Helpu Cymru i leihau ei Hôl Troed Carbon

Help Wales reduce its Carbon Footprint

Llywodraeth Cymru
Welsh Government

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Case Study 01

Canolfan Hyddgen

Owner:
Powys County Council

Architect:
JPW

Contractor:
C. Sneade Limited

Location:
Machynlleth, Powys

Building Types:
Offices

Project Description

Canolfan Hyddgen is a two storey, multi–occupancy office for adult learning. The building was designed to test the potential for collaborative working between a large number of user groups. It is now utilised by several users, including Careers Wales, the local high school and the local training centre.

The original brief was for the building to be the UK's first Passivhaus Institute certified office building. Additionally, the design also had to achieve a BREEAM Excellent rating in order to obtain funding for the scheme under the Welsh Assembly's Pathfinder Programme. The scheme achieves both of these, becoming the first building in the world to achieve both a Passivhaus and BREEAM certification.

Key Drivers

A primary driver for the development was to minimise energy consumption, fuel bills and overhead costs. This was of particular importance due to the anticipated 40% hike in gas prices during the winter of 2007.

Canolfan Hyddgen, Machynlleth
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Powys County Council

In addition, Powys County Council was keen to investigate alternative construction techniques and building processes for a number of their developments. This approach is linked to the Carbon Management Programme that is helping the Council to understand its own Carbon Footprint and initiate projects and carbon savings that will lead to a 50% cut in carbon emissions by 2017.

Canolfan Hyddgen is a pilot project, providing an example of the Council's preferred approach to meeting future Carbon targets whilst achieving environmentally sustainable low carbon and low energy buildings.

Renewable and Low Carbon Technologies

- Photovoltaic array
- MVHR
- Passivhaus design

'We wanted to control the buildings energy use by controlling the internal environment'
Russell Westlake
Powys County Council
Property Manager

The strategy brought with it the aspiration to exceed the Building Research Establishment Environmental Assessment Method (BREEAM) rating of Excellent within a tight funding programme. These additional drivers led to the use of innovative forms of procurement and construction.

Key Features

- Passivhaus design;
- w7 kW photovoltaic array; and
- Mechanical Ventilation with Heat Recovery (MVHR).

Other sustainable features of the development include:

- Permeable paving and Sustainable Drainage Systems (SUDS); and
- A green roof and grasscrete paving to retain green spaces;
- Triple glazed windows;
- FSC timber throughout, locally sourced;
- Point of use water heaters as no facility for hot water storage;
- Waterless urinals; and
- High proportion of recycled and Greenguide A rated building materials.

Scheme Costs and Finance

The total cost of the development was approximately £1.3 million, equating to a build cost of £1784/m^2, including the PV array. The project was co–funded by the Welsh Assembly Government's Pathfinder programme, which contributed approximately £750,000 to the build cost, with the remainder of the capital paid for by Powys County Council.

Procurement

Due to the requirement for a quick project delivery, a Design and Build contract was chosen under an NEC contract. JPW, a local architect, in partnership with a local contractor, C. Sneade Ltd, were selected as the project team.

The design team were keen to utilise the local economy as far as possible, especially locally sourced materials including certified timber and use of recycled materials in order to meet BREEAM targets.

Technology Selection

Passivhaus design principles were employed to minimise the energy requirements for heating through a highly insulated building envelope and maximisation of passive solar gain through building orientation. Consequently, the residual heat demand of the development was very low, removing the requirement for renewable heat generation. However, due to the highly airtight building envelope (with an air leakage rate of 0.29 $m^3/hr/m^2$ at 50 Pa), MVHR was required as part of the ventilation strategy in order to maintain indoor air quality. In addition 40 m^2 of photovoltaic panels were integrated on to the south–facing roof of the building, pitched at 35 degrees for optimal performance.

