20° impact angle test according to 7.1, *(test method) general*) as indicated by arrow 2 in Figure 1 and if more than 2 symmetries are identified[a].

[a] Any deviation from symmetry of the support structure should be evaluated.

[b] When the additional 160° impact angle tests are required, the high and low speed tests shall be conducted with that additional impact angle. For those tests performed with a 160° impact angle, the energy absorption category and the impact severity index shall be determined according to A.3 *evaluation of energy absorbing categories* and A.4 *evaluation of occupant safety class*. The collapse mode shall be determined according to A.6 *evaluation of the direction class*. Only one energy absorption category, impact severity, and collapse mode shall be declared for product performance classification. The occupant safety class is the same as the worst class obtained through testing to the two tested approaches.

EXAMPLE 1 One or more compartment doors positioned higher than 0.5m above the ground should not be considered as a lack of symmetry, and could be classified as Bi- or Multi-directional without any additional testing.

EXAMPLE 2 A sign fixed on one side of the support structure should not be considered as a lack of symmetry (only the support structure should be considered in the evaluation) and could be classified as Bi- or Multi-directional without any other test.

A.7 Evaluation of risk of roof indentation

The risk of roof indentation shall be evaluated according to the following test methods:

— Calculation of risk in accordance with Annex I, determining the speed and mass of the falling support.

— Evaluation of roof deformation measurements in individual test according to 8.4, vehicle behaviour.

— No evaluation required.

A.8 Additional information

Additional information shall not be used for classification purposes. This information on test conditions shall be available to inform the installation instructions.

Additional information which shall be included includes:

— description of the foundation or underground part of the support;

— tested item configuration;

— for a sign support, the height of the sign support, the sign mass and size;

— for a lighting column, the height, the bracket length, mass of the luminaire.

A.9 Specifying passive safety

If not all properties are of interest for the specifier they can put NR (no requirement) for that property.

EXAMPLE 100-HE-C-NR means the same as the old 100,HE,3 and 100-HE-NR-S-NR-MD means that occupant safety and collapse mode are allowed to be anything.

Annex B
(normative)

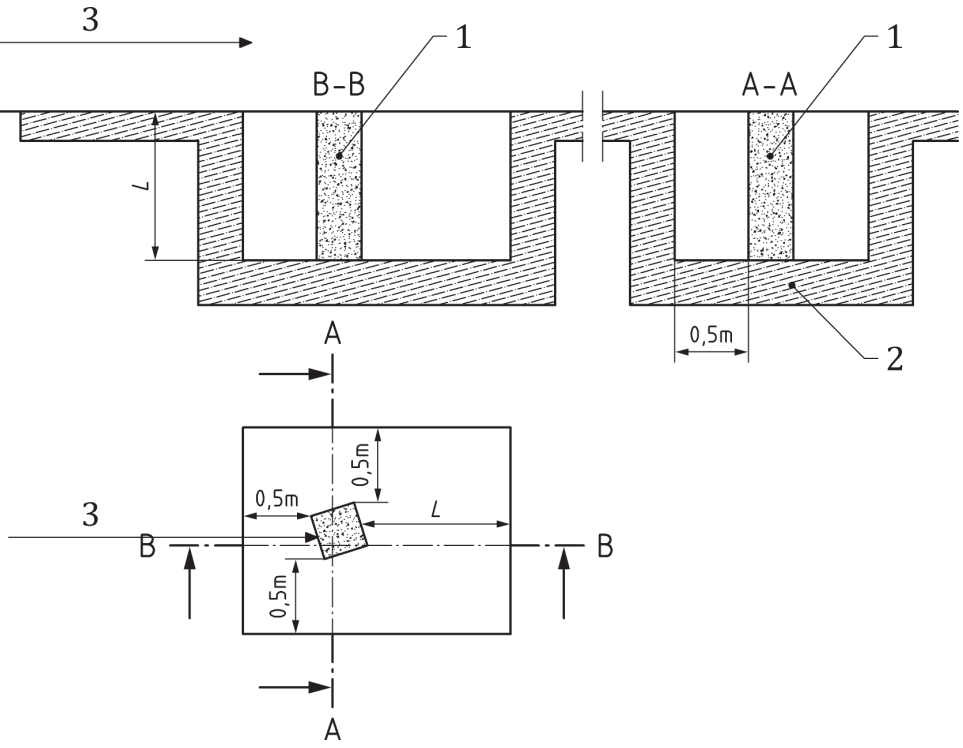
Backfill requirements

B.1 Backfill dimension and support structure positioning for S and X backfill types

The backfill dimension shall not be smaller than those indicated in Figure B.1 backfill minimum dimensions for Sand X backfill type, where the value of L is equal to the foundation depth of the test item. If a separate foundation is not used, the underground part of the support structure shall be considered to be the foundation.

The distances to be respected when positioning the support structure to be tested from the backfill's border shall not be smaller than those indicated in Figure B.1 backfill minimum dimensions for S and X backfill type.

At the bottom depth (L), a minimum free distance of 0,5 m from any foundation's edge shall be created in any direction.



Key

1 Underground part of the support structure
2 Backfill's border
3 Impact direction

Figure B.1 — Backfill minimum dimensions for S and X backfill type

B.2 Compaction of the backfill

The backfill shall be filled as follow:

a) aggregates shall be dropped and arranged in order to make a layer with a maximum thickness of 0,3 m;

b) each layer shall then be compacted using a compactor, moving in a concentric circle starting from the outside and moving to the inside, and then back to the outside;

c) a new layer can then be created and the operation repeated until the desired level is reached.

NOTE The maximum dry density of the backfill material should be determined before using it at the test site, and the dry density should be determined during compaction work in order to facilitate control of the compaction.

The compaction method used shall be recorded.

B.3 Standard aggregates, type S

Standard aggregates shall consist of hard and durable particles of stone or gravel. No binder, such as cement, shall be used. The grain size distribution shall fulfil the requirements of the following classes defined in prEN 13285:_. Only the overall grading range shall be applied. For convenience, the distribution is presented in Table B.1.

— Mixture designation = 0/31,5

— Grading category = GO

— Maximum fines content category = UF7

— Minimum fines content category = LF2

— Oversize category = OC85

Table B.1 — Standard aggregates requirements

Sieve mm	Mass percentage passing: EN13285, 0/31,5, G_0 (Overall grading range)	
	min	max
63	100	100
31,5	85 (OC_{85})	99 (OC_{85})
16	50	78
8	31	60
4	18	46
2	10	35
1	6	26
0,5	0	20

B.4 Rigid, type R

For some tests a rigid foundation may be requested. This rigid foundation shall not be permanently displaced more than 0,01 m by the impact test.

The displacement is measured at ground level.

Annex C
(informative)

Push / pull test

The result of the push/pull test is valid for not more than 6 months from the date of the first push/pull tests or 20 subsequent tests, whichever is the soonest, and can be used for a backfill with aggregates with equal grading delivered at the same time as the tested one. Any change of aggregate grading and/or compaction procedure shall require a new push/pull test.

The push/pull test is carried out using an HEB 120 S355JR beam (with a minimum length of 2 m). The beam shall be placed vertically in the backfill volume (see B.1) with one of the extremities 1 m (± 0,025 m) above the level of the vehicle approach path level. When the compaction procedure is completed (see B.2) the test load (horizontal force parallel to the pavement) shall be statically applied to the beam (between 0,6 m and 1 m above ground level) in the direction of the major inertia axis of the beam and perpendicular to the traffic face.

The push/pull test ends when one of the following conditions is reached:

a) the beam deflects 0,25 m at 0,5 m height (measuring position)

b) a force equal to a momentum of 50 kNm at the ground level is achieved.

The displacement of the measuring point placed 0,5m above ground level shall be recorded (deflection tolerance is ± 5 mm). The translated force history to this point shall be plotted (the minimum applied load increment shall be 0,1 kN) against the displacement. The curve and the maximum value shall be included in the test report.

Annex D
(normative)

Vehicle data

The following vehicle dimensions shall be reported:

— width (to be measured at the maximum body width, excluding rear view mirrors);

— length (excluding tow-bar hook);

— height;

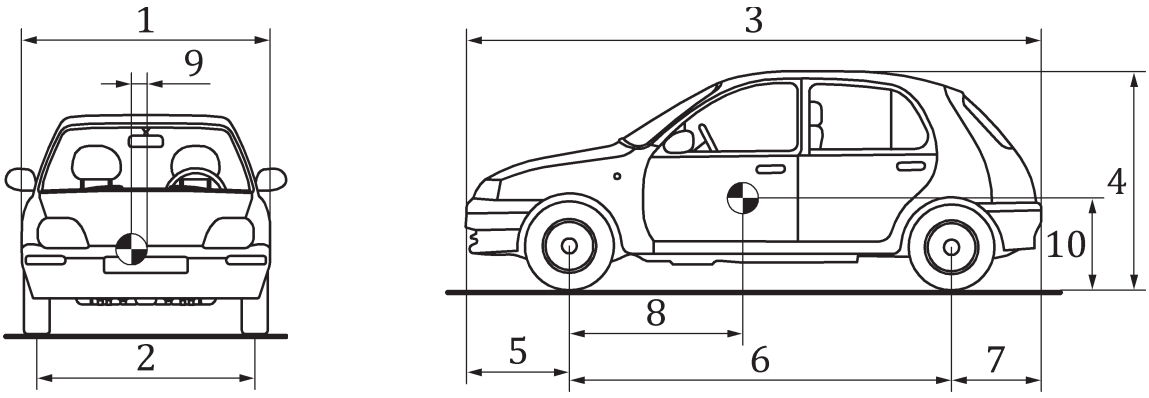
— wheel track: track width for both front and rear axles (to be measured at the centreline of the wheels);

— wheel base;

— frontal overhang;

— rear overhang (excluding tow-bar hook).

Figure D.1 illustrates these dimensions.



Key

1 Width
2 Track width (frontal)
3 Length
4 Height
5 Frontal overhang
6 Wheel base
7 Rear overhang
8 Centre of mass: Longitudinal distance from front axle
9 Centre of mass: Lateral distance from vehicle centre line
10 Centre of mass: Height above ground

Figure D.1 — Vehicle dimensions

The following items shall also be reported:

— Ballast, mass and position

NOTE Photograph(s) may be used to illustrate the position of ballast.

— Total mass

— Centre of gravity, CGx, CGy and CGz as required by 5.3 test vehicle.

— Vehicle kerb mass

Annex E
(normative)

Vehicle calibration

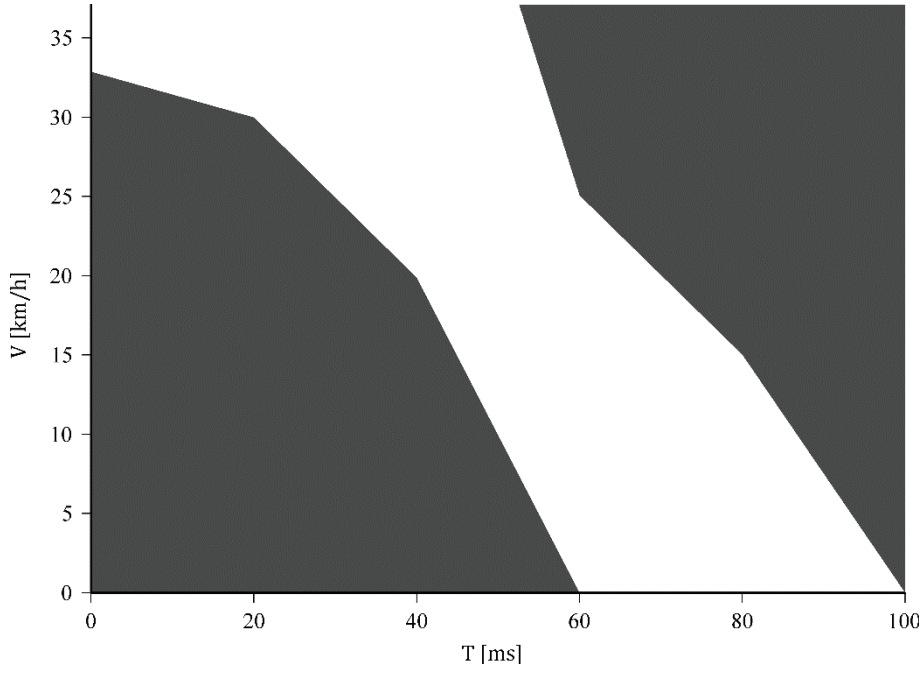
In order to ensure that the front deformation characteristics of the test vehicle are within a specified range, a calibration test shall be conducted. This calibration test shall be considered to be valid for cars of the same make, the same model, the same design version and the same engine size and type.

A calibration test shall be carried out on a sample test vehicle, to confirm that the deformation characteristics of the vehicle front lie within the unshaded area of the time-velocity curve in Figure E.1 vehicle calibration diagram and are in accordance with Table E.1 Time/velocity requirements.

The calibration test shall be performed with a test vehicle impacting a vertical, rigid cylinder head-on with the vehicle centre-line aligned with the centre-line of the cylinder.

The cylinder shall have a diameter of 290 mm ± 20 mm and a height greater than the contact surface of the deformed car front, typically greater than 1 m.

At the moment of impact the lateral offset of the two centre-lines shall not exceed 100 mm. The test shall be conducted at (35 ± 2) km/h, and the rigid cylinder shall not displace statically more than 10 mm, measured at the contact surface.



Key

V Velocity

T Time

Figure E.1 — Vehicle calibration diagram

Table E.1 — Time/velocity requirements

Time ms	Minimum Velocity Km/h	Maximum Velocity Km/h
0	33	37
20	30	37
40	20	37
60	0	25
80	0	15
100	0	0

If the actual impact velocity at the calibration test is within the tolerance of ± 2 km/h of the target speed, the input velocity at time 0 shall be linearly adjusted to 35 km/h, before the integration of the velocity curve is performed.

The acceleration of the car, used for this integration, shall be measured or transposed at the centre of gravity, in accordance with ISO 6487, with the channel frequency class (CFC) equal to 180 Hz.

It is permitted to shift the velocity/time curve in time to obtain the best fit.

Annex F
(informative)

Bogie vehicle

A bogie vehicle is a generic trolley, a surrogate for a production model vehicle, with specified shape and frame and specified simplified kinematic properties, to replace a real car in crash testing. The deformation capabilities must be known, validated and repeatable to be used for crash testing.

For the future development of this European Standard it is possible that a bogie vehicle could be used as a substitute for the passenger car. The following conditions may be used as a guideline for developing and validating such a vehicle:

— the total bogie vehicle gross static mass should be 900 kg ± 40 kg and the other dimensions shall be in accordance with EN 1317-1;

— the shape of the bogie vehicle should simulate the shape of a typical passenger car in this mass range especially in regard to the shape of the vehicle front and the roof and the height of the impact point;

— the requirements of the calibration test (Annex E vehicle calibration) shall be met;

— the vehicle front, the roof and the windscreen should be adequately simulated.

Annex G
(normative)

Product families

G.1 General

When a product is manufactured in different sizes, the sizes may be grouped into product families where only some of the sizes shall be tested and the performances of other sizes can be declared on the basis of those results.

Any other change as mentioned in Annex G, product families shall be assessed as a changed version according to Annex H, changed version.

G.2 Product families

A parent size shall be chosen for each product family.

Within a product family all members are smaller than the tested parent member. Related to the parent member a smaller member has:

a) An object length lower or equal to 1,1 times the object length of the parent and higher than 2,0 m in case the penetration risk isn't evaluated;

b) An object mass lower or equal to 1,1 times the object mass of the parent.

c) An equal shape of the cross section (i.e. circular, octagonal etc.);

d) The same material / alloy properties;

e) The same design of fixing or anchoring to ground;

f) The same presence of connection or stiffness changes within the deformed part due to the initial impact. Any connection or stiffness change shall be the same or scaled down related to the parent member (i.e. door-section, reinforcements, weakened area's, weldings, bolted connections etc.);

g) The same, smaller or no attachments above 2 kg in the first 2 m above ground level. The strength of the connections of these attachments will be equal or higher than the connection of the attachment that was present during the test;

h) The same or lower bending capacity and the same or lower shear capacity.

Additional rules for specific products are specified in G.3.

G.3 Evaluation of the performance within a product family

G.3.1 General

The parent member shall be tested at the speed class selected and at low speed to be able to determine a product family.

Depending on the results of the tests of the parent member, further tests shall be carried out as follows:

a) If the tested parent member complies with the NE category, no further tests are required. A product family with performance class as the tested parent member can be declared for the parent member and all smaller family members for which technical data has been provided.

b) If the tested parent member complies with the HE or LE category, further testing shall be carried out on the smallest member of the proposed product family at the high speed of the selected speed class. The result of the smallest member is valid for cases defined in G.3.2 to G.3.6.

    1) If the smallest member when tested fulfils a better or equal occupant safety class, a product family may be declared for all intermediate members of the proposed product family for which the technical data has been provided. All members of the product family shall be declared to have the same performance class as the parent member, except that for the smallest tested member the achieved better occupant safety class in the test of that member can be declared.

    2) If the smallest member, tested at the high speed test of the selected speed class, complies with a inferior occupant safety class and/or a different energy absorption category as the parent member, the smallest member and the parent member cannot be considered as being in one product family. A product family shall not be declared.

G.3.2 Lighting column

A successful test result of a lighting column shall also be valid for the same support structure:

— with a shorter single bracket of the same general form, no greater horizontal length, and equal or lower mass;

— with a double bracket of the same general form, and no greater horizontal length;

— with a post top luminaire, and no bracket.

G.3.3 Sign support

A successful test result of a sign support shall also be valid for the same support:

— with a smaller area of sign plate and no greater overall mass;

— with an asymmetric mounting sign plate and no greater overall mass or area.

G.3.4 Signal support

A successful test result of a signal support shall also be valid for the same support;

— with a lighter signal head;

— with an asymmetric mounting signal.

G.4 Multi-legged supports

A successful test result for a multi-legged support structure with a clear opening larger than 1,50 m at 20° shall also be valid for multi-legged supports assembled with a different number of legs than the tested configuration, provided that the clear opening remains larger than 1,50 m at 20°. In this case the item will inherit the parent evaluation.

The test result of multi-legged supports shall not be used to determine the performance classes of a single legged supports.

Annex H
(normative)

Changed versions

H.1 General

Any change which cannot be covered by Annex G, product families or by H.3 without further testing, shall be evaluated in accordance with H.2, evaluation based on a risk analysis.

