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Energy Efficiency

and Public Sector Housing

Foreword by the Rt Hon Cecil Parkinson MP, Secretary of State for Energy

I am delighted to introduce this Good Practice Guide on energy efficient housing. Although it has been produced primarily for local authorities and is intended for housing managers, treasurers, architects and councillors with housing interests, it will be useful to housing associations and any other large landlords or owners of housing stock.

Local authorities and housing associations are responsible for some 6.5 million homes in England and Wales. Almost 30% of the country's £38 billion energy bill is used in the home. £3 billion a year is spent on fuel bills in local authority housing alone. Much of this energy is still needlessly wasted. Some of that waste can be avoided through "good housekeeping" by tenants, but investment is also needed by landlords in insulation, replacement of doors and windows and improvements to heating systems. Those are the measures that make houses energy efficient.

This Guide illustrates how various local authorities and housing associations have successfully tackled the problem across the whole range of housing. I am grateful to those who have contributed these case studies of good practice and I am confident many others will benefit from them. Many of the projects are well worth visiting and have been chosen to stimulate the flow of information between local authorities in this area.

The Guide includes examples of new housing with major improvements in energy efficiency built in. These expose the myth that such improvements inevitably lead to increased capital costs. The local authorities and housing associations who have pioneered this approach are recognised in the Guide. Their tenants already benefit by lower fuel bills.

The ultimate beneficiaries of this Guide will therefore be the tenants, who will enjoy greater comfort and lower fuel bills if their landlords adopt these good practices. I commend this Guide as a step towards that goal.

ENERGY EFFICIENCY

and Public Sector Housing

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HS
Heating System

CON
Condensation

CS
Control System

HE
Heating Equipment

CHS
Communal Heating Controls

RHS
Reduced Heating System

EI
External Insulation

PSG
Passive Solar Gain

CV
Controlled Ventilation

TV
Trickle Ventilation

DG
Double Glazing

SH
Solar Heating

IP
Insulation Package

INTRODUCTION

This booklet is a practical guide to good practice in promoting energy efficiency in public sector housing. It has been produced by the National Housing and Town Planning Council (NHTPC) and the Energy Efficiency Office (EEO) with the Association for the Conservation of Energy (ACE) and the Building Research Energy Conservation Support Unit (BRECSU) and in consultation with the Department of the Environment. It is a companion document to ''Energy Efficiency and Local Authorities'' also produced by NHTPC, the EEO and ACE, which examines energy efficiency in other types of local authority buildings.

The booklet has been prepared with the active support of the Association of District Councils, the Association of Metropolitan Authorities, the Convention of Scottish Local Authorities and the National Federation of Housing Associations. The publishers are grateful to the national organisations and the many local authorities and housing associations who responded to the call for case studies.

Copies of the guide have been sent to *every* housing authority and one copy to every actively developing housing association. It is hoped that it will be widely used and that those interested in carrying out similar measures to those outlined in the case studies will get in touch with the contact officers and, if possible, visit the schemes. If each of the examples is replicated just once this publication will have been a success. Hopefully the impact will be even more substantial.

The publishers would welcome your comments on this edition and suggestions for a possible second edition.

How to use this Guide

The main part of the booklet consists of case studies, divided into sections according to the types of energy efficiency measures used. The index on the opposite page lists all the

case studies and the measures which they illustrate. Symbols have been used to depict each measure and are listed after the Index. If you are looking for one feature e.g. trickle ventilation then the symbols will help you locate appropriate case studies.

Where cases involve a range of measures or have certain features in common with case studies in other sections of the booklet then symbols are used against the case studies so that readers can cross reference. These symbols are listed after the Index.

The case studies are of *good* but not necessarily of *best* practice. They are practical examples of how local authorities and housing associations have made existing homes more energy efficient and incorporated higher standards of energy efficiency in new homes.

The case studies have been kept deliberately brief. However each contains the name of a contact from whom it will be possible to learn more. Information on specific products used and their manufacturers, on any architectural or other professional practice employed, and on the companies involved in construction or installation is not included but can be sought from the case study contacts.

About a quarter of the case studies are based on Demonstration Projects managed by BRECSU. This unit is funded by the EEO and manages the EEO's buildings research, development and demonstration programmes. It can provide further information on its case studies on request to its enquiry bureau, Tel: 0923-674040.

The cases are based on technical and financial information provided by individual local authorities or housing associations. As they supplied the figures for costs and savings based on calculations made at different times, these are inevitably not always consistent from one case study to the next.

Why is Energy Efficiency Important to Local Authorities and Housing Associations?

In England, Scotland and Wales local authorities (5,971,000) and housing associations (554,000) are responsible for a large and diverse range of properties. These properties provide

homes for millions of people, most of whom are on low incomes and very many of whom are in receipt of supplementary and/or housing benefit.

Despite financial constraint many local authorities and housing associations have made great strides in improving the energy efficiency of their houses and incorporating higher standards in their new buildings. The case studies in this booklet illustrate this, but much still needs to be done. The "Inquiry into the Condition of Local Authority Stock in England 1985" showed that some £4 billion of work was needed to improve the heating and insulation of local authority dwellings.

Local authorities are responsible for many buildings including offices, depots and schools which take many tens of millions of pounds to heat. It is not surprising if they concentrate their efforts to improve energy efficiency on those buildings for which they pay the heating bills.

By contrast local authorities and housing associations do not pay the heating bills in their houses and flats (except sheltered housing and residential homes, the latter not being covered in this publication). Yet increasingly they are investing in energy efficiency measures even though it will be individual tenants who will receive the immediate benefits. There are very good reasons for this:-

1. The Needs of Tenants

Many tenants are on low incomes. A recent report (*Energy Saving and Local Authorities* — Association for the Conservation of Energy) indicates that 63% of those receiving supplementary benefit heating additions are local authority tenants. Many tenants are elderly, or have young families, or are unemployed. They are at home more during the day and therefore need to keep their homes heated longer. Young families and elderly people also need to keep heating levels higher. They need affordable heat — and that means energy efficient housing.

2. Combating Condensation

Inadequate levels of heating, inappropriate forms of heating (eg paraffin), insufficient insulation and poor ventilation can cause condensation. Condensation affects many public rented properties. Apart from being miserable to live with it can seriously damage the building fabric and be very expensive to remedy.

3. Limiting Rent Arrears

Fuel bills compete with rent demands in a low income household. The threat of gas or electricity being cut off is a powerful one. Rent and rates may go unpaid in order to meet fuel bills. The lower the heating bills the less likely it will be that rent payments go into arrears.

4. Increasing Rental Income

It may be possible to charge higher rents for better heated and insulated properties. Indeed, there are examples of tenants choosing to pay higher rents in order to make their homes more comfortable and energy efficient.

5. Restricting the Number of Voids

Poorly heated and insulated homes can be difficult to let and often have a high turnover because of the poor living conditions. Voids mean lost rental income, higher management costs and vandalism.

6. Cutting Maintenance Requirements

Modern heating systems can be maintained more easily and less frequently and have a longer life before they need to be replaced. Getting rid of condensation also eliminates frequent maintenance such as cleaning and repainting.

7. Reducing Management Costs

Dealing with the problems of energy inefficient homes — chasing up rent arrears, dealing with complaints about condensation, or reletting properties all significantly increase management costs. They also divert valuable expertise from other areas of work.

8. National Resources

Some 29% of all Britain's energy is used in the home and at least one third of that is consumed in public rented housing. *Approximately three times as much energy (£3 billion) is used in local authority housing as is consumed in all other types of local authority buildings.* As many public sector homes are poorly insulated a large amount of this energy is wasted, and that means a waste of national resources. This is especially true of electricity which requires costly public sector investment to meet demand.

HELP·AND·ADVICE FOR·TENANTS

Tenants, as much as homeowners, are often woefully ignorant of how to efficiently heat their homes. Most available advice is aimed at owner occupiers. Advice from landlords is therefore crucial. They are uniquely placed to advise their tenants on how to heat their homes efficiently because of their knowledge of the heating systems installed, typical running costs and general good practice. To enable local authorities to provide good advice to their tenants, Energy Inform produced in 1985 a "Heating Action Pack" on behalf of the EEO. A new edition is currently being prepared for publication in late 1987.

Advice should include information on:

1. Controls

The controls of modern heating systems can appear daunting. Advice will normally be needed, particularly for some older tenants who may not be familiar with such systems. It is helpful if this advice be given on a card or in a leaflet to *each* tenant when they first occupy their home as is done in Newcastle-upon-Tyne. It is not practical to rely on information being passed on from one tenant to another.

Not being able to operate the heating system properly may well mean higher fuel bills for tenants — as the example from **Bolton** clearly illustrates.

2. Safety and Maintenance

Arrangements for maintenance of individual heating systems is normally the responsibility of the tenant. Heating systems must be properly used and well maintained, or they can become a hazard eg. blocked gas fire flues or covering electric storage heaters. A badly maintained system will also be inefficient to run. General advice on safety and maintenance as well as

specific information about individual heating systems, should therefore be given to each tenant on arrival, perhaps as part of a Housing Logbook.

3. Running Costs

Vital information should be made available on the running costs not only of heating systems but of other items of domestic equipment which may well contribute significantly to energy bills.

Tenants who heat their homes or hot water with electricity should have Economy 7 meters fitted (white meters in Scotland). They can be installed at no cost to the landlord or the tenant although a small additional standing charge is then payable with each bill. Even where electric heating systems are not installed most tenants can get some benefit from Economy 7 by the use of domestic appliances at night. The saving is, of course, reduced in those areas where Electricity Boards charge a higher day rate to those on Economy 7 meters.

Some Boards now operate schemes, aimed primarily at elderly householders and known under a range of titles such as "Budget Warmth", "Heat with Rent" etc. These schemes are designed to ensure that one room is kept warm, using a storage heater remotely controlled by the Boards. The cost of installation is covered in a comprehensive tariff.

4. Paying Fuel Bills

Low income tenants can find gas and electricity bills difficult to pay. Traditional coin meters can help tenants meet their bills more easily. In some areas the fuel boards are testing and installing coinless pre-payment meters using plastic keys and cards or tokens. Such meters can be set to allow for the gradual repayment of arrears, thus avoiding disconnections. They also remove the risk of burglary. Landlords need to keep up-to-date on developments in metering.

5. Homes Insulation Scheme

Most landlords have installed loft insulation, but where this has not been done tenants should be informed that they may be entitled to a grant under the Homes Insulation Scheme. This covers the insulation of lofts, pipes and tanks, including the hot water tank.

6. Draughtproofing

Some landlords also encourage tenants who are eligible to get their doors and windows draughtproofed by Community Insulation Projects. This service can currently be provided free under the MSC Community Programme to pensioners and householders on supplementary benefits. A small charge, typically £5, will be made from April 1988. The case study from **Worcester** is a good example. Neighbourhood Energy Action (NEA), with financial support from the EEO, asisted in the formation of this and almost 400 other projects, and coordinates their activities nationwide.

Landlords are recommended to make use of their local projects which fit good quality materials and provide a service which is well up to the standard of contractors. Further information is available from NEA.

7. Supplementary Benefits

Major changes will be made to the social security system in April 1988. Any specific advice given to tenants on the social security benefits available to them should be checked with the DHSS.

8. Additional Services

Many rented properties still lack central heating. It is now quite common for tenants to be offered central heating and other extra fixtures as part of a basic refurbishment programme in return for a higher rent. Whilst this cannot benefit all tenants it does mean that tenants are not denied basic amenities such as central heating because their landlord does not have the capital to install them. The **Eastbourne** case is a good example of this approach.

