August 21, 2015

Clemson University
310 Klugh Avenue
Clemson, South Carolina 29634

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

Re: Limited Mold Investigation Report
Clemson University
Alumni Association – Room 111
109 Daniel Drive
Clemson, South Carolina
Terracon Project No. 86127158 – Task 39

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation in Room 111 at the within the Alumni Association portion of the Alumni & Visitors Center facility located at 109 Daniel Drive on Clemson University's main campus in Clemson, South Carolina. It is our understanding there are occupant complaints pertaining to mold. The sampling was performed in general accordance with our IDC with Clemson University.

PROJECT DESCRIPTION

Scope of Services

At the request of Clemson University, Terracon conducted a limited mold investigation of Room 111 in the Alumni Association portion of the structure. Terracon representative Mr. Ben Hestir performed this investigation on July 29, 2015. The occupant of the office in Room 111 had complaints of particulates emanating from the HVAC supply vents in this office.

Terracon met with and interviewed Mack Whitmore of Clemson Facilities and Randy Boatwright, the Director of Facilities for the Alumni Association. Mr. Whitmore is responsible for maintenance of the building.

It is Terracon's understanding that the accumulation of particulate in Room 111 under the two HVAC supply registers was causing concern regarding a possible mold problem. This office is located in the southwest corner of the northernmost structure at the Alumni & Visitors Center building and is located over a basement level mechanical room.

Standard of Care

This 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 investigation. 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 investigation. 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.

INVESTIGATION CRITERIA AND METHODS

Physical Inspection

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 inspection focused primarily on collecting observational data (i.e., information obtained by physical inspection of the building and interviews with the building management, owners, and occupants). The physical inspection can help to formulate plans for more in-depth investigation. Destructive sampling or testing to inspect interior wall cavity spaces or mechanical enclosures was not within the scope of work for this project.

The physical inspection included:

- an examination of the physical structure and potential indoor and outdoor sources of moisture intrusion;
- the identification of any discoloration or odor that could indicate moisture intrusion, water damage, and/or fungal growth;
- using a moisture meter to detect moisture impacted materials; and,
- an examination of the HVAC system(s) and its components.

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. No demolition or fixture removal was performed to access interstitial spaces such as mechanical enclosures or wall cavities. A Protimeter® Mini Moisture Meter, Model BLD2000 direct-reading moisture meter was used to measure the moisture content of the building materials included in this investigation. Prior to use, the meter was calibrated according to the manufacturer's recommendations. The moisture meter works via the measurement of electroconductivity through the surface being tested via two penetrating probes.

According to Protimeter®, Wood Moisture Equivalent (%WME) readings above 16% should generally be considered excess moisture that may indicate moisture intrusion and the early stages of wood-deteriorating organism growth.

Mold Sampling

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.

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. To help interpret the sampling results, we compared indoor air and outdoor air measurements.

Total non-viable (non-culturable) fungal spore trap samples were collected using Air-O-Cell™ spore trap cassette specifically designed for the collection of airborne mold spores. Air samples were collected using a 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 AIHA® Laboratory Accreditation Programs, LLC under the Environmental Microbiology Laboratory Accreditation Program (EMLAP), Accreditation #173667. The samples were analyzed by direct microscopic examination and are reported in spores per cubic meter of air (spores/m^3).

In addition to the testing of indoor air, swab samples were collected and analyzed by direct microscopic examination. Those results are reported based on qualitative grading on the presence and degree of fungal growth observed.

Temperature and Relative Humidity

Readings of temperature and relative humidity were made with an Extech Model 445580 instrument which was calibrated by the manufacturer.

FINDINGS

Physical Assessment

The Alumni & Visitors Center at 109 Daniel Drive in Clemson, SC has three separate buildings that are interconnected by an entrance hallway:

- The Alumni Association – located on the north side of the site
- A University Events Room – located on the south side of the site
- The Visitors Center – located on the east side of the site

Room 111 is on the southwest corner of the Alumni Association. At the time of our investigation the occupant of the office (Mr. Wil Brasington – Senior Director of Alumni Relations) was out of town on vacation. The office contained normal office furniture and filing cabinets and included a restroom with a tub and shower unit. The office appears well maintained but an accumulation of surficial particulate matter was observed in areas beneath the two supply registers in the office and the supply register in the center of the office showed visual evidence of potential early stage fungal growth.

Heating and cooling is supplied through a commercial grade HVAC unit located in the mechanical space in the basement level beneath the Alumni Association. Mack Whitmore of University Facilities provided access to the HVAC unit believed to supply the Alumni Association portion of the facility. The condensate drain appeared to be functioning normally. The inside metal surface of the air handler unit appeared to be coated with a biofilm which could have included some early stage fungal growth. No exposed insulation was observed inside the air handling unit.

