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(उपभोक्ता मामले, खाद्य एवं सार्वजनिक वितरण मंत्रालय, भारत सरकार)
BUREAU OF INDIAN STANDARDS
(Ministry of Consumer Affairs, Food & Public Distribution, Govt. of India)

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व्यापक परिचालन मसौदा

हमारा संदर्भ : सीईडी 22:5/टी-02 **23 सितम्बर 2025**

तकनीकी समिति : अग्नि शमन विषय समिति, सीईडी 22

प्राप्तकर्ता :

1. **सिविल अभियांत्रिकी विभाग परिषद, सीईडीसी के सभी सदस्य**
2. **अग्नि शमन विषय समिति, सीईडी 22 और इसके पैनल के सभी सदस्य**
3. **रुचि रखने वाले अन्य निकाय।**

महोदय/महोदया,

निम्नलिखित मानक का मसौदा संलग्न हैं:

प्रलेख संख्या	शीर्षक
सीईडी 22(28725)WC	औद्योगिक सुरक्षा हेलमेट — विशिष्टि (आईएस 2925 का *तीसरा पुनरीक्षण*) का भारतीय मानक मसौदा *[आईसीएस 13.340.20]*

कृपया इस मसौदे का अवलोकन करें और अपनी सम्मतियाँ यह बताते हुए भेजे कि यह मसौदा प्रकाशित हो तो इन पर अमल करने में आपको व्यवसाय अथवा कारोबार में क्या कठिनाइयां आ सकती हैं।

सम्मतियाँ भेजने की अंतिम तिथि: 24 अक्टूबर 2025

सम्मति यदि कोई हो तो कृपया अधोहस्ताक्षरी को ई-मेल द्वारा ced22@bis.gov.in पर या उपरलिखित पते पर, संलग्न फोर्मेट में भेजें। सम्मतियाँ बीआईएस ई-गवर्नेंस पोर्टल, www.manakonline.in के माध्यम से ऑनलाइन भी भेजी जा सकती हैं।

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धन्यवाद।

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WIDE CIRCULATION DRAFT

Our Reference: CED 22:05/T-02 **23 September 2025**

TECHNICAL COMMITTEE: FIRE FIGHTING SECTIONAL COMMITTEE, CED 22

ADDRESSED TO:

1. All Members of Civil Engineering Division Council, CEDC
2. All Members of Fire Fighting Sectional Committee, CED 22 and its Panels
3. All others interested.

Dear Sir/Madam,

Please find enclosed the following draft:

Doc No.	Title
CED 22(28725)WC	Draft Indian Standard Industrial Safety Helmet — Specification (*Third revision* of IS 2925) [*ICS: 13.340.20*]

Kindly examine the attached draft and forward your views stating any difficulties which you are likely to experience in your business or profession, if this is finally adopted as National Standard.

Last Date for comments: 24 October 2025

Comments if any, may please be made in the enclosed format and emailed at ced22@bis.gov.in or sent at the above address. Additionally, comments may be sent online through the BIS e-governance portal, www.manakonline.in.

In case no comments are received or comments received are of editorial nature, kindly permit us to presume your approval for the above document as finalized. However, in case comments, technical in nature are received, then it may be finalized either in consultation with the Chairman, Sectional Committee or referred to the Sectional Committee for further necessary action if so desired by the Chairman, Sectional Committee.

The document is also hosted on BIS website www.bis.gov.in.

Thanking you,

Yours faithfully,

Sd/-

Dwaipayan Bhadra
Scientist 'E' & Head
Civil Engineering Department
Email: ced22@bis.gov.in
Phone: +91-11 2323 5529

Encl: As above

FORMAT FOR SENDING COMMENTS ON THE DOCUMENT

[Please use A4 size sheet of paper only and type within fields indicated. Comments on each clause/sub-clause/ table/figure, etc, be stated on a fresh row. Information/comments should include reasons for comments, technical references and suggestions for modified wordings of the clause. **Comments through e-mail to ced22@bis.gov.in shall be appreciated**.]

Doc. No.: CED 22(28725)WC **BIS Letter Ref**: CED 22:05/T-02

Title: Draft Indian Standard Industrial Safety Helmet – Specification (*Third revision* of IS 2925)

[ICS: 13.340.20]

Last date of comments: 24 October 2025

Name of the Commentator/ Organization: _____

Sl No.	Clause/ Para/ Table/ Figure No. commented	Type of Comment (General/ Technical/ Editorial)	Comments/ Modified Wordings	Justification of Proposed Change
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NOTE- Kindly insert more rows as necessary for each clause/table, etc

BUREAU OF INDIAN STANDARDS

DRAFT STANDARD FOR COMMENTS ONLY

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Draft Indian Standard

INDUSTRIAL SAFETY HELMET — SPECIFICATION

(*Third revision of IS 2925*)

ICS: 13.340.20

Fire Fighting Sectional Committee, CED 22	**Last Date for Comments: 24 October 2025**

FOREWORD

(*Formal clauses shall be added later*)

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, shipbuilding, 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 1965 and 1984. In this revision following changes has been incorporated:

a) The mass requirement for the helmet has been removed.
b) Performance tests have been categorised into mandatory and optional.
c) Test methods have been updated to align with the latest international practices.
d) Optional performance requirements have been introduced for very low temperatures, very high temperatures, electrical properties, lateral deformation, and molten metal splash.

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

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

For the formulation of this standard significant assistance has been taken from BS EN 397:2012+A1:2012 ‘Industrial Safety Helmets’.

To decide 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 per IS 2: 2022 ‘Rules for Rounding off Numerical Values’. The number of significant places retained in the rounded-off value should be the same as that of the specified value in this standard.

BUREAU OF INDIAN STANDARDS

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Draft Indian Standard

INDUSTRIAL SAFETY HELMET — SPECIFICATION

(*Third revision of IS 2925*)

1 SCOPE

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

1.2 The mandatory requirements apply to helmets for general use in industry. Additional optional performance requirements are included to apply only where specifically claimed by the helmet manufacturer.

