

Testing acute condensation and mould growth remedies



Building Research Establishment field trials of some available remedies for condensation and mould, carried out in England and Scotland on estates which had a history of complaints of dampness, have led to a new understanding of the factors involved in the occurrence of condensation and the ways in which they interact. The findings are set out in a new BRE audio-visual package, *Remedies for condensation and mould in traditional housing*.

Condensation is most likely to be a problem in the homes which use the least heating. About a quarter of the households in the UK use less than 10,000 units of energy per year (1 unit is equivalent to 1kWh electricity) for heating, lighting, cooking and power. Some of these low energy users spend less than £100 a year on energy and are unable or unwilling to spend more. In planning remedies for condensation and mould, the challenge is to find measures which will be effective even at these low levels of energy usage.

The remedies tested by BRE include improved wall insulation, by both cavity fill and external methods, extract fans under tenant or humidistat control, full and partial central heating, and domestic dehumidifiers. The effectiveness of fungicidal washes and paints has also been tested.

There are two million homes suffering from severe dampness in the UK and a further two and a half million suffering to a lesser extent. The major cause is condensation. Many of these damp homes also suffer from mould growth, causing acute anxiety to the occupants and giving rise to numerous complaints. Mould problems are most serious in tenanted accommodation, both public and private.

The results point to the effectiveness and cost of different remedies in varying situations, some of which worked very well, others having little effect.

Understanding the problem

People generate moisture in their homes by their normal household activities. The amount

depends on the number of occupants and their style of living; it ranges from four to 14 litres a day (two bucketfuls).

About half of this moisture is produced at a slow rate throughout the day in different rooms of the home. The other is produced over short periods and in large quantities in the kitchens and bathrooms. This commonly causes condensation in these



Flats at Stirling, Scotland, site of BRE studies of remedies for condensation.

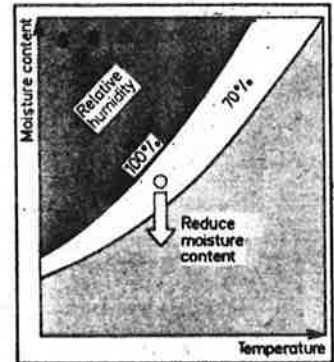
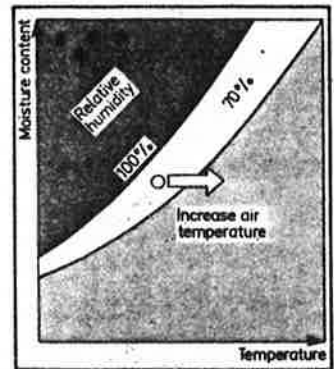


Fig. 1: Lowering relative humidity.

rooms, which very easily travels to other parts of the home, to cause condensation in any room which is cold and inadequately ventilated.

Condensation occurs because the amount of water which air can contain as vapour is limited at any given temperature. When it reaches that limit and becomes saturated, any extra vapour turns into liquid water. This limit depends on the air temperature: warm air can hold more moisture than cold air. So when warm moist air meets a cold surface and is suddenly cooled it immediately becomes saturated and water forms on the surface as condensation.

If the average humidity in a room rises to 70 per cent, condensation very easily occurs on cold surfaces. If it stays at 70 per cent or above constantly or regularly during the course of the day, it also provides the right conditions for mould to grow.

All remedial work aimed at curing condensation and mould must therefore bring the relative humidity below 70 per cent. This

