

CEN and ISO standards on energy performance of buildings



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The Recast-EPBD¹ requires an update of the current (2007/2008) set of 52 CEN-EPB standards. This update work started in 2012 and will result in a new set of CEN-EPB standards. Where possible this work is done parallel with ISO. This project is based on EU-Mandate 480. This mandate, accepted by CEN, requires a really out of the box thinking approach of the standard developers. This project is coordinated by CENTC371 the “Program Committee on EPBD” and is considered to be a step forward in progressing towards European Energy Codes for Buildings. This second generation of EPB standards aims on more comprehensive standards, a clear split between informative text in Technical Reports and normative text in Standards, attached excel files to illustrate the calculation procedures etc. The set of EPB standards and technical reports supports the holistic approach needed for the new developed buildings as the nearly Zero Energy Buildings (nZEB) and high performance energy renovation of the existing building stock.

Keywords: EU Energy Performance Buildings Directive; CEN ISO EPB Standards

The modular structure of the set of EPB standards is flexible in order to take into account national and regional choices. This approach has been introduced, via the so-called Annex A and B in all EPB standards. Annex B is an informative Annex and includes all default values, choices and options needed to use the standard. Normative Annex A includes empty tables for these needed values, choices and options, this empty template shall be used by National Standard Bodies (NSB) (or recognized local, regional or national authorities) to declare these values, choices and options to be followed under their jurisdiction if they choose not to follow the defaults in Annex B. This approach allows maximal flexibility and transparency in applying the EPB standards. If published by the NSB's these filled in Annexes conform Annex A are indicated as National Annexes. This flexible approach included in the EPB standards, sometimes criticized, but allowing

maximal freedom in innovative design approaches, able to demonstrate the impact of smart energy infrastructures as expected in future smart energy communities.

It is essential to understand that this Annex A/B approach allows a step-by-step introduction of the EPB standards, accepting first the most accepted standard (modules) from the total set and gradually expanding to the total set if appropriate.

Formal Voting of all EPB standards is expected to start by 31 October 2016. After the EPB standards are accepted the publication by the NSB's is expected by the beginning of 2017.

Introduction; current status

Analyses regarding the use of the in 2007/2008 published set of CEN-EPB standards and the require-

¹ EPBD: DIRECTIVE 2002/91/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2002 on the energy performance of buildings.

Recast-EPBD: DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 May 2010 on the energy performance of buildings; (recast).

ments set out in the recast-EPBD showed the clear need to update and improve these standards. The revision will improve the accessibility, transparency, comparability and objectivity of the energy performance assessment in the EU Member States, as mentioned in the EPBD.

This “first generation” CEN-EPB standards were implemented in many EU Member States “in a practical way”. Typically: partly copied in “all in one” national standards or national legal documents, mixed with national procedures, boundary conditions and input data.

For a more direct implementation of the EPB standards in the national and regional building regulations, it was necessary to reformulate the content of these standards so that they become unambiguous (the actual harmonized procedures), with a clear and explicit overview of the choices, boundary conditions and input data that can or needs to be defined at national or regional level.

The standards shall be flexible enough to allow for necessary national and regional differentiation to facilitate Member States implementation. Such national or regional choices remain necessary, due to differences in climate, culture & building tradition and building typologies, policy and/or legal frameworks. **Figure 1** gives an impression of the current status. All (52) EN and EN-ISO EPB standards are expected to go out for formal vote by 31 October 2016.

The Principles

The mandate M/480 explicitly requests for identification and prioritisation of items for revision and gaps in the first generation set of EPB standards in consultation with the EU member states (MS).

The EPB standards have been developed by the following CEN/TC’s:

- TC 089 Thermal performance of buildings and building components;
- TC 156 Ventilation for buildings;
- TC 169 Light and lighting systems;
- TC 228 Heating systems for buildings;
- TC 247 Building automation, control and building management;
- TC 371 Project Committee on Energy Performance of Buildings.

These TC’s are responsible for the technical content of EPB standards to be revised. CEN/TC 371, the overall responsible coordinating committee, also ensuring that the timetable will be met and that the basic principles (CEN/TS 16628:2014) and detailed technical rules (CEN/TS 16629:2014), the modular approach and the foreseen improvements of the current set of EPB standards, are in line with the targets indicated and meeting the expectations of the end users.

