



May 27, 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
Cleveland High School
3400 SE 26th Avenue
Portland, Oregon
PBS Project 25000.138

Dear Mr. Crelier:

On May 5, 2021, PBS Engineering and Environmental Inc. (PBS) performed indoor air quality testing in Cleveland 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 (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 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 (Pre)	1.2	446	58.5	45.6	0.034	0.012	N/A
Classroom 129	0.0	474	70.2	44.5	0.004	0.002	Supply & Return, Operable Windows, Air Purifier, Unit Ventilator
Classroom 117	0.0	463	71.7	40.9	0.009	0.002	Supply & Return, Operable Windows, Air Purifier, Unit Ventilator
Classroom 106	0.0	485	71.7	42.6	0.004	0.002	Supply & Return, Operable Windows, Air Purifier, Unit Ventilator
Cafeteria	0.0	481	73.5	39.7	0.007	0.002	Supply & Return, Air Purifier
Kitchen	0.1	478	73.1	39.2	0.076	0.044	Supply & Return, Air Purifier, Hood
Yoga Room 126	0.0	469	75.0	37.9	0.012	0.005	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Room 120 B	0.0	480	76.8	45.6	0.018	0.011	Operable Windows, Air Purifier, Radiator Unit
Health Clinic Room 163	0.0	484	74.3	39.1	0.010	0.005	Supply & Return, Operable Windows, Radiator Unit
Health Clinic Exam Room 2	0.0	477	74.5	38.2	0.005	0.001	Supply & Return, Operable Windows, Radiator Unit
Boys Locker Room	0.0	464	75.4	36.3	0.038	0.018	Supply & Return, Operable Windows
Faculty Dining Room 132	0.0	485	75.9	44.7	0.017	0.008	Supply & Return, Operable Windows, Air Purifier, Radiator Unit

Room	CO	CO ₂	Temp. (°F)	%RH	PM2.5	PM10	HVAC
Classroom 232	0.0	462	75.5	35.4	0.006	0.001	Supply & Return, Operable Windows, Air Purifier, Unit Ventilator
Office 234 – 12	0.1	480	74.3	34.6	0.005	0.003	Supply & Return
Band Room	0.0	458	74.5	35.6	0.073	0.039	Supply & Return, Air Purifier
Choir Room	0.7	447	69.6	38.2	0.005	0.002	Supply & Return, Air Purifier
Wrestling Room 252A	0.0	456	70.0	40.6	0.005	0.001	Supply & Return
Wood Shop Room 248	0.0	447	70.0	39.3	0.004	0.002	Supply & Return
Student Services Center 226	0.0	519	71.2	39.4	0.013	0.007	Supply & Return, Air Purifier
Office 226 F	0.0	556	70.2	40.2	0.028	0.016	Supply & Return, Operable Windows, Radiator Unit
Office 226 J	0.0	493	73.0	38.5	0.024	0.013	Supply & Return, Operable Windows, Radiator Unit
Office 226 R	0.1	492	72.7	37.5	0.018	0.011	Supply & Return
Office 226 A	0.0	489	72.6	37.4	0.010	0.006	Supply & Return
VP Office Room B	0.0	479	72.9	37.3	0.020	0.010	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Office K	0.0	499	72.4	37.9	0.024	0.010	Supply & Return
Main Office	0.0	483	71.2	38.3	0.025	0.006	Operable Windows, Air Purifier, Radiator Unit
Business Office	0.0	450	71.6	38.4	0.013	0.005	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Auditorium	0.0	463	73.5	40.5	0.004	0.001	Supply & Return, Operable Windows

