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2018

PROACTIVE INDOOR AIR QUALITY REPORT

MBIT

Test Date: September 26, 2018

MIDDLE BUCKS Institute of Technology
Merging Business, Industry, and Technology

Prepared
for:

Middle Bucks Institute of Technology
2740 Old York Road
Jamison, PA 18929

November, 2018

Introduction

This report presents the results of the annual, proactive Indoor Air Quality (IAQ) evaluation conducted at the Middle Bucks Institute of Technology (MBIT), located in Jamison, PA. Bill Fitzmaurice, Project Manager, EnviraHealth Corporation conducted the proactive IAQ testing on September 26, 2017.

During the IAQ surveys, tests were performed to assess the following parameters:

TESTING STRATEGY

- Airborne Chemicals
  - * Carbon Dioxide
  - * Carbon Monoxide
  - * Hydrogen Sulfide
  - * Volatile Organic Compounds (VOCs)
- -Organic Vapor Monitors (Total Hydrocarbons as n-hexane)
- - Temperature & Relative Humidity
- - Bioaerosols
  - * Non-Viable Spore Traps

For each of the parameters listed above, this report describes typical sources of each contaminant or condition, lists any established levels of concern, presents the test results, and the interpretations of and conclusions from these results.

Mr. Rich Hansen, Building and Grounds Supervisor, requested baseline IAQ testing for the MBIT. An IAQ testing strategy was developed to assess area conditions with regard to chemical and comfort parameters (temperature and relative humidity), bioaerosols, as well as, a visual site inspection conducted by a representative of EnviraHealth Corporation. After compiling and analyzing the test results, recommendations are made to help maintain and/or enhance the IAQ throughout the MBIT.

Indoor Testing Conditions

The school was occupied during the test period.
The ventilation system was operational during the test period.
There were numerous bay doors open throughout the building on the test date.
The testing was conducted in the center of each room/area.

Visual Site Inspection (September 26, 2018) & General Comments

A visual site inspection revealed the test areas were clean, dry and very well-maintained. No visible fungal growth was found at the time of this survey. No hidden areas (behind walls, above ceilings, under floors, etc.) were investigated.

Destructive testing was not included as part of this survey. If water damage or fungal contamination is suspected in hidden areas, contact EnviraHealth for additional testing. EnviraHealth cannot guarantee that water intrusion or fungal contamination is not present in hidden areas of the test areas or building.

The observations noted in this report are indicative of the conditions on site at the time of this investigation. EnviraHealth Corporation does not guarantee, warranty or certify that the conditions represented in this investigation will not change significantly over time.

AIRBORNE CHEMICALS

Airborne Chemicals

Airborne chemical sampling locations were chosen to obtain a representative cross-section of airborne chemical concentrations throughout the test areas. Concentrations of carbon dioxide, carbon monoxide, hydrogen sulfide and Volatile Organic Compounds (VOCs) were obtained using calibrated, hand-held monitors. Long-term sampling for Total Hydrocarbons was also conducted in Cosmetology 102 and 103 as part of this proactive IAQ survey. All airborne chemical test results are expressed in either Parts per Million (PPM) or Milligrams per Cubic Meter of Air (mg/M^3).

In the table that follows, sampling locations are referenced by the room/area where the sample was taken.

CARBON DIOXIDE

Typical Sources: Carbon dioxide is a colorless, odorless, tasteless gas resulting from combustion and metabolic processes (such as respiration). Carbon dioxide is produced by both plants and animals, including humans, and is a normal component of breathable air.

Level of Concern: The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 62.1-2004 states that maintaining a carbon dioxide concentration no greater than 700 Parts per Million (PPM) above the ambient level will satisfy a substantial majority of occupants with respect to human bioeffluents (body odor).

CARBON MONOXIDE

Typical Sources: Carbon monoxide is a colorless, odorless, tasteless gas, which results from the incomplete combustion of fuels such as gasoline, kerosene, methane, and propane. Effects of carbon monoxide exposure can range from mild symptoms such as headaches and dizziness to severe reactions such as unconsciousness and death. Carbon monoxide can be introduced from the outdoors, where it is generated from automobile exhaust and industrial combustion sources. Indoor sources include tobacco smoke, improperly vented combustion sources, and leaking heat exchangers.

Level of Concern: Then Environmental Protection Agency (EPA) National Ambient Air Quality Standard for carbon monoxide is 9 PPM/8 hour average.

