



uOttawa

Service des immeubles
Physical Resources Service

MOULD CONTROL PROGRAM

PART 1: MOULD IN BUILDINGS – GENERAL INFORMATION AND PREVENTION

**PART 2: PROCEDURE FOR MANAGING WATER INFILTRATION –
RESPONSIBILITIES, COMMUNICATION PLAN AND CONTROL METHODS**

**Physical Resources Service
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PART 1: GENERAL INFORMATION AND PREVENTION

1.1 Objectives and definitions

The main objective of this program for mould control is to prepare the employees of the University of Ottawa's Physical Resources Service to respond adequately and efficiently in cases of water damage on campus, in order to prevent undesirable mould growth within the university buildings.

As well, this document should contribute towards heightening the employees' awareness of the potential health hazards associated with exposure to mould.

Consequently, this program will help in providing a safe environment for occupants by minimizing the risk of health effects due to mould. It should also help in minimizing remediation costs by way of preventive maintenance.

Definitions

Moulds are microscopic organisms, most of which reproduce through production of massive numbers of spores. Most moulds need moisture to grow and will develop on any organic material (drywall, ceiling tiles, wood, paper, carpet backing, etc.).

An **amplification site** is a location which, due to a suitable nutrient base and water content, is fostering fungal growth.

Mould remediation is the treatment of mould contamination either by cleaning or by removal of the contaminated material.

A **high-efficiency particulate air (HEPA) filter** is a specialized filter capable of removing 99.97% of particulates 0.3 micrometers in diameter or more.

A **heating, ventilation and air conditioning (HVAC) system** refers to the equipment and distribution system used for heating, ventilating, cooling, humidifying, dehumidifying, and cleansing air in a building zone for the purpose of comfort, safety and health of the occupants.

1.2 Ecology of mould

Together with mushrooms and yeasts, moulds constitute the Fungi Kingdom, i.e. a group of micro-organisms that play an essential role in the natural environment by decomposing dead organic matter.

Moulds are microscopic organisms that are present throughout the natural world. Mould spores are always present in buildings. They can be carried indoors by the wind, insects, in dirt, on clothing or by ventilation equipment. Mould presents a problem when it starts growing in indoor environments. Mould growth indoor can occur when spores on susceptible building materials become wet long enough to allow the spores to germinate, grow and multiply.

For spores to germinate and mould to spread, three main conditions must be put together: an **appropriate temperature**, a **substrate** or **nutrient base**, and **water**. All conditions are summarized in the following table.

CONDITIONS THAT PROMOTE MOULD GROWTH

<i>Factor</i>	<i>Ideal conditions for mould growth</i>
Temperature	From 5 to 38°C (Practically all surfaces in a building are within this range of temperatures at least part of the year.)
Substrate	<ul style="list-style-type: none"> • Materials contain organic matter (wood, paper, drywall, plaster, natural textiles, ceiling tiles, carpet backing, soil in basements, crawlspaces or potted plants, dust, etc.). • Although moulds generally prefer natural materials to synthetic ones, some will grow on plastics or metals. • Others types of material may contain enough dust, dirt, soil and moisture to sustain mould colonies (HVAC equipment, ductwork, mineral wool insulation, synthetic textiles, vinyl, rubber, glass, electrical equipment, etc.).
Moisture	<ul style="list-style-type: none"> • Relative humidity in ambient air greater than 60% • Wet materials • Humidity in materials reaching 75% • Wood containing more than 24% moisture • Mould-contaminated materials also tend to absorb and retain moisture.
<i>Air velocity</i>	<ul style="list-style-type: none"> • Stagnant ambient air • Air velocity less than 2 feet/second <p>* <i>Activating fans close to mould growth will disperse more spores.</i></p>
<i>Light</i>	Darkness or dimness
<i>History of water leaks or floods</i>	Mould grows more rapidly on sites of past contamination.
<i>Duration of water saturation</i>	Probability of mould growth increases after 24 to 48 hours of water saturation.

1.3 Mould-related health effects

In workplaces where there are no mould amplification sites, mould exposure is not expected to present a health hazard except to very susceptible individuals. In situations where indoor mould amplification sites are present, the risk from exposure to mould increases. Potential health effects may include some of the following:

- throat irritation, cough, hoarseness, chest pain
- aggravation of asthma
- eye irritation
- nasal irritation and congestion, sinus problems, runny nose
- headaches

- chronic fatigue
- difficulty concentrating
- skin rash
- cold-like or flu-like symptoms in general

These symptoms could be due to

- an **allergic reaction**, when spores are airborne or the mould growth is disturbed;
- an **infectious disease**, after exposure to pathogenic moulds usually associated with bird or bat droppings;
- a **toxic response** arising from inhalation or skin contact with toxigenic moulds (i.e. moulds that naturally produce toxins) or after exposure to high levels of many moulds.

