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April 1, 2021

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

RE: Indoor Air Quality Assessment, Charles H. Flowers High School
IFB: 022-19
ATI Project Number: 21-603

Dear Mr. Baylor:

Prince George's County Public Schools requested that ATI, Inc., conduct a proactive indoor air quality (IAQ) assessment at Charles H. Flowers High School on January 25, 2021 and a follow-up assessment on March 31, 2021. The assessments' key findings are enclosed in the Executive Summary on page three, and the official laboratory reports for total fungal spore trap sampling are enclosed in Appendix A.

Thank you for the opportunity to provide Industrial Hygiene services for Prince George's County Public Schools. If you have any questions regarding this report, please contact us at (202) 643-4283.

Sincerely,
ATI, INC.

Reviewed By:

Courtney E. McCall
Project Manager

Nate Burgei, CIH, CSP
Certified Industrial Hygienist

Indoor Air Quality Assessment Report

Prince George's County Public Schools
Charles H. Flowers High School
10001 Ardwick Ardmore Road
Springdale, MD 20774

Prepared for:

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

April 1, 2021

Submitted by:

ATI Job # 21-603

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Abbreviations and Acronyms

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

Abbreviations involving scientific volume and measurements involving media or water sampling

Spores/m^3	Mold spores per cubic meter of air
LPM	Liters Per Minute
NTE	Not to exceed
°F	degree Fahrenheit
PPM	Parts Per Million

1 Executive Summary

ATI conducted a proactive Indoor Air Quality (IAQ) assessment on January 25, 2021, at Charles H. Flowers High School, located at 10001 Ardwick Ardmore Road, in Springdale, Maryland, and a follow-up assessment on March 31, 2021 in select rooms that had mold spore concentrations in the initial inspection that warranted corrective actions.

The initial assessment on January 25, 2021 included a visual assessment of randomly selected classrooms and other frequently occupied spaces, such as the cafeteria/gym, the main office, and randomly selected classrooms, for potential IAQ contributors and pathways. The Auditorium, Rooms 242, 322, 309, 533, and 903 had unusual fungal spore concentrations during the initial assessment and were selected for a follow-up assessment on March 31, 2021 after actions were taken to reduce the presence of mold and repair any water issues discovered. Steps were taken between the two assessments to repair roofing structures and HVAC equipment and treat the area for fungal growth. As part of both assessments, ATI measured common IAQ comfort parameters, including temperature, relative humidity, carbon dioxide, and carbon monoxide. Also, ATI collected total fungal air samples on spore trap cassettes for microbiological analysis.

The following is a summary of the key findings from these assessments:

1. Four of the tested spaces had a temperature less than the ASHRAE recommended winter range of 68°F - 75°F on January 25, 2021, and one of the reassessed spaces had temperatures less than the ASHRAE recommended winter range on March 31, 2021.
2. The relative humidity in all tested spaces on both January 25, 2021 and March 31, 2021 were less than the ASHRAE recommended maximum relative humidity of 65%. All tested spaces on January 25, 2021 had a relative humidity less than 30%, which may lead to respiratory discomfort in some occupants.
3. Carbon dioxide concentrations in all tested spaces were less than the ASHRAE limit for carbon dioxide relative to the outdoor carbon dioxide concentration on the day of each assessment.
4. Carbon monoxide concentrations during both assessments were less than the ASHRAE/EPA recommended limit.
5. The *Aspergillus/Penicillium*-like mold spore concentrations on January 25, 2021 in the Auditorium and Rooms 242, 309, 322, 533 and 903 were greater than the outdoor sample and greater than the mold spore concentrations in a typical occupied space. Corrective actions were made to repair any moisture issues and clean the spaces to reduce the presence of mold spores. All other tested spaces during this assessment had mold spore concentrations typical of occupied spaces.
6. The *Aspergillus/Penicillium*-like mold spore concentrations on March 31, 2021 in the Auditorium and Rooms 242, 309, 322, 533 and 903 all had a 92% to a 98% reduction after corrective actions were completed. While Room 242 had a *Aspergillus/Penicillium*-like mold spore concentration reduction of 93%, the concentration was still 2,968 spores/m^3, which is greater than the typical indoor space. The remaining spore concentration is likely residual mold dust that was not removed during clean-up. Thus, ATI, Inc. recommends additional cleaning using HEPA vacuums and wet wiping of surfaces in Room 242 to further reduce airborne spore concentrations.

2 Assessment Methods

Mikal Frater, Industrial Hygienist with ATI, Inc. conducted the initial visual assessment and air sampling on January 25, 2021. Sampled rooms were randomly selected and accounted for approximately 10% of classrooms or a minimum of five samples. Ms. Frater documented visual observations at the time she collected the air samples. Mr. Sama Wanigasundara, Industrial Hygienist with ATI, Inc. conducted a follow-up inspection on March 31, 2021 in the Auditorium, Rooms 242, 309, 322, 533 and 903 after repairs were made 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 ASTM D7391-09, which spores both viable and non-viable mold spores and particulates, which combined yields total fungal results. AMA participates in the National Institute of Standards and Technology's (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) for general laboratory performance and management, and the American Industrial Hygiene Association (AIHA) for Environmental Microbial Laboratory Accreditation Program (EMLAP). The AMA laboratory reports are included in Appendix A.

3 Visual Observations

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

Table 1: Visual Observations and Sampling Locations

Sample Location	January 25, 2021 Observations
Outdoors – Parking Lot	• Cloudy skies • Light vehicle traffic
Main Office	• Door to corridor closed • Two occupants at time of assessment • One air return, two air supplies • Main office splits into adjoining rooms • Some stained ceiling tiles in far corner of office • No odor or visible growth observed • Space is approximately 800 ft.^{2}
Auditorium	• Four air supplies visible on stage • Space is two stories • Large baffles observed • Five occupants present at time of assessment • Door to parking lot open during assessment • Light dust accumulation
Chorus Room	• Room 758 • Faux plants scattered along back wall with light dust accumulation • Stained ceiling tile along side wall with bookshelf • Stained ceiling tile also along back corner; some ceiling tiles missing • Two air returns, eight air supplies • Adjoining rooms/door to corridor closed • Space is approximately 1,568 ft.^{2}
Cafeteria	• Twelve air returns • Five occupants at time of assessment • Outside access via emergency exit

