

greener pastures

Steven Harris and Catherine Roberts' self-build project has been a labour of love, but the result is a zero-carbon home built for just £175,000

SELF-BUILD | MONMOUTHSHIRE | APR 06 - MAR 13
SIZE: 155m² | LAND COST: £90,000
BUILD COST: £175,000 (£1,129/m²) | VALUE: £400,000

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**HOMEBUILDING
& RENOVATING**
MAGAZINE
AWARDS 2014

**WINNER
ECO HOUSE**





Front Elevation

The house is mainly built of standard blockwork cavity walls and is lime rendered. The front elevation consists of a timber frame, with oak weatherboarding and hit-and-miss cladding, which reflect the traditional materials used in the area. The red sandstone entrance slab and cills, along with the oak window frames, were made locally. The monopitch roof plane was designed to maximise the area available for harvesting solar energy and also mirrors the ridge line of the Skirrid mountain range behind



WORDS: JANE CRITTENDEN
PHOTOGRAPHY: JAMES FRENCH



Building his own zero-carbon home has been a long-held ambition for architect Steven Harris, who's been championing this solution since helping to design Britain's first zero-carbon houses alongside ZEDfactory in the early 2000s.

Steven's wife, Catherine Roberts, also an architect, was equally keen and, as a result, their clever design proves just how achievable a low-running-cost home, built from ordinary building materials, can be. The critics might say such design ideas have to come at a cost, but the couple have completed their home for just £175,000.

"Catherine and I see zero-carbon design as logical," says Steven. "It makes sense to design a house that requires so little energy that it can almost run on renewable energy alone. This also makes it cheap to live in and environmentally sound."

The seeds were sown for their new home way back in 2005, when the couple decided to leave London and purchase a plot in Wales to be closer to family. The orientation of the site was ideal for the zero-carbon house, allowing the couple to create a glazed south-facing elevation to take in the best of the views and the sun's heat.

Steven and Catherine's planning application sailed through and they raised funds for the project through

the Ecology Building Society. "They understood what we were trying to achieve and were very personable and flexible," reflects Catherine. "Even now, so many years on, we have contact with the same individuals."

When the build got going in 2006, the couple managed the project remotely, spending many weekends travelling up from London in their campervan before moving into the part-finished house before it was fully habitable. "It was tough, but we knew from the start that progress would be slow," says Catherine. "We wanted to project manage and do as much of the work as we could ourselves, and then in 2009 we set up our own business, CRSH Architects."

Preparation was key to project managing the build from afar. "It was important for our design to fit in with how the trades build so that there weren't any complications or hidden costs," Steven explains. "We prepared drawings for each, which helped the pricing be more accurate, and gave us confidence that the tradespeople understood their level of involvement."

The couple also built up a relationship with their tradespeople in such a way that allowed them to do as much of the preparation work as they could. "The plasterer did his job, but also explained what we could do to get everything ready for him so he wasn't wasting time and money on the prep," Steven explains.

The resulting house owes its success to the couple's design through three key points: it takes reference from the vernacular by using a similar palette of materials, interpreted in a contemporary form; it has flexible space for the needs of their growing family; and, of course, it's a zero-carbon build. "We thought about the ages and stages of our lives and how we would live," says

Living Area

A sunroom is separated from the open plan ground floor living area and kitchen by inner glazed sliding doors. They can be opened up when it's warm to extend the space, or closed to keep the heat in without shutting out the light



“I hope one day zero-carbon living will be as ordinary as having an inside toilet”

Catherine. “Then we came up with a flexible design that could be changed within the existing volume without needing to extend.”

One example is the children’s bedrooms. When the couple’s two children were young they shared a room, but designing in a partition wall now allows them to enjoy their own separate spaces. It’s a similar story on the ground floor, with one big kitchen/dining/living area divided from the office by sliding screens. “The sliding door between our office and living space means we can use this as a guest bedroom,” says Steven. “We’ve also got a downstairs toilet and shower room which becomes an en suite wetroom.”

Eight years on from first starting on site, the couple acknowledge that there are still jobs to finish – like the green roof on the workshop – but they’re absolutely delighted with how the project has come together. “We’ve been able to prove that it’s possible to build a flexible, well-designed space that’s comfortable to live in, with low bills, without a massive budget,” says Steven. “The result almost makes being zero-carbon secondary because that’s the way it should be. I hope one day zero-carbon living will be as ordinary as having an inside toilet, and people will wonder why they never did it before!”

