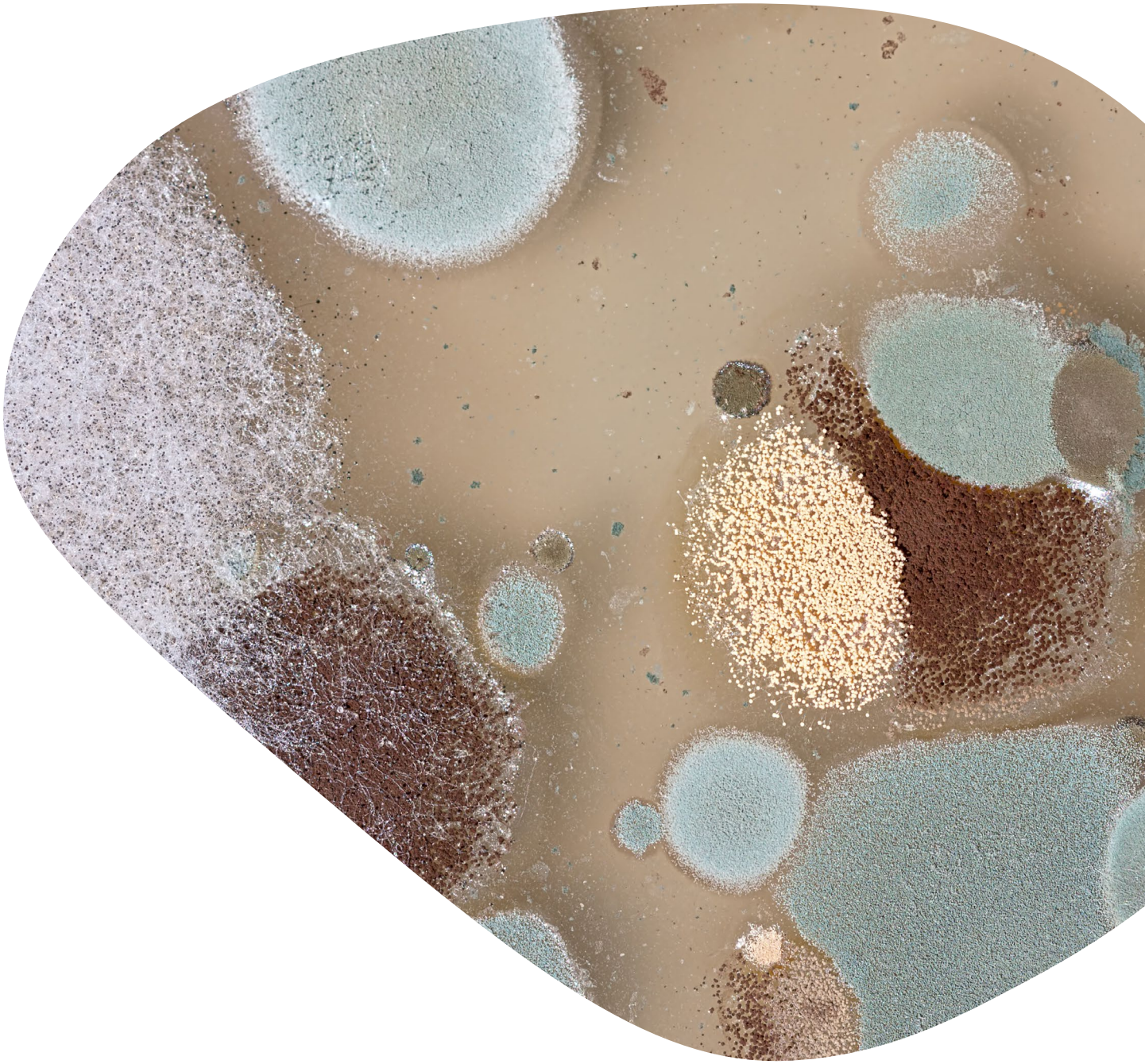
Government of **Western Australia**
Department of **Health**

Guidelines for managing mould and dampness

Related public health risks in buildings



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Contents

Abbreviations and definitions

Condensation	Condensation is the process used to describe moisture formation on a surface as a result of moist air coming into contact with a surface which is at a lower temperature. As cool air is unable to retain the same amount of water vapour as warm air, excess moisture is released as condensation. Factors that contribute to condensation include high humidity of indoor air, low temperature of the walls or surfaces, and inadequate ventilation.
Dampness	Dampness is the consequence of excess moisture in buildings. Dampness can be defined as any visible, measurable or perceived, unwanted and excess moisture in an indoor environment.
DMAT	Dampness and Mould Assessment Tool
EHD	Environmental Health Directorate
HEPA	High Efficiency Particulate Air
HVAC	Heating, ventilation and air conditioning
IEQ	Indoor Environmental Quality
Moisture	Moisture can be either water vapour or condensed liquid on the surface of objects. It refers to small amounts of liquid, sufficient to moisten or dampen the air or a surface.
Mould	Mould includes all species of microscopic fungi that grow in the form of multicellular filaments, called hyphae. Although the terms 'mould' and 'fungi' are often used interchangeably, mould is only one of the many organisms that make up the kingdom, Fungi. The number of mould species is large and diverse.
NATA	National Association of Testing Authorities
PPE	Personal protective equipment
The Guidelines	The Guidelines for Managing Mould and Dampness Related Public Health Risks
Ventilation	Ventilation is the process of supplying or removing air by natural or mechanical means to or from any space; the air may or may not have been conditioned.
WA Health	Western Australian Department of Health

Version control

Version	Date	Author	Approved by	Comments on revision
	2015	EHD	–	First release
	April 2024	EHD		Significant updates to entire guidelines including updates to guidance on assessment, remediation and prevention, restructuring of the guidelines, inclusion of health effects, inclusion of risk rating matrix, update to legislative context and inclusion of recommendations and considerations of managing indoor mould in a post-flooding context.

1. Introduction

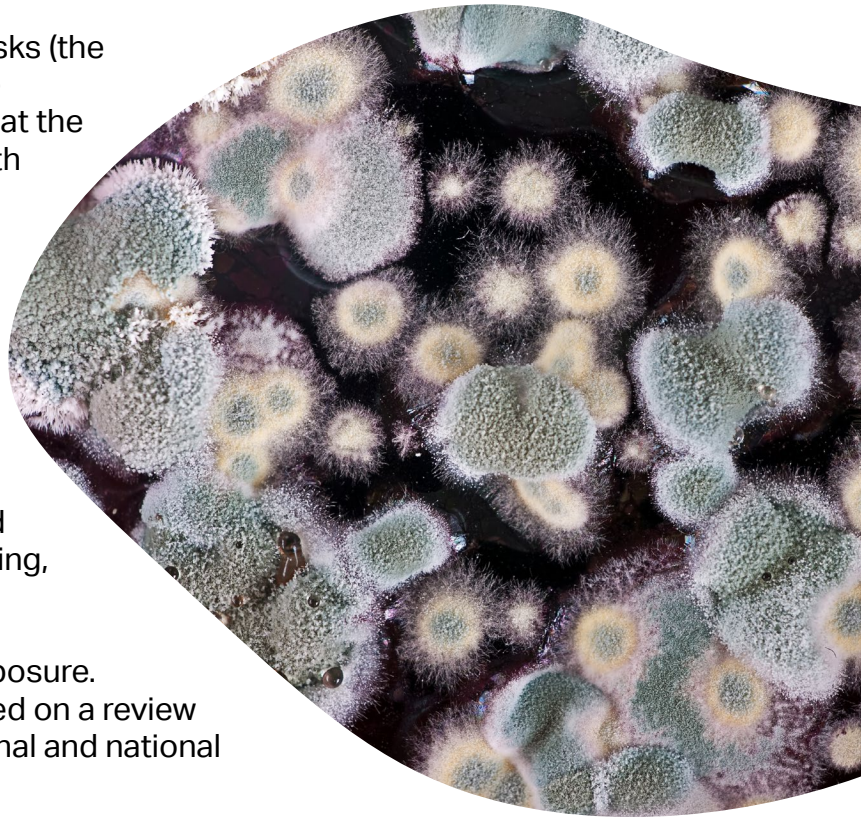
1.1 Background

Mould is a key indoor biological pollutant which has the potential to cause adverse health effects with exposure. Mould can also result in unpleasant odours and damage to building materials, contents and structures that may lead to expensive maintenance or management costs.

