SLOVENSKI STANDARD
SIST EN 15603:2008

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Energijske karakteristike stavb - Splošna raba energije in opredelitev potreb po energiji

Energy performance of buildings - Overall energy use and definition of energy ratings

Energieeffizienz von Gebäuden - Gesamtenergieverbrauch und Festlegung der Energiebedarfskennwerte

Performance énergétique des bâtiments - Consommation globale d'énergie et définition des évaluations énergétiques

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Energy performance of buildings - Overall energy use and definition of energy ratings

Performance énergétique des bâtiments - Consommation globale d'énergie et définition des évaluations énergétiques

Energieeffizienz von Gebäuden - Gesamtenergieverbrauch und Festlegung der Energiekennwerte

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Contents

Page

Foreword

This document (EN 15603:2008) has been prepared by CEN/BT/TF 173 "Energy Performance of Building project group", the secretariat of which is held by NEN.

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of an identical text or by endorsement, at the latest by July 2008, and conflicting national standards shall be withdrawn at the latest by July 2008.

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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 CEN/TR 15615.

Introduction

Energy assessments of buildings are carried out for various purposes, such as:

a) Judging compliance with building regulations expressed in terms of a limitation on energy use or a related quantity;

b) Transparency in commercial operations through the energy certification and/or display of a level of energy performance (energy performance certification);

c) Monitoring of the energy efficiency of the building and its technical building systems;

d) Helping in planning retrofit measures, through prediction of energy savings which would result from various actions.

This standard specifies a general framework for the assessment of overall energy use of a building, and the calculation of energy ratings in terms of primary energy, CO_2 emissions or parameters defined by national energy policy. Separate standards calculate the energy use of services within a building (heating, cooling, hot water, ventilation, lighting) and produce results that are used here in combination to show overall energy use. This assessment is not limited to the building alone, but takes into account the wider environmental impact of the energy supply chain.

An allowance is made for energy that may be generated within, or on the surface of the building and which is used to offset fuel and power drawn from other sources. Energy generated on the building site and exported is credited, provided it is exported for use elsewhere.

Energy certification of buildings requires a method that is applicable to both new and existing buildings, and which treats them in an equivalent way. Therefore, a methodology to obtain equivalent results from different sets of data is presented in this standard. A methodology to assess missing data and to calculate a standard energy use for space heating and cooling, ventilation, domestic hot water and lighting is provided. This standard also provides a methodology to assess the energy effectiveness of possible improvements.

Two principal types of energy ratings for buildings are proposed in this standard:

e) calculated energy rating;

f) measured energy rating.

Because of the differences in the way these two ratings are obtained, they cannot be directly compared. However, the difference between the two ratings for the same building can be used to assess the cumulative effects of actual construction, systems and operating conditions versus standard ones and the contribution of energy uses not included in the calculated energy rating.

Local values for factors and coefficients needed to calculate primary energy and CO_2 emissions related to energy policy should be defined in a national annex.

NOTE Energy is not produced, but only transformed. In this standard however energy is used in one form by systems that generate other forms of energy. At its final stage in the building, energy is used to provide services such as heating, cooling, ventilation, hot water, lighting, etc.

1 Scope

The purpose of the standard is to:

a) collate results from other standards that calculate energy use for specific services within a building;

b) account for energy generated in the building, some of which may be exported for use elsewhere;

c) present a summary of the overall energy use of the building in tabular form;

d) provide energy ratings based on primary energy, carbon dioxide emission or other parameters defined by national energy policy;

e) establish general principles for the calculation of primary energy factors and carbon emission coefficients.

This standard defines the energy services to be taken into account for setting energy performance ratings for planned and existing buildings, and provides for this:

f) method to compute the standard calculated energy rating, a standard energy use that does not depend on occupant behaviour, actual weather and other actual (environment or indoor) conditions;

g) method to assess the measured energy rating, based on the delivered and exported energy;

h) methodology to improve confidence in the building calculation model by comparison with actual energy use;

i) method to assess the energy effectiveness of possible improvements.

This European standard is applicable to a part of a building (e.g. flat), a whole building, or several buildings.

It is up to national bodies to define under which conditions, for which purposes and for which types of buildings the various ratings apply.

This standard handles the energy performance of a building as a whole. The assessment of the energy performance of specific technical building systems is handled in the appropriate part of EN 15241, EN 15243 and EN 15316 series.

