September 8, 2017

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
Sirrine Hall – Room 434
515 Calhoun Drive
Clemson, South Carolina 29634
Terracon Project No. 86127158 – Task 104

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited Mold investigation in Room 434 within Sirrine Hall located 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

### Scope of Services

At the request of Clemson University, Terracon representative Mr. Benjamin Hestir conducted a limited mold investigation in Room 434 of Sirrine Hall on August 22, 2017. The building, which contains primarily classroom and office space, was originally constructed in 1938 and renovated in 1978.

The investigation included measurements of temperature and relative humidity, the collection of two (2) spore trap samples inside Room 434 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 office space is on the 4th floor of Sirrine Hall and was occupied by Janette Robbins at the time of our air sample collection on August 22nd.
- The office was neat, with a minimum of clutter.
- Although there was an HVAC supply vent in the ceiling, Ms. Robbins reported that it had never worked during her three years in the space.
- Photographs from the assessment are attached.

### Mold Air Sampling Results

On the afternoon of August 22, 2017, Terracon collected two air samples (spore traps) in the office (Room 434) and two outside the building for comparison. The results of the total spore count samples analyses are presented in Table 1. The laboratory analytical reports are attached.

Table 1: Summary of Total Spore Count Analyses and Temperature/Relative Humidity Measurements – August 22, 2017

| Sample # | 434-1 | 434-2 | 434-3 | 434-4 |
|---|---|---|---|---|
| **Location Description** | **Back of office left filing cabinet** | **On desk of Janette Robbins** | **Outside in Sirrine courtyard** | **Outside across the street to the NE** |
| **Spore Type** | **Spores/ $m^3$** | **Spores/$m^3$** | **Spores/$m^3$** | **Spores/$m^3$** |
| Alternaria | --- | --- | 39 | 52 |
| Ascospores | 39 | 195 | 663 | 741 |
| Basidiospores | 39 | 156 | 9,360 | 11,400 |
| *Cladosporium* | 39 | 39 | 1,170 | 858 |
| *Curvularia* | --- | 39 | 130 | 13 |
| *Epicoccum* | --- | 13 | 13 | --- |
| *Nigrospora* | --- | --- | 13 | --- |
| *Penicillium/ Aspergillus* | 195 | 156 | --- | 195 |
| Smuts/*Periconia*/ Myxomycetes | --- | --- | 117 | 65 |
| *Pithomyces* | --- | --- | 26 | |
| *Torula* | --- | --- | 13 | --- |
| *Zygomycetes* | --- | --- | 91 | 39 |
| **Total** | **312** | **598** | **11,600** | **13,400** |
| Temperature (degrees Fahrenheit) | 78.0 | 78.2 | 91.7 | --- |
| Relative Humidity (%) | 55.5 | 55.1 | 48.6 | --- |

The lowest outdoor total spore count was approximately 19 times higher than the highest total spore count inside. The dominant mold genera indoors were *Ascospores and Aspergillis/Penicillium.* The dominant mold genera outdoors were *Basidiospores and Cladosporium*. Conditions outside on the day we sampled were hot and sunny.

The laboratory analytical report is attached.

## CONCLUSIONS

The following conclusions are provided based on our assessment:

- The results of mold air sampling indicated that total airborne mold spore concentrations inside the building were below the total mold spore levels measured in the two outdoor samples and concentrations of mold spore types inside the building were less than the highest corresponding outdoor mold spore levels measured. This is considered a favorable condition.

- Measurements of temperature and relative humidity were within recommended ranges.

## RECOMMENDATIONS

The following recommendations are provided based on our assessment:

- No further assessment or remediation is required for mold at this time.

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: Photographs
Laboratory Results

# Photographs




**Photo #1** Sirrine Hall – Room 434



**Photo #2** View of air handler and file cabinets behind desk at back of room



**Photo #3** View of HVAC supply duct in Room 434 that is reportedly non-functional



**Photo #4** View of sample location for air sample 434-1




**Photo #5** View of Sirrine Hall north entrance from area of air sample 434-3



**Photo #6** View of outside air sample location for sample 434-4

# Laboratory Results

SEEML Reference Number:
170823086

**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: 08/23/17

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

| | |
|---|---|
| Attention: Ben Hestir | Date Sampled: 08/22/17 |
| Terracon | Date Received: 08/23/17 |
| 72 Pointe Circle | Date Analyzed: 08/23/17 |
| Greenville, SC 29615 | Date Reported: 08/23/17 |
| | Date Revised: |
| | Project Name: 86127158-Task 104 |
| | Project Address: Sirrine Hall Rm. 434 |
| | Project City, State, ZIP: Clemson, SC |
| | SEEML Reference # : 170823086 |

