



Mold Prevention and Remediation Program

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INTRODUCTION

Objective

In accordance with guidance provided by the US Environmental Protection Agency (EPA), Centers for Disease Control and Prevention (CDC), and Federal Emergency Management Agency (FEMA), BGSU has developed this program to ensure there is no immediate threat to the health and well-being of staff, students, faculty, and visitors present in all indoor areas on campus. This is accomplished through utilization of prevention techniques to minimize the potential for mold growth and to identify, control and remediate areas containing mold growth.

Applicability

The procedures contained within this program apply to all maintenance and trades employees who are tasked with mold prevention efforts and response to water damage, high humidity, condensation, and potential mold growth concerns.

HAZARD ASSESSMENT

Visual Inspection

The presence of mold, water damage, or musty odors must be addressed immediately, beginning with a visual inspection. Ventilation systems must be visually checked for damp filters and other damp conditions where applicable. Ceiling tiles, walls, cardboard and paper must also be visually inspected for mold growth. When visible mold growth is present, the remediation process must begin.

Sampling

Mold is present in the indoor and outdoor air and on surfaces all around us each day. Mold requires moisture and a food source to colonize. The university does not routinely conduct sampling for mold and instead follows federal agency guidance.

Centers for Disease Control (CDC): "Standards for judging what is an acceptable, tolerable, or normal quantity of mold have not been established" and "You do not need to know the type of mold growing in your home, and CDC does not recommend or perform routine sampling for molds. No matter what type of mold is present, you should remove it. Since the effect of mold on people can vary greatly, either because of the amount or type of mold, you cannot rely on sampling and culturing to know your health risk."

U.S. Environmental Protection Agency (EPA): "In most cases, if visible mold growth is present, sampling is unnecessary. Since no EPA or other federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with federal mold standards."

WATER DAMAGE CLEAN UP AND MOLD PREVENTION

Although specific regulations have not been developed for Mold Prevention and Remediation in the workplace, Environmental Health and Safety (EHS) considers recommendations from the American Conference of Governmental Industrial Hygienists (ACGIH), American Industrial Hygiene Association (AIHA), Environmental Protection Agency (EPA), and the New York City Department of Health among other cognizant authorities to be best practice.

General Prevention

The key to mold growth prevention is eliminating the moisture source and cleanup of materials within 24-48 hours. The following must be followed to prevent mold growth:

- Fix leaky plumbing and other leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilation, and air conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside where possible.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled including replacement of wet filters.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide drainage and slope the ground away from the foundation.
- Clean with non-phosphate detergents (any phosphate residue is food for mold).
- Do not install vinyl wallpaper on walls. Vinyl wallpaper inhibits drying.
- When replacing drywall, leave a one-inch gap from the floor to promote further drying of the wall cavity and to prevent wicking in the event of future water damage.

Prevention Following Water Damage

The following guidelines are for damage caused by clean water (unless otherwise noted). If there is suspicion that the water source is contaminated with sewage, or chemical or biological pollutants, then personal protective equipment (PPE) and containment are required by the Occupational Safety and Health Administration (OSHA). An experienced professional must be consulted when remediating contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

Table 1 presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Table 1, or materials have been wet for more than 48 hours, refer to Table 2 for guidance on remediation.

Table 1: Water Damage - Cleanup and Mold Prevention	
Water-Damaged Material	Actions
Books and papers	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Any carpet that has been contaminated over a large area with sewage backup must be discarded and the entire area disinfected with a detergent solution. (see notes below) • Small areas contaminated with sewage backup and areas flooded with water that does not contain sewage backup can be treated as follows. <ul style="list-style-type: none"> ○ Remove all materials from the carpet and remove water with water extraction vacuum. Shampoo the carpet with a dilute surfactant or have the carpet steam cleaned. ○ Reduce ambient humidity levels with dehumidifier and accelerate drying process with fans. ○ Never reuse flooded carpet padding.
Ceiling tiles	<ul style="list-style-type: none"> • Discard and replace.
Cellulose insulation	<ul style="list-style-type: none"> • Discard and replace.
Concrete or cinder block surfaces	<ul style="list-style-type: none"> • Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.

