CLIMA 2019 Workshop nº 5

SUPPORTING DISSEMINATION AND ROLL-OUT OF THE SET OF ENERGY PERFORMANCE OF BUILDING (EPB) STANDARDS

Welcome and introduction

Jaap Hogeling

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Workshop organized by the EPB Center under Service Contract with the European Commission, in collaboration with

REHVA Federation of European Heating, Ventilation and Air Conditioning Associations

EPEE The voice of the heating, cooling and refrigeration industry

EVIA European Ventilation Industry Association

CLIMA 2019

Built environment facing climate change

REHVA 13th HVAC World Congress

26 - 29 May, Bucharest, Romania

PROGRAMME

15.30-15.40	**WELCOME AND INTRODUCTION**
	Jaap HOGELING, Director, EPB Center
15.40-16.00	**The promising prospect of EPB standards and the revised EPBD**
	Pau GARCIA AUDI, Policy Officer, DG ENER, European Commission
16.00-16.10	**Introduction to the roll-out of the set of EPB standards**
	Jaap HOGELING, Director, EPB Center
16.10-16.20	**The national implementation process of the EPB standards in Romania**
	Iuliana CHILEA, Director General, ASRO
16.20-16.30	**EN ISO 52016-1 Energy need calculation (heating/cooling) and calculation of indoor temperatures: hourly or monthly?**
	Dick VAN DIJK, Senior expert, EPB Center
16.30-16.40	**EN 16798-5-13 How to use the set of ventilation and cooling standards? Coordination issues with heat pump calculation (EN 15316-4-2)**
	Gerhard ZWEIFEL, Senior Expert, Consultant
16.40-16.50	**QUESTIONS AND ANSWERS**
16.50-17.00	**Synergies with linked EU projects: CEN-CE & ALDREN**
	Johann ZIRNGIBL, Senior Expert, CSTB
17.00-17.05	**EPB Standards Community facilitated by REHVA**
	Andrei Vladimir LITIU, Project Consultant, REHVA
17.05-17.15	**Benefits and challenges of the roll-out of EPB standards. Industry perspective.**
	Andrea VOIGT, General Director, EPEE
17.15-17.25	**Ventilation related EPB standards and their contribution to deliver high IEQ**
	Claus HAENDEL, Technical Director, EVIA
17.25-17.50	**INTERACTIVE DISCUSSION AND POLLS**
17.50	**Closing remarks**
	Dick VAN DIJK, Senior Expert, EPB Center

The set of EPB standards

- The set of EPB standards, published in 2017, provide EU Member States a toolbox to help the implementation of the Directive and aim at higher transparency regarding the energy performance calculation methodologies.
- Each EPB standard has a template for a National Annex that enables Member States to tailor the methodology to the national situation and needs.

Scope of the WS

- EU Member states are required to transpose and implement the Energy Performance of Buildings (EPB) policy in their country. Moreover, they are expected to use the EPB standards and report back to the European Commission (i.e. the revised EPBD requires Member States to fill in a few specific templates)

Thank you!

EPB Center is also 'available' for specific services requested by individual or clusters of stakeholders.

More information on
the set of EPB standards:

www.epb.center

Contact: info@epb.center

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The promising prospect of EPB standards and the revised EPBD

Pau Garcia Audi

Policy Officer, DG ENER, European Commission

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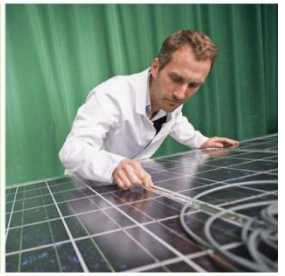


CLIMA 2019
Session: supporting EPB standards

European Commission- DG Energy
Energy Efficiency Unit
Buildings & Finance Team

Bucharest, 27 May 2019

CLEAN ENERGY FOR ALL EUROPEANS

Clean Energy for All Europeans Package (30/11/2016)

THE RIGHT REGULATORY FRAMEWORK FOR POST – 2020

Energy Union Governance

Energy Efficiency
(Energy Efficiency Directive, European Performance of Buildings Directive)

Renewables
(Revised Renewable Energy Directive)

New Electricity Market Design
(including Risk Preparedness)

Energy prices and costs report

Energy Efficiency Directive

32.5% energy efficiency target for 2030

Ecodesign Working Plan 2016-2019

- List of new product groups
- Contribution to circular economy objectives

Energy Performance of Buildings

- Supportive of renovation
- Smarter – ICT, smart buildings
- Simpler

European Commission

Energy efficiency update:

- Revised **Energy Performance of Buildings Directive** agreed and published – 19 June 2018, entry into force – 9 July 2018.
- Revised **Energy Efficiency Directive** agreed and published – 21 December 2018, entry into force– 24 December 2018.
- Revised **Tyre labelling regulation** adopted (2 May).
- In preparation - **revised** or **new ecodesign & energy labelling regulations**:
    - *household and commercial fridges, dishwashers, washing machines, electronic displays, lighting*
    - *external power supplies, motors, industrial fans, transformers, servers and welding equipment*

Main outcomes of the revision

A STRENGTHENED DIRECTIVE

- Stronger **long term renovation strategies** for Member States, aiming at decarbonisation by 2050 and with a solid financial component.
- Enhanced **transparency** of national building energy performance calculation methodologies.
- Targeted support to **e-mobility** infrastructure deployment in buildings' car parks.
- Reinforcement of **building automation**: additional requirements on room temperature level controls, building automation and controls and enhanced consideration of typical operating conditions.
- A **Smart Readiness Indicator** for buildings.

Provisions already in place

A GREATER MOBILIZATION OF INVESTMENTS

Minimum energy performance requirements

- Building, component and system level
- Revised at regular intervals
- Set according to the cost-optimal methodology

Nearly zero-energy buildings (NZEBs)

- Public buildings by end of 2018
- Rest of buildings by end of 2020

Energy Performance Certificates

- Obligatory for new buildings and buildings sold or rented
- Must be shown in advertising media

New obligation for Member States to describe their national calculation methodology following **the national annexes of the overarching standards** (ISO 52000-1, 52003-1, 52010-1, 52016-1, and 52018-1 developed under mandate M/480)

- Improve **transparency and comparability** but no harmonization of calculation methodologies
- **Not an obligation** on MS to comply with the EPB standards [recital 40]
- MS have **flexibility** to adapt the calculation methodologies to local and climatic conditions

Determining & expressing the energy performance

- The energy performance of a building must be determined on the basis of the **calculated or the actual** energy use
- The **typical energy uses** of a building
- The energy performance of a building must be expressed by a common numeric indicator of **primary energy use in kWh/(m².y)**
- The numeric indicators refer to **both Energy Performance Certification** schemes and compliance with **minimum energy performance requirements**
- Additional indicators **may** be added:
  - total, non-renewable and renewable primary energy use, and
  - greenhouse gas emissions produced

Additional aspects must be considered

Deletion of "where relevant in the calculation"

- The calculation methodology of the energy performance of a building must take into account the **positive influence** of local solar conditions, electricity produced by cogeneration, district heating and cooling systems and natural lighting
  - Even if a factor may not be common, its positive influence must be considered

Considerations for the calculations of Primary Energy Factors (PEFs)

- Calculating Primary Energy Factors:
  - Member States responsibility
  - Values differ significantly
  - The procedures used are not always transparent
- The objective of revised EPBD
  - is not to interfere with Member States competence to define PEFs
  - to improve transparency
- Flexibility on how to define Primary Energy Factors per energy carrier based on weighted averages:
  - national, regional or local
  - annual, and possibly also seasonal or monthly,
  - or on more specific information for individual district systems (where relevant)

Energy needs to be considered

- The energy needs of a building is an important step for the calculation of its energy performance
  - The energy needs should cover, inter alia, energy for space heating, space cooling, domestic hot water, ventilation, lighting and other technical building systems
- National calculation methodologies must reflect the energy needs of a building in order to provide the optimal comfort, indoor air quality and health conditions inside the building

Pursuing the optimal energy performance of the building envelope

- Reducing the overall energy demand is crucial component when optimising the energy performance of a building
- The consideration of the envelope is not underestimated
- Technical Building Systems and Building Automation and Control Systems are also most easily optimised if a highly-energy performing envelope is also installed
- Member States should always try to find the best combination of energy efficiency and renewable measures
- The use of renewables should be encouraged in conjunction with seeking energy savings from the building envelope and its technical building systems

Treatment of on-site and off-site RES

- RES, on-site or off-site, may be considered in the calculation of Primary Energy Factors but on a non-discriminatory basis
  - RES consumed by the building, whether on-site or off-site, improves the energy performance of the building
  - Flexibility to Member States to choose the regime which corresponds best to its particular situation, taking into account the specific national circumstances
  - The energy produced on-building reduces the primary energy associated with the delivered energy
  - The calculation of primary energy factors includes both non-renewable energy and renewable energy supplied to the building (total PEF)
  - A distinction between renewable and non-renewable primary energy factors can help understand the energy consumption of a building
  - Comparable situations must not be treated differently and different situations must not be treated in the same way unless such treatment is objectively justified

EPBD implementation (studies and contracts)

- Support to **use of CEN EPB Standards** https://epb.center/
- **Feasibility study (Article 19a of the revised EPBD)**
  - Standalone ventilation systems
  - Optional building renovation passports
- **Smart Readiness Indicator** https://smartreadinessindicator.eu/
  - Phase 1 Final report available (including summary version)
  - Phase 2 starting in December 2018
- Comprehensive study on **renovation rates and NZEB uptake** in the EU
- **Energy Performance Certificates**
  - Quality, Visibility, Usability
- **Finance measures on energy renovations**







Thank you!

Pau GARCIA AUDÍ
Energy Efficiency Unit
DG ENER, European Commission

#EnergyUnion

CLIMA 2019 Workshop nº 5

SUPPORTING DISSEMINATION AND ROLL-OUT OF THE SET OF ENERGY PERFORMANCE OF BUILDING (EPB) STANDARDS

Supporting the EPB standards at national level: Roll out of the set of EPB standards

Jaap Hogeling

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The project

Type	Service Contract
Contract	ENER/C3/2017-437/SI2-785.185
Title	SUPPORT THE DISSEMINATION AND ROLL-OUT OF THE SET OF ENERGY PERFORMANCE OF BUILDING STANDARDS DEVELOPED UNDER EC MANDATE M/480
Start	September 21, 2018
Duration	Three years

The project team

Coordinator:
Jaap Hogeling,
The Netherlands

Jaap Hogeling
The Netherlands

Federation of European Heating, Ventilation and Air Conditioning Associations

Anita Derjanecz
Belgium

Experts on the EPB standards:

- *Dick van Dijk*, The Netherlands
- *Dirk Van Orshoven*, Belgium
- *Gerhard Zweifel*, Switzerland
- *Jean-Daniel Napar,* France
- *Johann Zirngibl*, France
- *Laurent Socal*, Italy

Annet van der Horn
The Netherlands

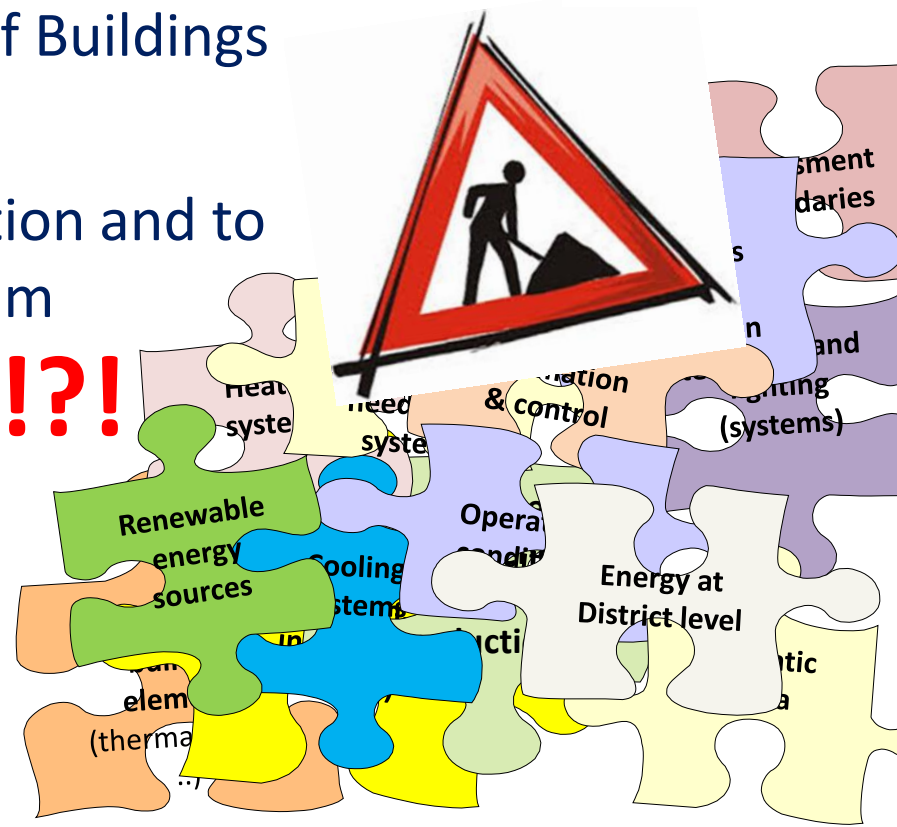
Background

December 2010: Mandate M480 European Commission to CEN

To develop a consistent set of standards to assess overall Energy Performance of Buildings

To support the EPB Directive (EPBD)

- For energy performance certification and to check compliance against minimum EP requirements
- Harmonized procedures, but:
- with flexibility for national situations



Current status

- The whole set of EPB standards was published in 2017[1)]:
  - 17 EPB standards at European (CEN) ánd global (ISO) level
    - The **ISO 52000** family
  - 36 EPB standards (for the moment..) at European (CEN) level only
  - 39 accompanying technical reports
- Now: to be implemented in national building regulations
  - In particular in Europe (EPBD!)
  - EPBD:2018, Annex I mentions explicitly 5 “overarching” EPB standards

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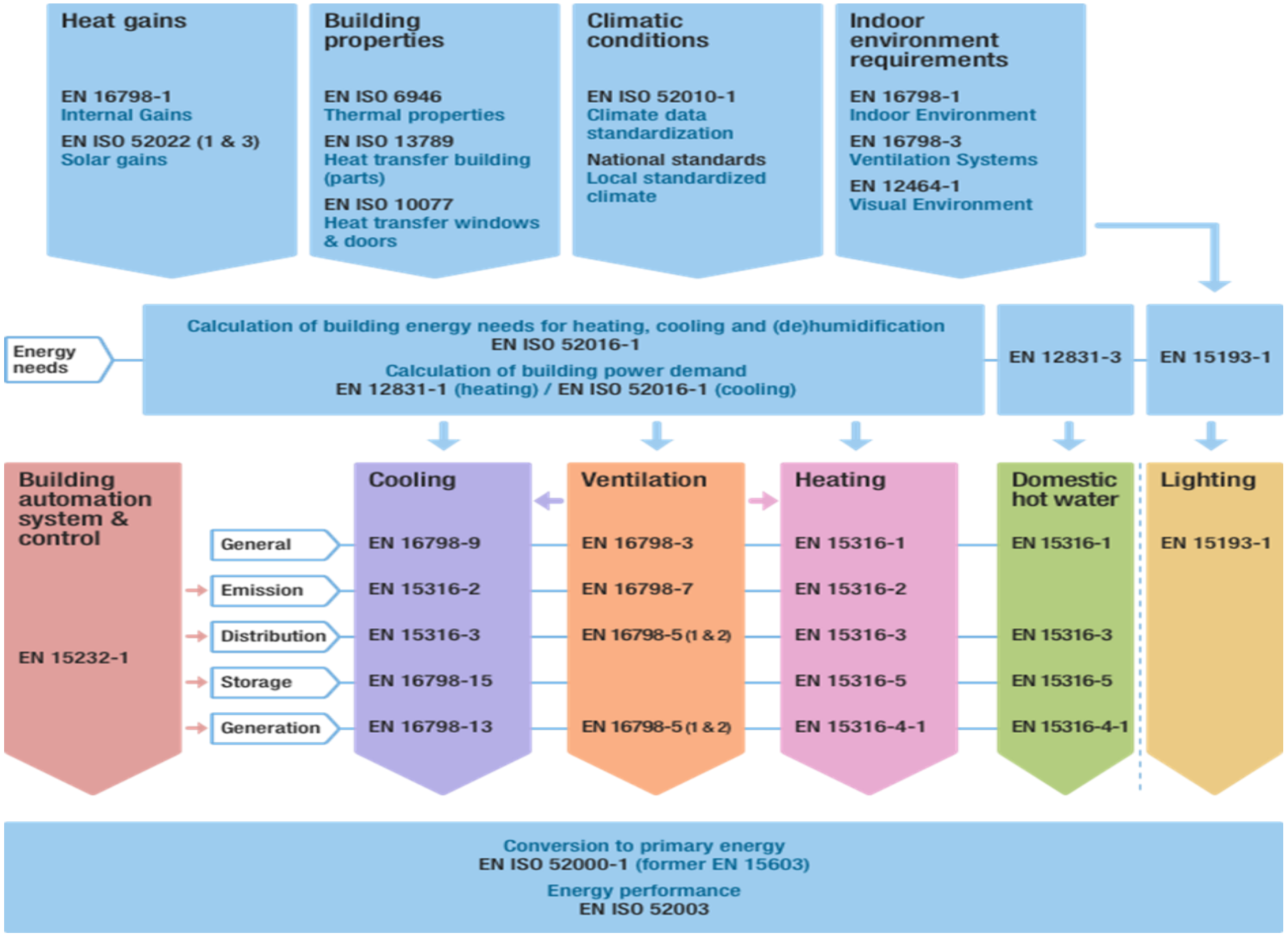
[1)]: 1 standard 1st May 2019

