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March 4, 2021

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

RE: Indoor Air Quality Assessment, Templeton Elementary School
Purchase Order: 734977
ATI Project Number: 21-622

Dear Mr. Baylor:

Prince George's County Public Schools requested that ATI, Inc., conduct a proactive indoor air quality (IAQ) assessment at Templeton Elementary School on February 16, 2020 and a follow-up assessment on March 01, 2021. Their 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

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Indoor Air Quality Assessment Report

Prince George's County Public Schools
Templeton Elementary School
6001 Carters Lane
Riverdale, MD 20737

Prepared for:

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

March 4, 2021

Submitted by:

ATI Job # 21-622

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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
SF^2	Square feet

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1 Executive Summary

ATI conducted a proactive Indoor Air Quality (IAQ) assessment on February 16, 2021, at Templeton Elementary School, located at 6001 Carters Lane, Riverdale, MD and a follow-up assessment on March 01, 2021, in select rooms that had mold spore concentrations in the initial inspection that warranted corrective actions.

The initial assessment on February 16, 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 Gymnasium, Cafeteria, Teacher's Lounge, Room 3, B230, B222, and the Media Room all had unusual elevated 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, if discovered. 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 February 16, 2021 and four of the seven reassessed spaces had temperatures less than the ASHRAE recommended winter range on March 01, 2021.
2. The relative humidity in all tested spaces on both February 16, 2021 and March 01, 2021 were less than the ASHRAE recommended maximum relative humidity of 65%, and all tested spaces except for one had a relative humidity greater than 30%. Room B222 had a relative humidity of 29% on March 1, 2021, which may lead to respiratory discomfort in some occupants.
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. There were sagging and stained ceiling tiles near the HVAC system in the Health Unit, which are typically an indication they have absorbed too much moisture over time, possibly due to unregulated high humidity during the warmer months, which can promote mold spore growth.
5. Carbon monoxide concentrations during both assessments were less than the ASHRAE/EPA recommended limit.
6. Suspect fungal growth surrounded the ceiling light fixture in the Room B230 restroom, which can be caused by high humidity from lack of ventilation from absent or insufficient exhaust vents.
7. During the initial assessment on February 16, 2021, the Gymnasium, Cafeteria, Teacher's Lounge, Room 3, B230, B222, and the Media Room were identified as having mold spore concentrations much greater than the typical indoor occupied space and were selected for corrective actions to reduce the presence of mold spores and be reassessed.
8. The March 1, 2021 reassessment showed a mostly favorable decrease in *Aspergillus/Penicillium*-like, *Cladosporium*, and *Stachybotrys/Memnoniella* spores in all reassessed spaces from a 51% decrease to a 99% decrease, respectively. The Gymnasium, Room B230 and the Media Center still had *Aspergillus/Penicillium*-like mold spore concentrations greater than the typical indoors space, suggesting the room may not have been sufficiently cleaned after treatment. ATI recommends ensuring any leaks or moisture issues were addressed in the Media Center and Room B230, as well as a thorough cleaning of all horizontal and vertical surfaces these rooms using HEPA vacuums, wet wiping all non-porous vertical and horizontal surfaces and materials, and running HEPA equipped air scrubbers for at least 24 - 48 hours.

2 Assessment Methods

Brian Chapman, Industrial Hygienist, of ATI, Inc. conducted the initial visual assessment and air sampling on February 16, 2021. Sampled rooms were randomly selected and accounted for approximately 10% of classrooms or a minimum of five samples. Mr. Chapman documented visual observations at the time he collected the air samples. Ms. McCall then conducted a follow-up

inspection on March 01, 2021 in the Gymnasium, Cafeteria, Teacher's Lounge, Room 3, B230, B222, and the Media Room 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 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 the current ASTM D7391, which counts 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	February 16, 2021 Observations
Parking Lot – Outside	• Cloudy skies, W Winds averaging 7MPH, Averaging 41°F • No traffic – foot or vehicle • Sampling area was in a parking lot near residences and trees
Main Office	• No occupants in this area during sampling • There is no odor or visible mold in this area • One wall unit in the rear of the office, which was off at the time of sampling • No concerns to note at the time of sampling • Return air is constantly pulled into the ceiling plenum • One air-return with constant flow, area is not equipped with an air-diffuser, which is sometimes common if a wall convector unit is in place, which there is • Main area is approximately 322 ft^2
Health Unit	• Ceiling AHU unit • Two stained ceiling tiles near the pipes attached to the ceiling unit and the tiles are sagging, which is an indication there may be too much moisture in the air during the hot months of the season, and can promote mold growth • Light debris on the ceiling AHU fins • No air-return or air-diffuser • Area is approximately 308 ft^2 of space
Cafeteria	• Cafeteria is being used for storage for new school supplies • There are six air-returns and four air-diffusers • Typical area for a cafeteria with a kitchen adjacent to the seating area • Four air-returns and four air-diffusers • No odor or visible mold in this area

