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**Navodilo za načrtovanje standardov CEN/TC 158**

Guidance Document for drafting CEN/TC 158 Standards

Leitfaden für die Erarbeitung von Normen des CEN/TC 158

Document directeur pour la rédaction des normes CEN/TC 158

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158

Leitfaden für die Erarbeitung von Normen des CEN/TC 158

This Technical Report was approved by CEN on 27 December 2010. It has been drawn up by the Technical Committee CEN/TC 158.

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## Foreword

This document (CEN/TR 16149:2011) has been prepared by Technical Committee CEN/TC 158 “Head Protection”, the secretariat of which is held by BSI.

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

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## Introduction

This document has been produced by the convenors of CEN/TC158 working groups. It is intended to serve as a guide, to be consulted when drafting new EN standards for head protection and when revising or amending existing ones.

Whilst implementation of its contents is not mandatory, working groups are urged not to make deviations from this guidance document without good cause.

This is a living document – omissions will be covered in later issues.

In this document, reference is made to CEN/TR 16148, *Head and neck impact, burn and noise injury criteria — A Guide for CEN helmet standards committees*. This gives further guidance about the areas of the head which helmet standards should aim to protect, and about head and neck injuries.

The working group should assess the foreseeable risks against which the helmet should provide protection. Each of the helmet standards should provide for a helmet, which will offer optimum protection to the head against these foreseeable risks and should satisfy the Basic Health and Safety Requirements of EU Directive 89/686/EEC to the extent indicated in Annex ZA of the helmet standard.

Helmet standards should indicate, in an informative annex, how the level of performance requirements specified relates to the severity of injury to be tolerated. Working groups should refer to CEN/TR 16148 when drafting this annex.

Reference is also made to EN 13087 (all parts), *Protective helmets — Test methods*. This standard provides harmonized methods of test for many of the topics listed below. The various parts of EN 13087 are listed in the Bibliography.

## CEN/TR 16149:2011 (E)

## 1 General

Typically, a helmet standard will include a Requirements section and a Testing section.

### 1.1 Requirements section

The topics listed below should always be addressed, as a minimum. Other requirements, not included here, will be dependent upon the type of helmet for which the standard is being written.

The choice of performance requirements should be based upon the risk to the wearer and the ability to perform the tasks to be undertaken whilst wearing the helmet.

It is recommended that these criteria be stated in the introduction to the helmet standard (and possibly also in the Scope) so that the risks and work activities that the standard intends to cover are made clear. It may also be useful to state the injury level that is regarded as tolerable when the helmet meets its performance requirements. This needs to be phrased with care – it should not suggest that it can replace the need for the user to conduct their own risk assessment before choosing/using a helmet, nor should it exclude the helmet from carefully considered use outside its primary field of use.

The level of performance requirement should be based upon the severity of injury to be tolerated. Refer to CEN/TR 16148 for specific guidance on the relevant topic. If there is a performance requirement then there must be a corresponding test method.

### 1.2 Testing section

Before specifying a test for a particular requirement, check to see if there is a relevant part of EN 13087. If there is not, or if the EN 13087 method is not considered suitable by the WG, then the WG should write a test method and include it in the helmet standard.

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## 2 Type of injuries

This topic is covered in CEN/TR 16148.

## 3 Areas of coverage, areas to be protected and areas to be tested

The following three areas are variously mentioned in many helmet standards. For the purpose of this document, they are defined and explained as follows.

- 1) 'Area to be tested' - the area /points on the helmet which will be subjected to a performance test (not only a visual assessment). This area may include ventilation features.
- 2) 'Area to be protected' - the area/points on a head or headform for which protection is intended/deemed to be provided by the helmet. This area should correspond to the parts of the head that are intended to be protected from injury, as described at the end of this section.

The helmet standard should specify performance and, if necessary, constructional requirements for all areas designated as areas to be protected. It is preferable for the 'area to be protected' to be entirely described by the area to be tested, i.e. to be defined only by performance requirements.

