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National foreword

This document (EN 1838:2013) has been prepared by Technical Committee CEN/TC 169 “Light and lighting” (Secretariat: DIN, Germany).

The responsible German body involved in its preparation was the *Normenausschuss Lichttechnik* (Lighting Technology Standards Committee), Working Committee NA 058-00-16 AA *Notbeleuchtung.*

Where the International Standards referred to are not also DIN ISO Standards with the same number, there are no national standards available.

Amendments

This standard differs from DIN EN 1838:1999-07 as follows:

a) the points of emphasis for placing lighting devices have been clarified and improved and the external illumination has been clarified as needing to extend to a place of safety. The illumination of fire alarm call points and first aid posts is now consistent, regardless of their location, and has been related to the equipment to be operated;

b) it has been clarified that all illuminance levels are maintained values;

c) it has been clarified that the first reflection, for example of an uplight used as emergency escape lighting may be taken as direct light, if the reflecting surface is considered in the maintenance plan;

d) the colour and style of safety signs has been amended to the revised ISO format;

e) for safety signs used in a bright environment or under general lighting conditions, reference is made to ISO 3864-1 and ISO 3864-4;

f) it has been stated that the formula to determine the maximum viewing distance of a safety sign is only applicable if the safety sign is mounted not higher than 20° above the horizontal view;

g) the A-deviations of Germany and some other countries have been amended.

Previous editions

DIN 5035-5: 1979-12, 1985-01, 1987-12
DIN EN 1838: 1999-07

Bibliography

DIN ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1838

July 2013

ICS 91.160.10

Supersedes EN 1838:1999

English Version

Lighting applications - Emergency lighting

Éclairagisme - Eclairage de secours

Angewandte Lichttechnik - Notbeleuchtung

This European Standard was approved by CEN on 15 June 2013.

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Foreword

This document (EN 1838:2013) has been prepared by Technical Committee CEN/TC 169 “Light and lighting”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2014, and conflicting national standards shall be withdrawn at the latest by January 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1838:1999.

Users of this European Standard, prepared in the field of application of Article 153 of the Treaty on the Functioning of the European Union TFEU, should be aware that standards have no formal legal relationship with Directives which may have been made under Article 153 of the Treaty on the Functioning of the European Union TFEU.

Significant changes between this document and EN 1838:1999 are:

a) Illumination of the points of emphasis have been clarified and improved and the external illumination has been clarified as needing to extend to a place of safety. Illumination of fire alarm call points and first aid posts are now consistent, regardless of their location, and are defined at the equipment to be operated;

b) The colour and style of safety signs is amended to the revised ISO format;

c) The A deviations of some countries have been amended.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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Introduction

Emergency lighting is provided for use when the supply to the normal lighting fails and is therefore powered from a source independent of that supplying the normal lighting.

For the purposes of this standard emergency lighting is regarded as a generic term of which there are a number of specific forms, as shown in Figure 1.

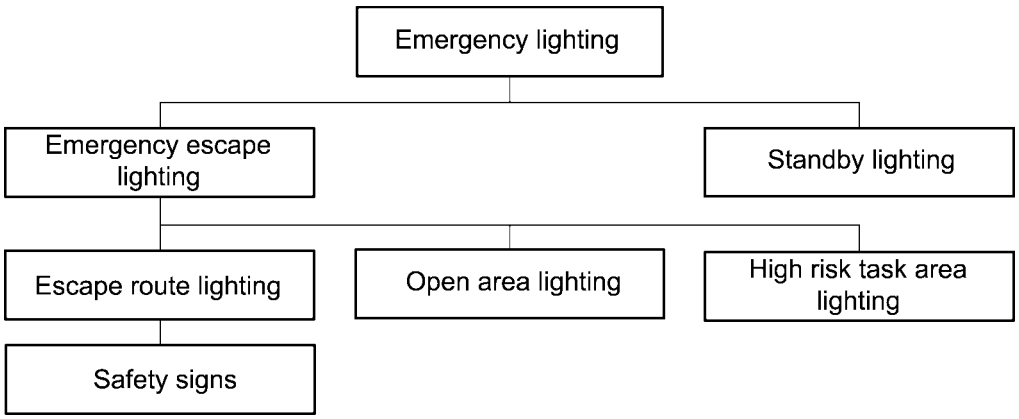

Figure 1 — Specific forms of emergency lighting

The overall objective of **emergency escape lighting** is to enable safe exit from a location in the event of failure of the normal supply. The objective of each form within this category is as follows.

