

ROGER HUNT visits one of London's largest Passivhaus schemes to discover the challenges of building to German principles within UK planning regulations



It's not easy *been green*



PHOTO CREDIT: ROGER HUNT

Kingspan's Kooltherm SIP system is used to form the structural envelope

Arriving at Octavia Living's The Greenhouses development in Sulgrave Gardens, London, W6, there is no immediate indication that it is much different to countless other developments across the country. But it is and the clue is in the name, specifically the play on the German 'haus'. When completed early next year, this will be one of London's largest mixed-tenure schemes built using a Passivhaus approach.

Despite being a tried and tested building method in Europe, Passivhaus is still relatively new to the UK. In 2011, Octavia completed the UK's first ever certified Passivhaus retrofit: a Victorian terraced house in a conservation area of London's Holland Park. With the new project, Octavia is working with partners Durkan and Cartwright Pickard architects to build 30 new homes.

Because of meticulous attention to detail and rigorous design and construction according to principles developed by the Passivhaus Institute in Germany, the homes will offer high levels of occupant comfort. Even in mid-winter residents will be able to



heat a large living room with the equivalent energy of just 10 tea lights. The result can be a dramatic 90% reduction in energy consumption for heating and cooling compared to standard new-build houses.

Although Grahame Hindes, Octavia Living's chief executive, acknowledges that there are challenges when adopting Passivhaus, he believes that The Greenhouses scheme, and others like it, represent the future of residential building in the UK. "More than just an incremental improvement on existing building regulations, Passivhaus is a radical improvement in sustainable design."

The Greenhouses scheme provides eight private, 13 shared ownership and nine affordable rent homes. Of these, 18 are intended to be certified Passivhaus while all are designed to Passivhaus principles and are built to Code for Sustainable Homes Level 4 and Lifetime Homes.

"Passivhaus as an energy-efficiency standard is not yet fully recognised by UK planning regulations," points out Octavia project manager, David Callachan. "The Code for Sustainable Homes considers energy and CO₂ emissions but Passivhaus far exceeds the energy savings of homes built to the Code."

On a site like The Greenhouses there are the complications that come with working in an inner city





OPPOSITE PAGE

TOP The clue is in the name, specifically the play on the German 'haus'

MIDDLE CGI of The Greenhouses interior

BOTTOM LEFT Kingspan's Kooltherm SIP system is used to form the structural envelope.

BOTTOM RIGHT Marmox Thermoblock has proved to be one of the single most useful product innovations and is being used throughout the site to prevent thermal bridging where the walls meet the floors.

THIS PAGE

LEFT Smoke is used to indicate areas where air leakage must be addressed

BELOW Air tightness tests are carried out constantly on site at all stages of construction

urban context. For example, building in and around conservation areas and the need to blend with the mixed architecture of the area in terms of aesthetics and scale. Passivhaus works best when buildings have a boxlike form but the constraints of a tight site and planning issues have necessitated some of the homes having a somewhat pyramid like construction and, as a result, a poor wall-to-floor ratio.

This has meant that not all the properties can physically meet the Passivhaus standard. "Even so, across the site, the thermal integrity and airtightness remains the same and, by and large, everything we do is trying to emulate the Passivhaus standard," explains Callachan. "All the homes will still be far in excess of the building regulations and equal to the best modern construction available."

The Greenhouses development is far from being a normal Passivhaus project. Firstly, two distinct forms of construction have been used: timber and concrete. Secondly, a brick rainscreen cladding is employed to echo the local vernacular. The common factor is the use of the Kingspan Kooltherm SIP system. This forms the structural envelope of one block and, on the taller five-storey block, clads what is essentially a concrete skeleton consisting of floor slabs and columns.

The build up of the 44cm thick walls has been described as a "massive club sandwich" with a plaster skim coat internally and a traditional rainscreen cladding of brickwork externally. In between is plasterboard, plywood, an airtight membrane, timber battens, a 9cm SIP additional insulation and a vapour check membrane.

A key challenge has been adapting Passivhaus details to work with the brick vernacular. Neil Hyland, contracts manager for Durkan, points to the intricacies of solving a thermal bridge at a window without using the insulated render normally associated with Passivhaus design. "Insulated render is a piece of cake, you can use it to overlap items such as window surrounds. Here we've had to create lots of details for door cills and around windows and doors to combat thermal bridging. These details don't exist so we've had to design them."

