



EMERGENCY LIGHTING GUIDE

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FROM SOURCE TO SITE

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1 INTRODUCTION

This guide has been written to offer practical guidance for contractors undertaking work on emergency lighting systems. It is not designed to replace any of the parts of BS 5266. The more detailed technical recommendations can be found in the actual standards. Anyone undertaking works on Emergency Lighting Systems should be in possession of the following British Standards:

BS 5266-1:2016

BS EN 1838:2013 (also numbered as BS 5266-7:2013)

BS EN 50172:2004 (also numbered as BS 5266-8:2004)

BS 7671:2018

This guide looks at these systems and offers some useful guidance and information on the use of the standards.

This guide is designed to explain the use of and interpret the recommendations of the British Standards, as it applies to the individuals and organisations that carry out the design, installation, commissioning and maintenance of emergency lighting installations.

BS 5266-1 was reviewed and reissued in 2016, and the previous 2011 edition has been withdrawn. Although often called emergency lighting, there are different types of emergency lighting systems and installations, which have different objectives and standards.

This guide covers:

- emergency lighting,
- emergency escape lighting,
- emergency escape route lighting,
- open area (often called anti-panic) lighting
- high risk task area lighting.

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The purpose of emergency lighting is to ensure the safety lighting is provided promptly, automatically and for a suitable time, in a specified area when the normal mains power supply to the usual lighting installation fails.

The overall objective of **emergency escape lighting** is to enable safe exit from a location and/or building in the event of failure of the mains' normal supply.

The objective of **escape route lighting** is to enable the safe exit from a location or building for occupants by providing appropriate visual conditions and direction finding on escape routes, and in special locations, and to ensure that fire fighting and safety equipment can be readily located and used.

The objective of **open area (anti-panic) lighting** is to reduce the likelihood of panic and to enable safe movement of occupants towards escape routes by providing appropriate visual conditions and direction finding.

The objective of **high risk task area lighting** is to contribute to the safety of people involved in a potentially dangerous process or situation and to enable proper shut down procedures to be carried out for the safety of other occupants of the location or the building.

A combination of different types of emergency lighting is likely to be needed in most buildings and a risk assessment should be carried out to identify the areas and locations, which will require emergency lighting and the type of installation needed.

Vision varies from person to person, both in the amount of light required to perceive an object clearly and in the time taken to adapt to the changes in the illuminance level. In general, older people need more light and take longer to adapt to A lower illuminance on hazard or escape routes.

Much anxiety and confusion can be alleviated by strategically placing emergency lighting luminaires and signs indicating the way out of a location or building. It is very important that exits are clearly signposted and are visible, whenever the location or building is occupied.

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2 DEFINITIONS

It is a good idea to familiarise yourselves with some of the definitions used within the emergency lighting design, installation, commissioning and maintenance standards.

BORROWED LIGHT

Light obtained from an adjacent reliable source-this is expected to be available at all material times.

CENTRALLY SUPPLIED EMERGENCY LUMINAIRE

Luminaire for maintained or nonmaintained operation, which is energized from a central emergency power system that is not contained within the luminaire.

COMPETENT PERSON

Person with the relevant current training and experience, and with access to the requisite tools, equipment and information, and capable of carrying out a defined task.

EMERGENCY EXIT

Way out that is used during an emergency.

EMERGENCY ESCAPE LIGHTING

That part of emergency lighting that provides for the safety of people leaving a location or attempting to terminate a potentially dangerous process before doing so.

EMERGENCY LIGHTING

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

EMERGENCY SAFETY LIGHTING

That part of emergency lighting that provides illumination for the safety of people staying in a premises when the supply to the normal lighting fails.

ESCAPE ROUTE

Route designated for escape to a place of safety in the event of an emergency.

FINAL EXIT

Terminal point of an escape route.

HIGH RISK TASK AREA LIGHTING

That part of emergency escape lighting that provides illumination for the safety of the people involved in a potentially dangerous process or situation and to enable proper shut-down procedures for the safety of the operator and other occupants of the premises.

MAINTAINED EMERGENCY LUMINAIRE

Luminaire in which emergency lamps are energized at all times when normal or emergency lighting is required.

MATERIAL TIMES

Times in which the emergency lighting lamps are in operation only when the supply to the normal light fails.

NON MAINTAINED EMERGENCY LUMINAIRE

Luminaire in which the emergency lighting lamps are in operation only when the supply to the normal lighting fails.

OPEN AREA LIGHTING

That part of emergency escape lighting provided to avoid panic and provide illumination allowing people to reach a place where an escape route can be identified.

PLACE OF SAFETY

Place in which persons are no longer in danger.

RESPONSIBLE PERSON

Delegated individual who is responsible for the provision and operation of the appropriate emergency escape lighting.

SIGN HEIGHT

Diameter of a circular geometric shape or height of a rectangular or triangular geometric shape.

STANDBY LIGHTING

The part of emergency lighting provided to enable normal activities to continue substantially unchanged.

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3 NEED FOR EMERGENCY LIGHTING

When the mains supply to the normal lighting of premises fails, emergency lighting may be required. Throughout this guide, reference to "emergency lighting" covers "emergency escape lighting" in particular, but also includes any element of standby lighting, which may be used for emergency escape lighting, and as determined by the risk assessment.

The safe movement of people 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.

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 of 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.

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 reflection from the surroundings. In many interior spaces, a high proportion of the light falling on any surface comes from the light source reflected 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 might 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 much smaller. The reflected light might be negligible in, say, a club or restaurant, where the carpets, walls and ceiling have been deliberately kept dark in colour to produce a feeling of intimacy and relaxation.

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. All potential obstructions or hazards on an escape route need to 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.

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4 CURRENT LEGISLATION AND POLICY

UK legislation imposes a duty on persons, including employers and other persons with control of premises, to carry out risk assessments and to take such precautions as to ensure as far as reasonably practicable the safety of the occupants. These measures include the provision of safe means of escape, including emergency escape routes and exits, together with, where necessary, signs indicating them. Legislation also states that suitable and sufficient emergency lighting needs are to be provided, where the people are particularly exposed to danger, in the event of failure of supply to the normal lighting.

There is increasing recognition of the application of emergency lighting to assist the safety of occupants who stay in a building during a mains supply failure. In many instances, particularly in places with frequently occurring power cuts, it might not be necessary or appropriate to evacuate the premises in the event of failure of the supply to the normal lighting, but precautions need to be taken to enable occupants to remain on the premises in safety. This revised edition of the standards covers the use of emergency lighting in premises that are evacuated immediately, as well as conventional emergency escape lighting.