Mould is a common term for all species of microscopic fungi that grow in the form of multicellular filaments (hyphae). It can grow on most building materials including ceilings, carpets, glass and wood or in heating, ventilation and air conditioning (HVAC) systems. The presence of indoor mould growth is contributed to by complex interactions between the outdoor environment, built indoor environment and occupant behaviours. While nutrients, oxygen, humidity and appropriate temperature are all essential for mould growth, moisture is the key determinant. Moisture control is therefore the primary way to limit mould growth.

Excess moisture in the indoor environment can be due to factors such as inappropriate building design and construction, poor building maintenance and insufficient or inadequate ventilation. Indoor moisture can also be contributed to by occupant behaviours through moisture generating activities including showering, cooking, and drying clothes indoors. Even breathing generates moisture. Occasional weather events such as floods and storms can also cause water damage to the built environment, and lead to subsequent mould growth if not adequately managed. Excess moisture can also promote the proliferation of other indoor biological pollutants, including bacteria and allergens such as house dust mites, and increase chemical emissions from building materials. These pollutants all have the potential to adversely affect human health and therefore excess moisture, irrespective of the presence of mould, should be minimised and remediated in indoor environments.

The Guidelines for Managing Mould and Dampness Related Public Health Risks (the Guidelines) have been developed by the Environmental Health Directorate (EHD) at the Western Australian Department of Health (WA Health) to provide guidance on the identification, assessment, remediation and prevention of mould growth and dampness in indoor environments.



1.2 Purpose

The purpose of this document is to outline the evidence-based health effects of exposure to indoor mould and provide guidance on identifying, assessing, remediating and preventing mould and dampness in indoor environments to reduce potential health risks from exposure. The strategies and approaches are based on a review of both existing literature and international and national guidelines and best practice.

1.3 Scope

This document has been prepared for owners, occupiers, and managers of residential dwellings and public, government and commercial buildings. Public, government, and commercial buildings include but are not limited to, schools, office buildings, day care centres and nursing homes.

The Guidelines are not intended for infection control in healthcare facilities which is covered by the *Australian Guidelines for the Prevention and Control of Infection in Healthcare*. They are also not intended for microorganism control in the food industry which is covered by the *Australia New Zealand Food Standards Code*. However, the Guidelines can still be used in both of these settings to assist in the identification, assessment, remediation and prevention of mould contamination or dampness.

This document covers both mould and dampness. Dampness is the most important condition conducive to mould growth in indoor environments but is also considered a risk factor for adverse health effects in the absence of any visible evidence of mould.

These Guidelines are designed for the identification and remediation of mould problems if they occur and the prevention of further contamination (if required). Ideally the prevention of dampness and potential mould problems should be considered at the building design and construction stages: the *National Construction Code* outlines requirements for moisture control in both commercial (*Volume 1, Part F1*) and residential (*Volume 2, Part H2*) buildings. Building design and construction are beyond the scope of this document.

1.4 Legislative context

WA Health receives many enquiries about mould contamination in public, government, commercial and residential buildings. The *Public Health Act 2016* specifies the role in protecting public health from indoor or outdoor environmental hazards, which includes potential public health risks from indoor mould exposure. A risk to public health is something that is known to cause or potentially cause disease or harm to the public health or wellbeing of humans.

1.4.1 General Public Health Duty

The general public health duty specified in Part 3 of the *Public Health Act 2016* requires that a person must "take all reasonable and practicable steps to prevent or minimise any harm to public health that might foreseeably result from anything done or omitted to be done by the person".

As defined in the *Public Health Act 2016*, harm includes physical or psychological harm to individuals, whether of long-term or immediate impact or effect. In cases where matters are a nuisance or amenity problem but are not likely to result in harm, the serious and material public health risk provisions will not apply.

In assessing what is reasonable and practicable, regard must be had to the objects of the *Public Health Act 2016* and to a range of other matters. A person will not breach the public health duty if they act in a manner or in circumstances that accord with generally accepted practices.

Detailed and specific guidance on the different enforcement options are available in the Public Health Act 2016 Handbook for local government.

These Guidelines may be used to clarify the application of the general public health duty and provide industry specific information on what might constitute 'reasonable and practical steps' to prevent harm to public health, in the context of indoor mould exposure.

1.4.2 Workplace Duty

When mould or dampness problems occur at a workplace and presents a hazard to workers, advice regarding occupational health issues should be sought from WorkSafe, Department of Energy, Mines, Industry Regulation and Safety under the *Work Health and Safety Act 2020*. Building owners and managers are responsible for providing a healthy workplace under this Act.

1.4.3 Residential Tenancies Duty

The *Western Australia Residential Tenancies Act 1987* requires that the owner or agent of a rental premise ensures that the premise is habitable and in a reasonable state of cleanliness and repair. Tenants are also required to ensure the premise is in a reasonable state of cleanliness and notify the owner as soon as practicable after any damage to the premise.

In terms of mould issues, owners are to ensure proper building construction and maintenance and occupants are required to manage the use of water, heating, ventilation and appliances in a manner that does not lead to dampness and mould growth, as outlined in the Renting a home in Western Australia - a tenant's guide.

2. Health effects of mould

Overview

- Persistent indoor mould growth or excess dampness in buildings is considered a public health risk.
- Evidence currently demonstrates a causal relationship between indoor mould exposure and asthma development and exacerbation in children.
- The relationship between indoor mould exposure and other health effects is not clearly established.
- A major limitation in understanding the health effects of indoor mould exposure is the lack of a clear dose-response relationship between mould exposure and human health effects.
- Some groups of people may be more at risk of potential adverse health effects of mould.

Mould spores are ubiquitous in the outdoor environment and usually present no health risks to healthy people. Exposure to excess dampness and mould in the indoor environments, however, has been associated with adverse health effects and may represent a risk to public health.[1]

Inhalation of mould, fragments and byproducts (e.g. microbial volatile organic compounds) is the primary route of exposure contributing to adverse health effects, although skin symptoms may be caused by contact with mould as well*.[2]

The evidence base reports a number of different health effects with varying types of evidence including epidemiological, clinical and toxicological. The evidence base describes a causal relationship between indoor mould exposure and asthma development and exacerbation in children, and an association between indoor mould exposure and other respiratory health effects.[1-3] Fungi can cause infections, allergic reactions and have toxic health effects; however, the evidence is not sufficient to conclude any causal relationships or definitive associations between indoor mould exposure and these health effects.[3,4]

The specific contribution of mould or dampness to adverse health effects is difficult to determine for a range of reasons.

*Any persons who think that they are experiencing adverse health effects from exposure to mouldy environments should seek medical advice.

Challenges include:

- people are likely exposed to multiple indoor pollutants simultaneously
- there is lack of strong evidence linking indoor mould exposure with all health effects that have been reported
- there is difficulty in identifying disease-causing mould
- there is a lack of validated sampling tools
- there is no established dose-response relationship between indoor mould exposure and health effects, and
- there are uncertainties in measuring the amount of actual exposure to mould.

These challenges highlight the need to take a precautionary approach and minimise exposure to mould and dampness to reduce any potential health effects.

2.1 Susceptible people

Individual responses to mould exposure vary depending on genetic makeup, allergic history, and underlying health status. People with existing respiratory, immunocompromising and allergic conditions are considered to be more vulnerable to dampness and mould related health risks.[4] Infants, children and elderly people are also often more susceptible to dampness and mould related health risks due to their respective developmental, immunological and health status. Some observational studies also describe an association between mould exposure in pregnancy with poorer health outcomes in offspring.[4]

3. Assessment

Overview

- When assessing mould, identifying the extent of its growth and any contributing factors can help determine the level of remediation required.
- A visual inspection using indicators such as visible mould, visible water damage, excess condensation, standing water and presence of mouldy odour is recommended. This should be part of regular building inspections or conducted in response to suspected contamination.
- In some circumstances, investigation and monitoring of the moisture level of the building structure, materials or the indoor air may be required to help determine the underlying source of the problem.
- Surface or air sampling of mould spores is not recommended for establishing the level of health risk.
- Always consider the potential exposure to mould in people who conduct mould inspections and ensure that appropriate level of personal protective equipment (PPE) is worn.

