



BSI Standards Publication

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

National foreword

This British Standard is the UK implementation of EN 12665:2018. It supersedes BS EN 12665:2011, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EL/1, Light and lighting applications.

A list of organizations represented on this committee can be obtained on request to its secretary.

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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 8 February 2018.

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European foreword

This document (EN 12665:2018) 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of an identical text or by endorsement, at the latest by December 2018, and conflicting national standards shall be withdrawn at the latest by December 2018.

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

This document will supersede EN 12665:2011.

The main technical changes in this revision are the inclusion of terms previously absent, collated from:

- EN 1837;
- EN 1838;
- EN 12193;
- EN 12464;
- EN 13032;
- EN 13201; and
- EN 15193.

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

Introduction

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

Where a term is contained in CIE Publication CIE S 017/E:2011 ILV, *International Lighting Vocabulary* or IEC 60050-845, *International Electrotechnical Vocabulary, Chapter 845: Lighting*, a reference is given to the equivalent term where the terms in both documents are, for all practical purposes, identical. For some terms additional explanation is given in informative Annex A. An index of terms is given in informative Annex B.

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

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

The relative importance of these factors will vary for different applications. This basic framework covers aspects in the field of vision, photometry and colorimetry, involving natural and man-made optical radiation over the UV, the visible and the IR regions of the spectrum, and application subjects covering all usages of light, indoors and outdoors, including environmental, energy and sustainability requirements and aesthetics and non- image forming biological aspects.

Peculiar and specific terms can be defined in application standards.

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

The parameters that 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.

LED terms and definitions already existing within EN 62504 have not been included in this standard.

For terms and definitions concerning daylight openings within a building envelope the following standards may also be consulted:

EN 12216, Shutters, external blinds, internal blinds - Terminology, glossary and definitions

EN 12519, Windows and pedestrian doors - Terminology

1 Scope

This document defines basic terms and definitions for use in all lighting applications. This document also sets out a framework for the specification of lighting requirements, giving details of aspects that are to be considered when setting those requirements.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 60050-845:1987, *International Electrotechnical Vocabulary — Chapter 845: Lighting*

CIE S 017/E:2011, *ILV: International Lighting Vocabulary*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

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 can have various luminances, spectral distributions and angular subtenses

Note 1 to entry: 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 to entry: Adaptation to specific spatial frequencies, orientations, sizes, etc. are recognized as being included in this definition.

[SOURCE: IEC 60050-845:1987 845-02-07 / CIE S 017/E:2011; 17-18]

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

[SOURCE: IEC 60050-845:1987 845-02-44 / CIE S 017/E:2011; 17-10]

3.1.3

visual acuity

visual resolution

<qualitatively> capacity for seeing distinctly fine details that have very small angular separation

[SOURCE: IEC 60050-845:1987 845-02-43 / CIE S 017/E:2011; 17-1403, modified - quantitative definition detached, see 3.1.15]

3.1.4

brightness

DEPRECATED: luminosity

attribute of a visual perception according to which an area appears to emit, or reflect, more or less light

Note 1 to entry: The use of this term is not restricted to primary light sources.

[SOURCE: IEC 60050-845:1987 845-02-28 / CIE S 017/E:2011; 17-110]

3.1.5

contrast

<perceptual> 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.)

EXAMPLE By the proportional variation in contrast near the luminance threshold ($\Delta L/L$) or by the ratio of luminances for much higher luminances (L_1/L_2).

[SOURCE: IEC 60050-845:1987 845-02-47 / CIE S 017/E:2011; 17-251, modified - definition of contrast in the physical sense detached, see 3.1.16]

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 by extreme contrasts

Note 1 to entry: See also “disability glare”, “discomfort glare”

[SOURCE: IEC 60050-845:1987 845-02-52 / CIE S 01/E 7:2011; 17-492]

3.1.9

flicker

impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time

[SOURCE: IEC 60050-845:1987 845-02-49 / CIE S 017/E:2011; 17-443]

3.1.10**visual field**

field of vision

extent of space in which objects are visible to an eye in a given position and direction of view

Note 1 to entry: In the horizontal plane meridian the field of vision extends to nearly 190° with both eyes open, the area seen binocularly is about 120°, and the area seen by one eye only is about 154°.