- The objective of **escape route lighting** is to assist 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.

- The objective of emergency lighting of escape route **safety signs** is to provide appropriate visual conditions and direction finding to assist escape routes to be readily located and used.

- The objective of **open area (anti-panic) lighting** is to reduce the likelihood of panic and to enable safe movement of occupants towards escape routes by providing appropriate visual conditions and direction finding. The flow of light for escape routes or open areas should be downward to the working plane but illumination should also be provided to any obstruction up to 2 m height above that plane.

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

There are techniques that may be used as a supplement and when applied to escape routes in addition to conventional emergency lighting luminaires can enhance their effectiveness in an emergency. These techniques are not included in this standard.

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

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.

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1 Scope

This European Standard specifies the luminous requirements for emergency escape lighting and standby lighting systems installed in premises or locations where such systems are required. It is principally applicable to locations where the public or workers have access.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12665:2011, *Light and lighting – Basic terms and criteria for specifying lighting requirements*

EN 50172, *Emergency escape lighting systems*

EN 60598-2-22, *Luminaires – Part 2-22: Particular requirements – Luminaires for emergency lighting (IEC 60598-2-22)*

EN 62034, *Automated test systems for battery powered emergency escape lighting (IEC 62034)*

EN ISO 7010, *Graphical symbols – Safety colours and safety signs – Registered safety signs (ISO 7010)*

ISO 3864-1, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs and safety markings*

ISO 3864-4, *Graphical symbols – Safety colours and safety signs – Part 4: Colorimetric and photometric properties of safety sign materials*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12665:2011 and the following apply.

3.1
emergency lighting
lighting provided for use when the supply to the normal lighting fails
[SOURCE: IEC 60050-845]

3.2
escape route
route used to evacuate in case of an emergency, starting where the evacuation starts and ending at a place of safety

3.3
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

3.4
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

3.5
open area lighting
that part of emergency escape lighting provided to avoid panic and provide illumination allowing people to reach a place where an escape route can be identified
Note 1 to entry: In some countries this is known as anti-panic lighting.

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3.6
high risk task area lighting
that part of emergency escape 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

3.7
standby lighting
that part of emergency lighting provided to enable normal activities to continue substantially unchanged
[SOURCE: IEC 60050-845]

3.8
emergency exit
way out that is intended to be used during an emergency

3.9
safety sign
sign that gives a general safety message, obtained by a combination of colour and geometric shape and which, by the addition of a graphical symbol, gives a particular safety message
[SOURCE: ISO 3864-1]

3.10
externally illuminated safety sign
sign that is illuminated, when it is required, by an external source

3.11
internally illuminated safety sign
sign that is illuminated, when it is required, by an internal source

3.12
place of safety
designated place where escaping people can assemble safely and are not at risk of the emergency status

4 Emergency escape lighting

4.1 General

4.1.1 Installation requirements

To ensure that emergency escape lighting operates when it is required to meet legal requirements, it shall be installed, tested and maintained in accordance with EN 60598-2-22, EN 50172 and EN 62034.

The requirements given in this standard are maintained minimum values and are calculated for the full rated duration period at the end of the design life of the equipment and the inter-reflected light contribution shall be ignored.

The emergency lighting scheme design should be based on worst conditions (e.g. minimum light output, maximum glare limits) of the luminaires during operating life and should be based only on direct light from luminaires. The contributions by room surface inter-reflections should be ignored. However, in lighting systems such as indirect luminaires or uplights (used as an emergency luminaire in maintained mode) where the luminaire works in conjunction with a reflecting surface, the first reflection (based on the maintained reflectance) may be taken as direct light from the system and subsequent reflections shall be ignored.

To provide visibility for evacuation purposes lighting is required in the volume of the space. Signs that are provided at all exits intended to be used in an emergency and along escape routes shall be illuminated to indicate unambiguously the route of escape to a place of safety. In this standard the requirement is fulfilled by mounting the luminaires for lighting and the escape route safety signs at least 2 m above the floor.

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Where practical, for ease of seeing, the safety sign should be mounted not higher than 20° above the horizontal view according to the maximum viewing distance of the sign.

