

People Exploring Low Energy Homes

Madingley Road, CB3 0EG

Ian and Sue – Ian says:

‘We have lived in Cambridge for many years, and we had upgraded our existing 1930’s house to improve its energy performance. We wanted to live more sustainably - in a different environment, and with more beautiful architecture.

However after looking for land elsewhere, we decided to build in our own back garden, seeing this as an opportunity to make a step-change.

We wanted to create an exciting, beautiful, low energy house which reflects our wish to reduce our impact on the environment.’



Overview

Age: 2010 **Type:** Custom built, detached
Wall type: Timber frame **Floor area:** 210m²
Project timescale: Planning 3 years, building 2 years
Cost of build: £600,000
Occupants: 4 adults

Energy usage compared with old home (also 210m² area)

	Energy kWh/m ² /year		Carbon KgCO ₂ /year	
	Elec	Gas	/m ²	/person
Old	53	143	53.2	2792
New	41	none	20.8	1092

New home: 200kg pa logs burned - zero carbon-rated

Insulation

External walls
 Underfloor
 Thermal mass – clay brick internal walls

Glazing

Windows & doors high performance double-glazed

Lighting

Natural light – full-length windows and doors
 Internal bathrooms lit by mirrored roof windows
 LEDs, circular CFLs

Heating

Passive solar gain
 Ground source heat pump
 Underfloor heating
 Solar thermal panels
 Whole house heat recovery and ventilation
 Woodburner

Water

Rainwater harvesting for toilets, clothes-washing, garden

Sustainable materials

Wood, stone, Marmoleum

Design and Construction

We were granted planning permission on our first application in January 2008. The design needed to address the issues around trees, cars and the visual street scene. Interestingly, sustainability is not an issue in planning terms, as long as the new development “preserves and enhances the Conservation Area”.

The natural world is important to us, so we have made strong connections between the house and garden, which is managed for wildlife; there is a sedum roof, wildflower meadow and pond.

The house is timber-framed, oak clad with exposed wooden beams to support the roof structure. The foundation is concrete piles, with steel beams reinforced with concrete containing recycled fly ash. This design minimised concrete use and also impact on the roots of nearby trees.

Low Energy Measures

Insulation

There is 350mm of expanded polystyrene insulation in the floor.

The external walls contain 100mm of hemp insulation and 120mm of external wood fibre insulation. They are faced on the inside with Smartply board, which has no formaldehyde resins. Internal walls are [lbstock](#) clay bricks which provide thermal mass.

The roof has 250mm of foam insulation and part is covered in sedum for biodiversity and to enhance the appearance.

The house is well sealed to eliminate draughts.

Glazing

All windows and doors are high-performance and double-glazed.

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The house faces south to maximise passive solar gain which on sunny days in the winter halves the heating requirements.



Lighting and appliances

We make the most of natural light, with full-length windows and doors. There is plenty of natural light streaming through the full length windows and doors. In the internal bathrooms light is reflected into the house by mirrored roof windows.

Most lighting is low energy, a mix of LED spotlights and circular CFLs.

There are energy-efficient appliances throughout.

We have a smart meter which monitors our electricity usage and helps us avoid wasting energy.

Heating and energy

Natural materials used include low VOC paints, wood, stone and [Marmoleum](#) floors.

The underfloor heating is supplied by a ground-source heat pump and domestic water is heated by a solar thermal collector on the roof.

We have a whole house heat recovery system which provides controlled ventilation in an energy efficient way.

Air is extracted from the bathrooms and kitchen and passes through a heat exchanger where it warms the incoming air, supplied to all rooms.

We keep the thermostat low in the living room and use the wood-burning stove for supplementary heat in the evenings. The stove's design is very efficient and suitable for a smokeless zone. We are currently burning wood leftover from the build and the site, which we expect to last us three years. We love sitting in front of the flickering firelight and enjoying the warmth it gives.

Water management

Rainwater is collected off the roof and stored in a 4250 litre underground tank, and supplies garden taps, low-flush toilets and the washing machine. Inside taps are aerating to save water. We use 55 litres of water/person/day.

Performance

We use around 8MWh per annum, which is 30% of consumption in our old home.

Professional Contacts

Architect: [Mole Architects](#) 01353 688287

Builder: [Cambridge Building Company](#)
 01223 324105 / 07775 500741

Products and Costs

Whole house heat recovery system: 50w system, HRU 4 from [ITHO](#) £5k

Ground-source heat pump: [Kensa](#) + 6x40m boreholes £15k including 6 x 40m boreholes

Solar hot water: [Thermomax](#) DF100 30-tube evacuated tube system; 1633Kwh/year £4.5k including hot water cylinder

Woodburning stove: [HWAM](#) £2.5k

