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Road lighting - Part 1: Selection of lighting classes

Eclairage public - Partie 1: Sélection des classes
d'éclairage

Straßenbeleuchtung - Teil 1: Auswahl der
Beleuchtungsklassen

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Foreword

This document CEN/TR 13201-1:2004 has been prepared by Technical Committee CEN/TC 169 "Light and Lighting", the secretariat of which is held by DIN.

Road lighting is dealt with by CEN as follows:

CR 13201-1: *Road lighting – Part 1: Selection of lighting classes.*

EN 13201-2: *Road lighting – Part 2: Performance requirements.*

EN 13201-3: *Road lighting – Part 3: Calculation of performance.*

EN 13201-4: *Road lighting – Part 4: Methods of measuring the light performance of installations.*

Introduction

This document offers further guidance on the selection of lighting classes and related aspects. It is applicable to fixed lighting installations intended to provide good visibility to users of outdoor public traffic areas during the hours of darkness to support traffic safety, traffic flow and public security.

1 Scope

This document specifies the lighting classes set out in EN 13201-2 and gives guidelines on the application of these classes. To do this, it includes a system to define an outdoor public traffic area in terms of parameters relevant to lighting. To assist in the application of classes, it suggests a practical relationship between the various series of lighting classes, in terms of comparable or alternative classes.

It also gives guidelines on the selection of the relevant area to which the lighting classes from EN 13201-2 and the calculation grids and procedure from EN 13201-3 should be applied.

The parameters used in this document allow:

- a) a lighting situation to be described in terms of:
 - the geometry of the area under consideration;
 - the use of the area;
 - the influence of the surrounding environment;
- b) a specific approach to situations to be taken to enable the effective use of energy.

This document does not give the criteria on which a decision to light an area can be made, nor on how a lighting installation should be used.

This document does not give guidelines on the selection of lighting classes for toll stations, tunnels or canals and locks.

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 13201-2:2003, *Road lighting – Part 2: Performance requirements*.

EN 13201-3:2003, *Road lighting – Part 3: Calculation of performance*.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13201-2:2003, EN 13201-3:2003 and the following terms and definitions apply.

3.1

user type

category of person or vehicle in an outdoor public traffic area

NOTE In this document, only user types as specified in this Clause are considered.

3.2

motorised traffic (M)

motor powered vehicles other than slow moving vehicles

3.3

slow moving vehicles (S)

motor powered vehicles, animal drawn vehicles and people on animals with speed limited to 40 km/h

NOTE In some countries this may be 50 km/h.

3.4

cyclists (C)

people on pedal cyclists and mopeds with speed limited to 50 km/h

NOTE In some countries this can be 40 km/h.

3.5

pedestrians (P)

people on foot or using wheelchairs

3.6

typical speed of main user

the assessed speed of the user defined as the main user type of the relevant area. Where the main user type is a combination of motorised traffic and one or more of the other types, motorised traffic is taken as the main user

NOTE For lighting purposes broad speed categories are sufficient. Speed is therefore assessed rather than measured and the method of assessment is a matter for the road authorities.

3.7

relevant area

part of the public traffic area under consideration

3.8

conflict area

relevant area where motorised traffic streams intersect each other or overlap areas frequented by other user types

3.9

interchange

a grade-separated junction with one or more turning roadways (ramps) for travel between the through roads

3.10

intersection

the general area where two or more roads join or cross at the same level, within which are included the roadway and roadside facilities for traffic movements

3.11

traffic flow of vehicles

the number of vehicles passing a given point in a stated time in both directions. This is measured as average daily traffic (see 3.12)

NOTE Although not necessary for lighting, the road authority may use traffic flow per lane and compose the figures together. In the case of a parking area, the given point is the entrance.

3.12

average daily traffic (ADT)

the total traffic during a given time period, in whole days, divided by the number of days in that time period

3.13

difficulty of navigational task

the degree of effort necessary by the road user, as a result of the information presented, to select route and lane, and to maintain or change speed and position on the carriageway

NOTE Visual guidance provided by the road is part of this information.

3.14

crime risk

crime risk in the considered traffic area compared to crime risk in the larger area

NOTE Ideally this should be objectively related to crime statistics, but experience indicates that a truly objective approach is very difficult.

