BRITISH STANDARD

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13546:2002

Protective clothing — Hand, arm, chest, abdomen, leg, foot and genital protectors for field hockey goal keepers and shin protectors for field players — Requirements and test methods

The European Standard EN 13546:2002 has the status of a British Standard

ICS 13.340.01

National foreword

This British Standard is the official English language version of EN 13546:2002.

The UK participation in its preparation was entrusted by Technical Committee PH/3, Protective clothing, to Subcommittee PH/3/11, Protective equipment for sports players, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

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Protective clothing - Hand, arm, chest, abdomen, leg, foot and genital protectors for field hockey goal keepers, and shin protectors for field players - Requirements and test methods

Vêtements de protection - Protège-mains et bras, plastrons, protection abdominale, guêtres, sabots et coquilles de gardiens de but de hockey sur gazon et protège-tibias de joueurs - Exigences et méthodes d'essai

Schutzkleidung - Hand-, Arm-, Brustkorb-, Unterleibs-, Bein-, Fuß- und Genitalschützer für Feldhockey-Torwarte und Schienbeinschützer für Feldhockey-Spieler - Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 25 March 2002.

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

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Contents

Foreword

This document EN 13546:2002 has been prepared by Technical Committee CEN/TC 162 "Protective clothing including hand and arm protection and lifejackets", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2003, and conflicting national standards shall be withdrawn at the latest by January 2003.

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

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

The annexes A, B and ZA are informative.

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

Introduction

Protective equipment is worn on the shins by most field hockey players to reduce the severity of injuries from accidental impacts by the hockey ball, hockey sticks and other players. Goalkeepers' more extensive protective equipment is designed to be both playing equipment to stop the ball entering the goal and to return it into play in a controlled manner, and also to be protective equipment which reduces the severity of injuries from accidental impacts by the hockey ball, hockey sticks and other players on parts of the goal-keepers' body not normally used for playing the ball. Impacts on the playing surfaces of the goal-keepers' equipment may be considered deliberate as they are part of the way the game is played. Such playing surfaces should have protection behind them that as far as possible eliminates the risk of injury in normal play at the level of competition for which the products are designed.

Genital protectors are worn by some adult players to protect against hockey ball impacts. Similar products are used in other ball sports such as cricket and lacrosse, but these will not be appropriate for field hockey unless tested to the same or greater severity than is required in this standard.

It has been assumed in the drafting of this standard that the execution of its provisions is entrusted to appropriately qualified and experienced people, for whose guidance it has been prepared. The apparatus described should only be used by competent persons and requires safeguards to prevent, as far as is reasonably practicable, injury to the operator and other persons.

This standard does not cover helmets, face masks and throat protection.

1 Scope

This standard specifies the general requirements for the ergonomics, performance, innocuousness, sizing and coverage of field hockey goal keepers' equipment, providing protection to the hands, arms, chest, abdomen, legs, feet and genitals, and field players' shin protectors. Requirements for the marking of equipment and the information to be supplied by the manufacturer are given. Test methods are described and performance levels are defined.

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 (including amendments).

EN 1082-1:1996, *Protective clothing — Gloves and arm guards protecting against cuts and stabs by hand knives — Part 1: Chain mail gloves and arm guards.*

ISO 3758, *Care labelling code using symbols.*

ISO 8559:1989, *Garment construction and anthropometric surveys — Body dimensions.*

3 Terms and definitions

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

3.1
General

3.1.1
coverage
area of the body which is covered by the whole of the protective equipment and its attachments

3.1.2
field hockey
team game played on a natural or artificial turf surface between goals with sticks and a round hard ball

3.1.3
performance level
number designating the category of the protection that it is intended the product should provide. This number is used in designating the test severity to which the product is to be subjected

NOTE Annex B contains informative guidance on the meaning of performance levels and the choice of equipment.

3.1.4
protective equipment
clothing and specific devices worn on the body, hands and feet, that are intended to reduce the severity of injuries from hockey balls, hockey sticks and other players

3.1.5
zone of protection
area of protective equipment that is intended to provide protection, and is subject to specific testing

3.2
Protective equipment

3.2.1
abdominal protectors
devices worn by goal-keepers to protect their abdomens below the waist from impacts. These devices may incorporate genital protectors

3.2.2
breast protectors
devices worn by female goal-keepers to protect breast tissue from impacts and shearing forces. These devices are normally intended to be worn beneath chest protectors, and only then to provide the intended protection

3.2.3
chest protectors
devices worn by goal-keepers to protect the anterior of their chests down to at least their waist level

3.2.4
elbow and forearm protectors
devices worn by goal-keepers to protect their elbows and forearms from impacts. Normally the cuffs of gloves will overlap these protectors

3.2.5
Genital protectors

3.2.5.1
hard genital protectors
devices worn to protect the male or female genitalia from impacts

3.2.5.2
soft genital protectors
soft foam containing devices sometimes used by women instead of the hard protectors

3.2.6
gloves

3.2.6.1
glove and hand definitions
the definitions in EN 1082-1 and the following shall apply

3.2.6.2
goal-keepers' gloves
the gloves are handed. They may be five digit or two digit designs, or may be hand enclosing protectors

3.2.6.3
the left or flat glove
is used palm forwards to play the ball. Padding is provided on the anterior of the wrist and hand and on the finger tips, and on the lateral surface of the hand

3.2.6.4
the right or stick-holding glove
is used to grip the hockey stick and is provided with padding to protect the outside or backs of the fingers, the thumb, and the anterior of the wrist

3.2.7
kickers
devices worn by goal-keepers over their hockey boots or shoes, for the purposes of play or protection, and covering the fronts, the tops (instep), and sides of the feet

3.2.8
leg protectors
devices worn by goal-keepers to block the ball entering the goal. The leg protectors are intended to be worn with kickers and to provide protection with the kicker, from the ankle to above the knee

3.2.9
shin protectors
devices worn by field players providing limited impact protection to their tibias and ankles. Type A protectors include some medial and lateral ankle joint protection, but Type B protectors do not

3.2.10
shoulder and upper arm protectors
devices worn by goal-keepers to protect the anterior aspects of their shoulders and upper arms from blows by hockey balls. The protection generally extends over the lateral surfaces of the arm and the upper surfaces of the shoulders. These protectors may be attached to chest protectors or may be independent garments

3.2.11
thigh and hip protectors
padding usually worn by goal-keepers as parts of trousers ending just above the knees. These trousers may incorporate genital protectors and abdominal protectors

3.3
Body dimensions

3.3.1
bust girth
maximum horizontal girth measured during normal breathing with the subject standing upright and the tape-measure passed over the scapulae under the armpits and across the breasts: normal underclothing to be worn

3.3.2
chest girth
maximum horizontal girth measured during normal breathing with the subject standing upright and the tape-measure passed over the scapulae under the armpits and across the chest

3.3.3
stature
(Height) vertical distance between the crown of the head and the ground, measured with the subject standing upright without shoes and with their feet together

3.3.4
total crotch length
lower trunk length. Length measured from the centre of the front of the waist as defined above through the crotch to the side of the genitalia, to the centre of the back of the waist

3.3.5
under bust girth
horizontal girth of the body immediately below the breasts measured as for the bust girth

3.3.6
waist girth
maximum horizontal girth measured during normal breathing with the subject standing upright and the tape-measure passed around the body in the plane of the waist, 50 mm above the supra-cristal plane which is at the level of the highest points of the iliac crests. The dimension of 50 mm refers to a subject of 178 cm tall and should be scaled *pro rata* with the height of the actual subject

3.3.7
waist to waist over the shoulder length
maximum length measured from the plane of the waist, as defined above, over the shoulder to the plane of the waist. The tape-measure crosses the shoulder at the mid point between the point of the shoulder and the junction of the shoulder to the neck. Anteriorly the tape measure passes over the chest (or bust) to a point 90 mm lateral to the midline of the body on the plane of the waist. Posteriorly the tape measure follows the shortest distance to a point 90 mm lateral to the midline of the body. The distances of 90 mm refer to a subject with a waist girth of 85 cm and should be scaled *pro rata* with the waist girth of the actual subject. Normal underclothing to be worn for the measurement

4 Requirements

4.1 Innocuousness

Protective clothing and equipment for field hockey players shall meet a general requirement that the product is safe to use and fit for its purpose. It shall be designed and manufactured to provide protection when used according to the manufacturer's instructions, without endangering the user or other players. There shall not be hard or sharp edges, seams, buckles or other items on the surfaces of the products that could harm the user or other players during normal use. Examination shall be made according to 5.4.

Construction materials and incorporated substances, shall not harm those coming into contact with them. The manufacturer shall list in the Information supplied with the product, the substances used in the main components of the product, and shall label any product containing substances or preparations generally known to be hazardous.

Information about determining the chemical innocuousness of protective clothing and equipment is given in informative annex A.

4.2 Ergonomic requirements

Hockey players' protective equipment shall be designed to minimise discomfort and impediment while wearing it. The designs should permit all normal playing movements. The equipment shall not render accidents such as trips and falls more likely. The equipment shall be assessed according to 5.5.

4.3 Sizing

4.3.1 General

Protective equipment shall be marked with its size (see clause 6). The size shall be related to the body dimensions of the players the equipment should fit, and this shall be explained in the Information supplied by the manufacturer (see clause 7). The following body dimensions shall be used as the control dimensions in sizing particular items of protective equipment. Other dimensions may be used in addition. Definitions of some body dimensions are given in 3.3; others shall be determined by reference to ISO 8559.

Abdominal protectors shall be sized against the users' waist girth and total crotch length calculated from their waist girth.

Breast protectors shall be sized against either the users' bust girth or the users' under bust girth and the brassiere cup size that is normally worn.

Chest protectors shall be sized against the users' chest or bust girth and waist-to-waist over the shoulder length. In sizing chest protectors for female players allowance shall be made for the use of a breast protector inside the chest protector.

Gloves shall be sized against the users' hand length and hand breadth as described in EN 1082-1:1996, annex B, Table B1.

Kickers shall be sized against the users' total height (stature) or the size of boot or shoe over which the kicker is intended to fit.

Shin protectors, leg protectors, elbow and forearm protectors, shoulder and upper arm protectors, shall be sized against the users' total height (stature).

Thigh and hip protectors shall be sized against the users' waist girth and total height (stature).

Hard genital protectors shall be sized according to Table 1. Figures 1a to 1c give an explanation of the dimensions, and clause 5 contains details of the measurement procedure.

Soft genital protectors shall be sized against the user's waist girth

Table 1 — Hard genital protector dimensions

Size designation	Dimensions shall be greater than these values			
	Dimension *A* Internal depth mm	Dimension *B* Internal length mm	Dimension *C* Internal width at widest part mm	Dimension *D* Volumes cm^3
Female size 1	20	100	55	70
Female size 2	25	110	65	110
Female size 3	30	120	75	150
Male size 1	40	120	85	170
Male size 2	45	130	95	225
Male size 3	50	140	105	300

Dimension in millimetres

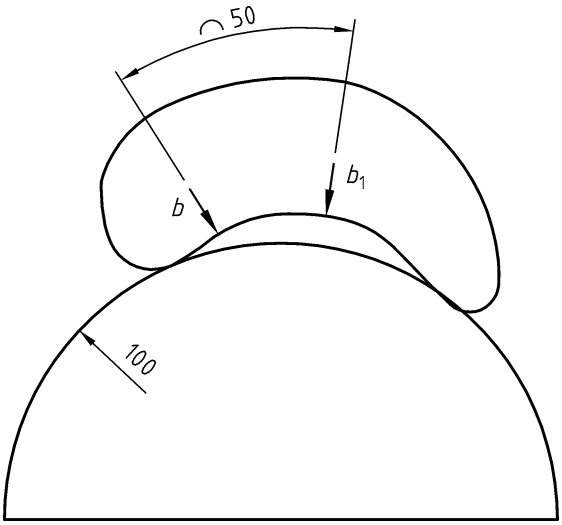


Figure 1a — Dimensions of hard genital protectors

A side view of a genital protector placed on the 100 mm radius half cylinder. Bearing area indicator marks are shown 50 mm apart (b, b_1).

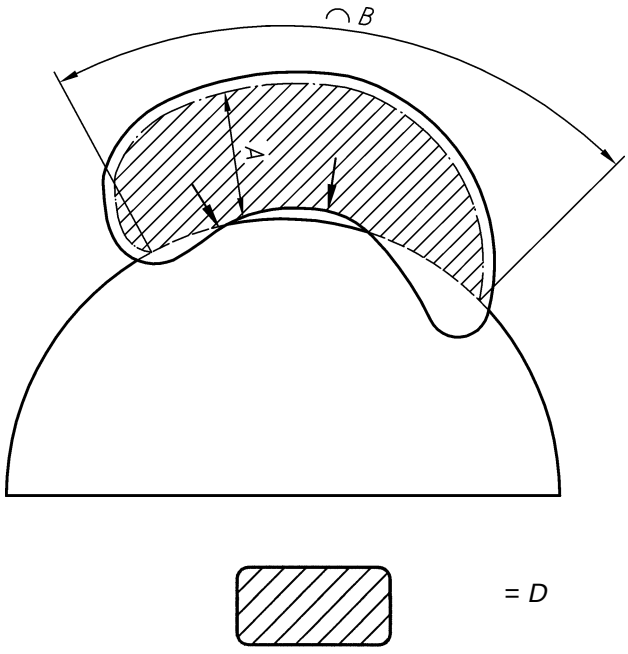
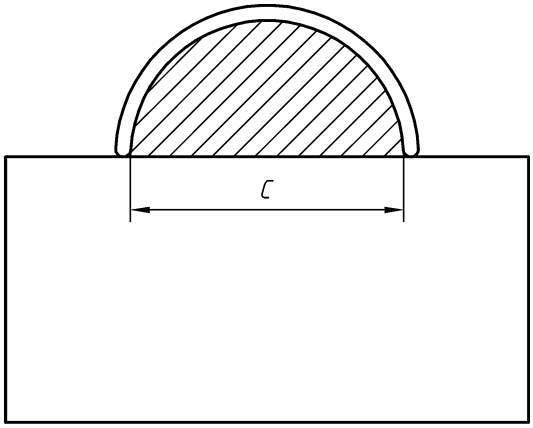
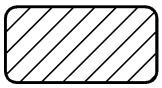


Figure 1b — Dimensions of hard genital protectors

A schematic side view of a genital protector trimmed to fit onto the 100 mm radius half cylinder. Dimensions *A* and *B* are shown.

D = The volume to be measured, dimension





= *D*

Figure 1c — Dimensions of hard genital protectors

A schematic cross section of a genital protector on the 100 mm radius half cylinder.

D = The volume to be measured, dimension *D*.