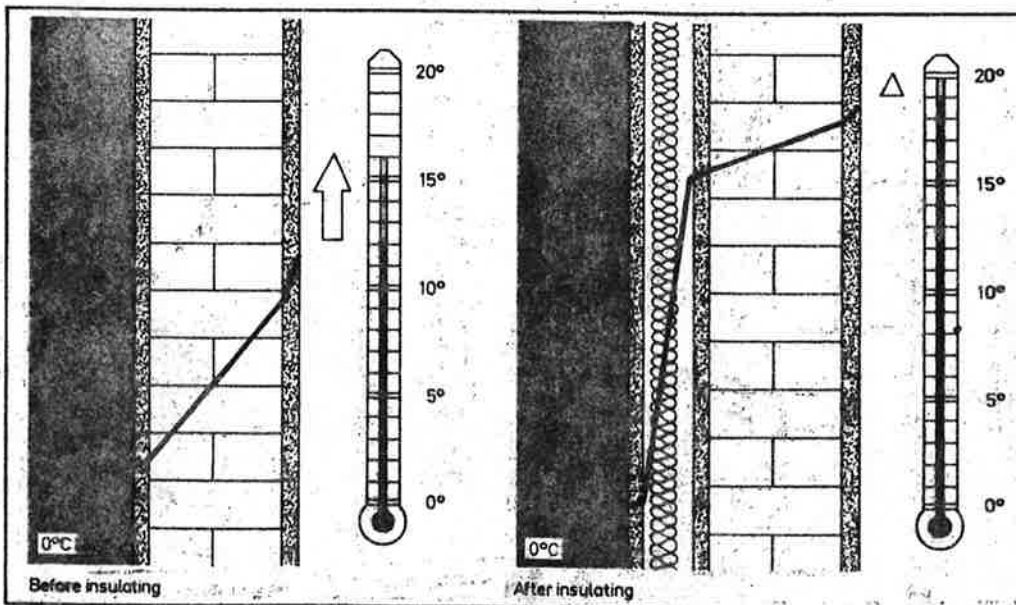


Fig. 2: Insulating a solid wall reduces heat loss and raises internal wall surface temperature.

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can be done either by increasing the air temperature or by reducing the moisture content of the air (see fig. 1). Temperatures can be raised by increasing the heat input or by improving thermal insulation, or both. Moisture content of the air can be brought down by reducing the output of water vapour, or by increasing ventilation. Thus, in the control of condensation, there are four main factors to take into account: thermal insulation, heating, ventilation and moisture generation. The BRE audio-visual package gives further information.

Ventilation

A home needs two types of ventilation. Low level background ventilation is needed throughout the house to get rid of the moisture produced slowly and steadily during the day. Much higher rates of ventilation are needed in kitchens and bathrooms at the times when large quantities of moisture are being produced.

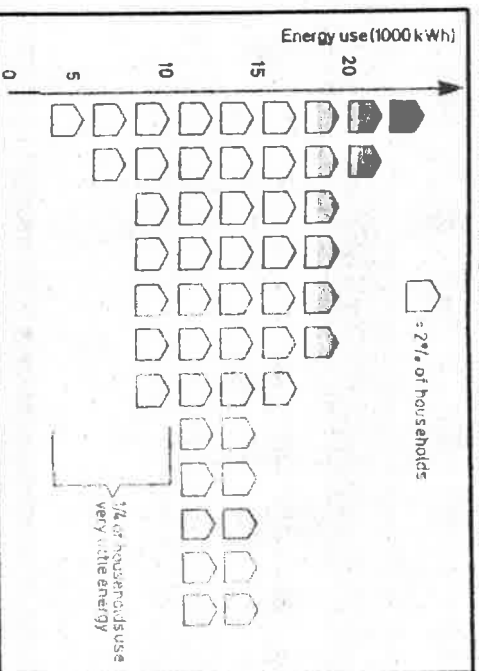
Background ventilation can be achieved in two ways. Opening windows slightly on opposite sides of the dwelling gives good cross ventilation. Individual rooms can also be ventilated by shutting the door and opening the

window just a little wider. In kitchens and bathrooms ventilation rates perhaps 10 times the average whole house rates are often necessary during periods of high moisture production. This may be achieved by opening the window wide during or after cooking, washing and drying clothes, or bathing. But a more reliable method is to fit an extract fan, preferably controlled by a humidistat. It also helps to prevent moisture transfer to the rest of the home if kitchen and bathroom doors are fitted with mechanical door closures or rising butts.

Heating and insulation

Heating and thermal insulation both contribute to reducing the risk of condensation by raising the temperature in the home and they need to be considered together in planning remedial measures. Furthermore, installing a package of heating and insulation measures can give savings in both capital and running costs.

