

Cinematography —

Part 7: Production and presentation —

Section 7.5 Film and television location lighting —

Subsection 7.5.2 Specification for location lighting power distribution units

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- Association of Film Laboratory Employers
- British Broadcasting Corporation*
- British Film Institute*
- British Kinematograph, Sound and Television Society*
- British Photographic Association
- Chartered Institution of Building Services
- Cinematograph Exhibitors' Association of Great Britain and Ireland
- Independent Television Companies' Association*
- Royal Photographic Society*

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the Technical Committee entrusted with the preparation of this British Standard:

- Association of British Theatre Technicians
- Association of Supervisory and Executive Engineers
- Electrical Installation Equipment Manufacturers' Association (BEAMA)
- Electrical, Electronic, Telecommunications and Plumbing Union
- Greater London Council
- Health and Safety Executive
- Lighting Industry Federation Ltd.
- National Illumination Committee of Great Britain

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Foreword

This British Standard has been developed at the request of the Television Broadcast Industry. It is based on BS 4363 *“Distribution units for electricity supplies for construction and building sites”*, but modified for the needs of location lighting where the distribution is normally only required for a short period of a few hours or days duration and often at short notice. A typical location lighting distribution layout is shown in Figure 1.

Attention is drawn to BS 5550-7.5.1 *“Code of practice for distribution of a.c. electricity for location lighting”*.

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

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 18, an inside back cover and a back cover.

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

1 Scope

This British Standard specifies electricity distribution units, suitable for outdoor and indoor use for the control and distribution of electricity from a three-phase, four-wire a.c. system, at declared voltage up to 415 V (240 V to earth), and with a capacity up to 600 A per phase. These units are intended to be used for the protection and control of temporary electricity supplies for lighting at film and television location sites.

2 References

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

3 Definitions

For the purposes of this Subsection, the following definitions apply.

NOTE Where the terms “voltage” and “current” are used, they imply the r.m.s. values unless otherwise specified.

3.1

intake switch unit (ISU)

an assembly of equipment designed for connection between the source of temporary supply and the remainder of the location lighting installation

3.2

control centre (CC)

a portable distribution unit accepting power from an intake switch unit and providing switch, contactor or dimmer control of outgoing circuits to suit the requirements of the production for which the location lighting is provided

3.3

final distribution unit (FDU)

a distribution unit accepting single-phase power from a control centre and providing contactor, switch or dimmer control of a number of sub-circuits each not more than 63 A capacity and protected by fuses or miniature circuit-breakers

3.4

cable splitter unit (CSU)

a unit enabling a single-phase supply circuit to be divided into two outgoing circuits

3.5

rated current

the current assigned to the unit by the maker

3.6

basic insulation

insulation applied to live parts to provide basic protection against electric shock

NOTE Basic insulation does not necessarily include insulation used exclusively for functional purposes.

3.7

supplementary insulation

independent insulation applied in addition to basic insulation, in order to ensure protection against electric shock in the event of failure of the basic insulation

3.8

double insulation

insulation comprising both basic insulation and supplementary insulation

3.9

reinforced insulation

a single insulation system applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation under the conditions specified in this standard

NOTE The term “insulation system” does not imply that the insulation is one homogeneous piece. It may comprise several layers which cannot be tested singly as supplementary or basic insulation.

3.10

class I appliance

a unit in which protection against electric shock does not rely on basic insulation only but which includes an additional safety precaution in such a way that means are provided for the connection of accessible conductive parts to the protective (earthing) conductor in the fixed wiring of the installation so that accessible conductive parts cannot become live in the event of a failure of the basic insulation

NOTE 1 Class I appliances may have parts with double insulation, or parts operating at safety extra-low voltage.

NOTE 2 For units intended for use with a flexible cord or cable, this provision includes a protective (earthing) conductor as part of the flexible cord or cable.

3.11

class II appliance

a unit in which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions, such as double insulation or reinforced insulation, are provided, there being no provision for protective earthing or reliance upon installation conditions

such a unit may be of one of the following types:

- a) a unit having a durable and substantially continuous enclosure of insulating material that envelopes all metal parts, with the exception of small parts, such as nameplates, screws and rivets, which are isolated from live parts by insulation at least equivalent to reinforced insulation; such a unit is called an “insulation-encased class II appliance”;

- b) a unit having a substantially continuous metal enclosure, in which double insulation is used throughout, except for those parts where reinforced insulation is used, because the application of double insulation is manifestly impracticable; such an appliance is called a “metal-encased class II appliance”;
- c) a unit which is a combination of the types a) and b).

NOTE 1 The enclosure of an insulation-encased class II appliance may form a part or the whole of the supplementary insulation or of the reinforced insulation.

NOTE 2 If a unit with double insulation and/or reinforced insulation throughout has an earthing terminal or earthing contact, it is considered to be of class I construction. Class II appliances may be provided with means for maintaining the continuity of protective circuits, provided that such means are within the unit and are insulated from accessible conductive parts by double insulation or reinforced insulation.

NOTE 3 Class II appliances may have parts operating at safety extra-low voltage.

