



EHPA Project online series - 4th webinar

“Training and re-training all along the value chain”

October 29th of October 2020

HVAC value chain:
New challenges
request
new skills

CEN-CE✓

CEN EPB Standards Certified Experts



Johann ZIRNGIBL

Senior Scientist

CSTB / France

CSTB
le futur en construction



What is CEN-CE (<https://www.cen-ce.eu/>)?

CEN-CE: CEN standard Certified Experts

EU-wide training / qualification scheme based on EPBD mandated CEN standards

H2020 - Project on Construction skills (2018 - 2020)

related to

- ***Reducing energy consumption and carbon footprint***
- ***Market uptake of energy innovation***

CEN-CE rational

To reach **EU's energy+climate targets**, **qualified building workforce** is needed
Professionals need to be trained on **upcoming challenges**: (e.g. nZEB, 2050 ready)



CEN-CE set up an EU wide training / qualification scheme



The importance of HVAC professional – key data

- Buildings currently account
 - **40 % of Europe's total energy consumption**
 - **36 % of its CO₂ emissions**mostly for **heating and cooling**.
- **35 %** of EU buildings are over **50 years old**, nearly **75 %** are **energy inefficient**
- **Renovating** existing buildings could reduce significantly energy consumption but: only **1.2 %** of buildings are **renovated each year**, only **15%** incorporate **significant energy efficiency improvements**.
- **total market share of heating systems** in buildings is ~ **20 billion EURO** (heat emitters account for approx. **12,5 %** of the total system costs).



HVAC professionals play an important role in energy efficiency update especially in renovation where HVAC systems are often upgraded first



HVAC system evolution and new challenges (1/2)

“White collar” workers (designers)

In the past:

- Important was the **dimensioning** (sizing) of heating systems (**kW**) (power of generation, emission, etc)
- **Products** were **characterised as products** (not as part of a “**system**”) at nominal power and the **related efficiency**

Now:

- Dimensioning of heating systems is still important but also **energy consumption** is evaluated (**kWh**) to **get the building permit**
But often the **Evaluation** is more **related to compliance** (fulfil regulations) than to **real performance** (e.g. mostly only monthly calculation methods)
- **Products** are characterised also by **part load (Ecodesign, ErP)**, as part of a “**system**”, the building (**Energy Performance of Building Directive**)



HVAC system evolution and new challenges (2/2)

In the future (2020 - 2050)

- **Nearly zero energy buildings** (new buildings **after 31 December 2020**).
(Problem is the definition of nZEB, not harmonised EU wide, **34 regional methods**)
- Buildings are **no longer energy consumer** but also **energy producer**
- **EU CO₂ neutral in 2050 (EU Green Deal)**, **EU funding** needs **EU comparability**
- Avoid a **“Building gate”** (→calculated consumption should be close to real consump.)
Evaluation of HVAC systems must be related to **real performance**
- **Change of systems: from fossil fuels to renewables, more storage, less power,**
more **complex interacting** systems **sensible to boundary conditions** (e.g Heat pumps)

