EFFECTIVE VENTILATION

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IEA ANNEX XIV: ENERGY AND CONDENSATION.

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*This paper reviews research activities undertaken in the framework of IEA Annex XIV, "Energy and Condensation".
It outlines the objectives and working scheme. The importance of ventilation as an influencing factor and a remedial measure is investigated.*

0. Introduction

The central theme of the IEA workshop, held in Leuven in September 1985, was the problem of condensation. During the workshop, it was proposed that an international programme of research should be set up to study the relation between condensation and energy saving, and to develop curative and preventive measures to combat the problem of moisture.
The research programme was formally initiated at a meeting in Utrecht in April 1987, the participating countries being Belgium, Italy, The Netherlands, Germany and Great Britain. Belgium was to act as international coordinator.

1. Brief outline of IEA ANNEX XIV

Following structure is defined to organize the work to be done (fig.1):

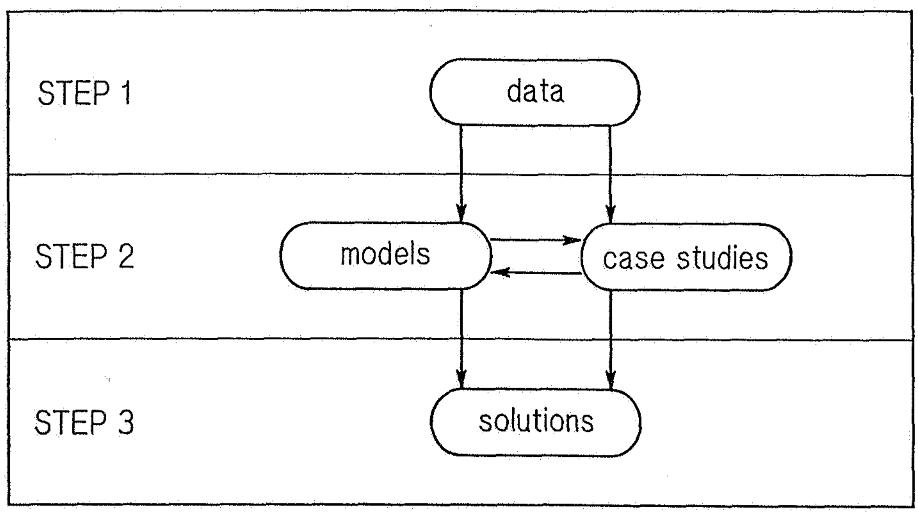

fig.1: structure of IEA ANNEX XIV

STEP 1: The collection of data, mostly concerning (critical) mould growth conditions and hygro-thermal material properties

STEP 2: Models are (further) developed in order to describe heat, moisture and air transport in buildings (interroom transfer), in rooms, on surfaces and to a lesser extend in the building construction, as far as they deal with the problem of surface condensation.
The case studies, one pro country, serve as points of reference for the models. They consist of a detailed study of the indoor climate (temperature, humidity, air movement) in one or more problem dwellings. Curative measures would also have to be evaluated.

STEP 3: Formulation of economically acceptable measures. Such measures should be either curative or preventive.

Each participant should do a case study and be involved in step 3, solutions. So, models may be verified and solutions may be found, adapted to the construction methods and the meterological conditions in the different countries.

The development of calculation models is optional. The same applies to the collection and deduction of data on the properties of building materials and mould growth.
The success of the annex does not depend on calculation models. Nevertheless, these models are of great importance in achieving the objectives.

In figure 2 the time schedule, based upon research steps as previously mentioned is shown.
The bars indicate the international meetings. Light-grey tint corresponds with preparation period or period of extension of the research step.