3.15

complexity of visual field

the amount of lighting and other visual elements existing in the visual field of the road user which mislead, distract, disturb or annoy the road user

NOTE Although visual guidance provided by the road and environment can be adequate, such elements can cause problems in detecting high priority objects such as traffic lights and other road users changing direction. Examples can include advertisements, lighting columns, lighted buildings, sports lighting.

3.16

ambient brightness level

assessed luminance level of the surroundings

3.17

main weather type

the weather conditions which prevail for a significant proportion of the time

4 Outline of selection procedure

This document is arranged in such a way that a step by step selection procedure may be followed to arrive at the appropriate lighting recommendations:

- a) define the public traffic area in one or more relevant areas and select the set of lighting situations (5.1);
- b) go to the table indicated for the selected set (see Annex A);
- c) define the relevant area in detail (see 5.2 and 5.3);
- d) select the range of lighting classes;
- e) select one lighting class from the range;
- f) find the lighting performance requirements for the selected lighting class(es);
- g) consider the general recommendations (see Clause 6).

5 Lighting situations

5.1 Groups of lighting situations

A lighting situation can be classified within a group in terms of the base parameters given in Table 1, which identifies for each group the appropriate set of lighting situations.

A full description of each set of lighting situations by specific parameters is given in the Tables in Annex A.

Table 1 — Grouping of lighting situations

Typical speed of main user km/h	User types in the same relevant area			Sets of lighting situations
	Main user	Other allowed user	Excluded user	
> 60	Motorised traffic		Slow moving vehicles Cyclists Pedestrians	A1
		Slow moving vehicles	Cyclists Pedestrians	A2
		Slow moving vehicles Cyclists Pedestrians		A3
> 30 and ≤ 60	Motorised traffic Slow moving vehicles	Cyclists Pedestrians		B1
	Motorised traffic Slow moving vehicles Cyclists	Pedestrians		B2
	Cyclists	Pedestrians	Motorised traffic Slow moving vehicles	C1
> 5 and ≤ 30	Motorised traffic Pedestrian		Slow moving vehicles Cyclists	D1
		Slow moving vehicles Cyclists		D2
	Motorised traffic Cyclists	Slow moving vehicles Pedestrians		D3
	Motorised traffic Slow moving vehicles			D4
Walking speed	Cyclists Pedestrians			
	Pedestrians		Motorised traffic Slow moving vehicles Cyclists	E1
		Motorised traffic Slow moving vehicles Cyclists		E2

5.2 Assessment of parameters

The lighting recommendations depend on the geometry of the relevant area and on traffic and time dependant circumstances. It is for the road authority to describe these circumstances for the relevant area, and thus evaluate the appropriate parameters.

A list of parameters with their possible options or values is given in Table 2.

Table 2 — Specific parameters

Parameters		Options
Area (geometry)	Separation of carriageways	Yes No
	Types of junctions	Interchanges Intersections
	Interchange spacing, distance between bridges	>3 km ≤ 3 km
	Intersection density	< 3 intersections/km ≥ 3 intersections/km
	Conflict area	No Yes
	Geometric measures for traffic calming	No Yes
Traffic use	Traffic flow of vehicles per day	< 4 000 4 000 to 7 000 7000 to 15 000 15 000 to 25 000 25 000 to 40 000 > 40 000
	Traffic flow of cyclists	Normal High
	Traffic flow of pedestrian	Normal High
	Difficulty of navigational task	Normal Higher than normal
	Parked vehicles	Not present Present
	Facial recognition	Unnecessary Necessary
	Crime risk	Normal Higher than normal
Environmental and external influences	Complexity of visual field	Normal High
	Ambient luminance	Rural Urban City centre
	Main weather type	Dry Wet

5.3 Relevant areas

5.3.1 General

A public area normally consists of more than one traffic area. Often, along a route, there is a carriageway with an adjacent footway or cycle path. When the relevant area is defined so that all parts of the route are included, the lighting recommendations should apply to the whole relevant area, and the calculation procedure and appropriate calculation grid from EN 13201-3 applied to the whole area.

When the road authority chooses to consider different traffic areas separately, each area should be defined separately, and the calculation procedure applied separately.

Conflict areas can occur within areas where motorised traffic is the main user. The boundaries of the conflict area should be defined in order to apply the recommended lighting class.

Geometric measures for traffic calming can occur within all areas where motorised traffic and cyclists are users. The boundaries of this relevant area of traffic calming measures should be defined in order to apply the recommended lighting class.

Detailed guidance, on the definition of the relevant area, the traffic area within the relevant area, and on the definition of the adjacent strip to determine surround ratio, is given below.

