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DIN EN 12464-1:2003-03

Light and lighting – Lighting of work places – Part 1: Indoor work places English translation of DIN EN 12464-1:2011-08

Licht und Beleuchtung –
Beleuchtung von Arbeitsstätten –
Teil 1: Arbeitsstätten in Innenräumen
Englische Übersetzung von DIN EN 12464-1:2011-08

Lumière et éclairage –
Eclairage des lieux de travail –
Partie 1: Lieux de travail intérieurs
Traduction anglaise de DIN EN 12464-1:2011-08

Document comprises 61 pages

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In case of doubt, the German-language original shall be considered authoritative.

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National foreword

This standard has been prepared by Technical Committee CEN/TC 169 “Light and lighting” (Secretariat: DIN, Germany), Working Group WG 2 “Lighting of work places” (Secretariat: DIN, Germany).

The responsible German body involved in its preparation was the *Normenausschuss Lichttechnik* (Lighting Technology Standards Committee), Working Committee NA 058-00-04 AA *Innenraumbeleuchtung mit künstlichem Licht.*

Occupational health and safety

In Germany, basic occupational health and safety requirements for lighting at the work place are not governed by this standard but by the *Arbeitsstättenverordnung* (ArbStättV) (German Workplaces Ordinance). All types of work place are included in the scope of this ordinance. The general lighting requirements specified in the *Arbeitsstättenverordnung* are given in greater detail in the German technical rule for work places ASR A3.4 *Beleuchtung* (Lighting).

Information on the lighting of work places in specific sectors is given in material published by the German statutory accident insurers. The accident prevention regulation “Principles of prevention” (BGV A1 or GUV V A1) refers to the *Arbeitsstättenverordnung* and also applies to voluntary members of the German statutory health insurance system (“*freiwillig Versicherte*”).

In Germany, if a work place lighting system is designed and/or commissioned solely in accordance with this standard, this could lead to non-compliance with the German governmental regulations and/or national accident prevention regulations mentioned above. These regulations contain requirements that supplement or deviate from this standard as regards the following subjects:

— the combination of all areas for visual tasks into one work area;

— the extension of the immediate surrounding area to include the remaining interior area;

— the height of the horizontal plane illuminance for some work places;

— the minimum values for the vertical and cylindrical illuminance;

— the uniformity of illuminance.

Amendments

This standard differs from DIN EN 12464-1:2003-03 as follows:

a) new terms and definitions have been included: “3.1 activity area” and “3.2 background area”;

b) specifications relating to the illuminance on the background area, wall and ceiling have been included;

c) the creation of an illuminance grid has been specified to indicate the points at which the illuminance values are calculated and verified for the task area, immediate surrounding area and background area (also recommended for wall and ceiling);

d) the cylindrical illuminance has been specified as a new criterion for the assessment of the lighting in the interior space;

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e) for DSE (display screen equipment) work stations, the permissible luminance limits for luminaires have been brought up to date with current display screen technology;

f) the importance of daylight has been taken into account: Requirements for lighting are generally applicable regardless of whether artificial lighting, daylight or a combination of both is used.

Previous editions

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12464-1

June 2011

ICS 91.160.10

Supersedes EN 12464-1:2002

English Version

Light and lighting - Lighting of work places - Part 1: Indoor work places

Lumière et éclairage - Eclairage des lieux de travail - Partie 1: Lieux de travail intérieurs

Licht und Beleuchtung - Beleuchtung von Arbeitsstätten - Teil 1: Arbeitsstätten in Innenräumen

This European Standard was approved by CEN on 14 April 2011.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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Foreword

This document (EN 12464-1:2011) 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 December 2011, and conflicting national standards shall be withdrawn at the latest by December 2011.

This document supersedes EN 12464-1:2002.

The main technical changes in this revision are:

— importance of daylight is taken into account: Requirements for lighting are generally applicable independent if provided by artificial lighting, daylight or a combination of both;

— specification of a minimum illuminance on walls and ceilings;

— specification of cylindrical illuminance and detailed information on modelling;

— uniformity of illuminance is assigned to tasks and activities;

— definition of "background area" and lighting specification for this area;

— definition of an illuminance grid is in accordance with EN 12464-2;

— new luminance limits are set for luminaires used with Display Screen equipment (DSE), the description of display screens is according ISO 9214-307.

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.

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

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Introduction

Adequate and appropriate lighting enables people to perform visual tasks efficiently and accurately. The degree of visibility and comfort required in a wide range of work places is governed by the type and duration of the activity.

It is important that all clauses of this European Standard are followed although the specific requirements are tabulated in the schedule of lighting requirements (see Clause 5).

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1 Scope

This European Standard specifies lighting requirements for humans in indoor work places, which meet the needs for visual comfort and performance of people having normal ophthalmic (visual) capacity. All usual visual tasks are considered, including Display Screen Equipment (DSE).

This European Standard specifies requirements for lighting solutions for most indoor work places and their associated areas in terms of quantity and quality of illumination. In addition recommendations are given for good lighting practice.

This European Standard does not specify lighting requirements with respect to the safety and health of people at work and has not been prepared in the field of application of Article 153 of the EC treaty, although the lighting requirements, as specified in this European Standard, usually fulfil safety needs. Lighting requirements with respect to the safety and health of workers at work can be contained in Directives based on Article 153 of the EC treaty, in national legislation of member states implementing these directives or in other national legislation of member states.

This European Standard neither provides specific solutions, nor restricts the designers´ freedom from exploring new techniques nor restricts the use of innovative equipment. The illumination can be provided by daylight, artificial lighting or a combination of both.

This European Standard is not applicable for the lighting of outdoor work places and underground mining or emergency lighting. For outdoor work places, see EN 12464-2 and for emergency lighting, see EN 1838 and EN 13032-3.

2 Normative references

The following referenced documents 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 12193, *Light and lighting — Sports lighting*

EN 12464-2, *Light and lighting — Lighting of work places — Part 2: Outdoor work places*

EN 12665, *Light and lighting — Basic terms and criteria for specifying lighting requirements*

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

EN 13032-2, *Light and lighting — Measurement and presentation of photometric data of lamps and luminaires — Part 2: Presentation of data for indoor and outdoor work places*

EN 15193, *Energy performance of buildings — Energy requirements for lighting*

EN ISO 9241-307, *Ergonomics of human-system interaction — Part 307: Analysis and compliance test methods for electronic visual displays (ISO 9241-307:2008)*

EN ISO 9680:2007, *Dentistry — Operating lights (ISO 9680:2007)*

ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs in workplaces and public areas*

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3 Terms and definitions

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

3.1
activity area
area within which a specific activity is carried out

3.2
background area
area adjacent to the immediate surrounding area

3.3
display screen equipment
DSE
alphanumeric or graphic display screen, regardless of the display process employed

NOTE Adapted from 90/270/EEC.

3.4
immediate surrounding area
band surrounding the task area within the visual field

3.5
roof light
daylight opening in the roof or a horizontal surface of a building

3.6
shielding angle
angle between the horizontal plane and the first line of sight at which the luminous parts of the lamps in the luminaire are directly visible

3.7
task area
area within which the visual task is carried out

3.8
visual task
visual elements of the activity undertaken

NOTE The main visual elements are the size of the structure, its luminance, its contrast against the background and its duration.

3.9
window
daylight opening on a vertical or nearly vertical area of a room envelope

3.10
work place
place intended to house work stations on the premises of the undertaking and/or establishment and any other place within the area of undertaking and/or establishment to which the worker has access in the course of his employment

NOTE Adapted from 89/654/EEC.

3.11
work station
combination and spatial arrangement of work equipment, surrounded by the work environment under the conditions imposed by the work tasks

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NOTE Adapted from EN ISO 6385:2004.

4 Lighting design criteria

4.1 Luminous environment

For good lighting practice it is essential that as well as the required illuminances, additional qualitative and quantitative needs are satisfied.

Lighting requirements are determined by the satisfaction of three basic human needs:

— visual comfort, where the workers have a feeling of well-being; in an indirect way this also contributes to a higher productivity level and a higher quality of work;

— visual performance, where the workers are able to perform their visual tasks, even under difficult circumstances and during longer periods;

— safety.

Main parameters determining the luminous environment with respect to artificial light and daylight are:

— luminance distribution;

— illuminance;

— directionality of light, lighting in the interior space;

— variability of light (levels and colour of light);

— colour rendering and colour appearance of the light;

— glare;

— flicker.

Values for illuminance and its uniformity, discomfort glare and colour rendering index are given in Clause 5; other parameters are described in Clause 4.

