

# UNIVERSITY OF TOLEDO

SUBJECT: LIQUID DAMAGE/MOLD PREVENTION AND REMEDIATION Procedure No: HM-08-035

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## PROCEDURE STATEMENT

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), the University has established procedures to limit the impact of liquid damage and set guidelines to ensure that there is no immediate threat to the health and well-being of staff, students, faculty, patients and visitors present in all indoor areas on campus.

## PURPOSE OF PROCEDURE

The purpose of this procedure is to detail appropriate liquid damage response procedures and mold prevention/response procedures for indoor areas at the University of Toledo, to identify, control and remediate areas containing mold growth, and to protect all employees, faculty, students, visitors, and patients.

## PROCEDURE

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

**These following guidelines are for damage caused by clean water (unless otherwise noted). If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then Personal Protective Equipment and containment are required by OSHA.** An experienced professional must be consulted when remediating contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

### Liquid Damage Response and Mold 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:

- Immediately report all building leaks to facilities and construction.
- If possible and safe, limit the damage caused by the leak by using absorbent materials, containing the spill in a bucket and removing or covering sensitive equipment or materials.
- Fix leaky plumbing and 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 all 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.
- Remove water damaged drywall within 24-48 hours. When replacing drywall leave a one-inch gap to promote drying and prevent wicking in the event of water damage.

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: Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth**  
Source: *Mold Remediation in Schools and Commercial Buildings*, U.S. EPA. September 2008.

WATER-DAMAGED MATERIAL	ACTIONS
<b>Books and papers</b>	<ul style="list-style-type: none"> <li>• For non-valuable items, discard books and papers.</li> <li>• Photocopy valuable/important items, discard originals.</li> <li>• Freeze (in frost-free freezer or meat locker) or freeze-dry.</li> </ul>
<b>Carpet and backing</b>	<ul style="list-style-type: none"> <li>• Areas flooded with water that does not contain sewage backup can be treated as follows:               <ul style="list-style-type: none"> <li>- Remove all materials from the carpet and remove water with water extraction vacuum.</li> <li>- Shampoo the carpet with a dilute surfactant or have the carpet steam cleaned.</li> <li>- Reduce ambient humidity levels with dehumidifier.</li> <li>- Accelerate drying process with fans.</li> </ul> </li> <li>• Small areas contaminated with sewage backup follow the same instructions above, except a fan cannot be used to accelerate drying time. Flooded carpet padding should not be reused.</li> <li>• 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.</li> <li>• The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.</li> </ul>
<b>Ceiling tiles</b>	<ul style="list-style-type: none"> <li>• Discard and replace.</li> </ul>
<b>Cellulose insulation</b>	<ul style="list-style-type: none"> <li>• Discard and replace.</li> </ul>
<b>Concrete or cinder block surfaces</b>	<ul style="list-style-type: none"> <li>• Remove water with water extraction vacuum.</li> <li>• Accelerate drying process with dehumidifiers, fans, and/or heaters.</li> </ul>
<b>Electrical</b>	<ul style="list-style-type: none"> <li>• Turn the power off in the area of the water damage. Consider all wet wiring, light fixtures, electrical outlets to be a shock hazard until checked by an electrician.</li> <li>• Replace all electrical circuit breakers, GFIs and fuses that were wet.</li> <li>• Clean switches and outlets; when in doubt, replace them.</li> <li>• Open, clean and air-dry all electrical motors, light fixtures, etc., that were wet. Before being put back in service, inspect the motors, light fixtures, etc., to ensure no visible moisture/water droplets are apparent.</li> <li>• Only qualified persons should work on the above listed projects.</li> </ul>
<b>Fiberglass insulation</b>	<ul style="list-style-type: none"> <li>• Discard and replace.</li> </ul>
<b>Furniture (Laminate)</b>	<ul style="list-style-type: none"> <li>• If laminate is intact, the furniture must be air dried and cleaned with a detergent solution.</li> <li>• If laminate is not intact, delaminate the furniture and dispose of furniture.</li> </ul>
<b>Furniture (Particle Board)</b>	<ul style="list-style-type: none"> <li>• Discard and replace.</li> </ul>
<b>Furniture (Upholstered)</b>	<ul style="list-style-type: none"> <li>• Remove water with water extraction vacuum.</li> <li>• Accelerate drying process with dehumidifiers, fans, and/or heaters.</li> <li>• Consult a restoration/water damage professional who specializes in furniture.</li> <li>• Dispose of furniture if it has been wet due to floods, roof leaks, or sewage back up and ground water infiltration.</li> </ul>
<b>Hard surface, porous flooring</b> (Linoleum, ceramic tile, vinyl)	<ul style="list-style-type: none"> <li>• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.</li> <li>• Consider turning heat up and use dehumidifiers to dry the area.</li> <li>• The subfloor under the carpet or other flooring material must also be</li> </ul>