Emergency lighting can perform the following functions, some of which can be combined into a single system:

- a) emergency escape lighting, which provides illumination of escape routes, signs and points of emphasis to assist occupants to evacuate the premises;
- b) emergency safety lighting, which provides lighting for safe movement in the premises when the occupants need not evacuate the premises immediately;
- c) standby lighting, powered by an alternative power supply, which provides sufficient lighting to operate the premises normally in the event of a total failure of the main power supply.

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EMERGENCY LIGHTING IS COVERED BY VARIOUS PIECES OF LEGISLATION AND REGULATIONS. THE MAJOR OF THESE ARE:



Regulatory Reform (Fire Safety) Order 2005



Part B of the Building Regulations

1. The Construction Products Directive. This is implemented by building control officers Requirements are given in Approved Document B Fire Safety (Statutory)
2. Regulatory Reform Order (Fire Safety) 2005 (Statutory)
3. The Signs Directive (90/664) implemented in UK by Statutory Instrument 341 (Statutory)
4. The Management of Health and Safety at Work Regulations 1999 (Statutory)

You should ensure you are familiar with these legislative documents and regulations before undertaking any design or any work. These laws and regulations require that those who undertake work within these areas may be required to demonstrate competence.

The different types of emergency lighting are illustrated below in Fig. 1

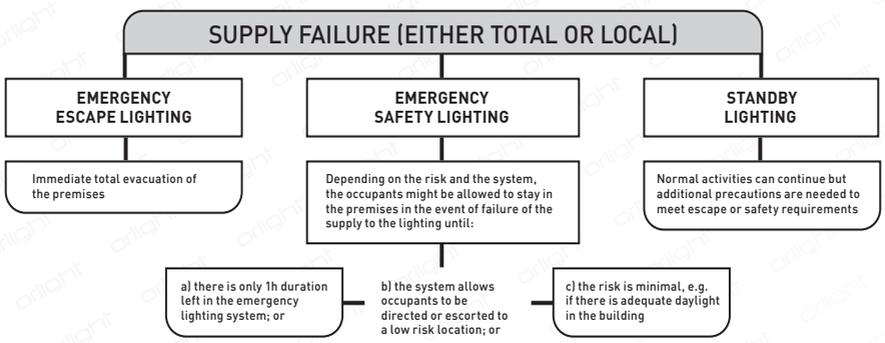


FIG. 1 TYPES OF EMERGENCY LIGHTING

This part of BS 5266 gives recommendations and guidance on the factors that need to be taken into account in the design, installation and wiring of electrical emergency lighting systems, in order to provide the lighting performance needed for safety of people in the building in the event of failure of the supply to the normal lighting.

This British Standards applies to emergency lighting systems used to:

- a)** assist occupants to leave a building during an emergency;
- b)** help protect occupants if they stay in a building during an emergency;
- c)** help occupants to continue normal operations in the event of failure of the supply to the normal lighting.

This part of BS 5266 is not applicable to dwellings; however, its provisions are applicable to common access routes within blocks of flats or maisonettes.

The start of any design is to identify and agree the escape routes so the design will be engineered in accordance with EN 1838 (BS 5266-7).

Plans or layout drawings showing the layout of the building and of all existing or proposed escape routes, fire alarm call points and fire fighting equipment, also indicating the positions of all structural items which may offer obstruction to escape should be provided before commencing system design.

Consultation between interested parties the owner/developer and/or occupier of the premises, the architect, the consultant, the lighting engineer, the installation contractor, the enforcing authorities (e.g. the building control and fire authorities), and any other interested parties, should be arranged very early in the design stage.

In addition to the recommendations of the standards, it is important that the requirements of any national and/or local legislation that may apply to the premises in question are fully recognized and discussed at the early design stage. This highlights the importance for a fire risk assessment as required by the regulatory reform fire safety order.

Fire risk assessment is the process of considering each part of a building from

the point of view of what fire hazards exist within an area and what would happen if a fire or explosion were to occur. This would normally include the provision and need for emergency lighting as lighting forms an important part of any evacuation/escape strategy.

The recommended illuminances that are given as a minimum (escape routes and open areas) or average (high risk task areas) should be regarded as the lowest value acceptable during the related duration, taking into account the effects of reduction in voltage, voltage drop in the system wiring, battery ageing, lamp ageing and accumulation of dirt and dust.

Calculations of illuminance should be made ignoring reflectance. However, with lighting systems such as indirect luminaires and uplights, where the luminaire works in conjunction with a reflecting surface, the first reflection should be taken as the direct output and subsequent reflections should be ignored.

5 EMERGENCY LIGHTING DESIGN

At the start of any emergency lighting design, the relevant information regarding the premises needs to be obtained either from drawings, a site survey or the building's responsible person.

5.1 Design checklist

The following describe a typical list of actions, which would take place during an emergency lighting system design process.

- Examination of the risk assessment
- Duration of the emergency lighting
- Identify emergency escape routes and take account of potential hazards
- Identify the locations of fire alarm call points, fire fighting equipment and fire safety signs
- Determine type of emergency lighting system
- Means of isolation for testing and/or maintenance
- Coordination/interface with luminaire manufacturers where main luminaires are to be converted into emergency lighting luminaires

- Identify the exit sign requirements
- Identify any high risk areas
- Open areas larger than 60m² floor areas need to be identified
- Need for external illumination outside final exit doors and on a route to a place of safety.

6 LOCATIONS

It is important that the emergency luminaires are located to give appropriate illuminance in the event of a failure of the normal lighting.

Fig 2 shows typical rooms that require emergency lighting, these areas should be identified when carrying out an emergency lighting design. It is also important to take into account any recommendations of the risk assessment.