5.3.2 Relevant area for lighting situation sets A1, A2, A3

If there are no adjacent emergency lanes, footways, or cyclepaths, the area is the total width of carriageway between the outer edges of the carriageway (kerbs).

For dual carriageways, the area is the total width of both carriageways including the central reservation unless the width of the reserve is such that the carriageways can be considered separately.

If there are adjacent emergency lanes, there are two alternatives:

- a) Consider the total area.

The area is the total width of carriageway including emergency lanes between the outer edges of the emergency lanes;

- b) Consider separately the carriageway and emergency lanes:

The area for the carriageway is the total width of the running lanes only.

The area for the emergency lane is the width of the emergency lane only.

If there are adjacent footways or cyclepaths, there are two alternatives:

- a) Consider the area for the carriageway only.

The area for the carriageway is the width of the carriageway between kerbs.

- b) Consider separately the carriageway and footway or cyclepath:

The area of the carriageway is the total width of the carriageway between kerbs.

The area for the footway or cyclepath is as in 5.3.4.

The width of the adjacent strip for surround ratio if used, when the ME lighting classes from EN 13201-2:2003, Table 1a and Table 1b are chosen and there are no adjacent traffic areas is taken as being equal to the width of the first lane of the carriageway.

5.3.3 Relevant area for lighting situation sets B1, B2

If there are no adjacent footways or cyclepaths, the area is the total area of carriageway between kerbs. The width of the adjacent strip for surround ratio, if used when the ME lighting classes are chosen and there are no adjacent traffic areas, is taken as being equal to the width of the first lane of the carriageway.

If there are adjacent footways or cyclepaths, consider separately the carriageway and footway or cyclepath.

- The area for the carriageway is the total width of carriageway between kerbs;
- The area for the footway or cyclepath, which may include the verge, is given in 5.3.4.

5.3.4 Relevant area for lighting situation sets C1, E1, E2

The area is the total width of the defined footway, footpath or cyclepath.

For footpaths or cyclepaths away from carriageways, the area may be extended to include a 2 m strip on each side.

Where footways (or footpaths) and cyclepaths are adjacent, the total width of both may be considered as one area.

5.3.5 Relevant area for lighting situation sets D1, D2, D3

If there are no adjacent footways, the area is the total shared area bounded by the facade of buildings directly bordering the area, or the property limits of premises bordering the area.

If there are adjacent footways, there are two alternatives.

- a) Consider the total area.

The area is the total width of carriageway and footway which may include verge, bounded by the facade of buildings directly fronting the area or the property limits of premises bordering the area;

- b) Consider separately the carriageway and footway.

The area for the carriageway is the total width of carriageway between kerbs.

The area for the footway is given in 5.3.4.

5.3.6 Relevant area for lighting situation set D4

The area is the total shared area bounded by the facade of buildings directly bordering the area or the property limits of premises bordering the area.

5.3.7 Relevant area of conflict area

If there are no adjacent footways or cyclepaths, the area is the total area of carriageway between kerbs.

If vehicles are in some circumstances permitted to travel on or over the central island of a roundabout or junction, the island should be included in the area.

The boundary must be determined between this area and the area of the approach road.

If there are adjacent footways or cyclepaths, there are two alternatives:

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- a) Consider the total area.

The area is the total width of carriageway, footway which may include verge, and cyclepath, bounded by the facade of buildings directly bordering the area, or the property limits of premises bordering the area;

- b) Consider separately the carriageway and footway or cyclepath.

The area for the carriageway is as the total area between kerbs.

The area for the footway or cyclepath is as in 5.3.4.

5.3.8 Relevant area of traffic calming measures

The area is the locality of the particular measures, and the boundary should be determined between this area and the approach road.

Where there is a significant distance between particular traffic calming measures on a road, each may be regarded as a separate relevant area. In this case the area will only be the immediate vicinity of the particular measure.

Where particular measures are close to each other, the measures and the road between may be regarded as one relevant area to which the same lighting class will be applied.

5.3.9 Relevant area of pedestrian crossing

The area is the specific area on the carriageway defined by road markings. In addition, it includes the area defined by continuing the lines of the carriageway markings across the whole width of the footway, or to a distance equal to the width of the specific area, whichever is the smaller.