HYDROGEN SULFIDE

Typical Sources: Hydrogen sulfide (Synonym: Sewer Gas) is a colorless gas with a strong odor of rotten eggs. Hydrogen sulfide gas is a natural product of decay and is most commonly a result of decomposition in septic or sewer systems. Some communities that have high concentrations of sulfur in their soil also tend to have detectable hydrogen sulfide in their water. While extremely high levels can be harmful, it is one of those chemicals that can be detected by the human nose at a concentration 1/400 times lower than the threshold for harmful health effects. Hydrogen sulfide causes the sense of smell to become rapidly fatigued.

Level of Concern: ACGIH has adopted an eight-hour, Threshold Limit Value (TLV) Time-Weighted Average (TWA) of 10 PPM. For an IAQ study, 1.0 PPM (1/10 ACGIH-TLV) will be used for comparative purposes.

VOLATILE ORGANIC COMPOUNDS (VOCs)

Typical Sources: Organic chemical compounds are everywhere in both indoor and outdoor environments because they have become essential ingredients in many products and materials. In the outdoor environment, VOCs are volatized or released into the air mostly during manufacture or use of everyday products and materials. Indoors, VOCs are mostly released into the air from the use of products and materials containing VOCs.

VOC Information: VOCs in indoor environments have greatly increased over the past several decades. Factors contributing to the increase in organic indoor air pollutants include; construction of tighter, more energy-efficient buildings, the increase of synthetic building materials and the development of improved and updated office equipment and technologies.

Level of Concern: The recommended VOC guideline for indoor environments is 3.0 milligrams/cubic meter (mg/m^3); 0.64 PPM (based on isooctane)*.

* *Molhave of the Institute of Environmental and Occupational Medicine.*

NOTE: **The American Conference of Governmental Industrial Hygienists (ACGIH) establishes TLV-TWA (Threshold Limit Value-Time Weighted Average) values for various chemicals. TLV-TWA values generally relate to single compounds and do not take into account the effects of simultaneous exposures to complex mixtures. Therefore, ACGIH has not established TLV-TWA values for VOC exposure. In addition, OSHA has not formulated PELs (permissible exposure limits) or IDLHs (immediately dangerous to life or health) for VOC exposure.**

Comfort Parameters

Temperature and relative humidity readings were obtained using a calibrated, hand-held, Fluke 975 air meter. This data should be considered a "snapshot" of conditions identified on the test date due to the small sample size.

TEMPERATURE AND RELATIVE HUMIDITY

Purpose: Occupant comfort is the primary reason for monitoring temperature and relative humidity in a building. While extremes in temperature and/or relative humidity do not normally pose health problems as would an extremely high airborne level of a hazardous chemical, the resulting discomfort tends to exacerbate other indoor environmental problems. Excessive variation in temperature throughout a building can also indicate inadequate ventilation. In addition, high temperature and relative humidity can create conditions favorable for microbial growth.

NOTE: The amount of moisture air can hold is contingent on ambient air temperature. As temperature increases, so does the amount of moisture the air can hold. Thus, the term "relative humidity" refers to the amount of moisture in the air relative to air temperature.

Achieving a comfortable temperature range for all occupants is difficult, but the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) has published recommended standards for thermal comfort parameters for people performing light sedentary activity and wearing clothes appropriate for the season. Maintaining a building within the following ranges of temperature and relative humidity will satisfy the thermal comfort requirements of most occupants.

Acceptable Temperature and Relative Humidity Ranges

Measurement Type	Winter	Summer
30% Relative Humidity	68.5°F – 76.0°F	74.0°F – 80.0°F
50% Relative Humidity	68.5°F - 74.5°F	73.0°F – 79.0°F
Relative Humidity	30% - 60%	30% - 60%

Source: *ASHRAE Standard 55-1992, Thermal Environmental Conditions for Human Occupancy.*

