4 Whichelo Place, Brighton BN2 9XF

OVERVIEW

Period: Victorian circa 1867

Type: Mid-terrace

No of bedrooms: 4

No of other rooms: 2

No of floors: 4

Floor area: 125m² including loft conversion

Cost: About £35 000 for 'green' elements of renovation and loft conversion

FEATURES

+ Airtight construction
+ Condensing boiler
+ Energy monitoring
+ Highly insulated loft extension
+ High performance glazing
+ Low energy appliances
+ Low energy lighting
+ Low water goods
+ Solar thermal
+ Solid wall insulation (external front and back, internal in loft)
+ Wood burning stove

Introduction

4 Whichelo Place is a typical Victorian three-storey mid- terrace, solid walled house in the Hanover area of Brighton.

The aim of refurbishment was to significantly enhance occupant comfort and reduce energy consumption by at least 60%; meeting or exceeding the then building regulations if possible and with an aspiration of addressing the then newly issued report 'The 40% house', and being an AECB Silver standard building performing at no more than 22kgCO_2/m²/year. See the AECB website www.carbonlite.org.uk

These aims have been achieved by fitting good quality double glazing and external doors, external and internal wall insulation and internal between floor insulation, new close-fitting internal doors, installation of a solar hot water system and a standalone 5kW wood burning stove. A new well insulated loft extension was also constructed, at the same time.

New energy efficient appliances (A+) were installed where possible. The existing boiler although old was retained as it is an early condensing type and is relatively efficient for the little use it gets.

Natural materials and finishes have been used where practicable, but compromises were made where synthetic insulation gave a significant advantage.

The house was lived in and observed for a year before the project began. Before renovation, it was comfortable in the summer but during the winter cold walls and poor quality double glazing, little loft insulation and poorly fitting or missing internal doors meant that the house became uncomfortably cool even with the central heating fully on. The internal surface of some external walls suffered from patches of mould from condensation where there was little air movement.

Warmer home in winter

Since renovation, the house has been significantly warmer and more comfortable with a relatively even temperature across each floor of the house, making all the floor space useable year round. Patches of mould have disappeared.

The house is far more comfortable than before the renovation with a significant reduction of energy use. Averaged over two years, with varying occupancy and behaviour the annual amount of energy used for heating (gas and wood) has been less than 8000 kWh and for electricity 1800 kWh.

This is significantly less than the average UK household shown above and much less than neighbouring un-renovated houses. 4 Whichelo Place is performing very well, delivering carbon emission reductions of 65% against an average home.

In 2008–2009 following the renovation, the living room temperature was logged (the coldest room in the house as it gets no sunlight in winter) and house energy usage noted. On the coldest days of the year the living room temperature never fell below 16 degrees centigrade even after 12 hours without heating, (and was generally above 18 degrees centigrade). With 4 people in the house and a wide variety of occupancy behaviours, the heating was provided by a mixture of wood stove and gas central heating. During February the quantity of gas required was a third of that of a comparative un-renovated house with a similar heating cycle and temperature. The solar water heating system exclusively provided 200 days of hot water and made a contribution for the remainder of the year. For the year, the gas bill

was around £230, electricity bill £350 and approximately 500kg of wood was burnt at about £175.

In 2009–2010 year two people lived in the house. The central heating was used on only two days during what was a cold winter, the main heat source being the wood stove. In the second year approximately 1000kg of wood was burnt, which equates to about 4000 kWh of energy. The gas bill was around £80 for the year for 2500 kWh, mainly for water heating and the electricity bill around £250. Since having their first child, Paul and Marion estimate that they are using approximately 1kWh energy more a day. This just illustrates how the way a house is used and the number of people living in it makes a real difference. Also how important it is to create thermal comfort even for the smallest members of the family!

In conclusion, the renovation has been a success with the house being more comfortable year round, with much reduced energy usage, CO_2 emissions and low energy bills.

Energy efficiency measures

External wall insulation Front (street); 80mm Celotex PIR insulation, stainless steel render mesh, haired lime render and tallow and lime wash finish. Back (garden); 100mm Celotex PIR insulation, stainless steel render mesh, cement render, masonry paint.

Internal wall insulation 40-100mm celotex PIR backed pasterboard in groundfloor extension. A mixture of 150mm sheep's wool and 100mm celotex PIR insulation in loft conversion.

