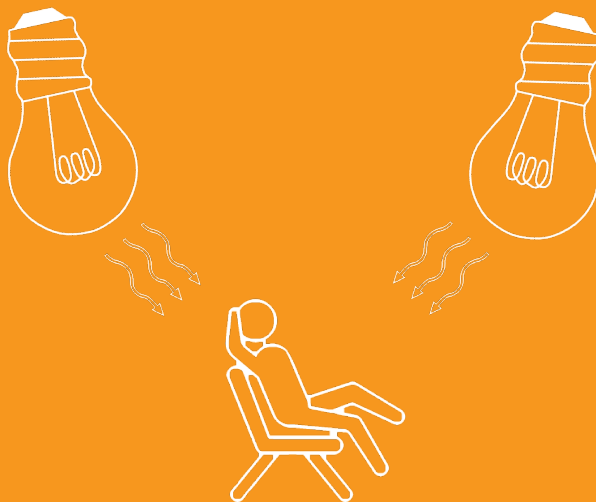


Can you imagine being able to heat your living room* with just two 60W light bulbs? And it being a constant comfortable 20°C?



Want to know more?

Give Ayshford Sansome a call and book an appointment with our Passive House Designer to discuss your next **steps**.

Email: t.lodge@ayshford.com

Tel : 01268 562266

Website: Ayshford.com

*Assuming 12 sq m living room

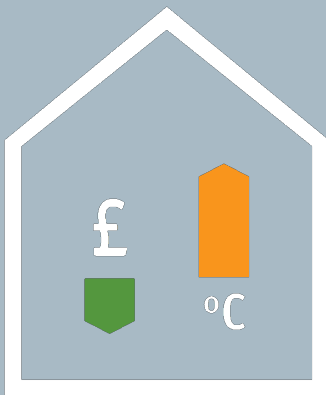


What is a passive house?

A passive House - or Passivhaus - uses physics to ensure that a small amount of heat or cooling provides a high level of comfort. To be a passive house you need to comply with the strict standards determined by the Passivhaus Institute in Germany.

Why should I have a passive house?

- The energy use of a passive house is about 1/5th of a standard house. This lessens the impact of energy price rises whilst reducing bills and carbon emissions.
- The passive house approach means that by reducing the energy used rather than offsetting energy use means more reliability in the savings provided.
- When combined with solar panels and battery storage you may not need to draw power from the grid.
- Following Passive House designs significantly reduces the risk of mould growth, pollutants in the air, cold spots, draughts, and overheating.
- Passive houses are designed to be extremely comfortable. They are design that approximately 94% of people are comfortable*
- Designers can predict the energy use usually to within +/- 3 kWh/(m2a) accuracy**.



So how does it work?

Passive houses are designed on 5 pillars.

- 1) High levels of insulation.
- 2) Triple glazed and airtight windows with solar shading features.
- 3) Heat recovery ventilation (known as MVHR).
- 4) High levels of Air tightness.
- 5) No gaps or interruptions to the insulation (called thermal bridge free).



Following these five pillars enables the building to meet 12 comfort criteria and 4 energy criteria.

These five pillars can be applied to any building not just houses. There are examples of Passive House accredited leisure centres, offices, schools and even a car showroom.

In fact, these pillars can be applied to existing buildings using the passive house retrofit standard EnerPHit.

So, who can design a passive house?

A Passive House designer or consultant is the best person to design a passive house. They can usually design the building themselves or they can work with your preferred designer/architect.

Who can build a passive house?

Any builder can build a passive house. They will need to be aware of the requirements and willing to learn from the Passive house designer. The PH designer will be able to guide any builder to construct a passive house. There are however accredited passive house trades persons who have been trained to build to the standards.

*Using the Predicted Mean Vote

**Accuracy figure based on the 2020 study "Are the energy savings of the passive house standard reliable? A review of the as-built thermal and space heating performance of passive house dwellings from 1990 to 2018." D. Johnston et al.

