Detecting and Addressing Hazards from Mold

Course Handbook

Prepared for:

U.S. Department of Housing and Urban Development, Office of Public and Indian Housing

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Recognizing Different Types of Unwelcomed Molds in the Home

What is Mold?

Molds are organisms that are found indoors and outdoors.

- They are part of the natural environment and play an important role in our ecosystem by breaking down (digesting) organic matter.

Molds are neither plant nor animal; rather, they are part of the Fungi kingdom.

The Five Kingdoms:

Monera (includes Eubacteria and Archeobacteria)

- Single-celled organisms that absorb nutrients through the cell wall or produce their own by photosynthesis.

Protista

- Single-celled organisms that acquire nutrients by photosynthesis or by ingesting other organisms.

Fungi

- Multicellular organisms that vary in size from microscopic to very large (e.g., mushrooms) and absorb nutrients, mostly from decaying material.

Plantae (plants)

- Multicellular organisms that acquire nutrients by photosynthesis.

Animalia (animals)

Multicellular organisms that acquire nutrients through ingestion.

Food sources for plants, animals, and fungi

- Plants convert carbon dioxide directly into carbohydrates for food.
- Animals and fungi must find complex carbon in the environment for food.
- While animals ingest the food and degrade it internally, fungi excrete chemicals (enzymes) into the environment that degrade the complex carbon into soluble form.

Fungi do not make their own food

- Fungi get nourishment from other living or dead organisms.
- The main role of fungi in the ecosystem is to break down dead materials, such as fallen leaves, trees, insects and animals remains, using their enzymes.
- These same enzymes are what make fungi damaging to building materials of houses.

What common building materials can be found in rental units that are also sources of nourishment for fungi?

Not all fungi are mold

- Yeast, mold, mildew and mushrooms are common forms of fungi.
- Mold is essentially a description of fungi that grows on surfaces, such as the black substance on a moldy shower wall.

Molds grow in many colors, including white.

"Black mold" is NOT a species or specific kind of mold, and neither is "toxic mold."

5 Common Types of Mold

1. Penicillium
   - Nearly always green or blue
   - Fuzzy appearance and musty smell
   - Found commonly on wallpaper, on decaying fabric and in carpets with water damage
   - Known to cause allergies

2. Alternaria
   - Plant mold, but enters the home easily
   - Grows in damp areas of the home like under sinks
   - Often found after water damage or flooding, in showers or window frames
   - Black color and velvet or fuzzy texture

3. Aspergillus

Can be found in areas of extreme dampness
Can be located around house dust

- Surface appearance is yellow-green color
- Has a red-brown appearance underneath

4. Cladosporium
   - Most common airborne outdoor mold, but can be easily carried/found indoors
   - Olive-green or brown pigmentation, but can turn black
   - Grows on porous surfaces like wood or textiles
   - Linked to hay fever or asthma type symptoms

5. Stachybotrys

Often known as Black Mold – mostly black in color, but can vary

- Harmful to humans
- Can appear wet or dry and powdery (depending on its water source)
- Distinctive musty odor
- Produces air-borne toxins

For more information about Stachybotrys see:

www.cdc.gov/mold/stachy.htm

Toxic Mold

The label "toxic mold" is misleading.

- Mold is not in itself toxic, although some molds produce mycotoxins – toxic substances produced by a fungus – that have the toxic effects attributed to mold.
- It is extremely rare to find mold species that provide the more aggressive mycotoxins, and even these forms of mold are generally only life-threatening to infants, the elderly, or the infirm.
- It is generally not the presence of a specific type of mold that creates health issues for people, but the volume of mold that produces mycotoxins.

While mycotoxins are toxic, other molds are ***allergenic*** and still others are ***pathogenic***.

It is important to note, mold allergies aren't exactly rare.

Someone with a severe mold allergy may be worse off being exposed to an allergenic mold, than a healthy person would be after being exposed to a mold that produces mycotoxins

Meanwhile, pathogenic molds can wreak similar havoc as molds that produce mycotoxins for people who have weakened immune system.

You can't point to specific molds as the "***dangerous***" kind or the "***harmless***" kind.

Allergenic means "having the capacity to induce allergy."

Pathogenic means, "causing or capable of causing disease."

Source: Merriam-Webster dictionary

How Mold Grows

Mold floats on air currents – allowing it to move from outdoor to indoor. Molds grow indoors if the right organic material is inside a building. But, these four conditions must be just right:

- Moisture
- Food
- Temperature
- Time

Moisture

Mold does not need much moisture to grow. Condensation in a bathroom or around a window sill are enough. Common sites for indoor mold growth include:

- Bathroom tile and grout
- Basement walls
- Areas around windows and sinks

Common sources of water/moisture include:

- Roof leaks
- Condensation from high humidity or cold spots
- Plumbing leaks and drips
- Floods
- Humidification systems
- Occupant behavior

What occupant behaviors can lead to increased water or moisture presence in a rental unit?

