ati INC
Architecture | Engineering | Construction

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March 1, 2021

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

RE: Indoor Air Quality Assessment, Bradbury Heights Elementary School
Purchase Order: 734977
ATI Project Number: 21-609

Dear Mr. Baylor:

Prince George's County Public Schools requested that ATI, Inc., conduct a proactive indoor air quality (IAQ) assessment at Bradbury Heights Elementary School on January 27, 2021 and a follow-up assessment on February 24, 2021. The assessments' key findings are enclosed in the Executive Summary on page three, and the official laboratory reports for total fungal spore trap sampling are 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.

Brian Chapman
Industrial Hygienist

Reviewed By:

Nate Burgei, CIH, CSP
Certified Industrial Hygienist

Indoor Air Quality Assessment Report

Prince George's County Public Schools
Bradbury Heights Elementary School
1401 Glacier Ave.
Capitol Heights, MD 20743

Prepared for:

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

March 1, 2021

Submitted by:

ATI Job # 21-609

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Appendices

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
LOA	Large Occupied Area

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
SF^2	Square feet

1 Executive Summary

ATI conducted a proactive Indoor Air Quality (IAQ) assessment on January 27, 2021, at Bradbury Heights Elementary School, located at 1401 Glacier Ave, in Capitol Heights, Maryland, and a follow-up assessment on February 24, 2021 in select rooms that had unusual results in the initial inspection.

The initial assessment on January 27, 2021 included a visual assessment of randomly selected classrooms and other frequently occupied spaces, such as the cafeteria/gym, the main office, and randomly selected classrooms, for potential IAQ contributors and pathways. The Main Office and Media Center had unusual fungal spore concentrations during the initial assessment and were selected for a follow-up assessment after actions were taken to reduce the presence of mold and repair any water issues discovered. On February 24, 2021, these two rooms were reassessed to determine if the mold remediation actions were sufficient. As part of both assessments, 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 these assessments:

1. Four of the tested spaces had a temperature lower than the ASHRAE recommended winter range of 68-75°F during the initial assessment. At the February reassessment both locations were within the ASHRAE winter range 68-75°F.
2. The relative humidity in all tested spaces was less than the ASHRAE guidelines of ≤ 65%, but also less than 30%, which can cause occupant discomfort. Additionally, the two tested locations for the reassessment were less than 30%. Low humidity levels in the building on February 24, 2021 could be due to the low humidity outdoors.
3. Carbon dioxide concentrations in all tested spaces were less than the ASHRAE limit for carbon dioxide, which was 1,072 parts per million (PPM) for the day of the initial assessment and 1,095 PPM for the reassessment.
4. Carbon monoxide concentrations were less than the IAQ meter's detection limit throughout the tested spaces.
5. The spore trap sampling results from January 27, 2021 suggested potential indoor *Aspergillus/Penicillium*-like spore amplification in the Main Office and the Media Room, based on the sampling results. Both areas were selected to be addressed and reassessed after remediation actions were completed. The other tested spaces had mold spore concentrations that were typical for occupied spaces.
6. The *Aspergillus/Penicillium* spore concentrations in the Main Office was significantly less at 106 spores/m^3, which originally had a concentration of 2,597 spores/m^3 on January 27, 2021. No *Aspergillus/Penicillium*-like spores were detected in the sample collected in the Media Room. Because of the favorable decrease in spore counts after mold remediation actions, ATI has no additional cleaning or sampling recommendations at this time.

2 Assessment Methods

Mikal Frater, IH of ATI, Inc. conducted the initial visual assessment and air sampling on January 27, 2021. 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. Mr. Brian Chapman conducted a follow-up inspection on February 24, 2021 in the Main Office and Media Room after the areas were treated for elevated airborne fungal contamination. 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 field calibrated 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. AMA Analytical Services, Inc. of Lanham, MD analyzed the samples using direct microscopic examination per ASTM D7391, which spores both viable and non-viable mold spores and particulates, which combined yields total fungal results. AMA 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 AMA laboratory reports are included in Appendix A.

3 Visual Observations

Table 1 lists the areas, conditions, observations, and other pertinent details related to the initial and follow-up IAQ assessments. On both dates of sampling, few occupants were present in the school because of the COVID-19 global pandemic.

Table 1: Visual Observations and Sampling Locations

Sample Location	January 27, 2021 Observations
Outdoors – Parking Lot	• Cloudy skies, winds 9mph NW • Heavy vehicle traffic, moderate foot traffic • Car explosion occurred in parking lot day prior to assessment
Main Office	• Light foot traffic • Three occupants during assessment • Door to corridor open at time of assessment, doors to adjoining rooms open • Faux plants on desktops • No stained ceiling tile, visible growth, or odor observed • Space is approximately 578 ft.^{2}
Room 5	• One occupant at time off assessment • Scattered light brown ceiling tile stains • Wall unit is on during assessment, some rust and dirt accumulation observed • No odor or growth observed • Space is approximately 816 ft.^{2}
Media Center	• Six occupants at time of assessment • Door to parking lot open • Six air supplies, one air return • Trace dust accumulation in this space • Few light brown stained ceiling tiles, one ceiling tile with hole – likely removal of sprinkler • No observed growth or mold • Space is approximately 1,472 ft.^{2}
Gym/Cafe	• Five occupants at time of assessment • Sample collected on cafeteria side • Panel wall open to expose one large area • Eight air suppliers, four air returns • Missing ceiling tile observed • No stained ceiling tile, visible growth, or odor observed
Room 27	• No stained ceiling tiles, observed odor or visible growth • One occupant at time of assessment • One air supplier in the form of a wall unit – on during assessment

Sample Location	January 27, 2021 Observations
	• Light dust accumulation observed • Space is approximately 864 ft.^{2}
Room 19	• One occupant at time of assessment • One air supplier in the form of a wall unit with moderate dust accumulation • Wall unit covered in books • Door to corridor open at time of assessment • No stained ceiling tiles, observed odor or visible growth • Doors to adjoining rooms open • Space is approximately 864 ft.^{2}
Sample Location	**February 24, 2021 Reassessment Observations**
Outdoors	• Partly cloudy skies with S winds averaging 7MPH and dew point pressure at 31°
Main Office	• Area is equipped with two overhead air-diffusers and with seven overhead light fixtures accompanied with air-return slats per light • Three rooms adjacent to the main office space • Two door entry ways to the office, which gives a cross breeze from the two adjacent corridors • No known concerns at the time of the assessment
Media Center	• There are five overhead air-diffusers and sixteen overhead light fixtures, which each light is equipped with an air-return • Area is being used for large quantities of new school supplies and books; assuming the school is prepping for school to resume • No known issues at the time of the assessment

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 January 27, 2021 initial assessment and reassessment from February 24, 2021 are summarized in Table 2. As indicated by the data in the table, temperatures in the school on January 27 averaged between 57°F and 71°F, with four tested locations measuring less than the ASHRAE recommended winter range.

ATI reassessed select rooms that had unusual fungal spore concentrations on February 24, 2021 after remediation actions were completed. At that time, the temperatures in the two designated locations were reevaluated. The average

temperatures in the locations ranged between 69°F and 70°F, which is within the ASHRAE recommended winter temperature range, between 68 - 75°F.

