INTERNATIONAL STANDARD

ISO 52003-1

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Energy performance of buildings — Indicators, requirements, ratings and certificates —

Part 1: General aspects and application to the overall energy performance

Performance énergétique des bâtiments — Indicateurs, exigences, appréciations et certificats —

Partie 1: Aspects généraux et application à la performance énergétique globale

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

ISO 52003-1 was prepared by ISO Technical Committee TC 163, *Thermal performance and energy use in the built environment*, in collaboration with Technical Committee TC 205, *Building environment design*, and with the European Committee for Standardization (CEN) Technical Committee CEN/TC 89, *Thermal performance of buildings and building components*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 52003-1 cancels and replaces ISO 16343:2013, which has been technically revised.

The necessary editorial revisions were made to comply with the requirements for each EPB standard. The content of ISO 16343 has been reworked significantly, but it has been attempted not to lose any substantial original information, even though the original text has sometimes been strongly restructured and rephrased, and new content has been added throughout. The original text has been split into 2 parts: a normative standard and an informative technical report.

A list of all parts in the ISO 52003 series can be found on the ISO website.

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Introduction

This document is part of a series aimed at the international harmonization of the methodology for assessing the energy performance of buildings. Throughout, this series is referred to as a “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 document, a normative template is given in Annex A to specify these choices. Informative default choices are provided in Annex B.

The main target groups for this document are architects, engineers and regulators.

Use by or for regulators: In case the document 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. These choices (either the informative default choices from Annex B or choices adapted to national/regional needs, but in any case following the template of Annex A) can be made available as national annex or as separate (e.g. legal) document (national data sheet).

NOTE 1 So in this case:

— the regulators will specify the choices;

— the individual user will apply the document to assess the energy performance of a building, and thereby use the choices made by the regulators.

Topics addressed in this document can be subject to public regulation. Public regulation on the same topics can override the default values in Annex B. Public regulation on the same topics can even, for certain applications, override the use of this document. Legal requirements and choices are in general not published in standards but in legal documents. In order to avoid double publications and difficult updating of double documents, a national annex may refer to the legal texts where national choices have been made by public authorities. Different national annexes or national data sheets are possible, for different applications.

It is expected, if the default values, choices and references to other EPB standards in Annex B are not followed due to national regulations, policy or traditions, that:

— national or regional authorities prepare data sheets containing the choices and national or regional values, according to the model in Annex A. In this case a national annex (e.g. NA) is recommended, containing a reference to these data sheets;

— or, by default, the national standards body will consider the possibility to add or include a national annex in agreement with the template of Annex A, in accordance to the legal documents that give national or regional values and choices.

Further target groups are parties wanting to motivate their assumptions by classifying the building energy performance for a dedicated building stock.

More information is provided in the Technical Report accompanying this document (ISO/TR 52003-2).

The overall and partial EPB indicators, i.e. the quantitative output of EPB assessments, can be used for different purposes:

1) Requirements: to set public or private requirements regarding the energy performance of buildings.

2) Decisions: to facilitate decisions or actions in the private or public domain.

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3) Information and communication: for building designers, owners, operators, users, policy makers and citizens (as sellers or renters, as prospective buyers or tenants).

This document and ISO/TR 52003-2 deal with several of these uses, which can generically be described as the post-processing of the outputs of the EPB assessment methods (see 5.1).

The main focus of the actual (normative) standard, i.e. this document, is on basic concepts and relations and on the actions that need to be taken. The accompanying (informative) technical report, i.e. ISO/TR 52003-2, provides extensive further information to support actors in a judicious implementation. For optimal understanding, both documents are therefore best read side-by-side, clause-by-clause.

This document and ISO/TR 52003-2 are complemented by

— ISO 52018-1 and ISO/TR 52018-2 that deal with partial EPB requirements related to thermal energy balance and fabric features, and

— CEN EPB standards that deal with the same topics for specific technical building systems, servicing specific types of energy use (such as heating, cooling, ventilation, domestic hot water and lighting).

Much of the content of these texts may be commonplace to those experienced in the domain. However, it has been decided to document basic considerations with a view to fully informing any interested party, including novices in the field. The texts thus partly serve as "institutional memory". The aim is to contribute to well-informed choices and also to any future revision of a regulation (choice of the mix of EPB features and indicators, variable or constant value requirements and/or rating references, actual requirement strictness).

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

NOTE 2 In 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.

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.

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Table 1 — Position of this document (in casu M1–4) within the modular structure of the set of EPB standards

	Overarching		Building (as such)		Technical Building Systems									
Sub-module	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								a	
3	Applications		(Free) Indoor conditions without systems		Maximum load and power									
4	Ways to express energy performance	ISO 52003-1	Ways to express energy performance		Ways to express energy performance									
5	Building categories 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 zoning		Solar heat gains		Generation and control									

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Table 1 *(continued)*

	Overarching		Building (as such)		Technical Building Systems									
Sub-module	**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**
9	Calculated energy performance		Building dynamics (thermal mass)		Load dispatching and operating conditions									
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													

[a] The shaded modules are not applicable

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Energy performance of buildings — Indicators, requirements, ratings and certificates —

Part 1: General aspects and application to the overall energy performance

1 Scope

The set of EPB assessment standards produces a great number of overall and partial EPB indicators as outputs. This document provides general insight to both private parties and public regulators (and all stakeholders involved in the regulatory process) on how to make good use of these outputs for different purposes (post-processing).

This document describes the relation between the EPB indicators and the EPB requirements and EPB ratings, and it discusses the importance of project-specific, tailored values as requirement or reference for certain EPB indicators. This document also includes a couple of possible EPB labels and it lists the different steps to be taken when establishing an EPB certification scheme.

This document provides standardized tables for reporting in a structured and transparent manner the choices that are to be made with respect to overall EPB requirements. The tables are non-restrictive, thus allowing for full regulatory flexibility. This document does not provide such tables for partial EPB requirements (related to the fabric or technical buildings systems), as this is dealt with in other documents.

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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

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

NOTE Default references to EPB standards other than ISO 52000-1 are identified by the EPB module code number and given in Annex A (normative template in Table A.1) and Annex B (informative default choice in Table B.1).

EXAMPLE EPB module code number: M5–5, or M5–5.1 (if module M5–5 is subdivided), or M5–5/1 (if reference to a specific clause of the standard covering M5–5).

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7345 and ISO 52000-1 and the following apply

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ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

NOTE The terms of ISO 52000-1 that are indispensable for the understanding of this document are repeated here.

3.1 Building

3.1.1
assessed object
building, part of a building or portfolio of buildings that is the object of the energy performance assessment

Note 1 to entry: The assessed object comprises all spaces and technical systems which may contribute to or influence the energy performance assessment.

Note 2 to entry: The assessed object may include one or several building units, if these are not individually object of the energy performance assessment.

Note 3 to entry: A distinction may be made between, e.g. a designed building, new building after construction, existing building in the use phase and existing building after major renovation.

[SOURCE: ISO 52000-1:2017, 3.1.1]

3.1.2
building
construction as a whole, including the fabric and all technical building systems, where energy may be used to condition the indoor environment, to provide domestic hot water and illumination and other services related to the use of the building

Note 1 to entry: The term refers to the physical building as a whole, or to all parts thereof, that at least include the spaces and technical building systems that are relevant for the energy performance assessment.

Note 2 to entry: Parts of a building can be physically detached, but are on the same building site. For example: a canteen or a guard house or one or more classrooms of a school in a detached part of a building; or an essential space in a dwelling (e.g. bedroom).

