

# **MOLD, MOISTURE, AND HOUSES – VENTILATION IS AN EFFECTIVE WEAPON**

This guideline document provides an overview of residential mold prevention in plain language that may be understood by the average consumer – the resident of today's North American housing. It provides a basic scientific explanation of mold fundamentals, findings related to problems blamed on mold, and an introduction to psychrometrics - the science of air containing moisture. That scientific base is then applied as a general guideline for making the practical decisions associated with residential design, construction, ventilation and operation for effective mold control.

Written by: David W. Wolbrink

With inputs from:

Rick Olmstead, Paul H. Raymer, Donald T. Stevens, John Ehlen,  
James D. Boldt, Daniel T. Forest, Gord Arnott, Joel Borque



Home Ventilating Institute  
1000 North Rand Road, Suite 214  
Wauconda, IL 60084  
USA  
Phone: 847.526.2010  
Fax: 847.526.2993  
e-mail: [media@hvi.org](mailto:media@hvi.org)  
Website: [www.hvi.org](http://www.hvi.org)

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## EXECUTIVE SUMMARY

Molds are our friends because they play a fundamental role on earth as they scavenge and renew. Molds can sometimes become enemies when they trigger adverse health effects. Reported potential health effects range from troublesome allergies, to infections, to frightful sounding toxicity. Allergic reactions from mold are well documented. Infectious mold is clearly documented but seldom found. However, documentation of toxicity problems falls short of proof.

It is unavoidable that residential air contains some moisture, and moist air is essential for health and comfort. However, there are several problems associated with excess moisture, and one is mold. Mold can grow when there is excess moisture; if moisture is controlled, mold is controlled.

The four practical steps to avoidance and control of residential mold are:

1. **Design and build** the house properly – as a system. Design and build to keep water out, to avoid condensation, and for easy maintenance. Don't oversize the air conditioner. Moisture control must dominate design.
2. **Operate** the house properly. Operate the heating and air-conditioning system for best dehumidification. Check the refrigerator, washer, dishwasher and other sources.
3. **Design ventilation** for good indoor air quality for health, comfort, and moisture control. Choose dependable ventilation equipment and install it with quality ducting and fittings. Vent-free equipment does not ventilate properly. Provide interior circulation paths and appropriate controls.
4. **Operate** residential ventilation properly for good indoor air quality and moisture control. Operate the continuous ventilation with weather sensitivity. Use kitchen ventilation while cooking, and bathroom ventilation 30 minutes after a shower.

The guidelines provide both scientific basis for decisions and practical guidance for achieving good indoor air while avoiding moisture and mold problems.

## **INTRODUCTION TO THIS GUIDELINE**

This introduction describes the major sections of this guideline to help users find their particular area of interest. The first two sections provide a brief scientific basis for the practical applications of the later parts.

The brevity of this document contradicts the complexity of the numerous subjects involved. Every house is a complete 'system', and those responsible for designing, building, operating and maintaining each part of the system must be experts in their fields, each of which utilizes a vast body of knowledge. Proper practices for each field vary with differences such as climate, local practices, codes and standards. This document is only an overview; it may also point the way to further study.

### **Section 1. Mold: Friend and Enemy**

The first section provides a basic understanding of residential mold – how it grows, and reported health effects gathered from the writings of several leading experts in the field. A basic understanding of mold enables practical applications to be properly planned.

### **Section 2. Moisture and the Air Around Us**

Section two provides a layman's understanding of moisture in air—psychrometrics. That scientific information helps to make the practical decisions necessary to properly apply the specifics of good residential construction. It will help consumers to utilize the mold mitigating advantages of good residential ventilation.

### **Section 3. The House: Design, Construction and Operation**

Section three provides an overview of a series of very complex subjects. The house must be designed properly for its setting. Construction must support good design, assisted by best practices for the area. Operation must incorporate weather and climate sensitivity, and be based on a knowledge of the parts of the house-system.

