ati INC
Architecture | Engineering | Construction

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February 22, 2021

Prince George's County Public Schools
13300 Old Marlboro Pike
Upper Marlboro, Maryland 20722
Attention: Mr. Alex Baylor

RE: Indoor Air Quality Assessment, Judge Sylvania Woods Elementary School
Purchase Order: 734977
ATI Project Number: 20-686

Dear Mr. Baylor:

Prince George's County Public Schools requested that ATI, Inc., conduct a proactive indoor air quality (IAQ) assessment at Judge Sylvania Woods Elementary School on November 30, 2020 and a follow-up assessment on February 16, 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.

Reviewed By:

Mikal Frater
Industrial Hygienist

Nate Burgei, CIH, CSP
Certified Industrial Hygienist

Indoor Air Quality Assessment Report

Prince George's County Public Schools
Judge Sylvania Woods Elementary School
3000 Church Street
Glenarden, MD 20706

Prepared for:

Prince George's County Public Schools
13300 Old Marlboro Pike
Upper Marlboro, MD 20722

February 22, 2021

Submitted by:

ATI Job # 20-686

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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 a proactive Indoor Air Quality (IAQ) assessment on November 30, 2020, at Judge Sylvania Woods Elementary School, located at 3000 Church Street, in Glenarden, Maryland, and a follow-up assessment on February 16, 2021, in select rooms that had unusual fungal results in the initial inspection.

The initial assessment on November 30, 2020 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. On February 16, 2021, Rooms 5 and 17 were reassessed after unusual spore concentrations were present during the first assessment. Steps were taken between the two assessments to repair water issues and treat the area for fungal growth. 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 less than the ASHRAE recommended winter range of 68-75°F on November 30, 2020 and both of the reassessed spaces had temperatures in the 50s on February 16, 2021.
2. The relative humidity in all tested spaces on both November 30, 2020 and February 16, 2021 was less than the ASHRAE guidelines of <65%, but greater than <30%, which is optimal.
3. Carbon dioxide concentrations in all tested spaces were less than the ASHRAE limit for carbon dioxide relative to the outdoor carbon dioxide concentration on the day of each assessment.
4. Carbon monoxide concentrations during both assessments were less than the ASHRAE/EPA recommended limit.
5. The mold spore trap samples from November 30, 2020 had unusual spore concentrations in Rooms 5 and 17 and 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 mold spore concentrations in Rooms 5 and 17 during the February 16, 2021 reassessment were 97-98% lower than the initial assessment, and any residual airborne mold spores are likely to be remnants that were not removed from the space after cleanup. ATI recommends an additional round of cleaning in Room 5 using HEPA vacuums and wet wiping horizontal surfaces to remove residual spores.

2 Assessment Methods

Mikal Frater, IH of ATI, Inc. conducted the initial visual assessment and air sampling on November 30, 2020. 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. Nate Burgei, CIH, CSP conducted a follow-up inspection on February 16, 2021 in Classrooms 5 and 17 after the areas were treated for mold presence. 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. of Beltsville,

MD, and AMA Analytical Services, Inc. of Lanham, MD analyzed the samples using direct microscopic examination per ASTM D7391-09, which counts both viable and non-viable mold spores and particulates, which combined yields total fungal results. Both laboratories participate 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 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	November 30, 2020 Observations
Parking Lot – Outside	• Light rain • Cloudy skies • No traffic – foot or vehicle • Sampling area surrounded by trees and brush
Main Office	• There are four occupants in this area during sampling • There is no odor or visible mold in this area • Printer ON and about 20 ft. from the sampling area • There are no plants in this space • Light foot traffic
Room 17	• Tiles removed from the floor to the left of the uninvent • Some light brown stained floor tiles in front of the uninvent • Ceiling tiles directly above uninvent display water stains • Sound barriers still present after previous assessment • Space is approximately 910 ft.^{2}
Room 13B	• 13A and 13B are now one large room, no longer separated by divider • Light brown water stain on ceiling tile in rear of room • There are two occupants in area during sampling • No odor or visible mold in this area • Trace dust accumulation • Space is approximately 980 ft^2
Room 12	• There are two occupants in area during sampling • There is a water stain on the ceiling tile in the front left corner of the room • There is no visible mold or order in this area
Room 5	• There are three occupants in area during sampling • One person in this room is repairing ceiling tiles • There is a light brown water stain near the area of repair • No odor or visible mold in this area • Air is supplied through a uninvent in the wall • Space is approximately 952 ft.^{2}
Cafeteria	• There are eight diffusers and two air returns in this space • Gym and cafeteria are one large open area, no longer separated by divider