NOTE In addition to the lighting there are other visual ergonomic parameters which influence visual performance, such as:

— the intrinsic task properties (size, shape, position, colour and reflectance properties of detail and background),

— ophthalmic capacity of the person (visual acuity, depth perception, colour perception),

— intentionally improved and designed luminous environment, glare-free illumination, good colour rendering, high contrast markings and optical and tactile guiding systems can improve visibility and sense of direction and locality. See *CIE Guidelines for Accessibility: Visibility and Lighting Guidelines for Older Persons and Persons with Disabilities*.

Attention to these factors can enhance visual performance without the need for higher illuminance.

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4.2 Luminance distribution

4.2.1 General

The luminance distribution in the visual field controls the adaptation level of the eyes which affects task visibility.

A well balanced adaptation luminance is needed to increase:

— visual acuity (sharpness of vision);

— contrast sensitivity (discrimination of small relative luminance differences);

— efficiency of the ocular functions (such as accommodation, convergence, pupillary contraction, eye movements, etc.).

The luminance distribution in the visual field also affects visual comfort. The following should be avoided for the reasons given:

— too high luminances which can give rise to glare;

— too high luminance contrasts which will cause fatigue because of constant re-adaptation of the eyes;

— too low luminances and too low luminance contrasts which result in a dull and non-stimulating working environment.

To create a well balanced luminance distribution the luminances of all surfaces shall be taken into consideration and will be determined by the reflectance and the illuminance on the surfaces. To avoid gloom and to raise adaptation levels and comfort of people in buildings, it is highly desirable to have bright interior surfaces particularly the walls and ceiling.

The lighting designer shall consider and select the appropriate reflectance and illuminance values for the interior surfaces based on the guidance below.

4.2.2 Reflectance of surfaces

Recommended reflectances for the major interior diffusely reflecting surfaces are:

— ceiling: 0,7 to 0,9;

— walls: 0,5 to 0,8;

— floor: 0,2 to 0,4.

NOTE The reflectance of major objects (like furniture, machinery, etc.) should be in the range of 0,2 to 0,7.

4.2.3 Illuminance on surfaces

In all enclosed places the maintained illuminances on the major surfaces shall have the following values:

— $\bar{E}_m$ > 50 lx with $U_o \geq 0{,}10$ on the walls and

— $\bar{E}_m$ > 30 lx with $U_o \geq 0{,}10$ on the ceiling.

NOTE 1 It is recognised that, in some places such as racked storage places, steelworks, railway terminals, etc., due to the size, complexity and operational constraints, the desired light levels on these surfaces will not be practical to achieve. In these places reduced levels of the recommended values are accepted.

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NOTE 2 In some enclosed places such as offices, education, health care and general areas of entrance, corridors, stairs, etc., the walls and ceiling need to be brighter. In these places it is recommended that the maintained illuminances on the major surfaces should have the following values: $\bar{E}_m$ > 75 lx with U_o ≥ 0,10 on the walls and $\bar{E}_m$ > 50 lx with U_o ≥ 0,10 on the ceiling.

4.3 Illuminance

4.3.1 General

The illuminance and its distribution on the task area and on the surrounding area have a great impact on how quickly, safely and comfortably a person perceives and carries out the visual task.

All values of illuminances specified in this European Standard are maintained illuminances and fulfil visual comfort and performance needs.

All maintained illuminance and uniformity values are dependent upon the grid definition (see 4.4).

4.3.2 Scale of illuminance

To give a perceptual difference the recommended steps of illuminance (in lx) are according to EN 12665:

20 - 30 - 50 - 75 - 100 - 150 - 200 - 300 - 500 - 750 - 1 000 - 1 500 - 2 000 - 3 000 - 5 000

4.3.3 Illuminances on the task area

The values given in Clause 5 are maintained illuminances over the task area on the reference surface which can be horizontal, vertical or inclined. The average illuminance for each task shall not fall below the value given in Clause 5, regardless of the age and condition of the installation. The values are valid for normal visual conditions and take into account the following factors:

— psycho-physiological aspects such as visual comfort and well-being;

— requirements for visual tasks;

— visual ergonomics;

— practical experience;

— contribution to functional safety;

— economy.

The value of illuminance may be adjusted by at least one step in the scale of illuminances (see 4.3.2), if the visual conditions differ from the normal assumptions.

The required maintained illuminance should be increased when:

— visual work is critical;

— errors are costly to rectify;

— accuracy, higher productivity or increased concentration is of great importance;

— task details are of unusually small size or low contrast;

— the task is undertaken for an unusually long time;

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— the visual capacity of the worker is below normal.

The required maintained illuminance may be decreased when:

— task details are of an unusually large size or high contrast;

— the task is undertaken for an unusually short time.

NOTE For visually impaired people special requirements can be necessary with regard to illuminances and contrasts.

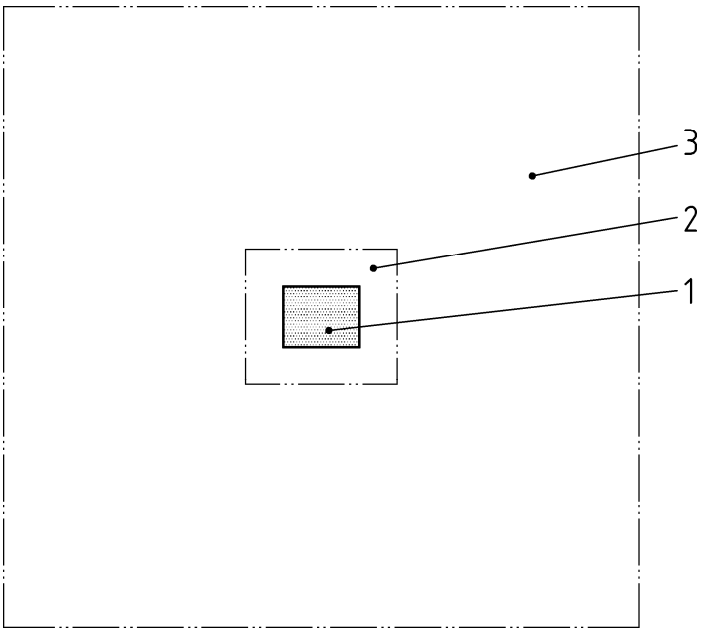
The size and position of the task area should be stated and documented.

For work stations where the size and/or location of the task area(s) is/are unknown, either:

— the whole area is treated as the task area or

— the whole area is uniformly (U_o ≥ 0,40) lit to an illuminance level specified by the designer; if the task area becomes known, the lighting scheme shall be re-designed to provide the required illuminances.

If the type of the task is not known the designer has to make assumptions about the likely tasks and state task requirements.



Key

1 task area

2 immediate surrounding (band with a width of at least 0,5 m around the task area within the visual field)

3 background area (at least 3 m wide adjacent to the immediate surrounding area within the limits of the space)

Figure 1 — Minimum dimensions of immediate surrounding and background area in relation to task area

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4.3.4 Illuminance on the immediate surrounding area

Large spatial variations in illuminances around the task area can lead to visual stress and discomfort.

The illuminance of the immediate surrounding area shall be related to the illuminance of the task area and should provide a well-balanced luminance distribution in the visual field. The immediate surrounding area should be a band with a width of at least 0,5 m around the task area within the visual field.

The illuminance of the immediate surrounding area may be lower than the illuminance on the task area but shall be not less than the values given in Table 1.

In addition to the illuminance on the task area the lighting shall provide adequate adaptation luminance in accordance with 4.2.

The size and position of the immediate surrounding area should be stated and documented.

Table 1 — Relationship of illuminances on immediate surrounding to the illuminance on the task area

Illuminance on the task area E_{task} lx	**Illuminance on immediate surrounding areas** lx
≥ 750	500
500	300
300	200
200	150
150	E_{task}
100	E_{task}
≤ 50	E_{task}

Figure 1 illustrates the minimum dimension of immediate surrounding area in relation to task area.

4.3.5 Illuminance on the background area

In indoor work places, particularly those devoid of daylight, a large part of the area surrounding an active and occupied task area needs to be illuminated. This area known as the “background area” should be a band at least 3 m wide adjacent to the immediate surrounding area within the limits of the space and shall be illuminated with a maintained illuminance of 1/3 of the value of the immediate surrounding area.

The size and position of the background area should be stated and documented.

Figure 1 illustrates the minimum dimension of immediate background area in relation to task area.

4.3.6 Illuminance uniformity

In the task area, the illuminance uniformity (U_o) shall be not less than the minimum uniformity values given in the tables of Clause 5.

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For lighting from artificial lighting or roof lights the illuminance uniformity:

— in the immediate surrounding area shall be $U_o \geq 0{,}40$;

— on the background area shall be $U_o \geq 0{,}10$.

For lighting from windows:

— in larger areas, activity areas and background areas the available daylight decreases rapidly with the distance from the window; the additional benefits of daylight (see 4.12) can compensate for the lack of uniformity.

