



November 20, 2017

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ECS Project No. 47:2199-A

Reference: Indoor Air Quality Monthly Testing Services, Corcoran Gallery of Art, 500 17th Street NW, Washington, DC – October 2017

Dear Mr. Janniello:

ECS Mid-Atlantic, LLC (ECS) is pleased to provide George Washington University (GWU) with the results of monthly Indoor Air Quality testing conducted in October 2017 at the above-referenced property.

Methodology

The testing parameters and acceptable limits were determined in collaboration with GWU. From the suitable methods available, ECS selected the following sample methods based on sampling feasibility, schedule, cost objectives, and prior history of performance in similar projects.

PROPOSED SAMPLE METHODS

Testing Parameter	Method	Analysis	Reporting Time	Sample Locations	Acceptable Limit
Carbon Monoxide	Direct Read Instrument	Electrochemical sensor	Immediate	Target Indoors, Outdoors	9 parts per million (ppm)
Carbon Dioxide	Direct Read Instrument	Non-Dispersive Infrared Detector	Immediate	Target Indoors, Outdoors	1,000 ppm
Formaldehyde	Assay 571 passive badge	NIOSH 2016, high performance liquid chromatography	24 Hours	Target Indoors, Blank	0.027 ppm
Volatile Organic Compound Scan	Assay 521 passive badge	OSHA 7, Gas Chromatography	24 Hours	Target Indoors, Blank	Reference specific parameters tested*

Testing Parameter	Method	Analysis	Reporting Time	Sample Locations	Acceptable Limit
Mold	Non-viable Spore Trap Sampler	Optical Microscopy	24 Hours	Target Indoors, Outdoors	Compare to Outdoors
Respirable Dust	Indoor Air Sampler	NIOSH 0600	24 Hours	Target Indoors	0.150 mg/m ³ (EPA NAAQS PM 10)
Silica Dust	Indoor Air Sampler	NIOSH 7500	24 Hours	Target Indoors	0.025 mg/m ³ (OSHA Action Level)

*CARB RELs = California Air Resources Board Recommended Exposure Limit, acute or 8-hour

ECS collected air samples for fungal spore count analysis. For air sample collection, a high volume sampling pump and air cassettes were utilized in sampling for airborne fungal spores, hyphal fragments, insect fragments, and pollen. Analytical background levels on the slide of skin fragments, fibers, and other debris are also reported. Samples were collected with an air flow of 15 liters/minute verified by a pre-calibrated rotameter for 5 minutes.

Samples collected were shipped to Scientific Analytical institute, Inc. (SAI) located in Greensboro, North Carolina for analysis. SAI is an AIHA (American Industrial Hygiene Association) EMLAP (Environmental Microbiology Laboratory Accreditation Program) accredited laboratory. The samples were analyzed for total spore concentrations in accordance to the laboratory's quantification methods. The analytical results and chain of custody are attached in the Appendix of the report.

Formaldehyde and Volatile Organic Compound (VOC) sampling was conducted using passive indoor air quality samplers. Formaldehyde samples were analyzed by High Performance Liquid Chromatography using NIOSH Method 2016 by Assay Technology in Boardman, Ohio, an independent AIHA Accredited Laboratory. The VOC samples were analyzed by Gas Chromatograph in general accordance with OSHA Method 7 by Assay Technology. The VOC scan includes a panel of 25 common solvents, including: Acetone, Benzene, 1-Butanol, Butyl Acetate, Chloroform, Cyclohexanone, Ethyl Acetate, Ethyl Alcohol, Ethylbenzene, Heptane, Hexane, Isopropyl Alcohol, Methyl Ethyl Ketone, Methyl Isobutyl Ketone, Methyl Methacrylate, Methylene Chloride, Naphthalene, Perchloroethylene, 4-Phenyl Cyclohexene, Styrene, Tetrahydrofuran, Toluene, 1,1,1-Trichloroethane, Trichloroethylene, and m-, o-, and p-Xylenes.

The Respirable Dust and Crystalline Silica samples were collected using indoor air sampling pumps fitted with pre-weighed poly-vinyl chloride filters. Respirable dust was determined by gravimetric analysis by NIOSH Method 600 by SAI in Greensboro, North Carolina, an independent AIHA Accredited Laboratory. Crystalline silica concentrations was measured by X-Ray diffraction analysis using NIOSH Method 7500.

