

Do-It- Yourself Mold Prevention, Inspection, Testing & Remediation

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Chapter One

Mold Prevention

Prevention is the best way to battle molds in your home! Airborne mold spores from live indoor plants can travel in air currents to cause health problems for occupants and possible toxic mold growth in the home through mold cross-contamination.

“The most important means for avoiding adverse health effects is the prevention (or minimization) of persistent dampness and microbial growth on interior surfaces and in building structures. The presence of many biological agents in the indoor environment is due to dampness and inadequate ventilation. Excess moisture on almost all indoor materials leads to growth of microbes, such as mould, fungi and bacteria, which subsequently emit spores, cells, fragments and volatile organic compounds into indoor air. Moreover, dampness initiates chemical or biological degradation of materials, which also pollutes indoor air. Dampness has therefore been suggested to be a strong, consistent indicator of risk of asthma and respiratory symptoms (e.g. cough and wheeze). The health risks of biological contaminants of indoor air could thus be addressed by considering dampness as the risk indicator. Health hazards result from a complex chain of events that link penetration of water indoors, excessive moisture to biological growth, physical and chemical degradation, and emission of hazardous biological and chemical agents.” recommended the World Health Organization in its report *WHO Guidelines for Indoor Air Quality: Dampness and Mould*, published July 16, 2009.

The “toxic mold” term refers to any mold that produces mycotoxins in its spores. Mycotoxins are generally recognized to be cytotoxic, meaning they have the capacity to pass through the human cellular wall and disrupt certain cellular processes. *Stachybotrys* “black mold”, *Cladosporium*, *Penicillium* and *Aspergillus* are the four most dangerous indoor toxic molds --- frequently found to be growing in homes and workplaces.

Ninety four percent (94%) of all respiratory ailments are caused by polluted air according to the **American Medical Association**, which also reported that one-third of our national health bill is for causes directly attributable to indoor air pollution.

The U.S. Government **Environmental Protection Agency** (EPA) warns people that "Most people are aware that outdoor air pollution can damage their health but may not know that indoor air pollution can also have significant effects. EPA studies of human exposure to air pollutants indicate that indoor air levels of many pollutants may be 2-5 times, and occasion more than 100 times, higher than outdoor levels. These levels of indoor air pollutants are of particular concern because it is estimated that most people spend as much as 90% of their time indoors. In recent years, comparative risk studies performed by EPA and its Science Advisory Board (SAB) have consistently ranked indoor air pollution among the top five environmental risks to public health."

How Mold Grows

by William B. Rose, in his book **Water In Buildings: An Architect's Guide to Moisture and Mold**, pp. 236-237

Mold spores are the principal means of mold reproduction. Most mold spores are transported in the air, in order to find new sites for colonization. Spores may carry toxins capable of disposing of previous colonizing organisms. *Penicillium* mold, for example, may poison bacteria in the neighborhood with penicillin. *Stachybotrys* spores may...contain toxins such as tricothecenes to wipe out the indigenous local bacteria or simpler fungi.

All organisms digest food; mold does its digestion outside the organism itself. It excretes enzymes capable of breaking down long-chain hydrocarbons. Those enzymes need to travel by diffusion in a thin water film to the food molecules,

which they break down into simpler sugars and starches. These water-soluble simpler compounds then diffuse outward from the site where they were created, and some of them migrate back to the hungry mold organism. Mold relies to a great extent on having a thin film of water several molecules thick that can transport the enzymes outward, but not too far, and transport the broken-down compounds back to the organism. The film, of course, is nothing like a flat membrane because the surface of materials at the microscopic level is mountainous and cavernous. The mold organism grows hyphae, which are thin strands the tips of which are capable of conducting the same reactions where they touch the upholstery (or other cellulose-based surfaces) on which the organism resides. The strands of hyphae form a mat called a *mycelium*. The mycelium creates a buffer that helps to regulate the wetness of the surface. It retards evaporation of the surface, helping to guarantee a stable moisture film necessary for digestion. Mold needs an edible substrate, air, and a multi-molecular film at the surface.

The conditions for initial mold growth on a surface may be quite different from the conditions under which growth continues,, or under which growth recurs on affected but scrubbed surfaces. Generally, initial growth requires higher levels of moisture than is required for continued growth. Mold continues to grow on surfaces:

- ▶ Where the moisture content of the substrate provides a dependable water source.
- ▶ Where the air humidity is high. This ensures that the water film is thick enough to permit diffusion of enzymes outward and simple hydrocarbons back to the organism.
- ▶ Where there is no water flow on the surface.
- ▶ Where sufficient food can be found.
- ▶ Where there are no significant inhibiting chemicals or treatments.

Different (mold) organisms require different thicknesses of films. The phylloplane (leaf-inhabiting) fungi, such as *Penicillium* and *Cladosporium*, get by with rather thin films. They can thrive where the relative humidity in the air is 80% or greater. *Stachybotrys* requires more water and a thicker film; it requires a surface relative humidity around 95% or greater.

Here is an article taken from the EPA website, explaining the in-depth meaning of the term **exposure pathways**:

Exposure Pathways to Hazardous Materials

An exposure pathway refers to the way in which a person may come into contact with a hazardous substance, whether it is a chemical, biological or some other harmful substance. There are three basic exposure pathways: inhalation, ingestion or direct contact. The degree or extent of exposure is determined by measuring the amount of the hazardous substance at the point of contact, whether that contact occurs in the lungs of someone who has breathed in the hazard, the stomach lining of someone who has eaten it, or the skin of someone who has touched it. Health and ecological hazards can result from such exposures. Some common ways in which people may become exposed to hazardous substance include the following:

Groundwater and Surface Water. Exposure will occur if people drink contaminated groundwater or surface water, accidentally ingest it while swimming or if it comes into contact with their skin (e.g. in the shower, while swimming, etc.).

Soil, Sediment, Dust. People will be exposed to hazardous substances in soil, sediment, or dust if they accidentally ingest it (e.g. the contaminants land on their food), if they breathe it in (especially dust) or if their skin comes into direct contact with the contaminated materials. Because of their play habits, children are highly susceptible to exposure through these pathways.

Air. When the hazardous substance takes the form of vapors or is absorbed by particulate matter (e.g. dust) the simple act of breathing can expose people to contamination. In some cases, a person's skin can absorb a hazardous substance in vapor form, although inhalation is considered the greater threat.

Food. Eating food that has been contaminated is another common exposure route. In some cases, food found on people's plates may be contaminated as a result of direct exposure to the hazardous substance. In other cases, food

contamination may occur further down the food chain. For example, hazardous substance can be collected in the fatty tissues of animals that ingest contaminated plants. The contamination can then be transferred to the animal's natural predators, and eventually, to people.

From the U.S. Environmental Protection Agency website (<http://www.epa.gov>)

"All molds have the potential to cause health effects. Molds can produce allergens that can trigger allergic reactions or even asthma attacks in people allergic to mold. Others are known to produce potent toxins and/or irritants. Potential health concerns are an important reason." The U.S. EPA, March, 2001.

The top mold health symptoms are the following in alphabetical order. A mold victim may experience one or more symptoms, separately or simultaneously ---

- Allergies
- Asthma
- Bleeding Lungs
- Breathing Difficulties
- Cancer
- Central Nervous System effects
- Colds, recurring and with decreased resistance to infection
- Coughing and resulting sore lungs/chest from excessive coughing
- Coughing up blood
- Dandruff Problems (chronic) that do not go away despite use of Anti-dandruff Shampoos
- Dermatitis and Skin Rashes
- Diarrhea
- Eye and Vision Problems
- Fatigue (chronic, excessive or continued) and/or general malaise
- Feeling lost or "disconnected" from what is happening around you
- Flu Symptoms
- Hair Loss
- Headaches
- Hemorrhagic Pneumonitis
- Hives
- Hypersensitivity Pneumonitis (extrinsic allergic alveolitis, farmers lung disease)
- Irritability
- Itching of the nose, mouth, eyes, throat, skin or any area
- Kidney Failure
- Learning difficulties or mental functioning problems or personality changes
- Memory Loss or Memory Difficulties / Alzheimer's-like symptoms
- Open Skin Sores and Lacerations
- Organic Dust Toxic Syndrome
- Peripheral Nervous System Effects
- Redness of the Sclera (white of your eyes)
- Runny Nose (Rhinitis), clear, thin, watery mucus from your nose may appear suddenly; or thick, green slime coming out of the nose (from sinus cavities)
- Seizures
- Sinus Congestion, Sinus Problems and Chronic Sinusitis
- Skin Redness

- Sleeping Disorders
- Sneezing
- Sneezing Fits (more than three sneezes in a row, happening often)
- Sore Throat
- Tremors (shaking)
- Verbal Dysfunction (trouble in speaking)
- Vertigo (dizziness)
- Vomiting

If you are experiencing any of the above mentioned health symptoms, it is recommended that you consult with your doctor. To know more on mold-related health problems, get your own copy of the Mold Health Guide E-book available from [Mold Mart](#).

Water intrusion can happen in your home, condominium, apartment building, office or commercial building from many sources. Water can enter your home or building by leaking or by seeping through basement floors, walls, foundations and concrete floor slabs. Water can enter your home from bathroom showers or even cooking also adds moisture to the air in your home and thus, increases the relative indoor humidity inside your home.

Indoor humidity of 50 to 60% or more can easily support active mold growth through out your home or building. Indoor humidity of 30 to 40% discourages mold growth. You measure indoor humidity year-round with a digital hygrometer [Thermometer Department of Home Depot, Lowe's, or at a hardware store]. The amount of moisture that the air in your home can hold depends on the temperature of the air. As the temperature goes down, the air is able to hold less moisture. This is why, in cold weather, moisture condenses on cold surfaces (e.g., drops of water form on the inside of a window). This moisture condensation can enable mold to grow on wet surfaces and increase humidity.

Water problems can also result from roof leaks from poorly-maintained or storm or weather-damaged roofs, from water supply line leaks, from sewer line breaks, from clogged condensation lines running from central air conditioning units on your roof or in your attic, from deteriorating or defective siding and from windows or doors that are not properly weather-sealed.

Mold prevention requires the prevention or prompt repair of water problems and moisture problems inside your home or other real estate property.

There are many ways to control moisture in your home:

- ✓ Avoid having the following moisture-creators/mold-makers indoors in your home, apartment or office: fish aquariums, indoor plants, vaporizer, humidifier, hot tub continually full of water and other indoor water reservoirs;
- ✓ Anything in your home that gets wet should be dried quickly because mold can grow after just 24 hours of continuous moisture;
- ✓ Note that wallpaper is worse than paint for causing mold because it seals with water in the wall and provides food for mold;
- ✓ Fix leaks and seepage. If water is entering the house from the outside, your options range from simple landscaping to extensive excavation and waterproofing. (The ground should slope away from the house.)

Water in the basement can result from the lack of gutters or a water flow toward the house. Water leaks in pipes or around tubs and sinks can provide a place for mold to grow;

- ✓ Even the smallest of openings in a roof, wall or foundation can permit entry of water into the home, especially during times of heavy rain. For example, you may need to apply a waterproofing roof sealant over an older asphalt shingled roof in its entirety to be sure to seal against roof leakage. **You may need a new roof;**
- ✓ Prevent mold by making your bathroom floors and walls out of glass blocks [set with non-wood-based rods which are sold with the blocks or in cement with adequate amounts of waterproofing compound];



An illustration of floors and walls made out of glass blocks. This type of construction materials are less susceptible to mold mildew growth and is easier to clean.

- ✓ Prevent mold by making your bathroom floors and walls out of marble [set in cement with cement containing adequate amounts of waterproofing compound];



An illustration of bathroom floors and walls made out of marble. Like the glass, this type of construction materials is less susceptible to mold mildew growth and is easier to clean.

- ✓ Put a plastic cover or heavy roofing paper on the ground over dirt crawlspaces to prevent moisture from coming in from the ground. Be sure crawlspaces are well-ventilated. If possible, do not enclose the crawlspace. In extreme conditions, a fan or blower may be needed in the crawl space to move the humid air from under the building. You can purchase a programmable exhaust fan that turns on whenever the crawl space humidity exceeds 40%;
- ✓ Replace cracked or defective mortar joints in foundations and basement walls;
- ✓ For waterproofing concrete and other masonry walls above ground level, apply two coats of cement paint, tinted with mineral coloring if desired. Waterproofed coatings to seal absorbent brick and other outside surfaces;
- ✓ To prevent dampness and future mold growth in your stairwell leading to your basement, install a good roof over the stairwell, with gutters to take roof rain away from the house. If you cannot stop the water intrusion, you will always have mold. If you have water penetration from the ground into the stairwell, stucco the sides of the stairwell with cement containing adequate amounts of waterproofing compound to make the stucco coating an effective barrier against water penetration.
- ✓ Waterproof basements and walls on the outside of the walls below ground level. Also, use water-sealant paint on basement floors and walls. As for waterproofing the exterior of basement walls, “Today’s new latex based sealants make tar a thing of the past. The problem of re-sealing the outside of a basement however is not so much in the material, as in the amount of excavation needed to actually expose the work surface. Be prepared for that step to be your most cost-intensive and, as always, dig safe. In addition, you will need to rent a power washer to get any old, ineffective sealant off. Also, you will need to ensure that the basement has proper drainage. If you are prepared to go forward with a job like this, take it all the way. The reason your basement is leaking now is probably because someone already tried to cut corners in the past,” advises the *Contractor Bulletin* website [see *Acknowledgements*];

HOT TIP: If you have serious problems with leaks in your foundations, basement walls and basement floors, and if exterior waterproofing is not possible or is too expensive, consider installing new concrete liner walls and floors, 2 to 4 inches thick, just inside and touching your present basement walls and floors, with the concrete containing sufficient amounts of waterproofing chemicals mixed into the concrete for complete water proofing..

- ✓ Install or adjust outside gutters and drains so that water does not collect near the outside walls, and so that the water is discharged away from the foundation or basement walls on a downgrade flow. Check gutters and drains regularly to avoid clogs. Place lawn sprinkler systems so that they do not soak outside walls;

HOT TIP: A house built on a downgrade slope will almost always have a water problem. Dig out the dirt away from the foundation walls so that you can apply a waterproofing material that will fill the concrete pores then, lay 4 inch plastic perforated pipe with the holes up at the base of the footing, continuing around the three sides of the upper grade of the house. These drainage pipes will continue on to a gravity flow. Backfill over the pipe system with at least 30 inches of 1- or 2-inch crushed stones, and lay 6 inches of 3/8-inch crushed stone over this system to restrict the oncoming top soil from filtering through the larger stone and entering into the pipe system. Next, lay rigid insulation against the foundation and backfill to grade. [From *The Wet Basement* book.]

- ✓ Trim back trees and shrub around the house to reduce shade on the house because sunlight with its ultraviolet light kills mold spores and heat dries out moisture and water;
- ✓ Ventilate and insulate attic and crawl spaces (remember to cover earth floors in crawl spaces with heavy plastic or black roofing felt paper of 30 lb weight). The plastic (polyethylene) sheeting or felt paper should be laid on the ground and extend slightly up the sides of the crawlspace to be effective. The sheeting or felt paper should be anchored with sand, bricks and other weights. Overlap plastic sheets and seal with caulking or tape to prevent ground moisture from entering the crawlspace. The plastic should also run up the sides of the crawl space to help make a tight moisture barrier;
- ✓ All non-electrical equipment, such as duct work, can be vacuumed, wet-wiped, rinsed and dried. Light fixtures, wiring boxes and appliances should be vacuumed with a plastic wand after turning off breakers or removing fuses. Check to make sure the circuit is not live! Moldy books and papers are difficult to treat. If they are valuable, dust between each page with baking soda, put the materials in a plastic bag and place them in the sun for several hours. When the items are odor-free, vacuum or wipe them, using gloves to protect your skin.

HOT TIP: A fan or blower may be needed in the attic to exhaust the humid air from under the attic. You can purchase a programmable exhaust fan that turns on whenever the attic humidity exceeds 40% and/or a specified temperature.

- ✓ Use exhaust fans in bathrooms to exhaust moisture to the outside (not into the attic). Bathrooms are more likely to have mold growth if exhaust fans are not used while showering or bathing. Run the exhaust fan both during and after showering or bathing. Soap scum, shower walls, the grout between ceramic tile, the ceramic tile itself and fiberglass are all possible surfaces for mold growth;
- ✓ Use an exhaust fan in the kitchen to remove moisture to the outside (not into the attic, ceiling or walls). One big source of kitchen moisture into the air is the boiling water using no exhaust fan;
- ✓ Vent your clothes dryer directly to the outside to remove the moisture from the dried clothes, **and never to a crawl space, attic, or into walls, ceilings or floors;**
- ✓ Turn off (or reduce your use of) certain appliances (such as humidifiers or kerosene heaters) if you notice moisture on windows and other surfaces. Humidifiers should be turned off when the relative humidity is more than forty percent (40%);
- ✓ Use dehumidifiers and air conditioners, especially in hot humid climates to reduce moisture in the air, but be sure that the appliances themselves do not become sources of mold. When the humidity level is high, run your dehumidifier when operating your air conditioner. Your desired indoor humidity level is 30 to 40% to discourage mold growth. Use a dehumidifier that is programmable to operate so as to maintain the desired indoor humidity level;
- ✓ When using air conditioners or dehumidifiers, keep windows and doors closed;
- ✓ During humid weather, get rid of dampness inside the house by heating the house for a short time with the doors and windows being left open to let out the moisture laden-air. An exhaust fan may be used to help force the air outside;
- ✓ Close your home's windows when it's raining outside to keep out moisture-laden air;

- ✓ Raise the temperature of cold surfaces where moisture condenses. Use insulation and thermal pane windows or storm windows. (A storm window installed on the inside works well than one installed on the outside.) Open the doors between rooms (especially the doors to closets which may be colder than the rooms) to increase circulation. Circulation carries heat to the cold surfaces. Increase air circulation by using fans and by moving furniture from wall corners to promote air and heat circulation. Be sure that your house has a source of fresh air and can expel excessive moisture from the home;
- ✓ Window sills are a prime location for mold growth. Prevent window sill mold with such steps such as: (1) increasing room ventilation with a ceiling or room fan; (2) raising blinds and moving curtains to allow the sun and fresh air to contact the window sills; (3) washing the sills frequently with Borax laundry detergent, a natural mold cleaner, in warm water to remove the dust that the mold eats to grow and deposited/landed mold spores; and (4) using a programmable dehumidifier to keep room humidity to a mold-discouraging 30 to 40 percent. Mold growth and moisture accumulation around a window may also be caused by poor window installation, inadequate window maintenance, and leaking flashing around the window.
- ✓ Pay special attention to carpeting, rugs and padding on concrete floors. Carpeting and padding can absorb moisture and serve as a place for mold and other biological pollutants to grow. Instead of carpeting and padding, install ceramic tile or linoleum flooring or asphalt tile flooring, and use area rugs which can be taken up and washed often. In certain climates, if carpet is to be installed over a concrete floor, it may be necessary to use a vapor barrier (plastic sheeting) over the concrete and cover that with sub-flooring (insulation covered with plywood) to prevent a moisture problem;
- ✓ Increase the flow of air within your home. Move furniture away from walls (provide a few inches of separation to allow air movement behind the furniture). Do not shelve books directly against an outside wall. Use a ventilation fan to bring dry air from the outside into your home or use fans to expel moisture laden air from your home. Open closet doors to permit air circulation. Consider installing a fan inside a closet to increase air circulation or frequently use a household fan to direct fresh air into a closet. Hang the clothes loosely so that air can circulate around them. Dry all wet clothing (including clothes wet from rain or perspiration) before putting them into closet;
- ✓ The air in closets and other small areas can be dried by using an electric light continuously (60 to 100 watt bulb). The heat from the light bulb will prevent growth of mildew if the space is not too large. *Caution: Be sure to place the light bulb far enough from clothing and other flammables to avoid the danger of fire;*
- ✓ Keep the quantity of indoor plants to a minimum and do not have an indoor-planted area. It is best to have NO indoor plants of any kind because mold feeds on plants and throws airborne mold spores into the air you breathe;
- ✓ Chemicals that absorb moisture (such as silica gel, activated alumina, anhydrous calcium sulfate and molecular sieves) may be used to absorb moisture from the air. These chemicals are not harmful to fabrics and feel dry even when they saturate the cloth. Hang cloth bags with the chemical in clothing closets, or place an open container of it in the closet, on a shelf, preferably, or on the floor. See that the door is well-sealed and kept closed so that moisture from outside air will not get in. You may scatter the dry granules through layers of clothing and other articles that are to be stored in tightly closed chests or trunks. All of these chemicals can be used over and over if you dry them between uses. Simply place the granules in a vented oven 300 - 350 °F (149 - 177 °C) for several hours. Then put the hot granules in an airtight container to cool. Silica gel and anhydrous calcium sulfate (specially treated with a color indicator) are pink when full of moisture while blue when dry;
- ✓ As for anhydrous calcium chloride (CaCl_2), this chemical is available in small, white granules that hold twice their weight of water. But it liquefies as it absorbs moisture, so do not let this chemical touch clothing or

household textiles because it can make holes in them. To use anhydrous calcium chloride (CaCl_2), place the granules in a simple, cup-shaped container made from non-rusting screen or waxed cardboard (milk carton) perforated with small holes. Support the container in an enameled pot so the liquid can drip away from the container, leaving the calcium chloride to take up more moisture. Then place the pot in the closet, preferably on the shelf, and keep the door shut and sealed. One pound (454 grams) will last from 2 weeks to 2 months, depending on the humidity. When only liquid is left, discard the liquid and start over. *Caution: Add water to the liquid before disposing it.* The above very thorough two pointers on using chemicals that absorb moisture were written by Wanda Eubank and Betty Feather, *University of Missouri-Columbia*, as published on the website: <http://muextension.missouri.edu/xplor> (reprinted with permission. Copyright 2000 University of Missouri. Published by the University Extension, University of Missouri-Columbia);

- ✓ Moisture problems and their solutions differ from one climate to another. The Northeast is cold and wet, the Southwest is hot and dry, the South is hot and wet, and the Western Mountain states are cold and dry. All of these regions can have moisture problems. For example, evaporative coolers used in the Southwest can encourage the growth of mold and other biological pollutants. In other hot regions, the use of air conditioners which cool the air too quickly may prevent the air conditioners from running long enough to remove excess moisture from the air. The types of construction and weatherization for the different climates can lead to different problems and solutions;
- ✓ Be careful in your use and care of humidifiers. It is usually very unwise to add mold-encouraging moisture to your indoor air. It is important to use a humidifier only when during a very low indoor humidity [such as 10 to 30%] and to correct moisture setting for existing conditions. The humidifier must be thoroughly cleaned to get rid of mold growth inside it. The possible health effects [beyond health harm from mold growth] resulting from the dispersal of microorganisms and minerals by home humidifiers are not fully understood. It may be prudent to reduce the potential for personal exposures to these materials by taking the following precautions particularly when using ultrasonic and impeller humidifiers;
- ✓ During the cleaning of a dehumidifier, be sure you unplug the unit from the electrical socket first. Empty the tank, wash off the surfaces with a solution of 2 cups of Borax laundry detergent in a 1 gallon of distilled water, wipe all surfaces dry and refill the water in portable humidifiers daily or every few days to reduce any growth of microorganisms. Another way of cleaning your dehumidifier is by using [MoldZyme™ Mold and Mildew Stain Cleaner](#); Also, follow the manufacturer's instructions for changing water in console humidifiers; and
- ✓ When filling a humidifier, use water with low mineral content [preferably distilled water] to prevent the build-up of scales and the dispersal of minerals into the air. Again, be sure to unplug the unit during cleaning. Clean portable humidifiers every third day. Empty the tank and use a brush or other scrub to clean it. Remove any scale, deposits or film that has formed on the sides of the tank or on the interior surfaces then, wipe all surfaces completely dry.
 - Follow the manufacturer's suggestions on the use of cleaning products or disinfectants. In the absence of specific recommendations, clean all surfaces coming in contact with water with a 3% solution of hydrogen peroxide (H_2O_2). If you use any cleaning or disinfecting agent, rinse the tank thoroughly with several changes of tap water to prevent dispersal of chemicals into the air during use. Follow the manufacturer's directions on cleaning and maintaining console and central (furnace mounted) humidifiers. In particular, if the humidifier contains a tank, do not allow water to stand in the tank for extended periods of time always and keep the water clean;

- Keep steam vaporizer humidifiers out of the reach of children because steam and boiling water may cause burns;
- Do not humidify indoor air if relative humidity level exceeds 50%. Higher humidity levels may encourage the growth of biological organisms in the home. Hygrometers, available at local hardware stores, may be used to measure humidity levels. Some humidifiers contain a built-in humidistat which may be adjusted to the proper moisture level. Relocate the humidifier, or lower its humidistat or reduce its use if water condenses on windows, walls or on pictures;
- Do not permit the area around the humidifier to become damp or wet. If dampness occurs, turn the output volume of the humidifier down. If the humidifier output volume cannot be turned down, use the humidifier intermittently. Do not allow absorbent materials, such as carpeting, drapes, or table cloths, to become damp;
- Follow the manufacturer's instructions regarding the use, maintenance and replacement of any materials supplied with the humidifier and use appropriate materials as recommended by the product manufacturer;
- As directed, clean the humidifier at the end of the humidifying season or when the product will not be in frequent use. Before storage, make sure all the parts are dry. Dispose all used demineralization cartridges, cassettes or filters. Store the unit in a dry location. After storage, clean the unit again and remove any dust on the outside of the humidifier unit; and
- Stop using your humidifier and contact your physician if you have respiratory symptoms which you believe are associated with periods of use of your home humidifier, even if you are following maintenance directions.

Prevent Mold by Maintaining and Cleaning All Appliances that Come in Contact with Water

- ✓ Have major appliances, such as furnaces, heat pumps and central air conditioners, inspected and cleaned regularly by a professional, especially before seasonal use. Change filters on heating and cooling systems according to manufacturer's directions. (In general, change filters monthly during use.). When first turning on the heating or air conditioning at the start of the season, consider leaving your home until it airs out;
- ✓ Have window or wall air-conditioning units cleaned and serviced regularly by a professional, especially before the cooling season. Air conditioners can help reduce the entry of allergy-causing pollen. But they may also become a source of mold if not properly maintained. Clean the coils and rinse the drain pans according to manufacturer's instructions so as to prevent accumulation of water;
- ✓ Have furnace-attached humidifiers cleaned and serviced regularly by a professional, especially before the start of the heating season. In general, it is very unwise to run a humidifier if you want to prevent mold problems. You might be wise to disconnect your humidifier, or to operate it only during times of abnormally low indoor humidity [such as 10 to 30% indoor humidity];
- ✓ Follow the manufacturer's instructions when using any type of humidifier, change the water as recommended by the manufacturer. Unplug the appliance before cleaning. Every third day clean all surfaces coming in contact with water with a 3% solution of hydrogen peroxide, H₂O₂, [available at your local drug store], using a brush to loosen deposits. Some manufacturers recommend using diluted household bleach for cleaning and maintenance, generally in a solution of one-half cup bleach in one gallon of water but **bleach is**

very ineffective as a mold killer. It is better to clean with either hydrogen peroxide, a solution of two cups of Borax laundry detergent diluted in one gallon of distilled water;.

- ✓ Empty dehumidifiers daily and clean often. When using any household chemicals, rinse well to remove all traces of chemicals before refilling the humidifier. If possible, have the appliance drip directly into a drain. Follow manufacturer's instructions for cleaning and maintenance. Always disconnect the appliance before cleaning; and
- ✓ Clean refrigerator drip pans regularly according to manufacturer's instructions. If the refrigerator and freezer doors do not seal properly moisture may build up and mold can grow. Remove any mold on door gaskets and replace faulty gaskets.

Prevent Mold by Knowing the Frequent Causes of Mold Growth

- Attics with roof leaks or inadequate ventilation;
- Basement flooding and water intrusion;
- Basements with dirt floors or water problems;
- Behind and under showers, tubs, toilets and bathroom walls;
- Books, magazines, newspapers;
- Carpeting and padding;
- Ceiling tiles;
- Ceilings from roof leaks;
- Closeness to lake, river or ocean;
- Clothes dryer exhausting into walls or attic;
- Clothing;
- Construction defects and poor workmanship;
- Crawl spaces;
- Drapes;
- Dryer venting into walls or attic;
- Drywall in ceilings and walls;
- Exhaust fans venting into walls or attic;
- Firewood stored indoors;
- Flooding;
- Garbage disposal;
- Heating/cooling equipment and ducts;
- High indoor humidity [60%+];
- Humidifiers and vaporizers;
- Humidifiers and vaporizers [inside];
- Inadequate ventilation;
- Indoor plants;
- Landscaping mistakes like mulch and plant glut;
- Leaky roof;
- Leather items;
- Lot grading downward to home;
- Overflow from tubs, showers, sinks and toilets;
- Paint;
- Paper, cardboard and other paper products;
- Plants, indoor plants;
- Rags;

- Sewage pipe leaks;
- Siding water leaks;
- Upholstered furniture;
- Venting inadequacies in kitchen and bathrooms;
- Wallpaper and behind wallpaper;
- Walls from siding, roof and plumbing leaks;
- Water supply pipe leaks; and
- Wood products.

Water Condensation is one of the major causes of mold growth indoors. Here are the major Condensation Causes & Solutions:

Area	Indication	Possible Causes	Suggest Solutions
Windows	Condensation on most inside surfaces of inner pane	<ul style="list-style-type: none"> • Abnormally high humidity • Lower thermostat setting at night • Sudden change to colder weather • Poor air circulation 	<ul style="list-style-type: none"> • Control humidity sources and moisture (humidifier, showers, etc.); • Add layer of glass or plastic on inside to increase interior surface temperature; • Condensation should disappear as house warms up (adjust thermostat setback slightly higher if condensation is severe); • Ventilate home to lower humidity level; • Improve circulation by opening drapes, moving furniture or objects blocking the registers; • Run furnace fan continuously.
	Condensation on upper storey windows only	<ul style="list-style-type: none"> • Cool air leaking into the lower level, warm air leaking out into the upper level 	<ul style="list-style-type: none"> • Improve caulking and weather-stripping to reduce cold air infiltration; • Ensure an adequate supply of fresh and combustion air.
	Condensation on windows on one side of house only	<ul style="list-style-type: none"> • Cold air in on windward side, warm air out on downwind side 	<ul style="list-style-type: none"> • Improve caulking and weather-stripping to reduce cold air infiltration.
	Condensation on north windows only	<ul style="list-style-type: none"> • Inner surfaces cooler than south windows in daylight 	<ul style="list-style-type: none"> • Open drapes and improve circulation; • Add layer of glazing on the inside.
	Condensation on windows, 1-2 rooms	<ul style="list-style-type: none"> • Room(s) cooler than rest of house • High humidity rooms, e.g. laundry room • Room with humidifier 	<ul style="list-style-type: none"> • Improve circulation by opening drapes, leaving room door(s) open; • Run furnace fan continuously; • Exhaust dryer to outside and shut off humidifier.
	Condensation	<ul style="list-style-type: none"> • Air leakage from 	<ul style="list-style-type: none"> • Seal inner pane between glass

	between layers of glazing	inside into space between glazing; <ul style="list-style-type: none"> • Outer storm window sealed; • Broken seal 	layers with caulking or replace weather-stripping between sliding units; <ul style="list-style-type: none"> • Seal inner unit; allow outer unit to breathe to exterior; • Replace window with good new sealed unit capable of withstanding relative humidity levels.
	Condensation on window frame	<ul style="list-style-type: none"> • Air leakage, rough opening space and poor weather-stripping; • Air leakage: frame, sash, meeting rails; • Poor quality metal or plastic frames 	<ul style="list-style-type: none"> • Seal between frame and rough opening space and improve caulking and weather-stripping • Install sealed interior plastic or Plexiglas storm or shutter • Replace with good quality wood or units with a thermal break
	Condensation on doors	<ul style="list-style-type: none"> • Uninsulated door 	<ul style="list-style-type: none"> • Replace with insulated door; add storm door
Doors	Condensation on door	<ul style="list-style-type: none"> • Air leakage around door 	<ul style="list-style-type: none"> • Replace, adjust weather stripping, threshold; add storm door frame/threshold
	Condensation on lock, knob, hinges	<ul style="list-style-type: none"> • Air infiltration due to negative pressure inside 	<ul style="list-style-type: none"> • Replace weather stripping; add fresh air duct to heating system; add storm door
Walls	Condensation on closet walls	<ul style="list-style-type: none"> • Poor air circulation around clothes 	<ul style="list-style-type: none"> • Improve air circulation; open doors; add louvers, grilles; undercut doors; leave space by outside wall
	Condensation and staining below window	<ul style="list-style-type: none"> • Melted window condensation Window in humid area • Insulation missing 	<ul style="list-style-type: none"> • Improve window as above. • Eliminate window unit, insulate opening • Add insulation to wall cavity
	Condensation on many walls	<ul style="list-style-type: none"> • Abnormally high humidity • Poor air circulation • Missing insulation 	<ul style="list-style-type: none"> • Control humidity sources • Run furnace fan continuously • Add insulation to wall cavities
	Condensation in corners	<ul style="list-style-type: none"> • Incoming air • Thermal bridging, missing insulation • Poor air circulation 	<ul style="list-style-type: none"> • Caulk siding corners, window brick moulds, siding – parting joints, etc. to exterior • Add insulation in wall or on outside • Aid circulation: move furniture/objects blocking registers; run furnace fan continuously
	Mould on wall	<ul style="list-style-type: none"> • Abnormally high 	<ul style="list-style-type: none"> • Control humidity sources

		humidity <ul style="list-style-type: none"> • Poor ventilation • Poor air circulation 	<ul style="list-style-type: none"> • Use fans; add mechanical ventilation • Aid circulation; move furniture/objects blocking registers; run furnace fan continuously
	Frost on basement walls	<ul style="list-style-type: none"> • Abnormally high humidity levels • Air leakage at sill plate, uninsulated walls 	<ul style="list-style-type: none"> • Control humidity sources • Seal and insulate basement walls
	Condensation in corners	<ul style="list-style-type: none"> • Incoming air • Thermal bridging, missing insulation • Poor air circulation 	<ul style="list-style-type: none"> • Caulk siding corners, window brick moulds, siding-parting joint, etc. to exterior • Add insulation in wall or on outside • Aid circulation: move furniture/objects blocking registers; run furnace fan continuously
	Mould on wall	<ul style="list-style-type: none"> • Abnormally high humidity • Poor ventilation • Poor air circulation 	<ul style="list-style-type: none"> • Control humidity sources • Use fans; add mechanical ventilation • Aid circulation: move furniture/objects blocking registers; run furnace fan continuously
	Frost on basement walls	<ul style="list-style-type: none"> • Abnormally high humidity levels • Air leakage at sill plate, uninsulated walls 	<ul style="list-style-type: none"> • Control humidity sources • Seal and insulate basement walls
	Condensation around electrical outlets	<ul style="list-style-type: none"> • Incoming cold air 	<ul style="list-style-type: none"> • Seal under plates
	Water on basement floor or walls	<ul style="list-style-type: none"> • External sources like runoff, rain or ground water • Abnormally high moisture level 	<ul style="list-style-type: none"> • Seal wall; install weeping tile; direct gutter drains away from wall; maintain ground slope away from wall: check that existing weeping tiles are open • Control sources of moisture
	Stains on ceiling	<ul style="list-style-type: none"> • Frost build-up melting in attic when weather warms • Leaking roof 	<ul style="list-style-type: none"> • Add vents to overcome inadequate attic ventilation; seal air leaks into attic space from below • Repair roof leak
	Frost on exposed nails in attic	<ul style="list-style-type: none"> • Small amount of warm air leaking into attic space 	<ul style="list-style-type: none"> • Occurs normally during cold weather in most homes (check for adequate ventilation)

Ceiling/Attic	Large isolated frost deposit in attic	<ul style="list-style-type: none"> Indicates large volume of warm and moist air leaking into attic space Inadequate attic space ventilation 	<ul style="list-style-type: none"> Identify source; caulk or seal leak at ceiling level (large amounts usually occur around stacks or from poorly sealed exhaust ducts - make sure all exhausts vent to exterior, not into attic space) Add attic vents
Other	Condensation on cold surfaces such as pipes, toilet tank, etc.	<ul style="list-style-type: none"> Abnormally high humidity level Cold water supply 	<ul style="list-style-type: none"> Control humidity sources insulate pipes or toilet tank
	Exterior paint peeling	<ul style="list-style-type: none"> Lack of air/vapour barrier Rain penetration behind siding 	<ul style="list-style-type: none"> Add air/vapour barrier to interior or paint with vapour barrier paint on interior surfaces; seal around electrical outlets Identify and caulk any leaks or gaps on exterior; repair flashings
	Structural damage to studs, joists or rafters	<ul style="list-style-type: none"> Bacterial action due to warm, moist and dark environment 	<ul style="list-style-type: none"> identify cause of leakage (external or concealed condensation); replace damaged members' seal wall, floor or ceiling assembly to prevent recurrence

Source from “Condensation Concerns” of Energy Matters

Prevent Mold by Good, Regular Cleaning of Your Home or Building

- ✓ Avoid the accumulation of dust [which airborne molds can eat to start mold colony growth and infestation in your home or building].
- ✓ Regularly clean and/or replace the filters of heaters, humidifiers, and air conditioners. Change air duct filters frequently.
- ✓ Spread out and dry the shower curtain after each usage.
- ✓ Dried flowers can contain significant amounts of mold spores, mold growth, dust, and dust mites. Get rid of dried flowers from your home, office, or other building.
- ✓ Wash bathroom and kitchen floor and wall tiles and grout frequently. Spray the tiles once per month or more often with **Mold Control** [available at <http://www.moldmart.net>].
- ✓ Check corner areas, areas under sinks, and behind toilets for water leaks and mold growth.
- ✓ Check around air conditioners and furnaces for stagnant water and mold growth. Keep these units serviced with regular cleaning of ducts and air filters. Spray the filters once per month or more often with **Mold Control** [<http://www.moldmart.net>].

- ✓ Trash compactors and garbage disposals can harbor mold if not kept totally clean. Spray the insides one per month or more often with **Mold Control** <http://www.moldmart.net>].
- ✓ Plants, terrariums, greenhouses, and indoor planted areas are good sites for mold growth and mold cross-contamination of your home, office, or building. Be mold safe by getting rid of such items.
- ✓ Keep your bathroom well ventilated, dry, and clean.
- ✓ To help keep outdoor mold spores outside of your home, install a 3M filtrete air filter on your fresh air intake of your heating/cooling system, and change the Filtrete filter at least every 2 to 3 months. Such filters are available at Home Depot, Lowe's and major hardware stores.
- ✓ Don't accumulate old newspapers and magazines because such items are great food for mold to eat and initiate mold colonies and airborne mold spore contamination of your home or building.
- ✓ Areas under sinks, dishwashers, and all water pipes need checking for possible leaks and/or condensation problems.
- ✓ Have organic debris around your home removed because it increases indoor mold counts. Don't let dead leaves accumulate close to your home. Don't use organic materials like bark as part of your landscaping.
- ✓ Wear a breathing mask when gardening, raking and mowing the lawn because such activities release mold spores that you don't want to be inhaling to start mold growth in your sinus cavities or lungs.
- ✓ Keep closets, dresser drawers, basements – any place where mold and mildew are likely to grow – as clean as possible. Soil on dirty articles can supply enough food for mold to start growing when moisture and the temperature are right. Greasy films, such as those that form on kitchen walls, also contain many nutrients for molds.
- ✓ Clean clothing is less likely to mildew than soiled clothing. Because most synthetic fibers, such as acetate, acrylic, polyester, and nylon, are resistant to mildew, clean fabrics of these fibers will not support mold growth.
- ✓ Clean and dry all moist surfaces, such as showers and kitchen counters.
- ✓ Remove safely and effectively and completely any visible mold growth from walls, ceilings, floors, and paneling. Do not simply cover mold with paint, stain, varnish, or a moisture-proof sealer, as it may resurface. To mold, paint, stain, varnish and sealers are like candy to eat. **Be sure you follow all of the mold remediation guidelines provided in Chapter 4 of this book.**
- ✓ Replace moldy shower curtains, or remove them and scrub well with a household cleaner and rinse before re-hanging them. In addition to watching out for mold on shower curtains, look for mold growth–
 - In tile grout
 - Around bathroom window frames and sills
 - Under sinks, and
 - Where the tub or shower meets the floor (courtesy of the Soap and Detergent Association on its website www.sdahq.org)

- ✓ In cleaning window frames and sills, be sure to clean the painted or aluminum surfaces using a nonabrasive, all purpose cleaner. Clean unpainted wood surfaces with a wood cleaner (courtesy of Soap and Detergent Association on its website www.sdahq.org).
- ✓ In cleaning bathtubs and showers (big moisture magnets), clean and dry areas where the tub or shower meets the floor. Disinfect these areas two or three times a week to control mold and mildew. Use a disinfectant (antibacterial) cleaner. After showering or bathing, wipe down walls and open shower doors or curtains to allow walls to air dry. Clean shower stalls and bathtubs using a nonabrasive, all-purpose or disinfectant (antibacterial) cleaner (courtesy of Soap and Detergent Association on its website www.sdahq.org). Spray or fog bathrooms at least once a month with Mold Control Solution [available: <http://www.moldmart.net>].
- ✓ Mold and mildew grow in soap scum, too. Use a soap scum remover to keep the ‘ring around the bathtub’ away, and you’re also practicing good allergen defense (courtesy of Soap and Detergent Association on its website www.sdahq.org).

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- ✓ Disinfectant products must be in contact with a surface from 30 seconds to 10 minutes in order to work properly. Read the product label to know how to use the product effectively and safely (courtesy of Soap and Detergent Association on its website www.sdahq.org).

Warning! Carefully read instructions for use and any cautionary labeling on cleaning products before beginning cleaning procedures.

- ✓ Do not mix any chemical products. Especially, never mix cleaners containing bleach with any product (such as ammonia) which does not have instructions for such mixing. When chemicals are combined, a dangerous gas can sometimes be formed.
- ✓ Household chemicals may cause burning or irritation to skin and eyes. Household chemicals may be harmful if swallowed, or inhaled. Avoid contact with skin, eyes, mucous membranes and clothing. Avoid breathing vapor. Open all windows and doors and use an exhaust fan that sends the air outside. Keep household chemicals out of reach of children. Rinse treated surface areas well to remove all traces of chemicals.
- ✓ Frequent smaller washing machine loads are best to avoid a hamper to fill with damp, soiled clothing. Worn clothing should be washed right away to avoid problems in closets and hampers. Dry clothes immediately after laundering.
- ✓ Damp shoes, boots, and sneakers should not be closeted. Get them dry as soon as possible.
- ✓ Only use vacuum cleaners with HEPA filter to remove mold spores from carpeting. Regular vacuum cleaners throw a lot of dirty air (with mold spores) back into the room’s air. Steam cleaning of carpeting is another effective way to remove or kill mold spores.
- ✓ Does cleaning the ductwork in the home reduce indoor air contamination? EPA has this to say about duct cleaning: “Duct cleaning has never been shown to actually prevent health problems. Neither do studies conclusively demonstrate that particle (e.g. dust) levels in homes increase because of dirty air ducts. This is because much of the dirt in air ducts adheres to duct surfaces and does not necessarily enter the living space.”

“It is important to keep in mind that dirty air ducts are only one of many possible sources of particles that are present in homes. Pollutants that enter the home both from outdoor and indoor activities such as cooking, cleaning, smoking, or just moving around, can cause greater exposure to contaminants than dirty air ducts. Moreover, there is no evidence that a light amount of household dust or other particulate matter in air ducts poses any risk to your health. You should consider having the air ducts in your home cleaned if:

- There is substantial visible mold growth present in hard surface (e.g., sheet metal) ducts or on other components of your heating and cooling system
- Ducts are infested with vermin (e.g. rodents or insects)
- Ducts are clogged with excessive amounts of dust and debris and/or particles are actually released into the home from your supply registers.

If any of the conditions identified above exist, it usually suggests one or more underlying causes. Prior to cleaning, retrofitting, or replacing of your ducts, the cause or causes must be corrected or else the problem will likely recur.

The U.S. Environmental Protection Agency (EPA) does not recommend that air ducts be cleaned routinely, but only as needed. For more information on choosing a contractor and the methods of duct cleaning, refer to the **EPA** publication *Should You Have the Air Ducts In Your Home Cleaned*

How to Clean Air Conditioner

Below is a very helpful article on how to clean your air conditioner at home or office to prevent mold growth. It is taken from the book “*Clean Your House From A to Z*” of Barnes & Noble Books, 2002 edition.

Air conditioners exchange air from outside to inside your house. Cutting down on dust, mold growth, and other airborne stuff is essential.

Technique: For room air conditioners (window units), filters should be washed before the unit is used for the first time in the season and once a month when the air conditioner is in use. Wash them more frequently if you have pets or a lot of activity in the house. Slide the filters out of the air conditioner and wash them by hand in warm water, with no soap. Be sure to let them dry thoroughly before reinstalling. If the fans in your unit are easily accessible, wipe them periodically with a soft cloth, says Vincent Brackin, spokesman for the Carrier Corporation in Syracuse, New York. With some units, the air conditioner chassis (the mechanical unit) slides into a metal casing or frame that holds the window open. If you have this type, slide the chassis out every few months and brush away twigs, leaves, or other debris from the casing. Lightly dust the exterior surfaces and grille of the air conditioner as part of your routine housecleaning. This will help prevent dust from building up on the filters.