Sample Location	November 30, 2020 Observations
	• There are two occupants in the area during sampling • Observed water stains on ceiling tiles
Room 23	• There are two occupants in the area during sampling • There is no odor or visible mold in this area • Trace dust accumulation • No stained ceiling tiles • Space is approximately 770 ft.^{2}
Room 31	• There are two occupants in the area during sampling • There is no odor or visible mold in this area • There is a stained ceiling tile in the back corner of the area • Space is approximately 816 ft.^{2}
Sample Location	**February 16, 2021 Reassessment Observations**
Room 5	• There were no occupants during the reassessment • Moderate dust/debris on the floor, minimal surface dust • Door to hallways closed, HVAC off, and felt cold in the classroom • The windows and wall heater looked clean and free of leaks • Single ceiling tile with a 4" diameter water stain by sprinkler • Signs of water damage under the sink, but felt dry • Dark brown/black ceiling tile staining about 1-2 inches from wall along the door, no signs of water stains, so could be dust from air passing through to plenum, or could be some signs of water staining • Signs of water stains running down the same wall, between chalkboard and window
Room 17	• Ceiling tile missing near window with water and debris on the ground under a leaking water pipe. Ladder under the space, so appears it is currently being addressed • No signs of water damage above ceiling tiles near leaking pipe, or signs of significant mold growth • Radiator cover off, with signs of dirt, but no signs of water damage or mold • No other stained ceiling tiles • Rug folded up with visible signs of water damage, but no visible mold growth • Sink in room 17A appeared to be free of leaks. • Sound barriers still present after previous assessment
Outdoors	• Cloudy, strong wind and damp, although not raining. • Parking lot was empty with little to no foot traffic

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 November 30, 2020 initial assessment and reassessment from February 16, 2021 are summarized in Table 2. As indicated by the data in the table, temperatures in the school on November 30 averaged between 64°F and 72°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 16, 2021, after remediation actions were completed. ATI also reassessed the temperature in the reassessed rooms. The average temperatures in the reassessed locations range from 55°F to 58°F, which is much less than the ASHRAE recommended winter temperature range; however, these spaces appeared to be unoccupied.

Table 2: Temperature

Sample Location	11/30/2020 Initial Assessment Temperature in °F			ASHRAE Standard °F
	Min	Max	Average	
Outside	66	66	66	N/A
Indoors				
Main Office	71	72	72	68-75°F
Room 17	63	64	64	68-75°F
Room 13B	65	65	65	68-75°F
Room 12	65	65	65	68-75°F
Room 5	67	69	68	68-75°F
Cafeteria	67	68	68	68-75°F
Room 23	68	68	68	68-75°F
Room 31	67	67	67	68-75°F
02/16/2021 Reassessment Temperature in °F				
Outdoors	51	52	52	N/A
Indoors				
Room 5	55	55	55	68-75°F
Room 17	58	58	58	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 for November 30, 2020 and February 16, 2021 are summarized in Table 3. As indicated by the data in the table, the average relative humidity ranged between 49% and 58% with all tested locations measuring less than the ASHRAE maximum recommendation of 65% relative humidity, and greater than 30% relative humidity.

ATI reassessed select rooms that had unusual fungal spore concentrations on February 16, 2021, after remediation actions were completed. ATI also reassessed the relative humidity in the space, and the average relative humidity ranged between

43% and 48% with all tested locations less than the ASHRAE maximum recommendation of 65% relative humidity, and greater than 30% relative humidity.

Table 3: Relative Humidity

Sample Location	11/30/2020 Initial Assessment (% RH)			ASHRAE Standard (% RH)
	Min	Max	Average	
Outside	73	74	74	N/A
Indoors				
Main Office	52	55	54	< 65
Room 17	51	51	51	< 65
Room 13B	57	57	57	< 65
Room 12	50	50	50	< 65
Room 5	47	51	49	< 65
Cafeteria	58	58	58	< 65
Room 23	51	52	52	< 65
Room 31	50	51	51	< 65
02/16/2021 Reassessment Relative Humidity (%RH)				
Outdoors	55	56	56	N/A
Indoors				
Room 5	48	48	48	< 65
Room 17	42	43	43	< 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 November 30, 2020 are summarized in Table 4. On the day of the assessment, the average outdoor carbon dioxide concentration was 371 ppm, which calculates to a maximum indoor concentration of 1,071 ppm (700 + 371). 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 16, 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 16, 2021 was 407 ppm, which calculates to a maximum indoor concentration of 1,107 ppm (700 + 407). All tested locations indoors were less than the recommended maximum for the day of the reassessment.

