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GROWTH OF MOULD IN HIGHLY INSULATED NEW AND OLD BUILDINGS

Survey of damage, causes and consequences

Research Study	Z 6 – 10.07.03 – 05.12 / II 13 – 80 01 05 – 12 Supported by : Bundesamt für Bauwesen und Raumordnung, Bonn The responsibility for the contents of the report lies with the Authors
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1. Summary Account

1.1 Aims of the study

This study was conducted to find out if highly insulated, airtight buildings which have been constructed or modernized since 1995 in compliance with the regulations on thermal insulation and energy conservation, tend to increased mould growth. It also investigates the major causes of mould-related damage.

1.2 Research methods

The study is essentially based on the information provided by 1,603 publicly appointed and certified building experts. 171 (11 %) of those questioned gave specific details on cases of damage.

Building experts with the professional experience of many years can certainly be relied on to notice any general trends toward increased damage caused by mould in highly insulated buildings. Moreover, the expert analysis of individual instances of

damage can reveal specific causal relationships between building characteristics and the formation of mould.

However, these data cannot be used to determine the exact percentage of houses with mould-related damage in relation to the total amount of new buildings. This can only be done by examining a representative sample of dwellings, which would also comprise damage-*free* buildings.

The relevant information in this respect is provided by a study published in 2003: S. Brasche et al., *Occurrence, causes and health impacts of moisture in dwellings* ("Vorkommen, Ursachen und gesundheitliche Aspekte von Feuchteschäden in Wohnungen"), which is based on a representative sample of 5,530 dwellings all over Germany inspected by certified district chimney sweepers.

1.3 Results – frequency of damage

The assumption that buildings which comply with current energy efficiency requirements are particularly prone to increased mould growth could *not* be confirmed by the research study.

In their investigation of mould growth in buildings constructed according to the regulations on thermal insulation, the authors reviewed and evaluated the above-mentioned publication by S. Brasche et al. on moisture-related damage in housing.

Whereas ca. 9.3 % of *all* existing buildings in Germany are affected by mould-related damage, the figure for those built or modernized after 1995 is ca. 8.2 %. The majority of publicly appointed and certified experts questioned in the survey do *not* confirm any significant increase of mould growth in highly insulated buildings.

Nevertheless, those seemingly positive findings cannot be regarded as satisfactory. In modern houses with high standards of thermal insulation, the risk of mould growth should not only remain at the same level when compared with old buildings, but it should be substantially reduced, which at present it is obviously not.

Therefore a further analysis of possible causes was conducted in order to help avoid future damage.

1.4 Results – causes of mould–related damage

First of all, it must be pointed out that in about one third of the relevant cases, mould growth in highly insulated, airtight buildings is due to technical details of construction which do *not* involve thermal insulation or ventilation. The various causes range from

inadequate damp-proofing, defective installation, trapped moisture to insufficient maintenance of sealing joints in sanitary rooms.

Another third of instances of mould-growth in highly insulated buildings is attributed by experts to partly defective thermal insulation, i.e. faulty thermal bridges. These defects occur most frequently with window reveals and window lintels, with some constructional details, with three-dimensional corners of rooms as well as with base courses.

In future, these building parts should be given special attention in design and execution, and well-directed efforts should be aimed at improving their quality. The constructional regulations and requirements for window joints and three-dimensional corners, especially in the area of base courses, ought to be checked and, if necessary, improved by the responsible associations and research institutes.

