

LED solutions

EN 1838 Emergency Lighting

Technical Information



TRIDONIC

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Why emergency lighting

Power supply systems may fail at any time, for example as a result of severe weather, fire, construction work or overloads. In serious cases it must be possible for people to leave buildings safely and for rescue services to be deployed.

The following minimum requirements for emergency lighting are defined in European standard EN 1838

- _ Emergency lighting must be at least twice as bright as the moon in a cloudless sky
- _ There must be an adequate number of signs to clearly indicate the escape route

Cloudless night sky	0.01 lux
Full moon	0.25 lux
Anti-panic lighting	0.5 lux
Safety lighting	1 lux

Definition of emergency lighting

The relevant standards define emergency lighting as lighting that is activated as a result of a malfunction in the general artificial lighting. The following systems may be used as replacement power supplies: single batteries, group batteries, central batteries, generating sets or a specially protected mains power supply.



2.1. Safety lighting

Safety lighting must provide for a minimum brightness level to avoid panic in buildings and to allow for hazardous procedures to be completed and equipment to be turned off safely. Escape routes and safety devices must be clearly recognisable, thus enabling people to leave the premises quickly. Safety lighting breaks down into anti-panic lighting, escape route lighting and safety lighting for high-risk workplaces.

2.2. Secondary lighting

Secondary lighting provides light in places where power failures will not cause any hazard, but where nevertheless work needs to be continued. For a limited period of time, it will assume the function of general lighting.

2.3. Anti-panic lighting

Anti-panic lighting is meant to avoid panic in case of a power failure and to enable the people in the building to clearly recognise escape routes. The required illuminance level in the defined area is at least 0.5 lux.

2.4. Escape route lighting

Escape route lighting allows for safety devices to be recognised clearly and used safely. Escape routes must be illuminated across a width of 2 m. In doing so, an illuminance level of at least 1 lux along the center line for a path width of one metre must be guaranteed.

According to the EN 1838 standard, the ratio of highest to lowest illuminance must not exceed 40:1 for anti-panic and escape route lighting. The required illuminance level must be reached after no longer than 60 seconds. 50 per cent of the illuminance level, however, must be reached already after 5 seconds. The rated service time is at least one hour.

2.5. Emergency lighting for high-risk workplaces

Emergency lighting for high-risk workplaces must reach 10 per cent of the illuminance level required for the respective tasks or at least 15 lux after a maximum switch-on delay of 0.5 seconds. The ratio between highest and lowest illuminance must not exceed 10:1.

Objectives of emergency lighting

- _ Safe escape from the problem zone on failure of the general power supply (visibility required for evacuation)
- _ Adequate visibility and orientation along escape routes and in danger zones (illuminated or backlit safety signs along escape routes, direction signs to assist progression towards the emergency exit)
- _ Easy identification of fire-fighting and safety equipment

Requirements for safety lighting

4.1. Uniformity

The ratio of the maximum to the minimum illuminance shall not be greater than 40:1.

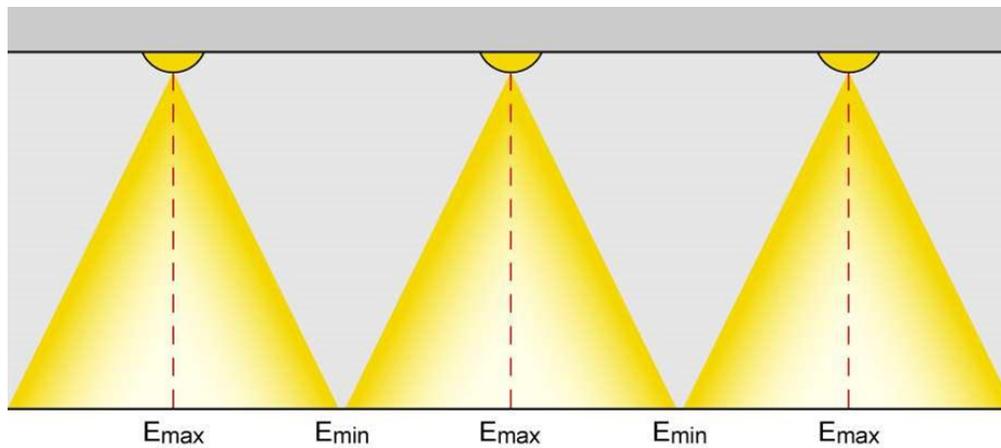


Fig.: Example of lighting for an escape route ($E_{\max} : E_{\min} \leq 40 : 1 \text{ lx}$)

4.2. Safety lighting for escape routes

The safety lighting for escape routes is that part of safety lighting that enables escape facilities to be effectively identified and safely used.

