Architype has been specifically promoting Passivhaus and designing to its technical standards for over four years, and in October 2011 it handed over its first major Passivhaus projects – two new schools in Wolverhampton, Oakmeadow primary school and Bushbury Hill primary school.

In this article, Architype Director, Jonathan Hines outlines how the experience of delivering these schools has enabled the practice to understand the challenges... and experience the reality of achieving Passivhaus in the UK.

Establishing that Passivhaus was the right standard to champion

For Architype, Passivhaus seemed to offer a logical progression of the ‘eco-minimalist’ approach to design that we have been pursuing for 27 years. Our focus has always been on reducing energy consumption by good design, rather than offsetting carbon with micro-renewables or relying on other ‘techno-fixes’ or ‘eco-cliches’.

However, we were initially sceptical of a number of aspects of Passivhaus, for example the requirement to use mechanical ventilation with heat recovery. We began thorough investigations, attending the annual International Passivhaus Conference in Germany, visiting Passivhaus projects, and talking to European Passivhaus designers and fellow pioneers in the UK.

We gradually began to realise that Passivhaus is simply a quality standard that guarantees performance. Its true value rests upon the assurance that its performance claims are both credible and reflect a genuine benefit to both the user and the environment, including:

- Minimised energy consumption;
- Avoidance of building defects that can lead to mould growth;
- Excellent standards of thermal comfort (satisfying ASHRAE55 and complying with EN7730);
- Minimised energy bills;
- High standards of indoor air quality;
- Optimised lifecycle costs.

We became convinced by the intensive monitoring of Passivhaus buildings over 20 years, which has demonstrated the validated quality-assurance requirements of the standard, in contrast to much of the current monitoring of buildings in the UK which is showing consumption way above that which was predicted.

Demonstrating to clients that Passivhaus is the best option

Next we had to demonstrate to clients that adopting Passivhaus was the best option – and that we could achieve it at no extra cost to them. We have found that the main barriers to persuading clients to adopt Passivhaus include:

THAT BREEAM & CODE FOR SUSTAINABLE HOMES ARE THE ESTABLISHED VALID UK STANDARDS

We explain that Passivhaus and UK standards such as Building Regulations, Code for Sustainable Homes and BREEAM were developed for different purposes and consequently have fundamentally different aims. UK standards were designed to meet ‘top down’ political aspirations – currently a broad range of environmental issues, including water and waste, but most significantly ‘zero-carbon’ targets.

Passivhaus was developed from the ‘bottom up’ by building physicists seeking effective ways to design low-energy buildings and ensure that they perform as predicted, in response to evidence that they were not. Instead of seeking to score wide-ranging environmental and carbon targets, Passivhaus sets a rigorous energy target.

We have found that the tangible benefits of Passivhaus – optimum internal comfort for the lowest possible energy consumption are easily understood by clients.

THE MYTHS

It is relatively easy to dispel the myths – we explain that you CAN open windows, that Passivhaus IS valid in countries outside of Germany, and that in German ‘haus’ means ‘building’ not just ‘house’ and that Passivhaus is equally valid to ALL buildings types.
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FORM AND ORIENTATION
We tested and refined ideas, looking at different orientations and options of single and two-storey. It became clear that optimising the ratio of internal floor area to external surface area was critical in minimising heat loss, and we opted for largely two-storey forms orientated with all principal rooms facing north or south, to enable maximum useful solar gain with effective control of overheating and good daylighting.

ELIMINATING THERMAL BRIDGES
Thermal bridges are all too common in standard UK constructions—junctures at wall and foundations, at window heads and jambs, at wall and roof, together with project structures for roof overhangs or balconies. We focussed rigorously on systematically eliminating these.

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The foundations were rethought completely to create a fully insulated concrete slab, floating on rigid insulation, which returns at the edges to meet the dripcap layer in the walls.

ACHIEVING THE RIGOROUS AIRTIGHTNESS STANDARD
UK building regulations set a standard of 0.6, and a 95% improvement on UK building regulations. Achieving Airtightness is fundamental to turning Passivhaus design into constructed reality. Integrated design and collaborative working is the key to delivering higher standards of construction.

WINDOwS AND DOORS
Particular attention was given to the design of windows and doors to balance the additional costs of the required U-values, and achieve the required daylighting and levels of ventilation. We opted for a curtain-walling system with simplified and optimised openings.

PRIMARY ENERGY
In contrast to UK regulations, PHPP takes into account all energy consumption including the ‘unregulated’ (IT, other equipment and fittings). A key challenge has been addressing the energy consumption of the schools’ IT equipment. The schools’ kitchens created an added pressure as most German schools do not have catering facilities.

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Together Architetype, our design team and Thomas Vale Construction have achieved Passivhaus at no extra cost. We are now supporting users through a Soft Landings process and are beginning the monitoring of the building’s performance.

Cultivating the collaborative approach required to deliver Passivhaus on site Architetype has developed a collaborative relationship with Thomas Vale Construction over many years of delivering innovative projects together. The trust and shared understanding that we have developed was fundamental to turning Passivhaus design into constructed reality. Integrated design and collaborative working is the key to delivering higher standards of construction.

Dealing with the certification process We have found the certification process to be demanding and rigorous. It is essential to commence early with putting together the technical evidence required which includes the PHPP, design and detailing information, thermal bridge calculations, evidence of construction including supply of key materials, air tests and commissioning data, and detailed calculation of primary energy.