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INDUSTRIAL HYGIENE ASSOCIATES, INC.

March 29, 2021

Mr. David Cell, CFEI, EMT-B, HMT
Safety, Security, and Environmental Coordinator
Central Bucks School District
320 W. Swamp Road
Doylestown, PA 18901

dcell@cbsd.org
Office 267-893-4038
Cell 215-588-7711

Re: Eagle Industrial Hygiene Associates, Inc. Report #201197
Diagnostic Mold Air Sampling – CB West, A Wing, Follow-up Sampling Room A208

Dear Mr. Cell,

On March 24, 2021, staff from Eagle Industrial Hygiene Associates, Inc. completed follow-up diagnostic mold air sampling within Room A208 at Central Bucks West High School located at 375 W. Court Street in Doylestown, PA.

The attached report details the results of the sampling.

Sincerely,

Tim MacPherson

ROOM A208 FOLLOW-UP
DIAGNOSTIC MOLD AIR SAMPLING

Eagle Project #201197

CENTRAL BUCKS WEST HIGH SCHOOL
375 W. COURT STREET
DOYLESTOWN, PA 18901

Prepared For:

Mr. David Cell, CFEI, EMT-B, HMT
Safety, Security, and Environmental Coordinator
Central Bucks School District
320 W. Swamp Road
Doylestown, PA 18901

Submitted By:

EAGLE INDUSTRIAL HYGIENE ASSOCIATES, INC.
359 DRESHER ROAD
HORSHAM, PA 19044

March 29, 2021

INTRODUCTION AND SCOPE OF WORK

On March 24, 2021, staff from Eagle Industrial Hygiene Associates, Inc. completed follow-up diagnostic mold air sampling within Room A208 at Central Bucks West High School located at 375 W. Court Street in Doylestown, PA.

The evaluation included completion of the following tasks:

1) Collected and analyzed airborne mold samples from within Room A208.
2) Prepared a written report outlining the sample analysis findings.

The samples collected during the evaluation were preserved and transported with a chain-of custody form to Eagle Industrial Hygiene Associates, Inc.'s laboratory (AIHA – IAQ EMLAP Accreditation #100421) for evaluation of mold spores. Detailed sample information and other supporting data are included as attachments to the report.

All evaluation services were directed by a Certified Industrial Hygienist (CIH) and performed in accordance with generally accepted industrial hygiene guidelines and other current applicable governmental and industry recommendations and guidelines for evaluating the indoor environment.

The information outlined in this report is believed to be accurate and true to the best knowledge of the inspector(s).

TABLE 1
Mold Air Sample Results

Air samples were collected for mold spores as part of the follow-up evaluation. These results are summarized in the table below.

Sample Location	Total Count Concentration (structures/m^3)
Outdoors (background)	9,200
A208	300
Corridor outside A202	540

Airborne mold spore levels indoors were less than outdoors and had similar population dispersions when compared to the outdoor sample. These are the desired conditions.

Laboratory reports are attached to this report text.

SAMPLE COLLECTION AND ANALYSIS METHODS

Sample Collection Methods

The airborne spore samples were collected using Air-O-Cell spore traps, connected to a Zefon Bio-Pump® Plus sampling pump. Air was drawn through the spore trap at an airflow rate of 15 liters per minute (LPM). The samples were collected for 10 minutes, yielding sample volumes of 150 Liters.

Sample Analysis Methods

The samples were analyzed by the Eagle Industrial Hygiene Associates, Inc. laboratory. The laboratory is accredited by the American Industrial Hygiene Association (AIHA LAP Accreditation #100421) for microbial sample analysis. The sample analysis results listing the types and quantities of fungi found in the samples are outlined on the laboratory data pages included with this report.

The Air-O-Cell spore traps used to collect the air samples were analyzed by counting and characterizing the spores and fungal structures collected in measured areas of the spore trap, as viewed through a light microscope at a magnification of 400x. The number of spores and structures counted and classified is then used to calculate the airborne concentrations, based on the total surface area of the spore trap, the size of the area viewed through the microscope, and the air volume drawn through the spore trap. The sample results are reported as spores and fungal structures per cubic meter of air (Spores/m3).

