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Energy performance of buildings — Overarching EPB assessment —

Part 2: Explanation and justification of ISO 52000-1

Performance énergétique des bâtiments — Évaluation globale de la PEB —
Partie 2: Explication et justification de l'ISO 52000-1

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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/TR 52000-2 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.

Introduction

The set of EPB standards, technical reports and supporting tools

In order to facilitate the necessary overall consistency and coherence, in terminology, approach, input/output relations and formats, for the whole set of EPB-standards, the following documents and tools are available:

a) a document with basic principles to be followed in drafting EPB-standards: CEN/TS 16628:2014, Energy Performance of Buildings - Basic Principles for the set of EPB standards[13];

b) a document with detailed technical rules to be followed in drafting EPB-standards; CEN/TS 16629:2014, Energy Performance of Buildings - Detailed Technical Rules for the set of EPB-standards[14];

The detailed technical rules are the basis for the following tools:

1) a common template for each EPB-standard, including specific drafting instructions for the relevant clauses;

2) a common template for each technical report that accompanies an EPB standard or a cluster of EPB standards, including specific drafting instructions for the relevant clauses;

3) a common template for the spreadsheet that accompanies each EPB standard, to demonstrate the correctness of the EPB calculation procedures.

Each EPB-standards follows the basic principles and the detailed technical rules and relates to the overarching EPB-standard, ISO 52000-1[1].

One of the main purposes of the revision of the EPB-standards is to enable that laws and regulations directly refer to the EPB-standards and make compliance with them compulsory. This requires that the set of EPB-standards consists of a systematic, clear, comprehensive and unambiguous set of energy performance procedures. The number of options provided is kept as low as possible, taking into account national and regional differences in climate, culture and building tradition, policy and legal frameworks (subsidiarity principle). For each option, an informative default option is provided (Annex B).

Rationale behind the EPB technical reports

There is a risk that the purpose and limitations of the EPB standards will be misunderstood, unless the background and context to their contents – and the thinking behind them – is explained in some detail to readers of the standards. Consequently, various types of informative contents are recorded and made available for users to properly understand, apply and nationally or regionally implement the EPB standards.

If this explanation would have been attempted in the standards themselves, the result is likely to be confusing and cumbersome, especially if the standards are implemented or referenced in national or regional building codes.

Therefore each EPB standard is accompanied by an informative technical report, like this one, where all informative content is collected, to ensure a clear separation between normative and informative contents (see CEN/TS 16629[14]):

— to avoid flooding and confusing the actual normative part with informative content,

— to reduce the page count of the actual standard, and

— to facilitate understanding of the set of EPB standards.

This was also one of the main recommendations from the European CENSE project[5] that laid the foundation for the preparation of the set of EPB standards.

This document

This document accompanies the overarching EPB standard (ISO 52000-1) that addresses the overarching principles for EPB-standards. The overarching EPB standard, contains the common terms, definitions and overall energy performance assessment procedures, as a basis for a systematic, clear and comprehensive set of EPB standards. It forms part of a set of standards related to the evaluation of the energy performance of buildings (EPB).

The role and the positioning of ISO 52000-1 in the set of EPB standards is defined in the Introduction to the standard.

Accompanying spreadsheets

Spreadsheets are produced through the implementation of ISO 52000-1. These spreadsheets (including possible updated versions) are available at www.epb.center. In this document, examples of each of these calculation sheets are included.

Background and history of this document, ISO 52000-1 **and the set of EPB standards**[1]:

Boosting energy efficiency of buildings

Since buildings burn 40 % of all the energy consumed, designing better buildings and retrofitting existing ones will help to reduce the energy demand and to create significant job opportunities world-wide.

The building sector has a great potential to reduce the greenhouse gas emissions, in line with the climate targets set at the Paris climate conference (COP21) in December 2015. Helping to decarbonize the building sector is the goal of the new holistic approach, the set of EPB standards (ISO 52000-series; see below under "Road ahead") being developed for the energy performance of buildings (EPB).

Holistic approach

The set of EPB standards …	
take into account	**and include:**
• indoor climate	• needs
• thermal properties (of walls, windows, etc.)	• use
• heating	• calculation
• cooling and air conditioning	• measurement
• domestic hot water	• inspection
• ventilation	• building design
• lighting	• new and existing buildings
• (de)humidification	• certification/labelling
• building automation and control (BAC/BMS)	• simple and complex buildings
• renewable energy sources	

Why is the holistic approach important for the energy performance of buildings (EPB) ?

In the past, energy performance requirements were set at component level – minimum thermal insulation levels and minimum efficiencies of products. This, however, leads to sub-optimal solutions and creates a barrier to the necessary technology transitions.