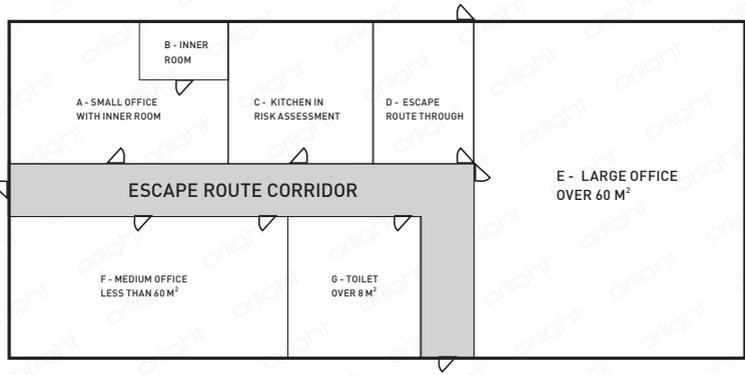


Fig 2 example of rooms needing emergency lighting

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Area	Dimensions	Function and relevant considerations	Emergency lighting needed
Escape route	2 x 17) m	Corridor leading to exits, luminaires required at change of direction, exits and outside building to place of safety	Yes
Room A	3 x 9) m = 27m ²	Small office, no risk identified	No
Room C	3 x 4) m = 12m ²	Kitchen identified as needing emergency lighting in the risk assessment for the premises	Yes
Room D	3 x 4) m = 12m ²	Small office, escape route passes through this open area	Yes
Room E	10 x 8) m = 80m ²	Main office larger than 60 m ² floor area	Yes
Room G	5 x 11) m = 55m ²	Toilet larger than 8 m ² floor area	Yes
Room F	5 x 6) m = 30m ²	Medium office smaller than 60 m ² floor area	No

As fig 2 shows there are several areas which would need to be considered when designing an emergency lighting system. These are:

6.1 Open areas

Open areas are often called anti-panic lighting. These are areas larger than 60m² floor area or may be areas identified by the fire risk assessment as requiring safety illumination.

6.2 Emergency exit and escape routes

Emergency exits and escape routes should be provided with signs. These should be illuminated to indicate unambiguously the route of escape to a point of safety. Where direct sight of an emergency exit is not possible, an illuminated directional sign (or series of signs) should be provided to assist progression towards the emergency exit.

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Every change of direction leading to an escape door needs to be illuminated. An escape lighting luminaire (complying with EN 60598-2-22) should be sited near each exit door and at positions where it is necessary to emphasize potential danger or safety equipment.

Siting and illuminance levels of emergency escape lighting luminaires should be in accordance with BS EN 1838.

Emergency escape lighting should be provided in escape routes, open areas, high risk task areas, and points of emphasis including:

- a) near (see Note 1) each exit door intended to be used in an emergency; b) near (see Note 1) stairs so that each flight of stairs receives direct light; c) near (see Note 1) any other change in level;
- d) externally illumination escape route signs, escape route direction signs and other safety signs needed to be illuminated under emergency lighting conditions;
- e) at each change of direction (see Note 2 below);
- f) at each intersection of corridors (see Note 2);
- g) near (see Note 1 below) each final exit and outside the building to a place of safety;
- h) near (see Note 1) each first aid post;
- i) near (see Note 1) each piece of fire-fighting equipment and call point; j) near (see Note 1) escape equipment provided for disabled people;
- k) near (see Note 1) refuges and call points, including two-way communication systems and disabled toilet alarm call position;
- l) near (see Note 1) manual release controls provided to release electronically locked doors as recommended in BS 7273-4.

Note 1: For the purpose of this sub clause, “near” is normally considered to be within 2 m measured horizontally

Note 2: For the purpose of this sub clause, “at” means that the emergency luminaire would illuminate in both directions at the change of direction or intersection.

6.3 External areas in the immediate vicinity of exits

In order to assist dispersal to a place of safety, the external areas in the immediate vicinity of final exits should be illuminated in accordance with the illumination level for escape routes, given in EN 1838 (BS 5266-7) of not less than 1 Lux. If the area outside the building has hazards in darkness such as a riverbank or steep stairs, the fire risk assessment should determine if further emergency luminaires are needed until a place of safety can be reached. This might involve the placement of emergency lighting on the outside of a building adjacent to the final exit door. An example of this would be an external fire escape staircase from a first floor.

If street lighting is available and adequate, it may be used with the agreement of the fire authority. It should, however, be remembered that the electrical supply to the local street lighting may also be affected by a local mains failure. And the availability of the street lights would need assessed to make sure they are illuminated during all times that the building is occupied.

Note: Illumination for these areas is specified in BS EN 1838:2013 and BS EN 50172:2004

6.4 Lift cars

Lifts present a problem because the experience of being confined in the dark within a small space for an indefinite period of time is not only unpleasant, but may cause harm to those who are nervous or suffer from claustrophobia.

The emergency lighting can either be self contained or powered from a central or a secondary supply in which case a life safety fire protected power supply will be required in accordance with BS 9999:2017 and BS EN 81-20:2020.

6.5 Moving stairways and walkways

Moving stairways and walkways should be illuminated as if they were part of an escape route in the event of mains failure.

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6.6 Toilet facilities

Toilet facilities exceeding 8 metres squared gross area should be provided with emergency lighting as if they were open areas.

Toilets for disabled use, and any multiple closet facilities without borrowed light, should have emergency illumination from at least one luminaire.

It is not necessary to provide emergency lighting in toilets designed to accommodate only a single able-bodied person or en suite toilets or bathrooms in hotel bedrooms.

6.7 Switch rooms and plant rooms

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

6.8 Covered car parks

The pedestrian escape routes from covered and multi-storey car parks should be provided with emergency lighting.

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7 DURATION OF BATTERY BACK-UP

The battery back-up of the emergency lighting system will depend on the use of the building and the evacuation strategy. 3 hour duration is required in places of entertainment (cinemas, theatres, etc) and for buildings that have a sleeping risk (hotels and guesthouses, etc.).

3 hour duration is also required if evacuation is not immediate, or where early re-occupation may be required.

For the common areas of blocks of flats a 3 hour duration is required, as the even though the occupants would be familiar with the layout of the building and an orderly evacuation can be expected in the event of an emergency. There is still the sleeping risk of the flats themselves which causes the longer duration requirement.

1 hour duration may be acceptable, in some premises, if evacuation is immediate and re-occupation is delayed until the system has recharged.

