Emergency Lighting

This module deals with emergency lighting; complying with legislation, the application and design of lighting schemes.

1 Defining Emergency Lighting

In human terms, the purpose of emergency lighting is to save lives. It does so by:

- guiding people quickly and safely from the building
- enabling specific tasks to be completed
- avoiding panic
- restoring confidence

Emergency lighting is present, though often unnoticed, in all of the public, retail, leisure and commercial environments we use or pass through every day and night. It is there because we have a moral obligation to ensure the safety of people who occupy or visit our buildings. Also it is there because certain legislation, such as The Fire Precautions Act and The Health and Safety at Work Act, make it obligatory to provide suitable means of escape during an emergency. Giving people enough light to see the escape route is an essential part of this requirement.

Fig 1 Office with emergency lighting

2 Complying with legislation

The standards and guidelines governing emergency lighting and its application are currently being harmonised into a European Standard by CEN and CENELEC working groups.

European legislation appears in the form of directives that are implemented in the UK through regulations. Below are requirements and standards currently in force, followed by an explanation of how the harmonised European Standard may affect emergency lighting in the UK.

Fundamentally, they can be divided into 3 areas:

- **The need for emergency lighting** – covering legal requirements and enforcing bodies.
- **The application of emergency lighting** – covering criteria for use.
- **The products for emergency lighting** – covering product design, manufacture, materials and operation.

The need for emergency lighting

Fire Precautions Act, 1971

Implies the necessity of emergency lighting by stating that it is necessary to ensure that " means of escape can be safely and effectively used at all material times".

Guides to Fire Precautions Act, 1971

These have been issued by the Home Office for designated buildings as follows:

- Guide No.1 'Hotels and Boarding Houses' strongly recommends the provision of emergency lighting for escape purposes.
- Guide No.2 'Factories'
- Guide No.3 'Offices, Shops and Railway Premises' both broadly recommend such provision where there is normally insufficient natural light.

Fig 2 Public place with emergency lighting

Fig 3 School with emergency lighting

Health and Safety at Work Act, 1974

Under this Act, enforcing authorities may require emergency lighting to be installed if there is deemed to be risk to the safety, health and welfare of employees, should the supply to the normal lighting fail. In general, the fire authorities deal with means of escape requirements and the Health and Safety Executive with matters outside this reference, e.g. the need for emergency lighting for hazardous activities.

The Building Regulations 1991, Fire safety section B1

This states that: "the building shall be designed and constructed so that there are means of escape in the case of fire in a building……" Section 5.33 and 5.34 refer specifically to lighting. The Regulations also state the need to comply with BS 5266 and BS 5499.

Health and Safety (Safety Signs and Signals) Regulations 1996

These Regulations impose requirements in relation to the provision of safety signs and signals and implements the EC Directive 92/58/EEC for the provision of health and safety and health signs at work. It specifically covers emergency escape (routes and exits) first aid and identification of fire-fighting equipment.

Local Fire Authorities

The actual, legal need to install emergency lighting is often at the discretion of the enforcement agencies who may be Fire Control Officers, Building Regulatory Officers and Health & Safety Executives. Therefore, when installing an emergency lighting system, liaison with and approval from the relevant enforcing authority should be established as a matter of course.

Workplace Directive

This European Directive requires most buildings in which people work to have suitable emergency lighting. The UK implementation of the Workplace Directive is in the Workplace (Health, Safety and Welfare) Regulations 1992. This came into force for new workplaces, extensions, modifications and conversions on 1 January 1993. Those workplaces in use prior to 31 December 1992 had to satisfy the Regulations by 1 January 1996. The Approved Code of Practice (ACoP) sets out the particulars of these Regulations.

Construction Product Directive

This European Directive requires all the escape routes of a building to be usable at all material times.

The UK implementation of the Directive is in the Building Regulations 1991, Fire Safety section, B1 'Means of escape'. This regulation states the need to comply with BS 5266 and BS 5499.

The application of emergency lighting

BS 5266, 1999

The new standard that covers emergency lighting requirements for escape routes and open areas. It contains the requirements for illuminance, response time, duration and suitable solutions. It also sets out the need for commissioning, inspection and testing. This standard covers the luminous requirements of emergency luminaires.

CIBSE TM12

This is a publication by the CIBSE providing guidance for the design and photometric testing of emergency luminaires and scheme/systems design.

BS 5499 Part 1, 2 & 3
This covers fire safety signs including exit signs and their operation.

Pr EN 50 172
This is a draft Harmonised European Standard for **Emergency Escape Lighting Systems**. This standard covers installation practice and sets out inspection, testing and service requirements being developed by the European Standards body CENELEC.

Pr EN 50 171
This is a draft Harmonised Standard for **Central Power Supply Systems** being developed by the European Standards body CENELEC. It will deal with central battery power and distribution systems.

Fig 4 Escape route lighting for stairway

The products for emergency lighting

BS 4533: 102.22/EN 60 598 2.22
This harmonised European product standard replaced BS 4533 and sets out the requirements for materials, design, manufacture, testing and operation of emergency lighting luminaires and equipment.

BS 5499 Parts 1, 2 & 3 ISO 3864:1984 Safety colours and Safety signs
This covers fire safety signs including exit signs and their operation.

CE Mark Directive
This is a European community conformity mark which came into force on 1 January 1996 for Electromagnetic Compatibility (EMC) and 1 January 1997 for low voltage safety compliance.

Since the 1 January 1996 all Thorn products carry the CE mark, indicating product compliance with any relevant EC Directives.

3 Application

Once it has been determined that an emergency lighting system is required, BS 5266 Part 1, 1999 sets out the standards for design and the installation of that system. Broadly speaking, the criteria covered in the British Standard deal with:

- How much light there should be in those areas in which it is mandatory to have emergency lighting.
- How long the light should remain on for in an emergency.
- How fast the emergency lighting should come on after the mains system has failed.

The following is a brief definition of the locations that require emergency lighting and the criteria they must meet.
When designing any emergency scheme it is recommended that the Fire Officers or Local Authorities are consulted at the earliest stage possible.

Fig 5 Leaving by an escape route

This section considers the requirements of the new European standard EN 1838:1999 for Emergency Lighting that is harmonised across Europe with minor variations in some countries. In the UK it has the status of a British Standard known as BS5266:1999.

A summary of the luminous requirements of this standard is in Appendix 1.

Specific forms of emergency lighting

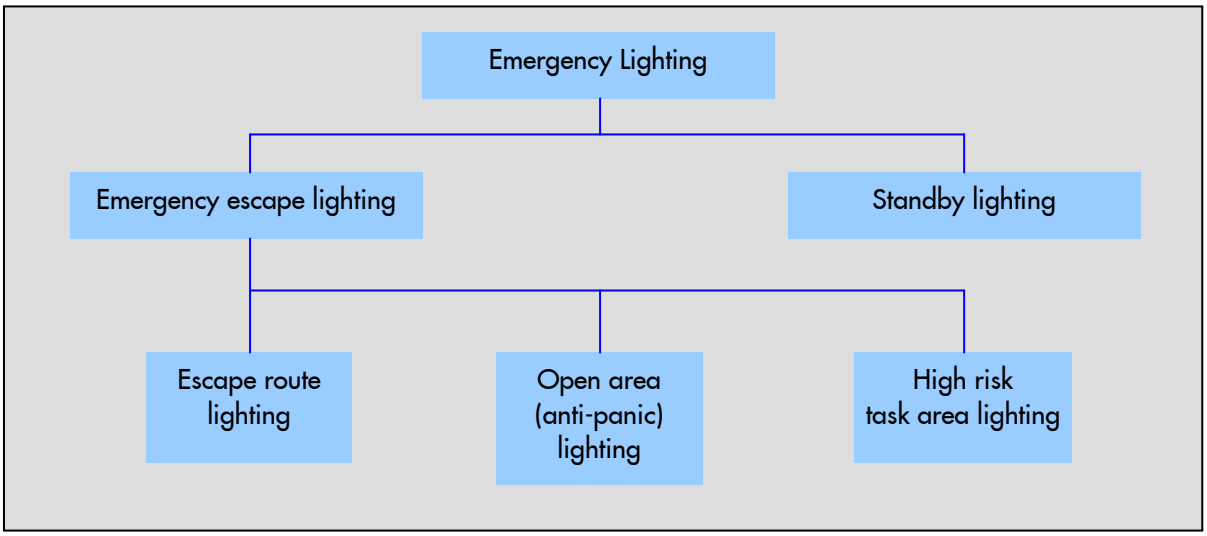


Fig 6 Specific forms of emergency lighting

Emergency escape lighting is to enable safe exit from a location in the event of failure of the normal supply.

Escape route lighting is to enable the safe exit from a location 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.

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.

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.

Standby lighting is that part of emergency lighting provided to enable normal activities to continue in the event of failure of the normal mains supply.

Fig 7 Retail open area

Clearly defined escape routes

Much anxiety and confusion can be alleviated by strategically placed signs indicating the way out of a location. It is very important that exits are clearly signposted and are visible, whenever the location is occupied.
Corridors and stairways, or gangways in open areas are all classified as clearly defined escape routes (Fig 9, 10 & 11).

BS 5266, 1999 requirements
Horizontal illuminance at the floor on the centreline of permanently unobstructed routes should not be less than 0.2 lux, **but preferably 1 lux**, with 50% of the width of the route, up to 2 m wide, being lit to a minimum of 0.1 lux. For stairways, the illuminance should be measured horizontally at the edge of each tread. Wider routes can be treated as several 2 m bands.

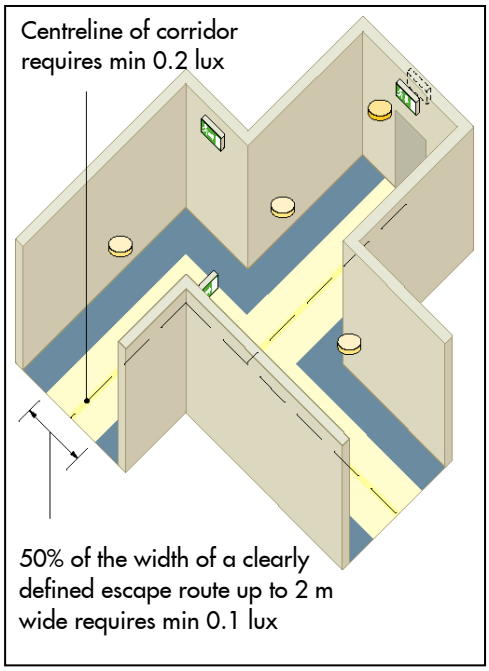


Fig 8 Escape route illuminance requirements

An escape lighting luminaire needs to be sited to provide appropriate illumination near each exit door and at positions where it is necessary to emphasis potential danger or safety equipment. For **points of emphasis** the minimum horizontal illuminance at the floor along the centreline of the escape route should not be less than 1 lux.