[SOURCE: ISO 52000-1:2017, 3.1.2]

3.1.3
building category
unit category
classification of buildings and/or building units related to their main use or their special status, for the purpose of enabling differentiation of the energy performance assessment procedures and/or energy performance requirements

EXAMPLE Buildings officially protected as part of a designated environment or because of their special architectural or historical merit, buildings used as places of worship and for religious activities, residential buildings, (a) single-family houses of different types;(b) apartment blocks;(c) offices;(d) educational buildings;(e) hospitals;(f) hotels and restaurants;(g) sports facilities;(h) wholesale and retail trade services buildings;(i) data centres; (j) other types of energy-consuming buildings.

Note 1 to entry: Building regulations often make a distinction between building categories.

Note 2 to entry: The building category, for instance, may determine if energy performance assessment is mandatory (e.g., not for religious or historic buildings) and which are the minimum energy performance requirements (e.g., for new buildings); in some countries measured energy performance of a building is prescribed for specific categories of buildings (e.g., apartment buildings, large public buildings), etc. Another type of categorization is the distinction between new and existing and renovated buildings.

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Note 3 to entry: Many buildings or building units of a given (use) category contain spaces of different (use) categories; for instance an office building may contain a restaurant; see 3.1.11.

Note 4 to entry: The allocation of a building category may also have a strong impact on other parts of the building regulations, for instance on safety (e.g., emergency exits, strength of floor) or indoor environmental quality (e.g., minimum ventilation rates).

[SOURCE: ISO 52000-1:2017, 3.1.3]

3.1.4
building element
integral component of the technical building systems or of the fabric of a building

[SOURCE: ISO 52000-1:2017, 3.1.4]

3.1.5
building fabric
all physical elements of a building, excluding technical building systems

EXAMPLE 1 Roofs, walls, floors, doors, gates and internal partitions.

EXAMPLE 2 It includes elements both inside and outside of the thermal envelope, including the thermal envelope itself.

Note 1 to entry: The fabric determines the thermal transmission, the thermal envelope airtightness and (nearly all of) the thermal mass of the building (apart from the thermal mass of furniture and technical building systems). The fabric also makes the building wind and water tight. The building fabric is sometimes described as the building as such, i.e. the building without any technical building system.

[SOURCE: ISO 52000-1:2017, 3.1.5]

3.1.6
building portfolio
set of buildings and common technical building systems whose energy performance is determined taking into account their mutual interactions

Note 1 to entry: An example of common equipment is an energy generation system (PV panels, wind turbine, cogen unit, boiler, etc.) serving the building portfolio.

[SOURCE: ISO 52000-1:2017, 3.1.6]

3.1.7
building thermal zone
thermal zone
internal environment with assumed sufficiently uniform thermal conditions to enable a thermal balance calculation according to the procedures in the standard under EPB module M2-2

Note 1 to entry: The EPB standard under module M2–2 is ISO 52016-1.

[SOURCE: ISO 52000-1:2017, 3.1.7]

3.1.8
building unit
section, floor or apartment within a building which is designed or altered to be used separately from the rest of the building

EXAMPLE A shop in a shopping mall, an apartment in an apartment building or a rentable office space in an office building.

Note 1 to entry: The building unit can be the assessed object.

[SOURCE: ISO 52000-1:2017, 3.1.8]

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3.1.9
reference floor area
floor area used as a reference size

Note 1 to entry: See definition of reference size.

[SOURCE: ISO 52000-1:2017, 3.1.12]

3.1.10
reference size
relevant metric to normalize the overall or partial energy performance and energy performance requirements to the size of the building or part of a building and for the comparison against benchmarks

[SOURCE: ISO 52000-1:2017, 3.1.13]

3.1.11
space category
classification of building spaces related to a specific set of use conditions

EXAMPLE Office space, restaurant space, entrance hall, toilet, living space, assembly hall, shop, residential bed room, indoor car park, heated indoor stair case, unheated indoor stair case, etc.

Note 1 to entry: The space category is relevant for the calculation of the energy performance assessment and for defining the reference size.

[SOURCE: ISO 52000-1:2017, 3.1.14]

3.1.12
thermal envelope area
total area of all elements of a building that enclose thermally conditioned spaces through which thermal energy is transferred, directly or indirectly, to or from the external environment

Note 1 to entry: The thermal envelope area depends on whether internal, overall internal or external dimensions are being used.

Note 2 to entry: The thermal envelope area does not include the area to adjacent buildings; see ISO 13789.

Note 3 to entry: The thermal envelope area may play a role in the ways to express the overall and partial energy performance and energy performance requirements and comparison against benchmarks.

[SOURCE: ISO 13789:2017[1], 3.9 — modified with addition of notes to entry 2 and 3]

3.1.13
useful floor area
<for EPB assessment> area of the floor of a building needed as parameter to quantify specific conditions of use that are expressed per unit of floor area and for the application of the simplifications and the zoning and reallocation rules

[SOURCE: ISO 52000-1:2017, 3.1.18]

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3.2 Indoor and outdoor conditions

3.2.1
conditions of use
requirement and/or restriction for the use of a building space category, related to the services for the energy performance assessment and/or the boundary conditions

EXAMPLE Heating set-point, cooling set-point, minimum amount of ventilation related to air quality, net domestic hot water needs (e.g. per m^2 floor area or per person), lighting levels, internal heat gains, etc., including the distribution over time (operation). Where relevant, the numbers are based on the number of occupants per m^2 per type of building space.

[SOURCE: ISO 52000-1:2017, 3.2.1]

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3.3 Energy performance

3.3.1
actual measured energy
measured energy without any correction for standard climate and use

[SOURCE: ISO 52000-1:2017, 3.5.1]

3.3.2
as built energy performance
energy performance calculated with data for the building after construction (prior to or during operation) and standard use data set

Note 1 to entry: This represents the calculated intrinsic annual energy use of a realized building under standardized conditions. It is particularly relevant for the energy performance certificate and for regulation (verification of compliance with requirements).

[SOURCE: ISO 52000-1:2017, 3.5.2]

3.3.3
calculated energy performance
energy performance based on calculations of the weighted net delivered energy for the EPB services

[SOURCE: ISO 52000-1:2017, 3.5.3]

3.3.4
design energy performance
energy performance with design data for the building and standard use and climate data set

Note 1 to entry: This represents the calculated intrinsic annual energy use of a designed building under standardized conditions. It is particularly relevant to obtain a building permit at the design stage.

[SOURCE: ISO 52000-1:2017, 3.5.5]

3.3.5
energy feature
EPB feature
any element, component or property aspect of a building or building unit, single or combined, that may have an effect on the energy performance of the assessed object

Note 1 to entry: An EPB feature may relate to a single building element (e.g. the thermal insulation of a wall) or any combination of building elements (e.g. the heating needs, the performance of a heating system, the overall energy performance, etc.), up to the entire building.

Note 2 to entry: Every EPB feature can be characterized by several possible EPB indicators. For instance, the thermal insulation of a wall can be quantified by its thermal transmittance, its overall thermal resistance, its temperature factor, etc. For more examples, see ISO 52018-1[9].

[SOURCE: ISO 52000-1:2017, 3.5.6]

3.3.6
energy performance
overall energy performance
<of an assessed object>calculated or measured amount of (weighted) energy needed to meet the energy demand associated with a typical use of the assessed object, which includes energy used for specific services (EPB services)

Note 1 to entry: See definition of EPB services and definition of assessed object.

Note 2 to entry: Also called overall energy performance, to distinct from partial energy performance.

[SOURCE: ISO 52000-1:2017, 3.5.7]

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3.3.7
energy performance certificate
<of an assessed object>certificate, for instance recognized by a country or by a legal person designated by it, which indicates the energy performance of the assessed object, calculated or measured according to one or more specified methodologies

Note 1 to entry: The meaning of the terms "certificate" and "certification" in this document differ from those in ISO/IEC 17000[6].

