

Specification for

Protective helmets for vehicle users

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Committees responsible for this British Standard

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- Auto Cycle Union
- British Medical Association
- British Motorcyclists' Federation
- Consumer Standards Advisory Committee of BSI
- Department of Transport (Highways)
- Industrial Safety (Protective Equipment) Manufacturers' Association
- Metropolitan Police
- Ministry of Defence
- Motor Cycle Association of Great Britain
- Royal Automobile Club

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Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Definitions	1
3 Classification	2
4 Materials	2
5 Construction	2
6 Performance	5
7 Flammability (optional)	7
8 Marking	7
9 Information to users (labels)	8
Appendix A Recommended method for assessing ageing of helmet shell materials	10
Appendix B Extent of shell and peripheral vision	10
Appendix C Recommendation on minimum radii for thermoplastics materials	10
Appendix D Solvent conditioning	10
Appendix E Conditioning before testing	11
Appendix F Shock absorption test	12
Appendix G Penetration test	13
Appendix H Test for effectiveness of retention system	14
Appendix J Test for strength of retention systems with chin straps	15
Appendix K Test for chin strap slippage	18
Appendix L Test for resistance to abrasion of the chin strap	18
Appendix M Test for strength of retention systems without chin straps	21
Appendix N Test for resistance to inertial release of quick-release mechanism, or "buckle"	22
Appendix P Test for durability of quick-release mechanism	22
Appendix Q Oblique impact test	24
Appendix R Test of chin guard	27
Appendix S Test for flammability	27
Figure 1 — Headform and helmet reference points	3
Figure 2 — Peripheral vision regions	4
Figure 3 — Warning label	9
Figure 4 — Warning label for helmets for motor car sports use	9
Figure 5 — Apparatus for testing shock absorption	11
Figure 6 — Test block for testing penetration resistance	14
Figure 7 — Modified headform for testing retention system effectiveness	15
Figure 8 — Apparatus for testing retention system effectiveness	16
Figure 9 — Apparatus for testing retention system strength	17
Figure 10 — Apparatus for testing slippage of the chin strap	19
Figure 11 — Apparatus for testing abrasion of the chin strap	20
Figure 12 — Headform arrangement for testing strength of retention systems without chin straps	21
Figure 13 — Apparatus for testing resistance to inertial release of buckles	23
Figure 14 — Apparatus for oblique impact test	25
Figure 15 — Apparatus for testing chin guard	26
Table 1 — Sequence of testing	13
Table 2 — Impact velocities	13
Publications referred to	Inside back cover

Foreword

BS 6658 was prepared under the direction of the Personal Safety Equipment Standards Committee and is a combined revision of BS 2495:1977, and BS 5361:1976 which will be withdrawn following a transition period after this standard becomes effective. This revision is intended to replace these two standards and becomes effective at such date as it is invoked by Regulations expected to be made by the Secretary of State for Transport. Helmets complying with BS 2495 were originally intended for high speed motor car racing but came to be used in other competitive events and as high-protection helmets for motor cycle riders on public roads.

Two types of helmet, A and B, are specified. Both types are intended to be adequate for use on public roads. Type A corresponds to the former high-protection standard and is intended for competitive events and for use by wearers who demand an especially high degree of protection. Type B is intended for the ordinary motor cycle rider on public roads. The type A specification consists of the type B specification with more stringent requirements; in particular, the conditions of test for shock absorption and resistance to penetration are more severe for type A than type B.

The protection given by a helmet depends on the circumstances of the accident, and wearing a helmet cannot always prevent death or long-term disability.

A proportion of the energy of an impact is absorbed by the helmet, thereby reducing the force of the blow sustained by the head. The structure of the helmet may be damaged in absorbing this energy and any helmet that sustains a severe blow needs to be replaced, even if damage is not apparent.

To achieve the performance of which it is capable and to ensure stability on the head, a helmet should be as closely fitting as possible consistent with comfort; in use, it is essential that the helmet is securely fastened, with any chin strap under tension at all times.

