EKVÜ | EESTI KÜTTE- JA VENTILATSIOONIINSENERIDE ÜHENDUS

REHVA TEGEVUSED

Jarek Kurnitski
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TAL TECH | TALLINNA TEHNIKAÜLIKOOL

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Kuidas arvutada heitevaba hoonet?

- Sisend Euroopa komisjoni juhendisse
- Summaarne primaarenergia, CO_2 ja primaarenergia katmine

Näidis sisekliima regulatsioon EPBD uute nõuete adresseerimiseks:

- Mh õhu kvaliteedi järgi juhtimine ja monitoorimine mitteelamutes – nõudluspõhine ventilatsioon kohustuslikuks
- Euroopa komisjoni juhend

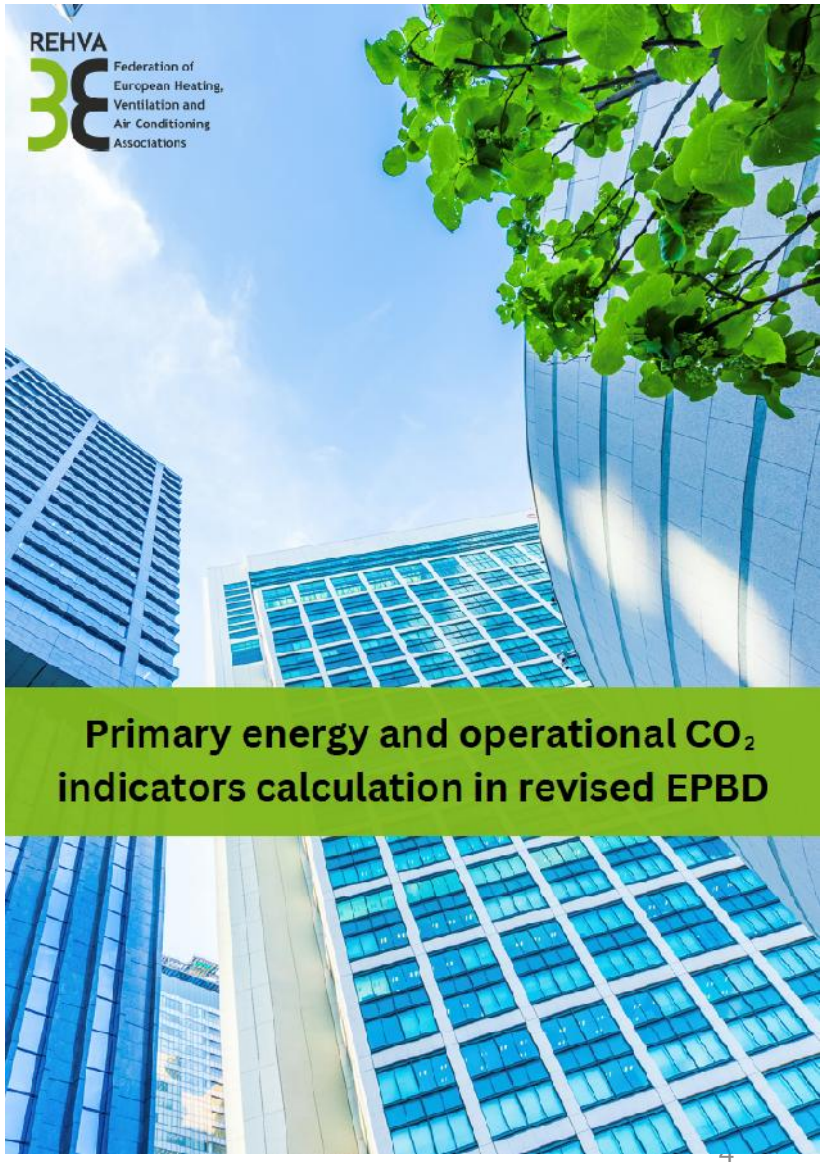
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EPBD Recast – Implementation timeline

December 2026	National Building Renovation Plans (final)
June 2026 (indicative)	Assessment by the Commission of the draft National Building Renovation Plans + country recommendations
29 May 2026	**EPBD transposition deadline** (24 months after entry into force)
December 2025	Draft National Building Renovation Plans
Q2/Q3 2025	Envisaged publication of the **Guidance documents on** the EPBD implementation
1st January 2025	Transposition deadline for Article 17(15) - phasing out financing for stand-alone boilers powered by fossil fuels
8 May 2024	Publication in OJ and entry into force 20 days after

