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February 26, 2021

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

RE: Indoor Air Quality Assessment, Seabrook Elementary School
Purchase Order: 734977
ATI Project Number: 20-691

Dear Mr. Baylor:

Prince George's County Public Schools requested that ATI, Inc., conduct a proactive indoor air quality (IAQ) assessment at Seabrook Elementary School on December 1, 2020 and a follow-up assessment on February 25, 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:

Nate Burgei, CIH, CSP
Certified Industrial Hygienist

Courtney E. McCall
Project Manager

Indoor Air Quality Assessment Report

Prince George's County Public Schools
Seabrook Elementary School
6001 Seabrook Road
Seabrook, MD 20706

Prepared for:

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

February 26, 2021

Submitted by:

ATI Job # 20-691

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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 December 1, 2020, at Seabrook Elementary School, located at 6001 Seabrook Road, Seabrook, MD, and a follow-up assessment on February 25, 2021 in select rooms that had unusual results in the initial inspection.

The initial assessment on December 1, 2020 included a visual assessment of randomly selected classrooms and other frequently occupied spaces, such as the cafeteria/gym, the main office, and randomly selected classrooms, for potential IAQ contributors and pathways. All tested rooms had unusual fungal spore concentrations during the initial assessment and all tested spaces were included for the follow-up assessment on February 25, 2021 after actions were taken to reduce the presence of mold and repair any water issues discovered. As part of both assessments, ATI measured common IAQ comfort parameters, including temperature, relative humidity, carbon dioxide, and carbon monoxide. Also, ATI collected total fungal air samples on spore trap cassettes for microbiological analysis.

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

1. Four of the tested spaces on December 1, 2020 had a temperature less than the ASHRAE recommended winter range of 68-75°F, while one room had a temperature greater than the ASHRAE recommended range during the initial assessment. On the day of the December assessment, one boiler was offline, which caused many rooms to have no heat. All of the tested spaces on February 25, 2021 had a temperature within the ASHRAE winter range.
2. The relative humidity in all tested spaces was less than the ASHRAE guidelines of <65%, but greater than 30%. All of the tested spaces on February 25, 2021 had a relative humidity less than 30%, which does not promote mold growth, but can cause occupant discomfort.
3. Carbon dioxide concentrations in all tested spaces were less than the ASHRAE limit for carbon dioxide, which was 1,083 parts per million (PPM) for the initial assessment in December and 1,095 ppm for the February reassessment.
4. The average carbon monoxide concentrations in all areas, for both assessments, were less than the EPA and ASHRAE recommended limit of 9 ppm.
5. The spore trap sampling results from the December 1, 2020 assessment suggested some level of indoor amplification of mold was present in all of the tested spaces. ATI recommended reassessing these spaces after cleaning and mold treatment occurred.
6. The February 25, 2021 reassessment showed a reduction in *Aspergillus/Penicillium* ranging from 58 to 99% reduction in the reassessed rooms. Because the *Aspergillus/Penicillium* concentration in Room 15 and 18 was greater than 1,000 spores/m^3 during the reassessment, ATI recommends an additional round of cleaning in these rooms using HEPA vacuums on floors and surfaces, as well as wet wiping of horizontal surfaces to remove residual spores in the room. Running HEPA equipped air scrubbers for 24 to 48 hours will also help in reducing residual spore concentrations.

2 Assessment Methods

Mikal Frater, IH of ATI, Inc. conducted the initial visual assessment and air sampling on December 1, 2020. Sampled rooms were randomly selected and accounted for approximately 10% of classrooms or a minimum of five samples. Ms. Frater documented visual observations at the time she collected the air samples. Nate Burgei, CIH, CSP, conducted a follow-up inspection on February 25, 2021 in all of the previously tested rooms after the areas were treated for mold presence. ATI references the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) *Standard 62.1 – 2016* and ASHRAE *Standard 55 – 2017* when providing IAQ services to clients. ASHRAE is an industry leader on energy efficiency and indoor air quality.

All measurements and air samples were collected between three-six feet from floor elevation, which represents a typical adult breathing zone, and away from air-supply and return diffusers. Real-time direct readings for temperature, relative humidity,

carbon dioxide (CO_2), and carbon monoxide (CO), were measured with a calibrated TSI Q-Trak 7575-X Meter and attached 982 Probe.

Total fungal air samples were collected with a field calibrated Buck BioAire High-Volume Sampling Pump on Zefon Air-O-Cell spore-trap cassettes at a flow rate of 15 liters per minute for a sample volume of 75 liters during the initial assessment and 150 liters for the follow-up assessment. EMSL Analytical, Inc. of Beltsville, MD analyzed the initial assessment and AMA Analytical Services, Inc. of Lanham, MD analyzed the follow-up assessment samples using direct microscopic examination per ASTM D7391, which spores both viable and non-viable mold spores and particulates, which combined yields total fungal results. Both EMSL and 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 EMSL and AMA laboratory reports are included in Appendix A.

3 Visual Observations

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

Table 1: Visual Observations and Sampling Locations

Sample Location	December 1, 2020 Observations
Outdoors	• Light wind and small puddles in the parking lot were present from yesterday's heavy rain. Some grass and small plants were about 15 feet from the sampler.
Room 10	• Wall ventilator supplies the heat and is not running. • Housekeeping looks adequate in the room and return air grille is free of dirt load. • Student supplies and books are stored along the perimeter of the room. Student desks are empty. • The sink is dripping and Bab-o-Brand cleanser with bleach is next to the sink and sprinkled into it. • Space is approximately 1,420 square feet and has a vinyl tile floor and a roof deck ceiling.
Room 13	• The sink is running slowly and is unclear when it was turned on. • Wall ventilator supplies the heat and is not running. It looks a bit dusty and has some paper debris in the vents. • Dust and dead insects are on the windowsills and on floor near the windows. • One area rug is present and materials are stored on student desks. • Room is approximately 1,420 square feet with vinyl flooring. Ceiling is the roof deck.
Room 14	• Wall ventilator supplies the heat and is not running. • Dust and dead insects are in the ventilator supply vents. • A dead plant is on a desk about 10 feet from the sampler. • Student materials are not put away, and materials and papers are scattered through the room. • Room is approximately 1,420 square feet with vinyl flooring and a roof deck ceiling.