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Lab ID # 100421

Client: Central Bucks School District
320 West Swamp Road
Doylestown, PA 18901

Location: CB West High School

Field Sample #: TM032401
Sample Description: Outdoors (background)

Project #: 201197
Lab #: 2103197
Eagle #: E21032601

AIRBORNE FUNGAL STRUCTURE SAMPLE ANALYSIS

Results reported as Structures per Cubic Meter of Air (structures/m^3)

Fungal Structure Identification	Fungal Structures Counted	Area of Sample Viewed (%)	Concentration (structures/m^3)	Percentage of Total Spores
Alternaria	ND	20	<34	
Arthrinium	ND	20	<34	
ascospores (undifferentiated)	103	14	5,000	54
Aspergillus/Penicillium-like	3	20	100	1
basidiospores (undifferentiated)	102	17	4,000	43
Botrytis	ND	20	<34	
Cercospora	ND	20	<34	
Chaetomium	ND	20	<34	
Cladosporium	ND	20	<34	
Curvularia	ND	20	<34	
Drechslera/Bipolaris-like	ND	20	<34	
Epicoccum	ND	20	<34	
Paecilomyces	ND	20	<34	
Pithomyces	ND	20	<34	
Polythrincium	ND	20	<34	
smuts/*Myxomycetes/Periconia*	3	20	100	1
Stachybotrys/Memnoniella	ND	20	<34	
Torula	ND	20	<34	
Ulocladium	ND	20	<34	
Zygophiala	ND	20	<34	
conidiospores	ND	20	<34	
hyphal fragments	ND	20	<34	
miscellaneous/unspecified spores	ND	20	<34	
TOTAL	**211**		9,200	100
Background Debris (0 - 5)	2			

ND= None Detected

The minimum reporting limit for this sample is 34 Structures/m^3

The reported total structure concentration and percentages may not be equal to the sum of the reported individual spore type concentrations and percentages due to the rounding of these numbers.

See 'Method Details' page for analysis explanations.

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Client: Central Bucks School District
320 West Swamp Road
Doylestown, PA 18901

Location: CB West High School

Field Sample #: TM032402
Sample Description: A208

Project #: 201197
Lab #: 2103197
Eagle #: E21032602

AIRBORNE FUNGAL STRUCTURE SAMPLE ANALYSIS

Results reported as Structures per Cubic Meter of Air (structures/m^3)

Fungal Structure Identification	Fungal Structures Counted	Area of Sample Viewed (%)	Concentration (structures/m^3)	Percentage of Total Spores
Alternaria	ND	20	<34	
Arthrinium	ND	20	<34	
ascospores (undifferentiated)	3	20	100	33
Aspergillus/Penicillium-like	4	20	140	44
basidiospores (undifferentiated)	2	20	68	22
Botrytis	ND	20	<34	
Cercospora	ND	20	<34	
Chaetomium	ND	20	<34	
Cladosporium	ND	20	<34	
Curvularia	ND	20	<34	
Drechslera/Bipolaris-like	ND	20	<34	
Epicoccum	ND	20	<34	
Paecilomyces	ND	20	<34	
Pithomyces	ND	20	<34	
Polythrincium	ND	20	<34	
smuts/*Myxomycetes/Periconia*	ND	20	<34	
Stachybotrys/Memnoniella	ND	20	<34	
Torula	ND	20	<34	
Ulocladium	ND	20	<34	
Zygophiala	ND	20	<34	
conidiospores	ND	20	<34	
hyphal fragments	ND	20	<34	
miscellaneous/unspecified spores	ND	20	<34	
TOTAL	**9**		300	100
Background Debris (0 - 5)	2			

ND= None Detected

The minimum reporting limit for this sample is 34 Structures/m^3

The reported total structure concentration and percentages may not be equal to the sum of the reported individual spore type concentrations and percentages due to the rounding of these numbers.