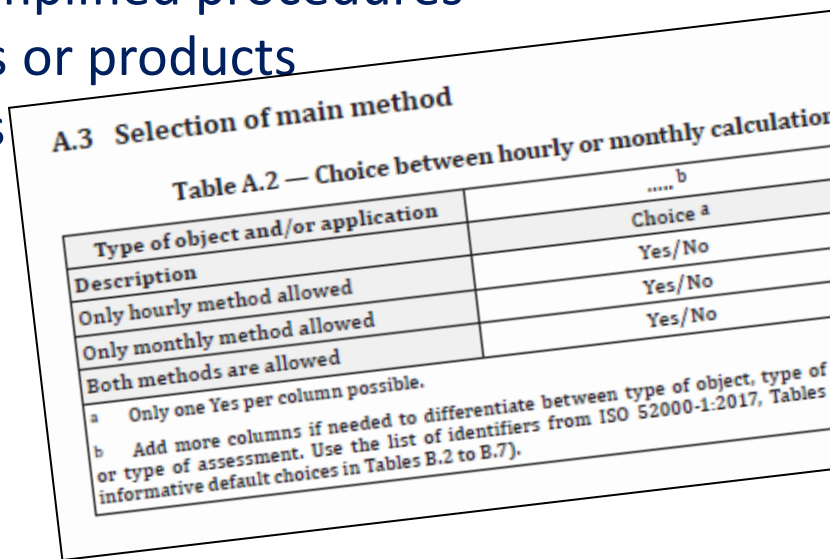

Heat gains
EN 16798-1
Internal Gains
EN ISO 52022 (1 & 3)
Solar gains
Building properties
EN ISO 6946
Thermal properties
EN ISO 13789
Heat transfer building (parts)
EN ISO 10077
Heat transfer windows & doors
Climatic conditions
EN ISO 52010-1
Climate data standardization
National standards
Local standardized climate
Indoor environment requirements
EN 16798-1
Indoor Environment
EN 16798-3
Ventilation Systems
EN 12464-1
Visual Environment
Energy needs
Calculation of building energy needs for heating, cooling and (de)humidification
EN ISO 52016-1
Calculation of building power demand
EN 12831-1 (heating) / EN ISO 52016-1 (cooling)
EN 12831-3
EN 15193-1
Building automation system & control
EN 15232-1
General
Emission
Distribution
Storage
Generation
Cooling
EN 16798-9
EN 15316-2
EN 15316-3
EN 16798-15
EN 16798-13
Ventilation
EN 16798-3
EN 16798-7
EN 16798-5 (1 & 2)
EN 16798-5 (1 & 2)
Heating
EN 15316-1
EN 15316-2
EN 15316-3
EN 15316-5
EN 15316-4-1
Domestic hot water
EN 15316-1
EN 15316-3
EN 15316-5
EN 15316-4-1
Lighting
EN 15193-1
Conversion to primary energy
EN ISO 52000-1 (former EN 15603)
Energy performance
EN ISO 52003

Harmonized but flexible

- The set of EPB standards:
  - Consistent and transparent package of harmonized procedures
  - Fit for use in the context of building regulations
- But clearly identified options and national data remain necessary due to differences in
  - climate
  - culture and building tradition
  - building typologies
  - policy
  - legal frameworks
    (including the type and level of quality control and enforcement)

Flexible: “National Annexes”

- Each EPB standard has a **template** for a **national annex** that enables Member States to tailor the methodology to the national situation
- Examples of types of choices:
  - Climatic data
  - Policy factors (e.g. primary energy conversion)
  - Building categories, space categories
  - Set of user conditions per space category
  - Choice between specific detailed or simplified procedures
  - Default values for specific components or products
  - Replacement of specific EPB standards by national procedures (to enable a “step by step” implementation of the whole set)



A.3 Selection of main method

Table A.2 — Choice between hourly or monthly calculation

Type of object and/or application	….. [b]
Description	Choice [a]
Only hourly method allowed	Yes/No
Only monthly method allowed	Yes/No
Both methods are allowed	Yes/No

[a] Only one Yes per column possible.

[b] Add more columns if needed to differentiate between type of object, type of or type of assessment. Use the list of identifiers from ISO 52000-1:2017, Tables informative default choices in Tables B.2 to B.7).

The role of the EPB Center

- Support Member States and National Standardization Bodies (NSB) to complete the national annexes of the overarching EPB standards
- Disseminate information and promote the use of the overarching and other EPB standards
- Information services for all involved stakeholders, such as industry, researchers, engineers and building professionals, financial institutions on the EPB standards

Knowledge tools

- FAQ on key issues (*How to fill in the annexes? How to use the standards?, How to find my way…, How to understand…., Where to find…..*)
- Calculation tools for key individual standards
- Case studies: pool of practical examples tailored to the needs of different stakeholders

- Hands-on workshops and offline training sessions
- EPB Standards webinar series

National Annexes to the 'overarching' standards

Priority is given to the 'overarching' standards: mentioned in Annex 1 of the revised EPBD.

Each standard describes an important step in the assessment of the energy performance of buildings

EN ISO 52000-1: Weighted overall (primary) EP, share of renewables

- EN ISO 52003-1: Overall EP indicators
- EN ISO 52010-1: Climatic data for energy calculations
- EN ISO 52016-1: Energy needs (heating/cooling) and indoor temperatures
- EN ISO 52018-1: EP indicators at building fabric level

Case Studies

- Two types are considered: Partial and full EP calculations
  - Preparation of case studies of the application of the standards in real buildings, both residential and non-residential, across the 28 Member States and the various climatic zones of Europe
  - Mostly as partial case studies, together with a few case studies covering simplified full EP calculations.

Database of Frequently Asked Questions

- The frequently asked questions will first be formulated on current experience and questions already posed to members of the consortium
- When this is placed on the website and communicated (e.g. e-newsletters), it will trigger new questions and answers
  - *A well-structured Q&A section on the website, with links to more information, will also help to find your way through the information*
- Most of the FAQs will be gathered via various parties and contacts

Thank you!

EPB Center is also 'available' for specific services requested by individual or clusters of stakeholders.

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The national implementation process of the EPB standards in Romania

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The national implementation process of the EPB standards in Romania

The new set of EPB standards: 89 European / international standards and standardization documents

- 49 standards
- 38 technical reports
- 2 technical specifications

All published standards and standardization documents have been adopted as national standards by publication of the Romanian version:

- 48 standards (2017-2018)
- 37 technical reports (2017-2018)
- 2 technical specifications (2015)

EN 16798-1:2019 and CEN/TR 16798-2:2019 have just been published (May 1st) and will soon be adopted as national standards (Romanian version)

The national implementation process of the EPB standards in Romania

To allow for necessary **national and regional differentiation** and facilitate the **implementation** and the **setting of requirements** by the Member States, flexibility is required.

For each individual country, the development of a consistent set of national annexes for each EPB standard is required

42 standards require the development of national annexes:

- 5 general standards
- 12 standards related to the building as such
- 25 standards related to the technical systems of the building

The national implementation process of the EPB standards in Romania

EPB standards provide a certain flexibility with regard to

- the methods
- the required input data (or methods to obtain that data)
- references to other EPB standards

Flexibility is ensured by the introduction of:

- a **normative template** in Annex A to specify **the mandatory national/regional choices**
- **informative default choices** in Annex B.

Mandatory choices are given by **regulators** at national or regional level for specific applications

Choices and input data are indispensable for the application of the standards:

- **geographical** data (e.g. altitude of the location)
- **climatic** data (e.g. external design air temperatures for summer and winter, wind speed, direct solar irradiance)
- **technical** data (e.g. calculation procedures, equipment life span, adjustment factors)
- **financial** data (e.g. electricity price, water price, exchange rate, interest rate)

Note: **Due to strong variety of climatic data in scale and detail on international level, Annex B in EN 12831-1:2017** (Energy performance of buildings - Method for calculation of the design heat load - Part 1: Space heating load) **does not provide default data for external temperatures!!!**

Development of the national annexes consists of:

- acquisition of climatic data (from the National Meteorological Administration)
- processing of climatic data
- research activities
- drafting of the annexes

The national implementation process of the EPB standards in Romania

NTCs in charge of EPB standards have analysed the standards and selected **the national annexes to be developed first**:

- **SR EN ISO 52010-1:2017** *Energy performance of buildings — External climatic conditions — Part 1: Conversion of climatic data for energy calculations*
- **SR EN ISO 52016-1:2017** *Energy performance of buildings — Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads — Part 1: Calculation procedures*
- **SR EN 12831-1:2017** *Energy performance of buildings - Method for calculation of the design heat load - Part 1: Space heating load, Module M3-3*
- **SR EN 16798-1:2019** *Energy performance of buildings - Ventilation for buildings - Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics - Module M1-6*

The national implementation process of the EPB standards in Romania

Current situation

- Discussions are taking place with the competent authority (**MRDPA**) on the development of the first national annexes
- *"Methodology for the assessment of energy performance of buildings"* - in preparation (MRDPA contract) – soon to be published - includes references to EPB standards → application and use of EPB standards will be mandatory in Romania

Current situation

- One NTC member (AIIR - Valahia) is a partner in a Horizon 2020 Project (**U-CERT** - Towards a new generation of User centred Energy Performance Assessment and Certification; facilitated and empowered by the EPB centre)
- One of the project's objectives is to assist and facilitate the development of the national annexes

Who we are?

Thank you for your attention!

Romanian Standards Association
Mendeleev 21-25, Bucharest, 1st District, 010362

romania2019.eu

www.asro.ro | www.magazin.asro.ro

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EN ISO 52016-1 Energy need calculation (heating/cooling) and calculation of indoor temperaturs: hourly or monthly?

Dick van Dijk

Senior expert EPB Center

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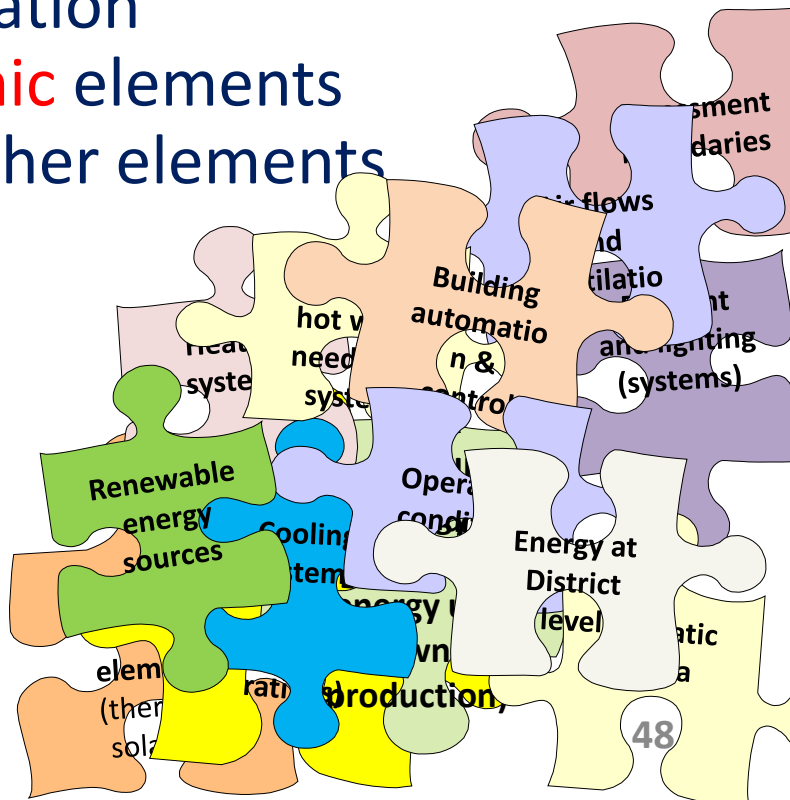
From yearly to hourly calculations

- EN ISO 52000-1, the overarching EPB standard, lists different options for the time interval for the calculation of the overall energy performance:
  - Hourly
  - Monthly
  - Seasonal
  - Yearly
  - Bin

Monthly or hourly calculations...

Holistic approach!

- The choice can be different per element in the calculation
- But within the overall EPB calculation there are several strongly dynamic elements that dynamically interact with other elements
- ➔ increasingly problematic for the *quasi-static monthly method* to cope with these dynamic effects
- ➔ *New hourly method* in EN ISO 52016-1 is the better alternative



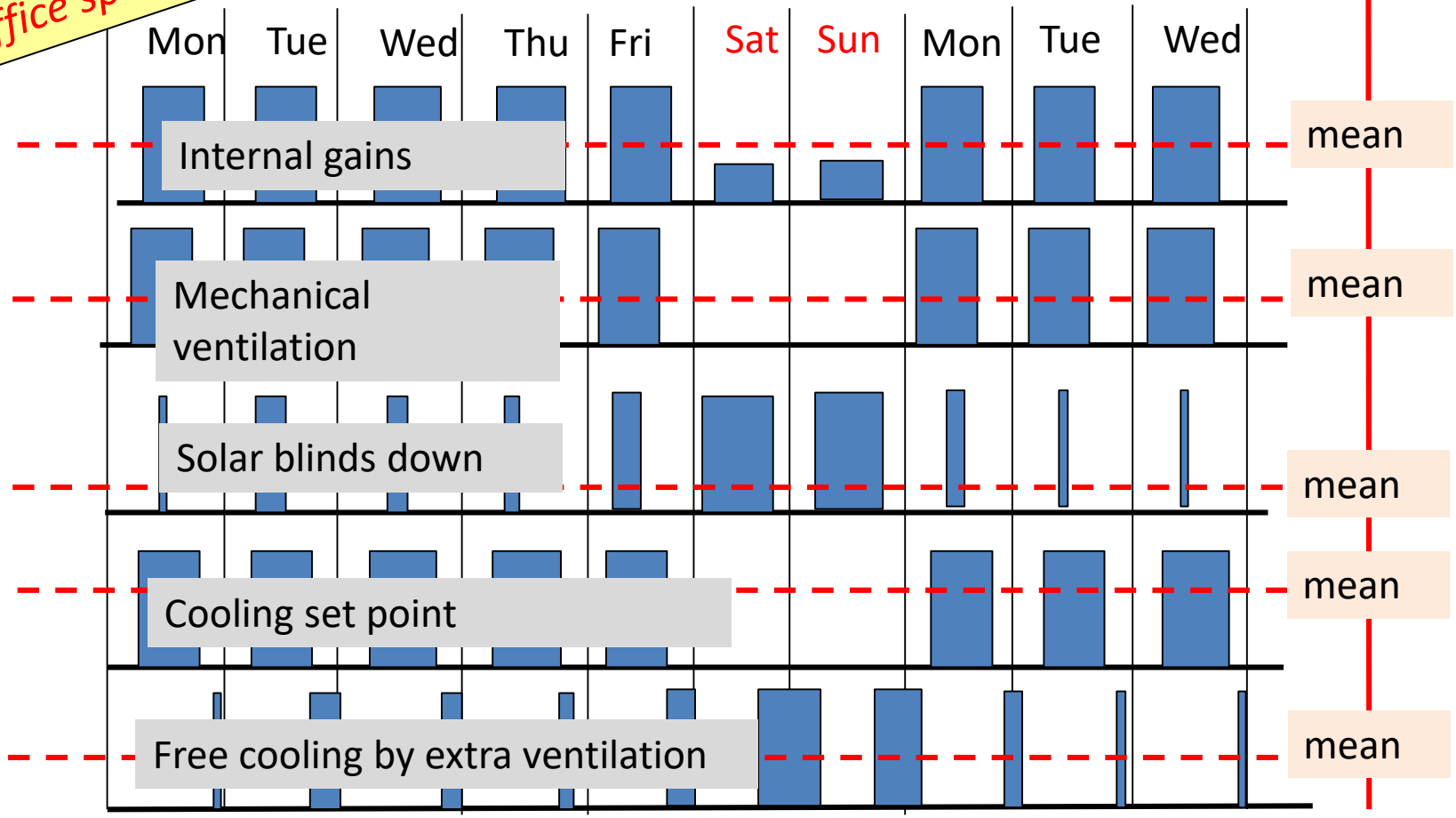
Monthly or hourly calculations

- The operation or performance of many technologies strongly varies in time: as function of weather, indoor environment requirements or use pattern (day/night, week/weekend)
  Examples:
  - Operation of
    - Solar blinds
    - Mechanical ventilation
    - Ventilative cooling
  - Heat accumulation (building mass)
  - Mechanical cooling need
  - Heat pump performance
  - ….