Typical types of premises that would require a 3 hour duration are:

Premises used as sleeping accommodation which would include:

- Hospitals
- Guest houses
- Boarding schools
- Care homes
- Colleges
- Some clubs

Non residential premises used for treatment or care which would include:

- Special schools
- Clinics and similar premises

Non residential premises used for recreation which would include:

- Theatres
- Concert halls
- Sports halls
- Restaurants
- Cinemas
- Exhibition halls
- Public houses

Non residential public premises which would include:

- Town halls
- Libraries
- Shops
- Shopping malls
- Art galleries
- Museums

Typical types of premises that would require a 1 hour duration are:

Non residential premises used for teaching, training and research, and offices which would include:

- Schools
- Colleges
- Technical institutes
- Laboratories

Industrial premises used for the manufacture, processing or storage of products which would include:

- Factories
- Workshops
- Warehouses

Were a premises fall into more than one "typical type" the longer duration would apply to the whole premises. Unless the differing types are contained within a separate fire compartment and each compartment has its own independent escape route. If this is the case then differing durations for the appropriate type and compartment may be used.

Emergency luminaires of the maintained type should be used in public areas where the normal lighting may be dimmed and in common areas where a build-up of smoke could reduce the effectiveness of normal lighting. Maintained lighting that combines both emergency and normal lighting functions may also be desirable for aesthetic or economic reasons.

The battery back-up for the emergency lighting system should be determined by the fire risk assessment for the building.

The exit signs always need to be illuminated and be visible at all times when the premises are occupied. Because of the difficulties of ensuring that the normal lighting will adequately achieve this, maintained exit signs are required in licensed and entertainment venues. Maintained exit signs should be used in any premises which are used by people who are unfamiliar with its layout.

Emergency lighting luminaires can be either self-contained emergency luminaires or centrally supplied emergency luminaires. Both may be used for escape route signs or emergency lighting. For certain applications, the luminaire itself should have satisfactory protection against the ingress of foreign bodies or moisture, using the appropriate IP classification as defined in BS EN 605529.

Details of the approvals and performance should be confirmed with the user and full documentation added to the system records.

If used in hazardous areas, where luminaires are certified to national or international standards by the recognized certification authority, compliance with temperature limits and explosion protection might be required (BS EN 60079-14:2014).

BS EN 50172:2004, 5.5.1 specifies a requirement for the emergency escape lighting luminaires to be designed and constructed in accordance with BS EN 60598-2-22. It also specifies a requirement for them to be selected to be appropriate for their location.

8 LUMINANCE LEVELS

The level of illuminance required depends on the function of an area.

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, and 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.

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 many interior spaces, a high proportion of the light falling on any surface comes from the reflected light. Where the walls, floor and ceiling are

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light in colour up to 60 % of the illuminance at floor level may be 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 nightclub 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 edges of stair treads, barriers and walls at right angles to the direction of movement.

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.

The recommended illuminance levels that are given as a minimum or average across an area should be regarded as the lowest value acceptable during the rated duration, taking into account the effects of reduction in voltage, voltage drop in the system wiring, battery ageing, lamp ageing and the accumulation of dirt and dust.

Calculations of illuminance, except where up-lighting is used, should be made ignoring reflectance.

For escape routes up to 2m in width, the horizontal illuminance on the floor along the centreline of an escape route shall be not less than 1 lux and the central band consisting of not less than half of the width of the route shall be illuminated to a minimum of 50 % of that value (0.5 lux). Wider escape routes can be treated as a number of 2m wide strips or be provided with open area (anti-panic) lighting.

The UK did have a national deviation to the European Standard stating that a value of not less than 0.2 lux is acceptable on the centre band of an escape route. But

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this value was only to be used if the escape route is permanently unobstructed. This deviation has been withdrawn and escape routes unobstructed or not requires 1 lux on the centre line.

In open area (anti-panic) lighting, the horizontal illuminance shall be not less than 0.5 lux at the floor level of the empty core area which excludes a border of 0.5m of the perimeter of the area.

In areas of high risk, the emergency maintained illuminance on the plane of work (reference plane) shall be not less than 10% of the normal required illuminance for that task. As a minimum, it should not be less than 15 lux and shall be free of harmful stroboscopic effects.

The uniformity of the high-risk task area lighting illuminance needs to be maintained across the area.

Some high output emergency luminaires can produce a glare effect which can interfere with the observation of safety signs and obstructions on the escape route. This is known as disability glare. The most common fittings to cause disability glare are the frog eye type.

Care needs to be taken when placing these types of fittings so to avoid disability glare this can be achieved by making sure they are at least 30° out of direct line of sight from the escape route.

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

- a) half-way between luminaires, especially in stairwells;
- b) where highest luminaire mounting height occurs;
- c) where widest spacing of luminaire occurs;
- d) at changes in direction of route;
- e) at thresholds of doorways forming part of the exit route;
- f) at face of externally illuminated safety signs.

In open areas, tests need to be carried out over the whole of the relevant area (see

BS EN 1838:2013) and paths lit by emergency safety lighting.

The results of the measurements then need to be checked against design data.

The rated duration of self-contained luminaires needs to be checked individually for certain system it is only necessary to carry out the test at one luminaire, preferably that luminaire subject to the highest vocal drop.

On-site testing can only prove or indicate to some degree the accuracy of the design data, and in most cases the illuminance measured is higher than the minimum design level. The minimum value of illuminance is demand is deemed to occur either at 5 s after switch-on or at the end of the battery discharge when the voltage is at a minimum value, and also 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 necessary to have data which relates to the lumen output of the luminaire during the lamp/battery life cycle.

Certain specific locations require a specific illuminance and response time the below table gives the locations and response time.

Location	Response time (s)	Minimum illuminance (lx)	Minimum duration (min)	Reference plane
Kitchens	0.5	15	30 min	Horizontal on working plane, switches and cut-outs readily visible
First aid rooms	5	15	30 min	Horizontal on working plane
Treatment rooms	0.5	50	30 min	Horizontal on working plane

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Refuges	5	5	Full rated	Horizontal on floor, vertical at wall mounted communication devices and sign
Plant rooms, switch rooms & emergency winding facilities for lifts	5	15	Full rated	In plane of visual task
Fire alarm control and indicating equipment	5	15	Full rated	In plane of visual task
Reception areas	5	15	Full rated	In plane of visual task
Panic bars & pads or security devices	5	5	Full rated	Horizontal on plane of panic bar/pad; vertical at vertically mounted/wall mounted security devices
Swimming pool surrounds and diving areas	0.5	5	Full rated	Horizontal on floor and treads

9 PRODUCT CONFORMITY

It is import that all emergency luminaires are engineered to the correct standard. This is especially important when retro fitting battery packs to existing luminaires. The European emergency lighting product standards, BS EN 60598-2-22, EN 60924 and EN 60925 cover most points of safety and performance for emergency luminaires and conversion modules. Emergency lighting luminaires used on escape routes are required to be fire retardant (850°C glow wire tested). Luminaires can be registered for product compliance through the ICEL Product Registration Scheme which assures compliance with this requirement. It also assures the user that the products have been certified to BS EN 60598-2-22:2014 + A1:2020 and are manufactured within a facility operating a scheme of quality assurance approved to BS EN ISO 9001 or BS EN ISO 9002.