[SOURCE: ISO 52000-1:2017, 3.5.8]

3.3.8
energy performance certification
process of providing an energy performance certificate

[SOURCE: ISO 52000-1:2017, 3.5.9]

3.3.9
energy performance indicator
EPB indicator
calculated or measured numerical quantity that characterizes an energy feature of an assessed object

Note 1 to entry: EPB indicators are used for the energy performance rating, the energy performance requirements and/or for the certificate. An EPB indicator can for example be expressed in energy performance per unit of floor area or energy performance divided by the energy performance of a specific benchmark or another reference value.

Note 2 to entry: This covers both overall and partial energy performances.

[SOURCE: ISO 52000-1:2017, 3.5.10]

3.3.10
energy performance requirement
minimum level of the (partial or overall) energy performance that is to be achieved to obtain a right or an advantage, e.g. right to build, lower interest rate, quality label

[SOURCE: ISO 52000-1:2017, 3.5.11]

3.3.11
energy rating
EPB rating
evaluation of the value of an energy performance indicator by comparison against one or more reference values, possibly including a visualization of the position on a continuous or discrete scale

Note 1 to entry: This may concern overall or partial energy performance.

[SOURCE: ISO 52000-1:2017, 3.5.12]

3.3.12
EPB service
building service included in the assessment of the energy performance

Note 1 to entry: See definition of building service. Which services are included is a national or regional choice, specified in ISO 52000-1:2017, Annexes A and B.

EXAMPLE Energy used for heating, cooling, ventilation, humidification, dehumidification, domestic hot water and lighting.

[SOURCE: ISO 52000-1:2017, 3.5.13]

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3.3.13
EPB standard
standard that complies with the requirements given in ISO 52000-1, CEN/TS 16628[7] and CEN/TS 16629[8]

Note 1 to entry: These three basic EPB documents were developed under a mandate given to CEN by the European Commission and the European Free Trade Association (Mandate M/480), and support essential requirements of EU Directive 2010/31/EU on the energy performance of buildings (EPBD). Several EPB standards and related documents are developed or revised under the same mandate.

[SOURCE: ISO 52000-1:2017, 3.1.14]

3.3.14
measured energy indicator
energy performance indicator based on measured energy performance

[SOURCE: ISO 52000-1:2017, 3.5.16]

3.3.15
measured energy performance
energy performance based on weighted measured amounts of delivered and exported energy

Note 1 to entry: The measured energy performance is the weighted sum of all energy carriers used by the building, as measured by meters or derived from measured energy by other means. It is a measure of the in-use performance of the building after correction or extrapolation. This is particularly relevant to certification of actual energy performance.

Note 2 to entry: Also known as "operational energy performance".

[SOURCE: ISO 52000-1:2017, 3.5.16]

3.3.16
numerical indicator of primary energy use
primary energy use per unit of reference floor area

Note 1 to entry: Since primary energy use can be expressed in total primary energy, non-renewable primary energy can be specified in the numerical indicator (e.g. non-renewable primary energy use).

[SOURCE: ISO 52000-1:2017, 3.5.18]

3.3.17
partial energy performance
<of an assessed object>energy performances of one or a combination of building elements or components or other energy features of the assessed object

Note 1 to entry: Other energy features are for instance: energy needs for heating and cooling and air tightness.

[SOURCE: ISO 52000-1:2017, 3.5.19]

3.3.18
reference value
standard legal or calculated value against which an energy indicator is compared

Note 1 to entry: This can be a fixed value for specific types of buildings or for specific energy features, or a variable value (formula or notional reference building) taking into account one or more data from the actual building.

[SOURCE: ISO 52000-1:2017, 3.5.20]

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3.3.19
standard energy indicator
energy performance indicator based on energy performance under a set of standard conditions

Note 1 to entry: Assessed under standard conditions (if calculated) or corrected for deviating conditions (if measured).

[SOURCE: ISO 52000-1:2017, 3.5.22]

3.3.20
standard energy performance
energy performance using actual data for a building and a standard use and climate data set (if calculated) or corrected for deviating conditions (if measured)

Note 1 to entry: This represents the intrinsic annual energy use of an assessed object, under standardized conditions. It is particularly relevant to certification of standard energy performance.

Note 2 to entry: In case of calculated energy performance it can also be termed "asset energy performance".

[SOURCE: ISO 52000-1:2017, 3.5.23]

3.3.21
tailored energy performance
calculated energy performance using actual data for a building and actual climate and occupancy data

[SOURCE: ISO 52000-1:2017, 3.5.24]

4 Symbols and subscripts

4.1 Symbols

For the purposes of this document, the symbols given in ISO 52000-1:2017, Clause 4 and Annex C and the following apply.

Symbol	Name of quantity	Unit
I	indicator (generic symbol)	—
n	number	—
R	reference	same as the considered EPB indicator
X	any physical quantity	any (symbol U from Unit)
ε	expenditure factor	—
η	efficiency	—

4.2 Subscripts

For the purposes of this document, the subscripts given in ISO 52000-1:2017, Clause 4 and Annex C and the following apply.

r	regulation
ref	reference
s	stock

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5 Description of the document

5.1 Brief overview of the document

The EPB assessment methods provide a large number of intermediate and final quantitative results, here called EPB indicators. This document supports users in making intelligent use of these indicators (sometimes after some further mathematical treatment of the primary numerical results). The users can be either public authorities or private actors.

It is the responsibility of the competent authorities (regulators) to take all of the various decisions related to the public EPB requirements, ratings, certificates, etc.

This document first explains the different concepts and their mutual relation (Clauses 6 and 7). It then discusses two main uses that can be made of these numeric values, namely:

— EPB requirement setting (Clause 9);

— EPB rating (Clause 10).

For both uses, smart limiting or reference values are needed. Often it may be best that these values are variable, tailored to the relevant characteristics of each individual project. Methods to establish such variable values are discussed in Clause 8. Finally, any results and further information can be documented in an energy performance certificate, possibly complemented by a further report, which is treated in Clause 11.

Clauses 12 and 13 relate to quality control of the application of the procedures provided in this document.

NOTE This document thus deals with what can be called the "post-processing" of the output of the EPB assessment methods.

5.2 Selection criteria between the possible options

Clauses 8 to 11 comprise, in brief, considerations concerning the choices between alternative options or combinations of options.

NOTE More extensive considerations, such as the rationale behind the options and the advantages and drawbacks of different options are given in the corresponding clauses in ISO/TR 52003-2:2017[4].

5.3 Input and output data of new calculation methodologies

5.3.1 General

Among other things, this document provides orientation and insight with respect to the setting of requirements (see 8.2) and the establishment of ratings (see Clause 10). These two objectives may require the establishment of additional calculation schemes (notably for tailored requirements and references, see Clause 8). However, unlike the other EPB standards, this document does not provide a readily applicable set of methods and equations, as it is the responsibility of the competent public authorities or private actors to take the various related decisions as a function of their specific purpose(s) and context. When specific methodologies are elaborated in full and practical detail, the specifiers shall systematically report all the input and output data of the calculations (e.g. formula or notional reference building).

5.3.2 Input data

The input data shall be reported in the same manner as in all EPB standards (see in principle 6.3 of each of these standards).

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At least the following input data are probably needed:

— General data about the assessed object and the application (see ISO 52000-1:2017, 6.3.2), as basic information about the context of the specific project (case), such as:

  — type of object (e.g. whole building, building portfolio, building unit, part of a building, or a building element; building fabric or technical building system; new or existing building, as built or in the use phase; renovations of existing buildings, extensions to existing buildings);

  — building category (e.g. residential, office);

  — type of application (e.g. to check compliance with energy performance requirements, energy certification, to obtain building permit, to obtain permit to use, energy audit (tailored), energy performance inspection);

  — type of assessment (e.g. calculated design; calculated as built; measured actual, measured standard (corrected for climate and use).

