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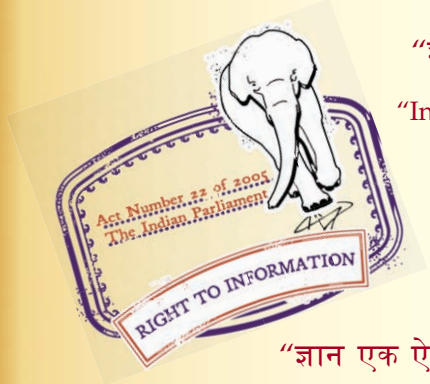
IS 2925 (1984): Specification for Industrial Safety Helmets(Bi-Lingual) [CED 22: Fire Fighting]



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Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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Indian Standard

SPECIFICATION FOR INDUSTRIAL SAFETY HELMETS

(Second Revision)

Fourth Reprint JULY 2007
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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4 *January* 1985

Indian Standard

SPECIFICATION FOR INDUSTRIAL SAFETY HELMETS

(Second Revision)

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(*Continued on page* 16)

AMENDMENT NO. 1 JANUARY 1988

TO

IS:2925-1984 SPECIFICATION FOR INDUSTRIAL SAFETY HELMETS

(Second Revision)

(Page 5, clause 5.1, line 11) - Add the following words after the word 'each':

'of the two'

(Page 5, clause 5.1, last line) - Add the following words after the word 'shall':

'not less than 180 mm^2 and'

(Page 15, clause H-2.1, line 2) - Add the following words after the word 'of':

'sodium chloride in'

(BDC 22)

AMENDMENT NO. 2 SEPTEMBER 1999 TO IS 2925 : 1984 SPECIFICATION FOR INDUSTRIAL SAFETY HELMETS

(Second Revision)

(*Page* 4, *clause* **2.3.1**) — Insert the following at the end of sub-clause:

'and the headband may or may not be continuous when Napestrap is provided.'

(CED 22)

AMENDMENT NO. 3 DECEMBER 2000
TO
IS 2925 : 1984 SPECIFICATION FOR INDUSTRIAL SAFETY HELMETS

(Second Revision)

(*Page* 3, *clause* **0.4**) — Delete clause 0.4.

(*Page* 5, *clause* **4.1**) — Substitute the following for the existing:

'Helmets shall be in sizes 520, 530, 540, 550, 560, 570, 580, 590 and 600 mm. These sizes may be generated out of one or more shells or one of more head bands. The size adjustment range shall be clearly marked on the helmet.'

(*Page* 9, *clause* **10.1**(b)] — Substitute 'Range/Size' *for* 'Size'.

(*Page* 10, *Appendix* A) — Delete.

(*Page* 13, *Appendix* G) — Substitute following Appendix G for the existing:

APPENDIX G
(*Clause* 8.3)

METHOD OF TESTING FLAMMABILITY RESISTANCE

G-1 SAMPLE

G-1.1 The samples for testing shall be selected as given in **9.1**.

G-2 BURNER

G-2.1 Burner shall be operated with the valve so as to get a flame height of 150 mm. Satisfactory operation of burner shall be checked by inserting in the flame, the bare copper wire of 0.71 mm diameter having a free length of not less than 100 mm in position normally occupied by low edge of the test piece, that is, 50 mm above the burner and reaching farther edge of the flame. The wire should not take more than 6 seconds to melt.

G-3 PROCEDURE

G-3.1 With the helmet upside down, and the burner angled at 45° to the vertical. The end of the flame shall be applied to the outside of the shell at any suitable point between 50 and 100 mm from the crown for a period of 10 seconds. The plane tangential to the test point shall be horizontal.

G-3.2 The shell shall be examined for flamming 5 seconds after removal of the flame.

AMENDMENT NO. 4 MAY 2002
TO
IS 2925 : 1984 SPECIFICATION FOR INDUSTRIAL SAFETY HELMETS

(Second Revision)

(*Page* 3, *clause* **0.5**) — Insert the following new clause after **0.5**:

'**0.6** In the formulation of this standard, due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. The performance requirements given in this standard are technically equivalent to those given in ISO 3873.'

