



SLOVENSKI STANDARD

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Svetloba in razsvetljava - Osnovni izrazi in kriteriji za specifikacijo zahtev za razsvetljavo

Light and lighting - Basic terms and criteria for specifying lighting requirements

Licht und Beleuchtung - Grundlegende Begriffe und Kriterien für die Festlegung von Anforderungen an die Beleuchtung

Lumière et éclairage - Termes de base et critères pour la spécification des exigences en éclairage

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EUROPEAN STANDARD
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English version

Light and lighting - Basic terms and criteria for specifying lighting requirements

Lumière et éclairage - Termes de base et critères pour la spécification des exigences en éclairage

Licht und Beleuchtung - Grundlegende Begriffe und Kriterien für die Festlegung von Anforderungen an die Beleuchtung

This European Standard was approved by CEN on 21 January 2002.

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 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 Management Centre has the same status as the official versions.

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EN 12665:2002 (E)

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Foreword

This document EN 12665:2002 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of an identical text or by endorsement, at the latest by November 2002, and conflicting national standards shall be withdrawn at the latest by November 2002.

Annexes A, B and C are informative.

This standard includes a Bibliography.

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

Introduction

This European Standard sets out a basic framework to be used for the specification of lighting requirements.

Terms common to many applications are defined here. Additional terms specific to particular applications are defined in the relevant standard setting out the requirements for that application.

Where a term is contained in CIE Publication 17.4/1987 International Lighting Vocabulary (IEC Publication 50 International Electrotechnical Vocabulary, Chapter 845 Lighting), the term given in this standard is identical. For some terms additional explanation is given in Annex A.

The lighting requirements for a space are determined by the need to provide:

- adequate illumination for safety and movement;
- conditions which will facilitate visual performance and colour perception;
- acceptable visual comfort for the occupants in the space.

The relative importance of these factors will vary for different applications. The lighting requirements for visual comfort and satisfaction of the occupants, will often exceed the requirements for visual performance alone. For example, the visual task may simply require the discrimination of black symbols on a white background; the colour rendering of the lighting is irrelevant to this task but it is important in making the appearance of the room and occupants acceptable. Variations of the lighting in space and time may also be important for visual satisfaction and can help to meet the interpersonal differences found within groups of people.

Considerations should also be given to the energy used by lighting and to maintenance.

The parameters which need to be specified to ensure good visual conditions and an efficient lighting installation are common to many applications. These are dealt with in clause 4 of this standard.

1 Scope

This standard defines basic terms for use in all lighting applications; specialist terms with limited applications are given in individual standards. This standard also sets out a framework for the specification of lighting requirements, giving details of aspects which shall be considered when setting those requirements.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

CIE 17.4:1987	International Lighting Vocabulary - Chapter 845: Lighting
ISO/CIE 10527	CIE standard colorimetric observers

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3 Terms and definitions

For the purposes of this European Standard the following terms and definitions apply.

3.1 Eye and Vision

3.1.1

adaptation

process by which the state of the visual system is modified by previous and present exposure to stimuli that may have various luminances, spectral distributions and angular subtanses

NOTE 1 The terms *light adaptation* and *dark adaptation* are also used, the former when the luminances of the stimuli are of at least several candelas per square metre, and the latter when the luminances are of less than some hundredths of a candela per square metre.

NOTE 2 Adaptation to specific spatial frequencies, orientations, sizes, etc. are recognized as being included in this definition.

[IEC 50 (845)/CIE 17.4:1987; 845-02-07]

3.1.2

accommodation

adjustment of the dioptric power of the crystalline lens by which the image of an object, at a given distance, is focused on the retina [IEC 50 (845)/CIE 17.4:1987; 845-02-44]

3.1.3

visual acuity

1. Qualitatively: Capacity for seeing distinctly fine details that have very small angular separation.
2. Quantitatively: Any of a number of measures of spatial discrimination such as the reciprocal of the value of the angular separation in minutes of arc of two neighbouring objects (points or lines or other specified stimuli) which the observer can just perceive to be separate [IEC 50 (845)/CIE 17.4:1987; 845-02-43]

3.1.4

brightness: luminosity (obsolete)

attribute of a visual sensation according to which an area appears to emit more or less light. [IEC 50 (845)/CIE 17.4:1987; 845-02-28]

3.1.5

contrast

1. In the perceptual sense: Assessment of the difference in appearance of two or more parts of a field seen simultaneously or successively (hence: brightness contrast, lightness contrast, colour contrast, simultaneous contrast, successive contrast, etc.) .
2. In the physical sense: Quantity intended to correlate with the perceived brightness contrast, usually defined by one of a number of formulae which involve the luminances of the stimuli considered, for example: $\Delta L/L$ near the luminance threshold, or L_1/L_2 for much higher luminances.