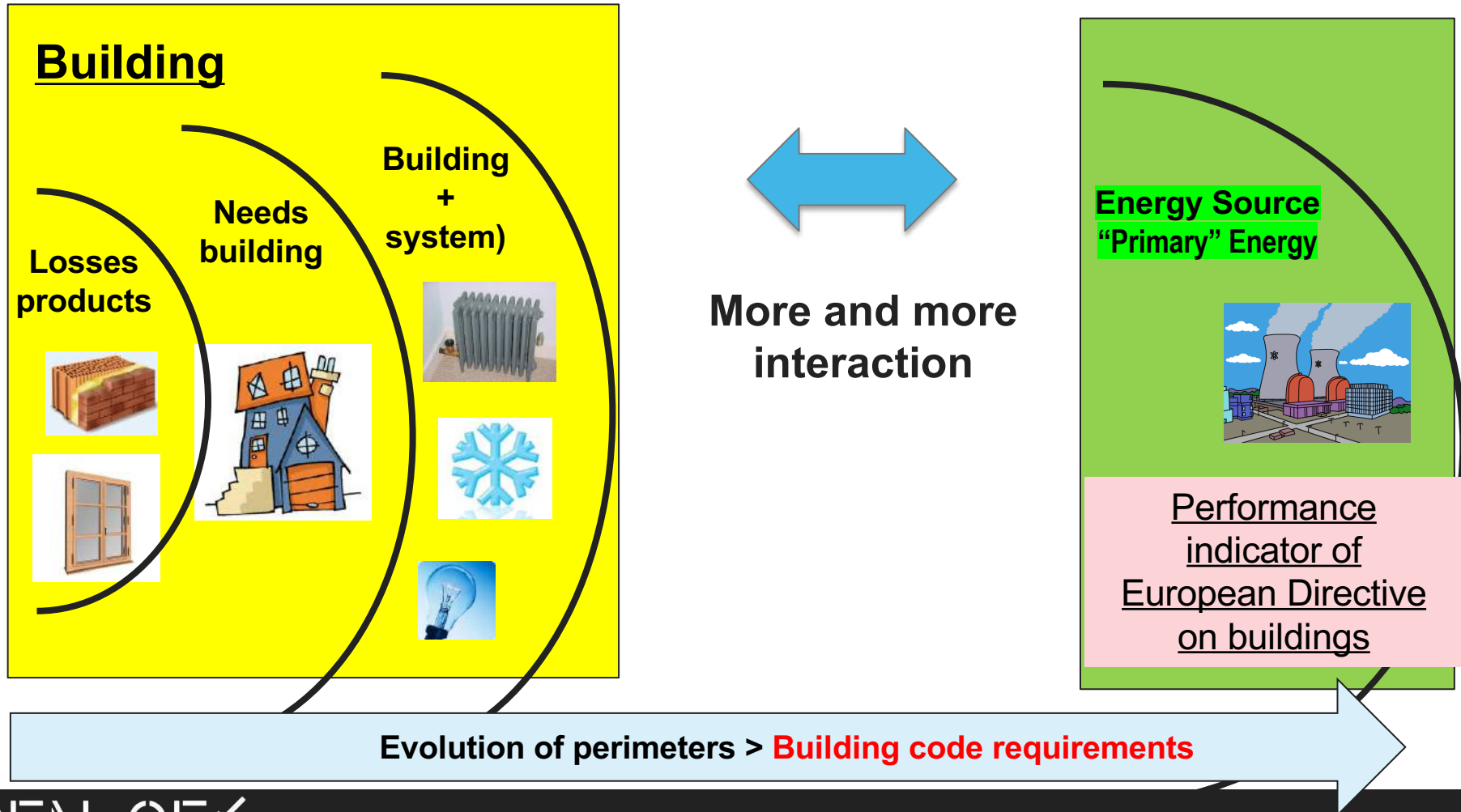


These **evolutions** and **new challenges** are **already taken into account** in
the new set of **EPB Standards related to HVAC systems** and
taught in **CEN-CE trainings**



Example on new requests: Assessment of energy performance

Evolution of assessment perimeters (assessment boundaries)



After the new challenges, the requested new skills for the whole HVAC value chain

Professionals need to be **trained** on:

- more **complex HVAC systems** e.g. renewables and storage,
- more **boundary conditions dependent** systems (e.g. heat pumps),
- on **new indicators** (e.g. share of renewable, primary energy, onsite, nearby distant).

Industrials need:

- a **common level playing field** for **fair competition** between products for the optimization of buildings energy performance,
- **common databases** and **tools** (HVAC systems are still the weak point in software tools).



