

White Paper

Part 2/4

Emergency Lighting Considerations



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Executive Summary

Emergency lighting is lighting for an emergency situation when the main power supply is cut and any normal illumination fails. The loss of mains electricity could be the result of a fire or a power cut and the normal lighting supplies fail. This may lead to sudden darkness and a possible danger to the occupants, either through physical danger or panic.

Emergency lighting is normally required to operate fully automatically and give illumination of a sufficiently high level to enable all occupants to evacuate the premises safely. Most new buildings now have emergency lighting installed during construction; the design and type of equipment being specified by the architect in accordance with current Building Regulations and any local authority requirements.

The British Standard provides the emergency lighting designer with clear guidelines to work to. BS 5266-1: 2011 embraces residential hotels, clubs, hospitals, nursing homes, schools and colleges, licensed premises, offices, museums, shops, multi-storey dwellings, etc. Although this standard recommends the types and durations of emergency lighting systems relating to each category of premises, it should be remembered that the standards are the minimum safe standards for these types of building and that a higher standard may be required for a particular installation.

What is emergency lighting?

Lighting that automatically comes on when the power supply to the normal lighting provision fails. Emergency lighting is a general term and is sub-divided into emergency escape lighting and standby lighting.

Emergency escape lighting

That part of an emergency lighting system that provides illumination for the safety of people leaving a location or attempting to terminate a potentially dangerous process beforehand. It is part of the fire safety provision of a building and a requirement of The Regulatory Reform (Fire Safety) Order 2005.

Standby lighting

That part of an emergency lighting system provided to enable normal activities to continue substantially unchanged. This guide does not include standby lighting as it is not a legal requirement and is a facility that may or may not be needed, depending on the use and occupancy of the premises, etc.

Emergency escape lighting is itself sub-divided into escape route lighting, open area lighting and high risk task area lighting.

Escape route lighting

That part of an emergency escape lighting system provided to ensure that the means of escape can be effectively identified and safely used by occupants of the building.

Open area lighting (in some countries known as anti-panic lighting) – that part of an emergency escape lighting system provided to minimise panic and ensure there is sufficient illumination to allow the occupants of a building to reach a place where an escape route can be identified.

High risk task lighting

The part of an emergency escape lighting system that provides illumination for the safety of 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.

Consultation & Design

The first stage of installing emergency escape lighting is consultation and design. The designer, responsible person and fire risk assessor should meet and decide where the escape lighting is required and mark up a plan showing the areas to be covered, the type (power supply), mode of operation, facilities and duration.

Type (Power Supply)

Self-contained - single point

Advantages

- The installation is faster and cheaper
- Standard wiring material may be used. Failure of mains supply due to cable burn-through will automatically satisfy the requirement for a luminaire to be lit
- Low maintenance costs – periodic test and general cleaning only required
- Low hardware equipment costs – no requirement for extended wiring, special ventilation etc.
- The integrity of the system is greater because each luminaire is independent of the others
- System can easily be extended with additional luminaires
- No special sub-circuit monitoring requirements

Disadvantages

- The environmental conditions will vary throughout the system and batteries may be adversely affected by a relatively high or low ambient temperature
- Battery life is limited to between 2 and 4 years, dependent upon the application
- Testing requires isolation and observation of luminaires on an individual basis

In general, the decision to use either a central battery or a self-contained system is likely to be cost determined. If an installation has longevity and low maintenance as priorities, then the higher cost of a central battery may be acceptable on a very large project. Typically, luminaire and installation costs are a major consideration, particularly on smaller jobs, and it is this criterion which makes the self-contained luminaire the most popular choice.

