The European EPB Standards for heating and cooling systems
Link with EPC Input Data

Dominique Hantz – CETIAT
Expert in CEN/TC 228 - WG4
The European Commission asked CEN through Mandate M/480 to develop standards supporting the implementation of EPBD 2010/031

The EPB set of standards addresses

- the energy performance of the buildings
- the sizing of technical systems
- the cost evaluation of technical systems
- the inspection of technical systems

Some standards are EN, others are EN ISO
Elaboration of standards supporting EPBD

The European EPB standards for heating and cooling systems:
- Ventilation of buildings
- Thermal performance of buildings
- Heating and cooling (water based) systems in buildings
- Controls for buildings
- Light and Lighting
- Building environment design
- Lighting

Source: REHVA Journal – August 2013
Principles for all EPB standards

A modular approach
- Consistency of standards
- Easy integration of new elements

A common format for each standard
- Input/output, description of options, relations with other standards
- An annex for describing the boundary conditions and input data
  - Annex A : normative
  - Annexe B : default values
- A technical report (with justification and validation of the choices made in the standards)

A structure allowing an easy development of software
EPB standards for heating, cooling and DHW systems

- **Energy Needs**
  - Heating: EN 12831-1
  - Cooling: EN ISO 52016-1
  - DHW: EN 12831-3

- **General**
  - EN 15316-1: General and Energy performance expression

- **Emission**
  - EN 15316-2: heating and cooling

- **Distribution**
  - EN 15316-3

- **Storage**
  - EN 15316-5

- **Génération**
  - EN 15316-4:1: Boilers
  - EN 15316-4:2: Heat pumps
  - EN 15316-4:3: Thermal and PV solar systems
  - EN 15316-4:4: cogeneration systems
  - EN 15316-4:5: District heating and cooling systems
  - EN 15316-4:7: space heating generation, air heating, radiant heating systems, stoves
  - EN 16798-13: cooling systems

The European EPB standards for heating and cooling systems: link with EPC input data
General scheme of calculation standards
Input data flow (example boiler standard)

1.1 Product characteristics
- Generator type
- Fuel type
- Boiler equipment

1.2 System characteristics
- Localisation
- Services (DHW, etc)

Selection properties
(vocabulary prISO 16757)

Data preparation
(catalogue - data base levels - default)

Module input data
(detailed method !!)

2.1 Product description
(qualitative)

2.2 Prod. technical data
(quantitative)

2.3 System design
(including control)

2.4 System operating conditions

Source: CEN TC 228 “Standard Template” - Johann Zirngibl – March 2012
The European EPB standards for heating and cooling systems: link with EPC input data

Source: CEN TC 228 “Standard Template” - Johann Zirngibl – March 2012
The European EPB standards for heating and cooling systems: link with EPC input data

### 2.1 Product description (qualitative)

#### Symbols and Possibilities

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>B_CO</td>
<td>Condensing boiler</td>
</tr>
<tr>
<td>B_LT</td>
<td>Low temperature boiler</td>
</tr>
<tr>
<td>B_ST</td>
<td>Standard boiler</td>
</tr>
<tr>
<td>E_el</td>
<td>electricity</td>
</tr>
<tr>
<td>E_gas_n</td>
<td>Natural gas</td>
</tr>
<tr>
<td>E_oil</td>
<td>oil</td>
</tr>
</tbody>
</table>

### 2.2 Product technical data (quantitative)

#### Symbols and Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristics</th>
<th>Catalogue unit</th>
<th>Comput. Unit</th>
<th>Interval</th>
<th>Default</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Φ_Pn</td>
<td>Gen. output at full load</td>
<td>kW</td>
<td>W</td>
<td>[0;+∞)</td>
<td>Non</td>
<td>EN XXX</td>
</tr>
<tr>
<td>Φ_Pint</td>
<td>Gen. output intermediate load</td>
<td>kW</td>
<td>W</td>
<td>[0;+∞)</td>
<td>Non</td>
<td></td>
</tr>
<tr>
<td>η_gnr,Pn</td>
<td>generator efficiency at full load</td>
<td>%</td>
<td>-</td>
<td>[0;1]</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>η_gnr,Pin</td>
<td>Gen. efficiency intermed. load</td>
<td>%</td>
<td>-</td>
<td>[0;1]</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>θ_gnr, max</td>
<td>Max running temperatures</td>
<td>°C</td>
<td>°C</td>
<td>[0;100]</td>
<td>Non</td>
<td></td>
</tr>
<tr>
<td>θ_gnr, min</td>
<td>Min running temperatures</td>
<td>°C</td>
<td>°C</td>
<td>[0;100]</td>
<td>Non</td>
<td></td>
</tr>
</tbody>
</table>

