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BSI Standards Publication

Energy performance of buildings — Energy requirements for lighting

Part 2: Explanation and justification of EN 15193-1, Module M9

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National foreword

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Energetische Bewertung von Gebäuden - Energetische Anforderungen an die Beleuchtung - Teil 2: Technischer Bericht zu EN 15193-1

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European foreword

This document (CEN/TR 15193-2:2017) has been prepared by Technical Committee CEN/TC 169 “Light and lighting”, the secretariat of which is held by DIN.

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 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This document has been prepared by the Working Group CEN/TC169/WG 9 "Energy performance of buildings”.

The document layout is structured to largely follow the content of the standard EN 15193-1:2017.

EN 15193 consists of the following parts, under the general title "Energy performance of buildings — Energy requirements for lighting"

— Part 1: Specifications, Module M9

— Part 2: (Technical Report) Explanation and justification of EN 15193-1, Module M9

Directive 2010/31/EU recasting the Directive 2002/91/EC on energy performance of buildings (EPBD, [EF4] [4]) promotes the improvement of the energy performance of buildings within the European Union, taking into account all types of energy uses (heating, lighting, cooling, air conditioning, ventilation) and outdoor climatic and local conditions, as well as indoor climate requirements and cost effectiveness (Article 1).

The directive requires Member States to adopt measures and tools to achieve the prudent and rational use of energy resources. In order to achieve those goals, the EPBD requires increasing energy efficiency and the enhanced use of renewable energies in both new and existing buildings. One tool for this is the application by Member States of minimum requirements on the energy performance of new buildings and for existing buildings that are subject to major renovation, as well as for minimum performance requirements for the building envelope if energy-relevant parts are replaced or retrofitted. Other tools are energy certification of buildings, inspection of boilers and air-conditioning systems.

The use of European Standards increases the accessibility, transparency and objectivity of the energy performance assessment in the Member States facilitating the comparison of best practices and supporting the internal market for construction products. The use of EPB-standards for calculating energy performance, as well as for energy performance certification and the inspection of heating systems and boilers, ventilation and air-conditioning systems will reduce costs compared to developing different standards at national level.

The first mandate to CEN to develop a set of CEN EPBD standards (M 343, [EF1] [1]), to support the first edition of the EPBD ([EF2] [2]) resulted in the successful publication of all EPBD related CEN standards in 2007-2008.

The mandate M 480 was issued to review the mandate M 343 as the recast of the EPBD raised the need to revisit the standards and reformulate and add standards so that they become on the one hand unambiguous and compatible, and on the other hand a clear and explicit overview of the choices, boundary conditions and input data that need to be defined at national or regional level. Such national

or regional choices remain necessary, due to differences in climate, culture and building tradition, policy and legal frameworks. Consequently, the set of CEN-EPBD standards published in 2007-2008 had to be improved and expanded on the basis of the recast of the EPBD.

The EPB standards are flexible enough to allow for necessary national and regional differentiation and facilitate Member States implementation and the setting of requirements by the Member States.

Further target groups are users of the voluntary common European Union certification scheme for the energy performance of non-residential buildings (EPBD art.11.9) and any other regional (e.g. Pan European) parties wanting to motivate their assumptions by classifying the building energy performance for a dedicated building stock.

Introduction

The set of EPB standards, technical reports and supporting tools

In order to facilitate the necessary overall consistency and coherence, in terminology, approach, input/output relations and formats, for the whole set of EPB-standards, the following documents and tools are available:

a) a document with basic principles to be followed in drafting EPB-standards: CEN/TS 16628:2014, Energy Performance of Buildings - Basic Principles for the set of EPB standards [5];

b) a document with detailed technical rules to be followed in drafting EPB-standards; CEN/TS 16629:2014, Energy Performance of Buildings - Detailed Technical Rules for the set of EPB-standards [6];

c) the detailed technical rules are the basis for the following tools:

    1) a common template for each EPB-standard, including specific drafting instructions for the relevant clauses;

    2) a common template for each technical report that accompanies an EPB standard or a cluster of EPB standards, including specific drafting instructions for the relevant clauses;

    3) a common template for the spreadsheet that accompanies each EPB standard, to demonstrate the correctness of the EPB calculation procedures.

Each EPB-standards follows the basic principles and the detailed technical rules and relates to the overarching EPB-standard, EN ISO 52000-1:2017.

One of the main purposes of the revision of the EPB-standards is to enable that laws and regulations directly refer to the EPB-standards and make compliance with them compulsory. This requires that the set of EPB-standards consists of a systematic, clear, comprehensive and unambiguous set of energy performance procedures. The number of options provided is kept as low as possible, taking into account national and regional differences in climate, culture and building tradition, policy and legal frameworks (subsidiarity principle). For each option, an informative default option is provided (Annex B).

Rationale behind the EPB technical reports

There is a risk that the purpose and limitations of the EPB standards will be misunderstood, unless the background and context to their contents – and the thinking behind them – is explained in some detail to readers of the standards. Consequently, various types of informative contents are recorded and made available for users to properly understand, apply and nationally or regionally implement the EPB standards.

If this explanation would have been attempted in the standards themselves, the result is likely to be confusing and cumbersome, especially if the standards are implemented or referenced in national or regional building codes.

Therefore each EPB standard is accompanied by an informative technical report, like this one, where all informative content is collected, to ensure a clear separation between normative and informative contents (see CEN/TS 16629 [6]):

— to avoid flooding and confusing the actual normative part with informative content,

— to reduce the page count of the actual standard, and

— to facilitate understanding of the set of EPB standards.

This was also one of the main recommendations from the European CENSE project [8] that laid the foundation for the preparation of the set of EPB standards.

