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Architecture | Engineering | Construction

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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, Carole Highlands Elementary School
Purchase Order: 734977
ATI Project Number: 20-711

Dear Mr. Baylor:

Prince George's County Public Schools requested that ATI, Inc., conduct a proactive indoor air quality (IAQ) assessment at Carole Highlands Elementary School on December 15, 2020 and follow-up assessments on February 25, 2021 and March 3, 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
Carole Highlands Elementary School
1610 Hannon Street
Takoma Park, MD 20912

Prepared for:

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

March 4, 2021

Submitted by:

ATI Job # 20-711

Table of Contents

List of Tables

Appendices

Abbreviations and Acronyms

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

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 December 15, 2020, at Carole Highlands Elementary School, located at 1610 Hannon Street, Takoma Park, MD and with two additional follow-up assessments on February 25, and March 3, 2021, in select room(s) that had mold spore concentrations in the initial inspection that warranted corrective actions.

The initial assessment on December 15, 2020 included a visual evaluation 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 Conference Room and Room 27 had 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 repaired any water issues, if discovered during the initial assessment. ATI inspected Room 27 again on March 3, 2021 after elevated results of *Aspergillus/Penicillium*-like spores were detected during the February 25, 2021 assessment. 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. Six of the tested spaces had a temperature greater than the ASHRAE recommended winter range of 68°F - 75°F on December 15, 2020 and one of the reassessed spaces had temperatures greater the ASHRAE recommended winter rages on February 25, 2021. During the March 3, 2021 reassessment, Room 27 had a temperature within the ASHRAE recommended winter range.
2. The relative humidity in all tested spaces on the three assessments were less than the ASHRAE maximum recommended relative humidity of 65%, yet all tested spaces had a relative humidity less than 30%, which can cause occupant discomfort.
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. Room 27 had sagging ceiling tiles, which is typically an indication of unregulated high humidity in the space during the warmer months which can promote fungal growth, like *Aspergillus Penicillium* molds which can grow with high humidity as its only water source. It is recommended to replace any ceiling tiles showing signs of sagging from excessive moisture exposure. Room 27 also had a medium dirt load on the HVAC system, which can also promote mold growth.
5. Carbon monoxide concentrations during both assessments were less than the ASHRAE/EPA recommended limit.
6. During the initial assessment on December 15, 2020, the Conference Room and Room 27 were identified as having mold spore concentrations greater than the typical indoor occupied space and were selected for corrective actions to reduce the presence of mold spores and be reassessed upon the completion of the corrective actions. The other tested spaces had mold spore concentrations that were typical for occupied spaces.
7. The February 25, 2021 reassessment showed an 80% decrease in the *Aspergillus/Penicillium*-like mold spore concentration in the Conference Room when compared to the initial assessment. The *Aspergillus/Penicillium*-like mold spore concentration in Room 27 increased 22%, suggesting the corrective actions were not successful in reducing the airborne mold concentration. ATI recommend additional cleaning and an additional assessment in Room 27.
8. On March 3, 2021, the *Aspergillus/Penicillium*-like mold spore concentration in Room 27 dropped to 159 spores/m^3, for a total reduction of 95%, which suggests the corrective actions successfully reduced the mold spore concentrations to that of a typical indoor occupied space.

2 Assessment Methods

Brian Chapman, Industrial Hygienist, of ATI, Inc. conducted the initial visual assessment and air sampling on December 15, 2020. 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. Mr. Wanigasundara conducted follow-up inspections on February 25, 2021 in the Conference Room and Room 27, and March 3, 2021 in Room 27 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	December 15, 2020 Observations
Parking Lot – Outside	• Sunny skies, NW winds averaging 6MPH, averaging 34°F • No traffic – foot or vehicle • Sampling area was in a parking lot near residences and trees
Facility Planning	• 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 is off at the time of sampling • No concerns to note at the time of sampling • One air-return and one window convector unit to supply air • Double entrance to the space, which can provide additional unfiltered air from the adjacent corridors into the space if the facility is under improper building pressure • One household stove and refrigerator, and two microwaves • Dried potpourri and eight small houseplants • School was not occupied at the time of the evaluation due to the pandemic • Main area is approximately 336 ft^2
Room 6	• Zero return-air vents and one window convector unit, which was operating while the assessment took place • Restroom adjacent to the classroom • Sink in the room has a slow drip to the faucet, which should be corrected by maintenance • Area is approximately 920 ft^2 of space
Main Office	• Sufficient lighting • One air-return and one window convector unit • Main office is equipped with two entrances, one near the corridor leading to the main entrance

