



Helpu Cymru i leihau  
ei Hôl Troed Carbon

Help Wales reduce  
its Carbon Footprint



Llywodraeth Cymru  
Welsh Government

## Case Study 14

# Welsh Government Offices, Llandudno Junction

[www.cymru.gov.uk](http://www.cymru.gov.uk)

**Owner:**  
Welsh Government

**Architect:**  
Austin-Smith Lord

**Location:**  
Conwy, Wales

**Building Types:**  
Offices  
Public

### Project Description

The new Welsh Government offices at Llandudno Junction are built on the site of a former Hotpoint factory and provide new office space for 650 staff.

The building has an area of 8,800 m<sup>2</sup> comprising three wings and two atria spaces, and employs a wide range of passive design features, energy efficiency measures, and renewable and low carbon technology through the installation of a biomass boiler and pond water cooling.

### Key Drivers

The Welsh Government was keen to develop a new centre at Llandudno Junction to provide residents in North Wales with a full breadth of Government Services.

In line with Welsh Government sustainability targets, the building was to achieve a BREEAM 'Excellent' rating and maximise the use of passive design features to minimise the carbon footprint.

### Key Features

The building employs the following renewable and low carbon technologies:

- two 160 kW biomass boilers, fuelled by woodchips; and

- pond water cooling loop to provide free cooling to the main air handling unit.

The new Llandudno Junction offices achieved a BREEAM 'Excellent' score of 75.8%, the highest of the Welsh Government estate.



The new Welsh Government offices at Llandudno Junction  
Source: xxx

The building also incorporates a wide range of passive design features and energy efficiency measures, including:

- natural ventilation and free night cooling (via purging);
- heat recovery for mechanically ventilated spaces
- high thermal mass;
- passive solar gain in winter and fixed solar shading for limiting summer overheating;

### LZC Technologies:

Biomass boiler

Pond water cooling  
of fresh air



- additional automated solar shading (tracks the sun in the summer to prevent overheating);
- rainwater harvesting with up to 7 days storage in 32,000 litre tank;
- ammonia chillers;
- daylighting linked to artificial lighting via dimming controls; and
- a Building Management System (BMS);

### Procurement

The scheme was procured in 2008 through a Design and Build (JCT) contract.

### Scheme costs and finance

The overall contract cost was £22 million.

### Technology selection process

The primary objective of the building design was to reduce energy demand through passive design. Natural ventilation is achieved through much of the building via stack effect (which exploits the natural buoyancy of air). Night cooling is employed at night in summer to purge excess heat and pre-cool the exposed concrete ceiling slabs. This stored coolth is then released slowly during the day to help dampen and delay external rises in temperature; effectively a 'free cooling'

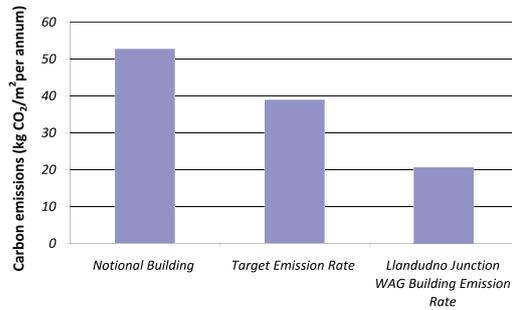
Fixed solar shading is also provided on the main glazed areas of the office space, which helps to prevent overheating in summer and optimise passive solar gain. Additionally, the three west facing ends of the building are fully glazed, to aid daylighting, with automatically controlled solar shading louvres attached.

Following demand reduction through passive design, further energy efficiency measures were implemented at the site to minimise energy consumption. The lighting strategy for the building incorporates daylight dimming, whereby peripheral artificial lighting levels respond to daylight via a Digital Addressable Lighting Interface (DALI) control system.

