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
Barre Hall
Room 2035 – Office of Ms. Jessi Wilson
Room 2037 – Office of Ms. Jan Urbanski
Clemson, South Carolina
Terracon Project No. 86127158 – Task 63

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation in two second floor offices within Barre Hall 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 performed limited indoor air quality (IAQ) testing in the 2nd floor offices of Ms. Jessi Wilson (Rm 2035) and Ms. Jan Urbanski (Rm 2037) on July 20, 2016. Specifically, our efforts focused on identifying levels of mold spores in the offices and measuring temperature and relative humidity.

Barre Hall includes office spaces for several departments within the School of Behavioral, Social and Health Sciences including the offices of the Department of Youth, Family and Community Studies. The building was constructed in 1976 and consists of approximately 26,000 square feet of office space on two floors. Terracon conducted airborne mold sampling which consisted of collecting air samples in two 2nd floor offices and two additional samples outside for comparison. A limited physical assessment a limited moisture survey of building materials in the two offices assessed was conducted. 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.

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.

Moisture Content in Building Materials

Excess moisture in building materials may result in the growth of fungi or bacteria. There are no regulations or standards for moisture content in installed building materials. Moisture content will vary building-to-building and across geography, depending largely on relative humidity and indoor environmental conditions. Terracon applied industry best practices and equipment manufacturer guidelines to determine the moisture content of materials in this facility.

A moisture meter was used to identify suspect water-impacted materials. Building materials have different absorptive and moisture retention properties and will come into equilibrium with environmental moisture (as indicated by relative humidity levels) or become wet by contact with water.

Our investigation was limited to accessible surfaces. A Protimeter® Mini Moisture Meter, Model BLD2000 direct-reading instrument was used to measure the moisture content of the building materials included in this investigation. The moisture meter works via the measurement of electroconductivity through the material being tested via two penetrating probes.

According to Protimeter®, readings above 16% on wood components should generally be considered excess moisture that may indicate moisture intrusion and the early stages of wood-deteriorating organism growth. Wood Moisture Equivalent (%WME) readings on materials other than wood components (e.g. drywall) above 16% WME would also be considered moisture impacted.

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

Physical Assessment

The two offices assessed (Rooms 2035 and 2037) are on the northwest side of the building, on the second floor. The offices are approximately 8 feet by 12 feet. Room 2035 has two exterior windows and Room 2037 has one. These windows consist of two glass panes stacked vertically and the lower panes have been insulated with what appears to be drop-in ceiling tile material.

In Room 2035, previous water intrusion was reported by Ms. Wilson, in the form of heavy condensation on the office windows. According to Ms. Wilson, a previous repair by University Facilities included re-sealing/re-caulking the windows on the outside of the building. The result was a major reduction in the amount of condensation in both rooms. A small area (approximately 1 square foot) of suspect mold growth was observed on drywall adjacent to one of the windows in Ms. Wilson's office and paper items reportedly left on the carpeted floor adjacent to the windows showed evidence of water damage. It was not clear whether the damage to the paper items occurred before or after the re-sealing/re-caulking of the windows.

In Room 2037, the ceiling tile material showed small amounts of suspect fungal growth (less than 1 square foot) and water staining up to a height of approximately one foot from the base of the window.

Moisture Content in Building Materials

Moisture readings identified drywall material on the right side of the window in Room 2037 as "wet". No other building materials located in close proximity to the windows in either office were found to be either "damp" or "wet" according to the Protimeter® instrument

Mold Air Sampling

On the afternoon of Wednesday, July 20, 2016, Terracon collected two (2) mold spore trap samples on the 2nd floor of Barre Hall and two (2) outdoor samples for comparison. The samples were collected, in Room 2035, the office of Jessi Wilson, and in Rm. 2037, the office of Ms. Jan Urbanski. 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 #	Barre-1	Barre-2	Barre-3	Barre-4
Location Description	**Office of Jessi Wilson – Rm 2035**	**Office of Jan Urbanski – Rm 2037**	**Outside NE Barre Entrance**	**Outside West McAdams Entrance**
Spore Type	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**
Alternaria	13	---	---	13
Ascospores	117	---	377	897
Basidiospores	---	117	1,370	2,960
Bipolaris/Drechslera	---	---	13	---
Cladosporium	39	39	624	1,940
Curvalaria	---	---	26	---
Epiccocum	---	---	13	---
Aspergillus / Penicillium	351	195	39	---
Smuts/Periconia/ Myoxmycetes	---	---	26	156
Pithomyces	26	13	---	13
Total	**546**	**364**	**2,490**	**5,980**

