VENTILATION OF CIRCULATION AREAS IN PASSIVHAUS BUILDINGS

UK CERTIFIERS CIRCLE GUIDANCE

July 2025

Ventilation of Circulation Areas in Passivhaus Buildings
UK Certifiers Circle Guidance

Publication date: July 2025

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I was working as a physicist. I read that the construction industry had experimented with adding insulation to new buildings and that energy consumption had failed to reduce. This offended me – it was counter to the basic laws of physics. I knew that they must be doing something wrong. So I made it my mission to find out what, and to establish what was needed to do it right.

— Prof. Dr. Wolfgang Feist

ACKNOWLEDGEMENTS

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Cover image: *Agar Grove, certified Passivhaus - image: Architype*

Thanks to our Patron members

The Passivhaus Trust Patron Members provide additional support to the Passivhaus Trust, including funding for technical research and publications.

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INTRODUCTION

This note covers the ventilation of corridors and circulation areas in Passivhaus projects. It gives the rationale for ventilating these spaces and some approaches to satisfying the requirements.

Any design must also meet building regulations and project requirements; this guidance is to complement those considerations.

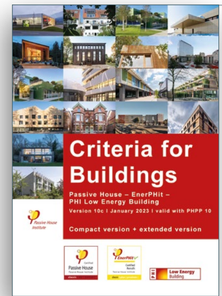
CRITERIA AND OTHER RELATED REQUIREMENTS

THE PASSIVHAUS CRITERIA

The current criteria are available from the Passive House Institute's website.

The project Passivhaus Certifier is responsible for checking that the project proposals satisfy the requirements and can answer queries during design development - best to have them appointed early!

Ventilation of circulation areas is addressed in paragraph 2.4.3, as follows:



2.4.3 Ventilation

All rooms within the thermal building envelope must be ventilated either directly or indirectly (transferred air) with a sufficient volume flow rate. This also applies for rooms which are infrequently occupied by persons, provided that the mechanical ventilation of these rooms does not involve a disproportionately high investment. Circulation areas (stairwells, corridors etc.) must be ventilated, except if these are used only rarely (e.g. for maintenance purposes or solely as emergency exits), if prohibited by law (see 2.4.3.a), or in the case of draught lobbies or crawl spaces (see 2.4.3.b). ...For circulation areas outside of dwelling/utilisation units used solely for access (stairwells, corridors etc.), at least a 0.1-fold air change rate must be used.

https://passiv.de/downloads/03_building_criteria_en.pdf

OTHER RELEVANT REQUIREMENTS

Other relevant requirements include:

- Protection against moisture risk, including mould growth.
- The airtightness requirement and testing protocol for this (including the requirement that only continuously used openings or ventilation systems can be temporarily sealed during testing).
- The limits for heating, either space heating demand or peak heating load: corridor ventilation contributes to heat loss, and needs to be included in the energy modelling. The final certification PHPP should reflect the commissioned systems, not the theoretical design.
- The energy use of mechanical systems within the building.
- Delivering occupant comfort, including avoiding cold drafts.

Passivhaus buildings are very airtight with low infiltration; this means that some background ventilation that exists in other buildings is not present. Therefore, a specific design for ventilation in these areas is required to remove pollutants, including volatile organic compounds (VOCs), moisture, and to help avoid overheating. It's worth noting that CIBSE TM59[1], a standardised methodology for assessing the risk of overheating in residential buildings, includes circulation spaces. As Passivhaus is a comfort and energy standard, consideration should be given to how the chosen ventilation approach will impact occupant comfort in these circulation spaces.

INFORMATION THE DESIGNER NEEDS TO PROVIDE

- What is causing the air movement through each and every space, and how good air quality is ensured.
- How ventilation is controlled, and how will it vary with internal or external conditions, e.g.:
    - Will the mechanical ventilation run 24/7 at a single flow rate, with the fan operating under volume control?
    - Will natural ventilation openings modulate to correct for variations in wind, internal temperature, and external temperature?
- How systems will be commissioned and evidenced.
- How much heat recovery will be achieved.
- Modelling in PHPP which reflects the expected flow rate and heat recovery efficiency at design stage, and then matches commissioning at the end of construction.