	<p>cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.</p> <ul style="list-style-type: none"> <li>• Check to make sure under-flooring is dry; dry under-flooring if necessary.</li> </ul>
<p><b>Non-porous, hard surfaces</b> (Plastics, metals)</p>	<ul style="list-style-type: none"> <li>• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.</li> </ul>
<p><b>Wallboard</b> (Drywall and gypsum board)</p>	<ul style="list-style-type: none"> <li>• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace.</li> <li>• Cut away wallboard and remove all wet and damp insulation immediately, even if the wallboard appears to be dry.</li> <li>• Electrical outlet and wall switch plates and door and window moldings must be removed prior to the tear out of the wall material.</li> <li>• Ventilate the wall cavity, if possible.</li> <li>• Respiratory protection should be worn when removing drywall as some older drywall joint compound contains asbestos.</li> <li>• Wallboard saturated by contaminated water must be removed. If the water level was less than 2½ feet, the wall material should be removed to a height of 4 feet to facilitate reinstallation of full sheets of drywall. If the water level was greater than 2½ feet, the wall material should be removed to a height of 8 feet or the ceiling junction, whichever is higher.</li> </ul>
<p><b>Window drapes</b></p>	<ul style="list-style-type: none"> <li>• Follow laundering or cleaning instructions recommended by the manufacturer.</li> </ul>
<p><b>Wood surfaces</b></p>	<ul style="list-style-type: none"> <li>• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.)</li> <li>• Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry.</li> <li>• Wet paneling must be pried away from wall for drying.</li> <li>• Moisture content of studs and sheathing must be below 20% moisture content before replacing insulation and closing wall.</li> </ul>

### Mold Remediation Guidelines

When mold growth is found on the materials listed in Table 1, or materials have been wet for more than 48 hours, first fix the water or humidity problem. Then conduct the mold growth remediation plan in accordance with the guidance provided in Table 2; using Table 2, employees will be able to determine whether the situation can be handled by UT employees, or whether the Environmental Health and Radiation Safety Department must be notified for further evaluation. Revise remediation plan, as necessary, if more damage is discovered during remediation. Communicate with building occupants, as appropriate regarding the situation.

Table 2 presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Table 2 are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information. Each situation should be evaluated to determine if the project requires an Infection Control Risk Assessment Permit (UTMC Construction Permit) located at

<http://www.utoledo.edu/depts/safety/docs/LS-08-008%20Appendix%20B.xlsx>.

**Table 2: Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water**  
**Source: *Mold Remediation in Schools and Commercial Buildings*, U.S. EPA. September 2008.**

<b>Material or Furnishing Affected</b>	<b>Cleanup Methods</b>
SMALL - Total Surface Area Affected Less Than 10 square feet (ft <sup>2</sup> )	
Books and papers	3
Carpet and backing	1, 3
Concrete or cinder block	1, 3
Hard surface, porous flooring (linoleum, ceramic tile, vinyl) 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
MEDIUM - Total Surface Area Affected Between 10 and 100 (ft <sup>2</sup> )	
Books and papers	3
Carpet and backing	1, 3, 4
Concrete or cinder block	1, 3
Hard surface, porous flooring (linoleum, ceramic tile, vinyl) 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
LARGE - Total Surface Area Affected Greater Than 100 square feet (ft <sup>2</sup> ) or Potential for Increased Exposure During Remediation Estimated to be Significant	
Books and papers	3
Carpet and backing	1, 3, 4
Concrete or cinder block	1, 3
Hard surface, porous flooring (linoleum, ceramic tile, vinyl) Non-porous, hard surfaces (plastics, metals)	1, 2, 3, 4
Upholstered furniture & drapes	1, 2, 3
Upholstered furniture & drapes	1, 3, 4
Wallboard (drywall and gypsum board)	3, 4
Wood surfaces	1, 2, 3, 4

In a small isolated area of 10 square feet or less, Environmental Health and Radiation Safety notification is not required as long as the small isolated area is on non-porous materials (plastics, metal, floor tile/grout). Gloves and chemical goggles are required and disposable N95 respirators are voluntary. In a small isolated area of 10 square feet or less, if mold growth is found on a porous surface (such as drywall), Environmental Health and Radiation Safety notification is required. A N95 respirator, gloves and eye protection must be worn. Remediation should be conducted using a (10:1) water:bleach solution.