Sample Location	December 1, 2020 Observations
Cafeteria Multipurpose Room	• Three occupants are present during sampling. • Heat is functioning in the room. • Dozens of books are stacked on the adjoining stage. • Wall convector units are present on both sides of the room. Some were inaccessible with tables stored along them. Ones that could be accessed were free of debris. • Light dust/debris are on windowsills. • Approximately 4,700 square feet with vinyl tile flooring and a roof deck ceiling.
Room 18	• Wall ventilator is blowing cold air. • Dust and insect fragments are on windowsills and on the floor by the ventilator. • Two area rugs have dirt/debris on them. • Student materials are scattered in the room. Computer monitors are staged in the rear of the room. • Room is approximately 1,420 square feet with vinyl flooring and a roof deck ceiling.
Room 15 (Reading Room)	• Wall ventilator is functioning and blowing warm air. • Most of room is covered in carpet (approx. 85%) and the rest is tile. • Ventilator and windowsill are dusty with insect fragments and dead insects on the floor. • Restroom and office adjoin the room. • Exit door to courtyard is present. • Hundreds of books are stored, along with other student supplies. • Approximately 675 square feet with most of room covered in carpet (approx. 85%) and the rest is tile.
Main Office	• One person is present in the room during sampling. • The office is orderly and housekeeping looks good. Some papers/binders are near the testing site. Ceiling tile looks clean. • The door to the hall is shut during sampling. • Room is approximately 450 square feet with vinyl tile flooring.

Sample Location	February 25, 2021 Reassessment Observations
Outdoors	• Collected in front parking lot near front entrance • Sunny, mild breeze and mostly dry grass and pavement • Low traffic on main road
Room 10	• Unoccupied space with heat off, door to hallways shut • There was a wet spot under the sink under a dripping valve, multiple water stains under the sink, but only one was wet at time of assessment • Faucet dripping into sink, sink wet. • No other signs of water intrusion, and room was otherwise clean • Light dust on surfaces and floor, wall vents clean
Room 13	• Unoccupied space with heat on, door to hallways shut • There was a wet spot under the sink under a dripping valve, signs of substantial previous water damage, but only one spot was wet at time of assessment • Faucet dripping into sink, sink wet.

Sample Location	February 25, 2021 Reassessment Observations
	• No other signs of water intrusion, and room was otherwise clean • Light dust on surfaces and floor, wall vents clean • Light water stain near teacher's desk, but otherwise ceiling appeared clean
Room 14	• Unoccupied space with heat off, door to hallways shut • The cabinet under the sink showed signs of previous water damage but was painted over and appeared dry to the touch. Appears there was wood damaged after it was painted over. No signs of current water leaks. • There was unusual discoloration on the beams coming into the space on the wall with the TV on it that appeared either rusted, dusty or possible growth. • No other signs of water intrusion, and room was otherwise clean • Light dust on surfaces and floor, wall vents clean
Cafeteria Multipurpose Room	• The custodian was in and out of the adjacent kitchen, but otherwise unoccupied • The cafeteria space appeared clean, however the stage floor had moderate dust and debris • Minor ceiling stain on stage near the roof access door • There were some unusual stains on the ceiling above the custodian's door • There were open gaps in all of the exit doors, but all were not very wide
Room 18	• Unoccupied space with heat on, door to hallways shut • The sink and faucet was clean and dry with no signs of water issues • Some desks had good amount of dust and debris, while others appeared clean • Light dust on surfaces and floor, wall vents clean • There were dust and spider webs in the corner of the room • No other signs of water intrusion
Room 15 (Reading Room)	• Unoccupied space with heat on, door to hallways shut • The sink in the health unit room appeared dry, but showed signs of past water damage under the sink • Door to the outdoors appeared well sealed • Moderate dust and debris on the carpet • The mini-fridge in the space appeared clean • Ceiling tiles appeared clean and free from water stains
Main Office	• One occupant in the Pupil Services office, but the main area was unoccupied • Occupant expressed concerns in the Pupil Services office due to past flooding • Minor water stains on ceiling tiles near vents, otherwise ceiling tiles were clean • No signs of major water intrusion, and surfaces appeared clean • Air vents appeared to be moderately dusty

4 Thermal Environmental Conditions for Human Occupancy

ASHRAE *Standard 55-2017, Thermal Environmental Conditions for Human Occupancy*, addresses thermal comfort in an office environment, which means that an employee wearing a normal amount of clothing feels neither too cold nor too warm. This standard discusses thermal comfort within the context of air temperature, humidity, and air movement and provides recommended ranges for temperature and humidity that are intended to satisfy 80% of occupants. The recommended ASHRAE ranges are referenced below by each comfort parameter.

4.1 Temperature

The ASHRAE standard establishes a winter comfort range of between 68°F and 75°F and a summer range of between 73°F and 79°F. The temperatures measured during the December 1, 2020 initial assessment and reassessment from February 25, 2021 are summarized in Table 2. As indicated by the data in the table, temperatures in the school on December 1, 2020, averaged between 57°F and 77°F, with four tested locations measuring less than the ASHRAE recommended winter range, while the cafeteria had a temperature greater than the ASHRAE winter range.

ATI reassessed all of the previously tested spaces on February 25, 2021, after remediation actions were completed. ATI also reassessed the temperature in the reassessed rooms. The average temperatures in the reassessed locations ranged from 70°F to 74°F, which all rooms were within the ASHRAE recommended range for winter.

Table 2: Temperature

Sample Location	12/1/2020 Initial Assessment °F			ASHRAE Standard °F
	Min	Max	Average	
Outdoors	49	53	51	N/A
Indoors				
Room 10	57	58	58	68-75°F
Room 13	58	58	58	68-75°F
Room 14	56	57	57	68-75°F
Cafeteria Multipurpose Room	75	78	77	68-75°F
Room 18	62	64	63	68-75°F
Room 15 (Reading Room)	72	72	72	68-75°F
Main Office	70	71	71	68-75°F
2/25/2021 Reassessment Temperature in °F				
Outdoors	58	59	59	N/A
Indoors				
Room 10	72	72	72	68-75°F
Room 13	69	70	70	68-75°F
Room 14	72	72	72	68-75°F
Cafeteria Multipurpose Room	74	74	74	68-75°F
Room 18	72	73	73	68-75°F
Room 15 (Reading Room)	71	71	71	68-75°F
Main Office	72	72	72	68-75°F

4.2 Relative Humidity

Relative humidity is a key factor for mold growth. Mold has the potential of growing on suitable surfaces with humidity levels above 65%. ASHRAE *Standard 62.1-2016*, *Ventilation for Acceptable Indoor Air Quality,* recommends a maximum indoor relative humidity of 65% to prevent condensation of moisture on surfaces. Relative humidity less than 30% may result in drying of occupants' mucous membranes and skin. Relative humidity measurements for December 1, 2020 and February 25, 2021 are summarized in Table 3. As indicated by the data in the table, the average relative humidity on December 1, 2020 ranged between 30% and 52% with all tested locations measuring less than the ASHRAE maximum recommendation of 65% relative humidity, but greater than 30% relative humidity.

