Energy Performance Buildings Framework, the EN ISO 52000-1 Overarching EPB standard, flexibility of the CEN and ISO standards on EPB

EPB: Energy Performance Buildings

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3E

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Standards on Energy Performance Buildings needed

• If you can’t measure, you can’t manage
• If you don’t have transparent and unambiguous assessment procedures you can’t analyse, report, design or compare the EPB
• Flexible Standards are essential to facilitate this, to bridge the gabs due to different building traditions, climate situations, policies, technical languages, etc...
• Precise and unambiguous communication on Energy Performance of Buildings is essential when we have to meet the Global targets on GHG emission and fossil energy use reduction!
Need for EPB standards: harmonisation on the energy-efficiency and -transition market is essential

• The Paris COP21 targets, the EU 20-20-20 targets for 2020
• “energy efficiency first” in EU Energy Union plan.
• Expecting binding EU-level 2030 target of at least a 30% increase in energy efficiency compared to 1990 levels. The European Commission will announce increased EU energy efficiency targets on Wednesday (30 November).
• EU 2013: 40% of energy consumption due to buildings, 2/3 for residential of which 80% by gas which the EU imports for 55%.
• A level playing field is essential for the market and the policy makers
The build environment responsible for 40% of our energy use!

- **Our first task**: reduce building energy need (by measures like insulation, passive solar), reduce the energy use by system efficiency improvement, smart controls, etc.

- **Next**: increase the fraction (also by “own” production) of renewable energy (PV, Thermal Solar, Wind, Hydro, Biofuels).

- **Asses and declare** the energy performance of buildings in a transparent & unambiguous way!

- Make this visible for market, regulators and consumers...

- For this we need **Energy Performance Buildings (EPB) standards** suited for local, regional, national & global application.
Observation in Europe

• This modularly structured, transparent, unambiguous, **but flexible set** of EN and ISO EPB standards is an important instrument to support the proper implementation of the Energy Performance Buildings Directive (EPBD) in the EU-Member States.

• The basis for the EU voluntary certification scheme for non-residential buildings.
Status EPB-project

- All 52 EPB standards are ready and are out for the final Formal Vote (closing before end of January 2017).
- Including the connected Technical Reports.
- Where relevant the connected Excel Files are available to support the correct use and understanding of the calculation procedures included in the EPB standards.
- After this Formal Voting (February 2017) we expect that beginning 2017 all EPB-standards will be published by the National Standard Bodies as EN or EN-ISO standards.
EU-Mandate: CEN project on EPB standards

Phase 1 (2011-2014)
- Basic principles EPB standards (EN/TS 16628)
  - Published July 2014
- Overarching standard EPB (EN ISO 52000-1)
  - TR: Explanation and justification (EN-ISO/TR 52000-2)
  - Out for Final Vote by Nov. 2016

Phase 2 (2013-2016)
- Detailed Technical Rules (EN/TS 16629)
  - Published July 2014
- Whole set of EN (ISO) EPB standards
Modular structure of the set of standards on Energy Performance of Buildings (EPB)

Many of EPB standards are expected to be published as EN & EN-ISO standards

- Assessment boundaries
- Overall EP balance
- Ways to express EP
- Indoor env. IEQ..
- Building and building elements
- Operating conditions
- Climatic data
- Heating systems
- Ventilation systems
- Domestic Hot Water systems
- Cooling systems
- Lighting and lighting systems
- Building automation & Control
- Consecutive ISO numbers reserved for EPB set

ISO 52000
ISO 52001
ISO 52003
ISO 52004
...
ISO 52009
ISO 52010
...
ISO 52015
ISO 52016
ISO 52017
ISO 52018
ISO 52019
ISO 52020
ISO 52021
ISO 52022
...
ISO 52145
ISO 52146
ISO 52147
ISO 52148
ISO 52149
Why we need flexibility and transparency

**Flexibility:** to be suitable for:
- local climate,
- National/ regional legal framework,
- National/ regional building tradition and building use,
- existing local (national or regional) energy-infrastructure,
- Etc...

**Transparency:** to accommodate a level playing field when:
- Expressing the EP of buildings
- offering various energy (or CO₂ emission) saving solutions
Principle of EPB standards
the holistic approach

EP: Overall Building Energy Performance

From product standards to overall energy use
*incl. technical building systems*

Product is not longer evaluated as a product but as part of a system

Maintain the links between product testing and system evaluation
Continuity from the product to the system energy performance assessment

ISO TC 163 (Building TC)
Technical Building Systems, bldng environment design (Building energy use calculation)

ISO TC 205 (System TC)
Holistic approach (System loss calculation)

JWG ISO TC 163/ISO TC 205
Holistic approach

Product TC's like ISO/TC 86; 115; 117; 118; etc... (Evaluation of product characteristics)

IMPORTANT:
Holistic approach is based on (tested) product characteristics

Product no longer evaluated as a product but as a part of a system

Various CEN product TC's like: 48; 57; 62; 109; 110; 113; 147; etc.
Flexibility in use of EPB Standards
the OAS: EN ISO 52000-1 as Backbone

- **CALCULATION STRUCTURE**
  EN ISO 52000-1 + general parts

- **CALCULATION MODULES**
  FOR EACH STEP
  1 XLS per module

- **EACH CALCULATION MODULE REQUIRES**
  - INTERCONNECTION VALUES (I/O TO THE STRUCTURE)
  - PRODUCT DATA (LOCAL DATA)
  - OTHER LOCAL DATA ABOUT SPECIFIC APPLICATION (LIKE LOCALISATION, INDOOR/OUTDOOR INSTALLATION INFO)
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
Connection of custom modules: input data

Each calculation module needs two types of input data:

• Data coming from other parts of the calculation: (required energy output, operating conditions, etc.),

• Data specified only when using this module, «local data»

Typically these are product data and application conditions like localization of components (boiler, pipes indoor/outdoor)

Conditions to be satisfied by custom non-EN/ISO modules:

• The input data of the replaced module, together with custom local data, shall be complete, to be able to perform the calculation according to the module requirements.