ZERO-CARBON DESIGN

Steven and Catherine kept their design simple: the house is built with standard blockwork cavity walls, with a 300mm cavity – rather than 100mm – stuffed with Rockwool cavity batt insulation. The decision to use Rockwool was well researched by Steven. “I worked on the design of Portcullis House (the MPs’ London office building) in the 1990s, which has a 120-year design life,” he explains. “Tests in all insulations showed Rockwool was the only one that would last.”

The blocks are lime rendered externally, and internally the walls are lime plastered and decorated with clay-paints. “Lime regulates humidity, which makes it a far more comfortable environment to live in,” Steven adds.

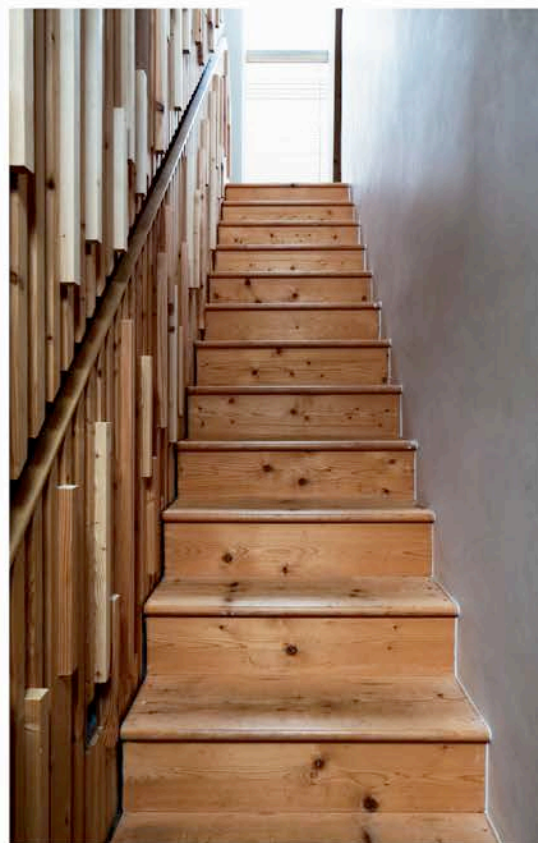
The home also features a handful of renewables, including an oversized solar thermal array and a wood-burning stove with back boiler; the latter is fuelled from off-cuts provided by a local tree surgeon. Both are connected to a thermal store that provides all the hot water and space heating needs for the house. In addition, solar photovoltaic panels have been installed to provide electricity for the home.

Steven, who also runs an energy-efficiency and renewable energy consultancy (Steven Harris Ltd.), monitors their energy usage at home closely. “We never have a cold shower as the immersion checks to see if the thermal ▶



First Floor

Steven customised the staircase (RIGHT) using waste timber off-cuts from the build. Upstairs, a walkway (ABOVE) leads from the master bedroom and bridges the double-height space, creating a fantastic viewpoint and spot to relax



store needs a boost early every morning, which it seldom does," he says. "We only consumed 7kWh/m² of space heating last year — twice as good as the PassivHaus standard of 15. We have an energy efficiency EPC A rating and make £350 a year profit."

At the start of the project, the couple thought they would need another renewable energy source, anticipating that the solar energy wouldn't be enough to run the house. Soon, however, it became apparent that the insulation and thermal mass in the house were doing their job.