EnviraHealth Equipment Photographs

FLUKE 975 AIR MONITOR

MSA ALTAIR 5X MULTIGAS DETECTOR

AIRBORNE CHEMICAL TEST RESULTS

MBIT

Test Date: September 26, 2018

Location	Time	CO2	CO	H2S	VOCs	Temp.	RH%
Cafeteria	9:05am	702	2	0	0	70.7	71.1
Kitchen Area	9:06am	692	0	0	0	71.6	68
Men's Locker Room	9:07am	683	0	0	0	69	63.1
Room 101	9:10am	629	2	0	0	69.8	78.5
Room 104	9:24am	719	0	0	0	70.7	72.3
Room 103	9:26am	765	0	0	0	69.8	63.8
Room 102	9:30am	720	0	0	0.1	69.8	73
Main Office	9:34am	730	0	0	0	70.7	65.6
Director's Office	9:36am	670	3	0	0	70	75.6
Room 120	9:39am	703	0	0	0	71.6	75
Room 117	9:41am	704	0	0	0	71	77.1
Room 114	9:47am	890	3	0	0.1	71.2	74.7
Room 115	9:48am	815	0	0	0	71	72.6
Room 116	9:50am	773	0	0	0	68.9	66
Room 200	9:52am	788	0	0	0	69.8	67.1
Room 307	10:00am	661	3	0	0	68	66.7
Room 306	10:12am	720	0	0	0	69.8	75.1
Room 305.1	10:17am	739	3	0	0.1	68.1	68
Room 304	10:25am	735	0	0	0	70	75.5
Hallway near 300	10:33am	690	0	0	0	70.7	67.1
Room 405	10:45am	780	0	0	0	71.6	68.2
Room 402.6	10:55am	655	0	0	0	70.7	69.4
Room 503	11:05am	630	0	0	0	70	76.6
Room 405	11:11am	666	2	0	0	71.6	72.2
Cafeteria	11:17am	840	0	0	0	71.6	68.7
Room 106	11:25am	800	3	0	0	71.1	66
Room 111	11:35am	770	0	0	0	70	62.4
Room 104	11:45am	746	0	0	0	69.8	67.1
Room 105	11:55am	736	0	0	0	71.6	70.7
Room 103	12:10pm	756	1	0	0	69.8	68.6
Main Office	12:17pm	731	0	0	0	70.7	61.6
Welding Classroom	12:20pm	834	0	0	0.2	70	69
Room 117	12:23pm	816	0	0	0	71.6	69.9
Room 114	12:26pm	785	0	0	0	69.8	72.6
Room 115	12:35pm	810	3	0	0	70	71.5
Room 116	12:39pm,	742	0	0	0	68.1	64
Room 200	12:42pm	844	1	0	0	70.7	65.2
Room 307	12:52pm	730	0	0	0	68.9	68.6
Room 306	12:54pm	659	2	0	0	69	71.5
Room 305.1	12:57pm	651	0	0	0	68	70
Room 304	1:00pm	694	0	0	0	71.7	78.8
Hallway near 300	1:07pm	677	0	0	0.1	70.7	64.3
D-Wing Hallway	1:10pm	692	0	0	0	71	66.1
Room 402	1:15pm	610	0	0	0	72.5	76
Room 503	1:21pm	771	1	0	0	72.5	73.4
Room 405	1:25pm	655	0	0	0	69	67.3
Room 401	1:20pm	715	0	0	0	70.7	67

Main Office	1:25pm	878	2	0	0	72	66.3
Room 114	1:30pm	879	0	0	0.1	73.1	56
Room 115	1:32pm	987	0	0	0	72.8	54
OUTDOORS	**1:45pm**	**500**	**3**	**X**	**X**	**83.2**	**65.7**

Key:
CO2: Carbon Dioxide
CO: Carbon Monoxide
H2S: Hydrogen Sulfide
VOCs: Volatile Organic Compounds
Temp: Temperature (F)
RH%: Relative Humidity

NOTE:
Carbon Dioxide, Carbon Monoxide, Hydrogen Sulfide and
Volatile Organic Compounds were measured in Parts Per Million (PPM).

AIRBORNE CHEMICAL TEST RESULTS
SEPTEMBER 26, 2018

CARBON DIOXIDE

Carbon dioxide is an excellent indicator of the relationship between occupancy and ventilation. High levels of carbon dioxide may indicate an inadequate amount of fresh air, high occupancy, or both. ASHRAE suggests indoor carbon dioxide levels should be less than or equal to 700 PPM above the ambient level. In this case, the indoor carbon dioxide level should not exceed 1,200 PPM in any test location.

Indoor carbon dioxide levels were within the ASHRAE guideline. This finding suggests the ventilation system serving the building is functioning properly and delivering an adequate amount of fresh air to occupied spaces.

NOTE: Carbon dioxide levels fluctuate throughout the course of the day. The levels are dependent on occupancy and the amount of fresh outdoor air entering the test areas. The ASHRAE level (700 PPM) is just a guideline and NOT a regulatory requirement.

CARBON MONOXIDE

During the test period, the levels of carbon monoxide were within the EPA National Ambient Air Quality Standard of 9 PPM/8 hour average in all indoor test locations.

HYDROGEN SULFIDE

During the test period, the levels of hydrogen sulfide were within the IAQ suggested guideline of 1.0 PPM (1/10 ACGIH-TLV).

