HARVARD
Campus Services
ENVIRONMENTAL HEALTH & SAFETY

FACT SHEET

Program: Indoor Air Quality

BUILDING/FACILITY MANAGER: GUIDELINES TO PREVENT MOLD GROWTH IN BUILDINGS

Preventing Mold Growth

Although some mold spores are always present indoors, mold will only grow if adequate moisture and appropriate food is available.

Mold grows readily on cellulose containing materials, such as, wood and paper. Common building materials that can support mold growth are ceiling tiles, gypsum wallboard, wood, particleboard, and certain types of insulations.

Nonporous materials such as plastic, metal, and glass are less likely to support mold growth but may do so if organic material is available in the dust or dirt coating these materials. Uncoated masonry is also less likely to support mold growth but may do so under special conditions.

Whenever mold grows indoors, there is the potential for increasing mold-related contaminants including mold spores, mold fragments, assorted volatile organic compounds and, in some cases, mycotoxins. These contaminants may produce unpleasant odors, and for some individuals cause allergic rhinitis including symptoms, such as, runny nose, itchy eyes, throat irritation, and cough.

Mold exposures may also cause asthmatic responses in sensitized individuals. **To avoid these undesirable outcomes, active mold growth should be prevented through moisture control**. In addition, levels of indoor mold spores should be minimized through appropriate cleaning and adequate filtration, where applicable.

Is sampling for mold needed? In most cases, if visible mold growth is present, sampling is unnecessary. Since no EPA or other federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with federal mold standards. Surface sampling may be useful to determine if an area has been adequately cleaned or remediated.

Sampling for mold should be conducted by professionals who have specific experience in designing mold sampling protocols, sampling methods and interpreting results.

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA), the American Conference of Governmental Industrial Hygienists (ACGIH), or other professional organizations.

Basic steps that you can take to prevent mold growth and reduce occupant exposures in your buildings:

- ☑ Survey the outside of your buildings to ensure adequate drainage away from the foundation and proper functioning of gutters and downspouts. Make sure any automatic lawn sprinklers are not excessively wetting building walls and foundation.
- ☑ Survey the inside of your building for any signs of moisture problems including standing water, the moisture problem and take appropriate steps to eliminate it.
- ☑ Prevent moisture from condensing by increasing surface temperature or reducing the moisture level in the air (relative 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).
- ☑ Keep HVAC drip pans clean, flowing properly, and unobstructed.
- ☑ Perform regularly scheduled building/ HVAC inspections and maintenance, including filter changes. Inspect interior duct linings periodically for signs of moisture and or mold growth, especially just downstream of cooling coils or humidification systems.
- ☑ Maintain indoor relative humidity below 60% (30-50%, if possible) especially in basements.
- ☑ Vent moisture-generating appliances, such as dryers, to the outside, where possible.
- ☑ Remove standing water and dry wet materials as quickly as possible to prevent mold growth. Porous materials not dried within 48 hours are likely to result in mold growth.

Basements and Mold

Basements are particularly susceptible to mold growth. Moisture from wet soil on the outside of foundations and under slabs will naturally move into the basement. Depending on the amount of water and the condition of the foundation, water may run or seep into basement areas.

As moisture moves through the foundation it will naturally move into any porous materials, such as, gypsum board or cardboard boxes, that are placed in direct contact with the foundation. This situation often causes ideal conditions for mold growth. Sometimes the water moving through the foundation will simply evaporate into the space, creating high relative humidity without wetting the floor and walls. If the basement air is not conditioned or dehumidified, the moist air warms in hot weather and condenses on the cool foundation and slab surfaces creating a microenvironment conducive to mold growth.

Finishing a basement can create a microenvironment between finished walls and the foundation very conducive to mold growth.

Special precautions must be taken to prevent mold growth in basements.

- ☑ Minimize the amount of porous materials stored in basements. Do not place porous materials in direct contact with foundation walls or floor slabs.
- ☑ Maintain relative humidity below 60% (30 to 50% is preferred) through air conditioning and/or dehumidification.
- ☑ If at all possible, do not finish basements. If they must be finished, then
    - Avoid the use of carpeted floor systems. Use nonporous floor coverings such as vinyl composition tiles and area rugs.
    - Install appropriate thermal and vapor barriers to prevent condensation on and behind walls.

Flooding

- ☑ Quickly and thoroughly dry all porous (e.g., carpet and wallboard) and non-porous materials (strongly recommend starting response within 24 hours and complete within 48 hours of the flood).
- ☑ Perform extraction with wet vacuums on carpets. Dehumidifiers alone will not effectively dry wetted porous materials.
- ☑ Move or elevate furniture and equipment such as filing cabinets and copiers so that the flooring (particularly porous material) is able to be dried.
- ☑ Cut or drill wetted wallboard (small holes or whole bottom sections) if necessary to promote drying inside the wall cavity. Lower portions of wetted sheetrock may need to be removed and replaced.

Preventing Mold in Construction Areas
It is important to pay attention to potential moisture problems during construction projects. Improper drainage may result in seepage of water into interior building areas. In addition, if not properly, stored, porous materials may become wet and create moisture and/or mold problems while in storage or after being installed.

The following tips will help prevent mold and moisture problems during construction.