(CED 22)

Indian Standard

SPECIFICATION FOR INDUSTRIAL SAFETY HELMETS

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 31 May 1984, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Helmet is one of the most important items of personal protective equipment used by workers for protection against head injuries which may be caused by falling objects in many industries, for example, mining, tunnelling, quarrying, ship building, construction projects and similar occupations. Head injuries caused by falling objects are usually serious and sometimes fatal. This standard has been prepared for industrial safety helmets capable of providing adequate protection from falling objects and other hazards commonly met with in many industries. This standard was first published in 1964 and revised in 1975. This second revision has been prepared so as to include all the amendments issued so far besides relaxing number of anchoring points of cradle from eight to minimum four so that latest designs could also be covered in the revised version besides including the provision of ventilation holes.

0.3 In formulating this standard, the Sectional Committee has taken special care to avoid unnecessary restriction in the design of safety helmets. If any special hazards, such as chemicals, oils, are likely to be encountered, the requirements of standard should be supplimented by special requirements to afford protection against such hazards.

0.4 In the course of use of helmets, it is advisable that at suitable intervals, these should be tested for the sterilization test as given in Appendix A.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained

*Rules for rounding off numerical values (*revised*).

in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard lays down the requirements regarding material, construction, workmanship and finish and performance requirements of helmets intended to provide protection against falling objects and other hazards which may be encountered in mining, tunnelling, quarrying, ship building, construction projects and similar other industrial occupations.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Brim — The rim surrounding the shell.

2.2 Chinstrap — An adjustable strap that fits under the chin to secure the helmet on the head.

2.3 Harness — The complete assembly by means of which the helmet is maintained in position on the head, which includes headband, cradle, etc.

2.3.1 *Headband* — Part of harness surrounding the head. The plane of lower margin of headband shall correspond to reference line of the headform (*see* IS : 7692-1975*).

2.3.2 *Anti-Concussion Tapes* — Supporting straps which form the cradle.

2.3.3 *Cradle* — The fixed or adjustable assembly compring of anti-concussion tapes and nape strap where provided.

2.3.4 *Nape Strap* — An adjustable (with respect to the shell) strap that fits behind the head to secure the helmet and may be integral part of the headband.

2.4 Peak — The extension of the shell above the eyes.

2.5 Shell — The hard smoothly finished material that provides the general outer form of the helmet.

2.6 Ventilation Holes — Holes provided in the shell to permit circulation of air-inside the helmet.

---

*Specification for wooden headform for testing of helmets.

3. MATERIAL

3.1 Shell — The shell of the helmet shall be of non-metallic materials conforming to test requirements given in **8**.

3.2 Harness — The criteria for the selection of material for the headband, anti-concussion tape, etc, is that these shall be sweat-resistant, non-irritant and shall not cause skin disease.

3.3 Metal Parts — The metal parts used in helmets shall be either inherently corrosion resistant or of such metal which have been treated for these properties. Such parts shall show no sign of corrosion when subjected to test, as specified in Appendix B.

NOTE — Helmets required for use in underground mines shall have no metal parts made from aluminium or magnesium or their alloys.

4. SIZES

4.1 Helmets shall be in the following three sizes depending upon the range of headband sizes. The shell shall be fitted with adjustable type of headband in accordance with the following requirements:

Nominal Size of the Helmet	*Range of Headband Sizes (Circumference Inside Headband)*
	Adjustable from
Small	500 to 540 mm
Medium	540 to 590 mm
Large	590 to 640 mm

4.1.1 A tolerance of ± 10 mm on the size of the headband shall be permitted.

NOTE — The size of the headband shall be measured with either a fixed ring gauge or an expanding gauge which shall be made of metal or by an appropriate headform.

5. CONSTRUCTION

5.1 The shell shall be dome-shaped. There shall not be any metallic component passing through the shell. It shall be provided with a brim with or without a peak. The brim and the peak (where provided) shall be integral part of the shell and these shall have no sharp edges. The brim shall be continuous around the dome. The dimensions of brim and the peak (where provided) shall be in accordance with Fig. 1. The position of ventilation holes shall be such that the central axis of the holes is almost horizontal when the helmet is in normal wearing position. The diameter of any hole shall not exceed 6 mm nor the edges of adjacent holes closer than 15 mm. The minimum number of holes on each side shall be not less than 3 and total aggregate area of holes shall not exceed than 300 mm^2.

NOTE — However the condition of usage preclude the positions of ventilation holes, the same may not be provided.