Sample Location	January 25, 2021 Observations
	• Sample collected near corridor access door, open during sampling • Light brown ceiling tile stains scattered around the room • Space is approximately 1,800 ft.^{2}
Gymnasium	• Six air supplies • Outside access via emergency exit • One occupant at time of assessment • Door to corridor open during assessment • No stained ceiling tile, odor, or visible growth observed
Room 533	• One occupant at time of assessment • Trace dust accumulation • Stained ceiling tile surrounding air supplies • Heavy dust accumulation on return duct • Space is approximately 800 ft.^{2}
Library	• Room 802 • Door to corridor open at time of assessment • Sample taken adjacent to circulation desk • One occupant at time of sampling • Few stained ceiling tiles in localized area near windows; some tiles removed • Sixteen air supplies, two air returns • Space is approximately 1,800 ft.^{2}
Art Design	• Room 814 • Four air supplies • Door to corridor closed at time of assessment • Six stained ceiling tiles towards the rear of the room • Two stained ceiling tiles in front of classroom, near whiteboard • No odor or visible growth observed • One occupant at time of assessment • No dust accumulation • Space is approximately 1,200 ft.^{2}
Nutrition Design Lab	• No odor or visible growth observed • Six air supplies, two air returns • Ceiling tile stains generally along the same line (seems to be sprinkler line) • Stained ceiling tiles, dark brown in some places • Some broken ceiling tiles with waste bins to collect falling debris and water due to active leak • One occupant at time of assessment • Door to corridor closed; door to adjoining room open • Space is approximately 2,024 ft.^{2}
Room 242	• VAV motor for HVAC malfunctioning, according to maintenance staff – damper not opening to allow air into diffusers • Many staff complaints about temperature not being regulated • Four air supplies, one air return • Stained ceiling tile in front corner • Space is approximately 720 ft.^{2}
Room 322	• Two air returns, one air supply • One occupant at time of assessment

Sample Location	January 25, 2021 Observations
	• Brown stained ceiling tile adjacent to air supply • No odor or visible growth observed • Space is approximately 775 ft.^{2}
Room 309	• One occupant at time of assessment • Four sir supplies, one air return • Faux plant in corner with trace dust accumulation • Stained ceiling tile above windows and near return vent
Room 903	• One occupant at time of assessment • Four air supplies, one air return • Faux plants with light dust accumulation • No stained ceiling tile, visible growth, or odor observed • Space is approximately 864 ft.^{2}
Room 609	• Seven stained ceiling tiles scattered around the room – in corner and center of room, as noted in previous IAQ • One occupant at time of sampling • Four air supplies, one air return • Door to corridor open at time of sampling • Space is approximately 1,008 ft.^{2}
Life Skills	• Room 142 • One air return, four air supplies • No stained ceiling tiles, visible growth, or odor observed • Space is approximately 1,080 ft.^{2}
Engineer Lab	• Room 408 • Three air returns, eight air diffusers • One occupant at time of assessment • Space is visibly cluttered with light dust accumulation • Stained ceiling tile near window – as noted in previous IAQ • Door to corridor closed during assessment • No odor or visible growth observed

Sample Location	March 31, 2021 Reassessment Observations
Outdoors – Parking Lot	• Cloudy sky and moderate wind • No traffic • Parking lot surrounded by trees
Auditorium	• No occupants at time of sampling • No visible mold growth observed • Ceiling tiles did not have water stains • Some trace dust load on air returns but dust not present on other surfaces
Room 242	• No occupants at time of sampling • No visible mold growth observed • Ceiling tiles did not have water stains • No dust observed on floor or furniture

Sample Location	March 31, 2021 Reassessment Observations
Room 309	• No occupants at time of sampling • No visible mold growth observed • Ceiling tiles did not have water stains • No dust observed on air returns or diffuser
Room 322	• No occupants at time of sampling • No visible mold growth observed • One ceiling tile had a water stain • No dust observed on floor or furniture • Some trace dust on air returns and diffusers
Room 533	• No occupants at time of sampling • Trace dust load observed on air returns and diffusers • Sink near teacher's desk was dripping slightly during sampling • Several water stained-ceiling tiles were present
Room 903	• No occupants at time of sampling • No visible mold growth observed • No dust observed on air returns or diffusers • Faux decorative plants were present with trace dust • Trace dust present on computers

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. While autumn and spring are not accounted for in these ranges, these are general guidelines to maximize occupant comfort so deviations from these ranges are fine as long as occupants are comfortable. The temperatures measured during the January 25, 2021 initial assessment and reassessment from March 31, 2021 are summarized in Table 2. As indicated by the data in the table, temperatures in the school on January 25 averaged between 61°F and 75°F, with four tested locations measuring less than the ASHRAE recommended winter range.

ATI reassessed select rooms that had unusual fungal spore concentrations on March 31, 2021, after remediation actions were completed. The average temperatures in the reassessed locations averaged between 66°F and 74°F, with one location less than the ASHRAE recommended winter range.

Table 2: Temperature

Sample Location	1/25/2021 Initial Assessment Temperature in °F			ASHRAE Standard °F
	Min	Max	Average	
Outdoors	37	42	40	N/A
Indoors				
Main Office	57	64	61	68-75°F
Auditorium	66	66	66	68-75°F
Chorus Room	67	67	67	68-75°F
Cafeteria	69	69	69	68-75°F
Gymnasium	61	61	61	68-75°F
Room 533	68	68	68	68-75°F
Library	69	69	69	68-75°F
Art Design	69	69	69	68-75°F
Nutrition Design Lab	70	71	71	68-75°F
Room 242	71	71	71	68-75°F
Room 322	71	71	71	68-75°F
Room 309	70	70	70	68-75°F
Room 903	74	75	75	68-75°F
Room 609	74	74	74	68-75°F
Life Skills	72	72	72	68-75°F
Engineer Lab	70	70	70	68-75°F
3/31/2021 Reassessment Temperature in ˚F				
Outdoors	66	66	66	68-75°F
Indoors				
Auditorium	66	66	66	68-75°F
Room 242	69	69	69	68-75°F
Room 309	67	68	68	68-75°F
Room 322	67	68	68	68-75°F
Room 533	70	70	70	68-75°F
Room 903	74	74	74	68-75°F

4.2 Relative Humidity

Relative humidity is a key factor for mold growth. Mold has the potential of growing on cool suitable surfaces when humidity levels are above 65% and condensation may occur on cold surfaces. ASHRAE *Standard 62.1-2016*, *Ventilation for Acceptable Indoor Air Quality,* recommends a maximum indoor relative humidity of 65% to prevent condensation of moisture on surfaces. Relative humidity less than 30% may result in drying of occupants' mucous membranes and skin. Relative humidity measurements for January 25, 2021 and March 31, 2021 are summarized in Table 3. As indicated by the data in the table, the average relative humidity ranged between 12% and 26% with all tested locations measuring less than the ASHRAE maximum recommendation of 65% relative humidity, and also less than 30% relative humidity.

