

Flood Damage Remediation

Guideline

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Applies To:

Summary

When water infiltration has occurred in a building, either due to heavy rains, plumbing failures, or sewer backups, important steps must be taken to ensure the health and safety of individuals involved. Flood waters and residues may contain a broad range of potential hazards depending on the circumstances and location. Disease-causing organisms may be present, and chemical, biological or radioactive materials may become involved if the flood impacted on laboratory space. This information as well as the source of the water is critical knowledge when making decisions involving personal safety of cleanup personnel and determining what materials may be salvaged and those that must be discarded.

Scope

This guideline provides guidance to all UM departments on water damage restoration procedures. EHS strongly recommends hiring professional carpet cleaners and water damage restoration companies for large floods or heavy sewage.

Reference Regulations

Code of the City of Ann Arbor, Chapter 28 of Title II, Sewer Use Ordinance

Definitions

TERM	DEFINITION
Building Occupants	People who spend extended time periods in the building. Clients and visitors are also considered occupants.
Mildew/Mold	Microscopic fungi that live and multiply on plant or animal matter.

Responsibility

Deans, Directors and Department Heads

- Actively support this Guideline within individual units.
- Responsible for coordinating the implementation of any remedial action recommended.
- Supervisors/Principal Investigators
- Assign resources to support the implementation of this Guideline.
- Follow Work~Connections procedures for any accidents, injuries, or exposures.
<http://www.workconnections.umich.edu/employees/work-related-illness-injury/step-one/>.

Employees

- Comply with this Guideline and any further safety recommendations initialized by the supervisor/principal investigator.
- Conduct their assigned tasks in a safe manner, wear appropriate personal protective equipment (PPE), and only use equipment for which they have been formally trained.
- Report any job-related injuries or illnesses, questions on health and safety, or any unsafe or unhealthy working conditions to the supervisor/principal investigator.
- Contact EHS to evaluate health and safety conditions.

EHS

- Review and revise the Guideline.
- Respond to health concerns by investigating buildings and recommending remedial action.
- Provide guidance on PPE selection for remedial procedures.

If necessary, conduct comprehensive environmental monitoring for specific identified contaminants.

Plant Operations

- Responsible for maintaining building infrastructure in a safe and healthy condition.
- Assign resources to support the implementation of this Guideline.

Building Services/Environmental Services (UMHHC)

- Coordinate with the affected Departments to implement the Guideline.
- Contact EHS to request technical assistance.

Risk Management

- Evaluate water damage claims for potential insurance coverage. Coordinate cleanup efforts with affected Departments and implement this Guideline.
- Contact EHS to request technical assistance.

Affected Area Safety and Sanitation

When planning a cleanup from a flood it is important to consider the source of water and the potential hazards. Water can be classified into the following categories.

CATEGORY	DESCRIPTION
Category 1 - "Clean"	Water originating from a source that does not pose substantial harm to humans. Examples of Category 1 water include broken water supply lines, tub and sink overflows, melting ice or snow, rainwater, and broken toilet tanks or toilet bowls that do not contain contaminants. Category 1 water may deteriorate to Category 2 or 3 over time or by coming into contact with other contaminants.
Category 2 – "Gray"	Water containing a significant degree of chemical, biological and/or physical contamination and having the potential to cause discomfort or sickness if consumed by or exposed to humans. Examples of Category 2 water include discharges from dishwashers or washing machines, overflows from toilet

CATEGORY	DESCRIPTION
	bowls with some urine (no feces), sump pump water, chilled and condensate water and fire protection water. Category 2 water may deteriorate to Category 3 over time or by coming into contact with other contaminants.
Category 3 – “Black”	Grossly unsanitary water, containing pathogenic agents, arising from sewage or other contaminated water sources and having the likelihood of causing discomfort or sickness if consumed by or exposed to humans. Examples of Category 3 water include sewage, toilet backflows from beyond the trap and ground and surface waters that may contain organic matter, pesticides, heavy metals or other toxic substances.

When performing cleanup, it is also important to consider the following:

- Water damages building components and equipment which can create physical or electrical safety hazards;
- Water, mud, or sewage may contain biological or chemical contaminants that could create a health hazard. Food preparation/service areas where flooding has occurred must be properly sanitized and inspected by EHS before foods are prepared or served. Any food that is impacted must be disposed of.
- If a research laboratory was flooded the waters may become contaminated with hazardous research laboratory materials; Call EHS at (734) 647-1143 if flood waters may have contacted research materials.
- Moisture will promote the growth of molds, fungus, and other microorganisms.

Sewage floods are particularly dangerous depending on the solids content and volume. Precautions should be taken to prevent contact with the materials and to isolate the area to prevent contaminants from being tracked to other parts of the building. Occupants not involved in the clean-up must be evacuated from these areas when sewage is present.

Personal Protection Equipment (PPE)

Only individuals conducting the clean-up should be in affected areas. Persons that are immunocompromised or susceptible due to age, medications, or respiratory health problems (e.g., asthma, emphysema, cystic fibrosis) should **not** undertake clean-up activities. Children, pets, and laboratory animals should not be allowed in these areas.

Boots and rubber gloves should be worn at all times. Splash goggles should also be worn when splashing of contaminated water may occur. Protective clothing and organic vapor/HEPA respirators should be worn by employees involved in the initial stages of heavy sewage decontamination (Contact EHS at (734) 647-1142 for more information regarding the use of respiratory protection). Provide good ventilation when using bleach or other potentially toxic disinfectants. Call EHS to evaluate the disinfectants and/or safety measures utilized.

Cuts, open sores, or rashes should never be left exposed during clean-up procedures.

Do not smoke, eat, drink or apply cosmetics during clean up.

General Safety

Be aware of the potential for electrical shock! Wear rubber boots in wet areas until it is certain no electrical hazard exists. Plant Operations or the appropriate maintenance group should be called to turn off all main electrical switches in the area. Electric equipment used for clean-up in flooded areas must be protected with Ground Fault Circuit Interrupters (GFCI).

After the main power has been disconnected by an electrician, unplug electrical appliances in wet areas and do not turn on any appliances which have become wet until they have been thoroughly dried and checked for proper operation.

If the water may have come in contact with chemical, radiological, or biological hazards, contact EHS at (734) 647-1143 to evaluate the situation.

Do not use any open flame until the area has been ventilated for the potential presence of natural gas. The gas supply to all appliances in flooded areas should be shut off until the appliance has been checked. Plant Operations or the appropriate maintenance group should be called to turn off gas lines in the affected area. Facilities Service Center can be reached 24 hours a day at (734) 647-2059.

Some building materials may contain hazardous substances such as asbestos or lead based paint. Prior to impacting or removing water damaged building materials, contact EHS to have the affected area evaluated.

Persons suffering an injury, illness or exposure should report to the UM Occupational Health Services Clinic located in Room C380 of the Med Inn Building, if between the hours of 7:30am to 4:30pm, or otherwise to the UMHS Emergency Department located at 1500 East Medical Center Drive.

Remediation Procedures

Time is an essential consideration of remediation. All remediation projects should strive to complete initial cleaning within 24 hours. Organisms will not become airborne as long as they remain wet. As long as surfaces remain wet, the only way organisms can enter the body and cause disease is by splashing into the mouth, eyes, open cuts, etc. Once dried, organisms can be spread on dust particles by air movement. Therefore, it is important to disinfect contaminated surfaces as soon as possible after rinsing off heavy soil. In order to prevent decomposition and rotting of wet items, immediate drying after disinfection is necessary. Some materials that do not dry well must be removed and disposed. See the following documents for recommended treatment:

- [Repairing Floors from Water Damage to Prevent Mold Growth](#)
- [Repairing Walls from Water Damage to Prevent Mold Growth](#)
- [Repairing Ceilings from Water Damage to Prevent Mold Growth](#)

Bacteria, viruses, mold, fungi, etc. must be killed in the cleanup process. The most widely-accepted, safe, and effective sanitizing agent is hypochlorite in the form of household bleach. The bleach solution referred to is one cup of bleach to one gallon of water (the bleach solution needs 15 minutes contact time to kill organisms). For a soapier cleaning solution that cuts dirt, add a half cup of mild detergent. **Warning! Mixing bleach with other cleaning chemicals may result in the generation of heat and/or poisonous gasses.** Other commercial disinfectants are also acceptable depending on the degree of

contamination, nature of surfaces, application, safety or cost and ease of use. Only use EPA registered disinfectants according to the manufacturer's instructions.

Classes of acceptable disinfectants, concentrations, advantages and disadvantages can be found in Table 3 in the document [Suggested Guidelines for Remediation of Damage from Sewage Backflow into Buildings](#). Call EHS at (734) 647-1143 to address safety concerns of specific disinfectants and application techniques.

Use the following steps in all clean-up procedures:

1. Determine the water source and ensure the problem has been corrected by Plant Operations by calling (734) 647-2059 or the appropriate maintenance group.
2. Assure that the personal protection and general safety steps previously described have been taken.
3. Remove all water and gross contamination or soil as soon as possible. Using various methods, dry all surfaces as much as possible. The wettest areas can be pumped, squeegeed or mopped to a floor drain. A wet/dry vacuum can be used on flat surfaces to further remove remaining water. See the following documents for removal of water from specific building components:
 - [Repairing Floors from Water Damage to Prevent Mold Growth](#)
 - [Repairing Walls from Water Damage to Prevent Mold Growth](#)
 - [Repairing Ceilings from Water Damage to Prevent Mold Growth](#)
4. Determine what items will have to be discarded and remove them for disposal. Generally, if the disinfectant can be made to come in contact with all surfaces, an item may be salvageable. Non-porous materials can be easily cleaned with surface disinfectants. Porous materials are much more difficult to clean and require complicated cleaning procedures or disposal.

Stuffed furniture, pillows, and mattresses will have to be discarded. Indoor/outdoor carpeting and rugs may be salvageable.

Thick wall to wall carpets and padding will have to be discarded or professionally treated (See [Repairing Floors from Water Damage to Prevent Mold Growth](#)).

Flood soaked drywall usually must be removed above the flood line (See [Repairing Walls from Water Damage to Prevent Mold Growth](#)).

Anything that cannot be cleaned (like wet ceiling tiles), is too damaged, or is disposable (like cardboard boxes) should be discarded and replaced.

Immediately discard food and other perishable items.

5. Start cleaning from the top floor or upper limit of flooding and work downward. Thoroughly rinse all visible soil from all items to be salvaged. Rinse the walls from several inches above the highest level the water reached to the floor. Carefully remove and rinse behind any base coving to remove all soil. Rinse down the entire floor. A mop can be used on both the walls and floors for this purpose.
6. Remove salvageable furnishings. Next remove moisture that has been absorbed by wood, plaster and other materials. Using fans and/or a dehumidifier, thoroughly ventilate the rooms to dry all surfaces. The indoor humidity should be reduced to 40% relative humidity (RH) or less as soon as possible.

Quick drying is essential to prevent mold growth, reduce water damage, and speed the resumption of work or research. The following are ways to lower the humidity to prevent mold growth:

- If the humidity outside is lower than indoors, open all adjacent doors and windows to exchange the moist indoor air for drier outdoor air. This option may not be appropriate for some buildings that need to remain secured. Also, many new buildings will not have windows that open.
- Open all doors, closets, cabinets and access panels in wet areas. The more air is allowed to circulate, the faster the drying time will be.
- Fans can be used to increase circulation and dry out the area. The central Heating Ventilating and Air Conditioning (HVAC) system in the building should not be used if the ducts were under water. Plant Operations AC Shop or the appropriate maintenance group will need to be called to ensure all water and contaminants are removed from the duct work.
- Dehumidifiers can be used to increase the drying rate. Everything will dry quicker if the humidity can be reduced. If possible, utilize commercial dehumidifiers, which remove three to four times more water than home models. When using dehumidifiers, shut windows and doors. If there is severe flooding, consider hiring a contractor for water removal.
- Desiccants (materials that absorb moisture) can be useful in drying enclosed areas with poor ventilation. Commercial desiccants should be purchased for this purpose. Oil dry or cat litter made of clay and silica gel are also useful.
- Commercial flood and carpet restoration companies that specialize in drying out flooded buildings should be used. Commercial vacuum trucks, fans, and dehumidifiers will dry an area very quickly. Contact EHS for a list of contractors certified by the Institute of Inspection, Cleaning and Restoration Certification (IICRC).
- Thoroughly wash and disinfect walls, ceilings and exposed wall cavities several inches up from the highest level reached by the flood waters and over the entire floor. Contact time of the disinfectant on contaminated surfaces is extremely important. All disinfectants should be permitted at least 15 minutes of initial contact time.

An effective method is to use a mop or sponge to splash the disinfectant on the walls and over the floor. Make sure all affected surfaces have been contacted with the disinfectant. Smaller items may be immersed in the solution, while larger items will need to be hand scrubbed. Professional contractors may use commercial sprayers for large projects.

If walls have already dried, work from the floor to the ceiling to prevent streaking. (Dirty water splashed on dry walls may be absorbed and become almost impossible to remove.) Overlap sections, cleaning the ceiling last. Rinse well with clean water and thoroughly dry the surface. If painting is necessary after drying, use paint containing an anti-mildew agent.

Wall materials that have absorbed too much moisture may need to be removed. EHS can determine this with the use of a moisture meter. Call EHS to provide assistance in determining if walls have absorbed too much moisture.

- Replace disposable HVAC filters to remove potentially trapped mold spores.
- All flood waters, sewage, and cleaning solutions must be disposed of in sanitary sewers in accordance with the City of Ann Arbor Sewer Use Ordinance, Chapter 28 of Title II, Code of the City of Ann Arbor. Under no circumstances should waste water be disposed of in storm drains outside of

buildings. Contact Plant Operations Plumbing Shop for a proper drainage location. Any questions should be directed to EHS Environmental Protection and Permitting at (734) 647-1143.

Related Documents

- UM Accident, Illness or Injury Report Form.
<http://www.workconnections.umich.edu/employees/work-related-illness-injury/step-one/>
- Centers for Disease Control and Prevention NCEH Fact sheet Molds in the Environment (<https://www.cdc.gov/mold/links.htm>)
- IICRC S500-06 Std. Ref. Guide for Prof. Water Damage Restoration
- Cleaning Flood-Damaged Carpets and Rugs & Flood Damaged Walls, Ceilings and Floors, American Red Cross (<http://www.redcross.org/get-help/disaster-relief-and-recovery-services/disaster-cleanup#Water-Damage>)

Technical Support

Professional flood damage restoration and carpet cleaners are available in the area. Only companies certified by the Institute of Inspection, Cleaning and Restoration Certification (IICRC) should be used. Contact EHS at (734) 647-1143 for local IICRC Certified Professional Cleaners or contact the IICRC Referral system at 1-800-835-4624 or by visiting www.iicrc.org.

All referenced guidelines, regulations, and other documents are available through EHS (734) 647-1143.

Attachments

- [Repairing Floors from Water Damage to Prevent Mold Growth](#)
- [Repairing Walls from Water Damage to Prevent Mold Growth](#)
- [Repairing Ceilings from Water Damage to Prevent Mold Growth](#)
- [Suggested Guidelines for Remediation of Damage from Sewage](#)