VOLATILE ORGANIC COMPOUNDS

Sampling conducted on the test date revealed that airborne chemical levels measured using a PID were within the "no effect" level (cumulative concentration) of 0.64 PPM.

TEMPERATURE & RELATIVE HUMIDITY

Indoor temperatures were within the comfort level suggested by ASHRAE on the test date. The measured temperature range was narrow and revealed no extreme temperatures. The building is typically on the "cooler" side due to the type of activities conducted in each of the areas.

Indoor relative humidity levels measured on the test date were ***elevated*** (>60%) throughout the building. ***This is a weather dependent situation in the building every year due to the amount of bay doors open in a majority of areas. Please keep in mind, indoor relative humidity should not be greater than 60% for extended periods of time due to the potential for mold growth and amplification.***

ORGANIC VAPOR MONITORS

Organic Vapor Monitors
Test Results
September 26, 2018

Introduction

On September 26, 2018, passive Organic Vapor Monitors (OVMs) were placed in the Cosmetology Area (Rooms 102 & 103). The sampling locations inside the building were selected due to the amount and types of chemicals used in these areas. Both monitors were exposed to the ambient air and left in place for a sampling period of 330 minutes.

The OVMs were sent for analysis to a Certified Industrial Hygiene (CIH) laboratory located in Ashland, Virginia. The laboratory was instructed to analyze the samples for the following: Total Hydrocarbons as Hexane (NIOSH Method 1500).

ORGANIC VAPOR MONITOR PHOTO

CLASSROOM ACTIVITIES

Room 102 – Class Instruction & Hair Braiding
Room 103 – Class Instruction, Hair Braiding & Hair Spraying

TEST RESULTS

The sample from Room 102 had a Total Hydrocarbon level of <0.803 ppm and Room 103 had a level of 1.05 ppm. The higher level in Room 103 was due to the hairspray. The airborne chemicals measured in both test locations are not an issue from an IAQ perspective.

The laboratory data is attached to this report.

ORGANIC VAPOR MONITORS

LAB RESULTS

Analytics Corporation
10329 Stony Run Lane
Ashland, Va 23005
Phone: (804) 365-3000 Fax: (804) 365-3002
AIHA-LAP, LLC Accreditation ID 100531

Final Report

Work Order W288039

ENVIRAHEALTH CORP
1937 STATION AVE
CENTER VALLEY, PA 18034

Customer: PSC00186
Attention: BARB PLOHOCKI
PO Number CC

Date Received: 10/15/18
Client Project ID MBIT

Lab ID: W288039001 **Sample ID:** FE6391 (102) **Media:** 3M 3500 ORGANIC POVM **Sample Date:** 9/26/2018 **Sampling Time:** 330

Analyte	Method	Analysis Date	Volume		Reporting Limit	Front	Rear	Total	Concentration	
Total Hydrocarbons as Hexane	NIOSH Method 1500	10/22/18	10.6	L	30 ug			< 30 ug	< 2.83 mg/M3	< 0.803 ppm

Lab ID: W288039002 **Sample ID:** FE7349 (103) **Media:** 3M 3500 ORGANIC POVM **Sample Date:** 9/26/2018 **Sampling Time:** 330

Analyte	Method	Analysis Date	Volume		Reporting Limit	Front	Rear	Total	Concentration	
Total Hydrocarbons as Hexane	NIOSH Method 1500	10/22/18	10.6	L	30 ug			39.3 ug	3.7 mg/M3	1.05 ppm

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General Laboratory Comments

Abbreviations:
ug = micrograms; mg=milligrams; g = grams, ppm=parts per million (volume), ppb = parts per billion (volume), mg/M3=milligrams per cubic meter of air, ug/M3=micrograms per cubic meter of air; Min=minutes, Qual=Qualifiers

BIOAEROSOLS

Bioaerosol Testing – Premise

Bioaerosols are those airborne particles that are living or originate from living organisms. Bioaerosols include microorganisms (i.e., culturable, nonculturable, and dead microorganisms) and fragments, toxins, and particulate waste products from all varieties of living things. Bioaerosols are ubiquitous in nature and may be modified by human activities. All persons are repeatedly exposed, day after day, to a wide variety of such materials. Individual bioaerosols range in size from submicroscopic particles (<0.01μm) to particles greater than 100 μm in diameter.