— Details from the energy performance assessment, for tailoring to individual project characteristics:

  — characteristics of the assessed object: reference size, thermal envelope areas, window orientations, etc.;

  — ventilation flow rates, illumination per space, etc.;

  — overall energy performance.

5.3.3 Output data

The output data shall also be reported in the same manner as in all EPB standards (see in principle 6.1 of each of these standards). Possible examples of such new outputs are: a new ratio (see 7.4), or the result (with its own symbol) of the formula or notional reference building approach.

NOTE More information about the way of reporting input and output data can be found in CEN/TS 16628[7] and CEN/TS 16629[8], which are the basis for the template for all EPB standards.

6 Relation between EPB features, indicators, requirements, ratings and certificates

A distinction is made between the building **feature**, for which the energy performance is assessed, and the numeric **indicator** that is used for it. This is because there may be more than one possible indicator to quantify a certain feature.

EXAMPLE The thermal insulation of an envelope element can be characterized by the temperature factor, thermal transmittance, thermal resistance, etc.

A distinction is also made between an energy performance **indicator** and an energy performance **rating**. This is because it is an important misconception that an indicator by itself, even if normalized (like energy use in kWh/m^2), is typically a proper indicator for the energy performance rating (see discussion on tailoring in Clause 8).

Energy performances can be considered for an almost endless number of aspects of a building, ranging from the building as a whole (including all its technical systems) to any of its technical (sub)systems apart, to the fabric (as a whole or in part), to individual elements. When it concerns the building as a whole, it is called an overall energy performance. When it concerns any sub-aspect, it is called a partial energy performance (see 3.3.9 and 3.3.17).

The energy performance of each aspect (i.e. each EPB feature) can be quantified by one or more numeric indicators, which may be calculated and/or measured. Such energy performance indicators can be used for a variety of purposes. Depending on the objective, an appropriate indicator (and when applicable, a

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corresponding requirement and/or rating) should be carefully chosen. It is, therefore, very important to first explicitly and precisely define the goal(s) that is (are) pursued.

Indicators may be used in the context of public policy or in a private context. Some of the major objectives that may be pursued are the following:

— for public authorities:

  — setting energy performance requirements in the context of building regulations;

  — providing information and transparency by means of a rating (and in this way, stimulating private actors to implement energy efficiency measures);

  — other objectives, such as, a basis for financial support schemes, statistical analysis, establishing policy actions, monitoring policy progress, etc.;

— for private actors:

  — formulating technical specifications;

  — optimal design;

  — optimal operation;

  — energy renovation of existing buildings;

  — other objectives, such as management of property stocks (by housing corporations, by (international) non-residential real estate investment/management/operating companies, by (international) retail chains, etc.).

This document focuses on the uses by public authorities and is mostly worded in this perspective. But much of the content is readily applicable by private actors for their own specific purposes.

In addition to the general principles of post-processing, this document also deals with overall energy performance in a more elaborated manner on a practical level (see 7.3.1). This includes standardized reporting templates for the chosen overall EPB requirement mix and for the indicators that are used for each of the requirements (see 9.5 and Annexes A and B).

NOTE 1 The partial energy performance of a great variety of systems and elements is discussed in a more practical manner in other, topical EPB standards under the modules M2–4, M3–4, M4–4, M5–4, M6–4, M7–4, M8–4, M9–4 and M10–4.

Complex interactions exist between the EPB features, indicators, requirements, ratings and certificates. These are further discussed in the following clauses.

NOTE 2 Schematic presentations of the possible relations between EPB assessment methods, product standards, EPB features, indicators, requirements, ratings, certificates and other uses are given in ISO/TR 52003-2[4].

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7 Energy performance features and their indicators

7.1 General

An energy performance indicator is a numeric quantity that characterizes in some way or another the energy efficiency of the "building feature" under consideration. When it concerns the building as a whole, including all its fixed technical installations, it is called an overall energy performance indicator (see 7.3.1). When it relates to only part of the building (e.g. a specific technical (sub)system, the fabric, or an individual element), it is called a partial energy performance indicator (see 7.3.2).

NOTE Overall EPB indicators by themselves do not give information on all aspects of the energy performance of a building. To provide full transparency, partial EPB indicators are therefore a useful complement. This holds also true for EPB requirements.

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The indicator can be a measured or calculated quantity, or a combination of both, e.g. a measured envelope air tightness that is used as input into the calculation of the overall energy performance.

7.2 Normalization to building size

The procedure for normalization of overall or partial energy performances to the reference building size, for instance reference floor area, are given in ISO 52000-1:2017, 9.4.

Such normalization alone usually does not constitute a proper basis for judging the energetic quality of a building or a specific EPB feature. In order to arrive at equitable requirements or a meaningful rating, a more sophisticated approach is generally needed (see Clauses 9 and 10).

7.3 Energy performances and their indicators

7.3.1 Overall energy performances

The overall energy performance of a building is represented by one or more overall indicators, E_{we}, that are the weighted delivered energy minus the weighted exported energy, determined according to ISO 52000-1:2017, 9.6.

EXAMPLE Total, non-renewable and/or renewable primary energy use; renewable energy ratio, greenhouse gas-emissions, annual energy costs; see ISO 52000-1:2017, 9.6.

ISO 52000-1:2017, 9.6 defines each of these variables in a precise, quantitative manner and provides the choices and further details concerning the overall energy performance indicators, such as the assessment boundaries, the type of weighting and the weighting factors.

The indicators can be normalized, as described in 7.2.

Which energy services are included in the overall energy performance is determined in ISO 52000-1:2017, 6.2 (identifier: EPB_LISTSERVICE_TYPE), with details in ISO 52000-1:2017, 9.2.

In ISO 52000-1:2017, consideration is given for buildings that are not equipped with all services for which the energy performance shall be assessed (e.g. building without cooling systems when cooling is part of the energy performance calculation). Two specific options are given in ISO 52000-1:2017 are

— **the principle of "Assumed system"**, requiring the specification of a default "fictitious" technical system for each missing service, and

— **the principle of "Presence of system"**, requiring the relevant EPB system standards to offer procedures to enable to decide if a system may be considered to be present or not

NOTE 1 This is not always evident. For instance, in case heating, ventilation or cooling is assumed to be supplied via a local provision in another room, or in case of a plug-in electric heater, or if the heating, ventilation or cooling service is obviously undersized.

In the case of the principle "Presence of system", a possibly better energy performance for buildings that are missing some service is accepted. This may lead to a violation of the level playing field when the energy performance is compared with other buildings. This may be compensated by additional specific indicators.

NOTE 2 An indicator based on the calculated basic energy needs (disregarding specific system properties) could already help, by revealing a discrepancy between the calculated needs and the calculated (or measured) energy use (absent if no system present).

7.3.2 Partial energy performances

The most commonly used partial energy performance features are

a) the energy use for one specific purpose (e.g. heating, cooling, domestic hot water, lighting, ventilation, humidification, dehumidification),

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b) the energy need for space heating and space cooling,

c) the characteristics of the fabric or of the technical building systems, each considered as a whole (e.g. heat transfer coefficient of the thermal envelope, efficiency of heating, hot water or cooling systems, efficiency of lighting systems), and

d) the characteristics of elements of the building fabric or of technical building systems (e.g. thermal transmittance of walls, efficiency of boilers, insulation of heating and hot water pipes, specific fan power).