See 'Method Details' page for analysis explanations.

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Lab ID # 100421

Client: Central Bucks School District
320 West Swamp Road
Doylestown, PA 18901

Location: CB West High School

Field Sample #: TM032403
Sample Description: Corridor outside A202

Project #: 201197
Lab #: 2103197
Eagle #: E21032603

AIRBORNE FUNGAL STRUCTURE SAMPLE ANALYSIS

Results reported as Structures per Cubic Meter of Air (structures/m^3)

Fungal Structure Identification	Fungal Structures Counted	Area of Sample Viewed (%)	Concentration (structures/m^3)	Percentage of Total Spores
Alternaria	ND	20	<34	
Arthrinium	ND	20	<34	
ascospores (undifferentiated)	9	20	300	56
Aspergillus/Penicillium-like	3	20	100	19
basidiospores (undifferentiated)	4	20	140	26
Botrytis	ND	20	<34	
Cercospora	ND	20	<34	
Chaetomium	ND	20	<34	
Cladosporium	ND	20	<34	
Curvularia	ND	20	<34	
Drechslera/Bipolaris-like	ND	20	<34	
Epicoccum	ND	20	<34	
Paecilomyces	ND	20	<34	
Pithomyces	ND	20	<34	
Polythrincium	ND	20	<34	
smuts/*Myxomycetes/Periconia*	ND	20	<34	
Stachybotrys/Memnoniella	ND	20	<34	
Torula	ND	20	<34	
Ulocladium	ND	20	<34	
Zygophiala	ND	20	<34	
conidiospores	ND	20	<34	
hyphal fragments	ND	20	<34	
miscellaneous/unspecified spores	ND	20	<34	
TOTAL	**16**		540	100
Background Debris (0 - 5)	2			

ND= None Detected

The minimum reporting limit for this sample is 34 Structures/m^3

The reported total structure concentration and percentages may not be equal to the sum of the reported individual spore type concentrations and percentages due to the rounding of these numbers.

See 'Method Details' page for analysis explanations.

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Client: Central Bucks School District
320 West Swamp Road
Doylestown, PA 18901

Location: CB West High School

SUMMARY REPORT

Project #: 201197
Lab #: 2103197

AIRBORNE FUNGAL STRUCTURE SAMPLE ANALYSIS
Results reported as Structures per Cubic Meter of Air (structures/m³)

Field Sample #:	TM032401		TM032402		TM032403	
Eagle #:	E21032601		E21032602		E21032603	
Sample Description:	Outdoors (background)		A208		Corridor outside A202	
Fungal Structure Identification	**Concentration (structures/m³)**	**Percentage of Total Structures**	**Concentration (structures/m³)**	**Percentage of Total Structures**	**Concentration (structures/m³)**	**Percentage of Total Structures**
Alternaria	<34		<34		<34	
Arthrinium	<34		<34		<34	
ascospores (undifferentiated)	5,000	54	100	33	300	56
Aspergillus/Penicillium-like	100	1	140	44	100	19
basidiospores (undifferentiated)	4,000	43	68	22	140	26
Botrytis	<34		<34		<34	
Cercospora	<34		<34		<34	
Chaetomium	<34		<34		<34	
Cladosporium	<34		<34		<34	
Curvularia	<34		<34		<34	
Drechslera/Bipolaris-like	<34		<34		<34	
Epicoccum	<34		<34		<34	
Paecilomyces	<34		<34		<34	
Pithomyces	<34		<34		<34	
Polythrincium	<34		<34		<34	
smuts/*Myxomycetes*/*Periconia*	100	1	<34		<34	
Stachybotrys/Memnoniella	<34		<34		<34	
Torula	<34		<34		<34	
Ulocladium	<34		<34		<34	
Zygophiala	<34		<34		<34	
conidiospores	<34		<34		<34	
hyphal fragments	<34		<34		<34	
miscellaneous/unspecified spores	<34		<34		<34	
TOTAL	**9,200**	100	**300**	100	**540**	100
Background Debris (0 - 5)	2		2		2	

ND= None Detected

The minimum reporting limit for this sample is 34 Structures/m³

The sum of the concentrations of the different types of identified structures may not be equal to the reported total value due to rounding of the individual results to two significant digits.

