



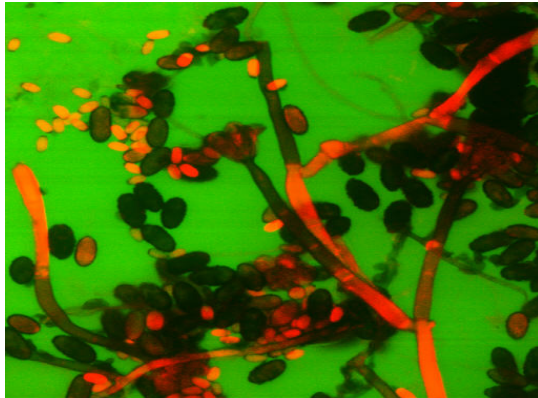
# Resilient Home Program

## Mold Prevention and Treatment in a Water-Damaged Home

This guide describes what the homeowner can do to help prevent mold or treat it effectively should it occur in their home after a flood, storm damage to the structure, a broken water line, or a backed-up sewer.

### What are molds and why are they a problem?

Molds are microscopic organisms that produce enzymes to digest organic matter and spores to reproduce.



Household mold viewed through a microscope

Molds thrive in warm and humid conditions, but they are found year-round in virtually every type of environment. Molds need moisture to begin growing and digesting whatever they are growing on.

In addition to the unpleasant “musty” smell associated with some molds, molds can adversely impact occupant health when their spores are released into the air. Some individuals, especially those who have existing health concerns such as allergies or asthma, may be sensitive to mold exposure. An individual exposed to mold may experience skin rash and itching, running nose, eye irritation, cough, congestion, and aggravation of asthma.

If mold is left untreated, occupants of the house may experience more serious effects, including fever, flu-like symptoms, fatigue, respiratory dysfunction (including coughing-up blood), frequent and excessive nose bleeds, dizziness, headaches, diarrhea, vomiting, and liver damage.

### How to prevent mold in a water-damaged home

#### The “Mold Zone”

For molds to grow they need adequate moisture, appropriate temperatures, and “food.” Removing any or all of these factors in a timely manner can reduce the occurrence of mold in water-damaged homes.

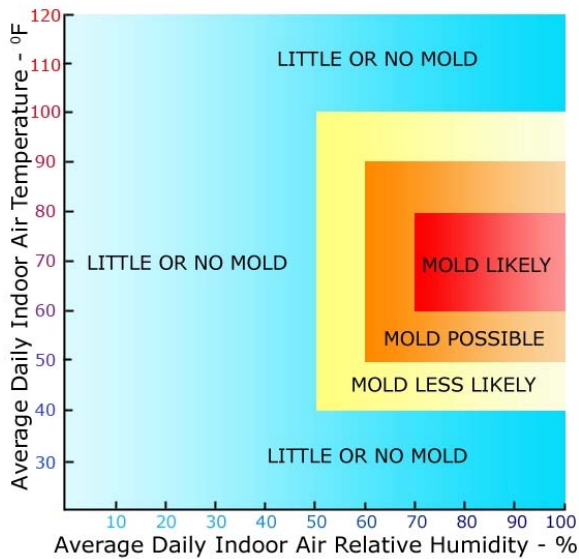
When excess moisture occurs in your home for an extended period due to a damaged roof, broken water pipe, or flooding, interior conditions are often ideal for molds. Even indoor average daily relative humidity levels above 70% can be enough to support mold growth.

Molds prefer average daily temperatures of 50-90°F and grow most vigorously in the 60-80°F range. Unfortunately, this is also the same temperature range that humans prefer.

Molds can grow on wood, ceiling tiles, wallpaper, paints, carpet, gypsum board, insulation, as well as the scum left by flooding which provide “food” on other materials.

#### Getting out of the “Mold Zone”

The best way to reduce mold development is to get your home out of the “mold zone” as quickly as possible. This involves three steps:



The “Mold Zone” – getting your house into the light blue and keeping it there is key to reducing mold problems.