CASE 1

WILLOWS COTTAGE ESTATE — BOLTON METROPOLITAN BOROUGH COUNCIL

The Willows Estate was the subject of a Priority Estates Project from 1979-84. In 1981/82 the 540 two, three and four-bedroom houses, on a very exposed site, were modernised. However, fitting a gas radiant fire in the living room, gas fired central heating in the other rooms and 100mm of roof insulation failed to cure problems of heat loss and draughts. Moreover, tenants were afraid to use or did not know how to use, their space and water heating.

Residents included many who were unemployed, elderly, disabled or had very young children, all of whom needed to use more heating during the day. They saw central heating — when it could be afforded — chiefly as providing hot water and as a back up to the gas fire. Residents were unaware that the greater the use of the fire, the greater the likelihood of condensation.

The estate was chosen as a research and development project by the Department of Energy and the Building Research Establishment to test out whether providing trained tenant advisers would help other tenants to maximise the benefits from their heating systems.

From a sample of 72 houses, 48 were given a package of additional improvements including cavity wall insulation, extra roof insulation where necessary, mechanical extractor fan in bathroom window (fixed shut) and draught stripping on doors and windows. Tenants of 24 of these improved houses also received energy advice for 32 weeks from October 1985 to May 1986. The control group of 24 houses were not improved and tenants received no advice.

Many of the 'advice' households used their 'savings' to achieve increased comfort. Some of the tenants converted from more expensive pre-payment meters to budget payments, so saving 96p per week during the heating season. Most of the 'control' households did not achieve their desired level of comfort, nor did they make as high a level of savings as their 'advice' neighbours.

The advice given by the two energy advisers — a total of nine visits at monthly intervals — relieved anxiety over paying bills and was fundamental to the tenants' more efficient use of their heating.

Contact: Hugh Broadbent, Assistant Director of Housing (Property), Department of Housing, Bolton Metropolitan Borough Council, Padborn House, Civic Centre, BOLTON BL1 1JW. Tel: 0204-22311

CASE 2

DRAUGHT PROOFING — CITY OF WORCESTER

One thousand low-rise flats, occupied by elderly tenants, are having their doors and windows draught stripped at a cost of approximately £35 each. The work runs from February 1987 to January 1988. It is being done through NACRO (National Association for the Care and Resettlement of Offenders).

Locally unemployed and disadvantaged people who are involved in NACRO's Community Programme activities have been recruited to carry out the work. Workers are therefore funded by the Manpower Services Commission. The Council has bought approximately £41,000 worth of materials which are being released gradually to NACRO.

Since the start of the scheme there has been a very positive feedback from tenants many of whom report increases in comfort and the elimination of long standing draught problems. The Council has yet to monitor before and after costs but the evidence suggests that these more vulnerable members of the community will see some impact on the level of their fuel bills next winter.

Contact: P. Rozee, Senior Maintenance Surveyor, Housing Department, City of Worcester, Farrier Street, WORCESTER WR1 3ES. Tel: 0905-723471

CASE 3

MODERNISATION MODULES — EASTBOURNE BOROUGH COUNCIL

The Council offers tenants of eligible properties improvement modules which are chosen from a "menu". Some of the modules are free whilst others involve an increase in rent. Some improvements involved a standard package for which there is a pre-set increase in the rent eg. a four radiator central heating system for £2.85 per week rent increase. Other improvements can be more varied with the tenant able to re-design the layout of the house and kitchen, with the rent increasing by 10p per week for every £100 spent.

Among the improvements available are a choice of types of central heating systems, hardwood front doors and a Security Package. Cavity wall insulation has been installed in all properties and 100mm of roof insulation is supplied free of charge to any tenants willing to install it themselves.

Contact: Peter Kegg, Director of Housing, Health and Community Services, Eastbourne Borough Council, 68 Grove Road, EASTBOURNE BN21 4UH
Tel: 0323 21333

STRATEGIC APPROACHES

This booklet is largely about individual schemes of rehabilitation or new building. However, local authorities have pioneered a number of more 'strategic' approaches to energy efficiency. These are worth considering because in addition to providing improvements for council tenants, they can spread the benefits of energy efficiency more widely — for example to all the properties in a local authority area, to all those managed by the authority, or to disadvantaged groups.

Such strategic approaches are primarily the province of local authorities but housing associations may well have a systematic approach to improving the energy efficiency of their housing stock and promoting greater awareness amongst tenants.

The London Energy and Employment Network (LEEN) has helped a wide range of local authorities (including Islington, Kensington and Chelsea, Bristol and Manchester) develop comprehensive inter-departmental strategies. These tackle the problems of cold, condensation, dampness and fuel debt experienced by many householders, and create jobs. LEEN has also been closely involved in Hackney's strategic campaign to promote energy efficiency in the Borough. Such strategies can often be integrated into broader economic development or anti-poverty programmes (see ''Policies for Warmth — guidelines for local authorities'' published by LEEN).

A similar approach is Local Energy Action. A Local Energy Action campaign aims to raise awareness of the potential benefits of energy efficiency, and motivation to achieve them, among all energy users within an area. Use is made of a range of promotional initiatives which are targeted at different sectors but coordinated within an overall campaign framework so as to reinforce and support each other.

This approach was successfully pioneered in Cardiff. The campaign involved several initiatives helpful to council tenants. These included a mobile energy advice caravan, an expansion of the community insulation projects, referrals from the home helps to the fuel boards for assistance, as well as a range of advice leaflets and press features aimed at householders. Local Energy Action has been taken up in Leicester and Wrexham, and is being carefully considered by several more authorities. (The EEO can advise on mounting a campaign: contact Roger Levett, Room 1695, Thames House South, Millbank, London SW1. Tel: 01 211 3656.)

Other strategic approaches include Glasgow's ''Heatwise'' project, involving close collaboration between the City Council and community insulation projects, through which 17,000 homes were draughtproofed in just two years.

Another ambitious approach has been that adopted in the Milton Keynes Energy Park which will, by 1991, include over 1,000 new low energy houses, shops, schools and offices.

The Energy Conservation and Solar Centre (ECSC) has carried out energy audits for several local authorities including Bristol and Islington, and through its Tenants Energy Advice Service provides technical support to tenants' groups and advice agencies.

Milton Keynes Energy Park

CASE 4

ENERGY INFORMATION CENTRE — NEWCASTLE CITY COUNCIL

In 1978 the Council identified 20,000 of its 56,000 properties as having severe condensation problems. A ten year priority ranked heating and insulation programme was launched in 1979. An Energy Advice Unit also provided direct help to tenants and others on how to avoid fuel debts and disconnections. In 1980, the Council supported a local insulation project. 'Keeping Newcastle Warm', to work in areas and properties not eligible for remedial work under the ten year programme.

In 1984 the City expanded the role of its Energy Advice Unit by providing a walk-in, shop front service. It was hoped to reach the wider public, not just tenants, including industrial and commercial energy users. The Centre has exhibition areas and rooms for seminars and workshops.

Education and information programmes are held for tenants before work is done to improve the energy efficiency of their homes. The programmes include talks, slide shows, advice surgeries and exhibitions. Staff then produce leaflets and guides advising tenants how to use their new heating systems efficiently, paying bills, avoiding disconnection, seeking help etc. Tenants are encouraged to visit the Centre for further guidance. Follow up visits are available on request.

A guide is prepared for each completed scheme. This is a joint effort between the Centre, North Eastern Electricity Board, Director of Housing and City Architect. A high priority is given to the use of 'plain English' and a clear visual presentation.

Between September 1985 and August 1986 over 8,000 enquiries were made to the Centre.

Contact: The Manager, Energy Information Centre, 43 Grainger Street, NEWCASTLE-UPON-TYNE NE1 5JE. Tel: 091 261 8428

CASE 5

ENERGY EFFICIENCY AREA — DUDLEY METROPOLITAN COUNCIL

In 1984 Dudley designated an Energy Efficiency Area covering 1,374 acres in Quarry Bank and Netherton. The Area had some 6,000 homes — 50% Council owned — and 200 companies and had been badly hit by economic recession. The five year programme was therefore intended to boost the local economy by saving 20% on energy bills — the amount claimed by the Department of Energy to be possible within minimum financial outlay. Urban Programme funding was obtained to cover salaries and promotional costs.

In 1986 an Energy Information Centre was opened for one year. It included a display area with leaflets on insulation and energy conservation aimed at domestic and industrial consumers. A counselling service was also made available and the programme was supported by the major energy suppliers.

The project offers information on grants and loans and helps to put people on low incomes in touch with the local Neighbourhood Energy Action Group in order to have their lofts insulated and doors and windows draught-proofed either at no cost or for a nominal sum. A team of energy advice workers is planned for 1987.

Other methods used to improve public awareness and promote energy saving measures have included exhibitions, mail shots, canvassing, advertising and leaflet displays. The campaign is being monitored using a computerised database, with British Gas helping with statistical data for the area.

In the first two years about 2,000 homes were contacted and many given help and advice. A sample survey of these households in 1985 revealed that over 50% of respondents had made some effort at home insulation since originally seeking information.

Contact: B. Fisher, Energy Efficiency Department, Dudley Metropolitan Council, Council House, Mary Stevens Park, STOURBRIDGE West Midlands DY8 2AA Tel: 0384 392111

NEW·BUILD

BRECSU

CASE 6

LAWRIE PARK ROAD, SYDENHAM — LONDON BOROUGH OF LEWISHAM

This is an integrated project which aims to show that if a house is treated as a system at the design stage it is possible to produce an energy saving house at negligible extra cost.

Eighteen five-person 'low energy' houses were built with high levels of insulation in walls, roofs and floors, draught stripping of all doors and windows and draught caulking. There is a passive solar contribution to the space heating and a thermosyphon system for water heating.

Monitoring showed a saving on space heating of 64% over current Building Regulations standards for an additional cost of £674. Payback period — less than five years.

Across the road, three large Victorian houses were each converted to five flats, incorporating high levels of insulation in walls, roof and under the floor.

Heating in both cases is by gas fired warm air which recirculates air from rooms other than bathroom and kitchen.

One of the renovated flats was used as a demonstration suite and attracted over 1300 visitors in two years. Three London Boroughs now require an Energy Consumption Certificate, based on the results of this project, for new schemes.

The houses and flats were designed by the Lewisham Architect's Department, with the South London Consortium Energy Group as energy consultants.

Contact: Ed Lucey, Assistant Borough Architect, London Borough of Lewisham, Capital House, 47 Rushey Green, Catford, LONDON SE6 4BA. Tel: 01 697 8111

BRECSU

CASE 7

THE SALFORD HOUSE — CITY OF SALFORD

The Council, in collaboration with the University of Salford, has developed the SALFORD Low Energy House. It is designed to alleviate the thermal discomfort suffered by many low income tenants, and to reduce condensation and rapid house deterioration.

The specifications for the new design had to:

- not exceed normal cost limits
- use established construction methods and materials
- impose no limitation on normal living patterns
- substantially reduce heating costs and energy requirements
- not increase maintenance costs
- be adaptable to a range of fuels and heating systems

The SALFORD design therefore incorporates:

- a highly insulated envelope, nominally 200mm all round
- a large heat storage capacity achieved by constructing inner leaves and floors of dense concrete blocks
- an inherently well sealed envelope to permit ventilation control (suitably low in winter and high in summer for cooling)
- stained, timber, dual glazed windows with trickle ventilators
- external doors opening into a hall or lobby

It has been possible to incorporate these design features within normal cost limits partly because full central heating is unnecessary since the design heat loss is only 2kw. Annual space heating energy consumption has averaged a third of that of equivalent houses built to the 1985 Building Regulations. Fuel costs average £1 per week.

Internal environmental conditions are generally superior with 24 hour equable temperatures, virtually no risk of houses freezing or occupant hypothermia even without heating, low noise levels and resistance to condensation, rot, fire and vandalism.

