

What is a Passivhaus?

And what do we like about living in one?

Sustainable St Albans' volunteer Linda, with her husband, commissioned a Passivhaus Plus and moved in just before lockdown in spring 2020. Linda produced the notes below for the Sustainable St Albans Eco Homes event October 2020.

Not a 'product' but a set of technical design standards which are based on the fundamentals of building physics – see the Passive House Planning Package created in Germany and now used worldwide (PHPP)

A PH building need not have certified products/technology – a Passivhaus Designer is free to develop design strategies to achieve the PHPP targets set for warmth, comfort, humidity and running cost economy. The PHPP goes way beyond the targets set by building regns

By achieving the PH technical design standards set for the above, other environmental outcomes are often achieved eg lower home-energy carbon emissions, improved internal air quality etc

Different solutions for hot and cold climates

<https://passivehouse.com/>

A note about Passivhaus Plus

An additional standard status if a Passivhaus also creates above a certain percentage of home-energy NOT using fossil-fuels > any excess can be stored in a battery and/or can be sold to participating renewable energy companies.

24 solar PV panels on angled stands, on a gently sloping 'flat' roof – high number so that we can charge our electric vehicle at home

FIVE Principles of Passive House standard	Meaning...	What we like
No 'active' heat creation energy source So – Where does heat come from?	Windows – capture cold ultra-violet sunlight > hot infra-red light > store in thermal mass floor > constantly emits gentle heat Kitchen – fridge/freezer, oven/hob, kettle, hot tap water, appliance motors, hot food/drink, extractor fan Bathrooms – hot shower/bath water, hot water tank Life! Human and animal bodies Household equipment – computer, iron, TV, lighting, vacuum, hairdryer etc	It works! Generate enough heat by simply 'living' – installed under-floor, hot-water heating on ground floor – on to dry house out when new, off the day we moved in – not expect to use it again No central heating radiators, plumbing or boiler Biggest problem – keeping interior cool < learned how to stop sunlight getting in without living in the dark, MVHR system regulates temperature PH+ means mainly solar PV electricity generation so way fewer carbon emissions
Insulate! Insulate! Insulate!	450mm walls with several cavities, each with different insulation solutions eg waterproof membrane, dense wood frame,	Use of non-oil-based insulating materials means lower carbon emissions in wall construction

	<p>cellulose, rockwool, fire resistant plasterboard, dense wood external cladding No thermal bridges < no metal links > inside and outside to conduct warm air outside</p>	<p>Reduced noise penetration from outside – planes, roads</p>
<p>Draught-free construction</p>	<p>Line of airtightness < special tape, not simple duck-tape!</p> <p>17 x airtightness required in Building Regulations</p> <ul style="list-style-type: none"> • modern 3-bed house = natural 6-8 air changes/hour • 3-bed PH target = not more than 0.6 natural changes/hour = once every 1.5 hours • our 3-bed PH house actual = 0.3 natural changes/hour = once every 3.3 hours <p>Roof included in line of airtightness</p>	<p>No chilly corners or rooms</p> <p>Same temperature range throughout</p> <p>Airtightness tests found breaches – around landing window, under front-door, under lounge patio door, keyholes! – all sorted</p>
<p>MVHR – mechanical ventilation & heat-recovery system</p>	<p>Mechanical ventilation > expels stale and humid air (from kitchen, bathrooms), filters fresh incoming air. Needed as house too airtight to rely on draughts for air change</p> <p>Heat recovery – c90% heat transferred from warmer expelled air > cooler incoming air</p> <p>Air-sourced heat/cooling pump regulates internal air temperature <> self-selected 22° - 26° - cooler in bedrooms</p> <p>Separate air-sourced heat pump heats domestic hot water</p>	<p>90% all heat sources created by simply 'living' is not wasted – good feeling – nobody likes waste</p> <p>Virtually free at point-of-use – tiny circulation fans – 35 watts/hour</p> <p>C50% constant humidity – British homes fluctuate, at more than c60% > damp, mouldy cupboards, walls, bathrooms, kitchen</p> <p>Filters result in less internal air pollution – catches wasps!</p> <p>Energy bills of PH+ = 20% of previous same-sized house BUT will reduce when sell over-generation</p>
<p>High performance windows & doors</p>	<p>3ple glazed, very clear glass, larger/more on South/West, smaller/fewer on North/East</p> <p>Insulated frames, continuous internal windowpane seals</p> <p>Draught-free fit > adjustable hinges, multi-point locking, special screws, airtightness tape</p> <p>Shading > internal blinds, external swivel louvred shutters, window/door canopies, window awning, terrace overhang in house design</p>	<p>Reduced noise penetration from outside – planes, roads</p> <p>No cold 'strike' from inner windowpanes</p> <p>Nice big windows</p>