Report For
Indoor Air Quality Testing
At The
Wilkins School
80 Boston Post Road
Amherst, NH

Study Date:
April 3, 2019

Project# 219 193.00

STUDY CONDUCTED BY:

UNIVERSAL ENVIRONMENTAL CONSULTANTS
12 Brewster Road
Framingham, Massachusetts

UEC universal environmental consultants

April 4, 2019

Mr. John Robichaud
Director of Facilities
SAU-39
1 School Street, P.O. Box 849
Amherst, NH 03057

Reference: Indoor Air Quality Testing
Wilkins School, Amherst, NH

Dear Mr. Robichaud:

Thank you for the opportunity for Universal Environmental Consultants (UEC) to provide professional services.

Enclosed please find the report for Indoor Air Quality Testing at the Wilkins School conducted on Wednesday, April 3, 2019.

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

Very truly yours,

Universal Environmental Consultants

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Ammar M. Dieb
President

UEC:\219 193.00\IAQreport-WS.DOC

Enclosure

1.0 Scope:

UEC was contracted to perform an Indoor Air Quality Testing at the Wilkins School, Amherst, NH. Testing was performed at select areas within the school.

Testing was performed on Wednesday, April 3, 2019.

2.0 Methodology:

Air testing was conducted for the following. The sample length at each test location was 2 minutes.

- Total Volatile Organic Compounds (***TVOCs***).
- Carbon Dioxide (***CO_2***), Carbon monoxide (***CO***), Temperature (***˚F***) and Relative Humidity (***RH %***).

Testing for ***TVOCs*** referenced to isobutylene was performed using a Rae Systems ppbRae3000 Photo-Ionization Detector (PID) model PGM7340 equipped with a 10.6 eV lamp (S/N 594-903008). This is a state of the art instrument capable of detecting total ***TVOCs*** in the parts per billion (ppb) range. The instrument is a direct reading monitor and provided sampling readings at 1 second intervals over the duration of each test. The instrument was calibrated prior to testing and is serviced annually by the manufacturer or an independent vendor.

TVOCs are a broad class of chemicals with diverse applications which are frequently emitted by new carpets, furniture, pressboards, varnishes, adhesives and high gloss finishes. Other common products which may emit ***TVOCs*** include paints, paint strippers, other solvents, wood preservatives, aerosol sprays, cleansers, disinfectants, moth repellents, air fresheners, stored chemicals and fuels, automotive products, hobby supplies, and dry-cleaned clothing. Elevated levels of ***TVOCs*** are a common IAQ problem, especially in newly constructed buildings.

Carbon Dioxide (***CO_2***), Carbon monoxide (***CO***), Temperature (***˚F***) and Relative Humidity (***RH %***) were measured using a TSI Corporation Q-Trak 7575 (S/N 7575X1337003) with a 982 probe (S/N P13350004). The instrument is a direct reading monitor that utilizes infrared technology to measure ***CO_2*** and an electro-chemical cell to measure ***CO*** and provided sampling readings at 1 second intervals over the duration of each test. The instrument was calibrated prior to testing and is serviced annually by the manufacturer or an independent vendor.

CO_2 is a useful measure of ventilation effectiveness in spaces occupied by people (i.e. verification that sufficient fresh air is being introduced into the occupied space being tested). Indoor ***CO*** levels were measured comparatively with outside levels to verify whether sources such as boiler and vehicle exhausts were causing elevated indoor ***CO*** levels. ***CO_2*** and ***CO*** were measured in parts per million (ppm). Temperature and relative humidity readings were taken to verify indoor levels were within ASHRAE[1] comfort ranges.

Samples results are attached.

[1] ASHRAE = American Society of Heating, Refrigeration and Air-conditioning Engineers.

