ati INC
Architecture | Engineering | Construction

9220 Rumsey Road, Suite 100, Columbia, MD 21045
T: 410.992.3424 | F: 410.992.1837

March 17, 2023

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

RE: Indoor Air Quality Assessment, Brandywine Elementary School
IFB: 022-19
ATI Project Number: 23629-23628

Dear Mr. Baylor:

Prince George's County Public Schools requested that ATI, Inc., conduct an indoor air quality (IAQ) assessment at Brandywine Elementary School on March 14, 2023. The assessment's 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) 643-4288.

Sincerely,
ATI, INC.

Mikal Frater
Industrial Hygienist

Reviewed and Approved By:

Nate Burgei, CIH, CSP
Certified Industrial Hygienist

Indoor Air Quality Assessment Report

Prince George's County Public Schools
Brandywine Elementary School
1401 Brandywine Road
Brandywine, Maryland 20613

Prepared for:

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

March 17, 2023

Submitted by:

ATI Job # 23629-23628

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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
Rev.	Revision

Abbreviations involving scientific volume and measurements involving media or water sampling

Spores/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

ATI conducted an Indoor Air Quality (IAQ) assessment on March 14, 2023, at Brandywine Elementary School, located at 1401 Brandywine Road, Brandywine, MD 20613.

The assessment included a visual assessment of randomly selected classrooms and other frequently occupied spaces, such as the cafeteria, the main office, and library, for potential IAQ contributors and pathways. As part of the assessment, ATI measured common IAQ 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 assessment:

1. The gymnasium had a measured temperature less than the ASHRAE personal comfort recommended winter range of 68°F - 75°F. All other tested rooms were within the ASHRAE recommended winter range.
2. The relative humidity in all tested spaces were less than the ASHRAE guidelines of < 65%, yet also < 30%, which can cause occupant discomfort.
3. Room 13 had a carbon dioxide concentration greater than the ASHRAE limit for carbon dioxide, which was 1,092 parts per million (PPM) for the day of the assessment. All other tested locations had a CO_2 concentration less than 1,092 ppm.
4. Carbon monoxide concentrations were less than the IAQ meter's detection limit throughout the tested spaces.
5. The spore trap sampling results suggest that significant indoor amplification of mold was not present and were typical for indoor occupied areas. Room 4 had a *Cladosporium* sp. concentration greater than the outdoor sample, but *Cladosporium* is commonly measured in higher concentrations outdoors and is not unusual to find comparable concentrations indoors.

2 Assessment Methods

Mikal Frater of ATI, Inc. conducted a visual assessment and air sampling on March 14, 2023. Sampled rooms were randomly selected and accounted for approximately 10% of classrooms or a minimum of five samples. Ms. Frater documented visual observations at the time she collected the air samples. 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 a typical adult 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 measured 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. EMSL Analytical, Inc. (EMSL), in Beltsville, MD, analyzed the samples using direct microscopic examination per ASTM D7391-09, which spores both viable and non-viable mold spores and particulates, which combined yields *total fungal* results. EMSL participates in the National Institute of Standards and Technology's (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) for general laboratory performance and management, and the American Industrial Hygiene Association (AIHA) for Environmental Microbial Laboratory Accreditation Program (EMLAP). The EMSL laboratory report is included in Appendix A.

3 Visual Observations

Table 1 lists the areas, conditions, observations, and other pertinent details related to this IAQ assessment.

Table 1: Visual Observations and Sampling Locations

Sample Location	Observations
Gymnasium	• Area occupied during sampling – approximately 20 people • Light/moderate dust accumulation on returns (2) and diffusers (4) • Doors to corridor open during sampling • Space is approximately 4,272 ft^2
Cafeteria	• Doors and windows to exterior closed during sampling • Slight draft from exterior door • Chalkboard present with light/moderate dust on sill • Moderate/heavy dust accumulation on air returns (2) under stage (particularly right) • Doors to corridor and kitchen open during sampling • Area smells of food being cooked • Light dust accumulation on stage • Area unoccupied during sampling • Space is approximately 2,785 ft^2
Library/Media Center	• Area occupied during sampling – approximately 20 people • Air notably dry in this area • Moderate/heavy dust accumulation on air returns (2) • Light dirt accumulation/discoloration on air diffusers (6) • Doors to corridors open during sampling • No odors, stained ceiling tiles, or visible mold growth observed • Heat ON during sampling • Space is approximately 3,092 ft^2
Room 13	• No odors, stained ceiling tiles, or visible mold growth observed • Area occupied during sampling – approximately 20 people • Light dirt accumulation/discoloration on diffusers (4) • Door to corridor open during sampling • Adjustable panel barrier between classrooms – shared air flow • Leaves blown in on shelving under window sill • Space is approximately 903 ft^2
Room 7	• Area unoccupied during sampling • Air notably dry in this area • Light dust on floor around perimeter of room, especially near exterior exit • Peeling paint on air diffusers (4) • Doors to corridor and exterior closed during sampling • Light dust on chalkboard sill/window sill • No odors or visible mold growth observed • Space is approximately 986 ft^2
Room 4	• Area occupied during sampling – approximately 20 people • Doors to corridor/exterior closed during sampling • Light dust accumulation on window sill

Sample Location	Observations
	• Light dust accumulation in/on cabinets, sink, chalkboard, and bookshelf • Space is approximately 956 ft^2
Parking Lot – Outdoors	• Clear skies • Heavy vehicle traffic observed at the opposite end of parking lot • Light Moderate/heavy winds, about 18mph SE

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 80% of 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 temperatures measured during the March 14, 2023, assessment are summarized in Table 2. As indicated by the data in the table, temperatures in the school averaged between 67°F and 75°F, with one location reporting less than the ASHRAE recommended winter range.