To ensure that emergency lighting operates when required it shall be installed, tested and maintained in accordance with EN 50172 and if automatic test facilities are installed they shall be in accordance with EN 62034.

Where direct sight of an emergency exit is not possible, an illuminated directional sign (or series of signs) shall be provided to assist progression towards the emergency exit.

An escape lighting luminaire conforming to EN 60598-2-22 shall be sited to provide appropriate illuminance near each exit door and at positions where it is necessary to emphasize potential danger or safety equipment. The positions to be emphasized shall include the following.

4.1.2 Points of emphasis

The points of emphasis when placing lighting devices are:

a) near (see NOTE 1) each exit door intended to be used in an emergency;

b) near (see NOTE 1) stairs so that each flight of stairs receives direct light;

c) near (see NOTE 1) any other change in level;

d) Externally illuminated escape route safety signs, escape route direction signs and other safety signs needing to be illuminated under emergency lighting conditions;

e) at each change of direction (see NOTE 2);

f) at each intersection of corridors (see NOTE 2);

g) near (see NOTE 1) to each final exit and outside the building to a place of safety;

h) near (see NOTE 1) each first aid post; so that 5 lx vertical illuminance shall be provided at the first aid box;

i) near (see NOTE 1) each piece of fire fighting equipment and call point so that 5 lx vertical illuminance shall be provided at the fire alarm call points, fire fighting equipment and panel.

j) near (see NOTE 1) escape equipment provided for the disabled; and

k) near (see NOTE 1) disabled refuges and call point. Also to include disabled refuge two way communication systems including disabled toilet alarm call position.

NOTE 1 For the purpose of this clause ‘near’ is normally considered to be within 2 m measured horizontally.

NOTE 2 For points e) and f), 'at' means that the emergency luminaire would illuminate in both directions at the change of direction or intersection

4.2 Escape route lighting

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

NOTE Countries requiring different lighting levels are given in Annex B.

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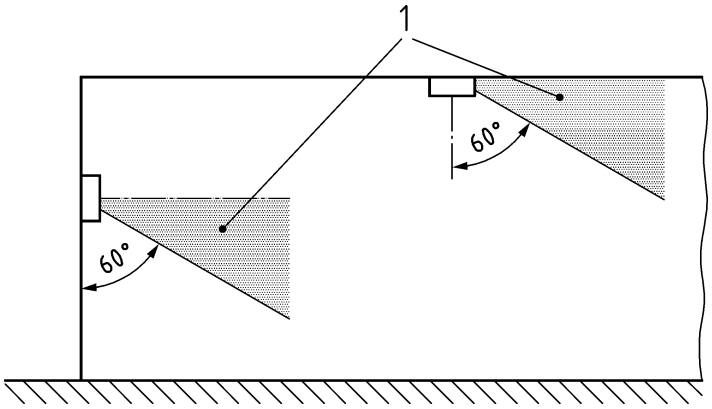
4.2.2 The diversity 'U_d' ratio of the minimum to the maximum illuminance (according to EN 12665) shall not be less than 1:40 along the centre line of the escape route.

4.2.3 Disability glare shall be kept low by limiting the luminous intensity of the luminaires within the field of view.

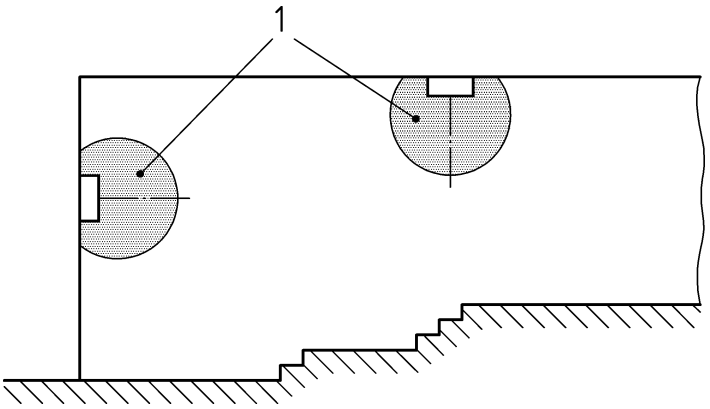
For level horizontal escape routes the luminous intensity of the luminaires shall not exceed the values in Table 1 within the zone 60º to 90º from the downward vertical at all angles of azimuth (see Figure 2).