### **Section 4. The Ventilation: Installation and Operation**

Ventilation must be designed into the house. Continuous ventilation is vital for comfort and health. Intermittent ventilation must be installed and used properly, enabling the continuous ventilation to provide good air at low flow rates that are consistent with energy efficiency.

### **Section 5. Related Issues**

This section covers additional issues especially related to mold. There is information about mold insurance, mold litigation, and the media.

Finally, references to some of the best mold-related information sources are provided.

## **MOLD: FRIEND AND ENEMY**

### **Mold is a Growing Health Concern**

There are several reasons for the current prominence of mold concerns. First, tighter construction can play a role in mold problems if the house is not adequately ventilated. On the other hand, buildings that leak excessively can develop mold problems by admitting excess moisture. Recently, public awareness has been aroused and the media has played a role in informing the public about this health issue. Another possibility is that recent physiological developments and trends may be responsible for some of mold's new prominence as a health problem.

Physiological changes are interesting and may vary. (Building factors and public awareness are discussed later.) The human body can withstand remarkable amounts of stress of various types. In 1950, Hans Selye described the "General Adaptation Syndrome," a systemic response of the body to resist any stressor<sup>1</sup>. Thus, a body can function normally with a moderate level of exposure for years, protected by its defense mechanisms in what becomes a routine manner. Gradually increasing stress sometimes helps generate increased resistance to that stress. However, if an unusually strong stressor enters the environment, the defense mechanisms are sometimes overpowered and weakened, or sometimes the opposite, they become overly sensitive and overly reactive. In either case, whether the defense mechanisms are weakened or made hypersensitive, the next exposure, even though not as strong, can act as a trigger for an allergic reaction.

The chances of damage to human defense mechanisms may be increased when our modern lifestyle exposes our bodies to a greater variety of respiratory stressors than ever before, including chemicals such as volatile organic compounds (VOCs), plasticizers, exhaust fumes, food additives and formaldehyde. This could explain a growing population of hypersensitive individuals who suffer more respiratory problems (allergies and asthma) than previous generations.

### **Mold's Effects Vary**

Molds can attack the human body in more than one way, and the reactions can be classified into three types: respiratory irritations (including allergic reaction), infections, and neuro-toxic reactions.

The most common response to mold exposure is respiratory irritation and/or allergic reaction. An estimated one in five Americans suffers from allergic rhinitis, the single most common human disease<sup>2</sup> and some of it is mold-related. Usually the reaction is to the spores and cellular debris sent into the air by molds. Growing molds emit gases (VOCs) that we recognize as the "moldy smell." The VOC emissions are in very small quantities and there appears to be no consensus that they are in sufficient concentration to trigger a reaction, although the odor can cause complaints about indoor air quality. Whatever the irritant, there is no shortage of documentation to make the

connection between various molds and allergies affecting both the respiratory system and the skin.

The second most common response is an infection associated with an extremely high concentration of a certain fungus in an individual's particular environment. The infection establishes itself in the body of the exposed person, typically in the respiratory system, but also in the skin and other places. For example, farmers consider moldy grain dust dangerous and know they need to be careful to avoid an infection from it, although even such infections are quite unusual. Some fungi (e.g. *Aspergillus fumigatus*) are believed to cause infections<sup>3</sup>, although there is some controversy in this area. There is documentation of an occasional, very real, mold infection hazard but the frequency of these occurrences has not been thoroughly studied.

Theories of neuro-toxic reaction are not well documented. We know that high levels of VOCs, as a general matter, can irritate mucous membranes and affect the central nervous system, sometimes stimulating the trigeminal nerve<sup>4</sup> and producing headaches, attention deficit, dizziness, etc. Molds produce very small amounts of VOCs, and some have made a connection between these ailments and mold. However, there is no documentation demonstrating that molds are capable of creating such high levels of VOCs.