Environmental conditions, including temperature and relative humidity (RH), were recorded using a Fluke brand meter. The purpose of these measurements was to evaluate if interior temperature and RH were sufficient to support mold growth and also to measure general indoor comfort parameters related to temperature/relative humidity. The relative humidity is the ratio of the amount of moisture contained in the air to the maximum amount of moisture the air can contain at a specific temperature. Additionally, a calibrated Air Quality Meter was used to collect measurements of carbon dioxide and carbon monoxide as general indicators of overall IAQ. Sample locations were identified by GWU representatives as areas of interest. Chemical and biological sampling was performed in occupied areas of the facility. Biological samples were also collected outdoors for comparison purposes. As required by the sample method(s), blank samples were also submitted with each set of chemical samples.

Results

Mold

Fungal spore-trap air samples were collected from the eight locations within the subject building identified by GWU representatives as areas of interest. It should be noted that the auditorium sample (Sample #8) was collected from the area of the auditorium behind the stage. Two representative exterior samples were collected for comparison. The appended table summarizes the results of sample analysis reported in spore counts per cubic meter of air.

The analytical results of the eight samples indicate that the total concentrations of airborne fungal spores detected were less than total spore concentrations reported on the exterior samples. With the exception of *Nigrospora* spores detected in the sub-basement wood shop (Sample #1) and the central portion of the second floor main atrium (Sample #8), the fungal genera identified were generally comparable with outdoor genera detected. *Nigrospora* spores were detected in the sub-basement and main atrium at a concentration of 78 spores per cubic meter (s/m^3) and 235 s/m^3 respectively. The detected concentrations were relatively low and probably indicate a normal variation between indoor and outdoor spore counts.

There are currently no accepted regulatory standards or guidelines with respect to acceptable fungal levels inside buildings. It is important to note however that spore trap measurements can fluctuate rapidly and the readings reported should not be used as a definitive indication that mold and or health hazards related to mold are present or absent.

Carbon Monoxide and Carbon Dioxide

Carbon monoxide and carbon dioxide were measured onsite utilizing a calibrated Air Quality meter. No readings exceeded the US EPA NAAQS or limits recommended in the

Occupational Safety and Health Administration (OSHA) Technical manual for carbon dioxide. The appended table summarizes the results

Formaldehyde

No formaldehyde levels above the laboratory detection limit or the 27 parts per billion (ppb) reference criteria (reference US Green Building Council – LEED Standard) were found.

Volatile Organic Compounds

Twenty-three (23) of the twenty five (25) volatile organic compounds (VOCs) analyzed for were not detected in any of the VOC samples collected. The remaining two VOCs are discussed below.

Isopropyl Alcohol was detected in one location, Sample Location 4 – B130 Screen Printing Studio, at $76.2 \mu/m^3$ (31 ppm). However, the level did not exceed the California OEHHA Acute REL for Isopropyl Alcohol of $3,200 \mu/m^3$.

ECS also notes that it is common to have some level of VOCs in building air produced or related to normal activities within the building including VOCs produced by printers, copiers, off gassing of building finishes, cleaning agents etc. The levels detected in this study were not deemed a concern.

Respirable Dust and Respirable Silica

Six of the eight respirable dust levels were below the laboratory detection limit, and seven of the respirable dust levels were below the $0.15 \text{ mg}/m^3$ ambient exposure limit (reference EPA NAAQS). One sample, collected from Sub-basement Wood Shop (Sample #1), was found to have a respirable dust level of $0.17 \text{ mg}/m^3$ which is above the EPA NAAQS ambient exposure limit.

Seven of the eight respirable silica samples collected were below the laboratory detection. However, one sample, Sample Location 1 – Sub-Basement Wood Shop, was found to contain a detectable level of respirable silica level of $28.0 \mu/m^3$ which is above the $25 \mu g/m^3$ Action Level under OSHA.

Conclusions

Based on the results of the indoor air quality sampling conducted in October 2017, no indoor air quality concerns were identified for the parameters tested for with the exception of respirable dust and silica detected in the subbasement wood shop.

Based on these findings for respirable dust and silica, it appears that construction dust is being generated and impacting air quality in the occupied areas of the building. Due to the

fact that the silica dust levels were so high, ECS recommends sharing this data immediately with the general contractor. It is recommended that the contractor implement additional control measures to reduce construction dust or contain it to work areas. Since the level of silica was found to be above the OSHA action level, OSHA regulations for silica, which are now in effect under 29 CFR 1926.1153, would also potentially be triggered. Contractors performing construction activities which may produce silica dust/exposure are required to implement specific control measures and perform exposure monitoring to verify that exposure levels are below OSHA prescribed action levels. ECS recommends follow-up with the general contractor as soon as reasonably possible regarding compliance with the new OSHA regulations on silica.

Respectfully,

ECS MID-ATLANTIC, LLC


Brian Wasserstein
Environmental Project Manager


Christopher Chapman
Director of Industrial Hygiene

Attachments: Results Tables
Laboratory Results
Limitations