ENERGY EFFICIENCY OFFICE OCTOBER 1985

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Energy Efficiency Demonstration Scheme
Expanded Project Profile 109

Trickle Ventilators in Low Energy Houses

A demonstration of the benefits of using trickle ventilators to control ventilation in well sealed, highly insulated houses.

Potential users
Manufacturers and installers of new and replacement windows; specifiers and designers of new and rehabilitated housing schemes.

Investment cost
£66/house (1982 prices)

Host organisation
United Kingdom Housing Trust
38 The Parade
Cardiff CF2 3AD

Site of demonstration
Edwards Terrace
Abertridwr

The aim of the project
As a result of increased insulation standards, heat loss by ventilation represents a much greater proportion of the total loss from a dwelling than hitherto. Draught stripping reduces the heat loss due to ventilation, but it can also prevent the dispersal of moisture-laden air, and may therefore cause condensation problems. Draught stripping is usually applied as a 'blanket measure' and, as such, it is insensitive to the specific ventilation requirements of individual spaces.
The aim of this demonstration was to show designers and builders that, in well sealed houses, trickle ventilators can provide an opening large enough to reduce condensation and odour problems, but small enough to avoid any significant increase in the energy used for space heating. It was also anticipated that, as the fitting of ventilators should provide adequate ventilation and reduce the need to open windows, an overall annual energy saving of about 0.05 tce per dwelling might be achieved.

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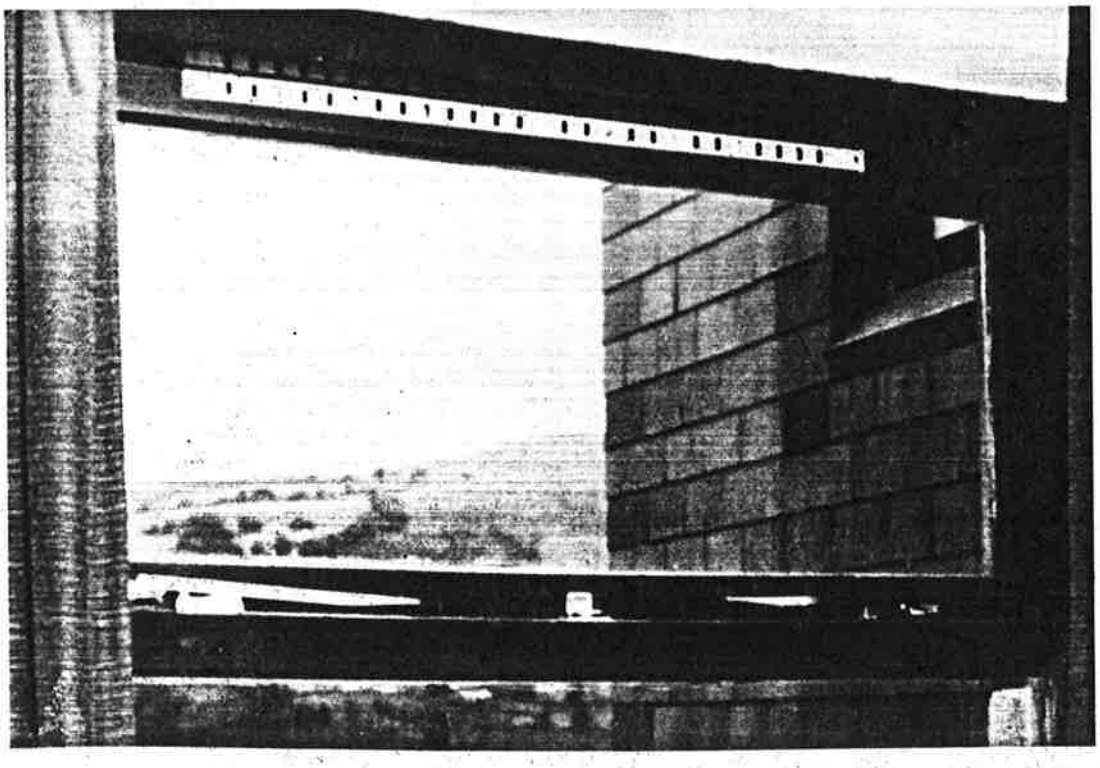


