



9 March 2021

Mr. Chris Locarno
 Director of Finance and Facilities
 Central Vermont Supervisory Union #68
 111B Brush Hill Road
 Williamstown, Vermont 05679

Re: Indoor Air Quality Assessment – Northfield Middle and High School, Northfield, Vermont
 K-D Project No. 20173-001

Dear Mr. Locarno:

At your request, K-D Associates, Inc. conducted an indoor air quality assessment of the Northfield Middle and High School in Northfield, Vermont. This assessment was conducted as part of a periodic monitoring plan for all schools within the Central Vermont Supervisory Union. The assessment included measurements of carbon monoxide (CO), carbon dioxide (CO₂), relative humidity (%RH), temperature (°F), and volatile organic compounds (VOC's). Measurements were made both indoors and outdoors for comparison purposes. The assessment was conducted on the morning of February 23, 2021. This report includes a description of the testing methodologies and measurements made while on site, laboratory analysis results for VOC's and airborne mold spores, a floor plan sketch showing the location of mold and VOC sampling, and a discussion of the sampling results.

Field Screening Results

Field screening results for carbon monoxide (CO), carbon dioxide (CO₂), relative humidity (%RH), and temperature (F) are presented below. All measurements were made using an Extech EA80 Indoor Air Quality Meter, MSA Altair4 Carbon Monoxide meter.

<u>Location</u>	<u>CO (ppm)</u>	<u>CO₂ (ppm)</u>	<u>Temp (°F)</u>	<u>RH (%)</u>
Outdoors	0	431	32.5	42.4
Hallway by Room 200	0	438	70.7	21.1
Entry, upper level	0	400	71.4	22.2
Boys Room	0	396	70.7	23.2
Near entrance	0	396	71.0	21.1
Main entry	0	400	69.4	22.0
Auditorium	0	402	70.3	23.0
Hall of Honors	0	398	71.1	20.0
Hallway by Nurses Office	0	419	71.6	21.2
Custodial storage	0	420	72.2	24.2
Gymnasium	0	440	70.5	20.9
Supervisory office	0	405	70.2	23.1
Near Room 129	0	415	71.0	23.4
Near Room 133	0	406	72.2	20.3

Near Room 123	0	411	69.8	20.8
Near Science Room	0	501	71.3	21.3
Near Math Room	0	487	71.1	20.3
Copy Room	0	463	72.1	22.6
Music Room	0	451	72.5	20.4

Temperature and Relative Humidity

Indoor temperatures ranged from 69.4 to 72.5 degrees F throughout the school. Most people are comfortable in this temperature range when sedentary or slightly active with a relative humidity above 20%. Relative humidity ranged from 20.0% to 23.4%, which is within what is generally a comfortable range of 20% to 60%.

Carbon Dioxide

The adequacy of ventilation can sometimes be evaluated using CO₂ measurements. CO₂ is a normal constituent of exhaled breath and, if monitored, can be used as a screening technique to evaluate whether adequate quantities of fresh air are being introduced and CO₂ exhausted. The outdoor ambient concentration of CO₂ is typically between 375 and 450 parts per million (ppm). Usually the CO₂ level is higher inside than outside, even in buildings with few complaints about indoor air quality. CO₂ levels ranged from a low of 396 ppm to a high of 501 ppm. As a rule of thumb, indoor CO₂ concentrations greater than 1000 ppm are an indication of inadequate ventilation. These measurements are within expected limits. The school was unoccupied at the time of these measurement.

Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless and toxic gas. Improperly vented gas, oil or kerosene heaters, or poorly adjusted and maintained combustion devices are typical sources of carbon monoxide. Auto and bus exhaust also contains carbon monoxide, which can be introduced into indoor air through poorly located fresh air intakes to a heating/ventilation system. Monitored with a calibrated, direct-reading air monitor, the levels of carbon monoxide in the office were recorded for comparison to the OSHA Permissible Exposure Limit (PEL) of 50 parts per million (ppm). Carbon Monoxide measurements were found to be 0 ppm in all areas.