If you have central air conditioning, “it’s wise to clean or change the filter monthly during periods of high use,” says Edward W. Dooley, spokesman for the Air-Conditioning and Refrigeration Institute near Washington, D.C. Some central air-conditioning filters are disposable (they’re flimsy and are usually marked “disposable” by the manufacturer). Others may be washed. Methods vary with the make of the filter, and it’s best to follow the manufacturer’s washing instructions. Dust or vacuum duct outlets and registers as part of your regular home-cleaning routine. The ducts themselves shouldn’t require cleaning if the outlets and filters are kept clean. Check the outdoor unit regularly for leaves and other debris.

Speed tips: Unit air conditioner filters may be vacuumed instead of washed. Handheld vacuums are best because a too-powerful suction could suck up and misshape the filter, says Bracklin.

Caution: Never apply soap or detergents to the coils inside the air-conditioning unit. If you vacuum the coils, do it carefully. “They’re fragile; they’re made out of aluminum,” says Bracklin. “If you bend the coils over, you’re preventing the heat exchange from occurring.” Always unplug the unit before cleaning inside.

How to Fix Air Conditioning Cooling Coil Drip Pan Problems to Prevent Mold Problems

When humid air passes over chilled cooling coils, water condenses and drips through the coils into a collection pan, from which it continuously drains. Problems with these systems may occur when this water collects and becomes stagnant either on the coils or in the drip pan. When standing water is present, a biofilm will develop. This biofilm is composed of bacteria and fungi that are embedded in a slimy matrix. Other organisms such as amoebae and algae may also occupy this comfortable growth site, feeding off the accumulated organic material.

Because this is a slimy layer, one might think that the organisms are unlikely to ever become airborne. This is not true. Organisms are released into the water, and the drops falling from the cooling coil, or wind from the fans create bubbles, each of which contains some of these organisms. The bubbles actually scavenge particles (including bacteria and spores) so that the concentration in the bubbles is higher than that in the water itself. Once in the air, these bubbles dry down into droplet nuclei and are readily transported downstream into the ventilation system. In addition to these particles, the organisms growing in the biofilms produce volatile organic compounds (odors) that are readily carried with the ventilation air into the occupied space.

Another problem that water in drip pans may cause results from the locally high relative humidity near the drip pan, and the fact that the fast moving air stream may pick up liquid droplets that impact onto downstream surfaces. The combination of high local humidity and deposition of droplets may be enough to allow fungal growth on the surfaces.

What can be done about these problems?

First, all air conditioning coil drip pans should drain continuously, and should never contain standing water. This means that the drain must be the lowest point in the drip pan, and be connected to drain plumbing.

Second, systems should be operated such that the coils are continuously washed by water so that biofilms are slow to develop. There is some evidence that germicidal ultraviolet light will reduce the chances of growth on cooling coils.

Third, porous insulation should be avoided close to cooling coils. It should be noted, however, that water droplets will not travel far before evaporating, so that only the first few feet of ventilation system surfaces are at risk of becoming wet.

Fourth, biocides will not fix the problem of non-draining drip pans. Organisms embedded in biofilms are relatively resistant to biocides, and continue to grow and produce odoriferous compounds. Also, biocides are likely to enter the ventilation air and be delivered to occupant breathing zones.

The Coil Dripping Pan Problem information is taken from: "Section 2 Cooling Coil Drip Pans", Environmental Reporter, EMLab. DEC 03/JAN 04

Are air cleaners that use ozone safe and effective?

Here is a summary of the EPA document, *Ozone Generators that are Sold as Air Cleaners*. Ozone generators that are sold as air cleaners intentionally produce the gas ozone. **Contrary to the claims of some vendors, no agency of the federal government has approved these devices for use in occupied spaces.** In fact, when ozone is inhaled, it can damage the lungs. Relatively low amounts can cause chest pain, coughing, nausea, throat irritation, and congestion. It may also worsen bronchitis, heart disease, emphysema, and asthma, and can compromise the ability of the body to fight respiratory infections.

Although manufacturers and vendors of ozone generators may describe ozone as “energized oxygen” or “pure air,” ozone is a toxic gas with different properties from oxygen. In fact, several federal agencies have established health standards or recommendations to limit human exposure to ozone. Scientific studies have shown that when ozone concentrations do not exceed these public health standards, ozone has little potential to remove indoor air contaminants.

Ozone does not react with some indoor contaminants, or does so only over a period of months. With other chemicals, the reaction with ozone can form harmful or irritating by-products. And particles such as dust and pollen that cause allergies are not removed by ozone. Ozone is also not effective at removing many odor-causing chemicals, nor does it remove viruses, bacteria, mold, or other biological pollutants. Some studies show that ozone concentrations produced by ozone generators can exceed health standards even when one follows manufacturer’s instructions.

High concentrations of ozone are sometimes used to help decontaminate unoccupied spaces from certain chemical or biological contaminants or odors, but these should only be used when people are not present. **At these high concentrations, not only can ozone be toxic to human health, but can also adversely affect indoor plants and damage materials such as rubber, electrical wire coatings,** and fabrics and art work containing susceptible dyes and pigments. The public is advised to use proven methods of controlling indoor air pollution such as:

- ✓ Eliminating or controlling pollutant sources
- ✓ Increasing outdoor air ventilation
- ✓ Using safe, effective air purifiers.

Get rid of musty odors

Replace moldy/mildewed shower curtains or remove them and scrub well with a household cleaner, rinse and dry before re-hanging.

- ✓ Musty odors (which indicate mold growth) are sometimes noticeable in basements and shower stalls. Take special precautions to rid of musty odors as soon as possible to prevent further objectionable and damaging mold growth. Usually musty odors disappear if the area is well heated and dried. If the odors persist, try these treatments –

- In basements, use chlorinated lime (commonly called chloride of lime or bleaching powder) to remove musty odors. Sprinkle this chemical over the floor and let it stay until all mustiness disappears. Then sweep it up.
- On cement floors and on tiled walls and floors in bathrooms, get rid of mustiness by scrubbing with a solution of two cups of Borax laundry detergent in one gallon of distilled water. Rinse with clear water and wipe as dry as possible. Keep windows open until walls and floors are thoroughly dry. For more information on Coverage Plus, you can also visit website: http://www.moldinspector.com/mold_killer.htm)
- Aerosol sprays for cleaning and sanitizing bathroom walls are also available in your local grocery or discount store. (Many of the above suggestions on musty odor removal were written by Wanda Eubank and Betty Feather, U. of Missouri-Columbia.)
- Charcoal (unlighted) and baking soda can be used to remove the odor of mold. Simply place the charcoal briquettes and /or bowls of baking soda in the affected area to absorb the odor. Do not directly apply (touch) charcoal or baking soda to items that can be easily damaged by direct contact.

To remove the smell of mildew slowly but effectively, buy charcoal filter rocks used in fish tanks and pack them around the item, then leave in a sealed bag or box for a month – or until the odor is gone. (Suggested by Mary Ellen Pinkham in her very helpful and in-depth *Complete Home Reference Book*.)

- Hydrogen peroxide (2 tablespoons per gallon), rubbing alcohol (half alcohol and half water), and tri-sodium phosphate (use 4 to 6 tablespoons per gallon) are three other proven ways to remove mildew and mold, but these methods may harm some surfaces or cause colors to bleed so always first test the chemical on an inconspicuous surface. (by Mary Ellen Pinkham.)

In Tightly-Sealed New Homes, Use Air to Air Heat Exchanger

“Tightly sealed newer houses may be better at holding in heat, but they’re also more like to trap moisture and spores. Mechanical ventilation, like air-to-air heat exchanger, is critical healthy air quality in tightly sealed new homes,” noted Spike Carlsen, in his article “Combating Mold and Mildew” on the very useful and helpful internet website www.familyhandyman.com.

Use Do-It-Yourself Mold Test Kits for Early Detection of Mold Infestation Problems in Your Home, Office, or Other Building

Part of preventing mold problems in your home or other building is for you to detect mold problems when they are just beginning, rather than after extensive mold growth and mold damage has taken place. You should mold test the air of all rooms of your house or building, crawl space, basement, attic, and the outward air flow from each heating/cooling duct register for the possible presence of elevated levels of airborne mold spores, in comparison to an outdoor mold control test. You can do this with self-observation, do it yourself mold test kits from [Mold Mart](http://www.moldmart.net).

Visit the website <http://www.moldmart.net> for complete mold test kit information and instructions. It is recommended that you test your home and other buildings at least quarterly so that you can take care of mold

problems before they overwhelm you. This regular building checkup is similar to your visiting your dentist for your regular dental checkup every 6 months to find cavities.

Use this Easy Plumbing Test to Uncover Possible Hidden Water Leaks and Therefore Hidden Mold Growth Problems

Do this easy-to-do plumbing test at least monthly or quarterly---

- Turn off completely all faucets and water-using appliances [including water supply to evaporative coolers, refrigerator icemaker, etc.] in your home, condominium, office, apartment building, or other building.
- Then, go watch your water meter for at least 5 to 15 minutes. The water usage dial on the water meter should not be moving at all if there is no plumbing leak in your home or building. If the meter is moving, you know that either you forgot to turn something off, or you have a water leak problem.

Common Breeding Grounds for Mold & Mildew

Thirteen major breeding grounds for mold and mildew with remedies are also posted on website <http://www.familyhandyman.com>. Here are three (3):

Problem	Solution
Leaky air-conditioning duct joints, especially those running through a hot attic, create a moist environment for mildew	Seal all duct joints with special flexible mastic available at heating and cooling supply stores.
Water-resistant drywall used as a bathroom tile backer quickly degrades once subjected to moisture	Install a cement backer board to which you attach tile. The cement backer board will remain structurally sound even if repeatedly subjected to moisture.
In warm environments, impermeable vinyl wall coverings can trap moisture laden air as it moves from the warm exterior to the cooler interior. Mold degrades the drywall and adhesive behind the vinyl wall covering.	Use paint or apply wall coverings with permeable paper backings that don't trap moisture on exterior walls.

How to Build a Mold-Safe Home or Commercial Building

1. Prior to blueprint drafting, obtain the advice and suggestions of a mold prevention consultant to include the most effective water intrusion and mold prevention strategies in building design, selection of building materials, and construction techniques. “The key to mold control is moisture control,” advises the U.S. Environmental Protection Agency (EPA).

2. Make sure that the building lot and its landscaping grading are downward and away from the building to keep rain and surface water from entering the building foundations, basement walls, concrete floors, and crawl space areas.

3. Install a thick, high quality moisture barrier (with no holes from negligent installation) beneath any concrete floor slab or basement concrete floor to stop water from wicking up from the ground into the concrete, and thus into flooring materials and walls resting on the wet concrete.

Do not use regular plastic sheeting as a moisture barrier because such sheeting is easily damaged in installation, and it usually suffers physical degradation over time---thus allowing water penetration into the concrete.

4. Add adequate amounts of top-quality waterproofing compound into the concrete mix to transform the entire concrete floor or slab into an effective water barrier. Also, thoroughly waterproof the exterior of basement walls and of the building foundations.

5. Dry thoroughly (30 days) the concrete floors and concrete/masonry walls prior to adding wood building components. New concrete holds thousands of pounds of water. Most of this water usually dries to the inside of the house or building if the wood building components are installed prior to complete concrete drying, according to the Nova Scotia (Canada) Department of Energy.

6. Do not install plumbing supply lines into concrete slabs or floors, wherein the lines usually degrade and start leaking in twenty years or less. Hire the most capable plumber to install the best quality plumbing lines, fittings, and equipment.

Concentrate all plumbing lines and sewer drain lines in as few areas as possible, with large, easy access panels for the monitoring, maintenance, and repair of plumbing components.

7. Minimize the potential for water damage from frozen, broken pipes by insulating water supply lines (in the attic, crawlspaces, garage, and exterior walls), protecting exposed outdoor faucets, and sealing gaps in exterior walls.

8. Use a hidden moisture meter to scan the ceilings, walls, and floors of all plumbing areas for water leaks prior to building occupancy, and on a regular basis thereafter.

9. Use steel framing components instead of wood [delicious food for mold growth] to build the walls, second floor, attic, and roof of the building. Although steel framing is a little more expensive than wood, it is very affordable long-term, especially in consideration of steel's water damage and mold prevention qualities, as well as fire resistance.

10. Alternatively, build the walls out of poured concrete, concrete blocks, or insulated concrete building components. Use adequate amounts of waterproofing compound in both the concrete and in cement stucco interior and exterior finishes.

Build weep holes into the exterior masonry walls. Weep holes are openings at the foundation level of a brick or concrete block wall that allow moisture to escape from behind and inside the wall. Do not close or block these openings.

11. If the owner or builder uses any wood timbers, plywood, plywood substitutes, drywall, plasterboard, and ceiling tiles, pre-inspect such cellulose-based materials for mold growth and mold stains prior to their use. Remove the mold completely from the materials or return the materials to the supplier, and replace with mold-free materials. Use a moisture meter to scan all wood for moisture content, which should not significantly exceed 16 to 17 percent.

Cellulose is the main substance in the cell walls of plants (and thus of wood from trees), and it is used in the manufacture of the paper backing of insulation, artificial fibers (e.g., for carpeting and padding), and many building materials such as drywall, plasterboard, and plywood substitutes.

12. In addition, spray all cellulose-based building material surfaces with at least two wet sprayings of an EPA-registered fungicide, followed with at least one coating of an EPA-registered protective fungicidal coating. Allow the surfaces to dry after each spray application.

13. Install a high-quality rubber water barrier beneath the roof shingles or tiles to keep rain from entering the building should there be degradation of, or damage to, the shingles or tiles. Install gutters (with leaf-catching screens) that lead to in-ground pipes that take rainwater away from the house.

14. During construction, store all mold-vulnerable, on-site building materials off the ground and beneath waterproof tarps or plastic sheeting to protect the materials against rain, and thus against mold growth.

15. During rain and as a precaution at the end of each construction day, cover the entire building with waterproof tarps or plastic sheeting to keep rain off of the building until the roof has been shingled, and the siding and windows have been installed.

16. Prevent construction defects that allow water entry into the home or building by carefully monitoring the day-to-day construction of the structure. A construction-savvy owner, a trained employee of the building's architect, or an independent physical engineer or home inspector should do this important construction quality control monitoring. Construction defects are an important cause of mold infestation.

17. Design the heating/ventilating/air conditioning (hvac) system to have in its return air duct a built-in mass media (6 inches or thicker), replaceable hepa filter, or a top-rated electronic air cleaner to remove continually airborne mold spores from the circulating air.

18. Install a programmable dehumidifier into the hvac to reduce indoor humidity to a mold-discouraging 30 to 40 percent. Do not install a moisture-increasing humidifier. Install a humidistat-controlled exhaust fan in the attic and any crawl space area to help keep the humidity level low in those areas. Install exhaust fans that vent directly outdoors in the bathrooms and kitchen.

19. Do not use wall-to-wall carpeting because carpeting and padding are great mold food and a great place for mold growth, viruses, bacteria, and dust mites to hide and to multiple. Instead, for concrete floors, use ceramic

tile set in cement containing a waterproofing compound. Use colored cement with waterproofing as the tile grout. For wood floors, install vinyl tile or linoleum. Use washable area rugs for comfort and beauty.

20. During construction and also upon completion prior to sale, rental, and occupancy, the building should be inspected and mold tested all-around for mold problems by a Certified Mold Inspector, or with do it yourself mold test kits.

How to Prevent Mold Damages from Water Flooding

Here are several practical tips to minimize the possibilities of water flooding and thus water and mold damage to your home:

1. If you are going away for the weekend or for a vacation or any other prolonged absence from your home, turn off the water valve at your water meter or well so that water cannot flood your home in a plumbing line break or leak during your absence.
2. Periodically, turn off all water-using equipment/fixtures in your home so that you can carefully watch your water meter to make sure that the usage meter is not turning because of a hidden or unknown water leak.
3. Make sure that your outdoor lot grading takes water away from your home and NOT toward your home.
4. Make sure that the drain lines from your roof gutters take the water away from your home and NOT put the rainfall into the immediate ground next to your home foundation and basement walls.
5. Have your roof carefully inspected at least once a year by a licensed roof contractor or capable handyman looking for missing shingles, degraded roof components, separation of the roof from chimneys and exhaust pipes, etc.
6. If your house lot is at risk of flooding from a higher neighboring property, build on your lot lines a solid wall masonry fence [hollow block construction with cement surface finishing] on the vulnerable boundaries of your property.
7. Use a hidden moisture meter from time to time to scan all floors, walls, and ceilings for hidden moisture/water problems [such as from roof leaks, siding leaks, or plumbing leaks].
8. Make sure that the condensation line from your roof-mounted air conditioning unit is not clogged [and thus allowing the backup of condensate water into your home because of the clogged line].

Mold Prevention Steps if Your Home or Building Has Been Damaged by a Hurricane, Typhoon, Tornado, Windstorm, Flooding, Earthquake, Fire, or other natural disaster.

If your home, condominium, apartment, office, or other building has suffered serious roof, wall, structural, flooding, or other water damage because of a hurricane, typhoon, tornado, windstorm, flooding, earthquake, fire, or other natural disaster, you would be wise to take the following preventive steps to reduce the resulting mold infestation that will surely grow from the damage your home or building has suffered.

Mold spores can damage building structures and pose health problems for many people. For example as to the 2004 Florida hurricanes, FEMA spokesman Cleo Howell said that Florida's high heat and humidity are perfect environments for mold growth, which can begin as early as a day or two after water gets in a house.

1. Prior to any repairs, photograph from every appropriate angle all damage that has been happened to your home or other building. You may need this photographic evidence to help collect for the water, structural, and mold damage.

2. Use do-it-yourself mold test kits or the Scotch tape lift sampling technique [explained in the mold test kit section of [Mold Mart](#)] to test any visible mold growth so that you can send the mold test kits to a mold laboratory for analysis and mold species identification. Also, use mold test kits to mold test the air of each room, attic, basement, crawl space, and the outward air flow [if electricity is on] from each heating/cooling duct register for the possible presence of elevated levels of airborne mold spores, in comparison to an outdoor mold control test. You should repeat this testing of the air every 7 days so that you can determine if the mold situation is under control or out of control. You should also be photographing and testing any new mold growths.

3. Read your insurance policy very carefully to see in what ways the insurance company could try to restrict or reject your insurance claim for mold growth damage and for the expenses of mold inspection, testing, and remediation. If you don't understand the policy, have it explained to you by your agent, the insurance company claims adjuster, an independent insurance adjuster [who works solely on your behalf against the insurance company on a commission basis], or your attorney. You may need to have the home or building inspected and tested [with a written report of the inspector's findings] by a [Certified Mold Inspector](#). The goal of the Certified Mold Inspector is to document that there is new mold growth that was directly caused by the sudden and accidental, insured event such as a hurricane, typhoon, tornado, windstorm, fire, or water line break. If you believe your insurance policy should cover the water and mold damage, but the company refuses to pay, you definitely need to have professional representation by an independent insurance adjuster or an insurance-oriented attorney. You should also read our in depth book [toxic mold legal book](#).

4. Cover or close in securely with tarps all broken windows, damaged roof sections, damaged siding sections, and other storm or fire building damage to keep as much rain as possible from entering into your home or building. The more water that enters your home or building, the worse the mold damage your property will suffer.

5. Learn and utilize the 25 steps required for safe and effective mold remediation, as explained at [Mold Remediation](#) or below.

6. When you return to your house after a hurricane, flood, or other natural disaster, and when it is safe to turn the electricity on [no standing water and with the approval of your local electric utility company or city building department], turn on the air conditioning to distribute cool, dry air throughout the house to begin the drying-out. If you don't yet have electricity, leave the windows closed to keep moist outdoor air from entering into your home or other building.

7. Wet drywall can sometimes be dried, but speed in drying is absolutely essential. If the drywall remains wet for any length of time [especially after 24 hours], mold can start to grow INSIDE the drywall, as well as behind the drywall. Vinyl wall covering should be removed because the vinyl is a moisture barrier preventing the drywall underneath from drying fast. FEMA [Federal Emergency Management Agency] recommends that wet drywall be cut out and discarded immediately because the moisture inside the drywall can wick its way up the drywall above and beyond any original flooding impact.

8. If you are going to cover furniture and household effects with plastic, make sure they are very dry and that the plastic is totally sealed on all sides, including the bottom, to completely encapsulate the furniture from high humidity in the air that is the result of hurricanes, flooding, etc.. When you put plastic over an item that is not totally dry, or that has access to high humidity, you have made the plastic coverings act like greenhouses where mold will grow abundantly.

9. FEMA recommends that flood or water damage victims first get everything that is wet out of the house ... if you can clean it, like clothes (wash and dry it properly) then you're OK. But things like wet sheetrock, insulation, carpeting ... probably have to be thrown away.

How Employers and Commercial Landlords Can Maintain a Mold-Safe Workplace

Employers, commercial landlords, and employees in Canada, the USA, and worldwide should suspect a mold health threat if any of these three mold warnings occur in the workplace---

- (1) Visible mold growth appears on or in ceilings, walls, floors, heating/cooling ducts and registers, attic, basement/crawl space, and/or on furniture, equipment, and inventory of raw materials or finished products.
- (2) Workers or customers report experiencing any of the most common, possible mold health symptoms: allergies, asthma, bleeding lungs, breathing difficulties, central nervous system problems, recurring colds, coughing (chronic), coughing up blood, dandruff problems (chronic) that don't go away despite use of anti-dandruff shampoos, dermatitis, skin rashes, diarrhea, and/or:

Eye and vision problems, fatigue (chronic, excessive, or continued) and/or general malaise, flu symptoms (chronic), sudden hair loss, headaches, hemorrhagic pneumonitis, hives, hypersensitivity pneumonitis, irritability, itching (of the nose, mouth, eyes, throat, skin, or any other area), kidney failure, learning difficulties or mental functioning problems or personality changes, memory loss or memory difficulties, and/or:

Open skin sores and lacerations, peripheral nervous system effects, redness of the sclera (white of your eyes), runny nose (rhinitis) or thick, green slime coming out of nose (from sinus cavities), seizures, sinus congestion, sinus problems, and chronic sinusitis, skin redness, sleep disorders, sneezing fits, sore throat,

tremors (shaking), verbal dysfunction (trouble in speaking), vertigo (feelings of dizziness, lightheadedness, faintness, and unsteadiness), and vomiting.

People differ significantly in their sensitivity and reaction to mold exposure. Consequently, there are no federal standards or recommendations, (e.g., OSHA, NIOSH, and EPA) for airborne concentrations of mold or mold spores in the workplace. Even the smell of mold can make some workers sick.

Thus, if only one or a few workers or customers experience one or more possible mold health symptoms, the employer or landlord should still inspect and mold test the work premises for the health protection of both the mold-sensitive employees and others who may ultimately be harmed from time-cumulative mold exposure.

(3) Workplace mold inspection and testing discover elevated levels of indoor mold in the air, on visible surfaces, or hidden inside walls, ceilings, floors, the heating/cooling equipment and ducts, the attic, or the basement/crawl space.

"All molds have the potential to cause health effects. Molds can produce allergens that can trigger allergic reactions or even asthma attacks in people allergic to mold. Others are known to produce potent toxins and/or irritants," according to the U.S. Environmental Protection Agency (E.P.A.).

As to asthma, a health study by the Finnish Institute of Occupational Health links adult-onset asthma to workplace mold exposure. "The present (health study) results provide new evidence of the relation between workplace exposure to indoor molds and development of asthma in adulthood. Our findings suggest that indoor mold problems constitute an important occupational health hazard."

The Finnish workplace mold study estimated that the percentage of adult-onset asthma attributable to workplace mold exposure to be 35%. (Reported in Environmental Health Perspectives, May, 2002)

Furthermore, a number of commonly found indoor mold species are, in fact, toxic mold, a description applied to any mold that produces mycotoxins in its spores. *Stachybotrys* ("black mold"), *Aspergillus*, and *Penicillium* are three of the most dangerous indoor toxic molds.

Mycotoxins are cytotoxic, meaning they have the capacity to pass through the human cellular wall and disrupt certain cellular processes---potentially causing serious health damage to workers and customers.

What should employees do? "If you see or smell mold, or if you or others are experiencing mold-related symptoms, report it so the problem can be investigated. You may need to tell your employer, supervisor, health and safety officer, union representative, or school board. Find out whether co-workers are experiencing any [mold-related] symptoms," recommends the California Department of Health Services.

What should companies and property managers do for mold prevention, maintenance, and remediation? Step 1 is to conduct periodic and thorough physical inspections of the workplace for evidence of water and mold problems---whether visible or hidden.

For effective mold inspection and testing, the employer or property owner should hire a certified mold inspector, environmental hygienist, or industrial hygienist. Alternatively and less expensive, utilize mold test kits for all-around mold testing.

The inspector or hygienist will collect samples of all visible mold growths, mold test the air of each room and area of the employer's facility, and obtain mold laboratory analysis and mold species identification and quantification of the collected mold and air samples.

The most common mold-causing water problems are roof leaks, siding leaks, plumbing line leaks, sewer line breaks, a wet crawl space or basement, flooding, and high humidity. Finding and fixing the underlying water problem are always required for successful mold remediation.

For step 2, follow the U.S. Occupational Safety and Health Administration (OSHA) recommendation that the employer and the building owner should notify workers in the affected area(s) of the presence of mold in their workplace.

Notification should include a description of the proposed remedial measures and a timetable for completion. Group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism.

Individuals with persistent health problems that might be related to mold exposure should be encouraged to visit their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about medical mold diagnostic and treatment procedures.

Step 3 is for the employer or landlord to do safe and effective mold killing, mold removal, and mold remediation of all mold growths and of all airborne and surface-deposited mold spores. After the completion of mold remediation, the workplace needs to pass "clearance tests" to be safe for employees and customers.

Water Prevention Tips

By: Texas Department of Health

- ≈ Water valve – Make sure everyone in the household knows where the main valve is located and how to turn the water off.
- ≈ Rain Gutters and Downspouts – Direct rainwater away from your home. Keep gutters clear and make sure downspouts are long enough to effectively carry water away from your foundation. Gutters that are filled with leaves and other debris allow water to back up on the roof, which can result in water damage to eaves and roofing material.
- ≈ Insulate Pipes and Outside Faucets – Minimize the potential for water damage from frozen, broken pipes by insulating supply lines (in attic, crawlspaces and exterior walls), protecting exposed outdoor faucets, sealing gaps in exterior walls and maintaining adequate heat in your home.
- ≈ Sump Pump – The sump pump is the first line of defense in preventing water seepage into basements. Periodically check the sump and remove any debris that could clog the pump. Consider installing a battery-powered backup to protect your basement during power outages.
- ≈ Don't block weep holes. Weep holes are openings at the foundation level of a brick wall that allow moisture to escape from behind the wall. Do not close or block these openings.
- ≈ Monitor Utility Bills – An abnormally high water bill could signal a water leak.

- ≈ Before Your Travel – Turn the water off at the main valve or at major appliances. While you are away, consider leaving a house key and contact information with a neighbor or trusted friend and ask the person to check the inside and outside of your home periodically while you are away.

Controlling Moisture in Basements – a Challenge

by Brian Hayes, Nova Scotia (Canada) Department of Energy

The major challenge in finishing and insulating a basement is to prevent moisture problems that can lead damage to flooring assemblies, walls, furniture, or belongings.

Basement walls and floors are more likely to get damp or wet than those above grade. If wetting occurs, drying is much slower, since it usually can only occur to the interior. Moisture sources include:

- Foundation leaks or leaks from under the floor slab if drainage cannot keep up with a sudden rise in the water table.
- New concrete holds thousands of pounds of water. Most of this water usually dries to the inside of the house.
- Concrete is porous and moisture will diffuse through it. Damp proof below-grade walls and place a moisture barrier under the floor.
- Humid summer air may condense on any surface not insulated from cool earth - creating the damp, musty conditions found in many basements during the summer months.
- Water from overflows, pipe breakage, sump pump failure, roof problems, etc., may collect in the basement.

Insulation is an important part of finishing a basement. It reduces heating costs, improves comfort and can prevent basements from being damp during humid summer months - so you won't need a dehumidifier. Ideally, the basement insulation system you choose should resist water damage and be able to dry out quickly if it does get wet. In practice, some systems come closer to this ideal than others, but none are perfect.

Interior insulation. In new construction, it is best to delay finishing the basement walls until the concrete has the chance to dry. Alternatively, build the wall so that drying can occur without damage to the wall assembly.

Start by examining your basement for water leakage. Any problems identified must be solved before proceeding. Install a moisture barrier against the concrete from grade level down to the floor to protect building materials from moisture in the concrete.

Leaving the top part of the wall exposed will allow any trapped moisture to dry to the exterior. Walls also require a continuous air barrier to prevent warm interior air from reaching the cool concrete. An inexpensive way to obtain R20 or more is to leave room between the wall framing and the concrete to allow for extra insulation. To keep the bottom plate dry, use asphalt shingles or foam insulation shims to keep it from touching the concrete floor.

If space is limited and the foundation wall is fairly straight, rigid insulation can be fastened directly to the wall with strapping inset into precut slots. Foam insulation must be covered with a fire-resistant material such as drywall.

Exterior insulation. Exterior insulation is usually best suited to applications where most of the foundation is below grade and the owner has no immediate plans to finish the interior walls. Exterior insulation is generally only practical up to about R10 because of the thickness and cost of the insulation required.

Protect exposed insulation from sunlight and physical damage with specialized trowel-on cement-based coatings or pressure-treated plywood. Extend protection at least a foot below grade to guard against insects or vermin tunneling through the insulation. Flash the top of the insulation to direct water away from the insulation. Some types of exterior insulation can channel water to the footing drains. If this drainage layer can keep the concrete's surface dry, then cracked concrete won't leak.

Basement floors. The least expensive way to insulate the floor is with rigid insulation on top of the crushed gravel base before the slab is poured. Use a minimum of R4 under the slab to separate the slab from the cool ground under it and prevent summer condensation. Insulation levels should be increased to R7 or R10 for the three feet nearest the foundation perimeter (where heat loss is greatest).

Floor slabs with radiant heat should have R7 to R10 under the entire floor and a strip of rigid insulation between the floor slab edge and the foundation wall to limit heat loss up the wall. A heated slab will feel warm and any water leakage is easy to clean up and dry out. Existing floors should have a moisture barrier between the concrete and the floor assembly. Carpet should never be applied directly over an unheated, uninsulated concrete floor.

Rigid insulation, strapping and plywood is a good choice if the floor is reasonably flat and headroom is tight. Otherwise, most builders use sleepers shimmed to a consistent height to support the subfloor. Unfortunately, built-up wood floors can be difficult to dry out if they get wet.

Chapter 2

Mold Inspection

Effective and comprehensive mold inspection has two parts: (1) the close physical examination of your home or building for evidence or signs of water problems and mold problems; and (2) actual mold testing procedures in suspect areas or in the overall home or building to determine whether or not there is, in fact, a serious mold infestation problem.

Physical Examination Begins with a Careful Inspection of, or Walk Through, Your House, Condominium, Rental Apartments, Office, or Commercial Building

Three major factors help create suitable conditions for mold growth: (1) organic nutrients such as clothing, drapery, leather goods, carpet padding, carpeting, drywall, insulation, wood, cellulose-based construction materials, and similar household and construction items; (2) constant moisture or wetness lasting longer than 24 hours or continual high humidity (above 50 to 60%); and (3) poor air circulation (prevents or slows down the drying process for wet materials).

Your first step in looking for possible mold infestation in your home is a careful physical inspection of your home or other building to uncover mold problems that may exist in your home or building of the three factors above-mentioned.

As both a guide as to what to look for when inspecting your home, office, or commercial property for possible mold problems, and as a well-organized way to record your observations during your physical mold inspection, please photocopy and then use either or both the “**Mold Awareness Inspection**” form from the Environmental Assessment Association (included as *Appendix 1* in the Appendices section located at the end of this book) and the E.A.A. “**Indoor Air Quality Inspection**” form (included as *Appendix 2* in the Appendices). You may reproduce as many copies of this form as you need provided that you do not remove the copyright notice printed on the form. You can use these forms for any type of property: residential, office, commercial, and agricultural.

Your Two Best Inspection Tools: Your Nose and Your Eyes

Follow your nose and use your eyes when you inspect your home or other building for possible mold problems.

HOT TIP: If you hire a **Certified Mold Inspector** to inspect your home or other building, he or she will inspect suspicious wall or ceiling areas with a fiber optics inspection device so that the Inspector and you can look inside wall and ceiling cavities to determine if there is hidden mold growth. A one-inch hole is drilled or cut into the wall for the entry of the three-foot long inspection device that can thus check both ways – three feet up and three feet down from the entry hole. To find a **Certified Mold Inspector** in your area, visit the website <http://www.certifiedmoldinspectors.com>.

On your inspection/physical examination tour, follow these very practical tips (as suggested by the **U.S. Consumer Product Safety Commission**, the **Conservation Center for Art and Historic Artifacts** and several other authoritative sources):

✓ Use a flashlight to see in dark corners and recesses throughout the house

- ✓ Look for dust and construction materials, such as wood, wallboard, and insulation, which contain nutrients that allow mold and other biological pollutants to grow. Firewood also is a source of moisture, fungi, and bugs. Molds can grow on organic materials such as paper, leather dirt, and soap scum.
- ✓ Inspect for appliances such as humidifiers, kerosene and gas heaters, and gas stoves which add moisture to the air.
- ✓ Seek out musty or moldy odors, moisture on hard surfaces, or water stains, resulting from improperly-cleaned or uncleaned –
 - Air-conditioning units and heating and air-conditioning ducts
 - Basements, attics, and crawlspaces
 - Bathrooms
 - Carpets
 - Humidifiers and dehumidifiers (empty the tank several times daily)
 - Refrigerator drip pans, basement sump pumps, etc.
- ✓ Smelling mold is one of the best indications of a possible mold problem, but people’s sense of smell varies significantly. “In general, women have a more acute sense of smell than men, and non-smokers compared to smokers. A second consideration is the fact that exposure to fungal contaminants, even at low levels, can sensitize some individuals so that they experience progressively great symptoms even with decreasing exposure. Therefore, some people can experience symptoms when concentrations of spores in the air are low enough that no telltale musty or moldy smell is present,” noted Michael A. Pinto, Ph.D. (environmental engineering) in his article “Mold Indoors”, in the Fall, 2000 issue of *Environmental Times*.
- ✓ Does your home or building feel humid? Can you see moisture on the windows or on surfaces such as walls and ceilings? Is the temperature in your home or building very hot or very cold? Is your basement damp or wet? **Whether or not a room “feels” humid, your inspection needs to include using a digital hygrometer to take the humidity level reading of each room, basement, crawlspace, and attic, and you will make note of each area’s humidity reading on your inspection form.**
- ✓ Are there signs of hidden moisture in your home such as cracking or staining of plasterboard or drywall, drywall tape loosening, and/or wood warping?
- ✓ Does the attic show frost or dampness on the underside of the roof (sure signs of water leakage in the roof)? Is insulation in the attic moldy or wet (sign of water leakage)?
- ✓ Are the ceilings sagging or stained, especially around exhaust fans and recessed lights?
- ✓ Is there peeling paint on the inside or outside of windows and walls? Is there condensation or frost on the windows? Is there wall damage or set carpet and under layment below windows? Is there evidence of water or mold damage on door sills?
- ✓ Is there efflorescence on the outdoor or indoor brickwork or concrete floors/walls, and concrete block walls? If so, that is a sign of wetness within the wall. **“Efflorescence” occurs when water or moisture reaches the**

minerals or salts in the concrete and deposits them on the surface as a white, powdery residue. It is easy to confuse efflorescence with mold.

- ✓ As to visual sighting of mold – study visual sightings carefully because accumulations of dirt, dust, stains, and cobwebs are sometimes mistaken for mold. Active mold is slimy or fuzzy and is usually green, black, orange, or purple. Although mold can be almost any color, mold is often seen as white thread-like growths or clusters of small black specks (for example, along damp bathroom or basement walls). In early stages, the mold may look like a fine web; in full bloom, it looks bushy. Inactive mold is dry and powdery and mat is white.

HOT TIP: To be more certain as to whether or not a visual sighting is actually mold, use a large magnifying glass to check it under magnification. Does it look like mold? In the early stages of growth, mold appears as a fine web of filaments (hyphae) on the surface or in the structure of the host material. In later stages, the mold develops a bushy appearance, and fruiting bodies containing spores are clearly visible under magnification.

- ✓ Look for the possible presence of the deadly toxic mold. *Stachybotrys atra* (also called *Stachybotrys chartarum*) is a black, slimy mold that grows on continually wet materials containing cellulose. Areas in which there are visible or hidden water problems are great places for Stachy to grow. Such materials include: paper, wood, cardboard, wallboard, ceiling tiles, drywall, wallpaper, newspaper, etc. This particular mold contains a toxin (called endotoxin) that can cause serious illness in children (especially infants) and adults. Because there are many other black molds similar in appearance that are not *Stachybotrys*, the only way to verify accurately mold species identity is by laboratory analysis after 7 days of mold culture growth.

HOT TIP: When you see visible mold growth, you to collect a sample for mold laboratory analysis. Follow the mold testing instructions provided in Chapter 3.

- ✓ One place to check for mold is along walls where warm moist air condenses on cooler wall surfaces, such as inside cold exterior walls, behind dressers, headboards, and in closets where articles are stored against walls. Rooms with high water usage and humidity, such as kitchens, bathrooms, laundry rooms, and basements, are also often havens for mold. Check inside bathroom vanities and underneath the kitchen sink and in adjoining kitchen cabinets for both moisture/water problems and mold growth. Pull back and check carpeting/padding.

Does the possible mold material feel damp? Test with a small, soft brush. Is the mold dry and powdery (dormant) or soft and smeary (active)? Active mold will continue to grow and cause further damage. Dormant mold will cause no further damage unless an increase in relative humidity to 70-75 percent or more causes dormant spores to germinate and the mold to become active again. Humidity above 50% is undesirable indoors if you want to prevent mold growth.

- ✓ Check for evidences of high humidity or moisture problems such as damp (heating, air conditioning, and ventilation) filters, ceiling tiles, gypsum wallboard (sheetrock), card, paper, and other cellulose-containing surfaces.
- ✓ Use a fiber optics inspection device or a borescope (to see through holes in the wall) to view spaces inside heating/cooling ductwork or inside walls, ceilings and floors. Use a moisture meter to detect moisture problems INSIDE building materials, walls, ceilings, and floors.
- ✓ Note that foxing on paper is a closely related phenomenon that can be confused with mold. Foxing involves various agents of bio-deterioration, including mold. Its appearance is characterized by red-brown stains in

either discrete spots or irregular splotches, usually with no visible hyphae or mold structure. Like mold, it appears in susceptible papers exposed to high relative humidity.

- ✓ What is the usual temperature in your home? Is it very hot or cold? Molds grow best at warm temperatures, between 77 and 86 degrees Fahrenheit. Be aware that mold can also grow in temperatures from above 32 degrees F (freezing) to 95 degrees F.
- ✓ Have you recently had an indoor water leak, roof leak, condensation problem, or other water damage? Where? Check for mold growth in those areas, including INSIDE walls and floors by using a fiber optics inspection device. Also check the areas with a hidden moisture meter.
- ✓ Is your basement wet or damp? Does your home or building have a sump pump because of basement water problems like flooding?
- ✓ Are there any visible signs of mold or mildew infestation growth?
- ✓ Is the air anywhere stale from lack of ventilation and air movement?
- ✓ Do your house plants show signs of mold growth?
- ✓ Do you have air conditioner or humidifiers that have not been properly cleaned?

Protect yourself against mold by inspecting your potential new home before you rent or buy

If you identify mold problems, have the landlord or seller correct them before you move in, or even consider moving or buying elsewhere. Look for –

- ✓ Mold and mildew under or in carpeting and rugs
- ✓ All of the items previously mentioned in this book as danger signs
- ✓ Does any area of the house have a moldy, mildew, or stale odor?

Look for visible mold growth throughout the house, including attics, basements, and crawlspaces and around the foundation

- ✓ See if there are many plants close to the house, particularly if they are damp and rotting. They are potential sources of mold contamination
- ✓ Are tree branches and shrubs too close to the home or other building – thus blocking the mold-killing and moisture-drying powers of the bright sun? You can always cut or trim back trees too close to the house or building.
- ✓ Downspouts from roof gutters should route water away from the building
- ✓ Look for stains on the walls, floor or carpet (including any carpet over concrete floors) as evidence of previous flooding or moisture problems. Is there moisture on windows and surfaces? Are there signs of leaks or seepage in the basement?
- ✓ Look for rotted building materials that may suggest moisture or water damage

- ✓ Look for evidence of dry rot, a building damage caused by mold.
- ✓ Are there any discolorations of any surface areas? Mold can change surfaces to white, green, brown, or orange.
- ✓ Check for exhaust fans in bathrooms and kitchens. If there are no vents, do the kitchen and bathrooms have at least one openable window in each room? Does the stove cooking area have a hood vented directly to the outside? Does the clothes dryer vent directly to the outside? Are all vents to the outside of the building, and not into attics, crawlspaces, walls, and floors, or other indoor areas?
- ✓ Examine the design of the building. Remember that in cold climates, overhanging areas, rooms over unheated garages, and closets on outside walls may be prone to mold problems.
- ✓ Are the foundation and basement walls made of concrete block or poured concrete? “While a properly laid and sealed block foundation with good drainage can be bone-dry, it is much easier for water to penetrate the many mortared edges of a cinder block foundation. The advantage of such a foundation is the ability to control any leaks by redirecting the water to a sump, where it may be easily pumped out. For my money, I’ll go with a properly sealed and back-filled poured (concrete) basement. It will be much stronger and less susceptible to leaks,” advises the *Contractor Bulletin* on its website.
- ✓ Have a qualified heating and air conditioning contractor check the heating and cooling system, including humidifiers and vents. Have the contractor pay particular attention to checking the duct lining and insulation for mold growth.
- ✓ You can use do-it-yourself mold test kits from <http://www.moldmart.net> to test for mold contamination in the ductwork of the heating and air conditioning system. Mold test procedures for heating and cooling equipment and ducts are explained in detail in Chapter 3.
- ✓ Make your purchase of the home contingent upon your hiring a qualified local home inspector service check out the overall physical condition of the home, reserving your right to cancel the purchase if you are unhappy with the inspection results. In addition to the normal items that the inspection service will investigate, ask the investigation service to be on the look out for mold growth, water stains, signs of present or former wetness and any indications of present or past water seepage, leakage, condensation, or flood damage. Also make the purchase of the home contingent upon your hiring inspection/mold testing by a **Certified Mold Inspector** [<http://www.sanjan.com>].

A good home inspector (you) will look for factors like the following for the possibility of the home having a wet basement (very ideal for mold growth!):

- ✓ Poor lot grade (water running toward house rather than away from it)
- ✓ Poor foundation grading
- ✓ Missing roof drainage
- ✓ Damaged roof drainage
- ✓ Roof drainage discharging directly to the foundation

- ✓ Cracked, deteriorated and damaged foundations
- ✓ Foundations with joins such as brick, block, and stone
- ✓ Deep foundation window wells without protective covers
- ✓ Basement entrances such as bulkheads and sliders
- ✓ Adjacent wetlands
- ✓ Adjacent water bodies
- ✓ Specific types of trees like willow and poplar
- ✓ House built on ledge and rock outcroppings
- ✓ Lot site is at the bottom of a valley or basin

The wet basement checklist above is from the very detailed and well-written **The Home Inspector's Bible** by Joseph and Michael Scaduto, that is available for \$75.00 from the Society of Professional Real Estate Inspectors, 993 Summer St. Lynnfield, MA 01940. The authors write that the following are clues that a basement might have a wetness or dampness problem –

- ✓ Water stains
- ✓ Mildew and mold growths
- ✓ Rot and low wood deterioration
- ✓ Crusted and damaged floor tiles
- ✓ Damaged rugs
- ✓ Rust and damaged wall-to-wall carpeting tack boards
- ✓ Rust and corrosion on metal objects
- ✓ Efflorescence
- ✓ Ledge/rock outcroppings in basement
- ✓ Exposed soils
- ✓ Sump pump in place
- ✓ Sump hole in basement but there is no sump pump in place
- ✓ Dehumidifier in place

- ✓ De-moist bags in place to absorb excessive air moisture
- ✓ Musty odors
- ✓ Damaged foundation walls
- ✓ Interior surface drain system
- ✓ Evidence of buried interior drain system
- ✓ Bulkhead in place
- ✓ Foundation windows in wells

Included in the list above is the word “efflorescence” which occurs when water or moisture reaches the minerals or salts in the concrete and deposits them on the surface as a white, powdery residue. Efflorescence does not affect the strength or durability of the concrete. It only mars the appearance. In some cases the dampness that leads to efflorescence will encourage mold and both can grow in the same location. For this reason, be cautious and treat areas with efflorescence in the same manner as mold infestation.

(Manitoba, Canada, Emergency Management Organization

<http://www.gov.mb.ca/gs/memo/undermold.html>)

Inspecting for Roof Leaks

One of the major ways water can enter your home to cause mold damage is a roof leak. The following suggestions for checking out a roof for leaks are from the well-worth-buying **Lowe’s Complete Home Improvement and Repair**, available from your local Lowe’s store. Here are some very practical, time-tested Lowe’s suggestions –

✓ Inspecting from the Inside

- Begin an inspection in the attic using a strong flashlight, a thin screwdriver, a knife, and a piece of chalk to examine the ridge beam, rafters, and sheathing. Look for water stains, dark-colored areas of wet wood, moisture, and soft spots that may indicate dry rot. Mark the wet spots with chalk so you can find them easily later on
- Be very careful when in the attic that you step only on ceiling joists or other surfaces that are strong enough to support you. If it’s necessary to remove insulation batts (or loose insulation) to examine the sheathing, be sure to wear gloves, goggles, a respirator for protection, and loose clothing to protect against skin irritation.
- Next, turn off any lights. If you see any holes above you, drive nails or poke wire through them so they’ll be visible from the roof’s surface. (In a wood-shingle roof, shafts of light coming in at an angle indicate separations that may hurt when the shingles are wet.)