6 Lighting recommendations

6.1 General

6.1.1 Glare control

Glare control should be considered for every situation. Where the ME lighting classes from EN 13201-2:2003, Table 1 are used, glare control in the form of threshold increment (TI) is inherent in the class. In those situations where the other lighting classes are used, recommendations are given referring to the intensity classes and glare rating classes in EN 13201-2:2003, Annex A.

6.1.2 Colour rendering

Colour rendering of the light source should be considered for every situation.

The lighting installation should provide the degree of colour rendition, necessary for:

- driver navigation;
- pedestrian orientation;
- identification of persons or objects.

It is recommended that the following questions are considered when evaluating parameters:

- Is the relevant area a conflict area?
- Are traffic calming measures in the relevant area?
- Is the difficulty of navigational task higher than normal?
- Are parked vehicles present?
- Is facial recognition necessary?
- Is crime risk higher than normal?

The purpose of this document is for safety, but authorities can also wish to make a choice of colour rendition for reasons of amenity or (colour) camera observation.

6.1.3 Night-time use

Unless otherwise stated, parameters are only relevant during hours of darkness. The value of the parameters can vary at different periods during the night and also in different seasons of the year, thus the recommendations may vary during these periods.

Significant variation of parameter values can apply at different periods of the night, particularly in respect of ambient luminance and traffic flow. The application of the Tables in Annex A can therefore indicate different lighting classes appropriate to these different periods. For this purpose a more detailed analysis of traffic flow than that provided by ADT can be necessary.

NOTE Various methods of reducing lighting level and thereby energy consumption, can be applied in the periods when a class of lower lighting level is indicated.

6.1.4 Visual guidance

There can be limited situations where it is desirable to erect an individual lighting unit, or a small number of units, for visual guidance purposes only. For such situations lighting classes S7 or A6 of EN 13201-2:2003, Tables 3 and 4 are appropriate, but the use of a glare rating class of EN 13201-2:2003, Table A.2 should also be considered.

6.2 Lighting classes per sets of situations

The lighting recommendations are specific to each relevant area. For each set of situations as specified in Table 1, specific recommendations are given in the Tables of Annex A, which each consist of a pair of Tables from Tables A.1 to A.20.

- In the «odd numbered» Tables, by consideration of the relevant parameters, a box is selected containing three lighting classes which comprise the recommended range for the particular situation;
- In the «even numbered» Tables, a selection from that range is made:
 - An arrow to the left indicates the lighting class at the left side of the selected box;
 - An arrow to the right indicates the lighting class at the right side of the selected box;
 - A zero indicates the lighting class in the middle of the selected box.

6.3 Adjacent areas

There should not be a difference greater than two comparable classes between adjacent areas. The area with the highest recommended lighting level is the reference area.

In order for this recommendation to be applied when adjacent areas have lighting recommendations based on luminance and horizontal illuminance, Table 3 gives lighting classes of comparable lighting level, using the « ME/MEW », « CE » and « S » lighting classes from of EN 13201-2:2003, Tables 1, 2 and 3 respectively.

Table 3 — Lighting classes of comparable¹⁾ lighting level

	ME 1	ME 2	ME 3	ME 4	ME 5	ME 6		
	MEW 1	MEW 2	MEW 3	MEW 4	MEW 5			
CE 0	CE 1	CE 2	CE 3	CE 4	CE 5			
			S 1	S 2	S 3	S 4	S 5	S 6

¹⁾ For ME / MEW classes: CIE road surface reflectance of CIE publication 66:1984, Table C.2.

When a carriageway is defined as a separate relevant area, adjacent traffic areas should always be defined and this recommendation applied to ensure adequate lighting of these areas in relation to the carriageway.

When there are no traffic areas adjacent to the carriageway and « ME » lighting classes are used, the surround ratio is applied.

6.4 Alternative and additional lighting classes

The Tables in Annex A give recommendations based on luminance or horizontal illuminance.

In some countries there may be a preference for:

- Using hemispherical illuminance alternatively to horizontal illuminance. In this case « A » lighting classes of EN 13201-2:2003, Table 4 may be applied as alternatives to the recommended « S » lighting classes of EN 13201-2:2003, Table 3, according to Table 4.

Table 4 — « A » classes of alternative lighting level to « S » classes

Reference class	S1	S2	S3	S4	S5	S6
Alternative class		A1	A2	A3	A4	A5

- Adding recommendations to horizontal illuminance by using semicylindrical or vertical illuminance. In this case « ES » or « EV » lighting classes of EN 13201-2:2003, Table 5 or Table 6 can be added to the recommended « CE » or « S » lighting, classes according to Table 5.