This revision differs from the standards which it replaces notably as follows. New materials are catered for, an oblique impact test replaces many of the former constructional requirements, there are new tests for chin guards and for the effectiveness of the retention system and the concept of separate component testing has been introduced.

Certification. Attention is drawn to the certification facilities described on the inside back cover of this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 27, an inside back cover and a back cover. |

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard specifies requirements for helmets to be worn by riders, drivers and passengers of motor vehicles, including participants in competitive events. Requirements for accessories such as visors, goggles, detachable peaks and detachable face covers are not specified unless they are supplied with the helmet as original equipment. Eye-protectors are specified separately in BS 4110. Requirements and the corresponding methods of test are given for:

- a) extent of shell;
- b) shock absorption properties;
- c) penetration resistance;
- d) response to oblique impact;
- e) strength of chin guard;
- f) strength and effectiveness of retention system.

In addition, a method of testing flammability is given for helmets for which compliance with the optional flammability requirement is claimed (see clauses 7 and 8). A recommended method for assessing the resistance of helmet shell materials to ageing is also given.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard 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 basic plane, without preventing adequate peripheral vision

2.2

shell

the hard, smooth material that provides the general outer form of the helmet

2.3

protective padding

liner material provided to absorb impact energy

2.4

comfort padding

soft material provided to ensure a close fit to the wearer

2.5

retention system

the complete assembly that prevents the helmet from coming off the head

2.6

quick-release mechanism

a system attached to, or incorporated in, the helmet that allows the retention system to be fastened and unfastened quickly

2.7

chin strap

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

2.8

chin cup

a device that fits around the point of the wearer's chin

2.9

chin guard

an extension of the shell covering the lower part of the face

2.10

face cover

an accessory protecting the lower part of the face against mud, stones and weather

2.11

peak

a semi-rigid extension of the shell above the eyes

2.12

visor (eye screen)

a transparent protective screen extending over the eyes and covering part or all of the face

2.13

goggles

eye-protectors having a one-piece protective lens or individual lenses designed to cover the orbital cavities and to be in contact with the face around the eyes

2.14

basic plane

1) 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) Of a headform. That plane relative to the headform that corresponds to the basic plane of the head that the headform simulates.

3) 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.

2.15**reference plane**

a plane, relative to a headform, parallel to the basic plane and at a distance above it specified in BS 6489

2.16**central vertical axis**

the line relative to a human head or headform or helmet that lies in the plane of symmetry, and that is normal to the reference plane at a point equidistant from the front and back of the headform or (for helmets) of the headform that simulates the head that the helmet is intended to fit

2.17**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

2.18**central transverse vertical plane**

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

2.19**size (of a helmet)**

the size of 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.

3 Classification

Helmets shall be classified as either type A or type B.

NOTE The requirements for the two types differ in the severity of impact in the tests for shock absorption and resistance to penetration (see clause 6), and in the requirement to identify the type by marking (see clause 8).

4 Materials

4.1 The materials used in the manufacture of helmets shall be known not to be sensitive to ageing due to exposure of the helmet in use to influences such as sunlight, rain, road spray and fumes, and extremes of temperature.

NOTE A method currently under development for assessing the ageing of helmet shell materials for information purposes is described in Appendix A. This method is applicable to all shell materials and to surface coatings on shells.

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 on its information label an appropriate warning as specified in item h) of 9.1.

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

5 Construction**5.1 General**

The construction of the helmet shall be essentially in the form of a shell containing the necessary additional means of absorbing impact energy secured within the shell. Anchorages for the tethers for a head and neck support system as used in motor car sports are permitted.

5.2 Extent of shell

When assessed by the method described in Appendix B, the shell shall extend downwards on both sides of the headform at least as far as the lines CDEF as shown in Figure 1 and defined in BS 6489.