Table 4: Carbon Dioxide

Sample Location	11/30/2020 Initial Assessment Concentration (parts per million)			ASHRAE Standard (ppm) NTE
	Min	Max	Average	
Outside	365	377	371	N/A
Indoors				
Main Office	433	443	448	< 1,071
Room 17	385	385	385	< 1,071
Room 13B	369	371	370	< 1,071
Room 12	377	381	389	< 1,071
Room 5	455	473	464	< 1,071
Cafeteria	391	395	393	< 1,071
Room 23	373	375	374	< 1,071
Room 31	370	372	371	< 1,071
02/16/2021 Reassessment Concentration (parts per million)				
Outdoors	405	408	407	N/A
Indoors				
Room 5	418	436	427	< 1,107
Room 17	424	426	425	< 1,107

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 November 30, 2020 were less than the Q-Trak's detection limit throughout the school.

ATI reassessed select rooms that had unusual fungal spore concentrations on February 16, 2016, 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 less than the EPA/ASHRAE recommended maximum of 9 ppm. Classroom 5 had an average carbon monoxide concentration of 3.0, however this may have been instrument error because it started at around 5 – 6 ppm, and dropped and hovered around 3 ppm, before dropping when moving to Classroom 17. No sources of potential carbon monoxide were observed.

Table 5: Carbon Monoxide

Sample Location	11/30/2020 Initial Assessment Concentration (parts per million)			ASHRAE Standard (ppm)
	Min	Max	Average	
Outdoors	<3	<3	<3	N/A
Indoors				

Sample Location	11/30/2020 Initial Assessment Concentration (parts per million)			ASHRAE Standard (ppm)
	Min	Max	Average	
Room 17	<3	<3	<3	< 9
Room 13B	<3	<3	<3	< 9
Room 12	<3	<3	<3	< 9
Room 5	<3	<3	<3	< 9
Cafeteria	<3	<3	<3	< 9
Room 23	<3	<3	<3	< 9
Room 31	<3	<3	<3	< 9
Room 17	<3	<3	<3	< 9
02/16/2021 Reassessment Concentration (parts per million)				
Outdoors	<3	<3	<3	N/A
Indoors				
Room 5	2.7	3.3	3.0	< 9
Room 17	<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 November 30, 2020 and February 16, 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 November 30, 2020 suggested unusual mold spore concentrations in two tested locations: Room 5 and Room 17. The *Aspergillus/Penicillium*-like concentration in Room 05 was 39,200 spores/m^3, which was greater than the outdoor sample which had a concentration less than the laboratory analytical limit of detection. This room also had a greater concentration of *Cladosporium*, 1,500 spores/m^3, which was greater than the outdoor sample which had a concentration less than the laboratory analytical limit of detection. The *Aspergillus/Penicillium*-like concentration in Room 17 was 5,660 spores/m^3, which was also greater than the outdoor sample, which had a concentration less than the laboratory analytical limit of detection. Though no water damage was observed, a few ceiling tiles in Room 5 were missing due to an active repair of a pipe above the tiles that was taking place at the time of sampling. The open drop ceiling may be a potential pathway for these spores to have entered.

Other tested rooms had low concentrations of spores that were not detected in the ambient sample, such as *Myxomycetes, Pithomycetes, Stachybotrys/Memnoniella, Epicoccum,* and *Cladosporium*. However, the concentrations measured in those rooms do not suggest significant mold growth and could be residual spores from prior growth, contamination from outdoors, or

possibly trivial amounts of mold growth normal in occupied 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.

Classrooms 5 and 17 were reassessed on February 18, 2021 after the initial assessment indicated the unusual presence of airborne mold spores. Classrooms 5 and 17 had an *Aspergillus/Penicillium*-like airborne mold spore concentration reduction of 97% to 98% from the November 30, 2020 initial inspection. Classroom 5 had an *Aspergillus/Penicillium*-like concentration of 1,007 spores/m^3, and a presence of Chaetomium less than the limit or quantification. While a *Aspergillus/Penicillium*-like concentration greater than 1,000 spores/m^3 is slightly greater than the typical occupied space, it is a large decrease from the November 30, 2020 assessment. The spores detected in the sample were likely residual mold spores that were not removed from the room during the first cleaning round. While it appeared that there was still an active water leak being repaired in Classroom 17, the *Aspergillus/Penicillium*-like mold spore concentrations were 106 spores/m^3, which is typical in most occupied spaces.

Differences in concentrations between both dates of assessment are summarized in Table 6.

ATI recommends an additional cleaning round using HEPA vacuums on the floors and walls throughout Classroom 5 and wet wiping down all horizontal surfaces to remove residual spores. Ensure any water intrusion sources have been identified and remediated. Verify that the area around the leak in Room 17 is dry before replacing the ceiling tile. Any building materials that remained wet longer than 48-hours should be thoroughly cleaned and disinfected or replaced if possible. Ensure HVAC filters are replaced per the recommended intervals.