Table 2: Temperature

Sample Location	March 14, 2023 °F			ASHRAE Standard °F
	Min	Max	Average	
Outdoors	45	46	45	N/A
Indoors				
Gymnasium	67	67	67	68-75°F
Cafeteria	68	71	70	68-75°F
Library/Media Center	74	75	75	68-75°F
Room 13	74	74	74	68-75°F
Room 7	69	70	70	68-75°F
Room 4	74	74	74	68-75°F

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 less than 30% may result in drying of occupants' mucous membranes and skin. Relative humidity measurements are summarized in Table 3. As indicated by the data in the table, the average

relative humidity ranged between 12% and 20% with all tested locations measuring less than the ASHRAE maximum recommendation of 65% relative humidity, and also less than 30% relative humidity.

Table 3: Relative Humidity

Sample Location	March 14, 2023 (% RH)			ASHRAE Standard (% RH)
	Min	Max	Average	
Outdoors	25	25	25	N/A
Indoors				
Gymnasium	20	20	20	< 65
Cafeteria	15	20	18	< 65
Library/Media Center	18	21	20	< 65
Room 13	20	20	20	< 65
Room 7	12	12	12	< 65
Room 4	16	17	17	< 65

4.3 Carbon Dioxide

Carbon dioxide concentrations 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 can maintain indoor carbon dioxide concentrations less than 700 parts per million (ppm) greater than the outdoor air concentration. Typically, outdoor carbon dioxide concentrations range from 300 ppm to 450 ppm, with the higher range typically found in urban areas during peak rush hour.

Carbon dioxide concentrations are summarized in Table 4. On the day of the assessment, the average outdoor carbon dioxide concentration was 392 ppm, which calculates to a maximum indoor concentration of 1,092 ppm (700 + 392). One room, Room 13, exceeded the recommended maximum for the day of the assessment. The elevated carbon dioxide concentrations in Room 13 can be attributed to the amount of people present – approximately 20 – during the assessment. While this concentration may not be a health hazard, elevated carbon dioxide concentrations can indicate an insufficient amount of outdoor air is exchanged in the space and may allow other airborne contaminants to build up such as odors. This is common in the winter when windows are closed and makeup air is reduced to limit the amount of cold air entering the space.

Table 4: Carbon Dioxide

Sample Location	March 14, 2023 Concentration (parts per million)			ASHRAE Standard (ppm) NTE
	Min	Max	Average	
Outdoors	372	411	392	N/A
Indoors				
Gymnasium	640	672	656	1,092
Cafeteria	578	602	590	1,092
Library/Media Center	1,074	1,066	1,070	1,092
Room 13	1,113	1,121	1,117	1,092
Room 7	505	522	514	1,092
Room 4	892	952	922	1,092

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 over an eight-hour time-weighted average. ATI measured carbon monoxide concentrations using a TSI Q-Trak model number 7575-X with an attached IAQ probe (model number 982). The instrument's carbon monoxide sensor has an error range of ± 3% of the reading or three (3) ppm, whichever is greater. As indicated by the data in Table 5, carbon monoxide concentrations were less than the Q-Trak's detection limit throughout the school.

Table 5: Carbon Monoxide

Sample Location	March 14, 2023 Concentration (parts per million)			ASHRAE Standard (ppm)
	Min	Max	Average	
Outdoors	<3	<3	<3	N/A
Inside				
Gymnasium	<3	<3	<3	< 9
Cafeteria	<3	<3	<3	< 9
Library/Media Center	<3	<3	<3	< 9
Room 13	<3	<3	<3	< 9
Room 7	<3	<3	<3	< 9
Room 4	<3	<3	<3	< 9

5 Total Fungal Air Sampling Results

The March 14, 2023, mold assessment sampled air using spore trap cassettes in the selected sampling locations. Total fungal spore trap counts include both viable spores that are able to grow and non-viable spores which are ultimately dead. Spore trap samples are unable to differentiate spores from current growth or past mold growth; however, both viable and non-viable spores can cause allergic response in individuals who are allergic to mold.