Figure 1

4.3.2 Nominal sizes of certain products

In addition to sizing based on the users' body dimensions as required in 4.3, manufacturers may, if appropriate, allocate their products to nominal sizes each of which covers a range of actual sizes. If nominal sizing is used the ranges and numbers in Table 1 shall be used. Sizing shall be verified as described in 5.6.

Table 2 — Values of body dimensions for nominal sizing

Nominal size	Items of protective equipment and the relevant body dimensions		
	Shin protectors Leg protectors Elbow and forearm protectors Shoulder & upper arm protectors Kickers	Chest protectors Breast protectors	Abdominal protectors Thigh and hip protectors Soft genital protectors
	Stature, cm	Chest girth, cm	Waist girth, cm
1	116 to 134	72 to 84	68 to 80
2	134 to 152	84 to 96	80 to 92
3	152 to 170	96 to 108	92 to 104
4	170 to 188	108 to 120	104 to 116
5	188 to 206	120 to 132	116 to 128

4.4 Minimum dimensions of zones of protection

4.4.1 General

All protective equipment shall have a zone, or zones, of protection, the dimensions of which shall be related to the size of the largest user the equipment is intended to fit. The dimensions and positions of the zones of protection, relative to the coverage provided by the equipment, shall be given in the Information supplied by the manufacturer, (see clause 7). Methods for determining the dimensions of the zones of protection are described in clause 5. In principle, apart from hard genital protectors, the outer surfaces of the protectors are marked to show the areas in which blows directed towards the underlying skeletal structures will fall on particular constructions. These will be compared to the dimensions given below. The dimensions are those on the outer face of the product. When a product is bent around part of the body such as the lower leg, the thickness of the product has a significant effect on the fraction of the circumference of the limb protected. Values of transverse dimensions of such products require scaling if the thickness of the product is unusual. If the thickness of the product differs from the following by more than 15 %, scaling is necessary. The following thicknesses have been assumed:

— Shin protectors - 15 mm,

— Leg protectors - 50 mm,

— Kickers - 40 mm (only relevant on toe to heel dimensions),

— Thigh and hip protectors - 30 mm, elbow and forearm protectors - 15 mm,

— Shoulder and upper arm protectors - 20 mm.

— Chest protectors, abdominal protectors and gloves do not require protective zone dimensions to be scaled for thickness.

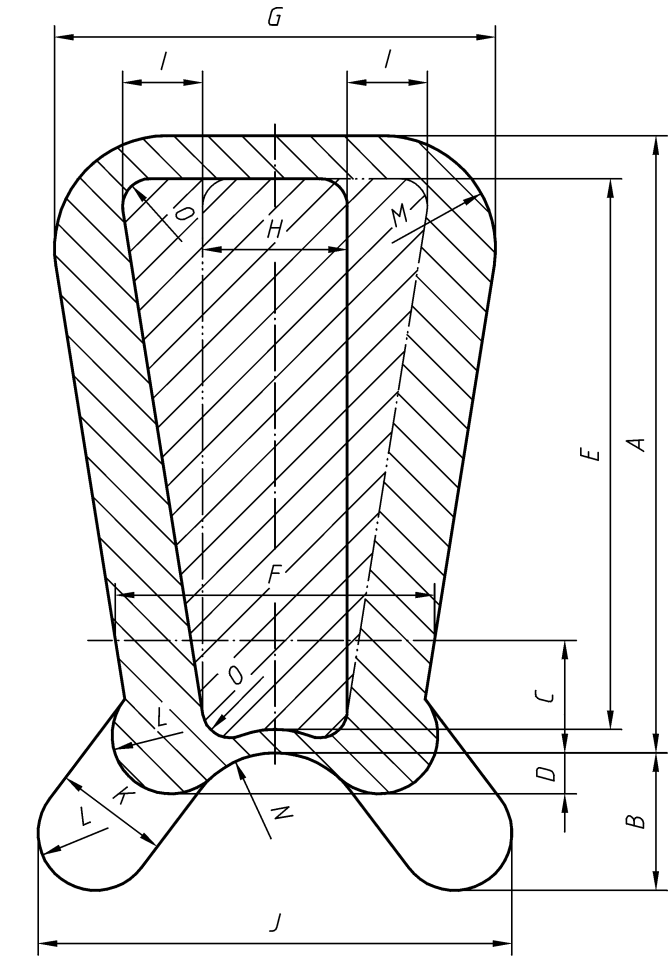
The dimensions of zones of protection shall be verified as described in 5.7. Areas outside zones 1, 2 or 3 do not have to meet impact or dimensional requirements and are designated zone 0. The zones, of the dimensions given below, will be subject to impact testing in accordance with 5.9 to establish compliance with the performance requirements.

4.4.2 Shin protectors

Shin protectors shall be of two types. Type A shall be as described below and shown in Figure 2. Type B shall be as Type A but shall not be required to include the Zone 1 area shown in Figure 2 and specified in Table 3. Dimensions *B*, *J* and *K* shall not apply to Type B.

Shin protectors shall have minimum and maximum dimensions of the zone of protection as given in Table 3 and illustrated in Figure 2. There may be three zones of protection defined by their impact performance. The zones where lower performance is required may have the same construction as the higher performance zones. A central zone is defined that shall have a central rectangular area on all shinguards. Triangular areas are defined beside the central area. It is only required that these cover the medial aspect of the front of the shin. A symmetrical shinguard may be worn on either leg. A left leg protector shall have an area shown by the solid line in Figure 2 and a right leg protector shall have an area shown by the dotted line in Figure 2. The corners of the central high performance zone shall have radii of curvature not exceeding the value of dimension *O*.

Asymmetrical shin protectors shall be marked Left or Right or otherwise identified, (see clause 6).



Key

1 = Zone 1, ankle area

2 = Zone 2, outer area

3 = Zone 3, central area

NOTE The central zone is shown for a left shin protector (solid line) and for the right shin protector (dotted line).

Figure 2 — A plan diagram of the outer surface of a shin protector showing the dimensions of the zones of protection listed in Table 3

Table 3 — Requirements for the dimensions of the zones of protection of shin protectors expressed as a percentage of stature, and also (for information) the values of the dimensions in millimetres for the five nominal sizes

Designation of the dimension	Value of the dimension expressed as a percentage of the user's stature	Value of the dimension in millimetres for each nominal size				
		1	2	3	4	5
A (min.)	15,8	212	240	269	297	325
B (min.)	3,52	47	54	60	66	73
C (actual)	2,9	39	44	49	55	60
D (min)	1,0	12	15	17	19	21
E (min.)	14,1	189	214	240	265	290
F (min.)	8,2	110	125	139	134	169
G (min.)	11,3	151	172	192	212	233
H (min.)	3,7	50	56	63	70	76
I (min.)	1,9	25	29	32	36	39
J (min.)	11,8	158	179	201	222	243
K (min.)	2,9	39	44	49	55	60
L (min.)	1,5	19	22	25	28	30
M (max.)	2,9	39	44	49	55	60
N (max.)	2,4	32	36	41	45	49
O (max.)	0,75	10	11	12	14	15

The values of dimensions *A*, *B*, *E*, *F*, *G*, *H*, *I*, *J*, *K* and *L* are minimum values. Dimension *C* is the actual distance up the shin protector that dimension *F* is measured. Dimension *D* is the minimum distance below the instep notch that the outer zone shall extend. Dimensions *M*, *N* and *O* are the maximum radii of curvature permitted.

4.4.3 Leg protectors

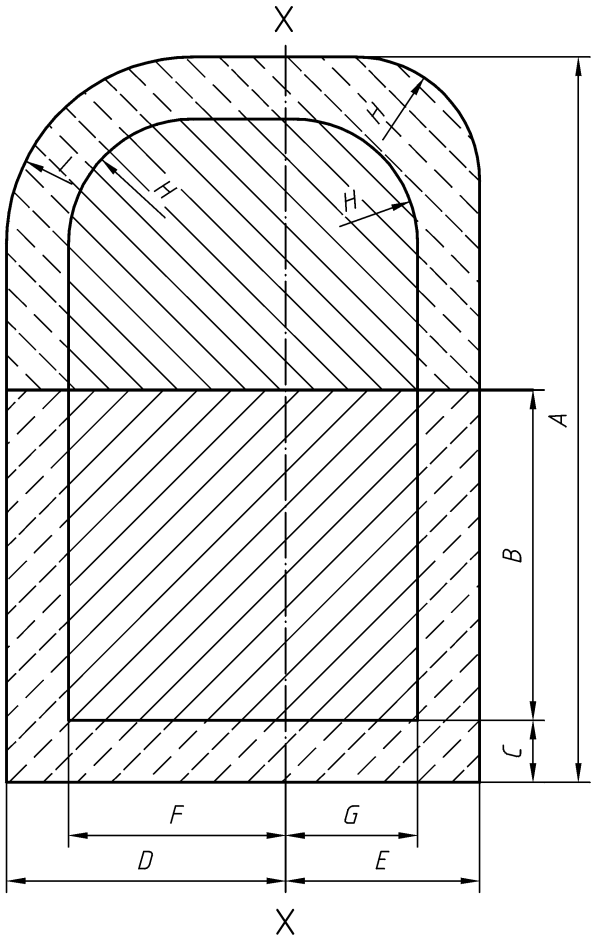
Leg protectors shall provide coverage and protection to the anterior, medial and lateral aspects of the lower leg and knee. Leg protectors may be of symmetrical design with equal protection to the lateral and medial aspects of the leg, or asymmetrical with less lateral aspect protection. Asymmetrical leg protectors shall be marked Left or Right or otherwise identified (see clause 6). Leg protectors that are constructed with separate blocks of padding on the inside surface shall be designed so that when the protector is strapped onto the leg the gaps between these blocks is less than 20 mm. The part of the protector from the lower edge of the shin protection downwards is in zone 0. The minimum dimensions of the zones of protection are given in Table 4 and illustrated in Figure 3, which shows a left leg asymmetrical leg protector. Symmetrical leg protectors shall have the same dimensions both sides of their centre line and these shall be as for the medial side of asymmetrical protectors.

Asymmetrical leg protectors shall have material on their lateral aspect that extends posteriorly for at least 60 mm from the vertical transverse plane of the front surface of the tibia when the leg protector is correctly adjusted to the leg of a subject. This material on the lateral aspect shall meet zone 1 impact requirements (It is not shown in Figure 3). This material may be provided by the outer surface layers of the protector wrapping around the leg, or by material behind the main outer structure wrapping around the leg, or by a block attached to the rear of the outer surface layers, or an equivalent structure that can be expected to keep a ball travelling in the same place as the front of the protector, from getting between the protector and the leg and injuring the tibia or fibula.

Table 4 — Requirements for the dimensions of the zones of protection of leg protectors expressed as a percentage of stature, and also (for information) the values of the dimensions in millimetres for the five nominal sizes

Designation of the dimension	Value of the dimension expressed as a percentage of the user's stature	Value of the dimension in millimetres for each nominal size				
		1	2	3	4	5
A (min.)	28,2	378	429	479	530	581
B (min.)	12,8	172	195	218	241	264
C (max.)	2,4	32	36	41	45	49
D (min.)	10,8	145	164	184	203	222
E (min.)	7,5	101	114	128	141	154
F (min.)	7,5	101	114	128	141	154
G (min.)	4,8	64	72	82	90	98
H (max.)	4,8	64	72	82	90	98
I (max.)	8,8	118	134	150	165	181

The values of dimensions *A*, *B*, *D*, *E*, *F* and *G* are minimum values.
The values of dimensions *C*, *H* and *I* are the maximum values permitted.



Key

2K = Zone 2, knee outer area

2S = Zone 2, shin outer area

3K = Zone 3, knee inner area

3S = Zone 3, shin inner area

XX = line of the protector determined by marking the centre line of the tibia of a subject wearing the protector.

Figure 3 — A plan diagram of the outer surface of a leg protector showing the dimensions of the zones of protection listed in the Table 4

The values of dimensions *A*, *B*, *D*, *E*, *F*, and *G* are minimum values. Dimensions *C*, *H* and *I* are the maximum values permitted; *H* and *I* are the maximum radii of curvature of the corners of the zone of protection.

If the compatible kicker to be worn with the leg protector does not lift the leg protector 40 mm, dimensions *A* and *B* shall be adjusted accordingly. *A* and *B* shall be altered by the difference in lift provided by actual kickers.

("New A" in millimetres = A + 40 mm - actual lift in millimetres).

Manufacturers shall provide information on the dimensions of compatible kickers, see clause 7.

4.4.4 Kickers

Kickers are made in different ways by different manufacturers. The requirements for particular zones of protection lay down the minimum areas to be provided with particular levels of performance, and thus define the areas where lower levels of performance are permitted, they do not prescribe the maximum limits of higher protection. Compliance with the requirements is verified by examination of the distribution of materials in the kicker and impact testing of representative areas.

Kickers are worn with leg protectors: together they provide protection to the foot, the ankle, and the leg to above the knee. Kicker and leg protector constructions need to be compatible if the necessary protection is to be provided. It is not possible to test for such compatibility of a kicker with all possible leg protectors. The information provided by the manufacturer for users, and the marking of the kicker will be examined to ensure that users are enabled to choose compatible products.

Kickers may have four levels of performance in different areas which are defined below:

a) The medial playing surface: This is the area on the inside of the foot and ankle that is used to play the ball.

b) The lateral surface: This is the equivalent area to the above, on the outside of the foot. If the two areas do not have equal performance the kickers shall be marked LEFT or RIGHT, see clause 6, Marking.

c) The toe area: This is the area over the tops of the ends of the toes and the ends of the toes.

d) The basic kicker or outer zone: This is the remaining parts of the kicker not included in any of the above, but excluding the tongue where it would lie in front of, or behind, a leg protector.

The dimensions of the above areas that a kicker shall have are given in Tables 5 and 6 below, and illustrated in Figure 4. The requirements shall be based on the largest size of user the kicker is intended to fit as indicated by the manufacturer as either a stature or a compatible shoe size. The areas are defined on the outside surface of the kicker when it has been opened out flat**.** During examination of the zones of protection of kickers in 5.7.1 and marking of impact test areas in 5.7.1 and 5.9.4, the positions of the skeletal structures to be covered during use shall be taken into account. The exact positions of the medial, lateral and toe zones of protection are not specified with respect to the edges of the product.

The gap between the toe area and the medial and the lateral areas in kickers where these areas are provided with additional thickness, shall not exceed 20 mm at the minimum width when the kickers are adjusted to an approximate playing shape with the medial and lateral surfaces parallel.