The council are very satisfied with the results and have now built nearly 200 as part of their normal building programme. The SALFORD design concept has also been taken up by a housing association for a sheltered housing development, and by private developers building properties ranging from small flats to detached houses.

Contact: J M A Hoyle, City Architect's Department, Salford City Council, Civic Centre, Chorley Road, SWINTON M27 2AD. Tel: 061 788 8282

CASE 8

PENNYLANDS — MILTON KEYNES DEVELOPMENT CORPORATION

Pennylands is a development of 177 houses designed in 1978 and completed in 1983. During the design of the homes — which range in size from two to seven bed spaces — Shadowprint contours were used to minimise energy loss through overshadowing. Main rooms have large, south facing windows to maximise solar gain. All the homes have cavity and loft insulation. Many have double glazing and most have high-efficiency light-weight gas boilers with good controls.

A social survey by the Development Corporation found that residents felt their houses were warmer than their previous homes and that they made more use of the rooms. 91% felt they were saving on their fuel bills and 67% claimed to be saving over a quarter.

Cost — £450 per house. Annual Savings — £115 (monitored by the Open University).

Contact: Stephen Fuller, Projects Development Manager, Planning Department, Milton Keynes Development Corporation, Saxon Court, 502 Avebury Boulevard, CENTRAL MILTON KEYNES, MK9 3HS
Tel: 0908 692692.

CASE 9

STORNOWAY, ISLE OF LEWIS — WESTERN ISLES ISLAND COUNCIL

Twenty two family houses and 22 flats were built on a relatively sheltered, south facing site bounded by suburban housing. Sixteen of the houses and all the flats incorporate features designed to maximise passive solar gain.

Research has shown that whilst heating demands in these northerly latitudes are higher, there is only a marginal reduction in solar radiation falling on south facing vertical surfaces — particularly in the extended spring and autumn.

The buildings were planned with living areas to the south, and service areas to the north. Large areas of double glazing were incorporated in the south elevations to maximise solar gain. The dwellings also contain a 'sun space' to act as a solar collector. The living room is divided off with a glazed folding screen — this space also acts as a buffer against southerly winter gales.

The walls and roofs also form a glazed solar collector. Temperature differential fans are incorporated and warm air is fed by convection.

The dwellings are built with heavy structural elements — blockwork partitions, walls and concrete floors — and the living areas are dry lined. The flats have electric storage heaters and the houses have solid fuel. Insulation levels are those laid down in the Scottish Building Regulations.

Constructing the spaces within the building envelope is considered more economical than constructing an external sun porch. In addition, the sun space in the flats is also used as an entrance and circulating space and further reduces the additional costs of the solar energy system.

Preliminary computer modelling at the University of Strathclyde predicts a significant reduction in heating costs of the flats compared to similar flats without a sun space and stairwell collector. It is proposed to install a monitoring system to test exact savings although results will not be available until 1988.

Contact: Alan Holling, Assistant Director (Design), Department of Architectural Services, Western Isles Islands Councils, Sandwick Road, STORNOWAY PA87 2BW. Tel: 0851 3773

BRECSU

CASE 10

COLLYHURST VILLAGE — CITY OF MANCHESTER

Gas condensing boilers are more efficient as they extract heat from the waste gases created during combustion. This process means that water vapour in the waste gases is condensed (hence condensing boilers) and has to be ducted away.

Condensing boilers were fitted in twenty, four-bedroom houses completed at the end of 1984. The level of insulation in the houses was the same as those in the Halliwell Lane case study (Case 12). The performance of the boilers is being monitored by the University of Manchester Institute of Science and Technology (UMIST). They are being compared with standard cast-iron, gas fired boilers in ten otherwise identical houses.

Initial monitoring has shown that the standard boilers are 67% efficient, the condensing boilers 86% efficient. This means a payback period on the investment of between four and five years.

Maximum efficiency could have been achieved by using larger radiators and extra controls in order to optimise return water temperatures. This was not thought justified because the 2% increase in efficiency would have meant a payback period of eight to eleven years.

Contact: Ian Brewerton, City Architect's Department, Manchester City Council, PO Box 488, Town Hall, MANCHESTER M60 2JT.
Tel: 061 234 5000.

BRECSU

CASE 11

DRAYTON — VALE OF WHITE HORSE DISTRICT COUNCIL

Twenty one dwellings, ranging from single person flats to three bedroom houses are being built to current Building Regulations standards with the addition of double glazing. Gas condensing boilers (see Case 10) are being fitted. They will provide heat through a normal wet central heating system but should achieve an overall annual efficiency of 85% compared with a standard system efficiency of no more than 70%.

Predicted annual energy savings are 9-16 GJ. This should be worth £32-£58 a year to tenants. Payback period is estimated at five to six years.

Monitoring will establish energy savings, maintenance requirements, tenant comfort and possible environmental effects from the wider use of condensing boilers. Comparisons will be made on computer rather than with a control group of dwellings.

Contact: C Gorton, Vale of White Horse District Council, Abbey House, ABINGDON, Oxon OX14 3JE. Tel: 0235 20202

BRECSU

CASE 12

HALLIWELL LANE, CHEETHAM — CITY OF MANCHESTER

In 1980 the city approved the building of 15 low energy houses. The City Architect's Department was required to make significant energy savings using features which were not too expensive and which could easily be included in new buildings. Key features included:

- a simple shape with no projections
- small windows sufficient to provide good lighting and aspect
- 150mm loft insulation
- 100mm wall insulation
- 25mm ground floor insulation
- double glazing and draught stripping of doors and windows
- avoidance of 'cold bridges'
- central location of boiler and flue
- light weight concrete blocks for inner cavity walls and ground floor dividing walls
- temperature controls for each room
- self closing doors
- trickle ventilation
- limited mechanical ventilation in bathrooms and kitchens

Seven were heated by gas, four by electricity and four by solid fuel. For comparison twelve low energy and thirty three standard houses of a similar size were built by the same contractor in another part of the estate, but using traditional gas central heating. Energy use and temperatures were monitored in the low energy and the control houses for two years.

It was found that, on average, tenants of the low energy houses used 46% less energy in winter compared with those in the control dwellings. Tenants expressed satisfaction with the design, comfort and economy of their heating.

Estimated payback period — less than 5 years.

Contact: Ian Brewerton, City Architect's Department, Manchester City Council, PO Box 488, Town Hall, MANCHESTER M60 2JT. Tel: 061 234 5000

BRECSU

CASE 13

CROMARTIE ROAD, ISLINGTON — ISLINGTON COMMUNITY HOUSING COOPERATIVE

Architects asked to design twenty flats on a difficult corner site with a busy road to the north east turned these difficulties to their advantage. The flats are being built in a sequence of five, three and four storey blocks creating a south facing communal garden. All habitable rooms are south facing with large windows to maximise passive solar gain. North facing wincows are kept small.

Insulation includes 100mm in wall cavities, 140mm in roofs, double glazing, floor insulation and the avoidance of cold-bridging. A low energy heating system using a heat storage tank served by a balanced flue gas circulator also reduces heating costs.

Predictions indicate that the total annual energy demand should be about 15.7 GJ per flat. A similar building with standard insulation would require 30.9 GJ per flat. This represents savings of about £50 per year to the tenant with a gas bill for space heating of about £1 per week excluding standing charges. In addition overall construction costs should be almost £1,000 lower than a similar building constructed to current building regulations standards.

The important feature of the design is that the energy efficient measures have been incorporated at a slightly lower total capital cost than would be required if the flats had been built to current Building Regulations requirements.

Contact: Jane Blackburn, Islington Community Housing Co-operative, 89a Tollington Park, LONDON N4 3AG. Tel: 01 263 1176

BRECSU

CASE 14

PETERLOO COURT, SALFORD — IRWELL VALLEY HOUSING ASSOCIATION

Completed in December 1985, Peterloo Court is a sheltered housing scheme of 31 flats with a resident warden and community facilities. Energy saving features include:

- 200mm loft insulation
- 170mm cavity wall insulation
- 50mm floor insulation
- double glazing
- draught stripping

There are single gas convectors in each flat with a gas multi-point hot water heater. Tenants are expected to use only 30% of the energy needed to heat similar flats built to current building regulations standards.

Additional costs of energy saving measures — £309 per flat (2% on building costs). Predicted annual savings — 16GJ of gas (£58) per flat. Predicted payback period — 6 years.

Contact: Mike Barlow, Irwell Valley Housing Association, Brunswick House, Broad Street, SALFORD M6 5BZ. Tel: 061 737 6991

CASE 15

KEEFIELD — HARLOW DISTRICT COUNCIL

In July 1985 work began on a thirty unit development. Twenty eight of the dwellings had gas fired central heating but an all-electric heating system (plus a sophisticated ventilation system) was installed in two semi-detatched houses. These two were chosen because they could be compared with six other houses being built to the same design.

The electric heating system combines off-peak storage heaters with on-peak panel radiators. The heat recovery system uses extract ventilation via a cooker hood, inlets from other rooms and an exchanger capable of transferring 80% of the heat to the incoming air. A pre-heater is available to ensure that the incoming air reaches the desired room temperature.

Additional energy saving features include:

- 50mm of floor insulation ('U' Value 0.35)
- cavity insulation increased from 50mm to 100mm ('U' Value 0.31)
- roof insulation increased to 150mm ('U' Value 0.23)

Cost of supplying and installing heating and ventilation systems — estimated £2,460 per dwelling.

Annual heating costs — estimated at £115 a year.

The first residents moved in early in 1987. Temperatures and fuel use will be monitored and a detailed evaluation report drawn up later in 1987.

Contact: R. Fowler, Senior Architect, Harlow District Council, Terminus House, The High, HARLOW, Essex CM20 1UU. Tel: 0279 446611

BRECSU CASE 16

GIFFARD PARK, MILTON KEYNES — SOCIETY FOR CO-OPERATIVES DWELLINGS

Thirty six dwellings in four identical terraces were built on an attractive site next to the Grand Union Canal. Each terrace has three, 4 persons units, five, 2 person units and one, 1 person unit. All face south and are spaced to reduce winter over-shadowing. Living rooms are all on the south side. Other energy features include;

- floor insulation
- 75mm insulated cavities
- 140mm roof insulation
- double glazing or insulated roller blinds
- mechanical extractor fans in kitchens
- draught stripping to external doors and windows

High levels of insulation made central heating unnecessary so heating is by

gas convectors in the bedrooms and gas fires in the living rooms. Hot water is provided by instantaneous heaters or hot water cylinders.

The scheme was completed in 1984. Monitoring during 1984/85 showed energy savings close to the predicted 60%. Tenants in four person houses were paying annual heating bills of about £300. For two or one person flats bills were less than £200. The space heating part of these bills was less than 20%.

Some condensation did occur during the first year but this soon cleared up after the installation of mechanical fans in the bathrooms.

Additional building costs of energy features — £497 per dwelling. Estimated payback period — 8½ years.

Contact: The Secretary, Giffard Park Housing Co-operative, 50 Hainault Avenue, Giffard Park, MILTON KEYNES.

CASE 17

ROWHEATH SOLAR VILLAGE, BIRMINGHAM — BOURNVILLE VILLAGE TRUST

Forty two flats in a sheltered housing scheme form part of the Rowheath Solar Village. Funded by the Housing Corporation the scheme was chosen as a demonstration project by the European Commission and they are providing some of the capital and monitoring costs.

The building is planned around two courtyards. Most of the accommodation is in the three south facing wings with corridors on the north. The southernmost wing is single-storey to reduce shading.

The walls and roof are highly insulated. The south walls incorporate single glazed, direct gain windows and mass walls constructed with solid concrete blockwork and render. The walls incorporate a special, selective, surface with nickel coated foil covered by an obscure glass panel. This allows heat into the wall but reduces heat transmission out through the wall.

