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Energetska učinkovitost stavb - Modul M4-3 - Izračun načrtovane hladilne obremenitve

Energy performance of buildings - Module M4-3 - Calculation of the design cooling load

Energieeffizienz von Gebäuden - Teil 11: Modul M4-3 - Berechnung der Norm-Kühllast

Performance énergétique des bâtiments - Partie 11 : Module M4-3 - Calcul de la charge de refroidissement de conception

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ICS:

91.120.10	Toplotna izolacija stavb	Thermal insulation
91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning

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EUROPEAN STANDARD
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English Version

Energy performance of buildings - Module M4-3- Calculation of the design cooling load

Energieeffizienz von Gebäuden - Teil 11: Modul M4-3 -
Berechnung der Norm-Kühllast

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 156.

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

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

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Foreword

This document (prEN 16798-11:2015) has been prepared by Technical Committee CEN/TC 156 “Ventilation for buildings”, the secretariat of which is held by BSI.

This document is currently submitted to the Enquiry.

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

EN 16798 is currently composed with the following parts:

- prEN 16798-3, *Energy performance of buildings — Part 3: Ventilation for non-residential buildings — Performance requirements for ventilation and room-conditioning systems*;
- prEN 16798-5-1, *Energy performance of buildings — Part 5: Ventilation for buildings — Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8 — Calculation methods for energy requirements of ventilation and air conditioning systems; (revision of EN 15241)*;
- prEN 16798-5-2, *Energy performance of buildings — Modules M5-6, M5-8 — Ventilation for buildings — Calculation methods for energy requirements of ventilation systems — Part 5-2: Distribution and generation (revision of EN 15241) — method 2*;
- prEN 16798-7, *Energy performance of buildings — Part 7: Ventilation for buildings — Modules M5-1, M5-5, M5-6, M5-8 — Calculation methods for the determination of air flow rates in buildings including infiltration*;
- prEN 16798-9, *Energy performance of buildings — Part 9: Ventilation for buildings — Module M4-1 — Calculation methods for energy requirements* Calculation methods for energy requirements of cooling systems — *General*;
- prEN 16798-11, *Energy performance of buildings — Module M4-3 — Calculation of the design cooling load* [the present document];
- prEN 16798-13, *Energy performance of buildings — Part 13: Module M4-8 — Calculation of cooling systems – Generation*;
- prEN 16798-15, *Energy performance of buildings — Part 15: Module M4-7 — Calculation of cooling systems — Storage — General*;
- prEN 16798-17, *Energy performance of buildings — Part 17: Ventilation for buildings — Module M4-11, M5-11, M6-11, M7-11 — Guidelines for inspection of ventilation and air conditioning systems*.

Introduction

This draft Standard is part of a series of standards aiming at international harmonization of the methodology for the assessment of the energy performance of buildings, called “EPB set of standards”.

As part of the “EPB set of standards” it complies with the requirements for the set of basic EPB documents (prEN 15603, CEN/TS 16628 and CEN/TS 16629 (see [3] and [2]) developed under a mandate given to CEN by the European Commission and the European Free Trade Association (Mandate M/480), and supports essential requirements of EU Directive 2010/31/EU on the energy performance of buildings (EPBD).

Where appropriate, the method(s) in each of the EPB standards may provide simplified procedures and/or default values as alternative options.

- Without further specification, these simplified procedures and/or default values may be used without restricting criteria.

NOTE For instance because these are conservative procedures or values.

The term 'default values' should not be confused with 'informative values'. If the values are given in the normative part of the standard, they are normative values. See also next options.

- In other cases, these simplified procedures and/or default values may be intended to be used only for situations where there is limited information. This may be the case in existing buildings with limited possibilities to acquire all input data. In particular when the EPB set of standards is used in the context of national or regional building regulations, specific criteria when the simplified method and/or default data are allowed, may be given at national or regional level, following the template in Annex A. Annex B provides (informative) default choices.

TC 156 deals with ventilation and air conditioning systems in buildings. Subjects covered by TC 156 are:

- a) energy performance calculation for ventilation, air conditioning and cooling systems;
- b) inspection of ventilation and air conditioning systems;

This standard specifies the method and the boundary conditions for the calculation of the design cooling load, including latent load, as a basis for the dimensioning of equipment on zone level and on central level for cooling and dehumidification. It specifies also the methods and conditions for the calculation of the humidification load.

The method given for the sensible cooling load can also be used for the calculation of the design heat load as an alternative to the simplified method given in prEN 12831-1. This is intended especially for the cases where the cooling load calculation needs to be done (i.e. when cooling is necessary) and/or an hourly calculation is used for the energy needs calculation. The principle idea is that there is only one method needed for load and energy calculations for heating and cooling in case of an hourly calculation interval.

This draft Standard replaces EN 15243:2007, Clauses 10 and 11. For the detailed description of the calculation method, it refers to prEN ISO 52016-1.

The result is also of possible use for the checking of the appropriate sizing of the equipment at the occasion of inspections.

1 Scope

Table 1 shows the relative position of this standard within the EN EPB set of standards.

