AMBASSADOR
CONSTRUCTION CONSULTANTS, INC.

To: XXXXXXXXXXXXXXXXX

Job: XXXXXXXXXXXXXXXX

From: Marko E. Vovk
Ambassador Construction Consultants Inc.
1501 Spring Garden
Lakewood, Ohio 44107
Civil Engineer / ASHI Certified Professional Home Inspector / 203K Certified / State Licensed Radon Inspector / State Licensed Lead Assessor / State Licensed Termite Inspector / Structural Inspector /Certified Indoor Environmentalist / Certified Air Balancer / Over 7500 Building and Home Inspections Performed / Over 750 Environmental Inspections performed / Over 3000 Microbial Mold or particulate samples taken. Carbon Monoxide Certified
216-431- TEST (8378) Voice mail and downtown office
216-924-TEST (8378) Car
216-421-0790 Home fax
216-521-VOVK Home after 9:30 PM only on weekdays.
Clevelandmold@AOL.com (E-mail)
www.houseinvestigations.com

Date: 1-24-05

RE: Forensic Moisture Evaluation for Fungal Reservoirs.

1. Building Science Investigation
2. Microbial Investigation with Sampling
3. Indoor Air Quality
4. **Executive summaries on pages 10 and 11.**

Dear XXXXXXXXXXXXXXXX,

On the afternoon of 1-24-05 , you employed Civil Engineer and Certified Indoor Environmentalist (CIE) Marko E. Vovk from Ambassador Construction Consultants Inc. to visually perform a non-destructive, partial, and visual inspection of the property located at XXXXXXXXXXXXXXXXXXXX

The purpose of this inspection was to determine if visual fungal reservoirs[1] could be seen or had conditions for amplification[2]. Secondly, to determine what is causing the fungal reservoirs and if dwelling conditions exist that will permit further amplification.

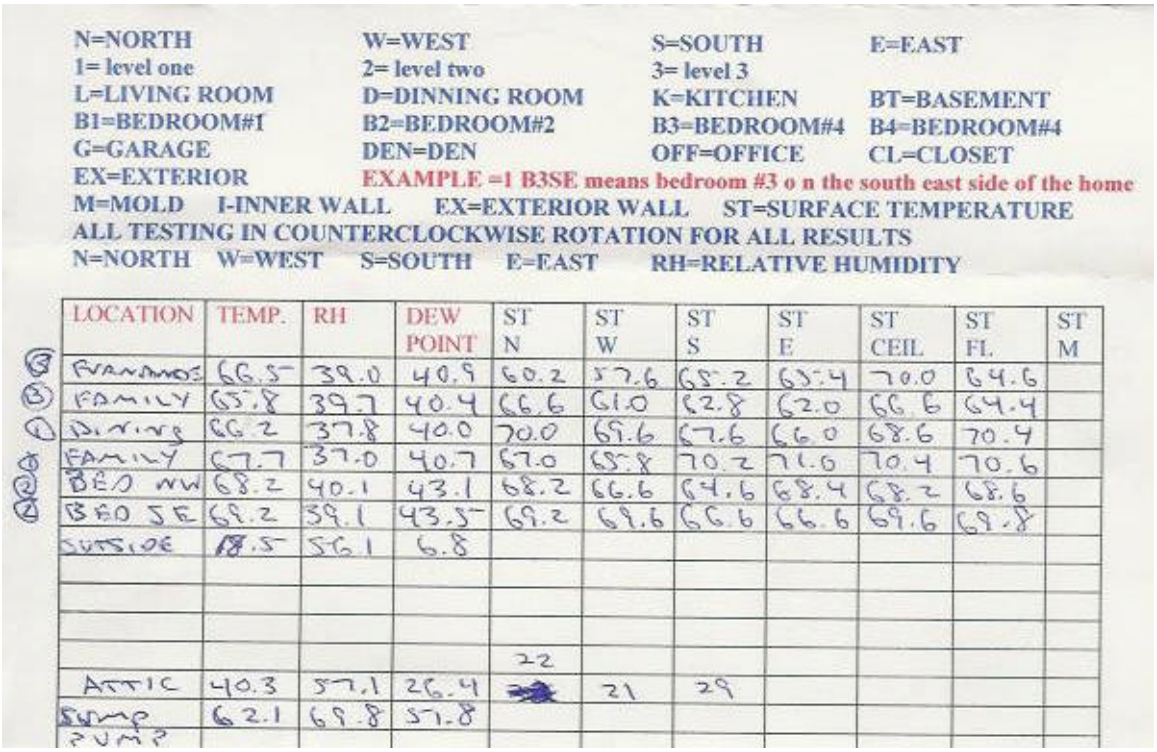
Based on my education, training, and experience, I have made the following observations and conclusions about the above referenced property:

[1] Fungal Reservoirs means visual mold.
[2] Amplification means growing mold.

Building Science Section

The entire home was mapped for room temperature, room humidity, surface temperatures, dew point, and moisture content. The sling psychrometer was used for baseline testing results and the digital hygrometer was used for the data collection. All surface moisture mapping was conducted using the Tramex moisture-testing gauge and an infrared laser. All values are represented in mathematical terms to determine potential cause of fungal development. We only plotted the attic location. This location had the coldest surface temperature and was a concern due to fungal reservoirs amplifying.

The following are field data from moisture and humidity mapping. These are the actual authentic field notes from mapping to decrease duplicating error.



N=NORTH W=WEST S=SOUTH E=EAST
1= level one 2= level two 3= level 3
L=LIVING ROOM D=DINNING ROOM K=KITCHEN BT=BASEMENT
B1=BEDROOM#1 B2=BEDROOM#2 B3=BEDROOM#4 B4=BEDROOM#4
G=GARAGE DEN=DEN OFF=OFFICE CL=CLOSET
EX=EXTERIOR EXAMPLE =1 B3SE means bedroom #3 o n the south east side of the home
M=MOLD I-INNER WALL EX=EXTERIOR WALL ST=SURFACE TEMPERATURE
ALL TESTING IN COUNTERCLOCKWISE ROTATION FOR ALL RESULTS
N=NORTH W=WEST S=SOUTH E=EAST RH=RELATIVE HUMIDITY

LOCATION	TEMP.	RH	DEW POINT	ST N	ST W	ST S	ST E	ST CEIL	ST FL.	ST M
FURNACE	66.5	39.0	40.9	60.2	57.6	65.2	63.4	70.0	64.6	
FAMILY	65.8	39.7	40.4	66.6	61.0	62.8	62.0	66.6	64.4	
DINING	66.2	37.8	40.0	70.0	65.6	67.6	66.0	68.6	70.4	
FAMILY	67.7	37.0	40.7	67.0	65.8	70.2	71.0	70.4	70.6	
BED NW	68.2	40.1	43.1	68.2	66.6	64.6	68.4	68.2	68.6	
BED SE	69.2	39.1	43.3	69.2	69.6	66.6	66.6	69.6	69.8	
OUTSIDE	18.5	56.1	6.8							
				22						
ATTIC	40.3	57.1	26.4	[redacted]	21	29				
SUMP PUMP	62.1	69.8	57.8							

Below we plotted the coldest obtained temperatures. This was done to see the mathematical representation of the conditions of the home.