Internally the solid concrete blockwork walls retain heat. Summer relief vents and internal insulating shutters prevent heat radiation from the inner face of the wall in daytime and the shutter insulates the window at night. Temperatures can also be reduced by movable shading which will operate on a seasonal basis.

A communal gas boiler provides heat. A control system relates heating to outside temperatures and solar radiation. Each flat has a sensor which only demands heat when necessary.

A Strathclyde University computer simulation model predicts annual fuel consumption of 2,100 kWh compared to 6,200 for a similar building constructed to Building Regulations standards.

Estimated additional costs are £1,500 per dwelling and pay back will be within ten years.

Contact: Alan Shrimpton, Chief Estates Officer, Estates Office, Bournville Village Trust, Oak Tree Lane, BIRMINGHAM B30 1UB
Tel: 021 472 3831

CASE 18

SHENLEY LODGE 1 & 1A — MILTON KEYNES DEVELOPMENT CORPORATION

The first houses in this complex were completed as part of the 1986 Milton Keynes Energy World Exhibition. The 53 shared ownership flats and houses, plus five bungalows for elderly people, have energy saving features including:

- 150mm of loft insulation ('U' value 0.25)
- cavity insulation ('U' value 0.39)
- 50mm underfloor insulation, plus a damp proof membrane ('U' value 0.45)
- thermostatic radiator valves
- double glazing and draught stripping
- small north facing and large south facing windows some of which open into conservatories
- solar control blinds
- mixer taps in the bathroom with shower attachments to conserve water
- long life, low energy lighting
- strategic landscaping and planting to provide shelter from cold winds
- pre-heated air drawn through the house from the conservatory

The use of trickle ventilators and the means of drawing pre-heated air through the ventilation system (airbricks from the outside combined with internal air ducts from the ceiling into the roof ducts) also means that condensation is avoided. Some kitchens and bathrooms have extractor fans.

With high levels of insulation the costs of the heating system were reduced. A smaller boiler could be used and smaller radiators were fitted and positioned on internal walls rather than beneath windows thus reducing the circulation pipework from the boiler. The savings and other features within the overall design of the scheme and individual houses meant that it was possible to incorporate the energy efficiency features within current cost controls.

Savings on the annual running costs are estimated to be between 20% and 25% over housing built to current Building Regulations standards.

Contact: Stewart McPherson, Milton Keynes Development Corporation, Building Directorate, Lloyds Court, 671 Silbury Boulevard, Secklow Gate West, CENTRAL MILTON KEYNES, MK9 3EB. Tel: 0908 691220

REFURBISHMENT

BRECSU

CASE 19

HEATHFIELD HOUSING ACTION AREA — CITY OF BIRMINGHAM

Standard improvements to houses under Birmingham's "enveloping" scheme included replacing windows and external doors, re-roofing, re-building chimneys, re-pointing and external re-painting and the fitting of 100mm loft insulation. This package cost £8,400 per property.

In the Heathfield HAA pre-1919 dwellings have been enveloped under four major contracts. In the 1983 contract twenty essentially similar houses were chosen in which extra energy saving features were incorporated.

- a further 100mm loft insulation
- double glazing
- draught proofing of windows, doors, suspended floors and loft hatches
- an additional 75mm of insulation to the hot water tank
- wind-up immersion heater time control

Ten other houses received the standard enveloping package and acted as a control sample.

Cost of additional measures — £928. Occupiers are now saving 22% on space heating bills.

Contact: Ken Gething, Urban Renewal Architect, City of Birmingham Urban Renewal Division, Environmental Services Department, 120 Edmund Street. BIRMINGHAM B3 2EZ. Tel: 021 235 4667

BRECSU

CASE 20

REHABILITATION — MERSEYSIDE IMPROVED HOUSES

Not all tenants in MIH's 11,000 dwellings can afford to make full use of their central heating. The housing association is therefore improving the energy efficiency of its older, inner city terraces.

Initially twenty three test houses have been insulated to a higher standard. The measures, costing about £1,000 a dwelling comprise:

- Internal wall insulation
- double glazing to ground floor windows except kitchens
- trickle ventilation to all windows
- draught stripping of all windows and external doors
- 150mm loft insulation
- kitchen extractor fans with humidistats

Monitoring since October 1985 shows tenants are not only more comfortable but saving an average of £93 a year compared with tenants in similar houses which lack the extra insulation.

Many MIH tenants were found not to understand their heating systems. They were not using them properly and were wasting energy as a result. Association staff are therefore visiting a number of tenants in the improved houses to give advice. They are also monitoring whether such regular advice helps save energy.

Contact: S J Porter, Area Director, Merseyside Improved Houses, 25 County Road, Walton, LIVERPOOL L4 3QA. Tel: 051 523 9192

CASE 21

BERNARD STREET — CITY OF GLASGOW

Severe damp, mould, discomfort and escalating fuel bills are common on this deck access estate of over 500 flats. The deck access walkways have caused cold-bridging to bedroom floors and ceilings and led to water penetration.

A user-controlled, community technical aid group, Technical Services Agency Ltd, was called in by the local residents' association. They conducted a survey and recommended that the problem be tackled by:

- cavity insulation
- 100mm insulation of top floor ceilings
- 100mm insulation of ground floor living rooms
- installation of humidistat fans in kitchens and bathrooms to expel moist air
- double glazed units inserted into existing frames
- draught stripping of windows
- storage heaters mounted on internal brick walls (the walls will store heat and even out temperature fluctuations)
- thermostats and fans linked with a weather sensor to increase and maintain an even, whole house temperature
- glazing the deck access openings, forming sun buffer zones, to reduce heat loss and allow pre-warmed ventilation air to be drawn into the flats

A pilot scheme, funded by Glasgow City Council, was then carried out on two maisonettes at a cost of approximately £5,000 a unit. Monitoring is now complete and preliminary results are showing fuel cost savings for tenants of between £5 and £15 per winter week.

A full monitoring report is available. Price £10.00.

Contact: Stirling Howieson, Project Architect, Technical Services Agency Ltd, Community Technical Aid, 21 Duke Street, GLASGOW G4 OUL.
Tel: 041 552 8557

CASE 22

LEA VIEW HOUSE — LONDON BOROUGH OF HACKNEY

Built in 1939, the 300 flat, five-storey blocks had, by 1980, become run down. Tenants were frustrated at the appalling condensation, lack of central heating, absence of a lift, the estate's oppressive appearance and the old fashioned facilities. Social friction was generated by large families and single elderly tenants sharing common staircases accessible to intruders. The damp caused severe problems of arthritis and bronchitis amongst elderly residents.

A comprehensive refurbishment programme was devised by consultant architects (costing £6.5m), with full tenant participation, incorporating a variety of energy saving measures including:

- internal dry lining of north facing walls
- central heating with thermostatic radiator valves

- floor insulation
- 150mm roof insulation
- double glazing of north facing windows (south facing windows were left single glazed to be passively solar heated)
- draught stripping
- reflective foil behind radiators

Solar water heating was installed in south facing maisonettes. A third tap in kitchens and bathrooms provides water pre-heated by the sun. Tenants can save 30% on their water heating costs by using the solar heated water.

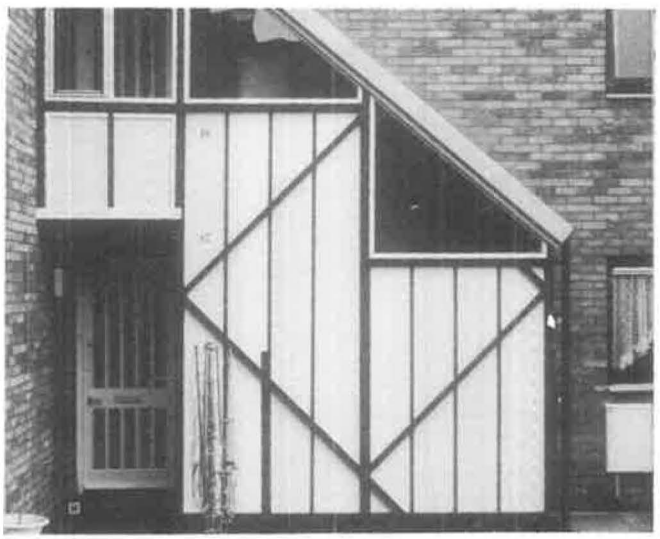
Gentle 24-hour air extraction in the kitchens and bathrooms has helped eradicate condensation.

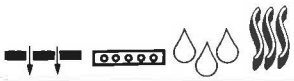
A tenant survey, a computer energy audit and the study of two season's fuel bills by the London Energy and Employment Network (LEEN) show a reduction in bills of about 50% although 90% of tenants said they were more comfortable. Condensation has been virtually eliminated and it is estimated that when the whole estate is refurbished there will be a 56% annual saving in the primary energy used.

Energy improvements worked out at 6.8% of total rehabilitation costs for two-bed flats and 4.6% for larger flats. Payback is 3½-4½ years depending on the size of the flat.

The scheme was the subject of a detailed report by LEEN (see bibliography).

Contact: Richard Buckwell, Lea View House Co-ordinator, Springfield Area Base, 186 Upper Clapton Road, Hackney, LONDON E5. Tel: 01 809 1234





CASE 23

SHERBORNE CLOSE — CITY OF HEREFORD

In 1984 Hereford Council took over 78 flats in 2, two-storey blocks, built for a housing association in the mid-1970s. The one, two and three bedroom flats had concrete floors and concrete tile roofs. They suffered from chronic condensation and mould growth and were cold. The inadequate and expensive radiant ceiling heating system had been abandoned by tenants who instead used moisture producing bottled gas or paraffin heaters. The deterioration of the fabric added to these problems to such an extent that closing orders were served on two of the flats — which was when the City Council stepped in.

Consultant architects were employed and they recommended:

- increasing ventilation to about two air changes per hour; by installing trickle ventilators in the heads of all opening windows; extractor fans in kitchens and bathrooms operated by humidistats; and air bricks.
- replacing the ceiling heating by gas central heating
- providing gas fires in each lounge using fan assisted horizontal flues. This avoids the expense and disruption of running vertical flues through another flat as well as allowing gas fires to be fitted on internal walls (see Case 34)
- floor insulation and additional roof insulation
- replacing the existing cavity wall insulation

These recommendations were implemented as part of a comprehensive rehabilitation project and the work was completed in March 1986 at a cost of £580,000. Fuel bills have been cut from £150 a quarter (1983 prices) to £40-60 (1986 prices). Condensation has been totally eradicated.

The waiting list for transfers from the flats has fallen from 50% to 5%. There is now a waiting list for tenancies and the Council has received its first right-to-buy application.

Contact: Stuart Gent, Department of Housing, Hereford City Council, Garrick House, Widemarsh Street, HEREFORD HR4 9EU. Tel: 0432 268121

HEATING EQUIPMENT

CASE 24

BACTON, WENDLING AND ST. SILAS ESTATES — LONDON BOROUGH OF CAMDEN

The 477 flats on the Bacton Estate, 230 on Wendling and 789 on St Silas were heated by inefficient and expensive, oil-fired, communal heating boilers (rated at 13.5 million, 12 million and 36 million BTU/HR). The Wendling boiler also provides heat for a day nursery and health centre and the St Silas boiler heats an OAP home, day centre and six shops.

It was decided to replace the existing burners with modern, microprocessor based, pressure jet burners. These adjust themselves automatically to produce constant efficiency of over 80%. Yet, as the boiler load diminishes, boiler efficiency is not affected.

Cost in 1984 — £58,400. Fuel savings — £43,000 in the first year. Payback period 1.36 years.

