November 10, 2017

Clemson University
310 Klugh Avenue
Clemson, South Carolina 29634

Attn: Mr. W. Robert Newberry, IV
E-mail: wnewber@clemson.edu

Re: Limited Mold Post Remediation Testing Report
Smith Hall – Room 2C5
Bryan Circle
Clemson, South Carolina 29634
Terracon Project No. 86127158 – Task 110

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation within Room 2C5, within Smith Hall located on Bryan Circle on the main campus of Clemson University in Clemson, South Carolina. This service was conducted in general accordance with our Master Service Agreement with Clemson University.

PROJECT DESCRIPTION

Background

Room 2C5 is a standard dormitory room with two occupants. The occupants previously expressed concerns regarding mold growth on personal belongings and high humidity conditions in the room. After our first investigation in this room on September 15, 2017, reportedly the HVAC unit was cleaned and the desks were wiped down by University Housing maintenance staff. In addition, JBR Environmental (JBR) was tasked with HEPA vacuuming and a damp wipe down of all horizontal surfaces in the room that could accumulate dust or allergens. That cleaning effort occurred on October 12, 2017.

After the specialized cleaning by JBR, Terracon was requested to conduct follow up air sampling, along with temperature and relative humidity readings.

Scope of Services

At the request of Clemson University Housing, Terracon representative Mr. Benjamin Hestir conducted a limited mold post remedial investigation in Room 2C5 on October 20, 2017. The building was originally constructed in 1972.

The investigation included measurements of temperature and relative humidity, the collection of two (2) spore trap samples inside the dorm room and two (2) spore trap samples outside the building 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 spore trap 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

- The dorm room was cluttered and messy, similar to the last investigation visit.
- The windows in this dormitory room can be opened to outside air.
- Both residents were present and reported constant use and emptying of a dehumidifier unit.

Mold Air Sampling / Temperature-Humidity Results

On the afternoon of October 20, 2017, after cleaning was performed by JBR on October 12th, Terracon collected two air samples (spore traps) in Room 2C5 and two outside the building for comparison. Measurements of temperature and relative humidity were also made. The results of the total spore count samples analyses and the measurements of temperature and relative humidity are presented in Table 1. The laboratory analytical reports are attached.

Table 1: Summary of Total Spore Count Analyses and
Temperature/Relative Humidity Measurements – October 20, 2017

Sample #	**2C5-1**	**2C5-2**	**2C5-3**	**2C5-4**
Location Description	**On desk – left side**	**On desk – right side**	**Outside Smith Hall entrance**	**Outside on Bryan Circle bench**
Spore Type	**Spores/ m^3**	**Spores/m^3**	**Spores/m^3**	**Spores/m^3**
Alternaria	---	---	13	13
Ascospores	39	---	312	468
Basidiospores	702	897	2,420	2,890
Bipolaris/Dreschlera	13	---	---	39
Cladosporium	507	585	1,210	468
Curvularia	26	---	26	---
Epicoccum	13	---	---	13
Nigrospora	---	---	---	---
Penicillium/ Aspergillus	1,760	741	3,040	117
Rusts	---	---	---	---
Torula	---	---	---	---
Smuts/*Periconia*/ Myxomycetes	91	65	195	221
Pithomyces	---	---	13	26
Total	**3,150**	**2,290**	**7,230**	**4,260**
Temperature (degrees Fahrenheit)	68.0	65.4	77.5	---
Relative Humidity (%)	56.0	64.8	36.3	---

Indoor air spore levels were below outdoor levels. The dominant mold genera indoors and outdoors were *Penicillium/Aspergillus and Basidiospores.* Conditions outside on the day we sampled were warm and sunny.

The laboratory analytical report is attached.

CONCLUSIONS

The following conclusions are provided based on our assessment:

- Indoor air spore levels were below outdoor levels, but seemed higher than expected after the specialized cleaning that was conducted.
- Measurements of temperature were within recommended ASHRAE ranges.
- The second reading of relative humidity in Room 2C5 was approximately 65% after the meter had time to equilibrate to room conditions. This is above the EPA recommend range of 30-60%.

