
**Energy performance of buildings —
Overarching EPB assessment —**

**Part 1:
General framework and procedures**

*Performance énergétique des bâtiments — Évaluation cadre PEB —
Partie 1: Cadre général et modes opératoires*

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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 52000-1 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 371, *Energy Performance of Buildings project group*, in collaboration with ISO Technical Committees TC 163, *Thermal performance and energy use in the built environment*, and TC 205, *Building Environment Design*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 52000 series can be found on the ISO website.

This document cancels and replaces ISO/TR 16344:2012^[3] and ISO 16346:2013^[2].

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 52000-2[6].

The framework for overall EPB includes:

- a) common terms, definitions and symbols;
- b) building and assessment boundaries;
- c) building partitioning into space categories;

- d) methodology for calculating the EPB (formulae on energy used, delivered, produced and/or exported at the building site and nearby);
- e) a set of overall formulae and input-output relations, linking the various elements relevant for the assessment of the overall EPB;
- f) general requirements for EPB dealing with partial calculations;
- g) rules for the combination of different spaces into zones;
- h) performance indicators;
- i) methodology for measured energy performance assessment.

[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[6] 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 3 The modules represent EPB standards, although one EPB standard could cover more than one module and one module could be covered by more than one EPB standard, for instance, a simplified and a detailed method respectively. See also [Tables A.1](#) and [B.1](#).

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Table 1 — Position of this document (in casu M1-1 - M1-3, M1-5, M1-7 - M1-10), within the modular structure of the set of EPB standards

	Overarching		Building (as such)		Technical Building Systems									
Sub module	Descriptions		Descriptions		Descriptions	Heat- ing	Cool- ing	Ven- tila- tion	Hu- midifi- cation	Dehu- midifi- cation	Do- mestic hot water	Light ing	Build ing auto mation and control	PV, wind, ..
sub1		M1		M2		M3	M4	M5	M6	M7	M8	M9	M10	M11
1	General	ISO 52000-1	General		General									
2	Common terms and definitions; symbols, units and subscripts	ISO 52000-1	Building en- ergy needs		Needs								a	
3	Applications	ISO 52000-1	(Free) Indoor conditions without systems		Maximum load and power									
4	Ways to ex- press energy performance		Ways to ex- press energy performance		Ways to ex- press energy performance									
5	Building categories and building boundaries	ISO 52000-1	Heat transfer by transmis- sion		Emission and control									
6	Building occupancy and operating conditions		Heat transfer by infiltra- tion and ventilation		Distribution and control									
7	Aggregation of energy services and energy carriers	ISO 52000-1	Internal heat gains		Storage and control									
8	Building zoning	ISO 52000-1	Solar heat gains		Generation and control									
NOTE The shaded modules are not applicable.														

Table 1 (continued)

Overarching		Building (as such)	Technical Building Systems											
Sub module	Descriptions		Descriptions		Descriptions	Heat- ing	Cool- ing	Ven- tila- tion	Hu- midifi- cation	Dehu- midifi- cation	Do- mestic hot water	Light ing	Build ing auto mation and control	PV, wind, ..
sub1		M1		M2		M3	M4	M5	M6	M7	M8	M9	M10	M11
9	Calculated energy per- formance	ISO 52000-1	Building dynamics (thermal mass)		Load dis- patching and operating conditions									
10	Measured energy per- formance	ISO 52000-1	Measured energy per- formance		Measured energy per- formance									
11	Inspection		Inspection		Inspection									
12	Ways to ex- press indoor comfort				BMS									
13	External environment conditions													
14	Economic calculation													

NOTE The shaded modules are not applicable.

Energy performance of buildings — Overarching EPB assessment —

Part 1: General framework and procedures

1 Scope

This document establishes a systematic, comprehensive and modular structure for assessing the energy performance of new and existing buildings (EPB) in a holistic way.

It is applicable to the assessment of overall energy use of a building, by measurement or calculation, and the calculation of energy performance in terms of primary energy or other energy-related metrics. It takes into account the specific possibilities and limitations for the different applications, such as building design, new buildings 'as built', and existing buildings in the use phase as well as renovation.

