



BSI Standards Publication

Daylight in buildings

National foreword

This British Standard is the UK implementation of EN 17037:2018+A1:2021, incorporating corrigendum October 2021. It supersedes BS EN 17037:2018, which is withdrawn.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by CEN corrigendum October 2021 is indicated in the text by AC AC.

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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 committee manager.

The UK committee draws users' attention to National Annex NA, which provides further recommendations to assist users in the application of this standard.

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Daylight in buildings

Lumière naturelle dans les bâtiments

Tageslicht in Gebäuden

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European foreword

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This document includes the corrigendum EN 17037:2018/AC:2021 issued by CEN on 13 October 2021, which corrects symbol " d_w " in Table 1, the table reference in the 5th paragraph of E.3.1 and replaces Table E.8.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags AC AC.

This document includes Amendment 1 approved by CEN on 24 August 2021 (BT C150/2021).

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This document supersedes EN 17037:2018 and EN 17037:2018/AC:2021.

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of an identical text or by endorsement, at the latest by June 2022, and conflicting national standards shall be withdrawn at the latest by June 2022.

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Introduction

Daylight should be a significant source of illumination for all spaces with daylight opening(s). Daylight is strongly favoured by building occupants as a way to adequately illuminate the indoor surfaces, and to save energy for electrical lighting.

Daylight can provide significant quantities of light indoors, with high colour rendering and variability, changing through the day and the seasons. Daylight openings provide views and connection to the outside and contribute to the psychological well-being of occupants. A daylight opening can also provide exposure to sunlight indoors, which is important, for example, in dwellings, hospital wards and nurseries. In a space, where activities comparable to reading, writing or using display devices are carried out, a shading device should be provided to reduce visual discomfort. The standard addresses daylighting performance over the year. Daylight should illuminate spaces during a significant fraction of the annual daylight hours over the year. Daylight provision depends firstly on the availability of daylight outside (i.e. the prevailing climate at the site) and, thereafter, the environment surrounding the building, the components immediate around the daylight opening and the configuration of the interior spaces.

This standard encourages building designers to assess and ensure successfully daylit spaces. It also allows building designers and developers to target ambitions with respect to daylighting, as well as addressing other issues related to daylight design, such as view out, protection against glare, and exposure to sunlight.

1 Scope

This document specifies elements for achieving, by means of natural light, an adequate subjective impression of lightness indoors, and for providing an adequate view out. In addition, recommendations for the duration of sunshine exposure within occupied rooms are given.

This document gives information on how to use daylighting to provide lighting within interiors, and how to limit glare. This document defines metrics used for the evaluation of daylighting conditions and gives principles of calculation and verification. These principles allow to address the issue of variability of daylight over the days and the year.

This document applies to all spaces that may be regularly occupied by people for extended periods except where daylighting is contrary to the nature and role of the actual work done.

The specification of lighting requirements for humans in indoor work places including visual tasks are given in EN 12464-1 and are not part of this document.

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.

EN 12216, *Shutters, external blinds, internal blinds — Terminology, glossary and definitions*

EN 12464-1, *Light and lighting — Lighting of work places — Part 1: Indoor work places*

EN 12665:2018, *Light and lighting — Basic terms and criteria for specifying lighting requirements*

EN 14501:2005, *Blinds and shutters — Thermal and visual comfort — Performance characteristics and classification*

ISO 15469:2004, *Spatial distribution of daylight — CIE standard general sky*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12665:2018 and the following apply.

3.1

daylight

visible part of global solar radiation

Note 1 to entry: Also defined as part of global solar radiation capable of causing a visual sensation [CIE ILV 278].

[SOURCE: EN 12665:2018, 3.4.7, modified – note to entry added]

3.2

daylight factor

ratio of the illuminance at a point on a given plane due to the light received directly or indirectly from a sky of assumed or known luminance distribution, to the illuminance on a horizontal plane due to an unobstructed hemisphere of this sky, excluding the contribution of direct sunlight to both illuminances

Note 1 to entry: Glazing, dirt effects, etc. are included.

