



May 25, 2021

Joe Crelier, Director–Risk Management
Portland Public Schools
501 N Dixon Street
Portland, Oregon

Via email: jcrelier@pps.net

Regarding: COVID Response Indoor Air Quality Testing Report
Laurelhurst K–8 School
840 NE 41st Avenue
Portland, Oregon
PBS Project 25000.138

Dear Mr. Crelier:

On April 13, 2021, PBS Engineering and Environmental Inc. (PBS) performed indoor air quality testing in Laurelhurst K–8 School located at the address above. These services were provided to Portland Public Schools (District) to measure air quality parameters before schools and district-owned buildings are opened again for reoccupancy.

As part of these indoor air quality testing services, PBS measured carbon monoxide (CO), carbon dioxide (CO₂), temperature in degrees Fahrenheit (°F), relative humidity (%RH), and airborne particulate (PM2.5 and PM10). Additionally, PBS reviewed and inventoried accessible components of the test rooms' heating, ventilation, and air conditioning (HVAC) systems.

Based on PBS' findings, four rooms tested below the recommended range for indoor temperatures. PBS observed rooms with open windows throughout the school which likely led to the decreased temperature readings. Additionally, 11 rooms in the investigation tested above the recommended ambient airborne particulate concentrations; however, when compared to the ambient outdoor concentrations these results do not present an actionable condition. One room, portable classroom 118, tested above the recommended indoor concentration for carbon dioxide. PBS recommends retesting in the portable buildings due to elevated levels of CO₂. The results of the testing and assessment indicates that indoor air quality in the buildings is good and that the buildings are acceptable for occupancy.

While PBS observed no measurable indoor air quality concerns in any of the rooms that were tested, PBS did not test every occupiable room in each building. This investigation has been performed in concert with a concerted effort on the part of the District to perform regular inspections and repair of all HVAC mechanical systems throughout the District. Additionally, it is the District's policy that rooms without adequate ventilation will not be utilized moving forward.

VENTILATION PARAMETERS AND AIRBORNE PARTICULATE MONITORING

PBS took spot measurements of ventilation parameters in approximately 20% of the classrooms, offices, and common areas in the building (or each building). The readings were compared to recommendations in the

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 62.1-2016, Ventilation for Acceptable Indoor Air Quality.

PBS used a TSI VelociCalc 9565 ventilation meter to measure temperature, %RH, CO, and CO₂. A TSI Aerotrak 9306-V2 optical particle counter was used to measure airborne particulate. The table below summarizes the results of the testing. Readings above or below the ASHRAE recommendations are shown in bold.

IAQ Testing Results

Room	CO	CO ₂	Temp. (°F)	%RH	PM2.5	PM10	HVAC
Outdoor Air (Pre)	0.0	462	58.5	20.7	0.032	0.014	N/A
Main Office	0.0	571	63.5	26.3	0.025	0.011	Operable Windows, Air Purifier
Auditorium/Café	0.0	478	67.3	16.2	0.011	0.003	Supply and Return Air, Operable Windows, Radiant Heat
Kitchen	0.0	489	68.1	16.9	0.018	0.011	Supply and Return Air, Exterior Door, Exhaust Hood
Room 19 Symptom Space	0.0	502	68.5	17.0	0.005	0.001	Supply Air, Operable Windows, Air Purifier, Radiant Heat
Classroom 3	0.0	483	69.7	15.4	0.021	0.008	Supply and Return Air, Operable Windows, Air Purifier, Radiant Heat
Faculty Room 23	0.0	487	69.6	13.8	0.011	0.006	Supply and Return Air,
Assistant Principals Office 24A	0.0	485	71.0	14.7	0.008	0.002	Supply and Return Air, Air Purifier, Fan
Media Center	0.0	491	72.0	14.5	0.038	0.021	Supply and Return Air, Exterior Door
Classroom 7 Art	0.0	490	71.6	15.0	0.033	0.015	Supply Air, Operable Windows, Radiant Heat
Classroom 10	0.0	515	71.0	14.7	0.032	0.014	Supply Air, Operable Windows, Air Purifier, Radiant Heat

