Moisture in indoor air: findings of 40 years

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SUMMARY

This extended summary is a part of a more extensive summary (technote to be published) that compiles a number of AIVC publications that deal with ventilation and health in relation to moisture in air, and the development over time.

KEYWORDS

AIVC publications, moisture, iaq

1 MOISTURE IN INDOOR AIR

AIVC has over the years had focus on air infiltration and ventilation. This is a brief review of the work, primarily within AIVC, that relate to moisture in buildings, connected to ventilation and indoor air quality.

Moisture in the air is one of the reasons for ventilating a building, as is removing contaminants and odours, and maintaining desired temperature and air movement (Parfitt, 1985). Liddament (1996) describes that moisture is often the dominant pollutant in dwellings, generated by occupants and occupant activities, such as cooking and washing. Since there are major health issues related to high moisture levels in buildings, moisture is an important aspect to consider in the design of buildings. In the history of AIVC publications and conference papers, moisture was discussed in combination with pollutants that influence the need for ventilation. In the 1980's moisture problems appeared in relation to the effects of weather-stripping actions and inadequate energy saving measures which resulted in thermal bridges, air gaps, increased humidity indoors and various types of moisture damage.

These problems have been discussed in several AIVC conference publications. Technical Note 26 (1989) summarized the findings of Annex IX about pollutant sources, effects and control of indoor pollutants, in order to define ventilation rates that meet the requirements of energy use as well as the demands of an adequate indoor environment. One of the seven pollutants discussed in the publication was indoor humidity, in relation to condensation problems and mould growth. Apart from the presence and activities of occupants as the main source of water vapour production, three other sources were mentioned: construction moisture, ground water and seasonal storage of water vapour. The incidence of mould growth was related to the relative humidity in a room, with 70% as a limiting value below which the incidence was found to be small. Ventilation was defined a necessary but not a sufficient method to maintain relative humidities below this value, the level of heating and thermal

insulation being equally important. In a later technote, Liddament (2001) provides statistics on moisture production from Annex 27.

Technical note 20 (1987) reports on a workshop in New Zealand addressing the specific problem of moisture accumulation in the building envelope as a result of air leakage. The publication showed that moisture control in light weight building envelopes is predominantly related to air movements, often in small amounts, and not to water vapour diffusion controlled by vapour barriers as was the general understanding in construction practice at the time. The understanding of the consequences of airborne moisture transfer led to recommendations to design ventilation systems that create a slight underpressure in dwellings in cold climates to prevent indoor water vapour from penetrating and condensing in the building fabric (Liddament 1996).

Currently, the moisture itself should not be considered a pollutant, but too high exposure to moisture can initiate processes that can lead to elevated exposure levels (Borsboom et al., 2016). Most building materials subjected to high moisture levels are affected by this. In case of wood based material, there is risk of mould growth, fungal growth, hydrolysis of resin in particle boards and plywood. High moisture levels are also favourable for some bacteria and viruses, and mites. It should also be mentioned that low moisture levels also have drawbacks. These include growth of some other bacteria and viruses, of respiratory infections, and ozone production. Low moisture levels can result in dimensional changes of wooden buildings with a resulting decrease in airtightness. Cold attic constructions are particularly sensitive to moisture convection and a large amount of cold attic have mould growth.

A valuable source of information with regards to ventilation and humidity is the guidebook by Liddament (1996), and with regards to health and humidity Technical note 68 by Borsboom et al. (2016), is recommended. Additional information on moisture in indoor air will be published in a new technote during 2019.

2 ACKNOWLEDGEMENTS

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