

EACO Mould Abatement Guidelines

Edition 3 (2015)



Foreword

This guideline has been prepared to assist building owners, constructors, contractors, subcontractors and workers who have duties under the Occupational Health and Safety Act and its Regulations to safely perform work activities involving Mould (Microbial) Abatement and remediation. The guideline is intended to promote safe work practices, the use of personal protective equipment, worker awareness and training and is based in a thorough review of the available guidance materials available to December 2014 and professional experience of the abatement industry in Ontario.

We believe that this guideline will not only help employers fulfill their responsibilities and due diligence under the Occupational Health and Safety Act but will also assist them to better address the challenges involved with proper assessment and remediation of Mould (Microbial) contamination in buildings.

Disclaimer

EACO disclaims any liability or risk resulting from the use of the work practices and recommendations discussed in the guideline. It is the user's responsibility to ensure that work practices and recommendations discussed in the guideline apply to specific workplaces and projects and to ensure compliance with all other applicable federal, provincial and local acts, codes and regulations.

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SECTION A: GENERAL POINTS AND LIMITATIONS

1. Three levels of work practice are given for removal of Small, Medium and Large-scale Mould growth, depending on the extent of material supporting Mould growth present. The thresholds between Small and Medium project areas (10 ft²) and between Medium and Large project areas (100 ft²) are a guideline only and are subject to professional judgment. EACO recommends that the enumeration of Mould growth be based on an approximation of the extent of visible growth (total affected area of building material), including the estimated extent of any hidden Mould.
2. These procedures do not address the identification or control of the cause(s) of the Mould growth being abated by these procedures. This would include such factors as past flooding, moisture intrusion and elevated levels of relative humidity. The project authority is cautioned to ensure that the underlying cause(s) of the Mould growth is investigated and remedied prior to completing the Abatement process to reduce the potential for Mould re-growth.
3. These procedures do not address the potential for fungal infections that may be acquired by Susceptible Occupants in hospitals or other health care settings if Mouldy materials are disturbed without appropriate precautions. Refer to “Construction-related Nosocomial Infections in Patients in Health Care Facilities – Decreasing the Risk of Aspergillus, Legionella and Other Infections”, July 2001, Canada Communicable Disease Report, Health Canada and CSA Standard Z317.13-12, Infection Control During Construction or Renovation of Health Care Facilities.
4. These procedures do not address the potential presence of Designated Substances (asbestos, lead, etc.) or other hazardous materials in a mould remediation work area. The project authority is cautioned that designated substances are regulated in Ontario under the Occupational Health & Safety Act. In addition, Ontario Regulation 278/05, *Regulation Respecting Asbestos on Construction Projects and in Buildings and Repair Operations* (O. Reg. 278/05) outlines specific procedures for the handling and disturbance of asbestos-containing materials (ACM). Typical ACMs that may be disturbed as part of a mould remediation project include drywall joint filling compound, ceiling tiles, pipe and duct insulation and vinyl flooring.
5. These procedures are not directly intended to address Biohazards, other than Mould, potentially present in a project area as a result of contamination with sewage waste, river floods or other water with high levels of Microbial contamination. Appendix D does provide additional procedures for unsanitary remediation. The reader is referred to the guidance of the Institute of Inspection, Cleaning and Restoration Certification S500 Standard, “Standard and Reference Guide for Professional Water Damage Restoration.” Additional precautions might apply.
6. These guidelines are not meant to respond to the development of minor areas of superficial mould growth in households due to water absorption or condensation on the occupied side of finishes, often referred to as lifestyle mould growth. Examples include spotty mould growth on grout in bathrooms or on cold window frames under winter conditions. Such areas of minor surface mould growth are generally limited in area and can usually be addressed with improved ventilation and/or moisture control, and standard house cleaning methods. However, if there are large areas of surface condensation or indications of sub-surface moisture sources, the area should be inspected for the possibility of hidden water damage or mould growth.

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SECTION B: GENERAL PRECAUTIONS APPLICABLE TO ALL LEVELS OF MOULD ABATEMENT WORK

1. Protection of Occupants

- 1.1 The project authority should consider whether occupants should be removed from areas adjacent to the work area. The removal of occupants from spaces adjacent to the work area is not necessary in all cases but should be considered in the presence of Susceptible Occupants including but not limited to infants less than 12 months old, persons having undergone recent surgery, the elderly, immune suppressed people, or people with chronic inflammatory lung diseases.

2. Worker Training and Medical Pre-screening

- 2.1 Mould abatement workers shall be trained in the hazards of Mould Abatement and in the procedures to be followed. Training at a minimum shall include classroom and site instruction. Minimum training topics shall include: hazards of mould abatement; use and limitations of personal protective equipment such as respirators and gloves; proper abatement practices including site isolation, removal techniques, proper clean-up and decontamination procedures. General health and safety training should also be provided to workers, as required by the Occupational Health & Safety Act and regulations for construction sites, and waste handling and disposal regulations.
- 2.2 Workers must be fit to work with potential Mould or microbial exposure. Workers with a history of significant allergic disease (asthma, hay fever, hives, etc.) or with a potential immuno-compromised status (persons with an immune system disease, taking immune system suppression medication, etc.) should consult with an experienced physician to determine whether Mould removal activities, and the associated potential for exposure to pathogenic materials, would present an unacceptable health risk.
- 2.3 Mould Abatement workers who may encounter a risk of infectious disease from unsanitary water sources (sewage, river floods, etc.) should consult with an experienced physician regarding vaccinations to reduce the risk of infectious disease through available immunizations, particularly Hepatitis A and B, tetanus and polio.

