INFORM

MOULD GROWTH

HISTORIC ENVIRONMENT SCOTLAND
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Fig. 1 Mould thriving on a damp (and therefore cold) area of wall. Eliminating the cause of dampness, and improving the heating and ventilation in this area will reduce the risk.

MOULD GROWTH

The presence of mould in a building is a visible sign of a problem with poor environmental conditions. Mould growth will occur whenever the conditions are suitable and the mould has a source of food to sustain itself. The presence of mould is a symptom of a wider failure of the way a building is performing and is usually caused by poor moisture management due to a combination of inadequate ventilation, heating, and insulation. Only by resolving these issues will the problem of mould be corrected.

This INFORM provides guidance on why mould grows in buildings and identifies practical steps to reduce the chance for mould to become established.

Why mould grows in buildings

Mould is a living organism which needs both water and a food source to survive. Mould uses enzymes to break down its food source and establish a viable colony. Within buildings the food source may be plaster, wallpaper, timber or other organic materials. Mould grows from spores released into the air, which lie dormant until conditions allow growth. It is virtually impossible to eliminate mould spores from a building, but it is possible to control conditions so that they cannot thrive.

Mould typically occurs when condensation forms on a cold surface, such as a wall, and remains damp and undisturbed. Condensation occurs when warm, humid air cools on cold surfaces and condenses to liquid water. Windows are the most common area for condensation to form as the glazing is colder than the fabric surrounding it. However, cold parts of walls such as window reveals, areas where insulation has been poorly installed, or localised damp areas can all create cold areas where condensation can form (Fig. 2). Poor ventilation can also prevent warm, moist air from leaving a building, leading to an increased risk of mould growth in unventilated areas such as behind furniture.

The use of modern vapour-resistant building materials within historic or traditional buildings can encourage the growth of mould, as they prevent the movement of moisture vapour through the building fabric. This

Fig. 2 Mould growth adjacent to a draughty door. This area of internal wall is colder so condensation is more likely.

Fig. 3 Traditional buildings were constructed with built-in ventilation which should be maintained and kept clear to reduce moisture levels.

encourages surface condensation and elevated moisture levels. In contrast, traditional materials such as stone, timber, lime plaster and mortar, as well as some natural insulation materials, are more 'breathable.' This means they can cope better with changes in humidity.

Health impacts of mould in buildings

Mould can have a serious impact on human health and may lead to health problems such as respiratory infections, allergic rhinitis and asthma. Allergic responses include hay fever-type symptoms, such as sneezing, runny nose, red eyes, and skin rash (dermatitis). In addition, mould exposure can irritate the eyes, skin, nose, throat, and lungs of both mould-allergic and non-allergic people.

Rarely, mould can also be toxic. The best known toxic mould is the black mould, *Strachybotrys*, though not all mould which is black in colour is toxic. However, if toxic mould is suspected within a building it is advisable to have it tested and there are private testing facilities that do so. It is not generally necessary to test samples of mould to identify what kind is present within a building, however. All types of mould can cause health problems and are indicative of defects within a building.

Ventilation

Mould and damp are related to poor indoor air quality. Indoor air quality is a general term which relates to the levels of carbon dioxide and pollutants within the internal environment of a building. Buildings can be vented by simply opening windows and it is healthy to cross ventilate buildings for short periods every day.

Continuous trickle ventilation (either deliberate or fortuitous) is also important to regulate air quality. Traditional sash windows allow controlled trickle ventilation when opened slightly at the top and bottom. Whilst mechanical extract ventilation removes warm, moist air from a room, it is usually only localised (for example in bathrooms and kitchens). Therefore, wall and floor vents, or other means of encouraging air to circulate within a building, should always be maintained and kept clear of debris (Fig. 3).

Fig. 4 The positioning of mechanical extract ventilation is extremely important. Here moisture from a bathroom escaped into a roof space, causing a localised concentration of moisture, mould growth and timber decay.

Where extract ventilation is provided in bathrooms and kitchens it should vent directly outside to avoid simply transferring moisture problems to elsewhere in the building (Fig 4). Humidity controlled ventilation can be useful, particularly where there has previously been a problem with mould growth (Fig. 5). For more information on properly ventilating buildings, see *Historic Environment Scotland's INFORM: Ventilation in Traditional Houses*.

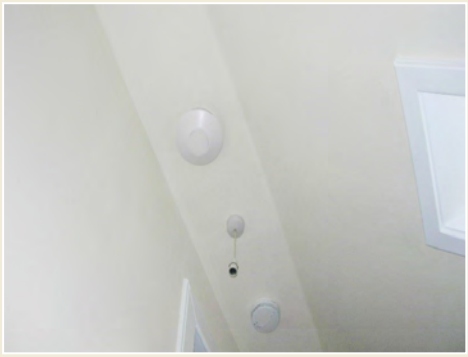

Fig. 5 Humidity controlled ventilation installed to help reduce the risk of mould growth.