Contact: Tom McMahon, Senior Energy Conservation Officer, London Borough of Camden, Old Town Hall, 197 High Holborn, LONDON WC1V 7BG. Tel: 01 405 3411

CASE 25

EVELYN AND MILTON COURT ESTATES, DEPTFORD — LONDON BOROUGH OF LEWISHAM

The estates were built between 1969 and 1973 using a pre-cast concrete panel system and comprise 12 high rise and 57 low rise blocks. Space heating in the high rise dwellings was provided by ducted, off-peak, electric fan assisted units. Hot water was supplied from a 40 gallon cylinder with a single kw immersion using off-peak electricity.

Following completion many problems were experienced on the estate. In the high rise blocks this included a high incidence of condensation and resulting damage to decoration by mould growth. A contributory factor was tenant dissatisfaction with the high running costs of the heating systems, resulting in the greater use of paraffin and bottled gas heaters.

In upgrading the heating the Council could leave heating under the full control of tenants or bring it under landlord control. With individual tenant control there would be no guarantee that heating systems would be used any more than the existing installations. Condensation and mould could not then be eliminated.

The Council decided to bring the system under landlord control by installing the Electricity Board's Cyclocontrol system. In this system remote weather sensing equipment controls storage heaters and is designed to anticipate daytime heating needs on the basis of overnight temperatures. Transmitters in the electricity transformer chamber send signals to each dwelling, and the necessary charge is supplied at the off-peak tariff.

There has since been a reduction in condensation problems and tenants in other blocks are now requesting the controls.

Current (April 1987) weekly charges for space and water heating are £3.31 for one bedroom flats and £3.32 for two bedroom flats.

Contact: Mike Connelly, Chief Mechanical Engineer, Architect's Department, London Borough of Lewisham, Capital House, 47 Rushey Green, LONDON SE6 4BA. Tel: 01 697 8111

BRECSU

CASE 26

ST CLEMENTS COURT, IRLAM — ANCHOR HOUSING ASSOCIATION

This sheltered housing scheme has 31 one and two-bedroom flats. It was originally built with two gas boilers and two storage calorifiers. In summer, although one boiler was turned off, the other, used solely for hot water, operated very inefficiently. Even in winter the maximum heat cemand was well below the optimum output of the boilers.

In 1984 the heating and domestic hot water loads were separated by replacing the existing plant by two smaller (73kW) space heating boilers and two gas fired low capacity boilers (17.6kW) for hot water.

St Clement's and an adjacent block, Holly Court, which retained its original heating plant were monitored. The original plant proved costlier and noisier and required more maintenance.

Cost — £7,000. Payback period estimated as 6.2 years, from the 14% fuel savings so far achieved.

In a new BRESCU project, the plant in Holly Court has been replaced in a similar manner, but using condensing boilers for the space heating.

Contact: David Fox, Anchor Housing Association, 13-15 Magdalen Street, OXFORD OX1 3BP. Tel: 0865 722261

CASE 27

ST. LEONARDS COURT — CITY OF LEICESTER

St. Leonards Court is a late 1960s ten-storey tower block with thirty flats and a penthouse. Sited on the edge of the city it has eight foot high floor-to-ceiling windows which provide beautiful views. Unfortunately they let in the cold which the expensive underfloor heating was incapable of combatting. Indeed tenants were losing 50% of their heat through the glass.

The Council therefore proposed to install new electric heating. Tenant resistance to electric heating — based on the reputation from the 1960s of bulky and expensive storage heaters — was overcome by illustrating the estimated running costs of the new system. Storage heaters — running on cheaper, off-peak, rate electricity — were installed in halls and lounges, with fan heaters in bathrooms and kitchens and panel radiators in bedrooms.

Tenants are delighted and, despite needing to 'top-up' the heating in the evening with an electric fire, have found running costs down by a third.

One unfortunate by-product has been increased condensation on the windows. Water runs off and forms pools on the floor. Tenants are now campaigning for wall insulation and secondary glazing to stop the condensation as well as cutting out draughts and street noise.

Contact: Alan Methven, Housing Department, Leicester City Council, New Walk Centre, Welford Place, LEICESTER LE1 6ZG. Tel: 0533 549922

CASE 28

OCEAN ESTATE — TOWER HAMLETS

These three, ten- storey tower blocks were built in the late 1960s using a large concrete panel system. Tenants found their flats were cold and suffered from condensation. A repair and improvement package was devised by the former Greater London Council and was implemented by the Central Technical Unit run by a group of London Boroughs.

Improvements included;

- re-covering and insulating roofs
- double glazing
- central heating
- kitchen and bathroom ventilation fans
- a fire and smoke containment system

Critical to the success of the scheme is a gas central heating system with Owner Based Resident Adjustable Control (OBRAC). The boilers are housed in a new detached boiler house. The system maintains a background temperature in all the flats of about 10°C (50°F) in order to overcome condensation. Tenants can then override the thermostat to provide higher temperatures. Controls also allow tenants to programme room and hot water heating.

The system is computer controlled and meters can be read centrally. Faults and other unusual situations in individual flats can also be detected centrally.

Tenants pay a flat rate of £1 per week included in their rent to cover the background heating costs and a further £5-£6 per week for their own needs.

The total cost of the scheme was just over £1m. Fuel savings are predicted to be 20-25% compared with conventional pool charging.

The first tenants moved back in November 1986.

Contact: Mike Prince, Central Technical Unit, Vauxhall Cross, 95-97 Wandsworth Road, LONDON SW8 1SB. Tel: 01 735 1266

BRECSU

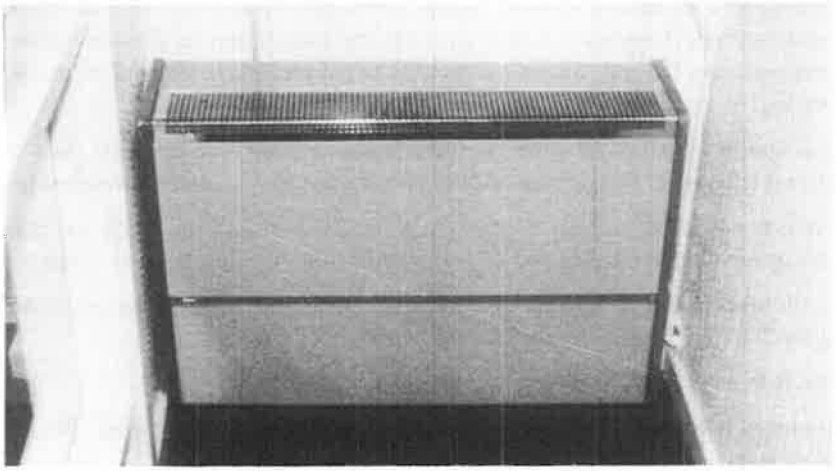
CASE 29

COLLYHURST STREET — CITY OF MANCHESTER

In December 1984, twenty houses were completed, eighteen with identical orientation. Ten were heated by just two gas wall heaters. One of these heats the ground floor, while the second heater, located in the hall, heats the first floor by natural convection via the stairwell, and incorporates a circulator to heat the domestic hot water. The other ten houses have conventional heating systems.

Although the system sounds like the ill-fated partial central heating schemes of the 1960's, these homes have far higher levels of floor, wall and roof insulation. There are also draught lobbies, low ventilation rates and heating controls.

The houses cost £850 less than Manchester's standard housing as the capital costs of the heating systems are reduced by 50%. A Department of Energy grant is paying for a sophisticated monitoring scheme. At the end of the first



year it was clear that mean weekly fuel consumption was considerably lower in the 'wall heater' houses than in ten structurally identical homes fitted with a conventional gas central heating system.

Architects are currently examining the relationship between fuel consumption and internal temperatures and a detailed study of the tenants' reactions to their homes and their heating systems will be completed in 1987.

Contact: Ian Brewerton, City Architect's Department, Manchester City Council, PO Box 488, Town Hall, MANCHESTER, M60 2JT
Tel: 061 234 5000

CASE 30

SHELTERED HOUSING — WATFORD BOROUGH COUNCIL

An energy conservation study was carried out on eight blocks of warden-supervised flats (254 in all) for elderly people built since the late 1960s. All had centralised gas fired boilers. Monitoring, as well as discussions with wardens and maintenance staff, showed that the heating systems took up to five hours to respond to changes in the outside temperature. Demand for hot water was also substantially less than the system was designed for.

Improvements were made including:

- cavity insulation
- weather stripping doors and windows
- separation of hot water and heating services
- removal of hot water calorifiers and the installation of direct gas fired water storage heaters
- installation of hot water control panels monitoring temperatures
- design and installation of purpose built control panels for central heating incorporating a unique combination of central elements designed to provide rapid response to outside air temperatures
- standardisation of circulating pumps
- installation of water meters.

Before the works were fully implemented there was extensive consultation with housing welfare officers. Each warden attended regular liaison meetings. Maintenance staff were consulted on proposed changes.

Simple report forms have been introduced for use by the wardens and maintenance staff to ensure recording and monitoring of all resident's queries and observations.

Costs £52,500. Savings £27,010 (1984 prices). Payback pericd 1.94 years. Reduction in tenants energy bills — 35%.

Contact: Malcolm Barlow, Technical Services Department, Watford Borough Council, Local Board Road, WATFORD WD1 2JP. Tel: 0923-28278

CASE 31

WESTFIELD COURT — CITY OF EDINGURGH

Built between 1946 and 1950, this block of flats consists of 88 two and four roomed flats and a children's nursery. The original central coal-fired boiler for hot water and space heating distributed heat unfairly as the system was designed to serve a second phase which was never built.

Control of the system rested with the boiler attendant who tried to balance the flow temperature against the external conditions and tenants' needs. Unfortunately the system could not cope and was slow to respond to changing weather conditions.

- modification of the distribution pipe work to create three separate circuits to provide a more suitable and equal distribution of heat
- Installation of an outside compensator and blended flow thermostat to vary the temperature of the heating water with outside weather conditions.
- Insulation of the pipework to minimise heat loss.

It is hoped to show fuel savings of 30% and already one initial indication of the success of these modifications is a one third reduction in the amount of ash produced (and, presumably of the coal burned).

Contact: J Armstrong, Senior Services Engineer, City Housing Department, City of Edinburgh District Council, 23-25 Waterloo Place, EDINBURGH EH1 3BH. Tel: 031-225-2424

CASE 32

CHURCHILL MANSIONS, RUNCORN — HALTON BOROUGH COUNCIL

Churchill Mansions, Halton's only tower block, is an eleven storey block built in the 1960s to Parker Morris standards in an exposed position overlooking the Mersey estuary. It has 22 one-bedroom and 22 two-bedroom flats.

Over the years the tenants, many of them elderly, have pressed for higher standards of heating. The original underfloor heating system, designed to give background heating, was being run for twelve hours a day, precluding the use of cheaper off-peak electricity.

Running costs were borne centrally by the Council and tenants paid a heating charge. Escalating energy costs in the '70s meant that the Council was eventually forced to subsidise the tenants. By 1985 this had reached £5,000 a year but tenants were still paying £9 a week in one-bedroom flats and £10.40 in two bedroom flats. In addition they also paid £2-£6 a week direct to the Electricity Board for hot water and cooking.

Churchill Mansions has an active Tenants Association and so, from the start, tenants participated in discussion on ways of tackling the problems both through the Association and individually.

In the autumn of 1985, after alternatives had been piloted, the Council installed storage heaters using off-peak electricity and added extra controls to the water heating systems. As the windows were going to have to be replaced it was decided to fit double glazed UPVC windows, because of the exposed site, at an extra cost of £13,800. It was estimated that this would further reduce running costs by around 20% as windows represent 50-55% of the wall area.