[IEC 50 (845)/CIE 17.4:1987; 845-02-47]

3.1.6

brightness contrast

subjective assessment of the difference in brightness between two or more surfaces seen simultaneously or successively

3.1.7

colour contrast

subjective assessment of the difference in colour between two or more surfaces seen simultaneously or successively

3.1.8

glare

condition of vision in which there is discomfort or a reduction in the ability to see details or objects, caused by an unsuitable distribution or range of luminance, or to extreme contrasts [IEC 50 (845)/CIE 17.4:1987; 845-02-52]

3.1.9**flicker**

impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time [IEC 50 (845)/CIE 17.4:1987; 845-02-49]

3.1.10**visual field**

area or extent of physical space visible to an eye at a given position and direction of view

NOTE It should be stated whether the visual field is monocular or binocular.

3.1.11**visual performance**

performance of the visual system as measured for instance by the speed and accuracy with which a visual task is performed [IEC 50 (845)/CIE 17.4:1987; 845-09-04]

3.1.12**visual comfort:**

subjective condition of visual well-being induced by the visual environment

3.2 Light and Colour**3.2.1****luminous flux (Φ)**

quantity derived from radiant flux Φ_e by evaluating the radiation according to its action upon the CIE standard photometric observer. For photopic vision

$$\Phi = K_m \int_0^{\infty} \left(\frac{d\Phi_e(\lambda)}{d\lambda} \right) V(\lambda) d\lambda$$

where

$$\frac{d\Phi_e(\lambda)}{d\lambda}$$

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is the spectral distribution of the radiant flux and $V(\lambda)$ is the spectral luminous efficiency.

unit: lm

NOTE For the values of K_m (photopic vision) and K'_m (scotopic vision), see IEC 50 (845)/CIE 17.4:1987; 845-01-56.

[IEC 50 (845)/CIE 17.4:1987; 845-01-25]

3.2.2**luminous intensity (of a source, in a given direction) (I)**

quotient of the luminous flux $d\Phi$ leaving the source and propagated in the element of solid angle $d\Omega$ containing the given direction, by the element of solid angle

$$I = \frac{d\Phi}{d\Omega}$$

unit: cd = lm · sr⁻¹

[IEC 50 (845)/CIE 17.4:1987; 845-01-31]

3.2.3**luminance (in a given direction, at a given point of a real or imaginary surface) (L)**

quantity defined by the formula

$$L = \frac{d\Phi}{dA \cos\theta \, d\Omega}$$

where

$d\Phi$ is the luminous flux transmitted by an elementary beam passing through the given point and propagating in the solid angle $d\Omega$ containing the given direction;

dA is the area of a section of that beam containing the given point;

θ is the angle between the normal to that section and the direction of the beam.

unit : $\text{cd} \cdot \text{m}^{-2} = \text{lm} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$

NOTE See notes 1 to 5 to IEC 50 (845)/CIE 17.4:1987; 845-01-34.

[IEC 50 (845)/CIE 17.4:1987; 845-01-35]

3.2.4

average luminance (\bar{L})

luminance averaged over the specified area or solid angle

unit: $\text{cd} \cdot \text{m}^{-2}$

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3.2.5

minimum luminance (L_{\min})

lowest luminance of any relevant point on the specified surface

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NOTE The relevant points at which the luminances are determined should be specified in the appropriate application standard.

unit: $\text{cd} \cdot \text{m}^{-2}$

3.2.6

maximum luminance (L_{\max})

highest luminance of any relevant point on the specified surface

NOTE The relevant points at which the luminances are determined should be specified in the appropriate application standard.

unit: $\text{cd} \cdot \text{m}^{-2}$

3.2.7

maintained luminance (L_m)

value below which average luminance should not fall. It is the average luminance at the time maintenance should be carried out

unit: $\text{cd} \cdot \text{m}^{-2}$

3.2.8

initial luminance (L_i)

average luminance when the installation is new

unit: $\text{cd} \cdot \text{m}^{-2}$

3.2.9**luminance contrast**

photometric quantity intended to correlate with brightness contrast, usually defined by one of a number of formulae which involve the luminances of the stimuli considered (see also 3.1.5 [IEC 50 (845)/CIE 17.4:1987; 845-02-47]).

NOTE Luminance contrast may be defined as luminance ratio

$$C_1 = L_2/L_1 \text{ (usually for successive stimuli),}$$

or by the following formula

$$C_2 = (L_2 - L_1) / L_1 \text{ (usually for surfaces viewed simultaneously),}$$

when the areas of different luminance are comparable in size and it is desired to take an average, the following formula may be used instead

$$C_3 = (L_2 - L_1) / 0,5(L_2 + L_1)$$

where

L_1 is the luminance of the background, or largest part of the visual field;

L_2 is the luminance of the object.

3.2.10**luminance uniformity**

ratio of minimum luminance to average luminance

NOTE Use is also made of the ratio of minimum luminance to maximum luminance in which case this should be specified explicitly.