ATI reassessed select rooms that had unusual fungal spore concentrations on March 31, 2021, after remediation actions were completed. During the March reassessment, the average relative humidity measured between 39% and 59%, within the ASHRAE maximum recommendation of 65% relative humidity.

Table 3: Relative Humidity

Sample Location	1/25/2021 Initial Assessment Relative Humidity (% RH)			ASHRAE Standard (% RH)
	Min	Max	Average	
Outdoors	37	45	41	N/A
Indoors				
Main Office	22	29	26	≤ 65
Auditorium	15	15	15	≤ 65
Chorus Room	18	18	18	≤ 65
Cafeteria	13	14	14	≤ 65
Gymnasium	17	18	18	≤ 65
Room 533	12	13	13	≤ 65
Library	15	15	15	≤ 65
Art Design	13	14	14	≤ 65
Nutrition Design Lab	13	13	13	≤ 65
Room 242	12	13	13	≤ 65
Room 322	12	12	12	≤ 65
Room 309	13	13	13	≤ 65
Room 903	12	12	12	≤ 65
Room 609	12	13	13	≤ 65
Life Skills	12	13	13	≤ 65
Engineer Lab	14	15	15	≤ 65
3/31/2021 Reassessment Relative Humidity (%RH)				
Outdoors	68	68	68	N/A
Indoors				
Auditorium	55	56	56	≤ 65
Room 242	50	50	50	≤ 65
Room 309	59	59	59	≤ 65
Room 322	58	58	58	≤ 65
Room 533	53	53	53	≤ 65
Room 903	39	39	39	≤ 65

4.3 Carbon Dioxide

Carbon dioxide concentrations within an occupied building are a standard method used to gauge the efficiency of ventilation systems. Carbon dioxide is a by-product of human respiration and does not pose an acute health hazard alone. Elevated concentrations may suggest that insufficient fresh air is being supplied to an occupied space and/or that the ventilation system does not provide a sufficient rate of air exchange.

Research has indicated that buildings with adequately operating ventilation systems are able to remove odors generated by activities in an indoor office environment efficiently. ASHRAE *Standard 62.1-2016* states that comfort (odor) criteria with respect to human bioeffluents are likely to be satisfied if the ventilation can maintain indoor carbon dioxide concentrations less than 700 parts per million (ppm) greater than the outdoor air concentration. Typically, outdoor carbon dioxide concentrations range from 300 ppm to 450 ppm, with the higher range typically found in urban areas during peak rush hour.

Carbon dioxide concentrations for January 25, 2021 are summarized in Table 4. On the day of the assessment, the average outdoor carbon dioxide concentration was 363 ppm, which calculates to a maximum indoor concentration of 1,063 ppm (700 + 363). All tested locations indoors were less than the recommended maximum for the day of the assessment.

ATI reassessed select rooms that had unusual fungal spore concentrations on March 31, 2021, after remediation actions were completed. The carbon dioxide concentrations measured during the reassessment are included in Table 4. The average outdoor carbon dioxide concentration on March 31, 2021 was 381 ppm, which calculates to a maximum indoor concentration of 1,081 ppm (700 + 381). All tested locations indoors were less than the recommended maximum for the day of the reassessment.

Table 4: Carbon Dioxide

Sample Location	1/25/2021 Initial Inspection Concentration (parts per million)			ASHRAE Standard (ppm) NTE
	Min	Max	Average	
Outdoors	356	370	363	N/A
Indoors				
Main Office	446	464	455	< 1,063
Auditorium	379	382	381	< 1,063
Chorus Room	390	390	390	< 1,063
Cafeteria	481	481	481	< 1,063
Gymnasium	417	433	425	< 1,063
Room 533	383	386	385	< 1,063
Library	424	424	424	< 1,063
Art Design	366	409	388	< 1,063
Nutrition Design Lab	430	441	436	< 1,063
Room 242	429	436	433	< 1,063
Room 322	410	414	412	< 1,063
Room 309	414	416	415	< 1,063
Room 903	433	437	435	< 1,063
Room 609	430	436	433	< 1,063
Life Skills	419	435	427	< 1,063
Engineer Lab	411	415	413	< 1,063
3/31/2021 Reassessment Concentration (parts per million)				
Outdoors	380	381	381	N/A
Indoors				
Auditorium	378	380	379	< 1,081
Room 242	406	407	407	< 1,081
Room 309	490	491	491	< 1,081
Room 322	414	415	415	< 1,081
Room 533	405	407	406	< 1,081
Room 903	488	490	489	< 1,081

4.4 Carbon Monoxide

Carbon monoxide is a colorless and odorless gas produced by the incomplete combustion of carbon containing fuels. Oil, gasoline, diesel fuels, wood, coke, and coal are the major sources of carbon monoxide. ASHRAE recommends that carbon monoxide not exceed nine ppm indoors over an eight-hour time-weighted average. ATI measured carbon monoxide concentrations using a TSI Q-Trak model number 7575-X with an attached IAQ probe (model number 982). The instrument's carbon monoxide sensor has an error range of ± 3% of the reading or three (3) ppm, whichever is greater. As indicated by

the data in Table 5, carbon monoxide concentrations for January 25, 2021 were less than the Q-Trak's detection limit throughout the school.

ATI reassessed select rooms that had unusual fungal spore concentrations on March 31, 2021, after remediation actions were completed. The carbon monoxide concentrations measured during the reassessment are included in Table 5. The carbon monoxide concentrations from the reassessment were also less than the Q-Trak's limit of detection and less than the EPA/ASHRAE recommended maximum of 9 ppm.