Note 2 to entry: When calculating the lighting of interiors, the contribution of direct sunlight needs to be considered separately.

Note 3 to entry: The term daylight factor is normally used when considering an overcast sky as sky type 1 or 16 in ISO 15469.

[SOURCE: EN 12665:2018, 3.4.8, CIE ILV 17-279, modified – note 3 to entry added]

3.3

daylight opening

any area in the building envelope that is capable of admitting daylight to an interior

3.4

daylight provision

level of illuminance achieved across a fraction of a reference plane for a fraction of daylight hours within a space

3.5

diffuse horizontal illuminance (from the sky)

illuminance produced by skylight on a horizontal surface on the Earth

[SOURCE: CIE ILV 17-302]

3.6

discomfort glare

glare that causes discomfort without necessarily impairing the vision of objects

[SOURCE: EN 12665:2018, 3.2.23, CIE ILV 17-333]

3.7

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

[SOURCE: EN 12665:2018, 3.1.8, CIE ILV 17-492]

3.8

global horizontal illuminance

illuminance produced by daylight on a horizontal surface on the Earth

[SOURCE: CIE ILV 17-495]

3.9

no-ground line for view

divider between the part of the space from which the ground can be seen directly by a sitting person and the part from which it cannot

3.10**no-sky line for view**

divider between the part of the space from which the sky can be seen directly by a sitting person and the part from which it cannot

3.11**obstruction**

anything outside a building which prevents the direct view of part of the sky

[SOURCE: CIE ILV 17-834]

3.12**outside distance of view**

distance from the inner surface of view opening to opposite major obstructions located in front of the opening

3.13**reference plane**

plane in a space on which illuminances and/or daylight factors are calculated, specified or measured

3.14**reference point for view**

position from which the view is assessed

3.15**skylight**

part of sky radiation capable of causing a visual sensation

[SOURCE: CIE ILV 17-1194]

3.16**solar altitude**

vertical angle between the line passing through the centre of the solar disc and the horizontal plane measured from the reference/observation point

3.17**solar azimuth**

horizontal angle between vertical plane passing through the geographical north and vertical plane passing through the centre of the solar disc

Note 1 to entry: Solar azimuth is measured clockwise from due North from 0° to 360°

3.18**sunlight**

part of direct solar radiation capable of causing a visual sensation

[SOURCE: CIE ILV 17-1281]

3.19**sunlight exposure**

sum of the time (hours) (e.g. on a given day) within a given period during which the sun is above the actual horizon with a cloudless sky, which may be limited by permanent obstructions like mountains, buildings, etc.

3.20**utilized area**

fraction of the space intended to be occupied

3.21**veiling reflections**

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

[SOURCE: EN 12665:2018, 3.2.24, CIE ILV 17-1396]

3.22**view**

visual contact with the surrounding through an opening in the surface of a building, providing information about the surrounding landscape/cityscape, possibility to experience the weather changes and to follow the time over the day

3.23**view opening**

any area in the building envelope admitting a view, including glazed walls, glazed doors, etc

4 Symbols and abbreviations

For the purposes of this document, the specific symbols listed in Table 1 apply.

Table 1 — Symbols and units

Symbol	Name of quantity	Unit
$A_{\text{façade}}$	Area of the façade	m ²
A_{glazing}	Area of the glazing	m ²
D	Daylight factor	%
DGP	Daylight glare probability	-
$DGP_e < 5 \%$	DGP -value, that is not exceeded in more than 5 % of the occupation time	-
DGP_s	Simplified DGP value	-
DGP_t	Threshold DGP value for a critical glare situation	-
D_T	Target daylight factor	%
D_{TM}	Minimum target daylight factor	%
$\langle AC \rangle d_w \langle AC \rangle$	Distance from daylight opening	m
ET	Equation of time	h
E_v	Vertical illuminance at eye level	lx (lm·m ⁻²)