5.2 Harness

5.2.1 *Headband* — The headband shall be not less than 30 mm in width, and so designed that adjustment to any size specified in **4.1** may be readily made. It shall be securely attached to the helmet shell and crown straps.

5.2.1.1 In order to provide ventilation the minimum distance of headband from the shell achieved by spacers or otherwise shall be 5 mm except at the point of general adjustment of headband.

5.2.2 *Cradle* — The headband shall be fitted with anti-concussion tapes secured at least at 4 anchoring points and forming a cradle. The width of the straps shall be not less than 19 mm. The straps shall ensure a clearance of at least 30 mm between the top of the wearer's head and the inside of the top of the helmet crown at the smallest size adjustment of the headband and a wearing height (depth of fit) of not less than 80 mm, at the maximum size adjustment of the headband when tested in accordance with the methods given in Appendix C.

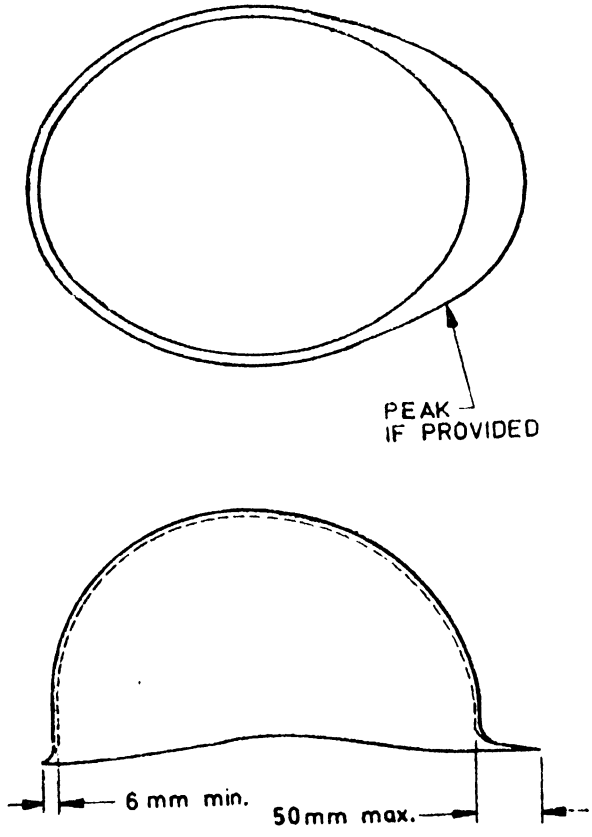

FIG. 1 DIMENSIONS OF BRIM AND PEAK

5.3 Chin Strap or Nape Strap — The helmet shall be provided either with the chin strap or nape strap.

5.3.1 *Chin Strap* — It shall be attached to the shell, be of at least 19 mm wide, permanently fitted with a fastening device to adjust and maintain tension, and conform to the requirements given in Appendix D.

5.3.2 *Nape Strap* — It shall be either an integral part or as an attachment to the headband, be adjustable and have a minimum depth of 115 mm when measured as in **5.3.2.1**.

5.3.2.1 With the helmet fitted on a headform (*see* IS : 7692-1975*) and loaded with a mass of 10 kg, the distance between the top of the headform and the bottom edge of the nape strap shall be not less than 115 mm measured at the centre rear of the headform.

5.4 Lamp Bracket (Where Required) — This shall be made of plastic or suitable material and fixed to the shell and shall satisfy the following performance requirements:

The helmet with the peak cut off is mounted on a wooden headform and held in position. A cap lamp hook (detached from the head piece of cap lamp) is fitted into the lamp bracket. A mass of 2·25 kg is suspended by a suitably strong cord of 100 cm from the outer rim of the cap lamp hook so that the cord coincides with the vertical axis of the mass. The mass is then raised through the same axis through 80 cm and let fall freely. Two trials being made in each case. The bracket shall remain intact.

5.5 Cable Clip (Where Required) — This shall be made of plastic or suitable material and fixed to the shell and shall satisfy the following requirements:

A helmet with the brim cut off partially at the back is mounted on the wooden headform and held in position. A mass of 2·25 kg is suspended by a suitably strong cord of length 50 cm from the cable clip, keeping the point of suspension closest to the shell. The mass is raised and let fall freely through the height of 30 cm; two trials being made in each case. The cable clip shall remain intact.