Roof insulation 150mm Celotex PIR insulation including 50mm Celotex PIR insulation backed Plasterboard in eaves, 150mm thick sheep's wool with Heraklith wood wool board and lime plaster in Dormer.

Floor insulation 200mm thick warmcell 100 in floor of loft conversion and approximately 75mm thick warmcell in two bedrooms where floorboards were lifted.

Improved glazing and external doors new wooden frame double glazing with average U values of 1.5. Doors of a similar standard. All windows fitted with trickle vents.

Increased air tightness Tested to 5.5 air changes per hour at 50 Pascals.

Energy and electricity systems

Existing condensing boiler retained despite being 12–15 years old as it is relatively efficient for the amount of use it gets and is always used at full load. Will replace with a micro CHP system (combined system to generate heat and power) when market ready.

Solar Thermal system installation of unvented 250 litre hot water tank and oversized evacuated tube collectors. Collectors sit flat on a Dormer roof.

Insulated pipe work all pipes accessible within floors during works were insulated

Lighting All low energy type.

Appliances New A++ rated fridge freezer, washing machine and dishwasher.

Wood Stove 5kW high efficiency smokeless zone compliant wood stove burning locally sourced wood.

Decorating

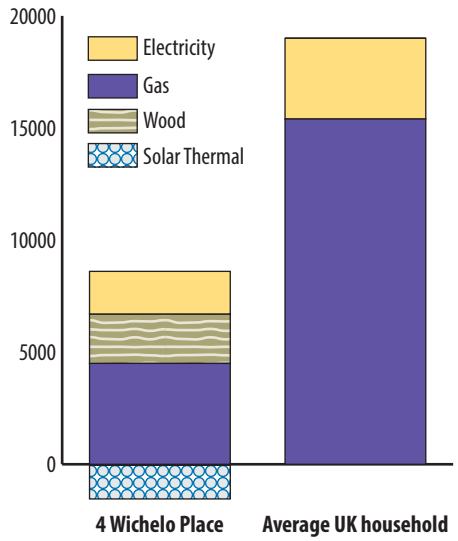
Finishes Biofa natural paint and oils and Earthborn natural paint were used.

Flooring Cork / wood fibre laminate used downstairs throughout. Cork to be fitted in bathroom.

Windows Curtains fitted throughout

Energy and CO_2 performance

Energy performance kWh



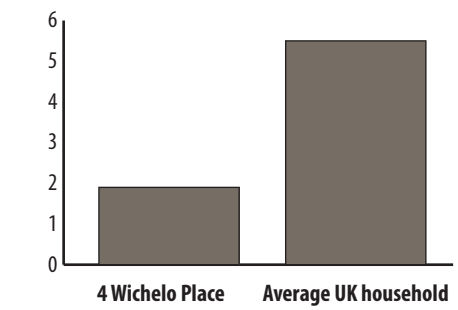
Energy use (generation) kWh

	4 Wichelo Place	Average UK household[1]
Gas	4500	15400
Wood	2200	0
Electricity	1900	3600
PV Electricity[2]	0	0
Solar Thermal	-1500	0
Totals	**7100**	**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

CO2 performance Tonnes CO2



CO_2 emissions (tonnes)[3]

4 Wichelo Place	Average UK household[4]
1.9	5.5

65% 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)

Monitoring

Temperature was monitored in the living room for one year as part of a wider study and energy use noted. An electricity logger is attached to the incoming supply. Solar water pump hours are aggregated on the controller.

Further works

Home composting is to be reactivated when the garden is renovated and rainwater collection is planned for garden use.

Insulating blinds / curtains to be fitted to some windows. Remaining decoration to be finished using natural paints and finishes.

Professional contacts

Architect ARCH-angels architects
www.aaarchitects.co.uk

Building and joinery
AJN Builders
www.ajnbuilders.co.uk

Insulation

Warmcel: www.excelfibre.com

Celotex: www.celotex.co.uk

Thermafleece sheep's wool insulation: www.secondnatureuk.com

Heraklith wood wool board: www.skanda-uk.com/heraklith.htm

Solar thermal system

Suntrader: www.suntrader.co.uk/

Wood stove WH Supplies: www.whsupplies.com/wood-burning-stove-west-sussex.html

Paints and finishes

Biofa biofapaint.co.uk

Earthborn
www.earthbornpaints.co.uk

Windows and doors

Wood Depot Ltd.

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

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