



May 26, 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
Roosevelt High School
6941 N Central Street
Portland, Oregon
PBS Project 25000.138

Dear Mr. Crelier:

On May 19, 2021, PBS Engineering and Environmental Inc. (PBS) performed indoor air quality testing in Roosevelt High 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 (PM_{2.5} 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 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 indicate 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	464	63.8	37.1	0.032	0.018	N/A
Main Office 103	0.0	529	71.9	36.4	0.060	0.028	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier, Fan
Classroom 086	0.0	491	68.1	37.8	0.000	0.000	Supply and Return Air, Radiant Heat, Air Purifier
Classroom 087 Art	0.0	466	69.3	35.3	0.004	0.003	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier
Room 091 Community Programs	0.0	476	70.5	36.8	0.003	0.002	Supply and Return Air
Kitchen 025A	0.0	468	70.5	38.0	0.011	0.008	Supply and Return Air, Exhaust Hood
Cafeteria Commons	0.0	473	70.3	34.7	0.003	0.002	Supply and Return Air, Operable Windows, Exterior Doors, Large Ceiling Fan
Library	0.0	471	71.0	35.2	0.006	0.004	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier
Office 117F	0.0	499	71.7	34.2	0.010	0.006	Supply and Return Air, Radiant Heat
Band/Choir 119	0.0	470	71.0	34.0	0.002	0.002	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier
Community Programs 113	0.0	473	71.0	34.7	0.004	0.004	Supply and Return Air, Air Purifier
Health Clinic 115	0.0	490	71.0	35.4	0.068	0.032	Supply and Return Air, Operable Windows

Room	CO	CO ₂	Temp. (°F)	%RH	PM2.5	PM10	HVAC
Classroom 295	0.0	484	71.4	34.2	0.004	0.002	Supply and Return Air, Operable Windows, Air Purifier
Writing Center 292	0.0	473	70.9	34.9	0.001	0.001	Supply and Return Air, Air Purifier
Teacher Planning 226	0.0	488	71.3	35.8	0.002	0.002	Supply and Return Air, Operable Windows, Radiant Heat, Unit Ventilator
Classroom 215	0.0	473	71.6	34.3	0.004	0.002	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier
Classroom 205 Computer Lab	0.0	479	71.6	34.1	0.002	0.000	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier
Classroom 239 Science Lab	0.0	476	71.5	34.1	0.002	0.000	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier
Teacher Planning 229	0.0	482	72.8	36.0	0.035	0.016	Supply and Return Air, Operable Windows, Radiant Heat, Fan
Conference Room 238	0.0	495	74.0	33.1	0.024	0.008	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier
Classroom 273	0.0	474	73.3	32.1	0.001	0.000	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier, Fan
Classroom 255	0.0	477	71.6	32.0	0.000	0.000	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier
Conference 263	0.0	481	71.8	31.8	0.008	0.004	Supply and Return Air, Radiant Heat
Classroom 173 Dance	0.0	481	70.0	36.0	0.003	0.002	Supply Air, Operable Windows, Air Purifier, Unit Ventilator
Office 164 SPED	0.0	489	71.3	33.1	0.013	0.008	Supply and Return Air, Radiant Heat

Room	CO	CO ₂	Temp. (°F)	%RH	PM2.5	PM10	HVAC
Classroom 153	0.0	460	71.0	32.3	0.000	0.000	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier
Science Lab 191	0.0	462	71.6	32.9	0.004	0.003	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier
Classroom 135	0.0	468	71.8	32.5	0.002	0.001	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier
Teacher Planning 138	0.0	490	71.8	34.6	0.123	0.061	Supply and Return Air, Radiant Heat
Staff Room 104	0.0	467	71.3	34.1	0.024	0.011	Supply and Return Air, Radiant Heat
Attendance Office 105	0.0	477	71.1	33.3	0.018	0.005	Supply and Return Air, Air Purifier
Family Room 105F	0.0	470	70.1	35.2	0.011	0.007	Supply and Return Air, Operable Windows, Air Purifier
Head Start 107	0.0	476	70.1	36.1	0.007	0.002	Supply and Return Air, Operable Windows, Radiant Heat
Counselors Offices 109	0.0	468	70.5	35.7	0.025	0.013	Supply and Return Air, Operable Windows, Air Purifier
Classroom 035	0.0	465	71.6	33.6	0.005	0.003	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier
Conference Room 036	0.0	463	71.4	33.1	0.004	0.002	Supply and Return Air, Radiant Heat
Makerspace 078	0.0	466	71.4	32.0	0.011	0.007	Supply and Return Air, Operable Windows, Exterior Door, Air Purifier
Main Gymnasium 073	0.0	475	70.3	31.8	0.002	0.002	Supply and Return Air, Exterior Doors
Small Gym 071	0.0	478	69.7	36.0	0.000	0.000	Supply and Return Air, Exterior Doors

Room	CO	CO ₂	Temp. (°F)	%RH	PM2.5	PM10	HVAC
Classroom 051	0.0	462	70.8	29.3	0.000	0.000	Supply and Return Air, Operable Windows, Radiant Heat, Air Purifier, Fan
Outdoor Air (Post)	0.0	455	66.8	28.4	0.017	0.006	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.

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

HVAC

The building ventilation is served by a combination of fan units and unit ventilators.

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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