Some mold can germinate, grow, and produce spores in as little as 24 hours after water damage occurs.

Since moisture influences the growth of mold the most, moisture control is key to mold control.

Indoor relative humidity (RH) should be between 30% and 60% to reduce mold growth.

Normal humidity levels should range from 30% to 60% at all times.

Changing the conditions in a building can create perfect growth conditions for mold.

Food

In addition to moisture, mold needs nutrients to grow.

Mold can grow on virtually any organic substance. Organic material in buildings include:

- Paper
- Cloth
- Wood
- Plant material
- Soil

Molds decompose material and receive nutrients by secreting enzymes.

Some molds can digest synthetic materials such as adhesives, pastes, and paints.

Mold can also decompose surface dirt, dust, grease, and other deposits on concrete, glass, and metal.

Temperature

Mold grows well in environments between about 40 to about 100 degrees, especially between 70 and 90 degrees.

Often more than one mold type can be found growing in the same area.

A building is filled with an abundant supply of food, making it impossible to eliminate all sources of mold growth.

Unlike moisture, temperature, and food, time cannot be adequately manipulated to control microbial growth.

Time

Mold is capable of germination, growth, and sporulation in as little as 24 hours after water intrusion or damage occurs.

Many Factors Affect Building Conditions and the Presence of Mold

Finding and preventing mold growth is a science. Buildings are dynamic, or constantly changing, environments influenced by:

- Geographic location
- Season
- Weather conditions
- HVAC system operation, age, and design
- Moisture intrusion
- Pest colonization
- Human activity

How do people, building materials and building systems impact the growth of mold?

Finding Mold in Buildings

Things to consider about finding mold growth in buildings:

- Construction flaws
- System or components that are damaged or inoperable
- Evidence of deferred or delayed maintenance
- Occupant activities

What role do maintenance workers have in the presence and growth of mold in a building?

Moisture Content

Moisture Content (MC) is typically expressed as a percentage.

A common formula is (100 x [wet mass – dry mass]) / (dry mass).

To prevent mold growth on lumber and wood, the MC needs to be below 20%.

At a MC of 17%, virtually no microbial growth can occur on even the most susceptible materials.

Most pine dimensional lumber dries to about 19% MC or less. MC content is indicated on the lumber grade stamp.

Target moisture content for lumber varies based on the location

Relative Humidity

Mold growth does not require the presence of standing water, but can be influenced by relative humidity.

In order to control mold growth, a basic understanding of relative humidity (RH) is a must.

Warm air holds more moisture than cold air

As air cools, the RH goes up because cooler air has a lower moisture-holding capacity.

RH is expressed as a ratio (percentage) of the amount of moisture present in the air to the maximum amount air can hold at a specific temperature.

RH and temperature will usually vary within a room.

The cooler side of the room will always have a higher RH than the warmer side.

The highest RH in a room is always next to the coldest surface (the location where the RH reaches 100% and condensation first occurs.)

Typically, in the winter, this is an exterior wall because walls are cooler than the ambient room air temperature due to wall insulation voids. (Interior walls carry the average building temperature. The temperature of exterior walls varies with exterior temperatures.)

Local cold spots, along with water intrusion, may allow the RH of air next to a surface to exceed 70%.

To control condensation due to vapor movement, prevent warm, moist air from contacting cool surfaces.

A properly functioning HVAC system is an important component of mold control

Water can enter a building as a liquid or a gas

In areas like kitchens, bathrooms, and laundry facilities, liquid is introduced into the environment, but can be introduced accidentally through leaks and spills.

Smaller amounts of water vapor enter buildings through building features such as leaky roof assemblies, poorly flashed or improperly installed windows or doors.

How can maintenance workers limit the amount of water (liquid or gas) that can enter a building?

Controlling Condensation in Cold Climates

- Use insulation to prevent large temperature differences between air and surfaces
- Install vapor barriers on the WARM side
- Use ventilation to reduce indoor moisture levels
- Avoid the use of humidifiers – potential sources for mold growth

Controlling Condensation in Warm and Humid Climates

- Install vapor barriers on the *EXTERIOR* side in warm climates
- Try to avoid excessive cooling of interior spaces
- Avoid using impermeable vinyl or other wall coverings, and use permeable paints and wall coverings on interior surfaces

Windows

In winter, windows are usually the coldest surfaces in a room.

Historically, storm windows were used to control heat flow, but a side effect is controlling condensation.

Visible condensation on windows can alert inspectors to the need to identify the source of the condensation and to use ventilation to flush out moisture.