NOTE A recommendation on minimum radii for thermoplastics materials is given in Appendix C.

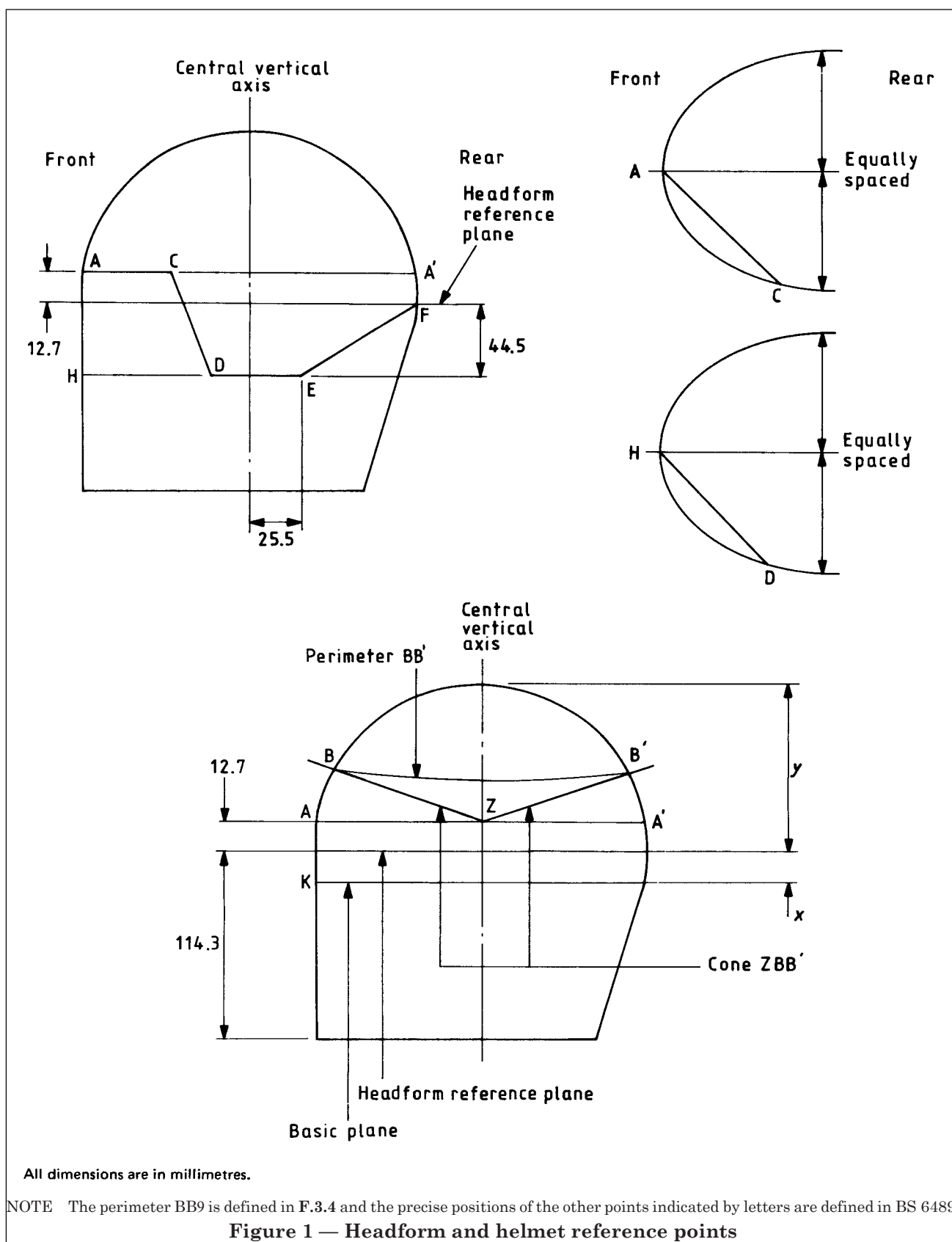
5.3 Internal projections

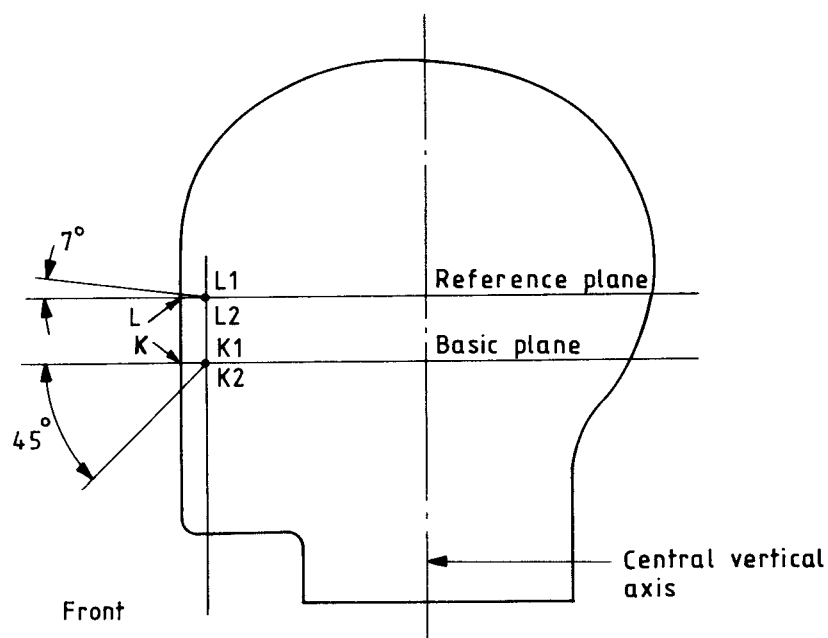
There shall be no sharp edges on the inside of the helmet, and rigid projections shall be covered with protective padding.

5.4 Retention

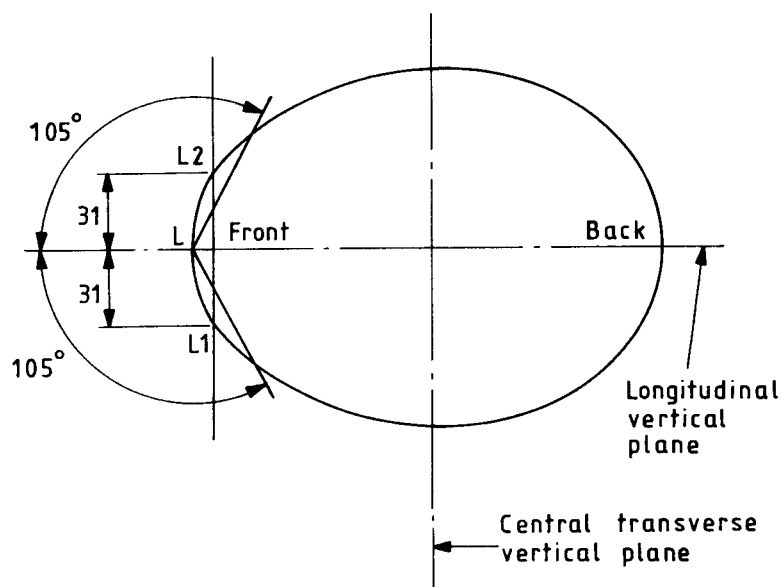
5.4.1 General. Means shall be provided for retaining the helmet on the wearer's head. This shall be either a chin strap anchored to the shell, or other means which secures the helmet to the head. All parts of the retention system shall be permanently attached to the system or to the helmet.

5.4.2 Chin straps. Chin straps shall be at least 20 mm wide and may be fitted with means of enhancing comfort for the wearer. A chin cup shall not be fitted to any system consisting of a single chin strap. Where a helmet is fitted with additional straps (one of which may carry a chin cup) to improve performance or provide comfort, the strap or straps which are necessary to meet the performance requirements of this standard shall be positively indicated by durable marking or other durable means.