7.4 Ratios of identical/similar quantities as indicators for energy performances

Instead of a physical quantity as such (irrespective whether or not the quantity has first been normalized with respect to the building size), a ratio can be used to characterize an energy performance. It appears that two major types of ratio can be distinguished:

1) The quantity divided by a reference value of the same quantity, resulting in a dimensionless value. When the reference value depends on political choices, that specific ratio cannot be fully defined in the technical standards.

2) For technical building (sub)systems: the output divided by the input (or vice-versa), either dimensionless or with dimensions. Since these are usually purely technical definitions, they can most often be fully defined in the technical standards.

These two points are now discussed in more detail.

1) Ratio of identical quantities

Such indicator (I) can, in a general manner, mathematically be defined as follows:

$$I = f \frac{X}{X_{\text{ref}}} \tag{1}$$

where

f	is an optional, dimensionless constant scale factor, with a value of, e.g. 10 or 100;
X	is the physical quantity under consideration, in [U];
X_{ref}	is the reference value for the same physical quantity, in [U].

I is a generic symbol that represents in an abstract manner any possible dimensionless index. [U] stands for the unit of the physical quantity. It can be any unit. It goes without saying that, in order to obtain a dimensionless quantity, the reference value shall have the same unit [U].

Defining such a ratio is particularly useful when the reference value varies from one building to another, as is often the case with compound quantities, such as overall energy performances, heating or cooling energy needs, or the mean thermal transmittance.

NOTE 1 For these examples, dimensionless ratios have been applied successfully in practice.

NOTE 2 In this manner, an easy to communicate final indicator is obtained, capturing in a single value an upstream analysis that can sometimes be quite complex and difficult to explain to the public at large. The summarizing single indicator is easy to understand by all.

The reference value is typically obtained by means of a mathematical formula or a notional reference building (see Clause 8). By judiciously defining the (variable value) reference, an equitable technological and economic indicator can be obtained. These aspects are further specified in 9.3.

NOTE 3 The main advantages and drawbacks of the use of ratios are further discussed in ISO/TR 52003-2[4]. This document also formulates a number of additional practical considerations, e.g. concerning the scale factor.

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2) Ratio between two different quantities

This second instance concerns the output/input ratio (or vice-versa) of technical building (sub)systems. There are two further possibilities.

a) Dimensionless input/output ratios

For technical building (sub)systems, the ratio of the output to the input ("benefit/cost ratio"), when expressed in the same units, is generally called the efficiency η (dimensionless). The reciprocal of the efficiency, i.e. the ratio of the input to the output ("cost/benefit ratio"), is usually called the expenditure factor ε (dimensionless).

The efficiency is widely used and gives an easy to understand indication of the losses and energy performance of a technical (sub)system. Care should be taken when calculating the efficiency when both thermal and electrical energy flows are involved: in that case particularly the electrical energy needs to be multiplied by a primary energy factor, Practical definitions of efficiencies can be found in technical system documents, e.g. for heating systems in EN 15316-1:2017, Clause 7[9].

b) Input/output ratio of different types of quantities

Sometimes, the output has a very different nature than the input (e.g. it is not really an energy flow anymore). In that case, the ratio is not dimensionless.

EXAMPLE The installed lighting power per illumination of a "work" plane, e.g. in W/m^2 per 100 lx or the specific fan power (SPF), i.e. the ratio of the electric input power of the fan to the air flow delivered in the rooms, in W per m^3/h. The latter quantity does not only depend on the fan characteristics, but also on the features of the entire ventilation system, in particular the overall pressure drop.

8 Tailoring for requirements and for ratings

8.1 Two approaches

A requirement for an EPB indicator or a rating reference may be a fixed value or a variable value.

A variable value reference may be necessary for requirements aiming at cost-optimal performance or for properly reflecting the average building stock for rating. A variable reference can, for instance, take into account the actual size of the building and/or the actual shape and/or any other factor that is needed as a sound basis for setting requirements or rating references.

Two ways to apply this principle in practice are:

1) the **formula approach**: the variable value is defined by a formula, e.g. function of location (climate), building size, shape and category. The formula is established based on a reference set of hypotheses.

2) the **notional reference building approach**: the variable value is the value of the performance calculated for a building having the same location (climate), building size, shape and category, etc., but with a reference set of hypotheses.

NOTE Although the ways to practically proceed for a given project are clearly different, the two methods actually lead to very similar numerical results, if the same set of reference hypotheses is taken as starting point. This is further discussed and illustrated in ISO/TR 52003-2:2017[4], which also lists some advantages and drawbacks of both approaches.

Tailoring can be relevant to both overall and partial energy performances.

The rationale behind the choice of a proper set of reference hypotheses for requirements is described in 8.2.

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8.2 Project characteristics for tailoring

Both in the formula approach and in the notional reference building approach several characteristics of the individual project are used for tailoring. Some of the most frequently used project characteristics for tailoring overall energy performances are listed in Table 2. Some of these are related to the design choices of the individual project (size, ventilation flows, illumination levels, etc.), some of which may be easily applicable only in the case of new buildings, because they cannot easily be determined in existing buildings.

Table 2 — Examples of project characteristics used for establishing tailored values for energy performances

Characteristics	Comment
Building category	In the standardized EPB assessment methods, this category usually determines several boundary conditions and hypotheses, such as (part of the) internal gains, hours of occupation, assumed average occupation density, etc. It is clear that these factors have a major impact on the calculated energy performance, and thus should also have an impact on the requirement.
Size of the building and its thermal envelope area	The size is most often characterized by the useful floor area, sometimes by the volume. If needed, the thermal envelope area can be subdivided in areas per type of element (opaque roofs, opaque walls, windows, floors on and above the ground, etc.).
Location	In the context of a regulation, this aspect usually automatically determines (fully or partially) the external environment conditions to be considered for the EPB assessment.
External environment conditions	This mainly concerns outdoor temperatures, solar radiation, possibly shading by objects in the environment, etc. In the context of a regulation, these aspects are usually automatically determined (fully or partially) by the location of the building.
Indoor environment and services:	
— temperature set-point profile for heating	In the context of a regulation, this aspect is usually automatically determined by the building or space category.
— temperature set-point profile for cooling	In the context of a regulation, this aspect is usually automatically determined by the building or space category.
— ventilation rate	The design occupation density and the design indoor air quality level determine the design ventilation rates. When these are taken as input for the EPB assessment, it is logic to use them also as input for a coherent reference.
— illumination level	The EPB assessment is usually based on the installed lighting power, which obviously strongly depends on the illumination level to be achieved. It is thus logic to use the illumination level as input for the reference.
— domestic hot water need	In the context of a regulation, this aspect is usually automatically determined by the building or space category and the size of the building.
Energy carrier	For instance, to take into account the availability of specific energy sources in specific locations.

9 Energy performance requirements

9.1 General

Setting effective EPB requirements is a challenging issue, whereby several aspects need to be taken into account in order to achieve the objectives.

In a first instance, it is important for public authorities to precisely and explicitly identify the goals that are pursued. These can be a combination of several independent objectives:

— a healthy and comfortable indoor environment;

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— energy efficiency;

— fabric and equipment preservation (e.g. avoid degradation due to moisture);

— others.

One single requirement can often contribute to a greater or lesser extent to more than one objective (e.g. thermal insulation can increase both thermal comfort and energy efficiency).

Defining the different objectives may be a somewhat iterative process: during the practical discussion about the EPB features and indicators for which to set requirements, extra motivations may be identified that were not initially listed. The original list should then of course be updated so that clarity is maintained.

Next, public authorities need to make three choices:

— the mix of EPB features and corresponding EPB indicators for which requirements are set (see 9.2);

— for each indicator for which a requirement is set: whether the requirement is a constant or variable (tailored) value (see 9.3);

— the actual strictness of each of the requirements (see 9.4).

