LOW ENERGY CONSTRUCTION - CARBON V ENERGY

Carbon emissions are a consequence of energy use, NOT vice versa.

A low energy building therefore will have consequently low carbon emissions, but a low carbon emissions building will NOT necessarily have a low energy demand.

The Building Regulations Approved Documents (L1A for Domestic housing, L2A for all non-domestic buildings) specify certain minimum construction standards including:

- Insulation standards (U values) for all heat loss elements.
- Airtightness.

(Although the fabric standards have been improved several times recently (in 2002, 2006, 2010 and 2013) they are not exceptional and cannot be described as "Low Energy").

They also specify that CO2 emissions must not exceed a target figure that is calculated by the approved method (SAP or SBEM). This target is lower than will be delivered by just meeting the minimum fabric standards, so additional measures have to be taken.

At present there is no mandatory limit on ENERGY demand of the building, only on the final emissions.

There are 2 ways that the regulations can be met or exceeded:

THE TECHNOLOGY APPROACH

- Build the fabric to meet the minimum standards but not significantly better.
- Add services using energy efficient products and Low and Zero carbon technologies (LZC) to meet this demand that will further reduce the emissions.

This will result in a building that meets the required CO2 target but does not have a low energy demand.

Advantages

It allows contractors to continue to build as usual; i.e. not to a very high insulation and energy efficiency standard; then achieve the emissions target through the use of technology.

It requires less effort spent on achieving improvements through good design.

Disadvantages

If the technologies fail (as they eventually will) the emissions and the fuel costs will rise.

As the building energy demand is still high, the occupants will still have to fuel this with consequent high costs.

THE FABRIC FIRST APPROACH

- Build the best possible fabric to reduce the total energy demand.
- Add services using efficient and low and zero carbon technologies to meet this reduced demand.

This will result in a building with low energy demand which consequently also delivers much lower emissions than required.

Advantages

The low energy demand is built in to the building for life. When the technologies fail it will still have a low demand for fuel and low emissions and running costs will always be lower.

Generally the thermal comfort of the building and the internal environment will be better than a poor fabric building with technology fixes.

It requires LESS technology

Disadvantages

Design has to be better (is this really a disadvantage?).

There will be some premium on the build cost, although this will be more than offset by lower running costs.

Some contractors will not be willing or able to deliver a building with more exacting fabric standards as it may require changing from traditional/conventional construction methods and working practices and will require greater attention to quality of construction.

IN SUMMARY

The first option relies on limited life technology to offset carbon emissions but does nothing for overall energy demand. When the technology fails the demand and emissions rise. This is a much less robust and quasi-sustainable option relying in "ecobling" rather than high quality low energy design.

The second option is preferable as it builds energy and carbon efficiency into the fabric, reducing energy needs and fuel costs for life. The emissions are reduced rather than offset. This is the most robust and truly sustainable option. And will return the lose##west overall cost of ownership.

PASSIVHAUS

The German Passivhaus energy standard and design tool is one of the most rigorous in the world today, and through 2 decades of research has also been shown, unlike most other methods of energy assessment, to deliver what it forecasts.

Originally developed as a “No Heat House” principle it can be applied to any building and if adopted the resultant very low heat demand allows a conventional heating system to be dispensed with. For most of the year no heat inputs are required.

It specifies a maximum peak heat demand of about 25% of a 2013 regulations compliant building and also a total primary energy demand. Unlike SAP it does not allow any of the energy demand to be offset by on site generation e.g. by PV panels. As such it prevents a poor fabric building being used to achieve certification simply by adding renewable generation.

Passivhaus is arguably the best tool currently available to ensure a truly low energy building.

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