INTERNATIONAL STANDARD

ISO 10256

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Head and face protection for use in ice hockey

Protections de tête et de visage destinées à être utilisées en hockey sur glace

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 10256 was prepared by Technical Committee ISO/TC 83, *Sports and recreational equipment*, Subcommittee SC 5, *Ice hockey equipment and facilities*.

This second edition cancels and replaces ISO 10256:1996, ISO 10257:1996 and EN 967:1996.

Introduction

The intention of head and face protection is to reduce the frequency and severity of localized injuries to the head and that part of the face surrounded by the protector. The protective function is such that the force from impacts against the protector is distributed and dampened and the penetration of objects is counteracted.

Head and face protection for use in ice hockey comprise helmets and an associated face protector. Face protectors can consist of eye protectors (visors) 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.

To achieve the performance of which it is capable, and to ensure stability on the head, a helmet and associated face protector should be as closely fitting as possible consistent with comfort. In use, it is essential that the helmet and associated face protector be securely fastened, with any chin strap or neck strap adjusted according to the manufacturer's instructions.

ISO/TC 83/SC 5 is aware that specifications for the performance of the helmet and the face protector are required to reduce the risk of injury in ice hockey. There was consensus that most of today's head and face protectors meet the performance requirements of this International Standard. However, the goal of ISO/TC 83/SC 5 is to promote the use of better materials and/or constructions as they become available to meet the future requirements of the sport of ice hockey. ISO/TC 83/SC 5 is also aware that in order to provide for comfort and correct fitting and use, helmets and face protectors should have low mass consistent with providing the appropriate performance characteristics.

Head and face protection for use in ice hockey

1 Scope

This International Standard specifies performance requirements and test methods for head and face protection for use in ice hockey.

NOTE 1 The intent is to reduce the risk of injury to the head and face without compromising the form or appeal of the game.

NOTE 2 Ice hockey is a sport in which there is a risk of injury. This International Standard is intended only for helmets and face protectors used for ice hockey. Ice hockey helmets afford no protection from neck or spinal injury. Severe head, brain or spinal injuries, including paralysis or death, may occur in spite of using an ice hockey helmet in accordance with this International Standard.

Performance requirements and test methods, where appropriate, are given for the following:

a) construction;

b) shock absorption;

c) puck-impact resistance;

d) penetration;

e) retention-system properties;

f) field of vision;

g) marking and information.

The head and face protection is intended for use by

a) players,

b) goalkeepers and

c) certain functionaries (e.g. referees).

2 Normative references

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

ISO 6487:2002, *Road vehicles — Measurement techniques in impact tests — Instrumentation*

EN 960:1994, *Headforms for use in the testing of protective helmets*

CAN/CSA Z262.4-00, *Ice hockey pucks*

ASTM F1446, *Standard test methods for equipment and procedures used in evaluating the performance characteristics of protective headgear*

3 Terms and definitions

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

3.1 General

3.1.1
acceleration of a body
a
(self-explanatory)

NOTE Acceleration is measured in metres per second squared, in units of g.

3.1.2
acceleration of a body due to gravity
g
(self-explanatory, $g = 9{,}806$ m/s^2)

3.1.3
central vertical axis
line relative to the headform that lies in the median plane of symmetry, and that is normal to the basic plane at a point equidistant from the front and back of the headform

3.1.4
Gadd Severity Index
GSI
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, and mathematically defined by the equation

$$\mathrm{GSI} = \int_{t_0}^{t_0 + t_1} a^{2,5} \mathrm{d}t$$

where

a is the acceleration of a body, in metres per second squared;

t is the time in seconds, at the 5 g level;

t_1 is the time of impact, i.e. pulse duration, in seconds, measured from the 5 g level.

3.1.5 Planes

3.1.5.1
basic plane of the human head
Frankfurt Horizontal
plane that is located at the level of the external upper borders of the ear canal (external auditory meatus) and the inferior margins of the orbits of the eyes

3.1.5.2
basic plane of a headform
plane relative to the headform that corresponds to the basic plane of the human head

3.1.5.3
reference plane
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

3.1.5.4
frontal plane
vertical plane that is perpendicular to the median and reference planes and passes through the crown of the headform

See Figure 1.

3.1.5.5
horizontal plane
plane that passes across the body at right angles to both the frontal and median planes

See Figure 1.

3.1.5.6
median plane
vertical plane that passes through the headform from front to back and divides the headform into right and left halves

See Figure 1.

3.1.6
permanent marking and warning
information that remains legible and cannot be removed in its entirety under normal use conditions

See Clause 8.

