BS 5266-1:1999

Emergency lighting —

Part 1: Code of practice for the emergency lighting of premises other than cinemas and certain other specified premises used for entertainment

ICS 91.160.10

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee CPL/34/9, Emergency lighting, upon which the following bodies were represented:

Association of British Theatre Technicians
Association of Building Engineers
Association of County Councils
Association of Manufacturers of Power Generating Systems
British Cable Makers Confederation
British Fire Consortium
Chartered Institution of Building Services Engineers
Chief and Assistant Chief Fire Officers' Association
Cinema Exhibitors' Association
Department of the Environment, Transport and the Regions
Department of Trade and Industry
District Surveyors' Association
Electrical Contractors' Association
Electricity Association
Engineering Industries Association
GAMBICA (BEAMA Ltd.)
Home Office
Industry Committee for Emergency Lighting
Institute of Fire Prevention Officers
Institute of Fire Safety
Institution of Electrical Engineers
Institution of Lighting Engineers
Lighting Industry Federation Ltd.
London Transport
London Fire and Civil Defence Authority
National Illumination Committee of Great Britain
National Inspection Council for Electrical Installation Contracting
Photoluminescent Safety Products Association
Tenpin Bowling Proprietors' Association
Co-opted members

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Contents

Foreword

This part of BS 5266 has been prepared by Technical Committee CPL/34/9. Together with BS EN 1838, it supersedes BS 5266-1:1988, which is withdrawn. This new edition of BS 5266-1 has been produced to take into account the requirements of, and remove any requirements which conflict with, BS EN 1838. The other parts of this standard are:

— Part 2: *Code of practice for electrical low mounted way guidance systems for emergency use*;

— Part 3: *Specification for small power relays (electromagnetic) for emergency lighting applications up to and including 32A*;

— Part 4: *Code of practice for design, installation, maintenance and use of optical fibre systems*;

— Part 5: *Specification for components parts of optical fibre systems*;

— Part 6: *Code of practice for non-electrical low mounted way guidance systems for emergency use — Photoluminescent systems*;

— Part 7: *Lighting applications — Emergency lighting*. (Also numbered BS EN 1838)

The aim of this code is to promote wider understanding of the different types of emergency lighting system which may be employed and to give guidance on their correct application to the varied requirements of different categories of premises.

The recommendations given in this code of practice have been drawn up to encourage uniformity of application, based on providing adequate safety to persons in the event of interruption of the normal lighting and having due regard to the hazard level and degree of familiarity of occupants with particular premises. The code recognizes that in addition to ensuring safe unobstructed means of escape from the premises at all times, an important function of emergency lighting is to make possible the immediate location and operation of fire alarm points and fire fighting equipment and another is to minimize the chance of panic arising in enclosed spaces, such as lifts. Although the code makes recommendations for the provision of emergency lighting in a wide variety of premises, the fact that particular types of premises are mentioned in clause **9** does not necessarily mean that all such premises will be required by law to have emergency lighting installed. For certain classes of premises the provisions of this code may be supplemented or replaced by alternative requirements at the discretion of the enforcing authority.

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 24, an inside back cover and a back cover.

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1 Scope

This part of BS 5266 relates to the provision of electric emergency lighting in most types of premises, other than private domestic premises, cinemas and existing premises to which the provisions of CP 1007, covering maintained lighting for cinemas, have been applied by the enforcing authority. Premises not covered are those used primarily as:

— ballrooms and dance halls;

— cinemas licensed under the Cinemas Act 1985;

— bingo premises licensed under the Gaming Act 1968 as amended by the Gaming (Amendment) Act 1982;

— ten-pin bowling establishments.

Although the code does not cover private domestic premises, its provisions are applicable to common access routes within multistorey dwellings.

This code no longer covers the levels of illumination required as these are dealt with in BS EN 1838. References to BS EN 1838 are made throughout the text.

The code gives recommendations for the indication and illumination of escape routes in the event of failure of the normal supply, and proposes minimum continuous periods of operation of such emergency lighting based on the size, type and usage of the premises.

NOTE 1 Should it be necessary to apply the code to any other type of lighting, the exact way in which each of its provisions is to be met should be the subject of agreement with the enforcing and/or other relevant authority before work is started.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this part of BS 5266 the following definitions apply.

2.1

combined (sustained) emergency luminaire

an emergency lighting luminaire containing at least two lamps, one of which is energized from the normal lighting supply and the other from an emergency lighting supply. Such a luminaire is intended to sustain illumination at all material times

2.2

duration

the period of time that the luminaire can continuously provide the minimum illuminance required in the emergency condition. The time is specified in hours

2.3

emergency exit

an exit which is intended to be used only during an emergency

2.4

emergency lighting

lighting provided for use when the supply to the normal lighting fails

2.5

emergency lighting system

a complete but discrete emergency lighting installation from the standby power source to the emergency lighting lamp(s), e.g. a self-contained emergency luminaire or a circuit from a central battery/generator connected through wiring to several escape luminaires

2.6

end of duration battery voltage

the minimum voltage of the battery as declared by the manufacturer that will occur at the end of the rated duration at the end of the declared battery replacement interval

2.7

escape lighting

that part of the emergency lighting which is provided to ensure that the escape route is illuminated at all material times

2.8

escape route

a route forming part of the means of escape from a point in a building to a final exit

2.9

exit

a way out which is intended to be used at any time whilst the premises are occupied

2.10

final exit

the terminal point of an escape route, beyond which persons are no longer in danger from fire

2.11

illuminance

the luminous flux density at a surface, i.e. the luminous flux incident per unit area. The unit of illuminance is lux

NOTE The term “illumination” is now used only to describe the general process of lighting.

2.12

input voltage

the voltage applied to a luminaire

2.13

lighting point

a termination of a fixed wiring system intended for the attachment of a luminaire

2.14

luminaire

apparatus which distributes, filters and transforms the light given by a lamp or lamps and which includes all the items necessary for fixing and protecting these lamps and for connecting them to the supply circuit

NOTE Internally illuminated signs are a special type of luminaire.

2.15

maintained emergency lighting

a lighting system in which all emergency lighting lamps are in operation at all material times

2.16

material times

times during which the emergency lighting is required to be illuminated, e.g. at all times that persons are on the premises, or at the times the main lighting is not available, according to the regulations, conditions of certificate or licence as appropriate

2.17

mounting height

the vertical distance between a luminaire and the working plane

NOTE Throughout this code the floor is taken to be the working plane.

2.18

nominal battery voltage

the nominal voltage of a battery as declared by the manufacturer

2.19

non-maintained emergency lighting

a lighting system in which all emergency lighting lamps are in operation only when the supply to the normal lighting fails

2.20

normal lighting

all permanently installed electric lighting operating from the normal supply which, in the absence of adequate daylight, is intended for use during the whole time that the premises are occupied

NOTE Also known as "general lighting".

2.21

normal supply

that source of electrical energy used to provide normal lighting

2.22

premises

the whole or part of a building which is to be treated as a single unit for the purposes of applying the recommendations of this code

2.23

self-contained emergency luminaire

a luminaire providing maintained or non-maintained emergency lighting in which all the elements, such as the battery, the lamp, the control unit and the test and monitoring facilities, where provided, are contained within the luminaire or adjacent to it (that is, within 1 m)

2.24

slave luminaire

luminaire supplied from a central emergency power source and not having its own internal secondary supply

2.25

standby lighting

that part of emergency lighting which may be provided to enable normal activities to continue

2.26

uniformity

the ratio of the minimum illuminance to the average illuminance applied to the values on the working plane

NOTE Throughout this code the floor is taken to be the working plane.

3 Consultation and records

3.1 Consultation

Consultation between the owner and/or occupier of the premises, the architect, the lighting engineer, the installation contractor, the enforcing authority (e.g. the fire authority), the electricity authority and any others concerned should be arranged at a very early stage. In addition to the recommendations of this code it is important that the requirements of any national and/or local legislation which may apply to the premises in question are fully recognized and discussed at this time.

3.2 Supply of plans

Plans showing the layout of the building and of all existing or proposed escape routes, fire alarm call points and fire fighting equipment and indicating the positions of all items, structural or otherwise, which may offer obstruction to escape, should be provided at an early stage for use during the consultations referred to in **3.1**.

3.3 Records

On completion of the work, drawings of the emergency lighting installation should be provided and retained on the premises. Such drawings should be regularly updated to keep them in line with any subsequent changes to the system.

In addition, and in accordance with **11.3**, a log book should be provided for the recording of routine examinations, tests, defects and alterations.

A manual of operation and maintenance should be handed to the occupier. Recommendations on the measuring of illuminance of emergency lighting are given in annex A.

4 Need for emergency lighting

4.1 General

When the supply to normal lighting of premises fails, emergency lighting may be required. Throughout this code reference to "emergency lighting" covers "escape lighting" in particular, but also includes any element of standby lighting which may be used for escape lighting.

4.2 Escape lighting

When the supply to the normal lighting or parts of the normal lighting to occupied premises fails, escape lighting is required to fulfil the following functions:

a) to indicate clearly and unambiguously the escape routes;

b) to provide illumination along such routes to allow safe movement towards and through the exits provided;

c) to ensure that fire alarm call points and fire fighting equipment provided along escape routes can be readily located.

