Safety Helmet

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Engineering Department

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Technical Specification of Safety Helmet

(For Working on Transmission Lines & Substations)

1. SCOPE

- This specification covers design, materials, manufacture, testing at manufacturer's works; inspection, marking, packing and documentation for industrial safety helmets designed to protect against head injuries from falling objects and other hazards used by electricians and linemen for working at transmission towers & substations.

2. APPLICABLE STANDARDS

Unless otherwise specified, the safety helmet and its components shall be designed, manufactured and tested in accordance with the latest editions of the following standards:

- IS 2925:1984, reaffirmed in 2010, with Amendments 1 to 4
- Relevant occupational safety rules and regulations
- Performance requirements align with ISO 3873 (per Amendment No. 4)

3. Terminology

- **Brim**: Rim surrounding the helmet shell.
- **Chinstrap**: Adjustable strap under the chin to secure the helmet.
- **Harness**: Assembly including headband and cradle to hold the helmet on the head.
- **Headband**: Part of the harness surrounding the head, aligned with the reference line of the head form (per IS 7692:1975).
- **Anti-Concussion Tapes**: Straps forming the cradle.
- **Cradle**: Assembly of anti-concussion tapes and nape strap (if provided).
- **Nape Strap**: Adjustable strap behind the head, integral or attached to the headband.
- **Peak**: Extension of the shell above the eyes.
- **Shell**: Hard, smooth component of the helmet.

3. MATERIALS

- **Shell**: The shell of the helmet shall be of non-metallic materials.
- **Harness**: Sweat-resistant, non-irritant and shall not causeskin disease.
- **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.(As per IS 2925:1984 Appendix A)

4. Sizes

- Helmets shall be available 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 or more headbands.

- The size adjustment range shall be clearly marked on the helmet. A tolerance of ±10 mm on the size of the headband shall be permitted.

5. Construction

5.1 Shell

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 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 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 of the two sides shall be not less than 3 and total aggregate area of holes shall not less than 180 mm2 and not exceeds 300 mm^2.

5.2 Harness

- **Headband**:

The headband shall be not less than 30 mm in width, and so designed that adjustment to any size.It shall be securely attached to the helmet shell and crown straps.Minimum clearance from shell to be 5 mm

- **Cradle(As per IS 2925:1984 Appendix B)**:

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

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

- **Chin Strap(As per IS 2925:1984 Appendix C)**:

It shall be attached to the shell, be at least 19 mm wide, permanently fitted with a fastening device to adjust and maintain tension.

- **Nape Strap**:

It shall be either an integral part of as an attachment to the headband, be adjustable and have a minimum depth of 115 mm.

Note:With the helmet fitted on a headform (As per 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 themass. 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 woollen 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

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.

7. Mass

The mass of a complete helmet without attachments 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 (As per IS 2925:1984Appendix D)

Helmets shall be tested for shock absorption 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°C 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 1.1/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 (As per IS 2925:1984 Appendix E)

Helmet shall be tested for penetration resistancewithin 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 forced 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 (As per IS 2925:1984 Appendix F)

Helmet shell shall be tested for flammability resistance. 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 (As per IS 2925:1984 Appendix G)

Helmet shell shall be tested for electrical resistance and shall not show a leakage current in excess of 3 mA.

8.5 Water Absorption (As per IS 2925:1984 Appendix H)

Helmet shell shall be tested for water absorption and shall not absorb water more than 5 percent of its mass.

8.6 Heat Resistance (As per IS 2925:1984 Appendix J)

Helmet shell shall be tested forheat resistanceand the shell shall not separate, distort or soften.

9. Sampling and Conformity

- Sampling method: Per IS 9695:1980.

10. Marking

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

1. Manufacturer’s name or trademark.
2. Size/range

The helmets may also be marked with the ISI Certification Mark (per Bureau of Indian Standards Act, 1986).

- **Instructions**:
- 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.
    1. Helmet must fit or be adjustable to head size.
    2. Replace helmet after severe impact, even if damage is not visible.
    3. No structural alterations allowed to maintain efficiency.

11. Testing Methods(As per IS 2925:1984Appendix A to J)

- Testing Corrosion Resistance Of Metal Parts (Appendix A)
- Checking Clearance Above The Head And The Wearing Height (Depth Of Fit)(Appendix B)
- Chin Strap Strength (Appendix C)
- Shock Absorption (Appendix D)
- Penetration Resistance (Appendix E)
- Flammability Resistance (Appendix F)
- Electrical Resistance (Appendix G)
- Water Absorption (Appendix H)
- Heat Resistance (Appendix J)

12. International Alignment

- Performance requirements align with ISO 3873 (per Amendment No. 4).