Symbol	Name of quantity	Unit
$E_{v,d}$	Diffuse horizontal illuminance (from the sky)	lx ($\text{lm}\cdot\text{m}^{-2}$)
$E_{v,d,med}$	Median diffuse horizontal skylight illuminance	lx ($\text{lm}\cdot\text{m}^{-2}$)
$E_{v,g}$	Global horizontal illuminance	lx ($\text{lm}\cdot\text{m}^{-2}$)
$E_{v,g,med}$	Median global horizontal daylight illuminance	lx ($\text{lm}\cdot\text{m}^{-2}$)
$F_{DGP,exceed}$	Fraction of reference usage time for which a threshold value DGP_t is exceeded	-
$F_{plane,\%}$	Fraction of the reference plane for target illuminance level	%
$F_{time,\%}$	Fraction of time for which a given value of illuminance is exceeded	%
f_{glaz}	Glazing fraction	%
i	Number of glare sources	-
J	J is the day number of the year (e.g. for 1st January, $J = 1$ and for 31st December, $J = 365$, February is taken to have 28 days)	-
LT	Local clock time	h
L_s	Luminance of glare source	cd/m^2
L_v	Sky luminance	cd/m^2
P	Position index	-
TST	True solar time	h
t_d	Daylight hours	h
t_{end}	Time when the duration of sunlight is ending by the obstruction or when the solar azimuth α_s reaches the end of the acceptance angle α_a	h
t_{start}	Time when the sun rays begin to reach reference point	h
α_a	Acceptance angle	degrees
α_{obs}	Angle of obstruction	degrees
α_s	Solar azimuth (measured clockwise from due North)	degrees
$\alpha_{wn,s}$	Azimuth angle of daylight opening normal, measured from South	degrees
γ_s	Solar altitude	degrees

Symbol	Name of quantity	Unit
$\gamma_{s,min}$	Minimum Solar altitude	degrees
Δ	Declination of the sun	degrees
Λ	Geographical longitude of the site East (+) or West (-) of Greenwich	degrees
λ_s	Longitude of standard meridian	degrees
$\tau_{glazing}$	Normal-hemispherical light transmittance of the glazing	-
$\tau_{v,n-dif}$	Normal-diffuse light transmittance	-
$\tau_{v,n-n}$	Normal-normal light transmittance	-
φ	Geographical latitude of the site	degrees
ω_s	Solid angle subtended by the glare source	sr
ω_η	The hour angle ω_η is counted from the meridian as positive towards the afternoon and negative towards the morning.	degrees

5 Assessment of daylight in interior spaces

5.1 Daylight Provision

5.1.1 General

Daylight can contribute significantly to the lighting needs of any type of building. This means that daylight openings should have appropriate areas to provide sufficient daylight throughout the year. Thus, the evaluation of daylight provision should make account of the availability of daylight at the site in addition to accounting for the properties of the space (e.g. external obstruction, glazing transmittance, thickness of walls and roofs, internal partition and surface reflectance, furniture).

5.1.2 Criteria for daylight provision

A space is considered to provide adequate daylight if a target illuminance level is achieved across a fraction of the reference plane within a space for at least half of the daylight hours.

In addition, for spaces with vertical or inclined daylight openings, a minimum target illuminance level is also to be achieved across the reference plane.

The reference plane of the space is located 0,85 m above the floor, unless otherwise specified. A small fraction of the reference plane may be disregarded to account for singularities.

Values for target illuminances, minimum target illuminances and fractions of reference plane are given in Table A.1.

5.1.3 Daylight Provision Calculation Methods

The following methods to assess daylight provision to the interior, using validated software, are possible:

Method 1) Calculation method using daylight factors on the reference plane. Annex A gives values for target daylight factors (D_T) and minimum target daylight factors (D_{TM}) to be achieved depending on the given site.