- at each exit door intended to be used in an emergency
- near stairs so that each flight of stairs receives lighting
- near any other change of level
- mandatory emergency exits and safety signs
- at each intersection of corridor
- outside and near to each final exit
- near each first aid post
- near each piece of fire fighting equipment and call point.

'Near' is normally considered to be within 2 m measured horizontally. It is better to have more than one luminaire in any part of an escape route. If a first aid post or fire fighting equipment is **not** on the escape route or open plan area it should be illuminated to 5 lux minimum on the floor.

All emergency luminaires on escape routes must pass the fire retardant housing 850°C test specified in EN 60598-2-22.


Fig 9 Corridor


Fig 10 Gangway in open area


Fig 11 Stairs

Signage

Exit and directional signage must be used in emergency lighting design to provide a clear and unambiguously marked route to a final exit, enabling safe evacuation of the building.
Signage is governed by two standards:
BS 5499, Part 1: 1990
European Safety Sign Directive.
Both formats are in use.

- For a new installation use signs complying with the Signs Directive, the 'running man'.
- For a building with some exit signage, the colour, format, and style of additional signs should be consistent with those already installed.
- It is advisable to check the format with enforcing agencies.

BS 5499 Part 1 is being revised to take account of the Signs Directive and to resolve the difficulties in use of the variants – 'Exit', 'Fire Exit' and 'Exit for Emergency Use Only' – and to standardise the use of arrows.

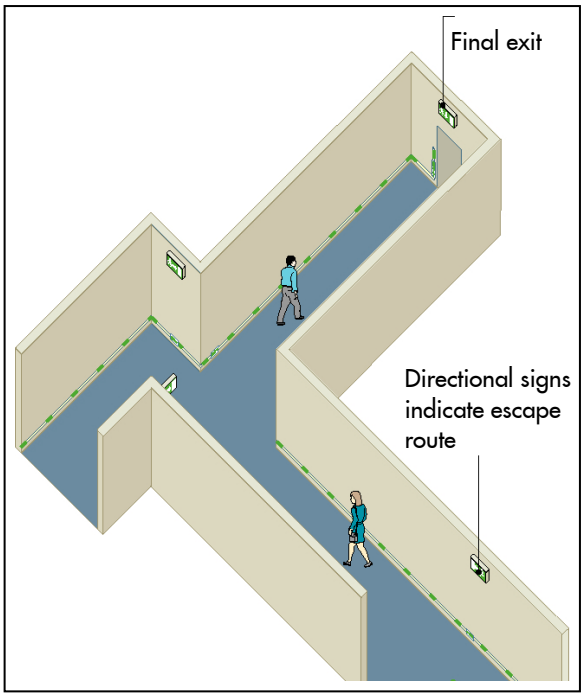
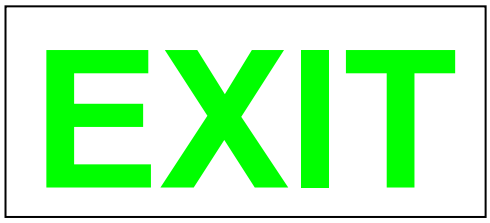


Fig 12 Signage on escape route

All safety signs must also be illuminated at all material times, for example 'Danger of High Voltage', 'Special Gas Valves', or 'Radioactive Stores'.

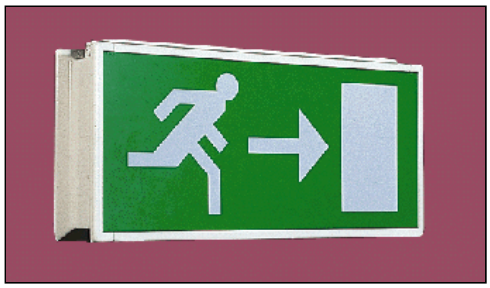
The format of signs

BS 2560 Signs 1975
These signs should have been replaced by 24 December 1998. It is recommended that care should be taken as the new pictorgram formats with larger areas of green colour will significantly reduce luminaire light output and installations may require additional emergency illumination to compensate for the change.



BS 5499 Part 1 1990
These signs are of a similar pattern to the Signs Directive and are considered to comply with the regulations and do not need to be replaced if already installed.

Sign Directive
Implemented as a legal requirement in the UK by Statutory Instrument 1996 No.341 on 1 April 1996.



Open areas

Areas that are frequently reconfigured and therefore do not have within them clearly defined escape routes, for example open plan offices or conference facilities, can be defined as open areas.

BS 5266, 1999 requirements

- the horizontal illuminance shall not be less than 0.5 lux at the floor level of the empty core area which excludes a border of 0.5 m of the perimeter area. The ratio of the maximum to the minimum open area lighting illuminance shall not be greater than 40:1.
- exit signs should be visible from any part of the space.

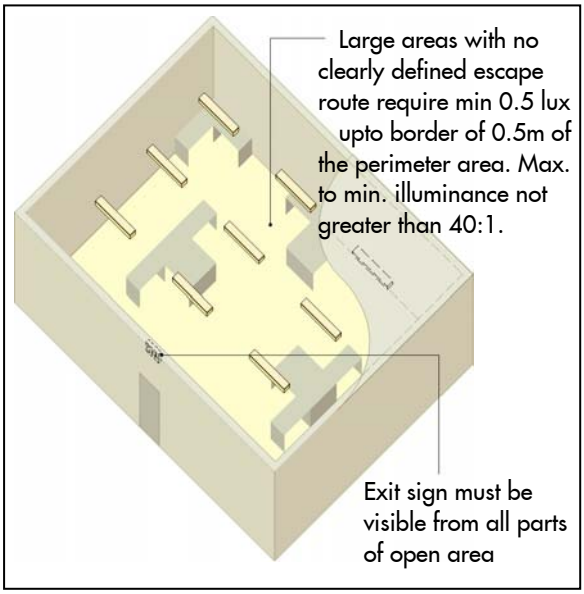


Fig 13 Open area illuminance requirements

Fig 14 Office open area

Fixed seating areas

Auditoria, stadia, conference facilities etc., with fixed seating layout are defined as fixed seating areas.

CIBSE TM 12, 1986 requirements

These should have at least 0.1 lux over the seating area with a minimum uniformity of 0.025. This is measured on a plane 1 m above floor/pitch line. Gangways should be treated as clearly defined escape routes.

Fig 15 Fixed seating

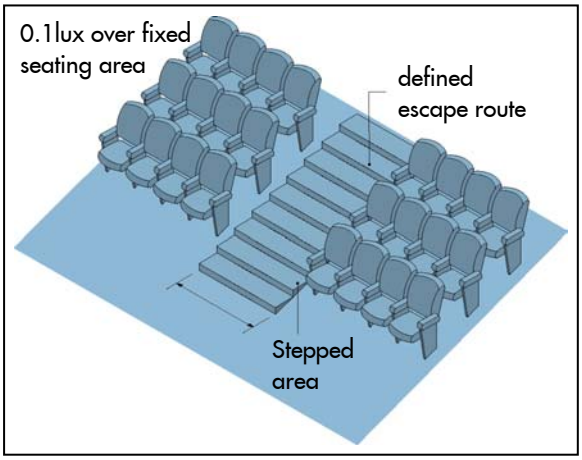


Fig 16 Fixed seating illuminance requirements

Adaptable seating areas

Any part of an auditorium or stadium or other area where movable or stackable seating is used.
CIBSE TM12, 1986 requirements
The average horizontal illuminance when measured on an unobstructed floor should be not less than
1.0 lux, with a uniformity of 0.025. (As for open areas.)

Fig 17 Adaptable seating area

Stepped areas

Any part of a building which is permanently constructed as a series of steppings within an open area.
CIBSE TM12, 1986 requirements
The average horizontal illuminance when measured at the nosing of each unobstructed step should be not less than 1.0 lux, with uniformity of 0.025. (As for open areas.)

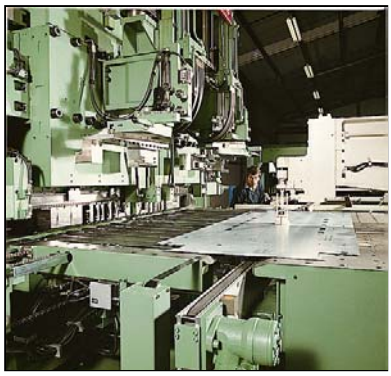


Fig 18 Special area - machinery

High risk task areas

During the failure of the normal lighting supply, emergency lighting is required in places where machinery, plant or other processes may present a hazard if left in operation, and must be shut down before evacuating the area.

In areas of high risk the maintained illuminance shall be not less than 10% of the required maintained illuminance for that task, however it shall not be less than 15 lux. The uniformity shall not be less than 0.1. Full illuminance provided within 0.5s.

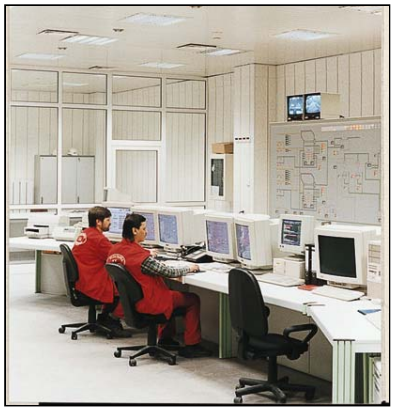


Fig 19 Special area – control room

Standby lighting

Emergency lighting is also required, where continuous operation of a task must be maintained. For some situations this may mean providing 100% maintained illuminance, instantly, for instance in an operating theatre. When standby lighting is used for emergency escape lighting purposes it shall comply with the relevant requirements of BS 5266:1999. When a standby lighting level is lower than the minimum normal lighting is employed, the lighting is to be used only to shut down or terminate processes.

Specific locations

Lift cars

BS 5266, 1999 requirements
An emergency lighting luminaire should be fitted in lift cars in which people may travel. Such luminaires should preferably be of the self-contained type. If the disabled are given access to a building, their means of escape in emergency conditions may only be available by lift car.

Toilet lobbies and closets

BS 5266, 1999 requirements
Facilities exceeding 8 m^2 gross area and facilities of less than 8 m^2 **without borrowed light** should be provided with escape lighting, complying as if they were part of an escape route.

Fig 20 Specific location

Covered car parks

BS 5266, 1999 requirements

Pedestrian escape routes from covered and multi-storey car parks should be easily identifiable and should be provided with emergency lighting.

External lighting

BS 5266, 1999 requirements

It should be remembered that the area outside the building beyond the final exit must be adequately lit.

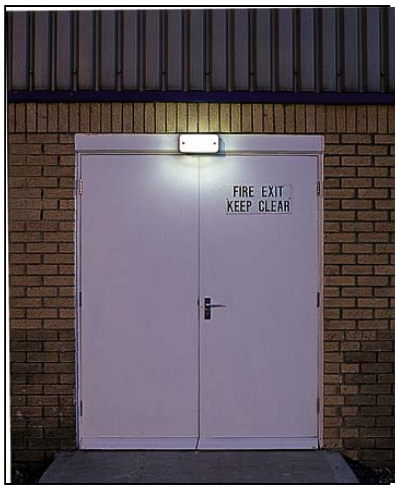


Fig 21 External emergency luminaire

Glare

If high contrast exists between background and luminaire, glare is created and occupants approaching may be dazzled, hindering progress. It is especially important that glare should be controlled in an emergency where there may already be congestion and panic.

