

Ventilation Calculations in Heatpunk

This guide primarily applies to the UK version of Heatpunk. For the IE version, S.R.50-2021 (UK *Legacy Method*) is still the primary method used and will be selected by default. Information on the other two available methods can be found below but disclaimers about MCS and the *Legacy method* can be ignored.

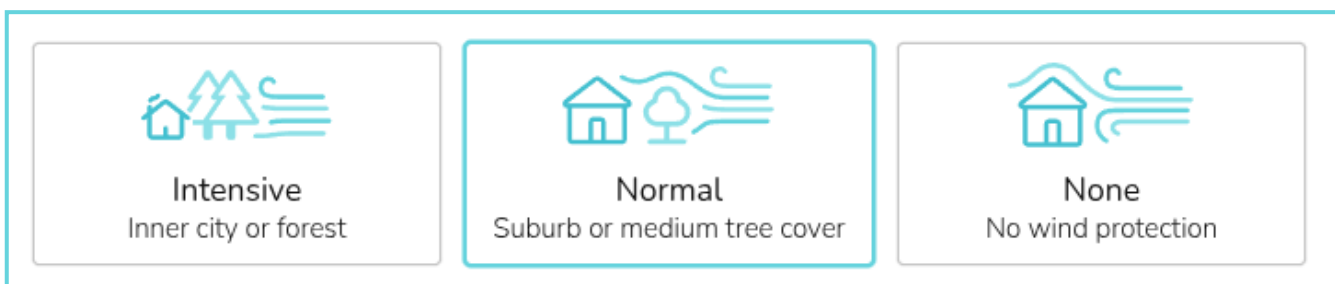
Choosing a method

Ventilation calculations are completed at the start of the [Plan task](#). In each project will you have the following options:

- **Standard method:** based on BS EN 12831-1:2017, using assumed values for measured air permeability.
- **Measured air permeability:** based on BS EN 12831-1:2017, using measured values for air permeability.
- **Legacy calculation:** based on BS EN 12831:2003.

Standard method and measured air permeability

After selecting either BS EN 12831-1:2017 method, you must then select 'How sheltered from the wind is the building?':



For the **Measured air permeability** option, you will also be asked to input an air tightness test result:

Air permeability

Text

$\text{m}^3/(\text{h}\cdot\text{m}^2) @ 50 \text{ Pa}$

For the **Standard method** this value is assumed based on the minimum ventilation rate required for the number of bedrooms in the property.

Heatpunk will then execute the calculation [detailed below](#).

Legacy method

For **UK** projects, MCS certification in accordance with MIS 3005-D now requires heat loss calculations comply with BS EN 12831-1:2017. Please only select this method when viewing old projects. For **IE** projects this is called S.R.50-2021 and is still the default option.

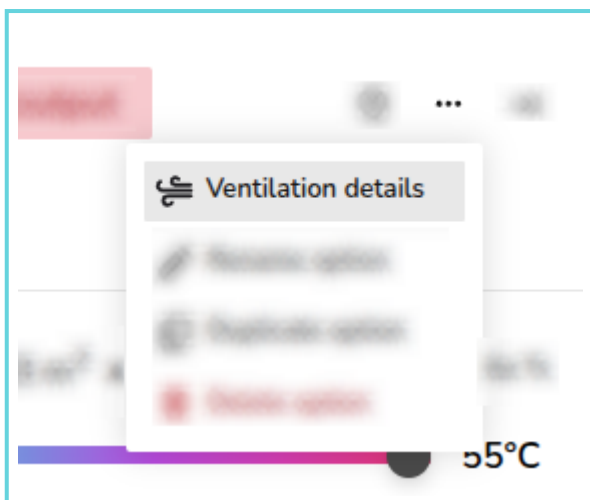
If opening a project created before Dec 2025, the Legacy method will be selected. This calculation is a sum of the individual ventilation losses of each room. For each room the following calculation is done:

Room ventilation losses = $0.33 * \text{ACH} * \text{Volume} * \text{Temperature difference}$,

where the ACH was taken from Table 3.8 of the CIBSE Domestic Heating Design Guide (2021).

Editing calculation

Once completed, you can edit the ventilation calculation by clicking click the **...** **three dots** in the top right corner and then selecting *Ventilation details*.



How are ventilation losses calculated?

Under BS EN 12831-1:2017, the ventilation losses for a building are not a simple sum of the ventilation losses for each room. Instead ventilation losses are calculated both at a room level (Equation 17) and then separately on a building (or zone) level (Equation 16):