Method 2) Calculation method of illuminance levels on the reference plane using climatic data for the given site and an adequate time step. Annex A gives values for target illuminances and minimum target illuminances to be achieved.

Annex B describes recommendations for the daylight calculations using the two methods.

5.1.4 Verification of daylight provision

Verification of daylight provision can be determined using either an adequate software or on site measurements.

The procedure by software requires a representative model of the space together with the key parameters (such as any significant nearby obstructions, the assigned surface reflectance values and glazing transmissivity) that are a reasonable representation of those for the actual, completed building. This can be determined using either Method 1 or Method 2 described in 5.1.3.

On site, it can also be verified using illuminance meters, to measure the distribution of the daylight factor in the actual, completed building. It needs to be conducted at grid points of the reference plane (see B.2) Methods for verification are described in Annex B.

5.2 Assessment for view out

5.2.1 General

View to the outside provides visual connection with the surroundings to supply information about the local environment, weather changes and the time of day. This information can relieve the fatigue associated with long periods of being indoors. All occupants of a space should have the opportunity for the refreshment and relaxation afforded by a change of scene and focus. View to the outside should be assessed from selected reference points corresponding to where people are located within the utilized area.

A view is considered to comprise three distinct layers:

- a layer of sky;
- a layer of landscape;
- a layer of ground.

NOTE The ground layer can include information of activities. The landscape layer can be comprised of buildings, nature, and/or the horizon only.

From any specific reference point (Q), the view quality depends on:

- the size of the daylight opening(s);
- the width of the view (horizontal sight angle);
- the outside distance of view;

- the number of layers;
- the quality of the environmental information of the view.

5.2.2 Criteria for view out

The criteria for view out concern the utilized area. In order to ensure an adequate view out, the following criteria should be met:

- the glazing material of the view opening should provide a view that is perceived to be clear, undistorted and neutrally coloured;
- in the utilized area, view opening(s) as seen from the reference point of the view should have a total horizontal sight angle higher than a minimum value;
- the distance to the outside view should be larger than a minimum value;
- in the utilized area a minimum number of layers should be seen.

Recommended values of view out are given in Table A.5 and calculation methods are described in Annex C.

5.2.3 Verification of view out

Two procedures for verification of view out are given in Annex C.

One simplified verification method of the criteria for view out is described in C.4.1.

One advanced verification method for complex shapes of daylight opening and/or multiple openings is described in C.4.2.

5.3 Exposure to sunlight

5.3.1 General

Exposure to sunlight is an important quality criterion of an interior space and can contribute to human well-being. Minimum exposure to sunlight should be provided in patient rooms in hospitals, play rooms in nurseries and at least one habitable space in dwellings. This is achieved through the expression of the minimum number of hours during which this space receives direct sunlight, for a clear cloudless reference day in the year.

5.3.2 Criteria for exposure to sunlight

For a given reference day (see A.4), a space should receive sunlight for at least a predefined number of hours. Recommended values of sunlight exposure (h) are given in A.4 and calculation methods are described in Annex D.

5.3.3 Verification of sunlight duration

Verification of sunlight duration needs to be conducted in a space which receives sun beams. The sunlight duration is to be verified at the reference point *P* described in Annex D, considering as many daylight openings as necessary to reach the recommended value. This can be determined using either a manual procedure or an adequate software. On site, it can also be verified using either geometrical measurements or pictures taken at point *P* using e.g. a camera equipped with a fish eye lens.

Methods for verification are described in Annex D.

5.4 Protection from glare

5.4.1 General

Glare is a negative sensation and the cause is bright areas with sufficiently greater luminance than the luminance to which the eyes are adapted to, producing annoyance, discomfort or loss in visual performance and visibility. Direct sunlight or high luminance differences between bright and dark areas within the field of view can cause risk of glare.

For any space with daylight openings, it is recommended to use shading devices to reduce risk of glare, and direct view to the sun or a reflection of it should be avoided.

Recommendations for glare protection can be found in Annex E.

