Liberty OHM
Established 1989

Indoor Air Quality Report

Liberty OHM File Number 12-179

Survey Location: Bixby North Elementary
7101 East 121st St.
Bixby, OK 74008

Survey Date: April 15th, 2013

Report Date: April 26th, 2013

Prepared For: Mr. Marty Foutch
Facilities Director
109 N. Armstrong
Bixby, OK 74008

CC: Jarred Doubrava
Operations Support Manager/District Safety Coordinator

Prepared By: Jack Kerr
EH&S Consultant
Liberty OHM

CONTENTS

1.0 SUMMARY

On April 15th, 2013, Liberty OHM visited Bixby North Elementary located at 7101 East 121st St, Bixby, OK. The purpose of this visit was to perform a survey and sampling in order to determine the type, concentration and causation of any mold/fungi present.

The ratio of *total* (all species combined) indoor/outdoor airborne mold concentrations **was not** elevated on the day of testing. There were no higher than outside concentrations of the water intrusion/indicator mold Penicillium/Aspergillus in Rooms 101 or 230 on the day of testing. See Section 3.0 for detailed analysis and recommendations.

2.0 OBSERVATIONS AND NOTES

Liberty OHM arrived on site and was met by Jarred Doubrava of Bixby Schools. Mr. Doubrava proceeded to escort us throughout Bixby North Elementary and show us all areas to be tested for air quality assurance. Approximately two weeks prior to our visit water was observed entering rooms 101 and 230 during a heavy rainfall at the exterior walls and windows. Bixby Public Schools removed 1 foot of wallboard on the east wall of room 101, the associated closet and hallway that connects room 101 and 103. Carpet was also removed and replaced with a sheet vinyl material. No water staining was noticed throughout the room. A moisture meter was used to check the percent of moisture on the walls of the room. No elevated levels of moisture were found. Next, room 230 was inspected and air quality sampling was conducted. Once water was observed entering the room through leaking windows, Bixby Public Schools placed fans in the room to dry out walls. No staining was noticed throughout Room 230. Carpet was also replaced in Room 230 with a sheet vinyl material. No elevated levels of moisture were found in the room.

3.0 ANALYSIS AND RECOMMENDATIONS

The following areas were selected for testing:

1. Room 101 (Air)
2. Room 230 (Air)
3. Outside Reference (Air)

Results are summarized in Table 1 below.

Table 1
Bixby North Elementary – Rooms 101 & 230
Spore Trap Analysis
Sample Date: 4/15/13

Location	Total spores/m3	Species	Raw count	Calc. count	% of total
1: Room 101	330	Penicillium/Aspergillus types	14	140	42
		Basidiospores	7	70	21
		Cladosporium	5	50	15
		Bipolaris/Drechslera group	4	40	12
		Smuts, Periconia, Myxomycetes	1	10	3
		Curvularia	1	10	3
		Ascospores	1	10	3
2: Room 230	850	Basidiospores	28	280	33
		Ascospores	20	200	24
		Penicillium/Aspergillus types	19	190	22
		Cladosporium	15	150	18
		Smuts, Periconia, Myxomycetes	3	30	4
3: Outside Reference	2,400	Basidiospores	76	760	32
		Ascospores	56	560	24
		Cladosporium	46	460	19
		Penicillium/Aspergillus types	45	450	19
		Smuts, Periconia, Myxomycetes	10	100	4
		Other brown	1	10	< 1
		Bipolaris/Drechslera group	1	10	< 1
		Alternaria	1	10	< 1

Recommendations are provided below. See Appendix A for detailed laboratory results, indoor/outdoor comparison ratios, and fungal descriptions.

Recommendations

Based on our visual inspection and sampling data, we recommend the following:

1. No recommendations are provided at this time.

*Recommendations are based in part on professional publication guidelines including the IICRC S500 Standard and Reference Guide for Professional Water Damage Restoration and IICRC S520 Standard and Reference Guide for Professional Mold Remediation.