Sample Location	December 15, 2020 Observations
	• Three offices adjacent to the main area, restroom in the area and one conference room down the corridor • Four air-returns and four air-diffusers • No odor or visible mold in this area • General seating area is approximately 920 ft^2
Conference Room	• There are two occupants in area during sampling • Two air-returns and one air-diffuser • Interior space with overhead ventilation • Seating is equipped for eleven occupants • Area is adjacent to the main office and corridor • Sampled area is approximately 252 ft^2
Room 13	• No occupants at the time of sampling • The room is approximately 858 ft^2 in size • No odor or visible mold at the time of the survey • One air-return and one window convector unit, which is making a noise while operating and should be serviced
Media Room 500	• Area is equipped with one air-return and six air-diffusers • Windows around the perimeter of the space • Area is 1,672 ft^2
Room 18	• Temperature in the room was extremely elevated. The convector unit appears to be on high and should be changed to low since the area is unoccupied • Zero air-returns and one wall unit • Area is approximately 792 ft^2 in size
Room 27	• Two large Exhaust fans with two ceiling mounted HVAC systems. Medium dirt load on HVAC units • Area is approximately 1,088 ft^2 in size • Sagging ceiling tiles, which is typically an indication of high relative humidity, which tends to be common during the warmer months • Two sinks in the space • Two windows on the one wall, with an emergency exit to the outdoors.
Room 31	• Two overhead air-returns and four air-diffusers • There appears to be a musty smell coming from the area but unable to identify the exact location due to the IH wearing a mask • One restroom adjacent to the main area • One wash sink in the main class area with slow leak and water damage under the sink • Exit to the outdoors • Approximately 864 ft^2
Gymnasium/Cafeteria	• Three air-returns and ten air-diffusers • The space serves as dual purposes • Kitchen adjacent to the space • Space is approximately 9,576 ft^2 • Access to the outdoors

Sample Location	February 25, 2021 Reassessment Observations
Outdoors	• Scattered clouds, mostly clear skies • Light foot and vehicle traffic observed • Trees around parking lot
Conference Room	• No odors, stained ceiling, or visible mold growth observed • two air diffusers, and one air return with accumulated dust • No visual dust accumulation on horizontal surfaces in this space • All the doors closed, and unoccupied • Space is approximately 300 ft^2
Room 27	• No odors, stained ceiling tiles, no plants • Suspect visible mold growth observed on widow frames, frames sealed with duct tape • No occupants in the area during sampling • Four air diffusers, two air returns • No visual dust accumulation in this space • Space is approximately 720 ft^2
Sample Location	**March 3, 2021 Reassessment Observations**
Outdoors	• Mostly clear skies and moderate breeze • Light foot and vehicle traffic observed • Trees around parking lot
Classroom 27	• No odors, stained ceiling tiles, no plants • Suspect visible mold growth observed on widow frames, frames sealed with duct tape • No occupants in the area during sampling • Four air diffusers, two air returns • No visual dust accumulation in this space • Space is approximately 720 ft^2

4 Thermal Environmental Conditions for Human Occupancy

ASHRAE *Standard 55-2017, Thermal Environmental Conditions for Human Occupancy*, addresses thermal comfort in an office environment, which means that an employee wearing a normal amount of clothing feels neither too cold nor too warm. This standard discusses thermal comfort within the context of air temperature, humidity, and air movement and provides recommended ranges for temperature and humidity that are intended to satisfy 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 December 15, 2020 initial assessment and reassessments from February 25, 2021 and March 3, 2021 are summarized in Table 2. As indicated by the data in the table, temperatures in the school on December 15, averaged between 71°F and 87°F, with six tested locations measuring greater than the ASHRAE recommended winter range.

ATI reassessed select rooms that had unusual fungal spore concentrations on February 25, 2021 and again on March 3, 2021 after remediation actions were completed. ATI also reassessed the temperature in the areas. The average

temperatures in the reevaluated locations ranged from 70°F to 80°F, with one room greater than the ASHRAE recommended winter temperature range; however, these spaces appeared to be unoccupied.

Table 2: Temperature

Sample Location	12/15/2020 Initial Assessment Temperature in °F			ASHRAE Standard °F
	Min	Max	Average	
Outside	34	34	34	N/A
Indoors				
Facility Planning	71	71	71	68°F - 75°F
Room 6	76	79	78	68°F - 75°F
Main Office	74	74	74	68°F - 75°F
Conference Room	77	77	77	68°F - 75°F
Room 13	84	84	84	68°F - 75°F
Media Room 500	75	80	78	68°F - 75°F
Room 18	84	90	87	68°F - 75°F
Room 27	75	77	76	68°F - 75°F
Room 31	71	73	72	68°F - 75°F
Gymnasium/Cafeteria	71	71	71	68°F - 75°F
Sample Location	**02/25/2021 Reassessment Temperature in °F**			**ASHRAE Standard °F**
	Min	**Max**	**Average**	
Outdoors	48	48	48	N/A
Indoors				
Conference Room	80	80	80	68°F - 75°F
Room 27	75	75	75	68°F - 75°F
Sample Location	**03/03/2021 Reassessment Temperature in °F**			**ASHRAE Standard °F**
	Min	**Max**	**Average**	
Outdoors	55	56	56	N/A
Indoors				
Room 27	69	70	70	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 December 15, 2020 are summarized in Table 3. As indicated by the data in the table, the average relative humidity ranged between 14% and 27% with all tested locations measuring less than the ASHRAE maximum recommendation of 65% relative humidity and also less than 30% which can cause occupant discomfort.

