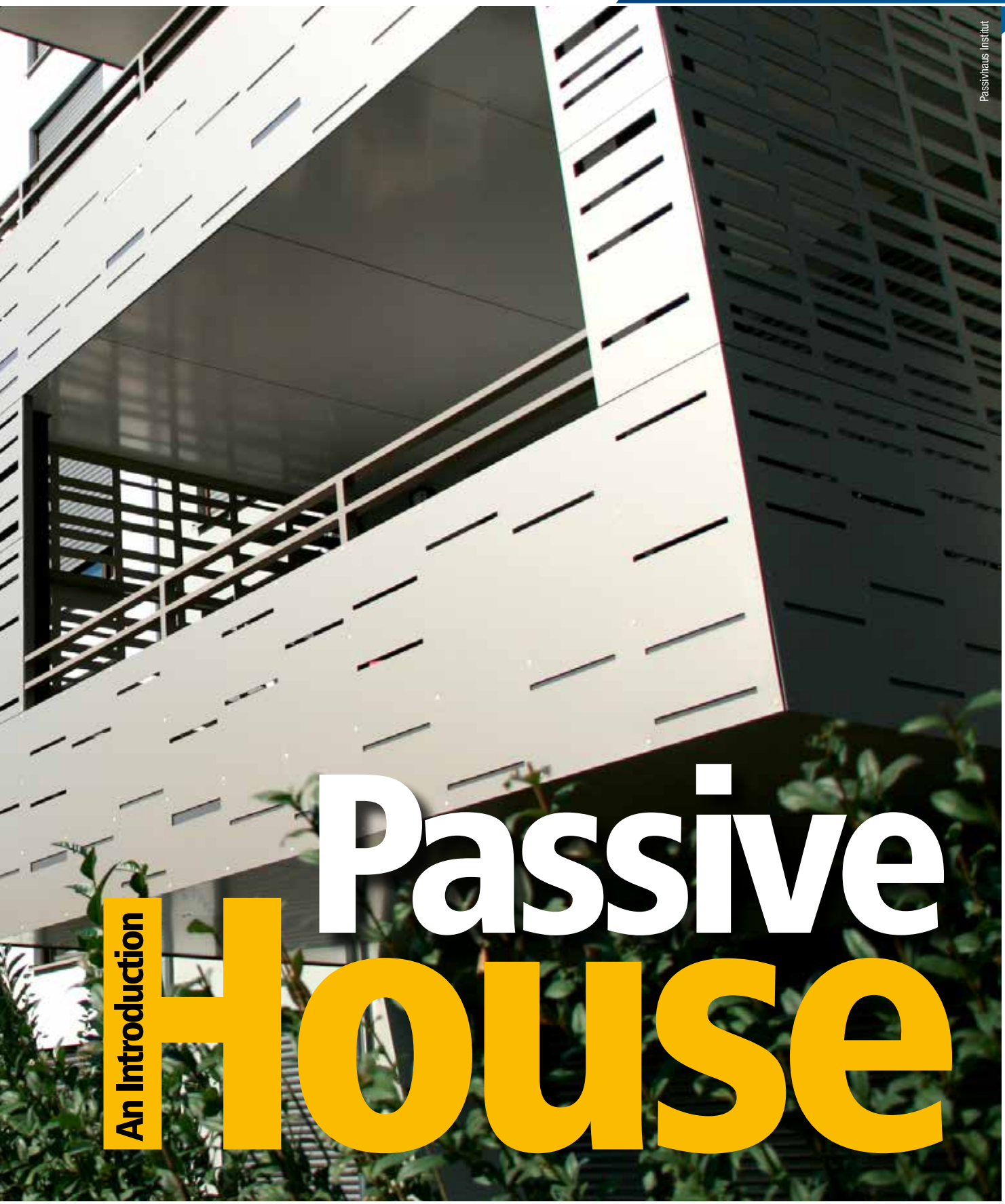
Passivehaus is the German construction concept for energy efficient and sustainable buildings. The term 'passive haus' refers to a building that emits zero carbon emissions. The innovative and energy-saving residential or commercial buildings construction method is becoming more popular in the UK thanks to its affordability, environmental values and quality. It fits perfectly into the responsible approach to the building and the creation of the better-built environment. The demand for economically conscious houses is high and here is why.



Passivhaus Institut

An Introduction Passive House


Günter Lang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Passive House is built up to the highest technological standards combining advanced insulation systems, heat recovery ventilation, tightness and air filtration what leads to the reduced building's carbon footprint. Passive House does not require the conventional heating system. A major part of the heating demand is met through "passive" sources such as solar radiation or the waste heat from occupants and technical appliances. A Passive House thus consumes about 90 percent less heating energy than


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existing buildings and 75 percent less energy than an average new construction. Passive house is the performance wise building, with low running costs and high level of internal comfort.