EXAMPLE This Annex H may be used for the evaluation of different foundation or using different clamps in multi-legged signs than in the tested version.

H.2 Evaluation based on a risk analysis

H.2.1 Risk evaluation

Any proposed change shall be submitted to risk analysis.

A table including all possible risks, the corresponding evaluation method(s) and the criteria for the assessments shall be created. The table shall be used together with the test/calculation results to investigate the proposed change(s).

Once the change has been evaluated, and if the risk is assessed, the changed product inherits the classification of the original product.

H.2.2 Choice of the method

The evaluation methods are classified in accordance with Table H.1 and are available to evaluate and document the risks related to changes.

Table H.1 — Categories of evaluation methods

Category	Description
A	Engineering judgement
B1	Calculation (not including virtual testing)
B2	Static or dynamic testing (not including full scale vehicle impacts tests), possibly in combination with category A and B1.
B3	Virtual vehicle impact testing, performed in accordance with Annex M, *virtual testing – validation procedure* possibly in combination with category A, B1 or B2.
C1	At least one full scale test, possibly in combination with category A, B1, B2 or B3.
C2	Full scale tests.

A report shall be written where the results of the risk analysis are presented and the choice of the evaluation method is justified. It shall also contain the basic results of the tests of the parent version and the results of the evaluation of the changed versions. The parent versions and the changed versions shall be described in detail.

Annex I
(normative)

Determining the speed and mass of the falling support

One high speed camera positioned perpendicularly horizontal to the support structure, at a height of 2 m shall be used for recording the movement of a specific point on the support structure.

The speed of the test item shall be determined by video/film tracking of a single point on the support structure during the test. This single point shall be located and marked 6 m (± 0,03 m) above ground. When this point, during the vehicle impact and support structure collapse, passes through a horizontal plane situated 2 m above ground, the speed of the single point should be determined. For supports shorter than 6 m, the very top of the support structure shall define the point to be speed determined. It shall be clearly noted in the report that the support, and subsequently the dedicated point, is situated lower than 6 m, and the actual height of the support shall be recorded.

The vertical component of the point falling speed and mass of the test item after the vehicle impact shall be measured and recorded. This requirement shall not apply to items that stay upright during and after the test.

The object mass of the support structure above ground prior the test shall be calculated.

Annex J
(informative)

Test report

The test report may, where applicable, include the information outlined in Table J.1, *test report*, preferably in the order given.

A summary sheet is recommended.

NOTE The contents of the test report is based upon the criteria of EN ISO/IEC 17025.

Drawings shall be obtained from the client. The test item shall be described in detail, together with material specifications, and installation and maintenance instructions. Also refer to the test item documentation requirements in 6.1, general test item documentation.

NOTE 2 Additional text and photographs are recommended to describe the general result of the test and to aid the understanding of the final position of the tested support structure, trajectory and position of the car and position of major debris.

Table J.1 — Test report (1 of 4)

Information	
1) Testing laboratory	a) Name: b) Address: c) Telephone number: d) Facsimile number: e) E-mail address: f) Test site location: g) Accreditation number when applicable:
2) Report number	
3) Client	a) Name: b) Address: c) Telephone number: d) Facsimile number: e) E-mail address:

Table J.1 (2 of 4)

Information		
4) Test item	a) Received date:	
	b) Tested date:	
	c) Name of test item:	
	d) Drawing, descriptions and installation instructions, enclosure No:	
	e) Foundation drawing	
5) Test procedure	a) Target data	— target impact speed, in km/h: — target impact angle: in degrees — target test item mass, in kg:
	b) Test installation	— detailed description of installation tested including its orientation: — backfill properties: — test site drawing, enclosure No: — photographs, enclosure No:
	c) Test vehicle	— model: — model year: — vehicle identification number, VIN: — test inertial mass (including ballast), in kg: — ballast, position and mass: — dummy, position, type and mass, seat belt type: — total mass (initial test mass and dummy), in kg: — dimensions of vehicle, enclosure N° (in accordance with Annex D, *vehicle data*): — position of centre of gravity: — photographs, enclosure No: NOTE In addition it is recommended to include vehicle type kerb mass in the report.
	d) Calibration test vehicle	— model: — model year: — calibration test number and test date: — calibration velocity-time curve, enclosure No:

Table J.1 (3 of 4)

Information		
6) Results	a) General	— test No: — date: — weather conditions including air and ground temperature at test: — impact angle, in degrees: — impact speed, in km/h: — exit speed, in km/h: — general description of test sequence: — photographs, enclosure No: — videos
	b) General performance requirements	— Collapse mode according to A.2, *evaluation of speed class*. — Speed class evaluation according to A.3, *evaluation of energy absorbing categories*. — Evaluation of energy absorption according to A.4, *evaluation of occupant safety class*. — Evaluation of risks in accordance with A.9, *specifying passive safety*. — Evaluation of vehicle behaviour in accordance with A.6, *evaluation of the direction class*. — Acceleration Severity Index, ASI: — Theoretical Head Impact Velocity, THIV, in km/h: — Roof deformation in accordance with A.7, *evaluation of risk of roof indentation* and 8.4 *vehicle behaviour*
	c) Additional requirements for particular items	— Additional observations
	d) Additional restrictions regarding the installation:	
	e) Acceleration graphs, enclosures No:	

Table J.1 (4 of 4)

Information		
7)	List of enclosures	Enclosure 1 ...name.....(x pages) Enclosure 2 ...name.....(y pages)
8)	General statements	The test results in this report relate only to the items as tested. Other impact conditions may give different results. Restrictions to the installation may be given in 6.e) of this report. This report may not be reproduced other than in full, except with the prior written permission of the issuing laboratory.
9)	Approval of report	a) Date: b) Names: c) Signatures: d) Job titles:

Annex K
(normative)

Deemed to comply

Standard metal tubes are often used as supports for traffic signs. Those particular types listed in Table K.1, single legged post supports can be regarded as complying with the classes of this standard identified in the Annex A, data evaluation.

Table K.1 — Single legged post supports

Description	Material and grade	Tested height (m) Height x width of sign (m) Mounting height to underside (m)	Speed class	Energy absorption category	Occupant safety class	Backfill	Collapse Mode	Direction
Circular hollow section steel posts of equal or less than 89 mm nominal diameter and 3,2 mm nominal wall thickness[a,b,c,d,e]	Steel S355J2H	3,6 1,5 x 1,15 2,1	100	NE	C	S, X and R	SE	MD

[a] Full details of the tests and conclusions are available in the report PR/SE/726/03: Passive safety tests on steel circular hollow section sign posts – TRL UK.

[b] Results are valid also for supports made of circular hollow steel or aluminium sections of the same or smaller diameter and which have a lower bending and shear capacity than tested (see Annex G).

[c] If two posts, perpendicular to the carriageway, are used for one sign:

- Where post clear opening L are less than 1,5 m, post dimensions shall not exceed 76 mm diameter and 3,2 mm wall thickness;
- Where post clear opening L are 1,5 m or greater, post dimensions shall not exceed 89 mm diameter and 3,2 mm wall thickness.
- (for definition of the clear opening L see 7.3.3)

[d] The results are not applicable to braced structures.

[e] All backfill types are deemed to comply, because the crash test was conducted in Rigid type R and any alternative will always be equal or less rigid.

Annex L
(normative)

Use of test results performed in accordance with previous versions of EN 12767

Table L.1 determines how tests performed in accordance with EN 12767:2007 and EN 12767:2000 shall be used to assess products in accordance with this standard. Tests performed before the year 2000 may be used, if the test is in accordance with EN 12767:2000.

Table L.1 — Use of old test results

Classification or level in this standard	Test in accordance with EN 12767:2007	Test in accordance with EN 12767:2000
Low speed	The low speed test specified in EN 12767:2007 is valid, but the acceptance criteria of this standard shall be used.	
Declared speed class	The high speed test specified in EN 12767:2007 is valid, but the speed class shall be declared in accordance with this standard (especially when other speed classes than test speed are declared)	
Declared energy class	The high speed test specified in EN 12767:2007 is valid, but the ranges of versions shall be evaluated in accordance with this standard	The high speed test specified in EN 12767:2000 is valid, but the exit speed shall be adjusted with the impact speed and the ranges of versions shall be evaluated in accordance with this standard
Declared occupant safety class	The low and high speed tests specified in EN 12767:2007 are valid, but the class shall be determined and the product families shall be evaluated in accordance with this standard. ASI values of NE supports not calculated in accordance with EN 1317-1:2010 shall be either recalculated or increased with 0,1.	
Backfill type	Backfill type shall be declared but there is no need to declare the result of the pull/push test. Backfill type S shall be as defined in EN 12767:2007.	
Collapse mode	The collapse mode shall be evaluated on the basis of the videos in accordance with this standard	
Detached elements with a mass greater than 2 kg	Report the location and mass of significant debris as specified in EN 12767:2007 or EN 12767:2000.	
Direction class	The direction class shall be evaluated on the basis of drawings and test results in accordance with this standard.	
Assessment of ranges of versions and changed versions	Assessment shall be based on this standard.	
Impact point in a multi-legged sign support	In two-legged systems either the rules of EN 12767:2007 or this standard shall be followed.	
Evaluation of risk of roof indentation	Evaluate the data if available according to A.7.	

Table L.2 gives equivalences between the old and new classes of occupant safety class.

Table L.2 — Equivalences between old and new classes

Energy class	New class	Old class	Low speed		High speed	
			Maximum value		Maximum value	
			ASI	THIV	ASI	THIV
HE / LE	C	3	1	27	1	27
	D	2	1	27	1,2	33
	E	1	1	27	1,4	44
NE	B	3	0,6	11	0,6	11
	C	2	1	27	1	27
	D	1	1	27	1,2	33
	E	-	1	27	1,4	44

NOTE For the other properties that were not covered in the old version of the European Standard, the results of the old test should be revaluated (Table L.1).

Annex M
(informative)

Virtual testing - Validation procedure

M.1 General

This Annex gives provisions for the use, validation and verification of virtual testing, defining procedures and acceptance criteria. The validation procedure verifies the reliability of the virtual testing performed.

Validation consists of determining the degree to which a model is an accurate representation of the real word from the perspective of the intended uses of the model.

Obtaining accurate and reliable models requires careful attention to detail and careful verification of material properties, energy management, numerical stability and a number of other important computational characteristics. Moreover, the professional entity performing the virtual test shall be competent in the use of virtual testing for crash analysis. Annex N *Requirements for the person / group performing virtual testing activities* gives information on the requirements to be met in order to be considered competent.

This procedure does not refer to a specific code, and can be applied to any finite element or multibody codes.

Regardless of the code used, the model must represent the test item and vehicle with a high level of accuracy.

Virtual test results and its verification shall be described inside the "Validation & verification Report", see Annex O *Virtual testing - Template for report*.

M.2 General considerations on the modelling techniques for the vehicle

Particular attention shall be paid on the modelling of vehicle kinematics and of the components that enable it: front and rear suspensions, wheels, steering system, etc. The geometry of the vehicle must be reproduced correctly to simulate the interaction with the support structure. The model shall include the main parts of the vehicle while other non-structural elements such as internal parts can be modelled only with regard to their inertial properties in order to reduce the computational cost.

Vehicle model shall conform to 5.3 test vehicle including the calibration test requirements described in Annex E *vehicle calibration*.

M.3 General considerations on the modelling technique for the test item

The numerical model shall include all significant parts, the connections between the parts, and appropriate boundary conditions. Particular attention shall be paid on the geometrical description of the contact areas of the modelled support structure. Proper geometry and material properties shall be used.

The virtual test shall be able to correctly describe the backfill type and behaviour. Modelling of any backfill, asphalt, concrete and similar should be documented. Simplifications as well as rigid aggregate conditions must be justified through empirical or engineering analyses, independent of the numerical model.

M.4 Validation Process

M.4.1 General

The validation process compares the results of physical testing with the result of the corresponding virtual test. The tests shall have equal initial conditions (according to this European standard).

The virtual testing shall be assessed by an independent expert.

NOTE An independent expert should be a single person or a board of experts having, as a minimum, the requirements listed in Annex N Requirements for the person / group performing virtual testing activities for performing virtual testing activities

M.4.2 Validation requirements

M.4.2.1 General

To validate the model, the requirements described in the following subclauses must be satisfied and reported.

When general requirements in Table M.4, comparison table are not satisfied, the author of the virtual test shall explain his reasons inside the final validation report and those reasons shall be checked and agreed by the notified body.

All the tables in this chapter shall be part of the final validation report, see Annex O *Virtual testing – Template for report*.

M.4.2.2 The vehicle exit speed

The vehicle exit speed (v_e) from the physical test shall be compared with the one calculated from the virtual test ($v_e\ v$), and evaluated in accordance with A.3, evaluation of energy absorbing categories. The virtual test and the corresponding physical test shall have the same energy absorbing category.

The virtual test and the corresponding physical test are verified when the requirement in formula (M.1) is met.

$$|v_e - \ v_e\ v| = Diff < \pm(0{,}05 \times v_i) \qquad \text{(M.1)}$$

Where:

v_e is the exit speed, expressed in kilometres per hour (km/h), of the real support structure (physical test)

$v_e\ v$ is the exit speed, expressed in kilometres per hour (km/h), of the numerical model (virtual test)

v_i is the nominal impact speed, expressed in kilometres per hour (km/h)

The result of the physical test and the virtual test validation shall be reported as shown in Table M.1.

Table M.1 — Vehicle exit speed

Critical	Is VT in accordance with result from physical test According to eq. M.1?
Is the vehicle exit speed criterion satisfied?	Yes/No

M.4.2.3 Occupant severity indexes

The occupant severity indexes shall be evaluated in accordance with A.4, evaluation of occupant safety class. The virtual test and the corresponding physical test shall have the same occupant severity class.

The virtual test and the corresponding physical test are satisfied when the requirements in formula (M.2) and (M.3) for ASI and formula (M.4) and (M.5) for THIV are met.

$$|ASI - ASI_v| = Diff < \pm 0{,}1 \quad \text{(M.2)}$$

$$|tASI - tASI_v| = Diff < \pm 0{,}05\ s \quad \text{(M.3)}$$

$$|THIV - THIV_v| = Diff < \pm 3\ km/h \quad \text{(M.4)}$$

$$|time\ of\ flight - time\ of\ flight_v| = Diff < \pm 0{,}05\ s \quad \text{(M.5)}$$

The result of the physical test and the virtual test validation shall be reported as shown in Table M.2.

Table M.2 — Occupant safety indexes

Critical behaviour	Is VT in accordance with result from physical test? According to formulae (M.2), (M.3), (M.4) and (M.5)?
Are the occupant severity indexes criteria satisfied?	Yes/No

M.4.2.4 Collapse mode

The collapse mode shall be evaluated in accordance with A.5. The virtual test and the corresponding physical test shall have the same collapse mode.

The result of the virtual test and its comparison with the physical test, shall be reported as shown in Table M.3.

Table M.3 — Collapse mode

Critical behaviour	Is VT in accordance with result from physical test?
Is the Collapse mode criterion satisfied?	Yes/No

The final shapes of the physical and virtual support structures shall be compared and reported.

M.4.2.5 Time history

The comparison is based on the global resultant velocity of the vehicle, in the plane motion.

The virtual test is considered validated when the vehicle velocity of the virtual test remains inside a window built around the physical velocity, until the farthest in time between the time of the maximum value of ASI and the time of flight is reached. The variation limits for the window are ±4% of the impact velocity, and ±.01s in time.

When the validation is requested for a modified product, the numerical velocity time history must remain inside the window until the vehicle has loaded the modified component(s).

M.4.2.6 Comparison table, general requirements

The virtual test shall be compared to the corresponding physical test. The result of the virtual test its comparison with the result from the physical test shall be reported as shown in Table M.4.

NOTE "Yes" is to be ticked if there is agreement between the virtual test and the physical test, furthermore when a criterion is defined, "yes" means that the criterion is satisfied.

Table M.4 — Comparison table

Critical behaviour	VT result	Is VT in accordance with result from physical test?
Does the vehicle Rollover?	Yes/No	Yes/No
Does the support structure collapse?	Yes/No	Yes/No
Is there any deformation of the vehicle roof?	Yes/No	Yes/No
Is there any detached element of the tested item?	Yes/No	Yes/No
Does any part of the support structure penetrate inside the vehicle?	Yes/No	Yes/No

M.5 Verification Process

M.5.1 General

The verification process checks criteria that ensure the virtual test reliability.

M.5.2 Verification requirements

The evaluation in Table M.5 shall be performed at the time when the vehicle leaves the support structure, or the vehicle stops.

Table M.5 — Verification Evaluation Criteria Table

Verification Evaluation Criteria	Change (%)	Pass?
Total energy of the analysis solution (i.e., kinetic, potential, contact, etc.) must not vary by more than 10% from the beginning of the analysis		
Hourglass Energy of the analysis solution is less than five percent of the total initial energy at the beginning of the run.		
Hourglass Energy of the analysis solution is less than ten percent of the total internal energy at the end of the run.		
The part/material with the highest amount of hourglass energy is less than ten percent of the total internal energy of the part/material.		
Mass added to the total model is less than five percent of the total model mass at the beginning of the run.		
The part/material with the most mass added had less than 10 percent of its initial mass added.		
The moving parts/materials in the model have less than five percent of mass added to the initial moving mass of the model.		
There are no shooting nodes in the solution?		
There are no solid elements with negative volumes?		

Annex N
(informative)

Requirements for the person / group performing virtual testing activities

The following is the list of information to ensure the competences of an expert/organization in the domain of the virtual testing:

- Have access to licensed software able to properly describe crash phenomena. This software shall as a minimum be able to handle the following requirements:
  - Contact, including friction (vehicle, test item, road surface and ground)
  - Large displacement, rotation, strain
  - Nonlinear constitutive laws
  - Energy absorption in vehicle, test item and foundations
  - Ability to handle buckling in vehicle and test item
  - Accelerometer definition
  - Represent vehicle trajectory
- Have knowledge and experience in physics and engineering. In order to understand and identify which physical phenomena is dominating the physical event of interest. Some relevant fields might be: mechanics, elasticity, strength of materials, fracture, non-linear geometric effects, dynamics, vibration, optimization, plasticity and collapse load, buckling and instability, limit states, multi-physics analysis, stochastic, and non-deterministic methods, uncertainty estimation methods.
- Knowledge on measuring principles, devices and techniques appropriate for virtual test model validation.
- Knowledge in virtual testing modelling, in order to identify what kind of modelling hypotheses are adequate for each regulatory act.
- Knowledge in mathematical methods and numerical calculations, in order to understand which numerical techniques are being used in virtual test models, and evaluate if convergence and numerical solution errors are acceptable.
- Knowledge in finite element or multi-body modelling and analysis, necessary to understand how modelling hypothesis and simplifications are translated.
- Knowledge in material laws and characterization methods, in order to evaluate if the right material laws are being used. Materials modelling, characterization and selection, composite structures.
- Knowledge and skill in engineering analysis software (CAE), in order to know which outcomes can be obtained and be able to explore and analyse virtual test models.

