February 15, 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 362
Clemson, South Carolina
Terracon Project No. 86127158 – Task 79

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation in Sirrine Hall, Room 362 on the Clemson University campus in Clemson, South Carolina after concerns regarding mold were made by building staff. 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 362 at Sirrine Hall. Room 362 is a vacant laboratory space consisting of two lab benches, associated cabinetry, a laboratory hood, an eye-wash, three free standing metal cabinets labeled as containers for flammable and corrosive chemicals and a hardwood floor. The building was originally constructed in 1938 and renovated in 1978.

Terracon conducted a cursory visual assessment of the laboratory room, made measurements of temperature and relative humidity and conducted airborne mold sampling which consisted of collecting spore trap air samples in two locations inside the laboratory, 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

Visual Assessment

The visual assessment was conducted to determine whether there was visual evidence that building materials were impacted by moisture intrusion or condensate formation, and to identify the presence of visible fungal growth. The assessment focused primarily on collecting observational data (i.e., information obtained by physical assessment of the building and interviews with the building management and maintenance staff). The visual assessment can help to formulate plans for more in-depth investigation.

The visual assessment included:

- the identification of any discoloration or odor that could indicate moisture intrusion, water damage, and/or fungal growth.

Mold Sampling

Mold spore trap samples were collected using Allergenco-D 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 air sample collection, the samples were hand delivered to Southeast Environmental Microbiology Laboratories, Inc. (SEEML), Greenville, SC. 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 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 humidity falling between 30% and 50% for both winter and summer temperatures.

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

FINDINGS

Visual Assessment

The lab in 362 Sirrine was vacant at the time of the inspection. The room had stains on painted wall surfaces throughout the room that were indicative of former surficial mold growth, but the surfaces appeared to have been cleaned, leaving staining behind. Many of the drop ceiling tiles in the room appeared to have been replaced.

Mold Air Sampling

On the afternoon of February 3, 2017, Terracon collected two mold spore trap samples inside the laboratory at 362 Sirrine Hall 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 – February 3, 2017

Sample #	362 Sirrine-1	362 Sirrine-2	362 Sirrine-3	362 Sirrine-4
Location Description	**South end of lab**	**NE corner of lab**	**Outside north entrance on bench**	**Outside in Sirrine roundabout on bench**
Spore Type	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**
Ascospores	---	---	117	39
Basidiospores	78	78	2,730	5,690
Cladosporium	13	39	1,290	702
Penicillium/ Aspergillus	195	429	351	312
Smuts/*Periconia*/ Myxomycetes	---	---	52	---
Spegazzinia	---	---	---	13
Total	**286**	**546**	**4,540**	**6,760**

The highest indoor total spore count was approximately 12% of the lowest total spore count outside. The dominant mold indoors was *Aspergillus/Penicillium* and Basideospores. The dominant mold types outdoors were *Cladosporium* and Basidiospores. The weather on the day we sampled was warm (57ºF) and overcast with a light breeze (winds less than 10 mph).

The laboratory analytical report is attached. Photographs from the sampling event are attached.

Temperature and Relative Humidity

The indoor temperature was 70ºF and the relative humidity was 38%. The outdoor temperature was 57ºF and the relative humidity was 45%.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are provided based on our assessment:

- Total spore counts inside were lower than outdoor air.
- *Aspergillus/Penicillium* was identified at higher spore counts inside versus outside. This may be remnant spores from the cleaning efforts.
- Temperature and relative humidity were within ASHRAE and EPA recommended guidelines.
- The laboratory (Room 362) appeared to be in generally good condition with staining on the walls potentially indicating previous surficial mold growth on the painted walls which was subsequently cleaned. It is recommended to prime the walls with an antifungal/stain blocker such as Kilz (or equivalent) and then re-paint.
- Maintain the relative humidity in the room below 50% to prevent future surficial mold growth.