(a) Section of headform in longitudinal vertical plane



(b) Section of headform in reference plane

All linear dimensions are in millimetres.

Figure 2 — Peripheral vision regions

5.4.3 Fastening devices

5.4.3.1 Chin straps shall be permanently fitted with a device to adjust and maintain tension in the strap.

5.4.3.2 Chin strap fastening and tensioning devices shall be positioned on the straps either so that there are no rigid parts extending more than 130 mm vertically below the headform reference plane with the helmet mounted on the appropriate sized headform, or so that the whole of the device is between the bony projections of the underside of the lower jaw.

5.4.3.3 If a retention system includes a quick-release mechanism, then the method of release of this mechanism shall be self-evident. Any levers, tabs, buttons or other components which need to be operated to release the mechanism shall be coloured red, those parts of the rest of the system which are visible when closed shall not be similarly coloured, and the mode of operation shall be permanently indicated.

5.5 Peripheral vision

When the helmet is mounted on the smallest headform appropriate to the size range of the helmet and complying with BS 6489 size A, C, E, G, J, K, M or O above the basic plane, vision shall be unobstructed within three regions defined as follows.

a) Within the angle between the reference plane and a plane intersecting it along the line L1L2 (see Figure 2) and sloping upwards at an angle of 7° above the reference plane. The points L1 and L2 lie on the surface of the headform and 31 mm to either side of the longitudinal vertical plane.

NOTE The points L1 and L2 represent the left and right eyes respectively.

b) The space between the reference plane and the basic plane, forward of two vertical planes each angled backwards from the line LK (see Figure 2), at an angle of 105° to the longitudinal vertical plane. The line LK lies on the front surface of the headform in the longitudinal vertical plane.

c) Within the angle between the basic plane and a plane intersecting it along the line K1K2 (see Figure 2) and sloping downwards at an angle of 45° below the basic plane. The points K1 and K2 lie on the surface of the headform and 31 mm to either side of the longitudinal vertical plane.

5.6 Eye protection

A helmet intended for use with goggles shall carry on its information label an appropriate warning, as specified in item i) of 9.1.

A helmet not intended for use with goggles shall be fitted with a visor or with means for fitting one and shall carry on its information label an appropriate warning as specified in item j) of 9.1.

Where a helmet is fitted or supplied by the manufacturer with a visor, the visor shall not be tinted and shall comply with BS 4110. Opening of the visor shall not cause abrasion of the visor within the field of peripheral vision as specified in 5.5 when the visor is closed.

6 Performance

6.1 General

6.1.1 Provision of helmets for testing. Helmets shall be supplied for testing in the condition in which they are offered for sale and shall be accompanied by any accessories which are part of their original equipment.

For the tests specified in 6.2 and 6.3, the helmets shall be grouped into two sets of three. A set may consist of helmets of different sizes (see 2.19).

The six helmets comprising the two sets shall include, for each size of shell, at least one example of the largest size of helmet made with that size of shell.

NOTE Additional helmets and/or components may be required in order to carry out the other performance tests.

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.

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

6.1.2 Sequence. Tests and procedures to determine compliance with the requirements specified in 5.2, 6.2, 6.3, 6.4 and 6.5 shall be carried out on each individual helmet in the following sequence:

- a) removal of visors, goggles, detachable peaks and detachable face covers;
- b) examination for extent of shell as specified in 5.2;
- c) solvent conditioning as described in Appendix D;
- d) exposure to the appropriate environmental conditions as described in Appendix E;
- e) tests of the helmet as specified in 6.2.1 and 6.2.2;
- f) tests of the chin guard as specified in 6.5;
- g) tests of the retention system as specified in 6.3;
- h) visors, detachable peaks and detachable face covers may be refitted, if applicable, at the discretion of the test authority;
- i) oblique impact tests as specified in 6.4, unless the manufacturer has opted to supply additional helmets for this test;

If the manufacturer has opted to supply extra helmets for the oblique impact test the sequence for such helmets shall be c), d), h), i).

