4221 Forbes Boulevard · Suite 250
Lanham, Maryland 20774
T: 202.558.7487 | http://atiinc.com/

June 3, 2019

Prince George's County Public Schools
13300 Old Marlboro Pike
Upper Marlboro, Maryland 20772
Attention: Mr. Alex Baylor

RE: Indoor Air Quality Screening, Charles H. Flowers High School
IFB: 022-19
ATI Project Number: ATI19-670

Dear Mr. Baylor:

Prince George's County Public Schools requested that ATI, Inc., conduct a proactive indoor air quality (IAQ) screening at Charles H. Flowers High School. The IAQ screening was conducted on May 18, 2019. Its key findings are enclosed in the Executive Summary on page three, and the official laboratory report for total fungal spore trap sampling is enclosed in Appendix A.

Thank you for the opportunity to provide Industrial Hygiene services for Prince George's County Public Schools. If you have any questions regarding this report, please contact us at (202) 643-4283.

Sincerely,
ATI, INC.

Courtney E. McCall
Project Manager

Sarath Seneviratne
CIH, CSP, CHMM

Indoor Air Quality Screening Report

Prince George's County Public Schools
Charles H. Flowers High School
10001 Ardwick Ardmore Rd.
Springdale, Maryland 20774

Prepared for:

Prince George's County Public Schools
13300 Old Marlboro Pike
Upper Marlboro, Maryland 20772

June 3, 2019

Submitted by:

ATI Job # 19-670

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Table of Contents

Abbreviations and Acronyms

AHU	Air-Handling Unit
AIHA	American Industrial Hygiene Association
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASTM	American Society for Testing and Materials
CO	Carbon Monoxide
CO_2	Carbon Dioxide
EMLAP	Environmental Microbiology Laboratory Accreditation Program
HVAC	Heating, Ventilating, And Air-Conditioning
IAQ	Indoor Air Quality
NIST	National Institute for Standards and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
RH	Relative Humidity

Abbreviations involving scientific volume and measurements involving media or water sampling

Counts/m^3	Mold spores per cubic meter of air
LPM	Liters Per Minute
NTE	Not to exceed
°F	degree Fahrenheit
PPM	Parts Per Million

1. Executive Summary and Key Findings

ATI conducted a proactive Indoor Air Quality (IAQ) screening on May 18, 2019, at Charles H. Flowers High School, located at 10001 Ardwick Ardmore Rd., Springdale, MD 20774.

The screening included a visual assessment of randomly selected classrooms and other frequently occupied spaces, such as the cafeteria, the main office, and classrooms, for potential IAQ contributors and pathways. As part of the screening, ATI collected direct reading measurements for comfort parameters, including temperature, relative humidity, carbon dioxide, and carbon monoxide. Also, ATI collected total fungal air samples on spore trap cassettes for microbiological analysis.

The following is a summary of the key findings from this screening:

1. Temperature measurements were below ASHRAE guidelines for summer temperatures, 73°F and 79°F.
2. Relative humidity measurements were elevated beyond ASHRAE guidelines, <65% in eight locations.
3. Carbon dioxide limits were below the recommended ASHRAE limit for carbon dioxide, which was 1,206.5 parts per million (PPM) for the day of sampling.
4. Carbon monoxide was not detected throughout the tested spaces.
5. Laboratory results indicated that indoor spore levels compared favorably to outdoor levels, with spore types detected at levels that do not pose a concern. Four tested rooms did not detect any mold spores.

2. Assessment Methods

Ms. Courtney McCall and Ms. Mikal Frater of ATI, Inc. conducted a visual assessment and air sampling on May 18, 2019. Sampled rooms were randomly selected and accounted for approximately 10% of classrooms or a minimum of five samples. Visual observations were made at the time the samples were collected. ATI references the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) *Standard 62.1 – 2016* and ASHRAE *Standard 55 – 2017* when providing IAQ services to clients. ASHRAE is an industry leader on energy efficiency and indoor air quality.

All measurements and air samples were collected between three-six feet from floor elevation, which represents the breathing zone, and away from air-supply and return diffusers. Real-time direct readings for temperature, relative humidity, carbon dioxide (CO_2), and carbon monoxide (CO), were obtained with a calibrated TSI Q-Trak 7575-X Meter and attached 982 Probe.

Total fungal air samples were collected with a Buck BioAire High-Volume Sampling Pump on Zefon Air-O-Cell spore-trap cassettes at a flow rate of 15 liters per minute for five minutes, for a sample volume of 75 liters. The samples were analyzed by direct microscopic examination (identifies and counts both viable and non-viable spores, which is then considered "total fungal"), via the American Society for Testing and Materials (ASTM) Standard D7391-09 by EMSL Analytical, Inc., (EMSL) located in Beltsville, MD.

EMSL participates in the National Institute of Standards and Technology's (NIST's) National Voluntary Laboratory Accreditation Program (NVLAP) for general laboratory performance and management and the

American Industrial Hygiene Association (AIHA) Environmental Microbial Laboratory Accreditation Program (EMLAP, Certificate Number 102891).

Instrument calibration records are included in Appendix B of this report.

3. Visual Observations

Table 1: Visual Observations and Sampling Locations

Sample Location	Observations
Outside Lot	• Moderate traffic on adjacent road. • Two occupants in immediate sampling area. • Large bus running idly in lot. • Partly cloudy skies. • Sunny.
Main Office	• Main office splits into various additional rooms. • One occupant in sampling area. • Printer about eight linear ft. from sampling area. • Light brown water stained ceiling tile in right corner space. • One air return, two sir diffusers. • Space is approximately 800 ft.^{2}
Auditorium	• Large area. • Four visible diffusers on stage. • One occupant in sampling area. • Two large faux plants near stage, light dust accumulation. • Auditorium is two stories high.
Choral Room	• Five faux plants scattered around room. • Light brown water stained ceiling tile in back corner or room. • One occupant in sampling area. • Partial ceiling tile missing in corner. • Room splits into six additional offices. • Trash bag in back of room full. • Two air returns, eight air diffusers. • Space is approximately 1,568 ft.^{2}
Cafeteria	• Twelve air returns. • Large occupied area. • Thirty-two occupants in sampling area, scattered around. • Room has doors that lead outside. • Various light brown water stained ceiling tiles. • Looks like patchy leak remediation in back corner of skylight.
Back Lobby/Gym Area	• No gym access at this time. • Ceiling tiles missing from back lobby. • One occupant in sampling area. • Trace dirt along base of brick wall perimeter (From leak? Flood?) • Space is approximately 625 ft.^{2}