Report Date: Monday, January 24, 2005
Project Information: ATTIC CONDITIONS Temperature 40.3 F and Humidity 57.1 F

Altitude: 804 (Feet)
Barometric Pressure: 29.062 (in.Hg)
Atmospheric Pressure: 14.274 (psia)

1. Attic

STATE POINT DATA

Air Flow (Standard) (cfm)	Dry Bulb (°F)	Wet Bulb (°F)	Relative Humidity (%)	Humidity Ratio (gr/lb)	Specific Volume (cu.ft./lb)	Enthalpy (Btu/lb)	Dew Point (°F)	Density (lb/cu.ft.)	Vapor Pressure (in.Hg)	Absolute Humidity (gr/cu.ft.)
1,000	40.300	34.694	57.1	21.6	13.037	13.010	26.9865	0.0769	0.1431	1.660

2. DEW POINT 27.0 F

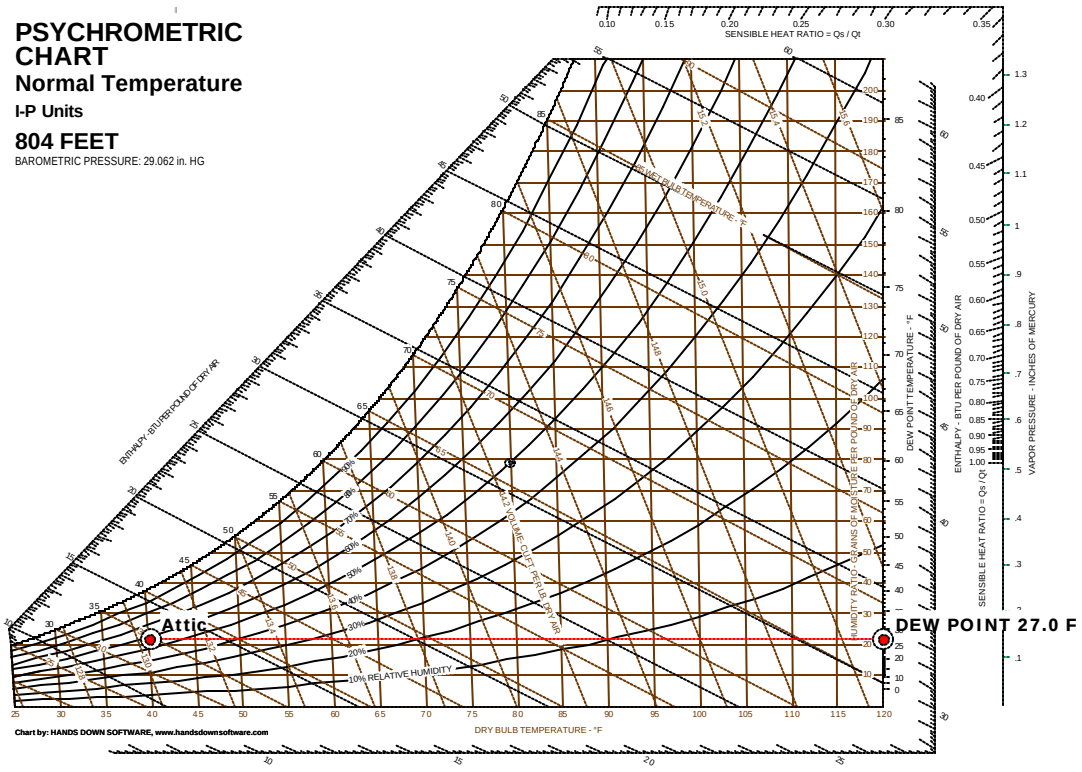
STATE POINT DATA

Air Flow (Standard) (cfm)	Dry Bulb (°F)	Wet Bulb (°F)	Relative Humidity (%)	Humidity Ratio (gr/lb)	Specific Volume (cu.ft./lb)	Enthalpy (Btu/lb)	Dew Point (°F)	Density (lb/cu.ft.)	Vapor Pressure (in.Hg)	Absolute Humidity (gr/cu.ft.)
1,000	120.000	67.747	4.1	21.7	15.115	32.250	27.0000	0.0664	0.1432	1.433

Process: Connect States

Start Point Name		Total Energy (Btu/hr)	Sensible Energy (Btu/hr)	Latent Energy (Btu/hr)	Moisture Difference (lb/hr)	Sensible Heat Ratio	Enthalpy/ Humidity Ratio (Btu/lb / lb/lb)
Attic		86,578	86,568	10	0.0	1.000	N/A

ATTIC CONDITIONS Temperature 40.3 F and Humidity 57.1 F



The above mathematical representation depicts that during our inspection, the dew point[3] for the above attic condition was 27.0 F. The attic surface temperatures are all below this dew point. The attic is wet from condensation. At the time of inspection, the attic was raining. Dew point temperature and moisture are necessary for microbial amplification. At this time, dew points are causing some deterioration to attic sheathing and allowing for microbial development. Lowering the homes humidity level is advised and should be done immediately.

The following are several digital images taken of this dwelling. These images show ongoing conditions, fungal reservoirs, and other building science[4] conditions. Below these images is an explanation of the condition.

The home is equipped with adequate upper top hat roof vents.

The home is equipped with adequate lower soffit vents.

The home is experience some exterior ghosting on siding. The small dirt stains indicate certain areas of the home are pressurized. It is common the have residential HVAC systems that are not balanced. Balancing the HVAC system helps these conditions.

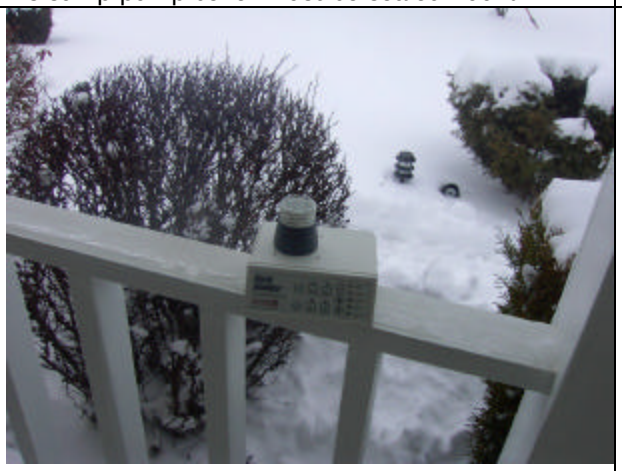
The HVAC system has some water at the base. This is a condensation drainage issue the can be repaired very simply. This condition is not causing upper attic condensation.

