

# Limited Indoor Air Quality Assessment Report

Irving R. Newhouse Building  
215 Sid Snyder Avenue SW  
Olympia, WA 98504

Prepared for:  
Washington State Department of Enterprise Services

November 7, 2019  
PBS Project No. 40535.427



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Bulk Sampling Chain-of-Custody Documentation

## **1 INTRODUCTION**

In October 2019, PBS Engineering and Environmental Inc. (PBS) conducted a limited indoor air quality (IAQ) assessment of portions of the Irving R. Newhouse Building located at 16101 215 Sid Snyder Avenue SW, Olympia, Washington. Following is a description of the project background, the general building construction, and project limitations.

### **1.1 Project Background**

According to the Washington State Department of Enterprise Services (DES), concerns relating to potentially adverse health impacts were reported by employees working on the basement level of the Irving R. Newhouse Building. DES requested that PBS conduct a limited investigation of the basement level of the Newhouse Building to include air quality/ventilation monitoring (carbon monoxide, carbon dioxide, temperature, and relative humidity), non-viable airborne particulate sampling, and non-viable bulk sampling of building materials suspected to be fostering fungal growth.

The airborne particulate testing was completed while the building was occupied. Air quality monitoring for carbon monoxide, carbon dioxide, temperature, and relative humidity was conducted during both occupied and unoccupied hours for a continuous period of approximately two days.

### **1.2 Building Description**

The Irving R. Newhouse Building is a three-story masonry and concrete building. This investigation was limited to the basement level. Interior floor finishes in the project area generally includes carpet, with concrete, sheet goods, and ceramic tile in limited areas. Walls are composed of concrete with a plaster finish and furred gypsum wallboard in select areas.

### **1.3 Project Limitations**

This study was limited to the tests and locations as indicated to determine the absence or presence of certain contaminants. The site may have other concerns that were not characterized by this study. Further study may be warranted. It is important to understand that statistically valid data come only from the collection of numerous samples in the study areas. The findings and conclusions of this investigation are not scientific certainties, but rather probabilities based on professional judgement concerning the significance of the data gathered during the course of this investigation. PBS is not able to represent conditions on the site beyond those conditions detected or observed at the time of the investigation.

The spectrum of potential sources affecting indoor air quality is broad and sensitivity of individuals to these sources can vary significantly. This investigation was limited in scope and intended to screen for potential pollutants and/or sources that may degrade the quality of the indoor air.

## **2 DISCUSSION OF FINDINGS**

PBS conducted field observation and testing activities at the Irving R. Newhouse Building on October 14, 2019. Interior features and building conditions were evaluated during the site visit. The following sections describe our testing activities.

### **2.1 Ventilation Monitoring**

The most common indoor air quality complaints are typically associated with the building ventilation system, which controls heating, cooling, contaminant removal, and the intake of fresh air. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) has established standards and guidelines to assist the industry and public by offering a uniform method of testing, suggesting safe practices in the design and installation of equipment, providing uniform definitions of equipment and practices, and providing

additional information that may serve to guide the industry. These industry standards and guidelines are voluntary and are not mandatory. They do, however, present the current indoor air quality state-of-the-art practices and are used to help evaluate HVAC systems.

PBS conducted ventilation monitoring within the area of concern for carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), temperature, and relative humidity (RH). Testing of these four parameters can reveal potential causes of indoor environmental quality concerns which are often related to the building’s HVAC system. Monitoring was performed utilizing two Fluke 975 AirMeters, data-logging instruments that measure and record four separate ventilation parameters. The instrument was set to collect data points on the basement level, Rooms B-4 and B-8, every 10 minutes during the monitoring period, which ranged from 9:56 am on October 14, 2019 to 3:40 pm on October 16, 2019.

Graphical representations of the data are provided in Appendix A.

### 2.1.1 Carbon Dioxide

Carbon dioxide (CO<sub>2</sub>) is a colorless, odorless gas that is one of the primary by-products of combustion and respiration. Although CO<sub>2</sub> is not considered toxic, elevated levels can cause drowsiness, headaches, irritability, and a general feeling of stuffiness. The Occupational Safety and Health Administration’s (OSHA) permissible exposure limit (PEL) for CO<sub>2</sub>, based on a time-weighted average (TWA), is 5,000 ppm (parts per million). This level is typically used in industrial and commercial settings for worker exposures.

The current version of ASHRAE Standard 62.1-2013, *Ventilation for Acceptable Air Quality*, does not provide a recommended upper limit for CO<sub>2</sub> concentrations. However, previous versions of the standard have recommended that CO<sub>2</sub> concentrations be maintained below the outdoor air concentration plus 700 ppm. The number of comfort-related complaints tends to increase when carbon dioxide reaches this level. Elevated carbon dioxide can also be an indicator of other potential issues.

Often in diagnosing the ventilation effectiveness of an HVAC system, measured indoor CO<sub>2</sub> levels are compared to measured outdoor levels. If indoor levels of CO<sub>2</sub> are significantly higher than outdoor levels, a deficiency is likely in the HVAC system or the space is not being used as designed. The monitoring results are shown in the table below:

**Table 1. Results for Carbon Dioxide Monitoring (Occupied Hours)**

Location	Monitoring Results, Peak (ppm)	Within Screening Parameters (Y/N)	WAC Regulatory Limit (ppm)	*ASHRAE Recommended Threshold (ppm)
B-4	365	Y	5,000	1,104
B-8	568	Y	5,000	1,104

\*Estimated based on outdoor concentrations measured in conjunction with interior monitoring.

PBS collected an outdoor sample and the average outdoor CO<sub>2</sub> level during the sampling period was 404 ppm. Therefore, the ASHRAE-recommended CO<sub>2</sub> threshold for this investigation is (700+ outdoors) 1,104 ppm. The peak concentration of CO<sub>2</sub> did not exceed 1,104 ppm during the monitoring period. This is an indication that the ventilation system provides a sufficient quantity of fresh outside air to the areas tested.

- Based on these values, PBS does not consider CO<sub>2</sub> to be a concern.

### 2.1.2 Carbon Monoxide

Carbon monoxide (CO) can be introduced into a building by means of improperly vented furnaces, boilers, or gas heaters; automobile exhaust from attached garages, street level air intakes near parking lots and loading dock areas; and environmental tobacco smoke. At low concentrations, CO can cause fatigue and possibly chest pains. In high concentrations, CO can cause impaired vision, headaches, nausea, and flu-like symptoms, and can be fatal.

Threshold limit value (TLV) refers to concentrations of airborne substances representing conditions under which it is believed that nearly all people can be repeatedly or constantly exposed without adverse health effects. The American Conference of Governmental Industrial Hygienists (ACGIH) TLV for CO is 25 ppm. The TLV is a non-mandatory guideline. The OSHA permissible exposure limit (PEL) for CO is 50 ppm. This PEL is a mandatory limit regulated by OSHA and Washington Administrative Code (WAC). The ASHRAE-recommended threshold for CO in indoor environments is 9 ppm. The monitoring results are shown in the table below.

**Table 2. Results for Carbon Monoxide Monitoring (Occupied Hours)**

Location	Monitoring Result, Peak (ppm)	Within Screening Parameters (Y/N)	Regulatory Limit (ppm)	ASHRAE Recommended Threshold (ppm)
B-4	0	Y	50	9
B-8	1	Y	50	9

The peak concentration of CO did not exceed 9 ppm during the monitoring period.

- Based on these values, PBS does not consider CO to be a concern.

### 2.1.3 Temperature

The most common indoor air quality complaints are associated with poor temperature control. Maintaining a comfortable temperature for a variety of building occupants engaged in a variety of activities is the most difficult task facing an HVAC design engineer. People engaged in stationary activities, such as data processing, may consider 72 degrees Fahrenheit (°F) comfortable. However, if that person were engaged in a more strenuous activity, 72°F would be uncomfortably warm. ASHRAE recommends that indoor temperatures be maintained between 68°F to 75°F for most people engaged in sedentary activities and 64°F to 70°F for people engaged in strenuous activities. Daily activities conducted in the Newhouse Building would generally be considered sedentary in nature.

The table below shows the temperature range recorded during occupied business hours at the monitoring location.

