



**INDOOR AIR QUALITY ASSESSMENT:  
1980s BUILDING DURING CONSTRUCTION**

---

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

**Prepared For:**

Rex Radloff  
Senior Project Manager  
Suffolk Construction  
65 Allerton Street  
Boston, MA 02119

**Prepared By:**

Bret Bradley  
IH & Building Sciences Consultant  
Cashins & Associates  
599 North Avenue, Suite 8  
Wakefield, MA 01880

**Job #: 7455-15**

**December 21, 2022**

## Contents

1. INTRODUCTION .....	3
2. METHODOLOGIES .....	3
3. FINDINGS .....	4
Findings: Basic IAQ Parameters .....	4
4. DISCUSSION .....	4
<b>Table 1: Real-time Air Quality Readings</b> .....	7

## APPENDIX A: RESULTS OF REAL-TIME AIR MONITORING

## 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. Now that teachers and students are occupying the 1980's building, Suffolk requested that Cashins perform routine IAQ surveys of the occupied side of the high school.

This assessment took place on Wednesday, December 21, 2022.

This indoor air quality assessment focused on the occupied areas of the 1980s building.

## 2. METHODOLOGIES

---

Sampling was performed between 9:00 am and 11:00 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 Gas-Alert 4-gas meter was used to measure carbon monoxide in the school.

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 space. The instrument does not provide information pertaining to which specific compounds are present in the air.

Dust concentrations were measured using a TSI SidePak™ dust meter. This personal aerosol monitor is a light-scattering laser photometer that provides real-time aerosol mass concentration and response concentration readings of respirable dust.

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 low during this assessment. It was observed that background VOC levels consistently remained in the low hundreds of parts per billion (ppb). This is most likely due to the use of magic erase markers, cleaning sprays, hand sanitizers, and aerosol sprays in the building's classrooms and offices.

Levels of VOCs in the hundreds of ppb are not uncommon in an active school environment where a lot of students and teachers use an assortment of scents, chemicals, cleaners, and supplies that off-gas VOCs.

It has been observed that classrooms either don't have windows or don't open them, and some classrooms keep the doors closed. The air circulation in classrooms is perceived as poor compared to the hallways. Poor airflow/exchange and inadequate fresh air circulation in the classrooms can lead to air conditions that people will find uncomfortable.

### 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.

**CASHINS & ASSOCIATES, Inc.**

599 North Avenue, Suite 8 • Wakefield, MA 01880 • Phone: 781-245-1400 • Fax: 781-245-3100

G:\Client Files\Suffolk Construction Company\2022-7455 Lowell High School Project\7455-15 Phase 2 Routine IAQ Surveys\SUF7455-15 Routine IAQ Survey 12-21-22.docx

Symptoms associated with elevated exposure to VOCs include eye irritation, swollen eyelids, nasal inflammation, nasal congestion, dry throat, sore throat, headache, abnormal tiredness, the sensation of getting a cold, and facial itch. 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.



Bret D. Bradley  
IH & Building Sciences Consultant

Reviewed by,



Michael R. Cashins, CIH  
Director of Consulting Services

**CASHINS & ASSOCIATES, Inc.**

## **APPENDIX A**

### **RESULTS OF REAL-TIME AIR SAMPLING**

**CASHINS & ASSOCIATES, Inc.**

599 North Avenue, Suite 8 • Wakefield, MA 01880 • Phone: 781-245-1400 • Fax: 781-245-3100

**Table 1: Real-time Air Quality Readings**

<i>Location</i>	<i>CO (ppm*)</i>	<i>TVOC (ppb*)</i>	<i>Dust (<math>\mu\text{g}/\text{m}^3</math>)</i>
<b>Guideline Limits</b>	<b>5.0</b>	<b>500</b>	<b>150</b>
<b>1980 Building – 9am</b>			
Outside Side Entrance	<1	96	32
1 <sup>st</sup> Floor Center of Cafeteria	<1	148	28
1 <sup>st</sup> Floor Kitchen / Café	<1	147	30
1 <sup>st</sup> Floor Entrance to Cafeteria	<1	128	33
1 <sup>st</sup> Floor Office 452A	<1	102	19
1 <sup>st</sup> Floor Corridor Outside Student Support	<1	178	64
1 <sup>st</sup> Floor Student Support Services Office	<1	211	39
1 <sup>st</sup> Floor @ Old Main Office Reception	<1	182	44
1 <sup>st</sup> Floor Corridor Outside Nurses Office	<1	180	26
1 <sup>st</sup> Floor @ College & Career Center	<1	173	22
1 <sup>st</sup> Floor SW Stairwell Vestibule	<1	162	29
2 <sup>nd</sup> Floor Teacher's Lounge	<1	492*	18
2 <sup>nd</sup> Floor Classroom 537	<1	367	34
2 <sup>nd</sup> Floor Classroom 527	<1	380	22
2 <sup>nd</sup> Floor Classroom 525	<1	312	24
2 <sup>nd</sup> Floor Classroom 535	<1	326	34
2 <sup>nd</sup> Floor Classroom 522	<1	330	35
2 <sup>nd</sup> Floor Corridor outside old Library	<1	183	32
2 <sup>nd</sup> Floor Office 553	<1	233	25
2 <sup>nd</sup> Floor Classroom 556	<1	364	20
2 <sup>nd</sup> Floor Stairwell 7	<1	228	21
3 <sup>rd</sup> Floor Classroom 648	<1	376	19
3 <sup>rd</sup> Floor Classroom 656	<1	248	25
3 <sup>rd</sup> Floor Classroom 643	<1	190	21
3 <sup>rd</sup> Floor Corridor outside old media center	<1	153	40
3 <sup>rd</sup> Floor Classroom 623	<1	148	23
3 <sup>rd</sup> Floor Classroom 625	<1	135	32
3 <sup>rd</sup> Floor Classroom 628	<1	183	27

