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FULL-SERVICE ENVIRONMENTAL CONSULTING:

Hazardous materials investigation—*asbestos, lead, radon, PCBs*

Abatement planning, design, and project monitoring

Indoor air quality—*sampling, testing, and monitoring*

Industrial hygiene investigations

OSHA compliance audits and monitoring

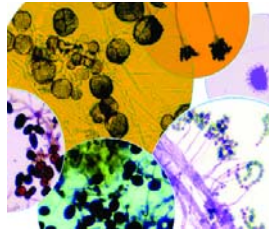
Water testing, monitoring, and remediation

Microbiologicals consulting—*mold, bacteria*

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Mold and Indoor Air Quality (IAQ)

Molds can be found almost anywhere; they can grow on virtually any organic substance, as long as moisture and oxygen are present. When excessive moisture accumulates in buildings or on building materials, mold growth will often occur, particularly if the moisture problem remains undiscovered or unaddressed. It is impossible to eliminate all mold and mold spores in the indoor environment. However, mold growth can be controlled indoors by controlling moisture indoors.



Molds can grow in a variety of colors and can change their appearance as they mature.

Molds reproduce by making spores that waft through the indoor and outdoor air continually. When mold spores land on a damp spot indoors, they may begin growing, digesting whatever they are growing on in order to survive, and gradually they destroy the things they grow on. Affected areas may include books, carpets, linoleum, ceramic tile, concrete, wallboard, and wood surfaces.

Concern about indoor exposure to mold has been increasing as people become aware that such exposure can cause a variety of health effects and symptoms.

Many types of molds exist and they all 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 to prevent mold growth and to remediate/clean up any existing indoor mold growth.



Molds reproduce by releasing spores into the air, and both outdoor and indoor air regularly carry these organisms.

Since mold requires water to grow, it is important to prevent moisture problems in buildings. Moisture problems can have many causes, including uncontrolled humidity. Some moisture problems in buildings have been linked to changes in construction practices during the 1970s, 80s, and 90s. Some of these changes have resulted in buildings that are tightly sealed, but may lack adequate ventilation, potentially leading to moisture buildup. Building materials, such as drywall, may not allow moisture to escape easily.

Moisture problems may include roof leaks, landscaping or gutters that direct water into or under the building, and unvented combustion appliances. Delayed maintenance or insufficient maintenance are also associated with moisture problems in schools and large buildings. Moisture problems in portable classrooms and other temporary structures have frequently been associated with mold problems. The Environmental Protection Agency (EPA) has developed guidelines for the remediation of building materials with mold growth. Cleanup is segregated into three categories: Small (total surface area affected is less than 10 sq. ft.); Medium (between 10 and 100 sq. ft.); Large (greater than 100 sq. ft. or potential of occupant or remediator exposure during remediation is estimated to be significant.) One of four cleanup methods may be appropriate for these projects, depending on the types of materials affected:

- Method 1: wet vacuum, including steam cleaning for some carpets and upholstery.
- Method 2: damp-wipe surfaces with plain water or with water and detergent solution; scrub as needed.
- Method 3: HEPA vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard/remove water-damaged materials and seal in plastic bags while inside of containment, if present. HEPA vacuum area after it is dried.

Containment of the area may be necessary on either a limited or full basis and personal protective equipment is called for in many instances. For a complete delineation of the EPA guidelines go to www.epa.gov/mold.

In most cases, if visible mold growth is present, sampling is unnecessary. But if health concerns are a consideration, and/or the source of the contamination is unclear, sampling may be useful in order to determine if an area has been adequately cleaned or remediated. Sampling should be conducted by professionals with specific experience in designing mold sampling protocols, sampling methods and interpretation of results.

The key to mold control is moisture control. Solving the mold problem is insufficient; the moisture problem causing it must be remediated as well. Accurately assessing the extent of the problem may be difficult, and the EPA guidelines suggest the consideration of professional evaluation and cleanup.

Remediation activities should be scheduled during off hours when building occupants are less likely to be affected.