6. WORKMANSHIP AND FINISH

6.1 The surface of the helmet shall be finished smooth, free from burrs; sharp edges shall be removed to ensure proper surface contact of all fittings. All metal parts including rivets shall be smooth and free from sharp or rough edges or projections.

*Specification for wooden headform for testing of helmets.

7. MASS

7.1 The mass of a complete helmet without attachements and with or without peak (where not provided) may not exceed 400 g. If the mass exceeds 400 g, this mass determined to the nearest 35 g shall be shown on a label attached to the helmet.

8. PERFORMANCE REQUIREMENTS

8.1 Shock Absorption Resistance — Helmets shall be tested for shock absorption by the method described in Appendix E within one minute after subjecting them to the conditions specified in (a), (b) and (c) below:

a) A temperature of 50 ± 5°C for 4 hours in an oven,

b) A temperature of −10 ± 2° for 4 hours in a refrigerator, and

c) Water flowing over the whole outer surface of the shell at room temperature for 4 hours at a rate of 1 l/min.

No single helmet shall, however, be subjected to more than one of these conditions. The shell shall not show any penetration and/or cracks (separation of material) and harness shall not show any damage deteriorating its function. The force transmitted from the headform to the base shall not be higher than 5 kN (510 kgf).

8.2 Penetration Resistance — Helmet shall be tested for penetration resistance in accordance with the method specified in Appendix F within one minute after subjecting it to one of the conditions given in **8.1** which has given worst result in shock absorption. These shall neither break nor be pierced through sufficiently to touch the headform; no integral part shall fail or stretch permitting the helmet to be forced down over the headform. The static measurement of the depth of a penetration or dent including the thickness of the material of the shell shall not exceed 10 mm.

8.3 Flammability Resistance — Helmet shell shall be tested for flammability resistance in accordance with the method specified in Appendix G. The material of the shell shall not burn with emission of flame after a period of 5 seconds following removal of flame.

8.4 Electrical Resistance — Helmet shell shall be tested for electrical resistance in accordance with the method specified in Appendix H, and shall not show a leakage current in excess of 3 mA.

8.5 Water Absorption — Helmet shell shall be tested for water absorption in accordance with the method specified in Appendix J, and shall not absorb water more than 5 percent of its mass.

8.6 Heat Resistance — Helmet shell shall be tested for heat resistance in accordance with method specified in Appendix K, and the shell shall not separate, distort or soften.

9. SAMPLING AND CRITERIA FOR CONFORMITY

9.1 The method of sampling and criteria for conformity shall be as specified in IS : 9695-1980*.

10. MARKING

10.1 Each helmet (shell and harness) shall be legibly and indelibly marked with the following information:

a) Manufacturer's name or trade-mark, and

b) Size of helmet.

10.1.1 The product may also be marked with Standard Mark.

10.1.2 The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufactures or producers may be obtained from the Bureau of Indian Standards.

11. INSTRUCTIONS

11.1 Each helmet shall be clearly and indelibly marked as follows either on helmet shell or on a label securely affixed or securely attached:

a) For adequate protection this helmet shall fit or be adjustable closely to the required size,

b) This helmet is made to absorb some of the energy of a blow by partial destruction of its component parts and even though damage may not be readily apparent any helmet subject to severe impact should be replaced, and

c) To maintain full efficiency of this helmet there shall be no alteration to the structure of the helmet or its component parts.

*Methods for sampling of helmets.

APPENDIX A

(*Clause* 0.4)

METHOD OF TESTING STERILIZATION

A-1. PROCEDURE

A-1.1 Subject the entire helmet to treatement set out in both (a) and (b) given below and after treatment examine it for evidence of deterioration, distortion or separation:

a) Expose the helmet to a moist atmosphere of antiseptic gas, preferably formaldehyde, at a temperature of 25°C for a period of 10 minutes;

b) Immerse the helmet in a formalin solution containing one part of 40 percent formaldehyde to nine parts of water, at a temperature of 25°C for a period of 10 minutes.

A-1.2 The helmet showing any sign of deterioration, distortion or separation, should be replaced.

APPENDIX B

(*Clause* 3.3)

METHOD OF TESTING CORROSION RESISTANCE OF METAL PARTS

B-1. SAMPLES

B-1.1 The samples shall be selected as in **9.1**.