3. Respiratory Protection

- 3.1 The respiratory protection in these procedures has been established for protection against fungal particulate material, for which a Respirator with a NIOSH-approved particulate filter will be adequate. Another type of Respirator may be required if the Mould Abatement will employ a Disinfectant with a volatile hazardous ingredient (e.g., household chlorine bleach). Consult MSDS data for specific respiratory protection in relation to specific cleaning products.
- 3.2 Respirators shall be NIOSH approved.
- 3.3 Workers should complete Respirator pre-screening as detailed in CSA Standard Z94.4-11, Selection, Care and Use of Respirators (Appendix E Figure E1) and, if required, consult with an experienced physician to determine if a Respirator can be used without serious difficulty.
- 3.4 Respirator wearers shall be Fit-tested for each type of Respirator, prior to use, following CSA Standard Z94.4-11, Selection, Care and Use of Respirators.

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- 3.5 Follow CSA Standard Z180.1-13 as amended, for testing of breathing air quality for supplied air respiratory protection required for dry ice abrasive blasting (see Appendix C).
- 3.6 Clean and maintain the Respirator and battery pack (where applicable) in accordance with manufacturer's recommendations.
- 3.7 No facial hair or spectacle side arms, which affect the seal of the Respirator to the skin, are allowed.
- 3.8 Dispose of filters daily due to the potential growth of Mould spores on damp filter media.
- 3.9 Due to the nature and working conditions of Mould Abatement, Filtering Facepiece Respirators shall not be utilized for Level 2 or Level 3 Abatement projects.

4. Personal Protection and Hygiene

- 4.1 Refer to the EACO Guideline Construction Worker Hygiene Practices 2014. Workers shall wear appropriate eye protection including safety glasses or goggles that provide protection from external debris (not required with full face negative pressure respirator), chemical splashes, impact or dusty environments, dust-impermeable gloves appropriate for the work underway and water-impermeable gloves for application of detergent and/or Disinfectant. Refer to the MSDS for the detergent and/or Disinfectant for glove selection.
- 4.2 Wash face and hands after work at the Abatement project each time after exiting the Abatement work area.
- 4.3 For all levels of work, eating, drinking or smoking is prohibited in the work area.

5. Cleaning

- 5.1 Pre-clean any items that will be retained, whether removed from the work area or covered and left in the work area. Use appropriate and effective cleaning methods.
- 5.2 After bulk removal, clean the surrounding areas with a HEPA vacuum. No other type of vacuum can be used. If a HEPA vacuum is not available, wet wiping may be adequate for Level 1 work.
- 5.3 Do not dry sweep or dry whisk. Use power tools only if fitted with effective HEPA-filtered dust collection.
- 5.4 Wipe all non-Porous surfaces within the removal area with a detergent solution. Rinse with clear water as required.
- 5.5 As an option, a Disinfectant solution can be used in place of, or in addition to a detergent. Apply the Disinfectant as specified by the manufacturer, maintaining the surfaces wet for the prescribed period. Generally, surfaces to be disinfected must be cleaned of all dust and loose organic material prior to application of the Disinfectant. A Disinfectant is required where the work area has been contaminated with a significant pathogenic hazard (i.e., sewage floods).
- 5.6 The project authority should consider the use of a Disinfectant in hospital or health care settings, or in other settings where the project authority believes occupants to be significantly immunocompromised. Refer to the Health Canada and CSA guidelines for prevention of fungal infections in health care settings, given above.

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- 5.7 Use only disinfectants with current Health Canada DIN registration. Apply the disinfectant according to the DIN label, observing requirements for mixing, storage time, worker safety, pre-cleaning, contact time, and any requirements for rinsing.
- 5.8 These cleaning requirements apply to all exposed surfaces within the work area. The project authority will determine if soft goods and Porous materials can be adequately cleaned or must be disposed of.
- 5.9 Clean all equipment used in the Abatement work area by HEPA vacuuming or wet wiping. Equipment that cannot be readily cleaned shall be HEPA vacuumed and sealed in 6 mil polyethylene bags before removal from the work area.

6. Post Abatement Cleanup

- 6.1 Remove Polyethylene sheeting used during abatement by carefully rolling towards the centre of the work area. Clean any visible dust and debris using a HEPA vacuum.
- 6.2 Clean all tools, supplies and equipment in the work area using a HEPA vacuum and by wet wiping. Equipment that cannot be readily cleaned (e.g. vacuum hose, wire brushes, etc.) shall be HEPA vacuumed and sealed in 6 mil polyethylene bags or suitable sealed containers before removal from the work area.
- 6.3 Seal the intake and exhaust of HEPA Filtered Exhaust Fans (negative air machines) and clean the cabinet by wet wiping, before removal from the work area.
- 6.4 Leave the work area and surrounding areas dry and visibly free of dust and debris.

7. Waste Disposal

- 7.1 Remove all waste as contaminated material, including but not limited to building debris, disposable coveralls, Respirator filters and/or cartridges, and plastic sheeting. All waste should be immediately double-bagged into two 6-mil polyethylene bags, each individually sealed. If the material cannot be bagged, wrap in 2 layers of 6 mil Polyethylene Sheeting and seal with tape.
- 7.2 Transport and dispose of the waste material in compliance with local, provincial and federal regulations, including the Ontario Environmental Protection Act and any other regulations, which may apply to the Mould or the substrate on which the Mould was located.

8. Post-Abatement Drying

- 8.1 By the completion of the mould abatement, ensure the cause of the mould growth has been identified and an action plan initiated to prevent further mould growth. This action would include mitigation of the original cause of the mould contamination. This would include such factors as past flooding, moisture intrusion or elevated levels of relative humidity. Also, at completion of mould abatement check that the remaining finishes (e.g., concrete, wood framing, sub-floors) have been adequately dried so that mould growth will not re-occur when new finishes are installed. The work area may require further drying efforts before re-construction can commence.

