

Procedures for Water Remediation from Flooding Contamination

Risk Control from Liberty Mutual Insurance



This reference addresses remediation from black or grey water contamination from flooding.

Flooding inside of buildings can occur due to rainwater leaks, groundwater intrusion, plumbing pipe bursts, sewage system backups, overflow of rising rivers and lakes, and ocean water due to storms or hurricanes.

Categories of Water Entering a Structure

In considering what kind of remediation is required, evaluate the type of water that entered the building. Water causing a flooding situation is divided into three categories that require different remediation (clean-up) measures. These categories are clean, gray, and black water.

1. Clean water originates from a source that does not contain significant microbial content and does not pose substantial harm to humans. Examples are rainwater or melting snow from openings in the roof with no contamination, broken water supply lines, or tub or sink overflows with no contaminants.
2. Gray water contains a significant level of contamination and has the potential to cause discomfort or sickness if consumed by or exposed to humans. Gray water carries microorganisms and nutrients for microorganisms. Examples may include sump pump failures, seepage due to hydrostatic pressure or floodwater, broken aquariums, or overflows from washing machines and dishwashers.
3. Black water contains pathogenic agents and is grossly unsanitary. Black water contains sewage and other contaminated water sources entering or afflicting the indoor environment. Such water sources carry silt and organic matter into structures and create black water conditions. Toilet backflows that originate from beyond the toilet trap and contaminated floodwaters are often considered black water contamination, regardless of the physical content or color of the water.

Procedures for Gray or Black Water Remediation from Flooding

Gray water or black water from flooding may contain pathogenic agents, including human or animal waste. This water may also be contaminated with chemicals such as pesticides, heavy metals, gasoline, or other petroleum products. Where gray or black water intrusions have occurred in buildings, additional measures are needed to protect against pathogens.

All floodwater from lakes, rivers, or other bodies of water are considered black water and should be treated as follows.

Handle Black Water Flooding as though it Contains Infectious Organisms

Those who perform remediation work after floods should wear impermeable rubber gloves and a suitable respirator (at least an N-95 disposable filtering facepiece respirator) to avoid breathing spores and other contaminated particulate, and protective eyewear while handling contaminated material. Workers should wash their hands with soap and water after handling contaminated material and before eating, smoking, drinking, or performing other hand to mouth actions.

Make Provisions for Handling Worker Injuries

Most cases of sickness associated with flood conditions are brought about by ingesting contaminated food or water. Tetanus, however, can be acquired from contaminated soil or water entering broken areas of the skin such as cuts, abrasions, or puncture

wounds. If a cleanup worker experiences any of the signs or symptoms associated with tetanus, appropriate first aid treatment and medical advice should be sought. If the skin is broken, particularly with a puncture wound or a wound in contact with potentially contaminated material, a tetanus vaccination may be needed if it has been five years or more since the individual's last tetanus shot. Since recommendations for immunization may change depending upon conditions, reference the CDC website prior to assigning workers to these areas.

Remove Standing Water Immediately

Excess water may be mopped or mechanically extracted by a pump or wet vacuum system. Black water that is extracted from a building should be disposed of in a sanitary sewer system or removed from the site by a septic waste transporter.

Dry Affected Areas as Soon as Possible

Drying will help stop the spread of mold and bacteria. This may be done before or during remediation.

Remove and Clean the Contents of the Building

Prior to beginning any of the remediation work, remove contents (furnishings, draperies, etc.) from the remediation area. Clean, wrap in plastic, and store the contents that can be salvaged in a humidity-controlled storage area, less than 60 percent relative humidity (RH) to prevent mold growth.

If cleaned contents are stored on site, provide a clean enclosure maintained at a slight positive pressure in relation to the remediation area so that no contamination from other areas of the building can enter the decontaminated area. Use a separate storage facility if a suitable storage space is not available on site.

Use plastic curtains and other appropriate containment enclosures to isolate the contaminated area from the rest of the building and prevent spreading contamination. Perform cleaning within containment enclosures to prevent mold or bacteria from spreading to previously cleaned areas.

A vacuum or air mover having HEPA filters should be used to keep containment areas under negative pressure with respect to the rest of the building or floor. This negative pressure system should run during the removal of contaminated material and during cleaning and treating of all contaminated structural and building material components. Exhaust air to the outside of the building.

The following procedures and work practices should be conducted inside the containment area:

Remove all movable furnishings and content from the impacted containment area(s).

Cover all non-movable objects with polyethylene sheeting.

Place ample dehumidification equipment throughout the containment area to keep the air below 60% RH.

Block off and cover all HVAC supply and return vents.

Remove all water-damaged and mold-damaged wallboard from the walls and ceiling. Continue removal for 16 to 24 inches (depending on wall framing spacing) past the perimeter of the damage.

Use airless sprayers for dust control and sanitation.

Remove water damaged and/or mold contaminated carpet and padding.

Allow only remediation workers inside the containment. Those who remediate in areas flooded with black water should avoid taking potentially contaminated clothes and shoes into clean, non-affected areas of a building or structure. Hands should be cleaned thoroughly before entering any clean area.

Files and papers: Remove and dispose of non-essential wet files and paperwork. Essential (i.e. legal documents, tax returns, etc.) wet paper from water damage area should be moved to a location where they can be dried, photocopied, and then discarded.

