April 19, 2019

Clemson University
310 Klugh Avenue
Clemson, South Carolina 29634

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

Re: Limited Mold Investigation Report
Clemson University
Godfrey Hall – Basement Rooms G02, G02A, and G03C
Clemson, South Carolina
Terracon Project No. 86197059B

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation in Rooms G02, G02A, and G03C in the basement of Godfrey Hall 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 conducted a limited mold investigation in the previously described rooms in the basement of Godfrey Hall on the afternoon of March 29, 2019. Noticeable amounts of mold were reported on a brick wall in Room G03C. Clemson wishes to test the area for mold.

On our March 29th visit, Terracon collected measurements of temperature and relative humidity and conducted airborne mold sampling which consisted of collecting spore trap air samples in three locations inside the rooms and the collection of two additional samples outside for comparison. Two swab samples were collected from Rooms G03C and G02A for surface mold analysis.

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 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 collection, the spore trap samples were delivered by overnight courier to EMSL in Cinnaminson, New Jersey. EMSL is accredited by the AIHA® Laboratory Accreditation Programs, LLC under the Environmental Microbiology Laboratory Accreditation Program (EMLAP), Accreditation #100194. 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 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.

Two swab samples were collected from Rooms G03C and G02A for surface mold analysis where visible mold was observed. The swab samples were collected using a HealthLink Transporter sterile swab. The samples were sent to EMSL for mold spore identification by direct microscopic examination.

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, 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 445580 Humidity/Temperature Meter instrument which was calibrated by the manufacturer.

FINDINGS

General Observations

- At the time of the assessment, Rooms G03C and G02A appeared largely cluttered with dust and debris and were used for storage of boxes and building materials, respectively. Room G02 serves as a metal workshop class room and was similarly cluttered with dust and debris at the time of the assessment.
- Room G03C is located in the rear, unconditioned portion of the basement and was largely filled with cardboard boxes at the time of the assessment. Mold was visible on the far brick wall of the room, adjacent to a hatch allowing access to the crawl space. The crawl space was not equipped with a vapor barrier or dehumidifier. Open crawl space vents were observed from Room G03C providing access to the exterior of the building.
- Room G02A is located in the unconditioned portion of the basement, immediately adjacent to Room G02. Room G02A was largely filled with building materials and tools at the time of the assessment. Visible mold was apparent on fiberboard sheets in Room G02A.
- Room G02 is a conditioned portion of the basement, equipped with drop-ceiling. Water stains were apparent on several ceiling tiles within Room G02.

- Several areas of water staining and mold growth were apparent in the mechanical room housing the HVAC unit and air handling units (AHU). A vented door provides access to the HVAC rooms from outside.
- Photographs from the assessment are attached.

Mold Air Sampling

On the afternoon of March 29, 2019, Terracon collected three mold spore trap samples inside the building and two samples from outdoor locations for comparison. The results of the total spore count sample analyses are summarized in Table 1 below:

Table 1: Summary of Total Spore Count Analyses in the Air – March 29, 2019

Sample #	G03C	G02A	G02	BGE	BGW
Location Description	**Room G03C/ Storage**	**Room G02A/ Storage**	**Room G02/ Metal Workshop**	**E Side Building**	**W Side Building**
Spore Type	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**
Ascospores	40	--	--	200	200
Aspergillus/Penicillium	80	200	200	--	300
Basidiospores	300	80	--	1,000	860
Bipolaris	10	--	--	--	--
Chaetomium	--	--	40	--	--
Cladosporium	570	40	40	100	200
Epicoccum	--	--	--	10	--
Fusarium	40	--	--	--	--
Myxomycetes	100	--	--	--	80
Unidentifiable Spores	--	--	--	10	--
Arthrinium	--	--	--	--	70
Botrytis	--	--	--	40	--
Oidiodendron	320	--	--	--	--
Torula-like	--	--	--	40	80
Total	**1,460**	**320**	**280**	**1,400**	**1,790**

The total mold spore levels indoors were generally lower than the outdoor levels, except for the sample from G03C, which detected similar concentrations of total spores compared to outdoor samples. The predominant mold types identified indoors and outdoors were Aspergillus/Penicillium, Basidiospores and Cladosporium. The laboratory analytical reports are attached.