✓ Inspecting from Outside

- When you examine the roof from outdoors, evaluate the condition of the roof structure, surface material, flashing, eaves, and gutters. To check the roof structure, stand back from the house and look at the lines of the ridge and rafters. The ridge line should be perfectly horizontal, and the line rafters, which you can

assess by looking along the plane of each roof section, should be straight. If either sags, call in a contractor – your house may have a structural problem.

- Next, inspect the roof's surface. Before climbing up on your roof, be sure to read the safety tips on page 325 (Lowe's book). If you're at all nervous about going up on the roof, make the inspection from a ladder, using a pair of binoculars. Don't work on the roof any more than is absolutely necessary, (because) you can easily cause more damage.
- Inspect the flashing for corrosion and broken seals along the edges. If you have metal gutters and downspouts, look for rust and holes. Then examine the roof surface for signs of wear, loose or broken nails, or curled, broken, or missing shingles.
- Use a knife and screwdriver to test the boards along the eaves and rakes. If you encounter damage caused by dry rot, replace the boards and finish them to match the existing areas.
- Roof leaks usually appear during storms when you can't make permanent repairs. But you can take steps to temporarily divert or halt the flow of water (as explained in the Lowe's book, p. 339).
- Generally, the leaks begin at a roof's most vulnerable spots – at flashing,, where shingles are damaged, in valleys, or at eaves. The water may show up far from its point of origin after working its way through layers of roofing materials and down rafters to collect in a puddle in the attic or other areas of the house.

HOT TIP: During a storm, trace the course of water to find where it's coming through the roof. If you can find a hole or leak, drive a nail or wire through the hole so you can find it later, when you get up on top of the roof. Once the roof is dry enough, look for spots that indicate the source of the leak. Remember, the point where a nail or wire is passing through may not be below the actual source for permanent repairs (explained on pages 340-343 of Lowe's book).

Chapter 3

Mold Testing

Available Testing Methods

1. Actual Physical Sample of a Mold-like Material Itself that May Contain or Be Mold Growth or Mold Spores

Collecting small, actual physical bulk portions of mold-contaminated building materials [wood, drywall, insulation paper, ceiling tile, carpeting, padding etc.] and of personal property [clothing, drapery, upholstery, etc.] is an excellent way to do mold sampling to send to Mold Inspector Laboratory, LLC, for mold analysis and mold identification. Put the physical sample into a zip lock bag, to which you attach a large adhesive label containing your name, property address, specific testing location at that property, and date of testing.

2. Scotch tape lift sampling

Lift tape testing is an easy and effective way to test a mystery substance when you can see and touch or feel [wearing rubber gloves] the mold-like material growing on a wall, ceiling, air conditioning duct or diffuser, or other surface, or you are concerned that there might be (e.g. a stain on the wall or possible mold on an air duct grill). Areas you might want to sample include any suspicious stains or color spots, areas of visible mold growth, damp materials like wallboard, and/or maybe places that collect dust to see what has fallen out of the air. You can utilize Scotch tape lift sampling for both viable mold sampling and non-viable mold sampling.

Viable Mold Sampling

1. Cut a three inch (3”) strip of one inch (1”) wide Scotch tape or transparent tape and wearing your rubber gloves, press it on to the surface you want to test.
2. Remove the tape from the surface you are testing.
3. Press the tape and the collected material onto the surface of the nutrient agar in the Mold Inspector Laboratory mold test kit [laboratory petri dish]. Do this gently and carefully; leave the tape stuck on to the surface of the mold test kit.
4. Close the lid of the petri dish.
5. Seal the outer edge with tape (as explained below in the section [Sealing Mold Test Sample](#)) and place it in a sealed Ziploc bag.
6. You can then grow the mold test sample for 5 to 7 days (or more) after which you can already interpret the visual results (explained under **Visual Results**) or send it to the Mold Inspector Laboratory for Lab Analysis and Identification with your **Mold Chain of Custody Agreement** [included as Appendix 4 in **Appendices**].

Non-Viable Mold Sampling

1. Cut a three inch (3”) strip of one inch (1”) wide Scotch tape or transparent tape and wearing your rubber gloves, attach it to the surface you want to test.
2. Remove the tape from the surface your are testing.
3. Press the tape on the inside of a Ziploc bag. Do not tape it to itself.
4. You can then send it to the Mold Inspector Laboratory for Lab Analysis and Identification with your [Mold Chain of Custody](#) [included as Appendix 4 in **Appendices**].

Sealing Mold Test Sample

1. Immediately after doing each test, completely seal the sample in the mold test kit by taping the entire circular edge (where the mold culture plate and lid come together) with a black electrical tape
2. Place each sealed mold test kit into a separate Ziploc bag with the corresponding label.
3. When you send the samples for Mold Lab Analysis, using a padded shipping envelop is suggested to protect the mold test kit from breaking.

Mold Culture Plates

(Primarily for testing for airborne mold spores, but can be used to grow physical samples of collected mold particles)

“If more detailed analysis of the fungal contamination is necessary, cultured samples are used. In this sampling technique, air is impacted against petri dishes with specific types of sampling media. These dishes are then incubated under controlled temperature and humidity conditions and the resulting growth visually examined. By its very design, the cultured samples do not identify non-viable spores, even though such material can also contribute to allergic reactions, but the technique does allow a more precise determination of fungal types ... There is a built-in waiting time of 3 to 7 days while the samples grow in an incubation chamber.”

You can purchase Mold Inspector Laboratory mold culture plate test from our [Online Mold Catalog](#).

Self-Observation of Mold Test Kit Mold Growth

You can either interpret the Mold Inspector test results your self, or better yet, send your test samples to the Mold Inspector Laboratory for professional laboratory analysis as to the identity and quantity of any molds present. Visit our website: <http://www.moldmart.net>. Buy enough test kits [sold in ten packs] to test all of your supply registers, plus the air return register[s] of your heating and air conditioning system, one or two for each room or area of your home or building, and one control test area just outside your home or building [5 feet beyond the drip edge of your roof line].

If you are not using laboratory analysis, your goal is to see whether there are only a few mold colonies growing at the end of 7 days (probably no serious mold problem), or many mold colonies (more than 3) and different kinds of mold – signs that you have a serious mold problem.

Contact Plate Samples

To determine the fungal presence on the sides of heating and air conditioning duct work or the horizontal and vertical surfaces of rooms, four to five contact plate samples should be collected from each room. Samples can be collected from randomly selected horizontal and vertical surface by pressing MEA-filled Rodac plates against the surface of interest for five seconds. You can use lift tape sampling that is included with each Mold Inspector mold kit to do this type of surface sampling.

Swab Samples

Swab samples, partially explained earlier, can be collected from the surfaces of heating and air conditioning diffusers, registers, duct work, room walls, and other flat surfaces. Swab sample test media are: (1) sterile swabs (dry); (2) Butterfield's Buffer, or other buffer solution; and (3) Ziploc type bags. You can buy mold swabs from <http://www.moldinspector.com/>.

The swab samples should be collected from relatively non-porous surfaces. Remove the sterile swab from the package aseptically. Unscrew the cap on the tube of buffer and moisten the tip of the swab. Gently swab the desired area thoroughly, using a rolling motion with the swab. Sterile templates are useful for sampling defined areas. When the swabbing of a specific area has been completed, insert the swab into the tube of buffer. Seal the cap tightly and place in a cooler with ice. Ship all swab samples to the testing lab within 24 hours of sampling. (As explained on the website: www.aerotechlabs.com/library/techtips.html.)

Air Samples

Use Mold Inspector mold culture plates to sample room air for mold spores, and/or test for mold contamination inside heating and air conditioning ducts.

Checking for Mold Contamination Inside Wall Cavities

Wall cavities have been recognized for some time as significant growth sites for toxigenic and allergenic fungi. Growth of these fungi in wall cavities can occur as a result of a number of circumstances ranging from construction and design defects to accidental water incursion. Assessment of microbial contamination in wall cavities presents a number of problems. Typical destructive testing performed to gain access for visible inspection and surface sampling should be avoided. In addition to the aesthetic issues associated with destructive testing, there are potential hazards to the sampling technician and occupants should the wall penetration expose mycotoxigenic fungi to the ambient indoor air.

As previously mentioned you can test the inside of wall and ceiling cavities through the holes existing in electrical boxes. You can also make small or larger holes in walls and ceilings for testing access.

Need for Control Samples Outdoors or Out of the Suspect Area

“What most of the expert guidance documents do indicate, is that comparisons should be made from outside to inside the building, and from compliant areas to non-compliant areas, with the levels and types of biological organisms compared to determine whether indoor amplification is present. The wide range of natural spore levels is dependent on the season, the surrounding vegetation, and even the time of day. This fact makes the collection of outside samples for comparison critical,” recommended Michael A. Pinto, PhD (environmental

engineering) in his article “Mold Indoors: It’s More than Just Unsightly, It’s a Health Hazard,” in the Fall, 2000, issue of *Environmental Times*.

Protect Yourself When Testing

Protect yourself against mold spores when you are testing various areas of your home by wearing:

1. Hat (not hardhat – just a hat like a painter’s cap)
2. Protective eye goggles (with no vent holes)
3. Breathing mask (cartridge type, about \$25 to \$35)
4. Rubber gloves
5. Painter’s disposable paper uniform; and
6. Painter’s disposable booties (over your shoes)

Professional Test Services

Find a **Certified Mold Inspector** in your area by visiting the Inspector Directory section of the website: <http://www.certifiedmoldinspectors.com>.

Lift tape testing is an easy and effective way to test when you can see and touch or feel [wearing rubber gloves] the mold growing on a wall or other surface, or you are concerned that there might be (e.g. a stain on the wall or possible mold on an air duct grill). Areas you might want to sample include any suspicious stains or color spots, areas of visible mold growth, damp materials like wallboard, and/or maybe places that collect dust to see what has fallen out of the air.

Viable Mold Sampling

1. Cut a three inch (3”) strip of one inch (1”) wide Scotch tape or transparent tape and wearing your rubber gloves, press it on to the surface you want to test.
2. Remove the tape from the surface your are testing.
3. Press the tape and the collected material onto the surface of the nutrient agar in the mold test kit or petri dish. Do this gently and carefully; leave the tape stuck on to the surface of the mold test kit.
4. Close the lid of the petri dish.
5. Seal the outer edge with tape (as explained under [Sealing Mold Test Sample](#)) and place it in a sealed Ziploc bag.

6. You can then grow the mold test sample for 5 to 7 days (or more) after which you can already interpret the visual results (explained under [Mold Test Kit](#)) or send it to the Mold Inspector Laboratory for Lab Analysis and Identification with your [Mold Chain of Custody](#).

Non-Viable Mold Sampling

1. Cut a three inch (3”) strip of one inch (1”) wide Scotch tape or transparent tape and wearing your rubber gloves, attach it to the surface you want to test.
2. Remove the tape from the surface your are testing.
3. Press the tape on the inside of a Ziploc bag. Do not tape it to itself.
4. You can then send it to the Mold Inspector Laboratory for Lab Analysis and Identification with your [Mold Chain of Custody](#).

Sealing Mold Test Sample

1. Immediately after doing each test, completely seal the sample in the mold test kit by taping the entire circular edge (where the mold culture plate and lid come together) with a black electrical tape.
2. Place each sealed mold test kit into a separate Ziploc bag with the corresponding label.
3. When you send the samples for Mold Lab Analysis, using padded shipping envelop is suggested to protect the mold test kit from breaking.

You can send your mold samples [taken through [Lift Tape Sampling](#)] along with your [Mold Chain of Custody](#) and your credit card payment receipt [which will be emailed to you upon your payment] for our **48-hour turnaround mold laboratory non-viable mold test results** directly to our **USA partner** mold test laboratory in your choice of either Texas or Florida, the addresses of which will be emailed to you within 24 hrs. of your completed payment of **US\$ 49.00** per nonviable sampling to Mold Inspector.

✓ Testing for Mold

One way to help detect mold hidden in walls and the ceiling is to remove electrical outlet covers, electric plugs still connected to service wires, and/or ceiling lighting fixtures, and then use a fan blowing outward from the wall surface or ceiling opening to draw the air from inside the wall through the electrical box and onto the surface of a mold test kit. **Be sure you first turn off the circuit breaker for the wall outlets or ceiling light (run an extension cord from another circuit to power the fan). Buy an electric circuit tester to make sure the electric is off before you do this procedure.** You can also use the same technique on a crack or existing hole in the wall (author Phillip Fry’s suggestion).

- **Alternatively, you can drill one inch or bigger holes into the wall or ceiling and use the same outward fan technique explained above. Also, you can use cotton q-tips or masking tape to collect possible mold samples from inside the wall cavity** (author Phillip Fry’s suggestion).

One non-invasive way to test inside walls and above ceilings is to:

1. Turn off the electric power to your home during this testing technique
 2. Remove the plastic light switch and electrical plug covers
 3. Use a utility knife to make the gap around the electrical box a little larger to facilitate air flow; and
- ✓ **Suck air from inside the wall or ceiling cavity with a alcohol-cleaned electric fan** (with one of our mold culture plates taped open to the fan so that the air flow impacts perpendicular to the sticky surface of the mold culture plate to capture air particles for laboratory analysis), or the vacuum pull of the electric pump that is collecting the air sample into an Air-O-Cell cassette (by your local Mold Inspector joint venture partner or [Certified Mold Inspector](#)).

How to Mold Test Carpeting and Padding

If carpeting and/or padding was wet for more than 24 hours, mold growth has probably already begun in the carpeting and/or padding. One way to test your padding and carpeting for mold growth is to attach one of our mold test kits to the side of a cleaned, rubbing alcohol-disinfected box fan so that the airflow through the fan comes from across the surface of padding itself (the carpet having been pulled back) or the carpeting, and then impacts air (and thus possibly mold spores) directly onto the open sticky surface of the mold test kit that has been taped to the fan surface. Run this fan test for 10 minutes; remove and seal the mold test kit; and then observe the mold test kit for 7 days for how much mold growth has happened, or send the kit to the nearest Mold Laboratory for mold analysis and identification. For an effective and accurate Do-It-Yourself Mold Test Kits, please visit [Mold Test Kit](#).

Chapter 4

Mold Remediation

Follow these guidelines to remediate water and mold damage to your home, office, condominium, apartment building, or commercial property.

- ✓ You may need ultraviolet (UV) lights in a special killing box to kill molds. One UV light will not generate enough μ watts of ultraviolet light to kill mold. One UV light of at least 10,000 μ watts per second of exposure can kill almost all viruses and bacteria, but no mold. For example, *Aspergillus Niger* mold requires 388,000 μ watts to be killed. It would take a large number of lights installed in a reflective surface [to increase bounce of rays and killing power] killing box in the return air ducts to kill mold. If you have mold in the air handler, you have mold cross contamination everywhere including the ducts and your house. You need to more fully mold test your home---directions are provided below. Learn also the **25 steps for safe and effective mold remediation**, as discussed in details below.
- ✓ If there is a flood or water leak, making part of the building or its personal property contents wet, your response in the first 24 hours is critical to prevent a mold outbreak. Building materials or personal property made of organic materials can have mold growth after just 24 hours of wetness.
- ✓ Work fast in the early hours of the cleanup when everything is still wet, but also be patient in knowing that the complete drying up process can take several weeks with the growth of micro-organisms continuing as long as the building materials and personal contents are wet and/or the humidity is high [above 50 to 60%]. If the house or building is not dried out properly and completely within 24 hours of the flooding or wetness problem, a musty odor, signifying growth of microorganisms can remain long after the flood or other water intrusion.
- ✓ Another benefit of prompt cleanup is that the mold organisms to be killed will not become airborne as long as they remain wet. As far as working fast, if you are cleaning up the **already dried** residue from water damage or a flood, you may want to work more slowly and carefully so as to not stir mold pollens up into the air.
- ✓ **Do NOT use chlorine bleach to kill mold** in your building structure or your personal possessions because bleach won't kill mold effectively. Chlorine bleach is ineffective for four reasons:
 - the chlorine level in bleach (about 5%) is too weak to kill mold and mildew
 - chlorine will not soak into porous materials such as dry wall and wood – it stays only on the outside surface; what little killing power chlorine bleach might have is quickly diminished as bleach sits in warehouses and on grocery shelves. Bleach is not an EPA-registered fungicide.
- ✓ If the clean up area is large and seriously water-damaged, consider having a professional **Certified Mold Contractor** or **Certified Mold Remediator** to carry out the mold remediation. To find a mold professional in your area, please visit the contractor directory of the website <http://www.certifiedmoldinspectors.com>.
- ✓ Be on notice that dangerous microorganisms brought into the home during flooding may present a long-term health hazard because these organisms can penetrate deep into soaked, porous materials and then later be released into the air or water.

- ✓ Be especially sure that porous, moisture-retaining concrete, concrete block and other masonry surfaces and structures (such as foundations and basement walls) are completely dry before completing mold removal, remediation and rebuilding.
- ✓ Read your homeowner's insurance policy or your tenant's insurance policy to discover what, if any, insurance coverage you have for water and mold damage from items such as broken pipes. Whether or not you are making an insurance claim for the water damage, your insurance agent or the claims adjusting office of your insurance company is another good source of leads for recommended professional cleanup companies. If you have trouble with your insurance company for water & mold damage, you may be wise to hire either an independent insurance adjuster [works only for your well-being against the insurance company on a commission basis] or an insurance-oriented attorney.
- ✓ During clean-up activities, only those individuals actually doing the clean up should be in the home or building. Persons with any respiratory health problems (e.g. asthma, emphysema) should NOT be in the home during the cleanup. Do not allow pregnant women, young children, senior citizens, or persons with immune deficiencies to be in the home or building during the cleanup process, and later during any required mold remediation.
- ✓ Anyone spending more than a brief time cleaning in a moldy environment should use a respirator or HEPA filter mask (minimum N-99 rating on the face piece). Don't use a dust mask as your protection. Protect your eyes with goggles or protective eyewear. You should wear surgical latex gloves, or better yet, heavy duty rubber gloves. After each cleanup session, shower as soon as possible in a non-affected area. Wear waterproof boots. Large scale removal or cleanup projects may require the use of disposable body coverings, hoods and booties, to minimize the cross-contamination from work areas to clean areas. After each work session, remove the disposable protection coverings in a designated 'dirty' area.
- ✓ Periodically disinfect non-disposable cleanup clothing, personal protection gear, and work tools. Wash work clothes, coveralls, and other washable items in hot water containing two cups of Borax laundry detergent [a natural mold cleaner].. Wipe breathing respirators or filter masks with isopropanol (rubbing alcohol), denatured alcohol, or a Lysol-type of germicide. Change HEPA filters in your breathing mask respirator frequently during the cleanup process and at the end of the cleanup/remediation job.
- ✓ In the aftermath of flooding, if necessary, pump the basement dry and clean out the debris after the outdoor flooding has receded, or after you have turned off the water supply to the home for a serious water leak or break.
- ✓ Pump out or otherwise remove standing water immediately. Standing water is a breeding ground for microorganisms and causes high indoor humidity that will drive large-scale mold growth.. Where floodwater or sewer line breaks contain sewage or decaying animal carcasses, infectious disease is of great concern. Even when flooding is due to rain water, the growth of microorganisms can cause allergic reactions in sensitive individuals.
- ✓ **PREVENT ELECTROCUTION.** In the event of flooding or big water leaks, shut off the electricity to your home prior to working on the home. If you cannot safely get to the indoor fuses or circuit breaker box to turn off the electricity, have your electric utility remove its meter or otherwise turn off the electricity from outside your home. As additional protection, wear rubber boots in wet areas until it is certain that no electrical hazard exists. Turn off main switches and unplug electrical appliances in wet areas. If any electrical circuits have gotten wet during water breaks, leaks, or flooding, leave the electricity off until the electrical wiring has been inspected and repaired by a licensed electrician and approved by your local building inspector.

- ✓ **PREVENT FIRE.** Besides turning off main switches, unplugging electrical appliances, and disconnecting electric service at fuse boxes or circuit breaker boxes, do not turn on any appliances which have become wet until they have been thoroughly dried and checked for proper operation. Do not use matches or any open flame until the area has been thoroughly ventilated from natural or LP gas. The gas supply to all appliances in flooded areas should be shut off until the appliances have been checked.
- ✓ **WATCH FOR STRUCTURAL DAMAGE.** In the event of flooding or a big water leak or break, be careful when entering the building. Leave immediately if shifting or unusual noises signal a possible collapse of the building. Contact your local building inspector for a building safety inspection as soon as possible.
- ✓ **WATCH FOR HAZARDOUS MATERIALS.** Dangerous materials that might be found in flooded homes include pesticides, fuel oil, gasoline, kerosene, and other substances brought in or spilled by the flood. Water damaged buildings may also contain asbestos. Lead-based paint can be found in pre-1978 housing and is still used in commercial and industrial buildings.
- ✓ When working on wet floors, be especially careful not to fall. Wear rubber boots with slip-resistant treads.
- ✓ Prior to beginning mold and water damage cleanup, be sure to properly bandage any of the workers' open cuts or sores (to prevent entry of mold spores into the body via the open cuts or sores).
- ✓ Do NOT smoke, eat, or drink during the cleanup process. Do such activities only away from, and outside of, the cleanup area.

HOT TIP: The biggest challenge in mold removal is to eliminate the mold without spreading it further in the process. You accomplish this objective by using the **containment techniques** outlined in this checklist.

- ✓ The first step is to slow or stop the mold's growth by isolating affected materials and areas. For small and movable contaminated items, place them into plastic garbage bags and move them to a dry area for appropriate treatment. Materials should not remain in the plastic bags unless the bags are being placed in garbage bins [with the approval of your local garbage company].
- ✓ Remove all of your furnishings from the area to be cleaned to a neutral area (best is outdoors on a porch or patio – cover the items in plastic) where you can clean such items after you have cleaned and disinfected the room area. This area is your “clean room.”
- ✓ For large contaminated items or for contaminated room areas, close the doors to those areas, and hang plastic sheeting between affected and unaffected areas, and reduce the circulation of air from the affected area to the rest of the building. “Depending on the type and amount of material to be dealt with, it may be necessary to isolate the work area from other areas in the building, through use of plastic sheeting, to seal doorways, windows, vents, and other openings, or to subdivide rooms to separate moldy areas from uncontaminated areas. If the potential for airborne dispersion of contamination is significant, it may be necessary to utilize large filter fans [industrial heap filters] to create negative pressure inside the specific work area,” cautions Michael A. Pinto, Ph.D (environmental engineering) in his article “Mold Indoors,” in the Fall, 2000, issue of *Environmental Times*.
- ✓ As part of the sealing off the work area from the rest of your home, cover heating and air conditioning registers, ducts, and grills with plastic sheeting taped down to the edges of the hole being sealed.
- ✓ Make an effective double clear plastic sheeting “door to contain spores and dust as workers enter and exit the work area. Cover by overlapping and taping the trim or edges of both the width and height of the door (or

other opening to the room being remediated) by hanging one sheet of clear plastic sheeting (available in the paint section of hardware stores or other paint retailers) with a slit or cut down the center. On the outside of the first sheet, tape and hang a second unslit plastic sheet. See the illustration provided in **Appendix 3** in the **Appendices** at the end of this book.

- ✓ Run a high capacity heap industrial air purifier **inside the containment area** to remove airborne spores. You will need to run a large dimension plastic flexible hosing from the exhaust outlet of the HEPA filter to the outdoors to safely exhaust the mold-laden .
- ✓ Test both the molds themselves (via the Scotch Tape lift sampling technique or mold scraping technique explained in Chapter 3 of this book) and the air (via mold culture plates) of all rooms, attic, basement, crawl space, and the outward air flow from all heating/cooling duct registers to know what types of mold are involved (especially as to whether the deadly toxic mold *Stachybotrys* and very unhealthy molds such as *Penicillium* and *Aspergillus* are present), and the number of mold colonies of each mold species in each mold sampling compared to your outdoor mold control test. Mold testing is explained in detail in Chapter 3.
- ✓ Lower the humidity and increase air circulation in the containment area by using an industrial or other high capacity dehumidifier[s] in conjunction with fans. Open windows if the outside humidity is lower than the humidity level present inside your home or bldg.
- ✓ If possible, clean moldy or dirty items outdoors, not inside.
- ✓ Any rags used during the cleaning process should be changed frequently. Discarded rags should be placed inside a closed (tight like with a lid) container, and then washed with two cups of Borax.
- ✓ Have the heat-exchange coils, filters, drip pan, and ductwork of your duct-based heating and air conditioning system inspected by a qualified local heating/air conditioning contractor or service company for mold contamination. If necessary, that contractor should be asked to clean and disinfect any contaminated parts or areas. NOTE: A service person can only get to about 70% of the interior services of heating/cooling/air handling equipment even if the equipment is dismantled prior to treatment with mold fungicide. In addition to direct cleaning, it would be wise to mist large amounts of diluted **your DIY mold killer recipe** with a fogger into the heating/cooling/air handling equipment and duct work. The system would need to have its air flow operating, with the fogging machine being placed in the return air intake of the system.
- ✓ Replace lined (insulated) air ducts that got wet, or have mold contamination. Unlined sheet metal ductwork can be taken apart, washed, disinfected, dried, and put back together. Air registers (vents) and diffusers should be removed, cleaned, disinfected with **HygienicAire™**, dried, and reinstalled. Read (below) the [laboratory scientific experiments](#) that [demonstrate the antifungal effectiveness](#) of [HygienicAire™](#).
- ✓ Water-damaged, porous materials should be thrown out or completely decontaminated if moldy. But it is difficult to make sure that mold fungicides have penetrated all mold-affected areas of porous materials. For timbers and wood framing, you can be sure of treating the insides of the lumber by pressure injecting **Tim-bor** antimicrobial protective coating.
- ✓ It may be necessary to remove and to replace water-damaged flooring, sub-flooring, drywall, paneling, and insulation. Sub-flooring made of particleboard or plywood should usually be removed and replaced with inspected-to-be-mold-free and pre-treated building materials because they cannot be completely dried and disinfected beneath the surface. Structural wood may have to be power planed, power scraped [power grinder with a wire brush attachment] and/or power sanded to get down to undamaged, clean and clear wood.

HOT TIP: As a minimum, walls that were wet should be stripped to the studs and the insulation and wallboard/drywall disposed of. Wall cavities and timbers should be inspected for visible mold growth, and mold tested by sucking air from the timbers onto the sticky surface of a mold culture plate attached to a cleaned fan, so that the open mold culture plate is facing and perpendicular to the air flow of the fan from the timbers being tested.

- ✓ Walls must remain open to allow them to completely dry and to be disinfected with your choice of Mold Killer Remedy Recipe [natural drying between sprayings], followed by two wet sprayings of **Tim-Bor** [natural drying between sprayings]. With the walls open, the interior areas of timbers can be pressure injected with **Tim-Bor**. When replacing water-damaged building materials, make sure that no moisture is trapped inside walls, above ceilings, or in or on the sub-floor. **Use a hidden moisture meter and a hygrometer to monitor moisture levels.**
- ✓ The exterior of the building should be inspected and evaluated to determine if any or all of the exterior materials should be removed (such as siding). Plaster, brick, and concrete block walls can probably be cleaned, disinfected and completely dried.
- ✓ Double bag [one bag inside the other] and seal tight (in thick, contractor grade plastic garbage bags) any water damaged or moldy materials that you are discarding.
- ✓ Remove the mold using a non-ammonia soap or detergent (especially effective is Borax laundry soap). Surfaces from which the mold cannot be completely removed should be treated with enough borax laundry detergent (both a strong cleaner and a natural mold fungicide) in solution with water to keep the surface moist for at least 15 minutes, then rinsed, then rapidly dried.
- ✓ Throw out mattresses, wicker furniture, straw baskets and similar porous materials that have been water damaged or contain mold. These types of items cannot be saved or otherwise salvaged.
- ✓ Discard any water-damaged furnishings such as carpets, drapes, stuffed toys, upholstered furniture and ceiling tiles, unless they can be recovered by the special instructions included later in this chapter.
- ✓ Remove and replace wet insulation and other wet or contaminated building materials to prevent conditions where mold can grow. **“One square foot of moldy drywall can harbor more than 300 million mold spores; slam-dunk that onto the basement floor and you’re just opening another Pandora’s box. Even dormant spores inhabiting dried-out materials are irritating to inhale, and if they find moist environs again, they can zip back to life and establish new colonies.”** (from www.familyhandyman.com)
- ✓ Replace disposable furnace filters several times during the cleanup process. Clean permanent filters several different times with bleach solution to kill trapped mold spores.
- ✓ Place a box fan in a window blowing outward from the area being cleaned and disinfected areas on a regular schedule to check for renewed mold growth or any aftereffects of treatment or cleaning. Be sure housekeeping and air-circulation remain adequate in cleansed/disinfected areas. Undertake necessary repairs and upgrades to the building to prevent a recurrence. (Suggested by the *Conservation Center for Art and Historic Artifacts*).
- ✓ If you drill enough access holes in each wall cavity to enable mold fogging to completely cover thoroughly the wall cavity, mold fogging is very effective inside walls and ceilings. Do the application at least twice to each wall cavity. You can buy a very effective mold sprayer with a hose sprayer attachment, plus your choice of Mold Killer Recipe from this guide. Learn the 25 steps for safe and effective mold remediation

below. You should also mold test your entire home both before and after mold remediation go measure your mold remediation effectiveness.

Methods to Remove Mold Using Specific Types of Products

The following specific suggestions for removing mold are a combination of suggestions of Kenneth Hellevang, P.E., Engineer (from North Dakota State University Extension Service on its website: www.ext.nodak.edu), Wanda Eubank and Betty Feather, University of Missouri-Columbia (reprinted with permission – Copyright 2000 University of Missouri. Published by University Extension, University of Missouri-Columbia), and the many others cited in the acknowledgments.

- ✓ If possible clean items outdoors, not inside.
- ✓ Any rags used during the cleaning process should be changed frequently. Discarded rags should be placed into a closed (tight with a lid) container, and then washed in Borax detergent.
- ✓ After items have been cleansed and disinfected, monitor those items on a regular schedule to check for renewed mold growth or any after-effects of treatment or cleaning. Be sure housekeeping and air circulation remain adequate in areas housing the cleaned and disinfected items. (Suggested by the Conservation Center for Art and Historic Artifacts.)
- ✓ Small items can be disinfected by immersing them directly into a solution of Borax and water using the mixture ratio suggested below for the respective item to be disinfected. Another effective way of disinfecting is to use [MoldZyme™ Mold and Mildew Stain Cleaner](#). MoldZyme™ is also helpful in removing mustiness or sour odor of the surface. Or treat the entire area with **HygienicAire™**, available at <http://www.moldmart.net>]. Read (below) the [laboratory scientific experiments](#) that [demonstrate the antifungal effectiveness](#) of [HygienicAire™](#).
- ✓ Painted surfaces inside the home. Scrub moldy surfaces with a solution of 1 to 2 cups of Borax to one gallon of distilled water. Rinse with clean water and allow drying thoroughly before painting or papering. Indoor wood surfaces covered with enamel or oil-resin paint rarely mildews. Softer paints on outdoor surfaces mildew more readily molds feed on the oil and minerals in the paint and cause a dirty-looking discoloration. They may penetrate the paint film deeply, even to the underlying wood.

Another effective way is to use [MoldZyme™ Mold and Mildew Stain Cleaner](#). MoldZyme™ also helps eliminate sour odor on mold-infested surfaces. It should be used in accordance with the manufacturer use directions.

- ✓ Painted exterior surfaces. Scrub mold on paint with a solution of one to two cups of borax per 1 gallon of distilled water. Mildew-resistant paints in all colors for outdoor wood surfaces are available at paint and hardware stores. Manufacturers have suitably formulated their products with fungicides to help combat mildew attack.
 - Caution. Mildew-resistant paints should not be used on window sills, playpens, beds or toys because these paints can harm small children if ingested. Use heat and increase the air circulation to get mildewed wood as dry as possible. Badly infected wood may need to be replaced, preferably with wood that has been treated or that is naturally decay-resistant.

Thoroughly clean mildewed surfaces, woodwork and other wooden parts by scrubbing them with a mild alkali, such as washing soda or trisodium phosphate (8 to 10 tablespoons to a gallon of water), or with

disinfectants such as quaternary disinfectant or pentachlorophenate. Paint and grocery stores and janitors' supply houses sell these products under various trade names. Rinse the wood well with clear water and allow the wood to dry thoroughly. Then apply a mildew resistant paint. (See the section below "Give special care to some articles and surfaces" for precautions.)

If the mold has grown under the paint or varnish, remove all the paint or varnish from the stained areas. Then scrub with a solution containing 8 to 10 tablespoons of trisodium phosphate and 1 to 2 cups borax to a distilled gallon (3.8 liters) of water. Stronger solutions can be used if necessary. Wear rubber gloves.

Another way to clean mold growth under the paint or varnish is to use [MoldZyme™ Mold and Mildew Stain Cleaner](#). It is also very helpful in eliminating mustiness on mold grown areas. Use safely by following the manufacturer use directions.

If a mold stain remains, apply oxalic acid, 3 tablespoons to 1 pint (0.47 liters) of water. Caution: The acid is poisonous – handle carefully. Finally, rinse the surface thoroughly with clear water. Dry well before refinishing.

- ✓ Unpainted wood. In damp, warm ventilated areas, surface mold often develops on wooden parts of buildings. Since new, unseasoned lumber is particularly susceptible to mildew, avoid using it whenever possible.
- ✓ Bathrooms. Scrub surfaces with a solution of 1 cup of borax and one gallon of water. Keep the surface wet for about 10 minutes, then rinse well with water and dry with a household fan (or vent fan in the bathroom). You can also clean your bathroom and remove mustiness of sour odor by using the known effective [MoldZyme™ Mold and Mildew Stain Cleaner](#). This product is available in [Mold Mart](#).
- ✓ Roofs with asphalt shingles and fiberglass panels. Use a mixture of 1 cup of borax per gallon of water to clean about 40 square feet of roof area. This solution might damage metal rain gutters and plants, so control the runoff and rinse the affected surfaces. Another safer way is to use MoldZyme™ Mold and Mildew Stain Cleaner to remove mold stains and odor. Please visit [Mold Mart](#) to know more about this product.
- ✓ Wood shingles, decks and other untreated wood. Scrub surfaces with a solution of 1 cup of borax per gallon of water. Rinse thoroughly. If the mold stains remain, increase the concentration of borax to water and re-treat. Allow mold to dry thoroughly before painting or enclosing it.

Another effective way is to use [MoldZyme™ Mold and Mildew Stain Cleaner](#). MoldZyme™ also helps remove unwanted odor on wood surfaces.

- ✓ Cooking utensils. Before using any dishes, pots, pans or cooking utensils that were in contact with flood water, wash and sterilize them.
 1. Any piece of equipment that can be taken apart should be cleaned in pieces. Remove plastic and wooden handles from frying pans and saucepans. Clean parts separately.
 2. Wash dishes, pots, pans and utensils in hot, sudsy water. Use a brush, if necessary, to remove dirt.
 3. After scrubbing and brushing, rinse in clear water. Place dishes in a wire basket or other container and dip them in a sanitizing solution. Use a solution recommended by local health authorities or use 1½ tablespoons sodium hypochlorite bleach or one cup of borax to a gallon of water. Or immerse dishes in boiling water for at least two minutes. An alternative method is to boil dishes for a half minute.

4. Air-dry dishes. Do not dry them with a dish towel. If cupboards and food preparation surfaces were in contact with flood water, clean and sanitize them before storing dishes and utensils. (From <http://www.doityourself.com/clean/flood.htm>.)

- ✓ Toys. Disinfect children's toys with a solution of one to two cups of borax per gallon of distilled water.
- ✓ Clothing and other textiles. Brush, shake, sun and air mildewed textiles outdoors.

How to remove mildew from clothing and household fabrics

- ✓ Remove mildew spots as soon as you discover them.
- ✓ Do not give the mold growth a chance to weaken or rot the material.
- ✓ Boil clothes, bedding, towels and draperies for at least one-half hour. It is a very effective method to kill mold spores and mold growth on such soft cloth items.
- ✓ Brush off any surface growth outdoors to prevent scattering the mildew spores in the house.
- ✓ Sun and air fabrics thoroughly. If any mildew spots remain, treat washable articles as described below.
- ✓ Dry clean non-washable articles.
- ✓ Wash mildew-stained articles at once with soap or Borax laundry detergent and water. Rinse well and dry in the sun. If any stain remains, use lemon juice and salt. If necessary, repeat the process.

Lemon juice and salt. Moisten stain with a mixture of lemon juice and salt. Spread in the sun to bleach. Rinse thoroughly.

- ✓ Peroxygen bleach. Mix 1 to 2 tablespoons of sodium perborate or a powdered bleach containing sodium perborate or potassium monopersulfate with 1 pint (0.47 liters) of water. Use hot water if it is safe for the fabric; otherwise, use lukewarm water. Sponge the stain or soak the stained area in the solution, or sprinkle the dry powder directly on the dampened stain. Let solution or powder remain on the stain 30 minutes or longer, and then rinse thoroughly.
- ✓ If mildew stains have been on the fabric for some time, it may be necessary to soak the fabric in the bleach solution overnight. Applying sodium perborate solution at or near the boiling point may remove stubborn stains. Be sure this treatment is safe for the fabric.
- ✓ Launder washable items with borax detergent. Keep fabrics dry. Never let clothing or other fabric articles lie around damp or wet. Dry soiled clothes before putting them in the hamper. Wash out dishcloths and hang them to dry. Spread out washcloths and damp towels. Stretch out wet shower curtains. It is the wet curtain left bunched together or sticking to the wall or tub that is most likely to mildew. Sprinkle only as many articles as can be ironed in a day. Shake out and dry those not ironed. Dry washed garments and fabrics thoroughly and quickly. Fabrics dried slowly may get sour and musty smelling – a sign of mold growth.
- ✓ To help keep moisture out of clothing and household fabrics and thus make them less susceptible to mold growth, treat them with water-repellent sprays. Spray draperies, slipcovers, mattresses, or overshoes and jackets and other outer garments.

- ✓ Fungicide products that may be sprayed on fabrics to give them mildew protection are available in low-pressure aerosol containers. Some germicidal, mothproof and water-repellent sprays may also protect against mildew. Read labels on the container for information. For adequate idle protection, wet the surface of the fabric thoroughly with the spray. Unless the sprayed fabrics are kept in a closed container, they should be examined frequently and re-sprayed.
- ✓ Clean before storing. If clothing or household textiles are not treated with a mildew-resistant finish, be sure to wash or dry clean them before storing, as soiled articles are more likely to mildew than clean ones. Unless you know that your laundry starch contains a mildew inhibitor, do not leave starch in fabrics you are going to store; molds feed on starch.
- ✓ From time to time on warm, dry days, sun and air the articles stored in closets. It pays to occasionally inspect cotton, rayon, leather, and woolen clothing stored in garment bags. Unless such materials are stored with a mildew inhibitor, they may mildew. A closed bag, dampness and hot summer weather make ideal growing conditions for molds.
- ✓ Store with a mildew inhibitor. Certain chemicals give off vapors that inhibit mold growth and can protect fabrics during storage. One such chemical, paradichlorobenzene, effectively controls mildew on clothing and other apparel when used in packages, trunks or garment bags kept as nearly airtight as possible. This chemical, which is widely recommended for moth control, is available in grocery, drug and department stores under various trade names.

Scatter paradichlorobenzene crystals through the folds of garments to be packed in boxes, or hang bags of crystals at the top of garment bags so the heavy vapors settle on materials being protected. Use about 1 pound (454 g) of crystals for 100 cubic feet (2.8 cu.m.) of airspace, proportionately less for small spaces. A closet 3 feet deep by 4 feet wide by 8 feet high (0.9 by 1.2 by 2.4 meters) has an airspace of 96 cubic feet (2.7 m³). As the vapors leak out mildew protection disappears and the chemical must be replenished.

Paradichlorobenzene is also available in spray cans. **Caution: Do not inhale the spray.**

Paradichlorobenzene damages some plastics. Therefore, remove plastic buttons and ornaments from garments and use wooden or metal hangers instead of plastic clothes hangers.

Paraformaldehyde is another chemical that has mildew-inhibiting properties. It is sold in powder form at drugstores. Use paraformaldehyde to protect stored clothing and bedding. Place bags of the chemical where the vapors can circulate and reach all surfaces of the stored articles. Use a mixture of 3.15 ounces (89.30g) of actual paraformaldehyde and 0.35 ounces (9.92g) of paradichlorobenzene (9 to 1 ratio) for every 500 cubic feet (14.16 m³) of airspace. A 9-x-10-foot room, 8 feet high (2.7 x 3 x 2.4 m) contains 720 cubic feet (20.3 m³) of airspace.

Low pressure sprays containing mildew-inhibiting chemicals will also help control molds and mildew growth in a closed area. To be effective, the spray must wet the interior surfaces of the closet or storage container.

Thoroughly spray into cracks and crevices. Re-spray as frequently as necessary. **Caution: Do not inhale the mist from the spray since the chemical is poisonous.** Don't use the spray near a flame. For directions for spraying fabrics, see the section "To remove mildew".

- ✓ **Paper and books.** In damp summer weather, keep papers and books as dry as possible to help control mold growth. If you have an enclosed bookcase, keep a small electric light lit continuously in the bookcase or use a chemical dehumidifier, keeping the doors closed as tightly as possible. Hang a bag of paradichlorobenzene

or paraformaldehyde in the closed bookcase. Or dust books and papers with paraformaldehyde, then package them and seal. Caution: Paraformaldehyde is poisonous and may be irritating to some persons. Avoid inhaling the fumes. Books can also be protected by wiping them with a cloth wet with a solution of 3/8 ounce (11 g) of salicylanilide in 1 quart (0.95) liters of rubbing alcohol. Or use low-pressure sprays containing a fungicide to protect paper products against mildew. Unless they are kept in closed containers, re-spray them frequently.

✓ **Remove molds from books.** Stand books on end. Spread out pages to dry. Wipe off mold with a clean, dry cloth. After a few hours, stack and press to avoid wrinkling. Alternate opening and stacking until completely dry. Sprinkle talcum powder or cornstarch on pages to absorb moisture. Books may be frozen until you have time to work with them. Place books in a closed container with moth crystals to stop mold growth.

- Remove any dry, loose mold from paper with a clean, soft cloth. If mildewed paper is damp, dry it first in an airy place. To dry wallpaper, heat the room for several hours or even days to dry the plaster as well as the paper. Plaster should be dried slowly to prevent cracking.
- If mildewed paper is washable, wipe it gently with a cloth wrung out of thick soapsuds then clear water. Take care not to wet the paper more than necessary. Do not scrub it. Finally pat with a soft, dry cloth. If stains remain, bleach with a solution of a household bleach, then sponge with a cloth wrung out of clear water. For small stains, a commercial ink eradicator helps.
- “Fan out” pages of books to increase air circulation. If the books are very damp, sprinkle cornstarch or talcum powder between the leaves to absorb the moisture. Leave starch or powder for several hours, then brush off. See the section “Give special care to some articles and surfaces.”

✓ **Photographs.** Mold damages and destabilizes the emulsion that forms the photographic image of most prints and negatives. Such damage should be fixed only by an experienced photograph restorer. (Find one locally by asking for recommendations from independent camera stores and film developers in your area.) If only the back of the photo print exhibits mold residues, it can be cleaned in the same manner as paper (explained above).

- **Valuable artifacts and photographs** should be handled by a professional conservator. If you would like a free referral for a conservator, you may contact the American Institute for Conservation of Historic and Artistic Works, 1717 K St. NW, Suite 301, Washington, D.C. 20036. Ph. (202)452-9545; Fax (202) 452-9328.

The following are tips on how to remove molds from paper collections, adopted from the [Library Preservation and Conservation](#):

To prevent mold growth in paper collections such as books, films and photographs, they should not be stored in an area with ideal conditions for the growth of mold – condition with a low temperature, high humidity, little light, and very low air circulation. Once mold is discovered, you need to take immediate steps to remove it. Vacuum or mop up standing water, adjust HVAC, and/or activate electric fans to speed up the circulation of air.

To preserve unprocessed films, place them inside a moisture-proof container. Coat microfilm with **polysulfide** during processing to reduce the risk to the film’s emulsion layer and to allow the mold to be removed before causing serious damage. Polysulfide is developed by the Image Permanence Institute of Rochester, New York, U.S.A.

To preserve prints, maps, framed items, and other paper artwork, dust and vacuum them gently and with care to prevent further damages. Place a piece of fiberglass insect screening over the piece, then vacuum through the screen to remove inactive molds. Wearing a respirator, gently scrub the moldy part to remove the molds. Be careful not to grind the spores into the medium or the paper fibers. To treat framed items, remove the artifact from the frame and remove molds infesting both on it and in the frame. Do not position the treated artifact into the same frame unless the frame is mold-free.

How to preserve moldy book materials? If a large number of books are wet or damp, freeze them to quickly stabilize the infestation. Take them to a well-ventilated area with electric fans to speed up air. In order to dry quickly, let the books stand on edge with the boards slightly opened so that the air from the fan blows across them through an open window. Or you can also handle the book inside a running fume hood (cupboard). Rapid moving air will help dry out the moisture and dehydrate mold spores to make them inactive.

