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 North High School Campus
1001 SE 135th Avenue
Portland, Oregon
PBS Project 23179.091, Phase 0001

Dear Ms. Komar:

On January 28, 2021, PBS Engineering and Environmental Inc. (PBS) performed indoor air quality testing and ventilation assessments at the David Douglas North 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 indoor air quality in the building is good.

The main building includes 103 classrooms, offices, a staff break room, cafeteria, gymnasium, and a portable building with 3 classrooms. The Social Studies Building, Annex, and Aquatics Center are stand-alone buildings and were also included in the testing and assessment.

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/m^3)
1	Main Office	70.2	35.2	497	0.0	0.004
2	Office 102A	70.5	33.6	465	0.0	0.008
3	Room 105	69.8	33.6	452	0.0	0.008
4	Girls locker room office	68.0	35.2	448	0.0	0.005
5	Weight room	68.1	37.3	292	0.0	0.005
6	Boys locker room office	69.6	37.6	480	0.0	0.007
7	Room 109	69.7	34.6	459	0.0	0.024
8	Room 112	70.7	34.0	469	0.0	0.077
9	Room 117	71.1	33.3	451	0.0	0.015
10	Room 122	73.2	32.5	469	0.0	0.012
11	Kitchen office	73.8	31.4	511	0.0	0.002
12	Office 126B	73.2	30.5	452	0.0	0.005
13	Stage office	73.5	31.1	456	0.0	0.002
14	Computer lab 170	69.8	31.6	463	0.0	0.007
15	Office 169B	71.6	32.6	462	0.0	0.005
16	Book Room	72.1	33.2	465	0.0	0.011
17	Room 159 (portable)	**67.0**	35.7	478	0.0	0.007
18	Room 156 (portable)	**66.9**	39.0	496	0.0	0.002
19	Room 153	68.7	38.5	461	0.0	0.002
20	Room 141	70.2	34.9	460	0.2	0.004
21	Room 148	70.5	34.7	455	0.0	0.005
22	Room S-11	71.8	33.7	472	0.0	0.003
23	Room S-7	71.7	32.9	459	0.5	0.003
24	Room S-4	71.7	33.3	462	0.0	0.002
25	Room 129	72.1	33.2	466	0.0	0.005
26	Room 136	72.6	32.9	465	0.2	0.004
27	Library	71.1	33.2	455	0.0	0.002
28	Room 301 – Social Studies Bldg	68.5	37.4	458	0.0	0.000
29	Room 308 – Social Studies Bldg	70.5	35.1	460	0.0	0.004
30	Room 320 – Social Studies Bldg	68.8	33.9	461	0.0	0.002
31	Room 313 – Social Studies Bldg	71.1	33.6	460	0.0	0.001
32	Room 171 - Annex	71.5	34.9	578	0.0	0.014
33	Room 180 - Annex	71.7	31.8	487	0.0	0.003
34	Room 177 - Annex	71.6	32.3	497	0.0	0.005
35	Room 175 - Annex	72.3	32.1	477	0.0	0.007
36	Aquatics Center 408	68.3	37.4	471	0.0	0.007
37	Aquatics Center 404A	72.1	33.4	469	0.0	0.001

°F: degrees Fahrenheit %RH: relative humidity ppm: parts per million mg/m^3: 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 portable classrooms 156 and 159 were slightly below the recommended indoor temperature of 68°F. These classrooms have their own heating system and were unoccupied at the time of the test.

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.

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

1. Office 103B has radiator heat with operable window (near main office)
2. Office 103C has radiator heat with operable window (near main office)

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 14:10:32 -08'00'

Dale Voeller, CHMM, CSP
Senior Project Manager

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