ATI reassessed select rooms that had unusual fungal spore concentrations on February 25, 2021 and March 3, 2021, after remediation actions were completed. ATI also reassessed the relative humidity in the space, and the relative humidity averaged 20% in all tested areas on both reassessment dates, which is less than the ASHRAE maximum recommendation of 65% relative humidity, and less than 30% relative humidity.

Table 3: Relative Humidity

Sample Location	12/15/2020 Initial Assessment (% RH)			ASHRAE Standard (% RH)
	Min.	Max.	Avg.	
Outside	51	51	51	N/A
Indoors				
Facility Planning	24	30	27	≤ 65
Room 6	19	21	20	≤ 65
Main Office	21	21	21	≤ 65
Conference Room	21	21	21	≤ 65
Room 13	14	14	14	≤ 65
Media Room 500	14	14	14	≤ 65
Room 18	17	19	18	≤ 65
Room 27	14	16	15	≤ 65
Room 31	22	24	23	≤ 65
Gymnasium/Cafeteria	15	15	15	≤ 65
Sample Location	**02/25/2021 Reassessment (% RH)**			**ASHRAE Standard (% RH)**
	Min.	**Max.**	**Avg.**	
Outdoors	16	16	16	N/A
Indoors				
Conference Room	20	20	20	≤ 65
Room 27	19	20	20	≤ 65
Sample Location	**03/03/2021 Reassessment (% RH)**			**ASHRAE Standard (% RH)**
	Min.	**Max.**	**Avg.**	
Outdoors	17	18	18	N/A
Indoors				
Room 27	20	20	20	≤ 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 December 15, 2020 are summarized in Table 4. On the day of the assessment, the average outdoor carbon dioxide concentration was 359 ppm, which calculates to a maximum indoor concentration of 1,059 ppm (700 + 359). All tested locations indoors were less than the recommended maximum for the day of the assessment.

ATI reassessed select rooms that had unusual fungal spore concentrations on February 25, 2021 and March 3, 2021, after remediation actions were completed. The carbon dioxide concentrations measured during the reassessment are included in Table 4. The average outdoor carbon dioxide concentration on February 25, 2021 was 361 ppm, which calculates to a

maximum indoor concentration of 1,061 ppm (700 + 361). The average outdoor carbon dioxide concentration on March 3, 2021 was 417 ppm, which calculates to a maximum indoor concentration of 1,117 ppm (700 + 417). All tested locations indoors were less than the respective recommended maximum for the day of the reassessments.

Table 4: Carbon Dioxide

Sample Location	12/15/20 Initial Assessment Concentration (parts per million)			ASHRAE Standard (ppm) NTE
	Min	Max	Average	
Outside	356	362	359	N/A
Indoors				
Facility Planning	424	434	429	< 1,059
Room 6	438	446	442	< 1,059
Main Office	466	484	475	< 1,059
Conference Room	443	451	447	< 1,059
Room 13	448	458	453	< 1,059
Media Room 500	444	450	447	< 1,059
Room 18	450	457	454	< 1,059
Room 27	440	444	442	< 1,059
Room 31	420	443	432	< 1,059
Gymnasium/Cafeteria	424	431	428	< 1,059
Sample Location	**02/25/2021 Reassessment Concentration (parts per million)**			**ASHRAE Standard (ppm) NTE**
	Min	**Max**	**Average**	
Outside	360	362	361	N/A
Indoors				
Conference Room	472	474	473	< 1,061
Room 27	430	433	432	< 1,061
Sample Location	**03/03/2021 Reassessment Concentration (parts per million)**			**ASHRAE Standard (ppm) NTE**
	Min	**Max**	**Average**	
Outside	416	418	417	N/A
Indoors				
Room 27	453	455	454	< 1,117

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 December 15, 2020 were less than the Q-Trak's detection limit throughout the school.

ATI reassessed select rooms that had unusual fungal spore concentrations on February 25, 2021 and March 3, 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	12/15/2020 Initial Assessment Concentration (parts per million)			ASHRAE Standard (ppm)
	Min	Max	Average	
Outdoors	< 3	< 3	< 3	N/A
Indoors				
Facility Planning	< 3	< 3	< 3	< 9
Room 6	< 3	< 3	< 3	< 9
Main Office	< 3	< 3	< 3	< 9
Conference Room	< 3	< 3	< 3	< 9
Room 13	< 3	< 3	< 3	< 9
Media Room 500	< 3	< 3	< 3	< 9
Room 18	< 3	< 3	< 3	< 9
Room 27	< 3	< 3	< 3	< 9
Room 31	< 3	< 3	< 3	< 9
Gymnasium/Cafeteria	< 3	< 3	< 3	< 9
Sample Location	**02/25/2021 Reassessment Concentration (parts per million)**			**ASHRAE Standard (ppm)**
	Min	**Max**	**Average**	
Outdoors	< 3	< 3	< 3	N/A
Indoors				
Conference Room	< 3	< 3	< 3	< 9
Room 27	< 3	< 3	< 3	< 9
Sample Location	**03/03/2021 Reassessment Concentration (parts per million)**			**ASHRAE Standard (ppm)**
	Min	**Max**	**Average**	
Outdoors	< 3	< 3	< 3	N/A
Indoors				
Room 27	< 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 December 15, 2020, February 25, 2021 and March 3, 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 December 15, 2020 suggested unusual mold spore concentrations in two tested locations: the Conference Room and Room 27. The *Aspergillus/Penicillium*-like spore concentration in these locations were 1,040 spores/m^3 and 3,172

