Plan task: system designs

Common questions about how to design a heat pump heating system.

- Why does my total heat loss not equal the sum total of the room heat loss?
- How are radiator outputs calculated?
- How do you select underfloor heating?
- Can I add in different brands of heat pump?
- How is the Outdoor Design Temperature (ODT) set?
- How do I change the Outdoor Design Temperature (ODT) for my project?
- Why is the Outdoor Low Temperature (ODL) not changing after I've amended it?
- How do I factor in intermittent heating?

Why does my total heat loss not equal the sum total of the room heat loss?

If you are using one of the **BS EN 12831-1:2017 methods**, 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 and then separately on a building (or zone) level.

On the building level, there's an additional factor (f_{i-z}), typically assumed to be 0.5, which makes the building ventilation losses smaller. This is to account for the fact that 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 ensures your radiators are large enough for worst-case conditions, while preventing your heat pump from being oversized, which would limit its efficiency.

Read more about this here.

How are radiator outputs calculated?

Heatpunk calculates actual radiator outputs with the below formula. This allows us to easily consider differences in flow, return and room temperatures.

$$P = P_{50}\left(\left(\frac{t_i - t_r}{ln\left(\frac{t_i - t_a}{t_r - t_a}\right)}\right)\frac{1}{49.83}\right)n$$

where
P = heat emission from radiator (W, J/s)
$\mathbf{P_{50}}$ = heat emission from radiator with temperature difference 50 ^{o}C between the radiator and room(W)
$\mathbf{t_i}$ = water temperature inlet (^{o}C)
$\mathbf{t_r}$ = water temperature outlet (^{o}C)
$\mathbf{t_a}$ = surrounding air temperature (^{o}C)
n = n coefficient

The other way you can calculate radiator outputs is by calculating the correction factor based on temperature differences and the specific radiator being used. **This can then be multiplied by the power output given on the datasheet to give the radiator output.** To calculate the correction factor you should use the below formula.

$$Correction\ factor = \left(\frac{t_{rad} - t_{room}}{d_T}\right)^n$$

where
n = n-coefficient (from radiator datasheet)
$\mathbf{t_{rad}}$ = mean radiator temperature
$\mathbf{t_{room}}$ = room temperature

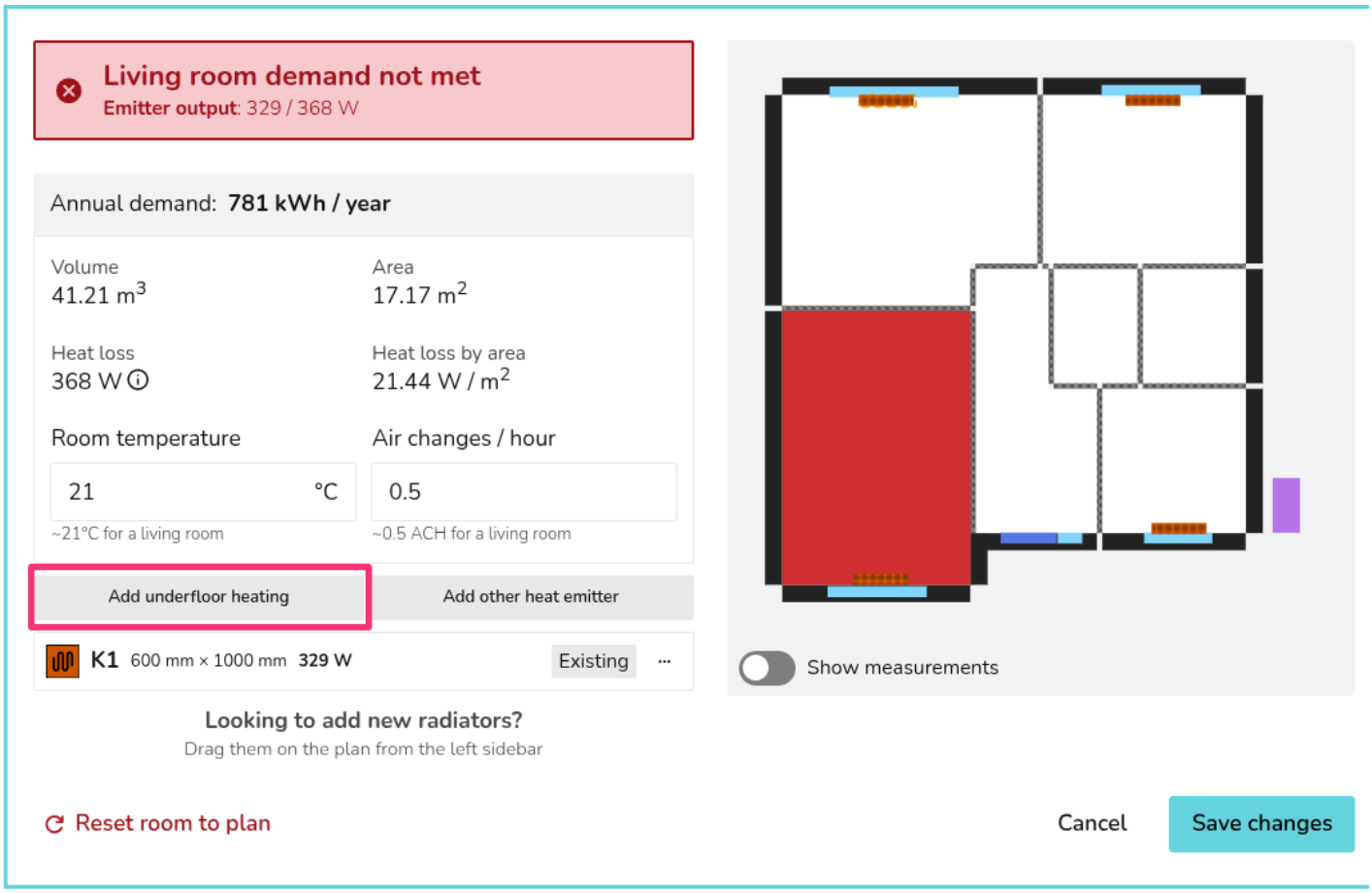
$\mathbf{d_T}$ = delta temperature used on the datasheet for the relevant radiator (this is usually 50^{o}C)

In the room breakdown of Heatpunk it should give you the total heat loss of the room and then radiator outputs will be calculated based on the flow temp you have used.