NOTE 1 With respect to energy efficiency, a recurring consideration throughout the decision-making process can be cost-effectiveness: it is generally considered desirable that the EPB regulations make sure that any energy efficiency investment that pays for itself in the course of its lifetime (at a given, assumed future energy price scenario) is implemented in each individual project (i.e. any building works undertaken). (Of course, the performance oriented way of expressing requirements allows for any other package of measures, as long as the performance is at least as good). This consideration of cost effectiveness can strongly influence each of the three choices. These issues are discussed in more detail in ISO/TR 52003-2[4]. Methodologies for economic evaluations are treated in the relevant standard under EPB module M1–14.

Another point of attention for public authorities is the formulation of exceptions to the requirements. Two types of provisions can be distinguished:

— A general clause in the EPB regulation that creates, in a general manner, the possibility to grant laxer requirements (or waive some of them altogether) for an individual project in very special cases, mostly when the requirement is very difficult (or even physically or mathematically impossible) to practically achieve or when it would be excessively expensive. This is often called the “hardship” clause. Public authorities then need to give explicit, preliminary approval on a project by project basis.

— Specific, predefined exceptions that are explicitly defined from the onset in the regulation.

In the first instance (general hardship clause), great care should be taken that it remains an exception and does not become general practice (or a backdoor for abuse). Extensive use of such a measure would also create a heavy administrative burden on the public authorities, requiring advanced technical and economic expertise, as they should carefully study and evaluate each individual request. It is important that clear rules are provided of what can be considered undue hardship (e.g. what is considered excessive cost). Also that the administrative procedure and exception granting authority (e.g. on local or central level) are clearly established.

In the second instance (predefined exceptions), it is important to precisely and clearly define when an exception applies, so that as little doubt and discussion as possible arise, although it often concerns complicated situations, for instance in the case of renovations. Examples of predefined exceptions range from historic and religious buildings to single glazing for shop windows or for all-glass external doors.

9.2 Choice of the mix of requirements

Two choices shall be made:

— the EPB features for which requirements are set;

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— the indicator that is used to express the quantitative requirement for each of these EPB features.

For obvious practical and economic reasons, the mix of EPB features for which requirements are set usually varies greatly according to the type of work that is being executed.

In ISO 52000-1:2017, 6.2, the different options with respect to the type of object are specified and for a specific project the relevant object type or types are identified.

In each instance, the requirement mix (and the way to express each requirement and the actual strictness; see 9.3 and 9.4) may differ depending on the building category (dwelling, office, etc.).

NOTE These issues are further discussed in ISO/TR 52003-2[4], differentiating between new and existing buildings.

9.3 Constant or variable value requirements

Given an EPB feature and a corresponding indicator for which it has been decided to set a requirement (see 9.2), it should be decided whether the requirement is a fixed numeric value, or a variable numeric value tailored to the specific characteristics of each individual project (see Table 2 for some common examples of influencing characteristics). This important choice, as well as the starting hypotheses chosen in the case of a variable value, deserve very careful attention because they may have a tremendous impact on the workings of the EPB regulations, notably whether all building projects are submitted to more or less comparable requirements in technological and economic terms (whatever the overall/average actual strictness, discussed in 9.4). Clause 8 discusses the topic of tailoring.

NOTE The issue of variable value requirements is discussed in greater detail in ISO/TR 52003-2:2017.

9.4 Actual strictness

As stated in 9.1, financial considerations may be of great importance when deciding on the actual strictness of energy efficiency requirements.

One of the most important questions to answer when performing economic analyses is the future energy price scenario. The choice of a scenario is primarily societal-political. Several variants of energy price scenarios can be considered, ranging from the expected private actor's cost, to the inclusion of external costs, to the costs of alternatives (e.g. the cost of large scale forms of renewable energy).

NOTE The issue of different energy cost scenarios is further explored in ISO/TR 52003-2:2017, 9.1[4].

9.5 Reporting template for the overall energy performance

In application of 9.2, Table A.2 provides a uniform template for the competent authorities to report their chosen mix on the overall energy performance requirement(s) (see also 7.3.1); with informative default choices in Table B.2. In addition to the completed table template, the objectives that are pursued (see 9.1) shall explicitly be mentioned, and it shall be explained how the chosen mix of EPB features achieves these objectives.

Tables A.3, A.4 and A.5 provide uniform templates to report the chosen indicator for the total, the non-renewable and renewable primary energy use (if applicable)), with informative default choices in Tables B.3, B.4 and B.5.

NOTE Requirements with respect to partial EPB features are dealt with in other standards, e.g. ISO 52018-1 for EPB features related to the thermal balance and to the fabric.

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10 EPB rating

10.1 General

A numeric indicator for an EPB feature (as produced by the EPB assessment methods) does not yet automatically reveal the energetic quality of the building with respect to that EPB feature. The EPB indicator needs to be compared to reference values in order to judge (rate) the good or poor performance of the EPB feature under consideration.

NOTE See ISO/TR 52003-2:2017, Figure 2[4].

This can often be translated into a representative value for new buildings related to the average building stock.

One of the possible objectives of the rating is the information and communication of the energy performance. This applies both to the overall energy performance of the building and to the energy performance of any specific energy feature (any partial energy performance).

10.2 EPB rating procedures

Various ways to express the overall or partial energy rating of a building or a building feature can be defined on the basis of the value of the energy performance indicator compared to reference values.

NOTE 1 If one of the reference values is, for example, zero then only one other reference value is needed. Examples are given in ISO/TR 52003-2[4].

The following default energy rating methods are elaborated in detail.

NOTE 2 The first is the method that has been introduced (as such or with specific adaptations) in many countries and the second is a further developed version taking into account new developments.

Table A.6 provides the template for the choice between these three methods, with an informative default choice in Table B.6.

1) **Default energy rating method with two reference points**:

- The performance scale shall range from A (buildings of best energy performance) to G (buildings of worst energy performance).
- The energy performance regulation reference, R_r, shall be placed at the boundary between two classes, for instance classes B and C.
- The building stock reference, R_s, shall be placed at the boundary between two classes, for instance classes D and E.
- A building with a net delivered energy equal to 0 shall be placed at the top of one of the classes, for instance class A.
- Subclasses may be defined in order to expand the classes, e.g. class A may be expanded with A+, A++, A+++.

The choices for the boundaries are given in Table A.6 (normative template) with informative default choices given in Table B.6.

The procedure for building energy certificates shall describe the limits of each class.

NOTE 3 ISO/TR 52003-2:2017[4] provides suggestions for reporting the specifications and ISO/TR 52003-2:2017, Annex D provides a practical suggestion for defining the boundaries of the other classes.

NOTE 4 ISO/TR 52003-2:2017, Annex E[4] provides example descriptions of energy labels.

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See Clause 9 for details on the proper choice of R_r and R_s.

2) **Default energy rating method with a single reference point (see examples in Table 3):**

- The performance scale shall range from Class A to Class G.
- Subclasses may be defined in order to expand the classes, for instance class A may be expanded with A+, A++, A+++.
- The boundaries of the classes are based on a nonlinear scale $\left(Y = \sqrt{2}^{(n-n_{ref})} \right)$.
- The energy performance regulation reference, R_r, shall be placed at the boundary between two classes, for instance classes 4 and 5 (n_{ref} = 4). The value of n_{ref} in formula $Y = \sqrt{2}^{(n-n_{ref})}$ determines the position of regulation reference, R_r, on the scale. The choice of the boundary, n_{ref}, is given in Table A.6 (normative template) with an informative default choice given in Table B.6.