Table 2: Temperature

Sample Location	1/27/2021 Initial Assessment °F			ASHRAE Standard °F
	Min.	Max.	Avg.	
Outdoors	44	47	46	N/A
Indoors				
Main Office	63	63	63	68-75°F
Room 5	65	65	65	68-75°F
Media Center	57	57	57	68-75°F
Gym/Cafe	64	64	64	68-75°F
Room 27	70	71	71	68-75°F
Room 19	70	71	71	68-75°F
02/24/2021 Reassessment °F				
Outdoors	52	52	52	N/A
Indoors				
Main Office	68	70	69	68-75°F
Media Center	70	70	70	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 greater than 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 for January 27, 2021 and February 24, 2021 are summarized in Table 3. As indicated by the data in the table, the average relative humidity ranged between 25% and 38% with all tested locations measuring less than the ASHRAE maximum recommendation of 65% relative humidity, and two tested locations measuring less than 30% relative humidity.

ATI reassessed select rooms that had unusual fungal spore concentrations on February 24, 2021 after remediation actions were completed. ATI also reassessed the relative humidity in the spaces, and the average relative humidity ranged between 22% and 26% with both tested locations measuring less than the ASHRAE maximum recommendation of 65% relative humidity and less than 30% relative humidity.

Table 3: Relative Humidity

Sample Location	1/27/2021 Initial Assessment (% RH)			ASHRAE Standard (% RH)
	Min.	Max	Avg.	
Outdoors	36	38	37	N/A
Indoors				
Main Office	37	39	38	≤ 65
Room 5	30	31	31	≤ 65
Media Center	32	32	32	≤ 65

Sample Location	1/27/2021 Initial Assessment (% RH)			ASHRAE Standard (% RH)
	Min.	Max	Avg.	
Gym/Cafe	33	33	33	≤ 65
Room 27	24	25	25	≤ 65
Room 19	25	25	25	≤ 65
02/24/2021 Reassessment (%RH)				
Outdoors	26	28	27	N/A
Indoors				
Main Office	22	22	22	≤ 65
Media Center	26	26	26	≤ 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 for January 27, 2021 are summarized in Table 4. On the day of the assessment, the average outdoor carbon dioxide concentration was 372 ppm, which calculates to a maximum indoor concentration of 1,072 ppm (700 + 372). All tested locations indoors were less than the recommended maximum for the day of the assessment.

ATI reassessed select rooms that had unusual fungal spore concentrations on February 24, 2021 after remediation actions were completed. The carbon dioxide concentrations measured during the reassessment are included in Table 4. The average outdoor carbon dioxide concentration on February 24, 2021 was 395 ppm, which calculates to a maximum indoor concentration of 1,395 ppm (700 + 395). All tested locations indoors were less than the recommended maximum for the day of the reassessment.

Table 4: Carbon Dioxide

Sample Location	1/27/2021 Initial Assessment Concentration (parts per million)			ASHRAE Standard (ppm) NTE
	Min.	Max.	Avg.	
Outdoors	361	382	372	N/A
Indoors				
Main Office	397	405	401	< 1,072
Room 5	418	431	425	< 1,072
Media Center	372	375	374	< 1,072
Gym/Cafe	504	516	510	< 1,072
Room 27	429	432	431	< 1,072
Room 19	424	438	431	< 1,072

Sample Location	1/27/2021 Initial Assessment Concentration (parts per million)			ASHRAE Standard (ppm) NTE
	Min.	Max.	Avg.	
02/24/2021 Reassessment Concentration (parts per million)				
Outdoors	389	401	395	N/A
Indoors				
Main Office	510	540	525	< 1,095
Media Room	448	462	455	< 1,095

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 for January 27, 2021 were less than the Q-Trak's detection limit throughout the school.

ATI reassessed select rooms that had unusual fungal spore concentrations on February 24, 2021 after remediation actions were completed. The carbon monoxide concentrations measured during the reassessment are included in Table 5. The carbon monoxide concentrations from the reassessment were also less than the Q-Trak's limit of detection and less than the EPA/ASHRAE recommended maximum of 9 ppm.

Table 5: Carbon Monoxide

Sample Location	1/27/2021 Initial Assessment Concentration (parts per million)			ASHRAE Standard (ppm)
	Min.	Max.	Avg.	
Outdoors	< 3	< 3	< 3	N/A
Indoors				
Main Office	< 3	< 3	< 3	< 9
Room 5	< 3	< 3	< 3	< 9
Media Center	< 3	< 3	< 3	< 9
Gym/Cafe	< 3	< 3	< 3	< 9
Room 27	< 3	< 3	< 3	< 9
Room 19	< 3	< 3	< 3	< 9
02/24/2021 Reassessment Concentration (parts per million)				
Outdoors	< 3	< 3	< 3	N/A
Indoors				
Main Office	< 3	< 3	< 3	< 9
Media Room	< 3	< 3	< 3	< 9

5 Total Fungal Air Sampling Results

Mold is carried indoors through building entrances, open windows, loading docks, foot traffic into buildings, and the HVAC system. To thrive indoors, mold requires a food source, proper temperature and humidity to foster its growth.

The January 27, 2021 and February 24, 2021 mold assessments 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 results from January 27, 2021 suggested unusual mold spore concentrations in two locations: Main Office and Media Center. The total ambient, outdoor spore concentration was 1,007 spores/m^3. The Media Center had the greatest total spore concentration of 3,445 spores/m^3, with *Aspergillus/Penicillium*-like spores being the predominant spores present at 1,802 spores/m^3. The Main Office had a total spore concentration of 2,597 spores/m^3, with *Aspergillus/Penicillium*-like being the predominant spore type at 1,272 spores/m^3.

The fungal spore concentrations in the Main Office and Media Center on January 27, 2021 were slightly greater than typical indoor mold concentrations of around 1,000 spores/m^3 or less; however, the concentrations measured in those rooms do not suggest significant mold growth and could be residual spores from prior growth, or possibly trivial amounts of mold growth in or near these spaces. ATI recommended evaluating these tested spaces and the surrounding areas to try and identify water sources, abate any mold issues and clean the area before retesting the space.

The Main Office and the Media Room were reassessed on February 24, 2021 after the initial assessment indicated the unusual presence of airborne mold spores. The Main Office had a significant drop in concentration for *Aspergillus/Penicillium* from 2,597 spores/m^3 to 106 spores/m^3, and the Media Center had no detectable *Aspergillus/Penicillium*-like spores on the sample. The differences in concentrations from the initial assessment and reassessment are summarized in Table 6. Because of the favorable decrease in spore counts, ATI has no additional cleaning or testing recommendations.

Table 6: *Aspergillus/Penicillium* Concentration Comparison

Sample Location	January 27, 2021 Concentrations	February 24, 2021 Concentrations	% Change
Main Office	2,597	106	- 96%
Media Center	3,445	0	- 100%

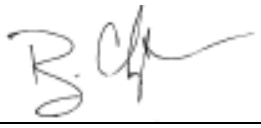
The official laboratory reports with spore trap samples collected on January 27, 2021 and February 24, 2021 are presented in Appendix A.

