



Risk navigator

Incidental mold awareness for contractors



Environmental

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About Markel's Risk Solution Services team

Risk Solution Services provides technical insight related to existing and potential insured risk at Markel. The team partners with our customers, claims, and underwriters to educate on both current and future risk trends and supports our clients with a comprehensive offering of risk management solutions.

We do this by engaging with clients, underwriting, and claims teams.

E-mail our team at risksolutions@markel.com.



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Maintenance and remediation of mold

During the normal course of your profession, you as a contractor, your employees, and/or your subcontractors may find yourselves in situations where you encounter incidental mold(s). This document is designed to provide you, as a contractor, with basic information pertaining to mold, bring to your attention issues to consider when mold is encountered and poses questions to be asked when mold, incidental to your normal contract activities, presents itself.

Current mold remediation guidelines generally classify mold work as either “maintenance” or “remediation,” based on the scale of the work involved. Maintenance is typically defined as involving small areas of mold contamination and tends to involve low-level exposure while remediation work is assumed to be large-scale, extensive work with associated higher levels of exposure. It is important for construction personnel to be able to differentiate maintenance from remediation work and to further be able to distinguish incidental from maintenance. This document in conjunction with jurisdictional and industry guidelines may assist you in your efforts to provide a safe and hazard-free working environment when encountering incidental mold. Incidental mold exposure would generally fall under the training auspices of maintenance rather than remediation based on project size, work practice and duration variables. However, caution should be exercised that minor encounters with mold do not escalate into remediation efforts as a different and more complex level of training is necessary for remediation efforts.



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What is mold?

Molds (moulds) are fungi that can be found both indoors and outdoors. Estimates of numbers of species of fungi range from tens of thousands to 300,000 or more with approximately 500 fungal species described as human pathogens that can cause infections. Multicellular fungi with visible growth consisting of branching filamentous structures are popularly known as molds. Molds grow best in warm, damp, and humid conditions, and spread and reproduce by making spores. Mold spores can survive harsh environmental conditions, such as dry conditions, that do not support normal mold growth, as well as, many types of cleaning agents.

Microbial pollution is a key element of indoor air pollution. It is caused by hundreds of species of bacteria and fungi, in particular filamentous fungi (mold). Microbial indoor air pollutants of relevance to health are widely heterogeneous, ranging from pollen and spores of plants coming mainly from outdoors to indoor locations; to bacteria, fungi, algae, and some protozoa emitted outdoors or indoors.



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Types of mold

Mold exposure, particularly exposure to indoor mold, can cause a variety of health effects, including severe allergies and respiratory affects. Molds can grow on almost any organic substance as long as moisture and oxygen are present; and affects can be exacerbated when mold growth is undiscovered and/or unaddressed. Many types of molds exist and all molds have the potential to cause health effects. Public concern regarding indoor mold has been on the rise as the public has become more aware of the associated health risks. One method of risk classification oftentimes utilized is to group indoor fungi into hazard classes based on associated health risk. These classes are similar to risk groups assigned to microorganisms handled in laboratory environments. They are:

- **Hazard class A:** includes fungi or their metabolic products highly hazardous to health. These fungi or metabolites should not be present in occupied dwellings. The presence of these fungi in occupied buildings requires immediate attention.
- **Hazard class B:** includes those fungi which may cause allergic reactions to occupants if present indoors over a long period.
- **Hazard class C:** includes fungi not known to be a hazard to health. Growth of these fungi indoors, however, may cause economic damage and; therefore, should not be allowed.

The most common indoor molds include:

- **Cladosporium** (hazard class B) – Produce olive-green to brown or black colonies and have dark-pigmented conidia that formed in simple or branching chains. Rarely pathogenic to humans but can cause infections, sinusitis and pulmonary infections. Commonly found on wallpapers.
- **Penicillium (hazard class B)** – Colorless hyphae with many branches, conidia resembling brooms and conidiospores often green in color. Over 300 species many of which produce highly toxic mycotoxins. Generally found on mattresses and carpets.
- **Alternaria (hazard class B)** – 40-299 species (depending on source) in thick colonies usually green, black or gray. Common allergen, causing hay fever or hypersensitivity reactions sometimes leading to asthma and can cause opportunistic infections. Serious infections are rare.
- **Aspergillus (hazard class A)** – at least 200 known species. Some species are toxigenic or pathogenic requiring immediate remediation, some are a health risk and others cause hypersensitivity pneumonitis or malt worker’s lung. May produce dry hydrophobic spores easily inhaled. Commonly found in kitchens, bathrooms, mattresses, and carpets.