**Table 3. Results for Temperature Monitoring (Occupied Hours)**

Location	Monitoring Results (°F)	Within Screening Parameters (Y/N)	Regulatory Limit	ASHRAE Recommended Comfort Range (°F)
B-4	68-76.1	N	None	68-75
B-8	68-73.4	Y	None	68-75

The temperatures recorded during occupied hours in Room B-4 were found to be within the higher end of the ASHRAE recommended comfort range. Temperatures were recorded at 76.1 °F from 12:40 PM to around 3:30 PM when the monitoring equipment was stopped. Aside from this event, the temperature remained within the ASHRAE Recommended Comfort Range during business hours.

- Based on these values PBS does not consider temperature to be a concern.

### 2.1.4 Relative Humidity

Relative humidity (RH) is another comfort parameter that will often correlate with incidents of poor indoor air quality. High RH can support the growth of pathogenic or allergenic microorganisms. Examples of these organisms include certain species of fungi and dust mites. RH is the concentration of water vapor in the air at a specific temperature compared to the concentration of water vapor that would represent saturation. Occupants in an area where RH is high will feel muggy and confined, whereas indoor air with very low RH will cause irritation and dryness to sinuses, nasal passages, and eyes.

RH inside a building can be managed by controlling temperature, introducing more outside air (if appropriate), and the use of humidifiers or dehumidifiers. Cooling indoor air decreases its ability to contain water in a vapor state and increases the RH. Conversely, heating air increases the amount of water vapor the air can contain and decreases the RH. ASHRAE recommends that RH in Western Washington be maintained between 30 and 60 percent for occupant comfort. RH levels greater than 70 percent have the potential to promote fungal growth.

In Western Washington, typical RH ranges from 30 to 60 percent. Depending on the weather, RH can vary from low teens to 100 percent.

The table below shows the range of the RH recorded at the monitoring location.

**Table 4. Results for Relative Humidity Monitoring (Occupied Hours)**

Location	Monitoring Result (% RH)	Within Screening Parameters (Y/N)	Regulatory Limit	ASHRAE Recommended Comfort Range (% RH)
B-4	36.1-47.5	Y	None	30-60
B-8	38.8-47.8	Y	None	30-60

RH results ranged from 36.1% to 47.8% during occupied hours monitored, within the lower end of the ASHRAE recommended comfort range.

- Based on these values PBS does not consider RH to be a concern.

### 2.2 Airborne Particulate

Human health can be affected by exposure to biological contaminants in the air (“bioaerosols”) and biological contaminants on building materials. Human comfort can also be affected by general (non-fungal) particulate in the air, which can be a source of irritation, discomfort, and potentially allergenic reactions. Non-viable (non-living) fungal particulate is generated from hyphal fragments (i.e. fragments of filamentous structures that make up the body of the fungi) and dead fungal spores. General particulate is generated from many sources such as epithelial cells from human skin, glass chips, soil, combustion products, corrosion products, insect parts, pollen, bacterial cells, cotton and wood fibers from clothing, and paper products.

PBS collected and analyzed airborne particulate samples from various locations on the basement level of the Newhouse building. These samples were analyzed for non-viable fungal and general (non-fungal) particulate to characterize the composition of airborne particulates in the building.

PBS collected samples of airborne particulate using the spore trap method. This method uses a high-volume vacuum pump fitted with an Allergenco-D™ cassette. The air pump draws a measured volume of air through the cassette, which impacts airborne particulates onto a specially treated slide mounted inside the cassette. Characteristic morphologies were observed by optical microscopy at a magnification of 600x. For each particle type observed, data was reported in particle counts per cubic meter (m<sup>3</sup>) or counts/m<sup>3</sup> of air. The high-volume air pump is calibrated before and after testing with a pre-calibrated rotameter. The rotameter is calibrated annually with a primary standard.

PBS collected nine indoor samples and one outdoor sample during this monitoring event, for a total of ten samples. The outdoor sample was taken as a control to which to compare the composition of indoor air particulates. Each sample was collected at a flow rate of 15 liters per minute for 10 minutes (150 liters per sample) from approximately four feet above floor level (i.e. in the breathing zone) while the building was occupied. The samples were labeled with unique identification numbers, packaged, and delivered with chain-of-custody documentation to Lab/Cor, Inc. of Seattle, Washington. Air samples follow preparation and analysis techniques outlined in Method 5 of the laboratory standard operating procedures (SOP). This method is based on guidelines from the Pan-American Aerobiology Association Standardized Protocol and ASTM Method 7391-09. See Appendix B for laboratory reports.

### 2.2.1 Airborne Non-Viable Fungal Particulate

The table below provides a list of sample locations and the corresponding summary test data.

**Table 5. Airborne Fungal Particulate Sampling Locations and Corresponding Lab Results**

Sample ID	Location Description	*Total Fungal Particulate/m <sup>3</sup>
40535.427-01	Room B-8	1,667
40535.427-02	Room B-7	5,666
40535.426-03	Room B-6	6,733
40535.426-04	Room B-5	3,133
40535.426-05	Room B-4	2,600
40535.426-06	Room B-3	1,600
40535.426-07	Room B-2	2,267
40535.426-08	Room B-1	966
40535.426-09	Room B-15	2,200
40535.426-10	Exterior, South	30,966

\*For each individual particle type observed, data was reported in particles per cubic meter of air.

Based on the analytical results, airborne fungal particulate concentrations in all locations tested were significantly lower in the indoor samples as compared to the outdoor control sample. Additionally, the predominant types of fungal particulate identified in the indoor samples were similar to those identified in the outdoor sample.

- Based on the data obtained PBS does not consider airborne non-viable fungal particulate to be a concern during the test period.

### 2.2.2 Airborne Non-Fungal Particulate

PBS conducted air sampling for general (non-fungal) particulate at the interior and exterior of the building. A discussion of the air sampling and interpretation of the results are included below.

In general, when total non-fungal airborne particulate is 50,000 counts/m<sup>3</sup> or greater, it is an indication of one or more of the following: high occupant density, inadequate housekeeping, and inadequate air filtration/circulation. Elevated counts can also be caused by vacuuming, sweeping, or some type of recent disturbance of a dusty surface, including wind blowing through an open window or door.

The following table provides a list of all sample locations and the corresponding summary test data:

**Table 6. Airborne Non-Fungal Particulate Sampling and Corresponding Lab Results**

Sample ID	Location Description	Total Non-Fungal (counts/m <sup>3</sup> )
40535.427-01	Room B-8	13,566
40535.427-02	Room B-7	19,266
40535.427-03	Room B-6	61,933
40535.427-04	Room B-5	12,401
40535.427-05	Room B-4	18,966
40535.427-06	Room B-3	34,568
40535.427-07	Room B-2	19,834
40535.427-08	Room B-1	8,166
40535.427-09	Room B-15	18,367
40535.427-10	Exterior, South	22,467

Laboratory analysis revealed levels greater than 50,000 counts/m<sup>3</sup> in one room tested, B-6. The composition of non-fungal particulate was mostly typical of office buildings. In addition to the counts shown above, an amorphous, violet-hued particulate was observed on all interior samples taken and the lab has been unable to identify it.

Laboratory analysis of airborne particulate samples identified an unknown violet-hued material present on all interior air samples collected to varying extents, from trace amounts to high loading on the sample media. This material was not identified on the sample collected from exterior air. Research with DES indicated that approximately 5 years ago a masonry waterproofing product was used on delaminating interior plaster prior to patching. According to DES this product was purple in color and applied at various locations.

No indication of a purple or violet hued material was noted on interior surfaces during the course of this investigation, and it is not known how such a material would become airborne or emanate from beneath patching plaster. While considered a low potential to adversely affect occupant comfort, additional investigation is required to determine if this product might be contributing to the conditions reported in the building.

- Based on the data obtained PBS considers airborne non-fungal particulate to be of low concern, but warranting additional evaluation.

### 3 BULK SAMPLING

As part of this investigation, PBS collected one bulk sample of building material that exhibited signs of possible fungal growth. One sample of plaster was collected from the west wall, behind the radiator, of Room B-4. The sample was labeled with a unique identification number, packaged, and delivered with chain-of-custody documentation to Lab/Cor, Inc. of Seattle, Washington. Bulk samples follow preparation and analysis techniques outlined in Method 6 of the laboratory standard operating procedures (SOP). This method is based on guidelines from the Pan-American Aerobiology Association Standardized Protocol and ASTM Method 7391-09. See Appendix C for laboratory reports.