Costs and benefits

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

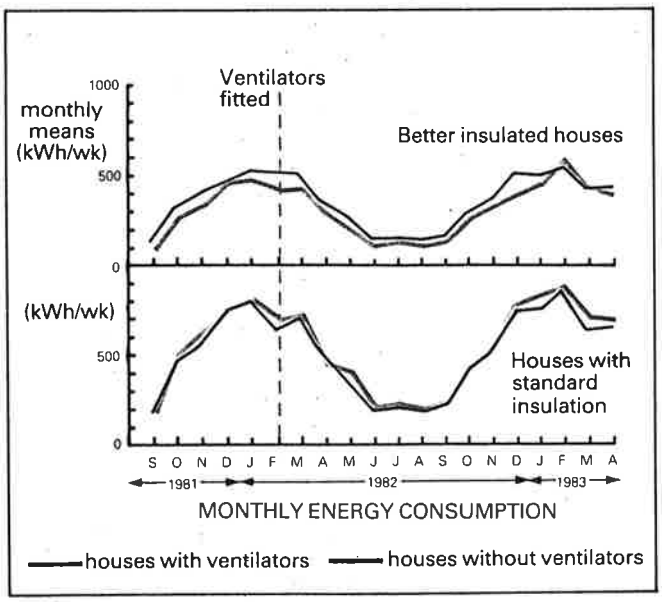
Measurements indicated that, with all the ventilators open, the background infiltration rate increased by about 10%: this increase was calculated to be equivalent to an energy load of 1 kWh per day. The corresponding figures for the typical pattern of window opening were 50% and 5 kWh per day respectively.

Although the number of open windows recorded was eventually halved after the installation of the trickle ventilators, the graphs show that no change in the energy performance was observed in either the Better Insulated or the Standard Insulated Houses. This may be because, with this particular house design, the potential energy savings made by reduced window opening were offset by the increased energy used to heat rooms which became better ventilated. It should, however, be noted that likely changes in ventilation rate and energy consumption are close to the limits of accuracy of the measurements, and therefore the existence or otherwise of significant differences cannot be claimed with certainty.

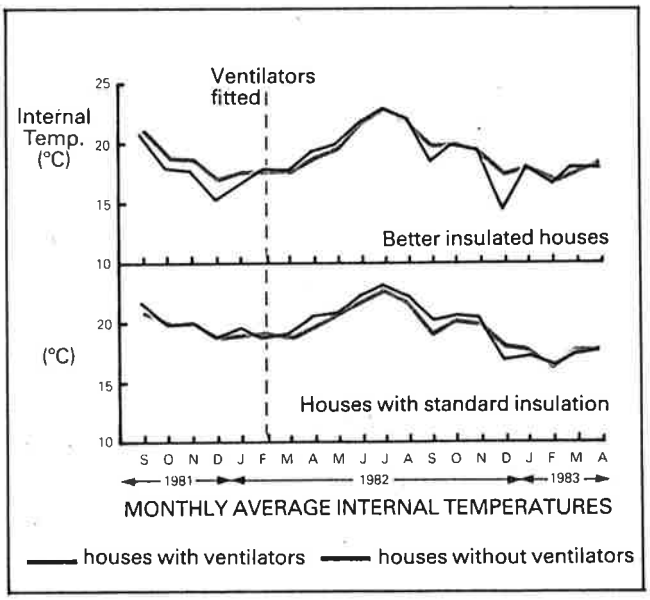
Before the ventilators were fitted, ventilation air tended to enter the house via the front door and kitchen window and leave from the bathroom, bypassing the living rooms and bedrooms. As a result, many of these rooms were so poorly ventilated that there was evidence of condensation and mould growth.

After the installation of trickle ventilators, one-third of the houses *with* the ventilators fitted were assessed as having a reduced incidence of mould growth, whereas one-third of the houses *without* ventilators showed no improvement or even a worsening of condensation. This pattern was slightly more pronounced in the Better Insulated Houses. It is not possible from this demonstration to conclude that installation of the ventilators at the time of construction would have eliminated the problem of mould growth.

Although occupants generally responded favourably to the use of ventilators as an alternative to window opening, there was some evidence that the ventilators caused draughts and that, relative to certain conditions of high smoke or moisture levels, it took a long time to ventilate a room. However, the installations did provide 'burglar proof' ventilation to ground floor rooms.



MONTHLY ENERGY CONSUMPTION



MONTHLY AVERAGE INTERNAL TEMPERATURES

Replication

Estimates suggest that a total of around 900,000 dwellings might benefit from the installation of trickle ventilators each year. In 1982, about 250,000 dwellings in Great Britain were renovated or repaired with Government grants, and a further 500,000 households install some form of window replacement each year. New housebuilding accounts for an additional 150,000 houses per year.