The Technical bit

Energy Balance

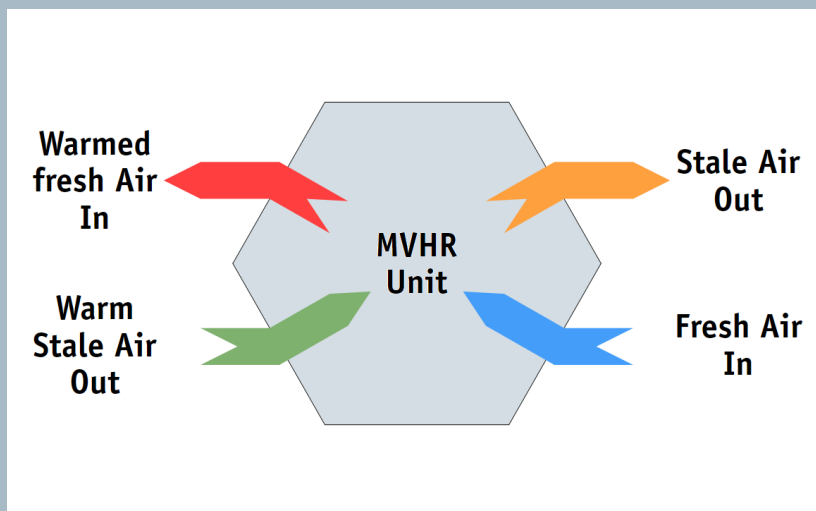
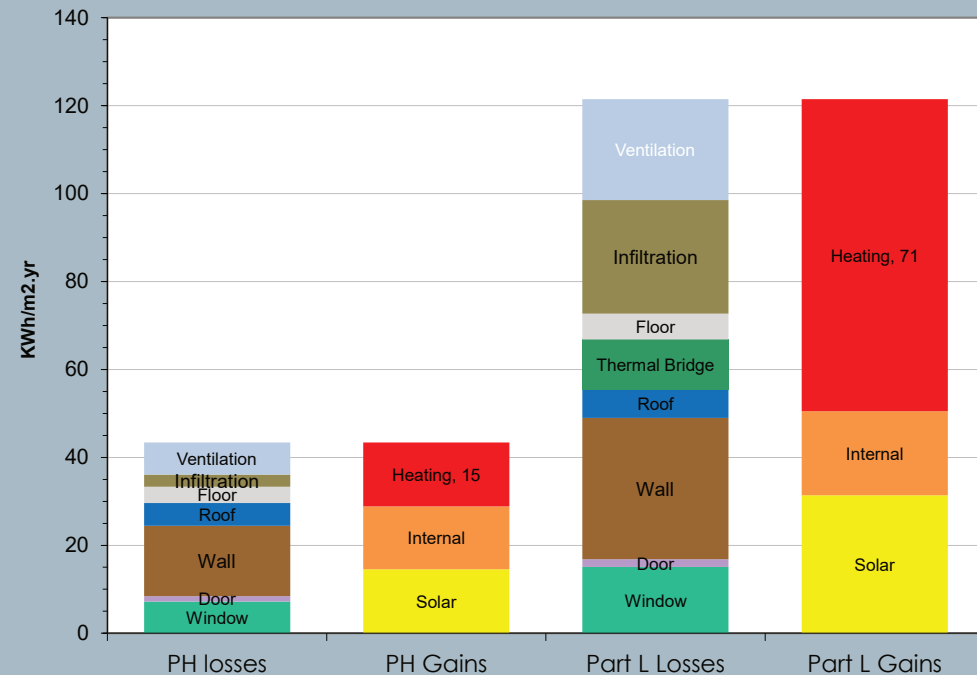
To have a constant temperature you need to have the same amount of heat losses as the amount of heat gains.

Heat losses are the heat lost through walls, windows, roofs etc. This also includes from ventilating the building - either by opening windows, trickle events or mechanical fans. It also includes infiltration, the air that leaks from a building, often referred to as draughts.

Heat gains are the useful heat produced or put into the building. This could be from the sun (solar), equipment or people (internal gains) and of course the heating system such as radiators.

This energy balance can be done for all buildings. The left example shows the balance for a Passive House (PH) and for a building that just complies with Building Regulations Part L.