Note 2 to entry: The extent of the field of vision tends to diminish with age

[SOURCE: CIE S 017/E:2011; 17-430]

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

[SOURCE: IEC 60050-845:1987 845-09-04]

3.1.12**visual comfort**

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

3.1.13**reaction time**

minimum time interval between the occurrence of an event demanding immediate action and the response to the event (unit: s)

Note 1 to entry: The reaction time includes the time needed for perception, taking a decision and acting.

3.1.14**visual task**

visual elements of the activity being undertaken

Note 1 to entry: The main visual elements are the size of the structure, its luminance, its contrast against the background and its duration.

3.1.15**visual acuity****visual resolution**

<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

[SOURCE: IEC 60050-845:1987 845-02-43 / CIE S 017/E:2011; 17-1403, modified - qualitative definition detached, see 3.1.3]

3.1.16**contrast**

<physical> quantity intended to correlate with the perceived brightness contrast, usually defined by one of a number of formulae that involve the luminances of the stimuli considered

EXAMPLE By the proportional variation in contrast near the luminance threshold ($\Delta L/L$) or by the ratio of luminances for much higher luminances (L_1/L_2).

[SOURCE: IEC 60050-845:1987 845-02-47 / CIE S 017/E:2011; 17-251, modified - definition of contrast in the perceptual sense detached, see 3.1.5]

3.2 Light and colour**3.2.1****luminous flux**
 Φ_v

quantity derived from radiant flux Φ_e by evaluating the radiation according to its action upon the CIE standard photometric observer (unit: lm)

Note 1 to entry: For photopic vision:

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

where

$\frac{d\Phi_e(\lambda)}{d\lambda}$ is the spectral distribution of the radiant flux;

$V(\lambda)$ is the spectral luminous efficiency function

Note 2 to entry: For the values of K_m (photopic vision) and K'_m (scotopic vision), see CIE S 017/E:2011; 17-730.

Note 3 to entry: Luminous flux may also be denoted using the symbol Φ .

[SOURCE: IEC 60050-845:1987 845-01-25, CIE S 017/E:2011; 17-738, modified - Note 2 and Note 3 to entry added]

3.2.2**luminous intensity**
 I_v

<of a source, in a given direction> quotient of the luminous flux, $d\Phi_v$, leaving the source and propagated in the element of solid angle $d\Omega$ containing the given direction, by the element of solid angle (unit: cd = lm · sr⁻¹)

$$I_v = \frac{d\Phi_v}{d\Omega}$$

Note 1 to entry: The definition holds strictly only for a point source.

Note 2 to entry: Luminous intensity may also be denoted using the symbol I .

[SOURCE: IEC 60050-845:1987 845-01-31 / CIE S 017/E:2011; 17-739, modified - Note 2 to entry added]

3.2.3**Luminance** L_v

<in a given direction, at a given point of a real or imaginary surface> quantity defined by the formula
(unit: $\text{cd} \cdot \text{m}^{-2} = \text{lm} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$)

$$L_v = \frac{d\Phi_v}{dA \cos \vartheta d\Omega}$$

where

$d\Phi_v$ 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.

Note 1 to entry: The above equation does not represent a derivative (i.e. a rate of change of flux with solid angle or area) but rather the quotient of an element of flux by an element of solid angle and an element of area. In strict mathematical terms the definition could be written:

$$L_v = \lim_{A, \Omega \rightarrow 0} \frac{\Phi_v}{A \Omega \cos \vartheta}$$

In practical measurements, A and Ω should be small enough that variations in Φ_v do not affect the result.

Otherwise, the ratio $\frac{\Phi_v}{A \Omega \cos \vartheta}$ gives the average luminance and the exact measurement conditions shall be specified

Note 2 to entry: Luminance may also be denoted using the symbol L .

[SOURCE: IEC 60050-845:1987 845-01-35, CIE S 017/E:2011; 17-711, modified - Note 2 to entry added]

3.2.4**average luminance** L_{av}

luminance averaged over the specified surface (unit: $\text{cd} \cdot \text{m}^{-2}$)

Note 1 to entry: In practice, this may be approximated by an average of the luminances at a representative number of points on the surface. The number and position of these points should be specified in the relevant application guide.

Note 2 to entry: Average illuminance may also be denoted using the symbol $\bar{E}$.

[SOURCE: CIE S 017/E:2011; 17-65]

3.2.5**minimum luminance** L_{min}

lowest luminance of any relevant point on the specified surface (unit: $\text{cd} \cdot \text{m}^{-2}$)

Note 1 to entry: The relevant points at which the luminances are determined should be specified in the appropriate application standard.

