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Tips for Investigating Moisture and Mold Problems in Schools

Moisture intrusion and the resulting mold growth are a source of major indoor air quality problems in non-industrial buildings and schools. Studies have shown that at least 34 percent of all “sick buildings” have major mold growth. A large Canadian study of 144 schools in the Atlantic Provinces found that 61 percent had a mold problem, which potentially could affect the health and well-being of students and staff.

Defining a mold problem, let alone finding a “cure” for it, can be a confusing and frustrating experience. School districts have often received bad advice from consultants on the extent of the problem and on proven methods to clean up a moldy school. Too often schools have been certified as “clean,” when staff and students continue to complain of mold-related symptoms.

Despite the confusion, there are proven and tested methods for documenting and fixing the problem. This factsheet will attempt to assist you through the maze of investigating a mold problem in your school. It will discuss the important elements of an investigation, including documenting the health problems associated with mold exposure.

Before Getting Started:

Understanding the Characteristics

Of Mold in Buildings

Molds are a natural constituent of indoor air; they can be found in healthy buildings as well as “sick” ones. Molds generally originate from the outdoor air where they grow abundantly in the soil, on leaves and other organic

material. In certain situations, mold growth can originate inside the building without being detected outdoors. Mold growth inside becomes a problem when one or two mold species from outdoors are “amplified” (i.e., grow more profusely than normal) or when exotic species (those not found in outdoor air) grow unchecked.

In the winter, freezing temperatures significantly reduce outside concentrations of mold; the reverse is true in summer--mold concentrations outside increase dramatically. Total counts of fungi are almost always higher outdoors than indoors--even in buildings with serious mold problems.

Most fungi found indoors are able to thrive on dead organic material. Wood, paper, particleboard, gypsum, plaster, carpeting, paint, soft furnishings and dust provide ample nutrients for the mold when adequate moisture is available. Most molds require moisture conditions near saturation; however there are groups that can grow when conditions are just damp.



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Spore and mold hyphae concentrations in the air are always in a state of flux. Settled dust serves as a storage or “holding area” for fungi; when the dust is disturbed by routine cleaning, vacuuming and construction activities, dust can be an important source of spores. Mold does not release spores continually; some species release spores at certain times of the day; others are more passive and release spores when air currents sweep them away.

There are at least two ways that molds can affect the building occupants’ health when they inhale mold spores, and hyphae and dust containing these materials. All molds can be considered allergenic. The spores and hyphae can spark an allergic reaction even if they are dead and no longer viable (able to reproduce). Significant exposure can trigger allergic reactions--rhinitis, watering eyes and asthma--in susceptible individuals. Other individuals can be become sensitized after exposure and develop new allergies and allergic respiratory ailments. In addition to allergies, there is now evidence that some species of indoor molds also produce toxins called mycotoxins. Exposure to some of these mycotoxins can potentially suppress the immune system; affected individuals would then be susceptible to secondary bacterial and viral infections such as colds and influenza. One such mold, *stachybotrys chartarum* produces a mycotoxin that can produce numerous symptoms in exposed individuals (headaches, sore throats, hair loss, flu symptoms, diarrhea and fatigue).



Investigating a Mold Problem:

Who Should Be Involved?

A school district is ultimately responsible for investigating and cleaning up schools that have mold problems. However, affected staff and students have not always gotten good results simply by complaining to the district.

One cannot assume that a school district will know how to adequately address mold problems. There is little if any formal guidance for administrators on approaching this problem or on choosing a good consultant. As a result, many districts have left the resolution to ill-equipped or untrained district personnel, or have chosen consultants

who have not performed adequate investigations. It’s all too common for a well-intentioned school district to spend a great deal of time and money on investigations and clean-ups without remedying the situation.

For this reason, it is essential that the union, its members at problem schools, and parents be involved from the beginning to ensure that the job gets done properly. From the moment the union confirms that there is a problem in a school, the leadership may want to alert parents through the PTA and/or other parent organizations. The union and parents can exchange information about the condition of the school and approach the administration together about their concerns.