EPBD ENERGIA JA CO_2 JUHEND

- https://www.rehva.eu/activities/technology-and-research
- Leiab ülesse White papers and Reports -alt
- 28.03.2024
- Põhimõtted on tänaseks jõudnud Euroopa komisjoni juhendisse koos arvutusnäidetega

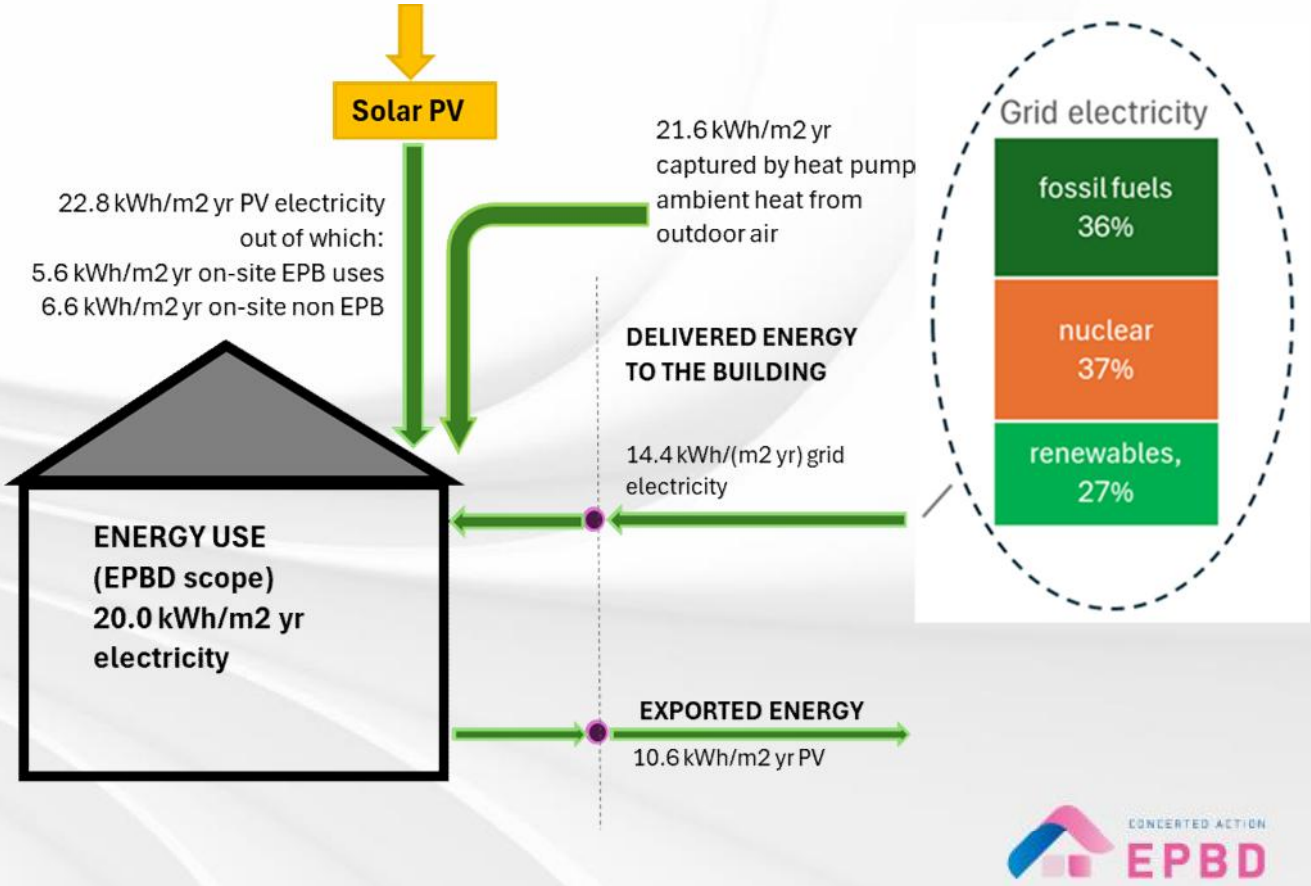


ZEB compliance calculations

1. **Energy demand/total primary energy threshold**
2. **Operational GHG threshold**
3. **Total primary energy covering**