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This report reflects conditions discovered at the time of the survey. In many instances, mold amplification may continue following our inspection and prior to any abatement work. Therefore, additional areas of water/mold damage not mentioned above may be found during the remediation efforts (discovery). There may also be areas impacted that could not be directly inspected during Liberty OHM's survey without performing exploratory destructive testing. If any other areas of water/mold damage are found during the remediation please contact our office so that we can perform additional inspections and scope of work. In general, abatement of materials should continue an additional two (2) feet beyond any previously undetected mold or water damage discovered during remediation.

Liberty OHM makes no assertion as to the health risks associated with the levels reported in this report. We make no correlation that the levels reported are safe for occupancy or do not pose a risk from exposure. We advise you, our client to consult with an Occupational Health or other qualified physician for additional information and guidance.

Please contact our office if you have any questions or need any additional information.

Sincerely,

Jack Kerr
EHS Consultant - Liberty OHM

APPENDIX A

LABORATORY RESULTS

EMLab P&K
A TestAmerica Company

Report for:

Jack Kerr
Liberty OHM
1211 E 39th St
Tulsa, OK 74105

Regarding: Project: 12-179; Bixby North Elementary
EML ID: 1051183

Approved by:

Technical Manager
Aaron Agajanian

Dates of Analysis:
Spore trap analysis: 04-19-2013

Service SOPs: Spore trap analysis (1038 (previously I100000 and I100007))
AIHA-LAP, LLC accredited service, Lab ID #102297

EMLab P&K
1501 West Knudsen Drive, Phoenix, AZ 85027
(800) 651-4802 Fax (623) 780-7695 www.emlab.com

Client: Liberty OHM
C/O: Jack Kerr
Re: 12-179; Bixby North Elementary

Date of Sampling: 04-15-2013
Date of Receipt: 04-16-2013
Date of Report: 04-19-2013

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	1: Room 101				2: Room 230				3: Outside Reference			
Comments (see below)	None				None				None			
Lab ID-Version‡:	4726652-1				4726653-1				4726654-1			
Analysis Date:	04/19/2013				04/19/2013				04/19/2013			
Sample volume (liters)	100				100				100			
Background debris (1-4+)††	4+				4+				4+			
	Count	Count/m3	DL/m3*	%	Count	Count/m3	DL/m3*	%	Count	Count/m3	DL/m3*	%
Hyphal fragments	5	50	10	n/a	1	10	10	n/a	10	100	10	n/a
Pollen					1	10	10	n/a	68	680	10	n/a
§ TOTAL FUNGAL SPORES	33	330	n/a	100	85	850	n/a	100	236	2,400	n/a	100
Alternaria									1	10	10	< 1
Ascospores	1	10	10	3	20	200	10	24	56	560	10	24
Basidiospores	7	70	10	21	28	280	10	33	76	760	10	32
Bipolaris/Drechslera group	4	40	10	12					1	10	10	< 1
Chaetomium												
Cladosporium	5	50	10	15	15	150	10	18	46	460	10	19
Curvularia	1	10	10	3								
Other brown									1	10	10	< 1
Penicillium/Aspergillus types	14	140	10	42	19	190	10	22	45	450	10	19
Smuts, Periconia, Myxomycetes	1	10	10	3	3	30	10	4	10	100	10	4
Stachybotrys												
Stemphylium												
Torula												
Ulocladium												
Zygomycetes												

Comments:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample.

The analytical sensitivity is the spores/m3 divided by the raw count. The limit of detection is the analytical sensitivity multiplied by the sample volume divided by 1000.

*The DL/m3 has been rounded to a whole number.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".
§ Total Fungal Spores has been rounded to two significant figures to reflect analytical precision.

Introduction

Molds are a natural and important part of our environment. They are ubiquitous and are found virtually everywhere. Molds produce tiny spores to reproduce. These spores can be found in both indoor and outdoor air and on indoor and outdoor surfaces. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive, leading to adverse conditions. In response to increasing public concern, a number of government authorities, including the United States EPA, California Department of Health Services and New York City Department of Health, have developed recommendations and guidelines for assessment and remediation of mold. Websites for these organizations can be found at the end of this report.

