



April 6, 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
Woodstock Elementary School
5601 SE 50th Avenue
Portland, Oregon
PBS Project 25000.138

Dear Mr. Crelier:

On March 24, 2021, PBS Engineering and Environmental Inc. (PBS) performed indoor air quality testing in Woodstock Elementary 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, there is no indication that a significant or measurable indoor air quality concern exists in the building. 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)	0.8	507	63.1	31.0	0.044	0.019	N/A
Classroom 20	0.0	511	70.1	29.7	0.005	0.003	Operative Windows, Unit Ventilator, Air Purifier
Classroom 22	0.0	503	72.4	29.0	0.005	0.001	Operative Windows, Unit Ventilator, Air Purifier
Classroom 25	0.1	497	72.7	30.6	0.002	0.000	Supply Air, Operative Windows, Unit Ventilator, Air Purifier
Office 16	0.0	496	71.4	28.7	0.009	0.005	Radiant Heat, Air Purifier
Office 16B	0.0	481	72.8	28.4	0.005	0.002	Supply Air, Radiant Heat, Air Purifier
Classroom 1	0.0	462	73.4	31.4	0.005	0.002	Operative Windows, Radiant Heat, Air Purifier
Classroom 3	0.0	471	73.0	32.0	0.002	0.002	Supply Air, Operative Windows, Radiant Heat, Air Purifier
Classroom 6	0.2	479	73.1	29.7	0.006	0.004	Supply Air, Operative Windows, Radiant Heat, Air Purifier
Library	0.4	474	72.2	28.4	0.004	0.001	Supply Air, Operative Windows, Radiant Heat, Air Purifier
Gymnasium	0.1	510	70.9	26.9	0.008	0.004	Supply Air
Play Area (Gym)	0.1	496	71.6	26.4	0.005	0.002	Return Air, Operative Windows, Radiant Heat
Cafeteria	0.0	487	71.8	26.7	0.004	0.002	Supply Air
Classroom 1A	0.2	492	72.0	27.0	0.002	0.000	Supply Air, Operative Windows, Radiant Heat, Air Purifier
Classroom 3A	0.2	494	72.4	28.1	0.002	0.000	Supply Air, Operative Windows, Radiant Heat, Air Purifier

Room	CO	CO ₂	Temp. (°F)	%RH	PM2.5	PM10	HVAC
Classroom 6A	0.1	507	72.0	27.5	0.002	0.000	Supply Air, Operative Windows, Radiant Heat, Air Purifier
Outdoor Air (Post)	1.2	515	62.9	30.9	0.040	0.022	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.

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/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 which is 0.150 mg/m³ as measured and averaged over a period of 24 hours.

HVAC

The boiler room fan supplies all classrooms in the main building. Classrooms on the ends of the buildings have unit ventilators. Additional classrooms have their own fan units. The gymnasium has a steam fan above the locker rooms and the auditorium and cafeteria share their own fan unit.

RECOMMENDATIONS

PBS observed one room that had neither operable windows nor an obvious mechanical or gravity ventilation system. If this room does not have adequate ventilation (active or passive), PBS recommends that they not be used for staff or student activities. This room includes the following:

- Office 16

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: 2021.04.06
16:16:39 -07'00'

Wayne Sehman
Project Manager

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