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LZ CARBON PROFILE

Profile: 014
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The BASF House

Level 4 Code for Sustainable Homes

CO2 emissions: **At least 44% reduction over Part L2006**
Developer: **BASF**
Architect: **Derek Trowell Architects**
Completed: **January 2008**
Location: **University of Nottingham**

The BASF house is part of the Creative Energy Homes Project at the University of Nottingham showcasing housing innovations and energy efficient design, and providing facilities for testing of performance. The 2-storey house has three bedrooms, a floor area of 116m^2 and a distinctive highly-glazed South elevation.

The aim of this project was to comply with the Code for Sustainable Homes using low energy principles from the PassivHaus Standard. Overall, the BASF House was completed within 25 weeks and is claimed to be replicable for £70,000 on a 20 house development.

Low-carbon approach

Fabric The lower level has been built using an insulated concrete formwork (ICF) system to provide a high thermal mass. Neopor® a grey expanded polystyrene (EPS) with higher thermal insulation performance than conventional white EPS is used for the ICF, which incorporates a new low-carbon footprint concrete. To provide additional thermal mass and passive air cooling/heating, internal south-facing ceilings are finished with a gypsum plasterboard containing Micronal® PCM, a phase change material. All wall systems are highly air tight.

Heat and power The house incorporates several low to zero carbon technologies and natural ventilation. Of note is the ground–air heat exchanger that uses the latent heat of the earth to passively heat or cool the air entering the house, solar thermal panels provide the majority of hot water, while a biomass boiler burns locally grown wood pellets to provide additional space and water heating when required.

LZ CARBON PROFILE: BASF House

Outline energy strategy

The design uses a high performance building fabric on the North, East and West walls combined with a glazed South wall to allow solar heat gain. Together with micro-generation, natural ventilation and low-impact heating technologies, it achieves significant reduction (>44%) in carbon emissions compared to 2006 Part L Levels.

Envelope

Walls U = 0.15 W/m^{2}K
Ground floor – ICF walls with 158mm concrete core and grey EPS blocks. Additional grey EPS on both exterior and interior
First floor – 150mm PU SIPS panels with 25mm grey EPS on interior.

Roof U = 0.15 W/m^{2}K
150mm PU SIPS system with additional 25mm grey EPS on interior. Outer metal coating incorporates pigments that reduce IR absorption and urban island heat effect.

Glazing
South Elevation (Solar Space)
Internal double glazed curtain wall with low E glass: U = 1.7 W/m^{2}K
External single glazed curtain wall:
U = 2.7 W/m^{2}K
North Elevation
Double glazed windows with low E glass, argon gas fill, aluminium spacer and uPVC frame: U = 1.66 W/m^{2}K

Airtightness 3.38 m^3/m^2/hr at 50 Pa
Air-tight materials and wall systems with a minimum of openings in the East/West walls.

Low impact heat and power

Ground –Air Heat Exchanger
REHAU's Awadukt Thermo® system uses the earth's latent heat to provide summer cooling and winter heating of incoming air.

Natural Ventilation
An automated natural ventilation system opens windows to provide fresh air and cooling.

Solar Thermal Array 7.2m^2
Over 80% of hot water is created by Hoval's Solkit® flat plate solar thermal array. A 15kW biomass boiler provides additional water heating when 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 69% reduction in carbon emissions	**8 of 15**
ENE 2 Building Fabric	**0 of 2**
ENE 3 Internal Lighting 100% of fixed fittings are dedicated and energy efficient	**2 of 2**
ENE 4 Drying Space Hoistable clothes dryer with 12 metres of clothes line located in sun space	**1 of 1**
ENE 5 Energy Labelled White Goods A++ rated fridge freezer, A rated washing machine and a rated dishwasher with leaflet on the EU Energy Labelling Scheme	**2 of 2**
ENE 6 External Lighting Space and security lighting are dedicated and energy efficient	**2 of 2**
ENE 7 Low or Zero Carbon Technologies	**0 of 2**
ENE 8 Cycle Storage Water-proofed lockable front store, of adequate size and readily accessible, with fixings set into the ground for security	**2 of 2**
ENE 9 Home Office Bedrooms provided with desk, operable windows for ventilation and daylighting, power sockets, telephone sockets and wireless for internet connectivity	**1 of 1**
	Total 18 credits*

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

Construction type

Foundation: Driven steel screw piles, topped with pile caps.
Ground Floor: Lightweight steel framework/concrete infill.
Walls: ***Ground Floor*** – ICF system with external render.
First Floor – SIPS panel with metal cladding.
Roof: SIPS cassettes with metal cladding.

Learning from the BASF House

PassivHaus design can help minimise energy use by maximising solar heat gain through a south-facing glass facade and cooling through an automated natural ventilation system.

Construction Methods The house demonstrates that two quite different methods of construction (e.g. ICF system and SIPS) can be utilised successfully on the same project to gain the sustainable benefits of each.

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