Almost all air in indoor environments contains microorganisms. Environmental factors that influence indoor microbial concentrations include outdoor concentrations, type and rate of ventilation, and indoor moisture levels. Airborne microbial concentrations in indoor environments also vary with the amount of mechanical and/or human activity. A large number of people and/or abundant activity stirs up dust (dispersing settled spores into the air) and creates air currents, delaying deposition by gravity. In addition, fungal spores can be introduced when people enter the area, either on people themselves or on clothing.

Molds can be found almost anywhere and can grow on virtually any organic substance as long as they have both oxygen and moisture. There are molds that can grow on wood, paper, carpet, foods and insulation. When excessive moisture accumulates in buildings or on building materials, mold growth will often occur, particularly if the moisture problem remains undiscovered or unaddressed. It is impossible to eliminate all molds and mold spores in the indoor environment. However, mold growth can be controlled indoors by controlling moisture indoors.

Spore Information

Mold spores are microscopic (2-10 microns) and are naturally present in both the indoor and outdoor environments. Molds reproduce by means of spores. Some molds have spores that are easily disturbed and waft into the air and settle repeatedly with each disturbance. Other molds have sticky spores that will cling to surfaces and are dislodged by brushing against them or by other direct contact. Spores may remain able to grow for years after they are produced. In addition, whether or not the spores are alive, the allergens in and on them may remain allergenic for years.

For mold to grow in an indoor environment, you need a certain temperature range (typically 40°F-120°F), spores (begin the growth of mold), moisture (water damage and/or infiltration or it can occur when high relative humidity or the hygroscopic properties of building surfaces allow sufficient moisture to accumulate) and nutrient materials (dust, paper, glue, dirt or organic matter). If any of the "four fundamentals" are taken away, mold will **not** grow. If a building is properly maintained and situations which involve water (floods, leaky pipes, etc.) are addressed quickly and efficiently, mold growth will not be an issue.

Burkard Spore Trap Sampling

The Burkard is a portable, volumetric air sampler used for collecting airborne particles directly onto glass slides. The glass slides used in the Burkard Spore Trap were prepared using a mixed cellulose ester (MCE) gel. They were supplied to EnviraHealth by a certified (EMLAP) environmental microbiological laboratory.

Ambient air was drawn into the sampler at a flow rate of 10 liters/minute (LPM). The total volume of air for each test sample was ninety (90) liters (Flow Rate - 10 LPM X 9 Minutes per Sample).

Please understand a spore trap method is typically the first step in conducting a complete building evaluation. Spore traps provide a quicker turnaround time than culture-based analysis and collect a wide range of airborne aerosols. There are several limitations to the spore trap method and they include the following:

Fungi cannot be fully speciated with this method. Aspergillus species and Penicillium species are reported as a "Group" due to similarities in spore morphology.

Spore viability cannot be assessed because it is not possible to differentiate between viable and nonviable spores.

Lab to lab variation in spore identification.

These samples (Indoor + Outdoor) are representative of a narrow time frame and for screening purposes only. The Burkard Spore Trap test results are NOT intended to represent definitive exposure levels.

General Air Sampling Information

It should be noted there are no regulatory standards for measuring indoor air quality. The ACGIH Bioaerosols Committee recommends sampling in complaint, non-complaint, and outdoor areas several times during the day and making comparisons between these areas. Since the purpose of this investigation was to conduct an air quality screening, and not to provide an in-depth microbiological assessment, EnviraHealth procedures deviated from the ACGIH recommendations in that only one (1) sample was collected from each indoor location on the test date.

AEML Laboratory

Collectively, the staff at AEML, Inc. has nearly 50 years of environmental and microbiological testing in private, industrial, and government programs in support of projects and contracts that encompass a wide variety of testing services. Their management staff has successfully completed courses in *Indoor Air Quality: Fungal Spore Identification* at the prestigious McCrone Research Institute.

AEML, Inc. is an active participant in the AIHA EMPAT Proficiency Testing Program and has developed and implemented policies and procedures that adhere to the General *Requirements for the Competence of Testing and Calibration Laboratories, ISO/IEC 17025:2005.* AEML, Inc. is accredited by the American Association for Laboratory Accreditation for Biological Testing (A2LA Cert #2572.01). AEML, Inc. is also fully licensed and insured.

Laboratory Analysis Information

Direct microscopy (100% at 600X Magnification) was used to analyze the spore trap samples (indoor + outdoor), providing both a qualitative and quantitative assessment of spores in the air. The limit of detection for each test sample was 11 spores/cubic meter. In addition to the spore trap analysis, the samples were also analyzed for Hyphal Fragments, Pollen, and given a debris rating. This information is documented at the bottom of each test sample.