Emergency lighting is covered by a series of interdependent standards, which can be

seen as forming a hierarchy as shown in the table below

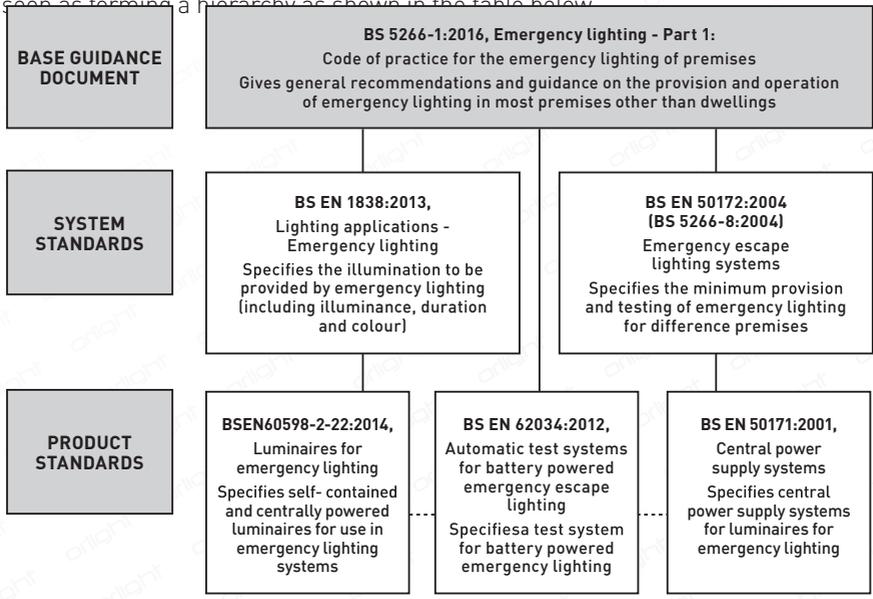


FIG.4 SUMMARY OF STANDARDS COVERING EMERGENCY LIGHTING

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10 PHOTOMETRIC DATA & SPACING TABLES

How you achieve the required illuminance levels is dependent on the position and orientation of the luminaires. Photometric data needs to be provided with the completion certificate. This is to ensure that the system has been designed correctly and that the required illumination will be achieved.

There are many different ways for providing this photometric data, annex E of BS 5266:2016 gives guidance on calculations and measurements. Another way is to use the lumen method; this is a simplified method to calculate the light level in a room. The method is a series of calculations that uses horizontal illuminance criteria to establish a uniform luminaire layout in a space. In its simplest form, the lumen method is merely the total number of lumens available in a room divided by the area of the room. In order to perform this calculation many factors such as coefficients, lamp lumen data and other quantities must be gathered. The simplest form of photometric data is in the form of spacing tables which provide the information to help you decide whether or not additional luminaires are needed besides those required for the points of emphasis. Most luminaires have been independently tested to prove their photometric performance and the tables generated have been third-party inspected. The manufacturers construct tables for use by designers and installers.

The tables show the distance from the wall or door to the first fitting and then the distance that must not be exceeded for spacing between subsequent luminaires. This is shown for the fittings being mounted either parallel to the route (Axial) or at right angles to the route (Transverse) for different mounting heights.

In addition to values for escape routes, figures are also given for the coverage of open areas by regular arrays of luminaires.

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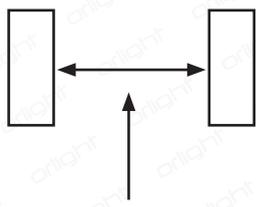
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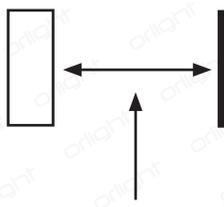
Fig 5 photometric table for an 8 watt non-maintained luminaire

Ceiling mounting height Metres	Escape Routes 1 lux along the centre line				Open areas 0.5 lux minimum in the central core			
	Transverse to wall	Transverse to Transverse	Axial to Axial	Axial to wall	Transverse to wall	Transverse to Transverse	Axial to Axial	Axial to wall
2.5 m	3.9m	11.3m	4.0m	2.0m	4.0m	12.0m	6.0m	1.9m
4 m	2.1m	9.6m	5.6m	1.2m	3.3m	14.8m	7.2m	1.9m
6 m	-	-	-	-	1.6m	12.4m	7.4m	0.8m

Transverse mounting positions

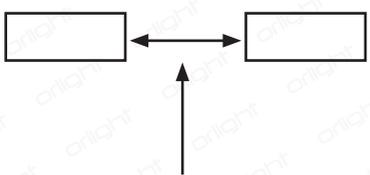


Transverse to Transverse



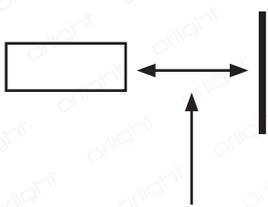
Transverse to Wall

Axial mounting positions



Axial to Axial

Lux levels on an escape route



Axial to Wall

11. ESCAPE ROUTES

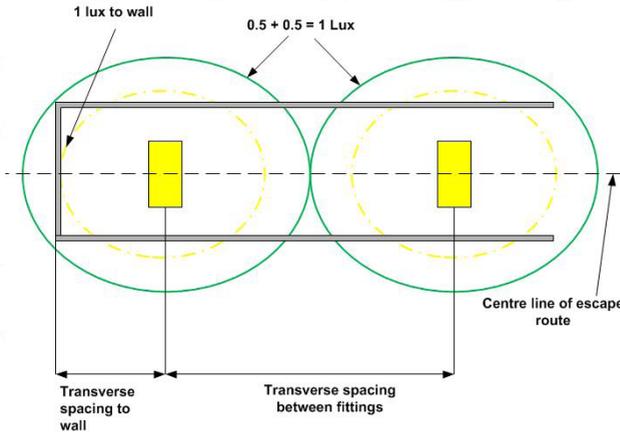


FIG. 6 SPACING OF EMERGENCY LUMINAIRES

When designing the lighting for an emergency escape route, care needs to be taken on the placement of luminaires so that there is an even distribution of illuminance throughout the escape route.

