A Guide to Emergency Lighting
A Guide to Emergency Lighting

Second Edition

Chris Watts
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He would also like to record his thanks to Cooper Lighting and Security Limited who have provided information on their product ranges and the performance data used in the production of this book.
1 Introduction

Emergency lighting has been developed over many years to provide illumination to allow occupants to use escape routes in the event of a failure of the normal lighting supply. It has traditionally been associated with fire protection systems and it has become an essential element to enable persons to escape from fires. But it also has an important function in the event of total or local supply failures, protecting users and giving them confidence to escape safely.

Because our task is only to assist people to evacuate buildings we are able to use much lower light levels than are used for normal lighting, however, this makes it essential to design the system correctly to make effective use of the system.

Many standards have been produced to endorse established good engineering practice in this important area of life safety. With the changes in requirements and responsibilities defined in current legislation this book is intended to reveal the intention behind the requirements, to enable them to be interpreted better for specific applications.

Emergency lighting terminology

For the purposes of the British and European standard BS EN 1838, ‘emergency lighting’ is the generic term for equipment that provides illumination in the event of failure of supply to normal lighting. There are a number of specific forms, as shown in Figure 1.

![Figure 1 – Specific forms of emergency lighting](image)

BS EN 1838:1999

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1 Introduction

emergency escape lighting
This is defined as that part of emergency lighting that is provided to enable safe exit in the event of failure of the normal supply. (This type of emergency lighting forms part of the fire protection of a building.)

standby lighting
This is that part of the emergency lighting provided to enable normal activities to continue in the event of failure of the normal mains supply. (This lighting does not provide fire protection unless it meets the same equipment, design and installation requirements as emergency escape lighting systems.)

Escape lighting systems

escape route lighting
This is the part of emergency lighting that is provided to enable safe exit for the building’s occupants, by providing appropriate visual conditions and direction finding on escape routes and in special areas/locations (e.g. corridors and stairs). It also ensures that fire fighting and safety equipment can be readily located and used.

open area (or anti-panic area) lighting
This is the part of emergency escape lighting that is provided to reduce the likelihood of panic and to enable the safe movement of the occupants towards escape routes by providing appropriate visual conditions and direction finding (e.g. in large rooms).

high risk task area lighting
This is the part of emergency lighting that is provided to ensure 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 premises (e.g. to protect persons from dangerous machinery).

Development of legislation

Emergency lighting is demanded mainly because of legislation. This legislation itself is a direct result of public and political pressure to safeguard life and to ensure uniform standards in places where the public gather.

In addition, local legislation is drawn up to meet specific and often local risks where these are not adequately covered nationally. The relevant fire
authority, jointly with the local authority building inspectors, enforces legislation and provides a local control.

Legislation is not the only factor in the decision to install emergency lighting. It may also be required to meet demands for safety, security, financial protection, or to maintain operation of a site.

History of the legislative process

At one time, the only places that were required by law to install emergency lighting were cinemas, theatres and passenger ships, although emergency lighting was also common in hospital operating theatres. It was also used in some department stores and in premises licensed by the Magistrates' Courts.

However, social conscience was triggered by a few tragic incidents in places of public entertainment, hotels, old people's homes and licensed clubs. This initiated a multitude of mainly disconnected acts, by-laws, regulations and standards. All imply or demand adequate lighting at all material times to provide means of escape for the public and employees.

The GLC (Greater London Council) and other local authorities when faced with large and concentrated risks, and in the absence of adequate national standards and legislation, pushed ahead with their own legislation, regulations and standards. Unfortunately, they did not agree on the requirements that should be met. This made product and application standardization difficult, and resulted in confusion as to which products were acceptable.

The Factories Act 1961 and the Offices, Shops and Railway Premises Act 1963 were introduced, these included measures to enforce public safety including requiring emergency lighting, in places of work.

These two Acts were administered and enforced at local level by inspectors who were independent of the fire brigades and who advised on fire and emergency lighting equipment in places of public entertainment.

The Fire Precautions Act 1971 and the Health and Safety at Work Act 1974, backed by existing legislation for cinemas, were strenuous efforts to bring order and consistency of requirements. They combined the enforcing powers and administration at local level and put them in the hands of the local authority fire service.

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1 Fire authorities are largely, though not completely, county brigades and there are specialist fire authorities for military and state properties.

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1 Introduction

The local authority reorganization of 1975, which created larger fire authority areas and a more uniform structure, improved the effectiveness of the fire authorities as an enforcing power.