> The radiators built into Heatpunk are **Stelrad Classic Compacts with Bottom Opposite End connection**. If you are using radiators where the outputs differ significantly, you should add them in as a custom radiator. If you are using other varieties of connections for pipework, you must also account for this to ensure the outputs are calculated correctly.

How do you select underfloor heating?

While on the plan task, from the *Emitters* sidebar, click the icon and then select *Add Underfloor Heating* which will prompt you to input the floor area covered by the underfloor heating elements and their outputs in W/m^2.



Can I add in different brands of heat pump?

You can add in different heat pumps if you have a Heatpunk Pro license. For information on how to do this, see our guide on how to Create and manage your own components.

How is the Outdoor Design Temperature (ODT) set?

The Outdoor Design Temperature (ODT) for your project will be automatically set using the 99th percentile temperature for the relevant project location from **CIBSE guide A**.

Using the 99th percentile temperature means the temperature will only fall below the ODT for 1% of the year. You may choose to use the 99.6th percentile in which case **no additional uplift is needed for intermittent heating or exposed locations** (see MIS 3005-d for details).

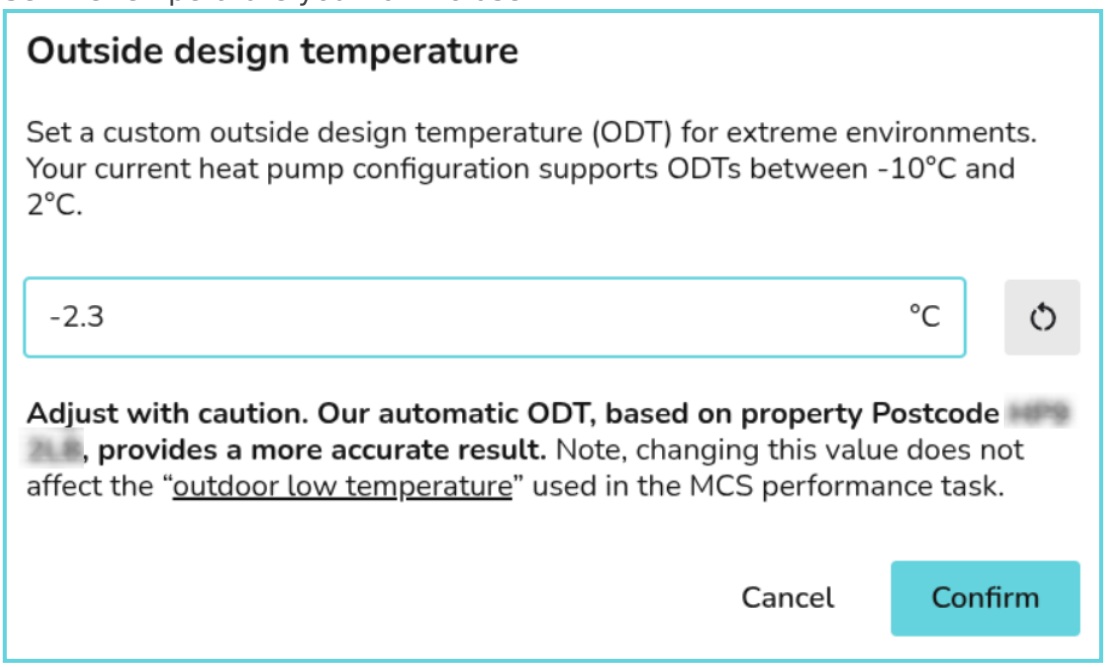
Using the project's location, Heatpunk will also automatically subtract **0.3°C** from the ODT for every **50 m** above sea level.

How do I change the Outdoor Design Temperature (ODT) for my project?

To change the ODT, follow these steps:

> Note this will **not** affect the Outdoor Low Temperature (ODL) used in the performance task.
> Read here for more information.

1. Navigate to the ***Plan task*** and the *Sources* tab
2. Below the sound heat pump load and sound check, click *Outside design temperature*
3. Set the temperature you want to use



> An additional **0.3°C** will need to be removed for every **50 m** above sea level, with altitude given in the input section of the technical report & customer proposal.

Why is the Outdoor Low Temperature (ODL) not changing after I've amended it?

Changing the Outdoor Design Temperature (ODT) does not affect the Outdoor Low Temperature (ODL) used in the performance task. This task is based on MCS 031, which states the the ODL from Appendix A must be used. MCS 031 Appendix A is equivalent to the 99.6th percentile from MIS 3005 D.

The ODL is not the same as the ODT used for the design, which you may adjust within MCS rules stated in MIS 3005 D. Read here for info on how Heatpunk sets the ODT.

How do I factor in intermittent heating?

Heatpunk assumes **continuous heating** when determining the ODT and sizing the heat pump.

If the property will be heated intermittently, you can change the ODT (in line with MIS 3005-d) to the 99.6th percentile and no uplift factor will be required. Read here to see what the 99.6th percentile is for your area, note that you will also need to subtract 0.3 degrees for each 50m above sea level.