June 16, 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
CCIT – P&A Basement
Clemson, South Carolina 29631
Terracon Project No. 86127158 – Task 90

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation in the CCIT offices in the P&A Building basement at Clemson University in Clemson, South Carolina. Reportedly, occupants have expressed concerns regarding mold after a recent steam line leak in a mechanical room. 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 the CCIT offices in the P&A Building basement, on Monday, June 5, 2017. These offices were recently impacted by a steam leak in a mechanical space and at the time of our investigation, two commercial-grade dehumidifiers were still running in the hallway outside of the mechanical room on the north end of the office space.

On our June 5th visit, Terracon made measurements of temperature and relative humidity and conducted airborne mold sampling which consisted of collecting spore trap air samples in four locations inside the office space and the collection of two additional samples outside 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 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

- Evidence of the steam leak was observed in the tile flooring outside the mechanical room.
- Two commercial grade dehumidifiers were in place and running in the hall outside the mechanical room at the time of our assessment.
- No evidence of mold growth was observed or reported.
- Photographs from the assessment are attached.

Mold Air Sampling

On the morning of June 5, 2017, Terracon collected four mold spore trap samples inside the CCIT offices in the P&A Building Basement and two samples in outdoor locations for comparison. The results of the total spore count samples analyses are summarized in Table 1 below:

Table 1: Summary of Total Spore Count Analyses – June 5, 2017

Sample #	CCIT-1	CCIT-2	CCIT-3	CCIT-4	CCIT-5	CCIT-6
Location Description	**Front reception desk**	**Room 12C**	**Room 22**	**Room 16**	**Outside East entrance**	**Outside P&A NE corner**
Spore Type	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**
Alternaria	---	---	---	---	13	13
Ascospores	---	---	---	---	9,360	7,960
Basidiospores	195	---	156	---	23,800	22,200
Cladosporium	78	13	78	13	2,340	5,070
Penicillium/ Aspergillus	390	390	234	117	273	---
Smuts/*Periconial*/ Myxomycetes	---	13	13	---	---	---
Pithomyces	13	---	---	---	---	---
Polythrincium	---	---	---	---	26	---
Rusts	---	---	---	---	169	416
Torula	---	---	---	---	13	---
Zygomycetes	---	---	---	---	39	130
Total	**676**	**416**	**481**	**130**	**36,000**	**35,800**

There was no visual evidence of mold growth in the areas of the office impacted by the steam leak. Two university-owned dehumidifiers were in place and running at the time of our assessment.

The lowest outdoor total spore count was approximately 50 times higher than the highest total spore count inside. The dominant mold genera indoors were *Basidospores and Aspergillis/Penicillium.* The dominant mold spore types outdoors were *Basidiospores, Ascospores and Cladosporium*. The weather on the day we sampled was cloudy, warm (76ºF) and calm.

The laboratory analytical report is attached.

Temperature and Relative Humidity

The indoor temperature was 73ºF and the relative humidity was 56%. The outdoor temperature was 76ºF and the relative humidity was 83%.

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 and concentrations of mold spore types inside the building were less than or similar to the highest corresponding outdoor mold spore levels measured. This is considered to be a favorable condition in the indoor environment. At the time of sampling it does not appear the steam leak has caused increased airborne mold spores.

- Temperature levels were within ASHRAE guideline ranges and relative humidity levels were within EPA guideline ranges.

- Two dehumidifiers were running adjacent to the recently impacted mechanical room and there was no evidence of mold growth at the time of our assessment.

RECOMMENDATIONS

The following recommendations are provided based on our assessment:

- Relative humidity (56% at the time of testing), while within recommended ranges, were higher than the ideal levels (30 – 50%) and efforts to reduce these airborne moisture levels should continue with the use of the dehumidifiers.

Terracon appreciates the opportunity to provide this service to Clemson University. If you have any questions regarding this limited mold investigation 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