Burkard Spore Trap Photo

BIOAEROSOL LAB RESULTS

MBIT SAMPLING KEY

Test Date: September 26, 2018

MIDDLE BUCKS
Institute of Technology
Merging Business, Industry, and Technology

Sample ID	Location
303M	Room 303
103M	Room 103
202M	Room 202
101M	Room 101
115M	Room 115
Café Stage	Cafeteria Stage
406M	Room 406
Main Office	Main Office
MBIT Out	Outdoors – Main Entrance

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Project: MBiT

Batch: 181394

Sampled: 9/26/2018
Received: 10/2/2018
Analysis Date: 10/2/2018
Report Date: 10/2/2018

AEML Test: A001 Spore Trap Analysis

Sample ID:	181002L062	181002L063	181002L064	181002L065
Client Sample ID:	303 M	103 M	202 M	101 M
Volume Sampled (L):	90	90	90	90
Media:	Impaction Slide	Impaction Slide	Impaction Slide	Impaction Slide
Percent of Trace Analyzed:	100% at 600X Magnification	100% at 600X Magnification	100% at 600X Magnification	100% at 600X Magnification

Spore Types	Raw Count	Count/m^3	%	Raw Count	Count/m^3	%	Raw Count	Count/m^3	%	Raw Count	Count/m^3	%
Alternaria	–	–	–	–	–	–	–	–	–	–	–	–
Arthrinium	–	–	–	–	–	–	–	–	–	–	–	–
Ascospores	–	–	–	–	–	–	–	–	–	–	–	–
Aspergillus/Penicillium-Like	9	100	90	–	–	–	1	11	100	–	–	–
Basidiospores	–	–	–	–	–	–	–	–	–	–	–	–
Bipolaris/Dreschlera	–	–	–	–	–	–	–	–	–	–	–	–
Botrytis	–	–	–	–	–	–	–	–	–	–	–	–
Chaetomium	–	–	–	–	–	–	–	–	–	–	–	–
Cladosporium	1	11	10	–	–	–	–	–	–	–	–	–
Curvularia	–	–	–	–	–	–	–	–	–	–	–	–
Epicoccum	–	–	–	–	–	–	–	–	–	–	–	–
Fusarium	–	–	–	–	–	–	–	–	–	–	–	–
Ganoderma	–	–	–	–	–	–	–	–	–	–	–	–
Memnoniella	–	–	–	–	–	–	–	–	–	–	–	–
Nigrospora	–	–	–	–	–	–	–	–	–	–	–	–
Oidium/Peronospora	–	–	–	–	–	–	–	–	–	–	–	–
Pithomyces	–	–	–	–	–	–	–	–	–	–	–	–
Rust	–	–	–	–	–	–	–	–	–	–	–	–
Smut/Myxomyces/Periconia	–	–	–	–	–	–	–	–	–	–	–	–
Stachybotrys	–	–	–	–	–	–	–	–	–	–	–	–
Torula	–	–	–	–	–	–	–	–	–	–	–	–
Ulocladium	–	–	–	–	–	–	–	–	–	–	–	–
Unidentified Spores	–	–	–	–	–	–	–	–	–	–	–	–
Total Spores	**10**	**111**		**0**	**0**		**1**	**11**		**0**	**0**	
Hyphal Fragments	–	–		–	–		–	–		–	–	
Pollen	–	–		–	–		–	–		–	–	
Debris Rating	3			2			3			2		
Detection Limit	11			11			11			11		

Joshua Krinsky
Technical Director

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Batch: 181394

Sampled: 9/26/2018
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Analysis Date: 10/2/2018
Report Date: 10/2/2018

AEML Test: A001 Spore Trap Analysis

Sample ID:	181002L066	181002L067	181002L068	181002L069
Client Sample ID:	115 M	Cafe Stage	406 M	Main Office
Volume Sampled (L):	90	90	90	90
Media:	Impaction Slide	Impaction Slide	Impaction Slide	Impaction Slide
Percent of Trace Analyzed:	100% at 600X Magnification	100% at 600X Magnification	100% at 600X Magnification	100% at 600X Magnification