CEN-CE based on European standards because they are :

- an advantage for **mutual recognition of qualifications** among EU Member States (qualification and training should be recognized EU wide)
- key to create a **level playing field for products**

A **first EU-wide qualification and training scheme** based on **EPBD mandated CEN standards** for HVAC professionals has been created (**CEN-CE: <https://www.cen-ce.eu/>**)



Content of CEN-CE training (1/4)

Recall of General structure of building energy assessment

Evolution of perimeters > **Building code requirements**

Building needs



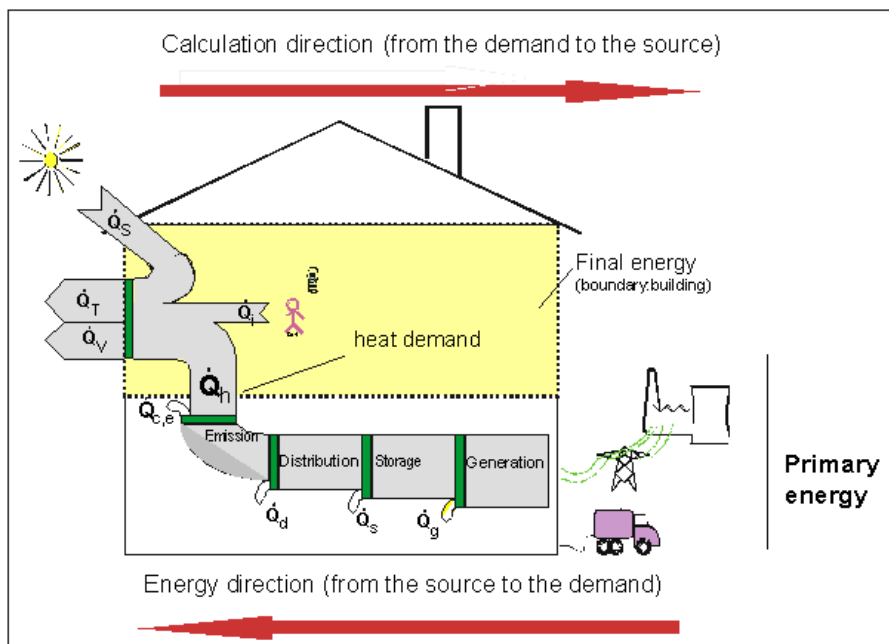
System losses

Delivered energy



Primary energy, CO₂, emission

Calculation direction: from the needs to the source



Energy losses **inside** the building are calculated **explicitly** (emission, distribution, generation)

Energy losses **outside** the building **and related emissions** are taken into account in the **primary energy factor** and **CO₂ emission coefficient**

Content of CEN-CE training (2/4)

CEN-CE background information on each standard

Training presentation

EN 15316-4-2 Heat pumps



CEN-CE

CEN EPB Standards Certified Experts

Event, location
03.12.2019.
Vladimir SOLDO
Iva BERTOVIĆ



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 780518

Fundamentals

Basic heat pumps types

<p>Standard operating outside temperature up to -7 °C (for EVI system up to -15 °C). Main issue: defrosting of the evaporator.</p> <p>Air source HP</p>	<p>Very stable heat source: Ground source temperature in the range of 10 to 15 °C. Main issue: vertical drilling of boreholes.</p> <p>Ground source HP</p>	<p>Ground water temperature in the range of 10 to 14 °C. The most efficiency heat pump. Main issue: very strict regulation for water intake: water capacity</p> <p>Water source HP</p>
--	---	---