BS 5266-7, 1999 requirements

The individual escape luminaires should be chosen and mounted to have a restricted output and limited luminous intensity in the zone 60° - 90° from the vertical for level horizontal escape routes. For all other routes and areas, the limiting values shall not be exceeded at all angles. BS5266-7,1999 sets the acceptable limits.

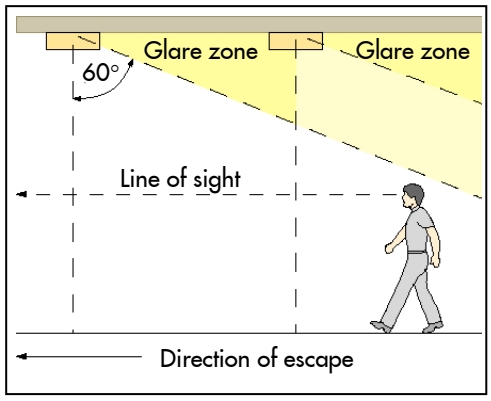


Fig 22 Glare zone BS5266-7,1999

Disability glare limits

Mounting height above floor (m)	Escape routes and open areas maximum intensity (cd)	High risk task areas maximum intensity (cd)
less than 2.5	500	1000
below 3.0	900	1800
below 3.5	1600	3200
below 4.0	2500	5000
below 4.5	3500	7000
4.5 and above	5000	10000

Low location lighting

Low location lighting can be used to supplement existing emergency lighting schemes, especially in hot smoke conditions by providing apparent continuous lines of light and small signage at low levels. These systems when used with standard emergency lighting, maintain confidence and reduce panic by making escape routes and exits more clearly visible.

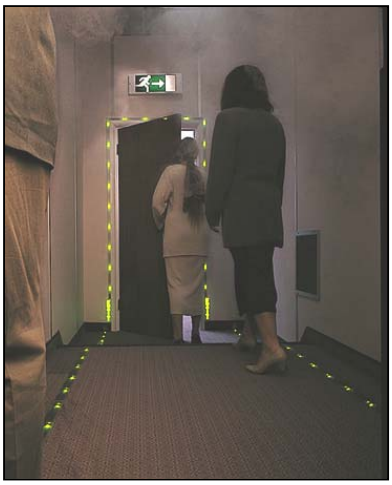


Fig 23 Low location lighting

4 Power systems for emergency lighting

In emergency conditions, emergency lighting is usually operated by batteries or generators that are automatically triggered as soon as the mains system fails. The two main types of system are:

Self-contained systems

Each luminaire is equipped with battery, charger, indicator and changeover device. These elements may be integral to the luminaire or housed in a separate unit mounted less than 1 m from the luminaire. The mains supply charges the battery which cuts in when the mains system fails. Self-contained systems are easy to install and extend, and require minimal maintenance.

Central systems

Here the power is provided by remote batteries or generators through sub-circuits to a number of slave luminaires. These systems may require comparatively large battery/generator rooms. The sub-circuits are monitored to protect local failure and high-integrity wiring must be used. Due allowance should be made for voltage drops.

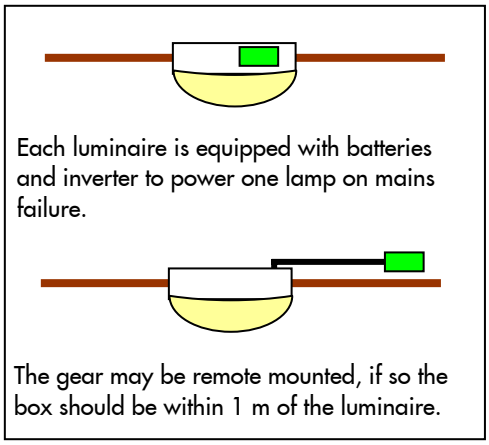


Fig 24 Self contained system

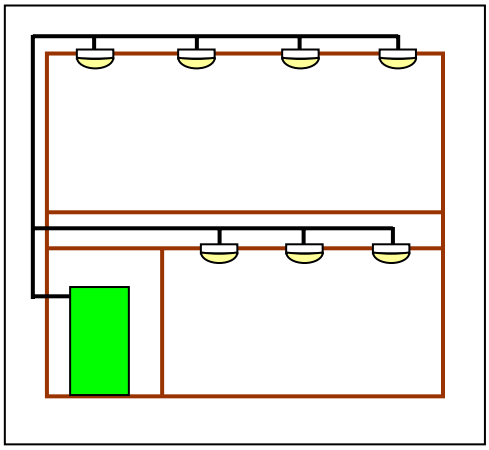


Fig 25 Central system

5 Mode of operation

Once a system has been selected, there are a number of ways that the emergency luminaires can operate. In all cases, where a battery is present, it is charged by the mains supply.

Non-maintained (NM)

The lamp is only lit when the mains fail and is operated by an emergency power source.

Maintained (M)

The lamp is lit at all material times and is powered by the mains supply under normal conditions. In emergency conditions, when the mains fails, an emergency power source cuts in to power the lamp.

Combined/Sustained (C)

This is a variant of the maintained luminaire in which one lamp is powered by the mains supply during normal conditions. A second lamp operates only under emergency conditions powered by an emergency power source. This type of luminaire provides light at all material times.

	Mains mode	Emergency mode
Non-maintained (NM)	lamp is off	lamp is on
Maintained (M)	lamp is on	lamp is on
Sustained/ Combined (C) or (S)	mains lamp is on	emergency lamp is on

Fig 26 Summary of modes of operation

6 Duration

In emergency conditions, light must be provided for a certain minimum amount of time to effectively achieve evacuation and/or to complete certain essential tasks. 'Duration' is the minimum period of time that the emergency luminaire remains lit to the minimum design output, after a mains failure. Various premises require different durations, from 1-3 hours. The duration required is based on whether the building will be evacuated or not just if the mains fail. While it is possible to use a 1 hour system if evacuation is immediate, this also means that the building should not then be re-occupied until a full recharge has occurred and in practice it is normally preferable to choose a 3 hour system.

7 Operating response

Operating response is the amount of time that elapses between the mains system failure and the illumination of the emergency system. Different areas and different types of building require differing operating responses.

15 seconds

In places where the occupants are familiar with the building, e.g. a place of work, the operating response may be extended to 15 seconds.

Fig 27 Operating response 15 s

5 seconds

Where the surroundings may be unfamiliar, emergency luminaires should provide the minimum illuminance within 5 seconds of the failure of the normal lighting. This would be the case in, for instance, a hotel, a public library or a covered car park.

Fig 28 Operating response 5 s

Fig 29 Instant response

Instantaneous

In highly critical areas (e.g. control rooms, intensive care units) the changeover from normal lighting to emergency should be instantaneous.

Mode of operation and duration

Area/Application	Mode/duration
General building areas	
Entrance lobbies	NM/1
Reception areas	NM/1
Corridors	NM/1
Staircases	NM/1
Staff restaurants and snack rooms	NM/1
Telecommunication/ control rooms	NM/3
Plant room/ boiler rooms	NM/3
Lift motor rooms	NM/3
Lifts	NM/1
Toilets	NM/1
Commercial	
Offices (cellular)	Not required
Offices (open plan)	NM/1
Departmental stores	NM/1
Covered shopping complexes	NM/1
Non-domestic residential	
Hotels, boarding houses	M/3
Hospitals	NM/3
Public Places	
Cinemas (auditoria)	M/3
Theatres (auditoria)	M/3
Places of assembly	M/3
Covered car parks	NM/1
Conference facilities	NM/1
Industrial	
Factories	NM/1
Educational and recreational	
Schools, colleges, universities	NM/1
Sports halls	NM/1
Pedestrian walkways which form part of the escape route	NM/1
Museum and art galleries (small) (large)	 NM/1 NM/3
Pubs and clubs	M/3

Fig 30 Modes of operation and duration

8 Choosing the right emergency lighting solution

In any environment, once legislation requirements have been established and met, a variety of functional and aesthetic criteria may apply influencing the types of lighting required.

It is most important that emergency lighting systems and products be appropriate to their environment, since, more often than not, they are lighting everyday circumstances in mains mode as part of the mains lighting system. They must therefore integrate with other elements of the lighting system, décor and overall design.

The actual design of an emergency lighting scheme is, as any other lighting design, to some extent a creative process. Each building is unique and it is true to say that a number of equally valid emergency lighting schemes could be devised for any one building.

Fig 31 Functional bulkhead

Generally speaking, there are three types of criteria, which may determine the type of emergency lighting installed:

- Functional criteria
- Performance criteria
- Aesthetic criteria

Functional

Many areas require products which have a purely emergency function or luminaires with an emergency function, but which are continuously lit (in maintained mode). These luminaires may well not be part of the overall lighting scheme. Functional emergency luminaires tend to put durability, toughness and reliability before aesthetics.

Signage is another example of lighting installed to fulfil functional emergency criteria only, although aesthetically the products should be in keeping with their surroundings, particularly in prestige environments.

Fig 32 Area with VDTs

Performance

Some situations require special performance qualities. These may be in terms of the materials from which the emergency luminaires are manufactured, for instance in environments where corrosive or damp atmospheres prevail. Other areas place demands on the type and quality of light emitted, especially, for example, low glare requirements in hospitals or where VDTs are used. (Fig 32) These areas may also require energy conservation and many emergency systems can incorporate the same presence detectors or dimmable features as their mains counterparts.

Aesthetic

Lighting with an aesthetic impact which contributes to the overall design and ambience is crucial in hotels, public buildings and many other prestige environments. In such cases, the prime function of the luminaires is to contribute to peoples' everyday lives and to the way they perceive their environment. As is the case in areas with predominantly performance orientated criteria, the lighting systems for aesthetic areas must incorporate luminaires with an integral emergency function that also allow design freedom and unified lighting schemes.

Fig 33 Aesthetic impact

Questions 1

1. What is the first priority of emergency lighting?
2. What are the three broad areas that emergency lighting is divided into?
3. Which European Directive requires most buildings in which people work to have suitable emergency lighting?
4. Which British Standard contains the requirements for illuminance, response time, and duration, it also sets out the need for commissioning, inspection and testing?
5. What is standby lighting?
6. What places can be classified as clearly defined escape routes?
7. What are the illuminance requirements for a 1.8m wide escape route?
8. What are the requirements for an open area according to BS5266:1999?
9. For self-contained emergency luminaires what is the maximum distance for remote gear?
10. Explain what is the maintained mode of operation.
11. Why is a 3 hour duration system preferable even if a 1 hour duration is recommended?