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

Jeffery A. Gurrie
Senior Industrial Hygienist

Attachments: Photographs
Laboratory Results

Photographs



Photo #1 View of lab bench on east side of 362 Sirrine laboratory facing east



Photo #2 View of bench and fume hood on east side of 362 Sirrine laboratory facing southeast



Photo #3 View facing south from entrance – 362 Sirrine



Photo #4 View of west lab bench – 362 Sirrine Hall



Photo #5 View of entrance and eyewash on north end of 362 Sirrine



Photo #6 View of corrosive and flammable chemical cabinets in 362 Sirrine Hall



Photo #7 View of staining on wall – this condition is present on a significant majority of the painted walls



Photo #8 More wall stains – suspected previous surficial mold growth which has been cleaned



Photo #9 Location of air sample 362-2 on NE corner of room – 362 Sirrine



Photo #10 Location of outdoor air sample 362-3



Photo #11 Location of outdoor air sample 362-4



Photo #12 North central entrance to Sirrine hall facing southwest

Laboratory Results

SEEML Reference Number:
170206078

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: 02/06/17

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: 02/03/17
Terracon	Date Received: 02/06/17
72 Pointe Circle	Date Analyzed: 02/06/17
Greenville, SC 29615	Date Reported: 02/06/17
	Date Revised:
	Project Name: Clemson University
	Project Address: 86127158
	Project City, State, ZIP: Task 79
	SEEML Reference # : 170206078

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

Client Sample ID	362 Sirrine- 1			362 Sirrine- 2			362 Sirrine- 3		
Location	South end of Lab			NE Corner of Lab			Outside North Entrance- Bench		
Lab Sample ID	170206078-233			170206078-234			170206078-235		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments							4	52	
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							9	117	3
Basidiospores	6	78	27	6	78	14	210	2730	60
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	13	5	3	39	7	99	1290	28
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	15	195	68	33	429	79	27	351	8
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy							4	52	1
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)3	1			2			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	22	**286**		42	**546**		349	**4540**	

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: 02/03/17
Terracon	Date Received: 02/06/17
72 Pointe Circle	Date Analyzed: 02/06/17
Greenville, SC 29615	Date Reported: 02/06/17
	Date Revised:
	Project Name: Clemson University
	Project Address: 86127158
	Project City, State, ZIP: Task 79
	SEEML Reference # : 170206078

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

Client Sample ID	362 Sirrine- 4								
Location	In Sirrine Roundabout- Bench								
Lab Sample ID	170206078-236								
Detection Limit (spores/m^3)	13								
Hyphal Fragments	3	39							
Pollen	24	312							
Spore Trap Used	Allergenco								
	raw ct.	spores/m^3	%						
Alternaria									
Ascospores	3	39	<1						
Basidiospores	438	5690	84						
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	54	702	10						
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	24	312	5						
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia	1	13	<1						
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)3	3								
Sample Volume(liters)	75								
TOTAL SPORES/M^3	520	**6760**							

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 #: 170306078	Lab ID: 233 - 236

Company Information		Client Information		Environmental Conditions	
(Project Manager)	Ben Hestir	Date Sampled:	2/3/17	Precipitation in last 16hrs:	
(Company Name)	Terracon	Project Name:	Clemson University	Relative Humidity I/O:	45% / 37%
(Address)	72 Pointe Circle	Project Address:	86127158	Temperature I/O:	70° / 57°
(City, State, Zip)	Greenville, SC 29615	City, State, Zip:	Task 79	Wind Conditions	light breeze
(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
362 Sirrine-1	South end of lab	A	1		75	
362 Sirrine-2	NE corner of lab	"	"		"	
362 Sirrine-3	Outside north entrance - bench	"	"		"	
362 Sirrine-4	In Sirrine roundabout - bench	"	"		"	

Relinquished By:	Date/Time	Recieved By:	Date/Time
Ben Hestir	2/6/17 0930		2-6-17

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