Table 5: Carbon Monoxide

Sample Location	1/25/2021 Initial Assessment Concentration (parts per million)			ASHRAE Standard (ppm)
	Min	Max	Average	
Outdoors	< 3	< 3	< 3	N/A
Indoors				
Main Office	< 3	< 3	< 3	< 9
Auditorium	< 3	< 3	< 3	< 9
Chorus Room	< 3	< 3	< 3	< 9
Cafeteria	< 3	< 3	< 3	< 9
Gymnasium	< 3	< 3	< 3	< 9
Room 533	< 3	< 3	< 3	< 9
Library	< 3	< 3	< 3	< 9
Art Design	< 3	< 3	< 3	< 9
Nutrition Design Lab	< 3	< 3	< 3	< 9
Room 242	< 3	< 3	< 3	< 9
Room 322	< 3	< 3	< 3	< 9
Room 309	< 3	< 3	< 3	< 9
Room 903	< 3	< 3	< 3	< 9
Room 609	< 3	< 3	< 3	< 9
Life Skills	< 3	< 3	< 3	< 9
Engineer Lab	< 3	< 3	< 3	< 9
3/31/2021 Reassessment Concentration (parts per million)				
Outdoors	< 3	< 3	< 3	N/A
Indoors				
Auditorium	< 3	< 3	< 3	< 9
Room 242	< 3	< 3	< 3	< 9
Room 309	< 3	< 3	< 3	< 9
Room 322	< 3	< 3	< 3	< 9
Room 533	< 3	< 3	< 3	< 9
Room 903	< 3	< 3	< 3	< 9

5 Total Fungal Air Sampling Results

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

The January 25, 2021 and March 31, 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 samples.

In normal circumstances, the diversity of spores identified indoors and outdoors should be similar with some exceptions. Fungi species present indoors are typically found in lesser concentrations compared to the outdoor air, reflecting the filtering by the building's HVAC system. The high concentration of one or two mold genera identified indoors and the absence of the same species outdoors can indicate a moisture problem with the potential to degrade the air quality.

The results from January 25, 2021 suggested unusual mold spore concentrations in six locations: Auditorium, Rooms 533, 242, 322, 309, and 903. The total ambient, outdoor spore concentration was 1,060 spores/m^3. Room 242 had the greatest total spore concentration of 45,189 spores/m^3, with *Aspergillus/Penicillium*-like spores being the predominant spores present at 45,030 spores/m^3. The Auditorium, Rooms 533, 322, 309, and 903 had total concentrations ranging from 2,544 to 15,266 spores/m^3, with *Aspergillus/Penicillium*-like spore concentrations ranging from 2,226 spores/m^3 to 14,577 spores/m^3.

Aspergillus/Penicillium measured in these locations were at a concentration much greater than the ambient, which suggests either current or past indoor mold growth. While these molds are very common in outdoor samples, they are the most common indoor growing mold as well. *Aspergillus* and *Penicillium* molds are viable for anywhere from six to more than eleven years and can remain in settled dust for quite a long time. These two molds can also grow on surfaces from high humidity alone or light condensation on cold surfaces when the room air is warm and humid. Additional investigation into potential water intrusion or water leak sources should be conducted. 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.

Six rooms, the Auditorium, Rooms 533, 242, 322, 309, and 903, were reassessed on March 31, 2021 after the initial assessment indicated the unusual presence of airborne mold spores. The *Aspergillus/Penicillium*-like mold spore concentrations in these rooms had a 92% to a 98% reduction after corrective actions were completed. While Room 242 had an *Aspergillus/Penicillium*-like mold spore concentration reduction of 93%, the concentration was still 2,968 spores/m^3, which is greater than the typical indoor space. Unless moisture issues still exist in the room, the remaining spore concentration is likely residual mold dust that was not removed during clean-up since the initial concentration was so high. ATI, Inc. recommends additional cleaning in Room 242 using HEPA vacuums and wet wiping of surfaces to reduce airborne spore concentrations further. The other reassessed rooms had a successful reduction of airborne spores to acceptable ranges.

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

Table 6: *Aspergillus/Penicillium* Concentration Comparison

Sample Location	January 25, 2021 Concentrations	March 31, 2021 Concentrations	% Change
Auditorium	14,577	901	-94%
Room 533	12,656	954	-92%
Room 242	45,030	2,968	-93%
Room 322	2,968	53	-98%
Room 309	2,226	53	-98%
Room 903	3,763	265	-93%

The official laboratory reports with spore trap samples collected on January 25, 2021 and March 31, 2021 are presented in Appendix A.

6 Summary of Findings

1. Four of the tested spaces had a temperature less than the ASHRAE recommended winter range of 68°F - 75°F on January 25, 2021 and one of the reassessed spaces had temperatures less than the ASHRAE recommended winter range on March 31, 2021.
2. The relative humidity in all tested spaces on both January 25, 2021 and March 31, 2021 were less than the ASHRAE recommended maximum relative humidity of 65%. All tested spaces on January 25, 2021 had a relative humidity less than 30%, which may lead to respiratory discomfort in some occupants.
3. Carbon dioxide concentrations in all tested spaces were less than the ASHRAE limit for carbon dioxide relative to the outdoor carbon dioxide concentration on the day of each assessment.
4. Carbon monoxide concentrations during both assessments were less than the ASHRAE/EPA recommended limit.
5. The *Aspergillus/Penicillium*-like mold spore concentrations on January 25, 2021 in the Auditorium and Rooms 533, 242, 322, 309 and 903 were greater than the outdoor sample and greater than the mold spore concentrations in a typical occupied space. Corrective actions were made to repair any moisture issues and clean the spaces to reduce the presence of mold spores. All other tested spaces during this assessment had mold spore concentrations typical of occupied spaces.
6. The *Aspergillus/Penicillium*-like mold spore concentrations on March 31, 2021 in the Auditorium and Rooms 533, 242, 322, 309 and 903 all had anywhere from a 92% to a 98% reduction after corrective actions were completed. While Room 242 had a *Aspergillus/Penicillium*-like mold spore concentration reduction of 93%, the concentration was still 2,968 spores/m^3, which is greater than the typical indoor space. The remaining spore concentration is likely residual mold dust that was not removed during clean-up. Thus, ATI, Inc. recommends additional cleaning in Room 242 to further reduce airborne spore concentrations.

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

Best,
ATI, INC.

