

**Thermal performance of buildings -
Sensible room cooling load calculation -
General criteria and validation
procedures**

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cooling load calculation - General criteria and
validation procedures

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 15255:2007 sisaldab Euroopa standardi EN 15255:2007 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 30.10.2007 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 15255:2007 consists of the English text of the European standard EN 15255:2007.</p> <p>This document is endorsed on 30.10.2007 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p>Käsitlusala:</p> <p>This European Standard sets out the level of input and output data, and prescribes the boundary conditions required for a calculation method of the sensible cooling load of a single room under constant or/and floating temperature taking into account the limit of the peak cooling load of the system. It includes a classification scheme of the calculation method and the criteria to be met by a calculation method in order to comply with this European Standard.</p>	<p>Scope:</p> <p>This European Standard sets out the level of input and output data, and prescribes the boundary conditions required for a calculation method of the sensible cooling load of a single room under constant or/and floating temperature taking into account the limit of the peak cooling load of the system. It includes a classification scheme of the calculation method and the criteria to be met by a calculation method in order to comply with this European Standard.</p>
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Võtmesõnad:

English Version

Energy performance of buildings - Sensible room cooling load calculation - General criteria and validation procedures

Performance thermique des bâtiments - Calcul de la charge de refroidissement en chaleur sensible d'un local - Critères généraux et procédures de validation

Wärmetechnisches Verhalten von Gebäuden - Berechnung der wahrnehmbaren Raumkühllast - Allgemeine Kriterien und Validierungsverfahren

This European Standard was approved by CEN on 6 July 2007.

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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 Management Centre has the same status as the official versions.

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Foreword

This document (EN 15255:2007) has been prepared by Technical Committee CEN/TC 89 "Thermal performance of buildings and building components", the secretariat of which is held by SIS.

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 February 2008, and conflicting national standards shall be withdrawn at the latest by February 2008.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association (Mandate M/343), and supports essential requirements of EU Directive 2002/91/EC on the energy performance of buildings (EPBD). It forms part of a series of standards aimed at European harmonisation of the methodology for the calculation of the energy performance of buildings. An overview of the whole set of standards is given in prCEN/TR 15615.

Attention is drawn to the need for observance of EU Directives transposed into national legal requirements. Existing national regulations (with or without reference to national standards) may restrict for the time being the implementation of this European Standard.

This European Standard is one of a series of standards on general criteria and validation procedures for transient calculation methods for the design and the evaluation of the thermal and energy performance of buildings and building components. No existing European Standard is superseded.

The target audience of this European Standard are software developers of building simulation tools and policy makers in the building regulation sector. The standard specifies the boundary conditions and the simplifications needed to reach calculation results for the building part which are comparable.

It needs to be emphasized that there exist more sophisticated energy simulation methods and procedures including interactions with the heating, cooling, ventilating and lighting systems which may be used for the design and optimization process of a building but are not in line with existing European Standards.

This European Standard provides the means (in part) to assess the contribution that building products and services make to energy conservation and to the overall energy performance of buildings.

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

The proper design and sizing of air conditioning systems requires the calculation of the cooling load in the space to be conditioned (room cooling load). The variables affecting the room cooling load calculation are numerous, often difficult to define precisely and always intricately inter-related. Many cooling load components vary widely in magnitude during a 24-hour period.

Since these cyclic changes are often out of phase with each other, they need to be analyzed to establish the maximum room cooling load for a building or zone. The maximum cooling capacity for a zoned building is the largest hourly total of the simultaneous zone loads throughout a design day; but it needs to handle the peak cooling load for each zone at its peak hour. This means that a calculation method needs to be able to determine the cooling load of each zone throughout the calculation period.

A large number of calculation methods are available in Europe. These methods generally are based on different solution techniques that include simplifications of the real phenomena. According to those simplifications they are able to consider specific or general situations. One specific situation is represented by the calculation of the maximum peak load of a single zone for convective source with the control of the air temperature.