B-2. PROCEDURE

B-2.1 Spray the specimens with a solution of 5 parts of sodium chloride to 95 parts of distilled water (by mass) at room temperature (25°C to 35°C) for a continuous period of 24 hours. Then wash the parts in clean running water, and dry. Inspect for signs of corrosion.

APPENDIX C

(*Clause* 5.2.2)

METHOD OF CHECKING CLEARANCE ABOVE THE HEAD AND THE WEARING HEIGHT (DEPTH OF FIT)

C-1. SAMPLES

C-1.1 The samples shall be selected as in **9.1**.

C-2. CLEARANCE ABOVE THE HEAD

C-2.1 In the case of helmet which has reinforcing ribs, measure the depth of rib and correct the measured clearance accordingly. Mount the helmet on a headform (*see* IS : 7692-1975*) corresponding to the size of headband marked on the helmet, in a position similar to that which it would occupy on a man's head. Apply a load of 10 kg, to the top of the helmet (this can be conveniently applied by using a 10 kg bag of sand). Measure the clearance by means of a rod of diameter not more than 10 mm inserted through the hole drilled in the vertical axis of the headform.

C-3. WEARING HEIGHT (DEPTH OF FIT)

C-3.1 Mount the helmet on a headform corresponding to the size of headband marked on the helmet and apply a pressure of 10 kg as in **C-2.1**. Mark on the headform the position of the lower edge of the headband. Remove the helmet and measure the vertical distance between the top of the headform and the mark showing the position concupied by the headband.

APPENDIX D

(*Clause* 5.3.1)

TEST FOR STRENGTH OF CHIN STRAP

D-1. SAMPLES

D-1.1 The samples for testing shall be selected as given in **9.1**.

D-2. PROCEDURE

D-2.1 The helmet is placed on the appropriate headform (*see* IS : 7692-1975*) with the chin strap fastened as in normal position.

*Specification for wooden headform for testing of helmets.

D-2.2 A load of 10 kgf will be applied to the chin strap through *S* hook. After 5 minutes the chin strap shall not break.

D-2.3 The *S* hook to be used in this set up shall be approximately 100 mm overall height, 50 mm overall width and will be made from 10 or 12 mm steel rod.

APPENDIX E

(*Clause* 8.1)

SHOCK ABSORPTION TEST

E-1. SAMPLES

E-1.1 The samples shall be selected as given in **9.1**.

E-2. APPARATUS

E-2.1 Wooden Headform — A wooden headform (*see* IS : 7692-1975*) shall be used.

E-2.2 A Gauge and Recording Apparatus for Measuring Force — The gauge and the associated recording apparatus shall have proper time constant to be able to measure the impact loading up to 40 kN (4080 kgf) independent of the time of application of the force and a slow application of the load required for its calibration. The gauge shall have a minimum stiffness of 500 kN/mm (51 tf/mm). The headform shall be mounted on the gauge so that its vertical axis through the crown coincides with the vertical axis of the gauge.

E-2.3 Accuracy — The overall accuracy of the recording apparatus shall be 10 percent.

E-2.4 Block — Concrete or similar monolithic block to support the gauge and headform, having the minimum dimensions : height 1 m, length 1 m, width 0·6 m and mass 1 t. The block shall be bedded on dry sand on a solid floor.

E-2.5 Striker — A striker in the form of a rectangular block of wood weighing 3 kg and having a horizontal striking face 180 mm × 180 mm. The striker shall slide freely and without oscillation down two vertical guide wires so positioned that the centre of gravity of the striker lies on the vertical axis of the gauge and both lie in the plane of the guide wires.

*Specification for wooden headform for testing of helmets.

E-3. METHOD

E-3.1 The helmet with apex cushioning material, if any, removed shall be mounted on the headform, of appropriate size. The striker shall be raised to a clear height of 1·5 m ± 5 mm above the point of contact with the helmet and allowed to fall freely. A photographic or other high speed record of the force transmitted during impact shall be made.

APPENDIX F

(*Clause* 8.2)

METHOD OF TESTING PENETRATION RESISTANCE

F-1. SAMPLE

F-1.1 The sample for testing shall be selected as given in **9.1** and shall be tested in one of the conditions given in **8.1** which has given worst result (*see* **8.2**).

