

Background

The subject property is located at 151 West Page Street, Saint Paul, MN 55107 (“the Property”). Inspection Solutions was retained by Deborah Costandine (“the Client”) to perform a mold assessment of the property.

On Tuesday, July 19, 2011, John Magnuson, Inspection Solutions representative performed indoor air quality assessment at the Property. Inspection Solutions inspected the property utilizing an E-Lite high volume air flow vacuum pump and a Fluke thermal imager.

INDOOR AIR QUALITY SUMMARY

Generally the levels and types of fungi found inside the property should be similar to the outdoor air due to windows and doors being opened. Refer to pages #2 of the certificate of mold analysis by Pro-Lab for each location.

- Airborne total spore count results at the Basement/Crawl Space sample indicated that Penicillium/Aspergillus was elevated when compared to the exterior results. Spores found in this location at a lower concentration than the exterior results included: Cladosporium. No other spores were represented at this location and not in the exterior results.
 - Airborne total spore count results at the Master Bedroom sample indicated that no elevated levels of mold spores were detected when compared to the exterior results. Spores found in this location at a lower concentration than the exterior results included: Cladosporium, Epicoccum, Basidiospores, Penicillium/Aspergillus and Smuts/myxomycetes. No other spores were represented at this location and not in the exterior results.
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CONCLUSION AND RECOMMENDATIONS

The indoor air quality test performed indicated that hazardous levels of mold spores or mold colonies were present in the crawl space/basement area. The indoor air quality test performed in the master bedroom is not considered to be elevated to the average person however; spores found in the crawl space/basement were present in the master bedroom.

Inspection Solutions recommends the following:

- Level/re-grade the earth within the crawlspace/basement area.
- Install a drain tile system at the perimeter walls in the crawlspace/basement area.
- Install a six millimeter thick poly sheathing down over the grade and mechanically or chemically fasten to the perimeter walls 24 inches above the crawlspace/basement grade.
- Clean and disinfect all framing materials and sub-flooring in the crawlspace/basement area. Clean materials by soda/dry ice blasting or scrub with anti-microbial/fungicide. After materials have been cleaned apply a mold prohibiting primer to the building materials.
- Ensure all grading adjacent to the exterior of the foundation walls have adequate drainage.
- Consideration should be given to installing a battery back-up sump pump with alarm to prevent over flow of sump pit if power is lost.
- Remove vinyl floor covering in the hallway adjacent to the bathroom and in the master bedroom.
 - Prior to the removal of the vinyl flooring the remediator should install a containment system to prevent any mold spores from being spread to other location in the home.
- Remove and replace sub-flooring that has swollen and warped in the master bedroom and hallway adjacent to the bathroom.
 - At the time of material removal and replacement, the remediator should use the opportunity to further examine the materials for moisture and deterioration, and continue to remove and replace materials vertically and horizontally two to four feet beyond areas of moisture affected materials as recommended by EPA and Construction Restoration Protocols. If during the removal and replacement of deteriorated materials there is any uncertainty as how far to continue removing or whether the materials are deteriorated or not, moisture readings should be taken at the time to determine how far removal should go.
 - If mold growth is found on the sub-flooring, and there is no signs of deterioration, clean and disinfect the framing with an anti-microbial solution. After materials have completely dried, apply a mold resistant penetrating sealer to the sub-flooring before reconstruction.

Inspection Solutions recommends that a qualified remediation contractor perform the removal of building materials under proper containment conditions. The remediation team should use this report as a guide in addition to looking for further contamination as materials are exposed during the removal process to correct the deterioration and microbial growth in your home.



As an assessment company that does not perform remediation or accept any referral fees, please consider this report an un-biased and accurate assessment based solely on inspection data available at the time of your inspection.

Contact Inspection Solutions at 952.249.1251 or info@moldsolutionsmn.com for clarification and/or recommendations on installation.

CREDENTIALS AND CERTIFICATIONS

John Magnuson and Gary Brown have over 25 years combined experience in industrial, commercial and residential construction. For over 10 years combined, John and Gary have utilized there extensive training, certifications, and expertise to assess and investigate hundreds of homes specifically for construction and structural defects, moisture and mold intrusions. There certifications include:

- International Code Council (ICC/ICBO) Commercial Building Inspector.
- International Code Council (ICC/ICBO) Residential Building Inspector.
- NACHI Certified Home Inspector.
- Certified Mold Inspector.
- Certified Thermographer Level 1.