Mould or dampness assessments should be included in any regular building maintenance program. A Building Inspection Checklist for mould and dampness should be developed. An example of a Building Inspection Checklist that can be amended to be relevant to specific situations is enclosed in Appendix A.[5]

Where mould is suspected, a preliminary mould or dampness assessment should be conducted primarily by visual inspection. Visual inspection is the recommended method for identification of mould or dampness problems, and completion of a basic building product moisture survey. A Dampness and Mould Assessment Tool (DMAT) has been developed by the United States National Institute for Occupational Safety and Health (NIOSH) to facilitate the assessment of mould or dampness problems.[6] The DMAT undertakes a semi-quantitative approach to score the level of dampness and mould related damage, which may assist in determining the level of remediation required.

An assessment of mould or dampness aims to:

- identify the presence of mould or dampness
- evaluate the extent of the mould and dampness problem, and
- identify the source of the problem.

People undertaking an inspection should always consider their potential exposure to mould, particularly if the inspection may disturb a contaminated area. Inspectors should ensure they have access to the appropriate level of PPE (see Appendix B). Inspectors should also consider their health history and the potential health risk from mould exposure. Where an inspector has conditions that make them susceptible to adverse health effects from mould exposure, higher levels of PPE may be required, or in instances where the health risk is significant, they should avoid undertaking the assessment altogether.

Following the initial assessment, a comprehensive assessment should be undertaken if extensive mould or damp problems are identified or suspected. Professional help may be required to undertake a comprehensive assessment.

Professional help for mould and dampness assessment

Professional help may be obtained from trained building maintenance staff, mould assessors or remediators, building consultants, Indoor Environmental Quality (IEQ) assessors and local government Environmental Health Officers. Assessments should be conducted in a manner that provides useful information for the development of an action plan for remediation of the affected area.

Finding professional help

WA Health does not endorse any company or individual or keep a register of experts.

There are currently no formal Australian qualifications for certifying mould assessors. However, there are companies and individuals that have qualifications and experience in mould assessment. Some specialise in mould assessment, while others work more broadly in IEQ or building management or maintenance.

Before engaging a professional with expertise in mould assessment, their level of expertise and competence should be first established. This may include sighting qualifications or any evidence of training and previewing their previous project work or experience portfolio.

Surface or air sampling of mould

As there are currently no quantitative health-based microbial exposure guidelines or thresholds, sampling is not recommended for primary health risk management. However, surface and air sampling may play a role in circumstances where extensive assessment processes are required, for example, if mould or dampness is suspected but cannot be identified.

Surface or air sampling of mould is limited by a lack of standard sampling and analytical procedures, a lack of comparability between sampling methods, high short-term variability in measured levels, and difficulties interpreting the highly variable results.[7] However, where the source of mould or the extent of a potential problem is unclear, various analytical tests and moisture measurements may be considered as part of a detailed dampness and mould assessment.

Sampling should be conducted by experienced professionals who have specific experience in designing mould sampling protocols, sampling methods, and interpreting laboratory analytical results. Laboratory testing should always be carried out in an appropriately accredited laboratory (National Association of Testing Authorities - NATA). It is important that the purpose of any sampling is made clear and that analytical test results are interpreted relative to that purpose. The laboratory analytical results should not be used for determining the level of health risk to the occupants, as no dose-response relationships have been established.[8,9]

3.1 Identification of mould

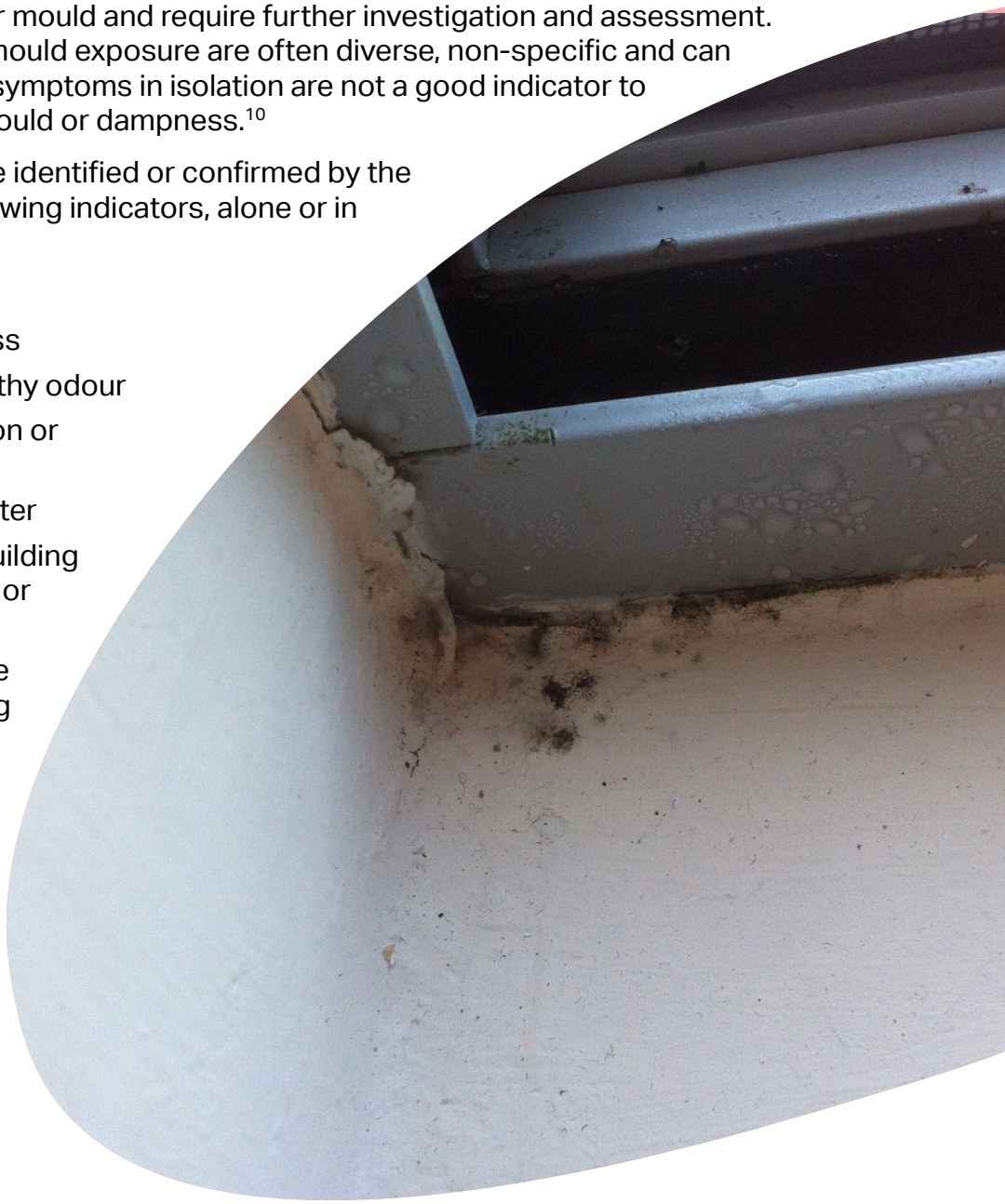
The presence of mould in the indoor environment should be considered when:

- Water-damage has recently occurred in the home from severe weather events, building envelope breaches or water leaks. Signs of water-damage include water stains or discolouration on flooring, carpets or walls, peeling paint, wrinkled wallpaper or efflorescence
- Dampness is consistently present in the form of condensation on surfaces or when objects feel wet
- Occupants report musty and mouldy smells
- The relative humidity is persistently high and there is poor ventilation.

Occupants may experience symptoms consistent with mould or dampness which may trigger a concern for indoor mould and require further investigation and assessment. However, symptoms from mould exposure are often diverse, non-specific and can be due to other causes so symptoms in isolation are not a good indicator to suggest the presence of mould or dampness.[10]

Mould or dampness may be identified or confirmed by the presence of any of the following indicators, alone or in combination:

- Visible mould growth
- Visible signs of dampness
- Perceived mouldy or earthy odour
- Presence of condensation or high humidity
- Presence of standing water
- Previous documented building history of water damage or mould growth
- Moisture readings[†] above what is normal of building materials or major furniture items, taking into consideration the environment when interpreting the moisture reading. Moisture readings may naturally be higher in high humidity or coastal regions.