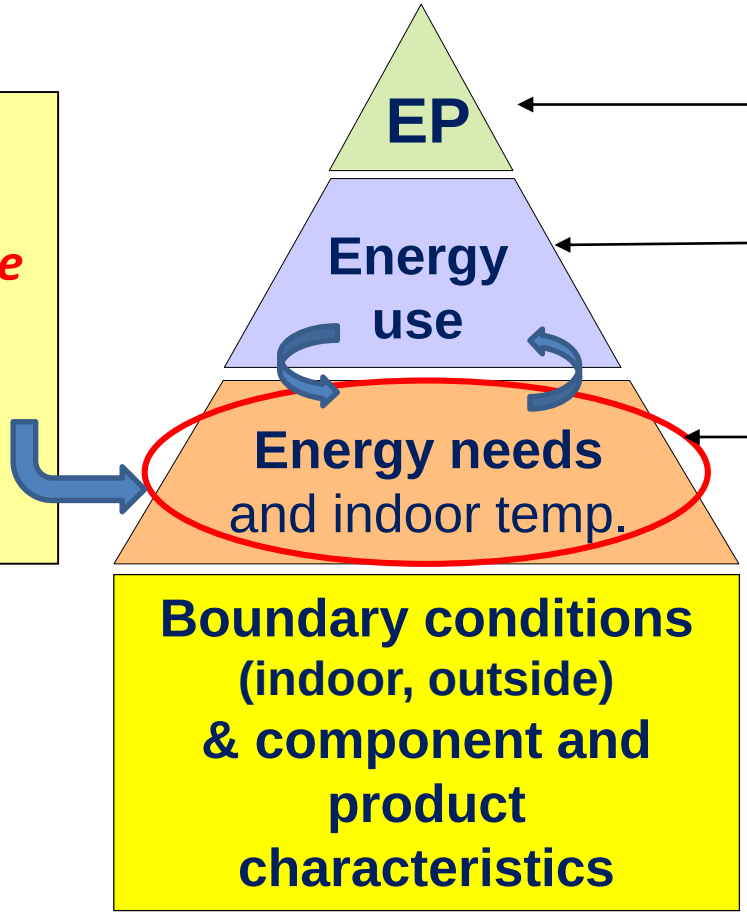
- Monthly calculation method:
  - Mean values over whole month
  - with correction factors for the dynamic effects

Hourly variations vs monthly mean

Illustration
e.g. office space



Hourly calculation procedures of energy needs and indoor temperatures



The core standard for the choice between monthly or hourly calculations

EN ISO 52000-1
Overarching EPB standard

EN xxxx
Suite of system standards

EN ISO 52016-1
Calculation of energy needs for heating and cooling, internal temperatures and sensible and latent heat loads

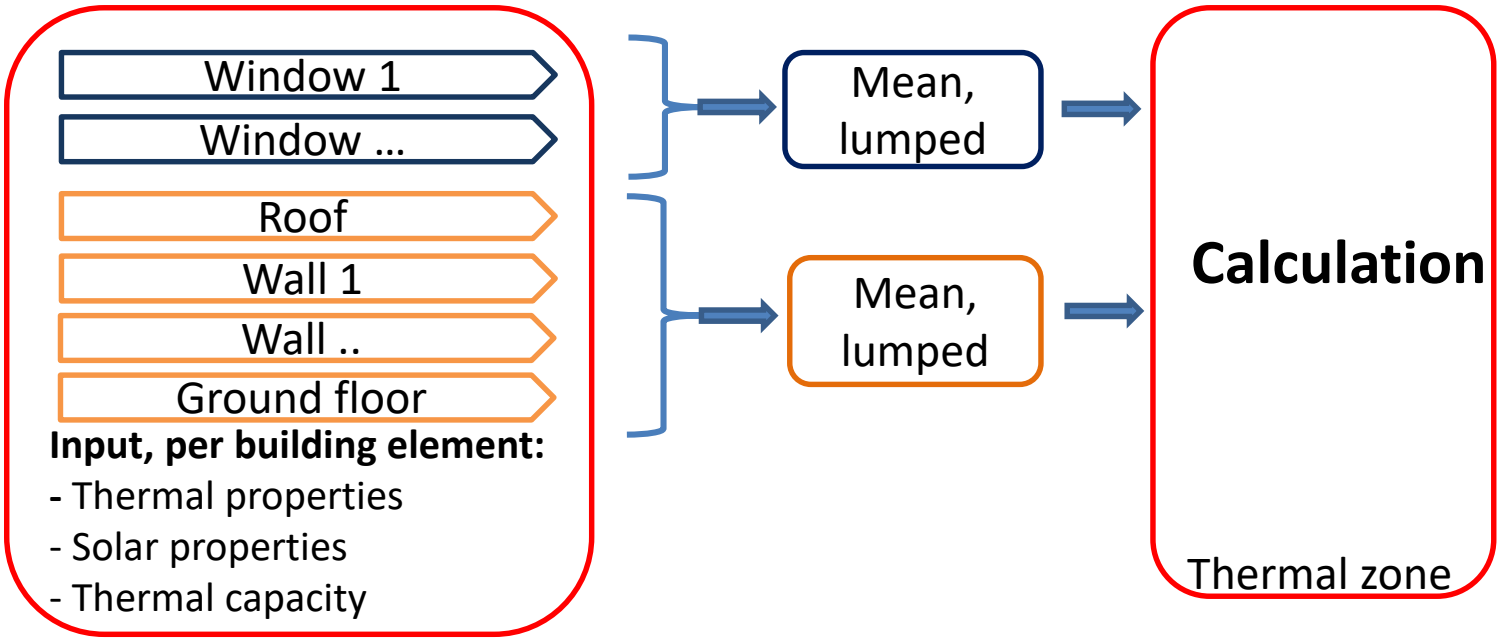
EN ISO 52016-1

Energy performance of buildings – Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads– Part 1: Calculation procedures

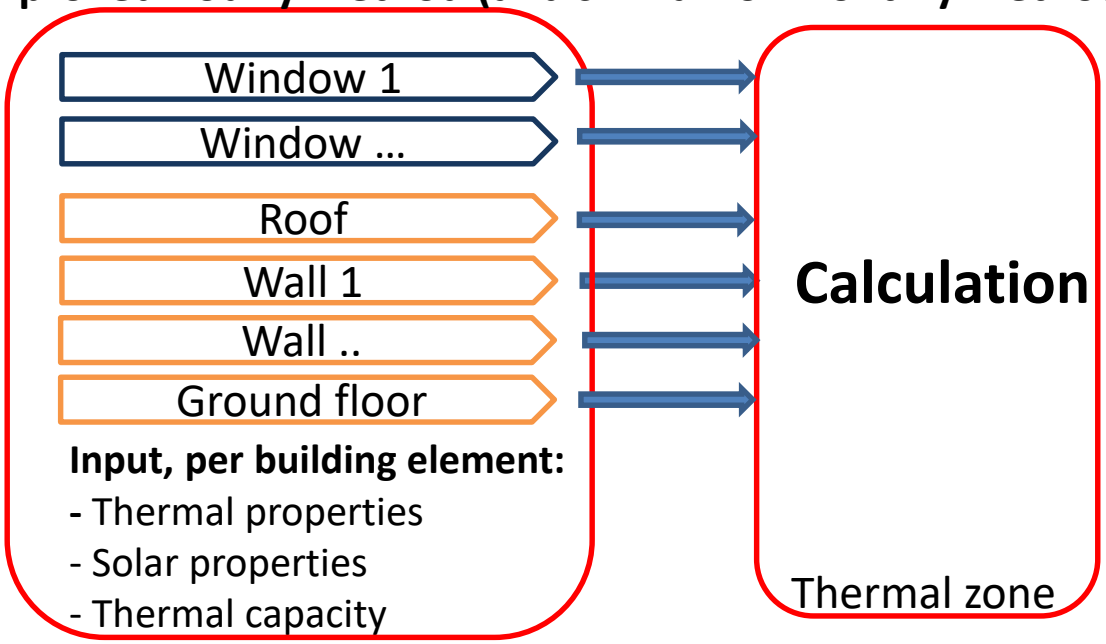
Description:

- EN ISO 52016-1:2017 (replacing EN ISO 13790:2008)
  - Contains (improved) -fully described- **hourly** calculation method
  - Contains (improved) **monthly** calculation method
  - **NEW! Hourly method has been tailored to the goal**: the input data asked from the user are the same for hourly and monthly method

a) Simplified hourly method in ISO 13790:2008



b) Improved hourly method (and similar for monthly method) in ISO 52016-1



Result:

- No longer loss of information per building element
- Differences in individual building elements are respected

EN ISO 52016-1: parallel hourly and monthly calculation methods

Hourly calculation of
- energy needs for heating and cooling
- both sensible and latent heat
- indoor temperatures
- heating and cooling load

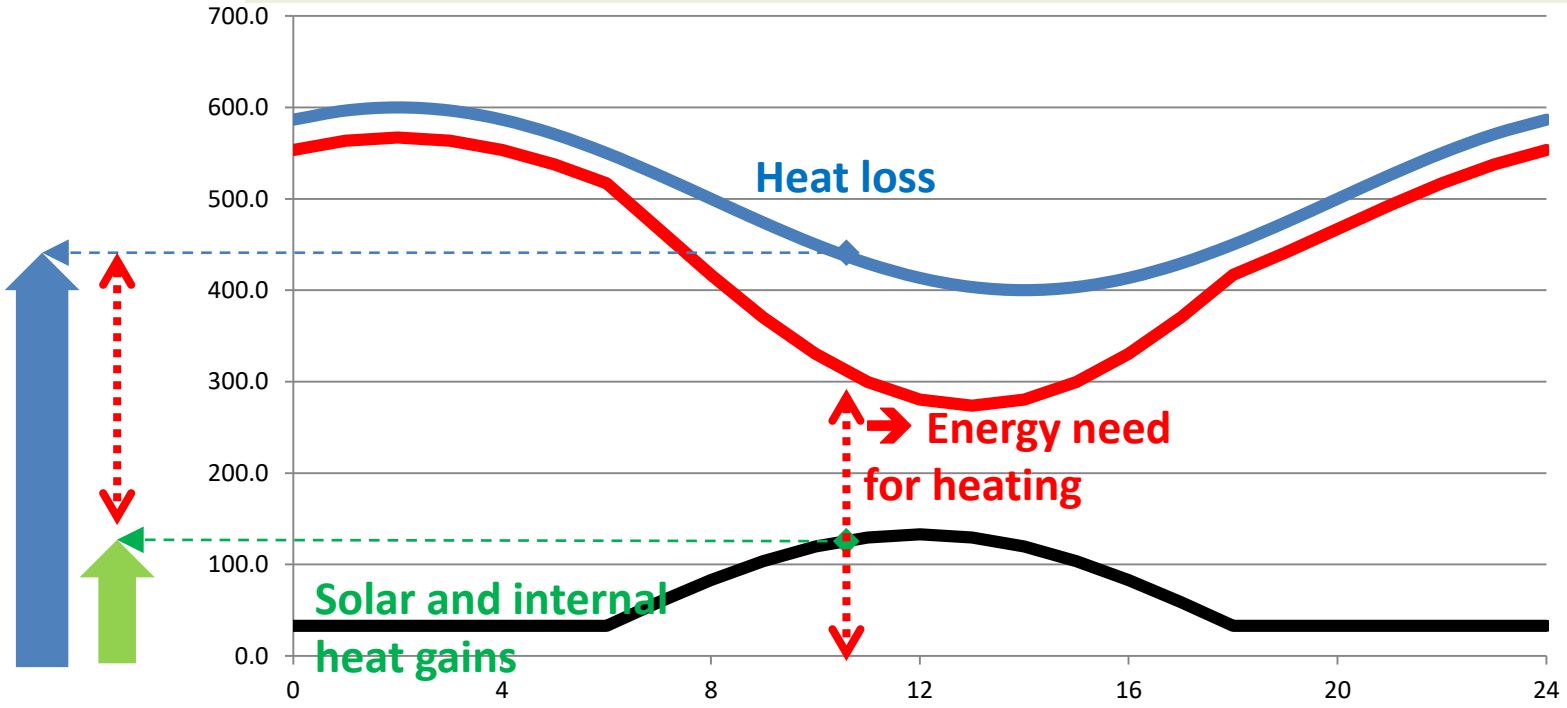
Same input data and boundary conditions

Extra output:
- Monthly characteristics
- Can be used as basis for generating or validating correlation factors for monthly method

Monthly calculation of energy needs for heating and cooling
- using national correlation factors to take into account dynamic effects
  - E.g. solar and internal gains, varying conditions of use (temperature and ventilation settings), ..

Demonstrated in Spreadsheet (update in preparation)

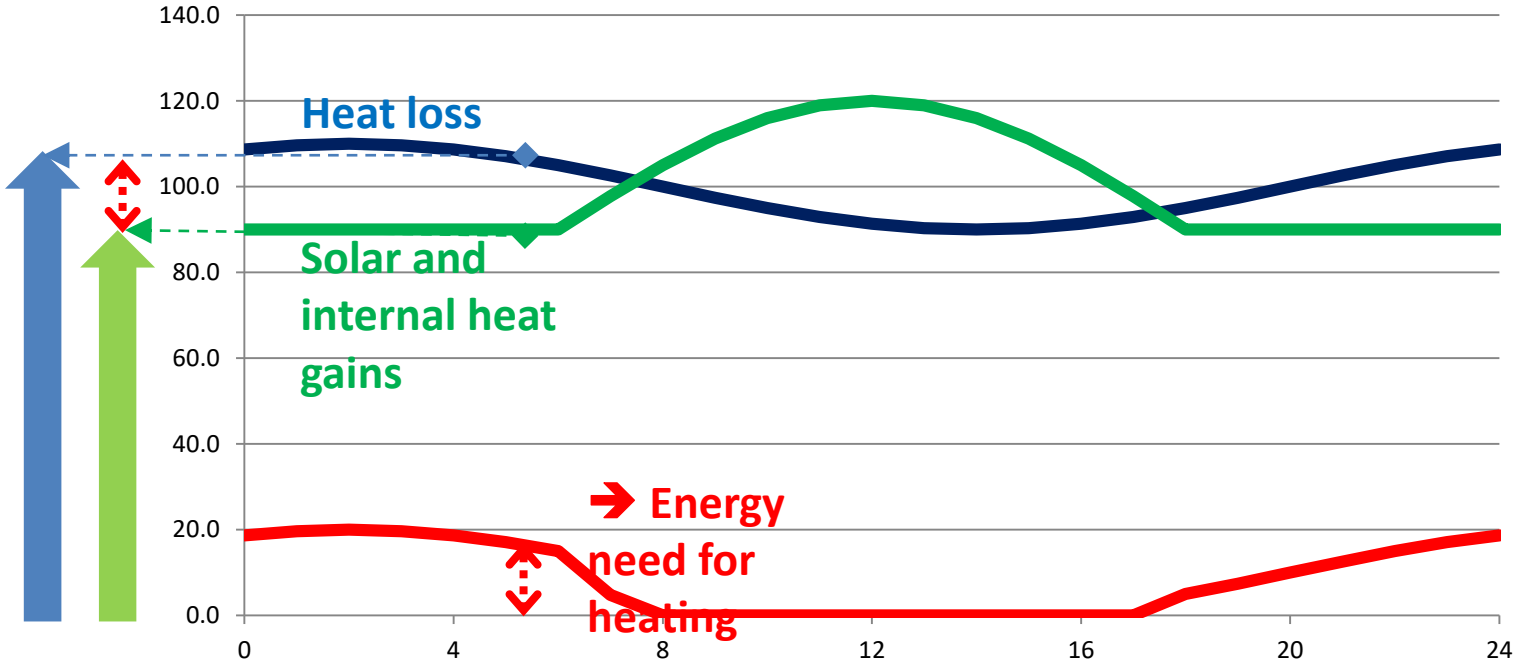
Buildings in the past



In the past:

- The high heat losses dominated the thermal balance
- A monthly calculation method leads to sufficiently accurate, transparent and robust results