Unions and parents should ask for the formation of an oversight committee at the school. The committee should include staff and parent representatives so that information is communicated to everyone on all aspects of the investigation. The committee should be asked for input on the designation of a coordinator and/or the hiring of a consultant. The committee needs to ask hard questions, especially if a consultant is going to be hired. The district with the committee’s help should examine, among other things:

The Consultant’s Experience

What work has the consultant done for schools having a similar design/mold problem? Did the consultant only conduct an investigation, or did he or she supervise clean-up efforts? Your school district should contact other school districts that have used the consultant for a reference and a detailed report of the outcome.

The Consultant’s Qualifications

Unfortunately, there is no one credential that identifies a consultant as a mold expert. However, a school district should ask for education/experience with mycology (science of molds); engineering and/or industrial hygiene qualifications. The committee should ask about medical expertise available to the consultant. A good consultant should have a board-certified occupational/environmental health physician as a collaborator.

The Consultant’s General Approach to Investigating These Problems

School districts should be wary of consultants who immediately recommend extensive (and expensive) sampling as the core of the investigation (review the next section for other elements of a good investigation).

The Consultant’s Recommendations for Communicating Information to Staff, Students and Parents

If the investigation and clean-up are going to be done internally by a facilities manager or other district personnel, teachers, school employees and parents should expect the designated person to have some training on indoor air quality and/or molds. When there has been no

formal training, the person should be able to demonstrate past experience and competence with indoor air quality problems. If the committee is not satisfied with the district's personnel, it should recommend that the district consult state and local environmental health agencies for assistance.

Even if the school district does not officially establish a committee, teachers, school staff and parents at the school should organize a monitoring committee to ask crucial questions and to watch all aspects of the investigation and clean-up efforts. The committee can also help allay fears of staff and parents by establishing two-way communication between the administration and staff and parents. This effort may also reduce misunderstanding and frustration.

What Should the District or the Consultant Be Doing?

Investigating a mold problem involves many steps. Emphasis should be placed on the health of students and staff when conducting an investigation. When there are complaints, the goal should be to find any mold that may be triggering symptoms and to eliminate it.

A good mold detective does not start out with fancy sampling equipment. The state of the science of sampling and testing for mold is in its infancy; sampling can give an incomplete picture about what's happening in a building. To get started, the consultant or facilities manager needs the opportunity to survey or talk to as many school staff as possible about health complaints, and to walk around the school.

An investigation will have three basic components:

ASSESSING OCCUPANT HEALTH COMPLAINTS

The most sensitive instrument available is a person suffering from symptoms potentially associated with mold exposure. The union and administration should share the complaints that they have received from staff and students with an investigator; the review of those complaints may be useful in identifying problem areas in the school.

In addition, an investigator may devise a simple questionnaire or survey for staff and students in the building in order to estimate the level of exposure and to get a good picture of how widespread the mold contamination is in the building. Here are examples of questions a consultant should ask occupants:



During the last year, have you experienced:

- Irritation of eyes, nose and throat when present in the building? That familiar moldy smell is a soup of volatile organic compounds (VOCs) produced by molds. VOCs can irritate the mucous membranes of the eyes, nose and throat.
- Allergies--allergic rhinitis (sneezing), itching/watery eyes that seem worse in the building? Mold spores (dead and alive) can sensitize individuals and cause new allergies or make pre-existing allergies worse.
- Asthma that recently has been recently diagnosed by a doctor or grows more difficult to control in the building? New cases of asthma are a strong indicator of newly sensitized individuals. Persons with pre-existing asthma often find that their asthma grows worse in moldy buildings.
- Hypersensitivity pneumonitis (diagnosed by a doctor)? Acute and chronic hypersensitivity pneumonitis are inflammatory lung diseases that are associated with mold exposure. Symptoms of the acute form include shortness of breath without wheezing, chills, fever and coughing four to 10 hours after exposure; symptoms last approximately 24 hours. Prolonged exposure to mold can cause the chronic form, which includes cough, productive sputum, weight loss, fatigue and scarring of the lungs.
- Frequent or chronic infectious diseases during the last year or since you have been in the school? Exposure to mycotoxins can weaken the immune system; individuals then become more susceptible to other infections.