2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute the provision of this standard. At the time of publication, the editions indicated was valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards:

IS No.	*Title*
IS 2828: 2019 | ISO 472: 2013	Plastics — Vocabulary (*second revision*)
IS 7692: 2024	Headform for testing of helmets — Specification (*second revision*)
IS 15758 (Part 5): 2020 | ISO 9185: 2007	Textiles — Protective clothing Part 5: Assessment of resistance of materials to molten metal splash (*first revision*)
IS 17863	Plastics — Methods of exposure to laboratory light sources
Part 1: 2022 | ISO 4892-1: 2016	Part 1: General guidance
Part 2: 2022 | ISO 4892-2: 2013	Part 2: Xenon-arc lamps
Part 3: 2022 | ISO 4892-3: 2016	Part 3: Fluorescent UV lamps

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply:

3.1 Brim — The rim surrounding the shell.

NOTE — A brim may include a rain gutter.

3.2 Chin Strap Anchorage — means by which the material of the chin strap is attached to the helmet; this includes, for example:

a) the component(s) fitted to the ends of the chinstrap material for this purpose;
b) that part of the helmet shell or of the headband where the chin strap is attached.

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

3.4 External Vertical Distance — Vertical distance between the top of the headform on which the helmet is mounted and the highest point on the outside surface of the helmet shell.

NOTE — This represents the height of the outer surface of the shell above the head when the helmet is worn and relates to clearance under low roofs, etc.

3.5 Harness — The complete assembly that provides a means of absorbing kinetic energy during an impact and/or maintaining the helmet in position on the head, which includes:

3.5.1 *Headband* — The part of the harness completely or partly surrounding the head above the eyes at approximately the largest horizontal circumference of the head.

3.5.2 *Nape Strap* — An adjustable strap that fits behind the head below the plane of the headband.

3.5.3 *Cradle* — An assembly of the parts of the harness in contact with the head, excluding the headband and nape strap.

3.5.4 *Cushioning* — The material to improve wearing comfort.

3.5.5 *Anti-Concussion Tapes* — The supporting straps that absorb kinetic energy during an impact.

3.5.6 *Comfort Band or Sweatband* — The accessory to cover at least the inner front surface of the headband to improve wearer comfort.

3.6 Helmet Accessories — any additional parts for special purposes such as chin strap, neck protector, draw lace, and attachment devices for lamp, cable, face protection, and hearing protection.

3.7 Horizontal Distance — horizontal distance between the headform on which the helmet is mounted and the inside of the shell measured at the level of the lower edge of the shell at the front (midway between the sides of the headform) and at the side (midway between the front and back of the headform)

3.8 Industrial Safety Helmet — A headgear, hereinafter referred to as a “helmet”, primarily intended to protect the upper part of a wearer’s head against injury from falling objects.

3.9 Internal Vertical Clearance — The difference in the level of the highest point on the outside surface of the helmet shell when the helmet is mounted on the head form:

a) with the cradle present; and
b) with the cradle removed and any protective padding in the crown area left in place

NOTE — This represents the height of the inner surface of the shell above the head when the helmet is worn and relates to stability.

3.10 Internal Vertical Distance — The difference in the level of the highest point on the outside surface of the helmet shell when the helmet is mounted on the headform:

a) with the cradle present; and
b) with the cradle and any protective padding in the crown area removed, so that the shell rests on the headform.

NOTE — This represents the height of the inner surface of the shell above the head when the helmet is worn and relates to stability.

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

3.12 Protective Padding — material contributing to the absorption of kinetic energy during an impact.

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

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

3.15 Wearing Height — Vertical distance from the lower edge of the headband to the highest point of the headform on which the helmet is mounted, measured at the front (midway between the sides of the headform) and at the sides (midway between the front and back of the headform), whichever gives the greater distance.

4 PHYSICAL REQUIREMENTS

4.1 Materials and Construction

4.1.1 The helmet shall include at least a shell and a harness.

4.1.2 Recommendations for materials and construction of helmets are given in Annex A.

4.1.3 For those parts of the helmet that come into contact with the skin, materials which are known to be likely to cause skin irritation or any adverse effect on health shall not be used.

4.1.4 There shall be no sharp edge, roughness, or projection on any part of the helmet, its accessories, or attachment devices, which are in contact, or potential contact, with the wearer, when the helmet is worn, such as is likely to cause injury to the wearer.

4.1.5 Any part of the helmet which can be adjusted or removed by the wearer for the purpose of replacement, shall be so designed and manufactured as to facilitate adjustment, removal, and attachment without the use of tools.

4.1.6 Any adjustment system incorporated within the helmet shall be designed and manufactured so as not to become incorrectly adjusted without the wearer's knowledge under the foreseeable conditions of use.

4.2 External Vertical Distance

When measured under the conditions given in **6.5** the external vertical distance shall be no more than 80 mm.

4.3 Internal Vertical Distance

When measured under the conditions given in **6.5** the internal vertical distance shall be no more than 50 mm. (*see* Fig. 1)

4.4 Internal Vertical Clearance

When measured under the conditions given in **6.5** the internal vertical clearance shall be no less than 25 mm. (*see* Fig. 1)