Central Battery Source

Advantages

- Maintenance and routine testing is easier, with only one location to consider
- The life of a battery is between 5 and 25 years, dependent upon type
- Environmentally stable in a protected environment; the luminaire can operate at relatively high or low ambient temperatures
- Large batteries are cheaper per unit of power and luminaires are usually less expensive

Disadvantages

- High capital equipment costs
- The cost of the installation and system wiring is high because fire resisting cable like MICC or Pirelli FP200 type is required to each satellite luminaire
- Poor system integrity – failure of battery or wiring circuit can disable a large part of the system
- A requirement for 'battery room' to house cells and charger circuits, etc; ventilation of acid gases may also be needed
- Localised mains failure may not trigger operation of emergency lighting in that area
- Voltage drop on the luminaire wired furthest from the central battery could become a problem

Mode of operation

Maintained or non-maintained is the principal consideration, which is decided by the use of the premises.

Maintained Emergency Luminaire

A luminaire in which the emergency lighting lamps are on at all times.

Maintained mode is generally used in places of assembly such as theatres, cinemas, clubs and halls; the full list is contained in BS 5266. The lights are typically dimmed when these premises are occupied and the emergency escape lighting prevents total darkness.

Non-maintained Emergency Luminaire

A luminaire whose emergency lamps only come on when the power supply to the normal lighting fails. Non-maintained is the typical mode in a workplace or similar environment in which artificial lighting is normally deployed while the premises are occupied.

Combined Emergency Luminaire

A luminaire containing two or more lamps, at least one of which is energised from the emergency lighting supply and the other(s) from the normal lighting supply. A combined emergency luminaire can be either maintained or non-maintained.

Compound Self-Contained Emergency Lighting

A luminaire providing maintained or non-maintained emergency lighting and also the emergency power supply to a satellite luminaire.

Satellite Emergency Luminaire

A luminaire for maintained or non-maintained operation and which derives its emergency operation supply from an associated compound self-contained emergency luminaire.

Facilities

Luminaire including test device

The luminaire contains a self-test module for testing purposes.

Luminaire including remote test device

The system is tested remotely by a centralised panel.

Luminaire with inhibiting mode

A control mode used to inhibit the emergency lighting luminaire from operating, thus preventing the discharge of the emergency lighting batteries at times when the building is unoccupied. If a mains failure occurs at such a time, the batteries will remain fully charged so that the building can be occupied when required. It is performed by an inhibitor switch that must be interfaced with other building services so that the premises cannot be inadvertently occupied without the emergency lighting being re-commissioned.

High risk task luminaire

High risk task luminaire: for risk task area lighting in areas of high risk, the maintained luminance shall not be less than 10% of the required maintained luminance for the task under normal lighting conditions. This will be subject to a minimum luminance of 15 lux. The uniformity ratio for task area lighting should be a minimum of 10:1 (0.1). The minimum duration shall be the period for which the risk presents to occupants.

Duration in minutes

The time required to evacuate the premises depends on their size and complexity. The duration itself is dependent not only on evacuation time but also on whether the premises are evacuated immediately the power and normal lighting fails and / or are reoccupied immediately the supply is restored. The minimum duration of an emergency escape lighting system is 1 hour.

A minimum duration of 3 hours should be used for emergency escape lighting if the premises are not evacuated immediately, as in the case of sleeping accommodation, for example, or if the premises will be reoccupied immediately the supply is restored without waiting for the batteries to be recharged.

One hour's duration should only be used if the premises are evacuated immediately on supply failure and not reoccupied until full capacity has been restored to the batteries. BS 5266 contains detailed information on the recommended duration of systems in various premises.

Emergency Lighting classifications

The old NM or M classification with duration in hours has been replaced with a code consisting of letter/number/letter/number, as follows:

Type	X - Self contained Y - Central battery
Mode of operation	0 non-maintained 1 maintained 2 combined non-maintained 3 combined maintained 4 compound non-maintained 5 compound maintained 6 satellite
Facilities	A including test device B including remote test device C including inhibiting mode D high risk task luminaire
Duration in minutes	10, 60,120 or 180

The classification is expressed as per the following example:

[X][0][***][180] – Self-contained, Non-maintained, ***, 3 hours duration.

*** This is added as applicable at the time of installation.

Emergency Luminaires

Self-contained emergency luminaire: a luminaire providing maintained or non-maintained emergency lighting in which all the components, such as the battery, charging circuit, mains ballast, lamp, control unit, test and monitoring facilities (where provided) are contained within the luminaire or adjacent to it, i.e. within 1m cable length.