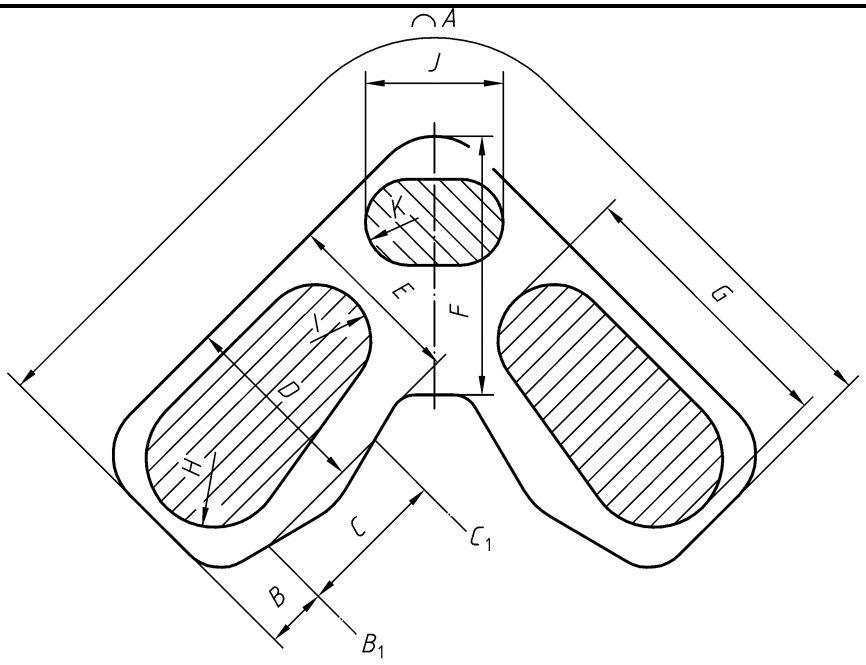
Table 5 — Requirements for the overall dimensions of the zones of protection of kickers expressed as a percentage of stature, and in relation to user's shoe sizes, and also (for information) the values of the dimensions in millimetres for the five nominal sizes

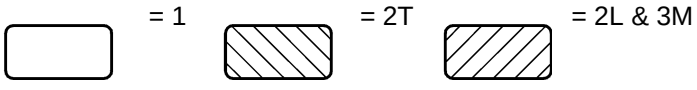
Designation of the dimension	Value of the dimension expressed as a percentage of the user's stature	Value of the dimension in millimetres for each nominal size				
		1	2	3	4	5
A (min.) Outer edge of the kicker	44,1	591	670	750	829	908
B (actual) Distance from the end of the kicker to point B_1	2,9	39	44	49	55	60
C (actual) Distance B_1 to C_1	7,0	94	106	119	132	144
D (min.) Smallest height of kicker between B_1 and C_1	7,5	101	114	128	141	154
E (min.) Smallest height of kicker	7,0	94	106	119	132	144
F (min.) Toe height of kicker	10,6	142	161	180	199	218
Shoe sizes that should be adequately covered by the size of kicker, (Point de Paris)		36, 37	38, 39, 40	41, 42, 43	44, 45	46, 47, 48
The values of dimensions *A*, *D*, *E* and *F* are minimum values. The values of dimensions *B* and *C* are the actual values to be used.						

Table 6 — Requirements for the dimensions of zones of higher protection of kickers expressed as a percentage of stature, and in relation to user's shoe sizes, and also (for information) the values of the dimensions in millimetres for the five nominal sizes

Designation of the dimension	Value of the dimension expressed as a percentage of the user's stature	Value of the dimension in millimetres for each nominal size				
		1	2	3	4	5
G (min.) Length of medial and lateral areas	13,0	174	198	221	244	268
H (min.) Radius of curvature of the posterior ends of the medial and lateral areas	3,2	43	49	54	60	66
I (min.) Radius of curvature of the anterior ends of the medial and lateral areas	2,6	35	40	44	49	54

Table 6 *(continued)*						
J (min.) Width of the toe area	6,4	86	97	109	120	132
K (min.) Radius of curvature of the ends of the toe area	2,0	27	30	34	38	41
Shoe sizes that should be adequately covered by the size of kicker, (Point de Paris)		36, 37	38, 39, 40	41, 42, 43	44, 45	46, 47, 48
The values of dimension *G*, *H*, *I*, *J* and *K* are minimum values.						





Key

1 = Zone 1, outer area

2T = Zone 2, toe area

2L = Zone 2, lateral surface

3M = Zone 3, medial surface

Figure 4 — A plan diagram of the outer surface of a kicker showing the dimensions of the zones of protection listed in Tables 5 and 6. For clarity, the tongue is omitted

4.4.5 Abdominal protectors

Abdominal protectors shall have a zone of protection that is continuous with a compatible genital protector and covers the abdominal surface as high as the waist.

The dimensions of the zone of protection shall be based on the users' waist girth and total crotch length. Nominal sizes are based on five waist girths and on three total crotch lengths for each of these. The total crotch length is assumed to be 70 %, 80 % and 90 % of the waist girth for short, regular and long fittings respectively, for men, and 80 %, 90 % and 100 % of the waist girth for short regular and long fittings for women.

The minimum dimensions of the zones of protection are given in Table 7 and illustrated in Figure 5.

Table 7 — Requirements for the dimensions of the zone of protection of abdominal protectors expressed as a percentage of waist girth, and also (for information) the values of the dimensions in millimetres for the five nominal sizes in short, regular and long fittings, for men and women.

Designation of the dimension			Value of the dimension expressed as a percentage of the user's waist girth	Value of the dimension in millimetres for each nominal size				
				1	2	3	4	5
A (min.) Waist girth	Women & Men	Short Regular Long	28	224	258	291	325	358
B (min.) Centre length	Women	Short	18,4	147	169	191	213	236
		Regular	20,8	166	190	215	240	265
		Long	23,0	184	212	239	267	294
	Men	Short	16,1	129	148	167	187	206
		Regular	18,4	147	169	191	213	236
		Long	20,7	166	190	215	240	294
C (min.) Side length	Women	Short	14,4	115	132	150	167	184
		Regular	16,3	130	149	168	188	207
		Long	18,0	144	166	187	209	230
	Men	Short	11,9	95	109	124	138	152
		Regular	13,6	109	125	141	158	174
		Long	15,3	122	141	159	177	196
The values of dimensions *A*, *B* and *C* are minimum values.								

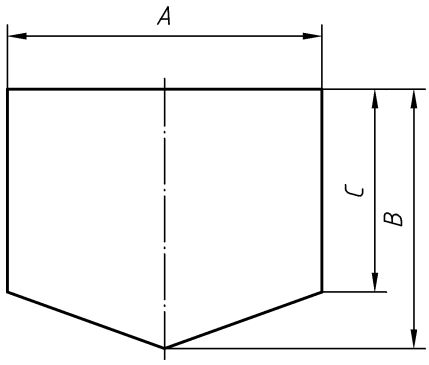
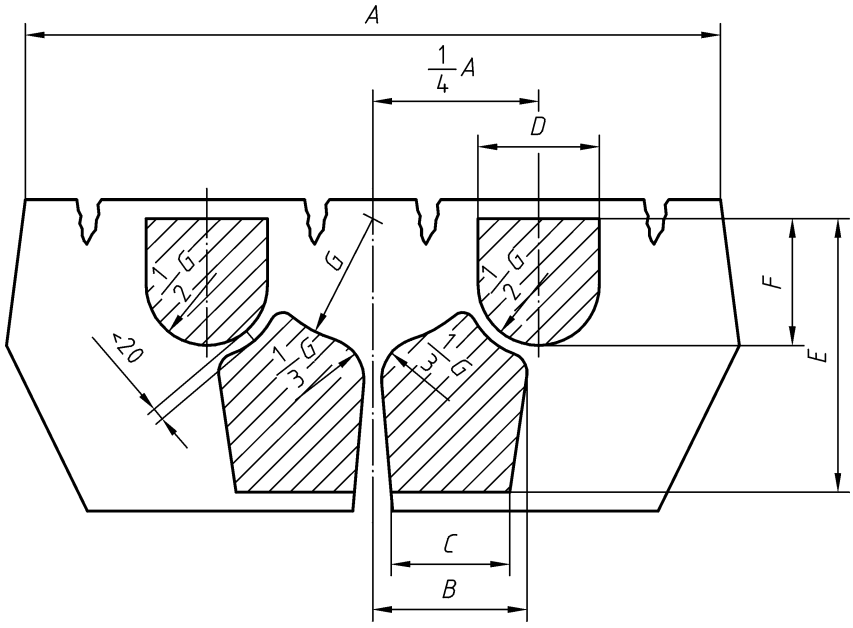


Figure 5 — A plan diagram of the outer surface of an abdominal protector showing the dimensions of the zone protection listed in Table 7

4.4.6 Thigh and hip protectors

Thigh protectors and hip protectors shall have a continuous zone of protection from the waist to just above the knee. The thigh protector shall cover the anterior half of the circumference of the thigh. The hip protector shall cover the hip and upper part of the femur; it shall be continuous with the thigh pad. The protection provided by the hip and thigh pads shall be continuous, but a gap not exceeding 20 mm may exist between the structures. Nominal sizes are based on five waist girths and on three length sizes for each of these. The short fitting shall be 11 % shorter than the regular, and the long fitting shall be 12 % longer than the regular fitting.

The minimum dimensions of the zones of protection are given in Table 8 and illustrated schematically in Figure 6. Dimension *E* shall be measured down the centre front of the thigh, and dimension *F* down the centre of the lateral surface of the hip region. The dimensions shall be measured from the level of the plane of the waist (see 3.3.5) when the product is worn by an appropriate subject.



= 1

Key

1 = zone of protection

Figure 6 — A diagram of a pair of short trousers with thigh and hip protectors showing the dimensions of the zone of protection listed in Table 8

NOTE The trousers are shown opened flat by cuts in the centre back and along the inside leg seam. The waist is shown cut to facilitate the drawing.

Table 8 — Requirements for the dimensions of the zones of protection of thigh and hip protectors expressed as a percentage of waist girth and stature, and also (for information) the values of the dimensions in millimetres for the five nominal sizes and three length fittings

Designation of the dimension		Value of the dimension expressed as a percentage of the user's waist girth or stature		Value of the dimension in millimetres for each nominal size				
		Waist girth	Stature	1	2	3	4	5
A (min.)		94		752	865	978	1090	1203
B (min.)		23,5		188	216	244	272	301
C (min.)		22,5		180	207	234	261	288
D (min.)		18,5		148	170	192	215	237
E (min.)	Short		22,7	304	345	386	427	468
	Regular		25,5	342	388	434	479	525
	Long		28,6	383	435	486	537	589
F (min.)	Short		10,5	141	160	179	197	216
	Regular		11,8	158	179	201	222	243
	Long		13,2	177	201	224	248	272
G (max.)	Short		10,5	141	160	179	197	216
	Regular		11,8	158	179	201	222	243
	Long		13,2	177	201	224	248	272
The values of dimensions *A*, *B*, *C*, *D*, *E* and *F* are minimum values. The values of dimension *G* are the maximum values permitted.								

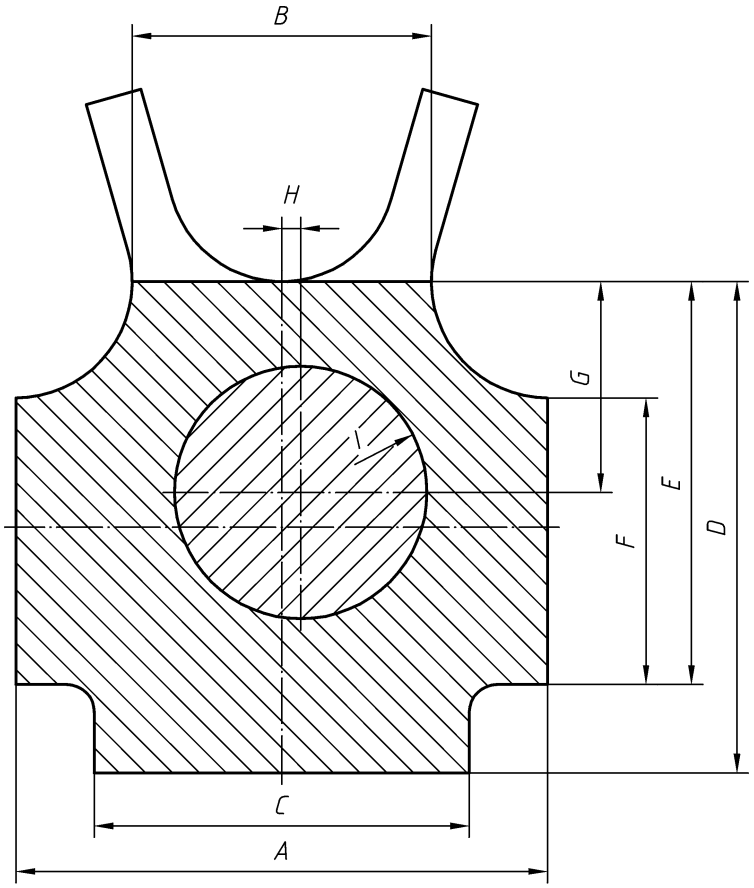
4.4.7 Chest protectors

Chest protectors shall have a zone of protection that covers the anterior of the chest, from the top of the shoulders to just below the waist. There shall be a zone of protection of high performance over at least the heart region. The dimensions of the zones of protection shall be based on the chest or bust girth, and the waist to waist over the shoulder length of the user. Nominal sizes are based on five chest girths and on three length sizes for each of these. The waist to waist length shall be 90 %, 100 % and 110 % of the chest girth for short, regular and long fittings respectively.

The minimum dimensions of the zones of protection are given in Tables 9 and 10 and illustrated in Figure 7. Dimensions *G* and *H* define the centre of the heart area. The remaining dimensions are minimum values.

Table 9 — Requirements for the dimensions of the zones of protection of chest protectors expressed as a percentage of chest girth, and also (for information) the values of the dimensions in millimetres for the five nominal sizes and three length fittings

Designation of the dimension		Value of the dimension expressed as a percentage of the user's chest girth	Value of the dimension in millimetres for each nominal size				
			1	2	3	4	5
A (min.)		39	328	374	421	468	515
B (min.)		21,5	181	206	232	258	284
C (min.)		27,5	231	264	297	330	363
D (min.)	Short	32,4	272	311	350	389	428
	Regular	36,0	302	346	389	432	475
	Long	39,6	333	380	428	475	523
E (min.)	Short	26,6	223	255	287	319	351
	Regular	29,5	248	283	319	354	389
	Long	32,5	273	312	351	390	429
F (min.)	Short	18,9	159	181	204	227	249
	Regular	21,0	176	202	227	252	277
	long	23,1	194	222	249	277	305
G (actual)	Short	13,9	117	133	150	167	183
	Regular	15,5	130	149	167	186	205
	Long	17,0	143	163	184	204	224
H (actual)		1,39	12	13	15	17	18
I (min.)		9,3	78	89	100	112	123
The values of dimensions *A*, *B*, *D*, *E*, *F* and *I* are minimum values. The values of dimensions *G* and *H* are the actual values to be used in determining the centre of the circle radius *I*.							



