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Abstract: The results of a significant and increasing number of investigations of condensation in houses carried out by MACDATA appear to suggest that energy conservation and other improvements may be giving rise to condensation as a side effect. It is important that such effects are taken into account when measures such as draught stripping, insulation, window replacement, etc, are considered.

THE PROBLEM

For many years there has been considerable commercial pressure on house owners to purchase energy saving devices such as replacement windows, draught excluders and insulation materials generally. This has been reinforced by government-financed campaigns, culminating in "Energy saving year — 1986".

Job creation schemes exist in most parts of the country where teams are engaged in weather stripping doors and draught proofing windows of council houses with the sincere intention of improving living conditions for the tenants, particularly in the lower income groups.

No one would deny that energy conservation is not only a worthwhile objective but has become an essential feature of economic life in the developed world. In many cases however energy conservation measures have been taken in isolation without consideration of their effect on the equilibrium of the environment in the property. It is axiomatic that if draught excluders or better fitting windows are installed in a house, and no other steps are taken to improve ventilation, the ventilation rate will be reduced. A paper to be published shortly by Provan and Younger (Paisley College of Technology) "Air Infiltration Characteristics of Windows" highlights the necessity of providing a proper balance between energy conservation needs and ventilation requirements in building design and discusses methods of assessing natural ventilation through different types of windows in relation to weathertightness criteria.

It follows that if the ventilation rate in a house is reduced the vapour pressure in the building will be raised, and other things being equal the risk of condensation will be increased. This is happening in many homes. Similarly loft insulation will inevitably result in colder roofing timbers etc, and a greater risk of condensation.

FIELD EVIDENCE

In the investigation of defects and building problems during the last few years MACDATA staff have encountered the following:—

- ☐ Severe condensation on roof timbers, brought about by the introduction of loft insulation without consideration of the temperature/humidity conditions.

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ENERGY CONSERVATION — SIDE EFFECTS OF REDUCED VENTILATION RATES AND INCREASED INSULATION

- ☐ Severe condensation in houses which have been dry lined and draught proofed "to cure condensation".
- ☐ Severe condensation and residual penetration dampness in rehabilitated tenement property where heating/ventilation regimes have inhibited the drying out of massive masonry walls.
- ☐ Apparent failure of newly installed chemical dpc's for reasons as above.
- ☐ Occurrence of condensation *for the first time* when replacement windows have been installed.

The last mentioned occurrence seems to be widespread and in some instances has led to litigation between the owner of the property and the installer of the replacement windows.

POSSIBLE LONG TERM EFFECTS

As the moisture in the form of water vapour generated by a small family can amount to 10 litres of water a day or more, humidity will be high in many homes. This has been borne out by measurements well in excess of 80% RH recorded regularly in MACDATA investigations. Many of these homes are only intermittently heated as the family are absent all day and for the same reasons windows are kept shut at most times. It follows therefore that either surface or interstitial condensation or both will inevitably occur in many such properties.

The continuing occurrence of condensation, particularly in Scotland where the season is longer than in the South, must lead to saturated building materials and insulants. This in turn leads to colder surfaces with a progressive deterioration in the condition of the property.

Moisture is the enemy of all building materials and its presence can of course lead to rotting of timber, mould growth and deterioration of decoration, plaster work and other building materials. If this is allowed to continue indefinitely some materials will pass the stage where the process can be reversed.

THE CURE

It is of the utmost importance that when energy conservation measures are considered, the whole package of heating and ventilation in the property is taken into account. Many homes are heated only for a few hours each day and in many cases only one room is regularly heated. Because of the high cost of heating, few families are inclined to ventilate where this is not perceived to be essential as it is well understood by tenants that ventilation equates with the loss of expensive energy.

affect the performance of wood windows, and ways of ensuring good performance, based on research at the Princes Risborough Laboratory. It also gives information on the role of architects, manufacturers, builders.

