

**THIS IMAGE** The three-bedroom 'Larch House' is a Code for Sustainable Homes Level 6 Passivhaus at the Welsh Future Homes project in Ebbw Vale



# time to **GET ACTIVE** ON PASSIVE



On the road to Carbon Zero housebuilders should stop off at a Passivhaus, for there is much to learn from its principles, says ROGER HUNT.

Picture credit: BRE

**During his keynote speech at the first UK Passivhaus Conference last October, Chris Huhne MP, Secretary of State for Energy and Climate Change, said he “would like to see every new home in the UK reach the Passivhaus standard.” This is a huge endorsement for passive design which, until recently, has largely been the preserve of forward thinking self-builders; but it should not come as a surprise.**

Through meticulous attention to detail and rigorous design and construction according to principles developed by the Passivhaus Institute in Germany, Passivhaus buildings provide a high level of occupant comfort. Equally importantly they use very little energy for heating and cooling as space heating requirements are reduced by approximately 75 per cent compared to standard practice for UK new build.

The first Passivhaus was occupied in 1991 in Darmstadt Kranichstein, Germany. The standard quickly spread and there are now over 20,000

houses and other buildings throughout the world built and tested to the standard, although the vast majority are in German-speaking countries and Scandinavia. In the UK more than 50 Passivhaus projects are currently underway and many more have been designed using Passivhaus principles.

Housing associations in particular are seeing the benefits of passive design and the Passivhaus Trust, a new advice and lobbying body, has been launched. It will focus on research, education and policy campaigns around the application of Passivhaus in the UK and is affiliated with the Passivhaus Institute via the International Passive House Association (IPHA).

Neil Cutland, a director of both Cutland Consulting and the Passivhaus Trust, explains that Passivhaus is a robust, proven and cost-effective way to help cut carbon within the built environment. “It can help housebuilders’ compliance with future standards, provides comfort and quality of environment for occupants, and has marketing and PR benefits in terms of low

“Local weather conditions are important when calculating the figures that underpin the Passivhaus compliance as they can significantly affect the result”



**ABOVE** Solar gain through large south facing windows is important at the ZERO @ Aubert Park Passivhaus **FAR LEFT** The ‘Larch House’ at the Welsh Future Homes project in Ebbw Vale under construction **LEFT** Octavia Housing’s Passivhaus retrofit

**OPPOSITE PAGE**

**LEFT** ZERO @ Aubert Park a collaboration between North London property developers Matrix Bau and German housebuilders Kauffman **TOP RIGHT** Installing Dow Floormate 300-A insulation material below the concrete floor slabs at Hastoe’s affordable Passivhaus housing development in Wimbish, Essex **MIDDLE RIGHT** The triple-glazed imitation sash windows in the Passivhaus retrofit by Octavia Housing meet conservation area requirements **BOTTOM RIGHT** The living room in the Passivhaus retrofit of the 1860s terrace house by Octavia Housing



energy bills, standard of build and air quality.”

When it comes to energy and performance levels, Cutland says Passivhaus is beyond 2010 building regulations and very likely to comply with 2013 regulations as we currently understand them. “It is also going a long way towards 2016 zero carbon requirements.”

Cutland emphasises that Passivhaus is more than a piece of software with a performance standard built in. “Passivhaus is a set of principles and philosophies. You do super insulation, you go out of your way to avoid cold bridges, you make the building airtight, you put in mechanical ventilation with heat recovery (MVHR) and you take the benefit of solar gains. All of which takes you to the point where the heat load is so small that you can provide it just through the ventilation air.”

At Inbuilt, a consultancy delivering carbon reduction, renewable energy and efficiency solutions, Passivhaus certifier Andrew Peel believes Passivhaus is, in many ways, a better option for housebuilders than the pursuit of zero carbon. “It gets away from a dependence on ‘bolt’ on equipment such as photovoltaics (PVs) or fuels with unknown future costs, such as biomass, and concentrates on what housebuilders know best – the building itself.”

One of the latest testing grounds for Passivhaus is The Welsh Future Homes project in Ebbw Vale. This is a partnership between BRE Wales, the Welsh Assembly Government, Blaenau Gwent Council and United Welsh Housing Association and is a showcase for sustainable development and construction.

Designed by Bere Architects, two of the project’s



homes are Passivhaus. The three-bedroom ‘Larch House’ is a Code for Sustainable Homes Level 6 Passivhaus constructed with a close panel timber frame system which was developed by BRE, Bere and Holbrook Timber Frame. The home includes PVs and is clad with Welsh larch. The two-bedroom ‘Lime House’ Passivhaus is similar but is clad in Welsh lime render. As there was no company able to make Passivhaus quality windows in Wales, a Passivhaus standard window was developed which can be made by Welsh joiners using Welsh timbers.

Both houses demonstrate typical Passivhaus features: they are super-insulated and draught free. The triple glazed windows have insulated wooden frames to keep warmth in and avoid any condensation or mildew while a MVHR system provides fresh air when windows are closed in winter, saving over 90 per cent of the heat. There is no need for radiators. If heat is needed, it is provided in the fresh air supply which uses the

heat from solar heated water, topped up, if necessary, by means of a small gas boiler.