ATI reassessed all of the previously tested rooms on February 25, 2021, after fungal remediation actions were completed. ATI also reassessed the relative humidity in the space during the reassessment, and the average relative humidity ranged

between 19% and 28% with all of the tested locations measuring both less than the ASHRAE maximum recommendation of 65% relative humidity and less than 30% relative humidity.

Table 3: Relative Humidity

Sample Location	12/1/2020 Initial Assessment (% RH)			ASHRAE Standard (% RH)
	Min	Max	Average	
Outdoors	41	42	42	N/A
Indoors				
Room 10	50	51	51	< 65
Room 13	50	50	50	< 65
Room 14	51	52	52	< 65
Cafeteria Multipurpose Room	27	33	30	< 65
Room 18	39	42	41	< 65
Room 15 (Reading Room)	35	36	36	< 65
Main Office	38	39	39	< 65
2/25/2021 Reassessment Relative Humidity (%RH)				
Outdoors	19	19	19	N/A
Indoors				
Room 10	22	23	23	< 65
Room 13	27	28	28	< 65
Room 14	23	23	23	< 65
Cafeteria Multipurpose Room	26	29	28	< 65
Room 18	18	19	19	< 65
Room 15 (Reading Room)	20	21	21	< 65
Main Office	18	19	19	< 65

4.3 Carbon Dioxide

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

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

Carbon dioxide concentrations for December 1, 2020 are summarized in Table 4. On the day of the assessment, the average outdoor carbon dioxide concentration was 383 ppm, which calculates to a maximum indoor concentration of 1,083 ppm (700 + 383). All tested locations indoors were less than the recommended maximum for the day of the assessment.

ATI reassessed all of the previously tested spaces on February 25, 2021, after remediation actions were completed. The carbon dioxide concentrations measured during the reassessment are included in Table 4. The average outdoor carbon dioxide concentration on February 25, 2021 was 395 ppm, which calculates to a maximum indoor concentration of 1,095 ppm (700 + 395). All tested locations indoors were less than the recommended maximum for the day of the reassessment.

Table 4: Carbon Dioxide

Sample Location	12/1/2020 Initial Assessment Concentration (parts per million)			ASHRAE Standard (ppm) NTE
	Min	Max	Average	
Outdoors	379	387	383	N/A
Indoors				
Room 10	388	393	391	< 1,083
Room 13	380	385	383	< 1,083
Room 14	378	386	382	< 1,083
Cafeteria Multipurpose Room	427	437	432	< 1,083
Room 18	399	409	404	< 1,083
Room 15 (Reading Room)	412	439	426	< 1,083
Main Office	505	543	524	< 1,083
2/25/2021 Reassessment Concentration (parts per million)				
Outdoors	394	395	395	N/A
Indoors				
Room 10	415	422	419	< 1,095
Room 13	402	404	403	< 1,095
Room 14	414	419	417	< 1,095
Cafeteria Multipurpose Room	440	491	466	< 1,095
Room 18	415	416	416	< 1,095
Room 15 (Reading Room)	410	427	427	< 1,095
Main Office	434	448	448	< 1,095

4.4 Carbon Monoxide

Carbon monoxide is a colorless and odorless gas produced by the incomplete combustion of carbon containing fuels. Oil, gasoline, diesel fuels, wood, coke, and coal are the major sources of carbon monoxide. ASHRAE recommends that carbon monoxide not exceed nine ppm indoors over an eight-hour time-weighted average. ATI measured carbon monoxide concentrations using a TSI Q-Trak model number 7575-X with an attached IAQ probe (model number 982). The instrument's carbon monoxide sensor has an error range of ± 3% of the reading or three (3) ppm, whichever is greater. As indicated by the data in Table 5, carbon monoxide concentrations for December 1, 2020 were less than the Q-Trak's detection limit throughout the school.

ATI reassessed all of the previously tested spaces on February 25, 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	12/1/2020 Initial Assessment Concentration (parts per million)			ASHRAE Standard (ppm)
	Min	Max	Average	
Outdoors	< 3	< 3	< 3	N/A
Indoors				
Room 10	< 3	< 3	< 3	< 9
Room 13	< 3	< 3	< 3	< 9
Room 14	< 3	< 3	< 3	< 9
Cafeteria Multipurpose Room	< 3	< 3	< 3	< 9
Room 18	< 3	< 3	< 3	< 9
Room 15 (Reading Room)	< 3	< 3	< 3	< 9
Main Office	< 3	< 3	< 3	< 9
2/25/2021 Reassessment Concentration (parts per million)				
Outdoors	< 3	< 3	< 3	N/A
Indoors				
Room 10	< 3	< 3	< 3	< 9
Room 13	< 3	< 3	< 3	< 9
Room 14	< 3	< 3	< 3	< 9
Cafeteria Multipurpose Room	< 3	< 3	< 3	< 9
Room 18	< 3	< 3	< 3	< 9
Room 15 (Reading Room)	< 3	< 3	< 3	< 9
Main Office	< 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 December 1, 2020 and February 25, 2021 mold assessments sampled air using spore trap cassettes in randomly selected classrooms and other areas throughout the facility. These cassettes collect both viable spores, those capable of producing more fungal colonies, and non-viable spores, which cannot reproduce. Based upon recognized industry practices, indoor mold concentrations are compared with those detected outdoors, which are also known as ambient or baseline samples.

In normal circumstances, the diversity of spores identified indoors and outdoors should be similar with some exceptions. The high concentration of one or two species of fungal spores identified indoors and the absence of the same species outdoors can indicate a moisture problem with the potential to degrade the air quality. Fungi species present indoors are typically found at levels ranging from approximately 10-50% of their levels in the outdoor air, reflecting the filtering by the building's HVAC system.