Key

0 = Zone 0

2 = Zone 2, outer area

3 = Zone 3, heart area

Figure 7 — A plan diagram of the outer surface of a chest protector showing the dimensions of the zones of protection listed in Table 9

4.4.8 Breast protectors

Breast protectors shall have a zone of protection that covers the breast tissue including the axilliary tail. The dimensions of the zone of protection shall be based on the bust girth OR the under girth and brassiere cup size. The nominal sizes in Table 10 are based on bust girth. Breast protectors are intended to be worn with chest protectors or to be part of a chest protector. The information supplied by the manufacture shall make it clear what performance level of chest protector should be worn (see clause 7).

The minimum dimensions of the zone of protection are given in Table 10, and illustrated in Figure 8.

Table 10 — Requirements for the dimensions of the zones of protection of breast protectors expressed as a percentage of bust girth, and also (for information) the values of the dimensions in millimetres for the five nominal sizes

Designation of the dimension	Value of the dimension expressed as a percentage of the user's bust girth	Value of the dimension in millimetres for each nominal size				
		1	2	3	4	5
A (min.)	21,0	176	202	227	252	277
B (min.)	17,6	147	168	189	210	231
C (min.)	6,5	55	62	70	78	86
D (min.)	9,2	77	88	99	110	121
E (min.)	5,0	42	48	54	60	66
F (min.)	4,6	39	44	50	55	61
The values of dimensions *A*, *B*, *C*, *D*, *E* and *F* are minimum values.						

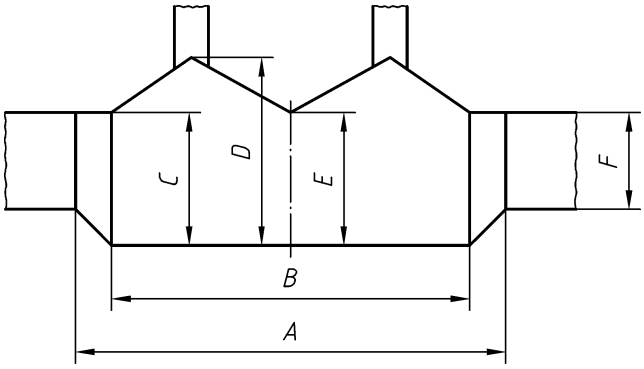


Figure 8 — A plan diagram of the outer surface of a breast protector designed to be worn under a chest protector. The dimensions of the zones are listed in Table 10

NOTE Restraint straps are indicated in sketch form only.

4.4.9 Shoulder, upper arm, elbow and forearm protectors attached to a jacket or sleeves

Shoulder, upper arm, elbow and forearm protectors shall have zones of protection that cover the top of the shoulder, the point of the shoulder, the upper arm, the elbow and the forearm with the exception of the inner elbow and the medial surface of the upper arm. Figure 9 illustrates a garment providing this coverage.

NOTE The protectors are normally in the form of a short jacket, or sleeves joined across the chest and back. Loose protectors may be attached to a suitable garment for assessing their coverage. It is intended that products conforming to this standard should provide the following coverage when worn:

a) A circular area on the point of the shoulder with a radius greater than one third of the circumference of the shoulder taken through the armpit in a vertical plane;

b) An area on the top, anterior and posterior of the shoulder towards the neck, extending down the chest and back at least as far as the shoulder point protection in (a);

c) An area covering at least the outer three quarters of the circumference of the of the upper arm;

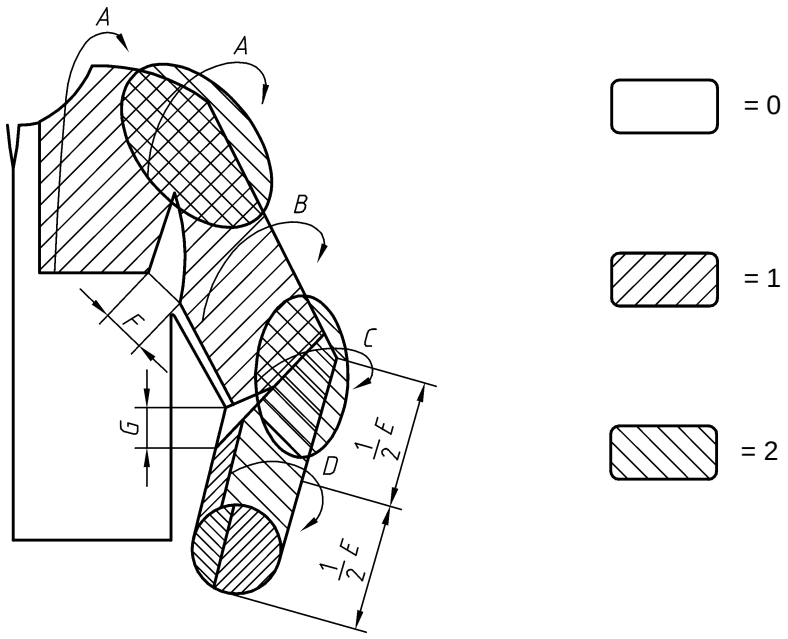
d) A circular area surrounding the elbow with a radius greater than three eighths of the circumference of this arm at the elbow;

e) An area surrounding the whole forearm. The outer half of the circumference having a high level of protection similar to that in (a) and (d) above. The forearm protection should overlap with that provided by the hand protectors or gloves.

The parts of the protectors shall have the dimensions given in Table 11 and illustrated in Figure 9. Protection shall be continuous between the parts. The protectors shall be marked up for examination and testing as described in 5.1.1 except that ”hard cap stand-off” designs that provide a protected volume shall be marked first on their insides according to the dimensions in Table 11, and the test areas shall then be marked on their outsides by projection of these dimensions through the product normal to the outer surface.

Table 11 — Requirements for the dimensions of the zones of protection of shoulder, upper arm, elbow and forearm protectors expressed as a percentage of stature, and also (for information) the values of the dimensions in millimetres for the five nominal sizes

Designation of the dimension	Value of the dimension expressed as a percentage of the user's stature	Value of the dimension in millimetres for each nominal size				
		1	2	3	4	5
A (min.)	19,4	260	295	330	365	400
B (min.)	17,6	236	268	299	331	363
C (min.)	12,9	173	196	219	243	266
D (min.)	8,2	110	125	139	154	169
E (min.)	12,9	173	196	219	243	266
F (max.)	8,8	118	134	150	165	181
G (max.)	5,9	79	90	100	111	122
The values of dimensions *A*, *B*, *C*, *D* and *E* are minimum values. The values of dimensions *F* and *G* are maximum values.						



Key

0 = Zone 0

1 = Zone 1

2 = Zone 2

Figure 9 — A sketch of a garment containing shoulder, upper arm, elbow and forearm protection with the designated dimensions shown (see Table 11)

4.4.10 Elbow and forearm protectors as separate item(s) not attached to a jacket

Elbow and forearm protectors shall have continuous zone of protection that covers the outer surfaces of the forearm and the elbow with the minimum dimensions given in Table 12 and illustrated in Figure 10.Table 12 — Requirements for the dimensions of the zones of protection of elbow and forearm protectors expressed as a percentage of stature, and also (for information) the values of the dimensions in millimetres for the five nominal sizes

Designation of the dimension	Value of the dimension expressed as a percentage of the user's stature	Value of the dimension in millimetres for each nominal size				
		1	2	3	4	5
A (min.)	6,4	86	97	109	120	132
B (min.)	8,8	118	134	150	165	181
C (min.)	7,0	94	106	119	132	144
D (min.)	12,9	173	196	219	243	266
The values of dimensions *A*, *B*, *C* and *D* are minimum values.						

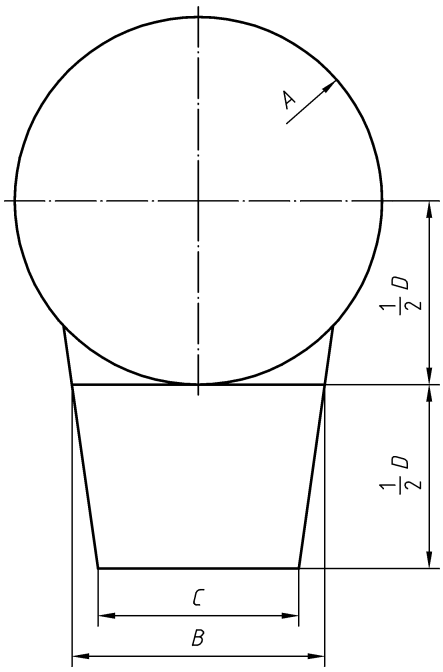


Figure 10 — A plan diagram of the outer surface of an elbow and forearm protector showing the dimensions of the zone of protection listed in Table 13

4.4.11 Goal-keepers' gloves

Figures 11 and 12 illustrate a pair of padded goal-keepers' gloves for a right-handed player. The outline projections of the hands are shown within them. The zones of protection are shown on the diagrams. Goal-keepers' gloves shall be provided with material in the zones of protection that provide protection to at least the areas of the hand, wrist, and forearm of users wearing conventional gloves, as illustrated in Figures 11 and 12, or as described below for less conventional gloves. Table 13 contains the minimum values of dimensions of protective materials for Performance Level 4 conventional gloves of sizes 5 to 10. Table 14 contains the corrections that apply to these dimensions for gloves of Performance Levels 1 to 3 and 5. Other sizes shall be scaled in proportion with the values in the tables.

Protective material shall be provided in the gloves to meet the impact requirements in 4.6, for the zones of protection in the areas shown in Figures 11 and 12. The assessment of the areas of protection shall be carried out as described in 5.7.

4.4.12 Goal-keepers' hand protectors

All enclosing hand protectors for goal keepers shall provide protection equal to or higher in performance than that in conventional gloves. The protection shall extend to at least the length ***F*** in Table 13 above the wrist line.

Protective material shall be provided so that the performance requirements are met as follows:

Left hand

Zone 1 The back of the hand and wrist.

Zone 2 The lateral and medial aspects of the wrist.

Zone 3 The palm and palmar aspect of the wrist, the ends of all the digits, the sides of the palm, and the outer aspects of digits 1, 2 and 5.

Right hand

Zone 0 Inside the closed hand on the stick.

Zone 1 The lateral and posterior aspects of the wrist.

Zone 2 The palmar and medial aspects of the wrist and the proximal half of the back of the hand.

Zone 3 The ends of all the digits, the backs of digits 2 to 5 to proximal to the knuckles (zone 2) and digit 1 to the second joint, and the outer aspects of digits 2 to 5.

Table 13 — Requirements for the dimensions of the zones of protection in goal-keepers' right-hand or stick gloves, and left-hand or flat gloves, in millimetres for particular glove sizes

Designation of the dimension	Values of dimensions of zones of protection in gloves of sizes 5 to 10, in millimetres					
	5	6	7	8	9	10
A (min.)	298	313	328	344	360	376
B (min.)	258	263	268	274	280	286
C (min.)	186	189	192	196	200	204
D (max.)	48	50	52	54	56	58
E (min.)	210	217	224	232	240	248
F (min.)	258	267	276	286	296	306
The values of dimensions *A*, *B*, *C*, *E* and *F* are minimum values. The values of dimension *D* are the maximum values permitted.						

Table 14 — Corrections to be applied to the values of the dimensions given in Table 13 for gloves of Performance Levels 1 to 3 and 5

Dimension	Values of the corrections to values of dimensions for gloves of Performance Levels 1 to 3 and 5, millimetres			
	1	2	3	5
A	-12	-8	-4	+4
B	-12	-8	-4	+4
C	-10	-7	-3	+3
D	No alteration			
E	-12	-8	-4	+4
F	-12	-8	-4	+4

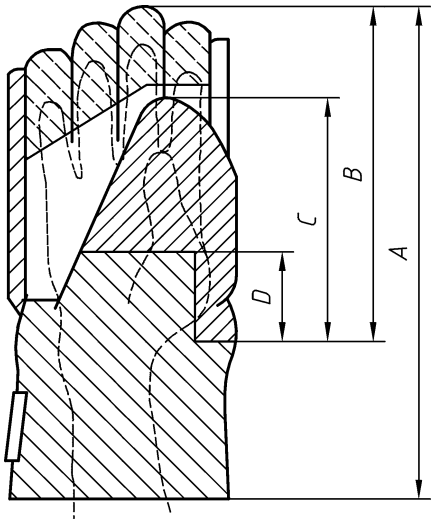


Figure 11a - Front

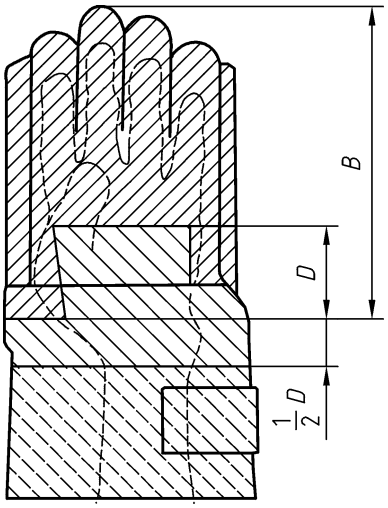


Figure 11b - Back

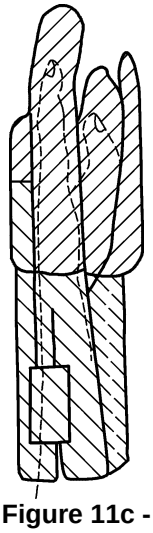


Figure 11c - Digit 5 side

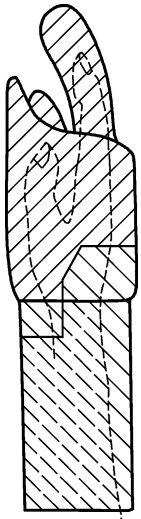


Figure 11d - Digit 1 side

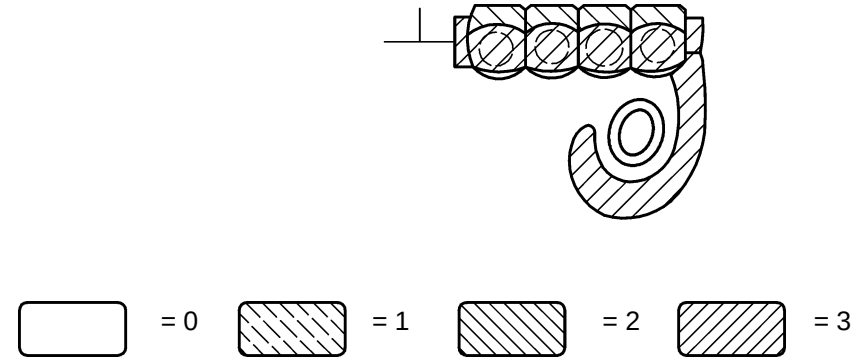


Figure 11e - End view digits

Key 0 = Zone 0, on the palm inside the grip on the stick

1 = Zone 1

2 = Zone 2

3 = Zone 3

Figure 11 — Hockey goal-keeper's right hand, or stick glove

NOTE A five digit glove is shown. Some designs are mitten (two digit) or fully hand enclosing in a single structure. A hand outline is shown inside the glove. The four levels of zones of protection are shown.