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 15193, *Energy performance of buildings — Energy requirements for lighting*

EN 15217, *Energy performance of buildings — Methods for expressing energy performance and for energy certification of buildings*

EN 15232:2007, *Energy performance of buildings - Impact of Building Automation, Controls and Building Management*

EN 15241, *Ventilation for buildings — Calculation methods for energy losses due to ventilation and infiltration in commercial buildings*

EN 15243, *Ventilation for buildings — Calculation of room temperatures and of load and energy for buildings with room conditioning systems*

EN 15316 (all parts), *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies*

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

EN ISO 12569, *Thermal insulation in buildings — Determination of air change in buildings — Tracer gas dilution method (ISO 12569:2000)*

EN ISO 13789, *Thermal performance of buildings - Transmission heat loss coefficient - Calculation method (ISO 13789:1999)*

EN ISO 13790, *Thermal performance of buildings - Calculation of energy use for space heating (ISO 13790:2004)*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN ISO 7345:1995 and the following apply.

3.1
Buildings

3.1.1
building
construction as a whole, including its envelope and all technical building systems, for which energy is used to condition the indoor climate, to provide domestic hot water and illumination and other services related to the use of the building

NOTE The term can refer to the building as a whole or to parts thereof that have been designed or altered to be used separately.

3.1.2
new building
for calculated energy rating: building at design stage or under construction
for measured energy rating: building too recently constructed to have reliable records of energy use

3.1.3
existing building
for calculated energy rating: building that is erected
for measured energy rating: building for which actual data necessary to assess the energy use are known or can be measured

3.1.4
technical building system
technical equipment for heating, cooling, ventilation, domestic hot water, lighting and electricity production

NOTE 1 A technical building system can refer to one or to several building services (e.g. heating system, heating and DHW system).

NOTE 2 A technical building system is composed of different subsystems.

NOTE 3 Electricity production can include cogeneration and photovoltaic systems.

3.1.5
building services
services provided by the technical building systems and by appliances to provide the indoor climate condition, illumination and other services related to the use of the building

3.1.6
space heating
process of heat supply for thermal comfort

3.1.7
space cooling
process of heat extraction for thermal comfort

3.1.8
dehumidification
process of removing water vapour from air to reduce relative humidity

3.1.9
humidification
process of adding water vapour to air to increase relative humidity

3.1.10
ventilation
process of supplying or removing air by natural or mechanical means to or from a space

NOTE Such air is not required to have been conditioned.

3.1.11
lighting
process of supplying the necessary illumination

3.1.12
other services
services supplied by energy consuming appliances

3.1.13
conditioned space
heated and/or cooled space

NOTE The heated and/or cooled spaces are used to define the thermal envelope.

3.2
Technical building systems

3.2.1
auxiliary energy
electrical energy used by technical building systems for heating, cooling, ventilation and/or domestic water to support energy transformation to satisfy energy needs

NOTE 1 This includes energy for fans, pumps, electronics, etc. Electrical energy input to the ventilation system for air transport and heat recovery is not considered as auxiliary energy, but as energy use for ventilation.

NOTE 2 In EN ISO 9488, *Solar energy – Vocabulary*, the energy used for pumps and valves is called "parasitic energy".

3.2.2
cogeneration
simultaneous generation in one process of thermal energy and electrical or mechanical energy

NOTE Also known as combined heat and power (CHP).

3.2.3
system thermal loss
thermal loss from a technical building system for heating, cooling, domestic hot water, humidification, dehumidification or ventilation that does not contribute to the useful output of the system

NOTE 1 A system loss can become an internal heat gain for the building if it is recoverable.

NOTE 2 Thermal energy recovered directly in the subsystem is not considered as a system thermal loss but as heat recovery and directly treated in the related system standard.

NOTE 3 Heat dissipated by the lighting system or by other services (e.g. appliances of computer equipment) is not part of the system thermal losses, but part of the internal heat gains.

3.2.4
recoverable system thermal loss
part of a system thermal loss which can be recovered to lower either the energy need for heating or cooling or the energy use of the heating or cooling system

NOTE This depends on the calculation approach chosen to calculate the recovered gains and losses (holistic or simplified approach).

3.2.5
recovered system thermal loss
part of the recoverable system thermal loss which has been recovered to lower either the energy need for heating or cooling or the energy use of the heating or cooling system

NOTE This depends on the calculation approach chosen to calculate the recovered gains and losses (holistic or simplified approach).

