#3340

Energy efficiency in housing refurbishment

by Paul J Davidson

One of the principal aims of the Building Research Energy Conservation Support Unit (BRECSU) is to demonstrate to housing owners and managers and to building contractors, that there are significant benefits to be gained from considering energy along with other factors involved in the rehabilitation and conversion of existing dwellings.

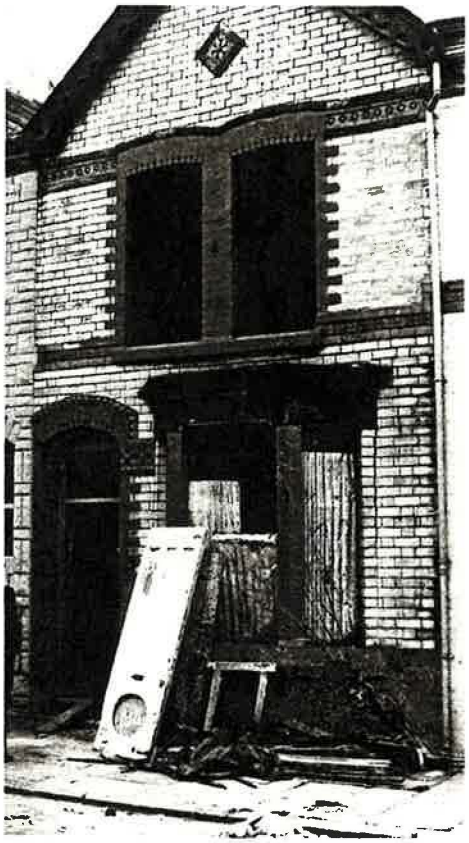
THE PRINCIPLES

Among BRECSU's portfolio of energy efficiency demonstration projects in housing, those projects concerned with rehabilitation, rather than with new buildings, seek to highlight two main points. The first is that, when the proposed work involves the renovation, replacement or extension of particular elements of the building – walls, roof, heating, – it is usually possible to incorporate a more energy efficient alternative for a cost which is only marginally higher than that of the standard approach. In this way, the work leading to energy savings becomes much more cost-effective than it would be if undertaken in isolation for its own sake. Table 1 contains a selection of examples to illustrate the sort of measures that can be considered in connection with various aspects of renovation work. Many other possibilities exist, including hot water cylinder insulation and draught-stripping which are almost certainly worth doing at any time.

The second basic message from these demonstrations is that for tenanted dwellings where the owner and supplier of funding for renovation work are not usually going to benefit directly from reduced energy costs other advantages still make the energy efficiency work worthwhile. An energy efficient house or flat is cheaper to heat: an important consideration for those on a limited budget.

Tenants on low incomes who previously have been unable to afford adequate heating can take the benefit in the form of increased temperatures. Tenants therefore become happier and less inclined to complain, or to take legal action, and are often more likely to pay their rent on time.

One major benefit of energy efficient refurbishment is invariably a reduction, or even elimination of condensation and mould growth problems, with attendent savings in maintenance and management costs. Property which was previously 'hard to let' can become desirable again, reducing the costs of vacant dwellings, constant relettings and, often, of vandalism. In extreme cases, the expensive alternative of demolition and rehousing is avoided.



Terraced housing on Merseyside receiving internal insulation.

ASSESSING THE OPTIONS

In deciding what energy saving measures are most appropriate for a particular dwelling, it is necessary to undertake a proper analysis of the costs and benefits of the various options. A number of sources of information are available to assess this process. The DOE publication *Energy Efficient Renovation of Houses* (1) gives a range of costs and savings for different measures in different house types as part of the advice to owners and designers in the public sector. More recently, a British Standard Code of Practice for the Energy Efficient Refurbishment of Housing (2), published last July, sets out the method for assessing measures and includes a worksheet version of BREDEM - the BRE Domestic Energy Model (discussed in earlier articles in this series). A design guide to accompany the code is scheduled for publication in the Spring. Indeed, for owners of large numbers of houses in need of improvement, the use of one of the commercially available versions of BREDEM is a valuable way of assessing the costs and likely energy savings resulting from particular energy efficiency measures.

The simplest method of comparing measures from an economic point of view is to use the payback period - the

Victorian flats undergoing energy efficient refurbishment in London.

number of years before annual savings equals the initial capital cost of the measure. However a more powerful measure of total net benefit is the Net Present Value (NPV). This takes account of the expected lifetime of the additional insulation, high efficiency boiler or other feature, and the fact that savings (and expenditure) in future years have a reduced equivalent value today. The method is explained in detail in number of papers and in particular a book by Pezzey (3). The usefulness of this approach is its ability to take account of other benefits such as reduced frequency of maintenance and to allow comparison between measures of very different initial cost and differing life cycles.