Since the completion of the scheme there has been a 16% drop in electricity consumption in the block. Tenants fuel bills have been reduced by between £5 and £8.50 a week. The Council has also been able to withdraw its subsidy and it no longer has the administrative cost of collecting heating charges.

Total cost was £48,600. total savings are some £14,500 a year of which about £4,000 is estimated to come from the double glazing. Simple payback period — 3.3 years.

Contact. A J Barratt, Administrator and Coordinator, Environmental Department, Halton Borough Council, Town Hall, Heath Road, RUNCORN WA7 5TD. Tel: 051-424-2161

CASE 33

BEACON RISE, CHUMLEIGH — NORTH DEVON DISTRICT COUNCIL

Since 1931 the Council have upgraded more than 500 dwellings for elderly people. Typical are the ten one-bedroom and four two-bedroom bungalows at Beacon Rise, built twenty five years previously and modernised in 1985/86. They had only an open fire for heating. Hot water was supplied by a back boiler or by an immersion heater operating on normal domestic rate electricity.

Improvements included:

- storage heaters in the lounge, hall and bedroom;
- thermostatically controlled panel heater in the second bedroom;
- infra-red wall heater in the bathroom;
- wall-mounted downflow fan heater in the kitchen;
- second immersion heater element to use off-peak electr city;
- cavity insulation

Tenants can now keep their bungalows warm in winter and they are no longer faced with large bills for solid fuel of up to £300 a year. Total electricity bills over the first twelve months remained much the same as the previous year, an average £5.50 per week per bungalow. Damp patches caused by condensation have also been eliminated and long term maintenance requirements have been reduced.

Total cost — around £850 per dwelling. Savings of £300 on solid fuel mean that the simple payback period is 2.8 years.

Contact; D G Smith, Assistant Director of Services (Development), North Devon District Council, Civic Centre, BARNSTAFLE, Devon EX31 1EA. Tel: 0271 72511

CASE 34

INDIVIDUAL GAS FIRES — WYRE FOREST DISTRICT COUNCIL

Operating the full central heating system just to provide background heat on a cool evening can be a very inefficient use of fuel. An individual fire is more economical. But if you are using gas that may be difficult if there is no chimney (or the chimney is unsuitable) or if there is no appropriate external wall where a balanced flue can be used.

Wyre Forest had this problem. Over 1,000 homes were being provided with a low cost four-radiator gas-fired central heating system. The package included an individual gas fire in the living room. Some dwellings did not have a chimney, so special flues were fitted to duct the exhaust gases outside. Fires could then be fitted to internal walls. The flues have a fan fitted near the discharge point which pulls rather than pushes out the exhaust gases. Their use has the added advantage of helping to minimise the risks of condensation.

The flues, developed by the manufacturers in conjunction with British Gas, incorporate a flow sensor which monitors the air flow in the duct. Only if the flow is sufficient can the gas reach the fire. If the air flow falls below the required level the safety valves will automatically turn off the fire.

Cost of package — from £1,100. Average Running Cost — £4 a week.

Contact: R Brookes, Head of Building Services, Department of Housing and Environmental Health Services, Wyre Forest District Council, Oxford House, Oxford Street, KIDDERMINSTER DY10 1BQ. Tel: 0562-820505.

CASE 35

BLACKSMITHS HILL, BENINGTON, STEVENAGE — EAST HERTFORDSHIRE DISTRICT COUNCIL

Twenty two one- and two- bedroom flats were occupied mainly by elderly residents who were visited by the Council's mobile warden service. Electric ceiling heating was expensive and so the energy efficiency of the properties was improved by;

- draught stripping external windows and doors
- cavity insulation
- loft insulation
- extractor fans controlled by humidistats in kitchens and bathrooms

A new heating system was installed in 1985 at a cost of £685 per flat. It consists of storage radiators, panel heaters in the living and sleeping areas and quick response fan heaters in kitchens and bathrooms all using off-peak electricity. New hot water cylinders with provision for heating at off-peak periods were installed. The system will provide temperatures averaging 20°C.

Total cost — £18,800. Running costs in eight flats monitored over 12 months were £300 compared with previous costs of £480-£530. Estimated payback period — 3.5 years.

Contact: Roy Pope, Chief Housing Officer (Technical), East Hertfordshire District Council, PO Box 103, Wallfields, Pegs Lane, HERTFORD SG13 8EQ. Tel: 0279 55261.

CASE 36

TORRINGTON GARDENS, THINGWALL — WIRRAL METROPOLITAN BOROUGH COUNCIL

Tenants of the 84 flats in these 7, four-storey blocks complained to the council about their cold homes. After extensive tenant consultation and the refurbishment of a show flat, work on the whole estate began in December, 1985 at a cost of £85,766.

Storage heaters were installed which are switched on and off by a Cyclocontrol system which responds to outside temperatures. The heaters then provide a constant background temperature of 21°C (70°F). The controller also operates the existing immersion heaters. Tenants are able to override the controls to increase heating levels.

Other energy saving measures carried out included cavity and loft insulation and draught stripping.

At the end of the first year, running costs are between £100 and £250 a year and the tenants are delighted with both the warmth and savings on their fuel bills.

Contact: R J Agass, Director of Housing and Environmental Health, Wirral Metropolitan Borough Council, The Municipal Offices, Westminster House, Hamilton Street, BIRKENHEAD, L41 5FN. Tel: 051 647 2320

EXTERNAL INSULATION

BRECSU

CASE 37

WOOLAWAY HOMES — TEWKESBURY BOROUGH COUNCIL

Upon local government reorganisation Tewkesbury Borough Council inherited about 1,100 system built houses. These included Woo away Houses (PRC houses subsequently designated under the Housing Defects Act, now the 1985 Housing Act). Very bad condensation and high fuel bills were major problems in the Woolaways.

In 1979/80 a pilot scheme was carried out to find the best solution to these problems which were caused by inadequate insulation. As a result of the study the Council decided in 1981 to apply external insulation to 58 houses, 20 of which also had gas central heating installed for the first time.

The insulation successfully cut fuel consumption, reduced condensation and improved comfort. It also improved the appearance of the houses, and tenants were able to remain in occupation during the building works.

There was some cracking of the surface render but satisfactory remedial works were completed. This does however emphasise that thermal movement of the external surfaces can be high and finishes must be capable of responding to this.

The result for those houses with both wall insulation and central heating was a reduction in space heating expenditure of 31%. Allowing for the increase in average temperatures experienced by the tenants raises this figure to 64%.

Contact: Peter Eccleshare, Borough Technical Officer, Tewkesbury Borough Council, Council Offices, Gloucester Road, TEWKESBURY GL20 5TT.
Tel: 0684 295010

BRECSU

CASE 38

EASTCOTE LANE ESTATE — LONDON BOROUGH OF HARROW

The 106 houses on this 1920's estate have solid brick walls. External insulation was added and rendered. Partial gas central heating was also installed with radiators downstairs. The external insulation reduced heat loss sufficiently to allow upstairs to be heated by the downstairs radiators.

The £200 savings from the smaller heating system partially offset the £1,389 cost of insulation.

Annual savings of £62 a dwelling on fuel bills have been established, from the monitoring exercise. The estimated payback period, at 1986 prices, is 19 years, without accounting for benefits of improved comfort and reduced condensation.

Contact: A J Eavis, Department of Architecture and Planning, London Borough of Harrow, Civic Centre, PO Box 39, HARROW, HA1 2XA. Tel: 01 863 5611

CASE 39

BARTON ESTATE — CITY OF OXFORD

Howard houses are post-war steel frame dwellings of which Oxford have 270. Following a pilot scheme on two houses in the summer of 1985 work began at the end of the year on 122 houses on the Barton Estate. The houses were almost completely stripped of their existing cement and asbestos cladding. This was replaced with load bearing insulated panels which also provide a degree of fire resistance and sound proofing. The work required only minimal modifications to the existing structure.

Tenants were consulted throughout the project (which was completed without tenants moving out) and were given a choice of finish to the render.

The external insulation work (which cost £8,200 a house) gives the walls a U-Value of 0.47 and should also give the properties a minimum of thirty years additional life. Other works include replacement of roofs, windows and doors and internal upgrading which bring the total cost of improvements to £13,500 per house. Demolition and rebuilding would have been more disruptive to tenants and would have cost £20,000 a unit.

Contact: Graham Watton, Chief Surveyor, Oxford City Council, St. Aldgate's, OXFORD. Tel: 0865 249811

CASE 40

RAINSCREENING TOWER BLOCKS — CITY OF GLASGOW

Rain penetration and dampness in Bison Wall Frame blocks were causing concern. Detailed structural surveys also revealed some serious structural weaknesses in the fixing arrangements of the precast aggregate panels. The Council therefore decided to repin and reclad the gables of three 23 storey blocks at Woodside, and nine blocks at Pollokshaws.

50mm of polystyrene insulation was fixed to the existing concrete. Decorative cladding panels were then rivetted to vertical aluminium rails. A 50mm airgap was left between the back of the new panels and the face of the insulation to allow air movements via vents at the bottom and louvres at the top to dry out existing dampness and any moisture that might penetrate the new rain skin.

At Woodside the grey blocks were tranformed by creating a mosaic of light blue, dark blue and bright red.

The work at Woodside was carried out in 1984 and cost £530,000 (£128 per square metre). The Pollokshaws blocks were reclad in 1985 and cost £1,380,000 (£130 per square metre).

Contact: R Scobie, Senior Depute Director of Architecture & Related Services, City of Glasgow District Council, 20 Trongate, GLASGOW G1 5EY.
Tel: 041 227 5213

WESTGATE HILL — CITY OF NEWCASTLE

enants in 360 flats in these three, 20-storey blocks had to live with draughts, severe cold and soaring fuel bills from an obsolete, underfloor electric heating system. To combat this:

- external walls were dry lined with 2" of insulation. This included walls adjacent to the communal staircase
- secondary glazing was fitted in living rooms
- windows were overhauled
- tenants were given the option to have one single glazed, steel framed balcony door blocked in and the other draught sealed
- to provide temperatures of 70°F in the living room, 65°F in kitchen and bathroom and 60°F in bedrooms two storage heaters were installed in the living room and one in each bedroom
- for reasons of space tenants were offered a choice of a storage heater or an infra-red overhead heater in the kitchen
- an infra-red overhead heater was fitted in the bathroom
- electricity meters were converted to the off-peak 'Economy 7' tariff
- existing hot water cylinders were re-insulated and two heating elements fitted to allow for the use of off-peak electricity
- tenants can heat more hot water during the day if necessary using a control which incorporates a timer. This cuts out the heating after two hours and stops tenants incurring costs unnecessarily by leaving the water heater on at peak rates

Costs (at 1987 prices) — insulation £1,300 and electrical works £1,000 per flat. Average savings on electricity bills in 1983/84 (compared with 1980/81) were £90 a year in the two bedroom flats and £54 in one bedroom flats.

Contact: Chris Mills, City Housing Department, Newcastle City Council, Civic Centre, NEWCASTLE-UPON-TYNE NE1 8PR. Tel: 091 232 8520 Ext 5732

CASE 42

PARSONS HOUSE — CITY OF WESTMINSTER

Parsons House is a 22 storey, late 1960s tower block. It was constructed with an in-situ concrete frame infilled with cavity brickwork, untreated softwood frame windows and spandrel panel units. A decision to refurbish it was taken after a survey of the external structure and the windows revealed multiple defects. The architects appointed to carry out the works recommended overcladding with aluminium panels and double glazed windows. The cladding was hung on vertical aluminium rails which double as supports for the maintenance cradle.

The rainscreen formed by the panels leaves a cavity which was then partially filled with insulating material which is waterproof but vapour permeable. At the same time the boiler plant and heating equipment was updated. Radiators were resized and the control system modified to match the conditions in the improved construction.

