February 28, 2021

Patt Komar
David Douglas School District
11300 NE Halsey Street
Portland, Oregon 97220

Via email: patt_komar@ddsd40.org

Regarding: Indoor Air Quality and Ventilation Assessment Report
David Douglas South High School Campus
1500 SE 130th Avenue
Portland, Oregon
PBS Project 23179.091, Phase 0001

Dear Ms. Komar:

On January 29 and 30, 2021, PBS Engineering and Environmental Inc. (PBS) performed indoor air quality testing and ventilation assessments at the David Douglas South High School campus in Portland, Oregon. These services were completed to provide an overall assessment of indoor air quality in the building.

The results of the testing and assessment indicates that overall indoor air quality in the building is good and that the school is acceptable for occupancy.

The campus includes 42 classrooms, offices, a staff break room, cafeteria, wood shop, metal shop, and gymnasiums in the main building, a portable horticulture classroom building and an auto shop building. The Horner Performing Arts Center (PAC) building was also included in the assessment of campus.

VENTILATION PARAMETERS & PM10 MONITORING

As part of indoor air quality testing services PBS took spot measurements of ventilation parameters in approximately 20% of the classrooms, offices, and common areas in each of the buildings. Measurements included temperature (°F), relative humidity (%RH), carbon monoxide (CO), carbon dioxide (CO_2), and airborne particulate matter (PM10). 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.

In addition, PBS visually assessed every occupied space in the building to determine if the space was served by a mechanical ventilation system or had an operable window. Spaces without a mechanical ventilation system or operable window were noted and referred to the district for further evaluation. The visual inspection also looked for obvious indications of water intrusion, fungal growth, and other conditions that could lead to poor indoor air quality.

PBS used a TSI VelociCalc 9565 ventilation meter to measure temperature, %RH, CO, and CO_2. A TSI Aerotrak 9306-V2 optical particle counter was used to measure PM10. The table below summarizes the results of the testing. Readings above or below the ASHRAE recommendations are shown in bold.

Table 1. Ventilation Monitoring Results

	Location	Temp (°F)	Relative Humidity (%RH)	CO_2 (ppm)	CO (ppm)	PM10 (mg/m³)
1	Vice Principal's office	71.7	34.9	441	0.0	0.019
2	Room 209	70.7	34.0	417	0.0	0.002
3	Room 204	71.4	34.5	419	0.0	0.020
4	Girls Locker Room office	71.8	35.2	501	0.0	0.008
5	Boys Locker Room office	69.8	38.1	523	0.0	0.005
6	Office 245A	70.4	36.9	429	0.0	0.035
7	3-D printing lab	70.8	36.1	433	0.0	0.038
8	Curriculum Staff Development	70.7	34.6	420	0.0	0.025
9	Room 247	72.3	33.9	415	0.0	0.016
10	Room 233 (Home Ec)	74.0	33.1	409	0.07	0.015
11	Health Room	69.8	34.0	420	0.0	0.014
12	Room 236	71.3	35.5	423	0.0	0.011
13	Cafeteria	70.5	35.3	414	0.3	0.000
14	Office 241C	70.4	42.5	505	0.0	0.005
15	Room 240	70.0	42.4	488	0.0	0.002
16	Room 215	69.4	44.7	460	0.0	0.004
17	Room220	69.4	44.5	459	0.0	0.001
18	Room 223	68.7	41.5	535	0.0	**0.183**
19	Wood Shop office	70.7	43.5	491	0.0	0.022
20	Metal Shop	68.3	46.0	469	0.2	0.021
21	Custodial office	**65.7**	53.5	518	0.0	0.024
22	PAC - Orchestra	70.5	47.5	485	0.0	0.007
23	PAC – Band office	70.2	42.6	483	0.5	0.003
24	PAC – Blue Box Theater	70.4	44.4	530	0.0	0.003
25	Horticulture classroom (portable)	**53.1**	58.7	502	0.0	0.005
26	Auto shop – center bay	**62.3**	62.8	643	0.2	0.002
27	Auto shop classroom 282	**57.1**	60.3	655	0.0	0.002

°F: degrees Fahrenheit %RH: relative humidity ppm: parts per million mg/m³: milligrams per cubic meter of air

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.

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_2 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_2 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.

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 be below 0.150 milligrams per cubic meter of air (mg/m^3) for indoor spaces.

CONCLUSIONS AND RECOMMENDATIONS

PBS measured ventilation parameters and airborne particulate matter in approximately 20% of classrooms, offices, and common areas throughout the building.

The temperature readings from the portable Horticulture classroom and the auto shop were below the recommended indoor temperature of 68°F. These rooms have their own heating systems and were unoccupied at the time of the test. The temperature in the custodial office was also below the recommended indoor temperature of 68°F. However, the custodial office gets significant heat from the adjacent boiler room and is kept intentionally cool by opening adjacent doors to bring in outside air.

Room 223 showed PM10 levels slightly above the ASHRAE recommended level. This room is the ceramics studio and significant dust is generated when working with dried clay. A separate dust filter is already in place in this room, but additional filtration may be necessary.

Ventilation parameters in all other areas were within ASHRAE recommended levels.

The visual assessment did not find any obvious indications of water intrusion, fungal growth, or other conditions that could lead to poor indoor air quality.

Thirteen areas were referred to the district for further evaluation of their ventilation systems.

Two areas were referred to the district for further evaluation of their ventilation systems.

1. Security office
2. Vice Principal's office
3. Girls locker room office
4. Boys locker room office
5. Curriculum Staff Development SW offices
6. Community Sports area (2 offices and lobby)

7. Room 239 office
8. Kitchen office
9. Custodial office
10. Metal shop office and computer room
11. Offices in Room 222 and 223
12. Exercise rooms and office west of yoga studio (old District Office area)
13. Auto shop, including offices

After evaluation, the District will post a summary detailing how issues in each area were resolved.

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.

Please feel free to contact me at 503.515.4726 or voeller@pbsusa.com with any questions or comments.

Sincerely,

Digitally signed by Dale Voeller, CHMM, CSP
Date: 2021.02.28 14:13:00 -08'00'

Dale Voeller, CHMM, CSP
Senior Project Manager

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