October 5, 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
Smith Hall – Room 2C5
Bryan Circle
Clemson, South Carolina 29634
Terracon Project No. 86127158 – Task 110

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation within Room 2C5, within Smith Hall located on Bryan Circle on the main campus of Clemson University in Clemson, South Carolina. Room 2C5 is a standard dormitory room with two occupants. The occupants have expressed concerns regarding mold growth on personal belongings and high humidity conditions 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 2C5 on September 15, 2017. The building was originally constructed in 1972.

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 was a typical arrangement with two bunk beds, two desks, two sets of drawers and two closets.
- The HVAC system is a 2-pipe fan coil unit.
- Total area is estimated at 144 square feet.
- The resident who was present during our investigation reported surficial mold growth on items stored in the closets and towels that would not dry out after showering. Reportedly the items with mold growth had to be thrown away.

Mold Air Sampling / Temperature-Humidity Results

On the afternoon of September 15, 2017, Terracon collected two air samples (spore traps) in Room 2C5 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 13, 2017

Sample #	2C5-1	2C5-2	2C5-3	2C5-4
Location Description	**On desk – right side**	**On desk – left side**	**Outside Smith Hall entrance**	**Outside on Bryan Circle bench**
Spore Type	**Spores/ m^3**	**Spores/m^3**	**Spores/m^3**	**Spores/m^3**
Alternaria	---	13	13	13
Ascospores	78	156	1,600	1,290
Basidiospores	312	429	5,300	9,980
Bipolaris/Dreschlera	---	13	---	---
Cladosporium	429	351	585	819
Curvularia	---	26	---	---
Epicoccum	---	---	---	13
Nigrospora	---	---	---	---
Penicillium/ Aspergillus	6,980	2,730	78	234
Rusts	---	---	39	---
Torula	---	---	26	---
Smuts/*Periconia*/ Myxomycetes	---	---	---	13
Pithomyces	---	---	13	26
Total	**7,800**	**3,720**	**7,650**	**12,400**
Temperature (degrees Fahrenheit)	69.0	68.9	83.1	---
Relative Humidity (%)	73.5	74.0	40.6	---

Indoor air spore levels were below outdoor levels. The dominant mold genera indoors were *Penicillium/Aspergillus and Cladosporium.* The dominant mold genera outdoors were *Basidiospores 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:

- Although indoor air spore levels were below outdoor levels, Room 2C5 had increased levels of aspergillus/penicillium type mold spores when compared to outdoors.
- Measurements of temperature were within recommended ASHRAE ranges.
- Measurements of relative humidity in Room 2C5 was approximately 75% at the time of testing. This is above the EPA recommend range of 30-60%.

RECOMMENDATIONS

The following recommendations are provided based on our assessment:

- The HVAC system should be evaluated to verify that is it effectively reducing humidity levels. Relative humidity levels in a conditioned space should be 30-60%.
- Until repairs can be made, the room should be dehumidified and HEPA filtered with a temporary unit.
- Items exhibiting mold growth should be cleaned in general accordance with the American National Standards Institute (ANSI)/Institute of Inspection Cleaning and Restoration Certification (IICRC) R520, Reference Guide for Professional Mold Remediation.

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: Laboratory Results

Laboratory Results

SEEML Reference Number:
170918081

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: 09/18/17

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: 09/15/17
Terracon	Date Received: 09/18/17
72 Pointe Circle	Date Analyzed: 09/18/17
Greenville, SC 29615	Date Reported: 09/18/17
	Date Revised:
	Project Name: Smith 2C5
	Project Address: 86127158 Task 110
	Project City, State, ZIP:
	SEEML Reference # : 170918081