[3] Dp = Dew Point Temperature: The temperature of moist air saturated at the same pressure and humidity ratio. Alternatively, more simply the temperature at which water vapor will begin to condense from a sample of air.

[4] Building science for this report means moisture findings caused by building materials, construction methods, and moisture addition.

The sump pump cover is not 100 % sealed. The HVAC system is depressurizing the basement. Moisture is being sucked out of this sump pump. Grains of moisture from the sump pump travel to the attic and condensate on the attic sheathing. This sump pump cover must be sealed 100%.

The HVAC cold air return is not 100% sealed. When the furnace turns on, it depressurizes the basement and suck moisture from cracks, and from the sump pump. Recommend properly sealing the cold air return and balancing the HVAC system.



Exterior clean air test taken on the front porch.

Humidifier on HVAC system is running. This is the largest moisture source in this home. This unit is causing 90% of the attic condensation conditions. The attic is raining due to this condition. Turn the humidifier off.

The door to the basement utility room could be vented better. Installing a hole or a louvered door would work. When this door is closed, the basement utility room becomes somewhat depressurized. Depressurized basements are not desirable

The attic has some fungal reservoirs amplifying. This condition is active and will continue until the homes humidity levels are lowered.

Attic sheathing temperature is below the dew point. This means all surfaces with temperatures below the dew point will have condensation.

Water is running down the rafters from active condensation.

Water is running down the rafters from active condensation

Old moisture stains in attic prom previous winter condensation conditions.

Manometer shows the high humdity in the sump pump. The reading shows almost 70% realative humdity.

Smoke testing shows that when the HVAC system is operating, it sucks moisture out of the sump pump.

Interior windows have condesation due to to high indoor humdity.

One air samplle was taken in the living room to seen if attic conditions communicate with lower level living areas.

APP (Aggressive Particle Profiling.)
Air-borne particulate
Particle Contamination Section

Scope and Purpose:

1. To sample with a laser particle counter the air in various locations of the dwelling;
2. To determine if there is contamination by airborne particulate;
3. To qualify the size and quantify the amounts of the contamination.

Laser particle count examination is critical to indoor air quality investigations. A particle investigation is designed to quantify air contamination by particle size. Particle counting effectively analyzes the effectiveness of the air handling filtration systems. The particle counter used for this project was an HHPC-6 ARTI Particle Counter. The device has six channels to read various size particles in microns. The channel sizes are .3, .5, .7, 1.0, 2.0, and 5.0. There is a variable pump rate, and was set to pump 2.83 liters per minute. This is equal to a volume 1/10th of a cubic foot.

The device quantifies particle contamination and allows the indoor air environmentalist to make determinations based on the results.

There is a distinct coordination between respiratory penetration and particle size. The symptoms and health affects of particulate inhalations vary from respiratory irritation, allergies, infections, and cancer. In general, respired particles affect us in the following ways:

- They can impair respiratory functions.
- Particle may cause a chemical or mechanical irritation of tissues. Nerve endings at the deposition site can also be damaged.
- They can aggravate existing respiratory or cardiovascular disease. They can impact our immune system and cause more morphological changes in lung tissue.

Health exposure to contaminate falls into two categories. Indoor air quality exposure (which is non-occupational) and occupational. Wallace (1991), and Wilkins (1993), showed that inhaling particles are associated with increased prevalence of "sick building syndrome." The symptoms are mucus irritation, difficulty in concentration, and distraction of occupancy by annoyance odors. Particulate contamination breaks down as follows in the human body:

- >10, um may be respirable but do not penetrate
- 7 to 11 um particles, penetrate nasal passages
- 4.7 to 7 um particles penetrate the pharynx
- 3.3 to 4.7 um particles penetrate trachea and primary bronchi
- 2.1 to 3.3 um particles penetrate secondary bronchi
- 1.1 to 2.1 um particles penetrate terminal brochi
- 0.65 to 1.1 um particles penetrate bronchioli
- 0.43 to 0.65 um particles penetrate alveoli

A study of high-rise office buildings (Armstrong, Sherertz, and Llewellyn 1989) showed that high levels of particulate resulted in sinus and upper respiratory congestion and headaches. In 1993, Gravessen, Ipsen and Skov found that macromolecular organic dust correlated significantly with the number of occupant's complaints consisting of:

- Extreme fatigue
- Itching eyes
- Nasal congestion
- Headache
- Sore and irritated throats

Two categories of particles are of particular concern: microbial and combustion by-product. Microbial particulate causes irritation, allergenic illness, infectious illness, and has toxic effects on the body. Combustion by-products (that is particulate from vehicle exhaust, tobacco smoke, heating appliances, office machinery, and cooking appliances) creates polycyclic aromatic hydrocarbons or PAH's.

Particulate testing is particularly critical to ASHRAE Standard 52.2-1999, titled "Method of Testing General Ventilation Air-Cleaning Devices For Removal Efficiency By Particle Size."

Readings were taken of outside air to compare. We are also comparing the readings to exterior air. The general observation of counting the particle was that there are many irregular and unequal conditions relating to air quality.

The following are field data from aggressive particle profiling . These are the actual authentic field notes from mapping to decrease duplicating error.

Location	.3	.5	.7	1.0	3.0	5.0	TIME	Microns
BASEMENT	60283	4920	1453	863	313	39		
FAMILY	92036	7484	1965	1135	689	40		
DINING	176940	13306	3319	1618	851	83		
FAMILY	191211	18176	4570	2334	1239	113		
BED NW	131266	9991	1923	891	458	48		
BED SE	120427	11292	3652	2342	1389	179		
OVERHEAD	33997	3303	868	347	134	7		

The following are conclusions to be drawn from the air particle testing:

1. There is some airborne particulate contamination in this dwelling.
2. Particulate includes, mold spores, construction dust, drywall dust, glass fibers, pollen, and other debris. High particulate is augmented with homes the have high humidity.
3. Particulate cleaning with the use of HEPA and other cleaning techniques is recommended.
4. Duct cleaning is recommended

Recommendations regarding this information:

- The sources of the airborne particulate should be identified and mitigated.
- Review the recommendations in the mold report and in executive summary.
- The document ACR 2002 Assessment, Cleaning & Restoration of HVAC Systems should be purchased and reviewed. The National Air Duct Cleaners Association publishes this document: NADCA. Their recommended procedures should be used and guidelines.
- If you are an immune compromised individual, proper air scrubbing apparatus should be used to clean the particulate contamination in your dwelling. Portable air scrubbers are available.
- We are not health specialists. The conclusions and opinions stated in this report are based on information gathered over time and the review of similar situations and conditions.
- Ambassador Construction Consultants Inc. does not accept any responsibility for the financial or health consequences of subsequent action taken by the client or its consultants based on this report, test results, opinions or recommendations. We strongly recommend second opinions.

