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GREEN HOMES

Energy efficient homes at Halliwell Lane Estate, Cheetham Hill, built for Manchester City Council

How to start the green homes effect

Everyone knows that the Earth's climate is changing because of mankind's increasing reliance on fossil fuels. We examine three practical ways to remedy the problem by making buildings more energy efficient

Increasing the energy efficiency of buildings in the UK has three main advantages — all of which have come to the fore as "green" issues have hit the headlines in the last 18 months:

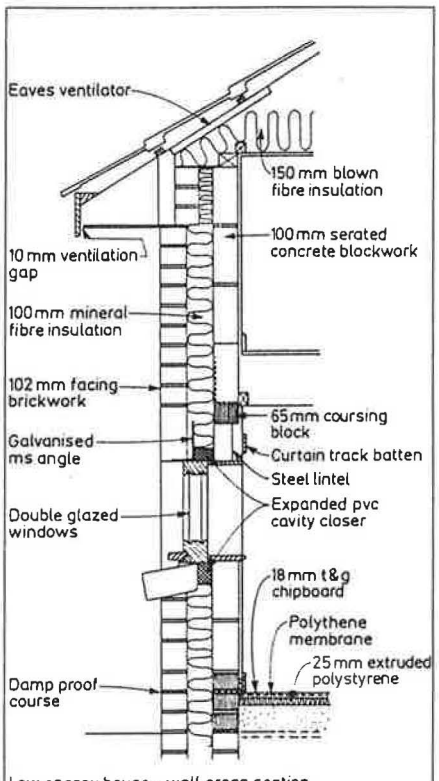
☐ cutting the money spent on energy

☐ cutting the money spent on building maintenance because of condensation and mould growth

☐ cutting the amount of carbon dioxide emitted into the atmosphere, which contributes to the greenhouse effect

It is the latter problem which has hit the public — and consequently construction — with the most force. It stems from a vast increase in the world's primary energy consumption since the 1950s, since carbon dioxide is the emission from any combustion of fossil fuels such as coal, oil, gas or lpg.

The carbon dioxide discharged has gone up from 5600 million tonnes in 1950 to 18,900 m tonnes in 1985 — an increase of more than 337 per cent. Of this Great Britain, according to informed sources, contributed more than 600 million tonnes of carbon dioxide, about half of which was emitted as a result of the energy needed to heat, light or cool our buildings.



Low energy house - wall cross section

From this the message is simple: cut the amount of energy used in buildings. Do this and there is a significant contribution to and saving on fuel bills and also towards cutting Britain's blame for changing the earth's climate through the greenhouse effect.

This is not what is happening. Current UK trends show that this country is increasing its carbon dioxide emissions and, at the rate it is going, will be emitting 20 per cent more than at present by the end of this century.

One limiting factor may be that people feel that a green future is difficult to achieve without checking growth but, according to Government research, carbon dioxide emissions from buildings can be cut by 23 per cent through cost effective energy efficiency measures.

To show what can be achieved, the Building Research Energy Conservation Support Unit managed three projects for the Energy Efficiency Office of the Department of Energy. They cover new-build housing, refurbished pre-1919 housing stock and a factory.

The host for the new-build project was Manchester City Council, which wanted the

p102▷

GREEN HOMES

◁p101

houses to be part of the Halliwell Lane Estate at Cheetham Hill and to act as prototype for further new council houses. The council agreed with BRECSU that it might not be necessary to heat the whole house for it to be comfortable if it was well insulated and that the cost of extra insulation would be offset by the cheaper heating system needed.

New build project

Ten houses were built in this way to an existing low energy design. Their main features were:

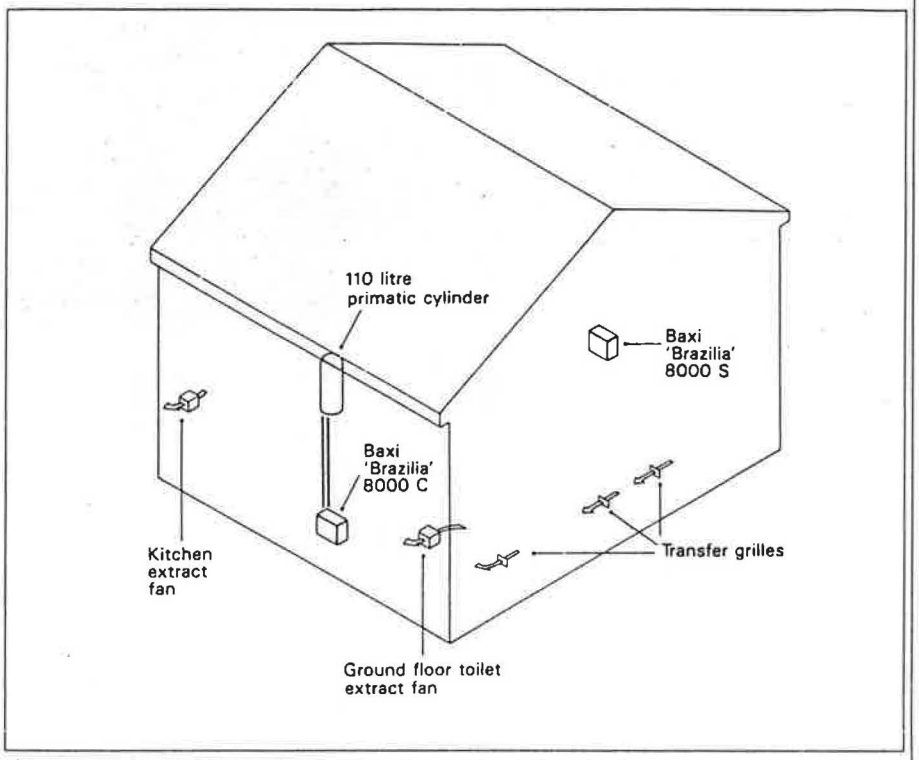
- ☐ 150 mm mineral fibre loft insulation
- ☐ 100 mm mineral fibre wall insulation
- ☐ 25 mm extruded polystyrene underfloor insulation
- ☐ draught stripped windows and doors
- ☐ controllable slot ventilators and extract fans
- ☐ no cold bridges in the structure
- ☐ central boiler
- ☐ concrete blocks for the inner leaf of cavity walls and ground floor partition
- ☐ room-by-room temperature control

None of these features is novel but together they achieved insulation values way in excess of those given in the Building Regulations that come into force next year. The wall U-value was 0.27 W/m²K, the value for the roof 0.2 W/m²K and floor U-values were 0.36 W/m²K.

The heating was simple and consisted of two models from the Baxi Brazilia 8000 range. These are gas-fired wall-hung heaters with an output of between 0.8 W and 2.5 W. Model 8000S went in the lounge and 8000C went in the hall. The 8000C has both a heat exchanger for space heating and a circulator for supplying domestic hot water, which is independently controlled. The 8000C has a factory-set water temperature thermostat and heats the domestic hot water through gravity-fed primaries that in this case serve a Primatic 110 litre hot water cylinder. Air transfer grilles coupled with natural convection within the house ensure that air circulates freely.

The end-result does not look that much different from any conventional house, so there is no loss of kerb-side appeal.

The 10 houses in this project were compared with a set of houses that had a conventional whole-house heating system in a low-energy design. The heating was a low pressure, small-bore, gas-fired central heating system that consisted of a Baxi WM30/3RS balanced flue boiler with a rated output of 4.4 kW – 8.8 kW to provide space heating through standard steel panel radiators and domestic hot water. Control for the system came from a Randall 102 programmer, a thermostat in the lounge and a cylinder thermostat for domestic hot water.



Energy efficient system cuts construction costs at Manchester

These houses were used as a control set and they showed that not only did the 10 houses with extra insulation save a further 13 per cent in energy costs but also the construction costs were cheaper. At the costs then current the extra insulation cost £80 per house but the two heater heating system was £990 cheaper to install than the conventional system, giving an overall saving of £910 per house. And, importantly, the level of comfort in the houses was unaffected by the difference in construction.

However, a large proportion of Britain's housing stock is pre-1919 and energy efficiency components can often be limited to a modern heating system and loft insulation. The result is a poorly insulated property with a central heating system that is too expensive for the occupiers to run at a comfortable level.

Refurbishment project

The Energy Efficiency Office teamed up with Merseyside Improved Homes, a housing association in Liverpool that is responsible for 11,000 dwellings. The brief was to produce a housing refurbishment package that would have higher insulation levels, be easy to install and cheap to operate.

The principal measures were:

- ☐ internal wall insulation — a plasterboard/rigid glass fibre slab
- ☐ double glazing the downstairs windows
- ☐ draught stripped windows and doors
- ☐ trickle ventilators in all windows
- ☐ extract fans in kitchens

This was in addtion to a standard refurb package of glass fibre roof insulation to a depth of 150 mm and modern gas central heating. The additional measures only added seven per cent (at 1985 figures) to the cost but produced a roof U-value of 0.25 W/m²K and wall U-values of 0.3 to 0.45 W/m²K.

The houses were monitored for two years against the standard refurbishment and showed a typical energy saving of around 25 per cent which was then equivalent to £40 a year. This saving goes to the occupier but, for landlords, there was the advantage that, unlike some refurb methods, there was no interstitial condensation found when the drylining was examined.