However, if performance testing of some parts of the 'area to be protected' is deemed by the working group to be too complex or difficult, then a constructional requirement may be used – e.g. specify a minimum thickness of the shell or liner or both and that the shell or liner or both shall be of the same density and material as within the test area. Such a constructional requirement should be carefully considered, and in particular the

validity of the assumption, that a similar thickness of shell or liner or both at different points on the helmet will afford similar impact performance at those different points, should be examined.

Therefore, the 'area to be protected' will include, but may extend beyond, the area to be tested by a performance test, (1) above.

- 3) 'Area of coverage', 'extent of coverage' - the area/points on a head or headform which are intended to be covered by the helmet; currently assessed visually in several helmet standards. These, and similar, terms should not be used within helmet standards because they are not relevant to the protective function of the helmet. They are subjective, cause confusion and lead to differences in interpretation.

For each performance requirement (e.g. shock absorption, resistance to penetration, etc), the working group should determine requirements for areas (1) and (2). These should be defined and assessed using the appropriate test headform, specified in the helmet standard.

For example, EN 1078:1997 states specifically:

#### "4.4 Shock absorbing capacity

The helmet shall give protection to the forehead, rear, sides, temples and crown of the head."

Standards should be no less descriptive than this example and should consider the need to be more descriptive with reference to N551. For example, use of terms such as "temporal region", "parietal region" and "occipital region" should be encouraged; if the Committee believes that this gives a more precise definition for the purpose of protection. Furthermore, if one part of the head is deemed to be more vulnerable or more susceptible to injury for a given dose (for example force, acceleration) then the committee should consider this and prescribe different requirements for the different parts. For example it is known that an impact in the temporal region is likely to be more injurious than an equivalent impact to the occipital region. The committee should be precise about the requirements for the area of protection if this is defined to be greater than the test area. It is not sufficient simply to define an area of protection without defining the requirements for that area.

As is noted in Clause 13 (and in sections W and X of Annex A), parts of the helmet (and accessories) may, or may not, have a protective function. Where part of the helmet or an accessory is not designed to protect it must not reduce the level of protection afforded by any other part of the helmet. In practice, this will often mean that the helmet should be tested with the non-protective part of the helmet or accessory fitted.

## 4 Field of vision

There will generally be a need to define at least a minimum requirement for the field of vision, since there is a balance between the protection from impact etc. and the risk of the field of vision being too small to be safe. The working group should specify the requirements for field of vision that are relevant for the particular type of helmet. In many types of helmet, requirements for field of vision may compromise both the area of the head to be protected and the area of the helmet to be tested for shock absorption and/or penetration.

Examples of field of vision requirements in helmet Standards include:

- Motorcycle helmets (UN ECE 22 05) – upward 70° from top of eyes, downward 45° from bottom of eyes, horizontally +/-52.5°. This reflects the need to protect the forehead and the lack of need to view very far upward to see the road, etc. The same requirement is used for snowmobile/bobsleigh helmets (EN 13781:2001) for the same reasons.
- Ice hockey helmets (EN ISO 10256:2003) - upward 35° from top of eyes, horizontally +/-45°. Here there is a greater need for upward vision, while there is no chin-guard so downward vision has not been specified.

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A useful reference for general fields of vision for different tasks is EN 894-2:1997, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays*. Subclauses 4.1.1 and 4.1.2 define three zones of decreasing efficiency for visual signal detection and monitoring tasks;

- recommended zone – a cone with 30° internal angle;
- acceptable zone – between a cone with 30° and 60° internal angle; and
- not suitable zone – outside a cone with 60° internal angle.

Of course, for many helmet applications peripheral vision outside the 60° cone is still needed (e.g. the Standards above).

Requirements for field of vision should use the test method given in EN 13087-6.

**5 Helmet sizes**

Helmet standards should specify which requirements are to be satisfied for particular sizes, or for ranges of helmet sizes, relevant to the population of intended wearers.