For all other escape routes and areas, the limiting values shall not be exceeded at all angles (see Figure 3).



Key
1 area where the maximum luminous intensity shall not exceed the values of Table 1

Figure 2 — Horizontal level escape routes



Key
1 area where the maximum luminous intensity shall not exceed the values of Table 1

Figure 3 — Other escape routes and areas

NOTE High contrast between a luminaire and its background can produce glare. In escape route lighting the main problem will be disability glare, in which the brightness of the luminaires can dazzle and prevent obstructions or signs being seen.

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Table 1 — Disability glare limits

Mounting height above floor level h m	**Escape route and open area (anti-panic) lighting maximum luminous intensity** I_{max} cd	**High risk task area lighting maximum luminous intensity** I_{max} cd
h < 2,5	500	1 000
2,5 ≤ h < 3,0	900	1 800
3,0 ≤ h < 3,5	1 600	3 200
3,5 ≤ h < 4,0	2 500	5 000
4,0 ≤ h < 4,5	3 500	7 000
h ≥ 4,5	5 000	10 000

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4.2.4 In order to identify safety colours the minimum value for the colour rendering index R_a from a light source shall be 40. The luminaire shall not substantially subtract from this.

4.2.5 The minimum duration of the illumination of the emergency escape lighting allowed for escape purposes shall be 1 h.

4.2.6 The emergency escape route lighting shall reach 50 % of the required illuminance within 5 s and 100 % required illuminance within 60 s.

4.2.7 Compliance with 4.2.1 to 4.2.4 and 4.2.6 can be checked by measurement or by comparison with authenticated design data.

4.3 Open area lighting

4.3.1 The horizontal illuminance shall be not less than 0,5 lx at the floor level of the empty core area which excludes a border of 0,5 m wide of the perimeter of the area.

4.3.2 The diversity 'U_d' ratio of the minimum to the maximum illuminance (according to EN 12665) shall not be less than 1:40.

4.3.3 Disability glare shall be kept low by limiting the luminous intensity of the luminaires within the field of view. These shall not exceed the values in Table 1 within the zone 60º to 90º from the downward vertical at all angles of azimuth (see Figure 2).

4.3.4 In order to identify safety colours the minimum value for the colour rendering index R_a from a light source shall be 40. The luminaire shall not substantially subtract from this.

4.3.5 The minimum duration allowed for escape purposes shall be 1 h.

4.3.6 The open area lighting shall reach 50 % of the required illuminance within 5 s and 100 % required illuminance within 60 s.

4.3.7 Compliance with 4.3.1 to 4.3.4 and 4.3.6 can be checked by measurement or by comparison with authenticated data.

4.3.8 Open area lighting is required in toilets for disabled people.

4.3.9 Open area lighting/escape route: if emergency escape lighting is required in a room, when this room has no direct access to the escape route in the adjacent fire-compartment, the escape route in between needs to be illuminated as well.

4.4 High risk task area lighting

4.4.1 In areas of high risk the maintained illuminance on the task area plane shall be not less than 10 % of the required maintained illuminance for that task, however, it shall be not less than 15 lx. It shall be free of harmful stroboscopic effects.

4.4.2 The uniformity *'U_o'* of the high risk task area lighting illuminance shall be not less than 0,1.

4.4.3 Disability glare shall be kept low by limiting luminous intensity of the luminaires within the field of view. These shall not exceed the values in Table 1 within the zone 60º to 90º from the downward vertical at all angles of azimuth.

4.4.4 In order to identify safety colours, the minimum value for the colour rendering index R_a from a light source shall be 40. The luminaire shall not substantially subtract from this.

4.4.5 The minimum duration shall be the period for which the risk exists to people. This should be identified by the employer.

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4.4.6 High risk task area lighting shall provide the full required illuminance permanently or within 0,5 s depending upon application.

4.4.7 Compliance with 4.4.1 to 4.4.4 and 4.4.6 can be checked by measurement or by comparison with authenticated data from a supplier.

4.5 Standby lighting

When standby lighting is used for emergency escape lighting purposes it shall conform to the relevant requirements of this standard.

Where a standby lighting level lower than the minimum normal lighting is employed, the lighting is to be used only to shut down or terminate processes.

5 Safety signs

5.1 General

All safety signs and supplementary arrow signs required during emergency escape shall meet the requirements of ISO 3864-1, ISO 3864-4 (photometric) and EN ISO 7010 (design).