Another way is to take the books outdoors and place them under the heat of the sun and a mild breeze for a short time. It is always advisable to remove the visible molds outdoors to prevent direct contaminations. The ultraviolet from the sun will eventually kill these molds. **NOTE: Individuals who will handle the mold remediation should wear HEPA face masks or respirators and plastic or rubber gloves.**

Once the books are dry, vacuum the covers with an HEPA vacuum cleaner to remove inactive molds. You can also use dusters **with an electrostatic charge or with mild adhesive** as substitute of HEPA filter vacuum to gently pick up the mold spores and prevent them from being released into the air.

After vacuuming or wiping the soft molds on book covers, wipe them with enough ethyl alcohol solution. This will help remove some of the outer staining.

To remove mold stains on the inside of the binding, joints, head and tail portions of the book, gently swab them with enough ethyl alcohol. Do not ever spray or swab the books with bleach of any kind.

Do not return the cleaned books to their respective shelves if the shelves are not effectively mold-remediated. Even if remedial treatment is undertaken, the book material will immediately deteriorate again if returned to the environment in which the mold first developed. Considering that the shelves are remediated, be sure that the area is completely dry and is not susceptible to mold growth.

Adopted from the [Library Preservation and Conservation](#) online information.

- ✓ **Leather goods.** Dyes used on leathers are very sensitive to numerous substances. Moisten a cloth with a solution of 1 cup of denatured alcohol to 1 cup water, wipe away visible mold, and then dry the area in circulating air (e.g., use a fan). If mildew remains, wash with thick suds made from a mild soap or detergent, saddle soap, or a soap containing a germicide or fungicide. Then wipe with a damp cloth and dry in an airy place. Polish leather shoes and luggage with a good wax dressing. Shoes contaminated with mold on the inside often develop unpleasant odors, and colored mildew shows up on the inner sole and linings and up into the toe. You can remove this kind of mildew with low-pressure sprays especially intended for freshening shoes. These sprays are available at shoe/department stores. Use these products as directed.
- **Leather goods (protection against mold).** To protect leather against mildew, treat with low-pressure aerosol sprays that carry specific directions. Shoe and luggage stores may have these aerosol sprays that have been specially made for leather goods. Before treating the article, test the spray on a small area where it will not show. Do this to see whether it will change the color of the leather. Repeat the treatment as directed on the label. Caution: Do not inhale the mist from the spray and do not use spray near flame. Follow precautions given on the can. See the section “Store with a mildew inhibitor.”

- Another way to protect leather goods is to apply a good wax dressing. A thin coat of floor wax applied to shoes – to both the uppers and the soles – keeps moisture out and helps prevent mildew. Some commercially available waxes or silicon resins have anti-mildew properties. However, some shoe dressings contain anti-fungal ingredients that might discolor white or light-colored leather.
- During warm humid weather, protect stored shoes, jackets, luggage and other leather articles with paradichlorobenzene-paraformaldehyde. Wrap the articles along with the chemical in packages and seal them. If there is any plastic on these articles, do not use paradichlorobenzene. Leather goods can also be protected by wiping them with a solution of 3/8 ounce (11 g) of salicylanilide in 1 quart (0.95 liters) of rubbing alcohol. Dry the articles completely & thoroughly before putting them away.

✓ **Bedding and mattress.** The following very helpful advice is from the website: <http://doityourself.com/clean/flood.htm> –

- **Beddings.** Boiling beddings and draperies for at least one-half hour is a very effective way to kill mold spores and mold growth on such soft cloth items.
- **Mattresses.** A good innerspring mattress should be sent to a commercial renovating company. Renovation is too difficult to do at home. Ask about the cost of such work. It could be less expensive to buy a good reconditioned or new mattress. If mattress must be used temporarily, scrape off surface dirt and expose it to sunlight to dry as much as possible. Cover mattress with a rubber sheet before using it. If you decide to keep any flood-soiled mattress, it should be sterilized. This must be done at a sterilizing plant – a mattress company or a state hospital. Crop drying fan or household fans may speed up the drying process.

✓ **Feather pillows.**

- **If ticking is in good condition,** wash feathers and ticking together.
 1. Brush off surface dirt.
 2. To circulate water through pillows, open a few inches of the seam in opposite corners of the pillow, turn edges in, sew loosely with strong thread or fasten with safety pins.
 3. Wash in machine or by hand in warm (not hot) suds 15 to 20 minutes. Use borax in the wash cycle. If using an automatic washer, do not wash more than two pillows at a time.
 4. Rinse at least three times in clear, warm water.
 5. Spin off water or gently squeeze out as much water as possible. Do not put pillows through a wringer.
 6. Dry in an automatic dryer at moderate heat setting, or dry in a warm room with a fan, or across two or three clotheslines. Put several bath towels in dryer with pillows to speed up drying. Allow at least 2 hours. Shake up feathers occasionally to hasten drying. **If ticking is not in good condition,** or if pillow is badly soiled, wash feather and ticking separately. If pillows have been badly soaked, it may not be possible to remove all objectionable odors. Discard pillows that are too damaged.
 1. Find a muslin bag which is two or three times larger than the ticking contained in a pillow.
 2. Open one edge of ticking.

3. Sew the open edges of the ticking and the bag together.
4. Shake the feathers from ticking to muslin bag.
5. Close seam of bag.
6. Wash bag of feathers in lukewarm, sudsy water with Borax.
7. Repeat if necessary.
8. Rinse in lukewarm water, changing water several times.
9. Squeeze out as much water as possible by hand. Do not use a wringer.
10. To air-dry, hang on line by two corners. Change positions end to end and shake feather occasionally to speed up drying.
11. Finish drying pillow by laying them on a flat surface or pinning them to a clothesline to dry in the pen air.
12. Wash the ticking. With a sponge, apply a starch solution to the inside of the ticking.
13. Transfer clean feather to the clean, sanitized starched ticking, using the same methods as for emptying.
14. Close seam of ticking.

✓ **Polyester fiberfill pillows**

1. Brush off surface dirt.
2. Wash by hand in warm water and low-sudsing detergent. Add borax to the wash water. Flush water through pillow by compressing it. (twisting and wringing will tear filling.) Change water and repeat if necessary. Rinse three times in clear, warm water.
3. Spin off water in automatic machine. Tumble dry in dryer at moderate setting with several bath towels, or press out as much water as possible by hand, and hang on line outdoors to dry.

✓ **Foam rubber or urethane pillows**

1. Remove cover. Brush off surface dirt.
2. Follow manufacturer's directions if they are available. Otherwise, soak in cool water; then wash in warm suds by hand. Use a bathtub or large sink. Then wash by pushing down on pillow, releasing, and pushing down again. Rinse the same way. Pillows can be machine-washed on gentle cycle with lukewarm water plus a disinfectant.
3. Rinse well in lukewarm water.
4. Gently squeeze or spin out excess water. Blot with towels.
5. Dry away from heat and sunlight. Do not dry in dryer unless on an air setting only. Pillows may dry very slowly in the air.

✓ **Blankets, quilts and comforters**

1. Wash only one blanket, quilt or comforter at a time.
2. Shake and brush to remove surface dirt
3. Follow manufacturer's laundering directions if available. Otherwise, proceed as follows:
 1. Soak at least 15 minutes in lukewarm water.

2. Turn two or three times during soak period.
3. Several soak periods may be beneficial, depending on the amount of soil lodged in fibers. Change water for each soak period.
4. Use borax and lukewarm water. Immerse blanket and work suds in gently, using as little agitation as possible. If necessary, change water and repeat.
5. Rinse in several changes of lukewarm water.
6. Gently squeeze out water. Hang blanket over two lines to dry so it forms an “M” shape or dry it in preheated dryer with several large dry bath towels. Remove blanket from dryer while it is still damp and hang over two lines to finish drying. Gently stretch blanket into shape.
7. Bush blanket on both sides with stiff brush to raise nap, press binding, using synthetic setting on iron.
8. Wash lightweight quilts following directions for wool blankets. Dry outdoors in sunlight, if possible to remove unpleasant odor.
9. You may need to take thick comforters apart, and wash cover and filling separately.
10. Electric blankets are washed as you would normally.

✓ **Sheets, towels, linens**

1. Brush off as much loose dirt as possible. Boiling towels for at least one-half hour is a very effective way to kill mold spores and mold growth on such soft cloth items.
2. Rinse mud-stained fabrics in cold water to take out particles of soil lodged in fibers.
3. Wash in warm suds and borax several times if necessary. Do not use hot water since it will set red and yellow clay stains.
4. If stains remain after several washings, try bleaching white cottons and linens with chlorine or sodium perborate bleach. Do not over bleach. Sun drying will aid bleaching. Bleaches may be used on some colored fabrics. Follow the manufacturer’s directions provided to you on bleach package.

Upholstered furniture, rugs and carpeting. (Also, please read the ADVANCED ADVICE section on upholstered furniture and wood furniture and the Cleaning Flood-Soiled Carpets section, both found after this discussion.)

1. Brush surface mold away with a broom outdoors. Vacuum using an upholstery attachment. Discard disposable vacuum cleaner bag. If possible, use a vacuum that includes a HEPA filter; then dispose of the HEPA filter after the mold removal process.
2. Use the services of a professional upholstery cleaner, or sponge the item with detergent suds and wipe with a clean cloth. Avoid getting the stuffing wet. Wipe the furniture with a cloth moistened with a solution of 1 cup denatured alcohol to one cup water, and dry thoroughly. Place the item in the sun for a few hours and air it thoroughly, or use a fan and indirect heat to dry. If mold is growing deep in the padding of an upholstered piece, nothing will eliminate the mold or odor except renovation or replacement.

✓ Upholstered articles, mattresses and rugs

1. Remove loose mold from outer coverings of upholstered articles, mattresses, rugs and carpets by brushing with a broom. Do this outdoors to prevent scattering mildew spores inside.
2. Run a vacuum cleaner attachment over the surface of the article to draw out more of the mold. Remember that the mold spores are being drawn into the bag of the vacuum cleaner. If the appliance has a disposable bag, remove and dispose it immediately. If not, empty the bag carefully, preferably outdoors, to avoid scattering mold spores in the house.
3. Do everything conveniently possible to dry the article – use an electric heater and a fan to carry away moist air. Sun and air the article to stop the mold growth.
4. If mildew remains on upholstered articles or mattresses, sponge lightly with thick suds of soap or detergent and wipe with a clean, damp cloth. In doing this, get as little on the fabric as possible so the filling does not get wet.
5. Another way to remove mildew on upholstered furniture is to wipe it with a cloth moistened with diluted alcohol (1 cup denatured or rubbing alcohol to 1 cup water). Dry the article thoroughly.
6. Sponge mildewed rugs and carpets with thick suds or a rug shampoo. Then remove the suds by wiping with a cloth dampened with clear water. Dry in the sun if possible.
7. Use a low-pressure spray containing a fungicide to get rid of mildew. Re-spray frequently, especially in localities where mildew is a major problem.
8. Vapors of paradichlorobenzene or paraformaldehyde, used in enclosed areas, will stop mold growth. See the section “Store with a mildew inhibitor.”
9. If molds have grown into the inner part of an article, send it to a reliable disinfecting and fumigating service. Such services are often listed under “Exterminating and Fumigating” or “Pest Control” services in the yellow pages of the telephone directory.

✓ Cleaning Fish Tank or Aquarium

Having a large open aquarium certainly will increase indoor humidity. If you are using an aerator to introduce oxygen into the water for the fish to live in the water, you could certainly consider covering the aquarium with a piece of safety glass cut to be a good cover for the aquarium. Do not use bleach to kill mold. Much more effective is to wash the moldy areas several times with Borax laundry detergent (a natural mold cleaner) mixed into warm water, and then followed after drying with at least one or two wet sprayings of the natural mold remover MoldZyme™, available from our [online mold products catalog](#).

Another very effective way of cleaning your fish tank or aquarium is to apply water-diluted [MoldZyme™ Mold and Mildew Stain Cleaner](#) into the mold-infested area. MoldZyme™ is known to eliminate unwanted smells resulting from mold or mildew growth. Read also the 25 recommended steps on mold inspection and remediation discussed below.

✓ Marble Mold Remediation

If you are concerned about mold growth in silicone caulking in the seams or gaps between sections of marbles, you should remove and discard the entire caulking. You should have no adverse effect on the marble if you treat the marble spacing gaps with natural mold remover MoldZyme™ or HygienicAire™, both available in [Mold Mart](#). To be sure of no adverse marble reaction, apply a small amount of the fungicide on the marble in and out of the way, hidden corner and see if there is any discoloration problem.

NOTE: Read (below) the [laboratory scientific experiments](#) that [demonstrate the antifungal effectiveness](#) of [HygienicAire™](#).

✓ **Mold Cleaning of Electronic Appliances**

Wipe off all exterior surfaces of the TV, music system, VCR, DVD, etc. with a solution of Borax laundry detergent mixed into distilled water. As to the insides, do not use water. While wear a full respirator breathing mask [e.g., 3M brand with organic vapors], use compressed air to force out any mold spores which are inside the TV. Do this cleaning outside and away from the home. Don't take your clothes or shoes into the house afterwards. Strip them off [except underwear of course] outside the house and put into a plastic bag to wash the clothes with Borax laundry detergent to get rid of mold spores on the clothing worn during the electronics item's cleaning. Take an immediate shower with hair washing shampoo. Compressed air in easy to use spray cans is available at large computer stores like CompUSA or Fry's Electronics or any other large computer retailer.

Advanced Advice for Upholstered Furniture and Wooden Furniture

The following very insightful tips are from the hurricane advice website of Martin County, Florida:

Salvaging household furniture

Before starting to salvage damaged furniture, decide which pieces are worth restoring. Such decisions should be based on:

- ✓ Extent of damage
- ✓ Cost of the article
- ✓ Sentimental value
- ✓ Cost of restoration

Consider each piece individually. Antiques may be worth the time, effort and expense of restoration. Unless damage is severe, you can probably clean, re-glue and refinish antiques at home. Extensive repair or re-veneering work should be done at a reliable furniture shop.

Solid wood furniture can usually be restored, unless damage is severe. You will probably need to clean, dry and re-glue the piece. Slightly warped boards may be removed and straightened. Wood veneered furniture is available in many qualities. Extensive damage may be costly to repair. If veneer is loose in just a few places, you may be able to repair it.

Upholstered furniture may be salvageable, depending on its general condition. Flooded pieces will need to be cleaned and dried, and mildew should be removed. If damage is extensive, you may have to replace

padding and upholstery. Since this is an expensive process, it might be wiser to apply the money toward a new piece of furniture. You will need to repair all pieces immediately. Any furniture worthy of repair should be completely cleaned, dried and stored in a dry, well-ventilated place until you have time to repair it.

Salvaging upholstered furniture

Upholstered furniture that has been submerged in flood water may be impossible to salvage if it has been badly soaked. If the piece seems worth the effort, however, you will need to clean and oil the springs, replace stuffing and clean the frame.

Stuffing and covering

- ✓ Remove furniture coverings using a ripping tool, hammer or tack puller, screwdriver or chisel.
- ✓ Remove all tacks from the frame.
- ✓ Wash coverings.
- ✓ Throw away all cotton stuffing. You can dry, fumigate, and sometimes reuse padding made of materials other than cotton.

Springs and frame

- ✓ Wipe off springs and frame. Dry all metal parts and paint them with rust-inhibiting paint. Oil springs.
- ✓ Store wood furniture where it will dry out slowly.

Mildew

Mildew may have developed on damp or wet furniture. Mildew is a gray-white mold that leaves stains and rots fabric unless it is removed promptly. To remove mildew or mildew spots:

1. Brush with a broom to remove loose mold from outer covering. Do this outdoors if possible, so you don't scatter mildew spots (which can start new growth) in the house.
2. Vacuum the surface to draw out mold. Dispose of the vacuum cleaner bag outside to avoid scattering mold spores in the house.
3. If mildew remains and fabric is washable, sponge lightly with thick soap or borax suds. Wipe with a clean, damp cloth. Get as little water on the fabric as possible so the padding doesn't get wet.
4. If mold remains, wipe the furniture with a damp cloth dipped in dilute alcohol (1 cup denatured alcohol to 1 cup water) or a borax water solution. Test in an area that is "hidden."
5. Dry the article thoroughly.
6. Use a low-pressure spray containing a fungicide to get rid of musty odors and remaining mildew. Moisten all surfaces thoroughly. Re-spray frequently if mildew is a continuing problem. Spraying rooms with an aerosol material will not eliminate mildew problems.

7. If molds have grown into inner part, send furniture to a dry cleaning or storage company for thorough drying and fumigation. Fumigation will kill molds present at the time, but will not protect against future attacks.

Salvaging flooded wooden furniture

Wooden furniture damaged by floods can best be salvaged through slow drying and proper repair.

Submerged furniture

1. Take furniture outdoors and remove as many drawers, slides and removable parts as possible. Drawers and doors will probably be stuck tight. Do not try to force them out from the front. After allowing to dry for a brief period, use a screwdriver or chisel to remove the back and push out the drawer from behind.
2. After you have removed movable parts, clean off mud and dirt, using a hose if necessary.
3. Take all furniture indoors and store it where it will dry slowly. Furniture left in the sunlight to dry will warp and twist out of shape.
4. When furniture is dry, re-glue it if necessary. You will need woodworking tools and clamps to re-glue some pieces. Before you start, decide whether you have the time, equipment and ability to do the work. Consult an experienced cabinetmaker if necessary. To re-glue loose joints, thoroughly clean joints of old glue so the area will be as clean and free of glue as possible. Use a white all-purpose glue, flowing directions on container. Hold parts together with rope tourniquets or suitable clamps. To prevent damage from ropes or clamp, pad contact areas with cloth protection.

Damp furniture – removing white spots

Furniture that has been submerged in flood waters will frequently exhibit mildew or mold growth which can be removed with warm soapy (mild detergent) water and a soft cloth. White spots or a cloudy film may develop on damp furniture that has not been submerged. To remove white spots:

- ✓ If the entire surface is affected, rub with a damp cloth dipped in turpentine or in a solution of ½ cup household ammonia and ½ cup water. Wipe dry a once and polish with wax or furniture polish.
- ✓ If color is not restored, dip 000 steel wool in oil (boiled linseed, olive, mineral or lemon). Rub lightly with the wood grain. Wipe with a soft cloth and re-wax
- ✓ For deep spots use a drop or two of ammonia on a damp cloth. Rub at once with a dry cloth. Polish. Rubbing cigarette ashes, powdered pumice, or a piece of walnut into spots may help remove them.
- ✓ If spots remain after all efforts to remove them, the piece should be stripped of the old finish and refinished.
- ✓ Thoroughly dry furniture. If veneer is loose in just at few places, carefully scrape glue under loose areas.
- ✓ Press veneer back in place. Place wax paper over affected area and heat with warm iron, remove iron and place weights on the area.
- ✓ If veneering doesn't stay in place or is bubbled, carefully slit the loose veneer with a razor blade, apply good quality glue. Weights are applied after covering glued spots with wax paper to prevent excess glue, which may spurt out when pressure is applied, from gluing the weights to the furniture.

- ✓ Repairing badly damaged veneered furniture requires special skill and tools. Unless you are an experienced woodworker, don't attempt the job yourself. Take the furniture to a cabinetmaker or have your dealer return it to the factory for repair.
- ✓ If insurance allows part value on flood-damaged furniture, it may be financially worthwhile to apply the money to new articles, rather than pay for extensive repairs.

Straightening Warped Furniture Boards

Slightly warped furniture boards, as in table top or dresser tops, usually can be straightened if they are made of solid wood. However, do not attempt to straighten severely warped parts, veneered parts (veneer usually separates) or parts with an elaborate grain, such as curly maple. If such pieces are worth salvage expense, send them to a reliable furniture repair shop. Get a cost estimate before leaving the piece for repair.

To straighten slightly warped boards:

- ✓ Remove the warped board from the furniture.
- ✓ Strip the board of its old finish. A clean board will straighten better than a finished board. You may have to strip the entire piece of furniture to attain an even finish when the board is straightened, refinished and replaced.
- ✓ The principle of warp removal is to add moisture to the dry side (concave) and remove it from the wet side (convex). You can do this by:
 - Placing the board with the wet side (convex) down on a radiator or heat vent in the winter.
 - Placing the wet side (concave) up in the direct rays of the sun. with either method keep the concave side moist with damp cloths and place bricks or other weights on top of the board and leave it for several days or until board is straight.
- ✓ Clamp board in a flat position when it has straightened. Place clamps no more than 12 inches apart. Use small pieces of wood or pads between board and clamps to protect the board. Loosen clamps and move them slightly once or twice a day to prevent splitting. You may place several boards in the same clamps. Insert small wooden blocks between boards for air space.
- ✓ Stand on end and leave in the clamped position until thoroughly dry. This will take from several days to several weeks.
- ✓ Paint or finish as desired. Apply the finish to both underside and top board. This will keep the board from absorbing moisture and from eventually re-warping. (From the <http://www.admin.co.martin.fl.us/EDUC/uf/hurricanes/furniture.htm>) Martin County, Florida website:

Cleaning Flood-Soiled Carpets

- ✓ Dry. It is very important to dry rugs and carpets as soon as possible to prevent mildew, a spreading gray-white mold that stains and rots fabrics. Pull up waterlogged rugs immediately to prevent further damage to the floor. If possible, dry small rugs outdoors in sunlight.

- ✓ To get air and heat to carpets, open windows if weather permits, or use household electric fans, crop drying fans, or electric lights suspended in coat hanger “nests”. Do not try to vacuum, seep or shampoo carpets until they are thoroughly dry.
- ✓ Sweep or vacuum. After the carpet is dry, thoroughly vacuum or sweep to get rid of dirt and debris. Move the vacuum cleaner slowly to pick up more dirt. Clean off as much crusted dirt and sediment as possible before shampooing.
- ✓ Shampoo. Some rugs may shrink when shampooed. Use a commercial rug shampoo or make your own by mixing $\frac{1}{4}$ cup mild dry Borax detergent and 1 cup warm water in a pail. Beat the mixture with an egg beater until it forms a stiff foam that looks like whipped cream. With a sponge, rub suds on a small patch of carpet (about 2 square feet) with a light circular motion. Use only the foam. (If the foam disappears during the shampooing process, beat the mixture again.) work suds in with sponge. Use a stiff bristle brush if carpet is deeply soiled. Dip sponge in a solution of one or two cups of Borax per gallon of distilled water. Wring out sponge and wipe suds off carpet. Or, apply lather to another small area, overlapping the first. (Overlapping helps prevent streaking when the carpet dries). Rinse and blot dry. Continue until the entire surface has been cleaned.
- ✓ Rinse several times with clear water, wringing most of the water from the sponge each time. Change the rinse water as it becomes dirty. Use as little water as possible on the sponge since water will weaken the carpet backing.
- ✓ Blot up remaining moisture with bath towels or other soft absorbent material.
- ✓ Dry. After shampooing, dry rugs or carpets quickly. Hang rugs on line if possible, or lay them out flat in a warm dry place. An electric fan will speed up drying. Carpets and rugs should be thoroughly dried. Even though the surface seems dry, any moisture remaining at the base of the fiber tufts will cause mildew or rot. If you must walk on the carpet before it is dry, put down brown paper.
- ✓ Vacuum when dry and brush the nap in one direction.
- ✓ Resize. Some types of machine-made pile rugs may need resizing to make them lie flat. To resize a rug:
 - Lay the rug facedown on papers where it can remain undisturbed for several days
 - Check to be sure rug is straight. Tack it down at intervals
 - Dissolve $\frac{1}{2}$ pound granulated glue in 1 gallon boiling water.
 - With a whitewash brush or whisk broom, brush hot glue over the back of the rug. Do not use so much glue that it soaks through the rug; and
 - Let the glue dry thoroughly.

Read also the carpet questions and answers in the Frequently Asked Questions section (Chapter 5).

✓ **Remediating Mold Growths in Your Shower Rooms**

To remediate mold growths in the caulking of your clear silicon shower, simply remove and discard the infested caulking. Then inspect and test the wall at the back side of tile lines for possible mold infestation. It is very common for showers to have leaks into the walls and floor behind and beneath the shower. You may need to

open up the shower walls from the backside of the shower area (such as common wall with a hallway, bedroom, or closet) for very thorough mold inspection and testing. If you find no evidence of mold infestation inside the walls and floors, re-caulk the tile lines. When washing the shower surface, clean with Borax laundry detergent, a natural mold cleaner, in warm water. You should also mold test the air of the bathroom with a do-it-yourself mold test kit available in [Mold Mart](#). Also use a digital hygrometer (\$30 from a large hardware or home improvement store) to check your bathroom before and after showers for high humidity (50-60% upward) that by itself can cause mold growth. While taking a bath or shower, be sure you are running a strong bathroom exhaust fan directly vented to the outdoors to quickly remove moisture-laden air.

Disadvantages of Using Chlorine Bleach

The following disadvantages of using chlorine bleach were published "Bleach Usage" on [Facility-maintenance.com](#)---

1. **Chlorine bleach lacks the ability to cut through dirt.** A surface or object being cleaned and disinfected must first be cleaned if bleach is going to be used as disinfectant, adding time and labor costs to any project. "Organic material readily inactivates these disinfectants, so the surface must be cleaned first," said one industry consultant. "You have to essentially double the time that it should take to clean and disinfect a soiled surface."
2. **More disadvantages of chlorine bleach are as follow---**
 - **Bleach loses strength rapidly:** Carol Bush, area manager for contract cleaner Central Property Services, Pittsburgh, said a bleach/water solution left on a shelf for any period of time will lose its effectiveness. At the same time, said cleaning industry educator William Griffin, Cleaning Consultant Services Inc, Seattle, bleach loses its effectiveness quickly when being used, "gassing off" before most disinfecting can be accomplished.
 - **Bleach can hide dirt:** The bleach can make some soil transparent, leading a cleaner to think he/she has actually cleaned a surface when in fact the soil remains there, said Michael Smith, academic custodial supervisor, Western Washington University, Bellingham, WA.
 - **Bleach damages floor finishes:** Bleach attacks floor coatings, eating away at their effectiveness.
 - **Bleach damages fibers, carpets etc.**
 - **Bleach corrodes hard surfaces:** Metals and other surfaces can not only be corroded, but discolored.
 - **Bleach causes health concerns:** Improper use of bleach – either using too much or mixing it with certain products – such as those that contain ammonia hydrochloric acid, acetic acid and phosphoric acid – can create hazardous health conditions.

Chlorine Bleach is ineffective in killing mold for four reasons [also read bleach user comments about [bleach and mold](#)]:

- a. It is too diluted and thus too weak to permanently kill mold unless the mold is simply sitting on top of a hard surface.
- b. What little killing power chlorine Bleach does have is diminished significantly as the bleach sits in warehouses and on grocery store shelves or inside your home or business [50% loss in killing power in just the first 90 days inside a never opened jug or container] Chlorine constantly escapes through the plastic walls of its containers.

- c. It is ion structure prevents chlorine from penetrating into porous materials such as dry wall and wood--- It just stays on the outside surface, whereas mold has enzyme roots growing inside the porous construction materials.---- and;
- d. **Chlorine Bleach is NOT registered with the EPA as a disinfectant to kill mold.** You can verify that important fact yourself when you are unable to find an EPA registration number for killing mold on the label of any brand of chlorine bleach.

More over, a recent research study reported that bleach is ineffective in killing molds. Read the following article:

2004 university study discovers that bleach does NOT kill mold

"While bleach is often recommended for remediation of surface mold on wood, our [university research study] results illustrate that the treatment does not eliminate the surface microflora," is the conclusion of the Oregon State University study of the effects of chlorine bleach on mold growth on Douglas fir wood [an important timber crop in the state of Oregon]. The research study was conducted by Professor Jeffrey Morrell, Dept. of Wood Science, Oregon State University, as assisted by Adam Taylor [graduate research assistant] and Camille Freitag [Senior Research Associate], as published in Forest Products Journal, 54:4, 2004.

More Mold and Mildew Removal Tips

Mildew and molds can grow anywhere there is moisture, dirt and heat. They especially like warm, dark areas, such as bathrooms, closets, basements, and crawl spaces. You can find mildew on draperies, bed linens, clothes, shoes, books, furniture and the exterior siding of your home. It can rot fabrics and discolor walls and wood surfaces if it is allowed to continue to grow. Signs of a moisture problem include musty odors in the home, as well as characteristic black, gray, white or even pink splotches on your walls, furniture, bathroom tile or clothes.

- Any kind of mold can make you sick. More information about "[toxic molds](#)."
- All molds may be allergenic, whether alive or dead
- Testing for mold is usually not feasible
- You can't compare it to guidelines; there aren't any.

How to Prevent and Control Mildew

- Keep your home, furnishings and fabrics dry and clean.
- Prevent the flow of moisture around and through the home.
- Provide good ventilation in and around the home (crawl space ventilation information)

MILDEW CONTROL CHECKLIST

Air conditioner or dehumidifier is used when relative humidity is above 60%.

Sheets of polyethylene have been installed over 80% of the crawlspace. (If it's an existing home, watch for signs of excess drying and wood shrinkage.)

Foundation vents are kept open to provide cross ventilation.

Ventilate the attic. Continuous soft-fit and ridge vents in combination are recommended.

Ventilating fans, vented to the outside, are used in the kitchen and bathroom.

Gas heaters and gas logs are vented to the outside using an approved flue.

Clothes dryers are vented to the outside of the house. Damp clothes and linens are hung to dry, not left around damp or wet.

Home and clothes are kept clean. (Remember that mildew begins on dirt).

Wet shower curtains are stretched out after every shower.

Moisture-absorbing materials are used during times of high humidity. Some examples are silica gel, activated charcoal, calcium chloride, and kitty litter.

A low-wattage light bulb is kept on in closets to dry out the area.

Heating system is turned on when the humidity is very high.

Leather goods are waxed.

Shrubs that grow close to the foundation are trimmed so that there is 1 foot of air space around the house.

Mildew is cleaned from any exterior area of the house before repainting.

How to Remove Mildew

Moisture control is the key to mold control. It is important to dry water damaged areas and items within 24-48 hours to prevent mold growth. If mold should be a problem in your home, you will need to clean up the mold and get rid of the excess water or moisture. Fix any leaky plumbing or other sources of water. Wash mold off hard surfaces with detergent and water. Rinse the area with clean water and collect excess rinse water. Dry the entire area as quickly as possible. After cleaning has removed all visible molds and other soiling from the contaminated surfaces, a disinfectant may be used to kill the mold missed by the initial cleaning. The disinfectant is made from mixing $\frac{1}{4}$ to $\frac{1}{2}$ cup bleach per gallon of water and applying to the surfaces where the mold sprayer, sponged on, or applied by other methods. Collect any run-off of bleach solution with a wet/dry vacuum, sponge or mop. Do not rinse the area where the bleach solution was applied. In other cases, you may want to use detergent, ammonia, white vinegar, washing soda or some combination of these ingredients.

CAUTION: Never mix liquid chlorine bleach and ammonia. This can produce toxic fumes.

There are a number of excellent commercial mildew removal products on the market. Many of these products come with a spray nozzle which makes them easy to apply. They cost more than homemade mildew removers, but sometimes work faster. If you use a commercial mildew remover, follow the directories on the container.

TAKE STEPS TO PROTECT YOURSELF

Whether you use a commercial or a homemade mildew remover, make sure you have plenty of ventilation. Raise a window or use an exhaust fan. To further protect yourself and minimize your exposure, use rubber gloves, eye goggles, outer clothing (long sleeves and long pants) that can be easily removed in the work area and laundered or discarded, and a medium-efficiency or high-efficiency dust mask..

COMMON MILDEW CLEANING SOLUTIONS

Interior Wood Surfaces. Make a solution of 8 to 10 tablespoons of washing soda and 1 gallon water. Scrub the mildewed surface using a soft-bristled brush. Then rinse with clear water and dry. This solution can be used on most painted or stained wood surfaces. If the mildew has grown under the paint or varnish, it may be necessary to use an abrasive cleaner to scrub the wood. After scrubbing, use the solution above adding 1 cup of chlorine bleach to the solution. Then rinse well with water. Dry thoroughly as quickly as possible. Apply a wood preservative before repainting.

Exterior Wood Siding. Prepare a solution of 3 quarts warm water, 1 quart chlorine bleach, 1 ounce detergent and 3 ounces trisodium phosphate (TSP). if you cannot find TSP at a paint pt hardware store, substitute 4-6 tablespoons of powdered laundry detergent. Use a long-handled brush to scrub the surface, and then rinse with a garden hose. The solution can also be applied with a garden sprayer.

Ceramic Tile. Wash with a solution of $\frac{1}{2}$ cup ammonia, $\frac{1}{2}$ cup white vinegar, $\frac{1}{4}$ cup washing soda, add 1 gallon warm water. Rinse thoroughly. For heavy mildew stains, make a paste of baking soda and liquid chlorine bleach, then scrub with a small toothbrush. If the grout is badly stained, apply pure bleach with a cotton-tipped swab. Allow the bleach to remain on the tile for 30 minutes, then rinse and dry.

To prevent reappearance, apply a coat of silicon wax or a good liquid car wax to the tile. Do not wax floors in shower or bathrooms as it may cause dangerous slipping. Transparent silicone waterproofing intended for waterproofing masonry walls may be applied to grout using an artist's paint brush. This will prevent mildew from reoccurring in the grout.

Washable Apparel. First, take the clothing outdoors and brush off the mildew. Then apply a detergent to the stain and launder. If the stain remains and the fabric may be bleached in chlorine bleach, soak it in a solution of $\frac{1}{4}$ cup liquid chlorine bleach and $\frac{3}{4}$ cup water. Rinse and then launder. Instead of bleach, you can use salt and lemon juice and let the fabric dry in direct sunlight. Do not use bleach on silk, wool, or when stated on the label that it is not safe. Test garments in a seam or the hem for colorfastness if you are unsure.

Leather Goods. Make a diluted alcohol solution by mixing one cup of denatured alcohol with 1 cup of water. Using a cloth dampened with this solution, wipe mildew off leather. Dry in a current of air. If mildew remains, clean with thick suds of mild soap, saddle soap, or a soap containing a fungicide or germicide. Wipe the suds off with a damp cloth and dry in an airy place. Polish leather with a good wax dressing.

Mildew Stains and Odor from a Rug. A musty odor often indicates mildew in a rug or carpet. Take a rug outside if possible. Brush with a broom or use a vacuum cleaner. Empty or change the vacuum cleaner bag immediately to prevent growth of the mold in the cleaner. Sun and air the rug outdoors. If not possible, use an electric heater and a fan to air and dry it. If the mildew remains, sponge the rug with thick suds of detergent or rug shampoo. Rinse with a sponge dampened in clean water. Dry thoroughly.

25 Recommended Steps for Effective Mold Cleaning, Mold Maintenance, Mold Killing, Mold Removal, Mold Remediation, Mold Mitigation, and Mold Abatement of Mold Contamination & Infestation

Whether you plan on doing your own mold removal and remediation, or hiring a [Certified Mold Contractor](#) or a [Certified Mold Remediator](#), follow these twenty-five (25) steps to completely and safely remove mold problems, contamination and infestation from your home, condominium, rental apartments, office, warehouse, retail store or other real estate building.

Just four words neatly summarize what has to be done in effective and mold removal, mold remediation, mold mitigation, and mold abatement: CONTAIN, KILL, REMOVE AND PROTECT.

- (1) **CONTAIN** the mold from spreading into uncontaminated areas;
- (2) **KILL** the mold;
- (3) **REMOVE** the dead mold; and
- (4) **PROTECT** the cleaned out area against future mold infestations.

Whether you plan on doing your own mold removal and remediation, or hiring a [Certified Mold Contractor](#) or [Certified Mold Remediator](#), follow these twenty-five steps to completely and safely remove mold problems, contamination, and infestation from your home, condominium, rental apartments, office, warehouse, retail store or other real estate building. Where relevant, mold testing and mold remediation suggestions from the U.S. Environmental Protection Agency are included below.

1. Learn the techniques and procedures recommended for safe and successful toxic mold inspection, testing, and remediation---whether you prefer do-it-yourself or to hire a [Certified Mold Remediator](#) (CMR). How? Read mold remediation self-help books and internet mold advice websites, plus get professional guidance. Visit the website [Bleach Mold Myth](#). Read the up-to-date, in depth contents of this ebook, plus learn how to make your own, low-cost, easy-to-make homemade fungicides and antimicrobial coatings [from readily available, non-bleach household products and other items readily available in your community] in our special report [Home Mold Remedy Recipes](#), both of which are available from [Mold Mart](#), or at our [online mold products catalog](#). If you are concerned about mold health problems, plus want to learn of all available mold medical diagnostic and treatment procedures, please read our new [Mold Health Guide](#) [ebook]. If you need information about prosecuting or defending a mold legal claim, read our new [Mold Legal Guide](#) [ebook].

2. Locate and fix all sources of mold-causing water intrusion such as recurring flooding, plumbing leaks, leaky roofs or siding, blocked air-conditioning condensation drain lines, and high indoor humidity [e.g., above 50 to 60%]. Follow the dozens of water-intrusion prevention and remediation suggestions contained in this ebook.

3. Inspect and mold test inside, above, and below each water-penetrated ceiling, wall, and floor with a fiber optics inspection device, a [hidden moisture meter](#), do-it-yourself [mold test kits](#) or a [mold inspection](#) by a [Certified Mold Inspector](#) [CMI], and by cutting small core dry wall samples. Remove and look in the middle and back of each core for visible mold growth. You can also cut off thin veneer moldy slices from each core sampling, and then insert each veneer slice into a do it yourself mold test kit to watch for mold growth over a 7 day time period. More valuable to you in mold insights, would be to put each sample into a separate ziplock bag properly labeled with property address, precise testing location at that address, date of testing, name of tester [you probably], and your full contact info, and then to mail your collected samples to our USA or Germany [mold analysis lab](#) after pre-payment of the lab fees at the [online mold products catalog](#). For low-cost mold testing, use inexpensive Scotch®Tape to do [lift tape mold sampling](#) and/or do [bulk physical sampling](#)

[collect physical pieces of moldy building materials or other items], and then send the tape samples or bulk samples to the [mold analysis laboratory](#).

4. Find and locate all toxic mold infestations (visible and hidden) in the entire home or building by thorough, all-around [mold inspection](#) and [mold testing](#) (with mold laboratory analysis and mold species identification of collected mold samples). "You may suspect hidden mold if a building smells moldy, but you cannot see the source, or if you know there has been water damage and residents are reporting health problems. Mold may be hidden in places such as the back side of dry wall, wallpaper, or paneling, the top side of ceiling tiles, the underside of carpets and pads, etc. Other possible locations of hidden mold include areas inside walls around pipes (with leaking or condensing pipes), the surface of walls behind furniture (where condensation forms), inside ductwork, and in roof materials above ceiling tiles (due to roof leaks or insufficient insulation)," warns the U.S. Environmental Protection Agency.

- For all building locations wherein you see visible mold, use the clear Scotch tape [lift sampling method](#) that is explained in the mold test kit instructions section on the [Mold Mart](#) website, or scrape visible mold particles into a [mold test kit](#).

- Conduct a **mold control test** using a do-it-yourself [mold test kit](#) outside your home or building with the test kit being at least five feet out from any roof or porch overhang. You need this outdoor control test for comparison of results from your indoor mold testing.

- Use a fiber optics inspection device, a hidden moisture meter, and internal wall and ceiling cavity mold testing to search for hidden mold growth.

5. Test the outward airflow from each heating/cooling duct register for elevated levels of airborne mold spores. If there is a serious toxic mold infestation anywhere in a building, airborne mold spores from such mold locations will usually enter and contaminate the heating/cooling equipment and ducts, as well as the rest of the building. Use our do it yourself [mold test kits](#) to collect possible mold spores in the outward air flow from each register with the system running on fan ventilation.

6. Replace mold-infested heating/cooling equipment and ducts if the owner can afford to do so. Otherwise, do repeated mold spraying with a [mold fogging machine](#) and a [mold home remedy recipe](#) into the return air duct while the system is running on fan ventilation to deliver the fungicide to internal surfaces. Do mold fogging for at least one half hour to hour into the return air duct of the central heating/cooling system. **If you would prefer to kill and remove mold infestation without using any chemicals,** use [superheated dry vapor steam technology](#) to both kill and remove mold growth and mold spores from your moldy walls, floors, ceilings, heating/cooling ducts and coils, furniture, and other personal possessions. As your second step [or alternative to using superheated dry vapor] to remove any remaining mold growth, mold stains, or mold odors, use **MoldZyme** [mold cleaner](#). As your third step in natural mold killing, place open jars of [HygienicAire](#) mold treatment [made from the natural tea oil mold killer] into the cold air return duct and/or outward supply duct registers of your heating/cooling system to kill airborne mold spores in your breathing air. If there are remaining visible mold growths, wear rubber gloves while you apply a coating of [HygienicAire](#) to the surface of the visible mold growth. Read (below) the [laboratory scientific experiments](#) that [demonstrate the antifungal effectiveness](#) of [HygienicAire™](#).

7. If any residents or workers are experiencing any possible toxic [mold health symptoms](#), or if there is a strong smell of mold, or if there are visible signs of major [mold growth](#) anywhere in the building, or if the building tests positive for elevated levels of airborne mold spores, the occupants should move temporarily to a mold-safe place until after successful mold remediation and clearance testing.

Hot Tip: Do you want or need quick and immediate mold relief? The first immediate action you can take is to remove almost all of the airborne mold spores 24 hours per day from the air you breathe in your moldy home, apartment, or workplace by running one or more of the [best air cleaners](#) in different areas of your house, rented house/apartment, or place of employment. Your second immediate action is to use our [mold fogging machine](#) to your choice of low-cost home-remedy [fungicide](#) in all rooms, attic, basement, crawl space, garage, and the heating/cooling equipment and ducts [through the return air duct while you are fogging directly into the return air duct] of your home, condominium, apartment, office, or other building. You can also place small to large fans in key areas of rooms/areas being mold-fogged to help the mold fog to reach all areas of a room or area. Let each fungicidal fogging dry for about one to two hours while the fungicide is killing the mold. Then fan dry the area quickly to remove excess moisture from the fogging procedures. Then fog with two layers of homemade [antimicrobial coating](#) to help protect the areas against future mold growth. After each fogging, let the fog set for about one to two hours, then dry the area quickly with fans. The person doing the fungicidal spraying or fogging application needs to wear proper personal protective gear, as explained at point 13 below.

Hot Tip: To get rid quickly of mold stains and mold odors, you can also use the very effective ZymoCat™ Mold and Mildew Stain Cleaner.

8. Occupants moving out should not take any clothing, personal possessions, furnishings, furniture, or equipment until after such items have been effectively mold decontaminated outdoors [or in a clean room built from plastic sheeting] to avoid mold cross contamination of the temporary living or working quarters.

9. Do not paint over mold problems. Mold loves to eat paint as a snack food. Don't expect to kill mold successfully by using paint containing a mildicide [too mild to kill existing toxic mold infestation] or with a [paint](#) primer sold to hide water damage stains. Do not rely on [Kilz](#) to kill mold or anything---it does **not** kill mold, and the product is NOT an EPA-registered fungicide. Kilz is an excellent product to hide or camouflage defects like water damage stains prior to painting over problem areas.

10. Before beginning to work in the mold-afflicted areas, contain the moldy work area (and thus contain the toxic mold spores that will be released into the air by opening up mold-contaminated areas) by using wall-to-wall, floor-to-ceiling plastic sheeting as containment walls. How to make effective mold containment walls, including a mold-secure entry way into the mold containment area, is explained in detail in our ebook [Do-It-Best-Yourself Mold Prevention, Inspection, Testing, and Remediation](#). Use 6 mill thick, clear plastic sheeting that you can buy at a hardware store or home improvement center.

11. After the installation of air tight mold containment walls, dry the work area [especially if still wet from flooding or a now fixed water leak or roof leak] with one or more large dehumidifiers or an industrial size dehumidifier. Improper fan drying can spread mold spores to cross contaminate an entire building and its heating/cooling system.

12. Inside the mold containment area, use a large fan in the window to exhaust air directly outside on a continuous basis to expel airborne mold spores and remediation-caused dust---or better yet, use an industrial hepa filter to filter out mold, with a flexible hose directly venting the exhaust air flow to the outdoors. You need to exhaust more air to the outside than is entering the containment area to create negative air pressure. (You know you have negative air pressure when the plastic containment sheets are being sucked inward toward the work area rather than bulging outward away from the work area.)

13. While working inside the mold containment area, always wear effective protective gear such as protective biohazard suit. [\$10 at safety stores] or painter's coveralls and booties or a long sleeve shirt and pants; gloves; and a one piece, full face breathing respirator mask using an organic vapor cartridge filtration, available from local safety, hardware, and home improvement stores. You also need such personal protective gear

when you spray your choice of lower-cost [Mold Home Remedy Recipes](#). Here are more details on advisable personal protective gear---

- **Tyvek protective biohazard suit.** [available at safety stores] or painter's coveralls and booties, or long sleeve shirt and pants.

- **Gloves:** either disposable latex or good work gloves. "Long gloves that extend to the middle of the forearm are recommended. When working with water and a mild detergent, ordinary household rubber gloves may be used. If you are using a disinfectant, a biocide such as chlorine bleach, or a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or PVC. Avoid touching mold or moldy items with your bare hands," recommends the [U.S. Environmental Protection Agency](#).