Because there are no established exposure limits or regulations regarding safe mold spore concentrations, the standard industry recognized guidelines are to compare indoor air samples in areas of concern with outdoor mold spore concentrations, and potentially areas of no concern. Indoor spaces without active or past mold growth typically have similar fungal types that were or are commonly

identified outdoors and in similar ratios, but typically in much lesser magnitude. Conversely, the dominating presence of one or two fungal spore types identified indoors in much greater concentrations than the outdoor sample often suggests the mold originated indoors and there may be a source of indoor moisture accumulation. Certain fungi indoors such as Chaetomium, *Stachybotrys*, Cladosporium, *Aspergillus*, or various *Penicillium* species much greater than outdoor concentrations are common in spaces that have or have had chronic water intrusion or moisture condensation issues.

Mold will likely grow on any organic material like carpets, wall boards, insulation, paper, or even accumulated dust if sufficient moisture and temperature are provided. Fungi will almost always be present in any indoor environment from outdoor air bypassing the HVAC filtered air-intakes such as open doors, open windows or are brought in on people or objects brought in from the outdoors. Indoor fungal investigations typically focus on sources of water inside the building like air duct condensation, plumbing leaks or operational processes, and sources of water intrusion from outside the building like roof or window leaks.

The results suggest the indoor concentrations were generally favorable compared to the outdoor concentrations. The total ambient, outdoor spore concentration was 50 spores/m^3, and all except two tested spaces, the Gymnasium and Room 4, had total spore concentrations less than or equal to the ambient total. Room 4 had a *Cladosporium* concentration of 440 spores/m^3 which was greater than the concentration measured in the outdoor ambient sample. *Cladosporium* is commonly found in much greater concentrations outdoors so the measured concentration in Room 4 does not suggest active indoor mold growth and is typical for occupied spaces.

On March 14, 2023, the region experienced winds up to 29 mph,[1] which likely prevented the sampling pump from adequately capturing outdoor mold spores resulting in low measured spore concentrations. Historically, outdoor mold spore concentrations are at least 1,000 spores/m^3 or greater in this area.

The official laboratory report with spore trap samples collected on March 14, 2023, is presented in Appendix A.

6 Summary of Findings

1. The gymnasium had a measured temperature less than the ASHRAE personal comfort recommended winter range of 68°F - 75°F. All other tested rooms were within the ASHRAE recommended winter range.
2. The relative humidity in all tested spaces were less than the ASHRAE guidelines of < 65%, yet also < 30%, which can cause occupant discomfort.
3. Room 13 had a carbon dioxide concentration greater than the ASHRAE limit for carbon dioxide, which was 1,092 parts per million (PPM) for the day of the assessment. All other tested locations had a CO_2 concentration less than 1,092 ppm.
4. Carbon monoxide concentrations were less than the IAQ meter's detection limit throughout the tested spaces.
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[1] Weather Underground Weather History for March 14, 2023. https://www.wunderground.com/history/daily/KDCA/date/2023-3-14

Appendix A: Laboratory Report and Chain of Custody

EMSL Analytical, Inc.

10752 Baltimore Avenue Beltsville, MD 20705

Tel/Fax: (301) 937-5700 / (301) 937-5701

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

EMSL Order: 192302156
Customer ID: ATII25A
Customer PO:
Project ID:

Attention: Mikal Frater
ATI
4221 Forbes Blvd
Suite 250
Lanham, MD 20706
Project: BRANDYWINE ELEMENTARY SCHOOL IAQ

Phone: (202) 832-1433
Fax:
Collected Date: 03/14/2023
Received Date: 03/14/2023 11:22 AM
Analyzed Date: 03/14/2023

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

Lab Sample Number:	192302156-0001			192302156-0002			192302156-0003		
Client Sample ID:	3453 0037			3517 9760			3517 9767		
Volume (L):	75			75			75		
Sample Location:	GYMNASIUM			CAFETERIA			LIBRARY/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	-	-	-	-	-	-	-	-	-
Aspergillus/Penicillium	-	-	-	1	40	100	1*	10*	20
Basidiospores	1	40	50	-	-	-	-	-	-
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium++	-	-	-	-	-	-	-	-	-
Cladosporium	-	-	-	-	-	-	1	40	80
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	-	-	-	-	-	-	-	-	-
Fusarium++	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	1	40	50	-	-	-	-	-	-
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Total Fungi	**2**	**80**	**100**	**1**	**40**	**100**	**2**	**50**	**100**
Hyphal Fragment	-	-	-	1	40	-	-	-	-
Insect Fragment	-	-	-	-	-	-	-	-	-
Pollen	-	-	-	1*	10*	-	2	90	-
Analyt. Sensitivity 600x	-	44	-	-	44	-	-	44	-
Analyt. Sensitivity 300x	-	13*	-	-	13*	-	-	13*	-
Skin Fragments (1-4)	-	3	-	-	1	-	-	3	-
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.

Abubakar Barry, Microbiology Laboratory Manager or other Approved Signatory

Initial report from: 03/14/2023 04:38 PM

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

EMSL Analytical, Inc.