Microbial Data
Microbial Section

On 1-24-04, there were three mold tests taken at the above address. We have attached the lab mold results.

1. Air test taken in attic.
2. Air test taken in living room.
3. Air test taken on exterior.

Spore growth is cultivated by the presence of a sympathetic environment. Food, (cellulose or wallpaper paste), moisture and limited light are conditions in which spores thrive. This is whether they enter from the exterior or any other means. Events such as dusting, opening the windows, vacuuming, and manipulating the contaminated areas, are conditions that stimulate spore movement throughout the house.

There are no thresholds for mold contamination levels. This is all individual difference and the health affects should be considered by a health specialist.

These are the following where visual fungal reservoirs were observed.

EXECUTIVE SUMMARY MOLD SECTION

1. The attic sheathing has some visual fungal reservoirs amplifying. The mold results taken on the exterior, living room and attic locations did not have significant spore amounts. At this time, molds types encountered were all allergenic type. At this time, mold amounts encountered were minimal. The attic mold counts are expected to augment during dryer and warmer seasons. It is recommended to lower the humidity in this home. Removing the attic mold or encapsulating the mold may be a good intern control. By encapsulating or painting the sheathing, one can monitor for future amplification. See the executive summary.

Due to visual fungal reservoirs and calculated optimal conditions for fungal amplification, a full microbial assessment can be done. Tape lift testing, swab testing, viable air, and non-viable air testing can be conducted at some future date if deemed. It is our professional opinion[5], that if you see mold or smell mold you pretty much have mold. It is also our opinion that all molds are bad and moisture maintenance must be implemented.

Ambassador Construction Consultants Inc. does not accept any responsibility for the financial or health consequences of subsequent action taken by the client or its consultants based on these mold test results, opinions, or recommendations. We strongly recommend second opinions. This report is not transferable and all third parties should procure their own microbial investigations.

All repairs to this property should be monitored by a third party in regards to compliance to existing building codes; industry established standards of practice and for good and workmanlike manner. Please read and review all sections of this report.

EXECUTIVE SUMMA RY BUILDING SCIENCE SECTION

It is my professional opinion that;

2. The running humidifiers on the HVAC system are causing the condensation and fungal development on the upper attic sheathing.

3. The Sump pump cover is not sealed. Grains of moisture are leaving this sump pump and contributing to the attic sheathing condensation. Sealing this sump pump cover is recommended.

4. The HVAC cold air return is infiltrating some basement air causing a depressurization conditions. Sealing the cold air return with furnace tape is recommended. Balancing HVAC systems are also good protocol.

5. Adding a hold in the basement utility rood door will allow for additional make up air to the gas fired systems.

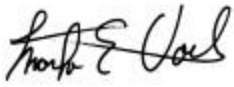
[5] Marko Emil Vovk is the co-author of "The Illustrated Mold Handbook " and has the capability to form opinions on mold.

6. Running a basement de-humidifier will remove much of the homes humidity conditions and lower this homes hydrick buffer capacity[6].

DISCLAIMER
This inspection should be considered partial, time-limited, non-destructive, and strictly opinion oriented. All opinions were generated from visual and non-destructive testing. We can at some future date perform destructive testing the would include soil borings, water table monitoring, soil analysis, peculation studiers and full review by a geo-technical engineer. We can also at some future date, generate a more extensive report with other observed conditions from our field notes, digital photographs, and additional inspections. We can at some future date conduct a full building inspection of all building components such as attic, roof, plumbing, interiors, floors, walls, joists, beams, headers, stairs, exterior, grounds, garage, stairs, heating, cooling, appliances, lead paint, radon gas, pest, or any other home inspection related field constituents. We cannot be held liable for misunderstanding or the omission of any item pertaining to the above said structure. We encourage that you obtain second opinions as we do all our clients for all our inspections. This report is not intended for third parties and is not transferable. Third parties should obtain their own reports from their own inspectors. This report is not intended to be; a design mitigation repair, an exact repair estimate, an full environmental inspection, a load study, a determination of footing size or footing depth, a determination of possible future conditions, a determination of future wall settlement, a code inspection, a prediction of additional cracking, a geotechnical soil investigation, and engineering calculation, a prediction of settlement, a run-off study, a boring inspection, a water table evaluation, and underground sewer exploration, basement seepage exploration a camera study, or any other technically exhaustive inspection that may require a more precise investigation. Furthermore, this inspection only includes visual conditions that can promote fungal development, fungal amplification, and musty odors. I have taken over 75 digital images. Furthermore, this is not a full microbial assessment. We can in the future conduct additional sampling for additional fees. This report does not take into account past basement floods, sump pump failures, foundation leaks, or other moisture events that would have caused visible or interstitial microbial proliferation or amplification.

If you have any questions pertaining to this matter, please feel free to contact me at 216-924-TEST / 216-431-TEST / 216-521-0790 FAX.

Respectfully submitted,



Marko E. Vovk
Civil Engineer / ASHI Certified / CIE / Building Scientist

THE FOLLOWING ARE THE LABORATORY MOLD RESULTS

New York City Department of Health & Mental Hygiene
Bureau of Environmental & Occupational Disease Epidemiology

Guidelines on Assessment and Remediation of Fungi in Indoor Environments

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[6] Hydrick Buffer Capacity (HBC) is the amount of moisture a home could hold without causing adverse reactions such as condensation. All homes have different HBC's depending on construction material types.

Executive Summary

On May 7, 1993, the New York City Department of Health (DOH), the New York City Human Resources Administration (HRA), and the Mt. Sinai Occupational Health Clinic convened an expert panel on *Stachybotrys atra* in Indoor Environments. The purpose of the panel was to develop policies for medical and environmental evaluation and intervention to address *Stachybotrys atra* (now known as *Stachybotrys chartarum* (SC)) contamination. The original **guidelines** were developed because of **mold** growth problems in several New York City buildings in the early 1990's. This document revises and expands the original **guidelines** to include all fungi (**mold**). It is based both on a review of the literature regarding fungi and on comments obtained by a review panel consisting of experts in the fields of microbiology and health sciences. It is intended for use by building engineers and management, but is available for general distribution to anyone concerned about fungal contamination, such as environmental consultants, health professionals, or the general public.

