

Head protectors for ice hockey players

The European Standard EN 967 : 1996 has the status of a
British Standard

ICS 13.340.20; 97.220.20

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW



Document Sharing Hub

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PH/6, Head protection, upon which the following bodies were represented:

- Department of Transport (Transport Research Laboratory)
- Fire Brigades Union
- Headway National Head Injuries Association
- Health and Safety Executive
- Institution of Mechanical Engineers
- Ministry of Defence
- Royal National Life-boat Institution
- Safety Equipment Association

This British Standard, having been prepared under the direction of the Health and Environment Sector Board, was published under the authority of the Standards Board and comes into effect on 15 April 1997

© BSI 1997

Amendments issued since publication

Amd. No.	Date	Text affected

The following BSI references relate to the work on this standard:
Committee reference PH/6
Draft for comment 93/301953 DC

ISBN 0 580 27143 9

Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Foreword	2
Text of EN 967	3

National foreword

This British Standard has been prepared by Technical Committee PH/6, and is the English language version of EN 967 : 1996 *Head protectors for ice hockey players*, published by the European Committee for Standardization (CEN).

Cross-references

Publication referred to	Corresponding British Standard
EN 960	BS EN 960 : 1995 <i>Headforms for use in the testing of protective helmets</i>
EN 45001	BS 7501 : 1989 <i>General criteria for the operation of testing laboratories</i>
ISO 6487	BS AU 228 <i>Impact tests on road vehicles</i> Part 1 : 1989 <i>Specification for measurement techniques and general instrumentation</i>

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 26, an inside back cover and a back cover.

ICS 13.340.10

Descriptors: Sports, ice hockey, accident prevention, safety, helmets, specifications, design, protection, dimensions, tests, characteristics

English version

Head protectors for ice hockey players

Protections de tête des joueurs de hockey
sur glace

Kopfschutz für Eishockeyspieler

This European Standard was approved by CEN on 1996-09-20. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

© 1996 Copyright reserved to CEN members.

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 158, Head protection, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 1997, and conflicting national standards shall be withdrawn at the latest by April 1997.

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

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Iceland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Contents

	Page
Foreword	2
Introduction	3
1 Scope	3
2 Normative references	3
3 Definitions	3
4 Types of head protectors	4
5 Requirements	4
6 Testing	11
7 Marking	19
8 Information for users	19
Annexes	
A (informative) Optical quality of eye protectors	20
B (informative) Headform with facial features — Key dimensions	24
C (informative) Artificial ageing	25
ZA (informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives	26

Introduction

The intention of head protectors is to reduce the risk of injury to the skull and the part of the face surrounded by the protector. The protective function is such that the force from impacts against the protector is distributed and damped and the penetration of objects is counteracted.

Head protectors for ice hockey players comprise helmets and, in most cases, an associated face protector. Face protectors can consist of eye protectors, teeth protectors or full face protectors. Helmets are tested and assessed as a separate unit, but face protectors are always tested and assessed together with the helmet or helmets for which the face protector is intended. This standard sets out minimum requirements and test methods. The intended function of the head protectors is to reduce skull and facial injuries that may occur in play or training.

The head protectors are intended for use by:

- players;
- goalkeepers;
- certain functionaries.

The working group which has prepared this standard has been aware that the requirements on mass of the head protector, shock absorbing capacity of the helmet and rigidity of face protectors should be more severe to cover the risks in modern ice hockey, with the tight play and high puck speeds. But the group has also been aware of that most head protectors today give good protection to most players and goalkeepers, so they did not wish to remove good products from the market by unreasonably severe requirements. However, the aim should be to find better materials and better constructions to meet higher requirements in the future.

1 Scope

This European Standard specifies performance requirements and tests for head protectors for ice hockey players. The intent is to reduce the risk of injury to the head without compromising the form or appeal of the game.

Requirements and the corresponding methods of test, where appropriate, are given for the following:

- construction;
- shock absorbing properties;
- puck impact resistance;
- penetration;
- retention system properties;
- field of vision;
- marking and information.

NOTE. Annex A gives optional properties and test methods for the optical quality of eye protectors.

