August 29, 2016

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
Administrative Services Building
Clemson, South Carolina
Terracon Project No. 86127158 – Task 65

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation in the Administrative Services Building on the Clemson University campus in Clemson, South Carolina. 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 Rooms 136, 137 and 139 and the hallway and cubicles adjacent to those offices within the Administrative Services Building at Clemson University on August 15, 2016. Specifically, our efforts focused on the air quality in the offices currently occupied by Ree Cooley (Room 139), Sherri Rowland (Room 137), Beverly Leeper (Room 136) and an adjacent cubicle occupied by Cathy Freeman. These staff members have expressed concern regarding indoor air quality in this area of the building.

Terracon conducted airborne mold sampling which consisted of collecting spore trap air samples in four locations inside Rooms 139, 137, 136 and adjacent to the cubicle of Cathy Freeman, 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 Air-O-Cell™ 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 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 an HVAC[1]-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 Carbon Dioxide

Indoor air temperature is a physical condition important to the perception of comfort. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) has

[1] heating, ventilating, and air-conditioning

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) are recommended for persons in a conditioned setting wearing light summer clothing. Higher temperatures require lower humidity for comfort.

According to ASHRAE Standard 62.1-2016, Ventilation for Acceptable Indoor Air Quality, the typical CO_2 concentration in the atmosphere is 400 ppm. Studies have shown negative cognitive effects in humans (and complaints by occupants) at levels as low as 1,000 ppm in indoor air.

Readings of temperature and CO_2 levels were collected with a Telaire Model 7001 IAQ instrument, which was calibrated by the manufacturer.

FINDINGS

Mold Air Sampling

On the afternoon of August 15, 2016 Terracon collected four mold spore trap samples in the Administrative Services Building 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 – August 15, 2016

Sample #	ASB-1	ASB -2	ASB -3	ASB -4	ASB -5	ASB -6
Location Description	**Room 139**	**Room 137**	**Room 136**	**Outside cubicle of Cathy Freeman**	**Outside on mailbox**	**Outside in break area on picnic table**
Spore Type	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**
Alternaria	---	---	---	---	52	130
Ascospores	---	---	---	---	819	273
Basidiospores	156	39	39	156	7,070	4,060
Bipolaris/Drechslera	---	---	---	---	156	26
Cladosporium	39	130	26	26	1,640	2,570
Curvularia	26	13	---	---	117	169
Aspergillus / Penicillium	---	117	---	---	507	2,260
Smuts/*Periconia*/ Myxomycetes	---	169	---	---	91	195
Tetraploa	---	13	---	---	13	---
Pithomyces	13	13	---	---	39	13
Total	**234**	**494**	**65**	**182**	**10,500**	**9,700**

The highest indoor total spore count was approximately 5% of the lowest total spore count outside. The dominant mold types indoors and outdoors were Basidiospores and *Cladosporium*. The weather on the day we sampled was clear and sunny with a light breeze (winds less than 10 mph).

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

Temperature and Carbon Dioxide

The indoor temperature in the area sampled ranged from 73ºF - 75ºF and the CO_2 levels ranged from 729 – 790 ppm. The outdoor temperature was 86ºF and the CO_2 level was 422 ppm.

Indoor temperatures were below ASHRAE guidelines and CO_2 levels are not considered elevated (less than 1,000 ppm), indicating that appropriate outside air volumes are being introduced by the HVAC system into the building.

CONCLUSIONS AND RECOMMENDATIONS

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

- Total spore counts inside were lower than outdoor air and the types of the molds detected were similar inside and out.
- Temperature and CO_2 were within acceptable 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

Cindy A. Baldwin, CIH, FAIHA
Senior Industrial Hygienist

Attachments: Photographs
Laboratory Results

Photographs



Photo #1 Office sign at Administrative Services Building in area of investigation