Table 6: *Aspergillus/Penicillium* Concentration Comparison

Sample Location	November 30, 2020 Concentration	February 16, 2021 Concentrations	% Change
Room 5	39,200	1,007	-97%
Room 17	5,660	106	-98%

The official laboratory reports with spore trap samples collected on November 30, 2020 and February 16, 2021 are presented in Appendix A.

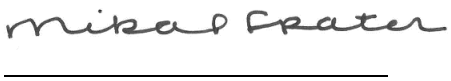
6 Summary of Findings

1. Four of the tested spaces had a temperature less than the ASHRAE recommended winter range of 68-75°F on November 30, 2020 and both of the reassessed spaces had temperatures in the 50s on February 16, 2021.
2. The relative humidity in all tested spaces on both November 30, 2020 and February 16, 2021 was less than the ASHRAE guidelines of <65%, but greater than <30%, which is optimal.
3. Carbon dioxide concentrations in all tested spaces were less than the ASHRAE limit for carbon dioxide relative to the outdoor carbon dioxide concentration on the day of each assessment.
4. Carbon monoxide concentrations during both assessments were less than the ASHRAE/EPA recommended limit.
5. The mold spore trap samples from November 30, 2020 had unusual spore concentrations in Rooms 5 and 17 and 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 mold spore concentrations in Rooms 5 and 17 during the February 16, 2021 reassessment were 97-98% lower than the initial assessment, and any residual airborne mold spores are likely to be remnants that were not removed from the space after cleanup. ATI recommends an additional round of cleaning in Room 5 using HEPA vacuums and wet wiping horizontal surfaces to remove residual spores.

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

Sincerely,
ATI, INC.

Reviewed By:



Mikal Frater
Industrial Hygienist

Nate Burgei, CIH, CSP
Certified 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: 285311
Client: ATI, Inc.
Address: 9220 Rumsey Road
Suite 100
Columbia, MD 21045
Attention: Mikal Frater

Job Name: IAQ-PGCPS
Job Location: Mattaponi Elementary
Job Number: 20-713
P.O. Number: Not Provided

Date Submitted: 12/18/2020
Person Submitting: Mikal Frater
Date Analyzed: 12/28/2020
Report Date: 12/28/2020

AMA Sample #	285311-1
Client ID	20-713-1
Analyst ID	TLW
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	2
Location	Parking Lot

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	3	15	52	156	37.5%
Basidiospores	2	15	52	104	25%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	52	52	12.5%
Curvularia					
Penicillium / Aspergillus	2	15	52	104	25%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Epicoccum					
Pithomyces					
Hyphal Fragments*					

Total Raw Ct: 8 **Total sp/m³:** 416

Comments

AMA Sample #	285311-2
Client ID	20-713-2
Analyst ID	TLW
Collection Apparatus	Air-O-Cell
Sample Volume (L)	0
Sample Condition	Acceptable
Debris Loading	1
Location	Field Blank

	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					
Other Colorless					
Epicoccum					
Pithomyces					
Hyphal Fragments*					

Total Raw Ct: 0 **Total sp/m³:** 0

Comments
No mold spores observed.

AMA Sample #	285311-3
Client ID	20-713-3
Analyst ID	TLW
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	2
Location	Main Office

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	4	15	52	208	26.7%
Basidiospores	5	15	52	260	33.3%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	52	52	6.7%
Curvularia					
Penicillium / Aspergillus	1	15	52	52	6.7%
Smuts/Periconia/Myxomycetes	1	15	52	52	6.7%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown	1	15	52	52	6.7%
Other Colorless	2	15	52	104	13.3%
Epicoccum					
Pithomyces					
Hyphal Fragments*					

Total Raw Ct: 15 **Total sp/m³:** 780

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285311	**Job Name:**	IAQ-PGCPS	**Date Submitted:**	12/18/2020
Client:	ATI, Inc.	**Job Location:**	Mattaponi Elementary	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-713	**Date Analyzed:**	12/28/2020
		P.O. Number:	Not Provided	**Report Date:**	12/28/2020
Attention:	Mikal Frater				

AMA Sample #	285311-4	**AMA Sample #**	285311-5	**AMA Sample #**	285311-6
Client ID	20-713-4	**Client ID**	20-713-5	**Client ID**	20-713-6
Analyst ID	TLW	**Analyst ID**	TLW	**Analyst ID**	TLW
Collection Apparatus	Air-O-Cell	**Collection Apparatus**	Air-O-Cell	**Collection Apparatus**	Air-O-Cell
Sample Volume (L)	75	**Sample Volume (L)**	75	**Sample Volume (L)**	75
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	2	**Debris Loading**	2	**Debris Loading**	2
Location	Multi-purpose Room	**Location**	Room 3	**Location**	Room 116

