October 13, 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
Clemson University
Wannamaker Hall – Room 204
Clemson, South Carolina 29634
Terracon Project No. 86127158 – Task 111

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation within Room 204, within Wannamaker Hall located on Klugh Avenue on the main campus of Clemson University in Clemson, South Carolina. Room 204 is a standard dormitory room and appears to be designed to have one occupant. The occupant has expressed concerns regarding indoor air quality in the 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 Housing, Terracon representative Mr. Benjamin Hestir conducted a limited mold investigation in Room 204 on September 21, 2017. The building was originally constructed in 1938 and was renovated in 2005.

The investigation included measurements of temperature and relative humidity, the collection of two (2) spore trap samples inside the dorm room 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 dorm room is single occupancy with a sink and closet.
- Total area of the room is estimated at 120 square feet.
- The resident was not present during our investigation.
- Relative humidity levels increased when the room AC came on before our 2nd air sample.
- Several pieces of medical gauze were taped over the HVAC supply duct register, partially covering the opening. This appeared to be an attempt to provide filtration to the airflow from the HVAC.
- No visual evidence of water damage, condensation or mold growth were observed during the investigation.

Mold Air Sampling / Temperature-Humidity Results

On the morning of September 21, 2017, Terracon collected two air samples in Room 204 and two outside the building for comparison. Measurements of temperature and relative humidity were also made. The results of the total spore count samples analyses and the measurements of temperature and relative humidity are presented in Table 1. The laboratory analytical reports are attached.

Table 1: Summary of Total Spore Count Analyses and Temperature/Relative Humidity Measurements – September 21, 2017

Sample #	204-1	204-2	204-3	204-4
Location Description	**On desk**	**On bed**	**Outside Wannamaker Hall SW corner**	**Outside NW corner of Core Campus**
Spore Type	**Spores/ m^3**	**Spores/m^3**	**Spores/m^3**	**Spores/m^3**
Ascospores	---	26	3,120	4,290
Basidiospores	13	78	7,770	3,120
Cladosporium	156	78	13,700	5,460
Cercospora	---	---	13	13
Nigrospora	---	---	13	13
Penicillium/ Aspergillus	117	---	---	---
Smuts/*Periconia*/ Myxomycetes	---	13	26	13
Pithomyces	---	---	13	---
Zygomycetes	---	---	52	78
Total	**286**	**195**	**24,700**	**13,000**
Temperature (degrees Fahrenheit)	73.4	69.8	83.4	---
Relative Humidity (%)	51.8	59.4	61.4	---

The lowest outdoor total spore count was approximately 45 times higher than the highest total spore count inside. The dominant mold genera indoors were *Cladosporium and Penicillium/ Aspergillus* type spores. The dominant mold genera outdoors were *Basidiospores, Cladosporium,* and *Ascospores*. Conditions outside on the day we sampled were warm and sunny.

The laboratory analytical report is attached.

CONCLUSIONS

The following conclusions are provided based on our assessment:

- With the exception of the detection of *Penicillium/Aspergillus* type spores indoors, 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 the highest corresponding outdoor mold spore levels measured. The slight elevation in *Penicillium/Aspergillus* type spores should not be of concern unless the spore levels are magnitudes higher when compared to outdoors samples.
- Measurements of temperature and relative humidity were within recommended ranges, although there was a marked increase in the room relative humidity after the AC unit came on before air sample 204-2.

RECOMMENDATIONS

The following recommendations are provided based on our assessment:

- The occupant's use of "filter material" on the HVAC system should be discontinued. The HVAC system has an internal filter which should be maintained.
- No further investigation or remediation is recommended.