The results from December 1, 2020 suggested noteworthy amplification of *Aspergillus/Penicillium* was present throughout all tested spaces in the school. The outdoor concentration of *Aspergillus/Penicillium*-like spores on December 1, 2020 was 40 spores/m^3; however, the indoor concentration of *Aspergillus/Penicillium*-like spores ranged from 4,430 to 52,300 spores/m^3. The wide indoor distribution of this spore type suggests that there was current or prior mold growth that was either widespread throughout the building or a single source that was transported or distributed throughout the building, through means such as centralized HVAC contamination, general air dilution or contaminated cleaning materials. ATI inquired about any building leaks from the previous day's rain event, and building staff said that no leaks had occurred from it at that point. It is very possible that

water damaged materials are present. Moreover, the low indoor concentration of ascospores and basidiospores supports that the contamination is not entering from outdoors, as those spore types often dominate the outdoor spore concentrations.

Cladosporium was elevated in Room 18 with 8,690 spores/m^3 while it was not detected outdoors. Low concentrations of other spore types are not significant and are typical background genera.

Aspergillus/Penicillium-like and *Cladosporium* are common primary colonizers of indoor water damaged building materials, meaning they are typically the first mold genera to be observed on newer water damaged materials. While these genera also occur naturally outdoors in much lesser concentrations, the concentrations observed indoors during this assessment suggest they are from indoor origin.

All of the previously tested spaces were resampled on February 25, 2021, and the total mold spore and *Aspergillus/Penicillium*-like spore concentrations dropped substantially in all areas, ranging between a 58% drop to a greater than 99% drop in *Aspergillus/Penicillium*-like spore concentration. The Reading Room and Room 18 still had *Aspergillus/Penicillium*-like spore concentrations greater than 1,000 spores/m^3. It is possible these spore concentrations are residual from the first clean up, and the spaces should be recleaned. ATI recommends additional HEPA vacuuming on all horizontal surfaces, followed by wet wiping all horizontal and vertical surfaces. If possible, running a HEPA equipped air scrubber for 24-48 hours will also help in significantly reducing residual spore concentrations.

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

Table 6: *Aspergillus/Penicillium* Concentration Comparison

Sample Location	December 1, 2020 Concentrations Spores/m^3	February 25, 2021 Concentrations Spores/m^3	% Change
Room 10	11,300	468	- 96%
Room 13	19,400	312	- 98%
Room 14	27,600	234	- 99%
Cafeteria	33,500	52	- 99%
Room 18	52,300	1,846	- 99%
Room 15 (Reading Room)	11,400	2,184	- 81%
Main Office	4,430	130	- 58%

*Room 18 also had over 8,690 spores/m^3 of *Cladosporium* during the initial assessment. At the reassessment, concentrations decreased to 52 spores/m^3 or by 99%.

The official laboratory reports with spore trap samples collected on December 1, 2020 and February 25, 2021, are presented in Appendix A.

6 Summary of Findings

1. Four of the tested spaces on December 1, 2020 had a temperature less than the ASHRAE recommended winter range of 68-75°F, while one room had a temperature greater than the ASHRAE recommended range during the initial assessment. On the day of the December assessment, one boiler was offline, which caused many rooms to have no heat. All of the tested spaces on February 25, 2021 had a temperature within the ASHRAE winter range.
2. The relative humidity in all tested spaces was less than the ASHRAE guidelines of <65%, but greater than 30%. All of the tested spaces on February 25, 2021 had a relative humidity less than 30%, which does not promote mold growth, but can cause occupant discomfort.

3. Carbon dioxide concentrations in all tested spaces were less than the ASHRAE limit for carbon dioxide, which was 1,083 parts per million (PPM) for the initial assessment in December and 1,095 ppm for the February reassessment.
4. The average carbon monoxide concentrations in all areas, for both assessments, were less than the EPA and ASHRAE recommended limit of 9 ppm.
5. The spore trap sampling results from the December 1, 2020 assessment suggested some level of indoor amplification of mold was present in all of the tested space. ATI recommended reassessing these spaces after cleaning and mold treatment occurred.
6. The February 25, 2021 reassessment showed a reduction in *Aspergillus/Penicillium* ranging from 58 to 99% reduction in the reassessed rooms. Because the *Aspergillus/Penicillium* concentration in Room 15 and 18 was greater than 1,000 spores/m^3 during the reassessment, ATI recommends an additional round of cleaning in these rooms using HEPA vacuums on floors and surfaces, as well as wet wiping of horizontal surfaces to remove residual spores in the room. Running HEPA equipped air scrubbers for 24 to 48 hours will also help in reducing residual 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.

Nate Burgei, CIH, CSP
Certified Industrial Hygienist

Appendix A: Laboratory Report and Chain of Custody

EMSL Analytical, Inc.

5221 Militia Hill Road Plymouth Meeting, PA 19462

Tel/Fax: (610) 828-3102 / (610) 828-3122

http://www.EMSL.com / plymouthmeetinglab@emsl.com

EMSL Order: 182003869
Customer ID: ATII25A
Customer PO:
Project ID:

Attention: Courtney McCall
ATI
4221 Forbes Blvd
Suite 250
Lanham, MD 20706
Project: 20-691 Seabrook ES

Phone: (202) 832-1433
Fax:
Collected Date: 12/01/2020
Received Date: 12/01/2020 03:02 PM
Analyzed Date: 12/08/2020

Test Report:Air-O-Cell(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods MICRO-SOP-201, ASTM D7391)