4.4 Illuminance grid

Grid systems shall be created to indicate the points at which the illuminance values are calculated and verified for the task area(s), immediate surrounding area(s) and background area(s).

Grid cells approximating to a square are preferred, the ratio of length to width of a grid cell shall be kept between 0,5 and 2 (see also EN 12193 and EN 12464-2). The maximum grid size shall be:

$$p = 0{,}2 \times 5^{\log_{10}(d)} \quad (1)$$

where

$p \leq 10$ m

d is the longer dimension of the calculation area (m), however if the ratio of the longer to the shorter side is 2 or more then d becomes the shorter dimension of the area, and

p is the maximum grid cell size (m).

The number of points in the relevant dimension is given by the nearest whole number of d/p.

The resulting spacing between the grid points is used to calculate the nearest whole number of grid points in the other dimension. This will give a ratio of length to width of a grid cell close to 1.

A band of 0,5 m from the walls is excluded from the calculation area except when a task area is in or extends into this border area.

An appropriate grid size shall be applied to walls and ceiling and a band of 0,5 m may be applied also.

NOTE 1 The grid point spacing should not coincide with the luminaire spacing.

NOTE 2 Formula (1) (coming from CIE x005-1992) has been derived under the assumption that p is proportional to log (d), where:

p = 0,2 m for d = 1 m;

p = 1 m for d = 10 m;

p = 5 m for d = 100 m.

NOTE 3 Typical values of grid point spacing are given in Table A.1.

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4.5 Glare

4.5.1 General

Glare is the sensation produced by bright areas within the visual field, such as lit surfaces, parts of the luminaires, windows and/or roof lights. Glare shall be limited to avoid errors, fatigue and accidents. Glare can be experienced either as discomfort glare or as disability glare. In interior work places disability glare is not usually a major problem if discomfort glare limits are met.

Glare caused by reflections in specular surfaces is usually known as veiling reflections or reflected glare.

NOTE Special care is needed to avoid glare when the direction of view is above horizontal.

4.5.2 Discomfort glare

For the rating of discomfort glare from windows there is currently no standardized method.

The rating of discomfort glare caused directly from the luminaires of an indoor lighting installation shall be determined using the CIE Unified Glare Rating (UGR) tabular method, based on the formula:

$$UGR = 8 \log_{10} \left(\frac{0{,}25}{L_B} \sum \frac{L^2 \omega}{p^2} \right) \qquad (2)$$

where

L_B is the background luminance, calculated as $E_{ind} \cdot \pi^{-1}$, in which E_{ind} is the vertical indirect illuminance at the observer's eye in $cd \cdot m^{-2}$,

L is the luminance of the luminous parts of each luminaire in the direction of the observer's eye in $cd \cdot m^{-2}$,

ω is the solid angle in steradian of the luminous parts of each luminaire at the observer's eye,

p is the Guth position index for each individual luminaire which relates to its displacement from the line of sight.

All assumptions made in the determination of UGR shall be stated in the scheme documentation. The UGR value of the lighting installation shall not exceed the value given in Clause 5.

The recommended limiting values of the UGR form a series whose steps indicate noticeable changes in glare.

The series of UGR is: 10, 13, 16, 19, 22, 25, 28.

NOTE 1 The variations of UGR within the room can be determined using the comprehensive tables for different observer positions, as detailed in CIE 117-1995.

NOTE 2 If the maximum UGR value in the room is higher than the UGR limit given in Clause 5, information on appropriate positions for work stations within the room should be given.

NOTE 3 If the tabular method is not applicable and the observer position and the viewing directions are known the UGR value can be determined by using the formula. However limited research has been done, to determine the applicability of existing limiting values. Limits for this condition are under consideration.

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4.5.3 Shielding against glare

Bright sources of light can cause glare and can impair the vision of objects. It shall be avoided for example by suitable shielding of lamps and roof lights, or suitable shading from bright daylight through windows.

For luminaires, the minimum shielding angles (see Figure 2) in the visual field given in Table 2 shall be applied for the specified lamp luminances.

NOTE The values given in Table 2 do not apply to up-lighters or to luminaires with a downward component only mounted below normal eye level.

Table 2 —Minimum shielding angles at specified lamp luminances

Lamp luminance $kcd \cdot m^{-2}$	Minimum shielding angle α
20 to < 50	15°
50 to < 500	20°
≥ 500	30°

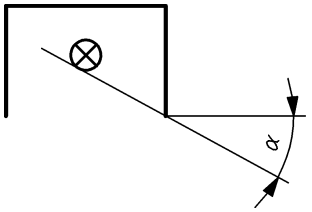

Figure 2 — Shielding angle α

4.5.4 Veiling reflections and reflected glare

High brightness reflections in the visual task can alter task visibility, usually detrimentally. Veiling reflections and reflected glare can be prevented or minimised by the following measures:

— arrangement of work stations with respect to luminaires, windows and roof lights;

— surface finish (matt surfaces);

— luminance restriction of luminaires, windows and roof lights;

— bright ceiling and bright walls.

4.6 Lighting in the interior space

4.6.1 General

In addition to task lighting the volume of space occupied by people should be lit. This light is required to highlight objects, reveal texture and improve the appearance of people within the space. The terms “mean cylindrical illuminance”, "modelling" and “directional lighting” describe the lighting conditions.

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4.6.2 Mean cylindrical illuminance requirement in the activity space

Good visual communication and recognition of objects within a space require that the volume of space in which people move or work shall be illuminated. This is satisfied by providing adequate mean cylindrical illuminance, $\bar{E}_z$, in the space.

The maintained mean cylindrical illuminance (average vertical plane illuminance) in the activity and interior areas shall be not less than 50 lx with $U_o \geq 0{,}10$, on a horizontal plane at a specified height, for example 1,2 m for sitting people and 1,6 m for standing people above the floor.

NOTE In areas, where good visual communication is important, especially in offices, meeting and teaching areas, $\bar{E}_z$ should be not less than 150 lx with $U_o \geq 0{,}10$.

4.6.3 Modelling

The general appearance of an interior is enhanced when its structural features, the people and objects within it are lit so that form and texture are revealed clearly and pleasingly.

The lighting should not be too directional or it will produce harsh shadows, neither should it be too diffuse or the modelling effect will be lost entirely, resulting in a very dull luminous environment. Multiple shadows caused by directional lighting from more then one position should be avoided as this can result in a confused visual effect.

Modelling describes the balance between diffuse and directed light and should be considered.

NOTE 1 The ratio of cylindrical to horizontal illuminance at a point is an indicator of modelling. The grid points for cylindrical and horizontal illuminances should coincide.

NOTE 2 For uniform arrangement of luminaires or roof lights a value between 0,30 and 0,60 is an indicator of good modelling.

NOTE 3 Daylight is distributed predominantly horizontally from windows. The additional benefits of daylight (see 4.12) can compensate for its effect on modelling values, and modelling values from daylight can be extended from the range indicated.

4.6.4 Directional lighting of visual tasks

Lighting from a specific direction can reveal details within a visual task, increasing their visibility and making the task easier to perform. Unintended veiling reflections and reflected glare should be avoided, see 4.5.4.

Harsh shadows that interfere with the visual task should be avoided. But some shadows help to increase the visibility of the task.

4.7 Colour aspects

4.7.1 General

The colour qualities of a near-white lamp or transmitted daylight are characterised by two attributes:

— the colour appearance of the light;

— its colour rendering capabilities, which affect the colour appearance of objects and persons.

These two attributes shall be considered separately.

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4.7.2 Colour appearance

The colour appearance of a lamp refers to the apparent colour (chromaticity) of the light emitted. It is quantified by its correlated colour temperature (T_{CP}).

Colour appearance of daylight varies throughout the day.

Colour appearance of artificial light can also be described as in Table 3.

Table 3 — Lamp colour appearance groups

Colour appearance	Correlated colour temperature T_{CP}
warm	below 3 300 K
intermediate	3 300 to 5 300 K
cool	above 5 300 K

The choice of colour appearance is a matter of psychology, aesthetics and what is considered to be natural. The choice will depend on illuminance level, colours of the room and furniture, surrounding climate and the application. In warm climates generally a cooler light colour appearance is preferred, whereas in cold climates a warmer light colour appearance is preferred.

In Clause 5, for specific applications a restricted band of suitable colour temperatures is given. These are applicable for daylighting as well as artificial lighting.

4.7.3 Colour rendering

For visual performance and the feeling of comfort and well being colours in the environment, of objects and of human skin, shall be rendered naturally, correctly and in a way that makes people look attractive and healthy.

To provide an objective indication of the colour rendering properties of a light source the general colour rendering index R_a is used. The maximum value of R_a is 100.