6 Summary of Findings

1. Four of the tested spaces had a temperature lower than the ASHRAE recommended winter range of 68-75°F during the initial assessment and the reassessment both locations were within ASHRAE winter range 68-75°F.
2. The relative humidity in all tested spaces was less than the ASHRAE guidelines of ≤ 65%, but also less than 30%, which can cause occupant discomfort. Additionally, the two tested locations for the reassessment were less than 30%. Low humidity levels in the building on February 24, 2021 could be due to the low humidity outdoors.
3. Carbon dioxide concentrations in all tested spaces were less than the ASHRAE limit for carbon dioxide, which was 1,072 parts per million (PPM) for the day of the initial assessment and 1,095 PPM for the reassessment.
4. Carbon monoxide concentrations were less than the IAQ meter's detection limit throughout the tested spaces.
5. The spore trap sampling results from January 27, 2021 suggested potential indoor *Aspergillus/Penicillium*-like spore amplification in the Main Office and the Media Room, based on the sampling results. Both areas were selected to be addressed and reassessed after remediation actions were completed. The other tested spaces had mold spore concentrations that were typical for occupied spaces.
6. The *Aspergillus/Penicillium* spore concentrations in the Main Office was significantly less at 106 spores/m^3, which originally had a concentration of 2,597 spores/m^3 on January 27, 2021. No *Aspergillus/Penicillium*-like spores were detected in the sample collected in the Media Room. Because of the favorable decrease in spore counts after mold remediation actions, ATI has no additional cleaning or sampling recommendations at this time.

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

Best,
ATI, INC.



Brian Chapman
Industrial Hygienist

Appendix A: Laboratory Report and Chain of Custody

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285332	**Job Name:**	Bradbury Heights Elementary School IAQ	**Date Submitted:**	01/27/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-609	**Date Analyzed:**	01/31/2021
		P.O. Number:	Not Provided	**Report Date:**	01/31/2021
Attention:	Mikal Frater				

AMA Sample #	285332-1	**AMA Sample #**	285332-2	**AMA Sample #**	285332-3
Client ID	21-609-1	**Client ID**	21-609-2	**Client ID**	21-609-3
Analyst ID	CD	**Analyst ID**	CD	**Analyst ID**	CD
Collection Apparatus	Air-O-Cell	**Collection Apparatus**	Air-O-Cell	**Collection Apparatus**	Air-O-Cell
Sample Volume (L)	75	**Sample Volume (L)**	0	**Sample Volume (L)**	75
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	2	**Debris Loading**	0	**Debris Loading**	2
Location	Parking Lot	**Location**	Field Blank	**Location**	Main Office

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	5	15	53	265	26.3%
Basidiospores	9	15	53	477	47.4%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	4	15	53	212	21.1%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Nigrospora	1	15	53	53	5.3%
Bispora					
Hyphal Fragments*					
Total Raw Ct:	19	**Total sp/m³:**	1007		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores					
Basidiospores					
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus					
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Nigrospora					
Bispora					
Hyphal Fragments*					
Total Raw Ct:	0	**Total sp/m³:**	0		

Comments
No mold spores observed

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	13	15	53	689	26.5%
Basidiospores	10	15	53	530	20.4%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	53	53	2%
Curvularia					
Penicillium / Aspergillus	24	15	53	1272	49%
Smuts/Periconia/Myxomycetes	1	15	53	53	2%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Nigrospora					
Bispora					
Hyphal Fragments*	1	15	53	53	2%
Total Raw Ct:	49	**Total sp/m³:**	2597		

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody: 285332
Client: ATI, Inc.
Address: 9220 Rumsey Road
Suite 100
Columbia, MD 21045
Attention: Mikal Frater

Job Name: Bradbury Heights Elementary School IAQ
Job Location: Not Provided
Job Number: 21-609
P.O. Number: Not Provided

Date Submitted: 01/27/2021
Person Submitting: Mikal Frater
Date Analyzed: 01/31/2021
Report Date: 01/31/2021

AMA Sample #	285332-4
Client ID	21-609-4
Analyst ID	CD
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	1
Location	Room 5

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	2	15	53	106	18.2%
Basidiospores	5	15	53	265	45.5%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	4	15	53	212	36.4%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Nigrospora					
Bispora					
Hyphal Fragments*					

Total Raw Ct: 11 **Total sp/m^3:** 583

Comments

AMA Sample #	285332-5
Client ID	21-609-5
Analyst ID	CD
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	2
Location	Media Center

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	13	15	53	689	20%
Basidiospores	17	15	53	901	26.2%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	53	53	1.5%
Curvularia					
Penicillium / Aspergillus	34	15	53	1802	52.3%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Nigrospora					
Bispora					
Hyphal Fragments*					

Total Raw Ct: 65 **Total sp/m^3:** 3445

Comments

AMA Sample #	285332-6
Client ID	21-609-6
Analyst ID	CD
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	2
Location	Gym/Cafe

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	14	15	53	742	31.8%
Basidiospores	21	15	53	1113	47.7%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	7	15	53	371	15.9%
Smuts/Periconia/Myxomycetes	1	15	53	53	2.3%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Nigrospora					
Bispora	1	15	53	53	2.3%
Hyphal Fragments*					

Total Raw Ct: 44 **Total sp/m^3:** 2332

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285332	**Job Name:**	Bradbury Heights Elementary School IAQ	**Date Submitted:**	01/27/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-609	**Date Analyzed:**	01/31/2021
		P.O. Number:	Not Provided	**Report Date:**	01/31/2021
Attention:	Mikal Frater				

AMA Sample #	285332-7	**AMA Sample #**	285332-8
Client ID	21-609-7	**Client ID**	21-609-8
Analyst ID	CD	**Analyst ID**	CD
Collection Apparatus	Air-O-Cell	**Collection Apparatus**	Air-O-Cell
Sample Volume (L)	75	**Sample Volume (L)**	75
Sample Condition	Acceptable	**Sample Condition**	Acceptable
Debris Loading	1	**Debris Loading**	1
Location	Room 27	**Location**	Room 19

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	1	15	53	53	9.1%
Basidiospores	3	15	53	159	27.3%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	7	15	53	371	63.6%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Nigrospora					
Bispora					
Hyphal Fragments*					
Total Raw Ct:	11		**Total sp/m^3:**	583	

Comments
Light Trace

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	2	15	53	106	15.4%
Basidiospores	1	15	53	53	7.7%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	10	15	53	530	76.9%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Nigrospora					
Bispora					
Hyphal Fragments*	1	15	53	53	7.7%
Total Raw Ct:	13		**Total sp/m^3:**	689	

Comments
Light Trace

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285332	**Job Name:**	Bradbury Heights Elementary School IAQ	**Date Submitted:**	01/27/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-609	**Date Analyzed:**	01/31/2021
		P.O. Number:	Not Provided	**Report Date:**	01/31/2021
Attention:	Mikal Frater				

Spore Comparison Guide

The criteria for these specifications are outlined, but not limited to those listed, below. Final specifications may differ from the listed criteria for certain samples. AMA Analytical Services, Inc. reserves the right to make changes to these criteria at any time without notice.