9 Designing an emergency lighting scheme

Below is a list of considerations that should be taken into account when designing emergency lighting for any area. They can be marked on a floor plan, as can the final positions of all mains emergency luminaires.

The list splits into two types of emergency requirements, for signage and illuminance:

Signage

Points at which emergency lighting is required, but where the luminaires are not necessarily contributing to illuminance levels.

- Identify exists and final exists
- Identify points where directional signage is required i.e. corners, doorways etc.
- Identify location of hazards, safety signs, fire-fighting equipment, alarm call points
- Identify location of exterior exits
- Select appropriate products

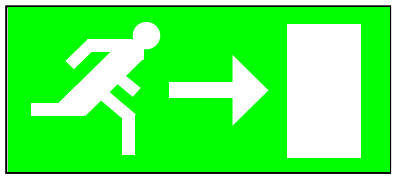


Fig 34 Example of European Sign Directive signage

Illuminance

Areas in which emergency lighting is required:

- Identify clearly defined escape routes
- Identify open areas
- Identify special areas
- Identify toilets and cubicles over 8 m^2, and less than 8 m^2 without borrowed light
- Noting illuminance requirements select appropriate products per area
- Work out number of luminaires required to give design illuminance and uniformity

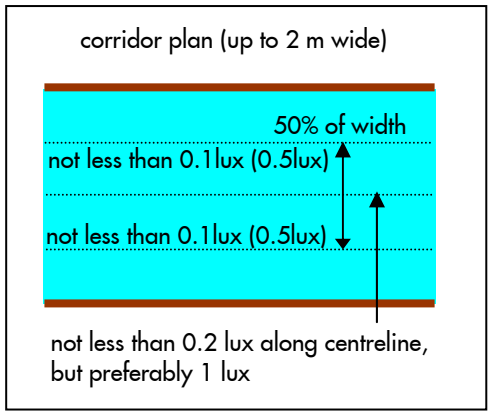


Fig 35 Illuminance requirements for clearly defined escape route

- Prior to installation, check for any changes to the building or equipment that may require additional luminaires to the scheme.

Note: It is good practice to have at least two emergency luminaires in a compartment of an escape route, between fire doors.

Data basis

The spacing data shown is based on initial (100 hour) lamp lumens for non-maintained luminaires or 3000 hour lamp lumens for maintained luminaires, all with a maintenance factor of 0.9. Also data is based on an ambient temperature of 25°C. For lower temperatures, lamp lumens will be reduced in accordance with the graph in Fig 36.

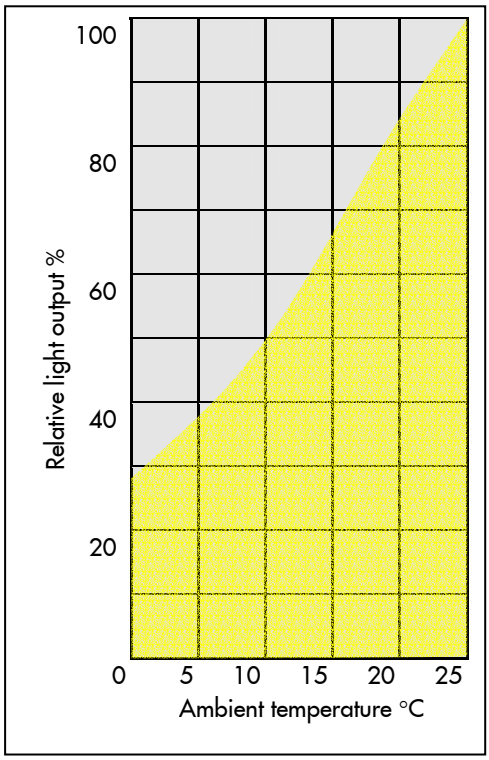


Fig 36 Emergency lighting variation of lamp lumens with ambient temperature for fluorescent tube luminaires.

Transverse and axial spacing

The diagram below illustrates the terms **transverse** and **axial** used when describing spacing between luminaires. For the purposes of establishing spacing, when adjacent luminaires are orientated transversely/axially to each other the worst case should be used.

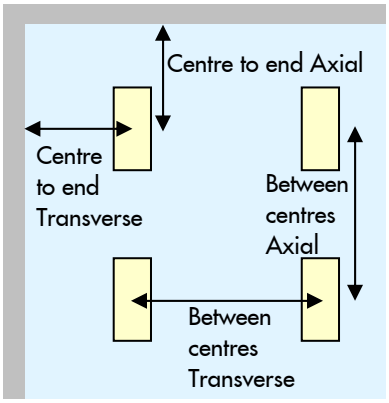


Fig 37 Transverse and axial spacing

Clearly defined escape routes example

Panther with 28W 2D lamp (EFCV32D28W) maintained surface luminaire.
Mounting height: 3 metres above floor.
Emergency design requirements:
0.2 lux along centre line

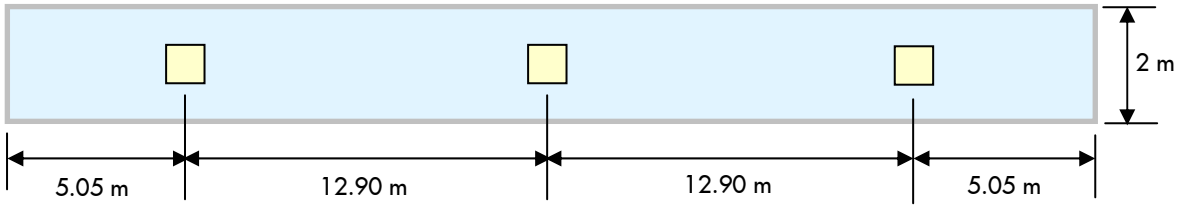
Fig 38 Panther luminaires on escape route

Spacing Data
Ceiling mounted luminaire, 2m escape route

		Maximum spacing		Maximum intensity 70 - 90°	
Minimum illuminance (lux)	Mounting height (m)	Centre to end (m)	Between centres (m)	Actual (cd)	Limit (cd)
	2	4.45	11.30	13.28	7399
0.2	3	5.05	12.90	13.28	2559
	4	5.35	14.00	13.28	1386
	2	2.40	6.40	13.28	15167
1.0	3	2.40	6.90	13.28	6076
	4	2.05	6.90	13.28	2886

Data code: R0008374

Panther luminaires at their maximum spacing between centres and end of corridor



Plan view of corridor

Wall mounted luminaire data
The data format is similar to the ceiling mounted data although escape route data is only given for a 2 m mounting height above the floor along a 2 m wide escape route.

Spacing
To establish the correct spacing for the above criteria, simply read off the appropriate value from the photometric data. The data for the Panther luminaire is shown with the relevant information highlighted. The data gives mounting heights from 2 to 4 metres above the floor. This range of heights allows easy judgement of maximum luminaire spacing for common ceiling heights.

Glare
With a minimum illuminance of 0.2 lux and a mounting height of 3 m the intensity is 13.28 cd. If, for example, no more than three luminaires are in view at a time, then the maximum cumulative intensity will be 3 × 13.28 cd, about 40 cd. This is well below the limit of 2559 cd set in CIBSE TM12 and the limit of 900 cd set in BS5266-7:1999. In most situations glare limits are unlikely to be approached.

Open area example

Quattro T-line maintained, recessed modular luminaire with 2 × 36W linear fluorescent lamps (EE3RFQTZ236 + FQTLS2312 CAT3 MB)
Mounting height: 4 metres above floor.
Emergency design requirements (BS5266:1999):
The requirement is for 0.5 lux minimum anywhere on the floor level excluding the shadowing effects of contents. The core area excludes the 0.5 m to the perimeter of the area.
In the example for general, non-emergency lighting, luminaires are modularly spaced at 3.0m.
20 luminaires gives an illuminance of about 450 lux.

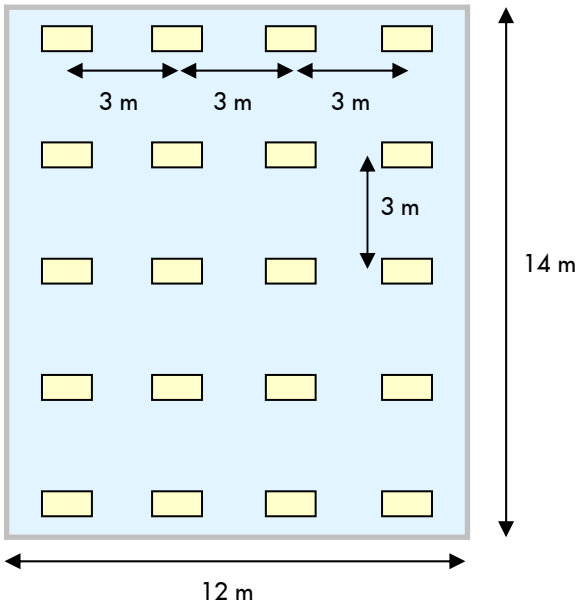


Fig 39 Example of open area

For schemes that use modular luminaires, it should be remembered to account for modular co-ordination when setting emergency luminaires spacing.

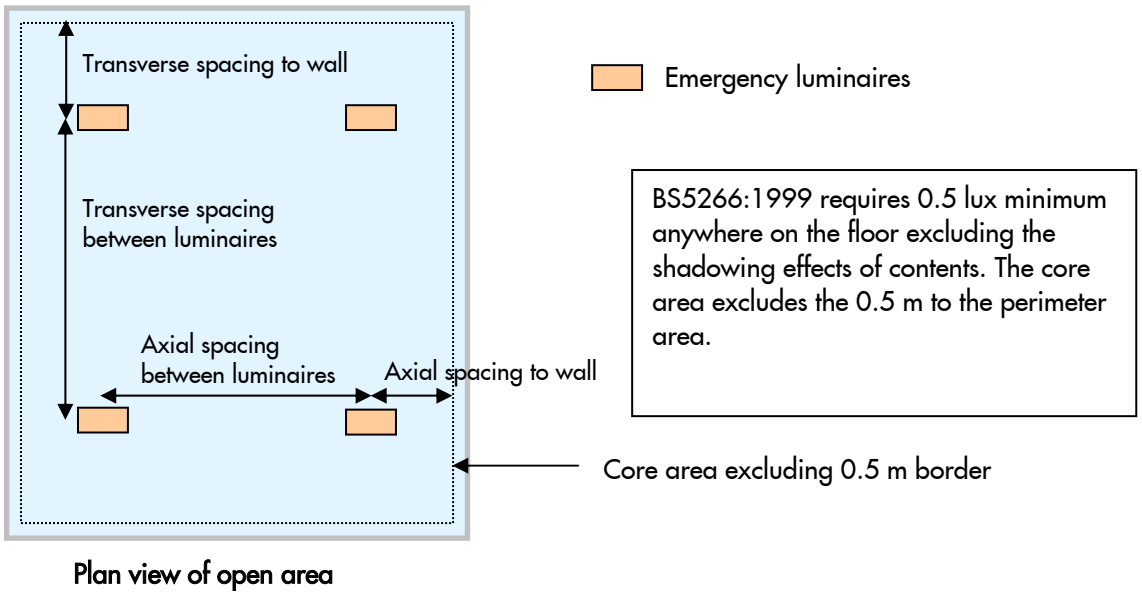
Care should be taken when planning open areas using emergency luminaires that have a narrow light distribution such as downlights or some luminaires with reflectors.

