COMMITMENT & INTEGRITY
DRIVE RESULTS

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Via Electronic Mail

January 15, 2020

Angelus Papageorge
Director of Operations
Fairfield Public Schools
501 Kings Highway East
Fairfield, CT 06825

Re: Indoor Bioaerosol Sampling and Environmental Assessment
Fairfield Ludlowe High School, Fairfield, Connecticut

Dear Mr. Papageorge:

As requested, Woodard & Curran performed bioaerosol sampling for total fungal spores and an environmental assessment, following building remediation in the lower level Trainer's Room and repairs to the pipes in the steam chase in the Physical Education Office at the Fairfield Ludlowe High School located at 785 Unquowa Road in Fairfield, Connecticut. This environmental assessment was performed following recommendations from a previous indoor environmental assessment performed by Woodard & Curran on November 11, 2019. The building remediation and pipe repair recommendations were included in a report from Woodard & Curran dated November 26, 2019.

On December 12, 2019, a moisture survey, visual inspection, and bioaerosol samples for airborne fungal spores and surface samples were collected at the request of The Fairfield School Department in areas remediated. In addition to the Trainer's Room and P.E. Office, Woodard & Curran was requested to collect air samples in the Auto Shop.

BACKGROUND

During a November 11, 2019, indoor environmental assessment Woodard& Curran identified standing water and visible mold growth in the Trainer's Room (Room 027) and a leak in the steam pipe in the pipe chase under the floor in the P.E. Office (Room 019). Fairfield Public Schools had these areas remediated including removing gypsum board walls in both rooms and repairing the leaking pipe in the P.E. Office.

Fungus thrives in damp organic matter and fungal growth media can vary widely. Examples of media that can support fungal growth include stagnant water, damp wood, backing on carpet and carpet pads, cellulose ceiling tiles, and paper facing on gypsum board. Interior finishes such as vinyl cove base and vinyl wall covering may hold moisture against gypsum board or wood, thus enhancing the conditions for fungal growth.

METHODS

Visual Inspection

Woodard & Curran conducted a visual inspection in the Auto Shop, P.E Office and Trainer's Room to determine if obvious sources of suspect fungal growth were present.

Moisture Survey

The moisture content of building materials was evaluated using a Dual Moisture Meter Pro moisture meter, manufactured by Extech Instruments, which has two operating modes: search and measure. In search mode, the instrument uses a non-invasive radio frequency emission technique to locate moisture and can penetrate most wall and floor coverings, including ceramic tiles, to a depth of approximately ¾ inch. It displays a semi-quantitative result on a scale of colored lights. In measure mode, the instrument uses the electrical conductivity of a damp porous building material to indicate its level of free water. Two electrode pins are inserted into the material and the moisture level is displayed on a digital numeric display in units of wood moisture equivalent (WME). WME is the water content that wood would have if it were in contact with the material being tested for sufficient time to reach moisture equilibrium. It is the ratio of the weight of the water in the wood to the dry weight of the wood, expressed as a percentage. Prior to use, the calibration of the instrument was checked using a calibration device.

Bioaerosol Sampling for Total Fungal Spores

Bioaerosol samples for total fungal spores were collected using a calibrated Zefon Biopump. Air was drawn through Air-O-Cell cassettes prepared by EMSL Analytical, Inc. at a flow rate of 15 liters per minute. Samples were collected at three indoor locations and two samples were collected outdoors for reference. Each Sample was collected for a period of five minutes. Samples along with a field blank, for quality control purposes, were sent via overnight mail to Eurofins EMLab P& K in Marlton, New Jersey. Analysis includes identification to genus or group of all fungi present, living, dead, or dormant.

Surface Samples for Mold Content Determination

Surface samples were collected by adhering clear tape onto the surfaces where suspect mold growth was observed and affixing the tape to a microscope slide which was sent via overnight mail to Eurofins EMLab P&K in Marlton, New Jersey. Samples were analyzed at various magnifications under light microscopy to visually estimate the presence of any fungal growth in the sample and subsequently identify any fungal growth that is detected to Genus or relevant group.

RESULTS

Visual Inspection and Surface Samples for Mold Content Determination

The lower portion of gypsum board wall was removed in the Trainer's Room. Visible suspect mold growth was observed in the base of the gypsum board wall in the interior portion of the remaining wall board. Surface samples confirmed the presence of mold growth. Results of the surface samples are included as Attachment A.

Gypsum board wall was observed to be removed in the P.E. Office and the steam pipe had been replaced. Visible suspect mold growth was observed on the paper facing of the vertical heat pipe insulation. Surface samples confirmed the presence of mold growth.

Moisture Survey

Woodard & Curran conducted a moisture survey in accessible areas with porous wall materials (gypsum board walls) in the P.E. Office and Trainer's Room. The moisture survey indicated that the moisture content was less than 15%, indicating dry conditions, in the porous wall materials evaluated in these rooms.