- Laboratory analysis did not reveal any fungi.

#### 4 CONCLUSIONS AND RECOMMENDATIONS

The following is a summary of our conclusions and recommendations of issues that have the potential to impact indoor air quality and/or potentially cause adverse health effects for sensitive individuals. They are based on our site observations and testing at the subject site. These conclusions and recommendations are not presented in order of priority.

- Airborne particulate sampling revealed a possible situation of concern in room B-6, where elevated levels were found
  - PBS recommends a review of housekeeping procedures to ensure thoroughness and use of appropriate cleaning products, which may affect occupant comfort,
- Airborne particulate sampling revealed a violet-hued amorphous particulate observed on all indoor samples. According to the laboratory, this particulate is big enough to see with the unaided eye.
  - PBS recommends investigating the possible source of this particulate.
- Ventilation monitoring did not reveal any conditions of concern.
- Bulk sampling did not reveal any conditions of concern.
- Additional investigation is recommended should occupant concerns persist.

Please do not hesitate to contact us if you have any questions regarding this report or require additional information.

Report prepared by:

Report reviewed by:

Kaitlin Soukup  
Industrial Hygienist

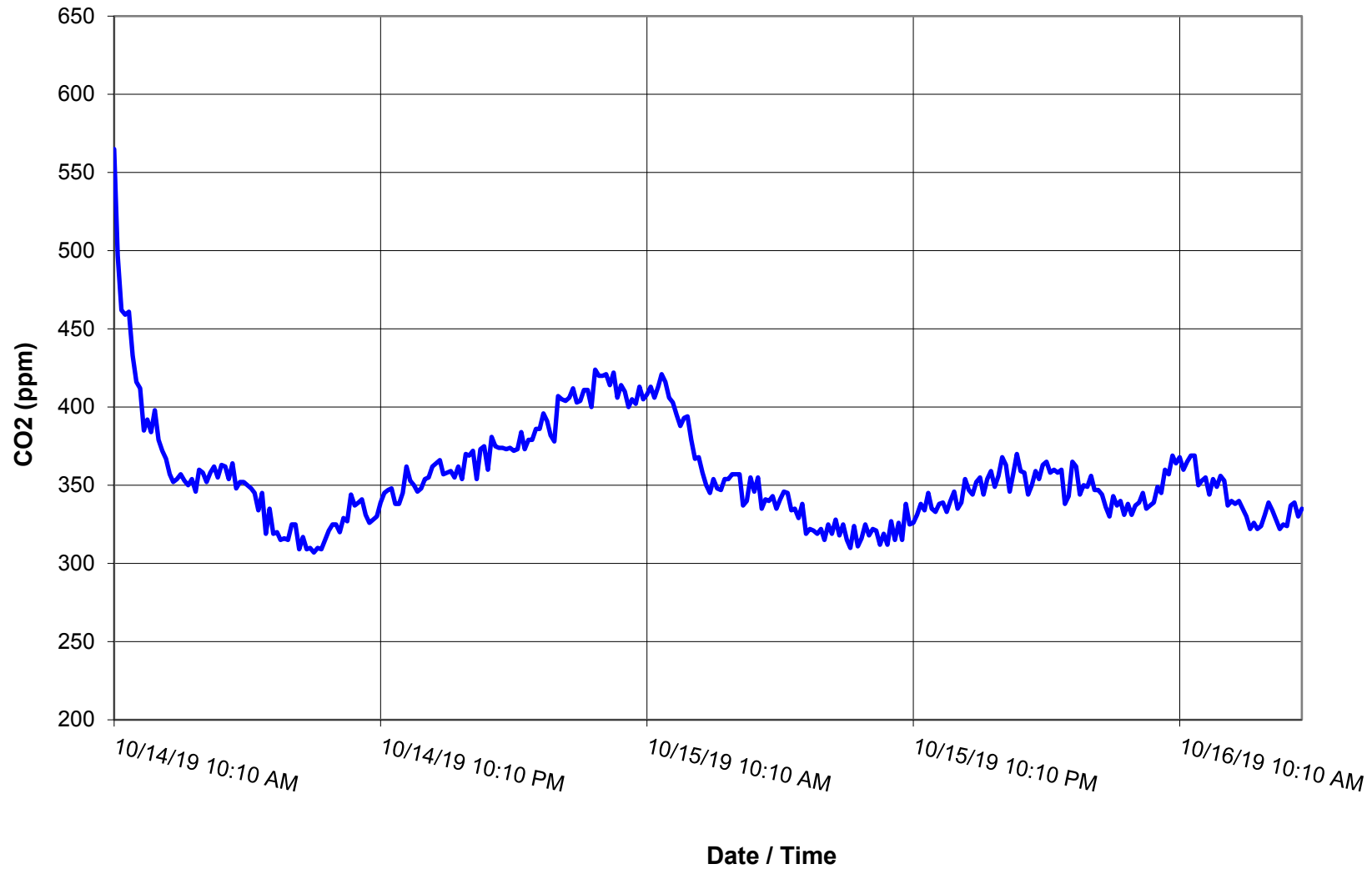
Tim Ogden  
Principal/Sr. Project Manager

## **APPENDIX A**

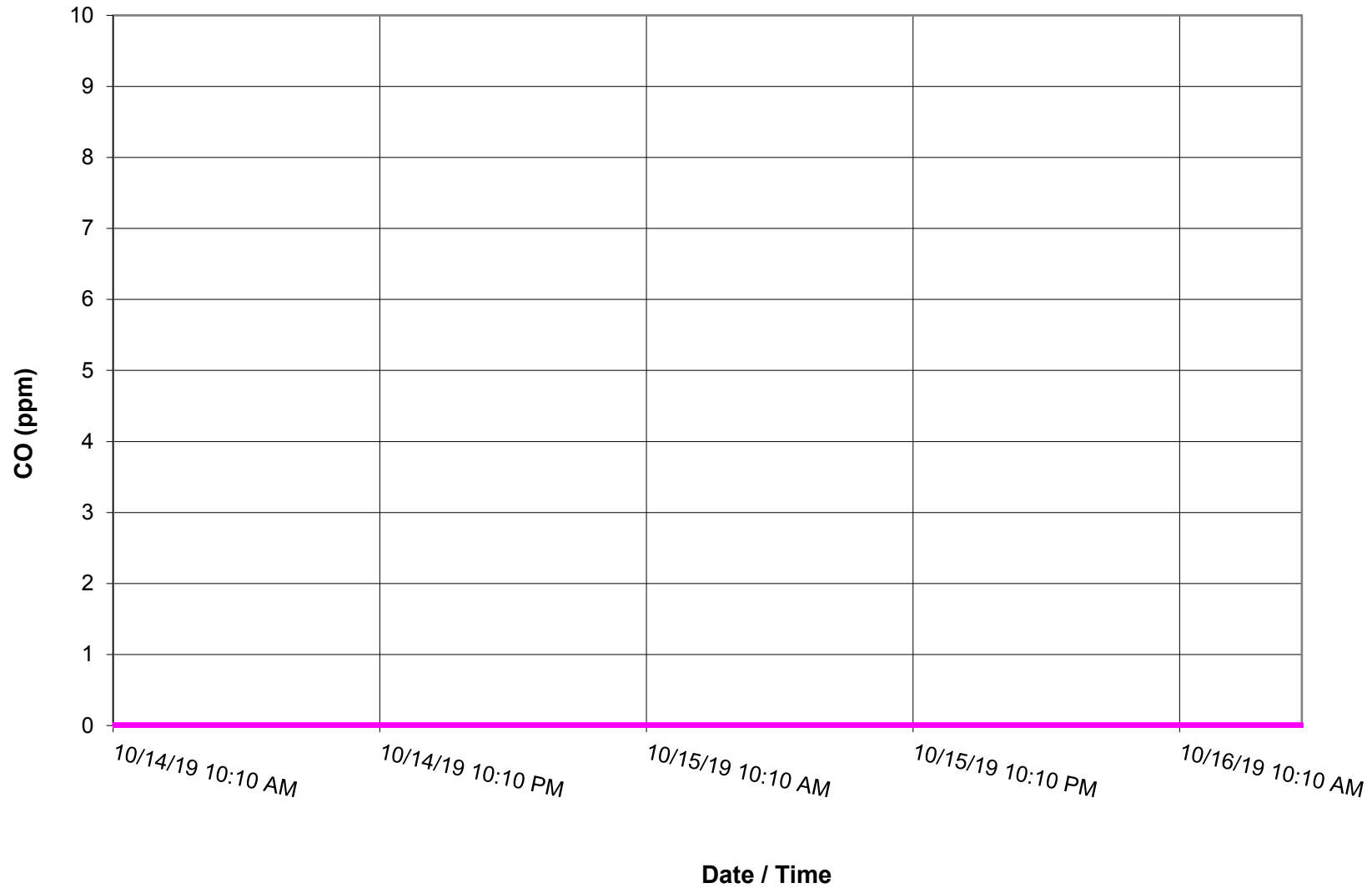
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### **Ventilation Monitoring Graphs**

