September 29, 2017

Clemson University
310 Klugh Avenue
Clemson, South Carolina 29634

Attn: Mr. W. Robert Newberry, IV
E-mail: wnewber@clemson.edu

Re: Limited Mold Investigation Report
Center for Applied Technology – Room 117A
511 Westinghouse Road
Pendleton, South Carolina 29670
Terracon Project No. 86127158 – Task 106

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited Mold investigation in Room 117A within the Center for Applied Technology (CAT) located on Westinghouse Road in Pendleton, South Carolina. This service was conducted in general accordance with our Master Service Agreement with Clemson University.

PROJECT DESCRIPTION

Scope of Services

At the request of Clemson University, Terracon representative Mr. Benjamin Hestir conducted a limited mold investigation in Room 117A of the CAT building on August 23, 2017. The CAT building was reportedly constructed in the 1980's and contains 30,000 square feet of office and laboratory space on a 2.5-acre parcel.

The investigation included measurements of temperature and relative humidity, the collection of two (2) spore trap samples inside Room 117A and two (2) spore trap samples outside the building for comparison.

Standard of Care

This limited Mold investigation was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same locale. Terracon did not attempt to identify every potential exposure or hazard present in the subject building. The results, findings, conclusions and recommendations expressed in this report are based on conditions observed during our sampling. Many factors, such as weather conditions, building occupancy, ventilation patterns and seasonal variations in fungal concentrations, can affect the conditions observed. The information contained in this report should not be relied upon to represent conditions that existed prior to or after this sampling. Terracon does not warrant the services of regulatory agencies, laboratories or other third parties supplying information that may have been used in the preparation of this report.

SAMPLING CRITERIA AND METHODS

Mold Sampling

Total mold spore trap samples were collected using Allergenco-D™ spore trap cassettes specifically designed for the collection of airborne mold spores. Air samples were collected using a calibrated Zefon Bio-Pump™ at a flow rate of 15 liters per minute (LPM) for 5 minutes at each location.

After collection, the spore trap samples were hand delivered to the Southeastern Environmental Microbiology Lab (SEEML) in Greenville, South Carolina. SEEML is accredited by the AIHA® Laboratory Accreditation Programs, LLC under the Environmental Microbiology Laboratory Accreditation Program (EMLAP), Accreditation #173667. Air samples were analyzed by direct microscopic examination and results are reported in spores per cubic meter of air (spores/m^3).

To help interpret the mold spore trap sampling results, we compared indoor air and outdoor air measurements. High variability in airborne fungal spore concentrations can exist in different geographic locations, during different seasons, and weather patterns, and over the course of a given day. As a general rule, indoor air fungal spore concentrations in a heating, ventilation and air-conditioning (HVAC)-supplied building are typically less than, but qualitatively similar to, fungal spore concentrations found in the outside environment.

No state or federal exposure limits have been established for fungal aerosols. Regulatory standards, medically based threshold limit or dose-response relationships have not been established for exposure to airborne or surface concentrations of mold spores. Terracon relies upon experience, professional judgment, current scientific literature, guidelines and recommendations made by professional organizations and experts, and statistical methods in interpreting mold sampling results.

Temperature and Relative Humidity

Indoor air temperature and relative humidity are physical conditions important to the perception of comfort. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) has published recommendations regarding thermal comfort. ASHRAE Standard 55-2013, Thermal Environmental Conditions for Human Occupancy, identifies six primary factors that affect comfort: metabolic rate (affected by the activity being performed); clothing insulation; air temperature; radiant temperature; air speed; and humidity.

Although the relationships are complex, a temperature range between 73 and 79 degrees Fahrenheit (°F) with relative humidity between roughly 20 and 60 percent (%) are recommended for persons in a conditioned setting wearing light summer clothing. Higher temperatures require lower humidity for comfort. For persons in winter clothing, temperatures can range between 68 and 75°F, with relative humidity between 20% and 60%, with preferred conditions falling between 30% and 50% for both winter and summer temperatures.

EPA recommends maintaining indoor humidity below 60%, ideally 30-50%, if possible.

Readings of temperature and relative humidity were collected with an Extech Model 445580 IAQ instrument which was calibrated by the manufacturer.

FINDINGS

General Observations

- The office space is on the 1st floor of the CAT building and was unoccupied at the time of our air sample collection on August 23rd.
- The room was reportedly recently constructed by subdividing a larger office space.
- Photographs from the assessment are attached.

Mold Air Sampling Results

On the morning of August 22, 2017, Terracon collected two air samples (spore traps) in the office (Room 117A) and two outside the building for comparison. The results of the total spore count samples analyses are presented in Table 1. The laboratory analytical reports are attached.

