Is the UK ready for Passivhaus?

Mark Siddall, of AECB member company Devereux Architects, comments on the challenges ahead in preparing the nation for low energy and low carbon buildings.

Over the last few years Devereux, architects, have been steadily researching how to design and construct projects to the world leading Passivhaus standard. Finally after all the painstaking research and the vigorous hunting for forward thinking clients the efforts are paying off! Devereux is proud to announce that it has secured its first Passivhaus commission. Not just for one home, but for twenty-five!

The project, being realised by Gentoo at Racecourse in Sunderland (see previous story), marks a step change for the UK building industry and helps to set the path for the future of sustainable low carbon design. By adopting the Passivhaus standard the project will meet many of the energy requirements of the government's Code for Sustainable Homes (CSH). And when you consider that housing associations will not receive government funding if their rating is below level 3, then meeting the CSH is crucial.

As Passivhaus achieves a 75% reduction in space heating, compared to standard practice for new build, early estimates suggest that Passivhaus projects will easily gain a rating of level 4 under the Code, and with some bolt-on renewable technologies the Passivhaus approach represents the least cost method for achieving level 6; the infamous 'zero' carbon target for all new houses built after 2016.

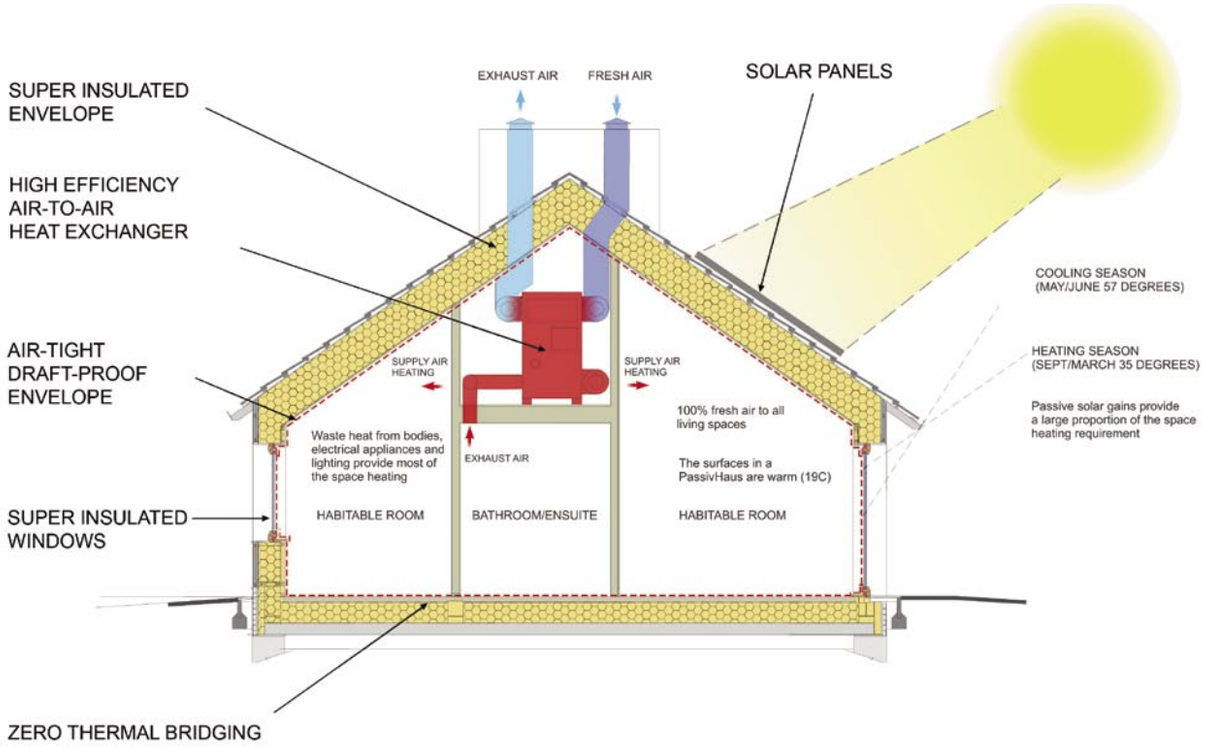
At the time of writing, there are currently no 'certified' Passivhaus buildings in the UK, and by helping to develop what is believed to be the largest, and hopefully one of the first (we know that there is competition), certified Passivhaus scheme in the UK, Devereux is becoming a trailblazer in this sector, which it has long aspired to be.

So what is Passivhaus?

Passivhaus is arguably the low energy, low carbon design standard. With over 10,000 houses, schools, offices and the like designed, built and, this bit is critical, performing 'to standard' it has little competition. When one considers the principles behind the concept it reveals just how far behind certain European countries we are in the advancement of energy efficient buildings. It is not the complexity that is so astounding, rather it is the simplicity. Like Einstein said, "I wouldn't give a nickel for the simplicity this side of complexity, but I'd give my life for the simplicity on the other side of complexity."