CEN-CE EN 15316-4-2 Heat Pumps
Vladimir SOLDO, Iva BERTOVIĆ 13/10/2020 6

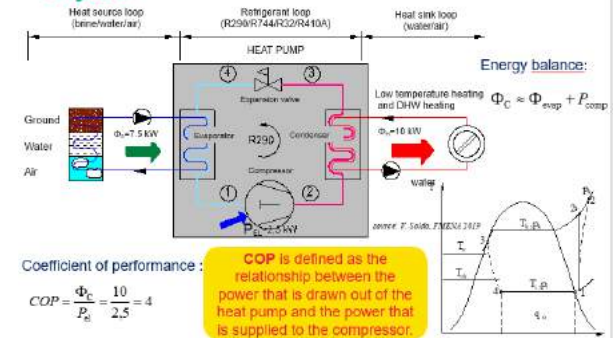
INDEX



1. Introduction
2. Fundamentals/Physics
3. Input data
4. Calculation method
5. Output data
6. Example

CEN-CE EN 15316-4-2 Heat Pumps
Vladimir SOLDO, Iva BERTOVIĆ 13/10/2020 3

Physics



CEN-CE EN 15316-4-2 Heat Pumps
Vladimir SOLDO, Iva BERTOVIĆ 13/10/2020 7

CEN-CE

CEN EPB Standards Certified Experts

CEN-CE in a nutshell
Johann ZIRNGIBL

29/10/2020

9



Content of CEN-CE training (3/4)

CEN-CE spread sheets for parameter analysis

HEAT PUMP DESCRIPTION DATA			
Heat pump type	Air-water	HP_TYPE	HP_TYPE_AIR_WATER
Type of end energy use (services)	Space heating and domestic hot water	HP_USE	HP_USE_HLW
Heat pump fuel	Electricity	HP_FUEL	HP_FUEL_ELE
CE marking	HP CE marked	HP_CE	HP_CE_YES
Heat pump location	Bolar room	HP_LOC	HP_LOC_BOIL
Heat pump techno type	ON - OFF technology	HP_TECH	HP_TECH_ONOFF
Heat pump back up	No back up	HP_BU	HP_BU_NO
Back-up fuel	No back-up fuel	HP_FUEL_BU	HP_FUEL_BU_NO
Level of the distribution system	Low	TAU_OUT_EM_TYPE	TAU_OUT_EM_TYPE_L
Heat pump technical data			
Standard used			
COP and thermal capacity calculation method			
Thermal capacity at standard rating conditions at full load			
COP at standard rating conditions at full load			
Inlet temperature at standard rating conditions at full load			
Outlet temperature at standard rating conditions at full load			
Temperature operating limit			
Evaporator temperature			
System design data			
Power of auxiliary (pumps)			
Part of the electrical power to operate the heat pump (heat pump control)			
Minimum UKL or part load ratio at minimum continuous operation (inverter technology)			

Month	N _{day}	Q _{heat pump}	E _{gas}	E _{electricity}	Q _{heat demand}	W _{gas}	COP _{gas}
		kWh	kWh	kWh	kWh	kWh	-
January	31	6 773	2 170	0	4 603	175	3,12
February	28	4 819	1 466	0	3 353	118	3,29
March	31	3 567	1 017	0	2 550	79	3,51
April	30	1 658	478	0	1 180	36	3,67
May	31	239	77	0	161	6	3,09
June	30	231	72	0	159	5	3,21
July	31	239	74	0	165	5	3,23
August	31	239	74	0	165	5	3,23
September	30	231	74	0	157	5	3,13
October	31	1 875	535	0	1 340	40	3,50
November	30	3 067	850	0	2 217	66	3,61
December	31	5 740	1 749	0	3 991	141	3,28
Annual		28 677	8 635	0	20 041	681	3,22



Content of CEN-CE training (4/4)