[†] Moisture monitoring requires specialised equipment and is usually conducted and interpreted by experienced professionals

3.2 Evaluation of the extent of mould and dampness problems

If mould or dampness has been identified, it is important to evaluate the extent of the problem to determine the remediation and risk management procedures that will be required. The DMAT tool can be used to assist in evaluating the extent of mould and dampness.[6] Evaluation includes:

- Identifying if the mould or dampness problem is recurrent or chronic
- Locating the source of the mould or dampness problem
- Determining the extent of the contamination. This includes identifying if the contamination is limited to affecting furniture and surface growth alone, or involves hidden mould that extends into the building structure, behind walls or into any HVAC systems
- Identifying contaminated materials and furniture, including recognising whether contaminated material is either porous or non-porous.

When evaluating the extent of contamination, it is important to consider the potential exposure to mould of the people undertaking the evaluation as well as building occupants. This includes consideration of the likely frequency or duration of exposure, the activities of occupants that may lead to mould disturbance and the susceptibility of occupants to potential health effects from mould or dampness. The building owner or manager should inform the occupants if any mould or damp problems have been identified, the extent of the contamination, the remedial measures that need to be taken and a timeline for completion.

3.2.1 Hidden mould

The extent of mould or dampness may not be easily identified as it may extend behind walls and wall coverings (e.g. tiles or wallpaper), under floors and floor coverings (e.g. carpets), within building structures and within the HVAC system. Hidden mould should be considered if there is a persistent mouldy or earthy odour, there has been known water incursion, or if occupants experience ongoing symptoms consistent with mould or dampness exposure.[11] Caution needs to be taken when investigating hidden mould as the mould spores may be disturbed, released and aerosolised leading to cross-contamination in the property. If mould or dampness is suspected but cannot be observed, it may require professional help.

3.2.2 Porous and non-porous materials

It is important to identify if the mould contaminated surfaces (e.g. ceilings, floorings and furnishings) are made from porous or non-porous materials. Mould can often be removed from non-porous materials such as metals, glass and hard plastics. However, mould may be difficult to completely remove from absorbent or porous material, such as carpet, tiles, gyprock and raw wood, as the mould can grow into the empty spaces and crevices of the material. Often these items are not economically salvageable as part of typical remediation processes and must be thrown out. Items of financial or sentimental value may require referral to a professional.

3.3 Identifying the source of the problem

If mould or dampness are confirmed, the source of the contamination must be located to properly address the cause of the mould or dampness and prevent further occurrences. Common dampness sources should be considered and include:

- Water accumulation. This may come from various sources such as:
  - Surface water: rainwater, groundwater or irrigation sprayers/drippers leaking into building roofs, ducting, walls, windows, or the building foundations
  - Internal plumbing leaks: plumbing spills and leaks
  - Capillary action: rising damp or water wicking through porous building materials from a moisture source such as groundwater, rainwater or plumbing water
- Condensation: condensation is formed when moist air contacts a cool surface. It can be caused by:
  - High indoor relative humidity
  - Steam from indoor activities such as showering, cooking and using non-condenser clothes dryers without instalment or appropriate use of exhaust fans
  - Inadequate ventilation, for example, poor air exchange between indoor and outdoor air
  - Inappropriate ventilation, for example, infiltration or exfiltration of warm and moist outdoor air
  - Poor building design
- Severe weather events such as flooding, cyclones or storms and incursion of water from firefighting. Mould growth will likely be a problem if the building foundations or porous internal building components stay wet for over 48 hours (see Appendix E for considerations in managing mould in a post-flooding context)
- Occupant behaviours: occupants may contribute to indoor dampness by:
  - Generating excess moisture through activities such as showering, cooking and air-drying clothes indoors without adequate ventilation and using appliances such as humidifiers, non-condensing clothes dryers and unflued gas heater
  - Failing to effectively vent or exhaust water vapour
  - Failing to fix water leaks or dry excess water quickly
  - Failing to maintain an irrigation system
  - Storing large amounts of water absorbent materials, such as books or cardboard boxes, in a damp space

Appendix C provides more detail on activities that may generate excess moisture and actions that can be taken by building occupants to control moisture in indoor environments.

3.4 Determination of the mould contamination level

The assessment process requires determining if the mould contamination level is simple or complex. How the level of mould contamination leads to health risks is difficult to define, as no dose-response relationships have been established. However, as the size of mould contamination increases, so does the potential for increased exposure.

The criteria described below can be used as a general guide in deciding if remediation can be done ‘in-house’ or requires professional assistance.

3.4.1 Simple level contamination

Mould and damp contamination that are simple can be defined as follows:

- It is new[‡] , isolated and visible
- The size[§] of mould contamination is no greater than one square metre
- When it is unlikely that the mould affects the HVAC system, split air-conditioning system or building structure
- When the causes of dampness/condensation can be easily identified and removed or corrected
- Water incursion, if any, is not highly contaminated (Category 1 or 2 water)
- When there are no other hazards involved (such as asbestos or toxic chemicals)
- Simple mould problems can often be dealt with in-house by building occupants using suitable PPE (see Appendix B) and taking the appropriate actions (see 4. Remediation)

3.4.2 Complex level contamination

Complex mould and dampness problems generally meet one or more of the following requirements:

- The size of mould contamination is larger than one square metre or is found in multiple rooms or places
- There is evidence of recurring and persistent mould or dampness
- If any mould growth is confirmed or suspected in the HVAC system – not including low level mould growth within a single split-system
- When the underlying causes of the mould or dampness are due to the faults in building design or structure and/or are difficult to repair
- Where there is highly contaminated water incursion (Category 3 water)
- When there are mouldy odours and/or unexplained illness associated with occupancy, but no obvious visual signs of water or mould damage i.e. suspected hidden contamination.
- When other hazards are involved (such as asbestos or toxic chemicals)

[‡] Recurring problems may also be simple with regards to cleaning and removing of the mould. However, this will indicate that the source has not been addressed and professional assistance may be required in identifying the source.

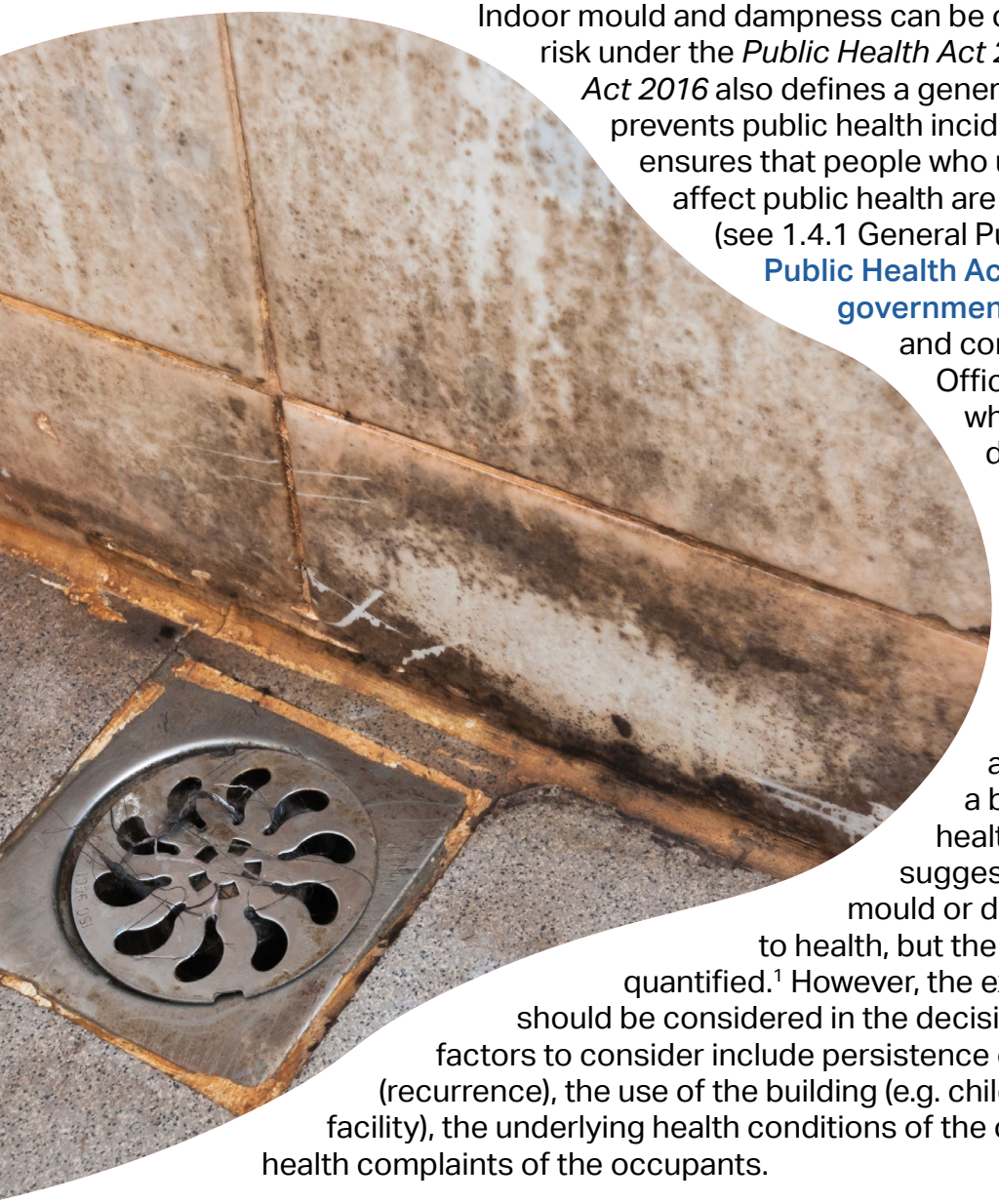
[§] This is an arbitrary size based on the United States Environmental Protection Authority (USEPA) and World Health Organization (WHO) recommendations. It is not precisely related to the frequency or severity of health effects. This is only a recommendation and areas larger than one square metre may be able to be remediated without professional help. The decision to employ professional help will be at the discretion of the building owner, manager or occupant.