Signs of mould growth

The most obvious signs of mould are its visual presence and a musty smell. However, mould can develop in any areas of a building with lower surface temperature and poor air circulation, and sometimes in hidden corners of buildings where it may be hard to detect visually (Fig 6). Mould should always be removed and the cause addressed if it is found. If mould is growing in one part of a building it is advisable to check for its presence elsewhere.

Fig. 6 Mould growth in an unventilated press cupboard.

Fig. 7 Measuring moisture in timber. Humid conditions (such as in an unventilated roof space) create ideal conditions for mould to grow.

Fig. 8 A cold spot has been created around this uninsulated loft access hatch, leading to mould growth.

Preventing mould growth

The best way to prevent mould growth is to ensure that the building fabric is kept dry, warm, and ventilated so that it can regulate and manage moisture correctly. If mould growth is cleaned from the surface of a building material but the problems which allowed its development are not rectified, then the mould will simply return.

Warm air can hold more moisture than cool air, so adequate heating and air movement can prevent mould from forming. Most moulds grow when moisture levels reach 70-75% relative humidity, and thrive at levels above 85% (Fig. 7). Heating to raise internal surface temperatures and reducing indoor humidity to between 40-60% is therefore likely to inhibit the growth of mould in most cases and prevent it re-establishing itself.

Whilst having a well-insulated external envelope can help improve internal conditions, care should be taken when undertaking energy efficiency refurbishments, as an increase in air-tightness can sometimes worsen existing conditions or create humid conditions which allow mould to thrive. Avoiding cold spots (Fig. 8) and ensuring there is adequate ventilation is important to maintaining a healthy internal environment.

Removing mould

Once the conditions which have allowed mould to grow have been rectified, it should be cleaned off. The use of biocides or strong bleach to kill mould is generally not required. Surface mould should be physically removed rather than simply sprayed; the dead mould spores are unsightly and both mould and biocides are potentially detrimental to heath.

Soap and water, or a weak bleach solution, may be used to remove mould from hard, non-porous surfaces such as walls or painted timber. When removing mould, eyes, skin and respiratory systems should be fully protected with appropriate personal protective equipment (PPE) including goggles, masks and gloves. The working space should be ventilated. Painting or papering over a mouldy surface is not advised, as the applied finish is likely to peel off the wall. Mould can also grow on

the back of wallpaper if sufficient moisture is present, and mould may feed off the paper and paste.

Mouldy material which is badly affected by mould and porous materials such as plasterboard (Fig. 9) may require removal and disposal (Fig. 10). Traditional materials such as lath and plaster and timber can normally be cleaned and allowed to dry out. The dust and mess created when removing affected materials can cause the spread of spores, so it is advisable to seal off the room using plastic sheets and duct tape in order to prevent spores from spreading throughout the building.

It is advisable to clean all surfaces which are near to an outbreak of mould and to vacuum using a high efficiency particulate air (HEPA) filter to remove as many spores as possible. It is important to recognise, however, that some mould spores will always be present and maintaining conditions which do not support their growth, i.e. keeping a building warm, vented and dry, is the only way to prevent mould from re-establishing itself.

Conclusion

Mould can be a serious problem within buildings and in extreme situations can render a building uninhabitable. Its presence is generally a symptom of poor environmental conditions, cold surfaces, inadequate heating and ventilation, and a failure with the way a building manages moisture.

Mould can affect human health and should be addressed with appropriate actions as soon as it is detected. Measures to improve conditions include improving insulation, the use of humidity-controlled extract ventilation, and maintaining existing pathways for air movement. Using breathable materials which help manage humidity and moisture levels can also improve internal conditions and inhibit mould growth.

Fig. 9 Substantial mould growth in this stairwell meant the plasterboard had to be removed.

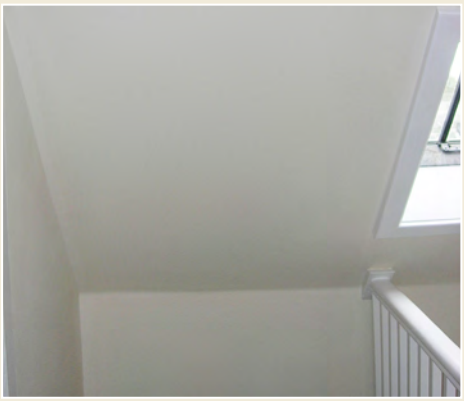

Fig. 10 The same stairwell as in Fig. 9 with replaced plasterboard following ventilation improvements and the installation of breathable insulation.

For more information on managing moisture levels in buildings see *Historic Environment Scotland's INFORM: Damp Causes and Solutions* and *Historic Environment Scotland's Short Guide 1: Fabric Improvements for Traditional Buildings*.

Further reading

INFORM: Damp Causes and Solutions Historic Environment Scotland, 2016

INFORM: Ventilation in Traditional Houses Historic Scotland, 2008

INFORM: Damp Gables Historic Environment Scotland, 2018

Short Guide 1: Fabric Improvements for Energy Efficiency Historic Scotland, 2013

Short Guide 9: Maintaining your Home Historic Environment Scotland, 2014

Short Guide 11: Climate Change Adaptation for Traditional Buildings Historic Environment Scotland, 2017

Further information

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