20 Avondale Road, Hove BN3 6ER

OVERVIEW

Year built: 1968

Type: Detached

No of rooms: 3 bedrooms; 4 other

No of floors: 2

Residents: 2 adults, 2 children

Floor area: 175 m²

Cost: refurbishment work £120,000

Wall: Cavity filled

FEATURES

+ Airtight construction
+ Cavity Wall Insulation
+ Condensing boiler
+ Electric car charging point
+ Grey water recycling
+ Heat recovery ventilation (MVHR)
+ High performance glazing
+ Insulated Render
+ Solar PV (3.8 kWp)
+ Solar thermal
+ Low energy LED lighting
+ Low energy appliances
+ Low water use goods
+ Natural materials & finishes
+ Underfloor insulation
+ Woodburning stove

Introduction

Oliver Heath's eco refurbishment of this 1960s detached house for his family in Hove was undertaken with the aim of reducing the house's carbon footprint 80% against an average UK home. The main refurbishment was completed in July 2011, at which time it was estimated that emissions had been reduced by 65%. A year later, solar PV panels were finally fitted, bring emissions down even further toward the target of 80%. This gives a dramatic saving on energy bills and has created a great home to live in.

The house is included in the 'Old Home SuperHome' network of exemplar, old dwellings which have undergone an energy-efficiency retrofit achieving at least a 60% carbon reduction network: www.superhomes.org.uk

The brick exterior has been transformed using insulating render and locally sourced sweet chestnut cladding. Lots of natural materials and finishes have been used inside to create a great eco chic interior, including reclaimed larch, Cumbrian slate, natural paints and recycled glass work surfaces. The house uses several cutting edge technologies including a heat recovery system, low energy LED lighting and benefits from a doubling of window area on the ground floor to maximise natural light and solar gain. But a good eco home is not simply about improving its technical specification; it's also about creating and nurturing happy internal spaces that people enjoy living in and using. Oliver has used his design skills to create a home that reflects the culture of sustainability in both a practical and aesthetic way, winning the British Institute of Interior Design eco retrofit award for 2011.

Energy measures

Insulation

Roof insulation Roof space has 270mm of Earthwool loft insulation made from recycled plastic – Cost around £200, with grant assistance. U-value 0.2W/(m²K)

Cavity wall insulation This was also grant assisted to cost only £200. It initially cut wall losses by 65%, to give a u value of around 0.5W/m²K.

Insulating Render The wall u value has been further reduced, close to 0.4W/m2K, by using insulating external render (Thermilate Insowall, 30mm thick).

Under floor insulation Yelofoam (XPS) 40mm has been fitted between joists beneath the under floor heating system and screed. U-value 0.40W/(m²K)

Double glazing Velfac high performance argon filled windows, with slim timber cored mullions, have an overall u value of less than 1.5W/(m²K)

Draughts

The house has been made more airtight by carefully reducing draughts from doors, windows, kitchen vents, under the floor, unused chimney and loft hatch. It is now a sealed unit, cutting out heat loss from draughts. Ventilation is provided via a Vaillant mechanical ventilation system with heat recovery (MVHR). This is located in the attic and recovers heat from warm moist air, extracted from the kitchen and bathroom, to heat incoming fresh air to the living rooms.

Energy systems

A new Vaillant condensing boiler with controls has replaced an ageing combi boiler. A Vaillant solar water heating supplies up to 60% of hot water needs; and was also grant assisted.

The heating system can: warm the whole house room by room; apply sophisticated control of water heating; allow for holidays, when the house is unoccupied; and control the under floor heating system on the ground floor and small eco radiators on the 1st floor.

There is also a wood burning stove to provide very low carbon heating, but this is only used occasionally, as the house is so energy efficient.

Solar PV panels were later installed on the south and west facing roof pitches in 2012. The 3.8 kW array has had a major impact on emissions and also neatly complements the recently acquired Vauxhall Ampera hybrid electric car, which can charge its batteries from surplus electricity.

Electricity saving plan

'A' rated appliances throughout (fridges, freezer, dishwasher, washing machine etc).

The kitchen hob is an induction hob, so is very efficient. An Effergy energy meter is used to monitor daily electrical usage. A Vphase voltage optimizer cuts incoming voltage to 220 volts when it was previously 265 volts.

There is low energy lighting throughout – a mixture of LED downlighters and compact fluorescent bulbs (CFLs). LEDs now only cost £10 or less and pay for themselves within a year.