Sample Location	Observations
Room 533	• Growing plants in room under lights "Tower Garden." • A/C on in room. • Plants about 20 ft. away from sampling area. • Space is approximately 800 ft.^{2}
Room 802 Media Center	• A/C on in room. • Book stacks and computer stations free of dust. • Ceiling tiles have slight water stains on two tiles near circulation desk. • Adjoining instructional room has missing ceiling tiles – likely post-cleanup. Also few water-stained tiles. • Space is approximately 1,800 ft.^{2}
Room 814 Art Studio	• Fake plants, one fern in back of room. • Light brown staining on eight tiles. • Dust not visible in area. • Art supplies stored on shelves. • Space is approximately 1,200 ft.^{2}
Nutrition Design Lab	• Onions and potatoes stored nearby. • Dry food stored nearby. • Some water damaged ceiling tiles – localized around a potential leaky pipe. • No visible dust in area. • Space does not feel humid – can hear A/C. • Space is approximately 2,200 ft.^{2}
Room 242	• No plants in space. • Stained ceiling tiles indicative of a past water leak. • No dust accumulation in area. • A/C on – room feels cool. • Individual oscillating fan blowing at teacher's desk in opposite direction of sampling. • Space is approximately 750 ft.^{2}
Room 322	• Slight water staining on two ceiling tiles. • No plants or visible dust accumulation. • Space is approximately 775 ft.^{2}
Room 309	• Faux plant in space, light dust accumulation. • Light brown stained ceiling tiles scattered around space. • One occupant in area during sampling. • One air return, four air diffusers. • Space is approximately 800 ft.^{2}
Room 903	• No stained ceiling tiles. • Faux plants in area. • No visible dust. • Room is located along building interior. • A/C can be felt. • Space is approximately 775 ft.^{2}
Room 609	• One air return, four air diffusers. • One occupant in sampling area.

Sample Location	Observations
	• Mold growth in four spots on ceiling tile along center of room (possibly coming from one pipe leak). • Physics lab. • Space is approximately 1,428 ft.^{2}
Life Skills Room	• Electronic cords strewn out on floor – fall hazard. • Room contains stove, refrigerator, coffee pot, microwave, washing machine. • Sitting paint water in back of room. • One air return, four air diffusers. • Space is approximately 1,080 ft.^{2}
Engineer Lab	• Three air returns, eight air diffusers. • Partial ceiling tile missing because of possible leak remediation. • Past leak stain on ceiling tile adjacent to window. • Engineer lab is very cluttered, smells of wood. • One occupant in area during sampling. • Dust accumulation in dust pan. • Hand sanitizer and cleaning supplies on desk. • Three air returns, eight air diffusers. • Space is approximately 2,952 ft.^{2}

4. Thermal Environmental Conditions for Human Occupancy

ASHRAE *Standard 55-2017, Thermal Environmental Conditions for Human Occupancy*, addresses thermal comfort in an office environment, which means that an employee wearing a normal amount of clothing feels neither too cold nor too warm. This standard discusses thermal comfort within the context of air temperature, humidity, and air movement and provides recommended ranges for temperature and humidity that are intended to satisfy most building occupants. The recommended ASHRAE ranges are referenced below by each comfort parameter.

4.1 Temperature

The ASHRAE standard establishes a winter comfort range of between 68°F and 75°F and a summer range of between 73°F and 79°F. The temperature measurements obtained during the May 18, 2019, screening is summarized in Table 2. As indicated by the data in the table, temperatures in the school averaged between 67.6- 71.8°F, below the ASHRAE summer comfort range.

Table 2: Temperature Measurements

Sample Location	May 18, 2019 °F			ASHRAE Standard °F
	Min	Max	Average	
Outside	70.2	71.6	70.9	N/A
Indoors				
Main Office	69.6	69.8	69.7	73 – 79
Auditorium	68.6	69.6	69.1	73 – 79
Choral Room	69.3	69.5	69.4	73 – 79
Cafeteria	67.4	67.8	67.6	73 – 79
Back Lobby/Gym Area	70.0	71.0	70.5	73 – 79
Room 533	70.0	70.2	70.1	73 – 79
Room 802 Media Center	71.8	71.8	71.8	73 – 79
Room 814 Art Studio	71.8	71.8	71.8	73 – 79
Nutrition Design Lab	70.0	70.0	70.0	73 – 79
Room 242	68.7	69.1	68.9	73 – 79
Room 322	69.4	70.2	69.8	73 – 79
Room 309	70.7	70.9	70.8	73 – 79
Room 903	69.6	69.6	69.6	73 – 79
Room 609	68.9	69.3	69.1	73 – 79
Life Skills Room	70.1	70.2	70.15	73 – 79
Engineer Lab	70.2	70.2	70.2	73 – 79

4.2 Relative Humidity

Relative humidity is a key factor for mold growth. Mold has the potential of growing on suitable surfaces with humidity levels above 65%. ASHRAE *Standard 62.1-2016*, *Ventilation for Acceptable Indoor Air Quality,* recommends a maximum indoor relative humidity of 65% to prevent condensation of moisture on surfaces. Relative humidity below 30% may result in drying of the mucous membranes and skin. Relative humidity measurements are summarized in Table 3. As indicated by the data in the table, relative humidity measurements averaged between 56.5 and 68.0%, with eight locations slightly above the ASHRAE maximum recommendation of 65% relative humidity.