Since the three theories of how molds attack the body have not all been thoroughly researched and documented, there is ambiguity. Although there is solid documentation of irritation from fungi by numerous experts<sup>5</sup>, personal injury claims related to mold neuro-toxic reactions invoke skepticism. Irritation and/or allergic reaction from mold exposure are widely accepted, and infection has been documented in special cases, but documentation supporting claims of neurotoxic reactions<sup>6</sup> is scarce.

The epidemiological ambiguity has caused concern among heating and air-conditioning (HAC) contractors, justified because of the potential for mold growth in HAC systems and the legal threat posed by some claims<sup>7</sup>. On the other hand, indoor air quality (IAQ) "professionals" are concerned about slow responses<sup>8</sup> on the part of contractors in general. More information and education about molds, as well as buildings, are needed.

## **Molds Are All Around Us and Play a Unique Role in the Environment**

To combat mold, it is necessary to recognize the importance of its place in the complex scheme of the Earth's environment and to understand how it grows. Scientists divide living organisms into five kingdoms: animals (Animalia), green plants (Plantae), single-celled organisms (Protocista), bacteria (Monera), and molds, mushrooms and yeasts (Fungi).

Fungi play an essential role on earth as they process decaying organic matter into substances that sustain plant and animal life<sup>9</sup>. Fungi are the earth's scavengers. For every dead and decaying form of living matter, such as fibers, textiles, leather, wood and paper, there are fungal scavengers. Even inorganic matter, such as glass, painted

surfaces, metal and bare concrete, can support mold growth if they are damp, and if organic nutrients, such as dust, soil particles, or even simple carbon particles, are present.

There is a staggering variety of fungi; approximately 69,000 species have been described in the literature, and estimates of the total exceed 1.5 million<sup>10</sup>. Fungi make up approximately 25 percent of the Earth's biomass. Of these, more than 20 species are commonly found in residences. They vary in color, but black and various hues of red<sup>22,11</sup> dominate.

Fungi are resilient and adaptable. Spores of molds, yeasts and other fungi are found nearly everywhere outdoors and indoors, normally in more or less equal concentration. A problem house can be identified by a higher indoor spore count than the outdoor count. When spore-sensitive cleanliness is practiced inside a house, including frequent vacuuming and air filtration, the indoor count can be made measurably lower than the outdoor level.

### **Mold Grows By the Rules**

To control molds, consider how they grow. In order for residential types of molds to grow, they need only nutrients, spores and excess moisture, so control might involve withholding one or more of the essentials. Because there is a mold for virtually every nutrient, it is impossible to control molds by eliminating nutrients.

The spores (fungal "seeds") are waiting virtually everywhere, sometimes for years, for the right conditions. Some spores can germinate in as little as four to 12 hours, and, if left undisturbed, fungi can grow and spread in 24 to 72 hours<sup>9,12</sup>. It's impossible to control mold by eliminating all spores, although controlling the spore count can reduce the potential population of growing mold. Spores are large enough to be captured by filtration.

Moisture holds the key to residential mold control. For mold to grow on the surface of a material, its "water activity" level must be 70 percent or higher for nearly all molds. Water activity level of a solid material is defined as the moisture level resulting from the material being in air of the indicated relative humidity long enough to stabilize. The relative humidity of the air at the material is more important than the air in the center of the room, and it may be different. A common example is when wall is colder than the ambient room, its water activity level increases. Materials vary in the time required to stabilize, but a day or two is sufficient for some materials to take on sufficient moisture to support mold growth.

**To prevent mold growth, control moisture to below 70 percent relative humidity<sup>13,14</sup>, preferably below 60 percent.** That rule provides a simple basis on which to plan and operate a mold-resistant house. Joseph Lstiburik, speaking at an [American Society of Heating, Refrigerating and Air-Conditioning Engineers](#) (ASHRAE) meeting, emphasized the rigid and absolute connection between moisture and mold:

“Water – mold; mold – water; it’s as simple as that!” In other words, control water and mold is controlled—absolutely. Good advice!

