

The set of EPB standards in CEN and ISO: common characteristics

The European Commission asked CEN (mandate M480) to develop standards supporting the application of recast EPBD (Energy Performance of Buildings Directive) in the Member States: the so-called set of Energy Performance of Buildings standards (EPB standards).

This paper summarizes some key aspects that characterize this set of EPB standards.

Keywords: energy performance of buildings, EPB, EPB regulations, system inspection, energy performance rating.

A comprehensive series of European (CEN) and international (CEN & ISO) standards have been prepared, aiming at international harmonization of the methodology for the assessment of the overall energy performance of buildings, called “set of EPB standards”. This work is based on a mandate given to CEN by the European Commission and the European Free Trade Association (Mandate M/480, [2]), to support essential requirements of EU Directive 2010/31/EC on the energy performance of buildings (EPBD) [1]. The main recommendations from the Intelligent Energy Europe CENSE project [5] were adopted in the Mandate.

This article summarizes some key aspects that characterize this set of CEN and ISO standards.

European directive and mandate to CEN *The EPBD*

The EPBD 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 directive requires Member States to adopt measures and tools to achieve the prudent and rational use of energy resources. In order to achieve those goals, the EPBD requires increasing energy efficiency and the



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enhanced use of renewable energies in both new and existing buildings. One tool for this is the application by Member States of minimum requirements on the energy performance of new buildings and for existing buildings that are subject to major renovation, as well as for minimum performance requirements for the building envelope if energy-relevant parts are replaced or retrofitted. Other tools are energy certification of buildings, inspection of boilers and air-conditioning systems.

European standards

The use of European standards increases the accessibility, transparency and objectivity of the energy performance assessment in the Member States facilitating the comparison of best practices and supporting the internal market for construction products. The use of EPB-standards for calculating energy performance, as well as for energy performance certification and the inspection of heating systems and boilers, ventilation and air-conditioning systems will reduce costs compared to developing different standards at national level.

History

The first mandate to CEN to develop a set of CEN EPBD standards (M/343, [4]), to support the first edition of the EPBD [3] resulted in the successful publication of all EPBD related CEN standards in 2007-2008. However, although these standards were implemented in many countries, in a practical way,

they were not yet fit to be applied as a ready-to-use, compatible and unambiguous set.

The mandate M/480 was issued to review the 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.

Target groups

The EPB standards are flexible enough to allow for necessary national and regional differentiation and facilitate Member States implementation and the setting of requirements by the Member States.

Further target groups are users of the voluntary common European Union certification scheme for the energy performance of non-residential buildings (EPBD art.11.9) and any other regional (e.g. Pan European) parties wanting to motivate their assumptions by classifying the building energy performance for a dedicated building stock.

The set of EPB standards

What is an “EPB standard”?

An “EPB standard” is a standard that complies with the requirements given in the following three documents: CEN/TS 16628 [6], the basic principles for EPB standards, CEN/TS 16629 [7], the detailed technical rules of EPB standards and EN ISO 52000-1 [8], the overarching EPB standard.

Modular structure

EN ISO 52000-1 [8], the overarching EPB standard, provides a modular structure of the assessment of the overall energy performance of buildings. The structure identifies different modules, see **Table 1** and **Table 2**.

Table 1. Modules main areas, from [6]

| Modules | Area |
|---------|---|
| M1 | Overarching standards |
| M2 | Building (as such) |
| M3-M11 | Technical Building Systems under EPB |
| M12-M13 | Other systems or appliances (not under EPB) |

Table 2. The modular structure of the set of EPB standards.

| Sub-module | Overarching | | Building (as such) | |
|------------|---|----|---|----|
| | Descriptions | | Descriptions | |
| sub1 | | M1 | | M2 |
| 1 | General | | General | |
| 2 | Common terms and definitions; symbols, units and subscripts | | Building Energy Needs | |
| 3 | Applications | | (Free) Indoor Conditions without Systems | |
| 4 | Ways to Express Energy Performance | | Ways to Express Energy Performance | |
| 5 | Building categories and Building Boundaries | | Heat Transfer by Transmission | |
| 6 | Building Occupancy and Operating Conditions | | Heat Transfer by Infiltration and Ventilation | |
| 7 | Aggregation of Energy Services and Energy Carriers | | Internal Heat Gains | |
| 8 | Building zoning | | Solar Heat Gains | |
| 9 | Calculated Energy Performance | | Building Dynamics (thermal mass) | |
| 10 | Measured Energy Performance | | Measured Energy Performance | |
| 11 | Inspection | | Inspection | |
| 12 | Ways to Express Indoor Comfort | | | |
| 13 | External Environment Conditions | | | |
| 14 | Economic Calculation | | | |