Electrical	<ul style="list-style-type: none"> • Consider all wet wiring, light fixtures, electrical outlets to be a shock hazard until it has been checked by an electrician. Until then, turn the power off in the area of the water damage. (Note: only people knowledgeable about electrical shock hazards must shut off the power.) • All electrical circuit breakers, GFIs and fuses that have become wet need replacing. Switches and outlets that were wet can be cleaned and reused but, when in doubt, replace them. • All electrical motors, light fixtures, etc. that were wet need to be opened, cleaned and air-dried by a qualified person. Before being put back in service, inspect the motors, light fixtures, etc. to ensure no visible moisture/water droplets are apparent.
Fiberglass insulation	<ul style="list-style-type: none"> • Discard and replace.
Furniture (Laminate)	<ul style="list-style-type: none"> • If laminate is intact, the furniture must be air dried and cleaned with a detergent solution. • If laminate is not intact, delaminate the furniture and dispose of furniture. The pressed wood under the laminate absorbs water readily and is hard to dry.
Furniture (Particle Board)	<ul style="list-style-type: none"> • Discard unless the furniture has become wet due to a steam line break. The furniture can then be dried and monitored for fungal growth.
Furniture (Upholstered)	<ul style="list-style-type: none"> • Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture. • Dispose of furniture if it has been wet due to floods, roof leaks, or sewage back up and ground water infiltration.
Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)	<ul style="list-style-type: none"> • Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. Turn heat up and use dehumidifiers to dry the area. • Check to make sure underflooring is dry; dry underflooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	<ul style="list-style-type: none"> • Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Wallboard (Drywall and gypsum board)	<ul style="list-style-type: none"> • Cut away wallboard and remove all wet and damp insulation immediately, even if the wallboard appears to be dry. • Ventilate the wall cavity, if possible.

Window drapes	<ul style="list-style-type: none"> • Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	<ul style="list-style-type: none"> • Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Test moisture content of studs and sheathing (using a moisture detector) before replacing insulation. Wood must drop below 20% moisture content by weight before you close the wall. • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling must be pried away from wall for drying.
<ul style="list-style-type: none"> ✓ If mold growth has occurred or materials have been wet for more than 48 hours, consult Mold Remediation 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. ✓ If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist. 	

REMEDIATION

The following information provides guidelines for effective mold growth remediation based on size of area and materials impacted. Further guidance is provided on whether BGSU personnel can perform the remediation or if an external contractor will need to be utilized.

Level 1: Small Isolated Areas (10 sq. ft or less)

BGSU staff may conduct remediation, using wet methods, under the following conditions:

- Mold/fungal growth remediation would **not** require destructive cleaning procedures and/or;
- Mold/fungal growth to be remediated is **not** located in an HVAC system.

Mold Prevention and Remediation training will cover personal protection, potential health hazards, and proper clean up methods. Gloves and goggles are required during remediation. An N95 filtering face piece may be used on a voluntary basis. The area must be unoccupied during cleaning. Vacating people in the adjacent work area is not necessary.

Note: If destructive removal or destructive cleaning procedures are required to remediate the mold at this level, please contact EHS to determine the best course of action.

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

Table 2: Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft²)			
Books and papers	3	Minimum 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		

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 a detergent solution (except wood —use wood floor cleaner); scrub as needed.

Method 3: 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.

Misting of a detergent solution on the affected area is recommended for dust suppression. The detergent solution must remain on the affected area for ten minutes prior to removal. Any impacted flooring near the area that was remediated must be mopped or shampooed with a detergent solution. All areas must be left dry and visibly free from contamination and debris.

Level 2: Mid-Sized Isolated Areas (10 – 100 sq. ft.)

Outside contractors trained in mold remediation will perform the work at this level. The impacted area and areas directly adjacent to the impacted area must be unoccupied during remediation. Further vacating those near the work area is recommended in the presence of people with reduced immune systems, recent surgery patients, infants, people with chronic inflammatory lung diseases or people with respiratory health concerns. Please contact EHS prior to remediation with as much notice as possible. EHS will communicate with building occupants regarding the work to be completed and will address any concerns.

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

Table 2: Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
MEDIUM - Total Surface Area Affected Between 10 and 100 (ft²)			
Books and papers	3	Limited or Full Limited: Gloves, N95 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.	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 air vents within containment 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		

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: 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.

Contractors must HEPA vacuum and mop with a detergent solution the containment area after completion of remediation. All areas must be left dry and visibly free from contamination and debris.

Level 3: Large Areas (100 + sq. ft.)

Outside contractors trained in mold remediation will perform the work at this level. The impacted area and areas directly adjacent to the impacted area must be unoccupied during remediation. Further vacating those near the work area is recommended in the presence of people with reduced immune systems, recent surgery patients, infants, people with chronic inflammatory lung diseases or people with respiratory health concerns. Please contact EHS prior to remediation with as much notice as possible. EHS will communicate with building occupants regarding the work to be completed and will address any concerns.

