



# A TIGHT FIT

Is this home the UK's most energy-efficient retrofit, asks **Louise Parkin**.

**W**hen Kate and Geoff Ball bought their 1950s detached brick house in Derby they already had plans to improve its energy efficiency. What they didn't know was the extent to which they would go, or the improvements in indoor air quality and the lower energy bills that they would reap in return.

Kate and Geoff lived in the house for a year before beginning the project, assessing the condition of the home and planning the scheme. They knew that both the pitched and flat roofs were leaking, but they didn't know that a sewage hatch under the dining room was also leaking. They had no way of knowing just how draughty and cold the house could become, and how expensive it was to heat.

With Geoff's background in engineering and Kate's teaching science, the couple shared a passion for energy efficiency and greener living, and soon decided to make the house as energy efficient as they were able.

**Pictures:** The 50s house in Derby has been refurbished to achieve the EnerPHit standard, which is the equivalent of the Passivhaus certification for retrofit homes. As well as an airtight shell, the house boasts many green features, including external insulation, triple-glazed windows, a thermal heat store for the hot water, and PV panels.



“The house looked smart from the outside but the windows were rotten, the roofs were leaking, there were strange odours and it was just so cold,” Kate recalls. “It cost a fortune to heat during that first year, and we never managed to get properly warm all winter.”



#### INTERIOR

A green approach has also been applied to the interior, with low energy lights, and, reclaimed parquet laid throughout the ground floor.

#### WHAT IS A SUPERHOME?

Kate and Geoff's home has been deemed a SuperHome, a scheme from the National Energy Foundation which registers homes that have been upgraded to improve their energy efficiency and carbon emissions. There are currently 205 SuperHomes in the UK, many of which hold open days. Kate and Geoff will be holding a SuperHomes open day on May 15 from 10am to 12pm. Bookings can be made online: [superhomes.org.uk/137](http://superhomes.org.uk/137).

They decided to try to achieve EnerPHit standards, which is the Passivhaus certification criteria for refurbishments.

A single-storey extension had been built in the 1980s, and so Kate and Geoff added two bedrooms above this, removing a utility room and slightly extending the kitchen/dining area. They also changed the garage into a large utility and storage area.

Little else was changed inside, but the external façades are unrecognisable. The roof height was raised half a metre to allow for 400mm of Rockwool roof insulation whilst the wall cavities were filled with blown mineral wool fibre.

New outer walls that form the first-floor extension are timber frame, infilled with mineral wool covered in an airtight membrane and taped 18mm OSB.

Existing outer walls have been covered first in a cementitious airtight coating and then a 250mm graphite EPS external insulation

wraps around the entire house, covered with an armoured render coating.

Kate and Geoff now have four children, but when work began back in 2011 they had only two. They knew it would be chaotic living on site but believed that the benefit of being there daily would outweigh the disruption.

Despite this, they were forced to decamp for two weeks while the floor was dug out and a 180mm PIR floor slab was installed, with airtightness achieved from the footings to the roof.

"We chose to work with an architect and a builder both with an interest in green building and energy efficiency but without any experience of Passivhaus standards, so we commissioned an airtightness expert to provide training, which proved very helpful," says Kate.

They also sought advice from Alan Budden of Eco Design Consultants and John Trinick who carried out the PHPP (Passive House Planning Package) modelling, with the design being tweaked each time to ensure it met the exacting standards.

Triple-glazed windows from The Green Building Store complete the airtight requirement, and a mechanical ventilation heat recovery system is needed in order to keep the air fresh – an essential element in a building that experiences just 0.3 air changes per hour. This far exceeds the Passivhaus standard, which asks for 0.6.

Architect Nigel Turner at ReDesign Architecture says: "It's impressive to achieve airtightness like this on a refurbishment. I think at the time it was the most airtight refurbished house in the UK, although this has probably been surpassed by now."

Kate and Geoff's completed home is noticeably drier, warmer and more spacious than its previous incarnation, and the energy use is just £20 a month for gas, which is 80 per cent less than before. Electricity usage totals 6kWh per day, representing a saving of 19 per cent. The new photovoltaic panels on the roof ensure the feed-in tariff pays for the family's heating and hot water bills, however minimal they may be. ➔

## CONTACTS

### MAIN SUPPLIERS AND CONTRACTORS

**Architect** ReDesign Architecture:  
[redesignarchitecture.co.uk](http://redesignarchitecture.co.uk)

**Builder** Burton Building Solutions:  
[burtonbuildingsolutions.co.uk](http://burtonbuildingsolutions.co.uk)

**Energy efficiency consultancy** Eco Design  
Consultants: [ecodesignconsultants.co.uk](http://ecodesignconsultants.co.uk)

**Windows, doors and MVHR** Green Building  
Store: [greenbuildingstore.co.uk](http://greenbuildingstore.co.uk)

**External insulation and render**  
PermaRock: [permarock.com](http://permarock.com)

**Condensing combi boiler** Viessmann: [viessmann.co.uk](http://viessmann.co.uk)

**Thermal store** Solartwin: [solartwin.com](http://solartwin.com)



*“It’s so energy efficient that we have no underfloor heating and only have radiators in the original bedrooms.”*

“It’s so energy efficient that we have no underfloor heating and only have radiators in the original bedrooms – there are none in the new bedrooms,” explains Kate. “Downstairs there are several radiators in position but only two of them are turned on. When the heating goes off, it can take hours or even days before we notice, and washing dries inside in a matter of hours.”

Eco features for the interior were specified as much as possible, including low energy lights, reclaimed parquet throughout the ground floor, reuse of the existing kitchen cabinets and reuse of carpets where possible.

A condensing combi boiler combines with a thermal heat store to provide hot water and heating when there is insufficient sunlight to power the PV panels, and water use is kept to a minimum by the installation of water saving taps, toilets and showers.

The two new bedrooms were originally used for lodgers before the two smaller children came along, and Kate and Geoff plan to have lodgers again once the children are a bit older. Kate says: “Good efficiency per square metre is all very well but actually efficiency per person is better environmentally. Passivhaus recommends 20–40 sqm per person so our 173 sqm is suitable for four to eight people, and that way you only need one washing machine, one cooker etc per household.”



#### **KITCHEN**

The old cabinets have been recycled in the new look kitchen.

#### **REAR**

The exterior of the house has been clad in armoured render, giving the facade a clean modern look.