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Why does mold grow?

Molds reproduce by making spores; when mold spores land on a damp surface indoors, they may begin to grow. The elimination of “all” indoor mold and mold spores is not practical, but mold growth can be controlled through moisture control. The most important means for avoiding adverse health effects is the prevention (or minimization) of persistent dampness and microbial growth on interior surfaces and in building structures.

And as the most important effects are increased prevalence of respiratory symptoms, allergies, asthma, and the perturbation of the immunological system most mold studies, concerns, and remediation revolve around:

- Building dampness
- Moisture control and ventilation
- Health effects associated with dampness and mold
- Human health risks

Common contributing factors to mold reproduction and growth include:

- High relative humidity (RH) above 60%
- Leaks and condensation
- Inadequate ventilation
- Water accumulation in or beneath a building/structure (rain, snow, flooding, broken water pipes, etc.)
- Uncontrolled moisture source (landscaping, gutters, improper construction including building envelopes, window and door installation, roofs, crickets, chimneys, etc.)



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How to recognize mold contamination

Common ways to recognize mold contamination include:

- Smell (musty, earthy, fruity, mildew smell) – sniff test
- Discoloration
- Hair-like, fuzzy projectile growths (appearing as if miniature soft stalagmites, stalactites-type growths)
- Building occupant health complaints
- Moisture presence (wet spots, standing water, water stains)

Common places mold can be encountered include:

- Along pipes and pipe fittings
- Bathrooms (behind tiles, under tubs and showers)
- Basement walls
- Crawl spaces
- Windows (around and beneath)
- Leaky sinks and water fountains
- HVAC systems (drip pans, plugged drains)
- Drywall and inside walls
- Ceiling tiles
- Behind wallpaper, vinyl wall covering, and chalkboards

Once encountered, building materials upon which mold may be found can generally be described as either porous (water-absorbing), non-porous, or semi-porous.

- **Porous materials** (e.g. drywall, carpets, insulation, ceiling tiles) are penetrated by mold making them difficult to clean. If saturated for over 48 hours they should be removed.
- **Non-porous materials** (e.g. glass, metals, hard plastics) can be dried, cleaned, and reused.
- **Semi-porous materials** (e.g. wood and concrete) can be cleaned if they are structurally sound; but should otherwise be removed depending on extent of damage.

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What contractors should watch out for

Telltale signs of poor mold prevention initiatives for contractors to watch out for include:

- Lack of performance of regular building inspections and maintenance paying close attention to sources of moisture (condensation and wet spots).
- Lack of diligence about cleaning and drying wet spots within 24-48 hours, fixing leaking plumbing, and fixing leaks in the building envelope.
- No remediation steps for any evidence of mold once it has started.
- No effort to keep foundations as dry as possible; provide drainage and sloping the ground away from the foundation.
- Not ensuring heating, ventilation, and air conditioning (HVAC) drip pans are clean, flowing properly, and unobstructed.
- No performance of regular HVAC inspection and maintenance.
- No attempt to reduce indoor humidity to 30-60% relative humidity.
- Not venting bathrooms and moisture generating appliances to the outside, no use of de-humidifiers, not increasing overall ventilation.
- Not preventing condensation by adding insulation or through temperature regulation.
- Abandoned or generally unmaintained property.



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Guidelines from external sources

Though there are few applicable OSHA standards, there are guidelines from governmental organizations and consensus bodies. Unfortunately, most are over ten years old. However, several guidance documents have been prepared to address assessment and remediation of indoor mold and/or various related issues including documents from OSHA, EPA, ACGIH, Health Canada, NIOSH, NYC to name a few. The Institute of Inspection Cleaning and Restoration Certification (IICRC) - S520 Standard and Reference Guide for Professional Mold Remediation) is considered to be one of the most comprehensive. IICRC S520 defines three mold conditions:

- **Condition 1 (normal fungal ecology)** - an indoor environment that may have settled spores, fungal fragments or traces of actual growth whose identity, location, and quantity are reflective of a normal fungal ecology for a similar environment.
- **Condition 2 (settled spores)** – an indoor environment which is primarily contaminated with settled spores that were dispersed directly or indirectly from a Condition 3 area and which may have traces of actual growth.
- **Condition 3 (actual growth)** – an indoor environment contaminated with the presence of actual mold growth and associated spores. Actual growth includes growth that is active or dormant, visible, or hidden.