Table 1: Summary of Total Spore Count Analyses and Temperature/Relative Humidity Measurements – August 23, 2017

Sample #	117A-1	117A-2	117A-3	117A-4
Location Description	**Back of office**	**Front of office**	**Outside on west picnic table**	**Outside in SW parking area**
Spore Type	**Spores/ m^3**	**Spores/m^3**	**Spores/m^3**	**Spores/m^3**
Alternaria	---	---	39	---
Ascospores	117	13	1,170	3,120
Basidiospores	234	117	16,000	28,900
Bipolaris/Drechslera	13	---	13	---
Cladosporium	117	78	3,630	8,190
Curvularia	13	---	143	13
Epicoccum	13	26	13	---
Cercospora	---	---	39	
Memnoniella	---	---	13	---
Nigrospora	---	---	13	---
Penicillium/ Aspergillus	117	117	---	---
Smuts/*Periconia*/ Myxomycetes	13	13	78	195
Pithomyces	---	---	26	52
Torula	---	---	---	13
Zygomycetes	13	---	39	26
Total	**650**	**364**	**21,200**	**40,500**
Temperature (degrees Fahrenheit)	73.9	---	88.5	---
Relative Humidity (%)	52.8	---	56.8	---

The lowest outdoor total spore count was approximately 32 times higher than the highest total spore count inside. The dominant mold genera indoors were *Basidospores and Aspergillis/Penicillium.* The dominant mold genera outdoors were *Basidiospores and Cladosporium*. Conditions outside on the day we sampled were hot and sunny.

The laboratory analytical report is attached.

CONCLUSIONS

The following conclusions are provided based on our assessment:

- The results of mold air sampling indicated that total airborne mold spore concentrations inside the building were below the total mold spore levels measured in the two outdoor samples. This is considered a favorable condition.
- However, penicillium/aspergillis genus molds were identified in the indoor samples, but not in the outdoor samples, indicating a possible source indoors.
- Measurements of temperature and relative humidity were within recommended ranges.

RECOMMENDATIONS

The following recommendations are provided based on our assessment:

- Other than a cleaning of the horizontal surfaces in the office and a HEPA vacuuming of the flooring, no further assessment or remediation is required for mold at this time.

Terracon appreciates the opportunity to provide this service to Clemson University. If you have any questions regarding this report, please contact the undersigned at 864-292-2901.

Sincerely,
Terracon Consultants, Inc.



Benjamin Hestir, P.E.
Project Industrial Hygienist



Jeffrey A. Gurrie
Senior Industrial Hygienist

Attachments: Photographs
Laboratory Results

Photographs



Photo #1 A view of the vacant office (Room 117A)



Photo #2 Return air is a louvered vent that passes through to the hallway



Photo #3 View of outside sample location for sample 117A-3 on west side break area picnic table



Photo #4 View of outside sample location for sample 117A-4 in employee parking area

Laboratory Results

SEEML Reference Number:
170823084

Southeast Environmental Microbiology Laboratories
506 Laurens Rd
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

The information and data for **Terracon** has been checked for thoroughness and accuracy. The following reports are contained within this document:

- ☐ Direct Exam Report
- ☒ Spore Trap Report
- ☐ Quantitative Fungal Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Direct Exam Report

Lab Manager Review: Rafael Berrios Date: 08/23/17

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are AIHA (American Industrial Hygiene Association) Environmental Microbiology Accredited laboratory for only fungal analysis Air-Direct Examination (EMLAP # 173667).

The data within this report is reliable to three significant figures. The third significant figure is technically unjustified. In this instance, the third figure is reported as an estimate to facilitate the interpretation by the customer.

Confidentiality Notice:
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Guidelines for Interpretation:
No accepted quantitative regulatory standards currently exist by which to assess the health risks related to mold and bacterial exposure. Molds and bacteria have been associated with a variety of health effects and sensitivity varies from person to person.
Several organizations, including: the American Conference of Government Industrial Hygienists (ACGIH); the American Industrial Hygiene Association (AIHA); the Indoor Air Quality Association (IAQA); the United States Environmental Protection Agency (USEPA); the Centers for Disease Control (CDC), as well as the California Department of Health Services (CADHS), have all published guidelines for assessment and interpretation of mold resulting from water intrusion in buildings.

Interpretation of the data and information within this document is left to the company, consultant, and/or persons who conducted the fieldwork.