- Start the home drying process as soon as possible
- Reduce/remove mold’s food sources
- Control the home’s interior relative humidity and temperature

To reduce mold problems you should begin the clean up process as soon after the water damage event as possible.

### Steps to follow to clean up water-damaged homes

If you are uncertain as to how to proceed, consider using professionals (See – Choosing Professional Help). If you decide to do it yourself follow the guidance below.

#### First steps

- Act quickly when water damage occurs. You can minimize the potential for mold by responding to the situation quickly and thoroughly. Water damaged materials left unattended frequently results in mold growth.
- If water is from damaged pipes or appliances, shut off the home’s water supply valve.
- Immediately remove standing water and wet materials including in crawl spaces and basements.
- If your home was damaged by a flood or storm, take appropriate actions to prevent further water

damage once it is safe to do so. This may include boarding up damaged windows, or covering a damaged roof with plastic sheeting.

#### Start the drying process

- To promote drying, initially open all exterior doors and windows whenever you are present and leave as many open when you are not present as security will permit. Upper floor windows can usually be left open all the time and will also assist in drying the whole house. Try to take advantage of cross-ventilation by opening windows on multiple levels and opposite sides of the building.
- Open all interior doors, especially closets and interior rooms, to allow air movement to reach all areas of the building.
- Take interior doors off their hinges if necessary to promote air-flow. Don’t open doors so that they are against a wall, as this will slow drying behind the door.
- Open kitchen cabinet and bathroom vanity doors; remove drawers and cross stack them to dry.
- Open the attic access, if available, to increase ventilation.
- When electricity is available, use fans to move moist air outside and dryer air into the house. However, avoid use of fans if the house is contaminated with sewage as the air movement may spread bacterial contamination.
- Use residential dehumidifiers, if needed to assist in the drying of the interior portions of the house, when the windows are closed up, or when the outdoor humidity level is higher than indoors.

#### Choosing Professional Help

To find a professional, look in your Yellow Pages under "Fire and Water Damage Restoration". Not all firms are equal so look for evidence of their training, certification, and years of experience working on problems like yours. Check out their references. After major natural disasters inexperienced and potentially unqualified firms appear – be wary. Doing it “right” is important to your long-term satisfaction.

#### Remove wet items

- Remove saturated porous materials such as rugs, drapes, mattresses or upholstery. Move them out of the home as soon as possible. Cover

- Remove wet carpet and padding. Tack strips should also be removed to minimize potential injury during subsequent activities.

#### *Cleaning*

- Remove mud and gross contamination from floors by shoveling into suitable containers. Reduce soil and contaminant levels on surfaces by flushing off with clear water. The fastest and most efficient method to clean and decontaminate materials and surfaces is by using a residential-type pressure washer to apply a cleaner-disinfectant solution to the affected areas. Brushes improve decontamination of floors and some walls by scrubbing solution into affected surfaces. Avoid scrubbing drywall and plaster walls at this time because they have become softened by the flooding and moisture and may have their surface damaged by scrubbing. Following the first cleaning, floors and walls should be rinsed with water and then cleaned and rinsed a second time. Squeegees and wet vacuums can be used to remove spent solution.

#### What to do should mold occur

Even with fast and effective action mold may develop in a water-damaged home. Should this occur the following steps will eliminate mold problems.

#### *Be realistic about your limitations*

- Even initial assessment and salvage can be hot, heavy work. If at all possible, work with another person while in the house. Unforeseen hazards can exist, so having help nearby is prudent.
- Consider having a professional clean up the area. If you decide to clean up on your own, follow the guidance below.