## MOISTURE AND THE AIR AROUND US

### Psychrometrics – the Science of Air Containing Moisture

“Psychrometrics” is defined as measuring the thermal characteristics of air with humidity. Although psychrometric science is sufficiently complex to be the subject of several books by itself, the fundamental principles can be easily understood.

It is essential that fundamental psychrometrics be considered for both design and operation if mold is to be avoided in a house. The psychrometric chart is a useful tool; basic familiarity with it is easier than its appearance at first conveys. Almost anyone can understand it.

The psychrometric chart is a logical representation of the way the properties of moist air change as conditions are varied. If any two properties of the air in a space are known, all the others can be found on the psychrometric chart. Similarly, if a property changes, the effect on the others is shown visually. It is exactly that capability that makes the chart so alluringly useful.

Properties shown, and simplified definitions, include:

Dry bulb temperature: the temperature of the air as indicated by an ordinary thermometer, usually measured in degrees Fahrenheit or Celsius. Dry bulb temperature is the bottom scale on the psychrometric chart.

Humidity ratio: the ratio of the mass (weight) of the moisture in a volume of air to the mass (weight) of that volume of dry air, sometimes called absolute humidity. At a humidity ratio of 0.010 there is 0.01 pound of moisture per pound of air. To visualize that, 0.01 pound of water is exactly one teaspoon and one pound of air is about equal to the knee space of a desk. Humidity ratio forms the right-hand scale of the psychrometric chart.

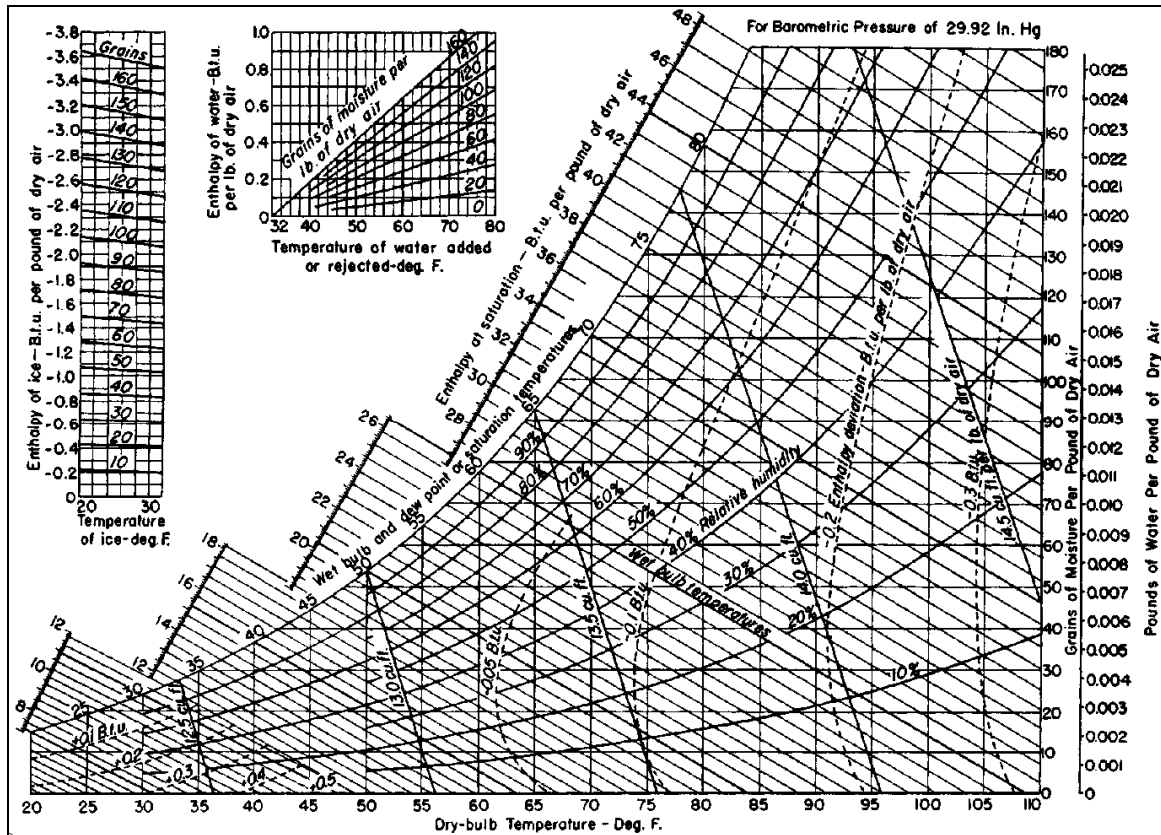
Dew point: the humidity ratio at which air of a given dry bulb temperature is saturated with moisture—it can not hold any more, and if moisture is added, it will condense to liquid water. Dew points are found on the saturation curve, which forms the third side of the psychrometric chart.

