March 9, 2018

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 - Tillman and Holtzendorff Halls Offices
Clemson, South Carolina
Terracon Project No. 86127158 – Tasks 128 and 129

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation in several offices used by staff members of the College of Education in both Tillman and Holtzendorff Halls, located on the main campus at Clemson University in Clemson, South Carolina. Reportedly, multiple employees have reported respiratory irritation that they suspect may be related to mold. 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 multiple offices on February 16, 2018. The buildings were originally constructed in 1892 (Tillman) and 1916 (Holtzendorff).

On our February 16th visit, Terracon made measurements of temperature and relative humidity and conducted airborne mold sampling which consisted of collecting spore trap air samples in eight locations inside the offices 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

- No evidence of water leaks or mold growth were observed in the offices.
- Photographs from the assessment are attached.

Mold Air Sampling

On the afternoon of February 16, 2018, Terracon collected eight mold spore trap samples indoors (two in Holtzendorff and six in Tillman) 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 and IAQ Readings – February 16, 2018

Sample ID	Location Description	Total Spores/m^3	Dominant Mold Genera	Temperature (Fahrenheit)	Relative Humidity (%)
228-1	Desk of Shanna Hirsch (Holtzendorff)	221	Basidiospores and Penicillium/Aspergillus	72.6	54.9
228-2	S side of Room 228 (Holtzendorff)	312	Basidiospores and Cladosporium	71.6	56.5
210-1	Desk of Pam Havice	234	Basidiospores and Penicillium/Aspergillus	74.1	51.3

Sample ID	Location Description	Total Spores/m³	Dominant Mold Genera	Temperature (Fahrenheit)	Relative Humidity (%)
211B-1	Desk of Tony Cawthon	169	Ascospores, Basidiospores and Penicillium/Aspergillus	71.4	54.3
213-1	N side of Digital Media Lab	507	Ascospores, Basidiospores and Cladosporium	75.0	54.2
213-2	S side of Digital Media Lab	312	Basidiospores and Cladosporium	75.2	51.8
214-1	Desk of Michelle Boettcher	221	Basidiospores and Penicillium/Aspergillus	75.9	51.0
403-1	Desk of Bill Havice	156	Basidiospores and Cladosporium	71.9	58.5
Outside-1	On bench S of Tillman Hall	2,470	Basidiospores and Cladosporium	78.2	49.0
Outside-2	NE corner of Tillman Hall	2,410	Basidiospores and Cladosporium	---	---

The highest outdoor total spore count was approximately 4.8 times higher than the highest total spore count inside. The predominant mold spore types indoors were *Basidiospores, Aspergillis/Penicillium and Cladosporium.* The predominant mold spore types outdoors were *Basidiospores* and *Cladosporium*. In general, molds spores detected in the indoor environment were also detected in the outdoor samples at equivalent or higher concentrations. The weather on the day we sampled was warm (78ºF) with a slight breeze. The laboratory analytical report is attached.

The indoor average temperature was 74ºF and the average relative humidity was 51%. The outdoor temperature was 78ºF and the relative humidity was 49%.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions are provided based on our assessment:

- There was no visual evidence of mold growth or water leaks in the offices.
- 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 outdoor samples. In general, the spore types detected inside were also detected outside at equivalent or higher concentrations. This may be considered favorable.
- Temperature levels were within ASHRAE guideline ranges. Relative humidity levels measured were within EPA guideline ranges.

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 desk of Shanna Hirsch in 228 Holtzendorff – location of air sample 228-1



Photo #2 View of desk of Pam Havice in 210 Tillman – location of air sample 210-1

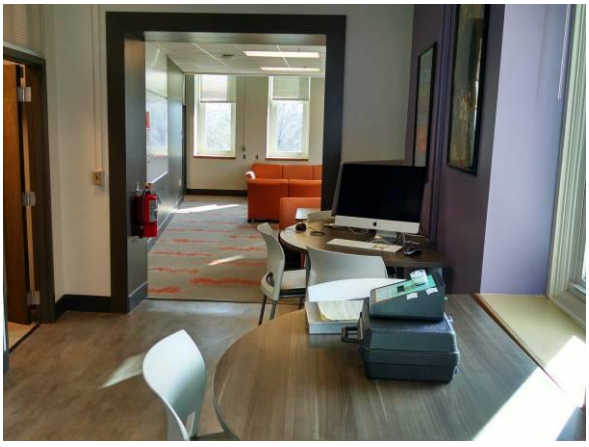


Photo #3 View of Digital Media Lab looking south and location of air sample 213-1



Photo #4 View of desk of Michelle Boettcher and location of air sample 214-1



Photo #5 View of S side of Tillman Hall looking north and location of air sample Outside-1



Photo #6 Air sample location on NE corner of Tillman Hall – sample Outside-2

Laboratory Results

SEEML Reference Number:
180219012

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
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:

- ☐ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: Rafael Berrios Date: 02/19/18

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

	Date Sampled: 02/16/18
Terracon	Date Received: 02/19/18
72 Pointe Circle	Date Analyzed: 02/19/18
Greenville, SC 29615	Date Reported: 02/19/18
	Date Revised:
	Project Name: Tillman / Holtzendorff
	Project Address: 86127158-Tasks 128 And 129
	Project City, State, ZIP:
	SEEML Reference # : 180219012

