



# Ecological Design Elements Incorporated at the Environment Centre



## Eco-design Principles

Ecological design within buildings encompasses many different aspects of the **design and construction** process. Many of these considerations may go largely unnoticed by a casual visitor, such as the method of manufacture of a particular material or are buried in a wall. Whether visible or not all these considerations are important to the overall ethos of Eco-design. We have tried wherever possible to incorporate Eco-design principles into our centre as an **example and inspiration** to visitors and members alike.



One of two Turf roofs at the Centre

We have tried to ensure that the design of materials, products, systems and environments have had no adverse environmental or economic impact and embody the principles of sustainability.

## Building Conservation

Building conservation is an essential part of Eco-design principles.

Our building, the old telephone exchange had been derelict for years and would probably have decayed so much through lack of use that it would have been dilapidated to a point of demolition. Any future developments on this site would have meant demolition and construction of a new building all costing money, time and energy. What's more another architecturally important building would have been needlessly lost, it is **recycling** on a grand scale.



Carved figure from the foyer



## Use of Materials

Materials may often serve the purpose they are intended for, but may have a negative impact on the environment. They could, for example, emit toxins or use toxins and greenhouse gases in production. They may come from a scarce or rare source, or contain a high-embodied energy. Materials that use a large amount of energy and are then discarded will have a high-embodied energy, materials that use minimal energy and can then be reused will have a low embodied energy.

Some of the issues we dealt with include:

Timber used in our building is locally sourced from sustainable sources. The FSC mark is a way of insuring the timber you use is from a sustainable source;

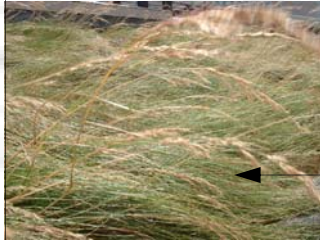
The paints we used were Eco-paints which have been designed with the environment and health in mind. Paints may emit powerful toxins that have a negative effect on your health. Look out for paints that have a low VOC label to minimise this.

The use of high performance materials will mean a building will last longer and it is also likely to require less energy to live in.

The use and choice of materials throughout the Centre was, therefore, carefully considered from the start.



**Structural Steel Frame**  
Steel is easy to reclaim and recycle and as such has a low embodied energy as it can be used time and time again. The steel also came from a local source.



**Red Cedar Cladding**  
locally sourced and extremely long lasting cladding.

**Turf Roof**  
Provides long lasting protection and provides another useable space for, say, a herb garden



**Natural Cork Insulation**  
Cork is a naturally growing, freely available material with a very low embodied energy.

**Recycled Paper insulation (Warmcell)**  
Toxin free, locally sourced and recycled.

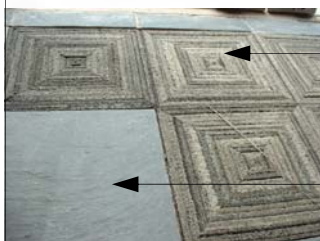


**Windows-from oak thinnings**  
Long-lasting window frames made from waste wood



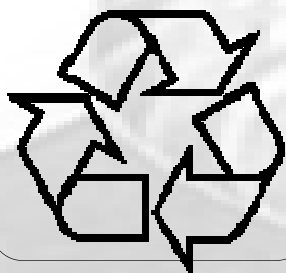
**Local Timber Trusses**  
Locally sourced wood, low in embodied energy

**Eco-Paint**  
Solvent, VOC, Glycol Free. Toxin free paints that help provide a healthier living/working space



**Tyre Door mat** - The mats at the front entrance are recycled from old car tyres an otherwise non-reusable material.

**Welsh Slate Tiles**  
Locally sourced, extremely durable flooring. It also acts as thermal storage for passive solar gains.



**Re-use of Stone** - The front wall was reconstructed from two adjacent walls, removing the need to quarry and buy additional stone.



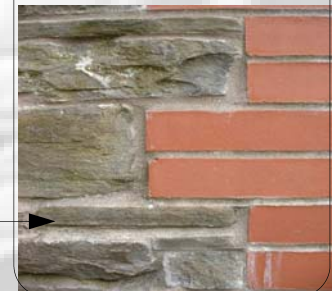
**Rock wool HCFC free insulation**  
An alternative to the Warmcell, and 'blown' without using greenhouse gases such as CFC's and HCFC's



*Installation of Rockwool EnergySaver into traditional brick/block cavity wall*



**Green Oak Columns**  
Use of 'uncut' structural Oak columns is low in embodied energy, attractive and long lasting.



## Heating, Cooling, Ventilation and Light

The heating and ventilation strategy in the centre are considered as a whole and not as independent aspects of the building, they are designed to work together. Detailed below are the individual elements and considerations, starting at the heart of the building:-

**The Gas condensing boiler**-When gas burns in air carbon dioxide and water are produced. Because of the high flame temperature the water forms as vapour (steam). **A gas-condensing boiler recovers the heat** used to create steam because the cool end of the heat exchanger is cool enough to cause the steam to condense. This causes the molecules of water in steam to give up the energy needed to turn them into steam - *the latent heat of vaporisation*. This extra heat is transferred to the circulating water. **Our condensing boilers work at over 93% efficiency.** This means simply that we will use considerably less gas than an ordinary boiler; less gas means less CO<sub>2</sub> emissions. THREE condensing boilers heat the whole of the Centre and much of the hot water.



Gas Condensing Boiler

### Heating Controls

Boiler efficiency means very little unless the heat that is supplied to a building is used where and when it is needed most.

#### Optimiser



An optimiser sets the main temperature control for the building, this can be preset for a week ahead. The optimiser can, therefore, be programmed to run the heating at a minimum when the building is not being used; at weekends or at night. It can also monitor the outside temperature so that if it detects an unusually hot or cold day or night it can adjust the temperature accordingly before the building becomes too hot or cold.

#### Thermostatic control



All the radiators at the Centre have Thermostatic Control Valves (TRV's) fitted to them. This means that the radiator can adjust its output depending on the setting given it by the room's occupier. This not only provides greater individual freedom for occupants but will also prevent unnecessary heating elsewhere. We also have silver reflective panels behind radiators on external walls, to reflect heat and maximise heat into the rooms.

### Ventilation

The ventilation of a building not only provides the occupants with good quality air it also helps control the temperature of the building. The annexe has been designed in such a way that it maximises passive solar gains. In doing so it not only provides a space that has plenty of natural daylight but also reduces the need to heat the space manually. However, there is also a danger that excessive solar gains will cause the space to overheat unless adequate ventilation has been incorporated into the design. The annexe uses both passive and active ventilation to control its solar gains.

#### Passive Ventilation-Solar Chimney

A solar chimney is designed to encourage the flow of hot air up through the centre of the building and out of the vents at the top. It uses the natural tendency of hot air to rise. The aluminium vent at the top of the annexe heats up during the course of the day, as it does so hot air will rise up and out of the top. As it does so it will draw cooler air in at the bottom through two controllable vents. What is more the weather vane on top of the chimney will ensure that the wind will always draw the hot air out.



#### Active Ventilation-Solar Powered Fans

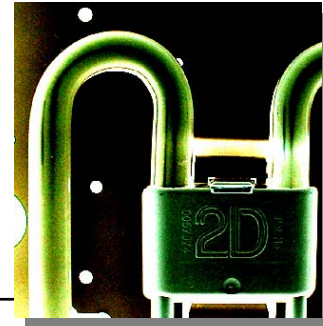
On the roof is a photovoltaic (PV) panel, which converts solar energy into electricity. A deep cycle battery stores this electricity for use by seven fans in the top of the solar chimney. A thermostat controls when the fans should turn on and off.





### Sand blasted glazing

The extensive use of glazing in the annexe is designed to maximise potential solar gains. Some areas of sand blasted opaque glass allow natural daylight but limit excessive solar gains.



### Lighting

The building is fitted throughout with low energy lighting. This will not only save electricity but will also last many times longer than ordinary bulbs. The savings made purely on lighting might surprise you.

We have also tried to make maximum use of natural daylight throughout the building, this is after all FREE!

### Under floor heating

Under floor heating provides not only a 'natural' feeling of heat but also a very efficient way to heat a space or room. A series of 'loops' are buried under the slate floor and have hot water passed through them in the same way as normal radiators. The solar water panels located on the roof of the exchange building supplies the hot water for the heating in the annexe. The panels can heat water up to temperatures of 80 degrees Celsius.

The combination of passive and active features in the annexe means that it is heated and cooled almost entirely by solar power!



The Environment Centre has incredibly low energy bills for a building of this size and provides a healthy, inspiring environment for people who come here. Most of the elements discussed here are affordable especially when compared with the building's life time savings. We hope that you may be inspired by your visit to our Centre.