3.2 Helmet

3.2.1
retention system
system which secures the helmet firmly to the head by passing under the mandible, in whole or in part, when adjusted according to the manufacturer's instructions

3.2.2
drop height
vertical distance between the lowest point (impact point) of the elevated helmet and the impact surface

3.2.3
fastening system
those devices used to connect all components of the helmet

3.2.4
helmet
device intended to reduce the risk of head injury to ice hockey participants and including

a) the outer covering and shock-attenuating system,

b) the retention system,

c) all associated hardware, and

d) the manufacturer's attachments

NOTE a) to d) can be discussed individually in relation to their function as part of the helmet as a whole.

3.2.5
helmet model
category of helmets that do not differ in such essential respects as the materials, dimensions, construction of the helmet, retention system or the protective padding

3.2.6 Impact sites (defined in relation to the headform) (see Figure 2)

3.2.6.1
crown
point where the central vertical axis meets the top of the headform

3.2.6.2
front
point on the median plane which is 50 mm above the anterior intersection with the reference plane

3.2.6.3
front boss
point 25 mm above the reference plane and 45° from the anterior intersection of the median plane and the reference plane (intersection of the reference and frontal planes)

3.2.6.4
side
point 25 mm above the reference plane and 90° from the anterior intersection of the median plane and the reference plane (intersection of the reference and frontal planes)

3.2.6.5
rear boss
point on the reference plane and 135° from the anterior intersection of the median plane and the reference plane

3.2.6.6
rear
point at the posterior intersection of the median and reference planes

3.2.7
liner
material inside the outer covering of the helmet, with a principal objective to absorb kinetic energy generated by an impact to the head, this material, or part of it, ensuring a snug comfortable fit of the helmet on the head

3.2.8
maximum value of acceleration
a_{max}
maximum acceleration encountered during impact, in units of g

3.2.9
natural frequency
frequency at which a system will tend to oscillate when displaced from its static equilibrium position

3.2.10
outer covering
shell
outer material that gives the helmet its form

3.2.11
support assembly
drop assembly in the monorail system minus the weight of the headform, ball clamp, ball-clamp bolts, and accelerometer

3.2.12
securely attached label and tag
label or tag affixed at the time of manufacture, and which is normally removed at the time of helmet use

See 5.4.6 and Clause 8.

3.3 Face protection

3.3.1
chip
readily visible macroscopic particle missing from the protector

3.3.2
collimated light source (source of illumination)
quartz halogen lamp (17 lx or 1,68 foot candles) producing a 100 mm beam at 6 m distance which is centred on the pupils of the eyes of the headform or on the midpoint between the pupils of the eyes of the headform, this centring being maintained at all times during the test

3.3.3
combination
combined unit of a face protector or visor placed on a hockey helmet with which it is designed to be used

3.3.4
computer interface
linkage between the computer, the goniometer and the sensors, enabling a fully automated measurement process via a menu-driven operation

3.3.5
dioptre
measure of the power of a lens or a prism equal to the reciprocal of its focal length expressed in metres

3.3.6
face protector
device intended to reduce the risk of injury to the eyes and face of ice hockey participants

3.3.7
field of vision
projection outward of all retinal points (the nervous layer of the eye) at which visual sensations can be initiated

See Figure 3.

3.3.7.1
temporally
refers to an angle in the horizontal plane measured from the primary position of gaze to the right for the right eye and from the primary position of gaze to the left for the left eye

3.3.7.2
nasally
refers to an angle in the horizontal plane measured from the primary position of gaze to the left for the right eye and from the primary position of gaze to the right for the left eye

3.3.7.3
inferior
downward
refers to an angle in the vertical plane measured downwards from the horizontal

3.3.7.4
superior
upward
refers to an angle in the vertical plane measured upwards from the horizontal

3.3.8
glabella
most prominent midline point between the eyebrows, identical to the bony glabella of the frontal bone

3.3.9
goniometer
positioning device that moves the headform such that the angular rotation and movement in both the horizontal and vertical directions enables a spherical scan to be made of the fields of vision as seen through a face protector or visor

3.3.10
haze
percentage of transmitted light that, in passing through the specimen, deviates from the incident beam by forward scattering

3.3.11 Impact sites

3.3.11.1
side impact
point half-way between the mouth level and the eye level in the horizontal plane, 25° to the median plane and in the direction of the axis formed by the intersection of the median plane and the frontal plane

See Figure 11.

3.3.11.2
eye impact
point in the horizontal plane 25° to the median plane and in the direction of the eye

See Figure 11.