TABLE 1 Examples of opportunities for energy efficiency in housing refurbishment

BUILDING ELEMENT	PROPOSED WORK	ENERGY EFFICIENCY OPPORTUNITY WORTH CONSIDERING
Pitched roof	100 mm insulation	150 mm insulation
Solid wall	a) New external render	a) External wall insulation under render
	b) New plaster	b) Internal insulation (various types)
Timber ground floor	Replace floorboards	Insulate beneath floorboards and draught proof
Windows	Replace windows/frames (single glazing)	Use sealed double glazing and integral draught seals
Heating	a) Install first central heating	Use efficient boiler and controls
	b) Renew boiler	Use condensing boiler
External wall to new extension	50 mm cavity	75 mm cavity filled with mineral fibre batts
Solid concrete floor	New concrete plus screed	Include expanded polystyrene board

FURTHER INFORMATION

Some of the BRECSU projects which involve refurbishment (such as those illustrated) will be discussed in future articles. However details of all BRECSU projects are available in the form of project profiles, expanded profiles for completed projects and reports. These can be obtained, free of charge from the BRECSU Enquiries Bureau, Building Research Establishment, Garston Watford, Herts, WD2 7JR. Telephone 0923 664258.

REFERENCES

1. Energy efficient refurbishment of houses – a design guide. DOE. HMSO. January 1986.
2. Code of Practice for Energy-efficient Refurbishment of Housing. BS 8211 Part 1.
3. Pezzy, J. An economic assessment of some energy conservation measures in housing and other buildings. Building Research Establishment Report 1984.

57

Recycled roadstone

(Continued from page 27)

Tests by the Transport and Road Research Laboratory showed that the foamed bitumen roadbase had a high resistance to deformation and rutting, and the predicted life of the road had been considerably increased.

It is estimated that on roads with heavier traffic loadings where a conventional repair would require a greater proportion of new material, the cost savings of the cold road recycling process would be more significant. However, the process should be restricted to roads where the design life is less than two million standard axles until the process is more fully evaluated

FURTHER INFORMATION

Jim Furnival, the ETSU project officer responsible for these projects, will gladly answer any queries on this article. Enquiries of a more general nature should be addressed to the Energy Efficiency Enquiries Bureau, ETSU, Building 156, Harwell Laboratory, Didcot, Oxon OX11 ORA. Tel No: 0235 834621. Telex No: 83135. Fax No:0235 432923.

56

Savings for homes and schools

Fuel bills in old people's homes have been cut by £28,000 a year by Sandwell Metropolitan Borough Council in the West Midlands – and the council's energy conservation unit is so confident of achieving a three-year payback on the installations costs of the energy management system at the homes, and in 22 high schools and 15 primary schools, that a further programme of installation is planned for next year.

The council are using Allen-Martin Conservation's energy management system, featuring the ACM8, an outstation which runs smaller buildings without the need for on-site central processing. All monitoring and control of each of the sites day-to-day operation of boilers and pumps is conducted from a remote central computer, with data accessed via modem links and – using dynamic colour graphics – settings may be altered on-screen, using a mouse point and click system. The computer also acts on incoming alarms of breakdowns of plant and high or low level temperatures of heating and hot water systems.

For the school installations, Sandwell have adapted the ACM8, adding manual controls for the caretaker to set the system for particular modes.

Sandwell previously relied on site users to let them know when there were heating breakdowns; while optimisers, time switches and compensators operated heating system.

Although in 1980 there were government grants for energy conservation available to local authorities it wasn't until the Department or Energy's audit commission that Sandwell first considered energy management systems in their buildings.

Energy conservation officer Richard Cooper explained:

'At that time energy management was far too expensive, there was no way we could justify the costs. More recently we looked at our residential homes – which has no on-site caretakers, and at various local authorities' energy management systems – but it all seemed too complex and costly. However, the Allen-Martin system was investigated, selected and installed in 1987 and is now performing satisfactorily.'

The system's capabilities for data collection are put to good use with data logging using STARK, a monitoring targeting programme which enables the conservation unit to keep accurate records of energy savings for each of the sites. The energy management system logs room temperatures, outside temperatures and flow temperatures, with an auto-scan capability that can check up – with a printout – on heating and hot water performance, comparing actual temperatures with target requirements; helping the unit to make long-term maintenance plans when deviation is detected.

58