The holistic approach to assessing the overall energy performance of buildings and the built environment, provided by the set of EPB standards, is a key tool to overcome these barriers.

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1) The references [26] to [43] (see bibliography) contain more extensive background information on the set of EPB standards.

The set of EPB standards enable to assess the overall energy performance of a building. This means that any combination of technologies can be used to reach the intended energy performance level, at the lowest cost.

Due to this 'competition' between different technologies, the holistic approach is a key driver for technological innovation and change. Countries using the approach for several years – take, for instance, the Netherlands – have experienced large scale implementation and cost savings on a variety of new technologies.

And there is the economic benefit: Energy expenditures account for a substantial part of a building's total operating costs.

Who are the potential users of the EPB set of standards, and what should they be aware of ?

The energy assessment of buildings is carried out for various purposes, such as:

— judging compliance with building regulations expressed in terms of limited energy use or a related quantity,

— increasing transparency in real-estate transactions through an energy performance certification and/or display of the level of energy,

— monitoring the energy efficiency of the building and its technical building systems,

— helping to plan retrofit measures through predicting energy savings that would result from various actions.

In general, the holistic approach means that the energy performance is assessed as the total energy used for heating, cooling, lighting, ventilation, domestic hot water, and, in some cases, appliances. It ensures that all technologies are treated equally and balanced.

With the EPB set of standards**:**

— **Policy makers** acquire an instrumentation that enables them to take measures in the built environment and to quantify how much these measures would reduce the energy consumed in buildings.

— **Building industry, engineers and designers** can improve the energy-efficiency of their designs, building products and systems. The set of standards take these current and future products, systems and designs into account. Due to the holistic approach the risk of suboptimum solutions at component level is minimized. This way industry knows in what direction to innovate.

— **Building owners and occupants** can benchmark against other buildings and predict the energy saving potential of improvements.

First editions: European standards

The set of standards and accompanying technical reports on the energy performance of buildings have been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association (Mandate M/480[4])

Directive 2010/31/EU recasting the Directive 2002/91/EC on energy performance of buildings (EPBD[2]) promotes the improvement of the energy performance of buildings within the European Union, taking into account all types of energy uses (heating, lighting, cooling, air conditioning, ventilation) and outdoor climatic and local conditions, as well as indoor climate requirements and cost effectiveness (Article 1).

The first mandate to CEN to develop a set of CEN EPBD standards (M/343[3],), to support the first edition of the EPBD[2] resulted in the successful publication of all EPBD related CEN standards in 2007-2008.

The mandate M/480 was issued to review the previous mandate M/343 as the recast of the EPBD raised the need to revisit the standards and reformulate and add standards so that they become on the one

hand unambiguous and compatible, and on the other hand a clear and explicit overview of the choices, boundary conditions and input data that need to be defined at national or regional level. Such national or regional choices remain necessary, due to differences in climate, culture & building tradition, policy and legal frameworks. Consequently, the set of CEN-EPBD standards published in 2007-2008 had to be improved and expanded on the basis of the recast of the EPBD.

Road ahead: ISO 52000- series

The numbers ISO 52000 through ISO 52150 are reserved for the EPB standards. So in the near future the term ISO 52000 series of standards will become equivalent to the term EPB set of standards.

Only standards that meet specific requirements, will be awarded such number. Currently, only 15 numbers are issued, mostly general EPB standards, or for building (thermal, solar) calculations. In 2017/2018 some 30 standards might become an ISO 52xxx standard, making use of the work already done in Europe.

The ISO 52000 series is modular and flexible, making it the perfect basis for future developments like innovations, new insights and new market demands.

Energy performance of buildings — Overarching EPB assessment —

Part 2: Explanation and justification of ISO 52000-1

1 Scope

This document refers to the overarching EPB-standard, ISO 52000-1[1].

It contains information to support the correct understanding, use and national implementation of ISO 52000-1. This includes:

— explanation on the procedures and background information and justification of the choices that have been made;

— reporting on validation of calculation procedures given in the standard;

— explanation for the user and for national standards writers involved with implementation of the set of EPB standards, including detailed examples.

2 Normative references

There are no normative references in this document.

Some explanations regarding Clause 2 of the overarching EPB standard:

If a reference is made in the text of the standard to a specific part of another standard, only this specific part is referenced, not the entire other standard.

The following text in ISO 52000-1:2017, Clause 2 “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.” is the standard phrasing for any ISO standard. As stated in the ISO/IEC Directives, Part 2:2016, Clause 15, the normative references clause is an informative element that lists, for information, those documents which are cited normatively in the document. Information on how these references apply is found in the place where they are cited in the document, and not in the normative references clause. The list of normative references is therefore given for the convenience of the user, who can then consult the place where they are cited in the document to understand and assess how they apply.