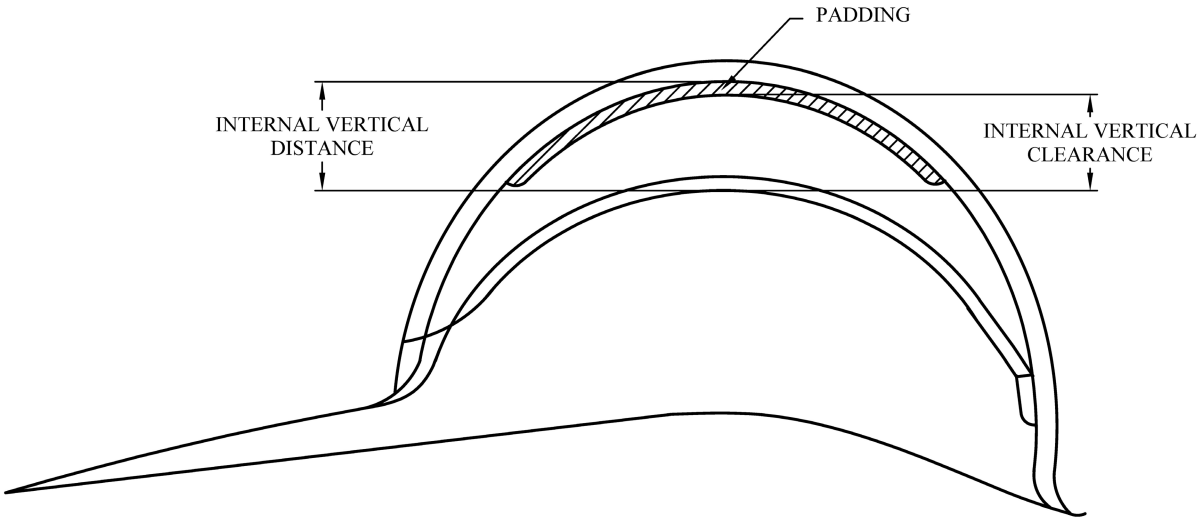


FIG. 1 INTERNAL VERTICAL DISTANCE AND INTERNAL VERTICAL CLEARANCE

4.5 Horizontal Distance

When measured under the conditions given in **6.5** the horizontal distance at the front and sides of the helmet shall be no less than 5 mm.

4.6 Wearing Height

Provision shall be made for the wearing height to be adjustable. When measured under the conditions given in **6.5** the wearing height at the front or sides of the helmet shall be no less than:

a) 80 mm for helmets mounted on headform size designation 525 (*see* IS 7692).
b) 85 mm for helmets mounted on headform size designation 555 (*see* IS 7692).
c) 90 mm for helmets mounted on headform size designation 585 (*see* IS 7692).

4.7 Harness

A harness shall include a headband and nape strap.

4.7.1 *Headband/Nape Strap*

The length of the headband or the nape strap shall be adjustable in increments of no more than 5mm.

Note: The angle which the nape strap makes with the edge of the shell may be adjustable. This may be achieved by angular adjustment of the headband within the shell. This provision may improve helmet retention.

4.7.2 *Cradle*

If the cradle incorporates textile tapes, their individual widths shall not be less than 15 mm, and the total of widths of the tapes radiating from their intersection shall not be less than 72 mm.

NOTE — Further reference to textile tapes is made in Annex A.

4.7.3 *Comfort Band or Sweatband*

If provided, a sweatband shall cover the inner front surface of the headband for a length of no less than 100 mm on each side of the centre of the forehead. The length shall be measured with a flexible measure along a line 10 mm ± 1 mm above the lower edge of the headband. The sweatband shall have a width not less than that of the headband over the length which it covers.

NOTE — Recommendations regarding the characteristics of the sweatband are given in Annex A.

4.8 Chin strap

Either the helmet shell or the headband shall be fitted with a chin strap or with means of attaching one.

Any chin strap supplied with the helmet shall be no less than 10 mm wide when un-tensioned and shall be attached either to the shell or to the headband.

4.9 Ventilation

If the helmet shell is provided with holes for ventilation purposes, the total area of such

holes shall be no less than 150 mm^2 and not more than 450 mm^2.

NOTES

1 Means of closing the ventilation holes may be provided.

2 If such means are provided, the holes shall be opened to the maximum extent when the above measurement is performed.

3 Manufacturers are encouraged to note the recommendations regarding design for ventilation given in Annex A

4.10 Accessories

For the fixing of helmet accessories, specified in the information accompanying the helmet, in accordance with **7.2.3**, the required fixing devices, or appropriate holes in the helmet shell, shall be provided by the helmet manufacturer.

5 PERFORMANCE REQUIREMENTS

5.1 Mandatory Requirements

5.1.1 *Shock Absorption*

When a helmet is tested by the method given in **6.6**, the force transmitted to the headform shall not exceed 5.0 kN. This requirement shall be satisfied by helmets treated in accordance with the appropriate conditioning processes given in **6.2**, as specified by the list of mandatory tests given in **6.1**.

5.1.2 *Resistance to Penetration*

When a helmet is tested by the method given in **6.7**, the point of the striker shall not contact the surface of the headform. This requirement shall be satisfied by helmets treated in accordance with the appropriate conditioning processes given in **6.2**, as specified by the list of mandatory tests given in **6.1**.

5.1.3 *Flame Resistance*

When tested by the method given in **6.8**, the materials of the shell shall not burn with the emission of flame after a period of 5 s has elapsed after removal of the flame.

5.1.4 *Chin Strap Anchorages*

When tested in accordance with **6.9**, the artificial jaw shall be released at a force of no less than 150 N and no more than 250 N, due to failure only of the anchorage(s).

5.1.5 *Label*

The label which may be attached to the helmet in accordance with **7.2.2** shall remain attached and legible on each sample helmet, following the appropriate conditioning in accordance with **6.2.3**, **6.2.4**, **6.2.5**, or **6.2.6**.

5.2 Optional Requirements

5.2.1 *Very Low Temperature (- 20 °C or - 30 °C)*

When tested for shock absorption by the method given in **6.6**, the requirement of **5.1.1** shall be satisfied by one helmet which has been conditioned in accordance with **6.2.7**.

When tested for resistance to penetration by the method given in **6.7**, the requirement of **5.1.2** shall be satisfied by a second helmet, which has been conditioned in accordance with **6.2.7**.

Helmets claimed to meet this requirement shall state this fact on the label attached to the helmet, in accordance with **7.2.2**.

5.2.2 *Very High Temperature (+ 150 °C)*

When tested for shock absorption by the method given in **6.6**, the requirement of **5.1.1** shall be satisfied by one helmet, which has been conditioned in accordance with **6.2.8**.