See 'Method Details' page for analysis explanations.

Estimated background debris categories:
ND: Non-Detected: no detectable debris
1: Trace: barely detectable debris
2: Few: detectable and measurable debris
3: Moderate: more detectable and measurable debris
4: Many: heavy/dense debris
5: Loaded: extremely heavy/dense debris

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METHOD DETAILS

ASTM D7391 - 09 (modified) "Standard Test Method for Categorization and Quantification of Airborne Fungal Structures in an Inertial Impaction Sample by Optical Microscopy" was used for the analysis of these samples.

20% of the sample surface (26 traverses) was viewed to count the fungal structures in the sample, unless otherwise noted.

Per method, when 100 counts for a given spore type or structure is reached, the number of traverses (percent of sample surface) viewed to that point is noted, and these values are used to calculate the concentration for the given spore or structure type.

The structure concentration calculation uses the percentage of the sample trace (number of traverses) viewed to count each spore or structure type and the sample air volume.

The detection limit for the area of the sample which was viewed is one fungal spore or structure.

400X magnification was used to view the sample, unless otherwise noted.

A background debris rating of 2 to 4 indicates particulate matter may obscure a portion of the sample surface and result in underreporting of fungal structures.

A background debris rating of 5 indicates the sample is overloaded with particulate matter and the fungal structures cannot be counted. A new sample should be collected at a shorter time interval, or other measures should be taken to reduce the particle load.

"X" indicates fungal structure observed but could not be counted.

See the chain of custody document for sample times or volumes, the date(s) of sampling, and the date of receipt of the samples by the laboratory.

The samples were received in acceptable condition unless otherwise noted on the individual sample page.

The analysis relates only to the samples tested, and the "scope" of this report pertains only to those items tested and listed as such on the individual pages of this document.

Unless the appropriate laboratory personnel signatures appear on the chain of custody for this report, this report is PRELIMINARY and is subject to change.

Receipt Date: 03/26/2021

Analyst: Renee Battiste

Analysis Date: 03/26/2021

Reviewed by:

Report Date: 03/26/2021

Date Samples Collected: 03/24/2021

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FUNGAL STRUCTURE FREQUENCY

	Outdoors	Indoor	Water Damage	High Humidity
Alternaria	X		X	
Aspergillus/Penicillium	X	X	X	
Chaetomium	X		X	
Cladosporium	X	X		X
Fusarium	X	X		X
*Myxomycetes/Periconia/*smuts/rusts	X			
Stachybotrys/Memnoniella			X	
Ulocladium			X	
ascospores	X			
basidiospores	X			

Normally, spores that are found indoors are found outdoors because most originate in soil and on dead or decaying organic material. The fungal glossary above is intended for general information about some of the mold Genera that Eagle Laboratory encounters.

CHAIN OF CUSTODY

Rev. 8-28-17

EAGLE
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CLIENT: Central Bucks School District	POINT OF CONTACT:	PROJECT NO: 201197
ADDRESS:	PHONE NO:	LAB NO: 2103197
	E-MAIL:	
TURNAROUND TIME / SPECIAL INSTRUCTIONS / COMMENTS: ASAP, results by noon 3/26/21		EAGLE NO: E2103260
JOB SITE / DESCRIPTION: CB West High School		

ANALYTE: Spores	SAMPLE TYPE: Air MEDIA: Air-O-Cell	ANALYTICAL METHOD: Count and ID