See Clause 9 for details on the proper choice of R_r.

NOTE 5 See ISO/TR 52003-2:2017 for background information on this method.

Table 3 — Example of classes of default energy rating method with a single reference point

Class	**Example of classes for n_{ref} = 4**
	EP < 0
Class 1	0 Ref < EP ≤ 0,35 Ref
Class 2	0,35 Ref < EP ≤ 0,50 Ref
Class 3	0,50 Ref < EP ≤ 0,71 Ref
Class 4	0,71 Ref < EP ≤ **1,00** Ref
Class 5	1,00 Ref < EP ≤ 1,41 Ref
Class 6	1,41 Ref < EP ≤ 2,00 Ref
Class 7	2,00 Ref < EP

3) **Other energy rating method:**

Any other method for energy rating.

NOTE 6 This third choice can also be used to open up some of the details of the default energy rating method 1 or 2 for (national) choice by specifying another energy rating method that resembles the default method 1 or 2 but differs in some detail not foreseen in the default choices in Tables A.6 and B.6.

10.3 Reference values

10.3.1 General

As stated in Clause 8, the references for the rating of the (overall or partial) energy performance may be fixed values or variable values (functions). A variable value reference (a function) may be necessary for reasons of cost-optimal performance.

10.3.2 Requirement as main reference value

The requirement for new construction (or renovation) constitutes a prime reference for evaluating the performance of an EPB feature. It is further indicated with the symbol R_r. The different aspects of establishing the requirements (including the question whether fixed or variable values are most appropriate) have been treated in Clause 9.

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10.3.3 Building stock as reference

A second major reference concerns the average for the building stock. This corresponds to the energy performance reached by a certain percentage, for instance approximately the median value (50 %), of the national or regional building stock, subject to the choice in Table A.6 (template) with informative default choice in Table B.6. It is further indicated with the symbol R_S. This reference too can be tailored to the individual building characteristics in the same way as the requirement for new constructions, notably by means of the formula approach or the notional reference building approach, as described in Clause 8.

A minimum of five years between changes in the values of the references is recommended.

NOTE National policy could decide whether to keep the same value for R_r even if the regulations are changed.

Different reference values shall be defined for classes of buildings belonging to different categories, e.g. single family houses, apartment blocks, offices, education buildings, hospitals, hotels and restaurants, sport facilities, wholesale and retail trade service buildings, and other types).

When a given building belongs to different categories (e.g. education + sport), one shall either

— define a reference for each building category separately, or

— define the reference value as an area weighted average of the reference values for each building category.

11 Energy performance certificate

11.1 General

This clause includes the following:

a) content of the procedure for a building energy certificate;

b) content of an energy certificate;

c) description of types of recommendations to be included in the energy certificate.

NOTE In addition to this clause, ISO/TR 52003-2:2017, Annexes D and E[4] provide a way to describe a procedure for a building energy certificate, an informative procedure for buildings classification, and examples of an energy certificate format.

11.2 Content of the procedure for a building energy certificate

When the procedure for a building energy certificate is set up according to this document, information on the choices done shall be properly documented.

NOTE 1 More details are given in ISO/TR 52003-2:2017, 11.2[4].

The following shall be included in a procedure for a building energy certificate.

a) ENERGY PERFORMANCE ASSESSMENT: Energy performance assessment according to ISO 52000-1.

b) APPLICATION: Specification of the cases where the procedure for a building energy certificate applies:

— for sale, rent, new building design or after construction, display in a public building, etc.;

— for checking compliance with energy performance requirements.

c) TYPE OF EP assessment: Specification of the type of EP assessment used, as specified in ISO 52000-1 [calculated (design, as built; standard, or tailored) and/or measured (standard or actual)], for

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each application (see point b) above) and for which building category (categories) it applies. In case of design rating, this includes under what conditions the design rating can be considered as or converted to a calculated energy rating for the actually realized building. In case of measured energy rating, this includes specification of which information on the actual conditions in the building is to be recorded (if any) and whether or not corrections shall be made to correct for deviating periods, weather, and/or indoor conditions.

d) OVERALL NUMERICAL INDICATOR: Specification of what the overall numerical indicator represents, as specified in 7.3, and specifically, which energy services are included and if renewable energy produced on site is part of delivered energy or not and if exported energy is taken into account.

e) NORMALIZATION: Specification of whether and (if so) how the overall numerical indicator is normalized for the size of the building, as specified in 7.3.

f) ENERGY PERFORMANCE REQUIREMENTS: If these are associated with the certificate, specification of

— which energy performance requirements apply, as specified in 9.2 (differentiating between building categories and between new buildings and renovations of and extensions to existing buildings), and

— how each of the requirements is expressed, as specified in 9.3, including the way requirements for buildings with different categories are defined and the actual strictness, as specified in 9.4.

NOTE 2 And the specifications in case of the application of the notional reference building approach as described in ISO/TR 52003-2:2017, Clause 8[4].

g) REFERENCE VALUES: Specification of the reference values and the procedure to define the values, as specified in 10.3 including the way the impact of certain parameters is modified, as specified in Clause 8.

h) OTHER (BUILDING ELEMENT) INFORMATION: Specification of other information on the energy performance of main building and system elements required on the certificate (if any).

i) ADDITIONAL INDICATORS: Specifications and assessment procedures on additional indicators required on the certificate (if any, see 7.1).

j) RECOMMENDATIONS: Procedures to assess the recommendations for cost-effective improvements, as defined in 11.4, and for which applications these are required on the certificate.

k) ENERGY PERFORMANCE RATING: Setup and procedures to assess the energy performance rating presented on a scale or as a class (to be specified), as defined in Clause 10.

l) ADDITIONAL CONTENT: Specific additional content on the certificate to identify the characteristics of the building.

EXAMPLES Reference floor area, useful floor area, number of thermally conditioned floors, year or period of construction, and year or period of the last major refurbishment.

m) ADDITIONAL INFORMATION: Specification of any other additional information required on the certificate (if any).

n) COMPLETION OF THE CERTIFICATE: General procedures for the completion of the administrative and technical data required on the certificate, as specified in 11.3.

o) FORMAT OF THE CERTIFICATE: Format of the certificate, as specified in 11.3 and which content is to be given in the certificate itself and which is to be given in an accompanying report.

p) CENTRAL DATABASE: If this is part of the certification procedures, the purpose of this procedure is to ensure that the data obtained from the energy certificates describing the building stock are stored in an organized way and in a central place (one database).

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11.3 Content of the energy performance certificate

11.3.1 General

The energy performance certificate shall contain a concise report of the input, method and output of the energy certification.

NOTE 1 Including ways to present recommendations for improvements (see 11.4), as well as ways to present the supporting evidence of the energy certificate (see 11.2).

NOTE 2 In ISO/TR 52003-2:2017, 11.3[4] suggestions for the content of a certificate are given.

One of the key elements of the certificate is the energy label. Again, many solutions are possible for the energy label. The energy rating on the label is described in Clause 10. The core of the label is the graphical representation of the energy rating.

One model for the graphical representation of the energy rating is elaborated as default model, because it is one of the models that has been introduced (as such or with specific adaptations) in many countries.

Model 1. Default graphical representation model:

See 11.3.2

Model 2. Other graphical representation model:

Any other graphical representation model.

NOTE 3 In ISO/TR 52003-2:2017, 11.3[4] suggestions for the content and alternative graphical representation models are given.

Table A.7 provides the template for the choice between these two models, with an informative default choice in Table B.7.

NOTE 4 Some of the details of the default graphical representation model could also be opened up for (national) choice by specifying another label model that resembles the default model but differs in some detail.

