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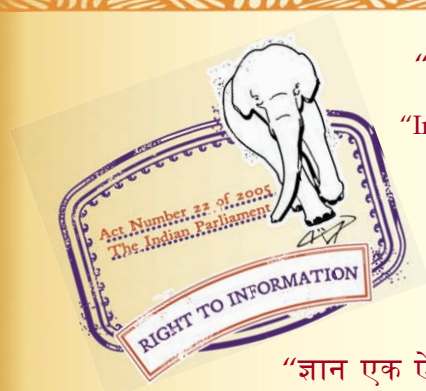
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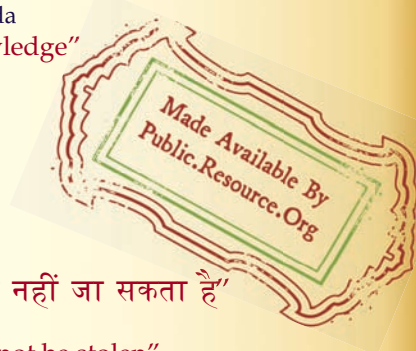
IS 8030 (1976): Luminaires for Hospitals [ETD 24:
Illumination Engineering and Luminaries]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

SPECIFICATION FOR
LUMINAIRES FOR HOSPITALS

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR LUMINAIRES FOR HOSPITALS

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Indian Standard

SPECIFICATION FOR LUMINAIRES FOR HOSPITALS

0. F O R E W O R D

0.1 This Indian Standard was adopted by the Indian Standards Institution on 13 April 1976, after the draft finalized by the Illuminating Engineering Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Luminaires for hospitals are distinct in themselves and are characterized by special features, such as:

- a) adjustability,
- b) heat-absorbing ability,
- c) colour correcting facility,
- d) focussing facility,
- e) perfect balance,
- f) easy manoeuvrability, and
- g) ease of maintenance.

This standard is intended to cover luminaires mentioned above.

0.3 Requirements for shadowless luminaires for operation theatres will be covered by a separate Indian Standard which is under preparation.

0.4 In preparing this standard, assistance has been derived from the following:

IEC Publication 162 (1972) Luminaires for tubular fluorescent lamps. International Electrotechnical Commission.

BS 3541 : 1962 Lighting fittings for general examination purposes in hospitals. British Standards Institution.

IES Report No. 12. Illuminating Engineering Society of London.

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, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (revised).

1. SCOPE

1.1 This standard covers the range of luminaires used in hospitals in general lighting. They include luminaires generally for incandescent and tubular fluorescent lamps rated for a maximum of 250 V.

1.2 This standard does not cover the requirements of shadowless luminaires for operation theatres of hospitals.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS:1885 (Part XVI/Sec 1)-1968* shall apply.

3. MATERIAL, DESIGN, CONSTRUCTION AND WORKMANSHIP

3.0 General — The following provisions shall apply in addition to those given in 3.0, 3.1 and 3.2 of IS:1913-1969†.

3.1 Exterior surfaces shall be smooth and free from formations which may harbour dirt and foreign matter.

3.2 All metal components which, by accident, might become electrically alive shall form an electrically low-resistance circuit to the earth terminal. Internal wiring shall be of adequate cross-sectional area to carry the required electrical load without overheating the insulating material and in case of adjustable luminaires, it shall retain its flexibility.

3.3 Insulating material shall be suitable for the particular purpose and should be resistant to oxidation and water absorption, and be rigid and non-flammable.

3.4 The wire-wound control gear for fluorescent lamps shall be so mounted that hum is not amplified by resonance of either the luminaire or of the structure to which it is attached. This also applies to the mounting where the control gear is located remote from the lamps. Where exceptional quietness is required, gear should be accommodated outside the quiet area.

3.5 Fluorescent lamps and their control gear may cause electrical interference to certain types of electromedical apparatus. In certain parts of the hospitals where sensitive gadgets may be in use like intensive care unit, radiography room, operation theatre, etc, the luminaires shall incorporate a low impedance path to the earthing terminal (with the help of suitable radio frequency suppressors) to eliminate unwanted frequencies. No appreciable radiated electrical disturbance should be received at a distance equal to or more than 3 m.

*Electrotechnical vocabulary: Part XVI Lighting, Section 1 General aspects.

†General and safety requirements for electric lighting fittings (first revision).

NOTE — A suitable limit for radio interference from the luminaires is under consideration.