FIELD SAMPLE NUMBER	SAMPLE LOCATION / DESCRIPTION	VOLUME/AREA (L)
TM0324-01	Outdoors (background)	150
TM0324-02	A208	150
TM0324-03	Corridor outside A202	150

COLLECTED BY: Tim MacPherson	DATE: 3/24/21	RECEIVED BY / CHAIN OF CUSTODY INITIATED BY: T. M. P.			DATE: 3/24/21	TIME: 1630
RELINQUISHED BY:		RECEIVED BY:			DATE:	TIME:
RELINQUISHED BY:		RECEIVED BY:			DATE:	TIME:
SUBMITTED TO LAB BY: T. M. P.	DATE: 3/25/21	RECEIVED AT LAB BY: RB	SAMPLES: 3		DATE: 3-26-21	TIME: 0600

FOR LAB USE ONLY

PRE-LOGGED BY: RB	PREPARED BY: Ben Bolt	ANALYZED BY: Ben Bolt	DATE: 3-26-21
DATA VALIDATED BY: PH	RUSH REPORT BY: —	POST-LOGGED BY: PH	
DATA PROCESSED BY: RB	TEST REPORT REVIEWED BY: PH	TEST REPORT APPROVED BY: Paul C.	DATE: 3/26/21

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INDUSTRIAL HYGIENE ASSOCIATES, INC.

March 19, 2021

Mr. David A. Cell, CFEI, EMT-B, HMT dcell@cbsd.org
Central Bucks School District
320 West Swamp Road
Doylestown, PA 18901

Re: Eagle Industrial Hygiene Associates, Inc. - Project #201197
Mold Evaluation – Central Bucks West High School – A Wing, March 2021

Dear Mr. Cell:

Eagle Industrial Hygiene Associates, Inc. completed an indoor environmental quality (IEQ) evaluation of the A Wing of Central Bucks West High School on March 13, 2021. The evaluation was completed to determine if there were any items or conditions negatively impacting the indoor environment, including unwanted water intrusions and any resulting mold growth.

The evaluation included a visual inspection of all classrooms, offices, and common areas in A Wing, except the Library, measuring temperature and relative humidity, and the collection of air samples for mold spores.

The attached report details the findings of the evaluation. If you have any questions, or need additional information, please call. Thank you for the opportunity to be of service.

Sincerely,

Tim MacPherson

MOLD EVALUATION
Project #201197

A Wing
Central Bucks High School West
375 W. Court Street
Doylestown, PA 18901

Prepared For:

Mr. David A. Cell, CFEI, EMT-B, HMT
Central Bucks School District
320 West Swamp Road
Doylestown, PA 18901

Submitted By:

EAGLE INDUSTRIAL HYGIENE ASSOCIATES, INC.
359 DRESHER ROAD
HORSHAM, PA 19044

MARCH 19, 2021

INTRODUCTION

Eagle Industrial Hygiene Associates, Inc. completed an indoor environmental quality (IEQ) evaluation of the A Wing of Central Bucks West High School on March 13, 2021. The evaluation was completed to determine if there were any items or conditions negatively impacting the indoor environment, including unwanted water intrusions and any resulting mold growth.

SCOPE OF WORK

The indoor environmental quality evaluation included the following tasks:

1. Inspected all classrooms, offices, and common areas in A Wing, except the Library.
2. Measured temperature and relative humidity.
3. Collected air samples for mold spores. Samples were collected in each of the classrooms, offices and in common areas. Air samples for mold spores were also collected outdoors as reference.

The samples collected during the evaluation were preserved and transported with a chain-of custody form to Eagle Industrial Hygiene Associates, Inc.'s laboratory (AIHA LAP Accreditation #100421) for evaluation of microbial content. Detailed sample information and other supporting data are included as attachments to the report.

All evaluation services were directed by a Certified Industrial Hygienist (CIH) and performed in accordance with generally accepted industrial hygiene guidelines and other current applicable governmental and industry organization protocols and guidelines for evaluating water damage and recommendations for water damage and mold growth related cleanup activities in buildings.