Terracon spoke with Randy Boatwright, the Director of Facilities for the Alumni Association and he indicated that a previous water infiltration issue affecting the north side of the Alumni Association building had been repaired a couple of years back including the installation of new gutters on the Alumni Association portion of the facility. That repair had reportedly resolved some previous water infiltration issues in the building and no recent water intrusion events were reported. Photographs of the assessment are attached.

Moisture Content in Building Materials

Wood moisture levels in drywall and drop ceiling tiles in Room 111 were below the damp region of the meter scale (16% WME). No evidence of water infiltration was observed in the office or in adjoining common areas.

Temperature and Relative Humidity

At the time of testing the indoor temperature was measured at 75.9 degrees Fahrenheit (ºF) and relative humidity at 50.5%. The outdoor temperature was 85.8ºF and relative humidity was 80.1% with light winds and thundershowers.

Mold Swab Sampling

During the investigation of Room 111, two swab samples were collected, one from the top of a file box behind the entrance door (which is located directly under an HVAC supply register) and one from the other HVAC supply register in the center of the office. The samples were designated as CUSS1 and CUSS2, respectively.

The file box was of interest due to an accumulation of particulate matter while the register in the center of the office showed visual evidence of potential early stage fungal growth.

The results for CUSS1 indicate that the particulate on the file box was not observed to contain fungal growth, although there were some scattered *Cladosporium* and *Penicillium/Aspergillus* spores identified.

The results for CUSS2 indicated that there was moderate fungal growth which was identified as *Cladosporium* along with a moderate amount of hyphal fragments, which are indicative of mold colony growth.

Mold Air Sampling

On July 29, 2015 a total of five air samples were collected; three samples indoors and two samples outdoors for comparison. The analytical results from the air samples are summarized in Table 1 which is located on the next page:

Table 1: Summary of Mold Spore Results – July 29, 2015

Sample #	CUAS1	CUAS2	CUAS3	CUAS4	CUAS5
Location	**Room 111**	**Across from Room 113A**	**Alumni Lobby**	**Outside West side loading dock**	**Outside Events Room on deck**
Spore Type	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**
Alternaria	---	---	---	39	---
Ascospores	39	---	---	351	5,850
Aspergillus/ Penicillium	351	273	195	975	2,150
Rusts	13	---	---	---	78
Basidiospores	78	---	78	585	624
Bipolaris/ Dreschlera	26	---	---	13	26
Cladosporium	78	156	13	4,720	14,400
Curvularia	13	13	---	39	39
Epicoccum	13	---	---	13	---
Cercospora	---	---	---	91	52
Myxomycetes/ Perconia/Smut	---	---	---	91	26
Torula	---	---	---	---	52
Oidium	---	---	---	1,310	39
Pithomyces	13	---	---	26	52
Total	**624**	**442**	**286**	**8,250**	**23,400**

The indoor total mold spore results in all three locations were lower than both outdoor levels. In addition, the types of mold identified from the indoor sampling were consistent with those identified on the outdoor samples.

The laboratory analytical report is attached.

Conclusions and Recommendations

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

- Mold spore levels in the Alumni Association Room 111 and in the hallway adjacent to Room 113A were below outdoor spore levels and the types of mold spores were consistent with those found in the outdoor samples.
- No evidence of water intrusion or leaks were visually observed or measured with the Protimeter® moisture meter.
- Moderate mold growth was observed in the swab sample (CUSS1) from the center HVAC register in the office, but the particulate swab from the file box behind the entry door (CUSS2) did not show evidence of fungal growth.

- Temperature and relative humidity as measured inside the Alumni Association at the time of our investigation were not at levels that should contribute to indoor fungal growth.
- The particulate observed in Room 111 is very likely the result of an insulation product breaking down within the HVAC system and is not necessarily a symptom of a larger mold issue. An obvious source of that particulate (such as older degraded fiberglass insulation) was not readily observable in the air handling unit believed to be associated with the room.
- Clemson should consider cleaning of the HVAC supply registers.
- Additional investigation of the duct system is needed to identify the source of the particulate on the supply side of the HVAC.

Terracon appreciates the opportunity to provide this service to Clemson University. If you have any questions regarding this limited asbestos sampling report, please contact the undersigned at 864-292-2901.

Sincerely,
Terracon Consultants, Inc.