10752 Baltimore Avenue Beltsville, MD 20705

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Lanham, MD 20706
Project: BRANDYWINE ELEMENTARY SCHOOL IAQ

Phone: (202) 832-1433
Fax:
Collected Date: 03/14/2023
Received Date: 03/14/2023 11:22 AM
Analyzed Date: 03/14/2023

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

Lab Sample Number:	192302156-0004			192302156-0005			192302156-0006		
Client Sample ID:	3517 9761			3517 9779			3517 9755		
Volume (L):	75			75			75		
Sample Location:	RM 13			RM 7			RM 4		
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	-	-	-	-	-	-
Basidiospores	-	-	-	-	-	-	1	40	8.2
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium++	-	-	-	-	-	-	-	-	-
Cladosporium	-	-	-	-	-	-	10	440	89.8
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	-	-	-	2*	30*	100	-	-	-
Fusarium++	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	-	-	-	-	-	-	1*	10*	2
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Total Fungi	**1**	**40**	**100**	**2**	**30**	**100**	**12**	**490**	**100**
Hyphal Fragment	1	40	-	2	90	-	1*	10*	-
Insect Fragment	-	-	-	-	-	-	-	-	-
Pollen	-	-	-	-	-	-	-	-	-
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.

Abubakar Barry, Microbiology Laboratory Manager or other Approved Signatory

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Phone: (202) 832-1433
Fax:
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Received Date: 03/14/2023 11:22 AM
Analyzed Date: 03/14/2023

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

Lab Sample Number:	192302156-0007			192302156-0008		
Client Sample ID:	3517 9782			3517 9777		
Volume (L):	75					
Sample Location:	OUTDOORS - PARKING LOT			Blank		
Spore Types	**Raw Count**	**Count/m³**	**% of Total**	**Raw Count**	**Count/m³**	**% of Total**
Alternaria (Ulocladium)	-	-	-	-	-	-
Ascospores	-	-	-	-	-	-
Aspergillus/Penicillium	-	-	-	-	-	-
Basidiospores	-	-	-	-	-	-
Bipolaris++	-	-	-	-	-	-
Chaetomium++	-	-	-	-	-	-
Cladosporium	3*	40*	80	-	-	-
Curvularia	-	-	-	-	-	-
Epicoccum	1*	10*	20	-	-	-
Fusarium++	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-
Myxomycetes++	-	-	-	-	-	-
Pithomyces++	-	-	-	-	-	-
Rust	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-
Total Fungi	**4**	**50**	**100**	**-**	**No Trace**	**-**
Hyphal Fragment	1	40	-	-	-	-
Insect Fragment	-	-	-	-	-	-
Pollen	1	40	-	-	-	-
Analyt. Sensitivity 600x	-	44	-	-	0	-
Analyt. Sensitivity 300x	-	13*	-	-	0*	-
Skin Fragments (1-4)	-	1	-	-	-	-
Fibrous Particulate (1-4)	-	1	-	-	-	-
Background (1-5)	-	1	-	-	-	-

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

Abubakar Barry, Microbiology Laboratory Manager or other Approved Signatory

Initial report from: 03/14/2023 04:38 PM

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

OrderID: 192302156

EMSL ANALYTICAL, INC.
TESTING LABS • PRODUCTS • TRAINING

Microbiology Chain of Custody Form

EMSL Order Number / Lab Use Only

T92302156

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077

PHONE:(800) 220-3675
EMAIL.CinnMicroLab@

If Bill-To is the same as Report-To leave this section blank. Third-party billing requires written authorization.

Customer Information		Billing Information	
Customer ID		Billing ID:	
Company Name	ATI, Inc.	Company Name	ATI, Inc.
Contact Name	Mikal Frater	Billing Contact:	Courtney McCall
Street Address	4221 Forbes Blvd Suite 250	Street Address	4221 Forbes Blvd, Suite 250
City, State, Zip	Lanham, MD 20706	City, State, Zip	Lanham, MD 20706
Country	USA	Country	USA
Phone:	(848) 702-8621	Phone	
Email(s) for Report:	mikal@atiinc.com ; courtney@atiinc.com	Email(s) for Invoice	courtney@atiinc.com

Project Information

Project Name/No.	Brandywine Elementary School IAQ
Purchase Order	
EMSL LIMS Project ID. (If applicable, EMSL will provide)	
State Samples Collected.	MD
Zip Code Samples Collected.	20613
State of Connecticut (CT) must select project location	☐ Commercial (Taxable) ☐ Residential (Non-taxable)
Sampled By Name	Mikal Frater
Sampled By Signature	
No. of Samples in Shipment	8

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.**

Turn-Around-Time (TAT) Please call ahead for large projects and/or turnaround times 6 Hours or Less. *32 Hour TAT available for select tests only; samples must be submitted by 11:30am.