spores/m^3, respectively. *Aspergillus/Penicillium*-like spores were undetectable in the outdoor spore trap sample, but *Aspergillus* and *Penicillium* are commonly measured in outdoor samples. The fungal spore concentrations in the Conference Room and in Room 27were greater than the typical indoor occupied space, suggesting the potential for indoor mold spore amplification. *Aspergillus/Penicillium* 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.

Other tested rooms had low concentrations of spores that were not detected in the ambient sample, such as *Myxomycetes and Unknown*. However, the concentrations measured in those rooms do not suggest significant mold growth and could be residual spores from prior growth, contamination from outdoors, or possibly trivial amounts of mold growth normal in occupied spaces.

ATI reassessed The Conference Room and Room 27 on February 25, 2021 after the initial assessment indicated the unusual presence of airborne mold spores. The Conference Room had an 80% decrease in *Aspergillus/Penicillium*-like spores from the initial assessment to the February 25, 2021 reassessment. However, the concentrations in Room 27 increased 22%, and thus, ATI reassessed Room 27 again on March 3, 2021 after additional mold abatement occurred. The spores detected in the sample were likely residual mold spores that were not removed from the room during the first cleaning round.

ATI reassessed Room 27 on March 3 after the reassessment from February 25, 2021 indicated the *Aspergillus/Penicillium*-like spore concentrations remained greater than the typical indoor concentration. The total mold spore concentration on March 3, 2021 in Room 27 was 530 spores/m^3, and the *Aspergillus/Penicillium*-like spore concentration dropped to 159 spores/m^3, for a total reduction in *Aspergillus/Penicillium*-like spore concentration of 95%, suggesting the corrective actions used to reduce the airborne mold spore presence was successful.

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

Table 6: *Aspergillus/Penicillium* spores/m^3 Concentration Comparison

Sample Location	December 15, 2020 Concentration	February 25, 2021 Concentrations	March 3, 2021 Concentrations	% Change
Conference Room	1,040	212	Not Assessed	- 80%
Room 27	3,172	3,869	159	- 95%

The official laboratory reports with spore trap samples collected on December 15, 2020, February 25, 2021 and March 3, 2021 are in Appendix A.

6 Summary of Findings

1. Six of the tested spaces had a temperature greater than the ASHRAE recommended winter range of 68°F - 75°F on December 15, 2020 and one of the reassessed spaces had temperatures greater the ASHRAE recommended winter rages on February 25, 2021. During the March 3, 2021 reassessment, Room 27 had a temperature within the ASHRAE recommended winter range.
2. The relative humidity in all tested spaces on the three assessments were less than the ASHRAE maximum recommended relative humidity of 65%, yet all tested spaces had a relative humidity less than 30%, which can cause occupant discomfort.
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. Room 27 had sagging ceiling tiles, which is typically an indication of unregulated high humidity in the space during the warmer months which can promote fungal growth, like *Aspergillus Penicillium* molds which can grow with high humidity

as its only water source. It is recommended to replace any ceiling tiles showing signs of sagging from excessive moisture exposure. Room 27 also had a medium dirt load on the HVAC system, which can also promote mold growth.

5. Carbon monoxide concentrations during both assessments were less than the ASHRAE/EPA recommended limit.
6. During the initial assessment on December 15, 2020, the Conference Room and Room 27 were identified as having mold spore concentrations greater than the typical indoor occupied space and were selected for corrective actions to reduce the presence of mold spores and be reassessed upon the completion of the corrective actions. The other tested spaces had mold spore concentrations that were typical for occupied spaces.
7. The February 25, 2021 reassessment showed an 80% decrease in the *Aspergillus/Penicillium*-like mold spore concentration in the Conference Room when compared to the initial assessment. The *Aspergillus/Penicillium*-like mold spore concentration in Room 27 increased 22%, suggesting the corrective actions were not successful in reducing the airborne mold concentration. ATI recommend additional cleaning and an additional assessment in Room 27.
8. On March 3, 2021, the *Aspergillus/Penicillium*-like mold spore concentration in Room 27 dropped to 159 spores/m^3, for a total reduction of 95%, which suggests the corrective actions successfully reduced the mold spore concentrations to that of a typical indoor occupied space.