Sample Location	February 16, 2021 Observations
	• General seating area is approximately 2760 ft^2
Media Room	• Two occupants in area during sampling • Zero air-returns and two air-diffusers • Typical media room with twenty-six computers for students, books and magazines throughout, which can hold moisture overtime • Two offices adjacent to the main area and a server room • Windows along the perimeter of the one wall • Sampled area is approximately 1600 ft^2
Teacher's Lounge	• No occupants at the time of sampling • Windows to the courtyard • Two refrigerators, soda machine, which will also have cooling coils and fan, and one candy machine • The room is approximately 448 ft^2 in size • No odor or visible mold at the time of the assessment • One air-return and three air-diffusers
B114	• There is one air-returns and one wall unit • Two windows along the one wall • Temporary wall along the one side of the room, which can be compressed to create one large room between two classrooms • Sink in room is leaking • Area is 864 ft^2
Room 3	• Dehumidifier (DRIEAZE Model # F203-A) operating at the time of initial assessment • One air-return and one wall unit • Area is approximately 896 ft^2 in size
Gymnasium	• Two large Exhaust fans with two ceiling mounted HVAC systems. Dirt load on HVAC units • Area is considered a LOA in size • No concerns at the time of the assessment
B230	• One air-return and one wall convector unit • One restroom adjacent to the main area • One wash sink in the main class area • Suspect mold growth on the bathroom ceiling surrounding the light fixture • Approximately 800 ft^2
B222	• One air-return and one convector wall unit • One sink near the entrance of the space • Poor housekeeping • Space is approximately 832 ft^2 • No concerns with exception of housekeeping at the time of the assessment

Sample Location	March 01, 2021 Reassessment Observations
Outdoors	• One other person was near sampler • Rain ended during sampling and puddles were present in the parking lot • Trees and grass were near the sampler

Sample Location	March 01, 2021 Reassessment Observations
Gymnasium	• One occupant was present during sampling • Materials such as metal chairs, gym mats, pillows, and rolled rugs were stored around the perimeter of the room • Dirt load on overhead HVAC supplies • White residue was present on the wood floor, possibly from washing area rugs
Multipurpose Room	• One occupant was present during sampling • The room was filled with student supplies such as books, IT carts, arts and craft supplies, t-shirts and other merchandise • Ceiling tiles were older but only one minor stain was observed. Ceiling grid had dark stains likely from previous water incursions
Teacher's Lounge	• One occupant was present during sampling • Old curtains were present along windows near the table • Sink was dry • Two photocopiers were in the adjoining room • Light dirt and dust were on the ground and bugs were present • Reams of paper were stored in the room and teachers' mailboxes had paper in them • Closet alcove was full of materials
Room 3	• One occupant was present during sampling • No obvious signs of leaks or water staining • Room was dusty and not vacuumed
B230	• One occupant was present during sampling • One ceiling tile in room center is stained • Attached bathroom had mildew/mold growing on hard lid ceiling
B222	• One occupant was present during sampling • Dead bugs were present along radiator vent
Media Center	• One occupant was present during sampling • Wall to wall carpet and hundreds of books were present

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 February 16, 2021 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 February 16, averaged between 66°F and 73°F, with all tested locations measuring less than the ASHRAE recommended winter range, but four of the tested spaces also had a relative humidity less than 30%. This does not pose a concern considering the school is not currently at full occupancy due to the pandemic.

ATI reassessed select rooms that had unusual fungal spore concentrations on March 01, 2021, after remediation actions were completed. ATI also reassessed the temperature in the reassessed rooms. The average temperatures in the reassessed locations range from 63°F to 72°F, with four of seven locations less than the ASHRAE recommended winter temperature range; however, these spaces appeared to be unoccupied, and the sampling occurred on a weekend when a more energy efficient HVAC mode was likely operating.

Table 2: Temperature

Sample Location	02/16/2021 Initial Assessment Temperature in °F			ASHRAE Standard °F
	Min	Max	Average	
Outside	41	41	41	N/A
Indoors				
Main Office	66	66	66	68°F - 75°F
Health Unit	73	73	73	68°F - 75°F
Cafeteria	69	69	69	68°F - 75°F
Media Center	69	69	69	68°F - 75°F
Teacher's Lounge	66	66	66	68°F - 75°F
B114	67	67	67	68°F - 75°F
Room 3	66	66	66	68°F - 75°F
Gymnasium	73	73	73	68°F - 75°F
B230	71	71	71	68°F - 75°F
B222	69	69	69	68°F - 75°F
Sample Location	**03/01/2021 Reassessment Temperature in °F**			**ASHRAE Standard °F**
	Min	**Max**	**Average**	
Outdoors	45	47	46	N/A
Indoors				
Gymnasium	62	63	63	68°F - 75°F
MPR	62	63	63	68°F - 75°F
Teacher's Lounge	67	67	67	68°F - 75°F
Room 3	66	66	66	68°F - 75°F
B230	70	70	70	68°F - 75°F
B222	72	72	72	68°F - 75°F
Media Center	67	68	68	68°F - 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 February 16, 2021 March 01, 2021 are summarized in Table 3. As indicated by the data in the table, the average relative humidity ranged between 31% and 40% with all tested locations measuring less than the ASHRAE maximum recommendation of 65% relative humidity.

ATI reassessed select rooms that had unusual fungal spore concentrations on March 01, 2021, after remediation actions were completed. ATI also reassessed the relative humidity in the space, and the average relative humidity ranged between

29% and 44% with all tested locations less than the ASHRAE maximum recommendation of 65% relative humidity, and all tested spaces except one, than 30% relative humidity, which is optimal.

