

## Common definitions and symbols

### Introduction

Many of the standards were not developed from scratch, and each standard was prepared by a group of experts organised within one of the CEN Technical Committees, each with their specific background and expertise (building, heating, ventilation, lighting, etcetera).

This was also reflected in the terminology, which was not necessarily the same in all CEN Technical Committees and which could easily lead to a Babel-like confusion. Figure 2 shows, as example, a number of terms that were found to be used for energy need and energy use, without a clear picture whether these terms had the same or a different meaning.



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Figure — Tower of Babel or towards common definitions?!

### Definitions

Consequently, one of the important actions was the preparation of a set of common definitions on the main concepts and physical quantities. , Due to the limited time available to develop the standards the preparation of common definitions was carried out in parallel with and even partly after the drafting of the standards. The coordinating task force, CEN/BT TF 173 (currently called CEN/BT TC 371) was responsible for this action. The action focussed on harmonization of terms used in the top level standards.

### Symbols

The CEN standards to support the EPBD introduce a large number of quantities and their associated symbols. To facilitate the use of the standards, a common set of symbols and subscripts have been defined.

Common definitions

In total, more than 100 terms have been selected that are common to the top level CEN standards to support the EPBD. The list, illustrated in figure 3, is adopted as annex C of CEN/TR 15615, the "Umbrella Document". A few examples are given in the text box below.

Most of these definitions can also be found in the top level CEN standard EN 15603. Information Papers P087 and P088 provide more information on that standard.

<ul style="list-style-type: none"> <li>• <u>Buildings:</u> <ul style="list-style-type: none"> <li>- building</li> <li>- new building</li> <li>- existing building</li> <li>- technical building system</li> <li>- technical building sub-system</li> <li>- internal dimension</li> <li>- overall internal dimension</li> <li>- external</li> <li>- thermal</li> <li>- heated</li> <li>- cooled</li> <li>- condition</li> <li>- uncond</li> <li>- condition</li> <li>- condition</li> <li>- occupi</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <u>Energy ratings and certification</u> <ul style="list-style-type: none"> <li>- energy performance of a building</li> <li>- energy rating</li> <li>- calculated energy rating</li> <li>- standard energy rating</li> <li>- design energy rating</li> <li>- tailored energy rating</li> <li>- standard use data set</li> <li>- measured energy rating</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <u>Energy calculation</u> <ul style="list-style-type: none"> <li>- space heating</li> <li>- space cooling</li> <li>- building calculation method</li> <li>- validated building data</li> <li>- calculation step</li> <li>- calculation period</li> <li>- heating or cooling season</li> <li>- external temperature</li> <li>- internal temperature</li> <li>- set-point temperature</li> <li>- conditioned zone</li> <li>- equivalent internal temperature:</li> <li>- set-back temperature</li> <li>- heat transfer coefficient</li> </ul> </li> </ul>	
	<ul style="list-style-type: none"> <li>• <u>Technical building systems</u> <ul style="list-style-type: none"> <li>- auxiliary energy</li> <li>- cogeneration</li> <li>- air conditioning</li> <li>- room conditioning</li> <li>- demand controlled ventilation</li> <li>- dehumidification</li> <li>- humidification</li> <li>- ventilation</li> <li>- ventilation</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <u>Energy</u> <ul style="list-style-type: none"> <li>- energy source</li> <li>- energy carrier</li> <li>- energyware</li> <li>- system boundary</li> <li>- delivered energy</li> <li>- exported energy</li> <li>- net delivered energy</li> </ul> </li> </ul>	

**Figure — Illustration of the kind of terms included in the common definitions**

*A few examples of the (in total more than 100) common definitions:*

#### **C.1.4 technical building system**

technical equipment for heating, cooling, ventilation, domestic hot water, lighting and electricity production

NOTE 1 A technical building system can refer to one or to several building services (e.g. heating system, heating and DHW system).

NOTE 2 A technical building system is composed of different subsystems.

NOTE 3 Electricity production can include cogeneration and photovoltaic systems.

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#### **C.1.22 conditioned space**

heated and/or cooled space

NOTE The heated and/or cooled spaces are used to define the thermal envelope.