Table 1 — Position of this standard within the EPB set of standards

Submodule	Overarching	Building (as such)	Technical Building Systems									
	Descriptions	Descriptions	Descriptions	Heating	Cooling	Ventilation	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation and control	PV, wind, ..
sub1	M1	M2		M3	M4	M5	M6	M7	M8	M9	M10	M11
1	General	General	General									
2	Common terms and definitions; symbols, units and subscripts	Building Energy Needs	Needs									
3	Applications	(Free) Indoor Conditions without Systems	Maximum Load and Power									
4	Ways to Express Energy Performance	Ways to Express Energy Performance	Ways to Express Energy Performance									
5	Building Functions and Building Boundaries	Heat Transfer by Transmission	Emission and control									
6	Building Occupancy and Operating Conditions	Heat Transfer by Infiltration and Ventilation	Distribution and control									
7	Aggregation of Energy Services and Energy Carriers	Internal Heat Gains	Storage and control									
8	Building Partitioning	Solar Heat Gains	Generation and control									
9	Calculated Energy Performance	Building Dynamics (thermal mass)	Load dispatching and operating conditions									

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	Overarching	Building (as such)	Technical Building Systems									
Submodule	Descriptions	Descriptions	Descriptions	Heating	Cooling	Ventilation	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation and control	PV, wind, ..
sub1	M1	M2		M3	M4	M5	M6	M7	M8	M9	M10	M11
10	Measured Energy Performance	Measured Energy Performance	Measured Energy Performance									
11	Inspection	Inspection	Inspection									
12	Ways to Express Indoor Comfort		BMS									
13	External Environment Conditions											
14	Economic Calculation											

The scope of this standard is to specify the calculation method and the boundary conditions for:

- the sensible design cooling load of a thermal zone;
- the conditions of the supply air to provide the necessary humidification and dehumidification of a thermal zone;
- the design heating load of a thermal zone, using an hourly calculation interval;
- the design heating load on sub system level, using an hourly calculation interval.

The simplified calculation method for the design heat load is given in prEN 12831-1.

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 12792:2003, *Ventilation for buildings — Symbols, terminology and graphical symbols*

prEN 12831-1 *Heating systems and water based cooling systems in buildings — Method for calculation of the design heat load — Part 1: Space heating load*

prEN 15603:2013, *Energy performance of buildings — Overarching standard EPBD*

EN ISO 7345:1995, *Thermal insulation — Physical quantities and definitions (ISO 7345:1987)*

EN ISO 15927-2, *Hygrothermal performance of buildings — Calculation and presentation of climatic data — Part 2: Hourly data for design cooling load (ISO 15927-2)*

EN ISO 15927-4, *Hygrothermal performance of buildings — Calculation and presentation of climatic data — Part 4: Hourly data for assessing the annual energy use for heating and cooling (ISO 15927-4)*

EN ISO 15927-5, *Hygrothermal performance of buildings — Calculation and presentation of climatic data — Part 5: Data for design heat load for space heating (ISO 15927-5)*

prEN ISO 52016-1:2015, *Energy performance of buildings — Calculation of the energy needs for heating and cooling, internal temperatures and heating and cooling load in a building or building zone — Part 1: Calculation procedures (ISO/DIS 52016-1:2015)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 7345:1995, prEN 15603:2013 and EN 12792:2003, and the following apply.

3.1

design cooling load

maximum hourly mean value of the cooling heat flow rate extracted from a thermal zone or sub system occurring during a design climate period under design use conditions

3.2

design heating load

maximum hourly mean value of the cooling heat flow rate supplied to a thermal zone or sub system occurring during a design climate period under design use conditions

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4 Symbols and abbreviations

4.1 Symbols

For the purposes of this draft Standard, the symbols given in prEN 15603:2013 apply.

4.2 Subscripts

For the purposes of this draft Standard, the subscripts given in prEN 15603:2013, EN 12792:2003 and the specific subscripts listed in Table 2 apply.

Table 2 — Subscripts

des	design	sens	sensible	SUP	supply
ld	load	ss	Sub system		

5 Description of the methods

5.1 General

This draft Standard does not describe any calculation method in detail. It refers to the hourly calculation method given in prEN ISO 52016-1 and defines the application rules for this method for the purpose of the calculation of the design heating, cooling, humidification and dehumidification loads.

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In case of the heating load, this is given as an alternative to the method given in prEN 12831-1 for the case, where a cooling load calculation shall be done and/or the energy needs calculation is done by a method using a calculation interval of 1 h.

5.2 Output of the method

This method covers the calculation of the design load for cooling, heating, humidification and dehumidification for a thermal zone and for a sub system.

The time step of the output is one hour.

5.3 General description of the method

The method uses the hourly calculation method given in prEN ISO 52016-1 and describes its application under the conditions of use and of climate of a design period.

A distinction is made between a basic cooling / heating load calculation and a system dependent cooling / heating load calculation.

For the basic cooling / heating load calculation, a continuous operation and no power restrictions for the cooling / heating system is assumed, and the emission is assumed to occur purely convective.

For the system dependent cooling / heating load calculation, a limited operation time may be assumed, the available power of the system may be limited and a convective fraction according to the system intended to be installed can be used.

5.4 Selection criteria between the methods

The basic cooling / heating load calculation is used, when no specifications of the system intended to be installed are known or when the usability of the system intended to be installed shall be evaluated.

The system dependent cooling / heating load calculation is used in cases where the type and design of the system is advanced and the effects of a specific operation shall be evaluated.

For some systems like building component embedded systems the use of a system dependent method may be compulsory, since the use of a basic load calculation may be misleading.

For the heating load calculation, the selection criteria for the preference of the method given in this standard against the method from prEN 12831-1 are:

- a cooling load calculation is necessary;
- an hourly calculation interval for energy needs calculation is used.

It can be decided by the design team to use the method given by prEN 12831-1 despite the need of a cooling load calculation or an hourly energy needs calculation.