

**Cricketers' Helmets**

Cricketers' Helmets

PAS 008: 1993

**PRODUCT  
ASSESSMENT  
SPECIFICATION**

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**Cricketers' Helmets****FOREWORD**

This Product Approval Specification( PAS) has been prepared in consultation with and published at the request of manufacturer and user interests to provide an interim specification for helmets for cricketers.

It has been compiled from relevant technical requirements derived several related British Standards.

Acknowledgement is given to the following organizations which were consulted in the preparation of this specification:

- Test and County Cricket Board
- National Cricket Association
- Cricketers Association
- Queen's Medical Centre Dept.of Neurosurgery and Neurology, University Hospital, Nottingham
- BSI Testing
- BSI Certification Authority for Personal Protective Equipment

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## INTRODUCTION

This PAS is based upon relevant proven methods of test and technical criteria selected from: BS 6183, BS 6863, BS 6658 AND BS 6489 (see 'Publications referred to').

Specifically, in respect of the test for shock absorption, the chosen impact sites represent :

- a) those considered most likely to be struck, and
- b) the potentially vulnerable points.

The requirement for there to be three impacts upon each site is intended to simulate a situation where a player would continue to use a helmet subsequent to serious impact(s).

The mass and shape of the impactor was selected from BS 6183. However, the test drop height is such that the higher energy created more closely equates with that in BS 6863.

The deceleration of 275 g<sub>n</sub> required is a more demanding requirement than in either BS 6863 or BS 6658.

No retention requirements are required of the chin strap, since it is considered:

- a) unlikely that helmets are worn with the retention system tightened sufficiently to prevent roll-off, and
- b) helmets are designed to absorb the shock from a single impact and therefore displacement of a helmet as a consequence is not of major significance.

The inclusion of the low temperature test at -20°C was not considered necessary in view of the general nature of the sport.

Similarly, with regard to hearing, whilst it was considered the ability to hear clearly was desirable, it was not absolutely essential for protection.

Equally, no account is taken of accessories, e.g. face guards and ear protectors. The reason being that they are usually separately supplied items, not normally produced by helmet manufacturers. Consequently, to cover all possible combinations of accessories and helmets is impractical at the present time.

The intention is to provide a simple and practical specification while providing optimum head protection.

Additions and revisions of the PAS can be undertaken in the light of experience.



**Cricketers' Helmets****1.0 SCOPE**

This specification defines the requirements for helmets to be worn by cricketers.

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

- a) construction
- b) shock absorption properties.

**2.0 DEFINITIONS**

For the purposes of this Specification the following definitions apply.

**2.1 Helmet**

Headwear primarily intended to protect against a blow to the part of the wearer's head that lies above the ears and eyes.

**2.2 Shell**

The material that provides the general outer form of the helmet.

**2.3 Protective padding**

Liner material provided to absorb impact energy.

**2.4 Retention system**

The complete assembly that prevents the helmet coming off the head.

**2.5 Chin strap**

A strap that passes under the wearer's chin or lower jaw and is intended to retain the helmet on the head.

**2.6 Chin cup**

A device that fits around the point of the wearer's chin, to assist the retention system or to improve comfort.

**2.7 Chin guard**

An extension of the shell covering the lower part of the face to give protection against impacts.



**2.8 Basic plane (of a human head)**

A plane at the level of the external auditory meatus (external ear opening) and the inferior margin of the orbit (lower edge of the eye socket).

**2.9 Basic plane (of a headform)**

That plane relative to the headform that corresponds to the basic plane of the head that the headform simulates.

**NOTE: A precise position for the basic plane of a headform complying with BS 6489 is given in that Standard.**

**2.10 Basic plane (of a helmet)**

That plane relative to the helmet that corresponds to the basic plane of the head that the helmet is intended to fit.

**2.11 Central vertical axis**

The line relative to a headform complying with BS 6489 that lies in the plane of symmetry and normal to the reference plane at a point equidistant from the front and back of the headform in the reference point.

**2.12 Central longitudinal vertical plane**

The vertical plane of symmetry of a human head or headform or of a helmet as it is intended to be worn on the head.

**2.13 Size (of a helmet)**

The size of the head which the inner parts and retention system of the helmet are designed to fit.

**NOTE: Several different sizes of helmet may be manufactured from one size of outer shell.**

**2.14 Positioning index**

A dimension established by the manufacturer that defines the position in which the helmet is intended to be placed on the appropriate headform for testing purposes. It is equal to the vertical distance measured in the central longitudinal vertical plane between the base plane of the headform and the edge of the shell above the eyes.