3.6 General Construction

3.6.1 Luminaires shall be so designed and constructed that general maintenance including cleaning, replacement of lamp(s) and starter in case of luminaires with fluorescent lamp(s) may be done without damaging the luminaires or endangering the operator. Compliance is checked by inspection and, if necessary, by dismantling and re-assembling the luminaire.

3.6.2 Screwed and other fixed connections between different parts shall be made in such a way that they will not work loose by vibration or such other disturbances. In the case of adjustable luminaires, mechanical means shall be provided to prevent excessive movement of adjustable arms or radial joints to prevent damage to the lamp housing and wiring.

3.6.3 Except in the reception area, in no other place shall a current-carrying cord be used as a part of suspension system. Wherever used, the stress imposed by the luminaire on the cable shall not exceed 15 N/mm^2 of conductor cross section. In addition, the maximum mass of any luminaire suspended only by its cables is limited to 5 kg per suspension point unless special cables which include suitable mechanical load-carrying wires are used.

3.6.4 Cable Entry — Luminaires provided with non-detachable flexible cables or cords shall have a cord anchorage such that the conductors are relieved from strain, including twisting where they are connected to the terminals, and that their outer covering is protected from abrasion. It shall be clear how the relief from strain and the prevention of twisting is intended to be effected.

It shall not be possible to push the cable or cord into the luminaire to such an extent that it is subjected to undue mechanical or thermal stress.

Make shift methods, such as tying the cable or cord into a knot or tying the ends with string, shall not be used.

3.6.5 Cord anchorages shall either be of insulating material or be provided with a fixed insulating lining if otherwise an insulation fault on the cable or cord could make accessible metal parts live.

NOTE — Provisionally, this requirement does not apply to luminaires for wall mounting and to other luminaires provided with a sheathed flexible cable or cord that is unlikely to be stressed at the cord anchorage at any time during its life.

3.6.5.1 Cord anchorages shall be so designed that:

- a) at least one part is fixed to or forms part of the luminaire;
- b) they are suitable for the different types of flexible cable or cord, which may be connected to the luminaire;

- c) they do not exert excessive pressure on the cable or cord; and
- d) they are unlikely to be damaged when tightening or loosening in normal use.

3.6.6 Glands or bushes shall not be used as cord anchorages in portable or adjustable luminaires, unless they have special provision for clamping all types and sizes of cables and cords which may be used for the supply connection.

3.6.7 The conductors shall be introduced into the terminals and the terminal screws, if any, shall be tightened just sufficiently to prevent the conductor from easily changing their position. The cord anchorage shall be used in the normal way.

3.6.8 After this preparation, it shall not be possible to push the cable or cord into the luminaire in such a way as to cause movement of the cable or cord at the terminals or to cause it to come into contact with moving parts or parts which operate at temperatures higher than that permissible for the conductor insulation.

3.7 All fabrication and construction shall be carried out in a thoroughly workman-like fashion complying with the appropriate requirements of this standard and generally accepted principles of sound and safe practice. The luminaires shall have neat, preferably white, finish on all visible parts.

4. ELECTRICAL AND MECHANICAL SAFETY

4.1 Supply Connections and Other External Wiring

4.1.1 Luminaires shall be provided with one of the following means of connection to the supply:

Fixed luminaires — Terminals, plugs for engagement with socket-outlets, connecting-leads (tails).

Ordinary portable luminaires — Non-detachable flexible cables or cords, appliance inlets.

Other portable luminaires — Non-detachable flexible cables or cords.

4.1.2 Cords or cables used for wiring shall have a cross-sectional area not less than the following:

<i>Wattages</i>	<i>Cross Section mm²</i>
Up to 13 W	0.5
Above 13 W	0.75

4.1.3 Cable entries for external flexible cables or cords and any other object in their vicinity shall have smoothly rounded edges, minimum radius of 0.5 mm to prevent abrasion of conductor insulation. This applies to all the other tubes, channels or other passages through which the cable or the cord may have to pass.

4.1.4 Cable entries shall allow the introduction of the conduit or the protective covering of the cable or flexible cord so that the cores are completely protected, and they shall provide a degree of protection against moisture or dust in accordance with the classification of the luminaire, when the conduit, cable or flexible cord is fitted.

4.1.5 If, in the normal use of the luminaire, there is severe flexing in the neighbourhood of the bush, the flexible cord shall be clamped at this point.