We are expanding the **guidelines** to be inclusive of all fungi for several reasons:

- Many fungi (e.g., species of *Aspergillus, Penicillium, Fusarium, Trichoderma,* and *Memnoniella*) in addition to SC can produce potent mycotoxins, some of which are identical to compounds produced by SC. Mycotoxins are fungal metabolites that have been identified as toxic agents. For this reason, SC cannot be treated as uniquely toxic in indoor environments.

- People performing renovations/cleaning of widespread fungal contamination may be at risk for developing Organic Dust Toxic Syndrome (ODTS) or Hypersensitivity Pneumonitis (HP). ODTS may occur after a *single heavy* exposure to dust contaminated with fungi and produces flu-like symptoms. It differs from HP in that it is not an immune-mediated disease and does not require repeated exposures 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.

- Fungi can cause allergic reactions. The most common symptoms are runny nose, eye irritation, cough, congestion, and aggravation of asthma.

Fungi are present almost everywhere in indoor and outdoor environments. The most common symptoms of fungal exposure are runny nose, eye irritation, cough, congestion, and aggravation of asthma. Although there is evidence documenting severe health effects of fungi in humans, most of this evidence is derived from ingestion of contaminated foods (i.e., grain and peanut products) or occupational exposures in agricultural settings where inhalation exposures were very high. With the possible exception of remediation to very heavily contaminated indoor environments, such high-level exposures are not expected to occur while performing remedial work.

There have been reports linking health effects in office workers to offices contaminated with moldy surfaces and in residents of homes contaminated with fungal growth. Symptoms, such as fatigue, respiratory ailments, and eye irritation were typically observed in these cases. Some studies have suggested an association between SC and pulmonary hemorrhage/hemosiderosis in infants, generally those less than six months old. Pulmonary hemosiderosis is an uncommon condition that results from bleeding in the lungs. The cause of this condition is unknown, but may result from a combination of environmental contaminants and conditions (e.g., smoking,

fungal contaminants and other bioaerosols, and water-damaged homes), and currently its association with SC is unproven.

The focus of this guidance document addresses **mold** contamination of building components (walls, ventilation systems, support beams, etc.) that are chronically moist or water damaged. Occupants should address common household sources of **mold**, such as **mold** found in bathroom tubs or between tiles with household cleaners. Moldy food (e.g., breads, fruits, etc.) should be discarded.

Building materials supporting fungal growth must be remediated *as rapidly as possible* in order to ensure a healthy environment. Repair of the defects that led to water accumulation (or elevated humidity) should be conducted in conjunction with or prior to fungal remediation. Specific methods of assessing and remediating fungal contamination should be based on the extent of visible contamination and underlying damage. The simplest and most expedient remediation that is reasonable, and properly and safely removes fungal contamination, should be used. Remediation and assessment methods are described in this document.

The use of respiratory protection, gloves, and eye protection is recommended. Extensive contamination, particularly if heating, ventilating, air conditioning (HVAC) systems or large occupied spaces are involved, should be assessed by an experienced health and safety professional and remediated by personnel with training and experience handling environmentally contaminated materials. Lesser areas of contamination can usually be assessed and remediated by building maintenance personnel. In order to prevent contamination from recurring, underlying defects causing moisture buildup and water damage must be addressed. Effective communication with building occupants is an essential component of all remedial efforts.

Fungi in buildings may cause or exacerbate symptoms of allergies (such as wheezing, chest tightness, shortness of breath, nasal congestion, and eye irritation), especially in persons who have a history of allergic diseases (such as asthma and rhinitis). Individuals with persistent health problems that appear to be related to fungi or other bioaerosol exposure should see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures. Decisions about removing individuals from an affected area must be based on the results of such medical evaluation, and be made on a case-by-case basis. Except in cases of widespread fungal contamination that are linked to illnesses throughout a building, building-wide evacuation is not indicated.

In summary, prompt remediation of contaminated material and infrastructure repair is the primary response to fungal contamination in buildings. Emphasis should be placed on preventing contamination through proper building and HVAC system maintenance and prompt repair of water damage.

This document is not a legal mandate and should be used as a guideline. Currently there are no United States Federal, New York State, or New York City regulations for evaluating potential health effects of fungal contamination and remediation. These **guidelines** are subject to change as more information regarding fungal contaminants becomes available.

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Introduction

On May 7, 1993, the New York City Department of Health (DOH), the New York City Human Resources Administration (HRA), and the Mt. Sinai Occupational Health Clinic convened an expert panel on *Stachybotrys atra* in Indoor Environments. The purpose of the panel was to develop policies for medical and environmental evaluation and intervention to address *Stachybotrys atra* (now known as *Stachybotrys chartarum* (SC)) contamination. The original **guidelines** were developed because of **mold** growth problems in several New York City buildings in the early 1990's. This document revises and expands the original **guidelines** to include all fungi (**mold**). It is based both on a review of the literature regarding fungi and on comments obtained by a review panel consisting of experts in the fields of microbiology and health sciences. It is intended for use by building engineers and management, but is available for general distribution to anyone concerned about fungal contamination, such as environmental consultants, health professionals, or the general public.

This document contains a discussion of potential health effects; medical evaluations; environmental assessments; protocols for remediation; and a discussion of risk communication strategy. The **guidelines** are divided into four sections:

1. Health Issues; 2. Environmental Assessment; 3. Remediation; and 4. Hazard Communication.

We are expanding the **guidelines** to be inclusive of all fungi for several reasons:

- Many fungi (e.g., species of *Aspergillus, Penicillium, Fusarium, Trichoderma,* and *Memnoniella*) in addition to SC can produce potent mycotoxins, some of which are identical to compounds produced by SC.[1, 2, 3, 4] Mycotoxins are fungal metabolites that have been identified as toxic agents. For this reason, SC cannot be treated as uniquely toxic in indoor environments.

- People performing renovations/cleaning of widespread fungal contamination may be at risk for developing Organic Dust Toxic Syndrome (ODTS) or Hypersensitivity Pneumonitis (HP). ODTS may occur after a *single heavy* exposure to dust contaminated with fungi and produces flu-like symptoms. It differs from HP in that it is not an immune-mediated disease and does not require repeated exposures 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.[5, 6, 7, 8, 9, 10]

- Fungi can cause allergic reactions. The most common symptoms are runny nose, eye irritation, cough, congestion, and aggravation of asthma.[11, 12]

Fungi are present almost everywhere in indoor and outdoor environments. The most common symptoms of fungal exposure are runny nose, eye irritation, cough, congestion, and aggravation of asthma. Although there is evidence documenting severe health effects of fungi in humans, most of this evidence is derived from ingestion of contaminated foods (i.e., grain and peanut products) or occupational exposures in agricultural settings where inhalation exposures were very high.[13, 14] With the possible exception of remediation to very heavily contaminated indoor environments, such high level exposures are not expected to occur while performing remedial work.[15]

There have been reports linking health effects in office workers to offices contaminated with moldy surfaces and in residents of homes contaminated with fungal growth.[12, 16, 17, 18, 19, 20] Symptoms, such as fatigue, respiratory ailments, and eye irritation were typically observed in these cases.