Prevention

To reduce mold growth:

- Eliminate sources of dampness in basements
- Use a dehumidifier
- Use an air conditioner with a high-efficiency particulate air (HEPA) filter attachment
- Change furnace filters
- Ventilate bathrooms
- Don't carpet bathrooms and basements
- Promote groundwater drainage away from housing
- Keep organic plant containers clean and dry
- Toss or recycle old books and newspapers

Chapter 2 Key Take-A-Ways:

- Buildings are constructed of materials that are rich in the nutrients that support mold growth.
- Once a building is affected by moisture intrusion, mold can start growing in very little time.
- Mold can grow on organic and inorganic material through surface dirt and dust.
- Temperature, food, and time cannot be adequately manipulated to control microbial growth, but moisture can.
- Indoor relative humidity (RH) should be between 30% and 60% to reduce mold growth.
- Mold does not need standing water to grow.

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Exposure to Mold Can Cause Health Problems in Certain People

The National Academy of Sciences (NAS) conducted a comprehensive literature review and analysis, and found there was sufficient evidence to link mold and other factors related to damp indoor environments with some upper respiratory tract symptoms, coughing, wheezing, and asthma in sensitized persons or people who already have respiratory problems, the elderly, or the very young.

Mold is most dangerous to people with respiratory problems, older people, and very young people

Negative Health Effects and Mold

Inhalation or touching mold can cause negative health effects in illness-prone individuals such as:

- Infants
- Children
- Elderly
- People with respiratory conditions (such as allergies and asthma)
- People with weakened immune systems (chemotherapy patients, those with HIV/AIDS, organ transplant recipients)

Molds produce allergens, irritants and in some cases, potentially toxic substances, or mycotoxins.

Mold does not have to be alive to cause allergic reactions.

Symptoms

There are many symptoms of mold exposure, and mold allergy symptoms may mimic other upper respiratory allergy symptoms.

Signs and symptoms of allergic rhinitis caused by mold allergy may include:

- Allergies
- Infections
- Irritations to eyes, skin, nose, throat, and lungs
- Nasal and sinus congestion
- Burning, watery, or red eyes
- Sore throats
- Dry cough and postnasal drip
- Sneezing
- Dry, scaly skin, or skin rash
- Fatigue

The symptoms listed, in addition to others, may be associated with exposure to mold, but all may be caused by other unrelated exposures or conditions, too.

Mold allergy symptoms may vary in severity depending on the person and can be contingent on weather and location.

The effects of mold exposure can be chronic or acute. An acute effect is an immediate, severe reaction typically occurring after a large exposure.

A chronic effect may take days, months, or years to manifest after long-term, repeated, small exposures.

Mold Allergy and Asthma

A person's asthma symptoms may be triggered by exposure to mold spores.

For mold-sensitive people, exposure to certain molds can cause a severe asthma attack.

Signs and symptoms of asthma include:

- Coughing
- Wheezing
- Shortness of breath
- Chest tightness

Infections

Only a small group of fungi have been associated with infectious diseases.

Aspergillosis is an infectious disease that can occur in immune-suppressed persons.

Several species of Aspergillus are known to cause aspergillosis.

The most common is Aspergillus fumigatus, but exposure to this common mold, even in high concentrations, is unlikely to cause infection in a healthy person.

Breathing in mold may cause hypersensitivity pneumonitis.

This is a rare condition that resembles bacterial pneumonia.

In addition, those with weakened or suppressed immune systems may have an infection after being exposed to mold.

Exposure to some pathogenic fungal infections can create flu-like illnesses, which can manifest into chronic lung issues – such as infections and obstructive lung disease.

These fungi include:

- Blastomyces – inhabits decaying wood
- Cryptococcus (Cryptococcus neoformans) – found in bird droppings
- Histoplasma (Histoplasma capsulatum) – found in bat droppings

In addition, there are studies that suggest an association between Stachybotrys chartarum and pulmonary hemorrhage/hemosiderosis in infants under six months old.

Smoking, alcohol, medication, and existing health problems are all potential factors that affect how a person reacts to mold exposure.

A ***pathogenic organism*** is an organism capable of causing disease in its host.

A ***human pathogen*** is capable of causing illness in humans.

Mycotoxins

When grown under certain conditions, some molds may produce potentially toxic byproducts called mycotoxins.

Some can be found in water-damaged buildings.

Exposure to mycotoxins can occur from inhalation, ingestion, and/or skin contact.

The toxic effects depend on the chemical or the material, the concentration, the route of entry, and the duration of exposure.

More than 200 mycotoxins from common molds are identified, and many more remain unidentified.

The amount and types of mycotoxin produced by a particular mold depended on many environmental and genetic factors.

Mycotoxin production is not visible to the naked eye.