Lab Sample Number:	182003869-0001			182003869-0002			182003869-0003		
Client Sample ID:	31462182			31461915			31461974		
Volume (L):	75			75			75		
Sample Location:	Room 10			Room 13			Room 14		
Spore Types	**Raw Count**	**Count/M³**	**% of Total**	**Raw Count**	**Count/M³**	**% of Total**	**Raw Count**	**Count/M³**	**% of Total**
Alternaria (Ulocladium)	-	-	-	-	-	-	-	-	-
Ascospores	-	-	-	-	-	-	1*	10*	0
Aspergillus/Penicillium	267	11300	94.4	459	19400	95.8	654	27600	97
Basidiospores	15	630	5.3	19	800	4	18	760	2.7
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium	-	-	-	-	-	-	-	-	-
Cladosporium	1	40	0.3	1	40	0.2	3*	40*	0.1
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	-	-	-	-	-	-	-	-	-
Fusarium	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	-	-	-	-	-	-	2*	30*	0.1
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Arthrinium	-	-	-	-	-	-	-	-	-
Nigrospora	-	-	-	-	-	-	-	-	-
Paecilomyces-like	-	-	-	-	-	-	-	-	-
Total Fungi	**283**	**11970**	**100**	**479**	**20240**	**100**	**678**	**28440**	**100**
Hyphal Fragment	-	-	-	-	-	-	-	-	-
Insect Fragment	-	-	-	1*	10*	-	1	40	-
Pollen	-	-	-	-	-	-	-	-	-
Analyt. Sensitivity 600x	-	42	-	-	42	-	-	42	-
Analyt. Sensitivity 300x	-	13*	-	-	13*	-	-	13*	-
Skin Fragments (1-4)	-	2	-	-	1	-	-	1	-
Fibrous Particulate (1-4)	-	1	-	-	1	-	-	1	-
Background (1-5)	-	1	-	-	1	-	-	1	-

182003869-0002 - Aspergillus conidiophores present in sample.
182003869-0003 - Aspergillus conidiophores present in sample.

++ Includes other spores with similar morphology; see EMSL's fungal glossary for each specific category.

Kevin Ream, Laboratory Manager
or other Approved Signatory

Initial report from: 12/08/2020 10:35 AM

For information on the fungi listed in this report, please visit the Resources section at www.emsl.com

EMSL Analytical, Inc.

5221 Militia Hill Road Plymouth Meeting, PA 19462

Tel/Fax: (610) 828-3102 / (610) 828-3122

http://www.EMSL.com / plymouthmeetinglab@emsl.com

EMSL Order: 182003869
Customer ID: ATII25A
Customer PO:
Project ID:

Attention: Courtney McCall
ATI
4221 Forbes Blvd
Suite 250
Lanham, MD 20706
Project: 20-691 Seabrook ES

Phone: (202) 832-1433
Fax:
Collected Date: 12/01/2020
Received Date: 12/01/2020 03:02 PM
Analyzed Date: 12/08/2020

Test Report:Air-O-Cell(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods MICRO-SOP-201, ASTM D7391)

Lab Sample Number:	182003869-0004			182003869-0005			182003869-0006		
Client Sample ID:	31462023			31461994			31461921		
Volume (L):	75			75			75		
Sample Location:	Cafeteria Multipurpose			Room 18			Room 15 Reading Room		
Spore Types	**Raw Count**	**Count/M³**	**% of Total**	**Raw Count**	**Count/M³**	**% of Total**	**Raw Count**	**Count/M³**	**% of Total**
Alternaria (Ulocladium)	-	-	-	-	-	-	-	-	-
Ascospores	1	40	0.1	1	40	0.1	-	-	-
Aspergillus/Penicillium	793	33500	96.8	1240	52300	84.9	269	11400	94.1
Basidiospores	20	840	2.4	2	80	0.1	12	510	4.2
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium	-	-	-	-	-	-	-	-	-
Cladosporium	5	200	0.6	206	8690	14.1	5	200	1.7
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	-	-	-	-	-	-	-	-	-
Fusarium	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	2*	30*	0.1	2	80	0.1	-	-	-
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Arthrinium	-	-	-	-	-	-	-	-	-
Nigrospora	-	-	-	1	40	0.1	-	-	-
Paecilomyces-like	-	-	-	9	400	0.6	-	-	-
Total Fungi	**821**	**34610**	**100**	**1461**	**61630**	**100**	**286**	**12110**	**100**
Hyphal Fragment	-	-	-	1	40	-	-	-	-
Insect Fragment	1	40	-	1*	10*	-	-	-	-
Pollen	1	40	-	-	-	-	1*	10*	-
Analyt. Sensitivity 600x	-	42	-	-	42	-	-	42	-
Analyt. Sensitivity 300x	-	13*	-	-	13*	-	-	13*	-
Skin Fragments (1-4)	-	2	-	-	1	-	-	2	-
Fibrous Particulate (1-4)	-	1	-	-	1	-	-	1	-
Background (1-5)	-	1	-	-	1	-	-	1	-

182003869-0004 - Aspergillus conidiophores present in sample.
182003869-0006 - Aspergillus conidiophores present in sample.

++ Includes other spores with similar morphology; see EMSL's fungal glossary for each specific category.

Kevin Ream, Laboratory Manager
or other Approved Signatory

Initial report from: 12/08/2020 10:35 AM

For information on the fungi listed in this report, please visit the Resources section at www.emsl.com

EMSL Analytical, Inc.

5221 Militia Hill Road Plymouth Meeting, PA 19462

Tel/Fax: (610) 828-3102 / (610) 828-3122

http://www.EMSL.com / plymouthmeetinglab@emsl.com

EMSL Order: 182003869
Customer ID: ATII25A
Customer PO:
Project ID:

Attention: Courtney McCall
ATI
4221 Forbes Blvd
Suite 250
Lanham, MD 20706
Project: 20-691 Seabrook ES

Phone: (202) 832-1433
Fax:
Collected Date: 12/01/2020
Received Date: 12/01/2020 03:02 PM
Analyzed Date: 12/08/2020

Test Report:Air-O-Cell(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods MICRO-SOP-201, ASTM D7391)

Lab Sample Number:	182003869-0007			182003869-0008			182003869-0009		
Client Sample ID:	31462011			31461985			31462162		
Volume (L):	75			75					
Sample Location:	Main Office			Ambient			Field Blank		
Spore Types	**Raw Count**	**Count/M³**	**% of Total**	**Raw Count**	**Count/M³**	**% of Total**	**Raw Count**	**Count/M³**	**% of Total**
Alternaria (Ulocladium)	-	-	-	-	-	-	-	-	-
Ascospores	-	-	-	3	100	3.9	-	-	-
Aspergillus/Penicillium	105	4430	80.7	1	40	1.6	-	-	-
Basidiospores	15	630	11.5	54	2300	89.8	-	-	-
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium	-	-	-	-	-	-	-	-	-
Cladosporium	8	300	5.5	-	-	-	-	-	-
Curvularia	-	-	-	-	-	-	-	-	-
Epicoccum	1	40	0.7	2	80	3.1	-	-	-
Fusarium	-	-	-	-	-	-	-	-	-
Ganoderma	-	-	-	-	-	-	-	-	-
Myxomycetes++	1	40	0.7	1	40	1.6	-	-	-
Pithomyces++	-	-	-	-	-	-	-	-	-
Rust	1	40	0.7	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Arthrinium	1*	10*	0.2	-	-	-	-	-	-
Nigrospora	-	-	-	-	-	-	-	-	-
Paecilomyces-like	-	-	-	-	-	-	-	-	-
Total Fungi	**132**	**5490**	**100**	**61**	**2560**	**100**	**-**	**No Trace**	**-**
Hyphal Fragment	-	-	-	-	-	-	-	-	-
Insect Fragment	-	-	-	-	-	-	-	-	-
Pollen	-	-	-	-	-	-	-	-	-
Analyt. Sensitivity 600x	-	42	-	-	42	-	-	0	-
Analyt. Sensitivity 300x	-	13*	-	-	13*	-	-	0*	-
Skin Fragments (1-4)	-	2	-	-	1	-	-	-	-
Fibrous Particulate (1-4)	-	1	-	-	1	-	-	-	-
Background (1-5)	-	1	-	-	1	-	-	-	-