When placing luminaires near stairs or any other change of level, the luminaires must be located so each tread receives direct light.

Generally at least two luminaires will be needed to provide the 1 lux minimum level on the centre of each tread (even designs to the older standard of 0.2 lux needed the higher level on the treads unless contrasting colour stair nosing were fitted). The spacing from luminaire 1 to luminaire 2 shown in fig 6 is reduced as their mounting height is being reduced as the point's illuminated rise up the stairs so the cosine correction factor reduces the light. Although the angle of correction improves in comparison with the floor level as the treads descend, at some point the effect of increased distance from the luminaire will outweigh this.

Other changes of level that can cause tripping hazards in low light levels must also be illuminated.

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Fig 7 Mounting positions on a staircase

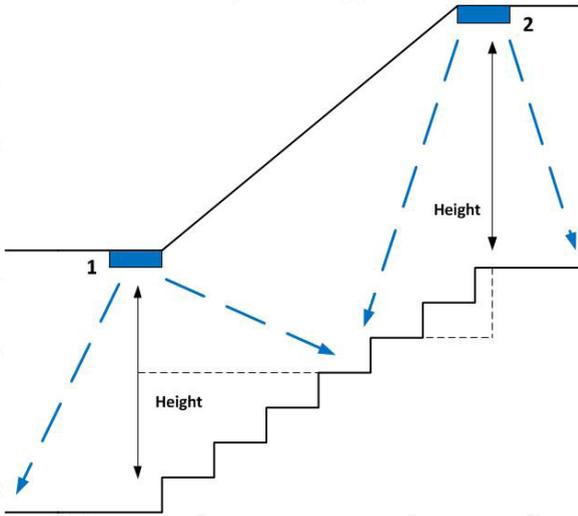
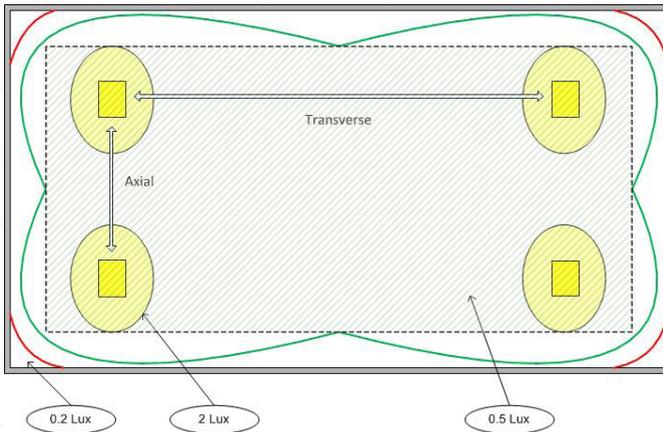


Fig 8 Mounting positions for open area lighting



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Figure 8 shows the area that needs to be covered for open area lighting. As you can see, the centre core is illuminated to a level of 0.5 lux. This excludes the area 0.5m away from the walls indicated by the dotted line.

12 EXIT SIGNS

The format of emergency exit signs has changed over the years.

Below are the four most common signs that you will see in use today. The current one has just a pictogram and arrow and the wording is an optional element. This has replaced the European signs directive format. And this is now an international format. This does mean that some of the older BS 5499:2013 designs are now compliant to BS 5266-1:2016 when they were non-compliant to BS 5266-1:2011, it is not allowed to mix the different designs.

	<p>Old exit sign format to BS 2560 These signs should all have been replaced by the 24th of December 1998, but some are still in existence.</p>
	<p>BS 5499 -1 format has the addition of a running man pictogram and was an interim move towards the full pictogram sign. This is classed as being acceptable on existing buildings provided the meaning is still clear.</p>



Signs Directive Format the European and British legislative requirement with a full pictogram only. This was the UK norm and was widely accepted and used. It is still acceptable to use on existing sites.



BS EN 5266:2016 now refers to BS EN ISO 7010:2012 which has replaced BS 5499-5. This now means that some of the older signs to BS 5499-1 now comply with BS EN 5266-1:2016. The descriptive text is an optional element of the sign and is not all ways required.

13 INSTALLATION

The installation of emergency lighting should only be carried out by persons who are competent in the installation of electrical wiring systems in accordance with BS 7671. Although emergency lighting can be installed after the main electrical work is complete, for example, converting a building's use from domestic premises not needing emergency lighting, to office space that would require emergency lighting, it is normal for the emergency lighting to be installed at the same time as the general electrical services installation.

Methods of cable support and fixings should be non-combustible and such that circuit integrity will not be reduced below that afforded by the cable used, and should be able to withstand a similar temperature, duration and water applications to that of the cable, while maintaining adequate support.

In effect, this recommendation precludes the use of plastic cable clips, cable ties or trunking where these products are the means of cable support, Steel and

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copper are examples of materials that are likely to be suitable.

Fixings and clipping distances should be in accordance with the manufacturer's recommendations.

Where cable management system support is provided by the drop rod size should be calculated in accordance with BS 8519.

Joints and cables for emergency lighting should be made only when circuit rewiring is not practicable. Where joints are unavoidable, they should be located in an area of low fire risk identified in the risk assessment to minimize the probability of early failure in the event of a fire.

14 WIRING SYSTEMS FOR CENTRAL POWER SYSTEMS

The importance and the reliability of a central power emergency lighting system requires a high standard of wiring system.

Cables or cabling systems used for central power emergency lighting installations should adequately resist the effects of fire and mechanical damage. This should be achieved either through the use of cables or cabling systems with an inherently high resistance to the effects of fire (fire rated cable) and mechanical damage.

In BS 5266-1:2016 the requirements for cables has not changed but they have been clarified and the standard now makes reference to "standard PH30 & enhanced PH120" cable types. These terms will be familiar to anyone who has had experience of installing fire detection and alarm systems.

The test to BS EN 50200:2015 Annex E requires heat, mechanical shock and water. Were as Annex D, as detailed in BS 5266-1:2005 was only heat.

The cable used in Fire Detection and Alarm systems to BS 5839-1 :2017. Has always been acceptable to use in central battery systems as it always met the requirements of BS EN 50200:2015. BS 5266-1:2016 now makes reference to the more common test the cable has to undertake.

