October 20, 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
Calhoun Courts – Unit S11F
Clemson, South Carolina
Terracon Project No. 86127158 – Task 70

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation in Calhoun Courts Unit S11F on the Clemson University campus in Clemson, South Carolina after a complaint by a resident regarding an allergic reaction alleged to be resulting from 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 Unit S11F within Calhoun Courts residential housing at Clemson University on October 18, 2016. Reportedly, there was a cleaning of the HVAC system conducted by University Facilities (or their vendor) just prior to our investigation.

Terracon conducted a physical assessment of the residence, made measurements of temperature and relative humidity and conducted airborne mold sampling which consisted of collecting spore trap air samples in three locations inside the residence, 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

Physical Assessment

The physical assessment was conducted to determine whether 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 physical assessment can help to formulate plans for more in-depth investigation.

The physical assessment included:

- an examination of the physical structure and potential indoor and outdoor sources of moisture intrusion in the area of concern; and,
- the identification of any discoloration or odor that could indicate moisture intrusion, water damage, and/or fungal growth.

Mold Sampling

Total mold spore trap samples were collected using Air-O-Cell™ 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.

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

Physical Assessment

There are 4 undergraduate students living in the 2-bedroom, 1-bathroom residence at the time of our investigation. None of the student residents were in the residence during our investigation and sampling activities. No indication of water infiltration was observed in the residence and no musty odors were detected that might suggest an indoor mold problem. However, small (less than 10 square feet) amounts of suspected fungal growth were observed on the HVAC supply duct in the 2nd bedroom in the residence.

Mold Air Sampling

On the afternoon of October 18, 2016, Terracon collected three mold spore trap samples inside the residence at Calhoun Courts S11F 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 – October 18, 2016

Sample #	S11F-1	S11F-2	S11F-3	S11F-4	S11F-5
Location Description	**Living Room**	**1st bedroom**	**2nd bedroom**	**Outside on entry steps**	**Outside in adjacent parking**
Spore Type	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**
Ascospores	26	13	---	91	13
Basidiospores	117	78	---	663	1,760
Bipolaris/Dreschlera	13	13	13	13	---
Chaetomium	13	---	---	---	---
Cladosporium	78	234	117	2,930	390
Curvularia	52	13	---	13	26
Cercospora	---	13	---	39	78
Epicoccum	---	---	---	---	---
Nigrospora	13	---	---	---	---
Penicillium/ Aspergillus	273	156	507	39	39
Pithomyces	---	---	---	---	---
Smuts/*Periconia*/ Myxomycetes	---	---	---	13	---
Total	**585**	**520**	**637**	**3,800**	**2,310**

The highest indoor total spore count was approximately 28% of the lowest total spore count outside. The dominant mold indoors was *Aspergillus/Penicillium* and *Cladosporium*. The dominant mold types outdoors were *Cladosporium* and Basidiospores. The weather on the day we sampled was warm (82ºF) and sunny 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 73ºF and the relative humidity was 53%. The outdoor temperature was 82ºF and the relative humidity was 53%.

CONCLUSIONS

The following conclusions 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.
- Temperature and relative humidity were within ASHRAE and EPA recommended guidelines.
- The residence (Unit S11F) appeared to be in generally good condition with no obvious dust accumulations or moisture infiltration issues.
- Small areas (less than 10 square feet) of apparent fungal growth were observed on some of the HVAC supply registers in the residence. The registers and the materials in contact with them should be inspected and either cleaned or replaced where fungal growth is present depending on the porosity of the material.

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

Brian J. DuChene, RPIH
Principal

Attachments: Photographs
Laboratory Results

Photographs



Photo #1 Apparent fungal growth on HVAC supply register in 2nd bedroom



Photo #2 View of location of air sample S11F-1 in living room



Photo #3 View of location of air sample S11F-2 in bedroom #1 (note aquarium in background)