The above requirements can be proven through:

- Participation in similar projects.
- Scientific publication.
- Training classes.
- Specific education in engineer of physics.
- Graduated in appropriate engineering with experience in crash.

Annex O
(informative)

Virtual testing - Template for report

O.1 General

The report for the Virtual testing contains one or more parts related to validation (one for each validated test) and one or more parts related to the evaluation of new performances (one for each virtual test).

O.2 Validation report general information

O.2.1 General

The validation and verification report shall include the following information as a minimum, in the order given below. All drawings and associated documents attached shall be clearly dated.

O.2.2 Validation report cover

The following is the list of information as a minimum to be included in the validation report cover:

a) Name of person/group

b) Date of report

c) Name of client

d) Name of test item

e) Validation number and/or validation report number (version number if applicable)

f) Test type and reference to standard

g) Number of pages including annexes

h) Official validation report language

i) Approval of report

O.2.3 Person/group performing VT

The following is the list of information as a minimum to be included in the validation report cover:

a) Name

b) Address

c) Telephone number

d) Internet address

e) Additional information

O.2.4 Client

The following is the list of information (as a minimum) to be included, concerning entity commissioning the VT:

a) Name

b) Address

c) Telephone number

d) Internet address

e) Additional information

O.2.5 Test procedure

The following is the list of information, as a minimum, to be included concerning the test procedure followed by the VT:

a) Test Type

b) Impact speed in kilometres per hours

c) Impact angle in degrees

d) Total vehicle test mass in kilograms

e) Centre of gravity location

O.2.6 Software

The following is the list of information, as a minimum, to be included concerning the validation of the VT conditions:

a) Type and release version of software

b) Filter used

c) Sampling rate

d) Reference to software used for pre-processing, analysis and post-processing

O.2.7 Validation virtual test conditions

The following is the list of information, as a minimum, to be included concerning the validation of the VT conditions:

a) Impact speed in kilometres per hours (actual impact speed for the impact test with the same test type)

b) Impact angle in degrees (actual impact angle for the impact test with the same test type)

c) Any additional information

O.2.8 Test item model

The following is the list of information, as a minimum, to be included concerning the model of the test item:

a) Total support structure for road equipment test mass

b) Mass of each support structure for road equipment components

c) Description of support structure for road equipment's component:

   1) For Finite Elements Models: number of nodes type and number of elements

   2) For Multi Bodies: number of rigid bodies, degrees of freedom, deformable element formulation and contact algorithms

d) Description of material models and material properties specifications

e) Boundary conditions and constraints including ground/aggregates anchoring where applicable

f) Potential failure modes of the model

g) Possible component failure

h) Deviation from physical test item (example anchoring, aggregates condition and splices)

i) Show a close-up picture (with mesh/elements) of all important functions

   EXAMPLE Bolt connections, splices and welds

O.2.9 Description of test item to be modelled

All differences between the original tested item and the model shall be presented with figures and explanations.

O.2.10 A table that shows/reports of the following:

The following is the list of information, as a minimum, to be included concerning the geometry of the components and of the whole item:

a) Side and front view of the test item model (with mesh/element)

b) Relevant dimensions of the test item model

c) Drawing reference for each component

d) Material specification for each component

O.2.11 Vehicle model

The following is the list of information, as a minimum, to be included concerning the model of the vehicle used:

a) Model: type and release

b) Model development year

c) Origin of model

d) Validation report (report reference to vehicle model validation report), if available

e) Deviation from validated model

EXAMPLE Added contact surfaces, modified height of vehicle and added/modified components

f) Ballast, position and mass

g) Dummy model type and mass in kilogramme (if fitted)

h) Total test mass in kilogramme

i) Dimensions and characteristics of vehicle

j) Position of centre of gravity

k) Description of vehicle's component

1) For Finite Elements Models: type and number of elements Number of nodes

2) For Multi Bodies: number of rigid bodies, degrees of freedom, deformable element formulation and contact algorithms

l) Material models used for different parts (rigid/deformable parts)

m) Report minor modification

n) Show a picture of the vehicle model (with mesh) and point out all deviations from the validated model

o) Relevant dimensions and characteristics of vehicle model

p) Special features (extra features that may affect the results)

q) Spinning wheels (Yes/No)

r) Wheel axles failure (Yes/No)

s) Possible penetration into the vehicle (Yes/No)

O.2.12 Validation criteria

Fill the Tables M.1, M.2, M.3 and M.4 for the relevant criteria.

Fill the Table M.5 for verification evaluation criteria."

O.2.13 Comment to validation activities

The following is the list of information, as a minimum, to be included concerning the comments on the validation of the numerical model:

a) Description of damage to model including foundations, ground anchorages and fixings.

b) Describe, comment and justify any deviation from validation requirements

O.2.14 General statements

The following general statements can be included in the report:

a) The validated model in this report related only to the item tested.

b) This report may not be reproduced other than in full, except with the prior written approval of the issuing simulating institute.

O.2.15 O.2.15 Approval of report

The following is the list of information as a minimum to be included concerning the approval person/entity:

a) Signature(s)

b) Name(s) of authorised and responsible person(s) of virtual test institute

c) Position(s)

d) Date

O.2.16 Annexes

a) Reference to TT test used for the validation (number, date, performing entity) relevant data from the TT. Video records (if available) shall be presented.

b) Top and side views pictures of the crash sequences

c) Pictures of the vehicle after impact. The pictures shall be presented with and without fringing of internal energy (with mesh)

d) Pictures of the test item after impact

e) ASI and acceleration graphs (for both virtual test and physical test), the following shall be presented:

    1) ASI as function of time

    2) X-acceleration (centre of gravity) as function of time

    3) Y-acceleration (centre of gravity) as function of time

    4) Z-acceleration (centre of gravity) as function of time

f) Global energy balance graph shall be performed with the following energy versus time:

    1) Total energy

    2) Internal energy

    3) Kinetic energy

    4) Sliding energy

5) Hourglass energy

6) Damping energy

7) External work

g) Drawing of test item that were used to build/validate the test item model shall be presented

h) Animations showing the validation VT shall be enclosed

O.3 New performances report

O.3.1 General

For each test type according to this European standard relevant part, one individually numbered virtual impact test report shall be produced.

The virtual impact test report shall include the following information as a minimum, in the order given below.

All drawings and associated documents shall be clearly dated.

O.3.2 Test procedure

The following is the list of information, as a minimum, to be included concerning the test procedure followed for the assessment of the modified version:

a) Test Type

b) Impact speed in kilometres per hours

c) Impact angle in degrees

d) Total vehicle test mass in kilogram

e) Centre of gravity location

O.3.3 Software

The following is the list of information, as a minimum, to be included concerning the software used for the assessment of the modified version:

a) Type and release version of software

b) Filter used

c) Sampling rate

d) Reference to software used for pre-processing, analysis and post-processing.

O.3.4 Impact virtual test conditions

The following is the list of information, as a minimum, to be included concerning the virtual test conditions for the assessment of the modified version:

a) Impact speed in kilometres per hours (actual impact speed)

b) Impact angle in degrees (actual impact angle)

O.3.5 Additional information

Relevant approved validation virtual testing report/ impact test reports for the support structure shall report the following:

a) Report number, date, test type and name of test item;

b) Test and approval date and institute;

c) Validation software type and version.

O.3.6 Modified component of the support structure for road equipment's model (values previous and after the modification shall be included).

This can include any modification influencing:

a) Mass / geometry

b) Modelling of the support structure for road equipment:

1) Material / geometry /boundaries and constraints / etc.

2) (with mesh) of all important functions

EXAMPLE Bolt connections, splices and welds

A table that shows/reports of the following:

— Side and front view of the test item model (with mesh);

— Relevant dimensions of the model;

— Drawing reference for each component;

— Material specification for each component;

O.3.7 Vehicle model shall be the same used for the validation (if not the same, information provided under O.2.11 shall be applied)

O.3.8 Results

The following is the list of information, as a minimum, to be included concerning the results of the assessment of the modified version:

a) Length of contact in meters

b) Impact point location

c) Major parts fractured or detached (Yes/No)

d) Elements of test item penetrated the passenger compartment of the vehicle (Yes/No)

e) Description of damage to test item including foundations, ground anchorages and fixings

f) Ground fixing meets design levels (Yes/No/Not applicable)

g) Impact speed in kilometres per hours

h) Impact angle in degrees

i) Exit speed

j) Exit angle

k) General description of vehicle trajectory

l) Description of the damage and deformation of the test vehicle (roof deformation)

m) Vehicle rolls over within test area (No/Yes)

n) Acceleration severity index, ASI

o) Theoretical head impact velocity, THIV in kilometres per hours

O.3.9 General statements

The report may include general statements such as:

— This report may not be reproduced other than in full, except with the prior written approval of the issuing simulating institute.

O.3.10 Approval of report

The report should include the following information concerning the person/entity which approved it:

a) Signature(s)

b) Name(s) of authorised and responsible person(s) of virtual testing institute

c) Position(s)

d) Date

O.3.11 Annexes

a) Top view pictures of the crash sequences

b) Pictures of the vehicle after impact. The pictures shall presented with and without fringing of internal energy (with mesh)

c) Pictures of the test item after impact

d) ASI and acceleration graphs, the following shall be presented (when specified within the EN 1317-1):

    1) ASI as function of time

2) X-acceleration (COG) as function of time

3) Y-acceleration (COG) as function of time

4) Z-acceleration (COG) as function of time

e) Global energy balance graph shall be performed with the following energy versus time:

1) Total energy

2) Internal energy

3) Kinetic energy

4) Sliding energy

5) Hourglass energy

6) Damping energy

7) External work

f) Drawing of modified support structure that were used to build/simulate the model shall be presented

g) Animations showing the impact virtual test shall be enclosed

Bibliography

[1] EN 40-1, *Lighting columns -— Part 1: Definitions and terms*.

[2] EN 40-2, *Lighting columns -— Part 2: General requirements and dimensions*.

[3] EN 40-3-1, *Lighting columns — Part 3-1: Design and verification-Specification for characteristic loads*.

[4] EN 40-3-2, *Lighting columns — Part 3-2: Design and verification-Verification by testing*.

[5] EN 40-3-3, *Lighting columns — Part 3-3: Design and verification-Verification by calculation*.

[6] EN 40-4, *Lighting columns — Part 4: Requirements for reinforced and prestressed concrete lighting columns*.

[7] EN 40-5, *Lighting columns — Part 5: Requirements for steel lighting columns*.

[8] EN 40-6, *Lighting columns — Part 6: Requirements for aluminium lighting columns*.

[9] EN 40-7, *Lighting columns — Part 7: Requirements for fibre reinforced polymer composite lighting columns*.

[10] EN 1794, *Road traffic noise reducing devices — Non-acoustic performance*.

[11] EN 12414, *Vehicle parking control equipment — Pay and display ticket machine — Technical and functional requirements*.

[12] EN 12368, *Traffic control equipment — Signal heads*.

[13] EN 12899-1, *Road equipment — Fixed, vertical road traffic signs — Part 1: Signs*.

[14] CEN/TR 16303-4, *Road restraint systems - Guidelines for computational mechanics of crash testing against vehicle restraint system - Part 4: Validation Procedures*

[15] prEN 1823, *Emergency roadside telephones.*

[16] prEN 12899-2, *Road equipment — Fixed, vertical road traffic signs — Part 2: Transilluminated traffic bollards.*

[17] prEN 12899-317, *Road equipment — Fixed, vertical road traffic signs — Part 3: Delineator posts and retroreflectors.*

[18] ISO 6813, *Road vehicles — Collision classification — Terminology*.

[19] ISO 10392, *Road vehicles with two axles — Determination of centre of gravity*

[20] EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*.

"Passive safety of support structures for road equipment"	CEN/TC 226/WG 10
Date: **2017-01-13**	
Convenor: *Daniel MUTRICY*	Doc. Number: **N 117**
Secretary: *Frédérique RIGAH* *Direct line: + 33 (0)1 60 52 32 49* *frederique.rigah@cerema.fr*	

prEN 12767 (WI 00226165)

"Passive safety of support structures for road equipment Requirements and test methods"

Resolution of comments

Comments / Decisions	Working document. The prEN 12767 (WI 00226165) has been submitted to the CEN Enquiry from 2013-09-05 to 2014-02-05. You will find hereinafter the follow-up given to the 341 received within this framework.
Follow up	☑ For information ☑ For discussion on **2017-01-18**
Source	CEN/TC 226/WG 10 Secretary

MB/ NC[1]	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
CY 001				ge	Lack of technical expertise		**NOTED**
EE 002				GE	Lack of expertise		**NOTED**
IS 003				ge	Abstention - Lack of expertise.		**NOTED**
IE 004					No Comment		**NOTED**
PT 005					No comments		**NOTED**
RO 006				GE	No national expertise		**NOTED**
SK 007				ge	No available expertise		**NOTED**
MK 008					No response from stakeholders, and national TC		**NOTED**
TR 009					Abstains due to lack of national interest		**NOTED**
DK 010				**te**	**Denmark votes NO.** **Reason: WG 10 has decided to solve some problems with a test before enquiry. The problems are not yet solved and consequently Denmark votes NO.**		**SOLVED** Main issue: roof deformation requested as requi
FR 011		Whole text		ed	French mistranslation: "Tableauau", "pavé" "mécanisme d'effondrement", "classe directionnelle", "affaissement", "structure de support" are wrong terms.	French version: Please: - replace "Tableauau" by "**Tableau**", - replace "pavé" by "**revêtu**",	**RETAINED**

1 **MB** = Member body (enter the ISO 3166 two-letter country code, e.g. CN for China) ** = ISO/CS editing unit

2 **Type of comment**: ge = general te = technical ed = editorial

NB Columns 1, 2, 4, 5 are compulsory.

MB/ NC[1]	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
						- replace "mecanisme d'effondrement" by "**mode de ruine**", - replace "classe directionnelle" by "**classe de directivité**", - "affaissement" by "**plastification**", - "structure de support" by "**structure support**".	
NEN 012		general		ed	There are double figures-numbers like figures 4,5 in the norm.	renumber al figures	**RETAINED**
NEN 013		general		te	The norm doesn't say anything about performance in time. All tests are done on new products, but how do they perform in time during their lifecycle. For standard poles this is not really an issue although corrosion will have influence, but for special activating mechanism inside (slip-bases, cables, composites) it's more sensitive. It's difficult to cover this aging problem, but maybe we can use some known techniques from automotive like salt-spray tests for this kind of poles with an activating part during impact.	A note to be aware of this should be the minimal to include somewhere.	**NOT RETAINED** Those environment and ageing requirements should be included in the product standards, because they may affect other performances than passive safety, and that issue should be taken as a hole.
NEN 014		general		te	because poles behave differently under different (climat) conditions, it would be wise to add conditioning aspects. e.g. the behavior of a metal pole depends of the temperature of the material.	Add conditions of the test products.	**NOT RETAINED** **See follow-up given to NEN 013**
SE-015				ge	The product standards EN 40-x and EN 12899-1 to -3 have undated references to EN 12767 meaning that the latest edition of the test standard applies. If the test standard is revised in such a way that the test results are severely changed, e.g. by new limit values, class limits, there is a risk that currently CE marked products may no longer meet the requirements and will have to be withdrawn.		**NOT RETAINED** **Guidelines on this matter are not introduced in the draft because it is an interpretation of the law.**

1 **MB** = Member body / **NC** = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

MB/ NC[1]	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
CH 016				ge	The experience with accident occurrence shows that side impacts to support structures can lead to serious passenger injuries	Add a side impact test, so that the safe functioning during a side impact can be evaluated	**NOT RETAINED**
CH 017				ed	The German translation is insufficient in its entirety and differs in terms of content partly from the English version e.g. for wrong translations 8.3.2 … eine der Prüfung bei hoher und niedriger Geschwindigkeit … Tab. 2 Toleranz der Anprallgeschwindigkeit +- 0,3 …. A.3 … Nennrestgeschwindigkeit .. B2.2 … halber Höhe .. B4 …. Lichtsignalanlagen … C1.1…. Wenn jedes ….. E.1 …von (290 ….) .. F.3 …. zum Verkehr aufzubringen …	An entire revision is necessary.	**NOTED** **Action for our German colleagues**
FR 018	5	Foreword	4th paragraph	ed	There are only 9 Annexes, Annex A to Annex I.	Please correct as follows : "Annexes A, B, C, D, E, F~~, G, H, I, J, L, N and O~~ of this European standard are normative, Annex**es G, H and I are** ~~K, M, P and Q is~~ informative."	**RETAINED**
NEN 019		foreword		ed	Annexes A t/m F normative and G,H,I informative, Annex J t.m. Q do not exist	Bring foreword in line with the annexes in the standard	**RETAINED**
SE-020		Foreword		ed	The list of normative and informative annexes is not entirely correct, needs to be further checked. It was intended to move the requirements to the respective updated product standards, e.g. EN 40 and EN 12899, and as a temporary solution publish the related requirements in informative annexes of EN 12767.	Change to correct normative or informative Annexes in the final version. Annexes J, K, L, M, N, O, P do not exist in this edition.	**RETAINED** **RETAINED**

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2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

