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1.0 Introduction

The Mold Prevention Assessment and Remediation Procedures were developed by the Department of Environmental Health & Safety in accordance with the University's Policy Statement on Health and Safety and to ensure compliance with the Ontario Occupational Health & Safety Act and other relevant regulations.

This procedure has been established in order to address the rising concern about indoor exposure to mold and to minimize the potential for mold growth and contamination. It outlines the necessary steps that must be followed to safely identify, control and remediate areas where indoor mold is found while protecting the health of building occupants and remediators.

2.0 Applicable Legislation and Guidelines

- Occupational Health and Safety Act
- EPA: Mold Remediation in schools and Commercial Buildings, EPA 402-K-01-001
- New York City Department of Health, Guidelines on Assessment and Remediation of Fungi in Indoor Environments, NYDOH 2002
- ACGIH Bioaerosols: Assessment and Control
- Manitoba Dept. of Labor, Guidelines for the Investigation, Assessment, & Remediation of Mold in Workplaces.
- IAHA, Assessment, Remediation, and Post-Remediation Verification of Mold in Buildings, 3-2004
- Environmental Abatement Council of Ontario: "Mould Abatement Guidelines", 2004

3.0 Definitions

HVAC: Refers to heating, ventilation and air conditioning system. In this document contamination of the HVAC system generally refers to mold growth within the air ducts.

Mold: A Group of organisms that belong to the fungi kingdom. Mold in this document refers to mold that has colonized a substrate and formed fungal mycelia & growth structures visible to the naked eye.

PPE: Personal protective equipment

Spores: Refers to the reproductive structures in mold. They are small microscopic particles not visible with the naked eye released by mold to form a new mold colony given the right environmental conditions. Mold spores can travel great distanced on skin, clothing, by wind currents and other means.

Type 1 Mold Remediation: Mold growth either continuous or periodic covering Less than 10 sq. ft., excluding HVAC contamination.

Type 2 Mold Remediation: Mold growth either continuous or periodic covering between 10 and 30 sq. ft., including HVAC contamination covering less than 10 sq. ft.

Type 3 Mold Remediation: Mold growth either continuous or periodic covering More than 30 sq. ft., including HVAC contamination covering more than 10 sq. ft.

4.0 Responsibilities

4.1 Departments are responsible for;

- Immediately reporting any water leaks or moisture buildup to Physical Plant Services (PPS) Fixit Desk at ext. 77301.
- Reporting any visible mold growth to the Department of Environmental Health & Safety (EH&S).
- Contacting EH&S if mould growth is suspected either due to the presence of a musty smell or unexplained health symptoms are experienced by building occupants.

4.2 Physical Plant Services are responsible for;

- Ensuring that PPS employees and Contractors that potentially could to come in contact with mold, or are involved in mold remediation, are knowledgeable about the hazards, and if involved in remediation are trained to perform any necessary remediation outlined in this procedure.
- Ensuring that PPS employees that are likely to come in contact with mold or are involved in mold remediation use the appropriate Personal Protective Equipment (PPE). A respirator fit-testing record must be retained on file.
- Ensuring that building occupants are notified and kept up to date about the status of the remediation.
- Locating sources of moisture and eliminating the causative agent (i.e., pipe break, leaks, condensation, etc) and;

- Utilizing prevention techniques to eliminate the conditions conducive to mold and fungal growth.
- Contacting The Department of Environmental Health and Safety if;
    a. mold /fungal contamination exceeds 10 sq. ft. (Type 2&3) or assistance is required with identification or extent of contamination.
    b. mold/fungal growth is found within the HVAC system, regardless of the extent of mold contamination.
    c. concerns of exposure have been raised.
- Conducting Type 1 Mold Remediation
- Utilizing approved contractors for Type 2 and Type 3 mold remediation

4.3 The Department of Environmental Health and Safety is responsible for;

- Reviewing this procedure periodically and communicating it to the appropriate departments.
- Investigating instances of suspected mold contamination.
- Providing mold identification when necessary
- Consulting with PPS to determine the type of mold contamination and remediation required.
- Assisting PPS in the selection and approval of outside contractors for Type 2 and Type 3 Mold Remediation. Ensuring that documentation is provided by the contractor in respect to training as outlined in Section 5.0
- Performing respirator fit testing.
- Performing mold sampling and clearance testing as necessary.
- Performing follow up inspections for any Type 2 and Type 3 Remediation.

4.4 Contractors are responsible for;

- Providing confirmation of worker training and competence as outlined in Section 5.0
- Following the mold remediation steps specified in this document. A contractor may submit alternative remediation procedures which must be pre-approved by EH&S and PPS prior to commencing any remedial action.
- Ensuring all Sub-contractors comply with the training and remediation protocols as outlined in this procedure, or with contractor procedures that have been approved by PPS/EH&S.
- Providing confirmation of liability insurance covering mold, and reference to other similar projects to PPS and EH&S.
- Communicating any action to be taken to PPS or EH&S who will notify the building occupants.