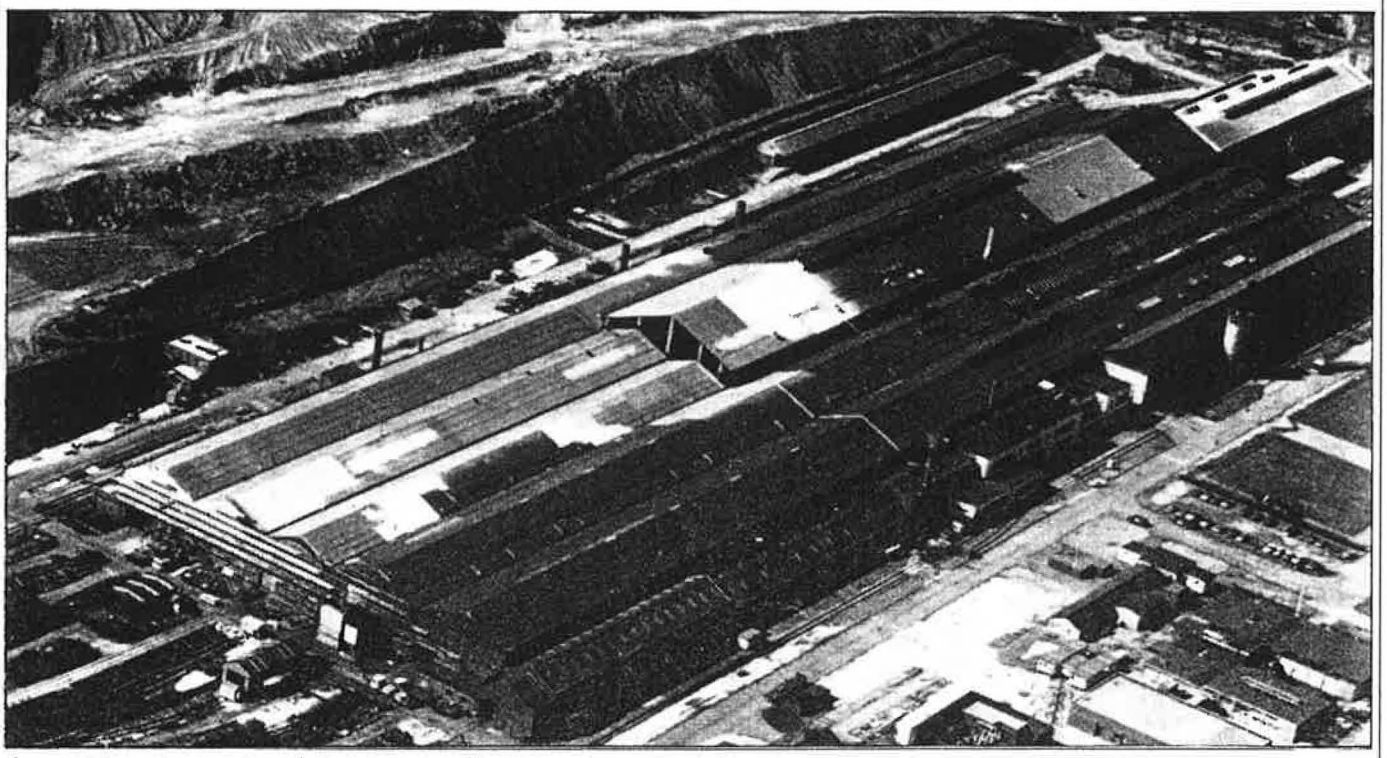
The work shows that simple and relatively cheap energy efficiency measures can be added very easily to refurbishment programmes.

Factory project

Old factories too can benefit from an energy efficient refurbishment, as has been shown at BSC Cumbria Engineering's plant in Workington, Cumbria. Here, heat loss through the factory roof was the problem — it was only a single skin with a U-value of more than 7 W/m²K. The solution was to insulate it externally with a two-layer foam system, comprising a 35 mm thick layer of DP 9761 polyurethane foam and two coats of elastomeric coating for a weatherproof finish. Spray guns applied the foam in four coats to build up the right thickness, which brought the U-value down to 0.6 W/m²K.

However, the insulation obscured the rooflights which meant that the artificial lighting would have to be increased. But calculations showed that high efficiency lighting could reduce lighting costs to the point where it was even cheaper than the naturally lit factory before refurbishment.

GREEN HOMES



Even old factories can benefit from energy efficient measures

This example shows how energy efficiency measures need to be considered as a package — lighting, insulation, draught-stripping, heating and controls — which often provide greater savings than any individual component considered separately.