The highest total spore count inside was approximately 22% of the lowest outside total spore count. The dominant indoor genera were *Aspergillus/Penicillium.* The dominant genera outdoors were *Basidiospores* and *Cladosporium.* The laboratory analytical report is attached.

Temperature and Relative Humidity

The indoor temperature in Rm 2037 was 72º F and the relative humidity was 58%. The outdoor temperature was 93º F and the relative humidity was 48% on a sunny, hot day.

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

CONCLUSIONS AND RECOMMENDATIONS

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

- Indoor fungal spore counts were not elevated as compared to outside air. The dominant indoor genera were *Aspergillus/Penicillium* type spores which was not the dominant outdoor mold spore type. After moisture intrusion or condensation events, *Aspergillus/Penicillium* type spores are generally the first to colonize. The sampling method cannot distinguish between viable and non-viable spores. Terracon recommends general cleaning of the office using HEPA vacuums to further reduce spore levels. Vacuuming should be conducted behind furniture and bookcases as well.

- Temperature readings were below the recommended ASHRAE guideline. Lower temperatures may be acceptable as long as it does not impact relative humidity within the space. Relative humidity measurements (58%) were within acceptable ranges (30% - 60%) for indoor workspaces at this time of year; however this is a spot measurement. Terracon recommends monitoring the humidity levels to ensure it does not exceed 60% for any length of time. Ideally relative humidity should be approximately 50% in a conditioned space this time of year. In general, if the water vapor content in the space stays the same and temperature is lowered, humidity increases.

- Previous window condensation issues are believed to have been largely mitigated by the re-sealing/re-caulking of the exterior around the windows.

- The one area of wet drywall just above floor level on the right side of the window frame in Room 2037 should be further inspected and repairs to prevent the wetting of this material should be conducted.

- Areas of drywall and ceiling tile material (used as an insulating/decorative panel on the lower windows) observed to have apparent mold growth should be replaced.

- The occupants of both offices are reportedly experiencing potential allergy symptoms which may or may not be related to the conditions noted in this report. Replacement of the carpet in these offices with a vinyl flooring product might alleviate some of the symptoms reported.

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: Photo Log
Laboratory Results

Photo Log

Limited Mold Investigation Report – Photo Log
Barre Hall ■ Clemson, SC
August 1, 2016 ■ Terracon Project No. 86127158 – Task 63



Photo #1 One of two offices being assessed in Barre Hall



Photo #2 Water staining on window insulation in Room 2037



Photo #3 Small amounts of suspect fungal growth in Room 2037



Photo #4 Moisture reading in “wet” category on drywall in Room 2037



Photo #5 Small area of suspect fungal growth in Room 2035



Photo #6 Suspect fungal growth on personal item from floor adjacent to window in Room 2035