Illuminance	$E_{\min} = 1 \text{ lx}$ (minimum horizontal illuminance at floor level)
Uniformity	$E_{\max} : E_{\min} \leq 40 : 1 \text{ lx}$
Colour rendering	$R_a \geq 40$
Rated service time for escape routes	1 hour
Switch-on delay	50 % of the required illuminance level within 5 seconds, 100 % within 60 seconds
Escape routes up to 2 m in width	<ul style="list-style-type: none"> _ At least 1 lx along the central axis _ 0,5 lx over at least half the width

The measurement is taken 2 cm above the floor; only the direct light from the safety or combination luminaire is taken into consideration.

Country-specific requirements for emergency lighting

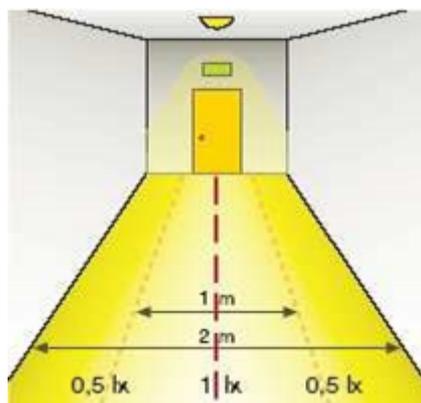


Fig.: Example of horizontal illumination of escape routes

4.3. Anti-panic lighting

Anti-panic lighting is that part of safety lighting that serves to avoid panic and provide illumination to allow people to reach a place where an escape route can be reliably identified.

Illuminance	E (horizontal at floor level) ≥ 0.5 lx (Marginal areas with a width of 0.5 m are not taken into consideration)
Uniformity	$E_{\max} : E_{\min} = < 40 : 1$ lx
Colour rendering	$R_a \geq 40$
Rated service time for escape routes	1 hour
Switch-on delay	50 % of the required illuminance level within 5 seconds, 100 % within 60 seconds

4.4. Hazardous workplaces

There are special requirements that relate to potentially hazardous work processes and situations. Proper shut-down procedures are needed for the safety of operators and all other occupants of the premises, for example in places where machines are running, in laboratories handling hazardous and in control rooms.

Illuminance	$E_{\min} = 10$ % of the level needed for the task or at least > 15 lx
Uniformity	$E_{\max} : E_{\min} = < 10 : 1$ lx
Colour rendering	$R_a \geq 40$
Rated service time for escape routes	For as long as the hazard persists
Switch-on delay	0.5 seconds

Country-specific requirements for emergency lighting

The following points from 5.1 to 5.5 show the deviations of the respective country requirements.

5.1. France

Products must be certified and have defined quality features. Luminance and illuminance levels are not taken into consideration in planning.

Safety lighting for escape routes:

- _ Certified emergency luminaires
- _ Maximum distance between the luminaires 15 m (30 m in schools)
- _ Positioned at each door used as an emergency exit
- _ Near stairways for directly illuminating each stair
- _ Near every change in level
- _ At every change of direction
- _ At every junction in passageways and corridors

Anti-panic lighting:

- _ Certified emergency luminaires must provide 5 lm/m² of floor area
- _ At least two luminaires per room
- _ Distance between the luminaires less than four times the installed height (distance from floor to luminaire)

Safety lighting for hazardous workplaces:

- _ EN 1838 does not correspond to French regulations
- _ The basis is a risk assessment

Safety signs:

- _ French standard NF 08-003 -or-
- _ Compatible standards of other European countries

In public buildings and workplaces, illuminance is not used as a photometric parameter.

5.2. Italy

Public places such as cinemas and theatres:

- _ An illuminance of at least 5 lx near stairways and exits (measured 1 m above floor level)
- _ At least 2 lx along escape routes

Illuminance values are not to be taken as planning values if they are based on specifications. They must be capable of being measured on site including reflections.

Country-specific requirements for emergency lighting

5.3. Germany

Safety lighting for escape routes and anti-panic lighting in workplaces:

- _ Maximum time of 15 seconds between failure of the general lighting system and achievement of the necessary illuminance levels (Workplace Directive § 7 Section. 4, Workplace Guidelines ASR 7/4)

5.4. United Kingdom

The following requirements apply to start-up of the emergency lighting system:

- _ Within 5 seconds of failure of the general lighting system
- _ In buildings that are used mainly by people who know the escape routes: the authorities are at liberty to extend this period to a maximum of 15 seconds (1988 "Emergency Lighting", BS 5266 Part 1)

Horizontal illumination of escape routes (which are unobstructed):