1 https://www.cibse.org/knowledge-research/knowledge-portal/technical-memorandum-59-design-methodology-for-the-assessment-of-overheating-risk-in-homes

EXAMPLE SOLUTIONS

Design and installation considerations are given, with notes on how they should be modelled in PHPP. For each approach, the Passivhaus designer should make sure that:

- All the heat losses and gains, and any electricity consumption, are included in the PHPP calculation.
- The solution doesn't compromise comfort, or cause moisture or mould growth issues.

WHOLE-BUILDING CASCADE

DESCRIPTION

Ventilation is provided by transfer air between zones from a mechanical system, for example from a classroom supply, through a circulation zone, to extract through a nearby WC. This is the idealised Passivhaus ventilation solution.

CONSIDERATIONS

- Reduces total air flow through the building.
- Reduces ventilation plant and ductwork.
- Fire protection between zones needs to be considered.
- Noise transfer between zones needs to be considered.
- Generally not possible nor desirable for communal corridors in residential buildings.
- Gives reliable and controllable ventilation.
- Check how flow rates will be controlled, and that 0.1 ACH is achieved in each space via indirect air transfer, and under expected usage scenarios if the system volume flow rate changes (e.g. with demand controlled ventilation).

EVIDENCE DURING DESIGN AND CONSTRUCTION

- Ventilation paths and flow rates should be noted on drawings. This will typically include the devices air is flowing through, such as transfer grilles, door undercuts etc.
- Commissioning records of the ventilation system should confirm flows to and from adjacent spaces, so the circulation space ventilation can be indirectly verified, and confirm that the openings needed to allow transfer ventilation are present.

MODELLING IN PHPP

- Note the ventilation air flow rate as transfer ventilation in the **Addl. Vent** worksheet.

DEDICATED HEAT RECOVERY VENTILATION UNIT FOR ONE ZONE

DESCRIPTION

Ventilation by a dedicated ventilation unit for one zone such as a stairwell or single floor lobby. Examples include:

- **Domestic-scale MVHR, with a supply duct run to the base, and extract from top, running continuously at fixed flow rate.**
- **Through-wall MVHR unit around half-way up the stairwell.**

CONSIDERATIONS

- Increases total ventilation flow rate compared to a cascade approach.
- Provides reliable and controllable ventilation with low energy use and heat loss.
- Can require multiple ventilation units with associated maintenance requirements.
- Check how fan flow rates will be controlled, and that they provide 0.1 ACH in each space.

EVIDENCE DURING DESIGN AND CONSTRUCTION

- Ventilation units, ductwork, and ventilation flow rates to be shown on design information.
- Commissioning records required for final certification.

MODELLING IN PHPP

- As a conventional MVHR unit.

DEDICATED HEAT RECOVERY VENTILATION UNIT FOR SEVERAL ZONES

DESCRIPTION

A dedicated ventilation unit serving several or all corridors and circulation spaces, for example, a ducted domestic scale MVHR, running 24/7/365.

CONSIDERATIONS

- Often problematic when ducts go through fire compartments. Sketches of duct routes signed off by fire consultants would be useful.
- Increases total ventilation flow rate compared to a cascade approach.
- Check how fan flow rates will be controlled.

EVIDENCE DURING DESIGN AND CONSTRUCTION

- Ventilation units, ductwork, and ventilation flow rates to be shown on design information.
- Commissioning records required for final certification.

MODELLING IN PHPP

- As a conventional MVHR unit.

DEDICATED MECHANICAL EXTRACT WITHOUT HEAT RECOVERY

DESCRIPTION

A dedicated extract fan or fans, operated to provide a low constant extract flow rate. Supply and transfer grilles positioned to provide ventilation to neighbouring spaces.

CONSIDERATIONS

- Check approach is acceptable with fire consultant/engineer.
- Increased heat loss compared to cascade ventilation or options with heat recovery.
- Gives control of ventilation flow rate.
- Check how fan flow rate will be controlled.
- Check make-up air will be provided reliably, and where it will come from.
- If running continuously, it can be sealed for airtightness testing. If running intermittently, it will need to make itself airtight when not operating, and for the building airtightness test.
- Typically has considerable impact on heating demand so is typically only possible for small spaces with high heat gains in large buildings.
- Potential comfort issues if openings are near areas where comfort is a concern, e.g. a corridor providing other functions such as breakout meeting space. Include example plans, cold and warm spaces.

EVIDENCE DURING DESIGN AND CONSTRUCTION

- Ventilation units, ductwork, and ventilation flow rates to be shown on design information.
- Commissioning records required for final certification.

MODELLING IN PHPP

- Include flow rate, modelled using a component with 0% heat recovery in the **Addl. Vent.** tab in PHPP, and for the impact in summertime in the **SummVent** worksheet.

MECHANICAL EXTRACT THROUGH SMOKE VENTILATION

DESCRIPTION

An auxiliary fan alongside smoke extract fans, operated to provide a low constant extract flow rate through smoke ventilation ductwork. Supply and transfer grills positioned to provide ventilation to neighbouring spaces.

CONSIDERATIONS

- Check approach is acceptable with fire consultant/engineer.
- Increased heat loss compared to cascade ventilation or options with heat recovery.
- Gives control of ventilation flow rate.
- Check how fan flow rate will be controlled.
- Check make-up air will be provided reliably, and where it will come from.
- If running continuously, it can be sealed for airtightness testing. If running intermittently, it will need to make itself airtight when not operating, and for the building airtightness test.
- Typically has considerable impact on heating demand so is typically only possible for small spaces with high heat gains in large buildings.
- Potential comfort issues if openings are near areas where comfort is a concern, e.g. a corridor providing other functions such as breakout meeting space. Include example plans, cold and warm spaces.

EVIDENCE DURING DESIGN AND CONSTRUCTION

- Ventilation units, ductwork, and ventilation flow rates to be shown on design information.
- Commissioning records required for final certification.

MODELLING IN PHPP

- Include flow rate, modelled using a component with 0% heat recovery in the **Addl. Vent.** tab in PHPP, and for the impact in summertime in the **SummVent** worksheet.

NATURAL VENTILATION

DESCRIPTION

Window or vent openings positioned to allow air flow through the whole space. Opening control typically via automated vents to ensure ventilation without any user input.

Please note that this is not a recommended solution.

CONSIDERATIONS

- No fan and minimal ductwork required.
- Difficult to control, with larger openings required to guarantee adequate ventilation in very still conditions leading to over-ventilation when it's windy. There is no convenient air parameter to measure to ensure 0.1 ACH is achieved (this is in contrast to ventilation for occupancy, where CO_2 can be used as a proxy for air quality).
- It is difficult to calculate a reliable air flow assumption for PHPP, so a conservative estimate should be used.
- Has considerable impact on heating demand so is typically only possible for small spaces with high heat gains in large buildings.
- Generally not possible if openings are near areas where occupant comfort is a concern e.g. a corridor providing other functions such as breakout meeting space. Include example plans, cold and warm spaces.
- Managing air flow and ensuring all spaces are ventilated is very challenging. Spaces deep into the plan may receive no ventilation.

EVIDENCE DURING DESIGN AND CONSTRUCTION

- Calculations for flow rate (see Modelling in PHPP section below).
- Drawings showing ventilation openings and design information showing how they will be controlled.
- Evidence of opening sizes and locations.
- Commissioning records of automated controls of natural ventilation system required for final certification, e.g. modulation of opening area with outside air temperature.

MODELLING IN PHPP

- To check that the minimum required airflow rate is possible: use the **SummVent** worksheet window ventilation calculation to size openings based on 0m/s wind speed to achieve 0.1 ACH (worst case), based on 3°C ΔT between inside and outside, based on the project characteristics (number of openings and their location, expected operation of the building etc.).
- To model the average airflow during the heating season: use auxiliary calculation to predict air flow at 1m/s wind speed, based on the temperature difference between 20°C inside, and the average air temperature outside for all months where there's a heating demand. This will typically mean a temperature difference of at least 10°C for the UK. Enter this in the **Addl. Vent.** worksheet with 0% heat recovery and no electricity demand.
- Use the **SummVent** worksheet to model the expected effect of these openings in summertime.

The Passivhaus Trust is an independent, non-profit organisation that provides leadership in the UK for the adoption of the Passivhaus standard and methodology.

Passivhaus is the leading international low energy design standard, backed with over 30 years of building performance evidence. It is a tried & tested solution that enables a meaningful transition to net-zero now. Over 65,000 buildings have been certified to this standard worldwide. The Trust promotes Passivhaus as a robust way of providing high standards of occupant comfort and health AND slashing energy use and carbon emissions from buildings in the UK.

Please find us on Linkedin, Instagram, Bluesky and other social media @PassivhausTrust. Keep up to date with all things Passivhaus by joining our mailing list.

www.passivhaustrust.org.uk

Passivhaus Trust
The UK Passive House Organisation

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https://passivhaus.uk/patron-members