All signs and notices will need illumination to ensure they are conspicuous and legible. There are a number of options available to achieve this, such as:

- external illumination; and
- internal illumination.

It is important to assure, that under emergency lighting conditions the sign shall be sufficiently illuminated to be visible and the safety colour green stays green and the contrast colour white stays white within the colour boundaries specified in ISO 3864-4.

NOTE Under normal lighting conditions other requirements apply.

5.2 What safety signs include

Safety signs include escape route direction signs, emergency exit signs and other safety signs deemed by risk assessment as needing to be legible under emergency lighting conditions.

5.3 Requirements of safety signs

Safety signs shall be in accordance with ISO 3864-1, ISO 3864-4 (photometric) and EN ISO 7010 (design).

NOTE The meanings of escape route direction signs and emergency exit signs with a supplementary direction arrow, used with and without a supplementary text sign, are given in EN ISO 7010.

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5.4 Luminance of safety signs

5.4.1 The luminance of any area of safety colour of the sign shall be at least 2 cd/m^2.

5.4.2 The ratio of the maximum to the minimum luminance within either white or the safety colour shall be not greater than 10:1. High variation of adjacent points should be avoided.

5.4.3 The ratio of the luminance $L_{\text{contrast colour}}$ to the luminance $L_{\text{safety colour}}$ shall be not less than 5:1 and not greater than 15:1 (see Annex A).

5.4.4 The safety colour and contrast colour shall conform to the requirements of ISO 3864-1 and ISO 3864-4, and shall be measured in accordance with ISO 3864-4.

5.4.5 The minimum duration of illumination of the safety signs shall be 1 h.

5.4.6 Safety signs shall be illuminated to at least 50 % of the required luminance within 5 s and 100 % required luminance within 60 s.

5.4.7 Compliance with 5.4.1 to 5.4.6 can be checked by measurement or by comparison with authenticated data.

5.5 Viewing distance

As an internally illuminated sign is discernible at greater distance than an externally illuminated sign of the same size the maximum viewing distance (see Figure 4) shall be determined by use of the following formula:

$$l = z \times h$$

where:

- l is the distance of observation
- h is the height of the sign
- z is the factor of distance (*z* is a constant: 100 for externally illuminated signs; 200 for internally illuminated signs)

The dimensional units of h and l shall be the same.

For better unambiguous legibility the safety sign should be mounted not higher than 20° above the horizontal view.

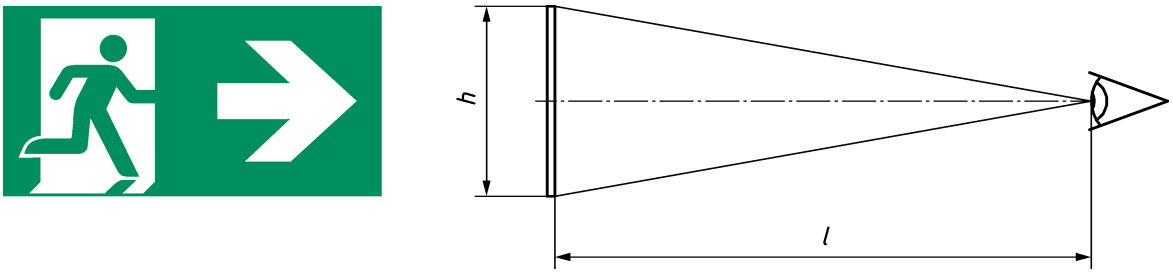

Figure 4 — Viewing distance

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Annex A
(normative)

Luminance and illuminance measurements

A.1 Luminance measurements of signs

Luminances are measured normal to the surface over a 10 mm diameter patch for each coloured surface of the sign. The minimum and maximum luminance is measured over the areas of each colour. For the coloured background a 10 mm wide outer border is excluded from the measurements. In order to determine the luminance ratio between two adjacent colours the luminance measurement should be taken at a distance of 15 mm on either side of the junction of the two colours. A search shall be made for the maximum and minimum ratios. If the diameter of the area of colour is less than 30 mm the patch diameter shall be reduced proportionally. The size of the patch shall be chosen to fit into the selected area and the measurement to be one patch size/width from the boundary of the area to the edge of the patch. For safety signs with a shortest side less than 100 mm the diameter of the patch size and the width of the excluded border shall be reduced to not less than 10 % of that shortest side.