The information outlined in this report is believed to be accurate and true to the best knowledge of the inspector(s). The findings and recommendations contained in this report are based on the observations of the conditions as they existed at the time of the mold evaluation.

INVESTIGATION & MEASUREMENT FINDINGS

The following information was obtained from the evaluation:

- With exception to Room A208, mold air sample analysis found total airborne mold spore levels indoors to be similar to outdoors, which is the desired condition. Total airborne mold spore levels outdoors (background) were extremely low which is not uncommon during the winter. With exception to the sample collected from Room A208, air samples are considered acceptable.
- Temperatures were within recommended ranges apart from a few classrooms with temperatures slightly below recommended levels.
- Relative humidity was below recommended ranges at all locations. Low relative humidity is typical during the heating season.
- At the time of the evaluation, facilities employees were dusting the classrooms in A Wing.

TEMPERATURE AND RELATIVE HUMIDITY MEASUREMENTS

No “ideal” temperature and humidity level is suitable for all building occupants. Many factors, such as personal activity and clothing may affect personal comfort. Guidelines issued by the American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) recommend that indoor temperatures in the winter be maintained between 68 and 75°F and temperatures in the summer be maintained between 73 and 79°F. These ranges should be acceptable for sedentary or slightly active persons.

Acceptable relative humidity levels should range from 20–60% year-round. Levels less than 20% in the winter and greater than 60% in the summer should be considered unacceptable. Elevated relative humidity can promote the growth of mold, bacteria, and dust mites, which can aggravate allergies and asthma. Low relative humidity can cause health complaints, including but not limited to sore throats, eye irritation, and dry skin, and static discharges when contacting conducting surfaces.

Location	Relative Humidity (%)	Temperature (F)
Outdoors, (background)	70	34
A101	11	68
A102	9	**67**
A104	12	**67**
A106	10	**67**
A108	9	**67**
A110	13	**67**
A112	11	68
A114	10	68
A115	11	68
A116	10	68
A117	10	68
A118	9	69
A119	11	69

A120	10	69
A121	10	69
A121B	9	69
A122	10	68
A123	9	69
Corridor at A100D	10	68
Corridor at A100C	11	69
Corridor at A100B	12	69
A201	9	68
A202	8	68
A204	9	68
A206	9	68
A208	10	69
A210	10	68
A211	10	69
A212	10	68
A213	10	68
A214	9	68
A216	10	69
A221	11	69
A221A	10	69
A221B	11	68
A218	10	68
A220	12	69
A223	10	69
A222	12	68
A224	12	69
A227	13	69
Corridor at A200D	11	69
Corridor at A200C	7	68
Corridor at A200B	8	68

Temperature levels were within acceptable ranges for occupant comfort at all areas evaluated with exception to A102, A104, A106, A108, and A110. Temperatures in these areas were slightly below recommended levels.

Relative humidity was below recommended ranges at all locations. Low relative humidity is typical during the heating season.

RESULTS OF SAMPLE ANALYSIS

Air samples were collected for analysis of airborne fungi spores as part of the evaluation. A summary of the analysis of the samples is outlined in the table below. Data detailing the quantities of individual spore types are outlined on the attached laboratory report pages.

TABLE 1
Mold Air Sample Results

Sample Location	Total Count Concentration (structures/m^3)	Sample Location	Total Count Concentration (structures/m^3)
Outdoors, flagpole (background)	**140**	A201	170
A101	68	A202	100
A102	140	A204	240
A104	68	A206	240
A106	240	**A208**	**1,700**
A108	34	A210	68
A110	34	A211	100
A112	68	A212	100
A114	68	A213	68
A115	68	A214	100
A116	100	A216	68
A117	68	A221	68
A118	240	A221A	100
A119	140	A221B	68
A120	34	A218	34
A121	170	A220	100
A121B	34	A223	68
A122	100	A222	68
A123	68	A224	68
Corridor at A100D	170	A227	34
Corridor at A100C	170	Corridor at A200D	100
Corridor at A100B	370	Corridor at A200C	240
		Corridor at A200B	240
		Outdoors, loading dock (background)	**200**

With exception to Room A208, mold air sample analysis found total airborne mold spore levels indoors to be similar to outdoors, which is the desired condition.