To establish the correct spacing for the above criteria, simply read off the appropriate values from the photometric data.

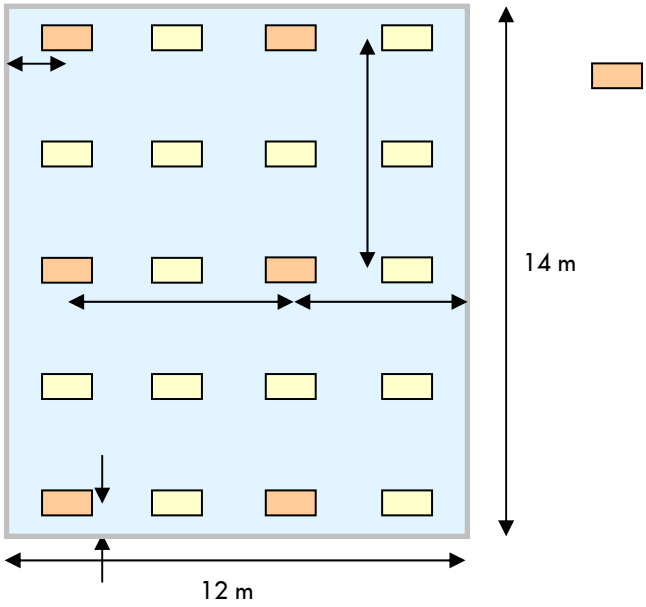
Applying the data to our example the layout shown on the next page complies with the requirements.

Spacing Data
Open area

Minimum illuminance (lux)	Mounting height (m)	Maximum spacing (m) Centre to end trans	Centre to end axial	Between centres trans	Between centres axial
0.025	2	2.35	3.25	5.80	7.40
	3	3.30	4.35	4.80	12.80
	4	4.20	5.20	6.30	14.30
0.5	2	1.90	2.85	2.60	6.60
	3	2.80	2.50	5.30	6.90
	4	2.00	4.00	7.10	6.60



Plan view of open area



Plan view of open area

The calculation method that accords with BS5266:1988 for this example is given in Appendix 3.

10 Checking compliance, commissioning and maintenance

Once installed, it must be established that the emergency lighting meets the appropriate design criteria. A framework for obtaining certification of design, installation and commissioning, periodic testing and servicing is laid out in BS 5266:1999

Maintenance and testing

Regular inspection, testing and servicing of emergency lighting systems must be carried out to ensure effective and reliable operation at all material times. The owner/user of a premise is responsible for maintaining a log book documenting all maintenance and test procedures.

To assist with this process, all Thorn emergency products are supplied with record cards.

To verify that adequate emergency lighting is available at all material times, the system needs inspection.

Test procedure

Self-contained luminaires
(BS 5266-1:1999)

Daily	Check every lamp in a maintained system is lit. Record faults in log book and take action to remedy faults.
Monthly	A short operational check to ensure that each luminaire illuminates on mains failure.
Six monthly	A duration test should be carried out for a period of at least one hour for 3 hour duration products, or 15 minutes for one hour duration products.
3 yearly	Check installation for compliance with Code and check luminaires for full rated duration, repeat yearly for full duration.
Then annual test	Repeat 3 yearly test.

Central power systems
Any emergency lighting scheme powered by a central system must also be given regular checks as set out in BS 5266-1:1999.

Programmable Central Testing for Emergency Lighting
The time and effort required to visually check each luminaire and manually record the findings is often extensive. Programmable central testing, such as provided by **Explorer**, provides a simple cost effective solution to this often onerous and expensive manual task. **Explorer** is an addressable central testing system for emergency lighting. Tests are run either manually or automatically by the use of a computer or a special control panel.

Key features

- Operates via a PC or dedicated control panel
- Easy to use, Windows style software
- Full fault diagnosis and reporting is possible
- Automatic or operator instigated reporting to current standards
- Low testing costs promote effective maintenance
- Totally flexible, to allow for scheme expansions and adaptations in legislation and standards
- Compatible with most Thorn emergency versions of mains luminaires.

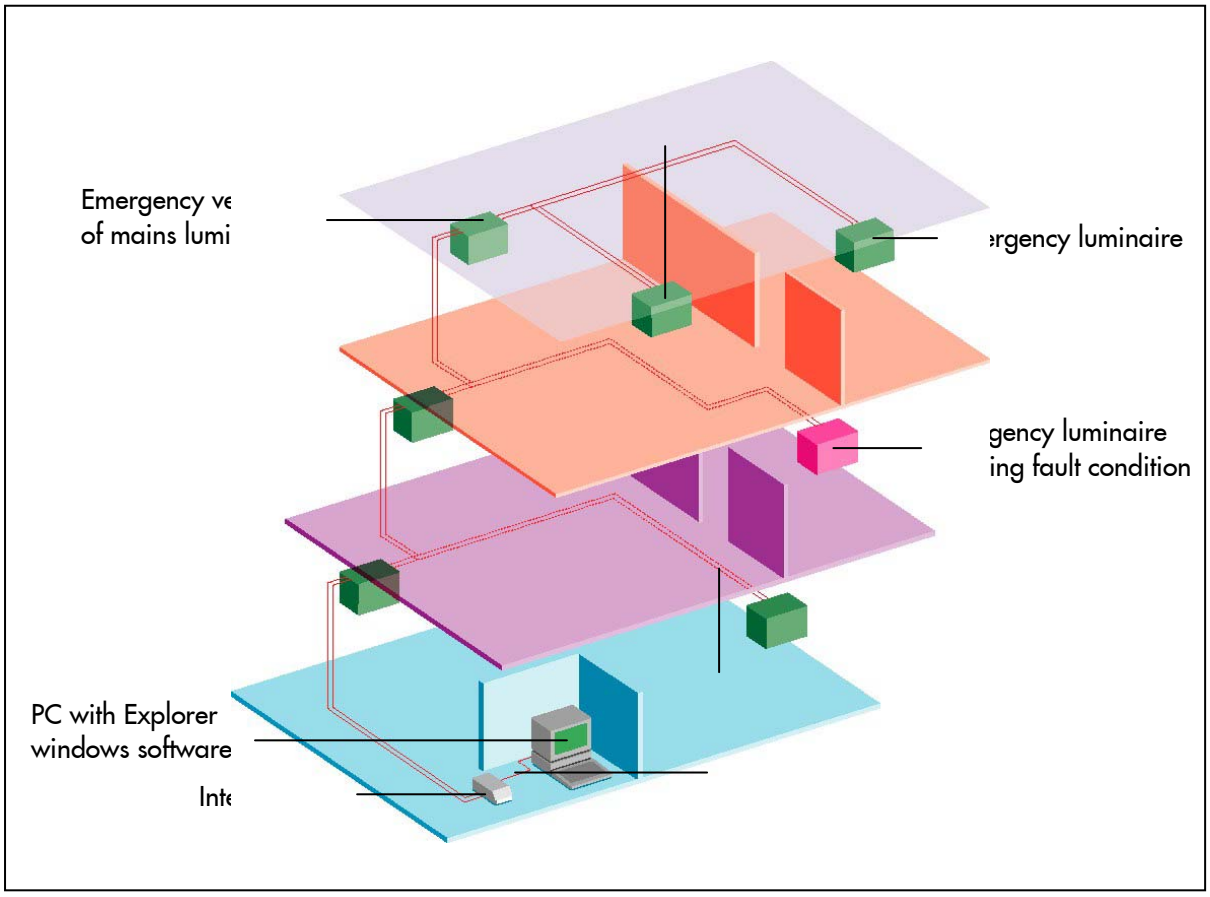


Fig 40 Schematic diagram of Automatic Testing System

Tests with Explorer

- Mains failure
- Faulty/missing lamps
- Battery capacity
- Emergency lighting duration
- Battery not charging
- Circuit integrity

There has always been a requirement for the regular testing of emergency lighting luminaires, however this has often been overlooked. New and incoming legislation now puts the responsibility for fire safety clearly with the director of businesses (Place of Work Act) and with building operators. All emergency lighting installations should be regularly tested and the results recorded for inspection.

11 Product Examples

1. Slim edge lit maintained exit sign with control gear and lamp in ceiling recessed box.

2. Functional exterior bulkhead IP65. Can have Euro legends and pictograms attached.

3. Decorative opal glass maintained luminaire.

4. A non-maintained, tungsten halogen twin spot luminaire for high bay and industrial applications.

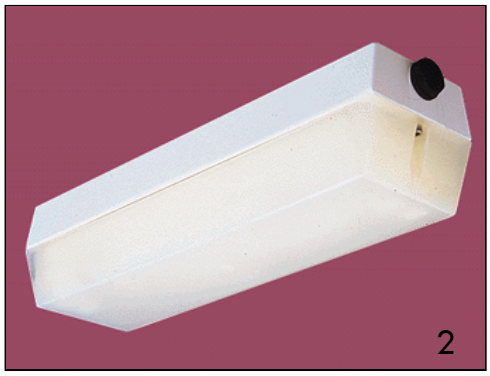
5. Maintained recessed modular luminaire with louvre.

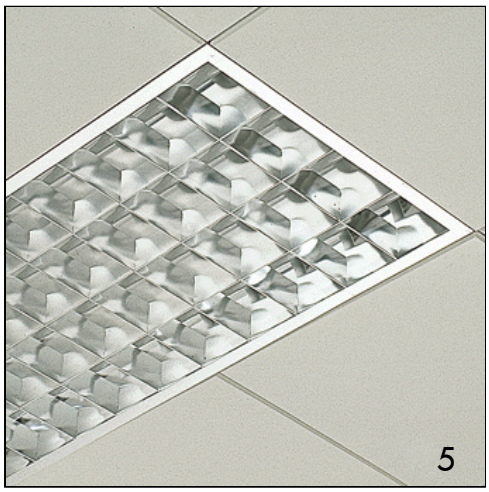
   (see Comprehensive Catalogue for full range of product)

Thorn Lighting offers a wide range of emergency versions of luminaires for commercial and industrial applications using long tube fluorescent lamps. They are usually identical luminaires, but an integral emergency function allows the design freedom to create unified lighting schemes.

Since all Thorn Lighting emergency fittings come purpose built, straight from the factory they are CE marked, assuring safety. They are designed to comply with EN 60 598 2.22 and are designed and manufactured under ISO 9001. All gear is designed to comply with EN 60 924/5.