Table 3: Relative Humidity Measurements

Sample Location	May 18, 2019 (%)			ASHRAE Standard (% RH)
	Min	Max	Average	
Outside	75.8	79.8	77.8	N/A
Inside				
Main Office	61.3	61.5	61.4	< 65
Auditorium	62.1	64.1	63.1	< 65
Choral Room	56.3	56.7	56.5	< 65
Cafeteria	67.3	68.3	67.8	< 65
Back Lobby/Gym Area	64.3	66.7	65.5	< 65

Sample Location	May 18, 2019 (%)			ASHRAE Standard (% RH)
	Min	Max	Average	
Room 533	68.0	68.0	68.0	< 65
Room 802 Media Center	61.9	62.3	62.1	< 65
Room 814 Art Studio	66.4	68.0	67.2	< 65
Nutrition Design Lab	65.8	66.2	66.0	< 65
Room 242	67.1	67.7	67.4	< 65
Room 322	66.3	67.5	66.9	< 65
Room 309	66.4	66.8	66.6	< 65
Room 903	61.5	61.7	61.6	< 65
Room 609	61.2	62.0	61.8	< 65
Life Skills Room	60.7	60.7	60.7	< 65
Engineer Lab	61.2	61.4	61.3	< 65

4.3 Carbon Dioxide

Carbon dioxide measurements within an occupied building are a standard method used to gauge the efficiency of ventilation systems. Carbon dioxide is a by-product of human respiration and does not pose an acute health hazard alone. Elevated concentrations may suggest that insufficient fresh air is being supplied to an occupied space and/or that the ventilation system does not provide a sufficient rate of air exchange.

Research has indicated that buildings with adequately operating ventilation systems are able to remove odors generated by activities in an indoor office environment efficiently. ASHRAE *Standard 62.1-2016* states that comfort (odor) criteria with respect to human bioeffluents are likely to be satisfied if the ventilation results indoor carbon dioxide concentrations are less than 700 parts per million (ppm) above the outdoor air concentration.

Carbon dioxide measurements are summarized in Table 4. On the day of the screening, the average outdoor carbon dioxide concentration obtained was 506.5 ppm, which calculates to a maximum indoor concentration of 1,206.5 ppm (700 + 506.5). The carbon dioxide levels inside the suite ranged from the minimum average detected, 396.5 ppm to 498 ppm, the maximum average detected, below the ASHRAE maximum recommended concentration of 1,206.5 ppm.

Table 4: Carbon Dioxide Measurements

Sample Location	May 18, 2019 Concentration (parts per million)			ASHRAE Standard (ppm) NTE
	Min	Max	Average	
Outside	502	511	506.5	N/A
Inside				
Main Office	472	474	473	1,206.5
Auditorium	479	494	486.5	1,206.5
Choral Room	465	465	465	1,206.5

Sample Location	May 18, 2019 Concentration (parts per million)			ASHRAE Standard (ppm) NTE
	Min	Max	Average	
Cafeteria	481	485	483	1,206.5
Back Lobby/Gym Area	498	498	498	1,206.5
Room 533	393	400	396.5	1,206.5
Room 802 Media Center	439	449	444	1,206.5
Room 814 Art Studio	426	436	431	1,206.5
Nutrition Design Lab	429	439	434	1,206.5
Room 242	413	415	414	1,206.5
Room 322	426	442	434	1,206.5
Room 309	446	446	446	1,206.5
Room 903	465	468	466.5	1,206.5
Room 609	475	477	476	1,206.5
Life Skills Room	469	475	472	1,206.5
Engineer Lab	469	471	470	1,206.5

4.4 Carbon Monoxide

Carbon monoxide is a colorless and odorless gas produced by the incomplete combustion of carbon containing fuels. Oil, gasoline, diesel fuels, wood, coke, and coal are the major sources of carbon monoxide. ASHRAE recommends that carbon monoxide not exceed nine ppm indoors. As indicated by the data in Table 5, carbon monoxide was not detected throughout the building.

Table 5: Carbon Monoxide Measurements

Sample Location	May 18, 2019 Concentration (parts per million)			ASHRAE Standard (ppm)
	Min	Max	Average	
Outside	0	0	0	N/A
Inside				
Main Office	0	0	0	< 9
Auditorium	0	0	0	< 9
Choral Room	0	0	0	< 9
Cafeteria	0	0	0	< 9
Back Lobby/Gym Area	0	0	0	< 9
Room 533	0	0	0	< 9
Room 802 Media Center	0	0	0	< 9
Room 814 Art Studio	0	0	0	< 9
Nutrition Design Lab	0	0	0	< 9
Room 242	0	0	0	< 9
Room 322	0	0	0	< 9
Room 309	0	0	0	< 9
Room 903	0	0	0	< 9

Sample Location	May 18, 2019 Concentration (parts per million)			ASHRAE Standard (ppm)
	Min	Max	Average	
Room 609	0	0	0	< 9
Life Skills Room	0	0	0	< 9
Engineer Lab	0	0	0	< 9

5. Total Fungal Air Sampling Results

Mold needs a food source, moisture, proper temperature and humidity, and at times, a source of light, to grow in an environment. Air infiltration through building entrances and exits, open windows and loading docks, and foot traffic into buildings, including the HVAC system all serve as primary pathways that can carry fungi indoors. Water leaks and humid conditions inside of buildings provide the moisture that fosters mold growth.

The May 18, 2019, mold screening sampled air using spore trap cassettes in randomly selected classrooms and other areas throughout the facility. These cassettes collect both viable spores, those capable of producing more fungal colonies, and non-viable spores, which cannot reproduce. Based upon recognized industry practices, indoor mold concentrations are compared with those detected outdoors, which are also known as ambient or baseline samples.

In normal circumstances, the diversity of spores identified indoors and outdoors should be similar with some exceptions. The high concentration of one or two species of fungal spores identified indoors and the absence of the same species outdoors can indicate a moisture problem with the potential to degrade the air quality. Fungi species present indoors are typically found at levels ranging from approximately 10-50% of their levels in the outdoor air, reflecting the filtering by the building's HVAC system.

The official laboratory report with spore trap samples collected on May 18, 2019, is presented in Appendix A. The findings indicated that the indoor concentrations were favorable compared to the outdoor concentrations, and indoor amplification was not present.