The introduction of the British Standards Code of practice BS 5266-1 in July 1975 further improved the standard and uniformity of emergency lighting installations by defining the illumination needed, and the introduction of the British Standard for Emergency Lighting Luminaires (now developed and numbered as BS EN 60598-2-22) helped to ensure an improved standard of performance and reliability.

New legislation promotes risk assessment techniques to demonstrate safety of a premises so current standards provide information and guidance to assist engineers and users to compensate for potential hazards in a premises.

National legislation and standards

Legislation is produced when the government responds to the concerns, expressed by public or private bodies, for the need to introduce specific legal controls for the safety of the citizens. The government approaches standards institutes, manufacturers’ associations, professional bodies, trade associations, research stations and representatives of those who will be affected to actively help in the drafting of the proposals.

Similarly, when the British Standards Institution (BSI) or any similar organization is producing a code of practice or equipment standard, the same bodies are involved and contribute to and influence the final form of the standard.

All legislation, standards and other documents that are cited have been listed in a Bibliography at the back of this book. The latest, up-to-date editions at the time of publication of this book are listed.

European Directives and UK legislation – major items

There is a considerable amount of British and European legislation affecting emergency lighting. The major items are given below.

The Construction Products Regulation (305/2011/EU – CPR)

This regulation has been adopted by the European Commission and the UK Government, it replaces the Construction Products Directive (CPD). As a result of the change, CE marking will soon become mandatory in the
UK. Manufacturers and importers have until 2013 to ensure that their construction products meet the CE requirements of the new regulation.

The Europa website gives the following explanation (at the time of publication of this book).

The CPR has already entered into force. However, the main parts of its substantial Articles shall apply first from 1 July 2013. Until then, the CPD therefore remains in application. The already applicable parts of the CPR focus on the notification and designation processes of the Notified Bodies (NB) and the Technical Assessment Bodies (TAB).

The Construction Products Directive (89/106)

The Construction Products Directive is implemented in the UK by the Building Regulations. It is implemented by the building control officers and applies to most new and refurbished buildings except for private dwellings.

Details of the requirements are given in Approved Document B, Volume 2, section B1, 5.36 of the Building Regulations, which specifies that all escape routes and areas listed in Table 9 of that section should have emergency lighting conforming to BS 5266-1.

The 2000 edition of the Building Regulations has been upgraded to require any open areas larger than 60 m² in shop, commercial, industrial, storage and other non-residential premises to have emergency lighting (previously this requirement just applied to offices). School buildings without natural light or used outside normal hours must now have emergency lighting.

The Workplace Directive (89/654): Regulatory Reform (Fire Safety) Order

This directive protects the occupants of premises and has two clauses that specifically relate to emergency lighting.

4.5. Specific emergency routes and exits must be indicated by signs in accordance with the national regulations.

4.7. Emergency routes and exits requiring illumination must be provided with emergency lighting of adequate intensity in case the lighting fails.
1 Introduction

In the UK this is implemented by the new guidance document issued by the Office of the Deputy Prime Minister (ODPM) which clarifies that this is done by the user performing a risk assessment for all premises in which people are employed. The fire and rescue authorities are responsible for auditing compliance.

If more than five people are employed there must be a written record of the assessment’s findings and the action taken.

If a fire certificate has been issued recently a risk assessment is still required but it is likely that few if any additional fire precautions will be needed. If the fire certificate was given according to an out-of-date standard this must be addressed in the risk assessment.

In England and Wales the workplace directive is implemented by the Regulatory Reform (Fire Safety) Order (Scotland and Northern Ireland have equivalent legislation). This amends or replaces 118 pieces of legislation, the most significant being the repeal of the Fire Precautions Act 1971 and the revocation of the Fire Precautions (Workplace) Regulation 1997. Anyone familiar with the 1997 Regulations will recognize much that is in the Order; it develops and extends many of their concepts.

The Order applies to the majority of premises and workplaces in the UK. But it excludes: dwellings, the underground parts of mines, anything that floats, flies or runs on wheels, offshore installations, building sites and military establishments.

The Order firmly places responsibility on the employer or operator (who may delegate responsibility to a ‘responsible person’) of the building and outlines the measures that must be taken to ensure the safety of all the people that he or she is directly or indirectly responsible for. At the same time it allows the enforcing authority to make sure that it is enacted (by force if necessary) and defines the penalties the courts can impose in the event of noncompliance.