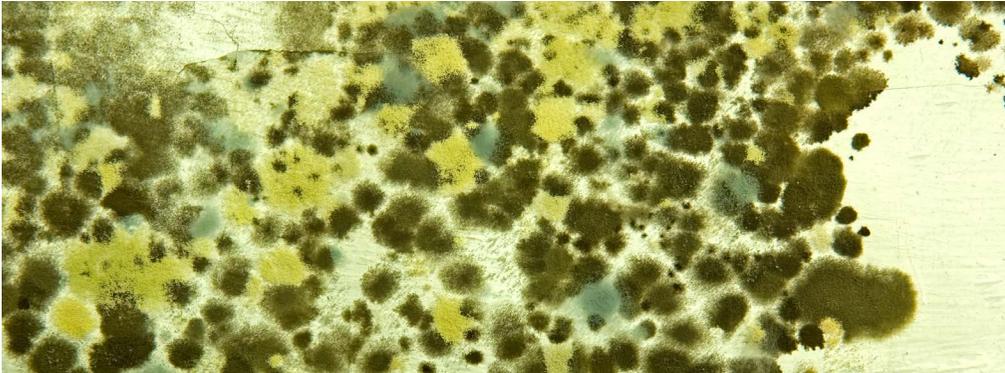


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The five-step approach to mold remediation

Several entities refer to a five or more “step” approach to mold remediation. The steps though varying somewhat depending on the source usually include:

- **Step 1 | Health and safety of workers and occupants**
 - Protect workers, occupants, and other potentially-exposed personnel from exposure hazards.
 - Use appropriate Personal Protective Equipment (PPE).
- **Step 2 | Documentation**
 - Obtain independent third-party assessment (lab analysis).
 - Obtain independent third-party assessment from an industrial hygienist or other environmental health and safety professional with experience performing mold remediation before beginning work in those cases where a large area of mold is encountered or suspected (usually designated as being more than 30 square feet.).
 - Determine extent and condition (1, 2, or 3) of mold growth for pre-remediation documentation.
 - Photo document pre, ongoing, and post-remediation processes.
 - Maintain contracts, scopes of work, and detailed work or activity logs.
- **Step 3 | Source control**
 - Utilize engineering controls: HEPA vacuum, temperature and humidity controls, negative air pressure, ventilation, area containment.
 - Utilize source containment: Prevent aerosolizing, hang polyethylene sheeting/erect isolation barriers, mitigate sources of moisture, apply fungicide.
- **Step 4 | Source removal**
 - Remove contaminated surfaces and/or,
 - Utilize engineering controls (encapsulate, sealants, etc.).
- **Step 5 | Prevention**
 - Identify source(s) of moisture.
 - Correct/control source(s) of moisture.

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Issues to consider

Issues for contractors and their personnel to consider:

- The amount of water on or in materials is the most important trigger of the growth of mold.
- Relative humidity is the next most important trigger of the growth of mold.
- Molds propagate rapidly wherever water is available.
- Dust and dirt normally present in most indoor spaces provide sufficient nutrients to support extensive microbial growth.
- Building standards and regulations with regard to comfort and health do not sufficiently emphasize requirements for preventing and controlling excess moisture and dampness.
- In the absence of dose-response data for workers exposed to mold, it is prudent to provide respiratory protection and training.
- It is recommended by OSHA, EPA, and the American Industrial Hygiene Association, NIOSH-approved N-95 disposable respirators should be the minimum level of respiratory protection provided for lower exposures in maintenance work.