Room	CO	CO ₂	Temp. (°F)	%RH	PM2.5	PM10	HVAC
Gymnasium	0.0	506	69.7	14.0	0.012	0.005	Supply and Return Air, Radiant Heat
Classroom 218	0.0	488	68.6	14.8	0.019	0.007	Supply Air, Operable Windows, Air Purifier, Radiant Heat
Room 216A	0.0	495	68.9	14.4	0.029	0.008	Supply Air, Operable Windows, Air Purifier, Radiant Heat
Classroom 215A	0.0	487	69.0	15.8	0.019	0.005	Supply and Return Air, Operable Windows, Air Purifier, Radiant Heat
Classroom 214	0.0	499	71.0	13.2	0.069	0.022	Supply and Return Air, Operable Windows, Air Purifier, Radiant Heat
Classroom 212	0.0	499	74.5	14.2	0.050	0.022	Supply and Return Air, Operable Windows, Air Purifier, Radiant Heat
Outdoor Air (Intermediate)	0.0	482	63.6	18.8	0.046	0.024	N/A
Classroom 112	0.0	715	70.3	15.0	0.100	0.044	Supply and Return Air, Operable Windows, Air Purifier
Classroom 113	0.0	536	69.1	16.8	0.054	0.029	Supply and Return Air, Operable Windows, Air Purifier
Classroom 111	0.0	582	68.8	18.0	0.097	0.052	Supply and Return Air, Operable Windows, Air Purifier
Classroom 114	0.0	597	70.4	27.7	0.091	0.049	Supply and Return Air, Operable Windows, Air Purifier

Room	CO	CO ₂	Temp. (°F)	%RH	PM2.5	PM10	HVAC
Portable 115	0.0	524	69.8	16.8	0.191	0.052	Supply and Return Air, Operable Windows, Air Purifier
Portable 116	0.0	547	65.5	14.8	0.112	0.034	Supply and Return Air, Operable Windows, Air Purifier
Outdoor Air (Intermediate)	0.0	480	63.7	14.8	0.052	0.027	N/A
Portable 117	0.0	911	67.7	25.5	0.105	0.021	Supply and Return Air, Operable Windows, Air Purifier
Portable 118	0.0	1544	68.4	32.5	0.079	0.030	Supply and Return Air, Operable Windows, Air Purifier
Outdoor Air (Post)	0.0	494	64.8	14.2	0.049	0.023	N/A

CO and CO₂ are presented in parts per million (ppm)

°F: degrees Fahrenheit

%RH: relative humidity

PM: particulate matter

HVAC: visible heating, ventilation, and air conditioning components

CARBON MONOXIDE

CO is produced from the incomplete combustion of carbon-containing fuels, including gasoline, heating oil, and natural gas. CO encountered in a classroom or office environment would likely be the result of proximity to motor vehicles or a malfunctioning heating system exhaust. While ASHRAE recommends that CO levels indoors should not exceed 9 parts per million (ppm), any sustained measurable amount of CO should be investigated.

CARBON DIOXIDE

CO₂ is a normal constituent of exhaled breath and indoor concentrations depend on the number of occupants, duration of occupancy, and air exchanges in a given space. ASHRAE recommends maintaining indoor CO₂ concentrations at less than approximately 1,200 ppm. Given that the building had only limited occupancy during the testing, the reported concentrations are not reflective of conditions during full occupancy. However, PBS did observe that students had been

TEMPERATURE

ASHRAE recommends maintaining indoor temperatures between 68 and 76°F.

RELATIVE HUMIDITY

ASHRAE recommends maintaining relative humidity indoors below 60%. Relative humidity indoors is difficult to regulate and is largely reflective of outdoor conditions.

AIRBORNE PARTICULATE

PM2.5

Airborne particulate matter was measured to assess the effectiveness of the buildings ventilation filtration system. ASHRAE recommends that ambient airborne particulate matter concentrations, measured as PM2.5, should meet National Ambient Air Quality Standards (NAAQS) which for PM2.5 which is 0.035 milligrams per cubic meter of air (mg/m^3) as measured and averaged over a period of 24 hours.

PM10

Airborne particulate matter was measured to assess the effectiveness of the buildings ventilation filtration system. ASHRAE recommends that airborne particulate matter concentrations, measured as PM10, should meet NAAQS which for PM10 which is 0.150 mg/m^3 as measured and averaged over a period of 24 hours.

For more detailed information regarding the laboratory results of these analyses, please refer to the attached laboratory reports.

HVAC

Annex classrooms have Univents and fan units. The main building has fan units that serve the classrooms. The media center has a roof top unit fan and a roof top unit feeds second floor rooms. The south side of the building is fed by a dedicated fan unit. The cafeteria has a dedicated fan unit. Gymnasium fans are supplied with rooftop units.

RECOMMENDATIONS

PBS did not observe any rooms that had neither operable windows nor an obvious mechanical or gravity ventilation system. PBS has no recommendations concerning ambient air quality at this time.

LIMITATIONS OF SCOPE

This study was limited to the tests and locations as indicated above. The site as a whole may have other environmental concerns that will not be characterized by this study. The findings and conclusions of this work are not scientific certainties but probabilities based on professional judgment concerning the significance of the data gathered during the course of this investigation. PBS is not able to represent conditions on the site or adjoining sites beyond those detected or observed by PBS.

PBS respectfully submits these results of our indoor air quality investigation. Please feel free to contact me at 503.417.7724 or marli.heininger@pbsusa.com with any questions or comments.

Sincerely,

 Marli Heininger
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Marli Heininger
Industrial Hygienist

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