3.4.3 Water incursion

If the mould is caused by incursion of water, either from an outdoor or indoor source, the type of water may also be important in both identifying the source as well as determining the level of remediation required. Water incursion can be categorised as follows:

- **Category 1:** Clean water. Water from a source that is not harmful to humans, including broken water supply lines, water from taps, clean groundwater or rainwater.
- **Category 2:** Grey water. This may contain a certain level of chemical, biological or physical contamination. It includes dishwasher or washing machine water, drain water, and water from fire hydrants. Category 2 water may cause illness or discomfort if consumed.
- **Category 3:** Black water. This is considered extremely unsanitary water that contains pathogenic agents. It includes toilet overflow water containing faeces and urine, sewage water and floodwater from rivers or streams.

3.5 Determining if there has been a breach of general public health duty



Indoor mould and dampness can be considered a public health risk under the *Public Health Act 2016*. The *Public Health Act 2016* also defines a general public health duty that prevents public health incidents from occurring and ensures that people who undertake activities that affect public health are responsible for them (see 1.4.1 General Public Health Duty). The Public Health Act 2016 Handbook for local government provides further guidance and considerations for Authorised Officers when assessing whether a breach of general duty has occurred in relation to indoor mould.

Currently there are no defined quantitative or qualitative exposure thresholds for mould or dampness that could be used to determine that a premises with mould is a breach of general public health duty. Current evidence suggests that the presence of any mould or dampness can pose a risk to health, but the level of that risk cannot be quantified.[1] However, the extent of the contamination should be considered in the decision-making process. Other factors to consider include persistence of the contamination (recurrence), the use of the building (e.g. child-care centre and health facility), the underlying health conditions of the occupants and reported health complaints of the occupants.

4. Remediation

Overview

- The remediation step aims to remove the mould and mould-damaged materials and to correct moisture problems.
- Remediation activities need to be conducted in a manner that minimises the disturbance of the mould and mouldy materials and contain the release of mould spores as much as possible.
- Simple level contamination can generally be remediated by building owners or occupants, although it is not recommended that these activities are undertaken by people who may be susceptible to mould and dampness. Professional help may be required to fix the source of the problem.
- Complex level contamination typically requires professional help to ensure that any mould and dampness is adequately removed and the underlying precipitants are addressed.

The aim of mould remediation is to restore the building back to normal condition by correcting any moisture problem and removing mould and mould-damaged materials. The level of remediation depends on the level of contamination as determined in mould assessment (see 3. Assessment). Remediation can be done by a building owner or occupant, but professional assistance may be required for the remediation of complex problems. Professional help may also be required if occupants are concerned about undertaking the work themselves or if previous remediation attempts have been unsuccessful.

Professional help for remediation: professional help may be required for both mould removal and for fixing the underlying causes. Therefore, more than one professional may need to be engaged. For example, mould specialists may be required to remediate mould problems, plumbers may be required to identify and fix any plumbing leaks, builders or roof specialists may be required to fix leaks in the building structure, and HVAC consultants or engineers may be needed for identifying and remediating problems with the HVAC system.

4.1 Principles of remediation

The basic principles of remediation are the same for simple and complex level contamination and include:

- Ensuring appropriate precautions are undertaken including for personal protection and environmental controls
- Containment – isolation of the contaminated areas, including travel pathways, from un-affected areas of the building and building occupants
- Removing dampness or standing water
- Removing mould and mouldy materials
- Complete drying of construction and building materials, furnishings, and carpet
- Repairing the source of the problem

Cleaning approaches, or disposal options, for contaminated areas and materials may vary depending on the extent and source of contamination. Any remediation procedures should be outlined in a remediation plan and discussed with any professionals undertaking the clean-up.

4.2 Simple level contamination

Small, isolated or simple mould contamination can generally be appropriately remediated by building occupants.

4.2.1 Precautions

The following precautions should be taken for remediation:

Personal protection: anyone who is involved in the mould remediation process should protect themselves from potential exposure to airborne mould. Recommendations for personal protective equipment are outlined in Appendix B.

Environmental controls: efforts should be made to prevent the spread of mould to other internal areas. These include:

- Close doors between the affected room and other rooms
- Ensure adequate ventilation to outdoors. Consideration, however, should be given to outdoor conditions such as rain and wind. For example, if outdoor wind speed is high, then opening external windows and doors of the affected room may just cause the dispersion of spores within that room
- Do not operate air-conditioners, ceiling fans or exhaust fans when removing mould
- Ensure there is clear signage and restrict access to the area while it is being cleaned
- Communicate with persons in the vicinity of the area being remediated. Susceptible individuals may need to vacate the area while remediation is undertaken

4.2.2 Remediation

Remediation involves removing the mould and mould-affected materials, drying all surfaces and fixing the source of the problem. Remediation should be done in a manner that minimises the release of mould spores. Removing the mould and dampness should be a priority but fixing the source needs to be done at the same time to prevent regrowth and reoccurrence.

4.2.2.A Removing the mould

Scrub mould off hard surfaces using soapy water**.[12] The physical action of scrubbing is the most important component of removing mould from surfaces as all mould must be physically removed to prevent regrowth.[4] The use of cleaning solutions only forms a small part of the remediation process. It is the physical action of the removal of the mould particulates that determines the efficacy of remediation.

- Dry brushing should be avoided as it will break up the fungi into small fragments and cause the release of fungal spores.
- The area being cleaned should extend 30cm to 50cm beyond the edge of the visible mould contamination to ensure that all mould, including any new growth that is often invisible to the naked eye, is removed.
- Mould residue that may accumulate around the clean-up area as the result of scrubbing needs to be removed using a damp cloth or a vacuum cleaner equipped with High Efficiency Particulate Air (HEPA) filtered vacuum. Vacuuming or wiping also needs to extend beyond the area of visible residue to capture spores that are invisible to the naked eye.

** WA Health recommends soapy water as is effective and has no potential environmental or health side-effects. Other options, such as commercially available mould removing products and natural anti-fungal agents, are discussed in 4.2.2.B Cleaning agents.

- Remove any standing water and dry damp areas using towels, heaters, dehumidifiers, and fresh air from open windows.

4.2.2.B Cleaning agents

Commercially available agents (e.g. biocides, antimicrobials and disinfectants)

Various mould cleaning products are commercially available. The decision to use these products as part of remediation will be case-specific and a personal decision of the remediator.

WA Health recommends scrubbing the mould with soapy water.[12] Scrubbing with soap and water will clean most surfaces, can be used safely by the building occupant and is least damaging to the cleaned surface.

The use of bleach, chlorine dioxide, quarterly ammonium salts and certain alcohols could be used in certain situations, but these chemicals will not completely remove mould or mycotoxins from infested building materials on their own. Although bleach products can reduce mould growth on treated surfaces, they do not appear to be very effective at preventing longer-term re-growth.