Volatile Organic Compounds

The VOC sampling utilized Mini Can collection devices and high flow regulators to collect grab samples of the indoor air. The indoor sampler was placed in the hallway near Room 200 as shown on the attached floor plan. At the end of the sampling period, the sample canisters were shipped under chain-of-custody to EMSL Analytical, Inc, for laboratory analysis. Analysis was performed by EPA Method TO-15, using GC/MS to identify 62 regulated target compounds. The EMSL laboratory report for this sample is attached. All target compounds sampled for were found to be either none detected (ND) or well within the National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Level (REL) and the Occupational Safety and Health Administration (OSHA) Permissible Exposure Level (PEL) with one exception:

- Benzene was found at a level of 1.8 ug/m³. This level is well below the NIOSH REL (320 ug/m³) and the OSHA PEL (3,200 ug/m³) but exceeds the EPA RSL of 0.36 ug/m³ and exceeds the Vermont Residential Indoor Air Standards of 0.13 ug/m³ which would be considered a theoretical risk that 1 in 1,000,000 would develop cancer. During the previous sampling round the concentration was ND.

Airborne Mold Spores

Laboratory analysis results for four Air-O-Cell cassettes, which were used to collect air samples from three areas within the school and outdoors (for comparison) are attached. Analysis of these samples provides a rough measure of airborne spores and a general description of the species present.

Air-O-Cell cassettes are a self-contained sampling device with a pre-applied collection/sampling media. Potential, inadvertent contamination is prevented because the media does not require handling. This method generally provides good consistency between samples. The cassettes are attached to a high volume, sampling pump with an adaptor and air is drawn through the cassettes. Particles (spores, pollen and other particles) in the air being sampled impact the slide, coated with a sticky transparent "acrylic" substrate and adhere. The pump is calibrated at the beginning and the end of the sampling period, using a rotometer to measure the flow rate at the face of the cassette. The cassette inlet orifice is oriented at a 45° angle downward and a minimum of 15 liters per minute is maintained for approximately 5 to 10 minutes. At the completion of sampling, the cassette is sealed and transported to the laboratory for analysis. Analysis data is separated into three categories: fungal spores, pollen, and other particles. Each category is looked at individually for interpretation. We are primarily concerned with the number of spores per cubic meter of air and the variety of spores found.

The total airborne spore count in Location A (Hallway near Room 200) was 0 spores per cubic meter of air, 53 spores per cubic meter of air in Location B (Gymnasium), 160 spores per cubic meter of air in Location C (Auditorium). The total airborne spore counts in all locations sampled at the school were very low and at a level that would not be considered unusual in an indoor environment. The spores identified are also common in both indoor and outdoor environments.

Mold Types Identified

Deuteromycetes - These spores are very commonly found outdoors and finding them in small numbers on indoor samples generally would not be a mold concern. These groups of mold spores do not commonly associate themselves with building materials inside the house.

Discussion

The field measurements made were well within expected limits. Temperature and relative humidity appear to be adequately controlled, to the extent that the system allows, within comfortable levels. No detectable level of carbon monoxide could be detected at the time of the survey and carbon dioxide measurements did not appear to be elevated.

Air sampling for mold spores did not find any unusual levels that would suggest a mold growth issue at this time.

The screening conducted for Volatile Organic Compounds (VOC's) detected one compound at a level that exceeded either the EPA Residential Regional Screening Level and/or the Vermont Indoor Air Standard. The Vermont Indoor Air Standard was developed to assess vapor intrusion from contaminated environmental media into a structure and is being used in this assessment to provide guidance in understanding the potential impact of these compounds. While contamination from an outside source can not be ruled out with what is currently known, it is more likely that the source of these contaminants is a product used within the school. The EPA screening levels are intended to assess the impact of exposure over a life time.

It is not obvious why Benzene would be elevated or to link this finding to a specific product used in the school or to a contaminant from another location. The level of this compound is many magnitudes below the OSHA and NIOSH exposure levels for a worker exposed in an occupational setting.

The screening conducted as part of this indoor air quality assessment is not sufficient to determine the cause or significance of these findings. The level detected suggests that additional investigation is needed including an assessment and inventory of cleaning and other products used within the school. Levels of VOC's within a building can be influenced by a number of variables including seasonal influences and maintenance activities. Follow-up testing for VOC's is recommended to determine the consistency of the levels measured. Previous sampling within the school conducted in October 2020, did not find elevated levels of this compound.

Please do not hesitate to call if you have any questions.

Sincerely,



John P. Madigan