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SECTION C: PRECAUTIONS FOR LEVELS 1, 2 AND 3 MOULD ABATEMENT

- 9. Level 1: Small Isolated Areas, Less than 10 ft² (1 m²) of Building Materials or Clean-up of Less than 10 ft² (1 m²) of Mould Growth in HVAC Systems in Non-occupied Areas.**
- 9.1 This section gives instructions for performing Mould Abatement specifically for small-scale projects. This work practice is suitable for the abatement of under about 10 square feet of mould growth on building materials or finishes or the abatement of the same extent of mould growth within HVAC equipment in non-occupied areas such as mechanical rooms. Abatement of HVAC equipment in occupied locations shall be performed following a minimum of Level 2 procedures (contained mould abatement). Comply with all of the items of Section B, General Precautions (protection of occupants, worker training and medical pre-screening, respiratory protection, personal protection and hygiene, cleaning, and waste disposal) while performing this work.
- 9.2 The worker shall wear a half face piece air-purifying Respirator fitted with replaceable filters (N95 minimum) or a Filtering Facepiece Respirator (N95 minimum) plus appropriate gloves.
- 9.3 Workers shall wear full-body dust-impervious coveralls with attached hoods. Secure the coveralls tight at the ankles and wrists.
- 9.4 Turn off HVAC systems where possible and seal over any diffusers immediately adjacent to the work area.
- 9.5 Where possible, place a drop sheet below the Mouldy materials.
- 9.6 Dust Suppression methods should be used where possible, prior to disturbance of the Mouldy materials. Tape a section of plastic sheeting or duct tape over the Mouldy material, or if this is not feasible, lightly mist the Mouldy material with water.
- 9.7 Remove any Porous substrate materials (ceiling tiles, drywall, etc.) to a point beyond the immediate areas of visible contamination, for a minimum distance of 30 cm in all directions.
- 9.8 Clean the work area and dispose of the waste.
- 10. Level 2: Medium areas, 10-100 ft² (1-10 m²) or less than 10 ft² (1 m²) in HVAC Systems in Occupied Areas**
- 10.1 This section gives instructions for performing Mould Abatement specifically for medium scale projects, or the abatement of less than 10 square feet of mould growth in HVAC equipment in occupied areas. Comply with all of the items of Section B, General Precautions (protection of occupants, worker training and medical pre-screening, Respiratory protection, personal protection and hygiene, cleaning, and waste disposal) while performing this work.
- 10.2 Consult with a qualified Health and Safety Professional prior to remediation work to provide Quality Assurance for the project and monitoring of compliance with these guidelines.
- 10.3 A competent supervisor must be present during all Contaminated Work.
- 10.4 The worker shall wear gloves appropriate for the work being done and full-body dust-impervious coveralls with attached hood. Secure the coveralls tight at the ankles and wrists.

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- 10.5 The worker shall wear an elastomeric half face piece air-purifying Respirator fitted with 100 Series Filter cartridges.
- 10.6 Workers shall wear disposable boot covers or separate work boots that can be effectively HEPA vacuumed or wiped clean prior to removal from the work area.
- 10.7 Turn-off HVAC systems where possible and seal over any supply and return openings immediately adjacent to the work area. Objective of this engineering control is to maintain negative pressure and prevent the distribution of mould spores and dust from the work area.
- 10.8 The Abatement area must be secured and access restricted. Isolate the work area with an enclosure constructed of fibre-reinforced Polyethylene Sheeting or 6 mil Polyethylene Sheeting, taped and supported as required. Provide a temporary roof where an existing ceiling does not complete the temporary enclosure. The Project authority may require a single chamber decontamination/change room.
- 10.9 A Competent Supervisor or project authority must inspect the work area for defects in the enclosure, barriers and change room, at the beginning of every shift and at the end of every shift. Records of the inspections should be generated and maintained.
- 10.10 Install signs warning of the exposure hazard. Suggested wording: CAUTION, MOULD EXPOSURE, WEAR ASSIGNED PROTECTIVE EQUIPMENT, AUTHORIZED PERSONNEL ONLY.
- 10.11 Provide continuous Negative Pressure within the enclosure by drawing air from the work area and exhausting it out of the enclosure, either by use of a HEPA vacuum or a portable HEPA-filtered exhaust fan. Provide a minimum Negative Pressure of 5 Pascals (0.02 inches of water column) and at least 4 air changes per hour. Discharge the filtered air outside the building and away from persons wherever possible, and if this is not possible, consider on-site leak testing of the HEPA filtered equipment. Refer to the EACO DOP/PAO Testing Procedure Guideline 2013. Negative Pressure must be maintained until the completion of all Contaminated Work.
- 10.12 Remove any Porous substrate materials (ceiling tiles, drywall, etc.) to a point beyond the immediate areas of visible contamination, for a minimum distance of 30 cm in all directions.
- 10.13 Clean the work area and dispose of the waste.
- 10.14 Before exiting the work area, workers shall fully wipe or vacuum clean all footwear, coveralls and other personal protective equipment and remove and dispose of protective equipment not for re-use. Workers shall then complete personal cleaning as in Section B, General Precautions.
- 11. Level 3: Large Areas, More than 100 ft² (10 m²), or more than 10 ft² (1 m²) in HVAC Systems**
 - 11.1 The following work procedures describe the general set-up, conduct and safety measures for Level 3 Mould Abatement. Each project should be conducted following a site-specific work plan or specification developed by a Health and Safety Professional.
 - 11.2 This section gives instructions for performing Mould Abatement specifically for large-scale projects. Comply with all of the items of Section B, General Precautions (protection of occupants, worker training and medical pre-screening, Respiratory protection, personal protection and hygiene, cleaning, and waste disposal) while performing this work.

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Quality Assurance

- 11.3 Consult with a qualified Health and Safety Professional (qualified by knowledge, training and experience) with experience performing Microbial investigations and remediation, prior to remediation work, to develop a site specific work plan or specification and Quality Assurance services for the project and monitoring of compliance with these guidelines.