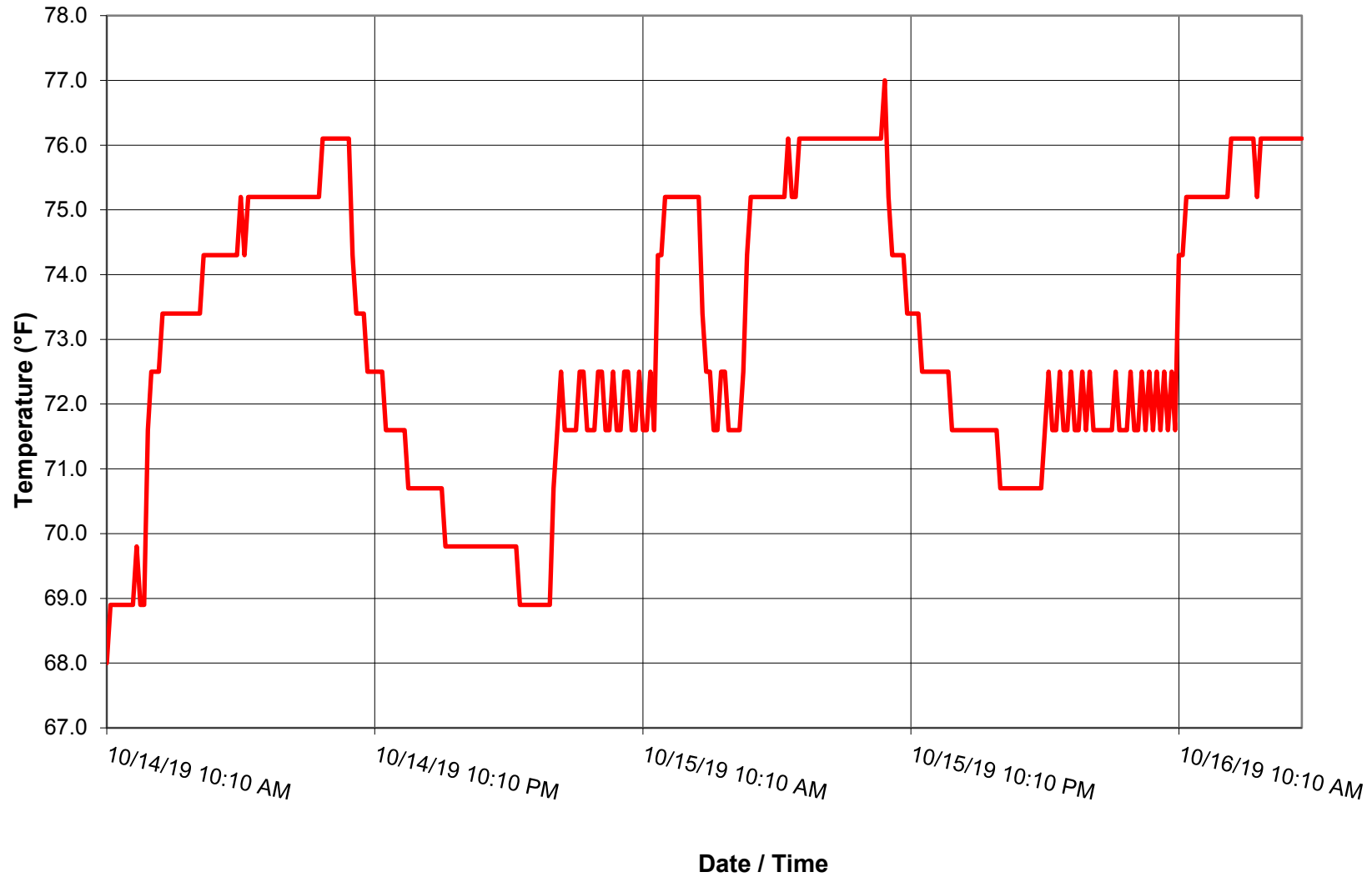
Room B-4 - 10/14/2019  
Carbon Dioxide



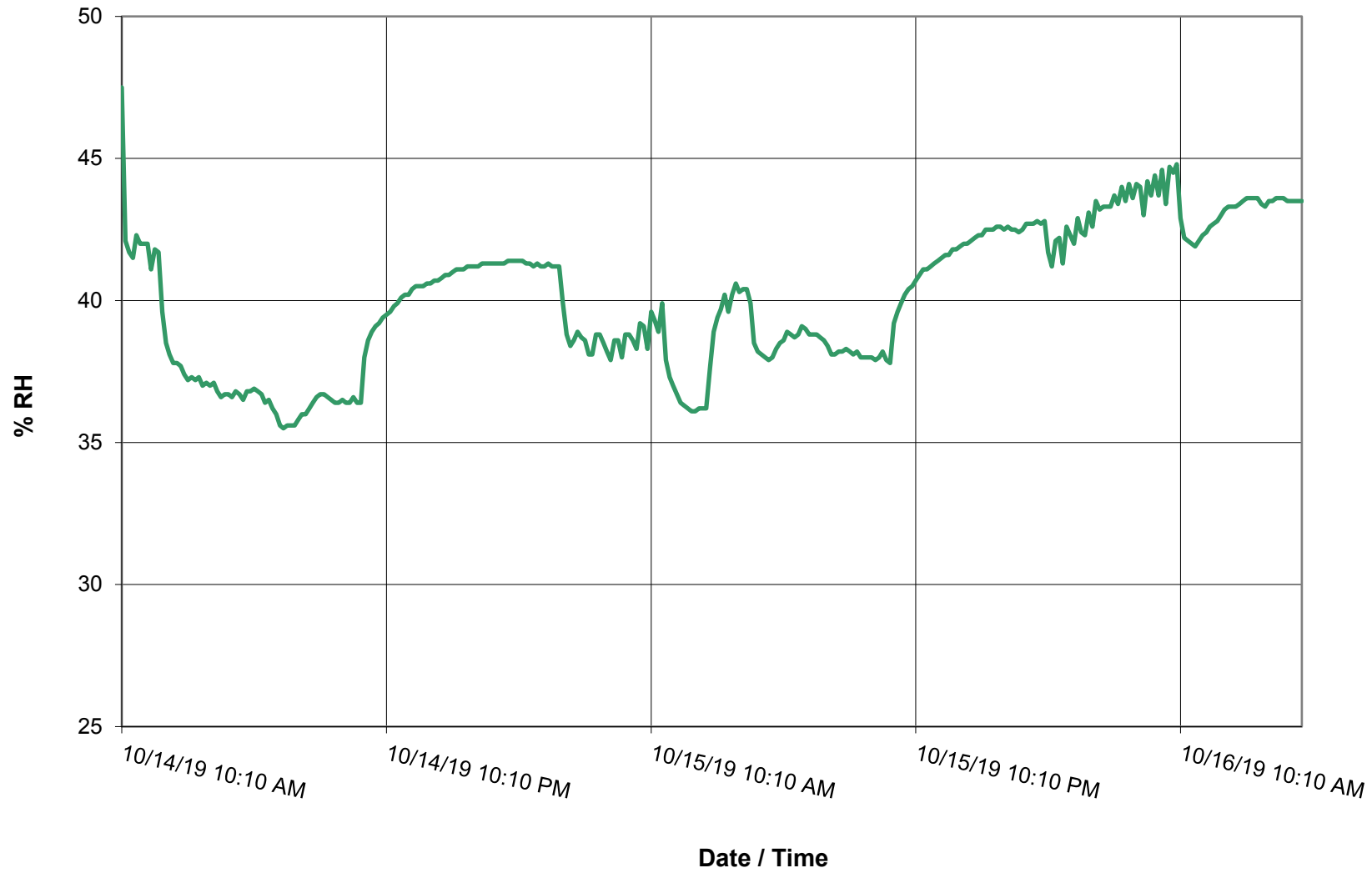
Room B-4 - 10/14/2019  
Carbon Monoxide