Some studies have suggested an association between SC and pulmonary hemorrhage/hemosiderosis in infants, generally those less than six months old. Pulmonary hemosiderosis is an uncommon condition that results from bleeding in the lungs. The cause of this condition is unknown, but may result from a combination of environmental contaminants and conditions (e.g., smoking, other microbial contaminants, and water-damaged homes), and currently its association with SC is unproven.[21, 22, 23]

The focus of this guidance document addresses **mold** contamination of building components (walls, ventilation systems, support beams, etc.) that are chronically moist or water damaged. Occupants should address common household sources of **mold**, such as **mold** found in bathroom tubs or between tiles with household cleaners. Moldy food (e.g., breads, fruits, etc.) should be discarded.

This document is not a legal mandate and should be used as a guideline. Currently there are no United States Federal, New York State, or New York City regulations for evaluating potential health effects of fungal contamination and remediation. These **guidelines** are subject to change as more information regarding fungal contaminants becomes available.

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1. Health Issues

1.1 Health Effects

Inhalation of fungal spores, fragments (parts), or metabolites (e.g., mycotoxins and volatile organic compounds) from a wide variety of fungi may lead to or exacerbate immunologic (allergic) reactions, cause toxic effects, or cause infections.[11, 12, 24]

There are only a limited number of documented cases of health problems from indoor exposure to fungi. The intensity of exposure and health effects seen in studies of fungal exposure in the indoor environment was typically much less severe than those that were experienced by agricultural workers but were of a long-term duration.[5-10, 12, 14, 16-20, 25-27] Illnesses can result from both high level, short-term exposures and lower level, long-term exposures. The most common symptoms reported from exposures in indoor environments are runny nose, eye irritation, cough, congestion, aggravation of asthma, headache, and fatigue.[11, 12, 16-20]

The presence of fungi on building materials as identified by a visual assessment or by bulk/surface sampling results does not necessitate that people will be exposed or exhibit health effects. In order for humans to be exposed indoors, fungal spores, fragments, or metabolites must be released into the air and inhaled, physically contacted (dermal exposure), or ingested. Whether or not symptoms develop in people exposed to fungi depends on the nature of the fungal material (e.g., allergenic, toxic, or infectious), the amount of exposure, and the susceptibility of exposed persons. Susceptibility varies with the genetic predisposition (e.g., allergic reactions do not always occur in all individuals), age, state of health, and concurrent exposures. For these reasons, and because measurements of exposure are not standardized and biological markers of exposure to fungi are largely unknown, it is not possible to determine "safe" or "unsafe" levels of exposure for people in general.

1.1.1 Immunological Effects

Immunological reactions include asthma, HP, and allergic rhinitis. Contact with fungi may also lead to dermatitis. It is thought that these conditions are caused by an immune response to fungal agents. The most common symptoms associated with allergic reactions are runny nose, eye irritation, cough, congestion, and aggravation of asthma.[11, 12] HP may occur after repeated exposures to an allergen and can result in permanent lung damage. HP has typically been associated with repeated heavy exposures in agricultural settings but has also been reported in office settings.[25, 26, 27] Exposure to fungi through renovation work may also lead to initiation or exacerbation of allergic or respiratory symptoms.

1.1.2 Toxic Effects

A wide variety of symptoms have been attributed to the toxic effects of fungi. Symptoms, such as fatigue, nausea, and headaches, and respiratory and eye irritation have been reported. Some of the symptoms related to fungal exposure are non-specific, such as discomfort, inability to concentrate, and fatigue.[11, 12, 16-20] Severe illnesses such as ODTS and pulmonary hemosiderosis have also been attributed to fungal exposures.[5-10, 21, 22]

ODTS describes the abrupt onset of fever, flu-like symptoms, and respiratory symptoms in the hours following a *single, heavy* exposure to dust containing organic material including fungi. It differs from HP in that it is not an immune-mediated disease and does not require repeated exposures to the same causative agent. ODTS may be caused by a variety of biological agents including common species of fungi (e.g., species of *Aspergillus* and *Penicillium*). ODTS has been documented in farm workers handling contaminated material but is also of concern to workers performing renovation work on building materials contaminated with fungi.[5-10]

Some studies have suggested an association between SC and pulmonary hemorrhage/hemosiderosis in infants, generally those less than six months old. Pulmonary hemosiderosis is an uncommon condition that results from bleeding in the lungs. The cause of this condition is unknown, but may result from a combination of environmental contaminants and conditions (e.g., smoking, fungal contaminants and other bioaerosols, and water-damaged homes), and currently its association with SC is unproven.[21, 22, 23]

1.1.3 Infectious Disease

Only a small group of fungi have been associated with infectious disease. Aspergillosis is an infectious disease that can occur in immunosuppressed persons. Health effects in this population can be severe. Several species of *Aspergillus* are known to cause aspergillosis. The most common is *Aspergillus fumigatus*. Exposure to this common **mold**, even to high concentrations, is unlikely to cause infection in a healthy person.[11, 24]

Exposure to fungi associated with bird and bat droppings (e.g., *Histoplasma capsulatum* and *Cryptococcus neoformans*) can lead to health effects, usually transient flu-like illnesses, in healthy individuals. Severe health effects are primarily encountered in immunocompromised persons.[24, 28, 29]

1.2 Medical Evaluation

Individuals with persistent health problems that appear to be related to fungi or other bioaerosol exposure should see their physicians for a referral to practitioners who are

trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures. Infants (less than 12 months old) who are experiencing non-traumatic nosebleeds or are residing in dwellings with damp or moldy conditions and are experiencing breathing difficulties should receive a medical evaluation to screen for alveolar hemorrhage. Following this evaluation, infants who are suspected of having alveolar hemorrhaging should be referred to a pediatric pulmonologist. Infants diagnosed with pulmonary hemosiderosis and/or pulmonary hemorrhaging should not be returned to dwellings until remediation and air testing are completed.

Clinical tests that can determine the source, place, or time of exposure to fungi or their products are not currently available. Antibodies developed by exposed persons to fungal agents can only document that exposure has occurred. Since exposure to fungi routinely occurs in both outdoor and indoor environments this information is of limited value.

1.3 Medical Relocation

Infants (less than 12 months old), persons recovering from recent surgery, or people with immune suppression, asthma, hypersensitivity pneumonitis, severe allergies, sinusitis, or other chronic inflammatory lung diseases may be at greater risk for developing health problems associated with certain fungi. Such persons should be removed from the affected area during remediation (see Section 3, Remediation). Persons diagnosed with fungal related diseases should not be returned to the affected areas until remediation and air testing are completed.

