



August 4, 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
Sunnyside Environmental K–8 School
3421 SE Salmon Street
Portland, Oregon
PBS Project 25000.138

Dear Mr. Crelier:

On April 7, 2021, PBS Engineering and Environmental Inc. (PBS) performed indoor air quality testing in Sunnyside Environmental 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, 13 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, five 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. The results of the testing and assessment indicates that indoor air quality in the building is good and that the building is 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)	0.6	474	57.0	44.0	0.050	0.021	N/A
Cafeteria 117	0.0	483	58.4	48.7	0.028	0.010	Supply and Return Air, Operable Windows, Exterior Door, Radiant Heat, Air Purifier
Gymnasium 119	0.0	479	61.3	42.0	0.032	0.011	Supply and Return Air, Operable Windows, Exterior Door, Radiant Heat, Air Purifier
Auditorium	0.0	464	64.2	44.0	0.043	0.020	Supply and Return Air, Operable Windows, Exterior Door, Radiant Heat, Air Purifier
Room 124 Counselor	0.0	497	66.9	43.8	0.202	0.102	Operable Windows, Radiant Heat
Classroom 102	0.0	482	67.3	37.8	0.029	0.014	Wall Plenum, Operable Windows, Unit Ventilator, Air Purifier
Library 100	0.0	514	65.8	37.6	0.003	0.000	Wall Plenum, Operable Windows, Exterior Door, Unit Ventilator, Air Purifier
Classroom 103	0.0	476	65.7	37.3	0.051	0.017	Wall Plenum, Operable Windows, Unit Ventilator, Air Purifier
Classroom 201	0.0	522	66.6	35.4	0.019	0.005	Wall Plenum, Operable Windows, Exterior Door, Unit Ventilator, Air Purifier

Room	CO	CO ₂	Temp. (°F)	%RH	PM2.5	PM10	HVAC
Classroom 205	0.0	473	67.1	34.3	0.053	0.023	Supply Air, Operable Windows, Unit Ventilator, Air Purifier
Faculty 220	0.0	498	67.7	41.0	0.036	0.012	Operable Windows, Unit Ventilator
Room 218	0.0	471	68.3	32.8	0.012	0.005	Operable Windows, Unit Ventilator
Room 215 Learning Center	0.0	491	68.3	35.2	0.015	0.005	Supply and Return Air, Operable Windows, Radiant Heat
Classroom 211	0.0	484	68.7	36.0	0.031	0.014	Wall Plenum, Operable Windows, Unit Ventilator
Main Office	0.0	529	68.4	36.0	0.058	0.024	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier
Classroom 109	0.0	480	67.3	34.2	0.020	0.008	Supply Air, Operable Windows, Unit Ventilator, Air Purifier
Outdoor Air (Intermediate)	0.1	466	55.9	42.6	0.044	0.14	N/A
P2 Columbia	0.0	533	58.0	50.2	0.002	0.001	Supply and Return Air, Operable Windows, Air Purifier
P1 Willamette	0.0	546	63.2	44.7	0.008	0.005	Supply and Return Air, Operable Windows, Air Purifier
Outdoor Air (Post)	0.0	460	56.8	39.5	0.067	0.025	N/A
Room 124 Retest	0.0	598	65.5	46.4	0.266	0.122	Operable Windows, Radiant Heat

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.

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 is 0.035 milligrams per cubic meter of air (mg/m³) 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 is 0.150 mg/m³ as measured and averaged over a period of 24 hours.

HVAC

Classrooms and library have unit ventilators. The gymnasium and auditorium are served by large fan units near the boiler room.

RECOMMENDATIONS

PBS did not observe any rooms that had neither operable windows nor an obvious mechanical or gravity ventilation system. However, counselor's office room 124 had elevated levels of PM2.5. The test was duplicated, and readings remained high. The room had operable windows and an air purifier, and at the time of PBS' investigation, there were no obvious factors that could explain the extraordinary particulate levels. The room did have an area rug, which could be harboring particulates, or the carpet fibers could also contribute to elevate PM2.5. PBS recommends continued and diligent use of air purifiers in occupied spaces, and this small room could benefit from deep cleaning.

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 503.313.9061 or wayne.sehman@pbsusa.com with any questions or comments.

Sincerely,

 Digitally signed by
Wayne Sehman
Date: 2021.08.04
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Wayne Sehman
Project Manager

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