MB/ NC[1]	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
					However, since the annexes contain "shall" requirements, it is not possible to apply this procedure. The annexes containing requirements thus have to stay normative for the time being. We recommend however to include a NOTE that applicable requirements will be reflected in the revised versions of the product standards.		
FR 021		Foreword		ed	According to the 6.1.3. of the Internal Regulations Part 3: Rules for the structure and drafting of CEN-CENELEC Publications, the Foreword "shall give a statement of significant technical changes from any previous edition of the document".	Please complete the Foreword accordingly.	**RETAINED**
NO 022	3		Introduction	Ge	The acceptance criteria is still included in the standard, but separated as normative annexes. The plan is to move acceptance criteria to EN 40 and EN 12899, and this is now made easier.	The CEN/TC 226 has to decide to amend EN 40 and EN 12899 to include acceptance criteria from EN 12767.	Already stated within CEN/TC 226 Liaisons have been established with the CEN/TC 226/WG 3/TG 4 (Mr SKÖLD) and the CEN/TC 50 (Mrs RIGAH) for working on this issue. → To be discussed during the October meeting
BE 023		introduction	1st para	ed	EN 12767 can be applied on other structures than those mentionned.	Replace reference to EN 40 and EN 12899 and use a more general reference ... the applicable product standard	**RETAINED**
FR 024		Introduction	1st paragraph, last sentence	ed	In this last sentence, reference is made to an informative Annex A while Annex A is normative.	Please correct as follows : "The previous version of EN 12767 did include acceptance criteria – this is now, for convenience, repeated in ~~informative~~ Annex A."	**RETAINED**
NEN 025		Introduction		ed/te	Introduction: First paragraph there's reverence to informative annex A. This should be normative annex A, as is mentioned in the header of Annex A. And as it's normative this First paragraph	- remove last sentence of first paragraph. - Annex A has to be normative, because EN 40 and EN 12899 doesn't give acceptance criteria.	**NOT RETAINED** **RETAINED**

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2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

MB/ NC[1]	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
					makes no sence, as there's no difference with the older versions of EN12767.		
DE 026		Introduction	Last sentence of first para	ed/te	The wording is not clear – What is meant is that the acceptance criteria have been moved from the main part of the standard to Annex A.	Reword.	**RETAINED**
FR 027		Introduction	2nd paragraph	ed	French mistranslation	French version: Please correct as follows : "En cas d'impact, et au-delà d'un certain niveau d'énergie cinétique, les structures de support installées cèdent et ~~d~~**d's'effondrent**, présentant alors un risque ~~d'accident~~ **de blessure** pour les usagers de la route."	**RETAINED**
FR 028		Introduction	3rd paragraph, 1st sentence	ed	French mistranslation, "composants" is unnecessary	French version: Please correct as follows: "La gravité d'un tel accident pour les passagers d'un véhicule dépend de la résistance ~~des composants~~ des structures de support des équipements routiers en cas de choc."	**RETAINED**
FR 029		Introduction	4th paragraph	ed	French mistranslation, "groups", is a wrong terms.	French version: Please correct as follows: "Les structures de support se décomposent en **différentes catégories** ~~différents groupes~~: …"	**RETAINED**
SE-030		Introduction	4th para	ed	"Support structures are classified in different categories, i.e…" and the there is mentioned (collapse) modes and (directional) classes. We should stick to the agreed terminology and should not mix "categories, modes and classes". For example, "classes" should always have boundary limits.	Could be rewritten saying "Support structures are classified in different categories and then divided into sub-modes and sub-classes".	**RETAINED** **The paragraph has been modified**
SE-031		Introduction	6th para	ed	"Energy absorbing support structures slow the vehicle considerably and thus the risk of	Deleting "with structures, trees, pedestrians and other road users" will decrease the risk of	**RETAINED**

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MB/ NC[1]	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
					secondary accidents with structures, trees, pedestrians and other road users may be reduced."	misunderstanding: "Energy absorbing support structures slow the vehicle considerably and thus the risk of secondary accidents ~~with structures, trees, pedestrians and other road users~~ may be reduced."	
SE-032		Introduction	7th para	te	It is stated that "This European standard defines four mechanism of collapse for support structures…" But foundation lift was never intended to be an accepted support structure behaviour, it was merely a way of describing a typical outcome of a crash test, an outcome regarded as a failure. It is questionable if we should keep this as a collapse mode or just a way of describing a failed test.	Suggest to delete mode Z, foundation lift.	**RETAINED** **It is no more necessary to define "test item lift".**
GB 033		Introduction	Para 7	te	'foundation lift' is not an acceptable method of operation for a passively safe structure – it is too unrepeatable between test and on-site installation	Delete all references to 'foundation lift' within the standard	**RETAINED**
SE-034		Introduction	8th para	ed	"Within the energy absorbing categories three types of directional classes are defined:" Non-energy absorbing structures might be directional sensitive as well.	Change to: "Three types of directional classes are defined:"	**RETAINED**
DE 035		Introduction	Last para.	te	Technical comment: A reference to class 0 is missing. For example, Annex A of EN 12899 and EN 40-2 refer to class 0 in cases where no requirements are specified. Class 0 is not mentioned in Annex A. Class 0 has probably been deleted in the current version of EN 12767 because it is not needed in a product testing standard. But some harmonized standards refer to this class 0. Therefore class 0 is needed and we propose keeping it.	Add provisions relating to class 0 to the document. Please add class 0 as in existing EN 12767	NOT RETAINED Class 0 in product standards should be "NPD for No performance Determined" The product standards should be updated accordingly. A note is added in an annex

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					In Germany products complying with EN 12899 and EN 40-2 which refer to class 0 of EN 12767 are in common use. Deleting class 0 will lead to serious problems.		for equivalencies with previous versions.
BE 036		introduction	footnote	ed	only the weight of the light vehicle is confusing and misleading. There are several other criteria to which the test vehicle should comply	remove footnote	**RETAINED**
SE-037		1	Scope		"…. test procedures to determine levels of passive safety intended to reduce the severity of injury"	Suggestion: Rephrase "levels of passive safety" to "passive safety properties of permanent support structures" However, more improvements will probably be needed.	**RETAINED** As follows considering the follow up iven to GB 038: ""passive safety properties of ~~permanent~~ support structures"
GB 038		1		te	The standard should also apply to temporary passively safe structures	Delete 'permanent'	**RETAINED**
BE 039		2		ed/te	an undated reference to EN 1317-1 implies that an update of this standard automatically also updates EN 1317-1. This can not only have consequences on the results for new tested products but could eventually require a reevaluation of previously tested products. K. Lehtonen mentioned a problem with the ASI-value that apparently changes because of the latest version of EN 1317-1	different options 1. seek advice how to deal with updates of referenced standards 2. copy the content of EN 1317-1 to EN 12767 3. include a section on how to deal with historical data	**RETAINED**
GB 040		2. Normative references	Para 5	ed	Inconsistent font	Italicise 'Road'	**RETAINED**
GB		2. Normative	New	te	Due to the restructuring of EN1317, EN1317-5 may need to be referenced in the future as well		**RETAINED**

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041		references			as EN1317-1		
BE 042		3.2		ed	angle between the intended direction of traffic ...	**smallest** angle between the intended ...	**RETAINED**
DE 043		3.6 + 9.3		te	Technical comment: The speed component perpendicular to the path of travel is not included.	Please take this into consideration in case it is relevant. Replace with: Speed (including x- and y-component)…	**NOT RETAINED** TRL use the centre of mass and the high speed overhead video; LIER use the side high speed video…the same issue exists with crash cushions – not very common as vehicle doesn't often rotate. The THG recognize this is difficult, but we suggest the centre of mass as the point to be measured as there is less reliance on the length of the vehicle. The velocity forward is the most important – but it is very difficult to measure.
BE 044		3.6	note 1 to entry	ed	... clause 4.17	should become clause 3.17	**RETAINED**
FR 045		3.6	Note 1 to entry	ed	In this Note 1 to entry reference is made to subclause 4.17 while there isn't a subclause 4.17 in the draft.	Please check and correct.	**RETAINED**
DE 046		3.6	Note 1 to entry	ed	The note refers to 4.17 which does not exist in this document. 3.17 is possibly meant instead.	Amend to: For unharmful products as defined in 3.17, this definition is replaced by Clause 8.5.	**RETAINED**
SE-047		3.6	Note	ed	Reference to Clause 4.17 is wrong.	Replace "Clause 4.17" with "3.17"	**RETAINED**
SE-		3.6	Note	ed	It is strange to replace a definition with "Clause	Suggestion:	**RETAINED**

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048					8.5".	"For exit speed of unharmful products as defined in 3.17, see clause 8.5."	
GB 049		3.6	Note	ed	'unharmful' is not a recognised term	Change 'unharmful' to 'non harmful' throughout the standard	**RETAINED**
BE 050		3.7		ed	commercially available test vehicle	what means commercially available ... are 2nd hand vehicles alllowed or not bring in line with EN 1317	**RETAINED** **Replaced by:** **"**production models representative of current traffic in Europe used in an impact test to evaluate the performance of a test item"
BE 051		3.9	note 1 to entry	ed	examples	remove examples to avoid that people start seeing this as a limititative list	**PARTIALLY RETAINED** 1st sentence eof the note to entry completed as follows: " Note 1 to entry: Items of equipment may include luminaires, traffic signs, traffic signals, telephones and utility cables **or any other equipment."**
FR 052		3.11		ed	Lighting column is defined within the CEN/TC 50.	Please take the definition of lighting column as specified in the 2.1 of the EN 40-1:1991: "support intended to hold one or more lanterns, consisting of one or more parts: a post, possibly an extension piece and, if necessary, a bracket."	**RETAINED**
FR 053		3.15		ed	French mistranslation	French version: Please correct as follows: " système de support qui **enjambe la chaussée** ~~s'étend le long de la chaussée~~, comportant un ou plusieurs pieds de chaque côté, et qui est destiné à recevoir différents équipements (panneaux fixes ou feux de signalisation par exemple)"	**RETAINED**

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GB 054		3.16		te	The term 'different needs clarification – does it mean different material, cross section, or something else	The term 'different' needs clearer definition	**RETAINED** Only different material, cross section
GB 055		3.17		ed	Self-restoring is not a recognised term	Change 'self-restoring' to 'self-righting' throughout the standard	**RETAINED**
BE 056		3.18		ed	dimension less	dimensionless (one word)	**RETAINED**
FR 057		3.18		ed	French mistranslation	French version: Please correct as follows: "indice de gravité de l'impact sans dimensions calculé d'après les accélérations **selon les trois axes du véhicule** ~~d'un véhicule à trois essieux~~ conformément à la procédure définie par la norme EN 1317-1"	**RETAINED**
SFS 058		3.24			All columns do not have a separate foundation. In some columns there is a section of column between a separate foundation and the mechanism designed to shear.	Shearing mode: support structure is transversally detached from the section of support below a mechanism which shears in the vehicle impact	The definition has been deleted.
SFS 059		3.26			The definition should include a case where both the soil and support yield and then the foundation the section of support I soil contact is lifted is lifted from ground.	Foundation lift: foundation or underground part of the support with soil contact is lifted from ground	See follow up given to SE 032 It was for 3.26 "foundation lift" which has been deleted.
GB 060		3.26		te	'foundation lift' is not an acceptable method of operation for a passively safe structure – it is too unrepeatable between test and on-site installation	Delete all references to 'foundation lift' within the standard	See follow up given to SE 032 It was for 3.26 "foundation lift" which has been deleted.
SE 061		3.27		ed	In 3.27 is a definition of anthropomorphic test device, which is also included in the	Suggestion:	**RETAINED**

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		4			abbreviations in clause 4.	**3.27** **anthropomorfic test device** **ATD** (Remove ATD from clause 4.)	
FR 062		4		ed	French mistranslation	French version: Please correct as follows: " Y **Mode de ruine par plastification** ~~Mécanisme d'effondrement : affaissement~~ F **Mode de ruine par rupture fragile** ~~Mécanisme d'effondrement : cisaillement~~ S **Mode de ruine par cisaillement** ~~Mécanisme d'effondrement : rupture~~"	**RETAINED**
NEN 063		4		te	type R (Rigid) foundation is missing	Add backfill type R, Rigid (copy from the 2007 version)	**RETAINED**
GB 064		4	'type P'	te	The paved surface can be misunderstood, and should be better defined. Most if not all tests in the UK will be conducted on rigid foundations	Revert back to the use of the term 'type R' for rigid foundation throughout the standard	**RETAINED**
NEN 065		4		ed	accorsding to the SI-system the symbol for time is the small letter 't' and for velocity 'v'	adjust accordingly	**RETAINED**
BE 066		5			All European standards (EN) are made available in English, German and French and have the same status	remove complete paragraph	**RETAINED**
FR 067		5		ed	What is the purpose of this clause ? The three official CEN/CENELEC languages are English, French and German and the CEN/CENELEC policy is clear enough on this matter. See "4.5 Equivalence of official language versions" and " ZC.4 Translation of an official version of a European Standard" of the of the Internal Regulations Part 3: Rules for the structure and drafting of CEN-CENELEC Publications (ISO/IEC Directives – Part 2, modified) - 2011-12)	Please delete this clause or refer to the Internal Regulations Part 3: Rules for the structure and drafting of CEN-CENELEC Publications (ISO/IEC Directives – Part 2, modified) - 2011-12)	**RETAINED**

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DE 068		5		te, ed	The official languages of CEN/CENELEC are German, English and French. For reference purposes and for the relationships between the contracting parties one of the three official language versions as a reference version can be specified according to an agreement. Please check the wording of this clause.		**RETAINED**
SE-069		5	5	ge	Clause 5 is a violation against the CEN rule stating that the three official language versions are identical (without preference for the English version). Even if this rule sometimes cause problems (translation errors and differences in interpretations do occur), the general CEN rule cannot be "over-ruled" by a statement in the standard.	Clause 5 "Official language" has to be deleted.	**RETAINED**
SFS 070		6.1	1st		Gradient 3,5 % should be accepted as well. With that gradient it is easier to keep the test track dry after a rain.	3,5 % instead of 2,5 %	**NOT RETAINED** 2,5 % alredy used for road restraint systems and from the point of view of test house, there is no need to increase the value
FR 071		6.1	1st paragraph	te	French mistranslation	French version: Please correct as follows: "En général, le site d'essai offre une surface plane **dont la pente** ~~qui~~ ne dépasse pas 2,5 %,"	**RETAINED**
SE-072		6.1	2nd and 3rd paragraphs	te	The two statements “The test vehicle shall run on a level hardened or paved surface until the vehicle first impacts the support…” and “The paved area of the test site shall never impede or interfere with the test item behaviour/deformation under impact” might be to statements with quite adverse implications. Can we make this more	Suggested to change the text to say that “the test vehicle shall run on a level hardened or paved surface until the vehicle reaches the installation backfill volume”.	**RETAINED**

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					clear? We do also have the Figure F.1 stating that the installation backfill volume shall be 0,5 meter wider and extend before (and after) the support structure footing, which might come into conflict with the hardened or paved surface.		
FR 073		6.1	2nd paragraph	ed	French mistranslation	French version: Please correct as follows: " Le véhicule d'essai doit évoluer sur une surface plane **ou** ~~et dure/~~pavée jusqu'à entrer en collision avec la structure de support soumise à l'essai."	**RETAINED**
SE-074		6.1	NOTE 2	ed	The information given in NOTE 2 in 6.1 has nothing to do with the actual test and is just unnecessary information.	Remove NOTE 2.	**RETAINED**
FR 075		6.2, 7.2, 8.3 & C.1		ed	According to the 5.2.4. of the Internal Regulations Part 3: Rules for the structure and drafting of CEN-CENELEC Publications, “Hanging paragraphs” shall be avoided since reference to them is ambiguous.	Please reformulate subclauses 6.2, 6.3, 7.2, 8.3 and C.1 for eliminating these hanging paragraphs.	**RETAINED**
DE 076		6.2 and 6.2.1		ed	Hanging paragraphs shall be avoided since reference to them is ambiguous. The first paragraph shall be numbered as a subclause. 6.2.3 is missing.	6.2 1 General 6.2.2 Typ S , D and X 6.2.3 Typ P	**RETAINED**
NEN 077		6.2		te	Type R, rigid, is missing. With Type P only the horizontal translation is excluded. With type R the horizontal translation ánd the rotation is excluded	Add backfill type R, Rigid (copy from the 2007 version)	**RETAINED** The following 3 Backfill types are considered: - standard aggregates (S), - special (X) and, - Rigid (R).

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NEN 078		6.2		te	Because with backfill P rotation of the pole is possible, the soil below this pavement should be defined. Is it S,D or X below?	to define the degree of rotation in combination with backfill P, add extra options which make the combination of backfill P and the other backfill soils possible, e.g. PS, PD, PX	See follow-up given to NEN 077.
SE-079		6.2	Table 1		Paved is not a type of backfill, it is a treatment of the surface and its influence on the test result depending on type, thickness etc. Paved is not mentioned in Annex F.	Remove "paved" from Table 1.	See follow-up given to NEN 077.
SE-080		6.2	Table 1		It is noted that the previous “rigid” backfill is now removed. Rigid backfill was intended for installations on concrete bridges etc. and is probably still needed.	We suggest to reinstate rigid backfill type R.	See follow-up given to NEN 077.
SFS 081		6.2.1 or partly F.3			The identification of backfill should be more precise.	The backfill type used in the impact testing shall be characterised with the following information: • sieving curve and soil type S, D or X • compaction procedure • type of material (crushed material with a known percentage of crushed grains, sand, gravel) • result of a push/pull test. There is no need to repeat the push/pull test if the sieving curve, compaction procedure and the type of material type are the same (within tolerances given in clause C.3) as in a tested backfill not more than 6 months or 20 tests before.	See follow-up given to NEN 077.
BE 082		6.2.1	1st para	ed	soil material is probably not the correct terminology for the material described in annex F.	consider using granular material	**RETAINED** Reformulated as follows: "Backfill type S and X identify the use of ~~soil~~ **backfill** material in the backfill volume."
SE 083		6.2.1		ed	Text refers to “clause F.4” and “clause F.3”.	Suggest to include "Annex" in the reference for clarity, e.g. "Annex F, clause F.4".	**RETAINED**

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DE 084		6.2.1	4th para.	ed	The reference to F.3 is unclear. General comment; the reference should be either to F.3 or Annex F.3. Both forms are used in the document.	Please clarify: …see Annex F, F.3.	**RETAINED**
FR 085		6.2.1	5th paragraph	ed	As written this paragraph is unclear.	For better understanding, please reformulate it e.g. by splitting the sentence in 2.	**RETAINED** Reformulated as follows: " Backfill type S and X shall not be paved, but any pavement where the wheels of the car travel is allowed."
SE-086		6.2.1	5th	te	The statement " Backfill type S, D and X shall not be paved with the exemption of the path of the vehicle wheel tracks" is quite complicated in reality. If an excavator shall work on the backfill volume and install the test item, followed by a requirement to pave the actual wheel tracks over that backfill volume, this will require substantial time and workforce between subsequent tests. It is very unpractical, and still does not enhance the quality or repeatability of the tests.	As of the comment above, we repeat the proposal to require hardened or level surface up until the beginning of the backfill volume, but no further. Then we can work with the backfill volume in a much more effective and repeatable way.	**PARTIALLY RETAINED** Last paragraph reformulated as follows : "Backfill type S, D and X shall not be paved."
SFS 087		6.2.1	6			Move the text: The lateral movement at the exit side ….shall be measured… to place where post impact measurements are described.	**RETAINED** To be moved in subclause 9.2.
SE-088		6.2.1	NOTE	ed	The NOTE at the end of 6.2.1 refers to Annex A. However, there is no such a classification in Annex A in respect of soil movement.	Suggest to change the note to "the determined lateral movement is used according to annex A for the classification of…" and then it is needed to include this type of classification in Annex A, which is now missing.	The NOTE has been deleted
GB 089		6.2.2		te	The paved surface can be misunderstood, and should be better defined. Most if not all tests in the UK will be conducted on rigid foundations	Revert back to the use of the term 'type R' for rigid foundation throughout the standard	See follow-up given to NEN 077.