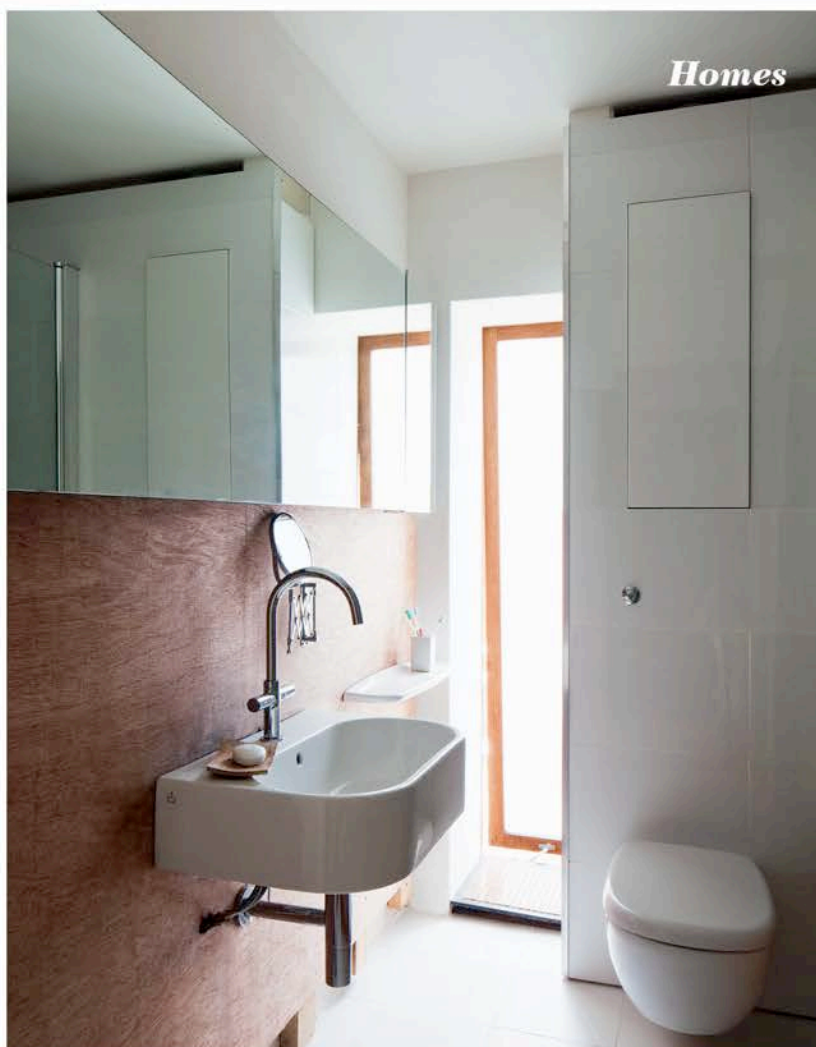
"We were going to buy a pellet log-burner accumulator, but they cost thousands so we held off and were pleasantly surprised to find our renewables managed all of our heating and hot water needs," says Catherine.

Creating an airtight build — stopping draughts and keeping the warmth in — was again key to creating this zero-carbon design. This also meant a heat recovery ventilation system was the final piece in the jigsaw, providing the house with fresh air. The system is powered passively by a wind cowl on top of the house rather than electric fans, which use carbon energy.

"The wind blows into the small end of the cowl and sucks air out of the large end," Steven explains. "The cowl always rotates to face the incoming wind and is connected to the heat exchange ventilation system, so we have no energy penalty or running costs no matter which way the wind is blowing."

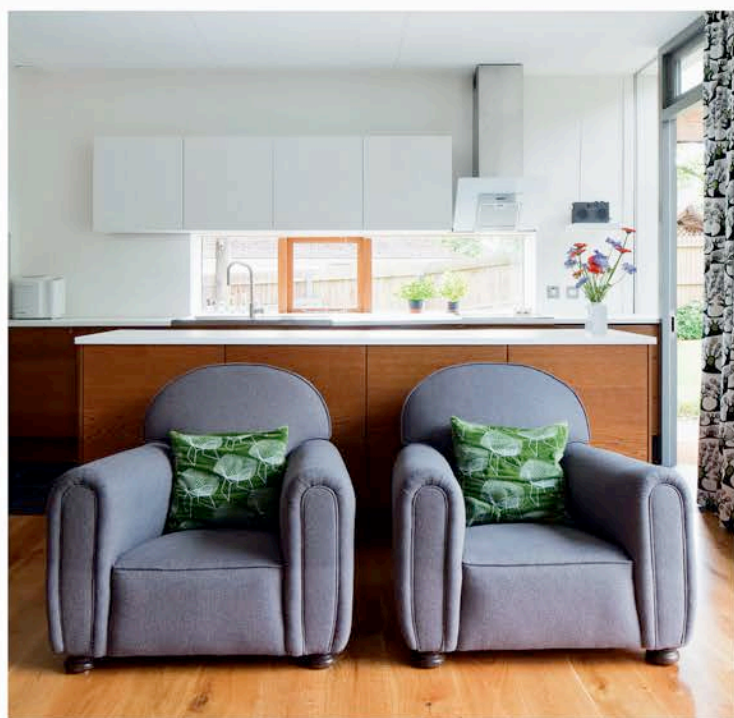
THERMAL MASS

The house is defined by two super-insulated 'bookend' concrete blockwork walls, which support a pre-stressed concrete plank first floor, creating thermal mass. This is important in the zero-carbon design as the passive solar gain — entering through the south-facing glass elevation — is absorbed into the walls, stored and gradually emitted back into the house.



