



Post-Flood Mold Clean-up: Assessing and Removing Mold Safely

There are many possible dangers in a flood-impacted building, including contamination with toxic chemicals or sewage, rats or snakes, unstable or collapsed structures, electric hazards and explosion hazards from gas lines or spilled fuel or oil. If there are piles of debris in or near the building, there may be hazards from debris removal vehicles and the piles themselves may be unstable. This factsheet will only address mold in detail.

What precautions should you take on first entering a flood-impacted building?

In some cases an inspection may be needed before you enter. For example, for unstable or collapsed structures, a registered structural engineer or architect can determine if it is safe to enter. Local utility companies can determine if there are live electric or gas lines that need to be turned off. If you have doubts about the safety of the building, you can request an inspection by a licensed building inspector. For more detail on first entrance, see **Resources 3 and 4** on the last page.

Before entering a flood-impacted home for the first time (after inspection), open windows and doors and allow the house to air out for at least 30 minutes. This will help dilute any chemical or mold odors.

When is it safe to re-occupy a mold-contaminated indoor space?

! In general, flood-impacted buildings with extensive mold contamination should not be re-occupied until mold remediation has been completed.

Reoccupation should depend on the amount of mold present, whether mold-impacted areas can be isolated, and the susceptibility of building occupants. Indoor spaces impacted by flood damage are likely to be contaminated with both visible mold growth and mold growth hidden from view, such as behind walls, under floors and above ceilings. If temporary relocation is desirable but not possible, impacted spaces (such as basements) should be *contained and isolated* from non-impacted spaces that will be occupied, such as upper floors. This can be done with barriers of heavy plastic sheeting secured with duct tape, and a powerful exhaust fan that filters the exhausted air with a HEPA (high efficiency particulate air) filter, as in the picture.



Courtesy of Armstrong
Cleaning and Restoration
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Who should (and should not) do mold clean-up and remediation?

In deciding whether you should address mold yourself, consider the *size of the impacted area and degree of contamination*. Most federal agencies categorize abatement jobs by levels of seriousness, such as those listed below. Note the special work practices recommended at each level.

- **Level I.** *Small amounts (less than 10 square feet, such as single ceiling tiles or small areas on walls).* Small removals can be done without extraordinary precautions. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended. Leave the work area dry and visibly free from contamination and debris. Protect yourself from direct sun and extreme heat or cold. Take breaks and drink water frequently. Observe good hygiene practices:
 1. Do not eat, smoke or drink in the work area.
 2. Do not rub your eyes, nose or mouth in the work area.
 3. Wash your hands, nails and all exposed skin with soap and clean, running water, especially before work breaks and meal breaks; at the end of the work shift, wash hands, nails, exposed skin, hair and scalp.
 4. Don't bring contaminated work clothing home.

! WEC strongly recommends that mold remediation of Levels II, III and IV be done by qualified, experienced professionals, to ensure that workers and occupants are properly protected and that remediation is effective and complete. If it must be a do-it-yourself job, observe the precautions below, and seek further detailed guidance from Resources 2 and 3 on the last page of this factsheet.

- **Level II.** *Removing Mid-Sized Isolated Areas (10 to 30 total square feet in one room or area e.g., individual wallboard panels).* Observe all precautions recommended for Level I, and: At the end of a shift, the work area and areas used by remediation workers for coming and going should be HEPA vacuumed and cleaned with a damp cloth or mop and a detergent solution.
- **Level III.** *Large Isolated Areas (30 to 100 total square feet, such as several wallboard panels).* Observe all precautions recommended for Level II, and: At the end of a shift, the work area and areas used by remediation workers for coming and going should be HEPA vacuumed and cleaned with a damp cloth or mop and a detergent solution.
- **Level IV.** *Extensive Contamination (greater than a total 100 square feet in an area).* Use all precautions recommended for Level III, and: Construct an enclosure of the contaminated area(s) using heavy plastic sheeting secured with duct tape. Use a powerful exhaust fan with a HEPA (high efficiency particulate air) filter to remove mold without contaminating other spaces. Contaminated materials that cannot be cleaned should be removed from the work area in sealed impermeable plastic bags. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the work area. These materials may be disposed of as ordinary waste. The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth or mopped with a detergent solution and be visibly clean prior to the removal of isolation barriers.