Normal ecology	Slightly above normal ecology	Moderately above normal ecology	Substantially above normal ecology

Stachybotrys / Memnoniella, and Chaetomium	**Other Spores* (Control Present)**	**Other Spores* (No Control)**
1-4 Spores: Yellow 5-9 Spores: Orange 10+ Spores: Red	< 10 Spores: Insignificant (no color) <= Control's spore count: Green Between Control and 2x Control: Yellow Between 2x Control and 3x Control: Orange 3x+ Control: Red	< 10 Spores: Insignificant (no color) 10-20 Spores: Yellow 20-50 Spores: Orange 50+ Spores: Red

*No evalutation is provided for the following spore types: Other, Other Colorless, and Unknown Fungi, and Misc

Interpretation of the data contained in this report is the sole responsibility of the client or the persons who conducted the field work. There are no federal or national standards for the number of fungal spores that may be present in the indoor environment. As a general rule and guideline that is widely accepted in the indoor air quality field, the numbers and types of spores that are present in the indoor environment should be comparable to those that are present outdoors at any given time. There will always be some mold spores present in "Normal" indoor environments. The purpose of sampling and counting spores is to help determine whether an abnormal condition exists within the indoor environment and if it does, to help pinpoint the area of contamination. Spore counts should not be used as the sole determining factor of mold contamination. There are many factors that can cause anomalies in the comparison of indoor and outdoor samples due to the dynamic nature of both of those environments.

This report is provided for informational and comparative purposes only and should not be relied upon for any other purpose. Sampling techniques, possible contaminants, unrepresentative samples and other similar or dissimilar factors may affect these results. With the statistical evaluation provided, as with all statistical comparisons and analyses, false-positive and false-negative results can and do occur. AMA Analytical Services, Inc. hereby disclaims any liability for any and all direct, indirect, punitive, incidental, special or consequential damages arising out of the use or interpretation of the data contained in, or any actions taken or omitted in reliance upon, this report.

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285332	**Job Name:**	Bradbury Heights Elementary School IAQ	**Date Submitted:**	01/27/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-609	**Date Analyzed:**	01/31/2021
		P.O. Number:	Not Provided	**Report Date:**	01/31/2021
Attention:	Mikal Frater				

General Comments, Disclaimers, and Footnotes

Analytical Method: Sample are analyzed following the instructions and guidelines outlined in ASTM 7391-09.

Sample Condition: Acceptable: The sample was collected and delivered to the our location without disturbing the material on the sampling media.
Unacceptable: 1. The sample trace (TR) has been disturbed. 2. The sample was damaged or otherwise unsuitable for analysis.
0 = No particulate matter detected; 1= >nd-~5% Particulate Loading; 2 = ~5%-25% Particulate Loading; 3 = ~25%- 75% Particulate Loading; 4 = ~75%-90% Particulate Loading; 5 = >90% Particulate Loading

Spore Notes: Based on their small size and very few distinguishing characteristics, Aspergillus and Penicillium cannot be differentiated by non-viable sampling methods. There are other types of spores whose morphology is similar to Aspergillus and Penicillium and cannot be differentiated by non-viable sampling methods. Examples of these similar spores are Acremonium, Paecilomyces, Wallemia, Trichoderma, Scopulariopsis, and Gliocladium.
Smuts, Periconia and Myxomycetes are three different types of genera that have similar morphological characteristics.
Bipolaris/Dreschlera/Helm: Bipolaris / Dreschlera / Helminthosporium are three different types of genera that have smiliar morphological characteristics.
Other Colorless represents all colorless spores that are non-distinctive and unidentifiable.
*Hyphal Fragments: A portion of the mycelium that becomes separated from the remainder of the thallus (vegetative body), each of which has the capacity to grow and form new individuals. Results for hyphal fragments are in fragments/m3 and are not incorporated in the total spore concentration.
The droplet symbol (💧) refers to water-intrusion indicator spores. These fungal spores, when found on indoor air samples, can be an indication of moisture sources and resultant fungal growth that may be problematic.

Quantification: Analytical Sensitivity (A.S.): This is dependent on the volume of air collected, size of the trace, ocular diameter, and the amount of the trace that was analyzed.
The value of "Present" indicated in the Raw Count column represents the presence of this spore type during the preliminary exam at 400x. The Raw Count converts to a whole number if the spore type is encountered again during the 600x-1,000x enumeration. The sp/m3concentration will be reported as less than the analytical sensitivity if "Present" is reported in the Raw Count.
Results are reported to 3 significant figures. sp/m3: Spores per cubic meter.
Uncertainty: for raw count in the range of 0-50 the SR is 0.375, 51-100 SR=0.333, 101-200 SR=0.257, >200 SR=0.245
All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.
Analyst(s): Christopher Dell

Technical Director Tristan Ward

MOLD SPORE DESCRIPTIONS

Ascospores

Ascospores are spores formed inside an ascus (asci-plural) or sac-like cell which is contained inside a fruiting body called an ascocarp or an ascoma (ascomata-plural). An ascus typically contains a definite nuimber of ascospores, usually eight. Ascospores are unique in shape, size, and color as to the Genus/species they represent. These spores are specific to fungi classified as Ascomycetes. They are ubiquitous in nature. Many decay organic matter, others are plant or animal pathogens. They can grow indoors on damp materials. Release of ascospores are released by forcible ejection and dispersed by wind, water, animals and other agents. Health Effects: Depending on the Genera, Ascospores may be allergenic.

Basidiospores

Basidiospores are reproductive spores produced by a group of fungi called basidiomycetes. This group includes the mushrooms, shelf fungi and various other macrofungi. Basidipspores serve as the main air (wind) dispersal units for the fungi and their release is dependent upon moisture. The structure of the spore complex can develop in various manners resulting in different appearances. It is often found growing in soil, decaying plant debris, compost piles and fruit rot. Indoors, it can be found on water damaged building materials (chipboard /OSB, plywood, wallpaper, and glue) as well as on food items (dried foods, cheeses, fruits, herbs, spices, cereals). Health effects: Some basidiospores may produce toxins and can act as allergens. They have not been reported to be pathogens.

Bispora

Bispora is a widespread mitosporic fungus. It is found on dead wood and soil. Spores are brown, ellipsoidal, usually two-celled, with a thick dark brown septum or band.

Cladosporium

Cladosporium is the most common indoor and outdoor mold. The spores are wind dispersed and are often extremely abundant in outdoor air. Many species are commonly found on living and dead plant material. Indoors, they may grow on surfaces with high moisture or high humidity levels such as damp window sills, poorly ventilated bathrooms and soiled refrigerators. It produces powdery or velvety olive-green to brown or black colonies. The conidia (spores) vary depending on the species and are formed in simple or branching chains with multi-attachment points. Health Effects: Cladosporium species are rarely pathogenic to humans, but have been reported to occassionally cause sinusitis and pulmonary infections as well as infections of the skin and toenails. The airborne spores are significant allergens, and in large amounts they may severely affect asthmatics and people with respiratory diseases.

Hyphal Fragments

Hyphal Fragments are segments or pieces of hyphae or mycelium that may have broken off during sampling (air, tape, dust). The mycelium is the entire mass of hyphae that makes up the vegetative body of a fungus. The presence of hyphal fragments may indicate the presence of viable mold.