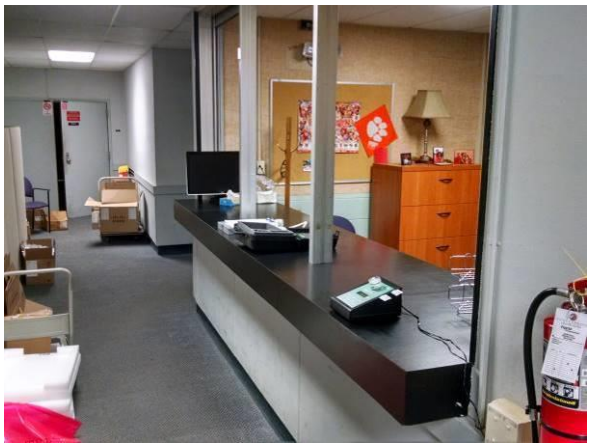


Photo #1 Front lobby – CCIT basement office



Photo #2 Location of steam leak in mechanical room – north end of office



Photo #3 Air sample location in Room 12C – office of Karen Smith



Photo #4 Dehumidifers in place outside of mechanical room after steam leak

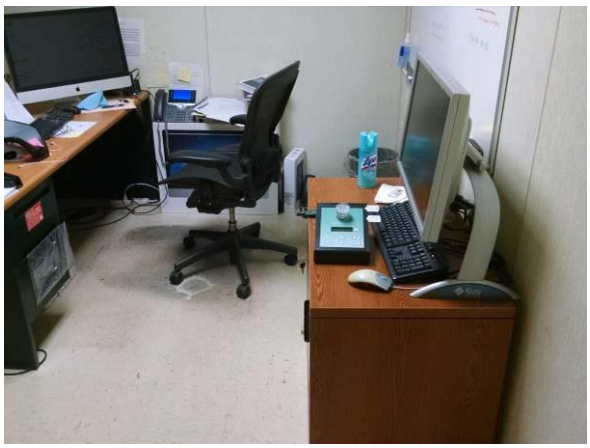


Photo #5 Air sample location in Room 16



Photo #6 Landscaped area outside E entrance to P&A building – location of two outdoor samples

Laboratory Results

SEEML Reference Number:
170605064

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: 06/05/17

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:
The document(s) contained herein are confidential and privileged information, intended for the exclusive use of the individual or entity named above. If the reader of this message is not the intended recipient, or the employee or agent responsible for delivering it to the intended recipient, you are hereby notified that any dissemination, distribution or copying of the document(s) is strictly prohibited. If you have received this document in error, please immediately notify us by telephone to arrange for its return. Thank you.

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: 06/05/17
Terracon	Date Received: 06/05/17
72 Pointe Circle	Date Analyzed: 06/05/17
Greenville, SC 29615	Date Reported: 06/05/17
	Date Revised:
	Project Name: CCIT
	Project Address: 86127158-Task 90
	Project City, State, ZIP:
	SEEML Reference # : 170605064

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

Client Sample ID	CCIT- 1			CCIT- 2			CCIT- 3		
Location	Front Reception Counter			Rm 12C			Rm 22		
Lab Sample ID	170605064-225			170605064-226			170605064-227		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments									
Pollen	1	13							
Spore Trap Used	Allergenco			Allergenco			Allergenco		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores									
Basidiospores	15	195	29				12	156	32
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	6	78	12	1	13	3	6	78	16
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	30	390	58	30	390	94	18	234	49
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy				1	13	3	1	13	3
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces	1	13	2						
Background debris (1-5)3	3			2			2		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	52	**676**		32	**416**		37	**481**	

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: 06/05/17
Terracon	Date Received: 06/05/17
72 Pointe Circle	Date Analyzed: 06/05/17
Greenville, SC 29615	Date Reported: 06/05/17
	Date Revised:
	Project Name: CCIT
	Project Address: 86127158-Task 90
	Project City, State, ZIP:
	SEEML Reference # : 170605064

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

Client Sample ID	CCIT -4			CCIT -5			CCIT -6		
Location	Rm 16			Outside E			Outside NE		
Lab Sample ID	170605064-228			170605064-229			170605064-230		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments	1	13		1	13				
Pollen									
Spore Trap Used	Allergenco			Allergenco			Allergenco		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria				1	13	<1	1	13	<1
Ascospores				720	9360	26	612	7960	22
Basidiospores				1830	23800	66	1710	22200	62
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	13	10	180	2340	7	390	5070	14
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	9	117	90	21	273	<1			
Polythrincium				2	26	<1			
Rusts				13	169	<1	32	416	1
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula				1	13	<1			
Ulocladium									
Colorless/Other Brown 2									
Oidium				1	13	<1			
Zygomycetes				3	39	<1	10	130	<1
Pithomyces									
Background debris (1-5)3	2			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	10	**130**		2772	**36000**		2755	**35800**	

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

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AIHA-LAP, LLC EMLAP # 173667

Southeast Environmental Microbiology Laboratories
Chain of Custody

506 Laurens Rd, Greenville, SC 29607
Phone : 864-233-3770, Fax: 864-233-3779, www.seeml.com, AIHA-LAP, LLC. (EMLAP) #173667

For Lab Use Only			
Condition of samples is acceptable	☒ YES ☐ NO	SEEML Ref #: 170605064	Lab ID: 225 - 230

Company Information		Client Information		Environmental Conditions	
(Project Manager)	Ben Hestir	Date Sampled:	6/5/17	Precipitation in last 16hrs:	Yes
(Company Name)	Terracon	Project Name:	CCIT	Relative Humidity I/O:	55% / 83%
(Address)	72 Pointe Circle	Project Address:	86127158 Task 90	Temperature I/O:	73° / 75°
(City, State, Zip)	Greenville, SC 29615	City, State, Zip:		Wind Conditions	calm
(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
M5- 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
CCIT-1	Front reception counter	A	1		75	
CCIT-2	Rm 12C	"	"		"	
CCIT-3	Rm 22	"	"		"	
CCIT-4	Rm 16	"	"		"	
CCIT-5	Outside E	"	"		"	
CCIT-6	Outside NE	"	"		"	

Relinquished By:	Date/Time	Recieved By:	Date/Time
Ben Hestir	6/5/17 11:30		6-5-17

* Area is only required for culturable surface samples.
** Volume = Pump setting (L/min) x minutes