3.3
Energy

3.3.1
energy source
source from which useful energy can be extracted or recovered either directly or by means of a conversion or transformation process

NOTE Examples include oil or gas fields, coal mines, sun, forests etc.

3.3.2
energy carrier
substance or phenomenon that can be used to produce mechanical work or heat or to operate chemical or physical processes

[ISO 13600:1997]

NOTE The energy content of fuels is given by their gross calorific value.

3.3.3
system boundary
boundary that includes within it all areas associated with the building (both inside and outside the building) where energy is consumed or produced

NOTE Inside the system boundary the system losses are taken into account explicitly, outside the system boundary they are taken into account in the conversion factor.

3.3.4
delivered energy
energy, expressed per energy carrier, supplied to the technical building systems through the system boundary, to satisfy the uses taken into account (heating, cooling, ventilation, domestic hot water, lighting, appliances etc.) or to produce electricity

NOTE 1 For active solar and wind energy systems the incident solar radiation on solar panels or on solar collectors or the kinetic energy of wind is not part of the energy balance of the building. It is decided at national level whether or not renewable energy produced on site is part of the delivered energy.

NOTE 2 Delivered energy can be calculated for defined energy uses or it can be measured.

3.3.5
exported energy
energy, expressed per energy carrier, delivered by the technical building systems through the system boundary and used outside the system boundary

NOTE 1 It can be specified by generation types (e.g. CHP, photovoltaic, etc) in order to apply different weighting factors.

NOTE 2 Exported energy can be calculated or it can be measured.

3.3.6
net delivered energy
delivered minus exported energy, both expressed per energy carrier

NOTE 1 A balance of the delivered and exported energy per energy carrier can be performed only if the same primary energy factors and/or CO_2 coefficients apply to the delivered and exported amounts of that energy carrier.

NOTE 2 The term "net" can also be applied to quantities derived from net delivered energy, e.g. primary energy or CO_2 emissions.

3.3.7
non-renewable energy
energy taken from a source which is depleted by extraction (e.g. fossil fuels)

3.3.8
renewable energy
energy from sources that are not depleted by extraction, such as solar energy (thermal and photovoltaic), wind, water power, renewed biomass

NOTE In ISO 13602-1:2002, renewable resource is defined as "natural resource for which the ratio of the creation of the natural resource to the output of that resource from nature to the technosphere is equal to or greater than one".

3.3.9
renewable energy produced on the building site
energy produced by technical building systems directly connected to the building using renewable energy sources

3.3.10
primary energy
energy that has not been subjected to any conversion or transformation process

NOTE 1 Primary energy includes non-renewable energy and renewable energy. If both are taken into account it can be called total primary energy.

NOTE 2 For a building, it is the energy used to produce the energy delivered to the building. It is calculated from the delivered and exported amounts of energy carriers, using conversion factors.

3.3.11
total primary energy factor
for a given energy carrier, non-renewable and renewable primary energy divided by delivered energy, where the primary energy is that required to supply one unit of delivered energy, taking account of the energy required for extraction, processing, storage, transport, generation, transformation, transmission, distribution, and any other operations necessary for delivery to the building in which the delivered energy will be used

NOTE The total primary energy factor always exceeds unity.

3.3.12
non-renewable primary energy factor
for a given energy carrier, non-renewable primary energy divided by delivered energy, where the non-renewable energy is that required to supply one unit of delivered energy, taking account of the non-renewable energy required for extraction, processing, storage, transport, generation, transformation, transmission,

distribution, and any other operations necessary for delivery to the building in which the delivered energy will be used

NOTE The non-renewable primary energy factor can be less than unity if renewable energy has been used.

3.3.13
CO_2 emission coefficient
for a given energy carrier, quantity of CO_2 emitted to the atmosphere per unit of delivered energy

NOTE The CO_2 emission coefficient can also include the equivalent emissions of other greenhouse gases (e.g. methane).

3.3.14
energy use for space heating or cooling or domestic hot water
energy input to the heating, cooling or hot water system to satisfy the energy need for heating, cooling (including dehumidification) or hot water respectively

NOTE If the technical building system serves several purposes (e.g. heating and domestic hot water) it can be difficult to split the energy use into that used for each purpose. It can be indicated as a combined quantity (e.g. energy need for space heating and domestic hot water).