5.4.2 Criteria for protection from glare

Daylight Glare Probability (*DGP*) is used to assess protection from glare for spaces where the activities are comparable to reading, writing or using display devices and the occupants are not able to choose position and viewing direction. The *DGP*-assessment can be applied to a space with vertical or inclined daylight openings, but is not applicable for a space with horizontal daylight openings.

DGP-threshold values should not be exceeded for a certain fraction of the reference usage time $F_{DGP, exceed}$ (see A.5). Recommended maximum *DGP* targets can be assessed by the simplified method given in Annex E. Alternatively an annual *DGP* calculation can be used.

Ratings of discomfort glare caused from an indoor electric lighting installation (e.g. UGR, see EN 12464-1) cannot be applied to rate discomfort glare from vertical or inclined daylight openings.

5.4.3 Verification for protection from glare

Verification of glare protection can be conducted with two methods. A simplified method verifying shading devices is described in E.3.2, or method for on site measurements to calculate *DGP* values, see E.5.

Methods for verification are described in Annex E.

Annex A (informative)

Recommendations

A.1 General

This annex gives three levels of recommendation for assessment of daylight in interior spaces, as specified in Clause 5. The three levels are: minimum, medium and high, and the minimum recommendation level should be provided. The recommendations are given for daylight provision (A.2), view out (A.3), sunlight exposure (A.4) and protection from glare (A.5). If activities in the space may benefit for higher levels, then recommendations are given.

A.2 Recommendations for daylight provision in a space

Table A.1 and Table A.2 give recommendations for daylight provision in a space. The tables include levels for target illuminance E_T (lx) and target minimum illuminance E_{TM} (lx). A target illuminance level E_T (lx) should be achieved across a specified fraction $F_{plane,\%}$ of the reference plane within a space. For a space with vertical and inclined daylight opening(s), a minimum target illuminance E_{TM} (lx) should be achieved across the entire (i.e. 95 %) fraction $F_{plane,\%}$. Horizontal opening areas can provide the target illuminance across the entire (i.e. 95 %) fraction $F_{plane,\%}$ of the reference plane (Table A.2). The fraction, $F_{plane,\%}$, of the reference plane within a space, in percentage, is given in Table A.1 and Table A.2. Table A.1 gives recommendations for a space with daylight openings in a vertical and/or inclined surface, while Table A.2 gives recommendations for a space with openings in a horizontal surface.

In case of doubt as to whether a particular daylight opening is to be evaluated as an opening in a vertical/inclined surface, or a horizontal surface, any opening is considered to be horizontal if the entire opening area is above the reference plane of the space under consideration.

The reference plane of the space is located 0,85 m above the floor, unless otherwise specified.

Table A.1 — Recommendations of daylight provision by daylight openings in vertical and inclined surface

Level of recommendation for vertical and inclined daylight opening	Target illuminance E_T lx	Fraction of space for target level $F_{plane,\%}$	Minimum target illuminance E_{TM} lx	Fraction of space for minimum target level $F_{plane,\%}$	Fraction of daylight hours $F_{time,\%}$
Minimum	300	50 %	100	95 %	50 %
Medium	500	50 %	300	95 %	50 %
High	750	50 %	500	95 %	50 %
NOTE Table A.3 gives target daylight factor (D_T) and minimum target daylight factor (D_{TM}) corresponding to target illuminance level and minimum target illuminance, respectively, for the CEN capital cities.					

Table A.2 — Recommendations of daylight provision by daylight openings in a horizontal surface

Level of recommendation for horizontal daylight opening	Target illuminance E_T lx	Fraction of space for target level $F_{\text{plane},\%}$	Fraction of daylight hours $F_{\text{time},\%}$
Minimum	300	95 %	50 %
Medium	500	95 %	50 %
High	750	95 %	50 %
NOTE Tables A.3 and A.4 give target daylight factor (D_T) corresponding to target illuminance level for the CEN capital cities. Note, that for spaces with horizontal daylight openings, there is no minimum target illuminance recommendations. Table A.4 is only for horizontal daylight openings with diffusing material.			