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 32* Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☑ 1 Week ☐ 2 Week

MICROBIOLOGY TEST CODES

M001 Air-O-Cell	**M174** MoldSnap	**M012** *Pseudomonas aeruginosa* (P/A***)	**M115** Sewage Screen - Water (P/A***)
M030 Micro 5	**M032** Allergenco-D	**M024** *Pseudomonas aeruginosa* (MFT*)	**M116** Sewage Screen - Water (MPN**)
M041 Fungal Direct Examination		**M015** Heterotrophic Plate Count	**M117** Sewage Screen - Swab (P/A***)
M169 Pollen ID & Enumeration		**M017** Total Coliform & *E. Coli* (Colilert P/A***)	**M013** Sewage Screen - Swab (MFT*)
M280 Dust Characterization Level-1		**M018** Total Coliform & *E. Coli* (MFT*)	**M730** *Methicillin-resistant Staph, aureus* (MRSA)
M281 Dust Characterization Level-2		**M114** Total Coliform & *E. Coli Enumeration (Colilert MPN**)*	**M031** Rapid-growing non-TB *Mycobacteria* Detection & Enumeration
M005 Viable Fungi-Air Samples (Genus ID & Count)		**M019** Fecal Coliform (MFT*)	
M006 Viable Fungi-Air Samples (Includes *Penicillum, Aspergillus, Cladosporium, Stachybotrys* Species ID & Count)		**M020** Fecal *Streptococcus* (MFT*)	**M014** Endotoxin Analysis
		M029 *Enterococci* (MFT*)	**M044** Group Allergen (Cat, Dog, Cockroach, Dust Mite)
M007 Culturable Fungi-Surface Samples (Genus ID & Count)		**M129** *Enterococci* (Enterolert P/A***)	**M095** Bacteroides
M008 Culturable Fungi-Surface Samples (Includes *Penicillum, Aspergillus, Cladosponum, Stachybotrys* Species ID & Count)		**M180** Real Time qPCR-ERMI 36 Panel	**Other** - See Analytical Price Guide for Test Code
		M025 Sewage Screen - Water (MFT*)	***Legionella Analysis*** Please use EMSL *Legionella* COC
M009 Bacteria Culture Gram Stain & Count		*MFT= Membrane Filtration Technique	
M010 Bacteria Count & ID - 3 Most Prominent		**MPN = Most Probable Number	
M011 Bacteria Count & ID - 5 Most Prominent		***P/A = Presence/Absence	

Sample #	Sample Location/Description	Sample Type (Matrix)	Potable / Non-Potable (Only for Water)	Test Code	Volume/Area	Date / Time Collected	Temperature (Lab Use Only)
Example: Sample 1	Kitchen	Water	Potable	M017	1,000 ml	1/1/2021 3:30pm	
3453 0037	Gymnasium	Air	N/A	M001	75L	3/14/23 @ 9:1	
3517 9760	Cafeteria	Air	N/A	M001	75L	3/14/23 @ 9:0	
3517 9767	Library/Media Center	Air	N/A	M001	75L	3/14/23 @ 9:2	
3517 9761	Room 13	Air	N/A	M001	75L	3/14/23 @ 9:3	
3517 9779	Room 7	Air	N/A	M001	75L	3/14/23 @ 9:4	
3517 9755	Room 4	Air	N/A	M001	75L	3/14/23 @ 10	

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc.)

Method of Shipment:		Sample Condition Upon Receipt	
Relinquished by: Mikal Frater	Date/Time: 3/14/23 @ 11	Received by:	Date/Time
Relinquished by	Date/Time.	Received by:	Date/Time '23MAR14 AM11:22

Controlled Document - COC-34 Micro R13 03/02/2021

☑ **AGREE TO ELECTRONIC SIGNATURE** (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc.'s Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to EMSL Analytical, Inc. constitutes acceptance and acknowledgment of all terms and conditions by Customer.

OrderID: 192302156

EMSL ANALYTICAL, INC.
TESTING LABS • PRODUCTS • TRAINING

Microbiology Chain of Custody Form

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077

PHONE: (800) 220-3675
EMAIL: CinnMicroLab@

EMSL Order Number / Lab Use Only

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

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc)

Sample #	Sample Location/Description	Sample Type (Matrix)	Potable / Non-Potable (Only for Water)	Test Code	Volume/Area	Date / Time Collected	Temperature (Lab Use Only)
3517 9782	Outdoors - Parking Lo	Air	N/A	M001	75L	3/13/23 @ 10	
3517 9777	BLANK	Air	N/A	M001	N/A	N/A	

Method of Shipment		Sample Condition Upon Receipt	
Relinquished by:	Date/Time:	Received by:	Date/Time
Relinquished by:	Date/Time:	Received by	Date/Time

Controlled Document - COC-34 Micro R13 3/02/2021

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OrderID: 192302156

EMSL ANALYTICAL, INC.
TESTING LABS • PRODUCTS • TRAINING

Microbiology Chain of Custody Form

EMSL Order Number / Lab Use Only

T92302156

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077

PHONE:(800) 220-3675
EMAIL.CinnMicroLab@

If Bill-To is the same as Report-To leave this section blank. Third-party billing requires written authorization.