3.2.6

maximum luminance

$L_{\max}$

highest luminance of any relevant point on the specified surface (unit: $\text{cd} \cdot \text{m}^{-2}$)

Note 1 to entry: The relevant points at which the luminances are determined should be specified in the appropriate application standard.

3.2.7

maintained luminance

$\bar{L}_m$

value below which the average luminance on the specified surface shall not fall (unit: $\text{cd} \cdot \text{m}^{-2}$)

Note 1 to entry: It is the average luminance at the time maintenance should be carried out

[SOURCE: CIE S 017/E:2011; 17-751]

3.2.8

initial average luminance

$\bar{L}_i$

average luminance of the specified surface when the installation is new (unit: $\text{cd} \cdot \text{m}^{-2}$)

[SOURCE: CIE S 017:2011; 17-583]

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

Note 1 to entry: See also 3.1.5.

Note 2 to entry: Luminance contrast can be defined as luminance ratio:

$C_1 = L_2 / L_1$ (usually for successive stimuli),

or by the following formula:

$C_2 = (L_2 - L_1) / L_1$ (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 can 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**illuminance** E_v (unit: lx = lm · m⁻²)

1. <at a point of a surface> quotient of the luminous flux $d\Phi_v$ incident on an element of the surface containing the point, by the area dA of that element
2. <at a point of a surface> equivalent definition: integral, taken over the hemisphere visible from the given point, of the expression:

$$L_v \cdot \cos \theta \cdot d\Omega$$

where

L_v 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

$$E_v = \frac{d\Phi_v}{dA} = \int_{2\pi} L_v \cos \theta d\Omega$$

Note 1 to entry: Illuminance may also be denoted using the symbol E .

[SOURCE: IEC 60050-845:1987 845-01-38 / CIE S 017/E:2011; 17-550, modified - Note 1 to entry added]

3.2.11**average illuminance** $\bar{E}$

illuminance averaged over the specified surface (unit: lx)

Note 1 to entry: In practice this can 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.

Note 2 to entry: The specification shall include a clear indication of the type of illuminance on the surface or at the points of the surface, i.e. horizontal, vertical, spherical, cylindrical or semi-cylindrical.

[SOURCE: CIE S 017/E:2011; 7-63]

3.2.12**minimum illuminance** $E_{\min}$

lowest illuminance at any relevant point on the specified surface (unit: lx)

3.2.13**maximum illuminance** $E_{\max}$

highest illuminance at any relevant point on the specified surface (unit: lx)

3.2.14

maintained illuminance

$\bar{E}_m$

value below which the average illuminance on the specified area shall not fall (unit: lx)

Note 1 to entry: It is the average illuminance at the time maintenance should be carried out.

[SOURCE: CIE S 017/E:2011; 17-750]

3.2.15

initial illuminance

E_{av}

average illuminance on the specified surface when the installation is new (unit: lx)

Note 1 to entry: Initial illuminance may also be denoted using the symbol $\bar{E}_i$.

[SOURCE: CIE S 017/E:2011; 17-582, modified - Note 1 to entry added]

3.2.16

spherical illuminance

E_o

<at a point> total luminous flux falling on the whole surface of a very small sphere located at the specified point divided by the surface area of the sphere (unit: lx)

Note 1 to entry: See also IEC 60050-845:1987 845 / CIE S 017/E:2011: 17-1245 spherical irradiance.

3.2.17

hemispherical illuminance

E_{hs}

<at a point> 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 (unit: lx)

Note 1 to entry: The base of the hemisphere is taken to be horizontal unless stated otherwise.

3.2.18

cylindrical illuminance

E_z

<at a point, for a direction> total luminous flux falling on the curved surface of a very small cylinder located at the specified point divided by the curved surface area of the cylinder (unit: lx)

Note 1 to entry: The axis of the cylinder is taken to be vertical unless stated otherwise.

Note 2 to entry: See also IEC 60050-845:1987 845 / CIE S 017/E:2011: 17-274 cylindrical irradiance.

3.2.19

semi-cylindrical illuminance

E_{sz}

<at a point> 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 (unit: lx)

Note 1 to entry: The axis of the semi-cylinder is taken to be vertical unless stated otherwise. The direction of the curved surface should be specified.