Quality assurance will include a combination of site inspections prior to abatement, during abatement, after abatement and clearance sampling including air sampling prior to dismantling of the abatement work area. Clearance sampling requirements to be defined by the appointed Health and Safety Professional. Refer to Section 11.22

Worker Protection

- 11.4 The worker shall wear a tight-fitting full face piece Powered Air Purifying Respirator with high efficiency particulate filters or a non-powered full face piece air purifying Respirator fitted with 100 Series Filters. Refer to Appendix C for respiratory protection for dry ice abrasive blasting.
- 11.5 The worker shall wear gloves appropriate for the work being done and full-body dust-impervious coveralls with attached hood. Secure the coveralls tight at the ankles and wrists.
- 11.6 Workers shall wear disposable boot covers or separate work boots that can be effectively HEPA vacuumed or wiped clean prior to removal from the work area.
- 11.7 A Competent Supervisor must be present during all Contaminated Work.

Site Isolation

- 11.8 Turn-off HVAC systems where possible and seal over any supply and return openings immediately adjacent to the work area.
- 11.9 Isolate the work area from adjacent spaces using temporary hoarding, tape and Polyethylene Sheeting, etc.
- 11.10 Install signs warning of the exposure hazard. Suggested wording: CAUTION, MOULD EXPOSURE, WEAR ASSIGNED PROTECTIVE EQUIPMENT, AUTHORIZED PERSONNEL ONLY.
- 11.11 Provide continuous Negative Pressure within the enclosure, through use of portable HEPA-Filtered Exhaust Fans. Provide a minimum Negative Pressure of 5 Pascals (0.02 inches of water column) and at least 4 air changes per hour. Note that higher levels of negative air pressure may be required to maintain site isolation. Discharge the filtered air outside the building and away from persons wherever possible, and if this is not possible, perform on-site leak testing of the HEPA filtered fan. Negative Pressure must be maintained until the completion of all Contaminated Work.
- 11.12 Negative Pressure within the enclosure shall be continuously measured and recorded with a portable monitor located at the entrance to the work area.

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- 11.13 A Competent Supervisor and/or the Health and Safety Professional must inspect the work area for defects in the enclosure, barriers and change room, at the beginning of every shift, at the end of every shift where there is no shift beginning immediately following the shift that is ending, and at least once per day on days where there are no shifts. Records of the inspections should be generated and maintained.

Worker and Waste Decontamination Facilities

- 11.14 Provide a Worker Decontamination Facility, to include a clean change room and a dirty change room. Install flap doors at each opening into and within the decontamination facility. Provide a wash station consisting of at least a basin, fresh water, soap and toweling, in the clean change room. A shower for worker comfort may be provided, but is optional. Refer to Appendix A for a diagram of a typical Decontamination Facility.
- 11.15 When going into the Contaminated Work area the worker will don clean coveralls and a Respirator in the clean change room.
- 11.16 Prior to exiting the Contaminated Work Area, the worker will use a HEPA vacuum in the work area to remove gross contamination from coveralls and boot covers (or separate dirty work boots).
- 11.17 The worker will then enter the dirty change room where the dirty coveralls and boot covers are removed (to be used only once). Work boots used without boot covers will also be removed and stored in the dirty change room.
- 11.18 The worker then proceeds to the clean change room to complete clean up. The wash station is to be used by each worker on leaving the work area to clean face and hands.
- 11.19 A separate Waste Decontamination Facility, consisting of a double bagging room and a waste transfer room should be provided where large volumes of waste will be removed. Seal the waste into bags (or Polyethylene Sheeting sealed with tape) in the Contaminated Work area, and wipe the exterior of the bags or other containers. Transfer the waste to the double bagging room and place a second bag around bagged waste. Seal the second bag. Transfer the double-bagged waste into the waste transfer room for removal by workers entering from the outside of the decontamination facilities.

Removal, Salvage and Cleaning

- 11.20 Remove any Porous substrate materials (ceiling tiles, drywall, etc.) to a point beyond the immediate areas of visible contamination, for a minimum distance of 30 cm in all directions.
- 11.21 Clean the work area and dispose of the waste. Clean tools and equipment such as vacuums, negative air units or any other items that were exposed during abatement.

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Clearance Inspection and Monitoring

11.22 The Health and Safety Professional or representative should inspect the Level 3 work area for acceptable completion, by a combination of careful inspection and testing. A site will be considered acceptable and clean when a thorough inspection shows an acceptable state of cleanliness. In addition, Clearance air samples to be taken to indicate the work area is no longer impacted by the Mould contamination abatement process.