When tested for resistance to penetration by the method given in **6.7**, the requirement of **5.1.2** shall be satisfied by a second helmet, which has been conditioned in accordance with **6.2.8**.

Helmets claimed to meet this requirement shall state this fact on the label attached to the helmet, in accordance with **7.2.2**.

5.2.3 *Electrical Properties*

When tested by all three of the methods given in **6.10**, the leakage current shall not exceed 1.2 mA.

NOTES

1 This requirement is intended to provide protection to the wearer against short-term, accidental contact with live electrical conductors at voltages up to 440 V a.c.

2 Test 1 is intended to simulate closely the in-use situation - that is, the leakage current to the wearer via a live conductor touching the shell.

3 Test 2 is dependent upon the transverse resistance of the complete shell (thickness). This effectively precludes the use of a metal shell and of metal fasteners or ventilation holes passing through the shell.

4 Test 3 is dependent only upon the surface resistance of the shell, and effectively precludes the use of shells which have a conductive surface (e.g. metal electro-plating). This test was deemed to be necessary in order to obviate the danger to the wearer should he try to remove a helmet whose shell was in contact with a live conductor.

Helmets claimed to meet this requirement (for all 3 tests) shall state this fact on the label attached to the helmet, in accordance with **7.2.2**.

5.2.4 *Lateral Deformation*

When tested by the method given in **6.11**, the maximum lateral deformation of the helmet shall not exceed 40 mm, and the residual lateral deformation shall not exceed 15 mm.

Helmets claimed to meet this requirement shall state this fact on the label attached to the helmet, in accordance with **7.2.2**.

5.2.5 *Molten Metal Splash*

When tested by the method given in **6.12**, the helmet shell shall not:

a) be penetrated by the molten metal;
b) show any deformation, measured at right angles to the base plane of the helmet, greater than 10 mm;
c) burn with the emission of flame after a period of 5 s has elapsed after the pouring of molten metal has ceased.

Helmets claimed to meet this requirement shall state this fact on the label attached to the helmet, in accordance with **7.2.2**.

6 TEST REQUIREMENTS

6.1 Samples

Helmets shall be submitted for testing in the condition in which they are offered for sale, including any requisite holes in the shell and other means of attachment of any accessories specified by the helmet manufacturer.

No helmet that has been subjected to testing shall be offered for sale.

The minimum number of samples and conditions required for one set of tests is as follows:

a) Mandatory tests:
    i) 1 helmet for shock absorption test at - 10 °C
    ii) 1 helmet for shock absorption test following water immersion
    iii) 1 helmet for shock absorption test at + 50 °C, then for flame resistance test
    iv) 1 helmet for shock absorption test following artificial ageing
    v) 1 helmet for resistance to penetration test at - 10 °C
    vi) 1 helmet for resistance to penetration test following water immersion
    vii) 1 helmet for resistance to penetration test at - 50 °C, then for chinstrap anchorage test
    viii) 1 helmet for resistance to penetration test following artificial ageing
b) Optional tests:
    i) 2 helmets, one each for shock absorption and resistance to penetration tests, following exposure to very low temperatures (- 20 °C or - 30 °C, as appropriate)
    ii) 2 helmets, one each for shock absorption and resistance to penetration tests, following exposure to very high temperature
    iii) 1 helmet for each of the 3 electrical properties tests
    iv) 1 helmet for lateral deformation test

v) 1 helmet for molten metal splash test

6.2 Conditioning for Testing

6.2.1 *Temperature Conditioning Cabinet*

This shall be sufficiently large to ensure that the helmets can be positioned so that they do not touch one another or the sides of the cabinet. It shall be fitted with a fan to provide effective air circulation. These requirements apply to cabinets used for temperature conditioning at + 50 °C/ + 20 °C/ - 10 °C/ - 20 °C/ - 30 °C.

6.2.2 *Pre-conditioning*

Before testing, each helmet shall be subjected, as appropriate, to one of the individual conditioning treatments given in **6.2.3**, **6.2.4**, **6.2.5**, **6.2.6**, **6.2.7**, and **6.2.8**.

6.2.3 *Low Temperature*

The helmet shall be maintained at a temperature of - 10 °C ± 2 °C for between 4 h and 24 h.

6.2.4 *High Temperature*

The helmet shall be maintained at a temperature of 50 °C ± 2 °C for between 4 h and 24 h.

6.2.5 *Water Immersion*

The helmet shall be totally immersed in water at 20 °C ± 2 °C for between 4 h and 24 h.

6.2.6 *Artificial Ageing*

NOTE — An alternative conditioning method is given in Annex B.

6.2.6.1 *Apparatus*

A fused silica envelope high-pressure xenon lamp of 450-watt nominal power, operated in accordance with the lamp manufacturer’s instructions.

A means to support the helmets so that they are exposed to the radiation and do not touch one another or the sides of the cabinet.

6.2.6.2 *Procedure*

The helmet shall be secured so that the vertical axis through the crown of the helmet (as worn) is perpendicular to the axis of the lamp and the distance between the crown of the helmet and the axis of the lamp is 150 mm ± 5 mm.

The sample shall be exposed to the radiation for 400 h ± 4 h. It shall then be removed and allowed to return to laboratory ambient conditions.

6.2.7 *Very Low Temperature*

The helmet shall be maintained at a temperature of - 20 °C ± 2 °C or - 30 °C ± 2 °C as appropriate, for between 4 h and 24 h.

6.2.8 *Very High Temperature*

6.2.8.1 *Apparatus*

A simplified arrangement of the tempering apparatus is given in Fig. 2.

Tempering chamber

The tempering chamber is a heat-insulated casing with a sheet metal bottom 1 mm thick in which an opening is cut with the dimensions indicated in Fig. 3. The interior of the tempering chamber is heated to an air temperature of 150 °C ± 5 °C (spatial and temporal).