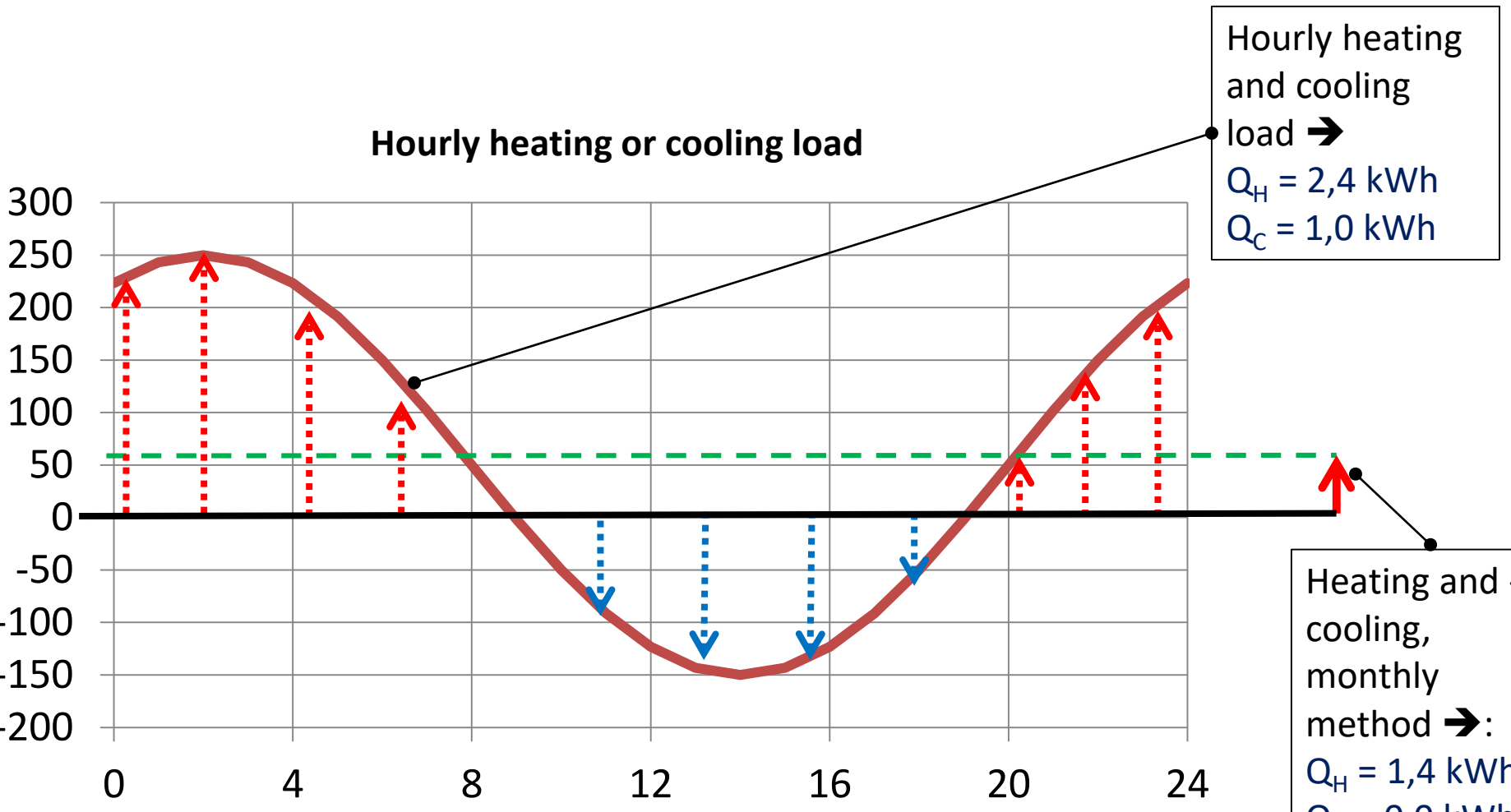
Low energy buildings



Now (new buildings or major renovation):

- The heat losses are low and no longer dominating
- Very difficult to find proper and robust correction factors for the monthly calculation method
- ➔ The monthly calculation method becomes **less** accurate, **less** transparent and **less** robust

Even possible:



EN ISO 52016-1: bridge from energy needs to systems

- EN ISO 52016-1 can also be run in a so called "**system specific mode**", taking into account the impact of:
  - **undersized** heating or cooling **power**
  - **recoverable** heat **losses**
  - adjustment of the **temperature set-points** (value and time-schedule) due to **imperfect** system **control**
  - **limitation** of heating or cooling **season** for the calculation defined by the **operation time** of the respective technical systems
- And vice versa:
  - the hourly heating and cooling **load** and indoor **temperature** calculated in EN ISO 52016-1 can be used in the system standards as parameters that may have an **impact on the performance** of the technical systems and their components

Conclusion

- The main choice between a monthly or hourly calculation method is at level of calculation of heating and cooling needs and indoor temperature (EN ISO 52016-1)
- The hourly method in EN ISO 52016-1:
  - Is transparent, robust and reproducible (➔ *fit for use in context of building regulations*)
  - Is tailored to the goal: to take into account dynamic interactions
  - Requires not more input data from the user than the monthly method

Conclusion

- The hourly method in EN ISO 52016-1 *(continued)*:
  - Can be used to validate or find the limits of a monthly method
  - Provides a bridge to interactive system performance calculation
    - via the “system specific calculation mode”
    - via exchanging input and output to/from system standards on hourly basis

Thank you!

EPB Center is also 'available' for specific services requested by individual or clusters of stakeholders

More information on
the set of EPB standards:

www.epb.center

Contact: info@epb.center

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CLIMA 2019 Workshop nº 5

SUPPORTING DISSEMINATION AND ROLL-OUT OF THE SET OF ENERGY PERFORMANCE OF BUILDING (EPB) STANDARDS

EN 16798-5-13 How to use the set of ventilation and cooling standards?
Coordination issues with heat pump calculation (EN 15316-4-2)

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Workshop organized by the EPB Center under Service Contract with the European Commission, in collaboration with

REHVA Federation of European Heating, Ventilation and Air Conditioning Associations

EPEE The voice of the heating, cooling and refrigeration industry

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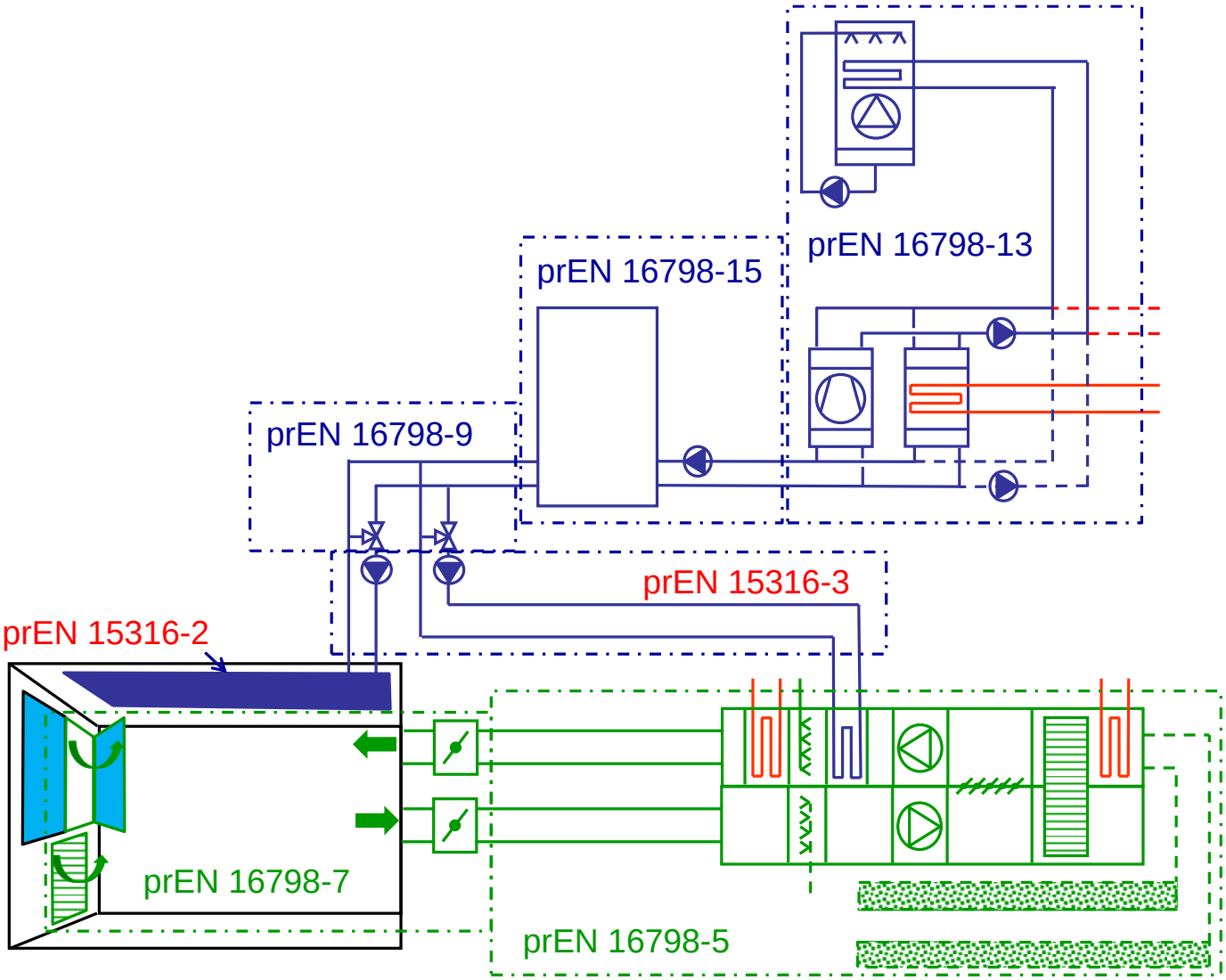
26 - 29 May, Bucharest, Romania

Overview


prEN 16798-13
prEN 16798-15
prEN 16798-9
prEN 15316-3
prEN 15316-2
prEN 16798-7
prEN 16798-5

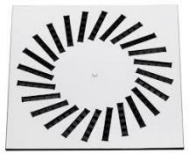
Ventilation standards

- **EN 16798-5-1:** Energy performance of buildings — Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8 — Ventilation for buildings — Calculation methods for energy requirements of ventilation and air conditioning systems — Part 5-1: Distribution and generation (revision of EN 15241) — method 1
- **EN 16798-5-2:** Energy performance of buildings — Modules M5-6.2, M5-8.2 — Ventilation for buildings — Calculation methods for energy requirements of ventilation systems — Part 5-2: Distribution and generation — Method 2
- **EN 16798-7:** Energy performance of buildings — Part 7: Ventilation for buildings — Module M5-5— Calculation methods for the determination of air flow rates in buildings including infiltration

Ventilation standards – “emission” (= air flow rate calculation)

EN 16798-7:

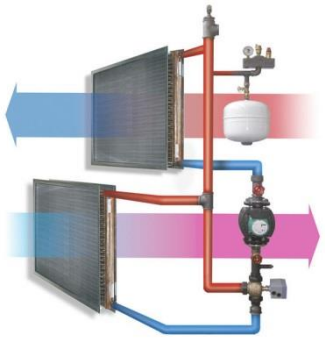
- Mechanical and natural ventilation
  - mechanical ventilation systems (mechanical exhaust, mechanical supply or balanced system)
  - passive duct ventilation systems for residential and low-rise non-residential buildings;
  - combustion appliances
  - window openings (manual or automatic operation)
  - kitchens where cooking is for immediate use (including restaurants)
- 2 Methods:
  - based on detailed building characteristics
  - based on statistical approach
- Monthly or hourly time step
- Connections to EN 16798-1 and/or EN ISO 52016-1
  - e.g. required flow rates

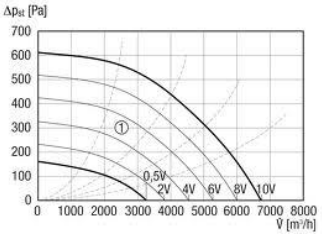



e.g. heating/cooling requirement for air based system

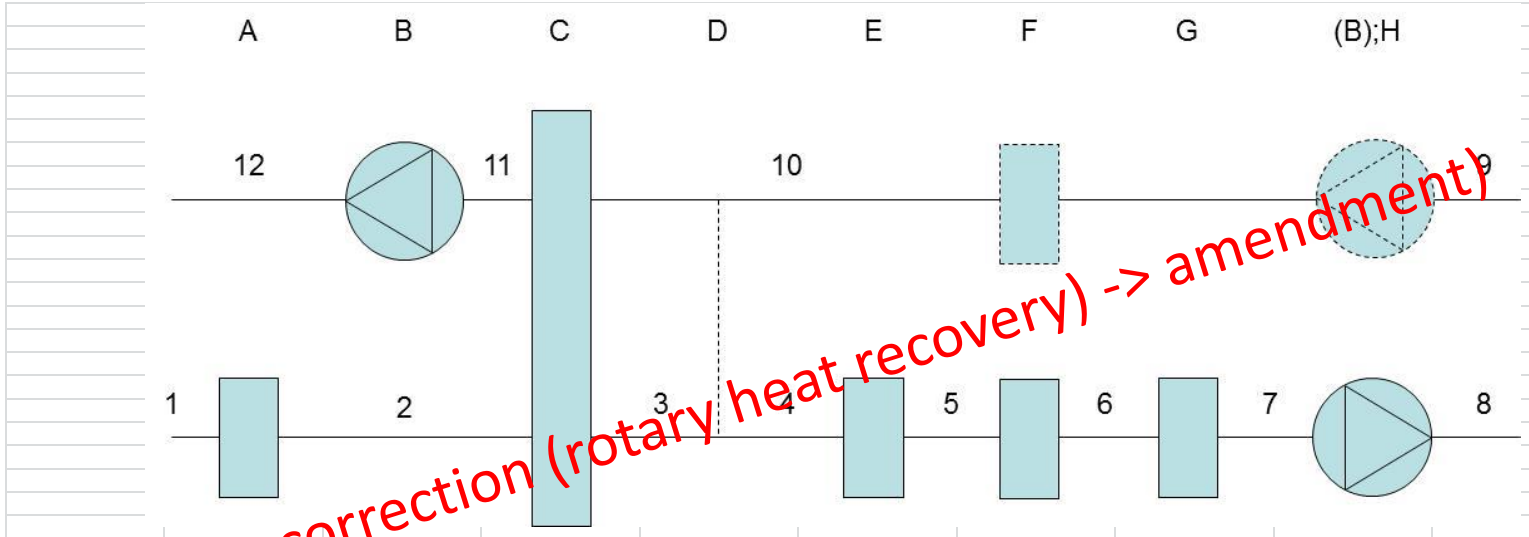
Ventilation standards – “distribution” (= ducts) and “generation” (= AHU)

- **EN 16798-5-1:**
  - Comprehensive ventilation and air conditioning system calculation
  - Hourly time step (or bin -> multiple criterion)
  - Services: Ventilation, heating, cooling, humidification, dehumidification
  - Technologies: Ground air preheating /-cooling, recirculation, heat recovery (plate, rotary, pumped circuit, incl. humidity recovery and frost protection), adiabatic cooling





EN 16798-5-1: Fully functional spreadsheet with choice menu



Updated: Error correction (rotary heat recovery) -> amendment)

General	A	B	C	D	E	F	G	H
Volume flow rates	Frost protection / ground preheating/-coo-ling	Exhaust air fan	Heat recovery	Recirculation	Cooling / dehumidification	Humidification	Heating	Supply fan
perflex								
Air handling unit localosation	Ground air preheating and -cooling	localisation	Heat recovery type			Humidifier type		Fan motor localisation
NC	NONE	UP_HR	ROT_HYG	yes		CONTACT		OUTS_AIR
Supply air temperature control	Frost protection type		only for FLAT_PLATE and ROT_HYG	Recirculation control		humidifier control		System type for variable air volume flow rate fan energy calculation
ODA_COMP	PREH		Residential	VARIABLE		ON_OFF		SINGLE_ZONE
Control of the volume flow rate	Control of the frost protection		Control of the heat recovery device			humidification energy carrier		Control of the fan
ODA_COMP	INDIRECT		SPEED			HUM_CR_EL		DIRECT
System type						Adiabatic cooling		localisation
else						no		UP_HR