11.3.2 Default graphical representation model

This default model is characterized by having one indicator and using energy rating classes of the type 2 (Default energy rating method with a single reference point) from 10.2.

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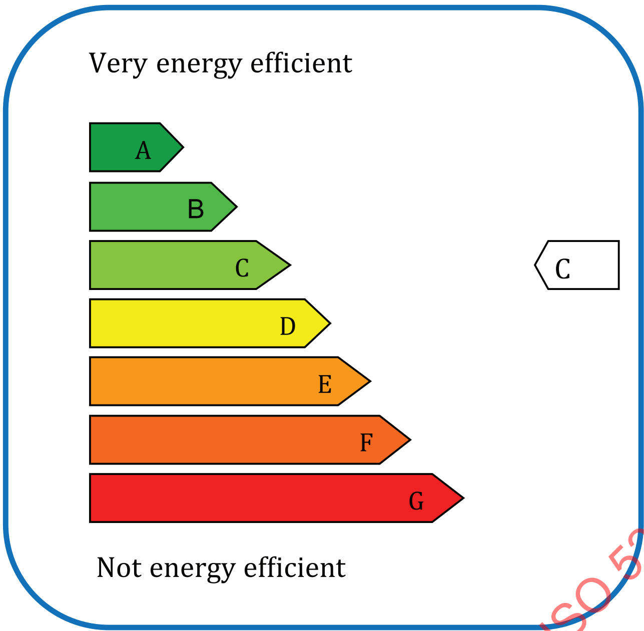

Figure 1 — Default model for the graphical representation of the energy rating

11.4 Recommendations

The procedures for building energy certificates shall specify the procedures to assess the recommendations for cost-effective improvements and for which applications these are required on the certificate, as part of 11.2 point j).

The energy certificate shall contain, if applicable, recommendations dealing with:

a) modernisation measures (building fabric and technical systems);

b) measures of property management (improvement of the operation and control of building and technical systems).

The assessment of the impact of possible measures can be done according to ISO 52000-1.

Recommendations may include the calculation of energy savings after realization of proposed measures and payback time for investment.

12 Quality control

The reporting and documentation of the choices made to specify numerical indicators, requirements, ratings and certificates serve as the main quality control. The reporting and documentation required for this document is limited to the overall energy performance, since the choices made on partial energy performances are made in other (topical) EPB standards.

13 Compliance check

In this document, most of the input is gathered through other EPB standards. The relevant procedures for compliance check are provided in those documents.

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Annex A
(normative)

Input and method selection data sheet — Template

A.1 General

The template in Annex A of this document shall be used to specify the choices between methods, the required input data and references to other documents.

NOTE 1 Following this template is not enough to guarantee consistency of data.

NOTE 2 Informative default choices are provided in Annex B. Alternative values and choices can be imposed by national/regional regulations. If the default values and choices of Annex B are not adopted because of the national/regional regulations, policies or national traditions, it is expected that:

— national or regional authorities prepare data sheets containing the national or regional values and choices, in line with the template in Annex A; or

— by default, the national standards body will add or include a national annex (Annex NA) to this document, in line with the template in Annex A, giving national or regional values and choices in accordance with their legal documents.

NOTE 3 The template in Annex A is applicable to different applications (e.g., the design of a new building, certification of a new building, renovation of an existing building and certification of an existing building) and for different types of buildings (e.g., small or simple buildings and large or complex buildings). A distinction in values and choices for different applications or building types could be made:

— by adding columns or rows (one for each application), if the template allows;

— by including more than one version of a table (one for each application), numbered consecutively as a, b, c, ... For example: Table NA.3a, Table NA.3b;

— by developing different national/regional data sheets for the same standard. In case of a national annex to the standard these will be consecutively numbered (Annex NA, Annex NB, Annex NC, ...).

NOTE 4 In the section "Introduction" of a national/regional data sheet information can be added, for example about the applicable national/regional regulations.

NOTE 5 For certain input values to be acquired by the user, a data sheet following the template of Annex A, could contain a reference to national procedures for assessing the needed input data. For instance, reference to a national assessment protocol comprising decision trees, tables and pre-calculations.

The shaded fields in the tables are part of the template and consequently not open for input.

Specific information concerning Annex A and Annex B of this document:

The reporting tables allow full freedom of choice at national or regional level.

Typically, different choices will be made according to the type of work, notably for new constructions (or equivalent) or works on existing buildings. Furthermore, there may be differentiations according to other criteria, such as between residential and non-residential buildings. Each different application area will thus have its own set of tables if different choices are made. The application domain of every set shall be clearly specified.

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A.2 References

The references, identified by the EPB module code number, are given in a table complying with the format given in Table A.1 (template).

Table A.1 — References

Reference	Reference document[a]	
	Number	Title
M1–6[b]		
M1–14[b]		
M2–4[b]		
M3–4[b]		
M4–4[b]		
M5–4[b]		
M6–4[b]		
M7–4[b]		
M8–4[b]		
M9–4[b]		
M10–4[b]		

[a] If a reference comprises more than one document, the references may be differentiated.

[b] Informative.

A.3 Energy performance requirements

Table A.2, which contains the overall energy performance requirement mix, should be filled out as follows:

— The first column lists the overall energy performance features that can be considered for setting requirements. The motivation for the chosen mix shall be reported. If required, other overall EPB features can be added at the bottom of the table. By means of a numbered reference, a precise description of each additional overall EPB feature will then be given and the motivation shall be described in a clear manner.

— In the second column, an X-mark is put at each of the features chosen to set a requirement.

— In the third column, a numbered reference is made to a full, detailed and clear explanation for each exception, including the motivation for the exception.

Table A.2 should be seen in conjunction with all the partial EPB requirements (which are beyond the scope of this document, e.g. concerning technical systems). Partial EPB requirements related to the fabric are discussed in ISO 52018, which also provides reporting templates for the corresponding EPB features.

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Table A.2 — Default choices with respect to the overall EPB requirements (see 9.5)

Application:		
Overall energy performance feature	**Requirement?**	**Exceptions*?**
Total primary energy use		
Non-renewable primary energy use		
Renewable primary energy use		
Renewable energy ratio		
Greenhouse gas emissions		
Energy policy factors (define*)		

The columns or cells that are marked with an asterisk * (i.e. any cell involving a specific national/regional element) shall be marked with a numbered reference. Clear explanation and motivation shall be given for each of these new elements.

Complete:

Explanations according to each of the numbered references:

(1) ...<free text>

(2) ...

Motivation for the requirement mix: ...<free text>

As explained in Clause 9, the numerical value of the requirement on the total primary energy use (notably whether variable or constant) should be set with great care.

Table A.3 — Numeric indicator used for the requirement on the total primary energy use (see 9.5)

Numeric indicator	**Choice**
Total primary energy use per useful floor area [kWh/m^2]	
Total primary energy use E_{Ptot} [kWh]	
Ratio (define)	
<free text> (Other: define*)	
...	

If another indicator is used, it shall be clearly described and precise reference shall be made to the determination method:

(1) ... < free text >

(2) ...

As explained in Clause 9, the numerical value of the requirement on the non-renewable primary energy use (notably whether variable or constant) should be set with great care.

Table A.4 — Numeric indicator used for the requirement on the non-renewable primary energy use (see 9.5)

Numeric indicator	**Choice**
Non-renewable primary energy use per useful floor area [kWh/m^2]	
Non-renewable primary energy use E_{Pnren} [kWh]	
Ratio (define)	
<free text> (Other: define)	
...	

If another indicator is used, it shall be clearly described and precise reference shall be made to the determination method:

(1) ...<free text>

(2) ...

As explained in Clause 9, the numerical value of the requirement on the renewable primary energy use (notably whether variable or constant) should be set with great care.

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