A potential side-effect of the use of these products is that they could leave residual chemicals that could pose health problems for remediation workers and occupants upon re-habitation. Therefore, the decision to use these products as part of remediation will be case-specific and should consider potential adverse effects of disinfectant exposure to applicators and building occupants. It is important to understand the limitations of each agent, their hazards and ensure that the manufacturer's instructions are followed when using these products. Furthermore, prior to using any products, it is important to understand if chemical treatments have been used previously. If there is residual contamination from a previous treatment, this may react with any new (natural or synthetic) treatments.

If using any chemical cleaning agents, the following precautions should be taken:

- Read the label carefully before using and follow the instructions.
- Store chemical products in their original bottles or containers.
- Don't mix household products together as this may create harmful by-products. For example, combining bleach and ammonia can result in toxic gases.
- Wear gloves to help protect the skin and safety glasses to protect the eyes.
- Ensure the working area is well ventilated with fresh air from open windows. To prevent mould from spreading, avoid using fans or exhaust fans when cleaning mould.
- Biocides, apart from natural biocides (see below), not specifically sold as mould cleaning products should not be used.
- Fungicides that are developed for outdoor use should not be used inside.

'Natural' biocides

Products such as vinegar, alcohol and essential oils (for examples, tea-tree oil and clove oil) may be used to aid the mould remediation process. These are biocides (i.e. they can kill micro-organisms) and may be effective for mould remediation. Various levels of dilution, in water, have been suggested but these vary. As with commercially available products, it is not known if these products are more effective than soapy water at removing mould. Even if biocides or other 'natural' cleaners are used, vigorous scrubbing, removal of mould residue and resolution of the moisture source is still required.

4.2.2.C Removing, cleaning and disposal of mouldy materials

Some materials, particularly porous or absorbent materials (for example, carpets, clothes and shoes, soft furnishings and tiles) may not be able to be adequately cleaned without professional assistance. If this is the case, they should be removed or discarded. Appendix D provides a list of actions for different materials if they become damp or water damaged.

Mould is not considered a 'hazardous waste' and as such can safely be disposed of through normal waste disposal channels. Mouldy material that is to be discarded should be placed in a plastic bag to prevent cross-contamination when they are carried through non-contaminated parts of the building.

4.2.2. D Fixing the source

The source of contamination needs to be identified and fixed so problems will not recur. Professional help may be required for issues like plumbing leaks or building repairs.

4.2.2. E Drying surfaces

After removing the mould and fixing the moisture source, any damp areas on walls, floors and ceilings need to be dried as much as possible. If the dampness or water damage is in the building structure, professional assistance may be required.

- Dehumidifiers, fans and outdoor air (if outdoor humidity is low) can be used to help dry surfaces.
- If using a fan, air should be directed across the face of the surface, not directly on to it, to carry the moisture away.
- Air temperature should be ambient, not hot. Hot air can dry the outer surface and trap moisture inside.

- Complete drying may take some time (days).
- Do not paint over, seal or cover surfaces until they are dry.

4.3 Complex level contamination

When mould and dampness problems are complex, professional advice and help may be required. It is recommended that a site-specific remediation plan is developed in consultation with professionals to ensure public health is protected and remediation is implemented effectively. The remediation plan should consider the following components:

- Remediation protocols including containment, structural drying, building surface and contents remediation, HVAC containment and remediation and waste disposal
- A schedule – when each stage of the remediation is expected to be carried out
- Use of Personal Protection Equipment (see Appendix B)
- Environmental controls
- A plan for post-remediation evaluation

4.3.1 Environmental controls (Containment and Air flow)

For complex level contamination, the contaminated area and waste travel pathways must be completely isolated or sealed by heavy grade plastic covers and kept under negative pressure with the use of an exhaust fan with a HEPA filtered vacuum. An adjacent decontamination or changing room may be identified so mould is not transferred from clothing or PPE to other parts of the building that may not be contaminated. It is recommended that occupants are evacuated during remediation. If they cannot be evacuated, all precautions should be taken to reduce their exposure.

4.4 Post-remediation evaluation

Remediation effectiveness can be determined by following indicators:

- Remediation work has been conducted according to the remediation plan.
- Causes of moisture have been eliminated and water problems have been repaired.
- Visible mould or mouldy materials have been removed and area is left dry, clean and free of mould, debris and dusts.
- There has been no recurrence of mould growth within two to four weeks after remediation.
- Occupants no longer report mould related health complaints. Due to the complexity of reported health problems, and their causes, reported health complaints should not be considered in isolation. However, if health problems continue after remediation, it may be indicative that a mould problem persists.

A post-remediation evaluation is encouraged, particularly if a professional cleaner was used. The post-remediation evaluation should assess the above indicators. It is recommended that the post-remediation evaluation is not carried out by the same entity that undertook the remediation work, due to any potential conflict of interest. There are no legal requirements for either a post-remediation assessment or who should undertake the assessment.

5. Mould prevention

Overview

- Once a mould or dampness issue has been identified and remediated, mechanisms should be put in place to rectify the source of the problem to prevent future contamination.

Mould growth and dampness problems are preventable through moisture control, appropriate operation of the building (including HVAC), adequate building maintenance and education of occupants to reduce behaviours that facilitate moisture and mould growth.

Building owners/managers: Building owners and managers should develop maintenance plans that include mould and dampness prevention. These plans could include:

- Regular inspection for signs of mould and damp.
- Maintain indoor relative humidity below 65% (35-65% if possible).[13]
- Identify and repair any water leaks or spills from roofs, walls and plumbing as soon as possible. Wet spots or materials must be dried and cleaned quickly.
- Ensure adequate drainage around building foundations.
- Keep the HVAC system clean, serviced regularly and in good condition, especially the air-handling components such as return air filters, coils, duct and registers[6].
- Conduct a proper assessment, clean up and remediation of buildings and contents after a storm, flood or other event involving water ingress.
- Occupants: Occupants can take steps to prevent the moisture problems. These are outlined in **Appendix C** and include:
- Take action to reduce moisture production in a building by using appropriate ventilation when performing activities that increase indoor moisture.
- Identify and repair any water leaks or spills from roofs, walls and plumbing as soon as possible. Wet spots or materials must be dried and cleaned quickly.
- Ensure adequate drainage around building foundations. Ensure irrigation systems don't continually soak exterior walls or foundations.
- Ensure that ventilation, heating and air-conditioning is adequate for the climate.
- Take action as soon as water damage or mould growth is identified.

[6] For specific information about HVAC maintenance refer to Australian Institute of Refrigeration, Air-conditioning and Heating (AIRAH)) HVAC Hygiene Best Practice Guidelines.

References

1. World Health Organization (WHO) (2009). WHO Guidelines for Indoor Air Quality: Dampness and Mould. WHO Regional Office Europe. Available online: https: //apps.who.int/iris/handle/10665/164348

2. Institute of Medicine (US) Committee on Damp Indoor Spaces and Health. Washington, DC: National Academies Press (US). 2004. Available from: https://www.ncbi.nlm.nih.gov/books/NBK215643/ doi: 10.17226/11011

3. Caillaud D, Leynaert B, Keirsbulck M, Nadif R; mould ANSES working group. Indoor mould exposure, asthma and rhinitis: findings from systematic reviews and recent longitudinal studies. Eur Respir Rev. 2018 May 15;27(148):170137. doi: 10.1183/16000617.0137-2017

4. Environmental Health Directorate (2024). Indoor Mould – Health Risk Assessment and Management. Perth: Department of Health, Western Australia.

