Edwardian terrace phased retrofit: CB3

Property overview

Property age: 1902
Type: Mid-terrace
Wall type: Solid brick
Floor area: 138m²
Project Timescale: 2001-present
Cost of Build: Approx. £40,000 for eco features
Occupants: 2 adults

Meet your hosts: Tom and Anne

Tom is a retired electronics engineer and Cambridge Carbon Footprint Trustee, much involved in Open Eco Homes. Anne also has an engineering background and is chair of Carbon Neutral Cambridge.

'We bought the house in 2001 and it shows the dramatic impact of many phases of improvements over a 20-year period. Lots were DIY, including some of our own ideas that we can share, with bigger jobs done by professionals.

Financing, Design and Construction

All the work has been self-financed. We started with quick-win DIY improvements, like draught-proofing, secondary glazing and installing insulation in the loft, which had none! Architect's advice guided our next priorities, like underfloor insulation. We have enough space to stay in the house while some rooms are disrupted, so phasing our on-going bigger retrofit suits us, particularly with breaks to enjoy the results and recover from builder-fatigue!

Home energy improvements

Insulation: Since autumn 2020, we have improved the back of the house, with high performance windows and doors, along with internal and external solid wall insulation. Our 2015 loft extension is much better insulated than the original, with better-than-building regs Celotex and double battened tri-iso insulation in the walls and ceiling, and triple glazed Velux windows. Underfloor insulation has been progressively installed on most of the ground floor, using several different DIY methods.

Draughtproofing: Making extensive air tightness improvements has made a big difference to a previously draughty Victorian terrace. We have explored various ways of finding leaks, from a simple homemade indicator wand to a survey using thermal imaging camera and blower-door.

Heating and energy: Recently we fitted a very efficient air-to-air heat pump (unusual in the UK) to heat our open plan kitchen and sitting space, which is working well. A lot of our winter heat comes from a woodstove, burning scavenged and hand-cut wood. However, because of particulate pollution, we have stopped burning wood on days when bad pollution is forecast. We still use our efficient but aging gas combi boiler for domestic hot water and central heating on very cold days. Our green electricity tariff is Tide from Green Energy, a smart time-of-day tariff.

Cooling: To keep cool in summer we use our own design of easily demountable awnings to shade south facing windows. At night in a heatwave, we flush the house with cool air from outside, letting warm air out at the top of the house. The heat pump would also provide cooling, but we promise ourselves not to use it!

Performance

Our home-energy carbon emissions have been cut by 72% since 2001, with recent improvements expected to reduce losses from the kitchen by 67%. We have made our home much more comfortable in winter and heatwaves. Much of this is due to the technical changes, but it has also been very worthwhile steadily getting comfortable with lower temperatures. Our thermostat is usually set at 15°C, but Tom plans to raise this in older age, so it feels great to be getting well insulated!

Future Plans

Upgrading the front of the house with new doors, windows and solid wall insulation. Because we are in a conservation area, the solid wall insulation will need to be all internal. We are still researching the ideal low carbon heating solution to replace our aging gas boiler, but it's likely to be some sort of hybrid system incorporating the woodstove and air-to-air heat pump.

Information and advice

Consider taking any opportunity for eco improvements – we regretted missing the chance for internal wall insulation when reworking our kitchen/dinner/sitting room in 2004. Now finally corrected! Our retrofitting moto is 'No half-measures'.

Key contacts, products and advice

Latest Retrofit at the back of the house by Green Hat Construction, with Triple Glazed Windows and Doors from Green Building Store, Triple-glazed Velux: GV Harrison. Internal insulation: 40-65 mm of Pavatex wood fibre, or PIR in some places. External insulation: 60mm Kingspan K5 Phenolic with 30 mm Lambdatherm Grey EPS on the outside.

DIY under-floor insulation: Living room: 200mm Rockwool. Hall: 100mm Celotex and recycled PET insulation.

Secondary glazing: DIY 2mm acrylic from Engineering & Design Plastics, with adhesive Velcro from MDP hook & loop. Professional, in sitting room bay window, by Go-Glass.

Woodstove: Morso 04 wood stove, installed by Peter Wakely, 01954 211049.

Heat Pump: Hitachi RAC-25 WSE & RAK-25PSEW, 3kW air-to air, installed by Anglian Energy Solutions.

Key specifications

Energy Usage: 2019, before recent improvements

Electricity	Gas	Other fuel	Water
9 kWh/m² pa	14 kWh/ m² pa	Wood 23 kWh/m² pa	55 L/ person/pa

Insulation & Glazing

- Solid wall insulation.
- High spec loft-insulation.
- DIY under-floor insulation.
- Passive cooling and awnings.
- Extensive improvements to air tightness.
- All triple, double or DIY secondary glazing.

Heating & Energy

- Air-to-air heat pump.
- Woodburning stove, scavenged wood.
- Low energy lighting with a variety of LEDs.

Water

- Short showers and care with water really help!

Garden and natural systems

- We only use stored rain and grey water on our garden and allotment, which usually thrive.

Materials

- Reclaimed and restored pine flooring.
- Marmoleum (eco-lino) in kitchen.