Nigrospora

Nigrospora is a ubiquitous, filamentous, dark colored fungus commonly isolated from soil, decaying plants, and seeds. Indoors, it is considered a laboratory contaminant. Colonies grow rapidly, initially white and woolly, later turning gray with black areas, and eventually turning black (both front and reverse). Its conidia are black, solitary, unicellular, slightly flattened horizontally, and have a thin equatorial germ slit. Health Effects: This mold may be a potential allergen. It is uncertain whether it is pathogenic to humans.

Penicillium/Aspergillus Like

Penicillium and Aspergillus are ubiquitous, filamentous fungi that are found in soil, decaying plant debris, compost piles, and in the air. Indoors, spores are commonly found in house dust, in water-damaged buildings (wallpaper, wallpaper glue, decaying fabrics, moist chipboards, and behind paint) as well as fruit and grains. They are the most common fungal genera, worldwide. Both produce chains of spores that are small, round to oval, colorless or slightly pigmented, and smooth to rough walled. These spores are indistinguishable between the two as well as other genera, such as Gliocladium, Trichoderma, Paecilomyces, and Scopulariopsis. They differ as to their conidiophores or fruiting bodies. While, Aspergillus spores are produced from phialides supported on conidia heads or swollen vesicles, Penicillium spores are produced on finger-like projections. Depending on species, typical colonies of Aspergillus are initially white and later turn to either shades of green, yellow, orange, brown or black. Texture is usually velvety to cottony. Typical colonies of Penicillium, other than Penicillium marneffei (yeast-like at 37oC), grow rapidly, white in color at first, later becoming bluish green with white borders with velvety to powdery textures depending on species. Some species produce radial patterns. Health Effects: Both Aspergillus and Penicillium are potential allergens. Several species of Aspergillus (A. flavus and A. parasiticus) produce aflatoxins or natually occurring mycotoxins that are toxic and carcinogenic. These are found in contaminated foodstuff and are hazardous to consumers. Penicillium has only one known species that is pathogenic to humans (P. marneffei) that causes lethal systemic infection (Penicilliosis) in immunocompromised individuals.

Smuts/Periconia/Myxomycetes

Smuts, Periconia, and Myxomycetes spores are grouped together due to their similar round, brown morphology. Smuts are outdoor parasitic plant pathogens. They rarely grow indoors but may grow on host plants if appropriate conditions are present. They are parasitic plant pathogens. They can be found on cereal crops, grasses, flowing plants, weed, and other fungi. They can cause allergies. Periconia are found in soils, dead herbaceous stems and leaf spots, and grasses. They have wind dispersed dry spores. Their spores are abundant in the air but it is not known if they are allergenic. Myxomycetes are found on decaying logs, stumps and dead leaves. They have wind-dispersed dry spores and wet motile (amoebic phase) spores. During favorable conditions they move about like amoebae. They form dry airborne spores when conditions are unfavorable. They are rarely found indoors. Health Effects: They may cause Type 1 allergies (hay fever, asthma). No human infections have been reported.

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 285332

Mailing/Billing Information:
1. Client Name: ATI, Inc
2. Address 1: 4221 Forbes Blvd
3. Address 2: Suite 250
4. Address 3: Lanham, MD 20706
5. Phone #: _____ Fax #: _____

Submittal Information:
1. Job Name: Bradbury Heights ES IAQ
2. Job Location: _____
3. Job #: 21-609 P.O. #: _____
4. Contact Person: Mikal Frater Cell: (848) 702-8621
5. Collected by: " Cell: "

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)
- ☐ 4 Hours
- ☐ Immediate Date Due: _____
- ☐ 24 Hours Time Due: _____
- Comments: _____

NORMAL BUSINESS HOURS
- ☐ 4 Hours
- ☐ Same Day
- ☐ Next Day
- ☐ 2 Day
- ☐ 3 Day
- ■ 5 Day + Date Due: 2/4/21
- ☒ Results Required By Noon

REPORT TO:
- ■ Email: mikal@atiinc.com
- ☐ Email 2: _____
- ☐ Verbals: _____

Asbestos Analysis
*PCM Air – Please Indicate Filter Type: _____
- ☐ NIOSH 7400 _____ (QTY)
- ☐ Fiberglass _____ (QTY)

TEM Air* – Please Indicate Filter Type: _____
- ☐ AHERA _____ (QTY)
- ☐ NIOSH 7402 _____ (QTY)
- ☐ Other (specify _____) _____ (QTY)

PLM Bulk
- ☐ EPA 600 – Visual Estimate _____ (QTY) ☐ Pos Stop
- ☐ EPA Point Count _____ (QTY)
- ☐ NY State Friable 198.1 _____ (QTY)
- ☐ Grav. Reduction ELAP 198.6 _____ (QTY)
- ☐ Other (specify _____) _____ (QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
- ☐ ELAP 198.4/Chatfield _____ (QTY)
- ☐ NY State PLM/TEM _____ (QTY)
- ☐ Residual Ash _____ (QTY)

TEM Dust*
- ☐ Qual. (pres/abs) Vacuum/Dust _____ (QTY)
- ☐ Quan. (s/area) Vacuum D5755-95 _____ (QTY)
- ☐ Quan. (s/area)Dust D6480-99 _____ (QTY)

TEM Water
- ☐ Qual. (pres/abs) _____ (QTY)
- ☐ ELAP 198.2/EPA 100.2 _____ (QTY)
- ☐ EPA 100.1 _____ (QTY)

☒ All samples received in good condition unless otherwise noted.
TEM Water samples _____ °C)

If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
- ☐ Pb Paint Chip _____ (QTY)
- ☐ *Pb Dust Wipe (wipe type _____) _____ (QTY)
- ☐ *Pb Air _____ (QTY)
- ☐ Pb Soil/Solid _____ (QTY)
- ☐ Pb TCLP _____ (QTY)
- ☐ Drinking Water ☐ Pb _____ (QTY) ☐ Cu _____ (QTY) ☐ As _____ (QTY)
- ☐ Waste Water ☐ Pb _____ (QTY) ☐ Cu _____ (QTY) ☐ As _____ (QTY)
- ☐ Pb Furnace (Media _____) _____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: _____
Collection Media _____
- ■ *Spore-Trap 8 (QTY)
- ☐ *Surface Swab _____ (QTY)
- ☐ *Surface Tape _____ (QTY)
- ☐ Other (Specify _____) _____ (QTY)
- ☐ Surface Vacuum Dust _____ (QTY)
- ☐ Culturable ID Genus (Media _____) _____ (QTY)
- ☐ Culturable ID Species (Media _____) _____ (QTY)

CLIENT ID #	SAMPLE INFORMATION: SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
21-609 1	parking lot	1/27/21	75					✓					✓			Date/Time: Contact:By:
21-609 2	Field blank	— N/A —						✓					✓			
21-609 3	main office		75					✓					✓			
21-609 4	room 5		75					✓					✓			
21-609 5	Media center		75					✓					✓			Date/Time: Contact:By:
21-609 6	Gym/cafe		75					✓					✓			
21-609 7	Room 27		75					✓					✓			
21-609 8	Room 19		75					✓					✓			
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:	Mikal Frater	Mikal Frater	1/27/21	4:55pm
Received by:				
Relinquished by:				
Received for Lab by:			1/27/21	1055

Shipping Information
☐ UPS ☒ In Person ☐ Other
☐ FedEx ☐ Drop Box
☐ USPS ☐ Courier
Airbill/Tracking No: _____