6.2 Shell

6.2.1 Shock absorption. The maximum deceleration of the headform shall not exceed $300 g^{1)}$ when the helmet is tested by the method described in Appendix F. Where the shell is of multipart construction, the shell shall remain intact when any joint line above the line ACDEF, as shown in Figure 1 and defined in BS 6489, is tested as described in Appendix F by impacts appropriate for the type of helmet.

NOTE An additional helmet may be required for testing the joints of a multipart shell.

6.2.2 Penetration. When the helmet is tested by the method described in Appendix G the striker shall not make contact with the test block at any point on the helmet from its uppermost point down to the limit of rotation of the helmet on the test block.

6.3 Retention systems

6.3.1 Retention system effectiveness. The helmet, selected to be of appropriate size, shall not come off the modified headform when tested by the procedure in Appendix H.

6.3.2 Retention systems relying on a chin strap

6.3.2.1 Retention system strength. If the retention system relies on a chin strap, the system shall be tested by the method given in Appendix J. The values observed for dynamic extension and residual extension shall not exceed 32 mm and 16 mm, respectively, for the first impact and 25 mm and 8 mm, respectively, for the second impact. Following the test, the retention system shall still permit the helmet to be released from the head by normal operation of the release system.

NOTE In this test, slippage of the fastening device may be measured and recorded separately from other contributions to the extension, but this is for information only and is not subject to a separate requirement.

6.3.2.2 Strap slippage. If the retention system relies for its main tension on the frictional grip of a rigid part on a strap, the total slippage through the grip shall not exceed 10 mm when tested by the method in Appendix K.

6.3.2.3 Strap abrasion. If removal of the helmet from the wearer's head is intended to be achieved by sliding a strap through an adjuster, or if the slippage occurring in the slippage test is greater than 5 mm, the strap shall be capable of withstanding a tension of 3 kN, without breaking, when tested by the abrasion and tensile test described in Appendix L.

6.3.3 Retention systems without chin straps. If the helmet is designed to be retained on the head without a chin strap, the helmet shall retain the lower part of the headform system when tested by the method described in Appendix M, and shall still be capable of being released from the headform after the test by operation of the release mechanism.

6.3.4 Retention systems relying on quick-release mechanisms

6.3.4.1 Inadvertent release by pressure. If the retention system is designed to be released by pressure on a certain part, the system shall not release when a rigid sphere of diameter 40 mm is pressed with a force of 100 ± 5 N directly in the line of movement of that part.

If such a system incorporates more than one quick-release mechanism, or one such mechanism requiring more than one operation to release it, the system shall be deemed not to comply with this British Standard if any release operation is caused by the pressure of the sphere.

6.3.4.2 Inadvertent release by inertia. When tested by the method in Appendix N, quick-release mechanisms shall comply with the following:

- a) the mechanism shall remain engaged after each impact;
- b) no fracture or distortion shall occur which could enable the mechanism subsequently to disengage;
- c) the mechanism shall remain capable of normal engagement, disengagement and use in wear.

6.3.4.3 Ease of release. Quick-release mechanisms for the retention system shall be capable of being operated by a force not exceeding 15 N when the helmet is mounted on the apparatus described in Appendix J and the retention system is loaded by a downward force of 500 ± 10 N either through a stirrup, as described in Appendix J, or a full headform, as appropriate.

6.3.4.4 Partial engagement. Partial engagement is the condition in which the locking sub-assembly of a quick-release mechanism appears to be correctly engaged even though the load-bearing members are not mechanically locked into their intended load-bearing condition.

If partial engagement is possible, then the parts partially engaged shall disengage completely when a tensile load of 10^{+0}_{-1} N is applied to the load-bearing members.