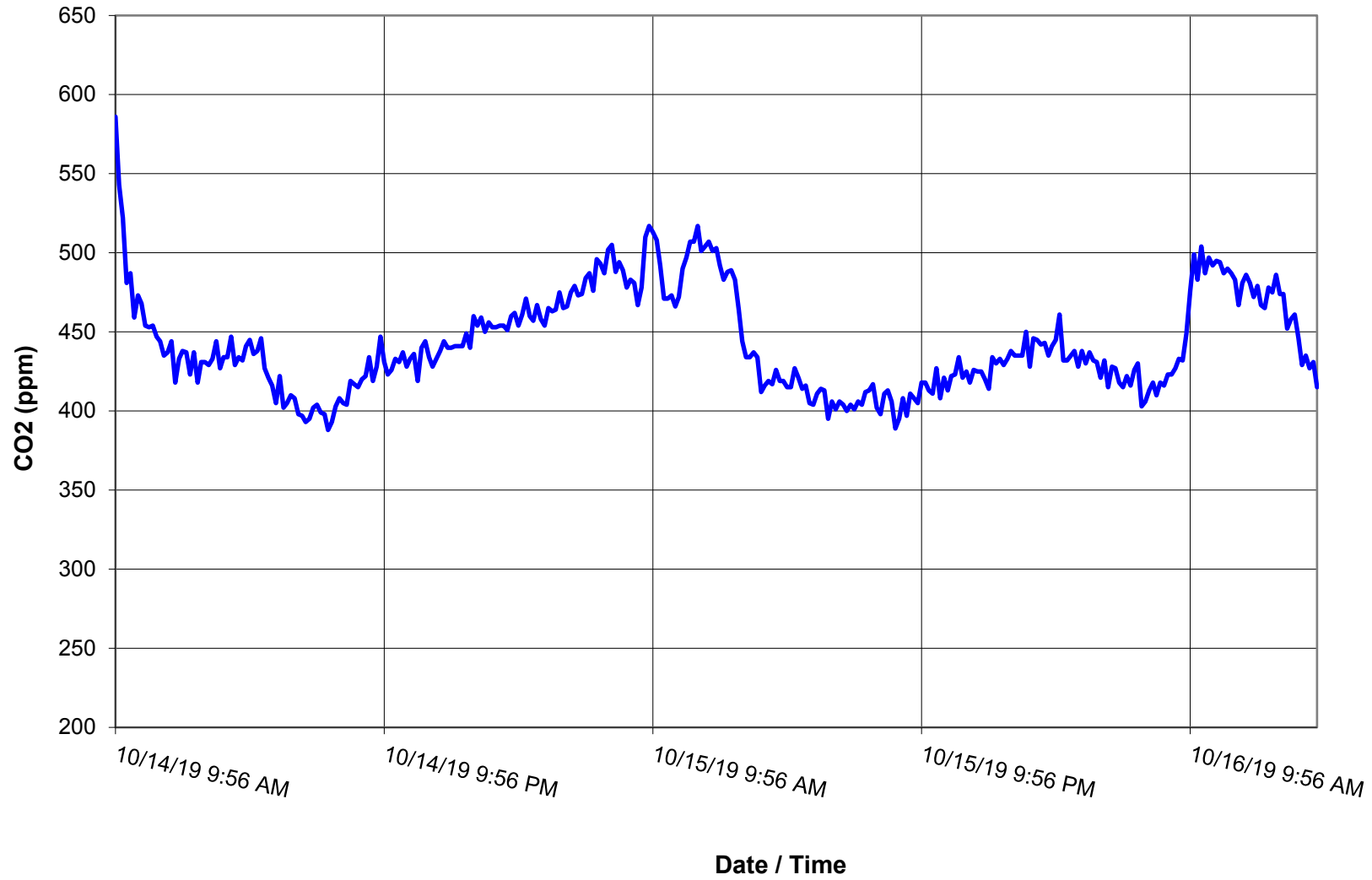
Room B-4 - 10/14/2019  
Temperature (°F)



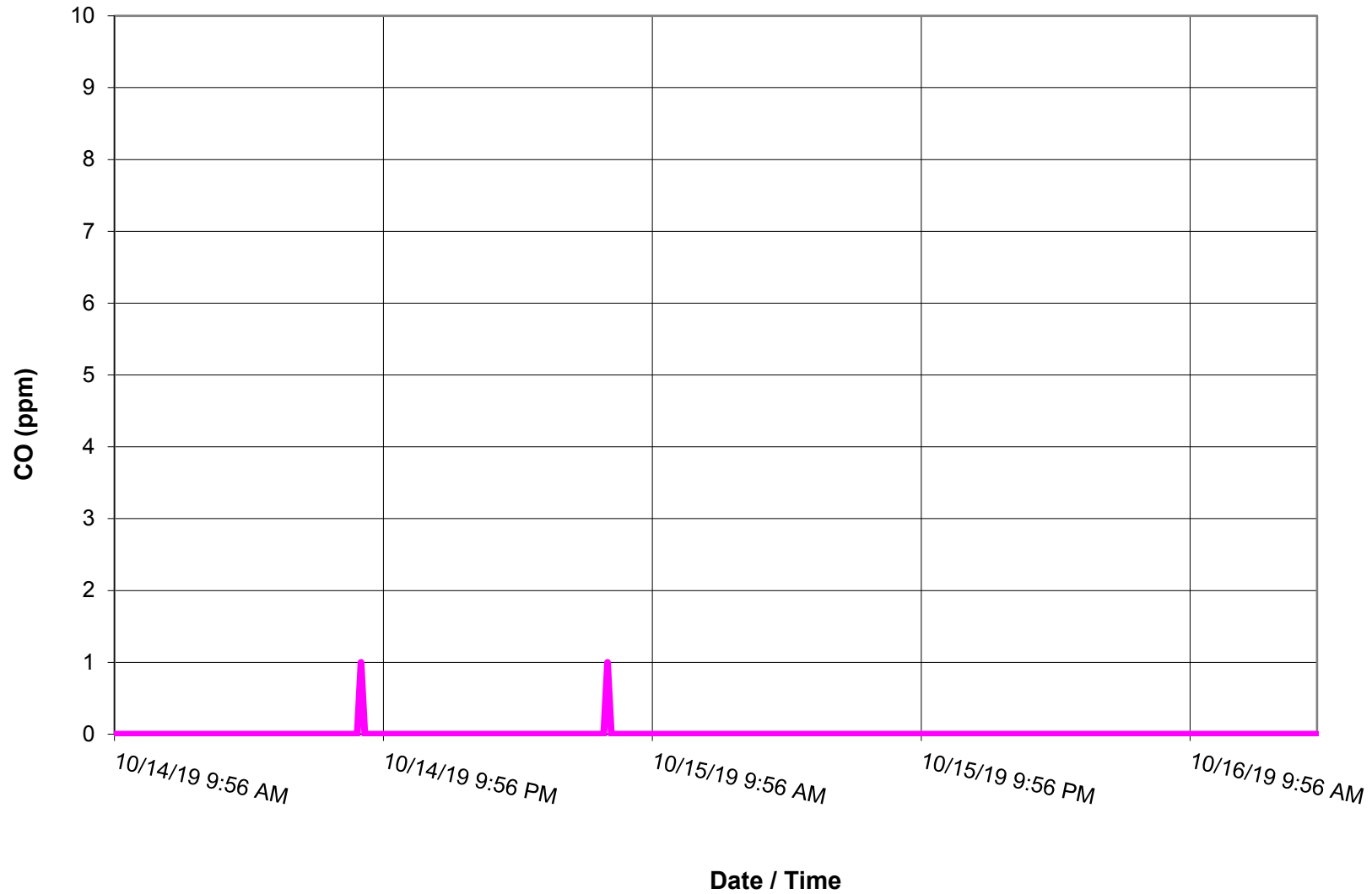
Room B-4 - 10/14/2019  
Relative Humidity



