October 24, 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
Clemson Institute for Environmental Toxicology (CIET)
Pendleton, South Carolina
Terracon Project No. 86127158 – Task 108

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation in select locations within the CIET Building in Pendleton, South Carolina. Reportedly, employees working in this area have experienced respiratory issues. 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 select locations within the CIET Building on Thursday, August 31, 2017. This one story building was constructed in 1989 and contains approximately 38,000 square feet of classroom, office and lab space. The office of Ms. Dawn White (Room E 136) was of special interest as Ms. White has reported significant respiratory irritation since the problem with the chiller has occurred. Ms. White specified multiple locations that she frequented while working in the building and requested that we collect dust samples from those locations for mold analysis.

On our August 31st visit, Terracon collected swab samples of accumulated dust in sixteen (16) locations inside the building.

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

Mold dust swabs were collected using Healthlink Transporterä sterile swabs with a 100 square centimeter area template. After collection, the dust swabs were delivered by overnight courier under standard chain of custody to EMSL Analytical, Inc. (EMSL) in Morrisville, North Carolina. EMSL is accredited by the AIHA Environmental Microbiology Laboratory Accreditation Program (EMLAP) program for fungi analysis, Accreditation 173741. The dust from the samples was cultured and analyzed for mold by direct physical examination. Results are provided in colony forming units per square inch (CFU/in^2)

In 2013 the New York Committee for Occupational Safety and Health (NYCOSH) published a document entitled Methods for Evaluation of Indoor Mold Growth. This document provides guidance on various mold levels within a conditioned environment. The NYCOSH presents guidance on swab sampling of dusts where mold growth less than 10,000 cfu/in^2 may be interpreted as background level and results greater than 10,000 cfu/in^2 may be interpreted as probable contamination.

No state or federal exposure limits have been established for fungal aerosols or dust swabs. 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

- Sections of the HVAC flexiduct were being removed and replaced on the day we sampled settled dust.
- Several of the dust swab sample locations were suggested by Ms. White, who has recently experienced respiratory irritation while in the building.
- Photographs from the assessment are attached.

Dust Swab Analytical Results

On the afternoon of August 31, 2017, Terracon collected sixteen (16) dust swab samples inside the CIET building. The results of the dust swab samples analyses are summarized in Table 1 below:

Terracon
Consulting Engineers & Scientists

Sample ID	Sample Description	Analytical Sensitivity (CFUs/in2)	Dilution	Fungal Identification	Colony Count	(CFUs/in^2)	Percent of Total
ETS-1	From Inside Flexiduct - removed from grad student cubicle area	65	1000	Penicillium implicatum	13	839	86.7
ETS-1	From Inside Flexiduct - removed from grad student cubicle area	65	1000	Penicillium waksmanii	1	65	6.7
ETS-1	From Inside Flexiduct - removed from grad student cubicle area	65	1000	Sterile(dark)	1	65	6.7
ETS-2	From Inside Flexiduct - removed from grad student cubicle area	6	100	Penicillium implicatum	56	361	91.9
ETS-2	From Inside Flexiduct - removed from grad student cubicle area	6	100	Penicillium waksmanii	4	26	6.6
ETS-2	From Inside Flexiduct - removed from grad student cubicle area	6	100	Sterile(white)	1	6	1.6
ETS-3	From Supply Register - grad student cubicles	6	100	Cladosporium sphaerospermum	2	13	25
ETS-3	From Supply Register - grad student cubicles	6	100	Sterile(dark)	6	39	75
ETS-4	Room 136 - W bookshelf	6	100	Cladosporium sphaerospermum	1	6	100
ETS-5	Room 136 - SE bookshelf	6	100	Sterile(white)	1	6	100
ETS-6	Room 136 - blue chair under window	6	100	None detected	---	---	---
ETS-7	Room 136 - standup desk device	6	100	None detected	---	---	---
ETS-8	Room 136 - gray visitors chair	6	100	None detected	---	---	---
ETS-9	Room E130A - 2nd shelf from top - right side	6	100	None detected	---	---	---
ETS-10	Room E130A - left side shelf by light switch	6	100	None detected	---	---	---
ETS-11	Room 136 - HVAC supply register	6	100	None detected	---	---	---
ETS-12	Women's restroom counter	6	100	None detected	---	---	---
ETS-13	Women's restroom - top of light fixture above sink	6	100	Penicillium implicatum	1	6	100
ETS-14	Women's restroom on chair near entrance	6	100	None detected	---	---	---
ETS-15	Kitchen - top of refrigerator	65	1000	Aspergillus niveus	1	65	6.7
ETS-15	Kitchen - top of refrigerator	65	1000	Cladosporium sphaerospermum	12	774	80
ETS-15	Kitchen - top of refrigerator	65	1000	Penicillium paxilli	2	129	13.3
ETS-16	Kitchen - top of paper towel dispenser	6	100	Fusarium sp.	1	6	33.2
ETS-16	Kitchen - top of paper towel dispenser	6	100	Pithomyces sp.	1	6	33.2
ETS-16	Kitchen - top of paper towel dispenser	6	100	Yeast sp.	1	6	33.2