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GB 090		6.2.2	Note	te	This Note is contradictory and confusing, and does not aid the reading of the standard	Delete the Note	**RETAINED**
DE 091		6.3. and 6.3.1		ed	Hanging paragraphs shall be avoided since reference to them is ambiguous. The first paragraph shall be numbered as a subclause. A subclause shall not be created unless there is at least one further subclause st the same level.	6.3.1 General 6.3.2	**RETAINED**
BE 092		6.3	all	te	the description of the test vehicle is not identical to EN 1317-1. For transparency and ease of use this should be identical for all types of crash tests (EN 1317 and EN 12767)	change to correspond with EN 1317-1	**RETAINED** The 5.3.1 General (test vehicle) has been reformulated.
SE-093		6.3		te	Test vehicle ought to be covered by EN 1317-1 clause 5.2.	Make sure that the vehicle specifications are equal in EN 1317-1 and prEN 12767, and refer to EN 1317-1 which is already a normative reference.	See foolow-up given to BE 092.
BE 094		6.3		te	how to deal with fluids in the test vehicle		**NOTED** This depends on the test house as some need the fluids and run the vehicle by their own engine, whereas other drain all the fluids and then pull the vehicle.
FR 095		6.3	Last paragraph	ed	French mistranslation	French version: Please correct as follows: "Toutes les masses lestées doivent être **solidement** ~~correctement~~ fixées au véhicule."	**RETAINED**
DE 096		6.3.1, 9.4		te	The reference to EN 1317-1 is undated. Is the reference meant to be undated?	Please clarify.	See follow up given to SE 015
BE		6.3.1	all	te	See also previous comment		**NOTED**

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097					accelerometers shall be positioned as described in EN 1317-1. Position has changed between 1998 and 2010 version. Influence varies from 0,1 to 0,3. Results obtained with the 2010 position are not comparable with the results obtained with the 1998 position.		
SE 098		7.1 7.2		ed	The first line of 7.1 says “the manufacturer shall select the configuration…” and then clause 7.2. is all about test item selection. Text needs to be refined. 7.1 is only about test item documentation.	Suggestion: Take out Note 1 of 7.1 and start 7.1 with the test “Before the test, the manufacturer shall supply drawings…” Make NOTE 2 of 7.1 the main text of 7.1. Move the full sentence “The manufacturer shall select…used in the tests” to the beginning of 7.2.	**RETAINED**
FR 099		7.1	NOTE 1	ge	French mistranslation, "should" has been translated by "doit".	French version: Please correct.	**RETAINED**
FR 100		7.1	2nd paragraph, last sentence	ed	French mistranslation	French version: Please correct as follows: "…~~La masse des composants soumis à l'essai généraux et celle des éléments divers~~ **La masse totale de l’objet d’essai ainsi que la masse de chaque composant** doivent être enregistrées."	**RETAINED**
FR 101		7.1	2nd paragraph & NOTE 2	ed	French mistranslation	French version: Please replace "cahier des charges" by des charges" by "**spécifications techniques**"	**RETAINED**
FR 102		7.1	NOTES 1 et 2	ge	As written these NOTES seem containing requirements: - in NOTE 1 references made to 2 normative Annexes, - in NOTE 2, last sentence, "must be defined".	Please reformulate them in order to avoid any misunderstanding.	**See follow-up given to GB 105**
SFS 103		7.1	NOTE 2		Note 2 should not be a note since it inludes requirements.		**See follow-up given to GB 105**

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DE 104		7.1	Note 2	ed	Notes shall not contain requirements or any information considered indispensable for the use of the document.	The last sentence shall be redrafted accordingly.	**See follow-up given to GB 105**
GB 105		7.1	Note 2	te	This text is important as it determines the minimum amount of information to be provided in the technical specification	Note 2 should become mandatory text	**RETAINED**
GB 106		7.1	Note 3	ed	The Note would be better placed elsewhere to aid understanding	This should be moved above paragraph 6 of Clause 7.1	**RETAINED**
DE 107		7.2 and 7.2.1 8.3 and 8.3.1		ed	Hanging paragraphs shall be avoided since reference to them is ambiguous. The first paragraph shall be numbered as a subclause.	7.2.1 General	**RETAINED**
GB 108		7.2	New	te	A reference to Annex B would be useful to help in the determination of the test item	Add a reference to Annex B	**RETAINED**
FR 109		7.2		ed	For better understanding	Please correct the title as follows: " 7.2 Test **sample** ~~item~~ selection"	**NOT RETAINED** Already used formulated this way in other standard.
FR 110		7.2.1	1st paragraph	ed	French mistranslation	French version: Please correct as follows: " L'essai d'un candélabre doit utiliser le plus grand et le plus lourd modèle de **simple crosse** ~~socle avec bras unique~~, ainsi que le plus lourd système d'éclairage correspondant, lequel est destiné à recevoir le candélabre."	**RETAINED**
FR 111		7.2.1	NOTE	ge	According to the 6.5.1. of the Internal Regulations Part 3: Rules for the structure and drafting of CEN-CENELEC Publications, "Notes and examples integrated in the text of a document shall only be used for giving additional information intended to assist the understanding or use of the document. They **shall not contain requirements** ("shall", see 3.3.1 and Table H.1) or any information considered indispensable for	Please reformulate this NOTE which contains a requirement.	**RETAINED** Moved in the main text.

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					the use of the document, e.g. instructions (imperative: see Table H.1), recommendations ("should"; see 3.3.2 and Table H.2) or permission ("may"; see Table H.3)."		
GB 112		7.2.2	NEW	te	In the UK, signs are attached to posts at 5 degrees to the travelling public. How should this be considered when determining the impact angle for the testing of sign supports?	Provide additional guidance on the impact angle for testing with sign supports.	**NOT RETAINED** It is a testing standard, the products shall be tested in the same conditions.
FR 113		7.2.2		te	The sign support surface depends on the maximal bending moment of the sign support, the applied wind pressure and the sign support's height of the panel. A maximal surface can't be defined without having fixed the other parameters. Furthermore, how to be sure that the maximal surface declared by the manufacturer is respected?	Please consider.	**RETAINED** It is decided that the manufacturer is responsible for choosing the test item. There is no harmonized windload in Europe, so the test standard cannot fix a windload value.
GB 114		7.2.2	Para 1	te	The term 'for which that height of support is designed' is open to misinterpretation and misuse.	A wind load must be added to make this meaningful	**NOT RETAINED** Clear enough.
NEN 115		7.2.2		te	The note that mountingheights of signs needs to be minimal 1,8m or 2m. lower heights need specific testing is missing.	Add/remove the note of annex B.1 to 7.2.2.	**RETAINED** The NOTE B.1 is moved in 7.2.2.
SE-116		7.2.2	1st para		Height from ground should be specified as in the earlier edition of EN 12767.	See EN 12767:2007, 5.5.1, last para.	See follow-up given to NEN 115
GB 117		7.2.3	Para 1	te	It should be permissible to test with more than one signal head	Change to read '…with the heaviest configuration of signal head(s)…'	**RETAINED**
SE-118		7.2.4		te	Compare with overhead cables in 7.2.1. It is required to install "at least three utility poles". But then it is said that overhead cable might not be necessary if the performance is known from other tests.	To be aligned with each other regarding number of poles, fixing of cables etc. Suggestion is "A utility pole shall be tested with the heaviest intended load. Overhead cables shall be installed unless the effect of overhead cables and its fixings on the performance is known from other	**RETAINED**

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					Then, if no cables are present, it is obvious that three utility poles are not anymore necessary. Need to be rephrased.	tests with similar utility poles. When testing with overhead cables, at least three utility poles shall be installed and the centre utility pole shall be the one impacted."	
FR 119		7.2.5	NOTE	ed	French mistranslation	French version: Please correct as follows: " Les structures de support (boîtes aux lettres, portiques, cantilevers, téléphones d'urgence, supports pour caméra, supports pour dispositifs météorologiques et de surveillance du trafic, panneaux publicitaires, etc.) et les autres **structures** ~~composants~~ non mentionné**e**s ci-dessus peuvent également être soumis à l'essai conformément à la présente Norme européenne."	**RETAINED**
GB 120		7.2.5	Note	ed	In the UK it is common to have additional items which could be referenced to aid understanding and implementation	Add 'solar panels' and 'wind turbines' to the list of examples in the Note	**RETAINED**
GB 121		7.2.6	Para 1	te	The term 'different needs clarification – does it mean different material, cross section, or something else	The term 'different' needs clearer definition	**RETAINED** "different" is replaced by "non identical".
GB 122		7.2.6	Para 2	ed	The term 'luminaire is used throughout the standard	Change 'light' to 'luminaire'	**RETAINED**
GB 123		7.2.6	Para 7	te	Does this mean you test with a sign attached with the largest sign area and it is acceptable to use the support to hold up a gantry? It is unclear	Clarify para 7 such that it cannot be open to misuse.	**PARTIALLY RETAINED** This 7th paragraph is deleted.
DE 124		8.2	3rd paragraph	te	… "(all the way around 180,0° minus 20,0°)". The meaning of the expression in brackets is unclear.	Please clarify.	**RETAINED** The Figure 1 has been improved.
SE-		8.2	3rd	ed	"…shall be made under the same test conditions	Maybe slightly better if we write"…shall be made	**RETAINED**

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125			paragraph		with the exception of…”.	under identical test conditions with the exception of…”.	
BE 126		8.3	2nd para	ed	incorrect reference	8.2.1 --> 8.3.1 8.2.2 --> 8.3.2	**RETAINED**
FR 127		8.3	2nd paragraph	ed	The references to subclauses 8.2.1 and 8.2.2 are wrong.	Please replace: - "8.2.1" by "**8.3.1**" and, - "8.2.2" by "**8.3.2**"	**RETAINED**
SE-128		8.3	2nd para		8.2.1 and 8.2.2 are referenced but missing.	References should probably be 8.3.1 and 8.3.2 respectively.	**RETAINED**
GB 129		8.3	Para 2	ed	The wrong Clauses are referenced	Change ‘8.2.1’ to ‘8.3.1’ and ‘8.2.2’ to ‘8.3.2’	**RETAINED**
NEN 130		8.3.2		te		add a general note that the impact-position is chosen for the most energy absorbing direction through the construction. This also covers multilegged structures with a matrix of posts behind (a combi of figure 3 and 4/5, for the shored-up construction we all know)	**NOT RETAINED** The position is acknowledged, but 20° is the common angle for a vehicle leaving the road. For products with multiple functioning angles, different impact angles are proposed.
BE 131		8.3.2		ge	Other situations than those described under 8.3.2 can exist (ex. two relatively light supports close to the road and a third more robust support further away If the clear opening between the two light supports is > 1,5 m, an impact might take place against the third more resistant support)	maintain 8.3.2. for supports with two legs and add an additional clause for multilegged supports (more then two legs). For these multilegged (> 2) supports, the impact configuration can be agreed between manufacturer and crash test laboratory.	**NOT RETAINED** Covered by the last paragraph (just before the 8.4).
FR 132		8.3.2	Figures 2 and 3	ed	These 2 Figures have the same title.	Please change the titles. Proposals: Figure 2: " Example of clear opening in the horizontal cross section of a multi-legged support structure **crosswise to the traffic** ~~in a horizontal plane at 0,3 m above ground level~~"	**RETAINED** As follows: Figure 2: "crosswise" → "parallel" Figure 3: "lengthway" →

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						Figure 3: "Example of clear opening in the horizontal cross section of a multi-legged support structure **lengthways to the traffic ~~in~~ ~~a horizontal plane at 0,3 m above ground level~~**"	"perpendicular"
SE-133		8.3.2	Figure 3		If front and rear legs are close one should aim at first leg.	Describe the case.	**RETAINED** The Figures have been improved.
GB 134		8.3.2	Under Figure 3 and in Figure 4 and 5	te	For practical implementation it would be easier to use a measurement normal to the sign, and not at 20 degrees to it.	It is therefore proposed to change 1.5m at 20 degrees to '1.6m normal to the sign, with the Figures updated to reflect this	**RETAINED** The figures have been improved.
FR 135		8.3.2	Figure	ed	The numbering is missing.	Please replace "Figure" by "**Figure 4**".	**RETAINED**
NEN 136		8.3.2	Fig. 4, page 18	ed	"4" is missing		**RETAINED**
SE-137		8.3.2	Figure 4		Figure number missing	Insert.	**RETAINED**
GB 138		8.3.2	Figure 4	ed	The Figure has no number	Change to read 'Figure 4'	**RETAINED**
NEN 139		8.3.2	Fig. 4,	te	No reference is made in the text to the new figures 4 and 5 and the old figures 4,5,7,8,9		**RETAINED**
NEN 140		8.3.2	Fig 4, 5 on page 20	ed	The numbering isn't continues		**RETAINED**
NEN 141		8.3.2	fig 4 and 5 page 18	te	For the figures 4 and 5 it would be good to note the impact-position for a construction with more then 2 legs.		**RETAINED** The figures have been improved.
SFS 142		8.3.2	last	ed		…at least one of the high speed tests shall be on the shortest leg and one on the strongest leg. One leg may fulfil both criteria.	**RETAINED**

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FR 143		8.3.2	Last paragraph just before 8.4	ed	For better understanding.	Please reformulate as follows: " For multi-legged support structures consisting of different support legs, at least one of the high speed tests shall be on the ~~shortest and~~ strongest leg. If that is not the same leg as **the one identified as Leg 1 in Figure 2** ~~that identified above~~, two additional tests shall be performed on the ~~shortest and~~ strongest leg (one high speed test and one low speed test)."	**RETAINED**
CH 144		8.3.2	Last paragraph just before 8.4	te	For multi-legged support structures consisting of different support legs, at least one of the high speed tests shall be on the shortest and strongest leg. If that is not the same leg as that identified above, two additional tests shall be performed on the shortest and strongest leg (one high speed test and one low speed test). **The text is unclear and may lead to misinterpretation**	A precise and clear formulation is needed	See follow-up given to FR 143
SFS 145		8.3.2	end		Most multi-legged supports are tested in level test track but in practice most of them are installed on a slope where the lengths of legs must differ from each other.	Add a NOTE: Testing a multi-legged structure on level terrain with identical length of legs does not prevent the product to be installed in a slope with different lengths of legs.	**NOT RETAINED** The proposed NOTE deals with installation, issue for the national authorities.
NEN 146		8.3.2		te	last paragraph: The text is not clear. The reference to “identified above”, what does that mean? They also require 2 the same tests on the shortest and strongest….?	explain the meaning of this paragraph of adjust the test to be more exclusive	See follow up given to FR 143
GB 147		8.3.2	Last para	te	It is unlikely that this will ever be needed as we are testing on flat surfaces, and this is a testing standard	Delete this paragraph	**NOT RETAINED** See follow up given to FR 143
GB 148		8.3.2	Last para	te	If the paragraph is not deleted (see comment above), the post representing the worst case should be tested	Change to read ‘…tallest and strongest leg.’	See follow up given to FR 143

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FR 149		8.4	1st paragraph	ed	French mistranslation, "à l'essai" is unnecessary	French version: Please correct as follows: "Le fabricant doit utiliser le Tableau 2 pour déterminer la classe de vitesse à laquelle soumettre ~~à l'essai~~ la structure ~~de~~ support..."	**RETAINED**
AT 150		8.4	Table 2	te/ed	The impact speed tolerance is limited with ± 0,3 km/h in the German version. These tolerances cannot be met and deviate from the ones given in the English version.	Change Table 2 according to the E-version: Speed class Impact speed km/h Impact speed tolerance km/h 50 50,0 ± 3,0 70 70,0 ± 5,0 100 100,0 ± 5,0	**NOTED** Action for our German colleagues.
NEN 151		8.4	table 2	te	In many cases the permitted speed (design speed) on the motorways is higher than the impact speed as mentioned in table 2.	Add a column with desing speed to table 2, so a comparison can be made between speed class and design speed	**NOT RETAINED** National guidelines.
GB 152		8.4	Table 2	te	The inclusion of ‘,0’ implies a level of measurement accuracy on impact speed measurement	Delete the ‘,0’ for the impact speeds (and throughout the standard’	**RETAINED**
FR 153		8.4	2nd paragraph	ed	The reference to A.3 is wrong.	Please replace "A.3" by "**A.2**"	**RETAINED**
NEN 154		8.4	2nd paragraph	ed	The reference to Annex A, clause A.3… should be A.2	adjust	**RETAINED**
DE 155		8.4	3rd paragraph and Table 2	te, ed	Please compare the details of the overall accuracy with the details on the tolerances indicated in table 2. The overall accuracy is higher than the tolerances, however, it should be smaller.	Please check.	**COULD BE NOT RETAINED** Wrong interpretation
SFS 156		8.4	3rd paragraph		The accuracy for measuring the impact speed shall be within ± 2 %, which means 0,7 km/h in the low speed test and 1 to 2 km/h for high speed tests. Are there any real reasons why the	Consider ± 2 km/h instead of ± 2 %.	**NOT RETAINED**