Any modification or conversion invalidates existing certification (e.g. kitemark, CE, ENEC) and contravenes the product liability provisions of the Consumer Protection Act 1987. Mains versions should not be converted by sub-contractors or emergency lighting manufacturers to emergency use by the addition of batteries and emergency modules.





Questions 2

1. What is the minimum recommended mounting height for emergency lighting luminaires?

2. What is the consequence of the ambient temperature being 16°C on the output of emergency luminaires with fluorescent tubes?

3. In a building needing emergency lighting do all the toilets need emergency lighting?

4. If an illuminated exit sign is 111 × 378 mm what is the maximum recommended viewing distance?

5. For the open area data shown on page 16 what is the maximum distance between the centre of the luminaire to the wall for transverse spacing when the luminaires are mounted at 4 m from the floor for BS5266:1999 illuminance requirements.

6. How is the term Emergency Factor derived?

7. In open areas over what area does BS5266:1999 require at least 0.5 lux on the floor excluding shadowing effects of contents?

8. Give two key advantages to using programmable central testing for emergency lighting.

9. What is the consequence of other manufacturers modifying Thorn Lighting luminaires for emergency lighting?

12 Definitions

Ballast lumen factor (BLF)
The ratio of the light output of a lamp operated on a test ballast, to the light output on a reference ballast all under test conditions.

Combined (sustained) emergency lighting
Luminaire with two or more lamps, one of which is energised from the battery and the other from normal mains supply (for Fire Authority approval, this luminaire is regarded as non-maintained).

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

Emergency factor (EF)
The term EF = BLF × K × UF where BLF is the ballast lumen factor, K is the smaller of (F5) 5 seconds duration light output or (Fend) end of duration light output, and UF the utilisation factor with floor, wall and ceiling reflectances of zero.

Emergency exit
A way out that is intended to be used during an emergency.

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

Emergency lighting design lumens (ELDL)
The lumen output of the lamp measured on a reference circuit at the end of the lamp life multiplied by the Ballast Lumen Factor (BLF) of the specific emergency lighting circuit.

End of duration light output factor (Fend)
The ratio of the light output at the end of the rated duration, to the nominal light output under test conditions.

Escape route
A route designated for escape in the event of an emergency

Escape route lighting
That part of emergency escape lighting provided to ensure that the means of escape can be effectively identified and safely used when the location is occupied.

High risk task area lighting
That part of emergency lighting 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.

Initial light output factor (F5)
The ratio of the light output at 5 seconds after switch-over to emergency operation, to the nominal light output under test conditions.

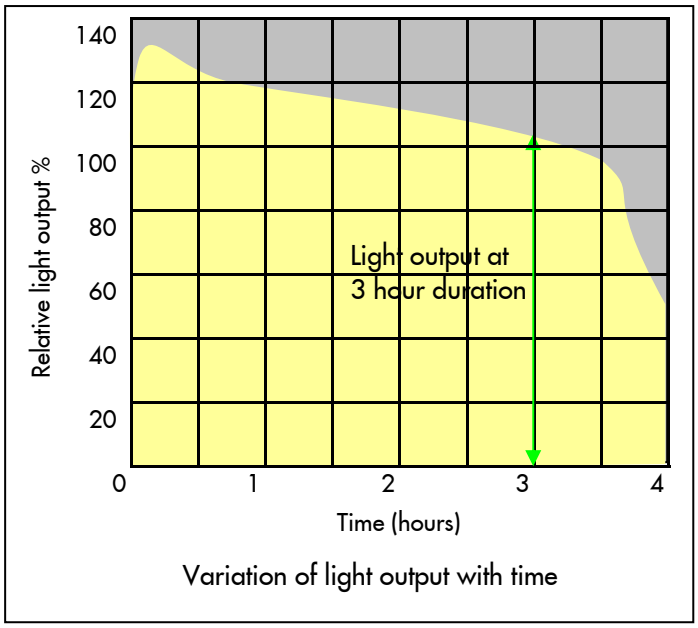


Fig 41 Evaluation of Fend

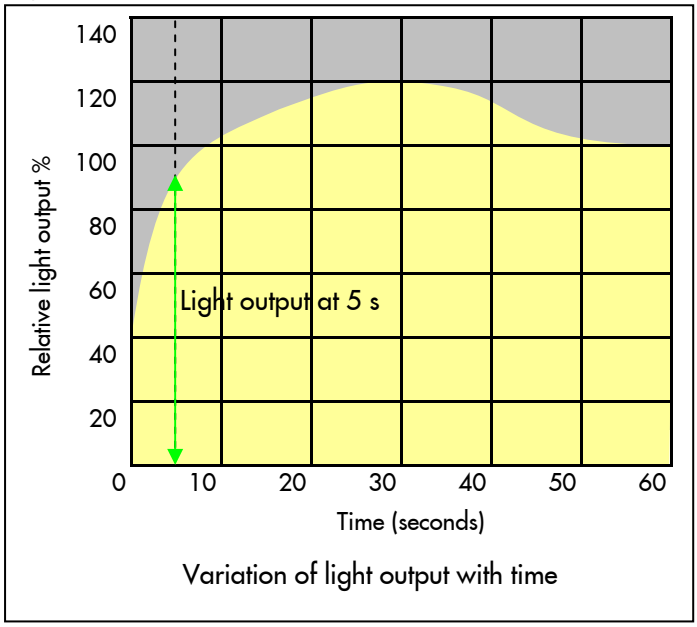


Fig 42 Evaluation of F5

Maintained emergency lighting
Luminaire containing one or more lamps, all of which operate on normal mains supply and on emergency mode upon mains supply failure.

Non-maintained emergency lighting
Luminaires containing one or more lamps, all of which operate only upon mains failure.

Open area (anti-panic) 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.

Safety sign
A sign which gives a general safety message, obtained by a combination of colour and geometric shape and which, by addition of a graphic symbol or text, gives a particular safety message.

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

Uniformity
The ratio of the minimum illuminance to the average illuminance over a given area.

References

CIBSE TM 12 Emergency Lighting 1986
BS 5266-1 Emergency Lighting 1999
BS 5266-7 Emergency Lighting 1999

ICEL Guides

ICEL 1006: Emergency Lighting Design Guide
ICEL 1008: Emergency Lighting Risk Assessment Guide

13 Appendix 1

Summary of luminous requirements of BS5266:1999

Escape Routes	
Illuminance	Not less than 0.2 lux (but preferably 1 lux) centre line, 0.1 lux centre area. 1 lux at point of emphasis
Illuminance max. to min.	Not to be greater than 40:1 along centre line of escape route
Siting of luminaires	Within 2 m of points of emphasis at each exit door intended to use in an emergency near stairs so that each flight of stairs receives direct light near any other change in level mandatory emergency exits and safety signs at each change of direction at each intersection of corridors outside and near to each final exit near each first aid post near each piece of fire fighting equipment and call point
Illuminance	At point of emphasis not less than 1 lux along centre line of escape route
Exit signs	Pictogram ISO 3864, white on green
Disability glare	Level routes limit intensity in zone 60° to 90° Other routes limit intensity at all angles
Colour rendering	Lamp minimum Ra over 40
Minimum duration	1 hour
Anti-panic open areas	
Illuminance	Not less than 0.5 lux excluding 0.5 m border
Illuminance max. to min.	Not to be greater than 40:1
Response time	50% of design value in 5 sec*, 100% of design value in 60 sec
Minimum duration	1 hour
High risk areas	
Illuminance	Min 10% of design illuminance, however not less than 15 lux
Uniformity	Min 0.1
Response time	Design value in 0.5 sec
Minimum duration	Period risk exists to people
Standby lighting	Provided to enable normal activities to continue
Safety signs	
Type	Set out in EC Directive 92/58/EEC May be externally or internally illuminated
Response time	50% of design value in 5 sec, 100% of design value in 60 sec
Colour	Conform to ISO 3864
Luminance	Safety colour 2 cd/m^2 min.
Diversity	Max to min luminance not greater than 10:1 (green) Max to min luminance not greater than 10:1 (white)
Contrast	$L_{white} \div L_{colour}$ between 5 and 15
Viewing distance	100 × height of externally illuminated sign 200 × height of internally illuminated sign
Signs	Between 2 m and 2.5 m above the floor
All luminaires	
Mounting	At least 2 m above the floor

* Can be extended to 15s.

Appendix 2

Table of suggested lamp lumen outputs

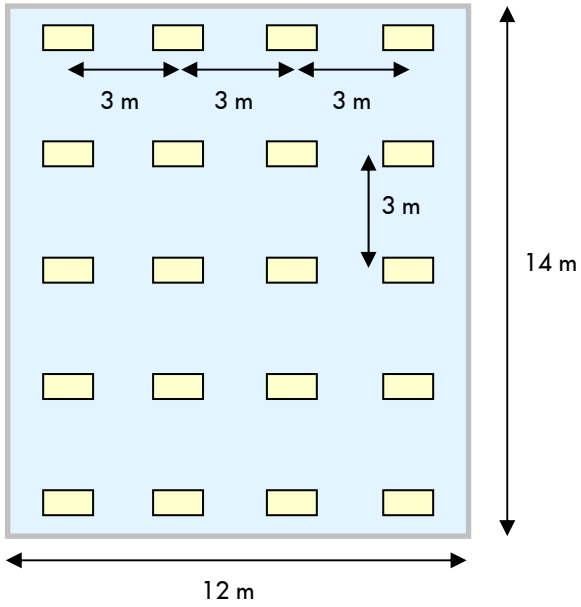
Lamp type (mm)	Rating W	Colour	Non-maintained (NM)		Maintained (M)	
			Initial Lumens (lm)	Design Period (h)	Design Lumens (lm)	Design Period (h)
150(16)T5	4	white	150	100	-	-
300(16)T5	8	white	480	100	400	4000
600(26)	18	white*	1225	100	1050	4000
1200(26)	36	white*	3000	100	2580	4000
1500(26)	58	white*	4800	100	4130	4000
1800(26)	70	white*	5800	100	4990	4000
2D	16	Polylux	1050	100	900	8000
	21	Polylux	1350	100	1150	8000
	28	Polylux	2050	100	1850	8000
	38	Polylux	2850	100	2500	8000
4 limb	13	Polylux	900	100	750	8000
	18	Polylux	1200	100	1000	8000
	26	Polylux	1800	100	1490	8000
2 limb	34	Polylux	2800	100	2380	8000
	40	Polylux	3500	100	3000	8000
	55	Polylux	4800	100	4100	8000

*White lamps may be installed in luminaires that are designed for lamps of higher output. It is recommended that the lumen values for white lamps are used so whatever colour of lamp is installed the criteria is met.

Appendix 3

Open area example to BS5266:1988

Quattro T-line maintained, recessed modular luminaire with 2 × 36W linear fluorescent lamps (EE3RFQTZ236 + FQTLS2312 CAT3 MB)
Mounting height: 4 metres above floor.
Emergency design requirements (BS 5266, 1988):
Average illuminance 1 lux, uniformity 0.025
In the example for general, non-emergency lighting, luminaires are modularly spaced at 3.0m.
20 luminaires gives an illuminance of about
450 lux.