Head protectors do not afford any protection from neck or spinal injuries.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- EN 960 *Headforms for use in the testing of protective helmets*
- EN 45 001 *General criteria for the operation of testing laboratories*
- ISO 6487 *Road vehicles — Measurement techniques in impact tests — Instrumentation*

3 Definitions

For the purposes of this standard, the following definitions apply.

3.1 planes

3.1.1 basic plane of the human head

A plane at the level of the upper border of the external ear opening and the lower edge of the eye sockets.

3.1.2 basic plane of a headform

The plane relative to the headform that corresponds to the basic plane of the human head.

3.1.3 reference plane

A construction plane parallel to the basic plane of the headform at a distance from it which is a function of the size of the headform.

3.1.4 longitudinal vertical median plane

The vertical plane of symmetry of a headform.

3.1.5 central transverse vertical plane

A plane at right angles to the longitudinal vertical plane and passing through the central vertical axis.

3.2 central vertical axis

The line relative to the headform that lies in the plane of symmetry, and that is normal to the basic plane at a point equidistant from the front and back of the headform.

3.3 impact sites

3.3.1 helmets (defined in relation to the headform)

3.3.1.1 crown

The site where the central vertical axis meets the top of the headform.

3.3.1.2 front

The site where the longitudinal vertical median plane meets the front of the headform 50 mm above the reference plane.

3.3.1.3 front boss

The site where a plane through the central vertical axis 45° to the longitudinal vertical median plane meets the fore part of the headform 25 mm above the reference plane.

3.3.1.4 side

The site where the central transverse vertical plane meets a side of the headform 25 mm above the reference plane.

3.3.1.5 rear boss

The site where a plane through the central vertical axis 45° to the longitudinal vertical median plane meets the rear part of the headform in the reference plane.

3.3.1.6 rear

The site where the longitudinal vertical median plane meets the back of the headform in the reference plane.

3.3.2 face protectors

3.3.2.1 side impact site

The site half-way between the mouth level and the eye level in the horizontal plane, 45° to the longitudinal vertical median plane and in the direction of the most protruding part of the cheek at that level.

3.3.2.2 eye impact site

The site in the horizontal plane 25° to the longitudinal vertical median plane and in the direction of the eye.

3.3.2.3 mouth impact site

The site in the intersection between the horizontal plane and the longitudinal vertical median plane in the direction of the mouth.

3.4 G_{SI} Gadd Severity Index

A weighted impulse criterion measure that estimates the injury hazard to the human head based on an impact and determined from the acceleration-time wave form. It is mathematically defined by the equation:

$$G_{SI} = \int_{t_0}^{t_0 + \tau} a^{2,5} dt$$

where

- 2,5 is the weighting exponent;
- a is the acceleration of a body, m/s²;
- t is time in seconds;
- τ is the time of impact, i.e. pulse duration in seconds.

3.5 helmet type

Categories of helmets which do 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.

4 Types of head protectors

The head protector for ice hockey players comprises a helmet and a face protector either specially adapted to the helmet or forming a continuous unity, designed to protect the whole or parts of the wearer's head against injury.

Types of head protectors are :

- helmet;
- helmet in combination with:
 - eye protector (visor);
 - mouth protector;
 - full face protector for players;
 - full face protector for goalkeepers;
- goalkeeper's protection mask.

5 Requirements

5.1 General requirements

5.1.1 Materials

When conditioned in accordance with any of the methods described in 6.3 the head protector shall still fulfil the requirements of this standard.

All materials used in the construction of the head protector shall not be adversely affected by ordinary household soap and cleaners recommended by the manufacturer. The shock absorbing material used shall be known to absorb impacts without crushing.

Paints, glues and finishes used in manufacturing shall be compatible with the materials used in the construction of the head protector.

Material coming in contact with the wearer's head shall not be of any type known to cause skin irritation or disease or undergo significant loss of strength, flexibility, or other physical changes as a result of contact with perspiration, oil or grease from the wearer's head.

Adhesive material used to attach padding or straps to the face protector or visor shall be of a formulation that will not alter the chemical or physical properties of the materials to an extent as to reduce their protective qualities.

5.1.2 Finish

All parts shall be well finished and free of sharp edges and other irregularities which would present a potential hazard to the user or other players.