Escape lighting is required not only on complete failure of the supply to the normal lighting but also on a localized failure if such a failure would present a hazard, e.g. a single subcircuit on stairways.

NOTE High risk task area lighting is covered by BS EN 1838.

4.3 Standby lighting

For areas where a continuous operation is needed during the failure of the supply to the normal lighting, standby lighting should be installed to meet some suitable proportion of the standard service illuminance required for that task.

For extreme situations this may mean providing 100 % service illuminance.

If the standby lighting forms part of the escape lighting, then that part of the escape lighting should be segregated from the rest of the standby lighting circuit and comply with the provisions of this code.

If the whole of the standby lighting is used for escape lighting then the installation should comply with the provisions of this code.

5 Illumination for safe movement

5.1 General

The safe movement of persons along escape routes towards and through the exits provided to a place of safety depends upon the illumination and the ability to see hazards, changes of level and direction.

5.2 Vision and visibility

The stimulus for vision is not the light which falls on objects but the light reflected to the eyes. Different objects are distinguished by contrast, the changes in light reflected to the eyes. A light coloured object on a dark background can be made conspicuous with far less light than a dark coloured object on a dark background.

All calculations of illuminance should be made ignoring reflectance; however, once the system is designed it is preferable to maximize the illumination by reflectance where acceptable.

The amount of light falling on an object (illuminance) is affected not merely by the power and position of the lamps used for illumination but also by reflection from the surroundings. In most interior spaces a very high proportion of the light falling on any surface comes from light reflected from the light sources by other surfaces in the room. Where the walls, floor and ceiling are light in colour, up to 60 % of the illuminance at floor level may have been reflected from the walls or ceiling.

In a room where the decorative finishes are dark in colour (i.e. have low reflectance) the contribution of reflected light to the illuminance is much smaller. The reflected light may be negligible in, say, a discotheque or restaurant, where the carpets, walls and ceiling have been deliberately kept dark in colour to produce a feeling of intimacy and relaxation.

All potential obstructions or hazards on an escape route should be light in colour with contrasting surround. Such hazards include the nosings of stair treads, barriers and walls at right angles to the direction of movement.

By using the light level given in **5.3.3** on an escape route, the recommendations of **5.2**, in relation to the use of colour and contrast, and **5.3**, in relation to older people, are not essential.

In restricted spaces such as corridors, light coloured decoration throughout is an advantage. Prominent edges to vertical surfaces at changes of direction can assist emergency evacuation.

5.3 Minimum illuminance and adaptation

5.3.1 *General*

Visual acuity varies considerably from one person to another with regard to the amount of light required to perceive an object clearly and the time taken to adapt to changes in the illuminance (visual adaptation). In general, older people need more light to follow an escape route and have longer visual adaptation times.

The maximum period which should be allowed to elapse between failure of the normal supply and the switch-on of the emergency lighting depends upon the rate at which panic may be expected to mount in a particular building. It also depends upon the time taken to adapt to the new, and normally much lower, illuminance provided by the emergency lighting. The illuminances in this code have been determined from experience and practical test.

5.3.2 *Defined escape routes and response times*

For routes that are permanently unobstructed and up to 2 m wide the horizontal illuminance at floor level on the centre line of the escape route should be not less than 0.2 lx but preferably 1 lx. For points of emphasis the minimum horizontal illuminance at the

floor along the centre line of the escape route should be not less than 1 lx. In addition, for escape routes up to 2 m wide, 50 % of the route width should be lit to a minimum of 0.1 lx.

The emergency lighting detailed in this clause should be provided within 5 s of the failure of the normal lighting supply, but at the discretion of the enforcing authority this period may be extended to a maximum of 15 s in premises likely to be occupied for the most part by persons who are familiar with them and the escape routes.

Wider escape routes can be treated as a number of 2 m wide bands.

NOTE This subclause contains the detail of the UK "A" deviation given in BS EN 1838:1999.

5.3.3 *Undefined escape routes (open areas)*

The light levels for these areas are given in BS EN 1838.

5.3.4 *Design conditions*

Reference should be made to BS EN 1838:1999, **4.3.6**. The recommended illuminances that are specified as a maximum or average should be regarded as the lowest value acceptable during the rated discharge period or due to the effects of the system ageing.

In designing a system, allowances should be made for all of the relevant factors, including reduction in voltage, voltage drop in the system wiring, lamp ageing and the accumulation of dirt and dust.

Recommendations on the measuring of illuminance of emergency lighting are given in annex A of this code.

NOTE Further guidance on design can be found in CIBSE technical memorandum TM12 "Emergency lighting" (1986), published by the Chartered Institution of Building Services Engineers[1)].

5.4 Uniformity of illuminance

Reference should be made to BS EN 1838:1999, **4.2.2**.

Care should be taken to avoid abrupt changes between excessive dark and light areas on the floor of the escape route. It is therefore necessary to illuminate the route reasonably uniformly.

5.5 Glare

Reference should be made to BS EN 1838:1999, **4.2.3**.

High contrast between a luminaire and its background may produce glare. In escape route lighting the main problem will be disability glare, in which the brightness of the luminaires may dazzle and prevent obstructions being seen, e.g. the beam of a car headlight or floodlight seen against a very dark background at the end of a corridor.

5.6 Identification of exits and escape routes by signs

Reference should be made to BS EN 1838.

6 Emergency lighting design

6.1 General

Emergency lighting is provided for use when the normal lighting fails and has therefore to be powered from a source independent of that supplying the normal lighting (see **6.11**).

6.2 Failure of normal supply to part of a premises

Except in the case of a maintained system, it is normally necessary to ensure that the emergency lighting is provided in the event of the normal supply subcircuit failure in particular areas. This should also be considered desirable where the normal supply distribution system within a large complex involves lateral supplies from a main electrical intake to submain switchrooms and the emergency lighting is supplied from a single central source. In such cases arrangements should be made to ensure that local emergency lighting will operate in the event of failure of normal supply.

6.3 Failure of individual lamp

It is not normally possible to cater for an interruption of the normal lighting due solely to the failure of an individual lamp. Should the normal illumination of, say, a short corridor depend upon a single lamp, consideration should be given to methods of eliminating any probable hazard which might arise due to the failure of this lamp.

6.4 Failure of emergency lighting luminaire

Emergency lighting systems should be designed to ensure that a fault or failure in any one luminaire does not further reduce the effectiveness of the system.

6.5 Mounting height of luminaires

For mounting height see BS EN 1838:1999, **4.1**.

The mounting height of the individual luminaires will usually be governed by the physical characteristics of the area under consideration and the best compromise should be chosen. The possibility of smoke accumulation rendering the emergency lighting ineffective should be considered with regard to mounting heights.

6.6 Spacing between luminaires

The provision of a highly reliable illuminance on the escape route is essential. It is therefore better to use a larger number of low power luminaires than few high powered units so that the light reaching any part of the escape route is from more than one luminaire and in the event of a luminaire failing will not plunge the route into total darkness or make the beacon effect of the lights inoperative.

[1)] Obtainable from CIBSE, Delta House, 222 Balham High Road, London SW12 9BS.

6.7 Siting of essential escape lighting luminaires

Siting of essential escape lighting luminaires is given in BS EN 1838.

6.8 Siting of additional escape lighting

6.8.1 *General*

Consideration should be given to provision of additional escape lighting at the locations described in **6.8.2** to **6.8.7**.

6.8.2 *External areas in the immediate vicinity of exits*

To assist dispersal and to enable final exits to be negotiated safely the illuminance in the area immediately external to such exits should not be significantly lower than that immediately inside the exit. Local authority lighting already provided on public thoroughfares may be considered to fulfil the recommendations of this clause; if this is not available then suitable luminaires should be installed outside the exits and linked to the emergency lighting to provide the necessary illuminance.

6.8.3 *Lift cars*

Except in very special circumstances and then normally only when they are fitted with their own emergency operating power supply, lifts cannot be considered as escape routes. However, lifts do present a problem because the experience of being confined in the dark within a small space for an indefinite period is not only unpleasant, but may cause harm to those who are nervous or suffer from claustrophobia. An emergency lighting luminaire should therefore be fitted in a lift car in which persons may travel. Such luminaires should preferably be of the self-contained type.

NOTE If the disabled are given access to a building, their means of escape in emergency conditions may only be available by lift car (in accordance with BS 5588-5 or BS 5588-8).

6.8.4 *Moving stairways and walkways*

Moving stairways and walkways should be illuminated as if they were part of an escape route.

6.8.5 *Toilets, lobbies and closets*

Facilities exceeding 8 m^2 gross area and facilities of less than 8 m^2 without borrowed light should be provided with escape lighting complying as if they were part of an escape route.

6.8.6 *Motor generator, control and plant rooms*

Battery powered emergency lighting should be provided in all motor generator rooms, control rooms, plant rooms, switch rooms and adjacent to main control equipment associated with the provision of normal and emergency lighting to the premises.

6.8.7 *Covered car parks*

The pedestrian escape routes from covered and multi-storey car park areas should be easily identifiable and should be provided with emergency lighting.

6.9 Emergency signs

6.9.1 *Signs for exits and escape routes*

Signs are required to ensure that escape routes from any position within the premises may be easily recognized and followed in an emergency.