5.0 Training

Any worker involved in the cleanup and remediation of mold and mold contaminated materials must be knowledgeable about the contents of this procedure, and be trained to safely perform any necessary work required in accordance with this procedure.

5.1 Training should cover but is not limited to;

- The mold growth cycle and necessary conditions for sustaining mold growth.
- Knowledge of potential health effects resulting from spore inhalation
- The selection and use of appropriate PPE including respirator fit testing
- Isolation of HVAC systems and installation of isolation barriers.
- Remediation, cleaning and disposal of mold-contaminated materials including PPE
- Final cleaning of remediation area

6.0 Moisture Damage Cleanup and Mold Growth Prevention

Naturally occurring mold spores can be found in virtually all indoor and outdoor environments. Their presence indoors does not necessary indicate problems with indoor air. However, mold spores can become a problem when sufficient moisture becomes available for the spores to establish a mold colony. Condensation, leaks, spills and high humidity can all support mold growth if the moisture source is not controlled and eliminated within 24-48 hours. Finding and correcting mold growth in buildings, therefore, becomes an exercise in finding and eliminating areas of moisture collection.

Cleaning up mold without eliminating the moisture source is not an effective way of controlling mold growth.

6.1 Prevention

- Perform regular maintenance to ensure building envelope, windows and roof do not leak
- Fix leaky plumbing and water leaks as soon as possible
- Eliminate condensation and wet spots as soon as possible by fixing the source of the problem:
  a. Insulate piping.
  b. Maintain low indoor humidity, below 60% RH, ideally 30-50% if possible.
  c. Provide adequate ventilation in high occupancy areas.

- Keep heating, ventilation, and air conditioning (HVAC) drip pans clean, flowing and unobstructed.
- Vent moisture generating appliances to the outside

6.2 Action required for "clean" water damage within 24-48 hours

- Eliminate and repair source of moisture.
- Dry affected area as soon as possible. Refer to **Table 1. Water Damage - Cleanup and Mold Prevention** for cleanup guidelines for specific materials.
- Assess surrounding area to ensure sub-floors, wall cavities and other areas remain dry
- Conduct a follow up inspection to ensure no visible mold growth has occurred, considering the possibility of hidden mold.

7.0 Mold Remediation Steps

When visible mold is located, the extent of growth must been fully investigated as mold may be hidden inside walls, under wall paper, in sub-floors, under carpets and other hard to assess areas. Remediation must take place as soon as possible and only after the source of moisture has been identified and has either been eliminated or will be eliminated upon the initiation of the remediation. The following are recommended steps and guidelines for the removal and clean up of mold affected areas. It is important to develop a thorough Remediation Plan, especially for larger projects.

Pre-cleanup

1. Determine the Type of Mold Remediation (TYPE 1, 2 or 3), and determine whether mold remediation will be conducted by PPS personnel or an outside contractor. EH&S shall provide assistance as necessary.

2. Consult **Table 2. Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water** and/or **Table 3. Guidelines for Remediating Mold Growth Caused by Clean Water in the HVAC System** to establish a "Remediation Plan" that must include the following;

a) Clean-Up / Remediation method: method may vary depending on the type of material and the extend of damage caused by mold and moisture,
b) PPE suitable for the type of remediation and
c) Containment (enclosure) to prevent the release of mold, mold spores and debris into the surrounding building areas.

3. Notify building occupants of the presence of mold and any remedial action taking place and remove occupants from the immediate area. In some instances (TYPE 2 and 3 Mold Remediation) susceptible individuals in adjacent areas may need to be relocated for the duration of the remediation.

Cleanup

1. Eating, drinking, chewing or smoking is prohibited in the work area

2. For Type 2 & 3 Mold Removal, clearly visible signs warning of the remediation must identify the area where the removal is being performed. Suggested warning sign: **Caution Mold Removal, Authorised Personnel Only, PPE Required**.

3. Ensure mold spores do not spread to other areas by misting the mold affected area with clean water or a detergent solution prior to any remedial action.

4. Remove mold according to the predetermined Remediation Plan and Guidelines provided. Clean the surrounding area including any airborne particulates. Cleaning should be performed with a detergent, the use of fungicide or disinfectants such as household bleach are not recommended.

5. Completely seal waste material and contaminated HEPA vacuum bags in two layers of 6ml polypropylene plastic prior to removal from the area. Dispose as regular garbage.