++ Includes other spores with similar morphology; see EMSL's fungal glossary for each specific category.

Kevin Ream, Laboratory Manager
or other Approved Signatory

Initial report from: 12/08/2020 10:35 AM

For information on the fungi listed in this report, please visit the Resources section at www.emsl.com

OrderID: 182003869

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Microbiology Chain of Custody

EMSL Order Number (*Lab Use Only*):

182003869

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX:(856) 786-0262

Company Name: ATI, Inc.	**EMSL-Bill to:** ☑ Same ☐ Different If Bill to is Different note instructions in Comments
Street: 4221 Forbes Blvd. Suite 250	*Third Party Billing requires written authorization from third party.*
City: Lanham **State/Province:** MD	**Zip/Postal Code:** 20706 **Country:**
Report To (Name): Courtney McCall	**Telephone #:** 703.399.5423
Email Address: courtney@atiinc.com	**Fax #:** **Purchase Order:**
Project Name/Number: 20-691 Seabrook ES	**Please Provide Results:** ☐ Fax ■ Email

U.S. State Samples Taken: MD **Project Zip Code:** 20706 **Connecticut Samples:** ☐ Commercial ☐ Residential

Sterile, Sodium Thiosulfate Preserved Bottle Used: ☐ **Biocide Used in Source (specify):** ☐

Public Water Supply Samples: ☐ **Note: All results may automatically be reported to DOH if required by state.**

Turnaround Time (TAT) Options - Please Check

☐ 3 Hour	☐ 6 Hour	☐ 24 Hour	☐ 48 Hour	☐ 72 Hour	☐ 96 Hour	■ 1 Week	☐ 2 Week

Microbiology Test Codes

M001 Air-O-Cell
M030 Micro 5
M174 MoldSnap
M032 Allergenco-D
M041 Fungal Direct Examination
M169 Pollen ID & Enumeration
M280 Dust Characterization Level-1
M281 Dust Characterization Level-2
M005 Viable Fungi- Air Samples (Genus ID & Count)
M006 Viable Fungi- Air Samples (Includes *Penicillium, Aspergillus, Cladosporium, Stachybotrys* Species ID & Count)
M007 Culturable fungi - Surface Samples (Genus ID & Count)
M008 Culturable fungi - Surface Samples (Includes *Penicillium, Aspergillus, Cladosporium, Stachybotrys* Species ID & Count)
M009 Bacteria Culture Gram Stain & Count
M010 Bacteria Count & ID - 3 Most Prominent
M011 Bacteria Count & ID - 5 Most Prominent

M012 *Pseudomonas aeruginosa* (P/A***)
M024 *Pseudomonas aeruginosa* (MFT*)
M015 Heterotrophic Plate Count
M017 Total Coliform & *E. coli* (Colilert P/A***)
M018 Total Coliform & *E. coli* (MFT*)
M114 Total Coliform & *E coli* Enumeration (Colilert MPN**)
M019 Fecal Coliform (MFT*)
M020 Fecal *Streptococcus* (MFT*)
M029 *Enterococci* (MFT*)
M129 *Enterococci* (Enterolert P/A***)
M180 Real Time qPCR-ERMI 36 Panel
M025 Sewage Screen –Water (MFT*)

M115 Sewage Screen - Water (P/A***)
M116 Sewage Screen - Water (MPN**)
M117 Sewage Screen - Swab (P/A***)
M013 Sewage Screen - Swab (MFT*)
M133 *Methicillin-resistant Staph. aureus* (MRSA)
M031 Rapid-growing non-TB *Mycobacteria* Detection & Enumeration
M014 Endotoxin Analysis
M044 Group Allergen (Cat, Dog, Cockroach, Dust Mite)
Other See Analytical Price Guide
***Legionella* Analysis** Please use EMSL *Legionella* COC

*MFT= Membrane Filtration Technique
**MPN= Most Probable Number
***P/A= Presence/Absence

Name of Sampler: Courtney McCall **Signature of Sampler:** Courtney McCall

Sample #	Sample Location/Description	Sample Type	Potable/ NonPotable (Only for Waters)	Test Code	Volume/ Area	Date/Time Collected	Temperature (°C) (Lab Use Only)
Example A1	Kitchen Sink/Tap	Water	☒ P ☐ NP	M017	100 mL	9/1/13 4:00 PM	
3146 2182	Room 10	Air	☐ P ☐ NP	M001	75L	12/1/20 930am	
3146 1915	Room 13	Air	☐ P ☐ NP	M001	75L	12/1/20 945 am	
3146 1974	Room 14	Air	☐ P ☐ NP	M001	75L	12/1/20 954 am	
3146 2023	Cafeteria Multipurpose	Air	☐ P ☐ NP	M001	75L	12/1/20 1005 am	
3146 1994	Room 18	Air	☐ P ☐ NP	M001	75L	12/1/20 1018 am	

Client Sample # (s): - **Total # of Samples:** 9 **Samples Received Chilled?** Yes / No (Lab Use Only)

Relinquished (Client): Courtney McCall **Date:** 12/1/20 **Time:** 250pm

Received (Lab): R. Howard Drop Box **Date:** **Time:**

Comments/Special Instructions:

RECEIVED
EMSL ANALYTICAL, INC.
BELTSVILLE, MD
2020 DEC 1 P 3:02

Controlled Document – COC-34 Micro R8 11/14/2017

OrderID: 182003869

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Microbiology Chain of Custody