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores					
Basidiospores					
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	Present	15	52	<52	
Curvularia					
Penicillium / Aspergillus	27	15	52	1404	100%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Epicoccum					
Pithomyces					
Hyphal Fragments*					
Total Raw Ct:	27	**Total sp/m³:**	1404		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores					
Basidiospores	10	15	52	520	6.7%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	13	15	52	676	8.7%
Curvularia					
Penicillium / Aspergillus	125	3	260	32500	83.9%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Epicoccum	1	15	52	52	0.7%
Pithomyces					
Hyphal Fragments*	1	15	52	52	0.7%
Total Raw Ct:	149	**Total sp/m³:**	33748		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria	1	15	52	52	0.1%
Ascospores	2	15	52	104	0.2%
Basidiospores	8	15	52	416	1%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	97	15	52	5044	11.6%
Curvularia					
Penicillium / Aspergillus	724	1	780	564720	86.7%
Smuts/Periconia/Myxomycetes	2	15	52	104	0.2%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Epicoccum	1	15	52	52	0.1%
Pithomyces					
Hyphal Fragments*	3	15	52	156	0.4%
Total Raw Ct:	835	**Total sp/m³:**	570492		

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285311	**Job Name:**	IAQ-PGCPS	**Date Submitted:**	12/18/2020
Client:	ATI, Inc.	**Job Location:**	Mattaponi Elementary	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-713	**Date Analyzed:**	12/28/2020
		P.O. Number:	Not Provided	**Report Date:**	12/28/2020
Attention:	Mikal Frater				

AMA Sample #	285311-7	**AMA Sample #**	285311-8
Client ID	20-713-7	**Client ID**	20-713-8
Analyst ID	TLW	**Analyst ID**	TLW
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	Media Center	**Location**	Room 24

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	2	15	52	104	3%
Basidiospores	4	15	52	208	6%
Bipolaris/Drechslera/Helm.	Present	15	52	<52	
Chaetomium					
Cladosporium	10	15	52	520	14.9%
Curvularia					
Penicillium / Aspergillus	51	15	52	2652	76.1%
Smuts/Periconia/Myxomycetes	Present	15	52	<52	
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Epicoccum					
Pithomyces					
Hyphal Fragments*	1	15	52	52	1.5%
Total Raw Ct:	67		**Total sp/m^3:**		3484

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	1	15	52	52	0.4%
Basidiospores	7	15	52	364	3.1%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	7	15	52	364	3.1%
Curvularia					
Penicillium / Aspergillus	208	1	780	162240	92.4%
Smuts/Periconia/Myxomycetes	1	15	52	52	0.4%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Epicoccum					
Pithomyces	1	15	52	52	0.4%
Hyphal Fragments*	3	15	52	156	1.3%
Total Raw Ct:	225		**Total sp/m^3:**		163124

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285311	**Job Name:**	IAQ-PGCPS	**Date Submitted:**	12/18/2020
Client:	ATI, Inc.	**Job Location:**	Mattaponi Elementary	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-713	**Date Analyzed:**	12/28/2020
		P.O. Number:	Not Provided	**Report Date:**	12/28/2020
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:	285311	**Job Name:**	IAQ-PGCPS	**Date Submitted:**	12/18/2020
Client:	ATI, Inc.	**Job Location:**	Mattaponi Elementary	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-713	**Date Analyzed:**	12/28/2020
		P.O. Number:	Not Provided	**Report Date:**	12/28/2020
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): Tristan Ward

Technical Director Tristan Ward

MOLD SPORE DESCRIPTIONS

Alternaria

Alternaria is ubiquitous in the environment and are normal agents of decay and decomposition. The spores are airborne and common outdoors than indoors isolated from plants, soil, and food. Indoors, the spores are found in house dust, carpets, textiles, wallboard and window frames. The production of melanin-like pigment is one of its major identifying characteristics. The club-shaped spores (conidia) are single or in long chains. They can grow thick colonies with grayish-white surfaces at the beginning which later darken to greenish black or olive brown colors. Health Effects: Allergies are common, but serious infections are rare, except in people with compromised immune systems. Certain species of this genus are often prolific producers of a variety of toxic compounds whose effects on human health are not well known.

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.

Bip/Drech/Helminth

Bipolaris, Drechslera, and Helminthosporium are found on grasses, grains, various plants, and decaying food. They tend to grow in semi-dry environments and some species can be found indoors. Because of their microscopic similarities, these three genera are grouped together on both viable and non-viable analysis. Microscopically, the spores are cylindrical, fusiform, or club-shaped with protrusions, Health Effects: Can cause hay fever and asthma, allergic fungal sinusitis, and pathogenic sinusitis.

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.

Epicoccum

Epicoccum is a cosmopolitan fungus that is often found growing outside in soil, plant litter, decaying plants, and damaged plant tissue. Indoors, it can be found growing on a variety of building materials including paper and textiles. Colonies have a rapid growth rate with cottony texture, initially yellow or orange becoming brown to black in color. Conidiophores or fruiting bodies produce dense masses where conidia (spores) arise. Spores are round to pear-shaped, smooth to warty, brown to black in color and muriform (partitioned in both directions, like a soccer ball). Health Effects: This mold can act as a potential allergen. Some people may experience hay fever and or asthma. This mold has not been linked to any human or animal infection.

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.

Other Colorless

- “Other Colorless” are all non-distinctive, unidentifiable, colorless spores seen on spore trap samples and include all the genera that do not have distinguishing morphology to belong to any of the other defined categories."

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.

Pithomyces

Pithomyces is a cosmopolitan, dark-walled fungus often found growing outside in soil, decaying leaves, and grasses. It is rarely found growing indoors, but will grow on paper given the right conditions. Colonies grow rapidly, cottony in texture with light to dark brownish black surface color. Spores are single, oval yellow to dark brown, multi-celled, and usually rough. One identification feature of the spores is the resemblance to barrels. Another identifying character is beak-like structures on young spores. Spores of Pithomyces chartarum are most common and are identified by distinctive tranverse septa. This species has been linked to facial eczema in sheep. Health Effects: It is a potential but not well-studied allergen or human pathogen.

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.

Unknown Fungi

“Unknown Fungi” are spores that cannot be identified under direct microscopic analysis. This includes partial spores. This category also includes spores that are hidden or hard to see during microscopic examination due to heavy presence of particulate.

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) 285311

Mailing/Billing Information:

1. Client Name: AFI, 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: IAQ - PGCPS
2. Job Location: Mattaponi Elementary
3. Job #: 20-713 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)	NORMAL BUSINESS HOURS	REPORT TO:
☐ 4 Hours ☐ Immediate Date Due: _____ ☐ 24 Hours Time Due: _____ Comments: _____	☐ 4 Hours ☐ 3 Day ☐ Same Day ● 5 Day + ☐ Next Day Date Due: 12/28/20 ☐ 2 Day ☐ Results Required By Noon	● 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)

SAMPLE INFORMATION				ANALYSIS					MATRIX							CLIENT CONTACT
CLIENT ID #	SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	(LABORATORY STAFF ONLY)
20-713 1	Parking Lot	11:35	752					✓					✓			Date/Time: Contact:By:
20-713 2	Field Blank	—						✓					✓			
20-713 3	Main office	11:50						✓					✓			
20-713 4	Multipurpose Rm	11:58						✓					✓			
20-713 5	Room 3	12:06						✓					✓			Date/Time: Contact:By:
20-713 6	Room 16	12:14						✓					✓			
20-713 7	Media Center	12:21						✓					✓			
20-713 8	Room 24	12:28						✓					✓			
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:	Mikal Frater	Mikal Frater	12/18/20	1:30 PM
Received by:				
Relinquished by:			12/18/20	1330
Received for Lab by:				

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

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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	324882	**Job Name:**	Mattaponi Elementary	**Date Submitted:**	02/16/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Nate Burgei
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-713	**Date Analyzed:**	02/17/2021
		P.O. Number:	Not Provided	**Report Date:**	02/17/2021
Attention:	Nate Burgei				

AMA Sample #	324882-1	**AMA Sample #**	324882-2	**AMA Sample #**	324882-3
Client ID	31638840	**Client ID**	31638844	**Client ID**	31638812
Analyst ID	MG	**Analyst ID**	MG	**Analyst ID**	MG
Collection Apparatus	Air-O-Cell	**Collection Apparatus**	Air-O-Cell	**Collection Apparatus**	Air-O-Cell
Sample Volume (L)	75	**Sample Volume (L)**	75	**Sample Volume (L)**	75
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	1	**Debris Loading**	1	**Debris Loading**	1
Location	Multipurpose Room	**Location**	Classroom 3	**Location**	Media Center

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	2	15	53	106	11.1%
Basidiospores	4	15	53	212	22.2%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	53	53	5.6%
Curvularia					
Penicillium / Aspergillus	11	15	53	583	61.1%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	18	**Total sp/m^3:**	954		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	4	15	53	212	12.5%
Basidiospores	5	15	53	265	15.6%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	2	15	53	106	6.3%
Curvularia					
Penicillium / Aspergillus	21	15	53	1113	65.6%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*	1	15	53	53	3.1%
Total Raw Ct:	32	**Total sp/m^3:**	1696		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	10	15	53	530	50%
Basidiospores	2	15	53	106	10%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	8	15	53	424	40%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	20	**Total sp/m^3:**	1060		

Comments

AMA Analytical Services, Inc.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	324882	**Job Name:**	Mattaponi Elementary	**Date Submitted:**	02/16/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Nate Burgei
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-713	**Date Analyzed:**	02/17/2021
		P.O. Number:	Not Provided	**Report Date:**	02/17/2021
Attention:	Nate Burgei				

AMA Sample #	324882-4	**AMA Sample #**	324882-5	**AMA Sample #**	324882-6
Client ID	31638799	**Client ID**	31561516	**Client ID**	31561391
Analyst ID	MG	**Analyst ID**	MG	**Analyst ID**	MG
Collection Apparatus	Air-O-Cell	**Collection Apparatus**	Air-O-Cell	**Collection Apparatus**	Air-O-Cell
Sample Volume (L)	75	**Sample Volume (L)**	75	**Sample Volume (L)**	75
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	1	**Debris Loading**	1	**Debris Loading**	1
Location	Room 24	**Location**	Room 16	**Location**	Outdoors

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	9	15	53	477	28.1%
Basidiospores	5	15	53	265	15.6%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	53	53	3.1%
Curvularia					
Penicillium / Aspergillus	17	15	53	901	53.1%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	32	**Total sp/m³:**	1696		
Comments					

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	19	15	53	1007	42.2%
Basidiospores	11	15	53	583	24.4%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	15	15	53	795	33.3%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	45	**Total sp/m³:**	2385		
Comments					

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	114	14	56	6384	64%
Basidiospores	60	15	53	3180	33.7%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	4	15	53	212	2.2%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	178	**Total sp/m³:**	9776		
Comments					

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	324882	**Job Name:**	Mattaponi Elementary	**Date Submitted:**	02/16/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Nate Burgei
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-713	**Date Analyzed:**	02/17/2021
		P.O. Number:	Not Provided	**Report Date:**	02/17/2021
Attention:	Nate Burgei				

AMA Sample #	324882-7
Client ID	31637239
Analyst ID	MG
Collection Apparatus	Air-O-Cell
Sample Volume (L)	0
Sample Condition	Acceptable
Debris Loading	1
Location	Blank

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
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/m^3:**	0	

Comments

No mold spores observed.

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	324882	**Job Name:**	Mattaponi Elementary	**Date Submitted:**	02/16/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Nate Burgei
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-713	**Date Analyzed:**	02/17/2021
		P.O. Number:	Not Provided	**Report Date:**	02/17/2021
Attention:	Nate Burgei				

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:	324882	**Job Name:**	Mattaponi Elementary	**Date Submitted:**	02/16/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Nate Burgei
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-713	**Date Analyzed:**	02/17/2021
		P.O. Number:	Not Provided	**Report Date:**	02/17/2021
Attention:	Nate Burgei				

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): Michael Greenberg

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.

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) 324882

Mailing/Billing Information:

1. Client Name: ATI, inc.
2. Address 1: 4221 FORBES BLVD STE 250
3. Address 2: LANHAM MD 20706
4. Address 3:
5. Phone #: Fax #:

Submittal Information:

1. Job Name: MATTAPONI ELEMENTARY
2. Job Location:
3. Job #: 20-713 P.O. #:
4. Contact Person: Nate Burgei Cell:
5. Collected by: Nate Burgei Cell: 614-286-5919

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 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
❑ Same Day ❑ 5 Day +
☒ Next Day Date Due: 2/17/21
❑ 2 Day
❑ Results Required By Noon (Additional fee may apply)

REPORT TO:
❑ Email: nate.burgei@atiinc.com
❑ Email 2: courtney@atiincc.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 ASTM D7521 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 (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.
Lab use only (TEM Water samples °C)
If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
❑ Pb Paint Chip ❑ % by Weight (QTY) ❑ mg/cm² (QTY)
❑ *Pb Dust Wipe (wipe type) (QTY)
❑ *Pb Air (QTY)
❑ Pb Soil/Solid (QTY)
❑ Pb TCLP (QTY)
❑ Drinking Water ❑ Pb (QTY) ❑ Cu (QTY)
❑ Waste Water ❑ Pb (QTY) ❑ Cu (QTY)
❑ Pb Furnace (Media) (QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: 7
Collection Media Air-O-Cell
❑ *Spore-Trap 7 (QTY) ❑ Surface Vacuum Dust (QTY)
❑ *Surface Swab (QTY)
❑ *Surface Tape (QTY)
❑ Other (Specify) (QTY