The first Passive House in the world was built in Darmstadt-Kranichstein (Germany) 25 years ago by four private homeowners on their own personal initiative. In 1991, these terraced houses have been regarded as a pioneer project for the Passive House Standard. 25 years later, building physicists have attested to the unimpaired functioning of the first Passive House and its unchanged low heating energy consumption. With its newly installed photovoltaic system, the world's first Passive House now utilises renewable energy and received the Passive House Plus certificate for this reason.

"The Passive House concept is a sustainable and cost-optimal solution for the Nearly Zero Energy Building. Because it functions everywhere, it is an opportunity to implement climate protection objectives with a high level of living comfort at the same time", says Prof. Dr. Wolfgang Feist of the Passive House Institute (PHI).

The Passive House Institute was hosting the International Passive House Conference "Passive House for all" last month. Passive House buildings are now possible for all stages of life: from kindergartens, schools and universities to retirement homes. Energy efficient Passive House buildings impress with their comfort and consistently low energy demand. In addition, Passive House buildings are feasible with all construction methods, with all kinds of energy supply systems and for all budgets. The Passive House Standard can be achieved for new constructions as well as for retrofits. Moreover, from a global energy efficiency perspective, the fact that Passive House buildings work well in all climate zones including arctic and tropical climates, is very important.

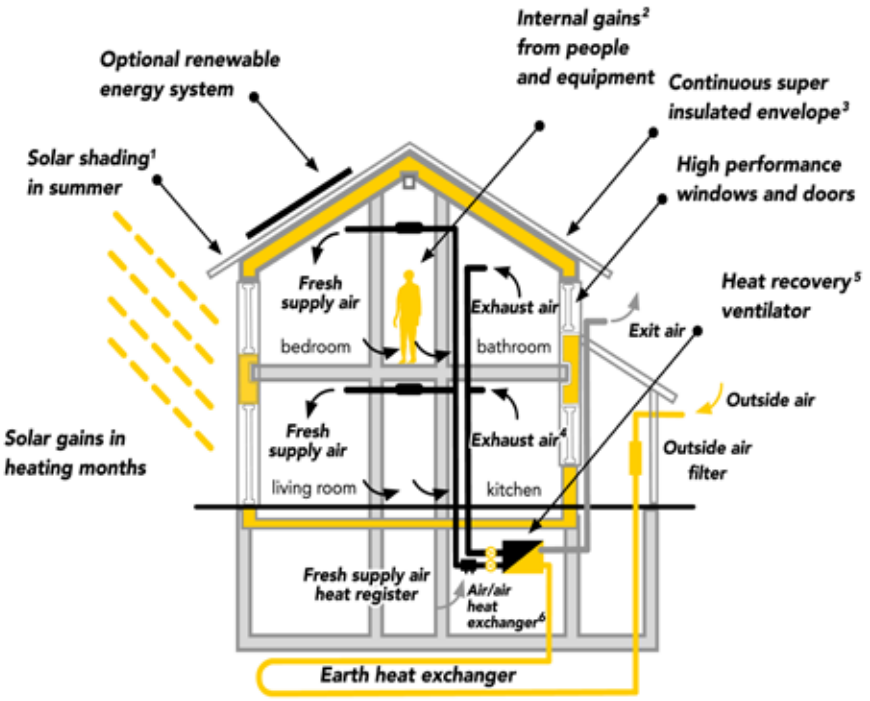
The Passive House uses the sun, internal heat sources and heat recovery systems, so the traditional heating is not required. In summer months the passive cooling techniques, for instance, shading is used to keep the house cool. The warmth inside or heat outside is achieved thanks to the highly insulated walls, roof, floor slab and special energy efficient windows. Ventilation supplies quality air.

The energy efficient Passive House building standard has proven to be successful throughout the world. The types of building constructed to the Passive House standard have also become more diverse.

"The Passive House concept is a sustainable and cost-optimal solution for the Nearly Zero Energy Building. Because it functions everywhere, it is an opportunity to implement climate protection objectives with a high level of living comfort at the same time. The associated added value is attractive especially for small and medium-sized businesses", explains Dr. Wolfgang Feist, Director of the Institute.