- **Avoid breathing in mold or mold spores.** Wear a 3M brand one piece, full face breathing respirator mask using an organic vapor cartridge filtration, available from your local safety store, Home Depot, Lowe's and other home centers and hardware stores. Alternatively (but less comfortable in your ease of breathing) you can use hole-free Chem-Splash eye goggles (\$4) along with a separate breathing mask with cartridge filters (\$30) from the same stores. Alternatively, "In order to limit your exposure to airborne mold, you may want to wear an N-95 respirator, available at many hardware stores and from companies that advertise on the Internet. (They cost about \$12 to \$25.) Some N-95 respirators resemble a paper dust mask with a nozzle on the front, others are made primarily of plastic or rubber and have removable cartridges that trap most of the mold spores from entering. In order to be effective, the respirator or mask must fit properly, so carefully follow the instructions supplied with the respirator. Please note that the Occupational Safety and Health Administration (OSHA) requires that respirators fit properly (fit testing) when used in an occupational setting; consult OSHA for more information (800-321-OSHA or [osha.gov](#)," advises the U.S. Environmental Protection Agency.

- **Wear goggles.** Wear eye goggles with no holes [such as Chem-Splash] if you are not wearing the 3M brand one piece, full face breathing respirator. "Goggles that do not have ventilation holes are recommended. Avoid getting mold or mold spores in your eyes," advises the U.S. Environmental Protection Agency.

HOT TIP: You can order a custom-fitted full face breathing mask by contacting your local 3M branch. Custom-fitted full face masks do a better job of keeping mold spores from entering inside the mask [and therefore into your body].

HOT TIP: If you have a beard, shave it off prior to wearing a full face mask breathing respirator to obtain a tighter fit to your face to help keep mold spores from entering inside the mask and your body.

14 Kill surface mold growth by with one or two wet sprayings or foggings of an effective mold home remedy---read [Mold Home Remedy Recipes](#). While spraying a fungicide, no one else should be inside until the spray or fog has dried. Use a hand-pumped garden sprayer or a small electric sprayer. If doing mold fogging, fog the Mold Home Remedy Recipe for at least one half hour in each room, and one half hour to hour into the return air duct of the central heating/cooling system while the heating/cooling system is running on fan ventilation. If possible, remove all furniture from each room to be fogged to fog the empty room [without furniture blocking access of the fungicide to wall and floor areas]. Then repeat the process but on the second effort with the furniture put back in the room to do mold killing on the furniture itself.

If you would prefer to kill and remove mold infestation without using any chemicals, use [superheated dry vapor steam technology](#) to both kill and remove mold growth and mold spores from your moldy walls, floors, ceilings, heating/cooling ducts and coils, furniture, and other personal possessions. As your second step [or alternative to using superheated dry vapor] to remove any remaining mold growth, mold stains, or mold odors, use **MoldZyme** [mold cleaner](#). As your third step in natural mold killing, place open jars of [HygienicAire](#) mold treatment [made from the natural tea oil mold killer] into the cold air return duct and/or outward supply duct registers of your heating/cooling system to kill airborne mold spores in your breathing air.

If there are remaining visible mold growths, wear rubber gloves while you apply a coating of [HygienicAire](#) to the surface of the visible mold growth. Read (below) the [laboratory scientific experiments](#) that [demonstrate the antifungal effectiveness](#) of [HygienicAire™](#).

IMPORTANT OZONE WARNING: Do not use an **Ozone Air Purifier/Ozone Generator** to kill mold. Ozone is ineffective in killing mold. Ozone can only kill what it comes into contact with. Ozone cannot get at, and thus cannot kill, mold growing INSIDE drywall, wall, carpeting, upholstered furniture, wall cavities, ceiling cavities, and floor cavities. Besides being ineffective at killing hidden mold [the worst type], a high ozone treatment can easily damage all rubber and plastic parts it comes into contact with such as rubber and plastic components of appliances, electronics of all types, exposed electric lines and extension cords, and hvac controls. Ozone is also unhealthy to humans according to the **U.S. Environmental Protection Agency**, which specifically discourages the use of ozone for mold remediation. For more information on the ineffectiveness of **Ozone** and the **Ozone Air Purifier** to kill mold and other indoor air contaminant, read the highly-informative U.S. Federal Appeals court decision: [Federal Trade Commission and the Court of Appeals](#).

15. Do not use chlorine bleach [sodium hypochlorite] to kill mold or disinfect moldy areas. Bleach is *not* an effective or lasting killer of toxic mold growth and mold spores on and inside porous, cellulose building materials such as wood timbers, drywall, plasterboard, particleboard, plywood, plywood substitutes, ceiling tiles, and carpeting/padding. Learn more about [bleach and mold](#).

16. After the killing of all visible surface mold, the next step is to remove and to clean off as much surface mold growth, mold stains, and mold odors as possible. "Dead mold may still cause allergic reactions in some people, so it is not enough to simply kill the mold, it must also be removed," recommends the U.S. Environmental Protection Agency. Persons cleaning mold should be free of mold symptoms and allergies. Gloves should be worn during cleaning. A good first step is to use a hepa vacuum cleaner to remove loose [invisible to the eye] airborne mold spores and mold growths deposited on all surfaces such as ceilings, walls, floors, and upholstered furniture. Vacuum at least twice, going in a different movement direction each time you do the vacuuming---e.g., horizontally the first time and vertically the second time. **Scrub and clean thoroughly and completely all surfaces [including furniture and appliances] with highly-effective, enzyme-based Zymo-Cat™ [Mold and Mildew Stain Cleaner](#) to remove mold colony growths, mold stains, and mold odors.** Product usage directions and photo's are provided at [Mold Cleaner](#). The cleaned area should then be thoroughly dried. Dispose of any sponges or rags used to clean mold. If you cannot clean off the mold growth and mold stains with [MoldZyme™](#) and hard scrubbing, then you probably need to replace the building materials themselves with new ones---preventively-treated with your choice of Mold Killer Recipe from this guide (or opt out to choose HygienicAire™, available in [Mold Mart](#)). "If you are unsure about how to clean an item, or if the item is expensive or of sentimental value, you may wish to consult a specialist. Specialists in furniture repair, restoration, painting, art restoration and conservation, carpet and rug cleaning, water damage, and fire or water restoration are commonly listed in phone books. Be sure to ask for and check references. Look for specialists who are affiliated with professional organizations," recommends the U.S. Environmental Protection Agency.

17. Except for wood support timbers and building materials to be saved, remove and safely discard all other mold-contaminated building materials (such as particle board, drywall, plaster, plasterboard, ceiling tiles, paper-backed insulation, mold-laden insulation, plywood, plywood substitutes, and carpeting/padding) in doubled up construction trash bags (double bagging) with a 6 mil thickness. "Absorbent or porous materials, such as ceiling tiles and carpet, may have to be thrown away if they become moldy. Mold can grow on or fill in the empty spaces and crevices of porous materials, so the mold may be difficult or impossible to remove completely," advises the U.S. Environmental Protection Agency.

18. Remove all mold growth from the mold-infested wood surfaces. All wood beams, wall timbers, roof trusses, floor joists, plywood surfaces, and other lumber to be saved need to be totally cleaned of mold growth

by using power tools such as a planer, grinder with wire brush attachment, and sander---or replace the moldy timbers. Mold cannot eat polystyrene insulating board such as Pinkboard or Blueboard, but mold can grow on organic dust which lands on the insulating board. "The only sure way to [kill mold] requires the physical elimination of mold and moldy materials by thorough cleaning or removal of the affected materials."---American Industrial Hygiene Association.

19. Re-spray twice the cleaned out area with your choice of an effective [mold home remedy](#) to kill any remaining, living toxic mold spores or mold growths.

20. Spray a protective fungicidal coating on all remediated-surfaces prior to rebuilding and closing in the mold-remediated area. The fungicidal coating helps to protect the wood and other cellulose-based building materials against future mold growth.

21. After the final drying of the fungicidal coat spraying, it would be helpful to spray all cleaned timbers and other wood surfaces with a clear, liquid, plastic coating [available from a well-stocked local paint dealer, hardware store, or home improvement center] to make a hard, impenetrable water barrier [upon drying] to protect the wood from future high humidity and water leaks.

22. After the toxic mold remediation is completed, mold test (clearance testing) all of the remediated surfaces plus the air of each room, attic, basement, crawl space, garage, and the outward air flow from each heating/cooling duct register to find out if those areas are now mold safe prior to rebuilding the cleaned out areas with new building materials. "Surface sampling may be useful to determine if an area has been adequately cleaned or remediated," advises the U.S. [Environmental Protection Agency](#).

23. Remove mold growth, mold stains, and mold odors from all personal property, furnishings, furniture, and equipment that have been exposed to mold infestation by washing and scrubbing the items thoroughly and completely outdoors [or in a plastic-sheet-built clean room] with **highly-effective, enzyme-based Zymo-Cat™** [Mold and Mildew Stain Cleaner](#). In addition, after the drying of the cleaned surfaces, the property owner can spray [Timbor](#) on all surfaces, to help prevent future microbial growth. Learn the recommended mold decontamination procedures for each type of clothing, furniture, electronics equipment, and other personal property in the ebook [Do-It-Best-Yourself Mold Prevention, Inspection, Testing, and Remediation](#), available at the [online mold products catalog](#).

24. Close in the mold-remediated area with mold-free, new building materials that been have carefully inspected to be mold-growth-free, and which have been pre-treated by spraying with one to two wet coatings of both an EPA-registered mold fungicide and an EPA-registered fungicidal coating.

25. On-going cleaning, building maintenance, mold maintenance, and all-around building inspection on a regular basis (including air conditioning/heating equipment and ducts, plumbing, roof, siding, windows, and water supply/sewer lines) are required to help prevent the re-occurrence of toxic mold infestation problems. A mold-safe building is not a one-time effort.

Fact Sheet on Natural Disaster Recovery: Fungi

U.S. Department of Labor Occupational Safety & Health Administration
Sept. 1, 2005, www.osha.gov

Flood conditions contribute to the growth and transmission of many kinds of fungi, some of which can cause sickness. Cleanup workers are at increased risk of exposure to airborne fungi and their spores because they often handle moldy building materials, decaying vegetable matter, rotting waste material, and other fungus-contaminated debris. The fungal material is carried into the respiratory tract when airborne dust particles are inhaled.

There are many different kinds of fungi, including mildew, molds, rusts, and yeasts. Most of these are harmless, but some can cause respiratory and other disorders when workers inhale or come into contact with fungi. Inhalation is the route of exposure of most concern to flood cleanup workers. The recommendations below offer strategies for workers renovating flooded buildings, homes, and structures to protect themselves while handling building materials that are visibly contaminated with fungi.

For workers cleaning up flooded buildings, homes, and other structures, excessive moisture or water accumulation indoors will encourage the growth of the fungi that are already present. Some fungi have the potential to cause adverse health effects such as allergic responses and asthma attacks. Individual who are sensitive to molds may have signs and symptoms of allergic reactions such as nasal stuffiness, eye irritation, and wheezing. These individuals should minimize fungal exposure by wearing respirators, gloves, and eye protection. They should also seek to eliminate fungi, as described below.

In addition, repeated or prolonged contact of the skin with flood water and continuous sweating can lead to fungal skin infections. These can be minimized or avoided by washing the skin with warm, soapy water and keeping it as dry as possible.

What to do if Symptoms Develop

If a cleanup worker experiences severe allergic or skin symptoms, or severe flu-like symptoms, he or she should seek medical advice. A health care provider can determine whether medication or any other precautions are necessary.

Tips to Remember

For all workers that may be exposed to mold and fungi:

- Avoid breathing dust (fungal spores) generated by wet building materials, crops, and other materials.
- Consider using an N-95 NIOSH-approved disposable respirator as a minimum when working with moldy or damp hay, grain, compost, or building materials.
- Consider discarding all water damaged materials. Articles that are visibly contaminated with mold should be discarded. **When in doubt, throw it out.**
- Surfaces that have a light covering of mold should be scrubbed with warm, soapy water and rinsed with a disinfectant made of ½ cup liquid household bleach mixed in one gallon of water.
- **CAUTION:** Do not mix bleach with other cleaning products that contain ammonia.
- After working with mold-contaminated materials, wash thoroughly, including the hair, scalp, and nails.

- If the safety of food or beverage is questionable, throw it out. Only drink safe drinking water that has been bottled, boiled, or treated until there is confirmation that the community water supply is safe for consumption.

For workers that are cleaning up or renovating buildings and homes that have been flooded, consider the following recommendations:

- If flooding has caused severe damage to a building or home and there is the chance of extensive mold growth, consult with your insurance carrier or local health department to identify a professional with expertise in Mold Remediation.
- If you suspect that flooding has damaged building integrity, consult a structural engineer or other professional with appropriate expertise.
- NIOSH-approved respirators are strongly recommended. Respiratory protection such as the N-95 must be used in accordance with OSHA's Respiratory Protection Standard (29 CFR 1910.134). Also wear gloves and eye protection.
- Remove building materials and furnishings that are wet and may become contaminated with mold growth and place them in sealed impermeable bags or closed containers. Large items with heavy mold growth should be covered with polyethylene sheeting and sealed with duct tape before being removed from the area. These materials can usually be discarded as ordinary construction waste.
- Remove and discard porous organic materials that have become wet or are visibly contaminated (e.g., damp insulation in ventilation system, moldy ceiling tiles, and mildewed carpets). Again, these materials can usually be discarded as ordinary construction waste.
- Clean and disinfect nonporous surfaces where microbial growth has occurred with detergents, chlorine-generating slimicides, or other biocides and ensure that these cleaners have been removed before air handling units are turned on. When you use a biocide or disinfectant, use appropriate personal protective equipment. NIOSH-approved respirators with the appropriate chemical cartridges are recommended. Wear gloves and eye protection also.

For cleanup workers in rural and agricultural communities:

- Silos and other enclosed areas should be vented prior to entry. However, this may not eliminate the problem entirely. If a worker is transporting or working with moldy animal feed, exposures are likely to be threatening if the feed and the worker are enclosed in a barn, silo or other structure. Workers will still need to wear respirators.
- Workers uncapping a silo, shoveling grain, or working with feed, especially in any enclosed space, should always wear at a minimum a NIOSH-approved N-95 particulate respirator. Grain and hay should be stored when fully dry.

For additional information concerning fungi, health effects, and addressing flood damaged materials, please see OSHA's Safety and Health Topics webpage on Molds and Fungi at:

<http://www.osha.gov/SLTC/molds/index.html>. Learn the 25 steps for safe and effective mold remediation.

Consumer Reports Magazine Warns of Five Repairs Homeowners Shouldn't Ignore To Avoid Mold Problems and Other Troubles

June, 2009, issue offers tips to spot trouble areas and avoid costly repairs

YONKERS, N.Y., May 4, 2009/PRNewswire-USNewswire/ -- Homeowners might be tempted to put off fixing their home until the economy rebounds. But Consumer Reports warns that some problems, if left unchecked, can lead to thousands of dollars in repairs and might even compromise your family's health.

The trouble signs are easy to spot, provided homeowners know what to look for. What's more, contractors aren't as busy now, so they're likely to be more flexible on price. Consumer Reports identifies the five biggest red flags of home maintenance, and offers advice on how to deal with them:

Runaway rainwater. Gutters, downspouts, and leader pipes collect rainwater and channel it away from the house. In very wet regions, leaders should extend at least five feet from the house. Check the entire gutter system seasonally for proper pitch and for clogs, corrosion, broken fasteners, and separation between connections and where gutters meet the fascia board.

CR's Advice: The soil around the foundation should slope away from the house at least one inch per foot for six feet or more. If you have planting beds along the foundation, make sure the grading of the bed, its edging, or the edge of the lawn isn't keeping water from draining away from the house.

Roof and siding. Roofs are the most vulnerable to water infiltration, given their exposure to the elements and the laws of gravity. On a sunny day, use binoculars to spot cracked, curled, or missing shingles, which are signs that the roof is near its end of life. Also check flashing around chimneys, skylights, and roof valleys, and the rubber boots around vents for cracks. Siding is also susceptible to leaks, especially where it meets windows and doors.

CR's Advice: A \$5 tube of caulk might save homeowners thousands of dollars in structural repairs. Adding attic insulation and sealing gaps around pipes, and ducts into the attic might help prevent future damming and lower your heating and cooling bills.

Pest infestations. Termites and carpenter ants gravitate to moist soil and rotting wood, another reason to make sure your gutters are in good shape and soil around your foundation is graded properly. Also keep mulch, firewood, and dense shrubbery away from your foundation. Once termites infiltrate a home, they can bore through the structure in a few short years.

CR's Advice: To detect termites, probe the sill plate (also called a mudsill) that sits on top of the foundation with a screwdriver to check for rotted wood. To check for carpenter ants, look for piles of sawdust along baseboards. Termites also shed wings along windowsills, walls, and other entry points.

Mold and mildew. Even houses in arid climates aren't immune. Hot outdoor temperatures can drive even small amounts of water trapped in the structure to condense on colder interior surfaces, leading to mold. Musty odors, dank air, and family members with chronic runny noses are warning signs. Check under carpets and around windows for visible mold or mildew. Also remove cover plates for cable-TV, phone, and Internet connections, and use a flashlight to peer behind walls and wallpaper for mold.

CR's Advice: Avoid mold tests sold at home centers and online. Each of the kits CR tested had significant flaws that were serious enough to earn them a Not Recommended Rating in CR's 2006 tests. If indoor mold covers less than 10 square feet, treat it with a homemade solution of one cup chlorine bleach per gallon of water. Be sure to don an N-95 disposable respirator, goggles, and heavy-duty gloves. Professional remediation is required for larger outbreaks, if the ventilation system is contaminated, or if an allergy sufferer lives in the home.

Foundation cracks. Some cracks are harmless, but others can mean trouble. Monitor them using a ruler. Cracks wider than 3/16 inch, even vertical ones, can be a problem. Mark smaller cracks with tape and monitor their progress over the coming months. Also be on the lookout for horizontal cracks or bulging or buckling. Along with expanding cracks, those conditions require the attention of a structural engineer.

CR's Advice: The longer homeowners wait to correct a problem, the more costly it could be.

For more on how to spot the trouble signs, simple spruce ups for the home, and home repair, check out the Consumer Reports June issue, on sale May 5 or visit www.ConsumerReportsenespanol.org.

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Home Selling and Home Buying & Water, Mold or Other Environmental Problems

Whether you want to sell or buy a home or other real estate, you need to be concerned about the possible presence of mold infestation and other environmental health threats which may be resident in the home, condominium, apartment complex, office, store or other real estate project.

If you are the home seller, you should consult with your local real estate attorney about whether or not your state requires real estate sellers to disclose any water, mold or other environmental problems known to the seller. You need to comply in good faith with all of your state's laws. If you know your home or property has a problem, you would be wise to remedy the water problem, mold infestation, or environmental threat *prior to even offering the property for sale and prior to even listing the property for sale with a realtor*. To find both the visible and hidden mold problems in the property you wish to sell, hire a comprehensive mold inspection and mold testing by a [Certified Mold Inspector](#), or follow the do-it-yourself mold tips provided at [Mold Inspection](#), including the use of our do-it-yourself mold test kits. Learn the steps recommended for safe and effective mold remediation. Ask your attorney to be the one to draft a home sales contract which might include the following items (plus any other helpful provisions recommended by your attorney): (1) the buyer is encouraged to hire [at his or her own expense] a qualified home inspector to inspect the entire home or building for water or environmental defects or problems of any kind, plus [a Certified Mold Inspector](#) for comprehensive mold inspection and mold testing; (2) a detailed listing of home or building water, mold, and other environmental problems currently known to the seller[s]; (3) a provision that the home is being sold "as is" with no home, plumbing, mold, or environmental warranty or guarantee of any kind; and (4) a provision that the buyer accepts full responsibility for any home, water, mold, and environmental problems which may be now in the home or property being sold, or which may ever arise in the future.

If you are the home buyer, you should consult with your local real estate attorney about whether or not your state requires real estate sellers to disclose any water, mold, or other environmental problems known to the seller. Regardless of any state requirement to do so, prior to making an offer to purchase the home or other real estate, insist that the seller[s] provide a signed and dated written disclosure [written by your attorney, if possible] of all seller-known home, water, mold, and environmental property problems of any kind. Your goal should not be the home or property "as is," but to try to obtain whatever written assurance [in the sales agreement] that you are able to negotiate from the seller [s], if any, about the home condition, water, mold, and environmental status of the home or property. Have your attorney insert a 21 day [14 day minimum, but 21 is better] environmental inspection time period [beginning at contract signing] for you to have the home or property thoroughly inspected by a Certified Home Inspector and by a [Certified Mold Inspector](#), and other environmental professions whose expertise may be required, with your retaining the right to cancel your purchase offer and receive back promptly a full refund of your earnest money deposit [in the hands of a title insurance company or the licensed realtor in the realtor escrow account] should there be any physical or environmental problems of any kind which are unacceptable to you as the prospective buyer. Do not rely on any mold testing and mold remediation done by the seller or mold professionals not hired by you. During the environmental inspection time period, pay for a comprehensive mold inspection and mold testing by a [Certified Mold Inspector](#), or, follow the do-it-yourself mold tips provided at [Mold Inspection](#), including the use of our do it yourself mold test kits. Learn the steps recommended for safe and effective mold remediation. Get legal help from your attorney before waiving any present or future legal claims you may have in regard to water damage, mold problems, and environmental problems. Please be aware that it is very easy for the costs of mold remediation to exceed the value of the remediated home.

New Home Mold Prevention with House Wrap

Use an effective house wrap such as Dupont's Tyvek House Wrap on the exterior of your new home between the exterior wall sheathing and the outer finish surface (bricks, aluminum siding, vinyl siding, plastered, wood siding, etc.). Learn how properly installed House Wrap can help protect your home from air and water infiltration in this chapter.

Tips for Managing Moisture and Air in Your Home

They just do not build homes the way they used to. All things considered, it is probably a good thing. There was a little or no concern for some of today's issues like increased comfort, energy efficiency, conservation, moisture protection, ventilation and interior air quality. Things have changed.

Today, homes average twice the size of their Post WW II predecessors, complete with multiple bathrooms, walls of windows, high ceilings, and a host of high-tech mechanical systems and appliances. Your home could contain many sophisticated engineered materials, employing innovative and often complex building techniques. Today's house is still a home, but now it is also a completely engineered system from roof ridge to foundation.

According to building consultant Steve Easley, S.C. Easley & Associates, it is important for you to choose a builder or remodeler who not only is concerned with your new home's interior features and amenities, but also with what's behind your walls. "Be sure you are as familiar with unseen features in your home as you are with all the visible features," said Easley. Selecting a builder who is knowledgeable about materials, systems, and the latest building practices, will help to ensure your long-term satisfaction.

Issues for the 21st Century home

Two key issues have recently emerged healthy homes and tight homes.

First -- the healthy home refers to buildings that are environmentally friendly, family safe, properly ventilated, and free from indoor pollutants. The issue is how indoor air quality affects the health and well-being of your family.

Second -- "tight" construction refers to homes that are energy efficient, with an indoor environment well controlled through mechanical ventilation systems. You might have read, or some builders might warn against overbuilding or building too tight. The contention is that these homes are so airtight, the interior air circulation and ventilation is not adequate and problems occur. "It is common to blame problems in new homes on tight construction. In reality most problems are related to poor installation of building materials and a lack of controlled ventilation," said Easley.

Build tight; ventilate right

The idea that a home can be built too tight really misses the point, according to Easley. "I can't repeat this phrase often enough—build tight; ventilate right," he said.

Today's homes are built within a shell. The walls, roofing systems, heating, cooling, ventilation, and all mechanical systems must be fully integrated to properly, efficiently, and safely manage the ever-present

movement of air and moisture in and out of your home. "The key to building a healthy, energy efficient, long-lasting home is proper ventilation and moisture management," said Easley.

Walls that breathe

The ideal construction, according to Easley, is a tight yet breathable home with proper air and heat flow to eliminate the potential for air leaks, heat loss and indoor air quality problems. "All homes at one time or another experience weather conditions and moisture that can cause problems. This is why the walls and the shell must breathe," said Easley. He explains that housewrap is one of the most important elements in your home's wall system that will allow your home to breathe properly.

Housewrap—your home's protective envelope

DuPont invented housewrap, a simple, low cost solution to the proper management of air and moisture in your walls—it's called Tyvek® HomeWrap®. Quality builders use Tyvek®, installed between your siding and the sheathing to reduce air and water infiltration and increase thermal efficiency. "Just as you wouldn't think of building without adding insulation, you shouldn't build without a housewrap that ultimately helps your insulation and your walls work most effectively," said Easley.

No matter what your exterior—wood or vinyl siding, brick, stucco or stone—water will eventually find its way inside your walls. Housewrap is an important secondary weather resistant barrier that can be used under any type of facade. It will help make your house more comfortable and help protect against moisture damage for years to come.

Your home's comfort factor

The Department of Energy estimates that nearly 40% of your energy loss is the result of air infiltration caused by wind driven pressures from the outside. The opposing forces of pressure between your inside and outside walls cause heat and air conditioning to be virtually sucked from your home—through walls, ceilings, sill plates, sheathing joints, top plates, electrical outlets and every inch of the estimated half-mile of cracks in newly constructed homes. As air infiltrates, it causes changes in temperature that requires your heater or air conditioner to work harder. Constant temperature fluctuations also reduce your comfort level. You feel too cold or too warm. Reducing air infiltration increases your home's comfort factor.

Protecting your home's R-Value

Insulation can help increase the R-value for your home, but it is only marginally effective in reducing air infiltration. When air infiltrates, the R-value itself can be reduced up to 60%. Adding thicker insulation will not solve the problem but stopping air from getting in will. Properly applied, House Wrap helps reduce air infiltration, preserving R-values, conserving energy, reducing heating costs and creating a more comfortable interior.

The tighter your home, the more comfortable and efficient. Unfortunately, the tighter your home, the more susceptible to moisture problems that can cause mold, mildew and rot. So all systems need to be in balance—designed to manage moisture effectively.

Protecting against moisture damage

Your walls can trap moisture that enters from outside through rain and moist air infiltration. From inside your home, cooking, humidifiers, dryers, bathrooms, range hoods and more add to trapped moisture. Without a means of escape, moisture can promote the growth of mold and mildew and begin to degrade wall materials.

Left undetected, such moisture damage can affect the indoor air quality. With a housewrap like Tyvek® that breathes, trapped moisture vapor escapes safely to the outside. A breathable housewrap helps dry out any water or moisture in your walls.

It helps to know what goes on inside your walls—for your comfort, for the durability of your home and for cost savings on energy bills.

Source: This article was taken from the Dupont Company Website:
<http://construction.tyvek.com/en/manageMoisture.shtml>.

Chapter 5

DIY Mold Prevention, Inspection, Testing and Remediation Frequently Asked Questions (FAQ)

MOLD PREVENTION

Q. We are wondering about what floor covering to use on a basement lower level concrete floor. We just tore out a pergo floor and discovered mold growth under the plastic barrier. Would we be safe installing hardwood or carpet, if, through changes to our furnace system, we are able to keep the humidity low?

A. It is likely that moisture is weeping upward from your concrete floor from the earth below because of no or a degraded or damaged water moisture barrier beneath the concrete. Your most effective flooring would be to install ceramic tile set into cement containing adequate amounts of waterproofing compound, with the grouting also done in cement with waterproofing. The result is that no water can seep up through your basement floor. You can use large, washable area rugs to introduce more beauty and comfort to your tiled floors. As to the present mold situation, you need to mold test your entire home with do-it-yourself mold test kits and easy to follow instructions available at [Mold Mart](#). You should also follow the 25 Steps of Effective Mold Remediation (above). Of course, anything you can do to reduce basement and home humidity is a step forward. Programmable dehumidifiers are now available at [Mold Mart](#).

Q. What do you recommend us to put on leather uppers once we have wiped off the mold to prevent the mold from coming back?

A. You could spray the leather shoe tops with a clear plastic sealant to keep out the moisture that enables the mold to grow.

Q. I have mold growing on the stained cedar shingles covering the outside of my house. What would be the best way to remove, kill and prevent the mold from growing again on this siding?

A. Kill the present mold growth with a mold home remedy recipe explained in the special report at <http://www.moldmart.net>. Then scrub off the killed mold growth with Borax laundry detergent, a natural mold cleaner, in warm water. You might have to use a grinder with a wire brush attachment to get rid of all molds. Then, re-stain the cedar shingles with a stain that is mixed into a clear plastic sealant to make your shingles absolutely resistant/repellant to water penetration of the shingles. Once your shingles are mold-free, help keep them that way by frequent use of a power sprayer to remove landed/deposited airborne mold spores and organic dust/dirt [mold food] on the top surface of the shingles.

Q. I live in a valley, about 200 yards from a large creek. My house is 2 years old. The builder took out only a few trees. There is a mix about 50/50 of pines and hardwoods in my front yard (North). We have lots of ferns that grow on the West side of the house. I have lots of mildew and mold - on the house, porch, trees and black stuff on my dogwood trees.

My question is - do you think it would help if we raked the front yard down a few inches to clear the years and years of old leaves that have broken down?

A. Getting rid of decaying vegetation such as accumulated leaves and pine needles is a smart move on your part to reduce airborne mold spores in the area of your home---spores that will travel in air current movements to enter your home's open windows and doors and fresh air intake of your heating/cooling system. You should also consider cutting back or down any trees or big landscaping that block sunlight from hitting your home. The ultraviolet light rays in sunlight are natural mold killers. Living in a wooded environment means that your home is going to be bombarded on a regular basis by elevated levels of airborne mold spores, with resulting mold contamination of your home. Consider installing what is called a "mass media", very thick hepa filter in the return portion of your heating/cooling ducts to continually remove airborne mold spores from the breathing air of your home. You also would be wise to mold test your entire home to determine how severely it might already be mold-infested. Follow the mold inspection and testing tips at <http://www.moldinspection.com>

Q. I live in South Florida where power washing the roof is become a seeming integral part of the annual 'house cleaning rituals' Is there any product which can be used to treat a roof so that mould will not grow on it, thus eliminating the need for the roof to be power washed at intervals?

A. To prevent mold growth on your roof, there is not substitute for periodic [every few months, not once a year] high pressure washing of the roof surface to remove deposited/landed mold spores and organic dust/dirt, upon which the mold feeds to grow into mold colonies. Use borax laundry detergent, a natural mold cleaner, as the cleanser to mix with the spray water. The borax residue will help inhibit future mold growth. To further help reduce the mold growth, at least once per year, after you have done an initial cleaning with borax, let the roof dry and then spray [with a regular sprayer, not a high pressure sprayer] with MoldZyme™, HygienicAire™ (both available in [Mold Mart](#)), or your choice of any of the mold killer recipes found in this guidebook. After the fungicide has dried naturally [killing any remaining mold spores and mold colony growths], then spray one more time with Borax in the high pressure sprayer to leave a borax residue as a mold inhibitor.

Q. We have built a new bathroom. What would be the proper steps to seal the drywalled walls and ceiling? I have already painted a coat of PVA primer on them. Should we be putting a fungicidal coating on next, before paint? Are high gloss paints more effective in preventing molds from happening?

A. You are very wise to worry about mold prevention. Your next step should be to spray [MoldZyme™](#) or [HygienicAire™](#), on the painted walls to kill any invisible mold spores which may have landed on the surface. Then, spray the white-paint-like protective fungicidal coating [Timbor](#). Paint the bathroom walls with an oil-based, high gloss painting to seal the wall against exterior moisture penetration [e.g., from high humidity of showering, tub baths]. Have an exhaust fan that exhausts bathroom air directly to the outdoors wired in the bathroom so that the fan turns on whenever you turn on the bathroom light. The exhaust fan will exhaust humid bathroom air.

Subject: Which material is less susceptible to mold growth?

Q. Can you tell me which materials (i.e. used for bathroom floors and walls, under sinks, and so on) are less likely to produce or encourage the growth of mold, and other toxic pollutants? And which ones are more likely to collect these things? [May 22, 2005]

A. The very best is to use marble, or ceramic tile, set in concrete with adequate amounts of waterproofing compounded mixed into the setting concrete beneath the marble or ceramic tiles, and into the cement grout between the tiles. Mold cannot eat cement, marble, or ceramic tile.

Both marble and ceramic tile can be washed easily and frequently to remove deposited mold spores and organic dirt or dirt [mold food]. By using enough waterproofing compound in the setting cement and in the grout, the tile or marble is an effective moisture barrier to keep moisture from rising up [wicking up] from the concrete or wood or earth beneath the marble or tiles. Similarly, surface water [cleaning, spills, flooding] on top of the marble or tiles will not penetrate the marble or tiles to get to any wood surfaces beneath the marble or tiles. Marble and ceramic tile can be installed on either a concrete floor, or a properly built wood floor.

Q. Are house plants dangerous for people allergic to mold and house dust?

A. Yes, because indoor plants thrive well indoors with regular watering. Mold loves to grow on plants, dead plant material, soil and fertilizers. The mold growth throws into the air large number of airborne mold spores which can mold cross contaminate the house and cause mold health problems for occupants. Having no LIVE or DEAD indoor plants makes for good mold prevention. Only plastic and silk plants are safe because of no mold spore generation.

Q. I plan to build a new home in Yellow Springs, Ohio. We want to take all the reasonable steps to provide good air quality. We have key concerns regarding the ductwork. What specific recommendations do you have to reduce the possibility of mold growth in a new home in the duct system and basement?

A. To prevent mold growth in the duct work and heating/cooling equipment, consider such steps as using sheet metal ducts (with NO INTERNAL insulation to trap dirt and mold spores and to foster mold growth). The insulation of the ducts should be on the outside of the ducts, isolated from the air flow of the ducts themselves. Sheet metal ducts can be cleaned of mold growth if necessary, whereas internally-insulated ducts and ducts made of other materials become throw-away during mold remediation efforts. Install several high output ultraviolet lights inside the system to kill airborne bacteria, viruses and mold spores. In the return air duct, it would be extremely useful to have a mass media hepa filter, changeable hepa filter to capture incoming mold spores. Mass media means about 6 inches thick or thicker hepa filter, and it requires special ductwork housing of course. You order the mass media filter to be installed with the system from the beginning. Follow manufacturer's guidelines for the cleaning and replacement cycles for the hepa filter itself (which goes inside a housing unit in the return air duct).

Q. I do not have a mold or mildew problem but I want to employ some preventative control in the attic of my one level home in Boynton Beach, Florida. What can I do?

A. Spray all attic wood surfaces (including beneath insulation) and all roof timber surfaces and the attic side of the roof decking with your choice of [mold killer home remedy recipes](#) (let it kill any mold spores on the surfaces for at least one to two hours before fan drying with air flow being to the outdoors to quickly dry the sprayed area), followed (upon drying) with spraying at least one to two wet coatings of the [fungicidal protective coating](#) (let set for one to two hours before fan drying after each spraying). You can buy both fungicides at our [online mold products catalog](#). Living in Florida means high humidity. Check your year-round humidity in the attic and through your entire home. If the humidity is 60% or greater, you are inviting mold to be permanent your house guest. You may have to use programmable dehumidifiers to reduce the level as close as you can to a mold discouraging 30-40%.

Q. We are about to carpet (a portion of) our dry basement. Our son has mild asthma tendencies. So long as we keep the humidity 30-40% to discourage any type of mold (that shouldn't even develop anyways) and keep it vacuumed with a HEPA vacuum cleaner like we do the rest of the house AND use an Air Filtration system in the basement recreation room, we should be safe, right? Also, we will be using carpet tacks, NOT glue, to affix the carpet (in the rare instance we ever would have to pull it up). My questions are, (1) what type of preparation might we want to do BEFORE laying the carpet and or pad ? There currently is tile down now and it will be staying there with the carpet and pad going over the top of it. (2) Is one particular type of pad cleaner, better, than another?

A. Your mold prevention precautions are very well thought out. I would add 2 more preventive steps. First, find out if your home has a mold problem [anywhere which can cross contaminate your entire house] by using our [do it yourself mold test kits](#) to mold test the basement, all rooms above, attic, and the outward air flow from each heating/cooling duct register for the possible presence of elevated levels of airborne mold spores, in comparison to your outdoor mold control test. Assuming there is no mold infestation problem found in your mold testing, your second preventive precaution would be to spray your choice of [home mold killer](#) (or use [MoldZyme™](#) or [HygienicAire™](#)) on the basement ceiling, walls and floors prior to carpeting. Buy a synthetic rubber-based padding for additional mold protection. Then spray at least one or two wet coatings of [Timbor](#) as a mold protectant on the ceiling, walls, and floor, and on both sides of the padding and carpeting to be as installed. Read about both EPA registered mold killers in our section which lists the 26 steps for safe and effective mold remediation found in the previous section of this chapter. Keep your humidity in the mold-discouraging 30 to 40% range with a programmable dehumidifier in the basement.

Subject: sealing the outside of concrete blocks to stop moisture/water intrusion in new home construction

Q. We are currently building a home with US Homes Inc. I have heard conflicting advice about sealing concrete block prior to applying stucco. Some have said that you should do it to prevent water intrusion and US Homes says not to do it because it will not allow the concrete block to "breathe" thus trapping moisture between it and the drywall. What is your advice?

A. Use an effective waterproofing sealant on the outside of the concrete block is very advisable to help keep water out of your home. You should also only install drywall in the finished home when you have done mold pre-treatment of interior block surface, wood timbers used, and drywall [both sides]. Use a hidden moisture meter to determine if the masonry wall is dry enough to do interior finishing. Then spray all such materials at least twice with your choice of [home mold killer remedy](#), then [Timbor](#) as your preventive coating. Make sure there is adequate ventilation in the basement and that the indoor basement humidity stays less than 60% including prior to your move in. You may need to use a programmable dehumidifier to keep indoor humidity to a mold-discouraging level [the best is 30 to 40%]. Learn about new home mold at [Mold Removal](#). You can buy the above-referenced fungicides at our [online mold products catalog](#).

Q. The use of carpet in schools has become somewhat of a controversial issue. Could you offer comments on the benefits/risks of carpet in schools?

A. For the sake of occupant health, carpeting and padding should not be used in schools, commercial buildings, and homes to deny mold food to eat and a place to hide (hidden mold growth is a huge problem). The best floors for mold prevention are concrete (with adequate amounts of compound in the concrete mix), marble (set in cement with waterproofing compound), ceramic tile floors (set in cement with waterproofing compound, and as the tile grout), and vinyl tiled floors. If new concrete floors are being poured, in addition to waterproofing inside the concrete mix, there should be a thick, highest quality water moisture prevention

membrane (not just plastic sheeting) installed beneath the concrete to prevent ground moisture from wicking up through the concrete.

Subject: Mold prevention tip for bathroom closet construction

Q. I am redesigning a master bedroom. I would like to put two closets for clothing in the bathroom. There will be a vent in the bathroom ceiling but I am concerned about mildew or mold growing on my clothing. Is this something I should be concerned about? I live in Southern California so the climate is pretty dry, if that is an issue.

A. That would be okay if you install a powerful exhaust that takes humid bathroom air directly to the outdoors. You would need to run it during and after all showers and tub baths. You might also consider utilizing in the bathroom (away from tub and shower) a programmable dehumidifier which keeps bathroom humidity to a mold discouraging 30 to 40°. You should need plenty of ventilation in the attic area if you want to avoid mold growth on your clothing. I would recommend that you install a full louver doors to allow plenty of air movements. Inside the closet, be sure to treat all the wood studs, dry wall, and other building materials with [Timbor Wood Preservative](#). Both are available online. The floors and walls, including the floor of the closet should be ceramic tile set in cement which has adequate amounts of waterproofing compound. The tile should have cement as the grout (in any color you desire) with waterproofing compound. Closet walls and the louver doors also need to be treated with a glossy or semi glossy enamel paint and/or with a clear plastic coating painted on as barriers to water penetration of the building materials.

Subject: New home mold prevention steps

Q. I am constructing a house in Tennessee and would like to have it treated for mold while it is being built. Can you recommend a company in TN that can do this for me?

A. Inspect all timbers for black or dark blue mold stains and mold growth which need to be removed by power planing, power grinding [with wire brush attachment], power sanding, and/or timber replacement. Then spray all construction timbers, drywall, plywood, on all surfaces and edges with [Timbor](#). It would be much more effective and affordable if you did it yourself, or supervised a handyman to do the spraying. Read the safety and effectiveness recommendations for mold treatment and remediation at http://www.moldinspector.com/mold_removal.htm. To find a Certified Mold Inspector in Tennessee, please visit the Certified Mold Inspector Directory online at: <http://www.certifiedmoldinspectors.com>.

Subject: Closet mold prevention tip

Q. I just found black mold in our bedroom closet and would like to know how to get rid of it. Our bedroom is always cooler and never has enough circulation. Is this a common problem?

A. To help prevent closet mold, leave the closet door open, or replace it with a louvered door so that there can always be air movement into and out of the closet. Check the indoor humidity in the bedroom closet, the bedroom and the rest of the house with a digital hygrometer, \$30 from a large hardware or home improvement store. Keep your indoor humidity to 30-40% to discourage mold growth. You may need to run programmable dehumidifiers to control your indoor humidity.

MOLD INSPECTION AND MOLD TESTING

Subject: How to do Professional Mold Inspection and Testing

Q. My wife recently contacted a Mold Remediator regarding a mold issue we have in our closet and bathroom. On his suggestion, she paid \$500 to do various mold tests to determine how far this has spread. He's telling us that the visible mold is *Stachybotrys* and that we have "astronomical" amounts of airborne mold in the room – more than he has ever seen (*Penicillium* and *Cladosporium* or something like that). None of us show any signs of being sick by the mold. We've read a lot of conflicting info about mold on the web and are not sure what to do. One step that we didn't do suggested hiring an inspector that does not do clean-up. Would you recommend starting over and paying another \$500 to find an independent inspector to make sure we were given correct information? I was hoping that filing an insurance claim and having an adjuster come out would give a second opinion, but have read that many times they under-test so as to support less payment from the insurance company. I just don't know how to tell if we're scammed or not. We have a 4 year old and a 1 year old and I sure don't want to do anything to jeopardize their health. It could be that we're getting 100% accurate information, but I just don't know. Any advice you could give would be appreciated.

A. If your doctor told you that you had incurable cancer, you would want a second opinion. The same is true in home mold poisoning. You would be very wise to hire a [Certified Mold Inspector](#) for the sole purpose of in-depth, accurate mold inspection and testing of your home. Let the Inspector know that you only want inspection and testing and not mold remediation. Or take a much more personal approach – do the mold testing yourself. Here's how:

Do-It-Yourself mold air testing should be your first step to determine whether your home and workplace have a serious mold infestation problem. If there is even a hidden mold problem inside walls, ceilings, attic and the heating/cooling system, usually detectable airborne mold spores will make it into the air. If the indoor mold levels are elevated in comparison to your outdoor mold control test, you know that you probably have a serious mold problem which needs further investigation and possible mold remediation. You can use the [online do-it-yourself mold test kits](#) to mold test any visible mold growths, the air of each closet, bathroom, personal room, basement, crawl space, attic, garage, the outward air flow from each heating/cooling duct register, and inside the passenger compartment of your vehicle (often mold cross contaminated if your home or office is mold infested). Watch the mold test kits for 7 days. If any of the test kits show a large number of mold colonies of one more different types of mold (visually different to you), you can submit the mold test kits to a [professional mold laboratory](#) for mold analysis and mold species identification. If mold test results indicate a problem, you may then want to then hire a [Certified Mold Inspector](#) to use fiber optics to inspect inside walls, ceilings and the heating/cooling ducts for evidence of physical mold growth, and to do in depth mold investigation and inspection. You should also visit [Mold Removal Online Tips](#) for more information. Buy the [best air purifier cleaner](#) to remove airborne mold spores from your home air to protect your family against breathing in elevated levels of airborne mold spores. This electronic air cleaner is rated the most effective by the leading, non-profit USA consumer products testing organization.

Q. I have a musty smell in the kitchen and one of the bathrooms. When I leave a wet rag in the kitchen, it gets a bad musty smell real quick. Also, the bath towels take on a wet musty smell. I don't see any evidence of mold, but I may not be looking at the right places. The scrawl space under my house didn't have any plastic on it, so I put a layer down. Will mold collect on the air filters for the furnace? If so what does it look like?

A. The return air duct register's air filter will look black or even bluish-green (*Penicillium* mold) if heavily mold laden. You can use the Scotch tape method of mold sampling to collect a sample of possible mold growth on the incoming side of an air filter. You can then put the Scotch tape sample sticky side down into one of our [mold test kits](#) and watch for mold growth over a 7 daytime period. You also need to use our test kits to mold test air of each room, any attic/basement/crawlspace/garage, and the outward air flow from each heating/cooling duct register for the possible presence of elevated levels of airborne mold spores, in comparison to an outdoor mold control test. The fact that the towels easily become mold-smelly is indicative a possible

elevated levels of airborne mold spores. Your crawlspace needs to be carefully inspected and tested because it is likely a real mold haven.

Subject: mold inspection in attic

Q. The question has come up are bath fans exhausting out the soffit ventilation creating a problem with mold in the attics. Your help in this manner would be a great help.

A. If there are open holes or entrance into the attic area from the soffit, there will probably be movement of moisture-bearing air from the exhaust fans into the attic area, resulting in mold growth problems in the attic. It is better to exhaust the fans via pipes that discharge the outward airflow above the roof line. (Please read the 26 effective mold inspection steps discussed in the previous chapter).