CEN-CE training platform

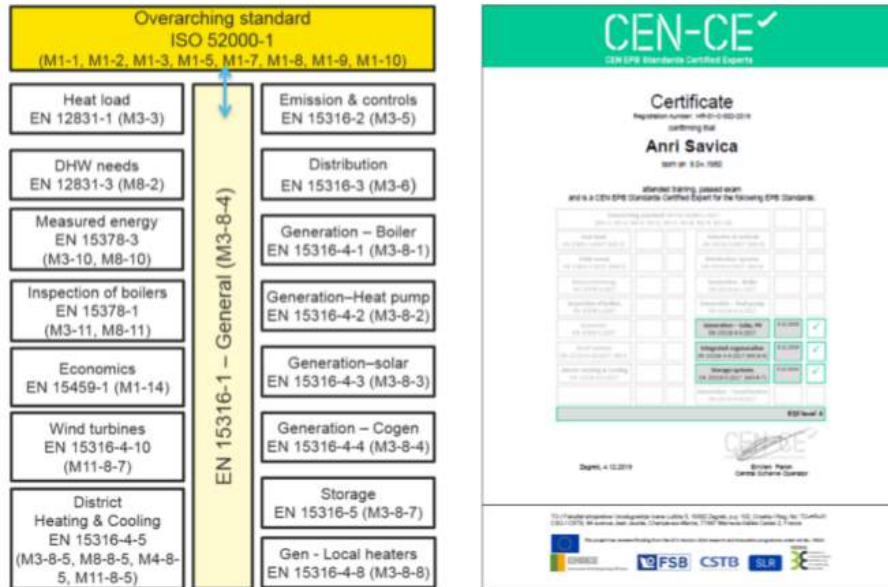


Figure 1. List of standards for CEN-CE training an example of CEN-CE certificate.

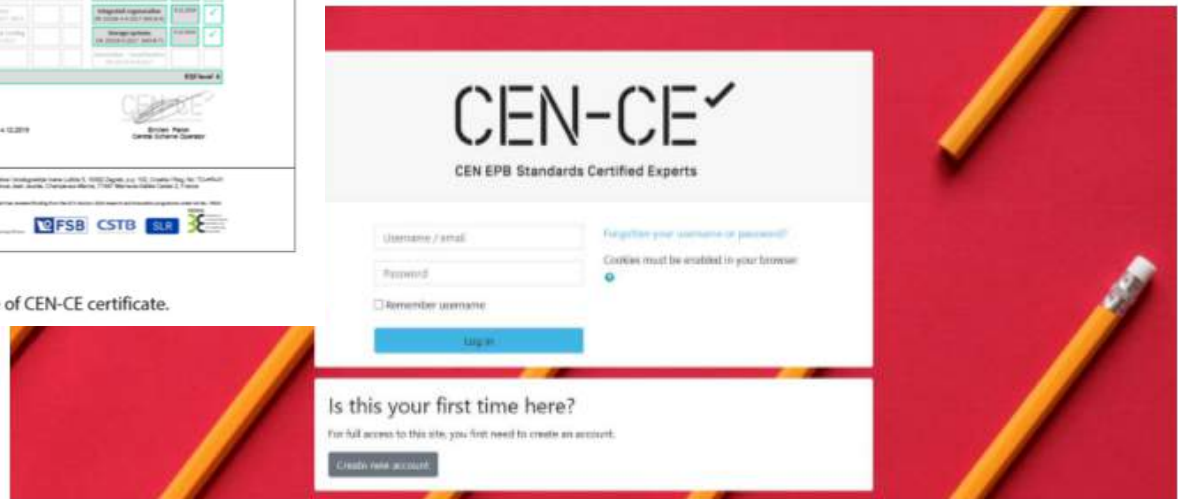


Figure 2: Opening page of the CEN-CE learning and certification platform

The CEN-CE outcomes (resume)

FOR BUILDING PROFESSIONALS, INDUSTRIALS

- **gain recognition for performance, comparability, reliability** by using best know-how based on European standards,
- **harmonized procedures** (training, tools) allowing professionals to work EU wide (target)
- **harmonized databases** (industrials, building owners)
- **a coherent and transparent level playing field** (technology neutral in Energy performance assessment of buildings).



To reach **EU's energy and climate targets**,
a **qualified building workforce** is needed.

HVAC Professionals need to be **trained** on **new upcoming challenges**:
This training should be **harmonized on EU level** to be **recognized in all EU**



CONTACT

Johann ZIRNGIBL

Johann.zirngibl@cstb.fr

THANK YOU

CEN-CE✓

CEN EPB Standards Certified Experts

www.CEN-CE.eu



CEN Certified Experts



Cen_Ce_



@CEN_CE_

CEN-CE✓

CEN EPB Standards Certified Experts

CEN-CE in a nutshell
Johann ZIRNGIBL

29/10/2020

13