3.3.11.3
mouth impact
point in the intersection between the horizontal plane and the median plane in the direction of the centre of the mouth

See Figure 11.

3.3.12
interpupillary distance
PD
distance, in millimetres, between the centres of the pupils of both eyes on the facially-featured headform

3.3.13
laser
luminous device used for alignment of the sensors

EXAMPLE Helium-neon (He-Ne) laser, power 0,5 mW, monochromatic light source.

WARNING — Observe safety rules when using a laser.

3.3.14
luminous transmittance
ratio of the light transmitted by a medium to the incident light

3.3.15
menton
lowest point on the mandibular symphysis

3.3.16
no-contact zone
designated zone of the headform where contact is not permitted during the puck-impact resistance test

See 5.3.3 and 5.4.3, and Figures 13 and 14.

3.3.17
optical clarity
sharpness of an image

3.3.18
optical quality field of vision area
that area on a transparent face protector or visor determined by the outline of a cone whose axis projects along the primary position of gaze and extends 35° (radius of fixation), the apex of the cone being centred on each pupil, the area generated by each cone being joined above and below and extended to a point 90° laterally to each side in the horizontal plane

See Figure C.1.

3.3.19
orbit
either a quadrilateral, pyramidal cavity situated at the upper and anterior part of the face, or the bony cavity containing the eyeball and other associated tissues within the orbit

3.3.20
orbitale
lowermost point on the inferior margin of the orbit (infraorbital margin)

3.3.21
peripheral field of vision
oval-shaped field extending 90° temporally, 60° inferiorly, 45° nasally and 35° superiorly

See Figure 4.

3.3.22
photosensor
sensor 5 mm in diameter centred in the pupils of the headform, covered by a 5 mm translucent lens of 8 mm radius of curvature, convex forward

NOTE 1 The photo sensor is cosine corrected, e.g. provided with a diffusing cover which is a means of correcting the light-sensitive surface for wide angles of incidence.

NOTE 2 Light contact with the sensor produces an electrical signal that is fed into a computer interface.

3.3.23
porion
highest point on the upper margin of the cutaneous, external auditory meatus

3.3.24
primary position of gaze
line running forward from the centre of the pupil parallel to the median and horizontal planes

See Figure 1.

3.3.25
prism dioptre
unit used in measuring the deviating power of a prism

NOTE This power in prism dioptres is 100 times the tangent of the angle of deviation of a ray of light.

3.3.26
prism imbalance
light passing through a lens and entering one eye is deviated by an amount differing in direction from the same light passing through the lens and entering the other eye

3.3.27
protector
face protector or a visor as they are defined in 3.3.6 or 3.3.34

3.3.28
resolution
ability of an optical system to distinguish two points at their minimum separation

3.3.29
scan area
oval, peripheral fields area, specified by superior, temporal, inferior and nasal directions

3.3.30
scotoma
blind spot in the field of vision

3.3.31
securely attached label and/or tag
label or tag affixed at the time of manufacture, and which is normally removed at the time of face-protector or visor use

See 5.4.6 and Clause 8.

3.3.32
subnasal
Sn
deepest point on the concavity of the anterior surface of the maxilla in the midline, within 3,0 mm of the floor of the nose

See Figure 6.

3.3.33
threshold value
output reading obtained when the collimated light beam has been centred on the midpoint between the pupils in the primary position of gaze

NOTE The headform is rotated 90° in the horizontal plane, and the collimated light source contacts the pupillary sensor closest to the light source.

3.3.34
visor
device intended to reduce the risk of injury to the eyes of ice hockey participants

3.3.35
vertex
point of intersection on the headform of the median plane with the frontal plane

See Figure 1.

4 Types of head and face protectors

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

Head and face protectors (adapted or continuous unit) are a helmet in combination with

a) eye protector (visor),

b) full-face protector for players, or

c) full-face protector for goalkeepers.

5 Requirements

5.1 General

5.1.1 Materials

5.1.1.1 Documentation

The manufacturer shall provide written documentation indicating that the materials used in the construction of the helmet and face protector fulfil the requirements of 5.1.1.2 to 5.1.1.7.

5.1.1.2 Conditioning

When conditioned in accordance with any of the methods described in 6.3, the head and face protector shall still fulfil the requirements of this International Standard.

5.1.1.3 Cleaners

All materials used shall not be adversely affected by ordinary household soap and cleaners as recommended by the manufacturer.

5.1.1.4 Finishes

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

5.1.1.5 Non-irritants

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.

5.1.1.6 Adhesives

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 such an extent as to reduce their protective qualities.