Table 3: Relative Humidity

Sample Location	02/16/2021 Initial Assessment (% RH)			ASHRAE Standard (% RH)
	Min.	Max.	Avg.	
Outside	88	88	88	N/A
Indoors				
Main Office	40	40	40	≤ 65
Health Unit	32	36	34	≤ 65
Cafeteria	35	35	35	≤ 65
Media Center	35	35	35	≤ 65
Teacher's Lounge	38	38	38	≤ 65
B114	34	34	34	≤ 65
Room 3	35	35	35	≤ 65
Gymnasium	31	33	32	≤ 65
B230	31	31	31	≤ 65
B222	32	32	32	≤ 65
Sample Location	**03/01/2021 Reassessment (% RH)**			**ASHRAE Standard (% RH)**
	Min.	**Max.**	**Avg.**	
Outdoors	65	69	67	N/A
Indoors				
Gymnasium	33	33	33	≤ 65
MPR	43	44	44	≤ 65
Teacher's Lounge	37	37	37	≤ 65
Room 3	33	34	34	≤ 65
B230	32	32	32	≤ 65
B222	29	29	29	≤ 65
Media Center	33	34	34	≤ 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 February 16, 2021 are summarized in Table 4. On the day of the assessment, the average outdoor carbon dioxide concentration was 397 ppm, which calculates to a maximum indoor concentration of 1,097 ppm (700 + 397). 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 March 01, 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 March 01, 2021 was 380 ppm, which calculates to a maximum indoor concentration of 1,080 ppm (700 + 380). All tested locations indoors were less than the recommended maximum for the day of the reassessment.

Table 4: Carbon Dioxide

Sample Location	02/16/2021 Initial Assessment Concentration (parts per million)			ASHRAE Standard (ppm) NTE
	Min	Max	Average	
Outside	391	403	397	N/A
Indoors				
Main Office	488	494	491	< 1,097
Health Unit	514	568	541	< 1,097
Cafeteria	531	539	535	< 1,097
Media Center	481	489	485	< 1,097
Teacher's Lounge	506	520	513	< 1,097
B114	446	464	455	< 1,097
Room 3	450	454	452	< 1,097
Gymnasium	452	456	454	< 1,097
B230	459	461	460	< 1,097
B222	444	446	445	< 1,097
Sample Location	**03/01/2021 Reassessment Concentration (parts per million)**			**ASHRAE Standard (ppm) NTE**
	Min	**Max**	**Average**	
Outside	376	384	380	N/A
Indoors				
Gymnasium	385	393	389	< 1,080
MPR	411	417	414	< 1,080
Teacher's Lounge	415	422	419	< 1,080
Room 3	401	415	408	< 1,080
B230	419	425	422	< 1,080
B222	417	421	419	< 1,080
Media Center	411	416	414	< 1,080

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 February 16, 2021 were less than the Q-Trak's detection limit throughout the school.

ATI reassessed select rooms that had unusual fungal spore concentrations on March 01, 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 less than the EPA/ASHRAE recommended maximum of 9 ppm.

Table 5: Carbon Monoxide

Sample Location	02/16/2021 Initial Assessment Concentration (parts per million)			ASHRAE Standard (ppm)
	Min	Max	Average	
Outdoors	< 3	< 3	< 3	N/A
Indoors				
Main Office	< 3	< 3	< 3	< 9
Health Unit	< 3	< 3	< 3	< 9
Cafeteria	< 3	< 3	< 3	< 9
Media Center	< 3	< 3	< 3	< 9
Teacher's Lounge	< 3	< 3	< 3	< 9
B114	< 3	< 3	< 3	< 9
Room 3	< 3	< 3	< 3	< 9
Gymnasium	< 3	< 3	< 3	< 9
B230	< 3	< 3	< 3	< 9
B222	< 3	< 3	< 3	< 9
Sample Location	**03/01/2021 Reassessment Concentration (parts per million)**			**ASHRAE Standard (ppm)**
	Min	**Max**	**Average**	
Outdoors	< 3	< 3	< 3	N/A
Indoors				
Gymnasium	< 3	< 3	< 3	< 9
MPR	< 3	< 3	< 3	< 9
Teacher's Lounge	< 3	< 3	< 3	< 9
Room 3	< 3	< 3	< 3	< 9
B230	< 3	< 3	< 3	< 9
B222	< 3	< 3	< 3	< 9
Media Center	< 3	< 3	< 3	< 9

5 Total Fungal Air Sampling Results

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

The February 16, 2021 and March 1, 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 February 16, 2021 suggested unusual mold spore concentrations in seven tested locations: the Gymnasium, Cafeteria, Teacher's Lounge, Room 3, B230, B222, and the Media Room. The *Aspergillus/Penicillium*-like mold spore concentration in the previously mentioned locations were greater than the outdoor concentration of 106 spores/m^3, ranging from 2,120 spores/m^3, up to 18,012 spores/m^3. *Aspergillus/Penicillium*-like are two different mold genera but are grouped when analyzed via ASTM-D7391 due to their similar characteristics under a microscope. 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. Some of the spaces had *Cladosporium* concentrations greater than a typical indoor occupied space, which is also a common mold that grows indoors. The Media Room also had a moderate *Stachybotrys/Memnoniella* spore concentration of 212 spores/m^3, which indicated at least some degree of chronic moisture issues. *Stachybotrys/Memnoniella* are mold spore genera that typically require a continual supply of moisture and are often found growing alongside primary colonizers such as *Aspergillus*, *Penicillium*, and *Cladosporium*.

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

The Gymnasium, Cafeteria, Teacher's Lounge, Room 3, B230, B222, and the Media Room were reassessed on March 01, 2021 after the initial assessment indicated the unusual presence of airborne mold spores. All areas retested had an *Aspergillus/Penicillium*-like airborne mold spore concentration reduction between 51% and 99% when compared to the February 16, 2021 initial inspection. The Gymnasium, B230 and Media Center had *Aspergillus/Penicillium*-like concentration greater than the typical occupied space, but it is still a significant decrease from the February 16, 2021 assessment. The spores detected in the sample may be residual mold spores that were not removed from the room during the first cleaning round. None of the spaces had detectable concentrations of *Stachybotrys/Memnoniella* spores and *Cladosporium* concentrations in the concerned areas were also reduced to acceptable concentrations.