Insulation has a two-fold effect in controlling condensation. It reduces heat losses from the dwelling, thus increasing air temperatures. It also brings the internal



wall surface temperature close to the air temperatures. Figure 2 shows what happens to these temperatures in the case of a solid wall, after it had been insulated.

In a poorly-insulated house with low energy usage, the humidity is likely to be in the danger zone (i.e. where the relative humidity is greater than 70 per cent) most of the time. In a well insulated house with the same heating level, the risk of condensation is small except at low ventilation rates. Thus in two-storey houses or maisonettes with bedrooms above heated living areas, it may only be necessary to improve the insulation of roofs and walls to cure condensation and mould in bedrooms. The heat gained from downstairs may be enough to raise temperatures upstairs sufficiently to bring the humidities into the safe area.

In flats and bungalows, adding insulation has little effect on the temperatures in unheated bedrooms, and the humidity is likely to remain in the danger zone. However, the addition of low-level background heating is enough to bring the humidity into the safe zone. This means that the remedial measures suitable for two-storey houses and maisonettes are different from

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those for flats and bungalows.

Adding insulation is likely to be one of the main remedial measures adopted in combating the problem of condensation and mould. Roof insulation is the most cost-effective form of insulation in houses. If it has not been brought up to the 100 mm minimum standard of the Homes Insulation Scheme this should be the first step.

Choice of insulation

For cavity walls the easiest, cheapest form of insulation is cavity fill, providing exposure to rain and wind is not too severe. Details are given in BRE Digest 236. Cavity fill is not suitable for walls with a history of persistent rain penetration, and it may not be the best choice for property where the external walls are in poor condition (see page 46).

For solid walls there is a wide choice of methods for internal or external application. The choice depends on the nature of the job.

Factors favouring internal insulation are: an empty dwelling, plain areas of walling, internal modernisation, no history of rain penetration, and firm wall surfaces; in addition the work is not dependent on good weather.

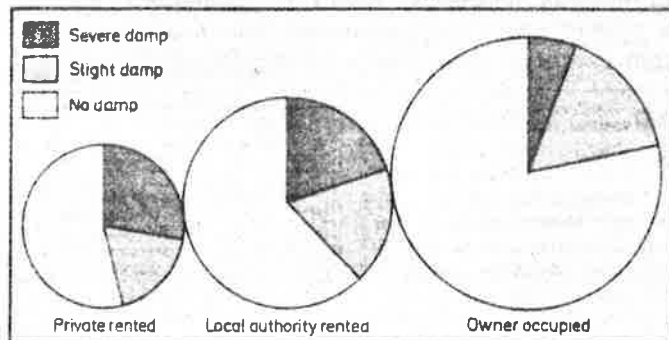
Factors favouring external in-

sulation are: exterior rendering renovation, simple rectangular shapes, few fixtures on wall, pipes or drains needing renewal, history of cold bridging problems or rain penetration, good roof overhangs.

Condensation and mould growth problems can be controlled, but it takes a degree of understanding about how much can be done by the householder, and what remedial measures are needed in the dwelling itself. In many cases the cure can be relatively inexpensive – perhaps installation of extract fans. In others, more expensive measures such as improved insulation and a new heating system may be necessary. Above all, remedial measures must enable householders to ventilate their homes, and to heat them adequately at a cost they consider reasonable and affordable, otherwise the measures are bound to fail. The new BRE audio-visual package gives background information which should improve the understanding of the problem of condensation and mould growth, and goes into more detail on ventilation, heating and insulation, heating systems, insulation systems, dehumidifiers, and mould and its control, including fungicidal treatments. □



Field studies on condensation and mould were carried out by BRE in occupied houses at Harrow.



● Information available from the publications sales office, Building Research Station, Garston, Watford includes:

– Remedies for condensation and mould in traditional housing, 60 minute BRE audio-visual package (in video or tapelslide format). £75 plus VAT

– Condensation in the home, 11 minute video for householders. £20 plus VAT
 – Condensation and mould: a guide to choosing a remedy, A1 size wallchart – £1
 – Literature package – (9 leaflets supporting audio-visual package, BRE Digests plus IP). – £5.

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