Courtney E. McCall
Project Manager

Appendix A: Laboratory Report and Chain of Custody

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285327	**Job Name:**	Charles Flowers High School IAQ	**Date Submitted:**	01/26/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-603	**Date Analyzed:**	02/01/2021
		P.O. Number:	Not Provided	**Report Date:**	02/01/2021
Attention:	Mikal Frater				

AMA Sample #	285327-1	**AMA Sample #**	285327-2	**AMA Sample #**	285327-3
Client ID	21-603-1	**Client ID**	21-603-2	**Client ID**	21-603-3
Analyst ID	CD	**Analyst ID**	CD	**Analyst ID**	CD
Collection Apparatus	Air-O-Cell	**Collection Apparatus**	Air-O-Cell	**Collection Apparatus**	Air-O-Cell
Sample Volume (L)	75	**Sample Volume (L)**	0	**Sample Volume (L)**	75
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	2	**Debris Loading**	0	**Debris Loading**	1
Location	Parking Lot	**Location**	Field Blank	**Location**	Main Office

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	3	15	53	159	15%
Basidiospores	6	15	53	318	30%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	3	15	53	159	15%
Curvularia					
Penicillium / Aspergillus	7	15	53	371	35%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless	1	15	53	53	5%
Hyphal Fragments*					

Total Raw Ct: 20 **Total sp/m³:** 1060

Comments

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

Total Raw Ct: 0 **Total sp/m³:** 0

Comments

No Mold Spores Observed

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	1	15	53	53	20%
Basidiospores	4	15	53	212	80%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus					
Smuts/Periconia/Myxomycetes	Present	15	53	<53	
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					

Total Raw Ct: 5 **Total sp/m³:** 265

Comments

AMA Analytical Services, Inc.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285327	**Job Name:**	Charles Flowers High School IAQ	**Date Submitted:**	01/26/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-603	**Date Analyzed:**	02/01/2021
		P.O. Number:	Not Provided	**Report Date:**	02/01/2021
Attention:	Mikal Frater				

AMA Sample #	285327-4	**AMA Sample #**	285327-5	**AMA Sample #**	285327-6
Client ID	21-603-4	**Client ID**	21-603-5	**Client ID**	21-603-6
Analyst ID	CD	**Analyst ID**	CD	**Analyst ID**	CD
Collection Apparatus	Air-O-Cell	**Collection Apparatus**	Air-O-Cell	**Collection Apparatus**	Air-O-Cell
Sample Volume (L)	75	**Sample Volume (L)**	75	**Sample Volume (L)**	75
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	1	**Debris Loading**	1	**Debris Loading**	1
Location	Auditorium	**Location**	Chorus Room	**Location**	Cafeteria

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	4	15	53	212	2.8%
Basidiospores	7	15	53	371	4.9%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	2	15	53	106	1.4%
Curvularia					
Penicillium / Aspergillus	129	7	113	14577	90.8%
Smuts/Periconia/Myxomycetes	Present	15	53	<53	
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	142	**Total sp/m³:**		15266	

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	1	15	53	53	16.7%
Basidiospores	2	15	53	106	33.3%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	3	15	53	159	50%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	6	**Total sp/m³:**		318	

Comments
Very Light Trace

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	1	15	53	53	7.7%
Basidiospores	6	15	53	318	46.2%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	2	15	53	106	15.4%
Curvularia					
Penicillium / Aspergillus	4	15	53	212	30.8%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*	1	15	53	53	7.7%
Total Raw Ct:	13	**Total sp/m³:**		689	

Comments

AMA Analytical Services, Inc.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody: 285327
Client: ATI, Inc.
Address: 9220 Rumsey Road
Suite 100
Columbia, MD 21045
Attention: Mikal Frater

Job Name: Charles Flowers High School IAQ
Job Location: Not Provided
Job Number: 21-603
P.O. Number: Not Provided

Date Submitted: 01/26/2021
Person Submitting: Mikal Frater
Date Analyzed: 02/01/2021
Report Date: 02/01/2021

AMA Sample #	285327-7
Client ID	21-603-7
Analyst ID	CD
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	1
Location	Gymnasium

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores					
Basidiospores	1	15	53	53	50%
Bipolaris/Drechslera/Helm.					
Chaetomium	Present	15	53	<53	
Cladosporium					
Curvularia					
Penicillium / Aspergillus	1	15	53	53	50%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					

Total Raw Ct: 2 **Total sp/m³:** 106

Comments
Very Light Trace

AMA Sample #	285327-8
Client ID	21-603-8
Analyst ID	CD
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	1
Location	Room 533

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	2	15	53	106	1.7%
Basidiospores	1	15	53	53	0.9%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	112	7	113	12656	96.6%
Smuts/Periconia/Myxomycetes	1	15	53	53	0.9%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					

Total Raw Ct: 116 **Total sp/m³:** 12868

Comments
Light Trace

AMA Sample #	285327-9
Client ID	21-603-9
Analyst ID	CD
Collection Apparatus	Air-O-Cell
Sample Volume (L)	75
Sample Condition	Acceptable
Debris Loading	1
Location	Library

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	4	15	53	212	40%
Basidiospores	3	15	53	159	30%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	1	15	53	53	10%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless	2	15	53	106	20%
Hyphal Fragments*					

Total Raw Ct: 10 **Total sp/m³:** 530

Comments
Very Light Trace

AMA Analytical Services, Inc.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285327	**Job Name:**	Charles Flowers High School IAQ	**Date Submitted:**	01/26/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-603	**Date Analyzed:**	02/01/2021
		P.O. Number:	Not Provided	**Report Date:**	02/01/2021
Attention:	Mikal Frater				

AMA Sample #	285327-10	**AMA Sample #**	285327-11	**AMA Sample #**	285327-12
Client ID	21-603-10	**Client ID**	21-603-11	**Client ID**	21-603-12
Analyst ID	CD	**Analyst ID**	CD	**Analyst ID**	CD
Collection Apparatus	Air-O-Cell	**Collection Apparatus**	Air-O-Cell	**Collection Apparatus**	Air-O-Cell
Sample Volume (L)	75	**Sample Volume (L)**	75	**Sample Volume (L)**	75
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	1	**Debris Loading**	1	**Debris Loading**	2
Location	Art Design	**Location**	Nutrition Design	**Location**	Room 242

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	Present	15	53	<53	
Basidiospores	2	15	53	106	100%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus					
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	2	**Total sp/m³:**	106		

Comments
Very Light Trace

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	1	15	53	53	16.7%
Basidiospores	3	15	53	159	50%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	53	53	16.7%
Curvularia					
Penicillium / Aspergillus	1	15	53	53	16.7%
Smuts/Periconia/Myxomycetes	Present	15	53	<53	
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	6	**Total sp/m³:**	318		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	2	15	53	106	1.7%
Basidiospores	1	15	53	53	0.9%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	114	2	395	45030	97.4%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	117	**Total sp/m³:**	45189		

Comments

AMA Analytical Services, Inc.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285327	**Job Name:**	Charles Flowers High School IAQ	**Date Submitted:**	01/26/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-603	**Date Analyzed:**	02/01/2021
		P.O. Number:	Not Provided	**Report Date:**	02/01/2021
Attention:	Mikal Frater				