4 Service conditions

All units shall be designed for continuous operation in an ambient temperature within the range of $-20\text{ }^{\circ}\text{C}$ to $+35\text{ }^{\circ}\text{C}$ in any condition of loading up to the rating of the unit. The design shall be such that the units shall be capable of operating continuously in conditions of 85 % relative humidity at $20\text{ }^{\circ}\text{C}$.

TEST. Compliance shall be checked by consideration of the specification of the sub-assemblies and materials incorporated and by the type tests specified in 12.1.1.

5 General requirements for units

5.1 Enclosures. The enclosure of each unit shall be robustly constructed so as to have adequate strength and rigidity to resist damage that could result from transportation, rough handling, heavy objects falling on it and exposure to all atmospheric conditions, as experienced under typical location conditions (see clause 4).

The material used in the manufacture of the enclosure, when tested in accordance with BS 476-3, shall not be penetrated by fire in less than half an hour and shall not be worse than category C in relation to the distance of spread of flame.

The top of the enclosure shall be so designed that rainwater cannot be retained on its surface. A sloping or a domed top is deemed to meet this requirement. The base of the enclosure shall have no aperture except for baffled drain holes if required. The enclosure shall have a minimum ground clearance of 4 cm.

TEST. Compliance shall be checked by inspection.

5.2 Protection of persons and equipment. Each unit shall be so designed that in normal use it shall meet degree of protection IP 23 as defined in BS 5420, i.e.:

- a) the equipment is protected against contact with live or moving parts inside the enclosure by fingers;
- b) the equipment is protected against ingress of medium size solid foreign bodies;
- c) the equipment is protected against rain.

NOTE The use of absorbent material should be avoided.

Each unit shall be so designed that in normal use it is protected against ingress of splashed water.

TEST. Compliance shall be checked by inspection, measurement and the tests specified in 12.2, 12.3 immediately followed by the tests specified in 12.4 and 12.5.

5.3 Stability. Each unit shall be stable when placed on its base in any direction on an inclined plane having an angle of 25° to the horizontal.

TEST. Compliance shall be checked by practical test.

5.4 Transit facilities. Means shall be provided to give protection to any projecting control operating handles and the like when the unit is in transit. This requirement shall apply to all sides of the unit. Adequate means shall be provided for the lifting and manoeuvring into position of units on site. Steel eyebolts, if fitted, shall comply with the requirements of BS 4278.

TEST. Compliance shall be checked by inspection.

5.5 Earthing and bonding

5.5.1 Provision shall be made on each unit so that during installation all cable armourings and earth continuity conductors can be readily bonded together and to the metal frame of the unit.

TEST. Compliance shall be checked by inspection.

5.5.2 Exposed conductive parts of class I units shall be permanently and reliably connected to an earthing terminal or termination within the unit, or to the earthing contact of the inlet to the unit.

Earthing terminals and earthing contacts shall not be electrically connected to the neutral terminal.

NOTE If accessible metal parts are screened from live parts by metal parts that are connected to the earthing terminal or termination or to the earthing contact, they are not, for the purpose of this requirement, regarded as likely to become live in the event of an insulation fault.

Class II units shall have no provision for earthing.

TEST. Compliance shall be checked by inspection.

5.5.3 Screwless terminals shall not be used for the connection of earthing conductors of flexible cords or fixed wiring.

The clamping means of earthing terminals shall be adequately locked against accidental loosening and it shall not be possible to loosen them without the aid of a tool.

NOTE In general, the designs commonly used for current-carrying terminals, other than some terminals of the pillar type, provide sufficient resiliency to comply with the latter requirement; for other designs, special provisions, such as the use of an adequately resilient part which is not likely to be removed inadvertently, may be necessary.

TEST. Compliance shall be checked by inspection and by manual test.

5.5.4 If detachable parts have an earth connection, this connection shall be made before the current-carrying connections are established when placing the part in position, and the current-carrying connections shall be separated before the earth connection is broken when removing the part.

For units with power supply cords, the arrangement of the terminals, or the length of the conductors between the cord anchorage and the terminals, shall be such that the current-carrying conductors become taut before the earthing conductor if the cable or cord slips out of the cord anchorage.

TEST. Compliance shall be checked by inspection and by manual test.

5.5.5 All materials forming parts of the earthing terminal shall be such that there is no risk of corrosion resulting from contact between these parts and the copper of the earthing conductor, or any other metal that is in contact with these parts.

TEST. Compliance shall be checked by inspection.

5.5.6 The connection between the earthing terminal or earthing contact and parts required to be connected thereto shall be of low resistance. In no case shall the resistance exceed 0.1Ω .

TEST. Compliance shall be checked by the following test.

A current derived from an a.c. source having a no-load voltage not exceeding 12 V, and equal to 1.5 times the rated current of the part up to a maximum of 25 A, shall be passed between the earthing terminal or earthing contact and each of the accessible metal parts in turn for a period of 1 min. The voltage drop between the earthing terminal of the unit, or the earthing contact of the inlet of the unit and the accessible metal part shall be measured, and the resistance calculated from the current and this voltage drop.

NOTE Care should be taken to ensure that the contact resistance between the tip of the measuring probe and the metal part under test does not influence the test result.