Ventilation standards – “distribution” (= ducts) and “generation” (= AHU) II

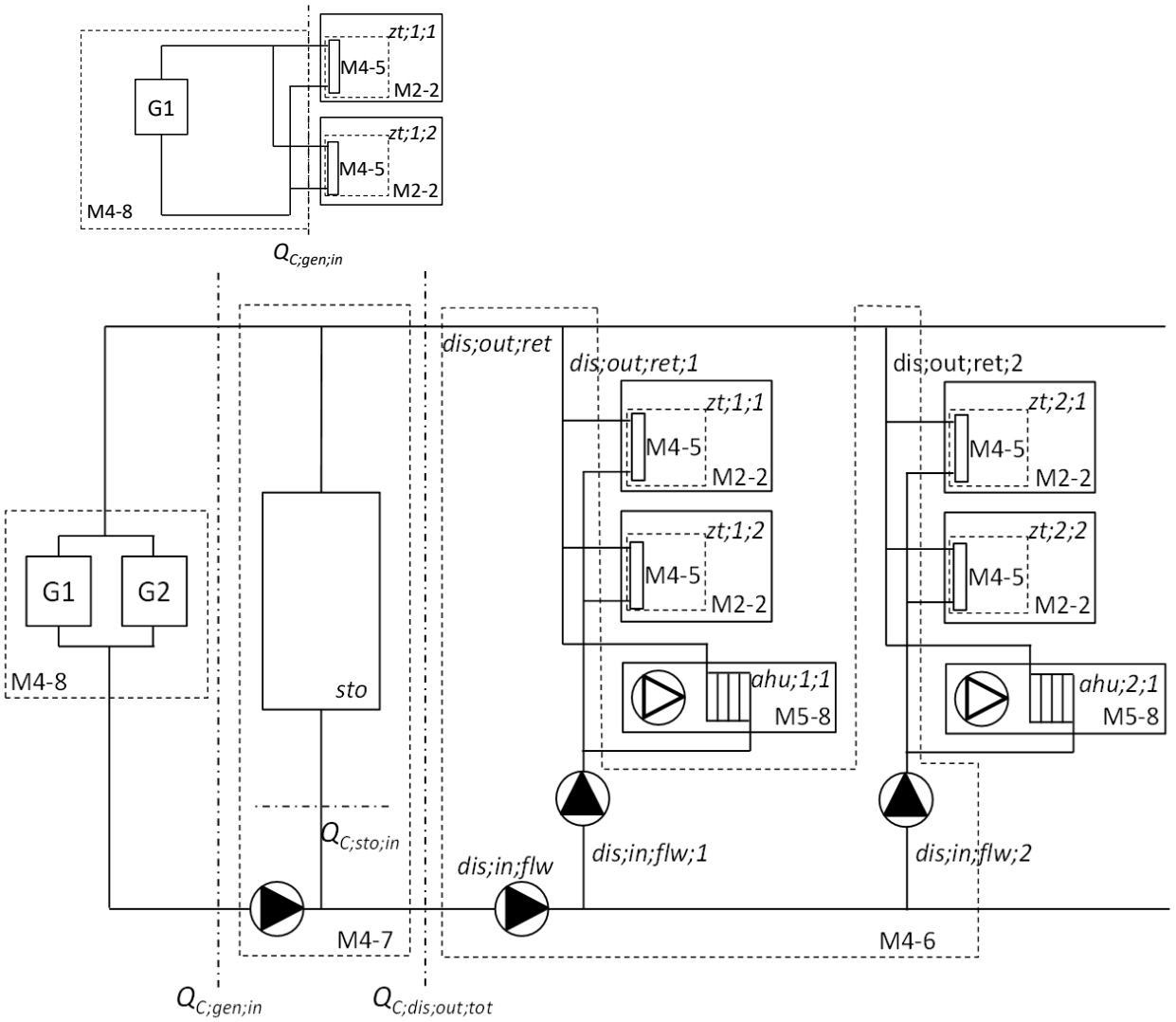
- **EN 16798-5-2:**
  - Simplified calculation for compact systems
  - Monthly, seasonal, bin
  - Services: Ventilation, heating, cooling
  - Includes generation for heating, cooling, DHW
  - Not restricted to residential

Cooling standards

- **EN 16798-9:** Energy performance of buildings - Part 09: Ventilation for buildings - Module M4-1, M4-4, M4-9 - Calculation methods for energy requirements - Calculation methods for energy requirements of cooling systems - General
- **EN 16798-13:** Energy performance of buildings - Part 13: Module M4-8 - Calculation of cooling systems - Generation
- **EN 16798-15:** Energy performance of buildings - Part 15: Module M4-7 - Calculation of cooling systems - Storage

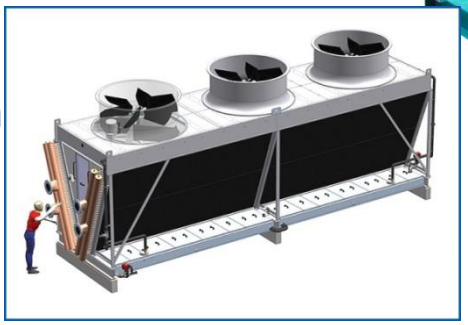
EN 16798-9: Cooling - general

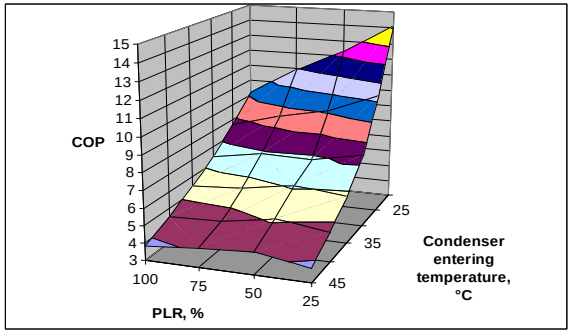
- Interconnection of modules
- Simplified method
  - zone emitter based DX systems
  - air distribution based DX systems
  - Water based
  - Schematics: TR 16798-10
- Detailed method
  - Interconnected set of spreadsheets for set up in schematic
  - Reported in TR 16798-10



EN 16798-13: Cooling generation

- 2 Methods
  - Method A: hourly – **much simpler!**
  - Method B: monthly
- Compression and absorption chillers
- Multiple generators
- “Free cooling” option
  - Direct cooling through heat rejection
- Heat rejection types
  - Air cooled condenser
  - Dry, wet, hybrid
  - Control
- Connection to product standards:
- Data from: EN 14825 / EN 14511 / default

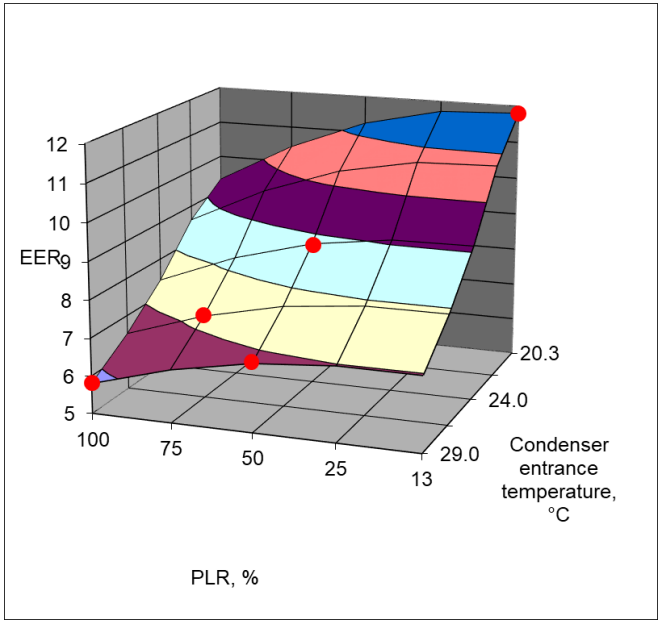




EN 16798-13 Cooling generation data example

- Data example:
  - Quantum W110-P2G-LL
  - Data for 5 PLR and 2 sets of condenser entrance temperature provided by supplier
  - Selection of 5 data points entered in EN 16798-13 spreadsheet
  - > Performance map

	%	100	75	50	25	13 [Min]	100	75	50	25	17 [Min]
Kälteleistung Qo	kW	900	675	450	225	117	900	675	450	225	153
Verflüssigerleistung Qk	kW	1056	769	501	245	127	1056	780	517	256	177
Elektrische Leistungsaufnahme	kW	156	94	51	20	10	156	105	67	31	24
EER		5,8	7,2	8,8	11,3	11,8	5,8	6,4	6,8	7,3	6,5
Verdampfer											
Kälteträger / Konzentration		Wasser / 0 %					Wasser / 0 %				
Volumenstrom	m³/h	128,8					128,8				
Eintrittstemperatur Kälteträger	°C	14,0	12,5	11,0	9,5	8,8	14,0	12,5	11,0	9,5	9,0
Austrittstemperatur Kälteträger	°C	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0
Druckabfall gesamt	bar	0,29					0,29				
Verschmutzungsfaktor	m²K/W	0,000018					0,000018				
Passzahl		2					2				
Verflüssiger											
Wärmeträger / Konzentration		Wasser / 0 %					Wasser / 0 %				
Volumenstrom	m³/h	152,3					152,3				
Eintrittstemperatur Wärmeträger	°C	29,0	26,5	24,0	21,5	20,3	29,0	29,0	29,0	29,0	29,0
Austrittstemperatur Wärmeträger	°C	35,0	30,9	26,8	22,9	21,0	35,0	33,4	31,9	30,5	30,0



Coordination of cooling and heating generation standards

- Several issues:
  - Different calculation methods
    - Although same data base EN 14825
    - Problem?
  - EN 15316-4-2 unclear and no actual spreadsheet
    - Not covering all heat sources
  - Devices providing both services
    - One service has priority -> method from there, to be explained
    - On cooling side: EN 16798-13 offers heat to be rejected for recovery
  - DX systems
    - Not found in EN 16798-13 -> EN 16798-9 (see above), to be explained
  - Ad hoc group CEN TC 156/228 underway
- -> Tasks for EPB Center!

Thank you!

EPB Center is also 'available' for specific services requested by individual or clusters of stakeholders

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CLIMA 2019 Workshop nº 5

SUPPORTING DISSEMINATION AND ROLL-OUT OF THE SET OF ENERGY PERFORMANCE OF BUILDING (EPB) STANDARDS

Questions and answers

(16h40 – 16h50)

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CLIMA 2019 Workshop nº 5

SUPPORTING DISSEMINATION AND ROLL-OUT OF THE SET OF ENERGY PERFORMANCE OF BUILDING (EPB) STANDARDS

The use of EPB standards Synergies with linked EU projects: CEN-CE & ALDREN

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EU projects facilitate transposition of revised EPBD and support the implementation of EPB standards

Example: The ALDREN project

	T2.1 Overall integration	T2.2 EVCS	T2.3 Measured energy	T2.4 Health Wellbeing	T2.5 Financial evaluation	T2.6 Building passport	T3.2 Training
Art 1 Amendments Directive 2010/31/EU							
'(2) Article 2a Long-term renov. Strategy							
(g) **evidence of expected energy savings** and related to **health, and air quality**.							
3. mobilisation of investments							
(b) the **reduction** of the **perceived risk**							
(4') Article 7 existing buildings							
high-efficiency alternative systems and shall **address healthy indoor climate**'.							
(6) Article 10							
'6. **link their financial measures** to the targeted or **achieved energy savings**							

ALDREN outcomes are related to 17 paragraphs of EPBD amendments

Standardisation = "Common European"
Why « Common European» transposition of the EPBD is key ?

Qst	Methodology	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	Scr
5.1	All build. cat. covered?	y	n	n	n	y	y	y	y	y	y	y	y	p	p	y	y	y	p	p	y	y	y	p	y	y	y	y	y	y	y	y	p	y	y	y	-12
1.1	Building definition fits?	y	p	p	p	y	y	y	y	y	y	y	y	p	y	y	y	y	p	p	p	y	y	y	p	y	y	y	y	y	y	y	y	y	y	y	-8
1.2	Is the EP determined?	y	y	y	y	y	y	y	y	y	y	y	y	p	y	y	y	y	p	p	y	y	y	p	y	y	y	y	y	y	y	y	y	y	y	y	-4
1.3	All build. services incl.?	y	p	p	p	y	p	y	y	y	y	y	p	p	y	y	y	y	p	p	p	y	y	p	y	y	y	y	y	p	y	y	p	y	y	y	-12
1.4	Typical use addressed?	y	y	y	y	p	y	y	p	p	p	y	p	p	p	y	p	y	y	y	y	p	y	p	y	y	p	y	y	y	p	p	p	p	y	y	-15
2.1	Can EP be compared?	y	p	p	p	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	-3
2.2	EP indicator defined?	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	p	y	y	y	y	y	y	y	y	y	y	y	-1
2.3	PE indicator defined?	y	y	y	y	y	p	y	y	y	y	y	y	p	y	y	y	y	y	y	y	y	y	p	p	p	y	y	n	n	n	n	n	n	n	n	-15
3a.1	Thermal charact. consid?	y	p	p	p	y	y	y	y	y	y	y	y	p	y	y	y	p	y	y	y	y	y	p	p	y	p	p	y	p	p	y	p	p	p	p	-15
3b.1	Hating inst. considered?	y	y	y	y	y	p	y	y	y	y	y	y	0	y	y	y	y	y	y	y	y	y	y	p	y	y	y	y	y	y	y	p	y	y	y	-3
3b.2	DHW inst. considered?	y	p	p	p	y	p	y	y	y	y	y	y	n	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	p	p	y	y	y	-8
3c.1	HVAC inst. considered?	p	y	y	y	p	p	y	y	y	y	y	y	p	y	y	y	p	n	n	p	y	y	p	y	y	y	y	y	p	y	y	p	y	y	y	-13
3d.2	Natural vent. syst. ?	y	y	y	y	p	y	y	y	y	y	y	y	y	y	y	y	y	n	n	n	y	y	n	y	y	y	y	y	n	y	n	p	n	n	n	-20
3d.3	Mech. Vent. Syst. ?	y	y	y	y	p	y	y	y	y	y	y	y	n	y	y	y	y	n	n	p	y	y	p	y	y	y	y	y	p	y	y	p	y	y	y	-11
3e.1	Built in lighting inst. ?	p	p	p	p	y	p	y	y	y	y	y	p	p	y	y	p	y	n	p	p	y	y	p	y	p	p	p	y	p	y	p	p	y	y	y	-19
3f.1	Build. Design consid.?	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	p	y	y	y	-1
3.f.2	Build. Position consid.?	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	p	y	y	y	-1
3.f.3	Outdoor climate?	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	p	y	y	y	-1
3g.1	Passive sol. Sys. Consid	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	n	y	y	y	-2
3g.2	Solar protection?	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	n	y	y	y	-2
3h.1	Indoor climate?	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	p	y	y	y	y	y	y	y	y	y	y	p	y	y	y	-2
3i.1	Internal loads	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	n	y	y	y	-2
4a.1	Local solar exposition?	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	p	y	y	y	-1
4a.2	Active solar systems?	y	y	y	y	p	p	y	y	y	y	y	p	y	y	y	y	y	y	y	n	y	y	y	p	y	p	y	y	y	y	y	p	y	y	y	-8
4a.3	Other renew. heat. syst.?	y	y	y	y	p	p	y	y	y	y	y	y	0	y	y	y	y	y	y	p	y	y	y	y	y	y	y	y	y	y	y	p	y	y	y	-4
4a.4	Other renew. Elect. Syst?	n	y	y	y	p	n	y	y	y	y	y	y	0	y	n	n	y	y	y	n	y	p	y	n	n	y	n	n	y	n	n	n	n	y	y	-24
4b.1	Cogeneration?	n	y	y	y	p	p	y	y	y	y	y	y	n	y	y	y	y	y	y	n	n	p	n	y	n	n	n	y	n	p	n	y	y	y	y	-24
4c.1	District or block heating?	y	y	y	y	y	p	y	y	y	y	y	y	0	y	y	y	y	y	y	n	y	y	n	y	n	y	y	n	n	y	n	p	p	p	p	-16
4c.2	District or block cooling	n	p	p	p	y	n	n	y	y	y	p	n	y	n	y	n	n	n	n	n	n	p	n	y	n	n	n	n	n	n	n	p	p	p	p	-48
4d.1	Natural lighting?	y	p	p	p	p	n	y	y	y	p	p	p	n	p	p	p	p	n	p	p	n	n	p	y	n	n	n	n	p	n	n	n	y	y	y	-39
	Score Annex I	-8	-10	-10	-10	-10	-17	-2	-1	-1	-2	-1	-5	-20	-3	-5	-5	-5	-16	-14	-10	-15	-6	-14	-12	-8	-12	-10	-13	-10	-10	-14	-36	-8	-7	-7	

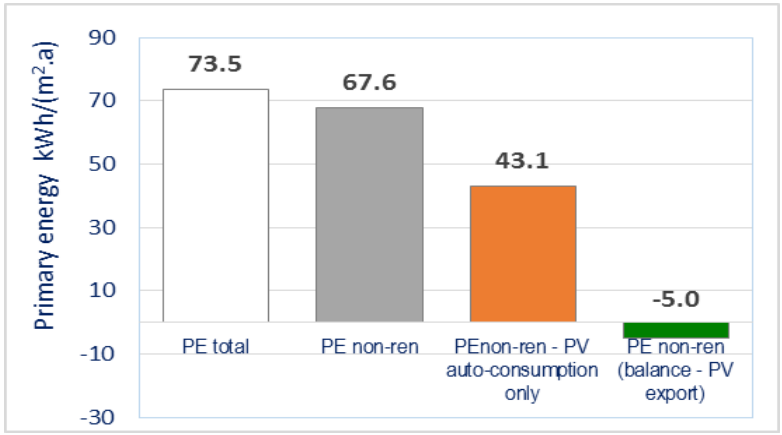
*Analysis of **conformity** to annexe 1 of EPBD (2010) of the **34 !! national and regional transpositions** (study made in 2014)*

Only a **common European transposition** will allow:

- to be able to work on the "other side of the border",
- to have a "level playing field" (fair competition) for products,
- to get common databases, common information.