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- Apart from its entry during occasional events (e.g. water leaks, heavy rain and flooding) most moisture enters a building in incoming air.
- Regardless of the type of mold, it should be treated as a potential health hazard.
- Some molds produce volatile organic compounds (VOCs) or microbial VOCs (mVOCs).
- Some molds (toxigenic molds) are capable of producing toxins (mycotoxins) under specific environmental conditions.
- Changes in building construction practices, initiated during the 1970s energy crisis, led to more tightly sealed buildings which may lack adequate ventilation to prevent mold growth.
- Earlier-constructed buildings though not as tightly sealed as later buildings may have multiple entrances for moisture.
- The combination of poor ventilation and tightly sealed buildings results in an increased propensity for moisture buildup and mold growth.
- Portable structures have a higher propensity for mold growth oftentimes due to the potential for increased moisture accumulation. These structures tend to have moisture problems because they are more likely to:
 - Have direct outdoor access (direct entry for water during precipitation events)
 - Be used for high-traffic purposes, which may result in water being tracked in on shoes, umbrellas, or jackets.
 - Utilize HVAC systems that function poorly and provide less efficient ventilation with outside air than HVAC systems utilized in permanent structures
- It is important that building inspections, including assessment of moisture buildup and mold growth, be performed on a regular basis. If a regular inspection and maintenance schedule is in place, moisture problems and mold growth are more likely to be identified and addressed in a timely manner.
- Contractors utilized for mold remediation projects should only utilize personnel properly trained in mold remediation procedures.
- Contractors should have a comprehensive waste management program and specialized assessment and abatement resources.
- A building may require vacancy during mold remediation. Building occupants and employees are often the parties that bring air-borne mold issues to a building owner's attention.

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Questions to ask when you encounter mold

The following questions should be asked when mold, incidental to normal contract activities, is encountered:

- When was the building constructed? Buildings constructed during the 1970s, 1980s and 1990s are at a higher risk for mold growth due to construction practices during that time period (more tightly sealed).
- How big an area is involved? Small areas are generally considered less than 30 square feet (although some jurisdictions may delineate a “mid-sized area being between 10 and 30 square feet.); large areas are generally considered 30-100 square feet; extensive areas are generally considered over 100 square feet. Generally, smaller areas require less control when remediating. OSHA, EPA, NYC, Health Canada and ACGIH all differ slightly in their categorizations.
- Are there potential hidden areas where additional mold propagation could have occurred?
- Are there any situations at the work site which would exacerbate the mold situation?
- Are your personnel going to perform the remediation or are subcontractors going to be utilized?
- How are workers going to be protected during the mold remediation? Worker protection is generally categorized as either engineering controls, work practices, or Personal Protective Equipment (PPE).
- Does the facility include any temporary structures/portable classrooms? These structures are known for having poorly functioning HVAC systems and increased likelihood for water intrusion. Both of these factors make temporary structures/portable classrooms more susceptible to mold growth.
- What kind of maintenance schedule is in place for the facility? Is moisture accumulation and mold growth included in routine inspections? Delayed identification of moisture accumulation and mold growth may result in more expensive remediation costs.
- Do you have a plan to avoid exposing personnel and others to mold-laden dusts as you conduct mold cleanup activity?
- Caution should be used to prevent mold and mold spores from being dispersed throughout the air where they can be inhaled by building occupants.
- Does your plan include and mandate proper disposal and/or cleaning of clothing of your workers? Contaminated clothing should not be worn or taken outside an exposure area as there could be a secondary spreading of mold and mold spores to other areas (e.g. the worker’s home, child’s school, other customer’s premises, your work place, etc.)
- Are your personnel trained in identifying early signs of mold growth and/or moisture damage?
- Are your personnel familiar with best construction practices for preventing mold growth, and properly trained in basic mold maintenance and remediation procedures?

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- Are personnel trained in cautionary practices when mold is encountered? The best approach to avoid exacerbating a mold situation and contributing to a costly mold cleanup is to eliminate and prevent mold and mold spore contamination through good construction practices, early identification, and properly conducted maintenance or remediation, when necessary. Utilizing properly trained and qualified personnel and professionals for these services is imperative.
- Are there presently or have there been in the past specific complaints regarding indoor air quality and/or mold identification at this site? What were the complaints and when did they begin?
- Are complainants numerous, or from one or two occupants?
- Is there a need or a real or perceived threat which would necessitate vacating the building until a mold condition is remedied?