While it is generally accepted that molds can be allergenic and can lead to adverse health conditions in susceptible people, unfortunately there are no widely accepted or regulated interpretive standards or numerical guidelines for the interpretation of microbial data. The absence of standards often makes interpretation of microbial data difficult and controversial. This report has been designed to provide some basic interpretive information using certain assumptions and facts that have been extracted from a number of peer reviewed texts, such as the American Conference of Governmental Industrial Hygienists (ACGIH). In the absence of standards, the user must determine the appropriateness and applicability of this report to any given situation. Identification of the presence of a particular fungus in an indoor environment does not necessarily mean that the building occupants are or are not being exposed to antigenic or toxic agents.

None of the information contained herein should be construed as medical advice or a call to action for evacuation or remediation. Only a qualified physician should make any decision relative to medical significance.

EMLab P&K did not conduct the site investigation, provide consulting or collect the samples referenced in this report. EMLab P&K's primary involvement in this project is to provide analytical results for the samples submitted. The data presented in this report are based on the samples and accompanying information provided and represents concentrations at a point in time under the conditions sampled.

EMLab P&K's standard terms and conditions govern all aspects of this report.

Materials

Please refer to the chain of custody included with this report.

Methods

1. **Surface Samples – Swab, Dust, Tape and Bulk Samples**
   Swab, Dust and Tape samples are mounted on a glass slide and observed under a bright field microscope for either Qualitative or Quantitative Examination. A bulk sample is also simultaneously observed under a stereomicroscope to look for signs of any visible discoloration or fungal growth, which is then mounted and observed under a bright field microscope for either Qualitative or Quantitative Examination. The samples are analyzed at a minimum of 200X magnification and up to a 1000X magnification. In the qualitative

examination, the prepared samples are observed for the presence of any structures or skewing of spore distribution that may indicate growth in the sample being analyzed. In the quantitative examination, the mold spores detected in the sample are counted and reported as spores per cm^2, spores per gram (or 1000mg), or spores per swab/wipe, etc depending on the sample type. These methodologies do not differentiate between viable and non-viable fungal spores.

2. Air Samples- Spore Trap Device

Spore traps are a unique sampling device designed for the rapid collection and analysis of a wide range of airborne particulates, including fungal spores. While analyzing the sample, the analyst takes a number of variables into account to select the proper analytical method to accurately determine the densities of the various spores on the trace. The densities of the debris and the spores on the trace will determine the approach to analyzing the sample. In general, the sample is directly mounted under the microscope and the various airborne particles detected are counted at a minimum of 200X magnification and up to 1000X magnification, with the entire trace (100% of the sample) being analyzed at 200X or 600X. This method does not differentiate between viable and non-viable fungal spores. This technique does not allow for the differentiation between *Aspergillus* and *Penicillium* spores. Additionally, depending on morphology, other non-distinctive spores are reported in categories such as ascospores or basidiospores. All slides are graded with the following debris scale for data qualification.

Debris Rating	Description	Interpretation
None	No particles detected.	No particulates on slide. The absence of particulates could indicate improper sampling as most air samples typically capture some particles.
<1+	Good visibility. A few particles detected.	Reported values are not affected by debris.
1+	Good visibility. No crowding of particles.	
2+	Decent visibility. Particles beginning to crowd.	Non-microbial particulates can mask the presence of fungal spores. As a result, actual values could be higher than the numbers reported. Higher debris ratings increase the probability of this bias.
3+	Decent visibility. Particles beginning to crowd.	
4+	Poor visibility. Particles beginning to overlap.	Excessive debris detected in the sample. Counts reported may vary drastically and actual values could be higher than the numbers reported. The sample should be collected at a shorter time interval, or other measures taken to reduce the collection of non-microbial debris. In addition, a >4+ rating will only allow for a count from the perimeter of the slide.
>4+	Poor visibility. Particles overlapping.	

3. Comments

Comments identify issues or events that are relevant to your analytical results. A comment includes information about any peculiar observation or situation encountered while analyzing the sample. In each case, the comments provide significant information vital to the interpretation of the laboratory data.

