KEY ELEMENTS IN PREVENTING AND MITIGATING MOLD CLAIMS

By Jerome E. Spear, CSP, CIH

Effective January 1, 2005, consultants who prepare mold management plans for buildings located in Texas must be licensed as a mold assessment consultant in accordance with the Texas Mold Assessment and Remediation Rules (http://www.tdh.state.tx.us/beh/mold/FinalRule.pdf).

According to the U.S. Environmental Protection Agency (EPA), mold has affected approximately 10 to 25 million workers and 800,000 to 1.1 million buildings. Mold spores are all around us and have been since the beginning of time. Actually, there are some beneficial uses of mold (including cheese, beer making, etc.). However, mold growing inside of buildings can create indoor air quality issues; therefore, steps should be taking to minimize the potential of indoor mold growth.

The first step in preventing claims of mold is to develop a written mold management program. A mold management program outlines the operations and management procedures to prevent, control, and manage potential indoor water and moisture conditions and subsequent indoor mold growth. Since mold requires moisture to propagate, prudent building owners and managers have the basic philosophy that water intrusion incidents are inevitable and thus they must be prepared to promptly respond and correct the such incidents and excessive moisture conditions. Also, if seeking insurance for your building(s) that covers indoor mold contamination, your insurance carrier will likely request to review your mold management program to assess the effectiveness of your program.

According to the U.S. Environmental Protection Agency (EPA), mold has affected approximately 10 to 25 million workers and 800,000 to 1.1 million buildings

A mold management plan should cover administering the program, defining roles and responsibilities, preventing water intrusion and mold growth issues, responding to water intrusion incidents, remediating indoor mold contamination, selecting qualified contractors, and training personnel. Elements of a mold management program are outlined below.

PROGRAM ADMINISTRATION

Administering the mold management program starts with defining the scope and purpose of the document. Since operations and maintenance procedures are critical components with preventing and managing water intrusion events and subsequent indoor mold growth, consideration should be given to integrating your mold management program with other existing programs, such as the building's operation and maintenance program.

Another critical aspect of administering the program is to define duties and responsibilities to all affected personnel. Like other maintenance and management programs, a program administrator should be assigned and understand his/her responsibilities. This person is generally responsible for the day-to-day activities involved in maintaining the building(s) in acceptable conditions with good indoor air quality. The program administrator should have knowledge and experience

in mold prevention concepts and mold responsive actions.

Other critical personnel in the management and control of indoor mold contamination include the property manager, maintenance and custodial workers, building occupants and tenants, and contractors. In general, the property manager should have the overall responsible for minimizing and managing the risk of water intrusion and indoor mold growth and for allocating the necessary resources to implement the program.

Maintenance and custodial workers play a vital role in preventing water intrusion events and are a key link in the cleanup response chain. Finally, a certain level of education and communication should be provided to building occupants and/or tenants as these people are responsible for promptly notifying maintenance personnel of water intrusion incidents and maintaining their unit in an acceptable conditions. One way to delineate and communicate the tenants' responsibilities is through the lease agreement.

Contractors should perform their scope of work as defined by their contract in a standard of care normal for their industry. However, specific requirements and specifications applicable to the project should be included in their contract. The Texas mold rules require the initial mold assessment to be performed by licensed mold assessment consultants (with certain exceptions). If remediation is warranted, the licensed mold assessment consultant is responsible for developing a written mold remediation protocol for the remediation contractor to follow. The mold remediation contractor is responsible for preparing a work plan (that is based on the consultant's protocol), submitting the work plan to the building owner's representative prior to the start of work, and performing the work in accordance to applicable mold-related laws and industry standards.

CONSTRUCTION AND RENOVATION PROJECTS

Water intrusion efforts must be considered in the design and construction of a building. An owner representative who is experienced in construction methods should be involved with coordinating and overseeing construction and renovation projects to observe that the work is performed according to the owner's specifications and according to the owner's mold management program. Depending on the complexity of a project, it may be helpful to engage construction experts to review plans and provide their expertise during the design stage, which can minimize or eliminate costly changes during or after the construction phase of the project. During the construction phase, independent testing or observation may also help minimize the risk of water intrusion and/or further protect against the potential of claims of interior mold contamination.