The laboratory report indicates that Aspergillus/Penicillium was found in most locations, but at low concentrations that do not exceed outdoor levels. According to the Center for Disease Control, in people with weakened immune systems and lung diseases, Aspergillus can cause serious health problems. Aspergillus-Penicillium are commonly found inside of buildings with water damage and other damp conditions. Four tested rooms had no spores detected. Low quantities of Basidiospores and Cladosporium were detected in a few tested spaces at levels that did not exceed the ambient. The room with the highest quantity of spores detected was a science classroom that had plants incubating nearby.

6. Summary of Findings

Temperature measurements were below ASHRAE guidelines for summer temperatures, 73°F and 79°F. Relative humidity measurements in eight locations exceeded ASHRAE guidelines, <65%. Carbon dioxide measurements fell below the recommended ASHRAE limit for carbon dioxide for the day of testing, 1,206.5 parts per million (PPM). Carbon monoxide was not detected throughout the tested spaces.

Laboratory results indicated that Aspergillus/Penicillium was detected most often, at very low concentrations that do not pose a concern. Other low concentrations of additional spore types were detected at levels that also do not pose a concern. Four of the tested rooms did not detect any mold spores.

We appreciate the opportunity to provide these IAQ testing services for you. If you have any questions, please contact us at (202) 643-4283.

Sincerely,
ATI, INC.

Courtney E. McCall
Project Manager

Sarath Seneviratne
CIH, CSP, CHMM

Appendix A:
Laboratory Report and Chain of Custody

EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514

Tel/Fax: (516) 997-7251 / (516) 997-7528

http://www.EMSL.com / carleplacelab@emsl.com

EMSL Order: 061909647
Customer ID: ATII25A
Customer PO:
Project ID:

Attn: Brian Chapman
ATI
4221 Forbes Blvd
Suite 250
Lanham, MD 20706
Project: 19-670-PGCPS - Flowers HS

Phone: (202) 368-1376
Fax:
Collected: 05/18/2019
Received: 05/20/2019
Analyzed: 05/23/2019

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

Lab Sample Number:	061909647-0001			061909647-0002			061909647-0003		
Client Sample ID:	19-670-01			19-670-02			19-670-03		
Volume (L):	75						75		
Sample Location	Outside Parking Lot			Field Blank			Main Office		
Spore Types	**Raw Count**	**Count/m³**	**% of Total**	**Raw Count**	**Count/m³**	**% of Total**	**Raw Count**	**Count/m³**	**% of Total**
Alternaria (Ulocladium)	-	-	-	-	-	-	-	-	-
Ascospores	38	1700	9.7	-	-	-	-	-	-
Aspergillus/Penicillium	54	2400	13.8	-	-	-	-	-	-
Basidiospores	289	12600	72.2	-	-	-	-	-	-
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium	-	-	-	-	-	-	-	-	-
Cladosporium	17	740	4.2	-	-	-	1	40	100
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	-	-	-	-	-	-	-	-	-
Fusarium	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	1*	10*	0.1	-	-	-	-	-	-
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Total Fungi	**399**	**17450**	**100**	**-**	**No Trace**	**-**	**1**	**40**	**100**
Hyphal Fragment	-	-	-	-	-	-	-	-	-
Insect Fragment	1*	10*	-	-	-	-	-	-	-
Pollen	1*	10*	-	-	-	-	-	-	-
Analyt. Sensitivity 600x	-	44	-	-	0	-	-	44	-
Analyt. Sensitivity 300x	-	13*	-	-	0*	-	-	13*	-
Skin Fragments (1-4)	-	1	-	-	-	-	-	1	-
Fibrous Particulate (1-4)	-	1	-	-	-	-	-	1	-
Background (1-5)	-	2	-	-	-	-	-	1	-

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

Jeffrey Lau, Microbiology 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. Carle Place, NY AIHA-LAP, LLC--EMLAP Accredited #102344

Initial report from: 05/24/2019 16:19:49

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

EMSL Analytical, Inc.

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http://www.EMSL.com / carleplacelab@emsl.com

EMSL Order: 061909647
Customer ID: ATII25A
Customer PO:
Project ID:

Attn: Brian Chapman
ATI
4221 Forbes Blvd
Suite 250
Lanham, MD 20706
Project: 19-670-PGCPS - Flowers HS

Phone: (202) 368-1376
Fax:
Collected: 05/18/2019
Received: 05/20/2019
Analyzed: 05/23/2019

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

Lab Sample Number:	061909647-0004			061909647-0005			061909647-0006		
Client Sample ID:	19-670-04			19-670-05			19-670-06		
Volume (L):	75			75			75		
Sample Location	Auditorium			Choral Room			Cafeteria		
Spore Types	**Raw Count**	**Count/m³**	**% of Total**	**Raw Count**	**Count/m³**	**% of Total**	**Raw Count**	**Count/m³**	**% of Total**
Alternaria (Ulocladium)	-	-	-	-	-	-	-	-	-
Ascospores	-	-	-	-	-	-	-	-	-
Aspergillus/Penicillium	1	40	100	-	-	-	2	90	31
Basidiospores	-	-	-	-	-	-	4	200	69
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium	-	-	-	-	-	-	-	-	-
Cladosporium	-	-	-	-	-	-	-	-	-
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	-	-	-	-	-	-	-	-	-
Fusarium	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	-	-	-	-	-	-	-	-	-
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Total Fungi	**1**	**40**	**100**	**-**	**None Detect**	**-**	**6**	**290**	**100**
Hyphal Fragment	-	-	-	-	-	-	-	-	-
Insect Fragment	-	-	-	-	-	-	-	-	-
Pollen	-	-	-	-	-	-	-	-	-
Analyt. Sensitivity 600x	-	44	-	-	44	-	-	44	-
Analyt. Sensitivity 300x	-	13*	-	-	13*	-	-	13*	-
Skin Fragments (1-4)	-	1	-	-	1	-	-	1	-
Fibrous Particulate (1-4)	-	1	-	-	1	-	-	1	-
Background (1-5)	-	1	-	-	1	-	-	1	-

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

Jeffrey Lau, Microbiology 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.