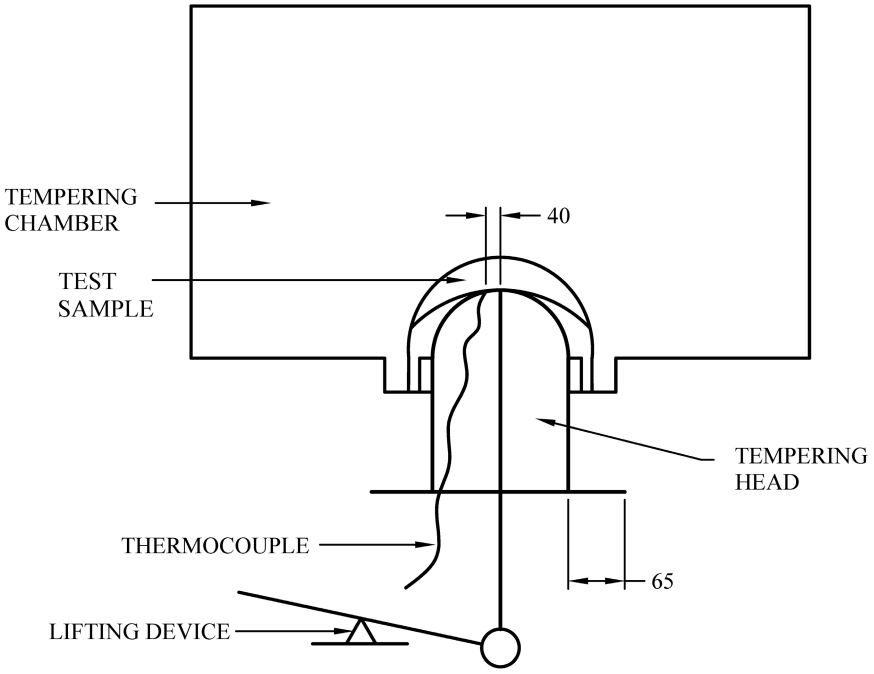
Tempering head

The tempering head is a hollow body made of copper plate 1.5 mm thick, the dimensions of which correspond to those of headform size designation 555 (*see* IS 7692). Its interior is cooled by the passage of coolant (e.g. air, water).

The tempering head is fitted with a ring, on its base, which is connected to a lifting device. The interior of the tempering head is heated to a temperature of 50 °C ± 2.5 °C (temporal). This is measured in the crown area by means of a thermocouple.

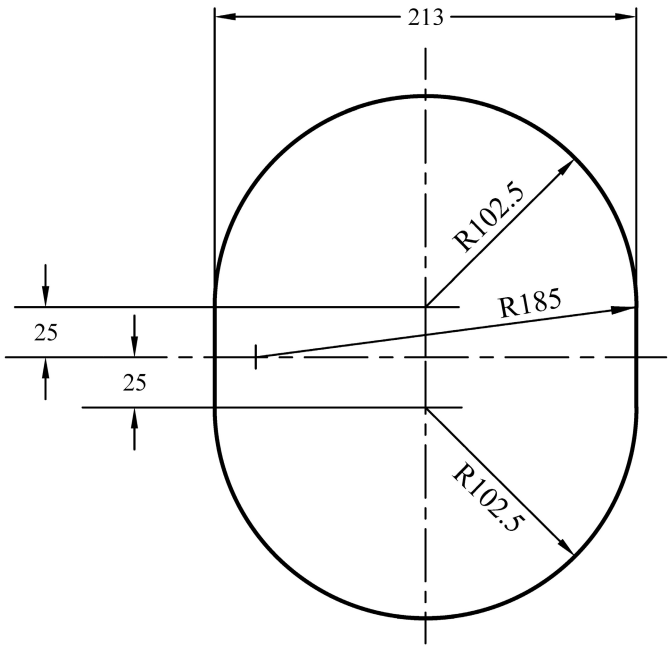
Lifting device

The lifting device serves to support and guide the tempering head through the opening in the bottom of the tempering chamber until the edges of the sample touch the bottom of the latter.



All dimensions are in millimetres.

FIG. 2 SIMPLIFIED ARRANGEMENT OF TEMPERING APPARATUS



All dimensions are in millimetres.

FIG. 3 DIMENSIONS OF OPENING IN BOTTOM OF THE TEMPERING CHAMBER

6.2.8.2 *Procedure*

The helmet shall be tempered for 60 min ± 2 min using the apparatus described.

6.3 Testing Atmosphere

Helmets shall be tested in an atmosphere having a temperature of 22 °C ± 5 °C and a relative humidity of 55 % ± 30 %.

6.4 Headforms

6.4.1 *Construction*

Head forms used for the tests shall comply at least with the following requirements:

a) Materials — either **3.1.1** or **3.1.2** of IS 7692;
b) Sizing — **2.11** and **3.2** of IS 7692; and
c) Marking — **4.1(d)** and **4.1(e)** IS 7692.

6.4.2 *Selection of Size*

6.4.2.1 Three sizes of headform are specified in this Standard, size designations 525, 555, and 585. (*see* IS 7692)

6.4.2.2 Other than as specified in **6.5**, helmets shall be tested on the headform of appropriate size (from size designations 525, 555, and 585), as selected by adjusting the headband/nape strap to the middle size of its adjustment range.

6.5 Measurement of Clearance, Distances, and Wearing Height

6.5.1 Vertical and horizontal distances, internal vertical clearance, and wearing height shall be measured with the helmet mounted in the wearing position successively on both the largest and smallest size of the headform (from size designations 525, 555, and 585) appropriate to its adjustment range.

6.5.2 The helmet shall be maintained in position on each headform by the application of a force of 50 N acting along the vertical axis.

6.5.3 For the measurement of wearing height and horizontal distance, the headband shall be adjusted in the vertical plane to its highest position within the shell.

6.6 Shock Absorption

6.6.1 *Principle*

Shock absorption is measured by the direct measurement of the maximum force transmitted to a rigidly mounted headform on which the helmet is fitted.