Spore Types	**Raw Count**	**Count/m^3**	**%**	**Raw Count**	**Count/m^3**	**%**	**Raw Count**	**Count/m^3**	**%**	**Raw Count**	**Count/m^3**	**%**
Alternaria	–	–	–	–	–	–	–	–	–	–	–	–
Arthrinium	–	–	–	–	–	–	–	–	–	–	–	–
Ascospores	–	–	–	–	–	–	1	11	14	–	–	–
Aspergillus/Penicillium-Like	–	–	–	–	–	–	–	–	–	–	–	–
Basidiospores	–	–	–	–	–	–	–	–	–	–	–	–
Bipolaris/Dreschlera	–	–	–	–	–	–	–	–	–	–	–	–
Botrytis	–	–	–	–	–	–	–	–	–	–	–	–
Chaetomium	–	–	–	–	–	–	–	–	–	–	–	–
Cladosporium	–	–	–	1	11	100	6	67	86	–	–	–
Curvularia	–	–	–	–	–	–	–	–	–	–	–	–
Epicoccum	–	–	–	–	–	–	–	–	–	–	–	–
Fusarium	–	–	–	–	–	–	–	–	–	–	–	–
Ganoderma	–	–	–	–	–	–	–	–	–	–	–	–
Memnoniella	–	–	–	–	–	–	–	–	–	–	–	–
Nigrospora	–	–	–	–	–	–	–	–	–	–	–	–
Oidium/Peronospora	–	–	–	–	–	–	–	–	–	–	–	–
Pithomyces	–	–	–	–	–	–	–	–	–	–	–	–
Rust	–	–	–	–	–	–	–	–	–	–	–	–
Smut/Myxomyces/Periconia	–	–	–	–	–	–	–	–	–	–	–	–
Stachybotrys	–	–	–	–	–	–	–	–	–	–	–	–
Torula	–	–	–	–	–	–	–	–	–	–	–	–
Ulocladium	–	–	–	–	–	–	–	–	–	–	–	–
Unidentified Spores	–	–	–	–	–	–	–	–	–	–	–	–
Total Spores	**0**	**0**		**1**	**11**		**7**	**78**		**0**	**0**	
Hyphal Fragments	–	–		–	–		–	–		1	11	
Pollen	–	–		–	–		–	–		–	–	
Debris Rating	2			2			3			3		
Detection Limit	11			11			11			11		

Joshua Krinsky
Technical Director

Results submitted pertain only to the sample presented on the accompanying Chain of Custody.
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Project: MBiT

Batch: 181394

Sampled: 9/26/2018
Received: 10/2/2018
Analysis Date: 10/2/2018
Report Date: 10/2/2018

AEML Test: A001 Spore Trap Analysis

Sample ID:	181002L070
Client Sample ID:	MBiT Out
Volume Sampled (L):	90
Media:	Impaction Slide
Percent of Trace Analyzed:	100% at 600X Magnification

Spore Types	Raw Count	Count/m^3	%
Alternaria	8	89	9
Arthrinium	–	–	–
Ascospores	46	511	49
Aspergillus/Penicillium-Like	–	–	–
Basidiospores	3	33	3
Bipolaris/Dreschlera	–	–	–
Botrytis	–	–	–
Chaetomium	–	–	–
Cladosporium	32	356	34
Curvularia	1	11	1
Epicoccum	–	–	–
Fusarium	–	–	–
Ganoderma	1	11	1
Memnoniella	–	–	–
Nigrospora	1	11	1
Oidium/Peronospora	–	–	–
Pithomyces	–	–	–
Rust	–	–	–
Smut/Myxomyces/Periconia	2	22	2
Stachybotrys	–	–	–
Torula	–	–	–
Ulocladium	–	–	–
Unidentified Spores	–	–	–
Total Spores	**94**	**1,044**	
Hyphal Fragments	–	–	
Pollen	1	11	
Debris Rating	3		
Detection Limit	11		

Joshua Krinsky
Technical Director

IMS Laboratory

Interpreting Laboratory Results

The following can be used to better understand the laboratory results:

Viable Air Samples:

Low	< 100 CFU/m^3
Low Moderate	100 – 250 CFU/m^3
Moderate	250 – 1000 CFU/m^3
High	> 1000 CFU/m^3
TNTC	Too Numerous To Count

Viable Topical Samples:

Low	≤ 5 CFU/square inch
Low Moderate	= 6-25 CFU/square inch
Moderate	= 26-100 CFU/square inch
High	> 100 CFU/square inch
TNTC	Too Numerous To Count

Non-Viable Air Samples:

Low	≤ 2000 Total Fungal Count/m^3
Low Moderate	2000-5000 Total Fungal Count/m^3
Moderate	5001-10,000 Total Fungal Count/m^3
High	> 10,000 Total Fungal Count/m^3
TNTC	Too Numerous To Count

Non-Viable Topical Samples:

Low	1+
Moderate	2+ or 3+
High	4+ or 5+

There are currently no standards or guidelines regarding results of fungal samples. There are no levels, which are typical or permissible. There are no recommended exposure limits, no permissible exposure limits, no threshold limit values and no short term exposure limits.