Table 5 — « ES » and « EV » classes additional to « CE » or « S » classes

Reference class	CE0	CE1	CE2	CE3 S1	CE4 S2	CE5 S4 S3	S4	S5	SE6
Alternative additional classes	ES1	ES2 EV3	ES3 EV4	ES4 EV5	ES5	ES6	ES7	ES8	ES9

Annex A
(informative)

Lighting situation tables

A.1 Lighting situations — set A1

Table A.1 — Recommended range of lighting classes

Main weather type	Separation of carriageways	Type of junctions		Traffic flow vehicles per day									
		Interchanges	Intersections	< 15 000			15 000 to 25 000			> 25 000			
		spacing, distance between bridges km	density intersections/km	←	0	→	←	0	→	←	0	→	
Dry	Yes	> 3		ME5	ME4a	ME3a	ME4a	ME3a	ME2	ME4a	ME3a	ME2	
		≤ 3		ME4a	ME3a	ME2	ME4a	ME3a	ME2	ME3a	ME2	ME1	
				< 3	ME5	ME4a	ME3a	ME5	ME4a	ME3a	ME4a	ME3a	ME2
				≥ 3	ME4a	ME4a	ME3a	ME4a	ME3a	ME2	ME3a	ME2	ME1
	No	> 3		ME4a	ME3a	ME2	ME3a	ME2	ME1	ME3a	ME2	ME1	
		≤ 3		ME3a	ME2	ME1	ME3a	ME2	ME1	ME2	ME2	ME1	
				< 3	ME4a	ME4a	ME3a	ME4a	ME3a	ME2	ME3a	ME2	ME1
				≥ 3	ME4a	ME3a	ME2	ME3a	ME2	ME1	ME2	ME2	ME1
Wet	Choice as above, but select MEW classes												

Table A.2 — Recommended selection from range

Conflict area	Complexity of visual field	Difficulty of navigational task	Ambient luminance		
			low	medium	high
No	Normal	Normal	←	←	0
		Higher than normal	0	0	→
	High	Normal	←	0	0
		Higher than normal	0	→	→
Yes			→ ^a		

^a For conflict areas, luminance is the recommended design criterion. However, where viewing distances are short and other factors prevent the use of luminance criteria, illuminance may be used. Comparable CE classes to recommended ME classes can be found in Table 3.

A.2 Lighting situations — set A2

Table A.3 — Recommended range of lighting classes

Main weather type	Intersection density Intersections/km	Traffic flow vehicles					
		< 7 000			≥ 7 000		
		←	0	→	←	0	→
Dry	< 3	ME5	ME5	ME4a	ME4a	ME3a	ME3a
	≥ 3	ME5	ME4a	ME3a	ME4a	ME3a	ME2
Wet		Choice as above, but select MEW classes.					

Table A.4 — Recommended selection from range

Conflict area	Complexity of visual field	Difficulty of navigational task	Ambient luminance		
			Low	Medium	High
No	Normal	Normal	←	←	0
		Higher than normal	0	0	→
	High	Normal	←	0	0
		Higher than normal	0	→	→
Yes			→ ^a		
<p>^a For conflict areas, luminance is the recommended design criterion. However, where viewing distances are short and other factors prevent the use of luminance criteria, illuminance may be used. Comparable CE classes to recommended ME classes can be found in Table 3.</p>					

A.3 Lighting situations — set A3

Table A.5 — Recommended range of lighting classes

Main weather type	Separation of carriageways	Intersection density Intersctions/km	Traffic flow vehicles											
			< 7 000			≥ 7 000 and < 15 000			≥ 15 000 and < 25 000			≥ 25 000		
			←	0	→	←	0	→	←	0	→	←	0	→
Dry	Yes	< 3	ME5	ME5	ME4a	ME5	ME5	ME4a	ME5	ME4a	ME3b	ME4a	ME3b	ME3b
		≥ 3	ME5	ME4a	ME3b	ME5	ME4a	ME3b	ME4a	ME3b	ME2	ME3b	ME2	ME2
	No	< 3	ME5	ME4a	ME3b	ME5	ME4a	ME3b	ME4a	ME3b	ME2	ME3b	ME2	ME2
		≥ 3	ME4a	ME3b	ME3b	ME4a	ME3b	ME 2	ME3b	ME2	ME2	ME3b	ME2	ME1
Wet			Choice as above, but select MEW classes											

