

People Exploring Low Energy Homes

Madingley Road, CB3 0EG

Ian, Sue and Sophie – 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, Type: **2010, Custom built, Detached**

Wall type, Floor area: **Timber framed, 210 sq m**

Project timescale: **Planning 3 yrs, Building 2 yrs**

Cost of build: **£600,000**

Energy usage – 4 adults

After: **48 kWh** per sq m pa electricity (new home)
200 kg pa logs for woodburner

Before: **53 kWh** per sq m pa electricity (old home)
143 kWh per sq m pa gas (old home)

Key features

- + insulation: under-floor (polystyrene); external walls (hemp + woodfibre); roof (foam)
- + thermal mass: internal walls (clay brick)
- + natural light: full length windows and doors
- + passive solar gain: large south facing windows
- + internal bathrooms light: mirrored roof windows
- + windows, doors: high-performance double-glazed
- + ground source heat pump: underfloor heating
- + solar thermal panels: domestic hot water
- + whole house heat recovery: controlled ventilation, energy efficient, heat exchanger
- + woodburner: supplementary heat
- + rainwater harvesting: toilets, clothes, garden
- + water conservation: aerating taps, low flush toilets
- + lighting: low energy LED spotlights, circular CFLs
- + energy efficient appliances
- + floors: natural materials, wood, stone, Marmoleum
- + biodiversity: sedum roof, wildflower meadow, pond

The natural world is important to us too, so we have made strong connections between the house and garden, which is managed for wildlife.

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”.

Low Energy Measures

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.

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

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

The external walls contain **100mm of hemp insulation and 120mm of external woodfibre insulation**. They are faced on the inside with Smartply board, which has no formaldehyde resins.

Internal walls are Ibstock 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.

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**.

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

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 usage and helps us **avoid wasting 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.

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.

The house is well sealed to **eliminate draughts**. 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 site, which we expect to last us three years. We love sitting in front of the flickering firelight and **enjoying the warmth it gives**.

Savings

Energy use: around 12MWh per annum which is **30% of our old home**.

Water use: 50% of our old home.

Professional Contacts

Architect: Mole Architects
www.molearchitects.co.uk 01353 688287

Builder: Cambridge Building Company
www.cambridgebuildingcompany.com
01223 324105 / 07775 500741

Products and Costs

Whole house heat recovery system: 50w system, HRU 4 from ITHO www.itho.co.uk (£5000)

Ground-source heat pump: Kensa + 6x40m boreholes www.kensaengineering.com (£15,000 inc. bore holes)

Solar hot water: Thermomax DF100 30-tube evacuated tube system; 1633Kwh/year (£4500 inc. hot water cylinder)

Wood-burning stove: HWAM www.hwam.com (£2500)