Except in cases of widespread fungal contamination that are linked to illnesses throughout a building, a building-wide evacuation is not indicated. A trained occupational/environmental health practitioner should base decisions about medical removals in the occupational setting on the results of a clinical assessment.

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2. Environmental Assessment

The presence of **mold**, water damage, or musty odors should be addressed immediately. In all instances, any source(s) of water must be stopped and the extent of water damaged determined. Water damaged materials should be dried and repaired. **Mold** damaged materials should be remediated in accordance with this document (see Section 3, Remediation).

2.1 Visual Inspection

A visual inspection is the most important initial step in identifying a possible contamination problem. The extent of any water damage and **mold** growth should be visually assessed. This assessment is important in determining remedial strategies. Ventilation systems should also be visually checked, particularly for damp filters but also for damp conditions elsewhere in the system and overall cleanliness. Ceiling tiles, gypsum wallboard (sheetrock), cardboard, paper, and other cellulosic surfaces should be given careful attention during a visual inspection. The use of equipment such as a boroscope, to view spaces in ductwork or behind walls, or a moisture meter, to detect moisture in building materials, may be helpful in identifying hidden sources of fungal growth and the extent of water damage.

2.2 Bulk/Surface Sampling

a. Bulk or surface sampling is not required to undertake a remediation. Remediation (as described in Section 3, Remediation) of visually identified fungal contamination should proceed without further evaluation.

b. Bulk or surface samples may need to be collected to identify specific fungal contaminants as part of a medical evaluation if occupants are experiencing symptoms which may be related to fungal exposure or to identify the presence or absence of **mold** if a visual inspection is equivocal (e.g., discoloration, and staining).

c. An individual trained in appropriate sampling methodology should perform bulk or surface sampling. Bulk samples are usually collected from visibly moldy surfaces by scraping or cutting materials with a clean tool into a clean plastic bag. Surface samples are usually collected by wiping a measured area with a sterile swab or by stripping the suspect surface with clear tape. Surface sampling is less destructive than bulk sampling. Other sampling methods may also be available. A laboratory specializing in mycology should be consulted for specific sampling and delivery instructions.

2.3 Air Monitoring

d. Air sampling for fungi should not be part of a routine assessment. This is because decisions about appropriate remediation strategies can usually be made on the basis of a visual inspection. In addition, air-sampling methods for some fungi are prone to false negative results and therefore cannot be used to definitively rule out contamination.

e. Air monitoring may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with a fungal exposure (e.g., pulmonary hemorrhage/hemosiderosis, and aspergillosis).

f. Air monitoring may be necessary if there is evidence from a visual inspection or bulk sampling that ventilation systems may be contaminated. The purpose of such air monitoring is to assess the extent of contamination throughout a building. It is preferable to conduct sampling while ventilation systems are operating.

g. Air monitoring may be necessary if the presence of **mold** is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., **mold** growth behind walls). The purpose of such air monitoring is to determine the location and/or extent of contamination.

h. If air monitoring is performed, for comparative purposes, outdoor air samples should be collected concurrently at an air intake, if possible, and at a location representative of outdoor air. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."

i. Personnel conducting the sampling must be trained in proper air sampling methods for microbial contaminants. A laboratory specializing in mycology should be consulted for specific sampling and shipping instructions.

2.4 Analysis of Environmental Samples

Microscopic identification of the spores/colonies requires considerable expertise. These services are not routinely available from commercial laboratories. Documented quality control in the laboratories used for analysis of the bulk/surface and air samples is necessary. The American Industrial Hygiene Association (AIHA) offers accreditation to microbial laboratories (Environmental Microbiology Laboratory Accreditation Program (EMLAP)). Accredited laboratories must participate in quarterly proficiency testing (Environmental Microbiology Proficiency Analytical Testing Program (EMPAT)).

Evaluation of bulk/surface and air sampling data should be performed by an experienced health professional. The presence of few or trace amounts of fungal spores in bulk/surface sampling should be considered background. Amounts greater than this or the presence of fungal fragments (e.g., hyphae, and conidiophores) may suggest fungal colonization, growth, and/or accumulation at or near the sampled location.[30] Air samples should be evaluated by means of comparison (i.e., indoors to outdoors) and by fungal type (e.g., genera, and species). In general, the levels and types of fungi found should be similar indoors (in non-problem buildings) as compared to the outdoor air. Differences in the levels or types of fungi found in air samples may indicate that moisture sources and resultant fungal growth may be problematic.

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3. Remediation

In all situations, the underlying cause of water accumulation must be rectified or fungal growth will recur. Any initial water infiltration should be stopped and cleaned immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit **mold** growth. If the source of water is elevated humidity, relative humidity should be maintained at levels below 60% to inhibit **mold** growth.[31] Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

Five different levels of abatement are described below. The size of the area impacted by fungal contamination primarily determines the type of remediation. The sizing levels below are based on professional judgement and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. **The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of fungi and dust contaminated with fungi from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement.** The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. The listed remediation methods are not meant to exclude other similarly effective methods. Any changes to the remediation methods listed in these **guidelines**, however, should be carefully considered prior to implementation.

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be

discarded if possible. A professional restoration consultant should be contacted when restoring porous materials with more than a small area of fungal contamination. All materials to be reused should be dry and visibly free from **mold**. Routine inspections should be conducted to confirm the effectiveness of remediation work.

The use of gaseous, vapor-phase, or aerosolized biocides for remedial purposes is **not** recommended. The use of biocides in this manner can pose health concerns for people in occupied spaces of the building and for people returning to the treated space if used improperly. Furthermore, the effectiveness of these treatments is unproven and does not address the possible health concerns from the presence of the remaining non-viable **mold**. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."

3.1 *Level I*: Small Isolated Areas (10 sq. ft or less) - e.g., ceiling tiles, small areas on walls

a. Remediation can be conducted by regular building maintenance staff. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

b. Respiratory protection (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended. Gloves and eye protection should be worn.

c. The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

d. Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

e. Contaminated materials that cannot be cleaned should be removed from the building in a sealed plastic bag. There are no special requirements for the disposal of moldy materials.

f. The work area and areas used by remedial workers for egress should be cleaned with a damp cloth and/or mop and a detergent solution.

g. All areas should be left dry and visibly free from contamination and debris.