The minimum value of colour rendering index for distinct types of interiors (areas), tasks or activities are given in Tables 5.1 to 5.53.

Safety colours according to ISO 3864-1 shall always be recognisable as such.

NOTE 1 Colour rendering properties of light from a light source may be reduced by optics, glazing and coloured surfaces.

NOTE 2 For accurate rendition of colours of objects and human skin the appropriate individual special colour rendering index (R_i) should be considered.

4.8 Flicker and stroboscopic effects

Flicker causes distraction and can give rise to physiological effects such as headaches.

Stroboscopic effects can lead to dangerous situations by changing the perceived motion of rotating or reciprocating machinery.

Lighting systems should be designed to avoid flicker and stroboscopic effects.

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4.9 Lighting of work stations with Display Screen Equipment (DSE)

4.9.1 General

The lighting for the DSE work stations shall be appropriate for all tasks performed at the work station, e.g. reading from the screen, reading printed text, writing on paper, keyboard work.

For these areas the lighting criteria and system shall be chosen in accordance with type of area, task or activity from the schedule in Clause 5.

Reflections in the DSE and, in some circumstances, reflections from the keyboard can cause disability and discomfort glare. It is therefore necessary to select, locate and arrange the luminaires to avoid high brightness reflections.

The designer shall determine the offending mounting zone and shall choose equipment and plan mounting positions which will cause no disturbing reflections.

4.9.2 Luminaire luminance limits with downward flux

Light can lower the contrast of the presentation on a DSE by:

— veiling reflection caused by the illuminance on the displays´ surface and

— luminances from luminaires and bright surfaces reflecting in the display.

EN ISO 9241-307 gives requirements for the visual qualities of displays concerning unwanted reflections.

This subclause describes luminance limits for luminaires which can be reflected in DSE for normal viewing directions.

Table 4 gives the limits of the average luminaire luminance at elevation angles of 65° and above from the downward vertical, radially around the luminaires, for work stations where display screens which are vertical or inclined up to 15° tilt angle are used.

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Table 4 — Average luminance limits of luminaires, which can be reflected in flat screens

Screen high state luminance	High luminance screen L > 200 cd·m^{-2}	Medium luminance screen L ≤ 200 cd·m^{-2}
Case A (positive polarity and normal requirements concerning colour and details of the shown information, as used in office, education, etc.)	≤ 3 000 cd·m^{-2}	≤ 1 500 cd·m^{-2}
Case B (negative polarity and/or higher requirements concerning colour and details of the shown information, as used for CAD colour inspection, etc.)	≤ 1 500 cd·m^{-2}	≤ 1 000 cd·m^{-2}
NOTE Screen high state luminance (see EN ISO 9241-302) describes the maximum luminance of the white part of the screen and this value is available from the manufacturer of the screen.		

If a high luminance screen is intended to be operated at luminances below 200 cd·m^{-2} the conditions specified for a medium luminance screen shall be considered.

Some tasks, activities or display screen technologies, particularly high gloss screens, require different lighting treatment (e.g. lower luminance limits, special shading, individual dimming, etc.).

In areas of industrial activities and crafts screens are sometimes protected by additional front glasses. The unwanted reflections on these protection glasses have to be reduced by suitable methods (such as anti-reflection treatment, tilting of the protection glass or by shutters).

4.10 Maintenance factor

The lighting scheme should be designed with an overall maintenance factor (MF) calculated for the selected lighting equipment, environment and specified maintenance schedule.

The recommended illuminance for each task is given as maintained illuminance. The maintenance factor depends on the maintenance characteristics of the lamp and control gear, the luminaire, the environment and the maintenance programme.

The lighting scheme should be designed with the overall MF for the selected lamp(s), luminaire(s), surface reflectances, environment and specified maintenance schedule.

For daylight calculations, reduction of glazing transmittance due to dirt deposition should be taken into account.

The designer shall:

— state the MF and list all assumptions made in the derivation of the value,

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— specify lighting equipment suitable for the application environment and

— prepare a comprehensive maintenance schedule to include frequency of lamp replacement, luminaire, room and glazing cleaning intervals and cleaning method.

The MF has a great impact on energy efficiency. The assumptions made in the derivation of the MF shall be optimized in a way that leads to a high value. Guidance on the derivation of MF for artificial lighting systems can be found in CIE 97-2005.

4.11 Energy efficiency requirements

Lighting should be designed to meet the lighting requirements of a particular task or space in an energy efficient manner. It is important not to compromise the visual aspects of a lighting installation simply to reduce energy consumption. Light levels as set in this European Standard are minimum average illuminance values and need to be maintained.

Energy savings can be made by harvesting daylight, responding to occupancy patterns, improving maintenance characteristics of the installation, and making full use of controls.

The amount of daylight varies throughout the day depending on climate conditions. In addition, in interiors with side windows the available daylight decreases rapidly with the distance from the window. Supplementary lighting may be needed to ensure the required illuminance levels at the work station are achieved and to balance the luminance distribution within the room. Automatic or manual switching and/or dimming can be used to ensure appropriate integration between artificial lighting and daylight.

A procedure for the estimation of the energy requirements of a lighting installation is given in EN 15193. It gives a methodology for the calculation of a lighting energy numeric indicator (LENI), representing the energy performance of lighting of buildings. This indicator may be used for single rooms on a comparative basis only, as the benchmark values given in the EN 15193 are drawn up for a complete building.

4.12 Additional benefits of daylight

Daylight can supply all or part of the lighting for visual tasks, and therefore offers potential energy savings. Additionally, it varies in level, direction and spectral composition with time and provides variable modelling and luminance patterns, which is perceived as being beneficial for people in indoor working environments. Windows are strongly favoured in work places for the daylight they deliver, and for the visual contact they provide with the outside environment. However, it is also important to ensure windows do not cause visual or thermal discomfort, or a loss of privacy.

4.13 Variability of light

Light is important to people’s health and wellbeing. Light affects the mood, emotion and mental alertness of people. It can also support and adjust the circadian rhythms and influence people’s physiological and psychological state. Up to date research indicates that these phenomena, in addition to the lighting design criteria defined in EN 12464-1, can be provided by the so-called “non-image forming” illuminances and colour appearance of light. Varying lighting conditions in time by higher illuminance, luminance distribution and wider range of colour temperature than specified in this European Standard with daylight and/or dedicated artificial lighting solutions can stimulate people and enhance their wellbeing. The recommended bands of variation are under consideration.

5 Schedule of lighting requirements

5.1 Composition of the tables

Column 1 lists the **reference** number for each interior area, task or activity.

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Column 2 lists those **areas, tasks or activities** for which specific requirements are given. If the particular interior area, task area or activity area is not listed, the values given for a similar, comparable situation should be adopted.

Column 3 gives the **maintained illuminance** $\bar{E}_{\mathrm{m}}$ on the reference surface (see 4.3) for the interior (area), task or activity given in Column 2.

NOTE 1 The maintained illuminance in some circumstances may need to be increased (see 4.3.3).

NOTE 2 Lighting control can be required to achieve adequate flexibility for the variety of tasks performed.

Column 4 gives the **maximum UGR limits** (Unified Glare Rating limit, UGR_{l}) that are applicable to the situation listed in Column 2.

Column 5 gives the **minimum illuminance uniformity** U_{o} on the reference surface for the maintained illuminance given in Column 3.

Column 6 gives the **minimum colour rendering indices** (R_{a}) (see 4.7.3) for the situation listed in Column 2.

Column 7 gives **specific requirements** for the situations listed in Column 2.