The national energy saving potential, assuming a saving per house of 0.05 tce per year, is 45,000 tce per year. A 10% penetration of the market would give national energy savings of almost 5,000 tce/year and this figure could be expected to rise to about 15,000 tce/year after six years.

How benefits were achieved at Abertridwr

As part of the Department of the Environment's Better Insulated House Programme, the thermal performance of 39 three-bedroom terraced houses at the UK Housing Trust's estate at Edwards Terrace, Abertridwr was monitored in order to identify the energy savings resulting from higher levels of insulation. Twenty of the houses (the Better Insulated Houses) were constructed with higher levels of insulation than the remaining 19. All the houses had high performance windows and were sealed to give a relatively air-tight construction.

In the past, all conventionally built houses had more than sufficient ventilation by air infiltration through the building envelope. In recent years, however, there has been a trend towards a more air-tight form of construction, with the result that the average background air infiltration rate can fall below 0.5 ach/hour.

Ventilation measurements carried out on the Abertridwr site showed that, although the whole house average air infiltration rates were reasonably satisfactory at 0.5 ach/hour, the individual room rates were in many cases extremely low and there were a number of serious cases of condensation and mould growth.

The results of a pilot study of three houses showed that, by fitting trickle ventilators, there was both an improvement in the internal ventilation distribution and a reduction in condensation. The results also indicated that there was no significant energy penalty from the use of these ventilators and there might instead be an energy saving if the amount of window opening was also reduced. As the Abertridwr houses were in an exposed situation, it was thought that the occupants would be keen to use the trickle ventilators rather than open windows. This, and the fact that the houses had already been extensively monitored, suggested that they would be suitable for demonstration purposes. The application for the inclusion of the proposal in the Energy Conservation Demonstration Projects Scheme (now the Energy Efficiency Office's Energy Efficiency Demonstration Scheme) was accepted by the Department of Energy.

In February 1982, 11 Titon 'hit and miss' ventilators were installed by a local builder in each of 17 houses. Nine of these houses were highly insulated and eight conventionally insulated, leaving 22 houses without ventilators to act as a 'control'. As many holes as possible (without affecting the strength of the timber) were drilled in the top rails of the windows. After drilling, the bared timber was treated with preservative and the ventilator fitted.

The 'Trimvent', a baffle-type slot ventilator which deflects the incoming air, would have been preferred to a 'hit and miss' type, but a slot could not safely be cut in the top rail of the existing window.

All the ventilators had an open area of 2,026 mm^2 except the kitchen and lounge ventilators which had an open area of 3,983 mm^2.

The houses were monitored both before and after the installation of the ventilators, by a variety of means:

- measuring and recording every five minutes the energy inputs to the house, the air temperatures in all spaces, and the external climate;
- measuring by pressurisation the change in the air leakage rates with ventilators open and then closed;
- observing the number of open windows;
- inspecting evidence of condensation and mould growth, and discussing the subject with occupants;
- interviewing occupants about their attitude towards the use of the ventilators.

Trickle ventilators

Trickle ventilators are finely adjustable slot ventilators which offer a better method of ventilation control than is possible by simply opening windows. They can be incorporated into both new and existing windows of timber, metal or plastic construction, and are fitted either into the frame or between the glass and the frame.

In timber windows, frame fixed ventilators are either recessed into a continuous ventilation slot in the frame or are surface mounted 'hit and miss' types with ventilation achieved through multiple holes drilled into the timber. The latter may be the only choice for existing windows because holes can be drilled through the frames on site without unduly affecting their strength. Alternatively, glazed-in ventilation can be used.

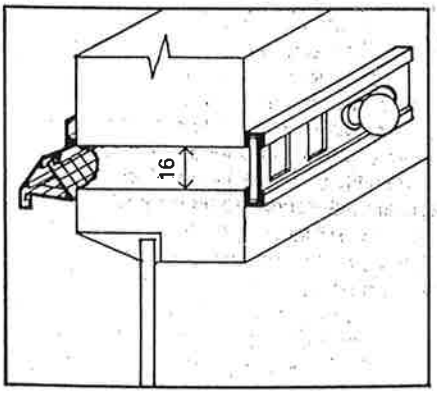
The 'baffle' type of ventilator has the advantage of deflecting air vertically and preventing a straight-through draught. It is, however, based like the 'flap' and 'rotary' types on a ventilation slot.