Subject: Testing for an Automobile Mold Problem

Q. I have a 2002 Saturn SL1 and the car was diagnosed with a manufacturers defect about 7 months ago. Apparently there was a leak in the firewall and water got into the car. After about six trips to the dealer they had replaced every piece of soft interior, pulled the dash apart twice, replaced all the mats, carpets, rubber and fiber insulation and they washed down the hard parts of the interior with Terminex. They have probably spent at least \$10K trying to fix it. My 3 year / 36000 warranty ran out on Friday and at that time I took the car in. The service manager, sales manager, and the General Manager reached a consensus that my smelling of mold was a figment of my imagination. I think the car still smells and so do my wife and my son. Saturn Customer Service relies on the dealer and I can't get them to respond to me. If I wan't to get any where with resolving the perceived problem I will have to prove; perhaps legally prove, that mold still exists. If the results are positive I can proceed and if they are negative I am still a happy camper that the problem is solved. Now the mold odor is not nearly as bad as it was but I believe that a little bit of mold is like a little bit pregnant. It will mature! What do you recommend that I do?

A. Using a medium-sized, clean [rubbing alcohol disinfected] fan, stir up the air inside the closed car for 15 minutes. Turn off and remove the fan. Place one of our opened [mold test kits](#) in the middle of the passenger compartment and leave it there it for one hour for any mold in the air to settle down onto the settling plate [mold test kit]. Then seal the test kit closed and follow the other instructions provided with our mold test kits. Watch for mold growth over a 7 day time period. Do a car heating/cooling duct test by holding a separate mold test kit in the direct outward air flow [outflowing air directly hits the sticky surface of the open mold test kit] from each heating/cooling duct register [running on fan ventilation] inside the car [open windows are fine]. Do a 15 minute air mold test for each separate duct register. Then seal the kits and watch for 7 days. If you have many molds in colony counts and types of molds growing, you have in your hands proof positive of the existence of a serious mold problem. You will also do [at the same time as your interior car testing] an outdoor mold control sample test 5 feet away from the car. If you so desire, the mold test kits showing the most mold growth can then be submitted to our mold lab for mold lab analysis and mold species identification. In view of all the effort that has been put into the interior of the car as to mold remediation, there is a distinct possibility that the remaining mold smell is coming from mold growth still resident in your car's heating/cooling equipment and in the duct work which carries heating/cooling into your passenger compartment. Please visit <http://www.moldmart.net> for more information on mold test kits.

Subject: High Humidity in Basement

Q. I have a home with a walkout basement. Every time my wife and I go down there, after a few minutes we feel sick and have a headache. The basement smells a little moldy, but the previous owners had a hot tub in one room without a dehumidifier.

When we moved in a few years ago the humidity was in the 90's. Do I need to remove all the carpeting and scrub everything down with bleach?

A. If indoor humidity exceeds 59%, the property owner has invited mold to grow big-time. One of the greatest humidity and mold threats to a home is a hot tub left full of water [without a protective, moisture-tight cover]. It is extremely likely that there is now mold growth inside basement walls and ceilings, from which mold can easily grow into the floors and walls above. In addition, airborne mold spores from the basement mold can travel in air currents to mold cross-contaminate the entire house and its heating/cooling system. Your first job is to mold test all-around your home [explained in Chapter 4].

Subject: Testing & treatment options for mold in toilet tank or water supply system

Q. Occasionally I get a buildup of what looks like dirt at the bottom and sides of the toilet. Looking closely, I think it is mold. What is the cause of this? Has it got something to do with the water supply? Or is it the pipes?

A. Bathrooms tend to have a higher humidity which is very supportive for mold growth. The mold is eating organic dirt/dust which is landing on the toilet. Some molds can even grow in the water on the inside walls of the toilet water supply tank and the toilet bowl itself. You should wash the toilet frequently with Borax laundry detergent, a natural mold cleaner. Of course, your water might be mold contaminated with mold spores contained in the water from mold growth in water supply pipes, water well, water storage tank, water softener, and other water distribution equipment. You can test your water first thing in the morning [prior to other water use] for possible mold contamination by running some water into a cup. Then using a new or sanitized eyedropper, transfer about 10 to 20 drops of water onto the surface of one of our mold test kits, and then watch for any growth over the next 7 days. You also should investigate this possibility: that your home has elevated levels of airborne mold spores. You can use our do it yourself mold test kits [at our [online mold products catalog](#).] to mold test the air of each room, basement, crawl space, attic, garage, and the outward air flow from each heating/cooling duct register, to determine the possible presence of elevated levels of airborne mold spores, in comparison to an outdoor mold control test.

Subject: Mold testing questions for mold test kit instructions

Q. Is there a certain temperature the outside air should be for the control test to work properly? Will there ALWAYS be some sort of mold growth in the petri dish? And how much mold is TOO much mold? Is the criteria strictly if the inside growth is greater than the outside growth? And, again, will the outside temperature come into play?

A. Above freezing would be very helpful because you need to leave the water-based outside control test open outdoors for at least one hour. You don't want rain or snow during the outdoor testing which needs to be the same date and time as the indoor mold testing.

Yes, there will always be at least some mold growth in a mold test kit because mold is everywhere. What you are going to do is compare the amount and diversity of mold growths of your indoor tests against your outdoor mold control test. If in a particular mold test kit, there are more colonies indoors than outdoors, or more types of mold growths [visible differences] indoors than outdoors, you can assume that there is an indoor mold contamination problem. Outdoor temperature above freezing is OK and won't materially affect mold sample collection which is a mold spore settling down from the air type of mold sampling.

MOLD REMEDIATION

Subject: using ultraviolet (UV) germicidal lights

Q. How effective are the UV germicidal lights you can buy for your heating/air conditioning system and as room lights at killing molds/bacteria in home. I've heard they are used in hospitals. Is there solid research on the benefits or mostly a sales gimmick?

A. One ultraviolet (UV) lamp of at least 10, 000 μ watts per second of exposure can kill almost all biological contaminants in the air EXCEPT for mold, which can take as high as 330, 000 μ watts per second of exposure, especially for the dangerous and commonly-found indoor mold *Aspergillus Niger*. To effectively kill mold with UV inside a heating/air conditioning system, you would need to have your heating/cooling contractor construct in the return air duct a kill box containing mirror-like surfaces to get a multiplication of killing power through the bouncing effect of the rays off the mirrors. The kill box would need at least a dozen or more UV lights with a power of at least 20, 000 μ watts each. That many lights, plus the bounce factor off the mirrors, would be strong enough in killing. In addition, you would need to have an access panel into the kill box to frequently dust off the bulbs which will become dust-laden and thus lose their effectiveness unless you have a really effectively and frequently replaced hepa filter system to clean incoming air into the return air duct. Just as effective as a UV killing box (and much easier and less expensive to install and maintain) would be to install a mass media (e. g. 4 to 6 inches thick) hepa filter in the return air duct. Get a mass media filter which can be washed, rather than replaced. Use an inexpensive, disposable pre-filter to do an initial dirt and mold removal prior to the air entering the expensive mass media hepa filter. In addition to the mass media filter, you could also install an electronic air cleaner into your return air duct. If you install an electronic air cleaner and/or mass media filter, you may need to upgrade the size of your ventilating fan and motor to overcome the greater resistance to airflow caused by the air cleaner and/or mass media filter.

Subject: Attic mold remediation

Q. I just had an engineer's inspection with my buyer and mold was found on the attic plywood and rafters, even though a new roof had been put on 1 yr ago and supposedly new plywood-I understand a professional mold remediator could cost \$3-4,000? Would it be better to just tear off the roof and start over or get rid of the mold and leave the present roof on? The inspector said only 2-3 sheets of new plywood were visible not 28 as the roofer said they put on-any feedback would be appreciated. This home was built in the 60's and had 2 layers of roof, the 2nd layer was removed and replaced with a new 2nd layer rather than doing a tear off last year. [Feb. 21, 2005]

A. You need to find and fix the moisture/water problem which has enabled the mold to grow in the attic---such as present or previous roof leaks, excess attic humidity [above 50 to 60%], and inadequate attic ventilation. Of course, removing the entire roof [both levels] would be the most appropriate step in mold remediation, but you also need to be concerned about mold cross-contamination of the entire attic air, and possible attic mold growth into the walls and ceilings below. Airborne mold spores from the attic mold will be continually traveling in air currents to mold cross contaminate your entire house and its heating/cooling system by entering thru the attic access opening, open windows and doors, and the fresh air intake of your heating/cooling system. You should mold test your entire home. Learn the 25 steps for safe and effective mold remediation (*discussed above*). If you want to try to save the present roof, you need to kill the present mold growth with natural cleaner [HygienicAire™](#), and then remove completely the mold growth by labor intensive use of a power planer, power grinder with wire brush attachment, and power sander. Read (below) the [laboratory scientific experiments](#) that [demonstrate the antifungal effectiveness](#) of [HygienicAire™](#).

Subject: Vinyl flooring mold remediation

Q. I have a client who has light colored vinyl flooring in her basement bathroom and there are dark spots under the vinyl flooring that look bluish or blackish. The spots look like mold to me, they had this floor put down around 5 years ago and they now want it replaced before it gets worse or spreads.

I believe it's because the cement floor is drawing moisture and being trapped and causing mold. Can I take the vinyl floor up, kill the mold and then use a ceramic tile on the cement floor? I have heard there is a rubber membrane available you can put on the floor then your mesh then scratch coat, does that sound right?

A. Your diagnosis and treatment plan are very good. What is your profession? You should expand your expertise to becoming trained and certified as a Certified Mold Inspector and Remediator. There is a big demand in Canada for such services, but very few trained inspectors and remediators. Visit our training website: <http://www.ecology-college.com> As an alternative to the rubber membrane and probably more effective on a long-term basis is to remove the vinyl, kill the mold with a strong fungicide, remove the mold growth, and then apply about an inch thick new basement floor cement finish containing adequate amounts of waterproofing compound---or do both this approach and your good idea of putting a rubber membrane on top of the new floor waterproofed cement liner.

Subject: window condensation problem from high indoor winter humidity

Q. My husband and I built a new home in 2002, our first winter in our home we noticed excess condensation on most of our windows. We contacted the builder who gave us every excuse imaginable... it was because we had horizontal blinds and did not get enough circulation, it was "normal", and then we had our humidifier on our furnace set too high.

We kept our blinds open all the way during the day, and we had the heating company come to our home and measure the humidity in our house- it was within the normal range. Closer to the end of our first winter I began to notice mold growing on the window casings and the windowsills. I would wipe it down with bleach water, but it soon would return. The condensation was enough that it rusted the screws in the window casings. A representative from the window company came out to assess our windows last spring and we have not heard anything back since! This is our third winter in our home and we have three small children. My question to you is should we be concerned for our health and that of our children? My 5 yr old has bad allergies, and it seems that we have all had constant runny noses and sinus congestion and infections this winter. Is this coincidence or a mold problem?

We are concerned that if we see that much condensation on the windows that there could be condensation accumulating down inside our walls and perhaps there is mold growing where we cannot see it or clean it. Please, we do not know what our next step should be. Can you offer some advice? [Feb. 9, 2005]

A. Your family's health troubles are probably related to living in the mold contamination you describe. From the accumulated mold buildup, airborne mold spores are traveling in air currents to mold cross contaminate your entire house and to make your family sick. The most likely cause of the window condensation is high indoor humidity, despite what has been told to you that your indoor humidity is within "normal" range. When windows are kept closed in the cold wintertime, indoor humidity can get very high.

Disconnect your indoor humidifier---your running the humidifier is contributing to your indoor moisture and mold problems. Do not rely on what someone else tells you about your home's indoor humidity. Buy a \$30 digital hygrometer from a large hardware store or home improvement store to measure indoor humidity year-round in all areas of your house, including your basement and attic. If your indoor winter humidity [or any time during the year] exceeds 50 to 60%, you have invited mold to be a permanent house resident. You need to use one or more programmable dehumidifiers to keep your indoor humidity year-round to a mold-discouraging 30 to 40%. The reason bleach is not working in your mold removal efforts is that bleach is ineffective for killing mold on porous surfaces like building materials. Visit <http://www.bleach-mold-myth.com>. Learn the 25 steps for safe and effective mold remediation, *as discussed above*. You would be wise to mold test your entire home with do it yourself mold test kits, available from [Mold Mart](#).

Subject: Roof mold remediation

Q. I hired a contractor to build a master bedroom addition over our existing garage. The structure was completed in November and the insulation was completed in early January. All the work was per code and approved by the local building inspector prior to continuing. Last Friday during a cleanup session the contractor noticed that there were some water stains on the cathedral ceiling area of the bedroom. He contacted the roofer to check the roof for any leaks or damaged shingles (nor is any visible from the ground). The shower portion has not been finished yet so we decided to pull off all the insulation and see if we can tell where the damage was coming from. When we did that, we noticed that there was mold on the roof plywood. Not all the area was visible so we took off the recessed ceiling light cans in the bedroom to see if we could ascertain any more information. It was determined that the rear side of the bedroom (including the bathroom) has mold damage, apparently from water entering the ceiling area although we are not sure how the moisture entered that space yet. The front side of the bedroom appears to be free and clear of all damage. My questions are --- have you ever heard of anything like this be remedied before? How would you recommend that damage such as this be remedied (the contractor is suggesting removing the shingles, plywood and insulation from above and re-installing with new material), the work would be done from the outside to avoid disruption on the inside? Can the damage be fixed without demolishing the roof?

A. The contractor's recommendation of fixing the problem from the outside is your only workable solution, but the entire exposed roof work area needs to be completely protected with waterproof tarps against possible rain until the new roof is installed. If the plywood was, in fact, accessible from inside (not your situation), you might still have to remove the moldy plywood roof sheathing (and therefore the roof) if the moldy roof sheathing could not be cleaned of mold by attachment, and power sander. Learn the 25 steps for safe and effective mold remediation, *as discussed above*.

Subject: Mold in Dirt Floors/Ground

Q. We have a dirt cleaner in our basement that has always appeared dry. We were planning to cover the walls and floors with concrete and took the plastic floor covering off. We put a few antique chairs in there for storage this summer. The chairs and floors and walls of the dirt room are now covered in white splotchy or complete coverage mold. Obviously, our first mistake was removing the plastic floor covering, and not replacing it. How can we remove in from dirt surfaces?

A. Remove and discard the top 2" of dirt from the floor/ground to be assured of getting rid of the present mold infestation. Learn the 25 steps for safe and effective mold remediation (above). Besides installing the best quality moisture barrier beneath your new concrete floor, be sure you mix into the concrete for the floor and walls sufficient amounts of basement waterproofing compound to make the entire floor and walls into absolute water barriers against water penetration from the ground beneath the floor and outside of the walls.

Subject: Handling Moldy Photos

Q. How do we get rid of mold smell in a picture? There is no visible mold, however, it smells musty.

A. Laminate the photo to stop the moldy smell and anymore mold growth and to protect you from airborne mold spores given off by the moldy photo.

Subject: Killing Mold in Fireplace

Q. Our fireplace leaks and water pooled on the inside and now there is an extremely strong smell of mold in the house. Is there anyway to get rid of the mold in the fireplace?

A. Of course, you will want to first fix the leak causing the water intrusion. You could use an electric sprayer danged on a long hose moved up and down the inside of the chimney and fireplace to spray one or more

of the [Mold Home Remedy Recipes](#). You should also learn the 25 steps for safe and effective mold remediation above.

Subject: the level 4 mold remediation

Q. I am an insurance agent. I have client who was affected by the Hurricanes in Florida. It appears that there is a mold issue on his claim. He was told upon an inspection that the mold was at “Level 4” and would require specialized attention? What does this mean in layman’s terms?

A. Level 4 refers to New York City Guidelines for **Mold Remediation: ... Level 4** = more than 100 square feet of mold contamination area requiring mold remediation by professionally trained technicians with full facial respirators and other personal protective gear.

Subject: Carpeting Mold Remediation

Q. My home is 5 years old. Tyvec was not used in the construction and the windows were faulty as well. This has caused leakage and mold growth on the studs (which have been removed or sanded) drywall (which has been removed and replaced) wood flooring (which is being replaced). The carpet and padding in two bedrooms have mold in them. Can this really be removed by steam cleaning?

A. The safest procedure is to remove and discard the carpeting. If you want to try to save it, adapt to your carpeting remediation the relevant 25 steps of mold remediation recommendations above. You would need to remove the carpeting and padding to do a thorough DRY VAPOR only steam cleaning and fungicidal application and antimicrobial coatings on both sides of both, and kill and remove mold from the flooring beneath the carpeting/padding.

Q. I have Berber carpet on my second floor due to the hurricane. One part of the carpet in my kid’s room got wet. Unfortunately, the smell does not go away. The carpet is already dry because of the humidifier but it smells strong. What should I do?

A. Pull the carpeting and any padding back or off so that you can scrub repeatedly both sides of the carpeting and padding with Borax laundry detergent, mixed into water. Borax is a natural mold cleaner and killer. Fan dry after each washing/scrubbing to get the carpet dry quickly. Then spray both sides of the carpeting and padding with your choice of [home mold killer remedy](#). Let the fungicide kill mold for about one hour and continue to fan dry as quickly as possible. Then do one more treatment with subsequent drying after one hour. You need to be concerned about airborne mold spores from the moldy carpeting spreading in air currents to mold cross contaminate your entire house and its heating/cooling system. You would be wise to use our [do-it-yourself mold test kits](#) to mold test the air of the bedroom. All other rooms, any attic/basement/crawl space, and the outward airflow from each heating/cooling duct register for the possible presence of elevated levels of airborne mold spores, in comparison to an outdoor mold control test.

Subject: Crawlspce Mold Remediation

Q. Most of my basement is a crawl space. The floor is concrete. The ceiling is fiberglass insulation with no face or vapor barrier. Should a plastic barrier be put up on the ceiling of the basement?

A. Your having a concrete floor [especially if there is an intact, functioning moisture/water barrier beneath the concrete or plenty of waterproofing compound mixed into the concrete] helps to prevent crawl space mold. If there is already mold growth on your crawl space ceiling, it will need to be first killed and removed. Follow the recommended steps for safe and effective mold remediation. Whether you have to do mold remediation, or the area is still mold-free, you would be wise to spray the area with your choice of [mold killer recipe](#) or MoldZyme™ Natural Mold Cleaner. After the application and total drying, that is the time to utilize your very good idea of attaching a plastic sheeting water barrier to the underside of the crawl space. Make sure the plastic sheeting is 6 mils thick and in one piece [use taping of seams if necessary] to help keep out high humidity and airborne mold spores.

Subject: Removing Mold or Mildew under the Sink

Q. Thanks ahead for taking the time to answer my question. My wife and I have recently purchased a new home and under the kitchen sink it appears there was a leak at one time and the back wall has some black discoloration. The area is dry now and very little moisture gets in there. How should I clean this area? I don't see evidence of this "mold" or mildew anywhere else in the house.

A. You need to investigate to whether the leak water damage and thus mold growth are present in and under the bottom of the kitchen sink cabinet and adjoining cabinets. Hidden mold growth in those areas is very common from a kitchen sink leak. You can open up the bottom of the sink cabinet floor for visual inspection. You can use a fiber optic inspection device to inspect beneath the under cabinets by drilling access holes. Such a big help is about \$300 – find one on the internet. You also need to mold test your entire home for possible mold contamination by airborne mold spores.

Subject: humidifiers cause high humidity which causes serious indoor mold contamination

Q. I am not sure if I have a mold problem or am creating one by way of our new furnace with built-in humidifier.

We installed it last winter and were shocked to see the extreme dampness on all our Andersen windows the next morning after a cold night. The beading water trickled into the corner of every wooden window frame. We are constantly wiping the windows and frames every morning. Our windows (We're talking about a full Florida room with 75% window space and most of the rear of the house-north facing...17 large windows in all) are shaded with honeycomb like shades that can cover the entire window, thus not letting any air out. Also, the dampness from the humidifier has now crept up to the ceiling of every room with a skylight. Those areas of sheetrock are now showing water stains as well and are the reason I'm seeking advice on possible mold damage.

Is it impossible to have any working humidifier for a furnace? As it was previously, the winter months provided very dry, choking heat from our old forced hot air system, so we replaced it with the new system/humidifier. But as it is now, we have the humidifier almost turned off completely to avoid further dampness damage. After inspecting the "[moldinspector](#)" web site, I see nothing about mold damage from a furnace/humidifier and I am at a bit of a loss to try and find a solution or information about how to proceed? Do I need to do a mold test? Please advise.

A. Running a built in humidifier, or a portable humidifier, or a vaporizer can significantly increase indoor humidity to make mold a permanent house guest if such humidity inputs are used on a regular basis. Because of the serious threat of mold infestation to family health, you would be wise to never again utilize the humidifier [which may also reduce the value of your home because smart prospective buyers will perceive the existence of the built in humidifier to be a red flag about probably mold contamination in your house]. Because of the heavy window condensation and the evidence of water damage on some of your sheetrock, you need to be concerned about whether your home is now mold contaminated. Your first step is to have the home

thoroughly mold inspected and tested with a [Certified Mold Inspector](#) or with our [do it yourself mold test kits](#). You should also buy a \$30 digital hygrometer from a large hardware store, Lowe's or Home Depot to regularly check your indoor humidity year-round in different areas of the house. If the indoor humidity is 60% or more that is going to result in big-time mold problems. Your goal is keep the indoor humidity to 30 to 40% which discourages mold growth. Many homeowners and tenants utilize a programmable dehumidifier to keep the humidity level that mold-safe.

Subject: Natural Mold Cleaners

Q. I have been hospitalized with aseptic meningitis and didn't know at the time what caused it. We know that it was from overexposure to mold. Recently, I sold my condo and moved into an apartment. The condo had mold growing in the cold air return, it smelled like "soured clothes".

I was washing my clothes, etc prior to moving into an apartment. I've been here for 3 weeks and now it smells like "soured clothes". I moved my mattress from the box springs this past Saturday and I suddenly got sick with the meningitis headache and nausea. It was instantaneous.

I called Chem Dry who is supposed to come here next Wednesday to dry clean my area rugs and box springs and mattress. They will also use a "microbial" but will not tell me what the chemicals are.

I am highly allergic to certain chemicals, too. Should I get rid of my bed and area rugs or should I let Chem Dry treat them? Am I just wasting more money on paying this company to do this and it not solve my problem?

I am at wit's end. I am now sleeping on the leather sofa in the living room and am running 2 dehumidifiers in my apartment hoping to dry out the mold. My clothes in the closet are smelling soured right now. I've been spraying everything with full strength white vinegar. What should I do?

A. There are two natural mold killer protects you can use to mold disinfect your mattress, clothes and other personal possessions of mold infestation --- read about MoldZyme and HygienicAire, both available from our [online mold products catalog](#). Both before and after you have done a thorough cleaning and mold killing with both products, you would be wise to mold test the air of each room of your apartment and the outward air flow from each heating/cooling duct register to determine the possible presence of elevated levels of airborne mold spores before and after your mold remediation efforts. If you did not do complete and thorough mold decontamination of all of your clothing and personal property prior to moving them from the moldy condo, it is likely that you have mold cross contaminated your new rental unit.

Subject: dissatisfied on mold analysis report

Q. Below is a mold report I paid for but got little to no explanation or advice. I have a two and a half year old little boy and I'm concerned about moving to a new home that was damaged by the 3 hurricanes that hit central Florida while it was being built. Below are the results of the mold test for the impending purchase of our new home. As you can see, the test was taken outdoors, in the kitchen, in the bonus room, and in the garage. As you may notice, there is a high count of Aspergillus in our future kitchen. I just need to know if this count is high and if we should be concerned about purchasing this new home. I don't want to subject my little boy to this if it'll be harmful to him. Any comments or suggestions you could offer us would be greatly appreciated. [Dec. 3, 2004]

Cassette Analysis of Fungal Spores & Other Airborne Particulates

Sample Location	outside front			bonus room			Kitchen		
Sample volume (liters)	25			25			25		
Spore Types	Raw Count	Spores/m3	% of Total	Raw Count	Spores/m3	% of Total	Raw Count	Spores/m3	% of Total
Agrocybe/Coprinus	-	0	-	2	79	8	1	39	6
Alternaria	1	39	2	3	118	13	-	-	-
Arthrospores	-	0	-	-	0	-	-	-	-
Ascospores	1	39	2	1	39	4	1	39	6
Aspergillus/Penicillium	17	670	39	11	434	46	4	158	25
Arthrinium	-	0	-	-	0	-	-	-	-
Basidiospores	3	118	7	-	0	-	1	39	6
Bipolaris	-	0	-	1	39	4	-	-	-
Chaetonium	-	0	-	-	0	-	-	-	-
Cladosporium	13	513	30	3	118	13	5	197	31
Curvularia	1	39	2	2	79	8	2	79	13
Epicoccum	-	0	-	-	0	-	-	-	-
Fusarium	-	0	-	-	0	-	-	-	-
Ganoderma	-	0	-	-	0	-	-	-	-
Myxomycete	-	0	-	1	39	4	2	79	13
Paecilomyces	7	276	16	-	0	-	-	-	-
Pseudocercospora	1	39	2	-	0	-	-	-	-
Scopulariopsis	-	0	-	-	0	-	-	-	-
Stachybotrys	-	0	-	-	0	-	-	-	-
Rust	-	0	-	-	0	-	-	-	-
Torula	-	0	-	-	0	-	-	-	-
Zygospores	-	0	-	-	0	-	-	-	-
Unidentifiable Spores	-	0	-	-	0	-	-	-	-
Total	44	1,730	100	24	946	100	16	631	100

Sample Location	outside front			bonus room			Kitchen		
Sample volume (liters)	25			25			25		
Spore Types	Raw Count	Spores/m3	% of Total	Raw Count	Spores/m3	% of Total	Raw Count	Spores/m3	% of Total
Agrocybe/Coprinus	-	0	-	2	79	8	1	39	6
Alternaria	1	39	2	3	118	13	-	-	-
Arthrospores	-	0	-	-	0	-	-	-	-
Ascospores	1	39	2	1	39	4	1	39	6
Aspergillus/Penicillium	17	670	39	11	434	46	4	158	25
Arthrinium	-	0	-	-	0	-	-	-	-
Basidiospores	3	118	7	-	0	-	1	39	6
Bipolaris	-	0	-	1	39	4	-	-	-
Chaetonium	-	0	-	-	0	-	-	-	-
Cladosporium	13	513	30	3	118	13	5	197	31
Curvularia	1	39	2	2	79	8	2	79	13
Epicoccum	-	0	-	-	0	-	-	-	-
Fusarium	-	0	-	-	0	-	-	-	-
Ganoderma	-	0	-	-	0	-	-	-	-
Myxomycete	-	0	-	1	39	4	2	79	13

Paecilomyces	7	276	16	-	0	-	-	-	-
Pseudocercospora	1	39	2	-	0	-	-	-	-
Scopulariopsis	-	0	-	-	0	-	-	-	-
Stachybotrys	-	0	-	-	0	-	-	-	-
Rust	-	0	-	-	0	-	-	-	-
Torula	-	0	-	-	0	-	-	-	-
Zygospores	-	0	-	-	0	-	-	-	-
Unidentifiable Spores	-	0	-	-	0	-	-	-	-
Total	44	1,730	100	24	946	100	16	631	100
Hyphal Fragments	1	39		5	197		3	118	
Pollen	-	0		-	0		2	79	
Fibrous Particulate	3	118		-	0		1	39	
Insect Fragment	-	0		1	39		1	39	
Skin Fragments (1-4)=		1			1			1	
Background (1-5)=		1			2			2	
Analytical Sensitivity		40			40			40	

High levels of background particulate can obscure mold spores and other airborne particulates leading to underestimation. Background levels of 5 indicates an overloading of background particulates, prohibiting accurate fungal spore detection & quantification. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. Present= Spores found during an additional scan at lower magnification. No discernable field blank was submitted with this group of samples.

Cassette Analysis of Fungal Spores & Other Airborne Particulates

Sample Location			Garage						
Sample volume (liters)			25						
Spore Types	Raw Count	Spores/m3	% of Total	-	-	-	-	-	-
Agrocybe/Coprinus	-	0	-	-	-	-	-	-	-
Alternaria	1	39	6	-	-	-	-	-	-
Arthrospores	-	0	-	-	-	-	-	-	-
Ascospores	4	158	22	-	-	-	-	-	-
Aspergillus/Penicillium	2	79	11	-	-	-	-	-	-
Arthriniium	-	0	-	-	-	-	-	-	-
Basidiospores	1	39	6	-	-	-	-	-	-
Bipolaris	-	0	-	-	-	-	-	-	-
Chaetoniium	-	0	-	-	-	-	-	-	-
Cladosporium	5	197	28	-	-	-	-	-	-
Curvularia	3	118	17	-	-	-	-	-	-
Epicoccum	-	0	-	-	-	-	-	-	-
Fusarium	-	0	-	-	-	-	-	-	-
Ganoderma	-	0	-	-	-	-	-	-	-
Myxomycete	1	39	6	-	-	-	-	-	-
Pseudocercospora	1	39	6	-	-	-	-	-	-
Pithomyces/Ulocladium	-	0	-	-	-	-	-	-	-
Scopulariopsis	-	0	-	-	-	-	-	-	-
Stachybotrys	-	0	-	-	-	-	-	-	-
Rust	-	0	-	-	-	-	-	-	-
Torula	-	0	-	-	-	-	-	-	-
Zygospores	-	0	-	-	-	-	-	-	-
Unidentifiable Spores	-	0	-	-	-	-	-	-	-
Total	18	710	100	-	-	-	-	-	-
Hyphal Fragments	1	79	-	-	-	-	-	-	-
Pollen	-	0	-	-	-	-	-	-	-
Fibrous Particulate	5	197	-	-	-	-	-	-	-
Insect Fragment	-	0	-	-	-	-	-	-	-
Skin Fragments (1-4)=		1	-	-	-	-	-	-	-
Background (1-5)=		2	-	-	-	-	-	-	-

High levels of background particulate can obscure mold spores and other airborne particulates leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate fungal spore detection & quantification. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. Present= Spores found during an additional scan at lower magnification. No discernable field blank was submitted with this group of samples.

A. One problem is that your mold testing was done with air cassette testing which is very weak in detecting mold problems compared to direct mold sampling and the settling method on petri dishes [mold test kits]. If you want to minimize or understate or conceal mold problems, one utilizes air cassettes as the testing media. For true mold results, one needs to use mold culture plates [test kits]. If you test all-around your entire home by using our [do it yourself mold test kits](#) or a [Certified Mold Inspector](#) to test the air of each room, basement, crawl space, attic, and the outward air flow from each heating/cooling duct register, for possible elevated levels of airborne mold spores, in comparison to your outdoor mold control test, you will have a much more all-around insight into your all-around new home mold situation. Even the air cassettes samples you do have show that the dangerous mold *Alternaria* is three times higher in raw spore count in your kitchen than in the outdoor mold control test. Even though the kitchen mold counts for unhealthy *Cladosporium* and *Aspergillus - Penicillium* [combination of two separate mold species] are less than found in the outdoor control test, the mold counts are high, especially in terms of the cumulative mold exposure your family will accumulate in living 24 hours per day in your new home. An air cassette test is just a small air sample carried out over a few minutes time. You breathe in moldy air hour after hour if there is hidden mold growing in your home.

Subject: Whole House Fogging

Q. What is the protocol for fogging 3200sf? Go from room to room with fogging machine? If so, how much time in each room?

A. Fog a Mold Home Remedy Recipe (www.moldinstruction.com) for at least one-half (½) in each room, and ½ hour to an hour into the return air duct of the central heating/cooling system while the heating/cooling system is running on fan ventilation. If possible, remove all furniture from each room to be fogged to fog the empty room (without furniture blocking access of the fungicide to wall and floor areas). Then repeat the process but on the second effort with the furniture put back in the room to do mold killing on the furniture itself. Refer to the 25 Steps for Safe and Effective Mold Remediation section above.

Subject: Exterior siding mold remediation tip

Q. I need to know how to remove mold from the outside of my house. I have used bleach and Kilz but it keeps returning every year. Please help me find a cure for this mold problem.

A. As you have already discovered, bleach and Kilz are worthless in mold remediation. Scrub off as much of the exterior siding mold as possible with Borax laundry detergent, a natural mold cleaner, in warm water. Remove any remaining visible mold growths with a power planer, grinder with wire brush attachment, and a sander. Then, after drying, treat the area with [MoldZyme™ Mold Cleaner](#). Then, after drying, spray with at least one wet spraying of the [Timbor Antimicrobial Coating](#). Then spray with a high quality semi-gloss, oil-based exterior house paint containing a good mildicide recommended by your paint vendor. You should also learn the 25 recommended steps for an effective mold remediation. You would be wise to mold test the interior

of your home and its heating/cooling system for the possible presence of mold cross-contamination from the large amounts of exterior siding mold.

Subject: Toilet mold remediation

Q. We had noticed a slight greasy appearing film on the part of the surface of the water in the bowl. Then we had pieces of brown particles coming into the bowl after flushing. These pieces looked like chunks of very dark brown leaves. We placed a blue cleaner in the tank and when we did, I noticed some mold on the water in the tank. Mr. Fix-It at this house said that the blue cleaner would take care of it all.

It is about this week later, the dark brown chunks have stopped, mostly, and that layer of brown is mostly gone from the inside of the tank. As I was checking the tank today, I found it loaded with what appears to be white clumps of mold all over the surface of the water in the tank! I have been researching online and am wondering about a couple of things. Should I put bleach in the toilet tank to try to get rid of the mold? We have a septic tank and town water. Is this a septic tank symptom?

A. Mold growth in toilet bowls and tanks is a common problem because mold grows well in a wet environment. Turn off the water supply to the toilet, empty the toilet bowl and tank of all water. Then scrub the moldy areas thoroughly and repeatedly with Borax laundry detergent in warm water. Then spray at least two wet sprayings of either 6-10% concentration hydrogen peroxide or, better yet, apply natural HygienicAire™, [available online](#). Bleach is ineffective for killing molds.

Subject: Ice blasting as mold remediation

Q. We are looking at a house that has been closed up for six months, and the house has molds everywhere. We are looking into ice blasting have you ever worked with this? Is there a better way to remove the mold? How can you test for mold inside the walls?

A. Ice blasting is an effective way to remove mold growth from wood, but be sure that all mold is removed completely, leaving a clean, mold-free timbers. You will also need to treat the area with [MoldZyme™](#) to clean the mold before it is removed (safety precaution), and spray [fungicidal coating](#) on the cleaned out area afterwards. Both fungicides are available from Mold Mart. If there is mold growth inside walls and ceilings, you will need to remove and discard the drywall to gain access to the wall and ceiling cavities to do ice blasting or any other form of mold remediation. To learn where there might be internal wall and ceiling mold growth, use fiber optics inspection by either a Certified Mold Inspector or buy your own fiber optics inspection device (about \$300 on the internet). Learn the 25 steps for safe and effective mold remediation.

Subject: Crawlspace mold remediation

Q. I am preparing to start remediation on my 50-year old house in Nepa, California. The crawl space is about three feet high with a dirt floor. The dirt floor has a light dusting of white mold. I plan to do the following in this order. I would appreciate your insights and any recommendations regarding my plan. I hope to do the work myself.

1. Apply a fungicide (can you suggest a product) to the dirt.
2. Install Visqueen over the dirt and up the cinder block walls, attaching it to the sill plate.
3. Install fans in existing vents to improve airflow.
4. Improve drainage/grade along exterior walls.

Does the dirt floor need to be dry (or somewhat dry) before I do this work? There is no standing water. Also, what should I do with the existing sump pump? Cover it with Visqueen? Run the Visqueen up to it? Remove it? I am clueless on this point.

A. You need to mold test the air of the crawl space, the air of each room of the house, and the outward airflow from each heating/cooling duct register to determine how widespread mold cross contamination might be from airborne spores traveling in air currents from the mold in the crawl space. Follow the mold inspection and mold testing tips provided at <http://www.moldinspection.com>. Be especially sure to carefully inspect the wood components of your crawlspace for possible mold growth. You will need to spray both the dirt and the crawlspace timbers and floor decking with your choice of [Mold Killer Remedy Recipe](#). The ground can be damp, but it would be nice if it were dry because dry substances absorb water-based fungicides better than already wet materials. Then, after drying of the wood and decking, those wood components should also be sprayed with the [Timbor Antimicrobial Coating](#). Leave the sump pump in place to help in future flooding problems.

Your idea of attaching a plastic moisture barrier is good – use 6 millimeter thickness over all dirt and up the sides of the crawlspace. Use a good plastic tape to join the plastic sheets together. Hold the plastic in place by placing bricks or rocks at key points on the plastic sheeting. Yes, anything you can do to change the around contour and drainage to keep water out of the crawlspace is extremely critical to the success of your important mold remediation and mold prevention project.

Subject: Mold remediation in truck vehicles

Q. I have a mold or fungus that has developed in the A/C system in my truck. It is inside the vent tubes which are made of plastic. One of the parts to the ac unit somehow got clogged with leaves and dirt and was encased in this organic stuff. That unit gets wet on the outside so all that stuff was wet and decaying. I have been breathing this stuff for quite awhile because I didn't know it was there. I got all the leaves and stuff cleaned out but I'm not sure what to do next. And if the mold isn't bad enough there is some kind of fly that has completely taken over my truck. I have sprayed, and fogged, to no avail. They're in the seats and maybe the head board too. I've also used a steam cleaner with boiling hot water. They are healthy and thriving still. I'm going to see a Dr. this coming week. I think that I may be getting sick in a bizarre kind of way. Am I carrying this mold into the house with me? Can the seats in my truck be saved? Are my clothes contaminated? HELP! Please advise me what steps I should take. PLEASE!

A. Wash and scrub the entire truck interior repeatedly with Borax laundry detergent [a natural mold cleaner] in warm water. After drying [fan dry for quickness], spray the entire passenger compartment [everywhere] and heavily into the heating/cooling ducts and tubing with [MoldZyme™ Mold and Mildew Stain Cleaner](#) to eliminate mold contamination and musty odors caused by molds.

Subject: Timber Gutter Mold Remediation

Q. My house in San Francisco had a gutter that fed into a vertical pipe within the wall. The pipe rusted, and for probably more than a decade, all the water collected by the gutter ran into the area between the sheathing and the drywall. There is visible mold for four feet on one side of the corner and more than six feet on the other side. However, only the sheathing on about two feet on each side seems to have been structurally damaged. Do we need to replace all the wood with visible mold, or can we replace only structurally damaged wood and treat the mold on the undamaged wood? Similarly, water leaking past a door sill has damaged the joist closest to the foundation. We have removed the part of the joist that is readily accessible. Do we have to

remove all damaged wood, or can we treat the remaining, relatively inaccessible, joist? Or, once the defective sill has been replaced, will the joist continue to disintegrate, or can it safely be left in place?

A. Gutter-damaged timbers with deep-rooted mold growth [not removable by power scraping, power grinding with wire brush and power sanding] should be replaced with mold-free timbers which have been pre-treated with both [Natural MoldZyme™ Mold Cleaner](#) and [Timbor Antimicrobial Coating](#). Any gutter-damaged timbers which cannot be cleaned to a mold-free condition and then treated with the above chemicals need to be removed and discarded to protect both your home investment and your health.

Subject: about low-cost heating/cooling mold remediation steps

Q. We had black mold particles coming through our heater last year and don't have the 300 + dollars to have the ducts cleaned...we had no health problems last year, but have 2 month old baby now. We just turned the heat on. Is there anything we can do ourselves with natural or non-toxic products?

A. Install advanced 3M brand Filtrete [purple packaging] with the highest 3M rating for mold spore removal. 3M has three different heating/cooling filters available at stores like lumber stores, Home Depot, and Lowe's. Tape the filters [if not the exact size required] or otherwise install them in or over the return air supply ducts [wherein air from your home returns to the heating/cooling system for more heating or cooling treatment], and the outward air flowing duct registers in each room.

Q. On July 1st of 2004 my husband and I closed the loan on our new home. The home was built in 1982 and appeared to be in excellent condition. We had the customary inspections done and felt we had made a good purchase. About a month ago, I noticed mold on the garage doors. I did not think too much about it because it was the wet winter time. My husband and I come and go to work in the dark so we did not notice what was happening to our home. We now have a very large mold problem on the outside of our home. Our siding is wood and apparently was painted 3 months before we purchased it. What can we do? It is quite frightening to see this happening to our beautiful home. [Feb. 14, 2005]

A. You need to remove the mold growth and the underlying paint upon which it is feeding, and any mold growth beneath the paint [very, very likely to be there]. Then, treat the area with [MoldZyme™ Mold Cleaner](#) [drying in between applications]. Then spray with one wet coating of the [Timbor Antimicrobial Coating](#). Then, repaint with an oil-based, semi-gloss enamel paint to seal the siding against further water penetration and mold growth. Learn the 25 steps for safe and effective mold remediation (*discussed above*). Because airborne mold spores in elevated levels from the siding mold have been probably entered your home through open windows, doors, and the fresh air intake of your heating/cooling system, you would be wise to mold test your entire home.

Q. I just subscribed to your home-made fungicide report. I am trying to kill and cover up mold I discovered under our rent house. I bought a huge roll of 6 mil plastic, but I don't know if the ground under the plastic should be treated with fungicide first or merely covered with plastic. If I do need to kill the mold on the ground before putting down the plastic, I need to know if it needs to be dry before the plastic goes down. The primary reason the plastic is being used is as a vapor barrier to reduce the moisture in the crawl space.

A. Spray a heavy application of a home remedy fungicide like hydrogen peroxide heavily onto the ground floor of the crawl space, and then let it dry before covering the ground with your 6 mil plastic. Be sure the plastic also goes up the sides of the crawl space on the house side, leaving open any ventilation openings or

open sides of the crawl space. Be sure there are no holes or gaps for airborne mold spores to get through the plastic. Use a staple gun to attach the plastic firmly to the house sides of the crawl space. Keep the plastic in place with bricks or rocks put onto of top of the plastic at many points.

Subject: Humidifier VS Dehumidifier

Q. I am thinking about putting a Honey well Flow through humidifier in the duct. Some of my research indicates that these are best if maintained properly. What do you recommend? Thanks for your help.

A. My recommendation is do NOT install a humidifier if you value your family health and home investment. Increasing indoor humidity is likely to cause substantial mold growth in your home and its heating/cooling system, and thus make your family potentially very sick from mold contamination. Usually, health-conscious persons are installing **dehumidifiers**, not humidifiers to help control mold growth in their houses.

Subject: automobile mold contamination

Q. My car was taken to a body shop on November 5, 2004. When I went to pick it up on December 27, 2004, I found black colored mold everywhere in the trunk. Cause: The break light mounted in the trunk lid was removed for painting and was not reinstalled correctly. Thus, causing water leak into my car unnoticed for quite some time. The body shop noted that the break light was not seated correctly on the left side (the black trim on that side was an inch below the truck lid) and didn't know what to say. I left the car there so that they could repair the damage and correct the other paint flaws that I noticed.

I called them today to find out when my car would be ready for pick up. At that time, I inquired as to how they were able to kill the mold from my car. They said that they had it detailed. I am concerned that detailing is not going to kill the mold. The mold spread from the trunk to the interior (evidenced by the presence of mold on the back plastic window) and was even in my CD changer on the cartridge.

What can I do to ensure that it is cleaned up correctly? Is it possible? Will it come back? How will I know? Is it going to make me sick? Is there some place in Seattle, Washington that handles this type of issue? Any advice you could give me would be greatly appreciated.

A. Your first step should be scrubbing the entire trunk and passenger compartment repeatedly with Borax laundry detergent in warm water. Borax is a natural mold cleaner. Then, after drying, apply [MoldZyme™](#) or [HygienicAire™](#) all around the trunk and car interior. Spray baking soda mixed with water into the heating/cooling duct registers to kill mold inside the heating/cooling ducts of the car. When all spraying is dried, our mold test kits to mold test the air of the trunk and of the passenger compartment for any possible elevated levels of airborne mold spores, in comparison to your outdoor mold control test. Please visit our [online mold products catalog](#) of our mold products.

Subject: Mold Growth on Fireplace Indoors

Q. We have a house built in the 1960's in the Dallas Ft. Worth area. We have a red brick fireplace, on which we placed some houseplants for a while. We soon noticed one of the climbing vine houseplants had a fluffy white mold growing atop its climbing pole. We've noticed that the surface of some of the bricks were covered with a white powder, and unfortunately doused the brick with bleach after removing the plants. This caused a fluffy white overgrowth that was much worse than the first. What kind of mold does this sound like and can we just treat the bricks with a fungicide? Or do we need to remove the entire fireplace? We will be

checking in the area where the roof meets the fireplace for a suspected leak. Thank you for your help. My mother suffers from sinus problems and I suffer from asthma and both of us have a low immune function.

A. As you now know, it is unwise to have indoor live plants growing if you want to prevent mold problems in your home. You are wise to carefully check your roof for water leaks in the fireplace area. Because of your family's serious mold-related health symptoms, you would also be wise to mold-test your entire house with our mold test kits. Mold test the air of each room, basement, attic, crawl space, garage, and the outward air flow from your outdoor mold control test.

Subject: Cedar Siding Mold Remediation

Q. I have what I believe is mold that is black in color growing on the outside of my house. It is a cedar home and the mold is sometimes limited to the bottom portion of the panels, although in many cases, the color continues the height of the panels. We need to re-stain the house and are wondering how we should go about treating the current problem (preferably a non-toxic way if possible). Thank you in advance for all of your help. *(Photo attached in this message for better understanding of the mold expert)*

A. It is a common problem that mold grows in exterior cedar siding. It needs to be first killed with your choice of [Mold Killer Remedy Recipe](#). Then the mold growth needs to be physically-removed by power planer, power grinder with wire brush attachment, and power sander. Then the cleansed surface needs to be sprayed with [MoldZyme™ Natural Mold Cleaner](#) and then [Timbor Antimicrobial Coating](#) as preventive measures for future mold growth. Then the cedar siding should be re-stained and then sealed with a plastic coating paint to seal the wood from moisture penetration (e.g., from rain and humidity). Besides improving the looks of a home or building, the mold removal will keep the mold from growing inward into the home walls and also prevent (by getting rid of the mold) airborne mold spores from the exterior mold from traveling indoors in air currents through open windows and doors, and the fresh air intake of the heating/cooling system. Please refer to the [Mold Removal Tips](#) online for more tips.