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 Reports and Chain of Custody Forms

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody: 327144
Client: ATI, Inc.
Address: 9220 Rumsey Road
Suite 100
Columbia, MD 21045
Attention: Brian Chapman

Job Name: Carole Highlands Elementary School
Job Location: 1610 Hannon Street, Takoma Park, MD
Job Number: 20-711
P.O. Number: Not Provided

Date Submitted: 12/15/2020
Person Submitting: Brian Chapman
Date Analyzed: 12/18/2020
Report Date: 12/18/2020

AMA Sample #	327144-1
Client ID	CH-6010-01
Analyst ID	TLW
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	2
Location	Outside

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	2	15	52	104	18.2%
Basidiospores	5	15	52	260	45.5%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	3	15	52	156	27.3%
Curvularia					
Penicillium / Aspergillus					
Smuts/Periconia/Myxomycetes	1	15	52	52	9.1%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Pithomyces					
Hyphal Fragments*					

Total Raw Ct: 11 **Total sp/m³:** 572

Comments

AMA Sample #	327144-2
Client ID	CH-6010-02
Analyst ID	TLW
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	1
Location	Blank

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

Total Raw Ct: 0 **Total sp/m³:** 0

Comments
Particulate observed. No mold spores detected.

AMA Sample #	327144-3
Client ID	CH-6010-03
Analyst ID	TLW
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	2
Location	Facility Planning

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	1	15	52	52	5.9%
Basidiospores	9	15	52	468	52.9%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	5	15	52	260	29.4%
Curvularia					
Penicillium / Aspergillus	2	15	52	104	11.8%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Pithomyces					
Hyphal Fragments*	1	15	52	52	5.9%

Total Raw Ct: 17 **Total sp/m³:** 884

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	327144	**Job Name:**	Carole Highlands Elementary School	**Date Submitted:**	12/15/2020
Client:	ATI, Inc.	**Job Location:**	1610 Hannon Street, Takoma Park, MD	**Person Submitting:**	Brian Chapman
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-711	**Date Analyzed:**	12/18/2020
		P.O. Number:	Not Provided	**Report Date:**	12/18/2020
Attention:	Brian Chapman				

AMA Sample #	327144-4	**AMA Sample #**	327144-5	**AMA Sample #**	327144-6
Client ID	CH-6010-04	**Client ID**	CH-6010-05	**Client ID**	CH-6010-06
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**	1	**Debris Loading**	2
Location	Room 6	**Location**	Main Office	**Location**	Conference Room

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	1	15	52	52	5%
Basidiospores	5	15	52	260	25%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	5	15	52	260	25%
Curvularia					
Penicillium / Aspergillus	8	15	52	416	40%
Smuts/Periconia/Myxomycetes	1	15	52	52	5%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Pithomyces					
Hyphal Fragments*	3	15	52	156	15%
Total Raw Ct:	20		**Total sp/m³:**		1040

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	1	15	52	52	20%
Basidiospores	1	15	52	52	20%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	52	52	20%
Curvularia					
Penicillium / Aspergillus	1	15	52	52	20%
Smuts/Periconia/Myxomycetes	1	15	52	52	20%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Pithomyces					
Hyphal Fragments*					
Total Raw Ct:	5		**Total sp/m³:**		260

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	2	15	52	104	5.9%
Basidiospores	2	15	52	104	5.9%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	10	15	52	520	29.4%
Curvularia					
Penicillium / Aspergillus	20	15	52	1040	58.8%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Pithomyces					
Hyphal Fragments*	1	15	52	52	2.9%
Total Raw Ct:	34		**Total sp/m³:**		1768

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody: 327144
Client: ATI, Inc.
Address: 9220 Rumsey Road
Suite 100
Columbia, MD 21045
Attention: Brian Chapman

Job Name: Carole Highlands Elementary School
Job Location: 1610 Hannon Street, Takoma Park, MD
Job Number: 20-711
P.O. Number: Not Provided

Date Submitted: 12/15/2020
Person Submitting: Brian Chapman
Date Analyzed: 12/18/2020
Report Date: 12/18/2020

AMA Sample #	327144-7
Client ID	CH-6010-07
Analyst ID	TLW
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	2
Location	Room 13

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores					
Basidiospores	2	15	52	104	8.3%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	4	15	52	208	16.7%
Curvularia					
Penicillium / Aspergillus	18	15	52	936	75%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Pithomyces					
Hyphal Fragments*					

Total Raw Ct: 24 **Total sp/m³:** 1248

Comments

AMA Sample #	327144-8
Client ID	CH-6010-08
Analyst ID	TLW
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	2
Location	Media Room - 500

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	1	15	52	52	6.3%
Basidiospores	2	15	52	104	12.5%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	12	15	52	624	75%
Curvularia					
Penicillium / Aspergillus	1	15	52	52	6.3%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Pithomyces					
Hyphal Fragments*					

Total Raw Ct: 16 **Total sp/m³:** 832

Comments

AMA Sample #	327144-9
Client ID	CH-6010-09
Analyst ID	TLW
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	2
Location	Room 18