The above guidelines are based on historical analysis and experience and should not be used for health evaluation purposes.

Many fungi (e.g. species of *Aspergillus sp*, *Penicillium sp*, *Fusarium sp*, *Trichoderma sp*, and *Memnoniella sp*) 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 original New York City Department of Health Bureau of Environmental & Occupational Disease Epidemiology *Guidelines on Assessment and Remediation of Fungi in Indoor Environments* recommended remediation if 1 CFU/m^3 of Stachybotrys is found in the indoor air. If 1000 CFU/m^3 of Stachybotrys is found in the indoor air, the guidelines recommended immediate evacuation.

Bioaerosol Test Results
September 26, 2018

General

It should be noted that aerobiology is a discipline, which is still developing sampling strategies and guidelines. Strict numerical values of what constitutes normal and out-of-range levels have not been clearly defined by the scientific community. When interpreting these results, we must evaluate the indoor/outdoor ratio of organisms with a rank order of species isolated from both environments. The presence of indicator species in the indoor environment must also be addressed. It is important to identify potential sites that may allow these organisms to amplify in the indoor environment.

Spore Trap Test Results – Non-Viable Air Samples

Current research in aerobiology suggests that several factors be considered when evaluating sampling data. These factors include comparing indoor and outdoor concentrations, complaint versus non-complaint areas and areas of general concern within the building (Ex. rooms below grade, water intrusion, etc.). In addition, the spores identified in both the indoor and outdoor environment should be qualitatively similar.

For purposes of this study, the attachment titled "Interpreting Laboratory Results" will be used as a guide to better understand the laboratory results.

Conclusion

The samples taken on the test date in the MBIT were within ***normal*** limits based on both the IMS Laboratory Guideline and outdoor air sample.

Please understand that bioaerosol testing is a "snapshot" of conditions identified on the test date. Indoor Air Quality (IAQ) is affected by occupancy, indoor and outdoor temperature and relative humidity, water infiltration, outdoor air infiltration and many other factors. The test results were an indication of conditions identified on the test date. At any point in time, these conditions may change and impact future test results.

PROACTIVE RECOMMENDATIONS

PROACTIVE RECOMMENDATIONS

Based on a visual inspection, the test areas were clean, dry and very well-maintained. Building Management should implement the following procedures to help maintain good air quality and further enhance occupant comfort.

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Building Maintenance

1. The Facilities Staff should immediately replace any water-stained, porous materials they identify throughout the building. It is difficult to thoroughly clean water-stained, porous building materials such as ceiling tiles and carpeting. These materials provide a good site for microbial growth. The key to proper building maintenance is not to allow a condition (temperature, relative humidity, water leakage, etc.) to reach a point that is favorable for microbial growth and amplification. In addition, all water leaks should be repaired as soon as possible.

2. The following are "mold prevention tips" for the building:

   - Fix leaky plumbing and leaks in the building envelope as soon as possible.
   - Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
   - Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
   - Keep HVAC drip pans clean, flowing properly and unobstructed.
   - Vent moisture-generating appliances.
   - Maintain low relative humidity (RH), below 60% RH, ideally 30 – 50%, if possible.
   - Perform regular building HVAC inspections and maintenance as scheduled.
   - **Clean and dry all wet or damp spots within 48 hours.**
   - Do not let foundations stay wet. Provide drainage and slope the ground away from the foundation.

General

1. Building Management should continue to implement an aggressive AHU maintenance program, which includes periodic tasks such as coil cleaning, visual ventilation system evaluations and mechanical adjustments. All AHU-related maintenance should be documented in a logbook and kept for future reference. A maintenance logbook, which documents all AHU-related activities, will be a valuable asset when addressing future IAQ concerns and/or inquires.

Indoor Air Quality Testing Limitations

The visual observations and sampling results documented in this report were representative of the on-site conditions at the time of this investigation. IAQ is affected by occupancy, change in building use, maintenance practices, indoor and outdoor temperature and relative humidity, water infiltration, and many other factors. EnviraHealth Corporation does not guarantee, warranty or certify that the conditions represented in this investigation will not change significantly over time.

This report is not intended to provide medical or healthcare advice. All allergy or health related questions, including concerns relating to potential mold exposure should be directed to a qualified physician.

If you have any questions, I can be reached at 610-653-7216 or envirahealth@gmail.com.

Regards,

Dr. Barbra A. Plohocki
Project Manager