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

| Client Sample ID | 434-1 | | | 434-2 | | | 434-3 | | |
|---|---|---|---|---|---|---|---|---|---|
| Location | Back of Office on Filing Cabinet | | | Desk Of Janette Robbins | | | Outside-Sirrine Courtyard | | |
| Lab Sample ID | 170823086-262 | | | 170823086-263 | | | 170823086-264 | | |
| Detection Limit (spores/$m^3$) | 13 | | | 13 | | | 13 | | |
| Hyphal Fragments | | | | 1 | 13 | | 4 | 52 | |
| Pollen | | | | | | | 2 | 26 | |
| Spore Trap Used | Allergenco | | | Allergenco | | | Allergenco | | |
| | raw ct. | spores/$m^3$ | % | raw ct. | spores/$m^3$ | % | raw ct. | spores/$m^3$ | % |
| Alternaria | | | | | | | 3 | 39 | <1 |
| Ascospores | 3 | 39 | 13 | 15 | 195 | 33 | 51 | 663 | 6 |
| Basidiospores | 3 | 39 | 13 | 12 | 156 | 26 | 720 | 9360 | 81 |
| Bipolaris/Drechslera | | | | | | | | | |
| Chaetomium | | | | | | | | | |
| Cladosporium | 3 | 39 | 13 | 3 | 39 | 7 | 90 | 1170 | 10 |
| Curvularia | | | | 3 | 39 | 7 | 10 | 130 | 1 |
| Epicoccum | | | | 1 | 13 | 2 | 1 | 13 | <1 |
| Cercospora | | | | | | | | | |
| Fusarium | | | | | | | | | |
| Memnoniella | | | | | | | | | |
| Nigrospora | | | | | | | 1 | 13 | <1 |
| Penicillium/Aspergillus | 15 | 195 | 63 | 12 | 156 | 26 | | | |
| Polythrincium | | | | | | | | | |
| Rusts | | | | | | | | | |
| Smuts/Periconia/Myxomy | | | | | | | 9 | 117 | 1 |
| Spegazzinia | | | | | | | | | |
| Stachybotrys | | | | | | | | | |
| Stemphylium | | | | | | | | | |
| Tetraploa | | | | | | | | | |
| Torula | | | | | | | 1 | 13 | <1 |
| Ulocladium | | | | | | | | | |
| Colorless/Other Brown 2 | | | | | | | | | |
| Oidium | | | | | | | | | |
| Zygomycetes | | | | | | | 7 | 91 | <1 |
| Pithomyces | | | | | | | 2 | 26 | <1 |
| Background debris (1-5)3 | 2 | | | 2 | | | 3 | | |
| Sample Volume(liters) | 75 | | | 75 | | | 75 | | |
| **TOTAL SPORES/$M^3$** | 24 | **312** | | 46 | **598** | | 895 | **11600** | |

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: 08/22/17 |
| Terracon | Date Received: 08/23/17 |
| 72 Pointe Circle | Date Analyzed: 08/23/17 |
| Greenville, SC 29615 | Date Reported: 08/23/17 |
| | Date Revised: |
| | Project Name: 86127158-Task 104 |
| | Project Address: Sirrine Hall Rm. 434 |
| | Project City, State, ZIP: Clemson, SC |
| | SEEML Reference # : 170823086 |

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

| Client Sample ID | 434-4 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Location | Ouside-Across The Street | | | | | | | | |
| Lab Sample ID | 170823086-265 | | | | | | | | |
| Detection Limit (spores/$m^3$) | 13 | | | | | | | | |
| Hyphal Fragments | 3 | 39 | | | | | | | |
| Pollen | | | | | | | | | |
| Spore Trap Used | AOC | | | | | | | | |
| | raw ct. | spores/$m^3$ | % | | | | | | |
| Alternaria | 4 | 52 | <1 | | | | | | |
| Ascospores | 57 | 741 | 6 | | | | | | |
| Basidiospores | 875 | 11400 | 85 | | | | | | |
| Bipolaris/Drechslera | | | | | | | | | |
| Chaetomium | | | | | | | | | |
| Cladosporium | 66 | 858 | 6 | | | | | | |
| Curvularia | 1 | 13 | <1 | | | | | | |
| Epicoccum | | | | | | | | | |
| Cercospora | | | | | | | | | |
| Fusarium | | | | | | | | | |
| Memnoniella | | | | | | | | | |
| Nigrospora | | | | | | | | | |
| Penicillium/Aspergillus | 15 | 195 | 1 | | | | | | |
| Polythrincium | | | | | | | | | |
| Rusts | | | | | | | | | |
| Smuts/Periconia/Myxomy | 5 | 65 | <1 | | | | | | |
| Spegazzinia | | | | | | | | | |
| Stachybotrys | | | | | | | | | |
| Stemphylium | | | | | | | | | |
| Tetraploa | | | | | | | | | |
| Torula | | | | | | | | | |
| Ulocladium | | | | | | | | | |
| Colorless/Other Brown 2 | | | | | | | | | |
| Oidium | | | | | | | | | |
| Zygomycetes | 3 | 39 | <1 | | | | | | |
| Pithomyces | | | | | | | | | |
| Background debris (1-5)3 | 3 | | | | | | | | |
| Sample Volume(liters) | 75 | | | | | | | | |
| **TOTAL SPORES/$M^3$** | 1026 | **13400** | | | | | | | |

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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SEEML Labs

# 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 #: 1708230860 | Lab ID: 362 - 365 |

| Company Information | | Client Information | | Environmental Conditions | |
|---|---|---|---|---|---|
| (Project Manager) | Ben Hestir | Date Sampled: | 8/22/17 | Precipitation in last 16hrs: | Yes |
| (Company Name) | Terracon | Project Name: | 86127158 - Task 104 | Relative Humidity I/O: | 55.5% / 48.6% |
| (Address) | 72 Pointe Circle | Project Address: | Sirrine Hall Rm 434 | Temperature I/O: | 78.2° / 91.7° |
| (City, State, Zip) | Greenville, SC 29615 | City, State, Zip: | Clemson, SC | 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 |
|---|---|---|---|---|---|---|
| 434-1 | back of office on filing cabinet | A | 1 | | 75 | |
| 434-2 | desk of Janette Robbins | " | " | | " | |
| 434-3 | Outside - Sirrine courtyard | " | " | | " | |
| 434-4 | Outside - across the street | " | " | | " | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| Ben Hestir | 8/23/17 12:12 | | 8.23.17 |

* Area is only required for culturable surface samples.

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