6.3.3.3.1 Ventilation heat loss of the building (build) / zone (z) / room (i)

$$\text{Building (build): } \Phi_{V,\text{build}} = \sum_z \langle \Phi_{V,z} \rangle \quad (15)$$

$$\text{Zone (z): } \Phi_{V,z} = \rho \cdot c_p \cdot \sum_i \left\langle \begin{aligned} &\max \langle q_{v,\text{leak}+ATD,i} + q_{v,\text{open},i} \cdot f_{i-z} \cdot q_{v,\text{min},i} - q_{v,\text{techn},i} \rangle \cdot (\theta_{\text{int},i}^* - \theta_e) \\ &+ q_{v,\text{sup},i} \cdot (\theta_{\text{int},i}^* - \theta_{\text{rec},z}) \\ &+ q_{v,\text{transfer},ij} \cdot (\theta_{\text{int},i}^* - \theta_{\text{transfer},ij}) \end{aligned} \right\rangle \quad (16)$$

$$\text{Heated space (i): } \Phi_{V,i} = \rho \cdot c_p \cdot \left(\begin{aligned} &\max \langle q_{v,\text{env},i} + q_{v,\text{open},i} \cdot q_{v,\text{min},i} - q_{v,\text{techn},i} \rangle \cdot (\theta_{\text{int},i}^* - \theta_e) \\ &+ q_{v,\text{sup},i} \cdot (\theta_{\text{int},i}^* - \theta_{\text{rec},z}) \\ &+ q_{v,\text{transfer},ij} \cdot (\theta_{\text{int},i}^* - \theta_{\text{transfer},ij}) \end{aligned} \right) \quad (17)$$

where

$\Phi_{V,\text{build}/z/i}$	ventilation heat loss of the building (build) / zone (z) / room (i)	W
ρ	density of air at the internal design temperature $\theta_{\text{int},i}$	kg/m ³
c_p	specific heat capacity of air at the internal design temperature $\theta_{\text{int},i}$	Wh/(kg·K)
f_{i-z}	ratio between the minimum air volume flows of single rooms (i) that are part of the considered zone (z) and the resulting air volume flow of the zone (z)	-
$q_{v,\text{leak}+ATD,i}$	external air volume flow into the room (i) through leakages and ATDs in accordance with 6.3.3.3.2	m ³ /h
$q_{v,\text{open},i}$	external air volume flow through large openings in the building envelope for the room (i)	m ³ /h
$q_{v,\text{min},i}$	minimum air volume flow of the room (i) in accordance with 6.3.3.5	m ³ /h
$q_{v,\text{techn},i}$	technical air volume flow of the room (i) in accordance with 6.3.3.3.3	m ³ /h
$q_{v,\text{sup},i}$	supply air volume flow of the room (i)	m ³ /h
$q_{v,\text{transfer},ij}$	transfer air volume flow into the room (i) from a neighbouring room (j)	m ³ /h
$q_{v,\text{env},i}$	external air volume flow into the room (i) through the building envelope in accordance with 6.3.3.3.2	m ³ /h
$\theta_{\text{int},i}^*$	internal air temperature of the considered room (i)	°C
θ_e	external design temperature	°C
$\theta_{\text{rec},z}$	temperature of the supply air volume flow into the zone (z) after passing heat recovery and, if any, passive preheating; without active preheating	°C
$\theta_{\text{transfer},ij}$	temperature of the transfer air volume flow $q_{v,\text{transfer},ij}$ from a neighbouring room (j) into the room (i)	°C

This is because some of the air flow into a room may be pre-warmed from another room. Rooms facing the wind may have cold outside air pushed into them, but then the warm air from those rooms will flow into other internal rooms. This reduces the amount of cold air entering a room not facing the wind, so not all warm air is lost to the outside. This then reduces the overall ventilation heat loss for the building compared to the individual rooms.

What is a zone?

A zone is a group of rooms that are air-connected by design, such as by an internal door that complies with the requirements in *Approved Document F: Ventilation, Volume 1 - Dwellings*.

Homes are commonly single ventilation zones and Heatpunk assumes a building represents a single ventilation zone.

How does this impact my designs?

- **Heat pump sizing:** Heat pumps should be sized to **meet the overall heat loss for the building**. The ventilation losses for the building are generally half the sum of the individual room ventilation losses.
- **Heat emitter sizing:** The emitter for an individual room must **meet the worst case ventilation heat loss**. The room ventilation losses are not discounted by the volume flow ratio that is applied to the building as a whole.

Calculation assumptions

Read below for the various assumptions made for the standard and measured air permeability methods.

Standard method assumptions

Where neither a measured air permeability or design air change rate is known, the whole-building air permeability is assumed based on **BS 12831 Table B.6** default values.

This uses a value of 12 m³/h.m² @ 50 Pa for all property types.

Measured air permeability assumptions

The air-tightness of the building can be tested using the methodology outlined in CIBSE TM23. The result is expressed in m³/m².hr at a specific pressure difference of 50Pa.

When the building air permeability has been measured, Heatpunk will apply a minimum air change rate of 0.5 ACH to all rooms. This minimum air change rate for habitable rooms is taken from Table B.7 of BS EN 12831-1:2017 and will replace the default values from Table 3.8 of the CIBSE Domestic Heating Design Guide (2021). This approach is intended to more accurately represent the actual air permeability of the building as measured. This may result in lower ventilation heat loss figures than using fixed default air change rates. Fixed default air changes rates can lead to a significant over estimation of ventilation heatloss, especially in older buildings.

You can choose to override the minimum air change rate of 0.5 ACH. Increasing the ACH for a room will only affect its ventilation loss if the ACH yields a larger loss than the loss computed using the measured air permeability.

By using Heatpunk, you are acknowledging and accepting this methodology.

If you have further questions, please get in touch at help@heatpunk.co.uk or help@heatpunk.ie.

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