A.2 Instrumentation for site measurement

All illuminance measurements shall be made with a cosine photopic $V(\lambda)$ – corrected meter and all luminance measurements shall be made with a photopic $V(\lambda)$ – corrected meter.

The meter shall have an error tolerance not exceeding 10 %.

The measurement of illuminance may be taken up to 20 mm height above the floor.

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Annex B
(informative)

A–deviations

Countries requiring different light levels

A-deviation: National deviation due to regulations, the alteration of which is, for the time being, outside the competence of the CEN/CENELEC member.

This European Standard does not fall under any Directive of the EU. In the relevant CEN/ CENELEC countries these A-deviations are valid instead of the provisions of the European Standard until they have been removed.

Clause	Deviation
1	**France**[1)] Illuminance and luminance design principles are not used.
4	**Italy**[2)] For cinemas, theatres and similar locations the minimum illuminance level measured at 1 m above the floor shall be 5 lx in proximity to the stairs and exit doors. A minimum illuminance of 2 lx is required along escape routes. Where defined illuminance levels are required by law, they shall not be considered as design values but actual measured values including reflectance and available when emergency lighting is required.
4.1.2	**France**[1)] g), h), i) and j) are not included in the French requirements.
4.2	**France**[1)] On escape routes, certified emergency luminaires must be installed with a spacing of not more than 15 m.
4.2.6/4.3.6	**Germany** Deutschland (Technische Regeln für Arbeitsstätten — Sicherheitsbeleuchtung, optische Sicherheitsleitsysteme — ASR A3.4/3)

1) The deviations from France are based on the following national regulations:

- Règlement de sécurité contre l'incendie dans les ERP, arrêté du 25 juin 1980 modifie, livre II, Chapitre VIII, section III.
- Arrêté du 14 décembre 2011 relatif aux circuits et installations de sécurité dans les établissements soumis au code du travail.

2) The deviation from Italy is based on the following national regulations:

- Decree of the Ministry of the Interior dtd. 1986-02-01 (Garages)
- Decree of the Ministry of Transport dtd. 1988-01-11 (Underground)
- Decree of the Ministry of the Interior dtd. 1992-08-26 (Schools)
- Decree of the Ministry of the Interior dtd. 1994-04-09 (Hotels)
- Decree of the Ministry of the Interior dtd. 1996-03-18 (Sports premises)
- Decree of the Ministry of the Interior dtd. 1996-08-19 (Cinemas, theatres and public entertainment)

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After failure of the normal lighting the emergency escape lighting for escape routes shall reach the required illuminance specified within 15 s.

4.3 **The Netherlands**

Minimum light level for anti-panic lighting is 1 lx. (Bouwbesluit)

4.3 **France**[1)]

Certified emergency lighting products must provide 5 lm/m^2 of floor area. To achieve adequate uniformity, the luminaire must be spaced less than 4 times their mounting height (with a minimum of two products in a room).

4.4 **France**[1)]

The categories are not included in the French requirements which are risk based.

5 **France**[1)]

The French regulation refers to the French Standard NF X 08-003 (or other European countries equivalent standards).

General **France**[1)]

The photometric approach with illuminance is not used in buildings open to the public and in work places.

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[1] CIE 121-SP1, *The Photometry and Goniophotometry of Luminaires – Supplement 1: Luminaires for Emergency Lighting*

[2] CIE 39-2, *Recommendations for Surface Colours for Visual Signalling*

[3] CR 14380, *Lighting applications – Tunnel lighting*

[4] EN 12193, *Light and lighting – Sports lighting*

[5] EN 13032-1, *Light and lighting – Measurement and presentation of photometric data of lamps and luminaires – Part 1: Measurement and file format*

[6] EN 13032-3, *Light and Lighting – Measurement and presentation of photometric data of lamps and luminaires – Part 3: Presentation of data for emergency lighting of work places*

[7] IEC 60050-845, *International electrotechnical vocabulary – Chapter 845: Lighting*

[8] ISO 9186-2, *Graphical symbols – Test methods – Part 2: Methods for testing perceptual quality*

[9] ISO 16069, *Graphical symbols – Safety signs – Safety way guidance systems (SWGS)*

[10] ISO 17724:2003, *Graphical symbols – Vocabulary*

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