Where direct sight of an exit or emergency exit is not possible and there could be any doubt as to the direction of the appropriate exit, a directional sign or series of signs should be provided, so placed that a person moving towards each sign will be progressed towards an exit or emergency exit.

6.9.2 *Mounting height of signs*

Signs should be positioned between 2 m and 2.5 m above floor level measured to the base of the sign. If this is not practicable the relevant authority should be consulted (see **3.1** and **6.5**).

6.9.3 *Illumination of signs*

The illumination of signs is covered by BS EN 1838:1999, clause **5**.

6.10 Escape lighting luminaires

6.10.1 *Construction*

Emergency lighting luminaires can be either self-contained (sometimes referred to as self-contained emergency luminaires) or slave luminaires. Both may be used for escape signs or escape route lighting. These luminaires should be designed and constructed in accordance with BS EN 60598-2-22. For certain applications the luminaire itself should have satisfactory protection against the ingress of foreign bodies or moisture; such protections are indicated by the IP classification as defined in BS EN 60529. Furthermore, if used in hazardous areas, where luminaires are certified to national or international standards by a recognized certification authority, compliance with temperature limits and explosion protection may be required. (See BS 5345 and BS 6467-2.)

6.10.2 *Flammability*

Emergency lighting luminaires used on defined escape routes (see **5.3.2**) should comply with the non-flammability (resistance to flame and ignition) provisions specified in BS EN 60598-2-22 and external parts should also be subjected to the 850 °C hot wire test; any burning parts should self-extinguish within 30 s.

6.11 Mode of operation

6.11.1 *General*

The recommendations of **6.11** are written primarily in terms of battery systems, although similar considerations will apply to the possible alternatives mentioned (see **6.11.4**).

6.11.2 ***Maintained operation***

With maintained operation the emergency lighting system is energized continuously, using the normal supply source when available, employing the same lamps to provide at least the minimum specified illuminance from an emergency supply whenever the normal supply is interrupted.

The effect of this method of operation is continually to prove the wiring and lamps, but not the battery. Any failure should be noted at normal times and defective lamps can be replaced before an emergency arises.

A maintained mode of operation may be achieved using a prime mover driven generator as the emergency lighting power source, provided that it can be run up and put on load in the required time (see **5.3**). In such circumstances, failure of the normal supply would automatically start up the generator and switch the input to the lighting circuits from the normal supply to the generator output.

Where batteries are used, either as the sole source of emergency lighting supply or as back-up to a generator, there are two methods of achieving maintained operation.

a) *Maintained floating systems*. In this mode of operation the battery charger is fed from the normal supply and connected in parallel with the battery and the emergency lighting loads. If the normal supply fails the battery will continue to supply the emergency lighting load and no changeover switch or similar device is required.

b) *Maintained changeover system*. In this mode of operation the emergency lighting system and the battery charger are separately connected to the normal supply and no load is connected to the battery. If the normal supply is interrupted, an automatic changeover device is actuated to connect the emergency lighting system to the battery. An automatic changeover device is essential in order to meet the recommendations of **5.3**. Automatic changeover contactors complying with BS 764 or an equivalent standard of electrical performance are recommended for this application.

6.11.3 ***Non-maintained operation***

In this mode of operation the emergency lighting lamps are not normally energized. An automatic monitoring and switching system is provided to switch on the emergency lighting if the normal supply is interrupted.

If separate lamps are required to provide normal lighting and emergency lighting in the same place, these lamps may either be housed in separate luminaires or may be combined in single sustained luminaires. Such sustained luminaires may also contain a separate charger, battery and control circuit for use with non-centralized battery systems.

As the emergency lighting only comes into operation on failure of the normal supply it is important to ensure that the recommendations given in clause **5** for the emergency lighting are fully met by the normal lighting at all other materials times.

6.11.4 ***Prime mover driven generator operation***

The enforcing authority may permit a prime mover driven generator as the sole source of supply to an emergency lighting system provided that it can be run up to the required output in 5 s (or 15 s in certain circumstances, see **5.3**). Where a generator supplied for emergency lighting takes longer than the required period to run up, a back-up battery system will be necessary to supply the emergency lighting load for the first hour of the emergency.

The alternative of using a continuously running generator to supply the emergency lighting load is unlikely to be economically acceptable except in very exceptional circumstances.

A further possibility, in premises in which the normal lighting is obtained from a local generator, would be to use the public electricity supply mains as the emergency lighting power source. Such an alternative, however, would have a very limited application.

6.12 Categories

Any emergency lighting system may be designed to supply the required load for any desired time. However, for most applications, it is considered that a duration of between 1 h and 3 h should meet all normal requirements.

In the interests of uniformity to the user, therefore, emergency lighting systems are categorized in this code by the prefix “M” for maintained and “NM” for non-maintained systems, followed by an “/” and the number of hours duration claimed for the installation, e.g.:

— M/1 is a maintained 1 h duration system;

— NM/3 is a non-maintained 3 h duration system.

6.13 Marking

The category and nominal operating voltage of the emergency lighting system should be clearly marked and readily identifiable; for centralized systems this should be either on or adjacent to the control unit and for non-centralized systems this should be on or adjacent to the appropriate luminaires.

In addition, all luminaires providing emergency lighting should be marked with details of the replacement lamp necessary to obtain the design performance. Such details may be in the form of a manufacturer’s name and type number or the type, rated voltage and rated wattage of the lamp required. Where sustained luminaires are used, these details should be given for both lamps, if these are different, together with a clear indication as to which lamp is which. (See BS EN 60598-2-22.)

Manufacturers should also provide sufficient additional information to enable batteries to be correctly replaced.

7 Batteries

Batteries provided for central systems or motor generator starting should be of a type designed for stationary use. Batteries made for automotive use are not normally acceptable.

In the case of premises which may only be used very occasionally by the public and in certain other circumstances at the discretion of the enforcing authority, the use of emergency lighting powered by automotive batteries may be considered.

8 Wiring systems and circuit requirements

8.1 General

The emergency lighting installation is required to comply with any statutory requirements applicable to the particular building and with any local regulations.

The installation should be undertaken generally in accordance with the latest edition of BS 7671. Although those parts of the emergency lighting system connected to a safety source are specifically excluded from the scope of BS 7671, the general principles of good practice in wiring installations in BS 7671 should be followed throughout the emergency lighting system.

8.2 Wiring

8.2.1 *Quality of installation*

The importance of reliability of an emergency lighting system makes a high standard of wiring essential and limits the permissible systems to those described in **8.2**. Wiring within a luminaire is excluded from this clause and is covered separately in the appropriate luminaire standard.

Wiring connecting a self-contained emergency luminaire to the normal supply is not considered to be part of the emergency lighting circuit.

Cables used for the connection of an escape lighting luminaire to the standby power supply should either possess inherently high resistance to attack by fire and physical damage or be enclosed in suitable conduit, ducting, trunking or in a channel so as to obtain the necessary fire protection and mechanical strength. Additional fire protection may be required (see **8.2.11**).

8.2.2 *Fire protection of cables*

Cables should be routed through areas of low fire risk. It may be possible to reduce the fire protection of cables where they follow routes of very low fire risk and such areas also contain a sprinkler installation. In general the following cables and wiring systems should be used.

a) Cables with inherently high resistance to attack by fire.

1) *Mineral-insulated copper-sheathed cable in accordance with BS 6207-1*. The cable may be installed with or without an overall PVC sheath.

2) *Cable in accordance with BS 6387*. The cable should be at least of category B.

b) Wiring systems requiring additional fire protection.

1) *PVC-insulated cables in accordance with BS 6004 in rigid PVC conduits*. Rigid PVC conduit should be of classification 405/100000 or 425/100000 of BS 6099-2-2:1982.

NOTE Conduit manufactured to BS EN 50086-2-1 will have a different classification number.

2) *PVC-insulated cables in accordance with BS 6004 in steel conduit*.

3) *PVC-insulated and sheathed steel wire armoured cable in accordance with BS 6346 or BS 5467*.

Additional fire protection may be present if cables are, for example, buried in the structure of the building or situated where there is negligible fire risk and separated from any significant fire risk by a wall, partition or floor having at least one hour fire resistance as ascertained by compliance with any of the following:

i) specifications tested or assessed under the appropriate part of BS 476;

ii) appropriate British Standard specifications or codes of practice;

iii) specifications referred to by building regulations applicable for the building;

iv) cables enclosed in steel conduit to be subjected to the tests given in BS 6387 for fire resistance.

Where appropriate, compliance is for stability, integrity and insulation. The test by fire is considered to be applied to the side of the construction remote from the cable. In certain premises a longer duration of fire resistance may be necessary for escape purposes.

c) Any wiring system giving equivalent protection.

8.2.3 *Cable sizes*

In selecting cable sizes, due regard should be paid to limitations imposed by voltage drop and physical strength. Each conductor shall be of copper having a nominal cross-sectional area of not less than 1 mm^2.

The voltage drop in cables connecting a central battery or generator to a slave luminaire is not to exceed 4 % of the system nominal voltage at maximum rated current and at the highest working temperature likely to be experienced (see also **8.3.5** regarding the compatibility of slave luminaires with central systems).

