



NSAI
Standards

Irish Standard
I.S. EN 13201-3:2015

Road lighting - Part 3: Calculation of performance

I.S. EN 13201-3:2015

Incorporating amendments/corrigenda/National Annexes issued since publication:

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):

NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.

This document is based on:

EN 13201-3:2015

Published:

2015-12-23

This document was published under the authority of the NSAI and comes into effect on:

2016-01-11

ICS number:

93.080.40

NOTE: If blank see CEN/CENELEC cover page

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

National Foreword

I.S. EN 13201-3:2015 is the adopted Irish version of the European Document EN 13201-3:2015, Road lighting - Part 3: Calculation of performance

This document does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with this document does not of itself confer immunity from legal obligations.

In line with international standards practice the decimal point is shown as a comma (,) throughout this document.

This page is intentionally left blank

EUROPEAN STANDARD

EN 13201-3

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2015

ICS 93.080.40

Supersedes EN 13201-3:2003

English Version

Road lighting - Part 3: Calculation of performance

Eclairage public - Partie 3: Calcul des performances

Straßenbeleuchtung - Teil 3: Berechnung der Güteermkmale

This European Standard was approved by CEN on 6 June 2015.

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

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

CEN members are the national standards bodies of 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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

European foreword.....	4
Introduction	5
1 Scope.....	6
2 Normative references.....	6
3 Terminology.....	6
3.1 Terms and definitions	6
3.2 List of symbols and abbreviations	9
4 Mathematical conventions.....	11
4.1 General.....	11
4.2 Decimal places of the requirements.....	12
5 Photometric data.....	12
5.1 General.....	12
5.2 The <i>I</i> -table.....	12
5.2.1 System of coordinates and advised angular intervals of the <i>I</i> -table.....	12
5.2.2 Linear interpolation in the <i>I</i> -table	14
5.3 The <i>r</i> -table	16
5.3.1 The <i>r</i> -table format.....	16
5.3.2 Linear interpolation in the <i>r</i> -table.....	19
6 Calculation of $I(C, \gamma)$	19
6.1 General.....	19
6.2 Mathematical conventions for distances measured on the road.....	19
6.3 Mathematical conventions for rotations	20
6.4 Calculation of C and γ	22
6.4.1 Calculation of x' , y' and H'	22
6.4.2 Evaluation of installation azimuth φ	23
6.4.3 Calculation of C	23
6.4.4 Calculation of y	23
7 Calculation of photometric quantities.....	24
7.1 Luminance	24
7.1.1 Luminance at a point.....	24
7.1.2 Field of calculation for luminance.....	25
7.1.3 Position of calculation points	26
7.1.4 Position of observer	27
7.1.5 Luminaires included in calculation	29
7.2 Illuminance.....	29
7.2.1 General.....	29
7.2.2 Horizontal illuminance at a point	30
7.2.3 Hemispherical illuminance at a point.....	30
7.2.4 Semi-cylindrical illuminance at a point	31
7.2.5 Vertical illuminance at a point.....	32
7.2.6 Field of calculation for illuminance.....	33
7.2.7 Position of calculation points	33
7.2.8 Luminaires included in calculation	34

7.2.9	Illuminance on areas of irregular shape	35
8	Calculation of quality characteristics	35
8.1	General	35
8.2	Average luminance.....	35
8.3	Overall uniformity.....	35
8.4	Longitudinal uniformity.....	35
8.5	Threshold increment f_{TI}	36
8.5.1	Definition and conventional hypotheses	36
8.5.2	Threshold Increment calculation process.....	38
8.5.3	Threshold increment calculation for C and P lighting classes.....	39
8.6	Edge Illuminance Ratio R_{EI}	39
9	Ancillary data.....	41
Annex A	(informative) Mathematical information technology conventions and flow chart diagrams	43
A.1	Mathematical and Information Technology conventions used in addition to Clause 4 to define the variables used in the following logical flow charts of the lighting calculation program	43
A.2	Linear interpolation in the tables.....	47
A.3	Information Technology requirements.....	49
Annex B	(informative) Extended r -table format for low mounting height luminaire	61
Bibliography	63

EN 13201-3:2015 (E)**European foreword**

This document (EN 13201-3:2015) 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 June 2016 and conflicting national standards shall be withdrawn at the latest by June 2016.

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

This document supersedes EN 13201-3:2003.

In comparison with EN 13201-3:2003, three significant changes were made:

- in the veiling luminance calculation, L_v , there is no more test about the contribution of at least 2 % of the next luminaire in the row to end the calculation before reaching a distance of 500 m (this is to avoid ambiguous interpretations that can produce different results from different software);
- the default option is about 500 m, but there is an alternative to retain only the luminaires of a shorter installation. This last case should be clearly mentioned in the lighting design by the number of luminaires involved in calculation of f_{TI} ;
- there is a new formula for calculating veiling luminance L_v , for a wider range of θ values. Thus the case where luminaires could be very near to the axis of vision of the observer: $0,1^\circ < \theta < 1,5^\circ$ can be evaluated with Formula (38).

NOTE for programmers: Calculation of threshold increment f_{TI} , (*new symbol for TI designation*) has changed in the revision of EN 13201-3:2003.

This European Standard was worked out by the Joint Working Group of CEN/TC 169 "Light and lighting" and CEN/TC 226 "Road Equipment", the secretariat of which is held by AFNOR.

EN 13201, *Road lighting* is a series of documents that consists of the following parts:

- *Part 1: Guidelines on selection of lighting classes* [Technical Report];
- *Part 2: Performance requirements*;
- *Part 3: Calculation of performance* [present document];
- *Part 4: Methods of measuring lighting performance*;
- *Part 5: Energy performance indicators*.

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

Introduction

The calculation methods described in this part of EN 13201 enable road lighting quality characteristics to be calculated by agreed procedures so that results obtained from different designers will have a uniform basis.

EN 13201-3:2015 (E)

1 Scope

This European Standard specifies the conventions and mathematical procedures to be adopted in calculating the photometric performance of road lighting installations designed in accordance with the parameters described in EN 13201-2 to ensure that every lighting calculation is based on the same mathematical principles.

The design procedure of a lighting installation also requires the knowledge of the parameters involved in the described model, their tolerances and variability. These aspects are not considered in this part of EN 13201 but a procedure to analyse their contribution in the expected results is suggested in EN 13201-4 and it can also be used in the design phase.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

EN 13201-2, *Road lighting — Part 2: Performance requirements*

EN 12665:2011, *Light and lighting — Basic terms and criteria for specifying lighting requirements*

3 Terminology

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12665:2011 and the following apply.

3.1.1

vertical photometric angle

γ

angle between the light path and the downward vertical axis both passing through the luminaire photometric centre

Note 1 to entry: Unit ° (degree).

Note 2 to entry: The direction $\gamma = 0$ is therefore oriented to the nadir.

Note 3 to entry: See Figure 1.

3.1.2

azimuth

C

angle between the vertical half plane passing through the light path and the reference half plane

Note 1 to entry: I.e. the vertical half plane passing through the second axis of a luminaire, when the luminaire is at its tilt during measurement.

Note 2 to entry: Unit ° (degree).

Note 3 to entry: See Figure 1.

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
 - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-