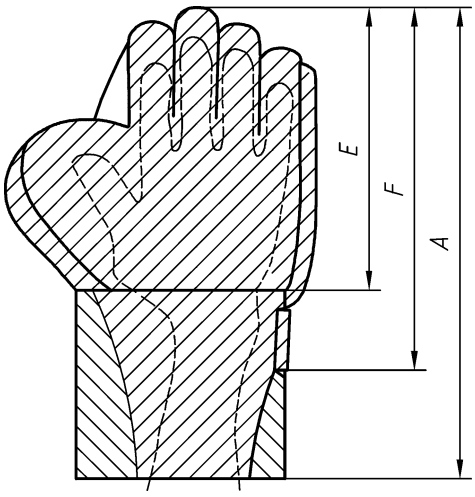


Figure 12a - Front

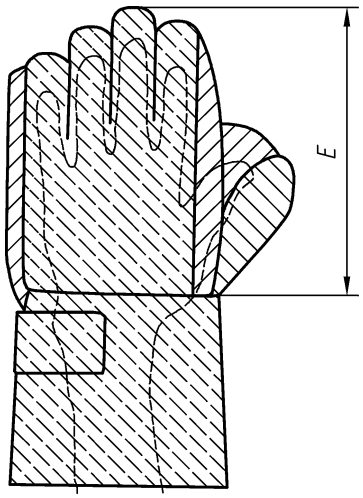


Figure 12b - Back

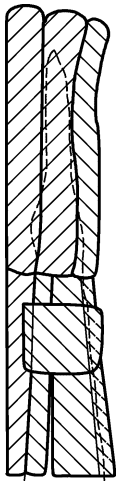


Figure 12c - Digit 5 side

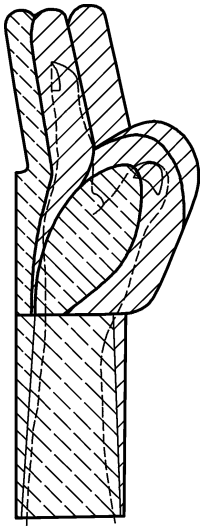


Figure 12d - Digit 1 side

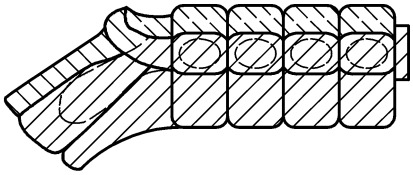


Figure 12e - End view digits

Key **1** = Zone 1

2 = Zone 2

3 = Zone 3

Figure 12 — Hockey goal-keeper's left hand, or flat glove

NOTE A five digit glove is shown. Some designs are mitten (two digit). A hand outline is shown inside the glove. Four levels of zones of protection are shown.

4.4.13 Hard genital protectors

Hard genital protectors shall have dimensions greater than the values given in Table 1 for the sizes marked on the protectors. The structure protecting a space of these dimensions shall be resistant to impact when tested in accordance with 5.9.2 and 5.9.4.

4.4.14 Soft genital protectors

Soft genital protectors for women shall have a zone of protection that is approximately triangular in shape. It shall have the minimum dimensions given in Table 15 and shown in Figure 13. Normally the protectors will be soft and flexible and be extended into a narrow tail designed to pass backwards between the legs.

Table 15 — Requirements for the dimensions of the zones of protection of soft genital protectors expressed as a percentage of waist girth, and also (for information) the values of the dimensions in millimetres for the five nominal sizes

Designation of the dimension	Value of the dimension expressed as a percentage of the user's waist girth	Value of the dimension in millimetres for each nominal size				
		1	2	3	4	5
A (min.)	14,0	112	129	146	162	179
B (min.)	18,8	150	173	196	218	241
C (min.)	4,7	38	43	49	55	60
The values of dimensions *A*, *B* and *C* are minimum values.						

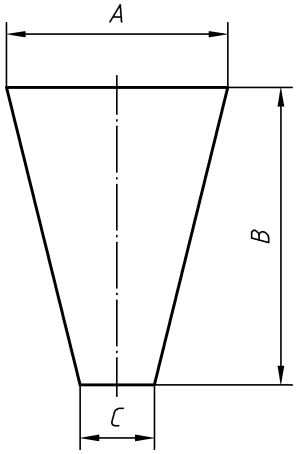


Figure 13 - A plan diagram of the outer surface of a soft genital protector showing the dimensions of the zone of protection listed in Table 15

4.5 Restraint requirements

Hockey players' protective equipment shall be designed so that it should remain in place during normal play and during impacts. This restraint can be achieved using integral straps with buckles, touch and close fasteners, separate 'harness' or other items of protective equipment or clothing. The manufacturer shall give details of how adequate restraint of the equipment may be achieved in the Information supplied by the manufacturer, see clause 7.

The restraint systems for the protective equipment shall be assessed as described in section 5.8. The reference dimension for assessment is the width or length of the outer or complete protective zone measured in line with the direction of the applied test force. The equipment shall not be displaced by more than **X** % of the protective zone dimension, when the test force is applied and shall return to within **Y** % of its initial position when the force is removed. The forces to be resisted are given in Table 16, together with the values of **X** and **Y**.

Table 16 — The test forces to be resisted by the restraint systems of hockey players' protective equipment in Newton

Item	% Movement		Test force for products of particular performance levels, Newton				
	X	Y	1	2	3	4	5
Shin protector	15	5,0	15	15	30	30	30
Leg protector	15	5,0	30	40	50	50	50
Kicker	25	8,3	30	40	50	50	50
Abdominal protector	15	5,0	15	30	30	30	30
Thigh and hip protectors	25	8,3	15	30	30	30	30
Chest protector	15	5,0	15	30	30	30	30
Breast protector	15	5,0	15	15	15	15	15
Elbow and forearm protectors	25	8,3	15	30	30	30	30
Shoulder protectors	25	8,3	15	30	30	30	30
Upper arm protectors	25	8,3	15	30	30	30	30
Goal-keepers gloves	25	8,3	10	10	25	25	25
Soft genital protectors	50	25	15	15	15	15	15
Hard genital protectors	50	25	5	10	-	-	-

4.6 Impact performance requirements (excluding hard genital protectors)

Hockey players' protective equipment shall provide some protection from hockey ball impacts. For each item of equipment tested, as described in 5.9 and 5.10 with impacts of the energies given in Table 17, the mean of the peak force measurements made shall be less than the values given in Table 17, and no single value shall exceed the value in Table 17 by more than 50 %.

Table 17 — Impact energies for testing zones of protection on hockey players' protective equipment and the maximum permitted transmitted forces

Item of equipment and zone of protection		Maximum transmitted force, kN	Impact energies to be used to test different performance levels of equipment, Joules				
			Level 1	Level 2	Level 3	Level 4	Level 5
Shin protectors:	Zone 1, ankle area	3	-	3	6	9	12
	Zone 2, outer area	5	4	8	11	14	17
	Zone 3, central area	5	5	10	15	20	25
Leg protectors:	Zone 1, lateral aspect	5	3	6	9	12	15
	Zone 2, outer shin area	5	8	15	20	25	30
	Zone 3, inner shin area	5	15	30	40	50	60
	Zone 2, outer knee area	6	8	15	20	25	30
	Zone 3, inner knee area	6	15	30	40	50	60
Kickers:	Zone 1, outer area	3	10	10	10	14	20
	Zone 2, toe area	3	10	10	15	21	30
	Zone 2, lateral surface	3	10	10	15	21	30
	Zone 3, medial surface	3	10	15	25	35	50
Abdominal protectors		4	8	11	14	17	20
Thigh protectors		4	8	11	14	17	20
Hip protectors		4	7,5	15	25	30	35
Chest protectors:	Zone 2, outer area	4	-	5	10	15	20
	Zone 3, heart area	4	5	20	30	40	50
Breast protector with a chest protector of the same or a higher performance level		2	5	20	30	40	50
Shoulder protectors:	Zone 1	6	3	6	9	12	15
	Zone 2	6	8	11	14	17	20
Upper arm protectors		5	8	11	14	17	20
Elbow protectors		4	3	6	9	12	15
Forearm protectors:	Zone 1	4	3	6	9	12	15
	Zone 2	4	8	11	14	17	20
Goal-keepers gloves:	Zone 1 left hand	3	5	5	6	8	10
	Zone 1, right hand	3	5	6	8	10	12
	Zone 2, left hand	3	5	7,5	10	12	15
	Zone 2, right hand	3	5	7,5	10	12	15
	Zone 3, left hand	3	7,5	10	12	15	20
	Zone 3, right hand	3	15	20	30	35	35
	Zone 3, digit ends	2	15	20	20	25	25
Soft genital protectors		3	5	10	15	20	25

4.7 Impact performance requirements for hard genital protectors

Hard genital protectors shall be tested as described in 5.9.2 and 5.9.4. The requirements for genital protectors are that they do not shatter or crack during the test, that the rubber is not perforated, and that the internal depth does not fall by more than 5mm below the minimum value of dimension *A* in Table 1 during the test. Impact energies are given in Table 18.

Table 18 — Impact energies for testing zones of protection on genital protectors in Joules

Performance level	1	2
Impact energy (J)	15	25

5 Test methods and procedures

5.1 General

Measuring instruments unless otherwise specified shall be an error limit of ± 2 % of the pass/fail level of the characteristic being measured.

For each of the required sequences of measurements performed in accordance with this standard a corresponding estimate of the uncertainty of the final result shall be determined. This uncertainty (*U*m) shall be given in the test report in the form *U*m = ± X. It shall be used in determining whether a "Pass" performance has been achieved. If the final result minus *U*m is below the pass level when the requirement that a certain value shall be exceeded, the sample shall be deemed to have failed.

5.2 Products for testing

Test items shall be supplied by manufacturers complete with labels and the Information supplied by the manufacturer (see clause 7) that will be supplied with the products. At least one specimen of each size shall be supplied except that in cases where the available size range exceeds five sizes, only five examples representing the whole size range are required. The total minimum numbers of different products to be supplied are listed in Table 19. However, more may be required by the test house to complete the examinations, and this shall be agreed between the supplier and test house. The manufacturer shall state the performance level to which the product shall be tested, or supply one additional example of the product for survey testing to establish the appropriate performance level as described in 3.1.3 and annex B, at which to test the products.

Table 19 — Minimum numbers of specimens to be supplied for testing

Product	Minimum number to be supplied for testing.
Shin protectors	4 (or 2 pairs)
Leg protectors	4 (or 2 pairs)
Kickers	4 (or 2 pairs)
Abdominal protectors	2
Thigh and hip protectors	4 (or 2 pairs)
Chest protectors	2
Breast protectors	2
Elbow and forearm protectors	4 (or 2 pairs)
Shoulder and upper arm protectors	4 (or 2 pairs)
Goal keeper's gloves	3 left and 3 right (or 3 pairs)
Soft genital protectors	4
Hard genital protectors	4 of each size

Each test item shall be inspected to verify that it is as described by the manufacturer and to determine its basic construction. Any areas that appear to be of reduced performance shall be marked for subsequent testing.

5.3 Conditioning of products

Products shall be cleaned five times by the method(s) specified in the Information supplied by the manufacturer (see clause 7) except that this shall not be required where only trivial surface cleaning treatments are recommended or the impact attenuating materials are excluded from the cleaning processes.

The products shall be hung in an atmosphere of (20 ± 2) °C and (65 ± 5) % humidity for at least 48 hours before testing. Testing shall be carried out in the conditioning environment or within 10 minutes of removal from that environment. Products specified to be usable at high ambient temperatures shall also be conditioned at (30 ± 2) °C for at least 48 hours before impact testing according to 5.10.

5.4 Innocuousness

The product shall be examined visually and by hand to locate any hard or sharp edges, seams, buckles, or other items that might injure the user or another player during normal use. Documents supplied by the manufacturer shall be examined to determine whether the claim that the materials are suitable for use in field hockey protective clothing and equipment is justified. Testing to ensure that the requirement is met shall be carried out if the documents examined are not adequate. The Information supplied by the manufacturer (see clause 7) shall be examined for a list of substances used in the main components of the product. The results of the examination shall be recorded in the test report.

5.5 Ergonomic testing

The product shall be examined with the assistance of a hockey player with at least three years experience of playing at a senior level. The assistant shall be a field player or goal keeper as appropriate, and shall be of the appropriate sex. For assessing children's sizes of products and "mini hockey" products, the assistant shall have had experience coaching or refereeing these games, rather than necessarily playing. The results of manufacturers' user trials and development studies that will be included in the Technical File may be taken into account.

The product shall be assessed as to whether it is adequately comfortable and permits all normal playing movements. The restraint and adjustment systems shall be examined to determine whether the product is likely to become

displaced in normal playing. The Information supplied by the manufacturer (see clause 7) shall be examined to determine whether adequate instruction for selection and adjustment of the product are given. The assistant shall report on whether there are any apparent hazards in using the equipment, such as for example a risk to the user of being tripped up by the equipment.

The product may be used in hockey training or games to complete the ergonomic examination, but only after the level of performance of the product has been determined in the mechanical tests. Only new undamaged products shall be used in training or games, which shall be at a level appropriate for the product.

The results of the examination shall be recorded in the test report.

5.6 Sizing

The dimensions of the product, restraint systems and adjustments, shall be measured with appropriate tape measures or other devices accurate to within 1 % of the dimension being measured. The results shall be compared with the calculated values for the dimensions determined from the requirements in 4.3 and 4.4, for the largest intended user indicated in the information supplied by the manufacturer. The size marked on the product and details in the Information supplied by the manufacturer (see clause 7) shall be examined to determine whether the product corresponds to the marking and to the information given. The results of the examination shall be recorded in the test report.