This Technical Report

This Technical Report accompanies the standard EN 15193-1:2017 on energy requirements for lighting in buildings. The role and the positioning of the accompanied standard in the set of EPB standards is defined in the Introduction to the standard.

All buildings occupied by humans require lighting indoors so that people have satisfactory visibility to move around and be able to participate in activities and carry out visual tasks. The lighting conditions required vary for different buildings, activities and visual tasks and these are well defined in the CEN lighting application standards EN 12464-1 for indoor work places, EN 12193 for sports facilities and EN 1838 for emergency lighting. As yet there are no CEN standards for lighting of domestic buildings but this document gives some guidance on requirements and solutions in Annex N.

It is very important that all occupied buildings or places have the right lighting conditions and that this lighting is provided by energy efficient solutions. Such solutions can be achieved with electric light or daylight or a combination of the two and are managed by appropriate lighting controls. The correct lighting solution for all buildings or places is established by comprehensive lighting design process. As yet there are no standards defining the lighting design process and the lighting design process is not part of this document. However, this Technical Report provides a general overview of the processes involved in interior lighting design as illustrated in Figure 1. Making comprehensive lighting design for new or refurbished buildings can yield effective and energy efficient lighting solutions that fulfil all the lighting criteria specified in the appropriate lighting application standards.

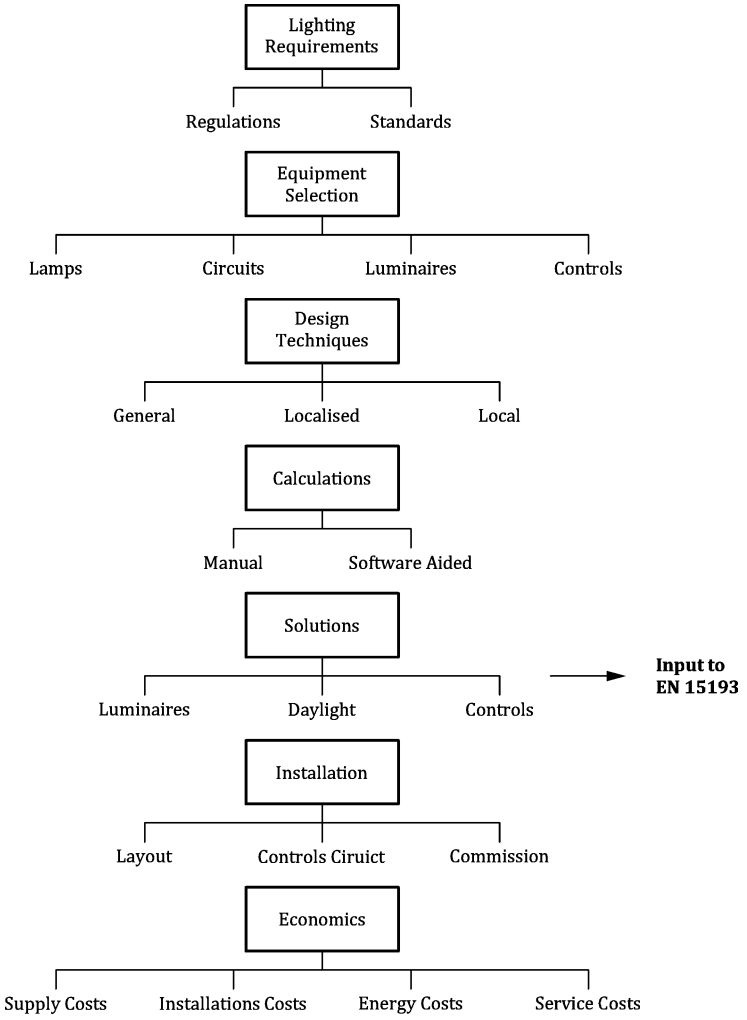

Figure 1 — General overview of the comprehensive lighting design process

The lighting design will include lighting controls that maybe passive (operated manually) or active (automatically controlled) or a combination of the two systems. The lighting controls can be an integral part of the lighting system and the power required for operation is included in the estimation of the energy requirements for lighting. However, the lighting control can be independent of the lighting system and the power needed for these is not included in the estimation of the energy required for lighting.

There might be requirements to provide lighting outside the building such as pathway lights to assist visibility for safe movement and security lighting around the perimeter for the protection of the buildings, and lighting of outdoor workplaces see EN 12464-2:2014. Floodlighting to beautify the façade or entrance at night can also be added. These lighting systems are described in Annex O. The energy for these outdoor lighting systems can be supplied from the building but they are not included in the calculation of the energy requirements for lighting in the building.

Accompanying spreadsheet(s)

Concerning the accompanied standard EN 15193-1:2017 a spreadsheet was produced. In this Technical Report, examples of the calculations are included.

1 Scope

This Technical Report is accompanying the lighting standard EN 15193-1:2017 and gives information to support the correct understanding, use and national implementation of this lighting standard.

This document provides:

— commentary to clauses of the standard;

— explanation on the procedures and gives background information;

— justification of the choices that have been made;

— description of the processes;

— spreadsheet of the calculation process;

— worked examples and benchmark values;

— advice on lighting control systems; and

— guidance on the lighting design for domestic buildings.

This document discusses but does not formally detail the lighting design process.

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 12665, *Light and lighting - Basic terms and criteria for specifying lighting requirements*

EN 15193-1:2017, *Energy performance of buildings - Energy requirements for lighting - Part 1: Specifications, Module M9*

EN ISO 52000-1:2017, *Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures (ISO 52000-1:2017)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 52000-1:2017, EN 15193-1:2017, EN 12665 and the following apply.

3.1
circuit
electrical network composed of components connected by conductive wires through which electric current can flow and perform various operations

3.2
general lighting
substantially uniform lighting of an area without provision for special local requirements