During the year of building works a Tenant Liaison Officer was involved on the site as the tenants remained in occupation during the work.

Total cost of overcladding was £220/m^2. It was anticipated that the cost of providing heating and hot water could be halved. The scheme has been operational since autumn 1986 and the results so far have fulfilled the Council's expectations.

Tenants have indicated that internal temperatures are adequate and that they are making savings in their fuel bills.

Contact: R A Michelmore, Assistant Director of Property Services. (Architectural Services), Westminster City Council, Westminster City Hall, Victoria Street, LONDON SW1E 6QP. Tel: 01 828 8070

CASE 43

AIREDALE ESTATE — WAKEFIELD METROPOLITAN CITY COUNCIL

Rigid 35mm external insulation board was fixed to the walls of 184 'Spooner' houses. This was made necessary because external metal cladding at first floor level had deteriorated. A sand and cement render with Canterbury Spa chippings was applied to the upper floor exterior on about half the houses while the others were finished in a special shiplap cladding.

The work took fourteen weeks at a cost of £1,100 per dwelling (1983 prices). Condensation has been eliminated, a further twenty five years has been added to the life of the houses and it is anticipated that tenants will save up to 18% on their fuel bills.

Contact: John Smith, Assistant Chief Housing Officer, City of Wakefield, Civic Centre, CASTLEFORD WF10 4JH. Tel: 0977 556555

CASE 44

MAERDY — RHONDDA BOROUGH COUNCIL

The external rendering of 72 houses at Tan Y Bryn and Wilson Place was spalling because of the exposed location of the sites. External brickwork was also deteriorating to such an extent that the bricks were breaking up and coming away with the external render. To hack off and re-render was not considered a practical proposition.

It was decided to apply external cladding, fixed through the existing render into the brickwork, after the removal or repair of any loose material. The extra cost of insulated rather than non-insulated cladding was marginal and considered worthwhile. The system used consisted of 50mm extruded polystyrene board held in place by a galvanised steel mesh fixed with polypropylene anchors. This was rendered with a waterproof pre-mixed render, and spar dashed.

The total cost of the scheme was £566,000 ie. £7,860 a house. This included new windows and doors and door frames and repairs to roofs and rainwater goods. The additional cost of using insulated cladding was approximately £1,500 a property. Reduced tenant fuel bills will mean an estimated payback period on the additional investment of 11 years for solid fuel heating, 16 for gas, 15 for electricity and 23 for partial electric heating.

The schemes, completed in 1984, appear to be successful. The majority of tenants report higher temperatures and improved comfort within the properties. Dampness has been eliminated and condensation reduced. The appearance of the properties has been substantially improved.

In 1987/88 the Council is embarking on schemes to externally insulate 134 houses at Highfield, Ferndale and Penygraig at a cost of £700,000. The properties have solid walls and suffer from damp penetration.

A major external insulation scheme is also proposed for the 950 houses on the 1960s Penrhys estate and a pilot scheme will be started in 1987.

Contact: Mr Viv McKelvay, Technical Services Department, Rhondda Borough Council, Bronwydd, PORTH, Mid Glamorgan, CF39 9DL.
Tel: 0443-682944

CASE 45

HARLOW GREEN AND ALLERDENE ESTATES — GATESHEAD METROPOLITAN BOROUGH COUNCIL

Piecemeal repairs on these six multi-storey blocks, built between 1969 and 1971, failed to stop water penetration through cracks in the concrete walls and around infill panels and window sashes, as well as condensation from cold-bridging. Despite these shortcomings, the communal areas and lifts were well treated by residents and there was no vandalism.

On-peak, thermostatically controlled, electric ceiling heating heated living rooms, kitchens and circulation space. Bedrooms and bathrooms were not heated.

In August 1983, the council started on the first phase of a £2.8m refurbishment with tenants still in residence. Improvements included:

- overcladding with a weatherproof skin of aluminium and brick, held in place with stainless steel angles and ties (careful attention was paid to the visual aspects). The overcladding is estimated to extend the buildings' life by at least 30 years.
- insulation in the new cavity including breather membranes to reduce the risk of interstitial condensation
- extra roof insulation, with a new waterproof membrane
- existing double glazed timber windows resealed where required
- draughtproof brush strips added to all the casement windows
- installation of trickle ventilators
- a new heating system including:-

— electric storage radiators in living room and hallways
  — thermostatically and time switch controlled panel radiators in the bedrooms
  — an infra red heater in the bathroom
  — retention of ceiling heating in the kitchen as no wall space was available
  — immersion heaters in a well insulated tank using off-peak electricity.

The final phase of improvements was completed in April 1986.

Contact: D C Purkiss, Department of Architectural Services, Gateshead Metropolitan Borough Council, Civic Centre, GATESHEAD NE8 1HH. Tel: 091 477 1011

CASE 46

YORK HOUSE — BRADFORD METROPOLITAN CITY COUNCIL

York House is an eight storey 1950s block of flats, of Wimpey 'No Fines' construction, on an exposed hillside in the city. Radiators in the 101 one- and two-bedroom flats were heated from communal gas boilers which also provided hot water. One of the council's most unpopular blocks it was notoriously difficult to let.

The heating controls were updated in 1982/83. In 1984/85 further improvement work was carried out including:

- the addition of fourteen studio flats, heated from the communal system but with individual electrically heated hot water systems
- external wall and roof insulation
- some cavity insulation
- replacement of the original draughty metal frame windows with single glazed UPVC windows
- installation of UPVC frames and doors to the balconies
- new wooden balcony doors fitted to each flat

The work cost £328,000 including £123,000 (UPVC windows and doors), £14,670 (roof insulation) and £190,000 (external wall insulation).

Results include;

- temperatures easily exceed 20°C which would previously have been impossible to achieve in bad weather
- gas consumption reduced by 27%
- weekly gas costs for a two bed flat in 1986 of £6.42 (£9.08 for the same size flat in a similar unimproved block)

Contact: Steve Harrison, Energy Unit, City of Bradford Metropolitan Council, Directorate of Development Services, Jacobs Well, BRADFORD, West Yorkshire BD1 5RW. Tel: 0274 753886

CONDENSATION

CASE 47

HAWTONVILLE ESTATE, NEWARK — NEWARK AND SHERWOOD DISTRICT COUNCIL

The houses on this pre-war estate — which have solid nine inch brick walls — were modernised between 1974 and 1982. However, severe condensation resulted — something previously prevented by open coal fires and good ventilation through chimneys, ill-fitting windows and doors, and air bricks.

In 1985/86 an Energy Upgrade Pilot Scheme was carried out on 17 houses identified by a local tenant action group on the estate, the "Damp Action Group". The scheme included:

- partial central heating upgraded to full central heating
- trickle vents to all the aluminium windows supplemented by an air brick in each room
- humidifans in kitchens
- roofs, dropped eaves, external walls, ceilings and suspended floors insulated or existing insulation upgraded.

Guidance to tenants was given through personal visits and the production by the Council of a booklet on condensation.

Cost — £7,750 per property. Predicted reduction in fuel bills from £576 to £320 a year (typical three bedroom, six person semi — 20°C in the living room, 18°C elsewhere, all day, all year).

A survey conducted after three months of winter occupation showed that only three households were using their central heating correctly. Tenants complained that they couldn't afford to run it. Those using gas relied mostly on the gas fire in the living room. The central heating was little used. Tenants believed this reduced bills but they actually paid more than tenants using their heating correctly. Only five households were controlling the emission of water vapour with unvented tumble driers a particular problem. Despite all this, there was no condensation or mould in the 17 homes.

The full package of improvements to previously modernised properties represents poor value for money although when carried out during modernisation it can be half as expensive.

A more cost effective solution may be to "contain" rather than "cure" condensation and mould. In June 1987 a second pilot scheme — of 22 houses — will begin on the estate. Full central heating will be provided. Insulation to roofs, dropped eaves and the double glazing of living room windows will be determined by the amount needed to bring theoretical fuel costs down to £255 a year, with minimum acceptable comfort levels of 21°C in the living room and 15°C elsewhere. The figure of £255 represents the DHSS Supplementary Benefit notional heating allowance less 25% to allow for inaccuracies in the theoretical fuel cost calculations. Air bricks and humidifans in kitchens and bathrooms will supplement the trickle ventilators.

The costs are estimated at £2,000 a dwelling.

A further effort at tenant education will be made with the production of a more stimulating and interesting package of booklets on condensation and the efficient use of central heating.

Contact: David Pickles, Principal Architect, Architects Division, Newark and Sherwood District Council, Kelham Hall, NEWARK, NG23 5QX.
Tel: 0636 708410

BRECSU

CASE 48

ST. EDWARDS TERRACE, ABERTRIDWR — UNITED KINGDOM HOUSING TRUST

Trickle ventilators (finely adjustable slots in window frames to disperse moisture and prevent condensation) were fitted to new and existing windows in 39 houses.

They were monitored by BRECSU and found to provide sufficient ventilation to reduce condensation and mould growth without the need to open windows and with no corresponding increase in energy consumption.

The total cost per house of installing the ventilators was £66 (£6 per window at February 1982 prices). The 1985 cost for the ventilators is between £3 and £8 while the additional cost of fitting them to standard windows will vary from £5 — £15.

Contact: Regional Manager, United Kingdom Housing Trust, Welsh Regional Office, 38 The Parade, Roath, CARDIFF CF2 3AD. Tel: 0222 492815

CASE 49

POLLARDS HILL, MITCHAM — LONDON BOROUGH OF MERTON

Excessive condensation, partly generated by internal bathrooms, was causing dampness and rot in the flat roofs of two and three-storey 1960s houses. This was so severe that in some rooms the ceiling boards had disintegrated. When the worst cases were re-roofed there was little improvement.

The Building Research Establishment's Advisory Service recommended that more insulation should be added to the existing roofs. The old chippings were therefore removed, a vapour barrier added followed by 68mm thick expanded polystyrene roof insulation board. Two layers of a high performance roofing material were then added, all bonded in hot bitumen on fibre board. The 'U' value for the new roofs is 0.35.

Condensation is now non-existent in all but two of the 350 properties treated.

Contact: Mike Milburn, Building Maintenance Surveyor, Housing Department, London Borough of Merton, Crown House, London Road, MORDEN, Surrey SM4 5DX. Tel: 01 545 3748

GOVERNMENT HELP

The Energy Efficiency Office

The overall objective of the Energy Efficiency Office is to promote cost effective improvements in the efficient use of energy. The Domestic and Technology Directorates of the EEO seek to encourage initiatives amongst local authorities and housing associations to improve the energy efficiency of their housing stock. The EEO seeks to do this in two ways:

By the provision of information and advice

EEO publications include:-

Energy Efficiency and Management — Building on Success
Published in collaboration with the Society of Chief Architects of Local Authorities (SCALA)

Cutting Home Energy Costs — a step by step Monergy guide
Four separate volumes: Gas, Electricity, Solid Fuel and Gas/LPG

New Technologies — your key to the profitable use of energy
(Energy Efficiency Demonstration Scheme (EEDS) leaflet)

EEDS — what you need to know

EEDS — financial assistance

Guide for Local Authority Shared Savings Energy Performance Contracts

Support and Advice for Industry, Commerce and Local Authorities

Energy Savings with Home Improvements — a practical DIY guide to improving your home and cutting your fuel bills, price £5.95.

Energy Efficiency Office Publications available free from Diss Handling Centre, Vinces Road, Diss, Norfolk IP22 3HH (except where otherwise stated.)

By Research and Development and by Demonstration Schemes

Much of the EEO's work in this area is done through the Building Research Energy Conservation Support Unit (BRECSU). A number of case studies in this publication (indicated by a "BRECSU" in the text) are based on demonstration and R & D projects managed, on behalf of the Energy Efficiency Office, by BRECSU.