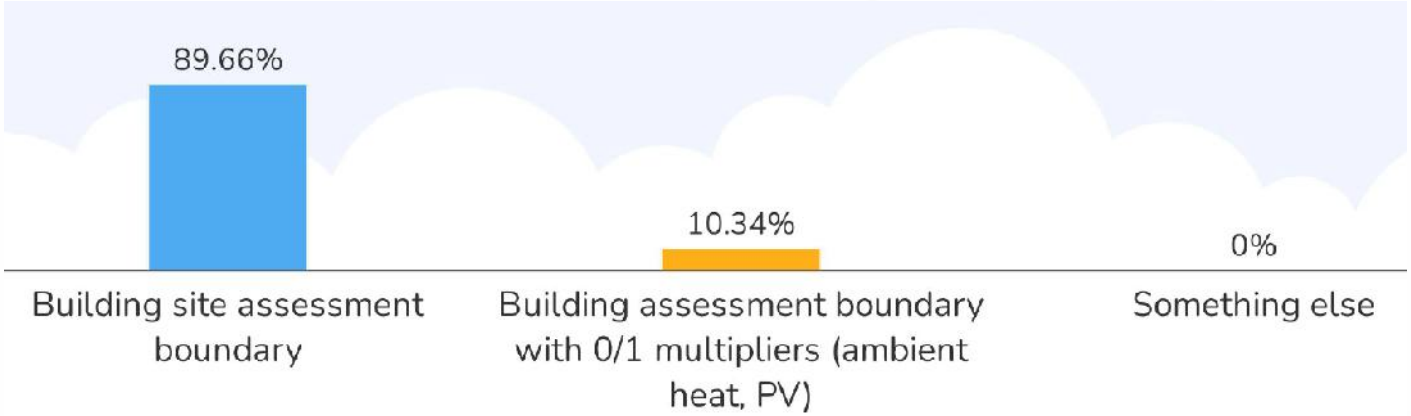
- Calculation examples included in (or still considered for) recast EPBD ZEB guidance document were discussed

- Important that everybody will get the same result when calculating these indicators

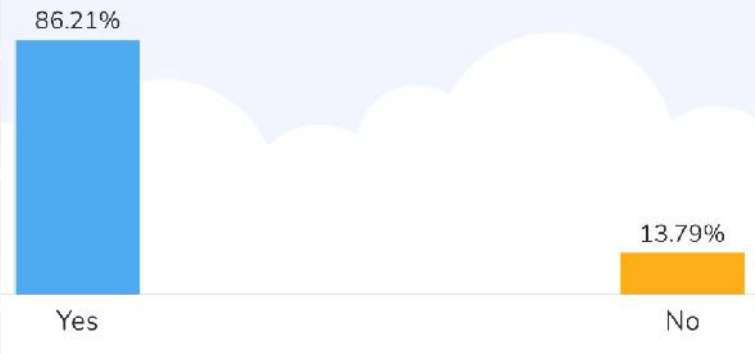


What are plans for ZEB implementation?

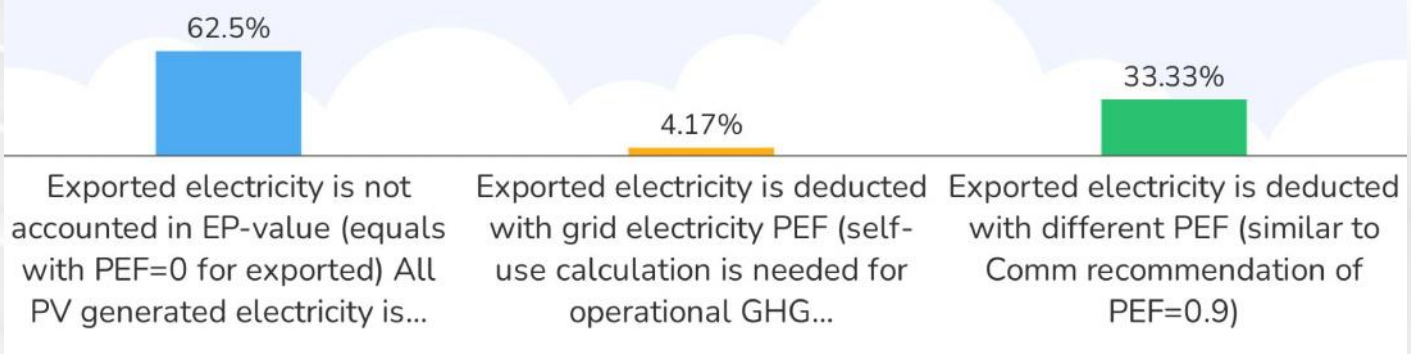
For ZEB energy calculations, do you plan to use a building or building site assessment boundary?



Do you plan to calculate the self-use of PV?



How do you plan to take into account the exported electricity?



Building site assessment boundary (instead of building boundary), calculation of the PV-self use and not accounting exported energy were popular choices

CONCERTED ACTION EPBD

Example of evidence based IEQ regulation + explanatory report

- To help to implement new IEQ provisions in national regulation, REHVA and Nordic Ventilation Group experts have developed a model IEQ regulatory text
- Proposed text is expected to serve as an example of evidence based IEQ useful minimum implementation
- Could support harmonised national EPBD implementation



https://www.rehva.eu/fileadmin/user_upload/2024/IEQ_Guidance_2025.pdf

CONCERTED ACTION EPBD

Measuring and Control devices for IAQ Article 13(5)

5. Member States shall require non-residential zero-emission buildings to be equipped with measuring and control devices for the monitoring and regulation of indoor air quality. In existing non-residential buildings, the installation of such devices shall be required, where technically and economically feasible, when a building undergoes a major renovation.
Member States may require the installation of such devices in residential buildings.

- Mandatory in non-residential ZEBs and, when technically and economically feasible, in non-residential existing undergoing major renovation / voluntary in residential buildings;
- These devices monitor and regulate the operation of the building and its technical systems to ensure that they operate optimally and provide the required indoor air quality;
- Link with demand-controlled ventilation;
- The Guidance provides relevant parameters and proxies distinct by new and renovated building and, where relevant, per building type.

Examples of Requirements for IEQ and IAQ

		Design	Monitoring	Inspections
Thermal Comfort	Operative temperature	X	(X)	
	Air temperature	X	X	X
	Air velocity	X		
	Relative humidity	X	X	
Indoor air quality	Ventilation Rate	X		X
	Carbon dioxide	X	X	
	PM2.5	X*	X*	
	Formaldehyde	X+		
	Nitrogen dioxide	X+		
	Radon	X+		
	Carbon Monoxide	X+		
Daylighting	Daylight provision	X		
	Illuminance	X		
	Glare probability	X		
Acoustics	Sound pressure	X		
	Sound reverberation time	X		optional

- Indicators and numerical ranges (EN 16798-1) are provided for the requirements identified, for MS consideration.
- The table provides examples of relevant IEQ parameters when setting design requirements (Art. 7(6) and 8(3)), performing monitoring (Art. 13(5)), conducting inspections (Art. 23).
- Clarification where requirements are relevant:
  - * $PM_{2.5}$: filters or monitoring may be needed for polluted areas. Indoor pollution levels may also need to be considered.
  - + NO_2, CO: indoor parking areas, in case of indoor pollution sources, in polluted areas.

New items to be addressed in IEQ regulation

Measuring and Control devices for IAQ Art 13(5)

- Mandatory in non-residential ZEBs and, when technically and economically feasible, in non-residential existing undergoing major renovation / voluntary in residential buildings;
- These devices monitor and regulate the operation of the building and its technical systems to ensure that they operate optimally and provide the required indoor air quality;
- Link with demand-controlled ventilation (CO_2);

Capacity to react to external signals

- Shall not compromise IAQ and thermal comfort
- Long term evaluation needed to show that IAQ and thermal comfort will stay within accpetable range

In your country, minimum ventilation requirements (in m^3/h or liter per second or air change rate) are specified in:



In non-residential ZEB which ventilation systems are expected to be used most commonly?



REHVA JOURNAL 01/2025 & 02/2025

The full text of the policy paper can be found at: https://www.rehva.eu/fileadmin/user_upload/2024/EQ_Guidance_2025.pdf

Model Indoor Environmental Quality regulation to fulfil new provisions of 2024 EPBD recast

– Common proposal by Nordic Ventilation Group, REHVA and EUROVENT association



JAREK KURNITSKI
REHVA Technology and Research Committee, Tallinn University of Technology, jarek.kurnitski@taltech.ee

To help to implement new IEQ provisions in national regulation, REHVA and Nordic Ventilation Group experts have developed a model IEQ regulatory text. It aims to support national regulators who can get an idea, how EPBD complaint regulation could look. Evidently there are different national practices, but all Member States need to check the development needs of existing regulations against revised EPBD.