Customer Information		Billing Information	
Customer ID		Billing ID:	
Company Name	ATI, Inc.	Company Name	ATI, Inc.
Contact Name	Mikal Frater	Billing Contact:	Courtney McCall
Street Address	4221 Forbes Blvd Suite 250	Street Address	4221 Forbes Blvd, Suite 250
City, State, Zip	Lanham, MD 20706	City, State, Zip	Lanham, MD 20706
Country	USA	Country	USA
Phone:	(848) 702-8621	Phone	
Email(s) for Report:	mikal@atiinc.com ; courtney@atiinc.com	Email(s) for Invoice	courtney@atiinc.com

Project Information

Project Name/No.	Brandywine Elementary School IAQ
Purchase Order	
EMSL LIMS Project ID. (If applicable, EMSL will provide)	
State Samples Collected.	MD
Zip Code Samples Collected.	20613
State of Connecticut (CT) must select project location	☐ Commercial (Taxable) ☐ Residential (Non-taxable)
Sampled By Name	Mikal Frater
Sampled By Signature	
No. of Samples in Shipment	8

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.**

Turn-Around-Time (TAT) Please call ahead for large projects and/or turnaround times 6 Hours or Less. *32 Hour TAT available for select tests only; samples must be submitted by 11:30am.

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MICROBIOLOGY TEST CODES

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M041 Fungal Direct Examination		**M015** Heterotrophic Plate Count	**M117** Sewage Screen - Swab (P/A***)
M169 Pollen ID & Enumeration		**M017** Total Coliform & *E. Coli* (Colilert P/A***)	**M013** Sewage Screen - Swab (MFT*)
M280 Dust Characterization Level-1		**M018** Total Coliform & *E. Coli* (MFT*)	**M730** *Methicillin-resistant Staph, aureus* (MRSA)
M281 Dust Characterization Level-2		**M114** Total Coliform & *E. Coli Enumeration (Colilert MPN**)*	**M031** Rapid-growing non-TB *Mycobacteria* Detection & Enumeration
M005 Viable Fungi-Air Samples (Genus ID & Count)		**M019** Fecal Coliform (MFT*)	
M006 Viable Fungi-Air Samples (Includes *Penicillum, Aspergillus, Cladosporium, Stachybotrys* Species ID & Count)		**M020** Fecal *Streptococcus* (MFT*)	**M014** Endotoxin Analysis
		M029 *Enterococci* (MFT*)	**M044** Group Allergen (Cat, Dog, Cockroach, Dust Mite)
M007 Culturable Fungi-Surface Samples (Genus ID & Count)		**M129** *Enterococci* (Enterolert P/A***)	**M095** Bacteroides
M008 Culturable Fungi-Surface Samples (Includes *Penicillum, Aspergillus, Cladosponum, Stachybotrys* Species ID & Count)		**M180** Real Time qPCR-ERMI 36 Panel	**Other** - See Analytical Price Guide for Test Code
		M025 Sewage Screen - Water (MFT*)	***Legionella Analysis*** Please use EMSL *Legionella* COC
M009 Bacteria Culture Gram Stain & Count		*MFT= Membrane Filtration Technique	
M010 Bacteria Count & ID - 3 Most Prominent		**MPN = Most Probable Number	
M011 Bacteria Count & ID - 5 Most Prominent		***P/A = Presence/Absence	

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3453 0037	Gymnasium	Air	N/A	M001	75L	3/14/23 @ 9:1	
3517 9760	Cafeteria	Air	N/A	M001	75L	3/14/23 @ 9:0	
3517 9767	Library/Media Center	Air	N/A	M001	75L	3/14/23 @ 9:2	
3517 9761	Room 13	Air	N/A	M001	75L	3/14/23 @ 9:3	
3517 9779	Room 7	Air	N/A	M001	75L	3/14/23 @ 9:4	
3517 9755	Room 4	Air	N/A	M001	75L	3/14/23 @ 10	

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc.)

Method of Shipment:		Sample Condition Upon Receipt	
Relinquished by: Mikal Frater	Date/Time: 3/14/23 @ 11	Received by:	Date/Time
Relinquished by	Date/Time.	Received by:	Date/Time '23MAR14 AM11:22

Controlled Document - COC-34 Micro R13 03/02/2021

☑ **AGREE TO ELECTRONIC SIGNATURE** (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc.'s Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to EMSL Analytical, Inc. constitutes acceptance and acknowledgment of all terms and conditions by Customer.

EMSL ANALYTICAL, INC.
TESTING LABS • PRODUCTS • TRAINING

Microbiology Chain of Custody Form

EMSL Order Number / Lab Use Only

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077

PHONE: (800) 220-3675
EMAIL: CinnMicroLab@

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

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc)

Sample #	Sample Location/Description	Sample Type (Matrix)	Potable / Non-Potable (Only for Water)	Test Code	Volume/Area	Date / Time Collected	Temperature (Lab Use Only)
3517 9782	Outdoors - Parking Lo	Air	N/A	M001	75L	3/13/23 @ 10	
3517 9777	BLANK	Air	N/A	M001	N/A	N/A	

Method of Shipment		Sample Condition Upon Receipt:	
Relinquished by:	Date/Time:	Received by:	Date/Time
Relinquished by:	Date/Time:	Received by	Date/Time

Controlled Document - COC-34 Micro R13 3/02/2021

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Appendix B: Instrument Calibration Records