Relative humidity: the amount of moisture in the air, expressed as a percent of the amount it will hold when saturated. The saturation curve (above) represents 100 percent relative humidity. Each of the other long curves on the chart are other values of relative humidity, such as 50 percent. Relative humidity is easily measured with a relative humidity indicator or ‘psychrometer’.



Equal energy lines: the straight lines running diagonally across the psychrometric chart. The equal energy lines depict the various conditions of dry bulb temperature and humidity that air can have, with equal energy.

The psychrometric chart that follows, and the examples given, deserve to be studied and used.



**A Typical Psychrometric Chart**

This chart has all the components defined above. (The two smaller charts in the upper left may be ignored.) Examples of using the chart will establish familiarity with it.

To understand air-conditioning, start at a typical easily measured point for air in a house in summer: 75° F dry bulb temperature along the bottom of the chart, and follow the vertical line up until it crosses the curved line for 50 percent relative humidity. That is the beginning condition of the air. (Notice that the air has about 0.0095 pounds of water per pound of dry air.)

When the air conditioner first runs, the air is cooled. That change is represented by moving the initial point horizontally to the left, demonstrating lower dry bulb temperature. Tracing the line to the left, you will hit the saturation curve at about 56° F. The wet bulb temperature has been identified: the point where water will begin to condense from the air.

When the air conditioner runs, one of two things happens. If the air conditioner continues to run for a significant period, the temperature of the coils is low enough to cause condensation to run down the drain. When that happens, the initial point will move both left (reducing dry bulb temperature) and down (reducing moisture in the air). That shows desirable dehumidification by air-conditioning.

On the other hand, if the air conditioner runs only a short time before it is satisfied, little moisture runs down the drain. The air conditioner stops, and most of the condensation on the coil will be re-evaporated into the house. The result is cooler air with higher relative humidity. That is the undesirable 're-humidification' associated with oversize air conditioners, one major cause of excess moisture problems.

Similarly, winter dryness can be traced on the psychrometric chart. Starting at typical heating season conditions, 70° F dry bulb temperature and 40% relative humidity, we find about 0.006 pounds of water per pound of air.

Now consider the effect on interior conditions when outdoor air enters the house. Outdoor air may be at 25° F and 80 percent relative humidity, and the chart shows it has less than 0.003 pounds of water per pound of air. That is only half as much as the indoor air, and as it mixes with the indoor air, it lowers the indoor moisture content.

In the extreme, if all the indoor air is made up of that same outdoor air, heated to 70° F without addition of moisture, the indoor relative humidity will be about 10 percent. That is unrealistic because of the people living in the house and their activities—breathing, showering, cooking, and normal body perspiration add surprising amounts of moisture. However, the example demonstrates how the result of almost any situation can be analyzed using the psychrometric chart.