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528 Mineola Avenue Carle Place, NY 11514

Tel/Fax: (516) 997-7251 / (516) 997-7528

http://www.EMSL.com / carleplacelab@emsl.com

EMSL Order: 061909647
Customer ID: ATII25A
Customer PO:
Project ID:

Attn: Brian Chapman
ATI
4221 Forbes Blvd
Suite 250
Lanham, MD 20706
Project: 19-670-PGCPS - Flowers HS

Phone: (202) 368-1376
Fax:
Collected: 05/18/2019
Received: 05/20/2019
Analyzed: 05/23/2019

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

Lab Sample Number:	061909647-0007			061909647-0008			061909647-0009		
Client Sample ID:	19-670-07			19-670-08			19-670-09		
Volume (L):	75			75			75		
Sample Location	Back Lobby / Gym			Rm 533			Media Center		
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	7.4	-	-	-
Aspergillus/Penicillium	2	90	40.9	4	200	37	-	-	-
Basidiospores	2	90	40.9	8	300	55.6	1	40	80
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium	-	-	-	-	-	-	-	-	-
Cladosporium	1	40	18.2	-	-	-	-	-	-
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	-	-	-	-	-	-	-	-	-
Fusarium	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	-	-	-	-	-	-	-	-	-
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	1*	10*	20
Zygomycetes	-	-	-	-	-	-	-	-	-
Total Fungi	**5**	**220**	**100**	**13**	**540**	**100**	**2**	**50**	**100**
Hyphal Fragment	-	-	-	-	-	-	-	-	-
Insect Fragment	-	-	-	-	-	-	-	-	-
Pollen	-	-	-	-	-	-	1	40	-
Analyt. Sensitivity 600x	-	44	-	-	44	-	-	44	-
Analyt. Sensitivity 300x	-	13*	-	-	13*	-	-	13*	-
Skin Fragments (1-4)	-	1	-	-	2	-	-	1	-
Fibrous Particulate (1-4)	-	1	-	-	1	-	-	1	-
Background (1-5)	-	1	-	-	1	-	-	1	-

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

Jeffrey Lau, Microbiology 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. Carle Place, NY AIHA-LAP, LLC--EMLAP Accredited #102344

Initial report from: 05/24/2019 16:19:49

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

EMSL Analytical, Inc.

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EMSL Order: 061909647
Customer ID: ATII25A
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Attn: Brian Chapman
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4221 Forbes Blvd
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Lanham, MD 20706
Project: 19-670-PGCPS - Flowers HS

Phone: (202) 368-1376
Fax:
Collected: 05/18/2019
Received: 05/20/2019
Analyzed: 05/23/2019

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

Lab Sample Number:	061909647-0010			061909647-0011			061909647-0012		
Client Sample ID:	19-670-10			19-670-11			19-670-12		
Volume (L):	75			75			75		
Sample Location	Art Studio			Nutrition Design			Rm. 242		
Spore Types	**Raw Count**	**Count/m³**	**% of Total**	**Raw Count**	**Count/m³**	**% of Total**	**Raw Count**	**Count/m³**	**% of Total**
Alternaria (Ulocladium)	-	-	-	-	-	-	-	-	-
Ascospores	-	-	-	-	-	-	-	-	-
Aspergillus/Penicillium	1	40	30.8	4	200	100	-	-	-
Basidiospores	-	-	-	-	-	-	1	40	100
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium	-	-	-	-	-	-	-	-	-
Cladosporium	2	90	69.2	-	-	-	-	-	-
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	-	-	-	-	-	-	-	-	-
Fusarium	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	-	-	-	-	-	-	-	-	-
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Total Fungi	**3**	**130**	**100**	**4**	**200**	**100**	**1**	**40**	**100**
Hyphal Fragment	-	-	-	-	-	-	-	-	-
Insect Fragment	-	-	-	-	-	-	-	-	-
Pollen	3*	40*	-	-	-	-	-	-	-
Analyt. Sensitivity 600x	-	44	-	-	44	-	-	44	-
Analyt. Sensitivity 300x	-	13*	-	-	13*	-	-	13*	-
Skin Fragments (1-4)	-	2	-	-	2	-	-	1	-
Fibrous Particulate (1-4)	-	1	-	-	1	-	-	1	-
Background (1-5)	-	1	-	-	1	-	-	1	-

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

Jeffrey Lau, Microbiology Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. Carle Place, NY AIHA-LAP, LLC--EMLAP Accredited #102344

Initial report from: 05/24/2019 16:19:49

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EMSL Order: 061909647
Customer ID: ATII25A
Customer PO:
Project ID:

Attn: Brian Chapman
ATI
4221 Forbes Blvd
Suite 250
Lanham, MD 20706
Project: 19-670-PGCPS - Flowers HS

Phone: (202) 368-1376
Fax:
Collected: 05/18/2019
Received: 05/20/2019
Analyzed: 05/23/2019

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

Lab Sample Number:	061909647-0013			061909647-0014			061909647-0015		
Client Sample ID:	19-670-13			19-670-14			19-670-15		
Volume (L):	75			75			75		
Sample Location	Rm. 322			Rm. 309			Rm. 903		
Spore Types	**Raw Count**	**Count/m³**	**% of Total**	**Raw Count**	**Count/m³**	**% of Total**	**Raw Count**	**Count/m³**	**% of Total**
Alternaria (Ulocladium)	-	-	-	-	-	-	-	-	-
Ascospores	-	-	-	-	-	-	-	-	-
Aspergillus/Penicillium	-	-	-	-	-	-	-	-	-
Basidiospores	-	-	-	-	-	-	-	-	-
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium	-	-	-	-	-	-	-	-	-
Cladosporium	-	-	-	1	40	100	-	-	-
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	-	-	-	-	-	-	-	-	-
Fusarium	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	-	-	-	-	-	-	-	-	-
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Total Fungi	**-**	**None Detect**	**-**	**1**	**40**	**100**	**-**	**None Detect**	**-**
Hyphal Fragment	-	-	-	-	-	-	-	-	-
Insect Fragment	-	-	-	-	-	-	-	-	-
Pollen	-	-	-	-	-	-	-	-	-
Analyt. Sensitivity 600x	-	44	-	-	44	-	-	44	-
Analyt. Sensitivity 300x	-	13*	-	-	13*	-	-	13*	-
Skin Fragments (1-4)	-	2	-	-	1	-	-	1	-
Fibrous Particulate (1-4)	-	1	-	-	1	-	-	1	-
Background (1-5)	-	1	-	-	1	-	-	1	-