4. Data Interpretation

According to ACGIH, "Data from individual sampling episodes is often interpreted with respect to baseline data from other environments or the same environment under anticipated low exposure conditions." In the absence of established acceptable exposure limits, it is often necessary to use a comparison standard when interpreting data. In this instance, it will be necessary to sample the suspect area as well as a non-suspect area.

According to ACGIH, "...active fungal growth in indoor environments is inappropriate and may lead to exposure and adverse health effects."

a. Total Fungal Spores

According to ACGIH, ".... differences that can detected with manageable sample sizes are likely to be in 10- fold multiplicative steps (e.g., 100 versus 1000...)". Following this logic, if total fungal spores are ten (10) times greater in the sample from a suspect area than in the negative control sample collected from a non-suspect area, then that sample area may be a fungal amplification site.

b. Mycelial Fragments

Mycelium is a fungal mass that constitutes the vegetative or living body of a fungus. Following the same logic above, if total mycelial fragments are ten (10) times greater in the suspect sample than in the negative control, then the sample area is considered to be a fungal amplification site. The presence of mycelial fragments provides evidence of microbial growth.

c. Mycotoxins

Molds can produce toxic substances called mycotoxins. More tha n 200 mycotoxins have been identified from common molds, and many more remain to be identified. Some of the molds that are known to produce mycotoxins are commonly found in moisture-damaged buildings. Exposure pathways for mycotoxins can include inhalation, ingestion, or skin contact. Although some mycotoxins are well known to affect humans and have been shown to be responsible for human health effects, for many mycotoxins, little information is available, and in some cases research is ongoing. Some molds can produce several toxins, and some molds produce mycotoxins only under certain environmental conditions. The presence of mold in a building does not necessarily mean that mycotoxins are present or that they are present in large quantities.

d. Water Indicator Molds

Certain authorities identify certain molds whose presence indicates excessive moisture. The presence of a few spores of indicator mold should be interpreted with caution. Additionally, it should be recognized that these named molds are not necessarily the only ones of potential significance.

e. Mold Glossary

Specific characteristics of the individual molds listed in the report are presented in Table 1.

f. Useful Resources

i. Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Department of Health.
www.ci.nyc.ny.us/html/doh/html/epi/moldrpt1.html

ii. Facts about Mold, New York City Department of Health.
www.ci.nyc.ny.us/html/doh/html/epi/epimold.html

iii. Mold Resources, United States Environmental Protection Agency. http://www.epa.gov/mold/moldresources.html
iv. Mold in My Home, What do I do? California Department of Health Services. www.asbestos.org/Microbial/index.html

Table 1: Summary of Specific Mold Characteristics

Fungi	Environmental Indicator		Typically Found
Alternaria			*Alternaria* is one of the more common fungi found in nature. It is found growing indoors on a variety of substrates including wallboards, painted walls, etc.
Arthrinium			*Arthrinium* is a saprobe and is found on plants. It is rarely found growing indoors.
Ascospores			Ascospores are ubiquitous in nature and are commonly found in the outdoor environment. Some fungi that belong to the ascomycete family include the sexual forms of *Penicillium/ Aspergillus*, *Chaetomium*, etc that may be frequently found growing on damp substrates.
Aureobasidium			*Aureobasidium* is commonly found in a variety of soils. Indoors, it is commonly found where moisture accumulates, especially bathrooms, and kitchens, on shower curtains, tile grout, windowsills, textiles, and liquid waste materials.
Basidiospores			Basidiospores are Saprophytes and plant pathogens and are commonly found in gardens, forests, and woodlands. They also include organisms that are the agent of "dry rot," and other fungi that cause white and brown wood rot, which may grow and destroy the structural wood of buildings.
Bipolaris/ Dreschlera			*Bipolaris* and *Dreschlera* are usually found associated with plant debris, and soil. They are plant pathogens of numerous plants, particularly grasses. *Bipolaris* and *Dreschlera* can grow indoors on a variety of substrates.
Botrytis			*Botrytis* is commonly found in tropical and temperate climates growing on vegetative matter. They may be found indoors in conjugation with indoor plants, fruits and vegetables.
Chaetomium			*Chaetomium* is often found on materials containing cellulose such as sheetrock paper, or other wet materials.
Cladosporium			*Cladosporium* is a common outdoor mold. They are commonly found on dead plants, food, textiles, and a variety of other surfaces. Indoors, they can grow on a variety of substrates including textiles, wood, moist windowsills, etc. It can grow at 0°C and is associated with refrigerated foods.
Curvularia			*Curvularia* is found on plant materials and is considered a saprobe. Indoors, they can grow on a variety of substrates.
Epicoccum			*Epicoccum* is a saprophyte and considered a weekly parasitic secondary invader of plants. They tend to colonize continuously damp materials such as damp wallboard and fabrics.
Fusarium			*Fusarium* requires very wet conditions and is frequently isolated from plants and grains. They colonize continuously damp materials such as damp wallboard and water reservoirs for humidifiers and drip pans.