5.2 Schedule of interior areas, tasks and activities

Table 5.1 — Traffic zones inside buildings

Table 5.2 — General areas inside buildings – Rest, sanitation and first aid rooms
Table 5.3 — General areas inside buildings – Control rooms
Table 5.4 — General areas inside buildings – Store rooms, cold stores
Table 5.5 — General areas inside buildings – Storage rack areas

Table 5.6 — Industrial activities and crafts – Agriculture
Table 5.7 — Industrial activities and crafts – Bakeries
Table 5.8 — Industrial activities and crafts – Cement, cement goods, concrete, bricks
Table 5.9 — Industrial activities and crafts – Ceramics, tiles, glass, glassware
Table 5.10 — Industrial activities and crafts – Chemical, plastics and rubber industry
Table 5.11 — Industrial activities and crafts – Electrical and electronic industry
Table 5.12 — Industrial activities and crafts – Food stuffs and luxury food industry
Table 5.13 — Industrial activities and crafts – Foundries and metal casting
Table 5.14 — Industrial activities and crafts – Hairdressers
Table 5.15 — Industrial activities and crafts – Jewellery manufacturing
Table 5.16 — Industrial activities and crafts – Laundries and dry cleaning
Table 5.17 — Industrial activities and crafts – Leather and leather goods
Table 5.18 — Industrial activities and crafts – Metal working and processing
Table 5.19 — Industrial activities and crafts – Paper and paper goods
Table 5.20 — Industrial activities and crafts – Power stations
Table 5.21 — Industrial activities and crafts – Printers
Table 5.22 — Industrial activities and crafts – Rolling mills, iron and steel works
Table 5.23 — Industrial activities and crafts – Textile manufacture and processing
Table 5.24 — Industrial activities and crafts – Vehicle construction and repair
Table 5.25 — Industrial activities and crafts – Wood working and processing

Table 5.26 — Offices
Table 5.27 — Retail premises

Table 5.28 — Places of public assembly – General areas
Table 5.29 — Places of public assembly – Restaurants and hotels
Table 5.30 — Places of public assembly – Theatres, concert halls, cinemas, places for entertainment
Table 5.31 — Places of public assembly – Trade fairs, exhibition halls
Table 5.32 — Places of public assembly – Museums

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Table 5.33 — Places of public assembly – Libraries
Table 5.34 — Places of public assembly – Public car parks (indoor)

Table 5.35 — Educational premises – Nursery school, play school
Table 5.36 — Educational premises – Educational buildings

Table 5.37 — Health care premises – Rooms for general use
Table 5.38 — Health care premises – Staff rooms
Table 5.39 — Health care premises – Wards, maternity wards
Table 5.40 — Health care premises – Examination rooms (general)
Table 5.41 — Health care premises – Eye Examination rooms
Table 5.42 — Health care premises – Ear Examination rooms
Table 5.43 — Health care premises – Scanner rooms
Table 5.44 — Health care premises – Delivery rooms
Table 5.45 — Health care premises – Treatment rooms (general)
Table 5.46 — Health care premises – Operating areas
Table 5.47 — Health care premises – Intensive care unit
Table 5.48 — Health care premises – Dentists
Table 5.49 — Health care premises – Laboratories and pharmacies
Table 5.50 — Health care premises – Decontamination rooms
Table 5.51 — Health care premises – Autopsy rooms and mortuaries

Table 5.52 — Transportation areas – Airports
Table 5.53 — Transportation areas – Railway installations

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5.3 Lighting requirements for interior areas, tasks and activities

Table 5.1 — Traffic zones inside buildings

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.1.1	Circulation areas and corridors	100	28	0,40	40	• Illuminance at floor level. • R_a and UGR similar to adjacent areas. • 150 lx if there are vehicles on the route. • The lighting of exits and entrances shall provide a transition zone to avoid sudden changes in illuminance between inside and outside by day or night. • Care should be taken to avoid glare to drivers and pedestrians.
5.1.2	Stairs, escalators, travolators	100	25	0,40	40	Requires enhanced contrast on the steps.
5.1.3	Elevators, lifts	100	25	0,40	40	Light level in front of the lift should be at least $\bar{E}_m$ = 200 lx.
5.1.4	Loading ramps/bays	150	25	0,40	40	

Table 5.2 —General areas inside buildings – Rest, sanitation and first aid rooms

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.2.1	Canteens, pantries	200	22	0,40	80	
5.2.2	Rest rooms	100	22	0,40	80	
5.2.3	Rooms for physical exercise	300	22	0,40	80	
5.2.4	Cloakrooms, washrooms, bathrooms, toilets	200	25	0,40	80	In each individual toilet if these are fully enclosed.
5.2.5	Sick bay	500	19	0,60	80	
5.2.6	Rooms for medical attention	500	16	0,60	90	4 000 K ≤ T_{CP} ≤ 5 000 K

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Table 5.3 — General areas inside buildings – Control rooms

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.3.1	Plant rooms, switch gear rooms	200	25	0,40	60	
5.3.2	Telex, post room, switchboard	500	19	0,60	80	

Table 5.4 — General areas inside buildings – Store rooms, cold stores

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.4.1	Store and stockrooms	100	25	0,40	60	200 lx if continuously occupied.
5.4.2	Dispatch packing handling areas	300	25	0,60	60	

Table 5.5 — General areas inside buildings – Storage rack areas

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.5.1	Gangways: unmanned	20	-	0,40	40	Illuminance at floor level.
5.5.2	Gangways: manned	150	22	0,40	60	Illuminance at floor level.
5.5.3	Control stations	150	22	0,60	80	
5.5.4	Storage rack face	200	-	0,40	60	Vertical illuminance, portable lighting may be used.

Table 5.6 — Industrial activities and crafts – Agriculture

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.6.1	Loading and operating of goods, handling equipment and machinery	200	25	0,40	80	
5.6.2	Buildings for livestock	50	-	0,40	40	
5.6.3	Sick animal pens; calving stalls	200	25	0,60	80	
5.6.4	Feed preparation; dairy; utensil washing	200	25	0,60	60	

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Table 5.7 — Industrial activities and crafts – Bakeries

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.7.1	Preparation and baking	300	22	0,60	80	
5.7.2	Finishing, glazing, decorating	500	22	0,70	80	

Table 5.8 — Industrial activities and crafts – Cement, cement goods, concrete, bricks

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.8.1	Drying	50	28	0,40	20	Safety colours shall be recognisable.
5.8.2	Preparation of materials; work on kilns and mixers	200	28	0,40	40	
5.8.3	General machine work	300	25	0,60	80	
5.8.4	Rough forms	300	25	0,60	80	

Table 5.9 — Industrial activities and crafts – Ceramics, tiles, glass, glassware

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.9.1	Drying	50	28	0,40	20	Safety colours shall be recognisable.
5.9.2	Preparation, general machine work	300	25	0,60	80	
5.9.3	Enamelling, rolling, pressing, shaping simple parts, glazing, glass blowing	300	25	0,60	80	
5.9.4	Grinding, engraving, glass polishing, shaping precision parts, manufacture of glass instruments	750	19	0,70	80	
5.9.5	Grinding of optical glass, crystal, hand grinding and engraving	750	16	0,70	80	
5.9.6	Precision work e.g. decorative grinding, hand painting	1 000	16	0,70	90	4 000 K ≤ T_{CP} ≤ 6 500 K
5.9.7	Manufacture of synthetic precious stones	1 500	16	0,70	90	4 000 K ≤ T_{CP} ≤ 6 500 K

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Table 5.10 — Industrial activities and crafts – Chemical, plastics and rubber industry

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	GR_L –	U_o –	R_a –	Specific requirements
5.10.1	Remote-operated processing installations	50	-	0,40	20	Safety colours shall be recognisable.
5.10.2	Processing installations with limited manual intervention	150	28	0,40	40	
5.10.3	Constantly manned work stations in processing installations	300	25	0,60	80	
5.10.4	Precision measuring rooms, laboratories	500	19	0,60	80	
5.10.5	Pharmaceutical production	500	22	0,60	80	
5.10.6	Tyre production	500	22	0,60	80	
5.10.7	Colour inspection	1 000	16	0,70	90	4 000 K ≤ T_{CP} ≤ 6 500 K
5.10.8	Cutting, finishing, inspection	750	19	0,70	80	

Table 5.11 — Industrial activities and crafts – Electrical and electronic industry

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.11.1	Cable and wire manufacture	300	25	0,60	80	
5.11.2	Winding: - large coils - medium-sized coils - small coils	 300 500 750	 25 22 19	 0,60 0,60 0,70	 80 80 80	
5.11.3	Coil impregnating	300	25	0,60	80	
5.11.4	Galvanising	300	25	0,60	80	
5.11.5	Assembly work: - rough, e.g. large transformers - medium, e.g. switchboards - fine, e.g. telephones, radios, IT equipment (computers) - precision, e.g. measuring equipment, printed circuit boards	 300 500 750 1 000	 25 22 19 16	 0,60 0,60 0,70 0,70	 80 80 80 80	
5.11.6	Electronic workshops, testing, adjusting	1500	16	0,70	80	

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Table 5.12 — Industrial activities and crafts – Food stuffs and luxury food industry

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.12.1	Work stations and zones in: - breweries, malting floor, - for washing, barrel filling, cleaning, sieving, peeling, - cooking in preserve and chocolate factories, - work stations and zones in sugar factories, - for drying and fermenting raw tobacco, fermentation cellar	200	25	0,40	80	
5.12.2	Sorting and washing of products, milling, mixing, packing	300	25	0,60	80	
5.12.3	Work stations and critical zones in slaughter houses, butchers, dairies mills, on filtering floor in sugar refineries	500	25	0,60	80	
5.12.4	Cutting and sorting of fruit and vegetables	300	25	0,60	80	
5.12.5	Manufacture of delicatessen foods, kitchen work, manufacture of cigars and cigarettes	500	22	0,60	80	
5.12.6	Inspection of glasses and bottles, product control, trimming, sorting, decoration	500	22	0,60	80	
5.12.7	Laboratories	500	19	0,60	80	
5.12.8	Colour inspection	1 000	16	0,70	90	4 000 K ≤ T_{CP} ≤ 6 500 K