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

Jeffrey Lau, Microbiology Laboratory Manager
or other approved signatory

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Project: 19-670-PGCPS - Flowers HS

Phone: (202) 368-1376
Fax:
Collected: 05/18/2019
Received: 05/20/2019
Analyzed: 05/23/2019

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

Lab Sample Number:	061909647-0016			061909647-0017			061909647-0018		
Client Sample ID:	19-670-16			19-670-17			19-670-18		
Volume (L):	75			75			75		
Sample Location	Rm. 609			Life Skills Rm			Energy Syst. Lab		
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	50
Aspergillus/Penicillium	-	-	-	1	40	100	-	-	-
Basidiospores	-	-	-	-	-	-	1	40	50
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium	-	-	-	-	-	-	-	-	-
Cladosporium	-	-	-	-	-	-	-	-	-
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	-	-	-	-	-	-	-	-	-
Fusarium	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	-	-	-	-	-	-	-	-	-
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Total Fungi	**-**	**No Trace**	**-**	**1**	**40**	**100**	**2**	**80**	**100**
Hyphal Fragment	-	-	-	-	-	-	-	-	-
Insect Fragment	-	-	-	-	-	-	-	-	-
Pollen	-	-	-	-	-	-	-	-	-
Analyt. Sensitivity 600x	-	44	-	-	44	-	-	44	-
Analyt. Sensitivity 300x	-	13*	-	-	13*	-	-	13*	-
Skin Fragments (1-4)	-	-	-	-	1	-	-	1	-
Fibrous Particulate (1-4)	-	-	-	-	1	-	-	1	-
Background (1-5)	-	-	-	-	1	-	-	1	-

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

Jeffrey Lau, Microbiology Laboratory Manager
or other approved signatory

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OrderID: 061909647

EMSL ANALYTICAL, INC.
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Microbiology Chain of Custody

EMSL Order Number (*Lab Use Only*): 061909647

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX:(856) 786-0262

Company Name: ATI, Inc	**EMSL-Bill to:** ☐ Same ☐ Different If Bill to is Different note instructions in Comments
Street: 4221 Rumsey Road, Suite 250	*Third Party Billing requires written authorization from third party.*
City: Lanham **State/Province:** MD	**Zip/Postal Code:** 20706 **Country:**
Report To (Name): Brian Chapman / Mikal Frater	**Telephone #:** 202-558-7489
Email Address: Brian@atiin.com & Mikal@atiinc.com	**Fax #:** **Purchase Order:**
Project Name/Number: 19-670- PGCPS - Flowers HS	**Please Provide Results:** ☐ Fax ■ Email
U.S. State Samples Taken: **Project Zip Code:**	**Connecticut Samples:** ■ Commercial ☐ Residential

Sterile, Sodium Thiosulfate Preserved Bottle Used: ☐ **Biocide Used in Source (specify):** ☐

Public Water Supply Samples: ☐ **Note: All results may automatically be reported to DOH if required by state.**

Turnaround Time (TAT) Options - Please Check

☐ 3 Hour	☐ 6 Hour	☐ 24 Hour	☐ 48 Hour	☐ 72 Hour	☐ 96 Hour	■ 1 Week	☐ 2 Week

Microbiology Test Codes

M001 Air-O-Cell
M174 MoldSnap
M030 Micro 5
M032 Allergenco-D
M041 Fungal Direct Examination
M169 Pollen ID & Enumeration
M280 Dust Characterization Level-1
M281 Dust Characterization Level-2
M005 Viable Fungi- Air Samples (Genus ID & Count)
M006 Viable Fungi- Air Samples (Includes *Penicillium, Aspergillus, Cladosporium, Stachybotrys* Species ID & Count)
M007 Culturable fungi - Surface Samples (Genus ID & Count)
M008 Culturable fungi - Surface Samples (Includes *Penicillium, Aspergillus, Cladosporium, Stachybotrys* Species ID & Count)
M009 Bacteria Culture Gram Stain & Count
M010 Bacteria Count & ID - 3 Most Prominent
M011 Bacteria Count & ID - 5 Most Prominent

M012 *Pseudomonas aeruginosa* (P/A***)
M024 *Pseudomonas aeruginosa* (MFT*)
M015 Heterotrophic Plate Count
M017 Total Coliform & *E. coli* (Colilert P/A***)
M018 Total Coliform & *E. coli* (MFT*)
M114 Total Coliform & *E. coli* Enumeration (Colilert MPN**)
M019 Fecal Coliform (MFT*)
M020 Fecal *Streptococcus* (MFT*)
M029 *Enterococci* (MFT*)
M129 *Enterococci* (Enterolert P/A***)
M180 Real Time qPCR-ERMI 36 Panel
M025 Sewage Screen –Water (MFT*)

M115 Sewage Screen - Water (P/A***)
M116 Sewage Screen - Water (MPN**)
M117 Sewage Screen - Swab (P/A***)
M013 Sewage Screen - Swab (MFT*)
M133 *Methicillin-resistant Staph. aureus* (MRSA)
M031 Rapid-growing non-TB *Mycobacteria* Detection & Enumeration
M014 Endotoxin Analysis
M044 Group Allergen (Cat, Dog, Cockroach, Dust Mite)
Other See Analytical Price Guide
***Legionella* Analysis** Please use EMSL *Legionella* COC

*MFT= Membrane Filtration Technique
**MPN= Most Probable Number
***P/A= Presence/Absence