AN EPA CHECKLIST FOR MOLD REMEDIATION*



Investigate and evaluate moisture and mold problems

- Assess size of moldy area (square feet)
- Consider the possibility of hidden mold
- Clean up small mold problems and fix moisture problems before they become large problems
- Select remediation manager for medium or large size mold problem
- Investigate areas associated with occupant complaints
- Identify source(s) or cause of water or moisture problem(s)
- Note type of water-damaged materials (wallboard, carpet, etc.)
- Check inside air ducts and air handling unit
- Throughout process, consult qualified professional if necessary or desired



Communicate with building occupants at all stages of process, as appropriate

- Designate contact person for questions and comments about medium- or large- scale remediation as needed



Plan remediation

- Adapt or modify remediation guidelines to fit your situation; use professional judgment
- Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth
- Select appropriate cleanup methods for moldy items
- Select Personal Protective Equipment – protect remediators
- Select containment equipment – protect building occupants
- Select remediation personnel who have the experience and training needed to implement the remediation plan and use Personal Protective Equipment and containment as appropriate



Remediate moisture and mold problems

- Fix moisture problem, implement repair plan and/or maintenance plan
- Dry wet, non-moldy materials within 48 hours to prevent mold growth
- Clean and dry moldy materials
- Discard moldy porous items that can't be cleaned
- Check for return of moisture and mold problems.
- If hidden mold is discovered, reevaluate plan.

* For details, see the complete text of *Mold Remediation in Schools and Commercial Buildings*, available at www.epa.gov/mold. Please note that this checklist was designed to highlight key parts of a school or commercial building remediation and does not list all potential steps or problems.



SAFETY FIRST

EPA Safety Tips While Investigating and Evaluating Mold and Moisture Problems

- Do not touch mold or moldy items with bare hands.
- Do not get mold or mold spores in your eyes.
- Do not breathe in mold or mold spores.
- Consult the EPA Web site for Personal Protective Equipment (PPE) and containment guidelines.
- Consider using PPE when disturbing mold. The minimum PPE is an N-95 respirator, gloves, and eye protection.

Questions to Consider Before Remediating

- ♦ Are there existing moisture problems in the building?
- ♦ Have building materials been wet more than 48 hours?
- ♦ Are there hidden sources of water or is the humidity too high (high enough to cause condensation)?
- ♦ Are building occupants reporting musty/moldy odors?
- ♦ Are occupants reporting health problems?
- ♦ Are building materials or furnishings visibly damaged?
- ♦ Has maintenance been delayed or the maintenance plan been altered?
- ♦ Has the building been recently remodeled or has building use changed?
- ♦ Is consultation with medical or health professionals indicated?

Mold Prevention Tips

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source of moisture problem as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilation, and air conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside where possible.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide drainage and slope the ground away from the foundation.

THE ABCs OF IAQ

Acceptable Indoor Air Quality Air in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80% or more) of the people exposed do not express dissatisfaction.

AHU Air handling unit—equipment that includes a blower or fan, heating and/or cooling coils, and related equipment such as controls, condensate drain pans, and air filters. Does not include ductwork, registers or grilles, or boilers and chillers.

Air Exchange Rate 1) The number of times that the outdoor air replaces the volume of air in a building per unit time, typically expressed as air changes per hour; 2) the number of times that the ventilation system replaces the air within a room or area within the building.

Allergen Substance (such as mold) that can cause an allergic reaction.

APR Air purifying respirator

Biocide Substance or chemical that kills organisms such as molds.

Biological Contaminants 1) Living organisms, such as viruses, bacteria, or mold (fungi), 2) the remains of living organisms, or 3) debris from or pieces of dead organisms.

Biological contaminants can be small enough to be inhaled, and may cause many types of health effects including allergic reactions and respiratory disorders.

Fungi Fungi, classified in a kingdom of their own, include molds, yeasts, mushrooms, and puffballs. The terms fungi and mold are sometimes used interchangeably. It is estimated that more than 1.5 million species of fungi exist.

Fungicide Substance or chemical that kills fungi.

HEPA High-Efficiency Particulate Air

Hypersensitivity Great or excessive sensitivity

Mold Molds are a group of organisms that belong to the kingdom Fungi. Molds can grow on virtually any organic substance, providing moisture and oxygen are present. There are over 20,000 species of mold.

mVOC Microbial volatile organic compound, a chemical made by a mold that may have a moldy or musty odor.

Mycotoxin A toxin produced by a mold.

PAPR Powered air purifying respirator

Particulates Fine liquid or solid particles such as dust, smoke, mist, fumes, and fog found in air and emissions.

PPE Personal Protective Equipment

Negative Pressure A condition that exists when less air is supplied to a space than is exhausted from the space, so the air pressure within that space is less than that in surrounding areas. Under this condition, if an opening exists, air will flow from surrounding areas into the negatively pressurized space.

Sensitization Repeated or single exposure to an allergen that results in an individual becoming hypersensitive to the allergen.

Spore Molds reproduce by means of microscopic spores, varying in shape and size (2-100 micrometers). Mold spores waft through indoor and outdoor air continually.