6.6.2 *Apparatus*

The base of the apparatus shall be monolithic and sufficiently large to offer full resistance to the effect of the blow. It shall have a mass of at least 500 kg and shall be suitably installed to obviate the return compression wave.

The headform shall be rigidly mounted in a vertical position on the base.

A striker, having a mass of $5.0^{+0.1}_{-0.0}$ kg and a hemispherical striking face of 50 mm ± 1 mm radius, shall be positioned above the headform so that its axis coincides with the vertical axis of the headform and so that it may be dropped in either free or guided fall. If guided fall is employed, the velocity of the striker, measured at a distance not

exceeding 60 mm prior to impact, shall be within 0.5 percent of that which would obtain for free fall.

The impact force shall be measured by a non-inertial force transducer firmly attached to the base. It shall be so positioned that its axis is co-axial with the path of the striker. The force transducer shall be able to withstand forces up to 40 kN without damage.

The measuring system, including the headform and its mounting, shall have a frequency response in accordance with channel frequency class (CFC).

6.6.3 Test Procedure

Each of the requisite sample helmets specified in **6.1** shall be adjusted to its greatest possible wearing height and conditioned appropriately in accordance with **6.2**.

Within 1 minute of its removal from conditioning:

a) the sample shall be mounted on the appropriate headform (*see* **6.4.2**) in the manner in which it is intended to be worn on the head, ensuring (minimal) clearance between the headband and the headform;
b) the striker shall be allowed to fall onto the centre of the crown of the helmet shell from a height of 1 000 mm ± 5 mm, measured from the point of impact on the helmet to the underside of the striker.

NOTE — This corresponds to an impact energy of nominally 49 J.

A recording shall be made allowing the determination of the maximum force transmitted.

6.7 Resistance to Penetration

6.7.1 *Principle*

A test striker is allowed to fall on to the helmet which is fitted to a rigidly mounted headform. Note is taken of whether or not contact is made between the striker and the headform or whether the contactable surface of the headform is visibly damaged.

6.7.2 *Apparatus*

6.7.2.1 The base of the apparatus shall be monolithic and sufficiently large to offer full resistance to the effect of the blow.

6.7.2.2 The headform shall be rigidly mounted in a vertical position on the base. The contactable surface of the headform shall be of a metal that will readily permit detection should contact by the striker occur, and that can be restored after contact, if necessary.

6.7.2.3 The striker has the following characteristics:

a) Mass — 3.0 kg + 0.050 kg
b) Angle of point — 60° ± 0.5°
c) Radius of point — 0.5 mm ± 0.1 mm

d) Minimum height of cone — 40 mm
e) Hardness of tip — between 50 and 45 Rockwell HRC

6.7.2.4 The striker shall be positioned above the headform so that its axis coincides with the vertical axis of the headform and so that it may be dropped in either free or guided fall. If guided fall is employed the velocity of the striker, measured at a distance not exceeding 60 mm prior to impact, shall be within 0.5 percent of that which would obtain for free fall.

6.7.3 *Test Procedure*

6.7.3.1 Each of the requisite sample helmets specified in **6.1** shall be adjusted to its greatest possible wearing height and conditioned appropriately in accordance with **6.2**.

6.7.3.2 Within 1 minute of its removal from conditioning:

a) the sample shall be mounted on the appropriate headform (*see* **6.4.2**), ensuring (minimal) clearance between the headband and the headform;
b) the striker shall be allowed to fall onto the helmet shell from a height of 1 000 mm ± 5 mm, measured from the point of impact on the helmet shell to the point of the striker. The impact point shall be within a circle of radius 50 mm cantered on the top of the helmet. The helmet shall be tilted on the headform as necessary;
c) each of the helmets as specified in **6.1** shall be impacted in a different position.

6.7.3.4 Note shall be taken of whether or not contact is made between the striker and the headform or whether the contactable surface of the headform is visibly damaged. If necessary, the contactable metal surface of the headform shall be restored prior to a subsequent test.

6.8 Resistance to Flame

6.8.1 *Principle*

The helmet shell is exposed to a standard flame.

6.8.2 *Apparatus*

The burner shall be suitable for propane gas, with a 10 mm diameter bore, an adjustable air vent, and an appropriate size of jet. The system shall incorporate a pressure control device, a suitable manometer, and a tap.

The gas used shall be propane having a minimum purity of 95 percent.

6.8.3 *Test Procedure*

The gas pressure shall be adjusted to 3 430 Pa ± 50 Pa (350 mm H_2O ± 5 mm H_2O).

The flame shall be adjusted by means of the air vent so that the blue cone is clearly defined, although turbulent, and is 45 mm ± 5 mm long.

The test shall be performed on the helmet used for the shock absorption test at 50 °C.

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

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

6.9 Chin Strap Anchorage

6.9.1 *Principle*

The helmet is supported on a headform, and a tensile force is applied to the chinstrap.

6.9.2 *Apparatus*

The apparatus consists of the appropriate headform (*see* **6.4.2**), suitably supported, and an artificial jaw comprising two cylindrical rollers of diameter 12.5 mm ± 0.5 mm, with their longitudinal axes separated by 75 mm ± 2 mm. A means of applying a known variable force to the artificial jaw is also required.

NOTE — The chinstrap is either the chinstrap normally supplied by the helmet manufacturer for use with the helmet or a suitable slave chinstrap if the helmet manufacturer does not normally supply one.

6.9.3 *Procedure*

The test shall be performed on the helmet used for the resistance to penetration test at 50 °C.

The helmet shall be mounted on the headform and the chinstrap passed around the artificial jaw.

A tensile force of 150 N shall be applied to the artificial jaw. This force shall then be increased at a rate of 20 N/min ± 2 N/min until the artificial jaw is released, due to failure only of the anchorage(s).

The maximum force measured during the test shall be recorded and note shall be taken of whether the anchorage(s) failed.

6.10 Electrical Properties

6.10.1 *Test 1*

6.10.1.1 *Principle*

The leakage current between the outside and inside of the helmet and chin strap, (as supplied by the helmet manufacturer) is measured at a specified voltage, when the helmet is mounted on a metal headform.

6.10.1.2 Procedure

The sample helmet and chin strap shall be completely immersed in fresh tap water at

room temperature for a period of 15 minutes ± 2 min. The helmet shall then be removed from the water and allowed to drain for not longer than 2 min.

The sample helmet shall be mounted crown uppermost on an appropriately sized aluminium headform, with the chin strap firmly secured.

An alternating test voltage at nominally 50 Hz or 60 Hz shall be applied between the aluminium headform and a suitably insulated hand-held metal probe of 4 mm diameter and with a hemispherical radiused end.

The probe shall be applied at any point on the external surface of the helmet shell situated at, or above, its lower edge. The test shall be repeated in order to investigate a number of test points.

At each test point, the voltage shall be increased to 1 200 V a.c. ± 25 V a.c., and maintained at this value for 15 s. The leakage current at this voltage shall be recorded, together with any evidence of breakdown.

6.10.2 *Test 2*

6.10.2.1 *principle*

The leakage current between the outside and inside of the helmet shell is measured at a specified voltage.

6.10.2.2 *procedure*

Before the test, the helmet shell shall be placed for 24 h ± 1/2 h in a 3 g/l ± 0.2 g/l solution of sodium chloride at a temperature of 20 °C ± 2 °C. The helmet shell shall then be removed, wiped, and placed upside down in a container of appropriate size. The container and the helmet shell shall then be filled with the sodium chloride solution, up to 10 mm below the lower edge of the shell.

An alternating test voltage at nominally 50 Hz or 60 Hz shall be applied between an electrode immersed in the solution inside the helmet shell and another electrode in the container, outside of the helmet shell.

The voltage shall be increased to 1200 V a.c. ± 25 V a.c. and maintained at this value for 15 s. The leakage current at this voltage shall be recorded, together with any evidence of breakdown.

NOTE — The orientation of the helmet shell in the sodium chloride solution for the test should be adjusted where necessary in order to accommodate shells whose lower edge is not straight.

6.10.3 *Test 3*

6.10.3.1 *Principle*

The leakage current between any two points on the surface of the helmet shell is measured at a specified voltage.

6.10.3.2 *Procedure*

It shall be ensured that the shell of the helmet is dry before the test.

An alternating test voltage at nominally 50 Hz or 60 Hz shall be applied between two suitably insulated hand-held metal probes of 4 mm diameter and with hemispherical radiused ends.

The probes shall be applied at any two points on the surface of the helmet shell (inside and/or outside) located not closer than 20 mm to each other. The test shall be repeated in order to investigate a number of pairs of test points.

At each test point, the voltage shall be increased to 1200 V a.c. ± 25 V a.c., and maintained at this value for 15 s. The leakage current at this voltage shall be recorded, together with any evidence of breakdown.

6.11 Lateral Deformation

6.11.1 *Principle*

The helmet is subjected to transverse compressive forces and the deformations measured.

6.11.2 *Procedure*

The helmet shall be placed transversely between two guided rigid parallel plates of nominal size 300 mm × 250 mm, having their lower edges radiused to 10 mm ± 0.5 mm. The brim shall lie outside, but as close to the plates as possible. In the case of helmets without a brim, the lower edge of the helmet shall lie between the plates.

An initial force of 30 N shall be applied perpendicular to the plates so that the helmet is subjected to a lateral force. After 30 s the distance between the plates shall be measured (dimension x).

The force shall be increased by 100 N per minute up to 430 N, which shall be held for 30 s, after which the distance between the plates shall again be measured (dimension y).

The force shall be decreased to 25 N and then immediately increased to 30 N, which shall be held for 30 s, after which the distance between the plates shall again be measured (dimension z).

Measurements shall be made to the nearest millimetre, and the extent of damage, if any, shall be noted.

The maximum lateral deformation is the difference between dimensions x and y.

The residual lateral deformation is the difference between dimensions x and z.

6.12 Molten Metal Splash

6.12.1 *Principle*

Molten iron is poured onto a helmet, which is then examined for damage.

6.12.2 *Apparatus*

The apparatus is described in IS 15758 (Part 5) modified by the introduction of an appropriate headform and by substituting the helmet under test for the PVC skin simulant. The metal shall be iron as specified in Annex A of IS 15758 (Part 5).

6.12.3 *Procedure*

The procedure specified in IS 15758 (Part 5) shall be employed, using a mass of 150 g ± 10 g of iron.

The helmet shall be placed on the headform in such a way that the point of impact of the liquid metal is within a circle of radius 50 mm centred on the top of the helmet.

After pouring has ceased it shall be noted:

a) whether any metal penetrated the helmet shell;
b) the extent of any deformation of the shell;
c) if the shell burned with the emission of flame after a period of 5 s.

7 MARKING

7.1 Markings on the Helmet

Every helmet shall carry moulded or impressed marking giving the following information:

a) Name or identification mark of the manufacturer;
b) Year and quarter of manufacture;
c) Type of helmet (manufacturer’s designation). This shall be marked on both the shell and the harness;
d) Size or size range (in centimetres). This shall be marked on both the shell and the harness.
e) The abbreviation for the material of the shell shall be in accordance with IS 2828. (For example, ABS, PC, HDPE, etc.)

7.2 Instructions

7.2.1 A label shall be attached to each helmet giving the following information, provided precisely and comprehensively in the local or English language:

a) For adequate protection, this helmet must fit or be adjusted to the size of the user’s head.
b) The helmet is made to absorb the energy of a blow by partial destruction or damage to the shell and the harness, and even though such damage may not be readily apparent, any helmet subjected to severe impact should be replaced.
c) The attention of users is also drawn to the danger of modifying or removing any of the original component parts of the helmet, other than as recommended by the helmet manufacturer. Helmets should not be adapted for the purpose of

fitting attachments in any way not recommended by the helmet manufacturer.

d) Do not apply paint, solvents, adhesives, or self-adhesive labels, except in accordance with instructions from the helmet manufacturer.

