

LZ CARBON PROFILE

Profile: 020
March 2011



SHINE-ZC

Level 6 Code for Sustainable Homes

CO2 emissions: **Zero CO2 emissions compliant with Code Level 6**

Developer: **East Midlands Renewable Energy Ltd**

Architect: **Simon Foote Architects**

Completed: **June 2011**

Location: **Derby, East Midlands**

The SHINE-ZC development in Derby aims to demonstrate how, through intelligent design, technology integration and control, buildings can be environmentally sustainable and economical to run. The SHINE-ZC demonstrator, which includes 6 terraced homes and 3 apartments has been developed by a consortium led by EMRE and Loughborough University. The project was 50% funded by the East Midlands Development Agency and 50% private financed.

Low Carbon Approach

The project includes advanced fabric and integrated low carbon heat and power systems. An innovative dynamic mathematical modelling approach has been used to help optimise the design of the fabric and technologies. A novel feature of the project is its large underground thermal store: this aims to provide long term storage of heat captured during warmer weather for use in the heating season.



Fabric Highly insulated ICF (Integrated Concrete Forms) walls and steel roof, combined with triple glazed windows and high airtightness performance result in a highly efficient fabric.

Heat and Power Generation A small scale CHP unit provides electrical power and heat. Solar technologies provide hot water and some heating/power. Any excess heat is fed into the underground thermal store.

Ventilation Each dwelling has a mechanical ventilation heat recovery (MVHR) system. Occupants can obtain additional cross ventilation by opening the windows.

Outline energy strategy

Using state-of-the-art building fabric, power and heating micro-generation equipment, coupled with intelligent monitoring and control, to deliver Level 6 of the Code for Sustainable Homes.

Envelope

Walls $U = 0.15 \text{ W/m}^2\text{K}$
Integrated Concrete Form (ICF) structure by Logix UK.

Roof $U = 0.15 \text{ W/m}^2\text{K}$
The roof is a conventional steel structure with 200mm of insulation.

Windows $U = 0.8 \text{ W/m}^2\text{K}$
Triple Glazed Sheerframe windows by the Litchfield Group.

Airtightness Varies across dwellings.
Maximum = $1.89 \text{ m}^3/\text{h}/\text{m}^2$ at 50 Pa.

Low impact heat and power

Building-integrated PV

The PV is a standard panel, integrated into the water shedding layer of the roof. Peak power generation is 3.78 kWp.

Biofuel CHP

The Biofuel CHP is a conventional diesel CHP rated at a nominal 8kW electrical power generation. This has been modified to run on a fuel derived from waste oil from the local catering industry.

Roof-integrated solar thermal array

Integrated large area solar thermal heating systems (from EMRE).

Solid-State Seasonal Thermal Store

Surplus heat is stored in an innovative insulation-lined subterranean thermal store structure (from EMRE).

Contact

Design: EMRE Ltd, Vincent Smedley, Technical Director, EMRE Ltd, Wilmot House St James Court, Friar Gate, Derby DE1 1BT

Low energy alignment with the Code for Sustainable Homes (Design stage)

Energy Issue	Credits awarded
ENE 1 Dwelling Emission Rate Compliant with Code Level 6	15 of 15
ENE 2 Building Fabric Heat loss parameter of 1.02	2 of 2
ENE 3 Internal Lighting 100% of fixed fittings are dedicated and energy efficient	2 of 2
ENE 4 Drying Space Rotary dryer in garden and secured by fence and gate	1 of 1
ENE 5 Energy Labelled White Goods B rated washer dryer and A+ rated fridge freezer	2 of 2
ENE 6 External Lighting Space light fittings are dedicated and energy efficient, and security lighting not supplied so credit awarded by default	2 of 2
ENE 7 Low or Zero Carbon Technologies At least 15% reduction in carbon emissions	2 of 2
ENE 8 Cycle Storage Bicycle sheds are water-proofed, of adequate size and readily accessible, with fixings set into the ground for security	2 of 2
ENE 9 Home Office Bedroom provided with desk, operable windows for ventilation and daylighting, power sockets and telephone sockets for internet connectivity	1 of 1

Total 29 credits*

* out of maximum of 29 credits for the Energy Category

Construction type

Foundation: Integrated Concrete Form (ICF)
Walls: Integrated Concrete Form (ICF)
Floors: Block & Beam with 300mm of insulation
Roof: Standard steel structure

Key Learning points

The final phase of the project will be two years of post occupancy monitoring of the overall building energy consumption and generation to confirm the achievement of zero carbon performance.