If ranges of sizes is preferred, it may be useful to refer in the standard to “helmet type”, i.e. “Category of helmets, which does not differ in such essential respects as the materials or dimensions or construction of the helmet, of the retention system or of the protective padding”.

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**6 Ventilation**

Ventilation features should allow air movement between the inside and outside of the helmet.

Ventilation of any helmet has an important impact on comfort and wearability. However, at present, there is no recognised test method for assessing ventilation performance. In many types of helmet, requirements for ventilation may compromise both the extent of protection provided and the area of the helmet to be tested for shock absorption and/or penetration. If ventilation features are provided and are positioned within the area of the helmet to be tested for shock absorption and/or penetration, all such features should be subjected to these tests. The definition of ventilation (and non-ventilation) holes and features needs to be carefully considered and clearly worded so as to avoid ambiguities in interpretation.

**7 Mass**

The mass of the helmet should always be made available to the user. The working group should define how and where this is done.

**8 Comfort**

It should be remembered that comfort is a very subjective assessment. However, it is a well-known fact that the more comfortable a piece of personal protective equipment, the more likely the user is to wear it. Many factors are involved – mass / position of the centre of gravity / stability of the helmet on the head / ventilation / provision of a comfort band or sweatband, etc.

If provision is made for the fixing of accessories, such as ear-muffs, face-shields, etc, both the design and positioning of the fixing point can affect the comfort of the total assembly.

Comfort is generally best assessed by practical performance tests. Such tests may be combined with tests for compatibility (see Clauses 14 and 15). There are existing standards which specify requirements and test

methods for the objective and subjective evaluation of the ergonomic and thermal effects on the human body of personal protective equipment (PPE) ensembles, including gloves, footwear, clothing, helmets and respiratory protective equipment (RPE), on wearers.

For example, BS 8469:2007, *Personal protective equipment for firefighters — Assessment of ergonomic performance and compatibility — Requirements and test methods* has been developed for the PPE ensembles used in structural firefighting.

Similarly, BS 7971-2:2003, *Protective clothing and equipment for use in violent situations and in training - Part 2: Guidance on risk assessment and on the selection, use, cleaning and maintenance of protective clothing and equipment* also has some advice on user trials of PPE (Subclause 5.4).

These standards are also useful references for practical performance trials of compatibility (see Clauses 14 and 15).

## 9 Skin irritation

At present, there are no prescriptive requirements for skin irritation. Refer to EU Directives 67/548/EEC and 76/769/EEC. (See also Clause 10, Innocuousness of materials.)

## 10 Innocuousness of materials

A recommendation has been sent to all PPE Technical Committees to introduce a clause and an informative annex on innocuousness, based on a model European Standard EN 340:2003, *Protective clothing — General requirements*. Further guidance is included in part C2 of Document PPE N122, CEN PPE Forum, *Guide for the drafting or the revision of EN standards on PPE*.

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## 11 Ignitability / Flame resistance

The underlying philosophy for requiring an ignitability test is that wearing a helmet should not increase the user's susceptibility to injury from flame. The test method is given in EN 13087-7. More severe ignitability test methods are given in EN 13274-4, *Respiratory protective devices — Methods of test — Part 4: Flame tests*.

## 12 Corrosion

If metal parts are used in the helmet construction, the working group should consider whether the corrosion of such parts during the lifetime of the helmet would adversely affect the protection afforded by the helmet or adversely affect its innocuousness.

## 13 Combined and combination PPE and accessories

Other items of PPE and accessories are often attached to, or built into, protective helmets. This practice then leads to the questions – “Does the helmet continue to satisfy the respective helmet standard, when such other items are attached or built in?”; “If the other item is PPE, normally covered by its own standard, does the item still satisfy its standard when attached to or built into the helmet?”

Following consideration of these questions within a CEN/BTS/4 ad hoc group a few years ago, the wording as given in Annex A was recommended and this should be applied by all TC158 working groups.

As noted Annex A, parts of the helmet and accessories may, or may not, have a protective function. Where part of the helmet or an accessory does not have a protective function, it must not reduce the level of