EPBD has introduced new provisions for indoor environmental quality (IEQ) which implementation in national regulations may require considerable effort. These new provisions include:

- A **new definition for IEQ** in Article 2(66) according to which a minimum scope of IEQ addresses thermal comfort and ventilation/indoor air quality domains.
- EPBD introduced new principle of **optimal indoor environmental quality**. When setting minimum energy performance requirements, Article 5 states that "those requirements shall take account of optimal indoor environmental quality, in order to avoid possible negative effects such as inadequate ventilation…". Revised Articles 7 and 8 for new and existing buildings stress IEQ for both new buildings and major renovations by stating that the issues of optimal indoor environmental quality shall be addressed.
- Article 13 calls to establish national IEQ requirements: "Member States shall set requirements for the implementation of **adequate indoor environmental quality standards** in buildings in order **to maintain a healthy indoor climate**." These requirements may be referred when recommendations to improve IEQ are provided in EPC-s which is new provision in Article 19(5).
- Article 13 also requires to equip new non-residential ZEBs with **IAQ monitoring and regulation** devices.
- Article 19 requires that the **energy performance certificates** include recommendations for the improvement of IEQ.

The following model regulatory text has been developed from EPBD provisions and by setting requirements with measurable indicators based on to those of the Level(s) framework for sustainable buildings [1]. **Proposed text is expected to serve as an example of evidence based IEQ useful minimum implementation to support harmonised national EPBD implementation.** All numeric values included serve as examples, following the Commission guidance [2] recommendation to use Category II specified in EN 16798-1:2019 (medium occupant expectation), whose values ensure avoiding adverse health effects and comfort and well-being of occupants.

In the following the regulatory text proposal is published with couple of examples from explanatory report, the full document can be found from REHVA website.

Model Indoor Environmental Quality regulation

1. Subject matter

1.1 This model regulation specifies minimum requirements for thermal comfort, indoor air quality (IAQ) and noise from building services compliant with 2024 EPBD for new buildings and major renovations with necessary considerations for residential and non-residential buildings.

1.2 Requirements apply for design and operation of buildings, including monitoring and long-term assessment of indoor conditions.

1.3 Commissioning of technical buildings systems which includes test procedures and measurement methods to hand over, and regular inspection of heating, ventilation and air conditioning systems are not included in this document.

1.4 Indoor environmental quality (IEQ) requirements follow the EPBD minimum scope that is limited to thermal comfort and IAQ. Lighting and acoustics, other than the noise of building services, are not included in this document.

2. Definitions

2.1 'Indoor environmental quality' [3] means the result of an assessment of the conditions inside a building that influence the health and wellbeing of its occupants, based upon parameters such as those relating to the temperature, humidity, ventilation rate and presence of contaminants.

3. Design values and requirements for thermal comfort

3.1 In continuously occupied spaces general thermal comfort shall be maintained and local thermal discomfort avoided.

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3.3 The values
shall be the lov
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from the specifi
the occupancy
(Kelvin hours):

Table 1. Room temperature [5] acceptable comfort ranges in the occupied zone [6].

Building Category	Heating season, (1.0 clo) °C	Cooling season, (0.5 clo) °C
Non-residential buildings	20.0 – 24.0	23.0 – 26.0
Residential buildings	20.0 – 25.0	22.0 – 26.0

What new Zero Emission Buildings can bring for HVAC?



JAREK KURNITSKI
REHVA Technology and Research Committee, Tallinn University of Technology
jarek.kurnitski@taltech.ee

Optimal indoor environmental quality (IEQ) and measuring and control devices for monitoring and regulation of indoor air quality (IAQ) may play an important role in HVAC development. Because of complex technical nature the essence of these requirements may be difficult to understand for national regulators struggling with many other new items to be implemented. Therefore, contribution by national experts and industry can be crucial to ensure adequate implementation quality that is evident precondition for improving and optimising IEQ in future buildings.

Keywords: ZEB, IEQ, EPBD, HVAC, smart control, CO_2 sensor, DCV

EPBD implementation to national regulation should currently run in high speed because Member States shall bring into force the laws and regulations by 29 May 2026. Zero-Emission Buildings (ZEB) requirements must apply in new buildings owned by public bodies from 1 January 2028 and in all new buildings from 1 January 2030.

Capacity to react to external signals

ZEB requirements set in EPBD Article 11 have mostly indirect impact on HVAC, because energy effective systems help to achieve primary energy and operational CO_2 thresholds. However, there is a specific requirement that ZEB shall offer the capacity to react to external signals and adapt its energy use, generation or storage. Together with fossil fuel ban, this is an important opportunity for heating and cooling generation with heat pumps where the most natural external signal is the electricity price. Therefore, price-based control of heat pumps, but maybe also ventilation systems can be important to satisfy this requirement. Another option would be the battery storage that will fulfil this requirement. Depending on national implementation, HVAC may play a big role, because HVAC is always present in buildings while electric battery investments may not be so easily justified if on-site electricity generation will be self-used in the building, i.e. if there will no surplus electricity that is typical situation in non-residential buildings.