The recommendations in Table A.1 and Table A.2 can be expressed in terms of a daylight factor D . Table A.3 and Table A.4 provide the corresponding daylight factor (D) relative to recommended target illuminance E_T (lx) and target minimum illuminance E_{TM} (lx). The corresponding daylight factors relative to the illuminance levels, to be used in method 1 (see 5.1.3), are given in Table A.3 and Table A.4.

Table A.3 — Values of D for daylight openings to exceed an illuminance level of 100, 300, 500 or 750 lx for a fraction of daylight hours $F_{\text{time},\%} = 50 \%$ for 33 capitals of CEN national members

Nation	Capital ^a	Geographical latitude φ [°]	Median External Diffuse Illuminance $E_{V,d,med}$	D to exceed 100 lx	D to exceed 300 lx	D to exceed 500 lx	D to exceed 750 lx
Cyprus	Nicosia	34,88	18 100	0,6 %	1,7 %	2,8 %	4,1 %
Malta	Valletta	35,54	16 500	0,6 %	1,8 %	3,0 %	4,5 %
Greece	Athens	37,90	19 400	0,5 %	1,5 %	2,6 %	3,9 %
Portugal	Lisbon	38,73	18 220	0,5 %	1,6 %	2,7 %	4,1 %
Turkey	Ankara	40,12	19 000	0,5 %	1,6 %	2,6 %	3,9 %
Spain	Madrid	40,45	16 900	0,6 %	1,8 %	3,0 %	4,4 %
Italy	Rome	41,80	19 200	0,5 %	1,6 %	2,6 %	3,9 %
Former Yugoslav Republic of Macedonia	Skopje	42,00	15 400	0,6 %	1,9 %	3,2 %	4,9 %
Bulgaria	Sofia	42,73	18 700	0,5 %	1,6 %	2,7 %	4,0 %
Romania	Bucharest	44,50	18 200	0,5 %	1,6 %	2,7 %	4,1 %
Croatia	Zagreb	45,48	17 000	0,6 %	1,8 %	2,9 %	4,4 %
Slovenia	Ljubljana	46,22	17 000	0,6 %	1,8 %	2,9 %	4,4 %
Switzerland	Bern	46,25	16 000	0,6 %	1,9 %	3,1 %	4,7 %

Nation	Capital ^a	Geographical latitude φ [°]	Median External Diffuse Illuminance $E_{v,d,med}$	<i>D</i> to exceed 100 lx	<i>D</i> to exceed 300 lx	<i>D</i> to exceed 500 lx	<i>D</i> to exceed 750 lx
Hungary	Budapest	47,48	18 100	0,6 %	1,7 %	2,8 %	4,1 %
Austria	Wien	48,12	16 000	0,6 %	1,9 %	3,1 %	4,7 %
Slovakia	Bratislava	48,20	16 300	0,6 %	1,8 %	3,1 %	4,6 %
France	Paris	48,73	15 900	0,6 %	1,9 %	3,1 %	4,7 %
Luxembourg	Luxembourg	49,36	16 000	0,6 %	1,9 %	3,1 %	4,7 %
Czech Republic	Prague	50,10	14 900	0,7 %	2,0 %	3,4 %	5,0 %
Belgium	Brussels	50,90	15 000	0,7 %	2,0 %	3,3 %	5,0 %
United Kingdom	London	51,51	14 100	0,7 %	2,1 %	3,5 %	5,3 %
Poland	Warsaw	52,17	14 700	0,7 %	2,0 %	3,4 %	5,1 %
The Netherlands	Amsterdam	52,30	14 400	0,7 %	2,1 %	3,5 %	5,2 %
Germany	Berlin	52,47	13 900	0,7 %	2,2 %	3,6 %	5,4 %
Ireland	Dublin	53,43	14 900	0,7 %	2,0 %	3,4 %	5,0 %
Lithuania	Vilnius	54,88	15 300	0,7 %	2,0 %	3,3 %	4,9 %
Denmark	Copenhagen	55,63	14 200	0,7 %	2,1 %	3,5 %	5,3 %
Latvia	Riga	56,57	13 600	0,7 %	2,2 %	3,7 %	5,5 %
Estonia	Tallinn	59,25	13 600	0,7 %	2,2 %	3,7 %	5,5 %
Sweden	Stockholm	59,65	12 100	0,8 %	2,5 %	4,1 %	6,2 %
Norway	Oslo	59,90	12 400	0,8 %	2,4 %	4,0 %	6,0 %
Finland	Helsinki	60,32	13 500	0,7 %	2,2 %	3,7 %	5,6 %
Iceland	Reykjavik	64,13	11 500	0,9 %	2,6 %	4,3 %	6,5 %