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BS 5266-1:2016 now recommends enhanced cable for

- a) unsprinklered buildings (or parts of buildings) in which the fire strategy involves evacuation of the occupants in four or more phases;
- b) unsprinklered buildings of greater than 30 m height;
- c) unsprinklered premises and sites in which a fire in one area could affect cables associated with areas remote from the fire, in which it is envisaged that people will remain in occupation during the course of the fire.

In other installations standard cable should be used.

Cables or cable systems should be installed through areas of low fire risk wherever practicable. A minimum survival time of 60 minutes is recommended for cables that supply luminaries from central power supplies. It may be possible to reduce the degree of fire protection of cables or cable systems where they follow routes of very low fire risk and such areas also contain a sprinkler installation. The same fire resistance rating that applies to the cables should also apply to the fixings/support of the cables.

The segregation of cables for central battery systems is required due to the risk of damage to the cables by others working on the electrical system. The new requirement within BS EN 5266-1:2016 requires central battery system wiring to be segregated, is due to the risk of mechanical damage (cable burn) when others are working on the general electrical system.

In BS 5266-1:2005 it was allowed to run cables that had a duration of survival of 60 min when tested in accordance with BS EN 50200:2000 (which corresponds to a classification of PH 60 as detailed in BS EN 50200:2000, Annex D) in the same compartment as the normal electrical system..

These cables commonly called soft skin cables (e.g. FP200 gold) are vulnerable to damage caused by other cables being installed after or at the same time as them.

Segregation of these cables has been common practice in the Fire Detection &

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Alarm industry from 2002. And BS EN 5266-1:2016 now references the Standard and Enhanced cable types used in the Fire Detection & Alarm industry. The segregation requirement now follows the requirement within BS 5839-1:2017.

The question of the need to segregate MICC cables has not been clearly defined in BS EN 5266-1:2016.

Clause 8.2.1 of BS 5266 Quality of installation states cables or cable systems used for the connection of the emergency lighting luminaire to the central power supply should adequately resist the effects of fire and mechanical damage and retain circuit integrity. This should be achieved through the use of cables systems with an inherently high resistance to the effects of fire, and either with inherently high resistance to mechanical damage, or with additional mechanical protection in any areas in which physical damage or rodent attack is likely.

Cables or cable systems should be routed through areas of low fire risk wherever practicable.

If the emergency supply cable is looped in and out of a luminaire, the integrity of supply to other luminaires should be protected. Porcelain terminal blocks should be used for the emergency cable, and a circuit protective device should be installed in the supply to each luminaire to safeguard the emergency supply.

The importance of reliability of an emergency lighting system makes high standard of wiring essential and limits the permissible systems.

Wiring from a fused spur to a simple luminaire, and internal wiring within a luminaire, are excluded from this guide and are covered separately in the appropriate luminaire standard.

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15 EMERGENCY LIGHTING TEST SWITCHES

Every emergency lighting system will need to have a suitable means for simulating failure of the normal supply for testing and maintenance purposes. This is normally achieved by the use of key switches. These should be able to be operated by the user/owner of the system so that they can carry out weekly tests of the system. The use of a miniature circuit breaker (MCB)* or fuse which isolates the whole lighting circuit is not acceptable as this could introduce a risk of injury when the emergency lights are being tested.

BS 7671:2018 refers to these devices as circuit breakers although this is correct, but it is common practice to still refer to them as miniature circuit breakers

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 large sections of electrical power in the premises, E>G> when unoccupied or for economy in the use of electricity, the electrical design should be such as to ensure that such switching off does not interrupt the normal supply to the emergency lighting.

Circuits incorporating rest mode and/or inhibiting mode facilities should conform to BS EN 60598-2-22:2014 + A1:2020 and BS EN 50171:2001

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 needs to be kept to minimum.

Each Isolator, switch and protective device associated with the normal supply to an emergency lighting system should be isolated in a position inaccessible to unauthorized persons or to protected against unauthorized operation.

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

If an emergency lighting system is supplied from a standby source, other than a

safety source installed in accordance with the supplies for safety sources detailed in BS 7671, additional earth leakage and protective measures might be required.

16 COMMISSIONING & HANDOVER

When commissioning and handing over an emergency lighting system there are a number of certificates that need to be produced. These are:

- Emergency lighting completion certificate
- Design declaration of conformity
- Installation declaration of conformity
- Verification declaration of conformity
- BS 7671 Electrical installation certificate

When testing and inspecting existing emergency lighting installations, the following certificates need to be completed and given to the client:

- Certificate for verification of existing installation
- Periodic inspection and test certificate

The design and installation certificates may be produced and signed by different people as the design might be done by one company and the installation by another.

The person responsible for commissioning the system will need to have copies of both the design and installation to enable them to verify that the design and installation is compliant with the standard. In addition to the emergency lighting certificates, a BS 7671 installation certificate is required to confirm that the wiring meets the requirements of BS 7671.

It is important that during the handover of the emergency lighting system the end user is informed of the correct method of carrying out short duration tests and is made aware of their responsibilities.

The competent person handing over the system to the responsible persons(s)

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should train that person or persons on the regular monthly tests and inspections and how to use the tests facilities, or to check the automatic test facilities.

The system documentation (including design, installation and verification declarations), certification, log book and any other relevant information should be handed over. In particular, the importance of keeping the documents up to date by completing the log book regularly and be explained.

The contact details of the competent person or organization should be given to the responsible person and entered prominently, for example on the log book.

On completion of the work of installing an emergency lighting system, or part thereof, or of a major alteration to an existing installation, a commissioning test should be performed to check that the system meets the design requirements, and a completion certificate and log book should be supplied to the occupier/owner of the premises.

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17 MAINTENANCE

It is essential that servicing and maintenance of emergency lighting systems is carried out at regular intervals to ensure that the system remains in a fully operational condition.

This would normally be performed as part of the periodic testing routine, but for consumable items, such as replacement lamps, spares should be provided for immediate use.

It is advisable to have in place a service and maintenance contract with a competent person or company, not only for routine inspection, but also for emergency repairs and alterations.

The discoloration of the diffuser can greatly reduce the illuminance of an emergency light and this should be taken into account when carrying out a maintenance visit.

