SLOVENSKI STANDARD
SIST EN 15459-1:2018

01-maj-2018

Nadomešča:
SIST EN 15459:2008

Energijske lastnosti stavb - Postopek ekonomskega vrednotenja energijskih sistemov v stavbah - 1. del: Postopki za izračun - Modul M1-14

Energy performance of buildings - Economic evaluation procedure for energy systems in buildings - Part 1: Calculation procedures, Module M1-14

Energetische Bewertung von Gebäuden - Wirtschaftlichkeitsberechnungen für Energieanlagen in Gebäuden - Teil 1: Berechnungsverfahren, Modul M1-14

Performance énergétique des bâtiments - Procédure d'évaluation économique des systèmes énergétiques des bâtiments - Partie 1 : Méthode de calcul, Module M1-14

Ta slovenski standard je istoveten z: **EN 15459-1:2017**

ICS:

27.015	Energijska učinkovitost. Ohranjanje energije na splošno	Energy efficiency. Energy conservation in general
91.120.10	Toplotna izolacija stavb	Thermal insulation of buildings
91.140.10	Sistemi centralnega ogrevanja	Central heating systems

SIST EN 15459-1:2018 **en,fr,de**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 15459-1

May 2017

ICS 91.140.10

Supersedes EN 15459:2007

English Version

Energy performance of buildings - Economic evaluation procedure for energy systems in buildings - Part 1: Calculation procedures, Module M1-14

Performance énergétique des bâtiments - Procédure d'évaluation économique des systèmes énergétiques des bâtiments - Partie 1 : Méthode de calcul, Module M1-14

Energieeffizienz von Gebäuden - Heizungsanlagen und wassergeführte Kühlanlagen in Gebäuden - Teil 1: Wirtschaftlichkeitsberechnungen für Energieanlagen in Gebäuden, Modul M1-14

This European Standard was approved by CEN on 27 February 2017.

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, Serbia, 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

Ref. No. EN 15459-1:2017 E

Contents

Page

European foreword

This document (EN 15459-1:2017) has been prepared by Technical Committee CEN/TC 228 “Heating systems and water based cooling systems in buildings”, 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 November 2017, and conflicting national standards shall be withdrawn at the latest by November 2017.

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 15459:2007.

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

EN 15459, *Energy performance of buildings — Economic evaluation procedure for energy systems in buildings*, is composed with the following parts:

— *Part 1: Calculation procedures, Module M1-14*;

— *Part 2: Explanation and justification of EN 15459-1, Module M1-14* [CEN/TR].

The revision kept the main principles of the calculation unchanged, but the structure of the document was changed. Informative content was removed to the accompanying Technical Report CEN/TR 15459-2. The values may be altered in a national annex.

The main changes compared to EN 15459:2007 are:

a) addition of the payback period and the addition of costs due to the end of life of the building;

b) update based on the evolution of the annual costs over a specific time period;

c) informative content is removed to the accompanying Technical Report CEN/TR 15459-2.

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European 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 "set of EPB standards".

All EPB standards follow specific rules to ensure overall consistency, unambiguity and transparency.

All EPB standards provide a certain flexibility with regard to the methods, the required input data and references to other EPB standards, by the introduction of a normative template in Annex A and Annex B with informative default choices.

For the correct use of this standard a normative template is given in Annex A to specify these choices. Informative default choices are provided in Annex B.

CEN/TC 228 deals with heating systems in buildings. Subjects covered by CEN/TC 228 are:

— energy performance calculation for heating systems;

— inspection of heating systems;

— design of heating systems;

— installation and commissioning of heating systems.

This standard gives a method for the economic calculation of the building envelope and others building related systems covered by the EPB standards.

This method can be used, fully or partly, for the following applications:

— consider economic feasibility of energy saving options in buildings;

— compare different solutions of energy saving options in buildings (plant types, fuels…);

— evaluate economic performance of an overall design of the building (for example, trade-off between energy demand and energy efficiency of heating systems);

— assess the effect of possible energy conservation measures on an existing heating system, by economic calculation of the cost of energy use with and without the energy conservation measure.

