August 1, 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
104A Eaton Circle
Thornhill Village
Clemson, South Carolina
Terracon Project No. 86127158 – Task 64

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold air sampling event in a 2-bedroom student housing unit located at 104A Eaton Circle in the Thornhill Village residential community at Clemson University 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 performed limited indoor air quality (IAQ) testing in the vacant residential unit on July 20, 2016. Specifically, our efforts focused on identifying levels of mold spores in the residence and measuring temperature and relative humidity. Reportedly the residence had been treated with an anti-fungal spray using a new application technology prior to our air sampling efforts.

Thornhill Village was originally constructed in the early 1960's as undergraduate residential housing. The buildings within Thornhill are duplexes and 104A Eaton Circle is a 2-bedroom, 1-bathroom unit which includes a living room, storage closet and kitchen. Terracon conducted airborne mold sampling which consisted of collecting air samples in four locations inside the residence and two additional samples outside for comparison. Temperature and relative humidity measurements were also collected.

Standard of Care

This sampling 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/bacterial concentrations or local sources of volatile chemicals, 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.

Mold Sampling

Total (non-culturable) fungal 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), accredited by the American Industrial Hygiene Association (AIHA®) Laboratory Accreditation Programs, LLC under the Environmental Microbiology Laboratory Accreditation Program (EMLAP), Accreditation #173667. Air samples were analyzed by direct microscopic examination and 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-supplied building are typically less than, but qualitatively similar to, fungal spore concentrations found in the outside environment.

There are no state or federal exposure limits established for fungal aerosols. There are currently no regulatory standards or medically based threshold limit or dose-response relationships 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 55-2004, 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

Mold Air Sampling

On the afternoon of Wednesday, July 20, 2016, Terracon collected four (4) mold spore trap samples in residential unit 104A Eaton Circle and two (2) outdoor samples for comparison. Samples were collected in the living room, the kitchen, each of the two bedrooms, outside on the back porch and outside on the front steps. Evidence of current water intrusion was not observed during a cursory visual inspection. Sample locations and total spore count samples analyses are summarized in Table 1 below.

Table 1: Summary of Total Spore Count Analyses – July 20, 2016

Sample #	104A-1	104A-2	104A-3	104A-4	104A-5	104A-6
Location Description	Living room	Kitchen	Right Bedroom	Left Bedroom	Outside back door on porch	Outside front door on steps
Spore Type	Spores/m³	Spores/m³	Spores/m³	Spores/m³	Spores/m³	Spores/m³
Ascospores	13	---	---	---	390	481
Basidiospores	117	39	117	39	2,150	3,080
Cladosporium	156	13	78	39	234	728
Curvalaria	---	---	---	---	91	---
Epiccocum	26	---	13	---	13	---
Aspergillus / Penicillium	195	429	156	390	---	---
Smuts/Periconia/ Myoxmycetes	39	---	---	13	130	39
Spegazzinia	---	---	13	---	---	---
Torula	---	---	---	---	13	---
Pithomyces	13	---	---	---	---	---
Total	**559**	**481**	**377**	**481**	**3,020**	**4,330**

The highest total spore count inside was approximately 19% of the lowest outside total spore count. The dominant indoor genus was *Penicillium/Aspergillis sp.* The dominant genus outdoors was *Basidiospores sp.* The laboratory analytical report is attached.

Temperature and Relative Humidity

The indoor temperature in unit 104-A Eaton Circle was 73º F and the relative humidity was 43%. The outdoor temperature was 98º F and the relative humidity was 36% on a sunny, hot day.

Indoor temperatures and humidity levels were within recommended ASHRAE comfort ranges.

CONCLUSIONS

The following conclusions are provided based on our assessment:

- Indoor fungal spore counts were not elevated as compared to outside air. However, the dominant fungal genus identified from the indoor sampling was not consistent with those identified in the outdoor samples.
- Temperature readings (73º F) and relative humidity measurements (43%) were within acceptable ranges (30% - 60%) for residential spaces at this time of year.
- No apparent water intrusion or visible mold growth was observed in the residence.