4.2 Internal Wiring

4.2.1 Internal wiring shall be made with conductors of suitable size and type with nominal cross sections not less than 0.5 mm² and a minimum insulation thickness of rubber or PVC of 0.6 mm. The wiring shall be insulated with a material capable of withstanding the maximum temperature to which it is subjected in normal use, without deterioration capable of affecting the safety of the luminaire when properly installed and connected to the supply.

4.2.2 Internal wiring shall be so situated or protected that it cannot be damaged by sharp edges, rivets, screws and the like or by moving parts of switches, joints, raising and lowering devices, telescopic tubes and the like. Wiring shall not be twisted through an angle exceeding 360°.

4.2.3 If, in adjustable luminaires or in portable luminaires other than those for wall mounting, internal wiring passes through accessible metal parts or through metal parts in contact therewith, the opening shall be provided with a tough bushing of insulating material, having smoothly rounded edges, so fixed that it cannot easily be removed. Bushings of material likely to deteriorate with age (for example rubber) and the like, shall not be used in openings with sharp edges.

NOTE — Bushings which are screwed into the luminaire and are not provided with a lock nut and bushings which are fixed with an adhesive are not deemed to be so fixed that they cannot easily be removed unless the adhesive is a self-hardening resin, such as epoxy resin.

4.2.4 Joints and junctions in internal wiring (excluding terminations on components) shall be easily accessible and shall be provided with an insulating covering no less effective than the insulation of the wiring.

4.2.5 Where internal wiring passes out of the luminaire and the design is such that the wiring is subjected to strain, such as will impair safety, a cord anchorage as prescribed for external wiring shall be provided.

4.2.6 Wiring of adjustable luminaires shall be fixed by means of wire carriers, clips or the like, of insulating material at all places where it might otherwise rub against metal parts in the normal movement of the luminaire.

4.3 Terminals for Supply Connection

4.3.1 Connection of supply conductors to terminals, if any, shall be by means of screws, nuts or equally effective means including screwless terminals according to IS:6585-1972*. For non-detachable flexible cords in luminaires having a rated current not exceeding 1A, soldered, welded, crimped and similar connections may be used.

4.3.2 Design — The provisions of **4.2.1** of IS:1913-1969† shall apply.

4.3.3 Fixing — The provisions of **4.2.2** of IS:1913-1969† shall apply.

4.4 Creepage Distance — The provisions of **4.3** of IS:1913-1969† shall apply.

4.5 Clearance Distance — The provisions of **4.4** of IS:1913-1969† shall apply.

4.6 Earthing Facility

4.6.1 For luminaires designed for connection to a rated supply voltage exceeding 25 V, all metal parts liable to become 'alive' in the event of a failure occurring shall be effectively bonded together and connected to the main earthing terminal. The resistance of the circuit to earthing terminal shall comply with the test as mentioned in 7.5.

4.6.2 The current-carrying capacity of an earthing terminal shall be adequate and shall be not less than that of the earthing conductor to be connected.

The earthing terminal provided shall be capable of accommodating an earth continuity conductor of the required size.

The earthing terminal shall have screw threads not less than M4.

4.7 Switches

4.7.1 In case of portable luminaires for general examination, no switch or supply interruption device shall be incorporated on the appliance or in the flexible supply cord unless otherwise specified by the purchaser.

4.7.2 In luminaires designed to be mounted near the patients' beds and meant for use of the patients, the supply interruption device may be in the form of a cord switch, made of nylon or similar insulating material or a safety low voltage (24 V) relay.

*Specification for screwless terminal and electrical connections for lighting fittings.

†General and safety requirements for electric lighting fittings (*first revision*).

4.7.3 Luminaires meant for intensive care units, psychotherapy rooms, shall have provision to connect them to a light dimmer.

4.8 Protection Against Electric Shock

4.8.1 *Guarding Live Parts* — The provisions of 5.1, 5.1.1 and 5.1.2 of IS: 1913-1969* shall apply.

4.8.2 *Separation of Live Parts from Noncurrent-Carrying Conductive Parts* — The provisions of 5.2 of IS: 1913-1969* shall apply.

4.9 Maximum Operating Temperature

4.9.1 When tested as described in 7.7, in an ambient temperature of $27 \pm 2^\circ\text{C}$, the maximum operating temperature shall not exceed the values mentioned in Table 2 of IS: 1913-1969*.

4.9.2 Where maximum operating temperature of the exposed metal parts of lamp housing exceeds 65°C , a handle shall be provided to facilitate its adjustment and the maximum operating temperature of the handle when tested as described in 7.7 shall not exceed the values specified in Table 2 of IS: 1913-1969*.

4.10 Overall Performance and Temperature of Adjacent Surfaces Under Abnormal Conditions (for Fluorescent Lamp Luminaires Only) — The provisions of 7.1, 7.1.1, 7.2 and 7.3 of IS: 1913-1969* shall apply.

4.11 Protection Against Ageing and Corrosion — The provisions of 8.1 of IS: 1913-1969* shall apply.

5. SPECIAL AND OPTICAL REQUIREMENTS

5.1 In areas where anaesthetic gases are used, any luminaire used at a lower level than 1.4 m from the floor and within a radius of 1.2 m from any point where an anaesthetizing machine may travel, should be totally enclosed to prevent hot particles falling into this zone in the event of lamp breakage.

5.2 Mortuaries and post-mortem rooms shall be illuminated by hose-proof luminaires, complying with Type 5 of protection against ingress of liquids specified in IS: 2147-1962†.

5.3 Luminaires used in general wards shall be so designed that the light source is not in direct view of patients lying or sitting on the bed.

5.4 The footlights embedded in the walls shall have a transparent cover for protecting the lamp against normal mechanical shocks. Also it shall be so

*General and safety requirements for electric lighting fittings (first revision).

†Degrees of protection provided by enclosures for low-voltage switchgear and controlgear.

designed that during normal cleaning operation in the patient's room, no water may enter into the luminaire. The degree of protection for the foot-light luminaire shall be IP34 (see IS : 2147-1962*).

5.5 Luminaires having provision for connecting gas supplies shall be so designed that there may be no leakage of gas inside the lamp compartment from inside the luminaire. In case of integrated type of fittings, gas outlets shall be removed from possible socket outlets by at least 300 mm.

5.6 Optical Requirements — The design of the luminaires shall be such that its luminance value is as given in 5.6.1 and 5.6.2.

NOTE — Although general illuminance in any part of the hospital is dependent upon number of light sources and types of luminaires used, the glare caused by the installation is decided by the design of the luminaires also. Overall glare index for the comfort of people working and admitted into hospitals has been given by IS:4347-1967†, the glare caused by looking straight into the luminaire is taken into account by this specification.

5.6.1 Luminaires of Night Lighting — Luminance of any night lighting should not exceed 3 cd/m^2 when viewed from the plane of the bed mattress, which is normally 600 mm from the floor level.

5.6.2 Luminaires for General Ward Lighting

5.6.2.1 Suspended luminaires — Luminance of any part of the luminaire visible to any patient in bed shall not exceed 1000 cd/m^2 for luminaires suspended below the ceiling and where upward light output ratio is between 0.6 and 0.2.

5.6.2.2 Ceiling-mounted luminaires — Ceiling-mounted luminaires may emit sufficient light onto the ceiling so that they are seen against a bright background. If 20 percent or more of the light output of the luminaire is emitted above horizontal, the permissible luminance shall be 1000 cd/m^2 . If the upward light output ratio is less than 20 percent, the maximum luminance seen by the patient shall be limited to 700 cd/m^2 .

5.6.2.3 Recessed luminaires — In the case of recessed luminaires, no part of the luminaire shall have luminance more than 700 cd/m^2 .

5.6.2.4 Wall-mounted luminaires — Wall-mounted luminaires shall also have provision for providing indirect lighting in the patients' room or ward. The limiting value of luminance shall be as given in 5.6.2.2.

6. MARKING

6.1 Information to be Marked — The luminaires shall be suitably and clearly marked with the following information:

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

*Degrees of protection provided by enclosures for low-voltage switchgear and controlgear.

†Code of practice for hospital lighting.

- b) Model or type designation,
- c) Range of electrical rating in watts,
- d) Maximum rated voltage,
- e) ac or dc or both, and
- f) Country of manufacture.

6.2 Method of Marking — Marking shall be legible and indelible, and shall be made either on the luminaire itself or on a name-plate securely fixed thereto.

NOTE — The performance of the marking is checked by inspection or by rubbing lightly with a piece of wet cloth or by both methods.