Room B-8 - 10/14/2019  
Carbon Dioxide



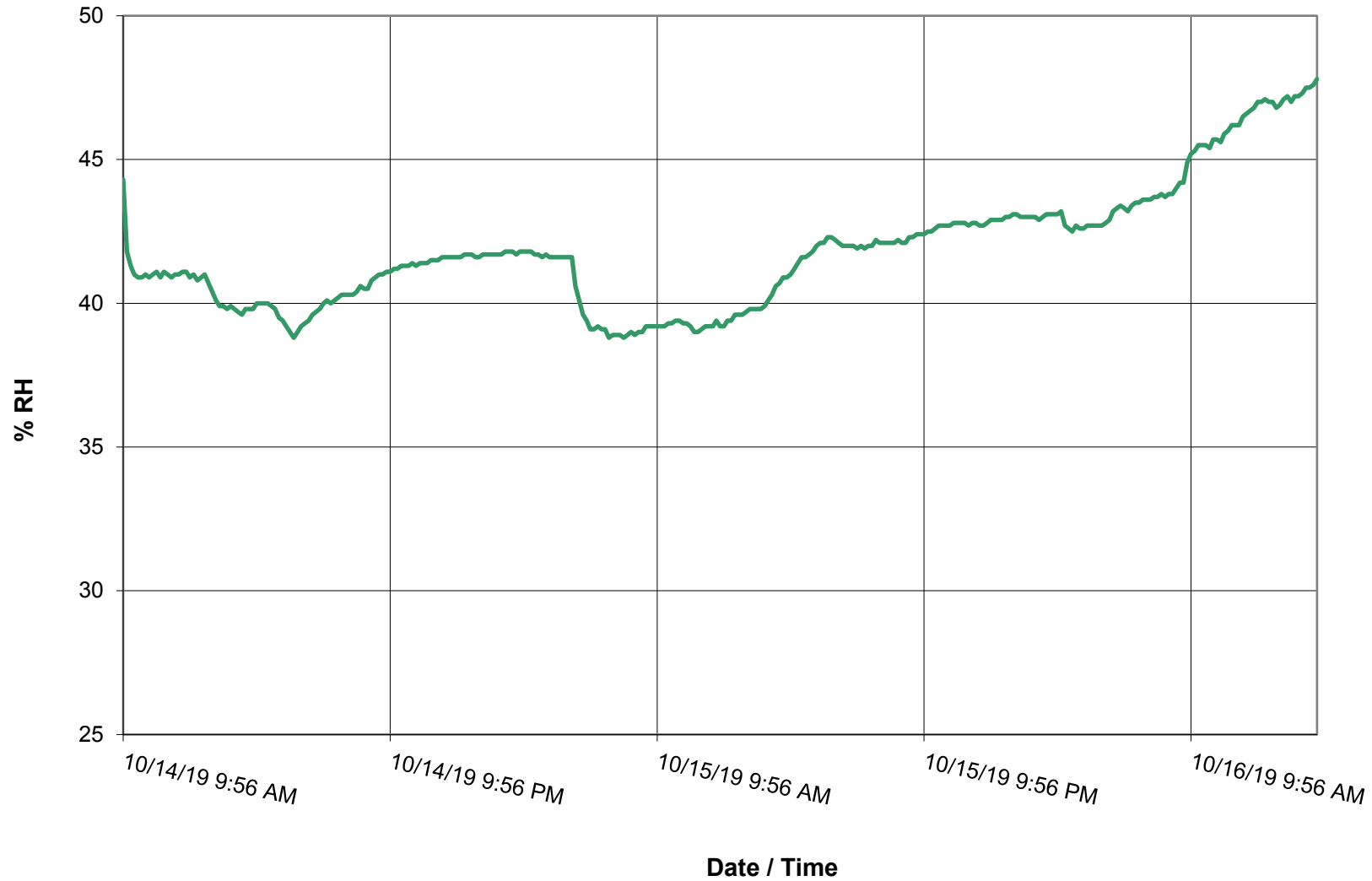
Room B-8 - 10/14/2019  
Carbon Monoxide







Room B-8 - 10/14/2019  
Relative Humidity

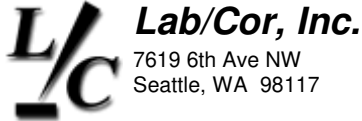


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## **APPENDIX B**

### **Airborne Particulate Sampling Information**

Airborne Particulate Laboratory Data Sheet  
Airborne Particulate Chain-of-Custody Documentation



**Lab/Cor, Inc.**  
7619 6th Ave NW  
Seattle, WA 98117

**Analysis Report Cover**  
**Final Report**

Phone: (206) 781-0155  
<http://www.labcor.net>

*A Professional Service Corporation in the Northwest*

**Job Number: 191051**      **SEA**  
**Client: PBS Engineering + Environmental**  
**Address: 214 E Galer Street**  
**Suite 300**  
**Seattle, WA 98102**  
**Project Name: Newhouse IAQ**  
**Project No.: 40535.427**  
**PO Number:**  
**Sub Project:**  
**Reference No.:**

**Report Number: 191051R03**  
**Report Date: 10/22/2019**

Unidentifiable Amorphous Particulate Observed on all samples. Violet hue, size 100 - 200 microns,  
**Report Note:** occasionally fibrous, amorphous sub-micron particulate visible within the larger violet particulate.

Enclosed please find results for samples submitted to our laboratory. A list of samples and analyses follows:

Lab/Cor Sample #	Client Sample # and Description	Analysis	Analysis Notes	Date Received:
191051 - S1	40535.427-01 - Rm B-8	NV, Air, Fungal & Part. ID	Unknown Particulate: Trace - Low Loading	10/14/2019
191051 - S2	40535.427-02 - Rm B-7	NV, Air, Fungal & Part. ID	Unknown Particulate: Trace - Low Loading	10/14/2019
191051 - S3	40535.427-03 - Rm B-6	NV, Air, Fungal & Part. ID	Unknown Particulate: Trace - Low Loading	10/14/2019
191051 - S4	40535.427-04 - Rm B-5	NV, Air, Fungal & Part. ID	Unknown Particulate: Trace - Low Loading	10/14/2019
191051 - S5	40535.427-05 - Rm B-4	NV, Air, Fungal & Part. ID	Unknown Particulate: Medium - High Loading	10/14/2019
191051 - S6	40535.427-06 - Rm B-3	NV, Air, Fungal & Part. ID	Unknown Particulate: Non Detect (ND) - Trace Loading	10/14/2019
191051 - S7	40535.427-07 - Rm B-2	NV, Air, Fungal & Part. ID	Unknown Particulate: Low - Medium Loading	10/14/2019
191051 - S8	40535.427-08 - Rm B-1	NV, Air, Fungal & Part. ID	Unknown Particulate: Medium Loading	10/14/2019
191051 - S9	40535.427-09 - Rm B-15	NV, Air, Fungal & Part. ID	Unknown Particulate: High Loading	10/14/2019
191051 - S10	40535.427-10 - Exterior, South	NV, Air, Fungal & Part. ID	Unknown Particulate: Non Detect (ND)	10/14/2019

**Job Number: 191051      SEA**  
**Client: PBS Engineering + Environmental**  
**Project Name: Newhouse IAQ**

**Report Number: 191051R03**  
**Report Date: 10/22/2019**

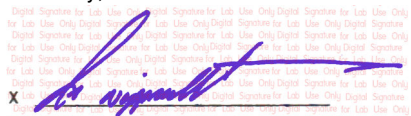
**Nonviable Air** Air samples follow preparation and analysis techniques outlined in Method 5 of the laboratory SOP; this method is based on guidelines from the Pan-American Aerobiology Association Standardized Protocol and ASTM Method 7391-09. Samples were collected using either an Air-O-Cell, Cyclex-D, Allergenco-D, or M2 Multi-Mold nonviable air sampling cassette. Characteristic morphologies were observed by optical microscopy at a magnification of 600x. For each individual particle type observed, data was reported in particles per cubic meter of air (m3).