It requires the responsible person to carry out a fire risk assessment, produce a policy, develop procedures (particularly with regard to evacuation), provide staff training and carry out fire drills. The responsible person must also provide and maintain: clear means of escape, emergency lighting, signs, fire detection, alarms and extinguishers.

2 The term ‘UK Fire Safety Legislation’ is used to refer to the Regulatory Reform (Fire Safety) Order and the Scottish and N.I. equivalent legislation.

The Safety Signs Directive is applicable to fire exit and first aid signs. It defines the format of the signs and specifies that they must be visible at all times that the building is occupied. It has the following clauses that relate to the provision of emergency lighting to enable the signs to be seen in the event of a supply failure.

6. Depending on requirements, signs and signalling devices must be regularly cleaned, maintained, checked, repaired, and replaced.

8. Signs requiring some form of power must be provided with a guaranteed supply.

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In the UK the Health and Safety Executive have passed responsibility for ensuring compliance for fire safety signs to the fire authority. They have produced a combined guidance document covering the use of safety signs.

Other UK legislation

Some workplaces require a licence from the local authority. The fire authority may require higher levels of fire precautions for specific premises. These include those that provide:

- the sale of alcohol;
- music and dancing;
- theatres and cinemas;
- gambling;
- sports stadia;
- public entertainment.

Some premises must be registered with the local authority and need to be accepted by the fire authority. These include:

- nursing homes;
- children’s homes;
- residential care homes;
- independent schools.
Other European Directives and Recommendations

The following directives have been adopted into UK legislation and are the subject of guidance documents produced by the relevant ministries.

- Workplace Directive (89/654 EEC)
- Construction Products Directive (89/106 EEC)
- Safety Signs Directive (92/58 EEC)
- Fire Safety in Hotels Recommendation: Requirements for Europe (86/666 EEC)

The Workplace Directive (89/654 EEC)

This is partially implemented in the UK by The Workplace (Health, Safety and Welfare) Regulations 1992. It includes within its scope of premises most buildings where people are employed. The major UK legislation implementing it is now the Regulatory Reform (Fire Safety) Order 2005.

The Regulatory Reform (Fire Safety) Order (2005)

This Order applies to every workplace with certain exceptions such as: ships, construction sites, mines, temporary workplaces, fields, woods or other agricultural or forestry land, aircraft, locomotive or rolling stock, trailers and some vehicles. The Regulations require a risk assessment and an emergency plan to be prepared. The supporting guidance stresses the need for cost–benefit analysis and minimizing burdens commensurate with saving lives and the safe evacuation of premises.

The Workplace Directive is retrospective, i.e. it requires that, over time, all places of work (with the above exemptions) are brought up to standard.

In June 2005 the Fire Precautions Act, together with a number of other smaller fire safety laws, was superseded and replaced in England and Wales by the Regulatory Reform (Fire Safety) Order that enforces the responsible operators of buildings to perform risk assessments and limit the risks to tolerable levels. Scotland introduced the Fire (Scotland) Act 2005 and Northern Ireland passed The Fire and Rescue (NI) Order 2006; both of the documents cover the same principles as the Fire Safety Order does for England and Wales.

To assist employers or other ‘responsible persons’ also known as ‘duty holders’, the national fire authorities have produced guides for different applications. System designers can also find that the guidance in these documents is useful and they should be considered as part of the consultation process. Compliance with this procedure will be audited by the fire authorities at any time either at completion or in the future so it
is important for the user to obtain and retain for inspection satisfactory completion documentation and test records.

Details of this legislation and its impact are discussed in Chapter 10.

The Construction Products Directive (89/106 EEC)

This covers both buildings and civil engineering works including domestic, commercial, industrial, agricultural, educational and recreational buildings as well as roads and highways, bridges, docks and tunnels. It requires that such buildings or works are designed and built in such a way that they do not present unacceptable risks of accidents in service or in operation such as stumbling or tripping in poor visibility, and that the safety of occupants and rescue workers is ensured in the case of fire. Minimum standards of illumination are required so that people may move safely within the works, including if they have to escape. In addition, escape routes are required to provide secure and adequate lighting, capable of operating despite failure of the electrical supply.

The Safety Signs Directive (92/58 EEC)

This is retrospective and was implemented in the UK on 1 April 1996 by SI No. 341. It calls for the provision of emergency signs in all places of work. These signs must be regularly cleaned, tested and maintained, and visible at all times. The traditional text EXIT signs must have been replaced by the pictogram by December 1998. The Health and Safety Executive has published guidance on the Regulations and it is called The Health and Safety (Safety Signs and Signals) Regulations 1996. Guidance on Regulations, L64.