Each of the homes is designed to have energy costs of as little as £50 per annum. Once occupied in summer 2011, the homes will be monitored to see how they perform in use.

“Local weather conditions are important when calculating the figures that underpin the Passivhaus compliance as they can significantly affect the result, since a Passivhaus in an exposed and misty location will require an enhanced fabric specification,” explains architect Justin Bere. “The final air test achieved one of the UK’s best-ever results: almost three times better than the air change rate actually required for Passivhaus Certification.”

Passivhaus Certification is principally a quality assurance process, providing robust procedures to ensure construction meets design intent. At Inbuilt, Andrew Peel warns that it is important to fix the design before work starts as this allows clarity ▶

of drawings and reduces the risk of mistakes resulting from changes being made during the build. A significant barrier to successful Passivhaus construction can be the inadvertent installation of non-compliant products.

"Feedback on the design should be sought as early as possible. Ideally, a consultant should be appointed prior to planning submission to ensure that aspects of the outline design will not prove detrimental to achieving Passivhaus. This is particularly relevant for building form and window areas. An early review can save significant costs in the specification," emphasises Peel.

One organisation which has fully embraced the standard and is a founding member of the Passivhaus Trust is Hastoe Housing Association. Hastoe is on site with a rural scheme of fourteen homes, which will reach Code Level Four, in Wimbish, near Saffron Walden, Essex. A number of construction options were evaluated before finally adopting solid aircrete external walls wrapped externally in over 250mm of foam insulation with a rendered finish. The dwelling forms have been kept deliberately simple to avoid thermal bridging risks, and porches, meter boxes and brise soleil are all independently supported to avoid penetrating the insulation overcoat. East west orientation of the blocks facilitates passive solar gains, with careful attention to shading to avoid summer overheating.

A development which proves the upmarket potential of Passivehaus is ZERO @ Aubert Park in Highbury, north London. Here a terrace of four 3142 sq ft town houses is awaiting Passivhaus Certification. Priced at £2,500,000, each has a double height living cube, four double bedrooms with en-suites, a cinema room, a games room and two roof terraces. The project is a collaboration



**ABOVE** An impression of the fourteen new affordable Passivhaus homes being built by Hastoe Housing Association in Wimbish, near Saffron Walden, Essex

**BELOW** One of the south facing terraces at ZERO @ Aubert Park

between North London property developers Matrix Bau and German housebuilders Kauffman – the two met at an eco-housing conference – and promises energy savings of 90 per cent.

### Passive Retrofit


Passivhaus standards have been used by Octavia Housing in the retrofit of a 1860s terraced house in a conservation area in London's Holland Park. The home will use less than 15kWh of energy for heating per m<sup>2</sup> per year, compared to the UK average of 130kWh. As a result CO<sub>2</sub> emissions and energy consumption will be cut by an estimated 83 per cent and 94 per cent respectively, therefore saving the tenant around

£910 on annual fuel bills.

Octavia Housing and the team, including Ryder Strategies who designed and developed many of the innovations used, architects Paul Davis and Partners, energy consultants Eight Associates and low energy designers and project managers Green Tomato Energy, received funding for the project through The Technology Strategy Board's Retrofit for the Future competition.

The property is insulated to achieve a U-Value of 0.1 (W/m<sup>2</sup>K) with external insulation on the rear elevation and internal insulation on the front to comply with conservation area requirements. The triple-glazed imitation sash windows also meet these requirements and were designed and developed in-house. Coupled with these measures, potential areas of thermal bridging have been addressed and an airtight envelope has been created.

Instead of conventional heating, a self-designed labyrinth heat exchanger beneath the insulation in the basement provides pre-heating in winter and cooling in summer. Hot water is supplied by a combination of solar thermal, air source heat pump and waste water heat recovery. Air quality is maintained through MVHR.

To maximise living space, radiators and chimney flues have been removed. For comparative purposes, the energy consumption and comfort levels of the home will be monitored for two years alongside two other homes refurbished by Octavia Housing. 

### CONTACTS

Bere Architects [www.bere.co.uk](http://www.bere.co.uk)

Cutland Consulting [www.cutlandconsulting.co.uk](http://www.cutlandconsulting.co.uk)

Hastoe Housing Association

[www.wimbishpassivhaus.com](http://www.wimbishpassivhaus.com)

Holbrook Timber Frame

[www.holbrooktimberframe.co.uk](http://www.holbrooktimberframe.co.uk)

Inbuilt [www.inbuilt.co.uk](http://www.inbuilt.co.uk)

Octavia Housing [www.greenoctavia.org.uk](http://www.greenoctavia.org.uk)

Passivhaus Institute [www.passivehouse.com](http://www.passivehouse.com)

Passivhaus Trust [www.passivhaustrust.org.uk](http://www.passivhaustrust.org.uk)

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