



A Union of Professionals

Cleaning Up after a Major Storm

Cleaning up schools and homes after major storms and flooding can be tricky. There are the obvious safety and health hazards associated with re-entering the building and cleaning it. And often, there are the wrenching emotional and economic decisions about what to save and what not to save.

This fact sheet primarily focuses on protecting yourself during a cleanup of a flooded or storm-damaged building with some tips on a cleaning approach and disposal of damaged material. It assumes that the building has been inspected for structural soundness and major electrical and gas safety. For more detailed information about re-entering a damaged home or school, please see the fact sheet “Re-entering Your Flooded Home,” developed by the Centers for Disease Control and Prevention (CDC). It can be found on the CDC website, www.cdc.gov/disasters/mold/reenter.html.

According to Michael Berry, Ph.D., a leading authority on cleaning: “Water is the single most long-term destructive substance in the indoor environment.” Water promotes the growth of mold and other micro-organisms that can be hazardous to occupants’ health and that literally dissolve many building materials. Time is the enemy for flooded buildings. Many building materials and personal items that remain water-saturated for longer than **24–48 hours** are beyond restoration.

The primary goal of any cleaning project involving water damage is to dry out the building as much as possible. Berry warns that “incomplete drying is the most destructive and unhealthy result of a restoration.” Micro-organisms will thrive, which poses a long-term health risk to all occupants.

ASSESS YOUR HEALTH STATUS BEFORE PARTICIPATING

Everyone wants to help speed the process of making homes and school buildings habitable. However, anyone with the following health conditions should not be involved in the cleaning effort:

- allergies to mold
- asthma
- chronic lung disease such as obstructive lung disease (COPD)
- weakened immune system
- cancer (being actively treated)

As much as possible, individuals with these conditions should allow their colleagues or family members to do this work.

Healthy individuals should also understand that this work may pose a health risk for them; they should not be cavalier about engaging in cleaning and restoration projects.

Assess the Job

The first step to take before cleaning is to know as much as possible about the water that caused the flood or water damage. Important things to find out include the possible presence of:

- sewage water contamination in the building
- any oil or chemical contamination of the water
- extensive mold growth in the building

This determination will help you select the type of personal protective equipment to use during the cleaning process and the type of cleaning important in the area.

CLEANING PRINCIPLES

General Steps

1. Manage the source of water

- a. Remove all excess water; if available, use wet/dry vacuums with HEPA (High-Efficiency Particulate Air) filters. The HEPA filter will help reduce exposure to micro-organisms in the air.
 - b. Dry out the environment as rapidly as possible. If the relative humidity is high, drying probably will require mechanical air movers (big fans), dehumidifiers and air conditioning if available.
2. Discard any materials that have been wet for an extended period of time. The following materials should probably be discarded if they have been saturated for more than 48 hours:
- a. books
 - b. papers
 - c. clothing
 - d. stuffed animals
 - e. carpeting and carpet pads
 - f. building materials made with any cellulose such as drywall or gypsum board, ceiling tiles, particle board, pressed wood, dirty insulation, etc.
 - g. vinyl wall covering

The rule of thumb is to remove and dispose of any materials that are porous and made of organic material such as cellulose. They provide an excellent food source for mold and other micro-organisms. **When in doubt, throw it away.** These materials should be placed in plastic bags and discarded in the regular trash.

- 3. Clean and scrub all non-porous surfaces with soap and water.
- 4. Wear proper **Personal Protective Equipment (PPE)**
 - a. Heavy-duty rubber gloves—rubber gloves (nitrile) gloves are highly recommended
 - b. Eye protection (goggles work best)
 - c. Long pants and long-sleeved shirts
 - d. Rubber apron; and
 - e. Rubber boots if you are wading through water
- 5. After working with mold-contaminated material, **remove and clean** personal protective equipment;

wash thoroughly including hair, scalp and nails.

MOLD, MICRO-ORGANISMS AND MOLD-CONTAMINATED MATERIALS

Mold—dead or alive—is highly allergenic. Exposed, sensitive individuals can develop serious respiratory symptoms, skin reactions and asthma attacks. Some individuals may develop new mold allergies when exposed to heavy concentrations of spores. Even non-allergic individuals can suffer from significant eye, skin and respiratory symptoms after exposure to high concentrations of mold. Doctors have diagnosed occupational dust toxic syndrome (ODTS)—a flu-like illness with fever—in workers who have cleaned large areas heavily contaminated with mold. ODTS can occur after a single heavy exposure to dust contaminated with mold. If you are cleaning in heavily contaminated areas, and develop fever and malaise, see a physician immediately.

Professional restoration cleaners are highly recommended for large mold cleanups (more than 30 square feet of mold contamination). They generally will do some mold testing—surface or bulk sampling—to determine if there is residual mold present and re-treat the areas when results are positive.

At a minimum, anyone who is engaging in mold cleanup should have the appropriate training and equipment as recommended by the U.S. Environmental Protection Agency and other federal agencies. The more mold to be cleaned up, the more training needed.