The air sample results from Room A208 returned elevated airborne mold spore concentrations when compared to both the outdoor and indoor samples.

CONCLUSION AND RECOMMENDATIONS

The evaluation found the A Wing acceptable for occupancy with regard to mold.

It is recommended that surfaces in Room A208 be wiped down by facilities staff and the room be resampled.

All services were provided by or under the direction of an Eagle Industrial Hygiene Associates, Inc. Certified Industrial Hygienist, and were conducted in accordance with applicable guidelines and recommendations regarding the evaluation of the indoor environment.

SAMPLE COLLECTION AND ANALYSIS METHODS

Sample Collection Methods

The airborne fungal structure samples were collected using Air-O-Cell spore traps and a Zefon Model ZBP-200 *BIO-PUMP® PLUS*. Air was drawn through the spore traps by the BIO-PUMP at an airflow rate of 15 liters per minute (lpm). The samples were collected for a measured time period. The sample volume was calculated by multiplying the sample flow rate by the sample collection time.

Sample Analysis Methods

The samples were analyzed by the Eagle Industrial Hygiene Associates, Inc. laboratory. The laboratory is accredited by the American Industrial Hygiene Association (AIHA LAP Accreditation #100421) for microbial sample analysis. The sample analysis results listing the types and quantities of fungi found in the samples are outlined on the laboratory data pages included with this report.

The Air-O-Cell spore traps used to collect the air samples were analyzed by counting and characterizing the spores and fungal structures collected in measured areas of the spore trap, as viewed through a light microscope at a magnification of 400x. The number of spores and structures counted and classified is then used to calculate the airborne concentrations, based on the total surface area of the spore trap, the size of the area viewed through the microscope, and the air volume drawn through the spore trap. The sample results are reported as spores and fungal structures per cubic meter of air (Spores/m^3).

INDOOR AIR QUALITY PARAMETERS

Temperature & Humidity

No “ideal” temperature and humidity level is suitable for all building occupants. Many factors, such as personal activity and clothing may affect personal comfort. Guidelines are provided by professional organizations, such as, the American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE).

Guidelines issued by ASHRAE recommend that indoor temperatures in the winter are maintained between 68 and 75°F. Temperatures in the summer should be maintained between 73 and 79°F. These ranges should be acceptable for sedentary or slightly active persons.

Acceptable relative humidity levels should range from 20–60% year-round. Levels less than 20% in the winter and greater than 60% in the summer should be considered unacceptable. Elevated relative humidity can promote the growth of mold, bacteria, and dust mites, which can aggravate allergies and asthma. Low relative humidity, friction, and contact with conducting surfaces result in static discharges. Low relative humidity can also cause health complaints, including but not limited to sore throats, eye irritation, and dry skin. To achieve maximum occupant comfort, relative humidity should be maintained between 30–50%.

BACKGROUND INFORMATION

Microbial Growth in Buildings

Microorganisms (bacteria and fungi) are a normal and essential component of all environments. They are needed to break down complex molecules found in organic matter. Microorganisms will grow in almost any environment, if they are provided with water and a food source. Microorganisms are almost always found in outdoor air and in the soil. The types and population

levels of microorganism will vary from location to location, depending on the local environmental conditions.

Microorganisms are also routinely found in the indoor environment. Doors, windows, and fresh air intakes provide easy access for microorganisms to enter the interiors of buildings. People entering the building are another common pathway for introduction of microbes to the indoor environment.

The normal and expected populations of microbial growth in the indoor environment should not be apparent in a visual inspection of the building interior. Visible microbial growth on building surfaces is an indication of "out of balance" environmental conditions which require correction.

