

The Passivhaus Principles

Passivhaus buildings are based on fundamental principles that must form part of an integrated approach to reliably deliver exceptional energy efficiency, comfort, and durability. There are three core principles of approach and five building principles that support successful outcomes.

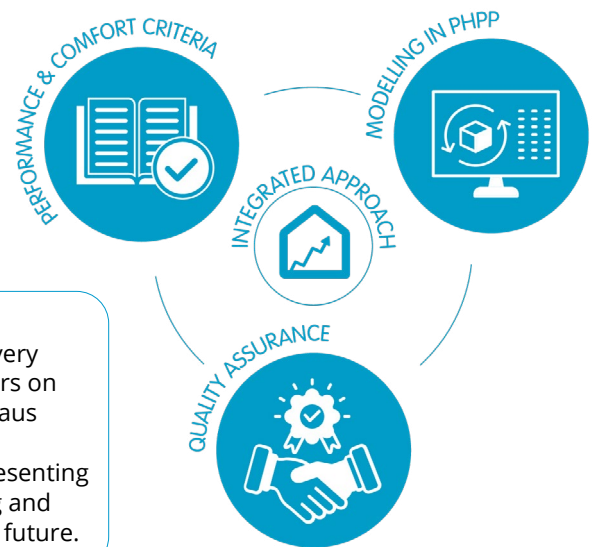
PRINCIPLES OF APPROACH

The three core principles of approach are detailed performance and comfort criteria, accurate performance modelling in PHPP, and rigorous quality assurance across design, construction, and commissioning. Together, these principles enable Passivhaus buildings to not only meet theoretical energy standards but also deliver on their real-world performance, comfort, and durability.

Clearly defined and detailed **performance and comfort criteria** which are underpinned by a strong and proven evidence base.

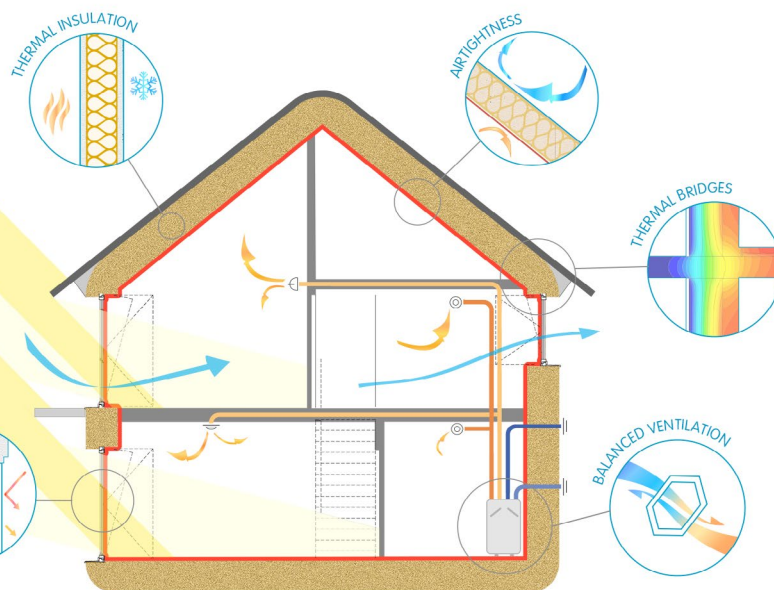
Every Passivhaus project must be modelled using the **Passivhaus Planning Package (PHPP)** for precise energy balance calculations and comfort assessments. It's both an invaluable design aid and a powerful tool for value engineering.

Quality assurance is delivered through careful verification at every stage, so that the building delivers on its performance targets. Passivhaus Certification is independent and impartial, with the Certifier representing the best interests of the building and building owners, now and in the future.



BUILDING PRINCIPLES

By following these principles of approach, each Passivhaus building will have a project-specific solution which optimises the five key building principles:



High performance **insulation** which is optimised for comfort, energy demand and the climate zone.

Continuous, high performance **airtight** layer to minimise heat loss, eliminate draughts and maximise fabric longevity.

Thermal bridges minimised to prevent cold spots and mould.

High performance **window** specification & shading to provide optimum comfort and efficiency in summer and winter.

Quiet and efficient mechanical **ventilation** with heat recovery (MVHR) delivering high indoor air quality.