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

Client Sample ID	228-1			228-2			210-1		
Location	Desk OfShanna Hirsch			S Side Of Room 228			Desk Of Pam Havice		
Lab Sample ID	180219012-032			180219012-033			180219012-034		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments				1	13		2	26	
Pollen				1	13		3	39	
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	1	13	6						
Basidiospores	3	39	18	15	195	63	6	78	33
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	13	6	6	78	25	3	39	17
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	12	156	71	3	39	13	9	117	50
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
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	17	**221**		24	**312**		18	**234**	

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

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233-6589
AIHA-LAP, LLC EMLAP # 173667

Spore Trap Report

	Date Sampled: 02/16/18
Terracon	Date Received: 02/19/18
72 Pointe Circle	Date Analyzed: 02/19/18
Greenville, SC 29615	Date Reported: 02/19/18
	Date Revised:
	Project Name: Tillman / Holtzendorff
	Project Address: 86127158-Tasks 128 And 129
	Project City, State, ZIP:
	SEEML Reference # : 180219012

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

Client Sample ID	211B-1			213-1			213-2		
Location	Desk Of Tony Cawthon			N Side Of Digital Media Lab			S Side Of Digital Media Lab		
Lab Sample ID	180219012-035			180219012-036			180219012-037		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments									
Pollen									
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	5	65	38	6	78	15			
Basidiospores	3	39	23	6	78	15	12	156	50
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	13	8	24	312	62	6	78	25
Curvularia	1	13	8						
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	3	39	23	3	39	8	6	78	25
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy									
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	13	**169**		39	**507**		24	**312**	

Comments: Condition of the sample(s) upon receipt: Acceptable.

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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

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AIHA-LAP, LLC EMLAP # 173667

Spore Trap Report

	Date Sampled: 02/16/18
Terracon	Date Received: 02/19/18
72 Pointe Circle	Date Analyzed: 02/19/18
Greenville, SC 29615	Date Reported: 02/19/18
	Date Revised:
	Project Name: Tillman / Holtzendorff
	Project Address: 86127158-Tasks 128 And 129
	Project City, State, ZIP:
	SEEML Reference # : 180219012

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

Client Sample ID	214-1			403-1			Outside -1		
Location	Desk Of Michelle Boettcher			Desk Of Bill Havice			Outside S Of Tillman Hall		
Lab Sample ID	180219012-038			180219012-039			180219012-040		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments									
Pollen									
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	1	13	6				15	195	8
Basidiospores	3	39	18	6	78	50	69	897	36
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	13	6	3	39	25	81	1050	43
Curvularia									
Epicoccum							3	39	2
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	12	156	71	3	39	25	18	234	9
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy							4	52	2
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	17	**221**		12	**156**		190	**2470**	

Comments: Condition of the sample(s) upon receipt: Acceptable.

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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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AIHA-LAP, LLC EMLAP # 173667

Spore Trap Report

	Date Sampled: 02/16/18
Terracon	Date Received: 02/19/18
72 Pointe Circle	Date Analyzed: 02/19/18
Greenville, SC 29615	Date Reported: 02/19/18
	Date Revised:
	Project Name: Tillman / Holtzendorff
	Project Address: 86127158-Tasks 128 And 129
	Project City, State, ZIP:
	SEEML Reference # : 180219012

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

Client Sample ID	Outside -2								
Location	Outside NE Of Tillman Hall								
Lab Sample ID	180219012-041								
Detection Limit (spores/m^3)	13								
Hyphal Fragments	3	39							
Pollen	4	52							
Spore Trap Used	AOC								
	raw ct.	spores/m^3	%						
Alternaria									
Ascospores	30	390	16						
Basidiospores	96	1250	52						
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	51	663	28						
Curvularia									
Epicoccum	3	39	2						
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	3	39	2						
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	2	26	1						
Spegazzinia									
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	185	**2410**							

Comments: Condition of the sample(s) upon receipt: Acceptable.

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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

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Southeast Environmental Microbiology Laboratories
Chain of Custody

102 Edinburgh Court, 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 #: 1802 19012	Lab ID: 032 - 041

Company Information	Client Information		Environmental Conditions	
(Project Manager) **Ben Hestir**	Date Sampled:	2/16/2018	Precipitation in last 16hrs:	None
(Company Name) **Terracon**	Project Name:	Tillman/Holtzendorff	Relative Humidity I/O:	54.2% / 49%
(Address) **72 Pointe Circle**	Project Address:	86127158 - Tasks 128 and 129	Temperature I/O:	75.0 deg / 78.2 deg
(City, State, Zip) **Greenville, SC 29615**	City, State, Zip:	Invoice the Tasks separately	Wind Conditions	very gusty 20 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
228-1	Desk of Shanna Hirsch	A	1		75	Charge to Task 129
228-2	S side of Room 228	A	1		75	Charge to Task 129
210-1	Desk of Pam Havice	A	1		75	Charge to Task 128
211B-1	Desk of Tony Cawthon	A	1		75	Charge to Task 128
213-1	N side of Digital Media Lab	A	1		75	Charge to Task 128
213-2	S side of Digital Media Lab	A	1		75	Charge to Task 128
214-1	Desk of Michelle Boettcher	A	1		75	Charge to Task 128
403-1	Desk of Bill Havice	A	1		75	Charge to Task 128
Outside-1	Outside S of Tillman Hall	A	1		75	Charge to Task 128
Outside-2	Outside NE of Tillman Hall	A	1		75	Charge to Task 129

Reliquished By:	Date/Time	Recieved By:	Date/Time
Ben Hestir	2/19/18 0915		2-19-18

* Area is only required for culturable surface samples.

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