Temperature and Relative Humidity

The highest indoor temperature measured was 73.2ºF and the highest indoor relative humidity measured was 72.2%. See all readings in Table 2 below.

Table 2: Summary of Temperature and Relative Humidity Measurements – August 31, 2017

Sample #	ETS-1	ETS-4	ETS-13	ETS-16
Location Description	**Graduate Student Cubicle Area**	**Room 136**	**Women's Restroom**	**Breakroom/ Kitchen**
Temperature (ºF)	73.2	70.7	72.6	71
Relative Humidity (%)	72.2	57.7	62	54.3

CONCLUSIONS

The following conclusions are provided based on our assessment:

- Seven (7) of the sixteen (16) dust swab analyses did not identify viable mold.
- The highest levels (839 cfu/in^2) of viable mold detected during this sampling event were an order of magnitude lower than the NYCOSH level (>10,000 CFUs/in^2) that indicates probable contamination.
- Temperature levels were within ASHRAE guideline ranges, however, relative humidity levels were above the EPA guideline ranges of 30 – 60% in two of the four areas assessed during this sampling event.

RECOMMENDATIONS

The following recommendations are provided based on our assessment:

- Relative humidity readings were not within recommended ranges and efforts to reduce relative humidity should be continued.
- The list of species of viable mold detected should be provided to Ms. White and her allergist.

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: Photographs
Laboratory Results

Photographs



Photo #1 Flexiduct section from graduate student cubicle area – source of samples ETS-1 and ETS-2



Photo #2 HVAC supply register in graduate student cubicle area – source of sample ETS-3



Photo #3 Area template for sample ETS-5



Photo #4 Area template for sample ETS-12



Photo #5 View of top of refrigerator/freezer in CIET breakroom

Laboratory Results

EMSL Analytical, Inc.
2500 Gateway Centre Blvd., Suite 600, Morrisville, NC 27560
Phone/Fax: (919) 465-3900 / (919) 465-3950
http://www.EMSL.com raleighlab@emsl.com

EMSL Order:	291707320
CustomerID:	GTER78
CustomerPO:	86127158-Task96
ProjectID:	

Attn: **Ben Hestir**
Terracon Consultants, Inc.
72 Pointe Circle
Greenville, SC 29615

Phone:	(864) 292-2901
Fax:	(864) 292-6361
Received:	09/01/17 11:15 AM
Analysis Date:	9/15/2017
Collected:	8/31/2017

Project: **Clemson Environmental Toxicology**

Test Report: Identification and Enumeration of Culturable Fungi by Swab (Including Speciation of Penicillium, Aspergillus, Cladosporium, and Stachybotrys (EMSL Method M005))

Sample Description	Sample Location	Temp (C)	Sample Measure (in^2)	Analytical Sensitivity (CFU/in^2)	Dilution	Fungal Identification	Colony Count	CFUs (CFU/in^2)	Percent of Total
ETS-1	From Inside Flexiduct	25	15.5	65	1000	*Penicillium implicatum*	13	839	86.7
				65	1000	*Penicillium waksmanii*	1	65	6.7
291707320-0001	*Media:* MEA			65	1000	*Sterile(dark)*	1	65	6.7
						Total	**15**	**967**	
ETS-2	From Inside Flexiduct	25	15.5	6	100	*Penicillium implicatum*	56	361	91.9
				6	100	*Penicillium waksmanii*	4	26	6.6
291707320-0002	*Media:* MEA			6	100	*Sterile(white)*	1	6	1.6
						Total	**61**	**393**	
ETS-3	Front Supply Register	25	15.5	6	100	*Cladosporium sphaerospermum*	2	13	25.0
				6	100	*Sterile(dark)*	6	39	75.0
291707320-0003	*Media:* MEA					**Total**	**8**	**52**	
ETS-4	Room 136	25	15.5	6	100	*Cladosporium sphaerospermum*	1	6	100.0
291707320-0004	*Media:* MEA					**Total**	**1**	**6**	
ETS-5	Room 136	25	15.5	6	100	*Sterile(white)*	1	6	100.0
291707320-0005	*Media:* MEA					**Total**	**1**	**6**	
ETS-6	Room 136	25	15.5	6	100	**None Detected**			
291707320-0006	*Media:* MEA								
ETS-7	Room 136	25	15.5	6	100	**None Detected**			
291707320-0007	*Media:* MEA								
ETS-8	Room 136	25	15.5	6	100	**None Detected**			
291707320-0008	*Media:* MEA								