For the correct use of this standard, Annex A will be used to specify the choices with the required input data. Information and guidance on use of the monthly and annual methods are provided in Annex B. In case the standard is used in the context of national or regional legal requirements, mandatory choices may be given at national or regional level for such specific applications, in particular for the application within the context of EU Directives transposed into national legal requirements. These choices can be made available as National Annex or as separate (e.g. legal) document. It is expected, if the default values and choices in Annex A are not followed due to national regulations, policy or traditions, that:

— either the national standardization body will consider the possibility to add or include a National Annex in agreement with the template of Annex A;

— or the national or regional authorities will, in the building regulations, reference the standard and prepare data sheets containing the national or regional choices and values, in agreement with the template of Annex A.

The user should refer to other European Standards or to national documents for input data and detailed calculation procedures not provided by this standard, especially dynamic economical calculation are

not detailed in this standard. The methods to calculate the building energy demand are provided by EN 15603.

NOTE Sensitivity of results increase depending on the number of parameters that are under consideration (lifetime, financial rates, ratio of price rise rates,…) and as numerous are the parameters that change when comparing different solutions, as difficult will be the conclusions that rise when economic results are compared between solutions.

Economical results are closely related to the project under consideration, and no general conclusion should be drawn from such results.

1 Scope

This European Standard provides a calculation method for the economic issues of heating systems and other systems that are involved in the energy demand and consumption of the building. It applies to all types of new and existing buildings.

The fundamental principles and terminology are explained in the standard.

The main items of the standard will be:

— the definitions and the structure of the types of costs which should be taken into account for the calculation of the economic efficiency of saving options in buildings;

— data needed for definition of costs related to systems under consideration;

— the calculation method(s);

— expression of the result of the economic study.

This European Standard is part of the method for calculation of economic performance of energy saving options in buildings (e.g. insulation, better performing generators and distribution systems, efficient lighting, renewable sources, combined heat and power…).

The scope of this specific part is to standardize:

— the required inputs;

— the required outputs;

— the calculation formulas;

— the type of energy systems concerned with the energy performance of the building.

NOTE 1 This is the revision of EN 15459:2007. The revision has been made consistent with the EU regulation on cost-optimal. This revision includes the definition of payback for investment, and inclusion of the costs due to the deconstruction of the building. The method presenting annualized costs has been suppressed.

NOTE 2 This standard does not consider financial advantages for higher productivity, higher attractiveness for tenants due to higher indoor comfort, when relevant for comparison of different options.

Table 1 shows the relative position of this standard within the set of EPB standards in the context of the modular structure as set out in EN ISO 52000-1.

NOTE 3 In CEN ISO/TR 52000-2 the same table can be found, with, for each module, the numbers of the relevant EPB standards and accompanying technical reports that are published or in preparation.

NOTE 4 The modules represent EPB standards, although one EPB standard may cover more than one module and one module may be covered by more than one EPB standard, for instance a simplified and a detailed method respectively. See also Clause 2 and Tables A.1 and B.1.

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

Overarching			Building (as such)		Technical Building Systems										
	Descriptions			Descriptions		Descriptions	Heating	Cooling	Ventilation	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation and control	Electricity production
sub1		M1	sub1	M2	sub1		M3	M4	M5	M6	M7	M8	M9	M10	M11
1	General		1	General	1	General	15316–1					15316–1			
2	Common terms and definitions; symbols, units and subscripts		2	Building Energy Needs	2	Needs						12831–3			
3	Applications		3	(Free) Indoor Conditions without Systems	3	Maximum Load and Power	12831–1					12831–3			
4	Ways to Express Energy Performance		4	Ways to Express Energy Performance	4	Ways to Express Energy Performance	15316–1					15316–1			
5	Building Functions and Building Boundaries		5	Heat Transfer by Transmission	5	Emission and control	15316–2	15316–2							
6	Building Occupancy and Operating Conditions		6	Heat Transfer by Infiltration and Ventilation	6	Distribution and control	15316–3	15316–3				15316–3			