This European Standard includes the criteria and the level of input and output data required for a simplified calculation method of the cooling load of a single room.

A simplified load calculation method is given in the informative Annex A.

Any calculation method satisfies the standard if it complies with the assumptions, data requirements and the validation procedures described in Clause 7.

The series of European Standards, giving general criteria and validation procedures for the building part of energy simulation models for the different calculation subjects, are listed below.

European Standard	Subject
EN ISO 13791 EN ISO 13792	Temperature calculations (air and operative)
EN 15255	Load calculations (sensible cooling)
EN 15265	Energy need calculations (heating and cooling)

1 Scope

This European Standard sets out the level of input and output data, and prescribes the boundary conditions required for a calculation method of the sensible cooling load of a single room under constant and/or floating temperature taking into account the limit of the peak cooling load of the system. It includes a classification scheme of the calculation method and the criteria to be met by a calculation method in order to comply with this European Standard.

The purpose of this European Standard is to validate calculation methods used to:

- evaluate the maximum cooling load for equipment selection and cooling system design;
- evaluate the temperature profile when the cooling capacity of the system is reduced;
- provide data for evaluation of the optimum possibilities for load reduction;
- allow analysis of partial loads as required for system design, operation and control.

The validation procedure is used to check the room sensible heat balance model, taking into account:

- the external surface heat balance;
- the conduction through the building envelope;
- the effect of the thermal mass of the structures;
- the internal surface heat balance;
- the air heat balance;
- the heat balance solution method.

All other aspects are given either by fixed boundary conditions or by input data and are not in the focus of the model validation. It is assumed that for all these other matters e.g. embedded heating and cooling systems, prescriptive models have to be used according to existing European Standards.

Informative Annex A gives a simplified method for cooling load calculation.

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 410, *Glass in building — Determination of luminous and solar characteristics of glazing*

EN 13363-2, *Solar protection devices combined with glazing — Calculation of total solar energy transmittance and light transmittance — Part 2: Detailed calculation method*

EN 15377-1, *Heating systems in buildings — Design of embedded water based surface heating and cooling systems — Part 1: Determination of the design heating and cooling capacity*

prEN ISO 6946, *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method (ISO/DIS 6946:2005)*

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

EN ISO 9251:1995, *Thermal insulation — Heat transfer conditions and properties of materials — Vocabulary* (ISO 9251:1987)

EN ISO 9288:1996, *Thermal insulation — Heat transfer by radiation — Physical quantities and definitions* (ISO 9288:1989)

prEN ISO 9346:2007, *Hygrothermal performance of buildings and building materials — Physical quantities for mass transfer — Vocabulary* (ISO/DIS 9346:2005)

EN ISO 10077-1, *Thermal performance of windows, doors and shutters — Calculation of thermal transmittance — Part 1: General* (ISO 10077-1:2006)

prEN ISO 13370, *Thermal performance of buildings — Heat transfer via the ground — Calculation methods* (ISO/DIS 13370:2005)

prEN ISO 13786, *Thermal performance of building components — Dynamic thermal characteristics — Calculation methods* (ISO/ 13786:1999)

EN ISO 13792:2005, *Thermal performance of buildings — Calculation of internal temperatures of a room in summer without mechanical cooling — Simplified methods* (ISO 13792:2005)

3 Terms, definitions, symbols and units

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 7345:1995, EN ISO 9288:1996, EN ISO 9251:1995, prEN ISO 9346:2007 and the following apply.

3.1.1

internal environment

closed space delimited from the external environment or adjacent spaces by a building fabric component

3.1.2

envelope element

element of a building fabric delimited by two parallel surfaces, one of them is exposed to the room under consideration

3.1.3

room air

air of the internal environment

3.1.4

internal air temperature

temperature of the room air

3.1.5

internal surface temperature

temperature of the internal surface of each element of the envelope

3.1.6

mean radiant temperature

uniform surface temperature of an enclosure in which an occupant would exchange the same amount of radiant heat as in the actual non-uniform enclosure