There are many design considerations to moisture control. One is the proper sizing of the heating, ventilation, and air-conditioning (HVAC) system. If the HVAC system is "oversized," the system will not run long enough to dehumidify the building. However, if the system is "undersized," the system may run for long periods and still not be able to handle the moisture load resulting in condensation on interior surfaces. However, equipment is routinely installed with total capacities that are 50% to 200% greater than needed (Hourahan 24). Other design and construction considerations are outlined in Figure 1.

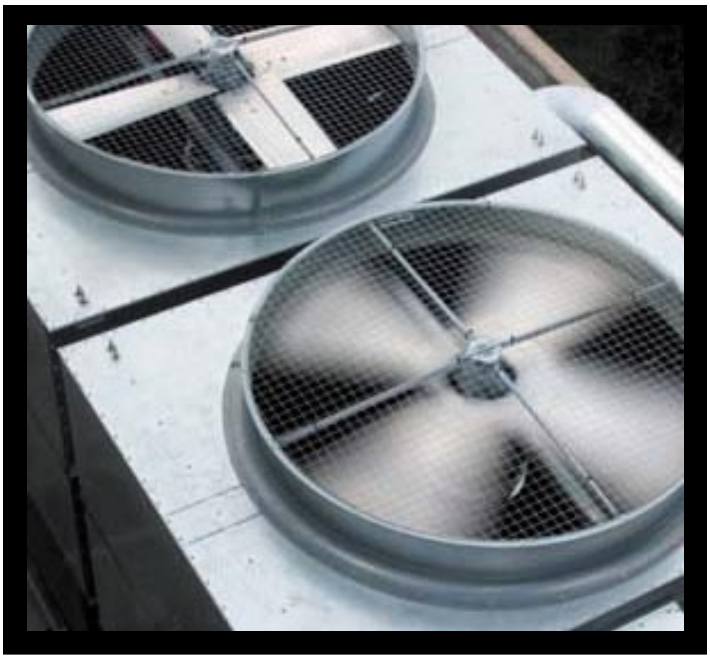
PREVENTIVE MAINTENANCE

Preventive maintenance of equipment (such as the HVAC system) and regular inspections should be part of an on-going maintenance program. Equipment components should be on a scheduled maintenance program in accordance with the manufacturer's recommendations. The American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) standard 62-2001 Section 8 contains maintenance recommendations for filters, air-cleaning equipment, humidifiers, dehumidifying coils, drain pans, air intakes, control sensors, and cooling towers. These provisions should be considered as minimum criteria. An effective system should be implemented to track and document preventive maintenance efforts.

One purpose of periodic inspections is to proactively identify areas that have previously experienced water damage and may have visible or hidden mold growth. Another purpose of periodic inspections is to determine the need for mechanical systems cleaning and maintenance.

Documented inspections should include the following:

- **Ductwork, diffusers, and air vents**
- **Window frames**
- **Carpets**
- **Ceiling tiles**
- **Interior sources of moisture (such as decorative fountains, sauna areas, planters, pools, spas, bathrooms, and kitchens)**
- **Roofs**
- **Attics**
- **Basements and crawlspaces**
- **Crawlspace**
- **Weatherproofing components and flashings**
- **Building exteriors for potential moisture sources (such as sprinklers and drainage)**
- **Outside air dampers for nearby sources of contamination**
- **Drain pans**



Interior moisture, humidity, and ventilation controls should also be incorporated into the site's preventive maintenance program. Such controls may include periodically taking temperature and humidity readings throughout the buildings as well as evaluating the buildings' ventilation rates to ensure it continues to meet ASHRAE 62-2001. Indoor humidity readings should be maintained between 30 and 50% relative humidity. ASHRAE's recommended ventilation rate in cubic feet per minute (cfm) per person depends on the type of indoor space. For offices, ASHRAE recommends 20 cfm/person of outdoor air. Consideration should also be given to automate building temperature and humidity controls such as the use of a humidistat. A humidistat is a control device that can be connected to the HVAC system and adjusted so that, if the humidity level rises above a set point, the HVAC system will automatically activate. The practice of shutting down the HVAC systems during unoccupied periods should be avoided as this practice may result in indoor moisture conditions that support mold growth.

For facilities with tenants, responsibilities pertaining to preventive maintenance of tenant-occupied spaces should be specified in the lease agreements. Specific language should require tenants to notify the property owner/manager if water intrusion exists (such as leaking faucets, deteriorating ceiling tiles, etc.) or if mold growth is noted on surfaces (such as floors and/or walls).