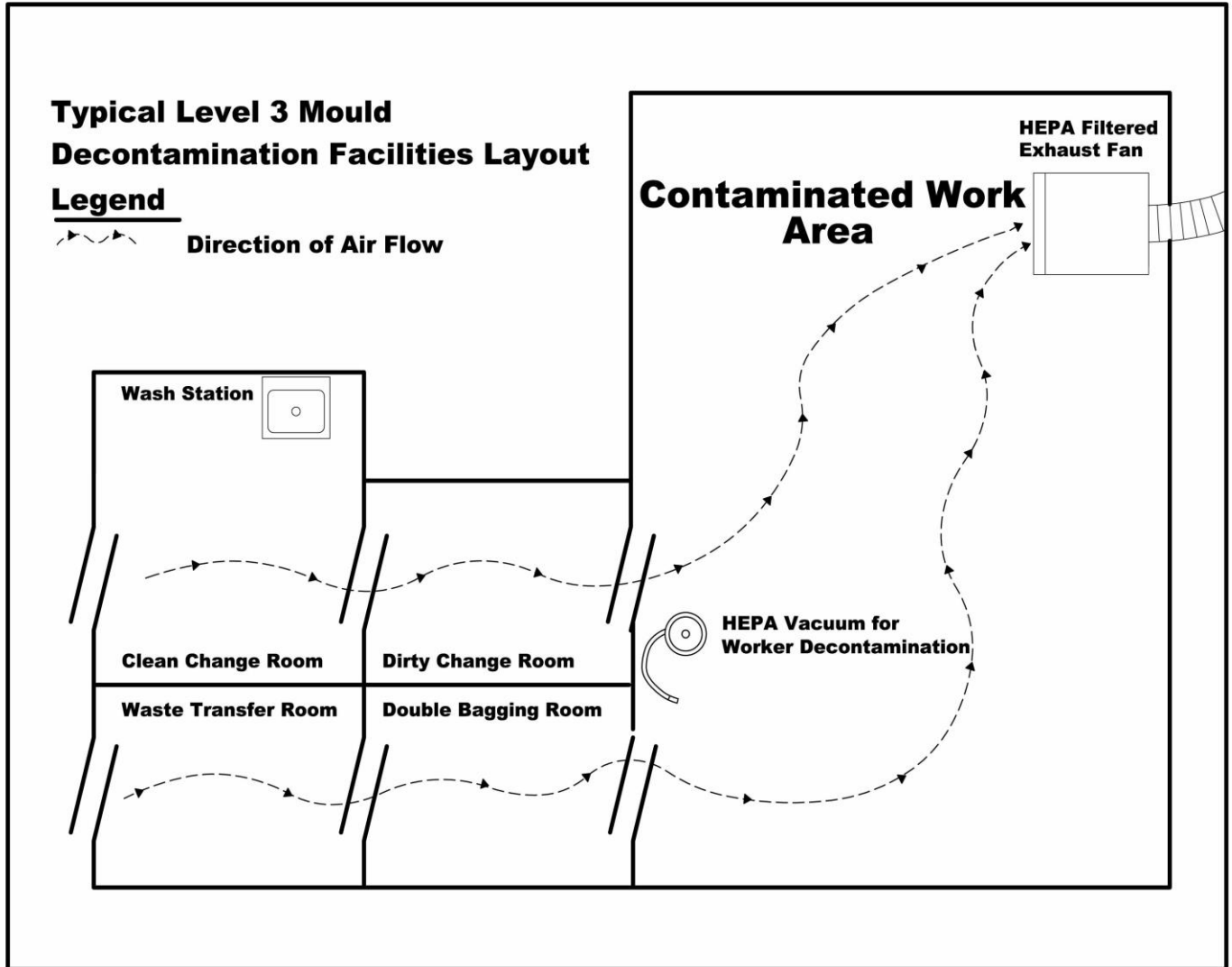
Generally, clearance air samples collected within the work area will be compared to samples taken in adjacent areas from where the work area make-up air is being drawn, another suitable location, or to outdoor air samples. An acceptable condition is indicated when:

1. Concentrations of airborne fungal particles in the work area are not significantly elevated when compared to concentrations in the reference area; and
2. The types of fungal particulate present in the work area do not significantly differ from those present in the reference area.

Surface samples should show minimal or no Mould growth remaining at completion. Interpretations of sample results are subject to the professional judgment of the Health and Safety professional with experience performing microbial investigation and remediation.

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Appendix A: Typical Level 3 Mould Decontamination Facility Lay-Out



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Appendix B: Procedures for Clean-up of Bird and Bat Droppings

*Workers removing accumulations of bird or bat droppings are at risk of exposure to airborne fungal spores (and other microbial hazards) likely to be released when this material is disturbed. Bird and bat droppings should be presumed to be contaminated with the fungi *Histoplasma capsulatum*, *Cryptococcus neoformans*, and other infectious hazards. The spores of some of these organisms can remain infectious for decades after their growth in the guano has ceased. Many of these microorganisms are known to cause respiratory infections in workers exposed during construction or maintenance disturbance.*

NOTE: Although a disinfectant will be applied during this work, the treated excrement may still contain viable organisms and use of personal protective equipment should continue until the site is cleaned.

General Precautions during Abatement Work

1. Health and safety measures and procedures required during the abatement of bird or bat droppings shall be based on the findings of a project-specific risk assessment completed by a health and safety professional.
2. The project-specific risk assessment must consider conservation and/or habitat preservation.
3. The project-specific risk assessment should consider post abatement corrective measures that may be necessary to prevent the return of birds or bats (e.g. block openings into buildings or structure ledges, screen off ventilation intakes or other void openings, install netting/mesh or anti-roosting control systems, etc.).
4. Requirements of Section B (of this document) shall also apply, as applicable, for the clean-up of bird or bat droppings. Section B provides general guidance related to; protection of occupants, worker training and medical pre-screening, respiratory protection, personal protection and hygiene practices.

Personal Protection

All work will require the following personal protective equipment, as a minimum:

- Rubber boots (CSA approved for construction work).
- Either disposable gloves taped to coveralls and worn under work gloves, or heavy rubber or nitrile work gloves, taped to coveralls.
- Water-resistant disposable coveralls, complete with elasticized hood, taped to gloves and boots.
- Minimum of a full-face piece respirator fitted with appropriate cartridge filters. As a minimum, P100 filters are required for protection against airborne particles. Depending on the disinfectant used, the cartridge may require protection against vapours or gases. A powered air purifying respirator (PAPR) fitted with an appropriate cartridge filter may also be used, and will provide more comfort for the worker.

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Appendix B: Procedures for Clean-up of Bird and Bat Droppings

Disinfectant

Use only disinfectants with current Health Canada drug identification number (DIN) registration. Apply the disinfectant according to the DIN label, observing requirements for mixing, storage time, worker safety, pre-cleaning, contact time, and any requirements for rinsing.

Hazard Sign

Install signs warning of exposure hazard during all abatement operations.

Site Isolation Considerations

The site isolation procedures implemented shall be based on the findings of a project-specific risk assessment. The following site isolation procedures, as a minimum, should be considered for all bird or bat dropping abatement operations.