Spacing
For emergency purposes it is often better to assess maximum spacing before calculating the minimum number of luminaires required.

The limits on centre to end spacing and between centre spacing need to be known. The values should be read against a minimum illuminance of 0.025 lux, and mounting height of 4m.

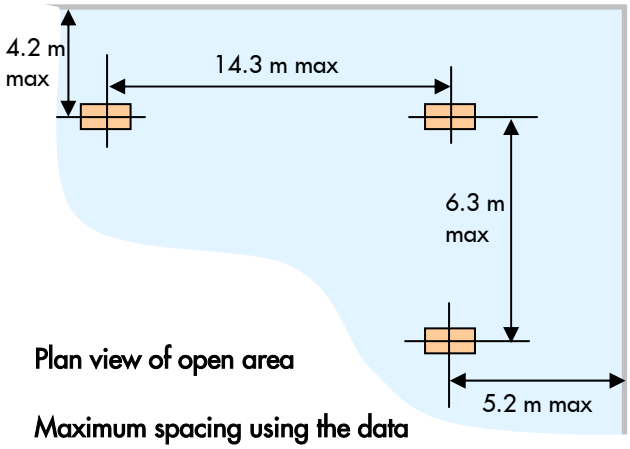
Spacing Data
Open area

		Maximum spacing (m)			
		Centre to end		Between centres	
illuminance (lux)	Mounting height (m)	trans	axial	trans	axial
	2	2.35	3.25	5.80	7.40
	3	3.30	4.35	4.80	12.80
	4	4.20	5.20	6.30	14.30
	2	1.90	2.85	2.60	6.60
	3	2.80	2.50	5.30	6.90
	4	2.00	4.00	7.10	6.60

The relevant information is highlighted in the tables and is used in the example.

Emergency factor SHR NOM = 2.5					
Room index	1	2	3	4	5
EF	0.04	0.04	0.04	0.04	0.04

Data code: R0002479

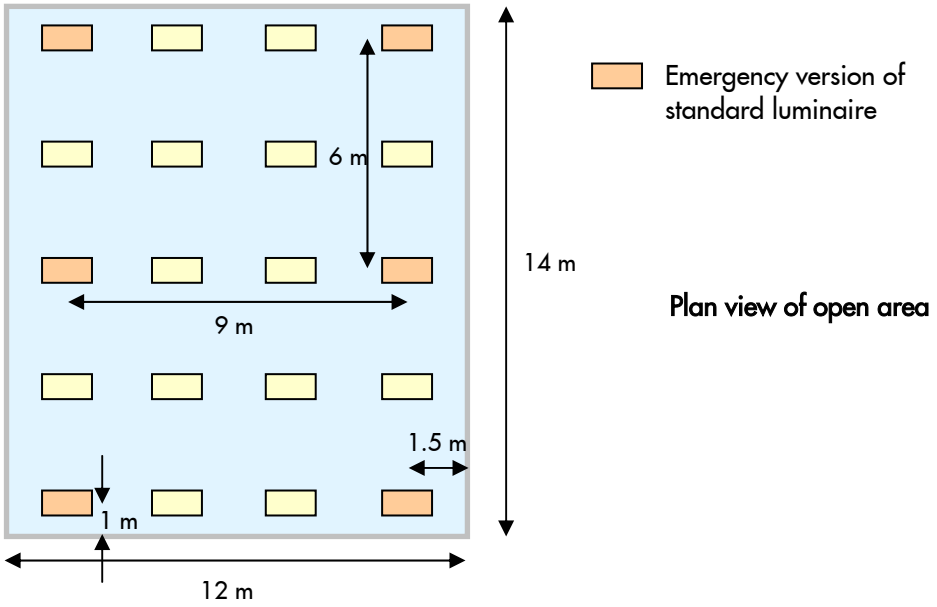


For schemes that use modular luminaires, it should be remembered to account for modular co-ordination when setting emergency luminaires spacing.

Care should be taken when checking the uniformity of open areas using emergency luminaires that have a narrow light distribution such as downlights or some luminaires with reflectors.

To establish the correct spacing for the above criteria, simply read off the appropriate values from the photometric data.

From the highlighted data above the spacing limits are shown at the top of this page.
Highlighted figures in the example correlate to maximum spacing allowed to achieve a uniformity of at least 0.025. The constraint imposed by the module of the ceiling layout allows six luminaires to be used that fall within the maximum spacing limits.



Average illuminance
Having calculated the maximum spacing between luminaires to achieve a uniformity of at least 0.025, the next step is to calculate the minimum number of luminaires to achieve an average illuminance of 1 lux.

The familiar formulae are used:

$$\text{Room Index} = \frac{L \times W}{H(L + W)} \qquad N = \frac{E \times L \times W}{F \times EF \times MF}$$

where:
L = Length of open area (m)
W = Width of open area (m)
H = Height from floor to centre of luminaire (m)
N = Number of emergency luminaires
E = Average illuminance (lux)
F = Initial lamp lumens for non-maintained luminaire, or 'design' lumens for maintained luminaire (lm)
MF = Maintenance factor
EF = Emergency factor

The term EF = BLF × K × UF where BLF is the ballast lumen factor, K is the smaller of (F5) 5 seconds duration light output or (Fend) end of duration light output, and UF the utilisation factor with floor, wall and ceiling reflectances of zero.

Applying the values established in our example gives the following:

$$\text{Room index} = \frac{14 \times 12}{4(14 + 12)} = 1.6$$

Emergency factor, EF is read as 0.04 from the data for the room index of about 2, not that it matters in this case as all values are 0.04.

Other values are inserted in the formula for N:
E = 1 lux
L = 14 m
W = 12 m
F = 2580 lm (value taken from table of maintained design lumens in **Appendix 2**)
MF = 0.9

$$N = \frac{1 \times 14 \times 12}{2580 \times 0.04 \times 0.9} = 1.8$$

When N is not a whole number it must be rounded up to ensure the average illuminance of 1 lux is achieved. However the number of luminaires required for uniformity, 6 is greater than the 2 required to have at least 1 lux, so the scheme requires 6 luminaires.

The final average illuminance for the 6 luminaires can be calculated by the formula:

$$E = \frac{N \times F \times EF \times MF}{L \times W} = \frac{6 \times 2580 \times 0.04 \times 0.9}{14 \times 12} = 3.3 \text{ lux}$$

For this example these calculations show that using 6 luminaires, the minimum average illuminance of 1 lux is easily exceeds with a uniformity better than 0.025.

14 Answers to Questions

Questions 1

1. To save lives.
2. a) The need for emergency lighting – covering legal requirements and enforcing bodies.
   b) The application of emergency lighting – covering criteria for use.
   c) The products for emergency lighting – covering product design, manufacture, materials and operation.
3. Workplace Directive.
4. BS 5266:1999.
5. Standby lighting is that part of emergency lighting provided to enable normal activities to continue in the event of failure of the normal mains supply.
6. Corridors and stairways, or gangways in open areas.
7. Horizontal illuminance at the floor on the centreline of the route should not be less than 0.2 lux, with 0.9 m of the width of the route being lit to a minimum of 0.1 lux.
8. A minimum horizontal illuminance on the unobstructed floor of 0.5 lux anywhere except 0.5 m to the perimeter of the area.
9. 1 m.
10. The lamp is lit at all material times and is powered by the mains supply under normal conditions. In emergency conditions, when the mains fails, an emergency power source cuts in to power the lamp.
11. A 3 hour duration is preferable so that after evacuation of a building, that could take less than an hour, the building could then be safely re-occupied straight away. A 1 hour duration for the system would still be available.

Questions 2

1. 2 m
2. The light output is 70% of published data.
3. Yes if there is no borrowed light, otherwise toilets over 8 m^2 need emergency lighting.
4. 22.2 m.
5. 2.5 m.
6. Emergency Factor = BLF × K × UF where BLF is the ballast lumen factor, K is the smaller of (F5) 5 seconds duration light output or (Fend) end of duration light output, and UF the utilisation factor with floor, wall and ceiling reflectances of zero.
7. The core area excluding 0.5 m to the perimeter walls.
8. It is a simple cost effective way of checking the compliance of an emergency system.
   It is easier to comply with new and incoming legislation that puts the responsibility for fire safety with the director of businesses (Place of Work Act) and with building operators.
9. Doing so invalidates existing certification, such as the CE and ENEC mark and contravenes the product liability provisions of the Consumer Protection Act 1987.

15 Summary

Purpose

In human terms, the purpose of emergency lighting is to save lives. It does so by:

- guiding people quickly and safely from the building
- enabling specific tasks to be completed
- avoiding panic
- restoring confidence

Complying with legislation

The need for emergency lighting

Fire Precautions Act, 1971
Guides to Fire Precautions Act, 1971
Health and Safety at Work Act, 1974
The Building Regulations 1991, Fire safety section B1
Health and Safety (Safety Signs and Signals) Regulations 1996
Local Fire Authorities
Workplace Directive
Construction Product Directive
Building Regulations 1991

The application of emergency lighting

BS 5266 Part 1, 1988
CIBSE TM12
BS 5499 Part 1, 2 & 3
BS 5266 :1999
Pr EN 50 172
Pr EN 50 171

The products for emergency lighting

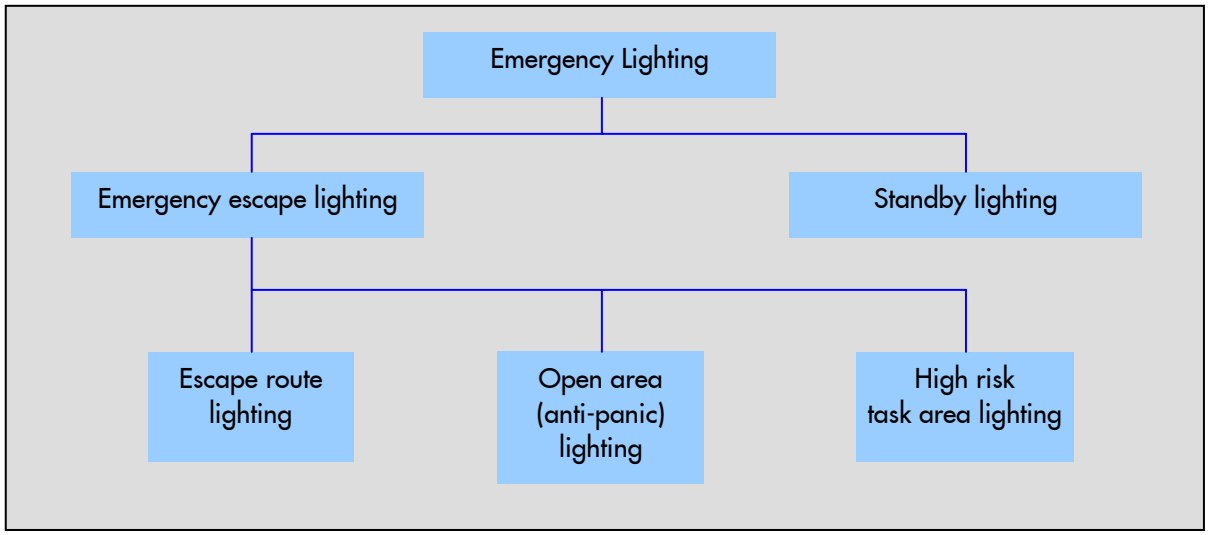
BS 4533: 102.22/EN 60 598 2.22
BS 5499 Parts 1, 2 & 3
ISO 3864:1984
CE Mark Directive