The health complaints should be examined carefully for problems that appear to be worse during the school day and improve when people are away from the building. If the results of the health survey indicate a problem, the investigation should shift to potential moisture/mold problems in the building.

REVIEWING THE MOISTURE HISTORY OF THE BUILDING

A mold investigation should review the water history of the building with a focus on flooding or plumbing/roof leaks that have saturated building materials/contents. As much information as possible about the clean-up of areas after such events should be collected. For instance, were saturated building materials replaced (i.e., carpeting, drywall, plywood, etc.) and/or were saturated upholstered items discarded, books and other belongings discarded? What dehumidification and disinfection measures were taken in lieu of total replacement? If clean-ups did not discard and replace all saturated material, those materials should be examined carefully for signs of mold contamination.

THE BUILDING WALKAROUND



A walkaround of the building is essential to link health complaints and building history with areas of mold growth and water intrusion. The mold detective's essential equipment for this activity are good eyes and a sensitive nose along with a flashlight for looking in crevices and under roofs.

During the building walkaround, the following conditions should be noted:

- Any visible mold growth (note location and extent of growth);
- The familiar smell of mold (note the location/rooms and material that it appears to emanate from);
- Signs of chronic roof and plumbing leaks;
- Wet/dirty roof insulation;
- Stained/wet ceiling tile;
- Stained/peeling wall paper (remove small parts of wallpaper/vinyl wall covering and look for mold);
- "Bubbling" paint (scrape areas to look for mold growth behind paint);
- Condensation of moisture on exterior walls of air-conditioned rooms or any condensation around walls and windows;
- Damp and dirty carpeting;

- Relative humidity that exceeds 70-75 percent over long periods of time;
- Wet building materials that have not been properly dried; and
- An examination of the heating, ventilation and air conditioning system as follows:
 - Standing water in the drip pan(s) under the coils of an airhandler/univent (in each classroom)/air conditioner;
 - Ductwork lined with porous material (especially fiberglass) that has become wet and dirty; and
 - Any areas in the air stream where dirt and water can accumulate.

When any of the above conditions are noted, it's time to start devising a clean-up strategy.

When is Sampling for Mold Helpful?

Consultants may also recommend doing limited sampling for the purposes of assisting with a clean-up and giving advice to physicians and persons with mold-related complaints. Good consultants will explain that there are no ideal methods for sampling fungal/mold materials. They will also emphasize that sampling will probably never "capture" the actual exposure of occupants because of the unpredictable fluctuations of mold concentrations discussed above. Consultants should state in their reports that sampling should be considered an auxiliary activity; it may help clarify the picture, but a diagnosis of the building's relative "health" cannot be made exclusively on the sampling results.

Sampling strategies that may be useful include:

AIR SAMPLING OF VIABLE (LIVING) AND NON-VIABLE (DEAD) MOLD. Both living and dead mold cause health problems and simply sampling for only the live mold will not give a complete picture.

AIR SAMPLING OUTDOORS AND INDOORS. This approach is useful in order to compare the types of mold found outdoors to those identified indoors. A healthy building should have the same mix of molds as found outdoors but at much lower concentrations. The presence of some molds indoors but not outdoors may be a strong indicator that there is a mold problem in a building. Examples of dangerous molds when found indoors include: *Aspergillus fumigatus*, *aspergillus versicolor*, *stachybotrys*, *fusarium*, *exophiala* and *ulocladium*. Also, the presence of one or more mold species at significant levels indoors but not outdoors is evidence of a problem.