Lighting plan

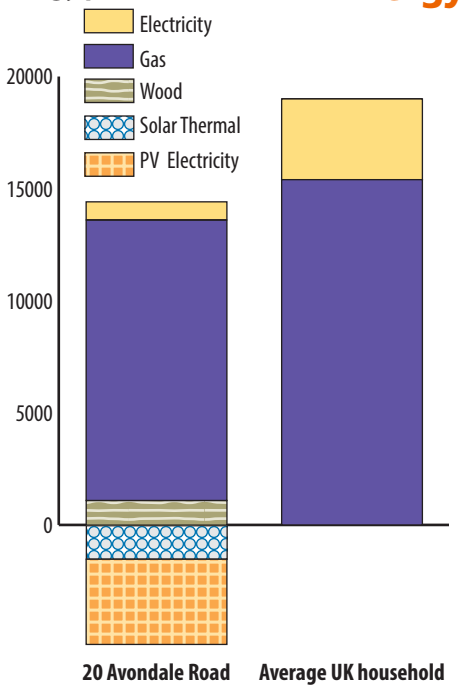
Maximizing natural light includes: enlarged windows with slim mullions, by Velfac; clean windows free from obstructions; curtains pull back beyond window opening; white wall, floor and ceiling bounces natural light; glass panel doors allow light to filter through.

Water saving measures

These include: Mira Eco Shower heads to cut water use to just 6 litres of water per minute; low flow aerated taps; dual flush toilets (2.5 litres and 4 litres); a foot pedal operated kitchen tap that saves water when user is standing at the kitchen sink; a water butt (180 litre) collects water from the roof; an easily fitted, £30 bath water diverter valve on the external waste pipe allows grey water recycling via a hose onto the garden.

Energy and CO_2 performance

Energy performance kWh



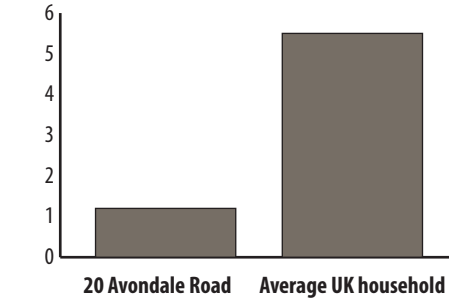
Energy use (generation) kWh

	20 Avondale Road	Average UK household[1]
Gas	12500	15400
Wood	1100	0
Electricity	800	3600
PV Electricity[2]	-3800	0
Solar Thermal	-1500	0
Totals	**9100**	**19000**

[1] 15400 kWh average gas use (DECC Energy Trends March 2013), 3600 kWh average electricity use (EST 'Powering the Future' 2012)

[2] Total generation figure, of which 500 kWh is assumed used by household

CO_2 performance Tonnes CO_2



CO_2 emissions (tonnes)[3]

20 Avondale Road	Average UK household[4]
1.2	5.5

79% below average

[3] CO_2 fuel emissions factors from SAP 2009

[4] Average fuel emissions 0.233kg CO_2/kWh (from EHS 2009 fuel split)

Lessons and Insights

A deep refurbishment like this really needs a detailed and professional design to get maximum performance and, equally importantly, ensure that a coherent, livable solution is achieved.

Tradesmen are notoriously conservative and often resist technology they are not familiar with. You have to be insistent!

The plumber wanted to install larger radiators, not trusting the insulated design. The small radiators specified are unobtrusive and have performed well, freeing up space.

The external wall render proved trickier to apply than traditional, requiring numerous coats.

Professional contacts

Contractors Curve construction
www.buildersinbrighton.com
Under floor heating
Thermo Floor Southern
www.thermofloorsouthern.co.uk

Materials and systems

Insowall by Thermilate
www.thermilate.com
Velfac double glazing
www.velfac.co.uk/
Engineered wood floor –
www.reevefloring.com
Recycled glass worktops
Resilica, Newhaven
'A' rated kitchen appliances
www.neff.co.uk
Lighting www.greenled.co.uk
Mechanical ventilation with heat recovery www.vaillant.co.uk
Mira Eco shower heads
www.mirashowers.co.uk/
Efergy energy meter
www.efergy.com

Eco Open Houses is an annual collaborative project between Low Carbon Trust, Brighton Permaculture Trust and Brighton & Hove City Council. This year the event is run as part of the Ecobee Project and has been selected within the scope of the INTERREG IV A France (Channel): England cross-border European cooperation programme and is financed by the ERDF. For more information on the Ecobee Project see: www.ecobeeproject.eu

Brighton & Hove City Council
Low Carbon Trust
Brighton Permaculture Trust
ECO BEE project
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