

Response to Water Intrusion and Mold/Microbial Growth

I. Rationale

Sufficient scientific evidence exists to conclude that there is an association between the presence of mold or other agents found in damp indoor environments and various health symptoms. Health issues associated with the presence of mold include: upper respiratory tract symptoms, asthma symptoms in sensitized asthmatic persons and hypersensitivity pneumonitis in susceptible persons. (Hypersensitivity pneumonitis is an inflammation of the lung, usually of the very small airways, caused by the body's immune reaction to repeated inhalation of organic material.)

Proper containment has been shown to prevent the spread of microbial contamination to non-contaminated parts of a building.

II. Scope

This procedure applies to buildings owned or operated by the University. For properties occupied by University staff, faculty or students and managed by outside parties, response to and remediation of microbial contamination is the responsibility of the external contracted entity.

Environmental Health and Safety (EHS) staff will respond to health and safety concerns expressed by University employees who occupy buildings owned or managed by outside parties.

III. Responsibilities

Building Services: Provides routine cleaning and housekeeping as well as prompt emergency clean-up services for floods and other water intrusion events, using appropriate techniques and personal protective equipment. For water events, Building Services is equipped with wet/dry vacuum cleaners, submersible pumps, water extractors, fans and industrial scale dehumidifiers.

Grounds and Buildings Maintenance (GBM)

Manages process for assessment, response, clean-up and recovery from water intrusion and mold contamination; maintains the work order process to track reports of water intrusion and/or mold contamination.

Director, Grounds and Building Maintenance: Serves as Project Manager, or if unavailable, appoints project manager, for water intrusion events and remediation of mold contamination projects; coordinates response by GBM staff and external service providers; communicates with clients through all phases of assessment, remediation and recovery, except for tenants in properties managed by Housing. Notifies EHS of mold/microbial contamination.

Environmental Compliance Manager: Acts as liaison with external service providers for mold contamination projects that require response and remediation; creates scope of work

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for providers; monitors compliance with work proposal. Participates in post-remedial verification for work conducted by an external provider.

Environmental Health and Safety

Responds to requests or notifications of microbial growth; notifies Director of GBM or designee, of microbial growth that requires response beyond cleaning by Building Services staff. Participates in assessment and investigation of reported mold contamination and development of remediation plan; determines if microbial air sampling is warranted and recommends outside consultants to collect and analyze the samples; participates in post-remedial verification of areas affected by microbial contamination prior to reoccupation. Documents microbial contamination and water intrusion events, including level of response and outcome.

Housing and Real Estate Services (HRES)

Participates in initial response and assessment of mold contamination calls, with EHS, that originate from undergraduate, graduate and staff/faculty housing residents; notifies Director of Grounds and Building Maintenance when mold contamination requires remediation efforts beyond those of the Building Services janitors or resident(s) of the affected property. Communicates with affected tenants on the scope and status of remediation efforts; arranges for temporary housing, if necessary.

Office of Design and Construction (ODC)

Notifies EHS of suspected or probable mold contamination; coordinates and manages the investigation and remediation of mold contamination for ODC-controlled renovation or construction projects. Notifies the Environmental Compliance Manager if external service providers are needed for water intrusion and/or mold remediation.

IV. Key Definitions

Approved Contractor: a contractor who has been approved by the EHS and GBM.

Post Remedial Verification: a post remediation inspection performed by EHS or Environmental Compliance Manager. The scope of the inspection may include visual surveys or sampling as deemed appropriate. The purpose of the inspection is to verify that the remediation has been properly executed and that the area has been restored to what would be considered a normal indoor environment fungal ecology.

V. Response to Water Intrusion Events

A rapid response to water intrusion and thorough cleaning, drying and/or removal of water-damaged materials, within 24-48 hours, will prevent or limit mold growth.

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Notifications

Facilities Customer Service must be notified of leaks or floods. Customer Service will notify:

- Building Services
- appropriate GBM shop
- Public Safety
 - Notifies the home department(s) affected by the water intrusion event. The following departments will be requested to respond on-site as soon as possible:
 - Libraries
 - Museum
 - McCosh Health Services
 - Laboratory Animal Resources facilities
 - Laboratories
- HRES (Contact only if event has affected undergraduate, graduate and faculty and staff housing)
- EHS
 - EHS is not a first responder to floods, but should be contacted if water intrusion affects laboratory or animal facility areas and if water source is contaminated (sewage, flood or storm water).