8.2.4 *Conduit, ducting, trunking and channel*

If an emergency lighting system cable is to be run in conduit, ducting, trunking or channel, the material of the conduit, ducting, trunking or channel should either be metallic or be non-metallic of adequate strength and resistance to fire. Non-flame propagating trunking complying with BS 4678-4 may be used bearing in mind that the non-flame propagating test does not necessarily indicate the suitability of the trunking to maintain the circuit integrity under fire conditions. Additional fire protection may be required in accordance with **8.2.2**b)3).

Where cables are run in conduit, either screwed metal or rigid PVC conduit may be used. Rigid PVC conduit should be in accordance with classification 405/100000 or 425/100000 [see **8.2.2**b)1)]. PVC conduit should not be used where the ambient temperature is likely to exceed 60 °C; where temperatures below −5 °C for 405/100000 or −15 °C for 425/100000 are likely, suitable precautions should be taken to avoid physical damage. Additional protection should be provided at any point where PVC conduit or non-metallic ducting or trunking is likely to suffer physical damage. It should not be assumed that the use of this conduit will necessarily indicate the suitability of the conduit to maintain circuit integrity under fire conditions. Additional fire protection may be required in accordance with **8.2.2**.

8.2.5 ***Alternative conduit, ducting or trunking***

Conduit, ducting or trunking not in accordance with **8.2.4** should be used only if it can be shown that, in the applications in which it is to be used, the following apply.

a) The resistance to heat and fire is not less than that of the type described in **8.2.4** as being suitable for the application.

b) The resistance to ambient conditions, including mechanical impact, is not less than that of the type described in **8.2.4** as being suitable for the application.

c) It is not prone to failure due to faulty assembly or installation.

8.2.6 ***Segregation***

It is essential that the wiring of escape lighting installations is exclusive to the installation and separate from the wiring of any other circuits, either by installation in a separate conduit, ducting, or trunking or by separation from the conductors of all other services by a mechanically strong, rigid and continuous partition of non-combustible material.

Escape lighting system cables should be separated from the cables of other services by a minimum distance of 300 mm between centre lines of the cables. Where such separation is not provided, mineral-insulated copper-sheathed cable, with or without PVC oversheath, in accordance with BS 6207-1 should be used for the escape lighting and should be rated in accordance with the "exposed to touch" conditions of BS 7671. Equally acceptable would be any cable complying with BS 6387 and assessed as suitable for use where separation is not provided under the "BASEC Certificate of assessment" scheme.

The escape lighting system cable should be completely enclosed when the cover of the ducting, trunking or channel is in place.

Ducting, trunking or channel reserved for escape lighting system cable should be marked to indicate this reservation.

Multicore cables should not be used to serve both escape lighting and any other circuit.

8.2.7 ***Joints***

A joint, except a joint in an emergency lighting luminaire or a control unit, should be enclosed in a suitable box labelled "EMERGENCY LIGHTING" or "ESCAPE LIGHTING" or "STANDBY LIGHTING" as appropriate, to avoid confusion with other services, and also with the warning "MAY BE LIVE". A joint should not be such as to reduce the reliability and resistance to fire of the cable below that of an unjointed cable.

8.2.8 ***Overhead lines***

Overhead lines for an emergency lighting system should be avoided. Where they are unavoidable the methods recommended in BS 7671 should be followed. If overhead lines cross or are installed in close proximity to electricity power lines, public telephone or other overhead lines, agreement relating to protection should be reached with the appropriate authority.

8.2.9 ***Damp, corrosive or underground locations***

Cables intended for installation in damp, corrosive or underground locations should be PVC-sheathed overall. Where the environment may attack PVC then a suitable alternative sheath should be adopted. In some locations further protection may be necessary. Some plasters have a corrosive effect on metals.

8.2.10 ***Ambient temperatures***

Cables should not be installed in locations where the combination of ambient temperature and temperature rise due to load currents results in a conductor temperature exceeding the cables' rated temperature. (The PVC insulated cables listed in **8.2.2** are rated at 70 °C.) If such locations cannot be avoided, cables having appropriate heat-resistant properties should be used, such as:

a) 85 °C rated rubber insulated cables in accordance with Tables 1 and 5 of BS 6007:1993;

b) 150 °C rated rubber insulated cables in accordance with Table 6 of BS 6007:1993;

c) 85 °C rated PVC insulated cables generally in accordance with BS 6004 but having type 4 or 5 insulation and sheath in accordance with BS 6746:1990;

d) 90 °C rated XLPE or EPR insulated cables in accordance with BS 5467 or BS 6724.

8.2.11 ***Protection against physical damage***

Suitable additional protection should be provided at any point where cables are likely to be subjected to accidental damage, for example by the passage of vehicles or persons carrying goods, ladders being rested on them, or articles falling from racks, etc.

8.2.12 ***Avoidance of flue-like openings***

In order to reduce the likelihood of damage by fire, emergency lighting system cables should not be run in unprotected shafts. Cables, other than those feeding emergency lighting luminaires in lifts, should not be run in lift wells.

8.2.13 ***Wiring to emergency lighting supply power sources***

Where the emergency lighting supply source is a secondary battery/battery charger combination, the wiring from the normal supply to the battery charger should be a fixed installation, not incorporating plugs and sockets unless they are of a type requiring a tool to separate them or are sited so as to prevent unauthorized interference.

The cables forming the load circuit from the battery to the load fuses or other protective devices should be separated from each other along their length and should not be contained within a harness, loom, conduit, ducting or trunking constructed of metal. Battery cables should be separately supported on insulating material. Multicore cables should not be used.

At the point where any battery conductor passes through an aperture, the conductor should be protected by the provision of a suitable insulated bushing or grommet; d.c. conductors should not pass through the same aperture as a.c. conductors and should be separated from them along their entire length.

8.3 Circuit requirements

8.3.1 ***General***

The normal supply to the emergency lighting system should be so arranged that continuity of supply is assured. Where it is the practice to switch off the normal supply to the premises, for example when unoccupied or for economy in the use of electricity, the electrical design should ensure that such switching off does not interrupt the normal supply to the emergency lighting.

8.3.2 ***Isolators, switches and protective devices***

Inadvertent operation of an isolator, switch or protective device causing prolonged interruption of the normal supply could result in the premature failure of the emergency lighting standby power source. To reduce this risk, the number of such devices should be restricted to the minimum necessary to comply with BS 7671.

Each isolator, switch and protective device associated with an emergency lighting system should be situated in a position inaccessible to unauthorized persons or be protected against unauthorized operation.

Each isolator switch, protective device, key and operating device should be marked “EMERGENCY”, “ESCAPE” or “STANDBY LIGHTING” as appropriate and the marking should indicate its use.

If an emergency lighting system is fed from a standby supply, other than a safety source installed in accordance with the supplies for safety sources detailed in BS 7671, the earth leakage and protective measures will need special consideration.

8.3.3 ***Test facility***

Each emergency lighting system should have suitable means for simulating failure of the normal supply for test purposes.

8.3.4 ***Isolation and maintenance hazards***

Warning labels should be provided in positions where they can be readily seen and read. The labels should state that switching off the normal supply to an emergency lighting system may not make it safe for maintenance purposes. Such warnings are necessary because, for example, non-illumination of a lamp does not always indicate that a circuit is dead, and a circuit still alive could present a hazard to maintenance personnel.

A test for voltage should be made before touching parts which may be live.

8.3.5 ***Voltage compatibility of a slave luminaire and a central battery system***

8.3.5.1 *General*

The considerations in **8.3.5.2** or **8.3.5.3** should be taken into account to ensure that a slave luminaire is compatible with the central power supply to which it is connected.

8.3.5.2 *A d.c. only system*

Slave luminaires have to be capable of operating over the following input voltage range.

a) Maximum voltage: battery float voltage.

b) Minimum voltage: voltage at end of duration battery voltage less a further allowance for cabling voltage drop, up to a maximum of 10 % of the system nominal voltage.

NOTE For maintained systems the luminaires have also to be capable of operating continuously at the maximum system voltage plus the r.m.s. voltage ripple content of the d.c. supply which should not be above 3.5 %.

8.3.5.3 *A combined a.c. and d.c. supplied system*

In the d.c. condition the luminaire should operate as in **8.3.5.2**. In the a.c. condition the luminaire should operate continuously over the following voltage range.

a) Maximum voltage: the design transformer voltage plus the supply voltage variations plus transformer load regulation, not exceeding 11 % total.

b) Minimum voltage: the design transformer voltage less the supply variation less an allowance for cabling voltage drop up to a maximum of 10 % of the system nominal voltage.

8.4 Electromagnetic compatibility

Emergency lighting systems should be so designed and installed that they do not cause electromagnetic interference, in accordance with EMC Directive 89/336/EEC.

Special care should be taken in the design and installation of emergency lighting equipment to reduce the possibility of interference signals from other services affecting the normal operation of the emergency lighting. High levels of interference may be likely from equipment such as discharge lighting and external sources such as mains-borne power supply transients.

Where an emergency lighting system is controlled by a programmable electronic device, care should be taken that the device cannot be influenced adversely by spurious signals or electromagnetic transmissions.