CLIENT ID #	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
31638840	MULTIPURPOSE ROOM	2/16 9:19a	75L										X			
31638844	Classroom 3	2/16 9:29	75L										X			
31638812	MEDIA CENTER	2/16 9:42	75L										X			
31638899	ROOM 24	2/16 9:51	75L										X			31638799
31561516	ROOM 16	2/16 10:01	75L										X			
31561391	OUTDOORS	2/16 10:13	75L										X			
31637239			OL										X			

Received but not listed (KMA)

	Print Name	Signature	Date	Time
Relinquished by:	Nate Burgei		2/16/21	11:43
Received by:			2/16/21	1145

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: R15046
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: Moran 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	70.72 (21.5)	°F (°C)
RELATIVE HUMIDITY	39.0	%RH
BAROMETRIC PRESSURE	29.15 (987.1)	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)*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	70.9 (21.6)	70.8 (21.6)	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	29.22 (989.5)	29.23 (989.8)	28.64~29.80 (969.9~1009.1)				

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	01-24-20	07-31-20	DC Voltage	E003493	08-14-19	08-31-20

ChaoVang
CALIBRATED

June 15, 2020
DATE

DOC ID: CERT_GEN_V02

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	74.0 (23.3)	°F (°C)
RELATIVE HUMIDITY	34	%RH
BAROMETRIC PRESSURE	29.20 (988.8)	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	3015.3	* 2902.7	2924.9~3105.8
2	499	458	449~549	5	5056	* 4859.6	4904.3~5207.7
3	1002	963	952~1052				

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	35.1	* 29.5	32.1~38.1	2	100.5	* 84.8	97.5~103.5

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	32.1 (0.0)	32.8 (0.4)	31.1~33.1 (−0.5~0.6)	2	140.02 (60.01)	* 141.31 (60.73)	139.02~141.02 (59.45~60.57)

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	10.0	10.4	7.0~13.0	4	70.0	67.1	67.0~73.0
2	30.0	29.3	27.0~33.0	5	90.01	* 85.88	87.01~93.01
3	50.0	48.5	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
5000 CO_2	14A044095	04-06-20	04-06-25
N2	T-0608	05-19-20	05-19-28
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
Temperature	E010657	02-14-20	02-28-21
Temperture	E010655	01-21-20	01-31-21

Measurement Variable	System ID	Last Cal.	Cal. Due
200 CO	149886	04-30-20	03-24-28
Air	T17939	04-09-20	04-09-28
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
Temperature	E010658	02-14-20	02-28-21
Humidity	E003539	02-26-20	08-31-20

Chimouva Vue
VERIFIED

June 15, 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	70.41 (21.3)	°F (°C)
RELATIVE HUMIDITY	50.3	%RH
BAROMETRIC PRESSURE	29.15 (987.1)	inHg (hPa)

MODEL	982
SERIAL NUMBER	P17100007

☒ 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	32.1 (0.0)	31.9 (-0.1)	31.1~33.1 (-0.5~0.6)	2	140.0 (60.0)	140.3 (60.3)	139.0~141.0 (59.5~60.6)

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	10.0	9.0	7.8~12.2	4	70.0	69.5	67.8~72.2
2	30.0	29.1	27.8~32.2	5	90.0	88.7	87.8~92.2
3	50.0	49.6	47.8~52.2				

CO2 GAS VERIFICATION — SYSTEM G-101 — *Unit: ppm*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	0	0	0~50	4	3016	3012	2926~3107
2	502	502	452~552	5	5056	5032	4904~5208
3	1005	1019	955~1055				

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 CO2	14A044095	04-06-20	04-06-25
N2	T-0608	05-19-20	05-19-28
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	02-26-20	08-31-20
200 CO	149886	04-30-20	03-24-28
Air	T17939	04-09-20	04-09-28
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

Chao Vang
CALIBRATED

June 16, 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	70.68 (21.5)	°F (°C)
RELATIVE HUMIDITY	38.0	%RH
BAROMETRIC PRESSURE	29.16 (987.5)	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)*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	70.8 (21.6)	71.1 (21.7)	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	29.22 (989.5)	29.17 (987.8)	28.64~29.80 (969.9~1009.1)				

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	01-24-20	07-31-20	DC Voltage	E003493	08-14-19	08-31-20

ChaoVang
VERIFIED

June 15, 2020
DATE

Doc ID: CERT_GEN_WCC

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