Overarching			Building (as such)		Technical Building Systems										
	Descriptions			Descriptions		Descriptions	Heating	Cooling	Ventilation	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation and control	Electricity production
sub1		M1	sub1	M2	sub1		M3	M4	M5	M6	M7	M8	M9	M10	M11
7	Aggregation of Energy Services and Energy Carriers		7	Internal Heat Gains	**7**	Storage and control	15316–5					15316–5 15316–4–3			
8	Building Partitioning		8	Solar Heat Gains	**8**	Generation									
					8–1	Combustion boilers	15316–4–1					15316–4–1			
					8–2	Heat pumps	15316–4–2	15316–4–2				15316–4–2			
					8–3	Thermal solar Photovoltaics	**15316–4–3**					**15316–4–3**			**15316–4–3**
					8–4	On-site cogeneration	15316–4–4					15316–4–4			15316–4–4
					8–5	District heating and cooling	15316–4–5	15316–4–5							15316–4–5
					8–6	Direct electrical heater	15316–4–9					15316–4–9			
					8–7	Wind turbines									15316–4–10
					8–8	Radiant heating, stoves	15316–4–8								

Overarching			Building (as such)		Technical Building Systems										
	Descriptions			Descriptions		Descriptions	Heating	Cooling	Ventilation	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation and control	Electricity production
sub1		M1	sub1	M2	sub1		M3	M4	M5	M6	M7	M8	M9	M10	M11
9	Calculated Energy Performance		9	Building Dynamics (thermal mass)	9	Load dispatching and operating conditions	15316–1								
10	Measured Energy Performance		10	Measured Energy Performance	10	Measured Energy Performance	15378–3					15378–3			
11	Inspection		11	Inspection	11	Inspection	15378–1					15378–1			
12	Ways to Express Indoor Comfort		12	–	12	BMS									
13	External Environment Conditions														
14	Economic Calculation	15459–1													
NOTE The shaded modules are not applicable.															

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

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

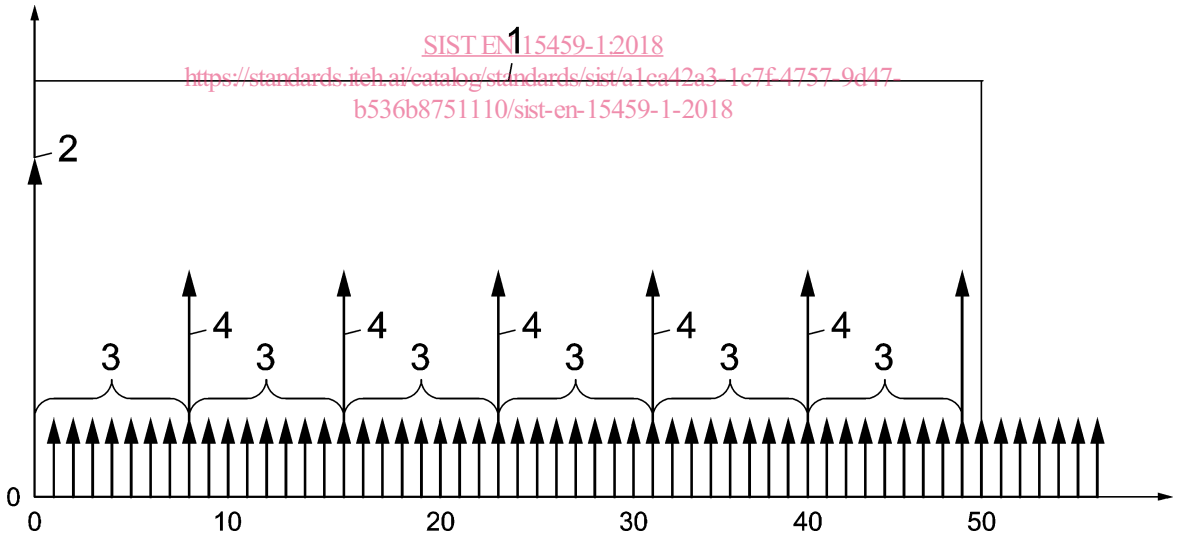
3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 7345:1995, EN ISO 52000-1:2017 and the following specific definitions apply.