Bioaerosol Samples for Total Fungal Spores

There are no published or regulatory standards to compare bioaerosol sample results in order to assess potential health risks. As such, a reference or background level, typically outdoor ambient air, is used to compare the results.

A total of six (6) indoor bioaerosol samples were collected in the Trainer's Room, Auto Shop and P.E. Office and two (2) outdoor samples were collected for reference. The total spores detected in the three indoor locations were less than concurrent outdoor samples. The average of the outdoor sample results (average of all detected concentrations) was 155 spores/m^3 (spores per cubic meter of air), whereas the average of the indoor sample results was 73 spores/m^3. The range of detected concentrations in the outdoor samples was 150 to 160 spores/m^3, whereas the range of detected concentrations in the indoor samples was 40 to 130 spores/m^3.

In addition, the individual spore types were similar between the indoor and outdoor samples. The detected concentrations of airborne fungal spores would not be expected to cause a health issue in healthy individuals.

A table of the bioaerosol sampling results is included as Attachment B and the analytical laboratory report is included as Attachment C.

RECOMMENDATIONS

Based on industry guidelines and best management practices, it is recommended that the following steps be taken:

- Remove interior portion of the gypsum board wall in the Trainer's Room to a height of one foot above the floor level in the locations where wall board has already been removed.
- Remove the pipe insulation, from the vertical heat pipe in the P.E. Office. Remove one additional foot of vertical pipe insulation in this office.
- Continue to monitor school areas for water damage and excess moisture in building materials. Note that the School's Asbestos Hazard Emergency Response Act (AHERA) records should be reviewed prior to disturbing any building materials.
- If there is any large water intrusion or interior water release effecting porous building materials, an experienced environmental assessment firm should be consulted.

Woodard & Curran appreciates the opportunity to assist you on this project. If you have any questions or require further information, please feel free to email me at whenderson@woodardcurran.com or call me at (781) 251-0489.

Sincerely,

WOODARD & CURRAN INC.

William Henderson, CIH, CSP
Project Scientist

Ray Cowan, CIH
Senior Project Manager

Attachment A: Eurofins EMLab P&K Surface Sample Results
Attachment B: Table of Laboratory Results
Attachment C: Eurofins EMLab P&K Bioaerosol Sample Results

ATTACHMENT A: EUROFINS EMLAB P&K ANALYTICAL LABORATORY RESULTS, SURFACE SAMPLES

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Report for:

Will Henderson
Woodard & Curran
980 Washington Street
Suite 325
Dedham, MA 02026

Regarding: Project: Fairfield - Ludlowe H.S.; Indoor Air Quality
EML ID: 2317458

Approved by:

Technical Manager
Ariunaa Jalsrai

Dates of Analysis:
Direct microscopic exam (Qualitative): 12-17-2019

Service SOPs: Direct microscopic exam (Qualitative) (EM-MY-S-1039)
AIHA-LAP, LLC accredited service, Lab ID #103005

Eurofins EMLab P&K
3000 Lincoln Drive East, Suite A, Marlton, NJ 08053
(866) 871-1984 Fax (856) 334-1040 www.emlab.com

Client: Woodard & Curran
C/O: Will Henderson
Re: Fairfield - Ludlowe H.S.; Indoor Air Quality

Date of Sampling: 12-12-2019
Date of Receipt: 12-16-2019
Date of Report: 12-18-2019

DIRECT MICROSCOPIC EXAMINATION REPORT

Background Debris and/or Description	Miscellaneous Spores Present*	MOLD GROWTH: Molds seen with underlying mycelial and/or sporulating structures†	Other Comments††	General Impression
Lab ID-Version‡: 11028561-1, Analysis Date: 12/17/2019: Tape sample T-01: Trainers Room				
Light	None	4+ *Chaetomium* species (ascospores, ascomata, hyphae)	None	Mold growth
Lab ID-Version: 11028562-1, Analysis Date: 12/17/2019: Tape sample T-02: P.E. Office				
Light	None	3+ *Cladosporium* species (spores, hyphae, conidiophores)	A few *Penicillium/ Aspergillus* group spores detected.	Mold growth

* Indicative of normal conditions, i.e. seen on surfaces everywhere. Includes basidiospores (mushroom spores), myxomycetes, plant pathogens such as ascospores, rusts and smuts, and a mix of saprophytic genera with no particular spore type predominating. Distribution of spore types seen mirrors that usually seen outdoors.

† Quantities of molds seen growing are listed in the MOLD GROWTH column and are graded <1+ to 4+, with 4+ denoting the highest numbers.