All the balcony and canopy structural fixings that penetrate the frame and fix back to the structure are stainless steel, chosen because it performs better than mild steel as it has a lower thermal conductivity. "Stainless steel reduces the thermal

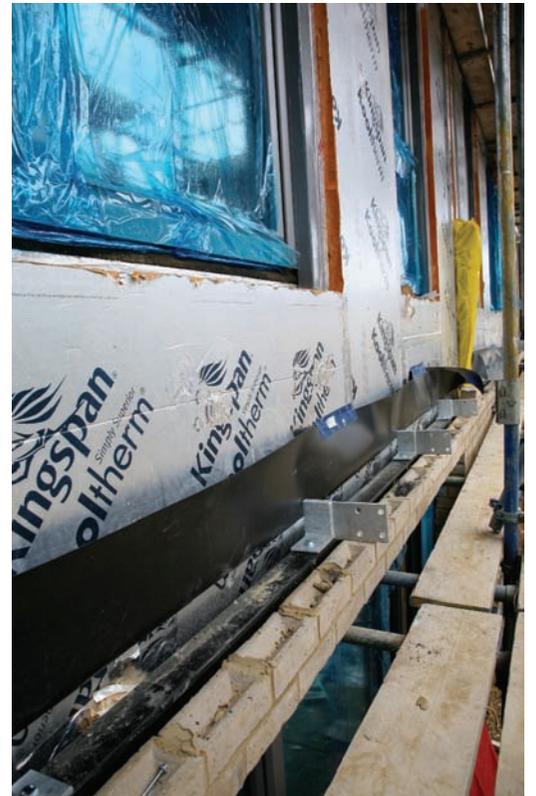




LEFT CGI of The Greenhouses exterior

BELOW All the balcony and canopy fixings that penetrate the frame and fix back to the structure are stainless steel and have had to be specially designed

BOTTOM CGI of The Greenhouses garden



bridging but doesn't eliminate it so we've had to design a small cross-sectional area, as small and neat as possible against the structure, therefore minimising the impact on the Passivhaus thermal requirements," says Hyland.

Callachan explains that another key aspect has been the windows: "Normally with Passivhaus you have a large south-facing window and a small north-facing window but here we're essentially building for a British audience so we have large windows everywhere and we're still managing to cope with Passivhaus."

All windows are triple glazed and thermal bridging through the frames is low. "It pushes the cost but not by a vast amount; if you've got 3% extra cost on your windows because of the extra glass it's worth it."

This was only part of the issue. Providers of triple-glazed windows in large volumes are virtually non-existent within the UK. Indeed, sourcing products and materials for use across the scheme has been challenging. Many items have had to be imported but Octavia's UK building guarantee insurers, such as NHBC, and building control often do not recognise materials imported from other EU countries.

"By and large NHBC wants to see a BBA certificate," says Hyland. "A lot of the products for Passivhaus are from the continent so they haven't got BBA certification. We spent a lot of time phoning people and saying 'Can you do this, have you got BBA?'. It tends to be the smaller things, such as fixings when you're trying to solve a thermal bridge problem, that are the most difficult to find."

He admits that build time has been lost during the 60-week project. "It's inherently slower building to Passivhaus standard; there is a learning curve. Thus far, probably eight extra weeks on site have been taken up by resolution. Although, of course, when you get to the final finishes these homes are

quite straightforward because you've done all of the work up front."

One of the lessons from the project is that there are very few designers, architects and builders with significant Passivhaus experience in the UK, and even fewer who can build schemes of any volume like The Greenhouses.

It can be difficult to source partners to work with, says Callachan: "The cost of labour and expertise is therefore relatively high. Some of the large housebuilders are beginning to recognise the merits of providing a Passivhaus induction for all staff who enter a Passivhaus site. However, the precise nature of the standard means that a short induction is often not effective and there's no substitute for practical experience. Even then, sub-contractors may not be familiar with the concept and will not realise that a gap the size of a 20p piece cannot be left within the airtight envelope."

At The Greenhouses, Octavia has an onsite Passivhaus specialist to advise on the approach. This is an additional cost to a standard build project but provides necessary expertise both to the design team and to those working on site.

In terms of M&E, mechanical ventilation with heat recovery (MVHR) is an essential element. To meet the 20% renewables requirement for the site, every home will have individual solar PV and solar thermal. Gas boilers will provide heating, if required, via skirting radiators in the private units and small radiators in the affordable and rented homes. Shading, to prevent overheating through solar gain, is provided by sliding external screens on the south and south-east elevations that can be pulled across the windows.

While there are clearly challenges to using the Passivhaus approach in the UK, David Callachan believes that the main driver for Octavia to embrace

the standard in its developments is the savings for residents. "We want to ensure that the environmental, financial and wellbeing benefits offered by the Passivhaus approach are available not only to those on high incomes. These benefits are not yet reflected in the price of a Passivhaus property as so few understand the principle."

What is unusual about The Greenhouses is that Octavia is set to achieve the Passivhaus standard without the development appearing aesthetically different. Some may regret that the scheme does not flaunt its 'passiveness' but this may be the key to Passivhaus reaching the mainstream market. [SN](#)

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