If the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), or if abatement procedures are expected to generate a lot of dust, you should consider the remediation as **Level IV**. Dust-generating procedures include:

- **abrasive** cleaning of contaminated surfaces.
- **breaking** apart moldy, porous materials such as wallboard.
- **removal** of contaminated wallpaper by stripping or peeling.
- **pulling** up linoleum tiles.
- **using** fans to dry items or ventilate areas.

! People with allergies, asthma, or other respiratory conditions, or who are immune-compromised should not participate in or be around mold remediation or removal of water-damaged materials.

Should you do air sampling?

Air sampling is costly and usually does not provide useful information. It is rarely needed to assess mold contamination and should only be done if there is a good technical or medical reason.

What are the stages of mold clean-up?

5. **Preventing further water intrusion.** Find and repair any damage that allows more water to enter the building (such as leaky roofs or plumbing, or a basement that lets in groundwater) before undertaking mold removal. The key to mold prevention is moisture prevention.
6. **Mucking out. This means getting rid of water, dirt, sand and debris.** Remember, there may be exposure to sewage and chemicals – requiring proper protective equipment, including boots or waders, respirators and gloves – as well as electric, gas, explosion and other hazards.
7. **Deciding what needs to be removed. In general, all water-damaged,** porous materials which have been wet more than 48 hours need to be cleaned and dried if possible, or discarded. These may include non-structural elements of the building, such as wallboard or flooring, as well as furniture, drapes and other items. A thorough assessment includes looking for visible mold, and probing for hidden mold. A moisture meter can be used to identify materials wet on the inside, which can be assumed to be moldy. It may be necessary to remove sections of walls, floors and ceilings to see if the underlying materials are wet and need to be removed.

Valuable furniture, books and papers may be salvageable – you may want to consult a restoration/water damage professional.

8. **Removing contaminated materials.** One or both of the following may be required:
 - a. Removing smaller structural elements.
 - b. Gutting. This is defined as removal and disposal of moldy and flood-saturated, non-structural porous building components, including sheetrock and all underlying insulation, plaster walls and ceilings, wood lathe behind plaster, non-structural wood studs and floor sills, wood flooring laid on subflooring, sub-flooring, cabinetry and trims, vinyl flooring, submerged window

components, and water damaged ductwork and air handlers. To avoid release of mold, materials removed should be put in sealed plastic bags before removal and discarded as regular trash.

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! Mucking may involve exposure to sewage and chemicals, as well as gas, electric and other hazards. Gutting involves greater exposure to mold than any other remediation procedure. Mucking and gutting should be done by professionals.

If you must do mucking and gutting yourself, follow the personal protective equipment guidance in this factsheet, and further guidance **in Resources 3 and 4** at the end of this factsheet.

1. **Cleaning remaining building elements.** Structural wood (such as studs, sill plates, floor and ceiling joists and sheathing) with mold growth should be HEPA vacuumed and then bristle-brushed with a mild dishwashing detergent. Some experts suggest adding a borate-containing product to the detergent solution. Avoid bleach and biocides, which kill mold but are also toxic to humans – dead mold left in place can still cause allergies and asthma. Allow all wood to dry until a moisture meter reading is less than 15 to 17 percent before rebuilding. Drying can be accelerated with heaters and industrial fans.

What personal protective equipment (PPE) is needed?

Assume that water-damaged buildings, materials and furnishings are contaminated with mold. Use proper PPE to protect yourself.