†† Some comments may refer to the following: Most surfaces collect a mix of spores which are normally present in the outdoor environment. At times it is possible to note a skewing of the distribution of spore types, and also to note "marker" genera which may indicate indoor mold growth. Marker genera are those spore types which are present normally in very small numbers, but which multiply indoors when conditions are favorable for growth.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".
The limit of detection is < 1+ when mold growth is detected.

ATTACHMENT B: TABLE OF BIOAREOSOL SAMPLING RESULTS

Summary of Bioaerosol Sampling Results for Total Fungal Spores

Fairfield Ludlowe High School
785 Unquowa Road, Fairfield, Connecticut
December 12, 2019

Total Spores/m^3				
Spore Type	**Outdoor Range**	**Trainer's Room**	**Auto Shop**	**P.E. Office**
Alternaria	< 13 to 13	< 13	< 13 to 27	<13
Basidiospores	53 to 110	< 13	< 13 to 110	< 13 to 53
Chaetomium	< 13	< 13	< 13	13 to 67
Cladosporium	< 13 to 110	< 13	< 13 to 53	< 13
Epicoccum	< 13 to 13	< 13	< 13	< 13
Penicillium/Aspergillus	<13	< 13 to 53	< 13	< 13
Pithomyces	< 13	< 13	< 13	<13 to 13
Rusts	< 13	< 13 to 13	< 13	< 13
Smuts, Periconia, Myxomycetes	< 13 to 13	13 to 27	< 13	< 13
Background Debris	1+	1+ to 2+	1+	2+
Total Spores/m^3	150 to 160	40 to 67	53 to 130	67 to 80

ATTACHMENT C: EUROFINS EMLAB P&K ANALYTICAL LABORATORY RESULTS, BIOAEROSOL SAMPLES

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Report for:

Will Henderson
Woodard & Curran
980 Washington Street
Suite 325
Dedham, MA 02026

Regarding: Project: Fairfield - Ludlowe H.S.; Indoor Air Quality
EML ID: 2317458

Approved by:

Technical Manager
Ariunaa Jalsrai

Dates of Analysis:
Spore trap analysis: 12-17-2019

Service SOPs: Spore trap analysis (EM-MY-S-1038)
AIHA-LAP, LLC accredited service, Lab ID #103005

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. Due to the nature of the analyses performed, field blank correction of results is not applied. The results relate only to the samples as received. Sample air volume is supplied by the client.

Eurofins EMLab P&K ("the Company") shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

Eurofins EMLab P&K's LabServe® reporting system includes automated fail-safes to ensure that all AIHA-LAP, LLC quality requirements are met and notifications are added to reports when any quality steps remain pending.

Eurofins EMLab P&K
3000 Lincoln Drive East, Suite A, Marlton, NJ 08053
(866) 871-1984 Fax (856) 334-1040 www.emlab.com

Client: Woodard & Curran
C/O: Will Henderson
Re: Fairfield - Ludlowe H.S.; Indoor Air Quality

Date of Sampling: 12-12-2019
Date of Receipt: 12-16-2019
Date of Report: 12-18-2019

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	O-01: Outdoors			O-02: Outdoors		
Comments (see below)	None			None		
Lab ID-Version‡:	11028563-1			11028564-1		
Analysis Date:	12/17/2019			12/17/2019		
	raw ct.	% read	spores/m3	raw ct.	% read	spores/m3
Alternaria	1	100	13			
Ascospores						
Basidiospores	2	25	110	1	25	53
Chaetomium						
Cladosporium				2	25	110
Curvularia						
Epicoccum	1	100	13			
Fusarium						
Myrothecium						
Nigrospora						
Other colorless						
Penicillium/Aspergillus types†						
Pithomyces						
Rusts						
Smuts, Periconia, Myxomycetes	1	100	13			
Stachybotrys						
Stemphylium						
Torula						
Ulocladium						
Zygomycetes						
Background debris (1-4+)††	1+			1+		
Hyphal fragments/m3	< 13			< 13		
Pollen/m3	< 13			< 13		
Skin cells (1-4+)	< 1+			< 1+		
Sample volume (liters)	75			75		
§ TOTAL SPORES/m3			150			160

Comments:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium, Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
††Background debris indicates the amount of non-biological particulate matter present on the trace (dust in the air) and the resulting visibility for the analyst. It is rated from 1+ (low) to 4+ (high). Counts from areas with 4+ background debris should be regarded as minimal counts and may be higher than reported. It is important to account for samples volumes when evaluating dust levels.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

For more information regarding analytical sensitivity, please contact QA by calling the laboratory.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".
§ Total Spores/m3 has been rounded to two significant figures to reflect analytical precision.