#### *First steps*

- Use goggles, gloves, and breathing protection while working in the area. Use an NIOSH (National Institute for Occupational Safety & Health) approved particle mask rated N-95, N-99, or N-100.
- Seal off the damaged area from the rest of your home. Prior to beginning tear out of water damaged materials, install plastic barriers

between affected and unaffected areas of the home (typically between floors). This will reduce the potential for secondary damage occurring in the unaffected areas. Cover heat registers or ventilation ducts/grills.

- Remove all your furnishings to a neutral area to be cleaned later.
- Bag in plastic all moldy and wet materials to be discarded.

#### *Cleaning*

- Following any necessary tear out, clean up any remaining debris and muck. Squeegees, shovels, and brooms are effective for such cleaning. Detailed cleaning and sanitizing of the remaining materials should be conducted. Use a shop vacuum with filters in place and with a solution of clean water and disinfectant in the tank (2-inch depth) to minimize the spread of dust.

#### *Mold removal*

- Porous materials with visible mold growth should be removed rather than treated. Porous materials include: paper-faced gypsum board, ceiling tiles, fabrics, cardboard, fiberboard, and other similar materials. It is possible to kill mold and bacteria on these materials, but it is difficult to remove the residual mold and bacteria materials which can also produce adverse health effects.
- Commercial mold removers or bleach eliminate visible evidence of mold growth on non-porous surfaces. Tests have found little or no mold growth in the non-exposed (hidden) portions of walls when the flood was several days duration and the walls were able to completely dry. Treatment of the non-exposed portions of walls is not warranted in many cases.



**Mold growth can be very heavy as in New Orleans after Hurricane Katrina where the flood lasted 3 weeks.**



**More typical mold growth is seen in the Tuskegee University test house where the flood lasted 3 days.**

- Bleach is convenient and is frequently suggested material for mold control. It is appropriate as a sanitizer for non-porous items after they have been thoroughly cleaned. Its effectiveness at killing bacteria and mold is significantly reduced when it comes in contact with residual dirt left by flooding. Bleach water can cause corrosion of the home's electrical components and metal parts of mechanical systems, and can also reduce the effectiveness of termite treatments in the soil surrounding the building. These risks should be considered when using it.
- Moldy surfaces should be cleaned thoroughly first and then disinfected. Residual mold spores should then be removed by added cleaning, since killing them does not reduce their toxicity. Scrub all affected hard surfaces: first with a mild detergent solution, such as laundry detergent and warm water. Then use a commercial mold remover according to the label directions or a solution of 1/4 cup (or more for heavy mold) of bleach to one quart of water. Spraying vertical surfaces using a compression (pump-up) garden sprayer is recommended. Wait 20 minutes and repeat this process.
- After another 20 minutes apply a borate-based detergent solution (read the ingredients listed on the package label for borates) and do not rinse. This will help prevent mold from growing again.

#### Drying

- Once the cleaning process is completed, the building and any remaining contents need to dry thoroughly.
- Exterior rooms with excellent ventilation can take 2 to 4 weeks to dry, depending on the

temperature and humidity outside. Interior rooms, or those with minimal ventilation, can take 4 to 6 weeks or more to dry and are candidates for the use of mechanical drying equipment. Fans, dehumidifiers, air conditioners, or auxiliary electric heaters will speed drying.

- Failure to allow for adequate drying prior to reconstruction can trap moisture in the building, which can cause rot and mold problems in the future. Be sure to check the moisture content of materials before enclosing them in reconstruction.

#### Control of future mold problems

- There is no practical way to eliminate all molds and mold spores in the indoor environment. The easiest way to control indoor mold growth is to control moisture and keep the house out of the "mold zone".
- Reduce indoor humidity by venting to the outside bathroom exhaust fans, range hoods, clothes dryers, and any other moisture-generating sources.
- Use air conditioners or residential dehumidifiers to reduce indoor humidity during periods of high outdoor humidity.
- In areas where there is a perpetual dampness like basements avoid installing carpeting, ceiling tiles and other materials that can retain the excess moisture.
- Keep your home in good repair to avoid incidences that could bring unwanted moisture into your home.

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