Excessive moisture inside a building from leaks, floods, or other sources can create an environment in which the microorganism population will grow and exceed the levels found outdoors. The type and extent of the microbial growth will depend on the amount of water and available food, temperature, lighting, and other factors. Surface samples can determine the types and quantities of microbial growth in the building.

Effects of Exposure to Molds

The presence of some microorganisms in large quantities in an indoor environment may cause health problems in some people. Infants, the elderly, and persons with compromised immune systems are more susceptible to the health problems from exposure to molds than healthy members of the general population.

EPA publication "A Brief Guide to Mold, Moisture, and Your Home" (#402-K-02-003) provides the following information about the health effects of mold.

> Molds have the potential to cause health problems. Molds produce allergens (substances that can cause allergic reactions), irritants, and in some cases, potentially toxic substances (mycotoxins). Inhaling or touching mold or mold spores may cause allergic reactions in sensitive individuals. Allergic reactions include hay fever type symptoms, such as sneezing, runny nose, red eyes, and skin rash (dermatitis). Allergic reactions to mold are common. They can be immediate or delayed. Molds can also cause asthma attacks in people with asthma that are allergic to mold. In addition, mold exposure can irritate the eyes, skin, nose, throat, and lungs of both mold-allergic and non-allergic people. Symptoms other than the allergic and irritant types are not commonly reported as a result of inhaling mold. Research on mold and health effects is ongoing.

Additional information on health effects of mold exposure can be provided by licensed health care practitioners, the state or local health departments. The reference section of this report lists consensus documents and additional information on mold and bioremediation.

Bio-Remediation Activities

All the currently available consensus guidance documents agree that amplification, i.e., "growth" of mold on building surfaces, requires remediation. The guidance documents also agree that the sources of moisture or water damage that permitted the growth of mold must also be eliminated. Remediation activities should be initiated if visible microbial growth is identified or when surface or air samples in the building find higher than expected microbial levels.

The goal of remediation is to remove or clean contaminated materials in a way that prevents microbes and dust contaminated with microbes from leaving the work area and entering other areas of the building. This work should be done in a way that protects the health of workers performing the abatement and the occupants of the building.

The guiding principles in remediation are as follows:

- Identify and correct the original moisture problem that caused the microbial growth.
- Remove moldy porous materials and remove semi-porous and nonporous material whose structural integrity has been compromised.
- Clean contaminated surface layers of otherwise sound semi-porous and nonporous materials.
- After demolition and surface cleaning work is complete, remove remaining dust and debris from the work area that may contain microorganisms, spores, and the chemicals produced by the growth of the microorganisms.

Decisions to clean or remove contaminated materials are based on the type of material, the extent of the mold contamination, and the structural condition of the material. The amount of contamination and whether the material will be removed or cleaned in place determine the type and extent of controls and protection needed for the remediation work.

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, concrete, and plaster) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be performed using a combination of a high efficiency particulate (HEPA) vacuum and damp-wiped with a detergent/disinfectant solution.

Porous materials such as ceiling tiles, insulation, and wallboard (drywall, sheet rock, or gypsum board) with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard and fabrics) with a small area of contamination can be cleaned and can be reused if the cleaning is successful. All materials to be reused should be dry and free from visible mold.

The decisions regarding appropriate removal procedures, work area containment, worker protection, and other controls or procedures should be made by a qualified person, such as a Certified Industrial Hygienist, or other environmental professional with appropriate training and experience in bioremediation.

References

Currently there are no standards or laws regulating the allowable levels of bio-aerosols in the indoor environment or specifying surface contamination levels at which remediation activities must be initiated.

The following references outline guidance and additional information for the evaluation and remediation of microbial growth in buildings, data on airborne fungi concentrations in buildings and outdoor environments, and information on the health effects of exposure to mold.

This listing, while comprehensive, should not be considered complete, as professionals in the mold evaluation and remediation fields continue to develop and refine their knowledge, and contributions to the advancements in these fields are ongoing.

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