Bathroom

Frosted slot windows in the bathroom draw in plenty of light but offer maximum privacy. The basin is from Bathstore and the WC is from Ideal Standard. The walls are clad in wood, providing warmth against the white sanitaryware



The inner glass skin is an important aspect of temperature control inside the house. When the weather is particularly hot, the inner doors can be closed and the outer set left open.

"We have two skins of ordinary double-glazing, so we've effectively quadrupled the glazing," Catherine explains. "Without the two skins, we'd have had to spend tens of thousands of pounds on triple glazing to achieve the same result. But it's the thermal mass that's key to making the sunroom work, otherwise it would be too hot or too cold."

The couple did, however, struggle to find a firm to supply the rear glazing for a reasonable price. Steven decided to build the timber frame and fit the window frames himself with the aid of a local carpenter. "Then I got a local glazing company to fit and seal the glass," he adds. "The approach proved more cost-effective and resulted in a much higher-quality finish."

The decision also turned to their advantage when the glass arrived in the wrong size, through no fault of their own. As the units had been made specifically to follow the angle of the roofline, they were going to be skipped.

"We asked if we could keep them," says Steven. "We then redesigned the inner screen to make use of the pieces and saved a lot of money in the process!" ■

The Lowdown

STEVEN AND CATHERINE'S COSTS

Groundworks.....	£30,000
Main walls (blockwork and timber).....	£30,000
Precast first floor slab.....	£5,000
Roof carpentry and covering.....	£13,000
Doors, windows and glazing (incl south screens).....	£25,000
Lime render and plaster (internal and external).....	£7,000
Screed and gypsum plaster.....	£5,000
Renewables and service (including photovoltaic, solar thermal, stove with back boiler).....	£20,000
Internal carpentry and joinery.....	£15,000
Bathrooms, kitchen and finishes.....	£20,000
External works.....	£5,000
Total	£175,000

CONTACTS

Architects CRSH Architects.....	01873 853238; crsharchitects.co.uk
Structural engineer Lachlan MacDonald at Ellis and Moore Consulting Engineers.....	ellisandmoore.co.uk
Precast slab Tarmac Topfloor.....	01759 304585
Lime render and plaster Ty Mawr Lime.....	01874 611350
Oak cladding and Douglas fir Pontrillas Timber.....	01981 240444
Thermal store Spec Flue.....	01787 880333
Oak flooring ATC Flooring.....	01600 713036
Welsh slate flooring Merionethshire Granite Company.....	01766 540885
Eco paints Ecohome Centre (Cardiff).....	029 2037 3094



The 'Buffer' Living Space

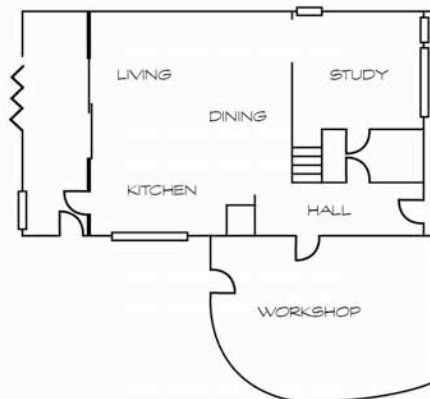
A fully glazed and independent south-facing 'conservatory' space acts as a buffer to store the solar-gain heat. It effectively makes the main body of the house quadruple-glazed and is open to the first floor bedrooms too



Floorplans

The ground floor benefits from an open plan living, kitchen and dining room and adjacent office, but is flexible enough to evolve with the family's changing requirements. Sliding doors between the living space and office, for example, can be closed in order to create a guest bedroom. This room sits next to the ground floor wetroom, which in turn doubles as an en suite. On the first floor there are four bedrooms — a partition wall between two of the bedrooms can be removed to create a third, more spacious, room. The two principal bedrooms enjoy views over the landscape beyond, thanks to the glazed rear façade, with the master bedroom even possessing its own walkway. Two bathrooms complete the picture.

GROUND FLOOR



FIRST FLOOR