^a Other cities could be added by countries to take into account more precise role of latitude and climate.

Table A.4 — Values of D only for horizontal daylight openings with diffusing material¹⁾ to exceed an illuminance level of 100, 300, 500 or 750 lx for a fraction of daylight hours
 $F_{\text{time},\%} = 50 \%$ for 33 capital cities of CEN national members

Nation	Capital ^a	Geographical latitude φ [°]	Median External Global Illuminance $E_{v,g,med}$	D to exceed 100 lx	D to exceed 300 lx	D to exceed 500 lx	D to exceed 750 lx
Cyprus	Nicosia	34,88	43 200	0,2 %	0,7 %	1,2 %	1,7 %
Malta	Valletta	35,54	33 600	0,3 %	0,9 %	1,5 %	2,2 %
Greece	Athens	37,90	35 350	0,3 %	0,8 %	1,4 %	2,1 %
Portugal	Lisbon	38,73	38 717	0,3 %	0,8 %	1,3 %	1,9 %
Turkey	Ankara	40,12	31 300	0,3 %	1,0 %	1,6 %	2,4 %
Spain	Madrid	40,45	35 200	0,3 %	0,9 %	1,4 %	2,1 %
Italy	Rome	41,80	30 900	0,3 %	1,0 %	1,6 %	2,4 %
Former Yugoslav Republic of Macedonia	Skopje	42,00	24 300	0,4 %	1,2 %	2,1 %	3,1 %
Bulgaria	Sofia	42,73	22 200	0,5 %	1,4 %	2,3 %	3,4 %
Romania	Bucharest	44,50	28 500	0,4 %	1,1 %	1,8 %	2,6 %
Croatia	Zagreb	45,48	20 300	0,5 %	1,5 %	2,5 %	3,7 %
Slovenia	Ljubljana	46,22	19 800	0,5 %	1,5 %	2,5 %	3,8 %
Switzerland	Bern	46,25	21 700	0,5 %	1,4 %	2,3 %	3,5 %
Hungary	Budapest	47,48	25 100	0,4 %	1,2 %	2,0 %	3,0 %
Austria	Wien	48,12	20 800	0,5 %	1,4 %	2,4 %	3,6 %
Slovakia	Bratislava	48,20	22 600	0,4 %	1,3 %	2,2 %	3,3 %
France	Paris	48,73	20 400	0,5 %	1,5 %	2,5 %	3,7 %
Luxembourg	Luxembourg	49,36	17 100	0,6 %	1,8 %	2,9 %	4,4 %
Czech Republic	Prague	50,10	17 400	0,6 %	1,7 %	2,9 %	4,3 %
Belgium	Brussels	50,90	17 200	0,6 %	1,7 %	2,9 %	4,4 %
United Kingdom	London	51,51	17 650	0,6 %	1,7 %	2,8 %	4,2 %
Poland	Warsaw	52,17	18 300	0,5 %	1,6 %	2,7 %	4,1 %

1) A diffusing material redistribute transmitted light evenly regardless of the angular distribution of the incident light. The ratio between the internal and external illuminance remains relative constant regardless of the sun and sky conditions.