As you can see the overall difference is almost a third. But the red area is the energy you use to run your heating which is a fifth - 14.5kWh/m².a for a passive house instead of 71.6kWh/m².yr for a standard house.



Mechanical Ventilation with Heat Recovery (MVHR)

How do you get fresh air into your build? By opening the windows. But when it is cold outside do you still open a window? Possibly not as it lets all the heat out.

An MVHR unit runs constantly and transfers the warmth from warm stale air leaving the building to incoming cold fresh air. They are highly efficient, able to recover 90% of the heat otherwise lost to ventilation whilst only using 54Wh*. Overall this could save £956 a year on a 3 bed home.**

During the summer the recovery section of the unit is bypassed meaning the warm internal air is removed without heating the already warm outside air.

But this unit not only provides a saving but ensures that the moisture in your building is properly removed. This means that during the winter moisture doesn't build up and then condensate on cold surfaces.



Thermal bridges, Bypass and Continuous Insulation

One key element of Passive house is ensuring that what is designed is achieved. This means the designer has to ensure that there are no gaps for heat to leak out of.

A 15mm gap in insulation can result in a 520% reduction in performance[^]. As part of the Passive House Designers role they educate and inform the contractor on advised construction methods. The contractor also has to photograph and confirm the quality of the works.



How do you apply this to existing homes or commercial building?

Because the Passive House standard is based on physics it can be applied to all buildings. In practice, many of the things needed for a passive house are things we can do to all building, such as installing additional insulation and improved triple glazed windows. There are some small differences which a designer needs to consider.

With existing buildings, it is important to get the order of work correct. For example, improving air tightness before improving ventilation can cause mould and damp issues.

For commercial properties the major difference is the change in internal gains. There are often more equipment and people to be considered. Furthermore, other considerations is hot water and heating systems are required.

What do I get from a Passive House designer?

The PH designer uses specialist software to calculate the heat losses and gains of your building. From this they can predict the energy use usually to within +/- 3 kWh/(m²a) accuracy^{^^}.

They can they advise on improvements to meet the Passive House requirements and, where necessary, advise on pay-back periods or early savings. Furthermore, they can show the effect of climate change on the comfort levels in your building.

They may also be able to provide other services such as embodied carbon calculations.

Confused? Need to know more?

Give Ayshford Sansome a call and book an appointment with our Passive House Designer and they can run through the science with you and calculate the savings you could have.

^{*}Figures based on 3 bed house of 90m² Treated Floor Area

^{**}Savings based on electric cost of 33.5p per kWh

[^]As reported by Mark Siddall in "Thermal Bypass - A Technical Review"

^{^^}Accuracy figure based on the 2020 study "Are the energy savings of the passive house standard reliable? A review of the as-built thermal and space heating performance of passive house dwellings from 1990 to 2018." D. Johnston et al.

Passive House Myth Buster

Myth	Truth
You can't open windows.	You can open windows in Passive Houses – in fact when you do a gale doesn't blow through the house.
You can't have pets.	You can have pets, but you'd need to open the door for them as cat flaps (and even letter boxes) leak too much air. There is a special air tight cat flap but it costs £1,000.
Airtight buildings are stuffy and mouldy.	Due to the ventilation and other requirements of passive houses there is no risk of mould. In fact they can get dry in the winter so you're encouraged to dry clothes indoors or have house plants.
Highly insulated and airtight buildings overheat.	Designers need to account for this and prove that the building won't go above 25°C for more than 10% of the year.
Passive houses cost too much.	Because much of the design is in the fabric the cost is about 8%** more than a normal building and is getting less.
Passive houses don't have any heating as they just use the sun.	Passive houses do have normal heating systems such as radiators or underfloor heating. They avoid relying on the sun to heat the building as that is very unpredictable and uncontrollable.
Passive houses are just boring squares.	Passive houses can be beautiful. There are many examples of this in the Passivhaus Awards.
Heat recovery ventilation (MVHR) is noisy.	Passive house standards specify maximum noise levels for MVHR units.
Heat recovery ventilation (MVHR) is costly to run.	MVHR uses little energy and can provide benefits at all outdoor temperatures.

**Costs based on a 2018 study by the Passivhaus trust