

ENVIRONMENT AND RAW MATERIAL COMMITTEE

Factsheet on:

Understanding the Management of Indoor Moulds

DATE: 16 JANUARY 2008

Even though moulds are a fact of the day-to-day life, mould growth can be eliminated by preventing the conditions which allows the spores (seeds) to develop into moulds and by taking sensible prevention measures detailed in this document. Basically, the key to mould is to control moisture impeding the mould's spores to come inside the building.

The Occurrence of Mould¹

Moulds are naturally occurring and always present in the environment.

Moulds are essentially fungi or simple plants and have similar requirements for their growth: food, water, oxygen and a suitable temperature. The fungus consists of fine microscopic root-like threads, which grow into the material from which they extract their nourishment (i.e. wood, wallpaper, furniture, clothes). The fungus develops fruiting bodies, which give off spores – a powdery, dusty appearance- that are dispersed into the atmosphere and leads to their rapid spread and growth elsewhere. Because of normal air exchange due to ventilation and infiltration, a source of fungal spores is always present in the indoor air of buildings.

Components of heating and air conditioning systems may also serve as reservoirs of microbial growth and distribution². As soon as spores settle in an area with the appropriate conditions for growth they establish colonies, which are often visible to the naked eye.

Mould will grow anywhere.

The three main factors affecting mould growth in buildings are:

- **Moisture**
- **Temperature:**
- **Nutrient source.**

Mould is able to flourish on many surfaces providing that these conditions exist. It can even occur on such non-porous surfaces as glass, metal and plastic. Normally, the temperature of interior finishes and any kind of building materials in the indoor environment will be in the range

¹ Mold : Cause, Effect and Response – a Study of the Wallcovering Products-2003

² Zaslow S.A, Genter M.B, Mold, Dust Mites, Fungi, Spores, and Pollen: Bioaerosols in the Human Environment. North Carolina State University Cooperative Extension Service. Publication FCS-360-5, January 1993

permitting fungal development. The nutritional requirements are minimal and are satisfied either by material (organic) constituents or by contamination of surfaces by dusts or other deposits.

There is no doubt that water is the only limiting factor in building practices allowing a sustained control of mould growth³. Mould growth will only occur on building materials when moisture is present. Invariably it is associated with either water penetration caused by incorrect installation, poor maintenance, damage to the structure of the building, or by high relative humidity and condensation: **No water means no mould growth.**

What is the relationship between Moulds and their Potential Impact on Human Health?

Exposure to mould may cause health effects to greater or lesser degrees.

Most common types of moulds associated with building interiors are generally not harmful to healthy individuals.

However, Exposure to mould in some individuals can cause reactions but this depends largely on overall health, age and the amount of time an exposed person spends in the home.

Susceptible populations including the elderly, pregnant women, infants and young children, people with allergies, chronic respiratory illness and/or chemical sensitivities and those with weakened immune systems are most likely to experience health effects from mould.

Hypersensitivity, pneumonitis may follow exposure (usually occupational) to very high concentrations of fungal and other microbial proteins.⁴

However, the most common health problems associated with exposure to mould are:

- Eye, nose and throat irritation
- Runny nose, sinus congestion, frequent cold symptoms
- Increased asthma attacks
- Allergic reactions⁵

Mycotoxins which are chemical compounds produced by some fungi are considered to be toxic to humans and animals. However, clear cut scientific data to document an irrefutable connection between exposure and diseases are not currently available.⁶

Avoiding Mould Growth

Measures for avoiding mould growth are necessary both in the construction of new buildings and in the maintenance of existing buildings:

New Buildings⁷

The key to avoiding mould growth is **to avoid moisture** (e.g. controlling condensation according to the climate: cold, hot, humid and mixed) Both in the building process and later in the daily use of the building, the moisture in the construction materials as well as the relative air humidity must be kept at a safe level.

³ Oxley T.A. Gober E.G. Dampness in Buildings –Diagnosis-Treatment-Instruments-second edition. Publication FC_CS-360- 5 January 1993

⁴ Mould : Cause, Effect and Response – a Study of the Wallcovering Products-2003, page 20

⁵ Toronto fact sheet on Mould (September 2004)

⁶ Burge HA. The Fungi: how they grow and their effects on Human Health. HPAC heating, piping, Air conditioning (69): 69-74, July 1997

⁷ Guidelines for Prevention of Mould Growth on Gypsum Board- US Gypsum Association-2003

During the building process this means being in control of the entire operation, including site conditions and logistics. Safe and dry storage and handling of materials are of great importance to avoid building concealed humidity into the constructions. A great responsibility rests with designers and contractors to select the correct construction product for the environment and task in hand and plan the construction process accordingly. Furthermore, a significant responsibility lies with the installer and the building owner to ensure that the construction products are installed and maintained in accordance with manufacturers specifications. Failure to do so may give rise to conditions that promote mould growth in the short, medium or long term.