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					accuracy could not be 2 km/h for all speeds?		
FR 157		8.4 9.3 Annex E Table G.1	3rd paragraph 3rd paragraph 6th paragraph 5 a).	ed		French version: For better understanding, think about another French translation for the notion of "target impact speed" in 8.4, 9.3, Annex E and Table G.1 5 a). Proposals: Replace "valeur cible" by "Vitesse visée" or "Vitesse théorique" or "vitesse nominale" or "Vitesse spécifié" French version Please consider	**RETAINED**
FR 158		8.4	4th paragraph	ed	French mistranslation	French version: Please correct as follows: " La vitesse d'impact du véhicule d'essai doit être mesurée sur la trajectoire d'approche, **à moins de** ~~à plus de~~ 6,0 m du point d'impact. La vitesse moyenne doit être mesurée sur une ~~distance~~ **longueur** d'au moins 1,0 m **et en amont de** ~~avant~~ l'impact."	**RETAINED**
FR 159		8.5	1st paragraph	te	"The simplified test method shall be used to test unharmful small support structures." seems excessive.	Please consider to reformulate this paragraph as follows: " The simplified test method ~~shall~~ **should** be used to test unharmful small support structures."	**NOT RETAINED** Unharmfull small support structures need to be tested to declare passive safety.
FR 160		8.5	clause 6.3	ed	French mistranslation	French version: Please correct as follows: "Pendant l'essai, un conducteur peut être utilisé **et** ~~:~~ aucune instrumentation n'est nécessaire sur le véhicule"	**RETAINED**
GB 161		8.5	Clause 6.3.1	ed	The paragraph appears out of alignment	Realign para 4	**RETAINED**
NEN 162		8.5	Clause 8.3		clause 8.3 only a high speed test should be carried out… What if there's a special mechanism inside that doesn't activate at lower speeds (as		**NOT RETAINED** The high speed test is

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					35 km/h)? We currently have NE3 products with exit's above 90km/h. If we only do a high-speed test on these are these products then unharmfull? If there's a special construction or spot in the structure for activation during impact I always would require the most critical low speed test.		considred as most critical.
SE-163		8.5	Clause 8.3	ed	8.3 refers to impact point.	Reference should be 8.4 (Impact speed)	**RETAINED**
DE 164		8.5	Clause 9.1	te	Re 9.1 in the list: Shouldn't this item be dealt with in the annex if it is not a requirement?	Please check.	**RETAINED** The 7.5 has been reformulated.
SE-165		8.5	Clause 9.1	te	We do not agree that 10 km/h speed reduction is still an "unharmful product". This is a major change from previous version where speed loss shall be less than 3 km/h. To lose 10 km/h in a 900 kg vehicle during an impact is quite substantial. We cannot find any decision or documentation supporting a change to 10 km/h from the earlier 3 km/h.	Propose to change back to 3 km/h as of EN 12767:2000 and EN 12767:2007.	**RETAINED** There is no documentation supporting the change from 3 km/h to 10 km/h.
FR 166		8.5	clause 9.2	te	"shall remain upright" is too vague and it is a requirement that shall be in the product standard not in the test method. As there is not a specific product, perhaps an informative Annex defining the acceptance criteria for non-identified products could be useful.	Please consider.	**RETAINED** That clause is about the vehicle not the product.
GB 167		8.5	Clauses 9.5 and 9.6	ed	The use of cine film is unlikely in any currently accredited test laboratory	Delete 'cine'	**RETAINED**
NEN 168		9			What is the purpose/relevance of the collapse mode in the classification?	In general, remove collapse mode from the performance class	**RETAINED**. It is a national authority request.
FR		9.1	NOTE	ed	Reference is made in this NOTE to Annex A as	Please correct.	**RETAINED**

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169					an informative one while it is a normative Annex.		"informative" deleted
DE 170		9.1	NOTE	ed	Incorrect reference. The annex is normative.	Please correct and explain more thoroughly. What is the intention of the note?	**RETAINED**
GB 171		9.1	Note	ed	The current references are incorrect	Change to read 'Construction Products Directive' and Construction Products Regulation'	**RETAINED**
FR 172		9.1	NOTE	ed	French mistranslation	French version: Please reformulate the NOTE.	**RETAINED**
FR 173		9.2	Title & whole subclause	ed	French mistranslation, "composant" is inapropriate	French version: Please replace "composant" by "**échantillon**"	**RETAINED**
CH 174		9.2		te	The momentum of the falling structure shall be calculated following the test by multiplying the maximum speed of the single point (in metres per second) by the mass (as defined above) of the falling support structure installation, (in kilograms). **The formulation regarding the physical laws is not correct**	A precise and clear formulation is needed	**RETAINED**
NEN 175		9.2			The collapse mode is probably introduced to get an idea for secondary risks for pedestrians. For the occupants we have roof deformation introduced as secondary risk. But EXIT-speed of the car (energy absorbtion level) is also giving an idea of this secondary risk. A car with high Exit speed is more dangerous than a flying pole to me. They both go in same direction. A situation where we have a high exit speed without a flying pole doesn't exist to me so adding a collapse mode does not add something. And if we have flying poles with no Exit speed the ASI will fail. - Modes Y, S and F are 3 situations not clearly distinguished by the examples to my opinion and	PROPOSAL for modes Y, S and F: Mode NS (No Separation): all pole-parts are still attached to eachother (1 piece) after the high speed crash. (HOW it behaves is not important, because that behavior is covered by ASI-limits. Most important behavior is that this pole is still connected to its origin) Mode DS (Designed Separation) : the pole separates from its bottomsection at designed location/area (slip base, shear mechanism, material-step, stiffness step, pulled out of prefab sleeve etc.) Mode US (Undesigned Separation): the pole	**RETAINED**

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					the examples mentioned don't cover all situations. The pole above ground separates from its rootsection or does not separate from its rootsection. And when it separates we have difference in a designed separation (determined location/area) or natural behavior (break somewhere undefined).	separates somewhere not determined from its bottom section because of natural behavior.	
GB 176		9.2		te	The UK supports the better clarification for the different types of failure mode for passive support structures. However, it feels that using this as a method for classifying product and including this class on a CE mark will significantly confuse the market. It will also reduce the number and type of products usable in certain locations, stifling competition and free-trade. This may be down to misunderstanding, and not due to safety reasons. This is therefore felt unnecessary as a class, although the mode should be identified within the test report.	Delete all references to classification of product by collapse mode within the standard. Require that these definitions are used to describe the failure mode in the test report.	See follow-up given to CH 174
FR 177		9.2 à 9.5		ed	For better understanding: - subclauses 9.2 to 9.5 should be restructured. Proposal: 9.5 (which lists the data to be recorded) 9.2 9.3 9.4 In addition, for better understanding, for each data to be recorded, it would be useful to indicate in which subclause of the standard this data is used (example: for the angle impact, see 8.2 and 8.3).	Please consider	**RETAINED** **RETAINED**
BE		9.2	a) & b)		the difference between shearing and yielding is	stress that shearing collapse mode implies that	See follow-up given to CH

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178					not very clear	failure should occur in a dedicated point	174
SFS 179		9.2				Add title 9.2.1 Collapse mode and 9.2.2 Detached elements and 9.2.3 Momentum of the falling support	**RETAINED** See also FR 190
FR 180		9.2	a) to d)	te	French mistranslation	French version: Please correct as follows: "Exemple 1 : plastification : la structure de support subit une grande déformation irréversible Exemple 2 : plastification suivie de rupture par allongement : etc. Exemple 4 : mode de ruine par cisaillement (S) Exemple 4 : cisaillement : la structure de support se détache ou glisse transversalement des fondations au niveau d'un point ou mécanisme précis. c/ mode ruine par rupture fragile figure 11 : remplacer cisaillement par "rupture fragile"	**NOT RETAINED** The Figures have been deleted.
FR 181		9.2	Figures 4 to 10	ed	The numbering of these Figures is wrong.	Please replace: - "Figure 4" by "**Figure 6**", - "Figure 5" by "**Figure 7**", - "Figure 6" by "**Figure 8**", - "Figure 7" by "**Figure 9**", - "Figure 8" by "**Figure 10**", - "Figure 9" by "**Figure 11**", - "Figure 10" by "**Figure 12**", And update the references made to these Figures in the text accordingly.	**NOT RETAINED** The Figures have been deleted.
GB 182		9.2	Figures 4 to 10	ed	These Figures could be improved	Improve the Figures	**NOT RETAINED** The Figures have been deleted.

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DE 183		9.2	Example	ed	Incorrect reference to figure. Should be Figure 7.	Please check and correct.	See follow-up given to GB 182.
SFS 184		9.2	Example 3		Clarify. It should include supports with no foundation.	Yielding support yields first but then it detaches from the foundation or the underground part of the support	See follow-up given to GB 182.
SFS 185		9.2	Example 4 and 5			Add: …due to shear. at the end of the definition.	See follow-up given to GB 182.
FR 186		9.2	Figures 7 & 8	ed	French version: Figure 7 is also used as Figure 8.	French version: Please add the correct Figure 8.	See follow-up given to GB 182.
GB 187		9.2	d)	te	'foundation lift' is not an acceptable method of operation for a passively safe structure – it is too unrepeatable between test and on-site installation	Delete all references to 'foundation lift' within the standard	See follow-up given to GB 182.
SFS 188		9.2	Example 7			Correct as definition 3.26	See follow-up given to GB 182.
SE-189		9.2	Figure 10	te	We are not confident with this behaviour, which to us a failure.	Should collapse mode Z be regarded as an accepted intended behaviour? The description can be kept in the document, but it should be noted that this is not an accepted collapse mode.	See follow-up given to GB 182.
FR 190		9.2	3rd to 7th paragraph	ed	For better understanding, the paragraphs after the Figure 12 could be brought together e.g. in a new subclause: "9.2.2 Other test item behavior to be recorded 9.2.2.1 Detached elements → 3rd paragraph 9.2.2.2 Momentum of the sample → 4th to 7th paragraphs".	Please consider	**RETAINED** This subclause has been restructured.
NO 191		9.2		Ed	The last 5 paragraphs on page 22 should be moved to the second paragraph in 9.2. to make it more readable.	Move text before collapse mode list to paragraph 2	See follow-up given to CH 174
SE-		9.2		te	Text below figure 10, describing the falling	Change "maximum speed" to "actual speed while	**RETAINED**

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192					columns momentum. However, it is not the maximum speed of the single point (6 meter above ground) which is to be multiplied by the mass, it is the actual speed of that point while it passes the plane 2 meter above ground. The intention of the plane is to be able to get rid of the parallax error in all camera lenses. This must be corrected. It is also important to point out that it is only the residual vertical z-component of the speed of the point on the falling structure that us used for this momentum calculation.	passing through the 2 meter plane" and define speed as being the vertical component of the point falling speed.	
GB 193		9.2	Paras 3 to 5 under Figure 10	te	It is not clear why this information needs to be collected. It is also not stated that this information needs to be recorded anywhere	Clarify why this information is needed, and that it should be reported in the test report.	See follow-up given to CH 174
SFS 194		9.2	3rd below Figure 10		Describe the measurement in chronological order. Present a method for using historic data.	A visible mark is made in the dupport at the height of 6,0 m (± 0,03 m) above ground. Its movement shall be observed in the video during the impact test. The vertical speed of the mark shall be measured when it crosses a horizontal plane 2,0 m above the ground. For supports shorter than… In case of old test, no mark is required if the point specified above can be followed. The momentum is determined in all impacts (low or high speed) where the support falls down. The highest value shall be declared for the test item even if the falling support did not hit the car.	See follow-up given to CH 174
NO 195		9.2 d)	Figure 10	Te	Foundation lift collapse mode: This is not an acceptable collapse mode because of uncertainty in the foundation design and possible dangerous for traffic safety.	This collapse mode should be deleted.	See follow-up given to CH 174
DE	d)	9.2	d), 3rd para.	te	"…When this point, during vehicle impact and support structure collapse, passes through a	Please make this more precise – what is meant	See follow-up given to CH

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196					horizontal plane situated 2,0 m above ground, the speed of the single point shall be determined …" What is meant here? Only the speed in the x- or y-direction or the absolute speed? In our view, the absolute speed should be referred to here as otherwise some important energy components of the vehicle are not taken into account. The magnitude of the falsification also depends on the test procedure.	exactly by "speed"? Add: Speed (including x- and y-component)…	174
SFS 197			4th below Figure 10		Mass and overall mass probably mean the same. Define and use one, only.		See follow-up given to CH 174
FR 198		9.2	7th paragraph (after Figure 12)	te	French mistranslation	French version: Please correct as follows: "~~Le moment~~ **La quantité de mouvement** de la structure de support qui s'effondre doit être calculé après l'essai en multipliant la vitesse maximale du point isolé (en mètres par seconde) avec la masse (conformément aux instructions ci-dessus) de ladite structure (en kilogrammes)."	**RETAINED**
SFS 199		9.2	5th below Figure 10			Delete maximum	See follow-up given to CH 174
GB 200		9.2	Para 5 under Figure 10	te	Energy is likely to be of more use than momentum	Make reference to energy instead of momentum	See follow-up given to CH 174
FR 201		9.3	1st paragraph	ed	French mistranslation	French version: Please correct as follows: Le véhicule d'essai ne doit pas se retourner **(même sur son côté)** ~~(même latéralement)~~ dans un rayon de 12 m à partir du point d'impact..."	**RETAINED**
SFS 202		9.3	2nd		It is not clear if the exit sped shall be measured when the front of the car crosses the 12 m line, or the rear or centre of gravity. Clarify.	The exit speed …shall be measured…when the front of the car is 12m beyond the impact point.	**NOT RETAINED** TRL use the centre of

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							mass and the high speed overhead video; LIER use the side high speed video…the same issue exists with crash cushions – not very common as vehicle doesn't often rotate. The THG recognize this is difficult, but we suggest the centre of mass as the point to be measured as there is less reliance on the length of the vehicle. The velocity forward is the most important – but it is very difficult to measure.
FR 203		9.3	4th paragraph, last sentence	ed	French mistranslation	French version: Please correct as follows: "~~La précision de la déformation verticale maximale du toit ne doit pas dépasser~~ **La déformation verticale maximale du toit doit être mesurée avec une précision de** ± 10 mm."	**RETAINED**
DE 204	Last line	9.3	4th para	te	"…The maximum vertical roof deformation shall be measured with an accuracy of ± 10 mm." This tolerance is very generous compared with the previous specifications for the accuracy of the measurements.	Please check – compared with the precision required for measurements, the tolerance seems too generous.	The THG do not have much experience of this to date, so recommend that we keep the tolerance for now, but review it on the next revision – there could be a wide variety/range in the measurement which needs to be taken. Could be an issue for the task group that will work on the Bogie.

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GB 205		9.3	Last Para	te	A maximum value of roof deformation should be stated.	Add: 'None of three measured values of roof deformation shall exceed 200mm.'	**NOT RETAINED** The roof deformation is not a criteria in the standard. Each National Authority will define its own limit value.
FR 206		9.4	2nd paragraph	ed	French mistranslation	French version: Please correct as follows: "Différents niveaux de sécurité passager sont définis dans le Tableau A3 en tant qu'éléments ~~influençant~~ **influencés par** la valeur des indices ASI et THIV."	**RETAINED**
DE 207		9.4	3rd para	te/ed	This sentence expresses a requirement. Table 3 should therefore be moved to the annex.	Please check and move.	**RETAINED** **Table 3 is deleted** **3rd paragaphe reformulated as follows:** **"** The maximum acceptable values for the pass and fail criteria of the tests for different energy absorption categories are specified in Table **A**.3**."**
SFS 208		9.4	Table 3		The method for calculating ASI presented in EN 1317:2010 differs from the version which was used when choosing the requirements for different severity indexes. For the high speed test of NE support the new ASI is most cases (but not always) 0,08…0,14 units higher than ASI calculated in accordance with the original EN 1317-1 when the duration of the impact was below 300 ms, which is typical for NE-supports. For longer durations, for LE and HE supports, the new ASI does not differ from the original one. The non-dated reference to EN 1317 has caused a	There are at least two alternatives to solve the problem: A. Change the ASI limit for class NE1 products from 1,2 to 1,4. That limit 1,4 has already been considered safe for LE1 and HE1 products. Also NE2 and NE3 limit should be the same as for HE and LE products. These new limits shall be only used when ASI is calculated in accordance with EN 1317-1:2010. As a result the limits for ASI would become	**SOLVED** See new Table A.3 inserted.