3.2 *Level II*: Mid-Sized Isolated Areas (10 - 30 sq. ft.) - e.g., individual wallboard panels.

h. Remediation can be conducted by regular building maintenance staff. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

i. Respiratory protection (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended. Gloves and eye protection should be worn.

j. The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

k. The work area should be covered with a plastic sheet(s) and sealed with tape before remediation, to contain dust/debris.

l. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

m. Contaminated materials that cannot be cleaned should be removed from the building in sealed plastic bags. There are no special requirements for the disposal of moldy materials.

n. The work area and areas used by remedial workers for egress should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

o. All areas should be left dry and visibly free from contamination and debris.

3.3 *Level III*: Large Isolated Areas (30 - 100 square feet) - e.g., several wallboard panels.

A health and safety professional with experience performing microbial investigations should be consulted prior to remediation activities to provide oversight for the project.

The following procedures *at a minimum* are recommended:

p. Personnel trained in the handling of hazardous materials and equipped with respiratory protection, (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended. Gloves and eye protection should be worn.

q. The work area and areas directly adjacent should be covered with a plastic sheet(s) and taped before remediation, to contain dust/debris.

r. Seal ventilation ducts/grills in the work area and areas directly adjacent with plastic sheeting.

s. The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

t. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

u. Contaminated materials that cannot be cleaned should be removed from the building in sealed plastic bags. There are no special requirements for the disposal of moldy materials.

v. The work area and surrounding areas should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

w. All areas should be left dry and visibly free from contamination and debris.

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the fungi is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level IV are followed.

3.4 *Level IV*: Extensive Contamination (greater than 100 contiguous square feet in an area)

A health and safety professional with experience performing microbial investigations should be consulted prior to remediation activities to provide oversight for the project. The following procedures are recommended:

x. Personnel trained in the handling of hazardous materials equipped with:

   i. Full-face respirators with high efficiency particulate air (HEPA) cartridges
   ii. Disposable protective clothing covering both head and shoes
   iii. Gloves

y. Containment of the affected area:

   i. Complete isolation of work area from occupied spaces using plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings)
   ii. The use of an exhaust fan with a HEPA filter to generate negative pressurization
   iii. Airlocks and decontamination room

z. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

aa. Contaminated materials that cannot be cleaned should be removed from the building in sealed plastic bags. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building. There are no special requirements for the disposal of moldy materials.

bb. The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

cc. Air monitoring should be conducted prior to occupancy to determine if the area is fit to reoccupy.

3.5 *Level V*: Remediation of HVAC Systems

3.5.1 A Small Isolated Area of Contamination (<10 square feet) in the HVAC System

dd. Remediation can be conducted by regular building maintenance staff. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

ee. Respiratory protection (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended. Gloves and eye protection should be worn.

ff. The HVAC system should be shut down prior to any remedial activities.

gg. The work area should be covered with a plastic sheet(s) and sealed with tape before remediation, to contain dust/debris.

hh. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

ii. Growth supporting materials that are contaminated, such as the paper on the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be removed in sealed plastic bags. There are no special requirements for the disposal of moldy materials.

jj. The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

kk. All areas should be left dry and visibly free from contamination and debris.

ll. A variety of biocides are recommended by HVAC manufacturers for use with HVAC components, such as, cooling coils and condensation pans. HVAC manufacturers should be consulted for the products they recommend for use in their systems.

3.5.2 Areas of Contamination (>10 square feet) in the HVAC System

A health and safety professional with experience performing microbial investigations should be consulted prior to remediation activities to provide oversight for remediation projects involving more than a small isolated area in an HVAC system. The following procedures are recommended:

mm. Personnel trained in the handling of hazardous materials equipped with:

i. Respiratory protection (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended.
ii. Gloves and eye protection
iii. Full-face respirators with HEPA cartridges and disposable protective clothing covering both head and shoes should be worn if contamination is greater than 30 square feet.

nn. The HVAC system should be shut down prior to any remedial activities.

oo. Containment of the affected area:

i. Complete isolation of work area from the other areas of the HVAC system using plastic sheeting sealed with duct tape.
ii. The use of an exhaust fan with a HEPA filter to generate negative pressurization.
iii. Airlocks and decontamination room if contamination is greater than 30 square feet.

pp. Growth supporting materials that are contaminated, such as the paper on the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be removed in sealed plastic bags. When a decontamination chamber is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. There are no special requirements for the disposal of moldy materials.

qq. The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

rr. All areas should be left dry and visibly free from contamination and debris.

ss. Air monitoring should be conducted prior to re-occupancy with the HVAC system in operation to determine if the area(s) served by the system are fit to reoccupy.

tt. A variety of biocides are recommended by HVAC manufacturers for use with HVAC components, such as, cooling coils and condensation pans. HVAC manufacturers should be consulted for the products they recommend for use in their systems.

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4. Hazard Communication

When fungal growth requiring large-scale remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals with persistent health problems that appear to be related to bioaerosol exposure should see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related

specialties and are knowledgeable about these types of exposures. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

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Conclusion

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to fungal contamination in buildings. The simplest and most expedient remediation that properly and safely removes fungal growth from buildings should be used. In all situations, the underlying cause of water accumulation must be rectified or the fungal growth will recur. Emphasis should be placed on preventing contamination through proper building maintenance and prompt repair of water damaged areas.

Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

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Acknowledgments

The New York City Department of Health would like to thank the following individuals and organizations for participating in the revision of these **guidelines**. Please note that these **guidelines** do not necessarily reflect the opinions of the participants nor their organizations.

Name	**Company / Institution**
Dr. Susan Klitzman	Hunter College
Dr. Philip Morey	AQS Services, Inc
Dr. Donald Ahearn	Georgia State University
Dr. Sidney Crow	Georgia State University
Dr. J. David Miller	Carleton University
Dr. Bruce Jarvis	University of Maryland at College Park
Mr. Ed Light	Building Dynamics, LLC
Dr. Chin Yang	P&K Microbiology Services, Inc
Dr. Harriet Burge	Harvard School of Public Health
Dr. Dorr Dearborn	Rainbow Children's Hospital

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Dr. Ed Horn	The New York State Department of Health
Dr. Judith Schreiber	The New York State Department of Health
Mr. Gregg Recer	The New York State Department of Health
Dr. Gerald Llewellyn	State of Delaware, Division of Public Health
Mr. Daniel Price	Interface Research Corporation
Ms. Sylvia Pryce	The NYC Citywide Office of Occupational Safety and Health
Mr. Armando Chamorro	Ambient Environmental
Ms. Marie-Alix d'Halewyn	Laboratoire de santé publique du Québec
Dr. Elissa A. Favata	Environmental and Occupational Health Associates
Dr. Harriet Ammann	Washington State Department of Health
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We would also like to thank the many others who offered opinions, comments, and assistance at various stages during the development of these **guidelines**.

Christopher D'Andrea, M.S. of the Environmental and Occupational Disease Epidemiology Unit, was the editor of this document.

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(April 2000) January 2002