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Re: Fairfield - Ludlowe H.S.; Indoor Air Quality

Date of Sampling: 12-12-2019
Date of Receipt: 12-16-2019
Date of Report: 12-18-2019

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	I-01: Trainers Room			I-02: Auto Shop		
Comments (see below)	None			None		
Lab ID-Version‡:	11028565-1			11028566-1		
Analysis Date:	12/17/2019			12/17/2019		
	raw ct.	% read	spores/m3	raw ct.	% read	spores/m3
Alternaria						
Ascospores						
Basidiospores						
Chaetomium						
Cladosporium				1	25	53
Curvularia						
Epicoccum						
Fusarium						
Myrothecium						
Nigrospora						
Other colorless						
Penicillium/Aspergillus types†						
Pithomyces						
Rusts	1	100	13			
Smuts, Periconia, Myxomycetes	2	100	27			
Stachybotrys						
Stemphylium						
Torula						
Ulocladium						
Zygomycetes						
Background debris (1-4+)††	2+			1+		
Hyphal fragments/m3	13			< 13		
Pollen/m3	13			< 13		
Skin cells (1-4+)	2+			1+		
Sample volume (liters)	75			75		
§ TOTAL SPORES/m3			40			53

Comments:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
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Re: Fairfield - Ludlowe H.S.; Indoor Air Quality

Date of Sampling: 12-12-2019
Date of Receipt: 12-16-2019
Date of Report: 12-18-2019

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	I-03: P.E. office			I-04: Trainers Room		
Comments (see below)	None			None		
Lab ID-Version‡:	11028567-1			11028568-1		
Analysis Date:	12/17/2019			12/17/2019		
	raw ct.	% read	spores/m3	raw ct.	% read	spores/m3
Alternaria						
Ascospores						
Basidiospores						
Chaetomium	5	100	67			
Cladosporium						
Curvularia						
Epicoccum						
Fusarium						
Myrothecium						
Nigrospora						
Other colorless						
Penicillium/Aspergillus types†				1	25	53
Pithomyces	1	100	13			
Rusts						
Smuts, Periconia, Myxomycetes				1	100	13
Stachybotrys						
Stemphylium						
Torula						
Ulocladium						
Zygomycetes						
Background debris (1-4+)††	2+			1+		
Hyphal fragments/m3	< 13			< 13		
Pollen/m3	< 13			< 13		
Skin cells (1-4+)	1+			1+		
Sample volume (liters)	75			75		
§ TOTAL SPORES/m3			80			67

Comments:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
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Re: Fairfield - Ludlowe H.S.; Indoor Air Quality

Date of Sampling: 12-12-2019
Date of Receipt: 12-16-2019
Date of Report: 12-18-2019

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	I-05: P.E. office			I-06: Auto Shop		
Comments (see below)	None			None		
Lab ID-Version‡:	11028569-1			11028570-1		
Analysis Date:	12/17/2019			12/17/2019		
	raw ct.	% read	spores/m3	raw ct.	% read	spores/m3
Alternaria				2	100	27
Ascospores						
Basidiospores	1	25	53	2	25	110
Chaetomium	1	100	13			
Cladosporium						
Curvularia						
Epicoccum						
Fusarium						
Myrothecium						
Nigrospora						
Other colorless						
Penicillium/Aspergillus types†						
Pithomyces						
Rusts						
Smuts, Periconia, Myxomycetes						
Stachybotrys						
Stemphylium						
Torula						
Ulocladium						
Zygomycetes						
Background debris (1-4+)††	2+			< 1+		
Hyphal fragments/m3	< 13			< 13		
Pollen/m3	13			< 13		
Skin cells (1-4+)	1+			< 1+		
Sample volume (liters)	75			75		
§ TOTAL SPORES/m3			67			130

Comments:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium, Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
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Client: Woodard & Curran
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Re: Fairfield - Ludlowe H.S.; Indoor Air Quality

Date of Sampling: 12-12-2019
Date of Receipt: 12-16-2019
Date of Report: 12-18-2019

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	B-01: Field Blank		
Comments (see below)	None		
Lab ID-Version‡:	11028571-1		
Analysis Date:	12/17/2019		
	raw ct.	% read	spores/m3
Alternaria			
Ascospores			
Basidiospores			
Chaetomium			
Cladosporium			
Curvularia			
Epicoccum			
Fusarium			
Myrothecium			
Nigrospora			
Other colorless			
Penicillium/Aspergillus types†			
Pithomyces			
Rusts			
Smuts, Periconia, Myxomycetes			
Stachybotrys			
Stemphylium			
Torula			
Ulocladium			
Zygomycetes			
Background debris (1-4+)††	None		
Hyphal fragments/m3	N/A		
Pollen/m3	N/A		
Skin cells (1-4+)	None		
Sample volume (liters)	0		
§ TOTAL SPORES/m3			N/A

Comments:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
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§ Total Spores/m3 has been rounded to two significant figures to reflect analytical precision.