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					situation where some NE products which were acceptable before year 2010 are not acceptable now. This endangers the development of supports designed for heavy loads and some products legally placed on the market would fail if they were reassessed in a case new versions of range are studied.	more logical. B. Replace non-dated reference to EN 1317-1 with a dated reference to 1317:1998. This would keep the ASI values as they were when the limits for severity indexes were chosen. Alternative A is better since the methods for measuring acceleration and method for calculating ASI is mathematically more correct in EN 1317-1:2010 than in the original.	
NEN 209		9.4	Table 3	ed	What is the relevance of table 3? please refer only to table A.3 which includes the same information. Now we have double info in the norm which can give problems in future versions.	remove Table 3 and make a normative reference to Table A.3	See follow-up given to DE 207
FR 210		9.5	Title	ed	French mistranslation	French version: Please correct as follows: " Données **d'impact** à enregistrer ~~en matière d'impact~~"	**RETAINED**
SFS 211		9.5	Pre-test data		Soil is not well documented.	Describe backfill as in 6.2.1	**RETAINED**
FR 212		9.5	"Pre-test data"	ed	For better understanding, review the order: The "- mass of the above ground part of the tested item;" and "- drawings of the test item" should be before "- profile of vehicle roof;" and "- push /pull test;"	Please consider	**RETAINED**
FR 213		9.5	"Test data", 4th dash	ed	French mistranslation	French version: Please correct as follows:	**RETAINED**
FR 214		9.5	"Test data", 4th dash	ed	As for the previous dashes, for better understanding, specify that these characteristics are the test vehicle's ones.	Please complete as follows: "- **test vehicle** linear accelerations and angular rates**"**;	**RETAINED**

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NEN 215		9.5	"Post-test data", 3rd dash	te	Post-test data: what are 'significant debris'? In the previous EN12767 it were masses of 2kg or more.	define 'significant debris'	**RETAINED** **See FR 226**
FR 216		9.5	"Post-test data", 7th & 9th dashes	ted	"- roof intrusion;" and "- roof deformation;" are redundant.	Please delete one of this dash.	**PARTIALLY RETAINED** "intrusion" → "penetration" + in A.7: "roof intrusion" → roof deformation"
SFS 217		9.5	Post-test data		Definition or meaning of roof intrusion and roof deformation should be clearer.		**See follow-up given to FR 216**
NEN 218		9.5	9th dash		Post-test data: Roof deformation needs to be reported. Also the distance between seat-level and roof or dummy-head and roof, is important, because a roof deformation of a high car is probably more acceptable then from a low car….	Add distance between seat-level and roof or dummy-head and roof	**NOT RETAINED** Depends on the vehicle used. Furthermore, such request would penalize the ones that have already realized the tests (they will not be able to adjust them).
FR 219		9.5	"Post-test data", 8th dash	te	French mistranslation	French version: Please correct as follows: ~~"moment du composant~~ **quantité de mouvement de l'échantillon** soumis à l'essai"	**RETAINED**
FR 220		9.6	1st paragraph, 2nd sentence	ed	French mistranslation	French version: Please correct as follows: " Ces clichés doivent permettre de décrire clairement le comportement de la structure ~~de~~ support et **de** son installation pendant et après l'impact, ainsi que le déplacement et la trajectoire du véhicule d'essai avant, pendant et après celui-ci."	**RETAINED**
GB 221		9.6	Para 3	ed	The use of cine film is unlikely in any currently accredited test laboratory	Delete 'cine'	**RETAINED**
FR		10		ed	A summary of the pass/fail criteria would be	Please consider.	**NOT RETAINED**

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222					useful.		It is an issue for laboratories.
FR 223		10.1	1st paragraph	ed	The reference made to Annex I is wrong.	Please correct as follows: "The test report for each impact speed may be in accordance with the template given in **Annex G** ~~Annex I~~."	**RETAINED**
NEN 224		10.1	1st paragraph		reference to Annex I, should be Annex G		**RETAINED**
FR 225		10.1	1st paragraph	te	As written, this paragraph could be misinterpreted and users may think that Annex G is normative while it is informative.	Please correct as follows: "~~The test report for each impact speed may be in accordance with the template given in Annex I.~~ For each performed test one test report shall be provided, for example for a defined speed class one test report shall be produced for the low speed test, and one test report for the high speed test." **NOTE An example of test report is given in Annex G."**	**RETAINED**
FR 226		10.1	4th paragraph	ed	For better understanding, this 4th paragraph should be in subclause 9.2.	Please consider.	**PARTIALLY RETAINED** 2nd dash of post-tes data in 9.5 completed as follows: "…**(with a mass greater than 2,0 kg)**"
SE-227		Annex A, B, C		ed		Add NOTE (as applicable) that applicable requirements will be reflected in the revised versions of the product standards.	**RETAINED**
SE-228		Annex A		te	Annex A does not cover any classification of the movement of support in soil, as stated in note of 6.2.1.	Either add a classification of soil and foundation movement in annex A or delete this soil movement classification completely.	See follow-up given to SE 088 **NOT RETAINED** No need to create new classes.
NEN 229		A.1	pag 27		The behavior (roof deformation and collapse mode) could be mentioned in the family description under a subject "Behavior test-item:		All the classes are not mandatory but it is necessary to explain how

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					roof deformation, Collapse mode US".		to declare them if wanted. An exchange on the way to handle this issue is wished with CCMC and/or the CEN/TC 266 Secretary.
DE 230		A.1	1st para	te	"roof intrusion" and " type of ground" are missing in the Table A.1.	These values are not listed in Table A.1. Are these additional values? Please clarify.	See Follow-up given to NEN 229.
NEN 231		A.1	1st paragraph		First sentence includes also roof intrusion and soil type in the expression, but in the second sentence these 2 properties are gone for the expression? What is the relevancy of the first sentence?	clarify	See Follow-up given to NEN 229.
DE 232		A.1	Table A.1	te	Class 0 is not listed anymore. It is referred to in several hENs, e.g. EN 12899-1 and -3	Class 0 is cited and referred to in many other standards – please check and modify accordingly.	**NOT RETAINED** It is perhaps an issue to be dealt with in the product standard. See also follow-up given to DE 035
NEN 233		A.1	Table A.1		roof intrusion and backfill type in table A.1 is missing, as introduced in the first sentence of par A.1perties are not needed to achieve	Bring text in line with table	**RETAINED** Roof intrusion is not a performance class Backfill type is a performance class.
GB 234		A1	Table A1	te	As previously stated, too many classes will confuse the market, and make the standard unworkable in practice	Delete reference to classes for 'Collapse mode' and 'Direction class'	**NOT RETAINED** They are considered as useful.
GB 235		A2	Title	ed	Misspelling	Change to read 'speed class'	**RETAINED**
FR 236		A.2	2nd paragraph	te	It shall be clear that it is possible to perform directly a test at low speed 50 km/h in order to	Please consider.	**NOT RETAINED** Covered in 7.4.

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					not increase the number of tests to be done by a manufacturer that already knows that his product will not readily activating at the 35 km/h. For better understanding, it would be useful to reformulate this paragraph as follows: "The test at low speed could be performed either at 35 km/h (the structure support shall be readily activated) or 50 km/h (and the structure support shall also be readily activated)."		
SFS 237		A.2	2nd	ed	Clarify	In the event of a support structure was not activated…	**NOT RETAINED** Covered in the 3rd paragraph of A.2.
NEN 238		A.2	2nd paragraph		second alinea, what is meant by “not readily activating”	define ‘not readily activating’	**NOT RETAINED** Covered in the 3rd paragraph of A.2.
GB 239		A2	Para 2	te	In the current text it is not clear what happens if the collapse mode of the additional 50km/h test is not the same as the high speed test.	Further clarification, perhaps with a flow diagram would aid the understanding	**PARTIALLY RETAINED** Instead of the flowchart the 2nd paragraph is replaced by the following 2 sentences: " In order to receive a speed class the test item shall be tested at high speed (class speed) and low speed (35 km/h test). If the support structure stays upright at low speed test, an additional test at 50 km/h shall be performed. All tests mentioned in Tables A.2 and A.3 are to be within ASI and THIV values for the occupant

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							safety."
FR 240		A.2	3rd paragraph	ed	At the end of this paragraph, reference is made to subclauses 4.23, 4.24, 4.25 and 4.2 which don't exist in the draft. Wouldn't be references to 9.2 a), b), c) and d) ?	Please consider and correct accordingly.	**RETAINED**
CH 241		A.2		ed	within Clauses 4.23, 4.24, 4.25 or 4.26. **3.23, 3.24 …..**		**NOT RETAINED** The reference to the definitions is not enough, reference to the full text is necessary. See follow-up given to FR 240.
SFS 242		A.2	3rd		obvious permanent change is not clear		See Follow-up given to GB 239.
SFS 243		A.2	4th		Why should speed class 50 product be activated at 35 km/h but not speed class 70 and 100 products. They all are used on roads where a car may crash at 35 km/h. That is not unsafe since ASI and THIV shall be within the acceptable limits.	Delete the paragraph.	**RETAINED**
FR 244		A.3	formula	ed	It is the V adjusted exit speed which is defined at this level.	Please correct as follows: $V^2_{ADJUSTEDEXITSPEED} = \sqrt{V^2_{NOMINALIMPACTSPEED} - V^2_{MEASUREDIMPACTSPEED} + V^2_{MEASUREDEXITSPEED}}$	**RETAINED**
SFS 245		A.3	Below table A.2		Add under the formula a warning.	Add a NOTE: If the measured impact speed is below the nominal speed class HE is not always possible in speed class 50 and 70.	**NOT RETAINED** Covered by the 3rd paragraph of A.3.
FR 246		A.4		te	Safety level 1 of category HE and level 1 of cathegory NE can be mixed-up while they haven't got the same ASi and THIV. Perhaps it would be better to link the safety level to the maximal acceptable ASI and THIV. HIV.	Please consider.	**NOT RETAINED** See Follow-up given to SFS 208.
NEN 247		A.4	Table A.3		Let's make the occupant-safety levels		**NOT RETAINED**

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					comparable for each energy-level. So move up the levels for NE with 1 that the “3” in NE3, LE3 and HE3 is the same “3”. Unharmfull products get a 5.		See Follow-up given to SFS 208.
GB 248		A4	Table A3	ed	There is currently inconsistency with the text below Table A3	Change entry in Table from ‘No test required’ to ‘No measurement required’	**RETAINED**
DE 249	heading	A.5, A.6	Heading	te	It is not clear why the collapse mode has to be stated, especially as the previous version of the standard did not include a direction class. =>Add an explanation?	Please add clarification as to why the collapse mode/ declaration of direction class are declared. How can these classes help road authorities etc.?	See follow-up given to CH 174.
GB 250		A5		te	The UK is against the inclusion of this class (see comment above)		See follow-up given to CH 174.
FR 251		A.5	3 first dashes	ed	French mistranslation	French version: Please correct as follows: "- Par **plastification** ~~affaissement~~ : Y - Par **rupture fragile** ~~cisaillement~~ : F - Par **cisaillement** ~~rupture~~ : S"	**RETAINED**
SFS 253		A.6		ed	The whole text could be clarified. Especially the NOTE is unclear (contents of the structure?)		See follow-up given to SE 256.
SFS 254		A.6			If the test item is tested in two directions why should the performance class be the same? There is no reason based on traffic safety if both results are acceptable for the road authority. Anyway, it might be difficult to get identical results even for symmetrical test items.	Delete Only one energy absorption category…	**PARTIALLY RETAINED** The following sentence is deleted: " The energy absorption category, and collapse mode shall be the same for both approaches."
GB 255		A6		te	The UK supports the better clarification for the direction of operation for passive support structures. However, it feels that using this as a method for classifying product and including this class on a	Delete all references to classification of product by direction class within the standard. Require that these definitions are used to describe the failure mode in the test report. Enhance the definitions of BD and MD to avoid	**PARTIALLY RETAINED** The classes have been maintained The definition of BD and

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					CE mark will significantly confuse the market. It will also reduce the number and type of products usable in certain locations, stifling competition and free-trade. This may be down to misunderstanding, and not due to safety reasons. This is therefore felt unnecessary as a class, although the direction of approach suitable for a product should be identified within the test report. It is also felt that the difference between classes BD and MD are not clear	confusion (perhaps with a diagram)	MD have been improved.
SE-256		Annex A, A.6	NOTE	ed	In the note is written “This does not include the contents of the structure”. What is the contents of the structure? Needs a clarification. Is the intention that the payload, the installed items on the structure, does not need to be in symmetry?	Text needs to be rephrased.	**RETAINED** 2nd sentence of the NOTE deleted.
NEN 257		A.7	2nd paragraph, 4th dash		roof intrusion is mentioned as additional info. Probably roof deformation is meant or maybe also needed to put in the additional info. There’s often roof deformation without intrusion. What exactly is meant by intrusion, is it penetration? Penetration is automaticly not allowed.	change roof deformation into roof intrusion, throughout the whole document	**NOT RETAINED** 4th dash: "roof intrusion" replaces by "roof deformation".
FR 258		A.7	Example	ed	French mistranslation	French version: Please correct as follows: "EXEMPLE Pour un support pour panneaux fixes, la hauteur du support, ainsi que la masse et la taille du panneau doivent être **enregistrées** ~~consignées~~…"	**RETAINED**
SE-259		Annex A, A.7	Example	ed	In the example at the end of A.7 there are a lot of “shall be reported”. This is then a requirement. Requirements cannot be in an informative annex, and certainly not in an example.	Move requirements to body text and rephrase.	**RETAINED**

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SFS 260		A	end		Some guidance is necessary on how historic data could be used when a range of version is extended or when the declaration of performance is revised to follow the latest product standard. For instance the momentum can sometimes be calculated from old test videos though white mark was never painted. Push/pull test should not be required for historic data.		**RETAINED**
SE-261		Annex B and C		ge	EN12767 is “requirements and test methods”. Annex B and Annex C describe something else, these annexes say that the performed test is valid for a lot of other combinations. This might be true, but that is not a task for the test procedure document, nor for the test houses to determine. Test houses will see the actual product put forward in front of them for testing and the outcome, the test report, will describe the tested product and its functionality. If one test with a certain product covers another combination is a completely different evaluation, most certainly much better handled by the notified body responsible for the evaluation if the test and while issuing the formal CE-mark approval letter.		**SOLVED** with the help of the CEN/TC 226/WG 3 consultant (see WG 10 N 103)
GB 262		Annex B		te	This entire Annex is confusing and could lead to misinterpretation.	The use of Tables and/or diagrams/flow charts/examples would help in explaining this difficult concept	**RETAINED** See follow-up given to SE 261.
SFS 263		B.1 and B.2 and partly C.2			Presenting general rules first and product type specific rules then increases the risk that there are conflicts between the two sets of rules. It is easier to explain what sizes shall be tested if it is done separately for lighting columns and sign supports. Now same kind of rules are presented in B.1, B.2 and C.2. One time should be enough. EN 12767:2007 clause 5.5.2 required that the largest lighting column had to be tested. At the	Delete most of B.1. Leave a short introduction on ranges of versions, but with nor requirements. Start B.2.1 by copying the idea of last paragraph of clause 5.5.2 of EN 12767:2007. Delete 1,1 times. Add that material, connection to the foundation etc. shall be the same. Edit the sentences to a list such as:. The test results concerning the largest version of	**RETAINED** These Annexes have been improved.

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					end of caluse 5.5.2 it is clarified that the result is valid for versions with • bending moment capacity at ground level not greater than in the tested one • mass nor more than 1,1 times greater than in the tested one • length (height + half of bracket projection) not more than 1,1 times greater than the tested one WG10 decided to delete 1,1 for length and but the purpose was to keep the rest as it was. If longest is defined as larges other clauses should not define tallest as largest, like it has been done in B.1, B.2.1 and C.2, but not in B.2.2. For HE or LE columns also another size had to be tested and then the performance of intermediate sizes could be interpolated, as long as the length, mass, bending moment capacity were between ones of the tested sizes and arm length was nor greater. Whole prEN 12767:2013 should follow clause 5.5.2 of EN 12767:2007 except for factor 1,1. The reason why longest (not tallest) lighting column should be tested is that the bending moment capacity needed at ground level and vehicle impact level depends on length (height + half of the bracket projection). • 10 m high column with 3 m bracket needs about the same strength (diameter and wall thickness due to combined bending and torsion) as 11,5 m high column with no bracket in the same wind conditions. • 12 m high column with one 2,5 m long arm needs about the same strength	the range are valid for versions with • the length of the column is not greater than in the tested one • the mass of the column above ground is not greater than in the tested one • the bending moment capacity at ground level is not greater than in the tested one • the material and the design of the shaft of the column is the same as in tested one • the type of connection to the foundation is the same and the type of foundation is the same If the largest column belongs to class LE or HE another size has to be tested at a high speed test in the same speed class. The performance of intermediate sizes shall be interpolated in accordance with B.2.2. The collapse mode of the two sizes shall be the same. Keep B.2.2 as it is. Star B.3.1 as follows: The test results concerning the largest version of the range are valid for versions with • the heght is not greater than in the tested one • the mass of the sign is not greater than in the tested one • the bending moment capacity at ground level is not greater than in the tested one • the material and the design of the support the same as in tested one • the type of connection to the foundation is the same and the type of foundation is the same Delete B.3.2 or if data on HE and LE supports is available to justify these rules for interpolation.	

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					(diameter and wall thickness due to combined bending and torsion) as one with two similar arms. In case on one arm the horizontal load is slightly smaller but torque is greater. The bending moment required at ground level and resistance to torque determines the strength, cross-section and other properties of the column at ground level and at the vehicle impact point. The performance under vehicle impact depends heavily on the strength and cross-section of that section of column. The correlation between the bending moment and height is not so good. Then it is obvious that the performance of a column depends more on length than height. If the longest column is tested it covers the smaller version better than if the tallest version is tested. There are other aspects, too, where length affects the performance. It is the exit speed. It is probable that 12 m with a bracket reduces the speed more than 12 m column without a bracket. Also here it is obvious that the performance of a column depends more on length than height. That is why length is used for interpolation instead of height. The interpolation rules were based on a reasonable number of test results on HE and LE columns. For sign supports length is not defined. That is why the tallest sign support shall be tested. The interpolation of performance between different sizes of HE and LE sign supports should be deleted or at least limited to a few cases. Quite many test results are needed in order to justify interpolation rules for different heights of HE and LE support with different kinds of signs.		

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					Most sign supports have been tested in NE.		
GB 264		B1	Para 1	ed	This is a very long sentence which should be punctuated in a better way	Change to read: 'A range of versions is a series of products (version members) of the same type and generic shape. They shall mainly be given the same name or other similar identification and by end users regarded as related products. They shall be in various sizes, made from the same materials, using the same design method and general construction method, and having the same mode of collapse as the parent member.'	**RETAINED**
NEN 265		B.1	2nd paragraph		Second paragraph states version members can belong to different energy absorbing categories. How is this possible? For LE and HE the smallest and biggest item is tested for declared performance class. As earlier commented on B.2.1 notes 1 and 2: all members within a range/family need to be of same performance class!! Otherwise the smallest tested member (with the other energy categorie) can be the biggest on for another performance class as well…		**NO T RETAINED** Possible but it is not a problem.
GB 266		B1	Bullet 4	te	The grade of the material can also have an influence on the performance of the support structure	Change to read 'the material grade of the…'	**NOT RETAINED** But the 4th dash is reformulated as follows: " - the material **properties** of the version members shall be the same as the parent member;"
GB		B1	Bullet 5	te	If the fixing or anchor is a different size, is it still	Clarify whether a different size is still the same	**SOLVED**

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267					the same design?	design.	The answer is YES
FR 268		B.1	4th paragraph	ed	What is the meaning of this paragraph?	Please clarify it.	**NOT RETAINED** Clear enough
NEN 269		B.1	NOTE	te	NOTE Heavy loads positioned between 1,0 m and 2,0 m above ground should be evaluated for the risk for vehicle occupants.	define 'heavy loads'	**RETAINED**
FR 270		B.1	NOTE	ed	French mistranslation	French version: Please reformulate this NOTE.	**RETAINED**
GB 271		B1	Note	te	The term 'heavy' should be quantified	Change to read 'Loads over 2,0kg positioned…'	The NOTE has been deleted in the Annex and inserted as follows in 6.2.3: "NOTE Loads over 2 kg positioned between 1 m and 2 m above ground should be evaluated for the risk for vehicle occupants."
GB 272		B1	Note	te	There is no guidance given for how to evaluate the risk for vehicle occupants	Include a method of evaluating this risk, or delete the Note	**SOLVED** See follow-up given to NEN 115.
NEN 273		B.2.1			missing is the note from EN12767:2007 that mass and/or length of member items can be 1,1 times the mass and/or length of the tested item…	add note from EN 12767:2007	**NOT RETAINED** Any kind of modification shall be risk evaluated according to the Table C.1.
NEN 274		B.2.1				add second paragraph from 5.5.1 of EN 12767:2007 to Annex B.2.1	**NOT RETAINED** This paragraph has been already inserted in the draft: - 1st sentence in 6.2.2 - 2nd sentence in B.2.