The Fire Safety in Hotels Recommendation

This applies to all establishments with 20 or more paying guests. The Recommendation is intended to reduce the risk of fire breaking out, prevent the spread of flames and smoke, and ensure that all occupants can be evacuated safely. In particular it requires that escape routes and doors are indicated by safety signs visible day and night, and that an emergency lighting system is provided with sufficient duration to enable evacuation for all occupants. Compliance with this recommendation will be covered by the Regulatory Reform (Fire Safety) Order in the UK.

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UK Fire Safety Legislation

The changes in the way legislation is implemented have resulted in considerable changes in responsibility for the systems. The relevant fire authority used to define the areas that needed illumination in order to conform to BS 5266-1 when this and other fire safety measures were installed the fire certificate was issued.

The employer is now responsible for assessing the risks in his or her premises and then providing emergency lighting to reduce those risks to tolerable levels. Fire authorities will audit the provisions to ensure appropriate levels of safety of the occupants have been achieved. So, the employer uses compliance with BS 5266-1 as a way of demonstrating compliance with his or her legal responsibilities.

Background to the forthcoming changes in UK Fire Safety Legislation

Currently there are two legislative drivers to the fire safety market. New buildings and major refurbishments have to comply with the Building Regulations which require both emergency lighting and fire alarms in most buildings. The building inspectors enforce these regulations during the construction phase and this protection will remain in place.

The changes defined in a new white paper will replace all other fire safety legislation in the UK with a single act. Unfortunately, this means that the inspection of buildings and issuing of a fire certificate will be
limited to a very small number of high risk premises. Employers occupying other buildings will be required to conduct a risk assessment and make whatever changes are necessary. The advantage of this new procedure is that it will be retrospective and so if a premises had a fire certificate issued 20 years ago it will have to be reassessed and be upgraded to the latest issue of the standards.

The outline of the procedure for employers with sites that are not classified as very high risk is that:

- They must appoint a ‘responsible person’ who has to provide the risk assessment.
- This person has to evaluate the hazards and the people at risk and then ensure that the fire precautions are adequate for that risk (meeting standards is deemed as complying).
- They are encouraged to use specialist competent people to assist them in providing reports on areas of risk and protection as needed.
- Written records must be kept for all premises with more than five employees.

![Figure 3 – Flowchart of implementation of the Regulatory Reform (Fire Safety) Order and the Building Regulations](image)

**Implications of the implementation of the UK Fire Safety Legislation**

With the removal of the enforcement of fire certificates for existing premises, it is important that employers understand their responsibilities to ensure that adequate emergency lighting and fire alarms are installed.
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to safeguard occupants by understanding and complying with the fire safety legislation. New buildings will still have the support of building control officers to enforce the Building Regulations.

Employers will benefit by using the services of trained and competent engineers to assist in the design, installation and maintenance of fire protection equipment to ensure the quality, reliability and long life of the equipment. They should use approved third-party certified safety equipment.

Competent engineers should be able to give advice on how to provide systems compliant with the requirements of the relevant codes of practice for emergency lighting and fire alarm system design.

For normal applications, within the scope of the relevant application standard, the employer should be able to accept compliance with current published standards for system design as a basis on which to incorporate the system design into their risk assessment in order to limit the risks to negligible or tolerable levels as required by the legislation.

Where the construction or operation of the building is such that increased hazards are present, or the risk of harm is higher than for a normal application, the employer (in conjunction with specialist advice where appropriate) should determine what, if any, additional measures are to be taken to limit the risks to negligible or tolerable levels.

Implementation of UK Fire Safety Legislation

If the fire authority considers that a premises is not adequately protected they can take various forms of action.

Alterations notice

An alterations notice requires the responsible person to notify the relevant fire authority of any proposed changes that may increase the risk in the premises. They are issued where the fire authority considers that the premises constitute a serious risk or may constitute a risk if changes are made.

Enforcement notice

An enforcement notice is issued where the responsible person has failed to comply with the legislation and details corrective measures that they are legally obliged to complete within a set timescale, to comply with the law.
Prohibition notice

A prohibition notice is issued where the use of the premises may constitute an imminent risk of death or serious injury to the persons using them. This may be a restriction of use (e.g. imposing a maximum number of persons allowed in the premises), or a prohibition of a specific use of all or part of the premises (e.g. prohibiting the use of specific floors or rooms for sleeping accommodation).

Prosecution

If the problem is considered very serious or if any of the lesser actions have not been satisfied the fire authority can initiate a prosecution.