TAKING BULK SAMPLES OF BUILDING MATERIAL THAT IS STAINED OR VISIBLY CONTAMINATED WITH MOLD SO THEY MAY BE ANALYZED. Dust samples from surfaces and carpeting may also reveal sources/types of molds. A consultant may take samples with transparent

tape to capture possible mold contamination of surfaces and carpeting.

Based on sampling results and the walk-around, the consultant should be able to advise the cleaning strategy for the building. Detailed recommendations should be made for replacing contaminated building materials, disinfecting and drying out salvageable materials, reducing relative humidity in a building and making repairs to reduce water intrusion.

What Next?

Having a plan of action on how to clean up and eliminate mold problems is important. A clean-up should be guided by the following principles:

- Visible fungal/mold growth is not acceptable.
- Elimination or significant reduction of all sources of moisture is important.
- Ongoing preventive maintenance is important to ensure that mold growth does not return.

Damp and Dank: Drying Out and Cleaning Up



Once an investigation has been completed, the next step is to develop a plan to get rid of the mold and to see that it doesn't "come back." What should you expect of the school district in this process? The most important thing staff, students and parents should ask for is the continued involvement of the persons affected and ongoing communication. The best way to achieve this is to establish an oversight or monitoring committee at the school with representatives of parents and staff working with the project coordinator and administrators. The committee structure is the most effective way to maintain two-way communication between the district, its consultants and the occupants of the school.

With or without an oversight committee, a clean-up should incorporate the following five basic elements:

Communication to Building Occupants and Parents

Effective ongoing communication with staff, students and parents after the investigation and during clean-up efforts is essential. Along with the findings of the investigation, affected persons should receive a detailed explanation of recommendations for clean-up and medical surveillance. A committee should schedule open meetings to explain the results to affected individuals. These meetings should provide ample opportunities for people to ask questions about the clean-up effort and the potential impact on the health of exposed individuals. If there are many concerns about the health consequences of exposure, a qualified physician (board-certified in occupational/environmental health) should be invited to the meeting to answer questions.

If school remains in session during the clean-up, organize an interim meeting to update occupants and parents about progress. After the clean-up, a meeting should be organized to evaluate the process and to discuss future efforts to keep the building mold-free

Elimination of Moisture Intrusion in the Building

Any effort to rid a building of mold contamination must include aggressive control of water and moisture intrusion. If that effort fails, there is no guarantee that the mold will not return. Some common forms of moisture intrusion that must be controlled include:

- Roof leaks and roof drainage back-ups;
- Plumbing leaks;
- Condensation left unchecked on surfaces and pipes;

- Wet basements and crawl spaces;
- Poorly drained drip pans in heating, ventilation and air conditioning (hvac) systems; and
- Relative humidity in the school that exceeds 70 percent for long periods of time.

A report about all repairs and adjustments that have been made to eliminate the moisture intrusion should be made available. Then devise a system that will encourage school teachers and school staff to report any leaks and/or condensation to administrators/facilities personnel so that the problems are corrected before mold growth can settle in.

Mold Contamination Removal and Disinfection

The strategy for the clean-up should take into account the extent of mold contamination and any contamination of HVAC systems. The goal of any clean-up is to remove contaminated building materials and/or disinfect potentially contaminated areas without exposing students, staff and the removal workers to dangerous mold exposure. The best guidelines that currently exist recommend the following strategy:



Small Scale Clean-ups:

Mold contamination found in small areas (under 2 square feet), such as ceiling tiles, does not require full-scale isolation. However, care should be taken not to disperse the mold from contaminated areas. Visibly contaminated material should be removed in a sealed plastic bag. Surrounding areas should be cleaned with household bleach.

School building maintenance staff can conduct small-scale efforts if they receive training from a qualified individual on proper methods and the health hazards of mold exposure. Maintenance staff should be provided with the

proper personal protective equipment such as a half-face respirator and gloves.