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NEN 275		B.2.1 a)			'height' should be 'length'	change 'height' into 'length'	**RETAINED**
GB 276		B2.1	c)	ed	The wording should be improved	Change to read '…a range of versions shall be declared…'	**RETAINED** The wording in improved.
GB 277		B2.1	Note 2	te	The UK would prefer to see separate families for LE, NE and HE and for there to be no overlap between them within the family	Do not allow overlap of the LE, NE and HE classes within a family	**NOT RETAINED** It is allowed to have different energies within the same family.
FR 278		B.2.2		ed	French mistranslation of the inheritance rules.	French version: Please review.	**RETAINED** The wording in improved.
SFS 279		B.2.2			If two sizes are have been tested what momentum shall be declared for different versions of the range? The largest for the whole range or should there be an interpolating?		**NOT RETAINED** Momentum is not declared.
NEN 280		B.2.2, B.3.2, B,4			Annex B.2.2 and C.2.1 are about family definition. Also B.3.2 and C.2.2 as well as B4 and C.2.3. Acceptable changes without further testing are given for familymembers in both annexes	join Annex C.2 with B.3.2 and B2.2 and C2.1.	**RETAINED**
GB 281		B2.2	c)	ed	The punctuation is missing	Change to read '…bracket length). The highest…'	**RETAINED**
GB 282		B2.2	Second a), b), c)	ed	Incorrect numbering	Change to read d), e) and f)	**NOT RETAINED** The numbering is correct.
FR 283		B.3.1		te	A member of the range of versions shall not have sign support installed at a lower height than the height tested for the member of reference.	Please consider	**RETAINED**
FR 284		B.4		ed	French mistranslation	French version: Please correct as follows: " Les règles et les exigences définies en matière **de supports pour panneaux fixes** ~~de supports pour feux de signalisation~~ dans l'Article B.3	**RETAINED**

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						doivent s'appliquer."	
FR 285		B.5		ed	French mistranslation	French version: Please correct as follows: " Les règles et les exigences définies en matière de **candélabres** ~~poteaux électriques~~ dans l'Article B.2 doivent s'appliquer."	**RETAINED**
GB 286		B7		te	This contradicts the requirements of Clause 8.3.2 which states 1,50m at 20 degrees	Revise the text to achieve consistency	**RETAINED** Reformulated as follows: A successful test result for a multi-legged support structure with a clearance opening larger than 1,50 m at 20° shall also be valid for multi-legged supports assembled from a different number of legs than the tested configuration provided that the clearance opening remain larger than 1,50 m at 20°.
GB 287		Annex C		te	There is no guidance on how to validate the computer modelling	Make reference to TR 16303, as appropriate	**RETAINED** 3 new annexes have been inserted: - Annex M (informative), Virtual testing - Validation procedure - Annex N (informative), Requirements for the person / group performing virtual testing activities - Annex O (informative),

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							Virtual testing - Template for report4
DE 288		C.1 and C.1.1		ed	Hanging paragraphs shall be avoided since reference to them is ambiguous. The first paragraph shall be numbered as a subclause. A subclause shall not be created unless there is at least one further subclause at the same level.	C.1.1 General C.1.2	**RETAINED**
FR 289		C.1		te	This clause gives more and more accurate methods for the risk analysis without indicating which one to use according to the modification. A Table specifying the requested method according to whether the modification impacts a priori the structure could be useful.	Please consider.	**RETAINED** As help for solving this comment the prEN 1317-5, Annex A Table 7 "Categories of evaluation methods " has been used.
NO 290		C.1		Te	Add new annex L (normative), M (informative), and N (normative) on L Virtual Testing – Validation procedure M Virtual Testing – Template for report N Requirements for the person/group performing VT activities. The reason is the use of simulation must be addressed. Text to these annexes is given in a separate document (emailed to the Secretary 2014-02-05).	Add new annex L (normative), M (informative), and N (normative) as shown in separate document on L Virtual Testing – Validation procedure M Virtual Testing – Template for report N Requirements for the person/group performing VT activities	**RETAINED**
NEN 291		C.1	Table C.1	te	We have 8 evaluation methods and 6 evaluation classes. Maybe better to create only methods or classes to avoid this strange situation where methods are often also classes. F.e. method 3 = class B. We nowhere use these methods and classes in the normtext.		**RETAINED** See follow-up given to FR 289.
GB		C1	Table C.1	ed	There are editorial errors on numbered rows 4, 5	Correct the editorial errors	**RETAINED**

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292					and 8		
FR 293		C.1	Table C.1 - Line 8	ed	For better understanding.	Please correct as follows: " full testing according to EN 12767, because no **virtual test** ~~VT~~ can be validated on such new design"	See the new formulation of the Annex H (normative), Changed versions.
NEN 294		C.1	3rd paragraph		Below the table "The risks are listed in the clauses below". Only clause C.1.1 is about Risk evaluation. The other clauses are within the deemed to comply changes.	change '…listed in the clauses' into '…listed in clause'	**NOT RETAINED** This paragraphe has been deleted (useless).
SFS 295		C 1.1			Some guidance is needed for the risk evaluation. Some examples should be given.	If the connection between the foundation and support is changed the behaviour of the section of support close to the connection shall be analysed. If the column flattened in the impact test, and is critical to achieve an acceptable performance, the new connection, new type of foundation or soil or new level of ground surface shall not prevent the section from flattening. New impact test is required if the section of column cannot flatten as in the original test. The size of the test matrix shall be considered after the first test results are available. If a compartment door is added in a yielding sign support tested with no compartment door its effect on yielding properties shall be studied. In case of yielding mode supports the evaluation shall include a simulated impact or a full scale test.	See the new formulation of the Annex H (normative), Changed versions.
NEN 296		C.1.1			C.1.1 is to small. A big list of all risks for each evaluation method or class is expected.	add list of list of all risks for each evaluation method or class	**RETAINED** See follow-up given to FR 289.
FR 297		C.1.1	1st paragraph	ed	French mistranslation, problem of syntax.	French version: Please correct as follows: "Les risques associés à une modification de la conception de la structure ~~de~~ support **doivent être évalués** conformément aux méthodes et critères	See the new formulation of the Annex H (normative), Changed versions.

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						d'analyse ci-dessus ~~doivent être évalués~~." And check with the CEN/TC 226/WG 10 that it is the correct meaning.	
FR 298		C.1.1	3rd paragraph	ed	As written, this paragraph means nothing.	Please, check if it could be: " If any criteria can**'t** be used, a full testing (full matrix) shall be done."	**RETAINED** See follow-up given to FR 297.
NEN 299		C.1.1	3rd paragraph		In C.1.1. is stated: "If any criteria can be used, a full testing (full matrix) shall be done" What does this mean? A crash-test or all 8 evaluation methods?	clarify/define 'full matrix' clarify/define 'if any criteria' etc.	**RETAINED** See follow-up given to FR 289
NEN 300		C.1.1	4th paragraph	ed	……been, evaluated…..	……been evaluated……	**RETAINED**
FR 301		C.2.2	3rd dash	te	The definition of the threshold's likeness of the mass (tolerance at +/- XX kg or %) would be useful.	Please consider	**NOT RETAINED** Any kind of modification shall be risk evaluated according to the Table C.1.
FR 302		C.2.2	3rd dash	te	French mistranslation	French version: Please correct as follows: « Les essais probants réalisés sur un support pour panneaux fixes doivent également être valides pour les structures identiques : **- avec un panneau d'une aire moindre et de masse égale ou moindre** **- avec un panneau plus léger d'une aire égale ou moindre** **- avec un panneau installé de façon asymétrique de masse et d'une aire égales ou moindre. »**	**RETAINED**
GB 303		C2.3	Bullet 2	ed	Misspelling	Change to read 'with an asymmetric…'	**RETAINED**
FR 304		C.2.3		te	Lighting colum and signal support should have fairness treatment.	Please consider.	**RETAINED**
FR 305		D.1, E.1, G.1, H.1 et			According to the Internal Regulations Part 3: Rules for the structure and drafting of CEN-	Please delete the following titles:	**RETAINED**

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		I.1			CENELEC Publications (ISO/IEC Directives – Part 2, modified) - 2011-12 : “5.2.3. : A subclause shall not be created unless there is at least one further subclause at the same level. For example, text in Clause 10 shall not be designated subclause “10.1” unless there is also a subclause “10.2”” "5.2.6: Annexes may be subdivided into clauses, subclauses, paragraphs and lists. A clause shall not be created unless there is at least one further clause in the annex."	-"D.1 Vehicle dimensions", - "E.1 Vehicle calibration test", - G.1 "General", - "H.1 General", and - "I.1 General".	
DE 306		D.1		ed	A subclause shall not be created unless there is at least one further subclause at the same level. Heading D.1 shall be deleted. Figure E.1 is Figure D.1		**RETAINED** **NOT RETAINED**
GB 307		D1	Figure D1	ed	The vehicle in the Figure looks outdated	Update the vehicle in the Figure	**RETAINED**
CH 308		E.1		te	The calibration test shall be performed with a test vehicle impacting a vertical, rigid cylinder head-on with the vehicle centre-line aligned with the centre-line of the cylinder. The cylinder shall have a diameter of 260 mm ± 20 mm and a height greater than the contact surface of the deformed car front, typically greater than 1 m. At the moment of impact the lateral offset of the two centre-lines shall not exceed 100 mm. The test shall be conducted at (35 ± 2) km/h, and the rigid cylinder shall not displace statically more than 10 mm during the test, measured at the contact surface.	A precise and clear formulation is needed	**NOT RETAINED** Clear enough

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					The formulation regarding the manner of execution (type and bending of the cylinder) is unclear		
FR 309		E.1	4th paragraph	ed	French mistranslation	French version: Please correct as follows: "Le diamètre ~~de ce dernier doit atteindre~~ **du cylindre doit être de** 260 mm ± 20 mm et sa hauteur être supérieure à la surface de contact de l'avant du véhicule en question (plus de 1 m en général)."	**RETAINED**
SE-310		Annex E, E.1	Table E.1	te	The limit for maximum velocity has been changed at 100 ms. The new calibration curve is shorter in duration, pointing at somewhat more stiff vehicles. Is this checked with a real crash test?. We have now changed the testing prerequisites; it is another test setup which might invalidate older tests.	Verify calibration curve before final decision. If not, then keep the previous calibration curve.	**RETAINED** The Figure and the Table have been reviewed.
NEN 311		Annex F		te	It would be good to include the pull/push test results/criteria in the standard for soils S and D (or an allowed range). This covers the combination of soil-mixture, compaction and dry density, but it also makes comparisons with soils in the field possible.	Add test criteria according the push/pull test for each test soil.	**RETAINED**
FR 312		F.1	Figure F.1	ed	There is no key explaining the meaning of the hatched grey areas	Please add a key and if possible for better understanding, work on this Figure F.1.	**RETAINED**
SFS 313		F.3			Changes proposed by FIN in 6.2.1 may have an effect here as well.		**RETAINED** Identification of the backfill made in accordance to the EN 13285
SFS 314		F.3			More precise description on the equipment and procedure is needed on push/pull test.		**NOT RETAINED** Clear enough

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SFS 315		F.3			It is difficult to repeat soil test in a way which gives the same results. More than one pull or push test should required in the same backfill. It might be necessary to define which kind of sieving curve is considered the same..	The push(pull test shall be repeated in the same kind of backfill (same sieving curve, material type, compaction process etc.) at least three times. The average shall be declared as the result in vehicle impact test reports where the result is applicable. A separate push/pull test report shall include observations on all three measurements. The result of a push/pull test is valid fo backfills, when all of the following criteria are fulfilled: • the percentage passing any of the sieves differs from the percentage observed in the tested backfill less than A squared, where A is the observed percentage in the push/pull tested case • the number of compactions or the result of a density measurement differs less than 20 % from the tested backfill • the percentage of crushed grains is within 0,8 to 1,25 time the one in the tested backfill	**NOTED** Kept for future work (amendment or revision)
SFS 316		F.3		ge	Introducing the push/pull test may risk the use of historic date. Historic data may be used when the range of versions is extended or when the declaration of performance of a product is revised to follow the latest product standard. If the requirement for a push/pull test makes it impossible to use historic data Finland will vote against this requirement or if necessary whole standard. A better way to get information on backfills of different laboratories and perhaps harmonise them would be to have a research which should cover all laboratories. Local road authorities might support such a study in order to avoid risks		**RETAINED** See new Annex L (normative), Use of test results performed in accordance with previous versions of EN 12767

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					in using historic data.		
NEN 317		F.3	1st paragraph	ed	first sentence	change 'Support structures installed in soil types S, X or D shall be submitted to pull-push tests.' into 'Soil types S, X or D shall be submitted to pull-push tests.'	**RETAINED**
SE-318		Annex F, F.3	3rd paragraph	ed	There is some error with a reference. Does say now that "*The beam shall be placed vertically (see Clause F.1) in the backfill volume…*". It is surely not "vertically" that needs a clarification in F.1.	Suggestion to change text to "*The beam shall be placed vertically in the backfill volume (see Clause F.1)…*".	**RETAINED**
319		F.3	4th paragraph		b) 50 kN/m should be 50 kNm		**RETAINED**
FR 320		F.5	Figure F.1	ed	Wrong reference.	Please replace "Figure F.1" by "**Figure F.3**".	**RETAINED**
NEN 321		F.5	Fig F.1	ed	Page 45: Figure F.1 …. Should be F.3		**RETAINED**
FR 322		G.1	Table G.1 - title	ed	According to the 6.6.6.5 of the Internal Regulations Part 3: Rules for the structure and drafting of CEN-CENELEC Publications (ISO/IEC Directives – Part 2, modified) - 2011-12 : "When a table is continued over several pages, it may be useful to repeat the table designation, followed by the title (optional) and by —(1 of #)‖, where # is the total number of pages on which the table appears, as in the following example." For Table G.1, the table designation on page 48 is wrong.	Please correct as follows: "Table G.1 (~~1~~ **2** of 2)"	**RETAINED**
FR 323		G.1	Table G.1	te	The test report shall contain all the information that enable to identify the sample submitted to the test (see subclause 7.1 and next).	Please complete the Table.	**RETAINED**
NEN 324		G.1	Table G.1	te	The test-item needs to be described in detail, especially the first 2m above ground level and the	change under 4d) 'drawing' into 'shop drawing including foundation parts'	**RETAINED**

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2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

MB/ NC[1]	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
					foundation part. Think about material, door sections, possible reinforcements inside, stiffness steps or other hard objects inside or around the test-item which influences the behavior during impact. Also the foundation-part of the test-item needs full description and drawings, like filled with soil to certain level, ground wings, bottomplates, concrete around or other stabilizers.		
FR 325		G.1	Table G.1 – 6. b)	ed	The references made at this level to clauses A.2, A.3, A.4, A.6, A.7, A.9 and A.10 are wrong.	Please correct.	**RETAINED**
FR 326		G.1	Table G.1 6. d)	ed	The reference made at this level to A.10 is wrong.	Please correct.	**RETAINED**
DE 327		Annex G	Table G.1	ed	Incorrect reference. A.10 does not exist.	Please check and correct accordingly.	**RETAINED**
FR 328		Annexe H		te	An Annex shall be cited in the text. It is not the case for Annex H.	Please clarify if this Annex H: - shall be maintained: introduce it in the text, - shall be deleted: delete it.	**RETAINED** See Annex I (normative) Determining the speed and mass of the falling support
SE-329		Annex H		ge	Deemed to comply is as well a classification, an evaluation of a product. According to CPR this must be in a harmonized standard to be able to support a CE mark or other classification. Thus, deemed to comply must be informative and then moved to either EN 40 or EN12899.	Make Annex H informative and move all of Annex H to EN 40 or EN 12899.	**NOT RETAINED** See follow-up given to GB 330
GB 330		Annex H		te	This may be difficult to move into the harmonised parts of the standard, however it is very important	Maintain the text of Annex H in EN12767	**RETAINED** See Annex I (normative) Determining the speed and mass of the falling support
GB 331		Annex H	Title	ed	The title is currently incorrect	Change to read either 'Standard metal tubes' or 'Standard metal tube structures'	**RETAINED** 'Standard metal tube structures'
SE-332		H.1		te		Must be reassessed regarding collapse mode and directions.	**RETAINED**

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MB/ NC[1]	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
							See Annex I (normative) Determining the speed and mass of the falling support
DE 333		H.1 , I.1		ed	A subclause shall not be created unless there is at least one further subclause at the same level. Headings H.1 and I.1 shall be deleted.		**RETAINED**
GB 334		H1	Para 2	ed	Hanging text	Delete para 2	**RETAINED**
SE-335		H.1	Para 2	ed	Unfinished sentence: "Single legged supports"	To be deleted or completed?	**RETAINED** Proposal : deletion
G B 336		H1	Table H1, Note b	te	The current note could be widened to include other systems meeting these acceptable requirements.	Change to read '…made out of hollow steel or aluminium with a lower plastic moment of resistance then tested (8.34kNm).'	**NOT RETAINED**
FR 337		Annexe I		te	An Annex shall be cited in the text. It is not the case for Annex I.	Please clarify if this Annex I: - shall be maintained: introduce it in the text, - shall be deleted: delete it.	**RETAINED** This Annex has been cited in the text.
DE 338	First indent	Annex I	I.1	ed	Undated reference. Is this intended? Why?	Please clarify.	In compliance with the Internal Regulations Part 3 - Rules for the structure and drafting of CEN/CENELEC Publications (ISO/IEC Directives — Part 2:2011, modified) - June 2015
DE 339		Bibliography		ed	Why are so many draft standards cited?	Please clarify.	**RETAINED**
SE-340		Bibliography		ed	Old standards and drafts appear in the list.	Update list of standards, or remove publication years.	**RETAINED**
GB 341		Bibliography	[3], [4], [5]	ed	These standards have all recently been updated and hence the dates are incorrect	Change to read: EN 40-3-1: 2013 EN 40-3-2: 2013	**RETAINED**

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						EN40-3-3: 2013	

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