NOTE 1 EPB is regulated in some countries or regions: regulations do not necessarily endorse the complete set of EPB standards and might modify the content of the standard(s).

To keep flexibility in referencing standards, the references to EPB standards are placed in the national choices and input data sheet, see Annex A and Annex B.

The references to EPB standards are given as module code numbers instead of a simple list ([1], [2],.[3]), because with the EPB module code numbers the same module code numbering can be used for all EPB standards.

NOTE 2 This will facilitate the making of a consistent set of national annexes for each EPB standard and contribute to overall consistency and transparency.

3 Terms and definitions

This clause provides an explanation of some of the terms and definitions given in ISO 52000-1. The numbers in brackets refer to the term-numbers in ISO 52000-1:2017, Clause 3.

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 Buildings

Building (term 3.1.2)

"Building" means the physical construction including the technical building systems.

"Building unit" has been defined separately (term 3.1.8).

The definition in EPBD: "'building' means a roofed construction having walls, for which energy is used to condition the indoor climate" is not usable in this context, e.g. because there are buildings without walls (only roof), or without roof (e.g. pyramid shaped, only inclined walls).

Building category (term 3.1.3)

The term "category" does not only relate to the type of use: also to size, to the period of use (e.g. temporary use) and to other qualifications (e.g. historic buildings).

See also the notes and examples in ISO 52000-1:2017 at this entry and at the definition of Space category (term 3.1.14).

Reference floor area (term 3.1.12)

The reference floor area should not be confused with the **useful floor area for EPB assessment** (3.1.18, see further on). The difference between useful floor area and reference area can be found in 9.3 and 9.4.

The **reference floor area** is one of the options is for the **reference size**.

Reference size (term 3.1.13)

The reference size is used for the normalization of the energy performance.

Extensive explanation on the reference size is given in 9.4.

Space category (term 3.1.14)

A building of a certain (use) category may contain spaces of different (use) categories. Therefore a separate definition at space level: "space category" is introduced.

The purposes of the building and space classifications may be different, which is expressed in the definitions. Moreover, the choice is given (see Clause 6) whether or not, in the EPB assessment, differentiation in space categories within a building of a specific building category is foreseen.

EXAMPLE Does an office building contain only office spaces or is there a distinction (in temperature set points, ventilation needs, lighting needs, domestic hot water needs, etc.) between e.g. office spaces, corridor, entrance hall, assembly spaces, toilets, kitchen, restaurant, …

See also the notes and examples in ISO 52000-1:2017 [1] at this entry and at the definition of Building category.

Thermal envelope area (term 3.1.15)

This term is only needed for the thermal part of the assessment, but still it is an overarching term, because it determines whether spaces are assumed to be thermally conditioned or not (e.g. staircases or attics) which subsequently may also affect e.g. the reference area and the zoning.

Useful floor area (term 3.1.18)

The terms ‘conditioned (floor) area’ and ‘(un)conditioned space’ are obsolete. This is because in the context of the overall energy performance assessment these are ambiguous terms, leading to many misunderstandings, because:

— Each space belongs to a space category with specific conditions of use. Some spaces are thermally conditioned, some have domestic hot water needs, some have only lighting and ventilation needs.

— Other spaces are thermally unconditioned, but have only a specific influence (e.g. adjacent building with adiabatic boundary, adjacent unheated space with thermal influence, ..) or are thermally unconditioned but still with specific services taken into account (in some countries for instance: lighting and/or ventilation of indoor car park or common staircase).

Instead, the terms ‘reference floor area’ and ‘useful floor area’ are used.

Difference between the useful floor area and the reference floor area:

— The reference floor area is used for normalization of the energy performance.

— The useful floor area is used for various purposes, such as:

  — for conditions of use, if conditions of use are given per m^2 of floor area (e.g. hot water use, ventilation needs);

  — for weighting according to floor area, for instance for redistribution in case of zoning (see Clause 10).

For assessing the thermal envelope of the assessed building or building part and for the zoning, the term ‘thermally conditioned space’ is used.

Extensive explanation of the useful floor area is given in 9.3.

3.2 Indoor and outdoor conditions

Conditions of use (term 3.2.1)

This term is needed for the zoning and for the calculations. It means the set of conditions that is needed for the intended use of the space, such as temperature level, lighting level, domestic hot water needs, ventilation (IAQ) needs, …

The relation with operating conditions is: in order to achieve these conditions of use, and depending on the types of provisions (building, systems, controls), specific operating conditions are needed.

3.3 Technical building systems

Cogeneration (term 3.3.5)

“Energy is generated” is not really possible in a philosophical way. ‘Transformed’ or ‘produced’ could be better terms. But definition as used in other documents[2] is clear enough.