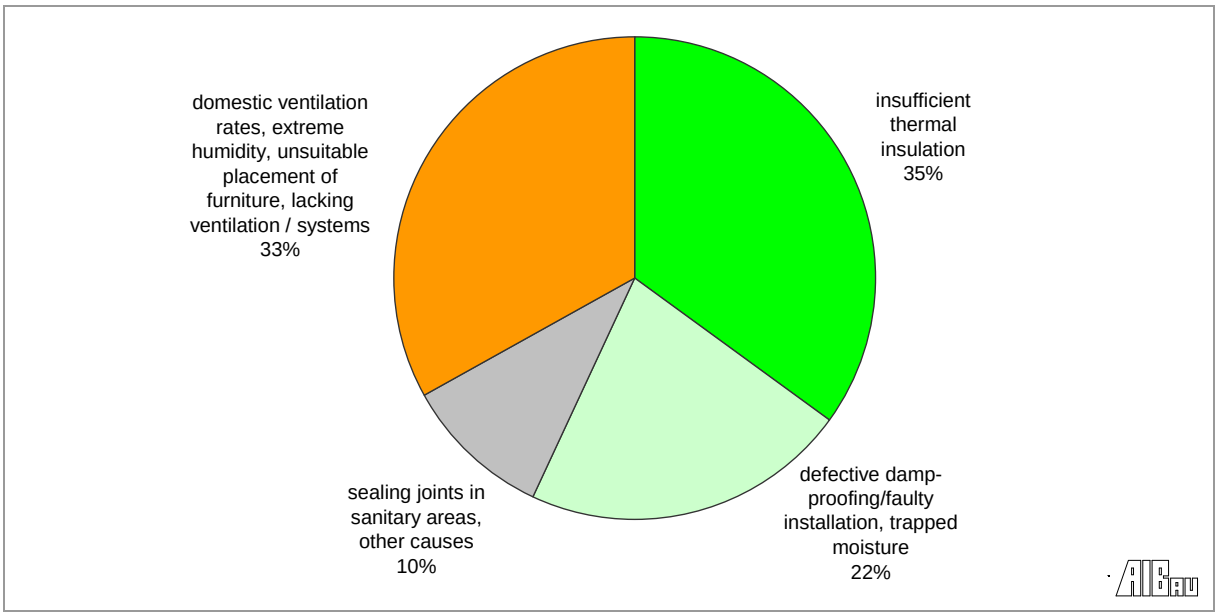

Figure 1: Causes of mould-related damage in highly insulated buildings (based on the description of 145 cases by publicly appointed and certified experts)

In the estimation of experts, another third of mould-related damage is due to ventilation rates in the building. This does not primarily concern faulty ventilation facilities, but more often it is caused by the behaviour of occupants.

These instances of damage occurred in buildings that – after a generally sufficient inspection – were considered to be free of structural defects. To a great extent, the mould was again found to grow in window reveals and lintels, which underlines the

necessity of thoroughly checking the building regulations concerning these structural components.

The above-mentioned study by Brasche/Bischof et al. (2007) cannot be used to distinguish the impact of defective thermal insulation on the one hand from that of inadequate residential ventilation on the other hand, because, due to its methodological approach, it subsumes faulty thermal insulation under the category of “damage related to ventilation”.

Nevertheless, the results of the study are important with regard to distinguishing between causes of mould growth due to thermal insulation and those related to ventilation, in so far as the study does not establish a direct link between the installation of ventilation facilities and the frequency of mould occurrence. Any additional ventilation facilities noticeable in the buildings were taken into account, but there were no mechanical humidity control systems among them.

It seems indisputable that mould growth in the interior of buildings, as far as it is attributable to (inadequate) thermal insulation or air humidity, can of course be reduced if air humidity is automatically kept at a certain level by humidity control facilities. But according to the findings of the research study, such facilities are not absolutely necessary to confine the problem of mould damage to its present extent.