Due to various factors that influence uncertainty (media type, particle loading, staining, instrumentation and other variable aspects of the method), only the first two figures reported are considered to be significant. The area analyzed on each sample is 20%.

**Disclaimer** The results reported relate only to the samples tested or analyzed; the laboratory is not responsible for data collected by personnel who are not affiliated with the laboratory. Results reported in both structures/cm3 and structures/mm2 are dependent on the sample volume and area. These parameters are measured and recorded by non-laboratory personnel and are not covered by the laboratory's accreditation. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please call us. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with the analytical services.

Sincerely,



**Derk Wipprecht**  
**Laboratory Supervisor**

**Nonviable Air**

**Job Number:** 191051

**Client:** PBS Engineering + Environmental

**Project Name:** Newhouse IAQ

**Project No.:** 40535.427

**Reference No.:**

**Report Number:** 191051R03

**Date Received:** 10/14/2019

<b>Lab/Cor ID:</b>	<b>S1</b>	<b>S2</b>
<b>Sample No.:</b>	40535.427-01	40535.427-02
<b>Description:</b>	Rm B-8	Rm B-7
<b>Sample Measure:</b>	150 L	150 L
<b>Media Type:</b>	Fungal-AllergencoD	Fungal-AllergencoD
<b>Analyst - Analysis Date:</b>	DW - 10/21/2019	DW - 10/21/2019
<b>MRL:</b>	33	33
<b>Scope - Magnification:</b>	Olympus BHS - 600	Olympus BHS - 600
<b>Notes:</b>	Unknown Particulate: Trace - Low Loading	Unknown Particulate: Trace - Low Loading

<b>Fungal Identification</b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>
Ascospores, non-specified	12	60	400	32	160	1067
Aspergillus/ Penicillium-like				9	45	300
Basidiospores - like	38	190	1267	127	635	4233
Cladosporium				1	5	33
Ganoderma						
Myxo./Periconia/Smuts/Rusts						
Pestalotiopsis/Pestalotia				1	5	33
<b>Summary Total:</b>	<b>50</b>	<b>250</b>	<b>1667</b>	<b>170</b>	<b>850</b>	<b>5666</b>

<b>Nonfungal Identification</b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>
Amorphous Particulates	132	660	4400	220	1100	7333
Cotton Fibers	6	30	200	13	65	433
Crystalline Particulates	187	935	6233	253	1265	8433
Dander	31	155	1033	32	160	1067
Hair						
Manufactured Fibers						
Rust Fragments						
Soot	51	255	1700	56	280	1867
Starch				4	20	133
<b>Summary Total:</b>	<b>407</b>	<b>2035</b>	<b>13566</b>	<b>578</b>	<b>2890</b>	<b>19266</b>

\* - Raw Counts per 20% of Sample

\*\* - Total Count per Sample

**Nonviable Air**

**Job Number:** 191051

**Client:** PBS Engineering + Environmental

**Project Name:** Newhouse IAQ

**Project No.:** 40535.427

**Reference No.:**

**Report Number:** 191051R03

**Date Received:** 10/14/2019

<b>Lab/Cor ID:</b>	<b>S3</b>	<b>S4</b>
<b>Sample No.:</b>	40535.427-03	40535.427-04
<b>Description:</b>	Rm B-6	Rm B-5
<b>Sample Measure:</b>	150 L	150 L
<b>Media Type:</b>	Fungal-AllergencoD	Fungal-AllergencoD
<b>Analyst - Analysis Date:</b>	DW - 10/21/2019	DW - 10/21/2019
<b>MRL:</b>	33	33
<b>Scope - Magnification:</b>	Olympus BHS - 600	Olympus BHS - 600
<b>Notes:</b>	Unknown Particulate: Trace - Low Loading	Unknown Particulate: Trace - Low Loading

<b>Fungal Identification</b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>
Ascospores, non-specified	15	75	500	19	95	633
Aspergillus/ Penicillium-like	25	125	833	11	55	367
Basidiospores - like	158	790	5267	61	305	2033
Cladosporium	1	5	33			
Ganoderma	2	10	67	3	15	100
Myxo./Periconia/Smuts/Rusts	1	5	33			
Pestalotiopsis/Pestalotia						
<b>Summary Total:</b>	<b>202</b>	<b>1010</b>	<b>6733</b>	<b>94</b>	<b>470</b>	<b>3133</b>

<b>Nonfungal Identification</b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>
Amorphous Particulates	910	4550	30333	132	660	4400
Cotton Fibers	29	145	967	3	15	100
Crystalline Particulates	671	3355	22367	165	825	5500
Dander	172	860	5733	30	150	1000
Hair	1	5	33			
Manufactured Fibers	1	5	33	2	10	67
Rust Fragments	3	15	100	2	10	67
Soot	71	355	2367	38	190	1267
Starch						
<b>Summary Total:</b>	<b>1858</b>	<b>9290</b>	<b>61933</b>	<b>372</b>	<b>1860</b>	<b>12401</b>

\* - Raw Counts per 20% of Sample

\*\* - Total Count per Sample

**Nonviable Air**

**Job Number:** 191051  
**Client:** PBS Engineering + Environmental  
**Project Name:** Newhouse IAQ  
**Project No.:** 40535.427  
**Reference No.:**

**Report Number:** 191051R03  
**Date Received:** 10/14/2019

<b>Lab/Cor ID:</b>	<b>S5</b>	<b>S6</b>
<b>Sample No.:</b>	40535.427-05	40535.427-06
<b>Description:</b>	Rm B-4	Rm B-3
<b>Sample Measure:</b>	150 L	150 L
<b>Media Type:</b>	Fungal-AllergencoD	Fungal-AllergencoD
<b>Analyst - Analysis Date:</b>	DW - 10/21/2019	DW - 10/21/2019
<b>MRL:</b>	33	33
<b>Scope - Magnification:</b>	Olympus BHS - 600	Olympus BHS - 600
<b>Notes:</b>	Unknown Particulate: Medium - High Loading	Unknown Particulate: Non Detect (ND) - Trace Loading

<b>Fungal Identification</b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>
Ascospores, non-specified	9	45	300	10	50	333
Aspergillus/ Penicillium-like	6	30	200	3	15	100
Basidiospores - like	63	315	2100	35	175	1167
Cladosporium						
Ganoderma						
Myxo./Periconia/Smuts/Rusts						
Pestalotiopsis/Pestalotia						
<b>Summary Total:</b>	<b>78</b>	<b>390</b>	<b>2600</b>	<b>48</b>	<b>240</b>	<b>1600</b>

<b>Nonfungal Identification</b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>
Amorphous Particulates	187	935	6233	506	2530	16867
Cotton Fibers	3	15	100			
Crystalline Particulates	253	1265	8433	440	2200	14667
Dander	89	445	2967	34	170	1133
Hair						
Manufactured Fibers	2	10	67	2	10	67
Rust Fragments	4	20	133	5	25	167
Soot	31	155	1033	47	235	1567
Starch				3	15	100
<b>Summary Total:</b>	<b>569</b>	<b>2845</b>	<b>18966</b>	<b>1037</b>	<b>5185</b>	<b>34568</b>

\* - Raw Counts per 20% of Sample  
 \*\* - Total Count per Sample



**Nonviable Air**

**Job Number:** 191051

**Client:** PBS Engineering + Environmental

**Project Name:** Newhouse IAQ

**Project No.:** 40535.427

**Reference No.:**

**Report Number:** 191051R03

**Date Received:** 10/14/2019

<b>Lab/Cor ID:</b>	<b>S7</b>	<b>S8</b>
<b>Sample No.:</b>	40535.427-07	40535.427-08
<b>Description:</b>	Rm B-2	Rm B-1
<b>Sample Measure:</b>	150 L	150 L
<b>Media Type:</b>	Fungal-AllergencoD	Fungal-AllergencoD
<b>Analyst - Analysis Date:</b>	DW - 10/21/2019	DW - 10/21/2019
<b>MRL:</b>	33	33
<b>Scope - Magnification:</b>	Olympus BHS - 600	Olympus BHS - 600
<b>Notes:</b>	Unknown Particulate: Low - Medium Loading	Unknown Particulate: Medium Loading