The Energy Efficiency Demonstration Scheme (EEDS) aims to promote the widespread adoption of new energy saving techniques in all types of building. Suitable projects, which combine novelty with a high potential for replication, are eligible for financial assistance and are then comprehensively monitored by independent consultants briefed by BRECSU. Further details of the scheme as it applies to housing can be obtained from Dr Paul Davidson at BRECSU. (0923 674040)

BRECSU Publications

The following publications, together with others relating to energy efficiency in non-domestic buildings, are available free of charge from:

BRECSU Enquiries Bureau, Building Research Establishment, Garston, Watford, Hertfordshire WD2 7JR Tel: 0923 674040

EXPANDED PROJECT PROFILES (Summaries of results of completed demonstration projects)

EPP 30	*Low energy houses as integrated systems*
EPP 59	*The SALFORD low energy house*
EPP 88	*External wall insulation applied to 'Woolaway' system houses*
EPP 89	*Low energy houses in the City of Manchester*
EPP 109	*Trickle ventilators in low energy houses*
EPP 121	*Separate boilers for space and water heating*
EPP 147	*Incorporating energy conservation measures in urban renewal*
EPP 170	*An integrated design for energy efficient co-operative housing*

PROJECT PROFILES (Describing current projects)

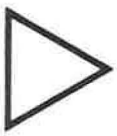
PP 110	*Use of external wall insulation with partial central heating as part of a general house rehabilitation scheme*
PP 209	*Application of internal wall insulation to inner city terraced houses on Merseyside*

PP 223 *New low energy housing for elderly people*
PP 245 *Low-cost full house heating for low energy housing*

MONITORING REPORTS (Completed demonstration projects)

ED/37/89 *Low energy houses in the City of Manchester*
F27/83/88 *External wall insulation applied to 'Woolaway' system houses*
ED/107/170 *An integrated design for energy efficient co-operative housing*

New publications will become available as projects are completed and new ones started. Contact the Enquiries Bureau to be put on the mailing list.



Department of the Environment

The Department's principal contribution to energy efficiency is the Homes Insulation Scheme, started in 1978, whereby householders have received grants for most of the cost of insulating lofts, cold water pipes and hot water cylinders in existing houses. Some three million householders have benefited so far from the Scheme, the emphasis of which has recently been focused on certain categories of disadvantaged households.

DOE's current housing research programme managed by the Building Research Establishment includes energy-related subjects which aim at pushing forward the technology of energy efficiency and most importantly at ensuring that energy efficiency in housing is compatible with adequate comfort and durable construction. In this latter area are projects on factors affecting condensation, the effects of thermal improvements on durability, and a fact finding study into adequate and affordable heating.

The Department is taking direct action to help authorities with certain identified housing problems. Estate Action, the vehicle for this, was set up in June 1985 to work with local authorities to tackle the problems of run-down housing estates with a variety of coordinated measures. To date 127 schemes in 63 authorities are receiving additional targeted resources. Of the measures being taken a third reflect a priority to improve heating and insulation.

Department of the Environment and Building Research Establishment Publications

DOE priced titles include:

- Energy efficient renovation of houses — a design guide. (ISBN 011 751837 9). Price £4.95

DOE unpriced titles include:

- *All about loft, tank and pipe insulation* — Homes Insulation Scheme 1984 (under revision)
- *Keep your home free from mould and damp* (leaflet)
- *Save money on loft insulation* — householders leaflet

BRE priced publications include:

- John Pezzey *"An Economic Assessment of Some Energy Conservation Measures in Housing and other Buildings" BRE 1984*
- *Remedies for condensation and mould in traditional housing.*
  Information pack from the BRE tape/slide or video programme.
  BRE 1986 price £5.00
  (ask about tape/slide and video programmes).

DOE priced publications — HMSO Publication Centre, PO Box 276, London SW8 5DT. Tel: 01 622 3316 (postal/telephone orders only), and HMSO Bookshops and Agents.

DOE unpriced publications — Distribution Centre, Victoria Road, Ruislip, Middx HA4 ONZ. Tel: 01 845 1200 x 212.

BRE Publications are available from BRE Publications Sales Office, Garston, Watford WD2 7JR.

NATIONAL ENERGY ORGANISATIONS

General

EARTH RESOURCES RESEARCH LTD

258 Pentonville Road, London N1 9JY Tel: 01 278 3833

Investigates contemporary environmental and resource management issues, specialising in the fields of energy and employment.

ENERGY CONSERVATION AND SOLAR CENTRE

99 Midland Road, London NW1 2AH Tel: 01 380 1002

A centre of expertise on energy conservation in dwellings, particularly public housing.

LONDON ENERGY AND EMPLOYMENT NETWORK (LEEN)

99 Midland Road, London NW1 2AH Tel: 01 380 1002

Helps tackle problems associated with high heating costs and provides training in relevant subjects.

NEIGHBOURHOOD ENERGY ACTION

2nd Floor, 2/4 Bigg Market, Newcastle upon Tyne NE1 1UW.
Tel: 091 261 5671

NEA promotes local energy efficiency initiatives via 400 local community insulation projects.

CARE AND REPAIR LTD

175 Grays Inn Road, London WC1X 8UP Tel: 01 278 6571

NEIGHBOURHOOD REVITALISATION SERVICES

c/o National Home Improvement Council, 26 Store Street, London, WC1E 7BT
Tel: 01 636 2562

EURISOL UK (Association of British Manufacturers of Mineral Insulating Fibres)

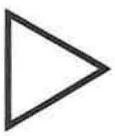
39 High Street, Redbourn, Herts AL3 7LW
Tel: 05825-4624

NATIONAL ASSOCIATION OF LOFT INSULATION CONTRACTORS (NALIC)

PO Box 12, Haslemere, Surrey, GU27 3AN
Tel: 0428 54011

INSULATING JACKET MANUFACTURERS FEDERATION

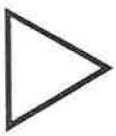
Little Burton West, Derby Street, Burton-on-Trent, Staffs, DE14 1PP
Tel: 0283 63815



Draught Proofing

DRAUGHT PROOFING ADVISORY ASSOCIATION LTD

PO Box 12, Haslemere, Surrey, GU27 3AN.
Tel: 0428 54011



Cavity Wall Insulation

NATIONAL CAVITY INSULATION ASSOCIATION (NCIA)

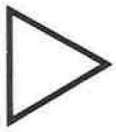
PO Box 12, Haslemere, Surrey, GU27 3AN
Tel: 0428 54011

CAVITY FOAM BUREAU

PO Box 79, Oldbury, Warley, West Midlands, B69 4BW.
Tel: 021-544 4949

EXPANDED POLYSTYRENE CAVITY INSULATION ASSOCIATION

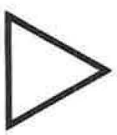
5 Belgrave Square, LONDON, SW1X 8PH
Tel: 01 235 9483



Solid Wall Insulation

EXTERNAL WALL INSULATION ASSOCIATION

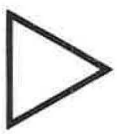
PO Box 12, Haslemere, Surrey, G27 3AN
Tel: 0428 54011



Double Glazing

GLASS AND GLAZING FEDERATION

44 Borough High Street, LONDON SE1Y 6DY
Tel: 01 403 7177



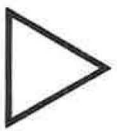
Controls

HEVAC ASSOCIATION – AUTOMATIC CONTROLS GROUP

Sterling House, 6 Furlong Road, Bourne End, Bucks SL8 5DG
Tel: 06285 31186/7

ASSOCIATION OF CONTROL MANUFACTURERS

Leicester House, 8 Leicester Street, London WC2H 2BN
Tel: 01 437 0678



Boilers and Heating Systems

CENTRAL HEATING ENERGY EFFICIENCY CONFEDERATION (CHEEC)

PO Box 17, Northampton, NM4 OPG

HEATING AND VENTILATING CONTRACTORS ASSOCIATION (HVCA)

34 Palace Court, London W2 4JG
Tel: 01-229 2488

Most professional bodies and institutes will normally be able to provide specialist energy conservation assistance to their members.

Association of Metropolitan Authorities:

35 Great Smith Street, London SW1P 3BJ
Tel: 01-222 8100

The Association of Metropolitan Authorities is a national organisation whose job is to promote and protect the interests of local authorities in London and the Metropolitan Districts in England. Its members are responsible for the full range of local authority functions and for the complete range of public buildings and housing associated with these functions. The Association has been increasingly active on the subject of energy conservation over the past few years. In 1985, two working groups, which also involved the other local authority Associations, published "An Energy Policy for Housing" and "Energy and Related Cost Savings in Local Authorities" — the latter being concerned with public buildings (other than housing), transport, plant and streetlighting. Both these reports are available from the AMA's offices at the above address.

Contact: Mike Irvine

Association of District Councils:

9 Buckingham Gate, London SW1E 6LE.
Tel: 01-828 7931

The ADC represents district councils outside the metropolitan counties in England and Wales.

It has been active in encouraging members to explore the advantages of energy conservation for some considerable time. In co-operation with bodies such as LAMSAC, the Energy Efficiency Office, IUTEP and others, it aims to assist members to maximise the efficient use of energy and consequential benefits.

Contact: Paul Johnson

Convention of Scottish Local Authorities:

Rosebery House, Haymarket Terrace, Edinburgh EH12 5X2. Tel: 031 346 1222
Fax 031-346-0055

COSLA was created after the reform of Scottish local government in 1975 to protect the interests of the regional, district and islands authorities in matters of national concern. All 65 Scottish local authorities are members.

National Federation of Housing Associations

175 Gray's Inn Road, London WC1X 8UP. Telephone: 01 278 6571

The National Federation of Housing Associations is the national body representing housing associations in England and Wales, which together own and manage some 550,000 rented dwellings. Its Energy Conservation and Fuel Poverty Working Party has a brief to encourage better standards of energy conservation in housing association properties and find solutions to problems of fuel poverty.

National Housing and Town Planning Council

14-18 Old Street, London EC1V 9AB. Tel: 01-251 2363

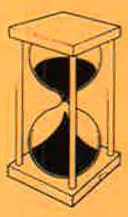
Founded in 1900 the Council's strength is the breadth and diversity of its membership. Most local authorities are members as are many builders, building societies, nationalised industries, housing associations, private consultants, components manufacturers and individuals. A democratic organisation, it is governed by a 37 member National Executive Committee which is elected annually.

The Council's key role is bringing together people across the many arbitrary professional and institutional boundaries which exist in housing and planning. This it does throughout the year thorugh its twelve regional organisations and once a year at its annual three day Conference. Over 1100 attended the last Conference which is run in conjunction with the National Housing Exhibition.

The Council is a non-party political organisation but is not afraid of controversy. It is therefore active in lobbying and campaigning for better housing and planning.

The Council publishes *Housing and Planning Review* six times a year.

Chairman: Councillor Eric Steele OBE JP (St. Edmundsbury)
Director: Ray Walker



Association for the Conservation of Energy

9 Sherlock Mews, London W1M 3RH. Tel: 01-935 1495

The Association for the Conservation of Energy (A.C.E.) was formed in the autumn of 1981 by a number of major companies active within the energy conservation industry, in order to; encourage a positive national awareness of the benefits of, and needs for energy conservation; to help establish a sensible and consistent national policy and programme; and to increase investment in all appropriate energy measures. It publishes the quarterly newsletter "The Fifth Fuel".

Chairman: Norman Adsetts
Director: Andrew Warren

Energy Efficiency Office

Department of Energy, Thames House South, Millbank, London SW1P 4QJ. Tel: 01-211 3000.