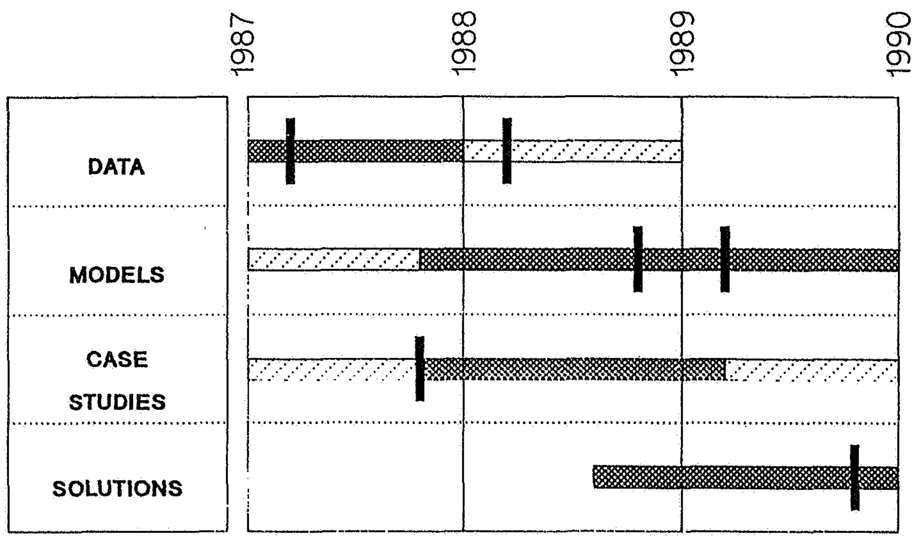

fig.2: research steps IEA ANNEX XIV

Each participant will be responsible for a part of the final report. The research steps are for this purpose divided into a number of subjects, more or less independent of each other. Figure 3 illustrates the allocation of subjects.

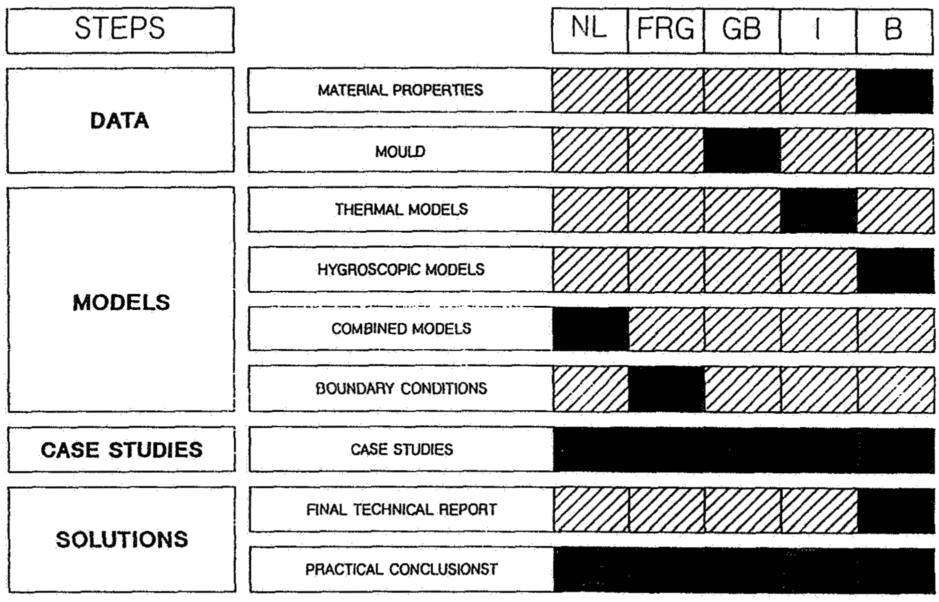

fig.3: allocation of subjects

Each participant presents an independent report on the case study being undertaken in his own country.
The final, technical report, to be made by the operating agent, will be translated in the various languages, drawing practical conclusions, appropriate to the building practice in his country.
It should be emphasized that figure 3 does not illustrate the research activities of the country in question. The aim is to allow participants to gain experience in as wide a field as possible.

2. What about "ventilation and condensation"?

Surface condensation occurs as soon as the dewpoint of the air is above the surface temperature.

The dewpoint of the air is HIGHER, and consequently the risk of surface condensation rises if...

factor

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1. The moisture content of the external air is higher: marine climate
2. The moisture production inside is higher: more intense

occupation, specific moisture sources (laundry drying, many plants, moist walls due to rising damp...)

