

LZ CARBON PROFILE

Profile: 006
February 2009



The Hanson Ecohouse

Level 4 Code for Sustainable Homes

CO2 emissions: **At least 44% reduction over Part L2006**

Developer: **Hanson**

Architect: **TP Bennett Architects**

Completed: **June 2007**

Location: **Watford, Hertfordshire**



The two-storey Hanson EcoHouse was the first dwelling in the UK designed to Code Level 4 using masonry construction. It has three bedrooms, a floor area of 117m² and a traditional brick finish for mass market appeal.

Built as a demonstration project on the BRE Innovation Park, the house has an 'upside down' layout, which can help reduce carbon emissions. Bedrooms are placed downstairs to maintain lower room temperatures than the upstairs open plan living area, which benefits from rising warm air. A pyramid shaped roof helps moderate changes in temperature through an opening rooflight and provides natural ventilation, with fresh air introduced from window louvers. Generous glazing provides very good daylighting to the upstairs living and kitchen areas.

Low carbon approach

Fabric Highly insulated walls, ground floor and roof, triple glazed windows and reasonable airtightness performance reduce heat losses through the building envelope. High thermal mass masonry walls and floors moderate daily and seasonal temperature fluctuations, while natural ventilation and night time cooling reduces CO₂ emissions from heating and ventilation.

Heat and power generation A ground source heat pump powers the underfloor heating and a roof mounted solar hot water collector provides hot water.

Upgradeability Plans exist to use the design to produce Code Level 5 and 6 homes. This could include reducing thermal bridging at junctions, and adding a MVHR system and PV panels.



Outline energy strategy

The design involves improving the performance of masonry construction and shows how natural ventilation, some supporting microgeneration and low-impact underfloor heating can significantly reduce (>44%) CO₂ emissions.

Envelope

Walls: U = 0.15 to 0.18 W/m²K
Offsite wall construction (brick, block and cavity insulation) provides high build quality, quick build and low waste.

Roof: U = 0.15 to 0.18 W/m²K
Insulated steel framed pyramidal roof clad in zinc for a distinctive appearance. Uses 230mm of EPS insulation.

Windows: U = 0.8 W/m²K
Triple glazed with low e glass, krypton gas fill, warm edge spacer bar and timber frame.

Airtightness: 4.8 m³/m²/hr at 50 Pa
Factory-produced wall panels helped achieve good airtightness. The measured airtightness is around the best that is recommended for a naturally ventilated house.

Low carbon heat and power

Ground Source Heat Pump (GSHP)
A Geothermal International GSHP with coiled trench collector buried in the ground surrounding the house is used to power underfloor heating on the ground floor.

Natural Ventilation
An automated natural (passive) ventilation system opens rooflights to provide fresh air and cooling.

Solar Thermal Array 2.7m²
A Rayotec solar hot water evacuated tube collector is mounted on the roof and supplements the GSHP in meeting the majority of domestic hot water needs. An electrical immersion heater within the water tank provides additional water heating if required.

Contacts
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Acknowledgement
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Low energy alignment with the Code for Sustainable Homes (Design Stage)

Energy Issue	Credits awarded
ENE 1 Dwelling Emission Rate 51.7% reduction in carbon emissions	8 of 15
ENE 2 Building Fabric Heat loss parameter of 1.18	1 of 2
ENE 3 Internal Lighting 90% of fixed fittings are dedicated and energy efficient	2 of 2
ENE 4 Drying Space Retractable external washing line fitted to rear wall	1 of 1
ENE 5 Energy Labelled White Goods No verified energy efficient fridge, freezer, washer and dryer	0 of 2
ENE 6 External Lighting	1 of 2
ENE 7 Low or Zero Carbon Technologies 17.6% reduction in carbon emissions	2 of 2
ENE 8 Cycle Storage Secure external bicycle storage.	2 of 2
ENE 9 Home Office Bedroom 3 provided with desk, wall 1.8m long, windows for ventilation and daylighting, two double sockets and two telephone sockets for internet connectivity.	1 of 1

Total 18 credits*

* out of a maximum of 29 credits for the Energy Category

Construction type

Foundation: Deep concrete strip
Walls: Panels of block, cavity with insulation and brick
Ground Floor: Composite suspended floor system with pre-cast beams and EPS infill blocks
First Floor: Prestressed hollowcore suspended floor system
Roof: Steel frame, EPS insulation, and zinc cladding

Learning from the Hanson House

Construction: The complexities of the pyramidal roof can make it difficult to achieve a good airtightness. Using simpler designs and ensuring a greater airtightness would reduce heat losses.

Energy Strategy: Using natural ventilation reduces need for a MVHR system and renewables. This can increase affordability of homes designed to Code Level 4 and below.



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