- _ At least 0.2 lx along the central axis
- _ At least 0.1 lx over half the width (for widths up to 2 m)
- _ Wider escape routes: division into 2 m wide zones, illumination as above (1988 "Emergency Lighting", BS 5266 Part 1)

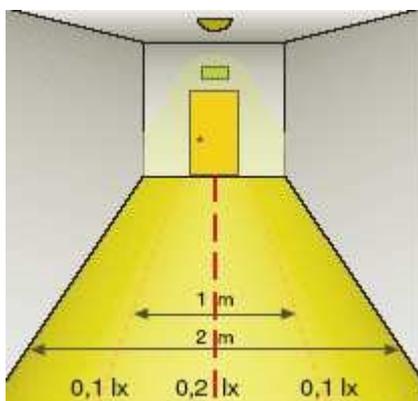


Fig.: Horizontal illumination requirements for United Kingdom

Country-specific requirements for emergency lighting

5.5. Ireland

The following requirements apply to start-up of the emergency lighting system:

- _ Within 5 seconds after failure (1989 "Code of Practice for Emergency Lighting", I.S. 3217)

Horizontal illumination of a clearly identified escape route:

- _ At least 0.5 lx along the central axis at floor level (1989 "Code of Practice for Emergency Lighting", I.S. 3217)

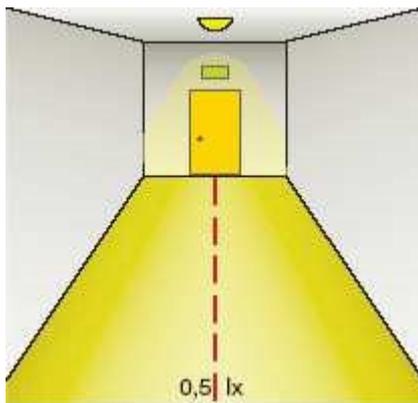


Fig.: Horizontal illumination requirements for Ireland

Safety power sources

Single battery system:

- _ Consists of a maintenance-free battery, charging and monitoring equipment
- _ Supplies backlit safety signs, standard luminaires or other safety equipment

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Tridonic offers the following emergency lighting units for single battery systems:

- _ EM converterLED (BASIC, SELFTEST, ST, PRO)
- _ EM powerLED (BASIC, SELFTEST, PRO)
- _ EM ready2apply (BASIC, SELFTEST, PRO)

Group battery system:

- _ Limited output
- _ Consists of a battery, charging and monitoring equipment

Central battery system:

- _ Battery system without output restrictions
- _ Consists of a battery, charging and monitoring equipment
- _ Supplies the necessary safety equipment

Safety power unit:

- _ Supplies the safety equipment with electrical energy no later than 15 seconds after failure of the general lighting system
- _ Additional measures may be needed to achieve the minimum illuminance within the prescribed period, such as further safety power sources

High-speed standby generating set:

- _ Supplies the safety equipment with electrical energy no later than 0.5 seconds after failure of the general lighting system
- _ Built-in energy buffer (battery) for short-term supplies to loads and if necessary for quickly starting up the generating set

Instant standby generating set:

- _ Supplies the safety equipment with electrical energy immediately on failure of the general lighting system with no interruption
- _ Built-in energy buffer (battery) for short-term supplies to loads and if necessary for quickly starting up the generating set
- _ There may be a temporary frequency deviation on transition from the electric motor to the power engine

Two independent systems:

- _ If one system fails the other ensures that power supply is continuous

Safety power sources

- _ Energy suppliers must prevent the simultaneous failure of both supply systems
- _ Two systems are deemed to be independent if they are decoupled from each other up to a voltage level of 110 kV.

European directives

There are two European directives that govern the need for emergency lighting

The construction products directive (89/106/EEC)

- _ "to ensure that lighting is provided promptly, automatically and for a suitable time when normal power supply to the lighting fails"

The workplace directive (89/654/EEC)

- _ "specific emergency routes and exits must be indicated by signs"
- _ "emergency routes and exits must be provided with emergency lighting of adequate intensity in case the lighting fails"

Europäische Normen

8.1. Application standards and guidance

EN 50172	Emergency escape lighting systems
EN 1838	Lighting applications – emergency lighting

8.2. Product safety and performance standards

EN 60 598-2-22	Emergency luminaires
EN 61 347-2-7	Safety requirements for DC supplied ballasts for emergency lighting
EN 61347-2-13	Lamp control gear - Part 2-13: Particular requirements for d.c. or a.c. supplied electronic control gear for LED modules
EN 62384	DC or AC supplied electronic control gear for LED modules - Performance requirements
EN 60 925	Performance requirements for DC supplied ballasts for emergency lighting