An example: Performance INDICATORS

EPBD: The **energy performance** of a building shall be expressed by a **numeric indicator of primary energy use in kWh/(m².y)…..**



Example:
*primary energy for the **same** building **from 73 to -5 kWh/m²y***

no comparability

Need for a **common indicator**

Need for a **common rating** (scale)

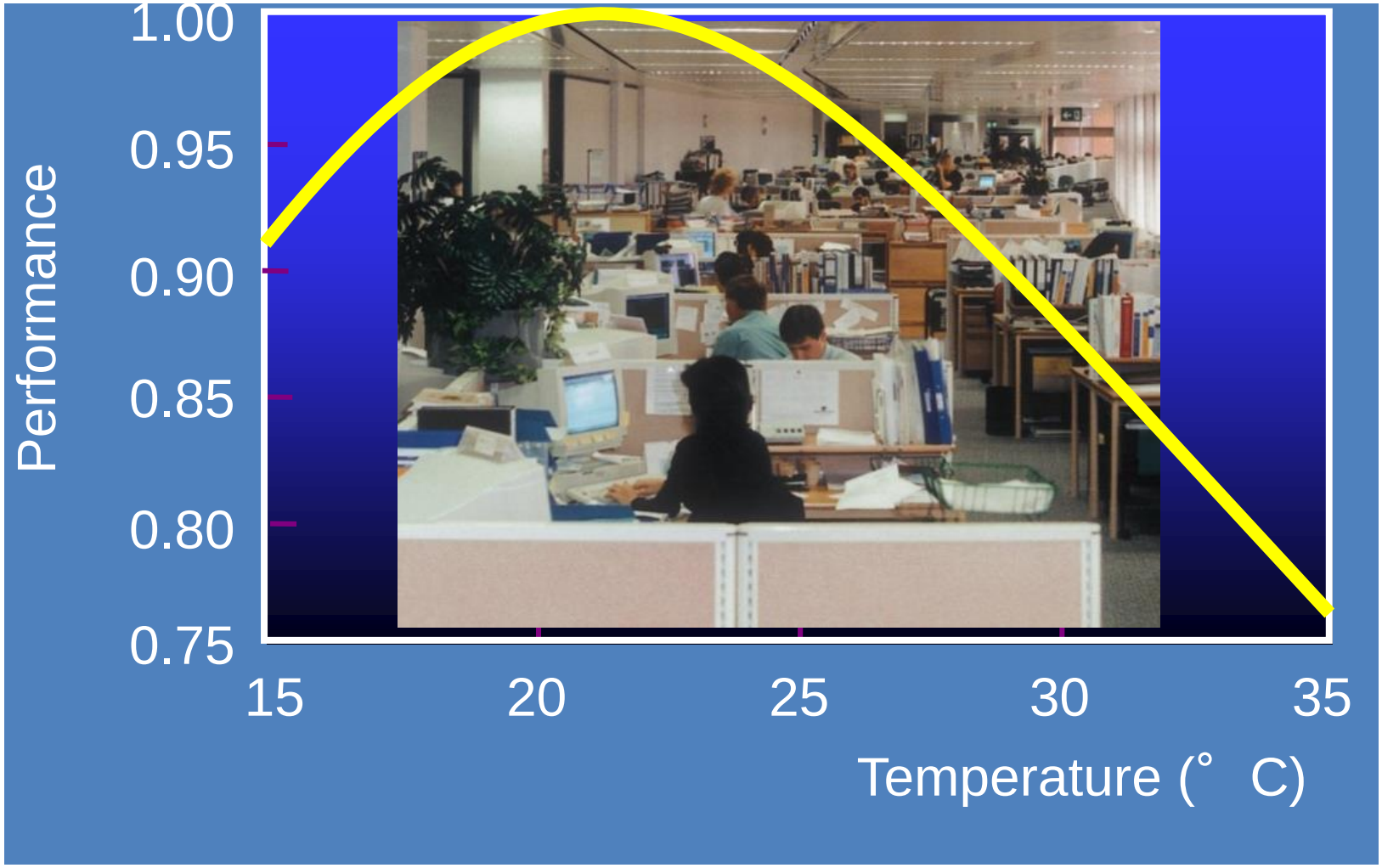
➢ **ALDREN'S MAIN INDICATOR BASED ON CEN STANDARDS:**

non-renewable primary energy balance
with compensation by exported energy

But also all indicators included, required by existing schemes (DGNB, IVE, HQE)

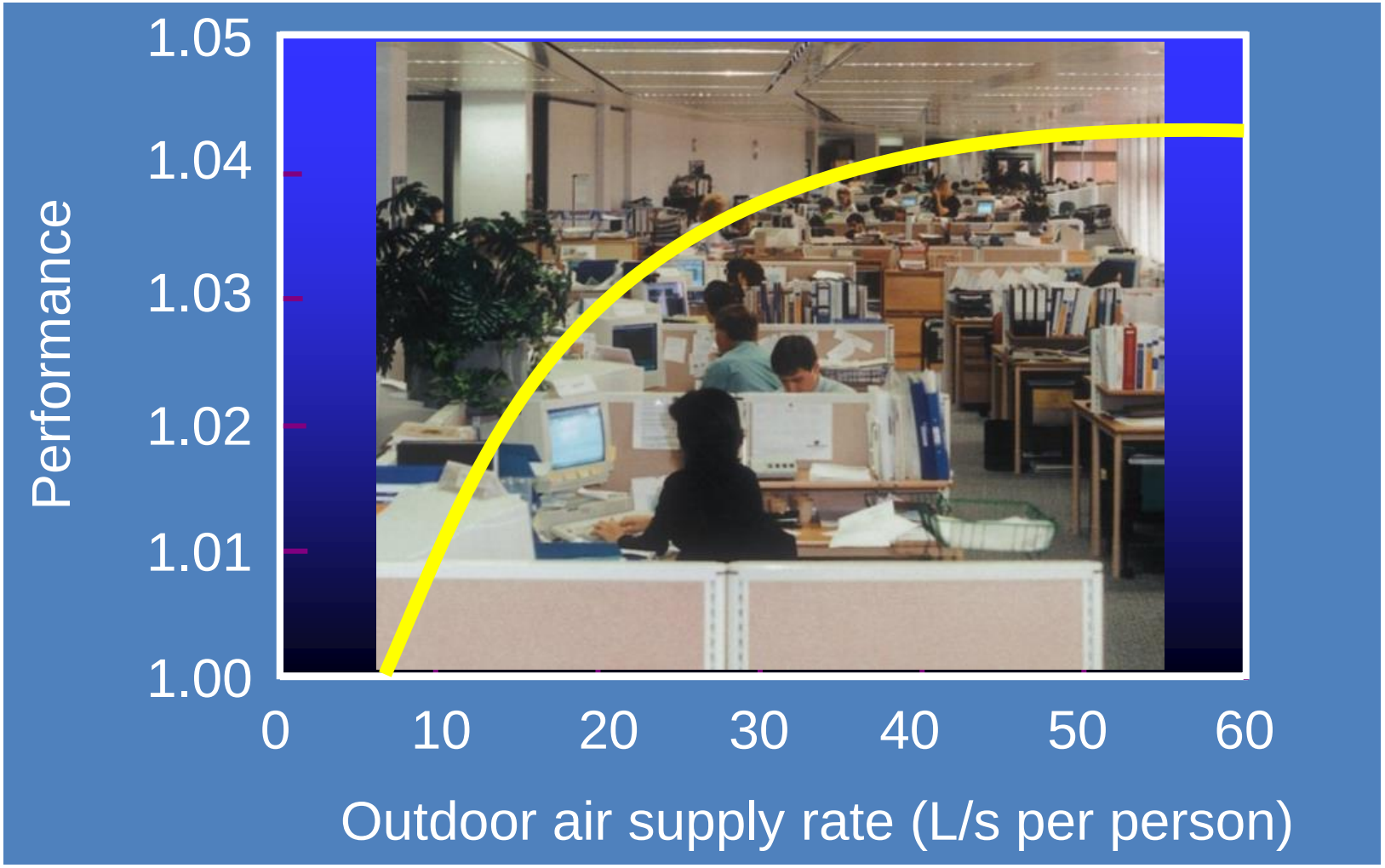
New challenges and requirements in revised EPBD
Example: Health & wellbeing

TEMPERATURE AND **PERFORMANCE OF OFFICE WORK**



Source: Seppanen et al. (2005)

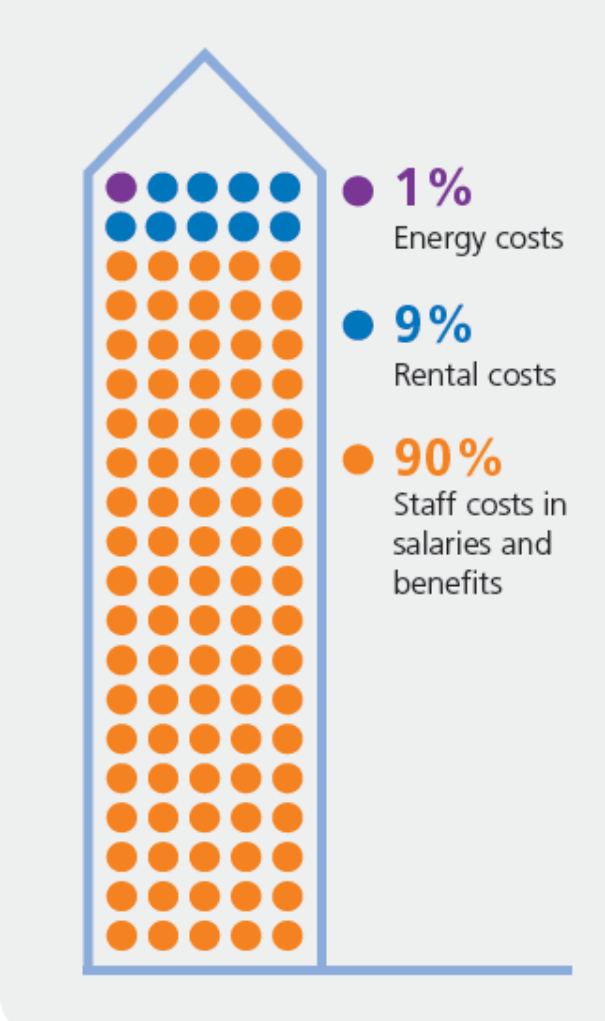
VENTILATION AND **PERFORMANCE OF OFFICE WORK**



Source: Wargocki and Seppanen (2006)

POSSIBILITIES :
Additional motivation for energy renovation

Example: Cost structure in an office building



Even modest gains in **work performance (staff costs)** can deliver **significant financial benefits**

↓

energy renovation improving productivity is cost-effective

↓

economic interest to underline is **not** only in **energy savings** but in the **increase of productivity**

↓

There is a need for:
- a **European** Health + well-being indicator
- a **link** between **Health+ well-being indicator** and the **financial benefits**

➢ ALDREN Classification: TAIL-score (under development)

THE HEALTH & WELLBEING INDICATORS

(Optional)

Overall quality of indoor environment

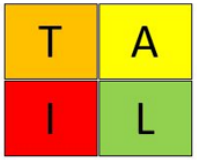
Quality of T-A-I-L

T – Thermal environment

Temperature	
Relative humidity	

A – Acoustic environment

Noise level	

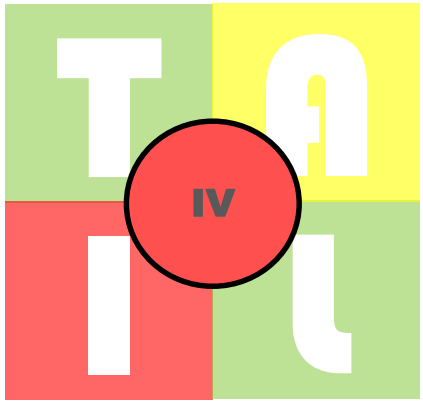


I – Indoor air quality

Ventilation	
Carbon dioxide	
Formaldehyde	
Benzene	
Particles (PM2.5)	
Radon	
Relative humidity	
Visible mould	

L – Light, visual environment

Illuminance	
Daylight factor	



The «CEN-CE» project

CEN standard Certified Experts

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

In addition, to reach the EU's energy and climate targets, a qualified building workforce is needed

- CEN-CE set up a **large-scale training and qualification scheme on CEN standards (**CEN/TC 228 and overarching in CEN TC/371) (heating, economy, overarching)

- CEN-CE **promote** CEN standards, show **advantage**, check **reliability**

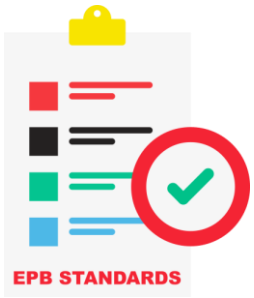
First feedback:
CEN standards (**methods)** are **not sufficient** to be **implemented**.
A tool (software) is needed (example: France, USA)

This project has received funding from the under the European Union's Horizon 2020 research and innovation programme under grant agreement No. 785018

Why a CEN-CE certified expert ?

CERTIFICATE

- passing exam per standard
- all standards passed will be listed, (as in a driving license)



A		A1	
B		B1	
C		C1	
D		D1	
BE			
CE		C1E	
DE		D1E	

CEN-CE certified experts should be allowed to **work EU wide**

EN 15316-1 - General	✓		
Heat load EN 12831- 1	✓	Emission & controls EN 15316-2	
DHW needs EN 12831- 3	✓	Distribution EN 15316-3	
Meas. performance EN 15378-3		Gen – Boiler EN 15316-4-1	
System design EN 12828	✓	Gen – Heat pump EN 15316-4-2	
Installation & comm EN 14336		Gen – solar EN 15316-4-3	
Instructions EN 12170 / 1		Gen – Cogen EN 15316-4-4	
Economics EN 15459	✓	Storage EN 15316-5	

This project has received funding from the under the European Union's Horizon 2020 research and innovation programme under grant agreement No. 785018

Conclusions

- Revised EPBD transposition **offers the possibility** for **common implementation**, considering **technical progress** and **new challenges**

- **One common holistic European Method**
  instead of
  34 national / regional different methods?

- **A common European tool (software) is missing**
  Feedback from Member States show that this would facilitate the use of CEN standards and common transposition

- **The CEN - ALDREN projects are a step forward towards a Common European method based on CEN standards**

Thank you for your attention

This project has received funding from the under the European Union's Horizon 2020 research and innovation programme under grant agreement No. 785018

CLIMA 2019 Workshop nº 5

SUPPORTING DISSEMINATION AND ROLL-OUT OF THE SET OF ENERGY PERFORMANCE OF BUILDING (EPB) STANDARDS

EPB Standards Community facilitated by REHVA

Andrei Vladimir Litiu

Project Consultant, REHVA

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Workshop organized by the EPB Center under Service Contract with the European Commission, in collaboration with

REHVA Federation of European Heating, Ventilation and Air Conditioning Associations

EPEE The voice of the heating, cooling and refrigeration industry

EVIA European Ventilation Industry Association

CLIMA 2019

Built environment facing climate change

REHVA 13th HVAC World Congress

26 - 29 May, Bucharest, Romania

Be part of the EPB Standards Community (#EPBstandards)

- EPB Center team encourages you to join

https://www.linkedin.com/groups/13619324/

http://www.buildup.eu/en/topics/energy-performance-calculation-procedures-and-cen-standards

- Share and connect others to the EPB Standards Community and remember to use the hashtag **#EPBstandards**

Thank you!

EPB Center is also 'available' for specific services requested by individual or clusters of stakeholders

More information on
the set of EPB standards:

www.epb.center

Contact: info@epb.center

This document has been produced under a contract with the European Union, represented by the European Commission (Service contract ENER/C3/2017-437/SI2-785.185).