17.1 Checklist for assessing an existing installation

Records

- Is there a log book?
- Are the entries made in the log book correct?
- Are up-to-date drawings available and correct?
- Are routine tests completed according to the requirements in BS 5266?

Emergency luminaires and escape route signs

- Are the fittings supplied with the correct operating voltage?
- Are the fittings cleaned and sited in their correct operating environment, i.e. for temperature and IP rating?
- Do the luminaires operate in the correct mode, i.e. maintained for sleeping accommodation?

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- Do the luminaires operate for the required emergency duration 1 or 3 hour?
- Are there signs that clearly show the emergency escape route from any position within the premises?
- Are all exits marked and directions of travel indicated?
- Are the signs illuminated internally or from an external source when the normal lighting supply fails?
- Is the size of each sign correct for the viewing distances?
- Do the sign legends comply with the current international standard format (i.e. running man style)?
- Are the luminaires positioned at all points of emphasis?
- Are the luminaires positioned along the escape routes at the correct spacing to ensure that the required illuminance levels are achieved?
- Are the luminaires positioned in open areas (anti-panic areas) at the correct spacing to ensure that the minimum illuminance level is achieved?
- Are the non-maintained luminaires fed from the same final circuits as the local lighting?
- Are there at least two luminaires in each "lighting compartment" to ensure that the area is not plunged into darkness if a luminaire fails?
- Are additional luminaires provided in lift cars, escalators, toilets, etc?
- Are hazardous areas illuminated at 10% of normal illuminance?

Central battery systems

- Does the central battery system comply with EN 50171 and BS 7671?
- Is the battery charger functioning?
- Where applicable, are the battery electrolyte levels and specific gravities satisfactory?

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Self-contained emergency luminaires and signs

- Are the batteries being charged (LED – on)?
- Are the luminaires marked with a BS mark to show compliance with all relevant product standards for escape routes?

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 full duration tests shall, wherever possible, be undertaken preceding time of low risk to allow for battery recharge. For example, during the day or out of normal working hours. Alternatively, suitable temporary arrangements shall be made until the batteries have been recharged.

17.2 Daily

Indicators of central power supply shall be visually inspected for correct operation. Also combined fittings should be checked for the charge light.

This is a visual inspection of indicators to identify that the system is in a ready condition and does not require a test of operation.

17.3 Monthly

If automatic testing devices are used, the results of the short duration tests still need to be recorded.

A typical test schedule is as follows:

- Switch on the emergency mode of each luminaire and each internally illuminated exit sign from its battery by simulation of a failure of the supply to the normal lighting for a period sufficient to ensure that each lamp is illuminated.
- During this period, all luminaires and signs shall be checked to ensure that they are present, clean and functioning correctly.
- At the end of this test period, the supply to the normal lighting should

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be restored and any indicator lamp or device checked to ensure that it is showing that the normal supply has been restored.

In addition to the above, for central battery systems, the correct operation of system monitors shall need to be checked.

17.4 Annually

If automatic testing devices are used, the results of the full rated duration test still need to be recorded.

As well as the test carried out during a monthly test, the following additional tests need to be done:

- Each luminaire and internally illuminated sign shall be tested for its full rated duration in accordance with the manufacturer's information
- The supply of the normal lighting shall 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
- The date of the test and its results shall be recorded in the system logbook.

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18 FREQUENTLY ASKED QUESTIONS

Q. Do I have to install emergency lights in toilets?

A. Yes, all toilets without any natural light and greater than 8m² need emergency lighting.

Q. Do emergency lights need a test key? Or can I just use the MCB or fuse?

A. A test switch is required; either a secret key type or a dedicated switch which will isolate the supply to the emergency lights, but not the normal lighting as this might introduce a risk when carrying out periodic inspections.

Q. Would any emergency lighting modifications to any existing emergency lighting circuits within an existing building, installed to an earlier standard, result in the whole building having to be brought up to the new standard? Or would it just be individual circuits and associated equipment that need to be brought up to the latest standard?

A. The whole building has to be brought up to the new safety standard, so taking action in one area is not enough.

Q. Is there a recommendation in BS 5266-1 on how often the batteries in emergency luminaires need changing?

A. There is no hard and fast recommendation. BS EN 5266-1:2016, **7.2.1**, defines that the required minimum illuminance should be provided during the rated duration. If this is not achieved, the batteries should be changed so that the system can provide the original required duration. For self-contained luminaires, if this failure period is less than 4 years, the luminaire should be investigated to ensure that the battery is being properly charged, and that the luminaire is not sited in a location outside of its temperature limits. Too high an ambient temperature will cause short

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battery life; too low a temperature will reduce the capacity available to meet the discharge period

- Q.** Can emergency lighting luminaries be fed from their own circuit off a distribution board?
- A.** No the emergency lights must be fed from the local lighting circuit
- Q.** Do you need to fit an emergency light outside the final exit door of an escape route?
- A.** Yes if there is not enough natural illuminance for people to safely exit away from the building.
- Q** Can I use a non maintained exit sign in a cinema or theatre?
- A.** No all exits signs need to be of the maintained type to ensure people are not confused in the case of the normal lighting failing.

However, it is not necessary for the full emergency lighting level to be provided when the normal lighting system is functioning. In other premises used for recreation, where there is no dimming, it is necessary only for exit signs to be maintained or combined and internally illuminated.

For some cinema and theatre auditoria where the recommended maintained illuminance of 1 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 lighting within the auditoria, the Emergency escape lighting illuminance is automatically restored to a minimum of 1 lx within 5 s.

- Q.** What size of battery do I need?
- A.** The sizing of the batteries needs to take into account the battery duration

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of the system. Not all systems require a 3 hour battery duration some buildings will only need a 1 hour battery duration. So the batteries may be smaller

- Q.** What are the emergency lighting requirements in a normal open plan office?
- A.** the requirement for emergency lights would be part of the fire risk assessment. But an illuminance level of 0.5 Lux is deemed acceptable for open plan offices
- Q.** Can use normal luminaires as emergency luminaires?
- A.** It is possible to fit battery packs to normal luminaries and in effect make them emergency luminaires. Care should be taken to ensure that the fitting meets the relevant product standards
- Q.** Is BS 5266-1:2016 retrospective?
- A.** As the standard always gets reviewed over time. The problem is whether it should be applied retrospectively. Briefings from government and understanding from the guides is that the latest version of the standard should be used to compensate for the risks identified by the any risk assessments that are required to carry out.

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