



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  
Lent K–8 School  
5105 SE 97th Avenue  
Portland, Oregon  
PBS Project 25000.138

Dear Mr. Crelier:

On April 15, 2021, PBS Engineering and Environmental Inc. (PBS) performed indoor air quality testing in Lent 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 (CO<sub>2</sub>), temperature in degrees Fahrenheit (°F), relative humidity (%RH), and airborne particulate (PM<sub>2.5</sub> and PM<sub>10</sub>). Additionally, PBS reviewed and inventoried accessible components of the test rooms' heating, ventilation, and air conditioning (HVAC) systems

Based on PBS' findings, two 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, 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 CO<sub>2</sub>. 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 <sub>2</sub> | Temp. (°F) | %RH  | PM2.5        | PM10  | HVAC                                                            |
|------------------------|-----|-----------------|------------|------|--------------|-------|-----------------------------------------------------------------|
| Outdoor Air (Pre)      | 0.0 | 474             | 71.8       | 21.1 | 0.031        | 0.015 | N/A                                                             |
| Multipurpose Room      | 0.0 | 493             | 72.3       | 26.0 | 0.016        | 0.003 | Supply and Return, Air Purifier                                 |
| Auditorium             | 0.0 | 513             | 71.6       | 26.1 | 0.027        | 0.009 | Supply and Return, Air Purifier                                 |
| Classroom 130          | 0.0 | 499             | 71.7       | 24.8 | <b>0.088</b> | 0.040 | Supply Air, Operable Windows, Radiant Heat, Air Purifier        |
| Classroom 169          | 0.0 | 492             | 72.6       | 24.9 | 0.027        | 0.010 | Operable Windows, Radiant Heat, Air Purifier                    |
| Workroom 159           | 0.0 | 503             | 72.6       | 24.9 | 0.021        | 0.010 | Supply and Return                                               |
| Room 140               | 0.0 | 500             | 72.4       | 23.9 | 0.032        | 0.017 | Supply and Return, Operable Windows, Radiant Heat               |
| Room 146A              | 0.0 | 485             | 73.5       | 25.6 | 0.021        | 0.007 | Operable Windows, Radiant Heat                                  |
| Classroom 149          | 0.0 | 497             | 72.0       | 24.5 | 0.007        | 0.004 | Operable Windows, Radiant Heat, Air Purifier                    |
| Cafeteria              | 0.0 | 482             | 71.9       | 25.1 | 0.020        | 0.008 | Supply and Return, Operable Windows, Radiant Heat               |
| Kitchen                | 0.0 | 478             | 73.5       | 23.2 | 0.024        | 0.010 | Supply and Return, Operable Windows, Range Hood                 |
| Health Office          | 0.0 | 512             | 73.5       | 24.1 | 0.002        | 0.002 | Supply Air, Radiant Heat, Air Purifier                          |
| Outdoor Air (Post/Pre) | 0.0 | 476             | 76.5       | 17.7 | 0.023        | 0.010 | N/A                                                             |
| Annex Room 32          | 0.0 | 484             | 76.8       | 17.6 | 0.019        | 0.010 | Supply and Return, Operable Windows, Radiant Heat, Air Purifier |

| Room                   | CO  | CO <sub>2</sub> | Temp.<br>(°F) | %RH  | PM2.5        | PM10  | HVAC                                                            |
|------------------------|-----|-----------------|---------------|------|--------------|-------|-----------------------------------------------------------------|
| Annex Room 33          | 0.0 | 497             | 74.2          | 19.3 | 0.004        | 0.002 | Supply and Return, Operable Windows, Radiant Heat, Air Purifier |
| Annex Room 34          | 0.0 | 496             | 72.4          | 21.3 | 0.008        | 0.002 | Supply and Return, Operable Windows, Radiant Heat, Air Purifier |
| Annex Room 35          | 0.0 | 491             | 71.8          | 21.8 | 0.009        | 0.004 | Supply and Return, Operable Windows, Radiant Heat, Air Purifier |
| Annex Room 36          | 0.0 | 496             | 71.6          | 21.4 | 0.011        | 0.008 | Supply and Return, Operable Windows, Radiant Heat, Air Purifier |
| Outdoor Air (Post/Pre) | 0.0 | 475             | 75.7          | 16.2 | 0.020        | 0.010 | N/A                                                             |
| Portable 204           | 0.0 | 498             | 74.6          | 20.6 | 0.012        | 0.007 | Supply and Return, Operable Windows, Air Purifier               |
| Portable 205           | 0.0 | 507             | 72.9          | 22.0 | <b>0.044</b> | 0.020 | Supply and Return, Operable Windows, Air Purifier               |
| Portable 206           | 0.0 | 515             | 76.0          | 20.5 | 0.005        | 0.003 | Supply and Return, Operable Windows, Air Purifier               |
| Portable 207           | 0.0 | 530             | 76.2          | 22.6 | 0.008        | 0.005 | Supply and Return, Operable Windows, Air Purifier               |
| Portable 201           | 0.0 | 508             | 76.6          | 21.3 | 0.005        | 0.002 | Operable Windows, Unit Ventilator, Air Purifier                 |
| Portable 202           | 0.0 | 492             | 74.1          | 25.7 | 0.018        | 0.011 | Operable Windows, Unit Ventilator, Air Purifier                 |
| Music Room 203         | 0.0 | 541             | 75.5          | 24.2 | <b>0.103</b> | 0.046 | Supply and Return, Operable Windows,                            |
| Gymnasium              | 0.0 | 488             | <b>81.1</b>   | 17.8 | 0.015        | 0.005 | Passive Roof Vents, Radiant Heat                                |
| Classroom 122          | 0.0 | 513             | <b>78.1</b>   | 19.4 | 0.013        | 0.005 | Supply Air, Operable Windows, Radiant Heat, Air Purifier        |

| Room               | CO  | CO <sub>2</sub> | Temp. (°F) | %RH  | PM2.5 | PM10  | HVAC                                                            |
|--------------------|-----|-----------------|------------|------|-------|-------|-----------------------------------------------------------------|
| Classroom 115      | 0.0 | 503             | 75.5       | 21.2 | 0.017 | 0.006 | Return Air, Operable Windows, Radiant Heat, Air Purifier        |
| Library            | 0.0 | 480             | 74.6       | 20.4 | 0.034 | 0.016 | Supply and Return, Operable Windows, Radiant Heat, Air Purifier |
| Main Office        | 0.0 | 484             | 73.0       | 22.3 | 0.018 | 0.009 | Operable Windows, Radiant Heat, Air Purifier                    |
| Outdoor Air (Post) | 0.0 | 483             | 74.8       | 18.3 | 0.034 | 0.018 | N/A                                                             |

CO and CO<sub>2</sub> 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

CO<sub>2</sub> 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 CO<sub>2</sub> 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<sup>3</sup>) 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/m<sup>3</sup> as measured and averaged over a period of 24 hours.

## **HVAC**

The media room is served by a unit ventilator. The auditorium is served by a fan unit. The portables are served by exterior mounted Bard units or unit ventilators. The annex building is served by a fan unit.

## **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](mailto:wayne.sehman@pbsusa.com) with any questions or comments.

Sincerely,

 Digitally signed  
by Wayne  
Sehman  
Date: 2021.04.29  
15:02:00 -07'00'

Wayne Sehman  
Project Manager

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