EMSL Order Number (*Lab Use Only*):

182003869

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX:(856) 786-0262

Additional pages of the chain of custody are only necessary if needed for additional sample information

Sample #	Sample Location/Description	Sample Type	Potable/ NonPotable (Only for Waters)	Test Code	Volume/ Area	Date/Time Collected	Temperature (°C) (Lab Use Only)
3146 1921	Room 15 Reading Room	Air	☐ P ☐ NP	M001	75L	12/1/20 1040 am	
3146 2011	Main Office	Air	☐ P ☐ NP	M001	75L	12/1/20 1045 am	
3146 1985	Ambient	Air	☐ P ☐ NP	M001	75L	12/1/20 1052 am	
3146 2162	Field Blank	Air	☐ P ☐ NP	M001	—	12/1/20 —	
			☐ P ☐ NP				
			☐ P ☐ NP				
			☐ P ☐ NP				
			☐ P ☐ NP				
			☐ P ☐ NP				
			☐ P ☐ NP				
			☐ P ☐ NP				
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			☐ P ☐ NP				
			☐ P ☐ NP				
			☐ P ☐ NP				
			☐ P ☐ NP				
			☐ P ☐ NP				

Comments/Special Instructions:

Controlled Document – COC-34 Micro R8 11/14/2017

182003869

GEN-FM-10-1: Sample Transfer-One Time
Revision 4.2
Revision Date: 1/05/2016
Effective Date: 1/05/2016

EMSL Analytical, Inc.

Sample Transfer Form

Receiving Lab:	EMSL- BELTSVILLE	**Phone Number:**	3019375700
		Fax Number:	3019375701
Relinquished to:	EMSL- Plymouth Mtg.	**Phone Number:**	8002203675
		Fax Number:	8567860262
Does new lab hold equivalent or additional accreditation? *			☒ Yes ☐ No

EMSL Customer ID # (if known):	ATII25A
Client Name:	ATI INC
Client Project:	20-691 - SEABROOK ES
Tests to be Performed:	M001
Date Received:	12/1/20
Date Relinquished:	12/2/20
Date Due:	1 WEEK - 12/8/20 @ 3:02 PM
Special Instructions: (e.g. Work Order # , required qualifications, project specific procedures/modifications)	

Relinquished by (Signature): L. Plymouth	**Date:** 12/2/20	**Received by (Signature):**	**Date:** 12-3-20
Relinquished by (Signature):	**Date:**	**Received by (Signature):**	**Date:**

Customer Agreement- Please sign form and send to the receiving laboratory. By signing below, you agree to permit the above named receiving lab to transfer samples to a separate EMSL lab with equivalent qualifications* for analysis. The final report will be issued from the analyzing laboratory. Ensure any requirements are listed in special instructions.

Name (please print):	**Signature:**	**Agent of:**	**Date:**

If this is a recurring project or sample type that may require samples to be relinquished on a regular basis, a Standing Agreement form must be completed.

* Receiving and analyzing labs shall be aware of required qualifications of project prior to transfer of samples.

Note: If customer has been notified and approved this transfer verbally or by e-mail, the receiving lab must sign for the customer above. EMSL employee filling out form on behalf of customer shall print name of person to whom they spoke, date agreement was received, and then sign under Signature.

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	324881	**Job Name:**	Seabrook Elementary	**Date Submitted:**	02/25/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Nate Burgei
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-691	**Date Analyzed:**	02/25/2021
		P.O. Number:	Not Provided	**Report Date:**	02/25/2021
Attention:	Nate Burgei				

AMA Sample #	324881-1	**AMA Sample #**	324881-2	**AMA Sample #**	324881-3
Client ID	31569773	**Client ID**	31569710	**Client ID**	31569789
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)	150	**Sample Volume (L)**	150	**Sample Volume (L)**	150
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	1	**Debris Loading**	1	**Debris Loading**	1
Location	Room 10	**Location**	Room 13	**Location**	Room 14

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	2	15	26	52	9.1%
Basidiospores	1	15	26	26	4.5%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	1	15	26	26	4.5%
Curvularia					
Penicillium / Aspergillus	18	15	26	468	81.8%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Epicoccum					
Hyphal Fragments*					
Total Raw Ct:	22	**Total sp/m³:**	572		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	2	15	26	52	5.7%
Basidiospores	17	15	26	442	48.6%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	4	15	26	104	11.4%
Curvularia					
Penicillium / Aspergillus	12	15	26	312	34.3%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Epicoccum	Present	15	26	<26	
Hyphal Fragments*					
Total Raw Ct:	35	**Total sp/m³:**	910		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m³	%
Alternaria					
Ascospores	2	15	26	52	13.3%
Basidiospores	4	15	26	104	26.7%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	9	15	26	234	60%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Epicoccum					
Hyphal Fragments*	Present	15	26	<26	
Total Raw Ct:	15	**Total sp/m³:**	390		

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	324881	**Job Name:**	Seabrook Elementary	**Date Submitted:**	02/25/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Nate Burgei
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-691	**Date Analyzed:**	02/25/2021
		P.O. Number:	Not Provided	**Report Date:**	02/25/2021
Attention:	Nate Burgei				

AMA Sample #	324881-4	**AMA Sample #**	324881-5	**AMA Sample #**	324881-6
Client ID	31569716	**Client ID**	31569740	**Client ID**	31569803
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)	150	**Sample Volume (L)**	150	**Sample Volume (L)**	150
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	1	**Debris Loading**	1	**Debris Loading**	2
Location	Cafeteria	**Location**	Main Office	**Location**	Room 15

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	2	15	26	52	18.2%
Basidiospores	4	15	26	104	36.4%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	2	15	26	52	18.2%
Smuts/Periconia/Myxomycetes	3	15	26	78	27.3%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Epicoccum					
Hyphal Fragments*					
Total Raw Ct:	11	**Total sp/m^3:**	286		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	3	15	26	78	21.4%
Basidiospores	6	15	26	156	42.9%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	5	15	26	130	35.7%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Epicoccum					
Hyphal Fragments*					
Total Raw Ct:	14	**Total sp/m^3:**	364		

