

Best Eco Home

WINNER JOHN & LEIGH CROFT

A Big, Green, Low-Energy Machine

At 1,550m², just how does John and Leigh Croft's self-built Cotswolds home justify our Award as Britain's Best Eco Home? Read on...

Words: Jason Orme Photography: Jeremy Phillips

If ever a self-build project could be deemed ambitious, it's the new 1,550m² (yes, it's some 21 times larger than the UK average) home of John and Leigh Croft in the Cotswolds, east of Cheltenham. For the big story here is not just that it ever managed to happen in the first place – not that the planning story was particularly run of the mill, taking almost two years of their lives to lobby and work with local planners and councillors to finally gain permission – but that it can also claim with some justification to be an absolutely A1, top-of-the-class, eco-friendly home, despite its whopping size. ►

This page: Impeccable eco credentials
 Despite its size, John and Leigh's home has a heat loss of just 6.6kW — the same as a one bedroom flat. The external walls are 1m thick and packed with 400mm of extruded polystyrene insulation, resulting in a U-value of just 0.06 — the lowest ever recorded for a house in the UK





The Planning Story

This being a plot within an Area of Outstanding Natural Beauty (AONB) in the middle of open countryside in the Cotswolds, John and Leigh's vision of building a contemporary family home was always likely to meet resistance. The site sloped away from the road and housed a few industrial units with a small chalet bungalow towards the bottom of the hill. "It was actually the conservation officer who encouraged us to come up with something quite contemporary," John recalls, "and so we engaged Mike Hope from Roderick James Architects to come up with five new designs, based around a Dutch barn shape. We obviously wanted to build something bigger than what was there already, and the planners were OK with us doing this so long as the 'extension' was longitudinal (i.e. adding to the length at the rear rather than adding to the cross width).

With initial support from the powers that be, a new head of planning took over and, according to John, said: "There is no way that this is going to be built in my back garden,' and recommended it for rejection. It was devastating, having committed so much time, effort and money to the venture.

We owned the site, and wanted to make the best of it. Mike Hope quite understandably felt that the chances of ever going ahead were next to nil and he moved on from the project." ►

“It took us just under four years to complete. It really was a monster build”

This page: Grand Cotswolds style 12,000 tonnes of the external stone used on the house was quarried from the site, with the remainder sourced from a quarry six miles away. The house, based on the design of a Dutch barn, is optimised for passive solar gain — facing due south with large overhanging roofs for solar shading in the summer months, while the low winter sun penetrates the glazing and heats the huge thermal mass of the house

JOHN & LEIGH'S SELF-BUILD

Construction Stone and concrete; zinc roof
Size 1,550m²
Dates Jun '05 – May '09
Build Route Self-managed
Plot Cost £370,000
Build Cost £1,600,000
Value on Completion £4m



Near the end of the line, a friendly local councillor suggested they take it to committee stage anyway. Cue an almighty last push from John and Leigh. “We did a full DVD presentation with visualisations of all the plans, a brochure, and hand-delivered it to everyone on the planning committee. We also lobbied for local support and received 72 letters of support and gave a powerful speech at the meeting — and we won,” says Leigh. “It was a huge relief.”

“We set out to build one of Britain’s very best eco houses,” begins John, who enjoys an interest in eco house design. “We designed it to far exceed Level 6 of the Code for Sustainable Homes, as well as the PassivHaus standard. It has no heating demand, is not connected to mains water or sewerage, it uses no fossil fuels, and it is lit entirely by low-energy LED lighting. As a result of what we’ve done, the home’s total calculated heat loss is just 6.6kW — about that of a small one bedroom flat.”

In addition to the home’s impeccable eco credentials, this is also a true self-build story. John carried out most of the excavation works, the blockwork and a lot of the internal construction — from detailed ceiling work to personally laying over 2,800 900 x 600mm stone floor slabs. “The fact that on most days just two people were on site seven days a week begins to explain why it took us just under four years to complete. It really was a monster build.”

Why it Won

The judges had significant reservations about the size of this home, generally holding the view that it was fundamentally unsustainable for a family with children to need a home so off-the-scale in floor area. Yet, the fact remains that this home has multiple and flexible usage both as a home working environment and, it seems, as a test house that John could try out the many, occasionally competing, eco theories in practice. It is so well built in eco terms that its heat demand is the same as that of a property less than 20 times smaller.

The fact is, despite its size, this is a home that is effectively a positive-energy house and goes a long way to prove that eco homes can come in all shapes and sizes — for this is truly a grand home in terms of scale and ambition and the fact that it manages to combine such luxury with such low impact is a huge achievement.