5.7 Examination of zones of protection

5.7.1 Protectors other than hard genital protectors

The products shall be marked on their outer surfaces with the minimum required dimensions of the zones of protection determined in accordance with 5.6. If necessary the product shall be put on by a subject so that anatomical landmarks such as the centre of the shin bone, or the ends and tops of the toes, can be marked on it. The examiner shall consider whether the three dimensional shape of the product, the thickness of the product or the change in its shape when strapped onto a player, causes the positioning or size of the markings of the zones of protection to be inappropriate. The examiner shall scale or modify the dimensions so as not to unreasonably reject a satisfactory product, or to accept one with possibly inadequate performance. Details of any modifications shall be included in the Test Report with reasons for the modification. The products shall be examined to determine whether their construction appears to provide protection throughout the minimum zones. The performance of the protection overall, and of any particular areas noted in this examination that may have a lower performance, are tested according to the methods given in 5.9. Goal-keepers' gloves shall be examined to determine whether protection is provided over the aspects and areas of the hands shown in Figures 11 and 12. Examination shall be visual or by manipulation to check that the appropriate minimum class of protection (zone 1 to zone 3) would be provided to an aspect of the hand in impacts that are normal to a particular point on the surface of the glove and are directed towards that part of the hand. The right or stick-holding glove shall be assessed on a subject holding a cylindrical object (35 ± 2) mm in diameter firmly in the position of a hockey stick. The Information supplied by the manufacturer (see clause 7) shall be examined to assess whether the dimensions of the zones of protection given therein correspond to the construction of the products.

The results of the examination shall be recorded in the test report.

5.7.2 Measurement of the linear dimensions and the protected volume provided by hard genital protectors

The principle of this measurement is to determine the protected volume of hard genital protectors when they are pressed firmly against the pubic bones. Determine from examination of the protector which part would bear on the pubic bones in normal use. Mark the bearing area, with two marks 50 mm apart, see Figure 1a, 1b and 1c. Place the protector against a half cylinder or cylinder of hard material with a radius of curvature of (100 ± 1) mm. If the marked bearing area is not in contact with the cylinder, trim away parts of the protector until it is in contact. The greater part trimmed away should be from the inferior end, see Figure 1a, 1b and 1c.

Measure to the nearest millimetre the internal depth, the internal length (around the curvature of the cylinder), and the maximum internal width of the protector while it is in contact with the cylinder. It may be found convenient to trace the outline of the protector on the cylinder and to allow for its wall thickness. Measure the protected volume of the protector to the nearest millilitre, by filling the space between the protector and the cylinder with soft modelling clay, or with a powder such as sand, and then weighing the filling material or measuring its volume in a measuring cylinder.

The values obtained shall be recorded in the test report, together with the results of a comparison of the values with the size marked on the protector, see Table 1 in 4.3.1, and details in the Information supplied by the manufacturer (see clause 7). The vertical centre line on the outer surface of the protector shall be marked as a guide for impact testing. If the genital protector is included in an abdominal protector or other garment, the surface of this garment overlying the impact test area shall be marked.

5.8 Restraint testing

The product shall be attached to a dummy or to a model body part, or shall be put on by a subject. The dummy or subject shall have dimensions within those specified by the manufacturer for users of the product. The product shall be restrained, and adjusted according to the Information supplied by the manufacturer (see clause 7).

A spring balance, force gauge, or other suitable device shall be attached once in turn to each specified point on the product, and the test force given in 4.5, Table 16 applied tangential to the surface of the product at the point of attachment, or if this is impractical, parallel to the body surface or to the plane of the tangent to the body surface beneath the test point. The specified points for testing, and the directions in which forces are to be applied, are shown in Figures 14a to 14l.

The force shall be maintained for at least 30 seconds and then released. The movements of the product when the force is applied, and when it is removed, shall normally be measured to a tolerance of 5 % of the maximum permitted displacements. If the movement is less than 75 %, or greater than 150 % of the permitted maximum movement, this fact may be recorded instead of a precise measurement. Between measurements, the position of the product and the adjustment of the restraint systems shall be corrected.

The results of this testing shall be recorded in the test report.

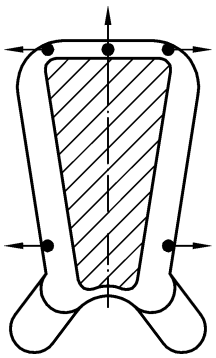


Figure 14a

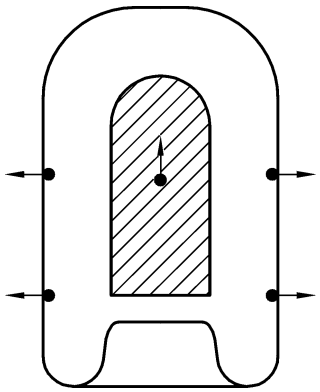


Figure 14b

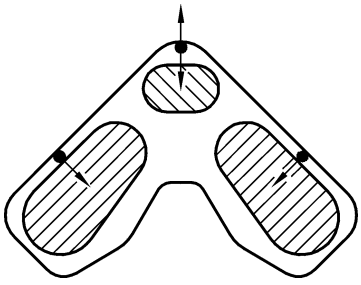


Figure 14c

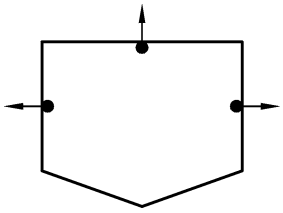


Figure 14d

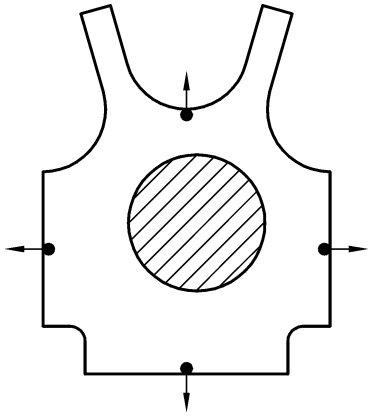


Figure 14e

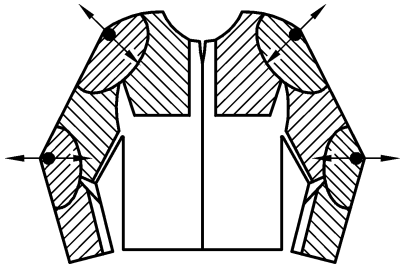


Figure 14f

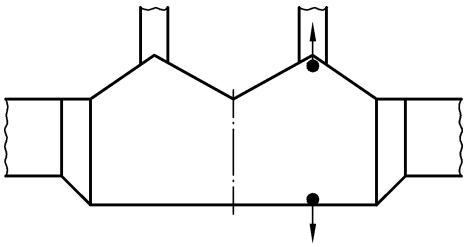


Figure 14g

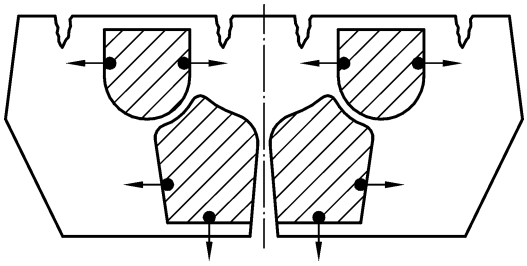


Figure 14h

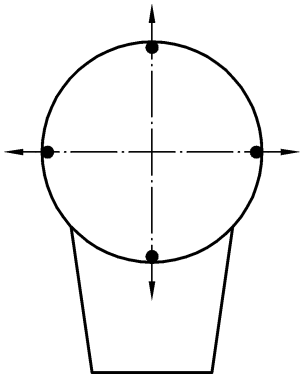


Figure 14i

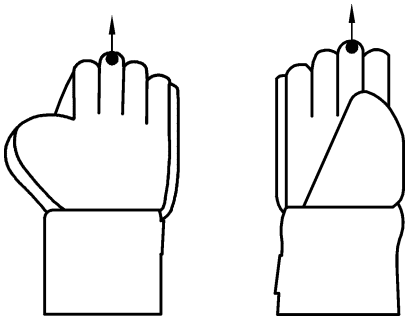


Figure 14j

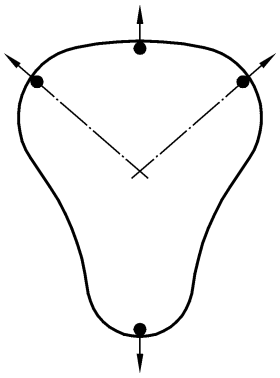


Figure 14k

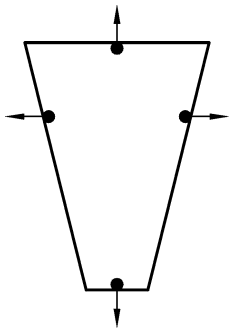


Figure 14l

Figure 14a Shin protector
Figure 14b Leg protector
Figure 14c Kicker
Figure 14d Abdominal protector
Figure 14e Chest protector
Figure 14f Elbow and forearm protector
Figure 14g Breast protector
Figure 14h Thigh and hip protector
Figure 14i Shoulder guard and upper arm protectors
Figure 14j Gloves, left and right
Figure 14k Hard genital protectors
Figure 14l Soft genital protectors

Figure 14 - The points of attachment of clamps and the direction of the force to be applied in restraint testing

5.9 Impact testing

5.9.1 Products other than hard genital protectors

Field hockey protective equipment shall be impact-tested with a falling mass in a vertical guidance system that allows the terminal velocity of the falling mass to be measured and to be within ± 2 % of the required velocity. For equipment with the exception of hip protectors the total mass shall be (2 500 ± 100) g including a hockey ball shaped hemispherical steel striker (72 ± 2) mm in diameter. Hip protectors shall be impacted with a flat face impactor (80 ± 1) mm in diameter on a falling mass of (5 000 ± 100) g.

The drop heights of the masses above the top surface of the protective equipment being tested shall be adjusted so that the impact velocities provide impact energies as specified in 4.6, Table 17, with a tolerance of ± 5 %.

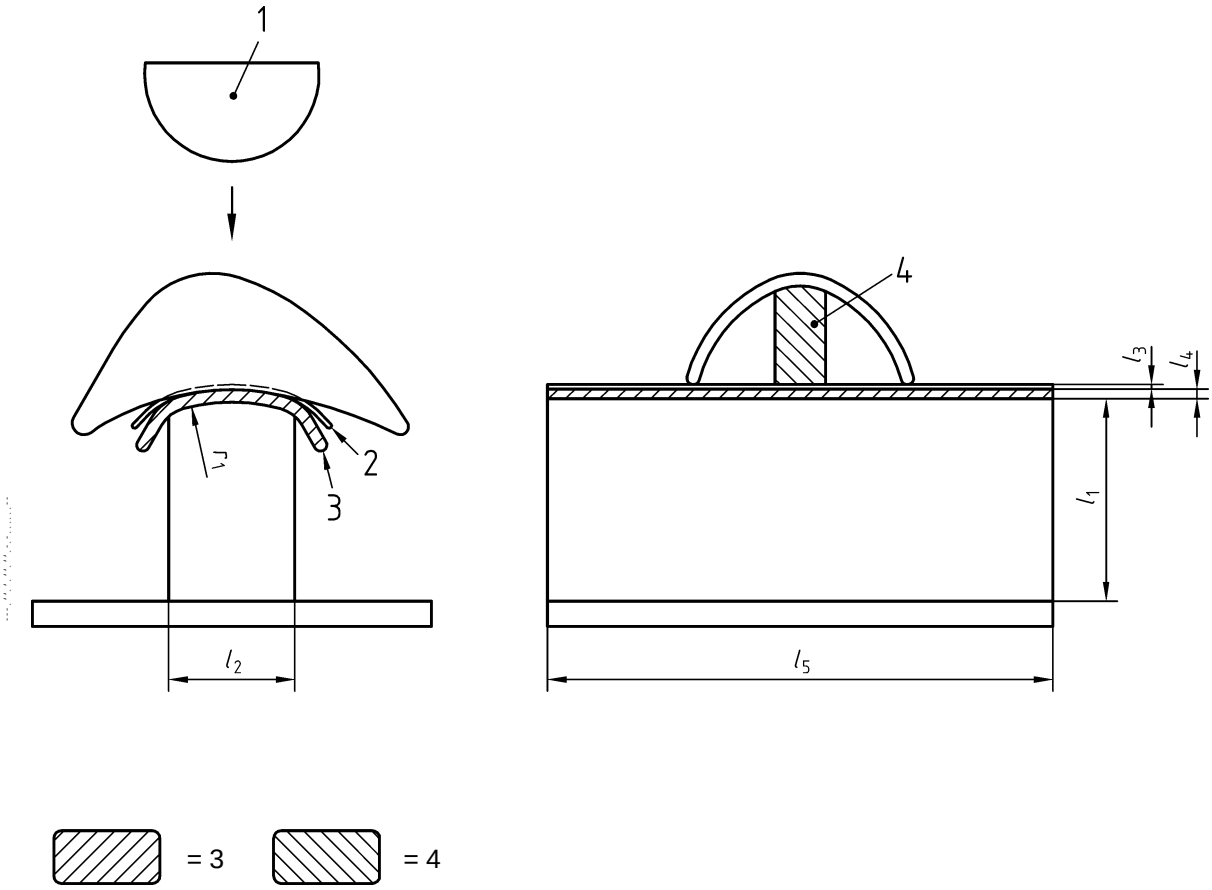
The different anvils and the guard ring system specified below are designed to represent the profiles of body parts and, in part, their responses to impact. Each anvil shall be mounted directly onto a stiff load cell or force transducer, such as a piezo-electric load cell. The frequency response of the load transducer shall be at least 10 kHz. The anvil and load cell shall be bolted or clamped to a concrete or similar massive base of at least 1 000 kg. The anvils shall be made of steel and the mass above the load cell shall be (10 ± 1,5) kg for anvils B, C, D, & E in 5.9.3 and (7 ± 1,0) kg for anvil A.

The recording system shall show a continuous force with time, or shall have a peak force detection capability. Sampling systems shall have a minimum rate of 10 kHz. The complete system shall be able to measure forces up to 50 kN with an accuracy of 0,1 kN between 1 kN and 10 kN.

5.9.2 Hard genital protectors

Genital protectors shall be impact tested with a striker made of steel and mounted on a guided falling mass as specified in 5.9.1. The total mass shall be (2 500 ± 100) g. The drop height above the top surface of the genital protector being tested shall be adjusted so that the impact velocity provides an impact energy as specified in 4.7, Table 18, with an accuracy of 5 %.