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	3	15	52	156	9.7%
Basidiospores	4	15	52	208	12.9%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	6	15	52	312	19.4%
Curvularia					
Penicillium / Aspergillus	15	15	52	780	48.4%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown	2	15	52	104	6.5%
Other Colorless	1	15	52	52	3.2%
Pithomyces					
Hyphal Fragments*	1	15	52	52	3.2%

Total Raw Ct: 31 **Total sp/m³:** 1612

Comments

AMA Analytical Services, Inc.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody: 327144
Client: ATI, Inc.
Address: 9220 Rumsey Road
Suite 100
Columbia, MD 21045
Attention: Brian Chapman

Job Name: Carole Highlands Elementary School
Job Location: 1610 Hannon Street, Takoma Park, MD
Job Number: 20-711
P.O. Number: Not Provided

Date Submitted: 12/15/2020
Person Submitting: Brian Chapman
Date Analyzed: 12/18/2020
Report Date: 12/18/2020

AMA Sample #	327144-10
Client ID	CH-6010-10
Analyst ID	TLW
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	2
Location	Room 27

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	4	15	52	208	4.8%
Basidiospores	12	15	52	624	14.3%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	2	15	52	104	2.4%
Curvularia					
Penicillium / Aspergillus	61	15	52	3172	72.6%
Smuts/Periconia/Myxomycetes	5	15	52	260	6%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Pithomyces					
Hyphal Fragments*					

Total Raw Ct: 84 **Total sp/m³:** 4368

Comments

AMA Sample #	327144-11
Client ID	CH-6010-11
Analyst ID	TLW
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	2
Location	Room 31

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	2	15	52	104	6.9%
Basidiospores	4	15	52	208	13.8%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	5	15	52	260	17.2%
Curvularia					
Penicillium / Aspergillus	15	15	52	780	51.7%
Smuts/Periconia/Myxomycetes	1	15	52	52	3.4%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown	1	15	52	52	3.4%
Other Colorless					
Pithomyces	1	15	52	52	3.4%
Hyphal Fragments*					

Total Raw Ct: 29 **Total sp/m³:** 1508

Comments

AMA Sample #	327144-12
Client ID	CH-6010-12
Analyst ID	TLW
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	2
Location	Gym/Cafeteria

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria	Present	15	52	<52	
Ascospores	1	15	52	52	7.7%
Basidiospores	2	15	52	104	15.4%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	52	52	7.7%
Curvularia					
Penicillium / Aspergillus	7	15	52	364	53.8%
Smuts/Periconia/Myxomycetes	1	15	52	52	7.7%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown	1	15	52	52	7.7%
Other Colorless					
Pithomyces					
Hyphal Fragments*					

Total Raw Ct: 13 **Total sp/m³:** 676

Comments

AMA Analytical Services, Inc.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	327144	**Job Name:**	Carole Highlands Elementary School	**Date Submitted:**	12/15/2020
Client:	ATI, Inc.	**Job Location:**	1610 Hannon Street, Takoma Park, MD	**Person Submitting:**	Brian Chapman
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-711	**Date Analyzed:**	12/18/2020
		P.O. Number:	Not Provided	**Report Date:**	12/18/2020
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.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	327144	**Job Name:**	Carole Highlands Elementary School	**Date Submitted:**	12/15/2020
Client:	ATI, Inc.	**Job Location:**	1610 Hannon Street, Takoma Park, MD	**Person Submitting:**	Brian Chapman
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-711	**Date Analyzed:**	12/18/2020
		P.O. Number:	Not Provided	**Report Date:**	12/18/2020
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.

Cladosporium

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

Hyphal Fragments

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

Other Colorless

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

Penicillium/Aspergillus Like

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

Pithomyces

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

Smuts/Periconia/Myxomycetes

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

Unknown Fungi

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

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 327144
(+ Courtney McCall)

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: Carole Highlands E.S.
2. Job Location: 1610 Hannon St Takoma Park, MD
3. Job #: 20-711 P.O. #: _____
4. Contact Person: Brian Chapman Cell: 202-368-1376
5. Collected by: Brian Chapman Cell: _____

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email 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 + Date Due: 12/23/20 ☐ Next Day ☑ Results Required By Noon (Additional fee may apply) ☐ 2 Day	☐ Email: _____ ☐ 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 12 (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
CH-6010-01	outside	12-18-20	75L										X			
-02	Blank															
-03	Facility planning	9:30														
-04	Rm 6	9:41														
-05	Main office	9:48														
-06	Conference Rm	9:55														
-07	Rm 13	10:09														
-08	Media Rm- 500	10:15														
-09	Rm 18	10:24														
-10	Rm 27	10:32														
-11	Rm 31	10:44														
-12	Gym / Cafeteria	10:59 ma											✓			

	Print Name	Signature	Date	Time
Relinquished by:	Brian Chapman		12-15-20	4:40
Received by:			12/15/20	1645