RECOMMENDATIONS

The following recommendations are provided based on our assessment:

- The HVAC system should be evaluated to verify that is it effectively reducing humidity levels. Relative humidity levels in a conditioned space should be 30-60%.
- Until repairs can be made, the room should be dehumidified and HEPA filtered with a temporary unit.

Terracon appreciates the opportunity to provide this service to Clemson University. If you have any questions regarding this 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

Laboratory Results

SEEML Reference Number:
171023040

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: 10/23/17

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:
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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

	Date Sampled: 10/20/17
Terracon	Date Received: 10/23/17
72 Pointe Circle	Date Analyzed: 10/23/17
Greenville, SC 29615	Date Reported: 10/23/17
	Date Revised:
	Project Name: Smith Hall Room 2C5
	Project Address: 86127158- Taks 110
	Project City, State, ZIP:
	SEEML Reference # : 171023040

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

Client Sample ID	2C5-1			2C5-2			2C5-3		
Location	Room 2C5- Left Desk			Room 2C5- Right Desk			Outside Front Entrance to Smith Hall		
Lab Sample ID	171023040-121			171023040-122			171023040-123		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments	11	143		5	65		2	26	
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							1	13	<1
Ascospores	3	39	1				24	312	4
Basidiospores	54	702	22	69	897	39	186	2420	33
Bipolaris/Drechslera	1	13	<1						
Chaetomium									
Cladosporium	39	507	16	45	585	26	93	1210	17
Curvularia	2	26	<1				2	26	<1
Epicoccum	1	13	<1						
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	135	1760	56	57	741	32	234	3040	42
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	7	91	3	5	65	3	15	195	3
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces							1	13	<1
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	242	**3150**		176	**2290**		556	**7230**	

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

	Date Sampled: 10/20/17
Terracon	Date Received: 10/23/17
72 Pointe Circle	Date Analyzed: 10/23/17
Greenville, SC 29615	Date Reported: 10/23/17
	Date Revised:
	Project Name: Smith Hall Room 2C5
	Project Address: 86127158- Taks 110
	Project City, State, ZIP:
	SEEML Reference # : 171023040

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

Client Sample ID	2C5-4								
Location	Bench in Parking Area Adjacent to Smith Hall								
Lab Sample ID	171023040-124								
Detection Limit (spores/m^3)	13								
Hyphal Fragments	8	104							
Pollen	2	26							
Spore Trap Used	Allergenco								
	raw ct.	spores/m^3	%						
Alternaria	1	13	<1						
Ascospores	36	468	11						
Basidiospores	222	2890	68						
Bipolaris/Drechslera	3	39	<1						
Chaetomium									
Cladosporium	36	468	11						
Curvularia									
Epicoccum	1	13	<1						
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	9	117	3						
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	17	221	5						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces	2	26	<1						
Background debris (1-5)3	3								
Sample Volume(liters)	75								
TOTAL SPORES/M^3	327	**4260**							

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.

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Respectfully submitted, SEEML

Rafael Berrios

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For Lab Use Only			
Condition of samples is acceptable	☑ YES ☐ NO	SEEML Ref #: 171023040	Lab ID: 121 - 124

Company Information		Client Information		Environmental Conditions	
(Project Manager) **Ben Hestir**		Date Sampled:	10/20/2017	Precipitation in last 16hrs:	None
(Company Name) **Terracon**		Project Name:	Smith Hall Room 2C5	Relative Humidity I/O:	56% / 36%
(Address) **72 Pointe Circle**		Project Address:	86127158 - Task 110	Temperature I/O:	68 deg / 78 deg
(City, State, Zip) **Greenville, SC 29615**		City, State, Zip:		Wind Conditions	calm
(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
2C5-1	Room 2C5 - Left desk	A	1		75	
2C5-2	Room 2C5 - Right desk	A	1		75	
2C5-3	Outside front entrance to Smith Hall	A	1		75	
2C5-4	Bench in parking area adjacent to Smith Hall	A	1		75	

Relinquished By:	Date/Time	Recieved By:	Date/Time
Ben Hestir	0905/Oct 23, 2017		10.23.17

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