Whether or not symptoms develop in persons exposed to mould depends on the nature of the fungal material and its concentration, the duration of exposure and the sensitivity of the person. Particularly susceptible individuals include infants and young children, individuals with a lung condition (asthma, bronchitis, hay fever, pre-existing allergies to mould, etc.) or impaired immune functions (organ transplant recipients, persons with diabetes or HIV, chemotherapy patients, etc.).

The greatest potential exposure to mould occurs during the remediation of mould-contaminated material. During the remediation, the mould is disturbed, releasing a large number of spores as well as other parts of the mould organisms into the surrounding air. In order to prevent the exposure of individuals to high levels of airborne mould, proper precautions and safe work procedures must be implemented whenever mould remediation is being performed.

1.4 Prevention of mould growth

1.4.1 How to recognize mould contamination

Because water is essential for mould growth, one must be on the lookout for signs of water damage when checking for mould contamination:

- flooding, dripping, leaks, seepage, spills, condensation
- sewage backup
- stained carpets, walls, ceiling tiles or pipes
- rusty metal
- loose vinyl baseboards, spalling masonry finishes, broken drywall seams
- softened wood or drywall
- powdery mineral deposits on walls or concrete, after water has evaporated
- damp filters and other damp sites in HVAC systems

Also, ceiling tiles, gypsum wallboard and cellulose material (cardboard, paper, wood, etc.) should be examined carefully. Mould-contaminated materials often show stains or coloured spots (usually greenish black or grey, but can also be white, pink or yellowish orange) with a downy or powdery texture (see cover page).

However, mould contamination is not always visible with the naked eye or from within the living/working space, as it can stay hidden under the floor or a carpet, above the ceiling tiles or in the wall cavity. In this case, musty, earthy or mouldy odours, as well as symptoms described in section 1.3 (p. 3) affecting building occupants, can reveal the presence of mould.

Common sites of water episodes and therefore potential mould growth include:

- bathrooms
- kitchens
- crawlspaces and tunnels
- windows and outside doors
- roof spaces and ceilings
- basement floors
- unheated or poorly isolated rooms and closets
- areas of inadequate heating during the cold season, poor humidity control or lack of fresh air
- areas of condensation

1.4.2 Preventing mould growth in building fabric and HVAC equipment

Any mould growth can be controlled only once the cause of the moisture has been addressed. Here are simple ways of dealing with moisture in buildings:

- prevent condensation by maintaining relative humidity below 60% and by raising the temperature of cold surfaces;
- maintain caulking in bathrooms, showers, and in exterior locations;
- avoid carpets on cool floors in order to prevent condensation;
- install exhaust fans near shower facilities;
- respond to any water incursion, even minor dripping from pipes;
- put a plastic cover over dirt in crawlspaces and keep these areas well ventilated;
- In the event of a flood:
 - remove the water by pumping or vacuuming as soon as possible;
 - if possible, dry construction and finishing materials in less than 24 hours, in order to bring the relative humidity down to 65 to 70% at the surface;
 - discard non-salvageable materials, i.e. materials that have been wet for more than 48 hours or contaminated with sewage water (wallboard, drywall, ceiling tiles, carpets, paper, insulation materials, upholstered furniture, etc.).

The good maintenance of HVAC equipment is also important in order to prevent mould growth in the equipment and the dispersion of spores throughout the buildings.

- To reduce incoming spore loads, use highest-grade filters compatible with the system;
- maintain bird screens at air intake and keep roosting birds away from air intake areas;
- maintain biocidal treatment of cooling tower;

- in damp sections of ductwork, avoid porous insulation or replace it with non-porous one;
- keep spray washers, sumps and drip pans well drained and free of slime;
- regularly inspect and permanently repair all areas where water collection or leakage is occurring in HVAC equipment;
- operate HVAC system so as to avoid water droplets from dehumidification cooling coils, water spray systems and humidifiers, or from the mixing of air from hot and cold decks;
- have the system cleaned every 3 or 4 years.

PART 2: PROCEDURE FOR MANAGING WATER INFILTRATION

2.1 Precautions and safety measures

2.1.1 Asbestos

Workers must take all the necessary precautions if any asbestos-containing material has to be disturbed; contractors must be informed of any materials containing asbestos.

2.1.2 Electrical

- Workers must consider all wet wiring, lighting fixtures and electrical outlets as shock hazards until they have been verified, and therefore must have everything checked by an electrician.
- Workers must follow the ground fault circuit interrupters (GFCIs) procedure if electrical hazards are present. Refer to the *Directive for Safe Work with Ground Fault Circuit Interrupters* issued by the Physical Resources Service.
- All motors and fixtures that were wet need to be dismantled, cleaned and air-dried. Workers must make sure that no moisture is present before using.