Name of Sampler: Mikal Frater **Signature of Sampler:** Mikal Frater

Sample #	Sample Location/Description	Sample Type	Potable/ NonPotable (Only for Waters)	Test Code	Volume/ Area	Date/Time Collected	Temperature (°C) (Lab Use Only)
Example A1	Kitchen Sink/Tap	Water	☒ P ☐ NP	M017	100 mL	9/1/13 4:00 PM	
19-670-01	Outside Parking Lot	Air	☐ P ☐ NP	M001	75L	05-18-19	
19-670-02	Field Blank	Air	☐ P ☐ NP	M001	75L	05-18-19	
19-670-03	Main Office	Air	☐ P ☐ NP	M001	75L	05-18-19	
19-670-04	AUDITORIUM	Air	☐ P ☐ NP	M001	75L	05-18-19	
19-670-05	CHORAL ROOM	Air	☐ P ☐ NP	M001	75L	05-18-19	

Client Sample # (s): - 18 **Total # of Samples:** 18 **Samples Received Chilled?** Yes / No (Lab Use Only)

Relinquished (Client): MIKAL FRATER **Date:** 5-18-19 **Time:**

Received (Lab): Thomas Walker **Date:** 5/20/19 **Time:** 8:50 am

Comments/Special Instructions:

Controlled Document – COC-34 Micro R8 11/14/2017

5/23/19

OrderID: 061909647

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Microbiology Chain of Custody

EMSL Order Number (*Lab Use Only*):

061909647

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX:(856) 786-0262

Additional pages of the chain of custody are only necessary if needed for additional sample information.

Sample #	Sample Location/Description	Sample Type	Potable/ NonPotable (Only for Waters)	Test Code	Volume/ Area	Date/Time Collected	Temperature (°C) (Lab Use Only)
19-670-06	CAFETERIA	Air	☐P ☐NP	M001	75L	05-18-19	
19-670-07	BACK LOBBY / GYM	Air	☐P ☐NP	M001	75L	05-18-19	
19-670-08	THRD RM 533	Air	☐P ☐NP	M001	75L	05-18-19	
19-670-09	MEDIA CENTER	Air	☐P ☐NP	M001	75L	05-18-19	
19-670-10	ART STUDIO	Air	☐P ☐NP	M001	75L	05-18-19	
19-670-11	NUTRITION DESIGN	Air	☐P ☐NP	M001	75L	05-18-19	
19-670-12	RM. 242	Air	☐P ☐NP	M001	75L	05-18-19	
19-670-13	RM. 322	Air	☐P ☐NP	M001	75L	05-18-19	
19-670-14	RM. 309	Air	☐P ☐NP	M001	75L	05-18-19	
19-670-15	RM. 903	Air	☐P ☐NP	M001	75L	05-18-19	
19-670-16	RM. 609	↓	☐P ☐NP	↓	↓	↓	
19-670-17	LIFE SKILLS RM	↓	☐P ☐NP	↓	↓	↓	
19-670-18	ENERGY SYST. LAB	↓	☐P ☐NP	↓	↓	↓	
			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				

Comments/Special Instructions:

Controlled Document – COC-34 Micro R8 11/14/2017

Appendix B:
Instrument Calibration Records

Certificate of Calibration

(✓) ~~Buck™~~ BioAire Pump Calibration Rotameter

( ) Buck™ BioSlide Pump Calibration Rotameter

Serial number: R14057

Date Calibrated: 1/22/19 **Calibration Due Date:** 1/22/20

Flow Calibration

This is to certify that the rotameter listed above has been calibrated using a Buck Primary calibrator listed below which is calibrated according to A.P. Buck, Inc. calibration procedure APB-1, Ver. 6.2 and is traceable to the National Institute of Standards & Technology (N.I.S.T). A.P. Buck guarantees the accuracy of the rotameter to be within ± 5% of the actual flow rate.

AMBIENT CONDITIONS: Temperature 74±3° F Relative Humidity 50±10%

Description	MFR.	Model	Serial #
Primary Calibrator	A.P. Buck Inc.	M30B	☐ A40020 ☑ ~~A40021~~

QA Approval By:

A.P. BUCK, INC.
7101 Presidents Drive, Suite 110
Orlando, FL 32809
Phone: 407-851-8602
Fax: 407-851-8910

BUCK
A.P. BUCK, INC.

CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

ENVIRONMENT CONDITIONS		
TEMPERATURE	75.3 (24.1)	°F (°C)
RELATIVE HUMIDITY	46	%RH
BAROMETRIC PRESSURE	28.84 (976.6)	inHg (hPa)

MODEL	7575-X
SERIAL NUMBER	7575X1711004

☐ AS LEFT
☒ AS FOUND
☒ IN TOLERANCE
☐ OUT OF TOLERANCE

– CALIBRATION VERIFICATION RESULTS –

THERMO COUPLE — SYSTEM PRESSURE01-02 — *Unit: °F (°C)*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	71.5 (21.9)	71.1 (21.7)	69.5~73.5 (20.8~23.1)				

BAROMETRIC PRESSURE — SYSTEM PRESSURE01-02 — *Unit: inHg (hPa)*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	28.89 (978.3)	28.80 (975.3)	28.31~29.47 (958.7~998.0)				

TSI does hereby certify that the above described instrument conforms to the original manufacturer's specification (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST) or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. TSI's calibration system is registered to ISO-9001:2015.

Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E002827	03-14-18	03-31-19
Pressure	E003982	02-07-18	08-31-18

Measurement Variable	System ID	Last Cal.	Cal. Due
Pressure	E005254	10-06-17	10-31-18
DC Voltage	E003493	09-21-17	09-30-18

K. Davey
VERIFIED

May 25, 2018
DATE

Doc ID: CERT_GEN_ACC

TSI P/N 2300157

CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

ENVIRONMENT CONDITIONS		
TEMPERATURE	75.2 (24.0)	°F (°C)
RELATIVE HUMIDITY	45	%RH
BAROMETRIC PRESSURE	28.81 (975.6)	inHg (hPa)

MODEL	7575-X
SERIAL NUMBER	7575X1711004

☒ AS LEFT ☐ AS FOUND

☒ IN TOLERANCE ☐ OUT OF TOLERANCE

– CALIBRATION VERIFICATION RESULTS –

THERMO COUPLE — SYSTEM PRESSURE01-02 — *Unit: °F (°C)*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	71.6 (22.0)	71.6 (22.0)	69.6~73.6 (20.9~23.1)				

BAROMETRIC PRESSURE — SYSTEM PRESSURE01-02 — *Unit: inHg (hPa)*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	28.89 (978.3)	28.91 (979.0)	28.31~29.47 (958.7~998.0)				

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Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E002827	03-14-18	03-31-19
Pressure	E003982	02-07-18	08-31-18

Measurement Variable	System ID	Last Cal.	Cal. Due
Pressure	E005254	10-06-17	10-31-18
DC Voltage	E003493	09-21-17	09-30-18

Ken Davey
CALIBRATED

May 25, 2018
DATE

Doc. ID: CERT_GEN_WCC

TSI P/N 2300157

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Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

ENVIRONMENT CONDITIONS		
TEMPERATURE	75.0 (23.9)	°F (°C)
RELATIVE HUMIDITY	45	%RH
BAROMETRIC PRESSURE	28.83 (976.3)	inHg (hPa)

MODEL	982
SERIAL NUMBER	P17100006

☐ AS LEFT ☐ IN TOLERANCE
☒ AS FOUND ☒ OUT OF TOLERANCE

– CALIBRATION VERIFICATION RESULTS –

GAS CO_2 AS FOUND — SYSTEM G-101 — *Unit: ppm*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	0	0	0~50	4	3033.5	* 2860.4	2942.5~3124.5
2	523.8	* 470.7	473.8~573.8	5	5060	* 4739.5	4908.2~5211.8
3	1025	* 960.5	975~1075				

GAS CO AS FOUND — SYSTEM G-101 — *Unit: ppm*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	36	* 0	33~39	2	101.3	* 0	98.2~104.3

TEMPERATURE AS FOUND — SYSTEM T-101 — *Unit: °F (°C)*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	32.0 (0.0)	32.4 (0.2)	31.0~33.0 (−0.6~0.6)	2	140.0 (60.0)	140.8 (60.4)	139.0~141.0 (59.4~60.6)

HUMIDITY AS FOUND — SYSTEM H-102 — *Unit: %RH*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	10.0	9.8	7.0~13.0	4	70.0	72.5	67.0~73.0
2	30.0	30.6	27.0~33.0	5	90.02	* 93.27	87.02~93.02
3	49.9	51.6	46.9~52.9				

**Indicates Out-of-Tolerance Condition*

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Measurement Variable	System ID	Last Cal.	Cal. Due
5000 CO_2	T-0926	02-15-18	12-18-20
N2	t78516	04-17-18	04-03-23
Flow	E003298	10-25-17	10-31-18
Flow	E003980	03-28-18	03-31-19
2000 C4H8	EB0053919	10-20-17	10-20-21
Temperature	E003986	02-14-18	08-31-18
Humidity	E003539	02-22-18	08-31-18

Measurement Variable	System ID	Last Cal.	Cal. Due
200 CO	CC506122	01-24-18	01-25-26
Air	108551y	04-23-18	03-09-20
Flow	E004631	10-25-17	10-31-18
Flow	E003525	01-10-18	01-31-19
100 C4H8	EB0078607	09-28-16	09-28-20
Temperature	E003987	02-14-18	08-31-18

K. Davey
VERIFIED

May 25, 2018
DATE

Doc ID: CERT_GEN_WCC

TSI P/N 2300157

TSI P/N 2300157

CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

Environment Conditions		
Temperature	75.9 (24.4)	°F (°C)
Relative Humidity	46	%RH
Barometric Pressure	28.81 (975.6)	inHg (hPa)

Model	982
Serial Number	P17100006

☒ As Left ☐ As Found

☒ In Tolerance ☐ Out of Tolerance

– Calibration Verification Results –

Temperature Verification — System T-101 — *Unit: °F (°C)*

#	Standard	Measured	Allowable Range	#	Standard	Measured	Allowable Range
1	32.0 (0.0)	32.4 (0.2)	31.0~33.0 (−0.6~0.6)	2	140.0 (60.0)	140.8 (60.4)	139.0~141.0 (59.4~60.6)

Humidity Verification — System H-102 — *Unit: %RH*

#	Standard	Measured	Allowable Range	#	Standard	Measured	Allowable Range
1	10.0	9.6	7.8~12.2	4	70.0	69.7	67.8~72.2
2	30.0	29.7	27.8~32.2	5	90.0	89.3	87.8~92.2
3	50.0	49.9	47.8~52.2				

CO_2 Gas Verification — System G-101 — *Unit: ppm*

#	Standard	Measured	Allowable Range	#	Standard	Measured	Allowable Range
1	0	0	0~50	4	3031	3043	2940~3122
2	518	510	468~568	5	5000	4988	4850~5150
3	1020	1030	970~1070				

CO Gas Verification — System G-101 — *Unit: ppm*

#	Standard	Measured	Allowable Range	#	Standard	Measured	Allowable Range
1	36	36	33~39	2	101	100	98~104

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Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E003986	02-14-18	08-31-18
Humidity	E003539	02-22-18	08-31-18
200 CO	CC506122	01-24-18	01-25-26
Air	108551y	04-23-18	03-09-20
Flow	E004631	10-25-17	10-31-18
Flow	E003525	01-10-18	01-31-19
100 C4H8	EB0078607	09-28-16	09-28-20

Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E003987	02-14-18	08-31-18
5000 CO_2	c5732043	04-16-18	10-04-20
N_2	t78516	04-17-18	04-03-23
Flow	E003298	10-25-17	10-31-18
Flow	E003980	03-28-18	03-31-19
2000 C4H8	EB0053919	10-20-17	10-20-21

Calibrated

May 29, 2018
Date

Doc. ID: CERT_GEN_WCC