Spore Trap Report

Attention: Ben Hestir	Date Sampled: 08/23/17
Terracon	Date Received: 08/23/17
72 Pointe Circle	Date Analyzed: 08/23/17
Greenville, SC 29615	Date Reported: 08/23/17
	Date Revised:
	Project Name: 86127158-Task 106
	Project Address: Center for Applied Technology
	Project City, State, ZIP:
	SEEML Reference # : 170823084

TEST METHOD: DIRECT MICROSCOPY EXAMINATION AT 400X (100% OF TRACE ANALYZED) SEEML SOP 7

Client Sample ID	117A-1			117A-2			117A-3		
Location	Back of Office			Front of Office			Outside- W side of bldg		
Lab Sample ID	170823084-253			170823084-254			170823084-255		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments	1	13					5	65	
Pollen									
Spore Trap Used	Allergenco			Allergenco			Allergenco		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria							3	39	<1
Ascospores	9	117	18	1	13	4	90	1170	6
Basidiospores	18	234	36	9	117	32	1230	16000	75
Bipolaris/Drechslera	1	13	2				1	13	<1
Chaetomium									
Cladosporium	9	117	18	6	78	21	279	3630	17
Curvularia	1	13	2				11	143	<1
Epicoccum	1	13	2	2	26	7	1	13	<1
Cercospora							3	39	<1
Fusarium									
Memnoniella							1	13	<1
Nigrospora							1	13	<1
Penicillium/Aspergillus	9	117	18	9	117	32			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	13	2	1	13	4	6	78	<1
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes	1	13	2				3	39	<1
Pithomyces							2	26	<1
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	50	**650**		28	**364**		1631	**21200**	

Comments: Condition of the sample(s) upon receipt: Acceptable.

1=Total % may not equal 100 due to rounding.

2 = Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.

3 = Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

The reporting limit is 1 Spore/sample.

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Rafael Berrios

Rafael Berrios, Approved Laboratory Signatory

506 Laurens Road
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233-6589
AIHA-LAP, LLC EMLAP # 173667

Spore Trap Report

Attention: Ben Hestir	Date Sampled: 08/23/17
Terracon	Date Received: 08/23/17
72 Pointe Circle	Date Analyzed: 08/23/17
Greenville, SC 29615	Date Reported: 08/23/17
	Date Revised:
	Project Name: 86127158-Task 106
	Project Address: Center for Applied Technology
	Project City, State, ZIP:
	SEEML Reference # : 170823084

TEST METHOD: DIRECT MICROSCOPY EXAMINATION AT 400X (100% OF TRACE ANALYZED) SEEML SOP 7

Client Sample ID	117A-4								
Location	Outside-SW Corner Parking								
Lab Sample ID	170823084-256								
Detection Limit (spores/m^3)	13								
Hyphal Fragments	3	39							
Pollen									
Spore Trap Used	Allergenco								
	raw ct.	spores/m^3	%						
Alternaria									
Ascospores	240	3120	8						
Basidiospores	2220	28900	71						
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	630	8190	20						
Curvularia	1	13	<1						
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus									
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	15	195	<1						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula	1	13	<1						
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes	2	26	<1						
Pithomyces	4	52	<1						
Background debris (1-5)3	3								
Sample Volume(liters)	75								
TOTAL SPORES/M^3	3113	**40500**							

Comments: Condition of the sample(s) upon receipt: Acceptable.

1=Total % may not equal 100 due to rounding.

2 = Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.

3 = Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

The reporting limit is 1 Spore/sample.

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Rafael Berrios

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AIHA-LAP, LLC EMLAP # 173667

SEEML Labs

Southeast Environmental Microbiology Laboratories

Chain of Custody

506 Laurens Rd, Greenville, SC 29607

Phone : 864-233-3770, Fax: 864-233-6589, www.seeml.com, AIHA-LAP, LLC. (EMLAP) #173667

For Lab Use Only			
Condition of samples is acceptable	☑ YES ☐ NO	SEEML Ref #: 1708233084	Lab ID: 253 - 256

Company Information		Client Information		Environmental Conditions	
(Project Manager)	Ben Hestir	Date Sampled:	8/23/17	Precipitation in last 16hrs:	No
(Company Name)	Terracon	Project Name:	86127158 - Task 106	Relative Humidity I/O:	52.8% / 56.8%
(Address)	72 Pointe Circle	Project Address:	Center for Applied	Temperature I/O:	73.9° / 88.5°
(City, State, Zip)	Greenville, SC 29615	City, State, Zip:	Technology	Wind Conditions	5-10 mph
(Phone)	864-293-7348				
(Email)	ben.hestir@terracon.com				

Sample Type Abbreviations:

A- Allergenco S-Swab AP-Andersen Plate
AOC- Air O Cell T-Tape W- Water
MS- Micro 5 B- Bulk D- Dust

Analysis Type:

1. SporeTrap, Air Sample Analysis-Same Day
2. Direct Exam Surface Sample Analysis -Same Day
3. Culturable Air / Surface Samples -7-10 days

Sample ID	Sample Location	Sample Type	Analysis Type	*Area	**Volume (L)	Notes
117A-1	Back of office	A	1		75	
117A-2	Front of office	"	"		"	
117A-3	Outside - W side of bldg.	"	"		"	
117A-4	Outside - SW corner parking	"	"		"	

Relinquished By:	Date/Time:	Recieved By:	Date/Time:
Ben Hestir	8/23/17 12:00		8-23-17

* Area is only required for culturable surface samples.

** Volume = Pump setting (L/min) x minutes