Developed in Germany in 1996, five years after the first experimental Passivhaus project, the Passivhaus standard relies upon a very simple set of premises; it relies on very high levels of insulation, super-insulated openable windows and a well sealed building fabric to reduce energy consumption. It also has a mechanical ventilation system to provide excellent air quality and highly efficient heat recovery. Whilst the principles behind it may not sound like rocket science, to achieve the standard it requires meticulous attention to detail and exacting design and construction on all levels; in essence impeccable quality assurance procedures.

It is as a consequence of these relatively simple



concepts that the building, say a house, retains heat from activities such as cooking, watching television and showering, and uses it to heat the building, and does not need a central heating system, whilst still ensuring that residents live in comfort; in fact due to the elimination of drafts they are more comfortable!

About now you may be thinking "Doesn't need a central heating system, is this guy barmy?" Well, truth be told, Passivhaus design does not a mean 'a house without heating', rather it just doesn't require radiators and all the associated plumbing. On the coldest days of the year heating is easily achieved with a small heater that's integrated into the ventilation system.

Considering that space heating and hot water accounts for 60% of the energy we use, these energy saving measures have a significant impact on reducing our impact upon the environment. When you combine all these measures together, compared to the average house, a Passivhaus reduces carbon emissions by 80% and energy consumption by 85%. It has been widely stated in the press that the total average energy bill is set to hit £1000 per year. In the average home the DTI reports that space heating accounts for 61% of all energy use and that domestic hot water accounts for a further 23%. That's a staggering 84% of energy use! If you are interested, the remaining energy use is cooking, lighting and appliances.

Now contemplate the average annual gas bill for a four bed, 1300 sq ft house designed to the Passivhaus standard. First of all it's about £63 per year for space heating and, depending upon whether or not you adopted solar hot water, for domestic hot water it can lie between £25 and £63 per year. So, for a princely sum of between £88 and £126 per year you can have all your heating needs met and be safely protected from peak oil and the subsequent risk of rocketing fuel bills in the future. Fuel poverty could be history! Not bad eh?

Add to this the fact that by using the best available technology, lighting bills can also be cut by over 80% and, according to Swedish research dating from 2002, compared to the average set of household appliances in 1985 the energy use can be reduced by 54% (an improvement of 12% upon a study just seven years earlier. Given that 2009 is now here, would another 12% be possible?). Another little recognised fact is that not only do energy efficient tumble-driers, refrigerators, freezers and lighting equipment, reduce carbon emissions, but they also help to prevent summer over heating.

Considering the above is it really surprising that, as of 2008, 20% of all new homes in Austria are built to the Passivhaus standard? With annual heating bills reduced overall by roughly a factor of 10, it is not especially surprising when it is backed up with copious studies and research documents suggesting that the Passivhaus standard delivers, arguably, the most cost effective means of addressing both climate change and the predicted shortage of fossil fuels.

One of the UK's key health concerns has to be the rising incidence of asthma in children. When discussing Passivhaus most people in 'the know' stick to energy and carbon as a consequence, but there is a largely unsung virtue in that it also provides excellent indoor air quality. The ventilation system helps to ensure permanent fresh air, without the risk of uncomfortable drafts. It regulates humidity; thus reducing the incidence of dust mites and preventing mould growth. Not only could this help to make happier, healthier children, and parents, but also it could save the NHS, and therefore the taxpayer, a small fortune. Oh, and not only can the technologies that underpin the Passivhaus standard be used in new buildings, but they can also be used in existing buildings where poor indoor air quality and asthma are most prevalent.

As one of only two British representatives that presented work at the international Passivhaus Conference in 2008, I feel a strange mix of hope and anxiety about the ability of the UK to address the problem appropriately. Hope because I know that the technology and know how exists, anxiety because whilst both exist the vast majority of architects, builders and politicians remain ignorant to what can be achieved by undertaking the appropriate programme for both the refurbishment of existing buildings and the construction of new ones.

One important argument for the Passivhaus approach is that it helps to reduce carbon emissions by reducing reliance upon complicated renewable technologies, which run the risk of break down and failure. Where these technologies witness some kind of catastrophic failure then, for some reason, let's say cost, they may never be repaired and all the potential carbon savings are lost.

The one thing better than solving a problem is to avoid it in the first place! Due to the simple concepts behind Passivhaus, it does just that. It offers a low risk, highly efficient and realistic solution, in a manner that considers least cost first. I believe that the Passivhaus approach differs significantly to what, in my view, is the government's more risky strategy to simply offset and displace carbon rich energy by emphasising expensive bolt-on renewable energy technologies.

I recognise that there is still much learning to do and many skills to develop to complete the Racecourse project but by having secured our first Passivhaus project, we can finally pass on our knowledge by working closely with the contractors to ensure that the client gets the quality of design and workmanship that they quite rightly demand.

Mark Siddall

Mark, sustainability champion at Devereux Architects, has conducted detailed research into low and net-zero carbon technologies. In addition to being one of the practice's lead designers, Mark also provides consultancy, project enabling and education for clients, design teams and constructors. Currently he working on what is understood to be the UK's first major PassivHaus scheme (25 homes) and is providing consultation for the Riverside One Net-Zero Carbon development in Middlesbrough (a significant scheme for Bio-Regional Quintain). Mark has presented two papers at the International PassivHaus Conference; one on advanced glazing and another on thermal bypass.
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