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Table 5.13 — Industrial activities and crafts – Foundries and metal casting

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.13.1	Man-size underfloor tunnels, cellars, etc.	50	-	0,40	20	Safety colours shall be recognisable.
5.13.2	Platforms	100	25	0,40	40	
5.13.3	Sand preparation	200	25	0,40	80	
5.13.4	Dressing room	200	25	0,40	80	
5.13.5	Work stations at cupola and mixer	200	25	0,40	80	
5.13.6	Casting bay	200	25	0,40	80	
5.13.7	Shake out areas	200	25	0,40	80	
5.13.8	Machine moulding	200	25	0,40	80	
5.13.9	Hand and core moulding	300	25	0,60	80	
5.13.10	Die casting	300	25	0,60	80	
5.13.11	Model building	500	22	0,60	80	

Table 5.14 — Industrial activities and crafts – Hairdressers

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.14.1	Hairdressing	500	19	0,60	90	

Table 5.15 — Industrial activities and crafts – Jewellery manufacturing

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.15.1	Working with precious stones	1 500	16	0,70	90	4 000 K ≤ T_{CP} ≤ 6 500 K
5.15.2	Manufacture of jewellery	1 000	16	0,70	90	
5.15.3	Watch making (manual)	1 500	16	0,70	80	
5.15.4	Watch making (automatic)	500	19	0,60	80	

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Table 5.16 — Industrial activities and crafts – Laundries and dry cleaning

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.16.1	Goods in, marking and sorting	300	25	0,60	80	
5.16.2	Washing and dry cleaning	300	25	0,60	80	
5.16.3	Ironing, pressing	300	25	0,60	80	
5.16.4	Inspection and repairs	750	19	0,70	80	

Table 5.17 — Industrial activities and crafts – Leather and leather goods

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.17.1	Work on vats, barrels, pits	200	25	0,40	40	
5.17.2	Fleshing, skiving, rubbing, tumbling of skins	300	25	0,40	80	
5.17.3	Saddlery work, shoe manufacture: stitching, sewing, polishing, shaping, cutting, punching	500	22	0,60	80	
5.17.4	Sorting	500	22	0,60	90	4 000 K ≤ T_{CP} ≤ 6 500 K
5.17.5	Leather dyeing (machine)	500	22	0,60	80	
5.17.6	Quality control	1 000	19	0,70	80	
5.17.7	Colour inspection	1 000	16	0,70	90	4 000 K ≤ T_{CP} ≤ 6 500 K
5.17.8	Shoe making	500	22	0,60	80	
5.17.9	Glove making	500	22	0,60	80	

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Table 5.18 — Industrial activities and crafts – Metal working and processing

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.18.1	Open die forging	200	25	0,60	80	
5.18.2	Drop forging	300	25	0,60	80	
5.18.3	Welding	300	25	0,60	80	
5.18.4	Rough and average machining: tolerances ≥ 0,1 mm	300	22	0,60	80	
5.18.5	Precision machining; grinding: tolerances < 0,1 mm	500	19	0,70	80	
5.18.6	Scribing; inspection	750	19	0,70	80	
5.18.7	Wire and pipe drawing shops; cold forming	300	25	0,60	80	
5.18.8	Plate machining: thickness ≥ 5 mm	200	25	0,60	80	
5.18.9	Sheet metalwork: thickness < 5 mm	300	22	0,60	80	
5.18.10	Tool making; cutting equipment manufacture	750	19	0,70	80	
5.18.11	Assembly: - rough - medium - fine - precision	 200 300 500 750	 25 25 22 19	 0,60 0,60 0,60 0,70	 80 80 80 80	
5.18.12	Galvanising	300	25	0,60	80	
5.18.13	Surface preparation and painting	750	25	0,70	80	
5.18.14	Tool, template and jig making, precision mechanics, micro-mechanics	1 000	19	0,70	80	

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Table 5.19 — Industrial activities and crafts – Paper and paper goods

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.19.1	Edge runners, pulp mills	200	25	0,40	80	
5.19.2	Paper manufacture and processing, paper and corrugating machines, cardboard manufacture	300	25	0,60	80	
5.19.3	Standard bookbinding work, e.g. folding, sorting, gluing, cutting, embossing, sewing	500	22	0,60	80	

Table 5.20 — Industrial activities and crafts – Power stations

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.20.1	Fuel supply plant	50	-	0,40	20	Safety colours shall be recognisable.
5.20.2	Boiler house	100	28	0,40	40	
5.20.3	Machine halls	200	25	0,40	80	
5.20.4	Side rooms, e.g. pump rooms, condenser rooms, etc.; switchboards (inside buildings)	200	25	0,40	60	
5.20.5	Control rooms	500	16	0,70	80	1. Control panels are often vertical. 2. Dimming may be required. 3. DSE-work, see 4.9.

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Table 5.21 — Industrial activities and crafts – Printers

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.21.1	Cutting, gilding, embossing, block engraving, work on stones and platens, printing machines, matrix making	500	19	0,60	80	
5.21.2	Paper sorting and hand printing	500	19	0,60	80	
5.21.3	Type setting, retouching, lithography	1 000	19	0,70	80	
5.21.4	Colour inspection in multicoloured printing	1 500	16	0,70	90	5 000 K ≤ T_{CP} ≤ 6 500 K
5.21.5	Steel and copper engraving	2 000	16	0,70	80	For directionality, see 4.6.4.

Table 5.22 — Industrial activities and crafts – Rolling mills, iron and steel works

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.22.1	Production plants without manual operation	50	-	0,40	20	Safety colours shall be recognisable.
5.22.2	Production plants with occasional manual operation	150	28	0,40	40	
5.22.3	Production plants with continuous manual operation	200	25	0,60	80	
5.22.4	Slab Store	50	-	0,40	20	Safety colours shall be recognisable.
5.22.5	Furnaces	200	25	0,40	20	Safety colours shall be recognisable.
5.22.6	Mill train; coiler; shear line	300	25	0,60	40	
5.22.7	Control platforms; control panels	300	22	0,60	80	
5.22.8	Test, measurement and inspection	500	22	0,60	80	
5.22.9	Underfloor man-sized tunnels; belt sections, cellars, etc.	50	-	0,40	20	Safety colours shall be recognisable.

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Table 5.23 — Industrial activities and crafts – Textile manufacture and processing

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.23.1	Work stations and zones in baths, bale opening	200	25	0,60	60	
5.23.2	Carding, washing, ironing, devilling machine work, drawing, combing, sizing, card cutting, pre-spinning, jute and hemp spinning	300	22	0,60	80	
5.23.3	Spinning, plying, reeling, winding	500	22	0,60	80	Prevent stroboscopic effects.
5.23.4	Warping, weaving, braiding, knitting	500	22	0,60	80	Prevent stroboscopic effects.
5.23.5	Sewing, fine knitting, taking up stitches	750	22	0,70	80	
5.23.6	Manual design, drawing patterns	750	22	0,70	90	4 000 K ≤ T_{CP} ≤ 6 500 K
5.23.7	Finishing, dyeing	500	22	0,60	80	
5.23.8	Drying room	100	28	0,40	60	
5.23.9	Automatic fabric printing	500	25	0,60	80	
5.23.10	Burling, picking, trimming	1 000	19	0,70	80	
5.23.11	Colour inspection; fabric control	1 000	16	0,70	90	4 000 K ≤ T_{CP} ≤ 6 500 K
5.23.12	Invisible mending	1 500	19	0,70	90	4 000 K ≤ T_{CP} ≤ 6 500 K
5.23.13	Hat manufacturing	500	22	0,60	80	

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Table 5.24 — Industrial activities and crafts – Vehicle construction and repair

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.24.1	Body work and assembly	500	22	0,60	80	
5.24.2	Painting, spraying chamber, polishing chamber	750	22	0,70	80	
5.24.3	Painting: touch-up, inspection	1 000	19	0,70	90	4 000 K ≤ T_{CP} ≤ 6 500 K
5.24.4	Upholstery manufacture (manned)	1 000	19	0,70	80	
5.24.5	Final inspection	1 000	19	0,70	80	
5.24.6	General vehicle services, repair and testing	300	22	0,60	80	Consider local lighting.