### Selection properties (designer)

#### 1.1 Product characteristics

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>B_CO</td>
<td>Generator type</td>
</tr>
<tr>
<td>E_gas_n</td>
<td>Fuel type</td>
</tr>
<tr>
<td>etc</td>
<td>Type of energy use</td>
</tr>
</tbody>
</table>

### Module input data

EN 15502-1 for gas boilers
EN 304 for oil boilers
EN 303-5 for biomass boilers

In addition:
Standby heat losses
Qaux nom
Qaux min
Qstandby

Source: CEN TC 228 “Standard Template” Johann Zirngibl – March 2012
1.2 System characteristics

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>L_h.ts</td>
<td>Localisation</td>
</tr>
<tr>
<td>Q_H.w</td>
<td>Services</td>
</tr>
<tr>
<td>Q_W</td>
<td>Services</td>
</tr>
</tbody>
</table>

2.3 System design

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>L_h.ts</td>
<td>Heated space</td>
</tr>
<tr>
<td>L_u.ts</td>
<td>Unheated space</td>
</tr>
</tbody>
</table>

2.4 System operating conditions (each time step)

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Possibilities</th>
<th>Computed Unit</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \theta_{\text{gnr.in}} )</td>
<td>Input temperature</td>
<td>°C</td>
<td>[0-100]</td>
</tr>
<tr>
<td>( \theta_{\text{gnr.out}} )</td>
<td>Output temperature</td>
<td>°C</td>
<td>[0-100]</td>
</tr>
<tr>
<td>Flow</td>
<td>Water flow heating</td>
<td>m³/h</td>
<td>[0:+∞]</td>
</tr>
<tr>
<td>( Q_{\text{H.gen,out}} )</td>
<td>Space heating</td>
<td>Wh</td>
<td>[0:+∞]</td>
</tr>
<tr>
<td>( Q_{\text{W.gen,out}} )</td>
<td>Hot water</td>
<td>Wh</td>
<td>[0:+∞]</td>
</tr>
</tbody>
</table>

Source: CEN TC 228 “Standard Template” Johann Zirngibl – March 2012
Source of EPB standards input data

Products standards

- For boilers: EN15502-1, EN 304 and EN 303-5
- For heat pumps: EN 14511, EN14825, EN16147, EN12309
- For solar systems: all solar systems products standards
- For emitters: EN 442, EN215, EN1264, EN 14037, EN15500, EN 416-2, EN 419-2, …
- For cooling systems: EN 14511 and EN 14825

Default values in an Annex B
Link with EPC input data

Some countries have already based their national EPC calculation method on the EPB set of standards, and thus use input data from product standards

Presently, most countries have their own calculation method generally using input data from product standards
Link with ErP input data

Input data for ErP (Ecodesign) are also issued from products standards

References to EPB standards are included in ErP regulations

- Default values for auxiliary energy of boilers (EN15316-4-1)
- Default values for stand-by heat losses of boilers (EN15316-4-1)
- Assessment of the annual non-solar heat contribution for solar water heaters (EN 15316-4-3)
Conclusions

A complete set of European/International standard has been developed for assessing the overall building energy performance.

Products standards provide EPC input data
EPB set of standards provides calculation method

It is wished that national EPC calculation methods will be more and more based on EPB set of standards.
Thank you for your attention
The sole responsibility for the content of this presentation lies with the authors. It does not necessarily reflect the opinion of the European Union. Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.