5.1.3 Attachment system

The attachment system of a face protector to a helmet shall be so designed so that the face protector can be easily attached to the helmet without requiring any machining operation by the user.

5.1.4 Field of vision

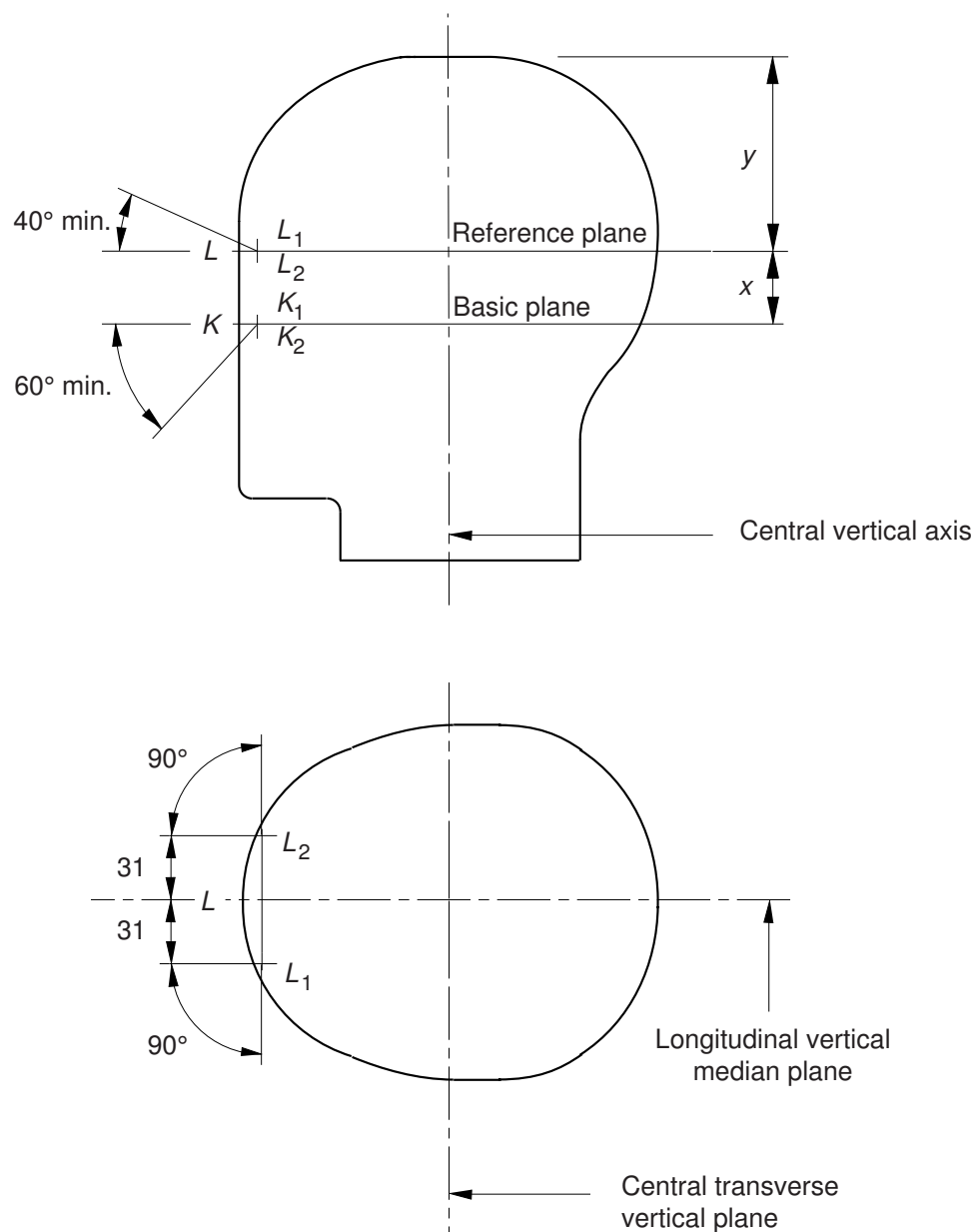
There shall be no occultation in the field of vision bounded by angles as follows, see figure 1:

- upwards: 40°;
- downwards: 60°;
- horizontally: 90°.

Suitable test methods are given in 6.6 and in annex A.