For many mycotoxins, little health information is available.

Research is ongoing

Organic Dust Toxic Syndrome (ODTS) and Hypersensitivity Pneumonitis (HP)

These are not common outside of farm residences.

ODTS may manifest itself with flu-like symptoms after a single, heavy exposure to dust contaminated with fungi.

ODTS differs from HP in that it is not an immune-mediated disease and does not require repeated exposure to the same causative agent.

A variety of biological agents may cause ODTS, including common species of fungi.

HP may occur after repeated exposures to an allergen and can result in permanent lung damage.

Contaminants

Mold is not the only potential contaminant in damp buildings.

Biological and non-biological contaminants, other than mold, may also be present and cause negative health effects.

Damp buildings attract rodents, dust mites, cockroaches, and other pests.

Damp or wet building components and furnishings may emit interior chemicals.

For more info on damp building and potential health effects, refer to the Institute of Medicine's 2004 report, "Damp Indoor Spaces & Health."

Chapter 3 Take-A-Ways

- Maintenance staff should never offer medical advice to tenants/occupants.
- Symptoms of mold allergies mimic other human illnesses.
- Young children, the elderly, or those with weakened immune systems may be most susceptible to mold exposure.
- Mycotoxins are not visible to the naked eye.
- Mold is not the only potential contaminant in damp buildings.

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Types of Assessment

There are two (2) primary forms of assessment used to detect mold.

The first is a non-intrusive visual inspection.

The second is a scientific assessment that may include the following techniques:

- Swabs
- Tapes
- Bulk samples
- Air sampling

A non-intrusive visual inspection is considered the lowest level of confirmation of mold.

When visual confirmation cannot be made, the next level of confirmation of mold would be scientific, which includes swabs, tapes, bulk samples and air sampling, and then intrusive.

Swabs, tapes and bulk samples are considered the lowest form of scientific confirmation as it only addresses a small localized area of possible mold growth.

Swabs, tapes and bulk samples are capable of identifying mold types, but typically do not indicate the size of a mold contamination even though a lab technician may state their opinion about the extent of the contamination, based on the parts of mold structures found.

Some dry or dormant molds found on building materials can be tested, however, may be non-viable and do not greatly impact or contaminate the air.

Sampling is a method of collecting evidence from the air or other materials by taking measurements in a few areas or at a few points.

Sampling for mold should be conducted by professionals with expertise in sampling methods and experience interpreting sampling results.

Air sampling not only confirms the presence of mold spores and types, it also indicates the quantified amount of mold spores in the air.

This information can then be interpreted to understand one potential impact to health as mold spores caught in the air can be inhaled into the lungs.

Mold spores found in the air are typically viable, meaning a living source or indoor reservoir exists.

Intrusive investigation would require physically removing building materials until the mold contamination is found.

Conducting a Non-Intrusive Assessment

A non-intrusive assessment does not cut or drill into any building materials.

The affected area can be tested for moisture by using a moisture meter and noting any anomalies.

Some assessors take pictures of any areas of concern to later include in a report.

The assessor can also take temperature readings.

An ***area of concern*** could be a room or area with moisture intrusion, water damage, musty odors, visible, apparent mold growth, and/or, conditions conducive to mold growth.

The Purpose of a Non-Intrusive Inspection

Non-intrusive inspections are used to:

- Report moisture intrusion
- Note water damage
- Note apparent mold growth
- Record the presence of musty odors
- Report conditions conducive to mold growth

Non-intrusive assessments are typically performed by maintenance staff.

Noticing bulging dry wall, blistering paint, or discolored wood could be signs of conditions conducive to mold growth

Intrusive Inspection

An intrusive inspection means the mold assessor will use tools and meters to penetrate selected walls, ceilings, or floors to examine conditions behind those surfaces. This type of assessment may include selective demolition.

Types of Mold Assessment

If there has been water damage, there may be mold growth.

Wood components, drywall, carpeting, plaster, wallpaper, and many other building materials provide favorable conditions for mold growth.

An inspection conducted by a certified mold inspector includes a non-invasive, visual examination of the readily accessible, visible, and installed systems and components.

Maintenance staff should report all moisture intrusion, water damage, musty odors, mold-like substances, and/or conditions that would encourage mold growth.

Other elements to consider when evaluating a building for mold include:

- Construction flaws to systems or components (poor or negative exterior grading, excessive overgrowth of brush, known obsolete building materials, evidence of poor previous maintenance repairs, etc.)
- Damaged or inoperable systems or components
- Evidence of delayed or deferred maintenance

An item or component is ***readily accessible*** if, in the judgment of the inspector, it is capable of being safety observed without movement of obstacles, disconnection or disengagement of connecting or securing devices, or other unsafe or difficult procedures to gain access.