1. Turn-off HVAC systems where possible and seal over any openings immediately adjacent to the work area.
2. Isolate the work area from adjacent spaces using temporary hoarding, tape and polyethylene sheeting, etc.
3. If the work area is enclosed, establish continuous negative pressure using portable HEPA-filtered exhaust fans. Provide a minimum negative pressure of 5 Pascals (0.02 inches of water column) and at least 4 air changes per hour. Refer to EACO document “*DOP / PAO Testing Guideline, 2013*”, for guidance on negative air system testing and reporting requirements.
 - a. Negative pressure within the enclosure shall be continuously measured and recorded with a portable monitor.
4. Provide a worker decontamination facility, to include a clean change room and a dirty change room. Install flap doors at each opening into and within the decontamination facility. Provide a wash station consisting of at least a basin, fresh water, soap and toweling, in the clean change room. Refer to Appendix A for a diagram of a typical decontamination facility.
 - a. For large work areas, long term projects or areas with excessive amounts of bird or bat droppings, including a shower in the worker decontamination facility should be considered.
5. Additional considerations for outdoor operations:
 - a. Install signs warning of exposure hazard, and ropes or barriers, around the perimeter of the work area, to the extent that is practicable, to prevent unauthorized personnel from entering the work area. All workers and personnel within the perimeter of the work zone must be adequately protected.
 - b. Provide a worker decontamination facility as close to the work area as practical.
 - c. Assess the prevailing wind patterns affecting the work area. Arrange the location of the worker decontamination facility, and sequencing of abatement operations, in a manner to minimize exposure to workers and surrounding areas.
 - d. Complete an assessment to identify the location of fresh air intakes for building heating, ventilation and air conditioning (HVAC) systems. Fresh air intakes and/or HVAC

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Appendix B: Procedures for Clean-up of Bird and Bat Droppings

systems located within the perimeter of the work area shall be turned-off where possible and openings shall be sealed.

- i. Clean HVAC system sheet metal that may have been contaminated.
- ii. Replace HVAC air filters that may have been contaminated.
- e. Isolate other routes of potential air transfer (into a building) located within the perimeter of the work area, such as windows, doors, void spaces, vents, etc.
- f. If soil removal is required, soil pretreatment or decontamination may be required.

Work Practices

1. Dampen dry and dusty droppings with water to reduce the amount of airborne dust that may be created during abatement activities. Adding a surfactant to water (i.e. a wetting agent) may further reduce the amount of dust that becomes airborne.
 - a. Wetting should be completed only by a low-pressure system or hose.
 - i. Never wet bird or bat droppings using a high pressure power-washer system or using a high pressure garden hose setting (e.g. do not use direct or jet spray settings).
 - b. Where bird or bat droppings are excessive, a prolonged wetting period and/or, repeated wetting during abatement work may be required.
 - i. Never dry shovel or dry sweep bird or bat droppings.
 - c. Avoid walking over areas with bird or bat droppings unnecessarily.
2. Perform an initial shoveling and HEPA vacuum removal of as much of the residue as possible.
3. Following a HEPA vacuuming, apply a disinfectant solution to all areas with visible residue. Apply with a garden sprayer set for droplet as opposed to mist spraying. Lightly brush to ensure uniform wetting and contact through to the underlying surface. Apply additional disinfectant as necessary to maintain the area wet for the contact time specified by the disinfectant manufacturer. Leave the material wet overnight where practical to do so.
4. Clean the area of residue with suitable tools and HEPA vacuuming. Lightly mist with water to reduce dust formation.
5. After surfaces have been cleaned of residue to the extent possible, apply a second application of the disinfectant and maintain wet contact time for the period recommended by the manufacturer. If the surface cannot be left with a residue, rinse and wipe with clear water.

Waste Collection and Disposal

Collect all waste into 6 mil disposal bags and immediately seal. Wipe the bag with the disinfectant solution and place into a second bag. Ensure proper notification and compliance with all applicable local, provincial and federal regulations including the Ontario Environmental Protection Act.

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Clearance Inspection

The project authority or representative should complete a detailed visual inspection of the work area to confirm that an acceptable level of cleanliness has been achieved.

NOTE: Currently there are no accredited analytical procedures able to measure the presence of viable organisms of *Histoplasma capsulatum*.

Post Abatement Corrective Measures

1. Review the findings and recommendations of the project-specific risk assessment. The project-specific risk assessment must consider conservation and/or habitat preservation.
2. The project-specific risk assessment should consider post abatement corrective measures that may be necessary to prevent the return of birds or bats (e.g. block openings into buildings or structure ledges, screen off ventilation intakes or other void openings, install netting/mesh or anti-roosting control systems, etc.).

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Appendix C: Additional Hazards with Abrasive Blasting in Mould Abatement

General guidance related to; protection of occupants, worker training and medical pre-screening respiratory protection, personal protection and hygiene procedures are found in Section of B of this document and shall apply, as applicable, for mould abatement using abrasive blasting,

Abrasive blasting techniques, using media such as soda, dry-ice or sand, are effective methods for the removal of mould growth from contaminated building materials. However, it must be recognized that additional hazards to workers and building occupants might exist when utilizing such methods. The primary hazards and additional precautions recommended for abrasive blasting of mould growth are summarized below:

- The aggressive disturbance of mould growth through blasting will result in much higher airborne mould concentrations than manual removal methods.
- Dry-ice blasting will release significant amounts of carbon dioxide (CO₂) into the work area which may result in an overexposure to carbon dioxide in enclosed work areas.
- The compressed air used to deliver the blasting media will reduce the negative pressure in the containment. Even smaller blasting equipment delivers 2000 cfm or more of additional air into the containment. This air supply will offset the negative pressure created by ventilation equipment.
- The pressure applied by the blasting equipment can transport or drive mould debris through various substrates, building elements, and assemblies (such as floor board seams, roof and wall sheathing seams, service penetrations, expansion joints) to an uncontained or occupied area where it may impact air quality or expose other workers, building occupants or the public.