CLIMA 2019 Workshop nº 6

SUPPORTING DISSEMINATION AND ROLL-OUT OF THE SET OF ENERGY PERFORMANCE OF BUILDING (EPB) STANDARDS

The new EPBD and its implementation

Andrea Voigt, EPEE, The European Partnership for Energy and the Environment

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Workshop organized by the EPB Center under Service Contract with the European Commission, in collaboration with

REHVA Federation of European Heating, Ventilation and Air Conditioning Associations

EPEE The voice of the heating, cooling and refrigeration industry

EVIA European Ventilation Industry Association

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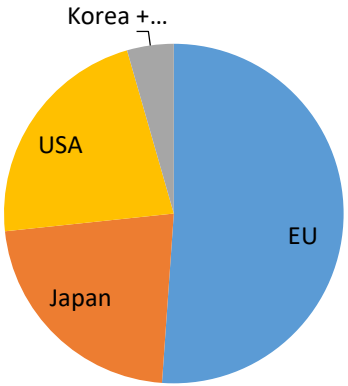
Who is EPEE?

Founded in 2000, headquartered in Brussels

Currently 48 members from three continents:

- OEMs : heat pumps, a/c, refrigeration
- Component manufacturers
- Gas producers
- Installers
- National & international associations



The EU‘s Clean Energy Package

A dedicated framework addressing energy with the objective to provide **clean and affordable energy for all Europeans**:

- ✓ Buildings (EPBD)
- ✓ Electricity
- ✓ Products (Ecodesign, Labelling)
- ✓ Renewables
- ✓ Energy Efficiency

EPBD: 5 Priorities for implementation

The EU has put in place a robust framework, but there is a lack of implementation at national level

EPEE recommends 5 priorities for implementation to unlock the potential of heating and cooling systems

Inspections

BACS

EPB Standards

Part Load

High Efficiency

Inspections:
Low hanging fruit, but lack of implementation!

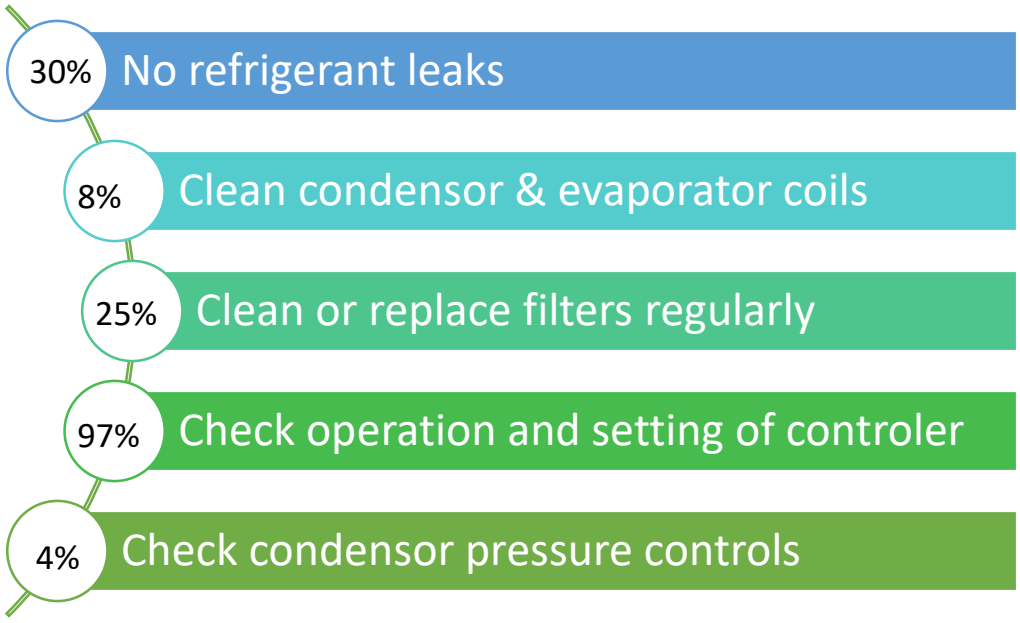
- Inspections of equipment for combined space heating/air conditioning and ventilation purposes of over 70 kW.
- For new TBS, energy consumption needs to be assessed and communicated to building owner.

Recommendations to Member States:

➔ Include inspection programmes in national renovation strategies

➔ Incentivise and compel building owners to act upon the inspection report

➔ Include energy consumption data, sizing, system integration in TBS assessments



Source: IEE Harmonac Project & iSERVcmb Project

BACS:
A cost effective opportunity for energy savings

- Mandatory BACS in non-residential buildings with an effective rated heating or combined heating, a/c and ventilation system output of over 290kW by 2025
- Non invasive, energy savings up to 49%

Recommendations to Member States:

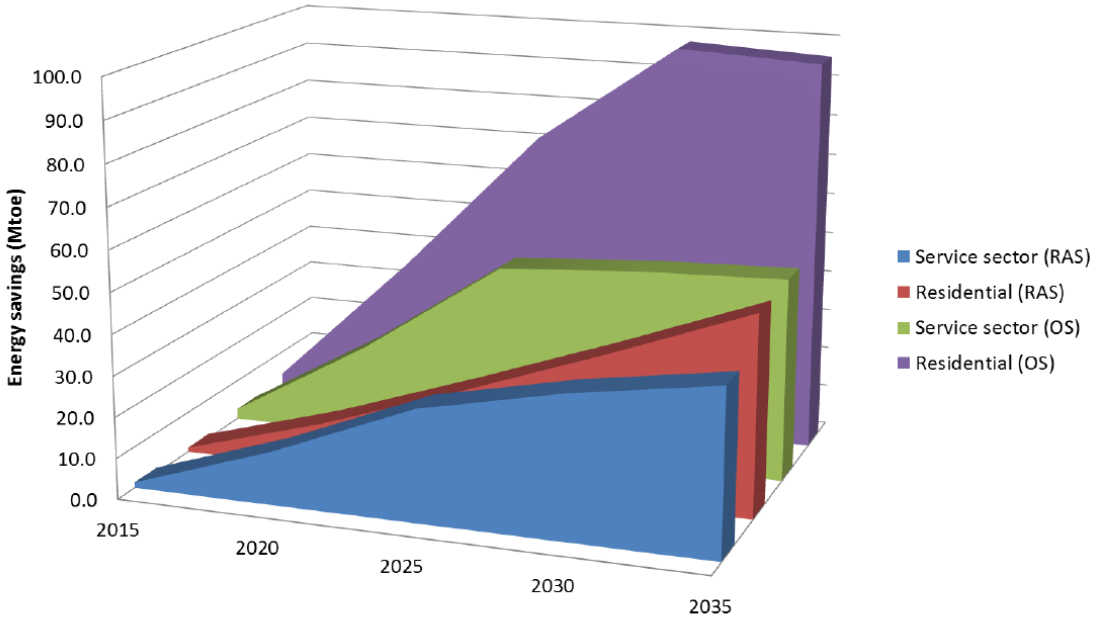
Member States need to ensure that BACS fufil certain criteria. Standard EN15232 will support implementation

➔ Monitor, log, analyse and adjust energy use

➔ Benchmark the building's energy efficiency

➔ Detect losses in efficiency of TBS and inform accordingly

➔ Allow communication and interoperability

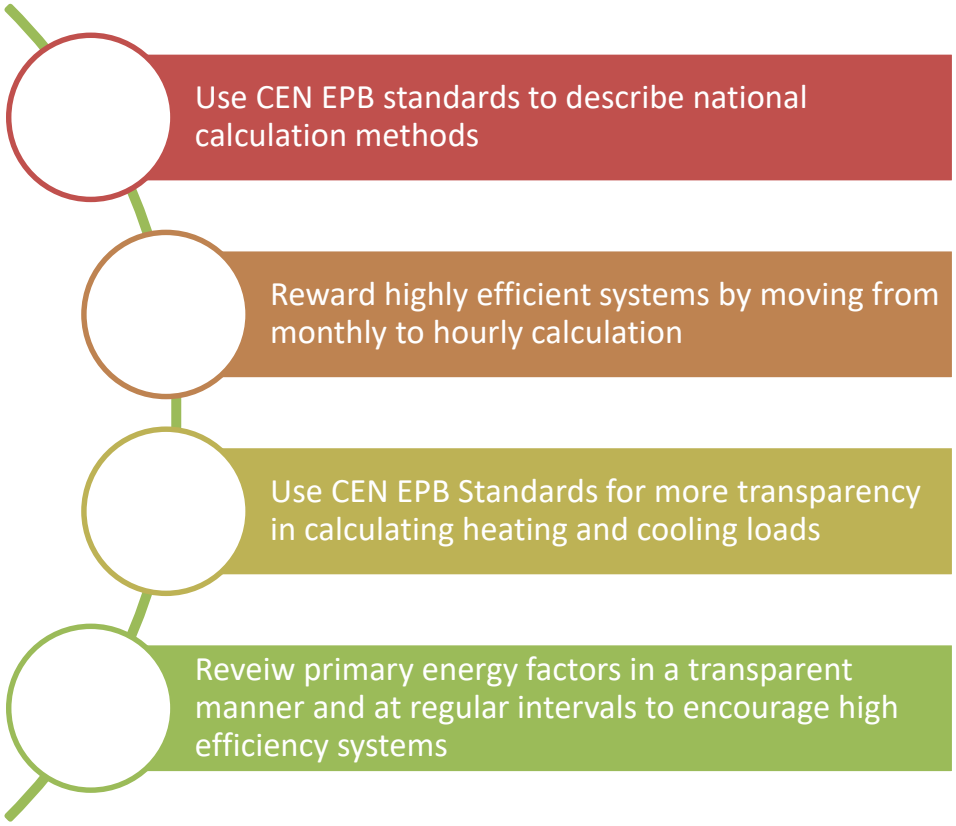


Source: Paul Waide, 2014: The scope for energy and CO2 savings in the EU through the use of building automation technology

EPB Standards:

A harmonised methodology for transparency and better implementation

- Member States are encouraged to use CEN EPBD standards to support the implementation of the EPBD
- Member States shall apply a methodology for calculating the energy performance of buildings in accordance with related CEN standards



Optimisation under part load conditions:
Huge savings potential

- Improve actual performance of HVACR systems under real-life conditions
- Most of the time (>90%) these are part load conditions. Therefore inspections of HVACR systems should include an assessment of part load operating conditions

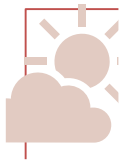
Recommendations to Member States:

➔ Take into account part load conditions when inspecting HVACR systems

➔ Consider part load conditions in national laws for renovation

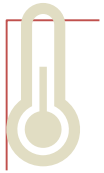
➔ Integrate part load conditions in EPB calculations to allow proper sizing of installations

Modulation of energy output upon signals from control system

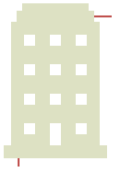


Weather compensation

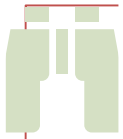
Flow and temperature adjustment to actual needs



Individual room temperature control



Dynamic hydronic balancing



Monitor operation and changes in the system

High efficiency alternative systems:
An opportunity for new and existing buildings

- High efficiency alternative systems including high indoor environmental quality
- For existing and new buildings

Recommendations to Member States:

➔Use harmonised definition of high efficiency aligned with Ecodesign / Energy Labelling

➔Introduce well documented commissioning

➔Monitoring and control systems

Thank you for your attention!

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CLIMA 2019 Workshop nº 6

SUPPORTING DISSEMINATION AND ROLL-OUT OF THE SET OF ENERGY PERFORMANCE OF BUILDING (EPB) STANDARDS

Ventilation related EPB standard and their contribution to deliver high IEQ

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Workshop organized by the EPB Center under Service Contract with the European Commission, in collaboration with

REHVA Federation of European Heating, Ventilation and Air Conditioning Associations

EPEE The voice of the heating, cooling and refrigeration industry

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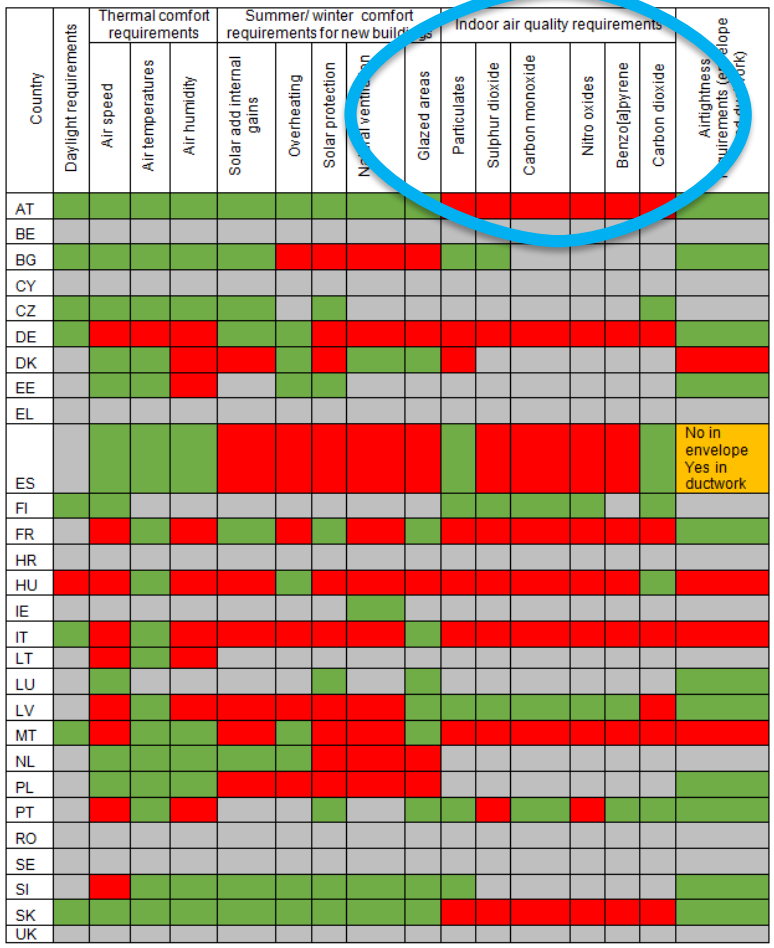
Some IEQ-aspects in EPBD 2018

- The 2009 World Health Organisation guidelines provide that, concerning indoor air quality, better performing buildings **provide higher comfort levels and wellbeing for their occupants and improve health**
- For new buildings and buildings undergoing major renovations, Member States should encourage high-efficiency alternative systems, if technically, functionally and economically feasible, while also **addressing the issues of healthy indoor climate** conditions, fire safety and risks related to intense seismic activity, in accordance with domestic safety regulations.
- The energy needs for space heating, space cooling, domestic hot water, ventilation, lighting and other technical building systems shall be **calculated in order to optimise health, indoor air quality and comfort level**s defined by Member States at national or regional level.
- 'Member States shall encourage, in relation to buildings undergoing major renovation, high-efficiency alternative systems, in so far as this is technically, functionally and economically feasible, and shall **address the issues of healthy indoor climate conditions**, fire safety and risks related to intense seismic activity.'.
- (a) the interoperability between systems (smart meters, building automation and control systems, built-in home appliances, self-regulating devices for the regulation of **indoor air temperature within the building and indoor air quality** sensors and ventilations); ..