3.2.20**reference surface**

surface on which optical quantities are measured or specified

[SOURCE: CIE S 017/E:2011; 17-1057]

3.2.21**disability glare**

glare that impairs the vision of objects without necessarily causing discomfort

[SOURCE: IEC 60050-845:1987 845-02-57 / CIE S 017/E:2011; 17-330]

3.2.22**discomfort glare**

glare that causes discomfort without necessarily impairing the vision of objects

[SOURCE: IEC 60050-845:1987 845-02-56 / CIE S 017/E:2011; 17-333]

3.2.23**veiling reflections**

specular reflections that appear on the object viewed and that partially or wholly obscure the details by reducing contrast

[SOURCE: IEC 60050-845:1987 845-02-55 / CIE S 017/E:2011; 17-1396]

3.2.24**luminous environment**

physical conditions of light in a scene considered in relation to its physiological and psychological effects on humans

Note 1 to entry: See also IEC 60050-845:1987 luminous environment.

3.2.25**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 1 to entry: In German, the term “Farbwiedergabe” is also applied to colour reproduction.

[SOURCE: IEC 60050-845:1987 845-02-59 / CIE S 017/E:2011; 17-221]

3.2.26**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

[SOURCE: IEC 60050-845:1987 845-02-63 / CIE S 017/E:2011; 17-154]

3.2.27**colour stimulus**

visible radiation entering the eye and producing a sensation of colour, either chromatic or achromatic

[SOURCE: IEC 60050-845:1987 845-03-02 / CIE S 017/E:2011; 17-229]

3.2.28

tristimulus values

<of a colour stimulus> amounts of the three reference colour stimuli, in a given trichromatic system, required to match the colour of the stimulus considered

Note 1 to entry: In the CIE standard colorimetric systems, the tristimulus values are represented by the symbols $R, G, B; X, Y, Z; R_{10}, G_{10}, B_{10}$ and X_{10}, Y_{10}, Z_{10} .

[SOURCE: IEC 60050-845:1987 845-03-22 / CIE S 017/E:2011; 17-1345]

3.2.29

chromaticity coordinates

ratio of each of a set of three tristimulus values to their sum

Note 1 to entry: As the sum of the three chromaticity coordinates is equal to 1, two of them are sufficient to define a chromaticity.

Note 2 to entry: In the CIE standard colorimetric systems, the chromaticity coordinates are presented by the symbols x, y, z and x_{10}, y_{10}, z_{10} .

[SOURCE: IEC 60050-845:1987 845-03-33 / CIE S 017/E:2011; 17-145]

3.2.30

chromaticity

property of a colour stimulus defined by its chromaticity coordinates, or by its dominant or complementary wavelength and purity taken together

[SOURCE: IEC 60050-845:1987 845-03-34 / CIE S 017/E:2011; 17-144]

3.2.31

colour temperature

T_c

temperature of a Planckian radiator whose radiation has the same chromaticity as that of a given stimulus (unit: K)

Note 1 to entry: The reciprocal colour temperature is also used with unit: K^{-1} or MK^{-1} (where $1 MK^{-1} = 10^{-6} K^{-1}$) whose previous name "mired" (micro reciprocal degree) is now obsolete.

[SOURCE: IEC 60050-845:1987 845-03-49 / CIE S 017/E:2011; 17-231]

3.2.32**correlated colour temperature****CCT** T_{cp}

temperature of the Planckian radiator having the chromaticity nearest the chromaticity associated with the given spectral distribution on a diagram where the (CIE 1931 standard observer based) u' , $\frac{2}{3}v'$ coordinates of the Planckian locus and the test stimulus are depicted (unit: K)

Note 1 to entry: The concept of correlated colour temperature should not be used if the chromaticity of the test

source differs more than $\Delta C = \left[(u'_t - u'_p)^2 + \frac{4}{9} (v'_t - v'_p)^2 \right]^{\frac{1}{2}} = 5 \times 10^{-2}$ from the Planckian radiator, where u'_t , v'_t refer to the test source, u'_p , v'_p to the Planckian radiator.

Note 2 to entry: Correlated colour temperature can be calculated by a simple minimum search computer program that searches for that Planckian temperature that provides the smallest chromaticity difference between the test chromaticity and the Planckian locus, or, for example, by a method recommended by Robertson, A. R. "Computation of correlated colour temperature and distribution temperature", J. Opt. Soc. Am. 58, 1528-1535, 1968. (Note that the values in some of the tables in this reference are not up-to-date.)