9 Choice of appropriate emergency lighting systems

9.1 Duration

The time required to evacuate premises depends upon their size and complexity but it should normally be possible to complete an orderly evacuation, even of the largest premises, in less than 1 h. However, in an emergency, evacuation times may be considerably increased because, for example, some of the escape routes may have been cut off, or injured people may have to be found and possibly given on-the-spot medical treatment. The time for which escape lighting is required to operate will therefore always be longer than the absolute minimum time required to evacuate the premises under ideal conditions. Furthermore, particularly in larger premises, emergency lighting which will remain in operation after the evacuation of the building has been substantially completed may be a necessary safety requirement in order, for example, to enable an adequate search of the premises to be carried out easily and quickly to ensure that no-one has been left behind, or to allow reoccupation of the premises after the emergency in order to get people off the street and into a place of relative safety.

In some premises, continued occupation for a limited period following a simple failure of the normal lighting may be permitted by the enforcing authority. In such cases the minimum duration of the emergency lighting should be 1 h plus any such period of permitted occupation.

Emergency lighting systems designed, installed and subjected to routine tests in accordance with the recommendations of this code should normally provide their rated output and duration whenever called upon to do so. However, consideration may have to be given to a possible degradation of the performance of emergency lighting systems due to unforeseen circumstances immediately preceding the emergency. It would be unwise to design any system to meet the bare requirements of the premises under consideration, particularly as to duration of operation, and an additional safety factor should be built into the design to cover possible technical problems which may reduce the light output and duration to less than the rated value.

Taking all these factors into account, it is considered that a design period of operation of the emergency lighting system of 1 h should be the absolute minimum for even the smallest premises considered in this code.

9.2 Category of system to be adopted

The type and category of system to be used is dependent upon the size and function of the premises.

The requirements of emergency lighting systems are fully described in clauses **5**, **6** and **10**. For many types of premises there are statutory requirements relating to emergency lighting, and it is important that the appropriate authority is consulted; however, for most applications it is considered that a duration of between 1 h and 3 h should meet all normal requirements.

A maintained mode of operation should invariably be employed in premises where the normal lighting can be dimmed or reduced below the levels required for escape route identification and illumination while the premises are occupied, e.g. places of public entertainment (see **5.3** and **6.11**). In all other premises a non-maintained mode of operation may be suitable.

9.3 Typical premises

9.3.1 *General*

The types of premises to which this code applies may be divided into the broad classes of **9.3.2** to **9.3.11**. Examples of premises falling within each of these classes are given but these are not necessarily comprehensive. In case of doubt, the appropriate class should be agreed with the enforcing authority.

9.3.2 *Premises used as sleeping accommodation*

This class includes such premises as hospitals[2)], nursing homes, hotels, guest houses, clubs, colleges and schools.

Persons using premises of this kind may be unfamiliar with their overall layout and/or may be infirm. Furthermore, particularly in the case of hospitals and similar premises, large hotels on busy thoroughfares, etc., it may be desirable to reoccupy the premises immediately the emergency has passed or to delay evacuation after the initial failure of the normal supply, should this be permitted.

Based on these considerations, it is recommended that the category of emergency lighting to be installed in hospitals, nursing homes and similar premises should invariably be NM/3 or M/3 except for small premises, as defined in this subclause, where a minimum category of NM/2 or M/2 should be used. For other types of premises in this general class the category should be related to size, ranging from NM/1 for small premises up to M/3 for large hotels, etc.

For the purposes of this recommendation, small premises are defined as those having not more than 10 bedrooms and not more than one floor above or below ground level. However, designating orders relating to the provision of emergency lighting in particular types of premises may define “small premises” differently.

[2)] Hospital Technical Memorandum No. 11 “Emergency electrical services” gives guidance on the provision of all emergency electrical services in hospitals, and compliance with the recommendations of the memorandum may, at the discretion of the enforcing authority, supplement or replace the recommendations of this code. The memorandum is obtainable from The Stationery Office.

9.3.3 ***Non-residential premises used for treatment or care***

This class includes such premises as special schools, clinics and similar premises. Reaction time to an emergency in premises of this type may be expected to be shorter than when emergencies arise during the night in residential premises and it will normally be satisfactory to provide an NM/1 emergency lighting system.

9.3.4 ***Non-residential premises used for recreation***

This class includes such premises as theatres, concert halls, exhibition halls, sports halls, public houses and restaurants, except for those particular types of premises excluded by clause **1**.

The people using such premises may be expected to be unfamiliar with their layout and regard should be paid to the possible effects of the consumption of alcohol. In parts of premises where the normal lighting may be dimmed it is considered essential that a maintained emergency lighting system should be installed, but even where this is not the case a maintained system may still have advantages, particularly in respect of exit signs, etc. However, early reoccupation of such premises following an emergency is not usual and a maximum duration of emergency lighting of 2 h should normally be satisfactory, even for the largest types of premises in this class.

It is recommended, therefore, that an M/2 emergency lighting system should be used for theatres, concert halls, discotheques and any other premises in this class in which there is either provision for dimming the normal lighting or facilities for the consumption of alcoholic liquor. For all other types of premises in this class an NM/2 category system may be used. In small premises, i.e. with not more than 250 persons present at any time, an M/1 or NM/1 system, as appropriate, may be employed.

For some theatre auditoria where the recommended maintained illuminance of 0.2 lx is likely to affect normal working, it is considered acceptable to reduce this level to not less than 0.02 lx, provided the system is so arranged that in the event of failure of the normal system of lighting within the auditoria the escape lighting illuminance is immediately and automatically restored to a minimum of 0.2 lx. Complete or substantially complete blackouts, which may be required for production reasons, may only be permitted with the approval of the enforcing authority.

In other places where it is desired to reduce the artificial lighting for effects purposes (e.g. a discotheque), it may be permissible with the approval of the enforcing authority to extinguish the emergency lighting, provided that the switching for this arrangement is under continuous management control and that the area is visible from the switching position. It is essential that the circuit and equipment adopted is such that the emergency lighting is automatically restored in the event of the failure of the normal supply. Exit signs should remain illuminated at all material times.

9.3.5 ***Non-residential premises used for teaching, training and research***

This class includes such premises as schools, colleges, technical institutes and laboratories.

In general, persons using this class of premises will be reasonably familiar with the layout and safety provisions and orderly evacuation can normally be expected in the event of an emergency. Also, except possibly in some types of process laboratories, there will not normally be any safety requirement for early reoccupation after an emergency and the minimum duration of escape lighting should therefore be adequate.

It is recommended, therefore, that emergency lighting systems of NM/1 category be used in premises of this type unless there is a particular requirement for early reoccupation, in which case a longer duration may be necessary.

9.3.6 ***Non-residential public premises***

This class includes such premises as town halls, libraries, offices, shops, art galleries and museums.

The majority of persons present in this class of premises will be unfamiliar with the layout, and evacuation may involve discharging large numbers of persons (large shops) or gathering together smaller numbers of persons from large dispersed areas. However, early reoccupation following an emergency is not usual.

Except within areas of such premises where the normal lighting may be deliberately dimmed, e.g. special displays in art galleries and museums, where a system of M/1 category should be used, a system of NM/1 category will be satisfactory.

9.3.7 ***Industrial premises used for manufacture, processing or storage of products***

This class includes such premises as factories, workshops, warehouses and similar establishments.

A non-maintained emergency lighting system will normally be satisfactory for use in this class of premises but whether or not a duration in excess of 1 h will be required can only be determined with reference to the actual premises and the use to be made of them.

In certain industrial processes a break in the power supply of even 5 s may constitute a hazard to personnel. In such circumstances a supplementary battery system will always be necessary for use with a generator, even where the generator can be run up to its required output within a period of 5 s.

9.3.8 *Multiple use of premises*

Where any premises fall into more than one of the broad classes of **9.3.2** to **9.3.7**, the whole premises should be treated in accordance with the most stringent of the applicable recommendations. In this connection, a recommendation for a maintained category is considered to be more stringent than a recommendation for a non-maintained category.

Where, however, the differing uses are contained within separate fire compartments having independent escape routes, they may be considered separately.

9.3.9 *Common access routes within multi-storey dwellings*

The majority of persons using access routes within multi-storey dwellings will be familiar with them and the identification of such routes by signs may not, therefore, always be necessary. However, the routes should be provided with emergency illumination for safe movement meeting the recommendations of **5.3**. An NM/1 system will usually be satisfactory for buildings of up to 10 storeys but for buildings in excess of 10 storeys it is recommended that an NM/3 system should be installed.

In premises where occupants are unlikely to be familiar with the escape routes illuminated signs should be used even during daylight hours.

9.3.10 *Enclosed shopping malls*

There are often many types of commercial premises within these enclosed malls without natural light and evacuation may involve discharging large numbers of people along extensive escape routes to safety. Many of the people may be unfamiliar with the layout of the malls and escape routes and the advice given in **9.2** should be followed.

Walkways and escape routes within the enclosed mall should have emergency lighting category M/2.

Commercial premises off such routes should have emergency lighting category NM/1.

9.3.11 *Covered car parks*

The normal pedestrian escape routes from covered car parks should be easily identifiable and should be provided with emergency lighting to the same standard as escape routes within non-residential public premises.

9.3.12 *Sports stadia*

Reference should be made to the Home Office's "Guide to safety at sports grounds"[3)].