General Guidelines for Evaluating a Building for Mold Growth

It is important to note, in order to address possible indoor fungal (mold) growth, mold inspectors must conduct an interview with the affected tenants and a visual examination to the EPA Standards of Practice.

Proper data collection and the handling of the findings are required for a credible report.

Where fungal (mold) exposure may be involved, the mold inspector should form a hypotheses based on an interview with the tenant regarding their adverse conditions.

Ask the tenant:

- Their concerns about mold (this will typically be potential negative health effects)
- The reasons why they are requesting a mold inspection (typically health, aesthetics, and structural integrity concerns)
- What relevant information they expect to receive from the inspector
- Set expectation

Types of Hypotheses

A hypothesis is a proposition advanced as an explanation for the specific observation or condition experienced.

Mold inspectors often start with a working hypothesis to guide their investigation and determine the most appropriate course of action.

There are generally four (4) types of hypotheses about fungi in an indoor environment that the inspector can develop:

1. No mold growth in the building (null hypothesis)
2. A musty odor indicates mold growth (aesthetic hypothesis)
3. The occupant's health is being affected by mold exposure (affected health hypothesis)
4. Structural damage has been caused by mold growth (damage hypothesis)

The inspector starts with the null hypothesis (i.e., no mold growth). If the evidence collected rejects that hypothesis, then one of the other hypotheses may be supported.

Assessing the Presence of Mold

Use Your Senses

As a maintenance professional, you see things every day that tell you if your buildings are functioning properly.

You also speak with residents on a daily basis and receive information about living conditions.

By simply making the following observations during your daily routine, you add a wealth of information to the on-going health of the buildings you maintain and the safety of its residents.

A visual assessment is the most important first step.

Look for substances that appear cottony, velvety, granular or leathery, and have varied colors, including:

- White
- Gray
- Brown
- Black
- Yellow; and/or
- Green

Mold often appears as discoloration, staining, or fuzzy growth on the surface of building materials and furnishings.

Walk around the subject property/unit.

Watermarks on cinderblock or bricks can lead to complaints of bad smell in units

Check the general grading of the ground around the perimeter of the building.

The ground around the building should be sloped away from the building's foundation.

Examine the downspouts and discharge of the roof water.

Water discharged from downspouts should be directed at least 4 to 6 feet away from the foundation.

Examine storm water collection systems.

There should be no standing water for more than 12 hours after a rainstorm.

Note the condition of all exterior siding and trim.

Trim around doors and windows should be watertight.

Evaluate the condition of sealants.

Inspect weep holes where required.

Evaluate the roof either from the ground with binoculars, from the eaves on a ladder, or by accessing the roof surface.

Inside and out, examine patched surfaces and look for stains and water marks.

Measure for wet, damp, and moist areas.

Inspect bathrooms by running the water at all fixtures.

Check for leaks and signs of previous leaks and repairs.

Check the exhaust fans and the location of where they discharge.

Kitchen appliances and fixtures should be operated and evaluated.

Check the dishwasher and refrigerator for leaks or drips.

HVAC systems humidifiers should be checked for mold and check to ensure dehumidifiers are discharged properly.

The drip pan and coils fins should be checked for mold growth.

There should be no standing water in any collection pans.

Enter crawlspaces to ensure there are no insulation or ventilation problems.

Exposed dirt floor should be sealed with a vapor barrier.

Check all plumbing lines and duct work that passes through the crawlspace for evidence of condensation.

Basements should be inspected.

Check all masonry wall for efflorescence, and check the sump pump and its discharge line.

Carpeting in the basement should be discouraged.

Check any part of an accessible attic for proper and adequate ventilation and insulation.

Check clothes dryer exhaust vents.

Inspect for the proper ventilation of the exhaust of all combustible appliances, including all fuel-fired heating systems and water heaters.

If you are unsure if something could be mold, presume it is mold and correct the problem.

Poor elevation causing standing water may not reveal a problem until you look inside the building and discover water has penetrated the outside walls into the basement.

Note any musty odors: some microbial compounds (known as Volatile Organic Compounds – VOC) produced by mold have strong, unpleasant smells. VOCs can spread throughout the inside of the building.

Interview (ask) the Occupant: If the residents relate experiencing allergic reactions or symptoms in a particular area of the building. It may be a clue that mold is present.

Equipment that May be Used During Mold Evaluation

- Culture swabs used for visual surface sampling and typically are accompanied with containers to storage and transportation
- Carpet cassettes are designed for collection of fibers and particulate from carpet and dusty areas
- Bio-tape is a quick way to determine possible microbial contamination and inorganic dust contamination. It is typically used on smooth surfaces and around or on valuable or fixed (immovable) materials.