Inspection Solutions' professional associations and affiliations include:

- American Indoor Air Quality Council
- Indoor Air Quality Association Inc.
- International Code Council
- Better Business Bureau
- AWCI International
- NACHI
- EMSL Laboratories
- MICRO
- Snell Infrared

WARRANTY OF ACCURACY AND PROFESSIONALISM

Warranty is given to reasonable expectations of professionalism and accuracy of findings. The certified inspector's liability and that of its contractors and subcontractors, arising from any services rendered hereunder, may exceed the total fee paid by the client to the certified inspector if negligence is found.

All the professional opinions presented in this report are based solely on the scope of work conducted and sources referred to in our report. The data presented by the certified inspector in this report was collected and analyzed using generally accepted industry methods and practices at the time the report was generated. This report represents the conditions, locations and material that were observed at the time the fieldwork was conducted. The scope of work for this project did not include an assessment of other environmental conditions which might exist on the property. No interferences regarding other conditions, locations or materials at a later or earlier time may be made based on the contact of this report. This report was prepared for the sole use of our client. The use of this report by anyone other than our client or the certified inspector is strictly prohibited without the expressed written consent of the certified inspector. Portions of this report may not be used independently of the entire report.

Complete Visual Inspection & Scope of Work

A thorough visual inspection is the initial step in identifying construction defects and structural problems producing possible moisture intrusion and potential mold contamination. The extent of any structural damage and potential mold growth was visually investigated by an inspector certified as an ICC/ICBO Building Inspector and Certified Mold Inspector. This complete visual examination included all relevant walls, floors and ceilings. The inspector examined for any code violations demonstrated by the builder at construction or during any remodeling activities. This complete analysis and documentation is vital to determining corrective strategies for contractors, remediators and legal experts when necessitated.

Armed with this information, the inspector then utilizes advanced equipment including a hygrometer, video-borescope (fiber optics), infrared camera and a Protimeter (moisture meter) to detect moisture levels behind walls, ceilings and floors. This data is documented and illustrated in detail as a forensic report. The comprehensive structural analysis combined with the latest moisture identification equipment offers the most accurate and reliable assessment of the dwelling.

METHODOLOGY

To determine whether the property has a construction defect, structural problem, moisture intrusion or potential mold infestation our inspectors use a variety of invasive and non invasive testing techniques. Our staff is certified as ICC/ICBO Building Code Officials, CHI, and CMI. This proprietary process combines decades of experience with the latest

moisture testing equipment including moisture meters, infrared equipment, hygrometers, fiber optic borescopes and microbial air analysis.

If an air sample is recommended, it is taken via a bioaerosol sampler. This type of sampler imparts viable and non-viable spores Air-O-Cell spore trap placed in an apparatus. After the sampling period, fungi samples are removed and recorded results can be found on the following pages. Topical samples, if any, are taken through the use of swabs. At the laboratory, the swabs samples are transferred to petri dishes, and identified as described above.

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.

Exposure to damp and moldy environments may cause a variety of health effects, or none at all. Some people are sensitive to molds. For these people, molds can cause nasal stuffiness, throat irritation, coughing or wheezing, eye irritation, or, in some cases, skin irritation. People with mold allergies may have more severe reactions. Immune-compromised people and people with chronic lung illnesses, such as obstructive lung disease, may get serious infections in their lungs when they are exposed to mold. These people should stay away from areas that are likely to have mold, such as compost piles, cut grass, and wooded areas.

A link between other adverse health effects, such as acute idiopathic pulmonary hemorrhage among infants, memory loss, or lethargy, and molds, including the mold *Stachybotrys Chartarum* (*Stachybotrys Atra*), has not been proven. Further studies are needed to find out what causes acute idiopathic hemorrhage and other adverse health effects.

AIR MONITORING

John Magnuson and Gary Brown are certified inspectors, trained in appropriate sampling methodology, performing air monitoring. Air samples are collected via an E-Lite high volume air flow vacuum pump sampler. This type of sampler imparts viable and non-viable spores Air-O-Cell spore trap placed in an apparatus at a rate of 15.0 cubic liters of air per minutes. After a ten minute sampling period, the impacted fungi are identified

down to genus and to species where possible through visual identification under the microscope. Results are provided in colony forming units per cubic meter of air. Air monitoring should be performed if there is evidence from a visual inspection that the ventilation systems may be contaminated. The purpose of such air monitoring is to assess the extent of contamination throughout the building. Sampling should be conducted while ventilation systems are operating. Air monitoring should be performed if the presence of mold is suspected in a particular area of the structure (e.g. a microbial volatile is detected) but cannot be identified through a visual inspection or bulk sampling. The purpose of such air monitoring is to determine the location and or extent of mold contamination. Air monitoring should also be performed if the building inhabitants are suffering from health problems, which are or may be associated with fungal exposure. If air monitoring is performed, for comparative purposes and at a location representative of outdoor air. The outdoor control test is very helpful in evaluating whether there is an internally generated mold problem. Such a problem may exist if indoor mold tests report mold levels are either (a) higher than the outdoor air test. (b) present indoors but absent from the outdoor control air test.