Most people will be comfortable with no less than 25 percent relative humidity in winter. In summer, mold will grow when materials in the house reach the equivalent of 70 percent relative humidity, and it is recommended that summer relative humidity be maintained at 60 percent or below.

Fundamental psychrometrics must be considered in all aspects of designing, building, operating and maintaining a residence. The psychrometric chart (See page 16) helps visualize the various cause and effect relationships.

## THE HOUSE: DESIGN, CONSTRUCTION AND OPERATION

Correct building design and construction are lengthy subjects that have been covered in detail elsewhere and the references are numerous<sup>15,16,17</sup>. The important general requirements are summarized and reviewed here. However, thorough coverage of all aspects of building science is impossible in the scope of this document. Design, construction, operation, and maintenance of residential buildings must unwaveringly focus on avoiding excess moisture problems. Excess moisture can come from extreme lifestyle factors, but it is usually caused by problems such as unwanted liquid water that enters the living space (water incursion), and condensation of vapor within the space.

Some excellent references are particularly focused on mold avoidance<sup>18</sup>.

### Design a House Properly for Its Setting

A house's 'setting' covers many things, including climate, occupancy, characteristics of the land and surroundings, local practices, local codes, etc. Some of the more general considerations are described here.

Liquid water incursion must be prevented through correct design and construction of flashings, caulking, roof, and other building elements. Site drainage and sub-slab moisture control are essential.

Condensation of moisture vapor on interior and exterior surfaces of walls, floors and ceilings can be prevented through proper insulation and by designing walls with thermal gradients that prevent condensation, in both cold and warm humid climates. Building wall systems must be designed to be appropriate for the climate; recent condensation problems inside walls with expanded foam and polymeric stucco (EFIS) dramatized that requirement. Proper application of vapor barriers and air barriers plays an important role in building moisture control; climate and weather for the location dictate different treatments. Provision for draining any accumulated water and drying structural spaces is required; laundry rooms need floor drains, and all exterior walls should be designed so they can dry both inward and outward.

Building tightness has been identified as the cause of mold problems – sometimes unfairly. In fact, tightness can help prevent uncontrolled entry of water vapor and thus prevent condensation and possible mold growth. Building pressures are more easily controlled in tightly sealed buildings. In cold climates, a slightly negative pressure is usually best because the outside air contains less moisture. In hot humid climates a tightly sealed building will minimize accidental entry of hot humid air making it possible for the HAC system to maintain the positive pressure required for moisture control<sup>19</sup>.

The HAC system must be designed and installed with sensitivity to potential mold problems. The system must be right-sized, and variable air-conditioning compressors can be beneficial for lowering the humidity through dehumidification. It is important to seal all ducts, especially those in garage or attic, be sure drain pans drain and avoid absorbent duct insulation within six feet of cooling coils.

Ventilation design must be correct for the setting. Occupants need air for health and comfort, and quiet ventilation equipment is more likely to be used. (See the Ventilation Section, page 12).

Moisture will be more readily controlled in a building designed and constructed to be resilient than in the opposite, a brittle building. A resilient building is one that can easily adapt to changes in operating conditions and occupancy with minimal intervention of trained technical personnel<sup>20,21</sup>.

### **Build the House Correctly for Its Setting**

The measures described above for proper design cannot be separated from construction. Knowledgeable construction supervision is crucial if design objectives are to be achieved.

Local practices, appropriate for the setting, are always an extension of good design.

### **Operate the House Correctly**

The best design, conscientiously constructed, requires proper operation if excess moisture is to be controlled. Occupants must properly operate bathroom exhaust 30 minutes after each shower, kitchen range hoods must be turned on to be effective, etc.

Water exclusion components – e.g., flashing, plumbing – must be maintained. Water-spillage accidents must be detected and cleaned up immediately. If a water accident occurs, extreme drying measures may be required. Plumbing and appliance leaks must be controlled and contained.