Subject: Molds inside classrooms

Q. I have tons of molds in my classroom. During the summer, I scraped them off, bleached them and painted them. They grew back within 3 days. I have been fighting to get it fixed. Over Christmas break, the janitor put mold paint on the walls and scraped it as well. When I went to school yesterday, he had painted the walls white. However, there were traces of it coming back in the cracks of the bricks. Today, when I went into work, the mold had drastically grown back. I am extremely worried, especially now since I am pregnant and are exposed to daily. Please tell me what you think. *(Attached with this message are photos of the walls with mold growths).*

A. You need to find and fix the underlying moisture causes of the mold growth. Use a hidden moisture detector to scan the entire surface wall to see if it is wet (perhaps from a roof or plumbing water leak). Your excellent photos illustrate likelihood that there is a water problem in the walls because of the substantial signs of both water damage and mold growth. Use a \$30 hygrometer to find out what is the indoor humidity level. If the humidity level is more than 50% to 60%, mold is going to really grow well. You also need to investigate the real possibility that the problem continues to arise because of elevated levels of airborne mold spores inside your classroom. Use do-it-yourself mold test kits to mold test the air of the classroom and the outward air flow from each heating/cooling duct register for the possible presence of elevated levels of airborne mold spores. Assuming that there is no water problem in the wall, no high humidity, and no elevated levels of airborne mold spores, you can do a much more effective mold remediation job on the wall by visiting the [mold removal page](#).

Subject: Mold Remediation on Moldy Toys

Q. I sat some of my child's toys on our screened in back porch, due to the heat and rain I am assuming they began to mold; I have wiped the toys down with bleach and washed the cloth parts of the toys in hot water but the spots are still there. Is it safe to allow my child to play with these toys now? And if not what are some ways to get rid of the molds.

A. Wash the toys thoroughly with Borax laundry detergent, a natural mold cleaner, in warm water. Then, after drying, spray a heavy coating of hydrogen peroxide [available in drug stores] on all surfaces. Let dry. If any mold spots or stains are still left, they won't cause health problems after you complete both of the above steps.

Subject: Moldy refrigerator remediation

Q. I have mold in my refrigerator. What is the best way to clean and rid my refrigerator of this problem? I have washed it, but it still comes back.

A. You should scrub the entire inside of your refrigerator/freezer several times and very thoroughly with Borax laundry detergent [a natural mold cleaner] in warm water.

Subject: Landlord mold liability to tenant and mold recommendations

Q. I have a rental property and there has been an enormous amount of rain in the last week. Along the building there are now several areas as large as 2 to 3 feet in diameter of what appears to be a white mold substance coming up through the concrete. This substance cakes up 2 to 3 inches high. My manager has tried treating it this with bleach and it has not stopped it from re-occurring.

I would like to know what it is. What agent to treat it with to kill it and how do I treat it? How dangerous it is for my tenants to be in its proximity. Please help. Thank you.

A. I am impressed that you are a responsible landlord who wishes to protect both your tenants and your property investment. Yes, the substance is likely to be mold, and airborne mold spores from it can make your tenant very sick, a potential landlord legal liability you need to protect yourself against. Your first step should be to test the mystery substance to confirm that it is mold growth. Collect some of it and place it in one of our do it yourself mold test kits and watch for mold growth over a 7 day period. You should also mold test the air of each room of each apartment and the air flow out of each heating/cooling duct register, and the air of the attic, crawlspace, basement, and garage for the possible presence of elevated levels of airborne mold spores, in comparison to an outdoor mold control test. If you want to know the species of grown molds, you can then send the mold test kits (one or all) to our mold lab for mold laboratory analysis and mold species identification. You can also learn tips from the Effective Mold Tips online. Become your own effective mold expert to improve your personal home and apartment environmental safety and/or the environmental health of your workplace and investment properties by reading intensely all sections of this book.

Subject: Basement mold prevention

Q. I have a question on preventing mold in my basement. I have a basement that I am going to install wood and drywall in the next few months. Is there anything you would recommend on the concrete walls or on the front of the wood/insulation before I install the drywall. I wanted to prevent mold from ever growing.

A. you should consider doing one or more of the following to mold-proof your basement in advance of doing basement finishing with wood, insulation and drywall. First, carefully inspect all surfaces of the basement for possible water and mold problems. Second, use a hidden moisture meter to scan the floors and walls to determine if there are elevated levels of moisture in them. Third, spray the floor, walls, and ceiling with [natural](#)

[mold cleaner](#). Fourth, spray the ceiling and walls with one wet coating [mold antimicrobial coating](#) to prevent future mold growth. Fifth, if there is no other present moisture or mold problems to take care of, then apply about a one-quarter to one-half inch thick of a cement coating containing adequate amounts of waterproofing compound and using cement as the tile grout, also utilizing waterproofing compound in the grout. Seventh, pre-treat (prior to using) all surfaces and all edges of all lumber, paper coating of insulation (exposed surface only), and drywall with HygienicAire™ or MoldZyme™, both products available online at [Mold Mart](#). Read (below) the [laboratory scientific experiments](#) that [demonstrate the antifungal effectiveness](#) of [HygienicAire™](#).

Subject: Moldy vinyl tiles mold remediation

Q. I believe there is mold underneath the sheet tile in my downstairs half bathroom. There is not a tub there, just a sink and a toilet. The townhouse is built on a concrete slab in 1992. I bought it in 1997. I noticed that there was a blue color around the toilet when I bought the place. I figured I would just replace the flooring. I didn't know anything about mold. Now I want to replace the floor not just in my bathroom but the whole kitchen. If it is mold growing under my vinyl sheet tile floor, how would I be able to get rid of it? Would the glue used to put the floor down cause problems for me to remove the mold? Over the past year, I have noticed blue areas have grown through out my floor in the bathroom. A floor specialist said that the mold would be trapped under the floor and I could put new flooring over it. I would think the mold could still spread throughout.

A. You are right that the mold needs to be removed. You cannot ignore mold growth, which can easily spread throughout your entire floor area and into the walls, if it has not already done so. The mold growth beneath your floor covering is probably driven by water wicking up from the ground into the concrete. Your home has either no water barrier beneath the concrete, or a damaged or degraded barrier. If this is your home's problem, you will also likely to have water and mold problems inside walls resting on the concrete slab and beneath and in carpeting, etc. You need to have your home carefully mold inspected and tested by a [Certified Mold Inspector](#). The problem cannot be easily and affordably fixed. At least in your bathroom and kitchen area you can remove the flooring and glue, kill and remove the mold, and apply a surface layer of concrete containing waterproofing compound as a good foundation for your installation of replacement flooring. Learn the 25 steps for safe and effective mold remediation discussed in the above section.

Subject: Crawlspace Molds

Q. I have a crawl space (dirt). I had a main water line break (Kitchen and Laundry Room). Pipes are fixed, but the house has a heavy musty smell now. The crawlspace is pretty much dry now, but there is a white almost chalky layer to the dirt down there. How do I kill the mold? [Feb. 7, 2005]

A. Crawl space mold can easily grow into the floors and walls above. In addition, airborne mold spores from the crawl space mold can travel in air currents to mold cross contaminate your entire house and its heating/cooling system by entering your open windows, doors, and fresh air intake of your heating/cooling system. If there is enough room to work in the crawl space, it would be a good idea to kill the mold growth in the dirt and any mold spores and mold growth on the timbers of the crawl space and the underneath side of the floor decking [MoldZyme Natural Mold Cleaner](#).

Then, if possible, remove and discard the top layer of dirt containing the mold. Similarly, also remove any visible mold growths on the crawl space lumber. If there is insufficient room to get into the crawl space for mold spraying, do mold fogging by using a [mold fogging machine](#) to distribute the fungicide totally inside the crawl space. After mold removal from timbers, the timbers should be re-sprayed first with [MoldZyme™](#), and then by the [Timbor Antimicrobial Coating](#). Both fungicides are available from the online mold product store. Do these steps as part of the overall mold remediation process. You would also be wise to mold test the crawl space afterwards, as well as the entire house. Follow thorough mold inspection and mold testing procedures.

Subject: Molds inside walls

Q. I have just noticed dark shadows going down my walls every two feet that were never there before. We have had four hurricanes hurricane this past summer, Charlie, Frances Ivan and Jeanne. When made my claim to my insurance adjuster I did not notice any of this so I do not know if it was there then or not. My son who sleeps in this room has been having headaches for the last couple of months. He has never had headaches before this time. His room has two exterior walls and the shadows from the floor to the ceiling every two foot is only on the inside of the exterior walls not the interior walls. Is there any inexpensive way of knowing for sure weather this is mold or something else?

A. The dark shadows in the walls are large amounts of mold growth in and behind the walls on which you see the dark shadows. Your son's health problems arise because our family is living in a mold-infested home. Mold testing of your house will document the serious mold health threat. A [Certified Mold Inspector](#) can use fiber optics inspection to look inside the walls and ceilings of your home for mold infestation. You would be wise to move to a mold-safe place to live until your home can be effectively mold decontaminated. Learn the 25 steps for safe and effective mold remediation (discussed in the above section of this e-book).

MOLD HEALTH PROBLEMS

Q. I have a few questions regarding mold and toddlers. We discovered after purchasing a condo that there is significant mold and water damage under the sub-floor. My daughter has been experiencing insane illnesses since the start of October ---sinus and breathing problems. After a few visits to my regular doctor I decided to seek other care, as he did not feel alarmed by the mold growth in our home. I went to an asthma and allergist M.D. After several tests were completed we discovered an allergy to cat dander and removed the cat from the home. However, my child under treatment for the cat dander is till having breathing issues. The number of what I call spasms has declined since she has been on nasal steroids, but they still exist. Her doctor has given me med., but do have them in case she has major breathing spasms. I cannot call this asthma, but the fact is she has breathing issues. I have to grab her and pat her back to clear her chest of white mucus. Doctors confirm continuous nasal congestion, but her lungs are clear. Clear snot will flow although she is not sick and has not been around cats.

I am rather confused by all the conflicting information out there. Can her symptom be caused by the mold even though she is not allergic? Can mold cause asthma's like symptoms in persons who are not allergic to mold? Can my child's illness be related to mold exposure; she has been disguisedly exposed for over a year? Thanks and your help is truly needed.

A. A person does not have to be mold sensitive to be adversely affected by exposure to mold. Mold exposure is very effective at starting asthma problems in a person's body, or in making a person's asthma or other health conditions even worse. Because of your child's adverse environmental health problems and because of the existence of a known mold problem (which will be both in and under the sub-flooring), you would be wise to move your family to a mold-safe place to live until your condo has been completely mold inspected, tested, and remediated. You should also hire a mold professional to test the house now, including fiber optics inspection and mold testing of the sub-flooring and beneath, and after mold remediation is allegedly completed (most remediators do a poor job of mold remediation). Refer to [Certified Mold Inspectors](#) to find one in your area.

Q. I am a physician (M.D. and surgeon). Consider a residence with a 700 sq. ft. attic that is accessed thru a trap door in a bedroom closet on second story. It is not used for storage or never entered except for rare

repairs. Attic has adequate soffit, baffle and ridge venting. What is the health risk to the residents of exposure to any attic mold in this situation where there is NO circulation of attic air into the vent system and air-space of the living quarters?

A. Doctor, your questions are logical and well-put. The better the questions, the better are my answers. Attic mold easily grows into the insides of the ceilings and walls below. Moreover, elevated levels of airborne mold spores from the attic mold can escape through the attic venting (you so well described) to re-enter and cross contaminate the house through open windows, open doors, and the fresh air intake of heating/cooling systems. It is also common that there are holes or cracks in the heating/cooling service ducts running in the attic area which can allow airborne mold spores to enter the heating/cooling ducts for re-distribution throughout the entire house. On a mold practical note, if the homeowner ever wishes to resell the moldy home in the future, prospective buyers are going to lose interest in the home after their hired mold inspectors or even regular home inspectors report an attic mold infestation problem, or worse. If your home has an attic mold problem now, learn the 27 steps recommended for safe and effective mold remediation at http://www.moldinspector.com/mold_removal.htm.

Q. After months of agony, I have found we have mold in our house. We are getting it removed but I have some questions. Will ultraviolet lights kill mold spores? I know I have it in my body; can I give it to another individual? I have a friend who has cancer, and is taking chemotherapy. Can I give it to her? The mold has been sent for identification, but the expert thinks it is *Stachybotrys*.....is there an antibiotic I can take to rid it in my body? Will a dermatologist be able to help or should I go to.....? (different type of doctor) I must be allergic and my husband is not, it seems to be worse at night. Why? It gets in my hair? Little black specks of dirt (whatever) is where the spores are. What is that? Under a microscope the specimens are all different colors-red, black, blue, green, white, and black. What do the colors mean? My 2 year old grand daughter has spent 3 nights per week for 2 years, what are the chances she has it in her body? [Jan. 1, 2005]

A. Your granddaughter can easily develop mold health problems from her frequent visits to your house. So can any others who spend an hour or more breathing in elevated levels of airborne mold spores in your home. Your body's mold health contamination cannot be spread directly to others. It is only your house that can do so. But you can transfer mold spores from your home to your car, workplace, and other locations on your shoes, clothing, hair, and skin. People vary significantly in their sensitivity to mold exposure---thus you can suffer heavily from mold, while your husband may not. Different color molds mean you have different types of mold species eating your home. When you receive back the mold species identification in the mold lab analysis you have ordered, you will know which molds are resident in your home. Most mold remediation is done poorly, leaving big-time mold problems still remaining AFTER alleged mold remediation. Learn the 27 steps recommended for safe and effective mold remediation. Ultraviolet light in huge levels from multiple ultraviolet bulbs [at least 388,000 μ watts per second of exposure of the mold spores to the UV light] can effectively kill mold which comes in contact with the UV lights [usually installed in the return air duct of the heating/cooling system]. One or two UV lights are inadequate to kill mold. Usually one UV light has only about 10,000 to 18,000 μ watts per second. To learn more about available medical mold diagnosis and treatment alternatives, read our in depth e-book *Mold Health Guide*, available kits at our online mold products catalog. The most appropriate medical specialists to visit for mold health problems are a pulmonary physician [lung doctor], allergist, neurologist [possible brain and nervous system problems], and ENT doctor [ear, nose, and throat].

Q. I'm 22 years old. When I was 19 I underwent breast implant surgery. The implants were saline filled and "teardrop" shaped to appear more natural. I was fine for 2 years, but eventually the left breast began to bother me. Turns out, it had rotated, so it wasn't sitting properly inside me. The original plan was to have another surgery, in which both implants would be taken out, and replaced with the more common "round" kind, so this "rotation" couldn't happen again. However, when the doctor (not the one who performed my original

surgery) pulled out the RIGHT implant (the one that I thought was fine), she found that there was black, feathery stuff floating all inside, and some stuck to the inside of the implant. After discovering this, the doctor swabbed me inside with antifungal and sewed me up with no implants. She sent me to a special "infectious diseases" doctor who told me that it was a fungus. Our concern was that it was still in my body, although it appeared to be contained. My surgeon was positive that it was contained and that I was fine. Just in case, the infectious diseases doctor drained some fluid from tubes that I had coming out of each breast after the surgery and sent it to be analyzed. He also recommended that in the meantime I take this certain antifungal medicine. Voriconazole...- something like that. He said it is the best. After 4 weeks on this medicine, getting my blood drawn every week to make sure it was not hurting my liver, we finally had hoped to get news that I could come off of the medicine because I was clean.

However, it was not good news after all. The results showed that a "scant growth" of the fungus appeared in the fluid sample from my right breast. The fungus name is Curvularia. No specific species, though. The doc was not very encouraging. He started saying "I will give you the options, but you make the decision of what to do." His best recommendation was to stay on the V-FEND (is what he called it) for another month. He said this may not do the trick. He said, "Not 100% sure, but....."

I don't know if you're a doctor, but if there is anything you can tell me that would be helpful, it would be appreciated. I am afraid for my life.

A. Because I am a mold expert and not a medical doctor, I am not able to give you much specific help, except for the following. Ask your doctor about the possibility of your having a mold antibody blood test. Mold antibodies are formed in your blood as a defense against molds being present inside your body. You might learn the extent of your body mold contamination problem and whether you are suffering from other specific molds in addition to Curvularia mold. You would also benefit from reading about mold medical diagnostic and medical treatment alternatives in our in-depth book Mold Legal Guide, available at our [online mold products catalog](#).

Q. Last night I watched an episode of "Court TV" in which a father and son suffered irreversible neurological damage due to an infestation of the poisonous black mold in their home. Theirs was a luxurious multi-million dollar house, but one leak in the residence caused these terrible illnesses. The growth of the mold was so serious that the house had to be condemned. Recently, I suffered inexplicable tears in my both retinas. First, the left eye developed four tears, and then the right eye developed mirror images of the tears in the left eye. I saw a neurologist, and although he didn't feel the tears in my retina were related to any problems in my brain, he did see signs of part of my brain that seemed to have suffered a stroke some time ago. I have been living in my house for ten years. The roof leaks, and once during my occupation of this residence, water came through the air conditioner, seeped on to the pine floors and caused the floor boards to buckle. My front door has a crack in it, and once there was the strangest "object" coming through the crack. I wish I had taken a picture of it for you. It looked like an insect, but it was an alienlike mold. I have always suffered from mold allergies, but the show on Court TV said the family I mentioned earlier had been tested for mold allergies and their diagnosis was negative. As you well know, there were being poisoned by the mold, not manifesting an allergy to it. Is there a way I could test my home to see if the mold in it is poisonous? I am a single woman of modest income.

A. The Court TV reported mold tragedy is the tip of the iceberg of the millions of people whose health is being ruined every day by mold poisoning from their living in mold infestation. Because airborne mold spores easily enter one's eyes to cause severe health damage to the eyes, your eye problems may well be mold-related. You would be wise to have yourself checked out medically by a lung doctor (pulmonary physician), neurologist (for possible brain and neurological damage), and an ENT (ear, nose and throat specialist). Learn all of the available medical mold diagnostic and treatment procedures in our in-depth ebook [Mold Health Guide](#).

Q. I am in Prescott Arizona at 5, 500 feet elevation. On my concrete basement floor, I have a fuzzy white mold popping up in places. It has been a very wet winter and there was minimal moisture coming up through cracks in the concrete. What species of mold is most likely growing and how dangerous is it?

A. Any mold species in elevated levels indoors is unhealthy according to the US [Environmental Protection Agency \(EPA\)](#). To learn the precise mold species of the mold growing in your basement, you need to send a sample to our [mold analysis laboratory](#). Mold growing on concrete from a wet concrete slab is a very common problem. Your first step should be to fill and seal all floor and wall cracks with a waterproofing compound designed for such purposes – check your local hardware or home improvement store. If the problem persists, put a one inch new concrete flooring down over your present floor, with adequate amounts of waterproofing compound in the concrete mix to make your entire basement floor into an effective water barrier against water leaks and water wicks up from the ground into your basement floor. Learn the 25 steps for [safe and effective mold remediation](#).

Q. We had a catastrophic mold homeowners claim last year resulting in our home testing positive for toxic mold and ¾ of our home being gutted and rebuilt. With that said, the contractor did not obtain a building permit and the mold remediation company hired an HVAC cleaning company that did not insulate the ductwork properly resulting in a huge condensation problem that has now ruined all of our ceilings again and everywhere that the ductwork runs has tested positive for the toxic mold again. During our last claim, our insurance company made us leave our home in the middle of the night and not return until almost 4 months later when the work was finished. This time they had us remain in our home the past 3 weeks until the test results returned and now say we should have left a few weeks ago, but definitely have to leave again so our home can be remediated again. We have a 6 year old child and that has been sick from allergy symptoms and a fever for the past few weeks and he has to be tested by an allergist next week to see if he is having a reaction to the mold. He is fine during the day at school, but gets sick within hours of returning home each day.

My question is: how can we determine if we have any adverse health consequences from this second exposure? And do we have any legal rights concerning the property damages that has occurred a second time due to the negligence of the contractor for not obtaining a building permit that an inspector would have caught in the improper insulation and also against the HVAC company for not insulating properly and causing this second exposure for our home to mold? Also, our insurance adjuster forgot to include replacing the insulation that was removed throughout our home and the contractor is claiming that the adjuster is at fault also and that is why he did not replace the insulation that contributed to the humidity and condensation problem.

A. Your very sad letter has several lessons that all property owners should realize. Here are my recommendations:

- 1) Pay for or do your own independent mold investigation, testing and remediation both prior to and after mold remediation to learn the extent of the mold infestation and to make sure the water and mold problems are definitely taken care of in the remediation process.
- 2) Hire only a mold remediator contractor that has the experience and training to do the mold remediation property.
- 3) Do not represent yourself in making a mold insurance claim ---utilize either an independent insurance adjuster who works on a commission basis of what is collected from your insurance company and makes sure the payment and scope of work are sufficient to get the job done, or an attorney who specializes in collecting on insurance claims.

- 4) Living in mold infestation, even for a few weeks, can cause severe health problems, including the possibility of permanent health problems. Your family members should have every possible mold medical diagnostic step done for each of them. Learn all about mold health and available medical mold diagnostic and treatment procedures in the in-depth ebook [Mold Health Guide](#). As to your possible claims against the mold remediator and the insurance company, you should learn what rights you may have by consulting with an environmental or insurance-oriented attorney. Learn about mold legal claims in the in-depth ebook [Mold Legal Guide](#).

MOLD RELATED CLAIMS

Q. I rent a home in Toronto, Ontario and have recently had many problems with leaking and flooding in the basement. The landlord has denied any structural problems with his house and so I had an inspector come to assess the property. Over 20 violations were cited but unfortunately this inspector was not able to assess the mould problem because that falls under another jurisdiction.

My question is about black mould. I have seen what I believe to be this type of mould in the basement and have just recently discovered that in all probability that the walls are full of it although it is not all visible. I have a two yr. old daughter who has also just been diagnosed with asthma and I am now worried for the safety of my family.

My landlord has just had the roof repaired and tells me when I express my concern about the mould that "it will all go away without moisture, now". Unfortunately I have also just renewed a lease and I want to know the exact danger that we are potentially in. Thank you for your time and I would greatly appreciate further information about this.

A. The leaking and flooding problems in the rental house are going to generate huge levels of indoor mold infestation, both visible, and growing inside floors, walls, ceilings, and the heating/cooling system. The health of your young daughter and your entire family is at serious risk for major and permanent health damage unless you move promptly to a mold safe place to live.

Unless you take steps like the [Tenant Notice to Landlord About Mold](#), and doing your own documentation of the mold problem with our do it yourself [mold test kits](#) which we can ship to your Toronto home, it is likely that your landlord, like most landlords, will do nothing as to safe and effective mold inspection, testing, and remediation of your rental unit's mold infestation problem. You would be wise to move to a mold-safe place as soon as possible. Most moldlords will not spend money to protect tenants against mold health threats. Learn about [landlord mold](#) liability. If you are going to move out from your present mold hell, or just move out temporarily during mold remediation, you should carefully mold inspect and test your temporary or new living quarters prior to renting or buying and moving to make sure you are not moving from one mold hell to another. As for your personal property, you are wise to do mold decontamination by washing all items outdoors by washing them thoroughly with Borax laundry detergent, a natural mold cleaner, in warm water. Use one pound of Borax per 1.5 gallons of water. To document your apartment mold health threats, you can use our do it yourself mold test kits, available from <http://www.moldmart.net>. Learn the [mold remediation](#) steps that your landlord needs to take AFTER you vacate the apartment [mold remediation while you are in the apartment will make your family even more ill].

Q. I am renting a house that has a basement that floods everytime it rains. My leasing company refuses to do anything about it. Recently, heavy rains have come through and my basement is now fully flooded (with standing water). My basement has dirt/soil exposed on one side with concrete floors and walls in the rest of the basement. Also, my washer and dryer as well as my air conditioning unit are down in the basement. Do you

think my basement is at risk for mold? I have not been down there to inspect because of the flooding, but it does smell. Should I have someone come and test for mold?

I don't know how to get my landlord to do anything about it. Any recommendations? I am mainly concerned about my health. I have headaches often and am tired when at home. A couple of months ago I was admitted to the hospital for a severe, but rare, viral infection. I know mold has been linked to several health problems, but has there been a link to viral infections?

A. With such recurring flooding and the presence of dirt walls in the basement means that the basement is fertile ground for the growing of large volumes of mold infestation. Basement mold can grow into the insides of the floors and walls above. In addition, airborne mold spores from the basement mold can travel in air currents to mold cross contaminate your entire rental unit. You are very likely living in a mold hell, very much endangering your health. Your first step should be to mold test any visible mold growth in the basement and to mold test the air of each room, attic, garage, and the outward air flow from each heating/cooling duct register for the possible presence of elevated levels of airborne mold spores, in comparison to an outdoor mold control test. Use do it yourself mold test kits that are available at <http://www.moldmart.net>. Learn about landlord mold liability at http://www.moldinspector.com/landlord_liability.htm.



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Microbiological Analysis of HygienicAire as against Mold Growth

Laboratory International

<http://www.moldinspector.com>



Remediator

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I. Abstract

Microbiological analysis was done to determine the efficiency of HygienicAire™ Mold and Mildew Treatment product against mold growth. Two experimental set – ups were designed for this experiment. The first experimental set – up involved the direct application of HygienicAire™ to a semi - porous surface of wooden closet initially infested with molds. The second set - up involved the assessment of HygienicAire™ effectiveness through vaporization into the indoor air of a moldy drawer.

II. Introduction

HygienicAire™ Mold and Mildew Treatment is specially prepared from steam distillation of the essential tree tea oil of *Melaleuca alternifolia*. This species is exclusive to Australia and native to Northern New South Wales. Research projects have demonstrated that tree oil has a broad range of both antibacterial and antifungal activities. Tea tree oil contains over a hundred components such as monoterpenes, sesquiterpenes and their alcohols. A specific tea tree oil component, terpinen – 4 – ol is present at the highest level and is responsible for most of the antimicrobial and antifungal activities.

III. Objectives

- To determine the effectiveness of HygienicAire™ as an antifungal agent when directly applied to a certain area of a mold – infested wooden cabinet;
- To determine if the musty odor due to presence of molds will be eliminated by HygienicAire™; and
- To determine the antifungal efficiency of vaporization of the biodegradable HygienicAire™ into the indoor air of a mold – infested drawer.

IV. Materials and Methods

A. Direct Surface Contact Efficiency Test

- Two external parallel sides of a drawer with a surface area of 699.77cm² infested with molds were tested;
- One side was directly applied with a layer of HygienicAire™ while the another parallel side of the mold – infested drawer was left untreated which served as the control; and
- A one – week observation was done and recorded.

B. Odor Vaporization Efficiency Test

- An uncovered plastic Petri bottom plate was filled with an estimate amount of 20ml HygienicAire™ and was placed inside a mold – infested drawer with surface area of 2, 528.57 cm²; and
- A one – week observation was done and recorded.

V. Results and Discussion

A. Direct Surface Contact Efficiency Test

Based on the data obtained, direct application of HygienicAire™ yielded a positive result in mold remediation. After the direct wiping off of mold growth with HygienicAire™ on the variable set – up surface, a one – week observation was done on both the control and variable set – ups with the same surface area of 699.77cm². It was noted that the mold infestation was totally eliminated and future infestation, within a time – frame of one week, was hindered as well on the variable external side - drawer. Kindly refer to Table A below.

Although the one – week time frame for the experiment was completed, the variable side – drawer had been observed for another five days and still no mold growth was observed.

Therefore, direct application of HygienicAire™ unto a mold – infested surface served as another effective alternative use of HygienicAire™ for combating mold growth due to its immediate response and long – term effect in hindering possible future mold infestation. However, it must be recommended to perform continuous monitoring of the set – up in order to determine how long the antifungal efficiency of HygienicAire™ will last.

Table A. Comparison between control mold – infested surface area [not applied with HygienicAire™] versus variable mold – infested surface area [applied with HygienicAire™].

<i>Days</i>	<i>Control External Side – Drawer</i>	<i>Variable External Side – Drawer</i>
<i>0 – day</i> <i>Nov. 4</i>	Abundant growth	All mold surface growth was eliminated upon application
<i>1st day</i> <i>Nov. 5</i>	Abundant growth	Negative Growth
<i>2nd day</i> <i>Nov. 6</i>	Abundant growth	Negative Growth
<i>3rd day</i> <i>Nov. 7</i>	Abundant growth	Negative Growth
<i>4th day</i> <i>Nov. 8</i>	Abundant growth	Negative Growth
<i>5th day</i> <i>Nov. 9</i>	Abundant growth	Negative Growth
<i>6th day</i> <i>Nov. 10</i>	Abundant growth	Negative Growth
<i>7th day</i> <i>Nov. 11</i>	Abundant growth	Negative Growth

B. Odor Vaporization Efficiency Test

A coverless Petri plate bottom was filled with an estimated amount of 20 ml HygienicAire™ and was left inside the variable drawer to dissipate while the control drawer was left as is. The surface area of both variable and control drawers is 2, 228.57 cm² and were observed to have an approximate 80 - 90% of mold growth on their entire surface area.

Based on the data obtained, it was observed that the vaporization of HygienicAire™ into the indoor air of the mold – infested drawer was effective in minimizing mold growth through time at a slow rate. Kindly refer to Table B. On the 1st and 2nd day, no difference was noted. Mold growth layer started to thin out slowly on the 3rd day at 0.50% out of the entire surface area. The antifungal effect of

HygienicAire™ vaporization was observed to take into effect at a gradual phase as noted on the 5th, 6th, 7th, and 8th day wherein a small estimated thinning of mold – surface area was observed to take place at 1.09%, 1.76%, 3.96%, and 5.36%, respectively. However, on the 9th and 10th day, notable mold growth thinning was observed to be 9.19% and 12.25% out of the total surface area, respectively.

Furthermore, the control drawer not subjected to HygienicAire™ vaporization smells musty due to presence of mold growth while the variable drawer's musty smell was counteracted by HygienicAire™ with its minty odor. Thus, HygienicAire™ served as an effective deodorizer.

Therefore, the vaporization antifungal capacity of HygienicAire™ requires sufficient period of time due to its gradual effect to take place. The surface area to be treated, amount of HygienicAire™ to be used, and duration of exposure must be taken into consideration when using HygienicAire™ as an antifungal vaporizer.

Table B. Comparison between the mold – infested variable drawer with vaporizing HygienicAire™ versus the mold – infested control drawer.

<i>Days</i>	<i>Variable Drawer with Vaporizing HygienicAire™</i>	<i>Percent Thinning of Mold Growth</i>	<i>Control Drawer</i>
0 – day <i>Nov. 4</i>	No reaction	0%	Abundant mold growth
1st day <i>Nov. 5</i>	No reaction	0%	Abundant mold growth
2nd day <i>Nov. 6</i>	No reaction	0%	Abundant mold growth
3rd day <i>Nov. 7</i>	Slight thinning of mold growth – estimated area of 6.35 cm x 2 cm	0.50%	Abundant mold growth
4th day <i>Nov. 8</i>	No difference noted	0.50%	Abundant mold growth
5th day <i>Nov. 9</i>	Greater area of thinning mold growth – estimated area is 8.75 cm x 3.14 cm	1.09%	Abundant mold growth
6th day <i>Nov. 10</i>	Slight progress compared to that of the 5 th day – estimated area is 10.86 x 4.10 cm of thinning growth	1.76%	Abundant mold growth

7th day Nov. 11	Notable progress compared to that of the 7 th day – estimated area is 20.48 cm x 4.89 cm of thinning growth	3.96%	Abundant mold growth
8th day Nov. 12	Greater area of thinning mold growth – estimated area is 26.67 cm x 5.08 cm	5.36%	Abundant mold growth
9th day Nov. 13	Slight progress compared to that of the 8 th day – estimated area is 28.50 x 8.15 cm of thinning growth	9.19%	Abundant mold growth
10th day Nov. 14	Notable progress compared to that of the 9 th day – estimated area is 30.48 cm x 10.16 cm of thinning growth	12.25%	Abundant mold growth

VI. Summary and Conclusion

Based on the two types of experiment conducted, it can be concluded that HygienicAire™ as mold and mildew treatment has a varying antifungal effects depending on the type of method it was utilized. Its effectiveness is at the highest level when applied directly unto a mold – infested surface area. It was observed that it could hinder possible future mold growth for a certain period of time and as based on the experiment, the applied surface area showed no fungal growth up to fifteen days of continuous monitoring. However, the definite time of its antifungal extent is not determined due to limited extension time to conduct further experimental monitoring.

On the other hand, the HygienicAire™ vaporization antifungal effect comes second. The vaporization antifungal efficiency was noted to be a slow and gradual process to take place as based on the data obtained. It is likely that using HygienicAire™ as an antifungal vaporizer would take a certain long period of time in order to eliminate mold growth entirely and several factors must also be taken into consideration such as the indoor surface area to be treated, the appropriate amount of HygienicAire™ to be vaporized into the allocated indoor surface area, and the required time of dissipation into the indoor air.

Lastly, HygienicAire™ is proven to be an effective deodorizer as it can counteract the musty odor caused by mold growth.

As a conclusion, HygienicAire™ is a versatile antifungal environmental treatment with a varying rate of efficiency depending on the method of its utilization.

VII. Recommendations

It is further recommended that extended duration of monitoring of both the Direct Surface Contact Efficiency Test and Odor Vaporization Efficiency Test set – ups must be done so as to be able to determine the extent of the HygienicAire™ antifungal effectiveness.

For the direct surface contact efficiency test, extended monitoring of the set – up will determine until when will the HygienicAire™ effectiveness can hinder future mold growth on a surface area which has been initially mold – infested. While for the odor vaporization efficiency test, extended monitoring of the set – up will provide an estimate of the total surface area that will be acted upon by the HygienicAire™ vaporization which will, in turn, determine the efficiency of HygienicAire™ based on the period of time it took to combat mold growth in terms of the affected thinning moldy surface area.

VIII. References:

Diagnostic Test

<http://www.edma-ivd.be/labo01.htm>

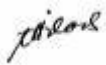
HygienicAire™ Mold & Mildew Treatment

<http://www.moldmart.net/hygienic-aire-cleaner.htm>

Tree Tea Oil Research Group

http://www.meddent.uwa.edu.au/teatree/#RIRDC_summaries_and_reports

Performed and prepared by:



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Mold Microbiologist

November 17, 2005

Report Available online at: <http://www.moldmart.net/hygienicaire-effectiveness-report.htm>

Chapter 6

Workplace Mold

Occupational Safety and Health Administration
Directorate of Science, Technology and Medicine
Office of Science and Technology Assessment

A Brief Guide to Mold in the Workplace

Safety and Health Information Bulletins

SHIB 03-10-10

This Safety and Health Information Bulletin is not a standard or regulation, and it creates no new legal obligations. The Bulletin is advisory in nature, informational in content, and is intended to assist building managers, custodians, and others who are responsible for building maintenance. Contractors and other professionals (e.g., environmental consultants and health or safety professionals) who respond to mold and moisture situations in buildings, as well as members of the general public, also may want to refer to these guidelines.

The Occupational Safety and Health Act requires employers to comply with hazard-specific safety and health standards as issued and enforced by either the Federal Occupational Safety and Health Administration (OSHA), or an OSHA-approved State Plan. In addition, Section 5(a)(1), the General Duty Clause, requires employers to provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm. Employers can be cited for violating the General Duty Clause if there is such a recognized hazard and they do not take reasonable steps to prevent or abate the hazard. However, failure to implement these guidelines is not, in itself, a violation of the General Duty Clause. Citations can only be based on standards, regulations, and the General Duty Clause.

Introduction

Concern about indoor exposure to mold has increased along with public awareness that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions. This safety and health information bulletin provides recommendations for the prevention of mold growth and describes measures designed to protect the health of building occupants and workers involved in mold cleanup and prevention. This bulletin is directed primarily at building managers, custodians, and others responsible for building maintenance, but may also be used as a basic reference for those involved in mold remediation. By reading this safety and health information bulletin, individuals with little or no experience with mold remediation may be able to reasonably judge whether mold contamination can be managed in-house or whether outside assistance is required. The advice of a medical professional should always be sought if there are any emerging health issues. This document will help those responsible for building maintenance in the evaluation of remediation plans. Contractors and other professionals (e.g. industrial hygienists or other environmental health and safety professionals) who respond to mold and moisture situations in buildings, as well as members of the general public, also may find these guidelines helpful. The information in these guidelines is intended only as a

summary of basic procedures and is not intended, nor should it be used, as a detailed guide to mold remediation. These guidelines are subject to change as more information regarding mold contamination and remediation becomes available.

Mold Basics

Molds are part of the natural environment. Molds are fungi that can be found anywhere - inside or outside - throughout the year. About 1,000 species of mold can be found in the United States, with more than 100,000 known species worldwide.

Outdoors, molds play an important role in nature by breaking down organic matter such as toppled trees, fallen leaves, and dead animals. We would not have food and medicines, like cheese and penicillin, without mold.

Indoors, mold growth should be avoided. Problems may arise when mold starts eating away at materials, affecting the look, smell, and possibly, with the respect to wood-framed buildings, affecting the structural integrity of the buildings.

Molds can grow on virtually any substance, as long as moisture or water, oxygen, and an organic source are present. Molds reproduce by creating tiny spores (viable seeds) that usually cannot be seen without magnification. Mold spores continually float through the indoor and outdoor air.

Molds are usually not a problem unless mold spores land on a damp spot and begin growing. They digest whatever they land on in order to survive. There are molds that grow on wood, paper, carpet, foods and insulation, while other molds feast on the everyday dust and dirt that gather in the moist regions of a building.

When excessive moisture or water accumulates indoors, mold growth often will occur, particularly if the moisture problem remains uncorrected. While it is impossible to eliminate all molds and mold spores, controlling moisture can control indoor mold growth.

All molds share the characteristic of being able to grow without sunlight; mold needs only a viable seed (spore), a nutrient source, moisture, and the right temperature to proliferate. This explains why mold infestation is often found in damp, dark, hidden spaces; light and air circulation dry areas out, making them less hospitable for mold.

Molds gradually damage building materials and furnishings. If left unchecked, mold can eventually cause structural damage to a wood framed building, weakening floors and walls as it feeds on moist wooden structural members. If you suspect that mold has damaged building integrity, consult a structural engineer or other professional with the appropriate expertise.

Since mold requires water to grow, it is important to prevent excessive moisture in buildings. Some moisture problems in buildings have been linked to changes in building construction practices since the 1970s, which resulted in tightly sealed buildings with diminished ventilation, contributing to moisture vapor buildup. Other moisture problems may result from roof leaks, landscaping or gutters that direct water into or under a building, or unvented combustion appliance. Delayed or insufficient maintenance may contribute to moisture problems in buildings. Improper maintenance and design of building heating/ventilating/air-conditioning (HVAC) systems, such as insufficient cooling capacity for an air conditioning system, can result in elevated humidity levels in a building.

Health Effects

Currently, there are no federal standards or recommendations, (e.g., OSHA, NIOSH, EPA) for airborne concentrations of mold or mold spores. Scientific research on the relationship between mold exposures and health effects is ongoing. This section provides a brief overview, but does not describe all potential health effects related to mold exposure. For more detailed information, consult a health professional or your state or local health department.

There are many types of mold. Most typical indoor air exposures to mold do not present a risk of adverse health effects. Molds can cause adverse effects by producing allergens (substances that can cause allergic reactions). Potential health concerns are important reasons to prevent mold growth and to remediate existing problem areas.

The onset of allergic reactions to mold can be either immediate or delayed. Allergic responses include hay fever-type symptoms such as runny nose and red eyes.

Molds may cause localized skin or mucosal infections but, in general, do not cause systemic infections in humans, except for persons with impaired immunity, AIDS, uncontrolled diabetes, or those taking immune suppressive drugs. An important reference with guidelines for immuno-compromised individuals can be found at the Centers for Disease Control and Prevention (CDC) website (www.cdc.gov).

Molds can also cause asthma attacks in some individuals who are allergic to mold. In addition, exposure to mold can irritate the eyes, skin, nose and throat in certain individuals. Symptoms other than allergic and irritant types are not commonly reported as a result of inhaling mold in the indoor environment.

Some specific species of mold produce mycotoxins under certain environmental conditions. Potential health effects from mycotoxins are the subject of ongoing scientific research and are beyond the scope of this document.

Eating, drinking, and using tobacco products and cosmetics where mold remediation is taking place should be avoided. This will prevent unnecessary contamination of food, beverage, cosmetics, and tobacco products by mold and other harmful substances within the work area.

Prevention

Moisture control is the key to mold control. When water leaks or spills occur indoors - act promptly. Any initial water infiltration should be stopped and cleaned promptly. A prompt response (within 24-48 hours) and thorough clean- up, drying, and/or removal of water-damaged materials will prevent or limit mold growth.

Mold prevention tips include:

- Repairing plumbing leaks and leaks in the building structure as soon as possible.
- Looking for condensation and wet spots. Fix source(s) of moisture incursion problem(s) as soon as possible.
- Preventing moisture from condensing by increasing surface temperature or reducing the moisture level in the air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in the air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keeping HVAC drip pans clean, flowing properly, and unobstructed.
- Performing regularly scheduled building/ HVAC inspections and maintenance, including filter changes.
- Maintaining indoor relative humidity below 70% (25 - 60%, if possible).
- Venting moisture-generating appliances, such as dryers, to the outside where possible.

- Venting kitchens (cooking areas) and bathrooms according to local code requirements.
- Cleaning and drying wet or damp spots as soon as possible, but no more than 48 hours after discovery.
- Providing adequate drainage around buildings and sloping the ground away from building foundations. Follow all local building codes.
- Pinpointing areas where leaks have occurred, identifying the causes, and taking preventive action to ensure that they do not reoccur.

Questions That May Assist in Determining Whether a Mold Problem Currently Exists

- Are building materials or furnishings visibly moisture damaged?
- Have building materials been wet more than 48 hours?
- Are there existing moisture problems in the building?
- Are building occupants reporting musty or moldy odors?
- Are building occupants reporting health problems that they think are related to mold in the indoor environment?
- Has the building been recently remodeled or has the building use changed?
- Has routine maintenance been delayed or the maintenance plan been altered?

Always consider consulting a health professional to address any employee health concerns.

Remediation Plan

Remediation includes both the identification and correction of the conditions that permit mold growth, as well as the steps to safely and effectively remove mold damaged materials.

Before planning the remediation assess the extent of the mold or moisture problem and the type of damaged materials. If you choose to hire outside assistance to do the cleanup, make sure the contractor has experience with mold remediation. Check references and ask the contractor to follow the recommendations in EPA's publication, "Mold Remediation in Schools and Commercial Buildings," or other guidelines developed by professional or governmental organizations.

The remediation plan should include steps to permanently correct the water or moisture problem. The plan should cover the use of appropriate personal protective equipment (PPE). It also should include steps to carefully contain and remove moldy building materials in a manner that will prevent further contamination. Remediation plans may vary greatly depending on the size and complexity of the job, and may require revision if circumstances change or new facts are discovered.

If you suspect that the HVAC system is contaminated with mold, or if mold is present near the intake to the system, contact the National Air Duct Cleaners Association (NADCA), or consult EPA's guide, "Should You Have the Air Ducts in Your Home Cleaned?" before taking further action. Do not run the HVAC system if you know or suspect that it is contaminated with mold, as it could spread contamination throughout the building. If the water or mold damage was caused by sewage or other contaminated water, consult a professional who has experience cleaning and repairing buildings damaged by contaminated water.

The remediation manager's highest priority must be to protect the health and safety of the building occupants and remediators. Remediators should avoid exposing themselves and others to mold-laden dusts as they conduct their cleanup activities. Caution should be used to prevent mold and mold spores from being dispersed throughout the air where they can be inhaled by building occupants. In some cases, especially those involving

large areas of contamination, the remediation plan may include temporary relocation of some or all of the building occupants.

When deciding if relocating occupants is necessary, consideration should be given to the size and type of mold growth, the type and extent of health effects reported by the occupants, the potential health risks that could be associated with the remediation activity, and the amount of disruption this activity is likely to cause. In addition, before deciding to relocate occupants, one should also evaluate the remediator's ability to contain/minimize possible aerosolization of mold spores given their expertise and the physical parameters of the workspace. When possible, remediation activities should be scheduled during off hours when building occupants are less likely to be affected.

Remediators, particularly those with health related concerns, may wish to check with their physicians or other health-care professionals before working on mold remediation or investigating potentially moldy areas. If any individual has health concerns, doubts, or questions before beginning a remediation/cleanup project, he or she should consult a health professional.

Mold Remediation/Cleanup Methods

The purpose of mold remediation is to correct the moisture problem and to remove moldy and contaminated materials to prevent human exposure and further damage to building materials and furnishings. Porous materials that are wet and have mold growing on them may have to be discarded because molds can infiltrate porous substances and grow on or fill in empty spaces or crevices. This mold can be difficult or impossible to remove completely.

As a general rule, simply killing the mold, for example, with biocide is not enough. The mold must be removed, since the chemicals and proteins, which can cause a reaction in humans, are present even in dead mold.