A. Response to all reports of water intrusion:

1. Director of Grounds and Building Maintenance, or designee:
 - acts as project manager, coordinating the University's response.
 - is responsible for communicating with the supervisor, manager or department head of area affected by the event of the ongoing status of response and recovery efforts.
 - with EHS, determines if external contractors are required for response to a water intrusion event. External contractors must be approved by GBM and EHS. Contractor's work practices must be consistent with nationally accepted standards such as ANSI/ IICRC S500 Standard and Reference Guide for Professional Water Damage Restoration.
 - notifies Public Safety and requests that they initiate an incident report, if there is a potential for property damage. Public Safety will notify Risk Management.
 - requests the manager, supervisor or department head(s) in areas affected by the water to generate a list of all water-damaged equipment and supplies.
 - reports all water intrusion and floods to EHS.

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2. If the potential for electrical shock exists, first responders request GBM electricians to turn off power at the main breaker or fuse on the service panel prior to entering. If unsure, the first responder is responsible for asking an electrician to respond and investigate prior to entering area. GBM electricians must inspect a property prior to restoration of electrical power.
3. If building material has been damaged and the potential exists for the disturbance of asbestos or (buildings built prior to 1980) lead, contact EHS or Environmental Compliance Manager prior to initiating cleanup activities that disturb building materials.
4. If event has resulted in release of hazardous chemicals or radioactive materials in a laboratory, contact EHS prior to initiation of clean-up.
5. Response to floods or water intrusion events that result in release of hazardous materials outside of a building must be reported to the Environmental Compliance Manager.
6. Every effort will be made to clean or restore items when possible. However, items that are contaminated with sewage or flood water and cannot be cleaned and disinfected or could become a source of mold growth should generally be disposed of in the regular trash. It is the responsibility of the lead representative of Housing or EHS to make recommendations to owners regarding final disposition of items. If owner refuses to dispose of an item that could present a health hazard, EHS shall conduct a risk assessment and make final recommendations.

B. Response to Unsanitary and Contaminated Water (Sewage, Storm Water and Flood Water)

If response is within 24 hours:

1. The decision to use Princeton University staff or external consultants with expertise in cleanup of areas contaminated with sewage will be made by the Director of GBM or designee and representatives from EHS.
2. Employees/residents may not re-occupy until clearance is issued by EHS.
3. Responding University personnel performing the cleanup must wear impermeable gloves, eye and face protection (safety glasses and face mask or safety glasses with face shield, slip-resistant shoe coverings and other garments such as fluid impervious disposable suits to minimize contact with liquid).
4. After extraction of water with wet vacuum, non-porous items such as tile flooring, tile walls, hard plastic, finished wood, epoxy-coated flooring and walls should be cleaned with a detergent and then disinfected using an EPA-registered tuberculocidal agent or a

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- registered germicide with specific label claims for HIV or HBV. A freshly prepared dilute household bleach solution (1:100) or ¼ to ½ cup bleach per gallon of water can also be used. Bleach can be used only if corrosion/discoloration of surfaces is not a concern and the surfaces have been thoroughly cleaned.
5. In all cases where chemical disinfectants are used, follow product label instructions for appropriate contact time.
 6. All items on the floor must be lifted to allow for thorough cleaning of hard surfaces or removal of porous materials, such as carpet.
 7. Semi-porous items, such as unfinished wood and concrete may be cleaned if they are structurally sound and if the surface of the material allows for thorough removal of contaminants, cleaning and disinfection. Follow the steps for cleaning and disinfecting non-porous items. In some cases, wood flooring with seams may not be able to be adequately cleaned and disinfected and will need to be removed.
 8. Porous material that has come in contact with wastewater, such as drywall, carpeting, insulation, upholstered furniture and ceiling tiles must be removed and replaced.
 9. Small areas of carpeting contaminated with sewage may be extracted, cleaned and then disinfected via commercial steam cleaning. EHS makes the decision to clean or remove/dispose of carpet.
 10. Papers and books should be bagged and disposed of, unless they have special value. If papers and books could have institutional value, arrangements should be made with an external restoration firm. EHS can provide contact information.
 11. Items designated for disposal should be placed into the regular trash.
 12. Do not use fans until contaminated water and porous items have been removed and porous and semi-porous items have been disinfected.
 13. Equipment used in response to contaminated or sewage water must be designated as such or thoroughly cleaned and disinfected prior to use in a clean environment. Equipment that cannot be disinfected must be discarded.

