A Victorian villa Cheltenham

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Case study 24

£1,025 Saving on fuel bills

22% Reduction in carbon emissions

Measures installed	Total cost	Annual CO_2 saving (tonnes)	Annual fuel bill saving
Sloping ceiling insulation	£20,641	1.59	£241
Floor insulation	£18,480	0.63	£95
Double glaze sash windows	£11,607	0.74	£142
Block up existing fireplaces	£1,058	2.06	£311
Two replacement boilers	£2,544	1.39	£236
Total package	£54,330	6.41	£1,025

The home

This is one of a number of Victorian villas around the Sydenham area of Cheltenham. It is of traditional construction comprising solid masonry walls finished in stucco lime render to the outer face. It has four floors, including accommodation in the basement and rooms in the roof with sloping ceilings and dormer windows. This large house had an old central heating system with two boilers when the current owners bought the house in 2009, at which time it was rated F for energy efficiency on the Energy Performance Certificate. They expected large heating bills and to feel the cold in winter, so when they planned their renovation of the house they wanted to take every opportunity to improve comfort, reduce running costs and minimise their environmental impact.

What they did

With a starting carbon footprint modelled at nearly 30 tonnes there were many significant opportunities to improve the energy rating of the house so it was a challenge to weigh up the costs of each measure against the benefits. Advice and information from the Target 2050 report aided the owners in deciding on a number of improvements. This included internally insulating the roof rooms and several rooms on the first floor, blocking off the unused open fireplaces to prevent draughts, and improving the glazing in a large number of the windows.

A number of improvements were also made to the central heating, including replacement of the old boilers.

"Our house has been transformed from a fridge to a comfortable family home. We have found ways to accommodate the measures without compromising the original features. The house is now fit for generations to come."

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Internal wall and sloping ceiling insulation

The Target 2050 report recognised that the greatest savings would be achieved through insulating the solid walls. External wall insulation was considered to preserve the interior, but as the house is in a conservation area this was not possible.

Insulating the two rooms in the roof was a priority as these were unbearably hot in the summer and similarly cold in winter. This entire storey was insulated with 50mm of phenolic foam with a layer of multi-foil insulation. The cost to complete this also included 80 roof vents that were required to ensure adequate ventilation behind the insulation.

A burst pipe in the winter of 2010 caused considerable water damage to the walls and ceilings on the first floor, which meant that the original plasterwork had to be removed. Having experienced the benefits of insulation on the second floor, the householders took this opportunity to install insulation backed plasterboard in two of the coldest and most often used rooms in the house: This was completed using 35mm extruded polystyrene bonded to standard gauge plasterboard.

Insulation in progress to the bay window and sloping ceiling

Glazing and draught-proofing

The next greatest saving could be achieved from a relatively simple measure: blocking the nine open fireplaces. Chimneys can be bricked up, or temporarily closed in a number of ways. It was decided that six of the fireplaces could be permanently blocked so that the remaining three can still be used.

Whilst insulating, the opportunity was taken to install 'A' rated double glazed windows in the roof rooms. It is ideal to install new windows at the same time as insulation so that a good seal is achieved and not compromised during later work.

The rest of the property was also single glazed, and it was hoped that this could be improved sympathetically to keep the period features. The owners used a combination of services provided by Wessex Restoration. This included the Ventrolla system which is a comprehensive system of seals designed especially for sash windows, and slimlite double glazing which replaces the individual panes of glass with narrow, double glazed units. The householders were so pleased with the work that they have now had almost all of the sash windows in the house upgraded in this way.

Heating improvements

Finally, attention turned to the heating system. As the two boilers serving the house were being replaced the householders took the opportunity to install a twin-coil hot water cylinder and pipe work so that solar water heating panels could easily be installed in future. It was decided to fit two boilers as part of the house may serve as a separate residence in the future. This will allow for separate controls and zones, so that heat is only provided to the rooms that are in use. This is complemented by insulation that has been installed into all the intermediate floors, so that less heat is lost through the floors and the individual zones are better controlled.

Energy consumption	Total (kWh)	Per m² floor area
Before improvement (2010)	124,610	408
After improvement (2011)	93,068	305
With all possible measures	41,746	137
UK average (2011)	19,800[1]	217[4]

CO_2 emissions	Total (tonnes)	Kg per m² floor area
Before improvement (2010)	28.67	94
After improvement (2011)	22.26	73
With all possible measures	9.35	31
UK average (2011)	6.00[2]	66[4]

Running costs	Total	Per m² floor area
Before improvement (2010)	£5,082	£16.63
After improvement (2011)	£4,057	£13.28
With all possible measures	£2,281	£7.46
UK average (2011)	£1,032[3]	£11.34[4]

[1] Ofgem 2011
[2] English Housing Condition Survey 2011
[3] Ofgem 2011
[4] Based on 91m² from English Housing Condition Survey 2011

Energy performance and carbon emissions in the Target 2050 exemplar homes have been modelled using the UK Standard Assessment Procedure (SAP). The savings data presented here is based on a standard occupancy pattern. This may not reflect actual usage by the building's current residents but is used to compare homes of different sizes and types in a way that assesses the building itself rather than the behaviour of any particular occupant.