5. Centers for Disease Control and Prevention – National Institute for Occupational Safety and Health. Preventing Occupational Respiratory Disease from Exposures Caused by Dampness in Office Buildings, Schools, and Other Nonindustrial Buildings. 2013. Available from: https://www.cdc.gov/niosh/docs/2013-102/pdfs/2013-102.pdf

6. Park JH, Cox-Ganser JM. NIOSH Dampness and Mold Assessment Tool (DMAT): Documentation and Data Analysis of Dampness and Mold-Related Damage in Buildings and Its Application. Buildings (Basel). 2022 Jul;12(8):1075-1092. doi: 10.3390/buildings12081075

7. Centers for Disease Control and Prevention. You Can Control Mold. Atlanta: Centers for Disease Control and Prevention. 2022. Available from: https://www.cdc.gov/mold/control_mold.htm

8. Victoria State Government – Department of Health. Mould and your health. Victoria, Australia: Department of Health. 2020. Available from: https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/mould-and-your-health

9. NSW Government – NSW Health. Mould. New South Wales, Australia: NSW Health. 2022. Available from: https://www.health.nsw.gov.au/environment/factsheets/Pages/mould.aspx

10. Commonwealth of Australia . Report on the Inquiry into Biotoxin-Related Illnesses in Australia. Parliament of Australia; Canberra, ACT, Australia: 2018. House of representatives standing committee on health aged care and sport. Available online: https://parlinfo.aph.gov.au/parlInfo/download/committees/reportrep/024194toc_pdf/ReportontheInquiryintoBiotoxin-relatedIllnessesinAustralia.pdf;fileType=application%2Fpdf

11. Government of Canada – Health Canada. Guide to addressing moisture and mould indoors. Ottawa, Canada: Government of Canada. Available from: https://www.canada.ca/en/health-canada/services/publications/healthy-living/addressing-moisture-mould-your-home.html

12. Johanning E, Auger P, Morey PR, Yang CS, Olmsted E. Review of health hazards and prevention measures for response and recovery workers and volunteers after natural disasters, flooding, and water damage: mold and dampness. Environ Health Prev Med. 2014;19(2):93-9. doi: 10.1007/s12199-013-0368-0

13. Bastholm CJ, Madsen AM, Andersen B, Frisvad JC, Ritcher J. The mysterious mould outbreak - A comprehensive fungal colonisation in a climate-controlled museum repository challenges the environmental guidelines for heritage collections. Journal of Cultural Heritage. 2022:55;78-87. doi: 10.1016/j.culher.2022.02.009

Appendix A - Building Inspection Checklist

Building Inspection Checklist	Yes	No	N/A
Ground level			
Proper drainage is away from the building (including roof down pipes)	☐	☐	☐
Sprinklers spray away from the building and outdoor air intakes	☐	☐	☐
Walk-off mats are used at exterior entrances and are regularly cleaned	☐	☐	☐
Roof			
The roof is in waterproof condition	☐	☐	☐
The roof is free of pooling water	☐	☐	☐
HVAC units operate properly (air flows in)	☐	☐	☐
Exhaust fans operate properly (air flows out)	☐	☐	☐
HVAC outdoor air intakes (dampers) are clear of obstruction and remain open, even at minimum setting	☐	☐	☐
Outdoor air intakes are clear of nests, droppings, or collected leaves or debris	☐	☐	☐
HVAC outdoor air intakes are free from entrainment of air from plumbing stacks and exhaust outlets	☐	☐	☐
All Rooms, Attic, and Plenum			
Rooms are dusted and vacuumed regularly	☐	☐	☐
Rooms, attics, or plenums are free from odors (especially mouldy or musty)	☐	☐	☐
Attic, plenums; walls, ceilings, floors, air supply and return vents; and areas under plumbing are free from visible mould and mildew growth	☐	☐	☐
Attic, plenums, walls, ceilings, and floors are free from visible signs of water damage	☐	☐	☐
Inside exterior walls, windows, windowsills, and window frames are free from signs of condensation	☐	☐	☐
Cold water pipes are free from condensation	☐	☐	☐
Attic and rooms are free from evidence of plumbing leaks	☐	☐	☐

Building Inspection Checklist (continued)	**Yes**	**No**	**N/A**
Ventilation			
Air Supply and Air Exhaust	☐	☐	☐
Air flows from supply vents	☐	☐	☐
Air supply pathway is free from obstructions	☐	☐	☐
Supply and exhaust vents are free from obstructions	☐	☐	☐
Bathrooms, restrooms, and kitchens have operating exhaust fans	☐	☐	☐
Filters			
Filters are clean	☐	☐	☐
Filters fit properly	☐	☐	☐
Filters are properly installed (correctly for direction of airflow)	☐	☐	☐
Filters have been changed according to the change-out schedule	☐	☐	☐
Drain			
Pans and Coils Drain pans slant toward the drain (to prevent water from accumulating)	☐	☐	☐
Drain pans are free from accumulated water and/or are not clogged	☐	☐	☐
Drain pans are clean and free of mould and mildew	☐	☐	☐
Heating and cooling coils are clean	☐	☐	☐
General			
Temperature and humidity are maintained within acceptable ranges	☐	☐	☐

Source: National Institute for Occupational Safety and Health – Preventing Occupational Respiratory Disease from Exposures Caused by Dampness in Office Buildings, Schools and Other Nonindustrial Buildings.
Available: https://www.cdc.gov/niosh/docs/2013-102/pdfs/2013-102.pdf

Appendix B - Personal protective equipment recommendations

The respiratory tract, eyes, and skin must be protected during remediation due to potential risk of adverse health effects from mould exposure. Increased protection may be required for extensive mould contamination and where substantial dust is generated, or where people have additional risk factors for potential adverse health effects of mould. People who don't conduct the remediation but are in the vicinity of the remediation may still be exposed to mould and should protect themselves with adequate PPE. People who are unable to use PPE or who have respiratory conditions, allergies, weakened immune systems or special health concerns that mean they are at greater potential risk of adverse health effects from exposure to mould should be made fully aware of the potential hazards and strongly recommended against entering mould contaminated areas during remediation.

Risk rating

Table 2. PPE recommendations for various exposure activities related to mould contamination

	Exposure activities				
Risk factor	**Assessment^ of simple mould**	**Assessment^ of complex mould**	**Contact with mould contaminated items e.g. recovery**	**Remediation of simple mould**	**Remediation of complex mould***
No risk factors	No precautions needed	P2/N95 mask+, goggles	Gloves, P2/N95 mask, goggles± gown	Gloves, P2/N95 mask, goggles± gown	Gloves, PAPR, non-breathable overalls, goggles
Immunocompromised people	Avoid exposure	Avoid exposure	Avoid exposure	Avoid exposure	Avoid exposure
People with atopy and hypersensitivity	P2/N95 mask	P2/N95 mask, goggles	Gloves, P2/N95 mask, goggles± gown	Avoid exposure	Avoid exposure
People with respiratory comorbidities	P2/N95 mask	P2/N95 mask, goggles	Gloves, P2/N95 mask, goggles± gown	Avoid exposure	Avoid exposure
Children	Avoid exposure	Avoid exposure	Avoid exposure	Avoid exposure	Avoid exposure
Pregnant	P2/N95 mask	P2/N95 mask, goggles	Gloves, P2/N95 mask, goggles± gown	Avoid exposure	Avoid exposure

^ Assessment only – does not involve disturbing mould or dust.

* Remediation of complex mould typically requires professional help. Remediators should follow WorkSafe Australian/New Zealand Standard Respiratory Protection Standards (AS/NZS1716).

+ Visit healthywa for more information about P2 respiratory facemasks: https://www.healthywa.wa.gov.au/Articles/N_R/P1-and-P2-face-masks

Adapted from the US Centers for Disease Control: Population-Specific Recommendations for Protection From Exposure to Mold in Flooded Buildings by Specific Activity and Risk Factor. Available: https://www.cdc.gov/disasters/mold/report/pdf/2005_moldtable5.pdf

PPE definitions

Table 2. PPE definitions

PPE item	Definition
P2/N95 mask	A P2 or N95 respirator face-mask should be worn to reduce exposure to airborne mould spores and other mould particles. These masks are readily available at many stores such as hardware stores and pharmacies.
Gloves:	Long gloves that extend to the middle of the forearm are recommended. When working with water and a mild detergent, ordinary household rubber gloves may be used. If the remediator uses a disinfectant, a biocide such as chlorine bleach, or a strong cleaning solution, gloves that are made from natural rubber, neoprene, nitrile, polyurethane, or PVC should be used.
Safety goggles	Goggles or glasses are recommended to avoid getting spores or dust in eyes.
Gown	An impervious disposable garment can be used. Gowns can also be worn for protection against transfer of mould spores.
Powered air purifying respirators (PAPR)	PAPRs should be used when remediating complex mould situations given the high likelihood of significant mould exposure. Alternatively, where these are not available, for example during a flood response, use a N100 particulate filtering facepiece to protect against airborne mould spores and other mould particles with an appropriate hood or face covering to achieve similar protection to PAPR use.
Non-breathable disposable overalls	The disposable coveralls should provide full-body protection.
Protective footwear	Waterproof/watertight boots should be used where available.

PPE disposal

Single-use or disposable PPE should be discarded after use.

When disposing of single-use or disposable PPE, ensure the contaminated PPE is adequately contained in suitable waste bags to contain the spread of mould and prevent any cross-contamination.

