



April 29, 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
Vestal Elementary School
161 NE 82nd Avenue
Portland, Oregon
PBS Project 25000.138

Dear Mr. Crelier:

On April 16, 2021, PBS Engineering and Environmental Inc. (PBS) performed indoor air quality testing in Vestal 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, three rooms tested above the recommended range for indoor temperatures. PBS observed rooms with open windows throughout the school which likely led to the increased temperature readings. Additionally, seven 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)	0.0	496	76.2	32.5	0.088	0.036	N/A
Library	0.5	515	76.0	24.7	0.057	0.021	Operable Windows, Unit Ventilators, Air Purifier
Classroom 111	0.1	537	74.3	26.4	0.027	0.011	Operable Windows, Unit Ventilators, Air Purifier
Classroom 210	0.1	517	73.8	25.3	0.034	0.012	Operable Windows, Unit Ventilators, Air Purifier
Classroom 209	0.0	540	74.1	27.0	0.021	0.007	Operable Windows, Unit Ventilators, Air Purifier
Classroom 204	0.0	519	72.8	25.0	0.037	0.016	Operable Windows, Unit Ventilators, Air Purifier
Classroom 102	0.0	522	71.2	27.3	0.022	0.008	Operable Windows, Unit Ventilators
Teacher's Lounge (103)	0.0	551	70.8	29.3	0.038	0.009	Operable Windows, Unit Ventilators
Counselor Room 107	0.0	566	71.6	29.6	0.027	0.012	Operable Windows, Unit Ventilators, Air Purifier
Auditorium	0.0	520	73.0	26.1	0.023	0.005	Supply and Return, Radiant Heat
Gymnasium/Cafeteria	0.0	522	74.7	24.8	0.027	0.011	Supply and Return, Operable Windows, Radiant Heat
Kitchen	0.0	524	77.1	19.6	0.023	0.006	Supply and Return, Range Hood
Main Office	0.0	510	76.0	17.7	0.052	0.020	Operable Windows, Radiant Heat, Air Purifier
Copy Room/Nurse Office	0.0	508	76.0	19.1	0.036	0.012	Operable Windows, Radiant Heat, Air Purifier
Room 114	0.0	551	74.1	23.1	0.028	0.015	Operable Windows, Unit Ventilator

Room	CO	CO ₂	Temp. (°F)	%RH	PM2.5	PM10	HVAC
Room 115	0.0	538	73.3	25.2	0.006	0.002	Operable Windows, Unit Ventilator
Assistant Principal	0.0	526	73.9	25.0	0.025	0.006	Operable Windows, Radiant Heat
Counseling 208	0.0	546	74.2	24.7	0.028	0.011	Operable Windows, Radiant Heat, Air Purifier
Outdoors (Post/Pre)	0.0	486	76.1	17.2	0.114	0.060	N/A
East Portable	0.0	508	77.2	19.6	0.044	0.013	Operable Windows, Unit Ventilator, Radiant Heat, Air Purifier
Center Portable (YMCA)	0.0	527	77.6	19.7	0.055	0.018	Operable Windows, Radiant Heat, Air Purifier
West Portable	0.0	500	74.7	21.1	0.051	0.019	Operable Windows, Radiant Heat, Air Purifier
Outdoors (Post)	0.0	489	79.9	14.7	0.084	0.039	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 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 is $0.150 \text{ mg}/\text{m}^3$ as measured and averaged over a period of 24 hours.

HVAC

The classrooms are served by unit ventilators. The gymnasium and cafeteria are served by their own independent fan units.

RECOMMENDATIONS

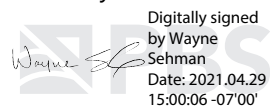
PBS did not observe any rooms that had neither operable windows nor an obvious mechanical or gravity ventilation system. PBS has no recommendations concerning ambient air quality at this time.

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

Sincerely,

 Digitally signed
by Wayne
Sehman
Date: 2021.04.29
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Wayne Sehman
Project Manager

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