HOME TRUTHS FROM ABROAD

Can superinsulation work in Britain? Ken Cooper reports on a project which suggests it can cut heating bills in a typical three bedroomed semi-detached to under £40 a year.

Paul Ruyssevelt lives in his work. His modern semi-detached home in Milton Keynes is also a laboratory to establish the case for superinsulation in Britain.

He and his neighbours in 11 adjoining houses are part of the first attempt in this country to apply superinsulation technology to private housing, and the initial results are highly promising.

Paul is a member of the Research in Building Group at the Polytechnic of Central London, who devised the project along with architects Feilden Clegg Design, and secured the financial backing of the EEC.

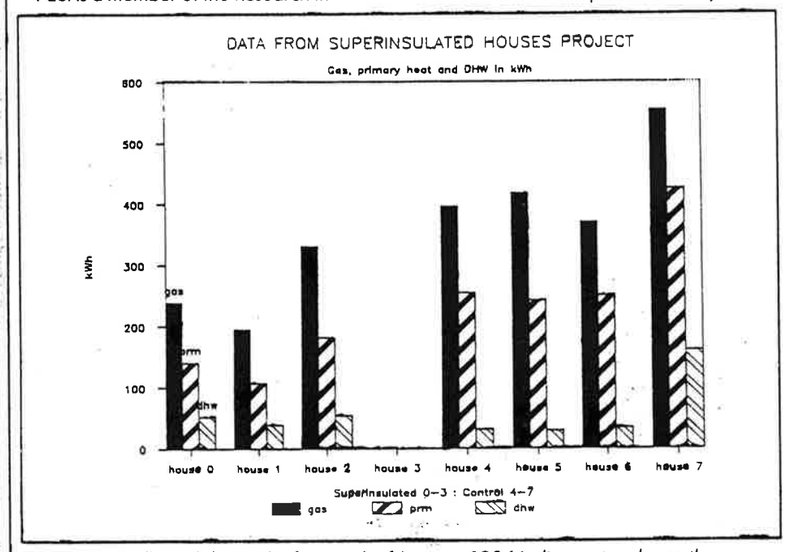
Of the 12 houses at Two Mile Ash, four are built to superinsulation standards three times more stringent than current Building Regulations, while the remainder are control houses, with conventional insulation.

Sensors have been placed in every house in living room, hall, and bedroom and from a room upstairs in his own home Paul, with the help of a BBC home computer, is monitoring the data.

Superinsulated houses are commonplace in Scandinavia and America but until now unheard of in Britain. The aim of the project was to show the value of superinsulation in the milder British climate and prove that the technology is not beyond the capabilities of the UK building industry.

Additional aims were to evaluate a ventilation system with heat recovery, substantial underfloor insulation and to analyse the performance of new space and water heating systems.

After collecting the first six months of data Paul concludes: "The superinsulated houses have so far experienced extremely low energy bills and there has been almost no requirements for auxiliary heating. The standard of comfort in the superinsulated houses is very high and there is a complete absence of condensation, a major problem in modern UK housing."



Information collected during the first week of January 1986 indicate at a glance the superior performance of the superinsulation houses.

The houses are three bedroomed, semi-detached of 75m² floor area and integral garage, 17m² window area facing east and west with high performance joinery and a draught lobby on the front door.

The floor has 100mm of Styrofoam under the concrete slab; there is 185mm of glass fibre in the walls (including studs); 300mm in the roof, including joists, while the windows are triple glazed.

The control houses are identical in design but constructed to current UK building regs with the exception of the walls which have a U value of 0.4W/m² rather than 0.6W/m², and lack a ventilation system.

A timber frame system was chosen as the most convenient method of achieving the high level of wall insulation. Finlandia a company based in Milton Keynes, supplied prefabricated panels with very few joints, which arrived on site completely finished from sheathing to plasterboard and windows and doors installed and glazed.