For full details on its green credentials, see over. ►

Contemporary interiors, 1 & 2: The main bedrooms are open en suite. The bath in the master (2) is a solid piece of travertine — there’s a drain built into the floor below as there is no overflow; **3:** The home office features a GRP fire surround bought for just £120. Strip LED lighting is set into ceiling recesses; **4, 5 & 6:** The huge kitchen/dining/living space is the focus of the house. John had a hand in laying all 2,800 of the stone floor slabs himself; **7 & 8:** The informal living room features a barrel vaulted roof and a cosy bar area



The Greenest House in Britain?

JOHN AND LEIGH'S HOME IS A MIX OF ULTRA-HIGH EFFICIENCY AND GREEN FEATURES

External Walls

The chunky external walls were designed to keep heat in. They consist (from outside to in) of a 600mm thick-cut Cotswold stone skin, 400mm of extruded URSA polystyrene insulation and a 150mm internal concrete skin, wrapped in a sealed 4mm airtight membrane. The result of these 1m+ thick walls is that the U-value is just 0.06W/m²k — the lowest ever recorded for a house in the UK and some 60% less than the PassivHaus standard.

The basement walls fare much the same. The house is built on four levels into the slope and the underground basement walls are constructed of 100mm dual-skin Quad-Lock walling with 225mm of waterproof concrete and a further 400mm of expanded polystyrene outer skin, giving a U-value of 0.07.

Windows and Roof

All the windows and large expanses of glass are triple glazed, low-E PassivHaus standard, argon filled, with a U-value of 0.7. The three curved zinc roofs have a sandwich construction of 160mm German Endelev insulation panels and 400mm Rockwool insulation, achieving a U-value of 0.08.

Airtightness and Heat Recovery

The solid (as opposed to cavity) wall structure means that the wall insulation is interlocking waterproof extruded polystyrene with a RIW epoxy resin with 4mm-thick waterproof skin applied to the face. An excellent airtightness test of 0.4 – 25% better than PassivHaus standard – was achieved with special detailing at all junctions to completely eliminate cold bridging. "In addition," says John, "I've installed five heat-recovery units which are connected to earth pipes from REHAU, to pre-warm the air in winter and pre-cool it in summer. The pipes draw air through the ground along a similar principle to water-based ground-source heat pumps. Heat is also recovered from the Bosch tumble dryer, the sauna and steam room, the underground plant room and also the Aquatron worm biodigester unit. "During the last 12 months of thoroughly testing the system," says

John, "we have found that the heat-recovery system can add around 17°C to the outside air temperature." ▶



A transparent approach The main entrance hall links the garage (on the left of image 10) and the rest of the house. The glass stairs ("not ideal for children, in all honesty" says John) lead up to a mezzanine home office



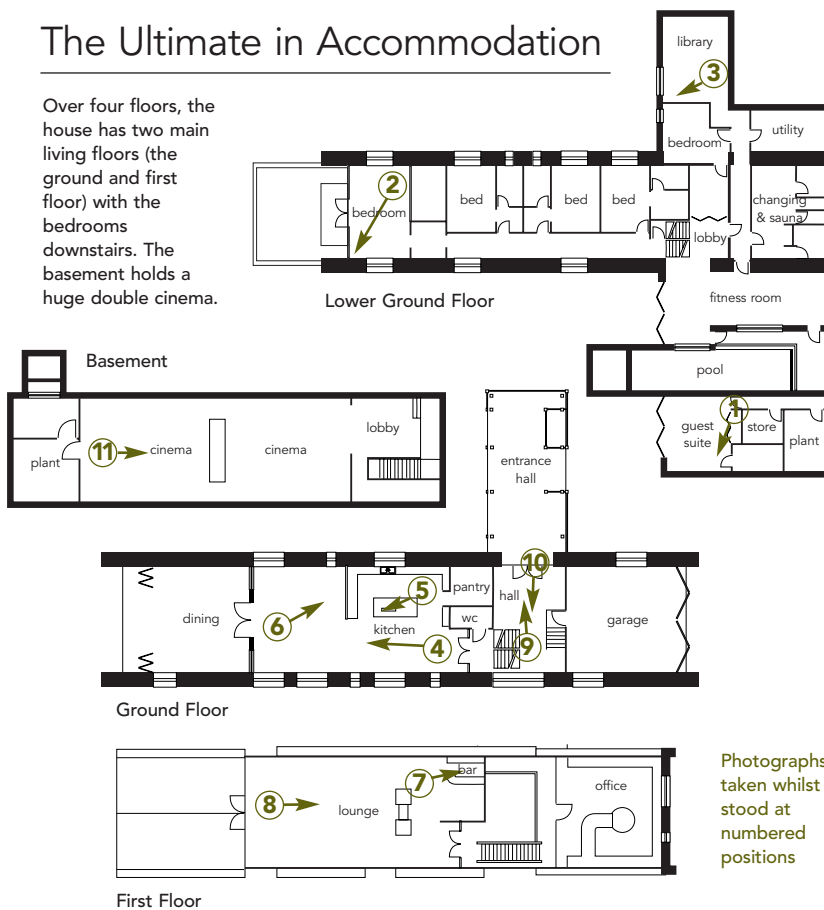


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No compromise on luxury The basement level features not one but two home cinemas — one doubles as a games room (SHOWN HERE), while the other is set up as a more formal cinema