Table A.6 — Recommended selection from range

Conflict area	Complexity of visual field	Parked vehicles	Difficulty of navigational task	Ambient luminance		
				Low	Medium	High
No	Normal	Not present	Normal	←	←	0
			Higher than normal	0	0	→
		Present	Normal	←	0	→
			Higher than normal	0	→	→
	High	Not present	Normal	←	0	0
			Higher than normal	0	→	→
		Present	Normal	0	0	→
			Higher than normal	→	→	→
Yes				→ ^a		
<p>^a For conflict areas, luminance is the recommended design criterion. However, where viewing distances are short and other factors prevent the use of luminance criteria, illuminance may be used. Comparable CE classes to recommended ME classes can be found in Table 3.</p>						

A.4 Lighting situations — set B1

Table A.7 — Recommended range of lighting classes

Main weather type	Geometric measures for traffic calming	Intersection density Intersections/km	Difficulty of navigational task	Traffic flow vehicles					
				< 7 000			≥ 7 000		
				←	0	→	←	0	→
Dry	No	< 3	Normal	ME6	ME5	ME4b	ME5	ME4b	ME3c
			Higher than normal	ME5	ME4b	ME3c	ME5	ME4b	ME3c
		≥ 3	Normal	ME5	ME4b	ME3c	ME4b	ME4b	ME3c
			Higher than normal	ME4b	ME3c	ME2	ME3c	ME3c	ME2
	Yes	Choice as above, but select –1 only at area of traffic calming ^a							
Wet	Choice as above but select MEW classes								
^a When the use of luminance criteria is impractical, illuminance may be used. Comparable CE classes to recommended ME classes can be found in Table 3.									

Table A.8 — Recommended selection from range

Conflict area	Complexity of visual field	Parked vehicles	Ambient luminance					
			Low		Medium		High	
			Traffic flow cyclists		Traffic flow cyclists		Traffic flow cyclists	
			Normal	High	Normal	High	Normal	High
No	Normal	Not present	←	0	←	0	0	0
		Present	0	→	0	→	→	→
	High	Not present	0	0	0	0	0	0
		Present	0	0	→	→	→	→
Yes			→ ^a					
^a For conflict areas, luminance is the recommended design criterion. However, where viewing distances are short and other factors prevent the use of luminance criteria, illuminance may be used. Comparable CE classes to recommended ME classes can be found in Table 3.								

A.5 Lighting situations — set B2

Table A.9 — Recommended range of lighting classes

Main weather type	Geometric measures for traffic calming	Intersection density Intersections/km	Difficulty of navigational task	Traffic flow vehicles					
				< 7 000			≥ 7 000		
				←	0	→	←	0	→
Dry	No	< 3	Normal	ME5	ME5	ME4b	ME4b	ME4b	ME3c
			Higher than normal	ME4b	ME4b	ME3c	ME4b	ME4b	ME3c
		≥ 3	Normal	ME4b	ME3c	ME2	ME3c	ME3c	ME2
			Higher than normal	ME3c	ME3c	ME2	ME3c	ME3c	ME2
	Yes	Choice as above, but select –1 only at area of traffic calming ^a							
Wet	Choice as above but select MEW classes								
^a When the use of luminance criteria is impractical, illuminance may be used. Comparable CE classes to recommended ME classes can be found in Table 3.									

Table A.10 — Recommended selection from range

Conflict area	Complexity of visual field	Parked vehicles	Ambient luminance					
			Low		Medium		High	
			Traffic flow cyclists		Traffic flow cyclists		Traffic flow cyclists	
			Normal	High	Normal	High	Normal	High
No	Normal	Not present	←	0	←	0	0	0
		Present	0	→	0	→	→	→
	High	Not present	0	0	0	0	0	0
		Present	0	0	→	→	→	→
Yes			→ ^a					
^a For conflict areas, luminance is the recommended design criterion. However, where viewing distances are short and other factors prevent the use of luminance criteria, illuminance may be used. Comparable CE classes to recommended ME classes can be found in Table 3.								

A.6 Lighting situations — set C1

Table A.11 — Recommended lighting classes

Geometric measures for traffic calming	Crime risk	Facial recognition	Traffic flow cyclists					
			Normal			High		
			←	0	→	←	0	→
No	Normal	Unnecessary	S6	S5	S4	S5	S4	S3
		Necessary	S5	S4	S3	S4	S3	S2
	Higher than normal		S4	S3	S2	S3	S2	S1
Yes			S3	S2	S1	S3	S2	S1

Alternative A classes of comparable lighting level to recommended S classes can be found in Table 4. Additional ES and EV classes to recommended S classes can be found in Table 5.