[SOURCE: CIE S 017/E:2011; 17-258]

3.2.33**fusion frequency****critical flicker frequency (for a given set of conditions)**

frequency of alternation of stimuli above which flicker is not perceptible (unit: Hz)

[SOURCE: IEC 60050-845:1987 845-02-50]

3.2.34**reflectance**

total reflectance

 ρ

<for incident radiation of given spectral composition, polarization and geometrical distribution> ratio of the reflected radiant flux or luminous flux to the incident flux in the given conditions (unit: 1)

Note 1 to entry: Reflectance, ρ , is the sum of regular reflectance, ρ_r , and diffuse reflectance, ρ_d : $\rho = \rho_r + \rho_d$.

[SOURCE: IEC 60050-845:1987 845-04-58 / CIE S 017:2011; 17-1058]

3.2.35**transmittance** τ

<for incident radiation of given spectral composition, polarization and geometrical distribution> ratio of the transmitted radiant flux or luminous flux to the incident flux in the given conditions (unit: 1)

Note 1 to entry: Transmittance, τ , is the sum of regular transmittance, τ_r , and diffuse transmittance, τ_d : $\tau = \tau_r + \tau_d$.

[SOURCE: IEC 60050-845:1987 845-04-59 / CIE S 017/E:2011; 17-1337]

3.2.36

absorptance

α

ratio of the absorbed radiant flux or luminous flux to the incident flux under specified conditions (unit: 1)

[SOURCE: IEC 60050-845:1987 845-04-75 / CIE S 017/E:2011; 17-5]

3.2.37

photometry

measurement of quantities referring to radiation as evaluated according to a given spectral luminous efficiency function, e.g. $V(\lambda)$ or $V'(\lambda)$

Note 1 to entry: The term “photometry” is sometimes used in a broader sense covering the science of optical radiation measurement (radiometry), but this use should be deprecated.

[SOURCE: IEC 60050-845:1987 845-05-09 / CIE S 017/E:2011; 17-914]

3.2.38

access zone luminance

eye adaptation luminance in the access zone (unit: $\text{cd} \cdot \text{m}^{-2}$)

3.2.39

contrast revealing coefficient

q_c

ratio between the luminance, L , of a road surface and the vertical illuminance, E_v , at a specific location in a tunnel (unit: $\text{cd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$)

$$q_c = \frac{L}{E_v}$$

[SOURCE: CIE S 017/E:2011; 17-254]

3.2.40

diversity

extreme uniformity

U_d

ratio of minimum illuminance (luminance) to maximum illuminance (luminance) on (of) a surface

Note 1 to entry: See also 3.2.53 illuminance uniformity.

[SOURCE: CIE S 017/E:2011; 17-343 – modified - alternative term added, note to entry added]

3.2.41

equivalent veiling luminance

L_{ve}

<disability glare or veiling reflections> luminance that, when added by superposition to the luminance of both the adapting background and the object, makes the luminance threshold or the luminance difference threshold the same under the two following conditions: (1) glare present, but no additional luminance; (2) additional luminance present, but no glare (unit: $\text{cd} \cdot \text{m}^{-2}$)

[SOURCE: IEC 60050-845:1987 845-02-58 / CIE S 017/E:2011; 17-398]

3.2.42**glare rating limit** R_{GL}

maximum allowed value given by the CIE Glare Rating system

[SOURCE: CIE S 017/E:2011; 17-494]

3.2.43**interior zone luminance** $\bar{L}_{in}$

<tunnel lighting> average road surface luminance of a transverse strip at a given location in the interior zone of the tunnel (as a function of the measurement grid) (unit: $\text{cd} \cdot \text{m}^{-2}$)

3.2.44 **L_{20} access luminance**

<tunnel lighting> average luminance contained in a conical field of view, subtending an angle of 20° with the apex at the position of the eye of an approaching driver and aimed at the centre of the tunnel mouth (unit: $\text{cd} \cdot \text{m}^{-2}$)

Note 1 to entry: L_{20} access luminance is assessed from a point at a distance equal to the stopping distance from the tunnel portal at the middle of the relevant carriageway or traffic lane.

3.2.45**longitudinal uniformity** U_l

<of road surface luminance of a carriageway> lowest of the ratios determined for each driving lane of the carriageway as the ratio of the lowest to the highest road surface luminance found in a line in the centre along the driving lane

3.2.46**obtrusive light**

spill light, which, because of quantitative, directional or spectral attributes in a given context, gives rise to annoyance, discomfort, distraction, or reduction in the ability to see essential information

Note 1 to entry: In the case of outdoor sports lighting installations, obtrusive light is considered around the installation and not for spectators, referees or players within the sports area.