Swab Sampling

Two swab samples were collected from the visible mold growth in Rooms G03C and G02A. The sample collected from Room G03C was collected from apparent mold over brick substrate and the sample collected from Room G02A was collected from stored fiberboard. Analytical results indicated the presence of Unidentifiable Spores at high concentrations with fruiting structures and/or hyphae associated with the spores in the sample collected from G03C. In addition, Ascospores, Basidiospores, Scopulariopsis/Microascus, Bispora, Monodictys, and Myxotrichum-like spores were detected in rare concentrations with Aspergillus/Penicillium spores detected at low concentrations in the sample from Room G03C. Analytical results of the swab sample collected in G02A indicated the presence of Aspergillus/Penicillium spores in low concentrations with Ascospores, Chaetomium, Cladosporium, and Curvularia spores detected in rare concentrations.

Temperature and Relative Humidity

The average indoor temperature was 72.8ºF and the relative humidity was 31.8%. The average outdoor temperature was 75.6ºF and the relative humidity was 22.8%. The following Table summarizes the results.

Table 2: Summary of Temperature and Relative Humidity
March 29, 2019

Location Description	Room G03C/ Storage	Room G02A/ Storage	Room G02/ Metal Workshop	E Side Building	W Side Building
Temperature (degrees F.)	73.2	71.2	74.1	74.4	76.8
Relative Humidity (%)	29.8	33.8	31.9	24.0	21.6

CONCLUSIONS/RECOMMENDATIONS

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

- At the time of the assessment, Rooms G02, G02A, and G03C appeared largely cluttered with dust and debris. Terracon recommends periodic cleaning of these areas to limit the dust and debris loading.
- Room G03C is located in the rear, unconditioned portion of the basement and was largely filled with cardboard boxes at the time of the assessment. Mold was visible on two brick walls of the room and on cardboard boxes left in the room. Terracon recommends the affected cardboard boxes be removed and disposed of and mold growth on the walls of the room be properly remediated.
- A hatch located in Room G03C allows access to the building crawl space. Open crawl space vents were observed along the perimeter of the crawlspace providing

access to the exterior of the building. Terracon recommends installation of weatherproof seals around access doors to the crawl space within the unconditioned portion of the basement. Terracon also recommends Clemson periodically measure humidity levels in Room G03C and, if humidity levels consistently exceed 60%, install a temporary dehumidifier in Room G03C.

- The fiberboard sheets impacted by mold located in Room G02A should be removed and disposed of.
- Water stains were apparent on several ceiling tiles within Room G02. The water stains were dry at the time of the assessment; however, Terracon recommends replacing the ceiling tiles for future identification of leaks, if still present.
- Several areas of water staining and mold growth were apparent on the ceiling of the mechanical room that houses the HVAC unit and AHUs. Terracon recommends ceiling areas be cleaned of visible mold.
- Temperature and humidity measurements showed the indoor areas were within the ASHRAE recommended ranges for winter/spring.
- In general, visible mold was observed in various areas. Although air results were not elevated at the time of testing, visible mold should be cleaned.

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

Sincerely,
Terracon Consultants, Inc.

Robert L. Patterson, CHMM
Senior Staff Industrial Hygienist

Jeffrey A. Gurrie, CIH
Senior Industrial Hygienist

Attachments: Photographs
Laboratory Results

Photographs



Photo #1 View of Room G03C, noticeable mold growth in background. Crawlspace access hatch also apparent.



Photo #2 Mold growth in Room G03C.



Photo #3 View of the crawl space from Room G03C. Noticeable vent leading to the building exterior.



Photo #4 View of the exterior of the building. Crawl space vent is apparent in the background.



Photo #5 General view of Room G02A.



Photo #6 View of the mold growth on fiberboard in Room G02A.



Photo #7 General view of Room G02.



Photo #8 View of dust and debris on a flat surface in Room G02.



Photo #9 View of water staining on 24”x24” ceiling tile in Room G02.



Photo #10 General view of water staining and damage to ceiling materials in the mechanical room.



Photo #11 View of ceiling water staining in the mechanical room with mold growth.



Photo #12 View of the vented door leading from the exterior of the building into the mechanical room.