For all sampling methodologies, to prevent cross-contamination, a new pair of rubber gloves is donned before collecting each sample. The samples are sealed, labeled and delivered to the laboratory within twenty-four hours.

INTERPRETING LAB RESULTS AND GUIDELINES

There are currently no standards or guidelines regarding results of fungal samples. There are no levels, which are typical or permissible. This report was developed in accordance with New York City Department of Health Bureau of Environmental & Occupational Disease Epidemiology “Guidelines on Assessment and Remediation of Fungi in Indoor Environments.”

Many fungi (e.g. species of *Aspergillus*, *Penicillium*, *Fusarium*, *Trichoderma*, and *Memnoniella*) in addition to *Stachybotrys* can produce potent mycotoxins. Mycotoxins are fungal metabolites that have been identified as toxic agents. Even low levels of these species should be remediated. For example, the New York Guidelines recommend remediation if 1 CFU/m³ of *Stachybotrys* is found in the indoor air. If 1000 CFU/m³ of *Stachybotrys* is found in the indoor air, the guidelines recommend immediate evacuation.

DECONTAMINATION RECOMMENDATION

1. Identify and Fix the Moisture Problem - the most important step in solving a mold problem is to identify and correct the moisture sources that allowed the growth in the first place. Keep indoor surfaces as dry as possible, try to maintain the home's relative humidity between 20-40 percent in the winter and less than 60 percent the rest of the year. You can purchase devices to measure relative humidity at some home supply stores. Ventilation, air circulation near cold surfaces, dehumidification, and efforts to minimize the production of moisture in the home are all very important in controlling high humidity that frequently causes mold growth in our cold climate.
2. Begin Drying All Wet Materials - as soon as possible, begin drying any materials that are wet. For severe moisture problems, use fans and dehumidifiers and move wet items away from walls and off floors. Check with equipment rental companies or restoration firms to see if you can rent fans and dehumidifiers.
3. Remove and Dispose of Mold Contaminated Materials - items which have absorbed moisture (porous materials) and which have mold growing on them need to be removed, bagged and thrown out. Such materials may include sheet rock, insulation, plaster, carpet/carpet pad, ceiling tiles, wood products (other than solid wood), and paper products. Likewise, any such porous materials that have contacted sewage should also be bagged and thrown away. Non-porous materials with surface mold growth may be saved if they are cleaned well and kept dry (see step 4).
4. Clean Surfaces - surface mold growing on non-porous materials such as hard plastic, concrete, glass, metal, and solid wood can usually be cleaned. Cleaning must remove and capture the mold contamination, because dead spores and mold particles still cause health problems if they are left in place
5. Disinfect Surfaces (if desired) - after cleaning has removed all visible mold and other soiling from contaminated surfaces, a disinfectant may be used to kill mold missed by the cleaning. In the case of sewage contamination, disinfection must be performed. Contact the Minnesota Department of Health for appropriate advice.
6. Remain on MOLD ALERT - Continue looking for signs of moisture problems or return of mold growth. Be particularly alert to moisture in areas of past growth. If mold returns, repeat cleaning steps and consider using a stronger solution to disinfect the area again. Regrowth may signal that the material should be removed or that moisture is not yet controlled.

REMEDIATION PROTOCOL

STEP #1: INSPECTION

- * To determine whether the property has a mold problem requiring remediation, the certified inspector, uses a wide variety of mold testing techniques and technologies. The air is sampled via a Bioaerosol Sampler and topical samples are taken through the use of swabs. This process enables the certified inspector to define the areas of removal and provide oversight for the project.

- * Consult with the construction and remodeling group prior to removal to facilitate efficient reconstruction of the space.

- * Develop a project time line and communicate this with building representatives prior to the remediation and construction project. Provide contact numbers if occupants have questions about the project.

STEP #2: PERSONNEL

- * Individuals trained in the handling of hazardous materials.

- * Provide right-to-know training on exposure to the chemicals used and the health effects of exposure to the fungal organisms.

STEP #3: PPE

- * Full faced negative pressure respirators (North 7600 series) with CD/CL/HC/HF/OV/SD/P100 cartridges. The cartridge protects against chlorine dioxide, chlorine, hydrogen chloride, hydrogen fluoride, organic vapor, sulfur dioxide and provides a HEPA filter to protect against particles.

