

DIRECT ACTION

The BRE has taken a long, hard look at the Electricity Council's Energy Efficient Design concept – and pronounced it viable.

The balance is changing, said an electricity campaign a couple of years ago, from gas to electric as the cheapest fuel to heat buildings if the lower capital costs of a de-centralised electric system (as opposed to a boiler, pipes and radiators) are taken into account. But the building has to be well insulated so that overall heating loads are small.

Hence the 'Medallion' insulation standards for houses promoted by the Electricity Council and, more recently its Energy Efficient Design (EED) scheme for commercial buildings. But is electric heating of well insulated buildings cheaper? Of course there will never be a definitive answer to that question; the variables are too variable (eg the balance between capital and running costs) and the alternatives too many. And asking someone from either the gas or electricity industries is to go to the wrong person. The advertising battle, though quiet now, is too important to be clouded by a definitive answer.

Enter the Building Research Establishment; an independent group of scientists who have recently taken delivery of a low energy office building. Heated by gas boilers it has been monitored over a number of heating seasons and, although the building suffered from some teething problems in the past, it's a success. It's a comfortable, working office building which costs about half what it costs to heat a 'conventional' office building.

Heating loads for the building were as low as 1,000W for each office on the design day

(external temperature -1°C). It was thought that replacing the windows with low emissivity glazing would reduce this to about 500W, and a trial installation of electric heating in four offices had shown that internal temperatures remained closer to design values than previously.

The BRE decided to evaluate the EED concept by converting the building to electric heating. Glazing was replaced with Pilkington Kappafloat double glazing, wiring was installed and, to comply with EED insulation standards, extra insulation was applied to the roof of the building. All of this work was sponsored by industry and the new heating system was closely monitored over the 88/89 heating season.

Direct acting panel heaters were installed in each office, sized, as far as selecting from a range of heater models will allow, against the design heat loss of that office. In practice the panels were oversized by an average of about 20%. Installation and, crucially, commissioning were both very easy. The heaters are switched centrally, but occupants were also given a degree of control. Three strategies were used, simple timeswitches, gadgetry to allow heaters to run for say 2/3 or 3/4 of the time according to outside air temperatures, and optimisers for preheat. Both on and off-peak electricity was used; the split between these being one angle to be monitored.

The heaters, supplied by four different manufacturers were domestic models, and their use in the low energy office has

allowed the BRE to make some suggestions to manufacturers to improve their design for use in commercial buildings.

Apart from some comments about high surface temperatures, occupants liked the heaters. Maintenance of the building is in the hands of the PSA, who liked the very low maintenance needs of the heaters.

But what about costs? Well the BRE verdict goes no further than to say that "the all electric commercial building is a viable option".

A direct comparison of heating costs with the previous, ten year old gas system is unfair to that technology, and the BRE is reluctant to provide one. Also the building is now better insulated. The running costs of the system (corrected to a "standard" winter), depending on the control strategy used hover between 45 and 52 kWh/m²/year. 60-70% of electricity used was on-peak.

The EED concept – direct acting electric heating, natural ventilation and a high insulation standard – will lead, say the BRE, to lower capital costs and slightly higher energy costs. Two points need to be watched very carefully to make it work, though: the quality of installation of the insulation and the selection of a control strategy.

The BRE is now equipping its low energy office with a modern gas system of condensing boilers and up-to-date controls, alongside the electric system. Operating experience from this combination should go a step further towards answering the original question.

One of the cellular offices with its new electric heater and double glazing.



Exterior of building; note solar shading.

