18 Hillcrest View, Leeds: A pilot for very low carbon building improvements for Leeds Victorian terrace homes.

Background

Latch is aiming to improve its properties to make them warm and affordable to heat, lifting tenants out of fuel poverty, improving their health and quality of life and substantially reducing carbon emissions.

Latch commissioned Andy Walker from Sure Insulation CIC, Jonathan Lindh from Leeds Environmental Design Associates and Ewan Jones from Aecom to develop and document an affordable and practical system for improving the thermal performance of our hard-to-treat Victorian terrace housing.

This resulted in the manual “Very low carbon building improvements for Leeds Victorian terrace homes”. The approach focuses on energy conservation, through superinsulation and air tightness works, using readily available building materials. The manual is available as a free download from www.latch.org.uk/innovation and sets out the approach in detail.

Measures installed

Latch obtained funding through Leeds City Council and DECC to pilot the approach on 18 Hillcrest View, a through terrace in Chapeltown, Leeds.

The house had single glazed windows, solid brick walls, 100mm of loft insulation and no heating.

Measures installed included triple glazing, internal solid wall, underfloor and loft insulation, high performance external doors, extensive air tightness works, central heating and mechanical heat recovery ventilation. This is equivalent to the “high specification” in the Comparison Matrix of Improvement Measures in the manual, minus the solar thermal and solar PV. A table with full specifications is included.

High attention to detail was required when carrying out airtightness works and fitting insulation to ensure that there were no small gaps as these can significantly reduce the performance of the works. All works were carried out by Latch staff and volunteers, with the exception of gas, electrics and commissioning of the HRV system.

Results

The works were completed in November 2013. Leeds Sustainability Institute at Leeds Metropolitan University tested the house to determine the impact of the measures. Pressurisation and depressurisation tests and thermal imaging were used to determine the air tightness of the property. The full report is available to download from www.latch.org.uk/innovation but key results are below.

Pressurisation test results	
Date	Air permeability $m^3/(h.m^2)$ @ 50Pa
11 March 2013	Unable to complete test due to incomplete air barrier, leakage detection only. For comparison, the result at the adjoining property was 19.14
21 November 2013	7.31
28 November 2013 (property completed)	4.73

The report states "The final mean air permeability of 4.73 $m^3/(h.m^2)$@ 50Pa is a very creditable result and reflects the level of application and attention to detail displayed throughout this refurbishment project. The main air leakage paths identified previously were still present, but had been reduced. Most noticeable reductions were observed around the trickle vents, the cellar door, the floor/party wall junctions around the chimney breasts and around the bathroom penetrations."

For comparison, Building Regulations for new build require air permeability of 10 $m^3/(h.m^2)$ @ 50Pa.

Full SAP assessments were carried out before and after improvements:

	SAP prior to works	SAP works complete	SAP prediction from manual
Energy costs	G 14	B 83	B rated: 83% saving on annual fuel bills
CO2 emissions	F 26	B 86 The calculated CO2 emissions are 18.44 kgCO2/m^2/yr (i.e. 1,448.19 kgCO2/yr).	B rated

The report states: "If the dwelling was being assessed against current standards for new houses (which are now very stringent – most new homes include photovoltaics) then it would scrape a pass of 0.43% which I think is a commendable achievement."

Ongoing work

The thermal performance works should result in a significantly warmer house that is cheaper to heat. Further monitoring and testing is ongoing to see whether the actual performance of the house measures up to the predicted performance.

We are working with the tenant to see how the house performs and monitoring the fabric of the building for damp or other potential problems.

Table of thermal performance measures installed

Item	Specification	Manufacturer	u–value
Triple glazing	4-12-4-12-4 triple glazed units in timber frames.	Russel TimberTech	1.063
High performance external doors	Door style MF07 4 panel 54mm thermal timber door blade. Fan lights triple glazed	Masterdor	0.96 1.1
Internal solid wall insulation	150mm PIR insulation with airtightness barrier at inner foil face. Overboarded with plasterboard bonded to PIR layer.	Kingspan	0.15
Underfloor insulation	200mm Rockwool between joists.	Knauf Earthwool	0.2
Loft insulation	400mm Rockwool	Knauf Earthwool	0.1
Cellar Head Insulation	50mm PIR to sides and 100mm PIR to ceiling of cellar head. Airtight seal to G/F Floorboards. Back of door at cellar head backed with 50mm PIR in Timber box. Airtightness works to door including draught strips, and airtight threshold.	KingSpan	
Airtightness – cellar floor	All gaps and joins between floorboards sealed with sanitary silicone. Floor edges sealed with expanding foam.	Generic	N/A
Airtightness – Interfloor Junctions	The joists run parallel to the external walls. Ceilings and floors adjacent to the outside walls were removed back to the location of the first joist. [Between 20 and 100mm from wall face]. Airtight membrane was passed through between the rooms above and below, where it was fixed to the inner airtightness face of the insulation. Void behind the membrane filled with PIR where possible, and expanding foam to fill any gaps.	N/A	N/A
Airtightness - chimneys	An innovative method which maintains ventilation to the unused stacks to stop damp problems. Chimneys cross drilled at each level to link up the cores, then vented into the cellar at the bottom of the stacks which is outside the airtightness envelope. The stacks also have a vented cowl at the top.	N/A	N/A

Item	Specification	Manufacturer	u- value
Airtightness – window installation	Strips of membrane 8cm wide were run around the external perimeter of the window with one edge taped to the frame. Once installed the other (internal) edge of this strip was taped to the internal face of the insulation (the airtightness layer) in the window reveals.	Visqueen	N/A
Mechanical heat recovery ventilation	Full Mechanical Ventilation with Heat Recovery. Extract points in kitchen, bathroom and utility. Fresh air returns to lounge and bedrooms.	Envirovent Energysava 280	N/A
Central heating system	Condensing boiler	Worcester Bosch Greenstar 25si	N/A
Heating controls	Programmable roomstat and TRVs	Horstmann AS1	N/A