- * Disposable tyvek coveralls covering both the head and the shoes.

- * Gloves: Neoprene, Rubber, Leather or cotton depending on the material to be removed. Leather is recommended when sharp material is expected to be encountered during the demolition.

- * Tools: Pliers or cutters to break up metal mesh in plaster walls. These and other tools are used to reduce skin contact with sharp objects.

STEP #4: HYGIENE

- * Wash hands after exiting the enclosure and prior to using the hands to place anything in the mouth. Fungal organisms can cause dermatitis. Ingestion of the bacteria or fungi can cause severe diarrhea.

- * During the exit from the enclosure, remove the coveralls leaving them inside either the enclosure or the first stage (dirty room) of the two stage decontamination room. In some cases, space will not allow for construction of the decontamination room.

- * In the change area, take off the respirator. Remove the cartridges. Clean the surfaces of the cartridges with a disinfectant wipe and keep the cartridges for reuse. Soak and clean the respirator in a gallon of disinfectant (1/2 oz. A-33 quaternary ammonia disinfectant per gallon of water). Rinse the respirator in water, clean with a disinfectant wipe and dry with a clean towel.

- * After an exhaust fan with a HEPA filter is used on a job site, the prefilter is covered with 4-6 mil poly and sealed with duct tape.

STEP #5: CONTAINMENT OF AFFECTED AREA

- * Complete isolation of work area from occupied spaces using plastic (4-6 mil poly) sheeting sealed with duct tape (including ventilation ducts/grills, fixtures and other openings).

- * Use an exhaust fan with a HEPA filter to generate negative pressurization. Use the appropriate sized unit for the space. For example, an Ulti Vac may be used for a glove bag removal, a HEPA Jr. for an office sized room and larger units for bigger areas. Do not use the same units for asbestos and mold removal. If units are shared, a break in the HEPA filter could change a mold containment into an asbestos containment.

- * The two sections of the Ulti Vacs are reinforced with duct tape wrapped around the taped junction in the middle of the vacuum unit.

- * If space allows, construct a two stage decontamination room with a changing area and a dirty room attached to the entrance of the containment area.

STEP #6: CONTROL OF EXPOSURE TO ADJACENT AREAS

- * Vacating people from spaces is not necessary but is recommended for individuals with reduced immune systems, infants, recent surgery patients, people with chronic inflammatory lung diseases or individuals with respiratory health concerns (asthma, hypersensitivity pneumonitis and severe allergies).

- * In general, there are fewer occupant complaints about the remediation if the adjacent spaces are vacated. The complaints about construction related odors are reduced and there is more space to place cleanup material.

STEP #7: PAINTING AND APPLYING BENZAALKONIUM CHLORIDE

- * Exhaust fan discharge is outside building - Keep HEPA exhaust fan on during the application of Benzalkonium Chloride and anti-microbial paint. Make sure adjacent outside windows are shut, the discharge is not close to an air intake, and window air conditions are shut off or set on re-circulation.
- * Exhaust fan discharge is inside building - Shut off HEPA exhaust fan during the application of Benzalkonium Chloride and anti-microbial paint. Turn the fan back on when the odor is no longer noticeable.
- * Applying Benzalkonium Chloride to visible fungal growth prior to removal of material. Apply the Benzalkonium Chloride solution to the surface and wait sixty minutes prior to removing the material. This provides sufficient time for the Benzalkonium Chloride to disinfect the material and reduces the dust generated because the material is wetted.
- * In some cases, a surface is lightly misted with a Benzalkonium Chloride solution prior to painting. Painting of the surface may begin within 90 minutes of the Benzalkonium Chloride misting.

STEP #8: REMOVAL OF CONTAINMENT MATERIALS

- * Containment materials that cannot be cleaned should be removed from the building in sealed plastic bags. The outside of the bags could be cleaned with a damp cloth and a detergent solution or HELP 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. Moldy materials that are bagged can be disposed of with other general waste.
- * Dirt, debris and broken plaster may be placed in 55 gallon drums inside the containment area. Before removal from the containment area, close the drum and clean the outside surface.

STEP #9: CLEANING OF THE CONTAINMENT AREA

- * 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.

STEP #10: CONTAINMENT OF AREA USED DURING RECONSTRUCTION

- * After the containment area has been cleaned, the enclosure can be used to contain the dusts generated by the sheetrock sanding and taping activities. This is done to reduce the problems with cleanup when reconstruction is completed. The use of HEPA exhaust filter is not required. The two stage decontamination area is also not needed.

STEP #11: FINAL INSPECTION

* Prior to re-occupancy of the space, a visual inspection and or air sampling will be done by (Any Inspector) or a designated representative. Re-occupancy may occur when the space passes the inspection.