CLEANING STRATEGIES FOR MOLD

- 1. The first step for cleaning mold is to dry the building out and discard any building material and personal items (described above) that have been wet for longer than 24-48 hours or any materials with visible mold growth. The difficult task will be to keep the relative humidity level in the building or house below **60 percent**—a level that inhibits mold growth. This may be impossible to do in very humid conditions without air conditioning and/or aggressive **dehumidification**.
- 2. Personal protective equipment is recommended for all mold jobs—large and small. At a minimum, workers should wear:
 - a. Goggles that do not have ventilation holes (so that mold spores will not get into the eyes)
 - b. **An N95 NIOSH-approved disposable respirator** (a paper respirator that can be found in most hardware stores)

- c. Long gloves that reach the middle of the forearm (made of natural rubber, neoprene, nitrile, polyurethane or PVC)
 - d. Long-sleeved shirts and long pants
 - e. Coveralls (plastic or Tyvek disposable suits are preferable) if mold contamination is more than 30 square feet
3. Use of methods to reduce dust in the area—misting (not soaking) areas before removing the mold.
 4. Cleaning of nonporous surfaces such as block walls with detergent and water. Soapy water will kill living and dead spores. Should disinfection be required, use of household bleach (sodium hypochlorite) sparingly or an EPA-registered disinfectant (preferably a disinfectant with hydrogen peroxide). **Overexposure to bleach or disinfectants may trigger existing asthma or cause a new case of asthma. Using high concentrations of bleach can also put cleaners at risk of toxic chemical exposure.**
 5. Vacuuming of work areas with a HEPA vacuum and cleaned with a damp cloth.
 6. Inspection and cleaning of any ductwork in a heavily mold-contaminated school or home preferably by a professional.
 7. Inspection and cleaning of unit ventilators (i.e., clearing drain pans; cleaning and disinfecting coils); filters should be changed if they are wet and dirty.
 8. Inspecting central heating, ventilation and cooling systems (air-handling units) before mold growth (coils and drain pans), and wet/dirty filters should be changed

Frequent rest breaks (at least 15-20 minutes each hour) may be called for if you are wearing a respirator. An N95 respirator or any negative pressure respirators put an additional strain on the cardiac and respiratory systems. Heat stress may become a problem if the building is not air-conditioned or well-ventilated.

EXTRA PRECAUTIONS FOR SEWAGE-CONTAMINATED WATER

Water contaminated with sewage or organic sewage material deposited by floodwater requires addi-

tional considerations; pathogenic micro-organisms hazardous to human health may be present. For this reason, sewage water cleanup is best done by professionals.

Cleaning up sewage treatment water calls for these added measures:

- Wet extraction methods to completely remove the sewage materials and all water used for cleaning up.
- Disinfection with any one of the following U.S. EPA registered disinfectants such as:
 1. Quaternary ammonium compounds (0.4 to 1.6 percent) such as Ecolab Mikro-Quat*
 2. Household bleach (sodium hypochlorite) diluted to 10 percent such as Clorox*
 3. Hydrogen peroxide (3 to 6 percent)
 4. Phenolics (0.5 to 5 percent) such as Ecolab Mikro-BacII*

Users must exercise caution in mixing disinfectants that may cause hazardous reactions. For instance, mixing chlorine-containing solutions such as bleach with ammonia will produce extremely toxic vapors.

These disinfectants will only work if they have the appropriate “**contact time**” with the contaminated surface. Most of these disinfectants require a minimum of 15 minutes contact time. Many also lose their ability to kill bacteria and micro-organisms very rapidly. For instance, household bleach and quaternary ammonium compounds are quickly inactivated by contact with sewage material. Only the phenolics will leave a residue that suppresses microbial growth. However, phenolics are very corrosive and irritating.

It is important that users of these potentially toxic disinfectants wear the proper respiratory protection; users may need to wear a properly fitted respirator with an organic cartridge. Selecting the right gloves and other protective clothing is also essential. If possible, users should consult a material safety data sheet (MSDS) for the disinfectant; it will give specific information on appropriate respirators, gloves and other protective measures for the product. Commercial products will also have important information on the labels.

* product/manufacturer names are examples only, not an endorsement of a particular manufacturer or product.

TOXIC CONTAMINANTS IN THE CLEANUP WATER

If you suspect that the flood or storm water is contaminated with gasoline, oil or other chemical contaminants, you should not participate in the cleanup. Only well-qualified professionals should engage in chemical cleanup work. Chemical cleanups require that workers wear properly fitted special respirators equipped with chemical cartridges designed for the toxic contaminants. Other types of specialized personal protective equipment are required as well.

EVALUATING THE CLEANING JOB

After a school or home is reoccupied, surveying the occupants for sickness, allergy and sensitivity is prob-

ably one of the best ways to measure the success of the cleaning project. A high rate of these health complaints should trigger a reassessment and cleaning of the building.

Inspecting the building for visible mold growth and “musty” odors weeks and months after the cleanup will also alert occupants that additional cleaning and remediation are necessary. Inspection need not be elaborate and can involve a simple tool such as the attached checklist.

SCHOOL INSPECTION: WATER DAMAGE AND MOLD

OBSERVATION	Basement	Cafeteria	Halls	Office	Auditorium	Classroom	Exterior	Other
Visible Mold								
Musty Smell								
Animal/Fecal Odor								
Roof Leaks								
Water intrusion – slab/ basement								
Chemical odors								
Cleanliness								
Water Stains								
Stains (Other)/ Other odors								