ATI recommends an additional round of cleaning in the Gymnasium, B230 and Media Center using HEPA vacuums on all surfaces, wet wiping all non-porous vertical and horizontal surfaces to remove residual spores, and running HEPA equipped air scrubbers for at least 24 to 48-hours. The presence of *Stachybotrys/Memnoniella* spores suggest there is either current or there was at some time in the past chronic moisture issues. Any currently known moisture issues or water leaks should be addressed before any recleaning activities are initiated.

Vacuum around the refrigerator coils in the Teacher's Lounge to remove additional dusts and at main entrances/exits of building (emergency exits as well) where mold spores typically found on plant materials from the outdoors, like leaves, soil, detritus, may have blown in and settled.

There were ceiling tiles in the Health Unit that were sagging, which suggested they have been saturated with moisture at some point in the past, mostly likely from high humidity. Tiles holding moisture can also grow fungus overtime and should be replaced. The fins to the HVAC system also have collection of debris on them. The debris can hold microbes, which can multiply if they are viable. Cleaning the ceiling unit on a routine basis can help reduce the accumulation.

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

Table 6: *Aspergillus/Penicillium* spores/m³ Concentration Comparison

Sample Location	February 16, 2021 Concentration	March 01, 2021 Concentrations	% Change
Gymnasium	12,312	1,300	- 89%
Cafeteria/MPR	3,710	572	- 84%
Teacher's Lounge	4,664	52	- 99%
Room 3	2,120	104	- 95%
B230	6,042	2,964	- 51%
B222	18,012	364	- 98%
Media Center	8,400	2,028	- 76%

The official laboratory reports with spore trap samples collected on February 16, 2021 and March 01, 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 February 16, 2021 and four of the seven reassessed spaces had temperatures less than the ASHRAE recommended winter range on March 01, 2021.
2. The relative humidity in all tested spaces on both February 16, 2021 and March 01, 2021 were less than the ASHRAE recommended maximum relative humidity of 65%, and all tested spaces except for one had a relative humidity greater than 30%. Room B222 had a relative humidity of 29% on March 1, 2021, which may lead to respiratory discomfort in some occupants.
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. There were sagging and stained ceiling tiles near the HVAC system in the Health Unit, which are typically an indication they have absorbed too much moisture over time, possibly due to unregulated high humidity during the warmer months, which can promote mold spore growth.
5. Carbon monoxide concentrations during both assessments were less than the ASHRAE/EPA recommended limit.
6. Suspect fungal growth surrounded the ceiling light fixture in the Room B230 restroom, which can be caused by high humidity from lack of ventilation from absent or insufficient exhaust vents.
7. During the initial assessment on February 16, 2021, the Gymnasium, Cafeteria, Teacher's Lounge, Room 3, B230, B222, and the Media Room were identified as having mold spore concentrations much greater than the typical indoor occupied space and were selected for corrective actions to reduce the presence of mold spores and be reassessed.
8. The March 1, 2021 reassessment showed a mostly favorable decrease in *Aspergillus/Penicillium*-like, *Cladosporium*, and *Stachybotrys/Memnoniella* spores in all reassessed spaces from a 51% decrease to a 99% decrease, respectively. The Gymnasium, Room B230 and the Media Center still had *Aspergillus/Penicillium*-like mold spore concentrations greater than the typical indoors space, suggesting the room may not have been sufficiently cleaned after treatment. ATI recommends ensuring any leaks or moisture issues were addressed in the Media Center and Room B230, as well as a thorough cleaning of all horizontal and vertical surfaces these rooms using HEPA vacuums, wet wiping all non-porous vertical and horizontal surfaces and materials, and running HEPA equipped air scrubbers for at least 24 - 48 hours.

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

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:	294978	**Job Name:**	Templeton Elementary School	**Date Submitted:**	02/16/2021
Client:	ATI, Inc.	**Job Location:**	6001 Carters Lane	**Person Submitting:**	Brian Chapman
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-	**Date Analyzed:**	02/17/2021
		P.O. Number:	Not Provided	**Report Date:**	02/17/2021
Attention:	Brian Chapman				

AMA Sample #	294978-1	**AMA Sample #**	294978-2	**AMA Sample #**	294978-3
Client ID	16-6001-01	**Client ID**	16-6001-02	**Client ID**	16-6001-03
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)**	0	**Sample Volume (L)**	75
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	2	**Debris Loading**	1	**Debris Loading**	3
Location	Outside	**Location**	Field Blank	**Location**	Main Office

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	74	15	53	3922	63.8%
Basidiospores	37	15	53	1961	31.9%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	53	53	0.9%
Curvularia					
Penicillium / Aspergillus	2	15	53	106	1.7%
Smuts/Periconia/Myxomycetes	2	15	53	106	1.7%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Stemphylium					
Cercospora					
Torula					
Pithomyces					
Epicoccum					
Nigrospora					
Hyphal Fragments*					
Total Raw Ct:	116	**Total sp/m³:**		6148	

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					
Stemphylium					
Cercospora					
Torula					
Pithomyces					
Epicoccum					
Nigrospora					
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	6	15	53	318	13.6%
Basidiospores	14	15	53	742	31.8%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	13	15	53	689	29.5%
Curvularia					
Penicillium / Aspergillus	4	15	53	212	9.1%
Smuts/Periconia/Myxomycetes	5	15	53	265	11.4%
Stachybotrys/Memnoniella	1	15	53	53	2.3%
Ulocladium					
Unknown	1	15	53	53	2.3%
Stemphylium	Present	15	53	<53	
Cercospora					
Torula					
Pithomyces					
Epicoccum					
Nigrospora					
Hyphal Fragments*	1	15	53	53	2.3%
Total Raw Ct:	44	**Total sp/m³:**		2332	