Certificate of Calibration

(X) Buck™ BioAire Pump Calibration Rotameter

( ) Buck™ BioSlide Pump Calibration Rotameter

Serial number: R16046
Date Calibrated: 9/14/22 **Calibration Due Date:** 9/14/23

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: Bridget Bradell

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

BUCK

CERTIFICATE OF CALIBRATION

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

ACCREDITED ISO/IEC 17025 CALIBRATION LABORATORY

CUSTOMER NAME:
ATI INC C/O COURTNEY MCCALL 10205 SUTHERLAND RD SILVER SPRING MD 20901 USA

CERTIFICATE NUMBER	300452578
DATE OF CALIBRATION	26 SEPTEMBER, 2022
PAGE	1 OF 1

ENVIRONMENT CONDITIONS		
TEMPERATURE	74.27 (23.5)	°F (°C)
RELATIVE HUMIDITY	29	%RH
BAROMETRIC PRESSURE	29.04 (983.4)	inHg (hPa)

MODEL	7575-X
SERIAL NUMBER	7575X1711006

☒ AS LEFT ☐ AS FOUND

☒ IN TOLERANCE ☐ OUT OF TOLERANCE

– CALIBRATION VERIFICATION RESULTS –

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

METHOD USED: 10000006236

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	72.4 (22.4)	72.5 (22.5)	70.4~74.4 (21.3~23.6)				

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

METHOD USED: 10000006236

UNCERTAINTY: +/- 0.042 INHG

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	29.07 (984.4)	29.07 (984.4)	28.49~29.65 (964.8~1004.1)				

^ Circuit portion of temperature measurement only, not including probe.

† Excluded from ISO 17025 accreditation.

TSI Incorporated does hereby certify that the above described instrument conforms to the manufacturer's specifications (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to the International System of Units (SI) through the National Institute of Standards and Technology within the limitations of NIST's calibration services or have been derived from accepted values of natural physical constants or have been derived by the ratio type of self-calibration techniques. TSI is registered to ISO 9001:2015. TSI is accredited to ISO 17025:2017 by ANAB Certificate Number AC-2850.

The aforementioned uncertainty values represent expanded uncertainty and are based on a standard uncertainty multiplied by a coverage factor k=2 providing a confidence level of approximately 95%. This report may not be reproduced unless permission is obtained in writing from the TSI calibration service department issuing this report. The unit is found to have passed when the readings are within the specification limits of the device as presented as the allowable range stated with each measurement above. The customer shall assess the results and uncertainty in order to determine if the results meet their needs.

Measurement Variable	System ID	Last Cal.	Cal. Due	Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E002827	04-25-22	04-30-23	Pressure	E005254	10-29-21	10-31-22
Pressure	E003982	07-19-22	01-31-23	DC Voltage	E003493	06-08-22	06-30-23

Performed By	Signature	Approved By	Signature	Date Issued
Chimova Vue	Chimova Vue	Calvin Vu	Calvin Vu	9/26/22

DOC. ID: CERT_GEN_WCC
END OF REPORT

TSI P/N 2300157

CERTIFICATE OF CALIBRATION

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

ANAB ACCREDITED ISO/IEC 17025 CALIBRATION LABORATORY

CUSTOMER NAME:	
ATI INC C/O COURTNEY MCCALL 10205 SUTHERLAND RD SILVER SPRING MD 20901 USA	

CERTIFICATE NUMBER	300452578
DATE OF CALIBRATION	26 SEPTEMBER, 2022
PAGE	1 OF 1

ENVIRONMENT CONDITIONS		
TEMPERATURE	73.75 (23.2)	°F (°C)
RELATIVE HUMIDITY	29	%RH
BAROMETRIC PRESSURE	29.05 (983.7)	inHg (hPa)

MODEL	7575-X
SERIAL NUMBER	7575X1711006

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

– CALIBRATION VERIFICATION RESULTS –

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

METHOD USED: 10000006236

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	72.5 (22.5)	72.3 (22.4)	70.5~74.5 (21.4~23.6)				

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

METHOD USED: 10000006236

UNCERTAINTY: +/- 0.042 INHG

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	29.07 (984.4)	29.07 (984.4)	28.49~29.65 (964.8~1004.1)				

^ Circuit portion of temperature measurement only, not including probe.

† Excluded from ISO 17025 accreditation.

TSI Incorporated does hereby certify that the above described instrument conforms to the manufacturer's specifications (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to the International System of Units (SI) through the National Institute of Standards and Technology within the limitations of NIST's calibration services or have been derived from accepted values of natural physical constants or have been derived by the ratio type of self-calibration techniques. TSI is registered to ISO 9001:2015. TSI is accredited to ISO 17025:2017 by ANAB Certificate Number AC-2850.

The aforementioned uncertainty values represent expanded uncertainty and are based on a standard uncertainty multiplied by a coverage factor k=2 providing a confidence level of approximately 95%. This report may not be reproduced unless permission is obtained in writing from the TSI calibration service department issuing this report. The unit is found to have passed when the readings are within the specification limits of the device as presented as the allowable range stated with each measurement above. The customer shall assess the results and uncertainty in order to determine if the results meet their needs.