NOTE CEN is currently developing a standard on sports stadium lighting which will include a section on emergency lighting; when the CEN standard is published it will be implemented as an identical British Standard.

10 Emergency lighting design procedure

10.1 General

Before any detailed design work commences it is essential that consultation is carried out in accordance with clause **3**. The design procedure should proceed as set out in **10.2** to **10.6**.

10.2 Determine requirements

Complete the following actions, by consultation (see clause **3**), when necessary.

a) Verify escape routes.
b) Establish fire alarm call point positions (see BS EN 1838).
c) Establish position of fire fighting equipment (see BS EN 1838).
d) Establish position of fire and safety signs (see BS EN 1838).
e) Investigate potential hazards on escape routes.
f) Establish open areas (see **6.8**).
g) Establish requirements for external escape lighting (see **6.8.2**).
h) Locate lifts (see **6.8.3**).
i) Locate moving stairways and walkways (see **6.8.4**).
j) Locate toilet accommodation over 8 m^2 gross area (see **6.8.5**).
k) Locate motor generator, control and plant rooms (see **6.8.6**).
l) Locate covered car parks (see **6.8.7**).
m) Investigate need for standby lighting (see **4.3**).
n) Establish areas or routes of low fire risk (see clause **3**).

10.3 Design of illuminance

Having determined the positions and areas which need to be illuminated from the emergency lighting system, the detailed design can commence, as set out below.

a) Position emergency luminaires on plan (see **10.2**).
b) Verify mounting height of luminaires (see **6.5**).
c) Investigate possible deterioration of luminaire light output due to dirt and dust (see **5.3**).
d) Check voltage and possible voltage drop (see clause **8**).
e) Determine the duration (see **9.3**).
f) Determine the mode of operation (see **6.11** and **9.3**).
g) Choose emergency lighting luminaires.
h) Obtain detailed light distribution of the luminaires.
i) Calculate the illuminance (see **5.3**).
j) Check uniformity (see **5.4**).

[3)] Obtainable from The Stationery Office.

10.4 Design of system

The design of the electrical installation will involve additional consultation with various organizations in order to verify certain facts, e.g. the cost and facilities for maintenance of the system when installed. Aspects to be covered are as follows.

a) Determine the type of system of emergency lighting (see **9.2**) (central battery, self-contained etc.).

b) Establish mode of operation (see **6.11**).

c) Choose the wiring system (see clause **8**).

d) Determine the routes of cable installation (see clause **8**).

e) Ensure correct fire protection of cables (see clause **8**).

f) Ensure wiring is segregated (see clause **8**).

g) Check suitability of wiring and circuit components for use in any damp, corrosive and underground locations (see clause **8**).

h) Check protection of wiring and circuit components against mechanical damage (see clause **8**).

i) Ensure avoidance of flue-like openings (see clause **8**).

j) Check joints in cables and labels (see **8.2.7** and **8.3.4**).

k) Check overhead lines (see clause **8**).

l) Establish voltage drop calculations (see clause **8**).

m) Ensure electromagnetic compatibility (see **8.4**).

10.5 Design of circuit protection and controls

The design of the circuit protection and controls requires consultation with those responsible for the continued operation and maintenance of the system. Hence there is a need to complete the following actions.

a) Establish siting of equipment (see **8.3**).

b) Choose isolators, switches and protective devices (see **8.3.2**).

c) Determine, and site, test facilities (see **8.3.3**).

d) Specify warning notices relating to isolation and maintenance hazards (see **8.3.4**).

e) Specify testing and maintenance procedures (see clause **12**).

10.6 Operation and maintenance following design and installation

The designer should include the preparation of instructions on the operation and maintenance of the system in the design schedule. The instructions should preferably be in the form of a manual for retention by the occupier. A suitable log book should also be provided (see **3.3**).

11 Certificate and log book

11.1 Completion certificate

On completion of the work of installing an emergency lighting system, or part thereof, or of a major alteration to an existing installation, a completion certificate should be supplied to the occupier/owner of the premises. A copy of this certificate may be required by the enforcing authority. A model completion certificate is given in annex B.

Recommendations on the measuring of illuminance of emergency lighting are given in annex A.

11.2 Periodic inspection and test certificate

On completion of a three-yearly inspection and test schedule as recommended in **12.4.5** a periodic inspection and test certificate should be supplied to the occupier/owner of the premises. A model inspection and test certificate is given in annex C. This certificate should be supplied at intervals of not more than 3 years or on the completion of a major alteration or addition to an existing installation, or at such other times as required by the enforcing authority. A copy of this certificate may be required by the enforcing authority.

11.3 Log book

A log book should be kept on the premises in the care of a responsible person appointed by the occupier/owner and should be readily available for examination by any duly authorized person.

The log book should be used to record the following information.

a) Date of any completion certificate including any certificate relating to alterations.

b) Date of each periodic inspection and test certificate.

c) Date and brief details of each service, inspection or test carried out.

d) Dates and brief details of any defects and of remedial action taken.

e) Date and brief details of any alterations to the emergency lighting installation.

NOTE The log book may also include pages relating to other safety records, e.g. fire alarms. Details of replacement components of luminaires such as lamp type, battery, fusing may also be recorded in the log book.

12 Servicing

12.1 Supervision

Regular servicing is essential. The occupier/owner of the premises should appoint a competent person to supervise the system. This person should be given sufficient authority to ensure the carrying out of any work necessary to maintain the system in correct operation.

12.2 Batteries

In all cases the manufacturer's instructions should be followed. It is particularly important that where applicable:

a) the tops of batteries and their terminals are kept clean and unobstructed and that battery cases are periodically checked for leaks;

b) the electrolyte is at all times kept at the correct level as recommended by the manufacturer;

c) any replacement battery should be compatible with the battery charger;

d) any replacement cell should be compatible with the battery;

e) any replacement battery charger should be compatible with the battery.

12.3 Generators

The manufacturer's instructions as given in the associated instruction manual or other literature should always be followed. It should be noted, however, that the failure of engines to start up readily often arises from poor maintenance or defects in the starting battery or in electromechanical apparatus, e.g. relays incroporated in the starting system.

Dust and damp, singly or in combination, can have an adverse effect on electromechanical apparatus and it is therefore important that a system of regular cleaning and, where necessary, adjustment is carried out.

Some parts of the starting system may be sited where they are subject to vibration and great care should therefore be taken in such instances to ensure that all connections are mechanically and electrically sound.

It is essential that air intakes and exhausts are unobstructed.

12.4 Routine inspections and tests

12.4.1 *General*

Because of the possibility of a failure of the normal lighting supply occurring shortly after a period of testing of the emergency lighting system or during the subsequent recharge period, all tests should wherever possible be undertaken at time of minimum risk.

Alternatively, suitable temporary arrangements should be made until the batteries have been recharged.

Inspections and tests should be carried out at the following intervals as recommended in **12.4.2** to **12.4.6**:

a) daily;

b) monthly;

c) six-monthly;

d) three-yearly;

e) subsequent annual test.

12.4.2 *Daily*

An inspection should be made every day to ascertain that:

a) any fault recorded in the log book has been given urgent attention and the action noted;

b) every lamp in a maintained system is lit;

c) the main control or indicating panel of each central battery system or engine driven generator plant indicates normal operation;

d) any fault found is recorded in the log book and the action taken noted.

12.4.3 *Monthly*

An inspection should be made at monthly intervals in accordance with a systematic schedule. A model schedule is illustrated in annex D.

Tests should be carried out as follows.

a) Each self-contained luminaire and internally illuminated exit sign should be energized from its battery by simulation of a failure of the supply to the normal lighting for a period sufficient only to ensure that each lamp is illuminated.

The period of simulated failure should not exceed one quarter of the rated duration of the luminaire or sign.

During this period all luminaires and/or signs should be examined visually to ensure that they are functioning correctly.

At the end of this test period the supply to the normal lighting should be restored and any indicator lamp or device checked to ensure that it is showing that the normal supply has been restored.

b) Each central battery system should be energized from its battery by simulation of a failure of the supply to the normal lighting for a period sufficient only to ensure that each lamp is illuminated.

The period of simulated failure should not exceed one quarter of the rated duration of the battery.

During this period all luminaires and/or signs should be examined visually to ensure that they are functioning correctly.

If it is not possible to examine visually all luminaires and/or signs in this period, further tests should be made after the battery has been fully recharged.

At the end of each test period the supply to the normal lighting should be restored and any indicator lamp or device checked to ensure that it is showing that the normal supply has been restored. The charging arrangements should be checked for proper functioning.

c) Each engine-driven generating plant should be started up by a simulation of a failure of the supply to the normal lighting and allowed to energize the emergency lighting system for a continuous period of at least 1 h.

During this time all luminaires and/or signs should be examined visually to ensure that they are functioning correctly.

At the end of the test period the system should be restored to normal operation and the charging arrangements for the engine-starting battery checked for proper functioning. The fuel tanks should be left filled and the oil and coolant levels topped up as necessary.

Frequent starting of the plant followed by a few minutes on load is not recommended.

d) The engine of each engine-driven generating plant with back-up batteries should be prevented from starting.