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	294979	**Job Name:**	Bradbury Heights Elementary School	**Date Submitted:**	02/24/2021
Client:	ATI, Inc.	**Job Location:**	1401 Glacier Avenue, Capitol Heights, MD 20743	**Person Submitting:**	Brian Chapman
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-609	**Date Analyzed:**	02/24/2021
		P.O. Number:	Not Provided	**Report Date:**	02/25/2021
Attention:	Brian Chapman				

AMA Sample #	294979-1	**AMA Sample #**	294979-2	**AMA Sample #**	294979-3
Client ID	21-609-01B	**Client ID**	21-609-02B	**Client ID**	21-609-03B
Analyst ID	CD	**Analyst ID**	CD	**Analyst ID**	CD
Collection Apparatus	Air-O-Cell	**Collection Apparatus**	Air-O-Cell	**Collection Apparatus**	Air-O-Cell
Sample Volume (L)	75	**Sample Volume (L)**	0	**Sample Volume (L)**	75
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	1	**Debris Loading**	0	**Debris Loading**	1
Location	Outside	**Location**	Blank	**Location**	Main Office

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	24	15	53	1272	63.2%
Basidiospores	4	15	53	212	10.5%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	3	15	53	159	7.9%
Curvularia					
Penicillium / Aspergillus	6	15	53	318	15.8%
Smuts/Periconia/Myxomycetes	1	15	53	53	2.6%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	38	**Total sp/m³:**	2014		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores					
Basidiospores					
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus					
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	0	**Total sp/m³:**	0		

Comments
No Mold Spores Observed

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	1	15	53	53	20%
Basidiospores	2	15	53	106	40%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	2	15	53	106	40%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*	1	15	53	53	20%
Total Raw Ct:	5	**Total sp/m³:**	265		

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody: 294979
Client: ATI, Inc.
Address: 9220 Rumsey Road
Suite 100
Columbia, MD 21045
Attention: Brian Chapman

Job Name: Bradbury Heights Elementary School
Job Location: 1401 Glacier Avenue, Capitol Heights, MD 20743
Job Number: 21-609
P.O. Number: Not Provided

Date Submitted: 02/24/2021
Person Submitting: Brian Chapman
Date Analyzed: 02/24/2021
Report Date: 02/25/2021

AMA Sample # 294979-4
Client ID 21-609-04B
Analyst ID CD
Collection Apparatus Air-O-Cell
Sample Volume (L) 75
Sample Condition Acceptable
Debris Loading 1
Location Media Center

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	2	15	53	106	33.3%
Basidiospores	3	15	53	159	50%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	53	53	16.7%
Curvularia					
Penicillium / Aspergillus					
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	6		**Total sp/m^3:**		318

Comments

AMA Analytical Services, Inc.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	294979	**Job Name:**	Bradbury Heights Elementary School	**Date Submitted:**	02/24/2021
Client:	ATI, Inc.	**Job Location:**	1401 Glacier Avenue, Capitol Heights, MD 20743	**Person Submitting:**	Brian Chapman
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-609	**Date Analyzed:**	02/24/2021
		P.O. Number:	Not Provided	**Report Date:**	02/25/2021
Attention:	Brian Chapman				

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Normal ecology	Slightly above normal ecology	Moderately above normal ecology	Substantially above normal ecology

Stachybotrys / Memnoniella, and Chaetomium	**Other Spores* (Control Present)**	**Other Spores* (No Control)**
1-4 Spores: Yellow 5-9 Spores: Orange 10+ Spores: Red	< 10 Spores: Insignificant (no color) <= Control's spore count: Green Between Control and 2x Control: Yellow Between 2x Control and 3x Control: Orange 3x+ Control: Red	< 10 Spores: Insignificant (no color) 10-20 Spores: Yellow 20-50 Spores: Orange 50+ Spores: Red

*No evalutation is provided for the following spore types: Other, Other Colorless, and Unknown Fungi, and Misc

Interpretation of the data contained in this report is the sole responsibility of the client or the persons who conducted the field work. There are no federal or national standards for the number of fungal spores that may be present in the indoor environment. As a general rule and guideline that is widely accepted in the indoor air quality field, the numbers and types of spores that are present in the indoor environment should be comparable to those that are present outdoors at any given time. There will always be some mold spores present in "Normal" indoor environments. The purpose of sampling and counting spores is to help determine whether an abnormal condition exists within the indoor environment and if it does, to help pinpoint the area of contamination. Spore counts should not be used as the sole determining factor of mold contamination. There are many factors that can cause anomalies in the comparison of indoor and outdoor samples due to the dynamic nature of both of those environments.

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ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	294979	**Job Name:**	Bradbury Heights Elementary School	**Date Submitted:**	02/24/2021
Client:	ATI, Inc.	**Job Location:**	1401 Glacier Avenue, Capitol Heights, MD 20743	**Person Submitting:**	Brian Chapman
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-609	**Date Analyzed:**	02/24/2021
		P.O. Number:	Not Provided	**Report Date:**	02/25/2021
Attention:	Brian Chapman				

General Comments, Disclaimers, and Footnotes

Analytical Method: Sample are analyzed following the instructions and guidelines outlined in ASTM 7391-09.

Sample Condition: Acceptable: The sample was collected and delivered to the our location without disturbing the material on the sampling media.
Unacceptable: 1. The sample trace (TR) has been disturbed. 2. The sample was damaged or otherwise unsuitable for analysis.
0 = No particulate matter detected; 1= >nd-~5% Particulate Loading; 2 = ~5%-25% Particulate Loading; 3 = ~25%- 75% Particulate Loading; 4 = ~75%-90% Particulate Loading; 5 = >90% Particulate Loading

Spore Notes: Based on their small size and very few distinguishing characteristics, Aspergillus and Penicillium cannot be differentiated by non-viable sampling methods. There are other types of spores whose morphology is similar to Aspergillus and Penicillium and cannot be differentiated by non-viable sampling methods. Examples of these similar spores are Acremonium, Paecilomyces, Wallemia, Trichoderma, Scopulariopsis, and Gliocladium.
Smuts, Periconia and Myxomycetes are three different types of genera that have similar morphological characteristics.
Bipolaris/Dreschlera/Helm: Bipolaris / Dreschlera / Helminthosporium are three different types of genera that have smiliar morphological characteristics.
Other Colorless represents all colorless spores that are non-distinctive and unidentifiable.
*Hyphal Fragments: A portion of the mycelium that becomes separated from the remainder of the thallus (vegetative body), each of which has the capacity to grow and form new individuals. Results for hyphal fragments are in fragments/m3 and are not incorporated in the total spore concentration.
The droplet symbol (💧) refers to water-intrusion indicator spores. These fungal spores, when found on indoor air samples, can be an indication of moisture sources and resultant fungal growth that may be problematic.