<b>Fungal Identification</b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>
Ascospores, non-specified	8	40	267	4	20	133
Aspergillus/ Penicillium-like				3	15	100
Basidiospores - like	60	300	2000	22	110	733
Cladosporium						
Ganoderma						
Myxo./Periconia/Smuts/Rusts						
Pestalotiopsis/Pestalotia						
<b>Summary Total:</b>	<b>68</b>	<b>340</b>	<b>2267</b>	<b>29</b>	<b>145</b>	<b>966</b>

<b>Nonfungal Identification</b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>
Amorphous Particulates	176	880	5867	106	530	3533
Cotton Fibers	32	160	1067	7	35	233
Crystalline Particulates	242	1210	8067	77	385	2567
Dander	91	455	3033	33	165	1100
Hair						
Manufactured Fibers	3	15	100			
Rust Fragments	2	10	67	3	15	100
Soot	49	245	1633	19	95	633
Starch						
<b>Summary Total:</b>	<b>595</b>	<b>2975</b>	<b>19834</b>	<b>245</b>	<b>1225</b>	<b>8166</b>

\* - Raw Counts per 20% of Sample

\*\* - Total Count per Sample

**Nonviable Air**

**Job Number:** 191051  
**Client:** PBS Engineering + Environmental  
**Project Name:** Newhouse IAQ  
**Project No.:** 40535.427  
**Reference No.:**

**Report Number:** 191051R03  
**Date Received:** 10/14/2019

<b>Lab/Cor ID:</b>	<b>S9</b>	<b>S10</b>
<b>Sample No.:</b>	40535.427-09	40535.427-10
<b>Description:</b>	Rm B-15	Exterior, South
<b>Sample Measure:</b>	150 L	150 L
<b>Media Type:</b>	Fungal-AllergencoD	Fungal-AllergencoD
<b>Analyst - Analysis Date:</b>	DW - 10/21/2019	DW - 10/21/2019
<b>MRL:</b>	33	33
<b>Scope - Magnification:</b>	Olympus BHS - 600	Olympus BHS - 600
<b>Notes:</b>	Unknown Particulate: High Loading	Unknown Particulate: Non Detect (ND)

<b>Fungal Identification</b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>
Ascospores, non-specified	6	30	200	154	770	5133
Aspergillus/ Penicillium-like	9	45	300	37	185	1233
Basidiospores - like	51	255	1700	726	3630	24200
Cladosporium						
Ganoderma				12	60	400
Myxo./Periconia/Smuts/Rusts						
Pestalotiopsis/Pestalotia						
<b>Summary Total:</b>	<b>66</b>	<b>330</b>	<b>2200</b>	<b>929</b>	<b>4645</b>	<b>30966</b>

<b>Nonfungal Identification</b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>	<b>Raw Count*</b>	<b>Total Count**</b>	<b>Total/m<sup>3</sup></b>
Amorphous Particulates	198	990	6600	231	1155	7700
Cotton Fibers	10	50	333	3	15	100
Crystalline Particulates	209	1045	6967	209	1045	6967
Dander	75	375	2500	3	15	100
Hair						
Manufactured Fibers	3	15	100			
Rust Fragments	3	15	100	8	40	267
Soot	50	250	1667	220	1100	7333
Starch	3	15	100			
<b>Summary Total:</b>	<b>551</b>	<b>2755</b>	<b>18367</b>	<b>674</b>	<b>3370</b>	<b>22467</b>

**Reviewed by:**

*[Handwritten Signature]*  
X Digital Signature for Lab Use Only

**Derk Wipprecht**  
**Laboratory Supervisor**

\* - Raw Counts per 20% of Sample  
\*\* - Total Count per Sample

191051

112

Fungal / Particulate Sample Chain of Custody Record

Turnaround Time:  
 6 hr RUSH\*  
 24 hours\*  
 48 hours  
 3 days  
 (NV Std)  
 X 5 days  
 Viable  
 (7-10 days)

Analysis Type:  
 Nonviable Options:  
 Fungal ID  
 Fungal & Particulate ID  
 Particulate ID  
 Quantitative Analysis  
 (Total Count)  
 Qualitative Analysis  
 (Relative Abundance)  
 Viable Options:  
 Complete Analysis  
 Genera Only Stachy Only

Client: PBS - Seattle  
 Address: 214 E. Galer St., Suite 300  
 City, State, Zip: Seattle, WA 98102  
 Contact: Tim Ogden  
 Phone: 206-233-9639 Fax:  
 Email: tim.ogden@pbsusa.com  
 Other Info: kaitin.soukup@pbsusa.com

Lab/Cor, Inc  
 7619 6th Ave NW  
 Seattle, WA 98117  
 Office (206) 781-0155  
 mail@labcor.net  
 www.labcor.net

Project Name: Newhouse IAQ Project Number: 40535 427 P.O. Number:

Sample #	Sample Description	Sample Information										Sampling Information				Total Volume / Area
		Sample Type		Media Type		Sample Date	Sample Time	Sample Flow Rate		Start	End	Avg				
		Air	Swab	Bulk	Dust			Tape	Other				On	Off		
40535-427-01	Rm B-8	X										10/14/19	15	15	15	150 L
-02	Rm B-7	X										09/09/16	15	15	15	150 L
-03	Rm B-6	X										09/09/16	15	15	15	150 L
-04	Rm B-5	X										09/09/16	15	15	15	150 L
-05	Rm B-4	X										10/01/11	15	15	15	150 L
-06	Rm B-3	X										10/03/13	15	15	15	150 L
-07	Rm B-2	X										10/13/23	15	15	15	150 L
-08	Rm B-1	X										10/15/25	15	15	15	150 L
-09	Rm B-15	X										10/25/35	15	15	15	150 L
-10	Exterior, South	X										10/22/02	15	15	15	150 L



By signing below you are agreeing to comply with Lab/Cor's Requests, Tenders and Contracts.

Relinquished by: Tim Ogden Date: 10/14/19 Time: 14:00 Relinquished by: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

Received by: Kaitin Soukup Date: 10/14/19 Time: 16:51 Received by: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

S:\Laboratory\OC\Master Documents\CURRENT\CHAINS\Fungal Particulate Chain of Custody Record Y16g.doc

\* Call ahead for TATs of 24hrs or less

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## **APPENDIX C**

### **Bulk Sampling Information**

Bulk Sampling Laboratory Data Sheet  
Bulk Sampling Chain-of-Custody Documentation

**Job Number: 191051      SEA**  
**Client: PBS Engineering + Environmental**  
**Address: 214 E Galer Street**  
**Suite 300**  
**Seattle, WA 98102**  
**Project Name: Newhouse IAQ**  
**Project No.: 40535.427**  
**PO Number:**  
**Sub Project:**  
**Reference No.:**

**Report Number: 191051R02**  
**Report Date: 10/21/2019**

Enclosed please find results for samples submitted to our laboratory. A list of samples and analyses follows:

Lab/Cor Sample #	Client Sample # and Description	Analysis	Analysis Notes	Date Received:
191051 - S11	40535.427-B1 - Plaster, W. Wall, Rm B-4	NV, Bulk, Fungal ID Qual.	No Fungi Observed	10/14/2019

**Nonviable Bulk** Bulk samples follow preparation and analysis techniques outlined in Method 6 of the laboratory SOP; this method is based on guidelines from the Pan-American Aerobiology Association Standardized Protocol and ASTM Method 7391-09. Sub-samples were collected from areas of known or suspected microbial growth on the submitted sample. If appropriate, each layer was separated and sampled to determine whether fungal colonization was present.

Characteristic morphologies were observed by optical microscopy at a magnification of 600x. Bulk samples that were analyzed qualitatively were reported in Relative Abundance of fungal and particulate types; High, Moderate, Low, and Trace. The Minimum Reporting Limit for qualitative samples is Trace (1-10 count in sample portion examined). Bulk samples that were analyzed quantitatively were reported as the total concentration for each fungal and particulate type.

**Disclaimer** The results reported relate only to the samples tested or analyzed; the laboratory is not responsible for data collected by personnel who are not affiliated with the laboratory. Results reported in both structures/cm3 and structures/mm2 are dependent on the sample volume and area. These parameters are measured and recorded by non-laboratory personnel and are not covered by the laboratory's accreditation. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please call us. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with the analytical services.

Sincerely,



**Derk Wipprecht**  
**Laboratory Supervisor**