Analyst(s)

eric crostic (16)

Alan Goldstein

Alan Goldstein, Ph.D., Laboratory Manager
or other approved signatory

"<" means less than the stated value. The level of detection is equal to 1 CFU per plate of sample analyzed. CFU = colony forming unit. 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 received in good condition unless otherwise noted.

Samples analyzed by EMSL Analytical, Inc. Morrisville, NC AIHA-LAP, LLC--EMLAP Accredited #173741

Report Amended: 09/15/2017 13:26:48 Replaces the Inital Report . Reason Code: Data Entry-Results Changed

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

EMSL Analytical, Inc.
2500 Gateway Centre Blvd., Suite 600, Morrisville, NC 27560
Phone/Fax: (919) 465-3900 / (919) 465-3950
http://www.EMSL.com raleighlab@emsl.com

EMSL Order:	291707320
CustomerID:	GTER78
CustomerPO:	86127158-Task96
ProjectID:	

Attn: **Ben Hestir**
Terracon Consultants, Inc.
72 Pointe Circle
Greenville, SC 29615

Phone:	(864) 292-2901
Fax:	(864) 292-6361
Received:	09/01/17 11:15 AM
Analysis Date:	9/15/2017
Collected:	8/31/2017

Project: **Clemson Environmental Toxicology**

Test Report: Identification and Enumeration of Culturable Fungi by Swab (Including Speciation of Penicillium, Aspergillus, Cladosporium, and Stachybotrys (EMSL Method M005))

Sample Description	Sample Location	Temp (C)	Sample Measure (in^2)	Analytical Sensitivity (CFU/in^2)	Dilution	Fungal Identification	Colony Count	CFUs (CFU/in^2)	Percent of Total
ETS-9	Room E130A	25	15.5	6	100	**None Detected**			
291707320-0009	*Media:* MEA								
ETS-10	Room E130A	25	15.5	6	100	**None Detected**			
291707320-0010	*Media:* MEA								
ETS-11	Room 136	25	15.5	6	100	**None Detected**			
291707320-0011	*Media:* MEA								
ETS-12	Women's Restroom	25	15.5	6	100	**None Detected**			
291707320-0012	*Media:* MEA								
ETS-13	Women's Restroom	25	15.5	6	100	*Penicillium implicatum*	1	6	100.0
291707320-0013	*Media:* MEA					**Total**	**1**	**6**	
ETS-14	Women's Restroom	25	15.5	6	100	**None Detected**			
291707320-0014	*Media:* MEA								
ETS-15	Kitchen	25	15.5	65	1000	*Aspergillus niveus*	1	65	6.7
291707320-0015	*Media:* MEA			65	1000	*Cladosporium sphaerospermum*	12	774	80.0
				65	1000	*Penicillium paxilli*	2	129	13.3
						Total	**15**	**967**	
ETS-16	Kitchen	25	15.5	6	100	*Fusarium sp.*	1	6	33.2
291707320-0016	*Media:* MEA			6	100	*Pithomyces sp.*	1	6	33.2
				6	100	*Yeast sp.*	1	6	33.2
						Total	**3**	**18**	

Analyst(s)

eric crostic (16)

Alan Goldstein

Alan Goldstein, Ph.D., Laboratory Manager
or other approved signatory

"<" means less than the stated value. The level of detection is equal to 1 CFU per plate of sample analyzed. CFU = colony forming unit. 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 received in good condition unless otherwise noted.