Clean Moderately Contaminated Structural Material

Assess the potential contamination of the wall studs and floor joists once the drywall and flooring are removed.

Hard, non-porous surfaces, such as metal wall studs, that are structurally sound should be cleaned with an EPA approved biocide rated for elimination of both pathogenic and non-pathogenic organisms. Numerous quaternary ammonium chloride products are rated for black water remediation. Use a pump sprayer or approved fogger to apply biocides. Be aware that biocides are irritants that can bother sensitive workers until the biocide dries.

Disinfect mops, brooms, and brushes with a quaternary ammonium solution after flushing thoroughly with water. Contact time should be ten minutes. Flushing with water should be followed with wring out and a thorough drying outside in the open air.

After work is completed, dry the materials by using air movement (e.g., fans blowing air across the surface) coupled with dehumidification to keep room air below 60% RH.

Clean Moderately Contaminated Articles

Wipe down all semi-porous (e.g., wood, concrete) and non-porous (e.g., metals, glass, and hard plastics) articles with EPA-approved biocide solution diluted to the manufacturer's dilution specifications.

Clean Air Conditioning/Heating Unit and Ductwork

A qualified HVAC contractor should determine if the black water contamination has been introduced into the HVAC system. If the lined duct has been contaminated with floodwaters, the insulated duct should be removed and replaced. Shut off and then clean the inside of the air conditioning/heating unit and ductwork. If HVAC system components are not replaced, a variety of biocides are recommended by HVAC manufacturers for use with HVAC components. Seal adjacent duct openings (supply and return openings) in all affected rooms during remediation work. Use a licensed HVAC contractor to complete the repairs and to reconstruct the system.

Remove Water-Damaged Porous Material

Porous material can contain mold and bacteria that can be harmful to health.

- Remove all visible, mold-contaminated porous material, including affected drywall, pressboard, paneling, insulation, cabinets, carpet, carpet padding, furring strips, etc. Saturated plaster, gypsum board (dry wall), and insulation should be removed at least 12 to 24 inches from the line of contamination then replaced. Double-bag materials and seal for disposal.
- Upholstered office partitions, chairs, and other large permeable objects that cannot be thoroughly cleaned and disinfected should be removed and discarded. Remove all porous items that have been wet for more than 48 hours that cannot be thoroughly cleaned and dried.
- Remove and dispose of all wet ceiling tiles within 24-48 hours of water damage. Visible mold growth or stains should not be covered with encapsulants, sealants, or coatings, but rather should be discarded.
- Carpeting. Remove and discard carpeting and/or padding that has been contaminated with black water. The concrete floor or sub-floor beneath carpeting or other floor covering systems should be thoroughly cleaned and dried before the floor covering is replaced.

Launder Moderately-Contaminated Materials

Washable materials can be washed in a commercial washing system. Non-contaminated items should not be mixed with items contaminated with floodwater or black water.

Post-Remediation Assessment Sampling

After remediation is complete, but prior to reconstruction, conduct verification sampling within the building to ensure the remediation was successful and no significant residual mold contamination is present in the structure. An air scrubber (HEPA-filtered) should be operated and exhausted inside (recirculation mode) the containment area for one to three days after the remediation and shut off 24-hours prior to the post-remediation test. The containment enclosure should not be removed until a successful post-remediation assessment is achieved.

General Safety Considerations

Before entering a flooded building, be sure the building is structurally safe. Isolate and shut off all electrical service until it is established that there is no danger of electric shock. Do not connect generators to a building's electrical circuits without the approved, automatic-interrupt devices. If a generator is on line when electrical service is restored to a building, it can become a major fire hazard and may endanger hot-line contractors helping to restore power in the area.

Ensure that gas is not flowing through the regulators of natural gas appliances such as heaters, clothes driers, etc.

Be sure that tetanus shots are current. If the skin is broken, particularly with a puncture wound or a wound in contact with potentially contaminated material, a tetanus vaccination may be needed.

Providing an adequate supply of fresh outdoor air to buildings through natural or mechanical ventilation is the most effective engineering control for preventing indoor air quality problems. It includes using natural, dilution, local exhaust or increased ventilation efficiency. Provide ventilation levels according to the design criteria set forth in ANSI/ASHRAE 62.1-2016.

Resources

Several state and federal agencies may have websites that provide more detailed information on the potential health hazards of floodwater.

Department of Health and Human Services, Centers for Disease Control and Prevention. (2006, August 25). *Protect yourself from mold*. Retrieved from <https://www.cdc.gov/disasters/hurricanes/pdf/moldprotection.pdf>

Environmental Protection Agency. Flood cleanup to protect indoor air quality. <https://www.epa.gov/indoor-air-quality-iaq/flood-cleanup-protect-indoor-air-quality>

National Safety Council. (2009). *Air quality problems caused by floods*. Retrieved from http://www.nsc.org/news_resources/Resources/Documents/Air_Quality_Problems_Caused_by_Floods.pdf

New York City Department of Health and Mental Hygiene. (2002, January). *Guidelines on assessment and remediation of fungi in indoor environments*. Retrieved from <http://www.nwhealth.org/pubs/NYC%20DOH%20Guidelines.pdf>

Occupational Safety and Health Administration (OSHA). Factsheets on Natural Disaster Recovery. *Flood cleanup*. Retrieved from <https://www.osha.gov/OshDoc/floodCleanup.html>

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