Quantification: Analytical Sensitivity (A.S.): This is dependent on the volume of air collected, size of the trace, ocular diameter, and the amount of the trace that was analyzed.
The value of "Present" indicated in the Raw Count column represents the presence of this spore type during the preliminary exam at 400x. The Raw Count converts to a whole number if the spore type is encountered again during the 600x-1,000x enumeration. The sp/m3concentration will be reported as less than the analytical sensitivity if "Present" is reported in the Raw Count.
Results are reported to 3 significant figures. sp/m3: Spores per cubic meter.
Uncertainty: for raw count in the range of 0-50 the SR is 0.375, 51-100 SR=0.333, 101-200 SR=0.257, >200 SR=0.245
All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.
Analyst(s): Christopher Dell

Technical Director Tristan Ward

MOLD SPORE DESCRIPTIONS

Ascospores

Ascospores are spores formed inside an ascus (asci-plural) or sac-like cell which is contained inside a fruiting body called an ascocarp or an ascoma (ascomata-plural). An ascus typically contains a definite nuimber of ascospores, usually eight. Ascospores are unique in shape, size, and color as to the Genus/species they represent. These spores are specific to fungi classified as Ascomycetes. They are ubiquitous in nature. Many decay organic matter, others are plant or animal pathogens. They can grow indoors on damp materials. Release of ascospores are released by forcible ejection and dispersed by wind, water, animals and other agents. Health Effects: Depending on the Genera, Ascospores may be allergenic.

Basidiospores

Basidiospores are reproductive spores produced by a group of fungi called basidiomycetes. This group includes the mushrooms, shelf fungi and various other macrofungi. Basidipspores serve as the main air (wind) dispersal units for the fungi and their release is dependent upon moisture. The structure of the spore complex can develop in various manners resulting in different appearances. It is often found growing in soil, decaying plant debris, compost piles and fruit rot. Indoors, it can be found on water damaged building materials (chipboard /OSB, plywood, wallpaper, and glue) as well as on food items (dried foods, cheeses, fruits, herbs, spices, cereals). Health effects: Some basidiospores may produce toxins and can act as allergens. They have not been reported to be pathogens.

Cladosporium

Cladosporium is the most common indoor and outdoor mold. The spores are wind dispersed and are often extremely abundant in outdoor air. Many species are commonly found on living and dead plant material. Indoors, they may grow on surfaces with high moisture or high humidity levels such as damp window sills, poorly ventilated bathrooms and soiled refrigerators. It produces powdery or velvety olive-green to brown or black colonies. The conidia (spores) vary depending on the species and are formed in simple or branching chains with multi-attachment points. Health Effects: Cladosporium species are rarely pathogenic to humans, but have been reported to occassionally cause sinusitis and pulmonary infections as well as infections of the skin and toenails. The airborne spores are significant allergens, and in large amounts they may severely affect asthmatics and people with respiratory diseases.

Hyphal Fragments

Hyphal Fragments are segments or pieces of hyphae or mycelium that may have broken off during sampling (air, tape, dust). The mycelium is the entire mass of hyphae that makes up the vegetative body of a fungus. The presence of hyphal fragments may indicate the presence of viable mold.

Penicillium/Aspergillus Like

Penicillium and Aspergillus are ubiquitous, filamentous fungi that are found in soil, decaying plant debris, compost piles, and in the air. Indoors, spores are commonly found in house dust, in water-damaged buildings (wallpaper, wallpaper glue, decaying fabrics, moist chipboards, and behind paint) as well as fruit and grains. They are the most common fungal genera, worldwide. Both produce chains of spores that are small, round to oval, colorless or slightly pigmented, and smooth to rough walled. These spores are indistinguishable between the two as well as other genera, such as Gliocladium, Trichoderma, Paecilomyces, and Scopulariopsis. They differ as to their conidiophores or fruiting bodies. While, Aspergillus spores are produced from phialides supported on conidia heads or swollen vesicles, Penicillium spores are produced on finger-like projections. Depending on species, typical colonies of Aspergillus are initially white and later turn to either shades of green, yellow, orange, brown or black. Texture is usually velvety to cottony. Typical colonies of Penicillium, other than Penicillium marneffei (yeast-like at 37oC), grow rapidly, white in color at first, later becoming bluish green with white borders with velvety to powdery textures depending on species. Some species produce radial patterns. Health Effects: Both Aspergillus and Penicillium are potential allergens. Several species of Aspergillus (A. flavus and A. parasiticus) produce aflatoxins or natually occurring mycotoxins that are toxic and carcinogenic. These are found in contaminated foodstuff and are hazardous to consumers. Penicillium has only one known species that is pathogenic to humans (P. marneffei) that causes lethal systemic infection (Penicilliosis) in immunocompromised individuals.

Smuts/Periconia/Myxomycetes

Smuts, Periconia, and Myxomycetes spores are grouped together due to their similar round, brown morphology. Smuts are outdoor parasitic plant pathogens. They rarely grow indoors but may grow on host plants if appropriate conditions are present. They are parasitic plant pathogens. They can be found on cereal crops, grasses, flowing plants, weed, and other fungi. They can cause allergies. Periconia are found in soils, dead herbaceous stems and leaf spots, and grasses. They have wind dispersed dry spores. Their spores are abundant in the air but it is not known if they are allergenic. Myxomycetes are found on decaying logs, stumps and dead leaves. They have wind-dispersed dry spores and wet motile (amoebic phase) spores. During favorable conditions they move about like amoebae. They form dry airborne spores when conditions are unfavorable. They are rarely found indoors. Health Effects: They may cause Type 1 allergies (hay fever, asthma). No human infections have been reported.

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 294979

Mailing/Billing Information:
1. Client Name: ATI, Inc
2. Address 1: 4221 Forbes Blvd.
3. Address 2: Ste 250
4. Address 3: Lanham, MD 20706
5. Phone #: _____ Fax #: _____

Submittal Information:
1. Job Name: Bradbury Heights ES.
2. Job Location: 1401 Glacier Ave. Capitol Heights, MD 20743
3. Job #: 21-1609 P.O. #: _____
4. Contact Person: Brian Chapman Cell: 202-368-1376
5. Collected by: Brian Chapman Cell: _____

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)
☐ 4 Hours ☐ Late Night
☐ Immediate Date Due: _____
☐ 24 Hours Time Due: _____
Comments: _____

NORMAL BUSINESS HOURS
☐ 4 Hours ☐ 3 Day ☐ Results Required By Noon
☐ Same Day ☐ 5 Day +
☒ Next Day Date Due: 2/25/21
☐ 2 Day

REPORT TO:
☒ Email: Brian@atiinc.com
☒ Email 2: Courtney@atiinc.com
☐ Verbals: _____