Because it is not possible to incorporate a continuous slot in metal and plastic window frames, ventilators are often incorporated between the frame and the lintel, or in the window between the glass and its surrounding frame (glazed-in version).

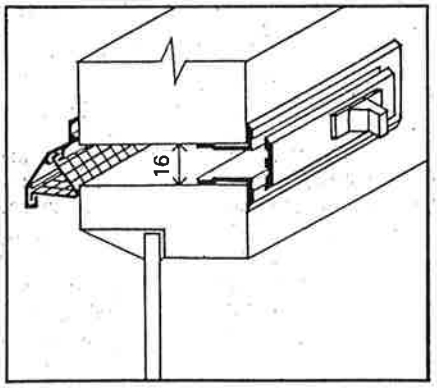
All types of ventilator incorporate a weather-proof hood and a flyscreen.

SELECTED TYPES OF TRICKLE VENTILATOR

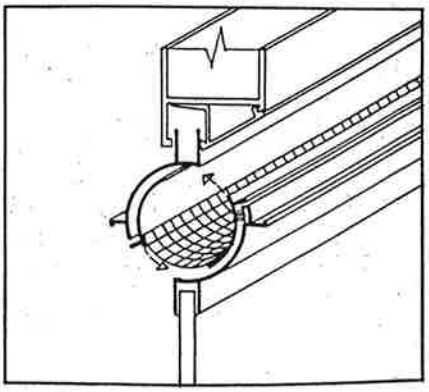
Hit and miss



Baffle



Rotary



United Kingdom Housing Trust

United Kingdom Housing Trust (UKHT) is a charity and a registered housing association. It develops housing for the benefit of people in housing need and provides housing management, maintenance and community development services for over 3,700 tenants and 600 hostel residents. It operates in three geographical areas, London and the South East, the East Midlands and South Wales, and concentrates on providing newly built and rehabilitated older housing in inner city areas, the Welsh Valleys, the rural shires and New Towns.

UKHT's experience

The problems of dampness and mould are familiar to those involved in housing people on low incomes. The pleasures of a well heated modern home can be diminished by high heating bills. A popular solution adopted by those faced with this dilemma is to keep windows closed to cut heat loss, thus creating ideal conditions for condensation.

When called upon to resolve the problems which develop, the inevitable advice given by a housing association landlord is to open a few windows. Correct though this advice is, understandably it is often ignored, and the UKHT was anxious to find some other way of overcoming the problem.

On our estate at Abertridwr, the use of trickle ventilators has successfully reduced the incidence of mould growth without any apparent increase in heating costs.

The presence of dampness and mould is unacceptable in new homes. It causes anxiety to tenants, damage to their belongings and can undermine good relations with the housing association. The time and money employed by the association investigating complaints and devising cures can be more usefully employed. On the evidence of Abertridwr, the UKHT believes that one solution has been found. Trickle ventilators offer a cheap and convenient way of reducing the likelihood of condensation and so of curing the problem at its source.

T Hendy
Deputy Director

Energy Efficiency Demonstration Scheme

The Government's Energy Efficiency Demonstration Scheme is aimed at stimulating investments in new ways of using energy more efficiently. By monitoring a full-scale trial of a piece of equipment or a process under normal working conditions, its technical and economic viability is demonstrated. Organisations receive grants to mount demonstrations and the energy savings and other aspects of performance are monitored. The Scheme is sponsored by the Department of Energy's Energy Efficiency Office.

Information from the demonstration is disseminated to interested parties to encourage replication of successful projects. Initially this takes the form of information sheets (Project Profiles) describing the demonstration and detailing expected costs, energy savings and payback period. Once the demonstration is complete, a comprehensive monitoring report and an Expanded Project Profile are published.

Seminars, open days and other events also serve to bring successful demonstration projects to the attention of possible replicators.

This Expanded Project Profile is based on a report submitted by the monitoring contractor. The Energy Efficiency Office has not published the final monitoring report on the demonstration at Abertridwr, but background information may be obtained from the Enquiries Bureau, BRECSU, Building Research Establishment, Garston, Watford WD2 7JR. Tel: 0923 662399. Copies of other reports and further information on other projects in the Scheme are available from the Enquiries Bureau, Energy Technology Support Unit (ETSU), Building 156, AERE, Harwell, Didcot, Oxon OX11 0RA. Tel: 0235 834621. Telex 83135. If you are a Prestel user, information on the Scheme and many other projects is available by keying *50038#.