



INDOOR AIR QUALITY ASSESSMENT: 1980s BUILDING DURING CONSTRUCTION

**Lowell High School
50 Father Morissette Blvd,
Lowell, MA**

Prepared For:

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1. INTRODUCTION

Cashins & Associates, Inc. was retained by Suffolk Construction to provide professional industrial hygiene consulting services. Our scope of work consisted of measuring various basic indoor air quality parameters in certain locations within the Lowell High School 1980s Building, located at 50 Morissette Blvd in Lowell, Massachusetts. Suffolk Construction is in the process of renovating sections of the Lowell High School campus as part of its Phase II project. Suffolk requested that Cashins perform routine IAQ surveys of the occupied side of the high school.

This assessment took place on Tuesday, June 27, 2023. This indoor air quality assessment focused on the non-construction areas of the 1980s school building.

On the day of the survey, there were no students or teachers inside the building as summer vacation had just started a week prior. The school had a limited number of cleaning crews and maintenance workers performing light menial tasks.

It was observed that the construction of the new five-story Freshman academy had progressed. A connector to the 3rd floor of the older 1980's building has completed the framing stage. Minimal levels of dust and VOCs were observed throughout the school; showing that this new construction phase has not affected air quality inside the school.

2. METHODOLOGIES

Sampling was performed between 8:30 am and 10:30 am. This is important because as the day progresses, any possible air contaminants can build up without the assistance of a properly functioning ventilation system to dilute and remove them. The concentrations of contaminants were collected at each sample location for a two-minute average.

A BW Gas-Alert 4-gas meter was used to measure carbon monoxide in the school.

Dust concentrations were measured using a TSI SidePak air sampler. This real-time aerosol monitor measures both respirable and thoracic fractions, with optimal responses to particles in the 0.1-10 micron size range.

A RAE Instruments part per billion photo-ionization detector (PID) was utilized to screen for the presence of TVOC. The PID is a screening tool that provides information as to total volatile organic compound loading in the sample space. The instrument does not provide information pertaining to which specific compounds are present in the air.

Results of real-time IAQ measurements are reported in Table 1 in Appendix A.

3. FINDINGS

Findings: Basic IAQ Parameters

We have listed in Table 1 the results of the real-time air sampling. These tables can be found in Appendix A of this report.

The particulate dust concentrations remained relatively low during this assessment.

The carbon monoxide concentrations were not detectable.

It was observed that background VOC levels consistently remained low, only reaching as high as 151ppb. These readings show what the background levels are when there are no students and teachers throughout the school.

4. DISCUSSION

Particulate Matter

There are currently no standards for Fine Particulate Matter (PM-10) in an indoor environment. The EPA has developed ambient air standards measured over 24 hours, which are referred to as National Ambient Air Quality Standards. The recommended guideline for PM-10 Dust is 150 micrograms per cubic meter for particulate matter. This value is often used as a guideline to assess indoor air quality but was not designed for that purpose.

Carbon Monoxide

Carbon monoxide is a byproduct of combustion engines. Carbon monoxide concentrations above 5 ppm would be considered a trigger condition, which means to investigate, eliminate, and control the source (D. Jeff Burton IAQ and HVAC Handbook 2002). According to the National Ambient Air Quality Standard (NAAQS), the concentration of CO should be below 9 ppm.

Volatile Organic Compounds

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs come from paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions. Organic chemicals are widely used as ingredients in household products. Paints, varnishes, and wax all contain organic solvents, as do many cleaning, disinfecting, cosmetic, degreasing, and hobby products.

Global consensus has resulted in the emergence of preliminary guidelines for Total Volatile Organic Compound (TVOC) standards for indoor air quality. By all accounts, the IAQ TVOC threshold for normal office environments is 500 ppb (0.5 ppm).

It should be noted that the indoor environment is a very complicated ecosystem, with countless variables affecting human comfort and health. These variables change constantly over time and are affected by things such as occupancy, time of year, outdoor temperature, humidity levels, and many more. This survey was not meant to be a comprehensive assessment of every aspect of the indoor air, but rather a general screening meant to determine whether key indoor air quality parameters are within the "normal" range.

Many factors contribute to the actual and perceived air quality within an occupied building, including variable comfort requirements, individual sensitivities, allergic responses, the amount of ventilation, changes in building or HVAC conditions, and many other variables. Thus, routine testing may or may not address all factors that are contributing to air quality issues. Also, because of the vast number of possible air contaminants, and the limitations of this assessment, not all aspects of indoor air were assessed during this visit. Follow-up testing or evaluation would be necessary at an additional cost to more thoroughly assess additional IAQ concerns.