A variety of cleanup methods are available for remediating damage to building materials and furnishings caused by moisture control problems and mold growth. The specific method or group of methods used will depend on the type of material affected. Some methods that may be used include the following:

Wet Vacuum

Wet vacuums are vacuum cleaners designed to collect water. They can be used to remove water from floors, carpets, and hard surfaces where water has accumulated. They should not be used to vacuum porous materials, such as gypsum board. Wet vacuums should be used only on wet materials, as spores may be exhausted into the indoor environment if insufficient liquid is present. The tanks, hoses, and attachments of these vacuums should be thoroughly cleaned and dried after use since mold and mold spores may adhere to equipment surfaces.

Damp Wipe

Mold can generally be removed from nonporous surfaces by wiping or scrubbing with water and detergent. It is important to dry these surfaces quickly and thoroughly to discourage further mold growth. Instructions for cleaning surfaces, as listed on product labels, should always be read and followed.

HEPA Vacuum

HEPA (High-Efficiency Particulate Air) vacuums are recommended for final cleanup of remediation areas after materials have been thoroughly dried and contaminated materials removed. HEPA vacuums also are

recommended for cleanup of dust that may have settled on surfaces outside the remediation area. Care must be taken to assure that the filter is properly seated in the vacuum so that all the air passes through the filter. When changing the vacuum filter, remediators should wear respirators, appropriate personal protective clothing, gloves, and eye protection to prevent exposure to any captured mold and other contaminants. The filter and contents of the HEPA vacuum must be disposed of in impermeable bags or containers in such a way as to prevent release of the debris.

Disposal of Damaged Materials

Building materials and furnishings contaminated with mold growth that are not salvageable should be placed in sealed impermeable bags or closed containers while in the remediation area. These materials can usually be discarded as ordinary construction waste. It is important to package mold-contaminated materials in this fashion to minimize the dispersion of mold spores. Large items with heavy mold growth should be covered with polyethylene sheeting and sealed with duct tape before being removed from the remediation area. Some jobs may require the use of dust-tight chutes to move large quantities of debris to a dumpster strategically placed outside a window in the remediation area.

Use of Biocides

The use of a biocide, such as chlorine bleach, is not recommended as a routine practice during mold remediation, although there may be instances where professional judgment may indicate its use (for example, when immuno-compromised individuals are present). In most cases, it is not possible or desirable to sterilize an area, as a background level of mold spores comparable to the level in outside air will persist. However, the spores in the ambient air will not cause further problems if the moisture level in the building has been corrected.

Biocides are toxic to animals and humans, as well as to mold. If you choose to use disinfectants or biocides, always ventilate the area, using outside air if possible, and exhaust the air to the outdoors. When using fans, take care not to extend the zone of contamination by distributing mold spores to a previously unaffected area. Never mix chlorine bleach solution with other cleaning solutions or detergents that contain ammonia because this may produce highly toxic vapors and create a hazard to workers.

Some biocides are considered pesticides, and some states require that only registered pesticide applicators apply these products in schools, commercial buildings, and homes. Make sure anyone applying a biocide is properly licensed where required.

Fungicides are commonly applied to outdoor plants, soil, and grains as a powder or spray. Examples of fungicides include hexachlorobenzene, organomercurials, pentachlorophenol, phthalimides, and dithiocarbamates.

Do not use fungicides developed for outdoor use in any indoor application, as they can be extremely toxic to animals and humans in an enclosed environment.

When you use biocides as a disinfectant or a pesticide, or as a fungicide, you should use appropriate PPE, including respirators. Always, read and follow product label precautions. It is a violation of Federal (EPA) law to use a biocide in any manner inconsistent with its label direction.

Mold Remediation Guidelines

This section presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines are designed to protect the health of cleanup personnel and other workers during remediation. These guidelines are based on the size of the area impacted by mold contamination. Please note that these are guidelines; some professionals may prefer other remediation methods, and certain circumstances may require different approaches or variations on the approaches described below. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator or occupant exposure, professional judgment always should play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager should rely on professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Level I: Small Isolated Areas (10 sq. ft or less) - e.g., ceiling tiles, small areas on walls.

- Remediation can be conducted by the regular building maintenance staff as long as they are trained on proper clean-up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).
- Respiratory protection (e.g., N-95 disposable respirator) is recommended. Respirators must be used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134). Gloves and eye protection should be worn.
- The work area should be unoccupied. Removing people from spaces adjacent to the work area is not necessary, but is recommended for infants (less than 12 months old), persons recovering from recent surgery, immune-suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).
- Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.
- Contaminated materials that cannot be cleaned should be removed from the building in a sealed impermeable plastic bag. These materials may be disposed of as ordinary waste.
- The work area and areas used by remediation workers for egress should be cleaned with a damp cloth or mop and a detergent solution.
- All areas should be left dry and visibly free from contamination and debris.

Level II: Mid-Sized Isolated Areas (10-30 sq. ft.) – e.g., individual wallboard panels.

- Remediation can be conducted by the regular building maintenance staff. Such persons should receive training on proper clean-up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).
- Respiratory protection (e.g., N-95 disposable respirator) is recommended. Respirators must be used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134). Gloves and eye protection should be worn.
- The work area should be unoccupied. Removing people from spaces adjacent to the work area is not necessary, but is recommended for infants (less than 12 months old), persons recovering from recent surgery, immune-suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

- Surfaces in the work area that could become contaminated should be covered with a secured plastic sheet(s) before remediation to contain dust/debris and prevent further contamination.
- Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.
- Contaminated materials that cannot be cleaned should be removed from the building in a sealed impermeable plastic bag. These materials may be disposed of as ordinary waste.
- The work area and areas used by remediation workers for egress should be HEPA vacuumed and cleaned with a damp cloth or mop and a detergent solution.
- All areas should be left dry and visibly free from contamination and debris.

Level III: Large Isolated Areas (30 –100 square feet) – e.g., several wallboard panels.

Industrial hygienists or other environmental health and safety professionals with experience performing microbial investigations and/or mold remediation should be consulted prior to remediation activities to provide oversight for the project.

The following procedures may be implemented depending upon the severity of the contamination:

- It is recommended that personnel be trained in the handling of hazardous materials and equipped with respiratory protection (e.g., N-95 disposable respirator). Respirators must be used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134). Gloves and eye protection should be worn.
- Surfaces in the work area and areas directly adjacent that could become decontaminated should be covered with a secured plastic sheet(s) before remediation to contain dust/ debris and prevent further contamination.
- Seal ventilation ducts/grills in the work area and areas directly adjacent with plastic sheeting.
- The work area and areas directly adjacent should be unoccupied. Removing people from spaces near the work area is recommended for infants, persons having undergone recent surgery, immunosuppressed people, or people with chronic inflammatory lung diseases. (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).
- Dust suppression methods, such as misting (not soaking) surfaces prior to mediation, are recommended.
- Contaminated materials that cannot be cleaned should be removed from the building in sealed impermeable plastic bags. These materials may be disposed of as ordinary waste.
- The work area and surrounding areas should be HEPA vacuumed and cleaned with a damp cloth or mop and a detergent solution.
- All areas should be left dry and visibly free from contamination and debris.

Note: If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), it is recommended that the remediation procedures for Level IV be followed.

Level IV: Extensive Contamination (greater than 100 contiguous square feet in an area).

Industrial hygienists or other environmental health and safety professionals with experience performing microbial investigations and/or mold remediation should be consulted prior to remediation activities to provide oversight for the project.

The following procedures may be implemented depending upon the severity of the contamination:

- Personnel trained in the handling of hazardous materials and equipped with:
 - Full face piece respirators with HEPA cartridges;
 - Disposable protective clothing covering entire body including both head and shoes; and
 - Gloves.
- Containment of the affected area:
 - Complete isolation of work area from occupied spaces using plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and other openings);
 - The use of an exhaust fan with a HEPA filter to generate negative pressurization; and
 - Airlocks and decontamination room.
- If contaminant practices effectively prevent mold from migrating from affected areas, it may not be necessary to remove people from surrounding work areas. However, removal is still recommended for infants, persons having undergone recent surgery, immune-suppressed people, or people with chronic inflammatory lung diseases. (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).
- Contaminated materials that cannot be cleaned should be removed from the building 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 building. 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.

Personal Protective Equipment (PPE)

Any remediation work that disturbs mold and causes mold spores to become airborne increases the degree of respiratory exposure. Actions that tend to disperse mold include: breaking apart moldy porous materials such as wallboard; destructive invasive procedures to examine or remediate mold growth in a wall cavity; removal of contaminated wallpaper by stripping or peeling; using fans to dry items or ventilate areas.

The primary function of personal protective equipment is to prevent the inhalation and ingestion of mold and mold spores and to avoid mold contact with the skin or eyes. The following sections discuss the various types of PPE that may be used during remediation activities.

Skin and Eye Protection

Gloves protect the skin from contact with mold, as well as from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of substance/ chemical being handled. If you are using a biocide such as chlorine bleach, or a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or PVC. If you are using a mild detergent or plain water, ordinary household rubber gloves may be used.

To protect your eyes, use properly fitted goggles or a full face piece respirator. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not appropriate in mold remediation.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, contaminated dust, and other particulates that are released during the remediation process. Either a half mask or full face piece air-purifying respirator can be used. A full face piece respirator provides both respiratory and eye protection. Please refer to the discussion of the different levels of remediation to ascertain the type of respiratory protection recommended. Respirators used to provide protection from mold and mold spores must be certified by the National Institute for Occupational

Safety and Health (NIOSH). More protective respirators may have to be selected and used if toxic contaminants such as asbestos or lead are encountered during remediation.

As specified by OSHA in 29 CFR 1910.134 individuals who use respirators must be properly trained, have medical clearance, and be properly fit tested before they begin using a respirator. In addition, use of respirators requires the employer to develop and implement a written respiratory protection program, with worksite-specific procedures and elements.

Protective Clothing

While conducting building inspections and remediation work, individuals may encounter hazardous biological agents as well as chemical and physical hazards. Consequently, appropriate personal protective clothing (i.e., reusable or disposable) is recommended to minimize cross-contamination between work areas and clean areas, to prevent the transfer and spread of mold and other contaminants to street clothing, and to eliminate skin contact with mold and potential chemical exposures.

Disposable PPE should be discarded after it is used. They should be placed into impermeable bags, and usually can be discarded as ordinary construction waste. Appropriate precautions and protective equipment for biocide applicators should be selected based on the product manufacturer's warnings and recommendations (e.g., goggles or face shield, aprons or other protective clothing, gloves, and respiratory protection).

Sampling for Mold

Is it necessary to sample for mold? In most cases, if visible mold growth is present, sampling is unnecessary. Air sampling for mold may not be part of a routine assessment because decisions about appropriate remediation strategies often can be made on the basis of a visual inspection.

Your first step should be to inspect for any evidence of water damage and visible mold growth. Testing for mold is expensive, and there should be a clear reason for doing so. In many cases, it is not economically practical or useful to test for mold growth on surfaces or for airborne spores in the building. In addition, there are no standards for "acceptable" levels of mold in buildings, and the lack of a definitive correlation between exposure levels and health effects makes interpreting the data difficult, if not impossible.

Testing is usually done to compare the levels and types of mold spores found inside the building with those found outside of the building or for comparison with another location in the building. In addition, air sampling may provide tangible evidence supporting a hypothesis that investigators have formulated. For example, air sampling may show a higher concentration of the same species of mold when the HVAC is operating than when it has been turned off. This finding may convince the investigators that the mold is growing within, and being disseminated by, the HVAC system. Conversely, negative results may persuade investigators to abandon this hypothesis and to consider other sources of mold growth or dissemination. If you know you have a mold problem, it is more important to spend time and resources removing the mold and solving the moisture problem that causes the moldy conditions than to undertake extensive testing for the type and quantity of mold.

If you are in doubt about sampling, consult an industrial hygienist or other environmental health or safety professional with experience in microbial investigations to help you decide if sampling for mold is necessary or useful, and to identify persons who can conduct any necessary sampling. Due to the wide difference in individual susceptibility to mold contamination, sampling results sampling may have limited application. However, sampling results can be used as a guide to determine the extent of an infestation and the effectiveness

of the cleanup. Their interpretation is best left to the industrial hygienist or other environmental health or safety professional.

Sampling for mold should be conducted by professionals with specific experience in designing mold-sampling protocols, sampling methods for microbial contaminants, and interpretation of results. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control." In addition, sampling and analysis should follow any other methods recommended by either OSHA, NIOSH, EPA, the American Industrial Hygiene Association, or other recognized professional guidelines. Types of samples can include: air samples, surface samples, bulk samples, and water samples from condensate drain pans or cooling towers.

Microscopic identification of the spores/ colonies requires considerable expertise. These services are not routinely available from commercial laboratories. Documented quality control in the laboratories used for analysis of the bulk, surface, and other air samples is necessary. The American Industrial Hygiene Association offers accreditation to microbial laboratories (Environmental Microbiology Laboratory Accreditation Program (EMLAP)). Accredited laboratories must participate in quarterly proficiency testing (Environmental Microbiology Proficiency Analytical Testing Program (EMPAT)).

Remediation Equipment

There are various types of equipment useful in mold assessment and remediation. Some of the more common items include:

Moisture Meters

Moisture meters measure/monitor moisture levels in building materials, and may be helpful for measuring the moisture content in a variety of building materials following water damage. They also can be used to monitor the progress of drying damaged materials. These direct reading devices have a thin probe that is inserted into the material to be tested or pressed directly against the surface of the material. Moisture meters can be used on materials such as carpet, wallboard, wood, brick, and concrete.

Humidity Gauges or Meters

Humidity meters can be used to monitor indoor humidity. Inexpensive (less than \$50) models that monitor both temperature and humidity are available.

Humidistat

A humidistat is a control device that can be connected to an HVAC system and adjusted so that if the humidity level rises above a set point, the HVAC system will automatically turn on and reduce the humidity below the established point.

Borescope

A borescope is a hand-held tool that allows users to see potential mold problems inside walls, ceiling plenums, crawl spaces, and other tight areas. It consists of a video camera on the end of a flexible "snake." No major drilling or cutting of dry wall is required.

HVAC System Filter

High-quality filters must be used in a HVAC system during remediation because conventional HVAC filters are typically not effective in filtering particles the size of mold spores. Consult an engineer for the appropriate filter efficiency for your specific HVAC system, and consider upgrading your filters if necessary. A filter with a minimum efficiency of 50 to 60% or a rating of MERV 8, as determined by Test Standard 52.2 of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, may be appropriate.

Remember to change filters as appropriate, especially following any remediation activities. Remove filters in a manner that minimizes the reentry of mold and other toxic substances into the workplace. Under certain circumstances, it may be necessary to wear appropriate PPE while performing this task.

How Do You Know When You Have Finished Remediation/Cleanup?

- You must have identified and completely corrected the source of the water or moisture problem.
- Mold removal should be complete. Visible mold, mold-damaged materials, and moldy odors should no longer be present.
- Sampling, if conducted, should show that the level and types of mold and mold spores inside the building are similar to those found outside.
- You should revisit the site(s) after remediation, and it should show no signs of moldy or musty odors, water damage, or mold growth.

Conclusion

After correcting water or moisture infiltration, the prompt removal of contaminated material and structural repair is the primary response to mold contamination in buildings. In all situations, the underlying cause of water accumulation must be rectified or the mold growth will reoccur. Emphasis should be placed on preventing contamination through proper building and HVAC system maintenance and prompt repair of water damaged areas.

Effective communication with building occupants is an essential component of all large-scale remediation efforts. The building owner, management, and/or employer should notify occupants in the affected area(s) of the presence of mold. Notification should include a description of the remedial measures to be taken and a timetable for completion. Group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals with persistent health problems that appear to be related to mold exposure should see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

References

American Conference of Governmental Industrial Hygienists 1999. Bioaerosols Assessment and Control
<http://www.acgih.org>

National Apartment Association
<http://www.naahq.org>

National Institute for Occupational Safety and Health (NIOSH)
<http://www.cdc.gov/niosh>

National Multi-Housing Council
<http://www.nmhc.org>

The Building Owners and Managers Association International (BOMA)
<http://www.boma.org>

New York City Department of Health & Mental Hygiene Bureau of Environmental & Occupational Disease
Epidemiology 2002. Guidelines on Assessment and Remediation of Fungi in Indoor Environments
<http://www.nyc.gov/html/doh/html/epi/moldrpt1.html>

United States Environmental Protection Agency, Office of Air and Radiation, Indoor Environments Division
2001. Mold Remediation in Schools and Commercial Buildings. EPA 402-K-01-001
<http://www.epa.gov/iaq/molds/graphics/moldremediation.pdf>

Mold Resources List

Business owners who are concerned about the cost of professional help can contact the OSHA Consultation Project Office in their state for free consultation service. Priority is given to businesses with fewer than 250 employees at a worksite, with further consideration given to the severity of the worksite problem. The Consultation Program can help the employer evaluate and prevent hazardous conditions in the workplace that can cause injuries and illnesses, including mold problems.

The following list of resources includes information developed and maintained by public and private organizations. However, OSHA does not control this information and cannot guarantee the accuracy, relevance, timeliness, or completeness of this outside information. Further, the inclusion of these resources is not intended to endorse any views expressed, or products or services offered, by the author of the reference or the organization operating the service identified by the reference.

An Office Building Occupant's Guide to IAQ
<http://www.epa.gov/iaq/pubs/occupgd.html>

Biological Contaminants
<http://www.epa.gov/iaq/biologic.html>

Building Air Quality Action Plan (For Commercial Buildings)
<http://www.epa.gov/iaq/largebldgs/actionpl.html>

Floods / Flooding
<http://www.epa.gov/iaq/pubs/flood.html>

Indoor Air Quality (IAQ) Home Page

<http://www.epa.gov/iaq>

IAQ in Large Buildings/Commercial Buildings

<http://www.epa.gov/iaq/largebldgs/>

IAQ in Schools

<http://www.epa.gov/iaq/schools>

Mold Resources

<http://www.epa.gov/iaq/molds/moldresources.html>

Mold Remediation in Schools and Commercial Buildings

http://www.epa.gov/iaq/molds/mold_remediation.html

U.S. EPA IAQ Information Clearinghouse (IAQINFO)

Phone: (800)438-4318 or (703)356-4020

Fax: (703)356-5386

Email: iaqinfo@aol.com

Indoor air related documents, answers to Indoor Air Quality (IAQ) questions, maintains listing of State IAQ contacts, and regional EPA Contacts.

Air Conditioning Contractors of America (ACCA)

(703)575-4477

<http://www.acca.org/index.html>

Information on indoor comfort products and services.

American College of Occupational and Environmental Medicine (ACOEM)

(847)818-1800

<http://www.acoemprivatepractice.com/>

Referrals to physicians who have experience with environmental exposures.

American Conference of Governmental Industrial Hygienists, Inc. (ACGIH)

(513)742-2020

<http://www.acgih.org>

Occupational and environmental health and safety information.

American Industrial Hygiene Association (AIHA)

(703)849-8888

<http://www.aiha.org>

Information on industrial hygiene and indoor air quality issues including mold hazards and legal issues.

American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE)

(800)527-4723

<http://www.ashrae.org>

Information on engineering issues and indoor air quality.

Association of Occupational and Environmental Clinics (AOEC)

(202)347-4976

<http://www.aoec.org>

Referrals to clinics with physicians, who have experience with environmental exposures, include exposure to mold; maintains a database of occupational and environmental cases.

Association of Specialists in Cleaning and Restoration (ASCR)

(800)272-7012 or (410)729-3603

<http://www.ascr.org/institutes>

Carpet and Upholstery Cleaning Institute, Mechanical Systems Hygiene Institute, National Institute of Disaster Restoration, National Institute Rug Cleaning, Water Loss Institute referrals to professionals.

American Academy of Allergy, Asthma & Immunology (AAAAI)

(800)822-2762

<http://www.aaaai.org/>

Physician referral directory, information on allergies and asthma.

Asthma and Allergy Foundation of American (AAFA)

(800) 7ASTHMA (800)727-8462)

<http://www.aaafa.org>

Information on allergies and asthma.

American Lung Association (ALA)

(800) LUNGUSA (800)586-4872)

[http:// www.lungusa.org](http://www.lungusa.org)

Information on allergies and asthma.

Allergy and Asthma Network Mothers of Asthmatics (AANMA)

(800)878-4403 or (703)641-9595)

<http://www.aanma.org>

Information on allergies and asthma.

National Institute of Allergy and Infectious Diseases (NIAID)

(301)496-5717

<http://www.niaid.nih.gov>

Information on allergies and asthma.

National Jewish Medical and Research Center

(800) 222LUNG (800)222-5864)

<http://www.njc.org>

Information on allergies and asthma.

Carpet and Rug Institute (CRI)

(800) 882-8846

<http://www.carpet-rug.com>

Carpet maintenance, restoration guidelines for water-damaged carpet, other carpet-related issues.

Centers for Disease Control and Prevention (CDC)

(800)311-3435

<http://www.cdc.gov>

Information on health-related topics including asthma molds in the environment, and occupational health. CDC is recognized as the lead federal agency for protecting the health and safety of the American people at home and

abroad. It serves as the national focus for developing and applying disease prevention and control, environmental health, and health promotion and education activities.

Floods/Flooding

Federal Emergency Management Agency (FEMA)

(800)480-2520

<http://www.fema.gov/mit>

Publications on floods, flood proofing, etc.

University of Minnesota, Department of Environmental Health and Safety

(612)626-5804

<http://www.dehs.umn.edu/iaq/flood.html>

Managing water infiltration into buildings.

Indoor Environmental Remediation Board (IERB)

(215)387-4097

<http://www.ierb.org>

Information on best practices in building remediation.

Institute of Inspection, Cleaning and Restoration Certification (IICRC)

(360)693-5675

<http://www.iicrc.org>

Information on and standards for the inspection, cleaning, and restoration industry.

International Sanitary Supply Association (ISSA)

(800)225-4772

<http://www.issa.com>

Education and training on cleaning and maintenance.

MidAtlantic Environmental Hygiene Resource Center (MEHRC)

(215)387-4096

<http://www.mehrc.org>

Indoor environmental quality training center giving courses in building moisture and biocontamination, and managing and operating facilities for good IAQ. Extensive courses given in IAQ.

National Air Duct Cleaners Association (NADCA)

(202)737-2926

<http://www.nadca.com>

Duct cleaning information.

National Institute of Building Sciences (NIBS)

(202)289-7800

<http://www.nibs.org>

Information on building regulations, science, and technology.

National Institute for Occupational Safety and Health (NIOSH)

(800) 35NIOSH (800)356-4674

<http://www.cdc.gov/niosh>

Health and safety information with a workplace orientation.

National Pesticide Information Center (NPIC)

(800)858-7378

<http://npic.orst.edu/>

Information on pesticides/antimicrobial chemicals, including safety and disposal information.

New York Department of Health, Bureau of Environmental and Occupational Disease Epidemiology,
Guidelines on Assessment and Remediation of Fungi in Indoor Environments.

(212)788-4290

<http://www.ci.nyc.ny.us/html/doh/html/epi/moldrpt1.html>

Occupational Safety and Health Administration (OSHA)

200 Constitution Avenue, NW

Washington, DC 20210

(800)321-OSHA (800)321-6742)

<http://www.osha.gov>

Information on worker safety and health, compliance assistance, laws and regulations, cooperative programs, state programs, statistics, and newsroom.

Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

(703)803-2980

<http://www.smacna.org>

Technical information on topics such as air conditioning and air ducts.

NIOSH Interim Recommendations for the Cleaning and Remediation of Flood-Contaminated HVAC Systems: A Guide for Building Owners and Managers

Introduction

During flooding, systems for heating, ventilating, and air conditioning (HVAC) can become submerged in flood waters. As a result, these systems may contain substantial amounts of dirt and debris and may also become contaminated with various types of microorganisms such as bacteria and fungi. If the HVAC systems are not cleaned and disinfected properly, these microorganisms can be spread throughout the entire building. These microorganisms can cause building occupants to have a variety of health effects such as itchy eyes, runny nose, sneezing, and difficulty in breathing. In addition, the symptoms of people with allergies and asthma may get worse. Exposures to microorganisms have been documented to cause allergic respiratory diseases in agricultural, biotechnology, office, and home environments.¹⁻⁸ Microorganisms may grow on all surfaces of HVAC system components that were submerged in flood waters. In addition, moisture can collect in HVAC system components that were not submerged (such as air supply ducts above the water line) and can promote the growth of microorganisms. Therefore, all components of the HVAC system that were contaminated with flood water or moisture should be thoroughly inspected, cleaned of dirt and debris, and disinfected by a qualified professional. The following recommendations will help ensure that HVAC systems contaminated with flood water are properly cleaned and remediated to provide healthy indoor environments. These interim recommendations are based on current knowledge as of September 21, 2005; the recommendations will be updated and revised as appropriate, as additional information becomes available.

Steps Before Cleaning and Remediation

- If the building is to remain partly occupied (for example, on upper floors not affected by flood waters), isolate the construction areas where HVAC systems will be cleaned and remediated by using temporary walls, plastic sheeting, or other vapor-retarding barriers. Maintain the construction areas under negative pressure (relative to adjacent non-construction areas) by using blowers equipped with HEPA filters (high-efficiency particulate air filters) to exhaust the area.

To ensure complete isolation from the construction areas, it may be necessary to pressurize the adjacent non-construction areas and temporarily relocate the outdoor-air intake for the HVAC system serving the occupied areas.

- Take precautions to protect the health of workers who are cleaning and remediating the HVAC system. Make sure that workers wear at least an N-95 NIOSH-approved respirator to protect against airborne microorganisms. Increased levels of respiratory protection (for example, powered, air-purifying respirators equipped with HEPA filters) may be appropriate depending on the level of visible contamination. In addition, when using chlorine bleach or other disinfectants in poorly ventilated environments, it may be necessary to use appropriate chemical cartridges in addition to the particulate filters to protect workers from breathing the chemical vapors. Employers must implement a complete respiratory protection program that meets the requirements of the OSHA respiratory protection standard (29 Code of Federal Regulations 1910.134).⁹ The minimum requirements for a respiratory protection program include a written standard operating procedure for the following: selecting and using respirators; the medical evaluation of workers to determine whether they are physically able to wear the respirator selected for use; training and instructions on respirator use; the cleaning, repair, and storage of respirators; the continued surveillance of work area conditions for worker exposure and stress; and a respirator fit-testing program. For tight-fitting respirators, fit-testing is necessary to help ensure that the respirator fits tightly, reducing the potential for leakage of

outside air from around the edge of the mask. In addition, employers must provide workers with appropriate skin, eye, and hearing protection for the safe performance of their jobs.

- Determine whether any asbestos-containing materials are present by having the HVAC system inspected by a qualified professional. If asbestos is determined to be present, follow Federal, State, and local requirements for removal and disposal of the asbestos-containing materials before proceeding with HVAC system cleaning and remediation. Additional information about protecting workers from asbestos hazards during flood cleanup is available from OSHA at http://www.osha.gov/OshDoc/data_Hurricane_Facts/AsbestosHazards.pdf

HVAC Cleaning and Remediation

- Remove all flood-contaminated insulation surrounding and within HVAC system components. Discard these contaminated materials appropriately following applicable Federal, State, and local regulations.
- Remove contaminated HVAC filter media and discard appropriately following applicable Federal, State, and local regulations.

After removing any insulation and filters, clean all flood-contaminated HVAC system component surfaces with a HEPA-filtered vacuum cleaner to remove dirt, debris, and microorganisms. Pay special attention to filter racks, drain pans, bends and horizontal sections of air ducts where debris can collect.

- After removing any insulation or debris, disinfect all HVAC system component surfaces while the HVAC system is not operating. Use a solution of 1 cup of household chlorine bleach in a gallon of water. Do not mix bleach with other cleaning products that contain ammonia.
- Follow the disinfection procedure with a clean water rinse. Depending on the amount of debris present, it may be necessary to mechanically clean the HVAC system component surfaces with a steam or a high-pressure washer before using the disinfectant.

Note: Remove and discard HVAC system components that are contaminated with flood water and cannot be effectively cleaned and disinfected. Replace them with new components.

- After cleaning and disinfecting or replacing the HVAC system components, replace the insulation – preferably with an external (i.e. not in the air stream) smooth-surfaced insulation to help prevent debris and microorganisms from collecting in the future.
- Make sure that the HVAC system fan has been removed and serviced (cleaned, disinfected, dried thoroughly, and tested) by a qualified professional before it is placed back into the air-handling unit.
- During the cleaning and remediation process, consider upgrading the HVAC system filtration to the highest efficiency filters practical given the static pressure constraints of the HVAC system fan. This step has been shown to be one of the most cost-effective ways to improve the long-term quality of the indoor environment, since it reduces the amount of airborne dusts and microorganisms.

Resuming HVAC Operations

- After cleaning and disinfecting or replacing HVAC system, have a qualified professional thoroughly evaluate its performance and correct it as necessary before the building is occupied again. The HVAC system performance should conform to the recommendations contained in ASHRAE Standard 62-2004, *Ventilation for Acceptable Indoor Air Quality*. 10
- Before the building is occupied again, operate the HVAC system continuously in a normal manner at a comfortable temperature for 48 to 72 hours. During this period, it may be beneficial to open the HVAC outdoor air dampers to the maximum setting that still allows you to provide the desired indoor air temperatures. If objectionable flood-related odors persist after this “flush out” period, reassess by

looking for flood-contaminated areas that were not identified earlier and continue the flush-out process until odors are no longer apparent. Replace the HVAC filters used during the flush-out prior to building occupancy.

- After a building is occupied again, make frequent (for example, weekly) checks of the HVAC system to ensure that it is operating properly. During these checks, inspect the HVAC system filters and replace them when necessary. Gradually reduce the frequency of the HVAC system checks to monthly or quarterly inspections, depending on the routine operation and maintenance specifications for the HVAC system.
- If no routine operation and maintenance program is in place for the HVAC system, develop and institute such a program. At a minimum, include the following *routine* procedures: inspection and maintenance of HVAC components, calibration of HVAC system controls, and testing and balancing of the HVAC system.
- After the building is occupied again, maintain the interior temperature and relative humidity to conform with the ranges recommended in ASHRAE Standard 55-2004, *Thermal Environmental Conditions for Human Occupancy*.¹¹

Additional Resources

Additional information about the cleanup and restoration of water-damaged and mold contaminated HVAC systems is available from the Institute of Inspection, Cleaning and Restoration Certification (IICRC) and the National Air Duct Cleaners Association (NADCA). Their pertinent documents (*Standard and Reference Guide for Professional Mold Remediation* [IICRC S520] and *Assessment, Cleaning and Restoration of HVAC Systems* [ACR 2005]) are available for purchase at www.iicrc.org/home and www.nadca.com/_secure/bookstore.asp, respectively. The University of Minnesota also has a document titled, “HVAC System Decontamination” available for free off the internet at www.dehs.umn.edu/iaq/hvacsys.html.

References

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4. Edwards JH [1980]. Microbial and immunological investigations and remedial action after an outbreak of humidifier fever. *British Journal of Industrial Medicine* 37:55-62.
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10. ASHRAE [2004]. ASHRAE Standard 62-2004: Ventilation for Acceptable Indoor Air Quality. American Society of Heating, Refrigerating, and Air-conditioning Engineers, Atlanta, GA.
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Appendix 1



1224 North Nokomis NE
Alexandria, Minnesota 56308 USA

Tel: (320)763-4320

Fax: (320)763-9290

E-mail: eea@iami.org

Website: <http://www.iami.org>

Indoor Air Quality Inspection Form

Date _____ Property Address _____
City _____ County _____ State _____ Zip _____

Property is zoned ☐ Residential ☐ Commercial ☐ Agricultural ☐ Other

Property is currently ☐ Vacant ☐ Occupied

Report Prepared For _____

Environmental Inspector _____

Company Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____

HVAC INSPECTION

Are air conditioner supply vents dripping water or sweating? ☐ yes ☐ no

Is the filter dirty or clogged? ☐ yes ☐ no

Is the side of the air conditioner sweating? ☐ yes ☐ no

Is there wetness around the insulated piping? ☐ yes ☐ no

Is there wetness around the drain pipe connections or

elsewhere on the drain pipe located in the attic area? ☐ yes ☐ no

Is the outside portion of the drain pipe partially clogged with any growth? ☐ yes ☐ no

Does the drain pipe have any black, green, or white growth? ☐ yes ☐ no

Has the air conditioning unit been ran in the last 30 days? ☐ yes ☐ no

Has the heating unit been ran in the last 30 days? ☐ yes ☐ no

Explain: _____

Air Handling Unit

Unit Identification _____ Area Served _____
Outdoor air intake location _____ Nearby contaminant sources _____

Bird screen in place and unobstructed? ☐ yes ☐ no

Design total cfm _____ outdoor air (O.A.)cfm _____ date last tested and balanced _____

Mechanical Room

Clean and dry? ☐ yes ☐ no

Stored refuse or chemicals? ☐ yes ☐ no

Describe items in need of attention: _____

ROOF INSPECTION

Specify any signs of roof damage or repair. _____

Date of known roof repair or replacement _____

Describe visual water damage either from roof leak, plumbing or other: _____

Evidence of mold or mildew on ☐ Walls ☐ ceiling ☐ attic ☐ under carpet
☐ wall paper ☐ basement ☐ crawl space ☐ around windows ☐ other

Describe visual mold or mildew _____

CHEMICAL INVENTORY

The inventory should include chemicals stored or used in the building for cleaning, maintenance, operations, and pest control. If you have an MSDS (Material Safety Data Sheet) for the chemical, put a check mark in the right-hand column. If not, ask the chemical supplier to provide the MSDS, if one is available.

Date Chemical/Brand Name Use Storage Location(s) MSDS on file?

WEATHER HISTORY AND CONDITIONS

Date and Time of Assessment _____

Present Temperature _____

Brief description of weather conditions over past 30 days: _____

Has there been any high humidity in the past few days?

☐ yes

☐ no

Any unusual weather pattern or condition?

☐ yes

☐ no

Explain: _____

Inspector _____ Date _____ Time _____

Appendix 2

[HAVE YOUR LOCAL ATTORNEY USE THIS AGREEMENT TO GET IDEAS FOR WRITING AN EVEN BETTER TESTING AGREEMENT THAT IS VERY CUSTOMIZED TO YOUR STATE AND TO YOUR INDIVIDUAL NEEDS.]

MOLD INSPECTION & TESTING AGREEMENT

PLEASE READ THIS AGREEMENT CAREFULLY BEFORE SIGNING

Agreement Date: _____

Client Name: _____

Realtor name, address, and phone [if any]: _____

Client mailing address: _____

Client daytime phone: (____) _____

Address of property to be inspected: _____

_____, hereinafter called "Subject Property," which the

Client represents to have been originally constructed on or about [year of construction if

known to, or as estimated by, the property owner]: _____

Inspection and testing date: _____

\$_____ Inspection and Testing Fee Paid by: _____

THIS AGREEMENT, made and entered into on the Agreement Date indicated above, by and between the above named Client and the undersigned _____, hereinafter referred to as "Inspector."

The Inspector will provide the following services to Client:

(1) Visually inspect the subject property to check for water damage and mold infestation. In doing such visual inspection, the Inspector will use where the Inspector believes to be a appropriate a hidden moisture meter, a fiber optics inspection device, and a hygrometer;

(2) Take _____ mold tests [including laboratory analysis] at the Subject Property. Each additional test [including laboratory analysis] shall be \$_____.

(3) Provide a written report of the Inspectors' visual inspection observations and explanation of laboratory test results, if the total inspection and mold testing fee exceeds \$ _____.

The inspection and testing shall be performed in accordance with the Standards of Practice of the Certified Mold Inspectors and Contractors Institute.

The inspection is not a Building Code Inspection, title examination, home inspection for problems other than water and mold, or a by-law compliance inspection. The Inspector does not offer an opinion as to: (a) the advisability or inadvisability of the purchase, sale, or repair or replacement of the property or its components such as, but not limited to, appliances, carpeting, heating, ventilating, and air conditioning equipment and ducts; (b) the property's value; or; (c) the property's potential use.

The Inspection and Testing fee, and any report based on the inspection and testing conducted, is based on a single visit to the property. Additional fees may be charged for any subsequent visits required by the Client. If the Inspector is called upon to prepare for litigation or give testimony as a result of the Inspection and Testing, additional fees shall be charged at the Inspector's then currently fees for any time spent, including, but not limited to, research, consultation, additional inspection and testing time, additional mold laboratory test fees, preparation of reports, travel, time waiting to testify and court appearances or depositions.

The inspection and testing report is based on the condition of the Subject Property existing and apparent on the precise time and exact date of the inspection. Not all conditions may be apparent on the inspection and testing date due to weather conditions, inoperable systems, inaccessibility of areas of the Subject Property, or for other reasons. The Client understands and agrees that the Inspector's inspection and testing can report only: (1) water and mold problems in existence on the date of the inspection and testing; and (2) water and mold problems physically present in the precise and exact Subject Property locations that are actually inspected and tested. Air tests can only report the presence of mold spores in the air of each room in which an air sample is taken. Air tests or swab samples can only report the presence of mold spores in the individual heating, ventilating, and air conditioning ducts in which air tests or swab samples are taken. The Inspector's hidden moisture meter can only detect wet conditions three-fourths of an inch into building materials tested, and only in locations actually tested by the Inspector. The Inspector's fiber optics inspection device can only detect mold growing in each individual wall or ceiling cavity actually inspected by the Inspector. In other words, the Inspector can not report on areas or locations in the building that have not been specifically inspected and tested.

The Inspector is not responsible or liable for the non-discovery of any water damage, water problems, or mold contamination or mold problems, or other conditions of the Subject Property, or any other problems which may occur or may be evident after the inspection and testing time and date. Inspector is not an insurer nor guarantor against water problems, mold problems, or other defects in the Subject Property and improvements, systems, or components inspected. Inspector makes no warranty, express or implied, as to the fitness for use or condition of the systems or components inspected. Inspector assumes no responsibility for the cost of repairing any water problems, mold problems, or any other defects or conditions. Inspector is not responsible or liable for any future water problems, mold problems, or any other future failures or repairs.

Inspector and its employees are limited in liability to the fee paid for the inspection and testing services and report in the event that Client or any third party claims the Inspector is in any way liable for negligently performing the inspection or testing, or preparing the Inspection and Testing Report, or for any other reason or claim that Inspector has not fully satisfied all its obligations hereunder. Client hereby agrees to indemnify, defend and hold harmless Inspector if any third party brings claim against Inspector relating to the inspection and testing, or Inspection and Testing Report.

This agreement is governed by the laws and jurisdiction of the State of _____. Any controversy or claim between the parties hereto, arising directly or indirectly out of, connected with, or relating to the interpretation of the Agreement, the scope of the services, the actual inspection and testing services rendered by Inspector, The Inspection and Testing Report provided to the Client by Inspector, or any other matters of any kind involving any act or omission performed under this Agreement, or promises, representations, or negotiations concerning duties of the Inspector hereunder, shall be submitted to arbitration in accordance with the applicable rules of the American Arbitration Association. The parties shall mutually appoint an arbitrator who is knowledgeable and familiar with the mold inspection and mold testing industry. Judgment on any award may be entered in any court having jurisdiction, and the arbitration decision shall be binding on all parties. Secondary or consequential damages are specifically excluded.

In the event that any dispute arises out of the Inspection, Testing, or Report, and proceedings are commenced by the Client, if the Client is unsuccessful in maintaining the claim in arbitration or elsewhere, then the Client shall be liable to the Inspector for all charges, expenses, costs and legal fees incurred by the Inspector on a complete indemnity basis, including a reasonable fee for all the time spent by the Inspector or Inspector's personnel in investigating, research, preparation for, and attendance at arbitration or court hearings and examinations.

Any claims must be presented to the Inspector in hand by certified U.S. mail or suitable proof of delivery within one (1) year from the date of the Inspection. Inspector shall have no liability for any claims presented one (1) year after the date of the inspection and testing. Client guarantees Inspector a right to examine the subject matter and area of any claim and offer a resolution prior to Client's performance of remedial measures (except in the event of an emergency, or to protect for personal safety, or to reduce avoid damage to property). This is a condition precedent to Client's claim.

This Agreement and the documents referred to herein constitute the entire Agreement between the parties hereto, and supersede any and all prior representations, discussions, or agreements, whether written or oral. No amendment, change, or variance from this Agreement shall be binding on either party unless mutually agreed to, in writing, and signed by the parties hereto. If any provision of this agreement is held invalid or unenforceable by any court of final jurisdiction, it is the intent of the parties that all other provisions of this Agreement be construed to remain fully valid, enforceable, and binding on the parties.

THE INSPECTION, TESTING, AND INSPECTION AND TESTING REPORT DO NOT CONSTITUTE A WARRANTY, GUARANTEE OR INSURANCE POLICY OF ANY KIND. There are no warranties, guarantees or insurance available or provided by the Inspector.

Having read and fully understanding the Agreement, I (we) hereby authorize the inspection and testing of the Subject Property.

Client Signature

Spouse's Signature

Inspector Signature

Appendix 3



MOLD AWARENESS INSPECTION

INSPECTION DATA

Job Name _____ Job Number _____

Client

Name _____

Address _____

City _____ County _____ State _____ Zip _____

Inspection Location

Name _____

Address _____

City _____ County _____ State _____ Zip _____

Is this a private residence, rental, or commercial building? _____

If commercial, what is the building used for? _____

Landlord name _____

Address _____ Phone _____

SITE INFO

What is the primary use of the building? _____

How often is the building occupied? _____

How old is the building? _____

Is the building sitting high or low pertaining to drainage? _____

Is there a slope towards or away from the building? _____

Is the building on a raised or slab foundation? _____

How many stories are in the building? _____

What is the shade level around the building? _____

Is there a lot of organic debris around the building? _____

Are there bushes/trees next to the building? _____

What is the exterior of the building composed of? _____

What is the roof composed of? _____

OCCUPANT HEALTH INFO

Have any of the occupants experienced any adverse health effects such as: Headaches, runny nose, irritation in the eyes, nose or throat, trouble breathing, coughing, sinus congestion, fatigue, dizziness, nausea, sneezing, irritation? _____

What symptoms and by whom? _____

How often? _____
Currently? _____
When did symptoms arise? _____
Are other previously diagnosed conditions such as bronchitis, asthma, or allergies? _____
Any children? _____
How Old? _____
Comments: _____

INVESTIGATION

Why did the client request the investigation/sampling? _____

Areas of concern to occupant/client. _____
When was the concern first noticed? _____
Was it wet or dry, hot or cold? _____
Are there signs of water damage anywhere? _____
Where? _____
Are occupants or client aware of any water damage in the past? _____
Describe: _____
Any previous testing/sampling done? _____
By whom? _____
Results _____
Was the problem fixed? _____

INSPECTION

Date and time of investigation/sampling _____
Weather day of sampling _____
Weather day prior _____
Temperature outdoors _____
Temperature indoors _____
Relative humidity outdoors _____
Relative humidity indoors _____
Is there visible mold? _____
Where? _____
Characteristics (area covered, texture, color) _____

VENTILATION

Are any windows and/or doors open? _____
How often are the windows opened and for how long? _____
Is AC or heating on or off? _____
Is there a musty smell in the building? _____
Is there a central electrostatic filtration system? _____
When were HVAC filters last changed? _____

CONDITION OF BUILDING

Is there visible dust? _____

How often are the carpets vacuumed? _____

Does the vacuum have a HEPA filter? _____

When was the last time the carpets were cleaned? _____

Any pets? _____

Number of live plants? _____

ADDITIONAL COMMENTS

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

OTHER AREAS TO CHECK

Furniture - wicker, water stains, discolorations

Flooring - dampness or mold, discoloration, baseboards, tack strips including nails, bubbling or warping of wood or linoleum

Windows and Patio Doors - moisture between panes, wood sills, window coverings, curtains, signs of excess condensation, cracked or bubbling paint, curtains

Walls - discoloration, water stains, cracked or bubbling paint

Ceilings - what kind of ceiling, stains

Bath - around tub/shower, toilet, sinks, under floor covering, medicine cabinet, hampers, ceiling and ventilation

Kitchen - under sink, behind refrigerator, stove and dishwasher, condition of floor covering, pantry

HVAC - filters, ducts, coils, ventilation (building open or closed, % fresh air)

Water heater - any leaks

Foyer or Entrance - eaves, frame

Attic - cellulose insulation, roof, animal or bird excrement

Appendix 4

Self-Analysis & Interpretation of Visible Mold Growth in Do-It-Yourself Mold Test Kits

Testing date _____ Tester's name _____ Position [owner, tenant, manager] _____ Complete address of the property which was tested on the testing date.

Tester's address _____ () _____ Tester's phone no. _____ Tester's email address _____
**Use these Test Type codes: OC (outside control), DS (direct sample of visible mold), RA (room air), and DA (duct airflow outwards)*

Test No.	Test* Type	Testing Location [basement, crawl space, BR, etc.]	1. Color/no. of most numerous colonies after 7 days growth	2. Color/no. 2 nd most numerous colonies after 7 days growth	3. Color/no. 3 rd most numerous colonies after 7 days growth	4. Color/no. 4 th most numerous colonies after 7 days growth	5. Total colonies # growing on entire kit	6. # Higher [H] or Lower [L] than outdoor control [Total from 1-5]	7. Indoor mold types that are not in out-door control? Y/N
1	OC	5 ft. past roof						N.A.	N.A.
2									
3									
4									
5									
6									
8									
9									
10									
TOTAL MOLD COLONY COUNTS THAT ARE HIGHER INDOORS THAN OUTDOORS [column 6]									
TOTAL MOLD COLONY COUNTS THAT ARE PRESENT INDOORS BUT NOT IN OUTDOOR CONTROL TEST [column 7]									
GRAND TOTAL OF MOLD COLONIES WHICH INDICATE AN INDOOR SOURCE FOR MOLD INFESTATION [add together 6 & 7]									