3.0 Results:

The ppbRAE 3000 monitor was used to measure ***TVOCs*** in µg/m$^{3.}$

TEMPERATURE, RELATIVE HUMIDITY, CARBON MONOXIDE, CARBON DIOXIDE & TOTAL VOLATILE ORGANIC COMPOUNDS by PID

Location	W	D	#	Temperature (°F)	Humidity %RH	CO (ppm)	CO_2 (ppm)	TVOCs (µg/m^3)
Outside	-	-	-	44.9	53.5	0.0	457	0.0
Gymnasium	C	O	30	66.2	35.9	0.0	791	25
Main Office	C	O	2	72.1	30.5	0.0	858	41
Library	C	O	1	73.7	25.6	0.0	831	46
Room 2	C	O	15	74.0	27.2	0.0	1,039	92
Room 4	C	O	19	74.1	27.8	0.0	1,134	52
Nurse	C	O	1	73.2	26.5	0.0	889	80
Room 12	-	O	0	74.1	25.1	0.0	830	75
Room 13	C	O	23	73.8	36.0	0.0	2,127	172
Room 9	C	C	0	72.1	28.1	0.0	1,115	156
Room 10	C	0	3	73.2	25.7	0.0	960	124
Room 14	C	0	0	71.0	26.6	0.0	923	156
Room 15	C	0	8	72.0	27.3	0.0	1,062	121
Room 11	C	0	20	73.7	30.7	0.0	1,433	416
Room 22	C	C	4	71.5	27.2	0.0	592	29
Room 28	C	C	21	72.5	33.2	0.0	1,773	108
Room 34	C	C	17	69.3	44.8	0.0	2,895	338

Legend:

W: Windows; D; Doors; # Number of Occupants (e.g. 25 Occupants = 25); O = Open; C = Closed;
mg/m^3 - milligrams per cubic meter; µg/m^3 - micrograms per cubic meter;
ppm - parts per million;
ppb - parts per billion;
CO OSHA PEL is 30 ppm and ACGIH TLV is 25 ppm;
CO_2 - OSHA PEL is 5000 ppm, Mass DOH Guideline is 800 ppm;
TVOC – Seifert "Target Guideline Value" of 0.3 mg/m^3

4.0 Observations and Interpretation of Results:

Temperature and Relative Humidity (T & RH):

The outside temperature and relative humidity were approximately 44.9ºF and 53.5%. It is recommended that indoor air temperatures be maintained in a range of 70 - 78 ºF and 35 to 55 % for indoor air relative humidity in order to provide for the comfort of building occupants.

The interior temperature and relative humidity were 66.3 – 74.1 ºF and 25.1 – 44.8 % during the test period. Interior temperature tests were mostly within than the recommended comfort temperature range of 70 - 78 ºF. Interior relative humidity tests were lower than the recommended comfort relative humidity range of 35 to 55 %.

TVOCs:

TVOC tests on this day were mostly lower than the Seifert "Target Guideline Value" of 300-µg/m^3 (0.3 mg/m^3). Levels at the Rooms 11 and 34 were higher than the Seifert "Target Guideline Value" of 300-µg/m^3. The Seifert Target Guideline Value (reference #3 and #8 below) is a widely recognized ***TVOCs*** guideline for pollutant levels based on Seifert's personal judgment, rather than on toxicological data, for long term exposure. Seifert proposed that 1 week after completion of construction or renovation ***TVOC*** concentration of 50 times higher be acceptable (i.e. 15 mg/m^3) and after 6 weeks, 10 times higher be acceptable (i.e. 3 mg/m^3). ***TVOCs*** test levels were between 0.025 and 0.416 mg/m^3, mostly lower than the Seifert target guideline of 0.3 mg/m^3, but much lower than the 1-week and 6-week post-construction/renovation acceptable limits of 15 mg/m^3 and 3 mg/m^3.

Neither OSHA (Occupational Safety and Health Administration) nor ACGIH (American Conference of Governmental Industrial Hygienists) promulgates exposure standards for ***TVOCs*** that relate to protection of the general population as opposed to industrial occupational standards. Both have limits on individual VOCs but they relate to industrial occupational standard.

