

1930s Eco-Retrofit & Loft Extension

Meet your hosts, Antony & Kathryn

This sensitive renovation of a 1930s house aims to increase living space while improving energy efficiency, providing greater comfort at lower cost. An engineer and project manager at a local technology partnership, Antony enjoys DIY and has a long-standing interest in green building. He says:

'Wanting to reduce our carbon footprint and lower our bills, we took part in the Square Energy Project, funded by Cambridge City Council in 2006-7. We installed low-cost internal wall insulation, draught-proofing and loft insulation, and turned down the thermostat – but found condensation and mould developed in the untreated rooms.'

This new project aimed to extend our space by adding a new bedroom and two ensuites, and address the damp problem while making a really substantial reduction to our energy consumption.'

How we went about our renovations

We used Sketchup software to draw up initial concepts in 2013, and engaged CtC Architects in early 2014. We discussed the project with neighbours and used Cambridge City Council's free pre-application planning consultation. We followed the planner's suggestions to minimise the impact of the extension, to fit in with the 1930s style of the estate.

*Designing with Sketchup:
rear of house*



The architect dealt with the planning application and approvals, developed the design with our input, and got builders to tender. To minimise costs, we took over installation of the heat recovery ventilation, plumbing and decorating, used our own electrician for electrical work, and project managed the construction.

Our family continued living in the property during the project, which ran from April-September 2015. Antony worked closely with the builders, spending 1-2 days each week on site. This was key to getting a good quality result as problems were identified and fixed at each stage of the programme.

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1930s Eco-Retrofit & Loft Extension, Cambridge – 2020

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Low Energy Measures

Internal Wall Insulation (IWI)

With solid brick walls all round, insulating this type of house is difficult. In 2007 we fitted two bedrooms with low-cost, 40mm thick IWI, by covering the existing plastered walls with Airtac Double foil, a 25mm unventilated cavity, and moisture-resistant plasterboard inside. With a U-value of 0.52 W/m²K this made a great difference to comfort in the treated rooms. Eight years on we removed this from one room as part of the new project, and found no signs of condensation or mould inside. However, our architect warned against this impermeable type of insulation for the new work, so we used wood fibre to internally insulate part of the front wall, carried into floors, window reveals and returns to minimise thermal bridging. This gives a U-value of 0.40 W/m²K (the U-value for uninsulated solid walls is 2.0 W/m²K).

Roof Insulation

In our large new loft conversion the flat roof is insulated with PIR insulation (U-value 0.18 W/m²K) fitted above the rafters (warm roof). The pitched roof is insulated as a cold roof with PIR between and below the rafters (U-value 0.15 W/m²K). Tiled walls are hung with counter-battens forming an air gap on the outside and PIR insulation inside (U-value 0.16 W/m²K).

Glazing

Aluminium/wood triple glazing in all new areas (U-value 1.0 W/m²K). UPVC double-glazing in remainder (U-value ~2.3 W/m²K).



Heating

We installed a mechanical ventilation heat recovery (MVHR) system to address the damp problems. This feeds fresh air to bedrooms and living rooms while recovering about 90% of the heat from the air extracted from the kitchen and bathrooms. We replaced our old condensing combi boiler for a more efficient model in 2016.

Water Management

Our new toilets have a low volume flush (6 litres), and we fitted the old ones with a water-saver. Showers have flow restrictors.

Sustainable Materials

We used wood fibre for internal wall insulation, and Fermacell (recycled gypsum fibreboard) instead of plasterboard.

Performance

We're delighted with the results. The house is notably warmer and quieter, especially the new rooms. With the MVHR and Velux blinds we don't seem to suffer from overheating, while the flow of fresh air has eliminated the damp and creates a lovely environment inside. Our gas usage seems to be down, even with much more space.

What would we have done differently?

There is now a much better choice of design software if we were starting again. Road noise in the loft conversion is more noticeable five years on as PIR insulation cannot accommodate rafters shrinking, and will be difficult to fix. We might have chosen a different system if we'd known this.

Future Plans

We love the thermal and sound insulating effect of the wood fibre internal wall insulation, and fitted out another bedroom with it. We plan to use this elsewhere to bring the older parts of the house up to the same level.

Key Specifications:

Property age: 1937

Type: Semi-detached

Walls: Solid brick

Floor area: 120m² increased to 152m²

Cost of Retrofit: £125k

Occupants: 2 adults, 2 children

Insulation & Glazing

- Internal & external wall insulation
- Flat & pitched roof insulation
- Glazing: triple or double glazing throughout

Heating & Energy

- Mechanical ventilation heat recovery system (MVHR)
- Energy efficient condensing combi boiler (2016)

| | Energy kWh/m ² /year | | Carbon KgCO ₂ /year | |
|---------------|---------------------------------|-------|--------------------------------|---------|
| | Electricity | Gas | /m ² | /person |
| Before | 27.8 | 138.3 | 32.5 | 976 |
| After | 21.9 | 105.3 | 25 | 948 |

Water saving measures

- Low volume flush toilets; low flow showers

Our top tips:

- *See this as an investment that's worth doing properly, as the details are critically important.*
- *If you're remaining in your home during major works, even in summer, fit a temporary roof:*



- *Check everything the builders do – they are still learning about high-performance insulation and may not be familiar with all the details. We found several problems that had to be fixed right away. If you can't do this yourself, employ an architect or project manager who can.*

Key Contacts, Products & Costs

Architect: [CtC Architects](#)

External Wall Insulation: [Wetherby Building Systems](#)
approx £8k (43m²)

Breathable Internal Wall Insulation: [Natural Building Technologies](#) approx £50/m²

DIY Internal Wall Insulation: YBS Airtec Double from [Screwfix](#)
+ moisture-resistant plasterboard, total £20/m²

Triple Glazing: [Sokolka](#) & [Velux](#), approx £1k per window excluding installation

Heat Recovery Ventilation System Vent-Axia Kinetic B Plus with radial ductwork from [BPC](#), total approx £4k with DIY installation (9 inlets, 7 extracts)

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