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#### **C.2.6 heat recovery**

heat generated by a technical building system or linked to a building use (e.g. domestic hot water) which is utilised directly in a related system to lower the heat input and which would otherwise be wasted (e.g. preheating of the combustion air by a flue gas heat exchanger)

...

#### **C.5.1 energy performance of a building**

calculated or measured amount of weighted net delivered energy actually used or estimated to meet different needs associated with a standardised use of a building, which may include, inter alia, energy used for heating, cooling, ventilation, domestic hot water and lighting

#### **C.5.2 energy performance requirement**

minimum level of energy performance that is to be achieved to obtain a right or an advantage: e.g. right to build, lower interest rate, quality label

#### **C.5.3 energy rating**

evaluation of the energy performance of a building based on the weighted sum of the calculated or measured use of energy carriers

## Common symbols and subscripts

In addition to the common definitions, a list of common symbols and subscripts was prepared for the main physical quantities that are commonly used in the top level standards.

### Symbols:

The given symbols concern only data passed from one standard to another. Additional symbols and units may be used locally within each standard, but it is strongly recommended to use the common symbols, subscripts and order.

The list, introduced below, is adopted as annex D of CEN/TR 15615, the "Umbrella Document". A few examples are given further on.

The following table shows some examples of common symbols from CEN/TR 15615.

**Table — Common symbols, some examples**

Sym bol	Quantity	Unit	Sym bol	Quantity	Unit
<i>A</i>	area	m <sup>2</sup>	<i>Q</i>	quantity of heat	J a
<i>C</i>	heat capacity	J/K <sup>a</sup>	<i>q</i>	volumetric airflow rate	m <sup>3</sup> /s
<i>c</i>	specific heat capacity	J/(kg·K) a	<i>q</i>	heat flow density	W/m <sup>2</sup>
<i>E</i>	energy in general; including primary energy, energy carriers (except heat, auxiliary electricity and work)	kg, m <sup>3</sup> , J a b	<i>t</i>	time, period of time	s a
<i>EP</i>	energy performance indicator	J/(m <sup>2</sup> ·a) a, kg/(m <sup>2</sup> ·a) , €/ (m <sup>2</sup> ·a) c	<i>W</i>	(electrical) auxiliary energy	J a
<i>I</i>	solar irradiance	W/m <sup>2</sup>	<i>η</i>	efficiency factor	-
<i>m</i>	mass (e.g. quantity of CO <sub>2</sub> emissions)	kg	<i>θ</i>	Celsius temperature	°C
<i>P</i>	power in general including electrical power	W	<i>Φ</i>	heat flow rate, thermal power	W
<sup>a</sup>	Hours (h) may be used as the unit of time instead of seconds for all quantities involving time (i.e. for time periods as well as for air change rates), but in that case the unit of energy is Wh instead of J.				
<sup>b</sup>	The unit depends on the type of energy carrier and the way its amount is expressed.				
<sup>c</sup>	The unit depends on the indicator chosen, see EN 15217 clause 5.				

### Subscripts:

The main subscripts are provided in four successive levels. It goes from the general to the detail:

- the first level is related to the use,
- the second to the main topics influencing the energy performance (energy carrier, heat transfer building envelope, technical building system),
- the third to balance items or qualifier of the higher level,
- etc.

At each level there may be different sets of subscripts, for different contexts. For example: in a certain context a distinction is required between type of energy use (heating versus cooling versus ventilation, etc.), while in another context a distinction is needed between the energy carrier (gas versus oil versus electricity versus...). But never a distinction is required between energy use for heating versus gas.

The levels are hierarchic, to harmonise the order of the subscripts used in different standards.

NOTE For example: recoverable ventilation system losses:

good:  $Q_{V,sys,ls,rcb}$

wrong:  $Q_{s,V,rcb}$

Because of its importance in helping to make the CEN standards accessible, transparent and consistent, the full table of these four levels is copied here from CEN/TR 15615:

**Table – The first four levels of subscripts**

Level 1		Level 2		Level 3		Level 4	
<i>Type of energy use</i>		<i>Building without technical systems</i>		<i>Utilised or non-utilised</i>			
H	heating	nd	need	ut	utilised		
C	cooling	ht	heat transfer	nut	non-utilised		
W	DHW	tr	transmission heat transfer				
T	thermal	ve	ventilation heat transfer				
L	lighting	-gn	-gains				
V	ventilation	sol	solar				
A	appliances	int	internal				
XY	combination of H, C, W	-sens	-sensible				
Tot	total	lat	latent				
		<b>-Technical building system</b>		<b>Balance item</b>		<b>Balance item</b>	
		-us	-use	ls	losses	rbl	recoverable
		sys	system	aux	auxiliary	rvd	recovered
		em	emission	in	input	nrbl	non-recoverable
		dis	distribution	out	output	nrvd	non-recovered
		st	storage				
		ctr	control				
		gen	generation				
		hum	humidification <sup>a</sup>				
		dhum	dehumidification <sup>a</sup>				
		<b>Energy carrier</b>		<b>Qualifier (where used)</b>		<b>Qualifier (which type)</b>	
		gas	gas	del	delivered	nren	non-renewable
		oil	oil	exp	exported	ren	renewable
		el	electricity	pr	produced		
		wd	wood	ntdel	net delivered		
		dh	district heating			<b>aggregated quantity</b>	
		dc	district cooling				
		sf	solid fuel			P	primary energy
		lf	liquid fuel			Ptot	total primary energy
		bm	biomass			Pnren	non renewable primary fraction
		sol	solar heat			CO <sub>2</sub>	CO <sub>2</sub> emission
		pv	solar electricity				

<sup>a</sup> Only at 'needs' level; energy use for humidification is included in energy use for ventilation; energy use for dehumidification is included in energy use for cooling

**More details:**

CEN/TR 15615 contains more details, e.g. additional common subscripts, such as time related (wk, day, h, m, ...), statistical (avg, mn, max, ...) and more detailed rules on the use of the subscripts, e.g. when a certain subscript may be omitted, within a given context.

**Use of the common symbols and subscripts in other languages:**

In CEN/TR 15615 the terms for the common symbols and subscripts are also translated into French and German.

It is strongly suggested to use the same symbols and subscripts in translated national standards and/or related (national) documents, with the English expression given as additional information, to explain the origin of the abbreviation.

**Table — A few examples of the common symbols used in another language (from Dutch OntwNEN 7120)**

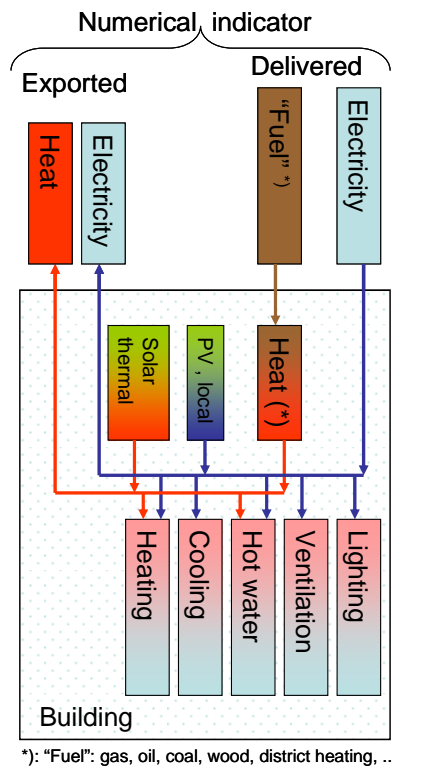
Symbol	Grootheid	Eenheid	Engelse oorsprong
<i>A</i>	Oppervlakte	m <sup>2</sup>	Area
<i>H</i>	warmteoverdrachtscoëfficiënt	W/K	Heat transfer coefficient
<i>R</i>	warmteweerstand	M <sup>2</sup> K/W	Thermal resistance

**Table — A few examples of the common subscripts used in another language (from Dutch OntwNEN 7120)**

Index	Betekenis	Engelse oorsprong
del	aangeleverd	delivered
C	Koeling (energiegebruik voor ~)	Cooling (energy use for ~)
gen	Opwekking	Generation

Building boundaries

One of the crucial elements in the definitions is the boundary of the building, including its technical building systems. Although the detailed procedures to define this boundary are set at national level, CEN provides common rules. Within the boundary a distinction is made between the building needs and the thermal losses of the technical building systems. The recoverable part of these losses may lead to an interaction with the building needs. Energy is delivered from outside the boundary by energy carriers, such as gas, electricity or heat. Additionally, renewable energy can be produced within its boundary. Optionally, energy can also be exported to outside, in the form of electricity and/or heat. More details can be found in the CENSE Information Paper P87 ("*How to integrate the CEN-EPBD standards in national building regulations? The use of EN 15603 to adopt the same structure as starting point for coordination of Member States regulations*").