Duration in minutes

A luminaire for maintained or non-maintained operation, which is energised from a central emergency power system that is not contained within the luminaire. Only the lamp (and an inverter if fluorescent) is located within the luminaire body, with the supply on power failure being fed from a centralised point.

The majority of systems installed in the United Kingdom are of the self-contained type, but both options have their own advantages and disadvantages.

Placing of luminaries and emergency signs

Having decided on your basic system, consideration should now be given to the siting of the lighting units and signs within the particular premises involved. This will then form the basis on which your selection of equipment can be made. Lighting units and signs should be sited so as to clearly show the exit routes leading to the final exits from the premises. Where the exit route or final exit is not readily identifiable, a sign should be utilised rather than a lighting unit. Particular attention should be paid to individual stairways, changes in floor level, corridor intersections, changes in direction, the outside of each final exit, control / plant rooms, lifts, toilet areas over 8m² (although there is an argument for providing all toilets with public access, and especially those for the disabled, with emergency lighting). Access to fire alarm call points and fire fighting equipment should be clearly illuminated.

In general, if careful consideration is given to siting the luminaries and signs to cover these areas, the completed scheme will meet most requirements. It is not necessary to provide individual lights (luminaries) for each item above, but there should be a sufficient overall level of light to allow them to be visible and usable. N.B: detailed computer point calculations or luminaire manufacturer's spacing tables should be used. The above is a brief summary and we recommend that the appropriate standard is studied to gain a full understanding of what is involved.

How much light?

BS 5266 recommends the provision of horizontal illumination at floor level along the centre line of a defined escape route (permanently unobstructed) not less than 1 lux, and 0.5 lux for anti-panic areas, to exclude a 0.5m border around the route. In addition, for escape routes of up to 2m wide, 50% of the route width should be lit to a minimum of 1 lux. Wider escape routes can be treated as a number of 2m wide bands. The actual degree of illumination should be closely related to the nature of both the premises and its occupants, with special consideration being given to care homes for the elderly, hospitals, crowded venues such as pubs, nightclubs and supermarkets, and to whether or not the premises have overnight accommodation, e.g. hotels.

The level of illumination in certain rooms and areas within a building will vary depending on their use; all this information is contained in the appendices to BS 5266-1: 2011.

N.B: The above is a brief summary and we recommend that the appropriate standard is studied to gain a full understanding of what is involved.

Commissioning Certificate & logbook

BS 5266 and the European Standard both require written declarations of compliance to be available on site for inspection. These should detail the quality of the installation and its conformance to IEE regulations, including the main circuit of the normal lighting system feeding non-maintained fittings.

Photometric performance is required and evidence of compliance with light levels has to be supplied by the system designer.

On completion of the installation of the emergency lighting system, or part thereof, a completion certificate should be supplied by the installer to the occupier / owner of the premises.

A declaration of satisfactory test of operation is necessary and a log of all system tests and results must be maintained. System logbooks, with commissioning forms, testing forms and instructions, should be provided by the installer.

Servicing & Testing

Finally, to ensure that the system remains at full operational status, essential servicing should be specified. This would usually be performed as part of the testing routine, but in the case of consumable items such as replacement lamps, spares should be provided for immediate use. To test an emergency lighting system, a mains power failure on the normal lighting circuit / circuits or individual luminaries must be simulated. This will force the emergency lighting system to operate via the battery supply. This test can be carried out manually or automatically.

Manual Testing

A simulated mains failure can be achieved by providing a switch to isolate all lighting circuits / individual circuits / individual luminaries. If manual testing is utilised, the following points should be considered:

- In a system with a single switch for the whole building or a large circuit, after simulating the mains failure it is necessary for the tester to walk the whole building or circuit, to check all emergency luminaire are operating correctly. After restoring the mains supply, the whole building or circuit must be walked again, to check that the emergency lights are recharging.
- If the emergency luminaries are individually switched, only a single walk around the building will be needed. However, the test switches could spoil the decor of the building and they must be of a type that is tamper proof. After the tests, it is recommended that the performance of the system is logged in the fire safety logbook.