NOTE 1 In some designs the load-bearing members or their locking parts may be hidden from view.

¹⁾ The symbol g signifies a unit of deceleration equal to 9.81 m/s^2 .

If partial engagement is possible, there shall be some positive indication to the wearer that correct engagement has occurred.

NOTE 2 This may be achieved by an indication continuously accessible to the wearer after engagement, or by an indication only at the moment of engagement. This momentary indication might, for example, be given by the feel of the action of the mechanism, but it is unlikely that an indication by sound would be adequate because of noise in the environment.

6.3.4.5 Durability of quick-release mechanisms.

When tested in accordance with Appendix P, quick-release mechanisms shall neither be fractured nor disengaged by the final loading procedure and shall then still be capable of operation.

6.4 Oblique impact resistance

6.4.1 These tests are not applicable to the head and neck support system as used in motor car sports.

6.4.2 *Bar anvil.* When the helmet is tested by the method described in Appendix Q using the bar anvil, the peak longitudinal force measured on the anvil shall not exceed 2.5 kN, nor shall its integral with time exceed 12.5 N·s for any of the specified impacts.

NOTE This test is intended to assess the force caused by projections, for example visor fittings, screws, press studs and steps in the shell surface.

6.4.3 *Abrasive anvil.* When the helmet is tested by the method described in Appendix Q using the abrasive anvil, the peak longitudinal force measured on the anvil shall not exceed 4 kN, nor shall its integral with time exceed 28 N·s for any of the specified impacts.

NOTE This test is intended to assess the force caused by friction against the surface of the helmet. It is particularly applicable to selected areas of helmets, the shells of which either have significant variations of curvature or are made of more than one material.

6.5 Chin guard

When any chin guard is tested by the method described in Appendix R, the maximum deceleration of the striker shall not exceed 300 g. The chin guard shall not develop or generate any additional hazard for the wearer and any internal padding shall remain in place.

NOTE A second impact may be carried out from a drop height of 1.5 m with the chin strap slack and the rear of the shell unsupported, but this is for information only and is not subject to a separate requirement.

7 Flammability (optional)

If compliance with this clause is claimed [see 8.1 g) and 8.2 d)], when subjected to the flame test described in Appendix S, the materials of the shell, the edge trim, any part of the lining that could be exposed to flame when the helmet is worn, and any part of the retention system, except for any strap, shall not burn with the emission of flame for a period exceeding 5 s after removal of the igniting flame. Any of these parts which would be in contact with the wearer shall not melt during the application of the igniting flame.

8 Marking

8.1 Each helmet shall be legibly and durably marked in such a way that the following information is accessible to the user:

- a) the number and date of this standard, i.e. BS 6658:1985,²⁾ and the type of helmet, i.e. type A or type B;
- b) the year and either the quarter or the month of batch release;
- c) the name or trademark or Kitemark licence number of the manufacturer;
- d) the country of origin of the helmet;
- e) the size or size range of the helmet;
- f) the designation of the model;
- g) a claim of compliance with the optional flammability performance requirement if such a claim is made for the helmet (see clause 7);
- h) either a statement that any helmet fitted with the head and neck support system (see 5.1) is for motor car sports use only; or a pictogram showing that the helmet is NOT for use by motor-cyclists.

NOTE It is the intention that the marking remain legible throughout the life of the helmet.

8.2 Each helmet shall be legibly and durably marked in such a way that the following information is protected from obliteration and is accessible to the test examiner:

- a) the number of this standard, i.e. BS 6658:1985,²⁾ and the type of helmet, i.e. type A or type B;
- b) the name or trademark or Kitemark licence number of the manufacturer;
- c) the code designation for the production date or batch;
- d) a claim of compliance with the optional flammability performance requirement if such a claim is made for the helmet (see clause 7).

²⁾ Marking BS 6658:1985 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third-party certification of conformity.