7.2.2 Each helmet shall carry moulded or impressed marking or shall carry a durable self-adhesive label stating the optional requirements complied with, as follows:

Optional Requirement	*Marking/Label*
Very low temperature	- 20 °C or - 30 °C as appropriate
Very high temperature	+ 150 °C
Electrical insulation	440 V AC
Lateral deformation	LD
Molten metal splash	MM

7.2.3 The following information, provided precisely and comprehensibly, shall accompany each helmet:

a) The name and address of the manufacturer;

b) Instructions or recommendations regarding adjustment, fitting, use, cleaning, disinfection, maintenance, servicing, and storage. Substances recommended for cleaning, maintenance, or disinfection shall have no adverse effect on the helmet and shall not be known to be likely to have any adverse effect upon the wearer when applied in accordance with the manufacturer's instructions;

c) Details of suitable accessories and appropriate spare parts;

d) The significance of the optional requirements complied with and given in accordance with **7.2.2**, and guidance regarding the limits of use of the helmet, corresponding to the respective risks;

e) Guidance regarding the obsolescence deadline or period of obsolescence of the helmet and its component parts;

f) Guidance regarding details of the type of packaging suitable for transportation of the helmet.

7.3 BIS Certification

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the Bureau of Indian Standards Act, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

ANNEX A *(Informative)*

(*Clauses* 4.1.2, 4.7.2, 4.7.3, and 4.9)

RECOMMENDATIONS FOR THE MATERIALS AND CONSTRUCTION OF INDUSTRIAL SAFETY HELMETS

A-1 The materials used should be of durable quality, that is their characteristics should not undergo appreciable alteration under the influence of ageing or of circumstances of use to which the helmet is normally subjected (exposure to sun, rain, cold, dust, vibrations, contact with the skin, effects of sweat or of products applied to the skin or hair).

A-2 The shell should have as uniform a strength as possible and should not be specially reinforced at any point. This does not exclude a gradual increase in shell thickness or ribs or means for attaching the harness or accessories but does exclude other highly localized reinforcement.

A-3 The shell should cover the upper part of the head and extend down to at least the level of the upper edge of the headband at the front of the helmet.

A-4 Helmets should be as light as possible without prejudicing design strength and efficiency. No part of the helmet should have sharp protruding edges and the outer surface of the shell should be smoothly finished.

A-5 For those parts of the harness coming into contact with the skin, materials which are known to cause irritation should not be used. For a material not in general use, advice as to its suitability should be sought before use.

A-6 Whilst not mandatory in this standard, the provision of a sweatband is recommended, in order to improve wearer comfort. The material(s) of the sweatband should be absorbent and should satisfy the following characteristics:

a) Thickness — 0.8 mm minimum;
b) pH value — 3.5 minimum;
c) Washable material content — 6 percent maximum; and
d) Proportion dichloromethane extractable materials — 4 percent to 12 percent (if made from leather).

A-7 For improved comfort the cradle, if fitted, should be made from textile tapes. This material also affords optimum accommodation of the shape of the wearer’s head and is more acceptable with regard to perspiration and irritation.

A-8 The design of the helmet should provide for maximal adjustment of the harness within the shell, in order to optimize wearer comfort.

A-9 Any devices fitted to the helmet should be so designed that they are unlikely to cause any injury to the wearer in the event of an accident. In particular, there should be no metallic or other rigid projections on the inside of the helmet such as might cause injury.

A-10 Where stitching is used to secure the harness to the shell, it should be protected against abrasion.

A-11 Where ventilation holes are provided, it should be noted that ventilation may be improved when fresh air is able to enter the helmet around its lower edge and to exit via holes in the shell located in the upper one third of the shell.

ANNEX B *(Informative)*
(*Clause* 6.2.6)

ALTERNATIVE PROCEDURE FOR ARTIFICIAL AGEING

B-1 The helmet submitted to artificial ageing should be exposed to the radiation of a xenon arc lamp. The radiant energy of the lamp should be filtered to provide a spectral power distribution that closely approximates that of terrestrial daylight.

B-2 The helmet should be fixed on a cylindrical holder concentric to the lamp and which rotates at a speed of 1 rev/min to 5 rev/min around its axis.

B-3 Each helmet which will subsequently be tested for shock absorption or for penetration should be orientated so that the area of test should be directed towards the lamp. The plane tangential to the shell at this point should be normal to a radius of the cylindrical holder.

B-4 The radiant energy incident in the plane of the test areas should be either measured or calculated from information provided by the manufacturer of the test apparatus. The exposure interval should be adjusted so that the exposed samples should receive a total energy of 1 GJ/m^2 over the wavelength range 280 nm to 800 nm.

B-5 The samples should be sprayed with distilled or demineralized water (having a conductivity below 5 µS/cm) intermittently with a cycle of 18 min of spraying and 102 min without spraying. During the latter periods, the measured relative humidity should be 50 percent ± 5 percent.

B-6 The temperature within the test chamber should be measured with a black standard thermometer placed at the same distance from the lamp as the exposed test areas of the helmets. The temperature should be maintained at 70 °C ± 3 °C.

B-7 All other test and calibration conditions for the apparatus should be in accordance with IS 17863 (Part 1), IS 17863 (Part 2) and method A of IS 17863 (Part 3).

NOTES

1 Not all available test apparatus, otherwise meeting the requirements of IS 17863 (Part 1), IS 17863 (Part 2) and IS 17863 (Part 3), will incorporate sample holder frames of diameter sufficient to accommodate complete helmets.

2 The position of the water sprays may require adjustment in order to avoid interference with the test samples.

3 The energy output of the xenon arcs has to be capable of being reduced below normal operational levels, so as to maintain acceptable intensities in the sample surface plane required by this procedure.

ANNEX C (Informative)

(*Foreword*)

METHOD OF TESTING STERILIZATION

C-1 PROCEDURE

C-1.1 Subject the entire helmet to treatment 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.

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