Asbestos Analysis
*PCM Air – Please Indicate Filter Type: _____
☐ NIOSH 7400 _____ (QTY)
☐ Fiberglass _____ (QTY)
TEM Air* – Please Indicate Filter Type: _____
☐ AHERA _____ (QTY)
☐ NIOSH 7402 _____ (QTY)
☐ Other (specify _____) _____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate _____ (QTY) ☐ Pos Stop
☐ EPA Point Count _____ (QTY)
☐ NY State Friable 198.1 _____ (QTY)
☐ Grav. Reduction ELAP 198.6 _____ (QTY)
☐ Other (specify _____) _____ (QTY)
MISC
☐ Asbestos Soil PLM_(Qual) PLM_(Quan) PLM/TEM_(Qual) PLM/TEM_(Quan)
*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
☐ ELAP 198.4/Chatfield _____ (QTY)
☐ NY State PLM/TEM _____ (QTY)
☐ Residual Ash _____ (QTY)
☐ Vermiculite
TEM Dust*
☐ Qual. (pres/abs) Vacuum/Dust _____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 _____ (QTY)
☐ Quan. (s/area)Dust D6480-99 _____ (QTY)
TEM Water
☐ Qual. (pres/abs) _____ (QTY)
☐ ELAP 198.2/EPA 100.2 _____ (QTY)
☐ EPA 100.1 _____ (QTY)
☒ All samples received in good condition unless otherwise noted.
(TEM Water samples _____ °C)
If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
☐ Pb Paint Chip _____ (QTY)
☐ *Pb Dust Wipe (wipe type _____) _____ (QTY)
☐ *Pb Air _____ (QTY)
☐ Pb Soil/Solid _____ (QTY)
☐ Pb TCLP _____ (QTY)
☐ Drinking Water ☐ Pb _____ (QTY) ☐ Cu _____ (QTY) ☐ As _____ (QTY)
☐ Waste Water ☐ Pb _____ (QTY) ☐ Cu _____ (QTY) ☐ As _____ (QTY)
☐ Pb Furnace (Media _____) _____ (QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: _____
Collection Media _____
☒ *Spore-Trap 4 (QTY) ☐ Surface Vacuum Dust _____ (QTY)
☐ *Surface Swab _____ (QTY)
☐ *Surface Tape _____ (QTY)
☐ Other (Specify _____) _____ (QTY)

CLIENT ID #	SAMPLE INFORMATION SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	COMMENTS / SPECIAL INSTRUCTIONS
21-1609-01B	outside	2/24/21	75L					X	X							9:45
02B	BLANK	↓	N/A					↓	↓							—
03B	Main Office		75L													10:03
04B	Media Center		75L													10:10

	Print Name	Signature	Date	Time
Relinquished by:	Brian Chapman		02/24/21	11:33
Received by:			2/24/21	1136

Shipping Information
☐ UPS ☒ In-Person ☐ Other
☐ FedEx ☐ Drop Box
☐ USPS ☐ Courrier

Appendix B: Instrument Calibration Records

Certificate of Calibration

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

Serial number: R15042
Date Calibrated: 11/12/2020 **Calibration Due Date:** 11/12/2021

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: Moroni Menk

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

BUCK

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	71.33 (21.9)	°F (°C)
RELATIVE HUMIDITY	53.9	%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	70.9 (21.6)	71.1 (21.7)	68.9~72.9 (20.5~22.7)				

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	28.82 (976.0)	28.82 (976.0)	28.24~29.40 (956.3~995.6)				

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	Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E004626	02-14-20	02-28-21	Pressure	E005254	10-10-19	10-31-20
Pressure	E003982	07-21-20	01-31-21	DC Voltage	E003493	06-17-20	06-30-21

CALIBRATED

August 31, 2020
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	71.24 (21.8)	°F (°C)
RELATIVE HUMIDITY	54.8	%RH
BAROMETRIC PRESSURE	28.74 (973.2)	inHg (hPa)

MODEL	7575-X
SERIAL NUMBER	7575X1711004

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

– CALIBRATION VERIFICATION RESULTS –

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	70.8 (21.6)	70.5 (21.4)	68.8~72.8 (20.4~22.7)				

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	28.75 (973.6)	28.84 (976.6)	28.17~29.33 (953.9~993.2)				

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	Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E004626	02-14-20	02-28-21	Pressure	E005254	10-10-19	10-31-20
Pressure	E003982	07-21-20	01-31-21	DC Voltage	E003493	06-17-20	06-30-21

VERIFIED

August 31, 2020
DATE

Doc. ID: CERT_GEN_WCC

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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	75.8 (24.3)	°F (°C)
RELATIVE HUMIDITY	48	%RH
BAROMETRIC PRESSURE	28.72 (972.6)	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	3020.5	* 2874.5	2929.9~3111.1
2	504	460	454~554	5	5037	* 4771.8	4885.9~5188.1
3	1008	964	958~1058				

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	35.3	* 30.8	32.3~38.3	2	100.7	* 87.7	97.7~103.7

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	32.0 (0.0)	32.6 (0.3)	31.0~33.0 (−0.5~0.6)	2	139.8 (59.9)	140.6 (60.3)	138.8~140.8 (59.4~60.5)

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	10.0	10.5	7.0~13.0	4	70.0	69.6	67.0~73.0
2	30.0	30.4	27.0~33.0	5	90.0	88.9	87.0~93.0
3	50.0	50.4	47.0~53.0				

**Indicates Out-of-Tolerance Condition*

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	Measurement Variable	System ID	Last Cal.	Cal. Due
5000 CO_2	T-0660	07-15-20	07-15-28	200 CO	149848	03-24-20	03-24-28
N2	CT308798	06-28-20	06-28-28	Air	T608955	06-17-20	06-17-28
Flow	E003341	09-03-19	09-30-20	Flow	E003980	04-22-20	04-30-21
Flow	E003525	01-06-20	01-31-21	Flow	E003342	09-03-19	09-30-20
2000 C4H8	EB0054467	08-13-19	08-12-22	100 C4H8	CC507339	03-24-20	03-24-28
Temperature	E010657	02-14-20	02-28-21	Temperature	E010658	02-14-20	02-28-21
Temperture	E010655	01-21-20	01-31-21	Humidity	E003539	08-21-20	02-28-21

ChaoVang
VERIFIED

August 31, 2020
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	71.33 (21.9)	°F (°C)
RELATIVE HUMIDITY	53.9	%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)	32.6 (0.3)	31.0~33.0 (−0.5~0.6)	2	139.8 (59.9)	140.6 (60.3)	138.8~140.8 (59.4~60.5)

HUMIDITY VERIFICATION — SYSTEM H-102 — *Unit: %RH*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	10.0	10.5	7.0~13.0	4	70.0	69.6	67.0~73.0
2	30.0	30.4	27.0~33.0	5	90.0	88.9	87.0~93.0
3	50.0	50.4	47.0~53.0				

CO_2 GAS VERIFICATION — SYSTEM G-101 — *Unit: ppm*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	0	0	0~50	4	3020	3025	2929~3110
2	504	501	454~554	5	5037	5026	4886~5188
3	1008	1027	958~1058				

CO GAS VERIFICATION — SYSTEM G-101 — *Unit: ppm*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	35	36	32~38	2	101	100	98~104

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	E010657	02-14-20	02-28-21
Temperture	E010655	01-21-20	01-31-21
5000 CO_2	T-0660	07-15-20	07-15-28
N_2	CT308798	06-28-20	06-28-28
Flow	E003341	09-03-19	09-30-20
Flow	E003525	01-06-20	01-31-21
2000 C4H8	EB0054467	08-13-19	08-12-22

Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E010658	02-14-20	02-28-21
Humidity	E003539	08-21-20	02-28-21
200 CO	149848	03-24-20	03-24-28
Air	T608955	06-17-20	06-17-28
Flow	E003980	04-22-20	04-30-21
Flow	E003342	09-03-19	09-30-20
100 C4H8	CC507339	03-24-20	03-24-28

Bao Yang
CALIBRATED

August 31, 2020
DATE

Doc. ID. CERT_GEN_WCC

TSI P/N 2300157