- Air sampling equipment such as:
    - Air pumps—with a pump range strong enough to force air through a one-time use devise like a sampling cassette. There are numerous types of air pumps

Centrifugal sampler—creates a vortex of air to trap participles on a semi-solid medium. Medium is typical Agar: a gelatinous substance used in biological culture media

Sampling

The non-intrusive visual inspection may result in a decision to conduct a more scientific evaluation of the conditions.

Samples are taken by a certified mold inspector (in states where such certification is required) and tested by a laboratory to confirm the presence and type of mold found.

Samples must be collected in a manner that is consistent with the laboratory's requirements.

Not everything that looks like mold is mold. Many substances may look like mold, such as:

- Alkaline crystals on soil or concrete
- Carpet stains
- Certain spider webs
- Fine dusts
- Dried paint spray
- Dried mud
- Water stains
- Soot

Many of these substances can also have mold spores in small amounts.

The types of mold present can often be determined through laboratory analysis of the air samples:

- Can help provide evidence of the scope and severity of a mold problem
- Can be confounded by outdoor air that enters the building bringing mold spores with it
- Can aid in assessing human exposure to mold spores
- After remediation, new samples are typically taken

Your next move in developing a mold prevention or mediation strategy may start after sampling.

What Questions Can Be Answered After the Assessment?

Generally, there are 8 questions that can be answered by a visual examination and mold sampling:

1. Is there water intrusion, damage or condensation in the building?
2. Are there any components of the building that are water-damaged?
3. Are there musty, moldy odors in the building?
4. Is there any visible, apparent mold?
5. Is that which is visible actually mold?
6. Are there indications of hidden mold growth?
7. Are there conditions conducive to mold growth?
8. What should be done if mold growth is discovered?

Apparent mold is visible growth with characteristics of mold.

When to Seek Assistance from a Professional Mold Remediation Contractor

PHAs must determine when to seek assistance from a professional mold remediation contractor. Below is a partial list of factors and conditions that may be considered:

- The source of the mold is uncertain
- There is mold (fungi) related structural or aesthetic effects
- Litigation is involved
- Health concerns

An assessment of the relationship between a person's sensitivity to fungi and symptoms should be determined by healthcare professionals

Professional Certification for Mold Inspectors

A Certified Mold Inspector is a specialist who has been professionally trained to assess both the presence of microbial contamination and the source of any underlying moisture intrusion.

States, Counties and Cities may have additional registration or licensing requirements for mold inspectors/assessors.

Know what your jurisdiction requires.

Your safety is just as important as the safety of the residents in your buildings. You use tools every day to assist with your work. The information here is to provide you another tool to utilize while performing your day to day tasks. You are the front line to safety and security and the health of your properties, your residents, and yourself.

Chapter 4 Take-A-Ways

- Maintenance professionals should familiarize themselves with all applicable governmental standards, including, but not limited to HUD, EPA, CDC and OSHA.
- Mold inspectors are trained to not guess. Guessing is not considered accurate, proper reporting, or proper due diligence.
- Maintenance staff commonly conduct non-invasive, visual examinations of the readily accessible, visible, and installed systems and components of residential buildings and units.
- The term “visible mold” should NOT be used in reference to actual mold growth. The term “visible, apparent mold” is accurate.
- Mold spores are not visible to the naked eye.
- Not everything that looks like mold is mold.
- Sampling may help to locate the source of mold contamination.
- Know when to seek advice of mold professionals (inspectors and remediation contractors)
- Most laboratories need only a little sample of the suspected substance to determine whether it is mold and the type of mold.

Remediation

The Environmental Protection Agency (EPA) has specific guidelines to ensure the safety of those removing mold and for controlling the spread of mold through the removal process.

Before any mold is removed, it is important to identify and assess the contamination areas and the severity level.

This will determine whether limited or full containment must be used during the removal process.

Typically, the level of containment needed is determined by: the size of the largest area affected, which leads to a higher chance of exposure and the risk of spreading to other areas.

If the mold infestation is severe, but only in a small area, it could warrant full containment measures.

Always consider wearing at least the minimum protection when first assessing mold contamination.

Limited Containment

In most cases, areas smaller than 100 sq. ft. require only limited containment before removal of the mold can begin.

All vents and outside airways must be sealed.

Full Containment

In larger areas or cases of heavy mold growth, full containment is needed. This includes:

- Using a double layer of polyethylene sheeting
- There should be an airlock space between the mold removal area and the clean area where workers enter or leave the space
- Exhaust fans should be used to create negative pressure.
- Negative pressure helps prevent mold and other dust from spreading beyond the work area.

Protection Levels for Mold Removal

In addition to using limited and full containment, there are four levels of protection that should be adhered to when removing mold.

These levels are designated with level I as the smallest or least dangerous, with level IV being the largest or most serious type of mold infestation.