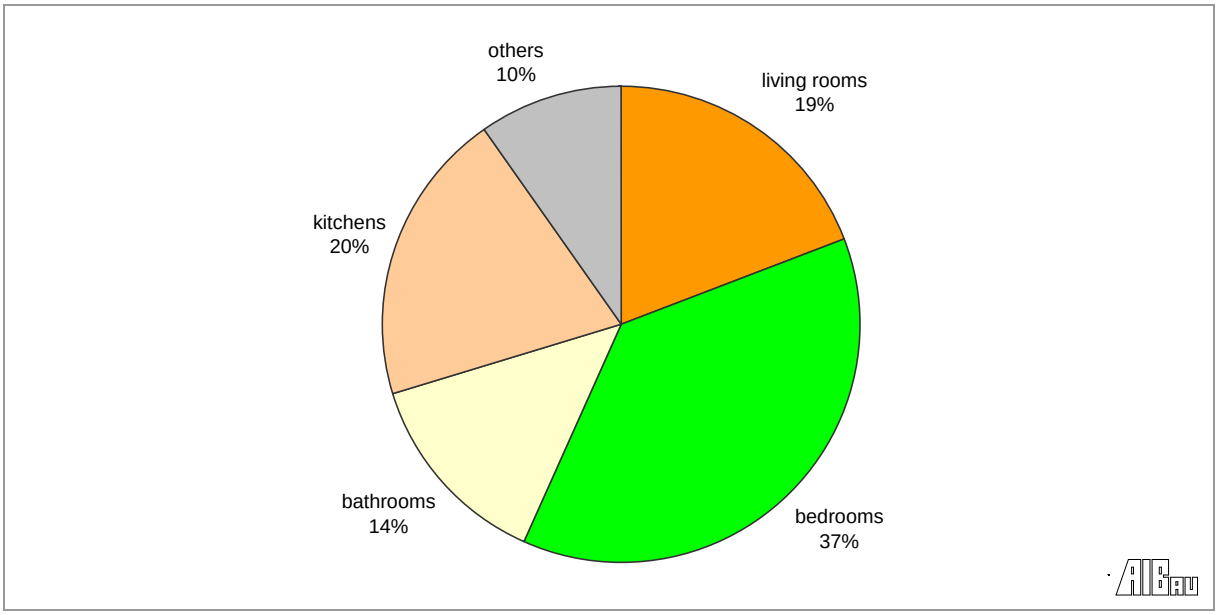

Figure 2: Occurrence of mould-related damage in various types of rooms (based on the description of 154 cases by publicly appointed and certified experts; multiple references possible)

As to the rooms in which mould growth occurs, both studies show that bedrooms are particularly affected. Since at home people spend a (comparatively) long time in their bedrooms, the prevention of mould growth in these rooms is of the utmost importance. More efficient measures are recommended to achieve appropriate control of heating and ventilation, especially in these rooms.

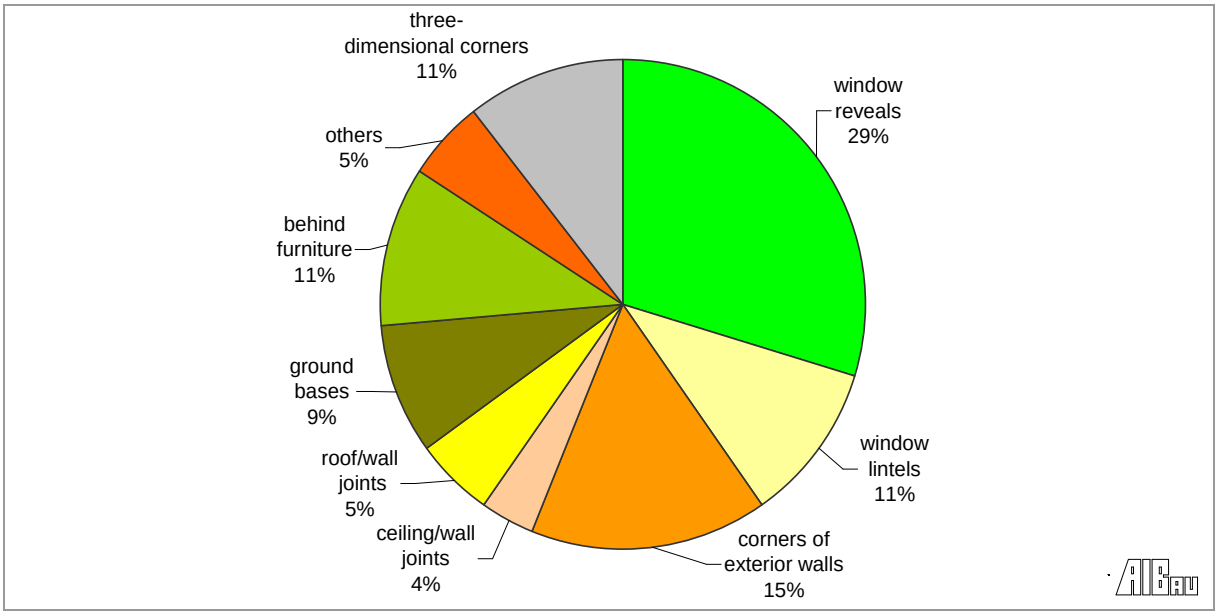

Figure 3: Location of ventilation-related mould damage in rooms (based on the description of 47 cases by publicly appointed and certified experts; multiple references possible)

It is remarkable that in both studies the most frequently-identified mould-affected areas are window reveals and lintels. There is obviously a great need for action to improve energy-efficiency, so that even in rooms with high levels of air humidity, dependent on the ventilation habits of occupants, the growth of mould will definitely be prevented.