- ☑ Prevent moisture accumulation by establishing appropriate drainage patterns during all phases of construction. Make sure foundation is dry.
- ☑ Inspect materials at delivery to ensure they are dry and free of visible mold.
- ☑ Store materials in a dry location, off the ground and with loose traps or sheets to allow air flow.
- ☑ Prevent excessive wetting of installed porous materials with coverings wherever feasible.
- ☑ Proper sequencing of the work. Keep materials away from exterior conditions.
- ☑ Ensure that wetted, porous materials are sufficiently dry before enclosing them with building components.
- ☑ Double check points where moisture may enter during all phases of instruction, including:
    - Doors
    - Windows
    - Flashing and caulking
    - Waterproof membrane (proper lapping at joints and corners)
    - Roofing systems and penetrations
    - Balconies and desks
- ☑ Prearrange drying equipment; fans, dehumidifiers, and wet-dry vacuums.
- ☑ Dry materials as quickly as possible if they become excessively wet. Using drying equipment such as fans, dehumidifiers, and wet vacuums when necessary.

Mold Assessments
Harvard University EH&S is available to conduct basic mold assessments, which include looking for signs of water damage or excess moisture and looking for visual signs of mold growth. In some cases, the survey may also include testing moisture levels on surfaces or within materials, using a moisture meter and/or measuring relative

humidity, to evaluate areas of potential condensation. Some basic assessments may require using a boroscope to perform visual inspections of hidden areas, such as, ventilation system ducts and wall cavities. In most cases, a visual inspection is all that is necessary to assess the seriousness of the situation and plan an appropriate response.

You should request a basic mold assessment if any of the following conditions exist in your building.

☑ Visible mold growth inside the building

☑ Moldy or musty smells within the building

☑ Signs of past or present moisture damaged such as staining and discoloration

☑ Known episodes of major leaks or flooding

☑ Persistent reports of allergy-like symptoms that appear worse indoors

In rare cases, mold assessments may require limited mold sampling including bulk, surface and/or air samples. Bulk or surface samples are generally used to confirm the presence or absence of mold in or on stained materials and, in some cases to identify specific types of mold. However, confirmation of mold is not necessary to develop a remediation plan.

Air sampling can be used to determine total spore counts or viable-colony forming units. This may be reported as totals or by species. Sampling is not routinely conducted as part of a basic mold assessment. Sampling results are of limited value because mold concentrations inside and outside vary considerably, methods of collection and analysis are not standardized and no widely accepted exposure guidelines exist.

Mold sampling may be indicated in the following situations.

☑ Bulk samples may be necessary to identify specific fungal contaminants if a specific allergy is detected as part of a medical evaluation, if occupants are experiencing symptoms that may be related to mold exposure or if the visual inspection is equivocal regarding the presence or absence of mold.

☑ Air sampling may be necessary if an occupant has been diagnosed with a specific disease that is or may be associated with mold exposure.

☑ Air sampling may be necessary if the visual inspection has revealed that the ventilation system is contaminated with mold.

☑ Air sampling may be helpful if the visual inspection has not revealed mold source but musty odors or other indicators suggest the presence of mold.

EH&S only recommends sampling on a case-by-case basis. In situations where mold sampling is recommended, EH&S can suggest an appropriate industrial hygiene consultant to conduct the mold sampling and analysis. EH&S is also available to review sampling plans and/or results as part of assessment and remediation planning.

Mold Remediation
There are two aspects to every mold remediation: **1.** Cleaning and/or removing existing mold growth, and **2.** Controlling the cause of the initial growth.

Both must be addressed to solve existing problem and prevent them from reoccurring. The actions required to complete both parts of the remediation may occur at different times, but both should be a part of the remediation plan. The details of the remediation plan will depend on several factors including:

☑ How much mold is growing

☑ Where the mold is growing

☑ The material that the mold is growing on

☑ The susceptibility of potentially exposed building occupants

Mold remediation companies with specialized expertise are becoming more common. These remediation companies are necessary when local resources are not available or when the scale or complexity of a situation requires specialized equipment or training. However, many mold problems can be cleaned up locally if on-site personnel are appropriately trained and equipped.

EH&S is available to help develop a remediation plan and review proposals from outside vendors. Harvard's Weissman Preservation Center has published *Guidelines for Managing Mold Contamination* to help Harvard University staff develop remediation plans that require the cleaning and preservation of mold-contaminated items such as documents or books. These guidelines are available at the following link: http://preserve.harvard.edu/guidelines/mold.html.

EH&S is available to perform post-remediation assessments. In most cases, a post-remediation visual survey is adequate to determine if a mold remediation project has been successfully completed.

A project can be considered successfully completed when the following conditions have been met:

- ☑ All sources of high moisture in the area have been identified and appropriately controlled
- ☑ All wet or damp materials have been thoroughly dried or removed
- ☑ All building materials with visible mold growth are cleaned or removed
- ☑ The entire work area has been thoroughly cleaned of all work related debris and materials
- ☑ No moldy or musty odors are present

As is the case with initial mold assessments, mold sampling is not routinely performed as part of a post-remediation assessment. However, in rare cases, such as when hidden mold is suspected, or particularly susceptible occupants work in the area, air sampling may be a useful as part of a post-remediation assessment.

EH&S is available to make recommendations regarding mold sampling on a case by case basis or review sampling plans.

Periodically inspect areas following a mold remediation to ensure that no indicators of excess moisture or mold growth occur including wet or damp materials, staining, moldy or musty odors, or visible mold growth.