AMA Sample #	285327-13		**AMA Sample #**	285327-14		**AMA Sample #**	285327-15		
Client ID	21-603-13		**Client ID**	21-603-14		**Client ID**	21-603-15		
Analyst ID	CD		**Analyst ID**	CD		**Analyst ID**	CD		
Collection Apparatus	Air-O-Cell		**Collection Apparatus**	Air-O-Cell		**Collection Apparatus**	Air-O-Cell		
Sample Volume (L)	75		**Sample Volume (L)**	75		**Sample Volume (L)**	75		
Sample Condition	Acceptable		**Sample Condition**	Acceptable		**Sample Condition**	Acceptable		
Debris Loading	1		**Debris Loading**	1		**Debris Loading**	1		
Location	Room 322		**Location**	Room 309		**Location**	Room 903		

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores					
Basidiospores	1	15	53	53	1.8%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	56	15	53	2968	98.2%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	57	**Total sp/m³:**	3021		

Comments
Very Light Trace

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	3	15	53	159	6.3%
Basidiospores	2	15	53	106	4.2%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	53	53	2.1%
Curvularia					
Penicillium / Aspergillus	42	15	53	2226	87.5%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	48	**Total sp/m³:**	2544		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores					
Basidiospores	3	15	53	159	4.1%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	71	15	53	3763	95.9%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	74	**Total sp/m³:**	3922		

Comments

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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285327	**Job Name:**	Charles Flowers High School IAQ	**Date Submitted:**	01/26/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-603	**Date Analyzed:**	02/01/2021
		P.O. Number:	Not Provided	**Report Date:**	02/01/2021
Attention:	Mikal Frater				

AMA Sample #	285327-16	**AMA Sample #**	285327-17	**AMA Sample #**	285327-18
Client ID	21-603-16	**Client ID**	21-603-17	**Client ID**	21-603-18
Analyst ID	CD	**Analyst ID**	CD	**Analyst ID**	CD
Collection Apparatus	Air-O-Cell	**Collection Apparatus**	Air-O-Cell	**Collection Apparatus**	Air-O-Cell
Sample Volume (L)	75	**Sample Volume (L)**	75	**Sample Volume (L)**	75
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	1	**Debris Loading**	1	**Debris Loading**	1
Location	Room 609	**Location**	Life Skills Rm. 142	**Location**	Engineer Lab

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	1	15	53	53	12.5%
Basidiospores	3	15	53	159	37.5%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	2	15	53	106	25%
Curvularia					
Penicillium / Aspergillus	2	15	53	106	25%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	8	**Total sp/m³:**	424		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	Present	15	53	<53	
Basidiospores	4	15	53	212	26.7%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	11	15	53	583	73.3%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	15	**Total sp/m³:**	795		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	2	15	53	106	15.4%
Basidiospores	3	15	53	159	23.1%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	8	15	53	424	61.5%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	13	**Total sp/m³:**	689		

Comments

AMA Analytical Services, Inc.
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CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285327	**Job Name:**	Charles Flowers High School IAQ	**Date Submitted:**	01/26/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-603	**Date Analyzed:**	02/01/2021
		P.O. Number:	Not Provided	**Report Date:**	02/01/2021
Attention:	Mikal Frater				

Spore Comparison Guide

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

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

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

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

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

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

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285327	**Job Name:**	Charles Flowers High School IAQ	**Date Submitted:**	01/26/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Mikal Frater
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-603	**Date Analyzed:**	02/01/2021
		P.O. Number:	Not Provided	**Report Date:**	02/01/2021
Attention:	Mikal Frater				

General Comments, Disclaimers, and Footnotes

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

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

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

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

Technical Director Tristan Ward

MOLD SPORE DESCRIPTIONS

Ascospores

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

Basidiospores

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

Chaetomium

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

Cladosporium

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

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.

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) 285327

1/2

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

Submittal Information:
1. Job Name: Charles Flowers, HS IAQ
2. Job Location: _____
3. Job #: 21-603 P.O. #: _____
4. Contact Person: Mikal Frater Cell: (848) 702-8621
5. Collected by: " Cell: "

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: _____
Collection Media _____
- ■ *Spore-Trap 18 (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 (1/25/21)	VOL (L)/ Wipe Area	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
21-603 1	Parking Lot	8:59	75L										✓			Date/Time: Contact:By:
21-603 2	FIELD BLANK	— N/A —											✓			
21-603 3	Main Office	9:14	75L										✓			
21-603 4	Auditorium	11:42	75L										✓			
21-603 5	Chorus Room	11:34	75L										✓			Date/Time: Contact:By:
21-603 6	Cafeteria	11:18	75L										✓			
21-603 7	Gymnasium	11:25	75L										✓			
21-603 8	Room 533	11:58	75L										✓			
21-603 9	Library	9:22	75L										✓			Date/Time: Contact:By:
21-603 10	Art Design	9:32	75L										✓			
21-603 11	Nutrition Design	9:41	75L										✓			
21-603 12	Room 242	9:58	75L										✓			

	Print Name	Signature	Date	Time
Relinquished by:	Mikal Frater	Mikal Frater	1/26/21	1:30 PM
Received by:				
Relinquished by:				
Received for Lab by:			1/26/21	1500

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

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
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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) 2853287

2/2

Mailing/Billing Information:

1. Client Name: _____
2. Address 1: _____
3. Address 2: _____
4. Address 3: _____
5. Phone #: _____ Fax #: _____

Submittal Information:

1. Job Name: _____
2. Job Location: _____
3. Job #: _____ P.O. #: _____
4. Contact Person: _____ Cell: _____
5. Collected by: _____ Cell: _____

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

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

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

REPORT TO:
☐ 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
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)
*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
☐ ELAP 198.4/Chatfield _____ (QTY)
☐ NY State PLM/TEM _____ (QTY)
☐ Residual Ash _____ (QTY)
TEM Dust*
☐ Qual. (pres/abs) Vacuum/Dust _____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 _____ (QTY)
☐ Quan. (s/area)Dust D6480-99 _____ (QTY)
TEM Water
☐ Qual. (pres/abs) _____ (QTY)
☐ ELAP 198.2/EPA 100.2 _____ (QTY)
☐ EPA 100.1 _____ (QTY)