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 View of Room 204 and sample location 204-1



Photo #2 Additional view of Room 204

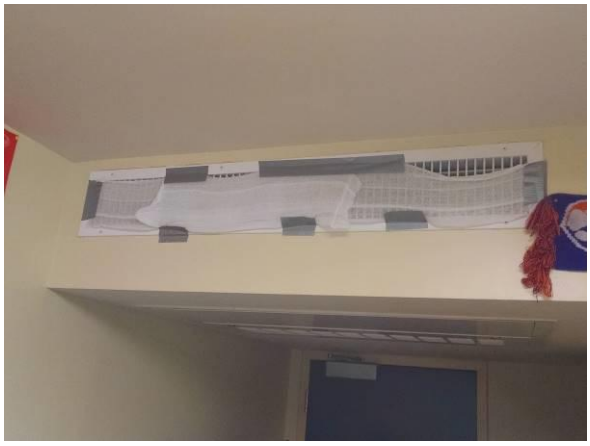


Photo #3 View of attempted air filtration in Room 204



Photo #4 View of Wannamaker Hall entrance facing northeast



Photo #5 Location of air sample 204-3



Photo #6 Location of air sample 204-4

Laboratory Results

SEEML Reference Number:
170922008

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: 09/22/17

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: 09/21/17
Terracon	Date Received: 09/22/17
72 Pointe Circle	Date Analyzed: 09/22/17
Greenville, SC 29615	Date Reported: 09/22/17
	Date Revised:
	Project Name: 204 Wannamaker
	Project Address: 86127158- Task 111
	Project City, State, ZIP:
	SEEML Reference # : 170922008

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

Client Sample ID	204-1			204-2			204-3		
Location	Desk			Bed			Outside- W Side Wannamaker		
Lab Sample ID	170922008-011			170922008-012			170922008-013		
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				2	26	13	240	3120	13
Basidiospores	1	13	5	6	78	40	598	7770	31
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	12	156	55	6	78	40	1050	13700	55
Curvularia									
Epicoccum									
Cercospora							1	13	<1
Fusarium									
Memnoniella									
Nigrospora							1	13	<1
Penicillium/Aspergillus	9	117	41						
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy				1	13	7	2	26	<1
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes							1	13	<1
Pithomyces							4	52	<1
Background debris (1-5)3	2			2			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	22	**286**		15	**195**		1897	**24700**	

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: 09/21/17
Terracon	Date Received: 09/22/17
72 Pointe Circle	Date Analyzed: 09/22/17
Greenville, SC 29615	Date Reported: 09/22/17
	Date Revised:
	Project Name: 204 Wannamaker
	Project Address: 86127158- Task 111
	Project City, State, ZIP:
	SEEML Reference # : 170922008

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

Client Sample ID	204-4								
Location	Outside- NW Corner Cove Campus								
Lab Sample ID	170922008-014								
Detection Limit (spores/m^3)	13								
Hyphal Fragments	1	13							
Pollen	2	26							
Spore Trap Used	Allergenco								
	raw ct.	spores/m^3	%						
Alternaria									
Ascospores	330	4290	33						
Basidiospores	240	3120	24						
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	420	5460	42						
Curvularia									
Epicoccum									
Cercospora	1	13	<1						
Fusarium									
Memnoniella									
Nigrospora	1	13	<1						
Penicillium/Aspergillus									
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	13	<1						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes	6	78	<1						
Pithomyces									
Background debris (1-5)3	3								
Sample Volume(liters)	75								
TOTAL SPORES/M^3	999	**13000**							

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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Southeast Environmental Microbiology Laboratories
Chain of Custody

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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 #: 1709222008	Lab ID: 011 - 014

Company Information		Client Information		Environmental Conditions	
(Project Manager)	Ben Hestir	Date Sampled:	9/21/17	Precipitation in last 16hrs:	No
(Company Name)	Terracon	Project Name:	204 Wannamaker	Relative Humidity I/O:	61.4% / 59.4%
(Address)	72 Pondfo Circle	Project Address:	86127158-Task 111	Temperature I/O:	69.8° / 83.4°
(City, State, Zip)	Greenville, SC 29615	City, State, Zip:		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
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
204-1	Desk	A	1		75	
204-2	Bed	"	"		"	
204-3	Outside - W side Wannamaker	"	"		"	
204-4	Outside - NW corner Core Campus	"	"		"	

Relinquished By: [signature] Date/Time: 9/21/17 2:00pm

Received By: [signature] Date/Time: 9.22.17

* Area is only required for culturable surface samples.

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