The following, general principles are valid for the set of EPB standards:

1. The complexity of the building energy performance calculation requires a good documentation and justification of the procedures. Informative text is required but it will be separated from actual normative procedures to avoid confusion and unpractical heavy documents. Therefore, each EPB standard (or sometimes a close connected set of) shall be accompanied by a Technical Report where all related informative material will be concentrated.²

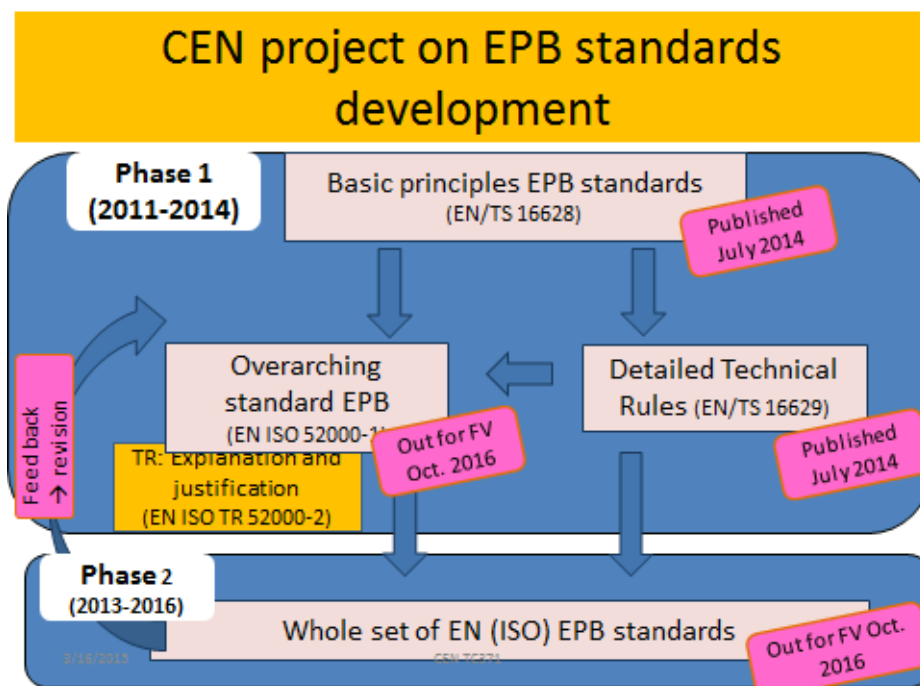


Figure 1. Current status of M/480 work.

² Either as a separate TR or if very limited as an informative annex to the standard. It is also possible that a TR will cover more standards.

2. The complexity of the building energy performance calculation requires also a very good coordination and testing of each calculation module. Therefore, each EPB standard shall be accompanied by a spreadsheet where the proposed calculation algorithms and data input/output are tested and proved to be consistent. For these Excel files it is checked that the calculation modules of the total set of EPB standards are functional. On basis of this Excel software it will be possible to assure that the in/output files of the various connected EPB standards are valid and possible to connect to the OAS backbone. These Excel files are publicly accessible via <https://isolutions.iso.org/ecom/public/nen/Livelihood/open/35102456>

The deliverables of CEN/TS 16628

CEN/TS Basic Principles

CEN/TS 16628:2014 Energy Performance of Buildings – Basic Principles for the set of EPBD standards. This TS provides a record of the rationale, background information and all choices made in designing the EPB package.

CEN/TS Detailed Technical Rules

CEN/TS 16629:2014 Energy Performance of Buildings – Detailed Technical Rules for the set of EPB-standards. This TS is based on the CEN/TS BP and provides mandatory detailed technical rules to be followed in the preparation of each individual EPB standard.

EN ISO 52000-1 Energy performance of buildings — Overarching EPB assessment – Part 1: General framework and procedures

EN ISO 52000-1 is the overarching backbone of the ISO 52000 series of standards on EPB. It establishes a systematic, comprehensive and modular structure for calculating the integrated energy performance of new and existing buildings in a holistic and systemic way. This includes calculation of the building energy needs, the energy use for heating, cooling, lighting, ventilation and domestic hot-water systems, taking into account the building automation and control, and renewable energy sources/production.

The standard oversees the assessment of overall energy use of a building 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 measures.