Level I

For small areas, usually less than 10 square feet:

- The mold remediation can be performed by anyone trained in mold removal using OSHA standards
- The affected area should be unoccupied except by those performing the remediation
- Workers should use respiratory protection, gloves, and eye protection
- Equipment should be cleaned or removed from the area in sealed containers
- Misting the area to deter dust is recommended

The area should be cleaned after mold is removed.

Wipe down all floors and horizontal flat surfaces.

Level II

For slightly larger areas than level I, usually up to 30 square feet:

- Similar protection should be used as Level I. This is often a wall or ceiling area that has not spread to the rest of the room
- It is recommended to use polyethylene sheeting to contain the area and protect other areas nearby

In addition, the area should be HEPA vacuumed before wiping or mopping the area.

Level III

For mold infested areas between 30-100 square feet:

- Remediation should be performed by a professionally trained mold remediation specialist
- Require that the full area be sealed off from the rest of the building
- It is recommended that no one occupy the adjacent areas while the work is being performed

All precautions used for Levels I and II should also be followed.

Level IV

For heavy mold infestations or areas larger than 100 square feet:

- Mold remediation should only be performed by a trained professional
- The workers should be wearing protective gear, including full HEPA respirators
- The area will need full containment with an airlock and the use of negative pressure using exhaust fans
- Workers will need a decontamination area to remove protective gear and clean equipment if walking or entering into a clean area
- Any contaminated gear or equipment that cannot be cleaned in this area needs to be removed in sealed bags or containers

By using the correct procedures and precautions during mold removal, the hazard can be contained while keeping workers safe.

All mold remediation should only be performed by those trained in these techniques and safety procedures to ensure they are protected from harm while effectively removing this potentially dangerous fungus.

The EPA containment recommendations four protection levels can ensure safe removal of mold.

Maintenance Best Practice

There are many reasons that that you may see "apparent mold" in a unit.

First, you may not have been paying attention for mold during the performance of other work orders.

It could also be that the resident has ignored their responsibility to report maintenance conditions.

Or the resident has not allowed you access for regular inspections for some time.

Nevertheless, when responding to maintenance calls or performing unit turnaround work in other units in the same building, you might want to check for mold in the same approximate areas in those units.

Maybe it is a common problem with the units.

Say, a pipe may be running through the same wall, leaking and effecting more than one unit?

Example of a Mold Remediation Protocol

A mold remediation protocol plan varies greatly from case to case.

Such factors include causes of mold contamination, locations of affected areas, methods of containment, and remediation and so on.

Each remediation protocol is different and unique.

- Seal off all surrounding areas with (6) mil plastic and mold free zones of the building/home by use of a negative air pressure containment system. This system will isolate the work area and prevent the mitigation of contaminants to the unaffected areas of the home
- Seal and protect contents with 6 mil plastic to prevent cross contamination in home
- Install negative air scrubbers in interior and attic of the home to remove airborne spores/particles and to further isolate the environment
- Removal of bathroom ceiling
- Removal of hallway ceiling and all affected wood flooring
- Removal of living room closet ceiling and all affected flooring
- Removal of living room ceiling and all affected wood flooring

- Removal of dining room ceiling and all affected wood floor
- Removal of kitchen ceiling and interior wall
- Removal of bedroom one (1) ceiling and all affected walls
- Removal of bedroom two (2) ceiling and all affected walls
- Removal of bedroom three (3) ceiling and all affected walls
- Removal of affected plaster ceiling on first floor
- Bag and dispose
- Clean, scrub, and disinfect affected areas within interior, attic, and all three (3) bedrooms of the home, as well as contents within interior with an EPA registered antimicrobial/antifungal disinfectant
- HEPA vacuum surfaces to remove dead spores
- Scrape, clean, scrub, and disinfect affected pantry
- Encapsulate affected pantry

Personal Protection Equipment (PPE)

PPE is used to protect people from hazardous vapors, gases, and particulates that they may come across in their work.

Personal protection equipment for mold include respirators (minimum N-95) gloves, protective clothing, and goggles.

- According to the CDC, the N-95 respirator is the most common of the seven types of particulate filtering face piece respirators. It filters at least 95% of airborne particles, but is not resistant to oil

Personal hygiene habits are important to reduce exposure for remediation workers and inspectors.

There are different levels of PPE corresponding to the potential for exposure to hazards

Sources:

www.epa.gov/mold

Chapter 5 Take-A-Ways

- The level of containment required is determined by the size of the largest affected area.
- The EPA established specific guidelines to ensure safety of those removing mold and to control the spread of mold during the process.
- There are four protection levels for mold removal.
- A mold remediation protocol plan varies greatly from case to case.
- The use of personal protective equipment is critical to ensure safety and sample integrity.