For a medium isolated area of between 10 to 100 square feet and a large area of greater than 100 square feet, Environmental Health and Radiation Safety Department must be contacted prior to remediation. For a medium isolated area, an N95, half- or full-face respirator (determined by Environmental Health and Radiation Safety), gloves and eye protection must be worn; disposable coveralls are optional. Limited containment may be required for remediation. Limited containment includes the use of polyethylene sheeting ceiling to floor around affected area with a slit entry and covering flap with the area maintained under negative pressure with HEPA-filtered fan unit, and the supply and return air vents blocked within containment area.

For a large area, a full-face respirator, gloves, and full body coveralls to include head gear and foot coverings must be worn. Full containment may be required for remediation. Full containment includes the use of two layers of fire-retardant polyethylene sheeting with one airlock chamber maintained under negative pressure with HEPA-filtered fan exhausted outside of building, and the supply and return air vents blocked within containment area. Remediation for a large area will be conducted in conjunction with an outside remediation contractor trained in the remediation process

Only UT staff trained in the remediation process may conduct remediation activities using the guidelines listed in Table 2. UT staff is not permitted to conduct remediation activities in the event that remediation would require destructive cleaning procedures and/or is located in an HVAC system. **Staff must be cleared through the Environmental Health and Radiation Safety Department to wear respiratory protection, and annually fit tested for respiratory protection.**

### 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. NOTE: Building materials and furnishings that are contaminated with mold growth and are not salvageable should be double-bagged using 6-mil polyethylene sheeting. These materials can be discarded as ordinary construction waste. It is important to package mold-contaminated materials in sealed bags before removal from the containment area to minimize the dispersion of mold spores throughout the building. Large items that have heavy mold growth should be covered with polyethylene sheeting and sealed with duct tape before they are removed from the containment area.

### Contamination of the Heating Ventilating and Air Conditioning (HVAC)

Environmental Health and Radiation Safety must be contacted before further action is taken. Due to the potential of aerosolization through the building of toxic or allergenic molds and/or fungus, personnel trained in this type of remediation will need to follow the work practice in Appendix A.

### Communication

When a medium or large remediation project is found, the affected employees must be notified. The notification must include a description of the remedial measures and a timetable for completion, as well as address the individuals' concerns. Communication should also include regular updates on the remediation progress. Communication with building occupants will be coordinated by the Environmental Health and Radiation Safety Department.

### Environmental Health and Radiation Safety Investigation

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. 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.

Air sampling methods for some fungi are prone to false negative results and therefore cannot be used to definitely rule out contamination. However, when visible mold growth is not present, but suspected, and/or an individual has been diagnosed with a disease that is, or may be associated with fungal exposure, air monitoring may be necessary. The purpose of this air monitoring is to determine location and extent of contamination. Air monitoring may also be conducted to determine the effectiveness of the remediation by verifying that air concentrations of mold and fungal spores are similar to ambient or outdoor air.

The University of Toledo is committed to providing a work environment that is free of recognized hazards and to investigate complaints that may be related to poor indoor air quality (IAQ), (Refer to [HM-08-034](#) IAQ Investigations).

Source: Environmental Health and Radiation Safety Department

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## APPENDIX A

### Remediation of HVAC Systems

Mold growth in heating, ventilation, and air-conditioning (HVAC) systems can pose building-wide problems. Obtaining professional help should always be considered in addressing even small amounts of mold growth or moisture problems within an HVAC system. Recurring problems, regardless of size, may indicate a systemic problem and appropriate professional help should be sought. (Source: 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) in the HVAC System

- 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 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. 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) in the HVAC System

An Environmental Health and Radiation Safety professional with experience performing microbial investigations must be consulted prior to remediation activities to provide oversight for remediation projects involving more than a small isolated area in an HVAC system. 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.