The implications of toxic mould for facilities management and building services

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Abstract

Is toxic mould the new phenomenon, after asbestos and legionnaires' disease? This paper describes toxic mould and its implications on people and property for managers of the built environment. The basis of the paper is to advise facilities managers and building services engineers on the main facts about mould, as related to the built environment, how to avoid the conditions in which mould growth thrives and which areas within typical buildings have the greatest likelihood of supporting mould growth. The paper includes reference to the highly publicised compensation claims as completed in the USA and responds to the debate surrounding innovations in design and construction techniques being criticised for causing the increased occurrence of mould in newer buildings. From this background position, the paper describes the depth to which remedial procedures may be developed by facilities managers and building services engineers in terms of time and cost and concludes with advice on how to conduct such actions should mould deposits be detected.

Keywords:

health, inhalation, environment, litigation, prevention, action

INTRODUCTION

Toxic mould has been described as the 'new asbestos' and the 'new legionnaires' disease', because it impacts on the health of individuals, as a result of inhalation. The key facts regarding mould are the following:

- mould is a naturally occurring form of fungi;
- mould is everywhere;
- in simple terms, mould is a microscopic fungus that grows on the surface of materials such as wood, carpet, ceilings and paintwork;
- the vast majority of moulds are harmless to humans;
- exposure to toxic mould, in extreme cases, can prove fatal;

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- the severity of illness which can be contracted is dependent upon the sensitivity of each individual person.

For facilities managers and building services engineers, the main concerns regarding toxic mould are:

- the health risks imposed on building users and visitors;
- the anxiety generated by knowledge of its occurrence;
- the cost pressure induced by the need for immediate clean-up works;
- the cost pressure of reinstatement/refurbishment of premises;
- achieving relocation of users, throughout the clean-up and reinstatement process;
- negative publicity affecting the premises;
- the cost and administration of legal proceedings.

TOXIC MOULD — THE BACKGROUND

More than 100,000 species of mould exist naturally and the extent of the varieties that exist in particular locations is dependent upon the particular environmental conditions of each specific strain. The vast majority of fungal moulds have no impact on human health. There are 12 strains, however, which are responsible for 90 per cent of all professional construction negligence claims. Therefore, it is a small number of mould species which emit a toxic form of airborne spore, which, if inhaled, causes effects comparable to acute cases of Sick Building Syndrome, ie asthmatic and allergic reactions. Exposure to high concentrations of one particular strain, *Aspergillus species*, can result in the contraction of infectious disease which, in some cases, has proved fatal.

Because mould is a naturally occurring fungi it can be carried into buildings on footwear, clothing, within nasal cavities, and on the hair and skin surface of people entering buildings. Mould spores also can be introduced by the forms of ventilation which support the operation of the premises.

COLONY GROWTH CONDITIONS

For optimum growth development, in the built environment, mould requires:

- a surface temperature of 5°C to 40°C;
- a food source, eg wood, paper, cellulose or carbon-based material;
- moisture, ie high humidity, considered to be above 55 per cent relative humidity;
- darkness;
- lack of air movement, as a result of poor ventilation.

Areas most at risk from the likelihood of mould growth in normally occupied premises are the following.

**12 strains of mould
affect human health**

How mould thrives

- Archive storage facilities are the most optimum areas in which mould growth can become established. They are generally windowless, heated rooms which are largely unvisited and remain dark throughout the day and night. Artefact packaging can be a food source and racking systems may block ventilation air paths.
- Basement rooms may be low prestige, unventilated areas with ingress of dampness due to lack of effective tanking against the ground water table.
- Apartments may be unoccupied for large periods of the year. Furthermore, in some cases, the property may be kept temperate, unventilated and dark and there may be some sources of inherent dampness.
- Windowless offices, or offices with sealed windows, may perform superbly with the appropriate selection and installation of heating, ventilation and air-conditioning (HVAC) plant/equipment, but seemingly superficial re-partitioning projects may introduce barriers into ventilation paths, causing lack of air movement and subsequent stagnant conditions which support mould growth.
- Cold bridging of finishes in some areas can cause condensation to be formed on internal surfaces. This may be a result of insulation material being poorly applied, by it being removed (unwittingly), by it being degraded or saturated by physical damage or normal wear and tear.
- Riser shafts, condensation drainage equipment or unvisited zones in buildings benefit from heat gains, are dark, unventilated areas where debris may have accumulated and can act as a food source and where a minor water leak may not be detected for normal repair.

DAMAGE CAUSED BY MOULD

Damage to people

Mould dies in dry conditions; however, toxic mould becomes more hazardous as it dries, because it releases spores more vigorously into the indoor environment, but, unlike asbestos, there are no accepted 'safe' statutory exposure levels for mould toxins. When toxic spores are inhaled or ingested they can cause a range of health injuries, such as:

The damaging consequences of mould

- asthmatic symptoms, eg difficulty in breathing, wheezing, coughing, inflammation of air passages and nausea;
- allergic reactions, eg runny noses, eye irritation, headaches, loss of concentration and drowsiness;
- respiratory diseases, eg sinusitis and rhinitis;
- skin conditions, eg dermatitis.

Damage to property

Other than the toxic effects of mould, property clean-up and remedial actions can become expensive to administer and disruptive to the

continuity of occupation. There may be medium to long-term contract operations, which may result in the following:

- temporary closure;
- temporary re-accommodation;
- loss of income, investment value and image;
- stringent cleansing requirements;
- replacement of finishes due to excess moisture and staining;
- refurbishment activities, following cleansing;
- part or full redesign, to prevent recurrence.