To enable the use in laws and regulations, the set of EPB procedures is systematic, transparent, comprehen-

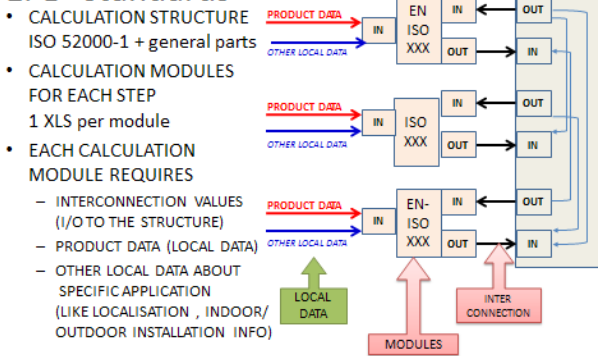
sive and unambiguous. At the same time, clear choices between options and input data allow to take into account differences in national and regional climate, energy infrastructure, culture and building tradition, as well as policy and legal frameworks.

The standard includes the holistic framework of the overall energy performance of a building, covering inter alia:

1. common terms, definitions and symbols to be used in the EPB set; description of the overarching framework and procedures;
2. overarching preparation steps; building and system boundaries;
3. building partitioning; rules for the combination of different partitioning, clear rules for zoning and service areas, Issues like reference floor area, zoning, service areas, the assumed presence of systems;
4. unambiguous set of overall equations on energy used, delivered, produced and/or exported at the building site, nearby and distant;
5. unambiguous set of overall equations and input-output relations, linking the various elements relevant for the assessment of the overall energy performance of buildings which are treated in separate standards;
6. calculation of the energy performance, routing and energy balance;
7. general requirements to standards dealing with partial calculation periods;
8. general rules in setting out alternative calculation routes according to the calculation scope and requirements;
9. methodology for measured energy performance assessment.

The OAS provides a systematic, clear and comprehensive, continuous and modular overall structure on the integrated energy performance of buildings, unlocking all standards related to the energy performance of buildings. The overall framework provided by the OAS will work as the “Backbone” (see **Figure 2**) of the set of EPB standards. This facilitates a step-by-step implementation by the user, taking also into account the nature of each procedure identifying the typical type of user. Facilitating a step-by-step approach is essential for the acceptance for the total set of EPB standards. Not all 52 standards have to be used from day first. This can be done step by step, giving the highest priority to those standards (modules) that are without any debate acceptable. More information is given in a Technical Report accompanying the OAS. The justification for the CEN defaults and options are also provided in this TR (ISO CEN TR 52000-2).

OAS BACKBONE for the set of EPB- standards



Replacing a module with a non- EN or EN-ISO-standard one

- Possible **thanks to the modular structure**
- ... but the I/O structure has to be respected
- Needed info can be found both in the accompanying XLS and in the specific I/O clauses in the EN or EN-ISO standard

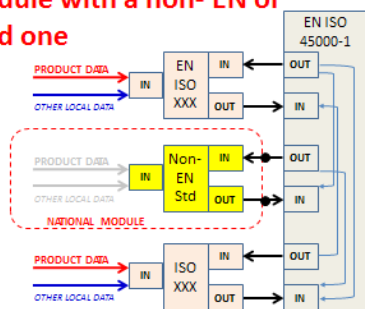


Figure 2. The OAS as backbone for the set of EPB standards illustrating replacement by a national module.

The Annex A/B approach allows maximum flexibility, regarding existing regulation/legislation, traditions or codes, all 35 tables in the informative Annex B include informative default values, informative default choices and references to other EPB standards. When not using these values the used values shall be declared according the empty Annex A template (to be published as a national Annex to the standard). Annex A includes empty tables for these needed values, choices and options, this empty template shall be used by National Standard Bodies (NSB) (or recognized local, regional or national authorities) to declare these values, choices and options to be followed under their jurisdiction if they choose not to follow the defaults in Annex B. This approach allows maximal flexibility and transparency in applying the EPB standards. If published by the NSB's these filled in Annexes conform Annex A are indicated as National Annexes. This flexible approach included in all EPB standards, sometimes criticized, but allowing maximal freedom in

innovative design approaches, able to demonstrate the impact of smart energy infrastructures as expected in future smart energy communities.

It is essential to understand that this Annex A/B approach allows a step-by-step introduction of the EPB standards, accepting first the most accepted standard (modules) from the total set and gradually expanding to the total set of 52 standards if appropriate.

CEN/ISO TR 52000-2:2016 Energy Performance of buildings — Overarching EPB assessment — Part 2: Explanation and justification of ISO 52000-1

This Technical Report contains information on the justification of the OAS procedures, default values and choices as given in Annex B, this to support the correct understanding, use and national implementation of this standard.