Table 5.25 — Industrial activities and crafts – Wood working and processing

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.25.1	Automatic processing e.g. drying, plywood manufacturing	50	28	0,40	40	
5.25.2	Steam pits	150	28	0,40	40	
5.25.3	Saw frame	300	25	0,60	60	Prevent stroboscopic effects.
5.25.4	Work at joiner's bench, gluing, assembly	300	25	0,60	80	
5.25.5	Polishing, painting, fancy joinery	750	22	0,70	80	
5.25.6	Work on wood working machines, e.g. turning, fluting, dressing, rebating, grooving, cutting, sawing, sinking	500	19	0,60	80	Prevent stroboscopic effects.
5.25.7	Selection of veneer woods	750	22	0,70	90	4 000 K ≤ T_{CP} ≤ 6 500 K
5.25.8	Marquetry, inlay work	750	22	0,70	90	4 000 K ≤ T_{CP} ≤ 6 500 K
5.25.9	Quality control, inspection	1 000	19	0,70	90	4 000 K ≤ T_{CP} ≤ 6 500 K

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Table 5.26 — Offices

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.26.1	Filing, copying, etc.	300	19	0,40	80	
5.26.2	Writing, typing, reading, data processing	500	19	0,60	80	DSE-work, see 4.9.
5.26.3	Technical drawing	750	16	0,70	80	
5.26.4	CAD work stations	500	19	0,60	80	DSE-work, see 4.9.
5.26.5	Conference and meeting rooms	500	19	0,60	80	Lighting should be controllable.
5.26.6	Reception desk	300	22	0,60	80	
5.26.7	Archives	200	25	0,40	80	

Table 5.27 — Retail premises

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.27.1	Sales area	300	22	0,40	80	
5.27.2	Till area	500	19	0,60	80	
5.27.3	Wrapper table	500	19	0,60	80	

Table 5.28 — Places of public assembly – General areas

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.28.1	Entrance halls	100	22	0,40	80	UGR only if applicable.
5.28.2	Cloakrooms	200	25	0,40	80	
5.28.3	Lounges	200	22	0,40	80	
5.28.4	Ticket offices	300	22	0,60	80	

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Table 5.29 — Places of public assembly – Restaurants and hotels

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.29.1	Reception/cashier desk, porters desk	300	22	0,60	80	
5.29.2	Kitchen	500	22	0,60	80	There should be a transition zone between kitchen and restaurant.
5.29.3	Restaurant, dining room, function room	-	-	-	80	The lighting should be designed to create the appropriate atmosphere.
5.29.4	Self-service restaurant	200	22	0,40	80	
5.29.5	Buffet	300	22	0,60	80	
5.29.6	Conference rooms	500	19	0,60	80	Lighting should be controllable.
5.29.7	Corridors	100	25	0,40	80	During night-time lower levels are acceptable.

Table 5.30 — Places of public assembly – Theatres, concert halls, cinemas, places for entertainment

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.30.1	Practice rooms	300	22	0,60	80	
5.30.2	Dressing rooms	300	22	0,60	90	Lighting at mirrors for make-up shall be “glare-free”. Disability glare should be avoided at mirrors for make-up.
5.30.3	Seating areas – maintenance, cleaning	200	22	0,50	80	Illuminance at floor level.
5.30.4	Stage area - rigging	300	25	0,40	80	Illuminance at floor level.

Table 5.31 — Places of public assembly – Trade fairs, exhibition halls

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.31.1	General lighting	300	22	0,40	80	

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Table 5.32 — Places of public assembly – Museums

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.32.1	Exhibits, insensitive to light					Lighting is determined by the display requirements.
5.32.2	Exhibits sensitive to light					1. Lighting is determined by the display requirements. 2. Protection against damaging radiation is paramount.

Table 5.33 — Places of public assembly – Libraries

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.33.1	Bookshelves	200	19	0,40	80	
5.33.2	Reading area	500	19	0,60	80	
5.33.3	Counters	500	19	0,60	80	

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Table 5.34 — Places of public assembly – Public car parks (indoor)

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.34.1	In/out ramps (during the day)	300	25	0,40	40	1. Illuminances at floor level. 2. Safety colours shall be recognisable.
5.34.2	In/out ramps (at night)	75	25	0,40	40	1. Illuminances at floor level. 2. Safety colours shall be recognisable.
5.34.3	Traffic lanes	75	25	0,40	40	1. Illuminances at floor level. 2. Safety colours shall be recognisable.
5.34.4	Parking areas	75	-	0,40	40	1. Illuminances at floor level. 2. Safety colours shall be recognisable. 3. A high vertical illuminance increases recognition of peoples faces and therefore the feeling of safety.
5.34.5	Ticket office	300	19	0,60	80	1. Reflections in the windows shall be avoided. 2. Glare from outside shall be prevented.

Table 5.35 — Educational premises – Nursery school, play school

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.35.1	Play room	300	22	0,40	80	High luminances should be avoided in viewing directions from below by use of diffuse covers.
5.35.2	Nursery	300	22	0,40	80	High luminances should be avoided in viewing directions from below by use of diffuse covers.
5.35.3	Handicraft room	300	19	0,60	80	

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Table 5.36 — Educational premises – Educational buildings

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.36.1	Classrooms, tutorial rooms	300	19	0,60	80	Lighting should be controllable.
5.36.2	Classroom for evening classes and adults education	500	19	0,60	80	Lighting should be controllable.
5.36.3	Auditorium, lecture halls	500	19	0,60	80	Lighting should be controllable to accommodate various A/V needs.
5.36.4	Black, green and white boards	500	19	0,70	80	Specular reflections shall be prevented. Presenter/teacher shall be illuminated with suitable vertical illuminance.
5.36.5	Demonstration table	500	19	0,70	80	In lecture halls 750 lx.
5.36.6	Art rooms	500	19	0,60	80	
5.36.7	Art rooms in art schools	750	19	0,70	90	5 000 K < T_{CP} 6 500 K.
5.36.8	Technical drawing rooms	750	16	0,70	80	
5.36.9	Practical rooms and laboratories	500	19	0,60	80	
5.36.10	Handicraft rooms	500	19	0,60	80	
5.36.11	Teaching workshop	500	19	0,60	80	
5.36.12	Music practice rooms	300	19	0,60	80	
5.36.13	Computer practice rooms (menu driven)	300	19	0,60	80	DSE-work, see 4.9.
5.36.14	Language laboratory	300	19	0,60	80	
5.36.15	Preparation rooms and workshops	500	22	0,60	80	
5.36.16	Entrance halls	200	22	0,40	80	
5.36.17	Circulation areas, corridors	100	25	0,40	80	

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Table 5.36 — Educational premises – Educational buildings *(continued)*

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.36.18	Stairs	150	25	0,40	80	
5.36.19	Student common rooms and assembly halls	200	22	0,40	80	
5.36.20	Teachers rooms	300	19	0,60	80	
5.36.21	Library: bookshelves	200	19	0,60	80	
5.36.22	Library: reading areas	500	19	0,60	80	
5.36.23	Stock rooms for teaching materials	100	25	0,40	80	
5.36.24	Sports halls, gymnasiums, swimming pools	300	22	0,60	80	See EN 12193 for training conditions.
5.36.25	School canteens	200	22	0,40	80	
5.36.26	Kitchen	500	22	0,60	80	

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Table 5.37 — Health care premises – Rooms for general use

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
						Too high luminances in the patients' visual field shall be prevented.
5.37.1	Waiting rooms	200	22	0,40	80	
5.37.2	Corridors: during the day	100	22	0,40	80	Illuminance at floor level.
5.37.3	Corridors: cleaning	100	22	0,40	80	Illuminance at floor level.
5.37.4	Corridors: during the night	50	22	0,40	80	Illuminance at floor level.
5.37.5	Corridors with multi-purpose use	200	22	0,60	80	Illuminance at task/activity level.
5.37.6	Day rooms	200	22	0,60	80	
5.37.7	Elevators, lifts for persons and visitors	100	22	0,60	80	Illuminance at floor level.
5.37.8	Service lifts	200	22	0,60	80	Illuminance at floor level.

Table 5.38 — Health care premises – Staff rooms

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.38.1	Staff office	500	19	0,60	80	
5.38.2	Staff rooms	300	19	0,60	80	

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Table 5.39 — Health care premises – Wards, maternity wards

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
						Too high luminances in the patients' visual field shall be prevented.
5.39.1	General lighting	100	19	0,40	80	Illuminance at floor level.
5.39.2	Reading lighting	300	19	0,70	80	
5.39.3	Simple examinations	300	19	0,60	80	
5.39.4	Examination and treatment	1 000	19	0,70	90	
5.39.5	Night lighting, observation lighting	5	-	-	80	
5.39.6	Bathrooms and toilets for patients	200	22	0,40	80	

Table 5.40 — Health care premises – Examination rooms (general)

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.40.1	General lighting	500	19	0,60	90	4 000 K ≤ T_{CP} ≤ 5 000 K
5.40.2	Examination and treatment	1 000	19	0,70	90	

Table 5.41 — Health care premises – Eye Examination rooms

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.41.1	General lighting	500	19	0,60	90	4 000 K ≤ T_{CP} ≤ 5 000 K
5.41.2	Examination of the outer eye	1 000	-	-	90	
5.41.3	Reading and colour vision tests with vision charts	500	16	0,70	90	

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Table 5.42 — Health care premises – Ear Examination rooms

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.42.1	General lighting	500	19	0,60	90	
5.42.2	Ear examination	1 000	-	-	90	

Table 5.43 — Health care premises – Scanner rooms

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.43.1	General lighting	300	19	0,60	80	
5.43.2	Scanners with image enhancers and television systems	50	19	-	80	DSE-work, see 4.9.