Indoor air quality should be monitored on a regular basis throughout this project in order to ensure that concentrations of various airborne contaminants remain at acceptable levels.

Please call if you have any questions or if we can be of further assistance.

Sincerely,
Cashins & Associates, Inc.

Reviewed by,



Bret D. Bradley
IH & Building Sciences Consultant



Michael R. Cashins, CIH
Director of Consulting Services

APPENDIX A

RESULTS OF REAL-TIME AIR SAMPLING

Table 1: Real-time Air Quality Readings

<i>Location</i>	<i>CO (ppm)</i>	<i>TVOC (ppb)</i>	<i>Dust ($\mu\text{g}/\text{m}^3$)</i>
Guideline Limits	5.0	500	150
1980 Building – 8:30am			
Outside Side Entrance	<1	2	12
1 st Floor Center of Cafeteria	<1	28	10
1 st Floor @Kitchen / Café	<1	7	8
1 st Floor Entrance to Cafeteria	<1	10	8
1 st Floor @Office 452A	<1	7	9
1 st Floor Corridor Outside Support	<1	39	10
1 st Floor @Student Support Office	<1	30	8
1 st Floor @ Old Main Office Reception	<1	39	7
1 st Floor Corridor @ Nurses Office	<1	41	7
1 st Floor @ College & Career Center	<1	42	5
1 st Floor SW Stairwell Vestibule	<1	39	10
2 nd Floor Teacher’s Lounge Center	<1	95	8
2 nd Floor Classroom 537	<1	39	11
2 nd Floor Classroom 527	<1	45	13
2 nd Floor Classroom 525	<1	38	12
2 nd Floor Classroom 535	<1	42	9
2 nd Floor Classroom 522	<1	50	15
2 nd Floor Corridor @ Old Library	<1	15	15
2 nd Floor Inside Office 553	<1	38	12
2 nd Floor Classroom 556	<1	44	8
2 nd Floor Stairwell 7	<1	56	15
3 rd Floor Classroom 648	<1	14	21
3 rd Floor Classroom 656	<1	9	19
3 rd Floor Classroom 643	<1	41	12
3 rd Floor Corridor@ Old Media Center	<1	38	13
3 rd Floor Classroom 623	<1	54	12
3 rd Floor Classroom 625	<1	62	10
3 rd Floor Classroom 628	<1	54	22

Parts Per Billion: 500ppb = 0.5ppm

Table 1: Real-time Air Quality Readings

<i>Location</i>	<i>CO (ppm)</i>	<i>TVOC (ppb)</i>	<i>Dust ($\mu\text{g}/\text{m}^3$)</i>
Guideline Limits	5.0	500	150
1980 Building – 9:30am			
Outside Side Entrance	<1	42	18
1 st Floor Center of Cafeteria	<1	72	22
1 st Floor @Kitchen / Café	<1	75	14
1 st Floor Entrance to Cafeteria	<1	76	10
1 st Floor @Office 452A	<1	79	12
1 st Floor Corridor @ Student Support	<1	92	11
1 st Floor @Student Support	<1	96	9
1 st Floor @ Old Main Office Reception	<1	84	11
1 st Floor Corridor @ Nurses Office	<1	88	14
1 st Floor @ College & Career Center	<1	84	17
1 st Floor SW Stairwell Vestibule	<1	89	10
2 nd Floor Teacher’s Lounge Center	<1	151	4
2 nd Floor @Classroom 537	<1	91	13
2 nd Floor @Classroom 527	<1	88	16
2 nd Floor @Classroom 525	<1	85	20
2 nd Floor @Classroom 535	<1	86	19
2 nd Floor @Classroom 522	<1	87	14
2 nd Floor Corridor @ Old Library	<1	72	23
2 nd Floor Inside Office 553	<1	85	15
2 nd Floor @Classroom 556	<1	90	17
2 nd Floor Stairwell 7	<1	81	19
3 rd Floor @Classroom 648	<1	64	26
3 rd Floor @Classroom 656	<1	60	36
3 rd Floor @Classroom 643	<1	99	32
3 rd Floor Corridor @ Old Media Center	<1	94	25
3 rd Floor @Classroom 623	<1	114	22
3 rd Floor @Classroom 625	<1	116	14
3 rd Floor @Classroom 628	<1	95	20

Parts Per Billion: 500ppb = 0.5ppm