Based on these hazards, the following precautions, in addition to the measures prescribed in Section B (of this document), should be followed when conducting abrasive blasting operations.

Containment

1. Level 3 precautions should be used for all blasting activities.
2. Ensure the substrate being blasted will not permit the penetration of blast media, dust or mould. If the substrate is likely to permit the transport of blast media, dust or mould then erect appropriate containment.
3. Provide adequate negative pressure ventilation during abrasive blasting. The ventilation must take into consideration the supply of air into the work area by the compressed air delivery of the abrasive media.
4. Continually monitor the workplace atmosphere for oxygen content and carbon dioxide when using dry-ice blasting methods.

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Blast Media and Substrate Dust

5. Silica containing blast media should not be used wherever possible due to the high toxicity of fine silica dust. This is of particular importance in occupied buildings.
6. Ensure that adequate precautions are taken to control the hazards of the dust generated from the surfaces being impacted, which may include lead based and lead containing paints, silica containing substrate or asbestos containing materials.

Personal Protection

7. The minimum respiratory protection for all abrasive blasting activities shall be a full face piece air purifying respirator with P100 filters.
8. Wear supplied air respiratory protection for abrasive blasting with dry ice. Monitor carbon dioxide concentrations on an ongoing basis to determine the requirement for and adequacy of supplied air respiratory protection.
9. The addition of a worker decontamination shower should be considered, but is optional.

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Appendix D: Additional Procedures for Unsanitary Remediation

1. Introduction and Scope

- Buildings can be flooded with Unsanitary Water sources that contain micro-organisms that pose a risk of infection to occupants and abatement workers. Examples of Unsanitary Water include water originating from a sanitary sewer system, and flooding from over-land water or waterways. This appendix presents the precautions necessary for the cleaning of Unsanitary Water contamination.
- Further precautions will be required where there other hazards in addition to Unsanitary Water, such as mould growth, chemicals or asbestos.
- For further information on water damage restoration, refer to Standard and Reference Guide for Professional Water Damage Restoration, IICRC S500, Institute of Inspection Cleaning and Restoration Certification, 3rd Edition, 2006.
- Requirements of Section B (of this document) shall also apply, as applicable, for the remediation of unsanitary water. Section B provides general guidance related to protection of occupants, worker training and medical pre-screening, respiratory protection, personal protection and hygiene practices.

2. Personal Protection

All work with Unsanitary Water restoration requires the following personal protective equipment:

- CSA-approved construction-rated rubber boots.
- Water-resistant disposable coveralls, complete with elasticized hood, taped to gloves and boots.
- Rubber or nitrile work gloves, tape-sealed to the coveralls at the wrists and cuffs. Inspect before re-use. Wear puncture-resistant work gloves on top of the liquid-resistant gloves, where there is a risk of cuts or tears.
- Minimum of a half-face piece Respirator, fitted with a P100 cartridge filter. Odour protection can be provided with combination organic vapour and P100 cartridges.
- Chemical splash goggles, or a full-facepiece respirator fitted with P100 filters, or a Powered Air Purifying Respirator (PAPR) fitted with Type H filters.

3. Isolation

- Turn off HVAC systems where possible and seal over any openings immediately adjacent to the work area.
- Seal off the contaminated areas to prevent access by unauthorized persons. Consider polyethylene sheeting isolation to ceiling height if there a strong odour present or there will be significant demolition work. Negative pressure ventilation as specified for Level 2 Mould Abatement elsewhere in this guideline may be a useful additional precaution.

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Appendix D: Additional Procedures for Unsanitary Remediation

- Install signs warning of a Biological Hazard and restricting access to personnel with suitable protection.

4. Cleaning and Disinfection

- Generally, all porous materials impacted by Unsanitary Water cannot be de-contaminated and must be discarded. Dispose of all drywall, carpets, carpet tiles, soft furniture, etc.
- It might be possible to restore some porous contents impacted by Unsanitary Water (e.g., high-value carpets, clothing, documents) using specialized restoration services. Any decision to restore contaminated porous articles should be approved by the Competent Person. Post-disinfection testing with bacteria swab testing is recommended for these items.
- Package all waste contaminated with Unsanitary Water into sealed water-tight containers, typically a 6 mil polyethylene bag. Wipe the containers with the disinfectant solution. Alternately, wrap items with 6 mil polyethylene sheeting, seal with tape and wipe the exterior of the packaged waste with disinfectant.
- After removal of items and finishes to be discarded, clean all surfaces with a general-purpose cleanser prior to application of a disinfectant. All soiling must be removed before disinfection.
- Apply a Health Canada approved disinfectant to all surfaces impacted with Unsanitary Water. If the product is sold as a concentrate, mix according to the manufacturer's recommendations and use within the time given by the manufacturer. Observe the wet contact time specified in the Health Canada approval (typically 5 – 10 minutes), re-applying as necessary.
- If indicated by the manufacturer, rinse the disinfected surfaces with clean potable water.
- Ensure all mould-susceptible surfaces are dry within 24 hours. Ensure all other surfaces are adequately dry before the installation of mould-susceptible surfaces that could be impacted by excess trapped moisture.

5. Post-Disinfection Testing

- Collect surface samples to test for residual viable bacteria, by swabbing 100 square centimetre areas of typical disinfected surfaces or articles.
- Analyse the swab samples for *E. coli* and possibly other Unsanitary Water indicator bacteria.
- The standard of acceptance for *E. coli* on disinfected surfaces, is no detectable Colony Forming Units per 100 square centimetre area.