Heat recoveries of up to 85% are achieved through the mechanical ventilation system which supplies central core areas of the building, where natural ventilation is not possible. Mechanical cooling is also often a requirement of office buildings due to the high proportion of computer server plant and IT equipment. Ammonia chillers with inverter driven pumps were selected for the new offices due to their high efficiency and the zero ozone depleting potential of the refrigerant.

In order to achieve a BREEAM 'Excellent' rating, the team decided to pursue renewable and low carbon technologies at the site. A feasibility study was carried out, covering a wide range of technologies. Due to the relatively constant heating baseload of the office building and availability of locally sourced woodchip, biomass was considered a suitable option for the site. Two 160 kW biomass boilers were selected to give some level of redundancy, and these were sized to meet 90% of the annual space heating and hot water load (Approximately 180 MWh per annum). Peak load top-up is then provided via high efficiency modular gas boilers.





Energy efficiency modelling outputs (SBEM) for WAG offices – 60% carbon reduction compared to Part L of 2006 Building Regulations

Source: S.I.SEALY

In order to ensure a reliable supply of biomass fuel, a 43 m<sup>3</sup> store for woodchip fuel was also constructed at the site. This provides storage for up to 2 weeks winter supply of fuel.

The carbon footprint of the biomass heating system is approximately 13 tonnes CO<sub>2</sub> per annum, around a fifth of the footprint for an equivalent office heated using natural gas.

## Monitoring and operation

The Welsh Government has a carbon management strategy for its whole of its administrative estate which includes an action plan for specific CO<sub>2</sub> reduction. The electricity and gas consumption for the Llandudno Junction office is currently being monitored on a monthly basis which provides CO<sub>2</sub> emissions benchmark data.

In addition, there are electricity, gas and water sub-meters that allow the energy and water consumption to be monitored on a day-by-day basis.

Performance of the building is not yet at its optimum however the Building Energy Management

System (BEMS) at the building is currently being reviewed in terms of maximising existing performance and identifying ways of reducing energy consumption.

## Boiler and Woodchip specifics:

Boiler : See <http://uk.remeha.com/index.php?id=612>

Woodchip: Current supplier pending long term contract tender is Clifford Jones Timber of Ruthin, Denbighshire, trading as Blazers Fuel.

Woodchip is sourced from various locations, but are generally off cut wood from the manufacture of wooden stake posts.

## Energy consumption

Total energy consumption of the building has been higher than what was envisaged at design stage, with a Display Energy Certificate rating of 'D' with a score of 82, the average would be a score of 100.

## Green Transport Plan

A Green Transport Plan has been developed to meet the needs of staff to encourage cycling and walking, public transport and car sharing.

## Lessons learnt

### Technological supply issues:

- Consistency in quality of woodchip supply
- Ensure designers / suppliers understand design parameters
- Early engagement with the supply chain

### Occupant involvement:

- No impact on occupants due to the gas boilers working as back up.
- Educate users in understanding the design principles of the environmental design and its operation.

### Financial Lessons:

- 50Mwh of energy £6240 in wood chips.
- Undertake detailed feasibility of studies of sustainable design options to fully understand risks.
- Whole life costing – pv panels, tri-generation were considered and discounted.

### Awards and Achievements

- BREEAM Wales 2010: Winner of Bespoke category award.
- Energy Performance Certificate (EPC) 'A' (score of 24).
- Constructing Excellence Wales Demonstration Project 2010.

### References and Acknowledgements

Main Contractor:  
Pochin Construction Ltd  
Building Services Consultant  
S.I.Sealy

Architect:  
Austim Smith Lord  
BREEAM Assessor  
WYG

### Further information

Welsh Government  
[http://wales.gov.uk/location/north\\_west\\_wales/llandoffice](http://wales.gov.uk/location/north_west_wales/llandoffice)

If you would like to arrange for a group to come and visit the new office please contact the Communications Team on 0300 062 5603 or e-mail [ybontnorth@wales.gsi.gov.uk](mailto:ybontnorth@wales.gsi.gov.uk).

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](http://www.wales.gov.uk/planning)**

