November 10, 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
Sirrine Hall – Room 349A
Clemson, South Carolina
Terracon Project No. 86127158 – Task 119

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation in room 349A in Sirrine Hall on the main campus of Clemson University, Clemson, South Carolina. Reports of respiratory irritation have been reported from the occupant of Room 349A. 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 including the collection of two (2) air samples (spore traps) in Room 349A (and one in Room 349 – the waiting room) on November 6, 2017. Room 349A consists of approximately 100 square feet and is occupied by Ms. Carter McElveen, a lecturer in the Marketing Department. The space includes a desk, book shelves, a file cabinet and a fan coil style HVAC unit.

The investigation included measurements of temperature and relative humidity in the areas where the air samples were collected. Also, two (2) spore trap samples were collected 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.

INVESTIGATION 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 occupant of a neighboring office in Suite 349 stated that Ms. McElveen was on maternity leave and had not occupied the office this semester.
- There was a slight discoloration on the fins of the supply register located on the top of the fan coil HVAC unit.
- The fan coil unit in Room 349A was running at the time of our investigation.
- Photographs from the assessment are attached.

Mold Air Sampling Results

The results of the total spore count samples analyses and IAQ measurements are presented in Table 1. The laboratory analytical reports are attached.

Table 1 – Analytical Results and Temperature/Relative Humidity readings – November 6, 2017

Sample #	349A-1	349A-2	349A-3	349A-4	349A-5
Location	On desk in Room 349A	In corner of Room 349A behind fan coil unit	In waiting area on table – Room 349	SE corner of storage area	Outside – picnic table
Spore Type	Spores/m³	Spores/m³	Spores/m³	Spores/m³	Spores/m³
Alternaria	---	---	¾	26	13
Ascospores	39	39	¾	741	702
Aspergillus/ Penicillium	429	273	1,720	624	819
Basidiospores	273	507	390	3,320	2,380
Bipolaris/Dreschlerea	¾	¾	¾	¾	26
Cladosporium	78	78	117	4,910	2,150
Curvularia	---	---	---	117	78
Cercospora	¾	¾	¾	26	65
Myxomycetes/ Perconia/Smut	¾	39	13	156	260
Rusts	---	13	---	---	13
Torula	¾	¾	¾	¾	39
Total	**819**	**949**	**2,240**	**9,920**	**6,550**
Temperature - degrees F.	68.3	66.9	69.6	75	---
Relative Humidity (%)	64.6	67.7	60.7	71.7	---

The lowest total spore count outside was approximately 3 times higher than the highest spore count inside. The dominant mold genera indoors were *Basidiospores* and *Penicillium/Aspergillus.* The dominant mold spore types outdoors were *Basidiospores* and *Cladosporium*. Conditions outside on the day we sampled were moderate and cloudy.

The laboratory analytical report is attached.

Temperature and Relative Humidity

The highest indoor temperature was 69.6ºF and the highest indoor relative humidity was 67.7%. The outdoor temperature was 75ºF and the relative humidity was 71.7% (See Table 1 above for all readings).

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 with one exception, mold genera detected indoors was less than outdoor levels. This is considered a favorable condition.
- *Aspergillus/Penicillium* type spores were detected in the waiting area of Room 349 at levels above those detected outside.
- Temperature levels measured were within ASHRAE guideline ranges.
- Relative humidity levels measured were above the upper range of 60% recommended by EPA for indoor air.

RECOMMENDATIONS

The following recommendations are provided based on our assessment:

- Sustained humidity levels above 60% could lead to mold growth. *Aspergillus/Penicillium* type spores detected in the waiting area could be a factor of this condition. Temporary dehumidification should be used until the building HVAC serving this area can be evaluated.
- The discolored register on the fan coil unit in Room 349A should be cleaned and/or replaced.