Post-Cleanup

1. Conduct a post remediation inspection to determine the effectiveness of the remedial work. Ensure that;
   a) Mold contaminated materials have been removed or treated and that adjacent surfaces and hard to reach spots are free of visible mold,
   b) Moisture sources have been effectively eliminated,

c) Mold growth has not reoccurred, considering the possibility of hidden mold. (Re-inspect every 2-3 weeks until satisfied that the remediation was successful).

d) Conduct clearance testing as necessary. Refer to section *9.0 Post Remediation Clearance.*

2. Re-clean any areas or surfaces that do not pass inspection/clearance, i.e., damp wipe with water/detergent, then HEPA vacuum. Repeat step 9.

3. Notify occupants about the completion of the remediation.

8.0 Post Remediation Clearance

An important part of any large remediation project, is to ensure the effectiveness of the remediation. Quantitative testing should be conducted for Type 3 Mold Remediation and remediation of more than 10 sq. ft. of the HVAC system to determine if the area is fit for re-occupancy. The following are suggested guidelines for conducting clearance sampling.

- Conduct clearance testing with the containment in place
- Leave negative air systems running so any remaining contamination will not be disturbed.
- Collect sufficient air samples inside the work area using aggressive techniques (i.e., use a leaf blower to move air around in the room.
- Collect air samples outside, and possibly in non-contaminated areas of the same building for results comparison.
- Collect swab or tape samples to check for adequate surface cleaning
- Interpret clearance sampling results

Table 1: Water Damage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth*	
Water-Damaged Material†	**Actions**
Books and papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
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	• 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.
Fiberglass 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

Table 1 (Cont.) : Water Damage - Cleanup and Mold Prevention

Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth*

Water-Damaged Material†	Actions
Wallboard (Drywall & 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 and dry the wall cavity, if wet.
Window drapes	• 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 paneling should be pried away from wall for drying.

* If mold growth has occurred or materials have been wet for more than 48 hours, consult Table 2 guidelines. Even if materials are dried within 48 hours, mold growth may have occurred. Items may be tested by professionals if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.

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 Personal Protective Equipment and containment are required by OSHA. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

† If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ 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.

*Adopted from: Mold Remediation in Schools and Commercial Buildings, U.S. EPA 2001.

Table 2: Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
TYPE 1 - Total affected surface area of less than 10 ft^2, excluding HVAC system			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

Table 2 (Cont.): Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
TYPE 2 - Total affected surface area between 10 and 30 ft^2 including HVAC system < 10 ft^2			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		

Table 2 (Cont.): Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
TYPE 3 - Total affected surface area greater than 30 ft^2 or greater than 10 ft^2 in HVAC system.			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

Table 2 (Cont.): Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Table 2 continued

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Table 1 if materials have been wet for less than 48 hours, and mold growth is not apparent. 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 the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- **Method 1:** Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- **Method 2:** Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- **Method 3:** Wipe with a mild detergent or High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- **Method 4:** Discard /remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Table 2 (Cont.): Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999); see Resources List for more information

7. Please note that Table 1 and Table 2 contain general guidelines. Their purpose is to provide basic information for remediation managers to first assess the extent of the damage and then to determine whether the remediation should be managed by in-house personnel or outside professionals. The remediation manager can then use the guidelines to help design a remediation plan or to assess a plan submitted by outside professionals.

*Adopted from: Mold Remediation in Schools and Commercial Buildings, U.S. EPA 2001

Table 3 : Guidelines for Remediating Mold Growth Caused by Clean Water* in the HVAC System

Action Required	<10sq.ft	>10sq.ft
Remove occupants from work area and adjacent areas	Yes	Yes
Seal off work area with 6-ml polyethylene sheeting, sealing all seams	Yes	Yes
Seal off all supply and return air ducts and doors into/out of the contained area.	Yes	Yes
Secure ventilation system	Yes	Yes
Place work area under negative pressure using fan(s) equipped with HEPA filters. Exhaust air outside	Yes	Yes
Use airlocks into/out of the work area	No	Yes
Establish Decontamination room outside of the enclosure	No	Yes
Use dust suppression methods (misting) on any material or object to be removed or cut	Yes	Yes
Dispose of all contaminated material including cleaning materials and vacuum bags in two layers of sealed 6ml polypropylene plastic.	Yes	Yes
Mop or wipe down area after cleaning/removal is complete	Yes	Yes
After damp wiping has dried, clean the same area with a HEPA-filtered vacuum	Yes	Yes
Visually inspect work area for cleanliness (no dust)	Yes	Yes
Conduct clearance sampling before removing containment	No	Possibly

*Adopted from “New York City Department of Health, “Guidelines on Assessment and Remediation of Fungi in Indoor Environments”, 2002 and,
Environmental Abatement Council of Ontario: “Mould Abatement Guidelines”, 2004