Monitoring and regulation of IAQ

Another requirement stressing the importance of smart control of HVAC is in Article 13 for Technical Building Systems. It says that "Member States shall require non-residential zero-emission buildings to be equipped with measuring and control devices for the monitoring and regulation of indoor air quality. In existing non-residential buildings, the installation of such devices shall be required, where technically and economically feasible, when a building undergoes a major renovation. Member States may require the installation of such devices in residential buildings." While must in non-residential buildings it is important to understand which ventilation and air conditioning systems are needed to satisfy this requirement. EPBD does not specify at which level, i.e. single room, larger zone or ventilation system the regulation and monitoring should be applied. Technically it would be the easiest to add one CO_2 sensor to air handling unit extract air and adjust the fan speed of supply and extract fans accordingly. It is well known that this control can compromise IAQ in occupied zones, especially if these are located at the longer end of the ductwork. Therefore, it would be important to avoid such interpretation possibility in national regulation. This can be done by experts by referring to optimal IEQ requirement in Article 5 that states "those requirements shall take account of optimal indoor environmental quality, in order to avoid possible negative effects such as inadequate ventilation…". Thus, when looking Article 13 and Article 5 together, it should be clear that central control would not be an option for IAQ regulation and monitoring. Instead, in technical language it should be said that ZEB shall be equipped with measuring and control devices as a part of a demand-controlled ventilation (DCV) system. Here we understand DCV as a general expression for any variable air volume (VAV) ventilation or more simple air flow control satisfying occupant needs.

At which level the control needs to implemented remains a question to be decided at national level. It is evident that air flow control is not cost effective in small rooms occupied by 1-2 person or for instance having lower nominal supply air flow rate than 50 L/s. In continuously occupied rooms with higher number of persons the air flow control would be natural and can be implemented with many DCV systems which may be classified as pressure-independent and pressure-dependent systems depending on the control logic. Thus, it may be expected that implementation of Article 13 will make DCV systems standard solution in non-residential buildings. However, it is well known that these dedicated systems have had many problems in practice. In many cases ductwork design with pressure loss calculations has not been complete, and there have been issues by contractors in installation and commissioning. Also, the maintenance need has been much more than expected. Therefore, it would be an issue for HVAC industry to develop more robust and reliable DCV systems that are easy to design, install, commission and operate. New thinking is needed, because current systems with high-end reputation are to be changed to mainstream standard solutions. Damper-optimized pressure dependent systems with stepless air flow control are perfect, but a lot can be done already with simple two airflow steps especially in the case of low-pressure design. Some good ideas can be found from recent REHVA publication*, **Figure 1**. Low pressure design for the final pressure drop is described in REHVA GB No 17.

In DCV systems such as in **Figure 1**, supply air diffusers should manage a wide range of airflow rates

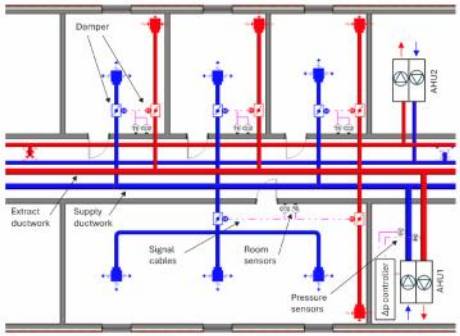


Figure 1. In pressure independent DCV system with the constant pressure control (AHU1), the fan speed is controlled to keep constant static pressure in the main ventilation duct, at the location of the pressure sensor. Dampers in each zone branch or diffuser adjust the air flow rates based on the room sensors CO_2 (and temperature) readings. Dampers may have continuous or stepwise control that should keep supply and extract air flows in balance with reasonable accuracy. AHU2 (CAV) with time control but not DCV serves toilets and corridors.

* https://www.rehva.eu/fileadmin/user_upload/2024/EQ_Guidance_2025.pdf

https://www.rehva.eu/rehva-journal/chapter/what-new-zero-emission-buildings-can-bring-for-hvac

https://www.rehva.eu/rehva-journal/chapter/model-indoor-environmental-quality-regulation-to-fulfil-new-provisions-of-2024-epbd-recast

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