The Ultimate in Accommodation

Over four floors, the house has two main living floors (the ground and first floor) with the bedrooms downstairs. The basement holds a huge double cinema.



Photographs taken whilst stood at numbered positions

USEFUL CONTACTS: ICFs *Quad-Lock*: quadlock.co.uk Stone bath and all stone tiles *Indigenous Tiles*: 01993 824200 CAD design and early planning process *Cameron Scott of Timber Design*: 01626 854405 Underfloor heating *Schluter*: 01530 813396 Heating controls *Heat Miser*: 01254 669090 In-wall speakers *Amina*: 01480 354390 Solar thermal system and store *TiSUN*: tisun.com Worm biodigester unit *Aquatron*: aquatron.se *Worms Wiggy Wiggles*: 01981 500391 Steel framework *Micklewrights Structures*: 01384 258400 All triple glazing, curtain wall, sliding folding and tri-folding *Becker & Sohn*: becker-team.de All glass floors, glass staircases and glass balustrades *Specialist Glass Products*: 01484 647744 Facing stone walls *Cotswold Natural Stone*: 01993 867392 Massive reconstituted stone lintels *Hampton Stone*: 01453 882180 Demolition and landscaping *David Horton Contractors*: 01249 721762 All electrical works *JK Audio Visual*: 01952 588915 Kitchen, built-in furniture *Stephen Anthony Design*: 023 9248 6478 Bespoke library, panelling, bed designs and bespoke internal doors *TJ Joinery*: 01285 831423 Zinc roofs *Pace Roofing*: 01794 515155 (zinc from *Rheinzink*: 01276 686725) Steel details *Steel Dreams*: 01484 841642 Reed bed *Cress Water Solutions*: 01884 839000 Oak frame and entrance pod *Carpenter Oak*: 01803 732900 Oak cladding and glazing detail *Black Pig Framing*: blackpig.me Dual-sided woodburning stove *Stuv*: stuv.com

Hot Water

The house has 44m² of thermal solar panels perfectly orientated towards the sun, charging two huge 1,500 litre Pro-clean hot water tanks — holding about eight days worth of hot water even when the sun doesn't shine. Water is pulled off the bottom of the tank at 34°C to feed 500m of pipework, laid in the innovative Bekotec underfloor heating (UFH) system. John explains: "We chose this for its extremely thin screed (25mm compared to a UK average of 70mm), which significantly increases its response time to the heat-up and cool-down cycle of the slab and reduces the input temperature of the system to 34°C — perfect for maximising the coefficient of the 12kW NIBE heat pump.



"The heat pump is there because over the course of a year, however, the solar panels can only produce about 90% of the annual requirement for hot water, UFH and swimming pool heating."

Water and Sewerage

The house has no mains water or sewerage. All guttering and garden runs are linked and can be fed into their 10,000-litre cold-water store

The nine conventional dual-flush (3 or 6 litres) toilets all connect to an Aquatron worm biodigester in the basement. "This allows us to have the convenience of a typical low-flushing toilet but the environmental benefits of a composting toilet," says John. "Solids are flushed down through a centrifugal chamber which removes 95% of the liquids — this black water passes through our two-tier vertical reed bed and is filtered back into drinking quality water. The solids fall into a chamber full of red composting worms, which reduce the volume of waste down to 10% — the chamber will need emptying every eight years, the by-product being an odourless compost ready to use on the veg patch. The small amount of heat generated by this composting process we then, of course, recover through our heat-recovery units."

Energy

"We made the decision from the outset to invest in LED lighting throughout, giving a total load of 26kW," says John. "In addition, a CLIPSAL lighting system only allows 80% of the necessary power to each lighting module (the human eye can't tell the difference between 100% power to a light fitting and 80%). PIRs (passive infrareds) turn lights on and off when people occupy rooms. John and Leigh are also in the process of installing PV (photovoltaic)

panels, which will allow the house to be a net exporter of energy. The installation of a V-phase kit introduces further efficiencies. 🏡