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	4	15	26	104	3.6%
Basidiospores	12	15	26	312	10.8%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	11	15	26	286	9.9%
Curvularia					
Penicillium / Aspergillus	84	15	26	2184	75.7%
Smuts/Periconia/Myxomycetes	Present	15	26	<26	
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Epicoccum					
Hyphal Fragments*	1	15	26	26	0.9%
Total Raw Ct:	111	**Total sp/m^3:**	2886		

Comments

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	324881	**Job Name:**	Seabrook Elementary	**Date Submitted:**	02/25/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Nate Burgei
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-691	**Date Analyzed:**	02/25/2021
		P.O. Number:	Not Provided	**Report Date:**	02/25/2021
Attention:	Nate Burgei				

AMA Sample #	324881-7	**AMA Sample #**	324881-8	**AMA Sample #**	324881-9
Client ID	31569788	**Client ID**	31569741	**Client ID**	31569742
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)	150	**Sample Volume (L)**	150	**Sample Volume (L)**	0
Sample Condition	Acceptable	**Sample Condition**	Acceptable	**Sample Condition**	Acceptable
Debris Loading	1	**Debris Loading**	2	**Debris Loading**	0
Location	Room 18	**Location**	Outdoors	**Location**	Blank

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores					
Basidiospores	5	15	26	130	6.3%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium	2	15	26	52	2.5%
Curvularia					
Penicillium / Aspergillus	71	15	26	1846	89.9%
Smuts/Periconia/Myxomycetes	1	15	26	26	1.3%
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Epicoccum					
Hyphal Fragments*	1	15	26	26	1.3%
Total Raw Ct:	79		**Total sp/m^3:**	2054	

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores	5	15	26	130	31.3%
Basidiospores	8	15	26	208	50%
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus	3	15	26	78	18.8%
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Epicoccum					
Hyphal Fragments*					
Total Raw Ct:	16		**Total sp/m^3:**	416	

Comments

	Raw Ct	Trav/Flds	A.S.	sp/m^3	%
Alternaria					
Ascospores					
Basidiospores					
Bipolaris/Drechslera/Helm.					
Chaetomium					
Cladosporium					
Curvularia					
Penicillium / Aspergillus					
Smuts/Periconia/Myxomycetes					
Stachybotrys/Memnoniella					
Ulocladium					
Unknown					
Epicoccum					
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:	324881	**Job Name:**	Seabrook Elementary	**Date Submitted:**	02/25/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Nate Burgei
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-691	**Date Analyzed:**	02/25/2021
		P.O. Number:	Not Provided	**Report Date:**	02/25/2021
Attention:	Nate Burgei				

Spore Comparison Guide

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

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

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

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

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

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

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

ASTM D7391-09 Spore Trap Analysis Report

Chain of Custody:	324881	**Job Name:**	Seabrook Elementary	**Date Submitted:**	02/25/2021
Client:	ATI, Inc.	**Job Location:**	Not Provided	**Person Submitting:**	Nate Burgei
Address:	9220 Rumsey Road Suite 100 Columbia, MD 21045	**Job Number:**	20-691	**Date Analyzed:**	02/25/2021
		P.O. Number:	Not Provided	**Report Date:**	02/25/2021
Attention:	Nate Burgei				

General Comments, Disclaimers, and Footnotes

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

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

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

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

Technical Director Tristan Ward

MOLD SPORE DESCRIPTIONS

Ascospores

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

Basidiospores

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

Cladosporium

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

Epicoccum

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

Hyphal Fragments

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

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) 324881

Mailing/Billing Information:

1. Client Name: AAI Inc
2. Address 1: 4221 Forbes Blvd
3. Address 2: LANHAM MD
4. Address 3:
5. Phone #: Fax #:

Submittal Information:

1. Job Name: Seabrook elementary
2. Job Location:
3. Job #: 20-691 P.O. #:
4. Contact Person: Nate Burgei Cell: 614 786 [illegible] 5919
5. Collected by: Nate Burgei Cell:

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

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

NORMAL BUSINESS HOURS
☐ 4 Hours ☐ 3 Day
☐ Same Day ☐ 5 Day
☒ Next Day Date Due: 2/26/21
☐ 2 Day
☐ Results Required By Noon (Additional fee may apply)

REPORT TO:
☐ Email: nate.burgei@atiinc.com
☐ Email 2: courtney@atiinc.com
☐ Verbals:

Asbestos Analysis
*PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 (QTY)
☐ Fiberglass (QTY)
TEM Air* – Please Indicate Filter Type:
☐ AHERA (QTY)
☐ NIOSH 7402 (QTY)
☐ Other (specify) (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate (QTY) ☐ Pos Stop
☐ EPA Point Count (QTY)
☐ NY State Friable 198.1 (QTY)
☐ Grav. Reduction ELAP 198.6 (QTY)
☐ Other (specify) (QTY)
MISC
☐ Asbestos Soil ASTM D7521 PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)
*It is recommended that blank samples be submitted with all air and surface samples

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

Metals Analysis
☐ Pb Paint Chip ☐ % by Weight (QTY) ☐ mg/cm² (QTY)
☐ *Pb Dust Wipe (wipe type) (QTY)
☐ *Pb Air (QTY)
☐ Pb Soil/Solid (QTY)
☐ Pb TCLP (QTY)
☐ Drinking Water ☐ Pb (QTY) ☐ Cu (QTY)
☐ Waste Water ☐ Pb (QTY) ☐ Cu (QTY)
☐ Pb Furnace (Media) (QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: Buck Bioaire
Collection Media Air-O-Cell
☐ *Spore-Trap 9 (QTY) ☐ Surface Vacuum Dust (QTY)
☐ *Surface Swab (QTY)
☐ *Surface Tape (QTY)
☐ Other (Specify) (QTY

SAMPLE INFORMATION CLIENT ID #	SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	COMMENTS / SPECIAL INSTRUCTIONS
31569773	ROOM 10	2/25 9:54	150L										X			
31569710	ROOM 13	10:06	150L										X			
31569789	ROOM 14	10:18	150L										X			
31569716	Cafeteria	10:30	150L										X			
31569740	MAIN OFFICE	10:42	150L										X			
31569803	ROOM 15	10:54	150L										X			
31569788	ROOM 18	11:07	150L										X			
31569741	OUTDOORS	11:20	150L										X			
31569742	Blank		~~150L~~ OL										X			
			~~OL~~										@			

	Print Name	Signature	Date	Time
Relinquished by:	Nate Burgei		2/25/21	11:45
Received by:			2/25/21	1145

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

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

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