The publications included in the package are: BRE Digests 304 'Preventing decay in window joinery', 286 'Natural finishes for exterior timber', and 261 'Painting woodwork'; Information Papers IP10/80 'Preventing joinery decay by design', IP21/81 'In situ treatments for existing window joinery', IP20/82 'The effects of water repellent preservative treatments on moisture levels in window joinery', and IP9/84 'Water borne paints for exterior wood'; Defect Action Sheets 11 'Wood windows and door frames — care on site' and 15 'Wood windows — resisting rain penetration at perimeter joints'. The cost of the package is £2 less than total cost of the individual publications.

Remedies for condensation and mould in traditional housing

Tape/slide package, including literature pack. Price £75.00 + VAT. *Ref No AP20* Video package, including literature pack. Price £75.00 + VAT. *Ref No AP21* Extra literature packs. Price £5.00 each. *Ref No AP22* Wallchart 'Guide to choosing a remedy'. Price £1.00. *Ref No AP23*

This package explains how to diagnose condensation, why it occurs, reports on how the available remedies work in practice, and gives guidance on how to select the right remedy for different situations.

The presentation, which lasts one hour, is available in either tape/slide or video format. Each is divided into nine sections: Introduction, Understanding the problem, Ventilation, Heating and insulation, Which heating system?, Which insulation system?, Dehumidifiers, Mould and its control, and How to select the right remedy. The package includes a set of nine leaflets summarising the information, and four BRE publications: Digest 139 'Control of lichens, moulds and similar growths', 236 'Cavity insulation', 297 'Surface condensation and mould growth in traditionally-built dwellings', and IP11/85 'Mould and its control'.

Condensation in the home

BRE Video. Price £20.00. *Ref No AP24*

This 6-minute video is designed to give householders a simple explanation of why they get condensation in their home, and what they can do to reduce it. It covers ways of reducing the amount of moisture produced, how and when to ventilate, and the importance of heating. In addition to individual householders, it should be useful to local authorities and housing and residents' associations.


Errata

In *Building Technical File 12* the Reference numbers of the two parts of the BREHEP microcomputer package were given as AP16(A) and AP16(B) when they should have been AP16 and AP17 respectively; similarly that for the STRONGBLOW package should have been AP18.

BRE News

A four page newsletter containing short articles on ongoing research work plus news of coming and recent publications. It is published in 3 editions: *News of construction research*, (6 times/yr), *BRE timber research* (3 times/yr), *BRE News of fire research* (3 times/yr). Copies are issued free to subscribers of these publications.

BRE Publications Sales Information Leaflets

Leaflets on: BRE Digests, Information Papers, Defect Action Sheets, Overseas Building Notes, and BRE Reports and Books, are obtainable free from Publications Sales Office, BRE, Garston, Watford WD2 7JR. 

Recommendations for ventilation and air conditioning in buildings are given in CIBS Guide: Section B2:

Ventilation and Air Conditioning (Requirements) 1976.

The guide is concerned with emphasising relevant practice directed to energy conservation and provides relevant information for the design of energy economic buildings. Recommended ventilation rates are given for various types of building and for individual rooms within the building. Design principles for ventilation are also given in BS 5925: 1980 and the problem is a continuing aspect of the work of the International Energy Agency via the Air Infiltration Centre at Bracknell.

It is essential that designers of new properties and redevelopers of old take full account of the recommendations given by appropriate standards and agencies. The possibility of unsatisfactory conditions may then be eliminated at the design stage. Sufficient ventilation beyond the control of the occupant, can then be provided to ensure the long term safety of the structure. This for example may require the provision of fans in bathrooms and kitchens where higher rates of air change up to 16 air changes per hour may be required. Although the tendency in recent times has been in general to reduce the number of air changes per hour it may be that such reductions must be limited as it is evident that unless significant increases in heating are provided in properties high ventilation rates will be essential.

The vendors of energy conservation products and particularly replacement windows must realise that it will be in their own interests to advise prospective purchasers of the need for adequate ventilation. They should try to explain, difficult as it may be at the point of sale, that while draught sealing is important, adequate ventilation should be provided. Housing authorities may need to consider the installation of automatic ventilators if deterioration of properties is to be avoided. [9]