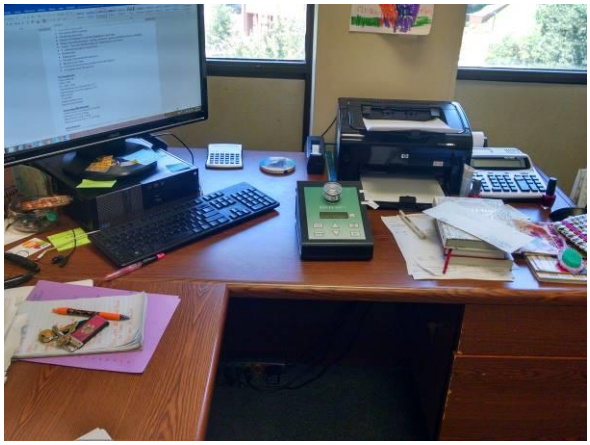


Photo #7 Location of air sample in Room 2035

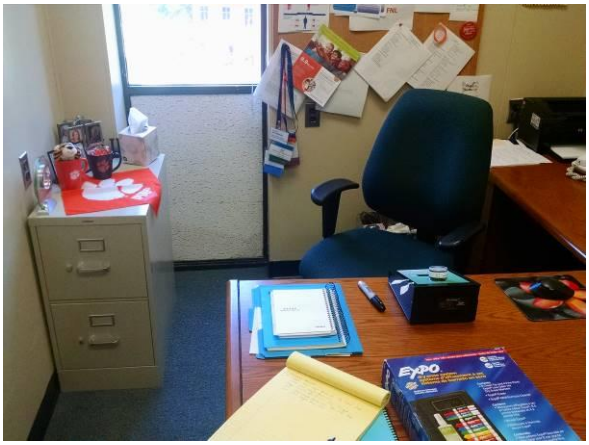


Photo #8 Location of air sample in Room 2037



Photo #9 Location of air sample outside Barre Hall



Photo #10 Location of air sample outside McAdams Hall

Laboratory Results

SEEML Reference Number:
160721060

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:
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: 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- Barre Hall
	Project Address: 86127158 Task 63
	Project City, State, ZIP: Clemson, SC 29631
	SEEML Reference # : 160721060

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

Client Sample ID	Barre-1			Barre-2			Barre-3		
Location	Rm. 2035- Jessi Wilson			Rm. 2037- Jan Urbanski			Outside NE Barre Entrance		
Lab Sample ID	160721060-178			160721060-179			160721060-180		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments									
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	1	13	2						
Ascospores	9	117	21				29	377	15
Basidiospores				9	117	32	105	1370	55
Bipolaris/Drechslera							1	13	<1
Chaetomium									
Cladosporium	3	39	7	3	39	11	48	624	25
Curvularia							2	26	1
Epicoccum							1	13	<1
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	27	351	64	15	195	54	3	39	2
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy							2	26	1
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces	2	26	5	1	13	4			
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	42	**546**		28	**364**		191	**2490**	

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- Barre Hall
	Project Address: 86127158 Task 63
	Project City, State, ZIP: Clemson, SC 29631
	SEEML Reference # : 160721060

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

Client Sample ID	Barre-4								
Location	Outside W McAdams Entrance								
Lab Sample ID	160721060-181								
Detection Limit (spores/m^3)	13								
Hyphal Fragments									
Pollen									
Spore Trap Used	AOC								
	raw ct.	spores/m^3	%						
Alternaria	1	13	<1						
Ascospores	69	897	15						
Basidiospores	228	2960	49						
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	149	1940	32						
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus									
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	12	156	3						
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces	1	13	<1						
Background debris (1-5)3	3								
Sample Volume(liters)	75								
TOTAL SPORES/M^3	460	**5980**							

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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AIHA-LAP, LLC EMLAP # 173667

Southeast Environmental Microbiology Laboratories

Chain of Custody

506 Laurens Rd, Greenville, SC 29607

Phone : 864-233-3770, Fax: 864-233-6589, www.seeml.com, AIHA-LAP, LLC. (EMLAP) #173667

Page 1 of 1

For Lab Use Only			
Condition of samples is acceptable	☒ YES ☐ NO	SEEML Ref #: 160721054960 7-16-16	Lab ID: 178 - 181

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 - Barre Hall	Relative Humidity I/O:	/
(Address)	72 Pointe Circle	Project Address:	86127158 Task 63	Temperature I/O:	72.1° / 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
Barre-1	Rm 2035 - Jessi Wilson	AOC	1		75	
Barre-2	Rm 2037 - Jan Urbanski	"	1		"	
Barre-3	Outside NE Barre entrance	"	"		"	
Barre-4	Outside W McAdams entrance	"	"		"	

Reliquished By:	Date/Time	Recieved By:	Date/Time
[signature]	7-21-16 12:32	[signature]	

* Area is only required for culturable surface samples.

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