| Technical Building Systems | | | | | | | | | | |
|----------------------------|---|---------|---------|-------------|----------------|------------------|--------------------|----------|-------------------------------|----------|
| | Descriptions | Heating | Cooling | Ventilation | Humidification | Dehumidification | Domestic Hot water | Lighting | Building automation & control | PV, wind |
| | | M3 | M4 | M5 | M6 | M7 | M8 | M9 | M10 | M11 |
| | General | | | | | | | | | |
| | Needs | | | | | | | | | |
| | Maximum Load and Power | | | | | | | | | |
| | Ways to Express Energy Performance | | | | | | | | | |
| | Emission & control | | | | | | | | | |
| | Distribution & control | | | | | | | | | |
| | Storage & control | | | | | | | | | |
| | Generation & control | | | | | | | | | |
| | Load dispatching and operating conditions | | | | | | | | | |
| | Measured Energy Performance | | | | | | | | | |
| | Inspection | | | | | | | | | |
| | BMS | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

■ The shaded modules are not applicable

Unambiguous, but flexible: the “Annex A/Annex B” approach

The “Annex A/Annex B” approach

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

At the same time, 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 the EPB standards, each EPB standard typically contains a normative template in Annex A to specify these choices. And 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 an EPB standard is used in the context of national or regional legal requirements, mandatory choices may be given at national or regional level for such specific applications. 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 this Annex A) can be made available as national annex or as separate (e.g. legal) document (national data sheet).

Note that in this case:

- the regulators will **specify the choices**;
- the individual user will apply the standard to assess the energy performance of a building, and thereby use the choices made by the regulators

Topics addressed in a standard can be subject to public regulation. Public regulation on the same topics can override the default values in Annex B of the EPB standard. Public regulation on the same topics can even, for certain applications, override the use of the standard. 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 the national annex (e.g. NA) refers to this text;
- 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 the overarching EPB standard, CEN ISO/TR 52000-2 [6].

Step by step implementation

The modular EPB structure and the “Annex A/Annex B” approach, in particular with the option to (preferably for a limited period) reference to a specific national standard instead of a specific EPB standard, strongly facilitates a step by step implementation of the set of EPB standards by individual countries or regions.

Accompanying technical report

The Detailed Technical Rules for the set of EPB standards [7], responding to the mandate M/480 [2], ask for a clear separation between normative and informative contents:

- to avoid flooding and confusing the actual normative part with informative content
- to reduce the page count of the actual standard
- to facilitate understanding of the package

Therefore, each EPB standard or group of EPB standards is accompanied by an informative Technical Report, containing the informative documentation and justification, including worked examples of the accompanied EPB standard.

Accompanying spreadsheet

Also, according to The Detailed Technical Rules [7], and in agreement with the mandate M/480 [2], for each EPB-standard containing calculation procedures an accompanying spreadsheet has been prepared to test and validate the calculation procedure. The spreadsheet also includes a tabulated overview of all output quantities (with references to the EPB module where it is intended to be used as input), all input quantities (with references to the EPB module or other source from where the data are available) and a fully worked example of the applica-

tion (the calculation method between the set of input and output quantities) for validation and demonstration.

These spreadsheets have been made publicly available at: <https://isolutions.iso.org/ecom/public/nen/Livelihood/open/35102456>

CEN and ISO

Several EPB standards have been prepared or revised as combined EN ISO standards under the so-called Vienna Agreement between CEN and ISO.

Some other CEN and ISO working groups have decided, for practical reasons, for the time being to work in parallel on separate CEN and ISO EPB standards, aiming to keep these as similar as possible, with the aim to merge these to EN ISO standards when the drafting has reached a more mature stage.

Up until now, 17 of the EPB standards are EN ISO standards: the overarching EPB standard, plus the EPB standards on building and building components (ISO/TC 163 in cooperation with CEN/TC 89). The other 30 EPB standards are up until now only available at European (CEN) level.

The intention is to come (eventually) to a complete and consistent set of ISO (EN ISO) standards on the Energy Performance of Buildings (EPB).

A unique Joint Working Group of ISO/TC 163 and ISO/TC 205, ISO/TC 163/WG 4 [10], [11], [12] co-ordinates since 2009 the development of the set of EPB standards at the global (ISO) level, under the responsibility of the two ISO parent TC's.

The ISO 52000 series: consecutive numbering of all new ISO EPB standards

Upon initiative of the above-mentioned ISO Joint Working Group a series of consecutive ISO numbers has been reserved for the EPB standards, based on the modular numbering of items prepared in ISO 52000-1 [8]. The numbers go from ISO 52000 until ISO 52150, with subseries for the successive modules.