- **Protect your skin** with ordinary household gloves. If you are using a strong disinfectant or cleaning solution (not recommended in most situations), you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or PVC. Do not touch mold with bare skin.
- **Protect your eyes** with properly fitted goggles or a full-facepiece respirator. Do not use safety glasses or goggles with open vent holes, because they will admit mold particles. Goggles are often incompatible with half-face respirators, making a full-facepiece respirator a better choice.
- **Protect your body** and street clothing while conducting inspections, mucking, gutting and large-scale remediation work (greater than 100 square feet). Use breathable, disposable protective clothing with elastic wrists and ankles. Discard disposable clothing at the end of a shift in impermeable bags. It can be discarded as ordinary waste, unless contaminated with asbestos.
- **Protect your respiratory system.** Respirators will protect you from inhaling airborne mold, contaminated dust and other particulates that are released during the mold removal process.

How can you be sure your respirator is protecting you?

To protect you properly, respirators must have the correct filter and should form an airtight seal to your face, and you should be properly trained, medically evaluated and fit-tested, as described below.

- **Correct filter.** The respirator must have the right filter. For tiny particles like spores, this is an N-95, N-100 or a HEPA filter. ("95" and "100" refer to the percent of tiny particles filtered; HEPA is essentially the same as "100.") **For silica, lead and asbestos, the filter should be N-100 or HEPA.** The whole mask may be the filter (filtering facepiece respirators, often incorrectly called dust masks – picture at left), or the filter may be in a canister attached to a rubber or plastic facepiece. The filtering facepiece mask must have two straps to secure it properly.
- **Correct type of respirator.** For Level I jobs (less than 10 square feet), use **at least** a NIOSH-certified **N-95 disposable** respirator, non-vented goggles and gloves.



1. For Level II and III jobs (10 to 100 square feet in one room), use **at least a half-face cartridge respirator** (picture at right) with a replaceable HEPA or N-100 cartridge and goggles, or a **full-face respirator**, with HEPA or N-100 cartridges, as well as gloves.



2. For Level IV jobs (larger than 100 square feet or likely to generate a lot of dust) use a **full-face cartridge respirator** with replaceable HEPA or N-100 cartridges, or a **powered air-purifying respirator (PAPR)** – at right), and disposable protective clothing that covers the entire body, including head and shoes. This work should be performed by trained mold remediation professionals, and requires isolation and ventilation.



3. **Correct Fit.** The edges of the mask must form a good seal to your face. Note that facial hair prevents a seal of any respirator. Only powered air purifying respirators (PAPRs – see last paragraph, this page) with a loose-fitting headpiece (a hood) do not require a face seal. If your respirator does not fit correctly, it may not protect you. There are two ways to make sure it fits:



1. **Fit tests** by a qualified person, to identify the respirator make, model and size that fits you.
2. Conduct a **"seal check"** every time you put on a respirator, to make sure you have positioned the respirator properly on your face. The idea is to hold your hands or a piece of plastic over the exhalation part of the mask and try to exhale; you shouldn't be able to exhale. Then cover the inhalation part and try to inhale; you shouldn't be able to inhale. For a filtering facepiece mask, the whole mask is for inhaling and exhaling, and may be hard to cover. If the filtering facepiece mask has an exhalation valve, just cover that and do the exhalation test. For a mask with canisters, cover the whole canister, and inhale, cover the exhalation valve and exhale (diagrams on next page). Seal checking is not a substitute for fit testing.

If you are a paid worker, the OSHA Respiratory Protection Standard (or PEOSH standard for public sector workers in New Jersey) requires your employer to:

Assess hazards.

1. Provide a respirator, at no cost, appropriate to the hazards.
3. Conduct annual fit-testing, training and periodic medical evaluation.
4. Train you in the proper use and care of your respirator.
5. Maintain records.



What work practices will minimize mold exposure?