The anvil shall consist of a horizontal steel bar at least 200 mm long and (50 ± 2) mm wide, and with a top profile with a radius of (80 ± 2) mm. The anvil shall be not less than 80 mm high. The anvil shall be positioned so that the striker would hit the top centre of the anvil. A system of straps or clamps shall be provided to hold the protector in place during impact. The system shall not prevent the protector distorting under impact. The anvil shall be covered in a layer of Plasticine type modelling clay (5 ± 1) mm thick, with a natural rubber membrane (0,6 ± 0,05) mm thick on top of it. A system shall be provided that enables a measurement to be made of the minimum internal height of the protector during an impact to a tolerance of ± 2 mm. A cylinder of inelastic modelling clay approximately 20 mm in diameter inside the protector under the point of impact has been found to be satisfactory. Figures 15a and 15b illustrate the design of the apparatus.



a End view showing a protector on the anvil.
b A longitudinal section view.

Key
1 Striker
2 Rubber membrane
3 Modelling clay sheet
4 Modelling clay cylinder

l_1 = ≥ 80 mm
l_2 = (50 ± 2) mm
l_3 = (0,6 ± 0,05) mm (rubber membrane)
l_4 = (5 ± 1) mm (plastic modelling clay)
l_5 = ≥ 200 mm
r_1 = (80 ± 20) mm

Figure 15 — Principle of the design of the genital (pelvic) anvil

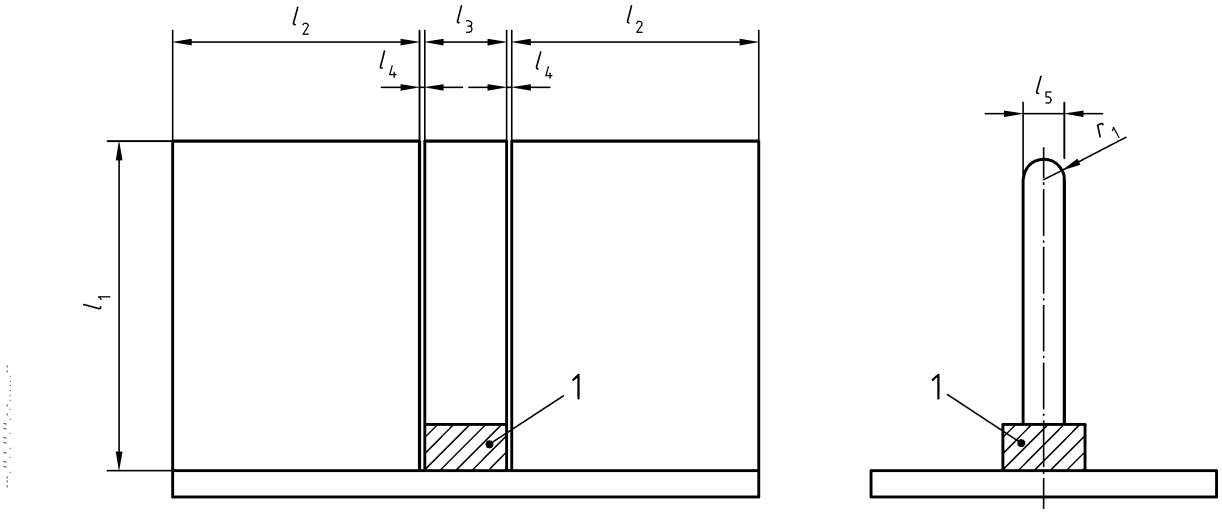
5.9.3 Anvils

5.9.3.1 Anvil A for testing products covering the lower leg, the forearm, the upper arm, the sides of the fingers and palms, or the digit ends

Anvil **A** shall consist of two vertical steel plates, (25 ± 0,5) mm thick and 200 mm in height, attached to a flat base securely bolted or clamped to a concrete or similar base of at least 1 000 kg in accordance with Figure 16. The top edge of the plates shall be round with a radius of (12,5 ± 0,25) mm. A third, similar plate, (50 ± 1) mm wide, shall be

mounted vertically on a load cell or force transducer bolted to the flat base, between and in line with the other steel plates mounted on the base (see Figure 16). The space between the steel plates shall be (1 ± 0,5) mm. The tops of the plates shall all be at the same level (± 1 mm).

The anvil shall be positioned so that the hemispherical striker would hit the centre of the free section mounted on the load cell with a limit deviation of ± 2 mm. The anvil shall be provided with a clamping system for securing test specimens. A system of elastic straps, exerting a force of 5 N to 10 N, has been found suitable.



Key **1** Load cell or force transducer

l_1 = ≥ 200 mm
l_2 = ≥ 150 mm
l_3 = (50 ± 1) mm
l_4 = (1 ± 0,5) mm
l_5 = (25 ± 0,5) mm
r_1 = (12,5 ± 0,25) mm

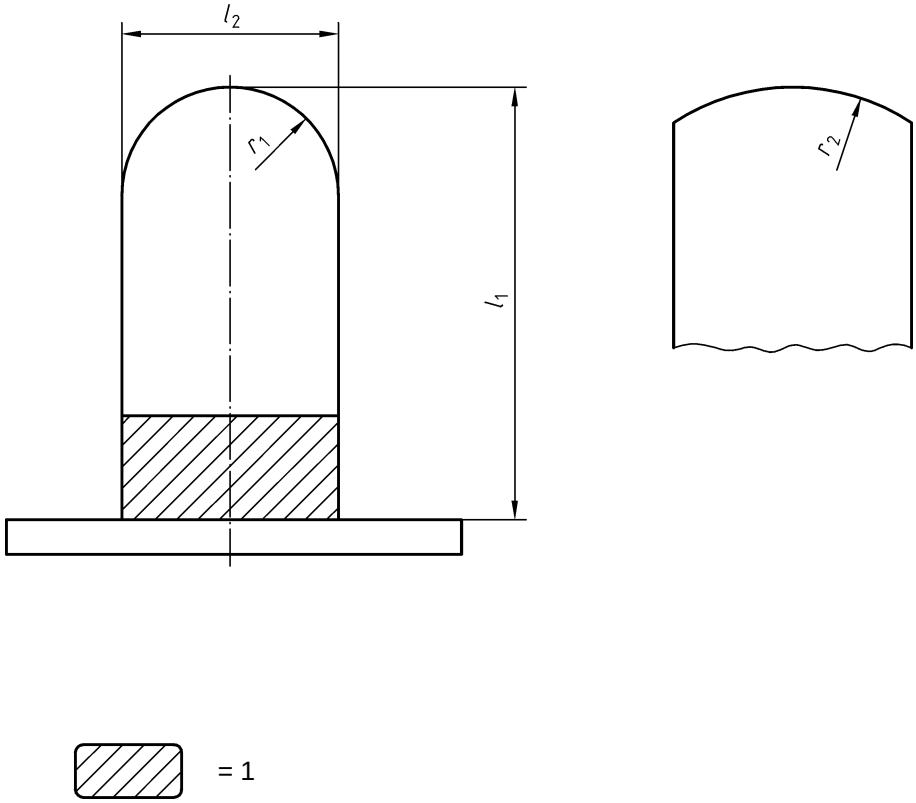
Figure 16 — Principle of the design of anvil A, the vertical plate anvil

5.9.3.2 Anvil B for testing products covering the knee or the shoulder

The knee and shoulder anvil shall consist of a vertical steel cylinder (100 ± 2) mm in diameter mounted directly onto a load cell or force transducer. The anvil shall have a hemispherical (50 ± 1) mm radius upper end. The anvil shall have a height of at least 200 mm. Elastic straps may be provided to hold the test specimens in contact with the anvil. Figure 17a illustrates the design of the apparatus.

5.9.3.3 Anvil C for testing kickers, gloves with the exception of the digit ends or sides, and women's soft genital protectors

This shall be as the knee anvil, except that the upper surface shall have a radius of curvature of (100 ± 2) mm as shown in Figure 17b.



a The 'knee' anvil, anvil **B**.
b The 'foot' and 'hand' anvil, anvil **C**

Key **1** = Load cell or force transducer
l_1 = ≥ 200 mm
l_2 = (100 ± 2) mm
r_1 = (50 ± 1) mm
r_2 = (100 ± 2) mm

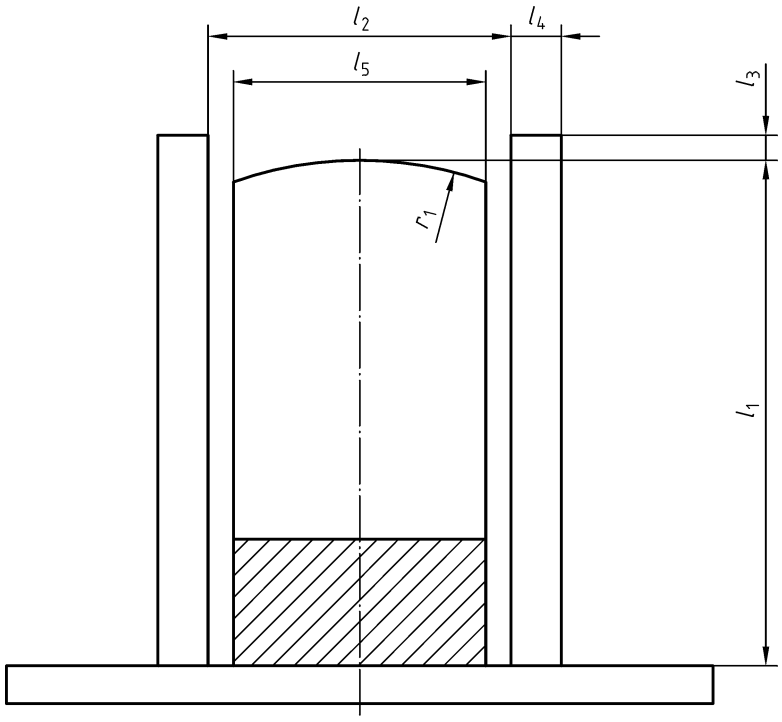
Figure 17 — Principle of the design of cylindrical anvils

5.9.3.4 Anvil D for testing the malleolar region of shin protectors and elbow protectors

This shall be as the knee anvil, except that the upper surface shall have a radius of curvature of (25 ± 0,5) mm.

5.9.3.5 Anvil E for testing abdominal, chest, breast, thigh and hip protectors

This shall be as the knee anvil, except that the upper surface shall have a radius of curvature of (150 ± 3) mm, and the anvil shall be surrounded by a "guard ring". The guard ring shall have an internal diameter of (120 ± 2) mm and a wall thickness of (20 ± 1) mm. The guard ring shall be solidly mounted to the base around the load cell or force transducer. The top of the guard ring shall be adjustable to be between 0 mm and (10 ± 0,5) mm above the centre of the top of the anvil. Figure 18 illustrates the design of the apparatus.



= 1

Key **1** = Load cell or force transducer
l_1 = ≥ 200 mm
l_2 = (120 ± 2) mm
l_3 = (10 ± 0,5) mm
l_4 = (20 ± 1) mm
l_5 = (100 ± 2) mm
r_1 = (150 ± 3) mm

Figure 18 — Principle of design on the abdominal, chest and breast anvil, anvil E

5.9.4 Procedures - general

Test specimens shall be prepared from hockey protectors that have had the minimum dimensions of the zones of protection marked on their outer surface. The protectors shall be cut up and the straps removed as necessary, to position the test areas on the anvils. If the product loses its integrity on being cut up, the cut edges shall be bound with adhesive tape to retain the normal relationship between the components of the product.

If the construction of the protector is similar throughout the zone of protection, the number of impacts specified below shall be made at the appropriate energy on the zone of protection (see 4.6. Table 17). The centres of impacts shall be not less than 60 mm apart, nor less than 30 mm from the edge of the zone of protection marked on the test specimen unless the zone of protection is less than 60 mm wide in which case the impacts shall be equidistant from the edges. If areas with different constructions, or areas possibly providing reduced protection were noted in the examination according to 5.7, unless otherwise specified, two additional impacts shall be carried out on each type of these areas.

For each impact the peak transmitted force shall be recorded. The mean value of all the results from the impacts on a particular zone of protection and the values of the individual impacts shall be given in the test report.

5.9.5 Procedures - specific

5.9.5.1 Shin protectors

Five impacts shall be made on the central zone and five on the outer zone using anvil **A.**

5.9.5.2 The malleolar regions of shin protectors and elbow protectors

The malleolar regions of shin protectors and elbow protectors shall be tested on anvil **D.** Two impacts shall be made on the regions of the protectors covering the medial and the lateral malleolli. Four impacts shall be made on elbow protectors.

5.9.5.3 Leg protectors

The central zone and the outer zone on either side of the shin shall be tested on the leg anvil, anvil **A.** The central zone of the knee region and the outer zone beside and above the central knee zone shall be tested on the knee anvil, anvil **B.** Five impacts shall be made on each zone of protection.

5.9.5.4 Kickers

Three impacts shall be carried out on anvil **C** in each designated zone of protection, unless an area of reduced protection has been noted in examination according to section 5.7, when an additional impact in each such area shall be carried out and used to calculate the mean peak of transmitted force for that zone.

5.9.5.5 Thigh and hip protectors and soft genital protectors

Thigh and hip protectors and soft genital protectors shall be tested on anvil **E**. The top of the guard ring shall be adjusted to be level with the top of the anvil ± 0,5 mm. Five impacts shall be made on each protector type.

5.9.5.6 Shoulder and upper arm protectors

The upper arm region shall be tested on the leg anvil, anvil **A.** The shoulder region shall be tested on the knee anvil, anvil **B**. (Note stand-off designs cannot necessarily be tested by this method). Five impacts shall be made on each protector type.

5.9.5.7 Chest, breast and abdominal protectors

These shall be tested on anvil **E** with the top of the guard ring adjusted to (10 ± 0,5) mm above the top of the anvil, except that for testing the heart areas (zone 3) the ring shall be level with the top of the anvil ± 0,5 mm. Five impacts shall be made on each zone of protection.

Breast protectors shall be tested with a chest protector, as recommended by the manufacturer. In such combinations the breast protectors shall be tested to performance levels equal to or below that of the chest protector.

5.9.5.8 Gloves

Three impacts shall be carried out on anvil **C** on each type of construction in each zone of protection. However if areas of reduced protection were noted in examination according to 5.7, an additional impact in each type of such area shall be carried out, and the additional results combined with the normal tests to calculate the mean peak transmitted force.

Preparation of samples from gloves and hand protectors shall take account of the design and construction of the products and their likely modes of action in impacts. Impacts in all sites except axially on the digit tips and on the sides of the digits and the left palm, shall be made on the 100 mm radius anvil. Digit tip impacts shall be made with the glove cut up and supported on the leg anvil, anvil **A,** so that the impact is axial in relation to the digits. All four fingers

shall be lightly taped together to produce a test specimen. Rigid or semi-rigid material between the fingers and outside the first and little fingers shall be cut away to a length of 20 mm ± 3 mm to allow the specimen to rest on the anvil. The orientation of the sample shall be such as to optimise the evaluation of the design of the protection. Specimens from the sides of the fingers and palm shall be similarly prepared with 15 mm ± 3 mm of the back and palm of the glove retained. These samples shall be tested orientated across the anvil.