Table A.12 Recommended selection from range

Ambient luminance		
Low	Medium	High
←	0	→

A.7 Lighting situations — sets D1 and D2

Table A.13 — Recommended lighting classes

Geometric measures for traffic calming	Crime risk	Facial recognition	Difficulty of navigational task	Traffic flow pedestrians					
				Normal			High		
				←	0	→	←	0	→
No	Normal	Unnecessary	Normal	CE5	CE5	CE4	CE5	CE4	CE3
			Higher than normal	CE5	CE4	CE3	CE4	CE3	CE2
		Necessary	Normal	CE4	CE4	CE4	CE4	CE4	CE3
			Higher than normal	CE4	CE4	CE3	CE4	CE3	CE2
	Higher than normal	Normal	CE4	CE4	CE3	CE4	CE3	CE3	
		Higher than normal	CE4	CE3	CE2	CE3	CE2	CE2	
Yes				Choice as above, but select ≤ 4 only at area of traffic calming					
Additional ES and EV classes to recommended CE classes can be found in Table 5									

Table A.14 Recommended selection from range

Ambient luminance		
Low	Medium	High
←	0	→

A.8 Lighting situations – sets D3 and D4

Table A.15— Recommended lighting classes

Geometric measures for traffic calming	Parked vehicles	Difficulty of navigational task	Traffic flow pedestrians and cyclists					
			Normal			High		
			←	0	→	←	0	→
No	Not present	Normal	S6	S5	S4	S5	S4	S3
		Higher than normal	S5	S4	S3	S4	S3	S2
	Present	Normal	S5	S4	S3	S4	S3	S2
		Higher than normal	S4	S3	S2	S3	S2	S1
Yes			Choice as above, but select ≤ 4 only at area of traffic calming					
Alternative A classes of comparable lighting level to recommended S classes can be found in Table 4. Additional ES and EV classes to recommended S classes can be found in Table 5.								

Table A.16 — Recommended selection from range

Complexity of visual field	Crime risk	Facial recognition	Ambient luminance		
			Low	Medium	High
Normal	Normal	Unnecessary	←	0	0
		Necessary	←	0	→
	Higher than normal		0	→	→
High	Normal	Unnecessary	0	0	0
		Necessary	0	→	→
	Higher than normal		→	→	→

A.9 Lighting situations — set E1

Table A.17 — Recommended lighting classes

Crime risk	Facial recognition	Traffic flow pedestrians					
		Normal			High		
		←	0	→	←	0	→
Normal	Unnecessary	S6	S5	S4 ^a	S5	S4	S3 ^a
	Necessary	S5	S4	S3 ^b	S4	S3	S2 ^b
Higher than normal		S3	S2	S1 ^b	S2	S1	CE2 ^b

^a Alternative A classes of comparable lighting level to recommended S classes can be found in Table 4.

^b Additional ES and EV classes to recommended S and CE classes can be found in Table 5.

Table A.18 — Recommended selection from range

Ambient luminance		
Low	Medium	High
←	0	→

A.10 Lighting situations — set E2

Table A.19 — Recommended lighting classes

Crime risk	Facial recognition	Traffic flow pedestrians					
		Normal			High		
		←	0	→	←	0	→
Normal	Unnecessary	S5	S4	S3 ^a	S4	S3	S2 ^a
	Necessary	S3	S2	S1 ^b	S3	S2	S1 ^b
Higher than normal		S2	S1	CE2 ^b	S2	S1	CE2 ^b

^a Alternative A classes of comparable lighting level to recommended S classes can be found in Table 4.

^b Additional ES and EV classes to recommended S and CE classes can be found in Table 5.

Table A.20 — Recommended selection from range

Ambient luminance		
Low	Medium	High
←	0	→

Bibliography

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

IEC 60050-845, *International Electrotechnical Vocabulary (IEV) — Chapter 845: Lighting*

NOTE CIE Publication 17.4, *International Lighting Vocabulary*, is identical to IEC 60050-845.

CIE Publication 66:1984, *Road surfaces and lighting*

CIE Publication 115:1995, *Recommendations for the lighting of roads for motor and pedestrian traffic*