**Figure — Diagram illustrating the energy delivered to and exported from a building site**

### Example

The following example shows a technical building system where the symbols and subscripts are applied and where the building boundary is clearly indicated.

The example is only to illustrate the uses of the symbols, the delivered and exported energy carriers and the rating (energy use). Not all losses, auxiliaries, etc are indicated.

**Gen1:** Solar collector producing only DHW

**Gen2:** Photovoltaic panel exporting partly the electricity produced

**Gen3:** Gas driven cogeneration unit for DHW production and exporting partly the electricity produced

**Gen4:** Oil fired boiler for heating and DHW

**Gen5:** Oil fired boiler for heating and DHW

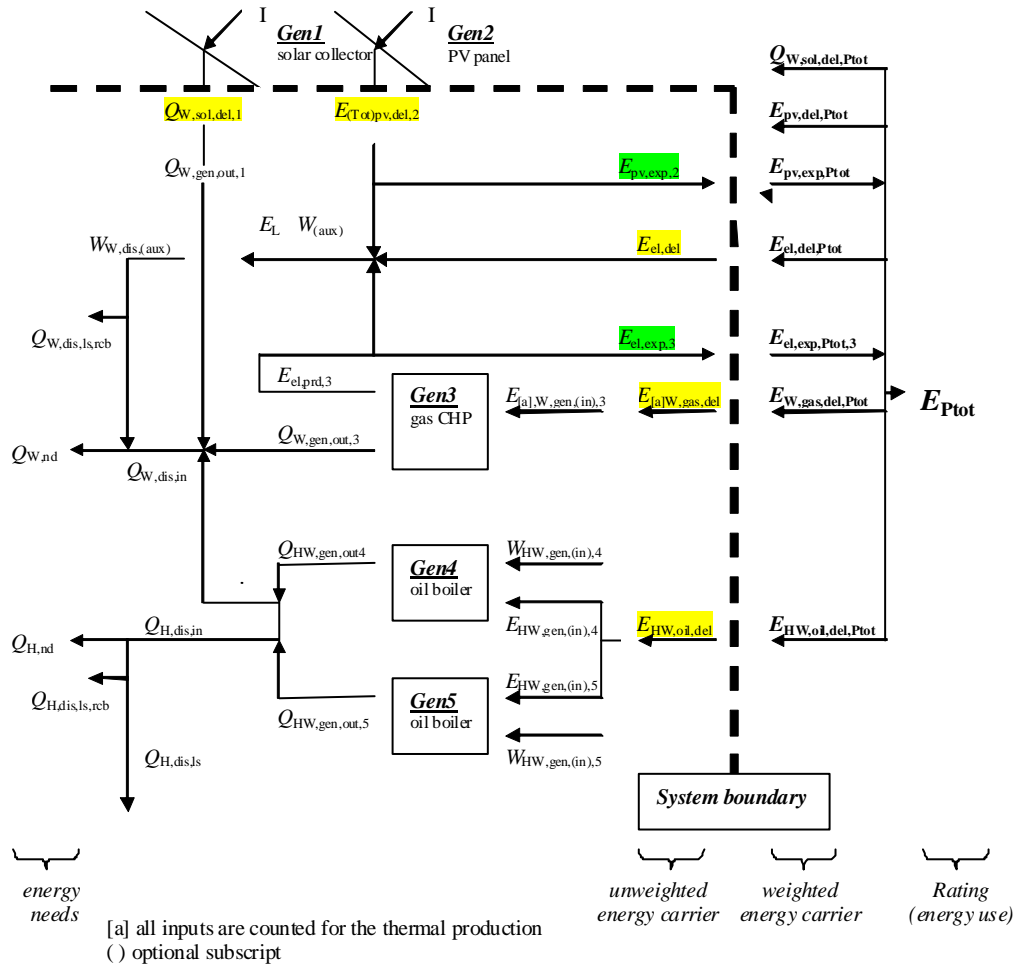


Figure — Illustration of the application of the common symbols on a technical building system