These eight principles together form the foundation of the Passivhaus approach, enabling buildings to achieve the highest levels of efficiency, comfort, and durability.

What is Passivhaus?

Passivhaus is a suite of performance and comfort standards for buildings that reliably deliver energy efficiency, comfort and quality.

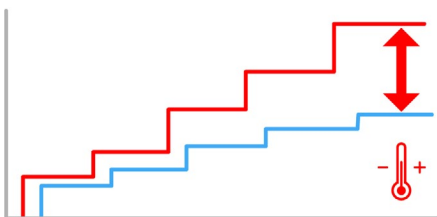
ENERGY, COMFORT AND QUALITY FOR BUILDINGS

The Passivhaus standards set clearly defined detailed criteria for space heating demand or peak heating load, total energy demand and energy generation, as well as summer comfort, airtightness, noise and ventilation, and requirements for accurate modelling and robust quality assurance.

In a successful Passivhaus project, climate, location, building orientation and glazing proportions, form factor, fabric and services, as well as cost and buildability, are all considered together from the earliest stage to deliver on energy, comfort, health, and the client's budget. As a result, a Passivhaus building is:

- The right temperature, steady in both winter and summer, and free of draughts
- High in indoor air quality, with a constant supply of tempered fresh air
- Cheap to run, with very low energy bills
- Robust and well-built.

ELIMINATING THE PERFORMANCE GAP



The 'performance gap' – the difference between the actual heating demand and what was predicted at design stage – is rife in the UK.

In-use monitoring of thousands of buildings, however, demonstrates that with Passivhaus, actual energy use is extremely close to modelling prediction.

The Passivhaus standard is reliable because of three core principles of approach: detailed performance and comfort criteria, accurate modelling in PHPP, and rigorous quality assurance.

BENEFITS OF PASSIVHAUS



CLIMATE EMERGENCY

Energy saving also means carbon saving. By slashing energy demand, Passivhaus buildings reduce the amount of renewable energy needed to get to net zero emissions – especially in winter, when solar generation is low – and help manage the peak load on the grid.

HEALTH AND WELLBEING

Passivhaus eliminates cold and damp from buildings. These warm, dry buildings support those with respiratory illnesses, a compromised immune system, or vulnerabilities to heat or cold stress. Tackling excess cold and dampness in homes could deliver savings to society of £15.4 billion every year.



PEOPLE PERFORMANCE

Evidence shows that better indoor air quality helps people perform better. In offices, a healthy indoor environment is linked to lower absenteeism and increased productivity. In schools, lower concentrations of CO₂ lead to improved focus and learning – and ultimately, happier children!

SOCIAL RETURN

A good building creates social value. Benefits to society include education and skills attainment, improved health and wellbeing of communities, as well as wider climate benefits. By tackling fuel poverty, Passivhaus enables a fair transition to net zero.



FINANCIAL BENEFITS

Lower bills and lower maintenance costs are the most obvious financial benefits. But also, for landlords, the lower bills leads directly to lower rent arrears. And for building owners, a higher quality building will ultimately translate to a higher capital value.

WHAT IS PHPP?

The Passivhaus Planning Package (PHPP) is a modelling tool that reports a bespoke energy balance for your project. This means that while the Passivhaus standard is the same for most building types, the particular solution for your building will be tailored.

PHPP has been proven to be reliable in giving accurate predictions of actual energy use in the finished building. Used as a design aid at an early stage, PHPP can help you quickly identify which details have the most impact, and find opportunities for optimisation.

FLEXIBILITY & OPTIMISATION

Passivhaus is not prescriptive about elemental building components, so long as the total **energy balance** and accompanying metrics meet the criteria. A good form factor, for example, can allow a relaxed specification in other areas – like reduced insulation.

This flexibility in Passivhaus opens up huge scope for true value engineering, with potential for a significant positive impact on the bottom line.

Form factor & keeping things simple

Both form factor and complexity have a significant effect on heat loss, buildability, cost, and embodied carbon. Passivhaus incentivises optimisation of all aspects of design, encouraging simplicity and efficiency.

Delivering summer comfort

As a comfort-driven approach, the Passivhaus standards include an overheating criterion to ensure that summer comfort can be achieved. PHPP analyses overheating risk and includes a robust stress testing tool.