Table 5.44 — Health care premises – Delivery rooms

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.44.1	General lighting	300	19	0,60	80	
5.44.2	Examination and treatment	1 000	19	0,70	80	

Table 5.45 — Health care premises – Treatment rooms (general)

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.45.1	Dialysis	500	19	0,60	80	Lighting should be controllable.
5.45.2	Dermatology	500	19	0,60	90	
5.45.3	Endoscopy rooms	300	19	0,60	80	
5.45.4	Plaster rooms	500	19	0,60	80	
5.45.5	Medical baths	300	19	0,60	80	
5.45.6	Massage and radiotherapy	300	19	0,60	80	

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Table 5.46 — Health care premises – Operating areas

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.46.1	Pre-op and recovery rooms	500	19	0,60	90	
5.46.2	Operating theatre	1 000	19	0,60	90	
5.46.3	Operating cavity			-		$\bar{E}_m$: 10 000 lx to 100 000 lx

Table 5.47 — Health care premises – Intensive care unit

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.47.1	General lighting	100	19	0,60	90	Illuminance at floor level.
5.47.2	Simple examinations	300	19	0,60	90	Illuminance at bed level.
5.47.3	Examination and treatment	1 000	19	0,70	90	Illuminance at bed level.
5.47.4	Night watch	20	19	-	90	

Table 5.48 — Health care premises – Dentists

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.48.1	General lighting	500	19	0,60	90	Lighting should be glare-free for the patient.
5.48.2	At the patient	1 000	-	0,70	90	
5.48.3	Operating cavity	-	-	-	-	Specific requirements are given in EN ISO 9680.
5.48.4	White teeth matching	-	-	-	-	Specific requirements are given in EN ISO 9680.

Table 5.49 — Health care premises – Laboratories and pharmacies

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.49.1	General lighting	500	19	0,60	80	
5.49.2	Colour inspection	1 000	19	0,70	90	6 000 K ≤ T_{CP} ≤ 6 500 K

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Table 5.50 — Health care premises – Decontamination rooms

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.50.1	Sterilisation rooms	300	22	0,60	80	
5.50.2	Disinfection rooms	300	22	0,60	80	

Table 5.51 — Health care premises – Autopsy rooms and mortuaries

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.51.1	General lighting	500	19	0,60	90	
5.51.2	Autopsy table and dissecting table	5 000	-	-	90	Values higher than 5 000 lx may be required.

Table 5.52 — Transportation areas – Airports

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.52.1	Arrival and departure halls, baggage claim areas	200	22	0,40	80	
5.52.2	Connecting areas	150	22	0,40	80	
5.52.3	Information desks, check-in desks	500	19	0,70	80	DSE-work, see 4.9.
5.52.4	Customs and passport control desks	500	19	0,70	80	Facial recognition has to be provided.

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Table 5.52 — Transportation areas – Airports *(continued)*

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.52.5	Waiting areas	200	22	0,40	80	
5.52.6	Luggage store rooms	200	25	0,40	80	
5.52.7	Security check areas	300	19	0,60	80	DSE-work, see 4.9.
5.52.8	Air traffic control tower	500	16	0,60	80	1. Lighting should be dimmable. 2. DSE-work, see 4.9. 3. Glare from daylight shall be avoided. 4. Reflections in windows, especially at night shall be avoided.
5.52.9	Testing and repair hangars	500	22	0,60	80	.
5.52.10	Engine test areas	500	22	0,60	80	
5.52.11	Measuring areas in hangars	500	22	0,60	80	

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Table 5.53 — Transportation areas – Railway installations

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	UGR_L –	U_o –	R_a –	Specific requirements
5.53.1	Fully enclosed platforms, small number of passengers	100	-	0,40	40	1. Special attention to the edge of the platform. 2. Avoid glare for vehicle drivers. 3. Illuminance at floor level.
5.53.2	Fully enclosed platforms, large number of passengers	200	-	0,50	60	1. Special attention to the edge of the platform. 2. Avoid glare for vehicle drivers. 3. Illuminance at floor level.
5.53.3	Passenger subways (underpasses), small number of passengers	50	28	0,50	40	Illuminance at floor level
5.53.4	Passenger subways (underpasses), large number of passengers	100	28	0,50	40	Illuminance at floor level.
5.53.5	Ticket hall and concourse	200	28	0,50	40	
5.53.6	Ticket and luggage offices and counters	300	19	0,50	80	
5.53.7	Waiting rooms	200	22	0,40	80	
5.53.8	Entrance halls, station halls	200	-	0,40	80	
5.53.9	Switch and plant rooms	200	28	0,40	60	Safety colours must be recognisable.
5.53.10	Access tunnels	50	-	0,40	20	Illuminance at floor level.
5.53.11	Maintenance and servicing sheds	300	22	0,50	60	

6 Verification procedures

6.1 General

Specified design criteria which are listed in this European Standard shall be verified by the following procedures.

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In lighting design, calculations and measurements, certain assumptions including degree of accuracy have been made. These shall be declared.

The installation and the environment shall be checked against the design assumptions.

6.2 Illuminances

When verifying conformity to the illuminance requirements the measurement points shall coincide with any design points or grids used. Verification shall be made to the criteria of the relevant surfaces.

For subsequent measurements, the same measurement points shall be used.

Verification of illuminances that relate to specific tasks shall be measured in the plane of the task.

NOTE When verifying illuminances, account should be taken of the calibration of the light meters used, the conformity of the lamps and luminaires to the published photometric data, and of the design assumptions made about surface reflectance, etc., compared with the real values.

The average illuminance and uniformity shall be calculated and shall be not less than the values specified.

6.3 Unified Glare Rating

Authenticated UGR data produced by the tabular method shall be provided for the luminaire scheme by the manufacturer of the luminaire. The spacing shall be declared for the UGR-tables provided.

6.4 Colour rendering and colour appearance

Authenticated colour rendering index R_a and correlated colour temperatures T_{cp} data shall be provided for the lamps in the scheme by the manufacturer of the lamps. The lamps shall be checked against the design specifications.

6.5 Luminaire luminance

The average luminance of the luminous parts of the luminaire shall be measured and/or calculated in the C-plane (azimuth) at intervals of 15° starting at 0° and the γ-plane (elevation) for angles of 65°, 70°, 75°, 80° and 85°. Normally the manufacturer of the luminaire shall provide these data based on maximum (lamp/luminaire) output (see also EN 13032-1 and -2).

The values shall not exceed the limits specified in Table 4.

6.6 Maintenance schedule

The maintenance schedule shall be provided and should be according to 4.10.

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Annex A
(informative)

Typical values of grid point spacing

Typical values of grid point spacing are given in Table A.1 based on Formula (1) in 4.4.

Table A.1 — Recommended number of grid points

Length of the area m	Maximum distance between grid points m	Minimum number of grid points
0,40	0,15	3
0,60	0,20	3
1,00	0,20	5
2,00	0,30	6
5,00	0,60	8
10,00	1,00	10
25,00	2,00	12
50,00	3,00	17
100,00	5,00	20

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Annex B
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A-deviation

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

European Standard not under any EU Directive

This European Standard does not fall under any Directive of the EU.

In Denmark this A-deviation is valid instead of the provisions of the European Standard until it has been removed.

Denmark

Danish Building Regulations BR 08, published by the Danish Enterprise and Construction Authority

Related to Clauses 4, 5 and 6

According to legal Danish Building Regulations BR 08 the use of DS 700 is mandatory.

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[20] 90/270/EEC, *Council directive of 29 May 1990 on the minimum safety and health requirements for work with display screen equipment (fifth individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC), OJ L 156, 21.6.1990, p. 14–18*

N1) National footnote: CIE 196-2011, Guide to increasing accessibility in light and lighting. Vision data and design considerations for better visibility and lighting for older people and people with disabilities

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Glazing (Bakeries)	5.7.2
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Music practice rooms (Education) 5.36

Night lighting (Health care) 5.39.5
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Underfloor tunnels, man-size (Foundries, etc.) 5.13.1
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