5.9.5.9 Hard genital protectors

Two genital protectors shall be used in impact testing. Each protector shall be struck three times. The centres of the impacts shall not be closer to each other than 15 mm, or less than 25 mm from the edge of the protector. Impacts shall be on or within 2 mm of the vertical centre line marked according to 5.7.2. Prior to each test, the anvil shall be covered in a layer of Plasticine type modelling clay (5 ± 1) mm thick, with an undamaged rubber membrane on top of it. A cylinder of modelling clay or other system shall be used to determine the pre-test internal height of the protector at the impact site. The protector shall be then fixed in place and an impact carried out. The minimum internal height of the protector during the impact shall be determined. The rubber membrane shall be examined for cuts or tears by stretching it gently between the hands. A perforation shall be recorded if a hole or cut is formed with a transverse or linear dimension greater than 2 mm in the relaxed membrane. The protector shall be examined for cracks, splits, permanent deformation, or other damage, which shall be recorded.

The minimum internal height of the protectors in each impact shall be recorded. The mean value of the six impact tests shall be calculated. This value and the examination results shall be included in the test report.

5.10 Impact testing of products specified to be usable at high ambient temperatures

Impact testing according to 5.9 shall be repeated on products conditioned at (30 ± 2) °C in that environment or within 5 minutes of removal from that environment.

6 Marking

Field hockey players' protective equipment shall be permanently and conspicuously marked with at least the following:

a) The name or trademark of the manufacturer or his authorised representative in the European Union or country where the product is placed on the market.

b) Designation of the product type, commercial name or code that uniquely identifies the item.

c) The size designation of the item.

d) The number of this standard and the level of performance of the item

e) If relevant, the side of the body on which the protector should be worn.

f) An instruction to see the Information supplied by the manufacturer (see clause 7) provided with the product.

The following information should be given on the product whenever practical:

g) The type of use for which the protectors are intended. Any type of use for which the protectors are specifically not intended.

h) The hazards specific to field hockey against which some protection is given.

i) The hazards specific to field hockey against which protection is **NOT** given.

j) Textile and material types in the protector.

k) International care label symbols according to ISO 3758 if appropriate. (Negative labels are important)

7 Information to be supplied by the manufacturer

Field hockey players' protective equipment shall be supplied with information and instructions for fitting and use that will promote their safe and effective use. The information shall be precise and comprehensible and in the official language(s) of the state or region in which they are placed on the market. The information shall contain at least the following:

a) All the information required in section 6: Marking**.**

b) The full address of the manufacturer or importer.

c) How to select protective equipment of the correct level of performance. An explanation of the levels of performance of protectors available under this standard.

d) How to choose the correct size of protector and check its fit.

e) Details of the size of protector and the body dimensions to which they relate.

f) How to adjust the protectors.

g) Instructions about wearing other PPE to obtain the protection desired. Instructions on what level of performance of another product is required to provide the intended protection, as in the case of breast protectors worn with chest protectors.

h) Information about the performance of the protector if it has been impact tested at a temperature of 30 °C.

i) A warning about any changes in environmental conditions, such as temperature, that would significantly reduce the performance of the protector.

j) A warning that no protector can offer full protection against injuries.

k) A warning about any contamination, alteration to the protector, or misuse that would dangerously reduce the performance of the protector.

l) A list of the substances used in the main components of the product.

m) Detailed instructions for caring for and cleaning the protector.

n) Instructions concerning inspection and repair of the protector, and how to decide that it should be thrown away because it can no longer provide adequate protection.

Annex A
(informative)

Information about determining the chemical innocuousness of protective clothing and equipment

A.1 General

This informative annex is provided for the assistance and information of manufacturers and test houses in the application of the innocuousness requirements in Annex II of the PPE Directive (89/686/EEC) and EN 340.

The basic requirements are that protective clothing and equipment should not adversely affect the health of the user. This can be assumed to be likely if it is shown that the constituent materials are chemically suitable, and that they will not in the foreseeable conditions of normal use release or degrade to release substances generally known to be toxic, carcinogenic, mutagenic, allergenic or otherwise harmful.

NOTE Information on the classification and identification of harmful substances can be found e.g. in the Directives 67/548/EEC (classification, packaging, labelling of dangerous substances) and 76/769/EEC (restriction on use of dangerous substances) and amendments.

A.2 Evidence of innocuousness

Any of the following types of document may be presented as evidence that a product is innocuous:

a) The manufacturer's technical file,

b) Materials specifications from the material producers, and certificates of conformity,

c) Safety data sheets relating to the materials,

d) Certificates or reports relating to the suitability of the materials for use with food, in medical devices, or other relevant applications,

e) Certificates or reports relating to toxicological, allergenic, carcinogenic or mutagenic investigations on the materials,

f) Other documents submitted by the manufacturer.

The examination of the documents should determine whether the claim that the materials are suitable for use in the protective clothing or protective equipment is justified. Particular attention should be paid to the presence of plasticisers, unreacted components, heavy metals or, impurities, and the chemical identity of pigments and dyes, some of which are harmful.

A.3 Possible specific innocuousness testing

In the absence of satisfactory documentary evidence, testing can be necessary to ensure materials in hockey protectors meet the requirements for innocuousness in European Directives. The following may be relevant:

1) The chromium VI content of leather in clothing and gloves should comply with the requirement in EN 420.

2) All metallic materials which could come permanently into contact with the skin (e.g. studs, fittings and buckles) should have an emission of nickel of less than 0,5 µg/cm² per week. The test method to be used is that in EN 1811.

3) The pH value of protective clothing material should be greater than 3,5 and less than 9,5. The test method for leather to be used is that in ISO 4045 and for other materials that in ISO 3071.

4) The colour fastness to perspiration of protective clothing material should be determined in accordance with ISO 105-A02 and should be at least grade 4 of the Grey scale for the colour change of the specimen. The test should be conducted in accordance with ISO105-E04.

5) Substances such as azo-dyes which release carcinogenic amines as defined by Directive 67/548/EEC and its amendments, should not be detectable by appropriate methods.

A.4 Bibliography

EN 340, *Protective clothing — General requirements*.

EN 420, *General requirements for gloves.*

EN 1811, *Reference test method for release of nickel from products intended to come into direct and prolonged contact with the skin.*

ISO 105-A02, *Textile — Tests for colour fastness — Part A02: Grey scale for assessing change in colour.*

ISO 105-E04, *Textiles — Tests for colour fastness — Part E04: Colour fastness to perspiration.*

ISO 3071, *Textiles — Determination of pH of the aqueous extract*.

ISO 4045, *Leather — Determination of pH.*

Annex B
(informative)

Selection of field hockey protective equipment with an appropriate level of performance

B.1 General

This informative annex is provided for the assistance and information of hockey players, sports organisations, manufacturers and retailers. Information is provided on the interpretation of performance levels defined in the standard.

B.2 Performance levels of products other than hard genital protectors

The performance level of a product is defined by the test conditions and associated requirements. The following general advice is given concerning the products that can be appropriate in particular circumstances. Sports Associations, those people advising players and in particular those people in charge of children, should provide up to date advice on the performance level of products suitable for the games they organise and the local environmental conditions. This guidance should be based on risk assessment and a consideration of all injuries. It should be kept under continuous review.

Five performance levels are defined in this standard. The highest performance level - Level 5 - is tested at the highest energy impacts. These products should give the best protection and prevent more injuries than the lower levels. However as heavier and thicker materials have to be used in the highest performance level products, there is an ergonomic cost. High performance protectors can be more uncomfortable and hotter than the lower performance level protectors. As no protector can provide complete protection, the most appropriate one to wear is always the one giving the greatest protection. This will be a Level 5 protector unless the physique of the player renders the use of such a garment impossible and a risk assessment shows that a product offering less protection is acceptable.

In user trials of leg protectors, kickers and hand protectors meeting this standard, Level 5 products prevented injury to International players in matches and training. Level 4 products allowed bruising to occur, and Level 3 products were considered unsafe by the players.

Level 1**:** Products for use only by children in games under modified rules which are intended to reduce the risk of impact injuries (mini hockey).

Level 2: Products for use by pre-adolescents of limited physical strength. Usually these will be children of less than twelve years of age and less than 160 cm stature.

Level 3**:** Products for use by adolescent males usually of 12-16 years of age who have not attained full adult strength and for use by adult women.

Level 4: Products for use by highly physically trained women and for use by adult males, who hit balls at up to 120 km/h.

Level 5: Products for use by highly physically trained men who hit balls at over 120 km/h.

NOTE It is the level of strength of the other players that determines the performance level of equipment that is suitable for an individual.

B.3 Use of products at high ambient temperatures

It has been reported that Level 5 products that were used in the autumn, winter and spring in the UK in International matches with complete satisfaction, allowed some ball impacts to be felt in matches in Singapore at temperatures above 33 °C, and for bruising to occur. It is strongly recommended that use of products meeting this standard in temperatures above 28 °C be avoided, unless the manufacturer has had testing carried out at temperatures of 30 °C or above, or it is known the construction materials are not temperature sensitive. For games below the highest level it may be adequate to use products of the next class above that which is normally satisfactory. Products constructed of thermoplastic foams will be worn out faster in impacts at higher temperature and this should be noted in the Information supplied by the manufacturer (see clause 7).

B.4 Performance levels of hard genital protectors

Hard genital protectors may be incorporated in other garments or protective equipment. Figures B1 – B3 show the position of genital protectors and their relationship to the bones of the pelvis. During impacts, a genital protector is supported on the pubic bones. To protect the genitalia, the protector should not be displaced, lose a significant volume of space within it, or disintegrate.

Two performance levels for genital protectors are defined in the standard. The differences in ergonomic cost of wearing different performance products are small.

Level 1: Products for use by adolescent males usually of 12-16 years of age who have not attained full adult strength and for use by adult women.

Level 2: Products offering a higher level of protection which should be used by all adult men.

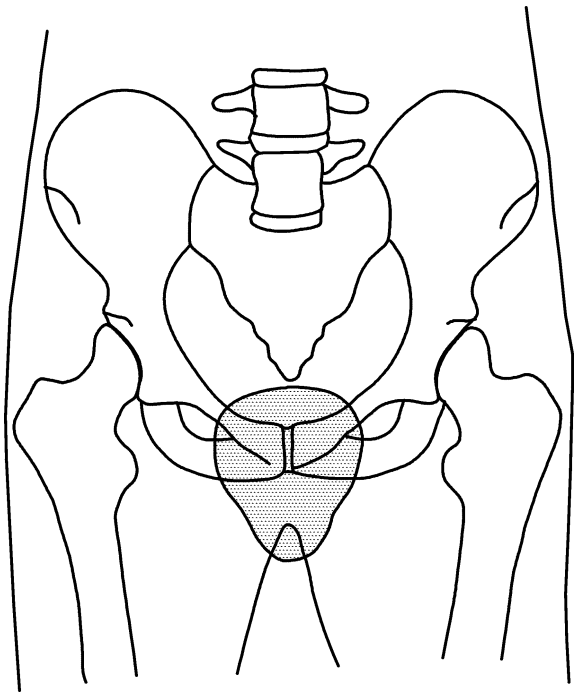


Figure B.1 — A hard genital protector shown as an outline of its internal dimensions, on a tracing of an X-ray of a male pelvis

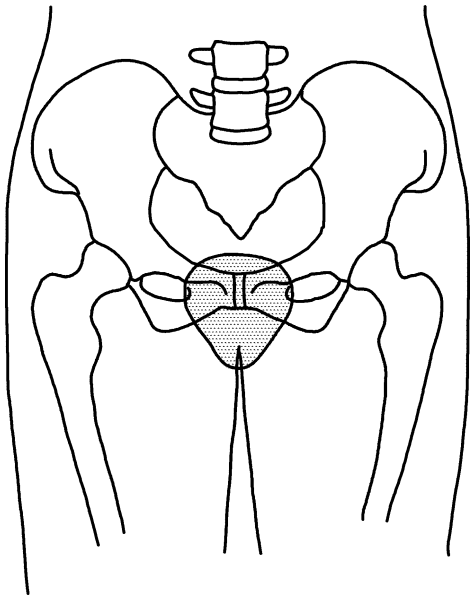
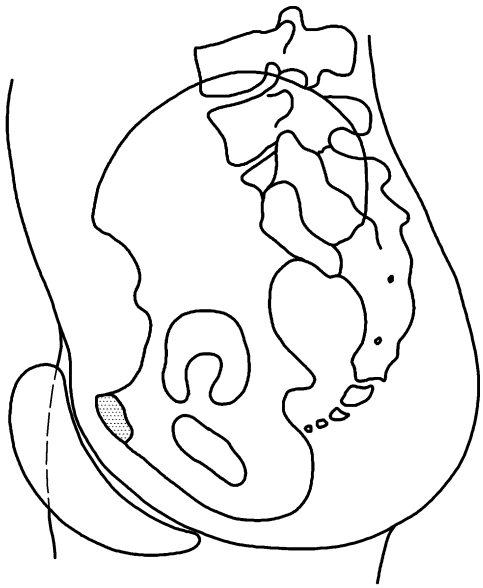
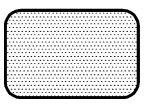


Figure B.2 — As Figure B1 but on a female pelvis





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Key 1 = Symphysis pubis

Figure B.3 — A diagram of the positioning of a hard genital protector on a half pelvis

Annex ZA
(informative)

Clauses of this European Standard addressing essential requirements or other provisions of EU Directives

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Trade Association and supports essential requirements of EU Directive 89/686/EEC.

WARNING: Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this European Standard.

The following clauses of this European Standard are likely to support requirements of Directive 89/686/EEC, Annex II.

EU Directive 89/686/EEC, Annex II		Clauses of this European Standard
1	All risks encountered	1, 4, Annex A
1.1.1	Ergonomics	4.2
1.1.2.1	Highest level of protection possible	4.6, 4.7, Annex A
1.1.2.2	Classes of protection appropriate to different levels of risk	Annex A
1.2.1.1	Suitable constituent materials	4.1
1.2.1.2	Satisfactory surface condition of all parts of PPE in contact with user	4.1
1.2.1.3	Maximum permissible user impediment	4.2
1.3.1	Adaptation of PPE to user morphology	4.3
1.3.3	Compatibility of different classes or types of PPE designed for simultaneous use	4.4
1.4	Information supplied by the manufacturer	7
2.1	PPE incorporating adjustment systems	4.5
2.4	PPE subject to ageing	7
3.1.1	Protection against mechanical impact	4.6, 4.7

Compliance with the clauses of this European Standard provides one means of conforming to the specific essential requirements of the Directive concerned and associated EFTA regulations.

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