Preventing Mold Growth

The most important element of mold prevention is moisture control.

- Keep all materials and furnishings dry
- When anything gets wet, immediately remove the water/moisture and quickly dry the affected areas (within 48 hours)
- Perform regular inspections and keep all systems in good repair
- As soon as possible after a severe or extreme weather event, conduct a thorough site check of all roofs, gutter, downspouts, splash blocks, and grading
- Routinely inspect basements, crawlspaces, and evaluate roofs
- Pay particular attention to areas that are out-of-sight that may have gotten wet (behind walls, in ceilings, and attics)
- Regularly clean furnace humidifiers and ducts, as well as stand-alone humidifiers. Humidifiers should be set to produce less than 60% relative humidity in the building. Higher settings can produce condensation
- Check furnace drain and condensate lines
- Make sure all sump wells and pumps are working as intended
- Maintain proper positive grading around all foundations

- Establish routine maintenance – areas frequently subject to, or known as past mold problems, should be evaluated and maintained
- Advise residents NOT to leave wet clothes in the washing machines where mold can spread quickly. Hang them to dry — preferably outside or in areas with good air circulation

Mold Prevention Advice

Insure there is proper ventilation is all indoor areas of possible high humidity (kitchens, bathrooms, basements, laundries, etc.).

You may inadvertently cause a negative change in airflow.

Boarding up windows of vacant or damaged units will change the flow of air through a building.

Be aware of the changes you make on a day to day basis to your buildings and units that could help mold flourish.

Investigate these items as soon as possible: areas that smell musty, blistering or peeling paint, or stained wall surfaces/coverings, areas where condensation occurs, or you observe standing water.

Use mold-resistant products like mold-resistant drywall or mold-resistant sheetrock and mold inhibitors for paints when renovating.

Check for full or damaged gutters.

Have gutters cleaned regularly and inspected for damage.

Repair them as necessary, and keep an eye out for water stains after storms that may indicate a leak.

Encourage tenants not to block airflow by allowing furniture and draperies to block supply grilles. Blocked grilles prevent the HVAC system from circulating air properly.

You may notice a resident has a habit of allowing draperies or other flammable items to touch heating elements.

No doubt you would speak to that resident about the fire hazard.

You may observe the same items placed in front of or on top of HVAC or other air flow mechanicals vents and mechanicals.

Just as you would speak to the tenant about the fire hazard, mention the mold hazard, too.

Five Unexpected Areas Where Mold May Grow

1. **Chimneys**: Brick crevices collect water, dirt, and other organic debris. Rusted chimney caps and faulty flashing lets in rain and snow, encouraging mold to grow.

2. **Refrigerator Drip Pans**: It's a rarely noticed place under your fridge that collects moisture and food spills.

3. **Front Loading Washing Machines**: The gasket around the door on front-loading washing machines often stays wet because the door is usually closed when not in use. Add some lint to the moisture, and mold may grow.

4. **Window Sashes and Sills**: Condensation provides the moisture; dirt and dust supply food.

5. **Dirty Dishes**: When you stack dishes in the sink for an extended time that are wet and have food remnants, mold has the perfect environment to grow.

Mold Mythology

Myth 1 - Housing Units Should be Completely Free of Mold

False.

Mold spores are part of the natural environment and are all around us when we are inside and outside.

It would be virtually impossible (and totally unnecessary for most people) to remove every last mold spore from your home. Mold is only an issue when its concentration reaches unhealthy levels, typically as large, visible colonies.

Myth 2 – Mold is Harmless

While you can't completely remove mold from your home, it should not be allowed to grow unchecked.

The health effects of mold are still unclear and depend a great deal on the person, their immune system, and the amount of exposure. But there's absolutely no question that mold can and will damage your property and personal belongings if allowed to grow on them.

Myth 3 – Bleach Kills Mold

Blanket statements like this are rarely completely true.

Bleach can kill certain kinds of mold on nonporous surfaces.

However, it is unclear if it kills all kinds of mold on every type of surface.

Myth 4 – A Small Amount of Mold Does Not Indicate a Problem

False.

A small amount of mold, especially adjacent to an area you can't see, could be just a small indication of a much larger problem that should be properly investigated.

Additional Resources and References

HUD Office of Lead Hazard Control and Healthy Homes (OLHCHH)

www.hud.gov/program_offices/healthy_homes

Environmental Protection Agency (EPA)

www.epa.gov/mold

Centers for Disease Control and Prevention (CDC)

www.cdc.gov/mold/default.htm

Occupational Safety and Health Administration (OSHA)

www.osha.gov/SLTC/molds/

National Institute of Environmental Health Sciences (NIH)

www.niehs.nih.gov/health/topics/agents/mold/index.cfm

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