Workers should be trained and should observe these practices:

- Mold can generally be removed from nonporous surfaces by damp-wiping or scrubbing with water and detergent. Wear gloves, protective clothing, respiratory protection and eye protection. Dry these surfaces quickly and thoroughly to discourage further mold growth.
- Avoid bleach and biocides, except possibly when immune-compromised people live in the space or for cleaning non-porous items such as ceramic tile. Semi-porous items, such as concrete or brick, can be HEPA-vacuumed and then disinfected with a solution of one cup bleach to one gallon water, to eliminate possible sewage bacteria. Ventilate area in which bleach or biocides are used. Never use fungicides indoors.
- Never fog with biocides.
- Never use ozone generators. Ozone is a strong respiratory irritant and can damage building surfaces. It is not an air cleaner.
- Use wet vacuums to remove water from floors, carpets and hard surfaces; use HEPA vacuums and careful damp wiping for final cleanup after mold removal. Avoid dry sweeping.
- To keep dust down when removing pieces of wallboard, flooring, etc., mist with water or cover with sheeting secured with duct tape. Then score (make a shallow cut) with a utility knife; use a crowbar instead of a hammer. Wet-scrape plaster.
- Remove moldy wallboard or other materials at least 6 inches and up to 2 feet beyond visible mold growth or water stains on front and back sides.

How should you choose a contractor?

As of July 2013, New Jersey does not have licensing or training requirements for mold remediators or inspectors. Below are some suggestions for selecting them:

- Ask what specific mold assessment training inspectors have. They should have been to a substantive training including visible inspection, use of moisture monitoring instruments and hands-on experiences.
- Ask about experience with mold assessment.
- Request and read several references.
- Obtain several estimates, and be sure that contractors are bidding on the same type of work so you can compare prices. Services may include inspection, air or other sampling for mold, moisture sampling, HVAC assessment, repairs and removal/replacement of damaged materials. Beware of estimates which are significantly lower than all the others.
- Talk to each contractor to learn exactly what they will do. If you have doubts, seek more information.
- Avoid contractors who use toxic chemicals, especially fogging or spraying with biocides.
- Only accept an estimate made after an onsite visit, not just a phone call.
- Get a written contract.
- Ask for written proof of liability and workers' compensation insurance.
- A building cannot be made mold free. Avoid a contractor who claims to make the building mold free. Indoor levels are "normal" when they are similar to outdoor levels in the neighborhood.
- To avoid conflict of interest, be sure to use three different contractors for the three stages of remediation: inspection, remediation and clearance (determining if the job is complete). Remediators doing inspection have an incentive to recommend excessive work to make extra money, or do insufficient work, to do the work cheaply. Remediators also have an incentive to declare the job complete when it is not.

Resources

1. Parts of this factsheet were adapted from the NYCOSH factsheet, *Post-Sandy Mold Clean-Up – Do It Once, Do It Right*, April 11, 2013 version, at www.nycosh.org.
2. Occupational Safety and Health Administration (OSHA), *A Brief Guide to Mold in the Workplace*, , section on Mold Remediation Guidelines, <https://www.osha.gov/dts/shib/shib101003.html>.
3. NIEHS, *Disaster Recovery Mold Remediation Guidance: Health and Safety Essentials for Workers, Volunteers and Homeowners*, May 2013. Published by National Clearinghouse for Worker Safety and Health Training, NIEHS, https://tools.niehs.nih.gov/wetp/public/hasl_get_blob.cfm?ID=9795
4. Detailed coverage of site preparation, mucking and gutting in US Department of Housing and Urban Development (HUD), Consolidated Safety Services, *Rebuild Healthy Homes, Safe Rehabilitation of Hurricane Damaged Homes Student Guide*, www.hud.gov/offices/lead/library/misc/HUD_CSS_Booklet.pdf.



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The Occupational Safety and Health Act was enacted in 1970 to prevent workers from suffering work-related injury, illness, or death. It created the Occupational Safety and Health Administration (OSHA), which sets health and safety standards and inspects workplaces for violations. In New Jersey, public workplaces are covered by the state's Public Employee Occupational Safety and Health Act (PEOSHA) which provides similar, but not identical, protections. Both laws prohibit any person from discharging or in any other manner retaliating against any worker for exercising their rights under these laws. These rights include raising health and safety concerns with an employer or seeking an inspection by OSHA or PEOSH. For information, go to www.osha.gov. Public employees should go to [www. www.state.nj.us/health/peosh/](http://www.state.nj.us/health/peosh/).

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