Medium Scale Clean-ups

Mold contamination in areas from 2-30 square feet require more precautions than small-scale clean-ups. An example of a small scale clean-up would be drywall panels in a school. Areas and/or material surrounding the contaminated material should be covered with plastic sheets and taped before removing the contaminated area. The contaminated materials should be removed in a sealed plastic bag and the contaminated area cleaned with household bleach.

School building maintenance staff should be able to handle a medium scale clean-up if the precautions described above are taken.

Large Scale Clean-ups

When the clean-up effort goes beyond an area easily isolated from staff and students, more care must be taken to contain the clean-up. An example would be several heavily contaminated wallboards in a classroom. The same methods developed for asbestos removal are essential for full-scale mold removal to guarantee that mold is not dispersed throughout the school.

The affected classroom or work area should be completely isolated from occupied spaces of the school. Generally, plastic sheets should be installed and sealed with duct tape. Openings such as doors, fixtures and ventilation components should be sealed. A high-efficiency particulate air (HEPA) exhausted negative air unit should be installed to ensure that mold does not escape from the contaminated classroom or area. A good contractor will install airlocks and a decontamination room to allow workers to remove contaminated work clothing and equipment.

Contaminated materials should be removed in double-sealed plastic bags, and the area should be thoroughly vacuumed with a HEPA vacuum before isolation barriers are removed.

Air monitoring should be conducted during the clean-up to ensure that no mold is escaping into other areas of the school. Post clean-up monitoring is also essential to guarantee that mold concentrations have fallen to acceptable levels.

This type of remediation should be conducted only by an experienced contractor who employs trained clean-up workers.

Heating, Ventilation and Air-Conditioning System Clean-Ups

Clean-up of the ventilation system can be very tricky because dangerous mold can be distributed throughout the school, exposing virtually all the building's occupants. The entire system should be isolated with plastic sheeting as described above. Dust and dirt should be vacuumed from the system with a HEPA vacuum cleaner. Contaminated duct liner (i.e., fiberglass) should be removed down to the bare sheet metal of the duct. Some experts recommend that the duct liner be disinfected before its removal to guarantee that the mold is not dispersed; when the material is removed it should be placed in double-sealed plastic bags.

All areas should be disinfected. The coils should be disinfected with household bleach. The ducts should be disinfected with chlorine dioxide and/or ozone. Special care should be taken that disinfection does not take place when school is in session because these disinfectants are toxic and can potentially overexpose staff and students. Sufficient time should be allowed for the disinfectants to dissipate before allowing staff and students to re-enter the building.



Cleaning the HVAC system goes hand in hand with eliminating moisture intrusion. The source of moisture and/or mold should be corrected to ensure that the problem does not return.

Medical Management

Staff and students who have been symptomatic because of exposure to molds need some guidance on their health. They should receive as much information as possible (mold reports, etc.) and advice on seeing an occupational-environmental health physician.

These individuals also can benefit from counseling on managing their health problems. For instance, many

people who have become sensitized to molds at school should be given information on reducing and/or eliminating sources of mold in their homes. At some point, they may need advice on whether they can remain in the school even after remediation.

Develop a reporting system for staff and students who have health complaints that they associate with exposures at school. Affected individuals should be given assurance that their complaints will be investigated in a timely manner.

Evaluating the Intervention

Often, clean-up plans lack a sound evaluation method. Such an evaluation plan is essential if school occupants are to trust the remediation effort. An evaluation plan should call for inspections of the school and HVAC system at two-to-three-month intervals for signs of water/moisture intrusion and signs of mold growth.

In addition, a good evaluation plan will include symptom surveys of staff and students at three and six-month intervals. If health complaints related to mold exposure drop significantly, the district can be more confident that the clean-up intervention worked.

Identifying and solving mold problems can be difficult, but your perseverance will be rewarded. Contact the AFT health and safety team at 4healthandsafety.org for more information and training opportunities. [June 2022]