Laboratory Results

EMSL Analytical, Inc.
200 Route 130 North Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-0262
http://www.EMSL.com / cinnmicrolab@emsl.com

Order ID:	371906162
Customer ID:	GTER78
Customer PO:	86197054B
Project ID:	

Attn: Rob Patterson
Terracon Consultants, Inc.
72 Pointe Circle
Greenville, SC 29615

Phone:	(864) 292-2901
Fax:	(864) 292-6361
Collected:	03/29/2019
Received:	04/01/2019
Analyzed:	04/02/2019

Proj: Clemson Godfrey 86197054B

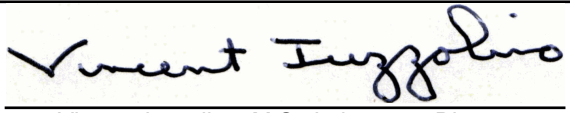
Test Report: Microscopic Examination of Fungal Spores, Fungal Structures, Hyphae, and Other Particulates from Swab Samples (EMSL Method MICRO-SOP-200)

Lab Sample Number:	371906162-0007	371906162-0008			
Client Sample ID:	S-1	S-2			
Sample Location:	G03C	G02A			
Spore Types	Category	Category	-	-	-
Alternaria (Ulocladium)	-	-	-	-	-
Ascospores	Rare	Rare	-	-	-
Aspergillus/Penicillium	Low	Low	-	-	-
Basidiospores	Rare	-	-	-	-
Bipolaris++	-	-	-	-	-
Chaetomium	-	Rare	-	-	-
Cladosporium	-	Rare	-	-	-
Curvularia	-	Rare	-	-	-
Epicoccum	-	-	-	-	-
Fusarium	-	-	-	-	-
Ganoderma	-	-	-	-	-
Myxomycetes++	-	-	-	-	-
Pithomyces++	-	-	-	-	-
Rust	-	-	-	-	-
Scopulariopsis/Microascus	Rare	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-
Unidentifiable Spores	*High*	-	-	-	-
Zygomycetes	-	-	-	-	-
Bispora	Rare	-	-	-	-
Monodictys	Rare	-	-	-	-
Myxotrichum-like	*Rare*	-	-	-	-
Hyphal Fragment	Rare	Rare	-	-	-
Insect Fragment	Rare	-	-	-	-
Pollen	Rare	-	-	-	-

Category: Count/per area analyzed - Rare: 1 to 10 Low: 11 to 100 Medium: 101 to 1000 High: >1000

- Denotes Not Detected.
++ = Includes other spores with similar morphology; see EMSL's fungal glossary for each specific category.
* = Sample contains fruiting structures and/or hyphae associated with the spores.

No discernable field blank was submitted with this group of samples.



Vincent Iuzzolino, M.S., Laboratory Director
or Other Approved Signatory

Samples received in good condition unless otherwise noted. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation of the data contained in this report is the responsibility of the client.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--EMLAP Accredited #100194

Initial report from: 04/02/2019 10:17:01

For Information on the fungi listed in this report please visit the Resources section at www.emsl.com

EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077

Tel/Fax: (800) 220-3675 / (856) 786-0262

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EMSL Order: 371906162
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Attn: Rob Patterson
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72 Pointe Circle
Greenville, SC 29615

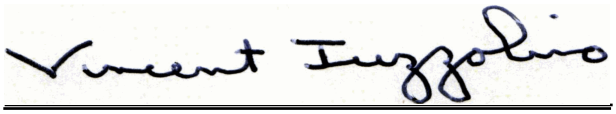
Phone: (864) 292-2901
Fax: (864) 292-6361
Collected: 03/29/2019
Received: 04/01/2019
Analyzed: 04/02/2019

Project: Clemson Godfrey 86197054B

Test Report: Air-O-Cell(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods MICRO-SOP-201, ASTM D7391)