3.1
global cost
CG
sum of the present value of the initial investments costs, annual running costs and replacement costs (referred to the starting year) as well as disposal costs if applicable

Note 1 to entry: Figure 1 illustrates how a selection of type of costs take place during the calculation period.

Note 2 to entry: For the calculation at macroeconomic level an additional cost category *costs of greenhouse gas emissions* is introduced.



Key

1 t_{TC} calculation period (50 years for example)
2 CO_{inv} investment cost
3 CO_{run} running costs
4 CO_{repl} replacement costs

Figure 1 — Global cost presentation

3.2
initial investment cost
***CO*$_{inv}$**
cost incurred up to the point when the building (or the building element) is delivered to the customer, ready to use

Note 1 to entry: These costs include design, purchase of building elements, connection to suppliers, installation and commissioning process.

Note 2 to entry: The costs are those that are presented to the customer.

3.3
running cost
***CO*$_{run}$**
cost including maintenance cost, operational cost and energy cost for the time step considered

3.4
maintenance cost
***CO*$_{ma}$**
cost for measures for preserving and restoring the desired quality of the building, building element or installation

Note 1 to entry: This includes annual costs for inspection, cleaning, adjustments, repair under preventive maintenance, consumable items.

3.5
operational cost
***CO*$_{0p}$**
cost linked to the operation of the building, including annual costs for insurance, utility charges and other standing charges and taxes

3.6
energy cost
***CO*$_{en}$**
cost and fixed and peak charges for energy including national taxes

Note 1 to entry: Conventionally, contracts for energy delivered are included in energy costs. It is considered good practice to include the external costs and metering costs in economic calculations and to specify them.

3.7
periodic costs of year i
***CO*$_{per(i)}$**
substitute investment that is necessary for age reasons; that corresponds to cost replacement of all components (or system) according to their lifespan that occur on year i

Note 1 to entry: Periodic costs include all replacement costs for any components or system that occur the same year.

3.8
replacement cost for component or system
***CO*$_{Rpl(j);\,LS(n)}$**
substitute investment for a building element, according to the estimated economic lifecycle during the calculation period

Note 1 to entry: Replacement costs for component or system include the periodic costs of component j at time LS_n, $2LS_n$,… that correspond to the economic lifecycle of the component (including disposal of component j).

3.9
annual costs
***CO*$_a$**
costs that represent the sum of running costs and periodic costs or replacement costs paid in a certain year

3.10
cost of green house gas emissions
***CO*$_{CO2}$**
monetary value of environmental damage caused by CO_2 emissions related to the energy consumption in buildings

Note 1 to entry: CO_2 emissions encounter effects of all greenhouse gases weighted with their global warming potential expressed as an equivalent to CO_2 during a 100 year period (EN 15978).

3.11
disposal cost
***CO*$_{disp}$**
cost for deconstruction at the end of life of a building or building element and include deconstruction, removal of building elements that have not yet come to the end of their lifetime, transport and recycling

3.12
price development rate
***RAT*$_{dev}$**
development over time of prices for energy, products, building systems, services, labour, maintenance and other costs and that can be different from the inflation rate

EXAMPLE

RAT_{en_1} is the rate of development of prices for energy 1 (rate could be different depending on the energy considered)

RAT_{op} is the rate of development of prices for human operation

RAT_{pr} is the rate of development of prices for products

3.13
discount rate
***RAT*$_{disc}$**
definite value for comparison of the value of money at different times expressed in real terms

Note 1 to entry: Corresponds to the interest rate which is charged or paid for the use of money for the calculation period considered.