3. The dwelling is less ventilated: airtight dwellings, bad ventilation habits or possibilities...
4. The volume of the dwelling is limited
5. There are less condensing surfaces! (e.g. simple glazing)

The surface temperature is LOWER, and consequently the risk of surface condensation HIGHER if...

factor

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6. The inside temperature is lower: not or almost not heated rooms
7. The outside temperature is lower: cold weather
8. The wall is badly insulated
9. The room has many cold walls (limited radiative heat exchange) and/or there is not much air movement (limited convective heat exchange), e.g. behind wardrobes
10. There is important thermal bridging

It is clear that all these factors are influenced either by the occupants, the dwelling or the ouside climate.
Figure 4 gives a review of all the factors according to this division.
Remarks: 1. In non steady state conditions also the thermal capacity of the wall plays an important role.
2. When we are speaking about mould growth, also the nature of the finishing material must be taken into account.

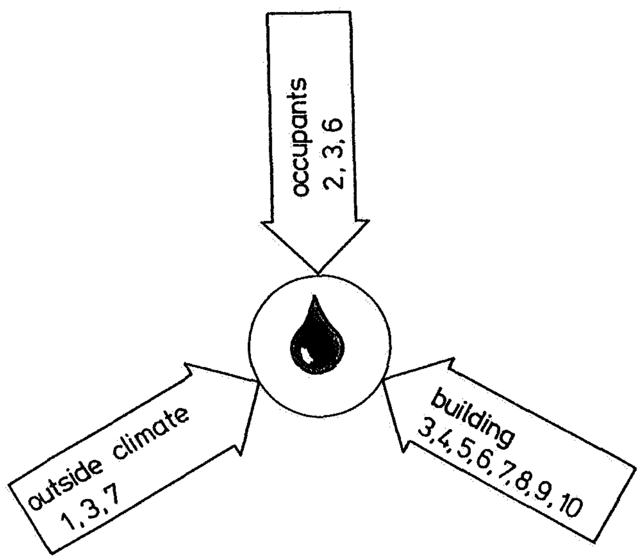

Fig.4: influencing factors

As we see in figure 4, ventilation interferes on many levels with surface condensation:

- through the occupants: ventilation habits: how much and how long which windows and which doors are opened, or in other words: how efficient do people ventilate
- through the building:
  . implantation (terrain characteristics)
  . efficient ventilation: position of (openable) windows and air ducts
  . mechanical ventilation
  . natural ventilation possibilities
  . interroom air (and humidity) transfer
- through the outside climate: temperature/wind speed

Therefore ventilation is an important tool in combating surface condensation; but it is not the only one. Figure 5 overviews the possible remedial measures.

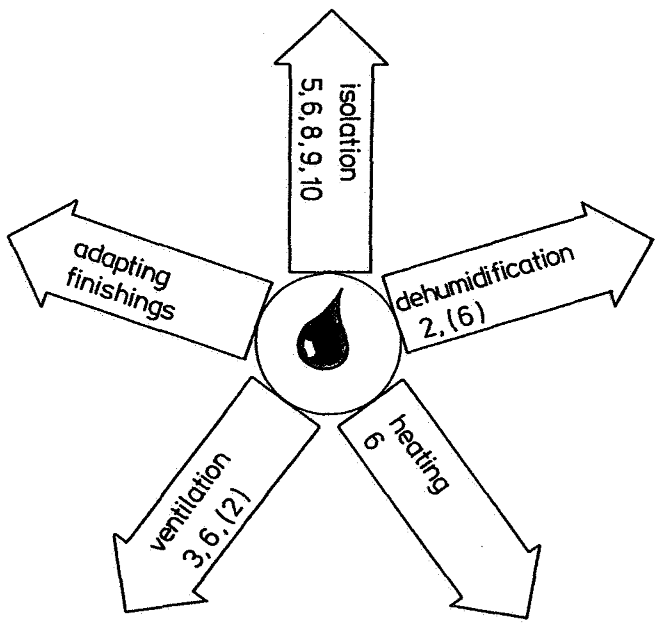

fig.5: remedial measures

The solution in a specific case will mostly be a combination of these measures.
In case of ventilation for example the dewpoint drops when ventilation is increased. However, if heating or the insulation of the dwelling is not enhanced, the inside temperature will lower and the risk of condensation may remain.

It is the aim of the Annex to develop models as well as simple guidelines to find combinations of these factors that cure or prevent moisture problems in the economically most acceptable way.