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**NOTE:** This index should be furnished to any person who requests the information, with respect to a helmet identified by manufacturer, model designation and size.

### 3.0 MATERIALS

If the shell is made of a thermoplastics material or of a material which is known to be adversely affected by contact with hydrocarbons, cleaning fluids, paints, transfers or other extraneous additions, then the helmet shall carry an appropriate warning as specified in 7.3.

For those parts of the helmet coming into contact with the skin, the material used shall be known not to undergo appreciable alteration from contact with sweat or with substances likely to be found in toiletries, and materials shall not be used which are known to cause skin disorders.

### 4.0 CONSTRUCTION

#### 4.1 General

The helmet shall not have an integral chin guard.

On the inside of the helmet there shall be no sharp edges, and any rigid projections inwards shall be covered with protective padding.

**NOTE 1:** The helmet normally consists of a shell, not necessarily of hard material, either containing or providing the necessary means of absorbing impact energy.

**NOTE 2:** A recommendation for minimum radii for thermoplastics materials is given in Appendix A.

**NOTE 3:** The helmet may be pierced by ventilation holes.

#### 4.2 Retention

##### 4.2.1 General

Means shall be provided for retaining the helmet on the wearer's head. All parts of the retention system shall be permanently attached to the system or to the helmet.

##### 4.2.2 Chin straps

Any chin strap shall not be less than 15mm wide and not more than 26mm wide.



**NOTE: Chin straps may be fitted with padding or other means of enhancing comfort for the wearer.**

A chin cup shall not be fitted to any system consisting of a single chin strap.

The strap or straps shall be of sufficient length that when the helmet is mounted and fastened in accordance with 4.2.3 the free end of the strap which extends beyond the fastening device is not less than 35mm long.

#### 4.2.3 Fastening devices

Any chin strap shall be fitted with a device to adjust and maintain tension in the strap. The device shall be so positioned on the strap, or be sufficiently adjustable that when the helmet is mounted so as to achieve the correct positioning index on a full headform complying with BS 6489 and of appropriate size chosen from the series A, E, J or M, the device is capable of being correctly fastened without any rigid part coming into contact with that part of the headform which simulates the angle between the cheek and the underside of the jaw.

### 5.0 PERFORMANCE

#### 5.1 General

Helmets shall be supplied for testing in the condition in which they are offered for sale.

Helmets incorporating systems for adjusting their size shall comply with each performance requirement when tested at the size which, in the opinion of the testing authority, is likely to give the poorest performance in that test.

Each helmet shall be subject to all necessary non-destructive tests and examinations before being subjected to any destructive test.

A helmet that has been tested shall neither be offered for sale nor worn.

#### 5.2 Shock absorption

When the helmet is tested by the method given in Appendix B, using the conditioning procedure described in Appendix C, the maximum deceleration of the striker shall not exceed  $275g_n$ .\*

\*the symbol  $g_n$  signifies a deceleration of  $9.81 \text{ m/s}^2$ .

### 6.0 MARKING





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Each helmet shall be marked in such a way that the following information is easily legible to the user and is likely to remain legible throughout the life of the helmet:

- a) the number and date of this PAS, i.e. PAS 008 : 1993
- b) the name or trademark of the manufacturer;
- c) the size or size range of the helmet, quoted as the circumference (in mm) of the head which the helmet is intended to fit;
- d) the designation of the model;
- e) the serial number of the helmet, or the manufacturer's identification of its production batch;
- f) words to the following effect:

**'IMPORTANT - FOR YOUR SAFETY  
Use only for playing cricket'**

- i) For painted or smooth plastics helmets:

**'Clean with a soft cloth and tap water only.'**

- ii) For flocked / fibre / fabric coated helmets:

**'Lightly rub with soft bristle clothes brush. Do not use in the rain since this may damage the flocked, fibre or fabric finish.'**

**'Replace the helmet after a hard drop or impact; you can not always see helmet damage.'**

**'Do not apply paint, solvents, glues or transfers.'**

## **7.0 INFORMATION TO USERS AND LABELLING**

### **7.1 Outer packaging**

Any box or outer wrapper in which the helmet is offered for sale shall carry words to the following effect:

**'CHOOSING YOUR HELMET**

This helmet can only protect you if it fits well.

Try different sizes and choose the size which feels secure and comfortable on your head.

Position the straps so that they do not cover your ears, position the Velcro or other fastener away from your jawline and adjust straps and fastener to be both comfortable and firm.'