Samples analyzed by EMSL Analytical, Inc. Morrisville, NC AIHA-LAP, LLC--EMLAP Accredited #173741

Report Amended: 09/15/2017 13:26:48 Replaces the Inital Report . Reason Code: Data Entry-Results Changed

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

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Client: Terracon Consultants, Inc. Test: M008 Culturable Fungi GS #Samples: 16
Order: 291707320 Project: Clemson Environmental Toxicology
Disposition: ***Discard after 10/31/2017***

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

OrderID: 291707320

Report To Contact Name: Ben Hestir		**Bill To Company:** Terracon (GTER78)	**Client ID #:**
Company Name: Terracon Consultants, Inc.		**Attention To:**	
Street: 72 Pointe Circle		**Street:**	
City: Greenville	**State/Province:** SC **Zip/Postal Code:** 29615	**City:**	**State/Province:** **Zip/Postal Code:**
Phone : 864-293-7348 **Fax :**		**Phone:**	**Fax:**
Project Name: Clemson Environmental Toxicology		**Email Results To:** ben.hestir@terracon.com	**U.S. State where Samples Collected:** SC
# Samples in Shipment: 16	**Date of Shipment:** 8/31/17	**Purchase Order:** 86127158 - Task 96	**Sampled By (Signature):** Ben Hestir

Turnaround Time (TAT) – Please Check: If No Selection Made, Standard 2 Week TAT Will Apply
☑ 2 Week ☐ 1 Week ☐ 4 Day ☐ 3 Day ☐ 2 Day ☐ 1 Day ☐ Other (Call Lab)

Media Type:
Manufacturer/Part #: **Lot #:**

Client Sample ID	Location/Description	Analyte / Method	Media	Flow (lpm)	Sample Time On	Sample Time Off	Volume / Area	Sample Type	Sample Date	Comments
ETS-1	From inside flexiduct	M008	Swab			1335	15.5 in2	☑ Area ☐ Personal	8/31/17	Removed from grad student cubicle area
ETS-2	From inside flexiduct	M008	Swab			1340	15.5 in2	☑ Area ☐ Personal	8/31/17	Removed from grad student cubicle area
ETS-3	From supply register	M008	Swab			1350	15.5 in2	☑ Area ☐ Personal	8/31/17	In grad student cubicle area
ETS-4	Room 136	M008	Swab			1408	15.5 in2	☑ Area ☐ Personal	8/31/17	On W bookshelf
ETS-5	Room 136	M008	Swab			1416	15.5 in2	☑ Area ☐ Personal	8/31/17	On SE bookshelf
ETS-6	Room 136	M008	Swab			1421	15.5 in2	☑ Area ☐ Personal	8/31/17	blue chair under window
ETS-7	Room 136	M008	Swab			1428	15.5 in2	☑ Area ☐ Personal	8/31/17	standup desk
ETS-8	Room 136	M008	Swab			1439	15.5 in2	☑ Area ☐ Personal	8/31/17	gray visitors chair

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Ben Hestir / Terracon	8/31/17		9/1/17

Comments: Swab sample template = 100 cm² = 15.5 in². Report results as CFUs/in²

FE 803795848831

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Terracon Consultants, Inc.
Clemson Environmental Toxicology
9/1/2017 11:15 **TAT:** 2 Week
M008 Culturable Fungi GS Swab

Order ID: 291707320
No Samples: 16
Due: 09/15 11:15 AM
Fax: 864-292-6361

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Client Sample ID	Location/Description	Analyte / Method	Media	Flow (lpm)	Sample Time On	Sample Time Off	Volume / Area	Sample Type	Sample Date	Comments
ETS-9	Room E130A	M008	Swab			1444	15.5 in2	☑ Area ☐ Personal	8/31/17	2nd shelf from top - right side
ETS-10	Room E130A	M008	Swab			1449	15.5 in2	☑ Area ☐ Personal	8/31/17	left side shelf by light switch
ETS-11	Room 136	M008	Swab			1455	15.5 in2	☑ Area ☐ Personal	8/31/17	HVAC supply register
ETS-12	Womens restroom	M008	Swab			1504	15.5 in2	☑ Area ☐ Personal	8/31/17	On counter by sinks
ETS-13	Womens restroom	M008	Swab			1510	15.5 in2	☑ Area ☐ Personal	8/31/17	top of light fixture above sinks
ETS-14	Womens restroom	M008	Swab			1516	15.5 in2	☑ Area ☐ Personal	8/31/17	on chair near entrance
ETS-15	Kitchen	M008	Swab			1522	15.5 in2	☑ Area ☐ Personal	8/31/17	top of refrigerator
ETS-16	Kitchen	M008	Swab			1530	15.5 in2	☑ Area ☐ Personal	8/31/17	top of paper towel dispenser
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		

Comments: