

## THE ECO HOUSE

The term eco house is often used in the media and property press to describe a house that is based on the principals of environmentally sustainable design. The term is a simplistic label used to convey something of the rationale used for the design of a project. In reality the eco house is a much more complex animal than the term would suggest. It can encompass anything from a house designed using reclaimed or found materials to the ultimate in high tech design and specification. It may be an earth-covered house or one with a green roof or it could simply be an existing property that has been enhanced so as to reduce its energy consumption and reduce the carbon footprint of the building.

Eco houses fall into three broad categories:

1. Houses using passive technology to heat and ventilate the homes.
2. Houses that are designed to a standard such as those promoted by 'Passivehaus'. These homes will incorporate high levels of insulation, air tightness and a sophisticated form of mechanical heat recovery and ventilation.
3. Zero carbon houses. These incorporate systems used in items 1 & 2 but go a step further and incorporate energy generation and take into account the embodied energy in materials (manufacturing and delivery) and the energy consumed by items such as cars.

### **PASSIVE SOLAR TECHNOLOGY**

This form of design is well suited to the self-builders who are going to do most of the work themselves. It relies on simple construction and low level technology to heat the house and to provide hot water. It doesn't aim to be a zero carbon building nor does it employ expensive technology to manage the systems within the building. Using passive solar technology, if done well, does provide a good platform for future upgrades to more sophisticated systems.

The basic principle of passive solar technology is to use the energy of the sun to provide heat. This is generally done by having a conservatory on the south west face of the building. This location provides the maximum solar gain. The heat generated in the conservatory is then directed to a hypocaust. A hypocaust is a void under the floor similar to that found in a classical Roman bathhouse. The heat from the conservatory warms the floor. The floor acts as a heat battery slowly releasing the heat into the house. Using this technology does require that the building is very well insulated and is airtight. Using solar collectors on the roof can also use passive solar technology to heat domestic water.

Passive solar technology will not eliminate your fuel bills, but given sufficient insulation and a well-designed conservatory it will substantially reduce them.

A good example of the use of this form of eco-house can be found at Paxton Court, Solar Building Cooperative in Sheffield, designed by the architect Cedric Green.

<http://greenart.info/Paxton%20Court/Paxton%20Court%20Sheffield.html>

## **HOUSES DESIGNED TO A STANDARD**

If you intend to build to a standard in order to design an eco home there are a plethora of standards available LEED (mainly north America) BREEAM (UK Building Research Establishment) and Passivhaus.

Probably the most popular, and certainly the fastest growing in popularity is Passivhaus.

<http://www.passivhaus.org.uk/index.jsp>

Passivhaus takes the approach of building fabric first. This means that the fabric of the building i.e. walls, floor, roof etc are the primary elements for reducing energy consumption. If the building is sufficiently airtight and highly insulated the amount of energy needed to heat the house will be substantially reduced. Energy consumption is further reduced by using heat recovery systems within the house to provide heat and ventilation.

*“A Passivhaus is a building, for which thermal comfort can be achieved solely by post-heating or post-cooling of the fresh air mass, which is required to achieve sufficient indoor air quality conditions – without the need for additional recirculation of air.”*

The approach is relatively simple but it does require careful design and detailing and it requires some relatively complex heating and ventilating systems.

If you are designing to a standard it should be remembered that the assessment and certification of your design is not free. All the standards organisations charge for this service.

## **ZERO CARBON HOMES**

Zero carbon is probably the most challenging and complex form of eco house. The concept is to have a house that does not add to the global output of carbon into the atmosphere. This means taking into account the energy consumption of the house, the background energy needed to run the house, waste disposal, the use of a car and the embodied energy in the material used to construct the house. Embodied energy is often the most difficult aspect to deal with. It means considering the energy used to produce and deliver the material to site. For example, aluminium requires a large amount of energy to produce it. This means that production is often located in areas where hydro-electric power can be used but the cost of transporting the finished product to where it is needed produces a large amount of carbon.

Zero carbon homes will often rely on wind power to generate electricity on a small scale and use the ideas of passive solar energy collection and Passivhaus technology to eliminate the carbon footprint of the house.

Generally zero carbon homes only make economic sense if they are built in groups. This means that the cost of power generation and other carbon mitigating strategies can be spread over a number of dwellings.

One of the most interesting zero carbon projects is in Shetland

<http://www.zerocarbonhouseshetland.com/project.htm>

The project has built a zero carbon home and is intended as a model for future developments.

## **SUMMARY**

The intention of this article has been to show that the eco-house is a complex building to define and that there are several approaches to designing an eco project. It is important to consult an expert in the design of these projects. Simply taking a pick and mix approach or building in every environmental bell and whistle may not achieve a significant reduction in energy consumption.

Each project must be considered individually and clear goals must be set out before the design work commences. No single project is going to produce the answer to all your energy problems and no single project will produce a design that will save the world, but as a certain supermarket often says 'every little helps'