5.6 Access. Live parts shall be made completely inaccessible in the normal operation of switches and circuit-breakers by ensuring that access cannot be gained to these live parts and wiring without the use of tools or keys. It shall be practicable for an outgoing circuit to be connected or disconnected safely without making any other circuit dead.

All combinations of switches and fuses shall be labelled and shall be arranged to ensure that the switch will isolate the fuse from the supply. Fuses shall be constructed or otherwise protected so that replacement can be carried out without risk of contact with any live conductor. Rewirable fuses shall not be used.

TEST. Compliance shall be checked by inspection and manual operation.

5.7 Circuit-breakers. Each circuit-breaker when used shall be clearly marked to associate it with the socket-outlet or feed that it controls, and a means of indicating the description, e.g. a blank label, of the actual circuit shall be provided.

Means shall be provided for ensuring that individual circuit-breakers cannot be accidentally switched to the ON position. In any unit the direction of the operating levers for the ON position shall be the same and shall be clearly marked.

TEST. Compliance shall be checked by inspection.

5.8 Cable entry and anchoring. Means shall be provided to anchor and terminate incoming and outgoing cables. Openings for such cables shall be the minimum size to accept the specified number and type of cables. Edges of cable entry openings shall be shaped or padded to prevent damage to the cable.

TEST. Compliance shall be checked by inspection.

5.9 Fault ratings. Switches, fuses and excess-current circuit-breakers used in any unit shall, according to the rated input current of the unit, be suitable for the rated short circuit current specified in Table 1.

Table 1 — Fault ratings

Rated input current of the unit	Minimum rated short circuit current r.m.s.
A	kA
Over 400	35
Over 200 up to 400	25
Over 100 up to 200	20
Over 60 up to 100	12.5
Up to 60	3

5.10 Creepage distances, clearances and distances through insulation

5.10.1 Creepage distances and clearances shall be not less than the values in millimetres shown in Table 2.

TEST. Compliance shall be checked by measuring creepage distances and clearances, as indicated in Appendix A.

Measurements shall be made with the appropriate inlet cable(s) fitted, with movable parts placed in the most unfavourable position and with nuts and screws with non-circular heads being tightened in the most unfavourable position.

The clearances between terminals and accessible metal parts shall also be measured with the screws or nuts unscrewed as far as possible, but the clearances shall then be not less than 50 % of the values shown in Table 2.

Distances through slots or openings in external parts of insulating material shall be measured to metal foil in contact with the accessible surface; the foil shall be pushed into corners and the like by means of the test finger (see Figure 2), but not pressed into the openings.

If necessary, a force shall be applied to any point on bare conductors, and to the outside of metal enclosures, in an endeavour to reduce the creepage distances and clearances while taking the measurements. The force shall be applied by means of a test finger having a tip similar to the test finger in Figure 2. The magnitude of the force shall be:

- a) 2 N for bare conductors;
- b) 30 N for enclosures.

If a barrier is interposed and if it is in two parts that are not cemented together, the creepage distance shall also be measured through the joint.

If a barrier is interposed, clearances shall be measured over the barrier or, if the barrier is in two parts with mating surfaces that are not cemented together, through the joint.

When assessing creepage distances and clearances, the effect of insulating linings of metal enclosures or covers is taken into consideration.

Internal conductors shall be considered to be bare conductors, unless their insulation withstands an electric strength test made between the conductor and metal foil wrapped round the insulation, a test voltage of 2 000 V being applied for 15 min.

NOTE The values given in Table 2 do not apply to a component part for which creepage distances and clearances are specified in the British Standard with which the part complies.

5.10.2 For appliances having a rated current exceeding 25 A the distance between the terminals and metal enclosures shall be at least 9.5 mm.

TEST. Compliance shall be checked by inspection and by measurement.

5.11 Insulation resistance and electric strength. The insulation resistance and electric strength of units shall be adequate.

TEST. Compliance shall be checked by the tests specified in 12.4 immediately after the test specified in 12.3, with all the normal working covers in situ.

5.12 Temperature rise. The temperature rise limits given in Table 3 shall not be exceeded when units are tested in accordance with 12.6.

6 Materials and components

The materials and components of the units shall comply with the relevant British Standards as regards materials, construction and performance except as otherwise stated. In particular

- fuses shall comply with BS 88
- composite units of switches and fuses shall comply with BS 5419
- circuit-breakers shall comply with BS 3871-1 or BS 4752
- current-operated earth-leakage circuit-breakers shall comply with BS 4293
- transformers shall comply with BS 171 or where appropriate with BS 3535
- plugs and socket-outlets shall comply with
 - a) BS 4343,
 - b) BS 5550-7.5.3 or BS 5550-7.5.4, or
 - c) BS 1363, when they shall be protected by suitable splashproof covers or enclosures.

TEST. Compliance shall be checked by inspection.

7 Intake switch units (ISU)

7.1 Safety in use. The ISU shall be so designed that, once it has been connected to the power source, it can be safely left unattended. Subsequently it shall be possible safely to connect, test and disconnect the outgoing circuits.

TEST. Compliance shall be checked by inspection and manual operation.