This subject is expanded upon in a series of roadshows put on by BRECSU in partnership with the Association for the Conservation of Energy. Called Seeing the Green Light, they are one-day events that consist of a morning of presentations given by experts followed by smaller workshop groups to address specific issues. These events take place at: Sheffield, Cutlers Hall, January 24 and 25; Birmingham, National Motor Cycle Museum, February 1 and 2; Cambridge, Peterhouse College, February 13 and 14; Edinburgh, Maybury Roadhouse, March 6 and 7; Southampton, Guildhall, April 3 and 4. Details from the Association for the Conservation of Energy, tel: (01) 935 1495. ○

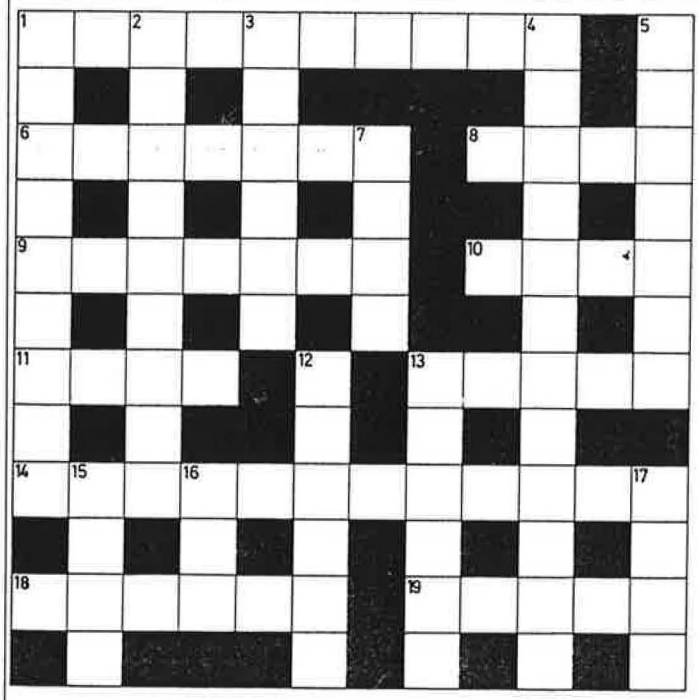
Thanks are due to the Energy Efficiency Office for permission to use photographs and information from its leaflets.

References

1 Expanded Project Profile 245 — Low-energy Local Authority Housing with Reduced Construction Costs
2 Expanded Project Profile 202 — External Insulation on a Factory Roof
3 Expanded Project Profile 209 — The Energy Efficient Rehabilitation of Inner City Terraced Houses on Merseyside.

These and other publications can be obtained from the BRECSU Inquiries Bureau, Building Research Establishment, Garston, Watford WD2 7JR, tel: (0923) 664258

CROSSWORD



Clues Across

1 Circular saw used in stone cutting (7/3)
6 Arris cut off symmetrically at 45 deg. (7)
8 Notch to receive another timber (4)
9 Joists supporting winders (7)
10 Often hoped for in wintry conditions (4)
11 Those which control local authority bye-laws (4)
13 Used to remove spoil (5)
14 Term used when local authorities engage tradesmen and labourers (6/6)
18 Low partition (6)
19 Large semi-circular moulding, or bead (5)

Clues Down

1 Inclined scaffold board with cleats to provide a foothold (4/5)
2 Translucent form of gypsum for decorative purposes (9)
3 Ledge in a wall where the wall thickness changes (6)
4 Piece planted at the bottom of an external door (7/5)
5 Path formed of planks for the passage of operatives (7)
7 Decorative plate for a door handle (4)
12 Green coating on copper (6)
13 Roof where summit is carried on a wall which is higher than the top of the roof (4/2)
15 Unit of imperial measure (4)
16 Inspection opening in a drainpipe (3)
17 Similar to a coarse file (4)

Solution to last week's crossword

D	R	A	I	N	S	■	T	■	P	D
■	E	■	N	■	■	M	A	N	A	G	E
P	A	S	T	E	D	■	M	■	L	■	B
■	M	■	E	■	A	S	P	H	A	L	T
A	S	C	R	I	B	E	■	■	C	■	■
R	■	■	I	■	■	T	A	L	E	N	T
C	O	M	M	O	N	■	■	A	■	■	A
■	■	A	■	■	C	A	R	R	I	E	R
B	A	S	T	A	R	D	■	M	■	L	■
Y	■	O	■	P	■	A	C	I	D	I	C
T	E	N	D	E	R	■	■	E	■	T	■
E	■	S	■	X	■	S	C	R	E	E	D