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	294978	**Job Name:**	Templeton Elementary School	**Date Submitted:**	02/16/2021
Client:	ATI, Inc.	**Job Location:**	6001 Carters Lane	**Person Submitting:**	Brian Chapman
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-	**Date Analyzed:**	02/17/2021
		P.O. Number:	Not Provided	**Report Date:**	02/17/2021
Attention:	Brian Chapman				

AMA Sample #	294978-4	**AMA Sample #**	294978-5	**AMA Sample #**	294978-6
Client ID	16-6001-04	**Client ID**	16-6001-05	**Client ID**	16-6001-06
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**	3
Location	Health Unit	**Location**	Cafeteria	**Location**	Media Rm

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	11	15	53	583	45.8%
Basidiospores	9	15	53	477	37.5%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	2	15	53	106	8.3%
Curvularia					
Penicillium / Aspergillus	1	15	53	53	4.2%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown	1	15	53	53	4.2%
Stemphylium					
Cercospora	Present	15	53	<53	
Torula					
Pithomyces					
Epicoccum					
Nigrospora					
Hyphal Fragments*	1	15	53	53	4.2%
Total Raw Ct:	24		**Total sp/m³:**		1272

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	4	15	53	212	4%
Basidiospores	14	15	53	742	14.1%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	8	15	53	424	8.1%
Curvularia					
Penicillium / Aspergillus	70	15	53	3710	70.7%
Smuts/Periconia/Myxomycetes	2	15	53	106	2%
Stachybotrys/Memnoniella	Present	15	53	<53	
Ulocladium					
Unknown					
Stemphylium					
Cercospora					
Torula	Present	15	53	<53	
Pithomyces	1	15	53	53	1%
Epicoccum					
Nigrospora					
Hyphal Fragments*	2	15	53	106	2%
Total Raw Ct:	99		**Total sp/m³:**		5247

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria	1	15	53	53	0.7%
Ascospores	3	15	53	159	2%
Basidiospores	13	15	53	689	8.8%
Bipolaris/Drechslera/Helm.					
Chaetomium	2	15	53	106	1.4%
Cladosporium	17	15	53	901	11.5%
Curvularia					
Penicillium / Aspergillus	105	10	80	8400	70.9%
Smuts/Periconia/Myxomycetes	3	15	53	159	2%
Stachybotrys/Memnoniella	4	15	53	212	2.7%
Ulocladium					
Unknown					
Stemphylium					
Cercospora					
Torula					
Pithomyces					
Epicoccum					
Nigrospora					
Hyphal Fragments*	10	15	53	530	6.8%
Total Raw Ct:	148		**Total sp/m³:**		10679

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	294978	**Job Name:**	Templeton Elementary School	**Date Submitted:**	02/16/2021
Client:	ATI, Inc.	**Job Location:**	6001 Carters Lane	**Person Submitting:**	Brian Chapman
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-	**Date Analyzed:**	02/17/2021
		P.O. Number:	Not Provided	**Report Date:**	02/17/2021
Attention:	Brian Chapman				

AMA Sample #	294978-7	**AMA Sample #**	294978-8	**AMA Sample #**	294978-9
Client ID	16-6001-07	**Client ID**	16-6001-08	**Client ID**	16-6001-09
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	3	**Debris Loading**	2	**Debris Loading**	2
Location	Teachers Lounge	**Location**	B114	**Location**	RM 3

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	1	15	53	53	0.8%
Basidiospores	7	15	53	371	5.7%
Bipolaris/Drechslera/Helm.					
Chaetomium	Present	15	53	<53	
Cladosporium	23	15	53	1219	18.7%
Curvularia	1	15	53	53	0.8%
Penicillium / Aspergillus	88	15	53	4664	71.5%
Smuts/Periconia/Myxomycetes	1	15	53	53	0.8%
Stachybotrys/Memnoniella	1	15	53	53	0.8%
Ulocladium					
Unknown	1	15	53	53	0.8%
Stemphylium					
Cercospora					
Torula					
Pithomyces					
Epicoccum					
Nigrospora					
Hyphal Fragments*	1	15	53	53	0.8%
Total Raw Ct:	123		**Total sp/m³:**	6519	

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	34	15	53	1802	60.7%
Basidiospores	18	15	53	954	32.1%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	2	15	53	106	3.6%
Curvularia					
Penicillium / Aspergillus	2	15	53	106	3.6%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Stemphylium					
Cercospora					
Torula					
Pithomyces					
Epicoccum	Present	15	53	<53	
Nigrospora					
Hyphal Fragments*					
Total Raw Ct:	56		**Total sp/m³:**	2968	

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	13	15	53	689	20.3%
Basidiospores	8	15	53	424	12.5%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	53	53	1.6%
Curvularia					
Penicillium / Aspergillus	40	15	53	2120	62.5%
Smuts/Periconia/Myxomycetes	1	15	53	53	1.6%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown	1	15	53	53	1.6%
Stemphylium					
Cercospora					
Torula					
Pithomyces					
Epicoccum					
Nigrospora					
Hyphal Fragments*					
Total Raw Ct:	64		**Total sp/m³:**	3392	

Comments

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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	294978	**Job Name:**	Templeton Elementary School	**Date Submitted:**	02/16/2021
Client:	ATI, Inc.	**Job Location:**	6001 Carters Lane	**Person Submitting:**	Brian Chapman
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-	**Date Analyzed:**	02/17/2021
		P.O. Number:	Not Provided	**Report Date:**	02/17/2021
Attention:	Brian Chapman				

AMA Sample #	294978-10					**AMA Sample #**	294978-11					**AMA Sample #**	294978-12				
Client ID	16-6001-10					**Client ID**	16-6001-11					**Client ID**	16-6001-12				
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	Gym					**Location**	B230					**Location**	B222				

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	8	15	53	424	5.2%
Basidiospores	3	15	53	159	1.9%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	35	15	53	1855	22.6%
Curvularia					
Penicillium / Aspergillus	108	7	114	12312	69.7%
Smuts/Periconia/Myxomycetes	1	15	53	53	0.6%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Stemphylium					
Cercospora					
Torula					
Pithomyces					
Epicoccum					
Nigrospora	Present	15	53	<53	
Hyphal Fragments*	2	15	53	106	1.3%
Total Raw Ct:	155		**Total sp/m³:**		14803

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	4	15	53	212	2.7%
Basidiospores	3	15	53	159	2%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	28	15	53	1484	18.7%
Curvularia					
Penicillium / Aspergillus	114	15	53	6042	76%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella	1	15	53	53	0.7%
Ulocladium					
Unknown					
Stemphylium					
Cercospora					
Torula					
Pithomyces					
Epicoccum					
Nigrospora					
Hyphal Fragments*					
Total Raw Ct:	150		**Total sp/m³:**		7950

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	14	15	53	742	6.3%
Basidiospores	9	15	53	477	4%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	42	15	53	2226	18.8%
Curvularia					
Penicillium / Aspergillus	158	7	114	18012	70.5%
Smuts/Periconia/Myxomycetes	1	15	53	53	0.4%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Stemphylium					
Cercospora					
Torula					
Pithomyces					
Epicoccum					
Nigrospora					
Hyphal Fragments*	4	15	53	212	1.8%
Total Raw Ct:	224		**Total sp/m³:**		21510

Comments

AMA Analytical Services, Inc.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	294978	**Job Name:**	Templeton Elementary School	**Date Submitted:**	02/16/2021
Client:	ATI, Inc.	**Job Location:**	6001 Carters Lane	**Person Submitting:**	Brian Chapman
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-	**Date Analyzed:**	02/17/2021
		P.O. Number:	Not Provided	**Report Date:**	02/17/2021
Attention:	Brian Chapman				

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:	294978	**Job Name:**	Templeton Elementary School	**Date Submitted:**	02/16/2021
Client:	ATI, Inc.	**Job Location:**	6001 Carters Lane	**Person Submitting:**	Brian Chapman
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-	**Date Analyzed:**	02/17/2021
		P.O. Number:	Not Provided	**Report Date:**	02/17/2021
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): 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.

Cercospora

Cercospora is a cosmopolitan, fungus isolated from agricultural areas, especially during harvest. Several species of this genus cause plant diseases, mostly forms of leaf spot. The spores are colorless or pale, smooth, cylindrical often with a broad end point or almost club-shaped. Health Effects: The health effects of this spore are not well documented or studied.

Chaetomium

Chaetomium is a genus of ascomycete fungi. It is a cosmopolitan, dark colored fungus (grayish-green to brown) commonly isolated from soil, seeds, dung, wood, and straw materials. Indoors, it is very commonly found on damp sheetrock and paper or cellulose-containing materials. There are certain characteristics such as color, shape, and size of the Chaetomium ascopores, asci, and ascomata that are unique in identification of the different species. Wind, insects, and water aid dispersal of spores. Due to their large size, they settle out of the air after just a few minutes. As a consequence, airborne mold levels are usually low even in infested environments. Due to this, exposure levels are likely to be low as well. Health Effects: Chaetomium does produce a variety of mycotoxins called chaetoglobsins, whose health effects on humans are unknown. Due to its toxigenic nature, special precautions may be required during remediation.

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.

Curvularia

Curvularia is a ubiquitous fungus commonly found dead plant material. It is often found outside growing in soil, seeds, plant litter, and decaying plants as well as on leaves. Indoors, it is found on a variety of building materials, especially those with cellulose surfaces. Colonies are expanding with olive-green to brown or black, with pinkish gray color and woolly or hairy in texture. The conidia (spores) are large and appear curved due to expanded central cells. This feature and the presence of edge to edge septations on the conidia walls distinguishes Curvularia from Bipolaris. Health Effects: This mold is a potential allergen. Some people may experience hay fever, asthma and or allergic fungal sinusitis.

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.

Memnoniella

Memnoniella is closely related Stachybotrys and they are often found growing together. Like Stachybotrys, it is a cosmopolitan fungus and commonly found in soil, plant debris as well as plants and trees. It is also cellulolytic or has the capacity to degrade cellulose and found on wet materials containing cellulose as well as other substrates. Unlike Stachybotrys, the spores form chains and not aggregated in slimy heads. Spores are spherical to sub-spherical, gray, dark brown or black in color, and smooth to rough walled. Colonies are black to blackish-green. Health Effects: Some species may produce mycotoxins with similar toxicities as some species of Stachybotrys. These mycotoxins may have the ability to infect humans and animals after ingestion, inhalation or absorption through unbroken skin.

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.

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.

Stachybotrys

Stachybotrys is known as black mold or toxic black mold. It is a worldwide, filamentous fungus that is commonly found growing on water damaged materials such as ceiling tiles, insulation, wallpaper, wood, and sheetrock. It is highly cellulolytic (has the capacity to degrade cellulose) and commonly isolated on wet materials containing cellulose, such as wallboard, jute carpet backing along with associated glues, straw baskets, and paper materials. The spores are slimy, ellipsoidal to, sub-spherical in shape, single-celled, gray to black in color, and smooth to rough walled. They usually form in clusters on the phialides. Colonies have a powdery to cottony texture and white in color at first, later turning dark gray to black. Health Effects: Certain species of Stachybotrys produce mycotoxins that may be harmful to human and animal after ingestion. They can cause allergic and asthmatic reactions in sensitive individuals.

Stemphylium

Stemphylium is dark colored, filamentous plant pathogen isolated from soil and widely distributed on decaying vegetation as well. Colonies are grow rapidly, gray, brownish black, or black, with cottony to velvety texture. Spores are single, light brown to black in color, muriform, smooth to rough walled, oblong or sub-spherical and rounded at the tip, and constricted in the center. The presence of a broad scar at the base is distinctive of this spore. Health Effects: Stemphylium may cause some mycotic infection in humans.

Torula

Torula is a cosmopolitan, dark-walled fungus often found growing outside in soil, dead herbaceous stems, wood, grasses, and seeds. It can grow indoors on cellulose containing materials. It is frequently found in temperate regions. Torula spores are colored in shades of brown, from pale brown to reddish brown. Spores are formed in simple or branched chains, one to several cells long that are often detached. A cup-like indentation at the point of detachment is characteristic of these spores. Health Effects: Torula is an allergen, which may cause hay fever and asthma. It has not been reported to be pathogenic to humans or produce toxins.

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) 294978

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: Templeton E.S.
2. Job Location: 6001 Carters Lane
3. Job #: 21- P.O. #: _____
4. Contact Person: Brian Chapman Cell: 202-368-1376
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 ☐ Late Night	☐ 4 Hours ☐ 3 Day ☐ Results Required By Noon	☑ Email: Brian@atiinc.com
☐ Immediate Date Due: _____	☐ Same Day ☐ 5 Day +	☑ Email 2: Courtney@atiinc.com
☐ 24 Hours Time Due: _____	☒ Next Day Date Due: 2-17-21	☐ Verbals: _____
Comments: _____	☐ 2 Day	

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 12 (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
16-6001-01	Outside	2-16-21	75L					✓	✓							11:47
02	BLANK		N/A													
03	main office		75L													11:59
04	Health Unit		75L													12:07
05	Cafeteria		75L													12:14
06	Media Rm		75L													12:22
07	Teachers Lounge		75L													12:31
08	B104		75L													12:37
09	Rm 3		"													12:46
10	Gym		"													12:54
11	B230															13:07
12	B222															13:08

	Print Name	Signature	Date	Time	Shipping Information
Relinquished by:	Brian Chapman		2-16-21	1:48	☐ UPS ☐ FedEx ☐ USPS ☒ In-Person ☐ Drop Box ☐ Courier ☐ Other
Received by:			2/16/21	1380	

AMA Analytical Services, Inc.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	625392	**Job Name:**	Templeton Elementary	**Date Submitted:**	03/01/2021
Client:	ATI, Inc.	**Job Location:**	6001 Carters Lane #3217, Riverdale, MD 207037	**Person Submitting:**	Courtney McCall
Address:	9220 Rumsey Road	**Job Number:**	21-622	**Date Analyzed:**	03/02/2021
	Suite 100	**P.O. Number:**	Not Provided	**Report Date:**	03/02/2021
	Columbia, MD 21045			**Revised:**	03/03/2021 (Revision #1)
Attention:	Courtney McCall				

AMA Sample #	625392-1	**AMA Sample #**	625392-2	**AMA Sample #**	625392-3
Client ID	31570096	**Client ID**	31570025	**Client ID**	31569988
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	Gymnasium	**Location**	MPR	**Location**	Teachers Lounge

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	4	23	52	208	9.8%
Basidiospores	12	23	52	624	29.3%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	Present	23	52	<52	
Curvularia					
Penicillium / Aspergillus	25	23	52	1300	61%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	41	**Total sp/m³:**	2132		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	16	23	52	832	50%
Basidiospores	4	23	52	208	12.5%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	23	52	52	3.1%
Curvularia					
Penicillium / Aspergillus	11	23	52	572	34.4%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	32	**Total sp/m³:**	1664		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	5	23	52	260	31.3%
Basidiospores	8	23	52	416	50%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	2	23	52	104	12.5%
Curvularia					
Penicillium / Aspergillus	1	23	52	52	6.3%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	16	**Total sp/m³:**	832		

Comments

AMA Analytical Services, Inc.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	625392	**Job Name:**	Templeton Elementary	**Date Submitted:**	03/01/2021
Client:	ATI, Inc.	**Job Location:**	6001 Carters Lane #3217, Riverdale, MD 207037	**Person Submitting:**	Courtney McCall
Address:	9220 Rumsey Road	**Job Number:**	21-622	**Date Analyzed:**	03/02/2021
	Suite 100	**P.O. Number:**	Not Provided	**Report Date:**	03/02/2021
	Columbia, MD 21045			**Revised:**	03/03/2021 (Revision #1)
Attention:	Courtney McCall				

AMA Sample #	625392-4	**AMA Sample #**	625392-5	**AMA Sample #**	625392-6
Client ID	31570007	**Client ID**	31570015	**Client ID**	31570068
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 3	**Location**	B230	**Location**	B222