- **Energy Performance without IEQ Definition makes no sense!**

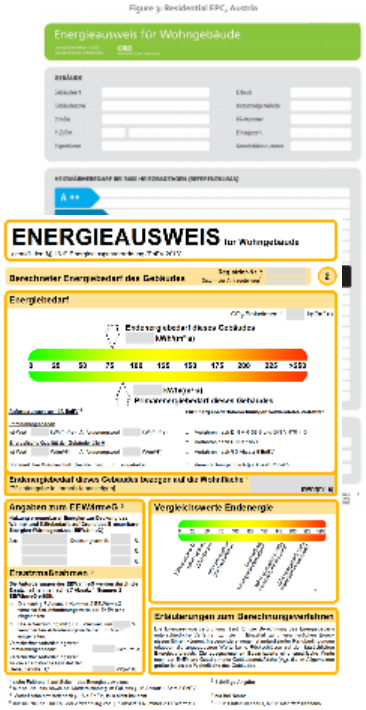
IAQ in Buildings: State of play

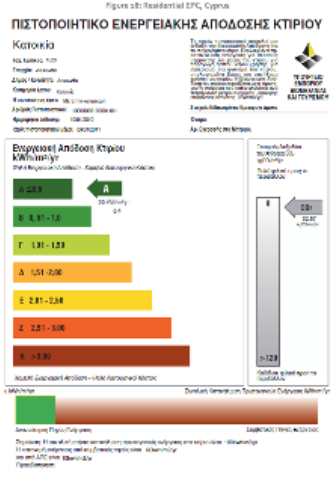
- Thermal comfort, daylight requirements and internal air quality in the EU
  (New buildings, 2016)
- Will be part of the upcoming EU Building Stock observatory.
  Any updated info is welcome!
  - green: requirements place,
  - red: no requirements,
  - grey: data not yet available

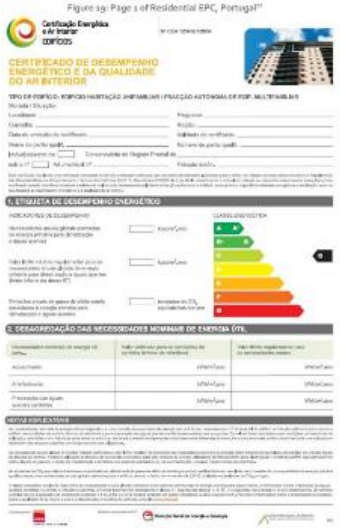


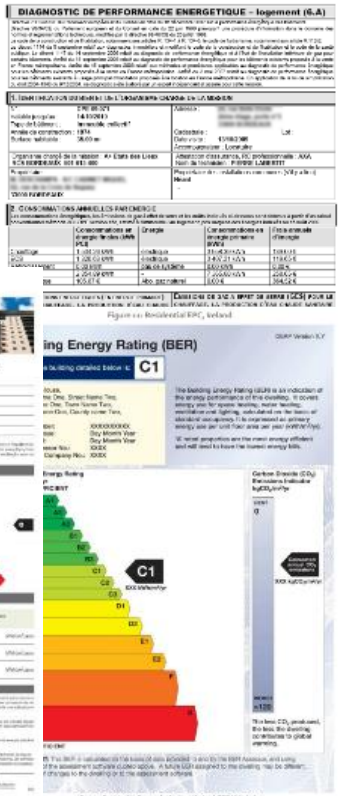
Laurent Deleersnyder
Directorate-General for Energy
Energy Efficiency
EPBD review
EVIA Seminar 11 May 2016, Brussels

Currently
No Indicator for IAQ in Building Certificates



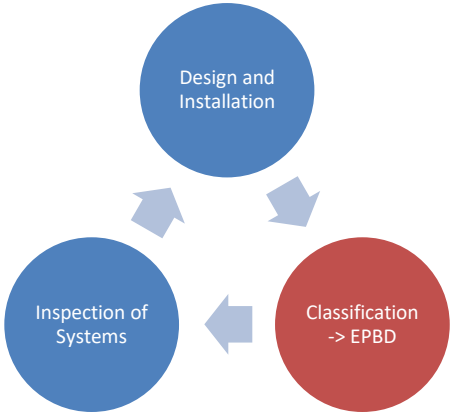






IEQ in EN 16798-1 and EN 16798-3

- Agreement on design Criteria – IEQ aspects
  - Location, outdoor conditions, neighbourhood
  - Design weather data
  - Use of the rooms
  - Human occupancy
  - Internal pollution and moisture sources
  - Type of control
  - Thermal comfort
  - Air quality for people
  - Noise level
  - Lighting



- Requirements of persons EN 16798-1 und -2 (Residential and Non-Residential)
- Performance of Ventilation and Room Conditionine SystemsEN 16798 - 3 und TR 16798 - 4 (Non-Residential).

EN 16798-1

- For design of buildings and sizing of technical building systems for heating, cooling, ventilation and lighting parameters and criteria shall be specified and documented.
- The present standard specifies, in informative annexes, default input values for use in cases where no national regulation is available. The default criteria are given for several categories.
- Default input values are given for each of the different categories of indoor environmental quality Category Level of expectation
- The categories are related to the level of expectations the occupants may have.
- A normal level would be “Medium”. A higher level may be selected for occupants with special needs.

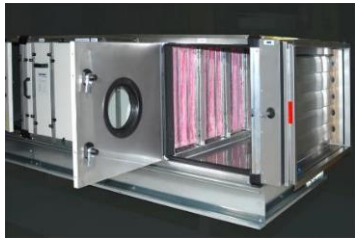
Category	Level of expectation
IEQ_I	High
IEQ_{II}	Medium
IEQ_{III}	Moderate
IEQ_{IV}	Low

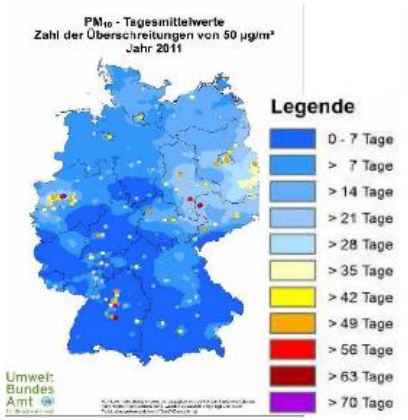
Default criteria informative annex - national annex

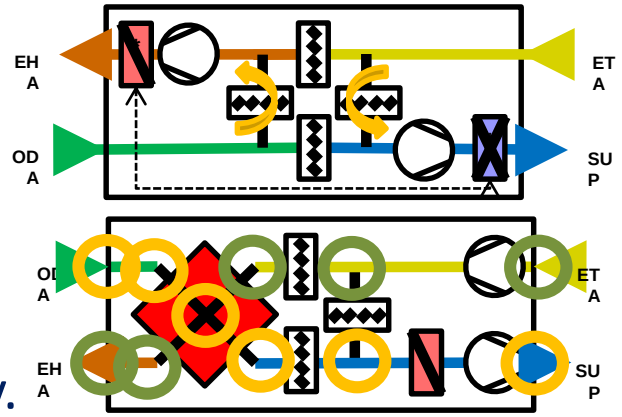
- Thermal Environment PPD-PMV (EN ISO 7730 [10])
  - indoor operative temperature in winter and summer
    - Design – Energy calculation
    - Cooling
    - No mechanical cooling
  - Local discomfort (draught, vertical air temperature differences, floor temperature, and radiant temperature asymmetry)
  - Humidity
- Indoor Air Quality
  - Method 1: method based on perceived air quality (non adapted)
  - Method 2 - method using limit values of substance concentration
  - Method 3 Method based on predefined ventilation flow rates
  - WHO guideline
- Lighting -> EN 12464
- Noise
- Occupants schedule for energy calcualtion

DIN EN 16798 - 3:Revision

- Clearer Strucutur
  - Design Aspects
  - EPBD links
- Considering ISO 16890 for Filtration
  - Outdoor Air Quality
  - Supply Air Qualitty
- Classification of types of air and leakage
  - Mixing
  - Outdoor Air -> Supply Air
- Possible national Annex for design aspects
  - Specification of Outdoor air
  - Distances Exhaust and Outdoor Air transfer devices
- Design weather data -> Climate change aspecty.







Classification of ODA based on PM 16798-3 rev.

Category	$PM_{2,5}$ annual mean µg/m^3	PM_{10} annual mean µg/m^3	Description
ODA 1 (P)	≤ 10	≤ 20	Outdoor air, which may be only temporarily dusty
ODA 2 (P)	≤ 15	≤ 30	Outdoor air, with high concentrations or particular matter
ODA 3 (P)	> 15	> 30	Outdoor air, with very high concentrations or particular matter

Classification of Supply air based on PM 16798-3 rev.

Category	Description	$PM_{2,5}$ annual mean µg/m3	PM_{10} annual mean µg/m3
SUP 1 (P)	Supply air with very low concentration of particulate matter	≤ 2.5	≤ 5
SUP 2 (P)	Supply air with low concentrations of particulate matter	≤ 5	≤ 10
SUP 3 (P)	Supply air with medium concentrations of particulate matter	≤ 7.5	≤ 15
SUP 4 (P)	Supply air with high concentrations of particulate matter	≤ 10	≤ 20
SUP 5 (P)	Supply air with very high concentrations of particulate matter	≤ 15	≤ 30
SUP 6 (P)	Supply air with no specification of concentration of particulate matter	Not specified	

EN 16798-3 Filter Classes (recommended)

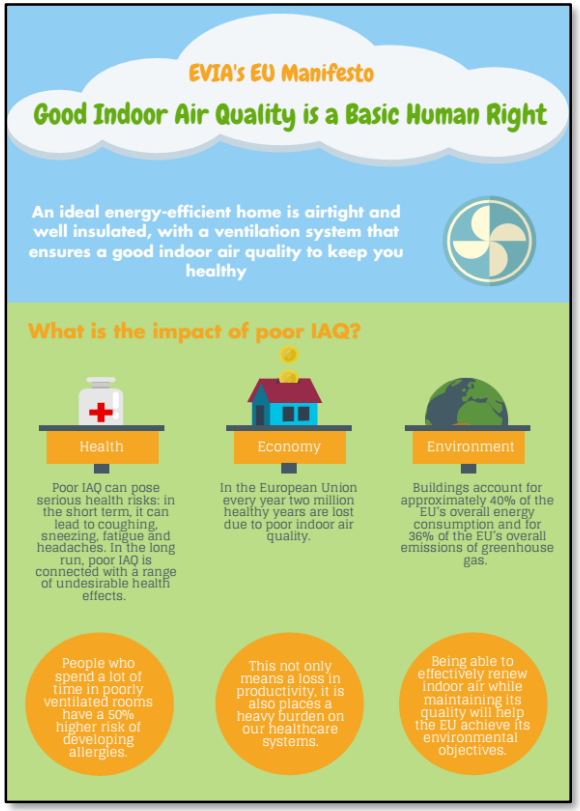
- Recommended filter classes in informative annex -> national annex

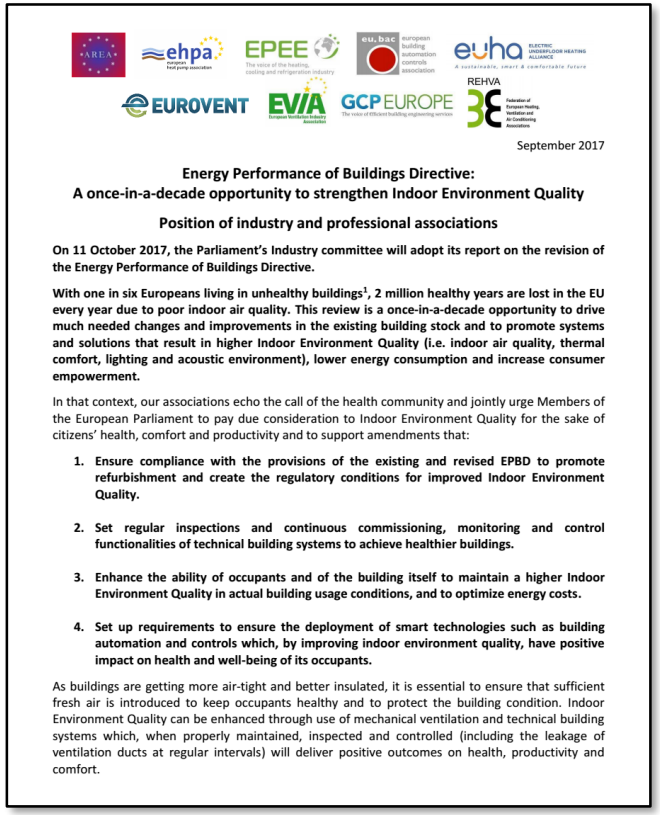
Outdoor air quality	Recommended minimum filtration					
	SUP 1 (P)	SUP 2 (P)	SUP 3 (P)	SUP 4 (P)	SUP 5 (P)	SUP 6 (P)
ODA 1 (P)	ePM_{10} 50 % ePM_1 60 %	ePM_1 50 %	$ePM_{2,5}$ 50 %	ePM_{10} 50 %	ePM_{10} 50 %	No filters required
ODA 2 (P)	$ePM_{2,5}$ 50 % ePM_1 60 %	ePM_{10} 50 % ePM_1 60 %	ePM_1 50 %	$ePM_{2,5}$ 50 %	ePM_{10} 50 %	
ODA 3 (P)	$ePM_{2,5}$ 50 % ePM_1 80 %	$ePM_{2,5}$ 50 % ePM_1 60 %	ePM_{10} 50 % ePM_1 60 %	ePM_1 50 %	$ePM_{2,5}$ 50 %	

Challanges in EN 16798-1, -3

- Dual use of the standards – Design and Energy Performance Calcultaion
- EPBD implementation
- Does the structure of national annex fit for national implementation according national legislation?
- European or options for national classes?
- Harmonisation of classes or procedures?
- Do the decribes criteria meet the requirements of the involved parties?
  - Lighting
  - Acoustik
- Responsibilities within CEN and involved parties

Good Indoor Environment Quality is a basic human right





September 2017

Energy Performance of Buildings Directive:
A once-in-a-decade opportunity to strengthen Indoor Environment Quality

Position of industry and professional associations

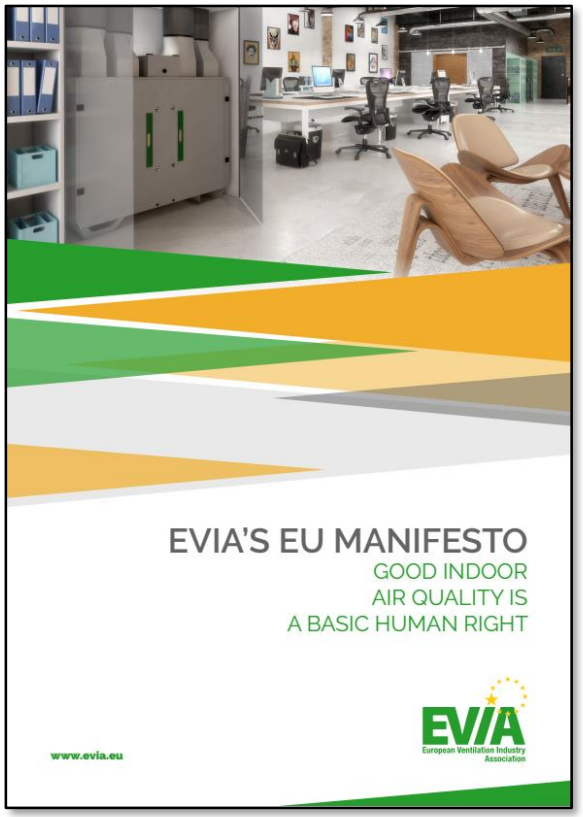
On 11 October 2017, the Parliament's Industry committee will adopt its report on the revision of the Energy Performance of Buildings Directive.

With one in six Europeans living in unhealthy buildings[1], 2 million healthy years are lost in the EU every year due to poor indoor air quality. This review is a once-in-a-decade opportunity to drive much needed changes and improvements in the existing building stock and to promote systems and solutions that result in higher Indoor Environment Quality (i.e. indoor air quality, thermal comfort, lighting and acoustic environment), lower energy consumption and increase consumer empowerment.

In that context, our associations echo the call of the health community and jointly urge Members of the European Parliament to pay due consideration to Indoor Environment Quality for the sake of citizens' health, comfort and productivity and to support amendments that:

1. **Ensure compliance with the provisions of the existing and revised EPBD to promote refurbishment and create the regulatory conditions for improved Indoor Environment Quality.**
2. **Set regular inspections and continuous commissioning, monitoring and control functionalities of technical building systems to achieve healthier buildings.**
3. **Enhance the ability of occupants and of the building itself to maintain a higher Indoor Environment Quality in actual building usage conditions, and to optimize energy costs.**
4. **Set up requirements to ensure the deployment of smart technologies such as building automation and controls which, by improving indoor environment quality, have positive impact on health and well-being of its occupants.**

As buildings are getting more air-tight and better insulated, it is essential to ensure that sufficient fresh air is introduced to keep occupants healthy and to protect the building condition. Indoor Environment Quality can be enhanced through use of mechanical ventilation and technical building systems which, when properly maintained, inspected and controlled (including the leakage of ventilation ducts at regular intervals) will deliver positive outcomes on health, productivity and comfort.



CLIMA 2019 Workshop nº 5

SUPPORTING DISSEMINATION AND ROLL-OUT OF THE SET OF ENERGY PERFORMANCE OF BUILDING (EPB) STANDARDS

Interactive discussion and polls

(17h25 – 17h50)

Workshop organized by the EPB Center under Service Contract with the European Commission, in collaboration with

REHVA Federation of European Heating, Ventilation and Air Conditioning Associations

EPEE The voice of the heating, cooling and refrigeration industry

EVIA European Ventilation Industry Association

CLIMA 2019

Built environment facing climate change

REHVA 13th HVAC World Congress

26 - 29 May, Bucharest, Romania

CLIMA 2019 Workshop nº 5

SUPPORTING DISSEMINATION AND ROLL-OUT OF THE SET OF ENERGY PERFORMANCE OF BUILDING (EPB) STANDARDS

Closing remarks
(17h50)

Dick van Dijk

Senior expert EPB Center

dick.vandijk@epb.center

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Thank you!

EPB Center is also 'available' for specific services requested by individual or clusters of stakeholders

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