Definitions

To be able to interpret standards and guidance documents correctly, it is important to understand the meaning of the major terms used in the industry. Unfortunately, not all the definitions in the standards are consistent or easily understood. So the following list gives a basic meaning for each term. These definitions are intended to give an understanding of the terms. If full technical details are needed they are printed in the relevant standards.

‘A’ national deviations
Within European standards, countries are allowed ‘A’ deviations to contract out of sections of the standard if they have national legislation that has different requirements. All of these deviations are listed in that standard for each country, so that any engineers working there know the relevant requirements.

ballast
The control circuit that controls the operation of a fluorescent lamp from a specified AC or DC source (typically in the range 2.4–240 V). It can also include elements for starting the lamp and ensuring that for power factor correction or radio frequency interference suppression requirements can be met.

ballast lumen factor (BLF)
The ratio of the light output of the lamp when the ballast under test is operated at its design voltage, compared with the light output of the same lamp operated with the appropriate reference ballast supplied as its rated voltage and frequency.

battery
A secondary cell providing the source of power during mains failure.
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battery capacity
The discharge capability of a battery, which is a product of the average current and time, expressed as ampere hours over a stated duration.

battery sealed (recombination)
A battery that is totally sealed or constructed so that no provision is made for the replacement of the electrolyte.

battery unsealed (vented)
A battery that requires replacement of the electrolyte at regular intervals.

central battery system
A system with a single battery and charger supplying a number of remote emergency luminaires.

combined emergency luminaire (previously known as sustained)
Contains two or more lamps at least one of which is energized from the emergency supply and the remainder from the normal supply. The lamp energized from the emergency supply in a combined emergency luminaire is either maintained or non-maintained.

design voltage
The voltage declared by the manufacturer to which all the ballast characteristics are related.

deviation
If the designer or installer deviates from the requirements of the code of practice, he or she has to identify the reasons for the deviation and demonstrate that the safety of the building is not impaired in this particular application. All relevant parties must be notified and the details must be recorded in the completion certificate.

emergency exit
A way out that is intended to be used any time that the premises are occupied.

‘F’ mark
Shows that the luminaire can be mounted on combustible surfaces. It does not show that the luminaire is fire retardant.

final exit
The terminal point of an escape route, beyond which persons are no longer in danger from fire or any other hazard requiring evacuation of the building.

Illuminance
The luminous flux density at a surface, i.e. the luminous flux incidence per unit area. The unit of illuminance is the lux (lx), which is the number of lumens per square metre on the surface being illuminated.
**Definitions**

**luminaire**
Is the technical term for a light fitting that distributes, filters and transforms the lighting provided by lamps and includes all the items necessary for fixing and protecting these lamps and for connecting them to the supply circuit. It should be noted that internally illuminated signs are a special type of luminaire.

**maintained emergency luminaire**
A luminaire containing one or more lamps that operate from both the normal supply and from the emergency supply as available. It should be illuminated at all material times.

**material time**
This is the relevant time that protection should be available for. It commonly refers to the time that maintained exit signs need to be illuminated for, the material time being when the building is occupied.

**mounting height**
The vertical distance between the luminaire and the working plane. It should be noted that the floor is taken to be the working plane for emergency escape route lighting.

**non-maintained emergency luminaire**
A luminaire containing one or more lamps, which operate from the emergency supply only upon failure of the normal mains supply.

**normal lighting**
All permanently installed artificial lighting operating from the normal electrical supply that, in the absence of adequate daylight, is intended to be able to be used at any time that the premises are occupied.

**place of safety**
A safe area beyond the premises where relevant persons are no longer at risk from fire.

**rated duration**
The manufacturer’s declared duration, specifying the time for which the emergency lighting will provide the rated lumen output after mains failure. This may be for any reasonable period, but is normally one or three hours.

**rated load**
The maximum load that may be connected to the system and supplied for the rated duration.

**recharge period**
The time necessary for the batteries to regain sufficient capacity to achieve their rated duration.
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self-contained emergency luminaire or single-point luminaire
A luminaire or sign providing maintained or non-maintained emergency lighting in which all the elements such as the battery, the lamp and the control unit are contained within the housing or within one metre of the housing.

slave or centrally supplied luminaire
An emergency luminaire without its own batteries designed to work with a central battery system.

850 °C glow wire test
Enclosures of batteries of emergency luminaires must pass this test as specified in BS EN 60598-2-22. This test protects the battery circuits so that internal circuit faults will not set fire to the luminaire.