MANAGING WATER INTRUSION INCIDENTS

When a water intrusion or indoor moisture episode occurs, an effective system of communicating and reporting the condition(s) promptly should be established so that the situation can be corrected in a timely manner in order to prevent indoor mold growth. The EPA suggests that an "IAQ Complaint Form" be completed by the facility staff handling the complaint as well as an "Incident Log" to document each response (see http://www.epa.gov/iaq/largebldgs/baqtoc.html). Feedback should be provided to the complainant(s) and a follow-up of the remedial action should be conducted to make sure the corrective action has been effective.

Since a prompt response to water intrusion is critical in preventing indoor mold growth, water restoration contractors should be pre-qualified and be prepared to respond immediately when needed. Water-damaged carpet and backing should be dried within 24 to 48 hours by using a water extraction vacuum, use of a dehumidifier, and use of fans to accelerate the drying process. Damaged ceiling tiles, fiberglass insulation, and cellulose insulation, should be discarded and replaced. Wallboard may be dried in place if there is no obvious swelling and the seams are intact. If not, they should be removed, discarded, and replaced. A water extraction vacuum should be used to remove water from impacted concrete or cinder block surfaces. For cleanup methods of other materials to prevent mold growth, refer to Table 1 in EPA's *Mold Remediation in Schools and Commercial Buildings* (see http://www.epa.gov/iaq/molds/mold_remediation.html).

For facilities with tenants, the mold management program should include a system of educating tenants on the importance of addressing water intrusion incidents and reporting such incidents to the facility owner immediately. The tenant's responsibility of notifying the facility owner immediately of water intrusion incidents should be addressed in the lease agreement.

MOLD ASSESSMENT AND REMEDIATION

If water damage cannot be cleaned-up within 24 to 48 hours or mold is present or suspected, the affected area(s) should be assessed by a qualified person to determine to determine if mold remediation is needed. A detailed visual inspection of the impacted areas should be conducted by trained personnel. A borescope can be used to view spaces in ductwork or behind walls, and a moisture meter is useful in evaluating the moisture content in building materials, which may be helpful in identifying hidden sources of mold growth and the extent of water damage. Bulk and/or surface sampling may be performed to identify the presence of mold on surfaces and air sampling may be performed in an attempt to determine if there is an indoor amplification of mold spores.

Based on the assessment, a mold remediation protocol should be prepared and provided to the mold remediation contractor.

The protocol should include the following:

- **Rooms or areas where the work will be performed.**
- **Estimated quantities of materials to be cleaned or removed.**
- **Methods to be used for each type of remediation in each area.**
- **Personal protective equipment to be used by remediators.**
- **Proposed type of containment.**
- **Proposed clearance procedures and criteria.**

The mold remediation contractor should prepare a work plan that provides the specific means and methods in which the affected area(s) will be remediated. Some locations (such as Texas) have licensing requirements for performing mold assessments and mold remediation in certain situations.

Mold remediation guidelines (based on the size of the affected area) are available in Table 2 of EPA's *Mold Remediation in Schools and Commercial Buildings* (see http://www.epa.gov/iaq/molds/mold_remediation.html). The guidelines include personal protective equipment requirements, cleanup methods, and containment requirements depending on the size of the remediation project. If contamination is in ductwork or HVAC system, the HVAC system should be shut down until the ductwork, HVAC system, and other impacted components are properly cleaned to prevent the spread of mold spores throughout the facility.

Mold assessment consultants and mold remediation contractors should also be pre-qualified and selected so that they can respond in a timely manner when needed.

TRAINING AND QUALIFICATIONS

Maintenance personnel should be trained in the site's planned and unplanned maintenance procedures and be trained in the site's mold management program. Personnel responsible for performing mold assessments and/or remediation require more extensive training and may also be required to be licensed depending on local requirements. Occupants and tenants should be provided with tips on how to prevent indoor mold growth and to report water intrusion incidents immediately. Contractor prequalification and selection criteria should be formalized to ensure they have the necessary qualifications and expertise to perform their scope of work in an effective manner.