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: Laboratory Results

Photo Log

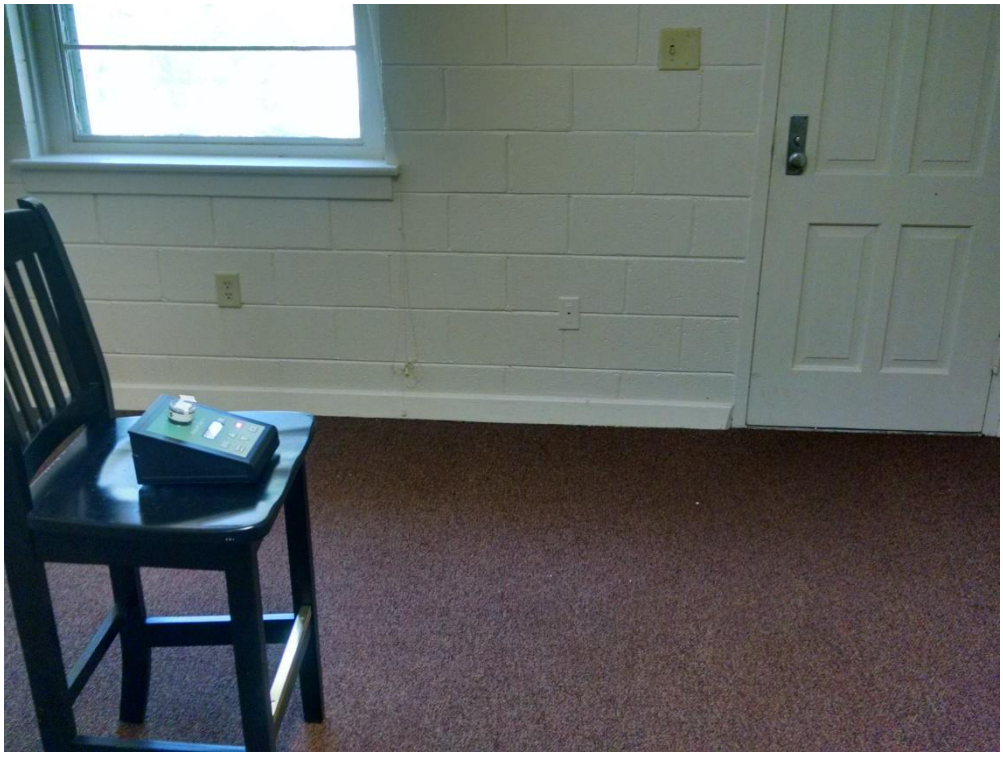


Photo 1 View of living room air sample (104A-1) location in Unit 104A Eaton Circle – Thornhill Village, Clemson, South Carolina. Samples collected July 20, 2016



Photo 2 View of kitchen air sample (104A-2) location in Unit 104A Eaton Circle – Thornhill Village, Clemson, South Carolina. Samples collected July 20, 2016



Photo 3 View of back porch air sample (104A-5) location in Unit 104A Eaton Circle – Thornhill Village, Clemson, South Carolina. Samples collected July 20, 2016



Photo 4 View of front steps air sample (104A-6) location in Unit 104A Eaton Circle – Thornhill Village, Clemson, South Carolina. Samples collected July 20, 2016

Laboratory Results

SEEML Reference Number:
160721061

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: 07/21/16

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: 07/20/16
Terracon	Date Received: 07/21/16
72 Pointe Circle	Date Analyzed: 07/21/16
Greenville, SC 29615	Date Reported: 07/21/16
	Date Revised:
	Project Name: Clemson- 104A Eaton Circle
	Project Address: 86127158- Task 64
	Project City, State, ZIP: Clemson, SC 29631
	SEEML Reference # : 160721061

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

Client Sample ID	104A-1			104A-2			104A-3		
Location	Living Room			Kitchen			Right Bedroom		
Lab Sample ID	160721061-182			160721061-183			160721061-184		
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	2						
Basidiospores	9	117	21	3	39	8	9	117	31
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	12	156	28	1	13	3	6	78	21
Curvularia									
Epicoccum	2	26	5				1	13	3
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	15	195	35	33	429	89	12	156	41
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	3	39	7						
Spegazzinia							1	13	3
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces	1	13	2						
Background debris (1-5)3	3			2			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	43	**559**		37	**481**		29	**377**	

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: 07/20/16
Terracon	Date Received: 07/21/16
72 Pointe Circle	Date Analyzed: 07/21/16
Greenville, SC 29615	Date Reported: 07/21/16
	Date Revised:
	Project Name: Clemson- 104A Eaton Circle
	Project Address: 86127158- Task 64
	Project City, State, ZIP: Clemson, SC 29631
	SEEML Reference # : 160721061

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

Client Sample ID	104A-4			104A-5			104A-6		
Location	Left Bedroom			Outside Back Porch			Outside Front Porch		
Lab Sample ID	160721061-185			160721061-186			160721061-187		
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				30	390	13	37	481	11
Basidiospores	3	39	8	165	2150	71	237	3080	71
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	3	39	8	18	234	8	56	728	17
Curvularia				7	91	3			
Epicoccum				1	13	<1			
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	30	390	81						
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	13	3	10	130	4	3	39	<1
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula				1	13	<1			
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	37	**481**		232	**3020**		333	**4330**	

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 #: 160721061 7-21-16	Lab ID: 182 - 187

Company Information		Client Information		Environmental Conditions	
(Project Manager)	Ben Hestir	Date Sampled:	7/20/16	Precipitation in last 16hrs:	
(Company Name)	Terracon	Project Name:	Clemson - 104A Eaton Circle	Relative Humidity I/O:	/
(Address)	72 Pointe Circle	Project Address:	86127158 - Task 64	Temperature I/O:	72.5° / 93.0°
(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
104A-1	Living Room	AOC	1		75	
104A-2	Kitchen	"	"		"	
104A-3	Right bedroom	"	"		"	
104A-4	Left bedroom	"	"		"	
104A-5	Outside back porch	"	"		"	
104A-6	Outside front steps	"	"		"	

Reliquished By:	Date/Time	Recieved By:	Date/Time
Andy Jonakin	7.21.16/12		7-21-16

* Area is only required for culturable surface samples.

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