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Appendix E: Definitions

Term	Definition
Abatement	The process of returning a building or part thereof, from a condition of Biohazard, to background concentrations of biological agents and products, typical of buildings not affected by Mould contamination.
Biohazard	The presence of (a) biologically derived aerosols, gases, or vapours of a kind and concentration likely to cause disease or predispose persons to adverse health effects, or (b) indoor biological growth and remnants of growth that may become airborne and to which people may be exposed.
Canister or Cartridge	A container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.
Clearance Tests	Environmental tests (e.g., air samples, tape lifts, swabs) taken after Mould Abatement has been completed as a Quality Assurance measure.
Competent Person or Supervisor	A person who is qualified because of knowledge, training and experience to organize the performance of Mould Abatement, is familiar with Mould Abatement procedures, and has knowledge of the hazards of Mould and other dangers in the Abatement work area.
Contaminated Work	The portion of the Abatement project during which active disturbance, handling or cleanup of contaminated materials is occurring.
<i>Cryptococcus neoformans</i>	A pathogenic yeast growing in accumulated bird (usually pigeon) or bat Guano and posing a risk of cryptococcosis infections in heavily exposed or immunocompromised individuals.
Disinfectant	Substance used to reduce the number of micro-organisms such as Moulds, bacteria or viruses to below the level necessary to cause infection. Some common Disinfectants, include sodium hypochlorite, quaternary ammonium compounds, and hydrogen peroxide.
DIN	Drug Identification Number. Registration number given by Health Canada for approval of disinfectants. Specifies the organisms against which the disinfectant is effective, and requirements for mixing, storage, application, and rinsing, if required.
Designated Substance	Hazardous materials (asbestos, lead, silica, mercury and others) designated by the Ontario Ministry of Labour for specific regulation under the Occupational Health and Safety Act. Property owners must notify contractors bidding on projects of the presence of Designated Substances. In addition to a regulation on asbestos, the Ontario Ministry of Labour has issued guidelines for the potential exposure from silica, lead, mercury and isocyanates on construction projects.
Dust Suppression	Measures taken to reduce the release of spores and other Mould-derived particulate matter during Mould Abatement.
Filtering Facepiece	Particulate-filtering Respirator where the facepiece is also the filter.
Fit-test	A qualitative or quantitative method to evaluate the fit of a specific make, model and size of Respirator on an individual.
Guano	Bird or bat dung, considered a risk for infection by Moulds or other micro-organisms.
HEPA Filtered Exhaust Fan	Portable exhaust fan in sealed cabinet equipped with HEPA filtration used to exhaust filtered air out of an enclosed Mould Abatement work area for the purpose of establishing and maintaining a Negative Pressure in the Mould Abatement work area with respect to surrounding areas, and also to provide general ventilation of the Abatement area.

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Health and Safety Professional	An individual qualified by knowledge, skills, education, training and experience to perform assessments of Mould contamination, collect and interpret environmental tests, develop recommendations for Abatement work and provide inspection and Quality Assurance services.
HEPA	High Efficiency Particulate Air filter capable of trapping and retaining particles greater than or equal to 0.3 micrometers in diameter, at a minimum efficiency of 99.97%
<i>Histoplasma capsulatum</i>	A fungus frequently found growing in deposits of bird and bat Guano, and a risk for human infections during remediation work, renovation and demolition.
HVAC	Heating, ventilating and air conditioning (equipment).
Mould	Normally refers to fungi with filamentous growth form, often giving rise to “fuzzy”, cottony, wooly or powdery textured colonies. Moulds produce spores that are poorly visible or not visible at all to the naked eye and that in many species are specialized to become airborne.
Microbial	Referring to any of Mould, bacteria, viruses or other micro-organisms.
MSDS	Material Safety Data Sheet, required by Workplace Hazardous Materials Information System (WHMIS) legislation, and giving information on hazardous materials, including properties, hazards, first-aid, emergency response, and personal protection.
N95	A Respirator particulate filter, 95% efficient at stopping a 0.3 micrometer aerosol, and not resistant to oil, a classification of particulate filters set by NIOSH.
Negative Pressure	A reduced pressure established within a Mould Abatement enclosure by extracting air directly from Abatement area, and discharging this air outside the work area. The discharged air must be HEPA filtered, the exhaust unit should be leak-checked and preferably the air is discharged outside the building.
NIOSH	National Institute for Occupational Safety and Health, part of the U.S. Centers for Disease Control and Prevention.
100 Series Filter	Any Respirator particulate filter, 99.97% efficient at stopping a 0.3 micrometer aerosol. A classification of particulate filters set by NIOSH.
Polyethylene Sheeting	Polyethylene Sheeting or rip-proof Polyethylene Sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required providing a continuous membrane to protect underlying surfaces from damage, and to prevent escape of airborne contamination through sheeting into occupied areas.
Porous	Permeable to Mould growth, allowing growth to extend significantly below the immediate surface.
Project Authority	Individual who has overall management responsibility for the project.
P100	A Respirator particulate filter, 99.97% efficient at stopping a 0.3 micrometer aerosol, and resistant to oil droplets, a classification of particulate filters set by NIOSH.
Quality Assurance	Measures of inspection, testing and documentation to promote confidence that the Abatement process will meet the desired goals.
Respirator	A device to protect the user from inhaling a hazardous atmosphere.
Susceptible Occupants	Persons with elevated risks of reacting to Mould exposure, usually due to allergic pre-disposition or compromised immune state. Examples include but are not limited to infants (less than 12 months old), persons recovering from recent surgery, or

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	people with immune suppression, asthma, severe allergies, sinusitis or other chronic inflammatory lung diseases.
Unsanitary Water	Water containing the known or presumed presence of harmful micro-organism such as <i>E. coli</i> , viruses or bacteria. Examples of Unsanitary Water include water originating from a sanitary sewer system, or flooding from over-land water or waterways.
Waste Decontamination Facility	A series of two rooms (Double-bagging and Transfer) constructed in such a way as to allow waste and equipment to enter and leave a Mould Abatement area without spreading contaminants beyond the Abatement area.
Worker Decontamination Facility	A series to two rooms (Clean and Dirty) constructed in such a way as to allow persons to enter and leave a Mould Abatement area without spreading the contaminants beyond the Abatement area.

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