F-2. PROCEDURE

F-2.1 Mount helmet on any headform (*see* IS : 7692-1975*). Drop freely a plumb bob of 500 g mass with a conical steel point having an included angle of 36° and a spherical point radius of not more than 0·5 mm from a clear height of 3·0 m with the pointed end downwards on to the top of the crown of the helmet. Examine the helmet for piercing or denting, failure of any integral parts, etc.

APPENDIX G

(*Clause* 8.3)

METHOD OF TESTING FLAMMABILITY RESISTANCE

G-1. SAMPLES

G-1.1 The samples for testing shall be selected as given in **9.1**.

G-2. BURNER WITH ACCESSORIES

G-2.1 The test shall be carried out with barthel burner conforming to **A-1** of IS : 4355-1977†.

*Specification for wooden headform for testing of helmets.
†Specification for fire-resistant brattice cloth (*first revision*).

G-2.2 The following accessories shall be used with the burner:

a) Reservoir,

b) Connecting tube of polyethylene or soft rubber,

c) Absolute alcohol (ethanol),

d) Bare copper wire 0·71 mm diameter having a free length of not less than 100 mm, and

e) Stand to help the reservoir.

G-2.3 The absolute alcohol shall be filled in the reservoir and the tube air bubbles entrapped in the tube shall be removed by pressing the tube several times. Cotton waste soaked in spirit shall be kept in the cup on the burner and lighted. After a few minutes when the burner is sufficiently heated the regulator of burner shall be turned to allow the spirit to flow in the form of vapour.

G-2.4 Burner shall be operated with the valve so as to get a flame height of 150 mm. Level of the fuel shall be not less than 760 mm above the base of the burner. Satisfactory operation of burner shall be checked by inserting in the flame the bare copper wires in position normally occupied by low edge of the test piece, that is, 50 mm above the burner and reaching farther edge of the flame. The wire should not take more than 6 seconds to melt.

G-3. PROCEDURE

G-3.1 With the helmet upside down, and the burner angled at 45° to the vertical, the end of the flame shall be applied to the outside of the shell, at any suitable point between 50 and 100 mm from the crown, for a period of 10 seconds. The plane tangential to the test point shall be horizontal.

G-3.2 The shell shall be examined for flaming 5 seconds after removal of the flame.

APPENDIX H

(*Clause* 8.4)

METHOD OF TESTING ELECTRICAL RESISTANCE

H-1. SAMPLES

H-1.1 The samples for testing shall be selected as given in **9.1.**

H-2. PROCEDURE

H-2.1 Invert the helmet and place it on a frame in a suitable container. With a solution of 6g/l of water, fill the container and the helmet to within 12 mm of the junction of the brim and the dome, or, if the helmet is provided with holes to a depth of 12 mm below the holes. Allow the helmet to remain in the solution for a period of 18 to 24 hours and maintain the temperature of 25°C to 35°C during this period. Then apply an alternating voltage of 2 000 V (rev/s) at 50 Hz and of approximately sine wave form, for one minute between electrodes placed in the solution inside and outside the helmet respectively. If no electrical breakdown occurs, disconnect the high voltage supply and connect a milliammeter in the circuit on each side of the electrode. Raise the test voltage slowly observing the ammeter reading, until the applied voltage is 2 000 V. An automatic tripping device may be used in the circuit in addition to the milliammeter.

APPENDIX J

(*Clause* 8.5)

METHOD OF TESTING WATER ABSORPTION

J-1. SAMPLES

J-1.1 The sample which have been used for shock absorption in condition **8.1**(b) shall be used for carrying out this test (*see* **9.1**).

J-2. METHOD

J-2.1 Weigh the sample (full shell). Immerse for 24 hours in water, at a temperature of 25°C to 35°C. Remove from water, dry the surfaces by wiping them, and weigh the again. Report the average gain in mass as a percenatge.

APPENDIX K

(*Clause* 8.6)

METHOD OF TESTING HEAT RESISTANCE

K-1. SAMPLES

K-1.1 The samples for testing shall be selected as given in **9.1**.

K-2. PROCEDURE

K-2.1 Place the shell for 15 minutes in an oven maintained at a temperature of 93 $\pm$ 5°C. The shell shall be shielded from direct radiation during the test. Remove the shell from the oven and examine for seperation, distortion or softening.

(*Continued from page* 2)

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