Measurement Variable	System ID	Last Cal	Cal. Due	Measurement Variable	System ID	Last Cal	Cal. Due
Temperature	E002827	04-25-22	04-30-23	Pressure	E005254	10-29-21	10-31-22
Pressure	E003982	07-19-22	01-31-23	DC Voltage	E003493	06-08-22	06-30-23

Performed By	Signature	Approved By	Signature	Date Issued
Chinaza Vue	Chinaza Vue	Calvin Vu	Calvin Vu	9/26/22

DOC. ID: CERT_GEN_WCC
END OF REPORT

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	75.0 (23.9)	°F (°C)
Relative Humidity	30	%RH
Barometric Pressure	29.06 (984.1)	inHg (hPa)

Model	982
Serial Number	P17100007

☒ As Left ☐ As Found

☒ In Tolerance ☐ Out of Tolerance

– Calibration Verification Results –

Humidity Verification — System H-120 — *Unit: %RH*

#	Standard	Measured	Allowable Range	#	Standard	Measured	Allowable Range
1	10.0	8.4	7.0~13.0	4	70.0	68.7	67.0~73.0
2	30.0	29.6	27.0~33.0	5	90.0	88.4	87.0~93.0
3	50.0	50.1	47.0~53.0				

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

#	Standard	Measured	Allowable Range	#	Standard	Measured	Allowable Range
1	32.0 (0.0)	31.7 (−0.2)	31.0~33.0 (−0.5~0.6)	2	139.8 (59.9)	140.1 (60.1)	138.8~140.8 (59.4~60.5)

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

#	Standard	Measured	Allowable Range	#	Standard	Measured	Allowable Range
1	0	0	0~50	4	2998	3003	2908~3087
2	495	492	445~545	5	5028	5031	4877~5179
3	997	1005	947~1047				

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

#	Standard	Measured	Allowable Range	#	Standard	Measured	Allowable Range
1	35	36	32~38	2	100	99	97~103

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
Humidity	E002008	08-17-22	02-28-23
Temperature	E010658	02-28-22	02-28-23
5000 CO_2	150077	02-04-22	02-04-30
N_2	UT-162	09-12-22	09-12-27
Flow	E005600	11-05-21	11-30-22
Flow	E003981	12-28-21	12-31-22
2000 C4H8	CC716226	02-09-21	02-09-29

Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E010657	02-28-22	02-28-23
Temperature	E010656	02-10-22	02-28-23
200 CO	149909	07-08-22	07-09-30
Air	CT308699	05-12-22	05-12-30
Flow	E003502	08-11-22	08-31-23
Flow	E003341	02-01-22	02-28-23
100 C4H8	cc75356	11-27-20	11-27-28

Haynlay
Calibrated

September 27, 2022
Date

Doc. ID: CERT_GEN_WCC

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	73.9 (23.3)	°F (°C)
RELATIVE HUMIDITY	28	%RH
BAROMETRIC PRESSURE	29.05 (983.7)	inHg (hPa)

MODEL	982
SERIAL NUMBER	P17100007

☐ AS LEFT ☒ AS FOUND

☐ IN TOLERANCE ☒ 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	2997	2920	2907~3087
2	496	472	446~546	5	5028	* 4871.6	4877.2~5178.8
3	996	977	946~1046				

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	35	37	32~38	2	100	101	97~103

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	32.0 (0.0)	32.9 (0.5)	31.0~33.0 (−0.5~0.6)	2	139.84 (59.91)	* 141.28 (60.71)	138.84~140.84 (59.36~60.47)

HUMIDITY AS FOUND — SYSTEM H-120 — *Unit: %RH*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	10.0	8.4	7.0~13.0	4	70.0	68.7	67.0~73.0
2	30.0	29.6	27.0~33.0	5	90.0	88.4	87.0~93.0
3	50.0	50.1	47.0~53.0				

**Indicates Out-of-Tolerance Condition*

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Measurement Variable	System ID	Last Cal.	Cal. Due
5000 CO_2	150077	02-04-22	02-04-30
N2	UT-162	09-12-22	09-12-27
Flow	E005600	11-05-21	11-30-22
Flow	E003981	12-28-21	12-31-22
2000 C4H8	CC716226	02-09-21	02-09-29
Temperature	E010657	02-28-22	02-28-23
Temperature	E010656	02-10-22	02-28-23

Measurement Variable	System ID	Last Cal.	Cal. Due
200 CO	149909	07-08-22	07-09-30
Air	C5757028	07-21-22	07-21-30
Flow	E003502	08-11-22	08-31-23
Flow	E003341	02-01-22	02-28-23
100 C4H8	cc75356	11-27-20	11-27-28
Temperature	E010658	02-28-22	02-28-23
Humidity	E002008	08-17-22	02-28-23

Hayslay
VERIFIED

September 26, 2022
DATE

DOC. ID: CERT_GEN_WCC

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