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	10	23	52	520	40%
Basidiospores	9	23	52	468	36%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	4	23	52	208	16%
Curvularia					
Penicillium / Aspergillus	2	23	52	104	8%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	25	**Total sp/m³:**	1300		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	10	23	52	520	13.3%
Basidiospores	4	23	52	208	5.3%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	4	23	52	208	5.3%
Curvularia					
Penicillium / Aspergillus	57	23	52	2964	76%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	75	**Total sp/m³:**	3900		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	3	23	52	156	18.8%
Basidiospores	5	23	52	260	31.3%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	23	52	52	6.3%
Curvularia					
Penicillium / Aspergillus	7	23	52	364	43.8%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	16	**Total sp/m³:**	832		

Comments

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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody: 625392
Client: ATI, Inc.
Address: 9220 Rumsey Road
Suite 100
Columbia, MD 21045
Attention: Courtney McCall

Job Name: Templeton Elementary
Job Location: 6001 Carters Lane #3217, Riverdale, MD 207037
Job Number: 21-622
P.O. Number: Not Provided

Date Submitted: 03/01/2021
Person Submitting: Courtney McCall
Date Analyzed: 03/02/2021
Report Date: 03/02/2021
Revised: 03/03/2021 (Revision #1)

AMA Sample #	625392-7
Client ID	31569989
Analyst ID	MG
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	3
Location	Media Center

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	10	23	52	520	9.8%
Basidiospores	36	23	52	1872	35.3%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	17	23	52	884	16.7%
Curvularia					
Penicillium / Aspergillus	39	23	52	2028	38.2%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					

Total Raw Ct: 102 **Total sp/m³:** 5304

Comments

AMA Sample #	625392-8
Client ID	31570001
Analyst ID	MG
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	1
Location	Ambient

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	54	23	52	2808	67.5%
Basidiospores	12	23	52	624	15%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	4	23	52	208	5%
Curvularia					
Penicillium / Aspergillus	10	23	52	520	12.5%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					

Total Raw Ct: 80 **Total sp/m³:** 4160

Comments

AMA Sample #	625392-9
Client ID	31570180
Analyst ID	MG
Collection Apparatus	Air-O-Cell
Sample Volume (L)	0
Sample Condition	Acceptable
Debris Loading	0
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					
Hyphal Fragments*					

Total Raw Ct: 0 **Total sp/m³:** 0

Comments
No mold spores observed.

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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	625392	**Job Name:**	Templeton Elementary	**Date Submitted:**	03/01/2021
Client:	ATI, Inc.	**Job Location:**	6001 Carters Lane #3217, Riverdale, MD 207037	**Person Submitting:**	Courtney McCall
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-622	**Date Analyzed:**	03/02/2021
		P.O. Number:	Not Provided	**Report Date:**	03/02/2021
				Revised:	03/03/2021 (Revision #1)
Attention:	Courtney McCall				

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.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	625392	**Job Name:**	Templeton Elementary	**Date Submitted:**	03/01/2021
Client:	ATI, Inc.	**Job Location:**	6001 Carters Lane #3217, Riverdale, MD 207037	**Person Submitting:**	Courtney McCall
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-622	**Date Analyzed:**	03/02/2021
		P.O. Number:	Not Provided	**Report Date:**	03/02/2021
				Revised:	03/03/2021 (Revision #1)
Attention:	Courtney McCall				

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.

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.

Record Changes Report

Client: ATI, Inc.

Client Code: ATIINC

Chain of Custody: 625392

Date	Description
03/03/2021	Corrected sample location for #625392-5 from B320 to B230 per client request

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) 025392

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: Templeton Elementary
2. Job Location: 6001 Carters Ln #3217, Riverdale, MD 20737
3. Job #: 21-622 P.O. #: _____
4. Contact Person: Courtney McCall Cell: 703 399 5423
5. Collected by: Courtney McCall 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 to contacts on file.

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ 4 Hours ❑ Late Night ❑ Immediate Date Due: _____ ❑ 24 Hours Time Due: _____ Comments: _____	❑ 4 Hours ❑ 3 Day ❑ Same Day ❑ 5 Day + 3/2/21 ☑ Next Day Date Due: _____ ❑ 2 Day ❑ Results Required By Noon (Additional fee may apply)	☑ Email: courtney@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
❑ 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: _____
Collection Media _____
☑ *Spore-Trap 9 (QTY) ❑ Surface Vacuum Dust ____ (QTY)
❑ *Surface Swab ____ (QTY)
❑ *Surface Tape ____ (QTY)
❑ Other (Specify ____) ____ (QTY)

SAMPLE INFORMATION: 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
3157 0096	Gymnasium	2/27/21 1040 AM	75L					✓	✓				✓			Received: 3/1/21 @ 0800 via DLO by KMAX
3157 0025	MPR	2/27/21 946 AM	75L					✓	✓				✓			
3156 9988	Teachers Lounge	2/27/21 955 AM	75L					✓	✓				✓			
3157 0007	Room 3	2/27/21 1030 AM	75L					✓	✓				✓			
3157 0015	B230	2/27/21 1013 AM	75L					✓	✓				✓			
3157 0068	B222	2/27/21 1021 AM	75L					✓	✓				✓			
3156 9989	Media Center	2/27/21 1005 AM	75L					✓	✓				✓			
3157 0001	Ambient	2/27/21 938 AM	75L					✓	✓				✓			
3157 0186	Field Blank	2/27/21 —	75L					✓	✓				✓			
Relinquished by Courtney McCall									Courtney McCall		2/28/21		1029 AM			

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

TSI P/N 2300157

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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