3.2.11**illuminance (at a point of a surface) (E)**

quotient of the luminous flux $d\Phi$ incident on an element of the surface containing the point, by the area dA of that element

Equivalent definition. Integral, taken over the hemisphere visible from the given point, of the expression $L \cdot \cos \theta \cdot d\Omega$, where L is the luminance at the given point in the various directions of the incident elementary beams of solid angle $d\Omega$, and θ is the angle between any of these beams and the normal to the surface at the given point.

$$E = \frac{d\Phi}{dA} = \int_{2\pi sr} L \cos\theta \, d\Omega$$

$$\text{unit : lx} = \text{lm} \cdot \text{m}^{-2}$$

[IEC 50 (845)/CIE 17.4:1987; 845-01-38].

3.2.12**average illuminance (\bar{E})**

illuminance averaged over the specified area

$$\text{unit : lx}$$

NOTE In practice this may be derived either from the total luminous flux falling on the surface divided by the total area of the surface, or alternatively from an average of the illuminances at a representative number of points on the surface.

3.2.13**minimum illuminance (E_{\min})**

lowest illuminance at any relevant point on the specified surface

$$\text{unit : lx}$$

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NOTE The relevant points at which the illuminances are determined should be specified in the appropriate application standard.

3.2.14**maximum illuminance (E_{max})**

highest illuminance at any relevant point on the specified surface

unit : lx

NOTE The relevant points at which the illuminances are determined should be specified in the appropriate application standard.

3.2.15**maintained illuminance (\bar{E}_m)**

value below which the average illuminance on the specified area should not fall. It is the average illuminance at the time maintenance should be carried out

unit : lx

3.2.16**initial illuminance (\bar{E}_i)**

average illuminance when the installation is new

unit : lx

3.2.17**spherical illuminance (at a point) (E_o)**

quantity defined by the formula

$$E_o = \int_{4\pi sr} L d\Omega$$

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where

$d\Omega$ is the solid angle of each elementary beam passing through the given point and
 L its luminance at that point.

unit : lx

(see also IEC 50 (845)/CIE 17.4:1987; 845-01-40 spherical irradiance).

3.2.18**hemispherical illuminance (at a point) (E_{hs})**

total luminous flux falling on the curved surface of a very small hemisphere located at the specified point divided by the curved surface area of the hemisphere. The base of the hemisphere is taken to be horizontal unless stated otherwise

unit : lx

3.2.19**cylindrical illuminance (at a point, for a direction) (E_z)**

quantity defined by the formula

$$E_z = 1/\pi \int_{4\pi sr} L \sin\epsilon d\Omega$$

where

$d\Omega$ is the solid angle of each elementary beam passing through the given point,
 L its luminance at that point and

ε the angle between it and the given direction; unless otherwise stated, that direction is vertical.

unit : lx

(see also IEC 50 (845)/CIE 17.4:1987; 845-01-41 cylindrical irradiance).

3.2.20

semi-cylindrical illuminance (at a point) (E_{sc})

total luminous flux falling on the curved surface of a very small semi-cylinder located at the specified point, divided by the curved surface area of the semi-cylinder. The axis of the semi-cylinder is taken to be vertical unless stated otherwise. The direction of the curved surface should be specified

unit : lx

3.2.21

illuminance uniformity

ratio of minimum illuminance to average illuminance on a surface (see also IEC 50 (845)/CIE 17.4; 845-09-58 uniformity ratio of illuminance)

NOTE Use is also made of the ratio of minimum illuminance to maximum illuminance in which case this should be specified explicitly.

3.2.22

reference surface

surface on which illuminance is measured or specified [IEC 50 (845)/CIE 17.4:1987; 845-09-49]

3.2.23

disability glare

glare that impairs the vision of objects without necessarily causing discomfort [IEC 50 (845)/CIE 17.4:1987; 845-02-57]

3.2.24

discomfort glare

glare that causes discomfort without necessarily impairing the vision of objects [IEC 50 (845)/CIE 17.4:1987; 845-02-56]

3.2.25

veiling reflections

specular reflections that appear on the object viewed and that partially or wholly obscure the details by reducing contrast [IEC 50 (845)/CIE 17.4:1987; 845-02-55]

3.2.26

luminous environment

lighting considered in relation to its physiological and psychological effects [IEC 50 (845)/CIE 17.4:1987; 845-09-03]

3.2.27

colour rendering

effect of an illuminant on the colour appearance of objects by conscious or subconscious comparison with their colour appearance under a reference illuminant

NOTE In German, the term "Farbwiedergabe" is also applied to colour reproduction.

[IEC 50 (845)/CIE 17.4:1987; 845-02-59]

3.2.28

CIE 1974 general colour rendering index [R_a]

mean of the CIE 1974 special colour rendering indices for a specified set of eight test colour samples [IEC 50 (845)/CIE 17.4:1987; 845-02-63]