If response occurs 24 hours or more after release:

1. Clean up of unsanitary and sewage water 24 hours or later after a release must be performed under controlled conditions and by trained staff wearing appropriate respiratory protection and using equipment to physically contain the area and create negative pressure enclosures. Due to the need for respiratory protection and containment equipment, this type of response should be performed by an external company that has been approved by EHS and Facilities.

C. Response to Clean Water, including Potable Water Source and/or Steam:

If response is within 48 hours:

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1. Carpet that has come in contact with clean water, with no previous water damage, should be thoroughly extracted and cleaned.
 - a. All materials, including furniture and file cabinets must be removed.
 - b. Extractors should be used to remove as much water as possible.
 - c. Shampoo the carpet with a dilute surfactant.
 - d. Utilize fans and dehumidifiers to assist with drying. Carpet should be dried within 12-24 hours of treatment.
 - e. Biocides available for use on carpets can cause adverse reactions in a small portion of the population and are generally not recommended. If disinfection is required, carpet may need to be steam cleaned.
2. Ceiling tiles that are water-damaged should be replaced.
3. Drywall:
 - a. Remove cove base or wall covering as soon as possible to assist with drying.
 - b. Drill holes at base of wall.
 - c. Place fans and dehumidifiers in the area.
 - d. After 48 hours of drying time, use a moisture meter to check the drywall. If material is not dry, cut the sheetrock at least 12 inches above the moisture mark. Remove and replace water-damaged drywall and insulation.
4. Plaster
 - a. Chalky substances can form on wet plaster; this substance should be removed and then surface allowed drying. After drying, the surface can be painted with an antimicrobial paint. It may be necessary to remove plaster to determine if wooden lath, if present, is wet or affected by microbial growth.
 - b. If plaster or lathe wall develops a strong odor, even without visible mold growth, replace the water-damaged plaster.
 - c. A moisture meter should be used to check the plaster. Material should be monitored for mold growth.
5. Upholstered Furniture
 - a. Extract as much water as possible.
 - b. Use fans and dehumidifiers.
 - c. Monitor for fungal growth/odor
6. Laminate furniture
 - a. If intact, clean laminate. If substantially delaminated, item should be disposed of; pressed wood under the laminate absorbs water and is difficult to dry.

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7. Files/Papers

- a. Wet papers, files and books that are not essential should be disposed of. Essential papers and files should be placed in a location to be dried. When dry, photocopy the papers and discard originals. Services from an external restoration firm may be required for handling of moisture-damaged items that cannot be discarded.

If response is not within 48 hours:

1. Visible fungal growth can occur within a few days of wetting if nutrients are available. Common construction materials often contain mold spores and if wet, germination can occur in less than 5 days.
2. If response occurs after 48 hours, the area will be inspected by the Director of GBM, a representative from EHS and a representative from Housing, if appropriate. A remediation plan will be developed by the team.

D. Response to Water Damage from Rain Water (Roof Leaks), Ground Water, Dishwashers, Washing Machines

1. Proceed as outlined in section entitled: "Response to Clean Water, including Potable Water Source and/or Steam". For non-porous surfaces, use disinfectant solution for final cleaning.

VI. Response to Mold

Notifications

Notifications made by employees, faculty or students regarding mold or microbial growth or adverse health symptoms that may be attributed to mold should be distributed to the following departments:

1. Director, GBM
2. HRES representative (for student, faculty and staff housing properties)
3. EHS should be notified of all calls

Initial Response:

1. For student, faculty and staff housing properties, an initial survey of the area will be performed by a representative of EHS and HRES. If assistance is needed from GBM shop staff, the Director GBM, or designee will be notified.

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2. For all other properties, the initial survey of the area will be performed by a representative of EHS and the Director, GBM, or designee.
3. If property damage or remediation by external party may be necessary, GBM should notify Risk Management.