Existing Buildings

In the daily use of the building, the implications of the behaviour of the occupants to the 'health of the building' will need to be taken into consideration. Indoor relative humidity conditions fluctuate depending on conditions such as the temperature of the indoor air, moisture-producing activities (drying clothes, cooking, bathroom activities), as well as the effective use of the ventilation features.

Poor maintenance of the building is often the main reason for mould to start growing. Leakages through roof constructions, around chimneys, windows and doors will cause wetting of the constructions and insulating materials, so will leaky plumbing. Together with the correct temperature conditions, this may cause considerable mould growth.

Seeking advice is important

Building materials manufacturers offer a wide range of products and systems to achieve specific levels of structural performance, fire protection, sound insulation, thermal insulation, and vapour control. It is therefore important that the correct products and systems are selected, in conjunction with the manufacturer's recommendations, for the appropriate performance levels and required end use.

Always be in control of the situation

Control measures include reducing the relative humidity (below 70%, or less for sensitive persons e.g. asthmatics)⁵ and to be sure the building has adequate ventilation, including exhaust fans in bathrooms and kitchens. Periodic checking for moisture problems and maintenance of air handling and heating systems is also fundamental to prevent constant moisture build up⁸.

Ventilation and Insulation are key to a Healthy Indoor Environment⁹

Insulation does not mean sealing. A certain level of ventilation is indeed necessary. It is proven that limiting uncontrolled air leakages in the building greatly help to reduce effectively energy use. However, it is also a fact that ventilation (natural or mechanical) plays a crucial role in improving and maintaining good indoor air quality.

High indoor humidity possibly resulting from poor construction/rehabilitation, site design that does not properly manage water, and/or inadequate air exchange, etc can promote mould growth. In cool climates, inadequate ventilation in the winter can contribute to excessive moisture and humidity because normal activities create moisture (cooking, bathing,

⁸Adan O.C.G, On the Fungal Defacement of Interior Finishes (Thesis), 1994, 30-40.

⁹ http://www.afhh.org/hah/hah_main.htm

Energy Efficiency and indoor air quality fact sheet-US June 2006

European Commission, report 23, ventilation, good indoor air quality and rationale use of energy-2003

breathing), and there is insufficient natural ventilation (opening windows) or mechanical ventilation (fans, exhaust systems) to remove the moisture. In warmer climates, the heating, ventilation, and air conditioning (HVAC) system can pull warmer, humid air inside. In this case, the ventilation system may help create indoor humidity problems unless the system also dehumidifies the air.

The major indoor air pollutants are moisture, volatile organic compounds, combustion gases and by-products. These pollutants arise from a variety of sources such as cleaning products, wood or fuels that are burned, building materials and products, furnishings, paint strippers, the soil under a house and human activities.

Two types of ventilation can help control harmful air contaminants and humidity: spot ventilation and dilution ventilation.

- **Spot Ventilation.** Exterior exhaust fans should be installed in all bathrooms and kitchens. These fans remove humidity and carbon monoxide. The most effective fans are quiet and durable.
- **Dilution Ventilation.** Dilution ventilation addresses the entire living space. Air changes (exchanging indoor air with outdoor air) and air cleaning help determine the effectiveness of dilution. Air changes result from a combination of natural ventilation (infiltration; leakage; windows) and mechanical (controlled) ventilation. Air cleaning occurs when particulates are filtered and when air is dehumidified to remove moisture. The goal is to provide sufficient changes to ensure a healthy environment. There are several types of heating and cooling systems with filtration that can be installed to accomplish this. A common element necessary in all systems is duct sealing, particularly on the return side (side drawing in the air).

In conclusion, we can say that to maintain an acceptable indoor environment with respect to control of mould growth it is recommended to follow national ventilation rates provided in each Member States Building Codes and it is also highly recommended to start public awareness campaigns explaining to the occupant that he himself promotes in most cases mould growth through its ineffective use of ventilation systems..