• The available input data coming from other parts are listed as «operating conditions» in the input data specification of the replaced EN/ISO standard module
Each EPB standard contains:

- **Annex A (normative):** template for choices and input data needed for using the standard
- **Annex B (informative):** informative default choices and input data
- In general:
  - The user of the EPB standard is free to create his/her own data sheet according to the template of Annex A (~ replace the default choices and values of Annex B)
Explained in a note in each Annex A and Annex B

“

NOTE

In particular for the application within the context of regional or national legal requirements.

These choices (either the 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.

”
### Example of a default choice in Annex B of ISO 52000-1: table B16-Weighting factors (partly)

<table>
<thead>
<tr>
<th>Energy carrier</th>
<th>f\textsubscript{Pnren}</th>
<th>f\textsubscript{Pren}</th>
<th>f\textsubscript{Ptot}</th>
<th>K\textsubscript{CO2e} (g/kW h)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Delivered from distant</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Fossil fuels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solid</td>
<td>1,1</td>
<td>0</td>
<td>1,1</td>
<td>360</td>
</tr>
<tr>
<td>Liquid</td>
<td>1,1</td>
<td>0</td>
<td>1,1</td>
<td>290</td>
</tr>
<tr>
<td>Gaseous</td>
<td>1,1</td>
<td>0</td>
<td>1,1</td>
<td>220</td>
</tr>
<tr>
<td>4 Bio fuels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solid</td>
<td>0,2</td>
<td>1</td>
<td>1,2</td>
<td>40</td>
</tr>
<tr>
<td>Liquid</td>
<td>0,5</td>
<td>1</td>
<td>1,5</td>
<td>70</td>
</tr>
<tr>
<td>Gaseous</td>
<td>0,4</td>
<td>1</td>
<td>1,4</td>
<td>100</td>
</tr>
<tr>
<td>7 Electricity</td>
<td>2,3</td>
<td>0,2</td>
<td>2,5</td>
<td>420</td>
</tr>
<tr>
<td><strong>Delivered from nearby</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 District heating a)</td>
<td>1,3</td>
<td>0</td>
<td>1,3</td>
<td>260</td>
</tr>
<tr>
<td>9 District cooling</td>
<td>1,3</td>
<td>0</td>
<td>1,3</td>
<td>260</td>
</tr>
<tr>
<td><strong>Delivered from on-site</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Solar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PV electricity</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>11 Thermal</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
It is expected, if the default values and choices in Annex B are not followed due to national regulations, policy or traditions, that:

– Either the **NSB** will consider the possibility to add or include a National Annex in agreement with the template of Annex A.

– Or the **national or regional authorities** will, in the building regulations, reference the standard and prepare data sheets containing the national or regional choices and values, in agreement with the template of Annex A.
National implementation of EPB standards:

• **National cover page and the Introduction text in the EPB standards**: this text allows the NSB’s (or authorities) to include information regarding the position of the EPB standard in their national regulation, version indication etc...

• NSB’s can publish a National Annex to each EPB standards where they make use of the Annex A template. A National Annex **is not** an Annex A.

• A NA is a separate document, it does not have to be attached to the standard it refers to

• A NA could include more additional information! More National Annexes could be developed, e.g. for different building functions etc...
Most EPB standards include calculation procedures

- They are accompanied by excel files including all calculation formulas
- Demonstrating how the rules are to be interpreted
- Offering easy access for software developers and avoiding misinterpretation by software builders
Excels to support the development and future use of the EPB-standards by software developers

- internal for CEN: to support, to demonstrate and validate
  - the consistency and unambiguity of equations in the set of EPB-standards and
  - their interconnecting procedures: all in- and outputs of the EPB standards will clearly be defined
Checking the calculation procedures in each EPB standard

EPB standard with formulas

input data from other EPB standards, product data or boundary conditions

Excel files including all calculations and input/output

output data to be used as input for other EPB standards

From other EPB standards

final or intermediate results as input for the OAS EN ISO 52000-1 and 52000-3 etc..

defining the data exchange in an unambiguous way offering software developers a clear interpretation how standards shall be used
Excels, standards and TR’s available

• The **excel files** are publicly available via link:
  
  **https://isolutions.iso.org/ecom/public/nen/Livelink/open/35102456**

• The final vote versions of the **Standards and Technical Reports**: available/published by the NSB.

• For a clear overview of the published standards see December issue of REHVA Journal 2016-06

• More articles on the EPB standards can be found in earlier published REHVA Journals.
Demonstration of this checking for heating system standards

• To check the consistency of the whole standard package it was decided to develop a test software.

• For a few well-chosen standards, software modules have been developed and integrated in a test software tool

• [http://dimn-cstb.fr/centool/default.html](http://dimn-cstb.fr/centool/default.html)
Collaboration with ISO

• 17 of the 52 EPB standards are EN-ISO standards
• This number will rise in future
• EN standards have the same status as EN-ISO standard in Europe
• For EN-ISO standards the same rules are applicable as for EN’s: Conflicting national standards have to be withdrawn by the National Standard Body.
Summary

- The EPB standards are able to support the implementation of the EPB Regulations
- They include the EP assessment procedures for buildings and systems for existing towards new low energy buildings to meet the nZEB and possible positive energy building perf. levels.
- The developed standards offer the flexibility to apply them throughout Europe and Globally
- CEN and ISO cooperate to achieve a common set of EPB standards (for ISO the numbers 52000—52150 have been reserved)