The emergency lighting system should then be energized solely from the back-up battery by simulation of a failure of the supply to the normal lighting for a period sufficient only to ensure that the change-over from normal supply to battery is functioning properly. After this check the starting system of the engine should be returned to normal operation and the engine allowed to start up in the normal way to energize the emergency lighting system for a continuous period of at least 1 h.

During these periods all luminaires and/or signs should be examined visually to ensure that they are functioning correctly.

At the end of the test period the system should be restored to normal operation and the charging arrangements for the back-up and the engine-starting batteries checked for proper functioning. The fuel tanks should be left filled and the oil and coolant levels topped up as necessary.

12.4.4 ***Six-monthly***

The monthly inspection (see **12.4.3**) should be carried out and the following tests made.

a) Each 3 h self-contained luminaire and internally illuminated sign should be energized from its battery for a continuous period of 1 h, by simulation of a failure of the supply to the normal lighting. If the luminaire is rated as having a duration of 1 h, then the period of simulated failure should be 15 min.

During this period all luminaires and/or signs should be examined visually to ensure that they are functioning correctly.

At the end of this test period the supply to the normal lighting should be restored and any indicator lamp or device checked to ensure that it is showing that the normal supply has been restored.

b) Each 3 h central battery system should be energized from its battery for a continuous period of 1 h by simulation of a failure of the supply to the normal lighting. If the system is rated as having a duration of 1 h then the period of simulated failure should be 15 min.

During this period all luminaires and/or signs should be examined visually to ensure that they are functioning correctly.

At the end of the test period the supply to the normal lighting should be restored and any indicator lamp or device checked to ensure that it is showing that normal supply has been restored. The charging arrangements should be checked for proper functioning.

c) Each engine-driven plant should be tested in accordance with the monthly schedule detailed in **12.4.3**c).

d) The engine of each engine-driven generating plant with back-up battery should be prevented from starting.

The emergency lighting system should then be energized solely from the back-up battery for a continuous period of 1 h by simulation of failure of the supply to the normal lighting.

The starting system of the engine should then be restored to normal operation and the engine allowed to start up in the normal way to energize the emergency lighting system for a further continuous period of 1 h.

During these periods all luminaires and/or signs should be examined visually to ensure that they are functioning correctly. At the end of the test period the system should be restored to normal operation and the charging arrangements for the back-up and engine-starting batteries checked for proper functioning. Any indicator lamp or device should then be checked to ensure that it is showing that the normal arrangements have been restored.

The fuel tanks should be left filled and the oil and the coolant levels topped up as necessary.

12.4.5 ***Three-yearly***

The monthly inspection (see **12.4.3**) should be carried out and the following additional tests made.

a) Each emergency lighting installation should be tested and inspected to ascertain compliance with this code (see annex C).

b) Each self-contained luminaire and/or internally illuminated sign should be tested for its full duration.

At the end of the test period the supply to the normal lighting should be restored and any indicator lamp or device checked to ensure that it is showing that normal supply has been restored.

c) Each central battery system should be tested for its full duration.

At the end of the test period the supply to the normal lighting should be restored and any indicator lamp or device checked to ensure that it is showing that normal supply has been restored. The charging arrangements should be checked for proper functioning.

d) Each generator back-up battery, where fitted, should be tested for its full duration.

At the end of the test period the system should be restored to normal operation and the charging arrangements for the back-up and engine-starting batteries checked for proper functioning. Any indicator lamp or device should then be checked to ensure that it is showing that normal arrangements have been restored.

The fuel tanks should be left filled and the oil and coolant levels topped up as necessary.

12.4.6 ***Subsequent annual test***

For self-contained luminaires with sealed batteries, after the first three-yearly test the three-yearly test should be carried out annually.

Annex A

Measuring illuminance of emergency lighting

Where authenticated data, mentioned in BS EN 1838, is not available, the following measurement method may be used.

Measurement of illuminance of emergency lighting installations can be very difficult and should be carried out with good instrumentation and great care. All site test work should be carried out by simulating a failure of the normal electrical supply and where practicable this should be done using the test facilities provided.

It is essential that the light meter used has a photocell having good cosine correction as a large proportion of the incident light is at glancing angles. The meter should be suitable for taking readings at the low illuminances involved. It should have a minimum range of 1 mlx to 100 lx and sensitivity of 1 mlx. Care has to be taken not to overshadow the light sensor and for this reason a sensor remote from the readout is preferable.

The measurement of the illuminance should be made on the same plane as that used for design, which should accord with the recommendations of clause **10**.

The effect of stray light (e.g. street or moonlight) can be substantial and as far as practicable it should be masked out. Where it cannot be excluded the illuminance from the emergency lighting should be obtained by taking readings at appropriate positions inside the building with all interior lighting, including the emergency lighting, switched off. The readings so obtained should be deducted from readings taken at the same positions with the emergency lighting switched on.

The light output of the emergency lighting system will vary with time. The test should therefore be completed as quickly as is practicable within the rated duration. This is particularly relevant in an occupied building or one in daily use as with discharged batteries the building could have reduced emergency lighting cover for up to 24 h following the test.

For measurement of emergency lighting on clearly defined escape routes it is advisable to select for test a number of specific areas likely to have minimum illuminance. Suggested locations are:

a) half-way between luminaires, especially in stair wells;

b) critical task areas;

c) where highest luminaire mounting height occurs;

d) where widest spacing of luminaires occurs;

e) changes in direction of route;

f) at thresholds of doorways forming part of the exit route.

Tests should not be carried out in areas where people will not normally tread, i.e. in extreme corners where a wall meets a floor or stairway.

For measurement of average illuminance where there is no defined escape route, tests should be carried out over the whole of the relevant area.

In practice the illuminance over an area is seldom uniform. The interior should therefore be theoretically divided into a number of zones; the illuminance in each zone should be measured and the mean value calculated. The total number of measurements taken in any open space should not be less than the total area in square metres divided by a constant value of 25, and in any case should not be less than four.

The results of the measurements should be checked against design data.

The rated duration of self-contained luminaires will need to be checked individually. For a central system it is only necessary to carry out the test at one luminaire, preferably that luminaire subject to the highest voltage drop.

On-site testing will only prove or indicate to some degree the accuracy of the design data and in most cases the illuminance measured will be higher than the minimum design level. The minimum value of illuminance will always occur at 5 s after switch on, at the end of the battery discharge when the voltage is at a minimum value, and at the end of useful lamp life. Such combinations are not usually encountered on-site, except where unsatisfactory equipment has been used or maintenance has been poor. When carrying out these tests it is therefore necessary to have data which relates to the lumen output of the luminaire during the lamp/battery life cycle.

Annex B
Model completion certificate

Emergency lighting — Completion certificate for new installation or alterations

Occupier/owner .....

Address of premises .....

..... Tel. no. .....

Designer's name .....

Designer's address .....

..... Tel. no. .....

Work carried out and covered by this certificate shown on drawings nos. .....

..... (see **3.3** of BS 5266-1:1999).

I/We hereby certify that the emergency lighting installation, or part thereof, at the above premises has been designed by me/us and to the best of my/our knowledge and belief, the system complies with the appropriate recommendations given in BS EN 1838 and BS 5266 'Emergency Lighting' Part 1:1999 'Code of practice for the emergency lighting of premises other than cinemas and certain other specified premises used for entertainment', published by BSI, for a category .....* installation, except as stated below. Photometric design data is appended to this certificate.

Signature of person responsible for design of the system .....

Qualification ..... Date .....

For and on behalf of .....

Installer's name .....

Installer's address .....

..... Tel. no. .....

Work carried out and covered by this certificate shown on drawing nos. .....

..... (see **3.3** of BS 5266-1:1999).

* Enter M/1, 2 or 3 or NM/1, 2 or 3 as appropriate (see **6.12** of BS 5266-1:1999).

Model completion certificate *(continued)*

I/We hereby certify that the emergency lighting installation, or part thereof, at the above premises has been installed by me/us in accordance with the system designer's specification and to the best of my/our knowledge and belief, the installation complies with the appropriate recommendations given in BS EN 1838 and BS 5266 'Emergency Lighting' Part 1:1999 'Code of practice for the emergency lighting of premises other than cinemas and certain other specified premises used for entertainment', published by BSI, for a category ....* installation, except as stated below.

Signature of person responsible for the installation of the system .....

Qualification† ..... Date .....

For and on behalf of .....

Systems verifier's name .....

System verifier's address .....

..... Tel. no. .....

I/We hereby certify that the emergency lighting installation, or part thereof, at the above premises has been inspected and tested by me/us and to the best of my/our knowledge and belief, the installation complies at the time of my/our test with the recommendations given in BS EN 1838 and BS 5266 'Emergency Lighting' Part 1:1999 'Code of practice for the emergency lighting of premises other than cinemas and certain other specified premises used for entertainment', published by BSI, for a category ..... * installation, except as stated below. Photometric verification data is appended, including light loss factors on photometric design, or the test data obtained from either authenticated data (see BS EN 1838) or the measurements carried out in accordance with annex A of BS 5266-1:1999.

Signature of person responsible for system verification .....

Qualification† ..... Date .....

For and on behalf of .....

* Enter M/1, 2 or 3 or NM/1, 2 or 3 as appropriate (see **6.12** of BS 5266-1:1999).