Nation	Capital ^a	Geographical latitude φ [°]	Median External Global Illuminance $E_{v,g,med}$	<i>D</i> to exceed 100 lx	<i>D</i> to exceed 300 lx	<i>D</i> to exceed 500 lx	<i>D</i> to exceed 750 lx
The Netherlands	Amsterdam	52,30	17 600	0,6 %	1,7 %	2,8 %	4,3 %
Germany	Berlin	52,47	17 100	0,6 %	1,8 %	2,9 %	4,4 %
Ireland	Dublin	53,43	18 200	0,5 %	1,6 %	2,7 %	4,1 %
Lithuania	Vilnius	54,88	18 400	0,5 %	1,6 %	2,7 %	4,1 %
Denmark	Copenhagen	55,63	17 300	0,6 %	1,7 %	2,9 %	4,3 %
Latvia	Riga	56,57	15 000	0,7 %	2,0 %	3,3 %	5,0 %
Estonia	Tallinn	59,25	14 500	0,7 %	2,1 %	3,4 %	5,2 %
Sweden	Stockholm	59,65	15 200	0,7 %	2,0 %	3,3 %	4,9 %
Norway	Oslo	59,90	14 600	0,7 %	2,1 %	3,4 %	5,1 %
Finland	Helsinki	60,32	16 900	0,6 %	1,8 %	3,0 %	4,4 %
Iceland	Reykjavik	64,13	14 000	0,7 %	2,1 %	3,6 %	5,4 %
^a Other cities could be added by countries to take into account more precise role of latitude and climate.							

A.3 Recommendations for view

View opening(s) should provide a sufficient view. If there are several openings with little distance between them, the sum of openings may be regarded as one opening.

Table A.5 gives recommendations for three levels of view out through vertical, inclined and horizontal openings. These levels depend on the horizontal sight angle, the distance to outside view, and the number of layers (content of the view). These aspects are assessed from reference positions (see Annex C for further details). The highest view levels are specifically important for buildings for people with limited mobility.

Table A.5 — Assessment of the view outwards from a given position

	Parameter ^a		
Level of recommendation for view out	Horizontal sight angle	Outside distance of the view	Number of layers to be seen from at least 75 % of utilized area: - sky - landscape (urban and/or nature) - ground
Minimum	$\geq 14^\circ$	$\geq 6,0$ m	At least landscape layer is included
Medium	$\geq 28^\circ$	$\geq 20,0$ m	Landscape layer and one additional layer is included in the same view opening
High	$\geq 54^\circ$	$\geq 50,0$ m	all layers are included in the same view opening
^a For a space with room depth more than 4 m, it is recommended that the respective sum of the view opening(s) dimensions is at least 1,0 m × 1,25 m (width × height).			

A.4 Recommendation for exposure to sunlight

The recommendation is that a space should receive possible sunlight for a duration according to Table A.6 (supposed to be cloudless) on a selected date between February 1st and March 21st. Table A.6 proposes three levels for sunlight exposure. See Annex D for further details.

When applying the recommendation to a whole dwelling, the proposal is that at least one habitable room in the dwelling should have at least exposure to sunlight after Table A.6.

Table A.6 — Recommendation for daily sunlight exposure

Level of recommendation for exposure to sunlight	Sunlight exposure
Minimum	1,5 h
Medium	3,0 h
High	4,0 h

A.5 Recommendation for glare protection

The Daylight Glare Probability (*DGP*) should not exceed a maximum value for more than the fraction $F_{DGP,exceed} = 5\%$ of the usage time of the space.

In Table A.7, $DGP_e < 5\%$ -threshold values for different levels of glare protection are proposed.

The minimum recommendation for glare protection is that the *DGP* for the occupied space does not exceed a value of 0,45 in more than 5 % of the occupation time of the relevant space.