Memnoniella			*Memnoniella* can be found growing on a variety of cellulose-containing materials.
Nigrospora			*Nigrospora* is especially abundant in warm climates and is rarely found growing indoors.
Oidium/ Peronospora			*Oidium* and *Peronospora* are plant pathogens and are not found growing indoors.
Penicillium/ Aspergillus			*Penicillium* and *Aspergillus* are ubiquitous in environment. *Aspergillus* tends to colonize continuously damp materials such as damp wallboard and fabrics. *Penicillium* is commonly found in house dusts, wallpaper, decaying fabrics, moist clipboards, etc.
Pithomyces/ Ulocladium			*Pithomyces* is commonly found on grass and decaying plant material and are rarely found growing indoors. *Ulocladium* has a high water requirement and therefore colonizes continuously damp materials such as damp wallboard and fabrics.
Rusts			Rusts are plant pathogens and only grow on host plants.
Smuts/ *Periconia*/ Myxomycetes			Smuts and Myxomycetes are parasitic plant pathogens that require a living host. Smuts do not usually grow indoors. *Periconia* are rarely found growing indoors. Myxomycetes are occasionally found indoors, but rarely growing.
Stachybotrys			*Stachybotrys* are commonly found indoors on wet materials containing cellulose, such as wallboard, jute, wicker, straw baskets, and other paper materials.
Stemphylium			*Stemphylium* is either parasitic or saprophytic and is rarely found growing indoors.
Torula			*Torula* can grow indoors on cellulose containing materials such as wallboard, jute, wicker, straw baskets, and other paper materials.
Other brown/ colorless			An uncharacteristic fungal spore that does not lend itself to classification via direct microscopy.

 Potential Water Intrusion/Indicator Mold

 Potential Water Intrusion/Indicator Mold Capable of Mycotoxin Production

Quality Programs

The EMLab P&K's laboratory network is staffed with highly trained analysts, the majority of which hold advanced degrees. The reliability of test results depends on many factors such as the personnel performing the tests, environmental conditions, selection and validation of test methods, equipment functioning, as well as the sampling, storage and handling of test items, all of which are a reflection of the overall quality system of the laboratory.

EMLab P&K has modeled its quality system after ISO 17025, General Requirements for the Competence of Testing and Calibration Laboratories, one of the most stringent sets of standards in the industry, to ensure that its customers receive the highest standard of accuracy, reliability, and impartiality that they have come to expect from the leader in the environmental industry. EMLab P&K's laboratories adherence to the standards set forth in ISO 17025 has been validated and formally recognized through accreditations granted by an independent outside agency, American Industrial Hygiene Association (AIHA), on a site by site basis. As an additional measure to demonstrate its competency to perform the analyses it offers to its clients, EMLab P&K laboratories

also participate in a variety of different proficiency testing programs, including the Environmental Microbiology Proficiency Analytical Testing Program (EMPAT) sponsored by the American Industrial Hygiene Association.

