Case study

86 Gordon Rd, Shoreham by Sea, BN43 6WE

Overview

Owner: Caroline Schofield

Type: Edwardian semi-detached house

Age: House built 1904

Beds: 3 rooms used as bedrooms, 1 as study

Area: 80m2 per floor

Residents: 2

Key Features

Whole house retrofit

Air Source Heat Pump

Mechanical Ventilation with Heat Recovery

High level insulation throughout

Non-toxic materials

Solar panels

Water conservation

Introduction and approach

Caroline lived in, observed and tweaked the house for 10 years before embarking on a full retrofit in 2021.

As an Edwardian house, it would have been designed to be well ventilated and heated with open fires throughout, but like many old houses was draughty and cold.

Initially, small measures were undertaken incrementally as funds and grants allowed and in 2021, and when more funds became available, Caroline and her partner decided to complete a full renovation.

Having consulted with Misha Hewitt from Earthwise, and drawing on experience from Green Architecture and Eco Open House events in the past, the house upgrade focused on the 3 pillars of **Airtight, Insulate, Ventilate.**

The thermal envelope of the house was defined, with a commitment to insulating and making airtight, every surface edge of the house, including walls, ground floor and roof.

Triple glazed front door

Natural non-toxic materials were utilised wherever possible, reducing chemicals and plastics and sourcing from as close to home as possible.

Valued and trusted local trades and crafts people were used throughout, gathering a great team of skilled and committed people.

The side extension and loft conversion were signed off in Feb 2024, and the remaining upgrade completed 2025.

Energy Efficiency Measures

Heating and hot water

Air Source Heat Pump - 8 kWh Midea system, installed by DH Solar Engineering in Feb 2024 (grant obtained). This supplies heating and 250l hot water for 2 occupants, at home most of the day. Gas mains now fully removed from the property. Heating and hot water controlled through Homely Smart+ app and Octopus Agile Tariff, which optimises energy use.

5kW Morso 3112 Badger wood-burner for occasional use in winter. Energy rating A+

Ventilation

Every possible source of air leakage in the building was investigated and taped.

A Zehnder ComfoAir Q MVHR (Mechanical Ventilation with Heat Recovery) was installed in the new loft space in 2023, with ducting into every room to provide fresh air without opening windows. This was commissioned once major works were completed in 2024.

Insulation

Walls - External wall insulation (EWI) on priority walls.

90mm Extruded polystyrene external wall insulation across side and rear walls (grant obtained)

40mm Internal wood-fibre wall insulation on front elevation

Replastered in lime plaster as per original materials

Bathroom replastered in clay to manage moisture/humidity

Extension built with lightweight I beams to maximize space for insulation

Windows - Some double-glazed uPVC, more recently, triple glazed Aluclad doors and windows in extension and loft

Materials - To reduce carbon and allow the building to breathe, Limecrete, lime plaster, natural breathable paints, wood-fibre insulation, and woodwool board used instead of cement, oil-based PIR/Celotex and Gypsum plasterboard.

Found or repurposed materials used extensively. The kitchen was built by a local carpenter from existing furniture, building leftovers and found wood. The loft room wooden floor was created from the original rafters. Large cupboard doors repurposed from the original leaky French doors.

Leftover materials from this build were passed on or Freecycled where possible.

Floors - Foundations in kitchen extension made from Limecrete instead of concrete.

All remaining suspended timber floors lifted and insulated from below with 40mm wood-fibre and made airtight with breathable membrane and Tescon airtightness tape.

Woodfibre insulation, triple glazed Velux, floor made from rafters

Floor coverings:
Utility room – Marmoleum
Bathroom floor - cork
Shower room - rubber
Loft - machined up old rafters

Renewables and low carbon technology

Solar panels 12 x 250w Eternity silver panels originally fitted in 2015, then moved and repositioned, with new inverter, in 2023 during loft conversion.

Electricity

Approx **4,000 kWh/year = £1200**

Winter costs approx. £100/month all heating, hot water and electric

Summer costs £50/month

Carbon emissions

Approx **380kg CO^2**

However, each solar panel is likely to generate around 2,645kWh clean zero-carbon electricity per year, and air source heat pump highly efficient producing 3-4kWh heat for 1kWh electricity

Other sustainable measures/ lifestyle decisions

Water Conservation - 6 x water butt array located from the garden cabin, supplying all water required for the garden.

3 house toilets all displaying different water saving features:

Downstairs shower room loo - grey handwash water into cistern to flush

Bathroom - high level cistern - only short flush required due to water pressure from height

Loft - compost loo

Compost - Garden compost 'Green

Joanna' rodent proof compost bin manages all household food waste

Bike Storage - New utility room houses 2 x bicycles for easy access

Food - Food from garden, allotment or local veg box schemes

Appliances - Energy efficient appliances throughout

South facing main living space. Triple glazed French doors and windows, insulated floor and walls, I beams for extension walls, Limecrete foundations

Lessons learned

The build took over 4 years, far longer than anticipated, but it seemed sensible to do lots of other things at the same time as the main work. A detailed plan prior to starting would have saved time, money and stress.

The work created lots of waste. Much could be reused in the build, or passed on to other people or Freecycle, but having a plan for managing waste would also have helped.

Living in the house during the build cut down on relocation costs, and decisions could be made quickly as the work was happening. However, electronics, delicate fabrics and anything fragile should have been completely removed - the dust gets everywhere.

Record everything! Keeping a diary, or a good record of everything on a weekly basis saves so much time later trying to remember the details.

The 'diary of an ecobuilder' is an inspiration.

Learning more about retrofit, doing some reputable retrofit courses, such as those run by AECB, before embarking on a project like this would be helpful.

Further improvements

The garden will be next. Raingarden at the front, more water catchment in the back, pergoda on the patio for sun shade, front gate…

And creating a house manual, to log when maintenance is needed eg changing MVHR filters, sweeping chimney, servicing ASHP, changing salt in water softener etc

Professionals/ Materials

Carpenters -

Richard Schofield/Jill Pendleton @ Beautiful Lofts

Gavin Bond & Lizzie Lee @Lizzielee.com

Builder/Carpenter -

Simon Young @ SY Construction

Decorator -

Bear Kalliabetsos - bearwood.btn@gmail.com

Wood-fibre insulation & lime/clay plasterers -

Patrick Wait/Kip/Gary @ Sussex Lime and Insulation

Underfloor insulation -

Andrea Jones @ ecoworks Hove

Architect/engineer -

Ade Williams @ QS design services

Sustainability consultant / airtightness test & thermal imaging -

Misha Hewitt @ low carbon trust

MVHR -

Ben East @ Earthwise Construction

ASHP -

Daniel Holloway / Ilya @ DH Solar Engineering

Internorm French doors -

Josh @ Benchmark Windows

Plaster removed and Internal insulation added to prevent thermal bridging

Velfac windows/glass front door -

Passivlux

Morso woodburner -

Bolney Stoves

General ecobuilding materials -

Celtic Sustainables/Kind Supplies/lime centre/chalk down lime

Chris at Natural Organic Paint/Greenshop

Plumbing -

Phil @ Majestic Bathrooms

Keith Madden @ Ethical plumbing (loft)

Nathaniel Sly @ H2Flow plumbing

Flooring -

Lee @ LC Flooring

Metal work -

Francois @ South coast Metal - Zinc gutters/pipes

Traditional Leadwork - lead flashings

Electrics -

Ed/Chris/Charlie @ Wavelength electrics

EPS external render repairs -

Adrian Thomas

Kitchen Lamps - made from recycled milk cartons