## THE VENTILATION: INSTALLATION AND OPERATION

### Ventilation Design and Installation

Ventilation can control excess moisture. Good residential ventilation has two interdependent and essential components. First, strong sources of moisture, especially the bathroom and kitchen, must be intermittently ventilated. Second, fresh air for breathing must be provided continuously by mechanical ventilation. The two are interdependent – for the continuous ventilation to be effective at a low, energy conserving, mold preventing rate, intermittent strong sources must be mitigated at the source by higher ventilation rates before they spread throughout the entire house.

Quality installation of ventilation requires that ducting be carefully designed, selected, and installed – lower duct velocity and high quality fittings helps performance and minimizes noise. Terminations (i.e., wall and roof caps) must be of good quality if ventilation equipment is to realize its potential. Duct leakage is almost always a problem, so it is imperative ducting be installed properly.

Fresh air should be provided mechanically to be sure it is in sufficient quantity to provide good indoor air quality. Depending on infiltration or open window to provide ‘accidental’ fresh air will hardly ever provide the right quantity; one day too much, the next too little.

There is a variety of ventilation strategies to choose from – each one is more effective and less costly than natural ventilation because extremes caused by temperatures and wind are avoided. The mechanical ventilation strategies are all based on supplying just the right amount of air and avoiding the accidental high moisture loads inevitable with natural ventilation in humid areas. Excess and “accidental” ventilation can increase the risk of mold.

When the mechanical fresh air system is operating at the proper rate, it optimizes the quality of the indoor air and it requires that intermittent strong sources be controlled locally.

Bathroom ventilation must intermittently mitigate shower moisture, the single largest strong source of contaminating moisture in the home. The bathroom exhaust must be located so that air from the source (e.g., diffuser or undercut door) sweeps across and over the shower and into the exhaust fan. Exhaust capacity must be adequate for the application; the Home Ventilating Institute (HVI) recommends eight air changes per hour. An easy approximation is to provide one cubic foot per minute (cfm) per square foot of bathroom. Extra large bathrooms and split bathrooms may be adequately served with slightly less if properly located. Although ventilation in a separated toilet room can effectively control odor, control of moisture is the important function in the bathroom.

Controls are important for bathroom ventilation. Timers and off-delay switches make a bathroom exhaust much more effective; if the bathroom door is opened immediately after a shower the huge moisture load is simply dumped into the rest of the house. Fans with sensors that detect a rapid rise in humidity can sense operation of a shower,

and run the fan until the moisture has been expelled. Controls that sense a rapid rise in humidity are available and can even prevent shower stall mildew.

Kitchen ventilation must control the strong sources of excess moisture associated with cooking. Whether boiling, frying or baking, kitchen ventilation mitigates the moisture load that otherwise would disturb the home's environment, enabling the full-time ventilation system to maintain air quality and optimize its effectiveness against mold. Range hoods capture and exhaust most efficiently; other types of kitchen ventilation are also effective.

### **Correct Operation of Residential Ventilation**

The full-time low-level ventilation for breathing should be operated continuously, especially when the dwelling is occupied. In the very humid coastal south, where there may be a concern that ventilation is bringing in excess moisture, the continuous ventilation can be shut down during periods when the dew point of incoming air is above a certain point, say 65° F, or lower. The dew point follows a more or less regular pattern from day to day during a season. The dew point can easily be obtained from television and the internet; once the local pattern is understood a daily operating procedure can be followed.

Operation of the bathroom exhaust fan must start at the beginning of every shower and continue afterwards for 20 minutes.

Kitchen ventilation must be used whenever cooking, to control heat and moisture. Although boiling water obviously sends moisture to the air, it is also released when we fry meat and sauté vegetables.

Kitchen ventilation also plays a role in mold prevention by limiting the amount of bio-nutrients contaminating the surfaces of the house.

## RELATED ISSUES

### Finding and Resolving Problems When the House is Already Contaminated

Even though recent conditions and health concerns have brought mold to the forefront of discussion, methods of resolving mold problems have been published for thousands of years.