As part of our continuous commitment to excellence, EMLab P&K laboratories are also inspected, licensed and/or accredited by a number of governmental agencies and independent associations in addition to those already mentioned above. The scope of services, accreditation certificates, and proficiency results can all be accessed at www.emlabpk.com.

References

1. Bioaerosols: Assessment and Control. Janet Macher, Ed., American Conference of Government Industrial Hygienists, Cincinnati, OH (1999).

2. EPA: The Inside Story. A Guide to Indoor Air Quality, United States Environmental Protection Agency and the United States Consumer Product Safety Commission, Washington DC (1995).

3. Health Canada: Exposure Guidelines for Residential Indoor Air Quality. Environmental Health Directorate. Health Protection Branch, Health Canada, Ottawa, Ontario (1989).

4. IIRC: Standard and Reference Guide for Professional Water Damage Restoration, 2nd Ed. Institute of Inspection, Cleaning and Restoration, Vancouver, WA (1999).

5. Field Guide for the Determination of Bio logical Contaminants in Environmental Samples. American Industrial Hygiene Association, Fairfax, VA (1996).

6. Standards of Practice for the Assessment of Indoor Environmental Quality, Volume I: Mold Sampling, Assessment of Mold Contamination. Indoor Environmental Standards Organization (2002).

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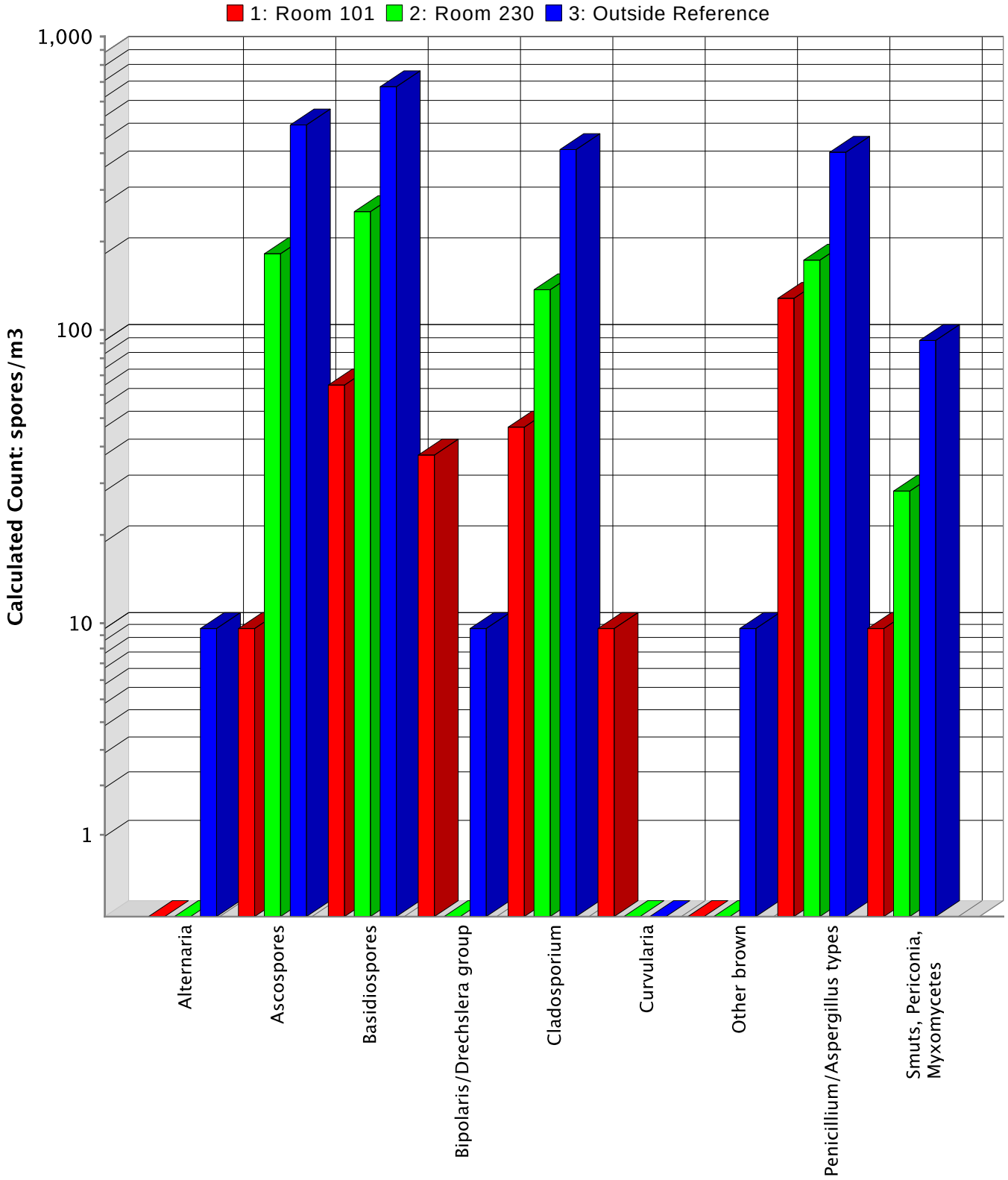
SPORE TRAP REPORT: NON-VIABLE METHODOLOGY