Lab Sample Number:	371906162-0001			371906162-0002			371906162-0003		
Client Sample ID:	G03C			G02A			G02		
Volume (L):	75			75			75		
Sample Location	Room G03C / Box Storage			Room G02A / Wood Storage			Room G02 / Metal Workshop		
Spore Types	**Raw Count**	**Count/m³**	**% of Total**	**Raw Count**	**Count/m³**	**% of Total**	**Raw Count**	**Count/m³**	**% of Total**
Alternaria (Ulocladium)	-	-	-	-	-	-	-	-	-
Ascospores	1	40	2.7	-	-	-	-	-	-
Aspergillus/Penicillium	2	80	5.5	6	200	62.5	5	200	71.4
Basidiospores	7	300	20.5	2	80	25	-	-	-
Bipolaris++	1*	10*	0.7	-	-	-	-	-	-
Chaetomium	-	-	-	-	-	-	1	40	14.3
Cladosporium	14	570	39	1	40	12.5	1	40	14.3
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	-	-	-	-	-	-	-	-	-
Fusarium	1	40	2.7	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	3	100	6.8	-	-	-	-	-	-
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Arthrinium	-	-	-	-	-	-	-	-	-
Botrytis	-	-	-	-	-	-	-	-	-
Oidiodendron	24*	320*	21.9	-	-	-	-	-	-
Torula-like	-	-	-	-	-	-	-	-	-
Total Fungi	**53**	**1460**	**100**	**9**	**320**	**100**	**7**	**280**	**100**
Hyphal Fragment	1	40	-	1*	10*	-	2	80	-
Insect Fragment	2	80	-	-	-	-	-	-	-
Pollen	-	-	-	-	-	-	1	40	-
Analyt. Sensitivity 600x	-	41	-	-	41	-	-	41	-
Analyt. Sensitivity 300x	-	13*	-	-	13*	-	-	13*	-
Skin Fragments (1-4)	-	1	-	-	1	-	-	1	-
Fibrous Particulate (1-4)	-	1	-	-	1	-	-	1	-
Background (1-5)	-	2	-	-	1	-	-	1	-

++ Includes other spores with similar morphology; see EMSL's fungal glossary for each specific category.



Vincent Iuzzolino, M.S., Laboratory Manager
or other approved signatory

High levels of background particulate can obscure spores and other particulates leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless otherwise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. "*" Denotes particles found at 300X. "-" Denotes not detected. Due to method stopping rules, raw counts in excess of 100 are extrapolated based on the percentage analyzed. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--EMLAP Lab 100194

Initial report from: 04/02/2019 10:17:01

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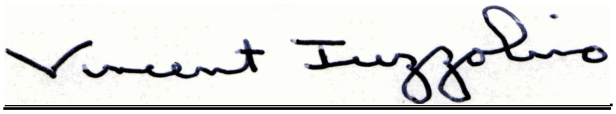
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Project: Clemson Godfrey 86197054B

Test Report: Air-O-Cell(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods MICRO-SOP-201, ASTM D7391)

Lab Sample Number:	371906162-0004			371906162-0005			371906162-0006		
Client Sample ID:	BGE			BGW			FB		
Volume (L):	75			75					
Sample Location	Background East Of Building			Background West Of Building			Field Blank		
Spore Types	**Raw Count**	**Count/m³**	**% of Total**	**Raw Count**	**Count/m³**	**% of Total**	**Raw Count**	**Count/m³**	**% of Total**
Alternaria (Ulocladium)	-	-	-	-	-	-	-	-	-
Ascospores	5	200	14.3	4	200	11.2	-	-	-
Aspergillus/Penicillium	-	-	-	8	300	16.8	-	-	-
Basidiospores	25	1000	71.4	21	860	48	-	-	-
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium	-	-	-	-	-	-	-	-	-
Cladosporium	3	100	7.1	6	200	11.2	-	-	-
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	1*	10*	0.7	-	-	-	-	-	-
Fusarium	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	-	-	-	2	80	4.5	-	-	-
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	1*	10*	0.7	-	-	-	1	<1	100
Zygomycetes	-	-	-	-	-	-	-	-	-
Arthrinium	-	-	-	5*	70*	3.9	-	-	-
Botrytis	1	40	2.9	-	-	-	-	-	-
Oidiodendron	-	-	-	-	-	-	-	-	-
Torula-like	1	40	2.9	2	80	4.5	-	-	-
Total Fungi	**37**	**1400**	**100**	**48**	**1790**	**100**	**1**	**<1**	**100**
Hyphal Fragment	1	40	-	-	-	-	-	-	-
Insect Fragment	2	80	-	-	-	-	-	-	-
Pollen	45	1800	-	35	1400	-	-	-	-
Analyt. Sensitivity 600x	-	41	-	-	41	-	-	0	-
Analyt. Sensitivity 300x	-	13*	-	-	13*	-	-	0*	-
Skin Fragments (1-4)	-	1	-	-	1	-	-	-	-
Fibrous Particulate (1-4)	-	1	-	-	1	-	-	-	-
Background (1-5)	-	1	-	-	1	-	-	1	-

++ Includes other spores with similar morphology; see EMSL's fungal glossary for each specific category.



Vincent Iuzzolino, M.S., Laboratory Manager
or other approved signatory

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