2.1.3 Wet surfaces

Water on the floor may render it slippery and increase fall hazards. Workers must be cautious.

2.1.4 Mould

Because of the potential health risk associated with mould, mentioned in section 1.3 (p. 3), all mould remediation must be performed by a competent specialized firm.

The objective of mould remediation is to remove the mould growth and all associated dust and spores. This requires special precautions. The proper cleaning of a mouldy workplace is a three-step process:

1. Removal of gross mouldy materials, including all porous materials supporting mould growth.
2. Cleaning of all settled dust within the contaminated area using a HEPA-filter vacuum.

3. Wet cleaning with a cleaning agent and a disinfecting agent.

2.2 Responsibilities

2.2.1 General

There is no provincial or federal law regulation specifically for mould control in public buildings. However, section 25(2)(h) of the Ontario *Occupational Health and Safety Act* stipulates that every employer is required to “take every precaution reasonable in the circumstances for the protection of workers.” Constructors and supervisors (sections 23 and 27 of the Ontario *Occupational Health and Safety Act* respectively) also have a legal responsibility in ensuring the health and safety of workers. Ensuring the health and safety of workers also includes protecting them from potential health hazards posed by the presence of mould in the workplace.

2.2.2 Physical Resources Service

Note:

The responsibility for any water damage occurring in University of Ottawa buildings, *including residence buildings*, falls to the Physical Resources Service.

2.2.2.1 Sanitary Services

- communicate with the occupants and/or the building manager;
- vacuum the water, clean up, disinfect and dry up the site of water damage;
- call a specialized firm (Xpertek Construction Inc. or ServiceMaster Clean – Disaster Restoration) to remedy the situation if walls show signs of humidity; use the humidity-meter if needed (see section 2.3, p. 10);
- work in compliance with section 2.1 (p. 6) of the present document and proceed with safe practices.

2.2.2.2 Mechanics and plumbers

- fix the defective pieces of equipment;
- report any observed sign of mould growth to the Supervisor, Mechanical and Plumbing;
- work in compliance with section 2.1 (p. 6) of the present document and proceed with safe practices.

2.2.2.3 Electricians

- report any observed sign of mould growth to the Supervisor, Electricity and Instrumentation;
- work in compliance with section 2.1 (p. 6) of the present document and proceed with safe practices.

2.2.2.4 Architectural trades

- make the final repairs;
- report any observed sign of mould growth to the Supervisor, Architectural Trades;

- work in compliance with section 2.1 (p. 6) of the present document and proceed with safe practices.

2.2.2.5 Call Centre (2222)

- direct calls to the appropriate trade (Plumbing, Mechanical, Sanitary Services, Architectural Trades).

2.2.2.6 Supervisor, Sanitary Services

- ensures clean-up of flood water in buildings and drying of the wet areas is completed within 48 hours;
- notifies the Environmental Health and Safety Officer of all mould contamination discovered by the Sanitary Services personnel;
- ensures that all mould-related activities are performed in accordance with the procedures established under the Mould Control Program;
- ensures that his/her employees who are permitted access to areas where mould contamination is being disturbed have been properly trained.

2.2.2.7 Supervisor, Mechanical and Plumbing

- ensures that the HVAC systems are inspected on a regular basis for any signs of mould growth;
- ensures that the steps described in section 1.4.2 (p. 5) of the present document are followed to prevent mould growth in the HVAC system;
- ensures clean-up of flood water in buildings and drying of the wet areas is completed within 48 hours;
- reports any discovered mould contamination in the HVAC system to the Environmental Health and Safety Officer;
- ensures that all his/her employees or external contractors who are permitted access to areas where mould contamination is being disturbed have been properly trained.

2.2.2.8 Supervisor, Electricity and Instrumentation, and Supervisor, Architectural Trades

- notifies the Environmental Health and Safety Officer of all mould contamination discovered by their personnel;
- ensures that all his/her employees or external contractors who are permitted access to areas where mould contamination is being disturbed have been properly trained.