Shipping Information: ☐ UPS ☐ FedEx ☐ USPS ☑ In-Person ☐ Drop Box ☐ Courrier ☐ Other _____

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285344	**Job Name:**	Carole Highland Schjool	**Date Submitted:**	02/25/2021
Client:	ATI, Inc.	**Job Location:**	Room 27 and Conference Room	**Person Submitting:**	Sama W.
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-711	**Date Analyzed:**	02/26/2021
		P.O. Number:	Not Provided	**Report Date:**	02/26/2021
Attention:	Courtney McCall				

AMA Sample #	285344-1	**AMA Sample #**	285344-2
Client ID	3157-0022-A1	**Client ID**	3157-9979-A2
Analyst ID	TLW	**Analyst ID**	TLW
Collection Apparatus	Air-O-Cell	**Collection Apparatus**	Air-O-Cell
Sample Volume (L)	75	**Sample Volume (L)**	75
Sample Condition	Acceptable	**Sample Condition**	Acceptable
Debris Loading	1	**Debris Loading**	2
Location	Conference Room	**Location**	Classroom 27

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	2	15	53	106	18.2%
Basidiospores	1	15	53	53	9.1%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	Present	15	53	<53	
Curvularia					
Penicillium / Aspergillus	4	15	53	212	36.4%
Smuts/Periconia/Myxomycetes	4	15	53	212	36.4%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	11	**Total sp/m^3:**	583		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	Present	15	53	<53	
Basidiospores	4	15	53	212	4.8%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	6	15	53	318	7.2%
Curvularia					
Penicillium / Aspergillus	73	15	53	3869	88%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Hyphal Fragments*					
Total Raw Ct:	83	**Total sp/m^3:**	4399		

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285344	**Job Name:**	Carole Highland Schjool	**Date Submitted:**	02/25/2021
Client:	ATI, Inc.	**Job Location:**	Room 27 and Conference Room	**Person Submitting:**	Sama W.
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-711	**Date Analyzed:**	02/26/2021
		P.O. Number:	Not Provided	**Report Date:**	02/26/2021
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.

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Focused On Results.

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		P.O. Number:	Not Provided	**Report Date:**	02/26/2021
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): Tristan Ward

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.

Smuts/Periconia/Myxomycetes

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

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 285344

Mailing/Billing Information:
1. Client Name: ATI INC.
2. Address 1: 4221 Forbes Blvd
3. Address 2: Lanham, MD 20706
4. Address 3:
5. Phone #: 202-643-4283 Fax #:

Submittal Information:
1. Job Name: Carole Highland School
2. Job Location: Room 27 and Conferance room.
3. Job #: 20-711 P.O. #:
4. Contact Person: Courtny MaCall Cell: 703-399-5423
5. Collected by: Sana W. Cell: 240-413-3728

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

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

NORMAL BUSINESS HOURS
- ☐ 4 Hours
- ☐ Same Day
- ☒ Next Day
- ☐ 2 Day
- ☐ 3 Day
- ☐ 5 Day + Date Due: 02/26/21
- ☐ Results Required By Noon

REPORT TO:
- ☒ Email: Courtny@atiinc.com.
- ☐ Email 2:
- ☐ Verbals:

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

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

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

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

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

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

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

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

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

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

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

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: Cassettes.
Collection Media ATY-O-Cell
- ☒ *Spore-Trap 2 (QTY)
- ☐ *Surface Swab (QTY)
- ☐ *Surface Tape (QTY)
- ☐ Other (Specify) (QTY)
- ☐ Surface Vacuum Dust (QTY)
- ☐ Culturable ID Genus (Media) (QTY)
- ☐ Culturable ID Species (Media) (QTY)

CLIENT ID #	SAMPLE INFORMATION SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS TEM	PCM	PLM	LEAD	MATRIX MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
								✓					✓			Date/Time: Contact:By:
3157-0022-A1	Conferance Room	02/25/21	75					✓					✓			
3156-9979-A2	Class Room 27	02/25/21	75					✓					✓			
																Date/Time: Contact:By:
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:	Don Sana W.		02/25/21	11:30 AM
Received by:				
Relinquished by:				
Received for Lab by:			2/25/21	1100

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

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285282	**Job Name:**	PGCPS	**Date Submitted:**	03/03/2021
Client:	ATI, Inc.	**Job Location:**	Carole Highland Elementary School	**Person Submitting:**	Sama W.
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-711	**Date Analyzed:**	03/04/2021
		P.O. Number:	Not Provided	**Report Date:**	03/04/2021
Attention:	Courtney McCall				

AMA Sample #	285282-1	**AMA Sample #**	285282-2	**AMA Sample #**	285282-3
Client ID	3214-0765	**Client ID**	3214-0762	**Client ID**	3214-0759
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)**	0
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	2	**Debris Loading**	2	**Debris Loading**	1
Location	Outside	**Location**	Classroom 27	**Location**	Field Blank

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	1	15	53	53	7.7%
Basidiospores	9	15	53	477	69.2%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	53	53	7.7%
Curvularia					
Penicillium / Aspergillus					
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown	1	15	53	53	7.7%
Other Colorless	1	15	53	53	7.7%
Hyphal Fragments*	2	15	53	106	15.4%
Total Raw Ct:	13		**Total sp/m^3:**	689	

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	1	15	53	53	10%
Basidiospores	1	15	53	53	10%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	3	15	53	159	30%
Smuts/Periconia/Myxomycetes	4	15	53	212	40%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless	1	15	53	53	10%
Hyphal Fragments*					
Total Raw Ct:	10		**Total sp/m^3:**	530	

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores					
Basidiospores					
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus					
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	0		**Total sp/m^3:**	0	

Comments

No mold spores observed.