The above can result in extensive compensation costs for professionals and contractors in the construction and property markets.

LITIGATION

The following are examples of litigation cases.

The mould damage caused from a plumbing leak to a 22-room mansion owned by the Ballard family, in the unfortunately named ‘Dripping Springs’ region of Texas, resulted in an insurance payment of \$32m, which was to cover total reconstruction of the mansion and compensate the family for the alleged bodily harm incurred. The legal process took several years and, throughout this time, the water leak was not repaired until the responsibility for negligence could be proven. In Martin County, Florida, the county filed a construction defect action against the architect, construction manager and subcontractors who worked on the courthouse. Toxic moulds and mildew were found in the building. Fifteen people alleged they had asthma-like symptoms as well as rashes as a result of the mould. The county went to trial against the construction manager after settling its claims against all other parties for nearly \$3m. The jury awarded the county \$11.5m in damages plus \$2.7m in interest. (The original cost to build the courthouse was \$13m, but it cost \$26m to rebuild it.) The jury verdict only dealt with property damage and did not include any personal injury claims, these were the subjects of separate cases.

In November 2001, a California judge finalised the payment of \$2.7m for a bodily injury jury award to a family for toxic mould exposure against an apartment building owner and the property manager. At that time it was believed to be the largest verdict in a mould-related personal injury case.

Ed McMahon sued his insurer for \$20m claiming botched repairs to a broken pipe led to the spread of a black toxic mould through his 8,000 square-foot, six-bedroom, Beverly Hills mansion. Soon after the incident, McMahon claimed he and his wife became seriously ill and their sheepdog, Muffin, developed respiratory problems and died.

In the USA, claims against architects and engineers have risen from a zero level in the early 1990s to tens of thousands of cases in the last ten years. Due to this rise in litigation cases, many North American insurance companies now exclude mould growth from their policy cover.

Legal repercussions of mould

WHY HAS TOXIC MOULD SUDDENLY BECOME A HEALTH ISSUE?

Is mould growth due to:

- Improvements implemented in more energy efficient design strategies within new premises in order to minimise operator costs?
- Implementing better construction materials and installation techniques, which have resulted in efficiently ‘sealing’ building envelopes?

The answer is ‘no’ to both these claims because designers, in making the above building improvements, are professionally bound to satisfy the following criteria in the development of their selection processes.

- deliver sufficient ventilation, which is appropriately distributed throughout all internal spaces;
- ensure the effective control of temperature and moisture levels;
- ensure appropriate selection of materials.

From the point of handover to the owner/occupier, however, the facilities manager/building services engineer should ensure that adequate maintenance care and attention is instructed, be that either planned preventative, condition-based or service-level compliant. The most important preventative procedure to employ, in minimising the initiation of mould conditions in new and existing buildings, is to ensure there is a management system to track the progress of remedial works, which can be used to measure the prompt resolution of defects and system failures. This remedial works tracking system becomes an essential tool for managing completion activities where there are several overlapping contracts. If such contracts are not managed holistically, faults can be particularly arduous to administer and, thus, responsibility for specific faults may not be attributed effectively to the right party and the owner/occupier, by default, will pick up the cost and responsibility for remedial action, whether the fault is due to base-build, fit-out, licence changes, vandalism, misuse or maintenance-related causes.

Important to ensure there is a management system tracking the progress of remedial works

PREVENTION MANAGEMENT OF TOXIC MOULD

Managers should consider the following stages of prevention.

Inspect for incidence

All visible wall and ceiling surfaces should receive regular visual inspections as a duty. If the opportunity exists, this service could be requested of a contract cleaning company, in the undertaking of their normal duties. Concealed areas also should receive routine inspections, eg moving semi-fixed kitchen appliances for a rear inspection and viewing the rear wall of unfixed cupboards, furniture and filing lockers. Air-conditioning plant and terminal equipment should be inspected routinely, in a dual exercise with the same prevention inspections undertaken for isolating legionella. These inspections should be focused particularly on

Prevention management

condensation collection pans, humidifiers and cooling batteries. It is in these areas that water may be held in suspension, proving a breeding medium. In the case of cooling systems, toxic spores may be entrained in the recirculation stream of mechanical air movement and distributed throughout the occupied space. The same conditions apply to dehumidification plants which store condensation water, here spores may be entrained and distributed by the ventilation cycle of the equipment fan. The key to effective inspection is diligent maintenance, which should be contracted to a prescribed specification in terms of the standard of service tasks and the frequency of application, with everything recorded for data-keeping purposes.

Identification

If, from the above inspections, mould is observed, deposits should be sampled and analysed by environmental laboratory equipment. Where mould is isolated, accessible surfaces should be cleaned by established sterilisation techniques. If the test laboratory confirms the sample contains toxins then a full remedial exercise may be required.

Action

The key is to act promptly when any toxic mould outbreak is detected.

Act promptly

- Isolate the area where the outbreak was detected.
- Instruct the environmental measurement of mycotoxins in the area of the outbreak and adjacent locations.
- Instruct for the cleaning away of all visible deposits.
- Remove any situations which promote growth conditions, as described above.
- Instruct maintenance engineers to action an environmental controls function regarding areas acting to support growth conditions.
- Isolate and clean air ductwork systems and ancillary equipment, where there is a local connection to the area of the outbreak.
- Remove materials and finishes which are harbouring mould.
- Inspect the HVAC design rationale used in the locality of the outbreak, re-engineer it as necessary.
- Decorate/refurbish as appropriate.
- Instruct for the environmental measurement of mycotoxins in the area where the outbreak was isolated.