This systematic set of consecutive ISO numbers may significantly boost the awareness on this EPB series. Gradually, all new or significantly revised ISO standards that are part of the set of EPB standards can receive the new number from this series.

The list covers both the standards and the corresponding technical reports. The rule is to always number a

standard as an odd part number (part 1, part 3, etc.) and the corresponding Technical Report as an even part number (part 2, part 4, etc.).

For instance, the EPB overarching standard received the number EN ISO 52000-1 and the accompanying technical report is CEN ISO/TR 52000-2.

Collecting errata in Final Drafts of the EPB standards during the final voting

Almost all CEN and EN ISO EPB standards and accompanying technical reports are under Final Vote during the period from (roughly) early November 2016 until (roughly) end of January 2017. The precise dates differ per subset. Inevitably, during the evaluation of the standards to prepare the voting, editorial or technical errors are and will be found. The intention is to collect these errata in the form of a standard comment sheet for each relevant standard, at a publicly accessible location at NEN Isolutions.

This will enable the readers to learn which corrections are already envisaged. In particular: for some of the EPB standards, the editors at the central ISO secretariat applied the internal editing rules so strictly, that for instance references to specific paragraphs or terms in other EPB standards were replaced by references to specific paragraphs or terms in the *earlier published drafts* of these standards for Enquiry, because references are only allowed to published documents. ■

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¹ The Concerted Action supporting transposition and implementation of Directive 2002/91/EC of the European Parliament and of the Council and its recast (CA EPBD III), henceforth CA, is an activity which aims to foster exchange of information and experience among Member States (MS). It involves the national authorities implementing the Directive, or those bodies appointed and entrusted by the national authorities to do so.

References

- [1] Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast), OJ L53, 18.6.2010.
- [2] Mandate M/480, Mandate to CEN, CENELEC and ETSI for the elaboration and adoption of standards for a methodology calculating the integrated energy performance of buildings and promoting the energy efficiency of buildings, in accordance with the terms set in the recast of the Directive on the energy performance of buildings (2010/31/EU) of 14th December 2010.
- [3] EPBD, Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.
- [4] Mandate M/343 Mandate to CEN, CENELEC and ETSI for the elaboration and adoption of standards for a methodology calculating the integrated energy performance of buildings and estimating the environmental impact, in accordance with the terms set forth in Directive 2002/91/EC; 30 January 2004.
- [5] Van Dijk, Dick; Set of recommendations: Towards a second generation of CEN standards related to the Energy Performance of Buildings Directive (EPBD), CENSE "Archiving Document 2", CENSE WP6.1_N05rev02, May 27, 2010.
- [6] CEN/TS 16628, Energy Performance of Buildings – Basic principles for the set of EPB standards, July 2014.
- [7] CEN/TS 16629, Energy Performance of Buildings – Detailed technical rules for the set of EPB standards, July 2014.
- [8] EN ISO 52000-1 Energy performance of Buildings – Overarching EPB assessment – Part 1: General framework and procedures.
- [9] CEN ISO TR 52000-2, Energy performance of Buildings – Overarching EPB assessment – Part 2: Explanation and justification of ISO 52000-1, ISO/TC 163/WG 4, Energy Performance of Buildings using the Holistic Approach, a joint working group (JWG) of ISO/TC 163, Thermal performance and energy use in the built environment and ISO/TC 205, Building Environment Design. Co-convenors Dick van Dijk (NL) and Essam Khalil (Eg).
- [10] Dick (H.A.L.) van Dijk and Essam E. Khalil, Future cities – Building on energy efficiency, ISO Focus+, The magazine of the international organization for standardization, Vol. 2, No 5, May 2011 (theme: Building energy efficiency with ISO standards - Construire l'efficacité énergétique avec les normes ISO).
- [11] ISO News. Boosting energy efficiency of buildings through ISO's holistic approach, by Elizabeth Gasiorowski Denis on 5 August 2015. http://www.iso.org/iso/home/news_index/news_archive/news.htm?Refid=Ref1990.
- [12] ISO focus January-February 2016, Boosting energy efficiency of buildings. ISO pushes for zero net energy construction worldwide http://www.iso.org/iso/isofocus_114.pdf.
- [13] The REHVA European HVAC Journal, issue: "Focus on EPB standards", Vol. 52, Issue 1, January 2015 (various articles).
- [14] The REHVA European HVAC Journal, issue: "EPB standards", Volume 53, Issue 3, May 2016 (various articles).

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