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

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

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

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

CLIENT ID #	SAMPLE INFORMATION SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
21-603 13	Room 322	10:19	75L										✓			Date/Time: Contact:By:
21-603 14	Room 309	10:11	75L										✓			
21-603 15	Room 903	10:29	75L										✓			
21-603 16	Room 609	10:40	75L										✓			
21-603 17	Life Skills, Rm 142	11:07	75L										✓			Date/Time: Contact:By:
21-603 18	Engineer Lab	10:52	75L										✓			
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:				
Received by:				
Relinquished by:				
Received for Lab by:				

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:	285286	**Job Name:**	PGCPS	**Date Submitted:**	03/31/2021
Client:	ATI, Inc.	**Job Location:**	Charles Flowers High School	**Person Submitting:**	Sama
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-603	**Date Analyzed:**	03/31/2021
		P.O. Number:	Not Provided	**Report Date:**	03/31/2021
Attention:	Courtney McCall				

AMA Sample #	285286-1	**AMA Sample #**	285286-2	**AMA Sample #**	285286-3
Client ID	3157-0176	**Client ID**	3157-0375	**Client ID**	3157-0175
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**	1
Location	Outside	**Location**	Auditorium	**Location**	RM 533

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	3	15	53	159	9.4%
Basidiospores	21	15	53	1113	65.6%
Bipolaris/Drechslera/Helm.					
Chaetomium	1	15	53	53	3.1%
Cladosporium	4	15	53	212	12.5%
Curvularia					
Penicillium / Aspergillus	1	15	53	53	3.1%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella	1	15	53	53	3.1%
Ulocladium					
Unknown					
Other Colorless	1	15	53	53	3.1%
Hyphal Fragments*					
Total Raw Ct:	32	**Total sp/m³:**	1696		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores					
Basidiospores					
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	17	15	53	901	100%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	17	**Total sp/m³:**	901		

Comments
No visible trace.

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores					
Basidiospores	2	15	53	106	9.1%
Bipolaris/Drechslera/Helm.					
Chaetomium	1	15	53	53	4.5%
Cladosporium	Present	15	53	<53	
Curvularia					
Penicillium / Aspergillus	18	15	53	954	81.8%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless	1	15	53	53	4.5%
Hyphal Fragments*	1	15	53	53	4.5%
Total Raw Ct:	22	**Total sp/m³:**	1166		

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285286	**Job Name:**	PGCPS	**Date Submitted:**	03/31/2021
Client:	ATI, Inc.	**Job Location:**	Charles Flowers High School	**Person Submitting:**	Sama
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-603	**Date Analyzed:**	03/31/2021
		P.O. Number:	Not Provided	**Report Date:**	03/31/2021
Attention:	Courtney McCall				

AMA Sample #	285286-4	**AMA Sample #**	285286-5	**AMA Sample #**	285286-6
Client ID	3157-0154	**Client ID**	3157-0243	**Client ID**	3157-0183
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	1	**Debris Loading**	1	**Debris Loading**	1
Location	RM 242	**Location**	RM 309	**Location**	RM 322

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores					
Basidiospores	1	15	53	53	1.6%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	5	15	53	265	8.1%
Curvularia					
Penicillium / Aspergillus	56	15	53	2968	90.3%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	62	**Total sp/m³:**	3286		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores					
Basidiospores	2	15	53	106	50%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	1	15	53	53	25%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless	1	15	53	53	25%
Hyphal Fragments*					
Total Raw Ct:	4	**Total sp/m³:**	212		

Comments
No visible trace.

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	1	15	53	53	50%
Basidiospores					
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	1	15	53	53	50%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless					
Hyphal Fragments*					
Total Raw Ct:	2	**Total sp/m³:**	106		

Comments
No visible trace.

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285286	**Job Name:**	PGCPS	**Date Submitted:**	03/31/2021
Client:	ATI, Inc.	**Job Location:**	Charles Flowers High School	**Person Submitting:**	Sama
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-603	**Date Analyzed:**	03/31/2021
		P.O. Number:	Not Provided	**Report Date:**	03/31/2021
Attention:	Courtney McCall				

AMA Sample #	285286-7	**AMA Sample #**	285286-8
Client ID	3157-0169	**Client ID**	3157-0202
Analyst ID	TLW	**Analyst ID**	TLW
Collection Apparatus	Air-O-Cell	**Collection Apparatus**	Air-O-Cell
Sample Volume (L)	75	**Sample Volume (L)**	0
Sample Condition	Acceptable	**Sample Condition**	Acceptable
Debris Loading	1	**Debris Loading**	1
Location	RM 903	**Location**	Field Blank

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores					
Basidiospores					
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	5	15	53	265	71.4%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Other Colorless	2	15	53	106	28.6%
Hyphal Fragments*					
Total Raw Ct:	7		**Total sp/m^3:**	371	

Comments
No visible trace.

	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:	285286	**Job Name:**	PGCPS	**Date Submitted:**	03/31/2021
Client:	ATI, Inc.	**Job Location:**	Charles Flowers High School	**Person Submitting:**	Sama
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-603	**Date Analyzed:**	03/31/2021
		P.O. Number:	Not Provided	**Report Date:**	03/31/2021
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.

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	285286	**Job Name:**	PGCPS	**Date Submitted:**	03/31/2021
Client:	ATI, Inc.	**Job Location:**	Charles Flowers High School	**Person Submitting:**	Sama
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	21-603	**Date Analyzed:**	03/31/2021
		P.O. Number:	Not Provided	**Report Date:**	03/31/2021
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.

Chaetomium

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

Cladosporium

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

Hyphal Fragments

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

Memnoniella

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

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.

Stachybotrys

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

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) 285286

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

Submittal Information: PGCPS
1. Job Name:
2. Job Location: Charles Flowers HS
3. Job #: 21-603 P.O. #:
4. Contact Person: Courtny McCall Cell: 703-399-5423
5. Collected by: Sama 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: COB 03/31/21
- ☐ Results Required By Noon

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

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

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

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

MISC
- ☐ 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 Trap/Air Samples:
Collection Media MV-O-Cell
- ☒ *Spore-Trap 8 (QTY)
- ☐ *Surface Swab (QTY)
- ☐ *Surface Tape (QTY)
- ☐ Other (Specify) (QTY)
- ☐ Surface Vacuum Dust (QTY)
- ☐ Culturable ID Genus (Media) (QTY)
- ☐ Culturable ID Species (Media) (QTY)