Application

BS 5266 Part 1, 1999 sets out the standards for design and the installation of emergency lighting. It deals with:

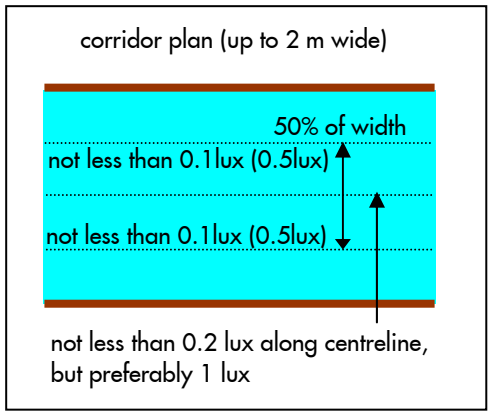
- How much light there should be in those areas in which it is mandatory to have emergency lighting.
- How long the light should remain on for in an emergency.
- How fast the emergency lighting should come on after the mains system has failed.

It is recommended that the Fire Officers or Local Authorities are consulted at the early stage of scheme design.



Specific forms of emergency lighting

Clearly defined escape routes



Along an escape route strategically place signs indicating the way out of a location. It is very important that exits are clearly signposted and are visible, whenever the location is occupied. Corridors and stairways, or gangways in open areas are all classified as clearly defined escape routes.

For stairways, the illuminance should be measured horizontally at the edge of each tread. Routes wider than 2 m can be treated as several 2 m bands.

An escape lighting luminaire needs to be sited to provide appropriate illumination near each exit door and at positions where it is necessary to emphasis potential danger or safety equipment.
For **points of emphasis** the minimum horizontal illuminance at the floor along the centreline of the escape route should not be less than 1 lux.

- at each exit door intended to be used in an emergency
- near stairs so that each flight of stairs receives lighting
- near any other change of level
- mandatory emergency exits and safety signs
- at each intersection of corridor
- outside and near to each final exit
- near each first aid post
- near each piece of fire fighting equipment and call point.

All emergency luminaires on escape routes must pass the fire retardant housing 850°C test specified in EN 60598-2-22.

Low location lighting

Low location lighting can be used to supplement existing emergency lighting schemes. These systems when used with standard emergency lighting, maintain confidence and reduce panic by making escape routes and exits more clearly visible.

Signage

Signage is governed by two standards:
BS 5499, Part 1: 1990
European Safety Sign Directive.

- For a new installation use signs complying with the Signs Directive, the 'running man'.
- For a building with some exit signage, the colour, format, and style of additional signs should be consistent with those already installed, if they are an acceptable format.
- It is advisable to check the format with enforcing agencies.

Open areas

BS 5266, 1988 requirements
- the average horizontal illuminance when measured on an unobstructed floor should be not less than 1.0 lux, with a uniformity of 0.025.
- exit signs should be visible from any part of the space.

BS 5266:1999 requirements
- 0.5 lux anywhere except 0.5 m to the perimeter of the area.
- exit signs should be visible from any part of the space.

Adaptable seating areas and **stepped areas** are treated as open areas in CIBSE TM12 as BS5266 above.

Fixed seating areas

CIBSE TM 12, 1986 requirements
These should have at least 0.1 lux over the seating area with a minimum uniformity of 0.025. This is measured on a plane 1 m above floor/pitch line. Gangways should be treated as clearly defined escape routes.

High risk task area lighting

BS 5266:1999 requirements
This new category aims to ensure the safety of people carrying out potentially dangerous tasks. (e.g. working with moving machinery and acid baths; and where there is a restricted escape route such as at a turnstile.) This should have 15 lux or 10% of normal lighting levels (whichever is the greater) within 0.5 s.

Specific locations

Lift cars

BS 5266, 1999 requirements
An emergency luminaire should be fitted in lift cars in which people may travel. Luminaires should preferably be self-contained.

Toilet lobbies and closets

BS 5266, 1999 requirements
Facilities exceeding 8 m^2 gross area and facilities of less than 8 m^2 without borrowed light should be provided with escape lighting, complying as if they were part of an escape route.

Covered car parks

BS 5266, 1999 requirements
Pedestrian escape routes from covered and multi-storey car parks should be easily identifiable and should be provided with emergency lighting.

External lighting

BS 5266, 1999 requirements
The area outside the building beyond the final exit must be adequately lit.

Power systems for emergency lighting

In emergency conditions, emergency lighting is usually operated by batteries or generators that are automatically triggered as soon as the mains system fails. The two main types of system are:

Self-contained systems
Central systems

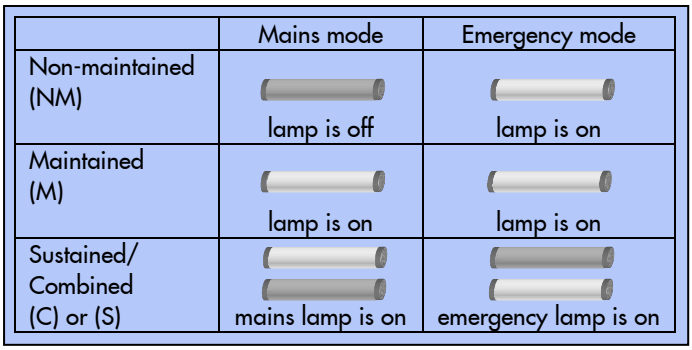
Mode of operation

Non-maintained (NM)

The lamp is only lit when the mains fail and is operated by an emergency power source.

Maintained (M)

The lamp is lit at all material times and is powered by the mains supply under normal conditions. In emergency conditions, when the mains fails, an emergency power source cuts in to power the lamp.



Combined/Sustained (C)

This is a variant of the maintained luminaire in which one lamp is powered by the mains supply during normal conditions. A second lamp operates only under emergency conditions powered by an emergency power source. This type of luminaire provides light at all material times.

Duration

This is the minimum period of time that the emergency luminaire remains lit to the minimum design output, after a mains failure. Various premises require different durations, from 1-3 hours..

Operating response

Operating response is the amount of time that elapses between the mains system failure and the illumination of the emergency system.

15 seconds

In places where the occupants are familiar with the building. (e.g. a place of work)

5 seconds

In places where the surroundings may be unfamiliar. (e.g. a hotel, a public library or a covered car park.)

Instantaneous

In highly critical areas (e.g. control rooms, intensive care units)

Choosing the right emergency lighting solution

There are three types of criteria, which may determine the type of emergency lighting installed:

- Functional criteria
- Performance criteria
- Aesthetic criteria

Functional

Many areas require products which have a purely emergency function which are continuously lit These luminaires may well not be part of the overall lighting scheme. Functional emergency luminaires tend to put durability, toughness and reliability before aesthetics.

Signage is functional but the products should be in keeping with their surroundings, particularly in prestige environments.

Performance

Performance qualities may be in terms of the materials of the emergency luminaires.
(e.g. in environments where corrosive or damp atmospheres prevail.)
Other areas place demands on the quality of light.
(e.g. low glare requirements in hospitals or where VDTs are used.)

Aesthetic

The overall lighting design and ambience is crucial in hotels, public buildings and many other prestige environments. The lighting for aesthetic areas must incorporate luminaires with an integral emergency function that allows design freedom and a unified lighting scheme.

Designing an emergency lighting scheme

List of considerations when designing emergency lighting for any area. They can be marked on a floor plan, as can the final positions of all mains emergency luminaires.

Signage

Points at which emergency lighting is required, but where the luminaires are not necessarily contributing to illuminance levels.

- Identify exists and final exists
- Identify points where directional signage is required i.e. corners, doorways etc.
- Identify location of hazards, safety signs, fire-fighting equipment, alarm call points
- Identify location of exterior exits
- Select appropriate products

Illuminance

Areas in which emergency lighting is required:

- Identify clearly defined escape routes
- Identify open areas
- Identify special areas
- Identify toilets and cubicles over 8 m^2 , and less than 8 m^2 without borrowed light
- Noting illuminance requirements select appropriate products per area
- Work out number of luminaires required to give design illuminance and uniformity
- Prior to installation, check for any changes to the building or equipment that may require additional luminaires to the scheme.

Design points

For schemes that use modular luminaires, it should be remembered to account for modular co-ordination when setting emergency luminaires spacing.

Care should be taken when checking the uniformity of open areas using emergency luminaires that have a narrow light distribution such as downlights or some luminaires with reflectors.

Checking compliance, commissioning and maintenance

A framework for obtaining certification of design, installation and commissioning, periodic testing and servicing is in BS 5266:1999.

Maintenance and testing

Regular inspection, testing and servicing of emergency lighting systems must be carried out to ensure effective and reliable operation at all material times. The owner/user of a premise is responsible for maintaining a logbook documenting all maintenance and test procedures.

Self-contained luminaires

(BS 5266-1: 1999)

Daily	Check every lamp in a maintained system is lit. Record faults in log book and take action to remedy faults.
Monthly	A short operational check to ensure that each luminaire illuminates on mains failure.
Six monthly	A duration test should be carried out for a period of at least one hour for 3 hour duration products, or 15 minutes for one hour duration products.
3 yearly	Check installation for compliance with Code and check luminaires for full rated duration, repeat yearly for full duration.
Then annual test	Repeat 3 yearly test.

Central power systems

Any emergency lighting scheme powered by a central system must also be given regular checks as set out in BS 5266-1:1999.

Programmable Central Testing for Emergency Lighting

This provides a simple cost effective solution to this often onerous and expensive manual task.
There has always been a requirement for the regular testing of emergency lighting luminaires. New and incoming legislation now puts the responsibility for fire safety clearly with the director of businesses (Place of Work Act) and with building operators.

Converting mains luminaires for emergency

All Thorn Lighting emergency luminaires are purpose built, straight from the factory and they are CE marked, assuring safety. They are designed to comply with EN 60 598 2.22 and are designed and manufactured under ISO 9001. All gear is designed to comply with EN 60 924/5.

Any modification or conversion invalidates existing certification (e.g. kitemark, CE, ENEC) and contravenes the product liability provisions of the Consumer Protection Act 1987. Mains versions should not be converted by sub-contractors or emergency lighting manufacturers to emergency use by the addition of batteries and emergency modules.