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 this document.

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*

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 documents covering M5-5).

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7345:1987 and the following apply.

[Clause 3](#) includes terms that are not used in this document, but that are needed for overall consistency in the EPB standards.

NOTE 1 An alphabetic list of all terms defined in this document is given in [Annex F](#).

NOTE 2 See ISO/TR 52000-2[6] for explanation on the overarching terms and definitions and how possible conflicts with national or regional (e.g., legal) specifications is avoided.

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>

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.

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).

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.

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 [3.1.14](#) definition of space category.

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).

3.1.4

building element

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

3.1.5**building fabric**

all physical elements of a building, excluding technical building systems

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

Note 1 to entry: It includes elements both inside and outside of the thermal envelope, including the thermal envelope itself.

Note 2 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.

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 technical systems is an energy generation system (PV panels, wind turbine, cogeneration unit, boiler, etc.) serving the building portfolio.

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.

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.

3.1.9**cooled space**

room or enclosure, which for the purposes of a calculation is assumed to be cooled to a given temperature set-point or set-points

3.1.10**elementary space****space**

room, part of a room or group of adjacent rooms that belong to one thermal zone and one service area of each service, used to administer the boundaries of the thermal zones and service areas and to administer the exchange of data between the service areas and thermal zones

3.1.11**heated space**

room or enclosure which for the purposes of a calculation is assumed to be heated to a given temperature set-point or set-points

[SOURCE: ISO 13675:2013,^[8] 3.1.17; modified]

3.1.12

reference floor area

floor area used as a reference size

Note 1 to entry: See definition of reference size.

3.1.13

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

3.1.14

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.

3.1.15

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^[9].

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^[9], 3.9 — modified with addition of notes 2 and 3]

3.1.16

thermally conditioned space

heated and/or cooled space

3.1.17

thermally unconditioned space

room or enclosure that is not part of a thermally conditioned space

3.1.18

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 (re-)allocation rules

3.2 Indoor and outdoor conditions

3.2.1

condition 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 m² 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 m² per type of building space.

3.2.2**design condition**

<building operating>description based on a particular environmental element such as indoor air quality, satisfactory lighting, thermal and acoustical comfort, energy efficiency and associated system controls to be used for assessing operation of the building, part of the building and technical building systems

3.2.3**external temperature**

temperature of outdoor air

3.2.4**internal temperature**

weighted average of the air temperature and the mean radiant temperature at the centre of the thermal zone

Note 1 to entry: This is the approximate operative temperature according to ISO 7726.

3.2.5**other building service**

service supplied by energy-consuming appliances

3.2.6**solar irradiance**

power density of radiation incident on a surface, i.e., the quotient of the radiant flux incident on the surface and the area of that surface, or the rate at which radiant energy is incident on a surface, per unit area of that surface

3.2.7**solar irradiation**

incident solar heat per area over a given period

Note 1 to entry: Incident energy per unit area of a surface, found by integration of solar irradiance over a specified time interval, often an hour or a day (ISO 9488^[10]).

3.3 Technical building systems**3.3.1****air conditioning system**

combination of all components required to provide air treatment in which supply air temperature is controlled, possibly in combination with the control of ventilation rate and humidity and air filtration

3.3.2**air conditioning system service area**

group of spaces connected to the same air conditioning system

3.3.3**building service**

service provided by technical building systems and by appliances to provide acceptable indoor environment conditions, domestic hot water, illumination levels and other services related to the use of the building

[SOURCE: ISO 13612-2:2014,^[7] 3.6 — modified]

3.3.4**building service area (service area)**

part of a building consisting of one or more elementary spaces served by a specific technical building system or sub-system

Note 1 to entry: Building service area for a specific heating system circuit, for a specific cooling system circuit, for a specific domestic hot water distribution system, for a specific ventilation system, for a specific air conditioning system, for a specific lighting (artificial light or daylight) configuration.