NOTE. Annex A also gives optional properties and test methods for the optical quality of eye protectors.





Section in reference plane

Dimensions in millimetres

Headform (see EN 960) Code letter	Size Inside circumference of helmet	x	y
A	500	24	89,5
E	540	26	96
J	570	27,5	102,5
M	600	29	107

Figure 1. Field of vision

5.1.5 Penetration

When tested in accordance with 6.7, no contact with the bare headform by the test blade shall be made within the protected areas, except for the ear apertures.

5.1.6 Mass

When tested in accordance with 6.2 the mass shall not exceed the values given in table 1.

Table 1. Maximum mass of head protectors	
Type of head protector	Max. mass g
Helmet	800
Helmet with eye protector (visor), mouth protector or full face protector for players	
Helmet with full face protector for goalkeepers	1000
Goalkeeper's protection mask	

5.2 Helmets — Special requirements

5.2.1 Design

No sharp surfaces or protruding parts shall present a potential hazard to the user or other players. The back edge of the helmet should be designed to minimize the possibility of lacerations and/or contusions to the back of the neck. The assembly to be used by the user shall require no machining operation.

Any optional devices fitted to the helmet shall be so designed that they are unlikely to cause any injury to the wearer or other players during contact or otherwise.

The components of the fasteners for securing attachments to the helmet shall be so designed that the degree of protection afforded to the wearer by the helmet is not thereby reduced.

5.2.2 Protected area

The protected area shall be at least the area above the line BCDEF in figure 2a) when the helmet is positioned in accordance with 6.4.4.2.

No ear aperture shall have a linear dimension exceeding 38 mm and the distance to any other edge of the helmet shall be not less than 20 mm. See figure 2b).

Ventilation openings shall fulfil the penetration requirements in 5.1.5 and the distance from any ventilation opening to the edge of the helmet shall be not less than 20 mm.

5.2.3 Shock absorbing capacity

When tested in accordance with 6.4 no single impact shall exceed a G_{SI} of 1500 and the peak acceleration shall not exceed 300 g. The helmet shall remain intact with no visible cracks through the thickness of the outer covering (shell) nor shall the liner show any permanent damage.

5.2.4 Retention system

Any chin strap and/or neck strap shall be not less than 13 mm wide. It shall be attached to the helmet in such a manner that the helmet will remain in its normal position on the user's head during play and impact conditions provided that the strap is firmly fitted.

When tested in accordance with 6.5 the displacement of the roller holder shall not exceed 25 mm during the load range between 5 N and 110 N and the release force shall be not less than 110 N and not more than 300 N.

5.3 Full face protectors — Special requirements

5.3.1 Design

The distance measured perpendicularly from the headform between the inside of the face protector and point K on the headform shall not exceed 60 mm. see figure 3.

Face protectors shall overlap the lower edge of the helmet (forehead area) by at least 6 mm in the horizontal plane.

The face protector shall rest against the chin and the load bearing area shall extend at least as shown in figure 4. Shock absorbing material shall be securely attached to the load bearing area.

Except in the chin area where it is covered by padding, no part of the face protector shall be closer than 10 mm to the surface of the headform.

5.3.2 Protected area

The area protected by the face protector and helmet combination shall extend laterally and vertically around the headform at least to the line GHJ in figure 3, seen from the side, when the face protector is assembled and mounted on the appropriate helmet in accordance with the manufacturer's instructions when placed on a headform as described in 6.8.2.4.

NOTE. For the time being only size 570 mm is available and used. see 6.8.2.4.

Where the helmet provides protection in front of the line GHJ, the face protector need not extend back to the GHJ line provided the face protector overlaps the helmet by at least 6 mm seen from the side.

For goalkeepers, the face protector shall overlap the lower edge of the helmet (forehead area) by at least 6 mm in the horizontal plane and follow the helmet backwards at least to the central transverse vertical plane down to the basic plane.

5.3.3 Puck impact resistance

When tested in accordance with 6.8, the face protector or the puck shall not have touched the headform, except on the mandible where it is covered by padding and except at the toughness test. There shall be no chipping, cracking or breakage of the face protector or separation of the face protector from the helmet. The shock absorbing material at the load bearing area shall remain securely attached to the face protector.