#### Mold in the House is an Old Problem

There have been laws and guidelines for control and prevention of residential mold for literally thousands of years. The earliest mold related regulations are found in the Laws of Moses, giving mold remediation responsibility to the priests<sup>22</sup>:

*. . . the owner of the house shall come and report to the priest, 'It looks to me as if my house were infected.'*

*The priest shall then order the house to be cleared out before he goes in to examine the infection, lest everything in the house become unclean. .*

*. . . If the priest, on examining it, finds that the infection on the walls consists of greenish or reddish depressions which seem to go deeper than the surface of the wall, he shall close the door of the house behind him and quarantine the house for seven days. . . . If he finds that the infection has spread on the walls, he shall order the infected stones to be pulled out and cast in an unclean place outside the city. The whole inside of the house shall then be scraped, and the mortar that has been scraped off shall be dumped in an unclean place outside the city. Then new stones shall be brought and put in the place of the old stones, and new mortar shall be made and plastered on the house.*

*If the infection breaks out once more after the stones have been pulled out and the house has been scraped and replastered, the priest shall come again; . . . It shall be pulled down, and all its stones, beams and mortar shall be hauled away to an unclean place outside the city.*

#### I Smell Mold: What Shall I Do?

As if their colorful or dingy appearance was not enough, molds often betray their presence by the 'musty smell' of their VOC output. Fortunately human olfactory systems are very sensitive to mold's smell, long before the concentration is great enough to be a problem.

If a mold problem already exists, it may be necessary to get professional help from a mold specialist. However, homeowners can sometimes find and eliminate the problem themselves.

First, determine where the moisture is coming from and resolve the problem there. It may be that flashing is leaking. Moisture may enter walls over windows; window head flashing is often omitted. The roof may be leaking – check valleys in particular.

Sometimes there is a plumbing leak in an out-of-sight location. The seal in the bottom of a dishwasher can leak a little water every day, and send it out into the house with the heat from the dishwasher.

Next, look for unique condensation problems, especially in cold climates. In humid climates, look for and plug up leaks in the building envelope that may be admitting excess air.

Be sure to use the bathroom exhaust for every shower and be sure it runs 30 minutes after a shower every time. Be sure the range hood is vented and use it faithfully each time while cooking.

Check around for other unusual moisture sources – high occupant density, leaking ducts, leaking basements, crawl space with poor ventilation or lacking a vapor barrier sheet on the ground.

Even though the human occupants may be away from the house most of the day, large pets continue to produce moisture and may be responsible for excess moisture levels.

Be sure the continuous ventilation is operating properly. It should provide 15 cfm per person in the house, especially while occupied. There needs to be circulation within the dwelling, leaving doors open can help. Finally, run the continuous ventilation only when the dew point of the outdoor air it is supplying is below 65°F—or even lower.

After the source of the excess water has been discovered and remediated, watch the humidity using a relative humidity indicator. After the relative humidity drops below 60 percent, you should be able to resume normal operation of the house, and continue to monitor relative humidity.

Special cleaning measures should be employed to reduce any unusually high concentration of mold spores. Filter the air with a good quality filtration system and vacuum carpets daily for a period of time.

### **Mold Insurance, Litigation, and the Media**

Recently the insurance industry has resorted to extreme measures, by degrees depending on parts of the country. At least one bill was introduced into the U.S. House of Representatives in recent years that would create a massive Federal bureaucracy ensuring all US homeowners mold insurance. These are drastic measures, reacting to conditions created by sensational journalism. Which way does the trend point?

Mold is not another asbestos. There is a need for buildings with better design and construction, and better ventilation, but it is not a complex matter and builders and tradesmen will take corrective action quickly because remedies are relatively simple, easily learned and employed.



The media will learn that “toxic mold” is an unreasonably inflammatory phrase and will begin to differentiate. In short, the emotions will cool, and excitement about mold will blow over, but it will take time.

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