This TR is expected to be published at the same time as the OAS.

Calculation Excel and Module description

The complexity of the building energy performance calculation requires also a very good coordination and testing of each calculation module to ensure coherence and the software-proof of the set of EPB standards. Therefore, each EPB standard is accompanied by a spread sheet in which the proposed calculation algorithms and data input/output are tested and proved coherent. As most of the other EPB standards there is also an excel sheet available to support the EN ISO 52000-1.

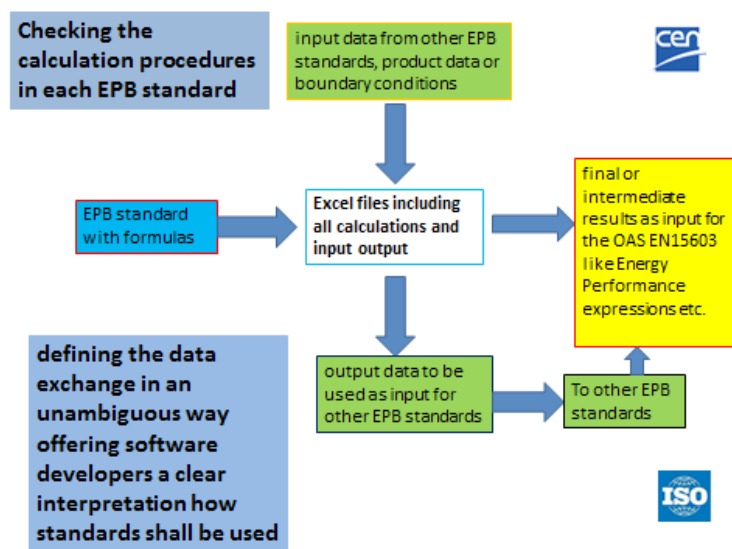


Figure 3. Software check of the excel sheets of the EPB standards.

How do the EPB standards interact with the relevant product standards?

Saving energy in the build environment requires not only that products consuming electricity and fuels are designed to be intrinsically more energy efficient. The interaction of a product with the rest of the system or installation in a building into which it is fitted plays an important role. This appears obvious for a number of product categories such as building equipment for ventilation, heating, cooling, lighting and control & automation.

On one hand we have the Ecodesign Directive requiring via EU regulation minimal energy use of energy using products. On the other hand we have the EPBD where the EU Member States are obliged to require minimal target values for the energy performance of buildings, including partial indicators for the overall thermal performance and the energy performances of the heating, ventilation lighting and cooling systems.

The EPB standards on the systems declare the input data needed to allow a reliable system energy use assessment. The input data are to be specified on basis of the referred product standards (or if not available yet the relevant EU regulation). These data can be retrieved from the Ecodesign product declaration or the underlying publicly accessible data base. It is also the CEN and/or ISO product Technical Committees responsibility to take care that this information is or will become available in the correct format according the EPB standards. Using the EPB system approach, to describe the energy performance of a product as part of a system, is the most efficient way to ensure effec-

tive energy performance targets for products, systems and finally the buildings (see also the article “Industry perspective on the holistic approach to buildings” by Drake Erbe, REHVA Journal May 2016).

Co-operation with ISO

There is active process of interaction for the overarching type of standards through the JWG of ISO TC 163 & 205 and for the other EPB standards via the different WG’s of ISO TC 163 and ISO TC 205. Experts in the ISO and CEN teams are working on these standards, with the ultimate goal to agree on EN-ISO standards. A challenge given the geographic and other differences in the building sector. For several CEN-EPB standards the cooperation with ISO is still informal. This means that for these standards no parallel voting is expected before 2017. Current parallel voting on EN-ISO EPB standards is expected for the OAS and the building thermal performance related standards as developed by CENTC89 and under ISO/TC 163. These ISO standards are indicated as EN-ISO 520xx-1 and the connected Technical Reports as EN-ISO TR 520xx-2. The central co-ordination of the preparation of a set of international standards on the energy performance of buildings at the ISO level is in the hands of ISO / TC 163/WG 4, the *Joint Working Group of ISO TC 163 and TC 205 on energy performance of buildings using a holistic approach*. The main leading and active experts in CEN and ISO are among the main leading and active members of this ISO Joint Working Group. This co-operation with ISO aims to avoid serious duplication of work, to avoid incompatibilities in (input) product data, procedures and (output) energy performance data. ■