Each house required only one day for erection and all joints were sealed on site with expanding UF foam.

A factory installed vapour barrier located between the 145mm structural stud and the 40mm cross battening provides a protective zone in which the electrical conduit and other services can run without puncturing the vapour barrier. Only the first floor vapour barrier is installed on site and here again all services run underneath.

In such a well sealed house air quality is vital and a mechanical ventilation system with heat recovery made by Bahco was installed, a neat package with fans, filters and heat exchanger which fits above the cooker hood in the kitchen.

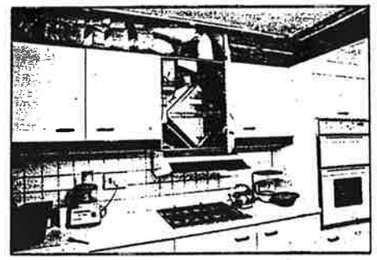
Space heating and hot water comes from Gledhills' Cormorant system, which imposes a large thermal store between the boiler and the load in the form of a 180 litre superinsulated water cylinder kept at 80°C by a 6kW boiler.

Hot water is obtained by passing cold water at mains pressure through a coil and on exit mixing it with cold water to reduce the temperature to an acceptable level.

The control houses are heated by a wet system of seven radiators whereas the the superinsulated ones have a 2kW water to air heat exchanger in the input stream of the ventilation system.

Using equipment supplied by the Energy Monitoring Company, Paul Ruyssevelt and his colleagues at the Polytechnic are monitoring:

- living room air temperature
- bedroom air temperature
- hall temperature close to the system thermostat



"The ventilation system with its heat recovery system has abolished condensation"

- total electricity and gas consumption
- status of the ventilation system and heating system
- heat output of the boiler
- heat input to domestic hot water
- volume of domestic hot water used.

In addition site values are being monitored for wind speed and direction, external dry bulb temperature and solar radiation on east and west vertical planes.

Paul, who is an architect on the design team has put his money where his research is, and bought the house in which he is experimenting. After six months of a monitoring period which will go on to June 1987, he is confident that the computer simulations made for the houses are proving accurate.

"Throughout last winter I maintained a comfortable room temperature of 20°C, though the gas central heating was on for only 40 hours before Christmas," he said.

"During the very cold spell when temperatures dropped to minus 15°C, I only had to switch on the heating for less than two hours a day at 2kW output to keep the constant 20°C."

The ventilation system with its heat recovery system has abolished condensation even though neighbours in the control houses relying on natural ventilation through windows, doors and standard vents are having serious condensation problems.

"The comfort level is so high that you are totally unaware of the weather conditions outside. In fact my wife got into the habit of popping up into the monitoring room to see from the equipment what the temperature was outside."

So free of condensation are the superinsulated houses that tumbler driers can be vented into them with impunity.

A co-heating experiment showed that the superinsulated houses have a specific heat loss rate of 70W/K including background air infiltration, while a thermographic survey conducted by Newcastle University showed no missing insulation or punctured vapour barriers in the factory constructed walls.

During periods of occupancy the super insulated homes are typically run at an air temperature 1-2°C below that of the control houses. Comfort is achieved at a lower temperature as a result of higher internal surface temperatures. A thermographic survey showed that the interior surfaces of both external and internal walls to be at the same temperature, with a steady state 15°C temperature difference between inside and outside.

Although no final conclusions can yet be made Paul Ruyssevelt and his colleagues are confident that superinsulation can cut heating bills to under £40 a year, and energy loss close to zero, with little or no extra cost. The real extra cost of constructing houses like those at Two Mile Ash to superinsulated standards is £2,000.

"This would add about £150 to £200 per year to the mortgage. Can you get this back in fuel savings? The answer is yes," says Paul. "We are achieving in savings on the heating bill what we are paying in extra mortgage and we have the bonus of much greater comfort and lack of condensation. Also, we would get the extra money back if we came to sell the house."