Comments:

Note: Graphical output may understate the importance of certain "marker" genera.

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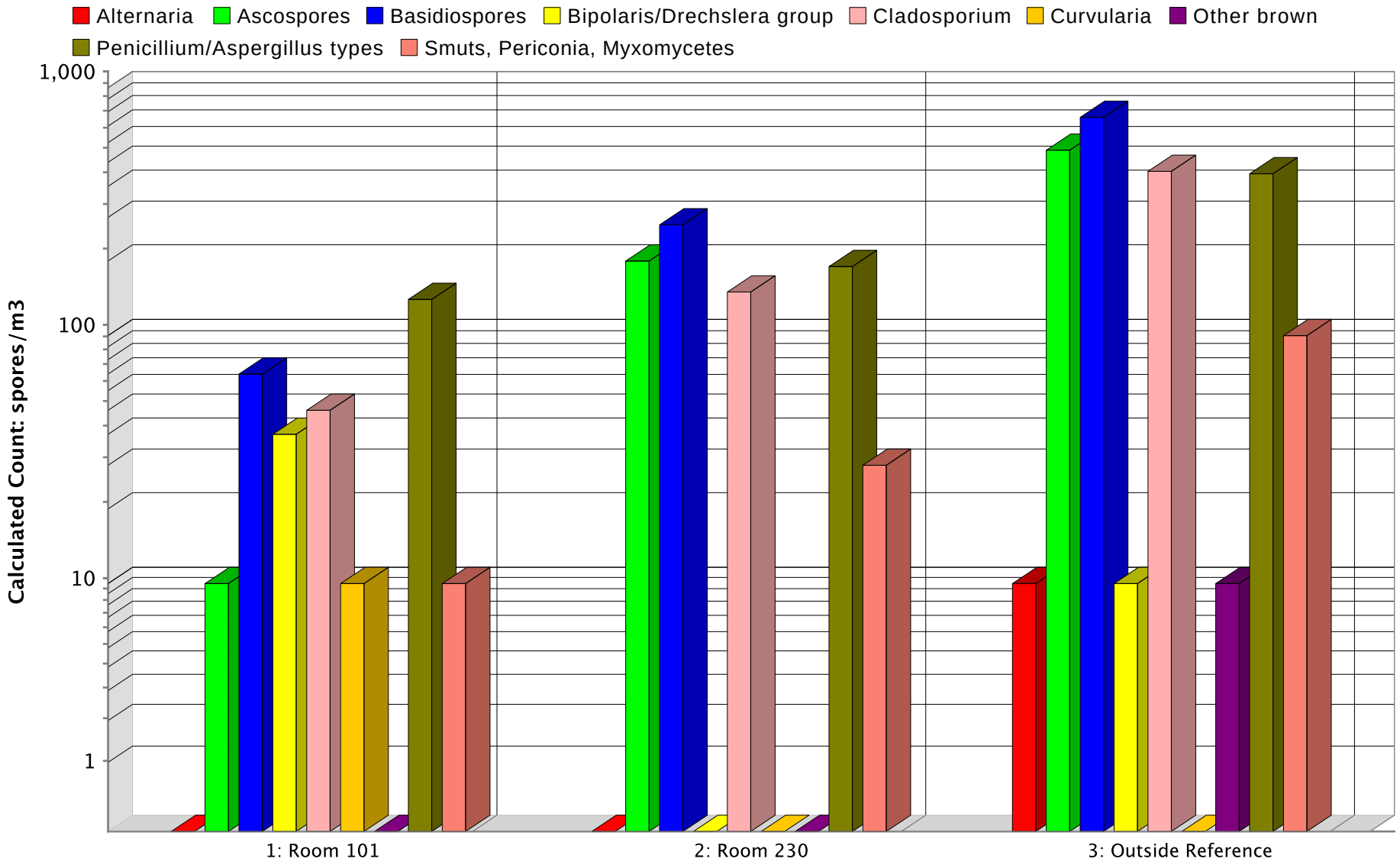
SPORE TRAP REPORT: NON-VIABLE METHODOLOGY