STEP #12" REFERENCES

Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Department of Health Bureau of Environment & Occupational Disease Epidemiology. April, 2000 16p.

Managing Water Infiltration in Buildings, U of MN DEHS and Institute for Environmental Assessment. N.G. Carlson and A. Quraishi - 1998.

BIOCIDE APPLICATION

1. All areas to be treated with a biocide must be clean.
2. Vacuum all debris in an appropriate hepa-vac.
3. Using a wire brush, aggressively scrub all areas to be treated with a solution containing one part water, one part sodium hypo chloride and 2 ounces of anionic surfactant. Let dry completely.
4. Using a sprayer, thoroughly saturate the entire area with the pre-mixed biocide (Benzalkonium Chloride or Lophene). Let dry completely.
5. Repeat step number four.
6. Spray or brush on an antimicrobial sealant (Tim bor, fosters). Complete coverage is essential.
7. Perform clearance tests.

WORKS CONSULTED



Various guidance documents for remediation of mold contamination have been developed.

The New York City Department of Health has a set of guidelines, Assessment and Remediation of Fungi in Indoor Environments, originally developed for Stachybotrys but expanded to be inclusive of all molds that are widely recognized available at

<http://www.nyc.gov/html/doh/html/epi/moldrpt1.html>

The Institute of Inspection Cleaning and Restoration Certification produced guideline S500: Standard and Reference Guide for Professional Water Damage

Healthy Homes Issues: Mold 14 October 2, 2001

Restoration (available by contacting the IICRC headquarters at (360) 693-5675

Or through e-mail at supplies@iicrc.org).

The American Conference of Governmental Industrial Hygienists (ACGIH) bioaerosols committee published in 1999, Biosaerosols: Assessment and Control, a compilation of information on investigation strategies, sampling and analysis, and control of indoor bioaerosols, including molds (can be ordered from ACGIH at <http://www.acgih.org/home.htm>).

The American Industrial Hygiene Association (AIHA) is in the process of developing a document with explicit guidelines for mitigation of mold hazards and some general guidelines for clearance.

U.S. Environmental Protection Agency published guidance for Mold Remediation in Schools and Commercial Buildings, which includes many general principles also applicable to residential mold mitigation efforts (available from EPA online at <http://www.epa.gov/iaq/molds/index.html>).

The Canada Mortgage and Housing Corporation published, Clean-up Procedures for Mold in Houses, which provides qualitative guidance for mold mitigation (can be ordered from CMHC at <http://www.cmhcschl.gc.ca/boutique/en/>)

Health Canada published its Fungal Contamination in Public Buildings guide to assist investigators in recognizing and managing fungal contamination Health Canada online at <http://www.hcsc.gc.ca/ehp/ehd/catalogue/bch.htm#technical>).

CDC Department of Health and Human Services
Centers for Disease Control and Prevention
http://www.cdc.gov/mold/dampness_facts.htm

“Mold Remediation in Schools and Commercial Buildings”, U.S. EPA Indoor Environments

Division. April 2001. www.epa.gov/iaq/molds/mold_remediation.html

“Guidelines on Assessment and Remediation of Fungi in Indoor Environments”, New York City

Department of Health Bureau of Environmental & Occupational Disease Epidemiology. April

2000. [NYC.gov/html/doh/html/epi/moldrpt1.html](http://nyc.gov/html/doh/html/epi/moldrpt1.html)

Standard and Reference Guide for Professional Water Damage Restoration IICRC S500, The

Institute of Inspection, Cleaning and Restoration Certification. Second Edition 1999.

Available for purchase by contacting IICRC: www.iicrc.org

Bioaerosols: Assessment and Control. American Conference of Governmental Industrial Hygienists (ACGIH). 1999. Available for purchase by contacting ACGIH: www.acgih.org

“Assessment, Cleaning, and Restoration of HVAC Systems (ACR-2002)”. National Air Duct

Cleaners Association (NADCA) of Washington, DC. Available for purchase by contacting

NADCA: www.nadca.com

“Fungal Abatement Safe Operating Procedure”. University of Minnesota Dept. of Environmental

Health and Safety. Www.dehs.umn.edu/iaq/sop.html

“Fighting Mold: The Homeowner’s Guide”. Canada Mortgage and Housing Corporation. Www.cmhc.ca/en/burema/gesein/abhose/abhose_50.cfm?renderforprint=1

“Fungal Contamination in Public Buildings”. A Guide to Recognition and Management. Health

Canada. www.hc-sc.gc.ca/ehp/ehd/catalogue/bch_pubs/fungal.pdf