The Passive House Institute (PHI) has defined quality criteria for the Passive House Standard. Buildings that achieve these criteria are Certified Passive Houses. Certification is carried out by the Passive House Institute or via a Passive House Institute accredited Building Certifier. The Passive House Standard can be combined well with on-site renewable energy generation. Since April 2015, the new building classes "Passive House Plus" and "Passive House Premium" have been available for this supply concept. The first buildings to be certified in these two categories include both private houses and office buildings.

Passive House Diagram



Passive House Performance Requirements (for detailed criteria, please see the Passipedia (www.passipedia.org))	
The Space Heating Energy Demand	not to exceed 15 kWh per square meter of net living space (treated floor area) per year or 10 W per square meter peak demand.
The Space Cooling Energy Demand	not to exceed 15 kWh per square meter of net living space (treated floor area) per year or 10 W per square meter peak demand.
The Renewable Primary Energy Demand	not to exceed 15 kWh per square meter of net living space (treated floor area) per year or 10 W per square meter peak demand.
Airtightness	a maximum of 0.6 air changes per hour at 50 Pascals pressure (ACH50), as verified with an onsite pressure test (in both pressurized and depressurized states).
Thermal Comfort	must be met for all living areas during winter as well as in summer, with not more than 10 % of the hours in a given year over 25 °C.

(Source: Passive House Institute www.passivehouse.com)

Passive House buildings are planned, optimised and verified with the Passive House Planning Package (PHPP). All of the above criteria are achieved through intelligent design and implementation of the 5 Passive House principles: thermal bridge free design, superior windows, ventilation with heat recovery, quality insulation and airtight construction.

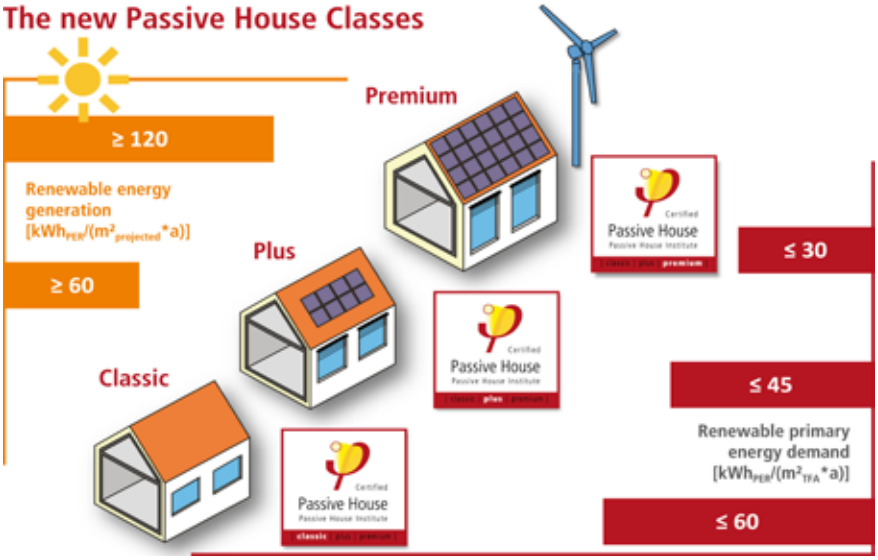
The following components' values (see table below) should not be exceeded to achieve the Passivhaus certification.

Passive Houses are highly innovative and excellent quality projects, so the investment costs tend to be higher than in the traditional construction mainly due to higher planning, designing costs and costs of technologically advanced components. However, when combining investments costs with the running costs over a building's lifecycle, the initial costs are compensated.

Information on projects certified as Passive houses can be found on the Passive House Database at www.passivehouse-database.org

In our sustainability guide every month we will include information for those interested in the passive house construction.

Windows and doors are the weakest part of a building's thermal performance. Zero Carbon Hub prepared the illustrated guidance to build the energy efficient homes. It is designated for traditional masonry construction of new homes and extensions.The presented chapters are about the windows installation to reduce cold bridging, increase air tightness and energy efficiency.



Source: www.passivehouse.com

Design Component	Limiting value
Walls, Roof, Floor (U-values)*	≤0.15 (W/m^{2}K)
Glazing unit	≤0.8 (W/m^{2}K
Installed glazing	≤0.85 (W/m^{2}K)
Doors	≤0.8 (W/m^{2}K)
Infiltration (ach-1)	≤0.6 @ n_{50}
Thermal bridging (linear ψ value)	≤0.01 (W/mK)
MVHR coefficient (η HR)	≥0.75
Ventilation electric limit	0.45 Wh/m^3
Appliances	High efficiency recommended
Lighting	High efficiency recommended
On site renewables	No requirementbut SHW typical

(Source: BRE, www.passivhaus.org.uk)

*please note opaque U-values are only recommended targets and are not critical to certification

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