Comments:

Note: Graphical output may understate the importance of certain "marker" genera.
Aerotech Laboratories, Inc

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WEATHER		Fog	Rain	Snow	Wind	Clear
LEVEL	None	X	X	X		
	Light				X	
	Moderate					
	Heavy					

REQUES

001051183

CONTACT INFORMATION

Company: **Liberty OHM**
Address: **1211 E 39th St, Tulsa, OK 74105**
Contact: **Jack Kerr**
Special Instructions:
Phone/Email: **918-742-1567/jack@libertyohm.com**

PROJECT INFORMATION

Project ID: 12-179
Project Desc.: Bixby North Elementary
Project Zip Code:
Sampling Date & Time: 4-15-13 9am
PO Number:

TURN AROUND TIME CODES - (TAT)

STD - Standard (DEFAULT)
ND - Next Business Day
SD - Same Business Day Rush
WH - Weekend/Holiday

Rushes received after 2pm or on weekends, will be considered received the next business day. Please alert us in advance of weekend analysis needs.

SAMPLE ID	DESCRIPTION	Sample Type (Below)	TAT (Above)	Total Volume/Area (as applicable)	NOTES (Time of day, Temp, RH, etc.)
1	Room 101	ST	STD	100 L	
2	Room 230	1	1	1	
3	Outside Reference				
					50°F
					NE @ 10mph
					RH 55%

Non-Culturable

Spore Trap		Tape Swab Bulk		BioCassett Water, Bull																
Fungi - Spore Trap Analysis	Spore Trap Analysis - Other particles	Direct Microscopic Exam (Qualitative)	Quantitative Spore Count Direct Exam	1-Media Surface Fungi (Genus ID + Asp. spp.)	2-Media Surface Fungi (Genus ID + Asp. spp.)	3-Media Surface Fungi (Genus ID + Asp. spp.)	Culturable Air Fungi (Genus ID + Asp. spp.)	Gram Stain and Counts (Culturable Air and Surface Bacteria	Legionella culture	Total Coliform, E.coli (Presence/Absence)	Membrane Filtration (Please specify organism)	MPN Bacteria (Please specify organism)	QuantiTray - Sewage Screen	Asbestos Analysis - PCM Airborne Fiber Count (NIOSH 74	Asbestos Analysis - PLM (EPA method 600/R-93-116)	PCR (please specify test)				
X																				
X																				
X																				

SAMPLE TYPE CODES

BC - BioCassette™	CP - Contact Plate	T - Tape	D - Dust
A1S - Andersen	ST - Spore Trap: Zefon, Allergenco, Burkard,..	SW - Swab	W - Water
SAS - Surface Air Sampler		B - Bulk	SO - Soil
O - Other:			

RELINQUISHED BY	DATE & TIME
Jam Kerr	4-15-13 12pm
	4/16/13

RECEIVED BY	DATE & TIME
	4/16