CLIENT ID #	SAMPLE 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:
3157-0176	Outside	03/31/21	75					✓					✓			
3157-0375	Audatorium	"	"					✓					✓			
3157-0175	Room 533							✓					✓			
3157-0154	Room 242							✓					✓			Date/Time: Contact:By:
3157-0243	Room 309							✓					✓			
3157-0183	Room 322							✓					✓			
3157-0169	Room 403							✓					✓			
		↓	↓					✓					✓			Date/Time: Contact:By:
3157-0202	Field Blank	—	—					—					—			

	Print Name	Signature	Date	Time
Relinquished by:	Don Sama W.		03/31/21	11:20 AM
Received by:				
Relinquished by:				
Received for Lab by:			3/31/21	1120

Shipping Information
☐ UPS ☒ In-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: R15046
Date Calibrated: 11/12/2020 **Calibration Due Date:** 11/12/2021

Flow Calibration

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

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

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

QA Approval By: Moran Menk

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

BUCK

CERTIFICATE OF CALIBRATION AND TESTING

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

ENVIRONMENT CONDITIONS		
TEMPERATURE	70.72 (21.5)	°F (°C)
RELATIVE HUMIDITY	39.0	%RH
BAROMETRIC PRESSURE	29.15 (987.1)	inHg (hPa)

MODEL	7575-X
SERIAL NUMBER	7575X1711006

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

– CALIBRATION VERIFICATION RESULTS –

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	70.9 (21.6)	70.8 (21.6)	68.9~72.9 (20.5~22.7)				

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

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

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

Measurement Variable	System ID	Last Cal.	Cal. Due	Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E004626	02-14-20	02-28-21	Pressure	E005254	10-10-19	10-31-20
Pressure	E003982	01-24-20	07-31-20	DC Voltage	E003493	08-14-19	08-31-20

ChaoVang
CALIBRATED

June 15, 2020
DATE

DOC ID: CERT_GEN_V02

TSI P/N 2300157

CERTIFICATE OF CALIBRATION AND TESTING

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

ENVIRONMENT CONDITIONS		
TEMPERATURE	70.68 (21.5)	°F (°C)
RELATIVE HUMIDITY	38.0	%RH
BAROMETRIC PRESSURE	29.16 (987.5)	inHg (hPa)

MODEL	7575-X
SERIAL NUMBER	7575X1711006

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

– CALIBRATION VERIFICATION RESULTS –

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	70.8 (21.6)	71.1 (21.7)	68.8~72.8 (20.4~22.7)				

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

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

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

Measurement Variable	System ID	Last Cal.	Cal. Due	Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E004626	02-14-20	02-28-21	Pressure	E005254	10-10-19	10-31-20
Pressure	E003982	01-24-20	07-31-20	DC Voltage	E003493	08-14-19	08-31-20

ChaoVang
VERIFIED

June 15, 2020
DATE

Doc ID: CERT_GEN_WCC

TSI P/N 2300157

CERTIFICATE OF CALIBRATION AND TESTING

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

ENVIRONMENT CONDITIONS		
TEMPERATURE	74.0 (23.3)	°F (°C)
RELATIVE HUMIDITY	34	%RH
BAROMETRIC PRESSURE	29.20 (988.8)	inHg (hPa)

MODEL	982
SERIAL NUMBER	P17100007

☐ AS LEFT ☒ AS FOUND

☐ IN TOLERANCE ☒ OUT OF TOLERANCE

– CALIBRATION VERIFICATION RESULTS –

GAS CO_2 AS FOUND — SYSTEM G-101 — *Unit: ppm*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	0	0	0~50	4	3015.3	* 2902.7	2924.9~3105.8
2	499	458	449~549	5	5056	* 4859.6	4904.3~5207.7
3	1002	963	952~1052				

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

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

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

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

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	10.0	10.4	7.0~13.0	4	70.0	67.1	67.0~73.0
2	30.0	29.3	27.0~33.0	5	90.01	* 85.88	87.01~93.01
3	50.0	48.5	47.0~53.0				

**Indicates Out-of-Tolerance Condition*

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

Measurement Variable	System ID	Last Cal.	Cal. Due
5000 CO_2	14A044095	04-06-20	04-06-25
N2	T-0608	05-19-20	05-19-28
Flow	E003341	09-03-19	09-30-20
Flow	E003525	01-06-20	01-31-21
2000 C4H8	EB0054467	08-13-19	08-12-22
Temperature	E010657	02-14-20	02-28-21
Temperture	E010655	01-21-20	01-31-21

Measurement Variable	System ID	Last Cal.	Cal. Due
200 CO	149886	04-30-20	03-24-28
Air	T17939	04-09-20	04-09-28
Flow	E003980	04-22-20	04-30-21
Flow	E003342	09-03-19	09-30-20
100 C4H8	CC507339	03-24-20	03-24-28
Temperature	E010658	02-14-20	02-28-21
Humidity	E003539	02-26-20	08-31-20

Chimouva Vue
VERIFIED

June 15, 2020
DATE

Doc. ID: CERT_GEN_WCC

TSI P/N 2300157

CERTIFICATE OF CALIBRATION AND TESTING

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

ENVIRONMENT CONDITIONS		
TEMPERATURE	70.41 (21.3)	°F (°C)
RELATIVE HUMIDITY	50.3	%RH
BAROMETRIC PRESSURE	29.15 (987.1)	inHg (hPa)

MODEL	982
SERIAL NUMBER	P17100007

☒ AS LEFT ☐ AS FOUND

☒ IN TOLERANCE ☐ OUT OF TOLERANCE

– CALIBRATION VERIFICATION RESULTS –

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

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	32.1 (0.0)	31.9 (-0.1)	31.1~33.1 (-0.5~0.6)	2	140.0 (60.0)	140.3 (60.3)	139.0~141.0 (59.5~60.6)

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

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

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

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

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

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

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

Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E010657	02-14-20	02-28-21
Temperture	E010655	01-21-20	01-31-21
5000 CO2	14A044095	04-06-20	04-06-25
N2	T-0608	05-19-20	05-19-28
Flow	E003341	09-03-19	09-30-20
Flow	E003525	01-06-20	01-31-21
2000 C4H8	EB0054467	08-13-19	08-12-22

Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E010658	02-14-20	02-28-21
Humidity	E003539	02-26-20	08-31-20
200 CO	149886	04-30-20	03-24-28
Air	T17939	04-09-20	04-09-28
Flow	E003980	04-22-20	04-30-21
Flow	E003342	09-03-19	09-30-20
100 C4H8	CC507339	03-24-20	03-24-28

Chao Vang
CALIBRATED

June 16, 2020
DATE

Doc ID: CERT_GEN_WCC

TSI P/N 2300157