# Grade II listed 1850s home Stroud

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Case study 35

**£888** Saving on fuel bills

**24%** Reduction in carbon emissions

| Measures installed | Total cost | Annual $CO_2$ saving (tonnes) | Annual fuel bill saving |
|---|---|---|---|
| External wall insulation | £7,635 | 0.89 | £164 |
| Internal wall insulation | £1,025 | 0.27 | £51 |
| Floor insulation | £1,630 | 0.75 | £140 |
| Flat roof insulation | £855 | 0.45 | £83 |
| Secondary glazing | £3,050 | 0.09 | £15 |
| Replacement boiler and controls | £5,888 | 3.60 | £435 |
| Total package | £20,083 | 6.05 | £888 |

## The home

This home is a Grade II listed, semi-detached property built in the 1850s with several later extensions that are of varying build quality. The original house has solid stone walls, the extensions have stone or brick walls, although one small part is just a timber stud wall. The house has large rooms with high ceilings. Much of the original glazing remains, including large sash windows and some unusual porthole and arch shaped windows on the second floor.

The current owners have lived in this house for about nine years, using only the ground and first floors. The second floor is currently not in use, and as it is not thermally separated from the rest of the house, draws considerable heat from it.

## What they did

Being a large property and a listed building, it was a challenge to decide on a package of measures that would be acceptable to a Conservation Officer and deliver improvement in comfort and running costs. Discussions with the Conservation Officer gave an idea of which measures were likely to receive listed building consent. This helped to inform a written proposal which was submitted along with photographs. This process resulted in a number of insulation improvements being approved & installed including the fitting of floor insulation, flat roof and a small amount of internal wall insulation. A new boiler and heating controls have significantly improved the heat delivered to the home, and secondary glazing on the second floor has helped to make this area far more comfortable.

"We haven't fully upgraded the house but the work done so far has taken us a long way. What's left to do now feels achievable."

asiantaeth ynni SevernWye energy agency

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## Insulation improvements

Given that neither internal nor external insulation on the solid stone walls would be acceptable, the action plan focused on the areas of the house where improvements in comfort would be most noticeable. Within the secondary glazed main living room, the floor boards were lifted, insulated beneath, replaced and draught sealed. The owners stated that, "The insulation produced an instant and very noticeable benefit".

Also improved was the 1920s extension, which has single thickness brick walls and a flat roof. The cement render on the outside of these walls was crumbling, so it was replaced with an insulating lime render. In terms of protecting the building, this is an improvement because lime render is breathable whereas cement render isn't. Around 40mm thick, this is about double the cement render thickness. It would have been better still to use insulation boards and then render over them, but this would not have been acceptable as it would significantly alter the external appearance, particularly around the window reveals. Two of the more straightforward improvements were; insulating the flat ceilings of the 1920s extension using 100mm phenolic foam insulation backed with 12.5mm plasterboard and applying 50mm phenolic foam insulation to the wall between the unheated utility room and the kitchen, effectively making the utility room a cold room. Both of these measures delivered immediate improvements in comfort.

*Applying insulating lime render to rear wall of house*

## Heating improvements

One of the most significant savings available was from replacing the gas boiler with a more efficient, condensing model and adding thermostatic radiator valves (TRV's) to all radiators. Having changed to regular home working, the householder has found the TRV's very useful in improving comfort without heating the whole house and has removed the need to use an electric fan heater. Whilst the boiler was being installed, the owners took the opportunity to install a twin coil cylinder, as they hope to be able to install solar water heating in the future.

## Secondary glazing

Installing secondary glazing to windows on the second floor was a fairly costly measure for little carbon or cost savings, but this badly needed doing as the design of the windows meant it was impossible to draught proof them effectively. Being high up in an exposed location, there was significant heat loss from the windows, which was drawing heat up from the rest of the house. Care was needed to ensure that the secondary glazing does not detract from the period character of the windows, but using a skilled joinery company has produced a very pleasing result.

| Energy consumption | Total (kWh) | Per m² floor area |
|---|---|---|
| Before improvement (2010) | 128,353 | 416 |
| After improvement (2011) | 96,415 | 312 |
| With all possible measures | 50,660 | 164 |
| UK average (2011) | 19,800[1] | 217[4] |

| $CO_2$ emissions | Total (tonnes) | Kg per m² floor area |
|---|---|---|
| Before improvement (2010) | 25.40 | 82 |
| After improvement (2011) | 19.35 | 63 |
| With all possible measures | 11.01 | 36 |
| UK average (2011) | 6.00[2] | 66[4] |

| Running costs | Total | Per m² floor area |
|---|---|---|
| Before improvement (2010) | £3,920 | £12.69 |
| After improvement (2011) | £3,032 | £9.82 |
| With all possible measures | £1,943 | £6.29 |
| UK average (2011) | £1,032[3] | £11.34[4] |

| Possible next steps | Annual $CO_2$ saving (tonnes) | Annual fuel bill saving |
|---|---|---|
| Insulate remaining solid walls | 4.14 | £507 |

[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.