Monitoring and Operation

Since its completion in January 2009, the designers JPW Associates have monitored the building's performance by following the approach outlined in the BSRIA/Usable Buildings Trust's Soft Landings framework. Using soft landings educates the occupier on controlling and operating the building effectively. Mechanisms are in place for pain/gain share and the client pays the contractors overheads and profit costs, as well as fine–tuning and de–bugging any issues with the system. After a few teething problems the building is now performing well with a lower

consumption than was anticipated at the design stage.

Two years of monitoring has shown that the predicted energy consumption figures were too high. Rather than 144 kWh/m^2/yr the scheme actually consumes just 80 kWh/m^2/yr. JPW Associates says that this is primarily because computer use has been lower than expected. The PV panels are producing more than the 15% of the electricity demand anticipated in the design (actually producing about 20%).

The project has been monitored using a remote access monitoring system with guidance from the Passivhaus Institute (PHI) to extract useful data to analyse the performance of the certified Pasivhaus projects in the UK Climate. It is hoped that the study of simulated, actual weather data, SAP, EPC outputs and Passive House Planning Package (PHPP) will assist in the design of future projects and inform the current debate. It will also assist the client to assess their billing and management strategy.

JPW would welcome an AECB lead in creating a standard monitoring formula to aid this process.

Photovoltaic output display at Canolfan Hyddgen
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Lessons Learnt

Through seeking compliance with both Passivhaus and BREEAM ratings it was found that differing policy for measuring floor areas meant two sets of data were required, proving to be time consuming, increasing costs to the project.

To achieve a renewable and low carbon building, a collaborative working approach between the client, project manager, design team and contractor is required. The contractor must be involved at a very early stage in the design process. A lowest price or adversarial culture is counterproductive. Envelope air tightness is the fundamental foundation of a sustainable renewable and low carbon building. "Eco bolt on" systems alone will not achieve this aspiration. The whole team, including the client must be prepared to use new construction techniques and innovative products.

Meeting the renewable and low carbon agenda is demanding, however, this is achievable when the client and delivery team are committed to the outcome with this common goal in view. The contractor will be engaged to meet this goal when appropriate. For co–location of services that are moving from separate buildings, pro–active stakeholder consultation is required, personally led by Heads of Service at key times.

Commitment to the project and the desired outcomes is necessary at all levels in the Authority to ensure the targets are met.

Awards and Achievements

- BREEAM Awards Wales 2009, Category office – winner.
- CLAW (Sustainability Award Commendation 2009).
- CIBSE Awards 2011 – New Build Project of the Year.
- WLGA Excellence Wales. Our Future, Responding to Climate Change – Commended.
- RICS Sustainability Award 2010, Commended.
- Constructing Excellence in Wales 2009 Construction Awards, Sustainability Category – shortlisted.
- The scheme was the first building in the world to achieve both a Passivhaus and BREEAM certification. The build was awarded a BREEAM score of 84.43%.

References and Acknowledgements

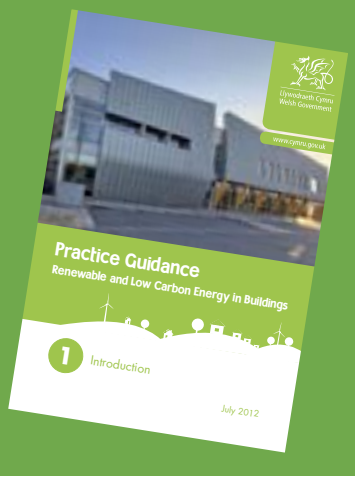
Russell Westlake, Property Manager, Powys County Council

Canolfan Hyddgen Case Study, Excellence Wales (Powys CC, WLGA)

Further information

Building4Change
www.building4change.com/page.jsp?id=748

These case studies are presented to show examples of how buildings can be designed and built to be low carbon and incorporate renewable and low carbon technologies. This case study is part of a series of case studies supporting a separate practice guidance document on low carbon buildings. **For further information see www.wales.gov.uk/planning**



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