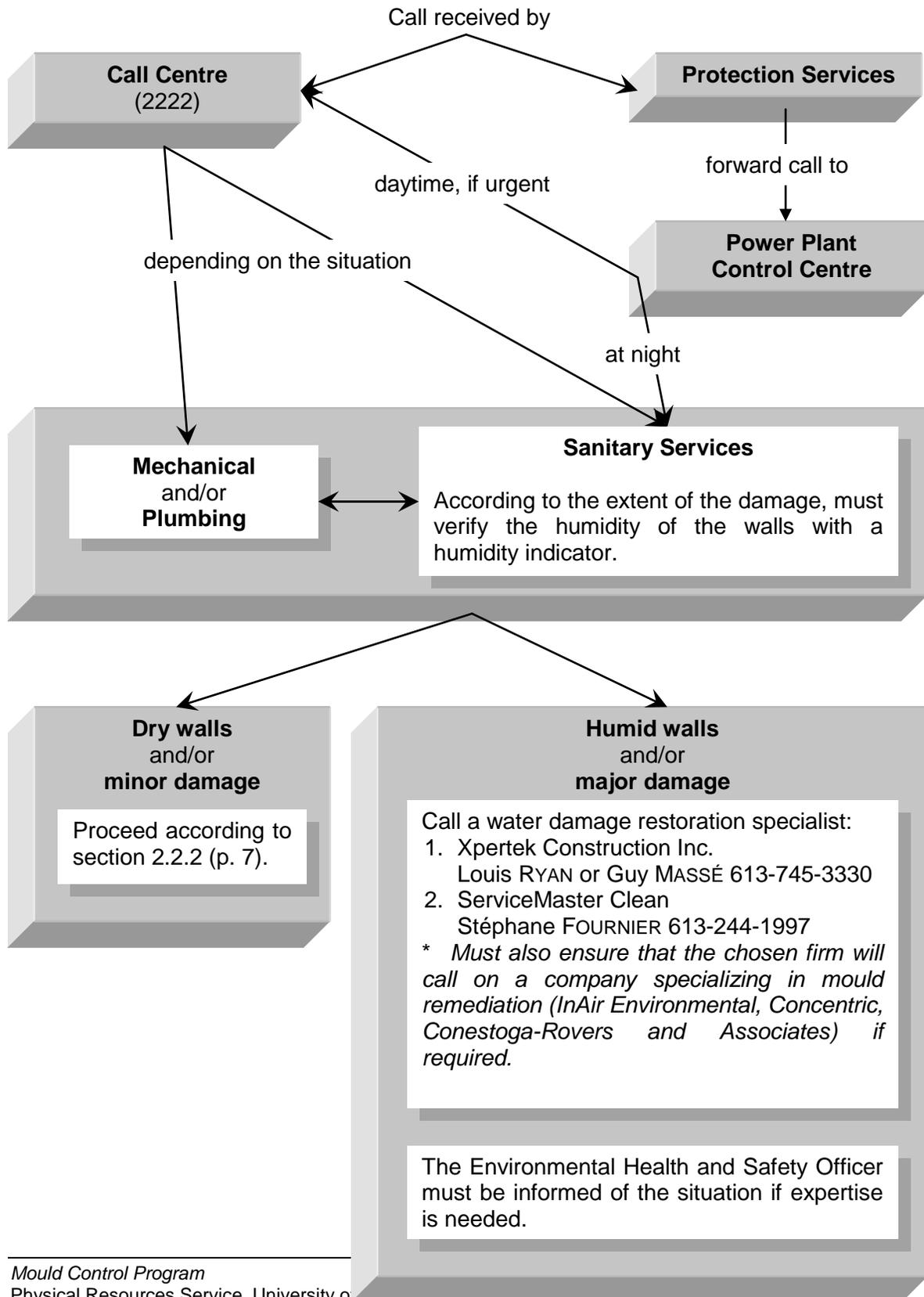
2.2.2.9 Assistant Director, Technical Services and Maintenance

- ensures that a regular inspection of the equipment for conditions listed in section 1.4 (p.4) of the present document is conducted, and that any problems discovered are corrected in a timely manner;
- responds to findings of newly discovered mould contamination, and ensures that appropriate clean-up and remediation measures are taken in a timely manner and in accordance with the Mould Control Program.

2.2.2.10 Environmental Health and Safety Officer

- ensures that all work involving mould, regardless of which department initiates the work, is conducted only by qualified employees or external contractors, that safe work procedures are in place, and that all other requirements of the Mould Control Program are implemented;
- ensures that competent mould remediation contractors and consultants are used, based on proven service and performance, and documentation of adequate training and experience;
- assesses conditions for potential mould contamination, and recommends appropriate remediation measures;
- responds to findings of mould-contaminated material during project activities, and ensures that appropriate clean-up and remediation measures are taken in a timely manner;
- maintains records of all mould remediation work;
- in situations where the mould investigation is triggered by an occupant or occupants experiencing symptoms, contacts the Manager, Occupational Health, Disability and Leave.

2.3 Communication plan



2.4 Humidity control methods

Mould growth can be reduced if relative humidity is well controlled and condensation on surfaces is prevented. This can be accomplished by:

- reducing the moisture content of air
- increasing air movement at the surface
- controlling air temperature
- insulating cold surfaces.

Equipment needed:

- dehumidifiers
- air conditioners (aid in removing humidity from air)
- ventilation units (fans)
- psychrometers/hygrometers
- shop-vac

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