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

Client Sample ID	2C5-1			2C5-2			2C5-3		
Location	Rm 2C5 - Right Desk			Rm 2C5 - Left Desk			Outside - Entrance to Smith		
Lab Sample ID	170918081-281			170918081-282			170918081-283		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments	5	65		5	65		1	13	
Pollen	2	26					5	65	
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	6	78	1	12	156	4	123	1600	21
Basidiospores	24	312	4	33	429	12	408	5300	69
Bipolaris/Drechslera				1	13	<1			
Chaetomium									
Cladosporium	33	429	6	27	351	9	45	585	8
Curvularia				2	26	<1			
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	537	6980	89	210	2730	73	6	78	1
Polythrincium									
Rusts							3	39	<1
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula							2	26	<1
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces							1	13	<1
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	600	**7800**		286	**3720**		589	**7650**	

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: 09/15/17
Terracon	Date Received: 09/18/17
72 Pointe Circle	Date Analyzed: 09/18/17
Greenville, SC 29615	Date Reported: 09/18/17
	Date Revised:
	Project Name: Smith 2C5
	Project Address: 86127158 Task 110
	Project City, State, ZIP:
	SEEML Reference # : 170918081

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

Client Sample ID	2C5-4		
Location	Outside - On Med. Bench		
Lab Sample ID	170918081-284		
Detection Limit (spores/m^3)	13		
Hyphal Fragments	1	13	
Pollen	1	13	
Spore Trap Used	Allergenco		
	raw ct.	spores/m^3	%
Alternaria	1	13	<1
Ascospores	99	1290	10
Basidiospores	768	9980	80
Bipolaris/Drechslera			
Chaetomium			
Cladosporium	63	819	7
Curvularia			
Epicoccum	1	13	<1
Cercospora			
Fusarium			
Memnoniella			
Nigrospora			
Penicillium/Aspergillus	18	234	2
Polythrincium			
Rusts			
Smuts/Periconia/Myxomy	1	13	<1
Spegazzinia			
Stachybotrys			
Stemphylium			
Tetraploa			
Torula			
Ulocladium			
Colorless/Other Brown 2			
Oidium			
Zygomycetes			
Pithomyces	2	26	<1
Background debris (1-5)3	3		
Sample Volume(liters)	75		
TOTAL SPORES/M^3	953	**12400**	

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

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 #: 1709180581	Lab ID: 281 - 284

Company Information		Client Information		Environmental Conditions	
(Project Manager)	Ben Hestir	Date Sampled:	9/15/17	Precipitation in last 16hrs:	No
(Company Name)	Terracon	Project Name:	Smith 2C5	Relative Humidity I/O:	74% / 41%
(Address)	72 Ponte Creek	Project Address:	86127158 Task 110	Temperature I/O:	69° / 83°
(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
2C5-1	Rm 2C5 - right desk	A	1		75	
2C5-2	Rm 2C5 - left desk	"	"		"	
2C5-3	Outside - entrance to Smith	"	"		"	
2C5-4	Outside - on Medical bench	"	"		"	

Relinquished By:	Date/Time	Recieved By:	Date/Time
Ben Hestir	9/18/17 9:45		9-18-17

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



Photo #1 Entry to Room 2C5

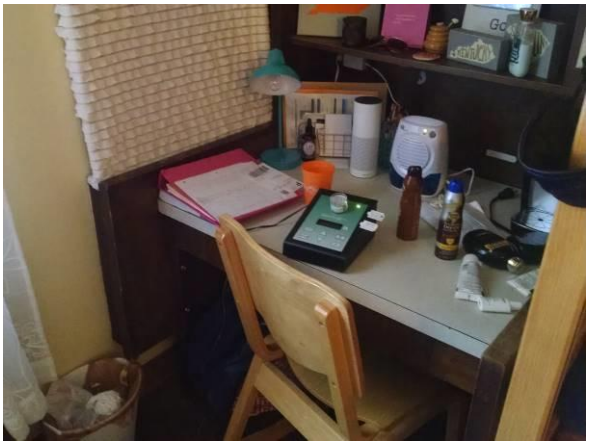


Photo #2 View of right hand desk, location of sample 2C5-1



Photo #3 View of left hand desk, location of sample 2C5-2



Photo #4 View of outside sample 2C5-4 location on Bryan Circle bench