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Sustainable living

Low energy housing concept Passivhaus is gaining in popularity as an option for rural developments. Siân Ellis interviews two CLA members who have recently completed projects to the exacting standards required

Passivhaus, originating in Germany in the 1990s, is an international low-energy design standard for buildings that is gaining in recognition. According to the Passivhaus Trust, which promotes the principles in the UK, more than 50,000 Passivhaus buildings have been completed across Europe (1080+ certified units in the UK).

So what does it involve? A Passivhaus has very high levels of insulation and airtightness, and uses passive heat sources like the sun and its own environmental appliances to cover most of the building's space heating or cooling needs – achieving a 75% reduction in space heating requirements compared to standard practice for UK new build. Certification is subject to rigorous assessments. The Passivhaus standard can also potentially be applied to retrofit projects.

Here two CLA members who have recently undertaken Passivhaus projects share their stories.

Tackling rural fuel poverty

Warwickshire Rural Housing Association (WRHA), working in partnership, recently delivered the county's first Passivhaus affordable housing development, Keyte Gardens in Wootton Wawen. It was named the Best Green Scheme in the UK in the 24housing Awards 2018.

"The Parish Plan called for new development which embodies the latest thinking in energy efficiency to help reduce fuel poverty," says Richard Muggleston, WRHA Company Secretary. "This struck a chord with our objectives and we proposed this exciting scheme developed to the challenging Passivhaus standard. The community agreed."

Committed to providing affordable homes for local people and families, WRHA manages 550 properties across rural Warwickshire. Keyte Gardens, officially opened by Princess Anne in September 2018, comprises 14 affordable dwellings: a mix of two- and three-bedroom houses and seven two-bedroom bungalows, for rent and for shared ownership, to meet local need.

WRHA's aim at Keyte Gardens was to achieve space heating requirements that are 70% less than in standard house construction. "The homes we provide must not only be affordable in terms of rents, but also in terms of living and heating costs," Richard says.

Super insulation and airtightness are key

Super-insulated traditional masonry, air-tightness and orientation of the new dwellings (for solar gain) were all key factors in the build in order to minimise energy use for heating and cooling. Air source heat-pumps heat radiators and hot water storage tanks. A mechanical ventilation heat recovery system provides constant clean fresh air into living spaces and extracts stale air from bathrooms and kitchens.

Windows are triple glazed, recessed and shaded on the south side to allow heat to enter when the sun is lower in the winter and prevent overheating in the summer. All windows have a tilt-and-turn mechanism to maximise solar gain.

The site is classified as green belt and landscaping mitigates visual impact of the new homes.

Savings on living costs

The total project cost for Keyte Gardens was £3,100,000, which WRHA funded through bank finance, and with £460,000 from Stratford-on-Avon District Council and £350,000 from Homes England.

Richard says that building to Passivhaus levels costs "significantly more" than for an equivalent standard-construction development, however a review of energy use at Keyte Gardens in a year's time will ascertain the gains in terms of savings on living costs.

Learning from the project, WRHA plans to look at how innovative technologies that tackle rural fuel poverty can be rolled out to benefit residents in existing stock or in future developments. WRHA is also examining how the benefits of Passivhaus might be achieved using less costly modular construction.

Choosing the right partners

Choosing the right partners, from architects to builders, has been key to meeting the rigorous Passivhaus assessments throughout the process, Richard says. He strongly recommends visiting examples of Passivhaus projects to learn from others before embarking on your own project.

"The Passivhaus standard is a very, very high bar but it is well respected within the building industry," Richard says. "It is a real eye-opener to everybody that we have delivered affordable homes to the Passivhaus standard."

PASSIVHAUS IN NUMBERS

UK projects
(estimate as of December 2018)

1080+
certified units

240+
certified projects

More than
1100 units
under development

100+
projects under
development

Source: Passivhaus Trust
www.passivhaus-trust.org.uk



ABOVE: MARSH FLATTS FARM IN SOUTH DERBYSHIRE

RIGHT: HRH PRINCESS ANNE FORMALLY OPENED KEYTE GARDENS IN WOOTTON WAWEN

The future of farmhouses

Justin Smith Architects, headquartered in Derby, specialises in innovative, inspiring and sustainable designs across a wide-ranging portfolio of building work. Among its most recent awards are Best Sustainable Design Practice in the UK and Best East Midlands Residential Architecture Project (Build Architecture Awards 2018). The latter accolade was for Marsh Flatts Farm, South Derbyshire, the practice's first carbon-zero project designed to Passivhaus Plus standard – meeting the energy efficiency required by Passivhaus, plus generating renewable energy on-site.

Inspired by the region's dry stone walling

The spacious family home is a striking contemporary interpretation of traditional rural buildings, using natural stone (inspired by the region's dry stone walling), cedar cladding, and a curved, zinc-finished roof form inspired by the roof structure of an existing hay barn.

Commissioned in 2013, the dwelling replaces an earlier farmhouse on the site and is in greenbelt, but careful discussions with the local authority over the building's vernacular design combined with Passivhaus aspirations meant that "planning permission was relatively straightforward," says director Justin Smith.

We could have built a rectangular box with a pitched roof

The project was hugely challenging. "We could easily have met the Passivhaus standard by building a rectangular box with a pitched roof, small windows and insulation," Justin says. "But we wanted to create a vision of the future of farmhouses in a remote location that is sustainable. The house is protected from the elements on the north face with the curved zinc roof and small windows, and completely committed on the south side to solar gain with the roof at a 30-degree pitch, which is the optimum for the solar array."

Renewables include a ground-source heat pump and air-source heat pump, and there is a mechanical ventilation with heat recovery system. Windows are triple glazed.

"Achieving airtightness was challenging because there are lots of different elements to the construction: masonry, steel, SIPs (structural insulated panels), and lots of junctions," Justin says. Much attention went into low thermal bridging.

A nice temperature all year round

It is too soon to take stock of savings on a 75% reduction in space heating requirements and payback on the higher cost of the build (the client receives money back from the grid). But early signs are encouraging. "The property has been through a winter and the client tells me it is a nice temperature all year round. In fact, the living room has no underfloor or space heating and he says it is a constant temperature. So Passivhaus does work in practice."

Justin's tip for anyone considering a Passivhaus project? "Bring on board a good energy consultant to work alongside the design team, because the energy consultancy around Passivhaus is a key component of the design and it is a specialist field. We had to do a much deeper level of detailing and get the details accredited."

More analysis needs to be done to work out long-term returns on energy savings in Passivhaus projects, Justin says, but with product choice and quality improving all the time, for example in triple glazing, achieving Passivhaus standards will become less expensive. Interest in Passivhaus is gaining momentum, he says, with more clients aspiring to meet the standard, whether or not they seek certification. ■

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