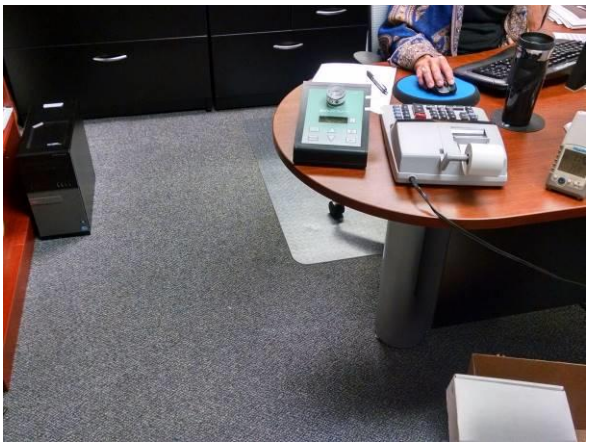


Photo #2 Sample location for sample ASB-1 in Room 139

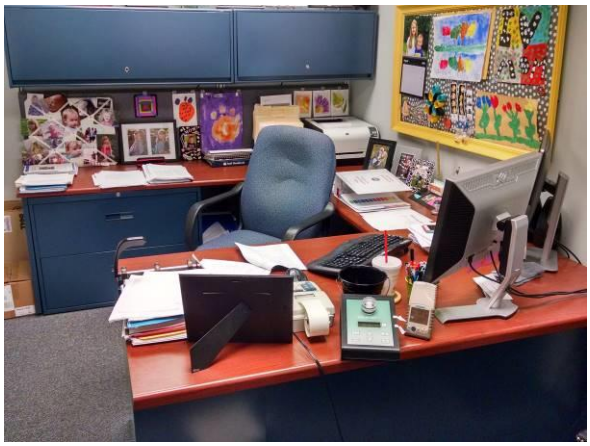


Photo #3 Sample location for sample ASB-2 in Room 137



Photo #4 Picture of hallway that was the target of this investigation



Photo #5 Sample location for sample ASB-5 outside on mailbox

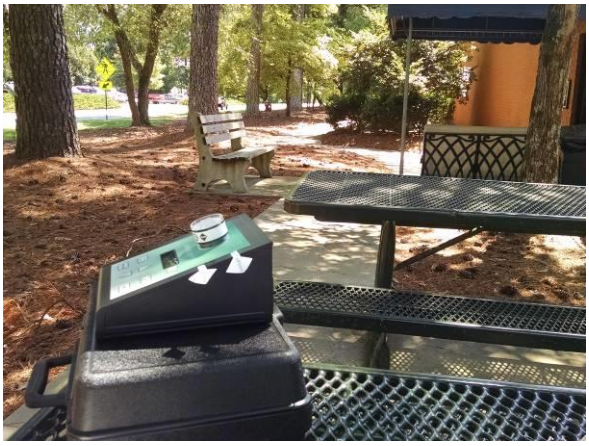


Photo #6 Sample location for sample ASB-6 outside on picnic table in break area

Laboratory Results

SEEML Reference Number:
160816066

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: 08/16/16

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: 08/15/16
Terracon	Date Received: 08/16/16
72 Pointe Circle	Date Analyzed: 08/16/16
Greenville, SC 29615	Date Reported: 08/16/16
	Date Revised:
	Project Name: Clemson ASB
	Project Address: 86127158-Task 65
	Project City, State, ZIP:
	SEEML Reference # : 160816066

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

Client Sample ID	ASB-1			ASB-2			ASB-3		
Location	Rm. 139- Office of Ree Looley			Rm. 137-Office of Sherri Rowland			Rm. 136- Office of Beverly Leeper		
Lab Sample ID	160816066-193			160816066-194			160816066-195		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments	3	39		5	65		2	26	
Pollen				2	26				
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores									
Basidiospores	12	156	67	3	39	8	3	39	60
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	3	39	17	10	130	26	2	26	40
Curvularia	2	26	11	1	13	3			
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus				9	117	24			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy				13	169	34			
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa				1	13	3			
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces	1	13	6	1	13	3			
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	18	**234**		38	**494**		5	**65**	

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: 08/15/16
Terracon	Date Received: 08/16/16
72 Pointe Circle	Date Analyzed: 08/16/16
Greenville, SC 29615	Date Reported: 08/16/16
	Date Revised:
	Project Name: Clemson ASB
	Project Address: 86127158-Task 65
	Project City, State, ZIP:
	SEEML Reference # : 160816066

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

Client Sample ID	ASB-4			ASB-5			ASB-6		
Location	Outside Cubicle of Cathy Freeman			Outside- Top of P.O. Box			Outside- Break Area		
Lab Sample ID	160816066-196			160816066-197			160816066-198		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments				5	65		6	78	
Pollen				1	13				
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria				4	52	<1	10	130	1
Ascospores				63	819	8	21	273	3
Basidiospores	12	156	86	544	7070	67	312	4060	42
Bipolaris/Drechslera				12	156	1	2	26	<1
Chaetomium									
Cladosporium	2	26	14	126	1640	16	198	2570	26
Curvularia				9	117	1	13	169	2
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus				39	507	5	174	2260	23
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy				7	91	<1	15	195	2
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa				1	13	<1			
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces				3	39	<1	1	13	<1
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	14	**182**		808	**10500**		746	**9700**	

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

Southeast Environmental Microbiology Laboratories

Chain of Custody

506 Laurens Rd, Greenville, SC 29607

Phone : 864-233-3770, Fax: 864-233-3779, www.seeml.com, AIHA-LAP, LLC. (EMLAP) #173667

For Lab Use Only			
Condition of samples is acceptable	☑ YES ☐ NO	SEEML Ref #: 1608116066	Lab ID: 193 - 198

Company Information		Client Information		Environmental Conditions	
(Project Manager)	Ben Hestir	Date Sampled:	8/15/16	Precipitation in last 16hrs:	
(Company Name)	Terracon	Project Name:	Clemson ASB	Relative Humidity I/O:	/
(Address)	72 Pointe Circle	Project Address:	86127158 - Task 66	Temperature I/O:	75.2 / 86.4
(City, State, Zip)	Greenville, SC 29615	City, State, Zip:		Wind Conditions	
(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
ASB-1	Rm 139 - Office of Ree Cooley	AOC	1		75	
ASB-2	Rm 137 - Office of Sherri Rowland	"	"		"	
ASB-3	Rm 136 - Office of Beverly Leeper	"	"		"	
ASB-4	Outside cubicle of Cathy Freeman	"	"		"	
ASB-5	Outside - top of P.O. Box	"	"		"	
ASB-6	Outside - break area	"	"		"	

Reliquished By:	Date/Time	Recieved By:	Date/Time
Ben Hestir	8/16/16 10:00		8-16-16

* Area is only required for culturable surface samples.

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