3.3.15
energy need for heating or cooling
heat to be delivered to or extracted from a conditioned space to maintain the intended temperature conditions during a given period of time

NOTE 1 The energy need is calculated and cannot easily be measured.

NOTE 2 The energy need can include additional heat transfer resulting from non-uniform temperature distribution and non-ideal temperature control, if they are taken into account by increasing (decreasing) the effective temperature for heating (cooling) and not included in the heat transfer due to the heating (cooling) system.

3.3.16
energy need for domestic hot water
heat to be delivered to the needed amount of domestic hot water to raise its temperature from the cold network temperature to the prefixed delivery temperature at the delivery point

3.3.17
energy need for humidification and dehumidification
latent heat in the water vapour to be delivered to or extracted from a conditioned space by a technical building system to maintain a specified minimum or maximum humidity within the space

3.3.18
energy use for ventilation
electrical energy input to the ventilation system for air transport and heat recovery (not including the energy input for preheating the air) and energy input to the humidification systems to satisfy the need for humidification

3.3.19
energy use for lighting
electrical energy input to the lighting system

3.3.20
gross calorific value
quantity of heat released by a unit quantity of fuel, when it is burned completely with oxygen at a constant pressure equal to 101 320 Pa, and when the products of combustion are returned to ambient temperature

NOTE 1 This quantity includes the latent heat of condensation of any water vapour contained in the fuel and of the water vapour formed by the combustion of any hydrogen contained in the fuel.

NOTE 2 According to ISO 13602-2, the gross calorific value is preferred to the net calorific value.

NOTE 3 The net calorific value does not take account of the latent heat.

3.4
Energy ratings and certification

3.4.1
energy rating
evaluation of the energy performance of a building based on the weighted sum of the calculated or measured use of energy carriers

3.4.2
calculated energy rating
energy rating based on calculations of the weighted delivered and exported energy of a building for heating, cooling, ventilation, domestic hot water and lighting

NOTE National bodies can decide whether other energy uses resulting from occupants' activities such as cooking, production, laundry, computer equipment, etc. are included or not. If included, standard input data needs to be provided for the various types of building and uses. Lighting is always included except (by decision of national bodies) for residential buildings.

3.4.3
standard energy rating
energy rating calculated with actual data for the building and standard use data set

NOTE 1 It represents the intrinsic annual energy use of a building under standardised conditions. This is particularly relevant to certification of standard energy performance.

NOTE 2 It can also be termed "asset energy rating".

3.4.4
design energy rating
energy rating with design data for the building and standard use data set

NOTE It represents the calculated intrinsic annual energy use of a designed building under standardised conditions. This is particularly relevant to obtain a building permit at the design stage.

3.4.5
tailored energy rating
calculated energy rating using actual data for a building and actual climate and occupancy data

3.4.6
measured energy rating
energy rating based on measured amounts of delivered and exported energy

NOTE 1 The measured rating is the weighted sum of all energy carriers used by the building, as measured by meters or other means. It is a measure of the in-use performance of the building. This is particularly relevant to certification of actual energy performance.

NOTE 2 Also known as "operational rating".

3.4.7
confidence interval
interval that has a high probability (e.g. 95 %) to include the actual value

3.5
Energy calculation

3.5.1
building calculation model
mathematical model of the building, used to calculate its energy use

3.5.2
calculation step
discrete time interval for the calculation of the energy needs and uses for heating, cooling, humidification and dehumidification

NOTE Typical discrete time intervals are one hour, one month or one heating and/or cooling season, operating modes, and bins.

3.5.3
calculation period
period of time over which the calculation is performed

NOTE The calculation period can be divided into a number of calculation steps.

3.5.4
heat gains
heat generated within or entering into the conditioned space from heat sources other than energy intentionally utilised for heating, cooling or domestic hot water preparation

NOTE 1 These include internal heat gains and solar heat gains. Sinks that extract heat from the building, are included as gains, with a negative sign. In contrast with heat transfer, for a heat source (or sink) the difference between the temperature of the considered space and the temperature of the source is not the driving force for the heat flow.

NOTE 2 For summer conditions heat gains with a positive sign constitute extra heat load on the space.

3.5.5
solar irradiation
incident solar heat per area over a given period

3.5.6
gain utilisation factor
factor reducing the total monthly or seasonal heat gains to obtain the resulting reduction of the energy need for heating

3.5.7
loss utilisation factor
factor reducing the total monthly heat transfer to obtain the resulting reduction of the energy need for cooling