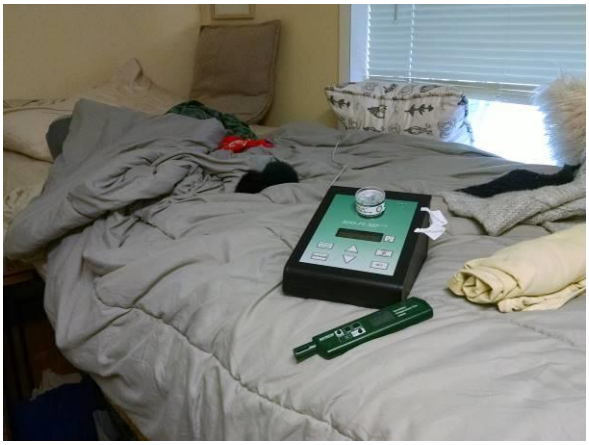


Photo #4 View of location of air sample S11F-3 in bedroom #2

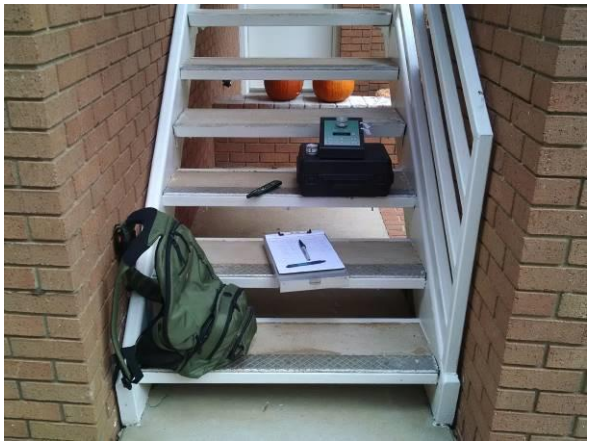


Photo #5 View of location of air sample S11F-4 outside on entry steps



Photo #6 View of location of air sample S11F-5 in adjacent parking

Laboratory Results

SEEML Reference Number:
161019013

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
- ☐ Andersen Fungal Report
- ☐ Quantitative Direct Exam Report
- ☐ Quantitative Fungal Report

Lab Manager Review: Rafael Berrios Date: 10/19/16

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:
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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

Attention: Ben Hestir	Date Sampled: 10/18/16
Terracon	Date Received: 10/19/16
72 Pointe Circle	Date Analyzed: 10/19/16
Greenville, SC 29615	Date Reported: 10/19/16
	Date Revised:
	Project Name: Calhoun Cts S11F
	Project Address: 86127158 Task 70
	Project City, State, ZIP:
	SEEML Reference # : 1610190136

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

Client Sample ID	S11F-1			S11F-2			S11F-3		
Location	Living Room			1st Bedroom			2nd Bedroom		
Lab Sample ID	161019013-063			161019013-064			161019013-065		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments	1	13							
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	2	26	4	1	13	3			
Basidiospores	9	117	20	6	78	15			
Bipolaris/Drechslera	1	13	2	1	13	3	1	13	2
Chaetomium	1	13	2						
Cladosporium	6	78	13	18	234	45	9	117	18
Curvularia	4	52	9	1	13	3			
Epicoccum									
Cercospora				1	13	3			
Fusarium									
Memnoniella									
Nigrospora	1	13	2						
Penicillium/Aspergillus	21	273	47	12	156	30	39	507	80
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	45	**585**		40	**520**		49	**637**	

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: 10/18/16
Terracon	Date Received: 10/19/16
72 Pointe Circle	Date Analyzed: 10/19/16
Greenville, SC 29615	Date Reported: 10/19/16
	Date Revised:
	Project Name: Calhoun Cts S11F
	Project Address: 86127158 Task 70
	Project City, State, ZIP:
	SEEML Reference # : 1610190136

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

Client Sample ID	S11F-4			S11F-5					
Location	Outside - Steps			Outside - Parking					
Lab Sample ID	161019013-066			161019013-067					
Detection Limit (spores/m^3)	13			13					
Hyphal Fragments	1	13		6	78				
Pollen	1	13							
Spore Trap Used	AOC			AOC					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria									
Ascospores	7	91	2	1	13	<1			
Basidiospores	51	663	17	135	1760	76			
Bipolaris/Drechslera	1	13	<1						
Chaetomium									
Cladosporium	225	2930	77	30	390	17			
Curvularia	1	13	<1	2	26	1			
Epicoccum									
Cercospora	3	39	1	6	78	3			
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	3	39	1	3	39	2			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	13	<1						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)3	3			3					
Sample Volume(liters)	75			75					
TOTAL SPORES/M^3	292	**3800**		177	**2310**				

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
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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 #: 16101913	Lab ID: 063-067

Company Information		Client Information		Environmental Conditions	
(Project Manager)	Ben Hestir	Date Sampled:	10/18/16	Precipitation in last 16hrs:	None
(Company Name)	Terracon	Project Name:	Calhoun Cts S11F	Relative Humidity I/O:	48%/ 53%
(Address)	72 Pointe Circle	Project Address:	86127158 Task 6970	Temperature I/O:	76°F / 82°F
(City, State, Zip)	Greenville SC 29615	City, State, Zip:		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
S11F-1	Living room	AOC	1		75	
S11F-2	1st bedroom	"	"		"	
S11F-3	2nd bed room	"	"		"	
S11F-4	Outside - steps	"	"		"	
S11F-5	Outside - parking	"	"		"	

Relinquished By:	Date/Time	Recieved By:	Date/Time
Ben Hestir	10/19/16 0948	BR	10/19/16

* Area is only required for culturable surface samples.

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