Room	CO	CO ₂	Temp. (°F)	%RH	PM2.5	PM10	HVAC
Room 213	0.0	457	76.2	36.6	0.026	0.015	Operable Windows, Air Purifier, Radiator Unit
Classroom 217	0.1	468	72.3	35.7	0.006	0.002	Supply & Return, Operable Windows, Air Purifier, Unit Ventilator
Classroom 229	0.0	454	73.3	36.9	0.004	0.002	Supply & Return, Operable Windows, Air Purifier, Unit Ventilator
Classroom 235	0.0	449	72.0	37.2	0.004	0.001	Supply & Return, Operable Windows, Air Purifier, Unit Ventilator
Book Room 225	0.0	459	74.9	35.0	0.018	0.012	Supply & Return, Air Purifier, Unit Ventilator
Library 275	0.0	462	75.0	35.0	0.012	0.006	Supply & Return, Operable Windows, Air Purifier
Computer Room 266	0.0	452	74.9	35.2	0.025	0.013	Supply & Return, Operable Windows, Air Purifier, Unit Ventilator
Classroom 280	0.0	447	72.4	36.6	0.009	0.005	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Classroom 283	0.0	451	71.8	37.9	0.005	0.002	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Classroom 286	0.0	452	71.1	38.6	0.007	0.003	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Classroom 386	0.0	464	72.1	38.1	0.014	0.009	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Classroom 381	0.0	474	72.5	37.8	0.011	0.006	Supply & Return, Operable Windows, Air Purifier, Radiator Unit

Room	CO	CO ₂	Temp. (°F)	%RH	PM2.5	PM10	HVAC
Classroom 378/380	0.0	438	71.7	37.8	0.003	0.001	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Classroom 366 Bio	0.0	452	74.0	37.7	0.005	0.003	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Classroom 336 Bio	0.0	478	74.9	36.1	0.007	0.005	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Classroom 330 Chem	0.0	468	75.3	35.7	0.009	0.004	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Classroom 320 Physics	0.0	460	74.9	35.1	0.031	0.018	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Classroom 306/312	0.0	471	77.8	35.2	0.014	0.009	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Classroom 311	0.0	460	76.6	32.6	0.032	0.017	Supply & Return, Operable Windows, Air Purifier, Unit Ventilator
Classroom 319	0.0	447	75.6	34.5	0.015	0.007	Supply & Return, Operable Windows, Air Purifier, Unit Ventilator
Classroom 329	0.0	434	73.8	34.9	0.013	0.008	Supply & Return, Operable Windows, Air Purifier
Classroom 335	0.0	444	73.1	36.2	0.014	0.005	Supply & Return, Operable Windows, Air Purifier, Unit Ventilator
Classroom 363	0.0	447	72.8	36.9	0.017	0.005	Supply & Return, Operable Windows, Air Purifier, Radiator Unit

Room	CO	CO ₂	Temp. (°F)	%RH	PM2.5	PM10	HVAC
Art Room 357 Ceramics	0.0	443	73.7	35.2	0.013	0.005	Supply & Return, Operable Windows, Air Purifier
Art Room 359/374	0.0	451	73.0	36.2	0.007	0.000	Supply & Return, Operable Windows, Air Purifier
Classroom 370	0.0	451	73.5	36.3	0.019	0.010	Supply & Return, Air Purifier
Outdoor (Post/Pre)	0.0	466	70.3	40.4	0.051	0.018	N/A
Gym	0.0	445	70.6	39.3	0.010	0.001	Supply & Return, Air Purifier
Boys Locker Room	0.0	448	69.7	40.6	0.013	0.008	Supply & Return
Girls Locker Room	0.0	465	70.3	42.4	0.016	0.007	Supply & Return
Mat Room G28	0.0	449	69.2	42.5	0.004	0.002	Supply & Return, Operable Windows
Weight Room G29/32	0.0	446	71.3	40.3	0.009	0.002	Supply & Return, Air Purifier
Outdoor (Post/Pre)	0.0	472	72.9	38.7	0.059	0.021	N/A
Portable 1	0.3	447	72.1	39.4	0.012	0.008	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Portable 2	0.1	462	70.6	42.1	0.018	0.009	Supply & Return, Operable Windows, Air Purifier, Radiator Unit
Outdoor (Post)	0.3	438	71.5	39.5	0.126	0.063	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/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

The classrooms are served by unit ventilators. The upstairs third floor south half horseshoe is served by a multi-zone fan unit. The library and art classrooms on the south side of the second and third floors are served by attic fan units. The gymnasium and locker rooms are served by their own fan units. The kitchen and cafeteria are served by their own fan units. The east wing has hot water exchanger and its own fan units. Fan units are in the ceiling for entrances. The portables are served by their own 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 503.313.9061 or wayne.sehman@pbsusa.com with any questions or comments.

Sincerely,

 Digitally signed
by Wayne
Sehman
Date: 2021.05.27
12:43:03 -07'00'

Wayne Sehman
Project Manager

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