\*elevated level due to cleaning spray used on tables  
 Parts Per Billion: 500ppb = 0.5ppm

**CASHINS & ASSOCIATES, Inc.**

599 North Avenue, Suite 8 • Wakefield, MA 01880 • Phone: 781-245-1400 • Fax: 781-245-3100

G:\Client Files\Suffolk Construction Company\2022-7455 Lowell High School Project\7455-15 Phase 2 Routine IAQ Surveys\SUF7455-15 Routine IAQ Survey 12-21-22.docx

**Table 1: Real-time Air Quality Readings**

<i>Location</i>	<i>CO (ppm*)</i>	<i>TVOC (ppb*)</i>	<i>Dust (<math>\mu\text{g}/\text{m}^3</math>)</i>
<b>Guideline Limits</b>	<b>5.0</b>	<b>500</b>	<b>150</b>
<b>1980 Building – 10am</b>			
Outside Side Entrance	<1	113	27
1 <sup>st</sup> Floor Center of Cafeteria	<1	147	21
1 <sup>st</sup> Floor Kitchen / Café	<1	164	27
1 <sup>st</sup> Floor Entrance to Cafeteria	<1	140	25
1 <sup>st</sup> Floor Office 452A	<1	137	16
1 <sup>st</sup> Floor Corridor Outside Student Support	<1	164	58
1 <sup>st</sup> Floor Student Support Services Office	<1	182	40
1 <sup>st</sup> Floor @ Old Main Office Reception	<1	172	22
1 <sup>st</sup> Floor Corridor Outside Nurses Office	<1	166	31
1 <sup>st</sup> Floor @ College & Career Center	<1	161	19
1 <sup>st</sup> Floor SW Stairwell Vestibule	<1	152	26
2 <sup>nd</sup> Floor Teacher's Lounge	<1	293	19
2 <sup>nd</sup> Floor Classroom 537	<1	281	34
2 <sup>nd</sup> Floor Classroom 527	<1	468*	24
2 <sup>nd</sup> Floor Classroom 525	<1	274	38
2 <sup>nd</sup> Floor Classroom 535	<1	299	32
2 <sup>nd</sup> Floor Classroom 522	<1	265	34
2 <sup>nd</sup> Floor Corridor outside old Library	<1	192	37
2 <sup>nd</sup> Floor Office 553	<1	277	38
2 <sup>nd</sup> Floor Classroom 556	<1	302	18
2 <sup>nd</sup> Floor Stairwell 7	<1	253	22
3 <sup>rd</sup> Floor Classroom 648	<1	309	24
3 <sup>rd</sup> Floor Classroom 656	<1	286	22
3 <sup>rd</sup> Floor Classroom 643	<1	216	24
3 <sup>rd</sup> Floor Corridor outside old media center	<1	196	52
3 <sup>rd</sup> Floor Classroom 623	<1	203	25
3 <sup>rd</sup> Floor Classroom 625	<1	174	21
3 <sup>rd</sup> Floor Classroom 628	<1	218	23

\*Door is closed to maintain heat and room has poor air circulation

Parts Per Billion: 500ppb = 0.5ppm

**CASHINS & ASSOCIATES, Inc.**

599 North Avenue, Suite 8 • Wakefield, MA 01880 • Phone: 781-245-1400 • Fax: 781-245-3100

G:\Client Files\Suffolk Construction Company\2022-7455 Lowell High School Project\7455-15 Phase 2 Routine IAQ Surveys\SUF7455-15 Routine IAQ Survey 12-21-22.docx