Benjamin Hestir, P.E.
Project Industrial Hygienist



Scott D. Rohlf CIH
Authorized Project Reviewer

Attachments: Photographs
Laboratory Results

Photographs



Photo #1 Location of limited mold investigation



Photo #2 Particulate observed behind entrance door to Room 111



Photo #3 HVAC supply register behind entrance door to Room 111

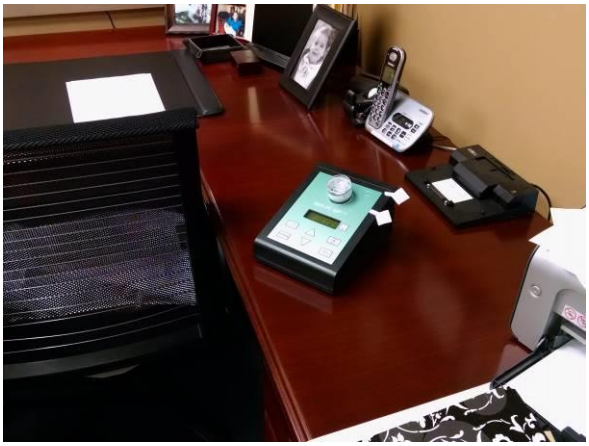


Photo #4 Sample CUAS1 location on desk in Room 111



Photo #5 Dust accumulation on supply vent in center of office in Room 111



Photo #6 Sample CUAS2 location on north side of Alumni Center outside Room 113A



Photo #7 Sample CUAS3 location in Alumni Center lobby area



Photo #8 Sample CUAS4 location on loading dock on west side of Alumni Center



Photo #9 Sample CUAS5 location on deck outside of Alumni Center meeting space on south side of facility

Laboratory Results

SEEML Reference Number:
150730052

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: 07/30/15

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: 07/29/15
Terracon	Date Received: 07/30/15
3534 Rutherford Road	Date Analyzed: 07/30/15
Taylors, SC 29687	Date Reported: 07/30/15
	Date Revised:
	Project Name: CU-Alumi Center
	Project Address: Clemson, SC
	SEEML Reference # : 150730052

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

Client Sample ID	CUS1			CUS2			CUS3		
Location	Rm. 111-Desk			Outside Rm. 113A			Alumni Center Lobby		
Lab Sample ID	150730052-189			150730052-190			150730052-191		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments	1	13		1	13				
Pollen									
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	3	39	6						
Aureobasidium									
Basidiospores	6	78	13				6	78	27
Bipolaris/Drechslera	2	26	4						
Botrytis									
Chaetomium									
Cladosporium	6	78	13	12	156	35	1	13	5
Curvularia	1	13	2	1	13	3			
Epicoccum	1	13	2						
Cercospora									
Fusarium									
Nigrospora									
Penicillium/Aspergillus	27	351	56	21	273	62	15	195	68
Rusts	1	13	2						
Smuts/Periconia/Myxomy									
Stachybotrys									
Stemphylium									
Memnoniella									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces	1	13	2						
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	48	**624**		34	**442**		22	**286**	
Quality Control									

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, Inc.

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: 07/29/15
Terracon	Date Received: 07/30/15
3534 Rutherford Road	Date Analyzed: 07/30/15
Taylors, SC 29687	Date Reported: 07/30/15
	Date Revised:
	Project Name: CU-Alumi Center
	Project Address: Clemson, SC
	SEEML Reference # : 150730052

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

Client Sample ID	CUAS4			CUAS5					
Location	Outside-Loading Dock			Outside-Alumni Patio					
Lab Sample ID	150730052-192			150730052-193					
Detection Limit (spores/m^3)	13			13					
Hyphal Fragments	3	39							
Pollen	5	65		2	26				
Spore Trap Used	AOC			AOC					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria	3	39	<1						
Ascospores	27	351	4	450	5850	25			
Aureobasidium									
Basidiospores	45	585	7	48	624	3			
Bipolaris/Drechslera	1	13	<1	2	26	<1			
Botrytis									
Chaetomium									
Cladosporium	363	4720	57	1104	14400	62			
Curvularia	3	39	<1	3	39	<1			
Epicoccum	1	13	<1						
Cercospora	7	91	1	4	52	<1			
Fusarium									
Nigrospora									
Penicillium/Aspergillus	75	975	12	165	2150	9			
Rusts				6	78	<1			
Smuts/Periconia/Myxomy	7	91	1	2	26	<1			
Stachybotrys									
Stemphylium									
Torula				4	52	<1			
Ulocladium									
Colorless/Other Brown 2									
Oidium	101	1310	16	3	39	<1			
Zygomycetes									
Pithomyces	2	26	<1	4	52	<1			
Background debris (1-5)3	3			3					
Sample Volume(liters)	75			75					
TOTAL SPORES/M^3	635	**8250**		1795	**23400**				
Quality Control									

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, Inc.

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