Automatic Testing

If the costs of an engineer's time and the disruption caused by manual testing are excessive, self-testing emergency lighting should be considered. Different formats are available to match particular site requirements. However, the results of the monthly and annual tests must still be recorded.

General information about emergency lighting testing

BS EN 50172:2004 / BS 5266-8:2004 (Emergency escape lighting systems) specifies the minimum provision and testing of emergency lighting for different premises. Additional information on servicing can be found in BS 5266-1: 2011 (Code of practice for the emergency lighting of premises).

The system should include adequate facilities for testing the system condition. These need to be appropriate for the specific site and should be considered as part of the system design. Discussions with the user or system designer should identify the calibre and reliability of staff available to do the testing and the level of difficulty in performing the test. Discharge tests need to be undertaken outside normal working hours. In buildings that are permanently occupied, the test should be phased so only alternate luminaries are tested. When automatic testing devices (self-testing emergency lights) are used, the information shall be recorded monthly and annually. For all other systems, the tests shall be carried out as described below and the results recorded.

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

Routine Inspections & Tests

Where national regulations do not apply, the following shall be met:

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 just before a time of low risk to allow for battery recharge. Alternatively, suitable temporary arrangements shall be made until the batteries have been recharged.

The following minimum inspections and tests shall be carried out at the intervals recommended below. The regulating authority may require specific tests.

Daily emergency lighting inspection (Only for central back-up systems)

This check only applies to emergency lighting systems with one central back-up battery system. In this case, there is a daily visual inspection of indicators on the central power supply to identify that the system is operational. No test of operation is required. This test does not apply to emergency lighting with self-contained back-up batteries in each unit (standard emergency lighting).

Monthly emergency lighting test

All emergency lighting systems must be tested monthly. The test is a short functional test in accordance with BS EN 50172:2004 / BS 5266-8:2004.

The period of simulated failure should be sufficient for the purpose of this test while minimising damage to the system components, e.g. lamps. During this period, all luminaries and signs shall be checked to ensure that they are present, clean and functioning correctly.

Annually

A test for the full rated duration of the emergency lights (e.g. 3 hours) must be carried out. The emergency lights must still be working at the end of this test. The result must be recorded and, if failures are detected, these must be remedied as soon as possible.

Benefits

We take for granted that lighting will be available at 'flick of a switch', so it is essential to have a suitable 'back-up' plan if your normal lighting fails. The loss of lighting can be for a number of reasons;

- a power cut due to the national grid
- A local loss of power due to supply damage

The main advantage of installing emergency lighting is to maintain lit areas when a building is occupied. Emergency lighting can reduce the disruption caused by loss of supply, enabling some work to be carried out and allow people to safely leave a building.



If an incident occurs, it is important to make it easy for the occupants to make their way out quickly and safely through the designated escape routes. Emergency lighting lights are incorporated in some standard luminaires, stand alone emergency light units and exit signs.

British & European Standards

Emergency lighting is now covered by a series of interdependent standards that can be seen as forming a hierarchy as shown below.

Base guidance document

BS 5266-1: 2011

Code of practice for emergency lighting of premises. Gives general rules and guidance on the provision and operation of emergency lighting in most premises other than dwelling houses.

System standards

BS EN 1838:1999 / BS 5266-7:1999

Lighting applications – emergency lighting.

Specifies the illumination to be provided by emergency lighting (including luminance, duration and colour).

BS EN 50172:2004 / BS 5266-8:2004

Emergency escape lighting systems.

Specifies the minimum provision and testing of emergency lighting for different premises.

Product standards

BS EN 60598-1: 2008

Luminaires. General requirements and tests.

See the 60598 series for particular requirements.

BS EN 62034:2006

Automatic test systems for battery powered emergency escape lighting. Specifies a test system for battery powered emergency lighting

BS EN 50171:2001

Central power supply systems.

Specifies central power supply systems for emergency lighting luminaires.

References

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