3.4 Energy

On-site (term 3.4.27)

This definition is linked with those of “nearby” and “distant”. On-site is a larger perimeter then the building only. On-site is often linked to energy production or energy transformation that can be exported.

Nearby the building site (term 3.4.24)

The current definition for “nearby the building site” is not fitted for nearby electricity generation. It is intended to introduce also nearby electricity. A proposal could be: Connected to the same branch of the distribution grid (distribution grid meaning voltage level lower than 150 kV)”.

Distant to the building site (term 3.4.7)

“On-site” and “nearby” are defined in the EPBD related to NZEB. “Distant” is defined in this standard to cover all perimeters where energy can be produced or transformed.

3.5 Energy performance

Energy rating (term 3.5.12)

The terms EPB assessment and energy rating have been clearly distinguished. More information can be found in ISO 52003-1[8] and its accompanying report ISO/TR 52003-2[9].

EPB standard (term 3.5.14)

Special attention is drawn to the term EPB standard. This defined term is necessary to make clear which ISO standards belong to the set of EPB standards and which do not. A standard that does not fulfil the conditions is not called an EPB standard. Of course, it may still play an (possibly even essential) role. In that case it will be referenced in an EPB standard, typically to provide appropriate input data (e.g. on products or boundary conditions).

Standard energy performance or energy performance (terms 3.5.23 and 3.5.7)

The term ‘energy performance’ is used in the EPBD . However, the affix ‘standard’ emphasizes that it concerns the energy performance under standard use and climate, in contrast to ‘tailored energy performance’.

3.6 Energy calculation

No need for additional information.

3.7 General information on terms and definitions

3.7.1 General

Definitions, term, perimeters etc. are important as a common basis and for the understanding of the assessment of the energy performance. Care has been taken to draft the definitions in line with other relevant documents and to keep them as general as possible to match existing definitions. If in a country more precise definitions exist, then the advice is to give this information in a national annex.

3.7.2 Overarching terms and definitions

ISO 52000-1 provides terms and definitions that are needed at the overarching level. The terms of lower-level EPB-standards are defined there; otherwise the overarching EPB standard would be overloaded,

the limit of the definitions to be considered would be difficult to define and the overview would be difficult to manage and keep up to date over time. However, ISO 52000-1 includes terms that are not used in the standard itself, but that are needed for overall consistency in the set of EPB standards.

Other terms and definitions seem overarching, but are only used in a certain area of EPB standards. For instance "expenditure factor" [ratio of the energy input (requested energy) to the useful energy output].

3.7.3 Difference between definition and specification

A clear difference should be made between a definition of a term and the procedure to specify (e.g. quantify) the term. The definition only identifies a term. Only in special cases this is enough to unambiguously specify the term. In other cases the actual assessment procedures in the standard contain appropriate procedures to unambiguously assess the value or otherwise specify the term. For instance the value for the energy need for heating or the specification of the energy performance assessment boundary.

3.7.4 Undefined and/or unspecified policy related terms

There are certain quantities, that are strongly related to national or regional policy, due to differences in culture and building tradition, building typologies (building use), policy and legal frameworks and administrative practices (including the type and level of quality control and enforcement and assessment cost expectations). It is impossible to fully harmonize these terms at the moment. Therefore they are not, or not completely, defined in the EPB standards or they are defined in a generic way, leaving room for further national or regional specification. Annex A of these EPB standards provides a template with tables for systematically specifying these specifications. Annex B gives informative default choices, that act as examples for the policy related quantities/terms.

Examples:

— useful floor area;

— the boundaries between "on-site", "nearby" and "distant";

— assignment of building and space categories (e.g. office space, shop, assembly room or hall, bed and breakfast, children day care, nursing home, …);

— subdivisions of building and space categories (e.g. residential buildings: single family house, student flat, senior homes, mobile home, house boat, holiday home, ..);

— assignment of category: designed building; new building after construction; existing building in the use phase; majorly renovated building.

Any (further) definition or specification of these terms would already be a too strong constraint for the required national or regional detailed specifications.

This does not lead to a problem in the form of an open end in the energy performance assessment, because such national or regional detailed specifications are done in the "pre-processing phase" of the energy performance assessment, so that it can be assumed that these have been assessed when starting the routing through the overarching EPB standard. For this reason, these issues are dealt with in the overarching EPB standard as "Overarching preparation steps" (see ISO 52000-1:2017, Clause 6).

4 Symbols, units, subscripts and abbreviations

4.1 Symbols

The list of symbols and units in ISO 52000-1:2017, 4.1 includes common symbols for the EPB standards. This list is normatively referenced in each subsequent EPB standard, but some of these may also be repeated in an individual EPB standard if convenient for the understanding. In particular if there is a need to give a systematic overview of specific subsets of symbols.