6.3 Marking of Earth Connection — The earthing terminal of any luminaire shall be identified by means of the word 'earthed' or by the symbol 'E' or '⊥' marked in a legible and indelible manner on or adjacent to the terminal.

6.4 The product may also be marked with Standard Mark.

6.5 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 manufacturers or producers may be obtained from the Bureau of Indian Standards.

7. TESTS

7.1 Classification of Tests

7.1.1 Type Tests — The following shall constitute type tests:

- a) Insulation resistance (dry) test (*see 7.2*),
- b) High voltage test (*see 7.3*),
- c) Insulation resistance (humid) test (*see 7.4*),
- d) Earthing resistance test (*see 7.5*),
- e) Cord anchorage test (*see 7.6*),
- f) Heating test (*see 7.7*), and
- g) Test for mechanical strength (*see 7.8*).

7.1.2 Acceptance Tests — The following shall constitute acceptance tests:

- a) Insulation resistance (humid) test (*see* 7.4),
- b) Earthing resistance test (*see* 7.5), and
- c) Test for mechanical strength (*see* 7.8).

7.1.2.1 The number of samples for acceptance tests shall be as agreed upon between the purchaser and the supplier. However, a recommended plan of sampling is given in Appendix A.

7.1.3 Routine Tests — The insulation resistance (dry) test (*see* 7.2) and the high voltage test (*see* 7.3) shall be carried out as routine tests.

7.2 Insulation Resistance (Dry) Test — The provisions of 11.2 of IS:1913-1969* shall apply.

7.3 High Voltage Test — The provisions of 11.3 of IS:1913-1969* shall apply.

7.4 Insulation Resistance (Humid) Test — The provisions of 11.4 of IS:1913-1969* shall apply.

7.5 Earthing Resistance Test — A current of 10 A, derived from a source with no-load voltage not exceeding 6 V, is passed between the earthing terminal or earthing contact, and each of the accessible metal parts in turn.

The voltage drop between the earthing terminal and the accessible metal part is measured and the resistance calculated from the current and voltage drop. In no case shall the resistance exceed 0.5 Ω .

7.6 Cord Anchorage Test — The provisions of 11.6 of IS:1913-1969* shall apply.

7.7 Heating Test — The provisions of 11.7 of IS:1913-1969* shall apply.

7.8 Test for Mechanical Strength — The provisions of 11.8 of IS:1913-1969* shall apply.

APPENDIX A

(Clause 7.1.2.1)

RECOMMENDED PLAN OF SAMPLING

A-0. If statistical quality control techniques have been used for production control; such test results and relevant charts may be made available along

*General and safety requirements for electric lighting fittings (*first revision*).

with the material supplied to enable the purchaser to judge the acceptability or otherwise of a lot. In case such information is not available, the following procedure is recommended for judging conformity of a lot to the requirements of this specification.

A-1. SCALE OF SAMPLING

A-1.1 Lot — In any consignment, all the fittings of the same size and from the same batch of manufacture shall be grouped together to constitute a lot.

A-1.2 The number of fittings to be selected from a lot shall depend upon the lot size and shall be in accordance with col 1 and 2 of Table 1.

TABLE 1 SIZE OF SAMPLE AND CRITERION FOR CONFORMITY

LOT SIZE N	SAMPLE SIZE n	PERMISSIBLE NUMBER OF DEFECTIVES
(1)	(2)	(3)
Up to 200	15	1
201 to 300	20	1
301 „ 500	30	2
501 „ 800	40	3
801 „ 1300	55	3
1301 and above	75	4

NOTE — The sampling plan recommended here assures that lots with 3 percent or less defectives would be accepted most of the times and lots with defectives above 20 percent would be rejected most of the times.

A-1.3 These fittings shall be selected at random. In order to ensure randomness, the following procedure may be adopted:

Arrange the fittings in a systematic manner and starting from any fitting count them as 1, 2,..., etc, up to r , r being equal to the integral part of N/n , where N is the lot size and n the sample size. Every r th fitting shall be included in the sample.

A-2. NUMBER OF TESTS

A-2.1 All the fittings selected under A-1.2 shall be subjected to acceptance tests given in 7.1.2.

A-3. CRITERION FOR CONFORMITY

A-3.1 A lot shall be considered as conforming to this specification, if the number of fittings out of those tested, failing to satisfy the requirements of any one or more of acceptance tests, does not exceed the corresponding number given in col 3 of Table 1.

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