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

Table 2: Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
LARGE - Total Surface Area Affected Greater Than 100 (ft²) or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full: Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter.	Full: Full: Use two layers of fire-resistant 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.
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		

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: 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.

Contractors must HEPA vacuum and mop with a detergent solution the containment area after completion of remediation. All areas must be left dry and visibly free from contamination and debris.

Level 4: Contamination of the Heating Ventilation and Air Conditioning System

Although a rarer occurrence, if contamination is found in the HVAC system, please contact Environmental Health and Safety to determine the proper course of action. Appendix A provides guidelines only for what the remediation of this nature may entail.

COMMUNICATION

Communicating with building occupants before mold remediation occurs at any level is important to ensure all concerns are addressed ahead of the work. The initial notification should include a description of the remedial measures to be taken for their protection and a timetable for completion. This communication will be coordinated by EHS.

REFERENCES

1. Macher, Sc.D., M/P.H., Editor, *Bioaerosols Assessment and Control*, American Conference of Industrial Hygienists. Cincinnati, Ohio, 1999.
2. *Mold Remediation in Schools and Commercial Buildings*, U.S. EPA. April 2001. <http://www.epa.gov/iaq/molds/images/moldremediation.pdf>
3. LSU Ag Center Research and Extension. <http://www.lsuagcenter.com>
4. University of Minnesota. <http://www.dehs.umn.edu/iaq/flood.html>
5. *Guidelines on Assessment and Remediation of Fungi in Indoor Environments*, New York City Department of Health, Bureau of Environmental and Occupational Disease Epidemiology. April 2000. <http://www.nyc.gov/html/doh/html/epi/moldrpt1.shtml>

APPENDIX A: REMEDIATION OF HVAC SYSTEMS

Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Department of Health, Bureau of Environmental and Occupational Disease Epidemiology

A Small Isolated Area of Contamination (<10 square feet)

- a. Remediation can be conducted by regular building maintenance staff. Such persons must receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication standard (29 CFR 1910.1200).
- b. Respiratory protection (e.g., N95 disposable respirator), in accordance with the OSHA Respiratory Protection standard (29 CFR 1910.134), is recommended. Gloves and eye protection must be worn.
- c. The HVAC system must be shut down prior to any remedial activities.
- d. The work area must be covered with a plastic sheet(s) and sealed with tape before remediation, to contain dust/debris.
- e. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.
- f. Growth supporting materials that are contaminated, such as paper on the insulation of interior lined ducts and filters, must be removed. Other contaminated materials that cannot be cleaned must be removed in sealed plastic bags. There are no special requirements for the disposal of moldy materials.
- g. The work area and areas immediately surrounding the work area must be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.
- h. All areas must be left dry and visibly free from contamination and debris.
- i. A variety of biocides are recommended by HVAC manufacturers for use with HVAC components, such as, cooling coils and condensation pans. HVAC manufacturers must be consulted for the products they recommend for use in their systems.

Areas of Contamination >10 square feet

A health and safety professional with experience performing microbial investigations must be consulted prior to remediation activities to provide oversight for remediation. The following procedures are recommended:

- a. Personnel trained in the handling of hazardous materials equipped with:
 - i. Respiratory protection (e.g., N95 disposable respirator), in accordance with the OSHA Respiratory Protection standard (29 CFR 1910.134), is recommended.
 - ii. Gloves and eye protection
 - iii. Full-face respirators with HEPA cartridges and disposable protective clothing covering both head and shoes must be worn if contamination is greater than 30 square feet.
- b. The HVAC system must be shut down prior to any remedial activities.
- c. Containment of the affected area:
 - i. Complete isolation of work area from the other areas of the HVAC system using plastic sheeting sealed with duct tape.
 - ii. The use of an exhaust fan with a HEPA filter to generate negative pressurization.
 - iii. Airlocks and decontamination room if contamination is greater than 30 square feet.
- d. Growth supporting materials that are contaminated, such as the paper on the insulation of interior lined ducts and filters, must be removed. Other contaminated materials that cannot be cleaned must be removed in sealed plastic bags. When a decontamination chamber is present, the outside of the bags must be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. There are no special requirements for the disposal of moldy materials.
- e. The contained area and decontamination room must be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.
- f. All areas must be left dry and visibly free from contamination and debris.

- g. Air monitoring must be conducted prior to re-occupancy with the HVAC system in operation to determine if the area(s) served by the system are fit to reoccupy.
- h. A variety of biocides are recommended by HVAC manufacturers for use with HVAC components, such as, cooling coils and condensation pans. HVAC manufacturers must be consulted for the products they recommend for use in their systems.