**Cricketers' Helmets****7.2 Information label**

Every helmet shall bear on a single label attached to the helmet the name and address of the manufacturer or importer and words to the following effect:

**'IMPORTANT - FOR YOUR SAFETY  
CHOOSING YOUR HELMET**

This helmet can only protect you if it fits well.

Try different sizes and choose the size which feels secure and comfortable on your head.

Position the straps so that they do not cover your ears, position the Velcro or other fastener away from your jawline and adjust straps and fastener to be both comfortable and firm.'

**'USING YOUR HELMET**

Only use your helmet for playing cricket. It is not designed for other sports or motor vehicle use. Every time you use your helmet, check that nothing is badly worn, torn or missing.'

**'LOOKING AFTER YOUR HELMET**

Keep your helmet away from chemicals, for example detergents, petrol, glues and sticky labels.

Store it away from heat and sunlight. Chemicals, heat and sunlight can all reduce the strength of your helmet.'

i) For painted or smooth plastics helmets:  
'Clean with a soft cloth and tap water only.'

ii) For flocked / fibre / fabric finished helmets:

'Lightly rub with a soft bristle clothes brush. Do not use in the rain since this may damage the flocked, fibre or fabric finish.'

**'REPLACING YOUR HELMET**

Get a new helmet:

after a severe impact from a cricket ball

after a hard knock, or squashing it



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if it gets badly scratched

after a few years' careful use

if it doesn't fit you any more.

You cannot always see when it is damaged.'

**'IF YOU NEED ADVICE**

If you are ever in any doubt about your helmet, ask your local cricket equipment dealer for advice, or write to the helmet maker or importer.'

**7.3 Warning label**

Every helmet having a shell made of thermoplastics material or of a material known to be adversely affected by contact with hydrocarbons, cleaning fluids, paints, transfers or other extraneous additions shall bear a warning label attached to the chin strap or to a suitable stud. The label shall consist of stiff card measuring at least 45mm by 120mm. The lettering shall be red on white background and shall consist of the legend 'BSI warning', in 12 point bold capitals, and the legend 'Do not paint or apply solvents, glues or sticky labels', in 24 point bold capitals. No other inscription or mark shall be placed on the same side of the card as this warning.

**NOTE: The requirements of 7.2 and 7.3 for two types of label may be achieved by a single label complying with both sets of requirements.**



## **APPENDICES**

### **APPENDIX A      RECOMMENDATIONS FOR MINIMUM RADII FOR THERMOPLASTICS MATERIALS**

Where thermoplastics materials are used for the shell, any irregularity in the internal or external surface should blend into the surrounding surface in a curve, the radius of which is not less than half the thickness of the shell at that point.

This recommendation need not be applied to holes for fasteners, or to the edges of the shell or to a rigid projection in accordance with 4.1.

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## APPENDIX B SHOCK ABSORPTION TEST

## B.1 Principle

The helmet, appropriately conditioned, is mounted on a headform and a striker allowed to fall on to the helmet at one of the sites specified in B.3.4. The maximum deceleration of the striker is measured.

## B.2 Apparatus

## B.2.1 For impact at the site specified in B.3.4.1

B.2.1.1 *Headform* in accordance with BS 6489 above the reference plane and of size B, D, F, J, L or N appropriate to the size of helmet.

B.2.1.2 *Impacting system*, in which the headform is mounted with its central axis vertical on a rigid monolithic base of concrete having a mass of at least 1000kg and a height of at least 0.9m. The striker has a mass of  $5 \pm 0.1$ kg and a hemispherical striking face with a diameter of  $7.3 \pm 0.1$ cm and is made of a material which does not deform on test. The striker can be dropped in guided fall between substantially frictionless guides which are vertical within 1 in 400.

## B.2.2 For impact at the sites specified in B.3.4.2

B.2.2.1 *Impact rig*, which consists of a steel base-plate  $600 \pm 10$ mm x  $600 \pm 10$ mm and 25mm (minimum) thick, fully supported by and attached to a monolithic concrete base. The striker has a mass of  $5 \pm 0.1$ kg and a hemispherical striking face with a radius of  $7.3 \pm 0.1$ cm and is made of a material which does not deform on test. The striker can be dropped in guided fall between substantially frictionless guides which are vertical within 1 in 400. A headform mounting column is fitted on the base-plate so that point Z of the headform lies in the plane of the guides and centrally between them and the central vertical axis is inclined  $60^\circ$  relative to the plane of the guides to present the front or rear impact site to the striker.