Note 2 to entry: In the case of large tertiary buildings with predominantly glazed facades, interior lighting can be considered as obtrusive light if it gives rise to annoyance, discomfort, distraction or a reduction in the ability to see essential information due to light spilling outside of the building structure.

3.2.47**spill light**

stray light

light emitted by a lighting installation that falls outside the boundaries of the area for which the lighting installation is designed

[SOURCE: CIE S 017/E:2011; 17-1246]

3.2.48**threshold zone luminance** $\bar{L}_{th}$

average road surface luminance of a transverse strip at a given location in the threshold zone of the tunnel (as a function of the measurement grid) (unit: $\text{cd} \cdot \text{m}^{-2}$)

3.2.49

threshold zone luminance ratio

k

<at a point> ratio between the threshold zone luminance $\bar{L}_{th}$ and the L_{20} access zone luminance

$$k = \frac{\bar{L}_{th}}{L_{20} \text{ access zone luminance}}$$

where

k is the threshold zone luminance ratio at a point;

$\bar{L}_{th}$ is the threshold zone luminance

3.2.50

transition zone luminance

$\bar{L}_{tr}$

average road surface luminance of a transverse strip at a given location in the transition zone of the tunnel (as a function of the measurement grid) (unit: $\text{cd} \cdot \text{m}^{-2}$)

3.2.51

unified glare rating limit

R_{UGL}

upper limit of glare by the CIE Unified Glare Rating system

3.2.52

windscreen luminance

L_{winds}

light veil as a result of the scatter in the vehicle windscreen expressed as a luminance (unit: $\text{cd} \cdot \text{m}^{-2}$)

3.2.53

illuminance uniformity

U_o

ratio of minimum illuminance to average illuminance on a surface (unit: 1)

[SOURCE: CIE S 017:2011; 17-552]

3.2.54

luminance uniformity

U_o

ratio of minimum luminance to average luminance on a surface (unit: 1)

[SOURCE: CIE S 017/E:2011; 17-721]

3.2.55

reflection

process by which radiation is returned by a surface or a medium, without change of frequency of its monochromatic components

[SOURCE: IEC 60050-845:1987 845-04-42 / CIE S 017:2011; 17-1065]

3.2.56**average road surface luminance** L

<of a carriageway of a road> luminance of the road surface averaged over the carriageway (unit: $\text{cd} \cdot \text{m}^{-2}$)

3.2.57**threshold increment** f_{TI}

<of an object at the road surface> percentage increase of contrast of an object that is needed to make it stay at threshold visibility in presence of disability glare generated by luminaires of a road lighting installation

Note 1 to entry: Threshold increment is sometimes signified by the abbreviation TI.

Note 2 to entry: TI is a measure of the effect of disability glare, described as an equivalent veiling luminance caused by scattering of light in the human eye. TI values are calculated in accordance with EN 13201-3 by means of an equation for the equivalent veiling luminance, which represents a young person. When setting requirements for the limitation of the TI, or when evaluating calculated TI values, it should be taken into account that the scattering in the eye tends to increase with the age of the person. The increase is individual and can be low for some, by a factor of two for others and can be high for persons suffering from untreated cataract conditions.

3.2.58**edge illuminance ratio****EIR** R_{EI}

<of illumination of a strip adjacent to the carriageway of a road> average horizontal illuminance on a strip just outside the edge of a carriageway in proportion to the average horizontal illuminance on a strip inside the edge, where the strips have the width of one driving lane of the carriageway

Note 1 to entry: Separate values apply for each of the two sides of a carriageway, and for each of the two sides of both carriageways of a dual carriageway. When a minimum requirement is made for the EIR of a lighting installation, each of the separate values shall meet the requirement.

3.2.59**vertical plane illuminance** E_v

<at a point> illuminance at a point on a vertical plane (unit: $\text{lx} = \text{lm} \cdot \text{m}^{-2}$)

3.2.60**vertical photometric angle** γ

angle between the light path and the downward vertical axis both passing through the luminaire photometric centre (unit: radian, degree)

Note 1 to entry: The direction $\gamma = 0$ is therefore oriented to the nadir.

3.2.61**azimuth** C

angle between the vertical half plane passing through the light path and the reference half plane (unit: radian, degree)

EXAMPLE The vertical half plane passing through the second axis of a luminaire, when the luminaire is at its tilt during measurement.