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 View of Room 349A



Photo #2 View of ceiling grid in Room 349A



Photo #3 View of fan coil register fins in Room 349A



Photo #4 View of sample location in Room 349 (waiting area)



Photo #5 View of sample location outside (Sample 349A-4)



Photo #6 View of 2nd outside sample (349A-5)

Laboratory Results

SEEML Reference Number:
171108015

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: 11/08/17

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

	Date Sampled: 11/06/17
Terracon	Date Received: 11/08/17
72 Pointe Circle	Date Analyzed: 11/08/17
Greenville, SC 29615	Date Reported: 11/08/17
	Date Revised:
	Project Name: Sirrine Hall Room 349A
	Project Address: 86127158 Task 119
	Project City, State, ZIP:
	SEEML Reference # : 171108015

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

Client Sample ID	349A-1			349A-2			349A-3		
Location	On Desk of Carter McElveen- Room 349A			In Corner of Room 349A Next to Fan Coil Unit			In Waiting Area- Room 349		
Lab Sample ID	171108015-050			171108015-051			171108015-052		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments				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									
Ascospores	3	39	5	3	39	4			
Basidiospores	21	273	33	39	507	53	30	390	17
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	6	78	10	6	78	8	9	117	5
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	33	429	52	21	273	29	132	1720	77
Polythrincium									
Rusts				1	13	1			
Smuts/Periconia/Myxomy				3	39	4	1	13	<1
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	63	**819**		73	**949**		172	**2240**	

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

	Date Sampled: 11/06/17
Terracon	Date Received: 11/08/17
72 Pointe Circle	Date Analyzed: 11/08/17
Greenville, SC 29615	Date Reported: 11/08/17
	Date Revised:
	Project Name: Sirrine Hall Room 349A
	Project Address: 86127158 Task 119
	Project City, State, ZIP:
	SEEML Reference # : 171108015

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

Client Sample ID	349A-4			349A-5					
Location	Outside NE Entrance to Sirrine Hall			Outside NW Corner of Riggs Hall					
Lab Sample ID	171108015-053			171108015-054					
Detection Limit (spores/m^3)	13			13					
Hyphal Fragments				8	104				
Pollen	1	13							
Spore Trap Used	Allergenco			Allergenco					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria	2	26	<1	1	13	<1			
Ascospores	57	741	7	54	702	11			
Basidiospores	255	3320	33	183	2380	36			
Bipolaris/Drechslera				2	26	<1			
Chaetomium									
Cladosporium	378	4910	49	165	2150	33			
Curvularia	9	117	1	6	78	1			
Epicoccum									
Cercospora	2	26	<1	5	65	<1			
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	48	624	6	63	819	13			
Polythrincium									
Rusts				1	13	<1			
Smuts/Periconia/Myxomy	12	156	2	20	260	4			
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula				3	39	<1			
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)3	3			3					
Sample Volume(liters)	75			75					
TOTAL SPORES/M^3	763	**9920**		503	**6550**				

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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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 #: 171108015	Lab ID: 050 - 054

Company Information		Client Information		Environmental Conditions	
(Project Manager) **Ben Hestir**		Date Sampled:	11/6/2017	Precipitation in last 16hrs:	None
(Company Name) **Terracon**		Project Name:	Sirrine Hall Room 349A	Relative Humidity I/O:	67% / 71%
(Address) **72 Pointe Circle**		Project Address:	86127158 - Task 119	Temperature I/O:	69 deg / 75 deg
(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
349A-1	On desk of Carter McElveen- Room 349A	A	1		75	
349A-2	In corner of Room 349A next to fan coil unit	A	1		75	
349A-3	In waiting area - Room 349	A	1		75	
349A-4	Outside NE entrance to Sirrine Hall	A	1		75	
349A-5	Outside NW corner of Riggs Hall	A	1		75	

Relinquished By:	Date/Time
Ben Hestir/Terracon	9:00 am 11/8/17

Recieved By:	Date/Time
[signature]	11-8-17

* Area is only required for culturable surface samples.

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