† Qualifications: a suitably qualified electrical engineer or a member of the Electrical Contractors' Association or the Electrical Contractors' Association of Scotland; or a certificate holder of the National Inspection Council for Electrical Installation Contracting; or a qualified person acting on behalf of one of these (in which case it should be stated on whose behalf he is acting). Where acceptable to the enforcing authority the authorized representative of a manufacturer of emergency lighting equipment may be deemed to be a suitably qualified person.

Model completion certificate *(continued)*

Details of variation from the code of practice (BS 5266-1:1999)

NOTE Where this certificate relates to a major alteration or addition it should be accompanied by an 'Emergency Lighting — Periodic inspection and test certificate' for the entire emergency lighting installation (see **11.2** of BS 5266-1:1999).

Annex C
Model periodic inspection and test certificate

Emergency lighting — Periodic inspection and test certificate

Occupier/owner .....

Address of premises .....

..... Tel. no. .....

Date of inspection and test .....

Inspection and test carried out by .....

Name and address .....

..... Tel. no. .....

I/We hereby certify that the emergency lighting installation at the above premises has been inspected and tested in accordance with the schedule below by me/us and to the best of my/our knowledge and belief complies at the time of my/our test with the recommendations of BS EN 1838 and BS 5266 'Emergency Lighting' Part 1:1999 'Code of practice for the emergency lighting of premises other than cinemas and certain other specified premises used for entertainment', published by BSI, for a category .....* installation, except as stated below.

Signature of person responsible for inspection and test .....

Qualification† ..... Date .....

For and on behalf of .....

Details of variation from the code of practice (BS 5266-1:1999).

* Enter M/1, 2 or 3 or NM/1, 2 or 3 as appropriate (see **6.12** of BS 5266-1:1999).

† Qualifications: a suitably qualified electrical engineer or a member of the Electrical Contractors' Association or the Electrical Contractors' Association of Scotland; or a certificate holder of the National Inspection Council for Electrical Installation Contracting; or a qualified person acting on behalf of one of these (in which case it should be stated on whose behalf he is acting). Where acceptable to the enforcing authority the authorized representative of a manufacturer of emergency lighting equipment may be deemed to be a suitably qualified person.

Model periodic inspection and test certificate *(continued)*

Schedule to emergency lighting periodic inspection and test certificates

NOTE 1 Because of the possibility of failure of the supply to the normal lighting occurring shortly after a period of testing, all tests should be undertaken at times of minimum risk. Alternatively, suitable temporary arrangements should be made until the batteries have been recharged.

NOTE 2 The figures in brackets indicate the relevant clauses of BS 5266-1:1999.

Results of inspection and tests

(a) Are correct entries made in the log book? YES/NO

(b) Are record drawings available? YES/NO

(c) Are record drawings correct? YES/NO

(d) *Signs.*

(1) Are the signs correctly positioned? (**6.9**) YES/NO

(2) Are details of the signs correct? (**6.9**) YES/NO

(3) Do the self-luminous signs (if any) need changing before the date of the next scheduled inspection? Is so state date ..... (See label on sign) (**6.9**) YES/NO

(e) *Luminaires.* Are luminaires correctly positioned? (**6.7**, **6.8** and **10.3**) YES/NO

(f) *Illumination for safe movement* (clause **5** and see record drawings).

(1) Are the correct lamps installed in the luminaires? (**6.13**) YES/NO

(2) Has there been any change in the décor or lay-out of the premises since the last inspection, which has caused any significant reduction in the effectiveness of the lighting system? (Any changes to be stated under COMMENT below.) YES/NO

(3) Is the installation in a generally satisfactory condition? YES/NO

(g) *Marking.*

(1) Are the category and nominal operating voltage of the system clearly marked or readily identifiable? (**6.13**) YES/NO

(2) Are luminaires clearly marked to indicate the correct lamp for use? (**6.13**) YES/NO

(3) Is information available to ensure correct battery replacement? (**6.13**) YES/NO

(h) *Wiring systems* (clause **8**).

(1) Are the results recorded on the last inspection and test certificate satisfactory? YES/NO

(2) State the date of this inspection and test .....

(i) *Power services.*

(1) Are the charging arrangements for batteries satisfactory? (**6.11**, **12.2** and **12.4**) YES/NO

(2) Do changeover devices operate satisfactorily upon simulation of failure of the normal supply? (**6.11** and **12.4**) YES/NO

Model periodic inspection and test certificate *(continued)*

(j) *Central battery systems including back-up batteries.*

(1) After operation for the rated duration:

(i) do all luminaires operate? (**6.7**, **6.8** and **12.4**); YES/NO

(ii) are all signs illuminated and visible? (**6.9** and **12.4**). YES/NO

(2) Following the restoration of the system to normal:

(i) is the battery charger functioning? (**6.11** and **12.4**); YES/NO

(ii) are the levels and the specific gravities of the battery electrolytes satisfactory, where applicable? YES/NO

(k) *Engine driven generating plant.*

(1) After a period of operation of at least 1 h:

(i) do all luminaires operate? (**6.7**, **6.8** and **12.4**); YES/NO

(ii) are all signs illuminated and visible? (**6.9** and **12.4**); YES/NO

(iii) does the back-up battery, where installed, operate satisfactorily? (see (j) above) YES/NO

(2) Following the restoration of the system to normal:

(i) is the battery charger for the engine starter battery functioning? (**6.11** and **12.4**); YES/NO

(ii) are the fuel, coolant and lubricating oil levels correct? (**12.4**) YES/NO

(l) *Self-contained luminaires and signs.*

(1) After operation for the rated duration, does each self-contained luminaire and sign operate? (**6.9**, **6.11** and **12.4**) YES/NO

(2) Following restoration of the system to normal supply, is the battery charger functioning? (**6.11** and **12.4**) YES/NO

COMMENT (if any) and variation from the code of practice.

Annex D

Model servicing schedule

Schedule of monthly servicing to be carried out by or on behalf of the occupier/owner

NOTE 1 In addition to the instructions given below, the instructions issued by the manufacturers should be observed.

NOTE 2 The figures in brackets indicate the relevant clauses of BS 5266-1:1999.

a) Check that defects recorded in the log book have been corrected.

b) Clean the exterior of luminaires and signs.

c) Check correct operation of luminaires and internally illuminated signs by operating the test facility (**12.4.3**).

d) Check correct operation of engine driven generator(s) and carry out the manufacturer's recommended maintenance (**12.4.3**).

e) Check fuel tanks, oil and coolant levels and top up as necessary (**12.4.3**).

f) Check level of electrolyte in batteries of central battery systems and generator starter batteries (**12.2**).

g) Check that all indicator lamps are functioning.

h) Record data in the log book (**11.3**).

Publications referred to

BS 476, *Fire tests on building materials and structures.*

BS 764, *Specification for automatic change-over contactors for emergency lighting systems.*

BS 4678-4, *Cable trunking — Part 4: Specification for cable trunking made of insulating material.*

BS 5345, *Code of practice for selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres (other than mining applications or explosive processing and manufacture).*

BS 5467, *Specification for 600/1000 V and 1900/3300 V armoured electric cables having thermosetting insulation.*

BS 5588-5, *Fire precautions in the design and construction of buildings — Part 5: Code of practice for firefighting stairs and lifts.*

BS 5588-8, *Fire precautions in the design and construction of buildings — Part 8: Code of practice for means of escape for disabled people.*

BS 6004, *Specification for PVC-insulated cables (non-armoured) for electric power and lighting.*

BS 6007:1993, *Specification for rubber-insulated cables for electric power and lighting.*

BS 6099-2-2:1982, *Conduits for electrical installations — Part 2: Particular specifications — Section 2.2: Specification for rigid plain conduits of insulating material.*

BS 6207-1, *Mineral-insulated cables with a rated voltage not exceeding 750 V — Part 1: Cables.*

BS 6346, *Specification for 600/1000 V and 1900/3300 V armoured electric cables having PVC insulation.*

BS 6387, *Specification for performance requirements for cables required to maintain circuit integrity under fire conditions.*

BS 6467-2, *Electrical apparatus with protection by enclosure for use in the presence of combustible dusts — Part 2: Guide to selection, installation and maintenance.*

BS 6724, *Specification for 600/1000 V and 1900/3300 V armoured electric cables having thermosetting insulation and low emission of smoke and corrosive gases when affected by fire.*

BS 6746:1990, *Specification for PVC insulation and sheath of electric cables.*

BS 7671, *Requirements for electrical installations. IEE Wiring Regulations. Sixteenth edition.*
CP 1007, Maintained lighting for cinemas.

BS EN 1838:1999 (BS 5266-7:1999), *Lighting applications — Emergency lighting.*

BS EN 50086-2-1, *Specification for conduit systems for electrical installations — Part 2: Particular requirements — Section 2.1: Rigid conduit systems.*

BS EN 60529, *Specification for degrees of protection provided by enclosures (IP code).*

BS EN 60598-2-22, *Luminaires — Part 2: Particular requirements — Section 2-22: Luminaires for emergency lighting.*

CIBSE technical memorandum TM12 'Emergency Lighting' (1986). Chartered Institution of Building Services Engineers.

Hospital technical memorandum No. 11 — Emergency electrical services. Department of Health and Social Security.

Guide to safety at sports grounds. Home Office.

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