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Incidental mold identification checklist for contractors

(To be utilized only for incidental mold risk identification. For areas of potential mold contamination or concern and in all cases larger than 30 square feet of interest consultation with an industrial hygienist or other environmental health and safety professional with experience performing mold remediation and your jurisdiction(s) is recommended.)

Name of contractor: _____

Name of project: _____

Address: _____

	YES	NO
1. Have your personnel been trained in mold identification, cleanup, PPE, and HAZCOM?	<input type="checkbox"/>	<input type="checkbox"/>
2. Is there standing water in the work area or any adjacent areas?	<input type="checkbox"/>	<input type="checkbox"/>
3. Is there apparent water damage or evidence of previous water damage in the work area or adjacent areas?	<input type="checkbox"/>	<input type="checkbox"/>
4. Is relative humidity in the work area maintained between 30% and 60%?	<input type="checkbox"/>	<input type="checkbox"/>
5. Are leaks apparent in the work area or building?	<input type="checkbox"/>	<input type="checkbox"/>
a. Ceilings	<input type="checkbox"/>	<input type="checkbox"/>
b. Floors	<input type="checkbox"/>	<input type="checkbox"/>
c. Walls	<input type="checkbox"/>	<input type="checkbox"/>
d. Attic	<input type="checkbox"/>	<input type="checkbox"/>
e. Basement, basement waterproofing, insulation	<input type="checkbox"/>	<input type="checkbox"/>
f. Crawl spaces	<input type="checkbox"/>	<input type="checkbox"/>
g. Window joints, house wrap, water proof membranes, caulk, flashing	<input type="checkbox"/>	<input type="checkbox"/>
h. Door joints, house wrap, water proof membranes, caulk, flashing	<input type="checkbox"/>	<input type="checkbox"/>
i. Kick plates under doors	<input type="checkbox"/>	<input type="checkbox"/>
j. Plumbing	<input type="checkbox"/>	<input type="checkbox"/>
6. Are HVAC systems in good condition?	<input type="checkbox"/>	<input type="checkbox"/>

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- 7. Are HVAC system(s) drip pans clean and unobstructed?
- 8. Are moisture resistant construction materials utilized in high-humidity areas (e.g. bathrooms)?
- 9. Are high-humidity areas and appliances well vented to the outdoors?
- 10. Is moisture damage apparent near entryways or windows?
- 11. Are landscaping features designed to route excess moisture away from the building foundation?
- 12. Are gutters properly installed and functional to route water off of the roof and away from the building?
- 13. Are unusual odors (musty, earthy, mildew) apparent in the building or work area?
- 14. Are areas of discoloration on walls, ceilings, or flooring observed?
- 15. Is excess moisture present (wet spots, water stains, etc.)?
- 13. Has a mold test been performed?
- 14. Is mold maintenance or remediation necessary prior to contracted work commencing?

Signature: _____ Date: _____

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Incidental mold maintenance/remediation checklist for contractors

(To be utilized only for incidental mold risk identification. For areas of potential mold contamination or concern and in all cases larger than 30 square feet of interest consultation with an industrial hygienist or other environmental health and safety professional with experience performing mold remediation and your jurisdiction(s) is recommended.)