**NOTE:** Point Z lies on the headform's central vertical axis 12.7mm above the reference plane (see BS 6489).

## B.2.3 For impact at the site specified in B.3.4.3

A suitable apparatus is shown in BS 6489.

A solidly built rig allowing a complete headform complying with BS 6489 to be supported from its neck so that the impact site is presented to the striker. The

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front of the test helmet shell receives additional support from an adjustable block, topped by a layer  $23 \pm 1$  mm thick of natural vulcanised rubber complying with BS 1154 (Group Z, Shore hardness  $70 \pm 5$ ). The apparatus is mounted on a rigid base. A striker of mass  $5.0 \pm 0.1$  kg and having a hemispherical impact face of diameter  $7.3 \pm 0.1$  cm that can be dropped in guided fall.

- B.2.4 Instrumentation** in which an acceleration transducer is firmly attached to the striker so that its sensitive axis is coincident with that of the striker within  $\pm 2^\circ$ .

The measuring system shall have a frequency response in accordance with channel class 600 of SAE recommended practice No. J211a *Instrumentation for impact tests* (1970).

**B.3 PROCEDURE****B.3.1 Instrumentation check**

Before commencing helmet testing, check the measuring system by impacting a suitable test piece from a previously established height to produce a nominal deceleration of the striker of  $275g_n$ . Record at least three such impacts on each occasion of checking; the results obtained and those previously obtained shall lie within a range of  $\pm 15g_n^*$ .

\*the symbol  $g_n$  signifies a deceleration of  $9.81 \text{ m/s}^2$ .

**B.3.2 Sequence**

The preferred sequence is for the impact tests to be carried out in the order of sites specified in B.3.4.3, B.3.4.2 and B.3.4.1.

**NOTE: Impact at site B.3.4.1 is judged to be the least likely to occur during normal use of the helmet.**

**B.3.3 Time schedule**

For temperature conditioned helmets, apply the first test loading to each helmet, as described in B.3.5,  $40 \pm 5$  s after its removal from the conditioning enclosure.

**B.3.4 Impact sites**

- B.3.4.1** The striker is allowed to fall on to the top of the helmet such that the projected path of the striker passes through the centre of gravity of the headform.



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B.3.4.2 With the headform inclined  $60^\circ$  backwards relative to the plane of the guides the front impact site is automatically set when the helmet is positioned correctly on the appropriate headform. Similarly with the headform inclined  $60^\circ$  forward relative to the plane of the guides the rear impact site is automatically set.

B.3.4.3 The striker is allowed to fall on to the helmet such that the point of impact on the helmet is at the rear of the helmet on the AA' line as defined in BS 6489.

### B.3.5 Testing of helmets

Position the helmet on the test headform so as to achieve the correct positioning index. Mark the perimeter AA' on the outside of the helmet.

The line AA' on the helmet is the line where the outer surface of the helmet intersects the horizontal plane AA' as defined in BS 6489.

Remove the helmet and condition it (see Appendix C). Replace the helmet on the headform in the same position. Lock the headform in position with the required impact site presented to the striker.

Deliver three impacts on the same impact site. A time period of not less than 1 minute but not more than 2 minutes should elapse between successive impacts. If necessary the helmet may be adjusted on the headform after each of the first two impacts to ensure that the subsequent impact is on the same site. For each impact use a drop height of  $40 \pm 0.5$  cm. Record and report the maximum deceleration under each impact.

**NOTE: The helmet should be returned to the conditioning enclosure for a period of not less than 30 minutes between testing at successive impact sites.**



**Cricketers' Helmets****APPENDIX C      CONDITIONING BEFORE TESTING****HIGH TEMPERATURE**

Place the helmet in a conditioning enclosure with effective air circulation, so that the helmet touches only the support on which it rests. Maintain the temperature in the enclosure at  $50 \pm 2^\circ \text{C}$  for a period of not less than 4 hours and not more than 24 hours.

**NOTE: Water conditioning prior to testing is not considered appropriate.**

**PUBLICATION REFERRED TO:**

- |         |  |
|---------|--|
| BS 1154 | Specification for natural rubber compounds   |
| BS 6183 | Protective equipment for cricketers<br>Part 1 Specification for batting gloves, leg guards and boxes |
| BS 6489 | Specification for headforms for use in the testing of protective helmets                             |
| BS 6658 | Specification for protective helmets for vehicle users   |
| BS 6863 | Specification for pedal cyclists' helmets  |