The testing conducted was of short duration and did not assess representative full-day occupancy levels. Measurements were made using a real-time, portable ***TVOC*** monitor referenced to isobutylene and not by sample collection for individual VOC analysis by gas chromatography technique and evaluation based on Seifert's chemical classes.

Mølhave of Denmark reported at INDOOR AIR '90 (reference #8 below) on low levels of indoor air VOCs and human health. Bearg summarized Mølhave's findings as follows.

Table 4.5 Tentative Dose-Response Relationship for Discomfort Resulting from Exposure to Solvent-Like VOCs

Total concentration (mg/m^3)	Irritation and discomfort	Exposure
< 0.20	No irritation or discomfort	The comfort range
0.20 - 3.0	Irritation and discomfort possible if other exposures interact	The multifactorial exposure range
3.0 – 25	Exposure effect and probable headache possible if other exposures interact	The discomfort range
> 25	Additional neurotoxic effects other than headache may occur	The toxic range

TVOCs test levels were between 0.025 and 0.416 mg/m^3 (The multifactorial exposure range). It is recommended either a ventilation system be installed or windows are opened several times during the day to introduce fresh air into the rooms.

Bearg points out that the overlap between Seifert's and Mølhave's recommendations could be interpreted as a consensus on recommendations for guideline values.

Carbon Monoxide:
No ***CO*** levels were detected during testing.

Carbon Dioxide:
CO_2 levels were mostly lower than acceptable range. ***CO_2*** levels in rooms 2, 4, 13, 15, 28 and 34 were higher than recommended levels. For comparative purposes, fresh outdoor air has approximately 400 ppm of ***CO_2***. All areas were well below the OSHA/NIOSH limit of 5000 ppm and mostly lower than the State of New Hampshire recommended guideline of 1,000 ppm for publicly occupied office buildings. We use this value as a reference for schools. Exposure to high levels of ***CO_2*** for prolonged periods could cause building occupants to become lethargic and generally uncomfortable. ***CO_2*** levels will rise over the course of the day especially in those areas which have a high occupancy. ***CO_2*** at these levels are a comfort as opposed to a health issue.

It is recommended either a ventilation system be installed, or windows are opened several times during the day to introduce fresh air into the rooms.

5.0 Limitations and Conditions:

This report has been completed based on visual and physical observations made and information available at the time of the site visits. This report is intended to be used as a summary of available information on existing conditions with conclusions based on a reasonable and knowledgeable review of evidence found in accordance with normally accepted industry standards, state and federal protocols, and within the scope and budget established by the client. Any additional data obtained by further review must be reviewed by UEC and the conclusions presented herein may be modified accordingly.

This report and attachments, prepared for the exclusive use of Owner for use in an environmental evaluation of the subject site, are an integral part of the inspections and opinions should not be formulated without reading the report in its entirety. No part of this report may be altered, used, copied or relied upon without prior written permission from UEC, except that this report may be conveyed in its entirety to parties associated with Owner for this subject study.

REFERENCES:

1. ACGIH, Threshold Limit values and Biological Exposure Indices, 2007.
2. AIHA, 2700 Prospect Ave., Fairfax, VA. IAQ Paper #130 June 23, 1999.
3. Seifert, B. Regulation Indoor Air. In: Indoor Air '90, Proceedings of the 5th International Conference on Indoor Air Quality and Climate, Volume V, p. 35. Toronto1990.
4. American Society of Heating, Refrigeration and Air-conditioning Engineers' ANSI/ASHRAE 55-1992 **"Thermal Environmental Conditions for Human Occupancy.**"
5. BOCA, 1993. The BOCA National Mechanical Code 1993 8th edition Building Officials and Code Administrators International., Inc., Country Club Hills, Ill
6. SBBRS, 1997. Mechanical Ventilation, State Board of Building Regulations and Standards Code of Massachusetts Regulations 780 CMR 1209.0
7. Field Guide for the Determination of Biological Contaminants in Environmental Samples. (2005)
8. Bearg, David W. Indoor Air Quality and HVAC Systems. (1993). Pages 76, 77 and others.