Name of contractor: _____

Name of project: _____

Address: _____

	YES	NO
1. Is mold Maintenance or remediation required?	<input type="checkbox"/>	<input type="checkbox"/>
2. What type(s) of mold(s) are present? _____		
3. Are your personnel going to perform the maintenance or remediation?	<input type="checkbox"/>	<input type="checkbox"/>
4. Are contracted personnel going to perform the maintenance or remediation?	<input type="checkbox"/>	<input type="checkbox"/>
5. Are personnel performing maintenance or remediation trained in cleanup methods, PPE, and HAZCOM?	<input type="checkbox"/>	<input type="checkbox"/>
6. Have personnel designated to perform the maintenance or remediation been certified?	<input type="checkbox"/>	<input type="checkbox"/>
7. Is a mold remediation contractor license required for the work contemplated?	<input type="checkbox"/>	<input type="checkbox"/>
8. Are there proper and current mold remediation contractor licenses for personnel performing the work?	<input type="checkbox"/>	<input type="checkbox"/>
9. Are proper engineering controls being employed by all parties?	<input type="checkbox"/>	<input type="checkbox"/>
a. Will re-wetting materials with a mist of water to suppress spores, dust, and debris be required?	<input type="checkbox"/>	<input type="checkbox"/>
b. Will items to be discarded be wrapped/sealed in plastic bag/sheets to reduce the spread of mold/spore?	<input type="checkbox"/>	<input type="checkbox"/>
c. Providing natural or local exhaust ventilation during all cleaning steps	<input type="checkbox"/>	<input type="checkbox"/>
10. Are proper work practices being employed by all parties?	<input type="checkbox"/>	<input type="checkbox"/>
a. No eating, drinking, or smoking allowed in the work areas.	<input type="checkbox"/>	<input type="checkbox"/>
b. Avoidance of breathing dusts.	<input type="checkbox"/>	<input type="checkbox"/>
c. Vacuuming areas with a HEPA vacuum after areas have been cleaned and are completely dry.	<input type="checkbox"/>	<input type="checkbox"/>
d. Cleaning up dusts that may have settled on surfaces outside the work area with a HEPA vacuum.	<input type="checkbox"/>	<input type="checkbox"/>

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- e. Cleaning work area used by maintenance and remediation workers.
 - f. Cleaning means of egress with a damp cloth/mop with detergent solution.
 - g. Setting up of a decontamination area.
 - h. Leaving the work area clean, dry, and free of visible debris.
 - i. Washing thoroughly after working including hair, scalp, and nails.
 - j. Sealing off area to unauthorized personnel.
 - k. Providing proper warnings, signs, and cautions to all parties.
 - l. Providing for proper disposal of all potentially contaminated filters, clothing, tools, and other articles.
11. Is proper Personal Protective Equipment (PPE) available and being utilized by all parties?
- a. Gloves – long gloves made of material that will protect workers from molds and chemicals
 - b. Eye protection – non-vented goggles
 - c. Disposable protective clothing (during medium to large projects)

NOTE: Protective clothing (e.g. disposable coveralls) should be provided to prevent contamination or skin contact with mold(s) and chemicals. For areas greater than 100 square feet ensure that protective clothing covers the entire body including head and feet. **Refer to your jurisdiction for additional or more stringent jurisdictional requirements mandated by your state and/or local jurisdiction. Always utilize the most stringent requirements.**

- d. Respiratory protection
 - i. Are N-95 respirators to be utilized?
 - ii. Are half-face or full-face air purifying respirators with HEPA filters to be utilized?
 - iii. Are full-face powered air purifying respirators fitted with HEPA filters to be utilized?

NOTE: For areas smaller than 100 square feet use an approved respirator, at a minimum, either a half-face or full-face N, R, or P-95 respirator. For areas greater than 100 square feet, areas where mold is heavy (blanket coverage rather than patchy), or areas where substantial dust is generated during cleaning or debris removal (i.e. abrasives are used to clean surfaces); use an approved respirator, at a minimum either a half-face, or full-face N, R, or P-100 respirator. Charcoal-impregnated filters may be used for odors. **Refer to your jurisdiction for additional or more stringent jurisdictional requirements mandated by your state and/or local jurisdiction. Always utilize the most stringent requirements.**

- 12. Are personnel involved with maintenance or remediation fit tested and medically cleared to use respirators?

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13. Do any employees have facial hair or situations that interfere with the proper functioning of a respirator?
14. Are mold-affected areas contained during maintenance or remediation work?
- a. via HEPA Vacuum use
- b. via negative air pressure
- c. via polyethylene sheeting
- d. via isolation barriers
- e. via fungicide application
15. Has the mold been removed?
16. Have all contaminated areas been removed (e.g. damaged and stained drywall)?
17. Has the mold source been removed, repaired, or otherwise remediated (water from leaking window flashing)?
18. Is the current RH within tolerable limits to preclude recurrence (30 to 60%)?
19. Have other engineering controls been implemented to preclude recurrence (e.g. ventilation)?
20. Have all sources of moisture been removed, repaired, controlled, or remediated (e.g. leaking building envelope)?

Signature: _____ Date: _____

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