General Guidelines

1. Remediation of mold cannot begin until moisture source has been identified and corrected. For those situations where finding and stopping the moisture source requires extensive modifications, short-term solutions should be provided and may include dehumidification, ventilation, heat, airflow management and interim drainage.
2. Generally, non-porous and semi-porous materials that are structurally sound can be cleaned and reused.
3. Microbial growth in residential bathrooms should be cleaned and disinfected following standard Building Services work practices and should not be reported to EHS or GBM, unless more extensive contamination is suspected.
4. Porous materials, except for those that are minimally contaminated by mold, of great value or those that can be laundered, should be discarded.
5. The use of gaseous, vapor phase or aerosolized biocides or odor suppressants are not permitted, except if approved by OEHS.
6. Microbial sampling will be performed only if approved by OEHS.
7. Mold contamination of areas less than 10 ft² can be cleaned by trained University staff.
 - a. Work may be performed by trained GBM staff, wearing gloves and eye protection.
 - b. Area must be unoccupied while material is removed.
 - c. Contaminated materials should be placed in bags that are sealed and discarded into the regular trash.

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Porous Items	
Textiles, including clothing and fabric	<p>Usually can be laundered or dry-cleaned in accordance with label instructions. The goal of laundering and dry cleaning is removal of the contaminant and odor, not killing the organism.</p> <p>Disposal is recommended for heavy contamination as it can damage fibers and result in permanent staining. For items of high value, clean in accordance with label instructions or consult with a restoration specialist.</p>
Porous furnishings, upholstery, area rugs, loose carpet, wicker	<p>Start with HEPA vacuuming and then professionally clean using an acceptable extraction method. Material should be dried rapidly after wet cleaning.</p> <p>Pillows, mattresses and leather products are typically not responsive to cleaning methods and disposal is recommended.</p>
Paper goods; books, documents, manuscripts, scrapbooks, photographs	<p>HEPA vacuum items in a ventilated enclosure. Remediation at this level should be performed by an external company. Items that are heavily contaminated should be disposed of unless valuable or irreplaceable, in which case an external restoration company will be consulted.</p>
Semi-porous items	
Unfinished Wood	<p>HEPA vacuuming is recommended. Use of liquids can stain or discolor the wood. Applying coatings to seal the surface may be appropriate in some situations.</p> <p>Heavy microbial contamination may damage unfinished wood.</p>
Nonporous items	
Finished wood, glass, metal, plastic, electronics	<p>Recommend detergent washing and rinsing or HEPA vacuuming followed by damp wiping with a cleaning/detergent agent. Some items such as metal that are heavily contaminated may not be restorable due to corrosion.</p> <p>The use of a disinfectant or biocide rather than thorough vacuuming and cleaning will not remove microbial contamination and should be used only if recommended by EHS.</p>

4. For mold contamination that affects an area larger than 10ft², a building's ventilation system a patient care area of McCosh Health Center or a child care area at 171 Broadmead:
 - a. remediation will take place as recommended by:
 - i. EHS representative
 - ii. Director, GBM or designee

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- iii. HRES representative (if appropriate)
 - b. Remediation will be performed by an approved contractor.
 - c. Approved contractors must submit a work plan for review and approval by the Environmental Compliance Manager and EHS. Plan must be submitted at least two working days prior to start of project except if need for remediation is urgent.
 - d. Environmental Compliance Manager is responsible for oversight of external service providers conducting mold remediation and shall perform periodic inspections to ensure compliance with the work plan.
5. Due to lack of agreed-upon standards for collection and interpretation of results, air and surface sampling for microbiologic contamination will be performed only if recommended by EHS.
 6. Prior to re-occupancy of areas affected by mold contamination, a post-remedial verification report shall be issued by the external service provider, if appropriate, or EHS, if work was conducted by University staff. The Environmental Compliance Manager shall participate in the post-remediation verification of all work conducted by external service providers.

Training

1. GBM shall receive training provided by EHS. Training content will include:
 - a. Human Health Effects Associated with Exposure to Microbial Contamination caused by Damp Indoor Spaces
 - b. Cleaning Methods
 - c. Protection of non-contaminated materials
 - d. Personal Protective Equipment

References:

Institute of Medicine of the National Academies. 2004. Damp Indoor Spaces and Health. Washington, D.C: The National Academies Press

Institute of Inspection, Cleaning and Restoration. 2005. IICRCS500; Standard and Reference Guide for Professional Mold Remediation.

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New York City Department of Health and Mental Hygiene. 2008. Guidelines on Assessment and Remediation of Fungi in Indoor Environments.

U.S. EPA. 2001. Mold Remediation in Schools and Commercial Buildings

http://www.epa.gov/mold/mold_remediation.html