Finally, to ensure that the mold management procedures are kept up-to-date, the mold management program should be formally reviewed and updated on an annual basis. It is unlikely, that water intrusion or indoor mold growth will completely be eliminated. However, the cost of water intrusion incidents and subsequent mold contamination can be minimized by formalizing a detailed mold management program that includes defining roles and responsibilities, establishing communication procedures with occupants and tenants, considering moisture control measures during the design and construction/ renovation of buildings, incorporating water intrusion and moisture control in preventive maintenance procedures, establishing formal response procedures for correcting moisture conditions and mold growth, providing training to maintenance personnel, and educating occupants on reporting water intrusion incidents.

REFERENCES

American Industrial Hygiene Association (AIHA). *Recommendations for the Management, Operation, Testing, and Maintenance of HVAC Systems: Maintaining Acceptable Indoor Air Quality in Non-industrial Employee Occupancies Through Dilution Ventilation* (AIHA Guideline 2 – 2004). Virginia: AIHA, 2004.

American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE). *Thermal Environmental Conditions for Human Occupancy* (ANSI/ASHRAE 55-1992). Georgia: ASHRAE, 1992.

ASHRAE. *Ventilation for Acceptable Indoor Air Quality* (ANSI/ASHRAE 62-2001). Georgia: ASHRAE, 2001.

Hourahan, G. "Sizing and Selecting Equipment for Proper Humidity Control." *ARI Magazine*. Spring 2003: 24-34.

U.S. Environmental Protection Agency (EPA). *Mold Remediation in Schools and Commercial Buildings*. March 2001. <http://www.epa.gov/iaq/molds/mold_remediation.html>.

U.S. EPA. Building Air Quality: A Guide for Building Owners and Facility Managers. December 1991. <http://www.epa.gov/iaq/largebldgs/baqtoc.html>.

spear consulting, LLC

19314 Timber Ridge Drive, Suite 100
Magnolia, Texas 77355
Phone (281) 252-0005
jerome.spear@jespear.com
www.jespear.com

FIGURE 1
DESIGN AND CONSTRUCTION CONSIDERATIONS

Design Considerations

- Do not locate building in a floodplain.
- Properly size the HVAC system.
- Use bare, galvanized ductwork where possible and avoid interior linings such as fiberglass since such linings can serve as a habitat for mold growth.
- Design the HVAC with filters that have American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Dust Spot Efficiency Rating of at least 50 percent or a rating of MERV 8, as determined by ASHRAE Test Standard 52.2.
- Peer review mechanical system designs (including shop drawings and detail drawings).
- Include appropriate flashings and weatherproofing features in the design specifications.
- Scrutinize the use of exterior insulation finish systems (EIFS). EIFS wall systems (i.e., synthetic stucco) have a history of allowing water intrusion and trapping moisture.
- Insulate chilled water pipes.
- Vent bathrooms to the exterior and actuated by the bathroom light.
- Incorporate an automated building monitoring system (to measure humidity, temperature, and carbon dioxide) into the design to proactively monitor the performance of the building's ventilation system.

Construction Considerations

- Inspect materials to be used and delivered to the site. Confirm that they are free of mold and water damage.
- Assure materials are properly stored and protected from moisture.
- Seal door and window openings, pipe chases, elevator shafts, roof openings and penetrations from weather.
- Protect ongoing and completed flashings, waterproofing, roofing and vapor barriers.
- Test plumbing and HVAC systems in accordance with local and national codes to ensure there are no leaks and keep signed test records with project documentation. Use various methods of testing of piping (such as air tests) prior to water tests.
- Charge domestic water lines to the building structure for as long as possible prior to the installation of drywall to help identify potential hidden leaks.
- Implement a documented inspection procedure throughout construction of the project with a plan to identify mold and potential water intrusion.
- Remove standing water from the building(s).
- Repair damaged materials promptly.
- Keep drains open and unobstructed.
- Repair plumbing leaks immediately.
- Remove trash and debris from the building on a regular basis.
- Install sump pumps and place them in operation as early as possible to prevent flooding. Consider battery-operated sump pumps.
- Place equipment that requires water (such as tile saws, mixers, etc.) in tubs during indoor operation to control the spread and seepage of water.
- Inspect shower receptor installations for proper sealant.
- Consider conducting an early startup of the mechanical system to provide heating or cooling and/or drying out the building of excess humidity. However, if the system is to be turned on while there is still construction dust being created, precautions should be taken so the interior ductwork does not become coated with construction dust, which is especially problematic if the ductwork is lined with fiberglass. The construction dust provides a food source for potential mold growth.