Appendix C - Moisture reduction strategies

This information sheet outlines activities that can lead to the accumulation of moisture indoors and the actions that can be undertaken to reduce this. Moisture problems will occur due to high indoor relative humidity and/or water damage from internal leaks/spills or external sources. To reduce the possibility of moisture and mould contamination, indoor humidity should not exceed 65% for extended periods and water damage and its causes should be dealt with as soon as they are identified.

1. Moisture generating activities	
Problems	**Actions**
Many day-to-day activities can generate excess moisture indoors. These include showering, cooking, drying clothes indoors, and using appliances such as clothes dryers, humidifiers and unflued gas heaters.	• Use exhaust fans in the bathroom when showering. Keep exhaust fans working and the doors of the bathroom shut until the water vapour has cleared. • Use exhaust fans when cooking. Put a lid on saucepans to keep the steam inside. Do not leave kettles boiling. • Ensure that there is adequate ventilation when using unflued gas heaters. • Dry washing outside whenever possible. • If you have a vented clothes dryer make sure it is correctly installed and the damp air is exhausted outdoors. If you have condensing clothes dryers make sure the room is well ventilated when using it. • Avoid growing an unusually large number of live plants indoors without exhausting or otherwise removing the humidity they produce. • Wipe up and dry condensation or moisture that collects on indoor surfaces. • Move items of furniture away from the wall slightly so that air can pass behind them. Leave the doors of cupboards open from time to time to air them. • Avoid storing large amounts of documents, furniture, or cardboard boxes in damp basements or crawlspaces or in contact with cold exterior walls or foundations.
2. Internal leaks and spills	
Liquid spills, plumbing leaks and leaks from appliances such as refrigerators, washing machines and dishwashers can dampen indoor surfaces and building structures.	• Keep shower or bathtub splash within the bathroom enclosure, limiting the amount of water that can soak the walls of the bathroom. • Mop and dry up any spilt liquids promptly. If liquid is spilt on a rug this can be dried by airing. If there is a spill on a fixed carpet complete drying of the damp area may require a fan or heater. • Ensure soft furnishings are completely dried if they get damp. • Intermittently check under and around white goods to ensure there are no leaks, standing water or damp patches. • Repair plumbing or other water leaks as soon as you can.

3. Outdoor water incursion	
Problems	**Actions**
Rainwater, groundwater and/or water from irrigation systems can leak into building through roofs, ducting, walls, windows and foundations, dampening indoor surfaces and building structures.	• Keep irrigation spray heads aimed carefully so that they do not continually soak the exterior walls or foundations. • Maintain the slope of exterior landscaping to ensure water runs away from the building. • Keep rainwater runoff from the roof at least 1 metre away from the foundation. • Clean and maintain roof gutters. • Keep air conditioning drip pans clean and the drain lines unobstructed and flowing properly. • Check and fix building damage, and clean and dry up any water incursion within 48 hours (if possible) after flooding, cyclone or storms.
4. Heating, ventilation, and air-conditioning (HVAC)	
Problems	**Actions**
Poor ventilation and inadequate HVAC can increase humidity and/or surface condensation inside buildings.	• Ventilation, heating and air-conditioning need to be adequate to ensure indoor relative humidity is maintained below 65% as much as possible. • Buildings need to be adequately insulated. • HVAC systems should be fit for purpose and relevant for the outdoor climate.

Appendix D - Damp and water damaged materials

Guidelines for response to clean water damage	
Water-damaged material	**Actions**
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals.
Carpet and backing – dry within 24 – 48 hours§	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans.
Ceiling tiles or gyprock (internal)	• Discard and replace.
Cellulose insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fibreglass insulation	• Discard and replace.
Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure underflooring is dry; dry underflooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specialises in furniture.
Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window treatments	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet panelling should be pried away from wall for drying.
These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then other actions may be required. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. §The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.	

Adapted from the USEPA. Available: https://www.epa.gov/mold/water-damage-table-mold-prevention-mold-remediation-schools-and-commercial-buildings

Appendix E - Managing mould risk following flooding

The aftermath of a major weather event such as flooding and severe storms may create conditions in the indoor environment conducive to dampness and mould growth. Water damage from severe weather events may also exacerbate any existing structural defects, making buildings more prone to water ingress and leaks in the building envelope, which may continue to promote conditions ideal for indoor mould growth.

Health effects from mould post-flooding

The extent of health effects due to increased mould exposure following severe weather events is not comprehensively understood, and there are limited studies available reporting on this association. However, studies do demonstrate that severe weather events may lead to water-damaged homes and create a moist environment that supports indoor mould growth.

Assessing for mould in homes following flooding

When assessing water-damaged homes from flooding, other hazards should be considered as they may represent additional significant health risks. These include hazards such as sewage contaminated floodwater, hazardous chemicals, asbestos, lead, electrical hazards and presence of pests, rodents or insects.

International health protection agencies advise that mould can grow within 24 to 48 hours in flood-affected homes with excessive moisture. It is imperative that homes are cleaned and dried out as soon as possible following a flooding event to prevent mould growth. In circumstances where flood-affected housing has not been cleaned and dried within 48 hours, it is likely that mould growth has already contaminated the home. In these situations, occupants and first responders should take precautions and ensure that they do not have any predisposing conditions that would put them at higher potential risk to health effects from indoor mould exposure and that they use appropriate personal protective equipment when assessing the home.

Preventing mould after a flood

To prevent excessive mould growth, prompt action should be taken to reduce sources of moisture in an indoor setting following a flood. This includes:

1. Implement ventilation practices as soon as possible. Where flood-affected buildings have been closed up for several days, enter briefly to open doors and windows and let the house be ventilated (at least 30 minutes) before staying on premises for any period of time.
2. Leave windows and doors open when departing, to allow for ongoing ventilation. The risks of keeping the windows and door open need to be weighed up and might include ongoing heavy rain and other factors such as wildlife and insects, security.
3. Open interior doors such as room doors, closets, kitchen cabinets, bathroom vanity doors and drawers to allow those closed spaces to be ventilated.
4. Remove mud, dirt and debris from the house using a hose, starting from the highest point and working down to the lowest level. This includes, where affected, the ceiling, walls and floors.
5. Remove all sources of pooled water and excessive moisture from the home.
6. Remove all wet or flood-damaged items, including floor coverings, rugs, mats, furniture, bedding, linen and clothing. If floor coverings are removed, thoroughly clean and dry the floor underneath before new material is laid.

7. Remove wet wall lining (plasterboard) to allow for proper drying out of internal wall spaces. Consider risk of other hazards such as asbestos contamination, dangerous structures, electrical wiring, plumbing, drainage and gas fitting. Licensed builders or professional services may be required.
8. Remove all soft or absorbent materials with mould growth.
9. If items are required for an insurance claim, temporarily store damaged or discarded items outside the home, in a safe, clean, dry place such as a shed or garage. Otherwise liaise with the local council to identify how rubbish and waste can be disposed of.
10. Clean and disinfect all surfaces using an appropriate cleaning method inside the house, including floors, walls, the kitchen, bathroom and laundry. Ensure each area affected by floodwater is cleaned, including cupboards.
11. Allow the house to dry throughout by opening doors and windows during dry days, using fans (do not use diesel-powered equipment in enclosed spaces as fumes can cause health harms), draining water away from under the house to increase airflow, and checking for any trapped water and mud in wall or floor cavities.

Practical considerations post-flooding

Avoidance of mould-contaminated sites and buildings in a post-flooding event may be difficult for susceptible individuals. Recovery communications should emphasise the recommendation of mould-exposure avoidance for susceptible individuals, the potential health risks of exposure to mould and clearly articulate personal protective equipment recommendations to reduce any risk if mould-exposure is unavoidable.

First responders – assessing a home after a flood

First responders should consider their health history and the potential health risk from mould. First responders should avoid entering flood-affected homes without the appropriate level of personal protective equipment, as per the recommended risk rating (see Appendix B). Where the first responder has health risk factors that put them at greater risk, such as immunocompromising conditions, they should avoid entering the flood-affected home.

Risk Rating and Protective Equipment Recommendations

Everyone should avoid mould exposure where possible. This is particularly important in individuals who are susceptible to potential health effects. Where indoor mould is identified, remediation needs to occur, so exposure avoidance is not always possible. A risk matrix to guide decision-making is presented in Appendix B which has been adapted from the Center for Disease Control and Prevention's *Population-Specific Recommendations for Protection From Exposure to Mold in Flooded Buildings by Specific Activity and Risk Factor.*

This document can be made available in alternative formats on request.

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