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285282	**Job Name:**	PGCPS	**Date Submitted:**	03/03/2021
Client:	ATI, Inc.	**Job Location:**	Carole Highland Elementary School	**Person Submitting:**	Sama W.
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-711	**Date Analyzed:**	03/04/2021
		P.O. Number:	Not Provided	**Report Date:**	03/04/2021
Attention:	Courtney McCall				

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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

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Client:	ATI, Inc.	**Job Location:**	Carole Highland Elementary School	**Person Submitting:**	Sama W.
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-711	**Date Analyzed:**	03/04/2021
		P.O. Number:	Not Provided	**Report Date:**	03/04/2021
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.
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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

Ascospores

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

Basidiospores

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

Cladosporium

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

Hyphal Fragments

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

Other Colorless

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

Penicillium/Aspergillus Like

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

Smuts/Periconia/Myxomycetes

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

Unknown Fungi

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

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

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 285282

Mailing/Billing Information:
1. Client Name: ATI, Inc.
2. Address 1: 4221 Forbes Blvd. Lanham,
3. Address 2: MD, 20706
4. Address 3:
5. Phone #: 202-683-4283 Fax #: 03-

Submittal Information:
1. Job Name: PGCPS
2. Job Location: Carole Highland ES.
3. Job #: 20-711 P.O. #:
4. Contact Person: Courtny McCall Cell: 703-399-5423
5. Collected by: Sama W. Cell: 240-413-3725

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

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

NORMAL BUSINESS HOURS
- ☐ 4 Hours
- ☐ Same Day
- ☒ Next Day
- ☐ 2 Day
- ☐ 3 Day
- ☐ 5 Day +
- Date Due: 03-04-21
- ☐ Results Required By Noon

REPORT TO:
- ☒ Email: Courtny@atiinc.com
- ☐ Email 2:
- ☐ Verbals:

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

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

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

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

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

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

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

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

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

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

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

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: Air O Cell
Collection Media Zefon
- ☒ *Spore-Trap 3 (QTY)
- ☐ *Surface Swab (QTY)
- ☐ *Surface Tape (QTY)
- ☐ Other (Specify) (QTY
- ☐ Surface Vacuum Dust (QTY)
- ☐ Culturable ID Genus (Media) (QTY)
- ☐ Culturable ID Species (Media) (QTY)

CLIENT ID #	SAMPLE INFORMATION SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
																Date/Time: Contact:By:
3214-0765	Outside	03/03/21	75L					✓					✓			
3214-0762	Class Room 27	"	"					✓					✓			
3214-0759	Field Blank	"	-					—					—			Date/Time: Contact:By:
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:	Don Sama W.		03/03/21	11.00 AM
Received by:				
Relinquished by:				
Received for Lab by:			3/3/21	1142

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

Appendix B: Instrument Calibration Records

Certificate of Calibration

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

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

Flow Calibration

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

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

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

QA Approval By: Moroni Menk

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

BUCK

CERTIFICATE OF CALIBRATION AND TESTING

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

ENVIRONMENT CONDITIONS		
TEMPERATURE	71.33 (21.9)	°F (°C)
RELATIVE HUMIDITY	53.9	%RH
BAROMETRIC PRESSURE	28.81 (975.6)	inHg (hPa)

MODEL	7575-X
SERIAL NUMBER	7575X1711004

☒ AS LEFT ☐ AS FOUND

☒ IN TOLERANCE ☐ OUT OF TOLERANCE

– CALIBRATION VERIFICATION RESULTS –

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	70.9 (21.6)	71.1 (21.7)	68.9~72.9 (20.5~22.7)				

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

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

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

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

CALIBRATED

August 31, 2020
DATE

Doc. ID: CERT_GEN_WCC

TSI P/N 2300157

CERTIFICATE OF CALIBRATION AND TESTING

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

ENVIRONMENT CONDITIONS		
TEMPERATURE	71.24 (21.8)	°F (°C)
RELATIVE HUMIDITY	54.8	%RH
BAROMETRIC PRESSURE	28.74 (973.2)	inHg (hPa)

MODEL	7575-X
SERIAL NUMBER	7575X1711004

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

– CALIBRATION VERIFICATION RESULTS –

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

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

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

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

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

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

VERIFIED

August 31, 2020
DATE

Doc. ID: CERT_GEN_WCC

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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